Thuraya Telecommunications Company

THURAYA

Installation Manual
SpaceCom IP321 Maritime Antenna
for Thuraya IP terminal

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2. Introduction

The stabilized SpaceCom IP321 Maritime Antenna is designed for use with the Thuraya IP terminal.

The SpaceCom IP321 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 a tracking beacon 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.
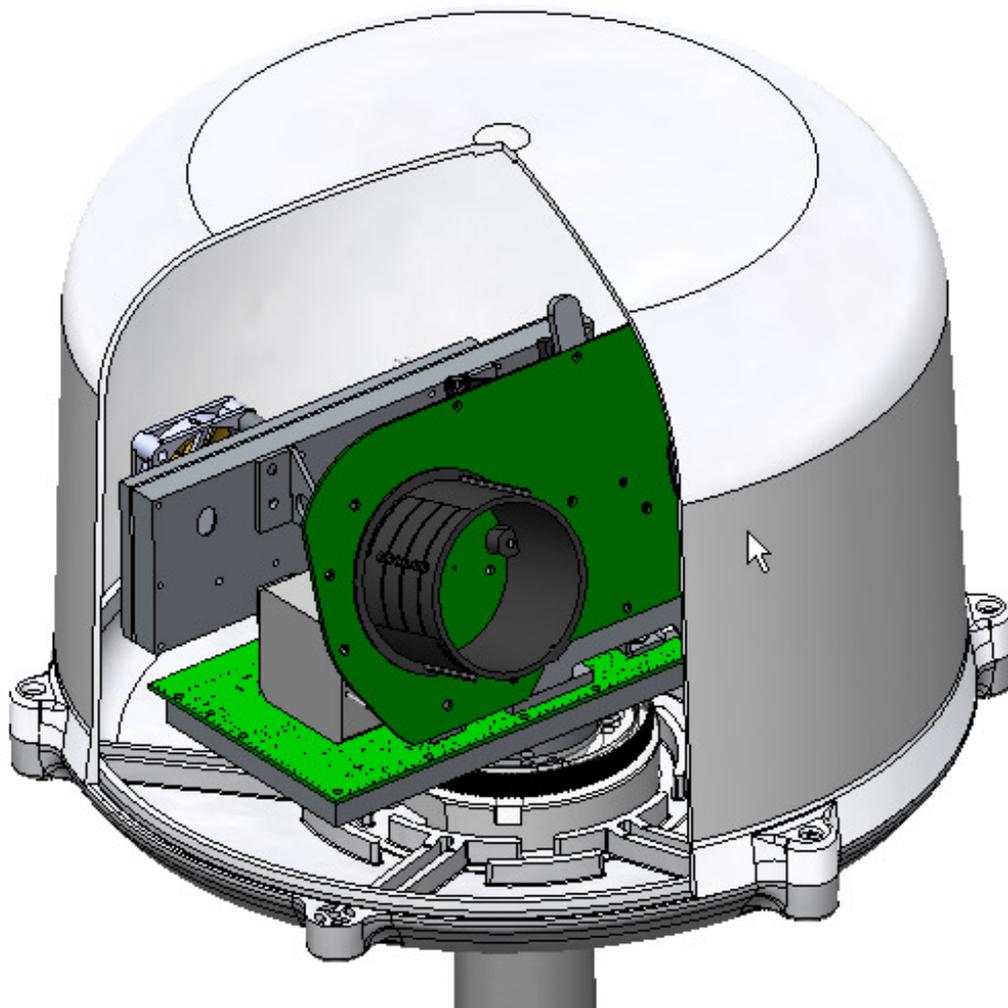

Figure 1. Cross section showing the SpaceCom IP321 Maritime Antenna inside the radome.

3. Specifications

Physical Characteristics	
Dimensions	Size of radome: 265x270mm (hxd)
Weight	3 kg (excluding cable and Power Supply, AS03951)
RF Connector	N type
Cable	15m RG223 or 25m LMR240
Electrical	
Antenna Gain	10dBi approx
LNA Gain	32dB ±3 (excluding cable loss)
TX Gain	35.5dBi ±1 (excluding cable loss)
Polarisation	LHCP
RX Frequency	1525 – 1559MHz
TX Frequency	1626.5 - 1660.5MHz
Max EIRP	16.5±1 dBW (Max. output from antenna)
G/T	> -16dB/K
Terminal Connector	SMC connector
Supply Voltage To Power Supply, AS03951	10 – 32V DC
Power Consumption	60W at 10V DC, max EIRP
	53W at 24V DC, max EIRP
Fuse	10A / trag, 5x20mm
Enviromental	
Temperature	-30 to +55℃
Humidity	95% at 40 ℃
Wind	200 Km/hr Relative speed
Vibration	Random Vibration of 1.05g rms
Motion	Roll: 25 degrees over 8 second periode
	Pitch: 15 degrees over 5 second periode
	Yaw: 8 degrees over 50 second periode
	Turn rate: 12 deg/s
	Turn angular rate change: 1 deg/s^2

3.1   Limits of Normal Operation

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

Random vibration	1.05 g rms with the following spectral density 5-20 Hz………….0.02G2/Hz 20-150 Hz……….-3dB/octave
Single frequency vibration	5-10 Hz with amplitude 2.54 mm 10-15 Hz with amplitude 0.76mm 15-25 Hz with amplitude 0.40mm 25-33 Hz with amplitude 0.23mm

3.2   Absolute Maximum Limits

Exposure outside these limits may cause permanent damage:

Temperature	-45 to +60 degree C

4. Package Contents

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

1. One stabilized SpaceCom IP321 Maritime Antenna
2. One pole mount installation kit
3. One Power Supply, AS03951
4. Cables for installation
    1. 15 meter or 25meter coax antenna cable with N-connectors
    2. 1 meter coax interface cable with SMA and SMC connectors
    3. 1 red/black DC cable for the Power Supply, AS03951
5. External GPS antenna
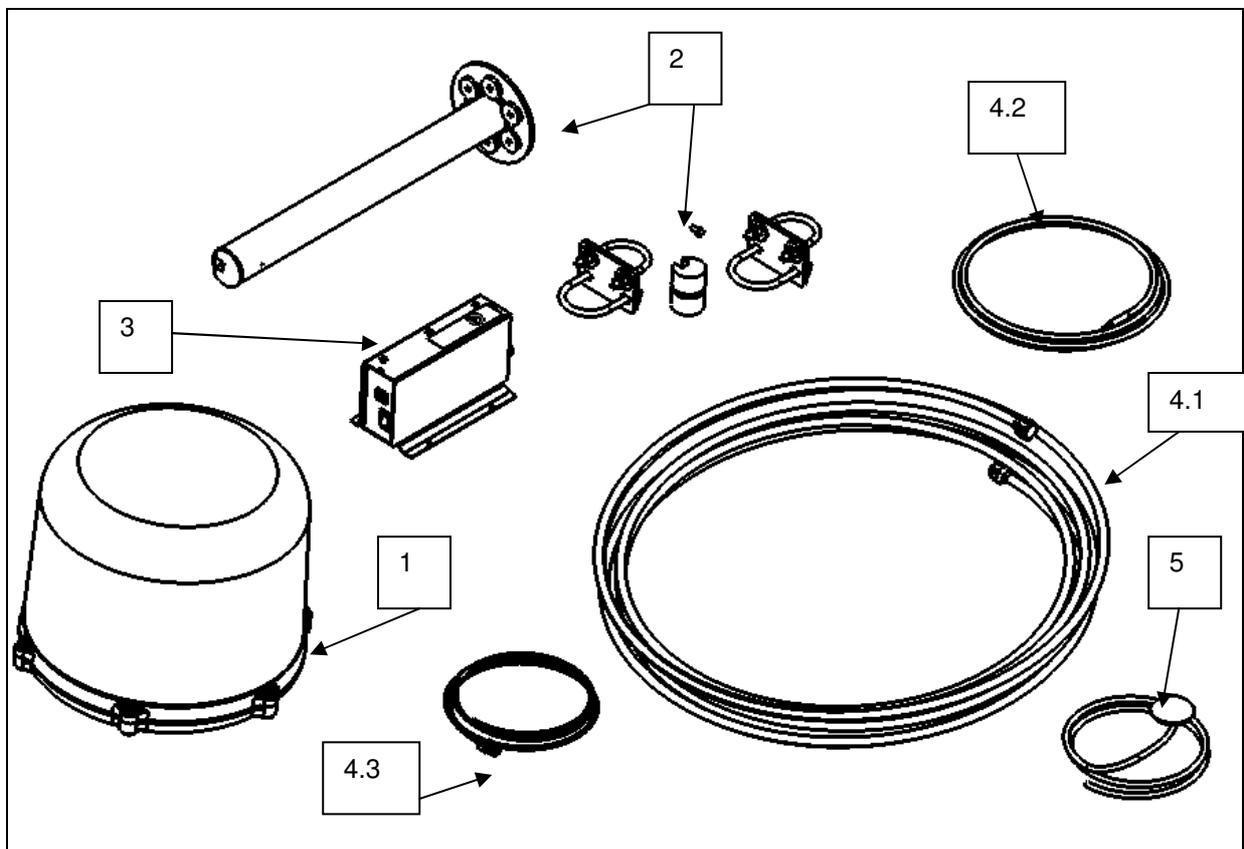6. One Installation Manual (this document)

Figure 2. SpaceCom IP321 Maritime Antenna package contents. Numbers refer to the contents list.

5. Installation

Please observe the following warnings when installing the SpaceCom IP321 Maritime Antenna with the Thuraya IP terminal:

WARNING:
- **Only use the included pole mount installation kit for permanent mounting of the SpaceCom IP321 Maritime Antenna. The kit is designed for easy installation and ensures proper drainage of the antenna 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 SpaceCom IP321 Maritime Antenna!! Using other cables can cause degradation or loss of the satellite link.**

5.1 Correct Placement 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 Thuraya IP terminal should be placed at least 1 meter from the SpaceCom IP321 Maritime Antenna and other interfering signal sources or receivers (see the Thuraya IP manual for details on the external GPS antenna).

5.2 Placement of Power Supply, AS03951

The Power Supply, AS03951 must be placed inside shielded from the elements.

5.3 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 AS-01518 supplied by SpaceCom.
Installation using the "Pole Mount Kit" is shown in Figure 3.

Installation of the SpaceCom IP321 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 or 25 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.

5.3.1 Pole Mount Kit Contents

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

1) 1pc. Mounting Pole, Part No. SPAC-M00423
2) 1pc. Rubber Gasket, Part No. SPAC-M00425
3) 2pcs. U-bolt, Part No. SPAC-M01616
4) 2pcs. Flage, Part No. SPAC-M01617
5) 2pcs. U-bolt, Part No. SPAC-M01619
6) 6pcs. Plastic Bushings, Part No. SPAC-M01515
7) 1pc. Plug for Mounting Pole, Part No. SPAC-M01620
8) 4pcs. Nuts M5 A4, Part No. SPAC-M90-10008
9) 1pc. Screw M4*22 A4, Part No. SPAC-M90-10068
10) 4pcs. Nuts M6 A4, Part No. SPAC-M90-10168
11) 6pcs. Screw M6*40 A4, Part No. SPAC-M90-10205
12) 10pcs. Washer, Part No. SPAC-M90-10062
13) 4pcs. Washer M5 A4, Part No. SPAC-M90-10128

5.3.2 Pole Mount Component Description

1. Mounting Pole, Part No. SPAC-M00423, is a piece of standard tube, made from a stainless steel alloy. The pole is part of the ventilation system for the radome. 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. U-bolts, Part No. SPAC-M01616, are used to fasten the Flange, SPAC-M01617 to the Mounting Pole, SPAC-M00423, refer to Figure 3
4. Flange, Part No. SPAC-M01617 is used to connect the U-bolts, refer to Figure 3
5. U-bolts, Part No. SPAC-M01619, are used to fasten the Mounting Pole to any post with a diameter between 35 and 50 mm, refer to Figure 3.
6. Bushes, Part No. SPAC-M01515, are used to ensure no electric contact between the mechanical parts of the antenna (in the radome) and the Mounting Pole.
7. Plug, Part No. SPAC-M01620, 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.

8. Nuts, Part No. SPAC-M90-10008, are M5 nut used for the u-bolts, SPAC-M01616, refer to Figure 3. Nuts are to be tightened to 5Nm. Remember to use the washers M90-10128 as shown in Figure 3.
9. Screw, M4*22, Part No. SPAC-M90-10068, is used to secure the plug.
10. Nuts, Part No. SPAC-M90-10168, are M6 nut used for the u-bolts, SPAC-M01619, refer to Figure 3. Nuts are to be tightened to 8Nm. Remember to use the washers M90-10062 as shown in Figure 3.
11. 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. Remember to use the washers M90-10062 as shown in Figure 3. DO NOT CHANGE THE LENGTH OF THE SCREWS.
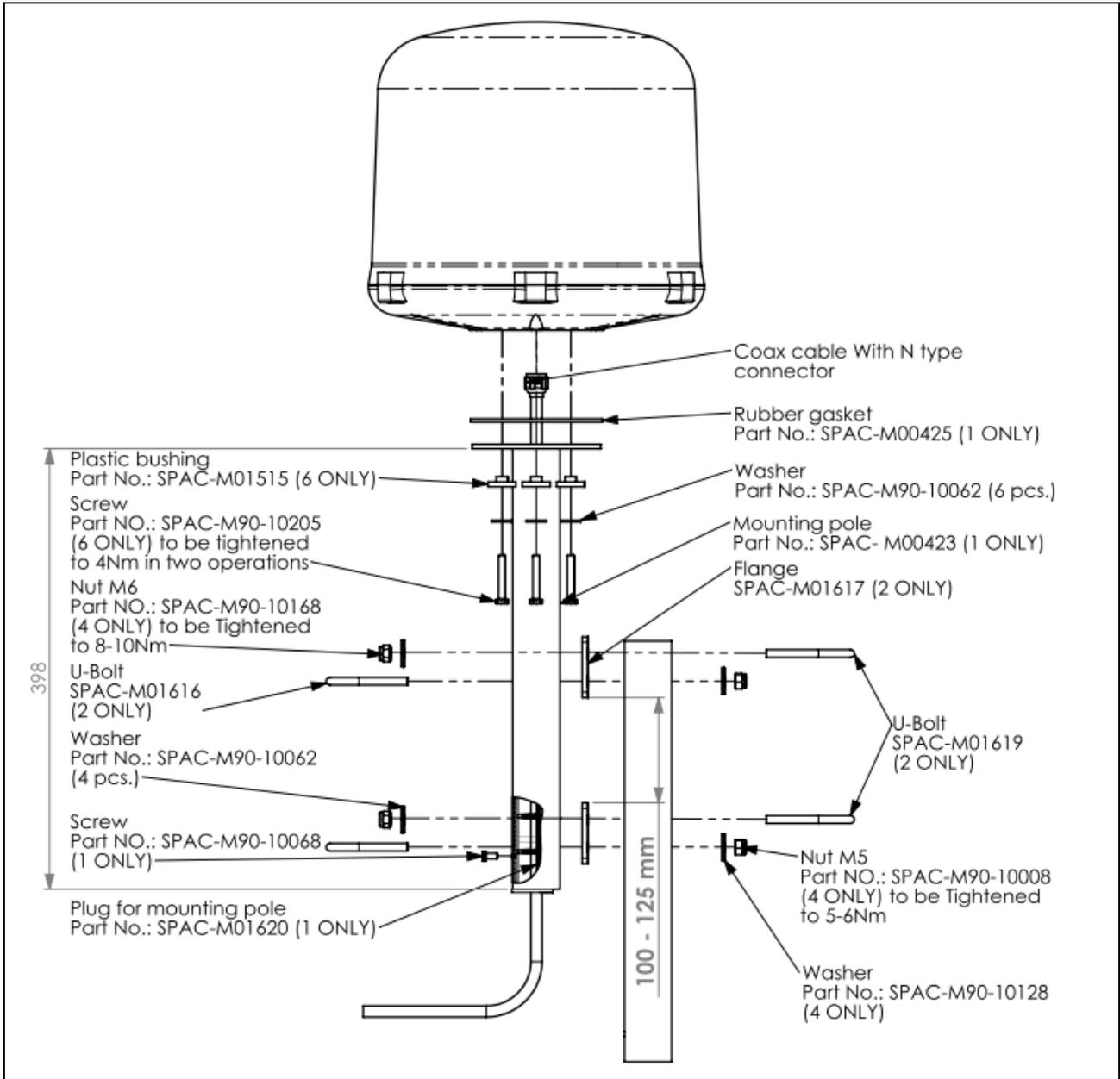
Figure 3. Installations using the standard pole mount kit.

5.4 Connecting to the Thuraya IP Terminal

The antenna is connected with the Power Supply, AS03951 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 Thuraya IP terminal and the Power Supply, AS03951. Figure 4 shows the connections.
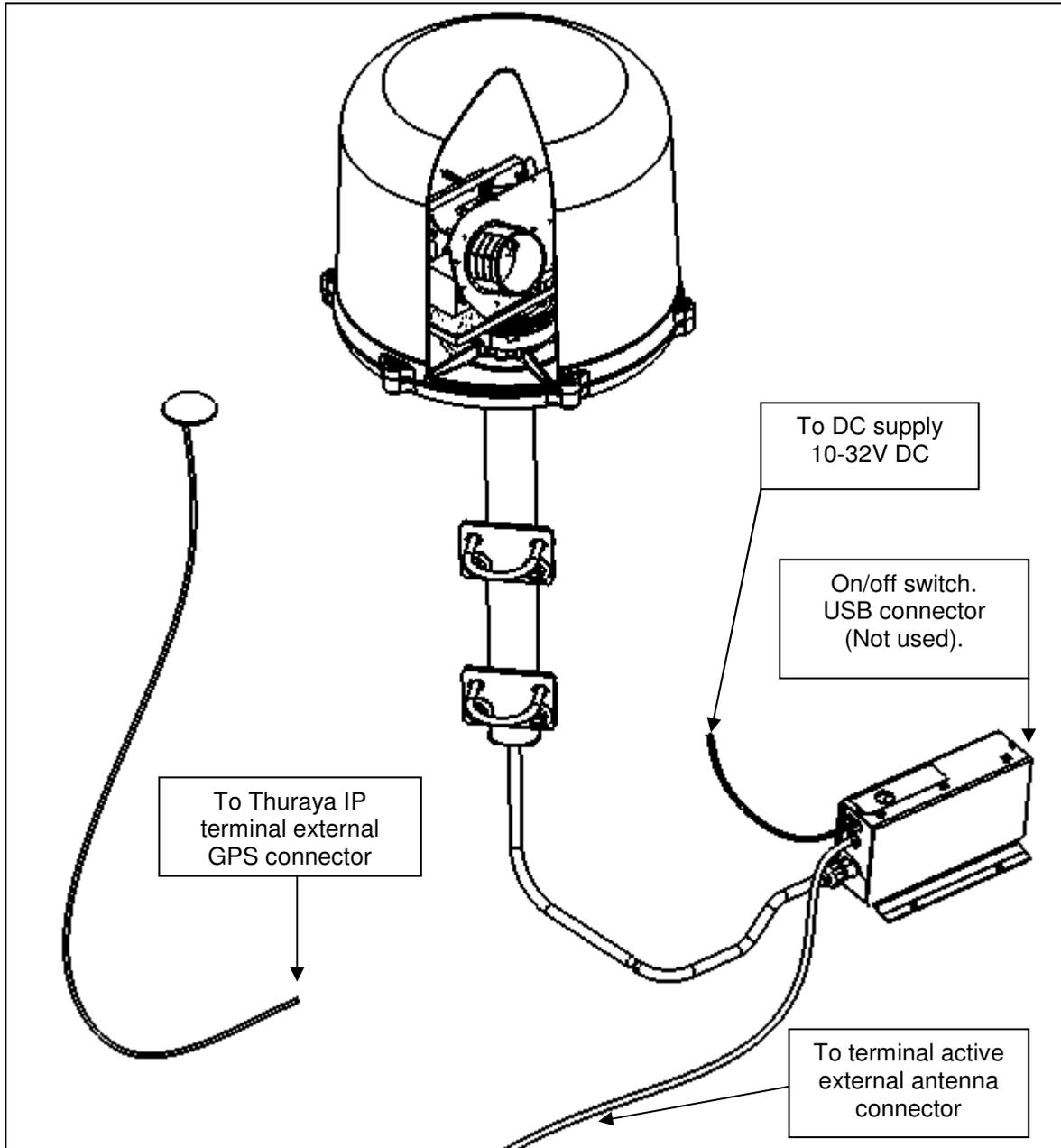
To DC supply
10-32V DC

On/off switch.
USB connector
(Not used).

To Thuraya IP
terminal external
GPS connector

To terminal active
external antenna
connector

Figure 4. Connecting the SpaceCom IP321 Maritime Antenna to the Thuraya IP terminal via the Power Supply, AS03951.

Connect the 1 meter coax cable from the Power Supply, AS03951 to the terminal active external antenna connector (see Figure 5). Remember to tighten the connecter in both ends with 1Nm force.

Figure 5. Connecting to the Thuraya IP terminal via the active external antenna connector.

The DC cable of the Power Supply, AS03951 is connected to the vessels power supply with specifications defined in Section 3. Ensure that the polarity is correct. The DC step-up converter in the Power Supply, AS03951 is isolated from the vessel's 0V.
The external GPS antenna and Thuraya IP power supply cable must be connected according to the Thuraya IP manual.

5.5 Bending Radius of the Coax Cables

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

Cable type	Bending radius
RG223, 15m RG223, 1m	Single bend: 25mm Multiple bends: 50mm
LMR240 , 25m	Single bend: 40mm Multiple bends: 80mm

6. Operating the Antenna

After the cable connections are made, apply power (10-32V DC) to the Power Supply, AS03951 and switch it on.

Wait for the SpaceCom IP321 Maritime Antenna to acquire the satellite signal, this takes approx. 1 minute.
Switch the Thuraya IP terminal on when the antenna is ready (see Section 6.1). Let the terminal acquire the satellite network as described in the Thuraya IP manual.

6.1 Satellite Acquisition

The tracking antenna performs a full hemispherical satellite search to acquire the Thuraya satellite every time power is applied. This takes approx. 1 minute.

6.1.1 Blocking of the Satellite

If blocking of the satellite signal happens, the antenna controller detects loss of the signal from the satellite (can occur if large objects block the line-of-sight to the satellite).

The antenna controller will first try to reacquire the satellite by turning around two 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 1 minute if a satellite signal is available. If no signal is available the antenna will continue to scan the sky until a signal can be acquired.

The antenna controller can stabilize the antenna at signal levels that are lower than the operational limits of the Thuraya terminal.

6.2 Satellite choice

The Thuraya satellite system consists of 2 satellites with each satellite having its own beacon the antenna can track. In order for the Thuraya IP terminal to have connection to the network, the antenna must track the correct satellite.

When the antenna performs a satellite search it will search for both satellites but in most covering areas only one satellite is visible and the antenna automatically detects this and tracks the visible satellite.

In certain areas both satellites are visible and therefore the antenna can track either of them, but only one of them will allow the Thuraya IP to connect to the network. The area with both satellites visible is from longitude 60° East to 110° East.

In the case where the antenna tracks the wrong satellite no service will be available. The user can redirect the antenna to the other satellite by, within the first 15 minutes after powering on the system, toggling the power switch on the antenna power supply,

AS03951. This will redirect the antenna to track the beacon of the other satellite visible. It is not necessary to power off the Thuraya IP terminal.

7. Appendices

7.1 Basic Maintenance

The SpaceCom IP321 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 radome and pole mount and keeping the associated cables free from damage and water ingress (see Chapter 5). Proper sealing of coax connectors and fastening of cables will ensure long and trouble-free service.

7.2 System fault finding

If for some reason the system can not connect to the Thuraya network the following things must be checked with respect to the antenna installation. For fault finding on the Thuraya IP terminal, refer to its manual.

1. Check all cables are correctly connected.

2. Check the antenna is detected by the terminal.
   a. Go to the web interface on the terminal and under the fan "Status" check that the Satellite Antenna Type reads: "Active External", see Figure 6.
   b. If Satellite Antenna Type differs from "Active External" go to point 3 else the antenna is detected and tracking a satellite, go to point 4.

3. The terminal has not detected the antenna. Perform the following.
   a. Check the antenna is powered. This is be done first by switching off the antenna on the antenna power supply, AS03951. Switch on the antenna power supply, AS03951 and hear that the antenna is moving.
   b. If the antenna is not moving check the fuse in the antenna power supply and power connection to the antenna power supply, AS03951.
   c. If antenna is moving check cable connection between antenna power supply, AS03951 and Thuraya IP terminal. After checking the connection the terminal must be restarted with the antenna power up first. Then go to point 2 again.

4. Switch tracking beacon as described in section 6.2 and restart Thuraya IP terminal.

If the above does not solve the problem, contact the Thuraya team with information of terminal type, antenna type and antenna serial number. Antenna type and serial number is found on the antenna radome bottom on a silver label marked with P/N and S/N.

Figure 6. Thuraya IP terminal web interface. Check for antenna type.

Warranty

8.1 SpaceCom limited warranty statement.

SpaceCom warrants that SpaceCom stabilized maritime antenna for ThurayaIP, 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.

8.2 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.