ORBIT

Installation and Operation Manual

OceanTRx™ 4-500

1.15m (45") Linear Ku-Band
Maritime Stabilized VSAT System

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Disclaimer of Warranty

About this Manual

This manual is designed to guide you through the installation and operating procedures for the OceanTRx™4-500 Linear Ku-Band 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.

Certifications

ORBIT Communication Systems Ltd. is an ISO 9001 registered company. Registration License No. 27870, issued May 1st, 2005.

ORBIT OceanTRx™4-500 Stabilized Maritime Satellite Communication System is in conformity with the appropriate standards:
IEC EN 60950-1; IEC EN 60950-22; UL 60950-1; UL 60950-22; CAN/CSA-C22.2

The OceanTRx™4-500 system complies with the various worldwide SatCom regulations (FCC, ETSI, EutelSat, IntelSat, ANATEL, etc.)

Revision History

Revision Level	Date	Responsible Person	Description of Change	ECO NO.
-	26/06/2011	Optimum	New Release	-
X1	04/02/2014	Optimum		
X2	11/06/2014	Michael D	Adding 'MET' request to doc	EC1400331
A	02/02/2017	Albert P.	Adding features and topographic changes	EC1700057
B	27/03/2017	Alex V	Addition of Emcon, Daolink & general updates	EC1700165
C	13/06/2017	Alex V.	Update mounting procedure 4.2.2	EC1700280

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 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 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 may be carrying 115/230 VAC.
- Take extra care when handling the servo drivers – which are connected to 48 VDC.
- The system conducts potentially harmful voltages when connected to the designated power sources. Never remove the equipment covers except for maintenance or internal adjustments.
- Keep clear of the moving antenna at all times. The antenna pedestal is equipped with high-torque motors that generate considerable force.

- When units are connected to the chassis ground (to prevent shock and similar hazards), the chassis ground conductor must not be removed.
- 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.
- When installing the system, ensure to use the materials and tools recommended in this manual.

NOTE: System interfaces require high-quality connectors and cables. Use only ORBIT-authorized parts for repair.

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.)

Table 1-1: Safety Distances

OceanTRx™ 4-500	BUC Power	ACGIH, 10mW/cm2 Occupational/Controlled six minutes Averaging Time Minimum Distance (m)	ICNIRP, 5mW/cm2 Occupational/Controlled six minutes Averaging Time Minimum Distance (m)	ICNIRP, 1mW/cm2 General/Uncontrolled Inapplicable Averaging Time Min. Distance (m)
Ku-Band	8W	Radome	Radome	8.0
Ku-Band	16W	Radome	Radome	12.0
Ku-Band	25W	Radome	Radome	18.0

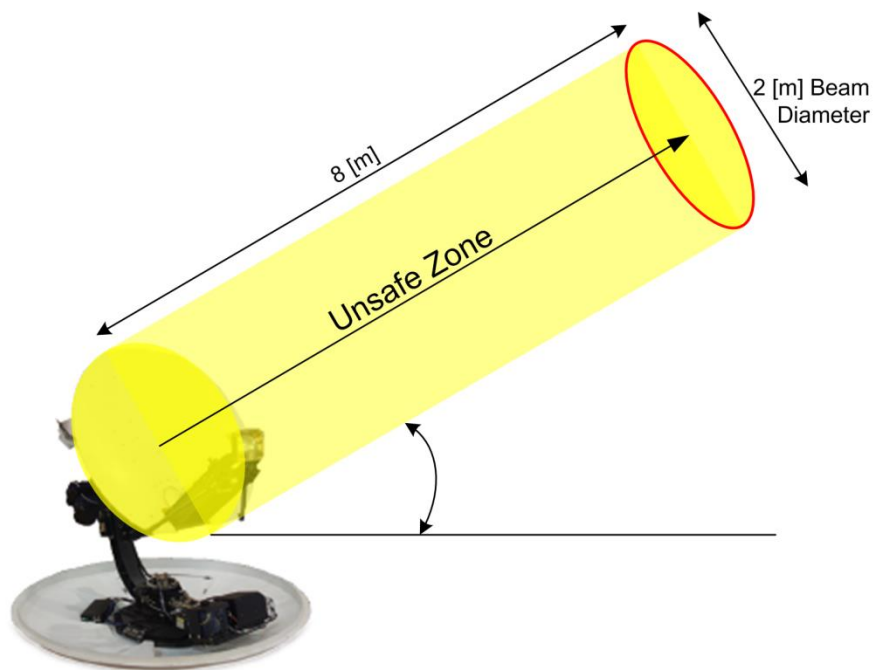The following figure illustrates the safety zones for the OceanTRx™4-500 system.

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1 Introduction

This chapter introduces the OceanTRx^{TM} 4-500 system.

The following information is included in this chapter:

1.1 About ORBIT

ORBIT is a global provider of highly engineered mission-critical communications systems and solutions for aerospace, maritime, and earth observation applications in commercial, defense, and homeland security markets.

ORBIT has developed, manufactured, delivered and supports thousands of mission critical systems worldwide since 1970.

Our portfolio includes Mobile Satellite Communications systems (Satcom), which are deployed on thousands of marine (over 3,500 installation worldwide), airborne and ground platforms worldwide, Communications Management Systems (CMS), and Tracking & Telemetry solutions (T&T).

ORBIT's customers include military users from more than 30 armed forces around the world, major integrators, communications service providers, and earth observation organizations. ORBIT was selected as the Satcom providers of more than 20 leading Navies worldwide.
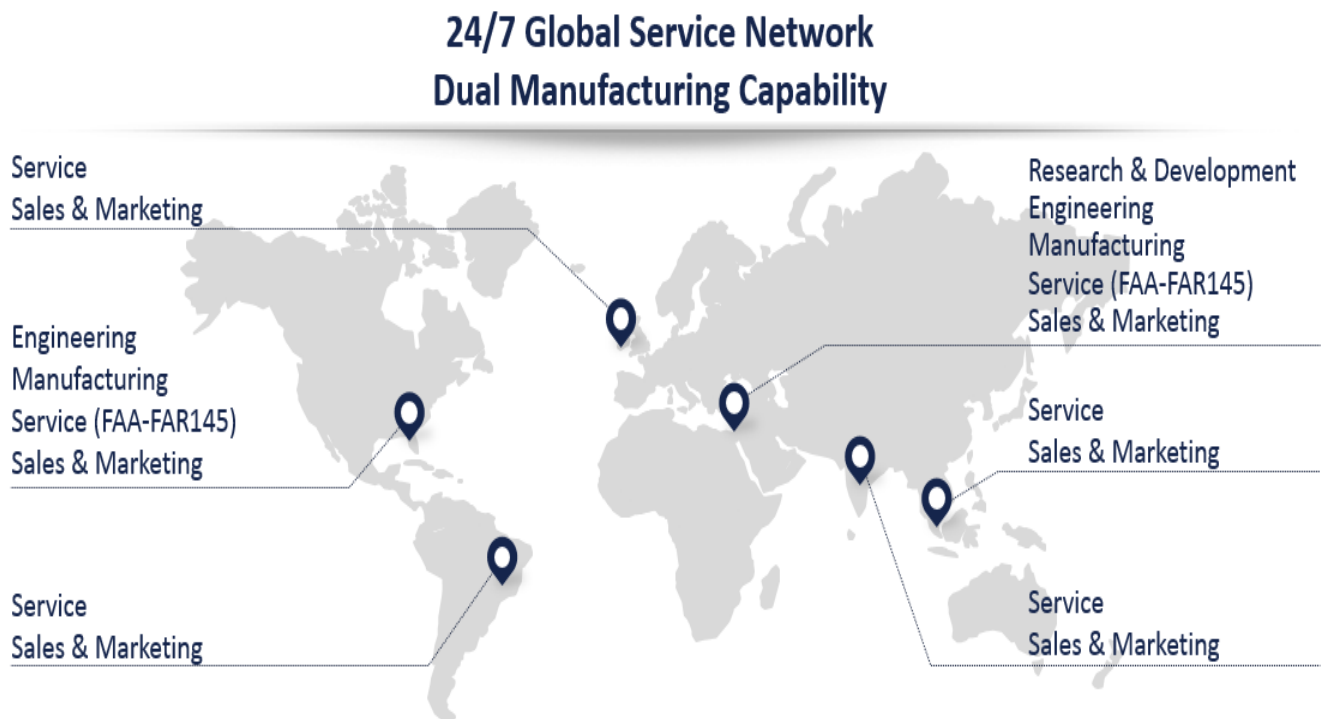
Figure 1-1: ORBIT's Distribution and Support Centers

ORBIT is a public company, traded in the Israeli stock exchange, with a headquarter in Israel and international sales and customer support network that includes the United States, Europe, Brazil and Singapore, in addition to its international technical service centers located around the world.

1.2 About OceanTRx^{TM} 4-500 Ka Band Inherent Support

OceanTRx™4-500 is part of OceanTRx4™product family. OceanTRx™4 is a revolutionary compact, lightweight maritime antenna system. (Other typical solutions require 88% more deck space and can be up to 40% heavier).

OceanTRx™4 innovative platform supports a variety of 1.15m stabilized maritime antenna system configurations in the Ku and Ka bands. As a common platform, it is inherently designed to accommodate the current and future needs of the maritime market. Built to empower mission and business-critical applications, OceanTRx™4 features outstanding RF performance, system availability, and dynamic response virtually under any sea conditions. As such, the system is an optimal solution for the broadband communications needs of myriad maritime platforms such as frigates, container ships, offshore drilling support vessels, mega yachts, and other vessels.

The 500 Series features built-in Ka band fully compatible design to ensure smooth migration to future high-speed Ka band services - for the entire Ka band range - using GEO and MEO satellites. OceanTRx™4-500 provides multi-band frequency support for Ku, Ka, and X bands*, based on field exchangeable kits.

* Field upgradable upon release and customization

Figure 1-2: OceanTRx^{TM}4 Antenna-to-Radome

This system consists of two main assemblies:

- Above Deck Equipment (ADE) - antenna system
- Below Deck Equipment (BDE) - Control and management unit. Installed in a 19" rack below deck and connected to the ship's communication and navigational (GPS) infrastructure

Figure 1-3: OceanTRx^{TM}4-500 Antenna-to-Radome

1.3 OceanTRx™4 Key Features and Advantages

- **Designed for Reliability and Durability -** designed to withstand the most demanding sea conditions.

  OceanTRx™4 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™4 is quick and simple to install, as it does not require balancing and it uses a single cable for below-deck connectivity.

  The system is shipped fully assembled and pre-tested over satellite. It can be installed in a mere matter of hours, dramatically shortening your installation time as compared to equivalent solutions.

- **Balance Free System Installation/Upgrades/Maintenance -** Balance Free system during installation and upgrades.

  Lowers cost of ownership as no periodic visits are required for balancing.

- **Enhanced on-board Serviceability and Platform Commonality for Cost-Effective Operations -** highly accessible pedestal design, enabling convenient service support, and field upgrade process.

  As part of ORBIT's new OceanTRx™ product line, OceanTRx™4-500 shares common electronic field-replaceable units (FRUs) with ORBIT's OceanTRx™4 systems, allowing for lower cost of ownership, easier maintenance support, and shorter response times.

- **Superior Tracking Performance -** ORBIT's superior tracking performance results with better RF performance and signal stability. Tracking performance is critical parameter when operating large dish and when operating at high frequencies such as Ku and Ka bands.

  For over 30 years, ORBIT designs and manufactures 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.

- **Superior Performance & Air-Time Efficiency -** outstanding RF performance, combined with the modem's adaptive coding modulation (ACM) technology and the superior tracking performance, improves satellite resource usage and ensures always-on connectivity on the fringes of satellite coverage.

- **High versatility and multiple configurations -** built-in support for a wide range of configurations with different RF packages (Ku, Ka*) and BUC power levels (up to 25W without cooling) facilitates field upgradability without the need for accurate balancing. The system supports dual or triple system operation and comes with a white or gray Radome.

  * Field upgradable upon release and customization

- **Field Upgradability –** system is field upgraded between Ku-band and Ka-band*. OceanTRx™4 is designed to simultaneously support two BUC modules for rapid field upgrade process.

  Upgrades (configuration dependent) require changing a number of modules: Feed and LNB, BUC and cables. If two BUC modules are installed in the system, only change the Feed + LNB.

  * Field upgradable upon release and customization

- **Seamless Global Coverage -** OceanTRx™4 ensures worldwide connectivity by supporting the full range of Ku or Ka band frequencies using optional RF feeds for GEO or MEO satellites.

  Operating with satellites across geographical regions, OceanTRx™4 delivers seamless global coverage via automatic beam switching (ABS) achieved through the industry-standard Open AMIP 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™4 complies with industry regulations and standards for X, Ku and Ka bands including ITU, FCC, ETSI, EutelSat, IntelSat, ANATEL regulations (for Ku & Ka Bands), as well as "STANAG 4484" and "Skynet 5-Paradigm"(for X Band).

- **World-Class Customer Support -** 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.

1.4 System Architecture for Standard Topology

The OceanTRx™4-500 system consists of the following main systems:

- Antenna system – mounted above deck as a single unit, the system is designed to operate with a specific satellite band. It receives and transmits high-frequency signals from and to the satellite.
- Control and Communication Unit (CCU) - installed below the deck in a standard rack, this unit interfaces to the antenna system (via a single cable) and to the ship's communication and navigational infrastructure.

The antenna system interfaces to the CCU via a single coaxial cable. The CCU acquires signals from the ship's compass and satellite modem for integration with the satellite data.

NOTE: The illustration below provides an overview of the connections. It does not include the power cables and other specific connections.
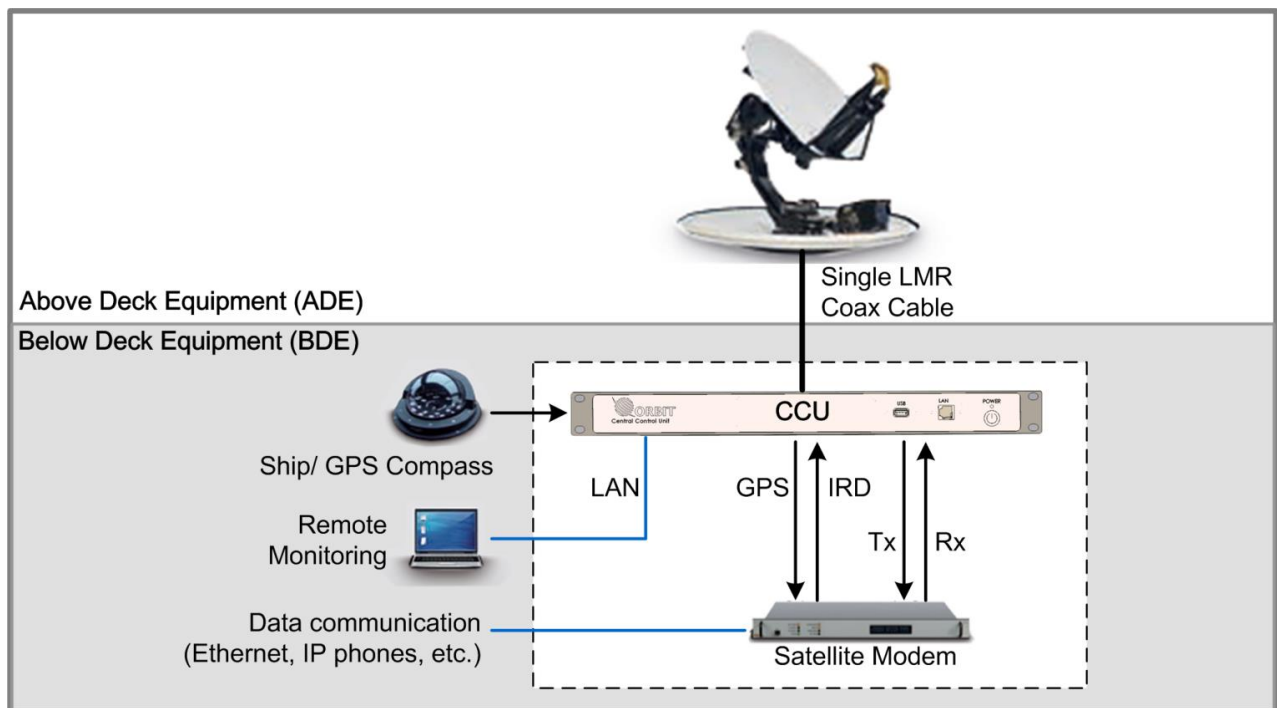
Figure 1-4: Single System Configuration Architecture Overview

1.5 Dual System Topologies

Dual system topologies are used in scenarios where installation space and line-of-sight to the sky/satellite is limited. In this type of scenario, the installation of two smaller antenna systems instead of one larger antenna system is recommended.

In a dual-system topology, two smaller antenna systems (installed above deck), are connected to the management equipment (located below deck), for single-source management.

This type of installation utilizes a Dual-System-Selector (DSS) to provide single-source management of both antenna assemblies via a single CCU.

NOTE: The illustration below provides an overview of the connections. It does not include the power cables and other specific connections.
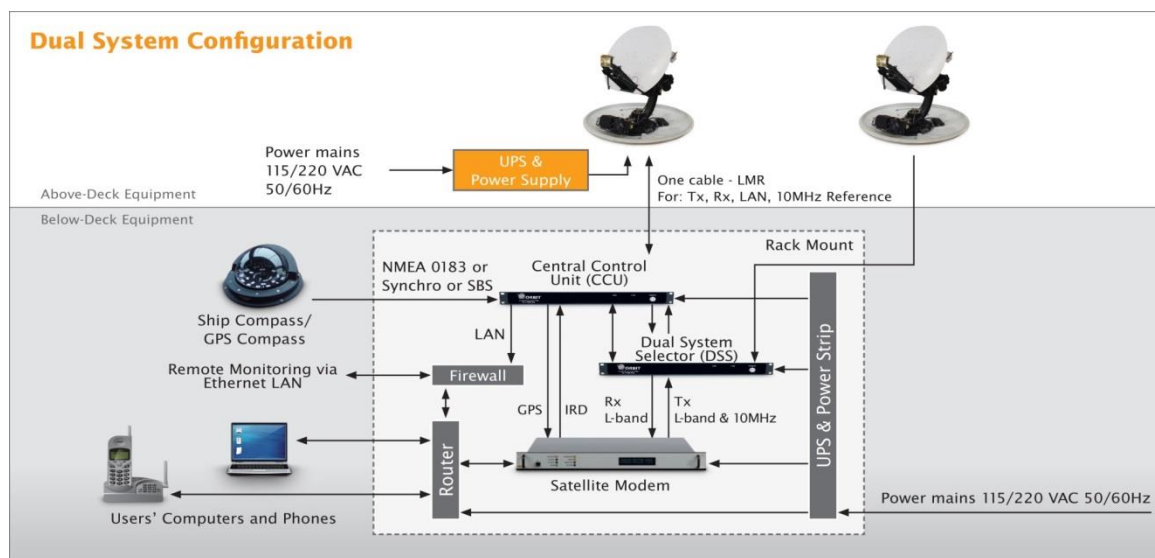
Figure 1-5: Dual System Configuration Architecture Overview

1.6 Ku-Band Configurations

Specific configurations of OceanTRx™4-500 system provide support for wide range of satellite networks. Global LNB – Covers the full Ku-Band receive range via selection of one of four LO (local oscillator) ranges.

- Cross Polarization or optional Co-Cross Feed with Dual LNB
- Ku Band BUCs

The OceanTRx™4-500 system is available with a wide variety of Ku-Band BUCs that work with linear polarization RF feeds. Antenna polarization is electrically switchable for Ku-Band feeds.

NOTE: The below configurations are comprised of fully integrated and operational systems including BUC and dual or quad-band LNB. This is available with linear polarization or Co-Cross Polarization Feed. Other configurations may be available on request.

Table 1-1 BUC Band Power

BUC	Band	Power
BUC Agilis 8W	Ku	8W
BUC Wavestream 16W	Ku	16W
BUC Agilis 16W	Ku	16W
BUC Wavestream 25W	Ku	25W
BUC Agilis 25W	Ku	25W
BUC Wavestream 40W	Ku	40W

1.7 Control and Monitoring

The system can be managed by opening a local or remote session to the CCU. The CCU supports Ethernet and USB connections on the front and on the rear panel.

NOTE: Optional - foldable LCD and 1U keyboard can be ordered from ORBIT.

- Local management –Direct operation thru the CCU, where it operates as the management station to which external peripherals (keyboard, mouse, screen) are connected. Management is carried out using the MtsVLink management application.
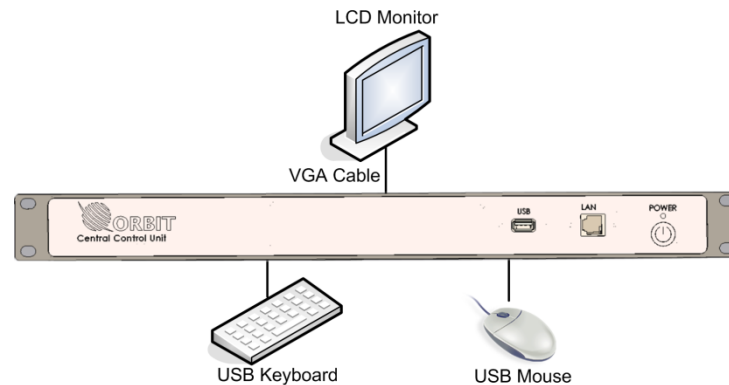
Figure 1-6: Local Management

- Remote management – opening a remote CCU session a standard MIB application or MtsVLink: in-band (via VSAT modem), out-band (via L-band modems such as Fleetboard band, airband)
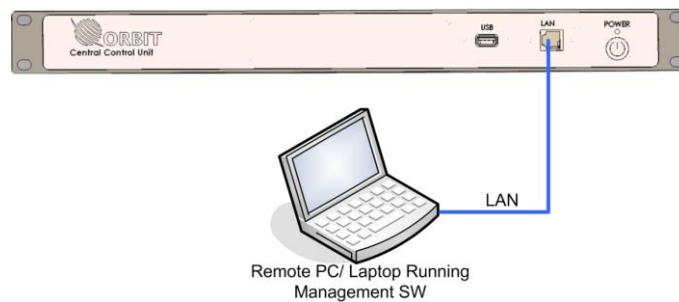
Figure 1-7: Remote Management

2   System Description

The following information is included in this chapter:

2.1 System RF Layout

The following figure shows the frequencies and RF measurements at various points in the system.
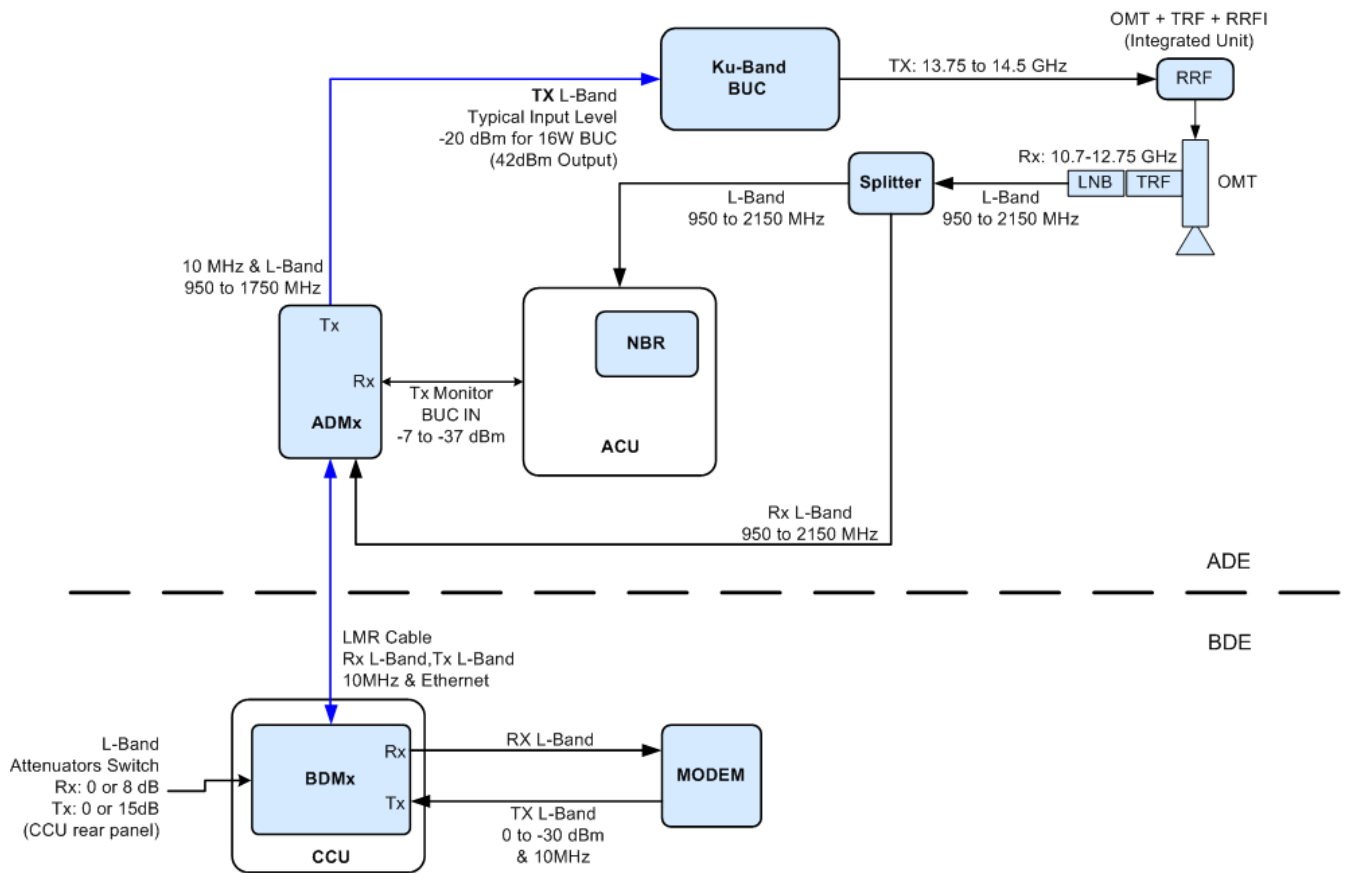
Figure 2-1: OceanTRx^{TM}4-500 RF Layout

2.2 Above Deck Equipment (ADE) - Antenna Unit

The ADE consists of the antenna system, completely covered and protected by a Radome. Maintenance access is provided via service hatch in the Radome base.

The antenna system supports three rotary axes:

- Azimuth axis – provides continuous unlimited 360° rotation.
- Tilt axis – provides ±75° of horizontal rotation.
- Elevation axis – provides 150° of vertical rotation (-30° to +120°).

These three axes and their range of movement allow continuous focus on the satellite under all specified sea conditions without exceeding the system's mechanical limits or encountering geometrical keyholes.

In addition to the above axes, an additional Polarization Skew axis provides 230° of rotation (±115°).
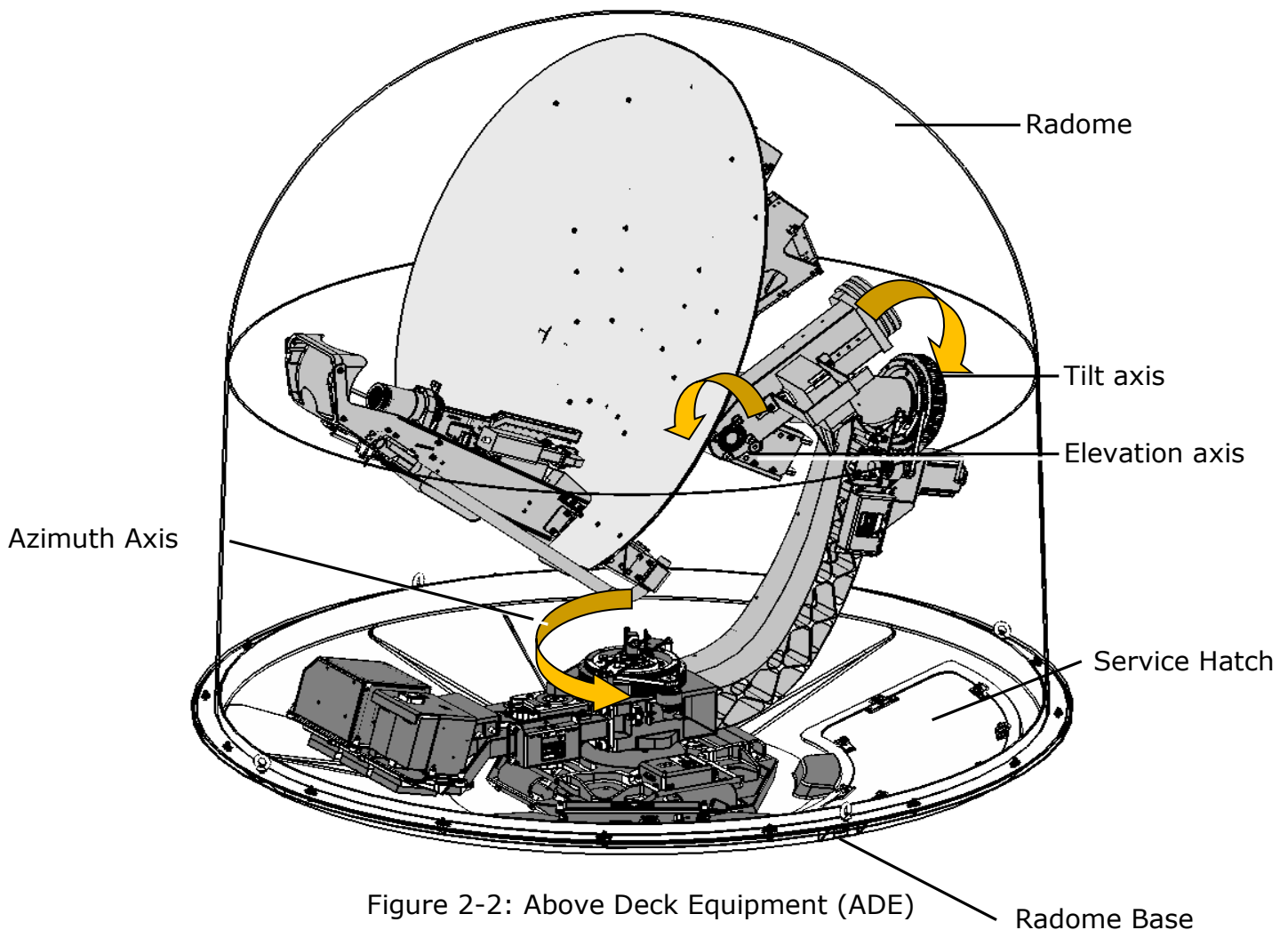
Figure 2-2: Above Deck Equipment (ADE)

2.3 Central Control Unit (CCU)

The CCU is installed below deck, in a 19" rack. It provides interfaces to the following:

- Control of the ADE
- Compass interface
- Satellite modem interface

The CCU implements the required IF and RF conversion functions, and supports both local and remote system management and control functionality via the MtsVLink management software installed on the CCU.

NOTE: There are two CCU models: with and without 10MHz reference signal. Models without the reference signal require an external 10MHz reference signal from the ship's modem.

2.3.1.1 CCU Front Panel

The CCU front panel contains the On/Off (soft) switch, a connection to the LAN and a USB port.

NOTE: Additional Ethernet and USB connections are available on the rear panel.

Figure 2-3: CCU Front Panel

Table 2-1: CCU Front Panel Elements

Element	Function
USB	General purpose USB port
LAN	Network management connection.
Power LED	Power indicator
HDD LED	HDD activity indicator

2.3.1.2   CCU Rear Panel

The CCU rear panel contains interfaces to the ADE and to the ship's communication equipment.

NOTE: BDE equipment pinouts are provided in **Appendix D.**
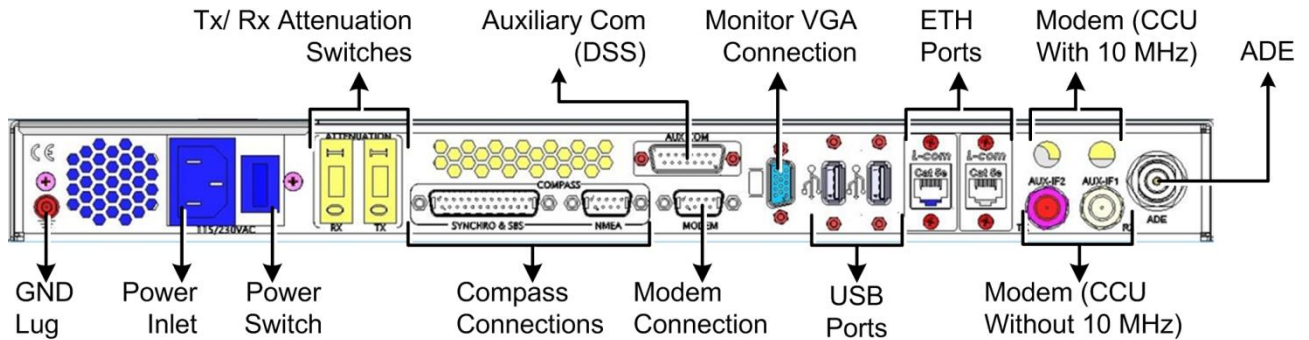
Figure 2-4: CCU Rear Panel

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

Table 2-2: CCU Rear Panel Interfaces

Interface	Function
ADE	N-Type. Connection to ADE via ADE-BDE coaxial cable
AUX-IF1/IF2	F-Type. For CCU with 10MHz reference signal. Connection to TX modem.
Tx/Rx	F-Type. For CCU *without* 10MHz reference signal. Connection to respective IF RX and TX of the modem.
LAN (2 ports)	General purpose Ethernet ports
USB (2 ports)	Mouse and keyboard connection
VGA	HD15. External video monitor connection. Used in conjunction with keyboard and mouse (USB connections) for direct management connection to the CCU.
AUX COM	D-Type (15-pin). EmCon Function and DSS control
MODEM	D-Type (9-pin). Modem management and control, M&C port connections. Optional: connection to IRD, GPS output etc.
COMPASS	Compass interfaces. Connect the compass to the connector corresponding to the compass type operating on your ship: NMEA: D-Type (9-pin) SYNCHRO or SBS: D-Type (25-pin)
POWER (inlet)	Male. Connects to the mains AC power
POWER (switch)	Power ON/OFF
ATTENUATION Rx*	Rx attenuation ON or OFF (8dB Attenuation)
ATTENUATION Tx*	Tx attenuation ON or OFF (15dB Attenuation)

*According to cable length.

2.4 Dual System Selector (DSS)

The DSS is used to implement the dual-system configurations (see section 1.5). Both ADEs are managed via the CCU. See section 1.5.

The DSS provides interfaces to the following:

- Second Antenna unit interface
- IF RX and TX connection to satellite modem

2.4.1.1   DSS Front Panel

The DSS front panel contains the On/Off switch.

Figure 2-5: DSS Front Panel

Table 2-3: DSS Front Panel Interfaces

Interface	Function
POWER	Power switch. (Main power ON/OFF switch is located on the rear panel).

2.4.1.2   DSS Rear Panel Interfaces

The DSS rear panel contains the power interfaces, and connections to the CCU and second antenna unit (ADE).

NOTE: BDE equipment pinouts are provided in **Appendix D.**
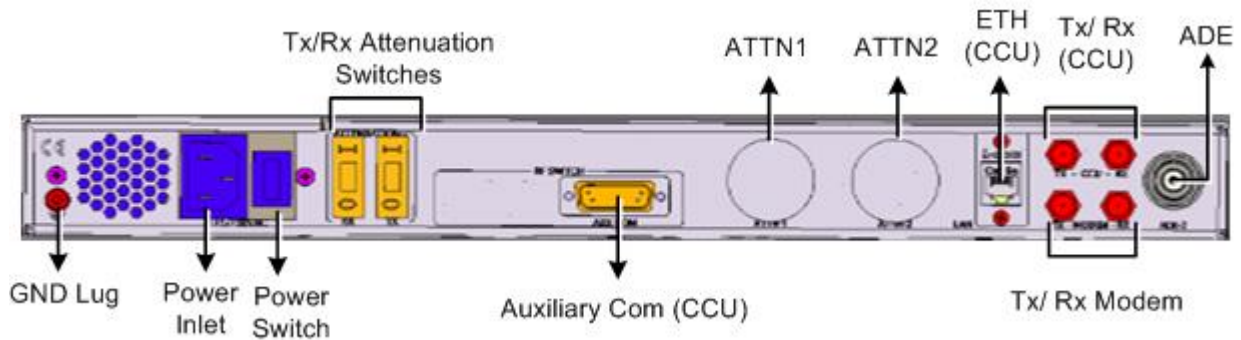
Figure 2-6: DSS Rear Panel

Table 2-4: DSS Rear panel Interfaces

Interface	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 10MHz
LAN	R-J45. Connects to one of the CCU LAN ports
AUX COM	D-Type. 15-pin – passes the switching commands from CCU to the DSS. Connects to the CCU AUX COM port
POWER	Connects to the mains AC power
POWER	Turns the power to the internal DSS power supply ON or OFF
ATTN-1	Raises or lowers attenuation of the first system (attached to the CCU) Tx signal in 1dB steps
ATTN-2	Raises or lowers attenuation of the second system (attached to the DSS) Tx signal in 1dB steps
ATTENUATION-2 RX	Turns Rx attenuation of the second system ON or OFF (8dB Attenuation)
ATTENUATION-2 TX	Turns Tx attenuation of the second system ON or OFF (15dB Attenuation)

3 Pre-Installation Requirements

This chapter provides the criteria for choosing the exact installation site for satellite and the required installation equipment.

The following information is included in this chapter:

3.1 System Physical Specifications

Table 3-1: System Physical Specifications

Unit	Weight*/**	Dimensions	Power Source**
Antenna System (ADE)	~200Kg/441lb*	Diameter = 1.68 Height 1.69	115/230 VAC 6A/3A
CCU/DSS	5.6Kg	1U x 48.26 x 47.4 cm (h*w*d)	115/230 VAC 1.0A/0.5A

* Model dependent

** Varies according to BUC model

NOTE: Since ORBIT's below deck equipment consists only of the CCU (and DSS for dual-system configurations), most of the information in this chapter describes the pre-installation requirements for the antenna system.

3.2 Overview of the Pre-installation Requirements

The antenna system and the Radome come as a single pre-assembled unit. Using a crane and harness, the unit is mounted on a prepared support structure (supplied and assembled by the customer). A coax cable connects between the antenna system and the CCU located below-deck. Additional Power cable is used to power the ADE

NOTE: For Dual-system assemblies, an additional coax cable connects the second antenna with the DSS.

➢ **Pre-installation preparations**

The antenna system pre-installation procedures consist of the following main phases:

- Location - select exact location for the antenna system (section 3.3).
- Link budget calculation
- ADE support structure (e.g. mast) - preparing (or verifying existence of) Antenna system support structure (section 3.4)
- Lifting equipment - you will need a crane and harness – capable of lifting the antenna system (section 3.5).
- All BDE (Below Deck Equipment) is installed in a rack and must have access to the interface of relevant devices such as the ship's compass, GPS, and communication equipment.
- The Hydro Phobic RADOME must be handled with latex gloves

The following figure provides an overview of the system architecture and connected equipment.
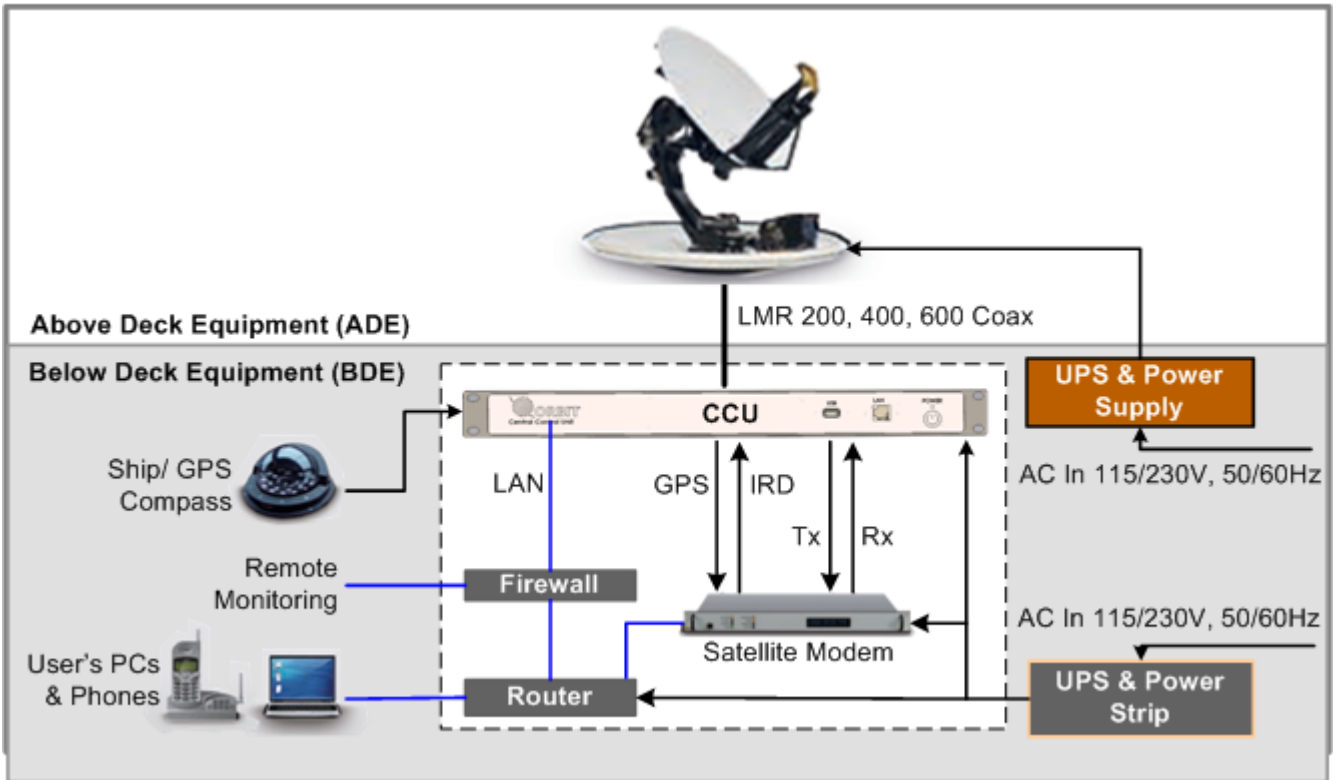
Figure 3-1: Architecture Detailed Overview

3.3 Location for ADE

When choosing the location for the ADE, consider the following criteria:

- Surface Stability
- Location Criteria
- Support structure requirements
- Line of Sight

3.3.1   Surface Stability

- Mechanical stability - support the ADE weight (200Kg ~440lb including Radome) and dynamics.
- Level mounting surface - the mounting surface must be level (±1 degrees)
- Vibration free – the mounting surface must be stable and free of vibration, with a natural resonance frequency of above 30 Hz.

3.3.2   Location Criteria

3.3.2.1   Link Budget Calculations

NTOE: It is important to perform link budget calculations.

3.3.2.2   Access to Electric main

The system should be located as close as possible to the ship's electrical panel, allowing room for the UPS.

3.3.2.3   Clearance

- Crane access, availability and height
- Cable runs

3.3.2.4   Maintenance Access

The bottom hatch (located on the base) must be accessible to the maintenance staff, their tools and spare parts. For this reason, it is recommended to mount the RADOME at a height of 1.2m above the deck. At the minimum, the system base should be mounted no lower than 0.6m above the deck to allow the hatch to open.

3.3.2.5   Line Of Sight (LOS)

The 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. However, it is usually necessary to compromise between the LOS and other considerations.

3.3.2.6   Radiation and Interference

- The mounting location should be as far as possible and on a different level from high-power radar systems or other radiating devices.
- The OceanTRx™4-500 system complies with the IEC 60945 standard. The installation should be planned to prevent any disturbing radiation that exceeds this 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.

3.4 Support structure requirements

It is the responsibility of the customer to provide the support structure (e.g. mast) on which the antenna system will be mounted.

This section describes the minimum requirements for this structure, provides a detailed example, and includes the mounting holes to the deck.
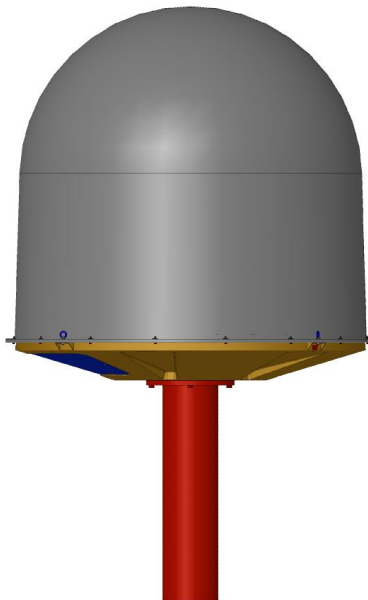
Figure 3-2: Typical Support Design is a Mast

3.4.1   Support Structure Minimum Requirements

➢ **Support structure minimum requirements**

- Mast must be of rigid construction and mounting
- It is recommended that the mast be **welded** directly above one of the deck's support beams, as shown in the following figure.
- It must provide ease of **access to the hatch** (on the base) for maintenance purposes – recommended 1.2m height from deck (minimum 0.6m)
- In addition, for antenna systems between **1.5m to 1.8 meters**, it is recommended to use **support cables**.

In this configuration, the support is designed to spread the pedestal weight over a wide rectangular area (marked in yellow), mounted over the main construction ribs of the deck over a wide welded area

Figure 3-3: Typical Support Mounting

3.4.2   Example of Mast Design

The following figures provide a suggested mast design.
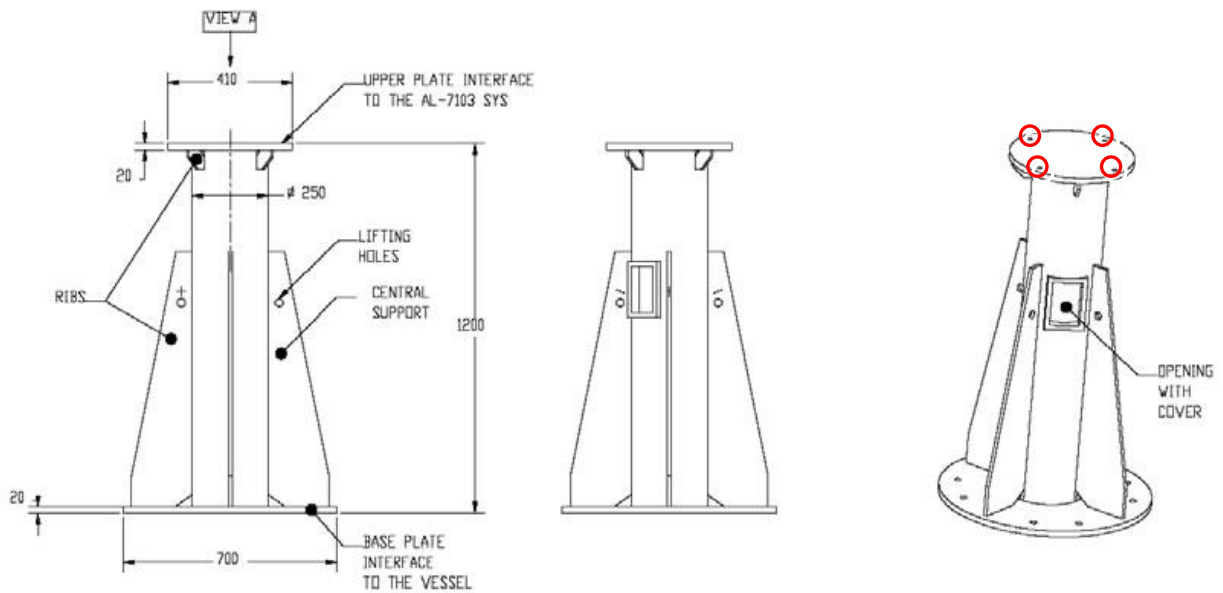
Figure 3-4: Mast Design
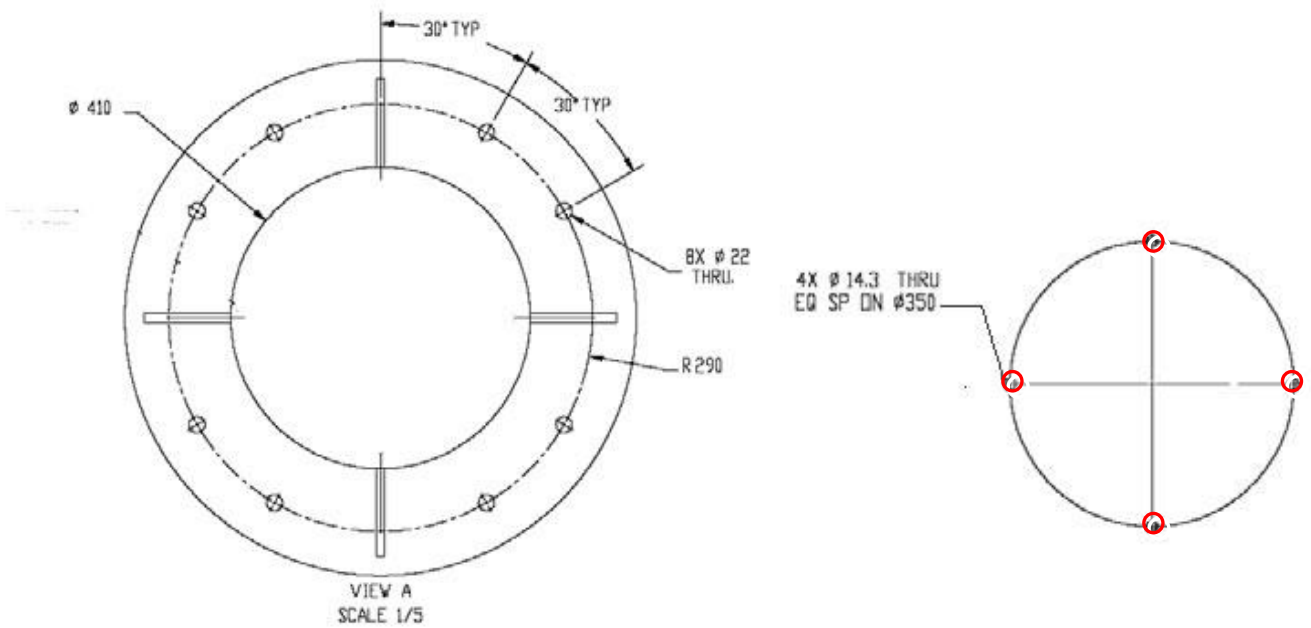
Figure 3-5: Base Plate Interface (left) and Upper Plate Interface (right)

3.4.3   Mounting Surface Layout

The following figure displays the mounting surface layout, including the holes required to bolt the ADE securely to the mounting surface. The bolts attaching the system to the support are supplied by ORBIT. Refer to ORBIT's drawing DCD31-1249.
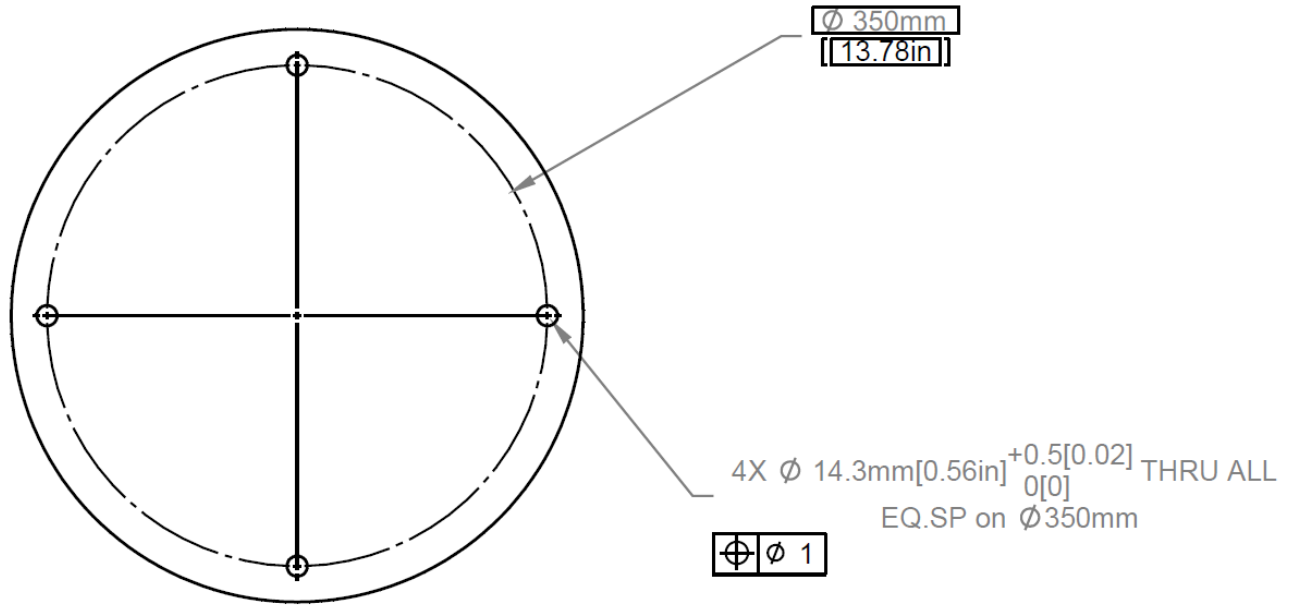
Figure 3-5: Mounting Interface Layout

NOTE: BEFORE screwing the bolt in, TEST that it is suitable by simply inserting it in the thread; the bolt must protrude 15 to 20mm BEFORE being screwed in.
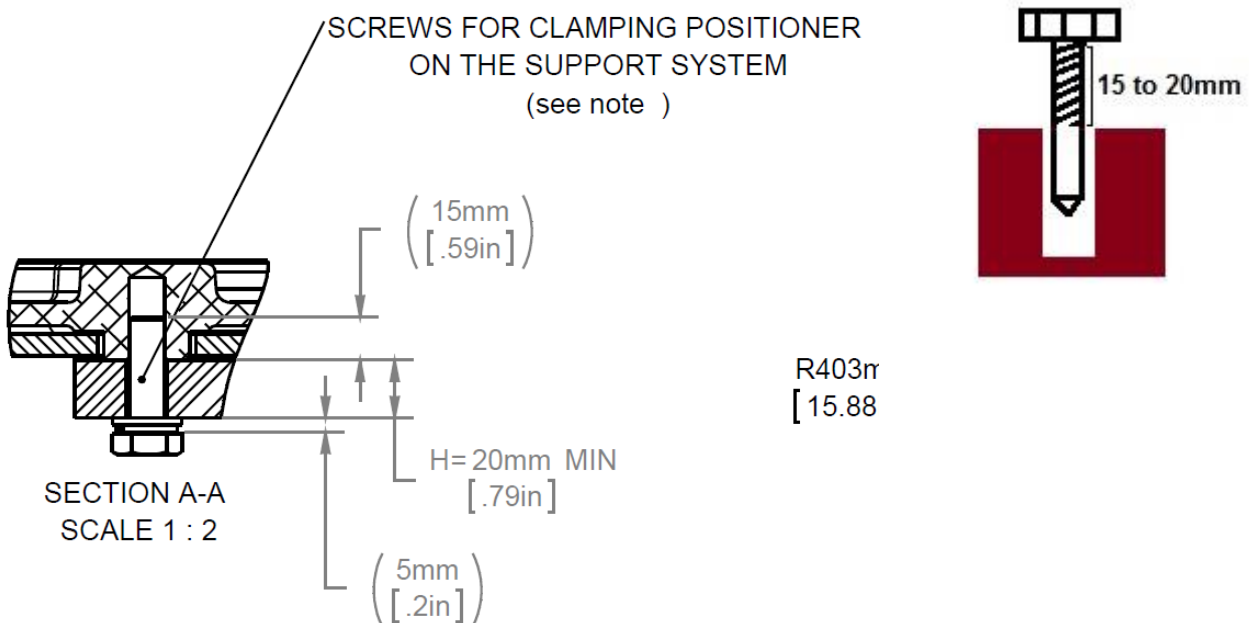
Figure 3-6: Screws requirements Definition

3.5 Crane and Harness Specifications

Check that the crane and harness that meets the following specifications are available:

Equipment	Specs	Additional info
Harness	Support for over 500Kg per single harness.	Can be order from ORBIT

Figure 3-6: Harness lifting the unit

3.6 Main Power Cabling and UPS Guidelines

3.6.1   Power Requirements

- All equipment: Antennas, CCU and DSS are classified and must be installed according to Over Voltage Category (OVC) II specifications.
- All equipment must be connected via a single-pole or dual-pole circuit breaker - depending on the ship's electrical infrastructure.
- Power to all equipment must be wired according to the national wiring rules.
- All equipment must be connected via the UPS (Uninterrupted Power Supply).
- Use a 10A main circuit breaker on the ship's power source, located as close as possible to the system.

3.6.2   Cabling Guidelines

Observe the following guidelines when connecting the system to the ship's AC mains power source:

- Use a maritime grade power cable with three conductors.
- The cable should be rated for at least 10A.
- The cable's cord diameter shall be at least 18 AGW.
- Use the shortest possible length of cable permitted by the system's location.
- Equipment grounding:
  - ADE equipment: at least 16 AWG protective earthling conductor should be connected to the ship's hull.
  - BDE equipment: at least 18 AWG protective earthing conductor should be connected to the rack's ground strip.

3.7 Verify Tx/Rx Path Gain Budgets

The modem verifies the Rx signal level and Carrier-to-Noise C/N (signal quality).

NOTE: It is not necessary to modify any of the parameters – unless the signal exceeds the dynamic range allowed for the specific modem or if the LMR cable is less than 2 or 3 meters.

When the modem is installed, verify the following:

- The Tx signal (from the modem) is set so that the BUC is not saturated, yet it is strong enough for quality transmission (1dB compression point).
- The Rx signal (into the modem) is within the modem's dynamic range.

For short range ADE-BDE connections (up to 30m), use a 30m LMR-200 cable (to achieve sufficient cable loss) or use the following CCU rear-panel attenuator selectors:

- **BDMX ATTEN RX Selector** – Select Rx Attenuator ("I" position: 0dB, "0" position: 8dB)
- **BDMX ATTEN TX Selector** – Select Tx Attenuator ("I" position: 0dB, "0" position: 15dB)
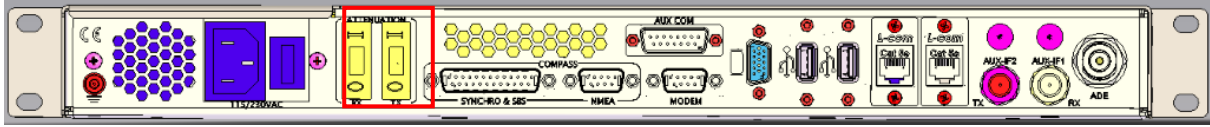
Figure 3-7: CCU Rear Panel Attenuator Selectors

The following figures show attenuation calculation charts for the LMR-200, 400, and 600 cables:

Attenuation vs. Frequency (typical)

Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	5800
Attenuation dB/100 ft	1.8	2.3	4.0	4.8	7.0	9.9	12.9	14.2	15.0	16.9	26.4
Attenuation dB/100 m	5.8	7.5	13.1	15.9	22.8	32.6	42.4	46.6	49.3	55.4	86.5
Avg. Power kW	1.02	0.79	0.45	0.37	0.26	0.18	0.14	0.13	0.12	0.11	0.07

Calculate Attenuation =
$(0.320900) \cdot \sqrt{F_{MHz}} + (0.000330) \cdot F_{MHz}$ (interactive calculator available at http://www.timesmicrowave/telecom)
Attenuation:
VSWR=1.0; Ambient = +25°C (77°F)
Power:
VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F); Sea Level; dry air; atmospheric pressure; no solar loading

Figure 3-8: LMR-200 Cable Attenuation
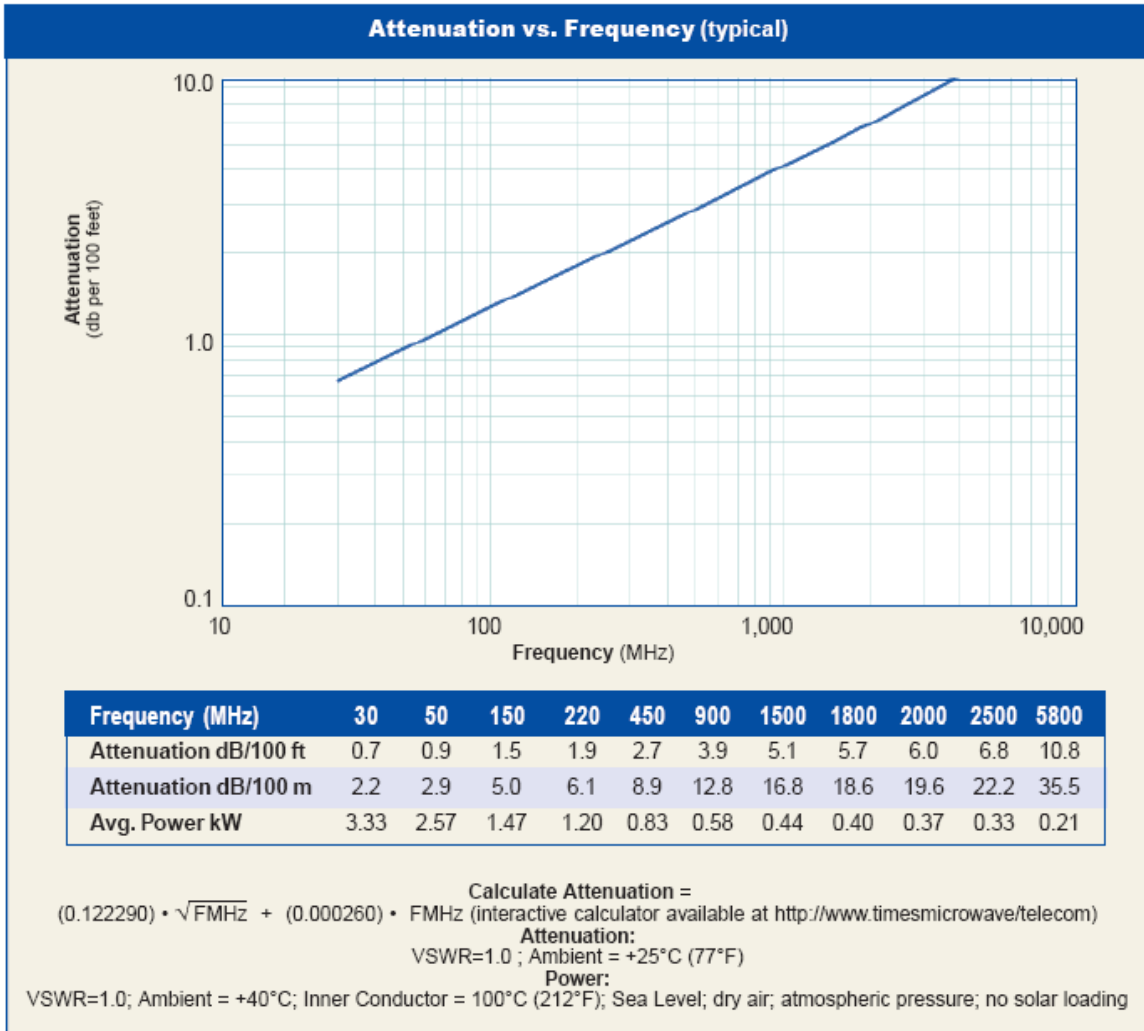
Figure 3-9: LMR-400 Cable Attenuation

Attenuation vs. Frequency (typical)

Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	5800
Attenuation dB/100 ft	0.4	0.5	1.0	1.2	1.7	2.5	3.3	3.7	3.9	4.4	7.3
Attenuation dB/100 m	1.4	1.8	3.2	3.9	5.6	8.2	10.9	12.1	12.8	14.5	23.8
Avg. Power kW	5.51	4.24	2.41	1.97	1.35	0.93	0.70	0.63	0.59	0.52	0.32

Calculate Attenuation =
$(0.075550) \cdot \sqrt{F_{MHz}} + (0.000260) \cdot F_{MHz}$ (interactive calculator available at http://www.timesmicrowave/telecom)
Attenuation:
VSWR=1.0; Ambient = +25°C (77°F)
Power:
VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F); Sea Level; dry air; atmospheric pressure; no solar loading

Figure 3-10: LMR-600 Cable Attenuation

The calculated coarse value of the modem output for 1dB BUC compression is well within the typical modem dynamic output range (0 to -30dB).

3.7.1   OceanTRx4-500 Single System Configuration

3.7.1.1   Single System L-Band Tx Levels

The calculation of the Tx L-Band path takes into consideration all Losses & Gains of the OceanTRx4-500™ system: CCU losses, Attenuation Set-Up in the CCU, LMR Cable loss (according to the length and type), Cables / RJ losses in the pedestal, BUC Power, BUC internal attenuation Set-Up, BUC Gain, ADMx / BDMx Tx Path Total Gain.

Figure 3-11: Single OceanTRx4-500 L-Band Tx Path

Example of L-Band Tx Levels calculations:

NOTE: Refer to the following figures.

In the example, the OceanTRx4 system is connected to the CCU via LMR-600 cable length of 50m; BUC power = 20W, BUC gain = 70dB, internal attenuation = -12dB.

Derived powers for BUC P1dB:

* Input power to BUC = -15dBm
* Input power to Pedestal = -7.2dBm

Tx L-Band = 1200MHz

CCU "BDMx" attenuation = "0"dB

LMR cable Loss = -11.4dB

In this example, the derived modem Tx L-Band Level for P1dB of BUC is: **-10.8dBm.**

CCU1U

MUX Band

BDMx
(Atten = 0db)

L Band

[B]

(Loss = -11.4dB)

LMR 600 50m
MUX Band

PEDESTAL

[C] RJ [D] ADMx

MUX Band

[E] L Band

[F] -15dBm

[A] L Band
1200MHz
-10.8dBm

Tx Modem

20W BUC

Att -12dB

Gain 70dB

[G] RF Band

43dBm (20W)
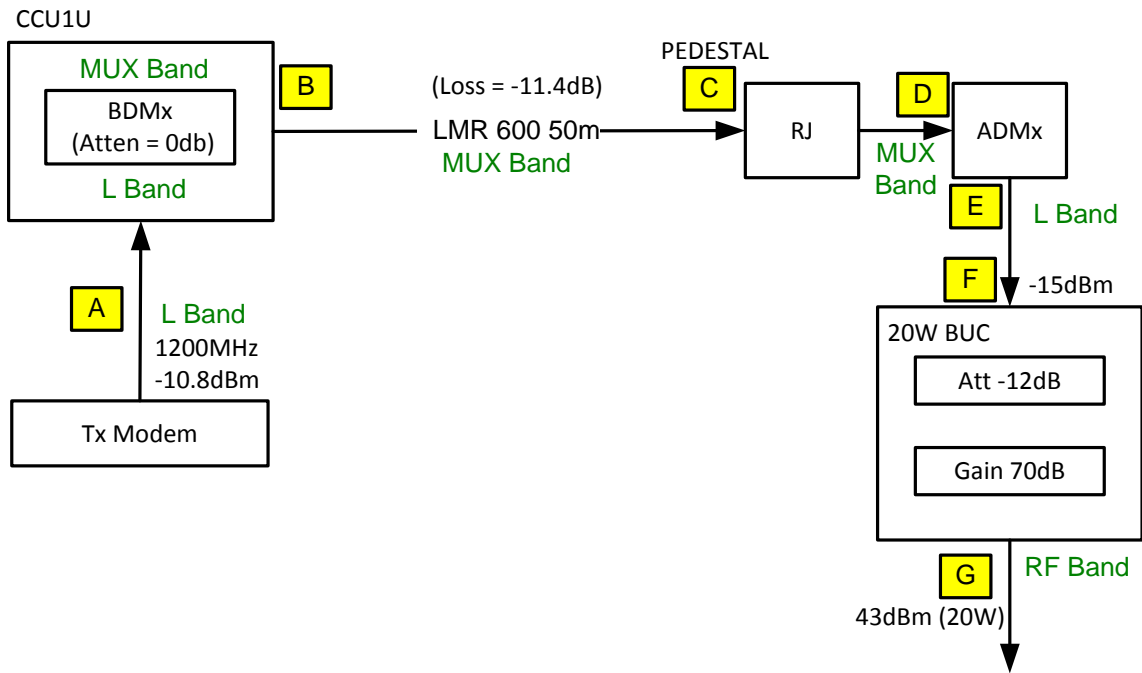
Figure 3-12: Example of Single OceanTRx4-500 L-Band Tx Path

OceanTRx4-Total Tx level Budget (L-Band from Modem)		
Parameter	**Unit**	**Value**
System Type	*N/A*	OTRx4
System Band	*N/A*	Ku

POINT		Unit	Value
G	BUC Power	*Watts*	*20.0*
G	**BUC Power (P1dB)**	dBm	43.0
	BUC Gain (Nominal)	*dB*	*70.0*
	BUC Internal Attenuation	*dB*	*-12.0*
F	*Derived Input power to BUC for P1dB*	*dBm*	*-15.0*
C to D, E to F	**Total Pedestal Attenuations: Cables (L-Band cables and Mux cable) + Rotary Joint**	dB	-7.8
C	*Derived Input power to Pedestal for BUC P1dB (Mux)*	*dBm*	*-7.2*
	Tx L Band Frequency from MODEM	*MHz*	*1200*
C	**MUX Band - Tx Frequency (@ Multiplexed highest frequency)**	MHz	4500
	Which LMR Cable Type ? (400 or 600)		*600*
B to C	ADE to BDE LMR Cable length	*Meter*	*50.0*
B to C	*Derived Cable Attenuation (according to length and LMR Type 400 or 600)*	*dB*	*-11.4*
	BDMx Tx Attenuation Selector (0dB or -15dB)	*dB*	*0*
	ADMx/BDMx Total Gain (Tx path)	dB	19
	Standard CCU Losses	dB	-4.0
	Derived Total ADE to BDE LMR-600 Cable Gain/loss (according to length) with Standard	*dB*	*-4.2*
A	*Derived L-Band (Tx) Output from Modem for BUC P1dB with Standard CCU*	*dBm*	*-10.8*

Figure 3-13: Calculations for Example of Single OceanTRx4-500 L-Band Tx Path

3.7.1.2   Single System L-Band Rx Levels

The calculation of the Rx L-Band path takes into consideration all Losses & Gains of the OceanTRx4-500™ system: CCU losses, Attenuation Set-Up in the CCU, LMR Cable loss (according to the length and type), Cables / RJ losses / Splitter in the pedestal, LNB Gain, ADMx / BDMx Rx Path Total Gain.

The LNB output level as calculated separately according to the satellite EIRP, Transponder Bandwidth, Used Bandwidth, OceanTRx4-500™ Antenna Gain, down link frequency.
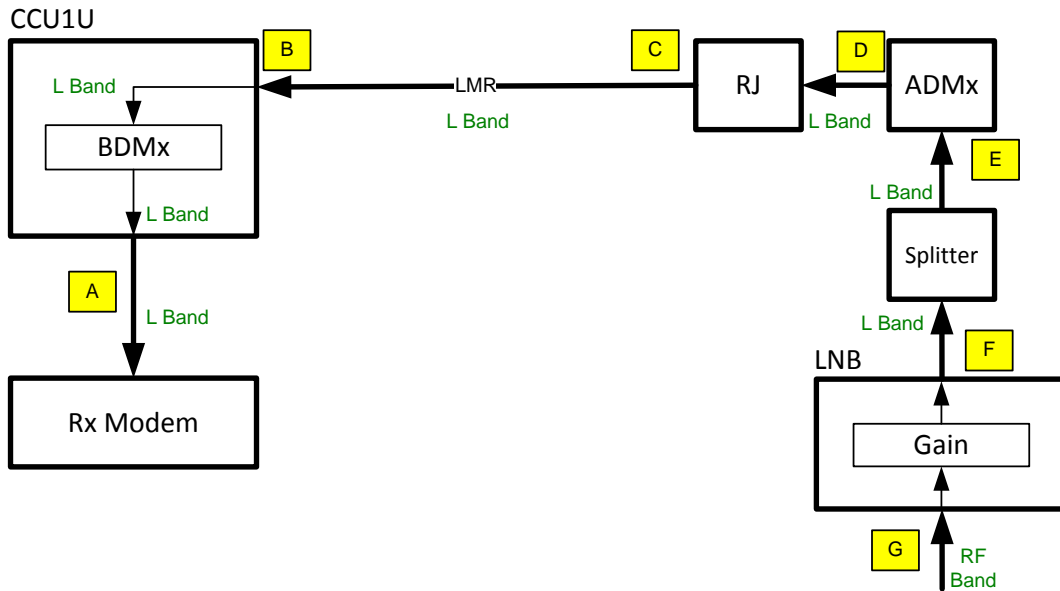
Figure 3-14: Single OceanTRx4-500 L-Band Rx Path

Example of L-Band Rx Levels calculations:

- LMR-600 cable length = 50m
- LNB Gain = 63dB
- Rx Ku-Band = 11.2GHz
- CCU "BDMx" attenuation = "0"dB
- Satellite EIRP = 39 dBW
- Transponder Bandwidth = 36MHz
- Used Bandwidth = 1MHz

Result of this example:

- LNB Output power = -51.1dBm
- Derived Rx L-Band Level received in the modem = -40.9dBm.

OceanTRx4 -Total Rx level Budget (L-Band from LNB to Modem)		Unit	Value
Parameter		Unit	Value
System Type		*N/A*	OTRx4
System Band		*N/A*	Ku
Transponder Saturation EIRP		dBW	39.0
Output Backoff		dB	4.0
Transponder Bandwidth		MHz	36.0
Terminal Used Bandwidth (Rx)		MHz	1.0
Downlink Frequency		GHz	11.20
OTRx4 Antenna Gain (Typical)		dBi	41.0
LNB Gain (Typical)		dB	63.0
Derived Fractional Used Bandwidth		*dB*	*-15.6*
Derived Downlink Path Loss		*dB*	*204.5*
dBW to dBm conversion factor		dB	30.0
LNB Output Power		*dBm*	*-51.1*

POINT				
G	*Derived LNB Output Power (H15), depends on Satellite EIRP, BW,Ant. Gain, etc,*	*dBm*	*-51.1*
F to E, D to C	Total Pedestal Attenuations: Cables (L-Band cables) + Rotary Joint + Splitter	dB	**-14**
C	*Derived Output Level Rx from Pedestal*	*dBm*	*-65.1*

G	Rx C-Band Frequency	*MHz*	*11200*
	LNB LO Frequency (Inverted)	MHz	10000
	Rx L Band Frequency	MHz	1200
	Which LMR Cable Type ? (400 or 600)		600
C to B	ADE to BDE LMR Cable length	*Meter*	*50.0*
C to B	*Derived Cable Attenuation (according to length and LMR Type 400 or 600)*	*dB*	*-4.8*

BDMx Tx Attenuation Selector (0dB or -8dB)	*dB*	*0*
ADMx/BDMx Total Gain (Rx path)	dB	30.0

Standard CCU Losses	*dB*	*-1.0*

Derived Total ADE to BDE Gain/Loss (according to length) with Standard CCU	*dB*	*10.2*

A	*Derived L-Band (Rx) Input to Modem with Standard CCU*	*dBm*	*-40.9*

Figure 3-15: Calculations for Example of Single OceanTRx4-500 L-Band Rx Path

3.7.2   OceanTRx4-500 Dual System Configuration

3.7.2.1   Dual-System L-Band Tx Levels

The calculation of the Tx L-Band path takes into consideration all Losses & Gains of the OceanTRx4-500™ system: CCU losses, Attenuation Set-Up in the CCU, DSS losses, LMR Cable loss (according to the length and type), Cables / RJ losses in the pedestal, BUC Power, BUC internal attenuation Set-Up, BUC Gain, ADMx / BDMx Tx Path Total Gain.
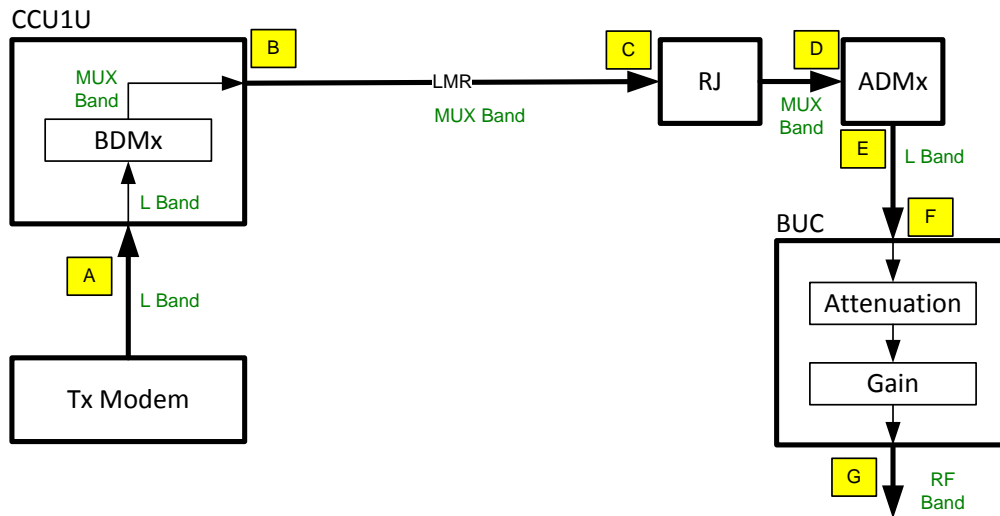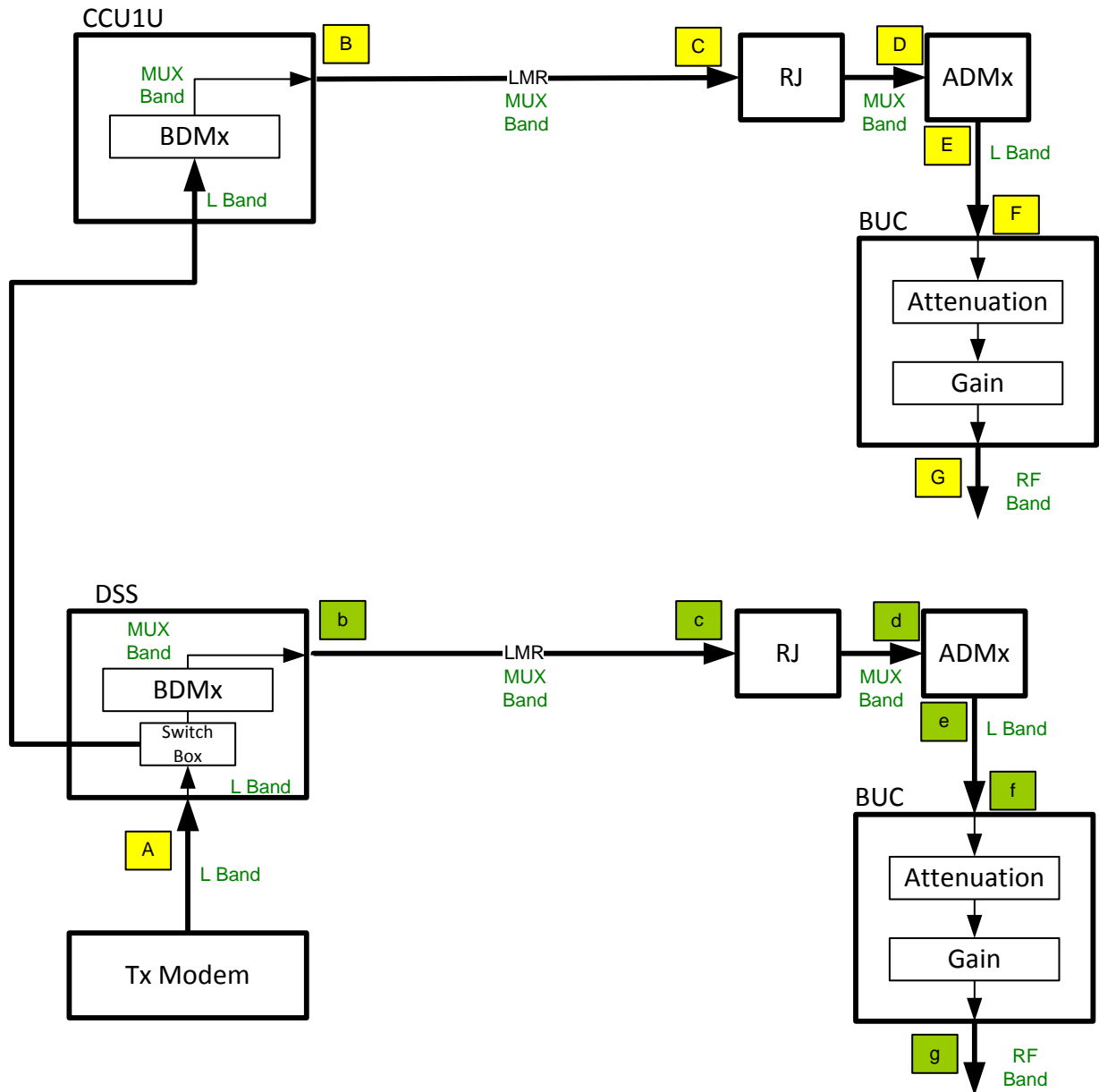

Figure 3-16: Dual OceanTRx4-500 L-Band Tx Path

Example of Dual-Band L-Band Tx Levels calculations:

In this example, the calculation of Tx attenuation is separated into two paths for two systems:

- On the first system's path (marked in Yellow on the Excel), the OTRx4 system is connected to the CCU via the LMR-600 cable of length 50m. The BUX power is 16W. BUC gain is 70 dB and the internal attenuation is 0 dB.

  The Derived powers for BUC P1dB are: Input power to the BUC is -28 dBm; Input power to Pedestal is -20.2 dBm. Tx L-Band is 1200 MHz, CCU "BDMx" attenuation is "0"dB and the "DSS" attenuation is set to -5 dB. The LMR cable Loss is -11.4 dB. In this example, the derived modem Tx L-Band Level for P1dB of BUC is: **-18.7 dBm**.

- On the second path's system, (marked in Green on the Excel) the O TRx4 system is connected to the DSS via the LMR-600 cable of length 100m. The BUX power is 20W. BUC gain is 70 dB, and the internal attenuation is 0 dB.

  The Derived powers for BUC P1dB are: Input power to BUC is -27 dBm, Input power to Pedestal is -19.2 dBm, Tx L-Band is 1200 MHz, CCU "BDMx" attenuation is "0"dB, and the "DSS" attenuation is set to -5 dB. The LMR cable Loss is -21.7 dB. As the result of this example, the derived modem Tx L-Band Level for P1dB of BUC is: **-7.5 dBm.**

Dual OceanTRx4-Total Tx level Budget (L-Band from Modem)

Parameter	Unit	Value
System1 Type	*N/A*	**OTRx4**
System1 Band	*N/A*	**Ku**
System2 Type	*N/A*	**OTRx4**
System2 Band	*N/A*	**Ku**

POINT		Unit	Value
G	BUC Power	*Watts*	*16.0*
G	**BUC Power (P1dB)**	dBm	42.0
	BUC Gain (Nominal)	*dB*	*70.0*
	BUC Internal Attenuation	*dB*	*0.0*
F	*Derived Input power to BUC for P1dB*	*dBm*	*-28.0*
C to D, E to F	**Total Pedestal Attenuations: Cables (L-Band cables and Mux cable) + Rotary Joint**	dB	-7.8
C	*Derived Input power to Pedestal for BUC P1dB (Mux)*	*dBm*	*-20.2*
A	Tx L Band Frequency from MODEM	*MHz*	*1200*
C	**MUX Band - Tx Frequency (@ Multiplexed highest frequency)**	MHz	4500
	Which LMR Cable Type ? (400 or 600)		*600*
B to C	ADE to BDE LMR Cable length	*Meter*	*50.0*
B to C	*Derived Cable Attenuation (according to length and LMR Type 400 or 600)*	*dB*	*-11.4*
CCU1U	BDMx Tx Attenuation Selector (0dB or -15dB)	*dB*	*0*
CCU1U	**ADMx/BDMx Total Gain (Tx path)**	*dB*	*19*
CCU1U	**Standard CCU Losses**	*dB*	*-4.0*
DSS	**Standard Dual System Selector Switch Box Losses**	*dB*	*-5.0*
	Derived Total ADE to BDE LMR Cable Gain/loss (according to length) with Standard CCU and DSS	*dB*	*-9.2*
A	*Derived L-Band (Tx) Output from Modem for BUC P1dB (System1)*	*dBm*	*-18.7*
g	BUC Power	*Watts*	*20.0*
g	**BUC Power (P1dB)**	dBm	43.0
	BUC Gain (Nominal)	*dB*	*70.0*
	BUC Internal Attenuation	*dB*	*0.0*
f	*Derived Input power to BUC for P1dB*	*dBm*	*-27.0*
c to d, e to f	**Total Pedestal Attenuations: Cables (L-Band cables and Mux cable) + Rotary Joint**	dB	-7.8
c	*Derived Input power to Pedestal for BUC P1dB (Mux)*	*dBm*	*-19.2*
A	Tx L Band Frequency from MODEM	*MHz*	*1200*
c	**MUX Band - Tx Frequency (@ Multiplexed highest frequency)**	MHz	4500
	Which LMR Cable Type ? (400 or 600)		*600*
b to c	ADE to BDE LMR Cable length	*Meter*	*100.0*
b to c	*Derived Cable Attenuation (according to length and LMR Type 400 or 600)*	*dB*	*-21.7*
DSS	BDMx Tx Attenuation Selector (0dB or -15dB)	*dB*	*0*
DSS	**ADMx/BDMx Total Gain (Tx path)**	*dB*	*19*
DSS	**DSS Standard CCU Losses**	*dB*	*-4.0*
DSS	**Standard Dual System Selector Switch Box Losses**	*dB*	*-5.0*
	Derived Total ADE to BDE LMR Cable Gain/loss (according to length) with Standard CCU and DSS	*dB*	*-19.5*
A	*Derived L-Band (Tx) Output from Modem for BUC P1dB (System2)*	*dBm*	*-7.5*

Figure 3-17: Calculations for Example of Dual OceanTRx4-500 L-Band Tx Path

3.7.2.2   Dual-Band System L-Band Rx Levels

Calculation of the Rx L-Band path takes into consideration all Losses & Gains of the OceanTRx4-500™ system: CCU losses, Attenuation Set-Up in the CCU, DSS losses, LMR Cable loss (according to the length and type), Cables / RJ losses / Splitter in the pedestal, LNB Gain, ADMx / BDMx Rx Path Total Gain.

The LNB output level is calculated separately according to the satellite EIRP, Transponder Bandwidth, Used Bandwidth, OceanTRx4-500™Antenna Gain, down link frequency.
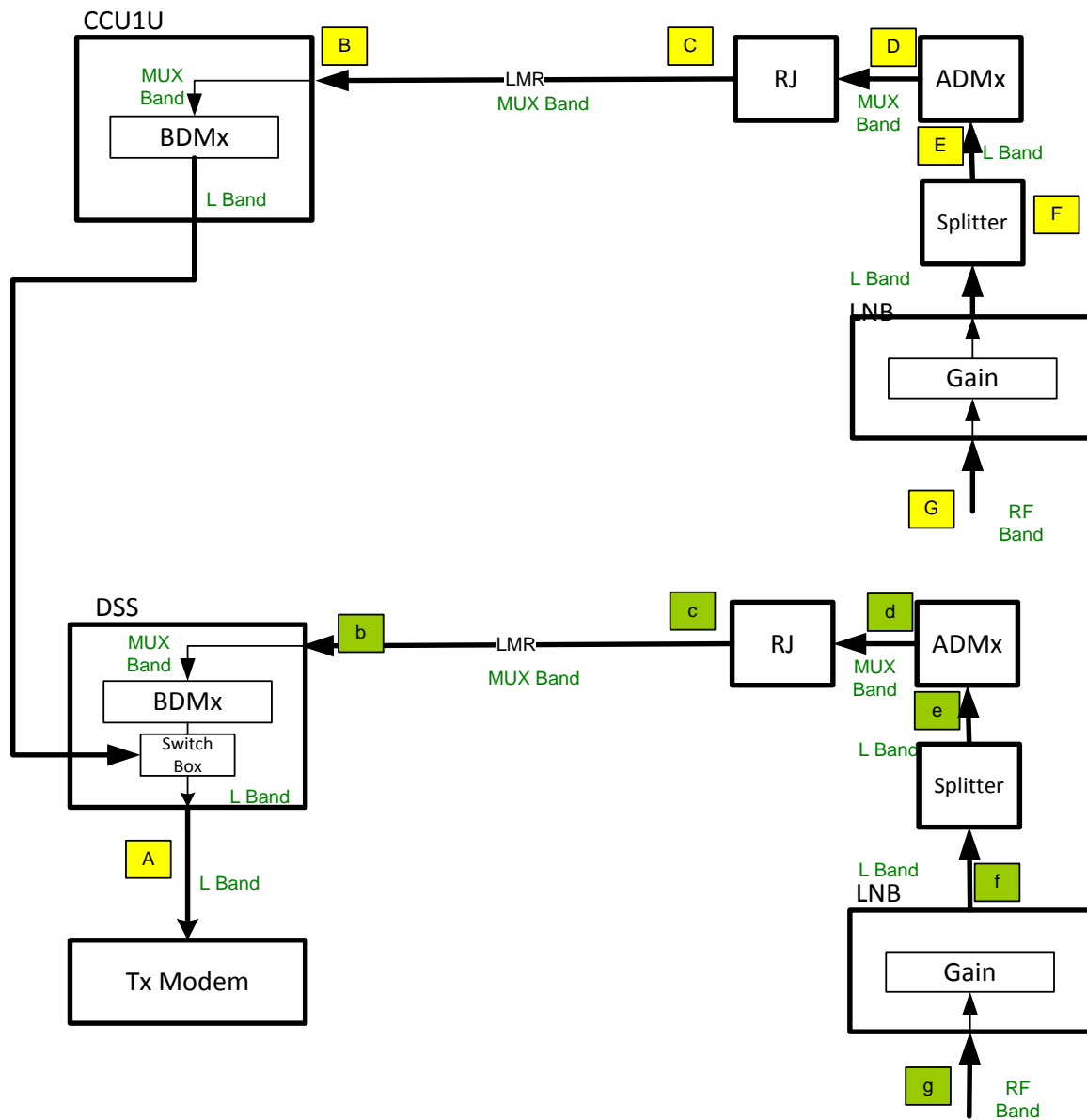
Figure 3-18: Dual OceanTRx4-500 L-Band Rx Path

Example of Dual-System L-Band Rx Levels calculations:

In this example, calculation of the Rx attenuation is separated into two paths for two systems:

- On the first path's system (Yellow marked on the excel), the LMR-600 cable length is 50m, LNB Gain is 63 dB, Rx Ku-Band is 11.2 GHz, CCU "BDMx" attenuation is "0" dB and the "DSS" attenuation is "-0.2dB" dB, Satellite EIRP is 39 dBW, Transponder Bandwidth is 36 MHz, and the Used Bandwidth is 1 MHz. As a result of this example, the LNB Output power is -51.1 dBm and the derived Rx L-Band Level received in the modem is: **-41.1 dBm**.

  LMR Cable loss: 4.8dB

- On the second path's system (marked in Green on the Excel file), the LMR-600 cable length is 100m, LNB Gain is 63 dB, Rx Ku-Band is 11.2 GHz, CCU "BDMx" attenuation is "0" dB and the "DSS" attenuation is "-0.2dB" dB, Satellite EIRP is 39 dBW, Transponder Bandwidth is 36 MHz, and the Used Bandwidth is 1 MHz. As a result of this example, the LNB Output power is -51.1 dBm and the derived Rx L-Band Level received in the modem is: **-45.9 dBm**.

  LMR Cable loss: 9.6dB

OceanTRx4-Total Rx level Budget (L-Band from LNB to Modem)

	Parameter	Unit	Value
	System Type 1	*N/A*	**OTRx4**
	System Band 1	*N/A*	**Ku**
	System Type 2	*N/A*	*OTRx4*
	System Band 2	*N/A*	*Ku*
	Transponder Saturation EIRP	dBW	39.0
	Output Backoff	dB	4.0
	Transponder Bandwidth	MHz	36.0
	Terminal Used Bandwidth (Rx)	MHz	1.0
	Downlink Frequency	GHz	11.200
	OrBand Antenna Gain (Typical)	dBi	41.0
	LNB Gain (Typical)	dB	63.0
	LNB Local oscillator	MHz	10000
	Derived Fractional Used Bandwidth	*dB*	*-15.6*
	Derived Downlink Path Loss	*dB*	*204.5*
	dBW to dBm conversion factor	dB	30.0
	LNB Output Power	*dBm*	*-51.1*
POINT			
G	*Derived LNB Output Power (D24), depends on Satellite EIRP, BW,Ant. Gain, etc,*	*dBm*	*-51.1*
F to E, D to C	Total Pedestal Attenuations: Cables (L-Band cables) + Rotary Joint + Splitter	dB	-14
C	*Derived Output Level Rx from Pedestal*	*dBm*	*-65.1*
G	Rx C-Band Frequency	*MHz*	*11200*
	Rx L Band Frequency, Depend on LNB LO (D19)	MHz	1200
	Which LMR Cable Type ? (400 or 600)		600
C to B	ADE to BDE LMR Cable length	*Meter*	*50.0*
C to B	*Derived Cable Attenuation (according to length and LMR Type 400 or 600)*	*dB*	*-4.8*
CCU1U	BDMx Tx Attenuation Selector (0dB or -8dB)	*dB*	*0*
CCU1U	ADMx/BDMx Total Gain (Rx path)	dB	30.0
CCU1U	Standard CCU Losses	*dB*	*-1.0*
DSS	Standard Dual System Selector Switch Box Losses	dB	-0.2
F to A	*Derived Total ADE to BDE Gain/Loss (according to length)*	*dB*	*10.0*
A	*Derived L-Band (Rx) Input to Modem with Standard CCU*	*dBm*	*-41.1*
	Transponder Saturation EIRP	dBW	39.0
	Output Backoff	dB	4.0
	Transponder Bandwidth	MHz	36.0
	Terminal Used Bandwidth (Rx)	MHz	1.0
	Downlink Frequency	GHz	11.200
	OrBand Antenna Gain (Typical)	dBi	41.0
	LNB Gain (Typical)	dB	63.0
	LNB Local oscillator	MHz	10000
	Derived Fractional Used Bandwidth	*dB*	*-15.6*
	Derived Downlink Path Loss	*dB*	*204.5*
	dBW to dBm conversion factor	dB	30.0
	LNB Output Power	*dBm*	*-51.1*
POINT			
g	*Derived LNB Output Power (D59), depends on Satellite EIRP, BW,Ant. Gain, etc,*	*dBm*	*-51.1*
f to e, d to c	Total Pedestal Attenuations: Cables (L-Band cables) + Rotary Joint + Splitter	dB	-14
c	*Derived Output Level Rx from Pedestal*	*dBm*	*-65.1*
g	Rx C-Band Frequency	*MHz*	*11200*
	Rx L Band Frequency, Depend on LNB LO (D54)	MHz	1200
	Which LMR Cable Type ? (400 or 600)		600
c to b	ADE to BDE LMR Cable length	*Meter*	*100.0*
c to b	*Derived Cable Attenuation (according to length and LMR Type 400 or 600)*	*dB*	*-9.6*
DSS	BDMx Tx Attenuation Selector (0dB or -8dB)	*dB*	*0*
DSS	ADMx/BDMx Total Gain (Rx path)	dB	30.0
DSS	Standard CCU Losses	*dB*	*-1.0*
DSS	Standard Dual System Selector Switch Box Losses	dB	-0.2
f to A	*Derived Total ADE to BDE Gain/Loss (according to length)*	*dB*	*5.2*
A	*Derived L-Band (Rx) Input to Modem with Standard CCU*	*dBm*	*-45.9*

Figure 3-19: Calculations for Example of Dual OceanTRx4-500 L-Band Rx Path

3.8 Pre-Installation Checklist

Before bringing the installation crew to the site, the customer should fill out the checklist provided in Pre-Installation Checklist, in order to verify that the installation site and customer-supplied equipment are ready and available.

4 Unpacking and Mounting

The following information is included in this chapter:

> ⚠️ **ATTENTION** Two people are required for the unpacking and mounting procedures.

(In most cases), the following procedures are the responsibility of the shipyard staff:

- Preparing for the attachment of ORBIT's Base Ring to the Radome support
- Installing the ADE/BDE cables and wiring
- Installing and connecting the modem.

NOTE: The remaining installation process is the responsibility of ORBIT certified installer

4.1 Unpacking the System

4.1.1   Crate Dimensions

The OceanTRx^{TM}4-500 system is packed in a single carton crate with the following dimensions:

- **Length:** 1.91m (75.2")
- **Width:** 1.91m (75.2")
- **Height:** 1.98m (78")
- **Weight** 450Kg

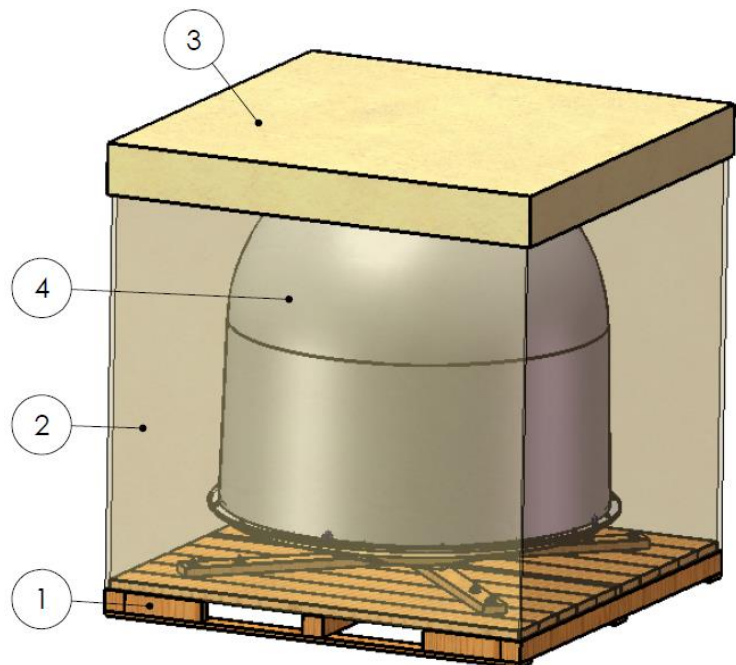|	
1.	Wooden Platform
2.	Cardboard Sleeve
3.	Box Cover
4.	ADE

***Figure** 4-7: Shipping Crate*

4.1.2   Crate Inspection and Unpacking

Note the following:

- Be sure to place the crate on a flat steady surface with enough access room.
- As soon as you open the crate, check for any evidence of external damage.

> ⚠ **ATTENTION!!** The crate is equipped with shock indicators, which change color if the crate has been subject to undue shock or vibration in transport.

Step 1
Cut all bands securing the box.

Cut Bands

Step 2
Remove the box top cover.

Top Cover

Step 3
Remove the screws securing the card board sleeve to the wooden base Remove the card board sleeve covering the system.

Sleeve
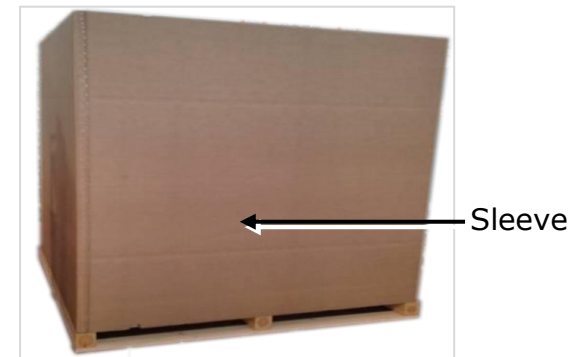
Step 5. Unpacking the BDE elements and accessories:

    a. Verify all items are present, according to the packing list.

    b. Visually inspect all items. Report any damaged parts to the shippers and to supportgroup@orbit-cs.com, as units damaged during shipping are not covered by the warranty terms and conditions.

BDE and accessories
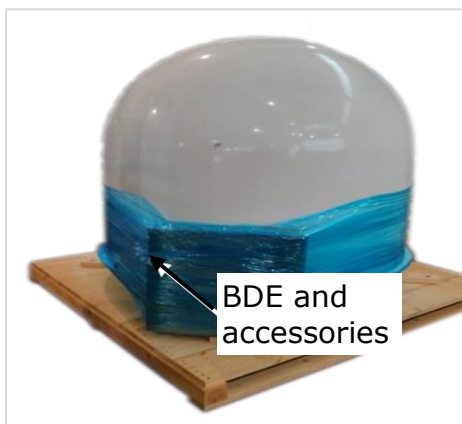
4.2 Mounting ADE

⚠	**ATTENTION!!** The ADE should be positioned with the ***bow marker*** aligned (as closely as possible) to the ship's centerline. Variations from the actual alignment can be compensated during the Setup procedure (section 7.5).

The mounting procedure is as follows:

- Using the crane and harness, partially lift the ADE along with the attached wooden platform
- Remove the wooden X platform
- Mount on the support structure.

4.2.1   Securing and Lifting Antenna System

Step 1 Attach the anchor shackles at the end of each strap to the *eyebolt* in four lifting points protruding from the RADOME. Attach the lifting harness to the crane and lower it over the Radome.	
Step 2 Remove the platform adapters 3/8" X 4 bolts securing it to the base plate.	
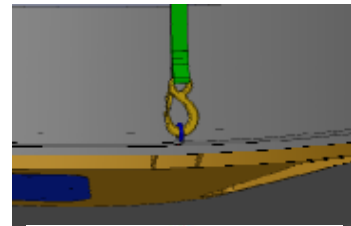
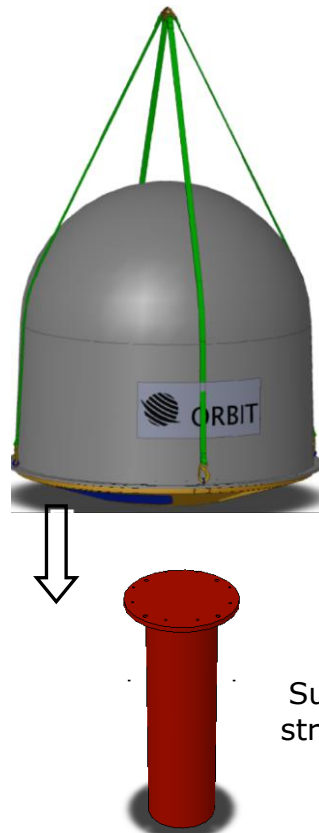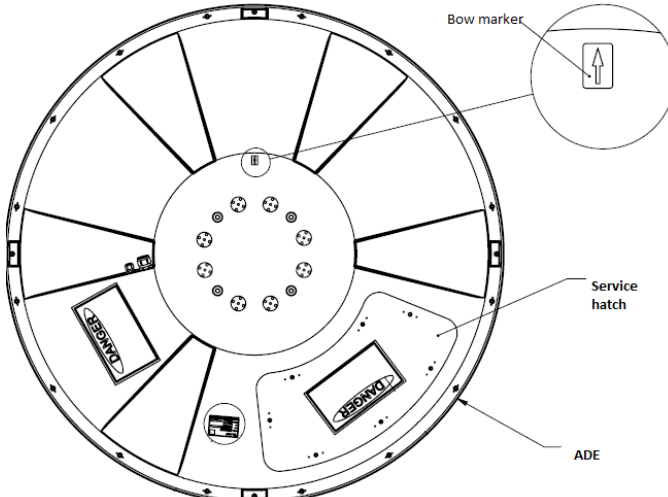|	
Step 4 Using the four eye bolts, lift the OceanTRx™4-500 slightly in the air so the wooden platform can be easily removed.	
Step 5 • Disassemble the wooden **cross** still connected to the Antenna System by removing the x4 M6X60mm bolts securing it to the base of the OceanTRx™4-500. ⚠ **CAUTION!** Be sure to support the platform adapter while removing the bolts.	
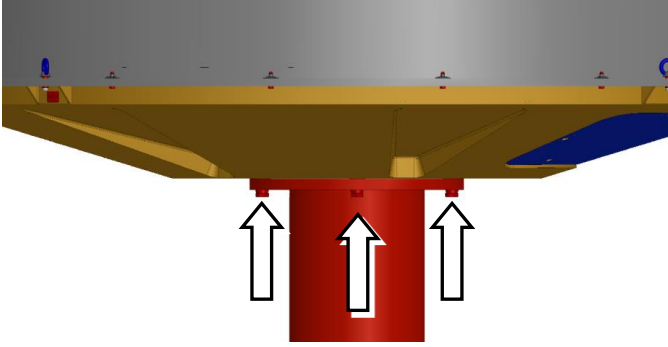
4.2.2   Mounting and Securing onto the Support Structure (e.g. Mast)

➤ **Ensure the following when mounting the antenna system to the support structure (e.g. mast)**

• Four M12X60mm screws are included in the system installation kit.

• Mount the system so the marker on the dome faces is as close as possible to the ship's bow center.

• Make sure that the orientation of the ADE enable convenient access via the hatch

• When attaching the system base ring to the system support, check that the used screws are appropriate for the thickness of the system support:

  The four screws that attach the center of the system base to the system support should not protrude more than 20mm from the system support.

• If necessary, use the washers below the system support to ensure that the screws can be tightened properly.

Step 1 Lift the system onto the support structure.	 Support structure
Step 2 Position the ADE unit on to the support in such way that service hatch will be accessible, while trying to align the bow marker (on the bottom base) with ships bow direction	 Bow marker Service hatch ADE
Step 2 Secure the ADE using 4 X M12 screws upwards through the system support and into the 4 threaded holes in the center of the system base. Use washer and spring washer Fastners are part of KIT32-0561 (Installation KIT)	 4 X M12 screws

5 Installation Procedure

The following information is included in this chapter:

NOTE: The procedures in this section are performed after the ADE is mounted securely.

- 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 may be carrying 115/230 VAC.
- Take extra care when handling the servo drivers – which are connected to 48 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 at all times. The antenna pedestal is equipped with high-torque motors that generate considerable force.

5.1 Required Tools

- Standard toolkit including flat screw drivers set and Allen key set
- Flash light (recommended)

5.2 ADE Physical Preparations and Connections

NOTE: The antenna power and RF connections are accessed by opening a hatch in the antenna base.

The procedure consists of the following steps:
- Opening the hatch
- Verify power switch is set to OFF
- Unlocking the four locks securing the antenna system axes (4 axes)
- Connecting the ADE to BDE cable
- GND and power connections
- Powering on – the last action

5.2.1   Opening the Hatch

NOTE: It is recommended to use a flashlight when working inside the dome.

➢ To open the service hatch

1. Reach under the ADE base and open the hatch fasteners (1/2 turn).
2. Allow the hatch to hang loosely on the connecting wire cable.
3. Slide shoulders and head in.

5.2.2   Unlocking the Pedestal Axes

Before operating the OceanTRx^{TM}4-500, the pedestal axes must be unlocked by removing the stow pins.

This is done by opening the hatch and fitting your head and shoulders through the opening.

NOTE: There are FOUR **STOW LOCK PINS** (all marked by a large orange label) **REMOVE BEFORE OPERATION.** It is recommended to **SAVE** stow pins in case they are needed when transporting the system in the future.

➢ To unlock the pedestal axes:

1. Open the hatch (see section 5.2.1).
2. Release the following stow pin housings, remove the pins, retighten the bolts on the housing, and set the pins aside:
   - ELEVATION axis
   - TILT axis
   - AZIMUTH axis
   - POLARIZATION axis*

Tilt Axis pin
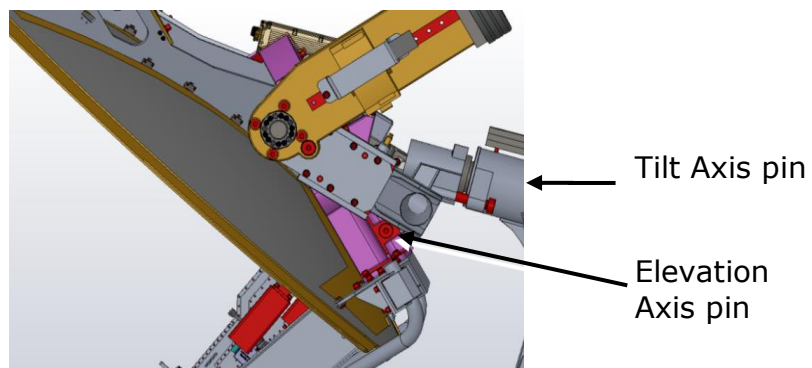
Elevation Axis pin

Figure 5-1: Elevation and Tilt Axes Stow Pins

*for Ku band feed only
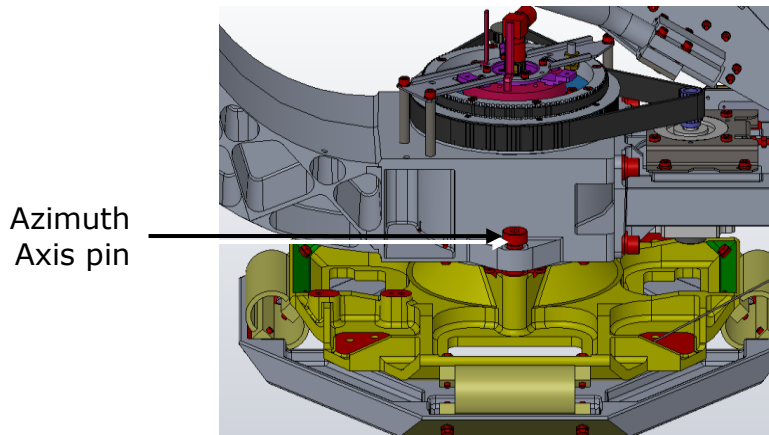
Azimuth
Axis pin

Figure 5-2: Azimuth Axis Stow Pin

Polarization
Axis pin
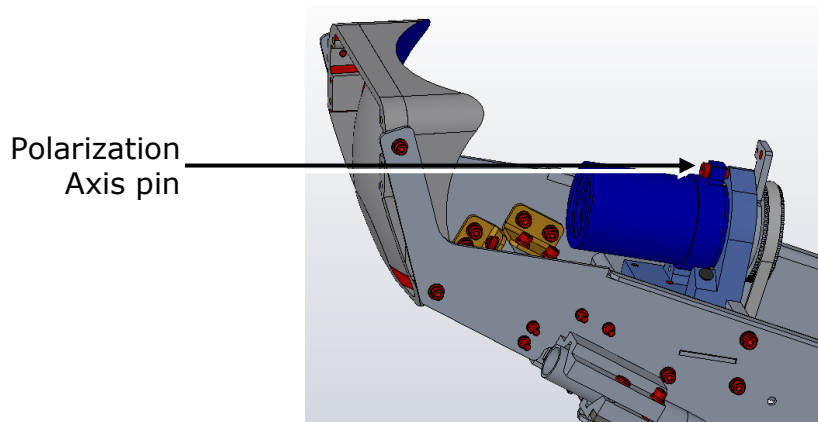
Figure 5-3: Polarization Axis Stow Pin

NOTE: Verify that each axis servo driver "Operation-Maintenance" switch is set to **MAINT** before operation. Switch location:
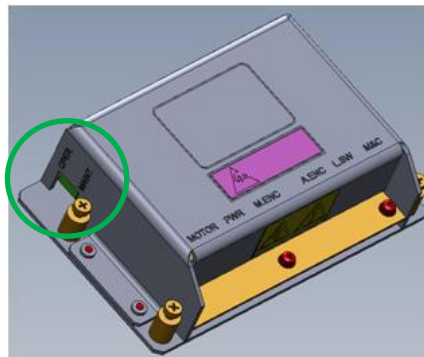
5.2.3   ADE to BDE LMR Coaxial RF Cable Connection

A single coax cable connects the antenna to the CCU side.

➢ **To connect the ADE to the BDE**

1. Install an N-Type connector on the ADE side of the coax (LMR) cable
2. Connect the cable to the N-Type connector on the ADE side.

5.2.4   Power Connections and Power ON

CAUTION!!!

Before connecting the power cable to the antenna:

- Verify the mains power supply is DISCONNECTED from the CIRCUIT BREAKER.
- Verify the mains power supply is DISCONNECTED from the UPS.

The power box is located in front of you as you enter the dome through the hatch.

1. Connect the following cables to the ADE power Connection box:

   - Grounding Connection:

     Connect a 16 AWG (at least) protective earthing (PE) conductor cable between the power Connection box GND lug and the ship hull.

   - AC Power Supply cable:

     Connect the antenna power cable according to section 3.6.2 (Cabling Guidelines).

2. Turn Power Switch ON
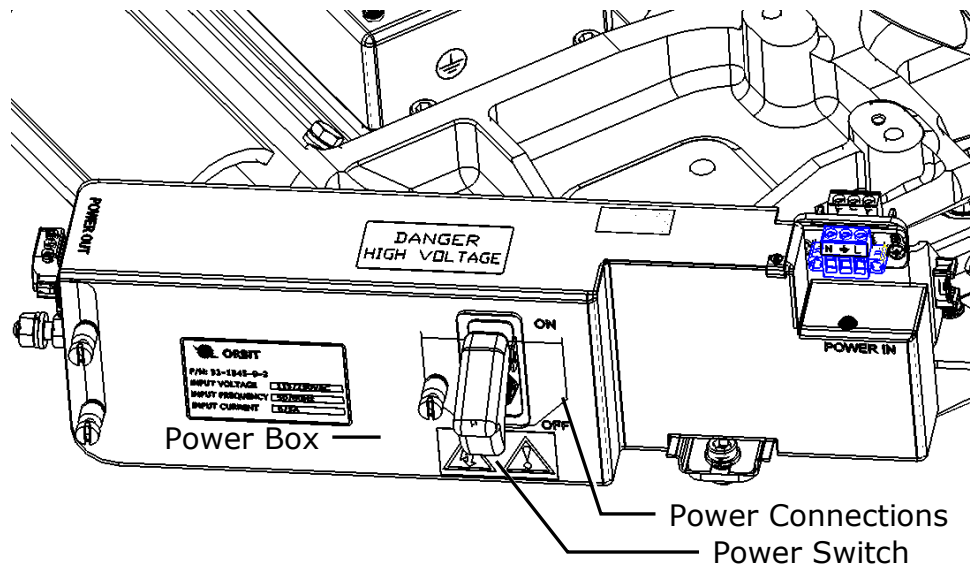
Figure 5-4: Location of Power Box

5.3 BDE Installation Procedure

5.3.1   Rack Installation Criteria

- Install the CCU in a 19-inch rack
- If a bracket is supplied, use the supplied bracket for the installation.
- Note the depth of the CCU and DSS.
- Consider the location of the interface elements when choosing the correct interface type and cable.
- Location should be easily accessible to the operator.
- Allow sufficient maintenance access for technical staff to the rear panel, where the cables are connected.
- Allow for heat dissipation (about 30cm)
- Allow for a sufficiently shallow bend in the coaxial cable when connected to the CCU.
- Free area around to access cables
- Access to UPS

5.3.2   CCU Installation Procedure
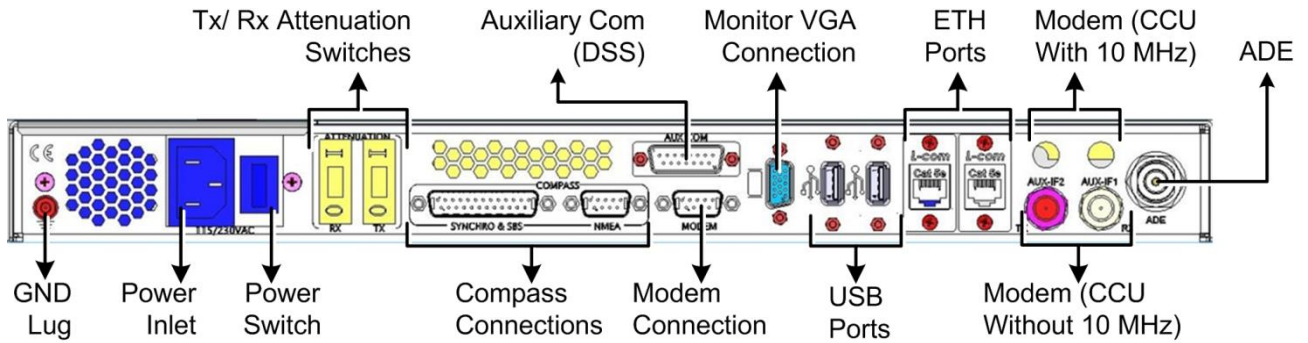
Figure 5-5: CCU Rear Panel Interface

➢ **To connect the CCU**

1. Connect the following cables:
    *   LMR Coax cable from ADE
    *   Ground cable from 'GND Lug' to rack's Ground
    *   Power to UPS 115/230 VAC; 1.0A/0.5A

Figure 5-6: CCU Power and Antenna Connections

2. For CCU without 10MHz reference signal - connect the Modem as follows:
    *   **CCU Tx** port to **Modem Tx** port.
    *   **CCU Rx** port to **Modem Rx** port

NOTE: The modem supplies the 10MHz reference signal with the Tx signal.
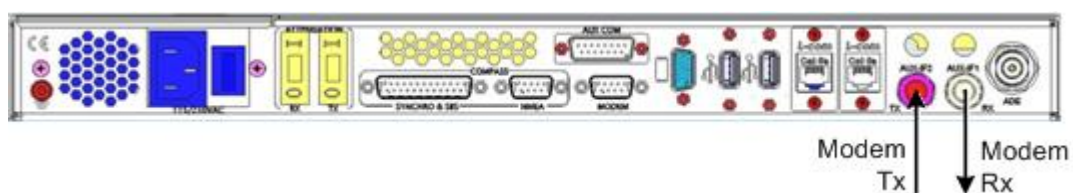
Figure 5-7: CCU without 10 MHz Tx/Rx Modem Connections

3. For CCU with 10MHz reference signal - connect the Modem as follows:

- **CCU AUX-IF2** port to **CCU Tx** port
- **CCU AUX-IF1** port **Modem Tx** port
- **CCU Rx** port to **Modem Rx** port
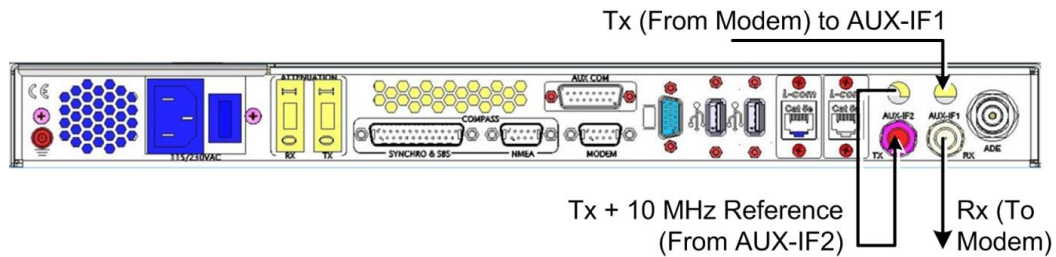
Figure 5-8: CCU with 10 MHz Tx/Rx Modem Connections

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

   Optional - Connect **CCU Modem** port to **Modem M&C** port. Use RS-232 cable.
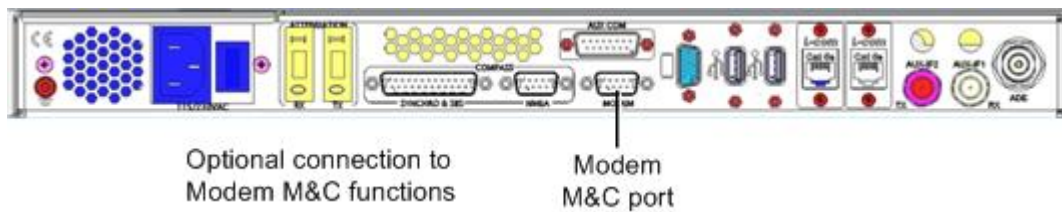
Figure 5-9: Connection to Modem M&C Function

5. Compass connections - the CCU Supports SYNCHRO, SBS and NMEA Compasses. Connect your compass to the relevant connector as shown below.
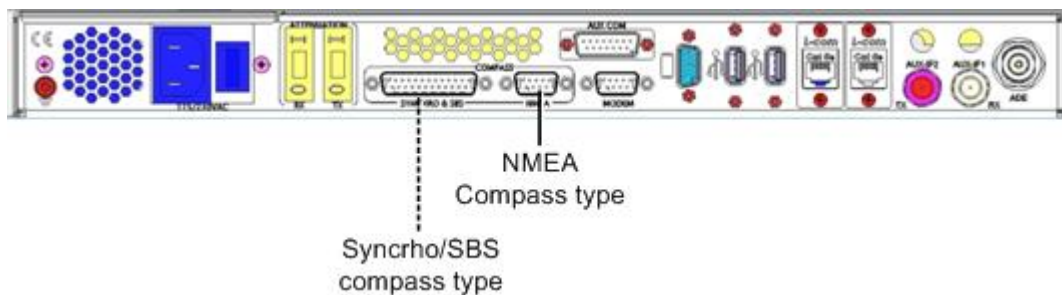
Figure 5-10: Compass Connections

5.3.3   DSS Installation Procedure

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

NOTE: it is recommended to install the DSS in the rack adjacent to the CCU since they are interconnected. If supporting rails are supplied, it is recommended to use the supplied supporting rails to install the DSS in the rack.
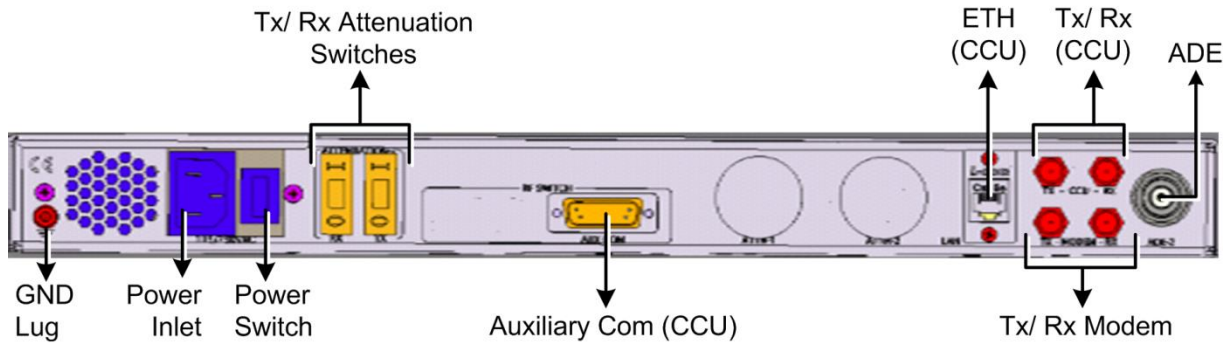
Figure 5-11: DSS Rear panel Interface

➢ **To connect the DSS**

1. Connect the following cables:
    *   LMR Coax cable from (second) ADE
    *   GND
    *   Power to UPS 115/230 VAC; 1.0A/0.5A
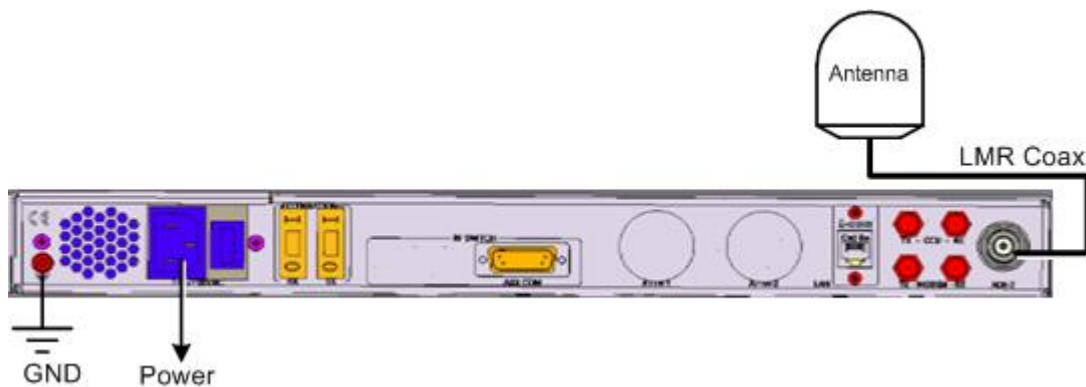
Figure 5-12: DSS Power and Antenna Connections

2. DSS to CCU connections:
    *   **DSS AUX** to **CCU AUX**
    *   **DSS ETH** to **CCU ETH**
    *   **DSS Tx** to **CCU Tx**
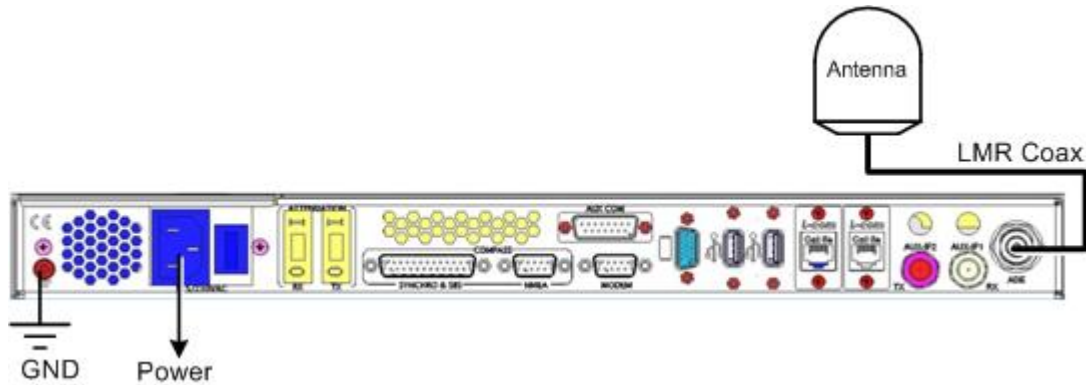   *   **DSS Rx** to **CCU Rx**
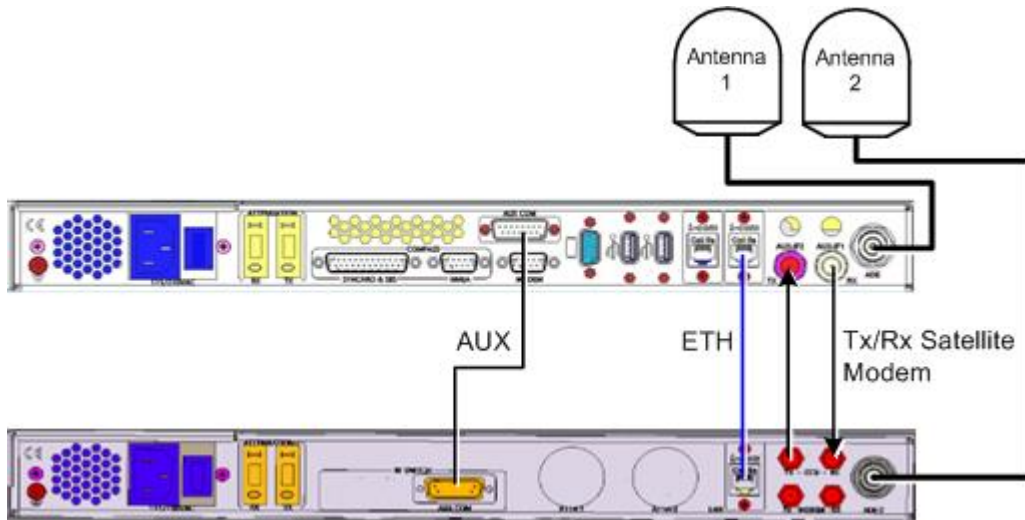
Figure 5-13: CCU to DSS Connections

3. For DSS to CCU *without* 10MHz reference signal - connect the Modem as follows:
    *   **DSS Tx** port to **Modem Tx** port.
    *   **DSS Rx** port to **Modem Rx** port

**NOTE:** The modem supplies the 10MHz reference signal with the Tx signal.
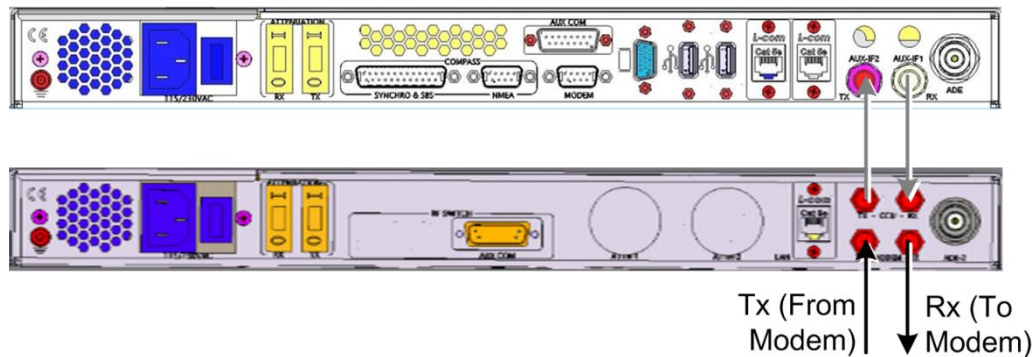
Figure 5-14: DSS to CCU without 10 MHz Tx/Rx Modem Connections

4. For DSS to CCU *with* 10MHz reference signal - connect the Modem as follows:

   - **DSS Tx** to **CCU AUX-IF2**
   - **DSS Rx** port to **Modem Rx**
   - **DSS AUX-IF1** port **Modem Tx**
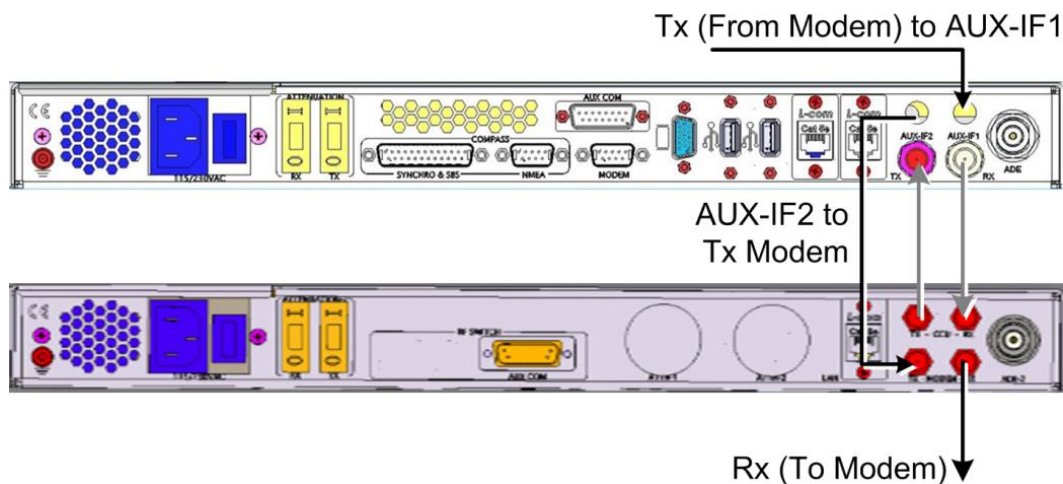
Figure 5-15: DSS to CCU with 10 MHz Tx/Rx Modem Connections

6 Navigating the MTSVLink

The MTSVLink management application is used to setup, operate, and monitor the system. The application is installed on the CCU and can be accessed locally or remotely via an in-band or out-of-band connection to the CCU.

The MTSVLink management application is automatically launched on the CCU each time the CCU is powered on (rear power switch)

The following information is included in this chapter:

6.1 Operation of the CCU

1. The CCU can be operated in one of the following ways:
   - Directly – using the peripherals (keyboard, mouse, display) directly connected to the CCU
   - Remotely– via a computer (running the MTSVLink application), that is connected to the one of the CCUs Ethernet port. Up to 30 sessions can be opened to single ADE

NOTE:	An optional 1U 17' LCD drawer with keyboard can be ordered from ORBIT.

The following figure shows the rear panel peripheral connections.
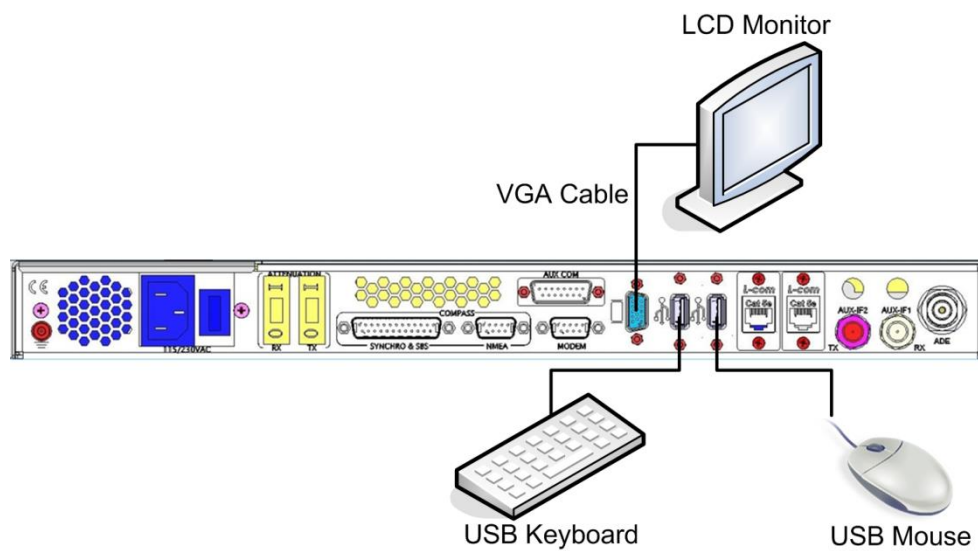
Figure 6-1: Connections for a Direct Session

2. The CCU launches the MTSVLink application on startup. The Startup Screen appears.

   Note the countdown:

   - When the countdown is completed, the Basic (monitoring only) screen is automatically accessed.

   - To access the Operations (configuration and control options) screen, carry out the following:

      o During countdown - press **[C**] and enter the password **al-7200**

      o From the Basic screen (countdown completed) - press **[O]** and the password **al-7200**
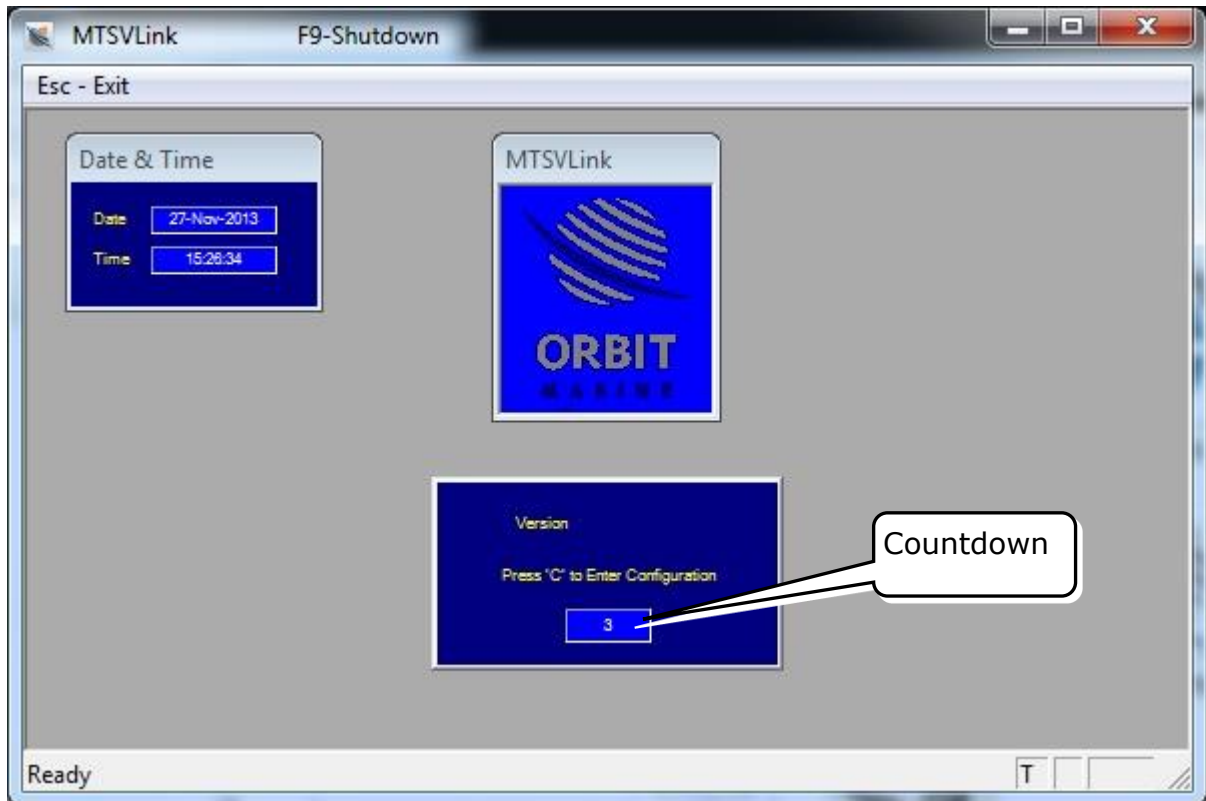
Figure 6-2: Startup Screen Showing Countdown

3. Verify antenna is operational - screen view will be populated (not empty of parameters).

Below is an example of the Operation screen – before setup, only some of the parameters may be displayed.
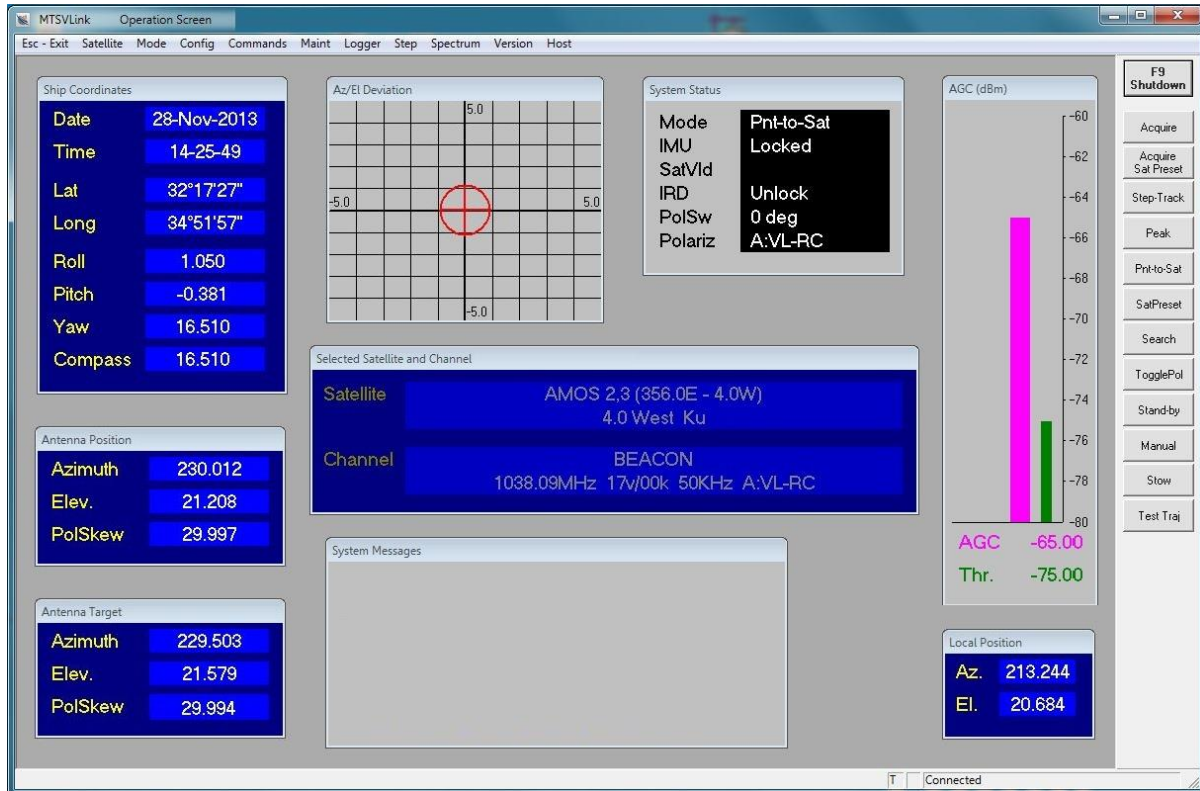
Figure 6-3: Operation Screen

6.2 Main Screens

Three main screens are available:

- Startup Screen - the application always begins with the Startup screen from which the screen can be selected.

- Basic Screen – allows definition of a few basic (e.g. communication) parameters and monitoring capabilities. This mode is accessed by default upon CCU power up (or reset).

- Operation Screen – provides all the required configuration options. This mode is entered using a password (**al-7200**)

6.2.1 Startup Screen

The Startup screen displayed after power-up or reset shows the software's logo, current Date & Time, and release version of the application.

The Startup screen automatically appears for 10 seconds (countdown) after you power on the CCU. During this time, you can choose the desired operation mode (monitoring or configuration) according to the instructions described in the following table.
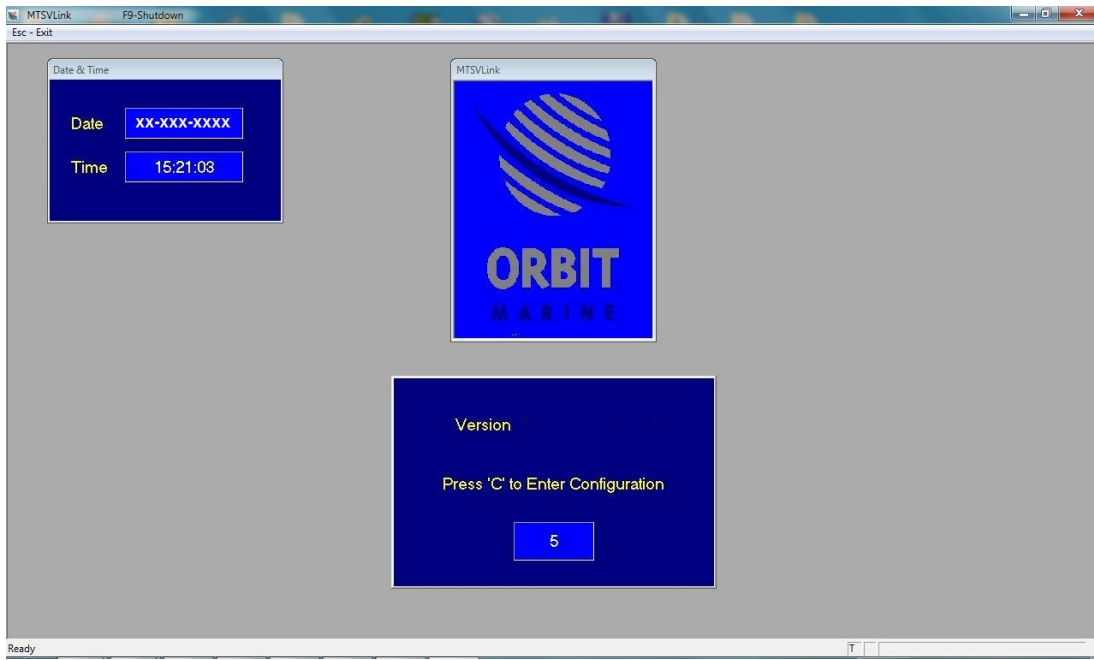
Figure 6-4: Startup (Initial) Screen

➢ **Accessing Basic or Operation screen from the Startup Screen**

To Access	Do this during Setup screen countdown
Basic Screen	Do not interrupt the countdown (wait 10 seconds). The **Basic Screen** appears automatically. *NOTE: If you are in **Operation Screen**, press **[u]** and then **Enter**, to return to Basic Screen.*
Operation Screen	Interrupt the countdown by pressing [**C**]. A dialog box will appear, enter the relevant password (**al-7200**) then press **Enter**. *NOTE: If you are in Basic Screen, press **[O]**, enter the password (al-7200), to access Configuration mode, then click **OK** or press **Enter**.*

6.2.2   Basic Screen

This mode allows you to set a few basic parameters such as remote communication (modem, IP, etc.), monitor the system, and perform a few basic operations.

The Basic Operation screen consists of the following main areas:

- Menu bar – includes remote communication definitions in addition to general system information.
- Display area – shows various types of system status information.

In addition, the top bar shows the screen type (Basic or Operation) as well as other parameters and the bottom bar shows the operation status messages.

Brief descriptions of the Basic Screen options are provided in the following sub-sections.
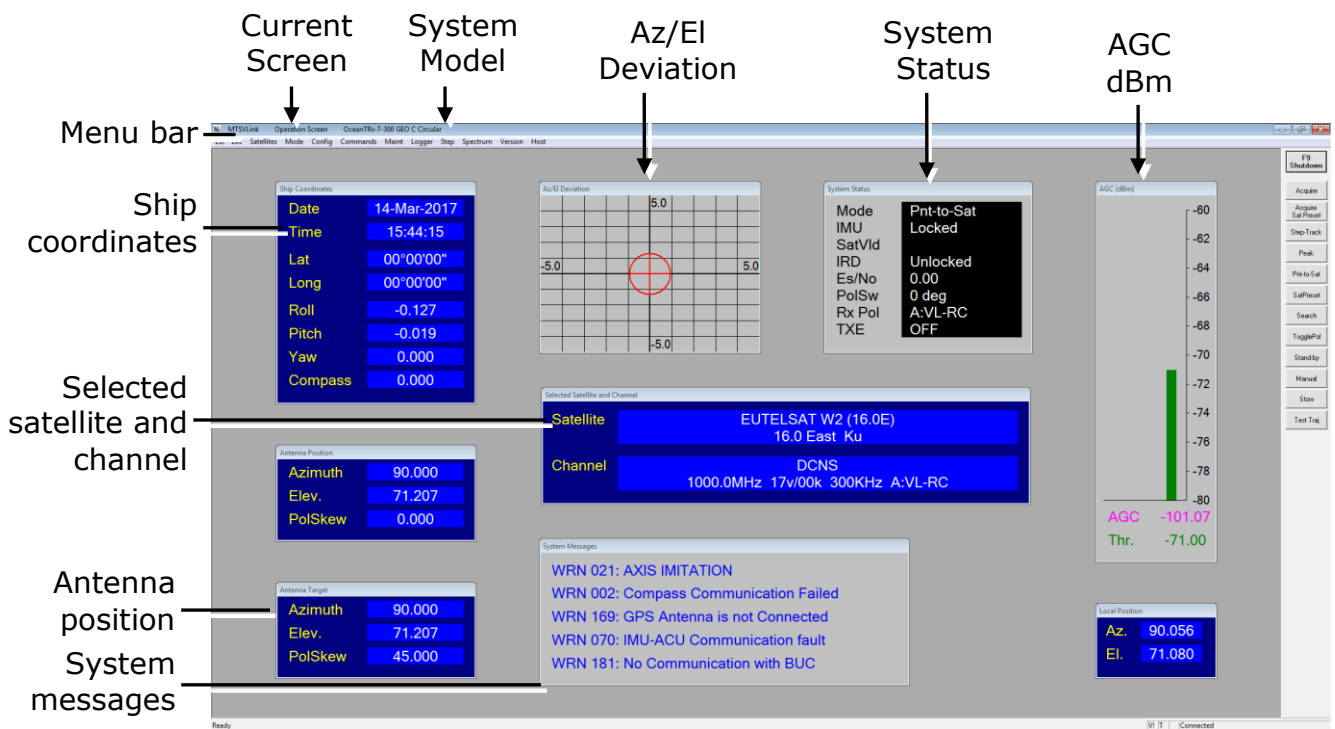
Figure 6-5: Basic mode (Basic Operation Screen)

6.2.2.1   Basic Screen Menu Bar

Item	Description
Esc – Exit	Closes and exits application.
Host	Edit Communication properties.
Version	Release version of application.

6.2.2.2   Basic Screen Display Area Information

Item	Description
Ship coordinates	Shows ship's date & time, exact geographic coordinates, position relative to sea level and compass heading.
Antenna Position	Shows antenna's azimuth, elevation level, and Pol-Skew angles
Az/El Deviation	Visual display of azimuth and elevation deviation of the actual antenna position (red circle) relatively to the antenna target (center of the grid)
System Status	Shows the antenna mode, polarization ,modem lock (IRD) status, and TX state
Selected Satellite and Channel	Shows the currently selected satellite and tracking channel.
System Messages	Displays active system error and warning messages.
AGC (dBm)	Shows the signal strength of the satellite RF tracking signal

6.2.2.3   Basic Screen Status Areas

Item	Description
General Info Bar	Shows the current operated screen and the current satellite and polarization.
General Status bar	General Status Bar – shows status messages relevant to current operations, including connection status.

6.2.3   Operation Screen

This mode allows you to configure/update all the relevant parameters, perform maintenance and manual system operations.

NOTE: All information except for the Antenna Target area and Local Position area is parallel to the Basic screen.

The Operation mode dialog includes the following areas:

- Menu bar – provides all configuration, monitoring, and management options
- Display area – system status information displayed in the background.

  The screen varies depending on the selected Menu option. By default, the screen displays (except for the Antenna Target) is the same information as the Basic screen.

- Side-bar buttons – shortcuts to commonly used control options.

In addition, the top bar displays general system information and the bottom bar displays status information relevant to the current operation.
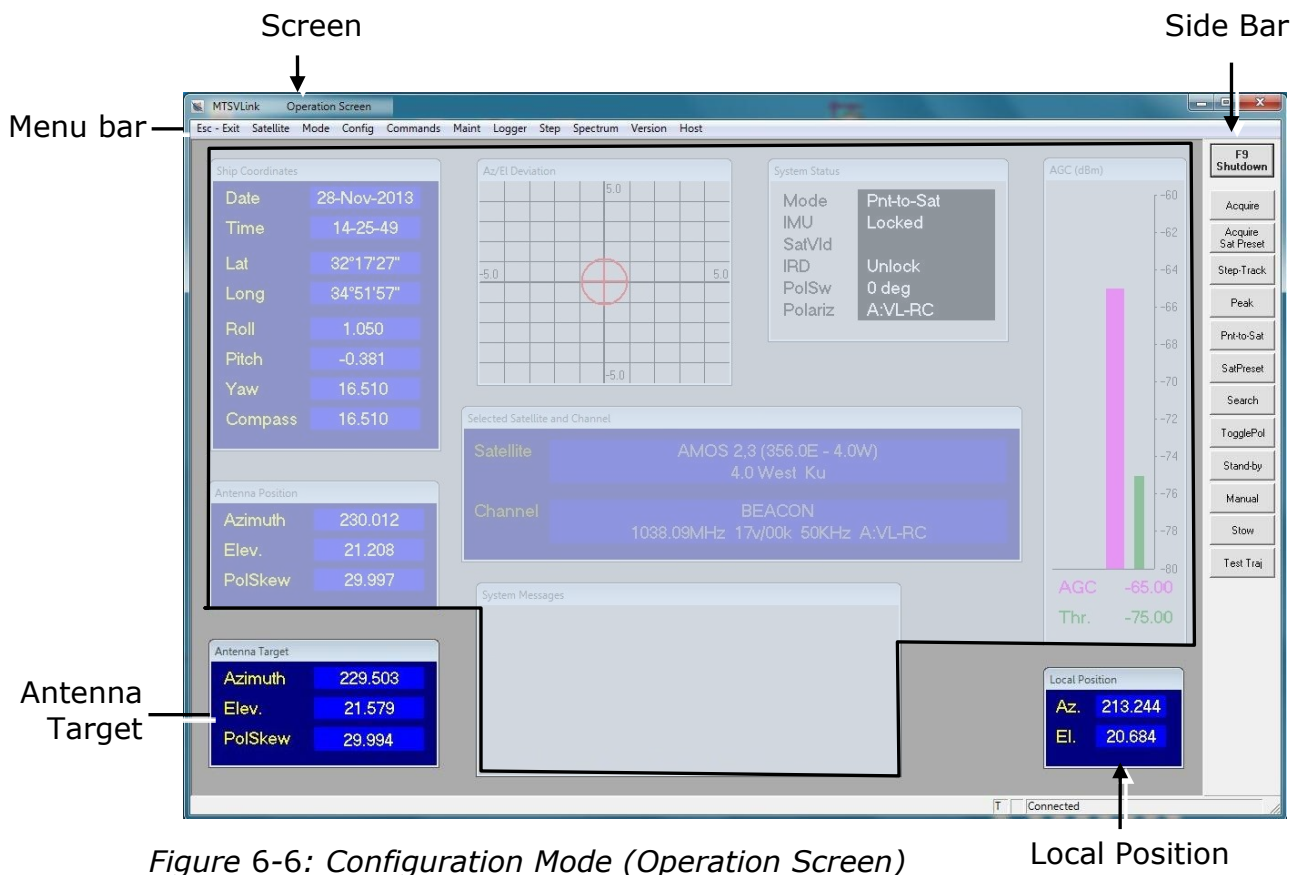

Figure 6-6*: Configuration Mode (Operation Screen)*

6.2.3.1   Operation Screen Menu Bar Options

NOTE: Below are the options displayed by default; the Maint, Logger, Step, and Spectrum menu options that invokes different menus.

Main Menu Bar	General Description
Esc - Exit	Go back to the previous screen or quit the application (from the last screen).
Satellites	Shows available satellite constellation and orbit options and provides detailed configuration parameters (section 7.4).
Mode	Antenna mode control options (Acquire, Search, etc.). Most of these options are parallel to the Side Bar shortcut buttons (section 6.2.3.2).
Config	Provides system configuration) options (Chapter 7).
Commands	Basic system commands menu
Maint	Invokes a **Maintenance** Screen.
Logger	Invokes a **Graphic Data Logger** tool (section 9.2)
Step	Invokes a **Step Track Screen** – shows antenna system location during Step-track mode.
Spectrum	Invokes the **Spectrum Analyzer** tool (section 9.1).
Version	MTSVLink Release Version window.
Host	Communication properties menu.

6.2.3.2   Side Bar (Operation Modes) Menu Options

NOTE: In Operating Screen, side bar buttons appear constantly regardless the screen you operate.

Side Bar Buttons	Description
F9 Shutdown	System shutdown.
Acquire	Points the antenna at the satellite last selected from the database, and activates Step-Track Mode.
Acquire Sat Preset	Points the antenna to a user-defined geo-stationary longitude and activates Step-Track Mode.
Step-Track	Under normal working conditions, **Step-Track Mode** is activated automatically from the Acquire and Acquire Satellite Preset Modes. However, it can be activated manually for maintenance and integration purposes.
Peak	Points the antenna at the position of maximum AGC, as determined by the last step-track iteration.
Pnt-to-Sat	Points the Antenna at the satellite last selected from the Satellite

Side Bar Buttons	Description
	Database (without taking into account the tracking signal level or tracking frequency for the satellite from the Satellite Database).
SatPreset	Points the Antenna to a user-defined geo-stationary longitude.
Search	Moves the Antenna in an expanding and contracting spiral until the AGC signal is above the threshold.
TogglePol	Toggles system Rx polarization from A to B and vice versa
Stand-by	Halts all axes in their current position
Manual	Allows positioning the antenna manually for maintenance purposes, or to find a satellite when the system does not acquire it automatically.
Stow	Moves the system axes to the predefined location
Test Traj	Allows you to test the performance of each of the antenna axes.

6.3 Saving Configuration changes

NOTE: System configuration changes must be saved; otherwise, they will be lost when the system reboots.

➢ **To save configuration changes**

Access Commands→save Configuration [**V**] at the prompt, click **OK.**
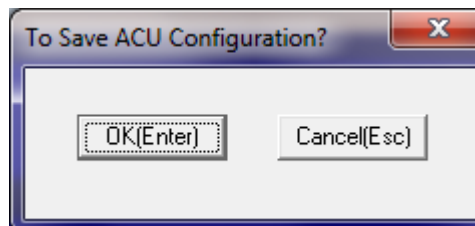
6.4 Shortcuts

- Keyboard Shortcuts
- Shortcut buttons

NOTE: Saving configuration changes. System configuration changes made using the software are stored in volatile memory. Changes not saved to non-volatile memory will be lost when the system reboots. Therefore, it is important to save any system configuration changes.

➢ **Basic Keyboard shortcuts**

Press	Operation Executed
[**o**]	Switches Basic mode **to** Configuration mode. Enter the password (al-7200)
[**u**]	Switches from Configuration mode **to** Basic mode.
[**v**]	Saves **ACU Configuration**
[**s**]	open **Geostationary Satellites** section Screen
[**3**]	Opens O3B **Current Satellite Constellation section** dialog
[**F9**]	Shuts Down the System motors. Pedestal is free
[**m**]	Enters the **Maintenance** Screen
[**l**]	Enters the **Graphic Data Logger** Screen
[**e**]	Shows Release **Version** of the software
[**r**]	Enters **Spectrum Analyzer** Screen
[ESC]	Goes back to the previous screen or quits (if this is the last screen)

➢ **Commands Menu**

Available commands	Function
Save ACU configuration	Save ACU configuration
Set GPS	Manual input of GPS position(emergency/maintenance)
Set Compass	Manual input of ship heading (emergency/maintenance)
Set Threshold	Sets threshold value on the AGC window
IMU init	Manually initializes IMU (maintenance)
Toggle Polarization	Toggle RX polarization
Reboot the ACU	Reboots the ACU (antenna unit)

6.5 Configuring the Display

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

➢ **To configure the AGC and Az/El Deviation display:**

1. Open the **Config** menu and select **Display**. The **Display Configuration** dialog box appears.
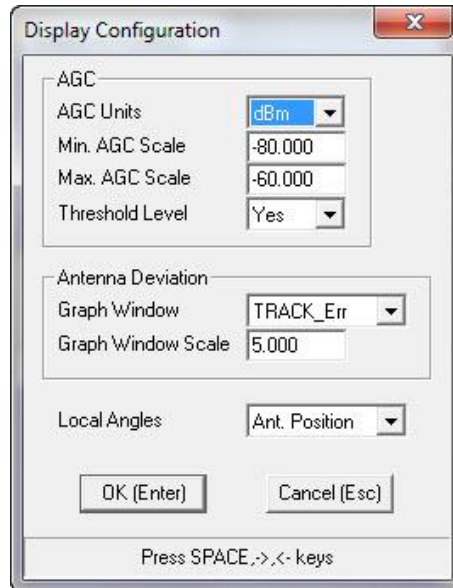
Figure 6-7: Display Configuration Dialog Box

2. Configure the **Graph Window Scale** value. During normal operation, it is recommended that **Graph Window Scale** is set to '5.000'.
3. Click **OK (Enter)**. The **Display Configuration** dialog box closes.

7 Setup Procedure

This chapter describes the procedures required for initially setting up the antenna. The procedures are described in the order in which it is recommended to be performed.

The following information is included in this chapter:

7.1 Overview of the Commissioning Procedure

NOTE 1: The OceanTRx™4-500 Maritime Satellite Communication 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.

NOTE 2: Be sure to press [**V**] on the keyboard to save changes to the system.

➢ **The commissioning procedure consists of the following steps**

1. Compass Input configuration
2. ACU & CCU IP address configuration
3. Selecting (or defining) the satellite (to be acquired at a later stage).
4. Perform compass offset.
5. Define the blockage zones.
6. Acquire satellite and verify AGC.
7. Perform cross polarization isolation (CPI) test and 1dB Compression Point (CP) test with the NOC and verify proper operation.
8. Perform open AMIP test for Idirect type modem.

   NOTE: Modem should be already configured according to the manufacturer's instructions). Verify that Tx and Rx are within range can be Locked (system locks-in the corrected satellite).

9. Verify the range of the RF parameters with the satellite operator.

7.2 ACU & CCU IP address configuration

7.2.1   Changing IP address of the ACU

a) Select Start → programs → **MtsDock** to launch the **MtsDock** application.

b) On the **MtsDock** menu, select the **ACU** drop-menu, and then select the **Edit network parameters** → **Detect ACU**.
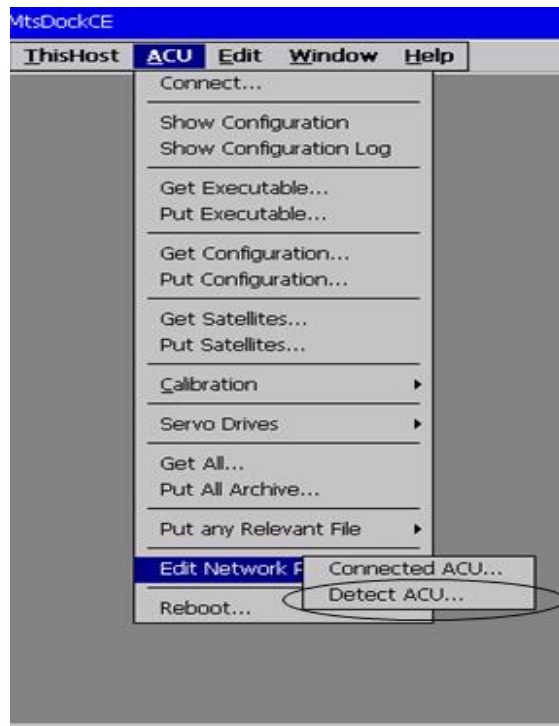
c) New window [*Detected ACU*] will appear. Select the ACU press **Edit/Reboot**.
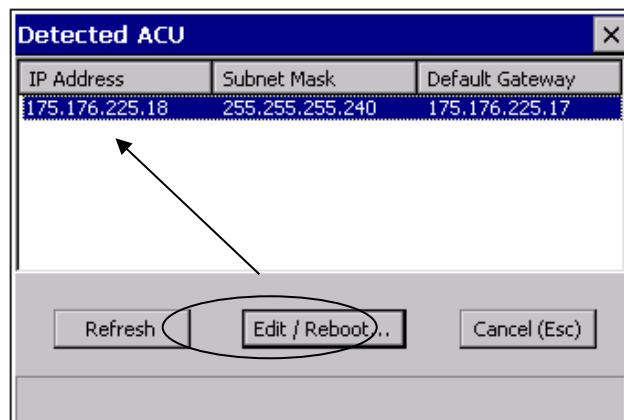
d) In the [*Detected ACU network parameters*] window, enter the ACU/SBC IP address, Subnet mask and default gateway IP (usually modem) in the **New Settings** fields.
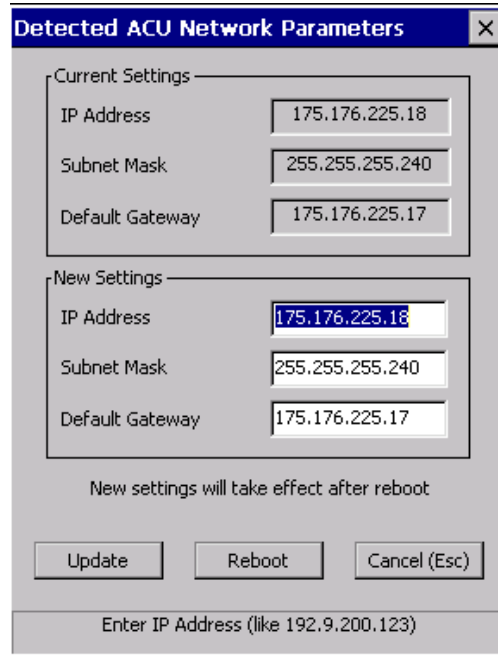
e) Select **Update** and **Reboot**.

f) Confirm reboot command by selecting OK. The ACU will reboot.

g) At the MtsVlink/Mtslink application, select the **Host** drop-menu, and chose **Communication➔ TCP/IP tab**. Change the Host IP to match the new ACU IP.
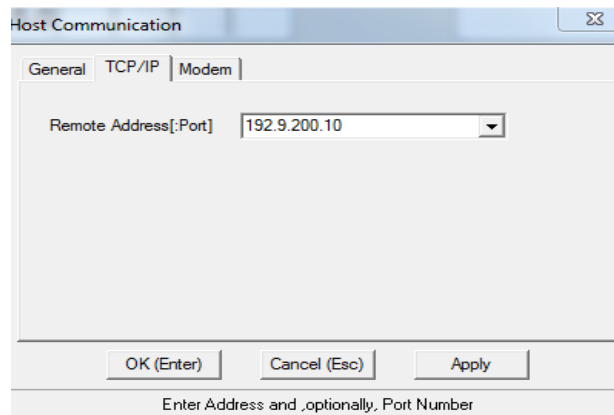
The given example shows non-default IP addressing scheme.

7.2.2   Changing IP address of the CCU

a) Access Windows Network Connections→Local Area Connections→Internet Protocol Version 4 and

b) Change the required network parameters

c) At the MtsVlink/Mtslink application, access **Inconfig** menu and chose **External hardware IP**.

d) Enter the CCU and the Modem IP addresses separated by ; (semi colon) sign.
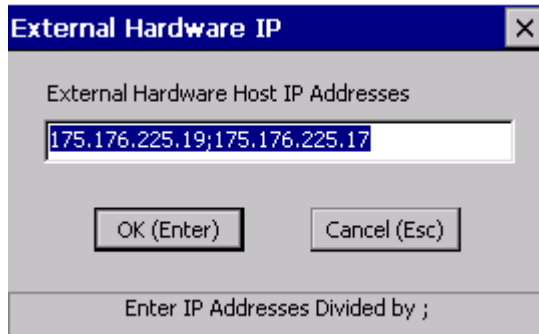
e) Select OK.

f) Confirm the System is working properly with no error messages.

7.3 Compass Input Configuration

NOTE: It is recommended to perform this step during the commissioning procedure. However, if for some reason, the compass is not available at this point, you can manually enter the heading information (**Commands** menu, **Set Compass** and enter **Ship's Heading –** section 7.3.3). The compass input configuration can then be performed at a later stage.

This procedure consists of two phases:
- Select the compass type
- Configure the compass communication parameters
- (If necessary – nor reading), set compass reading manually

7.3.1   Selecting Compass Type

This section describes the procedure for selecting compass type and configuring basic compass parameters.

➢ **To select the compass type**

1. From the **Config** menu, select **Compass**. The following dialog appears:
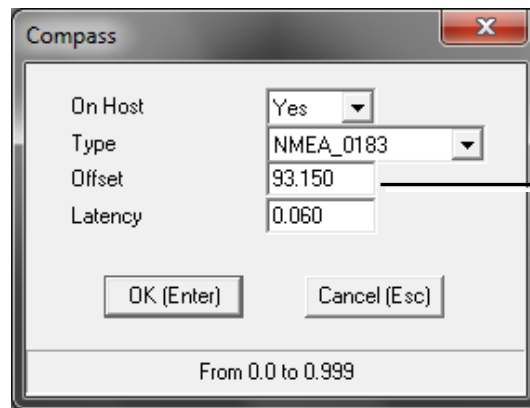
Set initial value. To be updated after accurate offset value is calculated

Figure 7-1: Compass Dialog Box

2. Verify **On Host** field is set to **Yes**.

3. Select the compass **Type** (default = NMEA_0183).

4. Enter the following information:

   - **Offset -** enter a preliminary compass offset value. This will be updated during the Compass Offset procedure. Section 7.5.

   - **Latency –** factory setting = **0.060** seconds. Do not modify unless specific compass data latency (in seconds) is known.

5. Click **OK.**

7.3.2   Set Compass Communication Parameters

These parameters allow communication between the compass and the CCU.

The configuration differs for NMEA type compasses and for non-NMEA type compasses. For NMEA type compasses (only), additional (advanced) compass parameters may be configured according to section 8.6.2.1.

NOTE: Take note of the **Data Sharing** parameter required for dual-system installations.

To set compass communication parameters

1. From the Host menu, select **Hardware Interface**, click the **Enable** tab and verify **Enable Hardware** is set to **Yes.** Click **Apply.**
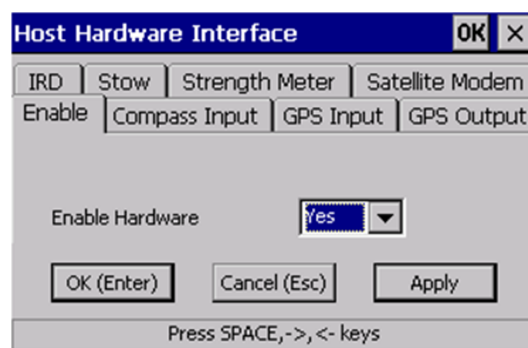
Figure 7-2: Host Hardware Interface Enable Tab

2. Click the **Compass Input** tab.
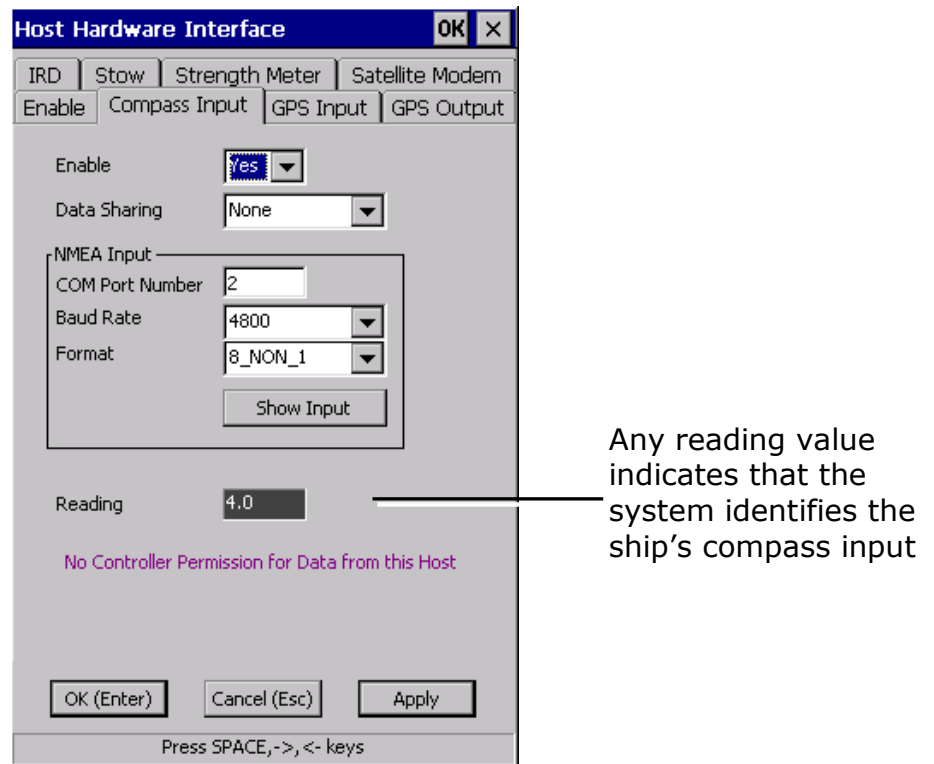
Figure 7-3: Host Hardware Interface Compass Input Tab

3. Verify that Enable is set to **Yes.**
4. For Dual System configuration - under **Data Sharing**, set the following values:
    - First System Compass **–** set as **Server**.
    - Second System Compass **–** set as **Client**.
5. For Compass type that is *not* NMEA:
    - Set Enable to Yes.
    - Click **Apply** and verify Reading field displays a value. If a value is not displayed, refer to section 7.3.3.
    - Click **OK.**
6. For NEMEA type compass:
    - Set Enable to Yes.
    - Under **COM Port Number –** set according to the type of physical connection:
        o   RS422 type - COM2
        o   RS232 type - COM3
    - Set **Baud Rate –** according to compass baud rate.
    - Set **Format –** according to compass vendor (default = 8_NON_1).
    - Click **Apply**, verify Reading field displays a value. If a value is not displayed, refer to section 7.3.3.
    - Click **OK**.

7.3.3   Setting Ship's Heading Manually

If a Compass Reading is not displayed, then you must set the ship's heading manually according to this section.

➢ **To set the ship's heading manually**

1. From the **Commands** menu, click **Set Compass.** The Ship's Heading dialog appears.
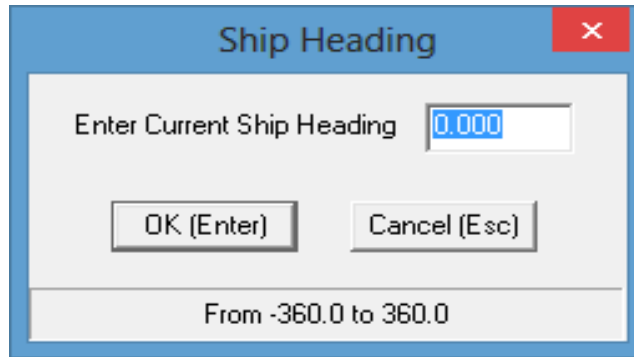
Figure 7-4: Host Hardware Interface Compass Input Tab

2. Enter the value of the **Current Ship Heading** and click **OK.**

7.4 Selecting a Satellite

This section describes how to select the *satellite* and define the *channels*. The satellite can be selected from a list of available satellites (downloaded via a file). If the satellite definitions are not listed, a satellite can be defined manually according to its position or name. (The selected satellite will be acquired at a later stage.)

If choosing to load from a file, you can also define to reload the file automatically under certain conditions.

NOTE: Upon system power-up, the system automatically locks onto the last satellite that was selected and saved prior to system shutdown.

7.4.1   Loading a Satellite List File

➢ **To select a satellite**

1. From the **Operation Screen**, click the **Satellite** menu and choose the relevant orbit type.
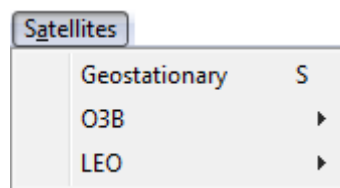
The Satellite management dialog will vary according to the previously selected orbit: GEO, O3B or LEO.

The following figure shows an example of the GEO related dialog *after loading* a file containing a list of satellites. (It is not necessary to load a file – a single satellite can be defined manually).

Satellite and channel
management options

Satellites in database

Defined channels
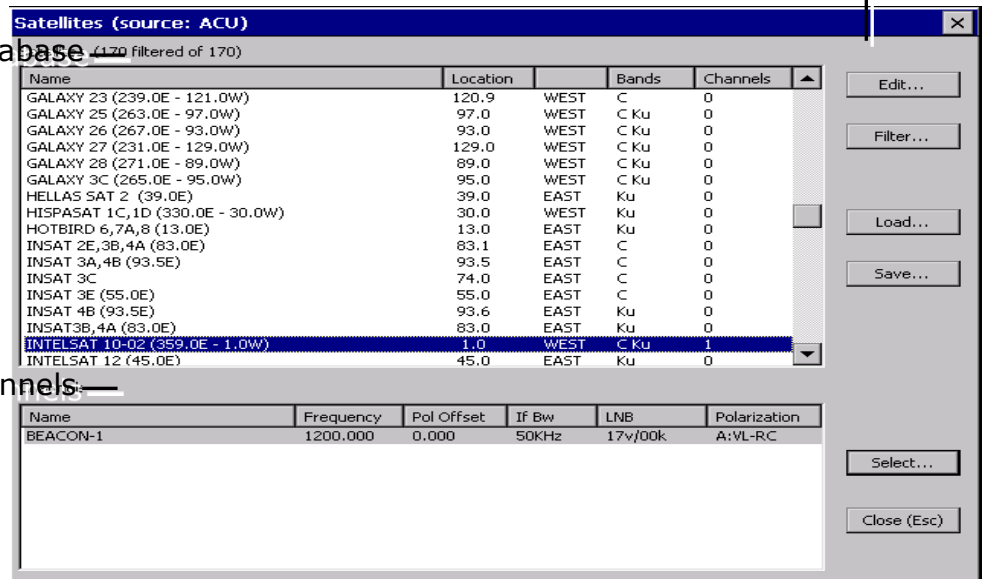
Figure 7-5: Satellite List Dialog Box

2. If a file listing the satellites is not available, click **Load** and load the file as follows:

- ACU – load the file from the ACU (default)
- LOAD – browse and load from the file location on your computer or the network
- Automatic loading – to download (from the selected location) automatically according to the available criteria.
- Click **OK.** The list of satellites will be displayed.

NOTE: The list may be modified (Add, Remove satellite definitions, channels, etc.), by clicking the **Edit** button and using the available management options. See section 8.2 for detailed descriptions of the Satellite Management options.

7.4.2   Adding a Satellite

You can add the definitions of a satellite (that is not currently listed in the database).

➢ **To add a satellite**

1. Click the **Edit** button, and click **Add.** The following dialog appears.

Figure 7-6: Add Satellites Dialog

2. Assign the Satellite **Name** or (and) **Location in degrees**

If the satellite position is west the location should be with "–"

3. Select the **Band** and click **OK.** The defined satellite will be listed now.

4. To save the changes in the ACU memory, click the **Save** button:

   - If a list is currently displayed, the manually defined satellite will be added to the list.

   - Otherwise, you will be prompted to save to a new file.

7.4.3 Defining Channels (Tracking Signals)

7.4.3.1 Criteria for Selecting the Tracking Signal

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 any 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 8PSK)
- **Wide-band TV transponder** – Digital only

The OceanTRx™4-500 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** – 50 KHz filter
- **Customer data channel** – 150, or 300 KHz filter, according to the channel's occupied bandwidth
- **Wide-band TV transponder** – 300 KHz filter

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.

7.4.3.2   Configuring Channels

NOTE: The required parameter values are provided by your satellite operator.

➢ **To define channels manually**

1. Click the **Edit** button and click **Add Channel**. The following dialog box appears.
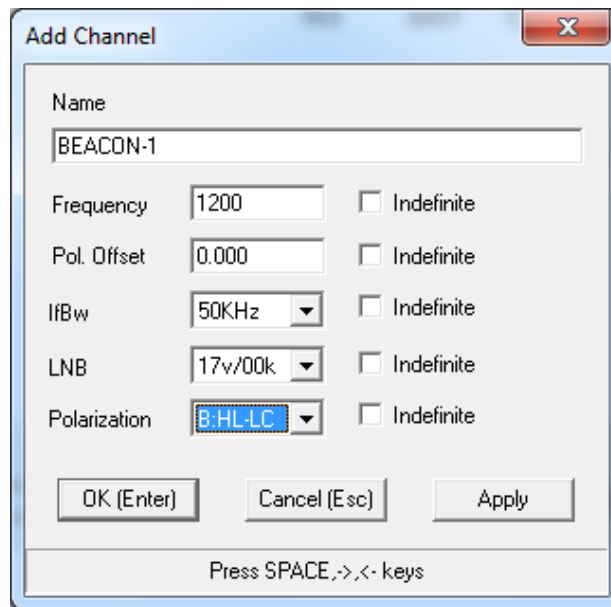
Figure 7-7: Add Channels Dialog

2. Enter the channel **Name** and define the remaining parameters according to the information provided by your satellite operator. Click **OK.**

7.4.3.3   Channel Polarization

The system polarization must be configured to ensure good acquisition of satellite signals.

In addition, for each linear satellite, the polarization offset must be configured. Polarization offset for satellites is configured using the **Satellites** database (see Section 8.3.1).

The current system polarization can be seen in the **Polariz** parameter of the System Status box on the **Operation Screen**.
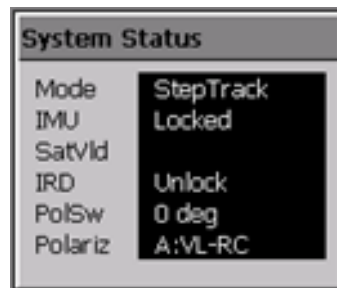
Figure 7-8: System Status Box

In the above figure, the system polarization is vertical-left, right-circular (A:VL-RC).

➢ **To toggle the system polarization:**

1. From the **Operation Screen**, open the **Command** menu and select **Toggle Polarization**. The **Polarization Status** dialog box appears.
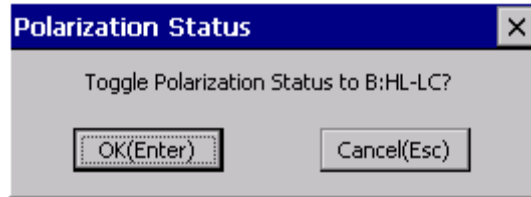
Figure 7-9: Polarization Status Dialog Box

2. Click **OK (Enter)**. The system polarization toggles and the **Polarization Status** dialog box closes.

7.4.4   Selecting the Desired Satellite and Channels

➢ **To select the desired satellite**

1. Select the satellite and click **Select.** The verification prompt appears.
2. Confirm the selection and click **OK.** The channel will appear in the **Selected Satellite and Channel** window on the **Operation Screen**.
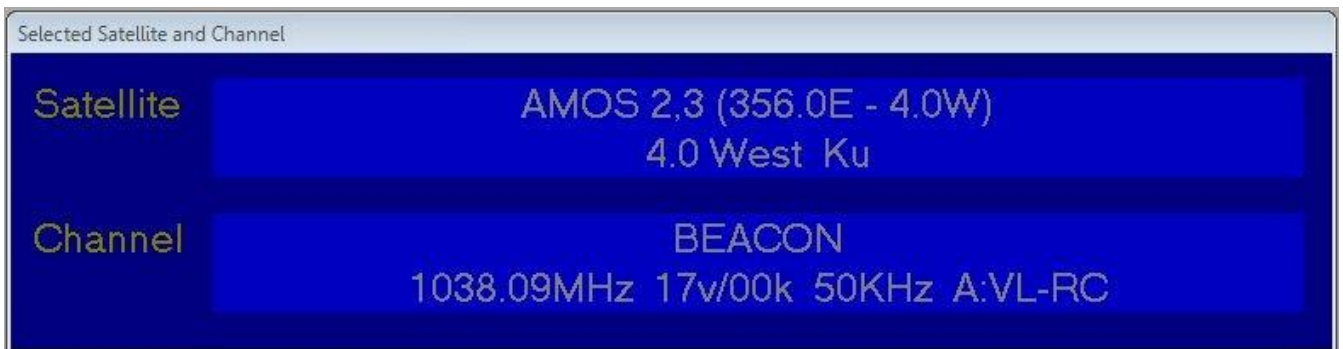
Figure 7-10: Example of Selected Satellite and Channel window area

7.5 Perform Compass Offset

The vessels compass and the OceanTRx™4-500 system must be aligned according to the vessel's bow-to-stern axis.

Ideally, the OceanTRx™4-500 system is installed so the 'marker' is aligned with the bow-to-stern axis of the ship (and with the ship's compass). However, this ideal installation is not always possible, due to physical limitations of the OceanTRx™4-500 installation site.

Therefore, the Offset between the desired alignment of the system and the actual installation is estimated and the required compass offset is configured – aligning the compass with the antenna.

The following figure shows the ideal system installation, where the system marker is parallel to the ship's bow-to-stern axis.
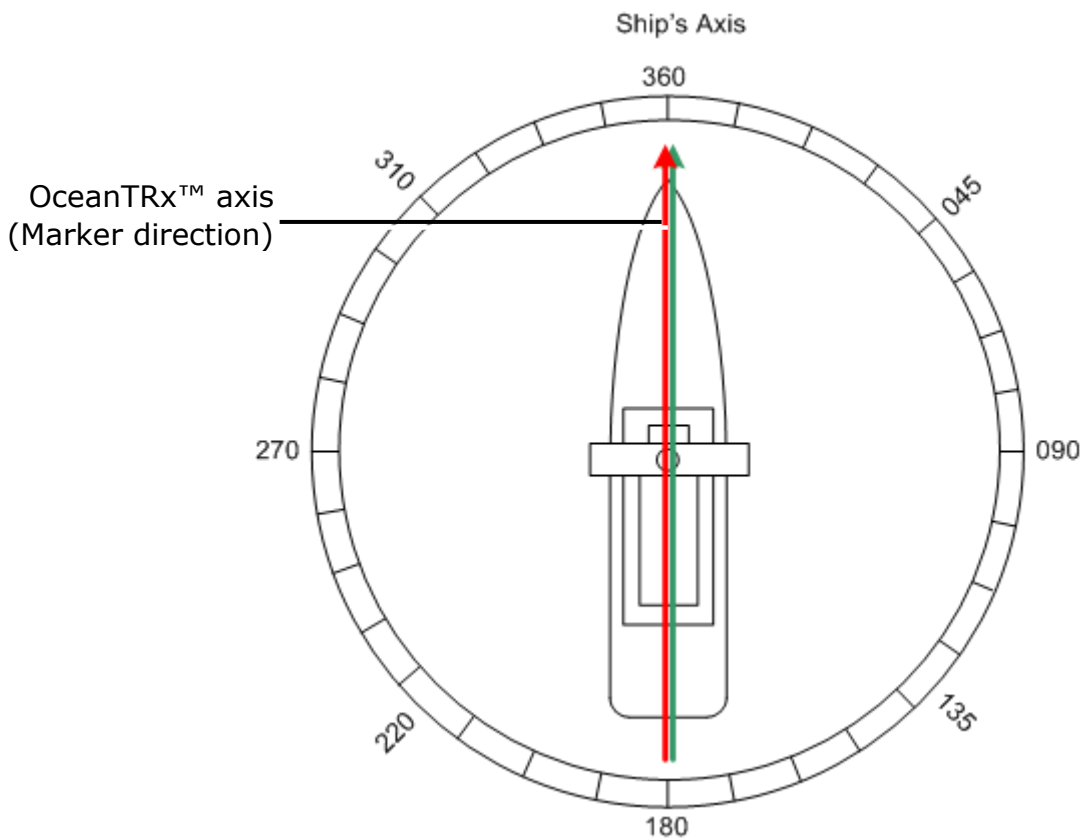
Figure 7-11: Ideal System Installation – No Offset

➢ **To calibrate the compass offset**

1. Make a 'naked-eye' rough estimate of the offset angle, using the following syntax:

   - Clockwise rotation from the ship's bow = positive (+) values
   - Counter-clockwise from the ship's bow = negative (-) values

   In the following figure, an appropriate estimate would be (-30°).
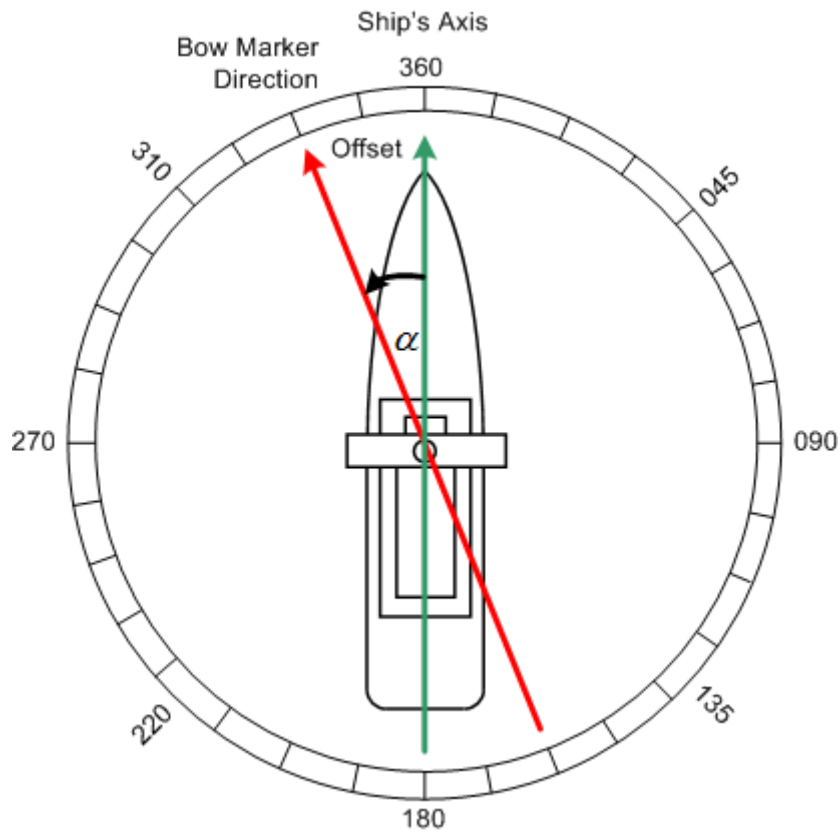
Figure 7-12: Compass Offset Variables

2. In the MTSVLink application, select the Compass type and define the initial offset parameters:

   - Select the **Config** menu and choose **Compass**. The following dialog appears
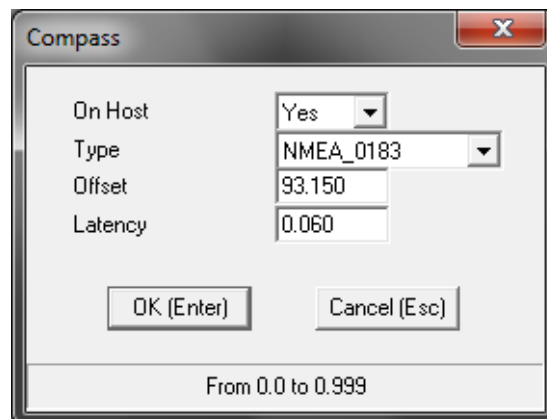
Figure 7-13: Compass Dialog Box

   - Enter the 'naked-eye' estimate in the **Offset** field.

- If the data latency (in seconds) is known, enter the latency in the **Latency** field. If the latency is not known, leave the factory default setting of 0.060 seconds.
- Click **OK** and then click **[V]** on the keyboard and press **Enter** to save.

3. Determine the antenna *nominal* azimuth:
- Point the antenna to the desired satellite.
- Write down the antenna's azimuth as it appears in the **Antenna Target** window of the **Operation Screen**. This will serve as your nominal azimuth. See the following figure:

Figure 7-14: Antenna Target Window

4. Determine the antenna *actual a*zimuth:
- Using Manual Mode (see **Section 8.1.10 Manual Mode** on page 8-6), change the antenna's azimuth orientation until it points to the satellite.
- The required amount of movement depends on the accuracy of your initial estimate (a typical estimate will fall within ±10°).

NOTE: Use the Spectrum Analyzer Screen to determine when you are locked onto the satellite (see Section 9.1 Once the satellite is acquired, set the antenna to Step-Track Mode (see Section 8.1.4 Step-Track Mode on page 8-4).

5. Determine the azimuth deviation. This is the difference between the nominal azimuth and the antenna's actual azimuth.

You can use one of the following methods:
- Observing the graphic **Az/El Deviation** window on the **Operation Screen** calibrated up to ±5°.
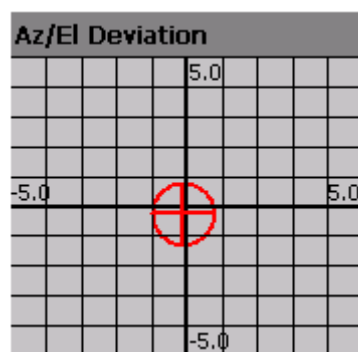
Figure 7-15: Az/El Deviation Window

- Running the **Graphic Data Logger**, which records azimuth deviation as a parameter of the Antenna Step Track subgroup (see **Section 9.2.1 Using the Graphic Data Logger** on page 9).

- Setting the antenna to Peak Mode (see **Section 8.1.5 Peak Mode** on page 8-4) and calculate the difference between the resulting azimuth and the nominal azimuth.

6. Calculate the degree to which the original 'naked-eye' estimation of the compass offset angle must be corrected in order to reach the accurate zero setting:

7. Configure the accurate offset value:

   - From the **Config** menu, select **Compass**.
   - Enter the correct compass offset in the **Offset** field.
   - Click **OK** and then click **[V]** on the keyboard and press **Enter** to save.

7.6 Setup Blockage Zone

This section describes how to configure blockage zones. These zones are areas in which elements (such as the ship's funnel) may interfere with antenna to satellite communication. The zones may also be areas frequented by personnel, in which case it is recommended to configure the LNB to be disabled when the signal transverses these areas.

You can define up to four blockage zones defined by the azimuth and elevation angles (per zone). *In addition, power transmission can be turned ON or OFF globally for all defined zones.*

When the antenna is within one of the zones, the following things happen:

- Tracking continues as long as the AGC value is greater than the Threshold value (default value = -75dbm). The AGC threshold value can be modified (section 8.9).
- When the AGC value drops below Threshold, the antenna will wait a few seconds before reverting to *Search Mode* in System Mode. The search pattern can re-target will continue until the satellite is re-acquired and tracking can resume.
- "System messages: antenna view blocked". Antenna will switch from *Step-Track* mode to *Point-to-Sat* mode.

NOTE: If this is a dual system, the antennas may be switched (depending on the system configuration)
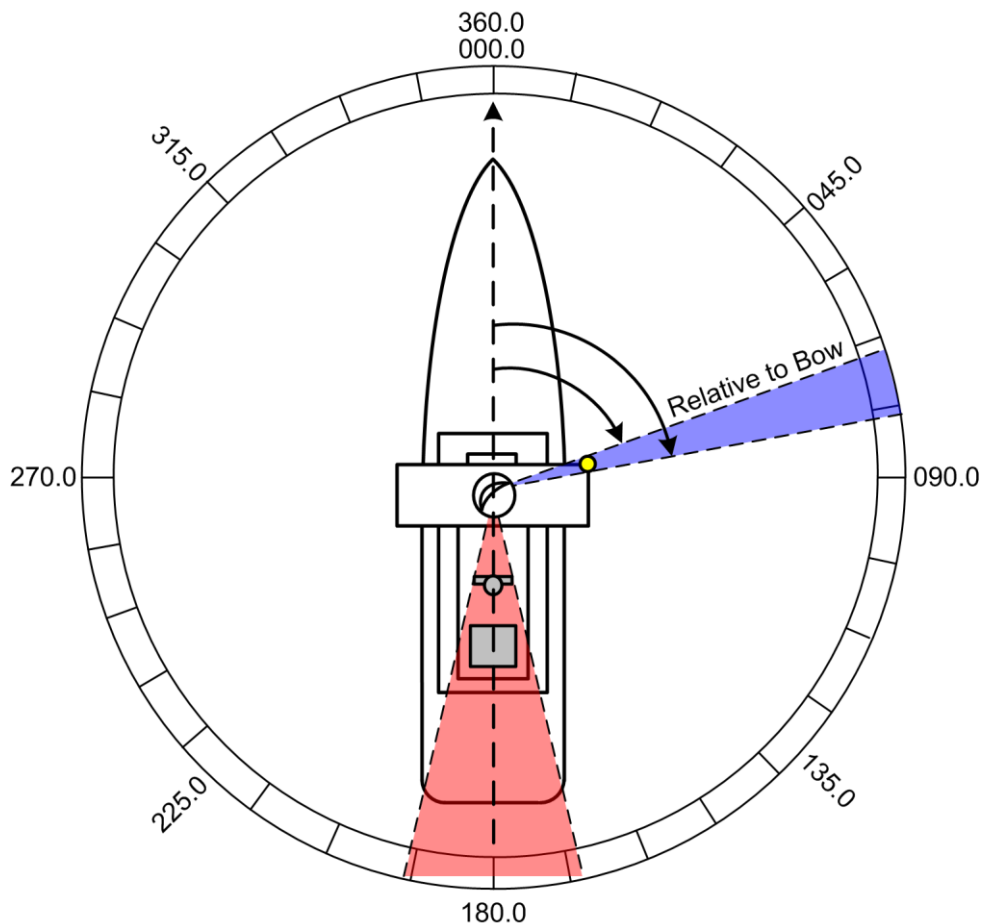
Figure 7-16: Top View of Blockage Zones Azimuth
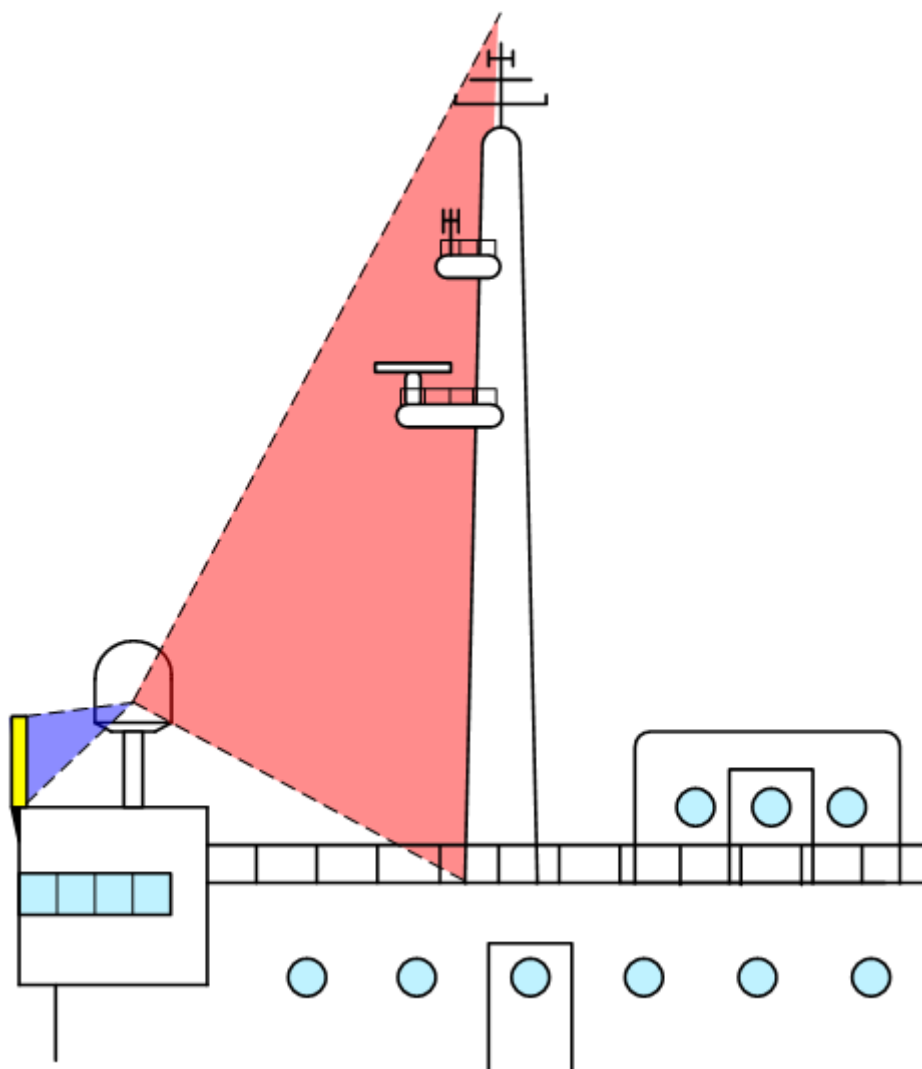
Figure 7-17: Side View of Blockage Zones (Elevation)

➢ **To configure the Blockage Zones**

1. From the **Config** menu, select **Antenna Blockage**. The following dialog appears.

Figure 7-18: Blockage Zones Configuration

2. For each blockage zone:

    •   Configure the horizontal blockage range: enter start (**From**) and end (**To**) **Azimuth** angles relative to the ship's bow-to-stern axis.

    •   Configure the vertical blockage range: enter start (**From**) and end (**To**) **Elevation** angles relative to the ship's deck level.

3. To disable power when the antenna points to (any) one of the defined blockage zones, check **LNB Mute**.

4. Click **OK (Enter)**.

7.7 Acquire Satellite and Verify AGC

This section describes how to acquire the last selected satellite (or defined) satellite.

➢ **To acquire the satellite and Verify AGC**

1. Click the **Acquire** side button. This activates Acquire mode.

   Activating **Mode → Acquire** 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.

2. In the main window, verify the AGC reading.
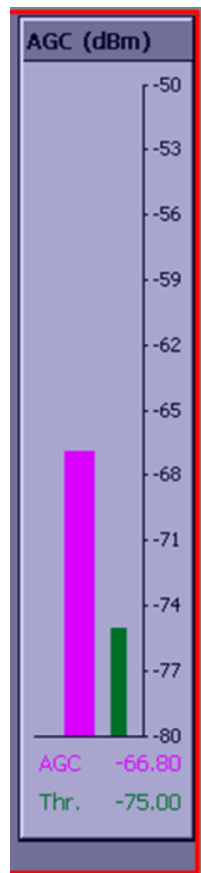
Figure 7-19: Example of AGC Reading

7.8 OpenAMIP Connection – Optional for Idirect Modems

NOTE: This is relevant only for Idirect Modems

This procedure (relevant only for Idirect modems, is used to verify that modem is locked on the correct satellite.

To receive monitoring information from a satellite modem via an Ethernet connection, the OpenAMIP must be configured on the system. OpenAMIP is a generic protocol which defines basic commands between modems and ACUs. This protocol allows the modem to set the necessary parameters in the ACU to switch between channels and satellites. It also allows the ACU to read the IRD lock signal status from the modem.

OpenAMIP can be used with a single system configuration when the modem supports the OpenAMIP protocol via the LAN interface.

➢ **To configure OpenAMIP:**

1. Disable the IRD lock hardware interface (see Section **8.6.4.1**).

   NOTE: This configuration can only be performed from the `CCU` MtsVLinkCE software. However, you can use Remote CCU software to perform the configuration.

2. Open the **Config** menu and select **External Hardware IP**. The **External Hardware Address** dialog box appears.

3. The **IP Addresses of Hosts** field displays the IP address of the CCU. Add the IP address of the modem, separated by a semi-colon.

   In the following example, 192.9.200.22 is the IP address of the CCU, and 192.9.200.17 is the IP address through which the `ACU` communicates with the modem.
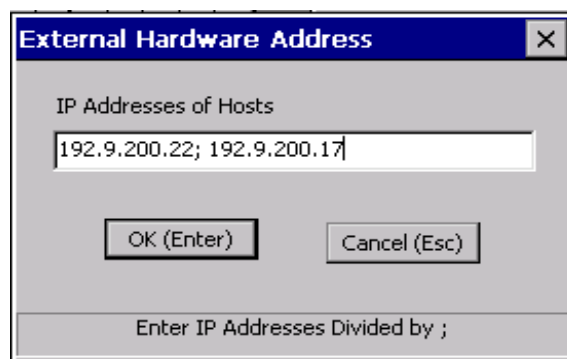
Figure 7-20: External Hardware Address Dialog Box

4. Click **OK (Enter)**. The **External Hardware Address** dialog box closes.

7.9 CPI and 1dBcP Compression Point Test

Perform Cross Polarization Isolation (CPI) test and 1dBcP compression point test with the NOC and verify proper operation. If necessary, modify the system parameters according to your satellite operator's input, according to the procedure described in this section.

➢ **To perform the CPI and 1dBcP tests**

1. Contact the satellite operator and set the modem for CW carrier transmit on test frequency.

2. If needed the satellite operator will require adjusting the TX power level. Control the modem to do that. If necessary, change the BUC attenuation to adjust the gain of the system.

3. The satellite operator should verify that the Cross polarization isolation (CPI) is above the limit(typically >30db)

4. If the isolation is not sufficient:

- From the **mode** menu, select **Manual Mode**. The Manual Mode dialog appears.
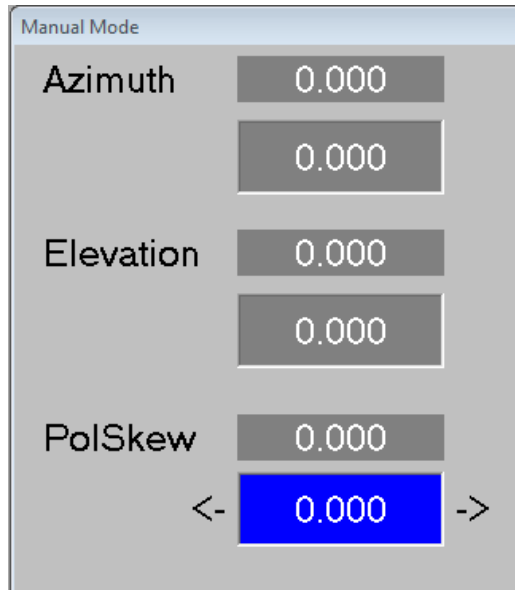
Figure 7-21: Manual Mode Operation Dialog Box

Change the **Pol-Skew** value one-step at a time (eg. 0.5 deg) until the satellite operator confirms sufficient CPI level.

- Note down the Poll Skew change.

5. Configure the pol-skew offset:

- From the **Config** menu, select **Axes parameters.**

- Under **Alignment offsets,** add or delete the value the antenna skewed and verify signal level with operator.

    For example: if the measured value was +1°, °, and current Cross-polSkew was "0" (zero), then define the **Cross-PolSkew KU** as -1°
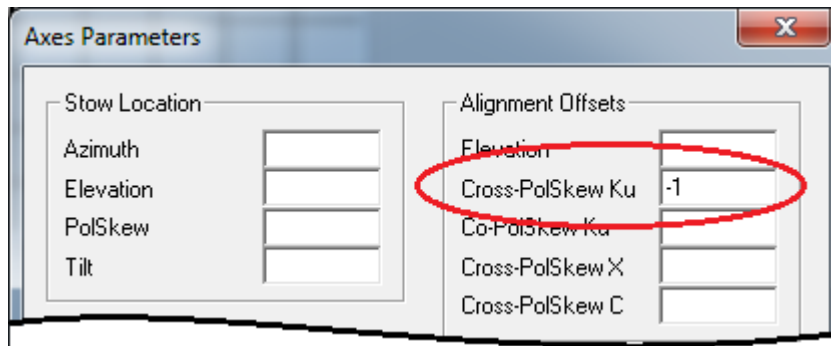
Figure 7-22: Defining Cross-poll Skew

- Click **OK**.

6. Set the **Mode** menu to **Acquire** and verify CPI with satellite operator.

7. If CPI is OK, save the configuration (press **V** on the keyboard); otherwise, repeat the process.

8. For 1dBc, test:
    - Verify with NOC operator that the antenna Tx is within the valid range.
    - You may be required to reduce BUC attenuation to increase Tx power.
    - Depending on your modem vendor, you may be required to perform additional operations, according to the instructions given by the satellite operator.

➢ **To validate the CPI**

1. Set the **Mode** menu to **Acquire** and verify CPI with satellite operator.

2. If CPI is OK, save the configuration (press **V** on the keyboard); otherwise, repeat the process.

3. For 1dBc, test:
    - Verify with the NOC operator that the antenna Tx is within the valid range.
    - You may be required to change the Modem TX power level in order to increase CW carrier.
    - Depending on your modem vendor, you may be required to perform additional operations, according to instructions given by the satellite operator.

7.10   Configure Modem and Verify Rx Lock

Configure your modem *according to the manufacturer's instructions* and verify RX lock on the modem.

NOTE: For modem type COMTECH CDN 570L and some GILAT SKYEDGE models, you may view additional readings via MNC (Management and Control link). *This requires a customized cable.*

7.10.1 Satellite Validation

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

- An adjacent satellite producing signals in the same frequency spectrum as the OceanTRx™4-500 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™4-500 system can be configured to perform periodic checks to verify that the antenna is locked on the right satellite, if 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)

7.10.2 Fine Adjustment (1dBc)

➢ **To set the modem power to drive the BUC to 1dB compression:**

1. Activate 'Tx on' in the modem.

NOTE: Use the coarse typical calculated values as a starting power level (to avoid `BUC` saturation).

---

2. Raise the modem power 1dB at a time while monitoring the signal on the HUB Spectrum Analyzer (1dB of power corresponds to a 1dB increase in signal level).

3. 1dB compression is achieved when a 1dB increase of modem power causes less than a 0.5dB increase in the signal level. Do not increase the power beyond this point, because it will drive the `BUC` into compression.

7.11   Submitting the Commissioning Checklist

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

Document	Description
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: 1. G-Shock indicators reported color upon System's arrival –both for the crate and for system, accompanied with real pictures of the shock indicators and their serial number shown clearly. 2. UPS Connectivity to system – approval of UPS connected to the system with its model and vendor name. 3. ORBIT's authorized technician –name and signature of ORBIT's authorized technician responsible for performing the System's installation and commissioning.
Commissioning Checklist	Commissioning Checklist provided in **Commissioning Checklist** (on page 5) - to allow ORBIT to follow up on field installation and commissioning issues.
	The Checklist includes: 1. Customer information 2. Commissioning requirements 3. Installation location 4. Below Deck Equipment 5. System Inspection 6. CCU settings 7. System Cables 8. System Configuration.

8 System Operation

This chapter describes the standard system operation and control options.

The following information is included in this chapter:

8.1 System Operation Modes

NOTE: When the power-up sequence is completed, the system will point to a track of the last satellite that was selected and saved prior to system shutdown.

In principle, after proper installation, configuration, and alignment, the OceanTRx™4-500 system functions automatically.

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™4-500 HMI allows you to activate a number of operating modes independently, for the purpose of installation, configuration, alignment, and maintenance.

8.1.1   Operating Modes Menu Options

You can manually activate the various operating modes from the **Modes** dropdown list or the buttons on the right side of the screen (see section 6.2.3.2).

The most common operation modes are displayed in the main window. Some of the modes can be configured via the **Config** menu, **Operating Modes** option.

Operating modes toolbar

Operating modes configurable options and additional commands
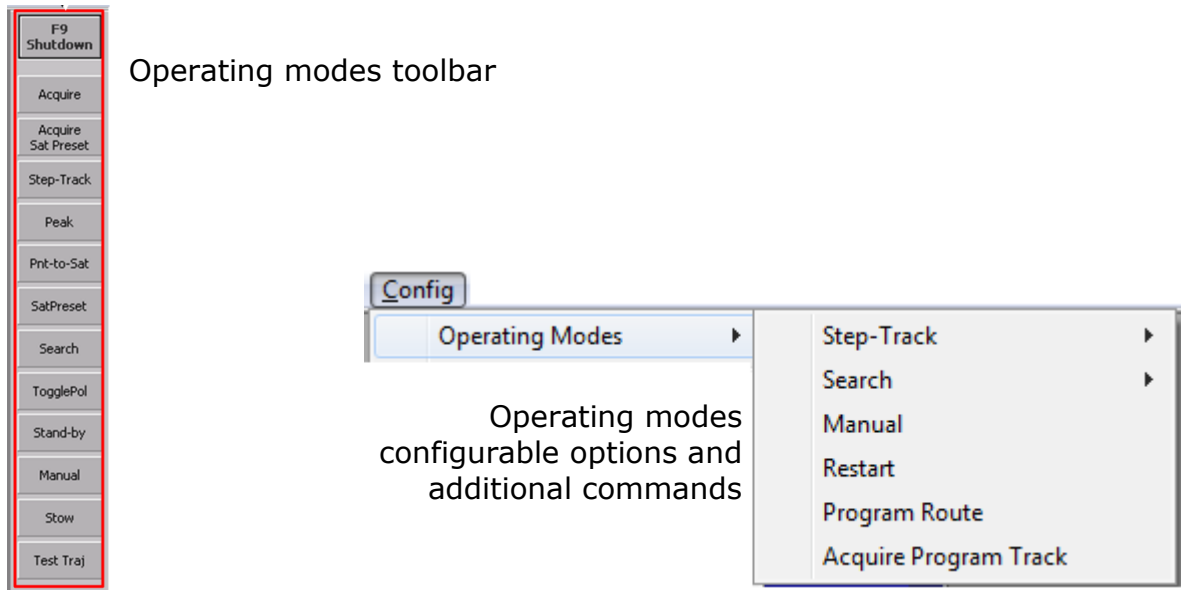
Figure 8-1: Operating Modes Menu Options

8.1.2   Acquire Mode

Activating Acquire Mode points the Antenna to the satellite selected last 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:**

1. From the **Operation Screen**, open **Mode** menu and select **Acquire**. A confirmation message box appears.
2. Click **OK (Enter)**. Antenna points to the selected satellite and initiates step-tracking to achieve peak reception.

8.1.3   Acquire Satellite Preset Mode

Activating Acquire Satellite Preset Mode moves 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:**

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

Figure 8-2: Satellite Preset Mode Dialog Box

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'.

3. Click **OK (Enter)**. A confirmation message box appears.
4. Click **OK (Enter)**. The ANTENNA points to the defined position and step-tracks to achieve peak reception.

8.1.4   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:**

1. Make sure that you are locked onto the satellite using the correct tracking channel.
2. Make sure that the AGC is above the defined threshold. Otherwise, the system will automatically revert to **Search Mode**.
3. From the **Operation Screen**, open the **Mode** menu and select **Step-Track**. A confirmation message box appears.
4. Click **OK (Enter)**. The antenna begins step-tracking.

8.1.5   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:**

1. From the **Operation Screen**, open the **Mode** menu and select **Peak**. A confirmation message box appears.
2. Click **OK (Enter)**. The antenna moves to the last determined peak position.

8.1.6   Point to Satellite Mode

Activating Point-to-Satellite Mode points the Antenna at the last selected satellite 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:**

1. From the **Operation Screen**, open the **Mode** menu and select **Pnt-to-Sat**. A confirmation message box appears.
2. Click **OK (Enter)**. The antenna points to the nominal position of the selected satellite.

8.1.7   Satellite Preset Mode

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

➢ **To activate Satellite Preset mode:**

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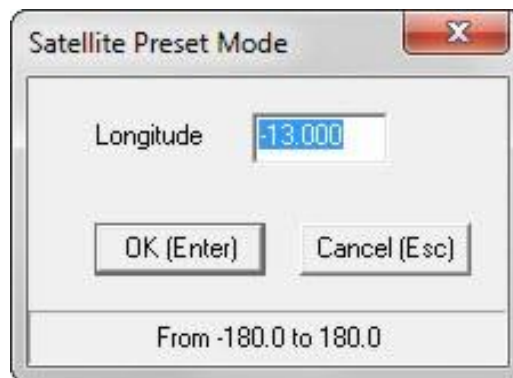

Figure 8-3: Satellite Preset Mode Dialog Box

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'.

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

4. Click **OK (Enter)**. The ANTENNA points to the specified longitude.

8.1.8   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**

1. Make sure correct satellite tracking channel is selected.

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

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

8.1.9   Stand-by Mode

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

➢ **To activate Stand-by Mode:**

1. From the **Operation Screen**, open the **Mode** menu and select **Stand-by**. A confirmation message box appears.
2. Click **OK (Enter)**. All axes are halted in their current position.

8.1.10   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.

8.1.10.1 Configuring Manual Mode

➢ **To configure Manual Mode:**

1. From the **Operation Screen**, open the **Config** menu and select **Manual** from the **Operating Modes** sub-menu. The **Manual Mode** dialog box appears.
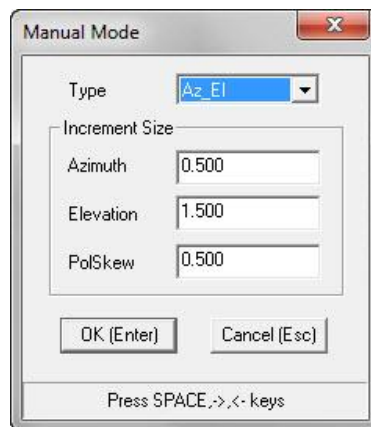
Figure 8-4: Manual Mode Dialog Box

2. Select the appropriate **Type** value:

• **Az_El** (Default) - incremental values are measured relative to the Antenna location at that moment Manual Mode is activated. Azimuth angles reference elevation, rather than Earth-horizon. In practical terms, it 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.

3. 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.

4. Click **OK (Enter)**. The **Manual Mode** window closes.

8.1.10.2 Activating Manual Mode

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

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

2. Click **OK (Enter)**. The **Manual Mode** window appears in the bottom left-hand corner of the **Operation Screen**.
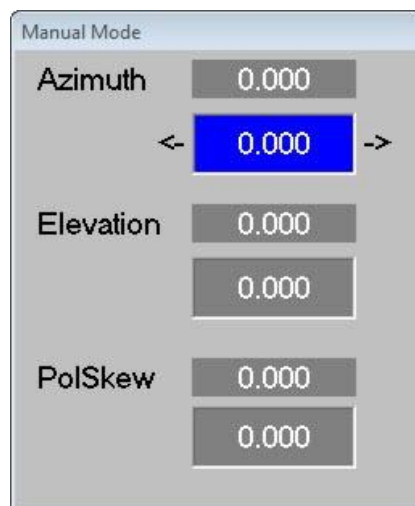
Figure 8-5: Manual Mode Window

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.

8.1.11 Stow Mode

Activating Stow Mode moves the system axes to the predefined stow position. It is possible to change the stow angles of the axis using the "axis parameters" dialog
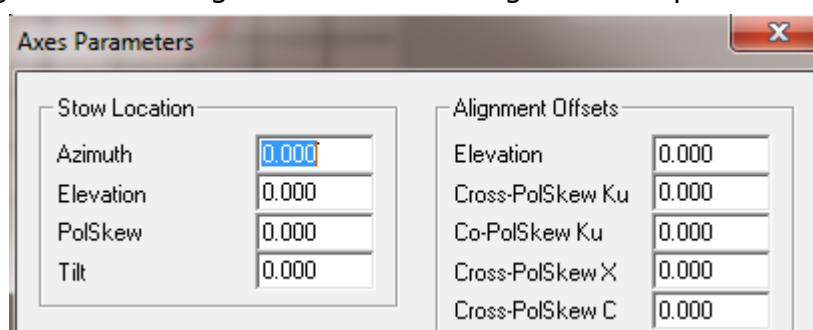
> ➤ **To activate Stow Mode:**

1. From the **Operation Screen**, open the **Mode** menu and select **Stow**. A confirmation message box appears.
2. Click **OK (Enter)**. The system `AXES` move to their predefined stow positions.

8.1.12   Test Trajectory Mode

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

> ➤ **To activate Test Trajectory Mode:**

1. Open the **Mode** menu and select **Test Traj**. A confirmation message box appears.
2. Click **OK (Enter)**. The system moves all four axes to their starting positions and then moves them forwards and backwards on their test trajectories, until it is stopped by the operator.

   While running the test, you can monitor the following axes parameters in the **Graphic Data Logger** (for instructions, see **Section 9.2.1**):

   • Position feedback

   • Position error

   • Velocity feedback

   • Velocity output

   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).
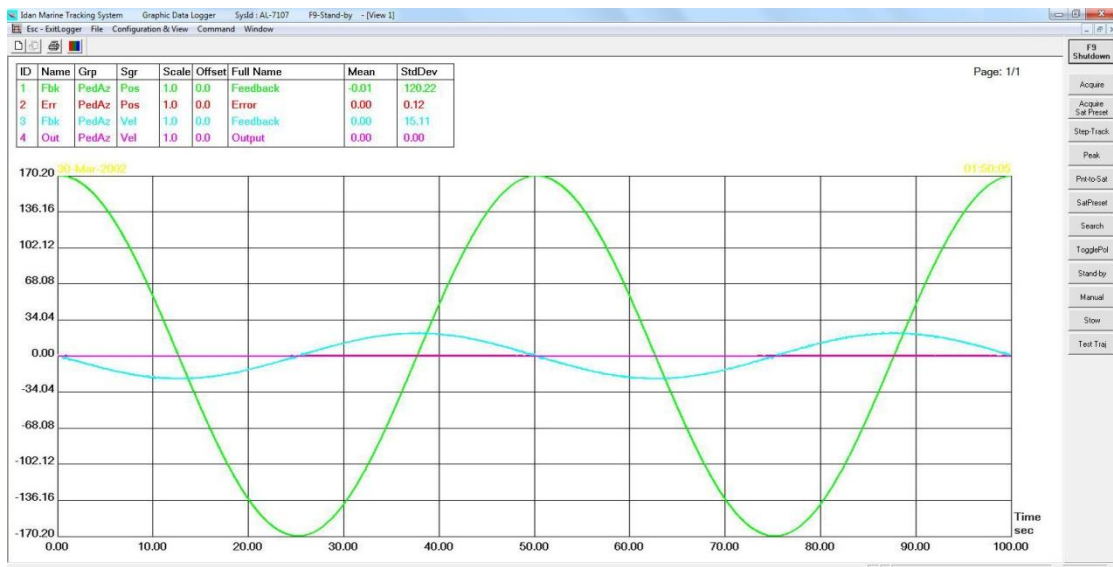
Figure 8-6: Monitoring Axes Test Parameters in the Logger

The actual trajectories for each axis are pre-configured and should not be changed. See the *OceanTRx™4-500 Maintenance and Troubleshooting Guide* for information regarding test trajectories.

8.1.13   Program Route Mode

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

8.1.14   Acquire Program Track Mode

Activating the Acquire Program Track Mode points the antenna to the point defined in the Two Line Elements (TLE) file and initiates step tracking.

8.2 Dual-Antenna System Operation

This section describes the Dual-ANTENNA operating procedures, to be performed by the designated system operator via the CCU.

When the dual system configuration is selected, the CCU automatically activates at start up three applications: the DAOLINK software application for monitoring and control of the DSS, and two MtsVLink applications for monitoring and control of each ANTENNA.
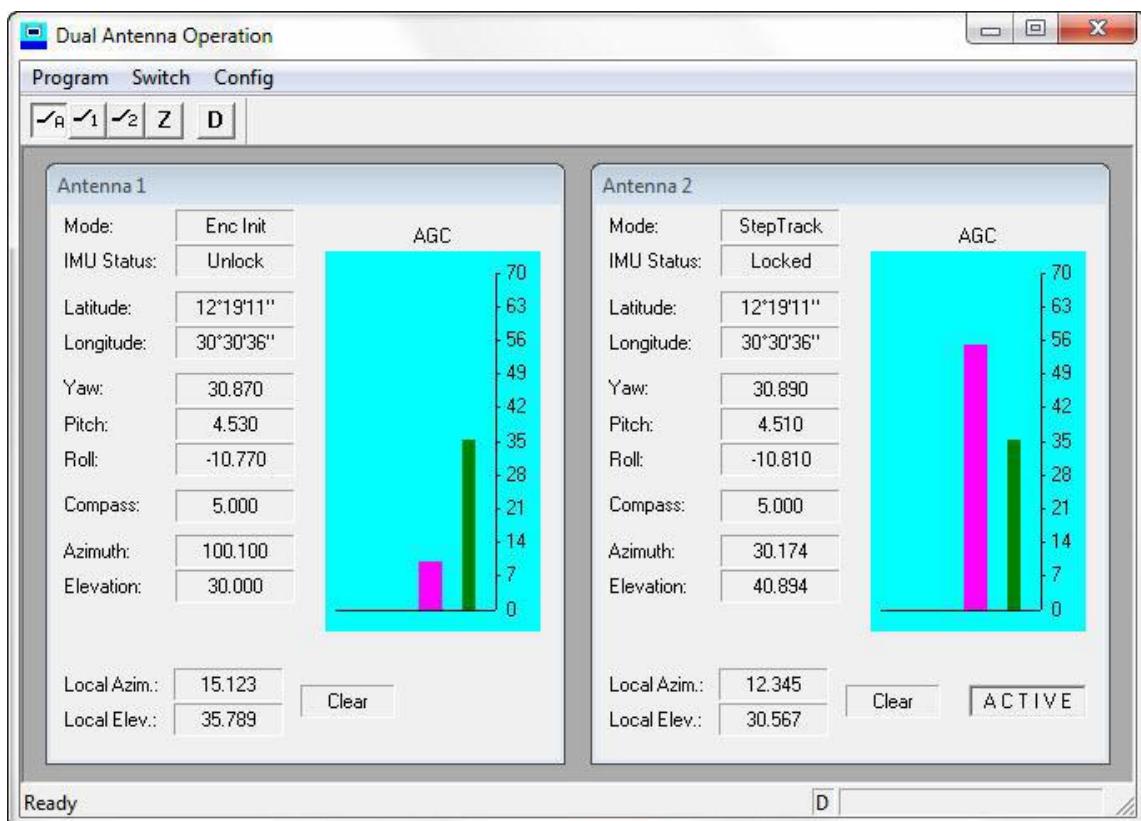
Figure 8-7: DaoLink Dual-Antenna Operation screen

The DAOLINK Dual Antenna Operation screen displays two Antenna windows containing monitoring and control fields for each terminal.
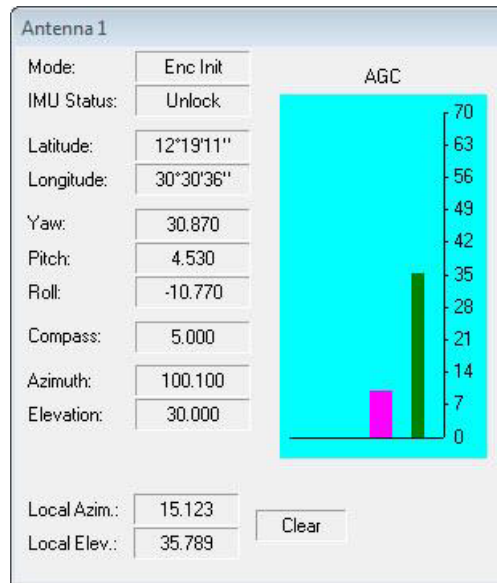
Figure 8-8: DaoLink Dual-Antenna Operation screen

The window can display the following parameters:

- Mode – Current system operating mode (for example: Acquire, Enc Init)
- IMU Status – Current IMU status (Lock/Unlock)
- Latitude – Ship's current latitude (from GPS)
- Longitude – Ship's current longitude (from GPS)
- Yaw – Ship's current yaw angle (from the IMU)
- Pitch – Ship's current pitch angle (from the IMU)
- Roll – Ship's current roll angle (from the IMU)
- Compass – Ship's current heading (from the ship's compass)
- Azimuth – ANTENNA's azimuth axis angle
- Elev. – ANTENNA's elevation axis angle
- Local Azim. – The local azimuth angle
- Local Elev. – The local elevation angle
- Clear/Blocked – Local azimuth/elevation blockage indicator
- Switching Indicator – Displays 'ACTIVE' when the ANTENNA is activated
- AGC – Graphically displays the ANTENNA's AGC signal level and acquisition threshold.

➢ **To set the CCU operation mode to Dual system configuration (working set)**

1. On the Windows 7 Embedded task bar, right click on the ![M](CCU manager).

2. Select working sets. List of available CCU modes will show
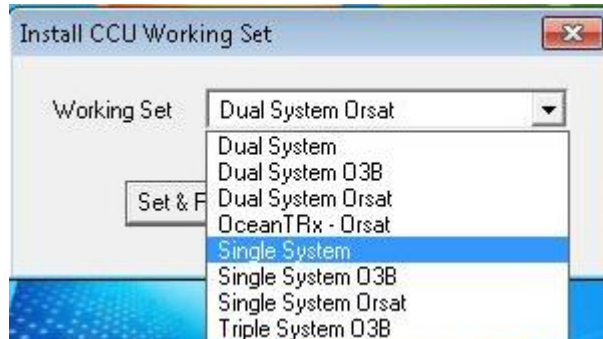
Figure 8-9: CCU Workin set

3. Select the relevant working set according the system type

4. Press Set &reboot. The system will issue confirmation prompt
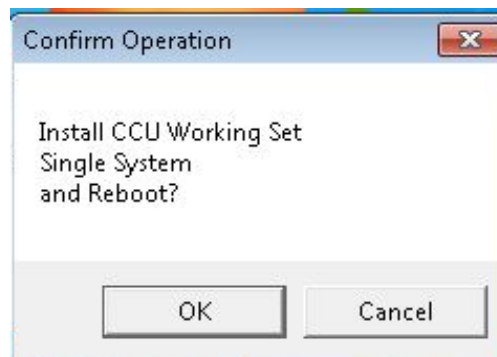
➢ **To set up communication links with the ANTENNA terminals:**
5. Open the Config menu and select Link. The Link Setup dialog box appears.
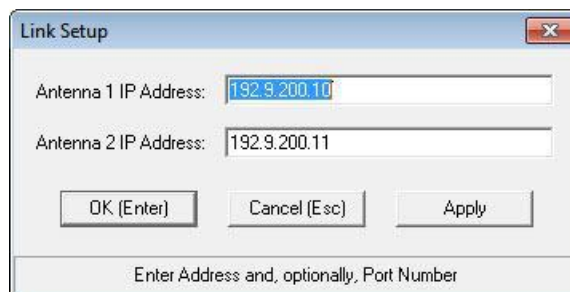
Figure 8-10: Antenna 1 Window

6. Enter the IP address of each ANTENNA's ACU.

7. Click OK (Enter).

➢ **To set up AGC-based antenna switching:**
1. Open the Switch menu and select the desired switching method:

• Auto – Switches automatically according to the difference between the ANTENNAS' AGC signals.

- Antenna 1 – ANTENNA 1 remains active as long as its AGC signal exceeds its acquisition threshold.
- Antenna 2 – ANTENNA 1 remains active as long as its AGC signal exceeds its acquisition threshold.

You can also click the relevant icon on the DAOLINK toolbar:

---
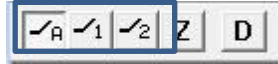
2. Open the Config menu and select AGC Switching. The AGC Switching dialog box appears.
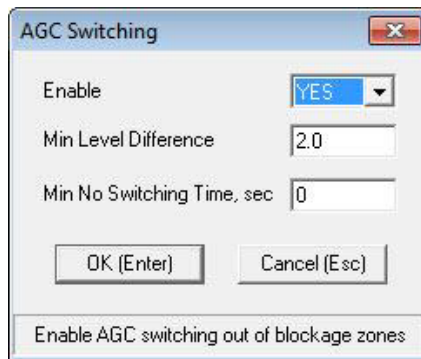
3. To enable AGC-based switching, select 'YES' in the Enable field.

4. If you have selected the Auto switching method, enter in the Min Level Difference field the minimum difference in AGC signal levels (in decibels) at which the system will switch from one ANTENNA to the other.

5. In the Min No Switching Time, sec field, enter the number of seconds the system will wait between switching ANTENNAs.

6. Click OK (Enter).

➢ **To define antenna blockage zones:**

1. Open the Config menu and select Zones (or click the Z icon on the DAOLINK toolbar). The Blocked Zones dialog box appears.
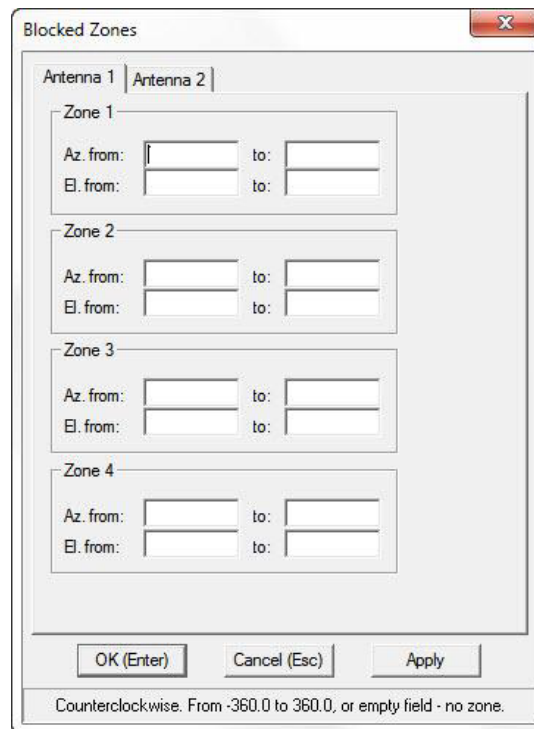
Figure 8-11: Blocked Zones dialog box

2. Define blockage zones for each ANTENNA terminal (see Defining Blockage Zones on page 106 for detailed instructions).

3. Click OK (Enter).

4. The following figure illustrates a simple blockage zone setting for two ANTENNA terminals.
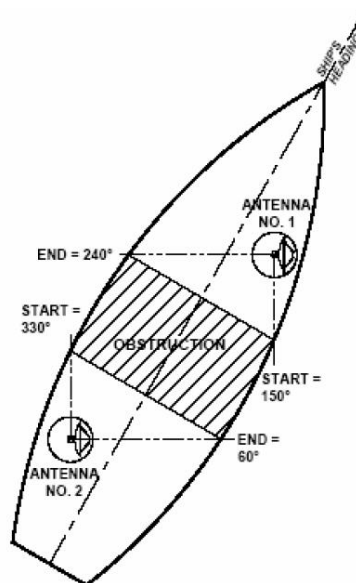
Figure 8-12: Dual blockage zones – example

In the above drawing, ANTENNA 1 is blocked in a 90° range from 150.0° to 240.0° local azimuth. ANTENNA 2 is also blocked in the same range from 330.0° to 60.0° local azimuth.

Note that each blockage zone is defined by a 'start' and 'end' angle moving in a clockwise direction.

The blockage zone settings in the above example would be defined as follows:
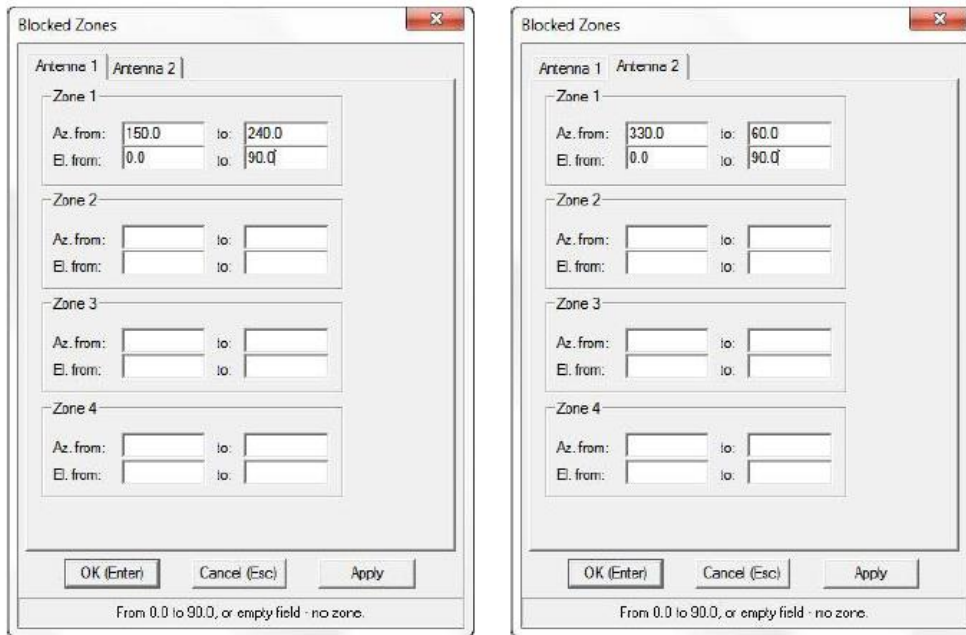
Figure 8-13: Blockage zone settings – example

➢ To hide or display parameters in the Antenna windows:

1. Open the Config menu and select Display (or click the icon on the DAOLINK toolbar). The Display Configuration dialog appears.
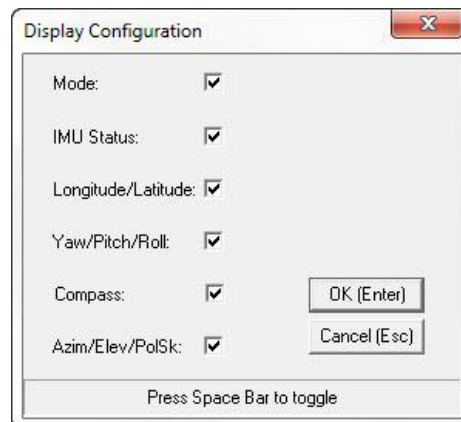
Figure 8-14: Display Configuration Screen

2. Check the parameters that you want to appear in the Antenna windows.

3. Click OK (Enter).

8.3 Satellite Database Management

8.3.1   Configuring the Satellite Database

The system software includes a file containing the list of available satellites and their tracking channels. For each satellite, you can define the following information for one or more channels:

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

The system automatically sets the LNB band tracking frequency and polarization when "Acquire" mode is issued

8.3.1.1   The Satellite Database Dialog

➢ **To view the satellite database**

Select **Satellites** on the Menu Bar. Then select the relevant constellation, the following dialog appears (below is an example of a Geostationary constellation database).

The satellites in the currently loaded file are displayed. If the satellite database is empty, load a database according to instructions in **Section 8.3.3**
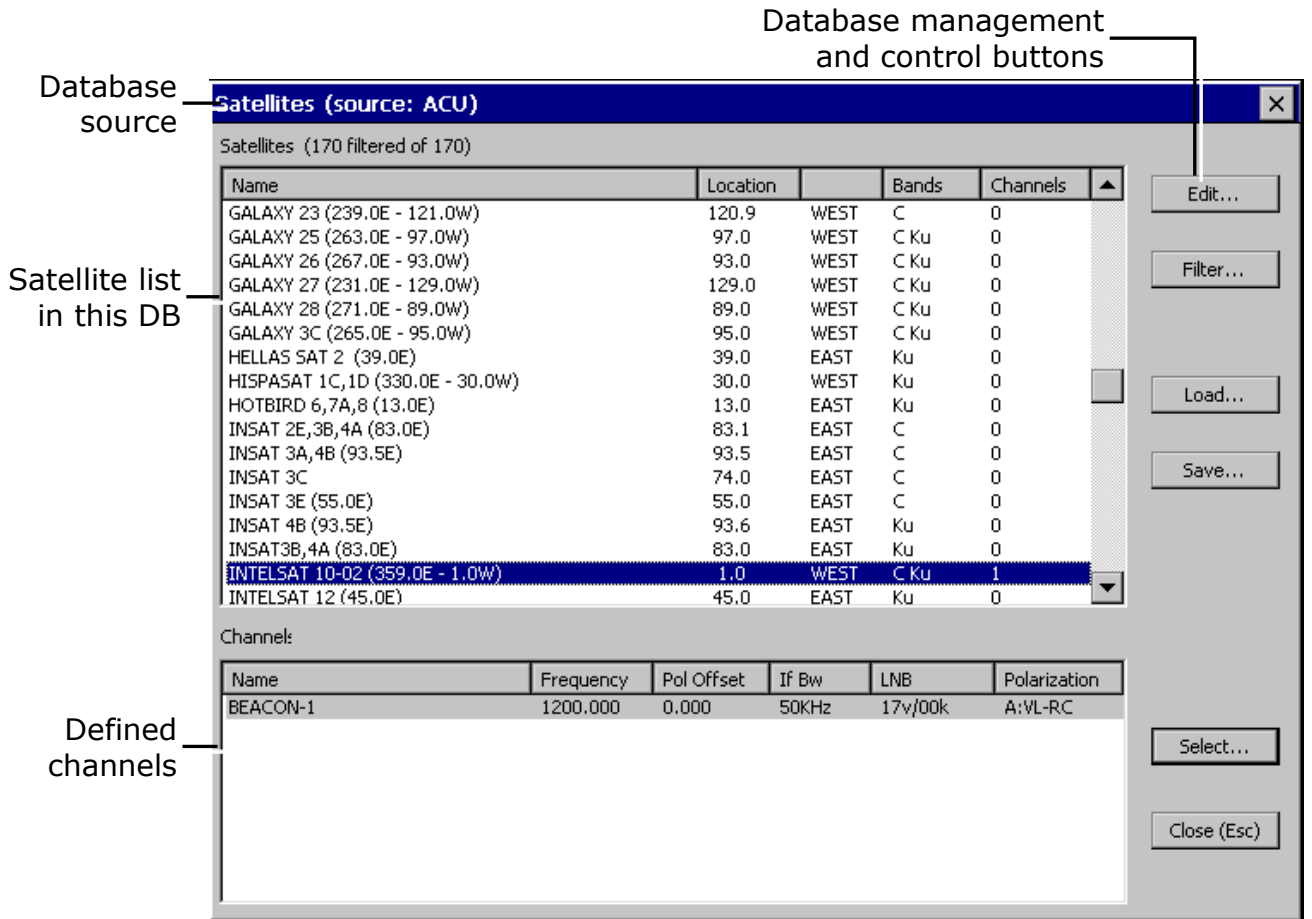
Figure 8-15: Satellites Dialog Box

Button	Description
Edit	Invokes the additional options for: editing selected satellite, adding a new satellite, and managing channels.
Filter	Filters are displayed according to user selected criteria
Load	Loads a new database
Save	Saves changes to current database
Select	Select satellite and channel.

8.3.1.2   Adding a Satellite

➢ **To add a satellite to the database**

1. In the **Satellites** dialog box, click **Edit** and select **Add Satellite**. The following dialog box appears.
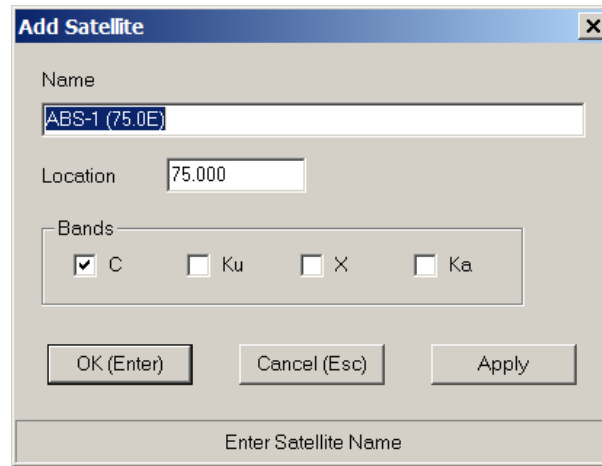
Figure 8-16: Add Satellite Dialog Box

2. Perform the following:
   - Enter satellite **Name**.
   - Enter satellite **Location**.
   - Select satellite **Bands** (according to your physical configuration).
   - Click **Apply** to add and proceed to work or Click **OK (Enter)** to add and exit the dialog box.
   - Confirm action by clicking **YES** or **NO** in the dialog box.

NOTE: To edit a satellite selected from the Satellite DB management dialog, click the **Edit** button (from the Satellites main dialog), click **Edit satellite**, make the required changes and apply. To delete selected satellites, click the **Edit** button, select **Delete satellites,** and verify the action.

8.3.1.3   Defining Channels

➢ **To add a channel to a satellite in the database**

1. In the **Satellites** dialog box, select a satellite from the satellites list.
2. Click **Edit** and select **Add Channel**. The following dialog box appears.
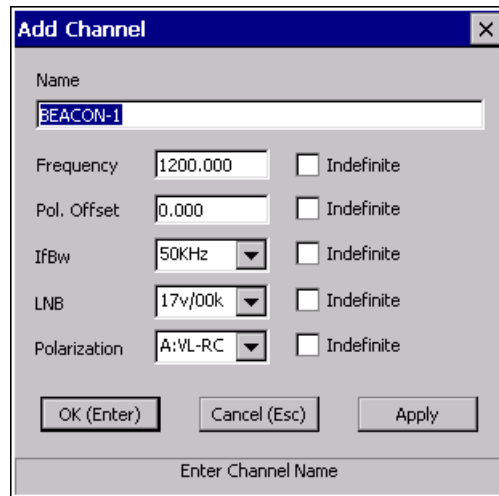
Figure 8-17: Add Channel Dialog Box

3. Perform the following:
   • Enter channel **Name**
   • Enter channel **Frequency in L band**
   • Enter channel polarization offset in **Pol. Offset**
   • Enter channel **I**nter**F**ace **B**and**W**idth in **IfBw**
   • Enter channel LNB voltage in **LNB**
   • Enter channel **Polarization**.
   • Click **Apply** to add and proceed to work or Click **OK (Enter)** to add and exit the dialog box.

NOTE: To edit a channel selected from the Satellite DB management dialog, click the **Edit** button (from the Satellites main dialog), click **Edit Channels**, make the required changes and apply. To delete selected channels, click the **Edit** button, select **Delete Channels,** and verify the action.

8.3.2   Filtering the View of Available Satellite Definitions

The satellites list can be filtered for easy searching of satellites.

➢ **To filter the satellites list:**

1. In the **Satellites** dialog box, click **Filter**. The following dialog box appears.
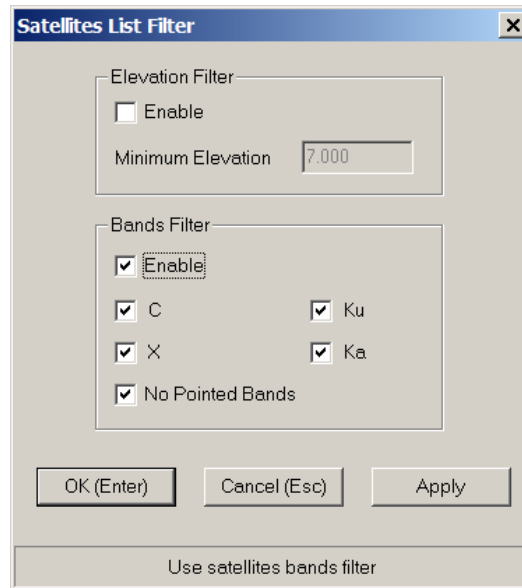
Figure 8-18: Satellites List Filter Dialog Box

- Enter the relevant parameters, which will be used to filter the satellites list.
- Click **Apply** to modify and proceed to work or Click **OK (Enter)** to modify and exit the dialog box.

8.3.3   Managing the Satellite Database

8.3.3.1   Loading the Satellite Database from the ACE

➢ **To load satellite database from the ACU:**

1. From the **Satellites** dialog box, click **Load** and select **Load from ACU**. The following dialog box appears:
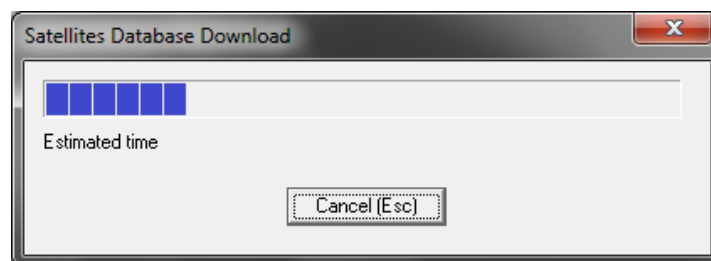
Figure 8-19: Satellite Database Download Dialog Box

- Do nothing. Wait until the downloading process is completed. The dialog box disappears by itself.

8.3.3.2   Loading the Satellite Database from File

➢ **To load satellite database from a file:**

1. From the **Satellites** dialog box, click **Load** and select **Load from File**. A file browser window appears.
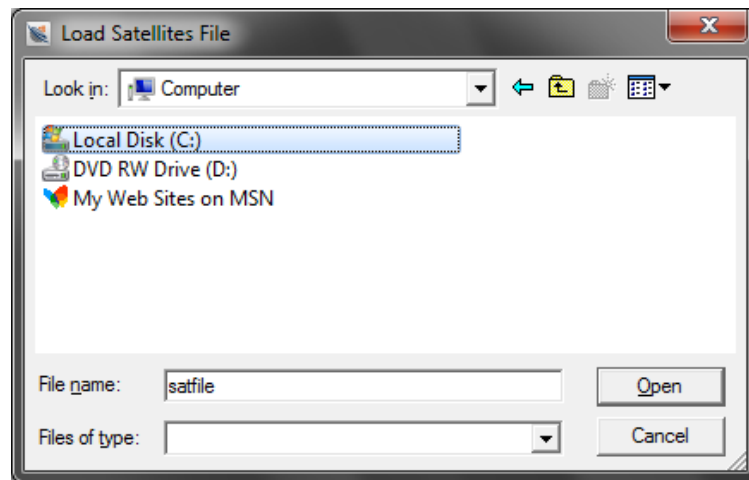
Figure 8-20: Load Satellite Database File

- Go to the directory in which the database file is saved.
- Select the SATFILE.
- Click **Open**. The selected satellite database will load.

8.3.3.3   Configuring Automatic Loading of Satellite Database

➢ **To configure automatic satellite database loading:**

1. From the **Satellites** dialog box, click **Load** and select **Automatic Loading**. The following dialog box appears.
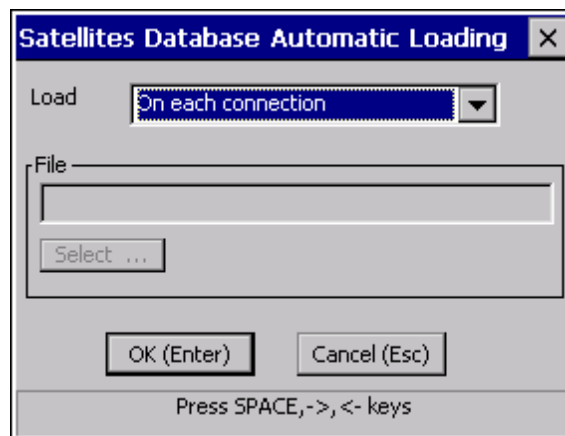
Figure 8-21: Satellites Database Automatic Loading Dialog Box

2. Select an automatic loading action from the following:
   - **Don't load automatically** – No database is loaded automatically.
   - **On first connection** – Automatically loads database from the ACU on the first connection to the CCU.

- **On each connection** – Automatically loads the database from ACU on each connection to the CCU.
- **On first Satellite Window opening** – Automatically loads database from the ACU on the first time the **Satellites** dialog box is opened.
- **On start from file** – Automatically loads the database from a specified file on powering up.

NOTE: To select a file, click **Select** and choose a file to load, and then click **Open.**

---

3. Click **OK (Enter)** to proceed and exit.

8.3.3.4   Saving the Satellite Database

The satellite database can be saved on 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 on the ACU:**

1. From the **Satellites** dialog box, click **Save** and select **Upload to ACU**. A confirmation dialog box appears.
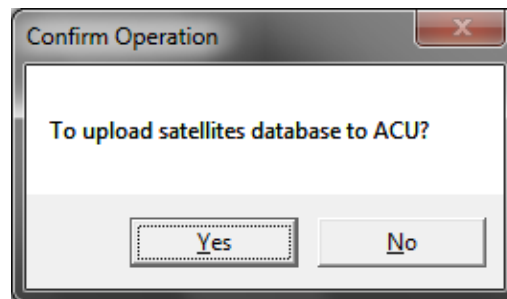
- Click **YES** and wait till The Satellites Database Upload process ends.

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

1. From the **Satellites** dialog box, click **Save** and select **Save in File**. A file browser appears.
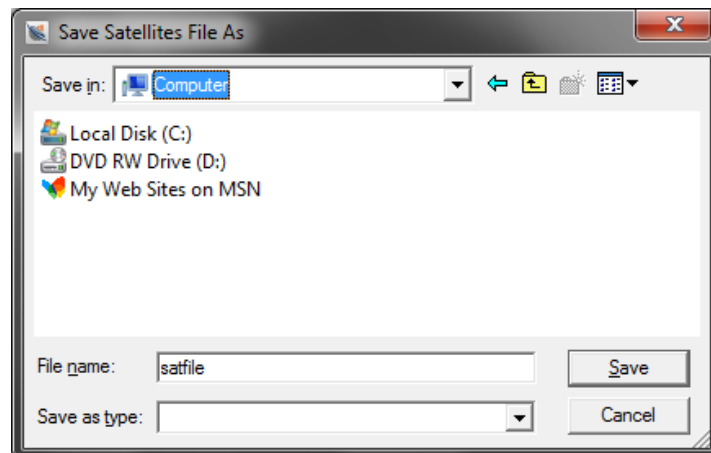
- Go to the directory in which the database file will be saved.
- Enter a name for the database file.
- Click **Save** and continue working.

8.4 Manual Input to the System

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

⚠️ Caution! The OceanTRx™4-500 Maritime Satellite Communication 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.

8.4.1   Setting the AGC Threshold

The OceanTRx™4-500 system is supplied from the factory with noise-floor correction calibrated and activated. AGC values are set to a constant value of -75dBm.

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

See Section **8.9 Configuring AGC Threshold** on page 8-37 for information on setting the AGC threshold.

8.4.2   Setting the Ship's Heading

> ⚠ Caution! This is used only if the compass malfunctions; changes will be overwritten when the compass again functions.

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:**

1. Put the `ANTENNA` into Stand-by Mode (for instructions, see **Section 8.1.9 Stand-by Mode** on page 8-6).

2. From the **Operation Screen**, open the **Commands** menu and select **Set Compass**. The **Ship Heading** dialog box appears.
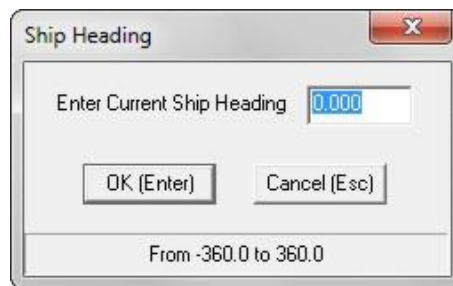
Figure 8-22: Ship Heading Dialog Box

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.

4. Click **OK (Enter)**. The ship's heading is updated in the **Compass** field of the **Ship Coordinates** window.
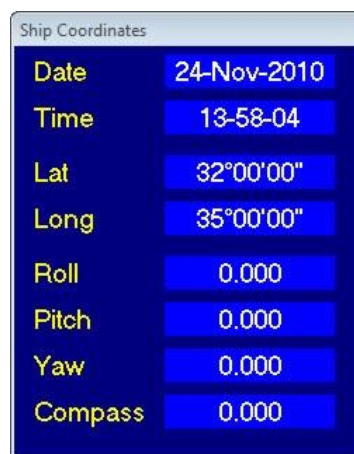
Figure 8-23: Ship Coordinates Window

8.4.3   Setting the GPS Position

⚠️ Caution! This is used only if the GPS antenna malfunctions; changes will be overwritten when the GPS antenna again is functional.

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:**

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

Figure 8-24: Set GPS Dialog Box

2. Enter values in the **Latitude** and **Longitude** fields.
   The latitude and longitude angles are entered in decimal format. When calculating the 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).

3. Click **OK (Enter)**. The new values are updated in the **Lat** and **Long** fields in the **Ship Coordinates** window.
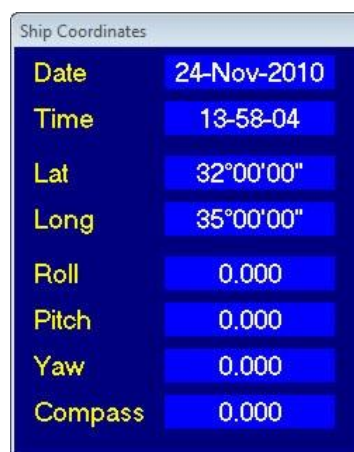
Figure 8-25: Ship Coordinates Window

8.5 Rebooting the ACU

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

➢ **To reboot the system:**

1. From the **Operation Screen**, open the **Commands** menu and select **Reboot**. A confirmation message box appears.
2. Click **OK (Enter)**. The system reboots.

8.6 Configuring Host Hardware Interfaces

This section includes instructions on enabling the hardware and configuring the communication parameters of the following devices:

- Compass
- Satellite modem
- GPS Input/output
- Stow
- IRD
- Strength meter

All the operations are performed via the **Host Hardware Interface** dialog.

NOTE: To allow the CCU to communicate with the external hardware interfaces, the global Enable Hardware parameter in the dialog must be set to **Yes**.

8.6.1   Host Hardware Interface Dialog Box

This dialog box provides all the options to enable interfacing to the external hardware (compass, GPS, Modem, etc.)

➢ **To view the CCU Host Hardware Interface dialog**

From the **Operation Screen**, open the **Host** menu and select **Hardware Interface**. The **Host Hardware Interface** dialog box appears.

Must always be
set to **Yes** for
during normal
operation
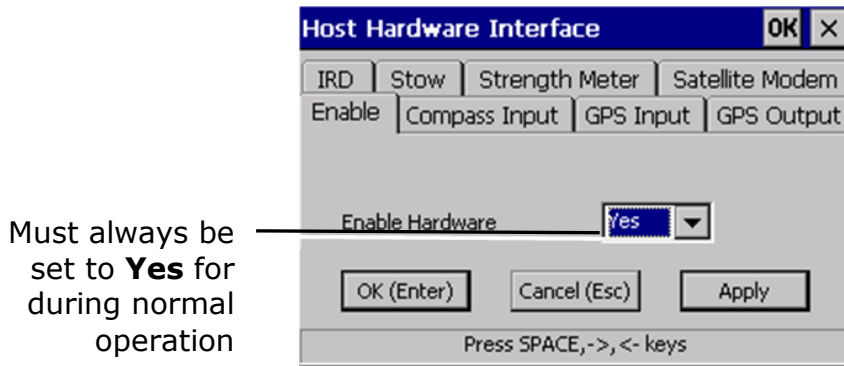
Figure 8-26: Host Hardware Interface Enable Tab

Tab	Description
Enable	Globally enables hardware interfaces. Must always be set to **Yes.**
Compass Input	Compass input - Communication parameters and state
GPS Input	GPS input Communication parameters and coordinates display
GPS Output	GPS output Communication parameters
IRD	IRD source and state (section 8.6.4)
Emission Control	Emission Control Function source and state
Strength Meter	Strength meter types
Satellite Modem	Modem types and communication parameters, modem state.

8.6.2   Compass Configuration

The compass type and communication parameters are configured during the setup procedure:

- Compass type – section 7.3.1
- Compass communication parameters section 7.3.2

No other configuration parameters are required; however, for NMEA-0183 compass type, you may define some advanced parameters. These parameters are described in this section.

8.6.2.1 ADVANCED - Configuring NMEA-0183 Compass Defaults

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

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

1. Open the **Config** menu and select **Compass NMEA**. The **NMEA Setup for Compass** dialog box appears.
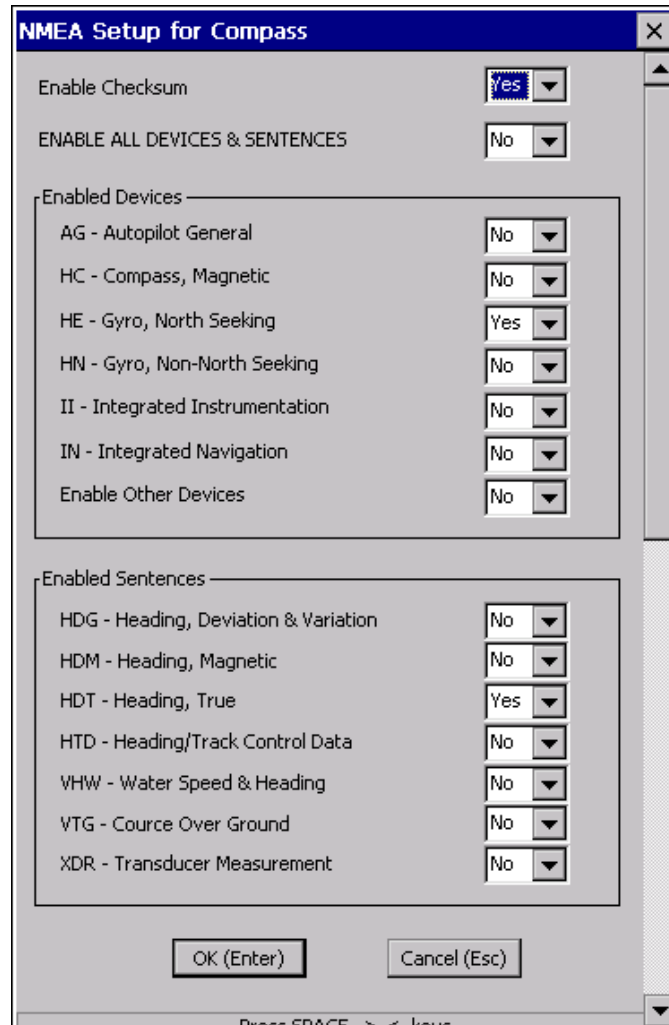
Figure 8-27: NMEA Setup for Compass Dialog Box

2. Make sure the **Enable Checksum** option is set to 'Yes'.

3. The following values are factory preconfigured, and should be changed only if the ship's compass is using a different NMEA telegram:
   - Under **Enabled Devices**, **HE – Gyro, North Seeking**
   - Under **Enabled Sentences**: **HDT – Heading, True**

4. Click **OK (Enter)**. The **NMEA Setup for Compass** dialog box closes.

8.6.3 Viewing Additional Modem Parameters

NOTE: The procedures required for integrating the modem are described in the Setup chapter. This section describes additional information.

The OceanTRx™4-500 System can be configured to receive monitoring information from the supported satellite modems via a serial connection or via an Ethernet connection.

Installation and integration of the modem is the customer's responsibility. Follow the instructions below and consult with ORBIT's Service Department for further assistance.

1. From the **Host** menu, select **Hardware Interface**... The following dialog appears:
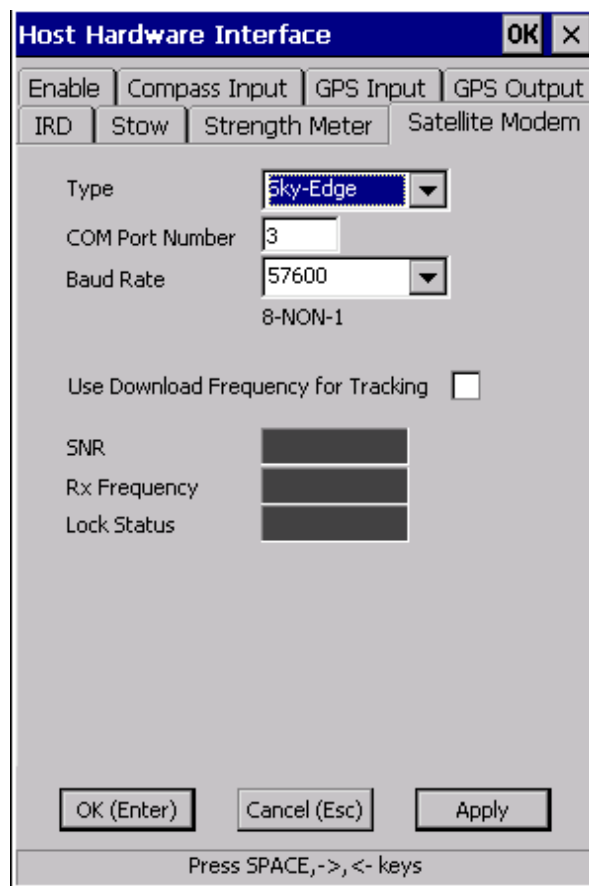
Figure 8-28: Host Hardware Interface Satellite Modem Tab

2. Click on the **Satellite Modem** tab.
- In **Type** field, select the relevant modem type.
- In **Baud Rate** field, select the correct baud rate for the modem.
- For Sky-Edge modems - enable the checkbox **Use Download Frequency for Tracking.**
- Click **OK** and then click **[V]** on the keyboard and press **Enter** to save.

No other Modem Configuration Procedures are required.

8.6.4   Configuring IRD Signal Lock

This section describes how to configure the source type of IRD signal and enable the signal.

8.6.4.1   Configuring the IRD (Integrated Receiver Decoder) Lock Hardware Interface

➢ **To configure the IRD LOCK hardware interface:**

1. From the **Host** menu, select **Hardware Interface**. The following dialog box appears.
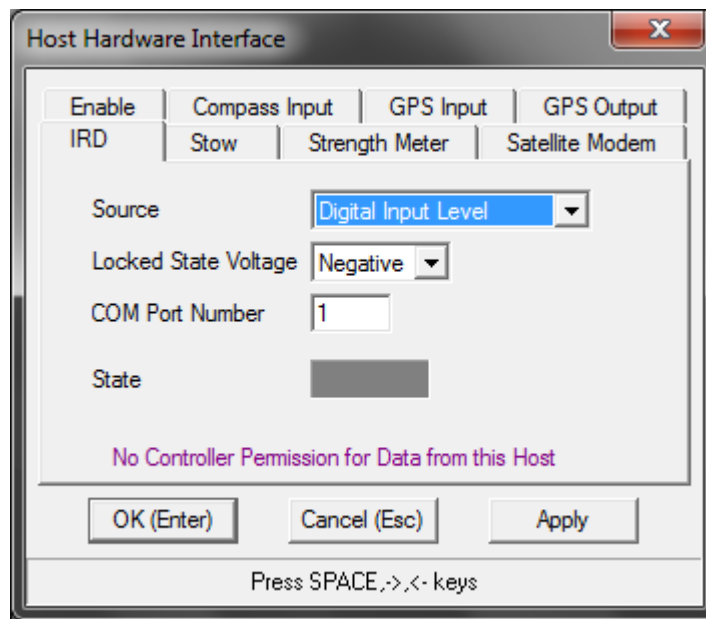
2. Click on the **IRD** tab.
3. In the **Source** field, select the relevant IRD source.
   - **None** – Disabling the IRD from the CCU MODEM connector interface.
   - **Digital Input Level** – Enabling IRD from the IRD Lock Signal on the CCU connector MODEM interface.
   - **Satellite Modem Lock** – Enabling IRD from the modem's M&C on the CCU MODEM connector interface.
4. In case **Digital Input Level** is selected to select the polarity of the IRD lock signal, In the **Locked State Voltage** field, select the relevant parameter (Positive/Negative).
5. Click **OK (Enter)**.

8.6.4.2   Enabling the IRD Lock Signal

➢ **To enable the IRD Lock Signal**

1. From the **Config** menu, select **Satellite Validation**. The following dialog box appears.
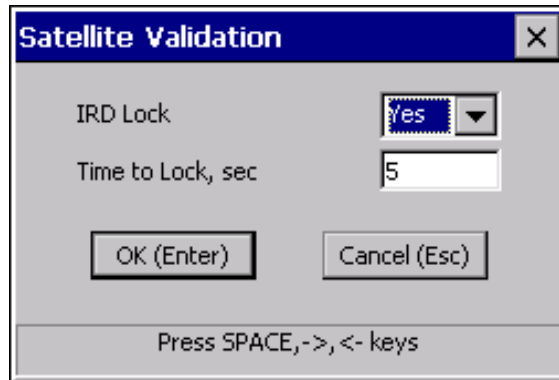
Figure 8-29: Satellite Validation Dialog Box

2. Set the **IRD Lock** field to **Yes**.

3. In the **Time to Lock, sec** field, enter the interval (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 5 seconds when using iDirect modems,

---

4. Click **OK (Enter)**.

8.6.5   Configuring the GPS Output Hardware Interface

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

➢ **To configure the GPS output hardware interface**

1. From the **Operation Screen**, open the **Host** menu and select **Hardware Interface**. The **Host Hardware Interface** dialog box appears.

NOTE: This configuration can be performed only from the `CCU` MtsVLinkCE software. However, you can use the Remote CCU software to perform the configuration.

---

2. Select the **GPS Output** tab.
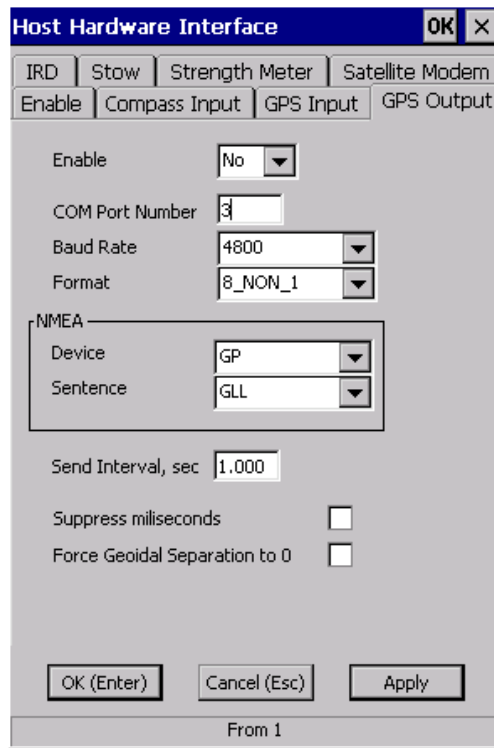
Figure 8-30: Host Hardware Interface GPS Output Tab

3. Open the **GPS Output** tab and set the following parameters:
   - **Enable** = **Yes**.
   - **COM Port Number** = **3**.
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 Genocidal Separation to 0
5. Click **OK (Enter)**. The **Host Hardware Interface** dialog box closes.

8.6.6   Configuring Emission Control

This section describes how to configure the source type of Emission Control signal and enable the signal.

Configure & Enable the Emission Control Hardware Interface

➢ **To configure the Emission Control hardware interface:**

1. From the **Host** menu, select **Hardware Interface**. The following dialog box appears.
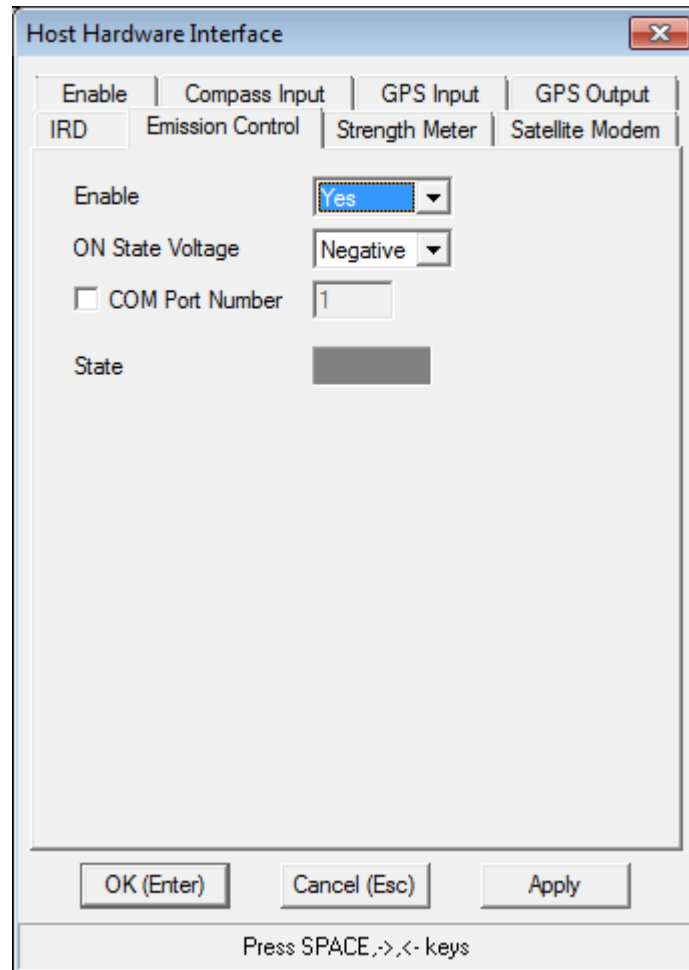
2. Click the **Emission Control** tab.
3. In the **Enable** field, Select Yes
4. In the **ON State Voltage** select the relevant parameter (Positive/Negative – usually Positive).
5. Click **OK (Enter)**.

> **State** indicates that pins are short or open circuit according to the ON state Voltage chosen polarity. When Negative – closed circuit indicates ON. When Positive – Closed Circuit indicates OFF.
>
> **COM Port Number** must be Un-Checked!

8.7 Configuring the Cease Tx Function

The Cease Tx function allows you to define 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 this function is the customer's responsibility. Follow the given instructions and consult with ORBIT's Service Department for further assistance.

The default setting is control AUTO –

8.7.1   Tx Chain Windows

The **Tx Chain** window is displayed on the **Maintenance Screen**, accessed from the **Maint** control on the **Operation Screen** Menu Bar.
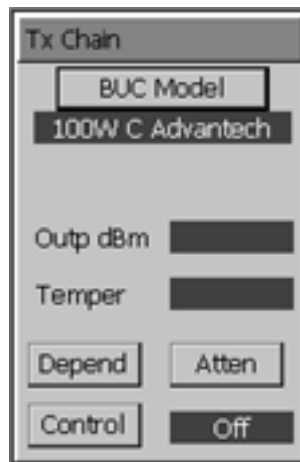
Figure 8-31: Tx Chain Window

The window provides the following options:

Item	Description
Control	BUC power control options
Depend	Sets criteria for disabling Tx
Atten	Sets BUC attenuation

8.7.1.1   BUC Power Control Options

Enter the Maintenance Screen (click the **maint** menu option) and in the Tx Chain dialog area, click **Control.** The following options are available:

- **Auto** (default)**:** disables 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.

- **None:** Leaves the BUC in its current state. Use it to disable the **Auto** control mode.

- **On:** Enables the BUC's power amplifier.

- **Off:** Disables the BUC's power amplifier.

8.7.1.2   Criteria for Disabling Transmit

Click the **maint** menu option and in the Tx Chain dialog area, click **Depend.** The following dialog box appears.
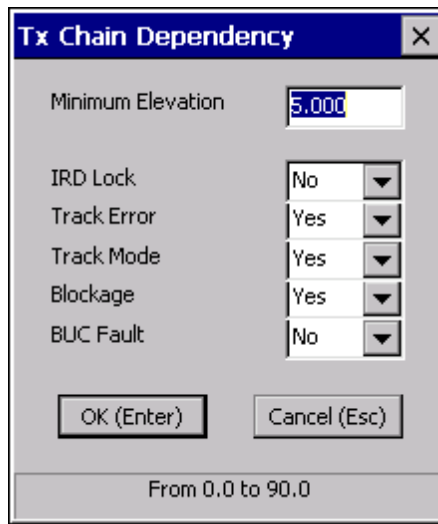
Figure 8-32: Tx Chain Dependency Dialog Box

Item	Description
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.

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

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

8.7.1.3   BUC Attenuation Control Capability

Atten – This button opens the **BUC Attenuator** dialog box, which is used to define the attenuator control capability of the ORBIT-certified `BUC` units.
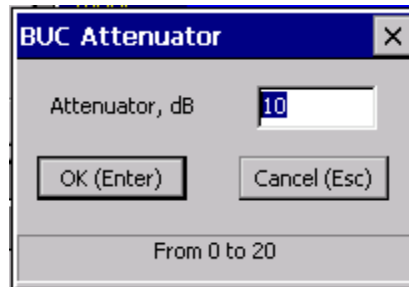
Figure 8-33: BUC Attenuator Dialog Box

8.7.2   Emission Control

Emission Control (EmCon) function allows stopping all Antenna transmission abruptly once the EmCon switch is activated.

The EmCon switch should be a "dry contact" shorting to pins 8 and 7 of the CCU **AUX COM Port** (DB15 Male). Note that pin 7 is connected internally to +12vdc (thru a 10 KOhm pull-up resistor) while pin 7 is connected internally to the CCU ground.

When activated (pin 8 shorted to pin 7), the following warning is displayed on the MtsVLink screen: "**EmCon Activated! Tx disabled**" and a Tx Shut-down command is sent to the BUC on its M&C communication interface. While EmCon is activated the user cannot change Tx Chain Control to ON.

The **EmCon** function is configured at **MtsVLink Host -> Hardware Interface -> Emission Control** sub-screen, as explained in section "**8.6.6 Configuring Emission Control**".

8.8 Configuring the Restart Mode

By default, the system automatically enters Acquire mode after it restarts. You can change the default setting to a different operating mode, for the purpose of installation, integration, or maintenance.

To set the default restart mode:

1. From the **Operation Screen**, open the **Config** menu and select **Operating Modes**.

2. Select **Restart** from the **Operating Modes** sub-menu. The **Restart Mode** dialog box appears.
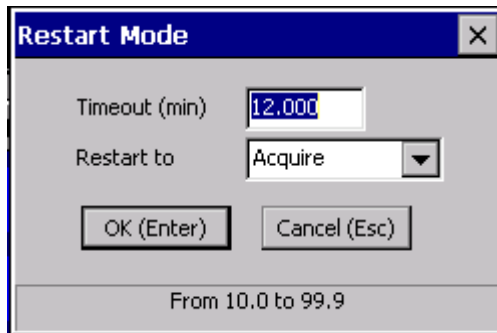
Figure 8-34: Restart Mode Dialog Box

3. Open the **Restart to** drop-down list and select one of the following values:

   - **Stand-by** – Halts the axes in their current position.

   - **Acquire** – Initializes the IMU and axis encoders, activates Acquire Mode (see **Section 8.1.2**).

   - **Slave** – Puts the system on call for commands from an external 'Master' controller.

   - **Enc Init** – Initializes the axis encoders.

   - **Test Traj** – Initializes the axis encoders and moves all axes on their test trajectories (see **Section 8.1.12**).

   - **AcqSatPreset** – Activates Acquire Satellite Preset Mode (see **Section 8.1.3**).

   - **AcqPrTrack –** Activates Acquire Program Track Mode (see **Section 8.1.14).**

4. In the **Timeout (min)** field, enter the number of minutes after which the system automatically reboots if it fails to engage the defined operating mode.

5. Click **Ok (Enter)**. The **Restart Mode** dialog box closes.

NOTE: For normal system operation, the restart mode should be set to **Acquire**.

8.9 Configuring AGC Threshold

When not using Noise Floor correction (in which case the default threshold is -75dBm), the AGC (tracking signal level) threshold can be configured. When the received tracking signal falls below the threshold level, the system automatically moves to **Search Mode**.

NOTE: Can be modified according to strength of the satellite signal (raised if signal is higher, lowered if satellite signal is weaker). Commands – set Threshold should be at least 8dbm between threshold and nominal AGC

➢ **To configure the AGC threshold level**

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

Figure 8-35: Set Threshold Level Dialog Box

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

• The threshold level should be at least 6dB 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 not to be more than the selected tracking signal by 7dB.

• The threshold should be set at a minimum of -75dBm.

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.

3. Click **OK (Enter)**. The new threshold level appears in the **AGC (dBm)** window.
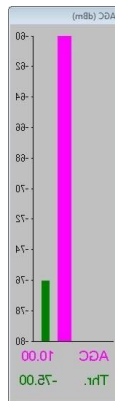
Figure 8-36: AGC (dBm) Window

8.10   Configuring the Tracking Receiver (LNBR)

Narrow Band Receiver (NBR) parameters can be configured manually, without modifying the satellite database. However, it is recommended that you configure the NBR parameters using the satellite database (see Section 0).

When you activate Point to Satellite (Pnt-to-Sat) Mode, the system extracts the name and geo-stationary longitude of the last satellite selected from the database. However, the tracking values are taken from the receiver window.

➢ **To configure the NBR tracking parameters:**

1. From the **Config** menu, select **Receiver**. The following dialog box appears.
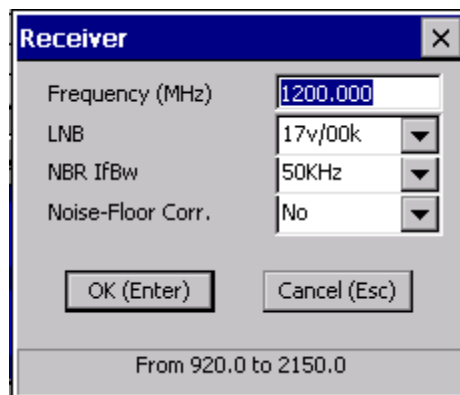
Figure 8-37: Receiver Dialog Box

- Enter channel **Frequency** (In MHz)**.**
- Enter channel **LNB** voltage
- Enter channel **NBR IfBw** - **I**ntermediate **F**requency **B**and**w**idth (In KHz).
- Determine **Noise-Floor Correction**, **Yes** for On and **No** for Off.
- Click **OK (Enter)**.

8.11   System Constellation and Communication Parameters

The Constellation, Band, and Polarization parameters suitable for your specific system are factory preconfigured.

> ⚠ **ATTENTION!!** It is critical that the system configuration is appropriate for the RF Feed installed in the ADE. Do not modify these parameters unless you have modified the physical configuration of the antenna and it is now a different system type.

➢ **To configure the constellation type and satellite specifications:**

1. From the **Operation Screen**, open the **Config** menu and select **System Type**. The **System Type** dialog box appears.
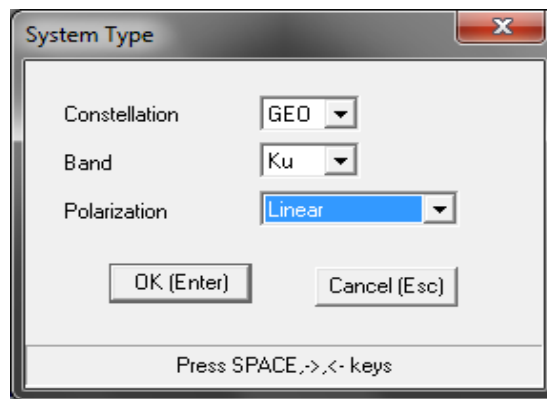
Figure 8-38: System Type Dialog Box

2. Select the constellation (and orbit) type of the system satellite. From the **Constellation** field select the relevant constellation:

   - **GEO** – **G**eosynchronous **E**arth **O**rbit, stationary satellites with the same angular velocity as the Earth. An altitude of ~36000 Km.
   - **O3B** – "**O**ther **3 B**illion", Medium Earth Orbit, Civil Telecommunications and data backhaul Satellites. An Altitude of ~8000 Km.
   - **LEO** – **L**ow **E**arth **O**rbit Satellites. Below an altitude of ~2000 Km.

3. Select the system communication band. From the **Band** field, select the relevant band:

   - **Ku** – Ku feed is installed.
   - **Ka** – Ka feed is installed

4. Select the polarization type from the **Polarization** field. Select the **Linear** option.

   - The following options are available:
   - **Linear** – Linear Polarization typically with Ku band.
   - **Circular** – typically used with Ka feed.

5. Click **OK** and then click **[V]** on the keyboard and press **Enter** to save.

9   Monitoring and Analysis Tools

The following information is included in this chapter:

9.1 Spectrum Analyzer Tool

The spectrum analyzer tool is used for various measurements and analysis operations such as measuring the floor noise.

The power levels can be displayed over a user defined frequency range. The display can be customized for optimal view and can be saved for reference as a file or an image to a user defined location. Several graph windows can be displayed simultaneously – but only one graph actively acquires data at any one time.

NOTE: The Spectrum Analyzer Tool can be accessed either from the **Operation** screen or from the **Maintenance** Screen.

9.1.1   Navigating the Spectrum Analyzer Tool

➢ To Access the Spectrum Analyzer Screen

From the **Operation** screen or from the **Maintenance** Screen, select the **Spectrum** menu option. The spectrum analyzer screen appears. The following figure illustrates a display with acquired data (the initial screen is empty).
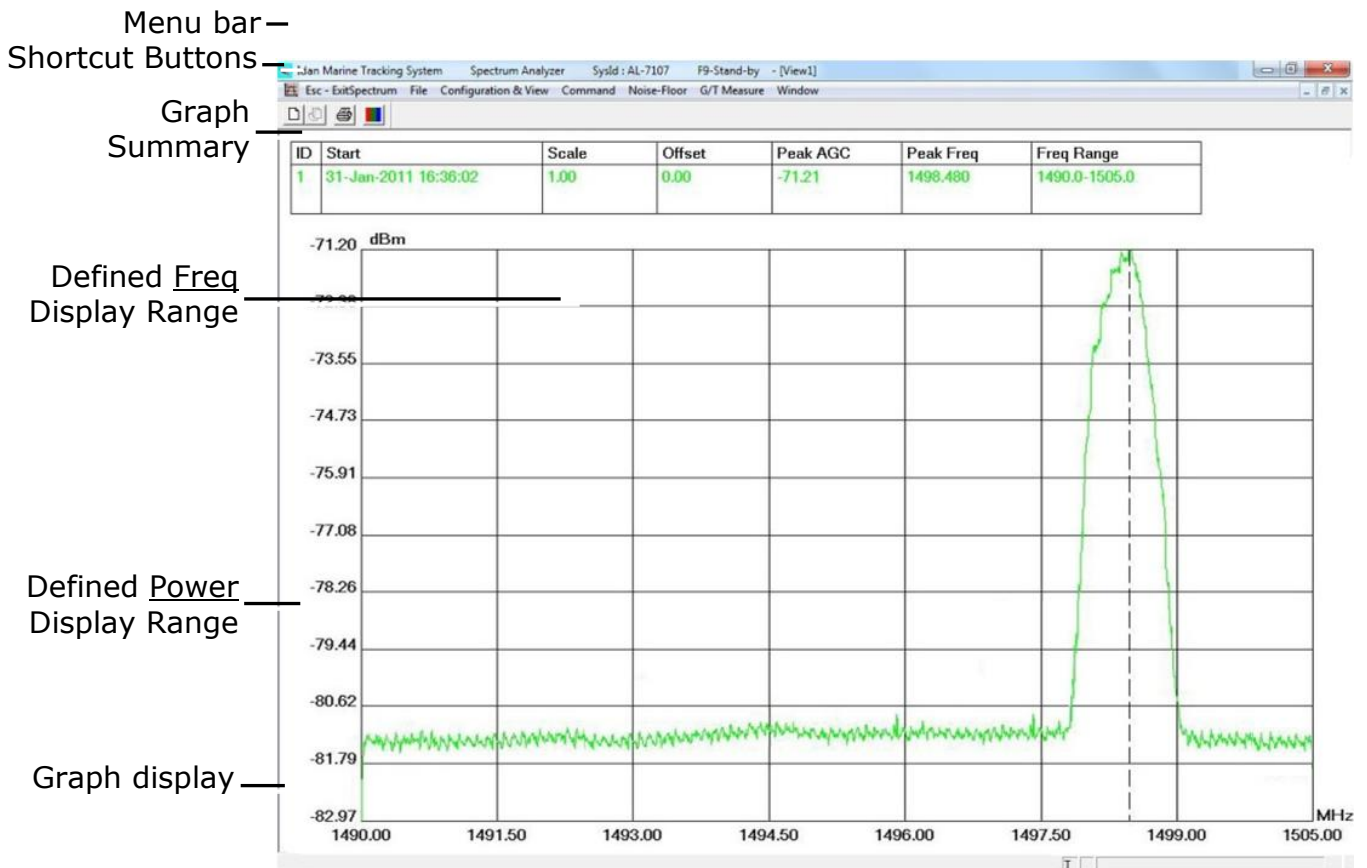
Figure 9-1: Spectrum Analyzer Screen example

Menu Bar

Item	Description
Esc – Exit	Goes back to the previous screen.
File	Opens a saved graph, save, or restore saved Spectrum Analyzer setup (data acquisition and display)
Configuration & View	Customizes the acquisition and view of the data.
Command	Initiates and controls the data acquisition process.
Noise Floor	Noise Floor calibration options.
G/T measure	
Window	Window Display management.

Shortcut Buttons

New   Next   Print   Run   Select
Window   Window   Measure   Colors
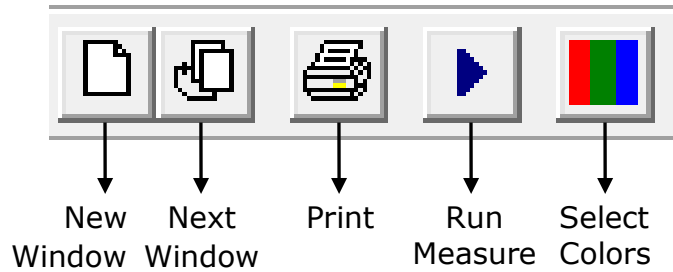
Item	Description
New Window	Opens the additional graph window. Several graph windows can be displayed simultaneously (only one of the windows can actively acquire data at any one time). The windows can be tiled or arranged via the **Window** menu.
Next Window	Used when several windows are displayed. Allows you to toggle between the windows (windows can also be selected manually via the **Window** menu).
Print	Standard print option to printer, file, PDF, etc.
Run	Starts data acquisition on selected graph (if more than one graph is displayed).
Select Colors	Customizes Display, Print, and background colors.

Graph Summary

ID	Start	Scale	Offset	Peak AGC	Peak Freq	Freq Range
1	31-Jan-2011 16:36:02	1.00	0.00	-71.21	1498.480	1490.0-1505.0

Item	Description
ID	Graph ID. If more than one window is defined, each window is assigned a consecutive ID.
Start	Date & Time of the current graph
Scale	Defines AGC Range Scale.
Offset	Shows display offset.
Peak AGC	Displays the peak AGC value in the current graph
Peak Freq	Displays the peak frequency in the current graph
Freq Range	Frequency range over which the graph is *acquired.*

9.1.2   Acquisition Criteria

These criteria are according to which data is acquired. They include (among other parameters), measurement steps and the acquisition rate per step (measurement point).

Duration of a measurement point = 2.5 milliseconds (ms).

Duration of a complete band = (Number of averaging points)*(Number of steps)*(0.0025).

Example:

$$\text{Band Range} = \big(1010(\text{MHz}) - 1000(\text{MHz})\big) = 10(\text{MHz})$$

$$\text{Number of steps} = \frac{\text{Band Range}}{\text{step}} = \frac{10}{0.05} = 2000$$

$$\text{Number of averaging points (user defined)} = 8$$

$$8 * 2000 * 0.0025(\text{sec}) = 40\ (\text{seconds})$$

Maximum number of measured points is 25,000. If the span-to-step ratio exceeds this number, an error message would be sent to the user.

NOTE: The bandwidth filters (which function effectively as the **Spectrum Analyzer Screen** resolution bandwidth) can be set to 50 KHz, 150 KHz, and 300 KHz bands, depending on the carrier's bandwidth.

➢ **To define the acquisition criteria**

1. In the **Spectrum Analyzer** screen, open the **Configuration & View** menu and select **General Config**. The **Configuration** dialog box appears.
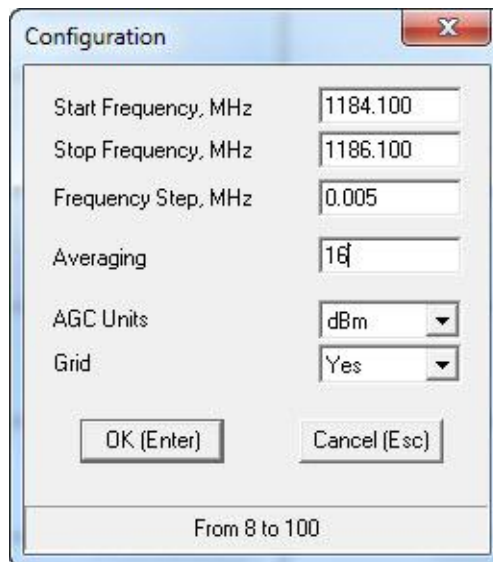
Figure 9-2: Spectrum Analyzer Configuration Dialog Box

2. Set the following parameters:
    *   **Start Frequency** and **Stop Frequency**.
    *   **Frequency Step** – Frequency measurements steps.
        Range: 0.005 MHz to 1.0 MHz (default step).

- **Averaging** – Measurement rate per step. Range: 8 to 100.
- **AGC Unit** – Select the desired AGC Unit. Values: dBm, dBµV.

3. In the **Grid** field, determine to show (Yes) or hide (No) the Grid.
4. Click **OK.**

9.1.3 Configuring the Display

By default, the displayed power range is calculated automatically and the displayed frequency range is set to the start-stop frequency range. If there is a need to focus on a specific area on the graph, the ranges can be defined manually.

The user can define the following display criteria:

- Frequency and power Display range
- Setting the graph color scheme

➢ **To customize the display**

1. In the **Spectrum Analyzer** screen, open the **Configuration & View** menu.
2. To manually define the displayed power range:
   - Select the **Scale** option.
   - Set the **Calculate AGC Range** to [**No**] and manually enter the AGC min and max values you want to be displayed on the AGC axis.
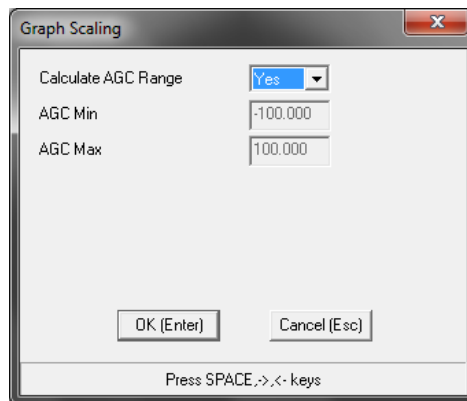
Figure 9-3: Spectrum Analyzer Graph Scaling Dialog Box

3.

To manually define the displayed frequency range:
- Select the **Zoom** option.
- Set frequency min value in **From** field: 0-10000.
- Set frequency max value in **To** field: 0-10000.
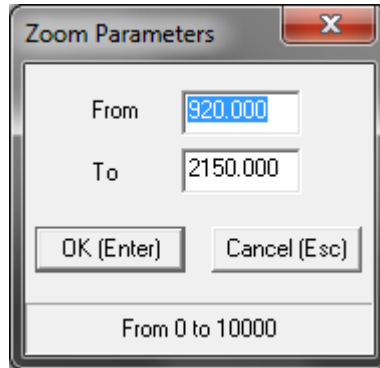
Figure 9-4: Spectrum Analyzer Zoom Parameters Dialog Box

4. To manually Customize graph colors:
- Select the **Colors** option.
- Set Display Colors – Any color.
- Set Print Colors – Any color.
- Set Background Color– Black or white.
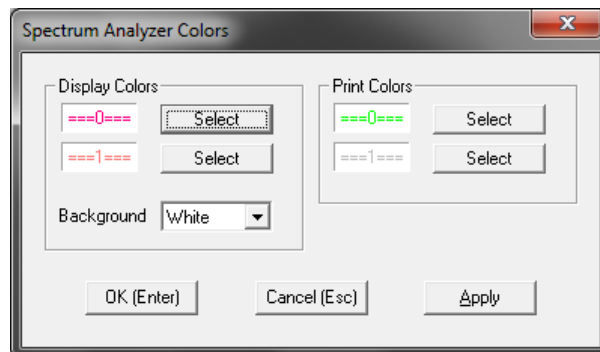
Figure 9-5: Spectrum Analyzer Color Parameters Dialog Box

9.1.4　Running a Measurement

1. Make sure the system is not in **Step-Track Mode**, which deploys the tracking receiver. If the system is in Step-Track Mode, set the system to **Peak Mode**.

2. Open the **Command** menu and select **Run**, or press **[R]** on the keyboard, or press on the button in the shortcut buttons bar.

The following figures show examples of Spectrum Analyzer displays.
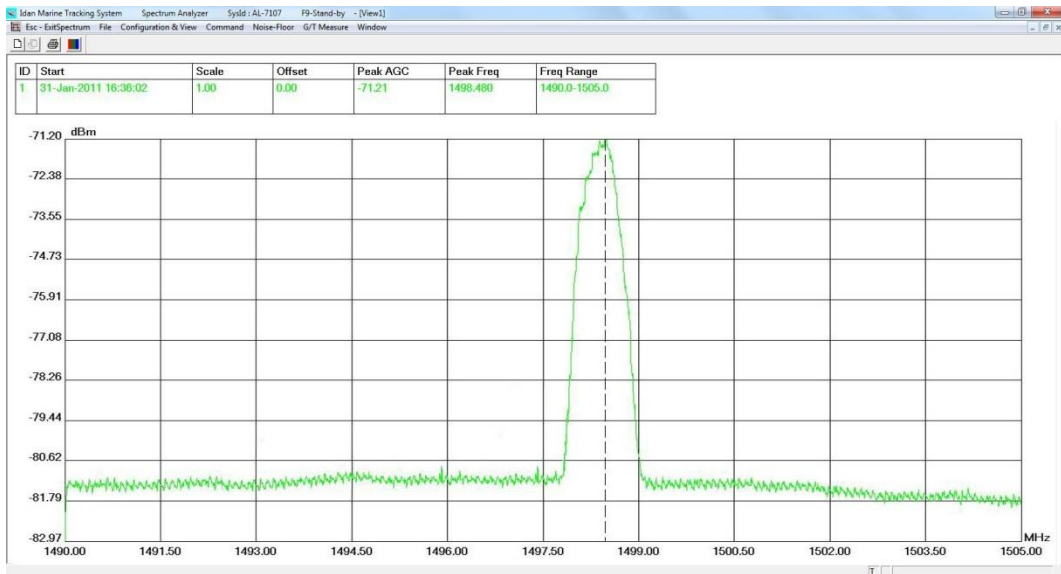
Figure 9-6: MtsVLink Spectrum Analyzer Display with an NBR IfBw of 150 KHz

NOTE: Wide band scans are also possible, although the scan resolution must be taken into account. In the below figure, a 200 MHz scan is taken using an NBR IfBw of 300 KHz at a resolution of 0.1 MHz with 8-point averaging. This scan takes about a minute.
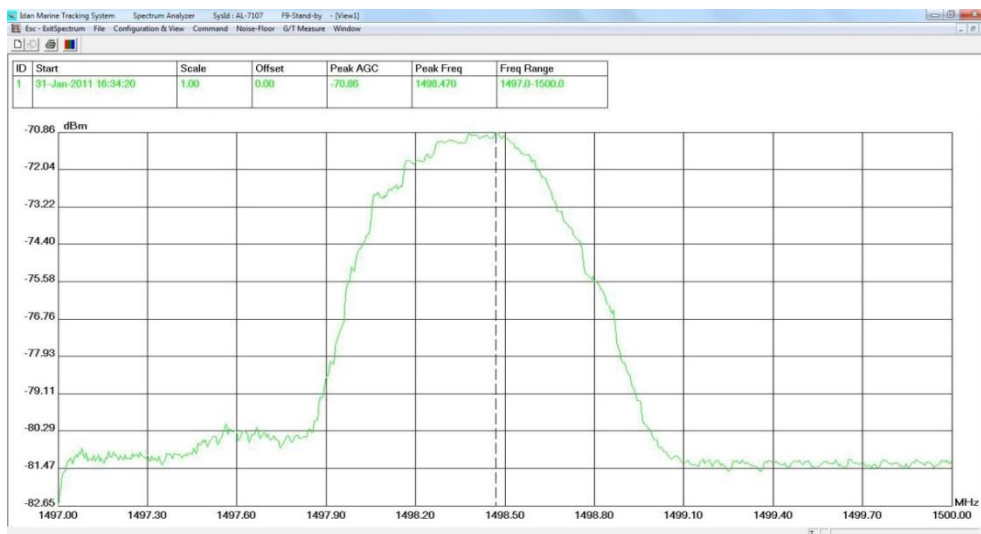
Figure 9-7: MtsVLink Spectrum Analyzer Display with an NBR IfBw of 300 KHz

9.2 Graphics Data Logger

9.2.1 Using the Graphic Data Logger

The **Graphic Data Logger** 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.

9.2.2 Configuring the Graphic Data Logger

To configure the Graphic Data Logger:

1. Click the **Logger** control on the **Operation Screen** Menu Bar. The **Graphic Data Logger** screen appears.
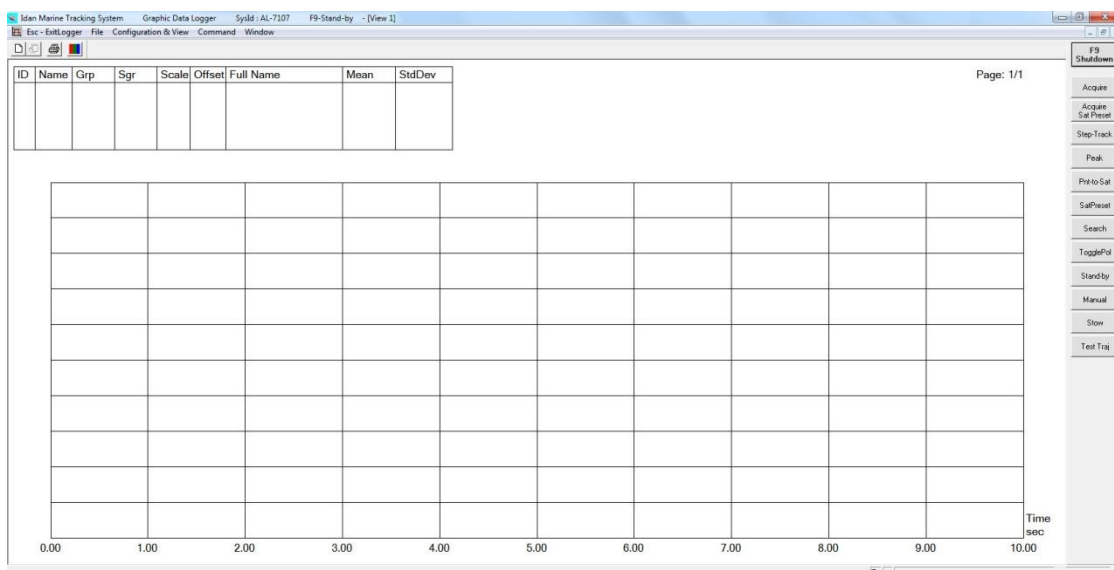
Figure 9-8: Graphic Data Logger Screen

2. Open the **Configuration & View** menu and select **General Config** (or press the <C> key). The **Logger Configuration** dialog box appears.
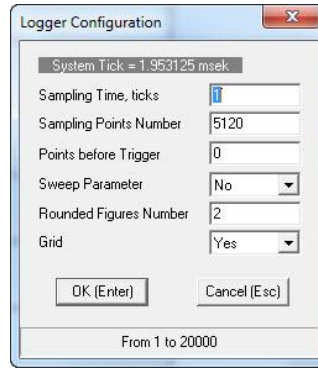
Figure 9-9: Logger Configuration Dialog Box

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.

4. Click **OK (Enter)**. The **Logger Configuration** dialog box closes.

9.2.3 Logging Data with the Graphic Data Logger

➢ **To log data:**

1. Open the **Configuration & View** menu and select **Add Parameter** (or press the `<A>` key). The **Add Parameter** dialog box appears.
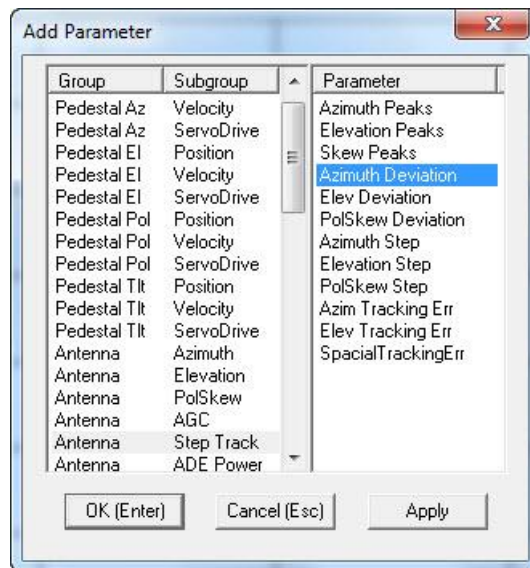
Figure 9-10: Add Parameter Dialog Box

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).

3. Click **OK (Enter)**. The parameter appears in the **Logger** control table.

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 9-11: Logging Multiple Parameters

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).

6. When the defined sampling time is completed, the recorded data appears 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.

9.2.4   Analyzing and Saving 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:

1. Open the **Configuration & View** menu and select **Scale** (or press the `<S>` key). The **Graph Scaling** dialog box appears.
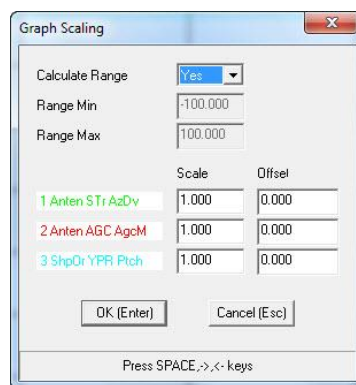
Figure 9-12: Graph Scaling Dialog Box

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 9-13: Logger Results before Scaling
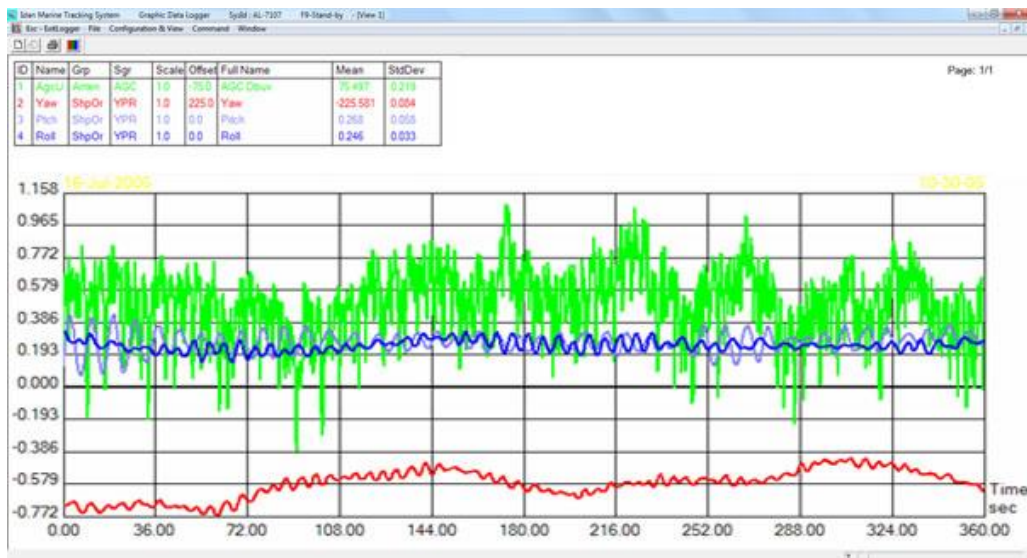
Figure 9-14: Logger Results after Scaling

In the above example, the Yaw curve was offset by 225.0° and the AGC curve by -75.0dB.

➢ **To save the logged data:**

1. Open the **File** menu and select **Write Graph** (or press the `<W>` key from the **Logger** screen).

2. Save one or all parameters to the desired folder.

➢ **To retrieve a data file:**

1. Open the **File** menu and select **Read Graph** (or press the `<G>` key from the **Logger** screen).

2. Do one of the following:

> Select **Replace** to overwrite the currently displayed data.
> Select **Add** to add the saved data to the currently displayed data.

➢ **To save the current Logger settings:**

1. Open the **File** menu and select **Save Setup** (or press the <V> key from the **Logger** screen).

2. Save the current configuration to the desired folder.

➢ **To load saved Logger settings:**

1. Open the **File** menu and select **Restore Setup** (or press the <E> key from the **Logger** screen).

2. Retrieve the settings file. The **Logger** is configured automatically according to the saved settings.

9.3 Calibrating and Activating Noise Floor Correction

9.3.1 Calibrating the Noise Floor

Noise floor calibration eliminates the effect of atmospheric noise on the program's **Spectrum Analyzer** measurements.

➢ **To calibrate the noise floor:**

1. Point the ANTENNA away from any radiation source. This can be done by activating Stow Mode unless the ship is on the equator.

2. From the **Operation Screen**, select **Spectrum** on the Menu Bar. The **Spectrum Analyzer Screen** appears.
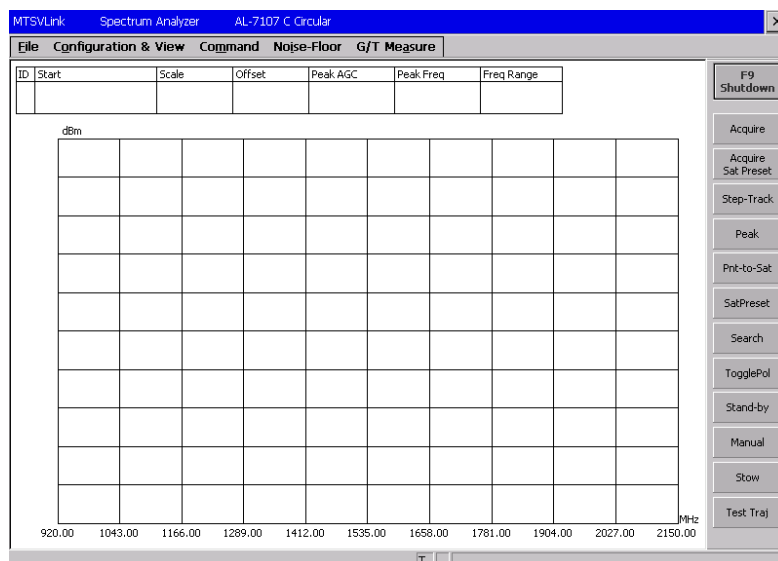
Figure 9-15: Spectrum Analyzer Screen

3. Open the **Noise-Floor** menu and select **Start Calibration**. The **Start Noise-Floor Calibration** dialog box appears.
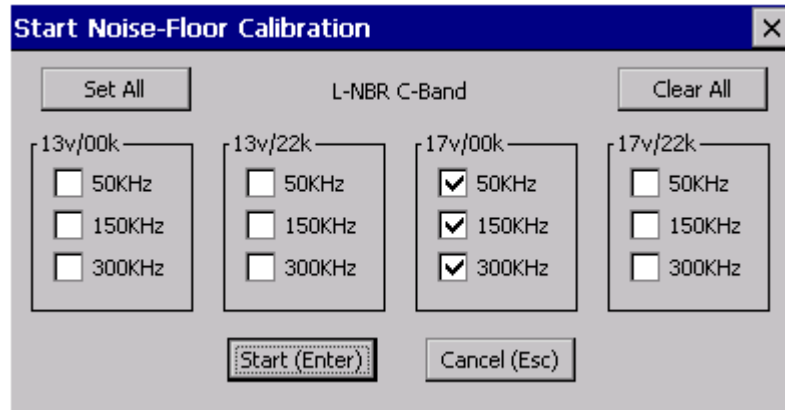
Figure 9-16: Start Noise-Floor Calibration Dialog Box

4. Check the relevant calibration lines in accordance with the LNB bands (single, dual or quad). These 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.

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.

6. After the process is completed, the results are displayed in the **Write Noise-Floor Calibration** dialog box. Refer to examples in section 9.3.2.

7. Click **Write (Enter)**. The **Write Noise Floor Calibration** dialog box closes.
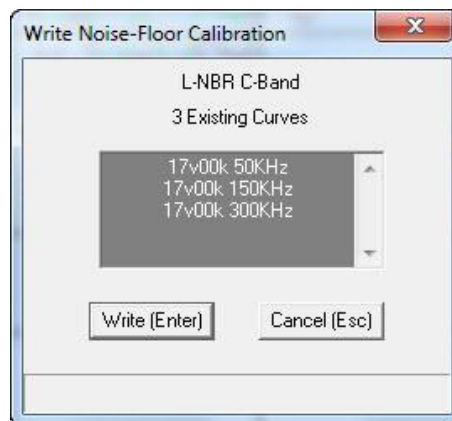
Figure 9-17: Write Noise-Floor Calibration Dialog Box

8. To review the measured data, open the **Noise-Floor** menu and select **Read Calibration**. The **Read Noise-Floor Calibration** dialog box appears.
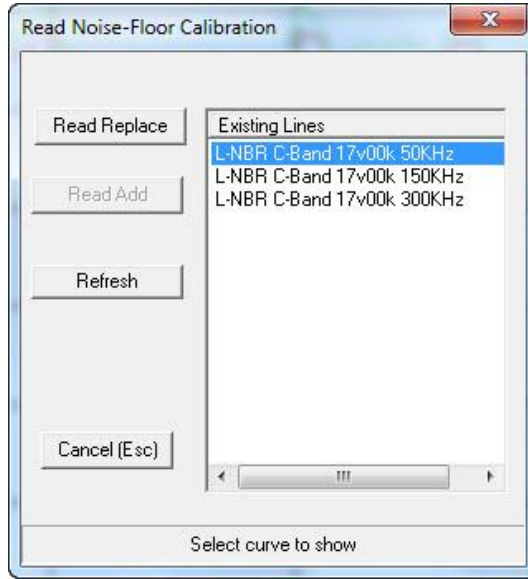
Figure 9-18: Read Noise-Floor Calibration Dialog Box

The curves are 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.

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

9.3.2   Typical Noise Floor Curves

Typical noise-floor curves for the various LNBs are displayed below for reference:
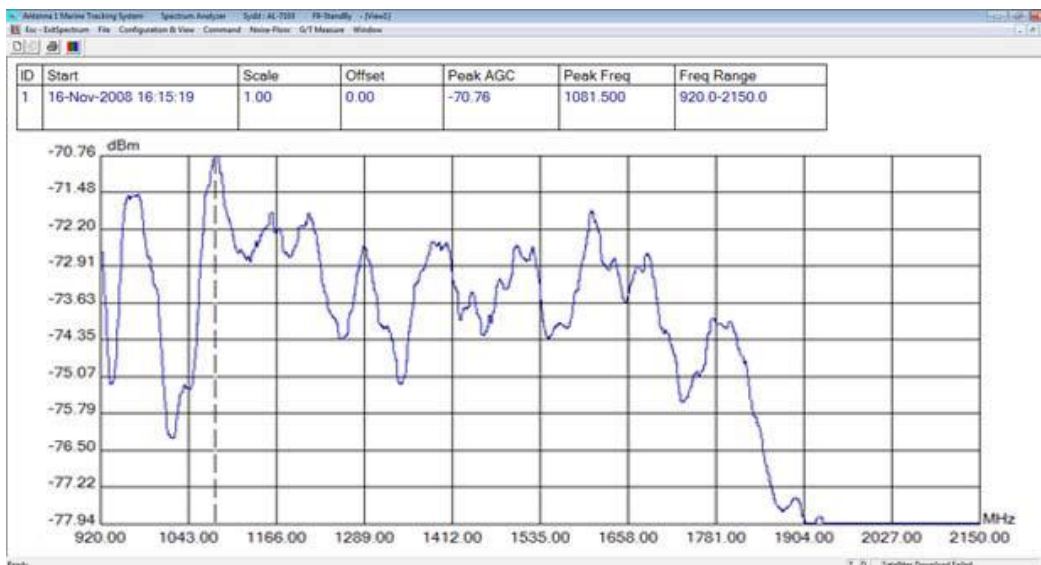
Figure 9-19: Norsat 1x07HC (10 GHz LO), NBR 50 KHz
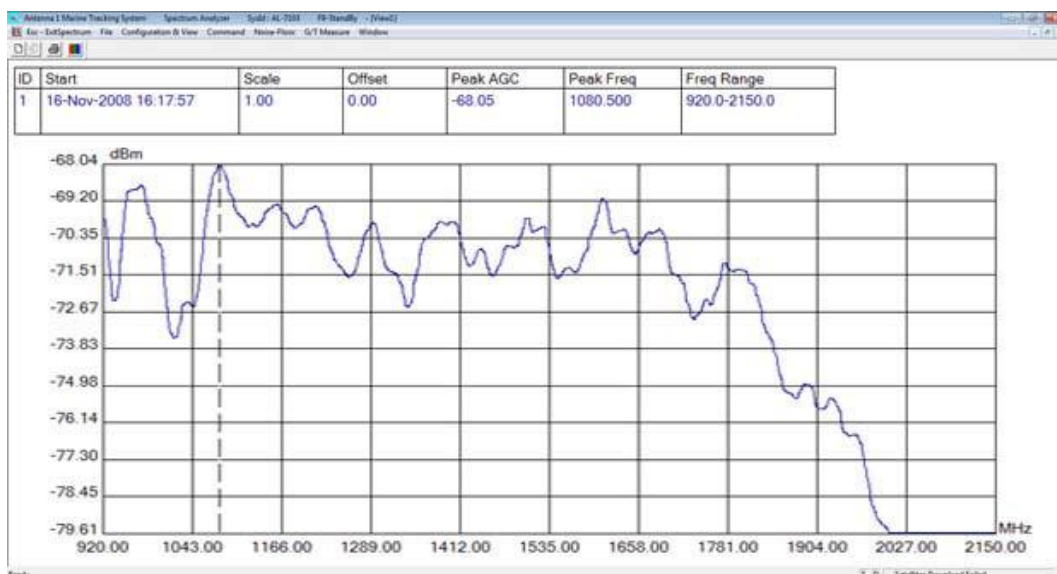
Figure 9-20: Norsat 1x07HC (10GHz LO), NBR 150 KHz
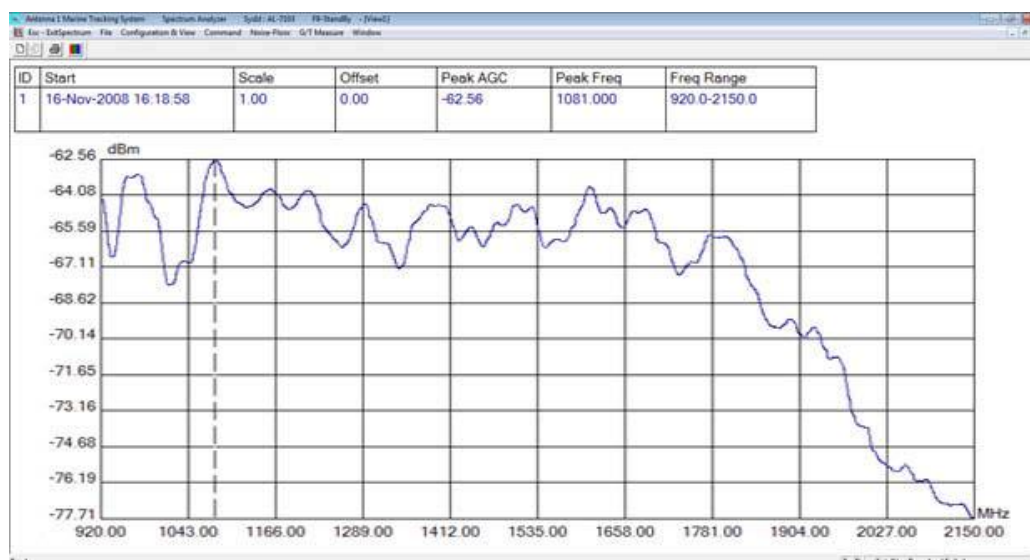
Figure 9-21: Norsat 1x07HC (10 GHz LO), NBR 300 KHz

9.3.3   Activating Noise Floor Correction

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

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

1. From the **Operation Screen**, open the **Config** menu and select **Receiver**. The **Receiver** dialog box appears.
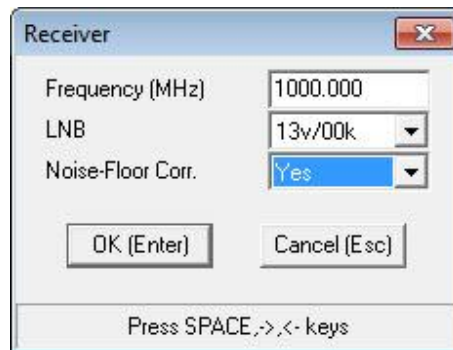
Figure 9-22: Receiver Dialog Box

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

   NOTE: The **Noise-Floor Corr.** setting is not important during the calibration process. It is handled automatically by the calibration program. If there are no calibration files in the `ACU` memory when the process is activated, the warning message **WRN 180: No Noise Floor Table** is displayed.

3. Click **OK (Enter)**. The **Receiver** dialog box closes.

9.4 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.
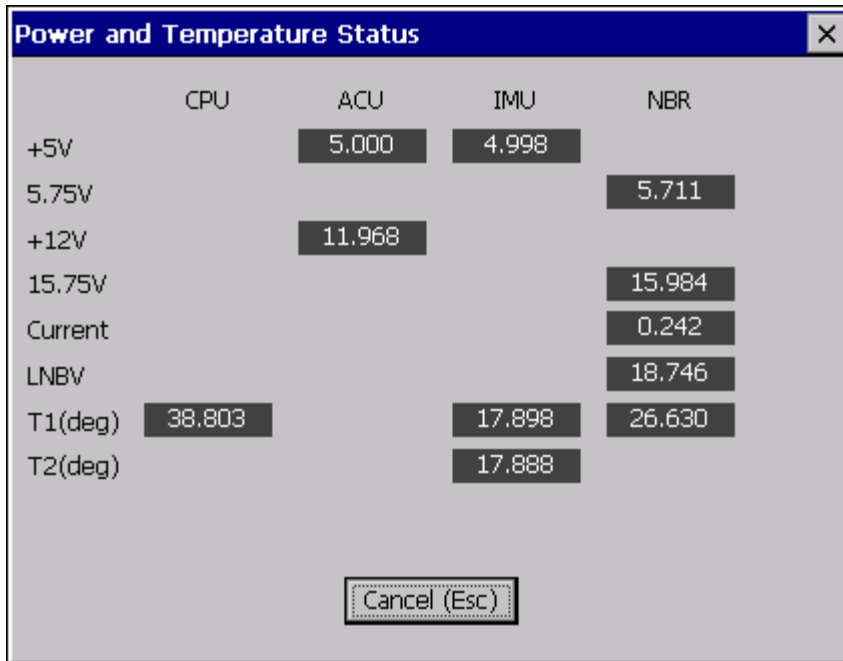
Figure 9-23: Power and Temperature Status Window

In the above figure, parameters that are out of the normal range are highlighted in red on a white background.

Test points can be recorded using the **Graphic Data Logger** (see below).

9.5 Monitoring the MtsVLink Work Session

To know how much time MtsVLink has been working continuously:

Open the **Host** menu and select **Work Time**. The **Work Time** window appears, displaying the duration of the current MtsVLink and ACU sessions.
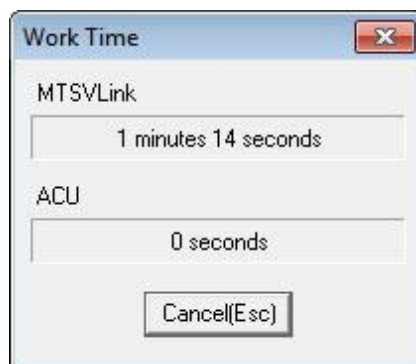
Figure 9-24: Work Time Window

9.6 Downloading the Status Dump File
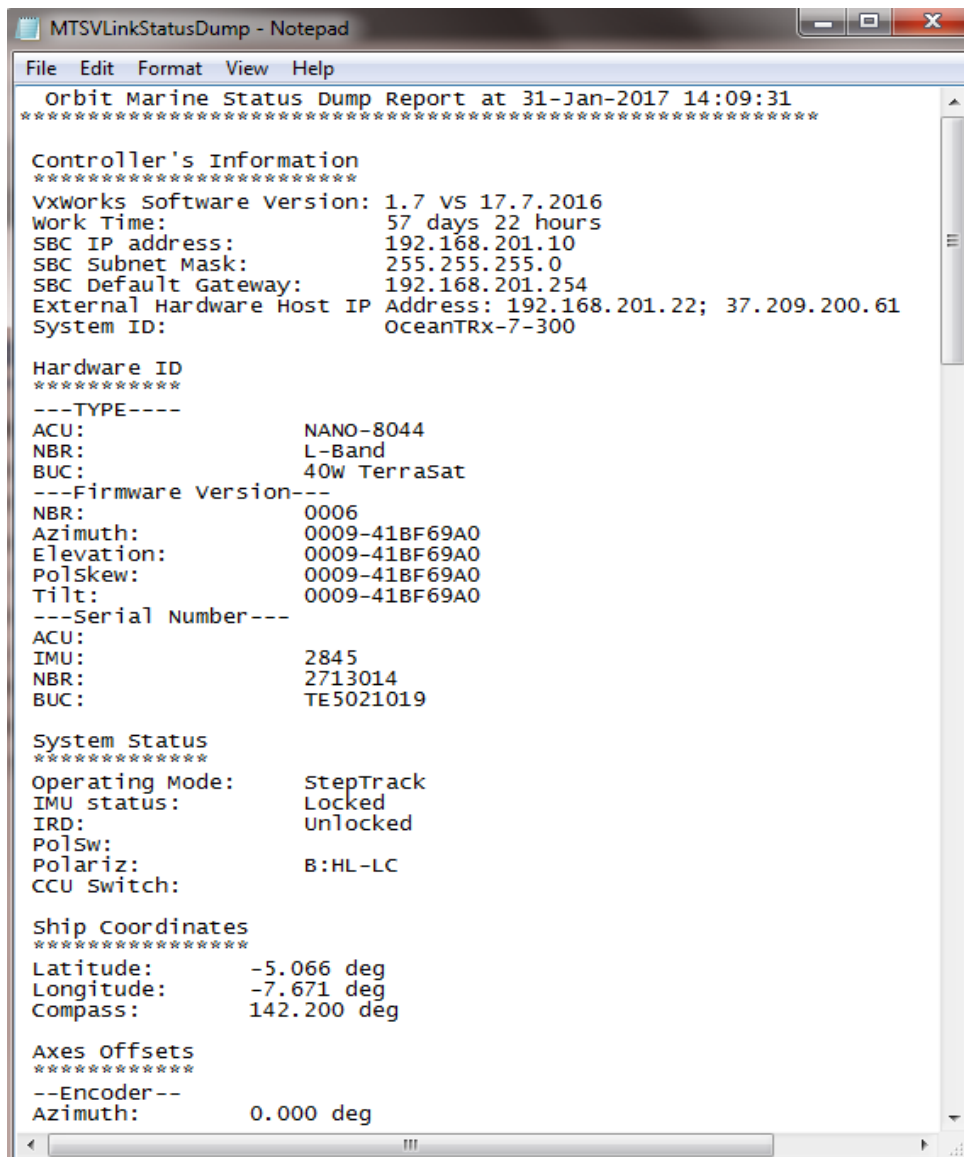
The **Status Dump** command generates the Status Dump Report

This is text file presenting system snapshot. It contains the system configuration, as well as system's condition like active error/warning messages and AGC level.

This information can be used to analyze current system condition and identify the possible source of system issues.

To obtain the Status Dump File:

1. From the **Operation Screen**, open the **Host** menu and select **Status Dump**. A file browser opens.

2. Browse to the directory in which to save the Status Dump File.

3. Click **Save**. The Status Dump File is saved in the specified location.

4. Example of **Status Dump** file is shown below

Figure 9-25: Example of Status Dump File

9.7 System Messages 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**. The **System Messages Log Snapshot** window appears.
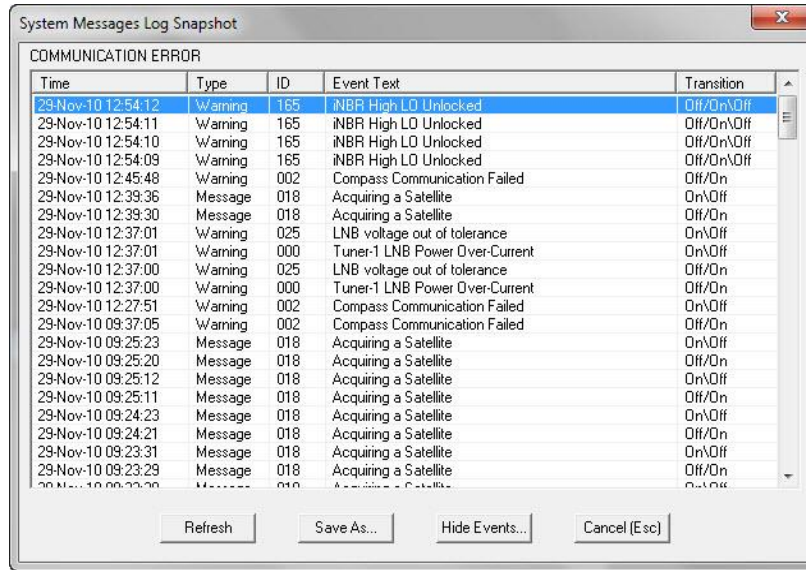
Figure 9-26: System Messages Log Snapshot Window

To filter a specific message or message type from the display:

1. Click **Hide Events**. The **Hide Events** dialog box appears.
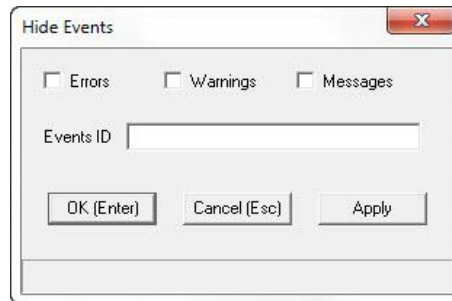
Figure 9-27: Hide Events Dialog Box

2. Select a type option or enter the Event ID of the specific message you wish to hide.
3. Click **OK (Enter)**. The selected messages are being 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.

9.8 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 number and release dates of the MtsVLink and ACU software
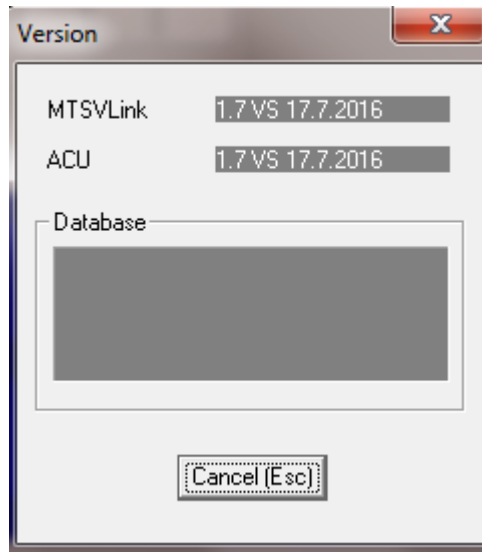
Figure 9-28: Version Window

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.

To check the Servo drivers firmware version, tick the **Config** menu on the **Operation Screen** Menu Bar. Select **hardware ID,** window appears in the Firmware version section. Check the driver revision represented by the first four Digits
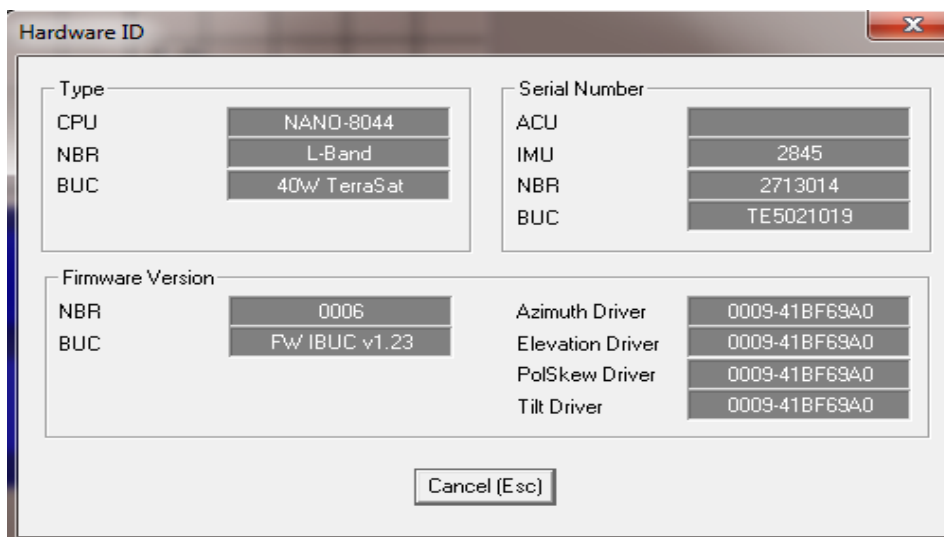
Figure 9-29: Hardware ID Window

9.9 Spare Parts

System Manufacturer	ORBIT Communication Systems Ltd.	
System Model	*OceanTRx™4-500*	
Above Deck Equipment		
Item	**Part Number**	
Central Control Unit (CCU) With or without 10MHz	OceanTRx-CCU-001	
Dual System Selector (DSS)	KIT32-1664-033-SP	
Inertial Measurement unit MU	OceanTrx-IMU-001-SP	
Antenna Control Unit (ACU)	KIT32-1664-002-SP	
GPS module	KIT32-1664-051-SP	
Above Deck Multiplexer (ADMx)	OTRx-ADMX-001-SP	
Slip-Ring with Rotary-Joint	OTRx-SR/RJ-001-SP	
Axis Encoder (for AZ/EL/Ti)	OceanTRx-A.E-001-SP	
Axis Motor with pulley	OTRx4-MOTOR-001-SP	
Belt KIT	OTRx4-Belts-001-SP	
Power Supply (ACU) 24V	KIT32-1664-009-SP	
Power Supply(Servo) 48V/5A	KIT32-1664-010-SP	
Power Supply (BUC)48V/10A	KIT32-1664-011-SP	
Servo Driver (Az ,EL,TI,POL)	OTRx-AXIS DRIVE-001-SP	

Appendix A: Technical Specifications

	OceanTRx™4-500	
	Ku-band	**Ka-band**
Operation Frequency	Tx: 13.75-14.50 GHz Rx: 10.95-12.75 GHz	Tx: 27.6-31.0 GHz Rx: 17.8-21.2 GHz Configuration dependent, Consult ORBIT
Antenna Polarity	Linear H/V	Circular Polarity: Tx-RHCP/Rx-LHCP, or Rx-RHCP/Tx-LHCP, electrically selected
System G/T (Typical, complete system including radome)	20 dB/K° @ 12.5GHz (Clear sky, 30° elevation)	20 dB/K° @ 19.7 GHz (Clear sky, 30° elevation)
System EIRP (Typical, at mid range, including all losses)	53.5 dBW (With 16W BUC)	57 dBW (With 10W BUC)
Cross-Pol Discrimination	35dB	24dB
BUC Options	8W/16W/25W/40W	5W/10W/20W
Power Requirements (Typical, single ADE/BDE; Auto ranging input of 90-130VAC or 200-250VAC 50/60 Hz)	ADE: 400W (16W BUC) BDE: <100W RMS	ADE: 400W (10W BUC) BDE: <100W RMS

OceanTRx™4 – General Features

Antenna Type	Dual offset Gregorian
Antenna Size	1.15m (45")
Radome Size	D: 1.55m (61") H: 1.69m (67")
Dynamic Accuracy	0.1° RMS
Dynamics (Ship motion): Roll Pitch Yaw Turning Rate	30° @ 8 Sec 15° @ 6 Sec 8° @ 15 Sec 10°/Sec
Range of Mechanical Pedestal Axes	Azimuth: Continuous Elevation: -30° to +120° Cross Elevation: -75° to +75°
Ship Gyro Interface	NMEA 0183, Step by Step, Synchro
Modem Interface	L-Band
System Weight (including radome, RF dependent)	< 200Kg /441lb
Enhanced Environmental Conditions Compliance	• Shock & Bump: IEC-60721 -4-6 class 6M3 • Vibration: IEC-60721-4-6 class 6M3, MIL-STD-167-1 (Mast Mounted), DNV #2.4 Class C • Temperature: -25°C+55°C as per IEC 60945:2002 • Wind: Up to 100 knots • Rain & Spray: IEC 60945 Section 8.8/IP Rating X6 • Humidity: IEC 60945:2002; Damp Heat Humidity: 93% (+/-3%) @ 40°C • Safety: IEC EN 60950-1; UL 60950-1; CAN/CSA-C22.2 • EMC: Conducted & Radiated Emission Immunity; IEC 60945:2002; IEC 61000-4-2,3,4,5,6,11

Appendix B. Status Messages

The CCU displays system status messages for a variety of purposes. These messages are classified into three categories, each identified by a different color:

- **Message (informative)** – green (for example, `Acquiring a Satellite`)
- **Warning** – blue (for example, `Compass Communication Failed`)
- **Error** – red (for example, `Servo Azimuth Init Error`).

NOTE: The list of status messages was up to date at publication time. However, more status messages may have been added to the system.

Messages (Informative)

Controller Screen Label	Description
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
WRN 000: 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 system logic.
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.
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.

Controller Screen Label	Description
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.
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.

Controller Screen Label	Description
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 009: System Reboots, Axes Jammed	The system will reboot because one or more of the axes is jammed.
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 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 on power-up.

Controller screen label	Description
ERR 057: No System Configuration File	The ACU could not find the system parameters configuration file in its flash memory on power-up.
ERR 058: No Valid IMU Calibration File	The ACU could not find the IMU calibration file in its flash memory 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.
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 C: CCU Equipment Pinout

Modem Port in-out

- RS-232 (D-Type 9 pin) Cable:

Pin	Signal	Function
1	NC	N/A
2	RXD	RS232 Receive
3	TXD	RS232 Transmit
4	NC	N/A
5	GND	RS232 Ground
6	NC	N/A
7	12 VDC Output	+12VDC for IRD/ Emission Control
8	IRD input	IRD/Emission Control input
9	GND	Shield ground

NOTE: To use the IRD function, 7th & 8th Pins should be connected via a 'dry-contact' modem relay.

NMEA (compass) Port pin-out

- RS-422 (D-Type 9 pin) Cable:

Table 9-1: NMEA Connector Pin-out

Pin	Signal	Function
1	RS422 TX+	Not in use
2	RS422 RX -	Connects to gyro NMEA box NMEA -
3	RS422 TX -	Not in use
4	RS422 RX +	Connects to gyro NMEA box NMEA +
5	GND	Shield Ground
6	NC	Not in use
7	NC	Not in use
8	NC	Not in use
9	GND	Shield Ground

The following figure shows the mating connector wiring diagram for the RS-422 NMEA-0183 compass signal. The recommended interconnecting wiring is a shielded twisted pair, with grounded shield.
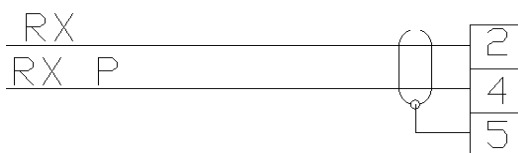
Figure 9-30: RS-422 NMEA-0183 Mating Connector Wiring Diagram

SYNCHRO & SBS Compass Port pin-out

- D-Type 25 pin Cable:

Table 9-2: SYNCHRO & SBS Connector Pin-out

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			

The following figure shows the mating connector wiring diagram in a SYNCHRO compass signal.

Figure 9-31: SYNCHRO Mating Connector Wiring Diagram

NOTE: The CCU supports SYNCHRO compasses with a 115 VAC reference only

The following figure shows the mating connector wiring diagram in a SBS compass signal.
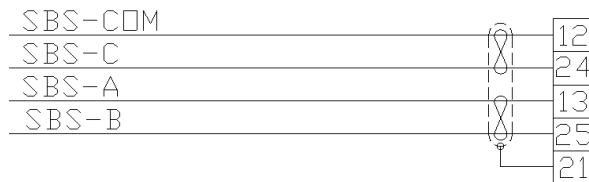
Figure 9-32: SBS Mating Connector Wiring Diagram

NOTE: The CCU supports SBS compasses with +20 VDC to +70 VDC and dual polarity:

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

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

Appendix D: Pre-Installation Checklist

Dear customer, please review and fill out this document, in accordance with the *OceanTRx™4-500 Installation and Operation Manual*. For any assistance or questions, please contact ORBIT Service team at supportgroup@orbit-cs.com.

Customer and Ship Information

Customer Name	
Country	
P.O No.	
Contact Name	
Phone No.	
Email	
Vessel Name	
Vessel Size	
Vessel Type	
Sailing Area	

Site Survey

☐ Thorough on-board ship survey was conducted
☐ Required system lifting harness and crane available
☐ UPS – On-line or Line Interactive type
☐ Power source available within the range of 90-220 VAC

Location Considerations

Mechanical Stability

☐ Stable flat surface
☐ Natural resonance frequency of above 30 Hz
☐ Support for 600 Kg

Maintenance Access

☐ System mounted at a height of at least 1.2m above deck

Line of Sight

☐ Straight line between the `ANTENNA` and the satellite

Other Considerations

☐ 10m and 10° from main lobe of any radar (IEC 60945, section 10.4)
☐ Maximum non-blocked hemispheric view down to 10° visibility

Mounting Surface

☐ `SYSTEM` support structure welded to ship hull

BDE

	Available 2U height in 19″ rack below deck, with supporting rails
	Tx/Rx cables between the BDE and the modem
	ADE-BDE IFL: ☐ FIBER IFL ☐ LMR-400 ☐ LMR-600
	compass cable with correct pin-out for connection with BDE
	Modem-to-BDE IF cables

Appendix E: Installation Checklist

Dear customer, please review and fill out this document, in accordance with the *OceanTRx™4-500 Installation and Operation Manual*. For any assistance or questions, please contact ORBIT Service team at supportgroup@orbit-cs.com.

CUSTOMER INFORMATION

Customer/Company Name	
Vessel/Platform Name	
ORBIT SL No./Customer PO No.	
ORBIT's Sales Director	

RECEIPT OF SHIPMENT

ORBIT systems are packaged and secured for smooth shipment to the customer's address. Each system delivered includes the following G-Shock detector labels:

- 1 internal (15G) on the ADE.
- 1 external (25G) on the system's packing crate

The G-Shock detector changes its color from **WHITE** to **RED** if the delivered items have suffered extreme shock or vibration when in transit. If this occurs, it can cause damage to the deliverables. In such a case, report immediately to ORBIT Communication Systems Ltd. for clarification with the shipping company.

Please check the state of the G-Shock detectors and mark their color:

Shock Label #	Location	Status upon shipment arrival
#1	External – Packing Crate	Color: White/Red
#2	External – Packing Crate	Color: White/Red
#3	Internal System – Pedestal	Color: White/Red

Crate Visual Inspection

Please conduct a general visual inspection of each crate, to verify that no external damage has occurred.

Crate #	Inspection Date	Reported Condition
#1 System	/ /	

CHECKLIST

☐	System crate is unpacked –4 side walls and top of crate removed
☐	Tie-wraps removed from RF Feed, Azimuth, Elevation, and Tilt Axes
	Stow locks are removed:-
☐	Elevation Axis locking pin
☐	Tilt Axis plugs
☐	Azimuth Axis locking pin
☐	For bottom hatch only: System lifted to a 60cm staging platform or axle stands for RADOME assembly, using a parallel-strap lifting harness
☐	System lifted to designated location, using RADOME lifting harness
☐	System mounted on RADOME support using the installation kit
☐	Coaxial cable connected between ADE and BDE
☐	Ship mains power cable connected to ADE
☐	CCU installed in 19'' rack below deck with supporting rails
☐	If ordered, 1U 17'' LCD and KBD unit installed below CCU
☐	Ship's compass connected to CCU
☐	Tx and Rx cables connected between modem and CCU
☐	Modem connected to CCU

Appendix F: Commissioning Checklist

Dear customer, please review and fill out this document, in accordance with the *OceanTRx™4-500 Installation and Operation Manual*. For any assistance or questions, please contact ORBIT Service team at supportgroup@orbit-cs.com.

CUSTOMER INFORMATION

Customer/Company Name	
Vessel/Platform Name	
Location of Commissioning	
Date of Commissioning	
ORBIT SL No./Customer PO No.	
ORBIT's Sales Director	

Commissioning Requirements

☐ System is connected to a UPS unit – On-line or Line Interactive type

☐ Power source is within the range of 90-220 VAC

Installation Location

System is installed on the ship's mast, as per the mast design recommended by ORBIT or its equivalent. Installation location complies with the following requirements:

Mechanical Stability

☐ Stable flat surface

☐ Natural resonance frequency of above 30 Hz

☐ Support for 250 Kg

Maintenance Access

☐ System mounted at a height of at least 1.2m above deck

Line of Sight

☐ Straight line between the ANTENNA and the satellite

Other Considerations

☐ 10m and 10° from main lobe of any radar (IEC 60945, section 10.4)
☐ Maximum non-blocked hemispheric view down to 10° visibility

Mounting Surface

☐ Support structure secured to mounting surface

BDE

	CCU is installed in a 19'' rack below deck, stable and secured with supporting rails
	Tx/Rx cables are connected between the CCU and the modem
	ADE and BDE IFL: ☐ ☐ ☐ Fiber IFL LMR-400 LMR-600
	Ship's GPS compass is connected with the CCU
	Main modem parameters are configured per customer definition: ☐ Rx Frequency ☐ Tx Frequency ☐ Data Rate ☐ FEC ☐ Coding

SYSTEM INSPECTION

Criteria	Pass / Fail	Remarks
Radome Condition		
External damage		**Immediately** report any damage to <u>supportgroup@orbit–cs.com</u>
Internal damage		
Antenna moves without obstruction		
Visual inspection		
GPS Module is secured		
Wiring		
Loose or free cable		
Damage on cables		
Antenna system		
Visual damage check		

System Checkup		
System Power up		
Green LED on ACU panel		
Green LED on BUC		
ADE/BDE communication: System data is displayed on the CCU main screen		
System restart sequence: AZ, Tilt, EL, PolSkew, and IMU finished their initialization process		
Test trajectory: AZ, Tilt, EL, and Pol Skew movement is smooth, with no noises or leakage		
CCU power up: MTSVLink software starts up		
The required satellite is selected and displayed on the CCU Main screen		
Polarization set to V/H on CCU main screen		
Compass offset procedure performed as per instructions in Installation Manual		
Tracking frequency selected		
IF BW filter was set up as per instructions in Installation Manual		
Satellite Acquisition: Selected satellite was acquired and system went to Step Track Mode		
Modem is locked: Tx and Rx are locked		
System restarted and satellite automatically re-acquired		

CCU Settings

Satellite Information	
Satellite Name	
Location	
Antenna Position	
Azimuth	
Elevation	
Polarization	
System Status	
Mode (Should be in Step-Track Mode)	
IRD Lock	
IMU	
Polarization (degree)	
Modem Type and Model	
AGC Status	
AGC level (dBm)	
Threshold level (dBm)	
L-Band Settings	
L-Band Bandwidth setting (50,150 or 300 KHz)	
Tracking Frequency	
LNB Power (13V:00, 13V:22,17V:00 or 17V:22 KHz)	
Software Version	
CCU	
ACU	
Compass	
Compass model	
Compass offset	

System Cables

ADE-BDE Cable			
Brand/Type		Length (M)	
CCU-Modem Cable			
Brand/Type		Length (M)	
CCU-Modem Console GPS Cable			
Brand/Type		Length (M)	
CCU-Gyrocompass Cable			
Brand/Type		Length (M)	

System Configuration

Network	
Modem IP Address	
SBC IP address	
CCU IP address	
Parameter Configuration	
SNR value	
Rx-power (dBm)	
TX-power (dBm)	
Temperature (Celsius)	