

**THURAYA** 

**Thuraya Orion IP  
Satellite Terminal  
*Maritime Installation Guide***

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# Understanding safety alert messages

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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.

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



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

## Safety symbols

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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

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

## 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.

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## 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 a 25 meter RF cable.



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

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

Model	Hughes part number	Description
Thuraya Orion IP (9105) Maritime kit	3500462-0004	Radio, Thuraya Orion IP (kit)
	9506197-0001	WLAN antenna (2.4 GHz, 3 dB)
	3500472-0003	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
	3500854-0001	Maritime Antenna Type HN321
	TNC-N/25m	RF coax cable TNC-N (25 meter)

**Table 1. Maritime 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 (vessel battery or some other 12 or 24Vdc power source) to the BDU. The power cable has a DC positive power line, a Remote Switch line and a DC negative 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.



ONLY use the Thuraya Maritime Antenna Type HN321 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 0257015. 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.



## Chapter 2 Below Deck Unit (BDU) Install

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The BDU is generally located in an area accessible by the operator and protected from water/spray. 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.

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### Basic BDU installation procedure

The basic installation procedure is as follows:

1. Ensure that the BDU is located inside the vessel in a position that is protected from salt water/spray/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 on the boat (side and top surfaces).
4. Perform the installation of the BDU per the instructions below.

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### 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 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.
3. Use cable ties every 300 – 450mm (12"-18").
4. **BDU - Ground the chassis ground bolt to a nearby vessel RF ground point with a wire 8 AWG or larger.**
5. 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 vessel.
6. Always provision the wiring into the BDU with a drip loop.
7. With the exception of the BDU-to-antenna RF cable, do not route the power cable outside the vessel.
8. **BDU MUST NOT be mounted closer than 1.0 m (3.3 ft) to a Magnetic Compass, Fluxgate Compass or other heading device** – it is strongly recommended that any

nearby Compass/heading device is checked for any change in deviation after installing the terminal.

## 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.

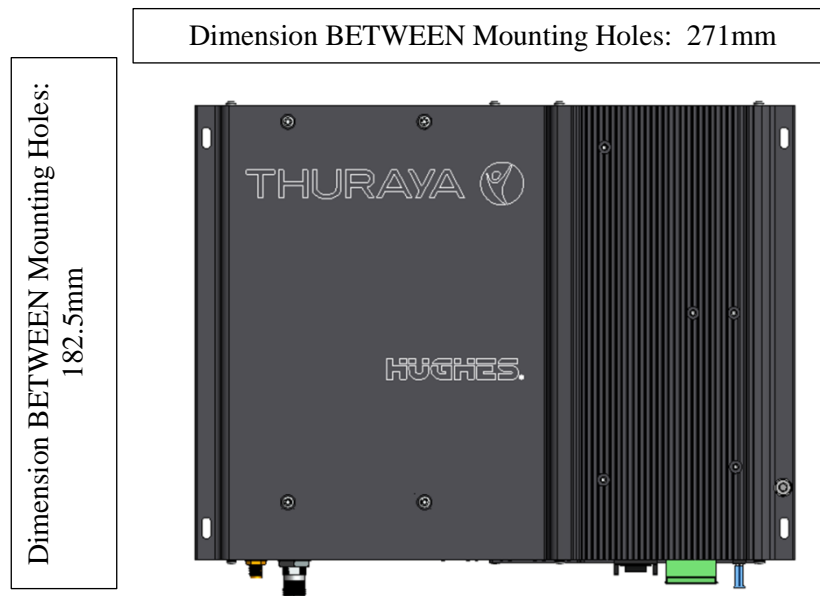


Figure 2-1. BDU - mounting dimensions in mm.

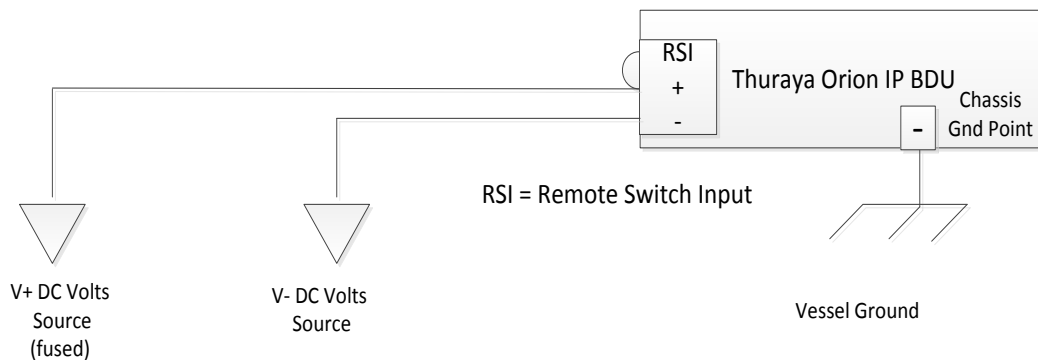


Figure 2-2 BDU Wiring Diagram

## Chapter 3 Above Deck Unit (ADU) Install

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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 HN321 3-axis antenna intended for maritime use.

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

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### Physical dimensions

- ADU: **Size:** 319.5mm x 277mm  
**Weight:** 4kg



Figure 3-1. ADU - Maritime Antenna

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### 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 25 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 Location

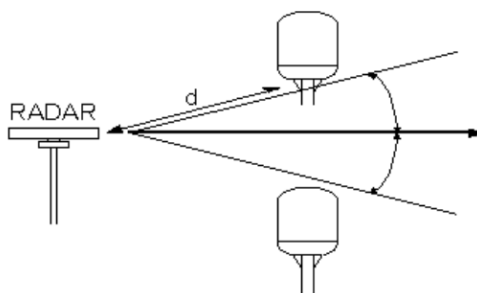
It is important for the operation and life of the Antenna and safety of personnel that the location / mounting / fitting instructions are followed – improper installation will void any warranty.

### Mounting Location:

- **Line-of-Sight:** when locating the antenna, it is very important to ensure there is a clear line-of-sight to the satellite for all the satellite elevation angles in the region in which the ship will operate. The antenna rotates 360° and down to –25° for pitch and roll to allow for continuous pointing even in heavy sea conditions. Any obstructions within this arc can cause some signal degradation. The amount of degradation depends on the size of the obstruction and the distance from the antenna but in general any obstructions within 3 meters (10 feet) of the antenna should be avoided. Obstructions less than 150 mm (6 inches) in diameter can be ignored beyond this distance.

### CAUTION

- **Radar:** DO NOT install the antenna on the same plane as a Radar Antenna – the High Power Radar signal can damage or overload the antenna front-end circuits – the Antenna must be mounted above or below the Radar beam – See following tables of recommended distances depending on the type of Radar(s) used.



Antenna Location – minimum distance from RADAR (S-Band)		
Radar Power Output	Min Distance @ 15° vertical separation	Min Distance at 60° vertical separation
0-10kW	0.4 m (1.3 ft.)	0.4 m (1.3 ft.)
30kW	1.0 m (3 ft.)	0.5 m (3 ft)
50kW	2.0 m (6.6 ft)	1.0 m (3.3 ft)

Antenna Location – minimum distance from RADAR (X-Band)		
Radar Power Output	Min Distance @ 15° vertical separation	Min Distance at 60° vertical separation
0-10kW	0.8 m (2.6 ft.)	0.4 m (1.3 ft.)
30kW	2.4 m (7.9 ft.)	1.2 m (3.9 ft)
50kW	2.0 m (6.6 ft)	2.0 m (6.6 ft)

### CAUTION

NAVIGATIONA AIDS: see the table below for suggested co-location minimum distances of other transmitting/receiving antennas;

Antenna Location – Minimum Distance from NAV-AIDS	
VHF	5.0 m (16.4 ft)
MF/HF (SSB)	5.0 m (16.4 ft)
Other L-Band Transmitters	10.0 m (32.8 ft)
GPS	Install below antenna beam - 10.0 m (32.8 ft) if in same plane as antenna beam

NOTE: If there is other equipment installed near the Thuraya satellite terminal, it is recommended to operate all equipment simultaneously and verify there is no co interference.

### WARNING

Radiation: locate the antenna so that personnel are not exposed to microwave radiation from the Antenna when transmitting - keep a minimum safe distance of 1 meter (39 inches) to the side and above the antenna.

### WARNING

Antenna Cable: the antenna cable carries DC power. Always power the BDU down prior to connecting or disconnecting the antenna cable from either the ADU (antenna) or the BDU.

### WARNING

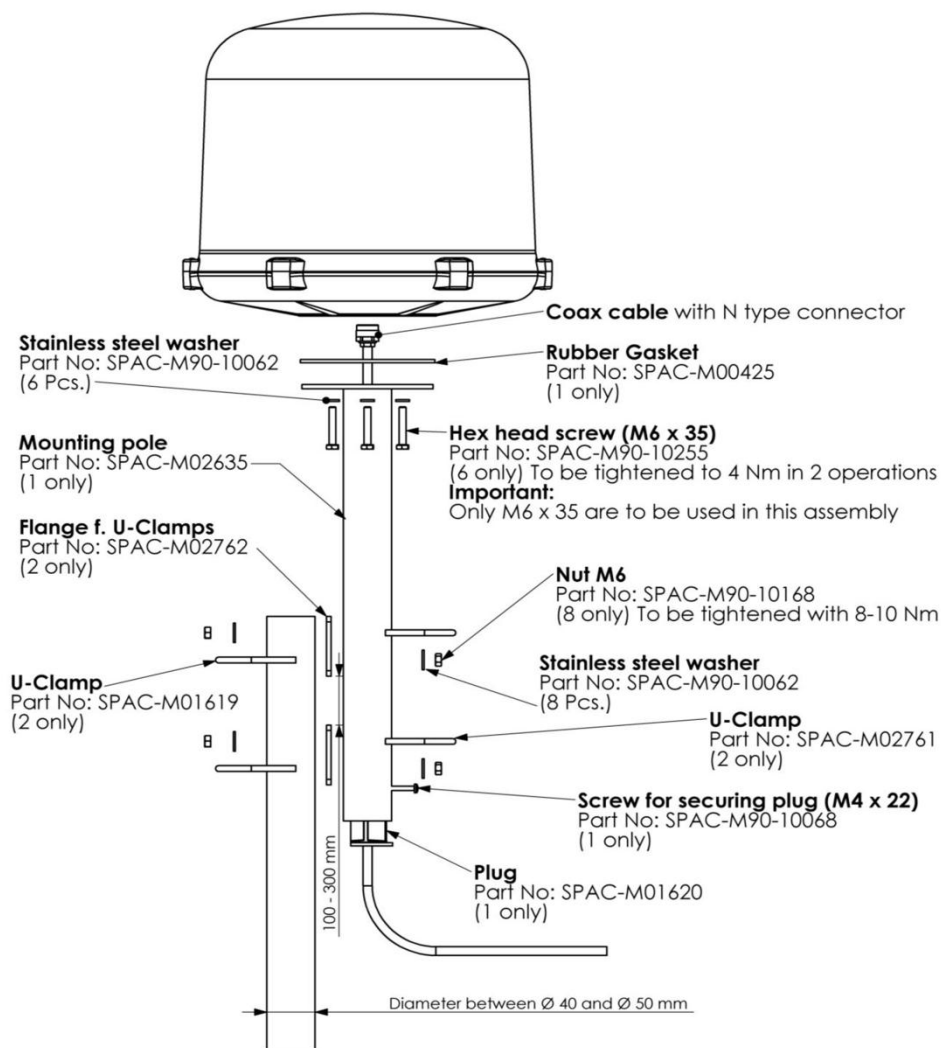
WLAN - antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter



## Antenna Mounting

### Pedestal/Pole Mounting / Fitting Instructions:

See the figure below for the installation of the Thuraya Maritime HN321 antenna on a pedestal. Connect the N-connector on the coax cable as shown before fastening the antenna to the pole mount. Do not obstruct the drain holes at the bottom of the antenna (around the N-connector) and at the bottom of the pole mount. Note: 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.

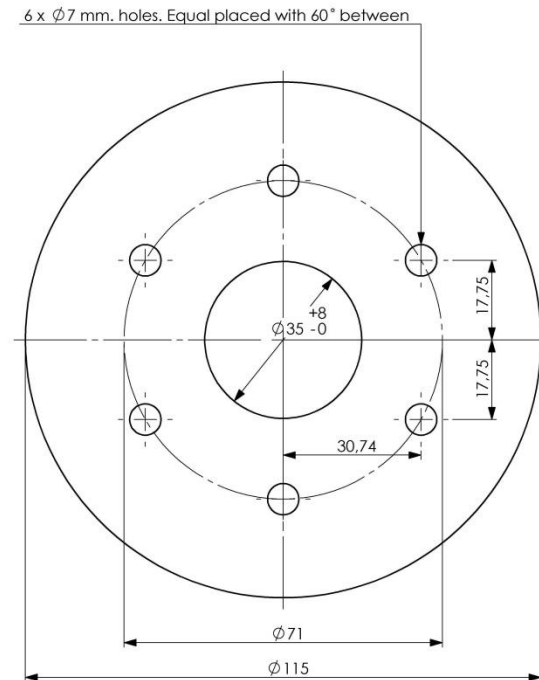


### Alternate Mounting Hardware:

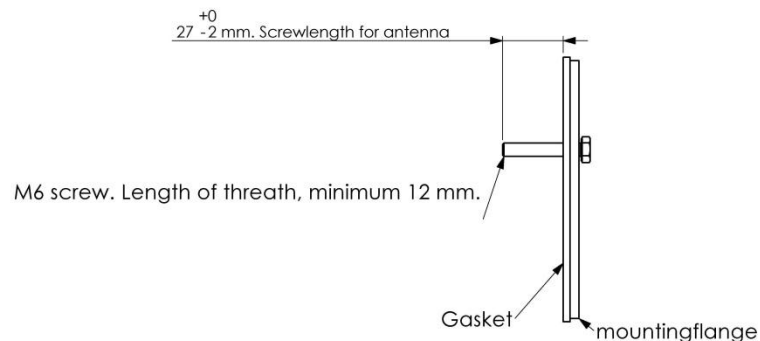
It is recognized that for some installations Custom mounts/mounting brackets may be required. The following template is provided for the Antenna footprint.

NOTE: the Antenna must be fitted to allow for natural water drainage – please see template information – Failure to follow this requirement shall void any warranty.

Footprint for Radome, Spacecom Maritime  
Ø 300 mm, Height 280 mm.



- The radome need to be mounted with a rubbergasket between radome and polemount. ( minimum 3 mm thick)
- Center hole ( $\varnothing 35$ ) need to be open for ventilation/ drain of radome, but protected from outside splash with a polemount with 400 mm pipe, or labyrinth in attachment.



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## 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 i.e. at the flange of the mounting pole.

### Random Vibration:

1.05 grms with the following spectral density

5-20Hz.....0.02g<sup>2</sup>/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 vessel. 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.