INSTALLATION MANUAL

SAILOR®

SAILOR 60 Satellite TV World

Thrane & Thrane

SAILOR Satellite TV Antenna

Installation and maintenance manual

SAILOR 60 satellite TV antenna including
Above Deck Unit TT-3054C and Antenna Control Unit TT-3057A

Disclaimer:

Any responsibility or liability for loss or damage in connection with the use of this product and the accompanying documentation is disclaimed by Thrane & Thrane. The information in this manual is provided for information purposes only, is subject to change without notice and may contain errors or inaccuracies.

Manuals issued by Thrane & Thrane are periodically revised and updated. Anyone relying on this information should acquire the most current version e.g. from the Thrane & Thrane Extranet at http://extranet.thrane.com.

Thrane & Thrane is not responsible for the content or accuracy of any translations or reproductions, in whole or in part, of this manual from any other source.

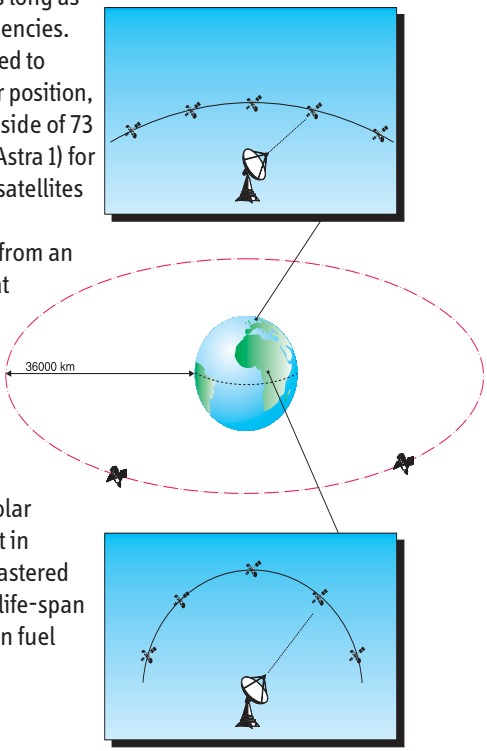
Table of Contents

General information

Satellite TV reception, general information, footprints

Satellite orbits

All TV-satellites move in so called geostationary orbit 36.000 km above the Earth's equator. At this specific altitude their angular velocity matches the Earth's exactly and make them appear motionless in the sky.
When viewed from the northern hemisphere the satellites appear along an arch with the satellite due south at the top.
The necessary separation between satellites depends on the frequency and the size of the antennas and is usually 3°. A large number of satellites can be co-located in the same position as long as they transmit on different frequencies. Co-located satellites are allowed to deviate 0,1 degrees within their position, which equals to a cube with a side of 73 km. At position 19.2 deg East (Astra 1) for instance, there are actually 5 satellites within the same position.
The satellites get their signals from an uplink station. The satellite that receives the signal shifts the frequency down to about 10-12 GHz, amplifies it and transmits it back towards earth by what is called transponders. The satellites electrical power comes from solar panels, and the satellite is kept in position by small jet-motors mastered by ground-control. The actual life-span of a satellite mainly depends on fuel left for positioning jets.



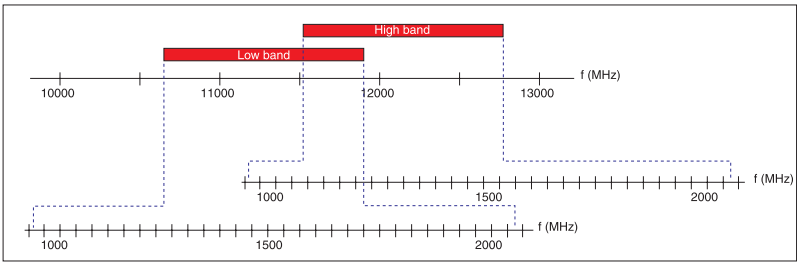
Transponders

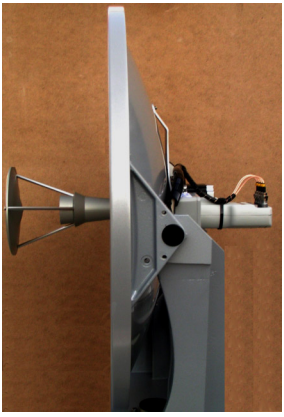
TV-satellites that can be viewed with Satellite antennas transmit in the Ku frequency band on frequencies between 10.700 and 12.750 MHz. Each satellite typically has several transmitters or transponders that carry a number of digital TV and/or radio channels.

Antenna and LNB

When the signals reach the antenna they are focused by the dish and radiated into the feedhorn and passed along to the LNB (Low Noise Block converter). The LNB amplifies the signals and transforms them to a lower frequency within the so-called satellite IF-band. Satellite receivers use the IF band which covers 950-2150 MHz (2300 MHz in some areas).

Since the Ku-band covers 2050 MHz and the IF-band only 1200 MHz, it is necessary to divide the incoming signals into a high band and a low band with separate outputs on the LNB. Low-band IF-signals are shifted 9750 MHz down and high-band IF-signals 10600 MHz down.

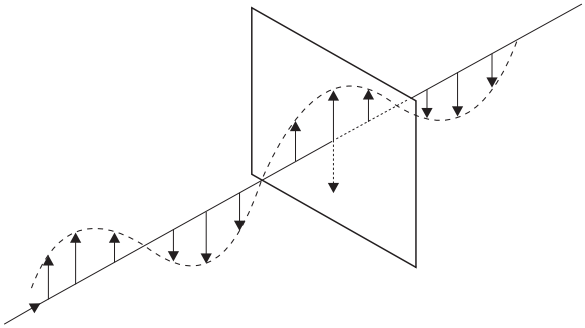




Polarisation

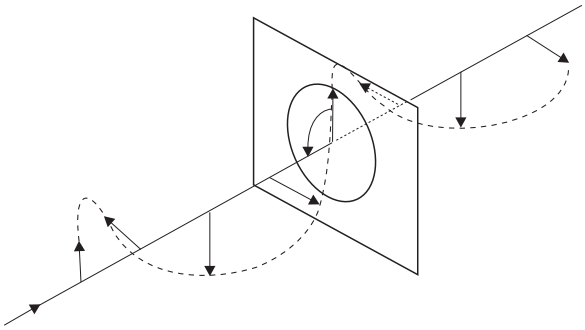
In order to increase the number of channels in each satellite slot the signals are transmitted with different polarisation. Two kinds of polarisation are used in TV transmissions: linear and circular.

Linearly polarised signals propagate with their wavefronts aligned either horizontally or vertically. The receiving LNB can then separate the two polarisations if it is aligned properly.



Circularly polarised signals propagate with their wavefronts rotating either clockwise or counter-clockwise

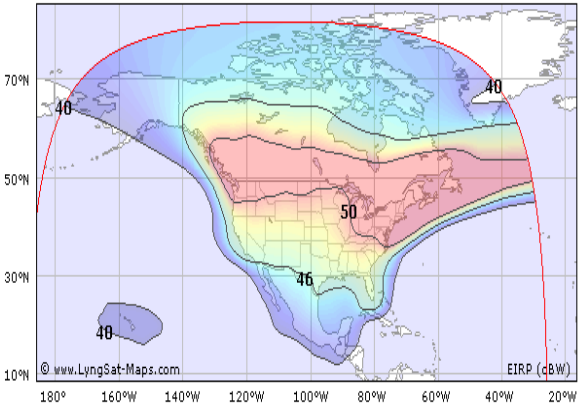
The main advantage with linear polarisation over circular is that the isolation between the two modes is better. The main advantage with circular polarisation is that the feedhorn doesn't need to be aligned.



Footprints

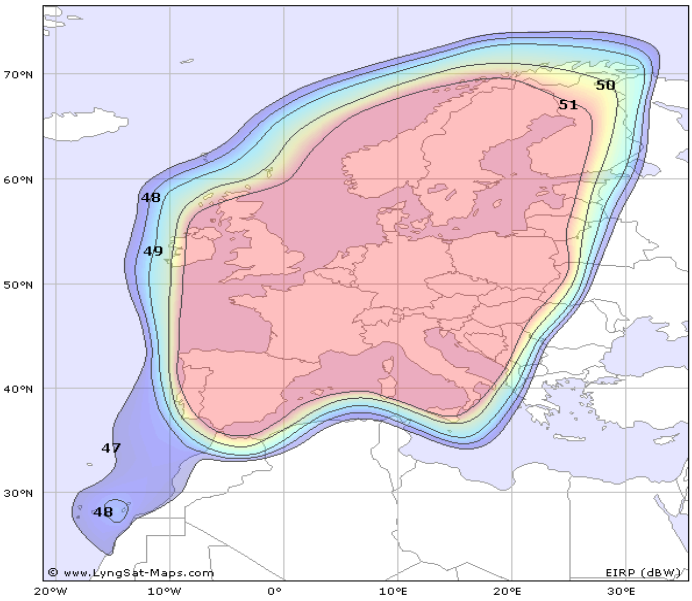
The satellite footprint is a map showing a satellite's fieldstrength or EIRP (Effective Isotopic Radiated Power). It's not a real unit, but more a practical model you can use when you graphically view the radiated area.
Every satellite has it's own footprint, and by consulting the footprints and the conversion table you can estimate the antenna size needed.
One satellite can transmit several beams, where every beam has it's own footprint and content regarding channels and service providers.
For updated information regarding footprints, frequencies, service providers etc. we recommend you to consult websites such as www.lyngsat.com, www.satbeam.com or www.kingofsat.net.

Below you can see a few typical footprints Anik F1R (W107,3), Astra 1H (E28,2) and NSS6 (E95,0)

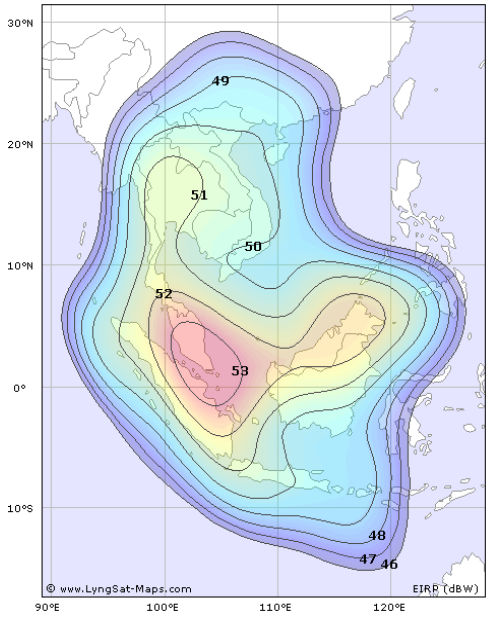


Anik F1R Ku band
EIRP
(dBW)
>50
50
49
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33

Astra 1H



NSS 6



Ku band
EIRP
(dBW)
>50
50
49
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33

Functional description

Description of operation

After power-up, the satellite TV antenna performs a self-test and calibration lasting up to five minutes. It then enters search mode and starts searching for a satellite. The antenna automatically calculates the elevation of the selected satellite using a built-in GPS-receiver to determine the current position[1].
After locking on a satellite, the ID-receiver attempts to identify it and repositions the antenna if necessary. Polarisation is adjusted automatically when a satellite is identified.
If the satellite is identified as using circular polarisation in the NID-list, the antenna reconfigures the LNB automatically.For a more detailed explanation a satellite identification see sections satellite ID and satellite ID menu.

Principles of antenna calibration

The IMU contains three orthogonally mounted gyroscopes and accelerometers.

The antenna is calibrated in three ways.

1. IMU calibration
This is performed in connection with factory testing and after IMU replacement. Its purpose is to measure the gyro rates (in °/V/s) and establish the cross axis contributions i.e. signals arising from motions that are not in the gyroscope's sensitive plane. These signals come from imperfections in the gyros themselves, misalignment between gyroscopes and misalignment between the IMU and antenna.
The gyro rates are essentially temperature-independent.

2. Power-on calibration
When powered up or after a manual reset a self-test of the IMU and motors are performed. The antenna then seeks to determine the individual gyroscopes' offset from the nominal null voltage.
At standstill this is simply a matter of measuring the output voltages. But, as ships tend to move it is important to separate this motion from the IMU. This is done using input from

the accelerometers to point the antenna in such a way as to minimise influence. The gyro-voltages are monitored during the process and if they fluctuate due to ship's movements the calibration is extended up to five minutes.

3. Noise calibration
Before search is initiated the antenna performs a 360° turn at 45° elevation to establish the lowest noise level.
Scan is performed on 10 tuner frequencies and using all three bandpass filters in detector mode.

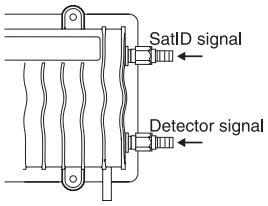
Managing gyro offset

When a satellite is acquired dish scan is used to correct the initial gyro offset. As offset is temperature dependent, this is a process that is always active in tracking mode.
In order to shorten the power-on calibration a table of offset values vs. temperature is created automatically. If a table is present when starting the antenna the power-on calibration is omitted.
Should the antenna fail to acquire a satellite a power-on calibration is initiated within a few minutes.

Satellite search

Two search patterns are used. The large pattern is used when no information is known about the satellite positions. The antenna then moves in full circles at different elevation angles. The small pattern is used to reacquire a satellite after loss of tracking.
If the default tracking mode (Auto) is set in the SatID-menu then the search is made with a signal detector that receives signals from a selectable part of the satellite IF-band.

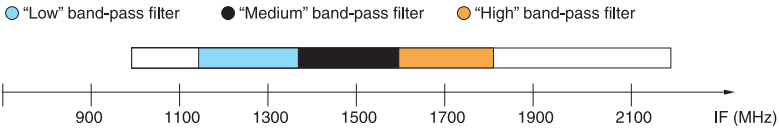
In some circumstances it can be useful to carry out the search using the tuner - the Tuner Tracking Mode. The antenna will then only lock on a satellite transmitting a DVB-S2 signal on the preset frequency with a certain symbol rate and FEC. These settings are available from the PC-program only.



[1] If the antenna has been switched off for a long time, the GPS receiver may take up to 20 minutes to initiate. It may then be necessary to enter the ship's position manually in the service menu.

Tracking

When the signal level exceeds the threshold level during a search, tracking is initiated. The antenna then uses a combination of gyroscopes and dish scan to keep it pointed at the satellite.



The dish scan continuously rotates the antenna in a small angle around its aiming point to correct for gyroscope drift. The signal is monitored either with a tuner set to a specific frequency or with a signal detector via a bandpass filter. See section Tracking mode

Signals from two of the four LNB outputs are tapped off and one fed to the tuner and the other to the detector. Vertical low is the default LNB output for the detector and horizontal high for the SatID.

Satellite identification

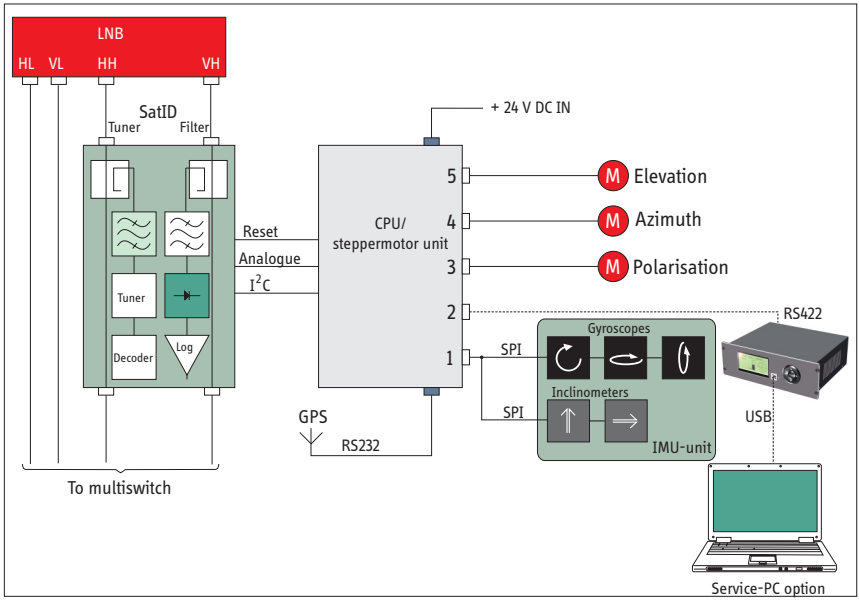
After locking on a satellite the ID-receiver attempts to identify it by matching the transponder's network identifier code or NID with the antenna's internal list.
If the identified satellite is another one than selected, the correct position is calculated and the antenna automatically repositioned. When a correct match is made, "Confirmed" is written after the satellite name in the display.
Please see section Network IDs.

If the satellite remains unidentified, the antenna tries to acquire another satellite.
After identification polarisation is adjusted to match the satellite.
The angles are calculated based on the ship's position and the satellite's longitude assuming a 0° angle in locations on the same longitude.
Compensation for ship´s movements is also performed continuously.
As some satellite's polarisation is offset, a provision is made to fine-tune it in the SatID menu of the PC-program.

Polarisation control

During initial NID-scanning, polarisation is set to 0°. If no identification is made, scans are executed on -15° and 15° as well.

If the satellite remains unidentified, the antenna tries to acquire another satellite.



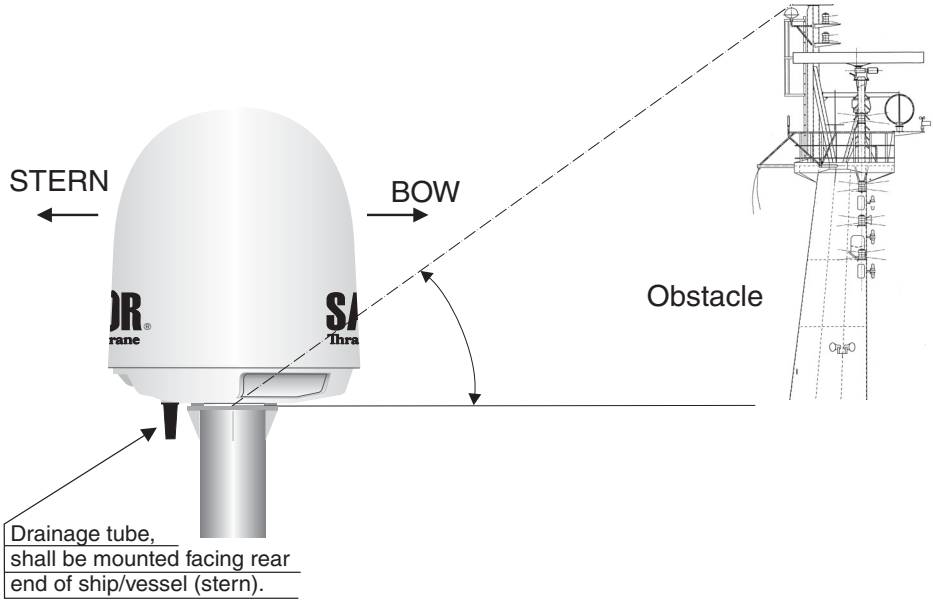
Installation

Antenna location

Choose a location that has an unhindered view of the satellite at the point of lowest elevation. Ideally, a location should be chosen as close to the vessel's centre as possible while keeping cable lengths to a minimum.
If the antenna is placed on a pedestal, care must be taken that it does not flex or vibrate.

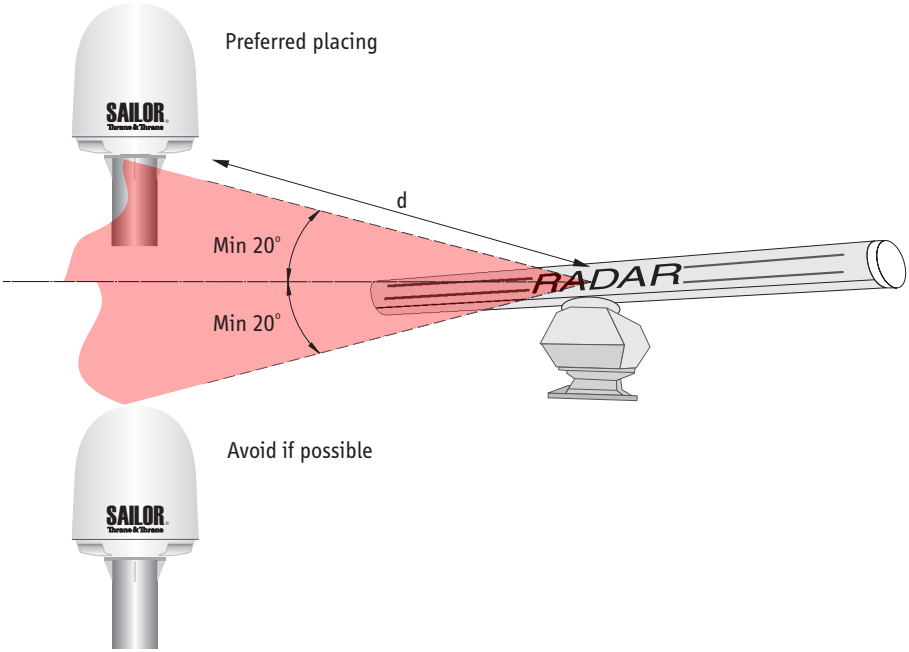
The satellite TV antenna's LNB is equipped with a radar filter but to avoid damage to the LNB it is strongly advised that it should not be placed in the path of a radar beam.

It must not be placed in the path of a VSAT antenna.



Radar

The satellite TV antenna must be mounted as far away as possible from ship's radar and high power radio transmitters (including Inmarsat based systems), because they may compromise the antenna performance. RF emission from radars might actually damage the satellite TV antenna.



It is difficult to give exact guidelines for the minimum distance between a radar and the antenna because radar power, radiation pattern, frequency and pulse length/ shape vary from radar to radar. Further, the antenna is typically placed in the near field of the radar antenna and reflections from masts, decks and other items in the vicinity of the radar are different from ship to ship.

However, it is possible to give a few guidelines:
Since a radar radiates a fan beam with horizontal beam width of a few degrees and vertical beam width of up to +/- 15°, the worst interference can be avoid by mounting the satellite TV antenna at a different level - meaning that the antenna is installed minimum 20° above or below the radar antenna. Due to near field effects the benefit of this vertical separation could be reduced at short distance (below approx. 10 m) between radar antenna and satellite TV antenna. Therefore it is recommended to ensure as much vertical separation as possible when the satellite TV antenna has to be placed close to a radar antenna.

Radar distance

The minimum acceptable seperation (d min.) between a radar and the satellite TV antenna is determined by the radar wavelength/frequency and the power emitted by the radar. The tables below show some "rule of thumb" minimum separation distances as a function of radar power at X and S band. If the d min. separation listed below is applied, antenna damage is normaly avoided. "d min." is defined as the shortest distance between the radar antenna (in any position) and the surface of the satellite TV antenna.

X-band (~3 cm/10 GHz) damage distance		
Radar power	d min. at 20° vertical seperation	d min. at 60° vertical seperation
0-10 kW	1.0 m	1.0 m
30 kW	2.0 m	1.0 m
50 kW	3.5 m	1.5 m

S-band (~10 cm/3 GHz) damage distance		
Radar power	d min. at 30° vertical seperation	d min. at 75° vertical seperation
0-10 kW	2.0 m	1.0 m
30 kW	5.0 m	2.0 m
50 kW	8.0 m	3.5 m

Compass Safe Distance: 1 m

Mounting

Rigid mounting is essential for proper function and parts of the vessel subject to heavy resonant vibrations are unsuitable for satellite TV antenna installation.
If pedestals higher than 1 m are used utmost care must be taken to ensure rigidity and that the natural frequency of the pedestal/satellite TV antenna is as high as possible.
Mounting bolts should be tightened with a torque of 20 Nm, and medium or permanent strength thread-locking fluid applied.

Connections

Three kinds of electrical connections are to be made during installation:

1. Power supply 24 V DC, min 5 A, 2 poles. Use prefabricated 25m cable enclosed in this antenna packaging (se pic 1 below).
2. Control unit, 7 poles + shield, use prefabricated 25m cable (se pic2 below).
3. Four coaxial cables, cables to be marked with ”1”, ”2”, ”3” and ”4”

picture 1

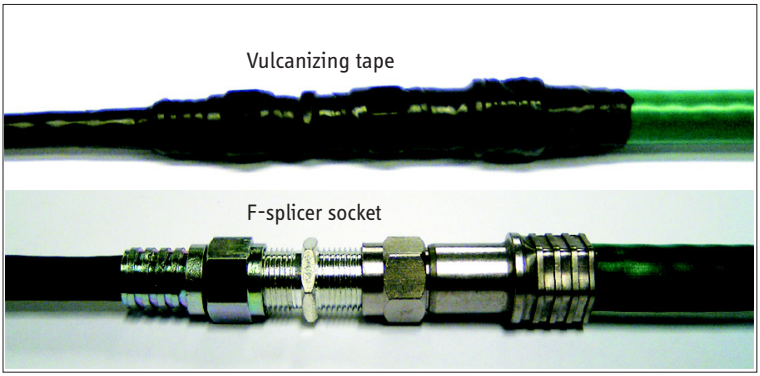
picture 2

For installtions 25 metres and below between satellite TV antenna and satellite receiver a thinner type of 7 mm:s low loss cable can be used.
For example TELASS 100 or TELASS 110 (KTV1 1/4.9 CV).
For more information regarding these cables please visit
www.coferro.dk
www.bedea.com/pdf/breitband/BK2004_18%2B19

For installations exceeding 25 metres between satellite TV antenna and receiver a thicker low loss cable must be used.
For example 75160AF or Coax 6. For more information regarding this type of cable please visit www.belden.com

NOTE: Maximum loss between satellite TV antenna and SAT-receiver 15 dB

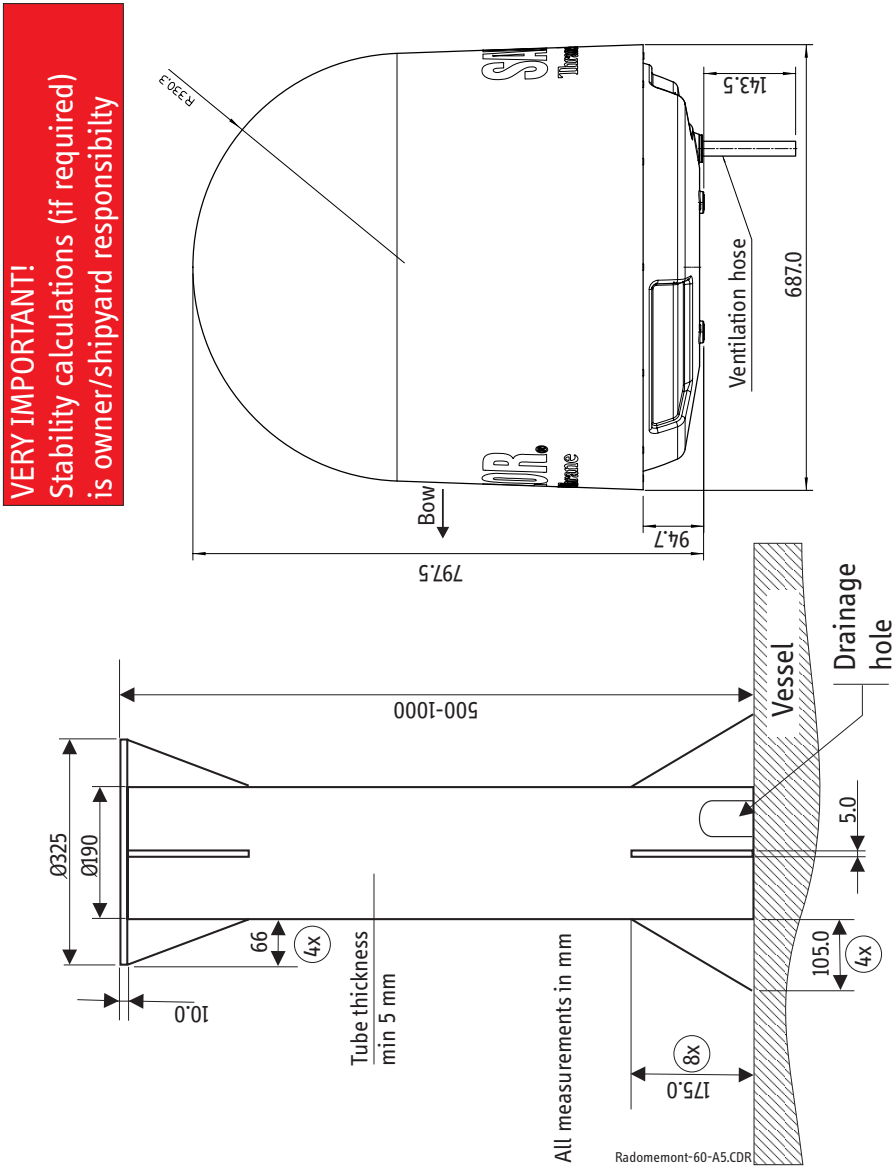
Cable splicing



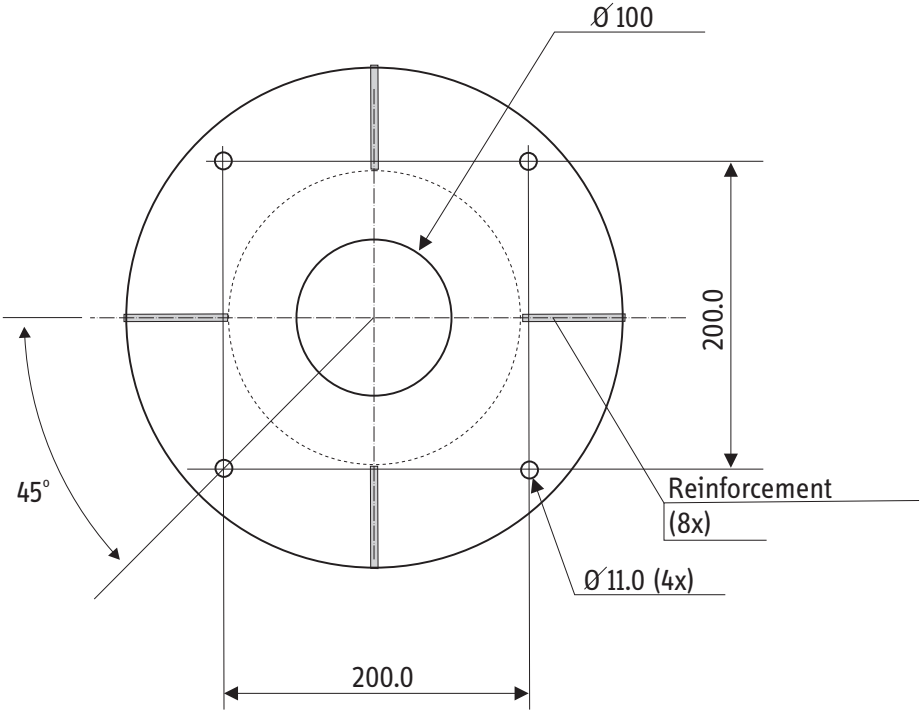
Crimp F-connector for 7 mm coax type
TELASS 110: (KTV 1.1/4.9 CV)
Crimp F-connector for 10 mm coax type RG11 or
75160AF: B004, PPC-Denmark

SAILOR 60 deck mounted pedestal example

Satellite TV antenna weight including radome: 49 kg



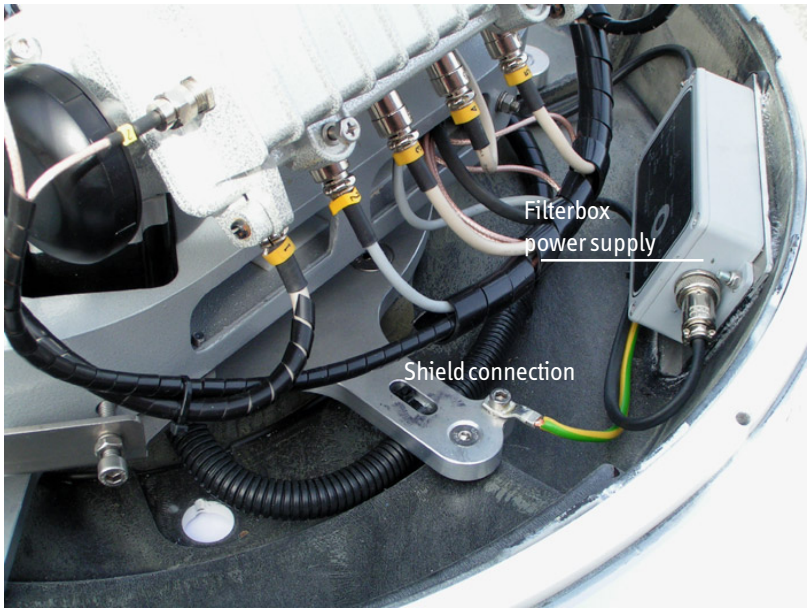
SAILOR 60 deck mounted pedestal example

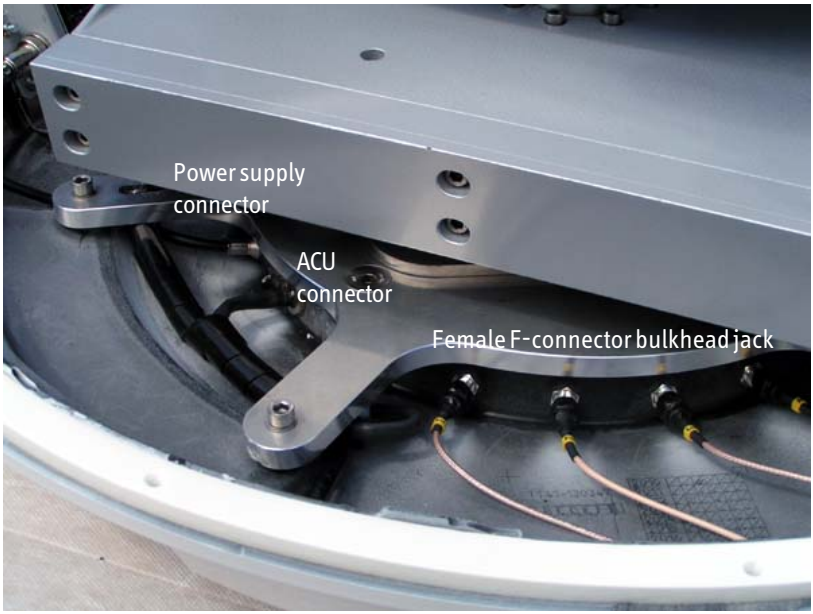


VERY IMPORTANT
The satellite TV antenna must be mounted on the pedestal using all 4 M10x25 hex bolts, spring washers, round washers and thread locking fluid applied. The length of the bolts must be such that they engage into the bushings of the radome with minimum 10 mm and maximum 15 mm.

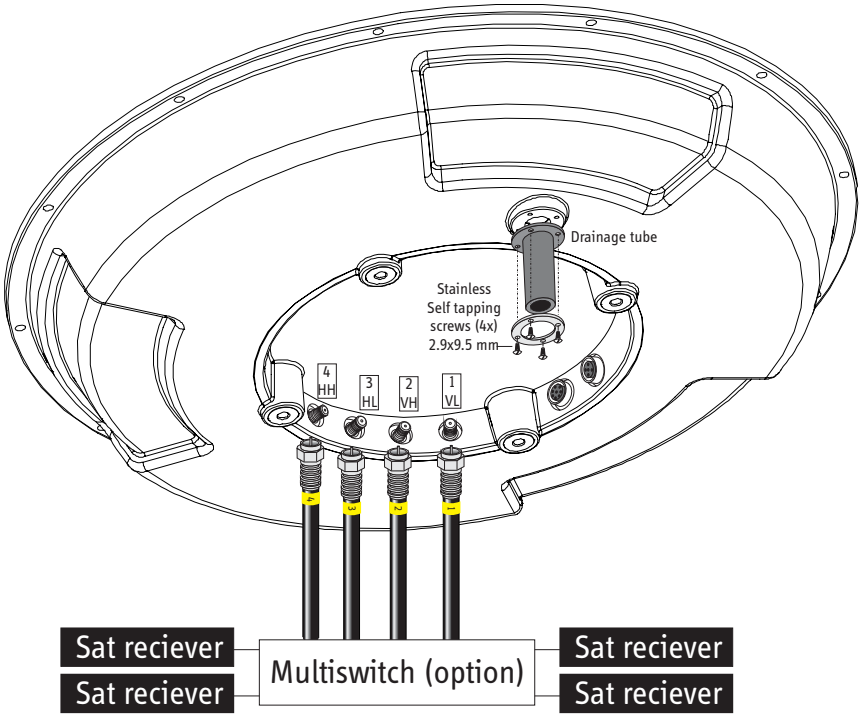
Radomemont-60-1-A5.CDR

Radome cable wiring

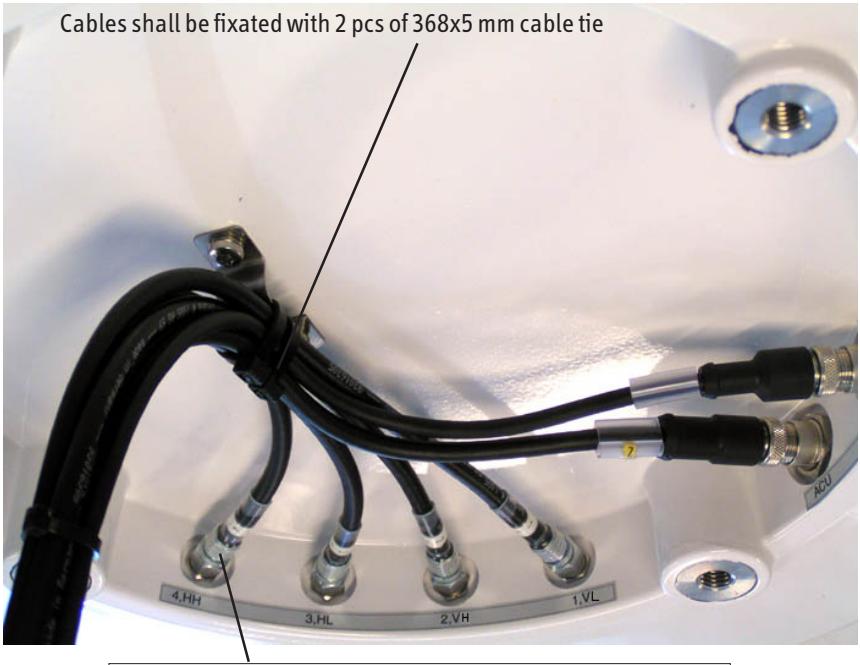


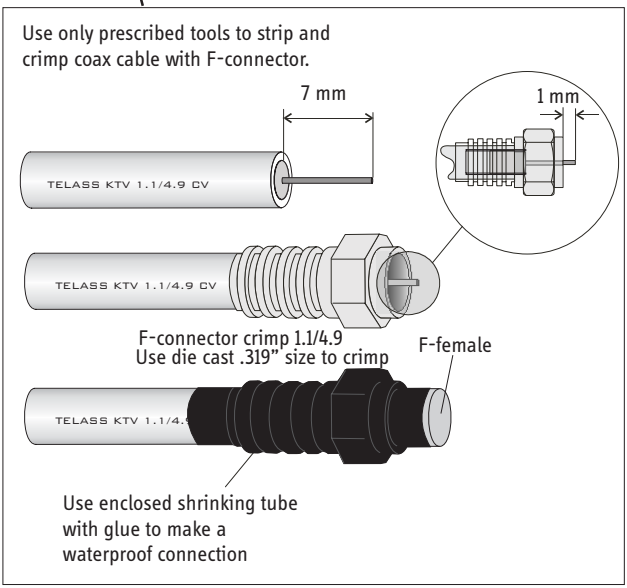


Radome cable wiring



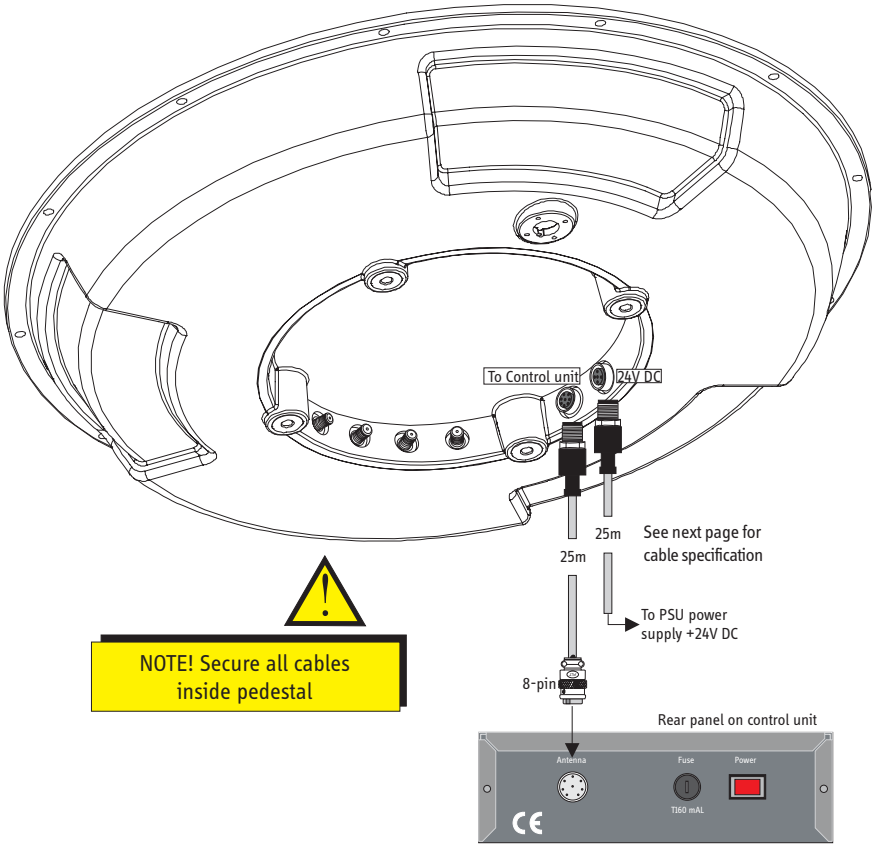
Cable fixing

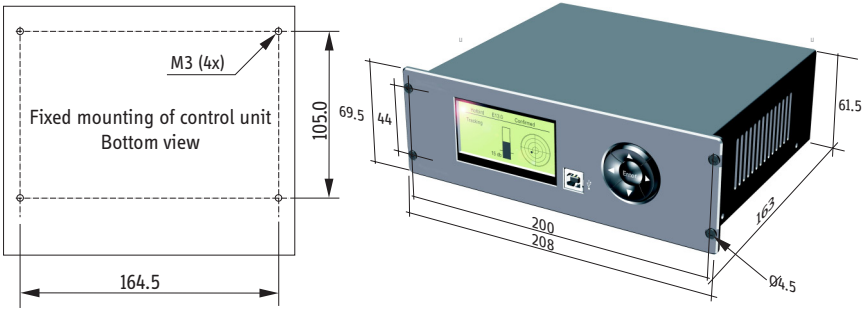


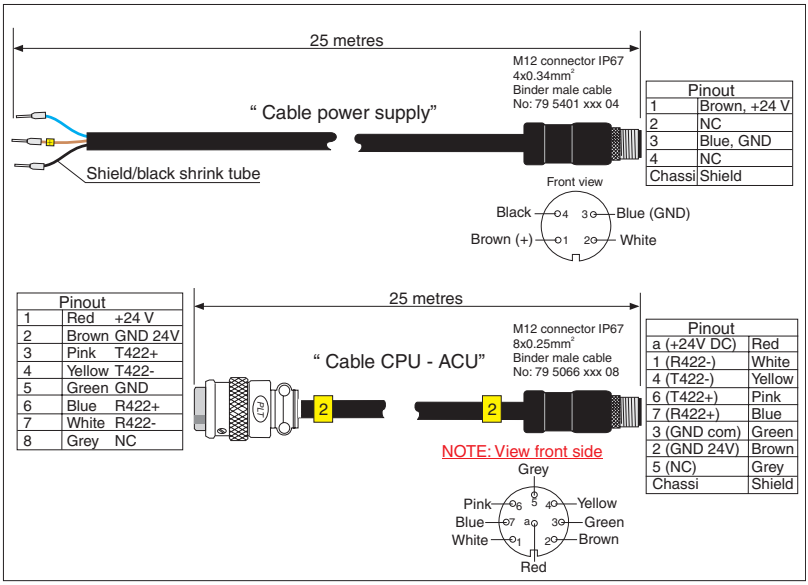


Control unit connection

Control unit can be mounted with M3 screws after removing rubber pads.
Screws should not extend more than 6 mm inside chassis.







Pinout	
1	Brown, +24 V
2	NC
3	Blue, GND
4	NC
Chassi	Shield

Pinout	
1	Red +24 V
2	Brown GND 24V
3	Pink T422+
4	Yellow T422-
5	Green GND
6	Blue R422+
7	White R422-
8	Grey NC

Pinout	
a (+24V DC)	Red
1 (R422-)	White
4 (T422-)	Yellow
6 (T422+)	Pink
7 (R422+)	Blue
3 (GND com)	Green
2 (GND 24V)	Brown
5 (NC)	Grey
Chassi	Shield

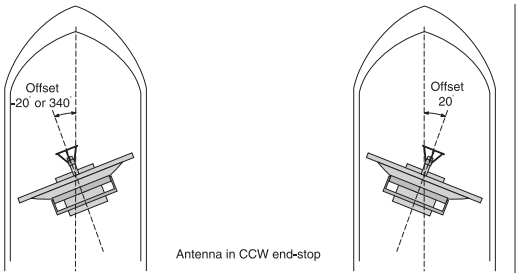
Choice of tracking and ID-receiver signals

The default connections are horizontal high (HH) to the ID-receiver and vertical high (VH) to the signal detector. The signal detector can be connected to any LNB output however (as long as it's not used by the ID-receiver). Another output than the default can be used to increase the signal-to-noise ratio on a specific satellite.

If the output for the ID-receiver is changed, a corresponding NID-table must be loaded. See section Satellite identification

Alignment of heading indicator

If the satellite TV antenna is aligned with the ship's bow direction in the CCW end-stop, the heading indicator's offset is zero.
If the antenna is positioned otherwise, the offset can be entered in the service menu. See section Service menu



Obscured sectors

A fixed object that obscures the satellite TV antenna not only precludes reception but can also cause strong reflections. To prevent the satellite TV antenna from locking on such signals, obscured sectors can be programmed in the calibration section of the service menu. See chapter 5.

Start-up procedure

1. If a satellite list with NID-codes is not preinstalled, see section 5.
2. Power up and choose a satellite from the list.
3. If GPS is not yet active, set position. **SERVICE ⇒ SET POSITION**
4. After calibration, place satellite TV antenna in manual mode, rotate at different elevations, and adjust tracking threshold to ensure that the antenna doesn´t lock on reflections from metal structures. **SERVICE ⇒ THRESHOLD**
5. Return to automatic mode.
6. If the satellite TV antenna can't maintain tracking, perform a reset. **SERVICE ⇒ RESET**

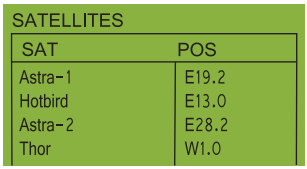
Operation

Normal use

In normal operation, choosing a satellite is the only required action.

When the satellite TV antenna has locked, the message "Tracking" is displayed and when the satellite is identified "Confirmed" is shown.

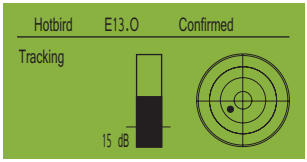
If the option "Adjacent ID" is activated the message "Confirmed ?" appears if the antenna is unable to positively identify the chosen satellite.



Menus

The default menu displays a pointing error indicator, mode of operation, signal strength and chosen satellite.

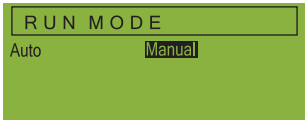
To enter the main menu, press ENTER and navigate using the arrow keys.



Special functions

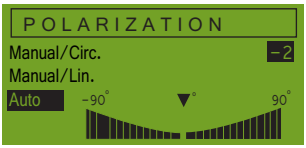
Manual/Auto

Allows manual control.



Polarization

Allows manual polarisation control.



SatID

Switching OFF the satellite identification function allows locking on satellites that do not transmit Network Identification (NID) code.

Adjacent ID

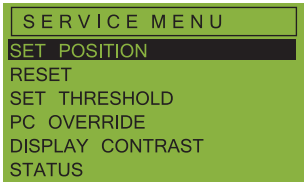
Allows the satellte TV antenna to identify a satellite that does not transmit a readable NID code by identifying a neighbouring satellite and calculating the angle between it and the selected satellite. If the function is switched OFF an NID is required. Default is off.

Set position

Position can be entered manually if the GPS receiver is inoperable.

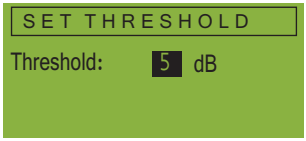
Reset

Activating the reset function causes the antenna to recalibrate gyroscopes and commence a new satellite search.



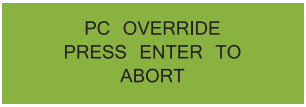
Set threshold

Sets the signal level needed to initiate tracking of a satellite. A larger value may be needed to keep the satellite TV antenna from tracking on reflections from different metal structures and a smaller to track a weak satellite.



PC-override

Makes the USB of the control unit transparent for communication directly between the satellite TV antenna and a PC.



Display contrast

Allows adjustment of the control-unit display contrast.

Status

Displays status codes for service purposes.

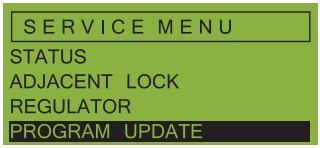
Regulator

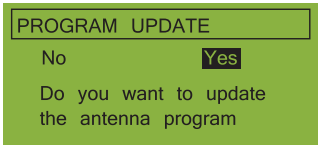
Allows control of the tracking regulator amplification. Three settings, LOW/NORM/HIGH, are possible in both elevation and azimuth. A HIGH setting causes the satellite TV antenna to react more aggressively to tracking errors but may cause over-compensation.

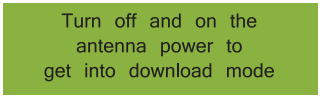
A LOW setting makes the antenna move more smoothly but may cause a pointing error.

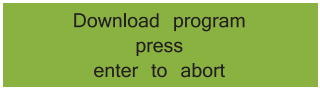
Program update

Allows the operator to upload new software to the satellite TV antenna via the USB-interface using a terminal program on the PC. For more detailed information regarding the configuration and settings of the terminal program, see "Antenna program update" section in chapter 5.

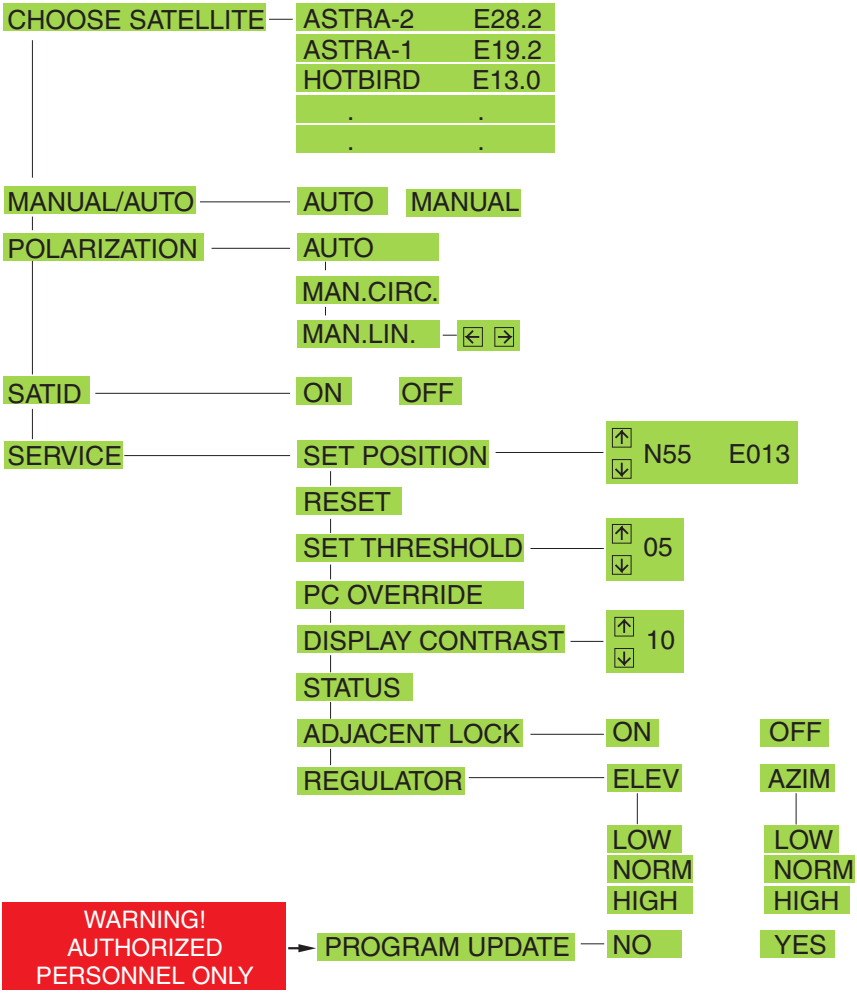








Overview of control unit commands



PC program, maintaining NID-tables

PC software installation

Insert CD - installation should start automatically. If not, run file "SatTV-ver.1.7.3.EXE" or the latest version of file “SatTV...EXE”.
Default installation folder is C:\Program\Satellite TV.
Install USB drivers by "clicking" on the shortcut "SatelliteTV-USB driver" located on PC desktop.
The USB driver for the SAILOR Satellite TV system is a standard USB Driver from Silicon Laboratories Inc.

After the installation connect the USB port of the SAILOR Satellite TV ACU to the USB port of the PC.

The SatTV configuration file

Configure the port number in the file "SatTV.ini" located in the default directory C:\Program\Satellite TV (or the directory chosen for the installation) to correspond to the USB-port allocated to the USB driver.

The preferred method is to check the port number in the Windows Device Manager (Control Panel Hardware Device Manager) and then change the port setting in the ini-file.
See figure on next page.

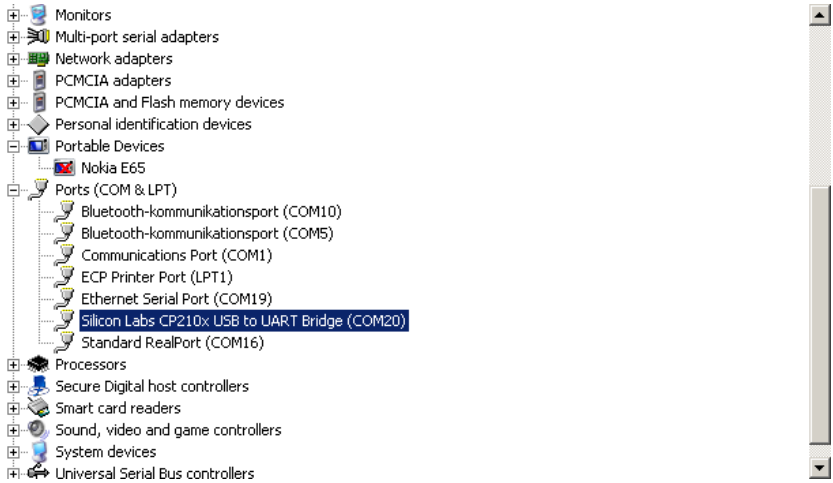
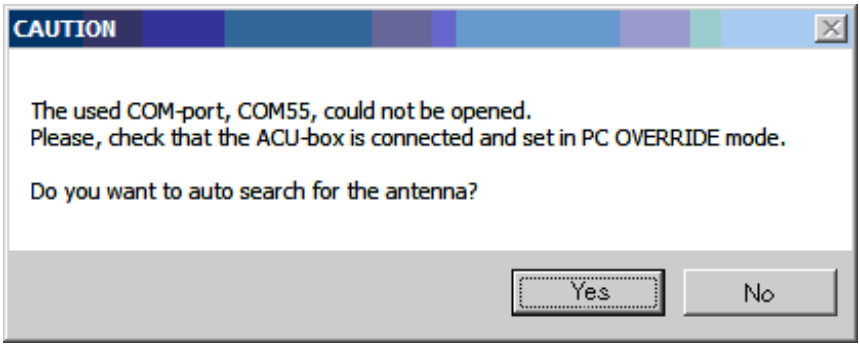


Figure 1: USB Driver in Device Manager
On figure above it can be seen that the driver was installed to use COM20.

If the port setting is wrong when the PC-program is started, the user will be asked to allow an automatic search. If accepted the ports will be scanned and the SatTV.ini file updated automatically.



SatTV.ini file

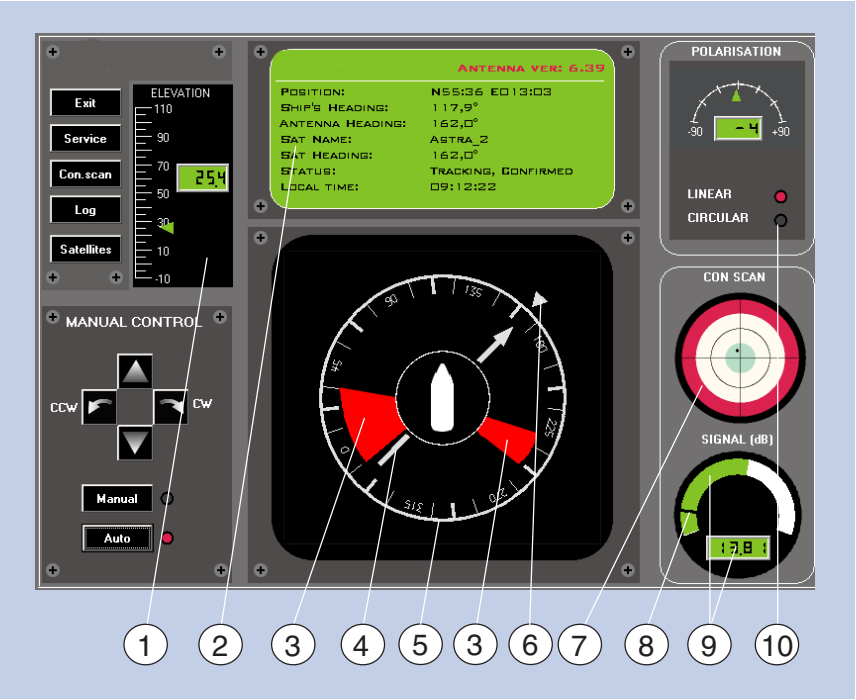
```
[Serial]
Port=20

[Controls]
UserMode=1

[Month]
CurrrentMonth=1
```

Main menu

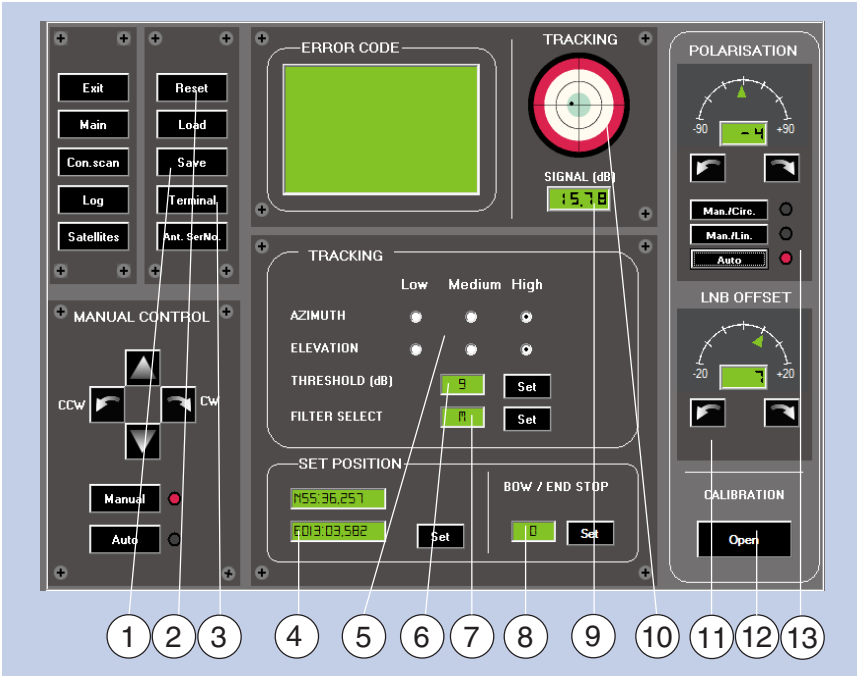
The main menu displays general information about the system such as signal strength, pointing error and elevation. Some functions i.e. manual control are available from other menus as well.



1. Antenna elevation.
2. Status window.
3. Obscured sectors.
4. Antenna heading indicator.
5. Ship's heading indicator. Active only after satellite has been identified.
6. Satellite indicator. Active only after a satellite has been identified.
7. Tracking error.
8. Tracking threshold.
9. Signal strength in dB above noise level.
10. Polarization control.

Service menu

The service menu contains settings for calibration and setup. Some factory settings are available only if "User mode" is set to 1.



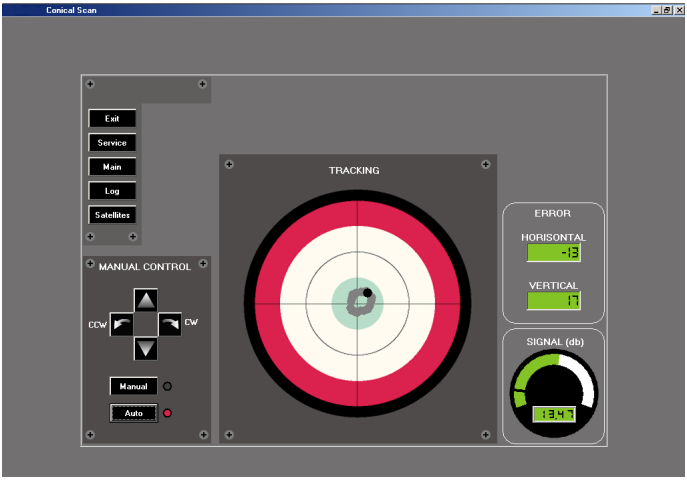
1. Load/save settings from/to PC.
2. Restart antenna.
3. Terminal window and program update.
4. Ship's position.
5. Tracking regulator settings.
6. Tracking threshold.
7. Filter mode band selector, H, M or L.
8. Angle between bow and the antenna's CCW end stop. This value affects indicator only.
9. Signal strength in dB above noise level.
10. Tracking error.
11. LNB offset. Difference between mechanical and electrical angle.
    User mode 1
12. IMU calibration and obscured sectors.
13. Polarization control.

Calibration menu

The calibration panel contains factory settings for the Inertial Measurement Unit.
A recalibration should be performed only if the IMU is replaced.
Up to three zones can be defined in the obscured sectors panel.

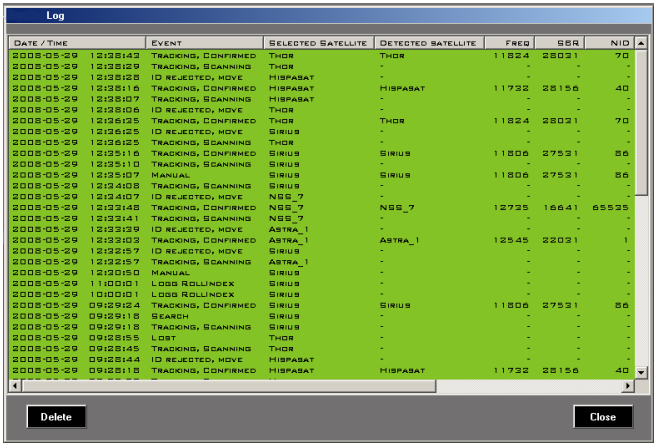
Conical scan menu

The conical scan menu displays the same tracking error indicator as in the main- and service menus, but traces are maintained for diagnostic purposes.



Log menu

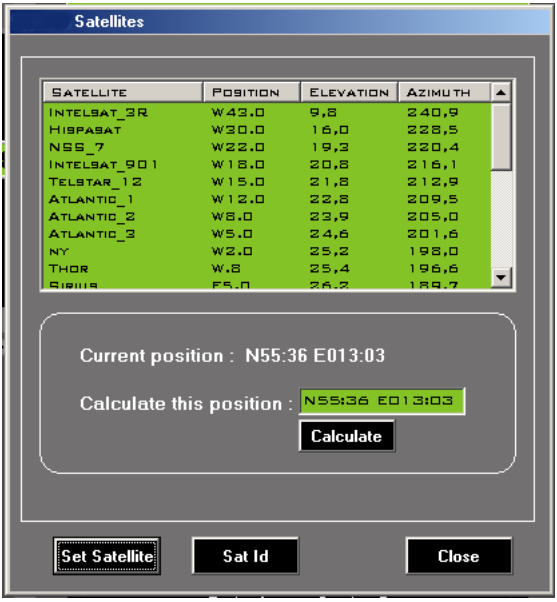
The log records the operations of the antenna such as tracking, unwinding and calibrating. Data is recorded only when a PC is docked to the control unit.



Date / Time	Event	Selected Satellite	Detected Satellite	Freq	SSR	NID
2008-05-29 12:28:42	Tracking, Confirmed	Thor	Thor	11824	28021	70
2008-05-29 12:28:29	Tracking, Scanning	Thor	-	-	-	-
2008-05-29 12:28:28	ID rejected, move	Hispasat	-	-	-	-
2008-05-29 12:28:16	Tracking, Confirmed	Hispasat	Hispasat	11732	28156	40
2008-05-29 12:28:07	Tracking, Scanning	Hispasat	-	-	-	-
2008-05-29 12:28:06	ID rejected, move	Thor	-	-	-	-
2008-05-29 12:26:25	Tracking, Confirmed	Thor	Thor	11824	28021	70
2008-05-29 12:26:25	ID rejected, move	Sirius	-	-	-	-
2008-05-29 12:26:25	Tracking, Scanning	Thor	-	-	-	-
2008-05-29 12:25:16	Tracking, Confirmed	Sirius	Sirius	11806	27531	56
2008-05-29 12:25:10	Tracking, Scanning	Sirius	-	-	-	-
2008-05-29 12:25:07	Manual	Sirius	Sirius	11806	27531	56
2008-05-29 12:24:08	Tracking, Scanning	Sirius	-	-	-	-
2008-05-29 12:24:07	ID rejected, move	NSS_7	-	-	-	-
2008-05-29 12:23:48	Tracking, Confirmed	NSS_7	NSS_7	12725	16641	65535
2008-05-29 12:23:41	Tracking, Scanning	NSS_7	-	-	-	-
2008-05-29 12:23:39	ID rejected, move	Astra_1	-	-	-	-
2008-05-29 12:23:03	Tracking, Confirmed	Astra_1	Astra_1	12545	22031	1
2008-05-29 12:22:57	ID rejected, move	Sirius	-	-	-	-
2008-05-29 12:22:57	Tracking, Scanning	Astra_1	-	-	-	-
2008-05-29 12:20:50	Manual	Sirius	-	-	-	-
2008-05-29 11:00:01	Logg Rollindex	Sirius	-	-	-	-
2008-05-29 10:00:01	Logg Rollindex	Sirius	-	-	-	-
2008-05-29 09:29:24	Tracking, Confirmed	Sirius	Sirius	11806	27531	56
2008-05-29 09:29:18	Search	Sirius	-	-	-	-
2008-05-29 09:29:18	Tracking, Scanning	Sirius	-	-	-	-
2008-05-29 09:28:55	Lost	Thor	-	-	-	-
2008-05-29 09:28:45	Tracking, Scanning	Thor	-	-	-	-
2008-05-29 09:28:44	ID rejected, move	Hispasat	-	-	-	-
2008-05-29 09:28:18	Tracking, Confirmed	Hispasat	Hispasat	11732	28156	40

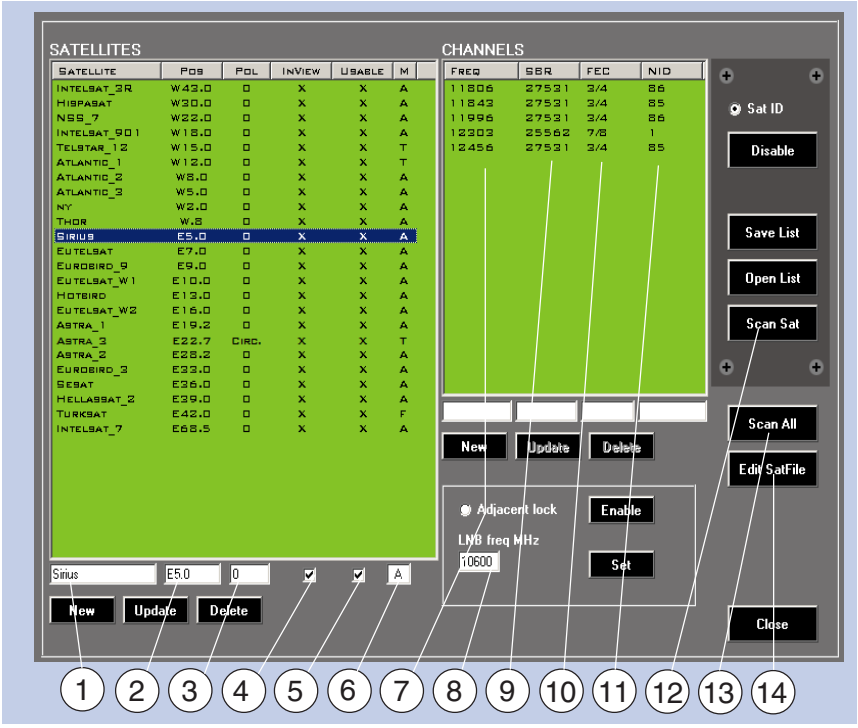
Satellite menu

The satellite menu contains a list of available satellites with their elevations and azimuth angles. Elevations and angles for a different position can be calculated by entering it in the field "Calculate this position". The list is not editable, see section Satellite identification menu



Satellite identification menu

The satellite identification menu is where the satellite list is edited. New satellites can be added by entering a name and orbital position. The satellite can then be scanned for NID-codes and corresponding frequencies, see below.
Tracking mode is selected for each satellite.



1. Satellite name.
2. Orbital position.
3. Polarization offset in degrees. "C" for circular.
4. Trackable satellites. This box should be checked if the satellite is within range.
5. Satellite selection. Check marked satellites are made available in the satellite list.
6. Tracking mode.
7. Transponder frequency in MHz.
8. LNB oscillator frequency in MHz.
9. Symbol rate.
10. FEC, forward error correction.
11. Network identification code.
12. Scan selected satellites for NID's.
13. Scan for new satellites. Use only at standstill.
14. Edit larger satellite and transponder files.

Tracking modes

Each satellite can be assigned a single letter code for tracking mode.

Filter Mode (F)

If the selected satellite is marked F in the NID-table, signal detection is made with a level detector sensitive for signals in the low/mid/high part of the IF-band. Default is mid-band but the setting can be changed in the tracking section of the service menu. This mode should only be used in special circumstances e.g. if a particular satellite does not have any transponders in the frequency band connected to the tuner input.

Tuner Mode (T)

In mode T, the built-in satellite tuner is used for level detection. The tuner only locks on to signals with the correct frequency, symbol rate and FEC and is suitable if the NID table contains only one or very few satellites.

Auto Mode (A)

In mode A, the Filter Mode is used during satellite searches and Tuner Mode for tracking. Provided that the NID-list contains most of the trackable satellites, this is the preferred mode.

Adjacent ID

If the target satellite does not transmit any NID codes or uses modulations other than DVB-S or DVB-S2, then the Adjacent ID function can be used.
When activated the antenna attempts to identify another satellite. It then moves to the correct position by calculating the angle between the identified and the target satellite.

The recommended tracking mode is A. Mode T is unavailable and if selected will default to A.
Frequency and symbol rate should be entered in the satellite list (Satellite Identification Menu) and dummy values för FEC and NID e.g 7/8 and 0.

NID-tables

The network identifier or NID-code is a number between 1 and 65535 embedded in the digital data stream. Each transponder has an NID assigned to the network provider.
The satellite TV antenna uses the NID in combination with symbol rate, frequency and FEC (Forward Error Correction) to identify satellites.

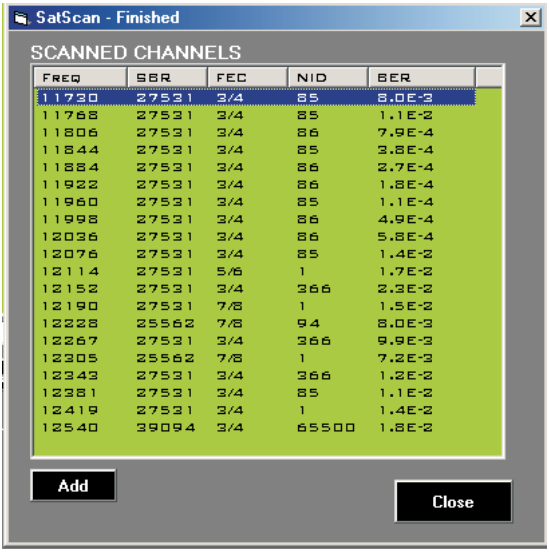
Ideally all satellites in the antenna's range should be identifiable to keep search times to a minimum.

Keeping a database of all the world's satellites is possible but unpractical as scanning times would be very long. It is therefore useful to limit the number of satellites to those that are within range, either by using satellite lists specific to a geographical area or by selecting appropriate satellites in the SatID menu i.e. check marking "In View".

As many satellites have beams directed at different areas, it is possible to enter several codes and frequencies per satellite. Using a large number increases the probability of a correct identification under difficult reception conditions but prolongs the scanning time as well. It is recommended to limit the number of frequencies/NID's to 5 per satellite.

Scanning a satellite for NID-codes

Altering the satellite list can be done either by loading a new file or editing the existing in the SatID menu.



If the ID receiver is connected to a low-band LNB-output, set LNB frequency to 9750 MHz. If it is connected to a high-band output, set LNB frequency to 10600 MHz.

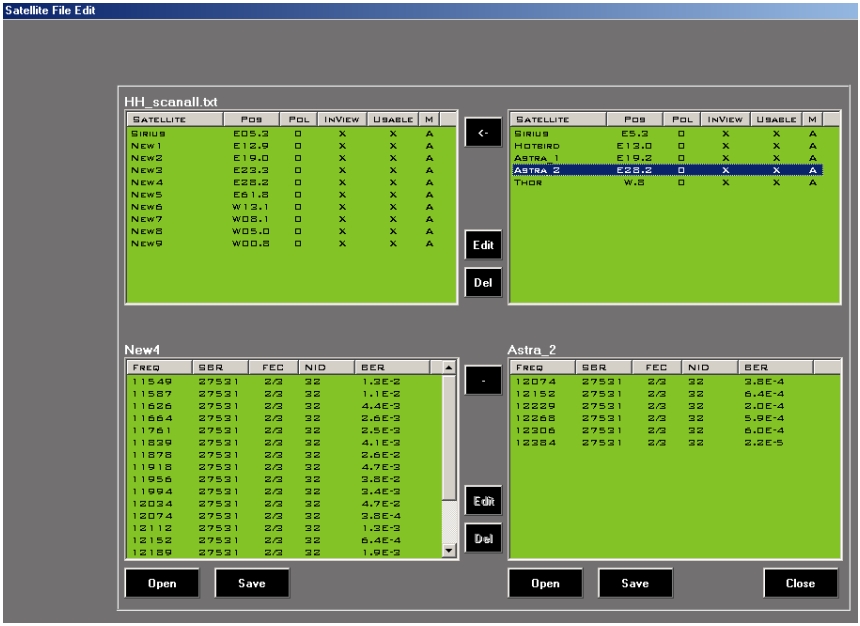
Enter a new satellite by typing name and longitude in the fields below the satellite list. Check "In view", "Usable" and select tracking mode "A", click "New".
Select the satellite by clicking on its name and enter frequencies, symbol rates and NID's in the same manner. If no NID's are known, the satellite can be scanned as follows:

1. Disable the SatID function in the SatID menu.
2. Select the satellite in the satellite menu and lock on it manually.
3. Return to the SatID menu and click "Scan Sat".
4. When scan is completed, select frequencies to be used and click "Add".
5. Enable SatID again.

To assist in frequency selection the BER or bit error rate is displayed in the list. A value of 0.0E-0 or 4.2E-0 indicates an error free signal and is normally the first choice. If other values are diplayed, a lower value indicates fewer bit errors.
In most cases it is best to limit the satellite search to transponders with a symbol rate greater than 15 Msymb/s. A rate setting down to 3 Msymb/s is possible but scans will become slower with decreasing rates.

Satellite list editing

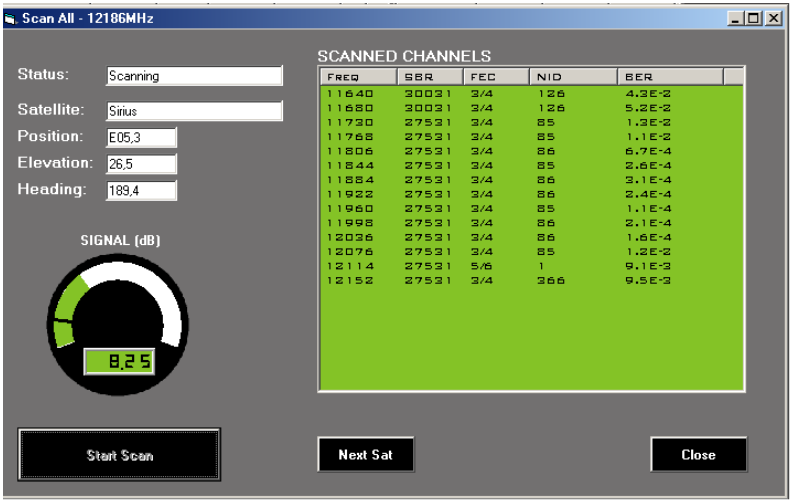
Additions and deletions in the satellite- and transponder list can be made directly in the SatID-menu. To facilitate editing of larger files an editing tool can be accessed from the "Edit Satfile" button.



Scan-all function

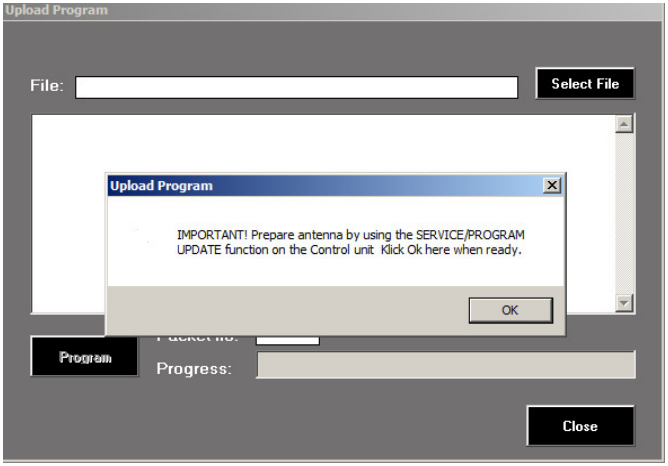
A search of the entire sky for satellites can be made using the "Scan All" function. A provision for its use is that the satellite TV antenna can track one satellite using filter mode and that it can be identified. The ship also has to be at standstill during the scan.

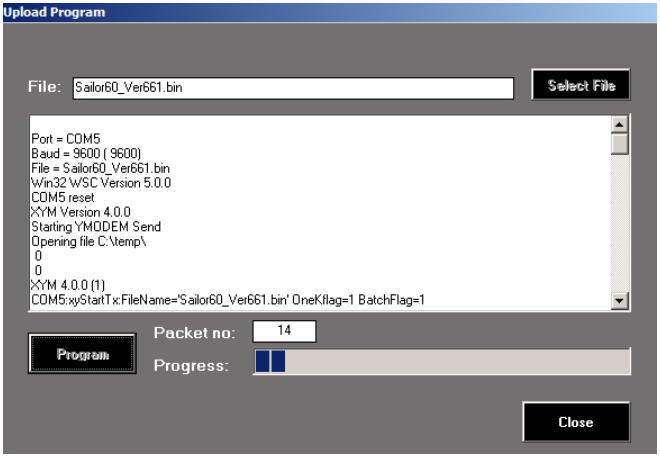
Upon activation the satellite TV antenna first scans the original satellite for NID's and then automatically proceeds to search for other satellites. When the scan is completed the resulting file can be saved and edited using the editing function.

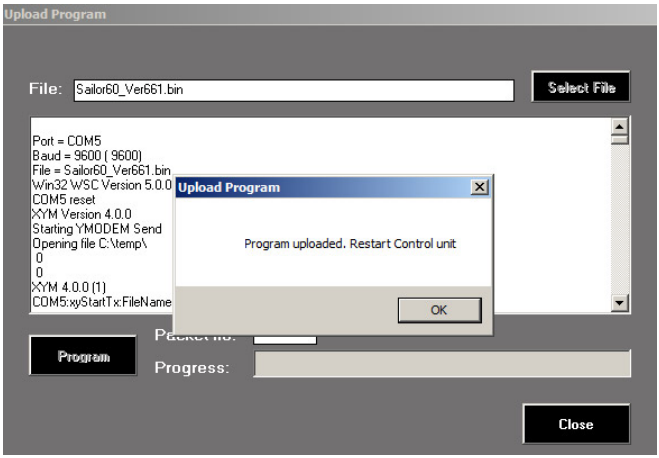


Antenna program update

Upload new software by clicking the "Terminal" button in the service menu.
Activate the "Program Update" function in the ACU service menu and switch power off and on again.
Select file and click "Program"
A command line interface allows specialized diagnostics.






Upload Program
File:
Sailor60_Ver661.bin
Select File
Port = COM5
Baud = 9600 (9600)
File = Sailor60_Ver661.bin
Win32 WSC Version 5.0.0
COM5 reset
XYM Version 4.0.0
Starting YMODEM Send
Opening file C:\temp\
0
0
XYM 4.0.0 (1)
COM5:xyStartTx:FileName
Upload Program
Program uploaded. Restart Control unit
OK
Program
Progress:
Close

Service and repair

Introduction

The SAILOR 60 satellite TV antenna systems are designed to operate without preventive routine maintenance.

Although the system is designed and built very service friendly, we strongly recommend that any acting service technician is trained specifically on the product. Repair or repair attempts performed by unqualified personnel may limit the warranty. The warranty on the system is defined and outlined by the distributor that supplied the system. For further information and downloading of manuals, you may also use the Thrane & Thrane Extranet at http://extranet.thrane.com. We recommend that your distributor who made the installation makes annual checks of below items.

Electrical

Check all external cables for wear
Check for corrosion of coaxial connectors

Mechanical

Check screw tension of (tighten if necessary)

CPU/motordriver box
Base plate
Motor mounts
Subreflector
Belt pulleys
LNB
Elevation arm
Azimuth bearing nut

Check belt tension (tighten if necessary)

For correct tightening of bolts and timing belts please consult section 6.0 in this manual.
We do not recommend repairing the antenna control unit on board the ship. Replace the defective unit and have it repaired at a qualified workshop on shore.
Some of the modules in the SAILOR 60 satellite TV antenna can be replaced. See list below

	Order no.
■ CPU/steppermotor unit	See Thrane&Thrane Extranet Eshop
■ IMU	See Thrane&Thrane Extranet Eshop
■ LNB with automatic depolariastor	See Thrane&Thrane Extranet Eshop
■ Azimuth motor	See Thrane&Thrane Extranet Eshop
■ Antenna control unit ACU	See Thrane&Thrane Extranet Eshop
■ Elevation motor SAILOR 60	See Thrane&Thrane Extranet Eshop
■ Polarotor motor	See Thrane&Thrane Extranet Eshop

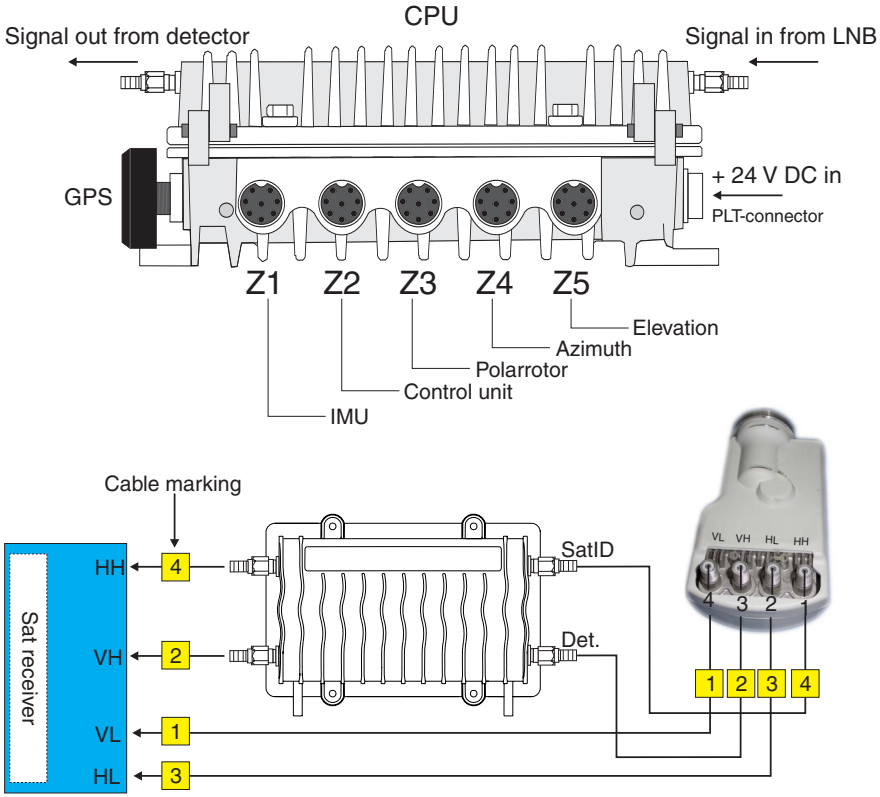
For more detailed information see chapter 6.0 in this manual.

Service, mechanical drawings

Medium strength thread-locking fluid should be applied on all screws and bolts that are not mounted with nylon locking nuts.

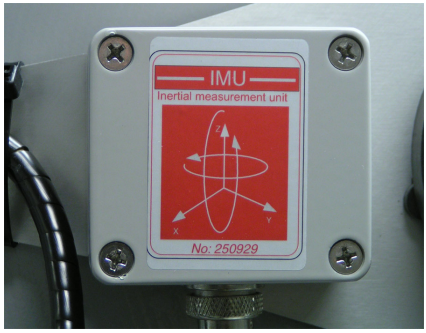
Replacing CPU

1. Save satellite list from the SatID menu and operational settings from the service menu.
2. Disconnect cables and replace unit.
3. Reload the satellite list and settings

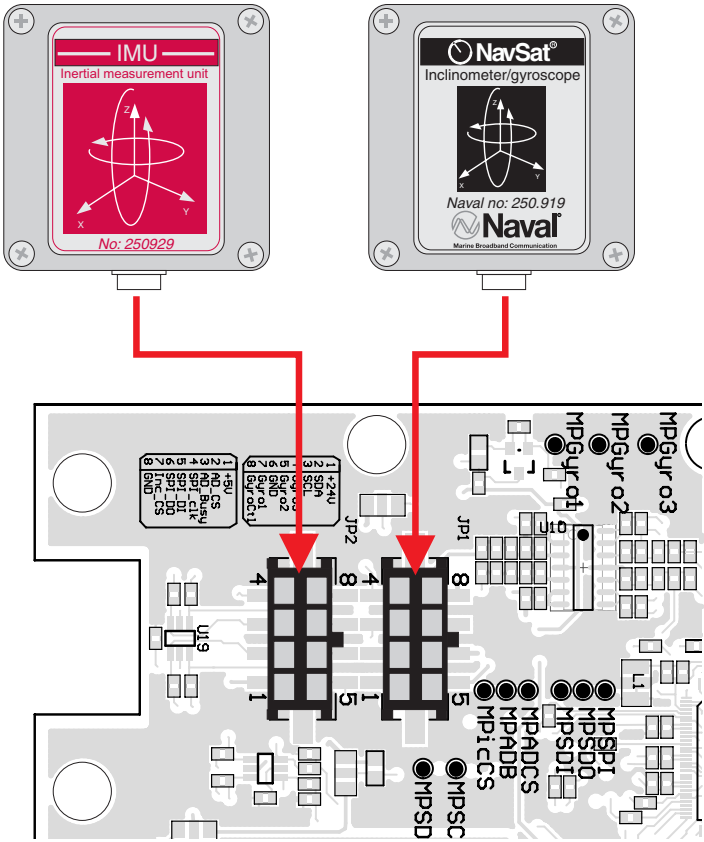


Replacing IMU

1. Disconnect cable and remove lid.
2. Unscrew the hexagonal socket bolts and replace unit.
3. Calibrate the new unit as per enclosed instructions.

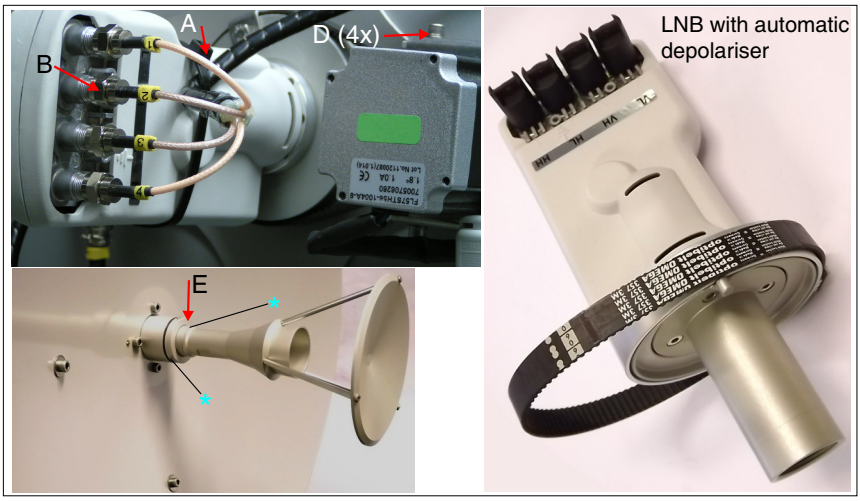


Antennas with program version 6.61 and higher can be fitted with IMU type 250.919 (black label) or type 250.929 (red label). It is **critical** that the PCB-connector is positioned as pictured below or the IMU will be permanently damaged.



Replacing LNB with automatic depolariser

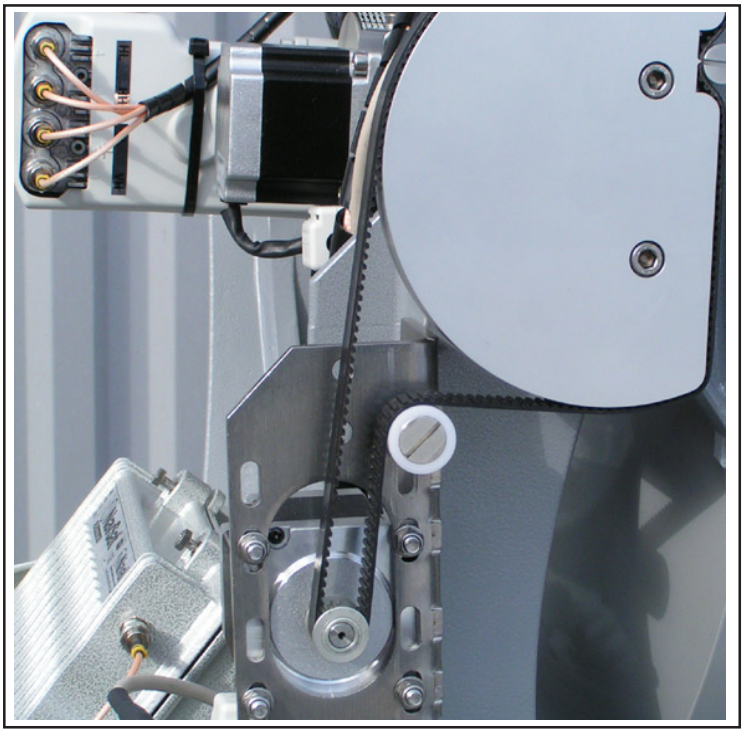
1. Note the four cables (B) mounting order and disconnect. Remove cable tie (A).
2. Loosen motor mounting plate screws (D).
3. Remove sub-reflector and outer part of feedhorn.
4. Remove locking-ring (E) on feedhorn.
5. Pull out LNB with automatic depolariser and bottom part of feedhorn.
6. Replace with new unit (LNB+automatic depolariser and feedhorn).
7. Mount the LNB and feedhorn with connectors pointing to the IMU-unit.
8. Press LNB firmly and mount locking-ring with a distance of 0.15 mm to the compound bearing.
9. Mount subreflector and outer part of feedhorn.
10. Tighten belt as shown in belt tension figure and tighten screws.
11. Connect cables.



** Low strength thread locking fluid*

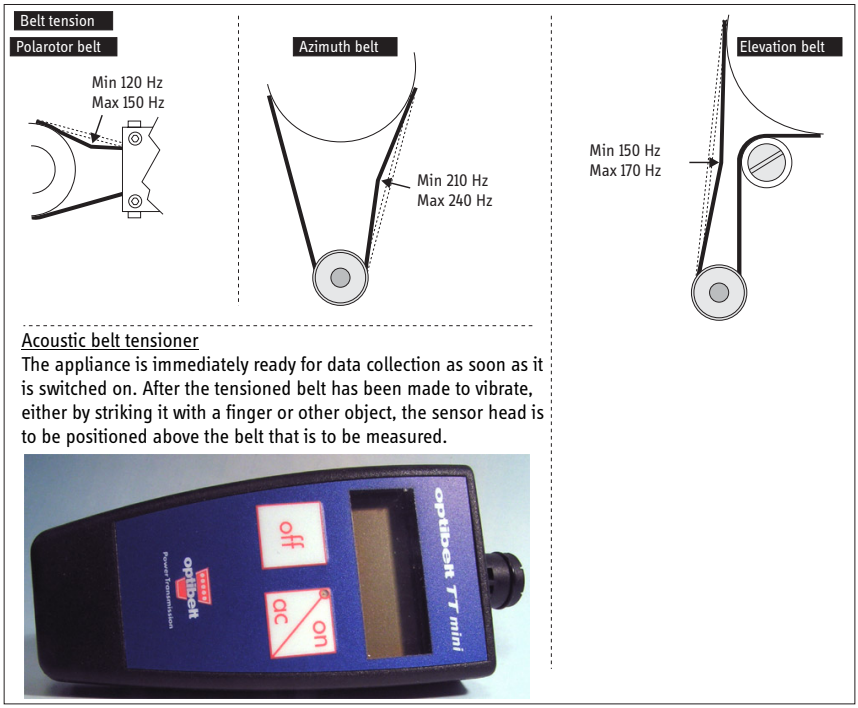
Replacing elevation motor belt

1. Loosen motor screws.
2. Remove belt from guide pulley and replace.
3. Tighten belt as shown in belt tension figure and tighten screws.



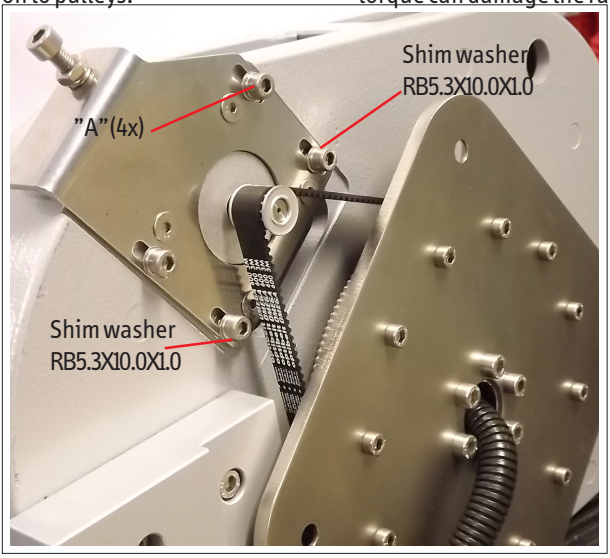
Replacing elevation motor

1. Disconnect cable.
2. Open cable holder and remove cable.
3. Remove motor screws and replace motor.
4. Tighten belt as shown in belt tension figure and tighten screws.
5. Reconnect motor and snap cable into toroid plastic cover.
6. Strap cable.



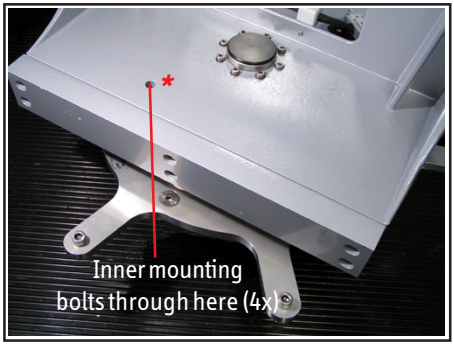
Replacing azimuth motor belt

1. Remove inner mounting bolts.
2. Cut away old belt.
3. Loosen belt tensioner.
4. Loosen mounting bolts "A".
5. Slide belt under bottom plate and on to pulleys.
6. Tighten belt as shown in belt tension figure, and tighten screws.
7. Tighten inner mounting bolts with a torque of 14 Nm. A higher torque can damage the radome.



Replacing azimuth motor

1. Remove inner mounting bolts.
2. Disconnect cable from cable holder and CPU-box.
3. Loosen belt tensioner.
4. Remove screws marked "A" and motor screws and replace motor.
5. Tighten belt as shown in belt tension figure, and tighten screws.
6. Reconnect motor and strap cable.



Inner mounting bolts (4x) inside radome should be tightened with a torque of not more than 14 Nm in order to avoid damage on the radome. Tightening these bolts are not necessary in a normal installation.

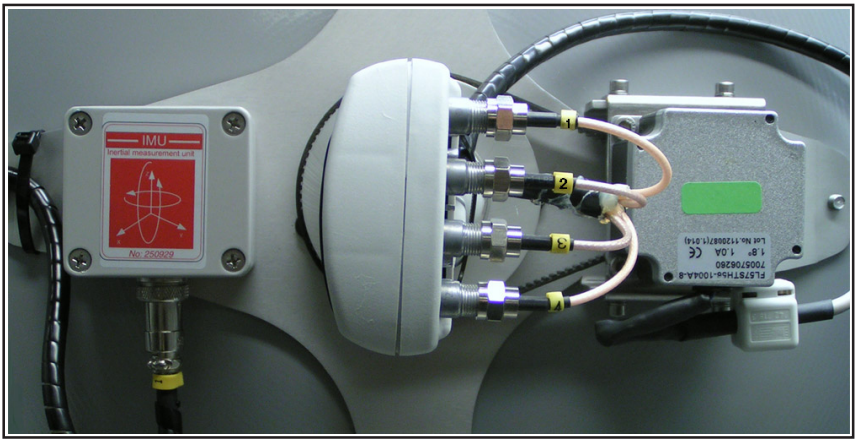
** Medium strength thread locking fluid*

Replacing polarization motor belt

1. Loosen motor mounting plate screws.
2. Replace belt.
3. Tighten belt as shown in belt tension figure and tighten screws.

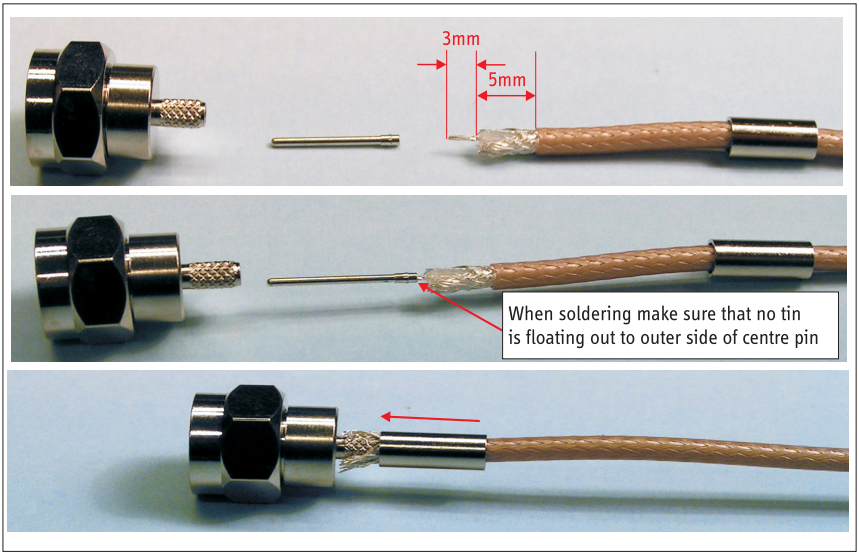
Replacing polarization motor

1. Disconnect cable from cable holder and CPU-box.
2. Loosen motor mounting plate screws.
3. Remove motor mounting screws and replace motor.
4. Tighten belt as shown in belt tension figure and tighten screws.
5. Reconnect motor and strap cable.



Replacing RG179 coaxial connectors

1. Slide crimp ferrule onto cable.
2. Strip cable.
3. Solder centre pin.
4. Slide the connector body under the shield.
5. Slide the crimp ferrule over the shield.
6. Crimp with a 3.25 mm (0.128 inch) crimp die.



Troubleshooting

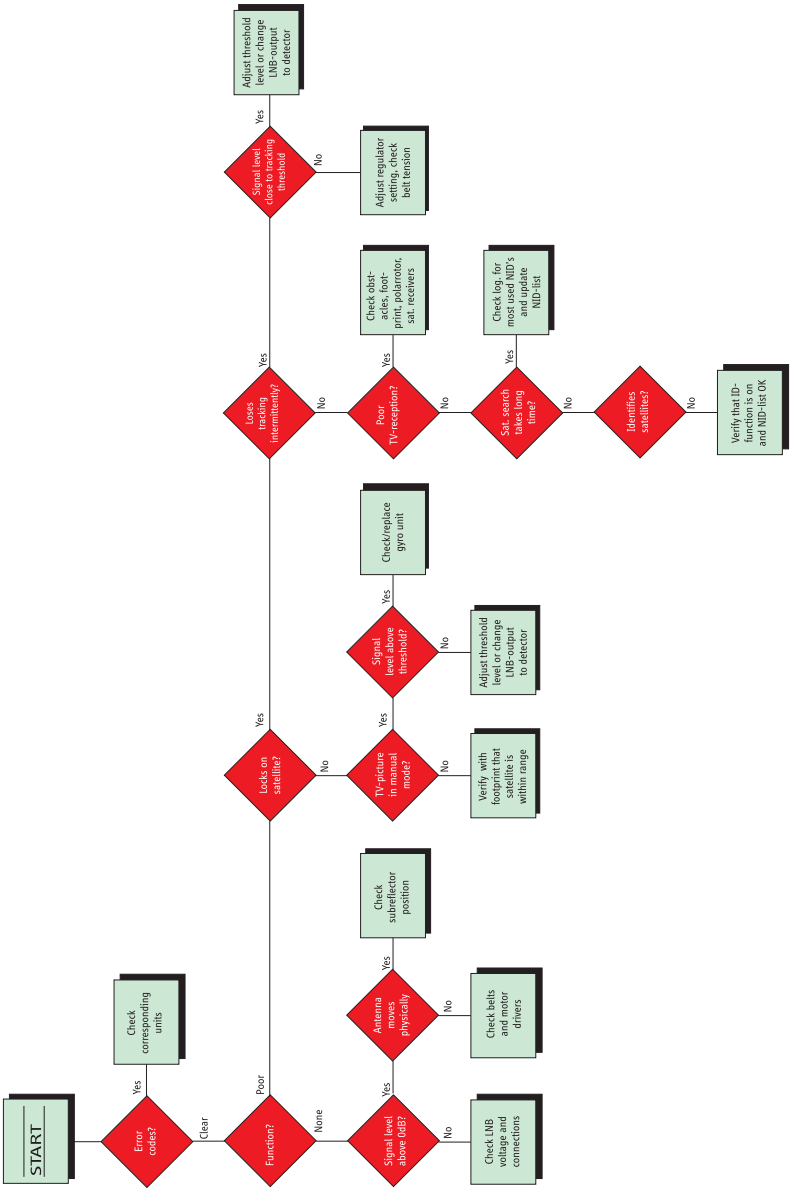
Error codes

In the control unit, error codes are presented as a four-digit hexadecimal number representing up to 11 fault conditions. I.e. 0070 = failure of all gyroscopes (codes 0010 + 0020 + 0040).

The error codes are also displayed in the PC-program service menu.

0001	Elevation motor failure
0002	Elevation motor failure, belt tension
0004	Azimuth motor failure
0008	Azimuth motor failure, belt tension
0010	Azimuth gyro failure
0020	Elevation gyro failure
0040	Roll gyro failure
0080	Gyro offset limits exceeded
0100	Inclinometer communication failure
0200	Inclinometer failure
0400	SatID communication failure

Troubleshooting chart



Technical specification

SAILOR 60 satellite TV World

Physical dimensions

Antenna diameter	600 mm
Focal length	250 mm
Radome height	817 mm
Radome diameter	687 mm
Weight incl. radome	49 kg

Performance data

Elevation range	-10° to 120°
Azimuth range	630°
Azimuth angular velocity	50°/s
Azimuth angular acceleration	40°/s^2
Elevation angular velocity	50°/s
Elevation angular acceleration	40°/s^2
Polarization	Linear and circular, simultaneous vertical/ horizontal or LHC/RHC
Polarrotor range	±90°
LNB frequency	10.70-12.75 GHz
LNB noise figure	0.3 dB
Minimum EIRP level (FEC 2/3)	46 dBW

Ship's motions

Roll/pitch range	±30°
Roll/pitch angular velocity	40°/s
Roll/pitch angular acceleration	25°/s^2
Yaw/turn angular velocity	40°/s
Yaw/turn angular acceleration	25°/s^2
Maximum antenna elevation	70° [1)]
Minimum antenna elevation	-10°

[1)] Tracking capability is progressively diminished at elevations (satellite elevation+ship´s roll/pitch) above 70°

Electrical

Voltage	24 VDC +20%/-10%
Current	3 A
Starting current	6 A
LNB osc. frequency, low bands	9750 MHz
LNB osc. frequency, high bands	10600 MHz

Environmental

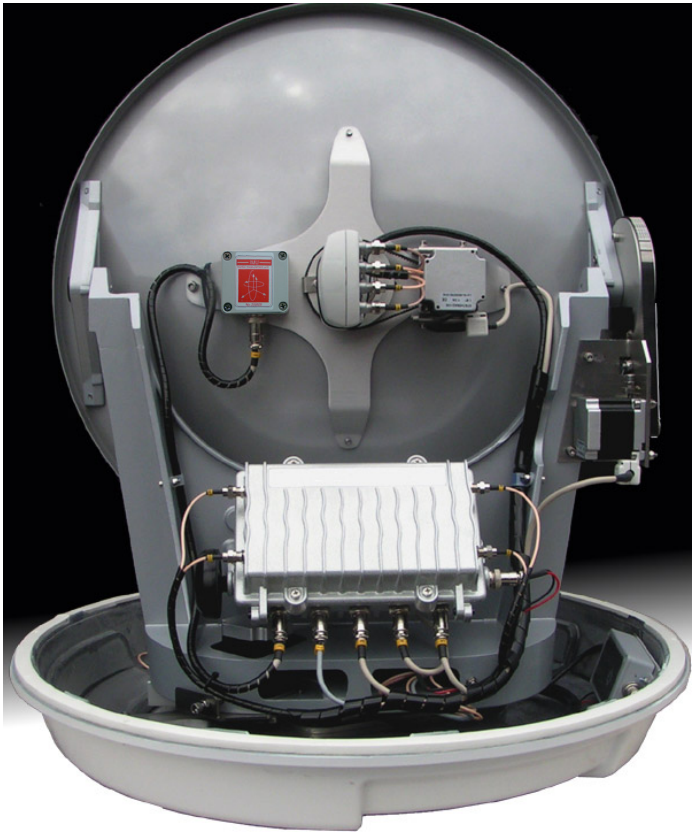
Temperature	-25 to 55°C
Humidity	0-100% RH
Wind speed	50 m/s

EMC

EN60945

Safety

EN60950



Approvals

Thrane & Thrane

Thrane & Thrane A/S

Declaration of Conformity with LVD and EMC Directives

The undersigned of this letter declares that the following equipment complies with the specifications of EC directive 73/23/EC concerning Low Voltage Safety and EC directive 89/336/EC concerning EMC.

Equipment included in this declaration

TT-3760B SAILOR 60 Satellite TV World:

TT-3057A Antenna Control Unit	PN = 403057A
TT-3054C 60cm Satellite TV World Antenna Unit	PN = 403054C

Equipment Applicability

The TT-3760B SAILOR 60 Satellite TV World is an antenna system used worldwide for receiving TV signals.

Declaration

The safety requirement with respect to the LVD directive 73/23/EC is met by conforming to the harmonized EU standards EN 60950-1. The protection requirement with respect to the EMC directive 89/336/EC is met by conforming to the harmonized EU standards EN 60945.

Manufacturer

Thrane & Thrane A/S, Lundtoftegårdsvej 93D, DK-2800 Kgs. Lyngby, Denmark
Porsvej 2, DK-9200 Aalborg SV, Denmark

Place and Date

Kgs. Lyngby, 4.06.2012

CE

Walther Thygesen / CEO
Thrane & Thrane A/S

Doc. no. 99-131000-C

Thrane & Thrane A/S · Lundtoftegaardsvej 93 D · DK-2800 Kgs. Lyngby · Denmark
T +45 39 55 88 00 · F +45 39 55 88 88 · info@thrane.com · www.thrane.com
Bank: Danske Bank · Comp.reg.: 65 72 46 18 · VAT: DK-20 64 64 46

Quality Management System DS/EN ISO 9001 by Det Norske Veritas

TT98-136298-B

Thrane & Thrane A/S · info@thrane.com ·

Thrane & Thrane