C-Nav High Latitude Antenna Kit Installation/ User Manual

Revision 4

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Release Notice

This is the July 2013 release of the C-Nav High Latitude Antenna Kit Installation/ User Manual.

Revision History

Revision	Date	Description	Author	Technical	Manager
4	7/25/2013	Added Antenna Certification	J. Hauschildt	G. Herbert	R. Morton
3	4/10/2013	Changed Operating Temperature	J. Hauschildt	G. Herbert	R. Morton
2	3/7/2013	Correct Part #'s on line cords	J. Hauschildt	G. Herbert	R. Morton
1	3/4/2013	Initial Release	J. Hauschildt	G. Herbert	R. Morton
0	2/18/2013	Internal Release for Review	J. Hauschildt	G. Herbert	R. Morton

Trademarks

FCC Notice

This device complies with Part 15 Subpart B Class B of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

The GNSS sensor has been tested in accordance with FCC regulations for electromagnetic interference. This does not guarantee non-interference with other equipment. Additionally, the GNSS sensor may be adversely affected by nearby sources of electromagnetic radiation.

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Use of this Document

This User Guide is intended to be used by someone familiar with the concepts of GNSS Sensor hardware installation and rack mounted equipment in a marine environment. It is intended as a quick-reference only; complete installation, operation and configuration information for system components are available via the user guides listed below in *Related Documents*.

Revisions to this User Guide can be obtained on our website (www.cnav.com) or by contacting C-Nav Support: support@cnav.com.

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Manual Organization

This section describes how the manual is laid out. It gives one or two sentence descriptions about each major section.

Section 1 – Overview (Page 6) gives a brief overview of the purpose of this document.

Section 2 – Installation (Page 8) gives the full installation guidelines of the High Latitude Antenna.

Appendix A- Antenna Location Tips (Page 11) gives tips on how to find the proper location for the High Latitude Antenna.

Appendix B- Cable Installation and Routing Tips (Page13) gives tips on how to install the cable and its proper routing.

Appendix C- Technical Specifications AD493-2 (Page16) gives electrical and mechanical specifications of the antenna

Appendix D- Certification (Page18) is the Model Declaration of Conformity for the antenna.

Conventions

Arial font is used for plain text in this document.

Arial italic font is used for settings names.

Arial Blue font is used for cross-references.

Arial Blue Underline font is used for hyperlinks.

⚠ This symbol is used for warnings in which failure to take heed may cause severe injury or death.

⚠ This symbol is used to caution the user that the improper installation and use of this product may damage this product and/or other devices connected to it.

Important notes are displayed in shaded text boxes

> ***Please note***:
> Such note box displays important information which should not be ignored.

Section 1 – Overview

Introduction

The C-Nav High Latitude Antenna Kit (P/N CNVAD493HL) is used to improve the quality of the L Band correction signals for those users who are located in high latitude areas where L Band coverage is marginal (ideal above latitudes >60°). This manual outlines the installation of the High Latitude Antenna Kit. This kit includes, along with this manual, a high latitude antenna (with mounting bracket), a Bias Tee (to provide power to the antennas), a one meter and three meters coax cables (preassembled with TNC connectors) and a power supply with various line cords. Table 1 lists the supplied equipment that comes with the C-Nav High Latitude Antenna Kit (CNVAD493HL). Figure 1 shows a basic diagram of the High Latitude Antenna Kit with its relation to the C-Nav3050 DGNSS antenna and receiver.

Supplied Equipment

Table 1**:** *C-Nav High Latitude Antenna Kit (CNVAD493HL) - Supplied Equipment*

1	1 ea. Antenna, Low Elevation. L band TNC (P/N ALIAD493-2-TNC)
2	1 ea. Power Supply, 12VDC, 1.25A (P/N ASTSPU15B-105)
3	1 ea. GPS Bias Tee, Waterproof (P/N GPSBT1-W-PM/5-TF-S)
4	1 ea. Cord, Power, IEC320-C7 (US) (P/N 4250011-110)
5	1 ea. Cord, Power, IEC320-C7 (EURO) (P/N 4250012-220)
6	1 ea. Cord, Power, IEC320-C7 (UK) (P/N 4250013-240)
7	1 ea. 1 meter of LMR-400 coaxial cable terminated with two TNC Male connectors
8	1 ea. 3 meters of LMR-400 coaxial cable terminated with two TNC Male connectors
9	1 ea. High Latitude Installation/ User's manual (P/N CNVAD493HL-MANUAL)

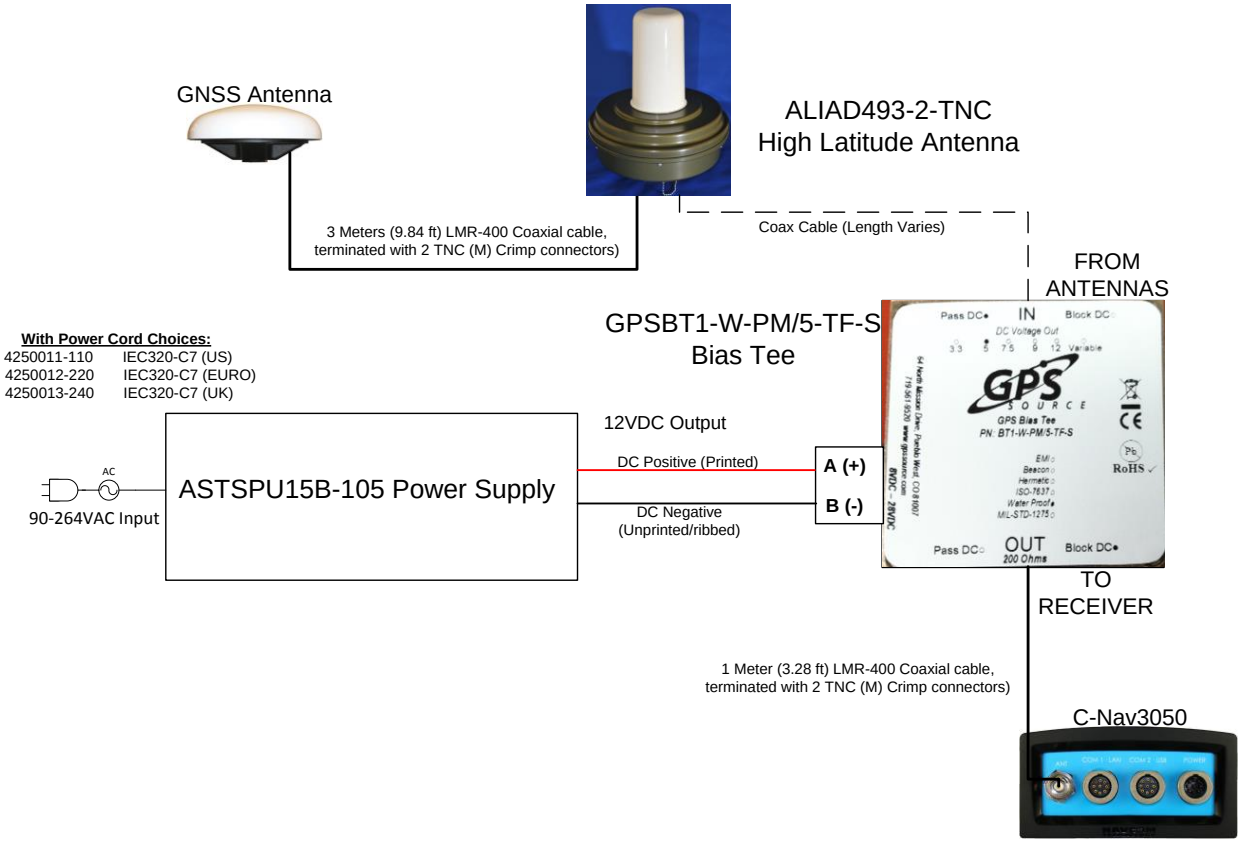

***Figure 1*:** *C-Nav High Latitude Antenna Kit Basic Diagram*

Section 2 – Installation

This section provides guidance on hardware installation for optimum performance.

Prior to commencing any installation, discuss proposed mounting locations/methods and cable routes with those involved to ensure all parties are aware of the work to be done and the risks involved.

⚠ Always wear appropriate protective equipment, including a certified fall arrestor harness and hardhat when working at heights to prevent injury to personnel, or death. Prior to commencing any work on the mast, ensure that all radar systems are switched off and isolated.

Consider the location and proposed cable routes prior to installing the C-Nav High Latitude Antenna Kit. Depending on the situation/location, it may be practical to connect and run data, power and antenna cables prior to mounting. The installation steps will be broken down into two parts:

Part A: Bias Tee and power supply installation.

Part B: High Latitude antenna installation.

Part A: Bias Tee and Power Supply Installation

Follow these steps for correct installation:

1. Power off the C-Nav3050 before installing.
2. Determine a good location for installing the Bias Tee and Power Supply. If the existing C-Nav3050 is mounted on a shelf in an equipment rack, then the Bias Tee and Power Supply should be mounted there as well.
3. Remove the bag containing the Bias Tee and Power Supply from the box containing the High Latitude Antenna Kit packaging; along with the one meter length of LMR-400 with terminate TNC connectors.
4. Disconnect the existing coax from the antenna (“ANT”) port from the back of the C-Nav3050; reconnect to the “IN” port on the Bias Tee.
5. Connect the one meter length of LMR-400 coax from the “OUT” port of the Bias Tee to the “ANT” port on the C-Nav3050.

Part B: High Latitude Antenna Installation

Please Read Appendix A (Antenna location tips) and Appendix B (Coaxial cable installation and routing tips) prior to installing the AD493-2 High Latitude Antenna.

1. Once the antenna location has been determined based on the aforementioned criteria (Appendix A), mount the AD493-2 High Latitude Antenna, using the supplied mounting kit to a stanchion (Minimum diameter of stanchion: 1 1/8" (28.6 mm); Maximum diameter of stanchion: 2 1/8" (54 mm)) located no more than three meters away from the GNSS antenna.
2. Disconnect the coax cable from the GNSS antenna and connect it to the "Receiver" port of the AD493-2 antenna. (See Figure 2)
3. Using the three meter length of LMR-400 coax (With terminated TNC Male connectors) provided, connect from the "L1/L2 Antenna IP" port to the antenna connector on the GNSS antenna. (Also See Figure 2)
4. Use a level to ensure that the antenna is mounted vertically.
5. Weatherproof the antenna connectors and properly secure the coax cables.

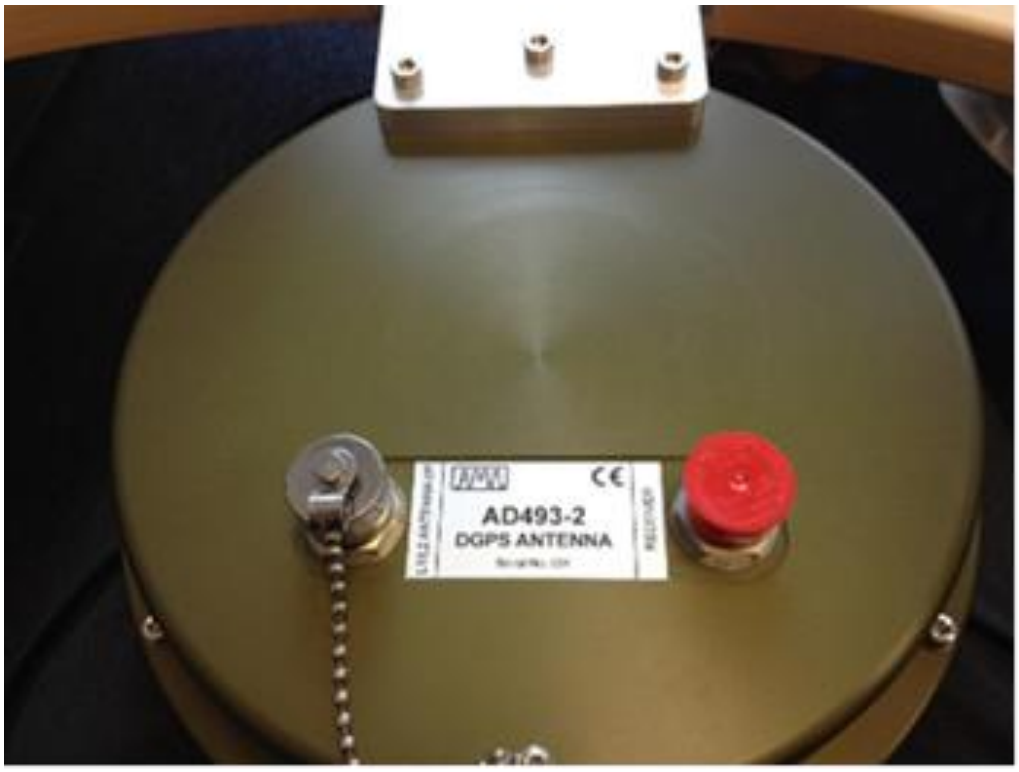

Figure 2: *Cable connections to the AD493-2*

Power up and Test

1. If it has not been done, connect the ASTSPU15B-105 Power Supply to the Bias Tee.
2. Use the appropriate power cord and connect the “shotgun” side to the ASTSPU15B-105 Power Supply. Plug the other end of the power cord into the appropriate outlet. Check to see if the LED on the Power Supply is lit.
3. Power up the C-Nav3050.
4. Once the C-Nav3050 has been powered up, determine that it is operating properly by viewing the LED’s on the receiver indicator panel.
5. The C-Nav3050 may also be connected to either a PC utility, such as C-Setup or C-Monitor. The C-Nav3050 may also be connected to a C-NaviGator. For more information, contact C-Nav Support.

Appendix A- Antenna Location Tips

Antenna Location Tips

1) Locate the antenna where it has a clear view of the sky, to an elevation angle of -5º (below the horizon- to compensate with the vessel rolling), if possible.
2) Avoid placing the antenna where more than 90º azimuth of the sky is obstructed. When more than 90º of azimuth is shaded, it is often still possible for the receiver to navigate, however, poor satellite geometry (due to satellite shading) will provide poor positioning results. Even 10º of shading can have a negative effect on performance, though this generally is not the case.
3) Avoid placing the antenna on or near metal or other electrically reflective surfaces.
4) Do not paint the antenna enclosure with a metallic-based paint.
5) Secure the antenna to the mast firmly to avoid wind and vibration which can affect the performance of the High Latitude Antenna system.
6) Avoid placing the antenna near electrical motors (elevator, air conditioner, compressor, etc.) or other sources of of interference such as radar systems, satcom domes, HF antennas or whip antennas.
7) Do not place the antenna too close to other active antennas. The minimum acceptable separation between antennas is 1m (39 in), which provides 5.9dB of isolation.
8) Active antennas (those with LNA's or amplifiers) create an electrical field around the antenna. These radiated emissions can interfere with other nearby antennas. Multiple GNSS antennas in close proximity to each other can create multipath and oscillations between the antennas. These add to position error or the inability to process the satellite signals.
9) Most antenna's have better gain when the satellite is high in elevation. Expect tracking performance to fade as the satellite lowers in elevation. It is not unusual to see 10dB difference in antenna gain (which translates into signal strength) throughout the entire elevation tracking path.
10) Use satellite prediction software with a recent satellite almanac to assess the impact on satellite visibility at your location. An L-band Communication Satellite Locator tool is available on C-Nav's website and Product CD to aid in determining potential obstructions to the C-Nav Signal: www.cnav.com/calculator

11) A clear line of sight between the antenna and the local INMARSAT satellite is required to track the C-Nav Subscription Service signal. INMARSAT satellites are geo-synchronized 35,786kms (22,300 miles) above the Equator.

Appendix B- Cable Installation and Routing Tips

Coaxial Cable Installation and Routing Tips

Proper installation of coaxial cables is important to ensure successful communication between the antenna and the GNSS sensor.

The connector used on the C-Nav3050 is a TNC female, labeled *ANT* on the rear panel of the sensor.

⚠ The GNSS antenna connector, at the receiver, provides +5V ± 0.5V at 100mA. Do not disconnect the antenna when the GNSS unit is powered on.

Cable Route

1) When choosing a cable route for coaxial cable, consider the following:
2) Avoid running coaxial cable across, or parallel too power cables and high power RF cables.
3) Ensure that the cable route is free of sharp edges or places where the cable could become pinched, kinked, sliced or damaged in any way.
4) Determine the manufacturer's specifications for the coaxial cable in use. This should include: impedance, diameter, attenuation in dB/100ft and dB/100m at 1.575GHz, velocity of propagation and the minimum bend radius of the cable.
5) Ensure the cable does not exceed the recommended minimum bend radius suggested by the manufacturer.
6) Ensure there is sufficient space at the cable entry point to the bulkhead as to not damage the connector during installation.
7) Measure the length of the cable route and refer to *Table 2* for acceptable cable lengths in relation to attenuation loss at the frequencies in use. The cable length between the antenna and C-Nav3050 should not exceed 7dB loss at 1.575GHz for optimum performance, though the system may tolerate up to 10dB of cable loss with minimal performance. Lower elevation satellite tracking suffers the most with more than 7dB insertion loss.
8) In-line amplifiers suitable for all GNSS frequencies may be used to increase the length of the antenna cable, but care should be exercised that tracking performance is not degraded due to multiple connections, noise from the amplifier, and possible ingress of moisture and dust to the in-line amplifier. In-line amplifier or splitter devices must pass DC

power from the receiver to the antenna, or source the appropriate voltage and current to the antenna. In-line amplifiers may also over-saturate the receiver front-end if improperly used. Contact C-Nav Support for more information on available in-line amplifier solutions.

Coaxial Cable Installation

1) Prior to connecting the coaxial antenna cable to the antenna, ensure that all connections are free of dirt and other debris. Apply silicone grease to the connector threads and wipe off any excess, ensure not to get any lubricant on the contact. Connect the coaxial cable and hand-tighten firmly. Wrap the connection with self-amalgamating tape or another weather sealant such as Coax-seal® to prevent water ingress.
2) Slacken the coaxial cable and tape firmly to the antenna-mounting pole. This will prevent any undue strain on the cable connector and antenna.
3) With the cable connected to the antenna, run the cable down the mast, securing with zip ties every 2 or 3 feet. Carefully lay the cable along the chosen route to further detect any potential kinks, bends or spots where the cable may become damaged.
4) Secure the cable along the cable route with tape or zip ties and place a label at both the GNSS sensor end and the High Latitude Antenna end of the cable for identification purposes.
5) Connect the coaxial cable to the female TNC connector on the GNSS receiver labeled “ANT”. Ensure that any slack in the cable is neatly stowed and that the minimum bend radius is not exceed during this process.

***Table 2**: Acceptable Coaxial Cable Lengths*

Cable Type	Atten. (dB) per 100 Ft.	Cable Length in Feet	Loss in dB	Atten. (dB) per 100 m	Cable Length in Meters	Loss in dB
RG-58C	19.605	36.00	7.06	64.32	11.00	7.08
RG-142	16.494	43.00	7.09	54.12	13.00	7.04
RG-213	9.564	74.00	7.08	31.38	22.50	7.06
RG-223	17.224	41.00	7.06	56.51	12.50	7.06
LMR600	3.407	207.00	7.05	11.18	63.00	7.04
LMR400	5.262	133.00	7.00	17.26	41.00	7.08
LMR240	10.127	70.00	7.09	33.23	21.00	6.98
LMR195	14.902	47.00	7.00	48.89	14.00	6.85

Lightning Protection

Where the GNSS antenna is exposed to sources of electromagnetic discharge such as lightning, install a properly grounded in-line electrical surge suppressor between the GNSS receiver and antenna. Install protective devices in compliance with local regulatory codes and practices. Protective devices must pass DC power from the receiver to the antenna. Contact C-Nav Support for more information on available lightning protection solutions.

Appendix C- Technical Specifications AD493-2

Technical Specifications AD493-2

Electrical Specifications

Antenna type:	Quadrifilar Helix antenna

Antenna pass-bands

L-Band:	1525 – 1558 MHz (AD493 DGPS Operation)

Through pass-bands

GPS/GLONASS/L1:	1565 – 1615 MHz
GPS L2/L5 / GLONASS L2:	1164 – 1254 MHz

LNA

LNA Gain:	39 dB (typical)
Total Noise Figure (NF) with pre-LNA band-pass filter:	2 dB

Connectors

External antenna:	TNC-f
GNSS receiver:	TNC-f
Nominal impedance (Z):	50 ohms

Power requirements

Input voltage:	+5V - +20V DC, +5V - +12V DC Nominal
Power consumption:	50mA

Mechanical Specifications

Material

Hard anodized and dichromate and nickel acetate sealed Aluminum with GRP pressure molded radome rated to IP67

Dimensions:	Ø225mm x 226mm (8.858” to 8.898”)
Weight:	4.9 Kg (10.803 Lbs.)
Environmental	
Operating temperature:	-40°C to +70°C (-40°F to 158°F)
Storage temperature:	-40°C to +85°C (-40°F to 185°F)
Certification:	See Appendix D

Appendix D- Certification

ALISON MICROWAVE LTD

Model Declaration of Conformity

We, manufacturer

Alison Microwave Ltd.
1 Fishers Quay,
North Quay,
Great Yarmouth
NR30 1JH
United Kingdom

Declare under our sole responsibility that the AD493 DGPS Antenna is in conformity with the following standards

Environmental

EN60945:2002
Clauses: 8.2, 8.3, 8.4, 8.7, 8.8
EN60529:1992

EMC
Emission: EN 301489-1:2011 & EN301489-1:2002
Immunity: EN 301489-1:2011 & EN301489-19:2002
ESD: EN 301489-1:2011 & EN 301489-19:2002

This equipment is certified for use in DP and Professional Survey applications

Dated 25 July 2013

D.W. Alison

Managing Director

Figure 3*: *Certificate of Conformity