OceanTRx™ 7-500

2.2m (87”) Ka-Band Linear Maritime Stabilized VSAT System

Installation and Operation Manual

Document Number: MAN30-0902-3

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Certifications

	Orbit Communication Systems Ltd. is an ISO 9001 registered company. Registration, License No. 27870, issued May 1st, 2005
	OceanTRx™ Stabilized Maritime Satellite Communication System is in conformity with the appropriate standards: ISO 12100-2:2003, EN 60204-1:1997, EN 614-1:1995, IEC 60945:2002.
	OceanTRx™ is compliant with RoHS Standard. Please note Orbit's BUC and LNB approved components list includes both RoHS and non-RoHS devices

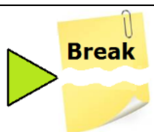
About this Manual

This manual is designed to guide you through the complete process of **installation and operating** required for the **OceanTRx^{TM}7-500** Maritime Satellite Communication System. It is recommended that you familiarize yourself with the information and procedures contained in this manual for smooth implementation of the system.

This manual includes the following:

- Orbit Introduction
- OceanTRx^{TM} System Topologies
- OceanTRx^{TM}7 System Configuration
- OceanTRx^{TM} System Monitor and Control
- OceanTRx^{TM}7-500 Above Deck Equipment
- OceanTRx^{TM} Below Deck Equipment
- OceanTRx^{TM}7 Pre-installation Requirements
- OceanTRx^{TM}7 Un-Packing the System
- OceanTRx^{TM}7 System Installation
- OceanTRx^{TM} System Commissioning
- OceanTRx^{TM} Principles of Operation

Notations

	**NOTE** - Indicates important information that should be noted
	**BREAK NOTE** – Note or sub-procedure that may appear during a procedure
	**HAZARD!!** – Indicates a potential hazard
	**WARNING!!** – Indicates the safest method of installation or an operation that *must be adhered to.*
	**LASER WARNING!**! – Indicates the laser related safest method of installation or an operation that *must be adhered to*

Safety Precautions

The following general precautions apply to the installation, operation and servicing of the system. Specific warnings appear throughout the manual where they apply and may not appear in this summary.

- Only **qualified and trained (by Orbit) personnel** should perform installation, operation and maintenance of this equipment.
- Only **certified electricians** should perform installation procedures that relate to the electrical system and its connections. All electrical work must be performed in accordance with the relevant standards and the instructions in this manual.
- **Before entering the Radome** for maintenance purposes shut OFF the main power to the system from the ship’s electrical panel. Upon entry, switch OFF the ADE Power Box.
- Take extra care when handling the ADE power box, Slip-Ring, and power supply units and their respective cables – which carries **110/220 VAC**.
- Take extra care when handling the Servo Sub System – which carries **96 VDC**.
- The system conducts potentially harmful voltages when connected to the designated power sources. **Never remove equipment covers** except for maintenance or internal adjustments.
- **Keep clear of the moving antenna and parts** at all times. The antenna pedestal is equipped with high-torque motors that generate considerable force.
- **ALL equipment should be grounded,** connected to the ship chassis ground (to prevent shock, and similar hazards), The ground conductor must not be removed.
- Although the **Radome parts** are not heavy, care should be taken when lifting them, because they will act as a sail under windy conditions. At least two people should handle the Radome parts during installation.
- To prevent shock or other hazards when sub-units are open or cables are disconnected, **do not expose the equipment to rain or moisture**.
- Avoid making **unauthorized modifications** to the system. Any such changes to the system will void the warranty.
- **Do not disconnect cables** from the equipment while the system is running.
- When not assembled, ensure that the system and its components are not exposed to **moisture or high humidity**.
- During system installation, ensure to use the **materials and tools** recommended in this manual. Use only **Orbit-authorized parts** for repair.

OceanTRx™7-500 Radiation Safety

Note The Minimum Distances in the table are calculated according to ACGIH (American Conference of Governmental Industrial Hygienists), and ICNIRP (International Commission on Non-Ionizing Radiation Protection), which is also adopted by FCC. (See 47 CFR §§2.1091 and 2.1093 on source-based time-averaging requirements for mobile and portable transmitters.)

Safety Distances

	BUC Power	ACGIH, 10mW/cm2 Occupational/Controlled 6 minutes Averaging Time Min Distance (m)	ICNIRP, 5mW/cm2 Occupational/Controlled 6 minutes Averaging Time Min Distance (m)	ICNIRP, 1mW/cm2 General/Uncontrolled Inapplicable Averaging Time Min. Distance (m)
Ka-Band	20W	Radome	Radome	> 3
Ka-Band	40W	Radome	> 1	> 5

Note

- The given safety distances are **worst case scenarios** (Standing angel related to antennas pointing direction is not taking under consideration).
- Defining “**Blocked zones**” causes the system to automatically stop transmitting when pointing to the defined zones, therefore shorter safety distances can be allowed.

Table Of Contents

1 Orbit Introduction

Orbit is a leading provider of mission-critical communication systems and related services addressing the needs of both commercial and defense/government customers and the application needs of satellite communications, earth observation, and C4ISR. With over 60 years of experience and more than three thousands of maritime systems deployed on vessels and operating worldwide, Orbit's innovative and reliable VSAT solutions deliver broadband data communications in the toughest conditions to users across the globe.

2 OceanTRx™ System Topologies

2.1 OceanTRx™ Single System Topology

The OceanTRx™ system consists of Above Deck Equipment (ADE) and Below Decks Equipment (BDE).

The ADE includes, in general, a four-axis PEDESTAL, ANTENNA, RF PACKAGE, ANTENNA CONTROLLER UNIT (ACU) and POWER SUPPLIES installed inside a weather-proof RADOME.

The BDE includes the CENTRAL CONTROL UNIT (CCU) which serves as the interface to the ship's gyrocompass, modem and the system's human-machine interface (HMI) device for manual operation.

The ADE connects to the BDE via a single coaxial cable, multiplexing the Up-Link and Down-Link Signals, Ethernet LAN control and a 10MHz reference signal.

Both the ADE and BDE are fed by AC mains power.

The Single System Topology functional layout is illustrated in the following diagrams:

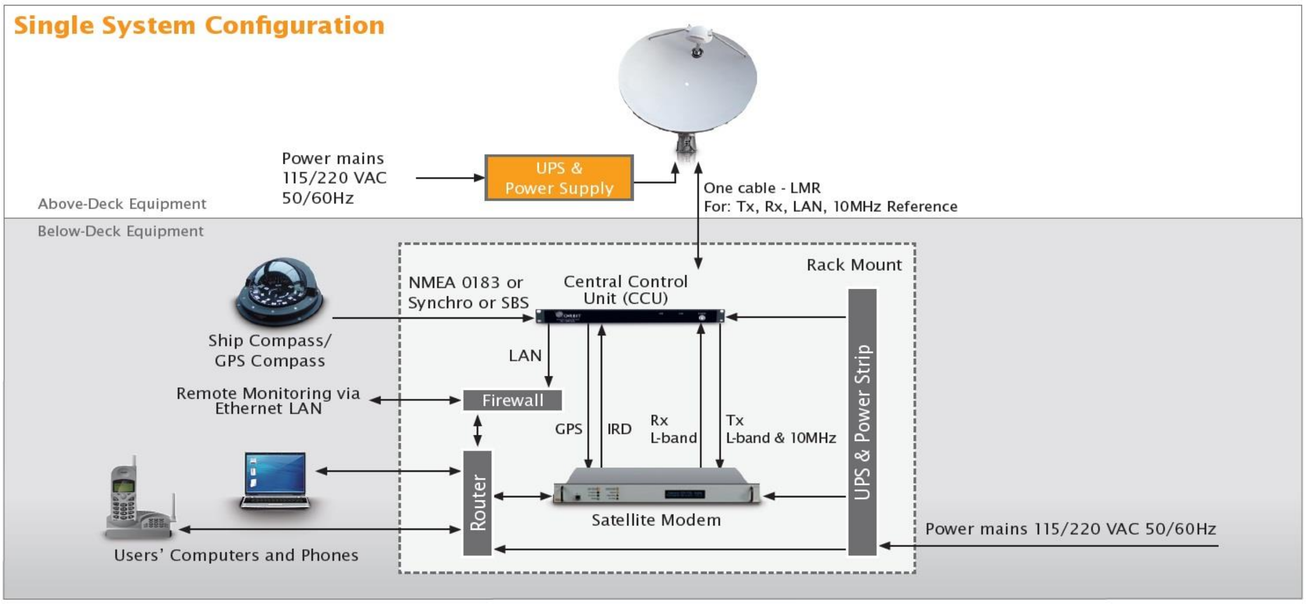


Figure 2.1-1: Single System Topology

2.2 OceanTRx™ Dual System Topology

The OceanTRx™ system consists of Above Deck Equipment (ADE) and Below Decks Equipment (BDE).

The ADE includes, in general, a four-axis PEDESTAL, ANTENNA, RF PACKAGE, ANTENNA CONTROLLER UNIT (ACU) and POWER SUPPLIES installed inside a weather-proof RADOME.

The BDE includes the CENTRAL CONTROL UNIT (CCU) which serves as the interface to the ship's gyrocompass, modem and the system's human-machine interface (HMI) device for manual operation.

In addition, in a dual system configuration, the BDE includes a DUAL SYSTEM SELECTOR (DSS) or ORBIT SYSTEM SELECTOR (OSS) which serves as the interface between the second system and the CCU.

The ADE connects to the BDE via a single coaxial cable, multiplexing the Up-Link and Down-Link Signals, Ethernet LAN control and a 10MHz reference signal.

Both the ADE and BDE are fed by AC mains power.

The Single System Topology functional layout is illustrated in the following diagrams:

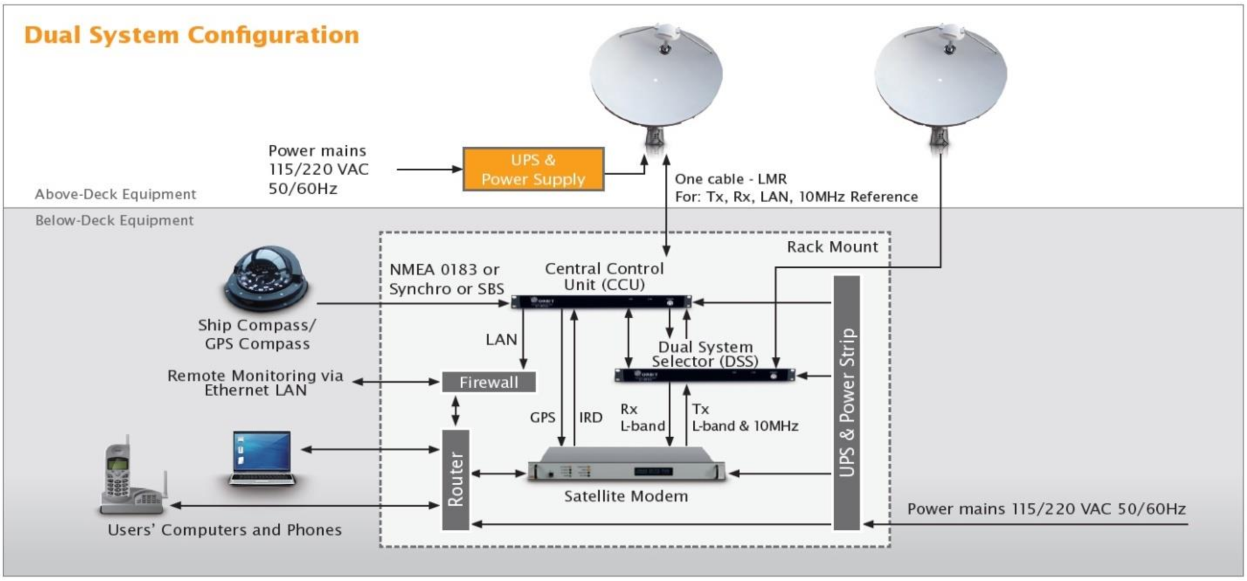


Figure 2.2-1: Dual System Topology

2.3 OceanTRx™ O3b Topologies - General

The OceanTRx™ system consists of Above Deck Equipment (ADE) and Below Decks Equipment (BDE).

The ADE includes, in general, **PEDESTAL (BASIC SYSTEM), ANTENNA, RF FEED, BUC, LNB**, installed inside a weather-proof **RADOME**.

The BDE includes the **CENTRAL CONTROL UNIT (CCU)** which serves as the interface to the ship's gyrocompass, modem and the system's human-machine interface (HMI) device for manual operation.

In addition, in Dual/Triple system topologies, the BDE includes a **ORBIT SYSTEM SELECTOR (OSS)** which serves as the interface between the additional system and the CCU.

The ADE may connect to the BDE via the following options:

- Single coaxial cable (**LMR COAX CABLE**) - allow up to distance of 140m between the ADE and BDE.
- Fiber Optics cable (**FIBER CABLE**) - allow long distance between the ADE and BDE.

In case of the coaxial cable, the BDE should include:

- For 2 system topology: 1xCCU and 1xOSS
- For 3 system topology: 1xCCU and 2xOSS

In case of the Fiber Optics cable, the ADE includes In addition **ADFOC (Above Deck Fiber Optic Converter)** which is used to convert the COAX signals to FIBER signals and the BDE include the appropriate **BDFOC (Below Deck Fiber Optic Converter)** to convert the FIBER signals back to COAX signals.

The Fiber Optic solution can support 1-Room or 2-Rooms redundancy option which in that case the BDE will include 2xBDFOC (1 for each room).

2.4 OceanTRx™7-500 O3b Triple System with Single Room Topology

The figure below shows a Single Communication Room configuration with either two or three antennas

The ADE (ADFOC) connects to the BDE (BDFOC) via a fiber optic cable (**FC/PC FIBER CABLES**) .

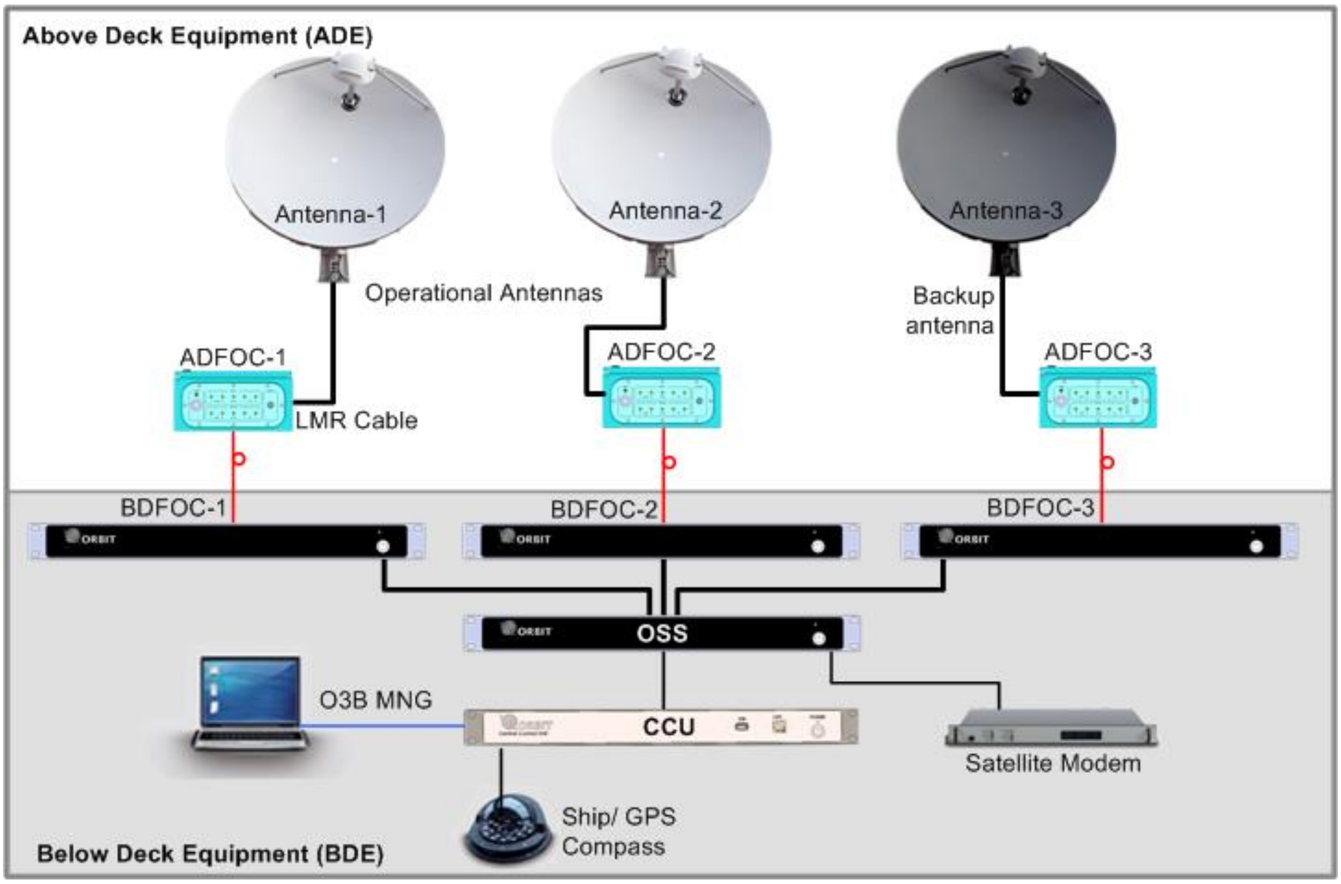


Figure 2.4-1: Single room Configuration Architecture Overview

2.5 OceanTRx™7-500 O3b Triple System with Dual-Room Topology

In a dual-room configuration (with either two or three antennas), the signals are split at each ADFOC for routing towards both communication rooms.

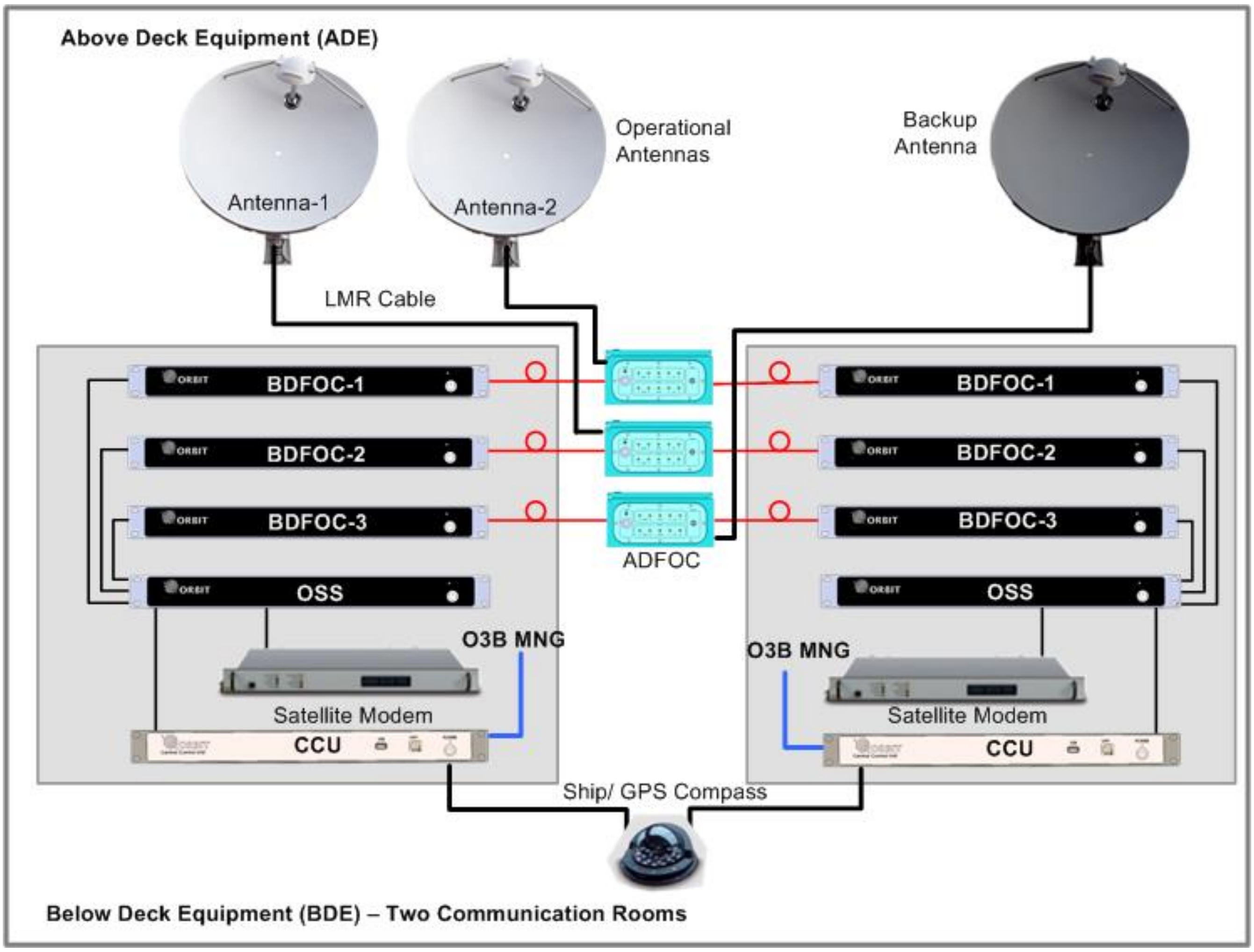


Figure 2.5-1: Dual room Configuration Architecture Overview

3 OceanTRx™7 Product Line

3.1 General

OceanTRx™ 7, which was released in its' C/Ku-band configuration in mid-2011, is a compact C/Ku/Ka-band maritime VSAT system that was built specifically to overcome, mainly, the limitations of traditional C/Ku-band systems.

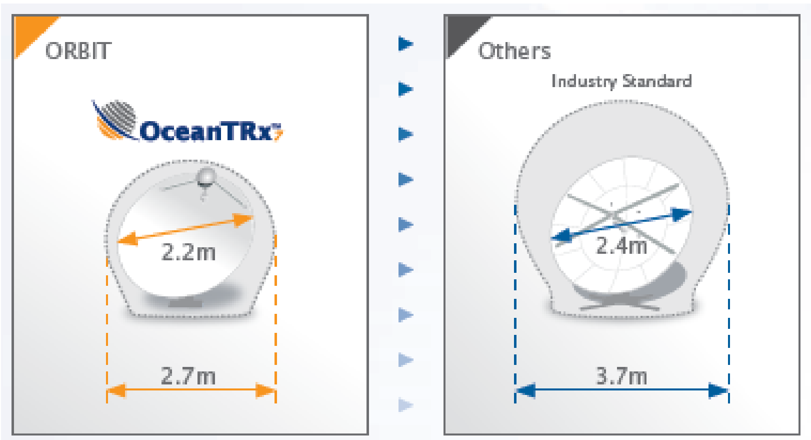
OceanTRx™ 7 is differentiated from competing solutions by its extraordinarily small footprint, outstanding RF performance, strict regulatory compliance and support of multiple optional RF feeds.

OceanTRx™ 7 features 2.2m/87" dish and a 2.7m/106" radome, while a typical system with 2.4m/95" dish with a 3.7m/146" footprint requires 88% more deck space than OceanTRx™ 7, and typically weight 40% more than ORBIT's compact system.

Small enough to be shipped as a single, fully assembled and tested unit in a standard 20-foot container, the OceanTRx™ 7 is designed for quick and simple single-day installation. This means that OceanTRx™ 7 can be installed while ships are on routine port calls, substantially driving down operational costs and eliminating the need for vessels to await dry dock.

OceanTRx™ 7 product line includes the OceanTRx™ 7-300 that supports C-band/ Ku-band solutions, and the OceanTRx™ 7-500 that supports Ka-band/Ku-band solutions, as well as other functionalities. These capabilities are feasible due to inherent architecture, mechanical / servo and electronic design, which enable Orbit to customize/modify the system as required.

- **Designed for Reliability and Durability** - Designed to withstand the most demanding sea conditions, OceanTRx™ 7 features a low-intensity electro-mechanical design and complies with the most stringent environmental standards for shocks, bumps and vibrations – including MIL-STD-167-1A and DNV 2.4 Class C, as well as IEC-60721 and designed to MIL-STD-901D (Grade B) standards in its enhanced configuration for defense and offshore O&G applications.
- **Rapid Low-Cost Installation** - OceanTRx™ 7 is quick and simple to install, since it does not require balancing and uses a single cable for below-deck connectivity. Shipped fully assembled and pre-tested over satellite, OceanTRx™ 7 can be installed in a mere matter of hours, dramatically shortening installation time as compared to equivalent solutions.
- **Balance Free System Installation/Upgrades/Maintenance** - OceanTRx™ 7 is a Balance Free system both during installation and upgrades. The Balanced Free results with customers' overall lower cost of ownership as no periodic visits are required for balancing.
- **Save deck space with Compact and lightweight system** - A typical 2.4m/95” dish with a 3.7m/146” footprint requires 88% more deck space than OceanTRx™ 7. With its 2.2m/87'' dish and 2.7m/106'' footprint, OceanTRx™ 7 offers the same level of RF performance as there standard system which typically weight 40% more than ORBIT's compact system.



- **Enhanced Serviceability and Platform Commonality for Cost-Effective Operations** - Designed for efficient on-board serviceability and maintainability, OceanTRx™ 7 features highly accessible pedestal design, enabling convenient service support and field upgrade process. As part of ORBIT’s new OceanTRx™ product line, OceanTRx™ 7 shares common electronic field-replaceable units (FRUs) with ORBIT’s OceanTRx™ 4 system, allowing for lower cost of ownership, easier maintenance support, and shorter response times.

- **Superior RF Performance** - OceanTRx™7 achieves outstanding RF performance for 2.2m/87'' dish with ONLY 2.7m/106'' footprint (equivalent to 2.4m/95'' dish and 3.7m/146'' footprint systems).
- **Superior Tracking Performance** - For more than 30 years Orbit design and manufacture elite tracking products with best in class tracking technology. This technology is used for its vast product portfolio such as missile and aircrafts tracking which have the most demanding tracking requirements. Tracking performance is critical parameter when operating large dish and when operating at high frequencies such as Ku and Ka. Orbit's superior tracking performance results with better RF performance and signal stability.
- **Air-Time Efficiency** - The combination of Orbits' superior RF and tracking performance, results with best effective RF performance in the industry. Such superior performance enables customers to utilize less satellite bandwidth while keep same channel throughput. They can also enjoy higher throughput while keeping the original bandwidth. The use of modem's adaptive coding modulation (ACM) technology improves satellite resource usage and ensures always-on connectivity on the fringes of satellite coverage. Modems operating with OceanTRx™ 7 with ACM will result with much higher throughput.
- **High versatility and multiple configurations** - Built-in support for a wide range of configurations with different RF packages (Ka, Ku) and power levels facilitates field upgradability without the need for accurate balancing. The system supports dual or triple system operation and comes with either a white or gray radome.
- **Seamless Global Coverage (ABS support)** - Operating with satellites across geographical regions, OceanTRx™ 7 delivers seamless global coverage via automatic beam switching (ABS) achieved through the industry-standard OpenAMIP and ROSS Open Antenna Management (ROAM) protocols. Electrically switchable polarization facilitates satellite switching and increases system versatility.
- **Remote Connection, Monitoring, Diagnostics and Troubleshooting** - Advanced remote monitoring capabilities allow complete replication of the system interface to any remote PC. Combined with an inherent logger and spectrum analyzer, it enables off-site technicians to remotely monitor and operate the system, or carry out troubleshooting and diagnostics as if they were on the ship, thereby reducing operational costs. Open platform design supports the use of SNMP for carrying out network and system management, while enabling system integration with any network operations center (NOC). Secured remote connection is available for software upgrades.

- **Strict Regulatory Compliance and Certifications** - OceanTRx™ 7 complies with industry regulations and standards for C and Ku bands including ITU, FCC, ETSI, EutelSat, IntelSat, ANATEL
- **World-Class Customer Support** - With five regional service centers located around the globe, ORBIT's trained support engineers/technicians are available 24x7 to handle the immediate needs of customers worldwide. A global inventory replenishment system ensures efficient spare parts distribution across regions. By using remote connection for troubleshooting and diagnostics, ORBIT expedites service support and enhances overall cost-effectiveness for its customers.
- **Cost effective shipment** - The system, with its radome and other components, are shipped as a single, pre-tested over satellite and fully assembled unit in a standard 20 foot container.

4 OceanTRx™7-500 System Configuration

4.1 OceanTRx™7-500 LNBs

The OceanTRx™7-500 Ka Band Feed (for O3b) support Dual LNB assembly on each Feed receive polarization port. The Feed supplied without LNBs. The system support below types of LNBs

- Norsat SINGLE LO 16.8GHz (O3B-A) assembled on both RHCP and LHCP Feed ports.
- Norsat SINGLE LO 17.4GHz (O3B-B) assembled on both RHCP and LHCP Feed ports.
- Norsat Dual band LO 16.8/17.4GHz switchable assembled on both RHCP and LHCP Feed ports

4.2 OceanTRx™7-500 BUCs

The OceanTRx™7-500 can be equipped with one of the following BUCs:

- CPI Ka Band BUC, 20W (O3b Frequencies Range)
- CPI Ka Band BUC, 40W (O3b Frequencies Range)
- CPI Ka Band BUC, 40W (dual Band switchable)

4.3 OceanTRx™7-500 Radome Color and Finish

The following options are available:

- OceanTRx7-500 Radome, clear white (RAL9010) color with gloss finish.

4.4 OceanTRx™7-500 LAN Switch

As an option, the client can order LAN Switch KIT which upgrades the ability of the system to monitor and control (M&C) the BUC using a LAN connection.

4.5 OceanTRx™7-500 BDE

In order to support all of the above systems topologies and architectures, two BDE configurator branches of Below Deck Equipment (BDE) were implemented where the first one (BDE OPTION 1 (CCU)) allow to choose the appropriate CCU type and the second one (BDE OPTION 2 (DSS/OSS)) allow to choose of the appropriate switching unit.

- BDE OPTION 1 (CCU) – two types of CCU are available
  - CCU equipped with Windows CE
  - CCU equipped with Windows Embedded
- BDE OPTION 2 (DSS/OSS) – two types of switching units are available
  - Orbit System Selector - OSS
  - Dual System Selector - DSS

4.6 OceanTRx™7-500 F/O Converters

In order to support all of the above systems topologies and architectures, branch of F/O Converters was implemented where:

- KIT FOC for 1-ROOM includes 1xADFOC (1-ROOM) and 1xBDFOC
- KIT FOC for 2-ROOM includes 1xADFOC (2-ROOM) and 2xBDFOC

4.7 OceanTRx™7-500 Air Conditioning

As an option, the client can order air conditioning unit (A/C) with the system. The air conditioning units (manufactured by Dometic) supplied with a dedicated A/C 5'' tubes (with length of 25'), thermal sensor and Remote control.

There are 2 options of A/C units depend on the operating voltage:

- Air Conditioning operating with 220VAC
- Air Conditioning operating with 110VAC

In addition, the OceanTRx7 A/C installation KIT should order separately. The A/C installation KIT including A/C Inlets tubes which fits to the OceanTRx7 Radome Base.

5 OceanTRx™ System Monitor and Control

5.1 MTSVLink Introduction

MTSVLink is a dedicated antenna management application used to set up, configure and monitor individual antenna.

Each MTSVLink application is associated with a specific antenna: thus, for installations with two antennas - two MTSVLink Applications are run; for three antennas - three MTSVLink applications.

The following figure shows the MTSVLink application main window.

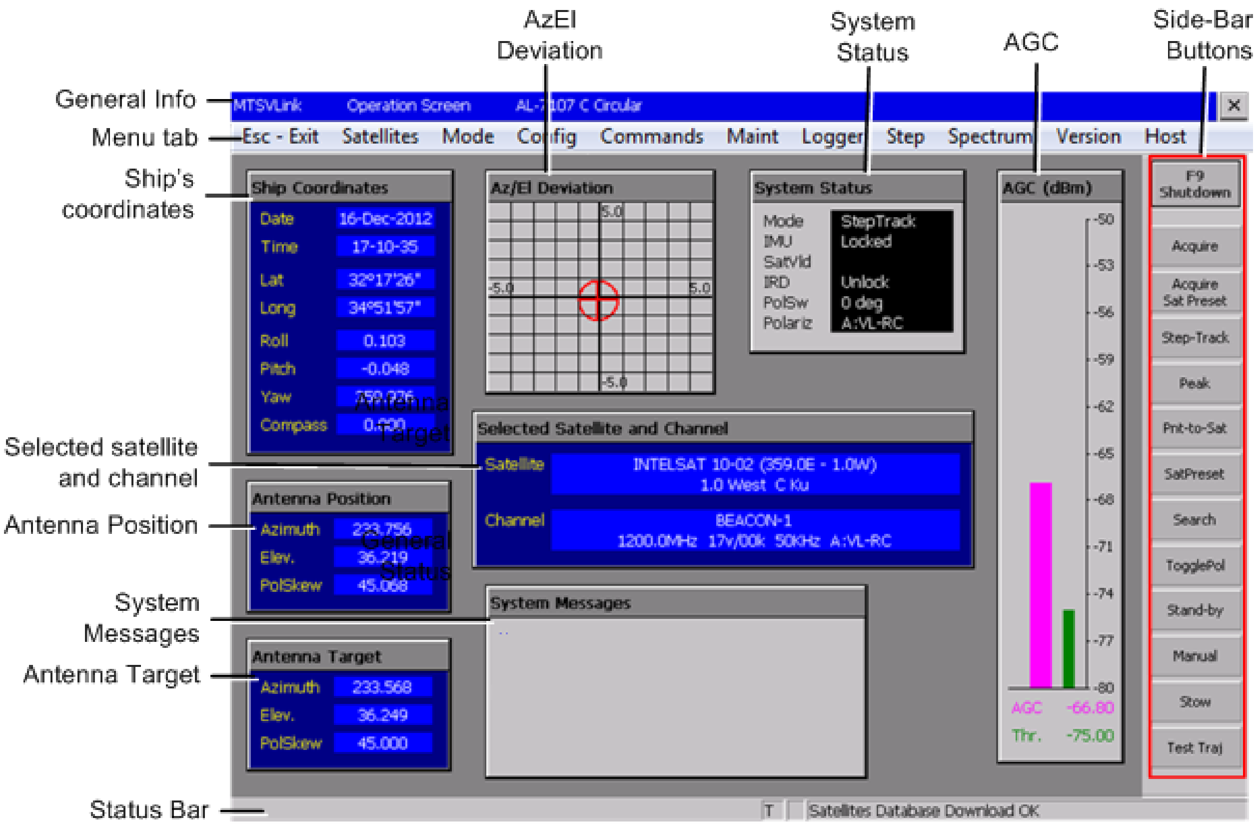


Figure 5.1-1: MTSVLink Operation Screen

5.2 MtsDock Introduction

The MtsDock application, which defined as a support application, may use in order to perform the following actions:

- Detecting and modifying the IP Address for the CCUs, ACUs
- Saving and Restoring system configuration, operation and calibration files
- Saving and Restoring system Satellite Data Base

The MtsDock main window is shown below, where the ACU menu options are displayed as an example.

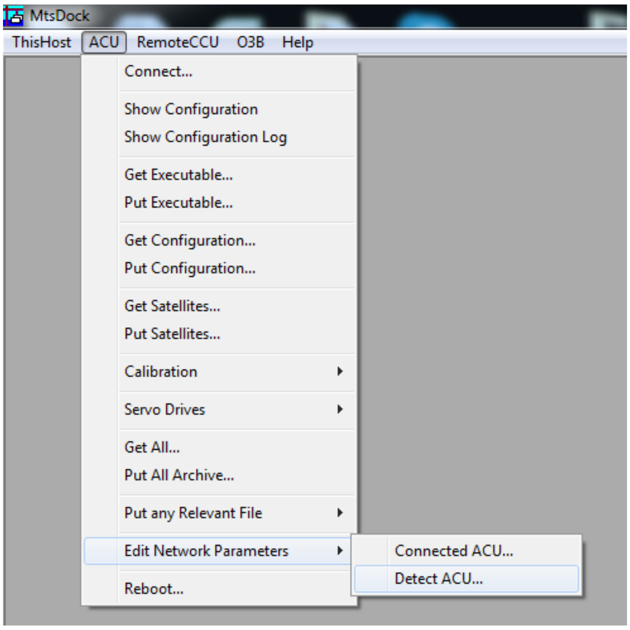


Figure 5.2-1: MTSDock Main Screen

5.3 Dual Antenna Operation Link Introduction

DAOLink is a dedicated Dual Antenna Operation management application used as a switching management monitor and control when using a dual system (antenna) topology.

The DAOLink allow a separate Switching Zones definition in addition to the Cease Transmit Blockage Zones.

The DAOLink software is running on CCU Windows CE based only. The CCU should be set to a Dual system working set to support dual system topology.

In addition, when CCU is configured to Dual system topology, two MTSVLink application will run.

Each MTSVLink application is associated with a specific antenna: thus, for installations with two antennas - two MTSVLink Applications are run.

The following figure shows the DAOLink application main window.

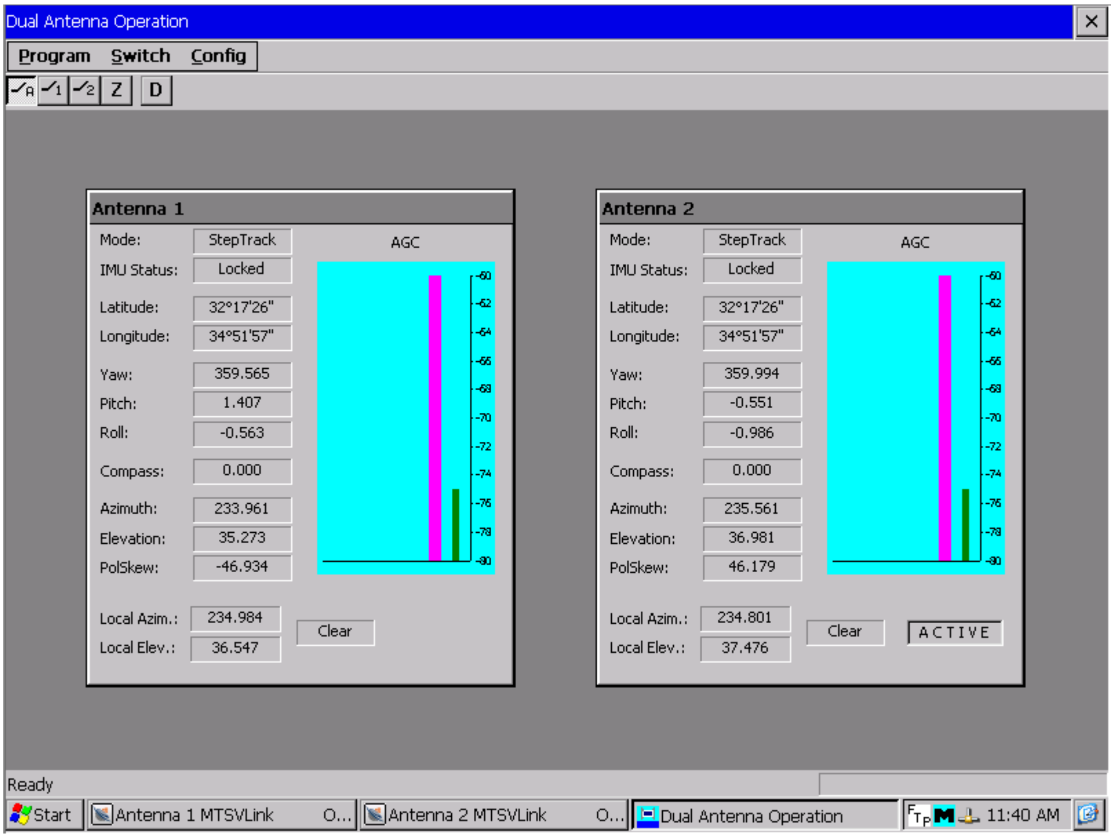


Figure 5.3-1: DAOLink Main Screen

5.4 OpenAMIP Introduction

OpenAMIP protocol is an industry-wide open-source standard for antenna-router integration. IP based, OpenAMIP facilitates the exchange of information between an Antenna Controller Unit (ACU) and a satellite router. It allows the router to command the antenna and enables the use of Automatic Beam Switching (ABS) which transfers connectivity from one satellite beam to the next as a vessel passes through multiple footprints. In addition, OpenAMIP and ABS enable service providers and their customers to meet government regulations by commanding the antenna to mute the signal in no transmit zones.

5.5 SNMP Introduction

Simple Network Management Protocol (SNMP) is part of Orbit's VSAT products' software version to enable the monitoring of network-attached components for conditions that warrant administrative attention. For example, the customer's Network Management System (NMS), supporting SNMP, translates the information into data management and presents it in a way that allows command & control of the system's performance.

SNMP is included in the OceanTRx™7-300 software to enable standardization of the interface to the customer's NMS. The following parameters, among many others, can be monitored and set via the SNMP protocol:

- BUC Model
- BUC Attenuation
- Monitoring of BUC Output Power and Temperature
- BUC Control
- Tracking Frequency
- LNB Voltage/Tone Setting
- Satellite Preset
- Polarization Skew Offsets
- NBR Bandwidth Selection
- Compass Offset
- Obstruction Zones

6 OceanTRx™7-500 Above Deck Equipment

6.1 Antenna Control Unit (ACU)

The Antenna Controller Unit (ACU) is a real-time tracking controller with an industry standard CPU, on-board Flash memory and SDRAM. This unit controls the positioning of the antenna via the Servo sub-system based on commands received from the CCU.

The ACU runs a real-time OS that reads all system sensors, performs 3D mathematical transformations, controls the movement of the positioning axes and provides on-line communication with the CCU via a standard Ethernet-LAN

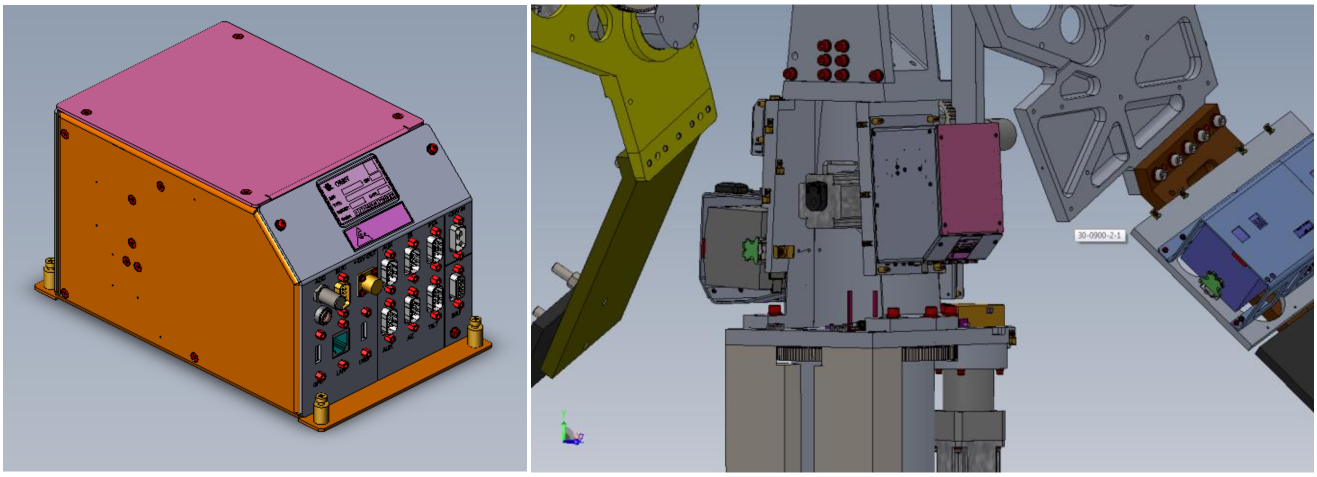


Figure 6.1-1: Antenna Control Unit (ACU)

The ACU is powered by a dedicated +24VDC power supply. The ACU contains an internal DC-DC power supply that provides the correct DC voltages to the LNB, ADMX, IMU and the GPS Module

The following picture presents the ACU front panel of connections:

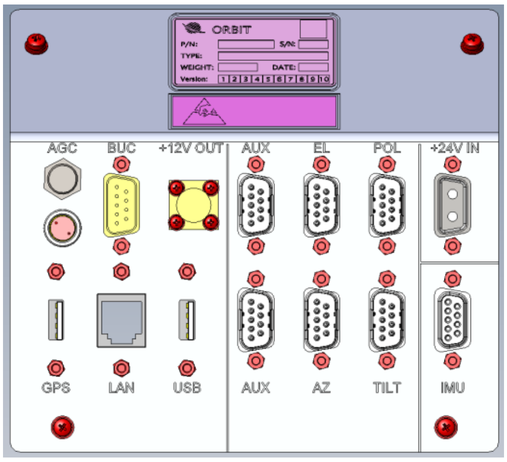


Figure 6.1-2: ACU Front Panel

6.2 Inertial Measurement Unit (IMU)

The solid-state Inertial Measurement Unit (IMU) provides real-time measurement of the ship's sea movement to the Antenna Control Unit (ACU).

- **Pitch and roll** - Short-term data are measured by two rate-gyro sensors and integrated with long-term data measured by two Inclinometers.
- **Yaw** variations - Short-term data is measured by a rate-gyro sensor and integrated with long-term data received from the ship's gyrocompass.

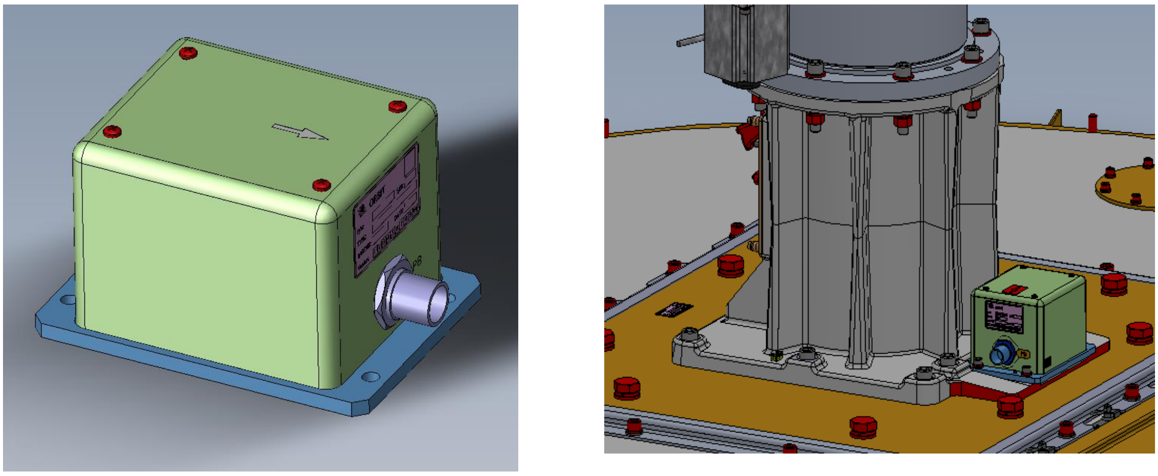


Figure 6.2-1: Inertial Measurement Unit (IMU)

6.3 Power Connection BOX

The ADE receives mains AC power via the Power Connection Box.

The Power connection Box includes the following interfaces:

- **UTILITY OUTLET** - utility power outlet, may use for connection of any maintenance test equipment with MAX current consumption of 5A.
- **POWER INLET** – the antenna mains AC power connection.
- **IMU** – ACU-IMU cable connection.
- **POWER SWITCH** - antenna power ON/OFF switch
- **GROUND** – antenna Ground lug
- **Tx/Rx** – ADE to BDE (antenna ADMX to CCU BDMX) coaxial cable connection (LMR)

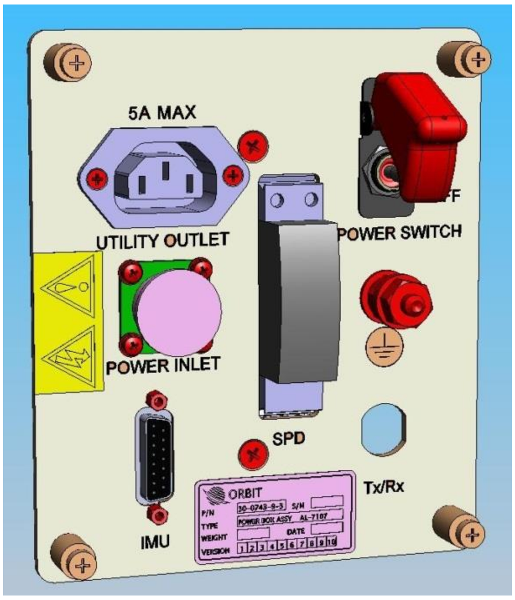


Figure 6.3-1: ADE Antenna Power Connections BOX

HAZARD!! The utility outlet is connected directly to the vessel's AC voltage input terminals. Therefore live voltage is always present at the utility outlet even when the power supply to the ADE is discontinued using the mains power ON/OFF switch.

WARNING!! The utility outlet bears the same voltage as the input power. Be careful not to connect a device that uses a different voltage

6.4 Slip-Ring/Rotary-Joint Assembly

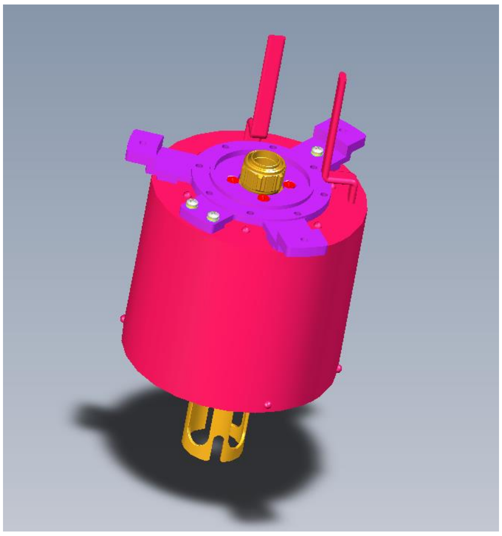
The ADE consist a Slip-Ring and Rotary-Joint assembly and wiring unit which allows the antenna azimuth axis continues rotation.

The Slip-Ring is used to pass the following:

- AC power from the Power Connection Box to the power supply modules.
- DC power from the ACU to the IMU.
- Communication between the ACU to the IMU.

The Rotary-Joint is used to pass the following:

- Up-Link (Tx) and Down-Link (Rx) signals
- 10MHz reference signal
- LAN communication



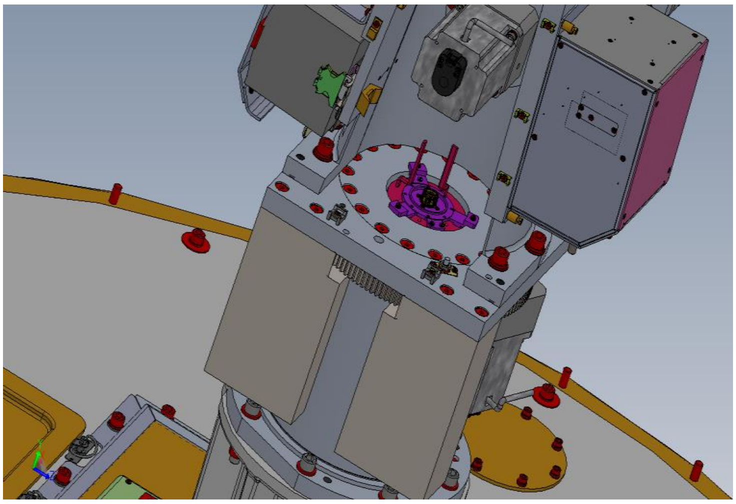


Figure 6.4-1: Slip-Ring/Rotary-Joint Assembly

6.5 Servo Sub-System

Each axis is dynamically positioned by its own Servo Driver and SERVO Motor as directed by the ACU. Separate incremental encoders are attached to both the motor and the axis itself – the former for driver commutation and the latter for dynamic axis-position feedback

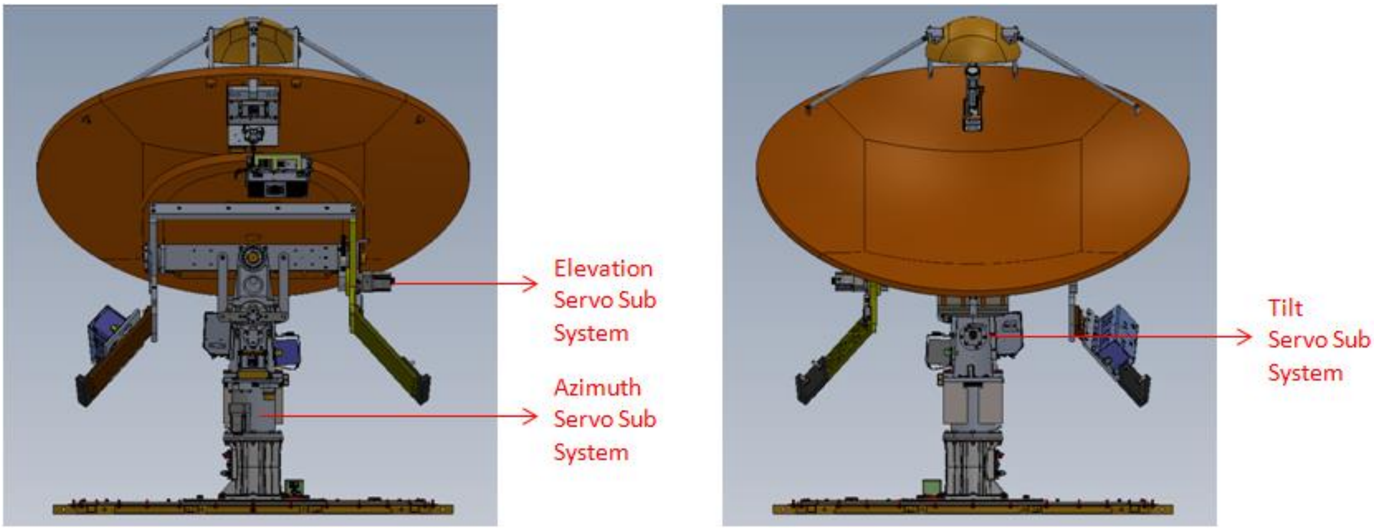


Figure 6.5-1: Azimuth, Elevation and Tilt Servo-Sub-Systems

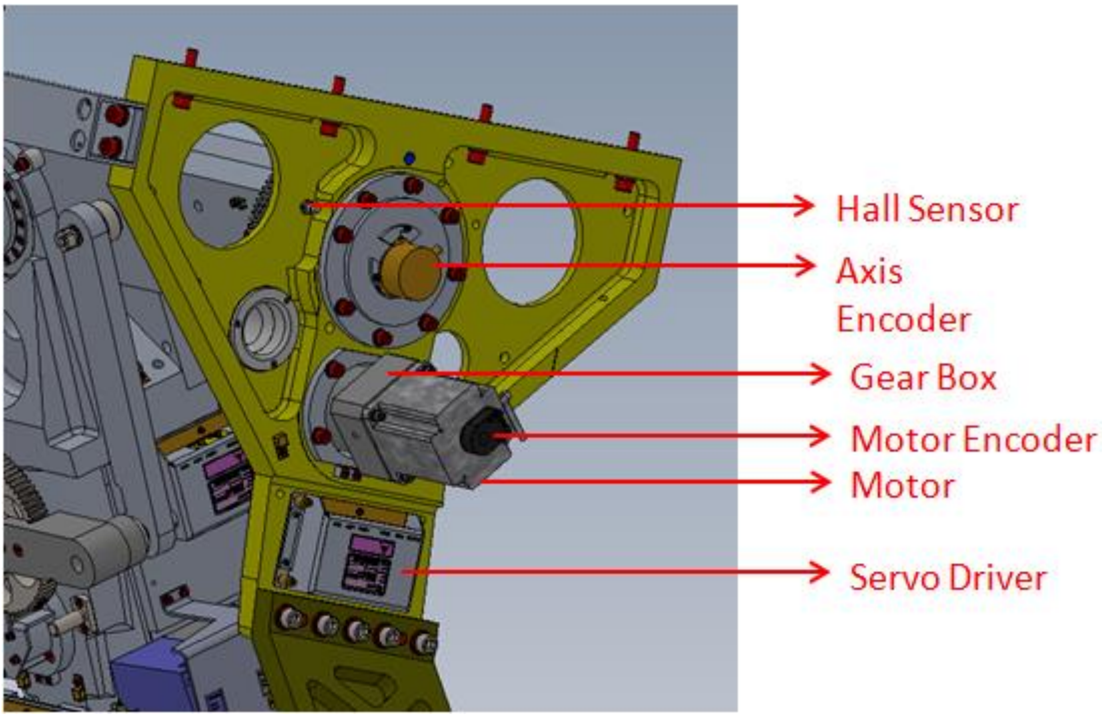


Figure 6.5-2: Servo-Sub-System components

The ACU sends positioning coordinates to the servo drivers which convert them into positioning commands. These commands are sent to the servo motors. As the motors move the antenna into position, the axis encoders on each of the pedestal axes return actual antenna location in a closed position loop.

Auto axis initialization uses the Zero Hall Sensors and MAGNETS (Axis Zero Position and mechanical/software Limits).

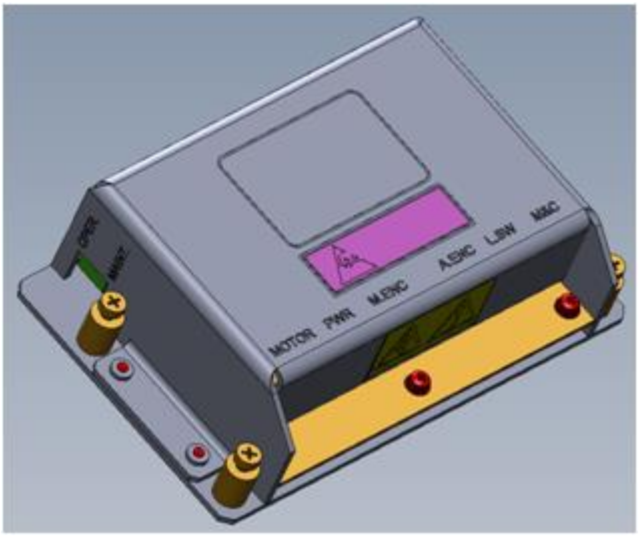


Figure 6.5-3: Axis Servo-Driver

When system power is OFF, a dynamic braking relay arrests movement of the pedestal, locking the axes in their current position.

In cases when it is necessary to rotate a given axis for maintenance purposes, a mechanical switch on the servo driver of each axis overrides the lock and allows free movement of that axis

6.6 OceanTRx^{TM}7-500 Block Up Converter (BUC)

The OceanTRx^{TM}7-500 may support 20W or 40W Ka-Band Block Up-converter (BUC) serves as the system's RF transmitter.

The BUC KIT consists of the following components:

- BUC support bracket
- BUC to Feed Wave-Guide
- M&C and Power Adaptor Cables

The BUC can Monitored and Controlled (M&C) using ACU commands such as MUTE/Attenuation/Output Power.

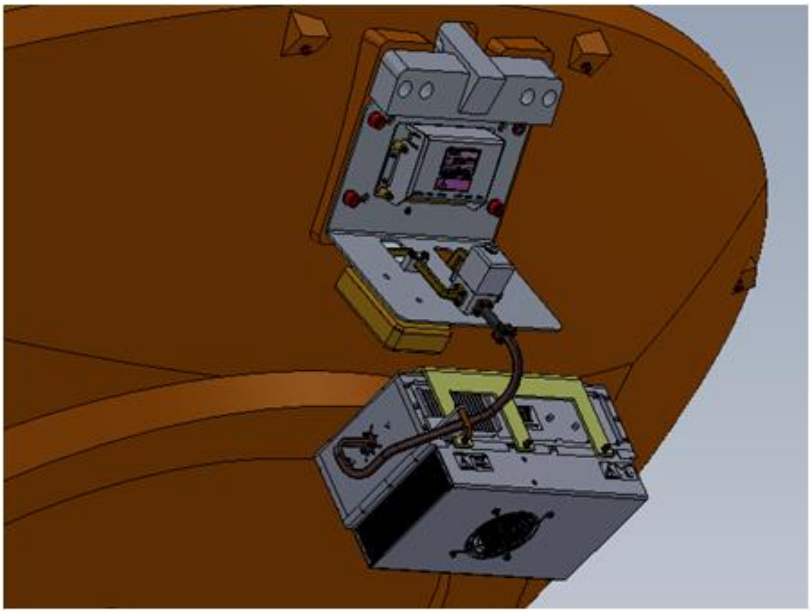


Figure 6.6-1: OceanTRx^{TM}7-500 BUC Mounting

Wave-guide switch is used to feed the BUC output signal to the RHCP or LHCP TX ports of the feed.

The feed servo driver controls the wave-guide switch.

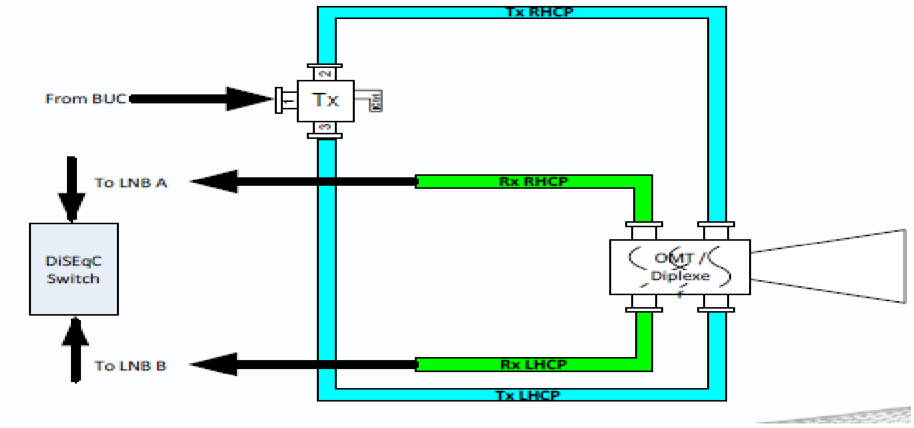


Figure 6.6-2: Feed RF connections

6.7 OceanTRx™7-500 Low Noise Block (LNB)

The OceanTRx™7-500 consist two Low Noise Blocks (LNBs) assembled on the both Left and Right hand polarization ports of the Circular Ka Feed:

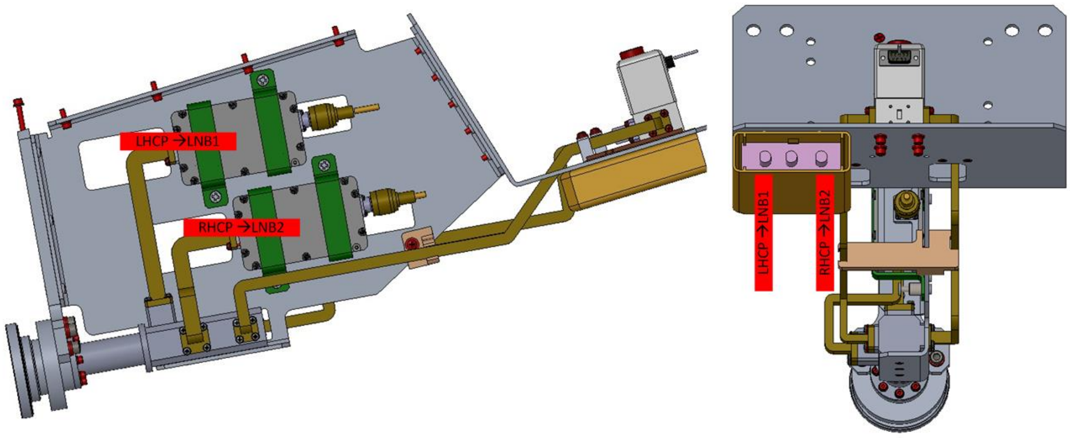


Figure 6.7-1: OceanTRx™7-500 Ka Circular Feed and LNB Mounting

When dual band LNB is installed, the active band selected by o3blink application based on the SDB files loaded

6.8 OceanTRx7^{TM} Radome

Light weight, weather proof unit that protects the antenna. The Radome is shipped unassembled (in segments), in a dedicated crate.

The disassembled Radome consists of five petals (sides) and one upper dome (top)

One of the Radome petals include side hatch.

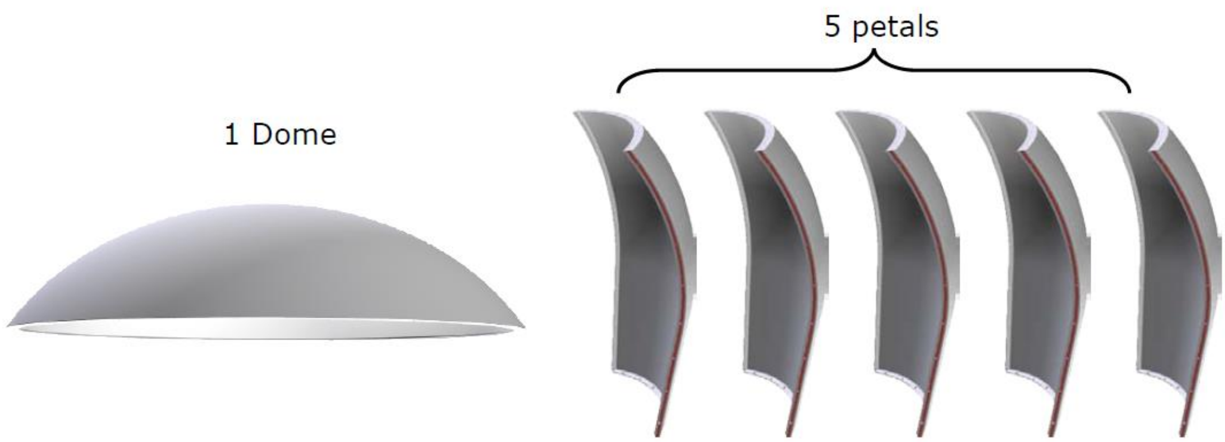


Figure 6.8-1: OceanTRx^{TM}7 Radome Elements

The Radome arrives disassembled and must be assembled (petal by petal) on the antenna Radome Base before mounting the complete ADE unit on its support structure.

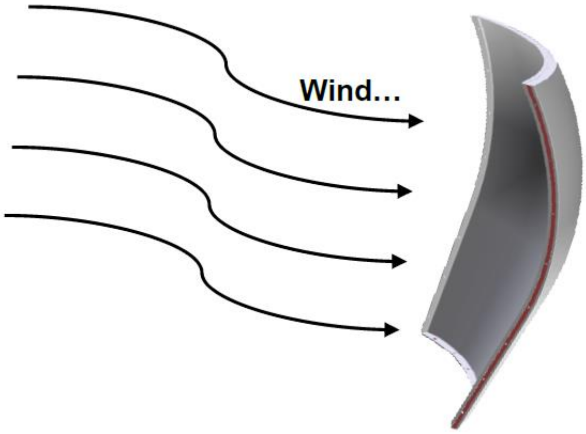


Figure 6.8-2: OceanTRx^{TM}7 Radome Petals Warning

WARNING!! Although the Radome petals are not heavy, they can act as sails during windy conditions. It is recommended that at least two people handle them during installation

After Radome assembly, the ADE, has two maintenance/service hatches access:

- **Bottom hatch** – located on the ADE Radome floor accessible from the bottom of the ADE.
- **Side hatch** – located on one of the five side petals.

HAZARD!! DO **NOT** ENTER THE RADOME TO POWER ON THE ANTENNA!

Reach into the Radome through the Side or Bottom Hatches and set the Power Switch located in the ADE Antenna Power Box to ON.

HAZARD!! Before entering the Radome for maintenance purposes, take care that the mains power to the antenna is shut OFF from the ship's electrical panel.

Upon entry, switch OFF the antenna Power Box – Power Switch.

7 OceanTRx™ Below Deck Equipment

7.1 Central Control Unit (CCU)

The Central Control Unit (CCU) is the interface between the system, the ship's equipment and the human operator.

The CCU provides the following functions:

- Antenna monitor and Control (using MTSVLink application)
- Modem monitor and control interface (Eb/No Reading, GPS Input and Output)
- Conversion of compass inputs
- Integrated Receiver/Decoder (IRD) interface
- Up-Link (Tx) and Down-Link (Rx) signal attenuation
- De-muxing and muxing of Up-Link (Tx), Down-Link (Rx) signals, LAN and 10MHz reference signal
- Ethernet (LAN) Hub.

The CCU is 1U high and is typically installed on a dedicated 19-inch rack in the ship's radio room. There are two versions of the CCU supported by the system:

- **CCU-1U without 10MHz** – requires 10MHz reference to be supplied by CFE modem
- **CCU-1U with 10MHz** – includes an internal 10MHz reference source

Note The CCU unit can be custom-ordered with an additional dedicated 17" LCD and 1U keyboard drawer.

Manual monitoring and control is performed using provided MTSVLink software running on the **CCU-1U Windows CE or CCU-1U Windows Embedded** operating system (depend on the system configuration).

The CCU-1U rear panel includes several connectors that connect to the ADE, the modem and the ship's gyrocompass (NMEA-0183, SYNCHRO or Step-by-Step).

The CCU contains the BDMx module that connects to the ADMx via a single coaxial cable. An attenuator switches, located on the CCU-1U rear panel, allow adaptation to various ADE-BDE cable lengths.

System operation is fully controlled and monitored from the CCU. Using the user friendly HMI.

Figure 7.1-1: CCU Front Panel

7.2 Dual System Selector (DSS)

The Dual System Selector (DSS) is only used in dual system configurations. One system is connected to the CCU, and one system is connected to the DSS. The DSS is connected to the CFE modem and the CCU.

The DSS provides the following functions:

- Modem L-Band interface
- Routes Up-Link (Tx) and Down-Link (Rx) signals between the active system and the modem
- Up-Link (Tx) and Down-Link (Rx) signal attenuation
- De-muxing and muxing of Up-Link (Tx), Down-Link (Rx) signals, LAN and 10MHz reference signal

The following drawing illustrates the Dual System Selector (DSS) switching scheme and CCU connection:

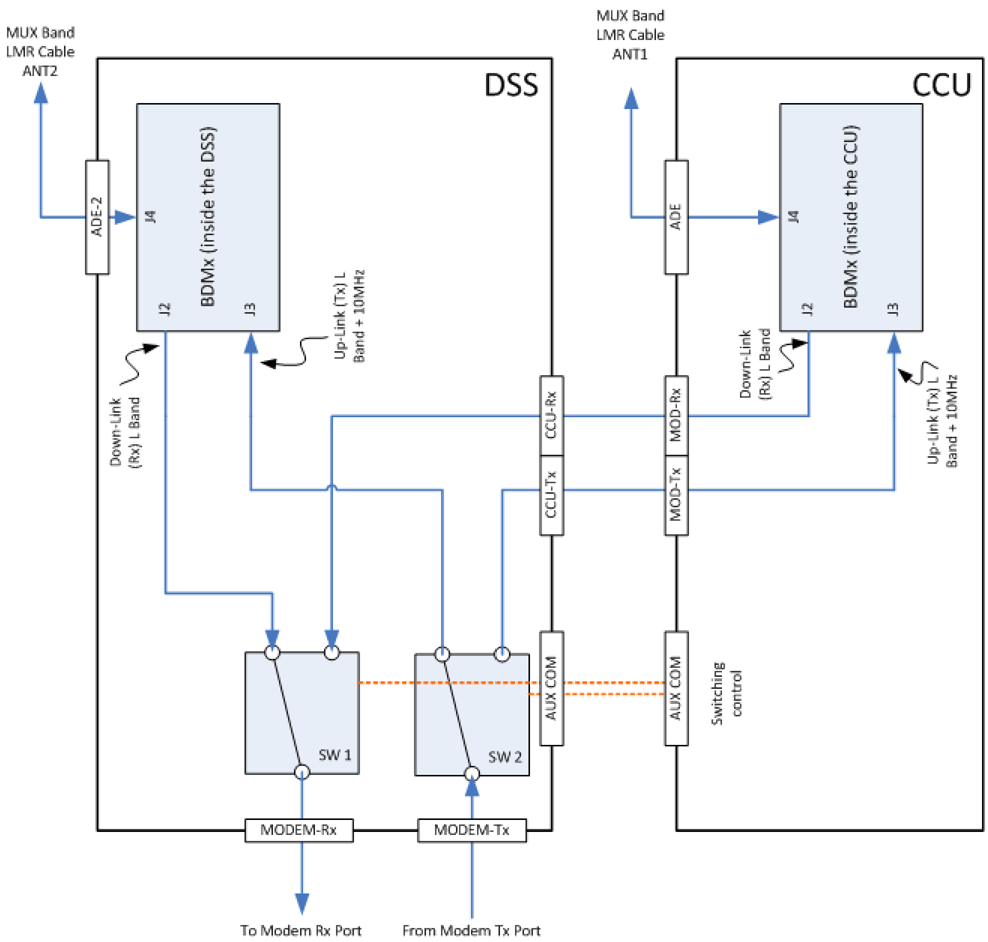


Figure 7.2-1: DSS Switching Scheme

7.3 Orbit System Selector (OSS)

The Orbit System Selector (OSS) is an RF switch controlled by the CCU that can switch up to 3 systems L-Band Signals.

The OSS provides the following functions:

- To provide simultaneously the Up-Link (Tx) L-Band and 10MHz signals to 3 different Antennas.

  AND

- To receive simultaneously the Down-Link (Rx) L-Band signal from 2 different Antennas by switching and selecting 2 Antennas from the 3 Antennas.

  OR

- To receive simultaneously the Down-Link (Rx) L-Band signal from 2 different Antennas by switching and selecting 1 Antenna from the 2 Antennas.

The following drawing illustrates the Orbit System Selector (OSS) switching scheme and CCU connection:

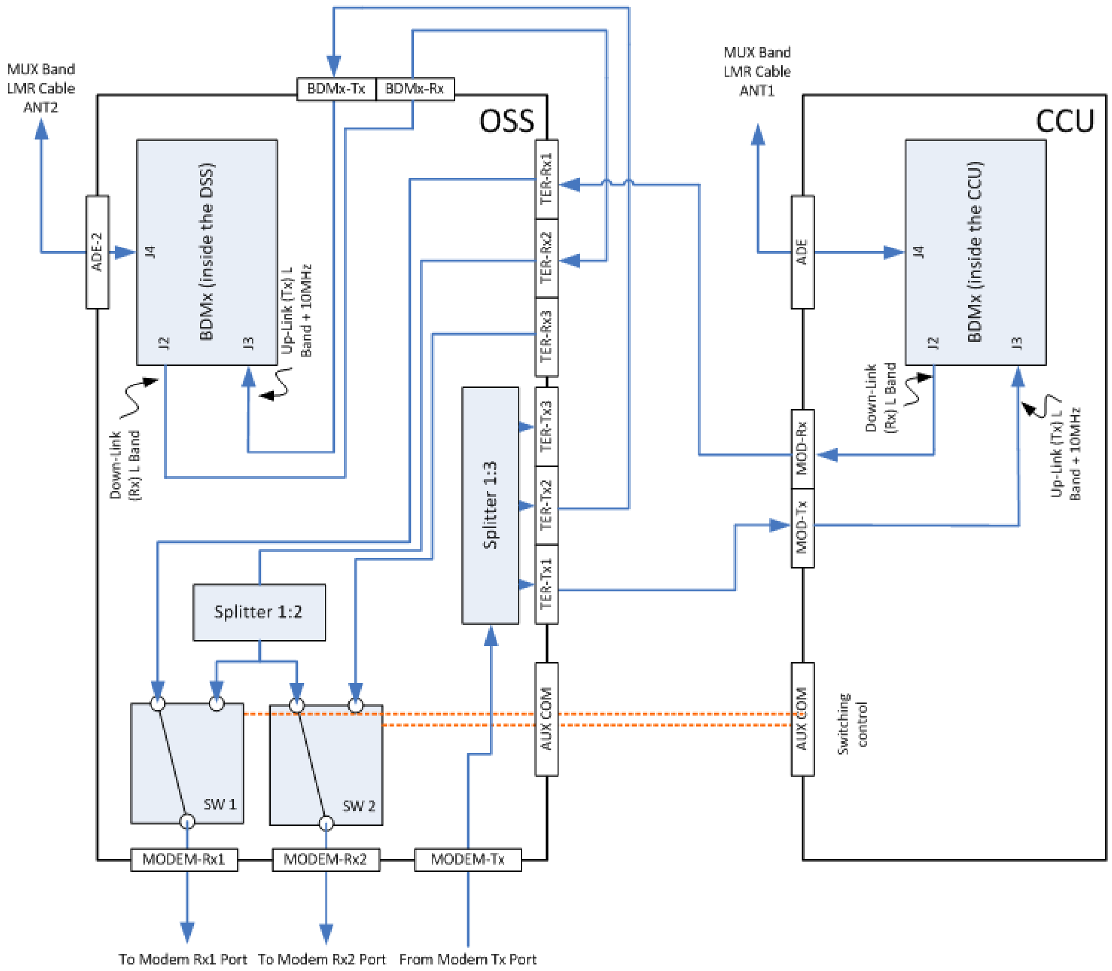


Figure 7.3-1: OSS Switching Scheme

8 OceanTRx™7 Pre-installation Requirements

8.1 OceanTRx™7 ADE Physical Requirements

The **mast support** connects the ADE Antenna and Radome with the deck of the ship. The **mast support** designed and supplied by the customer and it must conform to the following minimum requirements:

- Location with **minimal vibration** - The mast support shall have a natural frequency above 30Hz.
- Location with **minimal signal obstruction** – As clear as possible line of sight with the satellite (minimum blockage zones).
- **Rigid construction** and mounting. The mounting surface should be able to withstand lateral wind loading forces.
- **Full support of the ADE** - both peripheral and at its center.

  The mast center support will decrease vibrations at the system's center of gravity. Failing to do so can cause damage to the motors and gears.

  The mast peripheral support will increase the Radome ability to withstand lateral wind loading forces.
- **Flatness** of the mast support top surface.
- **Accurate holes position** according to the interface control drawing.
- At the **minimum (height)**, the ADE should be mounted no lower than 1m (39.3") above the deck in order to enable Installation of the screws and for the bottom hatch to open.
- **Air conditioning provisions** (inlet and outlet) are available on the Radome Base floor. The appropriate provision should be prepared with the mast support to allow easy access and assembly of the air condition inlet and outlet tubes.
- **Maintenance –** Bottom hatch is available on the Radome Base floor. The appropriate provision shall be prepared in the mast support to allow easy access (including bottom hatch latches).
- **Cables (LMR, Power, Ground) –** Routing shall be considered during mast support design. If necessary, cable tray/Tie-Raps can be used. The antenna mains power cable (length of 2 meter pig-tail) supplied as part of the antenna instillation kit.
- **ADE (Antenna and Radome) Orientation** – Offset from the ship heading can easily adjust (using compass offset) so mast support orientation is insignificant.

The following table summarizes the Antenna and Radome weights and dimensions:

Unit	Weight	Dimensions
ADE Antenna and Radome Assembly	~650 Kg (1433 lbs)	Diameter = 2.70m (106") Height = 2.60m (102")
ADE Antenna Assembly	~500 Kg (1102 lbs)	-
Radome Assembly	~150 Kg (331 lbs)	-

The following drawing present the OceanTRx™7 system (ADE) interface control drawing (ICD):

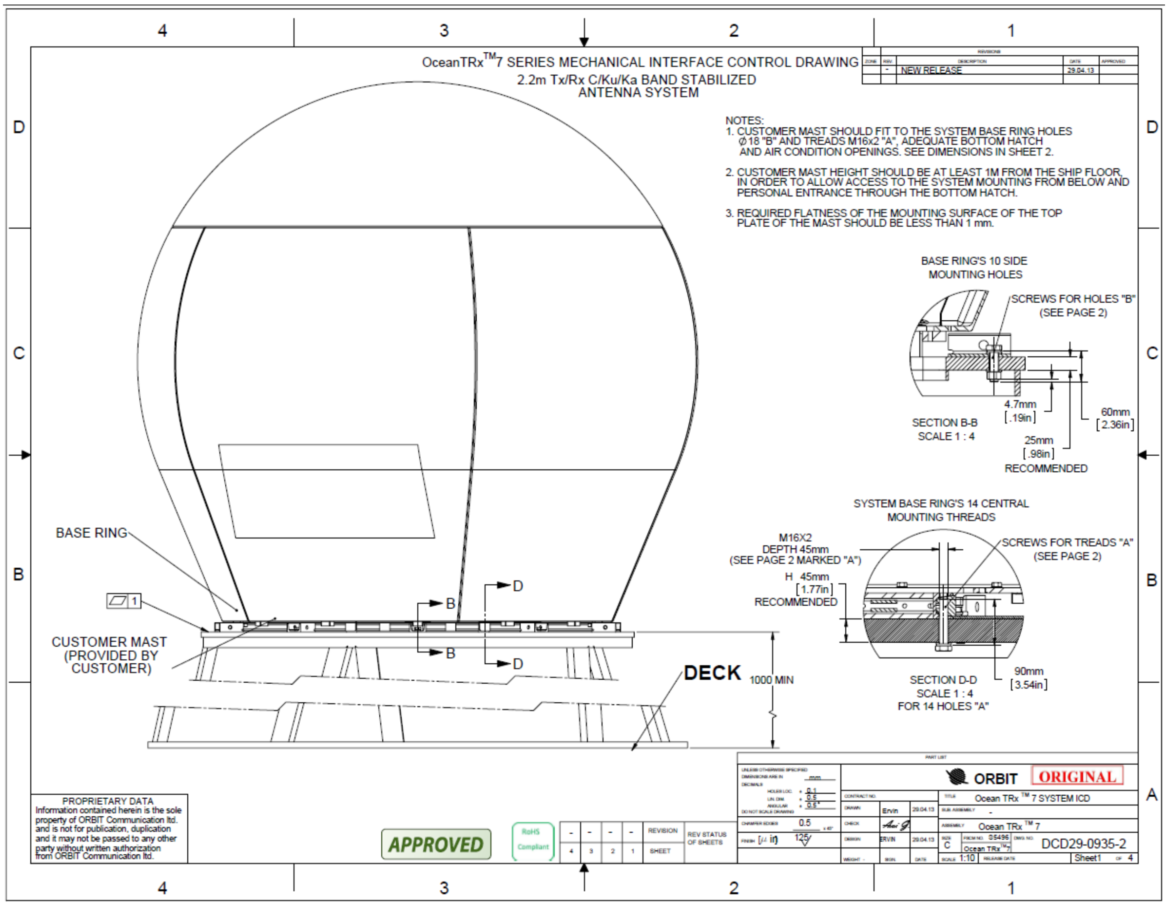


Figure 8.1-1: OceanTRx™7 Interface Control Drawing (Mechanical)

> **Note**
>
> The OceanTRx™7 system (ADE) interface control drawing (ICD) Will be sent upon request
>
> For further information, please contact Orbit service group: supportgroup@orbit-cs.com

The ADE antenna BASE RING is secured to the mast support with two series of screws:

- 10 screws through the 10 lifting points around the circumference of the base ring – support the Radome weight and resistance to lateral wind loading forces.
- 14 screws through the central plate into threaded holes in the ADE antenna BASE RING – support the antenna (pedestal) weight.

The OceanTRx^{TM}7 system (ADE) interface control drawing (ICD) includes, inter alia, information regarding:

- Mast Support mounting holes location
- Mast Support Air Condition inlet and outlet location and provision size
- Mast Support Bottom Hatch location and provision size
- ADE center of gravity (CoG) position.

8.2 OceanTRx^{TM}7 ADE Power Requirements

- ALL ADE and BDE (Above and Below Deck Equipment) are classed and must be installed according to Over Voltage Category (OVC) II specifications.
- ALL equipment must be connected via single-pole or dual-pole circuit breaker - depending on the ship's electrical infrastructure. Use a 16A main circuit breaker on the ship's power source, located as close as possible to the ADE.
- ALL equipment power to must be wired according to the National Wiring Rules.
- ALL equipment must be connected via UPS (Uninterrupted Power Supply) - It is recommended to use an On-Line UPS, which functions 100% of the time due to battery backup protection.
  The UPS should also eliminate incoming power surges and line noise.
  Alternatively, a Line Interactive UPS can be used. This UPS has enhanced power protection with Automatic Voltage Regulation (AVR).
- When choosing the power cable size (AWG) and length, take into account the electrical specifications listed below. Use the shortest possible length of cables permitted by the ADE location.
- The antenna mains power cable (length of 2 meters pig-tail) supplied as part of the antenna instillation kit.
- ADE grounding requirements: at least 14 AWG grounding conductor cable shall be connected to the ship's hull.

Unit	Power Source
Antenna unit (ADE)	115/230 VAC, 60/50 Hz 15.0 / 8.0 A (MAX)

Note

The antenna (ADE) power source parameters listed above is the MAX values. These values can vary according to the specific transmitter configuration (BUC).

8.3 OceanTRx™7 ADE Location Considerations

The ADE location considerations are as follows:

- The **Line of sight (LOS)** is a straight line between the antenna and the satellite. This line is typically obstructed by the ship's funnels and masts.

  Ideally, there should be no obstructions to the LOS, with a clear view of the satellite in all directions.

- **Radiation Considerations** – The mounting location should be as far as possible and on a different level of high power radar systems or other radiating devices.

  The OceanTRx™ systems comply with the IEC-60945 standard. The installation should be planned to prevent any radiation level exceeding that defined in the standard.

  Where there is difficulty calculating the correct conditions, it is recommended to maintain a distance of 10m and 10° from the main lobe of any Radar.

- **ADE (Antenna and Radome) Orientation** – Offset from the ship heading can easily adjust (using compass offset) so mast support orientation is insignificant, therefore:
  - During Radome assembly, the Side Hatch should assemble in front of the ADE Antenna Power Connection box to allow easy access into the ADE Antenna mains power switch.
  - The complete ADE (Antenna and Radome assembled), Bottom and Side Hatch location and orientation should allow easy and safe access into the ADE.

- **Blockage Zones** comprise specific ranges of antenna elevation and azimuth angles within which the antenna's line of sight (LOS) is physically blocked or obstruct (for example, by the ship's funnels, mast or nearby Radar).

  Within the defines Blockage Zone, the system will automatically turn OFF transmutation (BUC) and (as an option) will turn OFF the LNB voltage preventing the LNB receives external undesirable signals.

  In order to get the maximal availability and avoiding un-real blockage zones, it is highly recommended to estimate/calculate the ADE antenna blockage zone according to the ship's drawing.

8.4 OceanTRx^{TM}7 Additional Considerations

The list below pointing out additional consideration that may be addressed as part of the pre-installation preparation:

- **OceanTRx^{TM}7 Site Survey** – The site survey and installation planning go hand-in-hand, and comprise the first part of the installation process. The survey serves to familiarize you with the installation site in order to ensure that all the necessary pre-installation tasks can be carried out properly. It should also provide valuable information on the ship's facilities and the various parameters that affect installation planning. This visit to the ship is best conducted by an authorized representative of the ship's personnel. During your visit to the ship, prepare a site survey report, which will allow accurate and efficient installation planning. (Example of Pre-installation Checklist form provided in **Pre-Installation Checklist**.).

Note

Good preparation will assure the complete system (both ADE and BDE) installation and operation with less than 6hr.

For further information, please contact Orbit service group: supportgroup@orbit-cs.com

- **3rd Party Equipment** – it is important to mention that all 3rd party equipment such as the Satellite Modem and Satellite communication Link should be available for smooth system commissioning.
  Orbit System commissioning may start only after the availability of the Satellite communication Link and the Satellite modem configuration. Without these; Orbit cannot guarantee the proper operation of the complete system including Modem connectivity.

- **OceanTRx^{TM}7 Radome Assembly Site** – It is highly recommended to assemble the ADE Radome (on top of the ADE antenna) in a sheltered shore-side assembly site (dock or hanger) as close as possible to the ship avoiding un-necessary transportation challenges from the assembly site to the ship.

- **OceanTRx^{TM}7 ADE Lifting harness** – A dedicated ADE (Antenna and Radome) lifting harness were designed for OceanTRx^{TM}7 system. It is highly recommended that these tested and proved harnesses will be used during the ADE lifting to the ship.

Note

The OceanTRx^{TM} ADE lifting harness can be ordered separately.

For further information, please contact Orbit service group: supportgroup@orbit-cs.com

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- **OceanTRx^{TM}7 Mast Template** – The OceanTRx™7 system base ring must be attached to the Mast Support with 24 holes, 10 on the circumference of the system base ring and 14 inside the circumference. A dedicated OceanTRx™7 system mast template was designed to ensure that holes are properly positioned; the Bottom Hatch provision clearance and the Air Condition provision clearance are properly implemented.

Note

The OceanTRx^{TM} 7 Mast Template can ordered separately.

For further information, please contact Orbit service group: supportgroup@orbit-cs.com

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- **ADE to BDE LMR Cable** – the ADE to BDE LMR cable should be prepared head, prior to the installation. In order to save time during the installation, the LMR Cable connectors (male N-Type on both sides) should be prepared. It is recommended to test the LMR cable insertion loss and return loss to ensure its performance.

- **OceanTRx^{TM}7 ADE Cables Routing** – The OceanTRx™7 ADE Radome is a sealed, IP 67 rated, water proof. In order to route into the Radome the power cable, ground cable and LMR cable, it is required to drill a circular hole in the ADE Radome base (22mm up 33mm hole, depending on cable type). The gland hole should be located according to the Mast Support design and ship cable routing.

  The cables should be routed through a cable gland that should be sealed properly. The cable gland is NOT supplied as part of the system installation KIT.

- **OceanTRx^{TM} Power Connection Box** – in order to avoid long run power cable, from the ADE to the BDE, it is highly recommended to install inside the Mast Support a Power Connections Box which will include a circuit barker and a terminal connection allowing easy connection of the ADE antenna power cable during the installation.

- **ADE Grounding** – the mast support should include a grounding lug bolt which will be used to connect the ADE grounding cable, it is required to locate the mast support grounding lug bolt as close as possible to the ADE power connection Box located inside the Radome.

8.5 OceanTRx^{TM} BDE Physical Requirements

- ALL BDE units supplied with **rack mount rails (x2)** inside the package box.
- It is **recommended to mount the BDE** (CCU, DSS/OSS) near the modem in order to minimize cables length connected between the BDE and the modem.
- For **Dual system Topology**, when using CCU with DSS/OSS, It is recommended to mount both units one on top of the other.
- The distance between the BDE and the **Gyrocompass repeater** should be considered when choosing the correct interface type and cable.
- The operation of the rack-mounted CCU is largely automatic; however, it is preferable to monitor it periodically. It should therefore be located to facilitate **easy access by an operator**.
- Consideration should also be given to ensure that there is space around the equipment for the following:
  - The BDE rear panel should have a **clearance of at least 30cm** to ensure a sufficiently shallow bend in the coaxial cable when connected it to the CCU.
  - The BDE must be located to allow for **adequate air flow** to facilitate heat dissipation.
  - To allow access for technical staff to the **rear panel**, where the cables are connected.

The following table summarize the Below deck units weights and dimensions:

Unit	Weight	Dimensions
Central Control Unit (CCU)	5.9Kg	1U x 48.26 x 47.4 cm (HxWxD)
Orbit System Selector (OSS)	5.9Kg	1U x 48.26 x 47.4 cm (HxWxD)
Dual System Selector (DSS)	5.9Kg	1U x 48.26 x 47.4 cm (HxWxD)

The following drawing illustrates the typical CCU/DSS/OSS mechanical dimensions and mounting provisions:

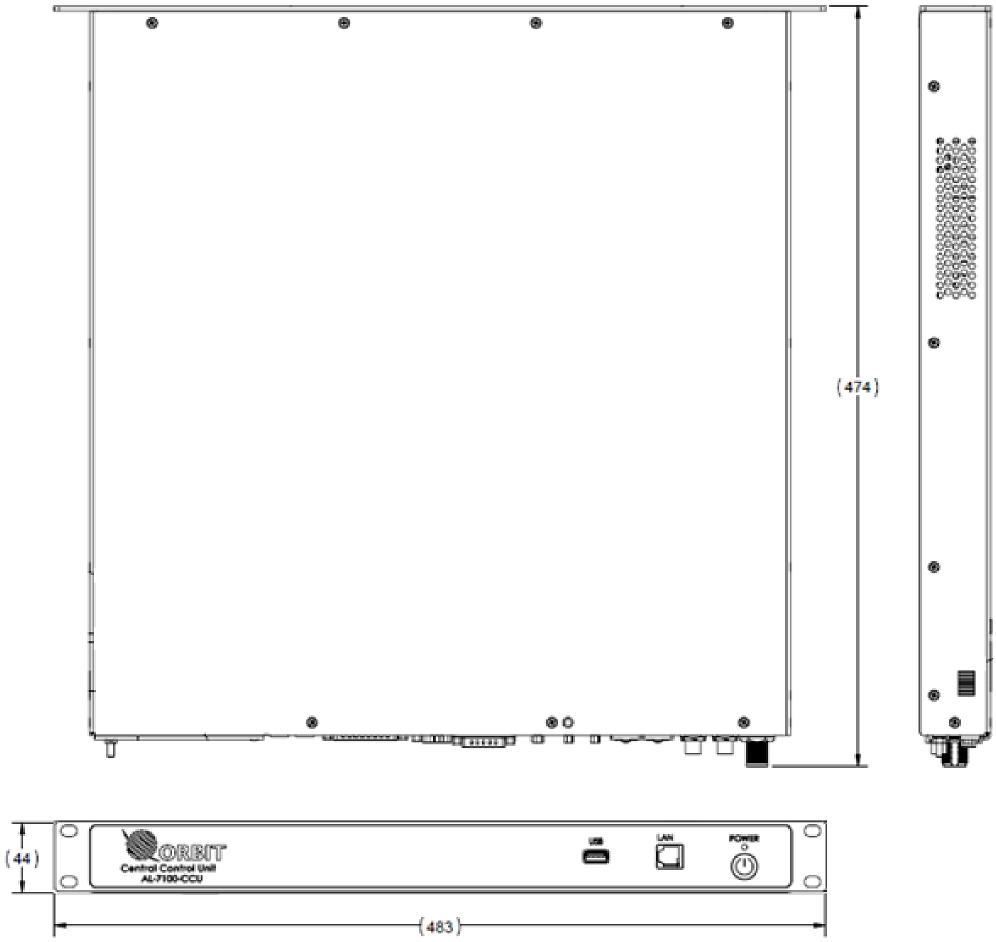


Figure 8.5-1: CCU/DSS/OSS 1U Mechanical Dimensions

8.6 OceanTRx™ BDE Power Requirements

- ALL ADE and BDE (Above and Below Deck Equipment) are classed and must be installed according to Over Voltage Category (OVC) II specifications.
- ALL equipment must be connected via single-pole or dual-pole circuit breaker - depending on the ship's electrical infrastructure. Use a 16A main circuit breaker on the ship's power source, located as close as possible to the BDE.
- ALL equipment power to must be wired according to the National Wiring Rules.
- ALL equipment must be connected via UPS (Uninterrupted Power Supply) - It is recommended to use an On-Line UPS, which functions 100% of the time due to battery backup protection.
  The UPS should also eliminate incoming power surges and line noise.
  Alternatively, a Line Interactive UPS can be used. This UPS has enhanced power protection with Automatic Voltage Regulation (AVR).
- When choosing power cables size (AWG) and length, take into account the electrical specifications listed below. Use the shortest possible length of cables permitted by the BDE location.
- The BDE mains power cable supplied in the unit package box.
- BDE grounding requirements: at least 18 AWG protective earthing conductor cable should be connected to the rack's earthing.
- The distance between the BDE and the Gyrocompass repeater should be considered when choosing the correct interface type and cable.

Unit	Power Source
Central Control Unit (CCU)	115/230 VAC, 60/50 Hz 6.0 / 3.0 A (MAX)
Orbit System Selector (OSS)	115/230 VAC, 60/50 Hz 6.0 / 3.0 A (MAX)
Dual System Selector (DSS)	115/230 VAC, 60/50 Hz 6.0 / 3.0 A (MAX)

9 OceanTRx™7 Un-Packing the System

9.1 OceanTRx™7 Un-Packing the ADE Antenna

The OceanTRx™7 system is packed into two wooden crates – one for the ADE Antenna assembly and the BDE and one for the Radome

Unit	Weight	Dimensions
ADE Antenna assembly crate (Includes the BDE inside the same crate)	~600 Kg (1322 lbs)	Length = 2.30m (90.6") Width = 2.35m (92.5") Height = 2.24m (88.2")
ADE Antenna assembly	~500 Kg (1102 lbs)	-
ADE Antenna assembly crate	~100 Kg (220lbs)	-

The package includes the ADE Antenna assembly assembled on its Radome Base Plate, as well as a separate package containing the BDE equipment, installation kit, cables and system documentation.
The following pictures illustrate the complete ADE Antenna assembly crate outline dimensions:

Package front view

Package top view

Figure 9.1-1: ADE Antenna Package Box

WARNING!! The crate contents may have shifted during transport. As soon as you open the crate, you need to check for any evidence of **external damage**. Each crate is equipped with two **shock indicators**, which change color if the crate has been exposed to undue shock or vibration during transport. One additional shock indicator is attached to the ADE Pedestal above the Tilt Axis Servo Motor.

➔ **To Un-Pack the ADE Antenna assembly crate:**

The following pictures illustrate the complete ADE Antenna assembly crate parts:

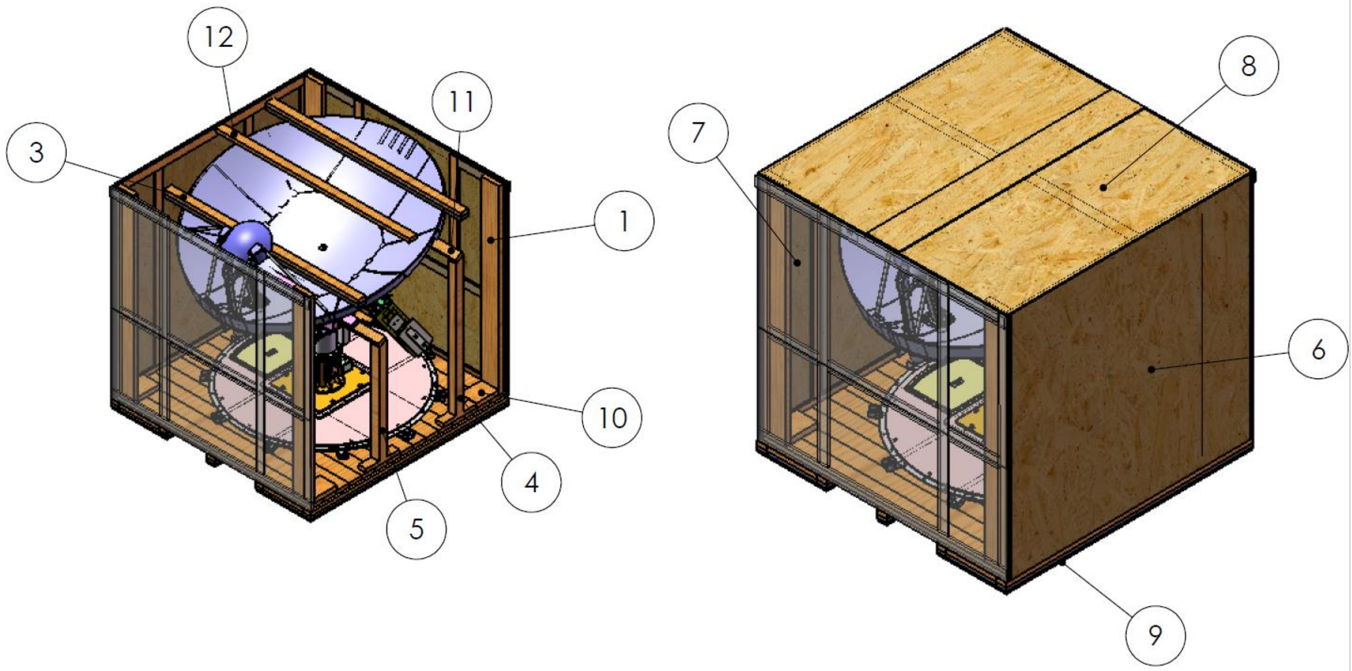


Figure 9.1-2: ADE Antenna Package Unpacking

STEP 1: Place the ADE crate on a stable, level surface.

STEP 2: Check the **shock indicators on the ADE crate**. If they have turned red, do not open the crate. Contact Orbit Communication Systems Ltd. immediately. Otherwise, continue to the next step.

STEP 3: Carefully unscrew the screws that hold the top panel ⑧ of the ADE crate to the side panels.

STEP 4: Slide the top panel ⑧ from the ADE crate, ensuring that it remains wholly outside of the crate.

STEP 5: Carefully dismantle and remove the two side panel walls ⑦ (both opposite sides), ensuring that they do not damage any system components.

STEP 6: Check the **shock indicator on the ADE Pedestal above the Tilt Axis Servo Motor**. If it has turned red, contact Orbit Communication Systems Ltd. immediately. Otherwise, continue to the next step.

STEP 7: Carefully dismantle and remove the three top bars, ③ and both of ⑫ bars, ensuring that they do not damage any system components.

STEP 8: Carefully dismantle and remove the two side panels walls⑥ (both opposite sides), ensuring that they do not damage any system components.

STEP 9: Carefully dismantle and remove the two bottom bars, ⑤, ④ and ⑪ bars, ensuring that they do not damage any system components.

STEP 10: Carefully dismantle and remove the four crate corner supports ① ensuring that they do not damage any system components.

STEP 11: Visually inspect the exterior of the equipment for evidence of any physical damage that might have occurred during shipment or storage.

STEP 12: Record the serial numbers of the system and each of its units (for example, ACU, IMU, BUC, CCU), located on each unit's nameplate. This information will be useful if you have to contact the Orbit Service and Support Department.

Note

Report any damaged parts to the shippers and to supportgroup@orbit-cs.com, as units damaged during shipping are not covered under the warranty terms and conditions.

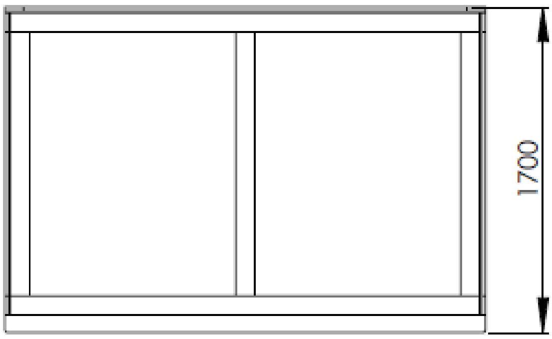
9.2 OceanTRx™7 Un-Packing the ADE Radome

The OceanTRx™7 system is packed into two wooden crates – one for the ADE Antenna assembly and the BDE and one for the Radome

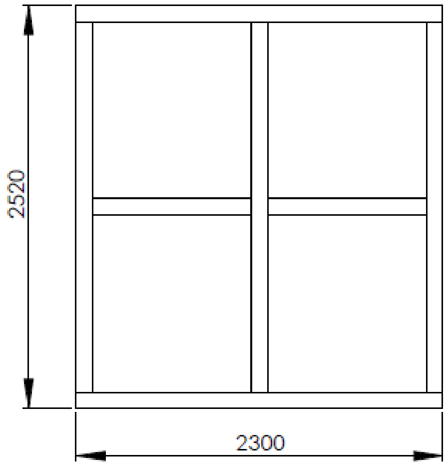
Unit	Weight	Dimensions
ADE Radome crate	~250 Kg (551lbs)	Length = 2.30m (90.6") Width = 2.52m (99.2") Height = 1.70m (66.9")
ADE Radome	~150 Kg (330lbs)	-
ADE Radome crate	~100 Kg (220lbs)	-

The package includes the ADE Antenna assembly assembled on its Radome Base Plate, as well as a separate package containing the BDE equipment, installation kit, cables and system documentation.

The following pictures illustrate the complete ADE Radome crate outline dimensions:



Package front view



Package top view

Figure 9.2-1: ADE Radome Package Box

WARNING!! The crate contents may have shifted during transport. As soon as you open the crate, you need to check for any evidence of **external damage**. Each crate is equipped with two **shock indicators**, which change color if the crate has been exposed to undue shock or vibration in transport. One additional shock indicator is attached to the ADE Pedestal above the Tilt Axis Servo Motor.

➔ **To Un-Pack the ADE Radome crate:**

The following pictures illustrate the complete ADE Radome crate parts:

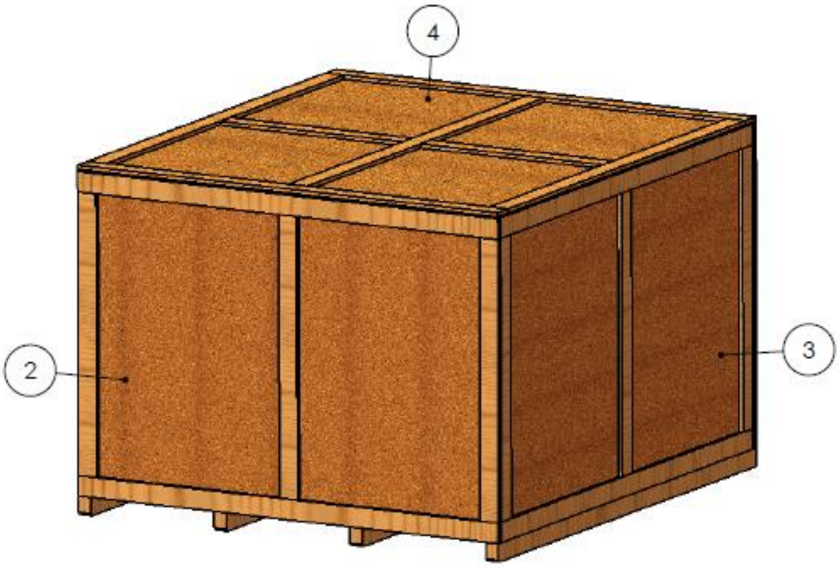


Figure 9.2-2: ADE Radome Package Unpacking

STEP 1: Place the Radome crate on a stable, level surface.

STEP 2: Carefully unscrew the screws that hold the top panel ④ of the Radome crate to the side panels.

STEP 3: Slide the top panel ④ from the Radome crate, ensuring that it remains wholly outside of the crate.

STEP 4: Carefully dismantle and remove the package side panels ③ and ② of the Radome crate, ensuring that they do not damage any of the Radome components.

Note

Report any damaged parts to the shippers and to supportgroup@orbit-cs.com, as units damaged during shipping are not covered under the warranty terms and conditions.

9.3 OceanTRx^{TM}7 Stow Lock Pins Un-Lock

The ADE Antenna Assembly transportation, the Antenna Pedestal axes are locked and secured using Stow Lock Pins.

Before assembling the ADE Radome around the ADE Antenna Assembly, remove the safety Stow Lock Pins on the Antenna Pedestal axes.

WARNING!! Antenna Pedestal axes are locked and secured using Stow Lock Pins. The following sign is attached to each Stow Lock:

➔ **To Un-Lock the Stow Lock Pins:**

STEP 1: Remove the locking pin restricting the Elevation Axis gear wheel.

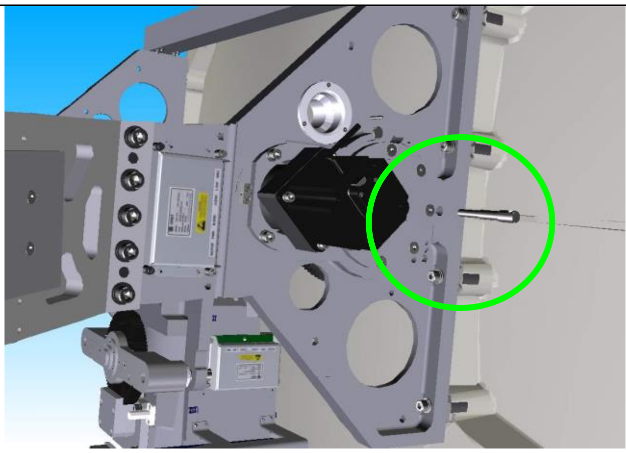


Figure 9.3-1: Elevation Stow Lock Pin

STEP 2: Unscrew and remove the rubber plugs restricting the Tilt Axis cylinder

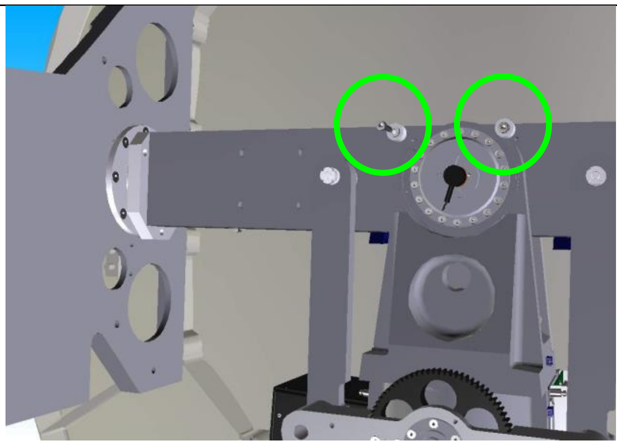


Figure 9.3-2: Tilt Stow Lock Pins

STEP 3: Remove the locking pin restricting the Azimuth Axis gear wheel.

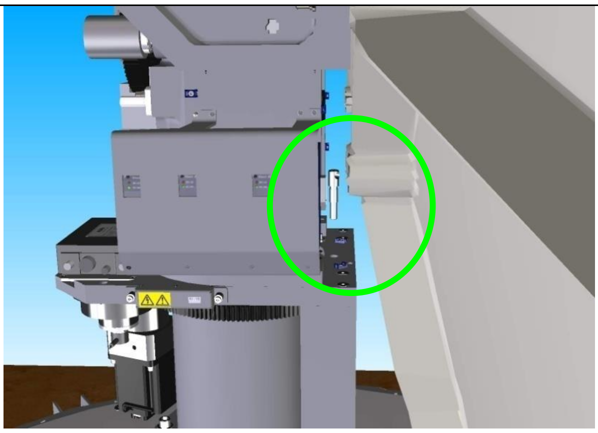


Figure 9.3-3: Azimuth Stow Lock Pin

9.4 OceanTRx^{TM}7 Servo-Drivers Un-Lock

Each axis Servo Driver includes a motor phase-lock mechanism which locks the motor movement when the ADE Antenna Assembly power is switched OFF (no power supply reach to the Servo Driver).

In order to allow smooth and easy movement of the axis, for example during Radome Assembly, this mechanism can be by-passed (disabled) using the "Operation-Maintenance" switch located on each Servo Driver.

- **MAINT.** – When Servo Driver power is OFF, placing the switch in "MAINT." position will release the axes for movement.
- **OPER.** – When Servo Driver power is OFF, placing the switch in "OPER." Position will Locks the axes in place.

The following picture presets the Servo Driver "Operation-Maintenance" switch location:

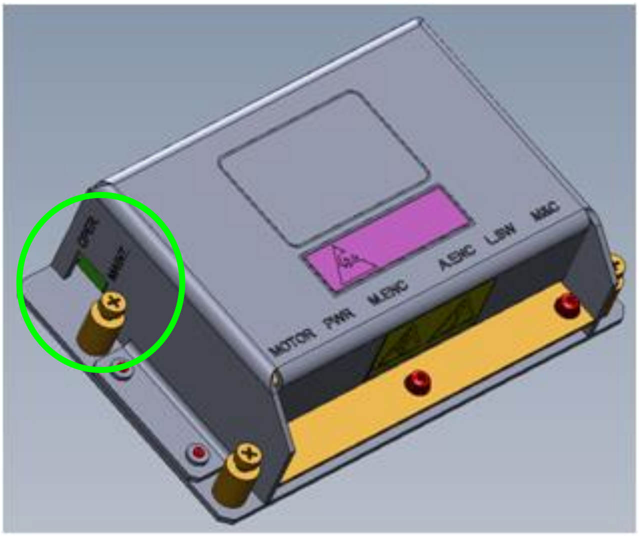


Figure 9.4-1: Servo Driver OPER and MAINT Switch

WARNING!! Rotating the pedestal axes with the switches in the OPER position should be avoided, over use of this ability might damage the system.

WARNING!! Do NOT use any sharp objects (such as screw-driver) to move the switch. It can easily switch by hand.

WARNING!! When completing ADE maintenance, place back the switch to its default position: "OPER." Position.

9.5 OceanTRx™7 ADE Radome Assembly

The ADE Radome is shipped unassembled (in segments/petals), in a dedicated crate.

The disassembled Radome consists of five petals (sides) and one upper dome (top). One of the Radome petals include side hatch.

The ADE Antenna is shipped assembled on top of the Radome Base and Base Ring which will be used as the ADE Radome assembly base.

WARNING!! Although the Radome petals are not heavy, they can act as sails during windy conditions. It is recommended that at least two people handle them during installation

Note

During Radome assembly, the Side Hatch petal should assemble in front of the ADE Antenna Power Connection box to allow easy access into the ADE Antenna mains power switch

➔ **Before starting the ADE Radome assembly:**

- In order to prevent gaps in the Radome, it is recommended to fit the parts together loosely with the minimum tightening of screws until the Radome is fully assembled, then to tighten the screws systematically in the manner described in the following procedure**.**
- The Radome assembly required two set of bolts:
    - When assembling the **petals to one another and to the top section**, place a spring washer and a regular washer on the bolt, insert the bolt through the appropriate hole, place a regular washer on the bolt and secure with the nut above.
    - When attaching the **petals to the base ring**, place a spring washer and a regular washer over the pre-installed exciting bolts, and secure with a nut above**.**

➔ **To assemble the ADE Radome:**

<u>**STEP 1:**</u> The petal holes, which located on the bottom side of the petal, should fit onto the existing Base Ring bolts.

Use supplied spring washers and nuts (which appropriate to the Base Ring existing bolts) to <u>**secure loosely**</u> the petal to the Base Ring.

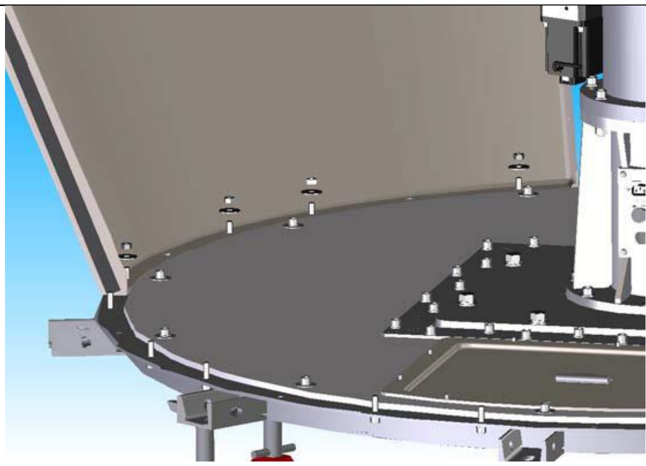


Figure 9.5-1: ADE Radome Petals to Base Ring Assembly I

<u>**STEP 2:**</u> Place and fit the next Radome petal next to the adjacent petal and to the base ring existing bolts.

Be sure the rubber insulated petal side, fits onto the un-insulated side of the assembled petal.

Use supplied spring washers and nuts (which appropriate to the Base Ring existing bolts) to <u>**secure loosely**</u> the petal to the Base Ring.

Use supplied spring washers, washers, bolts and nuts (which appropriate to the between petals connection) to <u>**secure loosely**</u> the petals.

Repeat the above STEPs to all five Radome petals.

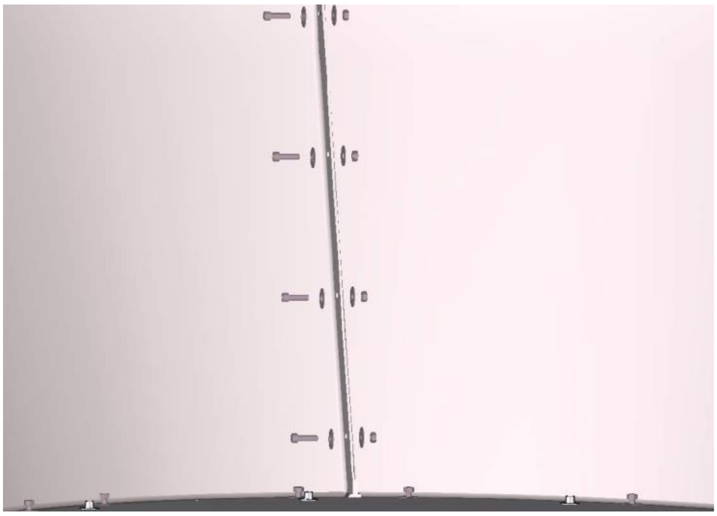


Figure 9.5-2: ADE Radome between Petals assembly

STEP 3: When all the Radome petals loosely assembled, position the top section into place.

Be sure the Radome top does NOT contact the Antenna Dish when it is positioned.

It is recommended that two people lift the Radome top into place.

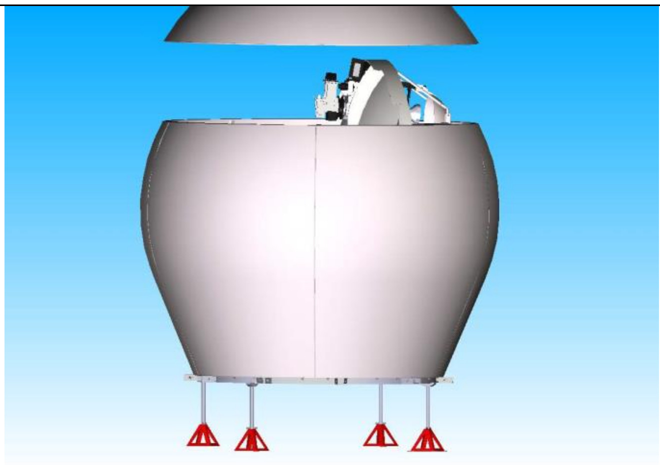


Figure 9.5-3: ADE Radome Top assembly

STEP 4: Enter the Radome through the side hatch.

Use supplied spring washers, washers, bolts and nuts (which appropriate to the between petals and Radome top connection) to **<u>secure loosely</u>** the Radome top.

Figure 9.5-4: ADE Radome Top to Petals assembly I

STEP 5: Tightening Petals side bolts using the following order

TOP 3 bolts of EACH PETAL all around.

MIDDLE 3 bolts of EACH PETAL all around.

BOTTOM 3 bolts of EACH PETAL all around.

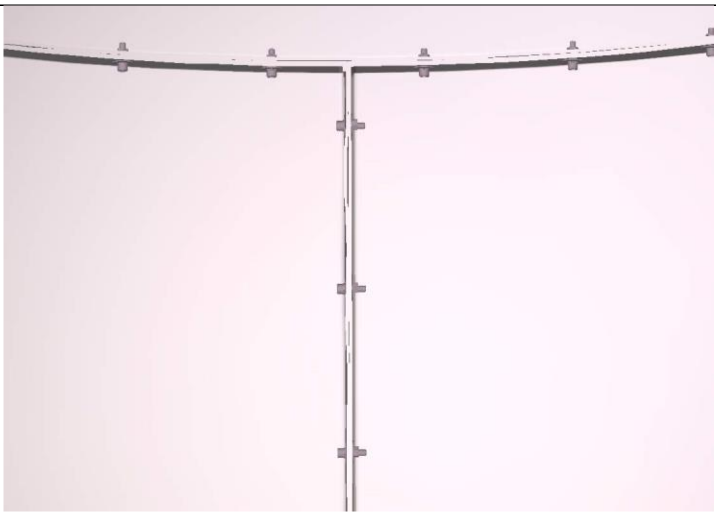
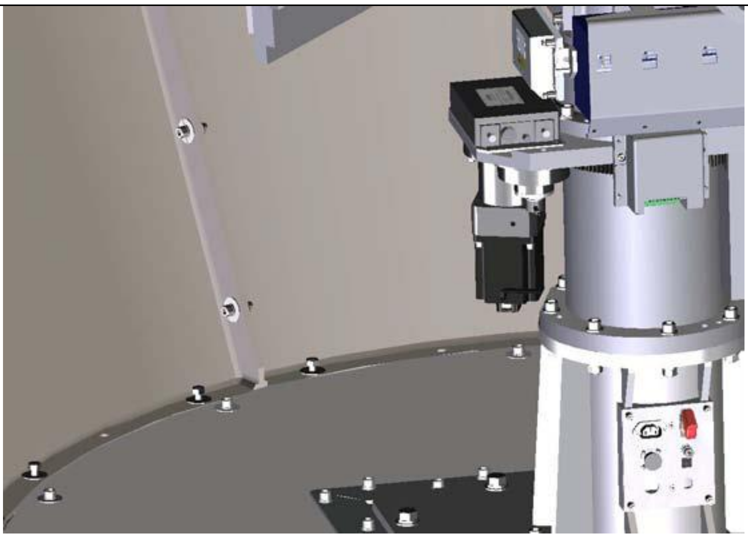
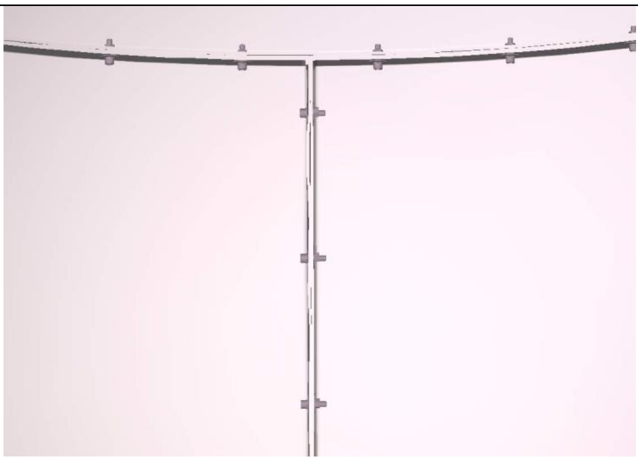


Figure 9.5-5: ADE Radome Top assembly II

STEP 6: Tighten the nuts onto the bolts connecting the Radome petals with the base ring.	 **Figure 9.5-6: ADE Radome Petals to Base Ring Assembly II**
STEP 7: Tighten the nuts onto the bolts connecting the Radome petals with the top section of the Radome	 **Figure 9.5-7: ADE Radome Top assembly III**
STEP 8: From OUTSIDE the Radome, apply silicone (supplied with the ADE) over all the Radome joints including: Between Petals. Between Petals and Base Ring Between Petals and Top. In addition, INSIDE the Radome, apply silicon between the Radome Base and the lower flange of the petals.	

10 OceanTRx^{TM}7 System Installation

10.1 OceanTRx^{TM}7 ADE Lifting and Mounting

Once the ADE Radome is assembled and secured, the complete ADE assembly (Antenna and Radome) is ready to be lifted onto the ship's mast support structure constructed on the ship.

In order to lift the ADE, you will need to use a lifting harness such as that illustrated below, capable of lifting at least 1000Kg.

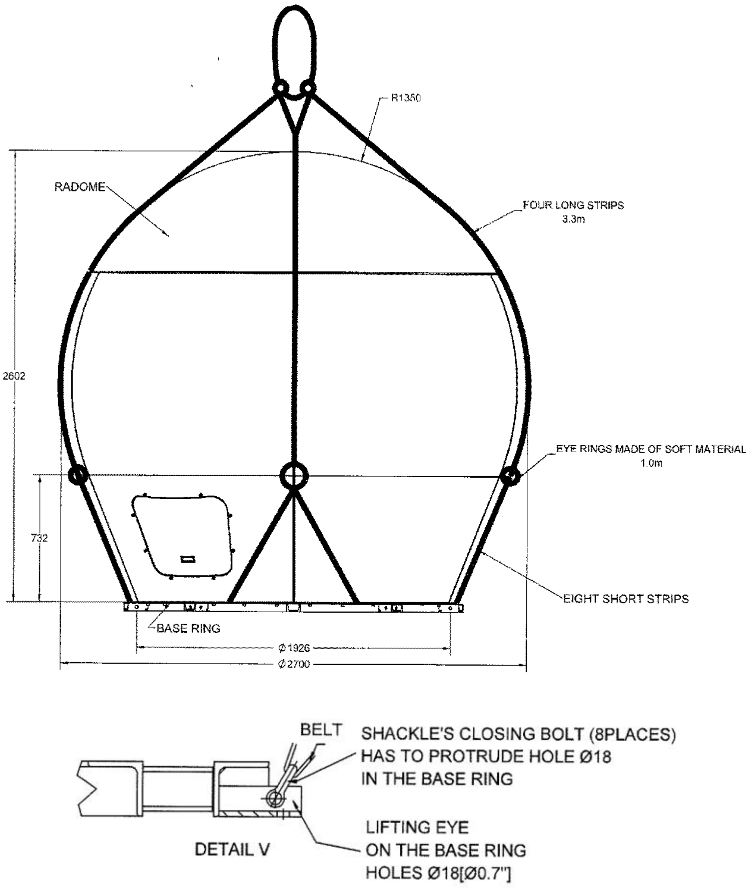


Figure 10.1-1:OceanTRx^{TM}7 Lifting Harness

Note

The OceanTRx^{TM} ADE lifting harness can be separately ordered.

For further information, please contact Orbit service group: supportgroup@orbit-cs.com

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Before lifting the ADE ensure that the bolts used are appropriate for the thickness of the mast support structure top plate and the all the necessary preparation were properly implemented (for example 24 holes location, Bottom Hatch provision, Air condition provision etc).

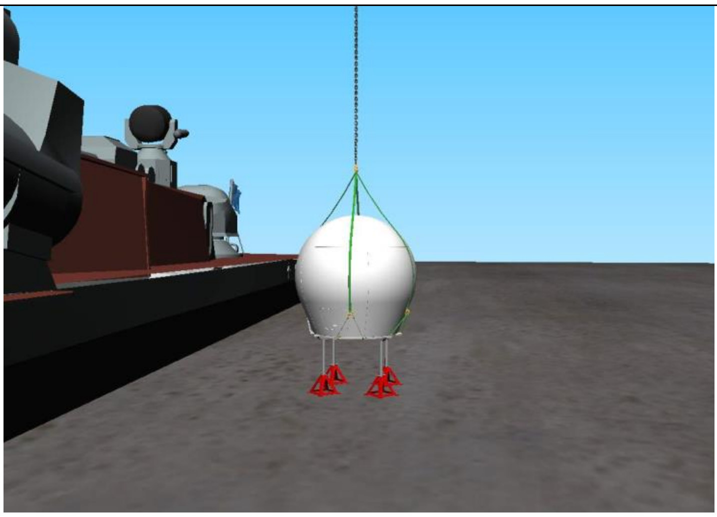
Note

The OceanTRx™ 7 Mast Template can be separately ordered.

For further information, please contact Orbit service group: supportgroup@orbit-cs.com

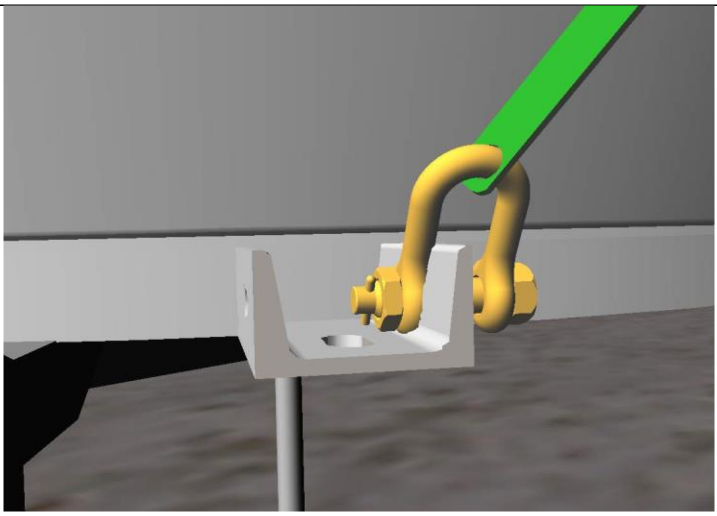
➔ **To Lift and Mount the ADE:**

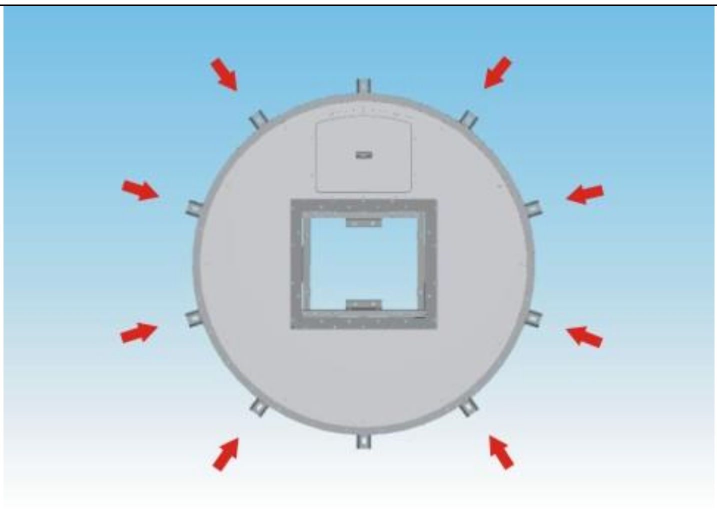
STEP 1: Attach the ADE lifting harness to the crane and lower it over the ADE.



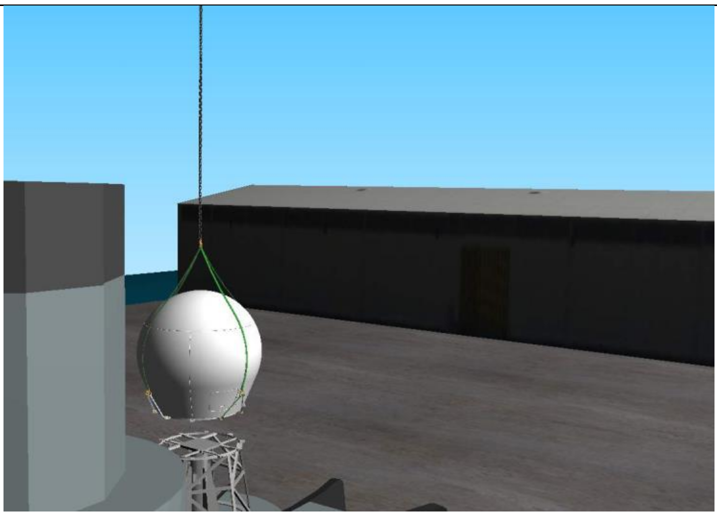
STEP 2: Attach the anchor shackles at the end of each short strap to the *right hole* in 8 of the 10 lifting points protruding from the ADE Base Ring.

Arrange the straps according to the displayed diagram, in order to distribute the weight of the system properly

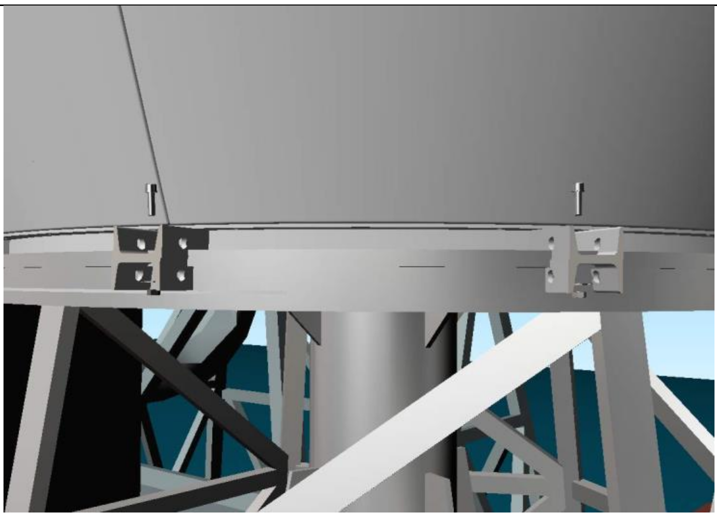




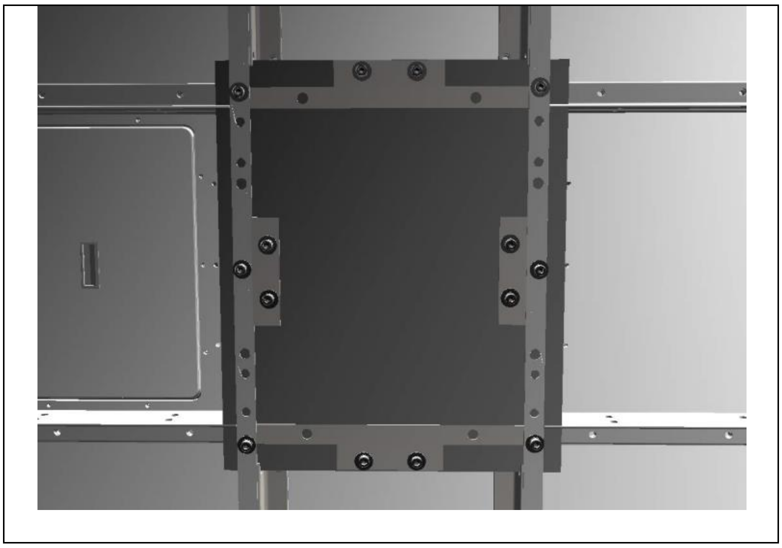
STEP 3: Lift the ADE onto the mast support structure mounted on the ship.



STEP 4: Insert M16 bolts, washers and spring washers downwards through the 10 lifting points on the ADE Base Ring, and tighten securely using appropriate nuts.



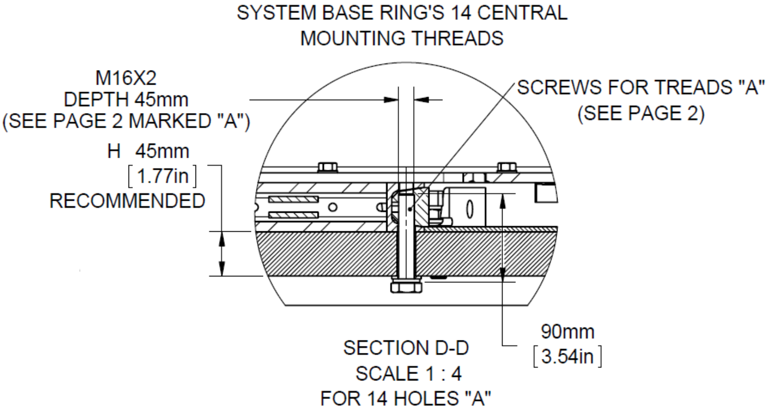
STEP 5: Insert M16 bolts washers and spring washers upwards through the system support and into the 14 threaded holes in the center of the ADE Base Ring.



The 14 bolts that attach the center of the ADE Base Ring to the mast support structure should not protrude more than 45mm from the mast support structure top plate level due to the ADE Base Ring threads depth of 45mm.

The following drawing (section D-D, from the OceanTRx[TM]7 system ICD) present an example of mast support structure top plate with thickness of 45mm (H).
Bolts with length of 90mm will be sufficient (taking into account the spring washer and flat washer thickness of approx 8mm).

Note



If necessary, use wide washers (supply as part of the ADE installation KIT) below the mast support structure to ensure that the bolts can be tightened properly.

10.2 OceanTRx^{TM}7 ADE Cable connection

The following cables must be connected to the ADE Power Box:

- Mains power supply cable (2meter cable with pig-tails supplied as part of the ADE installation KIT).
- LMR coaxial cable
- D-Type IMU cable
- Ground wire

The following pictures illustrate the ADE Power Box Cable connection:

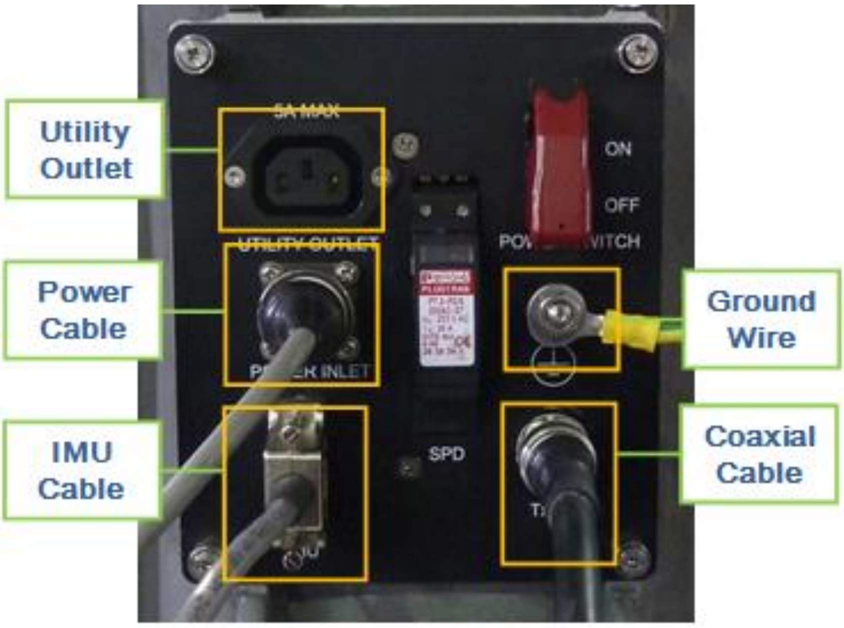


Figure 10.2-1: ADE Antenna Power Connection BOX Cables

➔ **To connect the ADE cables:**

STEP 1: The Mains Power, LMR Coaxial and Ground cables should be routed out from the ADE Radome floor. According to the mast support structure and ship cable routing, Drill a hole in the Radome floor. Take care that the hole drilled will be wide enough to accommodate the cable gland (not supplied with the ADE installation KIT).

STEP 2: Install the cable gland around the drilled hole.

STEP 3: Insert the cables and tighten the gland around them.

STEP 4: Verify that the gland secures both cables and does not allow any cable movement inside the gland.

STEP 5: If not prepared ahead, install an N-Type connector on the ADE side of the LMR cable.

STEP 6: Attach the LMR Coaxial N-Type connector to the N-Type connector located on the ADE Power Box.

10.3 OceanTRx™ BDE Cable connection

Follows the pre-installation BDE Physical and Power Requirements section, the following sections describe in details the BDE electrical connection.

According to the specific system configuration/topology, some of the connection should be connected and some should be left un-connected as described in the next section.

It is assumed that prior the BDE cables connection the following steps were completed:

- Installing the BDE in a 19-inch rack. It is recommended to use the supplied rack mount rails.
- The distance between the BDE and the Gyrocompass repeater was considered and the appropriate interface type and cable were prepared.
- The BDE power cable was routed and connected via UPS.
- The BDE Ground lug - at least 18 AWG protective earthing (PE) conductor cable used to connect to the rack's grounding

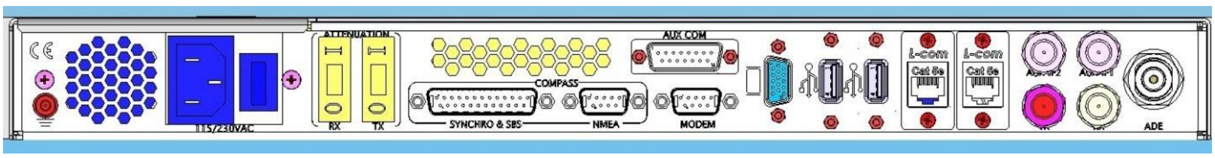
10.3.1 CCU General

The CCU includes connectors and a switch on the front panel and connectors and switches on the rear panel. The following table describes the connectors and switch on the front panel of the CCU:

Interface	Type	Function
USB	USB	General purpose USB port
LAN	RJ-45	Connects to a CFE computer for remote access to the CCU
POWER	Soft Toggle Switch	Turns the power from the internal CCU power supply ON or OFF

The following table describes the connectors and switches on the rear panel of the CCU:

Interface	Type	Function
ADE	N-Type	Connects to the ADE-BDE coaxial cable
AUX-IF1	F-Type	Input, connects to the CFE modem TX port when using a CCU with 10MHz.
AUX-IF2	F-Type	Output, connects to the CCU TX port when using a CCU with 10MHz.
RX	F-Type	Output, connects to the CFE modem RX port
TX	F-Type	Input, connects to the CFE modem TX port when using a CCU without 10MHz.
LAN (2 ports)	RJ-45	General purpose Ethernet ports
USB (2 ports)	USB	General purpose USB ports
VGA	HD15	Connects to an external video monitor
AUX COM	D-Type (15-pin)	Connects to the DSS, for dual system configurations only.
MODEM	D-Type (9-pin)	Connects to the M&C port of the CFE modem
COMPASS– NMEA	D-Type (9-pin)	Connects to an NMEA compass on the ship
COMPASS – SYNCHRO & SBS	D-Type (25-pin)	Connects to a SYNCHRO or SBS compass on the ship
POWER	Male	Connects to the mains AC power
POWER	SPDT Switch	Turns the power to the internal CCU power supply ON or OFF
ATTENUATION RX	SPDT Switch	Turns Down-Link attenuation ON or OFF
ATTENUATION TX	SPDT Switch	Turns Up-Link attenuation ON or OFF



10.3.2 CCU Compass ports

The CCU need to be connected to the ship's compass.

The CCU supports NMEA compass. Optional support for SYNCHRO and Step-by-Step compasses.

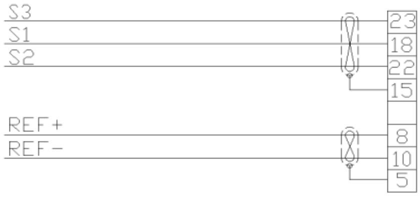
SYNCHRO and SBS Compass Pin-outs

The following table shows the pin-out of the CCU's SYNCHRO & SBS 25-pin connector:

Pin	Signal	Function	Pin	Signal	Function
1	NC	N/A	14	NC	N/A
2	GND	General	15	GND	General
3	Reserved	Reserved	16	NC	N/A
4	Reserved	Reserved	17	NC	N/A
5	GND	General	18	S1	SYNCHRO
6	NC	N/A	19	Reserved	Reserved
7	NC	N/A	20	Reserved	Reserved
8	REF +	SYNCHRO	21	GND	General
9	NC	N/A	22	S2	SYNCHRO
10	REF -	SYNCHRO	23	S3	SYNCHRO
11	NC	N/A	24	C	SBS
12	COM	SBS	25	B	SBS
13	A	SBS			

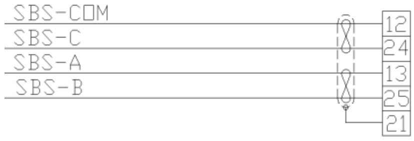
Note Pins 3, 4, 19 and 20 are reserved for internal use only and must be left open.

The following figure shows the mating connector wiring diagram for the ***SYNCHRO*** compass signal:



Note As an optional order, The CCU supports SYNCHRO compasses with a 115 VAC reference.

The following figure shows the mating connector wiring diagram for the SBS compass signal:



Note

The CCU supports SBS compasses with +20VDC to +70VDC.

The CCU supports dual polarity:

Positive – A, B, C: +VDC or Open; Common: GND

Negative – A, B, C: GND or Open; Common: +VDC

NMEA Compass Pin-outs

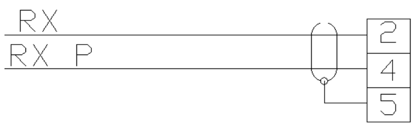
The following table shows the pin-out of the NMEA-0183 compass to the CCU's NMEA connector:

Pin	Signal	Function
1	Reserved	NMEA RS-422
2	RX -	
3	Reserved	
4	RX +	
5	GND	
6	NC	
7	NC	
8	NC	
9	GND	

Note

Pins 1 and 3 are reserved for internal use only and must be left open.

The following figure shows the mating connector wiring diagram for the RS-422 NMEA-0183 compass signal:



Note

The recommended interconnecting wiring is a shielded twisted pair, with the shield grounded.

10.3.3 CCU Modem port

The CCU supports a number of modem M&C functions including IRD lock, GPS output, GPS Input and modem monitor via the RS-232 9-pin MODEM connector.

The following table shows the pin-outs for the MODEM connector:

Pin	Signal	Function
1	NC	N/A
2	RXD	Modem M&C
3	TXD	Modem M&C
4	NC	N/A
5	GND	General
6	NC	N/A
7	12 VDC Output	IRD Lock Signal
8	IRD Indicator	IRD Lock Signal
9	GND	General

Note

IRD Lock Signal, Pins 7 and 8, should be connected via a 'dry-contact' relay.

The IRD Lock Signal polarity (Negative/Positive) can be set using the MtsVLink software.

10.3.4 CCU Display and Keyboard Connection

The CCU can optionally be controlled by direct connection of screen, keyboard and mouse.

The CCU include single VGA port (can be used for external screen connection); three general purposes USB ports (can be used for keyboard and mouse connection).

Alternatively, the CCU can be controlled via a remote connection (using a computer running MTSVLink software) attached to the LAN connector on the CCU.

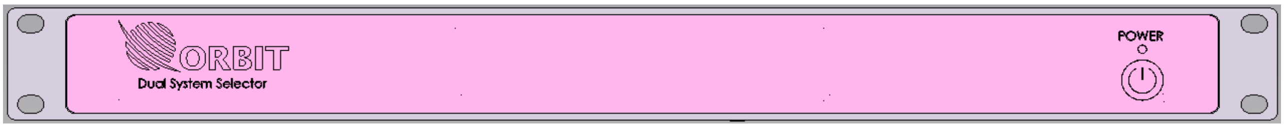
The CCU includes three general purposes LAN ports (can be used for external computer connection).

10.3.5 DSS General

The DUAL SYSTEM SELECTOR (DSS) is only used in dual system topology configuration. One system is connected to the CCU, and one system is connected to the DSS.

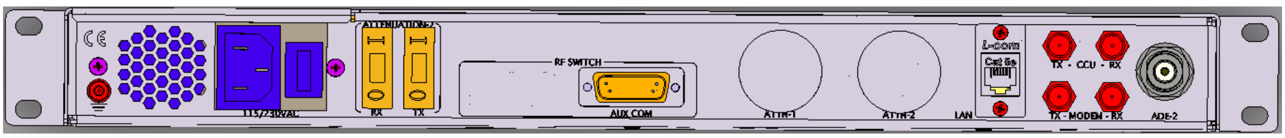
The following table describes the switch on the front panel of the DSS:

Interface	Type	Function
POWER	Soft Toggle Switch	Turns the power from the internal DSS power supply ON or OFF



The following table describes the connectors and switches on the rear panel of the DSS:

Interface	Type	Function
ADE2	N-Type	Connects to the ADE-BDE coaxial cable on the second system
CCU - RX	F-Type	Input, connects to the CCU RX port.
CCU - TX	F-Type	Output, connects to the CCU TX port.
MODEM - RX	F-Type	Output, connects to the CFE modem RX port.
MODEM - TX	F-Type	Input, connects to the CFE modem TX port in systems with a CCU WITHOUT 10MHZ and to the CCU AUX-IF2 port with a CCU WITH
LAN	RJ-45	Connects to one of the CCU LAN ports
RF SWITCH - AUX COM	D-Type (15-pin)	Connects to the CCU AUX COM port
POWER	Male	Connects to the mains AC power
POWER	SPDT Switch	Turns the power to the internal DSS power supply ON or OFF
ATTN-1	Knob	Raises or lowers attenuation of the first system (attached to the CCU) Tx signal in 1dB steps
ATTN-2	Knob	Raises or lowers attenuation of the second system (attached to the DSS) Tx signal in 1dB steps
ATTENUATION-2 RX	SPDT Switch	Turns Up-Link attenuation of the second ADE ON or OFF
ATTENUATION-2 TX	SPDT Switch	Turns Down-Link attenuation of the second ADE ON or OFF



10.3.6 OSS General

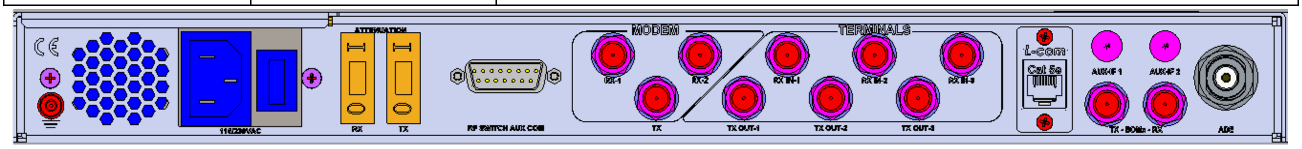
The ORBIT SYSTEM SELECTOR (OSS) is only used in dual system topology configuration. One system is connected to the CCU, and one system is connected to the OSS.

The following table describes the switch on the front panel of the OSS:

Interface	Type	Function
USB	USB	General purpose USB port
LAN	RJ-45	Connects to a CFE computer for remote access to the CCU
POWER	Soft Toggle Switch	Turns the power from the internal OSS power supply ON or OFF

The following table describes the connectors and switches on the rear panel of the OSS:

Interface	Type	Function
ADE-2	N-Type	Connects to the ADE-BDE coaxial cable on the second system
BDMx - TX	F-Type	Input, Up-Link path to the ADE-2.
BDMx - RX	F-Type	Output, Down-Link path from ADE-2.
MODEM – RX-1/Rx-2	F-Type	Output, connects to the CFE modem RX ports.
MODEM – TX	F-Type	Input, connects to the CFE modem TX port.
TERMINALS – RX-IN 1/2/3	F-Type	Input, Down-Link path from ADE-1, ADE-2 and ADE-3
TERMINALS – TX-IN 1/2/3	F-Type	Output, Up-Link path to ADE-1, ADE-2 and ADE-3
LAN	RJ-45	Connects to one of the CCU LAN ports
RF SWITCH - AUX COM	D-Type (15-pin)	Connects to the CCU AUX COM port
POWER	Male	Connects to the mains AC power
POWER	SPDT Switch	Turns the power to the internal DSS power supply ON or OFF
ATTENUATION-2 RX	SPDT Switch	Turns Up-Link attenuation of the second ADE ON or OFF
ATTENUATION-2 TX	SPDT Switch	Turns Down-Link attenuation of the second ADE ON or OFF



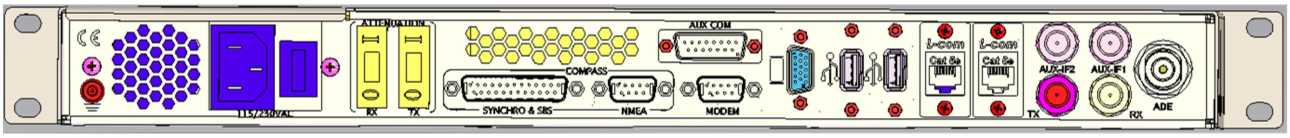
10.4 OceanTRx™ BDE Single System Topology

Follows the pre-installation BDE Physical and Power Requirements section, the following section describes in details the ADE, BDE and Modem IFL connection.

According to the specific system configuration/topology, some of the connection should be connected and some should be left un-connected as described in the next section.

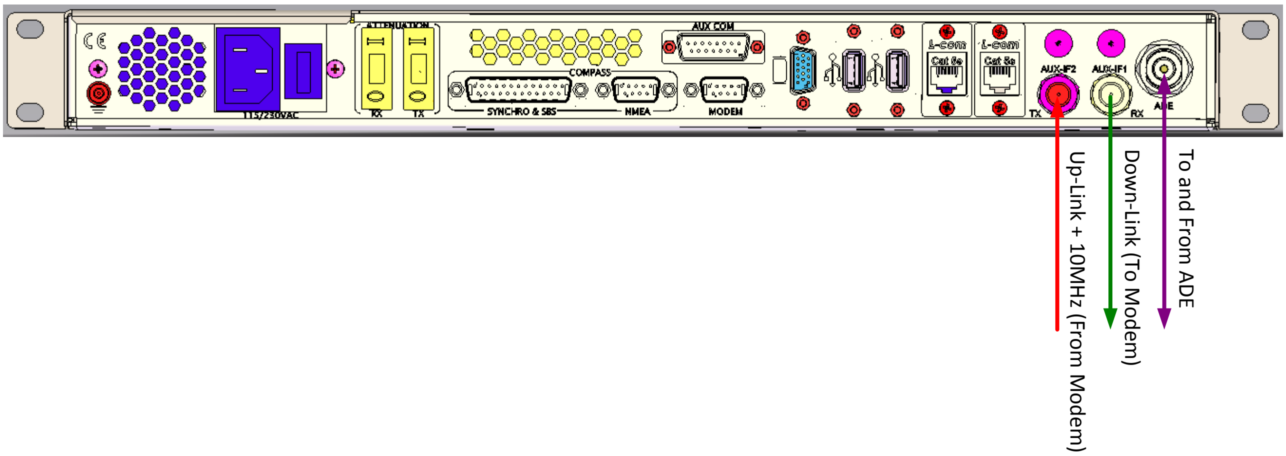
The following table describes the connectors and switches on the rear panel of the CCU (IFL related):

Interface	Type	Function
ADE	N-Type	Connects to the ADE-BDE coaxial cable
AUX-IF1	F-Type	Input, connects to the CFE modem TX port when using a CCU with 10MHz.
AUX-IF2	F-Type	Output, connects to the CCU TX port when using a CCU with 10MHz.
RX	F-Type	Output, connects to the CFE modem RX port
TX	F-Type	Input, connects to the CFE modem TX port when using a CCU without 10MHz.
AUX COM	D-Type (15-pin)	Connects to the DSS, for dual system configurations only.
ATTENUATION RX	SPDT Switch	Turns Down-Link attenuation ON or OFF
ATTENUATION TX	SPDT Switch	Turns Up-Link attenuation ON or OFF

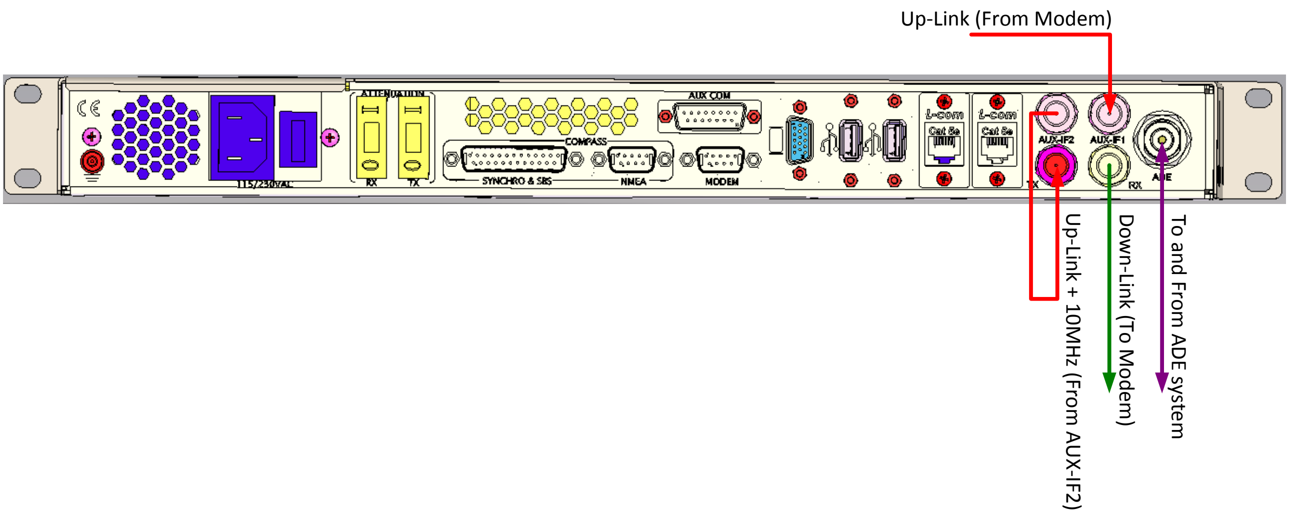


The following pictures illustrate the ADE, BDE and Modem IFL Cable connection for a single system topology:

In case of using the 10MHz Signal reference from the Modem Up-Link (Tx) port, the following connection set up can be used:



In case that the 10MHz Signal reference is not supplied from the Modem Up-Link (Tx) port, the following connection set up can be used:



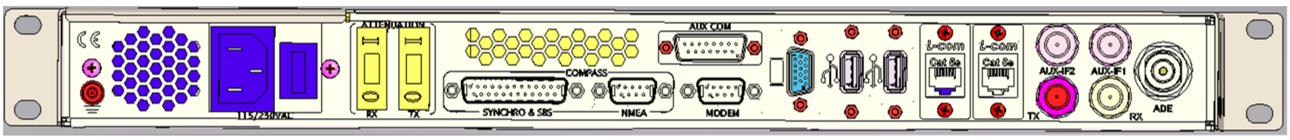
10.5 OceanTRx™ BDE Dual System Topology

Follows the pre-installation BDE Physical and Power Requirements section, the following section describes in details the ADE, BDE and Modem IFL connection.

According to the specific system configuration/topology, some of the connection should be connected and some should be left un-connected as described in the next section.

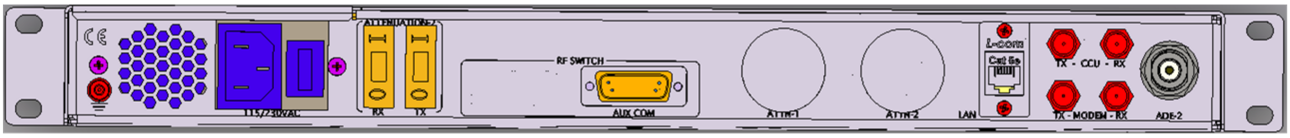
The following table describes the connectors and switches on the rear panel of the CCU (IFL related):

Interface	Type	Function
ADE	N-Type	Connects to the ADE-BDE coaxial cable
LAN (2 ports)	RJ-45	General purpose Ethernet ports
AUX-IF1	F-Type	Input, connects to the CFE modem TX port when using a CCU with 10MHz.
AUX-IF2	F-Type	Output, connects to the CCU TX port when using a CCU with 10MHz.
RX	F-Type	Output, connects to the CFE modem RX port
TX	F-Type	Input, connects to the CFE modem TX port when using a CCU without 10MHz.
AUX COM	D-Type (15-pin)	Connects to the DSS, for dual system configurations only.
ATTENUATION RX	SPDT Switch	Turns Down-Link attenuation ON or OFF
ATTENUATION TX	SPDT Switch	Turns Up-Link attenuation ON or OFF



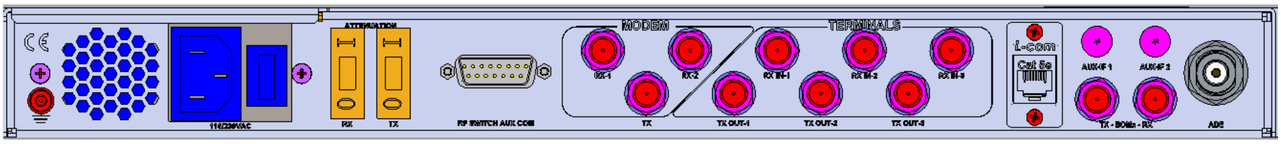
The following table describes the connectors and switches on the rear panel of the DSS (IFL related):

Interface	Type	Function
ADE2	N-Type	Connects to the ADE-BDE coaxial cable on the second system
CCU - RX	F-Type	Input, connects to the CCU RX port.
CCU - TX	F-Type	Output, connects to the CCU TX port.
MODEM - RX	F-Type	Output, connects to the CFE modem RX port.
MODEM - TX	F-Type	Input, connects to the CFE modem TX port in systems with a CCU without 10MHz and to the CCU AUX-IF2 port with a CCU with
LAN	RJ-45	Connects to one of the CCU LAN ports
RF SWITCH - AUX COM	D-Type (15-pin)	Connects to the CCU AUX COM port
ATTN-1	Knob	Raises or lowers attenuation of the first system (attached to the CCU) Tx signal in 1dB steps
ATTN-2	Knob	Raises or lowers attenuation of the second system (attached to the DSS) Tx signal in 1dB steps
ATTENUATION-2 RX	SPDT Switch	Turns Rx attenuation of the second system ON or OFF
ATTENUATION-2 TX	SPDT Switch	Turns Tx attenuation of the second system ON or OFF



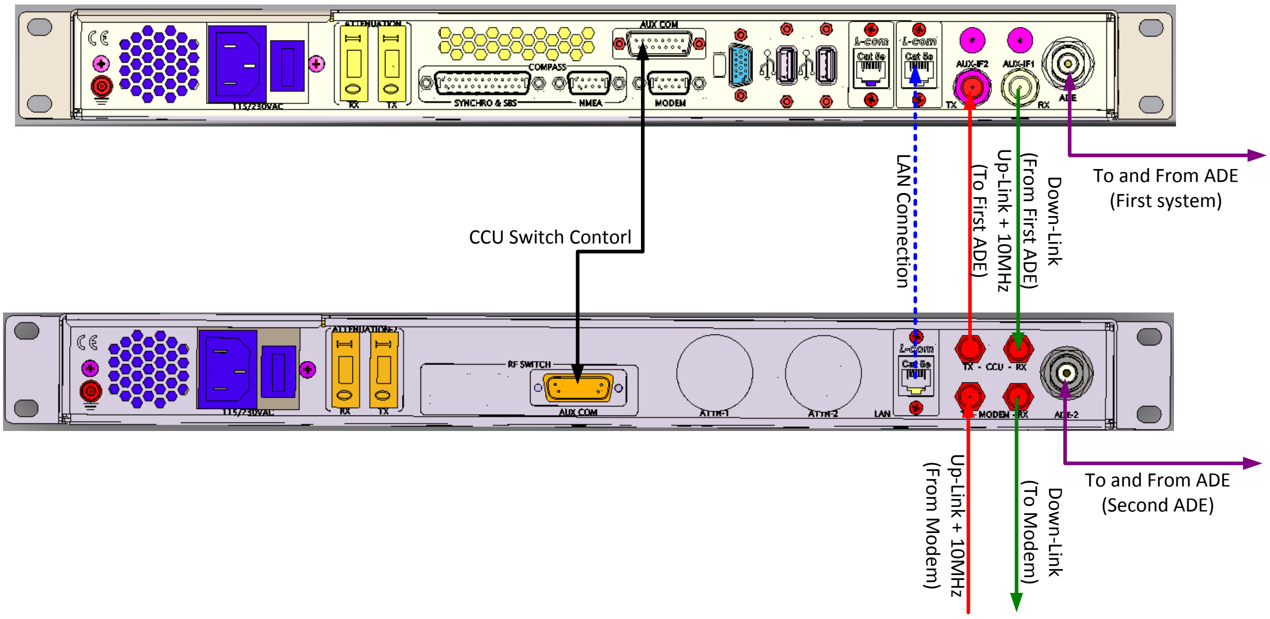
The following table describes the connectors and switches on the rear panel of the OSS (IFL related):

Interface	Type	Function
ADE-2	N-Type	Connects to the ADE-BDE coaxial cable on the second system
BDMx - TX	F-Type	Input, Up-Link path to the ADE-2.
BDMx - RX	F-Type	Output, Down-Link path from ADE-2.
MODEM – RX-1/Rx-2	F-Type	Output, connects to the CFE modem RX ports.
MODEM – TX	F-Type	Input, connects to the CFE modem TX port.
TERMINALS – RX-IN 1/2/3	F-Type	Input, Down-Link path from ADE-1, ADE-2 and ADE-3
TERMINALS – TX-IN 1/2/3	F-Type	Output, Up-Link path to ADE-1, ADE-2 and ADE-3
LAN	RJ-45	Connects to one of the CCU LAN ports
RF SWITCH - AUX COM	D-Type (15-pin)	Connects to the CCU AUX COM port
ATTENUATION-2 RX	SPDT Switch	Turns Up-Link attenuation of the second ADE ON or OFF
ATTENUATION-2 TX	SPDT Switch	Turns Down-Link attenuation of the second ADE ON or OFF

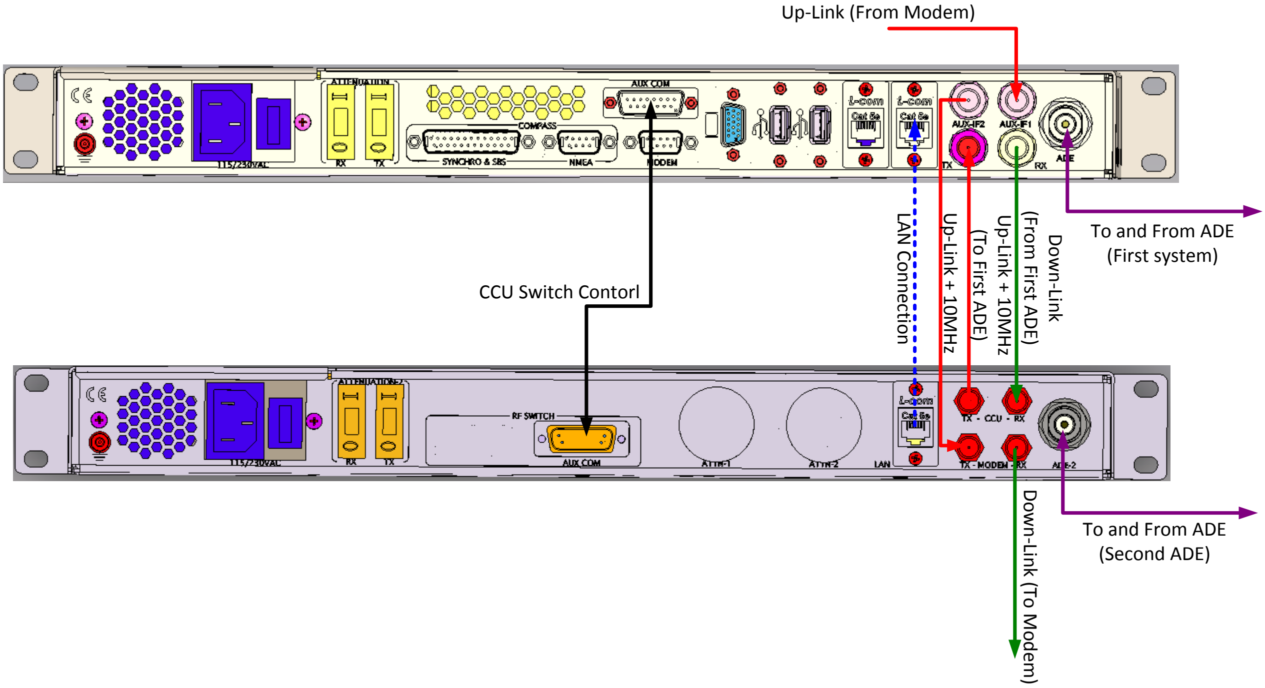


The following pictures illustrate the ADE, BDE and Modem IFL Cable connection and LAN connection for a Dual system topology.

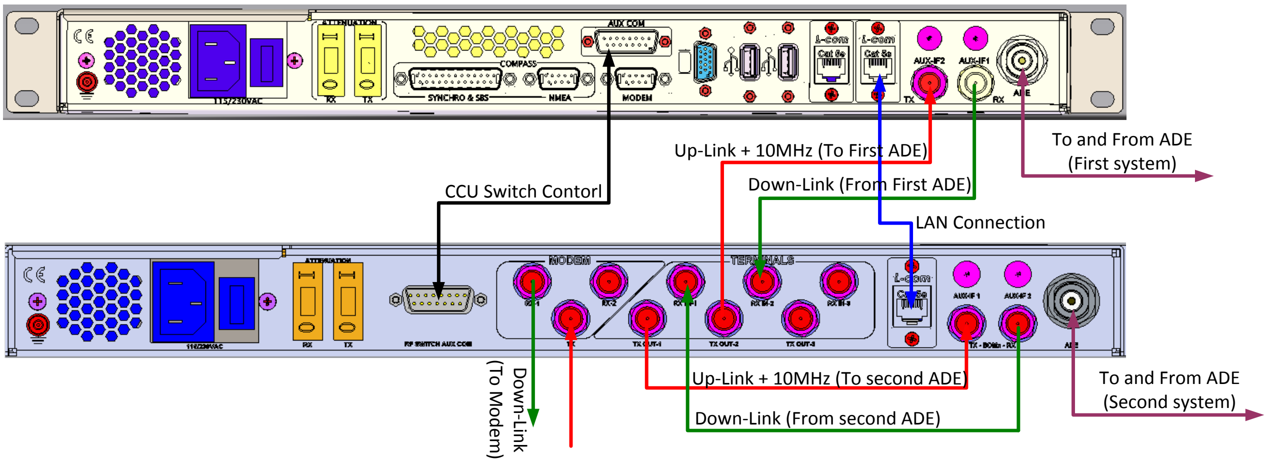
For Dual System Selector (DSS) configuration, In case of using the 10MHz Signal reference from the Modem Up-Link (Tx) port, the following connection set up can be used:



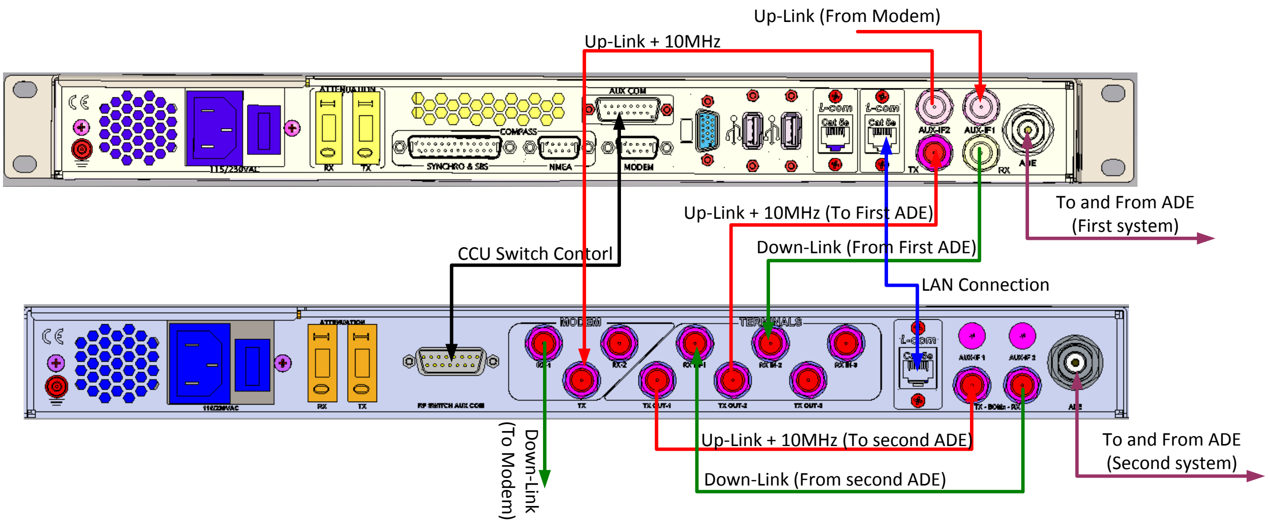
For Dual System Selector (DSS) configuration, In case that the 10MHz Signal reference is not supplied from the Modem Up-Link (Tx) port, the following connection set up can be used:



For Orbit System Selector (OSS) configuration, In case of using the 10MHz Signal reference from the Modem Up-Link (Tx) port, the following connection set up can be used:



For Orbit System Selector (OSS) configuration, In case that the 10MHz Signal reference is not supplied from the Modem Up-Link (Tx) port, the following connection set up can be used:



11 OceanTRx^{TM} System Commissioning

11.1 OceanTRx^{TM} System Commissioning

Follows the ADE and BDE installation, this section describe in details the complete system commissioning. According to the specific system configuration/topology, some of the commissioning steps are required as described in the next section.

The procedures below are described in their recommender order for implementation.

- The OceanTRx^{TM} System is preconfigured and tested before it is shipped. Tampering with any of the system settings that are not explicitly mentioned in this manual can impair the functioning of the system.
- For MTSVLink setup procedures, make sure to save the changes by pressing [V] on the keyboard (when accessing the Main Operations screen).

The commissioning procedure consists of the following steps:

- Power-ON
- CCU Management Applications Initialization (Single and Dual Topology)
- LAN Connection (Single and Dual Topology)
- Satellite Database Configuration
- Compass Configuration
- Polarization Offset
- Satellite Acquisition – Receive Only
- Blockage zones Configuration
- BUC Selection and Cease Transmit Configuration
- Satellite Acquisition – Transmit and Receive

11.2 Power-on

11.2.1 Verify Cables Connection

Verify the following:

- All power cables and ground cables are routed and connected securely.
- Verify that the power and LMR cables inside the Radome are routed properly and secured - otherwise, they may be pulled and damaged as the antenna continuously repositions itself.

11.2.2 Power ON

Power-on the following (recommended order):

- Verify the ADE(antenna) power switch is OFF
- Verify that the UPS and circuit breakers for the ADE and BDE are switched ON.
- Power ON the BDE: CCU, DSS/OSS - this allows monitoring the ADE as the ADE is powered-ON. Verify the power LED for each unit is ON.
- Power ON the ADE

WARNING!! Do NOT enter the Radome to power ON the ADE.
Reach into the ADE Radome through the SIDE or BOTTOM HATCH and set the power switch located on the antenna POWER BOX to ON.

Verify the ADE Antenna completes the initialization procedure for all axes; at the completion of the initialization procedure, each axis is set to its zero position.

11.3 CCU Management Applications Initialization

Note

- The OceanTRx™ System is preconfigured and tested before it is shipped. Tampering with any of the system settings that are not explicitly mentioned in this manual can impair the functioning of the system.
- In case of Dual System Topology, the system (CCU) is preconfigured to support such a configuration.

11.3.1 CCU Operation System

The CCU support two kinds of Windows operation systems: Windows CE and Windows Embedded.

According to the System Topology and architecture, the CCU operation system may differ.

The following manual instruction and procedure cover both operation systems.

11.3.2 CCU, Windows CE Working Set

The CCU, Windows CE based, can setup to work in both Single or Dual system topology. The appropriate Working Set should be configured as follows:

➔ **To change CCU working set (Single of Dual):**

STEP 1: After CCU start up, Right click on the CCU Manager icon located on the icon bar (right side). The menu will appear.

STEP 2: Click on the **Working Set…** and select **Single** or **Dual** according to the system topology. The CCU will automatically reboot after the selection of the new working set.

11.3.3 Application Startup

According to the System Topology, after powering on the CCU, verify that the following Management Applications run on the CCU Task Bar:

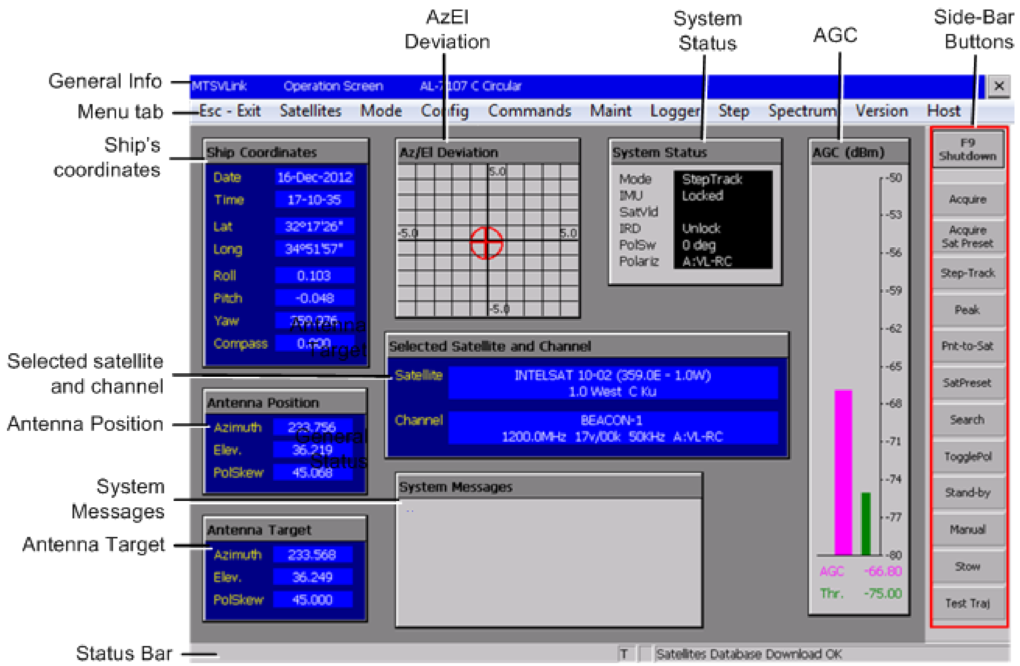
- MTSVLink application - one instance per ADE.
- CCU Manager (the M icon presented in the tool bar)
- Dual Antenna Operation application (DAO, For Dual System configuration only).

Note

Other applications may be running in the background as well. Do not close any application - they may be required for system operation.

Each MTSVLink instance should display:

- Data values of the relevant parameters - indicating communication with the corresponding ADE.
- Connected status in the MTSVLink status bar.



11.4 LAN Connection

The CCU and each ADE antenna (i.e. each antenna's ACU – Antenna Controller Unit) are supplied with the following factory defined default IP addresses:

- **CCU =** 192.9.200.22, 192.9.200.23
- **ACU =** 192.9.200.10, 192.9.200.11, 192.9.200.12

However, if necessary, the IP Addresses for the CCU and for the ACUs can be modified using the **MtsDock** application (installed on the CCU).

Note

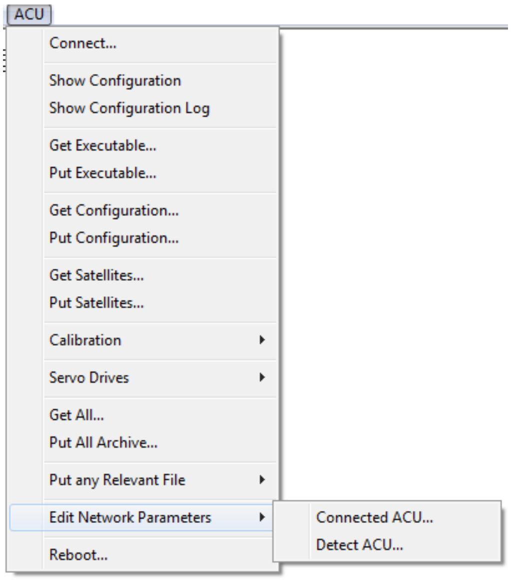
For Dual System topology, this procedure STEPs should be done on both ADE Antennas.

11.4.1 Detect and Configure the IP Addresses of the ACUs

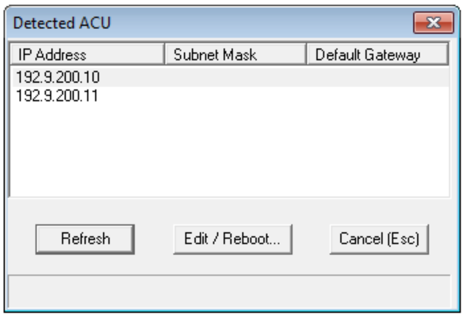
WARNING!! During this process, the antenna whose IP Address is modified will stop tracking the satellite and may automatically undergo an initialization process.

➔ **To detect and configure the IP Address of the ACU:**

STEP 3: Launch the **MtsDock** application on the CCU (**Start/Programs/MtsDock**) and choose the **ACU** menu. The following window appears.

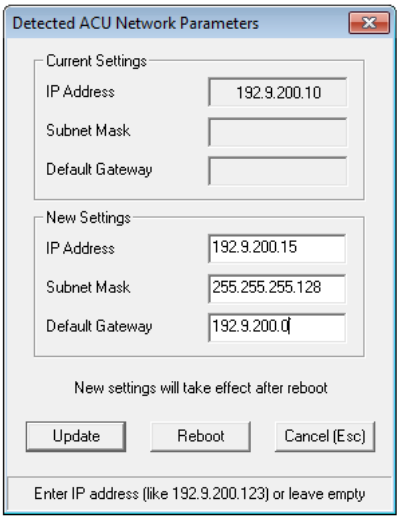


STEP 4: Select **Edit Network Parameters** and choose **Detect ACU**. The Detect ACU dialog appears, listing the IP Addresses of all ACUs connected to the CCU.



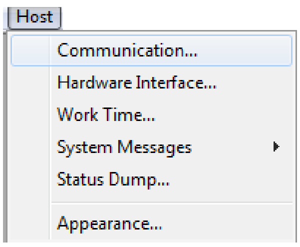
STEP 5: Click the **Edit / Reboot** button.

STEP 6: In the displayed dialog, enter New Settings parameters and click **Update**.

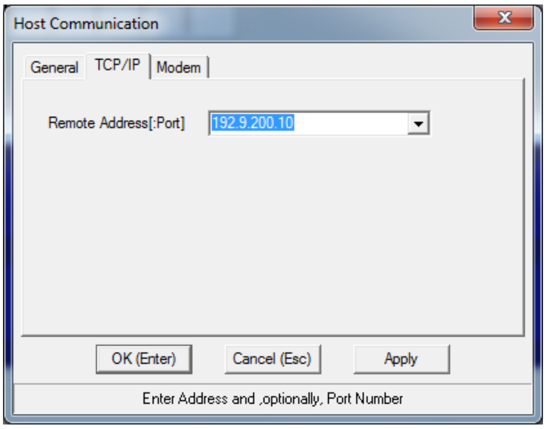


STEP 7: Click **Reboot.** Confirm reboot command by selecting OK. The *selected* ACU (whose address was modified) will reboot. This address will now be associated with this ACU.

STEP 8: Associate the new ACU IP Address with the relevant MTSVLink instance. Open the MTSVLink application, select the **Host** drop-menu, and choose **Communication.**



STEP 9: To configure the IP address of the relevant ACU, Click the **TCP/IP** tab.



STEP 10: Enter the IP Address (previously defined via the MtsDock) and Click **OK.** This MTSVLink instance is now associated with the specific ACU.

Note

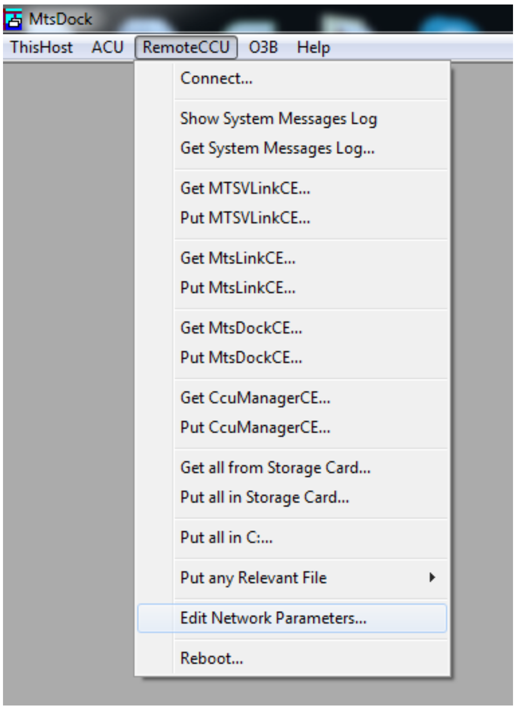
For Dual System topology, the above procedure should be repeated for each antenna ACU.

11.4.2 Detect and Configure the IP Addresses of the CCUs

Note This operation is performed using the MtsDock application.

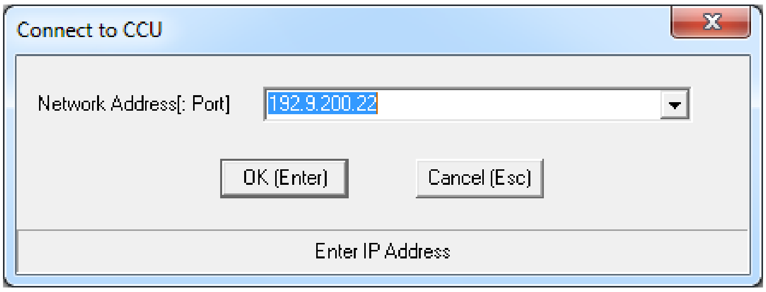
➔ **To detect configure the IP address of the CCU**

STEP 1: Launch the **MtsDock** application on the CCU (**Start/Programs/MtsDock**) and choose the **RemoteCCU** menu.

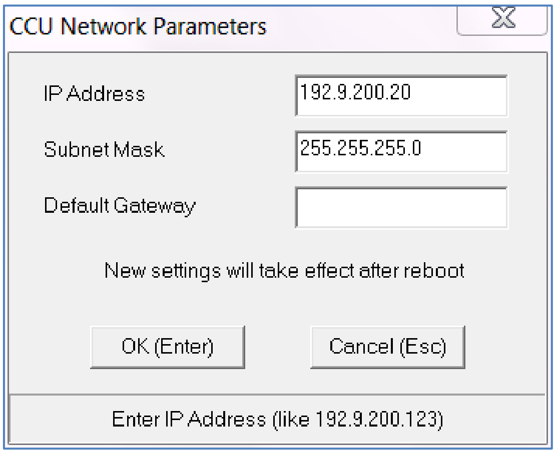


STEP 2: From the **RemoteCCU** menu, Select **Connect**.

STEP 3: In the displayed dialog, enter the *current* IP Address of the CCU (default CCU IP Address = 192.9.200.22 or 192.9.200.23) and click **OK.**



STEP 4: From the **RemoteCCU** menu, Select Edit Network Parameters.



STEP 5: Configure the required network parameters and click OK.

STEP 6: Select the RemoteCCU menu (again) and click Reboot. The CCU will reboot to the new IP Address.

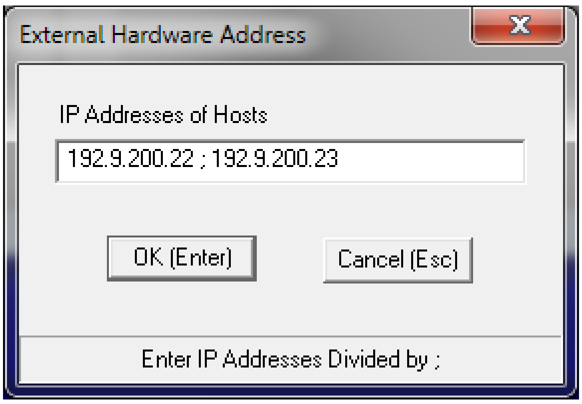
11.4.3 Configure the External Hardware IP Address

It is required to update the ACUs with the modified IP Address of the CCU.

➔ **To associate each ACU with the modified address of the CCU**

STEP 1: Select the **Config** menu and choose **External Hardware IP**.

STEP 2: Enter the CCU and the Modem IP addresses - separated by a semi-colon (;) and click **OK**.

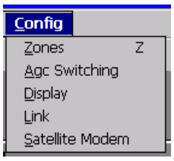


11.4.4 Configure the IP Address for Dual System Topology

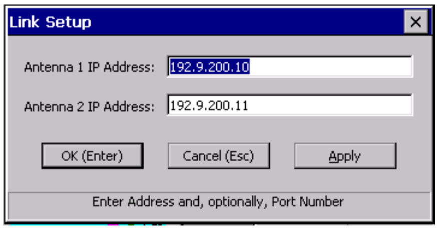
For a Dual System Topology, it is required to associate both ADE Antenna IP Addresses with the DAOLink application.

➔ **To associate each DAOLink with the IP address of the ACU**

STEP 1: From the DAOLink application, Select the **Config** menu and choose **Link**, the **Link Setup** dialog box appears.



STEP 2: Enter the ADE Antenna ACU IP addresses and click **OK**.



11.5 Satellite Database Configuration

The OceanTRx™ system includes **Satellites Database** containing the list of available satellites and their tracking data. For each satellite, following information for one or more channels is defined:

- Tracking frequency
- Satellite polarization offset
- NBR IF bandwidth
- LNB voltage
- Polarization

The system uses this data to acquire the satellite when selected from the **Satellites** screen or upon activation of the **Acquire** mode.

Note For Dual System topology, this procedure STEPs should be done on both of the ADE Antennas (MTSVLink application).

11.5.1 View and Load Satellite Database

A satellite database can be loaded from the ACU or from a locally stored file. In addition, automatic loading can be configured.

➔ **To View and Load the Satellite Database:**

STEP 1: From the **Operation Screen**, click the **Satellite** command on the Menu Bar. The **Satellites** dialog box appears, displaying the satellites defined in the database.

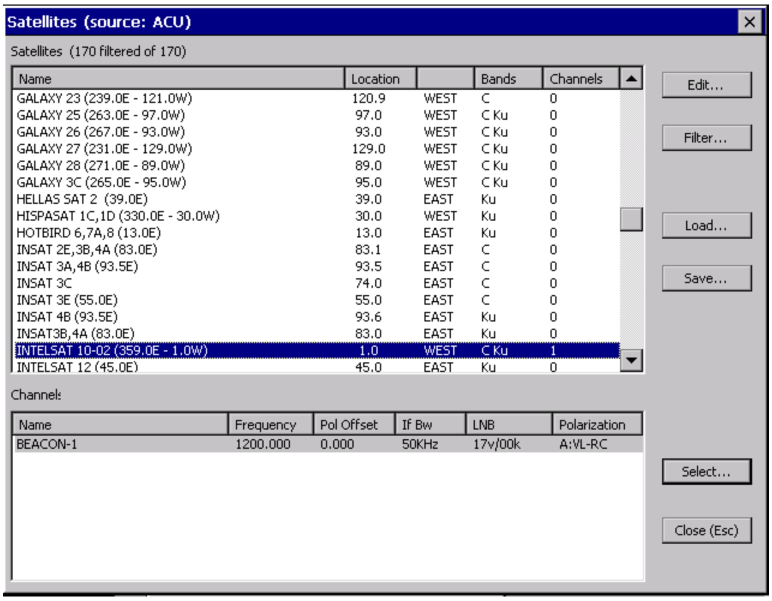


Figure 11.5-1: GEO Satellites Database window

Using the **Filter**… button, The Satellite Database can be sorted and filtered by the Elevation angles and Bands.

STEP 2: If the satellite database is empty, load a database using the **Load…** button and select the required loading source.

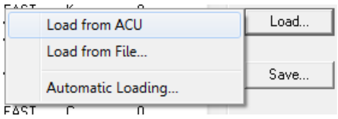


Figure 11.5-2: Load Database menu

The Satellite can be loaded from the ADE Antenna ACU (Default Satellite Database information) or from external file.

Note

The satellite Database file format should be kept for proper loading from file operation. For further information, please contact Orbit service group: supportgroup@orbit-cs.com

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STEP 3: For Satellite Database automatic loading, use the **Load…** button and select **Automatic Loading…** The **Satellites Database Automatic Loading** dialog box appears.

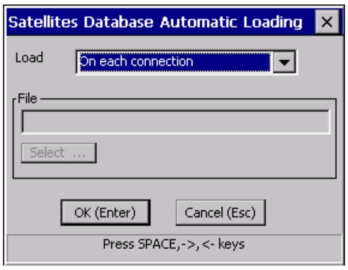


Figure 11.5-3: Satellites Database Automatic Loading window

STEP 4: Select an automatic loading action, The available automatic loading actions include:

- **Don't load automatically** – No database is loaded automatically (Default setting).
- **On first connection** – The database in the ACU is loaded automatically the first time the ACU connects to the CCU after the system powers up.
- **On each connection** – The database in the ACU is loaded automatically every time the ACU connects to the CCU.
- **On first Satellite Window opening** – The database in the ACU is loaded automatically the first time the Satellites dialog box is opened after the system powers up.
- **On start from file** – The database in the specified file is loaded automatically when the system powers up (Selection of the database file is required).

STEP 5: Click **OK (Enter)** and save the new system configuration **using [V]** on the Operation Screen.

11.5.2 Add, Edit and Delete Satellite

➔ **To add a satellite to the database:**

STEP 1: From the **Satellites** dialog box, click **Edit** and select **Add Satellite**. The **Add Satellite** dialog box appears:

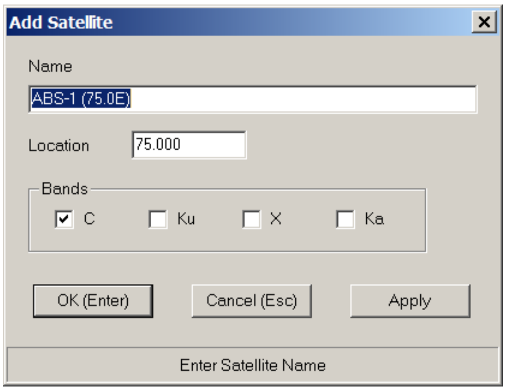


Figure 11.5-4: Add Satellite Dialog Box

STEP 2: Enter a name for the satellite in the **Name** field.

STEP 3: Enter a location for the satellite in the **Location** field.

STEP 4: Select the bands with which the satellite communicates.

STEP 5: Click **Apply**. The satellite is added to the database OR Click **OK (Enter)**. The satellite is added to the database and the **Add Satellite** dialog box closes.

➔ **To edit satellite data in the database:**

STEP 1: From the **Satellites** dialog box, select a satellite from the list of satellites.

STEP 2: Click **Edit** and select **Edit Satellite**. The **Edit Satellite** dialog box appears with the satellite configuration.

STEP 3: Edit the satellite configuration.

STEP 4: Click **Apply**. The satellite data is modified in the database OR Click **OK (Enter)**. The satellite data is modified in the database and the **Edit Satellite** dialog box closes.

➔ **To delete a satellite from the database:**

STEP 1: From the **Satellites** dialog box, select one or more satellites from the list of satellites.

STEP 2: Click **Edit** and select **Delete Satellites**. A confirmation dialog box appears.

STEP 3: Click **Yes**. The selected satellites are deleted from the database.

11.5.3 Add, Edit and Delete Channel

➔ **To add a channel to a satellite in the database:**

STEP 1: From the **Satellites** dialog box, select a satellite from the list of satellites.

STEP 2: Click **Edit** and select **Add Channel**. The **Add Channel** dialog box appears:

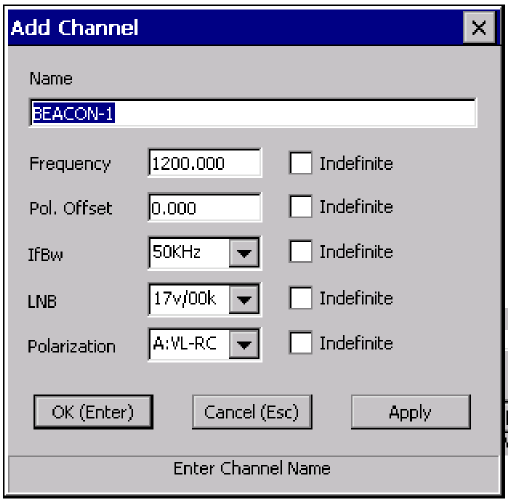


Figure 11.5-5: Add Channel Dialog Box

STEP 3: Enter a name for the channel in the **Name** field.

STEP 4: Enter a frequency for the channel in the **Frequency** field.

STEP 5: Enter a polarization offset for the channel in the **Pol. Offset** field.

STEP 6: Enter an interface bandwidth for the channel in the **IfBw** field.

STEP 7: Enter a LNB voltage for the channel in the **LNB** field.

STEP 8: Enter the polarization for the channel in the **Polarization** field.

STEP 9: Click **Apply**. The channel is added to the database OR Click **OK (Enter)**. The channel is added to the database and the **Add Channel** dialog box closes.

➔ **To edit channel data in the database:**

STEP 1: From the **Satellites** dialog box, select a channel from the list of channels.

STEP 2: Click **Edit** and select **Edit Channel**. The **Edit Channel** dialog box appears with the channel configuration.

STEP 3: Edit the channel configuration.

STEP 4: Click **Apply**. The channel data is modified in the database OR Click **OK (Enter)**. The channel data is modified in the database and the **Edit Channel** dialog box closes.

➔ **To delete a channel from the database:**

STEP 1: From the **Satellites** dialog box, select one or more channels from the list of channels.

STEP 2: Click **Edit** and select **Delete Channels**. A confirmation dialog box appears.

STEP 3: Click **Yes**. The selected channels are deleted from the database.

11.5.4 Save the Satellite Database

Note The satellite database can be saved to the ACU or to a local file. If the database is not saved, any changes to the database will be lost after the system is rebooted.

➔ **To save the satellite database to the ACU:**

STEP 1: From the **Satellites** dialog box, click **Save** and select **Upload to Controller**. A confirmation dialog box appears.

STEP 2: The **Satellites Database Upload** dialog box appears displaying the progress of the upload to the ACU. When completed, the **Satellites Database Upload** dialog box closes.

➔ **To save the satellite database to a file:**

STEP 1: From the **Satellites** dialog box, click **Save** and select **Save in File**. A file browser appears.

STEP 2: Browse to the directory in which to save the database file.

STEP 3: Enter a name for the file in the **File name** field.

STEP 4: Click **Save**. The satellite database file is saved to the specified file.

11.5.5 Selecting Satellite from Database

➔ **To Select specific Satellite and Channel form the satellite database:**

STEP 1: From the **Operation Screen**, click the **Satellite** command on the Menu Bar. The **Satellites** dialog box appears, displaying the satellites in the database

STEP 2: Select the desired satellite and channel and click **Select**. A confirmation dialog box appears.

STEP 3: Click **OK (Enter)**. The selected satellite and channel appears in the **Selected Satellite and Channel** window on the **Operation Screen**.

Note

The Satellite will not be acquired yet, therefore a "Not Pointed" massage appears on the Selected Satelite and Channel window top bar.

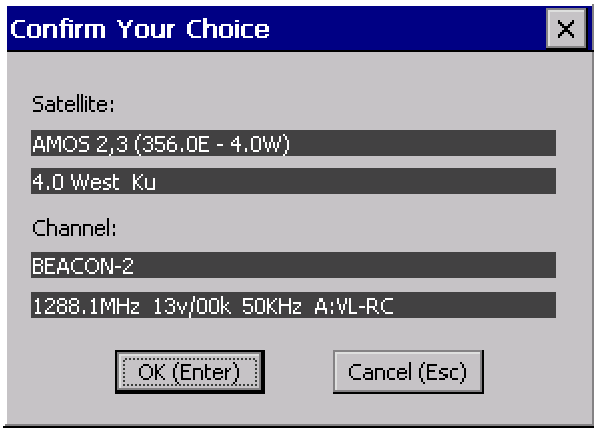


Figure 11.5-6: Selected Satellite and Channel Window

Note

For Dual System topology, the Satellite Database from first ADE antenna ACU can be saved (download) and the upload back to the second ADE antenna ACU.

11.6 Compass Configuration

Before you can begin running the OceanTRx™ system, you need to configure the Compass hardware and software interfaces to match ship's compass type and align the ADE antenna with the ship's heading.

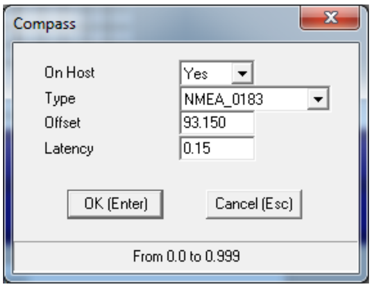
Note For Dual System topology, this procedure STEPs should be done on both of the ADE Antennas (MTSVLink application).

11.6.1 Compass Software Interface Configuration

The following section describes the ACU Compass software interface configuration including on Host (CCU), Compass Type, Compass Offset and Compass communication Latency.

➔ **To configure the Compass Software interface**

STEP 1: Using the MTSVLink, From the **Config** menu, select **Compass.** The **Compass** dialog box appears:



STEP 2: Validate the following default setting as follows:

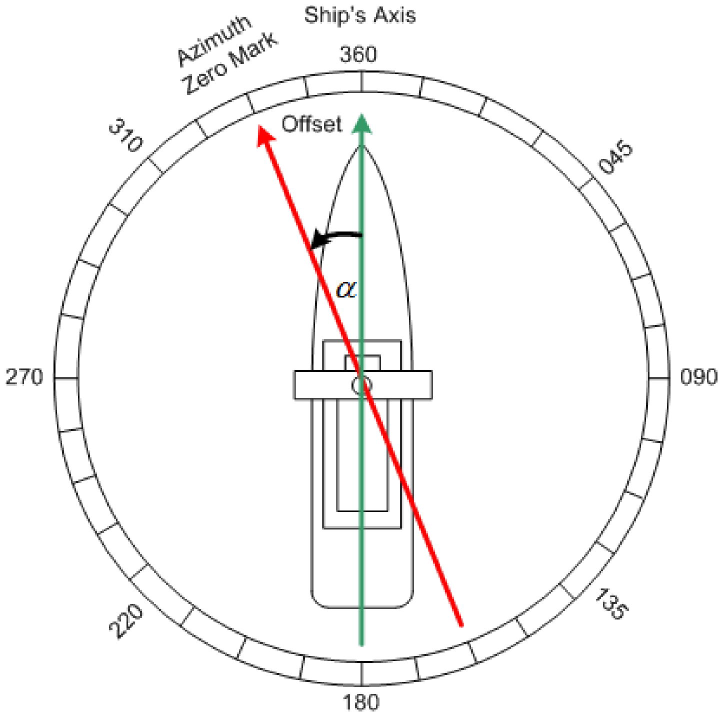
- Verify **On Host** field is set to **Yes**.
- Verify **Latency** = **0.15** seconds. Do not modify unless specific compass data latency is known.

STEP 3: Configure the appropriate compass interface type, The system supports the following interface types:

- **SYNCHRO**:
  - **SYNCHRO_1_1**: 1° of ship rotation corresponds to a 1° displacement of the compass readout.
  - **SYNCHRO_360_1**: 1° of ship rotation corresponds to a 360°displacement of the compass readout.
  - **SYNCHRO_180_1**: 1° of ship rotation corresponds to a 180°displacement of the compass readout.
  - **SYNCHRO_36_1**: 1° of ship rotation corresponds to a 36°displacement of the compass readout.
  - **SYNCHRO_60_1**: 1° of ship rotation corresponds to a 60°displacement of the compass readout.
  - **SYNCHRO_90_1**: 1° of ship rotation corresponds to a 90°displacement of the compass readout.
- **STEP_BY_STEP**
- **NMEA_0183**
- **PEDESTAL_Az**
- **OCTANS**

STEP 4: Make a 'naked-eye' rough estimate of the offset angle between the ship's bow-to-stern axis and the **system's azimuth zero mark**. Use the following syntax:

- Clockwise rotation from the ship's bow-to-stern = positive (+) values
- Counter-clockwise from the ship's bow-to-stern = negative (-) values
- For example, in the following figure, an appropriate estimate would be (-30°).



STEP 5: Enter a preliminary compass **Offset** value. (This will be updated during the Compass Offset procedure).

STEP 6: Click **OK (Enter)** and save the new system configuration **using [V]** on the Operation Screen.

Note

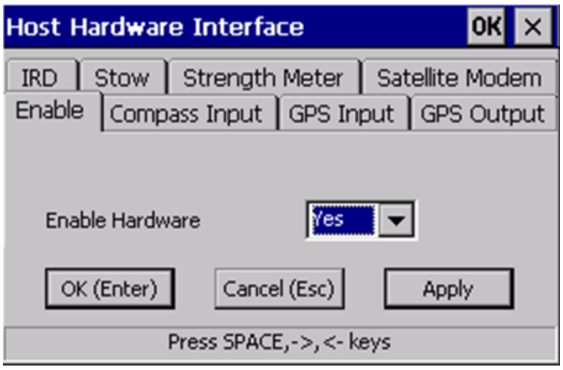
- Compass offset is the angle between the OceanTRx^{TM} ADE Antenna Azimuth Zero mark and the Ship's Bow-to-Stern axis.
- Since the system installation does not call for any specific Azimuth direction, the Compass Offset must be introduced and saved in the System ACU.
- The Azimuth Zero mark is physically shown by the arrow on the IMU unit, located on the antenna (inside the radome) as well on the base ring.
- For the preliminary compass offset value, perform a naked-eye estimation of the compass offset value

11.6.2 Compass Hardware Interface Configuration

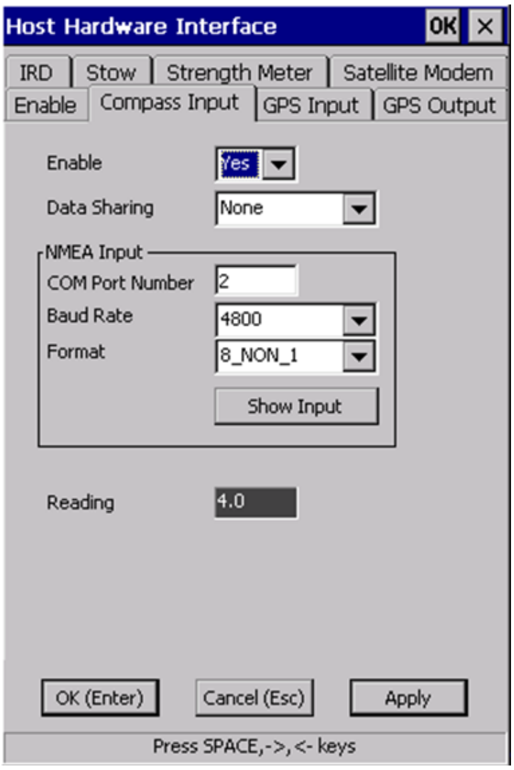
The following section describes the CCU Compass hardware interface configuration including Baud Rate and communication Format.

➔ **To configure the Compass Hardware interface**

STEP 1: Using the MTSVLink, From the Host menu, select **Hardware Interface**, click the **Enable** tab and verify **Enable Hardware** is set to **Yes.** Click **Apply.**



STEP 2: Click the **Compass Input** tab.



STEP 3: Configure and Validate the following default setting as follows:

Note

Data Sharing parameter configuration is used for Dual/Triple topology system installations

- Verify that Enable is set to **Yes.**
- Under **Data Sharing**, set the following values:
  - For one of the MTSVLink (ACU), set as **Server**.
  - In case of Dual/Triple system topology, for the other MTSVLinks (ACU), set as **Client**.
- Verify that the **COM Port Number** is set to **2**.
- For NMEA Compass Only, Set **Baud Rate** according to compass baud rate (default 4800 bps).
- For NMEA Compass Only, Set **Format** according to compass communication format (default 8_NON_1).
- Click **Apply**.
- Verify that the Compass value appear in the **Reading field**.

STEP 4: Click **OK (Enter)** and save the new system configuration **using [V]** on the Operation Screen.

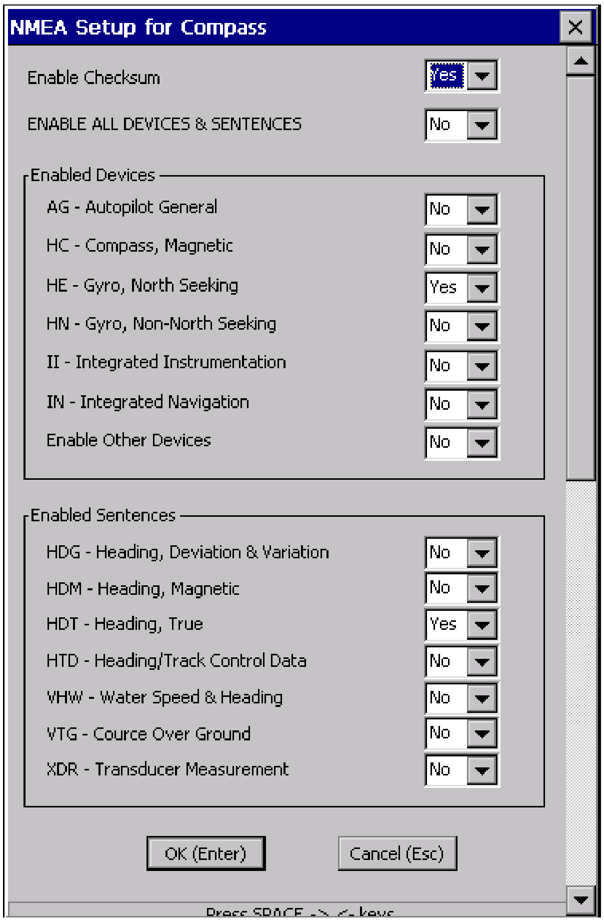
11.6.3 Compass NMEA-0183 Defaults Configuration

This procedure must be performed only when using an NMEA-0183 compass.

The following section describes the NMEA Compass communication protocol configuration (Telegram).

➔ **To configure NMEA-0183 compass defaults:**

STEP 1: Open the **Config** menu and select **Compass NMEA**. The **NMEA Setup for Compass** dialog box appears:



STEP 2: Configure and Validate the following default setting as follows:

- Make sure the **Enable Checksum** option is set to **Yes**.
- The following values are factory preconfigured, and should only be changed if the ship's compass uses a different NMEA telegram:
  - Under **Enabled Devices**, **HE – Gyro, North Seeking**
  - Under **Enabled Sentences**: **HDT – Heading, True**

STEP 3: Click **OK (Enter)** and save the new system configuration **using [V]** on the Operation Screen.

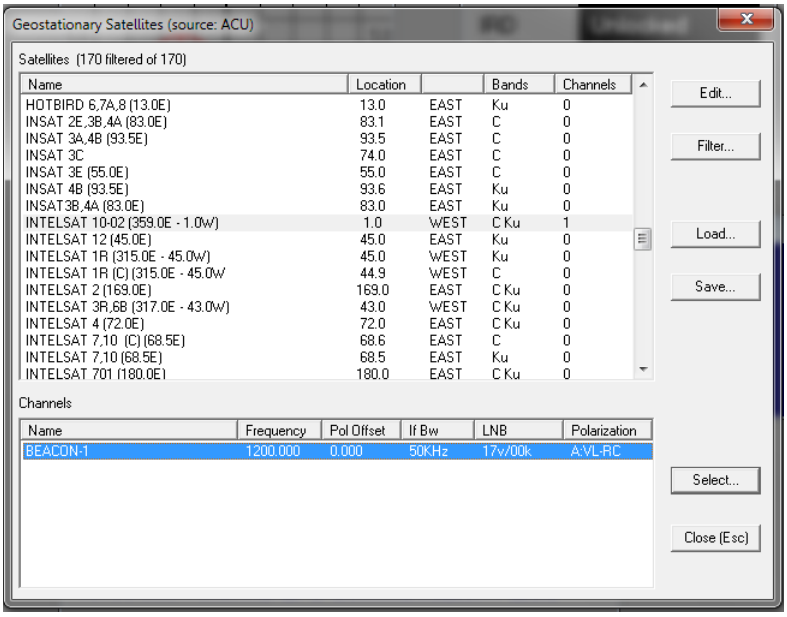
11.6.4 Compass Offset Configuration

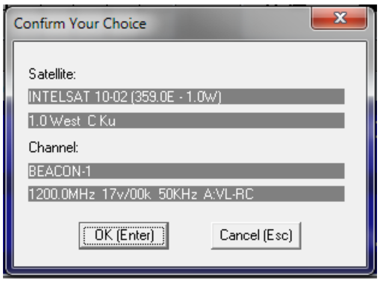
The following section describes the Compass offset configuration procedure.

➔ **To calibrate the Compass Offset.**

STEP 1: Open **Satellite** (GEO) and Select the desired Satellite and Satellite Channel (further information on the satellite data base can be found in the satellite data base section).

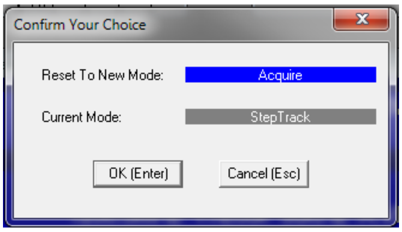
Press **Select…** and confirm your choice by clicking **OK (Enter)**





Note If needed, The required Satellite Channel parameters including LNBR Tracking Frequency, if BW, LNB Voltage and Polarization can be set manually.

STEP 2: Point the ADE toward the desired satellite by Open the **Mode** menu and select **Acquire**. Confirm your choice by clicking **OK (Enter)**.



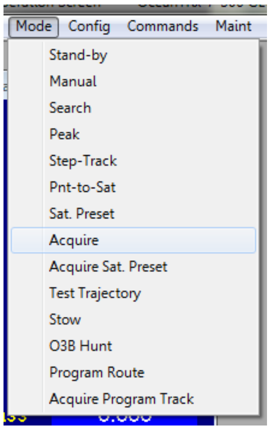


Figure 11.6-1: Setting the ADE Antenna to Acquire Mode

The **Acquire mode** functionality includes the following sub functions:

The ADE will point toward the desired satellite using **Pnt-to-Sat mode** according the pre-defined estimated Compass offset value and then automatically will move to **Step Track mode** to maximize the received signal level (AGC Signal).

If the desired satellite was not acquired (the AGC Signal level is below the defined AGC threshold, default value -75dBm) the ADE will automatically move to **Search mode** trying to search the desired satellite within the larger pre-define search sector.

In case a Satellite is not available, the **SUN Program Track** mode can be used. For using the Sun Program Track:

- The **System Type Constellation** should be set to **GEO.**
- The **Program Route** operation mode configuration should be set to **SUN**.
- The ADE should be set to **Acquire Program Track** mode

After the offset procedure has been completed, set the Program Route operation mode configuration back to **Satellite**. Failure to do so will cause the Solar Outage protection to be de-activated.

➔ **To set the ADE to SUN Program Track mode.**

STEP A: Validate that the System Type is set to **GEO** by open **Config** menu and select **System Type.**

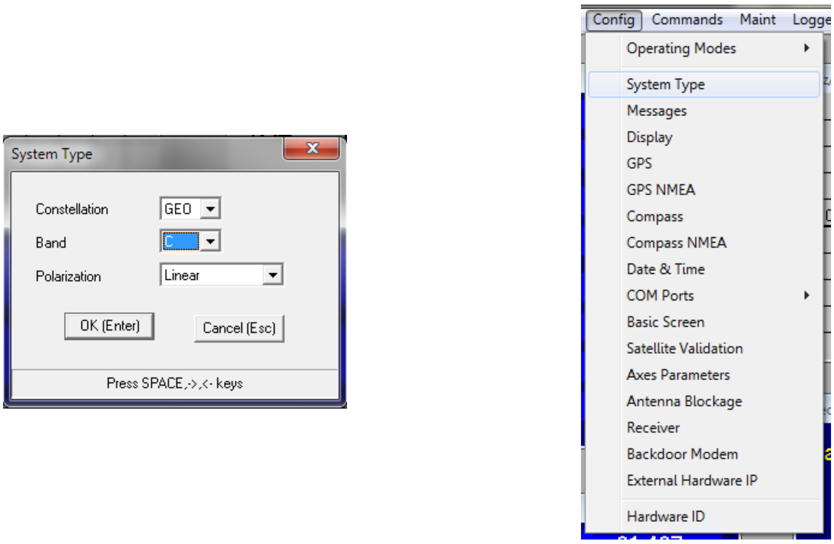


Figure 11.6-2: Setting the ADE Antenna System Type

Break

STEP B: Set the **Program Route** operation mode configuration to **SUN** by open **Config➔Operation Mode** menu and select **Program Route**

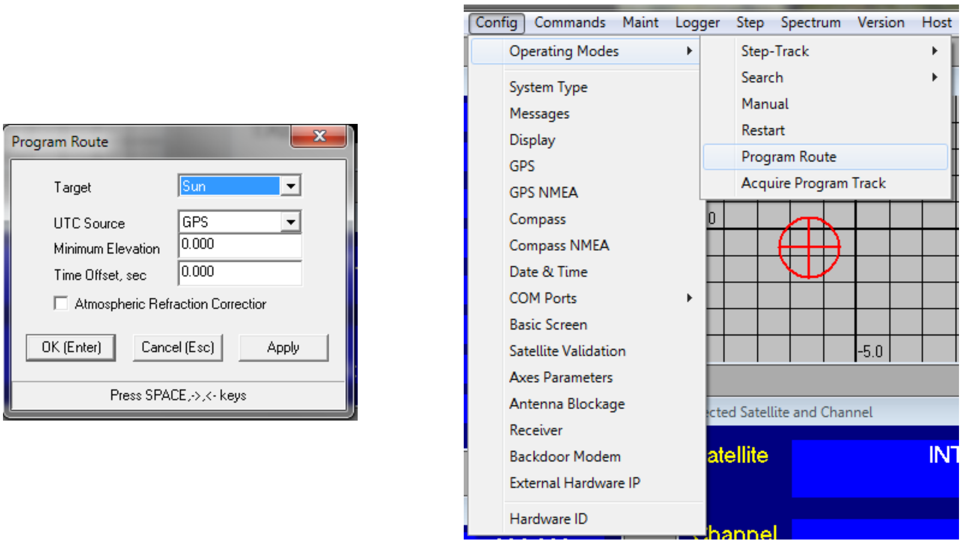


Figure 11.6-3: Setting the ADE Antenna Program Route Target to SUN

➔ **To set the ADE to SUN Program Track mode (Continue).**

STEP C: Point the ADE toward the **SUN** by Open the **Mode** menu and select **Acquire Program Track**. Confirm your choice by clicking **OK (Enter)**

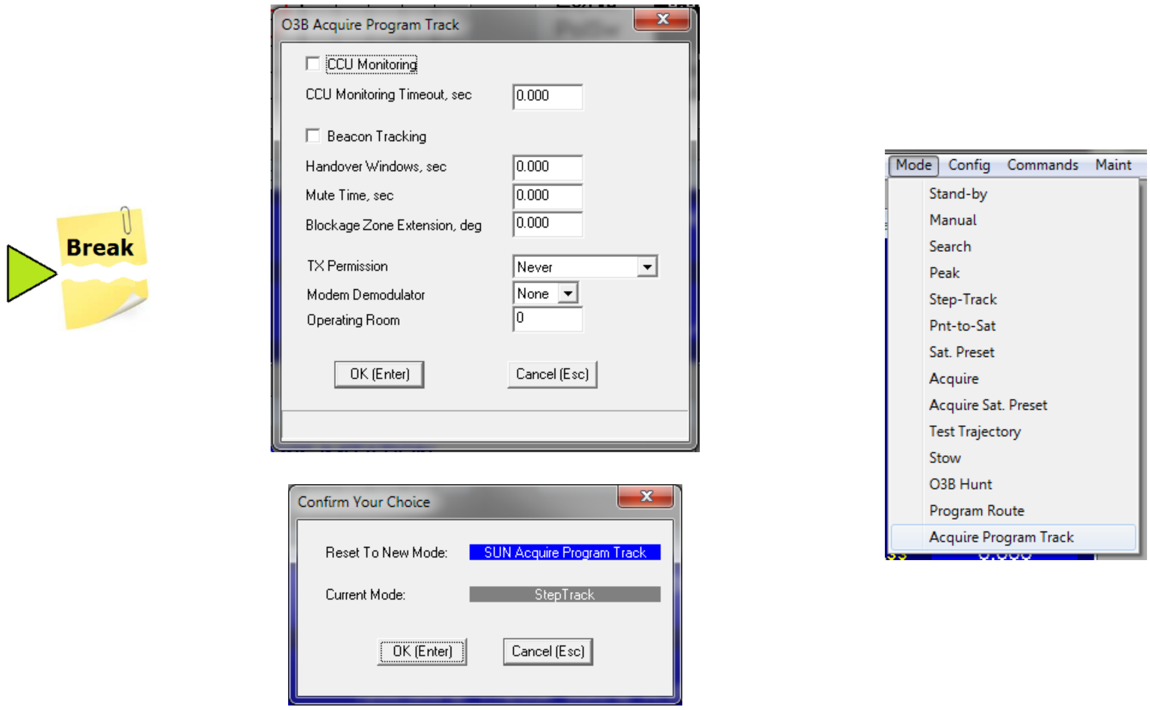


Figure 11.6-4:

STEP 3: In case that the automatic satellite acquisition was not successfully completed, manually search can be done.

Increment or decrement the antenna's azimuth orientation until it points to the satellite by open the **Mode** menu and select **Manual (Earth_Az_El mode)**. Confirm your choice by clicking **OK (Enter)**.

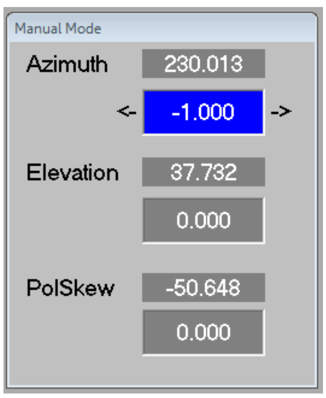


Figure 11.6-5:

Note

The required amount of movement depends on the accuracy of your initial Compass offset estimation (a typical estimate will fall within ±10°)

STEP 4: Once the satellite is acquired (AGC Signal received), set the ADE Antenna to **Step-Track Mode** by open the **Mode** menu and select **Step Track**. Confirm your choice by clicking **OK (Enter)**.

The following figure presents a typical AGC signal acquisition before compass offset adjustment. The azimuth deviation can be easily observed from the Az/El Deviation window where the Antenna Target shown as the BLACK axes grid lines and the Antenna Position (were the AGC received signal Peak was found) shown as the RED cursor.

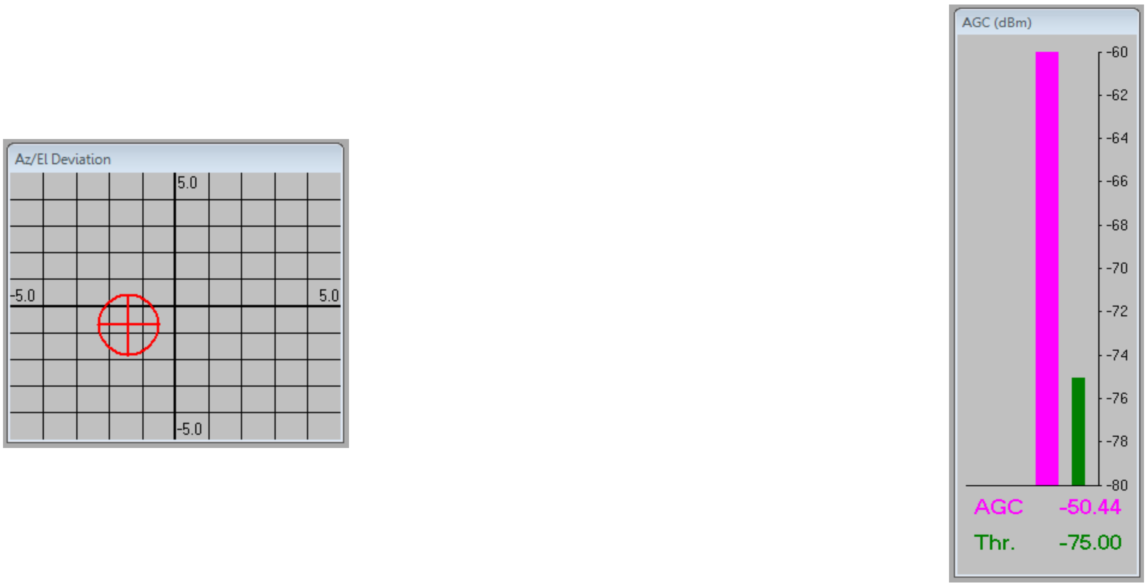
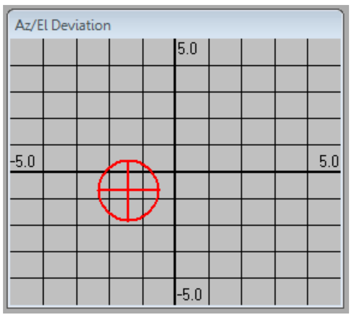


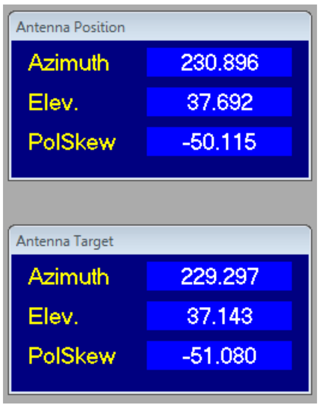
Figure 11.6-6: AGC Signal Acquired before Compass Offset adjustment

STEP 5: Determine the **azimuth deviation** and the required Compass offset adjustment value (from initial Compass offset estimation), using one of the following methods:

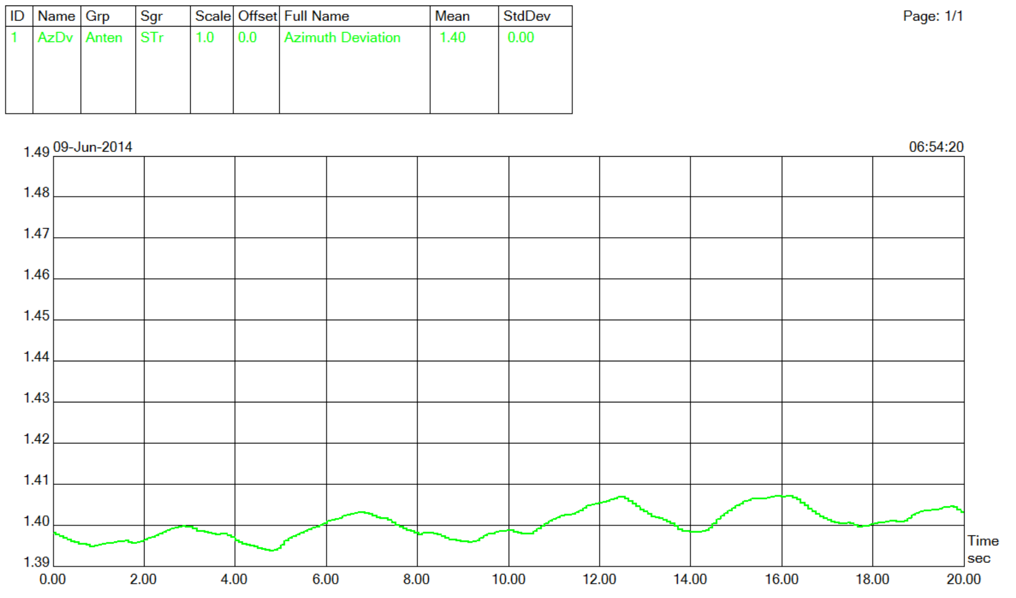
a. **Az/El Deviation** window – Using the graphical Az/El window (default scale to ±5°) on the **Operation Screen** - The azimuth deviation of approx. 1.1° Elevation deviation is 0.8° deg can be observed from the Az/El Deviation window in this example



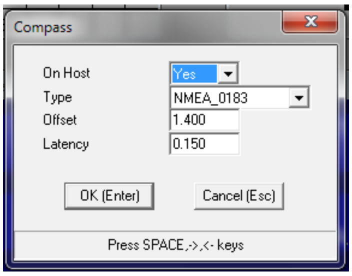
b. **Antenna Position versus Antenna Target** - Calculating the difference between the Antenna Position Azimuth value and the Antenna Target Azimuth value. The azimuth deviation of approx 1.6deg (230.896deg – 229.297deg) can be easily observed from the Az/El Deviation window.



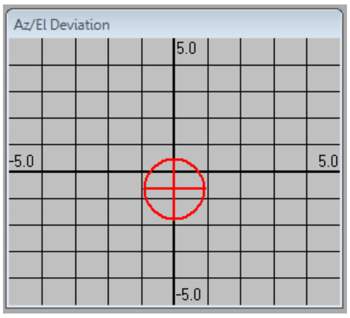
c. **Graphic Data Logger** – Using the graphical Logger recording the Antenna→Step Track→Azimuth Deviation value over time. The azimuth deviation of approx 1.4deg (Mean value) can be easily observed from the logger window.



STEP 6: Configure the accurate Compass offset value by open the **Config** menu, select **Compass** and add or subtract the compass offset from the initial Compass offset estimation in the **Offset** field.



STEP 7: Click **OK (Enter)** and save the new system configuration **using [V]** on the Operation Screen. The following figure presents a typical AGC signal acquisition before compass offset adjustment.



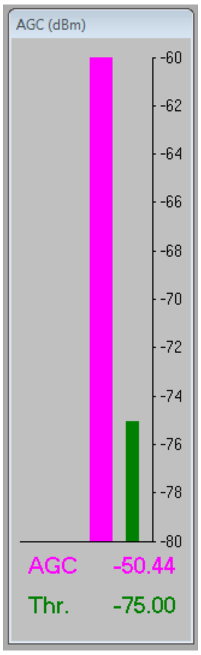


Figure 11.6-7: AGC Signal Acquired after Compass Offset adjustment

11.7 Polarization Offset

For OceanTRx™ system equipped with Linear Feed only, the **Polarization Offset** must be configured to ensure good acquisition of satellite signals.

The Polarization Offset used to compensate the difference between the **nominal Satellite polarization** and the **actual Satellite polarization**.

For each specific Satellite, the Polarization offset is configured using the **Satellites** database.

The OceanTRx™ System Linear Feeds support **electrical switching** between both Vertical and Horizontal polarization.

The system polarization can be seen in the **Polariz** parameter of the **System Status** box on the **Operation Screen**, where:

- A:VL-RC – refer to **V**ertical **L**inear – **R**ight **C**ircular Polarizations
- A:HL-LC – refer to **H**orizontal **L**inear – **L**eft **C**ircular Polarizations

The figure below present the system Status box were the polarization is Vertical Left – Right Circular (A:VL-RC).

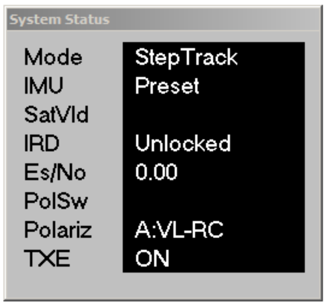


Figure 11.7-1: System Status Box – Polariz parameters

Note

For Dual System topology, this procedure STEPs should be done on both of the ADE Antennas (MTSVLink application).

11.7.1 X-Pol Discrimination Measurement

In order to validate the proper adjustment of the Polarization Offset, Measurement of the signal Cross Polarization (X-Pol) discrimination level should be performed.

It is assumed that the ADE Antenna Compass Offset was adjusted properly and the Satellite was acquired.

Note

A signal with at least of 35dBc (signal to noise ratio) should be used for the X-Pol measurement.

It is highly suggested to use a Continuous Wave (CW) with single frequency signal for these measurements.

➔ **To measure the X-Polarization Discrimination**

STEP 1: Point the ADE toward the desired satellite by Open the **Mode** menu and select **Acquire**. Confirm your choice by clicking **OK (Enter)**.

STEP 2: After satellite acquisition and step tracking for a few moments (AGC signal maximal value received) set the ADE Antenna to Peak position by Open the **Mode** menu and select **Peak**. Confirm your choice by clicking **OK (Enter)**.

STEP 3: Write down the received Co-Polarization signal level as it measured by AGC window.

In the example presented in the attached figure, a Co-Pol signal level of -50.43dBm received while pointing to INTELSAT 10-02 satellite at 1200MHz using Vertical polarization (A:VL-RC).

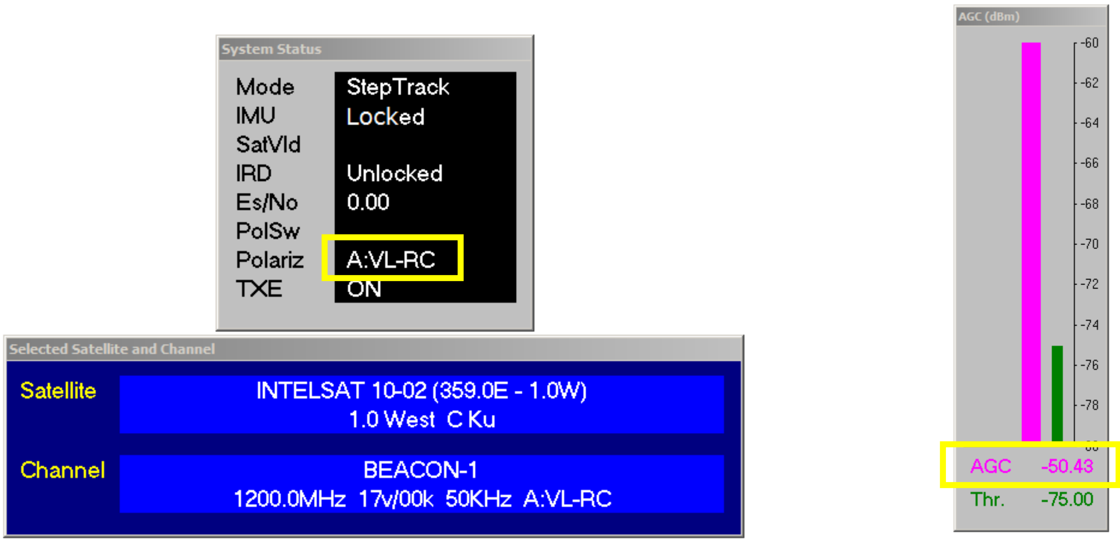


Figure 11.7-2: AGC Signal received level at Co-Polarization

STEP 4: Toggle the polarization from the Co-Polarization (Co-Pol) to the Cross Polarization (X-Pol) From the Operation Screen, open the **Command** menu and select **Toggle Polarization**. The Polarization Status dialog box appears.

Figure 11.7-3: Toggle Polarization Command

STEP 5: Write down the received Co-Polarization signal level as it measured by AGC window.

In the example presented in the attached figure, a X-Pol signal level of -78.16dBm received while pointing to INTELSAT 10-02 satellite at 1200MHz using Horizontal polarization (B:HL-LC).

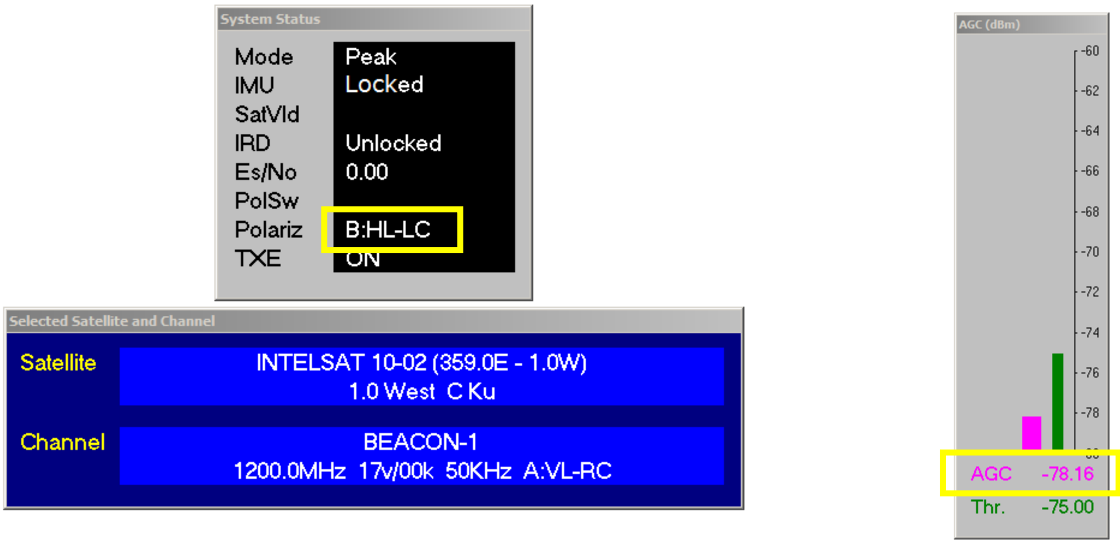


Figure 11.7-4: AGC Signal received level at X-Polarization before offset

STEP 6: Calculate the X-Polarization discrimination value which defined as the difference between the Co-Polarization level and the X-Polarization level measured above.

From the example presented in the attached figures above, a X-Pol discrimination level of -27.73dBc was measured.

11.7.2 X-Pol Offset Measurement

In order to validate the proper adjustment of the Polarization Offset, Measurement of the signal Cross Polarization (X-Pol) level should be performed, looking for the minimal signal level that can be received.

It is assumed that the ADE Antenna Compass Offset was adjusted properly and the Satellite was acquired.

It is also assumed that the above procedure was completed and the ADE Antenna was left in Peak Mode in the X-polarization state.

Note

Note that the following procedure stating from STEP 7 as it is a continuation of the last one.

➔ To measure the Polarization Offset

STEP 7: Set the ADE Antenna to Manual Mode by Open the **Mode** menu and select **Manual**. Confirm your choice by clicking **OK (Enter)**.

Increment or decrement the antenna's polarization orientation until the minimal as possible X-Polarization signal level is received as it measured by AGC window.

From the example presented in the attached figures above and below, the X-Pol discrimination level improved by approx 1.5dBc after changing the polarization orientation by 0.6deg (Polarization adjustment).

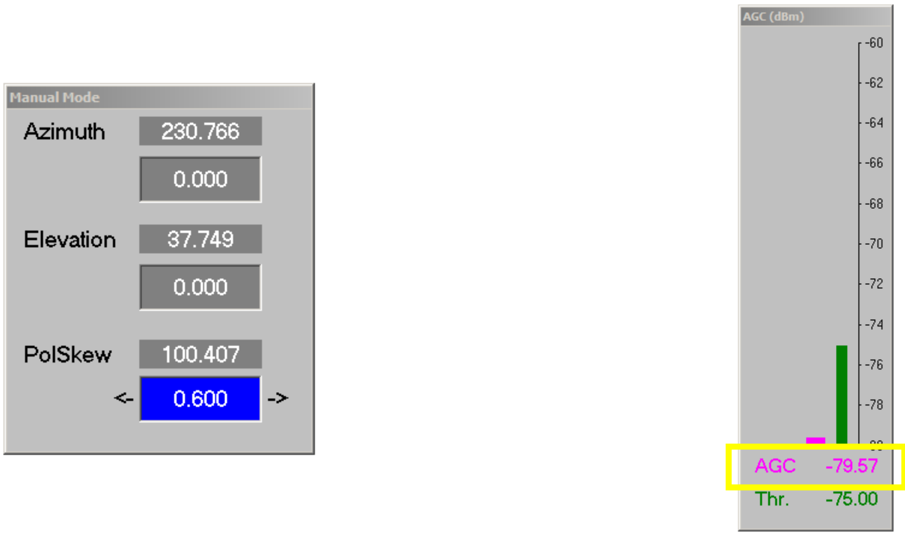


Figure 11.7-5: AGC Signal received level at X-Polarization after adjustment

STEP 8: The above Polarization adjustment value should be configuring in the specific satellite channel in the Satellite Database. Refer to the Satellite Database – Channel editing section of further information.

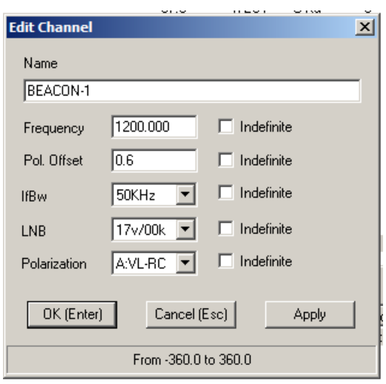


Figure 11.7-6: Satellite Database Pol. Offset (X-Polarization) value.

In order the proper X-Polarization offset adjustment, it is recommended to repeat the above steps (from STEP 1).

11.8 Satellite Acquisition – Receive Only

At this point, after all the above commissioning steps, the system should be able to acquire the satellite and tracking the signal.

The following actions may be performed in order to validate the proper satellite acquisition of the receive path only:

- **AGC Signal Level** - Validate that the AGC signal level received on the main operation screen.
- **Spectrum Analyzer Measurement (at ACU)** – The received signal can be monitored using the spectrum analyzer application.
- **Spectrum Analyzer Measurement (at CCU)** – The received signal can be monitored using external spectrum analyzer connected to the Rx port of the CCU.
- **System Messages** – Observation of the system massages presented on the main operation screen.
- **Tracking Signal Parameters** – validate that the signal acquired by the system fits the pre-defined/as expected Signal frequency, Polarization, Band-width.

11.9 Blockage zones Configuration

Blockage Zones comprises specific ranges of antenna elevation and azimuth angles within which the antenna's line of sight (LOS) is physically blocked or obstructed (for example, by the ship's funnels, mast or nearby Radar).

Within the define Blockage Zone, the system will automatically turn OFF transmutation (BUC) and (as option) will turn OFF the LNB voltage preventing the LNB receiving external undesirable signals.

Note In order to get the maximal availability and avoiding un-real blockage zones, it is highly recommended to estimate/calculate the ADE antenna blockage zone according to the ship's drawing.

The CCU displays the warning message `WRN 033: Antenna View Blocked` when the ADE Antenna enters one of the defined zones, and automatically reverts to **Pnt-to-Sat mode**, on the assumption that the ADE Antenna signal is not available for **Step-Track mode**. When the antenna leaves the blockage zone, a re-acquisition sequence is initiated automatically.

In the following simplified model, the ship's pitch and roll values are assumed to be zero, where:

- **A1** – Angle of the ship's heading relative to North.
- **A2** –Angle of the satellite azimuth view angle relative to North (True azimuth).
- **A3** – Angle of the satellite azimuth view angle relative to the ship's heading (Local azimuth).

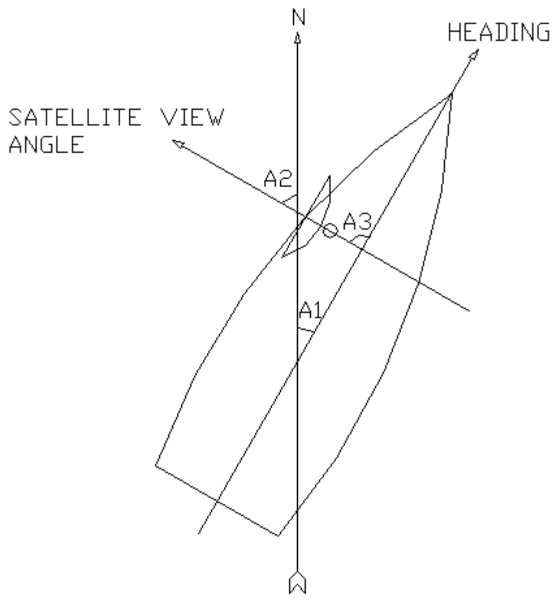


Figure 11.9-1: Blockage Zone azimuth Variables

In the following simplified model, the ship's pitch and heading values are assumed to be zero, where:

- **E1** – Angle of the ship's deck relative to the horizon.
- **E2** – Angle of the satellite elevation view angle relative to the horizon (True elevation).
- **E3** – Angle of the satellite elevation view angle relative to the ship's deck (Local elevation).

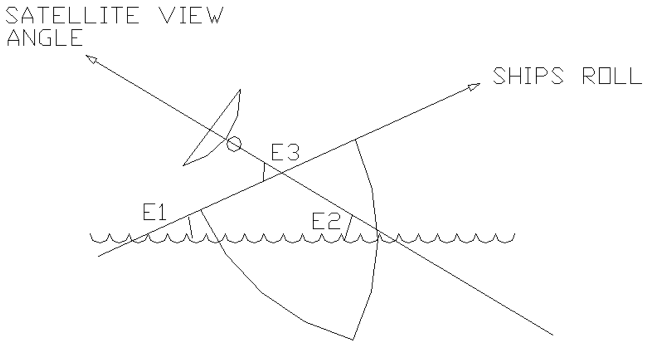


Figure 11.9-2: Blockage Zone Elevation Variables

One can see from the above models that the:

- **Local Azimuth** is the antenna azimuth relative to the ship's bow-to-stern line, rather than to true north.
- **Local Elevation** is the antenna elevation relative to the ship's deck, rather than to the horizon.

Note

The **local angles** depicted in these models are for illustrative purposes only. The actual mathematical definition of these angles is more complex, taking into account the ship's pitch, roll and heading at all times.

The use of local position angles makes the definition of blockage zones more convenient, because it allows you to measure the angles of obstruction between the antenna and other objects on the ship's deck.

11.9.1 Antenna Blockage Zone Configuration

The following section describes the Blockage Zones configuration.

The following model illustrates a simple blockage zone for a dual-antenna system:

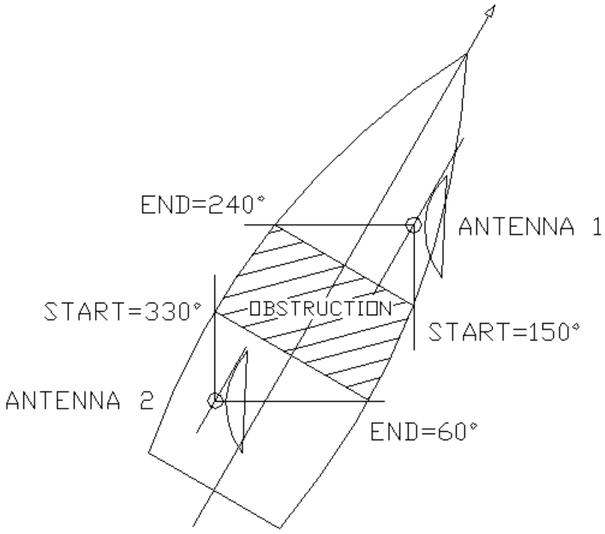


Figure 11.9-3: Blockage Zone Example

In the above model, ADE Antenna 1 is blocked within a range of 90°, from 150° to 240° local azimuth.

ADE Antenna 2 is also blocked within a range of 90°, from 330° to 60° degrees local azimuth.

The blockage zones for both antennas are defined as follows:

Antenna 1	Antenna 2
Zone 1	**Zone 1**
Azimuth from: **150.0** to: **240.0** Elevation from: **-90.0** to: **90.0**	Azimuth from: **330.0** to: **60.0** Elevation from: **-90.0** to: **90.0**

Note It is not necessary to enter values for all four zones. The default setting of 0.0000 to 0.0000 effectively disables any unused zones.

➔ To configure the Blockage Zones (MTSVLink)

Note

For Dual System topology, this procedure STEPs should be done on both of the ADE Antennas (MTSVLink application).

STEP 1: Using the MTSVLink, From the **Config** menu, select **Antenna Blockage.** The **Antenna Blockage** dialog box appears:

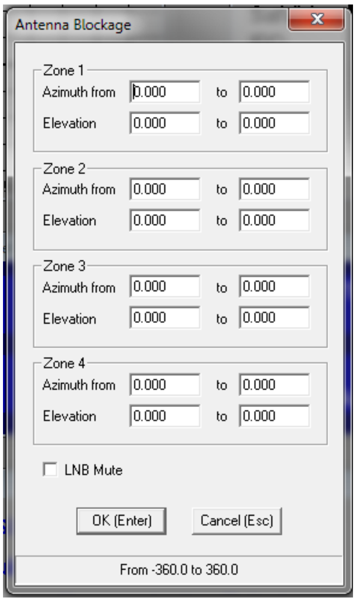


Figure 11.9-4: Blockage Zone Window for MTSVLink

STEP 2: Define up to four blockage zones, in four angular measurements relative to the antenna, where:

- In the **Azimuth** fields (**from** and **to**), enter the azimuth range of the blockage zone relative to the ship's bow (in a clockwise direction).
- In the **Elevation** fields (**from** and **to**), enter the elevation range of the blockage zone relative to the ship's deck (from bottom to top).

STEP 3: To turn off the power to the LNB automatically when the antenna is pointed to one of the defined blockage zones, check **LNB Mute**.

STEP 4: Click **OK (Enter)** and save the new system configuration **using [V]** on the Operation Screen.

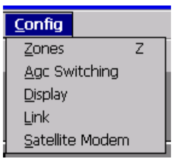
11.9.2 Dual System Topology Blockage Zone Configuration

In case of using a Dual System Topology based on a CCU running Windows CE the additional Blockage Zones configuration should be done within the Dual Antenna Operation (DAO) application.

These additional Blockage Zones definition control on the CCU switching commends (toward the DSS or OSS). These defined blockage zones do not control the BUC transmission nor the LNB power.

➔ **To configure the Blockage Zones (DAO)**

STEP 1: Using the DAO, From the **Config** menu, select **Zones.** The **Blockage Zones** dialog box appears:



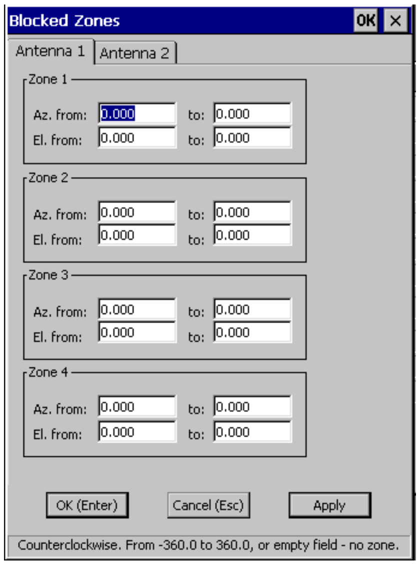


Figure 11.9-5: Blockage Zones Window for DAO (Dual System Topology, CCU CE)

STEP 2: For each ADE Antenna (Antenna 1 and Antenna 2 tabs), Define up to four blockage zones, in four angular measurements relative to the antenna, where:

- In the **Azimuth** fields (**from** and **to**), enter the azimuth range of the blockage zone relative to the ship's bow (in a clockwise direction).
- In the **Elevation** fields (**from** and **to**), enter the elevation range of the blockage zone relative to the ship's deck (from bottom to top).

Note

These additional blockage zones are only used for the CCU switching commends.
It is recommended to set the same blockage zones ranges (values), for each ADE Antenna, as were defined in the previous MTSVLinks Blockage Zones configuration.

STEP 3: Click **OK (Enter)** to save the new system configuration.

11.10 BUC M&C and Cease Transmit Configuration

The OceanTRx™ System support variety of Block Up Converters (BUCs) models and manufactures.

The OceanTRx™ System includes BUC Monitor and Control (M&C) interface which allow monitoring the BUC input and output power levels, monitoring the BUCs FAN operation and internal amplifier temperature and controlling the BUC internal attenuation/gain (depends on the specific BUC model M&C availability).
Dual band Ka BUC are supported, band is selected by o3blink application based on the SDB files loaded

The OceanTRx™ System includes Cease Tx function, which allows defining the conditions under which the system automatically interrupts transmission to the satellite (for example, when the antenna is pointing towards a predefined blockage zone).
Configuring Cease Tx functionality is under the customer's responsibility. Follow the instructions below further information.

The following section describes the BUC M&C and Cease Transmit configuration including selection of the appropriate BUC model, setting of the BUC internal attenuation and cease transmission dependency setting.

Note For Dual System topology, this procedure STEPs should be done on both of the ADE Antennas (MTSVLink application).

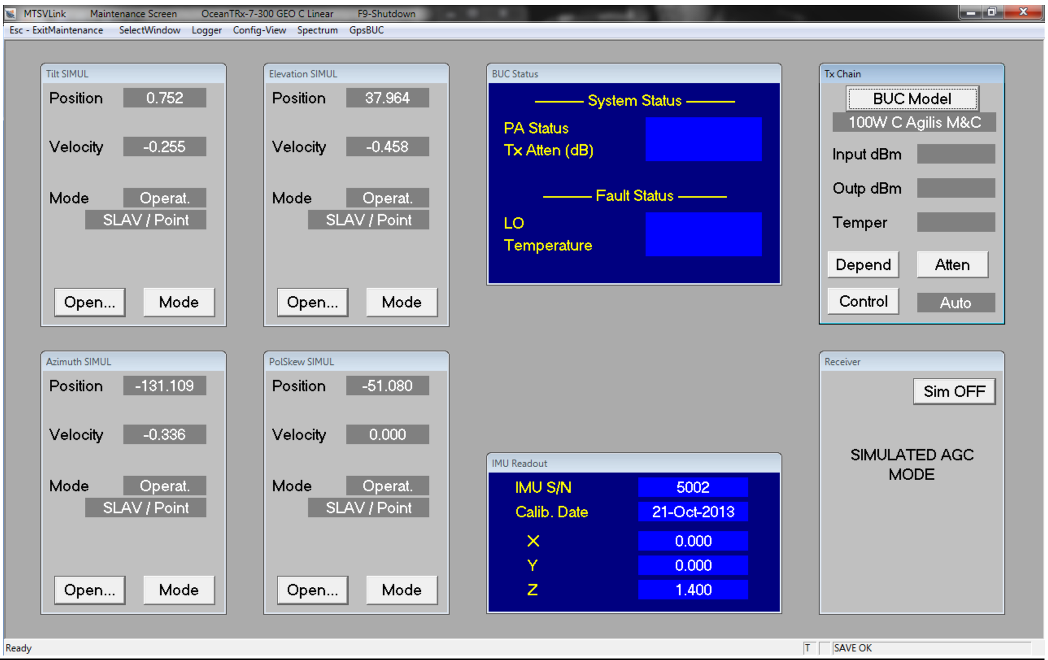


Figure 11.10-1: BUC Tx Chain and Status Windows uses for Monitor and Control

11.10.1 "Tx Chain" and Status Window

Note When the OceanTRx™ is ordered with specific BUC model KIT (including the BUC) the appropriate BUC model as pre-configured.

The **Maintenance Screen** includes the **Tx Chain Window** which allows both monitor and control of the specific BUC model and additional **BUC Status window** which allow monitoring of the specific BUC model. The BUC Status window is accessible from the **GpsBUC** menu (toggle between the GPS and BUC Status windows). The following figure presents the BUC Tx Chain and Status windows:

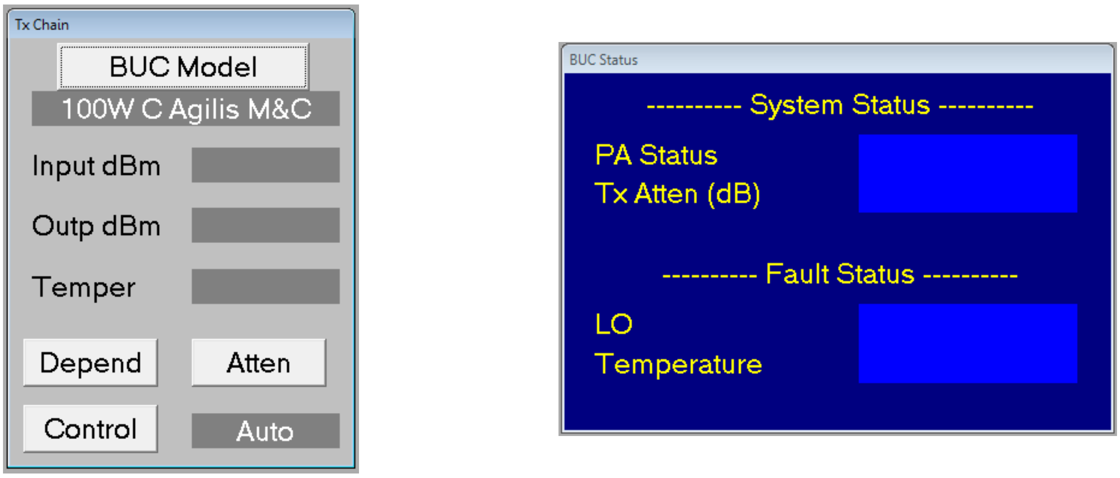


Figure 11.10-2: BUC Tx Chain and Status Windows uses for Monitor and Control

➔ **To configure the BUC Model**

STEP 1: In the **Maintenance Screen**, in the **Tx Chain** window, click on **BUC Model** bottom, a drop-down list will appear showing all supported BUC models (sort by Manufacturer, Power and Band):

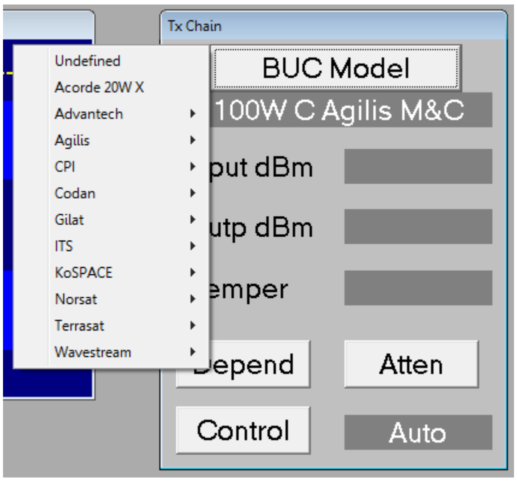


Figure 11.10-3: BUC Model Selection

STEP 2: Select the required BUC model and validate that the selected BUC model presented.

➔ **To configure the BUC Internal Attenuation Value**

Note

BUC internal attenuator configuration is available only if the specific BUC support this functionality.
Some of the BUCs support only step attenuation values were other can support continues attenuation values.

STEP 1: In the **Maintenance Screen**, in the **Tx Chain** window, click on **Atten** bottom, a **BUC Attenuator** window will appear showing the current BUC internal attenuation value.

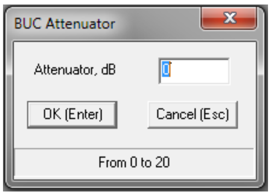


Figure 11.10-4: BUC Attenuator window

STEP 2: Set the required BUC internal attenuation value. Click **OK (Enter)** to save the new system configuration.

STEP 3: Validate that the BUC internal attenuation value changes as requested using the **BUC Status** window.

11.10.2 "Tx Chain Dependency" Window

The OceanTRx™ System includes Cease Tx function which allows defining the conditions under which the system automatically interrupts transmission to the satellite.

The cease Tx functionality is control from the Tx Chain window located in the Maintenance screen.

The Tx Chain window includes two buttons:

- **Depend** – This button opens the **Tx Chain Dependency** dialog box.
- **Control –** This button opens a selection list, which includes the following options:
    - **None:** Leaves the BUC in its current state. Use to disable the **Auto** control mode.
    - **On:** Enables the BUC's power amplifier.
    - **Off:** Disables the BUC's power amplifier.
    - **Auto:** Enables the BUC's power amplifier when the **Tx Dependency** parameters are true for at least two consecutive seconds and disables the BUC's power amplifier when at least one parameter is false.

The **Control** default selection is **Auto**.

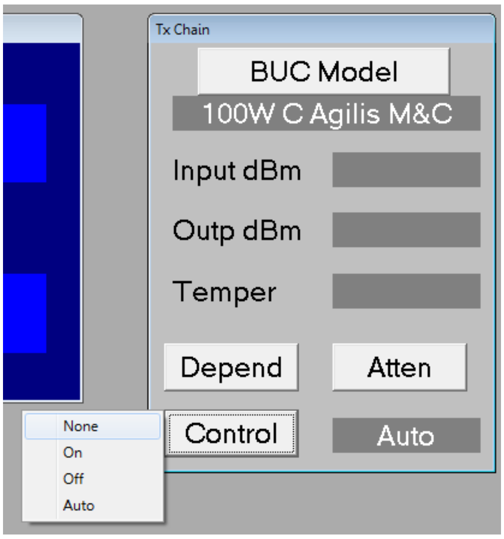


Figure 11.10-5: Tx Chain Control List

Note

When the Tx Control option in the Tx Chain window is set to 'On' or 'Off', the Tx Dependency parameters are disabled (grayed out).

➔ To configure the Tx Chain Dependency

STEP 1: In the **Maintenance Screen**, in the **Tx Chain** window, click on **Depend** bottom, a **Tx Chain Dependency** window will appear showing the current dependencies parameters, where:

- **Minimum Elevation (deg)** – The antenna elevation angle, relative to the horizon, below which the BUC automatically stops transmitting. The default value is 5°.
- **IRD Lock** – When set to 'Yes', the BUC stops transmitting when the modem reports an 'Unlock' status. The default setting is 'No'.
- **Track Error** – When set to 'Yes' (default), the BUC stops transmitting when a tracking error generated by the ConScan Step-Track exceeds the defined track-error threshold.
- **Track Mode** – When set to 'Yes' (default), the BUC stops transmitting when the current operating mode is not Step-Track.
- **Blockage –** When set to 'Yes' (default), the BUC stops transmitting when the antenna's view enters one of the predefined blockage zones.
- **BUC Fault –** When set to 'Yes', the BUC stops transmitting when a BUC fault is identified.

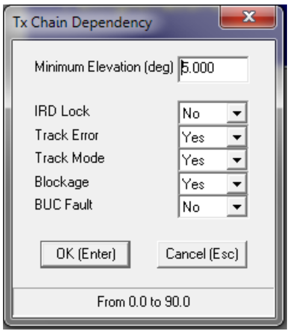


Figure 11.10-6: Tx Chain Dependency window

STEP 2: Set the required dependency parameters values (YES/NO).

STEP 3: Click **OK (Enter)** and save the new system configuration **using [V]** on the Operation Screen.

Note

When a Cease-Tx condition is identified, the BUC ceases transmitting immediately (less than 100msec). However, when the condition disappears, transmission is only renewed after a 2-second delay, in compliance with regulatory requirements.

11.11 Satellite Acquisition – Transmit and Receive

At this point, after all the above commissioning steps, the system should be able to acquire the satellite and tracking the signal. In addition, the system can transmit to the desire satellite.

The following actions may be performed in order to validate the proper satellite acquisition of the receive path only:

- **AGC Signal Level** - Validate that the AGC signal level received on the main operation screen.
- **Spectrum Analyzer Measurement (at ACU)** – The received signal can be monitored using the spectrum analyzer application. In some cases, the transmit signal can be observed also.
- **Spectrum Analyzer Measurement (at CCU)** – The received signal can be monitored using external spectrum analyzer connected to the Rx port of the CCU. In some cases, the transmit signal can be observed also.
- **System Messages** – Observation of the system messages presented on the main operation screen.
- **Tracking Signal Parameters** – validate that the signal acquired by the system fits the pre-defined/as expected Signal frequency, Polarization, Band-width
- **BUC Output Power** – Using the BUC M&C, presented on the maintenance screen, validate that the proper transmitting power is produced by the BUC.
- **Modem Lock** – at this point it is expected that the complete satellite link will be operational both Up-Link and Down-Link.
- **Blockage Zones** – the appropriate message should appear on the main operation screen during ADE antenna pointing toward a blockage zone.
- **System Switching** – for Dual system topology, according to the DSS switching zones (Blockage Zones) it is expected that a switching between the ADE antennas will occur.

Once the commissioning process is complete, you are required by obligation to complete and submit the following documents to your Orbit Contact person:

- Warranty Activation declaration provided in System's Warranty Annex to activate and validate the system warranty (for the warranty to be valid).

The Declaration includes:

- G-Shock indicators reported color upon System's arrival – for both the crate and the system, accompanied with real pictures of the shock indicators and their serial number shown clearly.
- UPS Connectivity to system – approval of UPS connected to system with its model and vendor name.
- Orbit's authorized technician – the name and signature of Orbit's authorized technician responsible for performing the System's installation and commissioning.
- Commissioning Checklist provided in Pre-Installation Checklist - to allow Orbit to follow up on field installation and commissioning issues. The **Commissioning Checklist** includes:
    - Customer information
    - Commissioning requirements
    - Installation location
    - Below Deck Equipment
    - System Inspection
    - CCU settings
    - System Cables
    - System Configuration.

12 OceanTRx™ Principles of Operation

12.1 OceanTRx™ System Operation

This section contains principles of operations and instructions for operating the system and includes the following topics:

Note

- The OceanTRx™ System is preconfigured and tested before it is shipped. Tampering with any of the system settings that are not explicitly mentioned in this manual can impair the functioning of the system.
- For MTSVLink setup procedures, make sure to save the changes by pressing [V] on the keyboard (when accessing the Main Operations screen).

Consists of the following information:

- Principles of Operation
- Activating Operation Modes
- Manually Adjusting the System
- Rebooting the System ACU
- Noise Floor Correction
- AGC Threshold Configuration
- Display Configuration
- Satellite Modem Hardware Interface Configuration
- Satellite Modem IRD Configuration
- GPS Output Configuration
- OpenAMIP Connection
- Monitoring System Voltage and Temperature Test Points
- Monitoring System Work Time
- Monitoring System Massages
- Downloading the Status Dump File
- Viewing Software Version Details
- Using the Graphic Data Logger
- Using the Spectrum Analyzer

12.2 Principles of Operation

The following section describes in details the OceanTRx™ principles of operation including the following issues:

- Acquisition and Tracking Algorithm
- Modes of Operation
- Tracking Receiver Feedback
- Satellite Validation

12.2.1 Acquisition and Tracking Algorithm

Maintaining a constant view angle towards the satellite is achieved by a combination of two processes:

- ***Stabilization***, which compensates for the ship's sea movement on the basis of input from the IMU.
- ***Step-tracking***, which periodically corrects any slight off-bore-site movement of the antenna so as to move it to the point of maximum reception.

Together, stabilization and step-tracking of the antenna constitute what is referred to by the general term of *tracking*.

The OceanTRx™ system is designed to acquire and track a selected satellite, defined by the system according to three functional parameters:

- Satellite location on the Geo-Stationary arch – positive for east and negative for west longitudes (for example, '-4.0' for 4.0° West).
- Tracking (or *hunt*) frequency, measured in L-Band MHz (for example, 1200.0MHz)
- Rx Polarization selection –vertical linear- right circular or horizontal linear-left circular (for example, A:VL-RC, B:HL-LC).

Upon activation of Acquire Mode, the system executes a series of automatic actions designed to acquire and track the selected satellite according to the above parameters, as depicted in the following diagram:

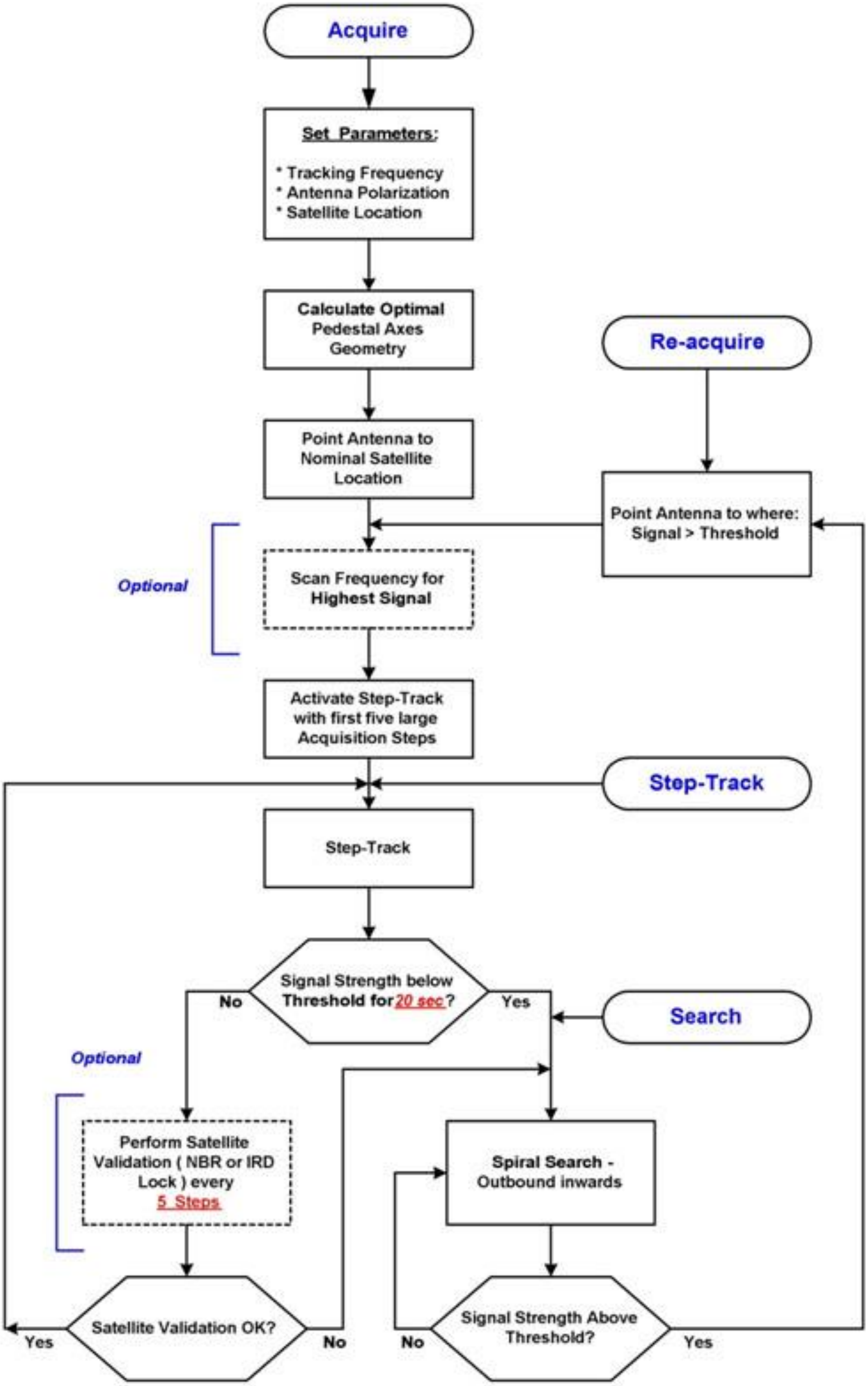


Figure 12.2-1: OceanTRx™ System – Simplified Acquisition and Tracking Algorithm

12.2.2 Modes of Operation

In principle, after proper installation, configuration, and alignment, the OceanTRx™7 system functions in a completely automatic manner. Upon power-up, the system acquires and tracks the last selected satellite without any manual intervention from a human operator. This process entails the utilization of several lower-level modes of operation: satellite acquisition, tracking, validation, searching, and re-acquisition.

Nonetheless, the advanced OceanTRx™ HMI allows you to activate a number of operating modes independently, for purposes of installation, configuration, alignment, and maintenance.

12.2.3 Tracking Receiver Feedback

A good-quality signal strength – defined as the highest possible signal-to-noise ratio – is required to perform step-tracking of the antenna. The tracking signal received from the satellite may be one of the following:

- **Satellite Beacon** – Typically an un-modulated CW
- **Customer Data Channel** – Typically occupying a few hundred KHz to a few MHz of bandwidth, with digital modulation (QPSK or BPSK)
- **Modulated channel** – Used by the customer specifically for tracking
- **Wide-band TV transponder** – Digital only

The OceanTRx™ system uses a narrow-band tracking receiver (NBR) to receive each of the above signals. To achieve optimal performance, the following specifications are recommended:

- **Satellite beacon** – 50KHz filter
- **Customer data channel** – 50, 150, or 300KHz filter, according to the channel's occupied bandwidth
- **Modulated channel** (typically a 16 or 32Kbps QPSK-modulated signal) – 50KHz filter
- **Wide-band TV transponder** – 300KHz filter

The selected tracking signal should be unique to the selected satellite or received on a considerably lower level from adjacent satellites. Otherwise, the system may lock onto the wrong satellite.

In general, a unique tracking channel is preferable to a satellite beacon (which may be the same for multiple satellites of the same type), and the latter is preferable to a data channel.

12.2.4 Satellite Validation

During the tracking process, a situation may develop where the antenna locks onto an incorrect satellite, due to any of the following factors:

- An adjacent satellite producing signals in the same frequency spectrum as the OceanTRx™ tracking signal.
- A terrestrial source of electromagnetic interference (EMI) in the same frequency spectrum.
- Strong reflections from obstructions, producing wide-band noise in the same frequency spectrum.

The OceanTRx™ system can be configured to perform periodic checks to verify that the antenna is locked on the right satellite, provided that the necessary satellite information can be obtained.

The IRD Lock function checks the status of a Lock/Unlock indication returned from the modem at a predefined interval. Since there are numerous parameters defining a given data stream (for example, frequency, modulation, data rate, coding, rate of forward error correction), the probability of the exact same signal being transmitted by another satellite is quite low.

12.3 Activating Operation Modes

Once a satellite has been acquired, you can manually activate the various operating modes from the **Modes** dropdown list or the buttons on the right side of the screen.

12.3.1 Manual Mode

Activating Manual Mode allows you to move the antenna manually for maintenance and integration purposes, or to find a satellite when the system does not acquire it automatically.

Manual Mode can be configured.

➔ **To configure Manual Mode:**

STEP 1: From the **Operation Screen**, open the **Config** menu and select **Manual** from the **Operating Modes** sub-menu. The **Manual Mode** dialog box appears:

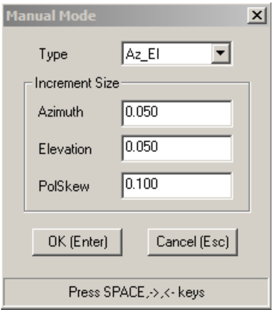


Figure 12.3-1: Manual Mode Dialog Box

- **Az_El** (Default) – Incremental values are measured relative to the Antenna location at the moment Manual Mode is activated. Azimuth angles reference elevation, rather than Earth-horizon. In practical terms, this means that when taking an azimuthal antenna cut, there is no need to translate the horizontal axis by the cosine of elevation. However, when moving the azimuth angle by a considerable amount (more than a few degrees), the elevation angle also changes.
- **Earth_Az_El –** Absolute antenna angles are used – azimuth references Earth true north, and the elevation references the horizon. If only the azimuth is moved, the elevation remains constant.
- **SatArch –** The azimuth represents the angular displacement along the satellite arch, in reference to the Greenwich Meridian. The azimuth and elevation change in accordance with the antenna displacement on the arch. This mode is most useful in 'hunting' for adjacent satellites.

STEP 2: Set the desired **Increment Size** for each angle, representing the size of one step in degrees. Default settings are 0.05º for azimuth and elevation, and 0.1º for polarization skew.

STEP 3: Click **OK (Enter)**. The **Manual Mode** window closes.

➔ **To activate Manual Mode and move the antenna manually:**

STEP 1: From the **Operation Screen**, open the **Mode** menu and select **Manual**. A confirmation message box appears.

STEP 2: Click **OK (Enter)**. The **Manual Mode** window appears in the bottom left-hand corner of the **Operation Screen**:

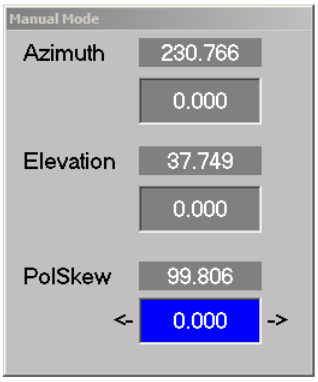


Figure 12.3-2: Manual Mode Window

STEP 3: For each axis, the upper field displays the current angle of the axis. Click the lower field of the axis you wish to move, and click the left or right arrow next to the field to decrease or increase the angle of the axis in steps based on the **Increment Size** configured in the **Manual Mode** dialog box.

12.3.2 Stand-by Mode

Activating Stand-by Mode halts all axes in their current position.

➔ **To activate Stand-by Mode:**

STEP 1: From the **Operation Screen**, open the **Mode** menu and select **Stand-by**. A confirmation message box appears.

STEP 2: Click **OK (Enter)**. All axes are halted in their current position.

12.3.3 Search Mode

Under normal working conditions, Search Mode is activated automatically from the Acquire and Acquire Satellite Preset Modes when the AGC level falls below the threshold. However, you may need to activate it manually for maintenance and integration purposes.

When Search Mode is active, the Antenna moves in an expanding and contracting spiral until the AGC signal is above the threshold.

➔ **To activate Search Mode:**

STEP 1: Make sure correct satellite tracking channel is selected.

STEP 2: From the **Operation Screen**, open the **Mode** menu and select **Search**. A confirmation message box appears.

STEP 3: Click **OK (Enter)**. The antenna begins searching.

12.3.4 Peak Mode

Activating Peak Mode points the antenna at the position of maximum AGC, as determined by the last step-track iteration.

➔ **To activate Peak Mode:**

STEP 1: From the **Operation Screen**, open the **Mode** menu and select **Peak**. A confirmation message box appears.

STEP 2: Click **OK (Enter)**. The antenna moves to the last determined peak position.

12.3.5 Step-Track Mode

Under normal working conditions, Step-Track Mode is activated automatically from the Acquire and Acquire Satellite Preset Modes. However, you may need to activate it manually for maintenance and integration purposes.

➔ **To activate Step-Track Mode:**

STEP 1: Make sure you are locked onto the satellite using the correct tracking channel.

STEP 2: Make sure the AGC is above the defined threshold. Otherwise, the system will automatically revert to **Search Mode**.

STEP 3: From the **Operation Screen**, open the **Mode** menu and select **Step-Track**. A confirmation message box appears.

STEP 4: Click **OK (Enter)**. The antenna begins step-tracking.

12.3.6 Point to Satellite Mode

Activating Point-to-Satellite Mode points the Antenna at the satellite last selected from the Satellite Database (without taking into account the tracking signal level or tracking frequency for the satellite from the Satellite Database).

➔ **To activate Point to Satellite mode:**

STEP 1: From the **Operation Screen**, open the **Mode** menu and select **Pnt-to-Sat**. A confirmation message box appears.

STEP 2: Click **OK (Enter)**. The antenna points to the nominal position of the selected satellite.

12.3.7 Satellite Preset Mode

Activating Satellite Preset Mode moves the Antenna to a user-defined geo-stationary longitude.

➔ **To activate Satellite Preset mode:**

STEP 1: From the **Operation Screen**, open the **Mode** menu and select **Sat. Preset**. The **Satellite Preset Mode** dialog box appears:

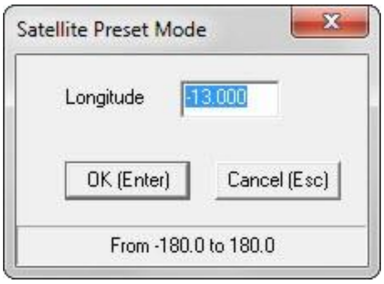


Figure 12.3-3: Satellite Preset Mode Dialog Box

STEP 2: 1. Enter the satellite's geostationary arch longitude in the following format: a positive number from 0.0° to 180.0° for east, or a negative number from -0.0° to -180.0° for west. For example:

- 4° West is entered as '-4.0'.
- 13° East is entered as '13.0'.

STEP 3: Click **OK (Enter)**. A confirmation message box appears.

STEP 4: Click **OK (Enter)**. The antenna points to the specified longitude.

12.3.8 Acquire Mode

Activating Acquire Mode points the Antenna at the satellite last selected from the database and activates Step-Track Mode, which moves the antenna to the position of maximum AGC based on tracking signal level.

➔ **To activate Acquire mode:**

STEP 1: From the **Operation Screen**, open the **Mode** menu and select **Acquire**. A confirmation message box appears.

STEP 2: Click **OK (Enter)**. The antenna points to the selected satellite and initiates step-tracking to achieve peak reception.

12.3.9 Acquire Satellite Preset Mode

Activating Acquire Satellite Preset Mode moves the Antenna to a user-defined geo-stationary longitude and activates Step-Track Mode, which moves the antenna to the position of maximum AGC based on tracking signal level.

➔ **To activate Acquire satellite Preset mode:**

STEP 1: From the **Operation Screen**, open the **Mode** menu and select **Acquire Sat. Preset**. The **Satellite Preset Mode** dialog box appears:

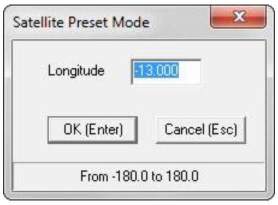


Figure 12.3-4: Satellite Preset Mode Dialog Box

STEP 2: 2. Enter the satellite's geostationary arch longitude in the following format: a positive number from 0.0° to 180.0° for east, or a negative number from -0.0° to -180.0° for west. For example:

- 4° West is entered as '-4.0'.
- 13° East is entered as '13.0'.

STEP 3: Click **OK (Enter)**. A confirmation message box appears.

STEP 4: Click **OK (Enter)**. The antenna points to the defined position and step-tracks to achieve peak reception.

12.3.10 Test Trajectory Mode

Activating Test Trajectory Mode allows you to test the performance of each of the antenna axes.

➔ **To activate Test Trajectory Mode:**

STEP 1: Open the **Mode** menu and select **Test Traj**. A confirmation message box appears.

STEP 2: Click **OK (Enter)**. The system moves all four axes to their starting positions (-90° for azimuth, tilt and polarization skew, -165° for elevation), then moves them forwards and back on their test trajectories, until stopped by the operator.

While running the test, you can monitor the following axes parameters in the **Graphic Data Logger**:

- **Position feedback:** Represents the axis position as reported by the Axis Encoder.
- **Position error:** Represents the difference between the commanded position and the actual position.
- **Velocity feedback:** Represents the velocity of the motor encoder.

The following figure displays a typical azimuth-axis response on the **Logger** screen (the Position Error curve is multiplied by 100 to bring it to a readable scale).

The actual trajectories for each axis are pre-configured and should not be changed.

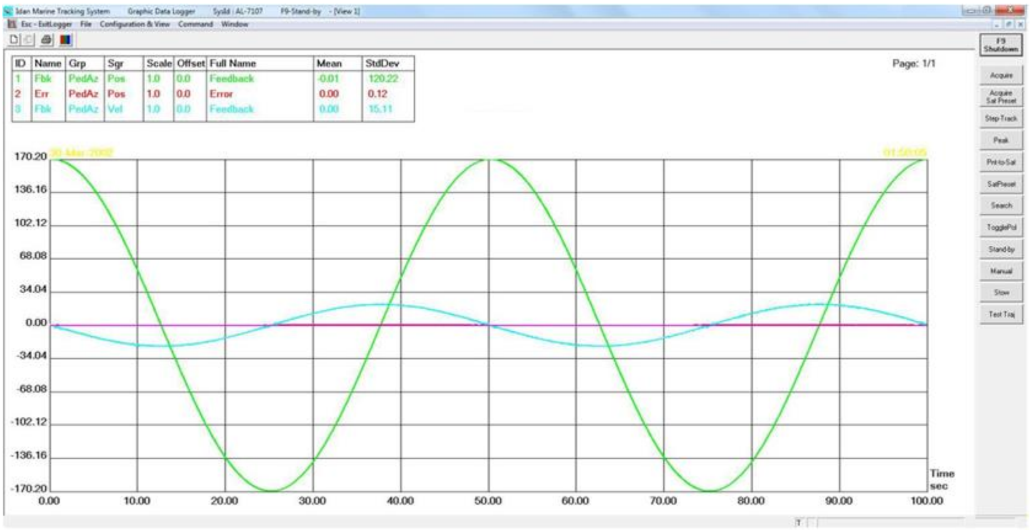


Figure 12.3-5: Monitoring Axes Test Parameters in the Logger

12.3.11 Stow Mode

Activating Stow Mode moves the system axes to the locations where the axis stow lock pins can be inserted. Stow position values are preconfigured and should not be changed.

➔ **To activate Stow Mode:**

STEP 1: From the **Operation Screen**, open the **Mode** menu and select **Stow**. A confirmation message box appears.

STEP 2: Click **OK (Enter)**. The system axes move to their predefined stow positions.

12.3.12 Program Route Mode

Activating Program Route Mode points the antenna to the point defined in the Two Line Elements (TLE) file.

➔ **To configure Program Route Mode:**

STEP 1: From the **Operation Screen**, open the **Config** menu and select **Program Route** from the **Operating Modes** sub-menu. The **Program Route** dialog box appears:

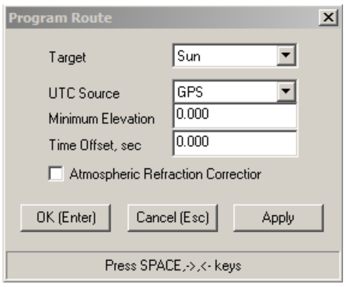


Figure 12.3-6: Program Route Mode Dialog Box

STEP 2: Select the appropriate **Target** value:

- **Sun** (Default) – The antenna will target and point toward the position of the Sun. no external TLE files are required for this mode of operation.
- **Satellite** – The antenna will target and point toward a specific Satellite according to the TLE file.

STEP 3: Select the appropriate **UTC Source** value:

- **GPS** (Default) – The antenna control unit (ACU) clock will synchronize with the GPS UTC clock.
- **CPU Clock** – The antenna control unit (ACU) clock will synchronize with the internal ACU CPU clock.

STEP 4: Set the desired **Minimum Elevation**, which representing minimal tracking elevation angle. Below that angle, the system will stop the tracking and rewind back to the next path beginning point (for both Azimuth and Elevation). Default settings are 0.

STEP 5: Set the desired **Time Offset**, which representing time offset between the used UTC source and the antenna control unit (ACU) clock. Default settings are 0.

STEP 6: Check or un-check the Atmospheric Refraction Correctior, which will…

STEP 7: Click **OK (Enter)**. The **Program Route Mode** window closes.

➔ **To activate Program Route Mode:**

STEP 1: From the **Operation Screen**, open the **Mode** menu and select **Program Route**. A confirmation message box appears.

STEP 2: Click **OK (Enter)**. The **Program Route Mode** (SUN or Satellite) Tracking will operated:

12.3.13 Acquire Program Track Mode

Activating Acquire Program Track Mode points the antenna to the point defined in the Two Line Elements (TLE) file and initiates step tracking. This mode functionality is reserved for O3b system topology use.

12.4 Manually Adjusting the System

The following adjustments may be made in response to conditions encountered during system operation.

Note

The OceanTRx™ Maritime Satellite Communication System is pre-configured and tested before it is shipped. Tampering with any of the system settings that are not explicitly mentioned in this manual can impair the functioning of the system

---

12.4.1 Setting the Ship's Heading

If the ship uses a Step-by-Step compass, or if the compass becomes inactive or unconnected (for example, during system installation), you need to set the ship's heading manually.

➔ **To set the heading:**

STEP 1: Put the antenna into Stand-by Mode

STEP 2: From the **Operation Screen**, open the **Commands** menu and select **Set Compass**. The **Ship Heading** dialog box appears:

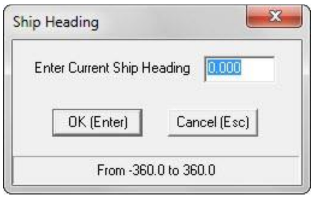


Figure 12.4-1: Ship Heading Dialog Box

STEP 3: Do one of the following:

- For an incremental compass (Step-by-Step, Synchro 36:1, Synchro 60:1, Synchro 90:1, Synchro 180:1, Synchro 360:1), enter a start value in the **Enter Current Ship Heading** field.
- For an absolute compass (NMEA-0183, Synchro 1:1), a default compass value may be entered (for example, during antenna commissioning). This value will be used until a valid compass update is received.

STEP 4: Click **OK (Enter)**. The ship's heading is updated in the **Compass** field of the **Ship Coordinates** window.

12.4.2 Setting the GPS Position

If for some reason there are no GPS position updates, or the GPS is malfunctioning or disconnected, you can enter the ship's position manually.

➔ **To enter the GPS position manually:**

STEP 1: From the **Operation Screen**, open the **Commands** menu and select **Set GPS**. The **Set GPS** dialog box appears:

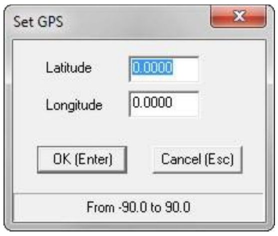


Figure 12.4-2: Set GPS Dialog Box

STEP 2: Enter values in the **Latitude** and **Longitude** fields.

- **The Latitude and Longitude angles are entered in decimal format**. When calculating decimal values, remember that 1° of arch is divided into 60 minutes, which are in turn divided into 60 seconds. Therefore, each degree of arch contains 3600 seconds.

  For example, 32.5125° of latitude are equivalent to 32° + 0.5125 × 3600 = 1845 seconds. 1845 seconds equal 1845 ÷ 60 = 30 minutes and 45 seconds.
  32.5125° of latitude are therefore equivalent to 32° 30 minutes and 45 seconds North (the positive latitude value indicates that the position is north of the equator).

STEP 3: Click **OK (Enter)**. The new values are updated in the **Ship Coordinates** window:

Figure 12.4-3: Ship Coordinates Window

12.5 Rebooting the System ACU

If the system did not start correctly or if you want to initialize the ACU or CCU, you can initiate reboot the system.

➔ **To Reboot the System ACU**

STEP 1: From the **Operation Screen**, open the **Commands** menu and select **Reboot**. A confirmation message box appears.

STEP 2: Click **OK (Enter)**. The ACU reboot.

12.6 Noise Floor Correction

Noise Floor Correction eliminates the effect of atmospheric noise on the received by the ADE Antenna L-Band narrow Band Receiver (LNBR) located inside the ACU. The Noise Floor Correction normalizes the AGC level, while the ADE Antenna pointed toward open sky, to a level of -80dBm.

12.6.1 Run Noise Floor Correction

➔ **To Run Noise Floor Correction:**

STEP 1: Point the antenna away from any radiation source. This can be done by activating **Stow** mode unless the ship is on the equator.

STEP 2: From the **Operation Screen**, select **Spectrum** on the Menu Bar. The **Spectrum Analyzer Screen** appears:

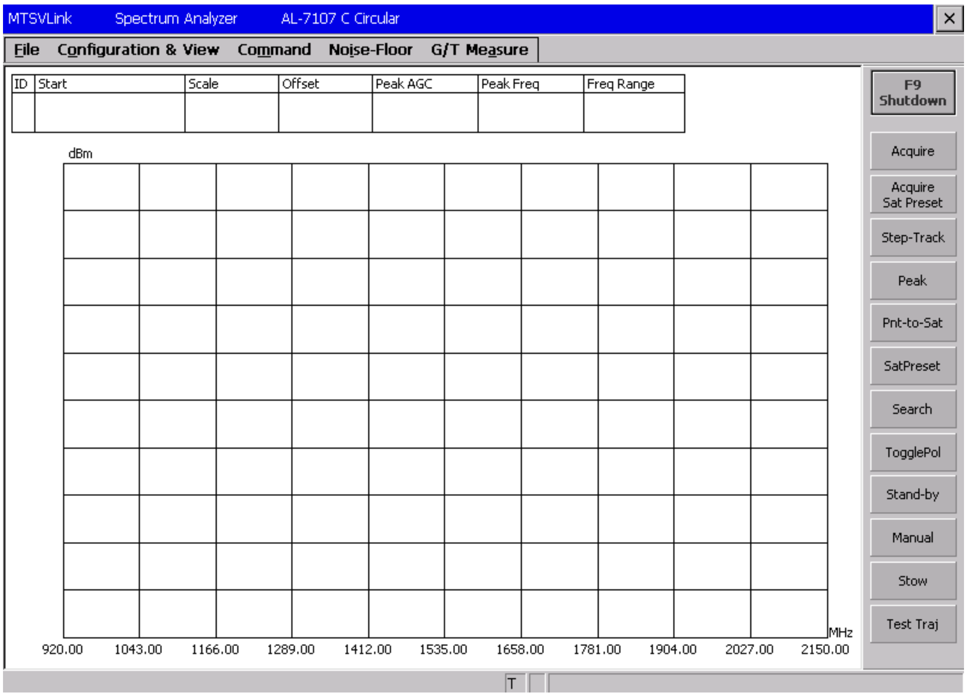


Figure 12.6-1: Spectrum Analyzer Screen

STEP 3: Open the **Noise-Floor** menu and select **Start Calibration**. The **Start Noise-Floor Calibration** dialog box appears:

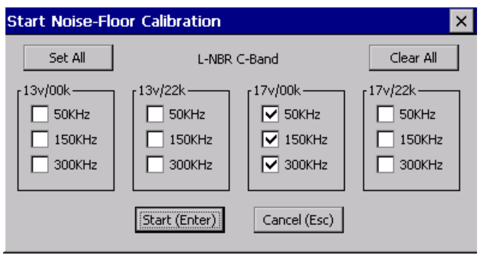


Figure 12.6-2: Start Noise-Floor Calibration Dialog Box

STEP 4: Check the relevant calibration lines in accordance with the LNB bands (single, dual or quad). The lines are ordered by LNB bands according to the LNB voltage/tones and by NBR IfBw (50KHz, 150KHz and 300KHz).

> **Note**
>
> Calibrating an excess number of lines (for example, all lines for a single-band LNB) will result in the measurement time increasing, but does not affect the system adversely. Any extraneous information is ignored

---

STEP 5: Click **Start (Enter)**. The calibration process runs in a fully automatic manner, scanning the calibration lines one by one. Each line takes approximately 100 seconds.

STEP 6: After the process is completed, the final results are displayed in the **Write Noise-Floor Calibration** dialog box**.**

STEP 7: Click **Write (Enter)**. The **Write Noise-Floor Calibration** dialog box closes.

Figure 12.6-3: Write Noise-Floor Calibration Dialog Box

12.6.2 Review Noise Floor Correction

➔ **To Review Noise Floor Correction:**

STEP 1: To review the measured data, open the **Noise-Floor** menu and select **Read Calibration**. The **Read Noise-Floor Calibration** dialog box appears:

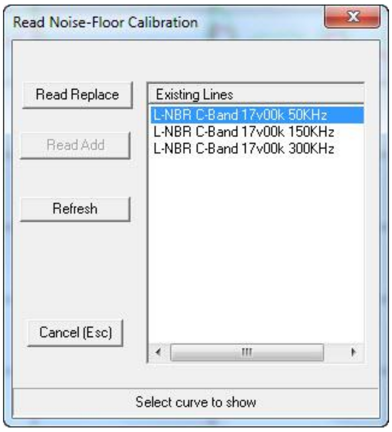


Figure 12.6-4: Read Noise-Floor Calibration Dialog Box

STEP 2: The curves may be presented in pairs. You can click the **Read Replace** button to view a single curve, and the **Read Add** button to add a second curve.

STEP 3: Click **Cancel (Esc)** to close the **Read Noise-Floor Calibration** dialog box.

12.6.3 Activate Noise Floor Correction

After noise floor correction has been configured, the LNBR should be configured to use noise floor correction.

➔ **To activate noise floor correction on the NBR:**

STEP 1: From the **Operation Screen**, open the **Config** menu and select **Receiver**. The **Receiver** dialog box appears:

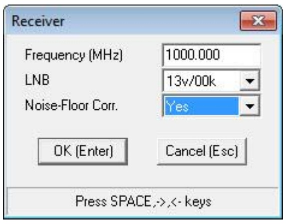


Figure 12.6-5: Receiver Dialog Box

STEP 2: Verify that the **Noise-Floor Corr.** parameter is set to 'Yes'.

Note

If there are no calibration files in the ACU memory, the warning message `WRN 180: No Noise Floor Table` is displayed.

STEP 3: Click **OK (Enter)** and save the new system configuration **using [V]** on the Operation Screen.

12.7 AGC Threshold Configuration

The OceanTRx™ system is supplied from the factory with noise-floor correction calibrated and activated. Therefore the AGC (Received tracking signal level) Threshold value is set to a constant value of -75dBm.

When the AGC Received tracking signal level falls below the AGC threshold level, the system automatically moves to **Search Mode** trying to re-acquire the satellite.

If for some reason noise-floor correction is deactivated, or the operator wants to introduce a user-defined threshold, the threshold level can be set manually.

12.7.1 AGC Threshold Configuration

➔ **To configure the AGC threshold level:**

STEP 1: Open the **Commands** menu from the **Operation Screen** and select **Set Threshold**. The **Set Threshold Level** dialog box appears:

Figure 12.7-1: Set Threshold Level Dialog Box

STEP 2: Enter a new value in the **Threshold Level, dBm** field, according to the following guidelines:

- The threshold level should be at least 6dBm higher than the off-satellite noise background. To check the off-satellite noise, move the antenna away from the satellite (for example, by activating Stow Mode) and check the AGC level.
- The threshold level should be lower than the selected tracking signal level. It is recommended to not be more than the selected tracking signal by 7dBm.
- The threshold should be set at a minimum of -74 dBm.

Note You can also configure the threshold level in the relevant Step-Track Mode configuration dialog box, accessed from the **Operating Modes** sub-menu of the **Config** menu.

STEP 3: Click **OK (Enter)**. The new threshold level appears in the **AGC (dBm)** window.

STEP 4: Save the new system configuration **using [V]** on the Operation Screen.

12.8 Display Configuration

The units and scale displayed in the **AGC Scale** and **Az/El Deviation** windows in the **Operation Screen** can be configured.

12.8.1 AGC and Antenna Deviation display Configuration

➔ **To configure the AGC and Antenna Deviation display:**

STEP 1: Open the **Config** menu and select **Display**. The **Display Configuration** dialog box appears:

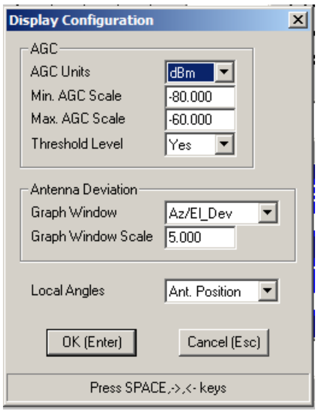


Figure 12.8-1: Display Configuration Dialog Box

STEP 2: Configure the **AGC** display values (AGC Units, Min and Max values and Threshold level appearance).

STEP 3: Configure the **Antenna Deviation** display values (Graph Type and Scale). During normal operation, it is recommended that **Graph Window Scale** will be set to ‘5.000’ (default)

STEP 4: Click **OK (Enter)**. The **Display Configuration** dialog box closes. Save the new system configuration **using [V]** on the Operation Screen.

12.9 Satellite Modem Hardware Interface Configuration

The OceanTRx™ System can be configured to receive monitoring information from supported satellite modems via a serial connection or via an Ethernet connection.

Installation and integration of the modem is under the customer's responsibility. Follow the instructions below further information.

12.9.1 Satellite Modem Serial connection configuration

To receive monitoring information from a satellite modem via a **serial connection** (RS-232), the system must be configured with satellite modem parameters.

➔ **To configure the system with the satellite modem parameters:**

STEP 1: Open the **Host** menu and select **Hardware Interface**. The **Host Hardware Interface** dialog box appears.

STEP 2: Validate that the **Enable Hardware Interface** is set to **Yes** in the **Enable tab**.

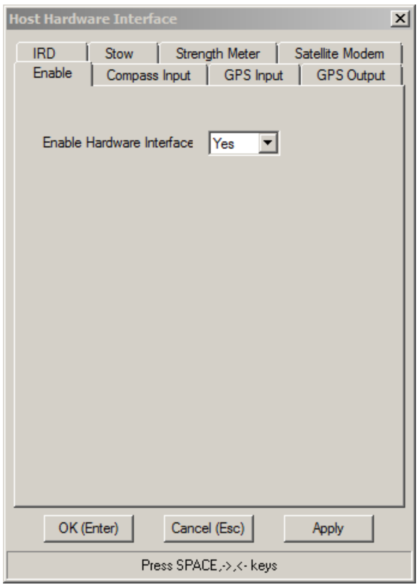


Figure 12.9-1: Host Hardware- Enable Hardware Interface Tab

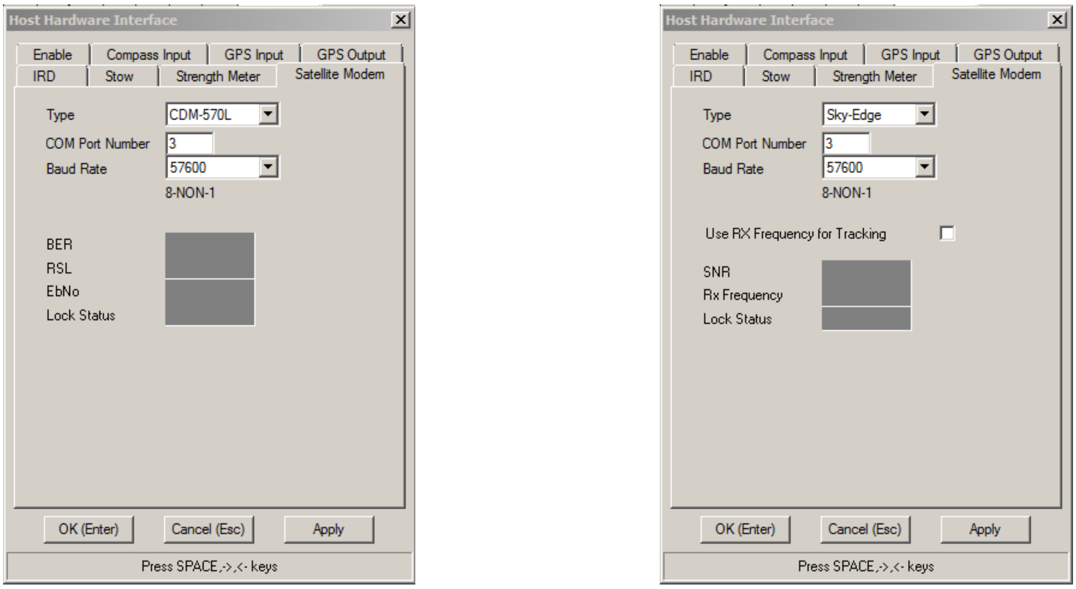


Figure 12.9-2: Host Hardware- Satellite Modem Tab

STEP 3: Click the **Satellite Modem** tab

STEP 4: Select the satellite modem type and Baud Rate for the selected modem.

STEP 5: For Sky-Edge modems, check **Use Download Frequency for Tracking** to enable using the modem's download frequency as the tracking frequency.

STEP 6: Click **OK (Enter)**. The **Host Hardware Interface** dialog box closes. Save the new system configuration **using [V]** on the Operation Screen.

12.10 Satellite Modem IRD Configuration

The OceanTRx™ System can be configured to receive monitoring information, including IRD Status, from supported satellite modems via a serial connection or via an Ethernet connection.

Thru the Integrated Receiver/Decoder (IRD) interface the OceanTRx™ system can monitor the modem Lock/Unlock status.

The IRD functionality adds another level of satellite acquisition validation on top of the received AGC signal level.

Installation and integration of the modem are under the customer's responsibility. Follow the instructions below further information.

12.10.1 Satellite Modem IRD Hardware Interface configuration

In order to allow the IRD functionality the Hardware interface should be configured.

➔ **To configure IRD Hardware Interface:**

STEP 1: Open the **Host** menu and select **Hardware Interface**. The **Host Hardware Interface** dialog box appears.

STEP 2: Validate that the **Enable Hardware Interface** is set to **Yes** in the **Enable tab**.

STEP 3: Click the **IRD** tab and Select the appropriate IRD source from the **Source** field. The system supports the following sources:

- **None** – Use to disable the IRD from the CCU MODEM connector interface.
- **Digital Input Level** – Use to enable IRD from the IRD Lock Signal on the CCU connector MODEM interface (pins 7 and 8).
- **Satellite Modem Lock** – Use to enable IRD from the modem's M&C on the CCU MODEM connector interface.

STEP 4: If **Digital Input Level** is selected, the IRD polarity should configure. select the appropriate parameter (Positive/Negative) in the **Locked State Voltage** field to select the polarity of the IRD lock signal.

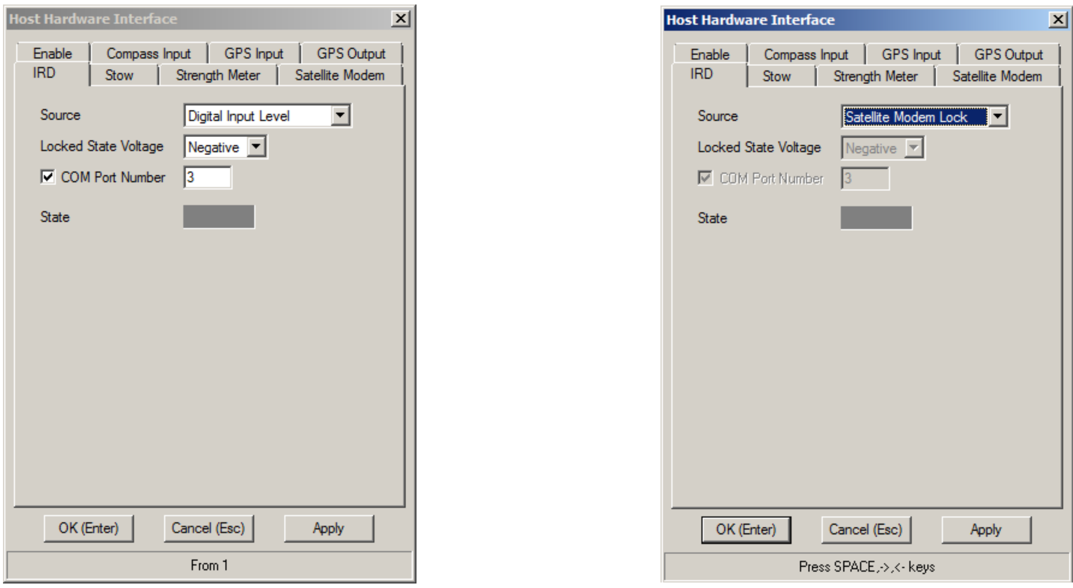


Figure 12.10-1: Host Hardware- IRD Tab

STEP 5: Click **OK (Enter)**. The **Host Hardware Interface** dialog box closes. Save the new system configuration **using [V]** on the Operation Screen

12.10.2 Satellite Modem IRD Satellite Validation Tx Dependency configuration

In order to allow the IRD functionality the **Satellite validation** and the **Tx Chain Dependency** should be enabled and configured.

The Tx Chain Dependency configuration is optional. When activated, the BUC will stop transmitting when the modem reports an 'Unlock' status.

➔ **To enable the Satellite Validation:**

STEP 1: From the **Operation Screen**, open the **Config** menu and select **Satellite Validation**. The **Satellite Validation** dialog box appears:

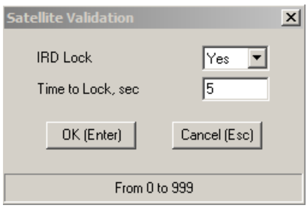


Figure 12.10-2: Satellite Validation Dialog Box

STEP 2: Set the **IRD Lock** option to 'Yes'.

STEP 3: In the **Time to Lock, sec** field, enter the interval in seconds after the activation of Step-Track Mode at which the IRD Lock is checked. The default value is 5 seconds.

Note

The **Time to Lock** value should be set to 40 seconds when using iDirect™ modems, whether connected through the OpenAMIP interface or any other interface.

STEP 4: Click **OK (Enter)**. The **Satellite Validation** dialog box closes. Save the new system configuration **using [V]** on the Operation Screen

➔ **To enable the Tx Dependency:**

Note

In case that the Tx Dependency is required to include the IRD status, perform the following STEPs.

Note that the following procedure stating from STEP 5 as it is a continuation of the last one.

STEP 5: In the **Maintenance Screen**, in the **Tx Chain** window, click on **Depend** bottom, a **Tx Chain Dependency** window will appear:

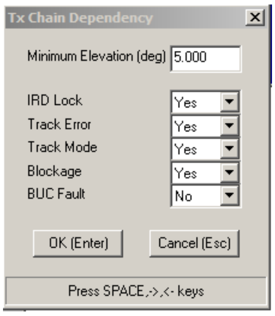


Figure 12.10-3: Tx Chain Dependency Dialog Box

STEP 6: Set the **IRD Lock** as follows: When set to 'Yes', the BUC stops transmitting when the modem reports an 'Unlock' status. The default setting is 'No'.

STEP 7: Click **OK (Enter)**. The **Satellite Validation** dialog box closes. Save the new system configuration **using [V]** on the Operation Screen

12.11 GPS Output Configuration

The OceanTRx™ supports **GPS Output** that can be delivered form the CCU, in NMEA-0183 format, to the satellite modem.

This procedure is only required if the satellite modem requires GPS input in NMEA-0183 format.

Installation and integration of the modem is under the customer's responsibility. Follow the instructions below further information

12.11.1 GPS Output Hardware Interface configuration

➔ **To configure the GPS output hardware interface:**

STEP 1: Open the **Host** menu and select **Hardware Interface**. The **Host Hardware Interface** dialog box appears.

STEP 2: Validate that the **Enable Hardware Interface** is set to **Yes** in the **Enable tab**.

STEP 3: Open the **GPS Output** tab and set the following parameters:

- **Enable**: 'Yes'
- **COM Port Number**: '3'

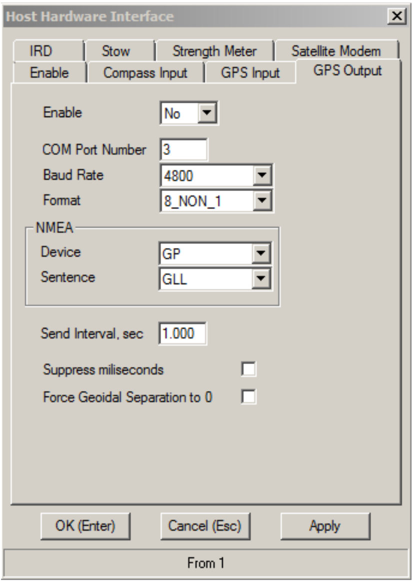


Figure 12.11-1: Host Hardware- GPS Output tab

STEP 4: The other parameters in the dialog box reflect the NMEA-0183 standard. If necessary, change the following parameters as appropriate for your particular satellite modem:

- **Baud Rate**
- **Format**
- **NMEA – Device**
- **NMEA – Sentence**
- **Send Interval, sec.**
- **Suppress milliseconds**
- **Force Geoidal Separation to 0**

STEP 5: Click **OK (Enter)**. The **Host Hardware Interface** dialog box closes. Save the new system configuration **using [V]** on the Operation Screen

12.12 OpenAMIP Connection

The OceanTRx™ supports OpenAMIP connection. OpenAMIP is an iDirect™ ASCII message-based protocol that provides an interchange of information specifications between an antenna controller and a satellite modem. The protocol enables the satellite modem to send ACU (Antenna Control Unit) commands when tracking a satellite. It also allows the operator to provide the necessary permission information to the modem when initiating and maintaining communication. Communication is maintained via the antenna and satellite. The OpenAMIP is designed only for performing modem and ACU synchronized automatic beam switching. It is not a status-logging system or a diagnostic system, although other options are available. The OpenAMIP is also designed for typical installations whereby specific satellite modem and antenna systems are configured to work in tandem. OpenAMIP does not make specific provisions for auto-discovery or parameter negotiation. It is the installer's responsibility to confirm that both the ACU (setup parameters) and satellite modem (proper option files) parameters are compatible for the intended satellite(s).

12.12.1 Interface Requirements

The interface requirements refer to any satellite modem manufacture supporting OpenAMIP.

12.12.2 Protocol Parameters

The following table describes the communication, port, and target parameters:

Table 12.12-1: Communication, Port, and Target Parameters

Communication	Port	Target
TCP/IP	5001	ACU (Above-deck controller)

12.12.3 Implemented Commands

Table 12.12-2: Implemented Commands

<table>
<tr><th>Command</th><th>Value</th></tr>
<tr><td>Modem to ACU command</td><td>B p1 p2</td></tr>
<tr><td colspan="2">ACU action: After reception of F command, use parameter 1 to set the LNB control: Compare parameter 1 to the following numbers:</td></tr>
<tr><td colspan="2">5150.0
9750.0
10250.0
10750.0
11250.0</td></tr>
<tr><td colspan="2">If closest to:</td></tr>
<tr><td>5150.0</td><td>Set the LNB control to 17v00k or Co17v00k, according to the last P command</td></tr>
<tr><td>9750.0</td><td>Set the LNB control to 13v00k or Co13v00k, according to the last P command</td></tr>
<tr><td>10250.0,</td><td>Set the LNB control to 13v22k or Co13v22k, according to the last P command</td></tr>
<tr><td>10750.0</td><td>Set the LNB control to 17v00k or Co17v00k, according to the last P command</td></tr>
<tr><td>11250.0</td><td>Set the LNB control to 17v22k or Co17v22k, according to the last P command</td></tr>
<tr><td>Modem to ACU command</td><td>P p1 p2</td></tr>
<tr><td colspan="2">After reception of “F” command use parameters 1 and 2 to set the LNB Control: Compare parameter 1 to the following numbers:</td></tr>
<tr><td colspan="2">p1=V and p2=H set polarization to Pol-A: VL-RC and LNB Control to XPol
p1=H and p2=V set polarization to Pol-B: HL-LC and LNB control to XPol
p1=R and p2=L set polarization to Pol-A: VL-RC and LNB control to XPol
p1=L and p2=R set polarization to Pol-B: HL-LC and LNB control to XPol
p1=V and p2=V set polarization to Pol-A: VL-RC and LNB control to CoPol
p1=H and p2=H set polarization to Pol-B: HL-LC and LNB control to CoPol - 2 -
p1=R and p2=R set polarization to Pol-A: VL-RC and LNB control to CoPol
p1=L and p2=L set polarization to Pol-B: HL-LC and LNB control to CoPol</td></tr>
</table>

Note

Disregard commands corresponding to any other combination of p1 and p1 values.

Table 12.12-3: Implemented Commands

Command	Value
Modem to ACU command	S p1 p2 p3
ACU Action: After reception of **F** command, set:	
Satellite Preset as per parameter 1 Disregard parameter 2 PolSkew Offset as per parameter 3	

Note

The updated PolSkew Offset corresponds to the currently active Frequency Band (Ku, C or X) and as the last XPol/CoPol selection.

Table 12.12-4: Implemented Commands

Command	Value
Modem to ACU command	H p1 p2
ACU Action: After reception of **F** command, write parameter 1 value to the NBR frequency and use parameter 2 to set the NBR bandwidth as follows:	
Compare parameter 2 to the following three numbers: 0.05 0.15 0.30 If closest to 0.05, set the NBR bandwidth to 50KHz If closest to 0.15, set the NBR bandwidth to 150KHz If closest to 0.30, set the NBR bandwidth to 300KHz	

Table 12.12-5: Implemented Commands

Command	Value
Modem to ACU command	F
ACU Action:	
Set LNB control according to last B and P commands Set polarization according to last P command Set NBR frequency and bandwidth according to last H command Set PolSkew offset according to last S p3 command Perform acquire sat. preset with satellite longitude given by last S p1 command	

12.13 Monitoring System Voltage and Temperature Test Points

From the **Maintenance Screen**, open the **Config-View** menu and select **Show Power State** (or press the <P> key). The **Power and Temperature Status** window appears:

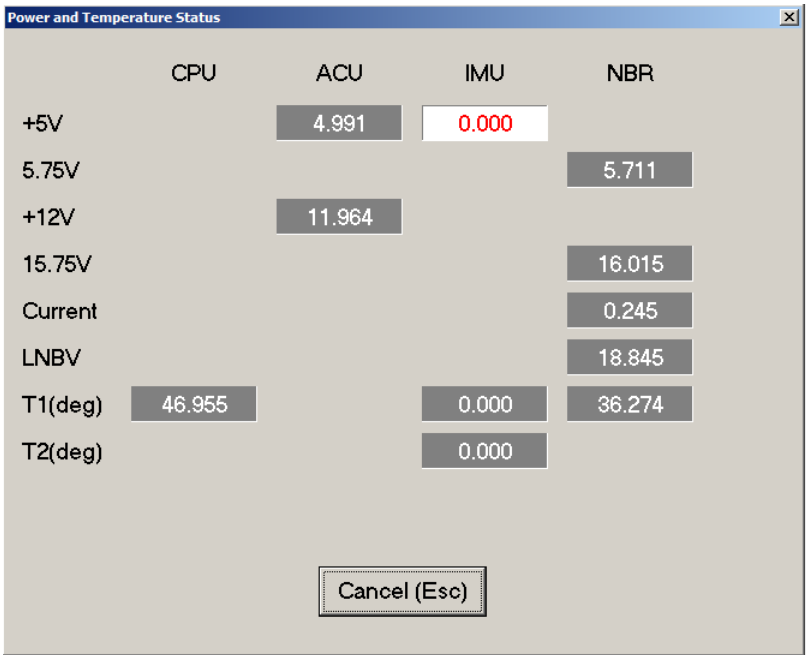


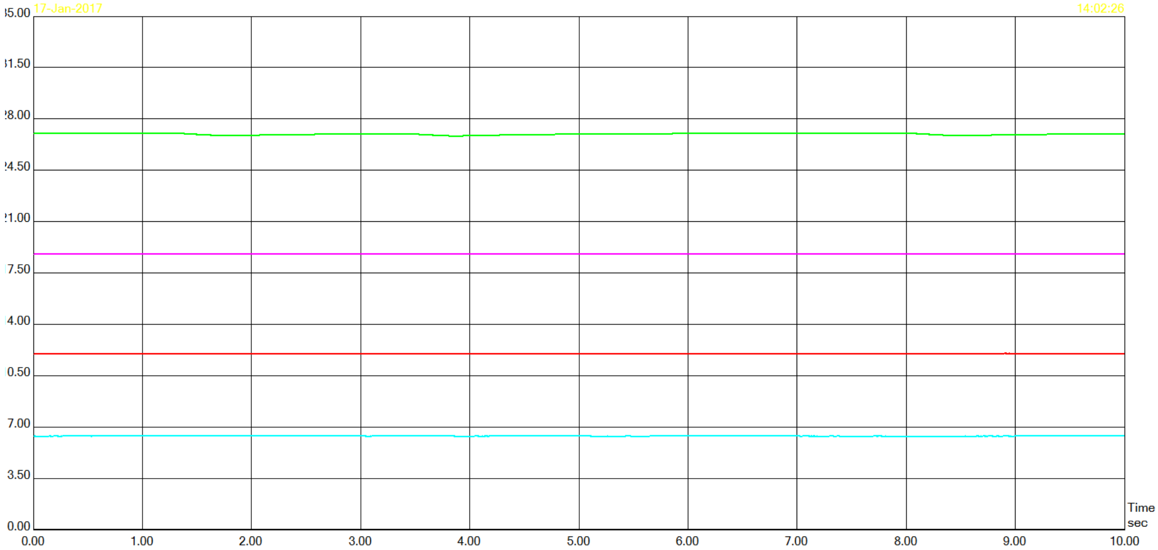
Figure 12.13-1: Power and Temperature Status Window

In the figure above, test points that are out of the normal range are highlighted in red on a white background.

Test points may also be recorded using the **Graphic Data Logger** (see section 12.18).

Name	Grp	Sgr	Scale	Offset	Full Name	Mean	StdDev
T1	PwrSt	CPU	1.0	0.0	T1 (deg)	26.94	0.05
+12V	PwrSt	ACU	1.0	0.0	+12V	11.98	0.00
T1	PwrSt	IMU	1.0	0.0	T1 (deg)	6.36	0.01
LNBV	PwrSt	NBR	1.0	0.0	LNBV	18.76	0.00

Page: 1/1



12.14 Monitoring System Work Time

Open the **Host** menu and select **Work Time**. The **Work Time** window appears, displaying the duration of the current MtsVLink and ACU sessions between reboots (How long they have been working continuously):

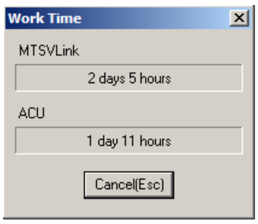


Figure 12.14-1: Work Time Window

12.15 Monitoring System Messages

The OceanTRx™ Antenna Control Unit (ACU) includes **System Message Logs** which record all reported, by the ACU to the CCU, messages, Warnings and Errors.

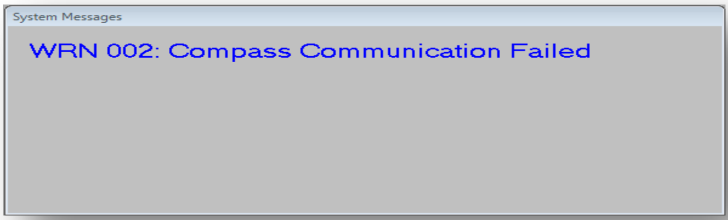
The CCU displays system status messages for a variety of purposes. These are divided into three categories, each identified by a different color:

- **Message (informative)** – GREEN (for example, Acquiring satellite)
- **Warning** – BLUE (for example, Compass Communication Failed)
- **Error** – RED (for example, Servo Azimuth Init Error)

Note

The complete list of status messages can be found in the APPENDIX at the end of this manual. The list of status messages was up to date at publication time. However, more status messages may have been added to the system.

The same massages are presented in real time on the Operation Screen, **System Massages window**.



➔ **To view System Massages Log:**

To view the last 1,000 status messages generated by the system Open the **Host** menu and select the **Log ➔ Show** sub-menu from **System Messages** sub-menu.

The **System Messages Log Snapshot** window appears:

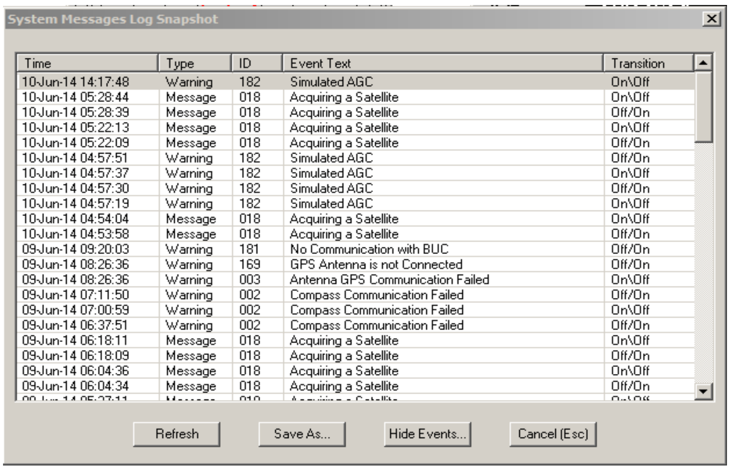


Figure 12.15-1: System Messages Log Snapshot Window

➔ **To Hide a specific Message or Message Type from the display:**

STEP 1: From **System Messages Log Snapshot** window click **Hide Events**. The **Hide Events** dialog box appears:

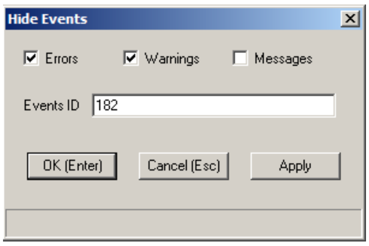


Figure 12.15-2: Hide Events Dialog Box

STEP 2: Select a type option or enter the Event ID of the specific message you wish to hide.

STEP 3: Click **OK (Enter)**. The selected messages are hidden from the **System Messages Log Snapshot** window.

Note

Click the **Refresh** button to update the display with any new messages that do not belong to a category defined as hidden.

➔ **To save the current Message Log :**

Click **Save As** and save the file to the desired location.

➔ **To Expand System Massages view:**

Right click directly on the System massage window and choose **Expanded View** OR open the **Host** menu and select the **Expanded View** from **System Messages** sub-menu

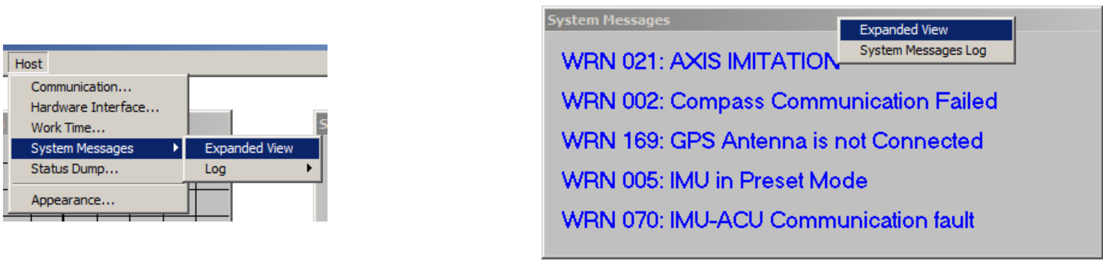


Figure 12.15-3: Massage Log Window – Expanded View

12.16 Downloading the Status Dump File

The **Status Dump** command generates the Status Dump Report, an ASCII file containing the system parameters defined during the commissioning process, as well as system status indications. These parameters and indications can be used to analyze system performance and determine the possible source of system faults.

➔ **To download the Status Dump File:**

STEP 1: From the **Operation Screen**, open the **Host** menu and select **Status Dump**. A file browser opens.

STEP 2: Browse to the directory in which to save the Status Dump File.

STEP 3: Click **Save**. The Status Dump File is saved to the specified location.

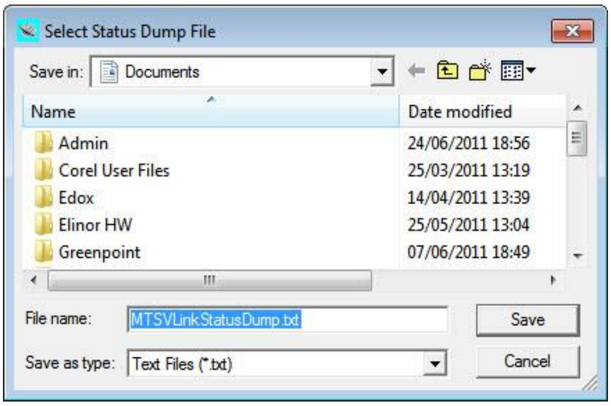


Figure 12.16-1: Select Status Dump File Dialog Box

12.17 Viewing Software Version Details

➔ **To view software version details:**

Click the **Version** control on the **Operation Screen** Menu Bar. The **Version** window appears, displaying the version numbers and dates of the CCU running software MtsVLink and ACU running software modules:

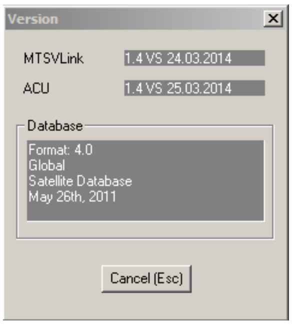


Figure 12.17-1: Version Window

Note

For proper CCU-ACU communication, the same software versions should be installed on both units. The release dates of the MtsVLink and ACU versions may differ.

12.18 Using the Graphic Data Logger

The OceanTRx™ systems includes a powerful monitor **Graphic Data Logger** that can record up to 32 simultaneous channels of data for a specified time interval and calculate the mean value and standard deviation for the recorded period. The **Logger** can be configured to sample data at a specific rate – from 1 sample per tick (approximately 2 milliseconds) to 1 sample per 20,000 ticks (approximately 39 seconds). Each data channel can contain up to 40,960 points. At the fastest sample rate, this allows data to be logged for up to 80 seconds. At the slowest rate, data can be logged for up to 18.5 days.

12.18.1 <u>Configuring the Graphic Data Logger</u>

➔ **To configure the Graphic Data Logger:**

<u>STEP 1:</u> Click the **Logger** control on the **Operation Screen** Menu Bar. The **Graphic Data Logger** screen appears:

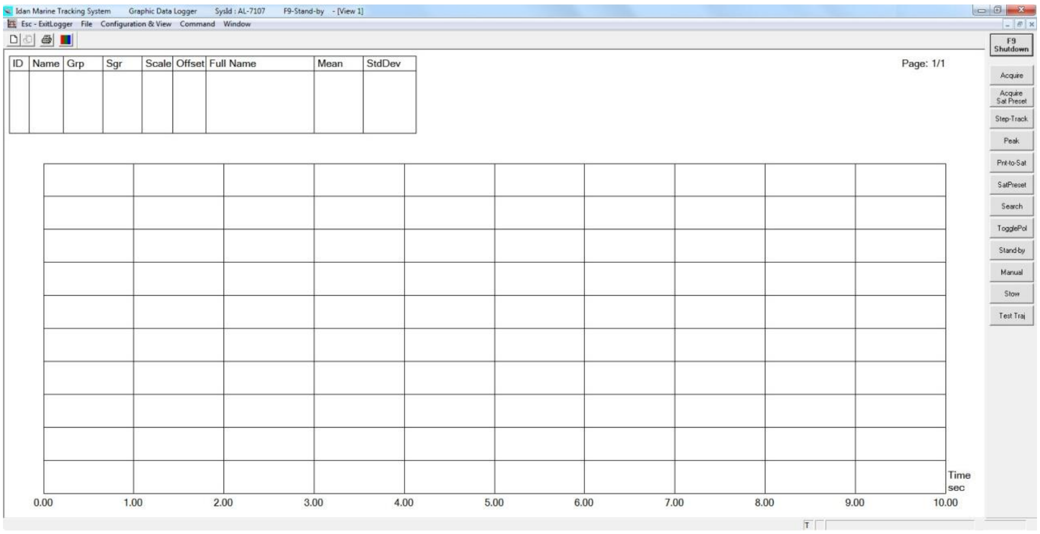


Figure 12.18-1: Graphic Data Logger Screen

<u>STEP 2:</u> Open the **Configuration & View** menu and select **General Config** (or press the <C> key). The **Logger Configuration** dialog box appears:

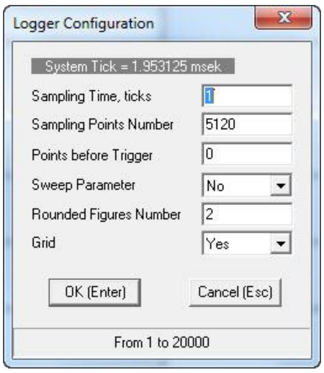


Figure 12.18-2: Logger Configuration Dialog Box

STEP 3: Set the desired sampling time and sampling points.

Note

When logging data at 1 sample per tick, it is recommended to set the number of points to 30,720, corresponding to 60 seconds of logging time per tick. Consequently, each additional minute represents a single tick

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STEP 4: Click **OK (Enter)**. The **Logger Configuration** dialog box closes.

12.18.2 Logging Data with the Graphic Data Logger

➔ **To log data:**

STEP 1: Open the **Configuration & View** menu and select **Add Parameter** (or press the <A> key). The **Add Parameter** dialog box appears:

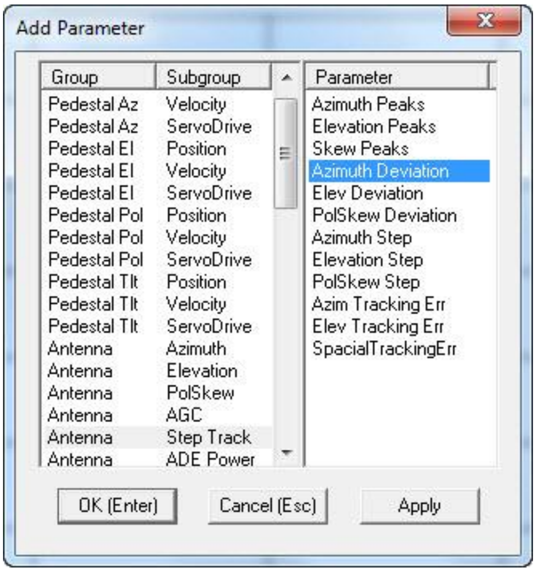

Figure 12.18-3: Add Parameter Dialog Box

STEP 2: Select a **Group/Subgroup** in the left-hand pane (for example, Antenna/Step Track), then select the **Parameter** you wish to log in the right-hand pane (for example, Azimuth Deviation).

STEP 3: Click **OK (Enter)**. The parameter appears in the **Logger** control table.

STEP 4: To log additional parameters simultaneously, reopen the **Add Parameter** window (press the <A> key) and repeat steps 2 and 3 for each parameter. The selected parameters appear in the control table highlighted in a different color.

Note

To delete a parameter from the **Logger** control table, open the **Configuration & View** menu and select **Delete** (or press the <D> key).

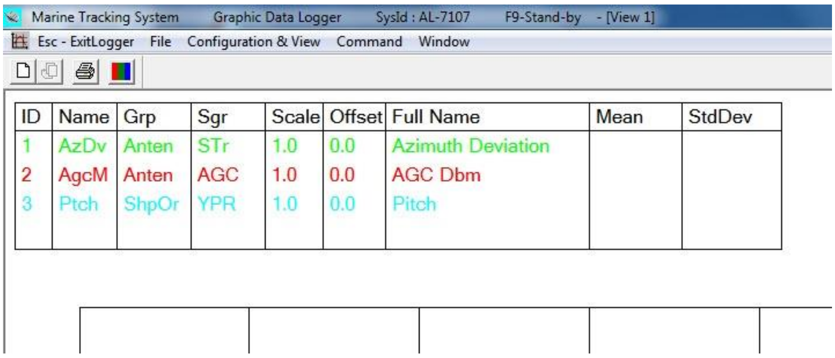

Figure 12.18-4: Logging Multiple Parameters

STEP 5: Open the **Command** menu and select **Run** (or press the <R> key). The **Logger** begins recording data.

A progress bar appears during the logging process, and intermediate results are displayed for measurements that last a considerable time (i.e. more than a few minutes).

STEP 6: When the defined sampling time is complete, the recorded data appear as curves in the **Logger** display, and the mean value and standard deviation for each parameter appear in the **Mean** and **StdDev** columns of the control table, respectively.

12.18.3 Analyzing Logger Data

The **Logger** provides a scaling and offsetting feature that facilitates analysis by making the graphic display more readable. This is particularly useful when logging multiple parameters.

➔ **To scale and offset logged data:**

STEP 1: Open the **Configuration & View** menu and select **Scale** (or press the <S> key). The **Graph Scaling** dialog box appears:

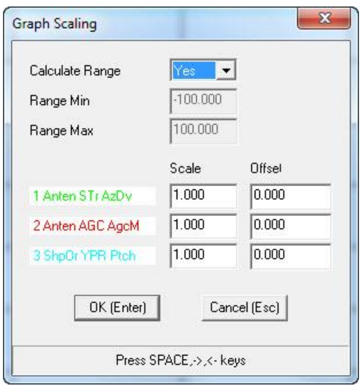

Figure 12.18-5: Graph Scaling Dialog Box

STEP 2: Set the desired **Scale** and **Offset** values for each parameter. For example, the following figures show the **Logger** results before and after scaling:

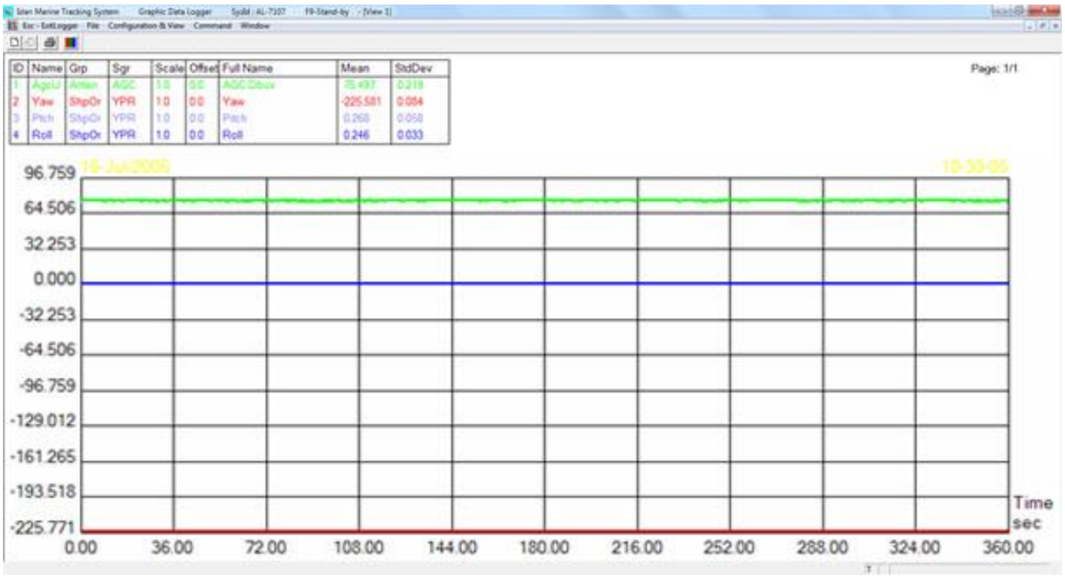

Figure 12.18-6: Logger Results before Scaling

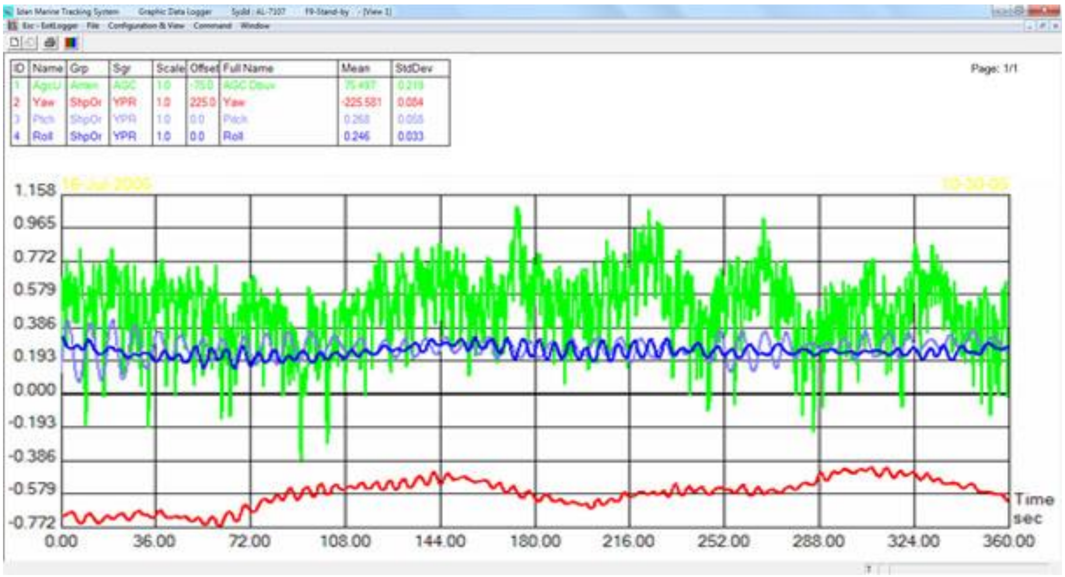

Figure 12.18-7: Logger Results after Scaling

In the above example, the Yaw curve was offset by 225.0° and the AGC curve by -75.0dB.

12.18.4 Logger Data Files

➔ **To save the logged data:**

STEP 1: Open the **File** menu and select **Write Graph** (or press the <W> key from the **Logger** screen).

STEP 2: Save one or all parameters to the desired folder.

➔ **To retrieve a data file:**

STEP 1: Open the **File** menu and select **Read Graph** (or press the <G> key from the **Logger** screen).

STEP 2: Do one of the following:

- Select **Replace** to overwrite the data currently displayed.
- Select **Add** to add the saved data to the data currently displayed.

➔ **To save the current Logger settings:**

STEP 1: Open the **File** menu and select **Save Setup** (or press the <V> key from the **Logger** screen).

STEP 2: Save the current configuration to the desired folder.

➔ **To load saved Logger settings:**

STEP 1: Open the **File** menu and select **Restore Setup** (or press the <E> key from the **Logger** screen).

STEP 2: Retrieve the settings file. The **Logger** is automatically configured according to the saved settings.

12.19 Using the Spectrum Analyzer

The **Spectrum Analyzer Screen** is accessed with the **Spectrum** command from both the **Operation Screen** and **Maintenance Screen**.

➔ **To configure the Spectrum Analyzer Screen:**

STEP 1: From the **Spectrum Analyzer Screen**, open the **Configuration & View** menu and select **General Config**. The **Configuration** dialog box appears:

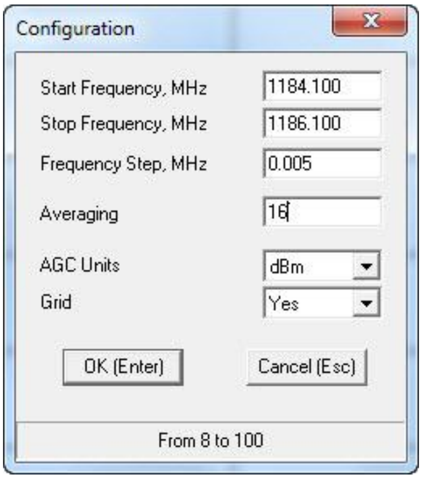

Figure 12.19-1: Spectrum Analyzer Configuration Dialog Box

STEP 2: Set the start and stop frequencies to the relevant range of measurement.

STEP 3: The frequency step is set to 1MHz by default. You should decrease the frequency step when measuring smaller frequency spans (the minimal step is 0.005MHz).

STEP 4: The Spectrum Analyzer takes a number of measurements for each frequency before advancing to the next frequency. The average power of the measurements is displayed in the Spectrum Analyzer. Set the number of measurements taken for each frequency before advancing to the next frequency in the **Averaging** field. Valid values are integers in the range 8 – 100.

STEP 5: Select an AGC unit from the **AGC Units** list. The selected unit is used by the Spectrum Analyzer when displaying the results. Available units are dBm and dBµV**.**

STEP 6: The Spectrum Analyzer graphs can be displayed with or without a background grid. Select the rid display from the **Grid** list.

STEP 7: Click **OK (Enter)**. The **Configuration** dialog box closes.

Note

- The spectral scan may take some time. The time required can be calculated by multiplying the amount of measurements to be performed by 2.5 milliseconds.
- The number of measurements is in turn a multiplication of measured points by the selected averaging factor (the minimum value is 8). For example, a scan of 1000MHz to 1010MHz with a 0.005MHz step and an averaging factor of 8 will take 40 seconds ($0.0025 \times 8 \times (1010\text{-}1000)/0.005$).
- The maximum number of measured points is limited to 25,000. If the span-to-step ratio exceeds this number, an error message is received.
- NBR IfBw filters (which effectively function as the **Spectrum Analyzer Screen** resolution bandwidth) can be set to 50KHz, 150KHz and 300KHz bands, depending on the carrier's bandwidth.

➔ **To run a measurement**

STEP 1: Make sure the system is not in Step-Track Mode, which deploys the tracking receiver. If the system is in Step-Track Mode, move the system to Peak Mode.

STEP 2: Open the **Command** menu and select **Run** (or press <R> from the **Spectrum Analyzer Screen**).

The following figures show examples of Spectrum Analyzer displays.

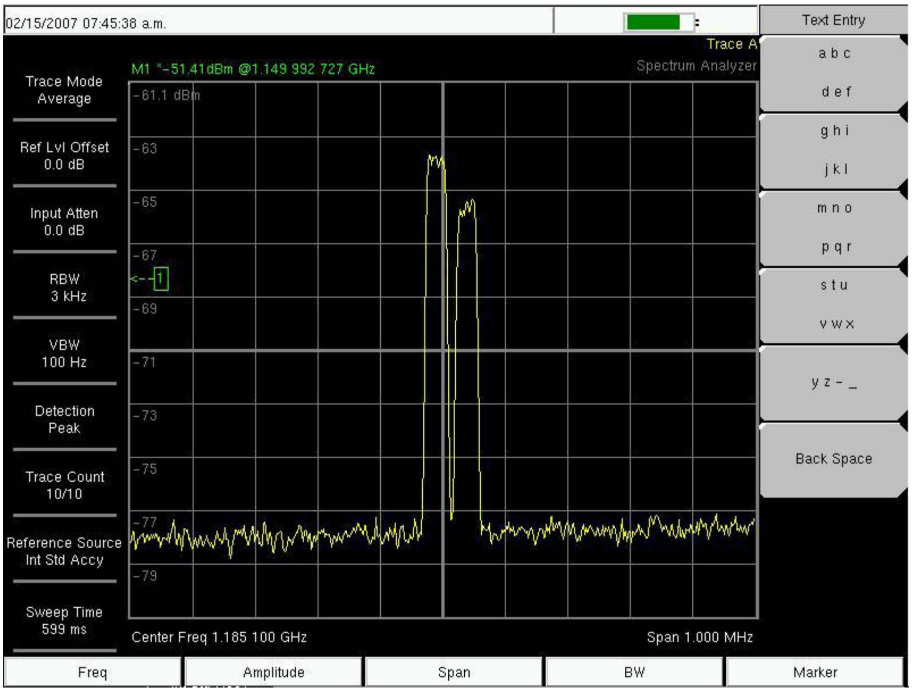

Figure 12.19-2: Anritsu MS2721A Spectrum Analyzer Display with a 3 KHz RBW

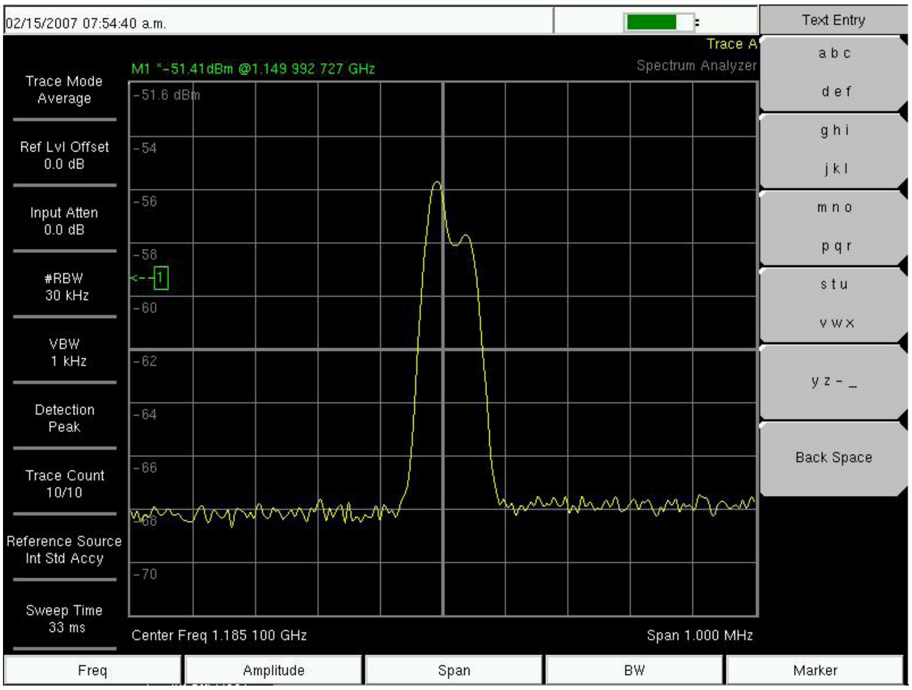

Figure 12.19-3: Anritsu MS2721A Spectrum Analyzer Display with a 30 KHz RBW

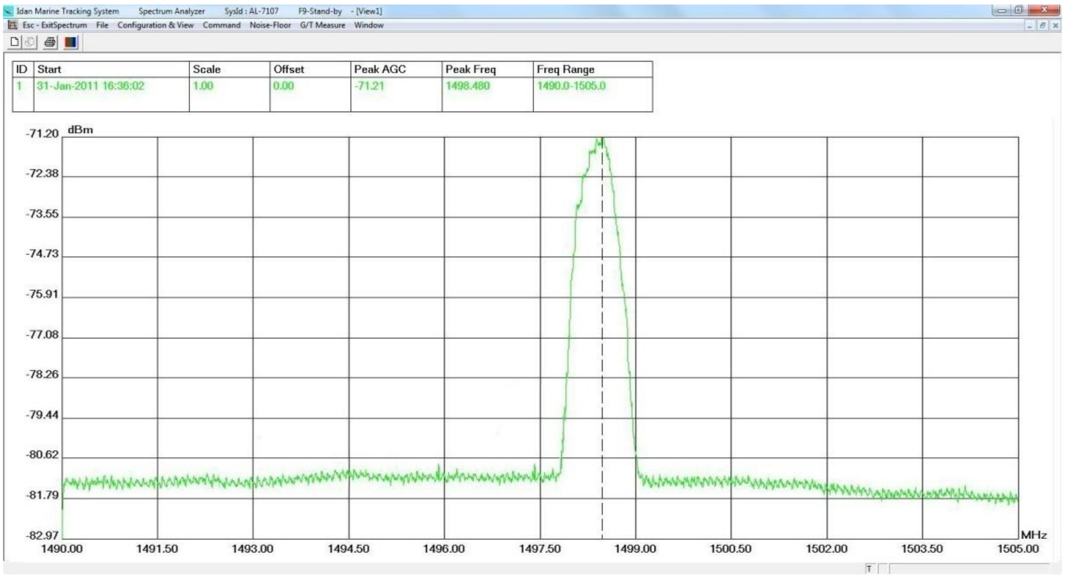

Figure 12.19-4: MtsVLink Spectrum Analyzer Display with an NBR IfBw of 150 KHz

Wide band scans are also possible, although the scan resolution must be taken into account. In the figure below, a 200MHz scan is taken using an NBR IfBw of 300KHz at a resolution of 0.1MHz with 8-point averaging. This scan will take about a minute.

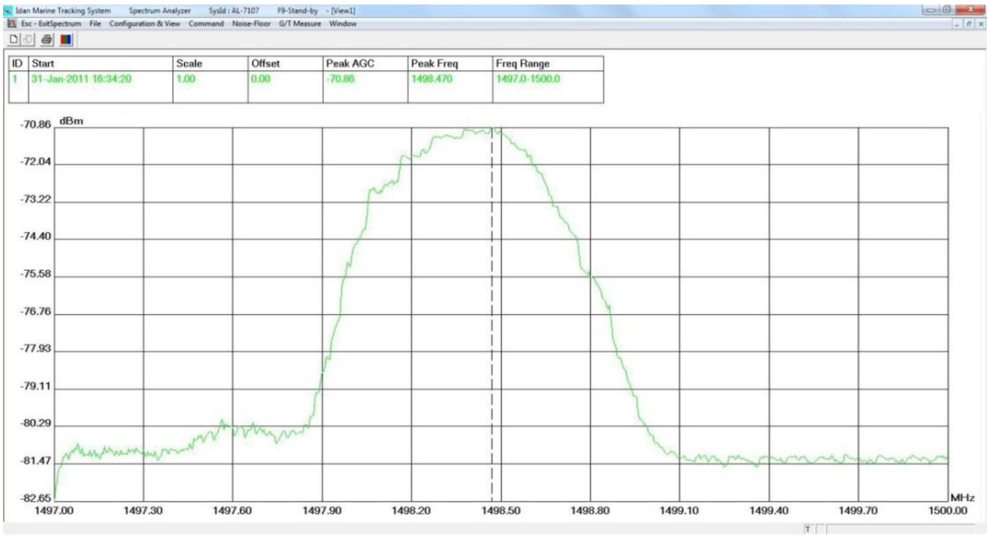

Figure 12.19-5: MtsVLink Spectrum Analyzer Display with an NBR IfBw of 300 KHz

APPENDIX A: System Massage

Messages (Informative)

Controller Screen Label	Description
009: System Reboots, Axes Jammed	The system will reboot because one or more of the axes is jammed.
016: Auto-Restart in Progress	The system is undergoing initialization, including IMU initialization, encoder initialization, and, optionally, satellite acquisition.
018: Acquiring a Satellite	The system is currently acquiring a satellite.
020: System Shutdown	The system is about to shut down and reboot.
037: Set Servo Azim Config from File	The ACU successfully wrote the stored configuration file to the azimuth servo driver.
039: Set Servo Elev Config from File	The ACU successfully wrote the stored configuration file to the elevation servo driver.
041: Set Servo Pol Config from File	The ACU successfully wrote the stored configuration file to the polarization skew servo driver.
043: Set Servo Tilt Config from File	The ACU successfully wrote the stored configuration file to the tilt servo driver.
052: COM Port – TCP/IP Bridge	TCP/IP monitoring has been assigned to at least one COM Port.
075: Tilt Init in Progress	The tilt axis is performing its servo initialization procedure.
118: Satellite Recognition Running	The satellite validation option is enabled.
120: Azimuth Init in Progress	The azimuth axis is performing its servo initialization procedure.
133: Elevation Init in Progress	The elevation axis is performing its servo initialization procedure.
146: PolSkew Init in Progress	The polarization skew axis is performing its servo initialization procedure.

Warning Messages

Controller Screen Label	Description
Tuner-1 LNB Power Over-Current	The controller 13V/18V power supply feeding the LNB is overloaded.
WRN 001: NBR-ACU Communications Fault	There is no communication with the NBR.
WRN 002: Compass Communication Failed	There is no communication with the compass.
WRN 003: GPS Communication Failed	There is no communication with the GPS MODULE.
WRN 004: No GPS Position Updates	There is communication with the GPS MODULE, but no coordinates are being received.
WRN 005: IMU in Preset Mode	The system is disconnected from the IMU and working on manually defined pitch, roll and yaw values.
WRN 011: Improper Azim SW Version	The Azimuth Servo Driver software version is not compatible with the Release Version.
WRN 012: Improper Elev SW Version	The Elevation Servo Driver software version is not compatible with the Release Version.
WRN 013: Improper Pol SW Version	The Polarization Servo Driver software version is not compatible with the Release Version.
WRN 014: Improper Tilt SW Version	The Tilt Servo Driver software version is not compatible with the Release Version.
WRN 019: System not Initialized	The system did not undergo initialization, including encoder initialization for all axes.
WRN 025: LNB Voltage out of Tolerance	The controller 13V/18V power supply feeding the LNB is exceeding its predefined tolerance levels.
WRN 033: Antenna View Blocked	The ANTENNA has moved into one of the predefined blockage areas.
WRN 034: LNB Supply Voltage Disabled	LNB supply voltage has been switched off by the controller.
WRN 050: No Communications with Host	Communication with the host computer has timed-out.
WRN 056: No Selected Satellite File	No satellite has been selected from the satellite database.
WRN 069: Signal Below Threshold	The controller signal strength indication (AGC) on the selected frequency is lower than the predefined threshold level.
WRN 070: IMU-ACU Communication Fault	There is no communication with the IMU.
WRN 071: No Tracking, Wait UTC	UTC Sync was activated but no UTC time was received from the GPS MODULE. Program tracking stopped.

Controller Screen Label	Description
WRN 072: UTC from Internal Clock	UTC Sync was activated but no UTC time was received from the GPS MODULE. The system reverted to the internal clock.
WRN 073: UTC Update Timeout	UTC Sync was activated but no UTC time was received from the GPS MODULE for more than a few seconds.
WRN 076: Tilt was not Initialized	The tilt axis has not yet performed its initialization procedure.
WRN 079: Tilt CW Software Limit	The tilt axis has reached its CW software limit.
WRN 080: Tilt CCW Software Limit	The tilt axis has reached its CCW software limit.
WRN 081: Tilt Driver Temperature High	The tilt axis servo-driver temperature is above the alarm temperature setting.
WRN 082: Tilt Driver Memory Error	The tilt axis servo driver failed one of its memory test routines.
WRN 083: Tilt Communication Error	There was a checksum error or timeout on commands received for the tilt axis.
WRN 084: Tilt 96V out of Range	Input 96V power is too high or low on the tilt axis.
WRN 087: System ID Changed	The system ID changed.
WRN 101: Satellite Database is Truncated	The satellite database file is truncated.
WRN 102: Receiver Cal Table not Found	The ACU could not find the internal NBR calibration file in its flash memory (C:\) on power-up.
WRN 121: Azimuth was not Initialized	The azimuth axis has not yet performed its initialization procedure.
WRN 124: Azimuth CW Software Limit	The azimuth axis has reached its CW software limit.
WRN 125: Azimuth CCW Software Limit	The azimuth axis has reached its CCW software limit.
WRN 126: Azimuth Driver Temperature High	The azimuth axis servo-driver temperature is above the alarm temperature setting.
WRN 127: Azimuth Driver Memory Error	The azimuth axis servo driver failed one of its memory test routines.
WRN 128: Azimuth Communication Error	There was a checksum error or timeout on commands received for the azimuth axis.
WRN 129: Azimuth 96V out of Range	Input 96V power is too high or low on the azimuth axis.
WRN 134: Elevation was not Initialized	The elevation axis has not yet performed its initialization procedure.
WRN 137: Elevation CW Software Limit	The elevation axis has reached its CW software limit.

Controller Screen Label	Description
WRN 138: Elevation CCW Software Limit	The elevation axis has reached its CCW software limit.
WRN 139: Elevation Driver Temperature High	The elevation axis servo-driver temperature is above the alarm temperature setting.
WRN 140: Elevation Driver Memory Error	The elevation axis servo-driver has failed one of its memory test routines.
WRN 141: Elevation Communication Error	There has been a checksum error or timeout on commands received for the elevation axis.
WRN 142: Elevation 96V out of range	Input 96V power is too high or low on the elevation axis.
WRN 147: PolSkew was not Initialized	The polarization skew axis has not yet performed its initialization procedure.
WRN 150: PolSkew CW Software Limit	The polarization skew axis has reached its CW software limit.
WRN 151: PolSkew CCW Software Limit	The polarization skew axis has reached its CCW software limit.
WRN 152: PolSkew Driver Temperature High	The polarization skew axis servo-driver temperature is above the alarm temperature setting.
WRN 153: PolSkew Driver Memory Error	The polarization skew axis servo driver failed one of its memory test routines.
WRN 154: PolSkew Communication Error	There was a checksum error or timeout on commands received for the polarization skew axis.
WRN 155: PolSkew 96V out of range	Input 96V power is too high or low on the polarization skew axis.
WRN 165: iNBR High LO Unlocked	The high local oscillator of the NBR is unlocked.
WRN 166: iNBR Low LO Unlocked	The low local oscillator of the NBR is unlocked.
WRN 167: Tracking Error Exceeds Limit	A tracking error has exceeded the predefined limit.
WRN 173: BUC Tx Stopped	BUC transmission has been stopped by the controller.
WRN 179: NBR Powr/Tempr out of tolerance	The NBR’s power supply/temperature has exceeded its predefined tolerance levels.
WRN 180: No Noise Floor Table	The LNB noise floor level is not calibrated.
WRN 181: No Communication with BUC	There is no communication with the BUC.
WRN 182: Simulated AGC	The system is running a software simulation of AGC rather than measuring real AGC from ACU input.

Error Messages

Controller screen label	Description
ERR 008: USB Ports not Detected; Reboot	USB bus initialization has failed. If shutdown is enabled for this message, the system will reboot one minute after startup.
ERR 017: Restart Timed Out(Rebooting)	The system was not able to complete the restart routine in the predefined time (normally set to 12 minutes).
ERR 022: CPU Power out of Tolerance	The CPU power supply has exceeded its predefined tolerance levels.
ERR 023: CPU Temp out of Tolerance	The CPU temperature has exceeded its predefined tolerance levels.
ERR 036: Servo Azimuth Config Init Error	The ACU could not compare or save the configuration file in the azimuth servo driver.
ERR 038: Servo Elev Config Init Error	The ACU could not compare or save the configuration file in the elevation servo driver.
ERR 040: Servo PolSkew Config Init Error	The ACU could not compare or save the configuration file in the polarization skew servo driver.
ERR 042: Servo Tilt Config Init Error	The ACU could not compare or save the configuration file in the tilt servo driver.
ERR 053: No Maintenance Config File	The ACU could not find the maintenance configuration file in its flash memory (C:\) on power-up.
ERR 054: No Operational Config File	The ACU could not find the operational modes configuration file in its flash memory (C:\) on power-up.
ERR 055: No Satellite Database File	The ACU could not find the satellite database file in its flash memory (C:\) on power-up.
ERR 057: No System Configuration File	The ACU could not find the system parameters configuration file in its flash memory (C:\) on power-up.
ERR 058: No Valid IMU Calibration File	The ACU could not find the IMU calibration file in its flash memory (C:\) on power-up.
ERR 074: Tilt Stuck	The tilt axis is stuck – no motor motion occurs in response to received commands.
ERR 077: Tilt Initialization Failed	The tilt servo driver failed to complete its initialization routine.
ERR 078: Tilt Encoder Fault	An error occurred between the tilt axis and motor encoders, or an encoder fault was detected.
ERR 085: Tilt Overcurrent on 96V	A 96V bus overcurrent trip occurred on the tilt axis.
ERR 086: Tilt Overcurrent on 5V	A 5V peripheral overcurrent trip occurred on the tilt axis.

Controller screen label	Description
ERR 088: Missing Configuration File	One or more of the configuration files critical for ACU operation is missing.
ERR 100: Satellite File Read Error	The ACU could not read the satellite database file from its flash memory (C:\) during operation.
ERR 121: Azimuth Stuck	The azimuth axis is stuck – no motor motion occurs in response to received commands.
ERR 122: Azimuth Initialization Failed	The azimuth servo driver failed to complete its initialization routine.
ERR 123: Azimuth Encoder Fault	An error occurred between the azimuth axis and motor encoders, or an encoder fault was detected.
ERR 130: Azimuth Overcurrent on 96V	A 96V bus overcurrent trip occurred on the azimuth axis.
ERR 131: Azimuth Overcurrent on 5V	A 5V peripheral overcurrent trip occurred on the azimuth axis.
ERR 132: Elevation Stuck	The elevation axis is stuck – no motor motion occurs in response to received commands.
ERR 135: Elevation Initialization Failed	The elevation servo driver failed to complete its initialization routine.
ERR 136: Elevation Encoder Fault	An error occurred between the elevation axis and motor encoders, or an encoder fault was detected.
ERR 143: Elevation Overcurrent on 96V	A 96V bus overcurrent trip occurred on the elevation axis.
ERR 144: Elevation Overcurrent on 5V	A 5V peripheral overcurrent trip occurred on the elevation axis.
ERR 145: PolSkew Stuck	The polarization skew axis is stuck – no motor motion occurs in response to received commands.
ERR 148: PolSkew Initialization Failed	The polarization skew servo driver failed to complete its initialization routine.
ERR 149: PolSkew Encoder Fault	An encoder fault was detected.
ERR 156: PolSkew Overcurrent on 96V Bus	A 96V bus overcurrent trip occurred on the polarization skew axis.
ERR 157: Azimuth Overcurrent on 5V	A 5V peripheral overcurrent trip occurred on the polarization skew axis.

APPENDIX A: MIB for the Antenna Control Unit

The actual MIB file is provided by Orbit as part of the system software. The following description is for reference purposes only.

Note The provided MIB was up to date at publication time. However, the MIB file may have been updated.

Object ID	Node Name	Description
nodeMarineSatcom 2	Acu7107	MIB for Antenna Control Unit of Marine Satellite Communication System OceanTRx™
nodeAcu7107 1	od	Operating Dynamic Data
nodeOd 1	odMode	SET operation assigns new operating mode. GET operation returns current operating mode.
	Mode	**String**
	Stand-by	halt
	Manual	man
	Search	srch
	Peak	peak
	Step-Track	stept
	Sat. Preset	satpr
	Acquire Sat. Preset	acqs
	Test Trajectory	tst2
	Stow	stow
nodeOd 2	odSms	System Messages
nodeOdSms 1	odSmsAll	GET operation returns a hexadecimal value reflecting the state of all system messages, according to their ID.
	ID	**Message**
	0	Tuner-1 LNB Power Over-Current
	1	NBR-ACU Communications Fault
	2	Compass Communication Failed
	3	GPS Communication Failed
	4	No GPS Position Updates
	5	IMU in Preset Mode
	8	USB Ports not Detected; Reboot
	9	System Reboots, Axes Jammed
	16	Auto-Restart in Progress
	17	Restart Timed Out (REBOOTING)
	18	Acquiring a Satellite
	19	System Not Initialized
	20	System Shutdown

Object ID	Node Name	Description
	22	CPU Power Out of Tolerance
	23	CPU Temp Out of Tolerance
	25	LNB Voltage Out of Tolerance
	33	Antenna View Blocked
	36	Servo Azimuth Config Init Error
	37	Set Servo Azim Config from File
	38	Servo Elev Config Init Error
	39	Set Servo Elev Config from File
	40	Servo PolSkew Config Init Error
	41	Set Servo Pol Config from File
	42	Servo Tilt Config Init Error
	43	Set Servo Tilt Config from File
	50	No Communications with Host
	52	COM Port - TCP/IP Bridge
	53	No Maintenance Config. File
	54	No Operational Config. File
	55	No Satellites Database File
	56	No Selected Satellite File
	57	No System Configuration File
	58	No Valid IMU Calibration File
	69	Signal Below Threshold
	70	IMU-ACU Communication Fault
	74	Tilt Stuck
	75	Tilt Init in Progress
	76	Tilt was not Initialized
	77	Tilt Initialization Failed
	78	Tilt Encoder Fault
	79	Tilt CW Software Limit
	80	Tilt CCW Software Limit
	81	Tilt Driver Temperature High
	82	Tilt Driver Memory Error
	83	Tilt Communication Error
	84	Tilt 96V out of Range
	85	Tilt Overcurrent on 96V
	86	Tilt Overcurrent on 5V
	100	Satellite File Read Error
	101	Satellite Database is Truncated
	102	Receiver Cal Table not Found
	118	Satellite Recognition Running
	119	Azimuth Stuck
	120	Azimuth Init in Progress
	121	Azimuth was not Initialized
	122	Azimuth Initialization Failed
	123	Azimuth Encoder Fault

Object ID	Node Name	Description
	124	Azimuth CW Software Limit
	125	Azimuth CCW Software Limit
	126	Azimuth Driver Temperature High
	127	Azimuth Driver Memory Error
	128	Azimuth Communication Error
	129	Azimuth 96V out of Range
	130	Azimuth Overcurrent on 96V
	131	Azimuth Overcurrent on 5V
	132	Elevation Stuck
	133	Elevation Init in Progress
	134	Elevation has not been Initialized
	135	Elevation Initialization Failed
	136	Elevation Encoder Fault
	137	Elevation CW Software Limit
	138	Elevation CCW Software Limit
	139	Elev Driver Temperature High
	140	Elevation Driver Memory Error
	141	Elevation Communication Error
	142	Elevation 96V out of Range
	143	Elevation Overcurrent on 96V
	144	Elevation Overcurrent on 5V
	145	PolSkew Stuck
	146	PolSkew Init in Progress
	147	PolSkew was not Initialized
	148	PolSkew Initialization Failed
	149	PolSkew Encoder Fault Detected
	150	PolSkew CW Software Limit
	151	PolSkew CCW Software Limit
	152	PolSkew Driver Temperature High
	153	PolSkew Driver Memory Error
	154	PolSkew Communication Error
	155	PolSkew 96V out of Range
	156	PolSkew Overcurrent on 96V Bus
	157	PolSkew Overcurrent on 5V
	165	iNBR High LO Unlocked
	166	iNBR Low LO Unlocked
	167	Tracking Error Exceeds Limit
	173	BUC Tx Stopped
	179	NBR Powr/Tempr out of Tolerance
	180	No Noise Floor Table
	181	No Communication with BUC
	182	Simulated AGC
nodeOd 3	odAgc	AGC
OdAgc 1	odAgcM	Current AGC Value in dBm

Object ID	Node Name	Description
nodeOd 4	odAntpos	Antenna Position
nodeOdAntpos 1	odAntposAz	Current Antenna Azimuth
nodeOdAntpos 2	odAntposEl	Current Antenna Elevation
nodeOdAntpos 3	odAntposPol	Current Polarization Skew
nodeOd 5	odShipc	Ship Coordinates
nodeOdShipc 1	odShipcLat	Current Ship Coordinates: Latitude
nodeOdShipc 2	odShipcon	Current Ship Coordinates: Longitude
nodeOd 6	odShipm	Ship Motion
nodeOdShipm 1	odShipmPit	Current Ship Motion: Pitch
nodeOdShipm 2	odShipmRol	Current Ship Motion: Roll
nodeOdShipm 3	odShipmYaw	Current Ship Motion: Yaw
nodeOdShipm 4	odShipmComp	Current Compass Readout
nodeOd 7	odPolst	Current Polarization Status
nodeAcu7107 2	os	Operating Static Data
nodeOs 1	osSatset	Satellite Preset
nodeOsSatset 1	osSatsetLon	Satellite Preset Geostationary Arch Longitude Command (interval: -180.0 – 180.0; res: 0.1°)
nodeOs 2	osPolcmd	Polarization Status Command
	Setting	**String**
	Horizontal (HL-LHCP)	Hl
	Vertical (VL-RHCP)	Vl
nodeAcu7107 3	sc	System Configuration
nodeSc 1	scComp	Compass
nodeScComp 1	scCompOfs	Compass Offset Command (interval: -360.0 – 360.0)
nodeAcu7107 5	ms	Maintenance Static Data
nodeMs 1	msRcv	Receiver
nodeMsRcv 1	msRcvFreq	L-band Tracking Frequency Command (interval: 920.000 – 2150.000
nodeMsRcv 2	msRcvIffr	IF-Band Tracking Frequency Command (interval: 60.000 – 150.000
nodeMsRcv 3	msRcvLnb	Set LNB Command, according to setting.
	Setting	**String**
	13v00KHz	1300
	13v22KHz	1322
	17v00KHz	1700
	17v22KHz	1722
	Col13v00KHz	co1300
	Col13c22KHz	co1322
	Col17v00KHz	co1700
	Col17v22KHz	co1722
	DISABLE	Dis
nodeMs 2	msAlgn	Alignment Parameters
nodeMsAlgn 1	msAlgnCoplku	Axes Alignment Co-PolSkew Ku-Band Offset Command (Interval: -90.0 to 90; Resolution: 0.1°)

Object ID	Node Name	Description
nodeMsAlgn 2	msAlgnCrplc	Axes Alignment Cross-PolSkew C-Band Offset Command (Interval: -90.0 to 90; Resolution: 0.1°)
nodeMsAlgn 3	msAlgnCrplku	Axes Alignment Cross-PolSkew Ku-Band Offset Command (Interval: -90.0 to 90; Resolution: 0.1°)
nodeMsAlgn 4	msAlgnCrplx	Axes Alignment Cross-PolSkew X-Band Offset Command (Interval: -90.0 to 90; Resolution: 0.1°)
nodeMsAlgn 5	msAlgnEl	Axes Alignment Elevation Offset Command (Interval: -90.0 to 90; Resolution: 0.1°)
nodeMs 3	msNbr	Narrow Band Receiver
nodeMsNbr 1	msNbrIfbw	NBR Bandwidth Command (50/150/300KHz)
nodeMs 4	msAntblcTable	Antenna Blockage Zones Table
nodeMsAntblcTable 1	msAntblcEntry	Row of Antenna Blockage Zones Table
nodeMsAntblcEntry 1	msAntblcZone	Blockage Zone Number
nodeMsAntblcEntry 2	msAntblcAzmin	Obstruction Zone Azimuth Minimum (interval: -360.0 – 360.0; resolution: 0.1°)
nodeMsAntblcEntry 3	msAntblcAzmax	Obstruction Zone Azimuth Maximum (interval: -360.0 – 360.0; resolution: 0.1°)
nodeMsAntblcEntry 4	msAntblcElmin	Obstruction Zone Elevation Minimum (interval: -360.0 – 360.0; resolution: 0.1°)
nodeMsAntblcEntry 5	msAntblcElmax	Obstruction Zone Elevation Maximum (interval: -360.0 – 360.0; resolution: 0.1°)
nodeAcu7107 6	cmd	Commands
nodeCmd 1	cmdReboot	ACU Reboot Command (SET)

APPENDIX B: Preparing Coaxial ADE-BDE Cable (LMR)

Required Tools

The following tools are needed to prepare the connectors of the ADE-BDE coaxial cable.

Prep tool for LMR-400 crimp-style connectors

Part No.: ST-400EZ

Stock No.: 3190-401

Deburring tool

Part No.: DBT-01

Stock No.: 3190-406

Crimp tool for LMR-400

Part No.: CT-400/300

Stock No.: 3190-666

or

Part No.: HX-4

Stock No.: 3190-200

0.429” hex dies for EZ-400 crimp connectors

Part No.: Y1719

Stock No.: 3190-202

Preparing the Cable

Perform the following procedure to prepare the connectors on both sides of the LMR cable.

<u>STEP 1:</u> Flush cut the cable squarely.

<u>STEP 2:</u> Slide the heat-shrink boot and crimp ring onto the cable. Strip the cable end using the ST-400-EZ prep/strip tool by inserting the cable into End 1 and rotating the tool. Remove any residual plastic from the center conductor.

<u>STEP 3:</u> Insert the cable into End 2 of the ST-400-EZ prep/strip tool and rotate the tool to remove the plastic jacket.

STEP 4: Debur the center conductor using the DBT-01 deburring tool.

STEP 5: Flare the braid slightly and push the connector body onto the cable until the connector snaps into place, then slide the crimp ring forward, creasing the braid.

STEP 6: Temporarily slide the crimp ring back, and remove the connector body from the cable to trim the excess braid at the crease line, then remount the connector and slide the crimp ring forward until it butts up against the connector body.

STEP 7: Position either the heavy duty HX-4 crimp tool with the appropriate dies (0.429” hex) or the CT-400/300 crimp tool directly behind and adjacent to the connector body and crimp the connector. The HX-4 crimp tool automatically releases when the crimp is complete.

STEP 8: Position the heat shrink boot as far forward on the connector body as possible without interfering with the coupling nut and use the heat gun to form a weather-tight seal.

APPENDIX C: Pre-Installation Checklist

The following table summarizes the major Pre-Installation topics that should be taken into account during the installation planning and site survey

Topic	To-Do/Verify
Mast support	Location: 1. LOS 2. Radar influences 3. Minimal vibrations >30Hz 4. Rigid construction – withstand wind 5. Full support of the ADE - both peripheral and at its center (middle to withstand 500KG and peripheral 150KG of the Radome). 6. Flatness 7. Accurate hole position – according to ICD in the manual 8. Minimum height of 1M 9. Air conditioning provisions 10. Maintenance – bottom and side hatches considerations
ADE/BDE cables	Check LMR and power rout and distance between ADE to BDE
ADE (Antenna and Radome) Orientation	Easy access to the antenna
UPS	Verify that exist
Compass	Verify the type
OceanTRx Radome Assembly Site	It is highly recommended to assemble the ADE Radome in a sheltered shore-side assembly site (dock or hanger) as close as possible to the ship avoiding un-necessary transportation challenges from the Radome assembly site to the ship
Lifting kit	Verify having dedicated lifting harness
Input voltage	110/220V
BDE	Verify that the rack is ready with the right amount of space for CCU, Screen and keyboard, OSS. Also verify its deep enough for LMR cable not to be bended.
Satellite	Verify having coverage of satellite in the installation site.

APPENDIX D: Commissioning Checklist

The following table summarizes the major Post-Installation topics that should be verified after the system installation and commissioning are completed.

Topic	To-Do/Verify
UPS model and power rating	Verify the type
Power on the system	1. All power and ground are connected securely. 2. Verify that the power and LMR cables inside the Radome are routed properly and secured - otherwise, they may be pulled and damaged as the antenna continuously repositions itself.
Compass type	Verify right settings in the CCU accordingly.
LMR type and length	Verify the exact attenuations are being set on the RX and the TX path according to manual
Tracking frequency	Verify the following: 1. Right frequency and channel. 2. The right IFBW setting on the MTSVlink 3. Polarization.
Compass offset	Set it according to the manual.
GPS	Verify output parameters according to modem provider
Modem interface	Verify how the ACU is communicating with the modem e.g. OpenEmip, SNMP or serial.
IP addresses	Verify setting the IP addresses of ACU and CCU according to customer architecture.
Antenna Tracking	Verify that the antenna is step tracking the satellite with good AGC while the red crosshair is in the middle.
X-Pol Discrimination Measurement	It is necessary to perform this test according to manual verifying correct installation.
P1dB Test	Verify that the NOC is performing this test and write down the results
Blockage Zones	Verify inserting the right blockage according to ship drawing or ship orientation – according to manual.
BUC M&C and Cease Transmit Configuration	It is possible to set BUC cease transmit according to manual.

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