# Installation manual
# ThurayaDSL
# Maritime Antenna

# 1 Introduction

The stabilized SpaceCom "ThurayaDSL Maritime Antenna" is designed for use with the Thuraya Network System DSL terminal.

The "ThurayaDSL Maritime Antenna" is a 3-axis constant gain antenna designed for maritime use. It is an autonomous satellite tracking antenna using a patented beam squint technology and built-in control software to acquire the satellite and stabilize the antenna using the CCCH channels from the Thuraya satellites. This ensures that the antenna is always pointed optimally towards the satellite regardless of ship movements and position.

The antenna includes onboard LNA (Low Noise Amplifier) and HPA (High Power Amplifier) in order to give a more versatile installation of the antenna and terminal by compensating for cable loss resulting from long cables.
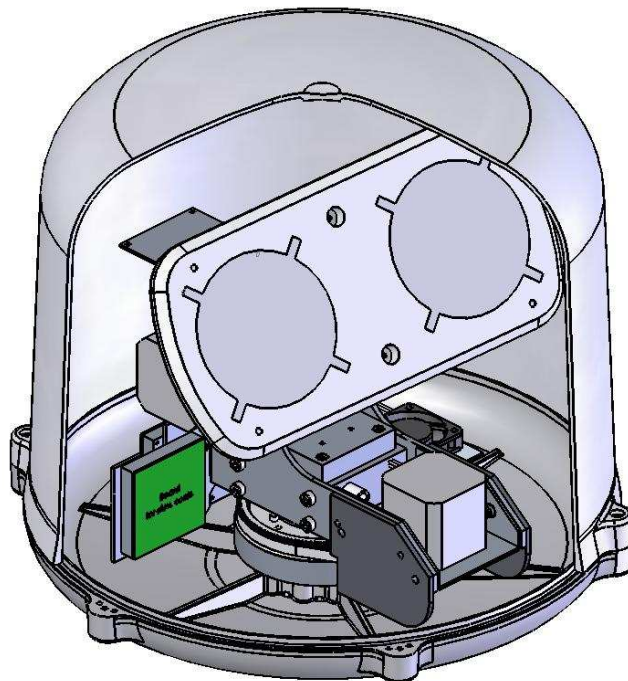


**Figure 1. Cross section showing the "ThurayaDSL Maritime Antenna" inside the dome.**

## *Limits of Normal Operation*

The antenna is designed to perform optimally within these operational limits:

| Temperature | -30 to +43 degree Celsius |
| --- | --- |
| Random vibration | 1.05 g rms with the following spectral density<br>5-20 Hz………….0.02G2/Hz<br>20-150 Hz……….-3dB/octave |
| Single frequency vibration | 5-10 Hz with amplitude 2.54 mm<br>10-15 Hz with amplitude 0.76mm<br>15-25 Hz with amplitude 0.40mm<br>25-33 Hz with amplitude 0.23mm |
| Supply voltage | 11.5V to 15.6V |
| Input power | 40W max. (Maximum EIRP and full temperature range) |

## *1.1 Absolute Maximum Limits*

Exposure outside these limits may cause permanent damage:

| Temperature | -45 to +49 degree C |
| --- | --- |
| Supply voltage | 10.5V to 16V |

# 2 Unpacking

After opening the box check the contents (see Figure 2):

1. One stabilized "ThurayaDSL Maritime Antenna"
2. One pole mount installation kit
3. One junction box
4. Cables for installation
    1. 15 meter coax antenna cable with N-connectors
    2. 1 meter coax interface cable with SMA and SMB connectors
    3. 1 red/black DC cable for the junction box
5. External GPS antenna
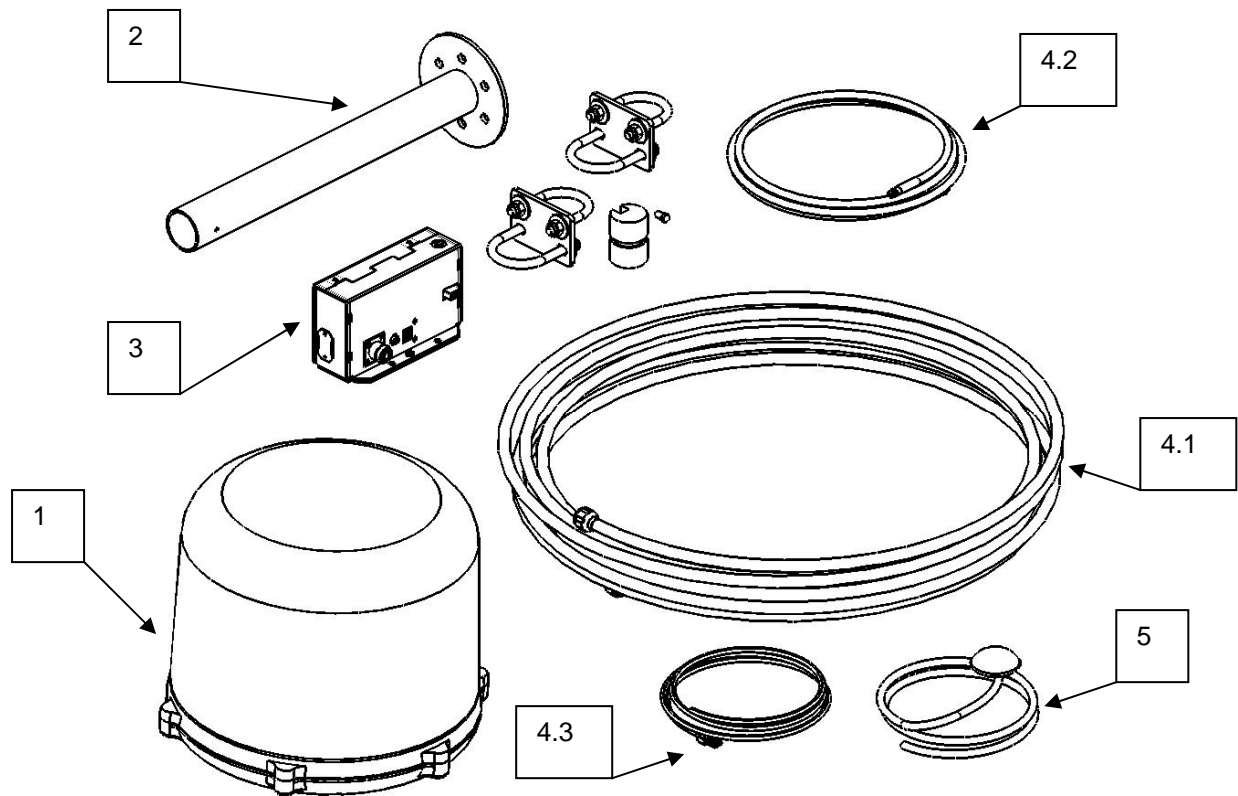6. One manual (this document)

**Figure 2. "ThurayaDSL Maritime Antenna" package contents. Numbers refer to the contents list.**

# 3  Installation

Please observe the following warnings when installing the "ThurayaDSL Maritime Antenna" and the ThurayaDSL terminal:

**WARNING:**
- **Only use the included pole mount installation kit for permanent mounting of the "ThurayaDSL Maritime Antenna". The kit is designed for easy installation and ensures proper drainage of the antenna, galvanic isolation and is able to withstand the rigid mechanical stress encountered on a vessel.**
- **Do not obstruct the drain holes at the bottom of the antenna (around the N-connector) and at the bottom of the pole mount.**
- **It is very important only to use the coaxial cables supplied for the installation of the "ThurayaDSL Maritime Antenna"!! Using other cables can cause degradation or loss of the satellite link.**

## 3.1  Correct Placing of the Antenna

- WARNING!! Avoid exposure to microwave radiation! Keep a safe minimum distance of 1 meter around and above the antenna!
- Keep a clear line of sight to the satellite. Preferably avoid all obstructions within 3 meters of the antenna. Obstructions less than 15cm in diameter can be ignored beyond this distance.

Otherwise the line-of-sight to the satellite may be obstructed and the satellite link performance degraded.

- Do not place the antenna close to interfering signal sources or receivers.
- Vibration levels in a typical installation are usually much less than the specified maximum 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 to displace the resonance frequency or to dampen the vibration amplitude.
- The external GPS antenna required for the ThurayaDSL terminal should be placed at least 1 meter from the "ThurayaDSL Maritime Antenna" and other interfering signal sources or receivers (see the ThurayaDSL manual for details on the external GPS antenna).

## 3.2  Mechanical installations using the Pole Mount Kit

When installing a Maritime Antenna on a vessel the following important guidelines must be followed in order to ensure that the antenna will operate trouble free throughout its service life. Warranty will be void if guidelines are not followed.

The installation is based on a Pole Mount Kit AC-1005 supplied by SpaceCom. Installation using the "Pole Mount Kit" is shown in Figure 3.

Installation of the "ThurayaDSL Maritime Antenna" on a post is done according to Figure 3. The diameter of the post should preferably be between 35 and 50mm using the standard U-bolt supplied in the kit. Notice the TORQUES for bolts and nuts.

Remember to connect the N-connector on the 15 meter coax cable as shown in Figure 3  before fastening the antenna to the pole mount.

If a long (e.g. 3 meters) post is used onboard a vessel it is recommended that it is fastened to the vessel using standard U-bolts rather than welding. This will enable the post to be laid down in case removal of the antenna is required.

### 3.2.1  Pole Mount Kit Contents

The pole mount kit consist of the following components: (subject to change)

1)  1pc. Mounting Pole, Part No. SPAC-M00423
2)  1pc. Rubber Gasket, Part No. SPAC-M00425
3)  6pcs. Plastic Bushings, Part No. SPAC-M00227
4)  6pcs. Washer, Part No. SPAC-M90-10062
5)  6pcs. Screw, Part No. SPAC-M90-10205
6)  2pcs. Clamp, Part No. SPAC-M00428
7)  2pcs. Clamp, Part No. SPAC-M00429
8)  8pcs. Nuts M8, Part No. SPAC-M90-10105
9)  8pcs. M8 washers Part No. SPAC-M90-10136
10) 2pcs. Flange, Part No. SPAC-M00430
11) 1pc. Plug for Mounting Pole, Part No. SPAC-M00233
12) 1pc. Screw M5*10, Part No. SPAC-M90-10104

### 3.2.2 Pole Mount Component Description

1. Mounting Pole, Part No. SPAC-M00423, is a piece of standard tube, made from a stainless steel alloy, with a mounting flange welded onto it. The pole is part of the ventilation system for the dome. The standard length is 400mm and must <u>not</u> be shortened.

2. Rubber Gasket, Part No. SPAC-M00425, is used to ensure that water or dust does not enter into the area around the centre hole in the bottom of the dome. The centre hole is part of the ventilation system for the dome and MUST NOT BE BLOCKED. Also the gasket will protect the N-type connector from water and dust and hence ensure long life.

3. Bushes, Part No. SPAC-M00227, are used to ensure NO electric contact between the mechanical parts of the antenna (in the dome) and the Mounting Pole. This isolation is required in maritime installations, where the antenna and coaxial cable to the antenna must be isolated from the vessel structure in order to avoid any circulating DC current that could cause uncontrolled corrosion.

4. Washers, Part No. SPAC-M90-10062, are used to protect the plastic bushes SPAC-M00227 when the screws SPAC-M90-10205 are tightened to the specified torque (refer to FIG.1 and 2). The washers MUST be used.

5. Screws, Part No. SPAC-M90-10205, are M6 (metric) 40mm long screws made of stainless steel (A4) used for fastening the antenna to the flange on the Mounting Pole so that the installation will endure vibrations and heavy loads due to wind or surges from rough sea. DO NOT CHANGE THE LENGTH OF THE SCREWS.

6. U-bolts, Part No. SPAC-M00428, are used to fasten the flanges SPAC-M00430 to the Mounting Pole, refer to FIG.1 and 2.

7. U-bolts, Part No. SPAC-M00429, are used to fasten the Mounting Pole to any post with a diameter between 35 and 50 mm, refer to Figure 3.

8. Nuts, Part No. SPAC-M90-10105, are M8 nut used for the u-bolts, refer to Figure 3. Nuts are to be tightened to 5Nm. Remember to use the washers M90-10136 as shown in Figure 3.

9. Flange, Part No. SPAC-M00430, is used for linking the opposing u-bolts.

10. Plug, Part No. SPAC-M00233, is used for partially closing the bottom of the Mounting Pole so that no surge of water will fill the tube or damage any part of the antenna. Any condensing water within the antenna and/or tube is drained by the plug. The plug will also prevent the coaxial cable from vibrating in the tube.

11. Screw, M5*10, Part No. SPAC-M90-10104, is used to secure the plug.

Installation of Maritim Antenna
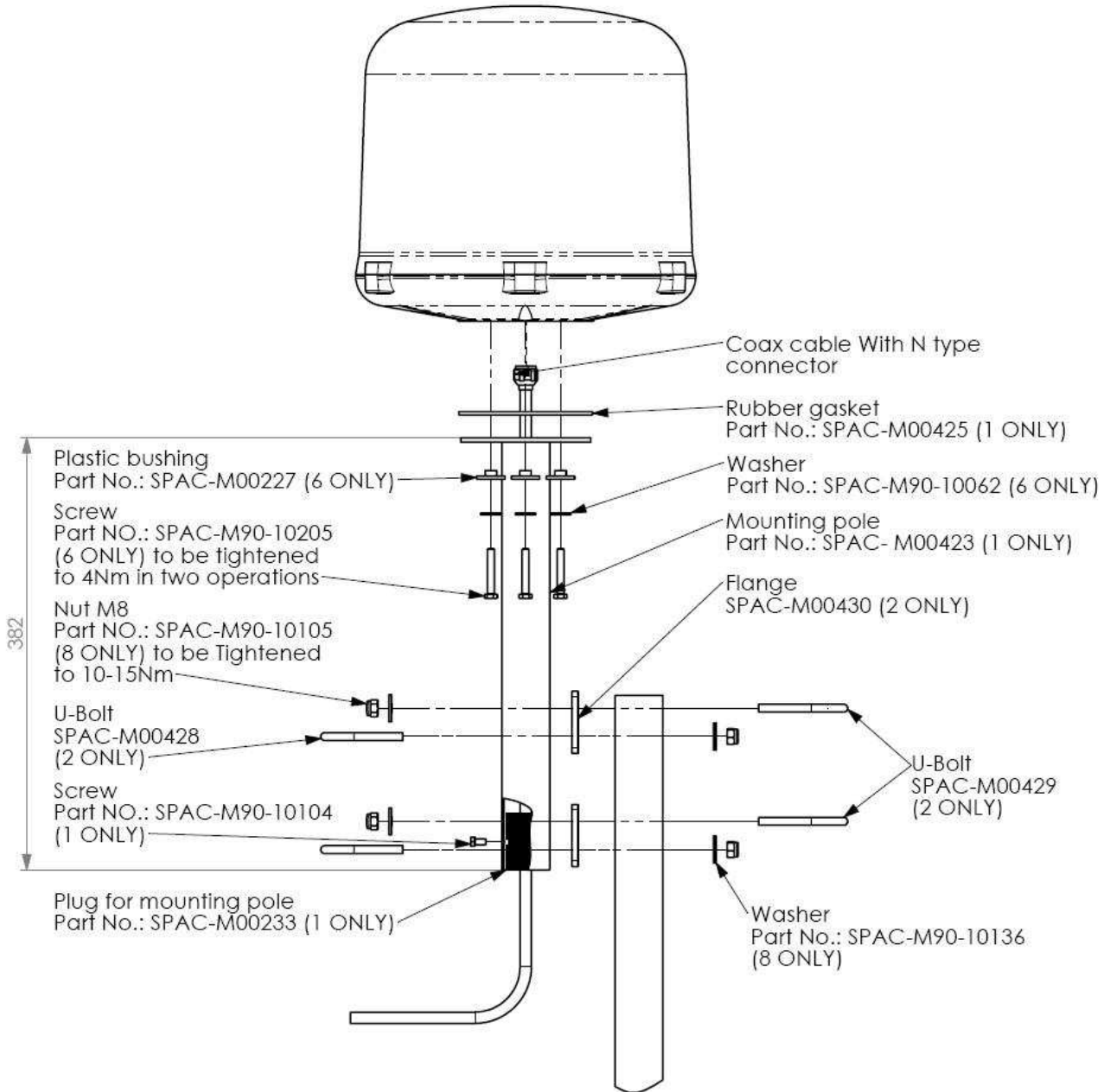using standard Pole Mount Kit

Coax cable With N type
connector

Rubber gasket
Part No.: SPAC-M00425 (1 ONLY)

Plastic bushing
Part No.: SPAC-M00227 (6 ONLY)

Washer
Part No.: SPAC-M90-10062 (6 ONLY)

Screw
Part NO.: SPAC-M90-10205
(6 ONLY) to be tightened
to 4Nm in two operations

Mounting pole
Part No.: SPAC- M00423 (1 ONLY)

Nut M8
Part NO.: SPAC-M90-10105
(8 ONLY) to be Tightened
to 10-15Nm

Flange
SPAC-M00430 (2 ONLY)

U-Bolt
SPAC-M00428
(2 ONLY)

U-Bolt
SPAC-M00429
(2 ONLY)

Screw
Part NO.: SPAC-M90-10104
(1 ONLY)

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Plug for mounting pole
Part No.: SPAC-M00233 (1 ONLY)

Washer
Part No.: SPAC-M90-10136
(8 ONLY)

**Figure 3. Installations using the standard pole mount kit.**

## 3.3  Connecting to the ThurayaDSL Terminal

The antenna is connected with the junction box by a single coaxial cable with an N male connector at each end. The cable carries receive and transmit L-band signals as well as DC power to the antenna. A separate coax cable is connected between the ThurayaDSL terminal and the junction box. See drawing showing the "ThurayaDSL Maritime Antenna" connections:

8

**To terminal external antenna connector**

**To 12V DC supply**
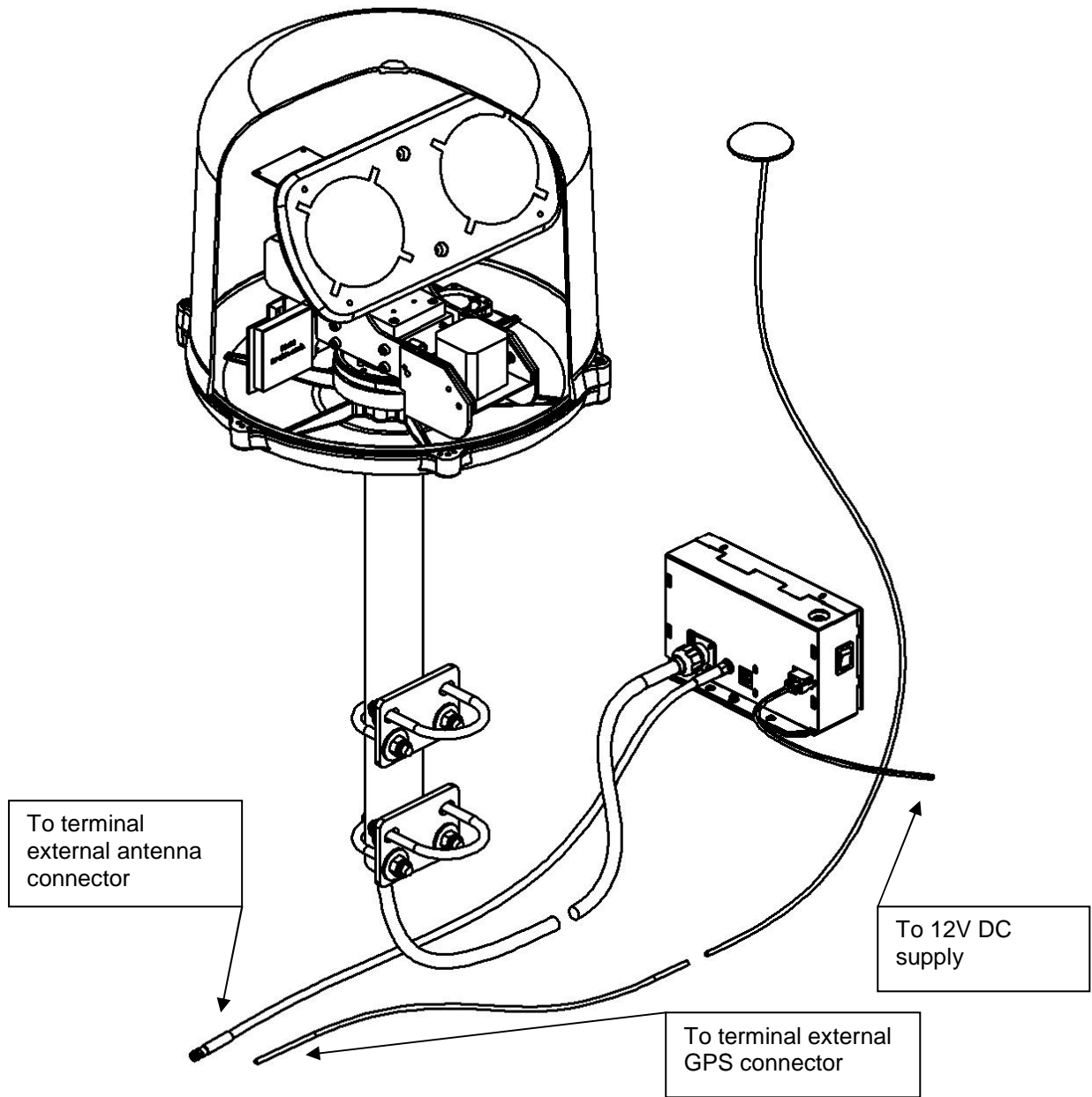
**To terminal external GPS connector**

**Figure 4. Connecting the "ThurayaDSL Maritime Antenna" to the ThurayaDSL terminal via the junction box.**

Connect the 1 meter coax cable from the junction box to the terminal external antenna connector (see Figure 5) and turn the antenna switch to "EXT" on the ThurayaDSL terminal in order to use an external antenna (see Figure 6).
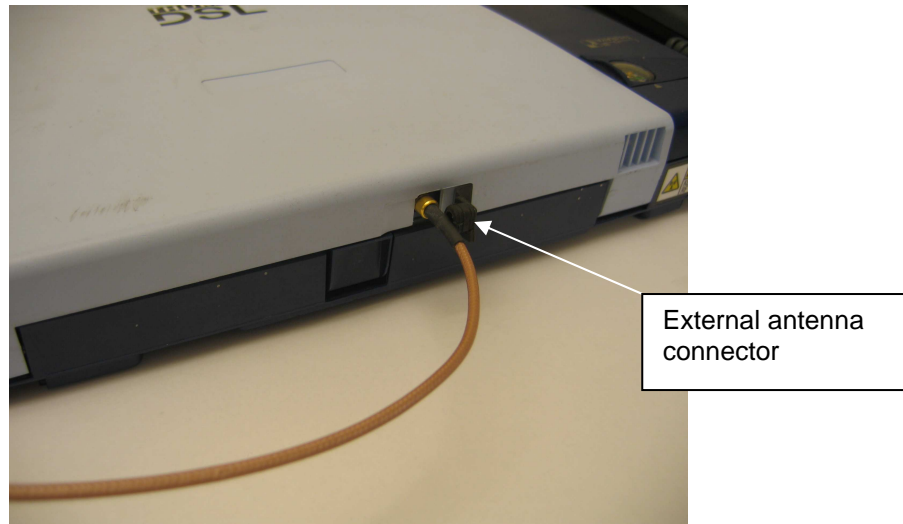
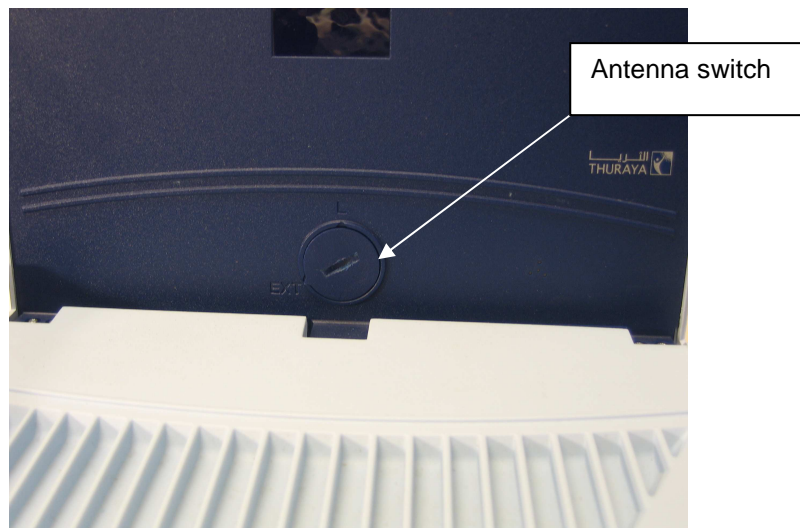**Figure 5. Connecting to the ThurayaDSL terminal via the external antenna connector.**



**Figure 6. Selecting the external antenna on the ThurayaDSL terminal. Turn the antenna switch to the "EXT" position.**

The DC cable of the junction box is connected to a 12V nominal power supply with specifications defined in section 0. Please ensure that the 12V (red wire) and the 0V (black wire) are connected correctly. The DC step-up converter in the junction box is isolated from the vessel 0V.
The external GPS antenna, ThurayaDSL power supply and Ethernet cable must be connected according to the ThurayaDSL manual. Please observe the guidelines for the GPS antenna in section 3.1.

### 3.3.1  Bending Radius of the Coax Cables

Please observe the minimum bending radius for the 2 types of coax cables. Warranty will be void if guidelines are not followed.

| 15m LMR-400 type | 25.4mm |
|---|---|
| 1m RG223 | Single bend: 25mm<br>Multiple bends: 50mm |

# 4  Operating the Antenna

After the coax cable connections are made, apply 12 V DC to the Junction Box and switch the antenna power supply on (the switch is located on the side of the supplied junction box). Wait for the "ThurayaDSL Maritime Antenna" to acquire the satellite signal. Switch the ThurayaDSL terminal on when the antenna is ready (see section 4.1). Let the terminal acquire the satellite network as described in the ThurayaDSL manual.

**PLEASE NOTE THAT INFORMATION ON WHICH FREQUENCIES THE CCCH CHANNELS ARE FOUND IS ESSENTIAL FOR THE OPERATION OF THE ANTENNA. THURAYA NETWORK SYSTEMS CAN CHANGE THESE FREQUENCIES WITHOUT NOTICE. READ SECTION 5.2 ON HOW TO UPDATE THE CCCH CHANNEL FREQUENCY LIST USED BY THE ANTENNA CONTROLLER!!**

## 4.1  Satellite Acquisition

The tracking antenna performs a full hemispherical satellite search to acquire the Thuraya satellite the first time the power is applied. This can take up to one minute the first time the antenna is used in a given area because every known CCCH channel frequency has to be scanned by the antenna controller.

Information on which CCCH channel frequency is used will subsequently be stored by the antenna controller and used for acquiring the satellite the next time the antenna power is applied.

The satellite search with a known CCCH channel frequency will typically take about 10 seconds when the antenna is switched on. This is usually the case if the antenna has not been moved out of the region where it was previously used. If the antenna fails to reacquire a stored CCCH channel the full hemispherical satellite search is used instead to acquire a new CCCH channel.

### 4.1.1  Blocking of the Satellite

Blocking is whenever the antenna control detects that the signal from the satellite is lost (can occur if large objects block the line-of-sight to the satellite). It should be noted that the antenna controller can stabilize the antenna at signal levels that are lower than the limits of the ThurayaDSL terminal. The antenna controller will first try to reacquire the satellite by turning around a couple of times which usually will take only a few seconds.

If this fails a full hemispherical acquisition is performed to reacquire the satellite which can take up to one minute before the antenna is ready.

### 4.1.2  Seamless Handover

The antenna will check which CCCH channel is best for stabilizing the antenna every 30 minutes to optimize the antenna controller performance even when the vessel is moving in and out of regions using different CCCH channel frequencies from the satellite. This check will not have any effect on the performance of the antenna.

# 5  Appendices

## 5.1  Basic Maintenance

The "ThurayaDSL Maritime Antenna" is designed for a long maintenance free life. However it is important to install the antenna correctly, not blocking the drain holes in the bottom of the dome and pole mount and keeping the associated cables free from damage and water ingress (see chapter

3). Proper sealing of coax connectors and fastening of cables will ensure long and trouble-free service.

## 5.2 CCCH Channel Frequency List Update Procedure

The CCCH channel list has to be updated when Thuraya Network Systems changes the frequencies used by the satellite network.

A PC with Windows XP and USB is required for updating the CCCH channel list stored in the "ThurayaDSL Maritime Antenna".

The process for updating the channel list is:

1. Switch on the "ThurayaDSL Maritime Antenna" if it is not already in use.
2. Download the channel update program from the SpaceCom website (see section 5.2.1).
3. Check the revision date in "readme.txt" file in the distribution. Proceed only if a new channel list has been issued.
4. Remove the USB cover on the side of the junction box and connect the PC to the USB connection on the junction box (see Figure 7).
5. Install the USB driver, if not installed previously (see section 5.2.2).
6. Run the channel update program (see section 5.2.3)
7. Switch the antenna power off and on (the switch is located on the side of the junction box) to force the antenna to search for the new channels.
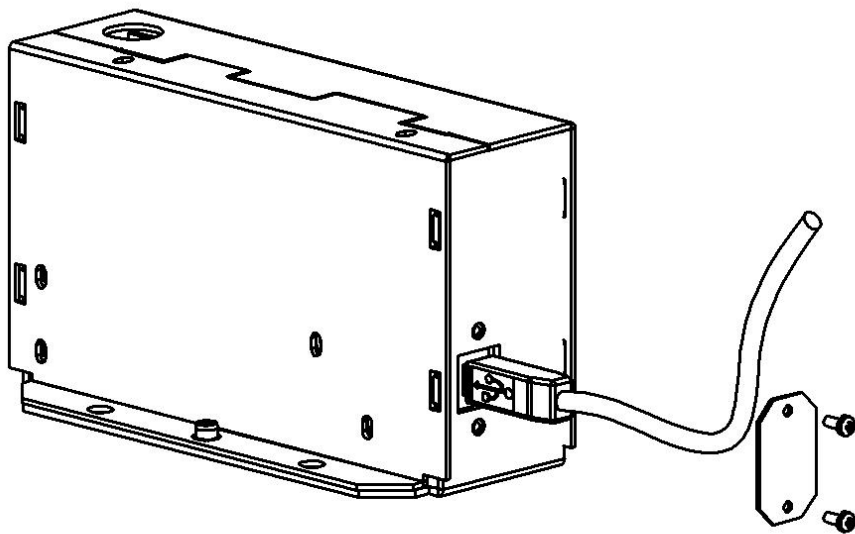


**Figure 7. Open the USB cover on the side of the junction box to connect the USB cable to the junction box.**

### 5.2.1 Downloading the Channel Update Program

1. Download from the Thuraya website (http://www.thuraya.com) or directly from the SpaceCom website (http://www.spacecom.dk/CCCHlist.zip).
2. Unzip the files and check the revision date in "readme.txt".

### 5.2.2 Installing the USB driver

A USB driver has to be installed the first time the junction box USB interface is connected to a PC. The "Found New Hardware Wizard" will pop up and guide you through the process. Please use the

"Windows Update" to search and install the driver as shown below and follow the guidelines in the wizard (the wizard will run twice):



**Figure 8. The "Found New Hardware Wizard".  Enable the Windows Update search and press "Next".**
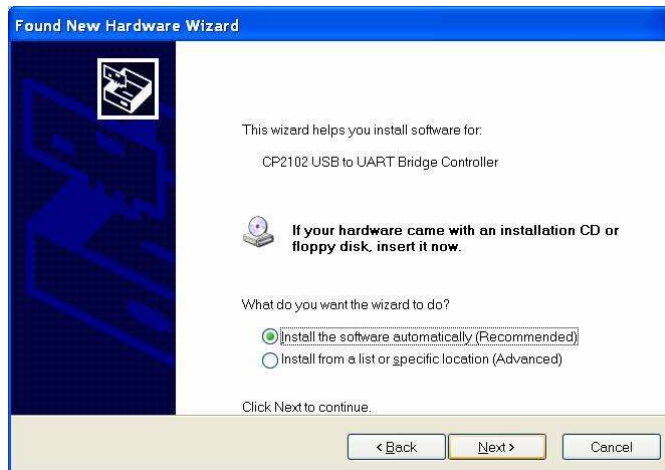


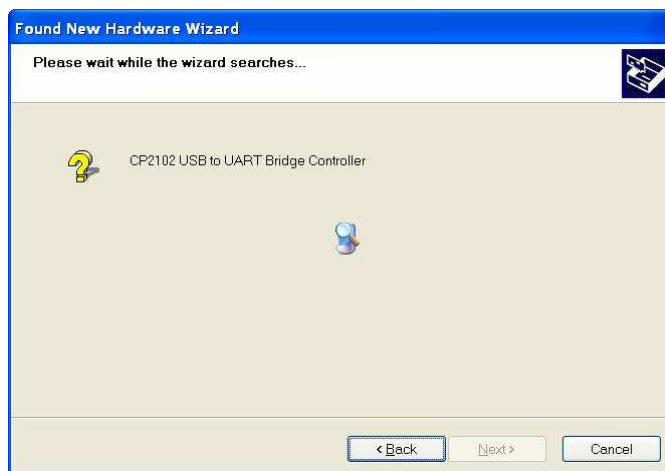**Figure 9. Select "Install the software automatically" and press "Next".**



**Figure 10. The Windows Update finds the driver.**

**Figure 11. The driver installation is completed.**

### 5.2.3 Updating the Channel List

- Determine which COM port is used for the UART Bridge Controller using the Windows System properties window:

  1. Open the "System Properties" in the "Control Panel".
  2. Press the "Device Manager" button:
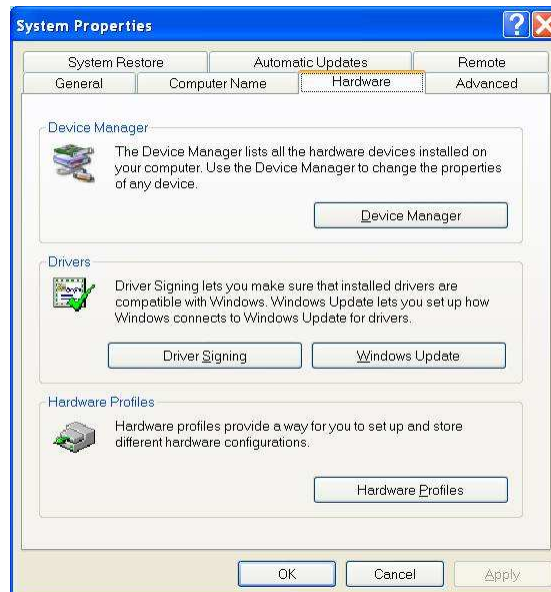


  3. Find the "CP210X USB to UART Bridge Controller" and locate the COM port number (The COM port number is 3 in the example):
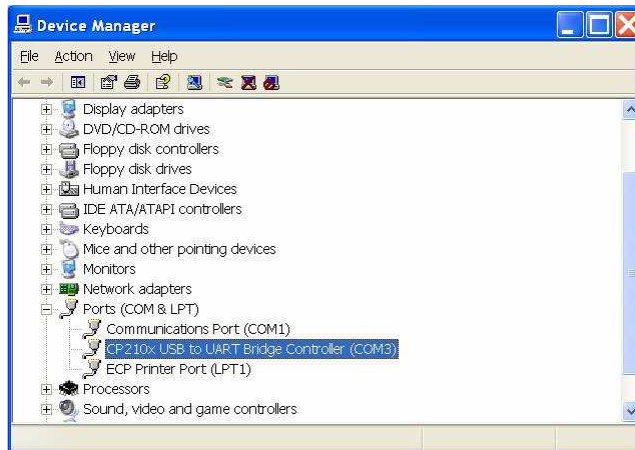
- Open a command line tool and run the program using the syntax: "sendlist –PORT" where PORT is the COMPORT number found previously (COM5 is used in the example below):
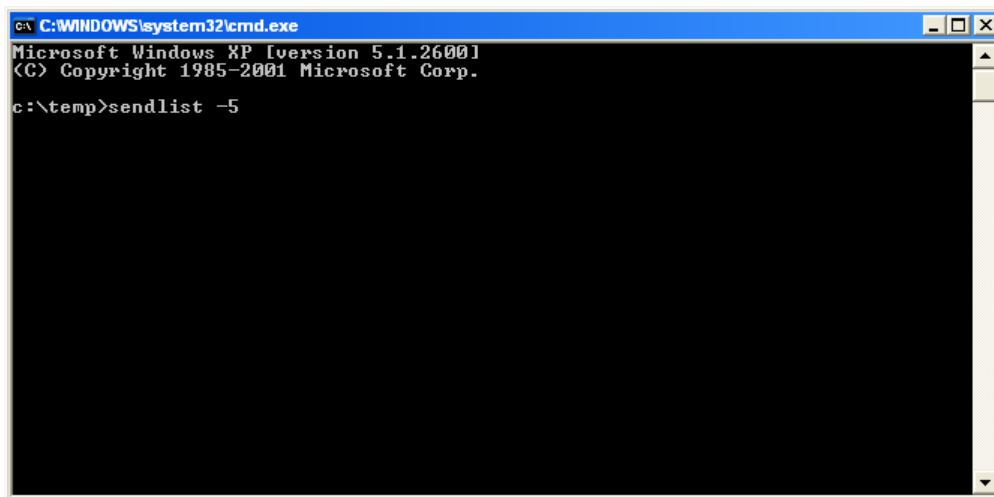


The channel update program shows if the update was successful:
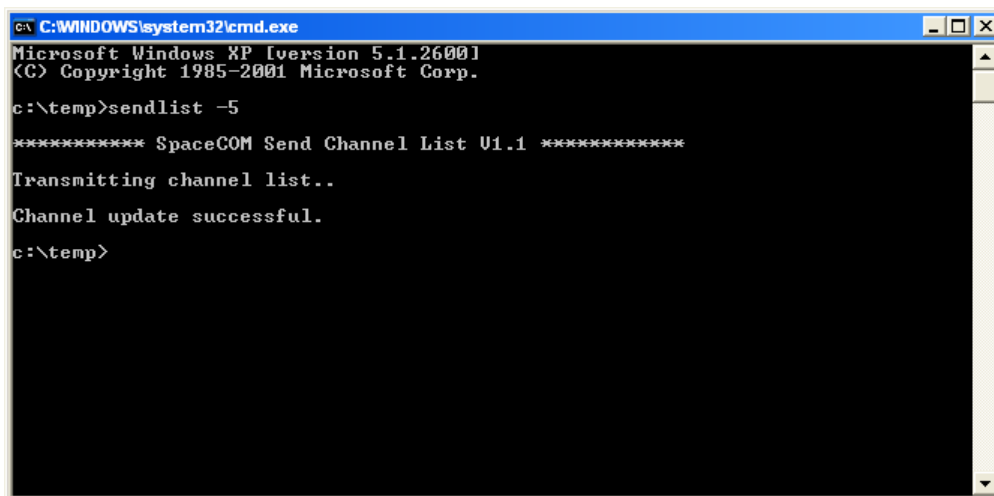
- The channel list update is now complete. Switch the antenna power off and on to force a CCCH channel frequency scan with the new frequencies.

# 6  Warranty

SpaceCom limited warranty statement.

SpaceCom warrants that SpaceCom stabilized maritime antenna for ThurayaDSL, accessories and software will be free from defects in materials and workmanship after the date of production for a period of 18 months.

If SpaceCom receives notice of such defects during the warranty period, SpaceCom will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or equivalent in performance to new.

The warranty does not apply to defects resulting from (a) improper or inadequate installation or maintenance, (b) unauthorized modification or misuse, (c) operation outside the published supply voltage and environmental specification for the product or (d) improper site preparation or maintenance.

SpaceCom products may contain remanufactured parts equivalent to new in performance or may have been subject to incidental use.

IN NO EVENT WILL SPACECOM BE LIABLE FOR LOSS OF DATA OR FOR DIRECT, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFIT OR DATA), OR OTHER DAMAGE.

## 6.1  Return of defective antennas and parts

Before returning antennas or other equipment for repair, a RMA number will be issued by SpaceCom. This RMA number must be included in the failure description in order to track the repair.

The customer will arrange and pay for shipment to SpaceCom. After repairs SpaceCom will return the product to the customer at SpaceCom's cost. For antennas out-of-warranty SpaceCom will charge the customer for repair and return shipment.

It's important that failures are described as well as possible, and actions have been taken to ensure failures are related to SpaceCom antennas and accessories – not due to faulty installation.

If there are no failures found, the equipment will be returned and a handling fee charged.