



Thuraya IP Voyager

Satellite Terminal

Land Mobile Installation Guide

3500868-0001

Revision 5

December 31, 2013

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Understanding safety alert messages

Safety alert messages call attention to potential safety hazards and tell you how to avoid them. These messages are identified by the signal words WARNING or CAUTION, as illustrated below. To avoid possible property damage, personal injury, or in some cases possible death, read and comply with all safety alert messages.

Messages concerning personal injury

The signal words WARNING and CAUTION indicate hazards that could result in personal injury or in some cases death, as explained below. Each of these signal words indicates the severity of the potential hazard.



WARNING

WARNING indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.



CAUTION

CAUTION indicates a potentially hazardous situation, which if not avoided, could result in minor or moderate injury.

Safety symbols



The generic safety alert symbol calls attention to a potential personal injury hazard. It appears next to the WARNING and CAUTION signal words as part of the signal word label. Other symbols may appear next to WARNING or CAUTION to indicate a specific type of hazard (for example, fire or electric shock).

Chapter 1

Introduction

The purpose of this guide is to provide assistance to personnel installing the Thuraya IP Voyager mobile satellite terminal into a vehicle.

WARNING

This terminal must be installed by Authorized Service Personnel.

-  Note: Damages resulting in the failure to conform to the instructions found herein, as well as standard installation practices, will be the responsibility of the installer.

Hughes mobile satellite terminals

The mobile satellite terminals are composed of four core component parts: the transceiver or Below Deck Unit (BDU), the antenna or Above Deck Unit (ADU), the power connector/cable, and an RF cable.



Figure 1-1. BDU (left) and ADU (right) Land Mobile antenna

The Thuraya Mobility (Land Mobile) kit is shipped with the following contents:

Model	Hughes part number	Description
Thuraya IP Voyager (9105) Land Mobile kit	3500462-0004	Radio, Thuraya IP Voyager (kit)
	9506197-0001	WLAN antenna (2.4 GHz, 3 dB)
	3500472-0001	Power cable with 3-pin connector
	3500860-0001	SIM cover plate
	9504275-0008	15 Amp, fast blow, ATO blade fuse (2 pieces)
	PDF	Install Manual
	PDF	User Manual
	3500855-0001	Land Mobile Antenna Type HN221
	TNC-TNC/4m	RF coax cable TNC-TNC (4 meter)

Table 1. Land Mobile Kit Parts

Below Deck Unit (BDU)

The BDU provides all of the TE interfaces, plus the interface for the antenna (ADU) and manages the communications over the Thuraya network. Communication to the ADU is provided by a single RF cable from the BDU.

Physical dimensions

BDU: Size: 46mm x 281mm x 233mm
 Weight: 2.2kg



Figure 1-2. Below Decks Unit (BDU)

Power port

The power port is the connection from the power supply (vehicle battery or some other 12 or 24Vdc power source) to the BDU. The power cable has a positive DC power line, a Remote Switch line and a negative DC power line.

Line type	Pin number
V+ DC power line	1
Remote Switch	2
V- DC power line	3

Table 2. Power port pin out

Four RJ-45 Ethernet with Power over Ethernet (PoE) ports

There are four RJ-45 ports with Power over Ethernet (PoE) on the BDU. The ports supply standard PoE according to the IEEE 802.3af standard and 10/100BaseT Ethernet. The pinout of the ports supports a direct straight-through connection to a PC with a standard Ethernet cable. Table 3 shows the pinout of the Ethernet connector.

Pin	
1	RX+
2	RX-
3	TX+
4	NC
5	NC
6	TX-
7	NC
8	NC

Table 3. RJ-45 Ethernet port pinout



Note: The +48V and -48V are supplied over the TX, RX pairs. They are only active when an 802.3af compliant device is plugged in. The other pairs (4, 5, 7, and 8) are unused.

All four Ethernet interfaces support up to 15 Watts of power to each PoE powered device. The total power supplied by the PoE is limited to 30W maximum for 12 V installations. The BDU automatically detects the class of the device plugged in and will apply power so that the total cannot exceed these limits. If the user attempts to connect a combination of devices that require more than this, the BDU will not power any devices that would cause the limit to be exceeded.



Note: Class 4 (802.3at) PD devices are not supported.

WLAN port

The WLAN port on the BDU is a reverse polarity SMA jack. A flexible antenna with RP-SMA plug connector is supplied, part number HG2403RD-RSF.

To prevent blocking or attenuation of the WLAN signal, the BDU should be installed such that there is no metal blocking the radio path to the user's device.

Antenna port

The ADU (antenna) connects to the 50 Ohm female TNC connector antenna port on the BDU by an RF cable which carries L-band RF; signaling, & DC power (42Vdc) for the antenna.

NOTE: The antenna cable carries DC power; do not connect or disconnect the antenna cable while the unit is powered on.

CAUTION

ONLY use the Thuraya Land Mobile Antenna Type HN221 with this BDU – use of other antennas may damage the BDU and Antenna and shall void the warranty.

SIM card

SIM Card: The BDU requires a Thuraya SIM to be installed. Insert the SIM (supplied by your service provider) into the SIM card holder with the metal contacts facing down. A SIM card cover is supplied as an accessory with the BDU and may be utilized if desired. Use this to prevent accidental removal of the SIM card or if additional security is required. Note: the following tool (not supplied) is required to fit the SIM Card Cover: Screwdriver, Torx 8 (for a metric M2.5 screw). See Figure 1-3 for attaching the SIM card cover.



Figure 1-3. Fitting the SIM card Cover

System power requirements

There is one power connection on the BDU. This must be connected to a 12 or 24Vdc supply. Power requirements and consumption are as follows:

Voltage Input Minimum	10V
Voltage Input Maximum	32V
Total Current for ADU and BDU (Max. @12V)	12A
Required Fuse	15A

Table 4. System power requirements

Fuse

The fuse is a 15 Amp, fast blow, ATO blade fuse. The installed part is from Littelfuse, part number 0287015. To replace the fuse, pull fuse out of fuse holder (pliers may be needed to grip fuse) and press new fuse into fuse holder. Spare fuses are provided with your Thuraya Mobility terminal.

Power Cable

The Power cable uses a Phoenix contact #1718384 PC5/3 STCL-7, 62 connector and the pinout is shown in the Table below.

Color	Function
Red	DC +
White	Ignition Sense +
Black	DC -

The optional accessory car adapter power cable, Hughes' part number 3500472-0002, includes a car adapter plug with a 20 Amp, 250 V fuse, and the ignition sense wire is connected to the positive power wire in the plug.

Chapter 2

Standard Cable connections

In addition to the DC power connection, an ignition sense connection must be made. This is done using the three-wire power cable. In the case of a vehicle installation, the power source is typically the vehicle battery. Cables should be routed appropriately, cable ties and clamps should be used as required to ensure that vibration and/or rubbing of the cables does not occur.

Ignition sense (white wire)

Route and connect the white wire (ignition sense) to a switched 12 or 24 Vdc source, such as accessory line or fuse block. Extended use of ignition sense in the accessory position (ACC) by the end user may lead to a discharged car battery.

Note: Ensure that the connection is a switched source: OFF when ignition is off or in start and ON only when ignition switch is in the ACCESSORIES or RUN position.

Note: If using the optional car adapter plug, the ignition sense wire is already connected to the positive power wire in the plug.

Chassis grounding

The unit includes an isolating power supply. The IDU must be grounded by connecting a 8 AWG grounding wire from the chassis ground point to the vehicle chassis. See figure below. The ground wire should be clamped between the two nuts ensuring both are securely tightened.



Chapter 3 Below Deck Unit (BDU) Install

The BDU is generally located in an area accessible by the operator and protected from water and heat. The ADU is generally located in a position to give clear line of sight to the satellite and to avoid exposure of microwave radiation to personnel.

Basic BDU installation procedure

The basic installation procedure is as follows:

1. Ensure that the BDU is located inside the vehicle in a position that is protected from water and heat and attached to something structurally solid. Locations that vibrate will degrade performance. Note: The BDU is not waterproof.
2. Determine the power cable routing from the BDU to the power source.
3. Determine an RF cable routing from the BDU to the ADU. The ADU will need to be mounted so that it has a 360° clear view of the sky and is not within one meter of personnel in the vehicle (side and top surfaces).
4. Perform the installation of the BDU per the instructions below.

Installation notes

WARNING

1. Use the correct gauge of wire for both Positive and Negative wires to ensure a minimal voltage drop under load. Suggested wire size: 14 AWG: up to 8m (26ft), 12 AWG: up to 12m (40ft), 10 AWG: up to 20m (65ft).
2. The remote switch line may be used to power the system up and down remotely. It should be connected to a physical remote on/off switch or the vehicle's ignition line. When the engine is not running prolonged operation should be avoided to prevent draining the vehicle's battery.
3. The power must be connected to a fused 12 or 24Vdc power source. The unit is fused, but a 15A or greater fuse is required in the source to protect against shorts in the cabling. If connecting to a circuit in a DC panel that is already in use, ensure that the circuit can supply the unit with up to 15A for a 12V installation or 7.5A for a 24V installation.
4. Use cable ties every 300 – 450mm (12"-18").
5. **BDU - Ground the chassis ground bolt to a nearby vehicle ground point via an 8 AWG wire.**
6. Whenever routing cable through holes drilled in metal or through bulkheads, use grommets and RTV sealant to weatherproof all holes drilled on the outside of the vehicle.
7. With the exception of the BDU-to-antenna RF cable, do not route the power cable outside the vehicle.

BDU mounting information

1. The BDU can be mounted in either the horizontal or vertical position.
2. Install the BDU in a protected but ventilated area. Allow at least a 1-inch space around top and sides to provide adequate cooling.
3. Mount the terminal onto a flat surface using at least four screws or bolts (not supplied). Use screws or bolts with a diameter between 3.5 to 4mm. Vibration-resistant screws or lock washers should be used.

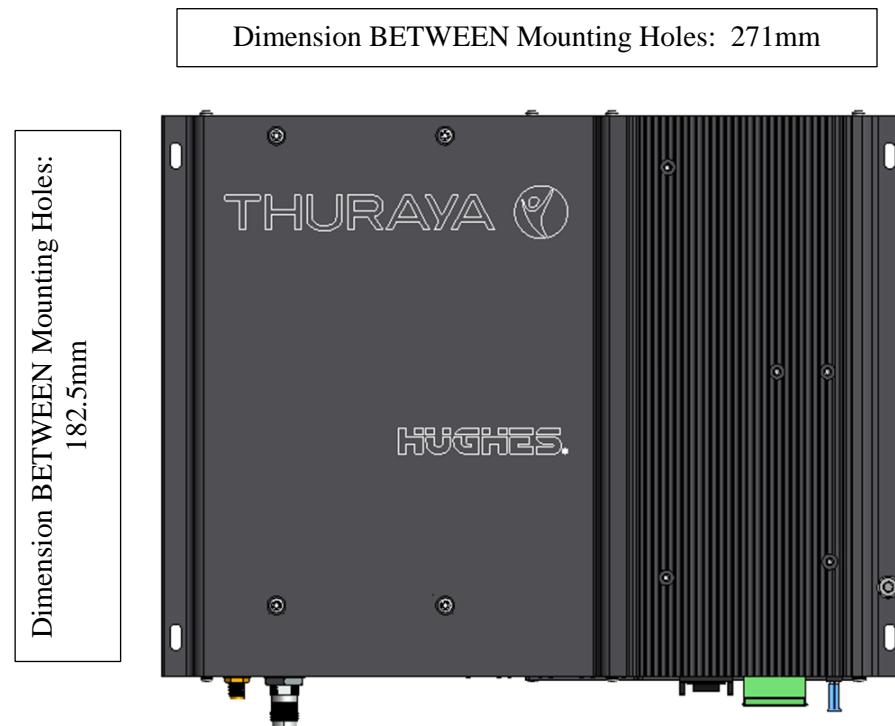


Figure 3-1. BDU - mounting dimensions in mm.

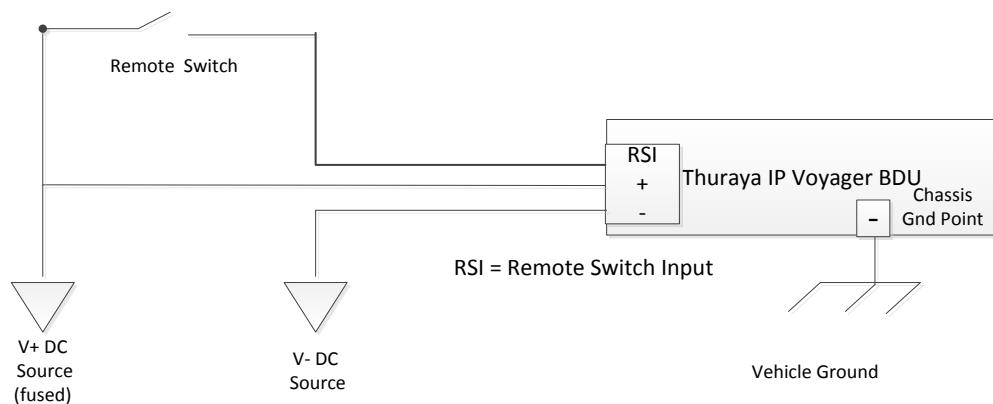


Figure 3-2 BDU Wiring Diagram

Chapter 4 Above Deck Unit (ADU) Install

The antenna unit (ADU) is composed of the antenna element, high-power and low-noise amplifier systems, and a mechanical tracking system housed in the radome.

The ADU is a SpaceCom HN221 2-axis antenna intended for vehicular use.

Connection to the ADU is made by a TNC connector. The single coaxial cable carries L-band RX and TX, power, and control information.

Physical dimensions

- ADU: **Size:** 252mm x 119mm
Weight: 2kg



Figure 4-1. ADU – Land Mobile Antenna

Antenna cable lengths and types

The Hughes BDU has an automatic cable calibration feature that determines the loss of the cable. The RF cable that comes standard in the terminal kit is four meters long. If a different cable is required for the installation, the end-to-end RF loss needs to be 10dB +0dB/-8dB at 1.6GHz and the cable must be 50 Ohm impedance.



Note: The installer is responsible for choosing the proper type of cable for the length required in order to meet the loss requirement.

Antenna Installation

WARNING

When the Thuraya Mobility satellite terminal is powered up - avoid exposure to microwave radiation. Keep a minimum safe distance of 1 meter (39 inches) to the side and above the antenna.

WARNING

The antenna cable carries DC power. Always power the BDU down prior to connecting or disconnecting the antenna cable from either the antenna or the BDU.

Keep a clear line-of-sight to the satellite. Preferably, avoid all obstructions within three meters of the antenna. Obstructions less than 150 mm (six inches) in diameter can be ignored beyond this distance.

Do not locate the antenna close to interfering signal sources or receivers. It is recommended that no other antennas be located within three meters of the Thuraya Mobility antenna. If there is other equipment installed near the Thuraya Mobility satellite terminal, it is recommended to operate all equipment simultaneously and verify there is no co-interference.

WARNING

It is important for the operation and life of the Antenna and safety of personnel that the mounting / fitting instructions are followed – improper installation will void any warranty.

WARNING

WLAN - antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Antenna Mounting

Always install the antenna so that it is in a horizontal position, even if the surface on which it is installed e.g. roof of a vehicle, is not horizontal.

The antenna has three drainage holes at the bottom. Always install the antenna so that clearance between bottom of antenna with drainage holes and mounting surface is no less than 5 mm and preferably 10mm, refer to Fig.2. In order to fulfill these criteria a set of bolts and washers has to be defined for each individual installation, refer to Fig.1.

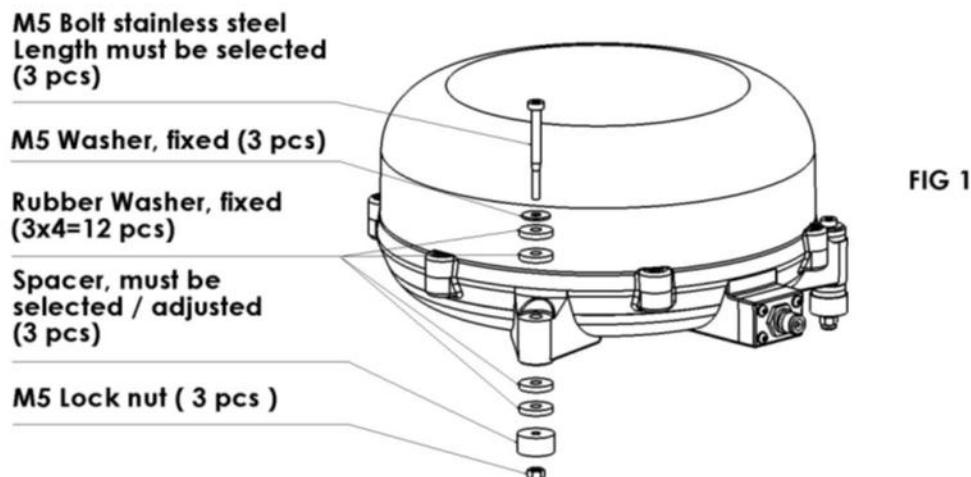
The M5 stainless steel washers/rubber washers and spacers in the kit are always used and positioned as shown in Fig.1.

The 3 spacers will have identical length if the antenna is installed on a non-tilting surface, but may require individual length adjustment if the surface is tilting.

The M5 stainless steel bolts will have identical length if the three spacers are identical and may require individual length adjustment if spacer length are different.

Note 1: Drainage of the antenna - a simple mechanism in the form of three holes in the dome (plastic enclosure) bottom is used. The holes are made so that water e.g. solid drops is not likely to enter the dome and simultaneously water that has entered the dome or moisture condensed in the dome is drained out simply by gravity. Correct function of the drainage system is ensured by following the correct installation requirements as shown in Figures 1 and 2.

Note 2: Antenna Cable - it is important to protect against moisture using self-amalgamating tape (or similar) wrapped around the coaxial connector at the ADU. Also, secure the antenna cable at short intervals to prevent movement and stress.



Tighten M5 screw so that the four rubber washer are compressed 2 mm altogether

Spacer, must be selected / adjusted

**M5 Lock nut
(Use only nuts that have active retain function)**

Minimum distance 5mm

FIG 2

Antenna Magnetic Mounting

Three magnetic mounts (part number 1502819-0003) are optional for the antenna installation. These mounts will withstand 100 mph wind force when properly installed on a flat metal surface such as a vehicle's roof.

The magnet mount consists of three individual high-intensity magnets with rubber coating. Each magnet has a stainless steel center bolt.

First attach the magnets to the antenna. There are three "legs" on the antenna where the magnets are placed. Note the position of the two rubber washers just below and above each antenna "leg," the stainless steel washer above the upper rubber washer, and the protective nut on top.

Now place the antenna with magnets on the roof of the car. When installing the antenna cable it is important to protect against moisture by using self-amalgamating tape, or similar, wrapped around the coaxial connector. Secure the RF cable at short intervals to prevent movement and stress.

Note 1: Removing the Antenna - use your hand to pry underneath the antenna near one of the magnets and lift.

Antenna Vibration

The antenna is designed to meet the following operational vibration levels in any of three perpendicular directions measured at the mounting base of the radome

Random Vibration:

1.05 grms with the following spectral density

5-20Hz.....0.02g₂/Hz

20-150Hz.....-3dB/octave

Single Frequency Vibration:

5-10Hz with amplitude 2.54 mm

10-15Hz with amplitude 0.76mm

15-25Hz with amplitude 0.40mm

25-33Hz with amplitude 0.23mm

Note: Vibration levels in a typical installation are usually much less than the above mentioned values. It is however the responsibility of the installer to verify, that the cited levels are not exceeded in any mode of operation of the vehicle. In case of abnormal vibration, typically at a resonance frequency, measures must be taken in order to displace the resonance frequency or to dampen the vibration amplitude.