ANTENNA SELECTION GUIDE

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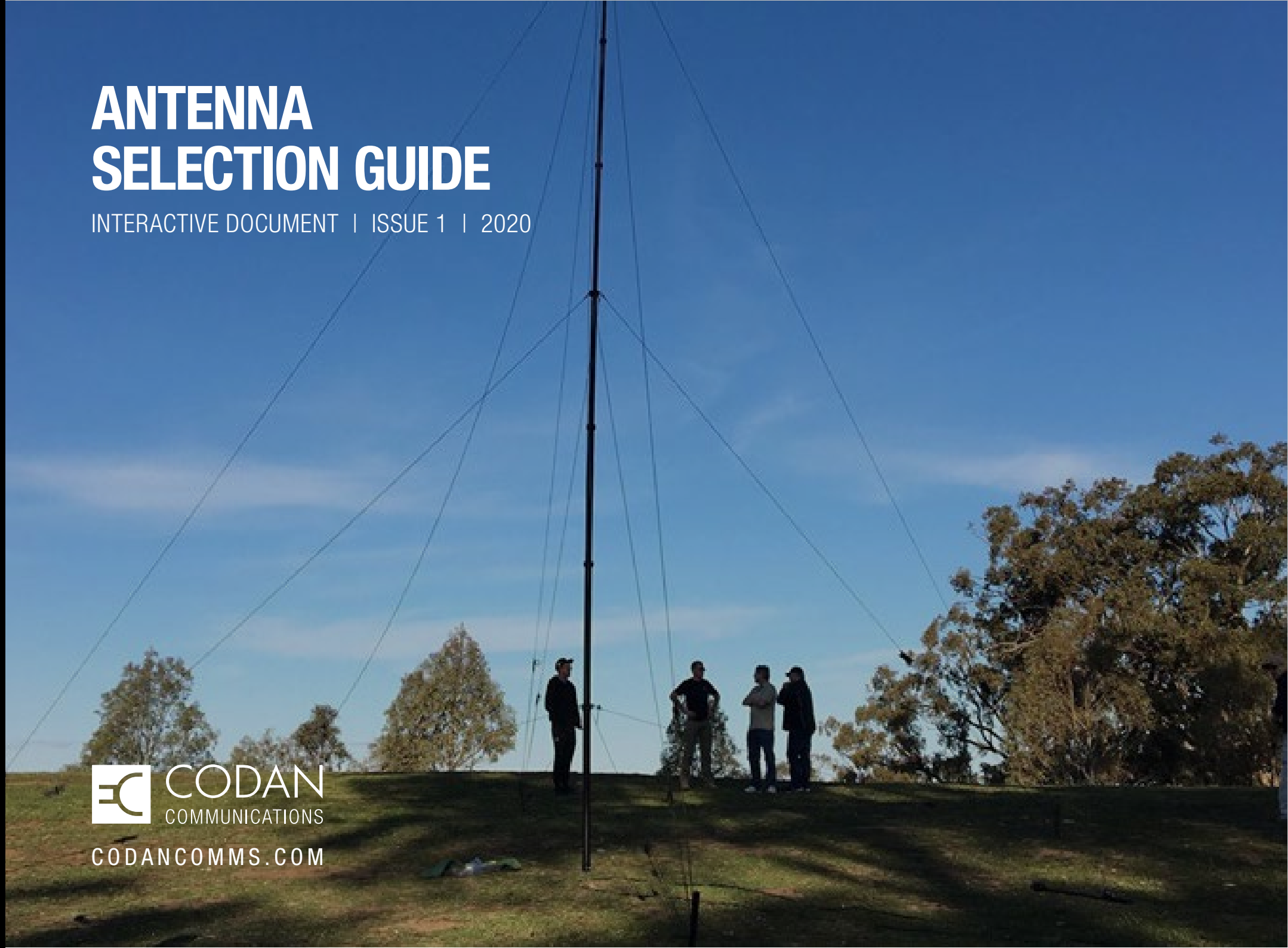

CODAN COMMUNICATIONS

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CONTENT

PURPOSE

The purpose of this Antenna Selection document is to assist in identifying which antenna from Codan's range best suits operational use case and installation specifics for high frequency (HF) communications.

The antenna is a crucial element of HF communications. A high performance radio with a low performance antenna is very unlikely to give good results. An appropriate antenna must be correctly selected and installed in order to ensure good performance.

N.b.: This document is intended to provide the minimum practical understanding necessary to allow an end user with minimal experience in HF communications to select the most appropriate antenna for their specific needs. In the interest of readability and general comprehension by a wide audience, many technical concepts have been deliberately simplified. Many technical terms have been replaced with more familiar non-technical terms. As such, this document is not intended as a training or reference manual.

The document is divided into five sections as listed below:

HF COMMUNICATIONS OVERVIEW

FUNDAMENTAL CRITERIA TABLE

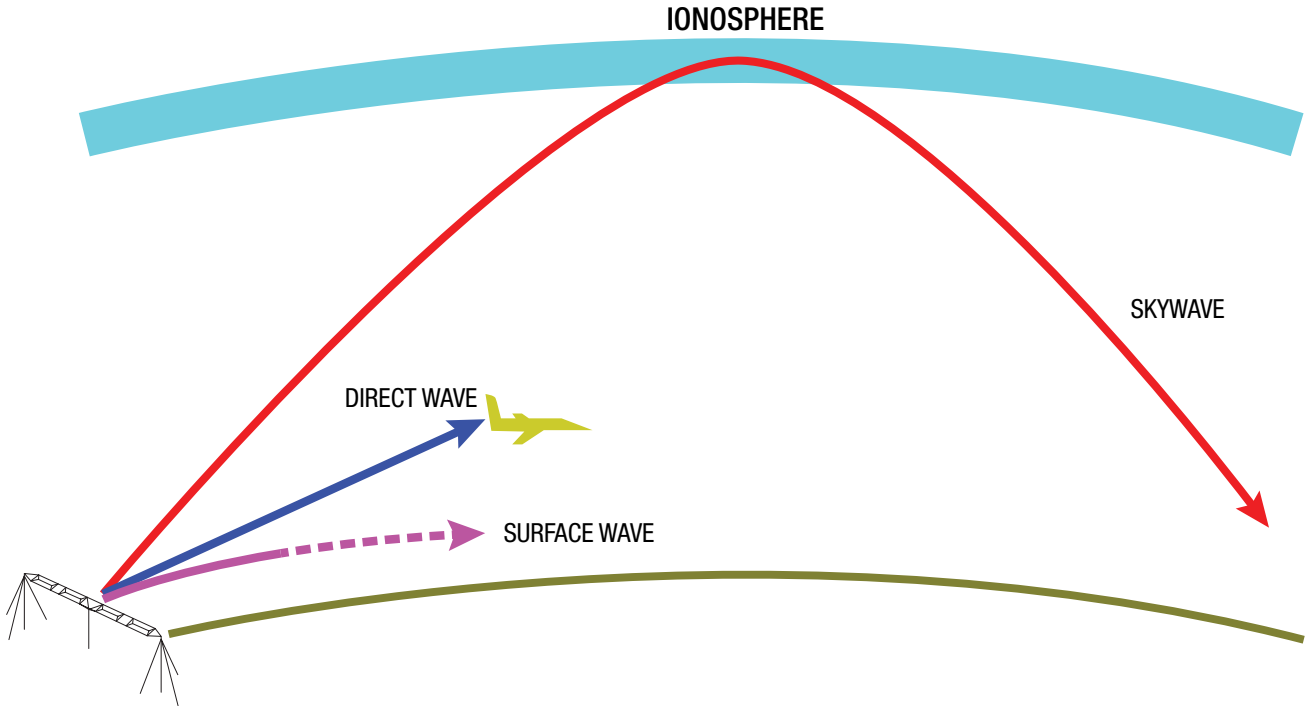
USING THE ANTENNA SELECTION GUIDE

ANTENNA COMPARISON TABLE

DATASHEETS

HF COMMUNICATIONS OVERVIEW

HF communications involves purposefully transmitting a radio signal upwards, relying on electrical charges in the ionosphere to naturally refract (or 'bounce') the signal back down to earth, allowing it to travel much further than with more common direct radio. HF signals can still travel directly, as with VHF or UHF radio communications, or even be carried along surfaces, but the main purpose of HF is to bounce off of the ionosphere to achieve longer distances than those possible with direct communication radios. HF communications use frequencies between 3 and 30 MHz. VHF and UHF communications use much higher frequencies, between 30 to 300 and 300 to 3000 MHz respectively. VHF and UHF communications cannot refract from the ionosphere in the same way as HF.



N.b.: - Achievable distances and signal performance are subject to, among other factors, the quality of installation, use of appropriate antennas on both sides of a radio link, levels of background noise, operator training and frequency selection.

FUNDAMENTAL CRITERIA TABLE

The Fundamental Criteria Table for selecting an antenna covers the basic requirements of a system, e.g. communication distance, frequency range and more. This will help you to complete the Antenna Selection Guide and select the antenna that is most suitable to you.

COMMUNICATION DISTANCE (TYPICAL RANGE): This is the expected maximum to minimum communication distance. Please note that actual distances achieved can vary significantly depending on various factors including channel frequency in use, time of day, geographical location, and quality of installation.

With many of the antennas mentioned in the Comparison tables it is possible to achieve range results far beyond expectations, through meticulous installation of the antenna in the best possible conditions. The distances shown in the table are broad predictions based on an end user with an average level of competency, installing under average conditions.

FREQUENCY RANGE: This is the frequency range over which the antenna is designed to be used. Antennas should not be operated on frequencies outside the specified range.

POWER RATING: This is the RF power level that the antenna is designed for. Antennas must not be operated with RF power level inputs greater than designed for as this could result in damage to the antenna.

BENEFITS / CONSTRAINTS: Key benefits and constraints relating to each antenna are provided to ensure key aspects can be taken into account when identifying possible antenna solutions to match requirements.

PERFORMANCE VALUE: Each antenna in the same category is given score from 1 to 5 for both relative efficiency and price point. A low score translates to lower efficiency / lower cost and a high score translates to a higher efficiency / higher cost. High efficiency antennas will generally provide better communications performance but are larger and generally the more expensive choice.

TYPICAL APPLICATION: Provides a high level summary of the most appropriate applications that the antenna solution is designed for.

DATASHEET: The antenna and mast product datasheets provide additional information to that which is provided in the Antenna Comparison table such as technical specifications, installation requirements and other practical criteria to assist in making a final selection.

USING THE ANTENNA SELECTION GUIDE

1. USING THE ANTENNA SELECTION GUIDE

To ensure the best performance of your HF radio communications network, it is important to select the most appropriate antenna solution for your specific installation and communications requirements. This guide provides important information about Codan base and mobile HF antennas, split between high level comparison tables and detailed product datasheets, to assist the reader in matching solutions to requirements.

An Antenna Selection Form is included within this document to assist you in identifying your key antenna requirements which can then be used to short list suitable antenna solutions that match based on the antenna comparison tables and antenna / mast datasheet details.

Fixed site (base) antennas and mobile (vehicle or boat) antennas function very differently, with different performance characteristics and installation criteria. The Antenna Selection Form and Comparison Tables are divided into separate sections for base and mobile antennas.

Recommended steps to follow are:

1. Read the General Advice for Fixed Site Antenna Selection and Installation (if not already proficient in antenna theory)

and / or

1. Read the General Advice for Mobile Antenna Selection and Installation (if not already proficient in antenna theory)
2. Complete the Antenna Selection Form with your basic antenna requirements
3. Use the Antenna Comparison Tables to identify potential antenna solutions that match your basic requirements and note them down on the form
4. Use the Antenna and Mast product datasheets to confirm other details, such as installation footprint and grounding requirements, where applicable, can be met
5. Identify the specific antenna / mast (if applicable) solution on the forms

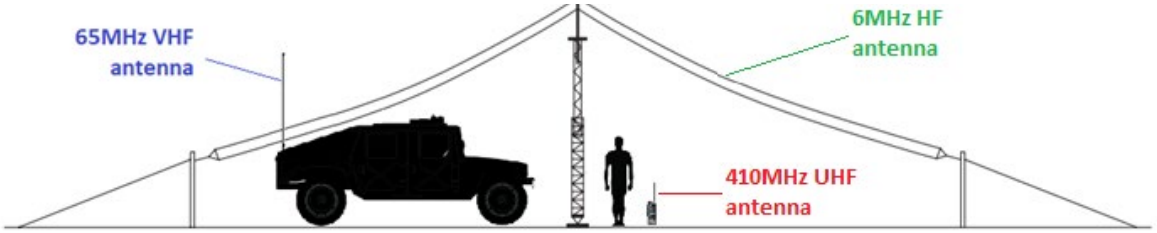
2. GENERAL ADVICE FOR FIXED SITE ANTENNA SELECTION AND INSTALLATION

Different antenna designs have specific properties, such as efficiency, directivity, size and cost. Generally speaking, HF antenna performance is directly proportional to size and cost, that is, a larger, and therefore more expensive antenna will out perform a smaller, cheaper version.

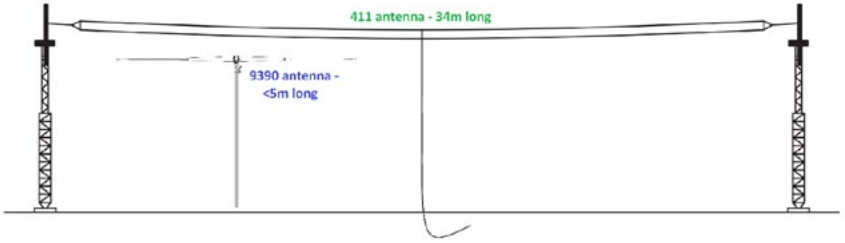
In HF radio:

- Short distance is **generally** classed as less than 400 km (250 miles)
- Medium distance is **generally** classed as 400-1500 km (250 - 1000 miles)
- Long distance is **generally** classed as more than 1500 km (1000 miles)

Compared to other radio types such as VHF or UHF, HF antennas are very large. This is due to their lower operating frequency – lower frequency radios use larger antennas, higher frequency radio use smaller antennas. This comparison can be seen in the examples below.



HF antennas can be designed in different sizes, however, as a broad rule, larger HF antennas will always give a better performance than smaller antennas.



The image above shows two antennas, a large Codan 411 Folded Dipole antenna, and a much smaller Codan 9390 Tuned Dipole antenna. Both antennas can transmit and receive in the same way, but the 411 is more efficient and is likely to provide better overall performance due to its significantly larger size.

This effect is seen very clearly in vehicle communications – vehicles are obliged to use small antennas for reasons of mobility and practicality. The maximum length of a vehicle antenna is slightly shorter than the length of the vehicle itself, typically 2 to 3 metres long. It will never give the same performance as a much larger base antenna.

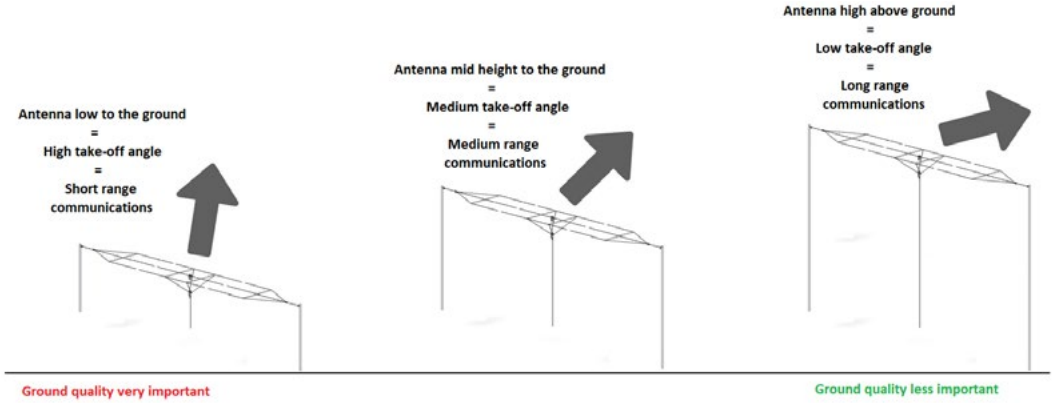
In addition to the antenna radiation pattern the radio site is the most important element of any base radio installation. The best antenna in the world, installed in a bad location, will not perform well. Comparatively even a very basic antenna can, if it is installed in the right location, give excellent performance.

The antenna site will *ideally* be above an empty area of ground. If possible, it should not be mounted on a rooftop. The best possible ground is of adequate size to easily accomadate the antenna, flat with high moisture content – for example green grass, or any flat area of earth with frequent water application.

1 2 3 4

The above images show different ground conditions, ranging from very dry and rocky (1) to very clear and humid (4). 1 may not give good performance. 4 will give the best possible performance.

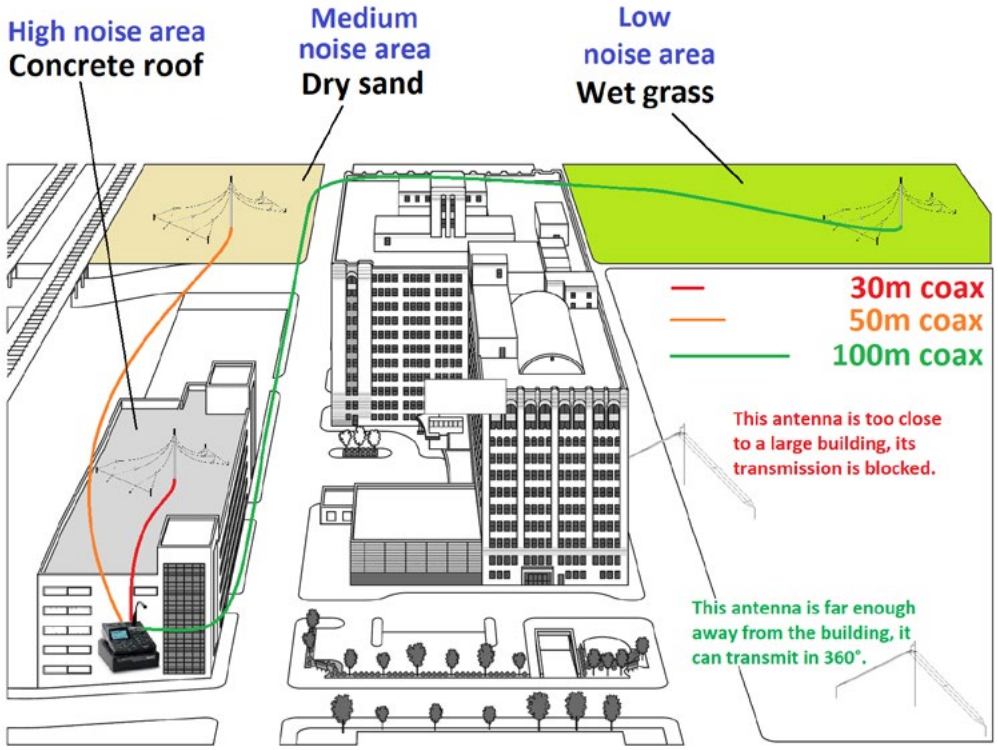
Antenna performance is greatly affected by the ground underneath it. Antennas can be mounted closer to the ground than recommended height to emphasise higher angle radiation to improve shorter distance communications. Generally, an antenna lower down to the ground will give good short distance but poor long distance communications. See 'Take-Off Angle' and 'NVIS' in the Key Terminology section below.



Antennas that are installed close to the ground (for shorter distance communications) require good quality ground underneath them – clear of obstruction and with high moisture content. Dry, rocky, sandy ground is not ideal. For example, achieving short range communications when installing the antenna low to the ground in ground condition 1 would be much less likely than in ground condition 4.

The antenna should not be located directly adjacent to any large buildings, particularly if the antenna is being utilised for low take off angle characteristics. The building will block the antenna's signal in a particular direction.

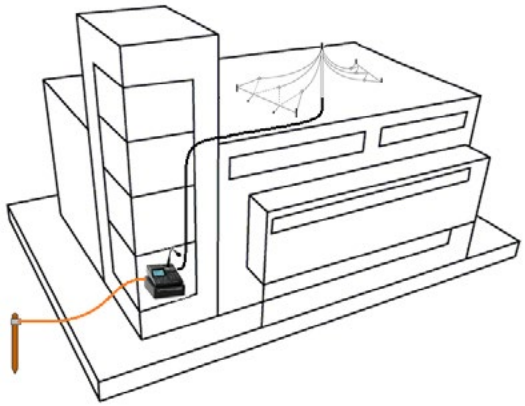
HF radio receivers are highly sensitive and as such are greatly affected by antennas installed in high interference environments. Other radio transmitters, power lines, mains electrical substations, high voltage mains transformers, air conditioning units, electrical machinery, poorly filtered electrical device etc can all generate significant emissions that will be picked up by a nearby HF antenna. If necessary, do not hesitate to position an antenna at a long distance away from the radio transceiver to avoid these sources of interference.



Grounding

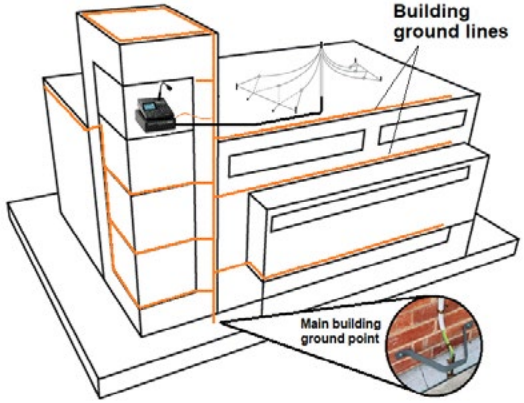
The grounding, or earthing of a radio system has an important effect on quality of communications. Radio transceivers both produce and react to electrical charges that can have a negative effect on overall performance. For that reason, a proper RF ground is vital.

The ideal ground is a direct link from the radio transceiver to an electrically conductive earth point – as in the diagram below.

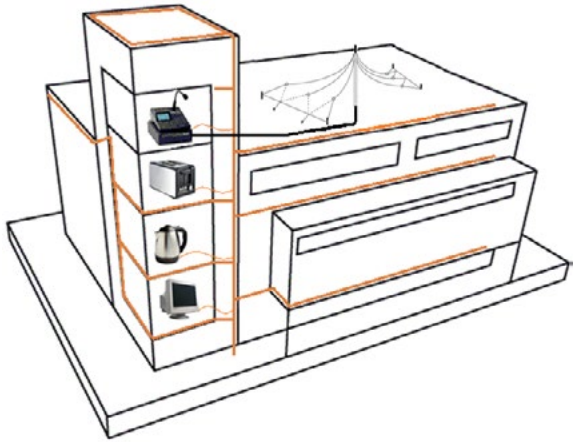


Here, a dedicated earth stake (also known as a grounding rod) has been installed, with a single electrical cable going from the radio transceiver to the earth stake. This earth stake should be in electrically conductive ground – ideally with as high a moisture content as possible.

In some instances, it may be difficult to install a dedicated earth stake just for the radio transceiver. The transceiver may be in a high point with difficult outside access, or the building may be entirely surrounded by concrete. In these instances, it can be easier to link the radio transceiver to a building's existing earth system, as in the diagram below:



This shared system can cause issues if other electrical devices are connected to the same grounding cables, as in the below diagram:



In this example, the three additional electrical devices are connected to the same ground. The sensitive radio transceiver may be picking up electrical noise from the grounding system. In an even worse example, if the main building ground is defective (e.g. corroded or non-conductive), electricity may not even discharge to ground, and be received by the transceiver. In this extreme case, the radio may even function better with no ground at all, rather than the bad shared ground with its electrical noise.

Wherever possible, a radio transceiver should be given its own dedicated grounding system. This system should run directly and as short as possible to a good electrical earth contact. If an existing building ground must be used, ensure that the building ground is efficient, providing good electrical contact, and that no other electrical devices on the shared system are creating electrical interference.

**Please note that using a lightning ground solution is not recommended.

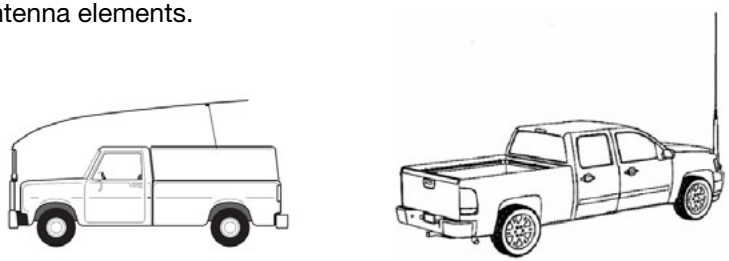
3. GENERAL ADVICE FOR MOBILE ANTENNA SELECTION AND INSTALLATION

Mobile antennas refer to those used on vehicles and boats. While many of the general characteristics of antenna theory are relevant to mobile antennas, three key points are different:

- Mobile antennas are always physically smaller than fixed site antennas
- Due to their small size mobile antennas are inherently less efficient than larger base antennas and is a core reason why good installation practices must be observed
- As a result of being smaller, mobile antennas include tuners to help them transmit and receive (see Broadband / Tuned in the Key Terminology section)

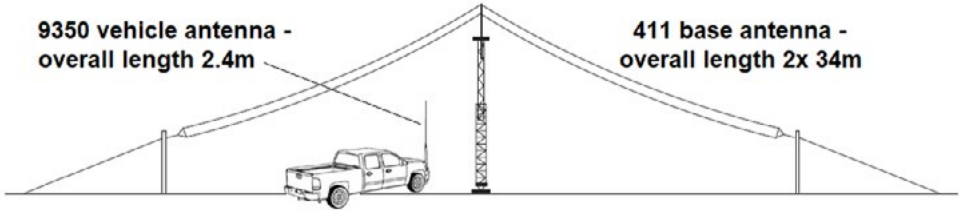
There are some exceptions to the above, but are only relevant to highly specific, typically marine situations, and are beyond the scope of this document.

Mobile HF radios use (outside of a small number of specific models, again beyond the scope of this document) fixed length whip antennas, either mounted vertically or semi-horizontally. It is possible for the radio user to switch between vertical and horizontal antenna systems simply by unscrewing and replacing/reorienting the antenna elements.



Vehicles showing a horizontal and a vertical whip antenna

As mentioned previously, antenna size is directly proportional to antenna performance – generally, a larger antenna will perform better than a smaller antenna. For that reason, a small mobile antenna wont perform as well as a large fixed base antenna. With careful antenna and frequency selection and observing recommended installation practices, these issues can be minimised.



A non-optimised base antenna (e.g. a Codan 411 dipole) may give a good enough performance for base to base communications, but for base to vehicle communications, a more efficient base antenna (such as a TWD, Delta or Whiskey model) may be required.

The two methods of using a mobile whip antenna (vertical or horizontal) give different performances. Primarily, the semi-horizontal method (often referred to as NVIS, see NVIS in the Key Terminology section) allows for a longer antenna, around 4 m instead of 2.4 m. The longer length makes the NVIS antenna perform better than the shorter vertical antenna overall.

The vertical antenna method gives better longer distance communications (above 400 km) than the horizontal NVIS method. This is due to the difference in Take-Off Angles. The vertical antenna often experiences very poor communications in the Skip Zone. Generally, the vertical antenna is recommended for very short (<20 km) and medium (>400 km) communications. For distances above 20 km and below 400 km, the horizontal NVIS antenna is recommended.

Mobile antenna systems must be securely mounted onto the vehicle/boat. Some vehicles are built with compatible antenna mounting points or brackets, for example on the bullbars of civilian 4x4s or on the bodywork of military armoured vehicles. Others may require antenna mounting points or brackets to be fitted.

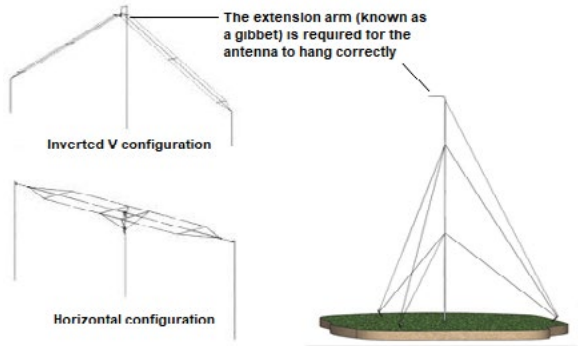
Antenna mounting can have a significant effect on a vehicle radio's ability to communicate. Certain positions on a vehicle can offer good performance, while certain others may block transmission entirely. Codan is able to supply antenna mounting systems that take into account antenna position, height, orientation and earthing, precision-milled to ensure a secure fit and resistance to stress and vibration.

4. ANTENNA MASTS

An antenna mast is a simple concept, but with several key criteria:

1. Overall height
2. Overall weight
3. Ease of installation
4. Wind resistance
5. Compatibility with certain antennas

Of these points, 5 is the most critical, in that certain antennas are not compatible with single mast systems, and require an extension arm. The below images show the Traveling Wave Dipole antenna. The TWD is around 80 cm wide horizontally. As such an ordinary (straight vertical) mast is not suitable when the TWD is in an inverted-V configuration. When in a horizontal configuration however, ordinary straight-up masts may be used.



Other standard antennas, such as the 411 Dipole, Delta, Semi Delta or Whiskey do not require the gibbet mast as above.

Codan's highest performance mast available is the CT15 telescopic mast system. The CT15 can be adjusted to any height up to 15m, and can be quickly assembled or disassembled by two people. The CT15 can not be supplied with a gibbet arm, and as such is not suitable for the TWD antenna in inverted-V format.

The Guyed Mast is available in either 12 or 15 m configuration, composed of separate tubular sections. The Guyed Mast can be supplied with a gibbet arm, and as such is suitable for the TWD antenna in inverted-V format. The Guyed Mast is unsuitable for heavyweight antennas (i.e. the 1 kW variants) in horizontal format, due to the increased weight of the antenna.

The Premium Guyed Mast is available in 10m configuration, composed of separate tubular sections. The Guyed Mast can be supplied with a gibbet arm, and as such is suitable for the TWD antenna in inverted-V format. The Premium Mast is unsuitable for heavyweight antennas (i.e. the 1 kW variants) in horizontal format, due to the increased weight of the antenna.

5. HF PROPAGATION

In order to understand and correctly use the selection criteria listed in this document, it is necessary to understand certain key terms.

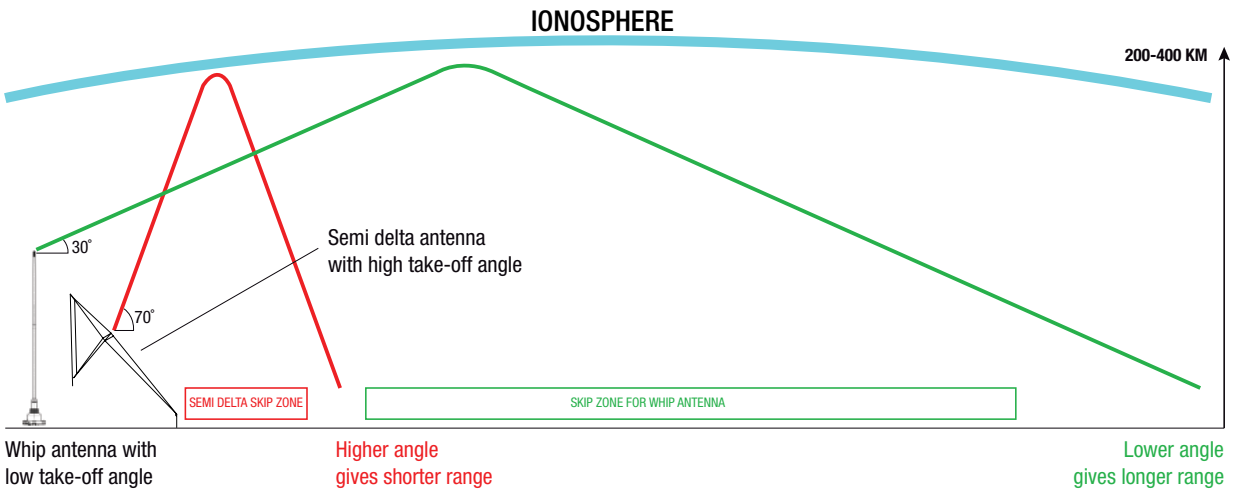
N.b. – the Antenna Selection Guide is intended to help select the correct antenna, it is not intended as an instruction manual. The below explanations have been greatly simplified.

Skywave: Skywave describes long-range HF communication, when a signal is transmitted up to the ionosphere and bounces (or refracts) back down to earth. This type of propagation can be utilised to achieve HF communications over the greatest distances, ranging from hundreds to thousands of kilometres. Actual distances achievable vary greatly depending on a number of factors including channel frequency, time of day, time of year, solar activity, RF power level, antenna radiation patterns and receiver interference.

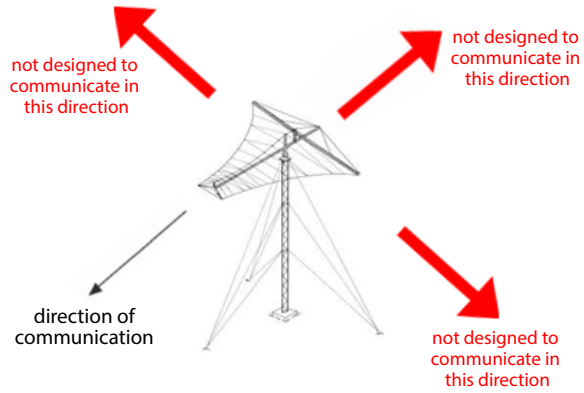
Surface / Ground Wave: A groundwave or surface wave is a signal that carries a short distance from the antenna along the Earth's surface, making this type of propagation ideal for very short range local communication. Groundwave communication distance varies significantly depending on transmit power, the actual ground conditions local to the region of communications, frequency and antenna type.

NVIS: Near Vertical Incidence Skywave propagation occurs when signals are radiated at a very high angle, almost vertically upwards. Because of this very high angle, the signals come back down to earth at short ranges. NVIS propagation can be utilised to minimise the 'skip-zone' (see 'Skip zone' below).

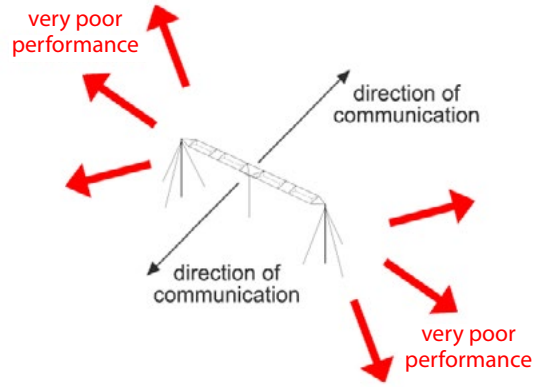
Skip Zone: This refers to a 'dead zone' where HF communications are unachievable. It is the area after which surface wave and direct communications stop, and before skywave communications begin. The skip zone is often a problem for vehicles attempting to communicate back to their own base of origin. While its size is dependent on many factors, it typically exists between 20 and 80 km from a radio station. The skip zone can be reduced or eliminated using NVIS antennas.



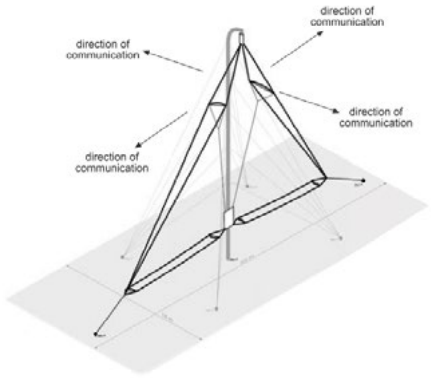
Directional / Mono-directional: A directional antenna communicates very efficiently in one particular direction (or azimuth), but almost not at all in any other direction. This would be seen in the case of a single isolated site that communicates back to one unique location. For example, an overseas embassy that communicates back to its home country's capital city using a log periodic antenna, or a group on foot that conducts patrols away from and talks back to their base of origin using a tuned wire antenna.



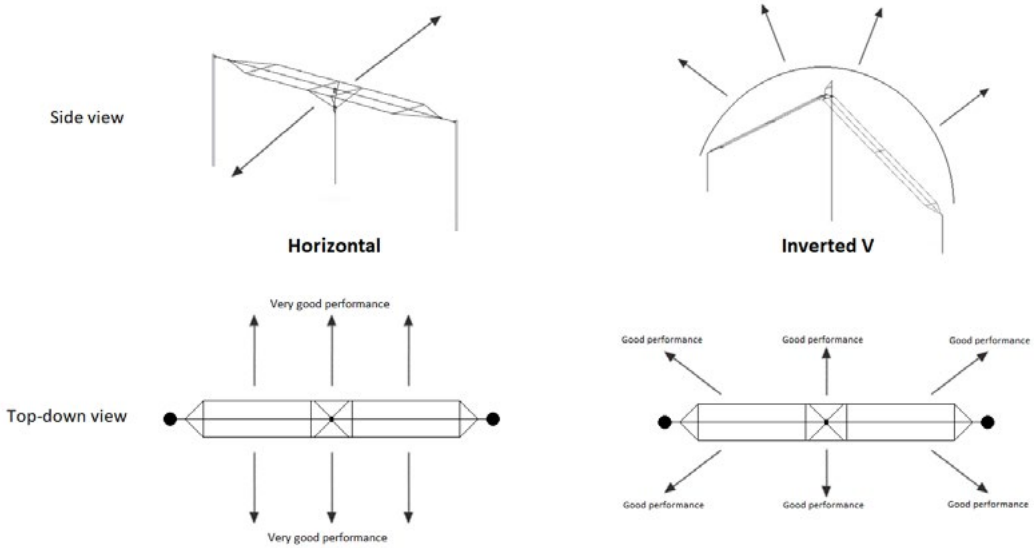
Bi-directional: A bidirectional antenna communicates well in two distinct directions, at 180° angles to each other – e.g. it typically radiates mostly in directions broadside to the plane of the antenna, but much less from the ends. A horizontal antenna such as the TWD shown below is typically bi-directional (see Horizontal / Inverted V below).



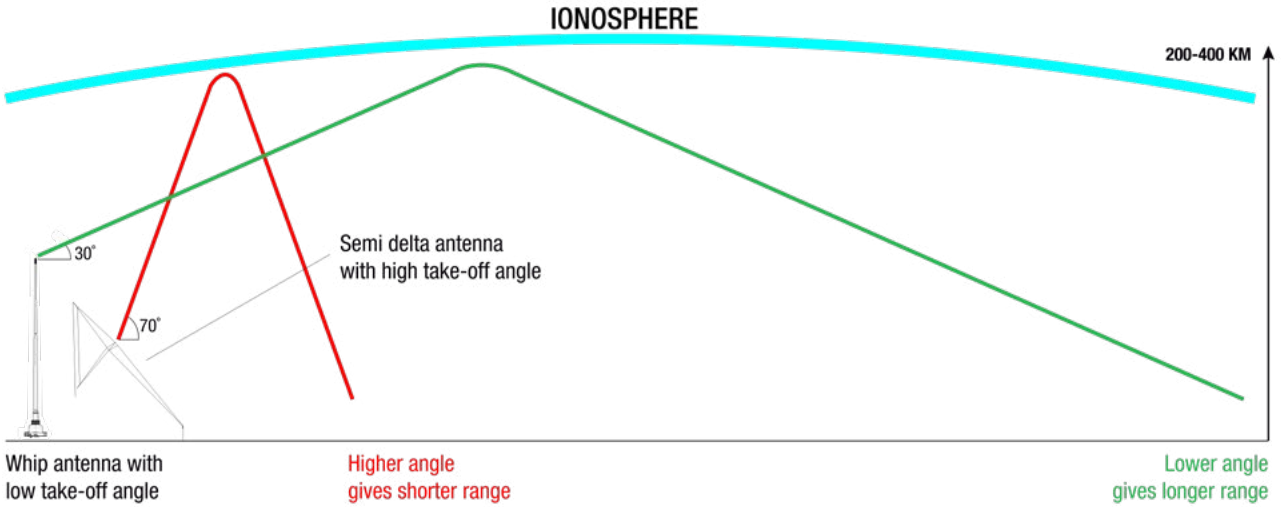
Omnidirectional: An omnidirectional antenna communicates in 360°, giving coverage in every direction. Antennas such as the Whiskey model, Full Delta shown below or vertical whips are all omni-directional.



Horizontal / Inverted V: Some antennas, such as Terminated Folded Dipole (TFD), Travelling Wave Dipole (TWD) and manpack dipoles can be installed in multiple configurations. The two most common configurations are horizontal and inverted V. Generally a horizontal antenna can give very good performance bi-directionally. An inverted V antenna can give good performance omni-directionally.

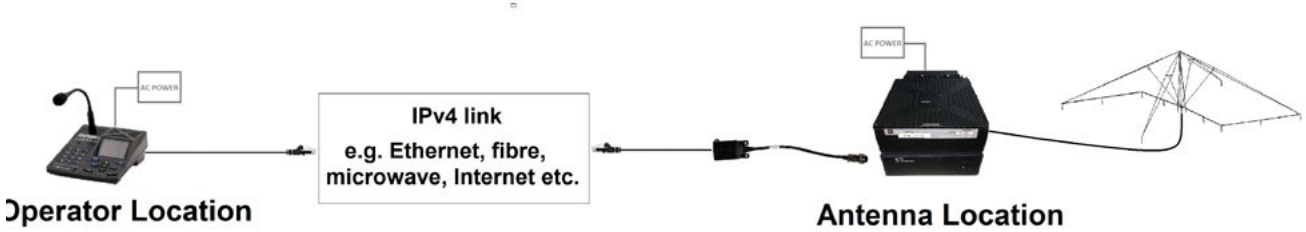


Take-Off Angle (also referred to as elevation): Just as different antennas perform differently in different horizontal directions, antennas also have particular performances vertically. These differences can decide the distance an antenna can communicate over.

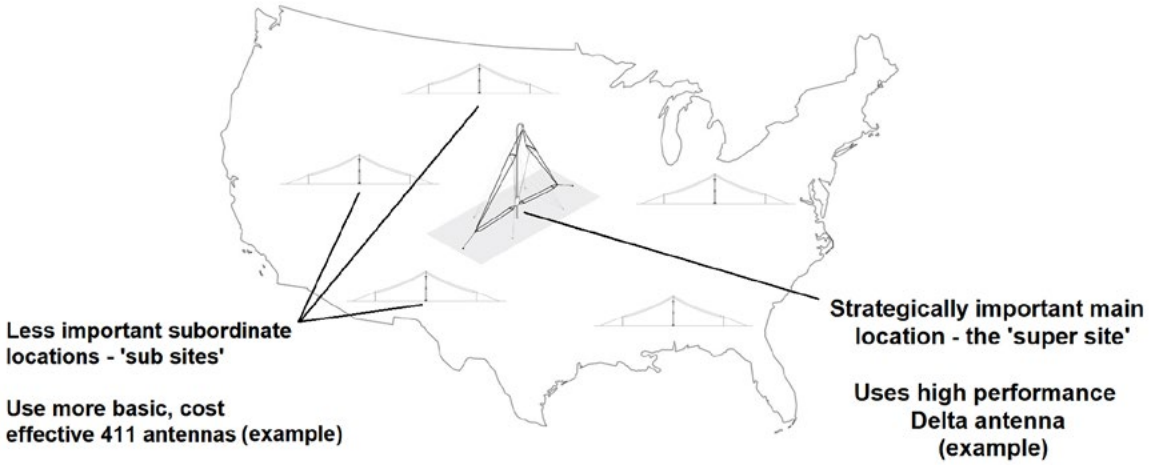


Broadband / Tuned: In order to improve efficiency, and above all to reduce overall size, antennas can be equipped with a system known as a tuner (sometimes referred to as a coupler). The most common use of a tuner is to allow a radio to transmit with an antenna that is much smaller than expected. Tuned antennas have a maximum cable distance from the radio, as the tuner is both powered and controlled by the radio itself. Broadband antennas do not require a tuner, and are much larger than tuned antennas. Generally, a large broadband antenna will give better performance than a small tuned antenna.

Remote: Remoting describes positioning the antenna, or antenna and radio transceiver, at a significant distance from the operating location. This is typically done to be able to install a large, efficient antenna in an appropriate space, and / or to avoid installing the sensitive antenna and transceiver in a location with high levels of interference – for example the centre of a city. This could be done simply using a very long coaxial cable (typically no more than 100m), or by using some form of IP link between the operator position and the transceiver with antenna. For example this could be a simple Ethernet cable, fibre-optic, Internet, microwave or other. This can give a significant overall communications quality increase in performance.



Super-site / Sub-site: Very commonly, multiple subordinate radio stations (sub-sites) will all communicate with one single, strategically important headquarters station (a super-site). In this situation, it can be highly cost and performance effective to use a more expensive, higher quality antenna in the main location, and lower quality antennas in lesser locations. This is shown in the diagram below.



6. ANTENNA SELECTION FORM - FIXED

Basic Requirements - Refer to Fundamental Aspects section to confirm Antenna options.

Maximum Communication Distance _____ Km **Minimum Communication Distance** _____ Km

Radio Output Power ☐ ≤125 W ☐ ≤150 W ☐ ≤500 W ☐ ≤1000 W

Radio Operating Mode ☐ 3G ALE ☐ Non 3G ALE ☐ Unknown

Direction of Communication
Will this radio need to communicate in multiple or all directions, or only towards a specific region or transceiver?

☐ Multiple directions ☐ All directions ☐ Specific Region ☐ Transceiver site ☐ Other

Allocated Frequency Range
Use of particular frequencies is often legally restricted. End users may be allowed access only to certain particular frequencies, or access between certain upper and lower frequencies.

_____ MHz Unallocated ☐

Distance from Transceiver to Preferred Antenna Location _____ Metres

6. ANTENNA SELECTION FORM - FIXED

Basic Requirements - Refer to Fundamental Aspects section to confirm Antenna options.

ANTENNA LOCATION:

Rooftop ☐ Ground ☐

POSSIBLE ANTENNA CHOICES:

OTHER REQUIREMENTS:

Restricted Space
Antennas can typically take anywhere from 30m x 30m to 50m x 50m, and are ideally not close to high buildings that will block their signal.

☐ Yes ☐ No

Install Environment

Rural ☐ Urban ☐ Dense Urban/Industrial ☐

Grounding Required

☐ Yes ☐ No

Masts Required?

☐ Yes ☐ No

Mast Choice

Not Applicable ☐

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7. ANTENNA SELECTION FORM - MOBILE

Maximum Communication Distance _____ km

Minimum Communication Distance _____ km

Radio Output Power ☐ ≤125 W ☐ ≤150 W ☐ ≤500 W ☐ ≤1000 W

Radio Operating Mode ☐ 3G ALE ☐ Non 3G ALE ☐ Unknown

TYPE OF VEHICLE (if applicable):

☐ **Military / Paramilitary / Tactical Police**
(For example; HUMVEE, MRAP, Bushmaster or other armoured / military specific vehicle)

☐ **Tracked vehicle**
(Continuous track, also called tank tread or caterpillar track, is a system of vehicle propulsion in which a continuous band of treads or track plates is driven by two or more wheels.)

☐ **Civilian / Non Tactical**
(For example; Hilux, Landcruiser or other non-armoured vehicle)

TYPE OF BOAT (if applicable):

Metal Hull ☐ Fibreglass Hull ☐ Inflatable ☐ Sail ☐ Other _____

LENGTH OF BOAT:

<10 m / 30’ ☐ <50 m / 150’ ☐ >50 m / 150’ ☐

ANTENNA MOUNTING BRACKET:

Required ☐ Not Required ☐

TUNER SHOCKMOUNT:

Required ☐ Not Required ☐

ANTENNA COMPARISON TABLES

1. Base Broadband
2. Base Tuned
3. Mobile
   - Integrated Tuner and Whip Systems
   - Separated Tuner and Whip Systems

ANTENNA COMPARISON TABLES

1. BASE BROADBAND

Name / Type	Typical Range (km)	Frequency (MHz)	Power Rating (W)	Benefits	Constraints	Mast Suitability	Directivity	Performance Value		Typical Application	Datasheet
								Efficiency	Price Point		
Terminated Folded Dipole - 2 wire (TFD)	80 - 1500 (depending on height of installation) Inverted V: 0 - 80	2 to 30	150 / 1kW (depending on model version)	Can be installed in Inverted “V” or Horizontal format. Light weight, simple to install, cost effective. Can be installed at different heights to achieve different ranges of communication.	Large installation site, 1 or 2 masts typically required *Check datasheet for area required.*	12m/15m Guyed Mast / 10m Premium mast / CT15	Bi-directional / omnidirectional			Base to base communications, base to mobile when installed under good (low noise) conditions. Can be used for efficient bi-directional communications when installed horizontally, or acceptable omni-directional communications when installed as an inverted-V.	12-20054-EN  
Militarized Terminated Folded Dipole	80 - 1500 (depending on height of installation) Inverted V: 0 - 80	2 to 30	150 / 1kW (depending on model version)	Can be installed in Inverted “V” or Horizontal format. Light weight, simple to install, cost effective. Can be installed at different heights to achieve different ranges of communication.	Large installation site, 1 or 2 masts typically required *Check datasheet for area required.*	12m/15m Guyed Mast / 10m Premium mast / CT15	Bi-directional / omnidirectional			Identical size and performance to standard TFD. Built using ruggedized, lower visibility components with N-type coaxial connector.	WIP  
Travelling Wave Dipole - 3 wire (TWD)	50 - 2000 (depending on height of installation)	2 to 30 / 3 to 30 depending on model	150 / 1kW (depending on model version)	Can be installed in Inverted “V” or Horizontal format. . Can be installed at different heights to achieve different ranges of communication. Better performance than TFD.	Large area, clear ground installation, unsuitable for Premium Mast in horizontal format *Check datasheet for area required.*	10m Premium with gibbet arm or 12m/15m Guyed Mast when installed as inverted V. CT15 / 12m/15m Guyed Mast when installed horizontally	Bi-directional / omnidirectional			Base to base communications, base to mobile when installed under good (low noise) conditions. Can be used for efficient bi-directional communications when installed horizontally, or acceptable omni-directional communications when installed as an inverted-V.	12-20365-EN 

ANTENNA COMPARISON TABLES

1. BASE BROADBAND

Name / Type	Typical Range (km)	Frequency (MHz)	Power Rating (W)	Benefits	Constraints	Mast Suitability	Directivity	Performance Value		Typical Application	Datasheet
								Efficiency	Price Point		
Full Delta	0 - 1500	3 to 30	150 / 1kW	Highly efficent omni-directional, can help to eliminate skip zones (very good short range performance). Performs well even in areas with poor ground.	Large area installation, costly. Designed for short/ medium ranges - unsuitable for long range communications *Check datasheet for area required.*	1CT15 / 15m Guyed Mast	Omnidirectional			Base to base and base to mobile communications. Highly efficient omni-directional performance. High performance short/mid range, unsuitable for long range communications. Often used with IP remote due to large size.	12-20186-EN
Semi-Delta (no mast)	0 - 1200	2 to 14	125 / 1kW	Efficient omni-directional. Good short/mid range communications.	Less efficient than Full Delta, limited operating band width (2 to 14MHz). Unsuitable for long range communications. *Check datasheet for area required.*	CT15 / 12m/15m Guyed Mast	Omnidirectional			Base to base and base to mobile communications. Efficient omni-directional performance. Good performance short/ mid range, unsuitable for long range communications. A smaller, less expensive alternative to the Full Delta.	12-20302-EN 
Whiskey	0 - 1800	2 to 30	1kW	Highly efficent omni-directional, can help to eliminate skip zones (very good short range performance). Performs well even in areas with poor ground. Fully militarized to MIL-STD810G.	Large area installation, costly. Designed for short/ medium ranges - unsuitable for long range communications *Check datasheet for area required.*	CT15 / 12m/15m Guyed Mast	Omnidirectional			Base to base and base to mobile communications. Highly efficient omni-directional performance. High performance short/mid range, unsuitable for long range communications. Often used with IP remote due to large size.	12-20321-EN 

ANTENNA COMPARISON TABLES

2. BASE TUNED

Name / Type	Typical Range (km)	Frequency (MHz)	Power Rating (W)	Benefits	Constraints	Directivity	Performance Value		Typical Application	Datasheet
							Efficiency	Price Point		
Active Tuned Dipole - 3048	60 - 1000	2.5 to 30	150	Small foot print, omni-directional, easy to install, short to medium distance	Restricted cable length without external power injection, cost *Check datasheet for area required.*	Omnidirectional			Antenna with built-in tuner system. Small area to install / short - medium coverage distances	12-20233-EN 
Active Tuned Dipole - 9390	60 - 1000	1.6 to 30	150	Very small foot print, omni-directional, easy to install, easy to move, covers short to medium distance	Restricted cable length, cost *Check datasheet for area required.*	Omnidirectional when low to the ground, bidirectional when high above ground			Antenna with built-in tuner system. Very small area to install, used for short - medium coverage distances, height adjustable	12-20340-EN 
9.5m Vertical Whip	80 - 2000	2 - 30 Tuner dependent	Tuner dependent	Very small footprint, omni-directional, works well with other vertical antennas, long range	Large skip zone, poor short range communications; requires artificial earthing if positioned above poor ground (e.g. rooftop) *Check datasheet for area required.*	Omnidirectional			Vertical whip antenna, requires additional tuner. Used for long-range omni-directional communications in areas with restricted size. Suitable with 3240, 3046 and 3049 tuners.	TBD
Long Wire	80 - 2000	2 - 30 Tuner dependent	Tuner dependent	Very small footprint, omni-directional, works well with other vertical antennas, long range	Large skip zone, poor short range communications; requires artificial earthing if positioned above poor ground (e.g. rooftop) *Check datasheet for area required.*	Omnidirectional			Long Wire antenna, requires additional tuner. Used for long-range omni-directional communications in areas with restricted size. Suitable with 3240, 3046 and 3049 tuners.	TBD

ANTENNA COMPARISON TABLES

2. BASE TUNED

Name / Type	Typical Range (km)	Frequency (MHz)	Power Rating (W)	Benefits	Constraints	Directivity	Performance Value		Typical Application	Datasheet
							Efficiency	Price Point		
3046 Antenna Tuning Unit (ATU)	Antenna dependent	2.5 to 30 (antenna dependent)	150	Small foot print, Omni-directional, easy to install, medium/long distance (low take-off angle), robust weather proof housing.	Restricted cable length, relies on Tuner, cost, only suitable for tuning lengths less than 10m. Cannot tune closed-loop antennas.	Antenna dependent			Rugged tuner, used for base or mobile operations. Typically used for whip antennas. Optional shock absorber advised for high shock/ vibration environments.	12-20258-EN 12-2xxxx-EN 12-2xxxx-EN 
3049 Antenna Tuning Unit (ATU)	Antenna dependent	2.5 to 30	150	Tunes antennas up to 23m long. More cost-effective than 3046, up to 100m cable length. Can tune closed-loop antennas.	Less rugged than 3046 tuner	Antenna dependent			Cost effective alternative to 3046 tuner. Can operate using twin cables to 30m length or single coaxial cable to 100m length. Typically used for fixed base whip or wire antennas.	TBD
3240 Antenna Tuning Unit (ATU)	Antenna dependent	2.5 to 30 (antenna dependent)	500 / 1kW	Can tune up to 1kW of power. Fully ruggedized. Compatible as split-site solution with separate TX/RX antennas. Tunes antennas up to 46m long.	100m maximum cable length, twin components (tuner & separate power supply), cost, minimum antenna length 5m	Antenna dependent			Tuner for high power installations; 100m maximum cable length from radio & tuner power supply. Highly suitable for large naval installations. Optional shock absorber advised for high shopck/vibration environments.	12-20328-EN 

ANTENNA COMPARISON TABLES

3. MOBILE FUNDAMENTAL - INTEGRATED TUNER AND WHIP SYSTEMS

Name / Type	Typical Range (km)	Frequency (MHz)	Power Rating (W)	Benefits	Constraints	Directivity	Performance Value		Typical Application	Datasheet
							Efficiency	Price Point		
3040 / 3040 (Maritime)	100 - 1500 (depending on vertical / horizontal mounting)	2.5 to 30	150	Simple to install, fast tuning, small and light. Additional riser elements can be added to increase length and efficiency.	Performance dependent on position of installation; exposed whip elements more vulnerable to impact damage than 9350	Omnidirectional			Small area to install; short vertical format for longer range, extended horizontal format for improved performance and short/ medium range. Fast tuning, small. Available as variant suitable for marine environments.	TBD 
9300 / 9230 Maritime	100 - 1500 (depending on vertical / horizontal mounting)	1.6 to 30	150	Simple installation, similar foot print to the 9350, slight performance advantage over 3040. Physical design makes the 9300 slightly more resistant to light impact damage.	Large size can be unsuitable for front mounting (depending on local vehicle regulations)	Omnidirectional			Better performing than 3040 but with higher cost. Vertical format for longer range, extended horizontal format for improved performance and short/medium range. Available as 9320 variant suitable for marine environments.	12-20341-EN 
9350 / 9350M	100 - 1500 (depending on vertical / horizontal mounting)	2 to 30	125	Cost, simple installation, similar foot print to the 9300. Physical design makes the 9350 slightly more resistant to light impact damage than the 3040.	Large size can be unsuitable for front mounting (depending on local vehicle regulations). Slow tune time makes the 9350 unsuitable for 3G ALE. Not rated for 6120BM 150W power.	Omnidirectional			Vertical format for longer range, extended horizontal format for improved performance and short/ medium range.	12-20051-EN 

ANTENNA COMPARISON TABLES

3. MOBILE FUNDAMENTAL - SEPARATED TUNER AND WHIP SYSTEMS

Name / Type	Typical Range (km)	Frequency (MHz)	Power Rating (W)	Benefits	Constraints	Directivity	Performance Value		Typical Application	Datasheet
							Efficiency	Price Point		
3046 & 3m Carbon Fibre Whip	100 - 1800 (depending on vertical / horizontal mounting)	2.5 to 30 (antenna dependent)	150	Appropriate for military vehicles and applications. High impact resistance, low visible profile. Whip can be extended vertically to 7m for static operation. Can tune wire antennas for different transmission performance.	Cost, more complex installation. Whip and tuner should be located within 30cm of each other.	Omnidirectional			High performance, military grade 3m carbon fibre whip linked to rugged external tuner via short HV cable. Compatible with 3rd party whips/wires of appropriate length.	12-20258-EN 

DATASHEETS

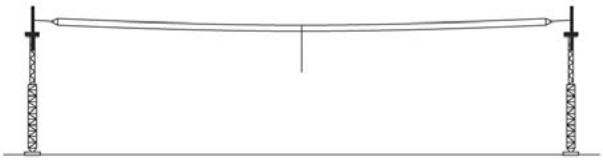
1. 411 Terminated Folded Dipole - 2 wire
2. Militarized 411 Terminated Folded Dipole
3. Travelling Wave Dipole - 3 wire
4. Full Delta
5. Semi Delta (no mast)
6. Whiskey
7. Active Tuned Dipole - 3048
8. Active Tuned Dipole - 9390
9. 9.5m Vertical Whip
10. 3046 ATU
11. 3049 ATU
12. 3240 ATU
13. 3040 Maritime
14. 9300 / 9320 Maritime
15. 9350 / 9350M
16. 3046 & 3m Carbon Fibre Whip
17. Long Wire

DATASHEETS

1. 411 TERMINATED FOLDED DIPOLE - 2 WIRE

BASE ANTENNA
411 TERMINATED FOLDED DIPOLE

CODAN COMMUNICATIONS



Codan's 411 Terminated Folded Dipole Antenna is a 2-wire antenna designed for broadband operation in fixed stations. Separate variations are available to support power levels of 150 or 1000 W. Easy to install, the 411 Antenna can be mounted horizontally between two support systems, or as an inverted "V" using a single central support mast.

PERFORMANCE

The 411 Antenna provides excellent performance for short to medium distance HF communications. It is offered in a range of lengths to suit installation requirements. To optimise the antenna for Near Vertical Incidence Skywave (NVIS) propagation use an inverted V configuration or adjust the installed height above ground. Designed and manufactured with corrosion and UV resistant materials to withstand all types of hostile environments.

EASY TO INSTALL

The 411 Antenna is supplied completely assembled and ready for installation. Installation hardware includes 60 m of high quality UV resistant rope and pulley as well as easy to understand installation instructions. A range of coaxial cable lengths and types are available but are ordered separately. Codan also has a large range of mast options that are suitable for use with the 411 Antenna.

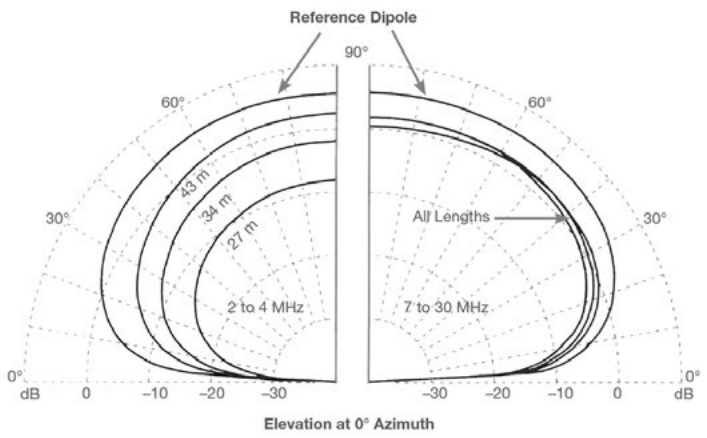
ANTENNA MODEL

The model of 411 Antenna should be selected to suit the application depending on the required power rating and the maximum amount of available space to install it. As a general rule the radiation efficiency of the 411 Antenna increases with antenna length so it is recommended to select the longest variant that will suit available space.

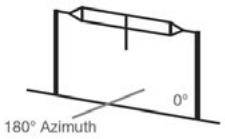
MODEL	LENGTH (M)	POWER (W)
15-00411-003	43	150
15-00411-004	34	150
15-00411-005	27	150
15-00411-012	43	1000
15-00411-011	34	1000

Notes:

1. The 43m antenna is 10dB more efficient from 2 to 4 MHz than the 27m version.
2. The reference dipole is 1/4 wavelength above ground.
3. Radiation patterns are for antenna installation heights recommend in the antenna mounting details.



Elevation at 0° Azimuth



DATASHEET: Codan 411 Terminated Folded Dipole, 12-20054-EN, Issue 16, © 2020 **CODANCOMMS.COM**

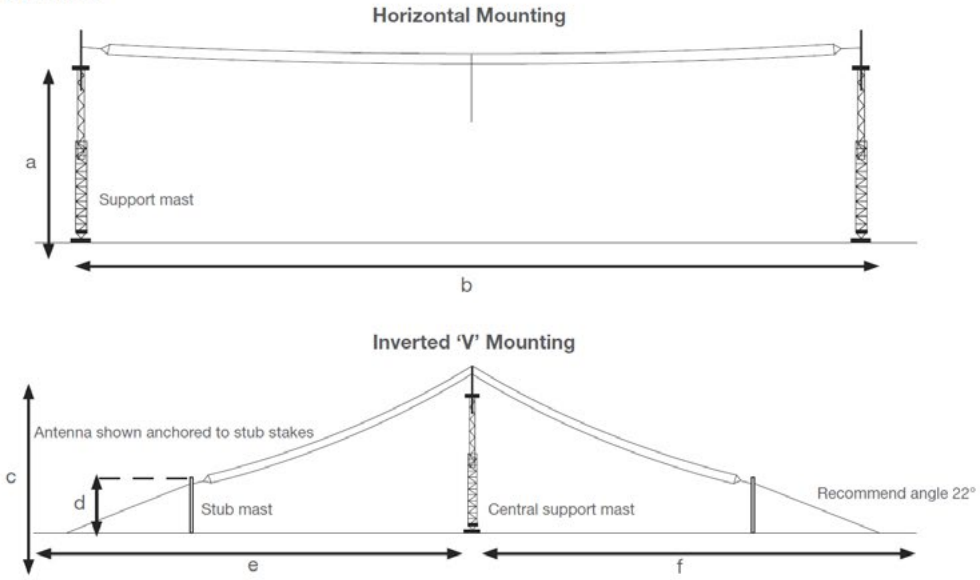
DATASHEETS

1. 411 TERMINATED FOLDED DIPOLE - 2 WIRE

BASE ANTENNA
411 TERMINATED FOLDED DIPOLE

CODAN COMMUNICATIONS

ANTENNA INSTALLATION



Note: Antenna should be orientated at right angles to the preferred direction of propagation to maximise network performance.

ANTENNA MOUNTING DETAILS

MODEL	DIMENSIONS (M)					
	a	b	c	d	e	f
15-00411-003/012	10	47	13	4.8	22	32
15-00411-004/011	8	38	11	4.2	18	27
15-00411-005	6.5	31	8	3	14.5	20

Note: Dimension 'b' allows 2 metres between each end of the antenna and the support mast.

ACCESSORIES

- 30m RG58 Coaxial Cable
- 100m low loss RG213 Coaxial Cable
- RG213 Strain Relief Hardware
- In-line Lightning Arrestor
- Spare waterproof UHF plug

SPECIFICATIONS		PRACTICAL CRITERIA	
Frequency range	2 to 30 MHz	Recommended mast	15-60038 (alternative – see catalogue
Connector	UHF type socket	Distance, Tcvr to Antenna (m)	≤100 m
Input impedance	50 ohm	Grounding requirements	N0
VSWR	Typically 2.5:1	Footprint	Large (up to 47m not including guys)
Power rating	150 W PEP, 100 W CW 1000 W PEP, 600 W CW	Antenna Location	Roof Ground

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

DATASHEET: Codan 411 Terminated Folded Dipole, 12-20054-EN, Issue 16, © 2020 CODANCOMMS.COM

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DATASHEETS

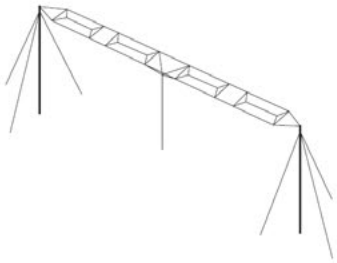
2. MILITARIZED 411 TERMINATED FOLDED DIPOLE

DATASHEETS

3. TRAVELLING WAVE DIPOLE - 3 WIRE

BASE ANTENNA
TRAVELLING WAVE DIPOLE

CODAN COMMUNICATIONS



The Travelling Wave Dipole Antenna is a very efficient antenna for short to medium distance communications. Its radiation patterns are generally omni-directional, resulting in a consistent coverage over the frequency range. Designed for 100% duty cycle voice and data operation at the rated power level.

PERFORMANCE

Codan's TWD Antenna supports operation over the frequency range of 2 to 30 MHz, and is capable of full duty cycle voice and data operation at the rated power levels.

The antenna is essentially omni-directional, but has a good combination of high and low angle radiation to support both short and medium distance HF communications. The large size of the antenna enables a very high level of radiation efficiency thus maximising on-air performance.

The broadband design of the antenna eliminates the need for a separate antenna tuner unit, the antenna is connected to the transceiver via a single coaxial cable.

Manufactured using materials designed for long service life, the TWD is built to survive in harsh outdoor environments.

KEY FEATURES

- 2 to 30 MHz frequency range
- Omni-directional radiation
- High efficiency
- Short to medium distance coverage
- Up to 1000 W RF power rating
- Rated for data

INSTALLATION

The antenna requires two masts of 15 m in height separated by 40 m. Typically the antenna is installed at full height of 15 m, but can be installed at a lower height to improve communications over shorter distances. For long distance links the TWD should be oriented broadside to the required direction of communication.

SPECIFICATIONS

ELECTRICAL	
Frequency range	2-30MHz or 3-30MHz variants available
Power rating	125 W or 1000 W PEP
Nominal impedance	50 Ω
VSWR	Typically < 2.5:1
RF connector type	UHF-type (125 W), N-type (1000 W)
MECHANICAL	
Mast heights	2 masts at 10 to 15 m each
Mast spacing	40 m
Wind rating	200 km/hr, no ice
Packed weight	36 kg (125 W), 46 kg (1000 W)

ACCESSORIES

- Coaxial cables (RG58 or low loss RG213)
- Lightning protection kit
- CT15 telescopic mast

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

DATASHEET: Codan Travelling Wave Dipole, 12-20365-EN, Issue 2, © 2018 CODANCOMMS.COM

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DATASHEETS

4. FULL DELTA

BASE ANTENNA
DELTA

CODAN COMMUNICATIONS

The Delta antenna is a high performance, omni-directional, broadband antenna that is suited to base-to-base or base-to-mobile communication over short to medium distances.

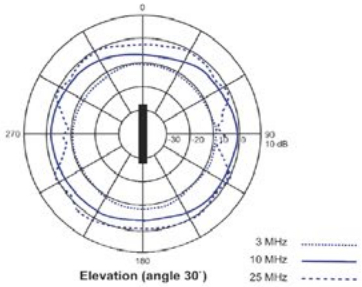
HIGH PERFORMANCE

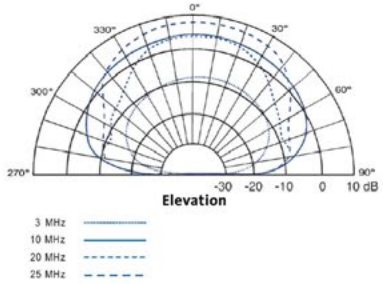
The Delta antenna offers high performance over short to medium distances, and exhibits essentially an omni-directional pattern. It has been designed to provide continuous coverage throughout its entire frequency range (3 to 30 MHz) making it an ideal choice for a base station antenna.

EASY TO INSTALL

The Delta can be supplied with or without a support mast and comes complete ready to install on site. It requires a relatively large cleared area for installation at either ground level or on a flat roof of a building; a ground plane is not required. The coaxial cable must be purchased separately.

RADIATION PATTERNS





SPECIFICATIONS

Frequency	3 to 30 MHz
Impedance	50 Ω (nominal)
VSWR	Less than 2:1
Power rating	200 W PEP (100 W Avg)
Radiator elements	Marine grade stainless steel
Packed weight	30 kg
Carton dimensions	Antenna (1 carton): 910 x 285 x 205 mm
Mast height	15m
Antenna width	46m
Guy radius	10m
Overall height	16m (includes gibbet)
Footprint	50 x 18m
Wind rating	Up to 180 kph (112 mph) in clear air, subject to mast, footing and anchoring

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

DATASHEET: Codan Delta Antenna, 12-20186-EN, Issue 5, © 2018 CODANCOMMS.COM

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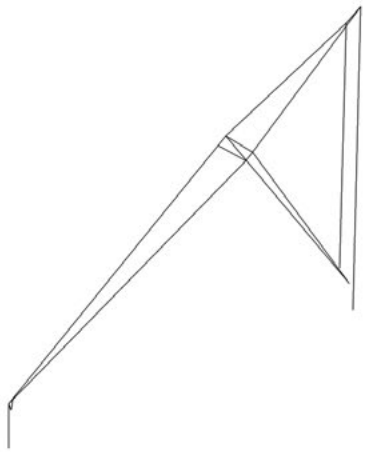
DATASHEETS

5. SEMI DELTA (NO MAST)

BASE ANTENNA
SEMI-DELTA

CODAN COMMUNICATIONS



The Semi-Delta Antenna is an economical broadband base station antenna suitable for short to medium distance HF communications. The compact design of the antenna makes it suitable for installations that have limited space available.

PERFORMANCE

The Semi-Delta Antenna supports operation over the frequency range of 2 to 14 MHz, and is capable of full duty cycle voice and data operation at the rated power levels.

The antenna is an omni-directional antenna but has a good combination of high and low angle radiation to support both NVIS and longer distance HF communications.

The broadband design of the antenna eliminates the need for a separate antenna tuner unit, the antenna is connected to the transceiver via a single coaxial cable.

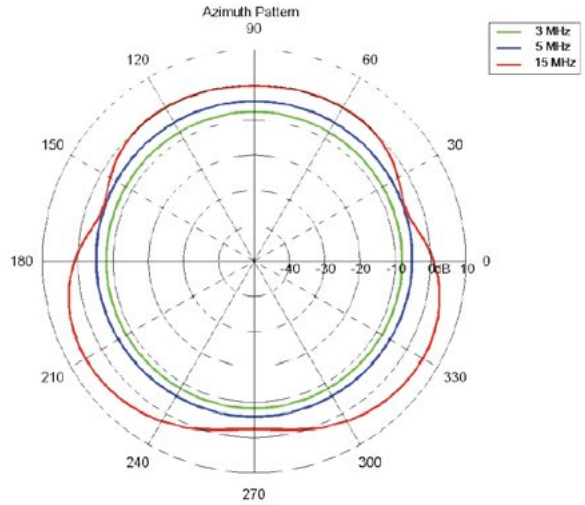
Manufactured using materials designed for long service life, the Semi-Delta is built to survive in harsh outdoor environments.

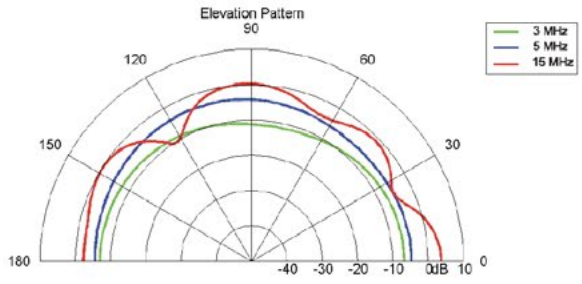
INSTALLATION

The antenna requires a high anchor point of 15 m and a lower anchor point of 1.5 to 2 m, separated by 20 m. It is supplied partially assembled to minimise shipping size. However, it can be assembled quickly and easily without special tools.

The coaxial feed cable is connected to the balun that is conveniently located at the lower end of the antenna. For ground installations with poor soil conductivity or roof top installations with non-conductive roof materials, it is recommended a counterpoise system is fitted to maximise antenna performance.

RADIATION PATTERNS





Note: Antenna radiation patterns are based on perfect earth conditions.
Azimuth plots are at 35° elevation. Elevation plots are taken broadside from antenna.

DATASHEET: Codan Semi-Delta Antenna, 12-20302-EN, Issue 3, © 2018 **CODANCOMMS.COM**

DATASHEETS

5. SEMI DELTA (NO MAST)

BASE ANTENNA
SEMI-DELTA

CODAN COMMUNICATIONS

SPECIFICATIONS	
ELECTRICAL	
Frequency range	2 to 14 MHz
Power rating	400 W PEP (240 W average) or 1000 W (600 W average)
Nominal impedance	50 Ω
VSWR	Typically < 2.5:1
RF connector type	UHF-type (400 W), N-type (1000 W)
MECHANICAL	
Mast heights	15 m mast and 1.5 to 2 m stub mast
Mast spacing	20 m
Balun mounting	2 x U-bolts to suit 50 mm diameter tube
Wind rating	160 km/hr, no ice
Packed weight	8 kg (400 W), 11 kg (1000 W)
Packed dimensions	880 mm x 340 mm x 100 mm (excluding mast hardware)
Installation hardware	Pulley/halyard suitable for a 15 m mast

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

ACCESSORIES

- Coaxial cables (RG58 or low loss RG213)
- Lightning protection
- Copper earth strap
- Earth stake

DATASHEET: Codan Semi-Delta Antenna, 12-20302-EN, Issue 3, © 2018 CODANCOMMS.COM

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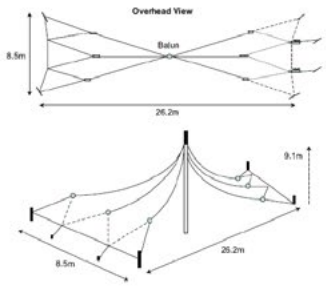
DATASHEETS

6. WHISKEY

PORTABLE ANTENNA
WHISKEY BROADBAND

CODAN COMMUNICATIONS



The Whiskey antenna is designed to provide coverage from near to mid-range HF communications (0-4000km).

The Whiskey antenna fulfills many use case scenarios, from permanent to semi-permanent installations, and provides true broadband capability with a wide omni-directional footprint and NVIS pattern. The antenna is lightweight, easily transportable and quick to set up rapid assembly kit from.

Its strong NVIS (Near Vertical Incidence Skywave) capabilities allow for communications in challenging environments and its full 2-30 MHz spectrum broadband coverage makes it an excellent antenna for ALE operations without the need for a tuner/coupler.

Radial ground plane or grounding is not required making the antenna ideal for ground/rooftop installations and mobile "on the move" field use.

The Whiskey antenna is suited for use with the Codan CT15M mast.

KEY FEATURES

- Omni-directional theatre range HF antenna
- 2 - 30 MHz True broadband
- Designed to meet MIL-STD-810G High Temperature, Low Temperature, Rain, Salt Fog, Sand and Dust, Immersion, Shock, Icing / Freezing Rain
- Designed to meet IP67 rating
- No 'dead spot' in the transmission patterns over the entire frequency band
- Wind rating of 90 mph with standard stakes
- Power rating of 1 kW continuous
- Options up to 5 kW with an enhanced balun and larger resistors
- Capable of simultaneous voice and data communication

DATASHEET: Codan Whiskey Broadband Antenna, 12-20321-EN, Issue 3, © 2020 CODANCOMMS.COM

DATASHEETS

6. WHISKEY

PORTABLE ANTENNA
WHISKEY BROADBAND

CODAN COMMUNICATIONS

SPECIFICATIONS

GENERAL

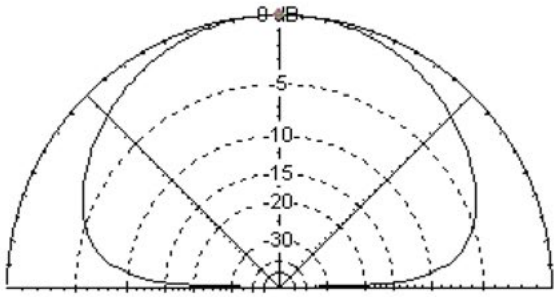
Frequency	2-30 MHz Broadband
Power (5 kW Avail.)	1 kW CW, 4 kW PEP
Impedance	50 Ohms
Polarization	Horizontal
VSWR	1.8:1 Max
Pattern	Omni-directional
Weight	19.5 kg with stakes (43 lbs)
Suggested Balun height	9 m (30ft)

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

2 MHZ

Total Field

EZNEC+



2 MHz

Elevation Plot		Cursor Elev	90.0 deg.
Azimuth Angle	0.0 deg.	Gain	-13.38 dBi
Outer Ring	-13.38 dBi		0.0 dBmax
			0.0 dBmax3D
3D Max Gain	-13.38 dBi		
Slice Max Gain	-13.38 dBi @ Elev Angle = 90.0 deg.		
Beamwidth	112.8 deg.; -3dB @ 33.6, 146.4 deg.		
Sidelobe Gain	< -100 dBi		
Front/Sidelobe	> 100 dB		

*Items subject to change. Contact Codan for latest component specifications.

DATASHEET: Codan Whiskey Broadband Antenna, 12-20321-EN, Issue 3, © 2020 CODANCOMMS.COM

DATASHEETS

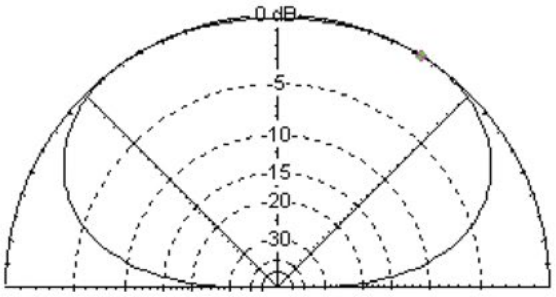
6. WHISKEY

PORTABLE ANTENNA
WHISKEY BROADBAND

CODAN COMMUNICATIONS

10 MHZ

Total Field — EZNEC+

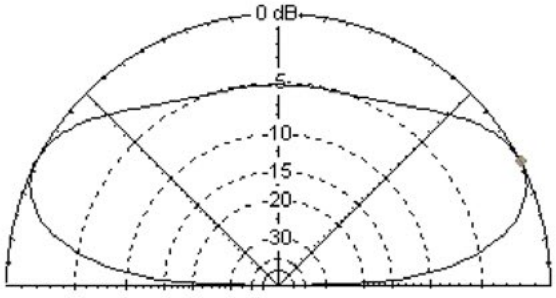


11 MHz

Elevation Plot		Cursor Elev	58.0 deg.
Azimuth Angle	89.0 deg.	Gain	2.92 dBi
Outer Ring	2.92 dBi		0.0 dBmax
			0.0 dBmax3D
3D Max Gain	2.92 dBi		
Slice Max Gain	2.92 dBi @ Elev Angle = 58.0 deg.		
Beamwidth	132.6 deg.; -3dB @ 23.7, 156.3 deg.		
Sidelobe Gain	2.92 dBi @ Elev Angle = 121.0 deg.		
Front/Sidelobe	0.0 dB		

24MHZ

Total Field — EZNEC+



20 MHz

Elevation Plot		Cursor Elev	27.0 deg.
Azimuth Angle	89.0 deg.	Gain	1.07 dBi
Outer Ring	1.07 dBi		0.0 dBmax
			0.0 dBmax3D
3D Max Gain	1.07 dBi		
Slice Max Gain	1.07 dBi @ Elev Angle = 27.0 deg.		
Beamwidth	38.0 deg.; -3dB @ 12.5, 50.5 deg.		
Sidelobe Gain	1.07 dBi @ Elev Angle = 153.0 deg.		
Front/Sidelobe	0.0 dB		

*Items subject to change. Contact Codan for latest component specifications.

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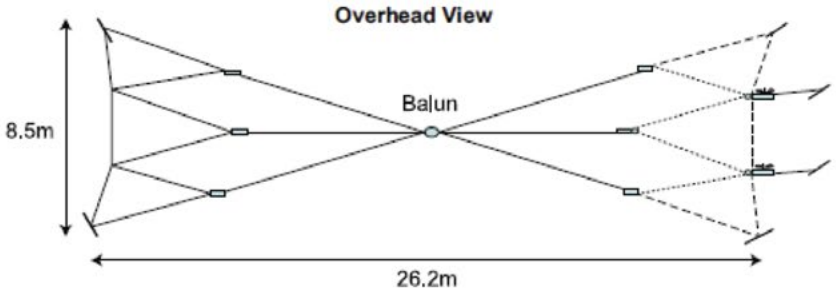
DATASHEETS

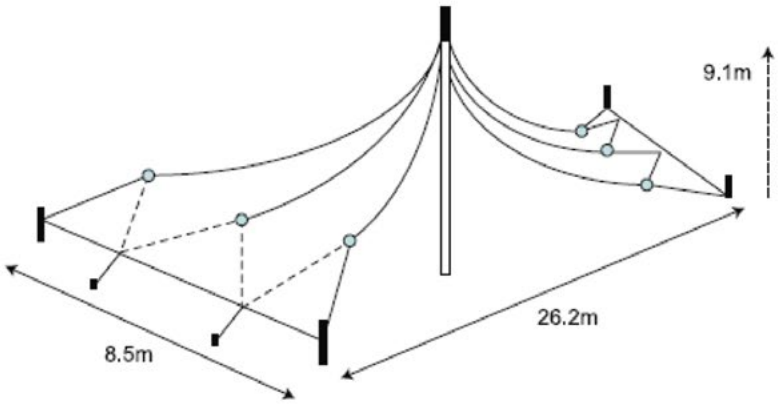
6. WHISKEY

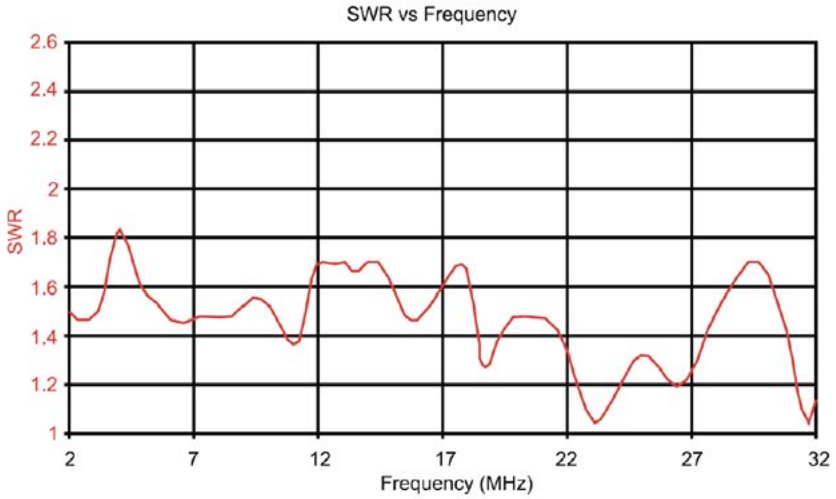
PORTABLE ANTENNA

WHISKEY BROADBAND

CODAN COMMUNICATIONS







*Items subject to change. Contact Codan for latest component specifications.

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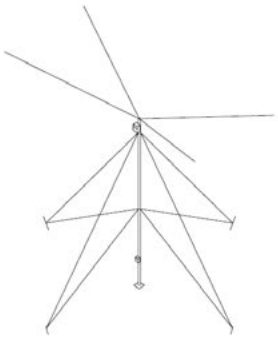
DATASHEETS

7. ACTIVE TUNED DIPOLE - 3048

BASE ANTENNA

3048 TUNED DIPOLE ANTENNA

CODAN COMMUNICATIONS



The 3048 Tuned Dipole is a HF antenna solution designed for base station use. When compared to wire broadband antennas the 3048 has a significantly reduced installed footprint, which is especially suitable for installations where space is restricted.

The antenna system comprises a main tuner unit and antenna element assembly mounted on top of a 6 m mast. A control cable and coaxial cable run down from the tuner unit to an interface box mounted at the base of the mast. The interface box provides connection points for the transceiver antenna control, RF cables and ground connection.

KEY FEATURES

- 2.5 to 30 MHz continuous
- 125 W PEP
- Small installed footprint
- Fast tuning 1 sec average
- Memory tune < 150 ms
- Supports ALE and Frequency Hopping modes
- Omni-directional
- Supports NVIS propagation
- MIL-STD-810G Compliance
- Single mast deployment

HIGH PERFORMANCE

With 125 W RF power handling capability the 3048 can be used for voice (including Frequency Hopping) and data operation over the full 2.5 to 30 MHz frequency band. The tuner has an unlimited tune from memory capacity, and using a state-of-the-art tuning algorithm, new frequencies are tuned in typically less than one second.

The 3048's radiation pattern is essentially omni-directional with a combination of NVIS (Near Vertical Incidence Skywave) and medium distance propagation performance. With a guy radius of 4 m and a self supporting antenna span of less than 10 m the antenna system has a compact installation footprint.

ROBUST DESIGN

The high strength, lightweight alloy construction of the 3048 main tuner unit and the interface box ensures that it is capable of withstanding the severe environmental conditions that may be encountered in outdoor environments. The units are designed to meet MIL-STD-810G for dust ingress, and are waterproof to 1 m as per IP67 standard.

INSTALLATION

It is recommended that the 3048's antenna tuner and radiating antenna element assembly be installed at a height of 6 m. Codan offers a dedicated 2 section, 6 m aluminum mast, complete with two guy sets, and installation hardware and instructions. The interface box is mounted at the base of the mast and also acts as the termination point for the antenna ground system.

SPECIFICATIONS

GENERAL

Frequency range	2.5 to 30 MHz
Power rating	125 W PEP (voice and data)
Power consumption	Typically 0.4 A, less than 0.8 A max
Input impedance	50 Ω
VSWR	Typically ≤1.5:1
Tuning speed	New frequency <1 sec average, memory tune <150 ms
Memory channels	Unlimited

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

DATASHEET: Codan 3048 Tuned Dipole Antenna, 12-20233-EN, Issue 4 ©2020 CODANCOMMS.COM

DATASHEETS

7. ACTIVE TUNED DIPOLE - 3048

BASE ANTENNA
3048 TUNED DIPOLE ANTENNA

CODAN COMMUNICATIONS

SPECIFICATIONS			
MECHANICAL		**PRACTICAL CRITERIA**	
Temperature rating	-30°C to 60°C	**Recommended mast**	6m (mas supplied optional)
DC operating range	10 to 16 V DC (12 V DC nominal)	**Distance, Tcvr to Antenna (m)**	≤20m (Longer with external DC)
Protection	Open circuit, short circuit, over temperature, voltage transients, high VSWR	**Footprint**	Medium (allow 10m)
MIL-STD-810G	Dust Ingress, Immersion (IP67)	**Grounding requirements**	Yes (earth mat)
Dimensions	Main tuner unit: 319 mm x 548 mm x 250 mm (includes antenna horns & mast spigot)	**Antenna location**	Roof mount option Ground mount option
Antenna elements	Four 4.8 m long elements (each made up of 3 sections)		
Weight	11.5 kg (main tuner unit & interface box)		
Colour	White		
INTERFACE			
RF connector	UHF socket (interface box)		
Control	6 pin bayonet (MIL Spec)		

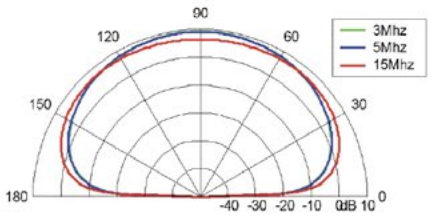
Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

ACCESSORIES

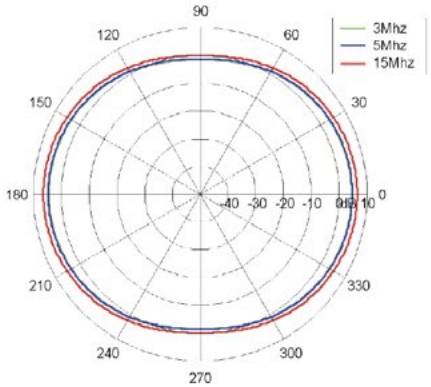
- **Cables:** 20 m RF Coaxial Cable, 20 m Control Cable (maximum length)
- **Mast:** 6m aluminimum mast (2 x 3 m sections, 2 guy sets and installation kit)

RADIATION PATTERNS

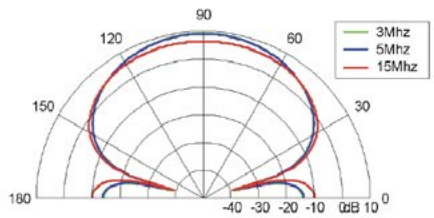
Elevation Pattern (0 degrees)



Azimuth Pattern



Elevation Pattern (90 degrees)



DATASHEET: Codan 3048 Tuned Dipole Antenna, 12-20233-EN, Issue 4 ©2020 CODANCOMMS.COM

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DATASHEETS

8. ACTIVE TUNED DIPOLE - 9390

BASE ANTENNA
9390 TUNED DIPOLE

CODAN COMMUNICATIONS

KEY FEATURES

- Continuous 1.6 to 30 MHz coverage
- 150W RF power rating
- Fast memory tune
- Exceptional weak signals performance with built-in broadband RX amplifier
- Supports 2G and 3G Automatic Link Establishment (ALE)

Codan's 9390 Automatic Tuning HF Dipole is designed for tactical and fixed base station applications where rapid deployment or simplified installation in space restricted areas is required without compromising quality of communication. The ultra-compact 9390 HF antenna system is optimised for both short and long distance communications.

HIGH PERFORMANCE

The 9390 antenna is an automatic tuning HF dipole with continuous frequency coverage throughout the 1.6–30 MHz HF band. It radiates with omnidirectional pattern in both vertical and horizontal configurations. When installed horizontally at 5 to 10 metre heights, 9390 antenna exhibits excellent NVIS performance. A built-in broadband receive amplifier and a low insertion loss RF-circuit ensure excellent receive and transmit performance. With ultra-fast tuning and 150 W power handling capability, the 9390 antenna is an ideal broadband HF field antenna for secure data and voice communications in conventional and 2G /3G ALE networks.

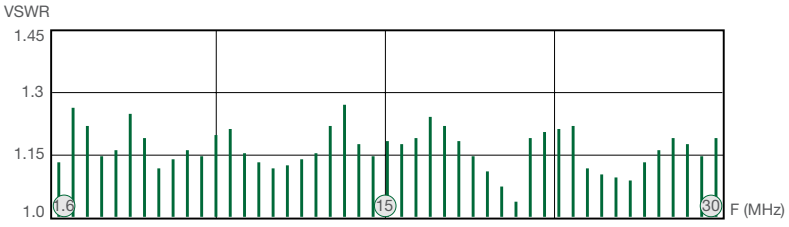
EASY INSTALLATION

The 9390 antenna is supplied with a quick-lock clamping system and optional 6 m mast. The antenna package is only 1.8 m long, making it compact for air and ground transportation. The 9390 tuned dipole antenna requires less than 30 minutes setup or take-down by a single person.

RUGGED DESIGN

Housed in a fully weather-proof and rugged MIL-STD 810G enclosure the 9390 antenna is impervious to dust and water ingress. Engineered with use of the latest generation of materials and technology, the 9390 dipole is tested for reliable operation in the harshest environmental conditions.

9390 Typical Standing Wave Ratio



9390 operates in NVIS mode at 5-10m heights

Improved gain is available as height reaches 12m

DATASHEET: Codan 9390 Tuned Dipole, 12-20340-EN, Issue 8, © 2018 **CODANCOMMS.COM**

DATASHEETS

8. ACTIVE TUNED DIPOLE - 9390

ANTENNA TUNER
3240 1KW AUTOMATIC TUNER

CODAN COMMUNICATIONS

SPECIFICATIONS

3240 ANTENNA TUNER

Frequency range	Wire: 23 m to 46 m (75 to 150 ft) 2-30 MHz Whip: 10 m (32 ft) 2-30 MHz Whip: 5 m (16 ft) 3-30 MHz
Power rating	1kW PEP and Average
Duty cycle	Full voice and data
Input impedance	50 Ω
VSWR	Typically ≤1.5:1
Tune time	Memory 150 ms, initial tune 5 sec (typical)
Tune power	10 W nominal, 50 W max
Memory channels	Unlimited
Tune modes	Fully automatic and memory
RF connector type	N-type socket
Control connector type	10 pin military screw connector
Auxiliary receive antenna connector	TNC
Auxiliary receive antenna power	12 V DC, 1 A max
Operational temperature	-20 to +55°C
Finish	Marine grade paint – haze grey, desert sand, white
Enclosure	Aluminium sealed to IP66
Certifications	CE for EMC, MIL-STD-810G (with shock mount)
Dimensions	350 x 380 x 330 mm
Packed dimensions/weight	500 x 500 x 500 mm; 25 kg

3220 POWER SUPPLY

Input voltage	230/115 (manually switchable)
Dimensions	2RU
AC power connector type	10 A IEC (fused)
Control connector type	15-way D connector
AC power switching	Tuner switching may be slaved to radio or controlled by PSU

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

ACCESSORIES

- 3061/3062 HPA to 3220 PSU to Interface Cable, 1 m
- 3220 PSU to 3240 ATU Control cable, 30 m, 40 m, 75 m, and 100 m
- 3061/3062 HPA to 3240 ATU RG213 coaxial cable (UHF to N-type), 30 m, 40 m, 75 m, 100 m
- 3240 ATU Shock Mount Accessory
- 1 kW Long Wire Antenna

DATASHEET: Codan 3240 1kW Automatic Tuner, 12-20328-EN, Issue 2, © 2018 **CODANCOMMS.COM**

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DATASHEETS

9. 9.5M VERTICAL WHIP

DATASHEETS

10. 3046 ATU

ANTENNA TUNER 3046

CODAN COMMUNICATIONS

The 3046 is a low profile, 125 W HF antenna tuning unit designed to deliver high performance and reliability in the world's harshest environments. It provides high speed and efficient tuning of short and long whip antennas across the full operational HF band.

HIGH PERFORMANCE

With a 125 W RF power handling capability, the 3046 can be used for voice (including frequency hopping) and data operation over the full 2 to 30 MHz frequency band. The tuner has an unlimited tune from memory capacity, and using a state-of-the-art tuning algorithm, new frequencies are tuned in typically less than one second.

The 3046's innovative circuit design ensures power delivery to the antenna is maximised, and receive mode performance is optimised by the internal receive mode amplifier. These features combine to provide an easy-to-use, trouble-free, high performance mobile antenna solution.

COMPLIANT TO MIL-STD-810G

The high strength and lightweight alloy housing of the 3046 ensures that it is capable of withstanding the severe environmental conditions encountered in mobile environments. The unit is designed to meet MIL-STD-810G for dust and vibration and is waterproof to 1 m as per IP68 Standard.

TRANSCEIVER INTEGRATION

The control interface of the 3046 is fully integrated with Codan's HF transceivers so that tuning is transparent to the operator. If there is a tune problem, the transceiver issues an audible and visual warning, however an override capability exists for emergency situations. The 3046 is designed for full compatibility with all modes of operation, including receiver scanning, ALE (Automatic Link Establishment) and frequency hopping.

ANTENNA & MOUNT OPTIONS

The 3046 is offered with a 3 m carbon fiber MIL spec whip antenna, MIL spec rubber spring and NATO hole pattern base. The 3 m whip can be configured for NVIS operation using the tie down kit included and can also be extended to 7 m with the 3 section Extension and Guy Kit for semi-permanent stationary use. An additional antenna accessory is the 9 m tactical long wire kit designed to attach directly to the NATO base stud.

KEY FEATURES

- Fast tuning
- High efficiency
- Waterproof
- MIL-STD-810G compliance
- 2 to 30 MHz
- 125 W RF power handling
- Suits antennas up to 9 m
- Flexible mounting
- ALE, 36 ALE, and frequency hopping compatibility
- Internal receive mode amplifier

DATASHEET: Codan 3046 HF Antenna Tuner, 12-20258-EN, Issue 5, © 2020 CODANCOMMS.COM

DATASHEETS

10. 3046 ATU

ANTENNA TUNER 3046

CODAN COMMUNICATIONS

SPECIFICATIONS

GENERAL

Frequency range	2 to 30 MHz (using 3 m or 7 m MIL spec whip or 9 m long wire antenna)
Power rating	125 W PEP
Power consumption	Typically 400 mA, less than 0.8 A maximum
Input impedance	50 Ω
VSWR	Typical ≤1.5:1
Tuning speed	New frequency <1 second average, memory tune <150 ms
Memory channels	Unlimited (unique non-linear memory allocation)
DC operating range	Codan transceiver (12 V nominal)

MECHANICAL

Temperature	-30 to +60°C (–22 to +140°F), 95% humidity
Protection	Open Circuit, Short Circuit, Over Temperature, High VSWR
Environmental	MIL-STD-810G (Dust, Vibration) Immersion to IP68
EMC	Designed to MIL-STD-461
Dimensions	340 mm L x 210 m W x 95 mm H (13.4 in L x 8.3 in W x 3.7 in H)
Weight	2.4 kg (5.3 lbs)
Colour	White or olive drab green

INTERFACE

RF connector	N-type socket
Control	6 pin bayonet (MIL spec)

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

ACCESSORIES

Antennas
- 3 m MIL spec two section whip (includes NVIS tie down kit)
- MIL spec, 3 section antenna extension and guy kit (extends standard)
- 3m antenna to 7m **(WHERE in Catalogue)**
- 9 m long wire antenna kit **(WHERE in Catalogue)**

Antenna bases
- MIL spec rubber spring
- Flange mount base
- Single hole mount base

Mounting hardware
- Vehicle shock mount
- Installation kit

Cables
- 2, 6 10 and 20 m (6.6, 19.7, 32.8 and 65.6 ft) RF coaxial cables
- 2, 6 10 and 20 m (6.6, 19.7, 32.8 and 65.6 ft) control cable

DATASHEET: Codan 3046 HF Antenna Tuner, 12-20258-EN, Issue 5, © 2020 CODANCOMMS.COM

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DATASHEETS

11. 3049 ATU

ANTENNA TUNER
3049

CODAN COMMUNICATIONS

KEY FEATURES

- 2 to 30 MHz
- 125W PEP
- Memory tune <500 ms
- 2G and 3G ALE compliant
- Suited for whip and long wire antennas
- Up to 100m cable lengths
- Robust construction
- IP67 rated

The 3049 is an HF band Antenna Tuner designed for use with most end-fed long wire and base whip antenna systems for base station applications. With its robust design, extended interface cable capability and high performance specifications, the 3049 provides an ideal choice for base stations requiring a tuned HF base station antenna solution.

HIGH PERFORMANCE

With 125 W RF power handling capability, the 3049 can be used for full duty cycle voice and data operation over the full 2 to 30 MHz frequency band, within rated environmental conditions. The tuner is designed for up to 125 W RF power levels and with Codan fast tune interface and tune from memory capability, it is compatible with timing dependant calling protocols such as 2G and 3G ALE and voice and data operation.

FLEXIBLE INTERFACE

The 3049 tuner is available in two variants that provides a flexible approach for different installation scenarios. The 3049 variant is fitted with permanently attached but separated coaxial cable and transceiver control cables, each 30 m in length. The 3049-S variant is coupled with a dedicated Interface Adaptor unit which allows for a single coaxial cable connection between the Codan HF transceiver and the antenna tuner, up to 100m in length. Both variants of the 3049 derive power from the connected Codan HF transceiver.

ANTENNA COMPATIBILITY

The 3049 tuner is designed to tune antenna elements with lengths ranging from 2.4 m and up to 23 m across the full 2 to 30 MHz band, covering typical tuned base antenna types like the Codan Code 406 Whip and Code 403 Long wire.

ROBUST DESIGN

With its UV stabilised glass reinforced nylon housing and IP67 ingress rating the 3049 tuner has a robust design making it suitable for installation in both indoor and outdoor environments. Additional protection can be provided with the optional sunshield accessory, recommended for installations where the 3049 tuner is expected to sustain continuous hot summer sun exposure.

DATASHEET: Codan 3049 Antenna Tuner, 12-xxxx-EN, Issue 1, © 2020 **CODANCOMMS.COM**

DATASHEETS

11. 3049 ATU

ANTENNA TUNER
3049

CODAN COMMUNICATIONS

SPECIFICATIONS

GENERAL (3049 & 3049-S TUNER)

Frequency range	**Tx:** 2 to 30 MHz **Rx:** 250 kHz to 30 MHz
RF power rating	125 W PEP
Duty cycle	100% all modes up to 55°C
Input impedance	50 Ω
VSWR	**Peak:** ≤1.8:1 **Average:** ≤1.2:1
Tuning speed	**Initial tune:** 6.7 second average **Tune from memory:** <200 ms (3049) **Tune from memory:** <500 ms (3049-S)
Memory channel	Unlimited
Tune power	20 W PEP
DC power requirements	12 V DC nominal **Peak Current:** 1.5 A **Tuned state:** 800 mA maximum

INTERFACES (3049 & 3049-S TUNER)

Tune interface protocol	Codan proprietary fast tune
Antenna	M6 threaded stud
Ground	M6 threaded stud
RF input / output	**3049:** 30 m RG58 flying lead coaxial cable terminated in UHF plug **3049-S:** 200 mm RG58 flying lead coaxial cable terminated in N-type socket
Transceiver control	**3049:** 30 m fixed cable to standard Codan 6 pin circular plug **3049-S:** Transceiver control via coaxial cable, requires use of Interface Adaptor

INTERFACES (INTERFACE ADAPTOR)

Antenna tuner	150 mm RG58 flying lead coaxial cable terminated in UHF socket
Transceiver control	150 mm flying lead to standard Codan 6 pin circular plug
Transceiver RF	150 mm RG58 flying lead coaxial cable terminated in UHF plug

DATASHEETS

11. 3049 ATU

ANTENNA TUNER
3049

CODAN COMMUNICATIONS

SPECIFICATIONS

MECHANICAL (3049 & 3049-S TUNER)

Housing material	Glass reinforced nylon – UV stabilised
Colour	Black
Dimensions	415 x 260 x 100 mm (16 x 10 x 4 in): tuner unit without cables
Weight	3.2 kg (7.1 lbs): 3049 / 3049-S tuner unit without cables 6 kg (13.2 lbs): 3049 tuner unit with 30 m cables

MECHANICAL (INTERFACE ADAPTOR)

Housing material	ABS plastic – non UV stabilised
Colour	Black
Dimensions	165 x 65 x 35 mm (6.5 x 2.5 x 1.5 in) – enclosure only
Weight	200 g (0.4 lbs)

ENVIRONMENTAL

Storage temperature	10 - 30°C (50 - 90°F)
IP Rating	3049 / 3049-S Tuners: IP67 Interface Adaptor: IP42

COMPLIANCE

Safety	Complies with IEC 62368-1:2014
RoHS	Compliant
EMC	**CE:** EMC Directive 2014/30/EU (ETSI 301 489-1/-15) **FCC:** Part 15B **IC:** ICES-003 **RCM:** CISPR32

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

ACCESSORIES

Compatible Codan Antennas

- 9.5m Base Whip – ground mount
- 9.5m Base Whip – roof mount
- 20m Base Long Wire

Optional Accessories

- Sun shield
- High Voltage (HV) RF cable
- Radial ground plane – ground mount
- Radial ground plane – roof mount
- Copper earth stake – 1.8m
- Copper earth strip

DATASHEET: Codan 3049 Antenna Tuner, 12-xxxx-EN, Issue 1, © 2020 **CODANCOMMS.COM**

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DATASHEETS

12. 3240 ATU

ANTENNA TUNER

3240 1KW AUTOMATIC TUNER

CODAN COMMUNICATIONS

Codan's 3240 is an automatic antenna tuner developed to interface directly with Codan's 3061 and 3062 HF power amplifiers to provide reliable, high performance tuned antenna solutions for land and sea deployment, at RF power levels up to 1 kW.

KEY FEATURES

- 1 kW RF rating
- 2 to 30 MHz
- Fast Tuning
- Unlimited memory tune
- Tunes whips and long wire antennas
- Auxiliary receive antenna input
- Low current design
- ALE & Frequency Hopping compatible
- MIL-STD-810G
- NGT / Envoy / Sentry-H compatible

HIGH PERFORMANCE

With 1 kW RF power handling capability, the 3240 can be used for full duty cycle data and voice, including frequency hopping, over the full 2 to 30 MHz HF band. The use of custom designed latching relays ensure that power draw when tuned is minimised, contributing to long term reliability, low noise and efficient use of energy.

The tuner has unlimited tune from memory capacity, and using a highly optimised tuning algorithm, new frequencies are tuned in typically less than 5 seconds, previously tuned frequencies are tuned within 150 mS. This means that HF systems using this tuner are fully compatible with high speed linking waveforms, such as 3G ALE.

FLEXIBLE ANTENNA CONFIGURATIONS

Both wire and vertical whip antenna elements are supported by the 3240, ensuring that varying requirements for propagation and installations constraints can be easily met. Antenna lengths as short as 5 m and from 10 m to 46 m are supported for 3-30 MHz and 2-30 MHz tuning ranges respectively.

POWER SUPPLY

The tuner has a separate rack mountable power supply unit which provides a power and control interface which will support cable lengths of up to 100 m. This enables the tuner and antenna to be located remotely from the radio equipment for tactical security or co-location requirements.

RUGGED DESIGN

The tuner housing is of rugged welded aluminium construction with, high quality, marine grade paint that is available in haze grey, desert sand or white finish.

For applications likely to experience high levels of vibration, for example shipboard, an optional shock mount accessory is available. When combined with the shock mount the tuner unit meets Military standards for shock and vibration.

DATASHEET: Codan 3240 1kW Automatic Tuner, 12-20328-EN, Issue 2, © 2018

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DATASHEETS

12. 3240 ATU

ANTENNA TUNER
3240 1KW AUTOMATIC TUNER

CODAN COMMUNICATIONS

SPECIFICATIONS

3240 ANTENNA TUNER

Frequency range	Wire: 23 m to 46 m (75 to 150 ft) 2-30 MHz Whip: 10 m (32 ft) 2-30 MHz Whip: 5 m (16 ft) 3-30 MHz
Power rating	1kW PEP and Average
Duty cycle	Full voice and data
Input impedance	50 Ω
VSWR	Typically ≤1.5:1
Tune time	Memory 150 ms, initial tune 5 sec (typical)
Tune power	10 W nominal, 50 W max
Memory channels	Unlimited
Tune modes	Fully automatic and memory
RF connector type	N-type socket
Control connector type	10 pin military screw connector
Auxiliary receive antenna connector	TNC
Auxiliary receive antenna power	12 V DC, 1 A max
Operational temperature	-20 to +55°C
Finish	Marine grade paint – haze grey, desert sand, white
Enclosure	Aluminium sealed to IP66
Certifications	CE for EMC, MIL-STD-810G (with shock mount)
Dimensions	350 x 380 x 330 mm
Packed dimensions/weight	500 x 500 x 500 mm; 25 kg

3220 POWER SUPPLY

Input voltage	230/115 (manually switchable)
Dimensions	2RU
AC power connector type	10 A IEC (fused)
Control connector type	15-way D connector
AC power switching	Tuner switching may be slaved to radio or controlled by PSU

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

ACCESSORIES

- 3061/3062 HPA to 3220 PSU to Interface Cable, 1 m
- 3220 PSU to 3240 ATU Control cable, 30 m, 40 m, 75 m, and 100 m
- 3061/3062 HPA to 3240 ATU RG213 coaxial cable (UHF to N-type), 30 m, 40 m, 75 m, 100 m
- 3240 ATU Shock Mount Accessory
- 1 kW Long Wire Antenna

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DATASHEETS

13. 3040 MARITIME

DATASHEETS

14. 9300 / 9320 MARITIME

VEHICULAR ANTENNA
9300 AUTOMATIC TUNING WHIP

CODAN COMMUNICATIONS

Codan's 9300 Automatic Tuning Whip Antenna is designed for superior performance and reliability in the most demanding mobile military operations, where communications failure is not an option. It is intended for installation on all type of vehicular platforms equipped with Codan HF transceivers.

KEY FEATURES

- Continuous 1.6 to 30 MHz coverage
- 150W RF power rating
- Excellent radiation efficiency
- Fast memory tune
- Integral broadband receiver amplifier
- 2G and 3G ALE and Frequency Hopping Compliant
- Rugged MIL-STD 810G certified design
- Up to 200 memory channels

HIGH RADIATION EFFICIENCY

The 9300 antenna is a closer-to-centre loaded monopole radiator that provides substantially greater radiation resistance compared to base loaded antenna-and-coupler combination typically used in mobile HF installations. This smart and elegant design allows the Codan 9300 antenna to increase radiation efficiency and provide exceptional reliability compared to competitor products.

FULL HF BAND COVERAGE

The 9300 antenna features ultra-fast automatic tuning to any frequency over the entire 1.6–30 MHz HF frequency range permitting maximum utilization of HF transceiver spectrum capability. A wideband receiver amplifier is activated in Scan mode making the 9300 antenna sensitive to even weakest signals over the supported frequencies. With an extremely low RF insertion loss, the 9300 is the best-in-class mobile antenna capable of a high duty cycle RF power handling required for intensive analogue/digital voice and data communication.

ADAPTIVE MATCHING

The 9300 antenna operates under control of intelligent adaptive matching algorithm which continuously monitors any significant variations of standing wave ratio that may be caused by weather conditions or proximity of other vehicles and automatically adjusts built-in matching circuit to VSWR 1.6:1 or less at every new transmission. This ensures that the HF transceiver is able to maximise RF output power at all times, ensuring optimum communication quality and range at all times.

RUGGED DESIGN

The 9300 antenna housing is moulded from fiberglass reinforced nylon, stabilised by artificial aging treatment. The aluminium die cast antenna base incorporates heavy duty anti-vibration rubber mounts, water-tight air valve and military grade connectors. Rugged and impervious to dust and water ingress, the 9300 meets or exceeds requirements of MIL-STD-810 assuring long term reliable operation in all altitudes, terrains and climatic zones.

EASE OF INSTALLATION

Packaged in a compact self-contained form factor, the 9300 is easy to install on all type of vehicles. Installation is facilitated through wide selection of mounting brackets, installation kits and cable length options.

DATASHEET: Codan 9300 Automatic Tuning Whip Antenna, 12-20341-EN, Issue 10, © 2020 CODANCOMMS.COM

DATASHEETS

14. 9300 / 9320 MARITIME

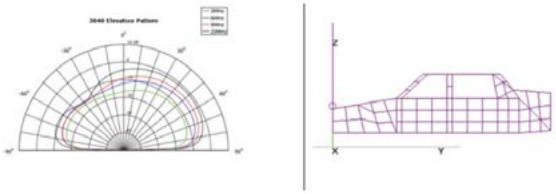
VEHICULAR ANTENNA
9300 AUTOMATIC TUNING WHIP

CODAN COMMUNICATIONS

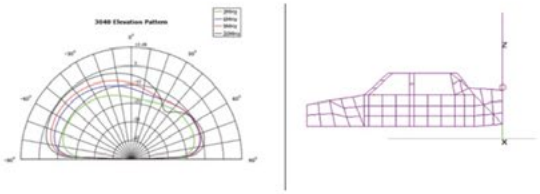
SPECIFICATIONS		PRACTICAL CRITERIA	
Transmit frequency range	1.6MHz to 30MHz	Distance, Tcvr to Antenna (m)	≤30 m
Receive frequency range	250KHz to 30MHz	Footprint	Small
RF power rating	150W PEP voice/data	Grounding requirements	Yes
MAX VSWR	1.6:1		
Input impedance	50Ω		
Tuning speed specifications	725 ms average for new frequency 350 ms average for memory tune		
Memory channels	200		
DC operating range	10-30V DC		
Current draw - tuning	3.2A		
Current draw - static	60–110mA		
Operating temperature	-40°C to +70°C		
Protection	Reverse Polarity, Short Circuit, Over Voltage		
RF connector style	RG58 UHF		
Control connector style	8-PIN		
MIL-STD-810	MIL-STD-810G Salt Fog, Immersion, Sand, Dust, Shock, Vibration		
Ingress protection	IP67		
Weight	5.4 kg		
Dimensions	100 x 100 x 2490 mm		
Mounting method	Single stud M16		
Vehicle mount footprint	100 x 100 mm		
Colour	Black		
Compliance	MIL-STD-461, IEC/EN 61000		

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.
Continuous transmission for periods of greater than 10 minutes using digital modes may result in reduced radiation efficiency.

RF PATTERN ANTENNA MOUNTED ON FRONT



RF PATTERN ANTENNA MOUNTED ON BACK



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14. 9300 / 9320 MARITIME

VEHICULAR ANTENNA

9320 AUTOMATIC TUNING WHIP

CODAN COMMUNICATIONS

Codan's 9320 Automatic Tuning Marine Whip Antenna is designed for maximum performance in marine conditions. The 9320 is intended for installation on all types of small ships and boats with limited space, where large HF antennas are difficult to install and consistent communication is required.

RUGGED DESIGN

The 9320 antenna is a marine version of 9300 automatic tuning antenna system acclaimed for its outstanding performance and reliability. Designed for harsh marine environments, the 9320 antenna comprises a premium stainless steel base, an epoxy coated fiberglass reinforced nylon enclosure and other marine grade parts and materials. Rugged and waterproof construction is capable of withstanding extreme wind loads and ship vibrations.

CONTINUOUS 1.6-30 MHZ COVERAGE

The 9320 antenna features continuous frequency coverage over entire 1.6–30 MHz HF frequency band permitting maximum utilisation of Codan HF transceiver spectrum capability. Excellent radiation performance and fast tuning of the 9320 antenna provides outstanding communication range and quality.

FAST TUNING

The 9320 marine antenna incorporates microprocessor controlled stepper inductor which tunes the antenna to any frequency stored in the memory bank of up to 200 channels in less than half a second. Intelligent adaptive matching algorithm continuously monitors any VSWR variations caused by flexing of other collocated V/UHF antennas and vessel structures in rough weather. The 9320 antenna automatically re-adjusts matching circuit to VSWR 1.6:1 or less at every new tune ensuring the HF transceiver operates at full RF power.

HIGH RADIATION EFFICIENCY

A built-in wideband receiver amplifier makes the 9320 marine antenna sensitive to even weakest signals over entire frequency range ensuring crystal clear reception and faster connection in 2G and 3G ALE modes. With a low insertion loss RF circuit, the 9320 antenna is capable of RF power duty cycles, required for extended analogue/digital voice and data transmission.

EASE OF INSTALLATION

The 9320 marine antenna is implemented in compact self-contained form factor optimized for easy and frequent re-installations using simple cabling system and mounting brackets. It can be installed on metal hulled vessels as well as most small yachts and cabinless workboats made of fiberglass or inflatable rubber.

KEY FEATURES

- Continuous 1.6 to 30 MHz coverage
- 150W RF power rating
- Excellent radiation efficiency
- Fast memory tuning
- Integral broadband receiver amplifier
- 2G and 3G ALE and Frequency Hopping Compliant
- Rugged MIL-STD 810G certified design
- Up to 200 memory channels
- Easy to install on small yachts and workboats
- Designed to withstand harsh marine environment

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DATASHEETS

14. 9300 / 9320 MARITIME

VEHICULAR ANTENNA
9320 AUTOMATIC TUNING WHIP

CODAN COMMUNICATIONS

SPECIFICATIONS	
Transmit frequency range	1.6MHz to 30MHz
Receive frequency range	250KHz to 30MHz
RF power rating	150W PEP voice and data
MAX VSWR	1.6:1
Input impedance	50Ω
Tuning speed specifications	725 ms average for new frequency 350 ms average for memory tune
Memory channels	200
DC operating range	10-30V DC
Current draw - tuning	3.2A
Current draw - static	60-110mA
Operating temperature	-40°C to +70°C
Protection	Reverse Polarity, Short Circuit, Over Voltage
RF connector style	RG58 UHF
Control connector style	8-Pin
MIL-STD-810	MIL-STD-810G Salt Fog, Immersion, Sand, Dust, Shock, Vibration
Ingress protection	IP67
Weight	5.4 kg
Dimensions	100 x 100 x 2490 mm
Mounting method	Single stud M16
Vehicle mount footprint	100 x 100 mm
Colour	White
Compliance	MIL-STD-461, IEC/EN 61000

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.
Continuous transmission for periods of greater than 10 minutes using digital modes may result in reduced radiation efficiency.

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DATASHEETS

15. 9350 / 9350M

VEHICULAR ANTENNA
9350 AUTOMATIC TUNING WHIP

CODAN COMMUNICATIONS

9350 Antenna parts (main assembly, fibreglass whip, stainless steel whip and spring)

KEY FEATURES

- Rugged, best-in-class mobile antenna
- Fast, optimum tuning
- High radiation efficiency
- Continuous tuning
- Two whips supplied
- Sensitive to weak signals

Codan's 9350 Automatic Tuning Whip Antenna is designed for maximum durability and reliability in demanding mobile military operations. It is used with transceivers that have a large channel capacity.

RUGGED DESIGN

The 9350 Antenna is constructed to withstand the harsh field and environmental conditions common in military operations. It meets or exceeds the shock and vibrations requirement for MIL-STD-810.

The main antenna section is constructed of fibreglass reinforced nylon. This provides a weatherproof housing for the control and tuning devices, which are fitted inside. It is mounted on an anti-vibration base that incorporates rubber mounts. The 9350 Antenna will operate in a broad range of temperatures.

FAST, OPTIMUM TUNING

Typically, the 9350 takes only a few seconds to tune to any frequency. It will seek the optimum tuning point for all operating conditions – this ensures the best communications possible.

HIGH RADIATION EFFICIENCY

The 9350 Antenna has a comparably high rate of radiation efficiency. It is rated for maximum voice power of 125 watts PEP.

CONTINUOUS TUNING

The whip antenna uses a microprocessor controlled stepper motor to provide continuous tuning to any required frequency over the transmit /receive operating range of 2 to 30 MHz.

TWO WHIPS SUPPLIED

Two whip top sections are provided with the 9350 Antenna. The standard or primary whip is a wire that is encased in a polyurethane covered fibreglass rod. It is designed to withstand substantial flexing and hard knocks and operates over the full frequency range of this antenna.

The shorter, secondary whip is manufactured from stainless steel. It is designed for use as a backup in emergency situations when the standard whip has been damaged. This whip is only suitable for operation over a transmit frequency range of 2.5 to 30 MHz and is less efficient than the primary whip.

SENSITIVE TO WEAK SIGNALS

When in Scan or Free Tune Receiver mode, a broadband amplifier is activated. This makes the antenna sensitive to even the weakest signals over the entire frequency range.

DATASHEET: Codan 9350 Automatic Tuning Whip Antenna, 12-20051-EN, Issue 17, © 2018

DATASHEETS

15. 9350 / 9350M

VEHICULAR ANTENNA
9350 AUTOMATIC TUNING WHIP

CODAN COMMUNICATIONS

SPECIFICATIONS

Frequency range	**Primary whip top** Transmit operation: 2 to 30 MHz **Secondary whip top** Transmit operation: 2.5 to 30 MHz Receive-only (Scan mode/Free Tune Receiver mode): 250 kHz to 30 MHz
Power rating	125 watts PEP (voice)
Power consumption	Static: 150 mA Tuning: 1 A (12 V DC nominal — supplied from the transceiver)
Input impedance	50 ohms: VSWR typically 1.5:1
Temperature	–40 to +60°C
Tuning speed	Typically 2 seconds
Size and weight	Primary whip: 2.47 m; 5.8 kg
Colour	Black, Green

Values noted are typical. Equipment descriptions and specifications subject to change without notice or obligation.

NEAR VERTICAL INCIDENCE SKYWAVE (NVIS) KIT

The NVIS kit is an add-on accessory for Codan's 9350 Antenna.

Short vertical whip antennas are poor radiators at high take-off angles. This makes short distance communications difficult, especially in hilly terrain. Making the whip longer and more horizontal improves the high take-off angle radiation efficiency.

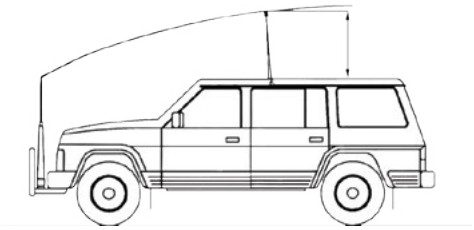
Improves short-range communications
Transmit and receive paths over the range of 0 to 500 kms will be greatly improved with the addition of the NVIS kit.

Easily attached to a variety of vehicles
The NVIS kit can be quickly and easily attached to a wide variety of vehicles. All fitting instructions are provided – no special tools are required.

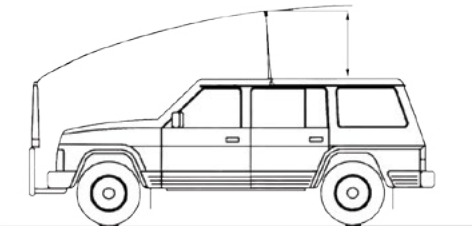
Rugged design
The tough design of the NVIS has been proven through extensive field testing.

Easy to transport
The NVIS kit is supplied in a canvas bag for ease of transportation.

Note: The frequency range of the NVIS kit is 1.6 to 12 MHz.



One metre minimum separation between roof top or rack



One metre minimum separation between roof top or rack

DATASHEETS

16. 3046 & 3M CARBON FIBRE WHIP

DATASHEETS

17. LONG WIRE ANTENNA

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