ORBIT

OceanTRx™ 7-300

2.2m (87”) Linear/Circular C-Band & Linear Ku-Band Maritime Stabilized VSAT System

Installation and Operation Manual

Document: MAN30-0902-2 Revision B

COMMUNICATION WITHOUT BOUNDARIES

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Certifications

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

ORBIT OceanTRx™7-300 Stabilized Maritime Satellite Communication System is in conformity with the appropriate standards: ISO 12100-2:2003, EN 60204-1:1997, EN 614-1:1995, IEC 60945:2002.

The OceanTRx™7-300 system complies with the various worldwide SatCom regulations (FCC, ETSI, Eutelsat, Intelsat, Anatel, etc.).

The system is compliant with RoHS if the BUC and LNB component selected by the customer is compliant with RoHS. Please note Orbit's BUC and LNB approved components list includes both RoHS and non-RoHS devices.

Revision History

Revision Level	Date	Responsible Person	Description of Change	ECO NO.
-	26/06/2011	Optimum	New Release	-
A	27/03/2017	Alex V	Addition of Emcon, Daolink & general updates	EC1700165
B	13/06/2017	Alex V	Add Section 2.3 Fiber Optics	EC1700280

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About this Manual

This manual is designed to guide you through the installation and operating procedures for the OceanTRx™7-300 Linear/Circular C-Band and 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.

Text Conventions

Style	Indicates	Example
Text	Normal descriptive text	Contents
`Text`	Words or figures that appear on the screen or that should be typed The name of a file or directory	`System Status`
`<Text>`	A key to be pressed	`<ESC>`
TEXT	The name of a hardware component	ANTENNA
Text	The name of a GUI element	**Operation Screen**
➢	The description of a procedure	➢ **To configure…**

Notations

	Indicates important information that should be noted.
	Indicates a potential hazard.
	Indicates the safest method of installation or an operation that *must be adhered.*

Acronyms & Abbreviations

ABS	Automatic Beam Switching
ACU	Antenna Controller Unit
ADE	Above Deck Equipment
ADMx	Above Deck MUX
AGC	Automatic Gain Control
BDE	Below Deck Equipment
BDMx	Below Deck MUX
BUC	Block Up-Converter
CCU	Central Control Unit
CFE	Customer-Furnished Equipment
CW	Clockwise
CCW	Counter-Clockwise
DSS	Dual System Selector
FRU	Field Replaceable Unit
GPS	Global Positioning System
HMI	Human-Machine Interface
IfBw	Intermediate frequency Bandwidth
IMU	Inertial Measurement Unit
IRD	Integrated Receiver/Decoder
LNA	Low Noise Amplifier
LNB	Low Noise Block
LO	Local Oscillator
LOS	Line of Sight
M&C	Monitor & Control
MIB	Management Information Base

MUX	Multiplexer
NBR	Narrow Band Receiver
NMS	Network Management System
PS	Power Supply
RJ	Rotary-Joint
SNMP	Simple Network Management Protocol
SR	Slip-Ring
VSAT	Very Small Aperture Terminal

Effective Releases

This document is effective for the *OrBand*™ AL-7107 and the OceanTRx™7-300.

For description of the changes between the *OrBand*™ AL-7107 and the OceanTRx™7-300, refer to the *OceanTRx™7-300 Release Notes*.

Field Replaceable Units

The following table lists the OceanTRx™7-300 FRUs which can be replaced on site without removing the system from its support column.

Table 1-1: Field Replaceable Units

Field Replaceable Unit Part No.	Field Replaceable Unit (FRU) Part Description
OceanTRx-ACU-001-SP	SP OceanTRx ANTENNA CONTROL UNIT (ACU)
OceanTRx-ADMX-001-SP	SP OceanTRx ADMx UNIT
OceanTRx7-300-Axis-Encoder-001-SP	SP OceanTRx7-300 AXIS ENCODER and WIRING
OceanTRx-AXIS-DRIVER-001-SP	SP OceanTRx AXIS DRIVER 10A UNIT
OceanTRx7-300-Cables-001-SP	SP OceanTRx7-300 KIT ADE CABLES
OceanTRx7-300-Cables-002-SP	SP OceanTRx7-300 C BAND RF CABLE
OceanTRx7-300-Cables-003-SP	SP OceanTRx7-300 Ku BAND RF CABLE
OceanTRx7-300-Cables-004-SP	SP OceanTRx7 MAIN HARNESS
OceanTRx-CCU-001-SP	SP OceanTRx CENTRAL CONTROL UNIT (CCU)
OceanTRx-CCU-002-SP	SP OceanTRx CENTRAL CONTROL UNIT (CCU) W/10MHz
OceanTRx-DSS-001-SP	SP OceanTRx DUAL SYSTEM SELECTOR (DSS)
OrBand-R1-FEED-001-SP	SP OrBand-R1 FEED Ku X-POL LIN W/D-LNB
OrBand-R1-FEED-002-SP	SP OrBand-R1 FEED Ku X-POL LIN W/Q-LNB
OrBand-R1-FEED-003-SP	SP OrBand-R1 FEED Ku X-POL LIN W/O LNB
OceanTRx7-300-FEED-001-SP	SP OceanTRx7-300 FEED C CIR S-LNB
OceanTRx7-300-FEED-002-SP	SP OceanTRx7-300 FEED C LIN S-LNB
OceanTRx7-300-FEED-003-SP	SP OceanTRx7-300 FEED Ku X-POL LIN W/D-LNB
OceanTRx7-300-FEED-004-SP	SP OceanTRx7-300 FEED Ku X-POL LIN W/Q-LNB
OceanTRx7-300-FEED-005-SP	SP OceanTRx7-300 FEED Ku X-POL LIN W/O LNB
OceanTRx7-300-Gear&Motor-001-SP	SP OceanTRx7-300 AZ GEAR and MOTOR ASSEMBLY
OceanTRx7-300-Gear&Motor-002-SP	SP OceanTRx7-300 EL GEAR and MOTOR ASSEMBLY
OceanTRx7-300-Gear&Motor-003-SP	SP OceanTRx7-300 TILT GEAR and MOTOR ASSEMBLY
OceanTRx7-300-Gear-001-SP	SP OceanTRx7-300 GEAR
OceanTRx7-300-Gear-0001-SP	SP OceanTRx7-300 EL GEAR ASSEMBLY

Field Replaceable Unit Part No.	Field Replaceable Unit (FRU) Part Description
OceanTRx7-300-Gear-0002-SP	SP OceanTRx7-300 TILT GEAR ASSEMBLY
OceanTRx7-300-Gear-0003-SP	SP OceanTRx7-300 AZ GEAR ASSEMBLY
OceanTRx7-300-Motor-001-SP	SP OceanTRx7-300 POL (Feed) MOTOR and WIRING
OceanTRx7-MOTOR-001-SP	SP OceanTRx7 AXIS MOTOR and WIRING
OceanTRx7-300-GPS-001-SP	SP OceanTRx7-300 GPS UNIT
OceanTRx7-Hall-Sensor-006-SP	SP OceanTRx7 HALL SENSOR
OceanTRx4-500-IMU-001-SP	SP OceanTRx4-500 Ku INERTIAL MEASUREMENT LP UNIT
OceanTRx7-300-IMU-001-SP	SP OceanTRx7-300 INERTIAL MEASUREMENT UNIT
OceanTRx-LNB-001-SP	SP OceanTRx7 C BAND S-LNB
OceanTRx-LNB-002-SP	SP OceanTRx Ku BAND D-LNB
OceanTRx-LNB-003-SP	SP OceanTRx Ku BAND Q-LNB
OceanTRx7-PB-001-SP	SP OceanTRx7 POWER-BOX ASSEMBLY
OceanTRx-PS-001-SP	SP OceanTRx ACU PS +24VDC 120W ASSEMBLY
OceanTRx-PS-002-SP	SP OceanTRx DRIVERS PS +48VDC 240W ASSEMBLY
OceanTRx-PS-003-SP	SP OceanTRx BUC PS +48VDC 480W ASSEMBLY
OceanTRx7-SHUNT-001-SP	SP OceanTRx7 SHUNT VOLTAGE REGULATOR +96VDC UNIT

System Technical Specifications

Table 1-2: System Technical Specifications

Parameter	Specification
Antenna Type	Dual-offset Gregorian
Antenna Diameter	2.2m x 2.3m (87" x 91")
ADE Weight (including RADOME, excluding BUC Kit)	590 Kg (1,300 lbs.)
Radome	
Dome Diameter	2.7m (106")
Base Diameter	1.93m (76")
Radome Height	2.60m (102")
Radome Color	White (RAL 9010) or Grey (RAL 7035 / RAL 7045)
Hatch	Bottom and side hatch
C-Band Frequency and Polarity Operation	
Available RF Feeds – C-Band	
Linear Feed	Linear, Vertical or Horizontal electrically switched
Circular Feed	Circular, Right Hand or Left Hand electrically switched
Linear Polarity (H/V)	
Tx	5.850-6.725 GHz
Rx	3.400-4.200 GHz
Circular Polarity (RHCP/LHCP)	
Tx	5.850-6.425 GHz
Rx	3.625-4.200 GHz

Table 1-2: System Technical Specifications

Parameter	Specification
C-Band Typical RF Performance	
G/T	19.60 dB/ºK @ 3.95 GHz @ 30° elevation clear sky (Antenna System, excluding RADOME loss) 17.90 dB/ºK @ 3.95 GHz @ 30° elevation clear sky (Complete System, including RADOME loss)
EIRP (including all losses)	20W BUC: 50 dBW @ 6.150 GHz 40W BUC: 53 dBW @ 6.150 GHz 80W BUC: 56 dBW @ 6.150 GHz 100W BUC: 57 dBW @ 6.150 GHz 200W BUC: 60 dBW @ 6.150 GHz
Cross-Pol. Discrimination	Linear: • Rx > 30 dB • Tx > 30 dB Circular: • Rx > 18 dB • Tx > 28 dB
Regulation Compliance	
Side Lobe Levels	Complies with: • ITU S.465 & Intelsat IESS601 C-Band Co-Pol side lobes • EESS-502 C-Band • ANATEL #572 C-Band • FCC 25.209
EIRP Density	• ITU S.524 & Intelsat IESS601 C-Band 2.2m antenna EIRP/BW • EESS-502 C-Band 2.2m antenna side lobes EIRP/BW • ANATEL #902 C-Band 2.2m antenna side lobes EIRP/BW • FCC 25.221 C-Band 2.2m antenna side lobes EIRP/BW
LNB Support	

Table 1-2: System Technical Specifications

Parameter	Specification
LNB Band	Single band
LO Stability	±10 KHz
Ku-Band Frequency and Polarity Operation	
Available RF Feeds – Ku-Band	
Linear Feed	Linear, Vertical or Horizontal electrically switched
Linear Polarity (H/V)	
Tx	13.75-14.50 GHz
Rx	10.70-12.75 GHz
Ku-Band Typical RF Performance	
G/T	24 dB/ºK @ 12.5 GHz @ 30° elevation clear sky (Complete System, including RADOME loss)
EIRP	16W BUC: 55.6 dBW 25W BUC: 57.6 dBW 40W BUC: 60.0 dBW
Cross-Pol. Discrimination	Linear: • Rx > 30 dB • Tx > 30 dB
Regulation Compliance	
Side Lobe Levels	Complies with: • ITU S.465 & Intelsat IESS601 Ku-Band Co-Pol side lobes • EESS-502 Ku-Band • ANATEL #572 Ku-Band • FCC 25.209

Table 1-2: System Technical Specifications

Parameter	Specification
EIRP Density	• ITU S.524 & Intelsat IESS601 Ku-Band 2.2m antenna EIRP/BW • EESS-502 Ku-Band 2.2m antenna side lobes EIRP/BW • ANATEL #902 Ku-Band 2.2m antenna side lobes EIRP/BW • FCC 25.222 Ku-Band 2.2m antenna side lobes EIRP/BW
LNB Support	
LNB Band	• Dual Band • Quad Band
LO Stability	±10 KHz
Supported BUC Options	
C-Band	20W, 40W, 80W, 100W, 200W *Other options may be available upon request
Ku-Band	16W, 25W, 40W *Other options may be available upon request
Range of Motion	
Full hemispherical coverage down to satellite elevation view angle as low as 10° at all sea conditions. With no mechanical “points of singularity” (i.e. no ‘keyholes’ at zenith or horizon).	
Range of Mechanical Pedestal Axes	
Azimuth	Continuous
Elevation	-30° to +120°
Cross Elevation	-30° to +30°
Antenna view angles	
Azimuth	Continuous
Elevation	+10° to +90° with reference to the horizon under all ship’s dynamics

Table 1-2: System Technical Specifications

Parameter	Specification
Ship Dynamics	
Roll or Pitch	Up to 30° in any direction in 8 seconds
Roll or Pitch	Up to 15° in any direction in 6 seconds
Yaw	±80° in 50 seconds
Power Rating and Consumption	
ADE System Maximum Power Consumption for BUC (as per BUC manufacturer's specifications) This table shows the total power consumption, including the ACU and Drivers	Auto switching 90-130 VAC or 200-250 VAC at 50/60 Hz • 20W C-Band: 193W RMS • 40W C-Band: 450W RMS • 80W C-Band: 425W RMS • 100W C-Band: 750W RMS • 200W C-Band: 900W RMS • 16W Ku-Band: 176W RMS • 25W Ku-Band: 313W RMS • 40W Ku-Band: 350W RMS
BDE	Auto switching 90-130 VAC or 200-250 VAC at 50/60 Hz Less than 100W RMS
L-Band	
RX	950 – 1950 MHz
TX	950 – 1700 MHz
GPS Module	Included
GPS output	Continuous, 1 update per second
Satellite Narrow-Band Tracking	Built in
Receiver (NBR)	Built in 950-2150 MHz
NBR Bandwidth	0-70 KHz (50 KHz), 70-180 KHz (180 KHz), >180 KHz (300 KHz)
Tracking Signal (for the NBR)	C/N no less than 6 dB per Bandwidth no less than 25 KHz

Table 1-2: System Technical Specifications

Parameter	Specification
Modem Lock (IRD)	Dry contacts or OpenAMIP
VGA Out	Yes
LAN	Ethernet T Base 10/100
USB	USB2.0
Ship Gyro Interface	NMEA-0183 or Optional Synchro & Step-by-Step
CE Compliance	
Safety and Ergonomics	ISO 12100-2:2003
	EN 60204-1:1997
	EN 614-1:1995
	IEC 60945:2002
	RoHS compliant under Directive 2002/95/EC
EMC	
Conducted & Radiated Emission Immunity	• IEC 60945:2002 • IEC 61000-4-2:1995 • IEC 61000-4-3:1995 • IEC 61000-4-4:1995 • IEC 61000-4-5:1995 • IEC 61000-4-6:1996 • IEC 61000-4-11:1996
Environmental Conditions	
Wind Speed	Up to 100 knots
Shock	MIL-STD 810 F, MIL-STD 901 (Designed to Grade B)
Vibration	MIL-STD 167-1 (mast-mounted equipment)
Temperature	Operation: -25°C to +55°C with Radome, as per IEC 60945:2002 Dry Heat Storage: -25°C to +70°C

Table 1-2: System Technical Specifications

Parameter	Specification
Humidity	IEC 60945:2002 – Damp Heat Humidity 93% (±3%) @ 40°C
M&C and Remote Diagnostics	
Interface Protocols	OpenAMIP, SNMP, ComLink (Orbit proprietary)

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 the instructions in this manual.
- Before entering the RADOME for maintenance purposes, shut off the main power to the system from the ship's electrical panel. Upon entry, switch off the ADE POWER BOX.
- Take extra care when handling the ADE POWER BOX, SLIP-RING, and POWER SUPPLY UNITS and their respective cables – which may be carrying 110/220 VAC.
- Take extra care when handling the SERVO DRIVERS – which are connected to 96 VDC.
- The system conducts potentially harmful voltages when connected to the designated power sources. Never remove equipment covers except for maintenance or internal adjustments.
- Keep away from 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 ground conductor of the chassis must not be removed.
- Although the RADOME parts are not heavy, care should be taken when lifting them, because they will act as a sail under windy conditions. At least two people should handle the RADOME parts during installation.
- To prevent shock or other hazards when sub-units are open or cables are disconnected, do not expose the equipment to rain or moisture.
- Avoid making unauthorized modifications to the system. Any such changes to the system will void the warranty.
- Do not disconnect cables from the equipment while the system is running.
- When not assembled, ensure that the system and its components are not exposed to moisture or high humidity.
- When installing the system, ensure to use the materials and tools recommended in this manual.

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

Radiation Safety

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 1-3: Safety Distances

AL-7107	BUC Power	ACGIH, 10mW/cm2 Occupational/Controlled 6 minutes Averaging Time Min Distance (m)	ICNIRP, 5mW/cm2 Occupational/Controlle d 6 minutes Averaging Time Min Distance (m)	ICNIRP, 1mW/cm2 General/Uncontrolled Inapplicable Averaging Time Min. Distance (m)
C-Band	20W	Radome	Radome	45.2
C-Band	40W	Radome	22.8	66.6
C-Band	80W	22.8	39.5	95.8
C-Band	100W	28.4	45.2	107.6
C-Band	125W	33.5	51.4	120.6
C-Band	200W	45.2	66.6	153.2
Ku-Band	16W	Radome	Radome	89.5
Ku-Band	25W	Radome	Radome	116.4
Ku-Band	40W	Radome	51.6	150.9

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

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1 Overview

1.1 Introduction

The OceanTRx™7-300 Linear/Circular C-Band or Linear Ku-Band Maritime Satellite Communication System represents a revolution in VSAT design, providing industry-standard RF capabilities in a uniquely light and compact assembly. The system features a stabilized 2.2m (87”) ANTENNA within a 2.7m (106”) RADOME allowing unparalleled space economy on the deck without sacrificing transmission and reception performance.

Figure 1-1: OceanTRx™7-300 Antenna-to-Radome Dimensional Ratio

The above-deck terminal is shipped fully assembled and tested in a single crate along with the RADOME parts which are easily assembled and sealed by hand without the need of any heavy lifting machinery. The entire system including the RADOME weighs 590Kg (1,300lbs.), up to 40% lighter than comparable systems.

This System is specially designed to provide continuous connectivity in harsh sea conditions or in equatorial areas with heavy rains. Orbit’s OceanTRx™7-300 system ensures a superior 2-way high-speed broadband communication for vital onboard communication and entertainment services.

With its state-of-the-art stabilizing capabilities, the OceanTRx™7-300 system provides communication infrastructure to onboard phones, Internet, streaming video, data, GSM cellular, fax and videoconference systems for cargo vessels, navy vessels, cruise ships, tankers, oil and gas rigs, ferries etc.

The OceanTRx™7-300 system is available with a wide variety of C-Band BUCs that work with linear and circular RF feeds, and Ku-Band BUCs that work with linear RF feeds. ANTENNA polarization is electrically switchable for both C-Band and Ku-Band feeds.

The OceanTRx™7-300 system supports a two-BUC configuration with field replaceable feeds, enabling easy switching between C-Band and Ku-Band operation, and a dual system configuration (two systems controlled from a single interface).

Other feature configurations will include a Dual Band electrically switchable C & Ku feed.

See **Section 1.4 System Configurations** on page 8 for a list of configuration options.

Backed by decades of experience and internationally-deployed teams of highly skilled engineers, the comprehensive OceanTRx™7-300 system is enhancing Orbit's VSAT portfolio.

1.2 System Architecture

The OceanTRx™7-300 system consists of equipment mounted above decks (Above Deck Equipment or ADE) and below decks (Below Deck Equipment or BDE).

The ADE includes a four-axis PEDESTAL, ADFOC (ABOVE DECK FIBER OPTIC CONVERTER), ANTENNA, RF PACKAGE, ANTENNA CONTROLLER UNIT (ACU) and POWER SUPPLIES installed inside a weather-proof RADOME.ADFOC (ABOVE DECK FIBER OPTIC CONVERTER).

The BDE includes the CENTRAL CONTROL UNIT (CCU) which serves as both the interface to the ship's gyrocompass and modem and the system's human-machine interface (HMI) device for manual operation. Moreover, in the dual system configuration, the BDE includes a DUAL SYSTEM SELECTOR (DSS) which serves as the interface between the second system and the CCU.

The ADE connects to the BDE via a single coaxial cable, multiplexing L-Band Tx/Rx, Ethernet LAN control and a 10MHz reference signal.

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

In addition, ADFOC (Above Deck Fiber Optic Converters) and BDFOC (Below Deck Optic Fiber Converters), provide the required L-band, Ethernet and 10 MHz signal to optic conversion (and vice versa) between the ADE and BDE, thus enabling these signals to be transported over optic fiber for long distances.

The system's functional layout is illustrated in the following diagrams for both single and dual system configurations:

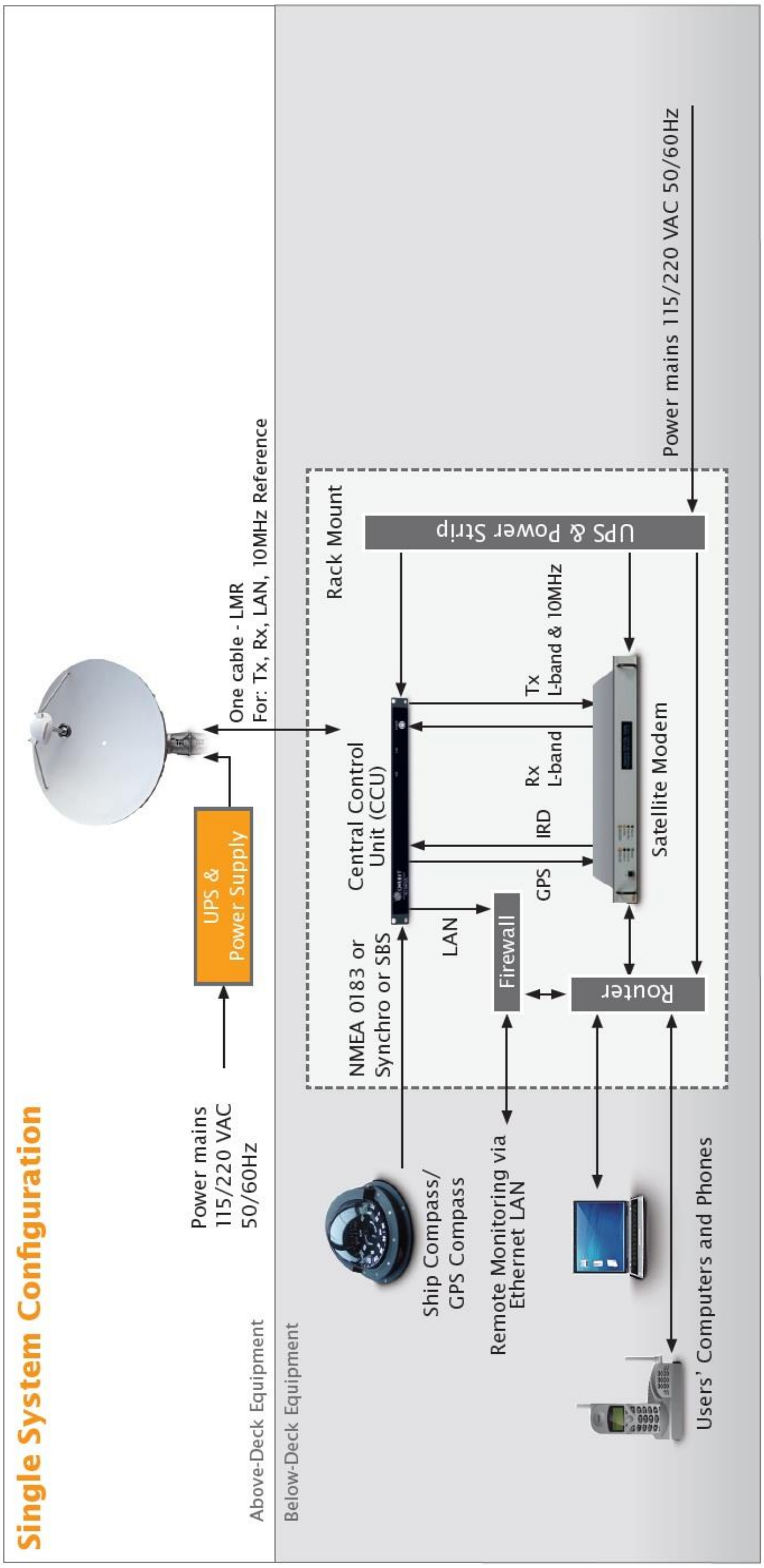


Figure 1-2: OceanTRxTM7-300 Single System Configuration Architecture

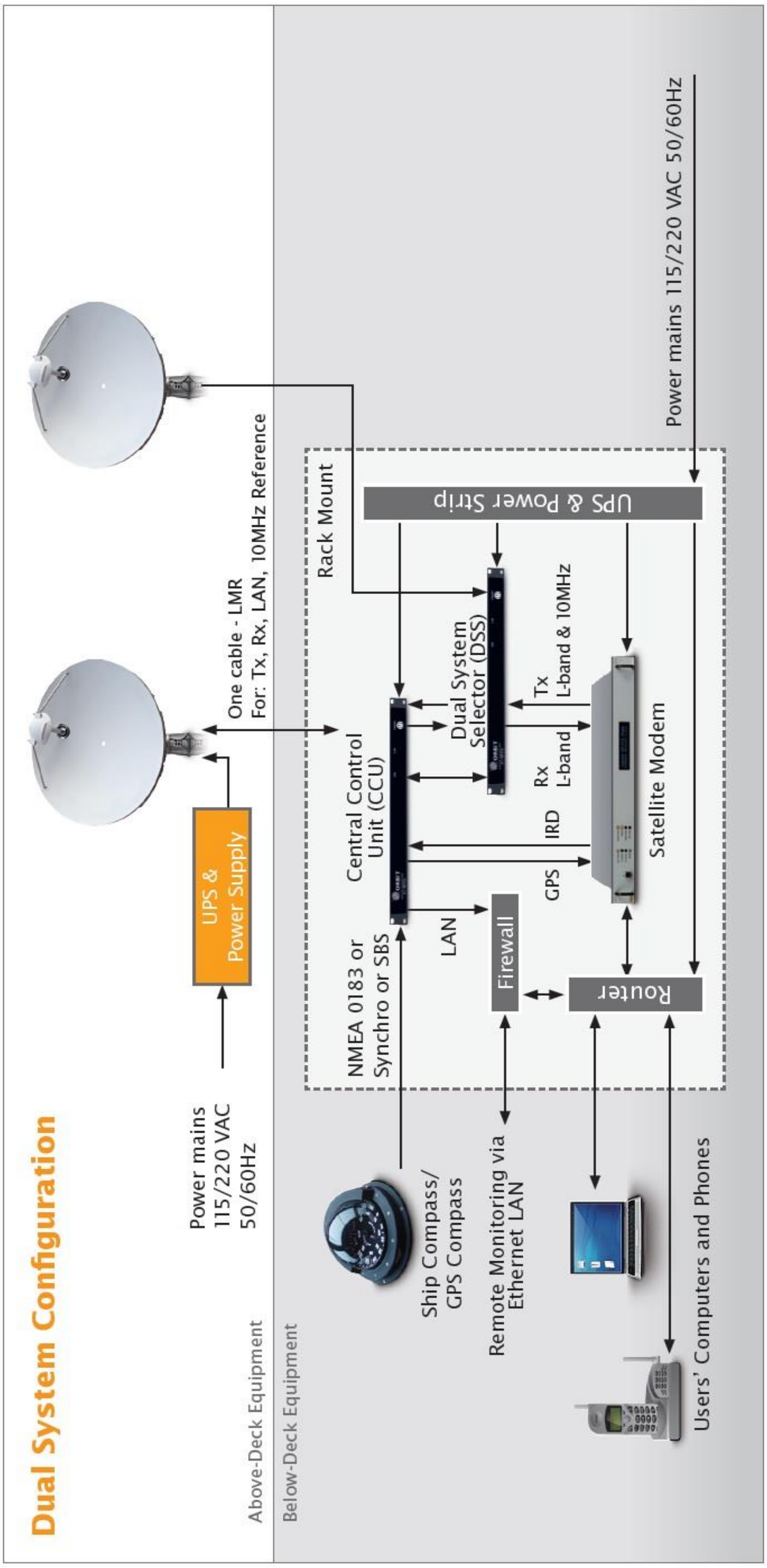


Figure 1-3: OceanTRx^{TM}7-300 Dual System Configuration Architecture

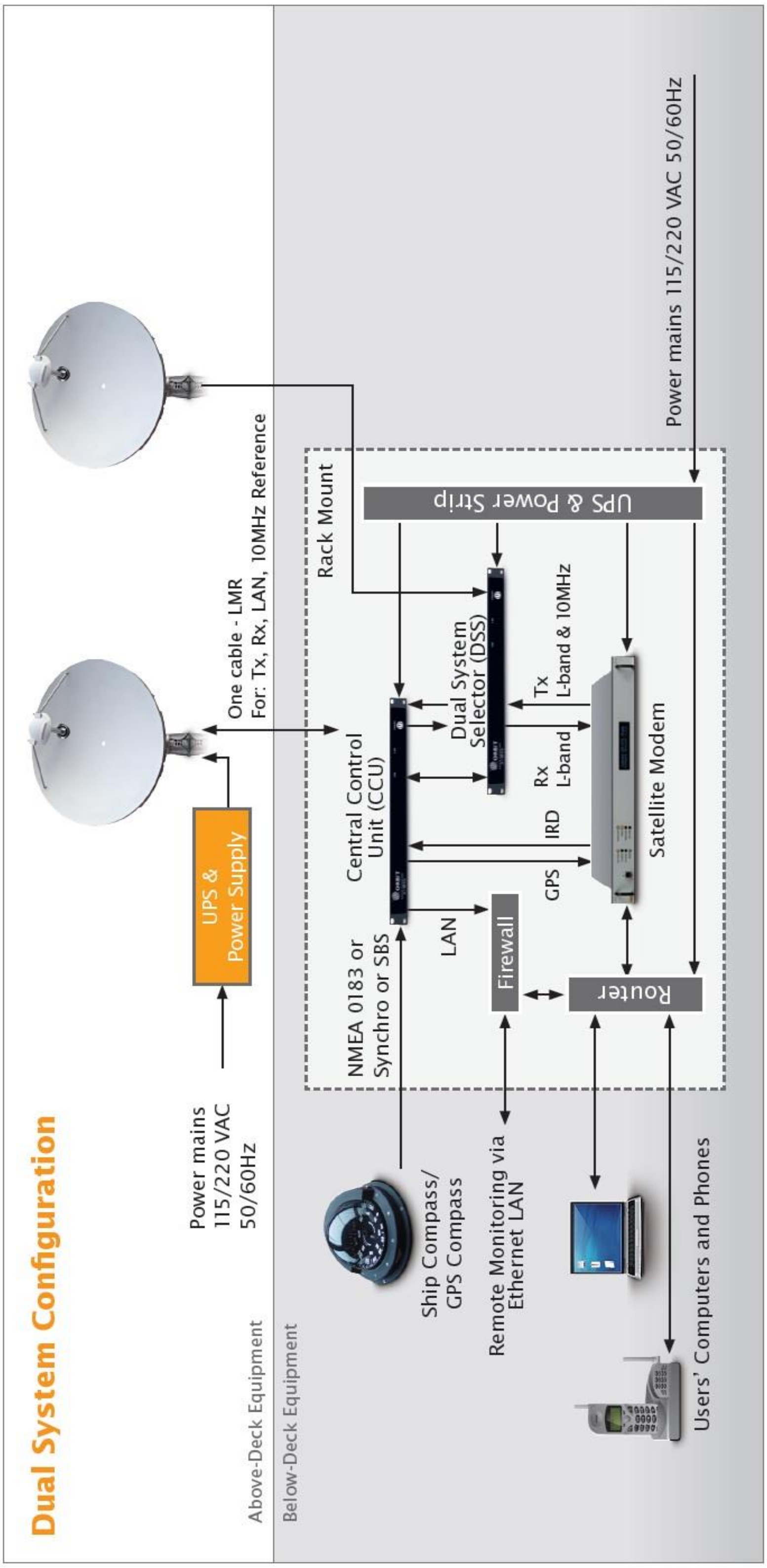


Figure 1-4: OceanTRx™7-300 Dual System with FOC Configuration Architecture

1.3 Key System Features

The OceanTRx™7-300 Linear/Circular C-Band and Linear Ku-Band system provides the following features:

- Revolutionary mechanical and RF design provides outstanding RF performance from a 2.2m ANTENNA dish within a compact 2.7m RADOME – the lowest antenna/dome ratio available today.
- Light-weight above-deck terminal – 590Kg. (1,300lbs).
- Advanced automatic tracking capabilities with high dynamic accuracy based on positioning input from the system's GPS MODULE and heading data from the ship's compass (supports NMEA-0183, Step-by-Step and Synchro compass interfaces).
- Stable & efficient communication is provided by a quadruple-axis polarization-over-elevation-over-tilt-over-azimuth configuration that provides full hemispherical coverage with no 'keyholes' at the horizon and zenith.
- Electrical switching between the vertical/horizontal (linear) or left/right (circular) polarization from the below-deck CCU.
- Capable of supporting all major standard commercial VSAT modems.
- Built in NARROW BAND RECEIVER (NBR).
- IRD interface to the modem.
- Above-deck mux (ADMX) and below-deck mux (BDMX) that is used to transfer RF and data between the ADE and the BDE via a single coaxial cable.
- Built-in global satellite coverage database which may be edited to append user-defined communication links.
- Plug & play installation – the ADE terminal is shipped fully assembled and tested.
- Field-replaceable modular components for easy maintenance.
- User-friendly operational interface with maintenance and data logging features.
- Below-deck BUC monitoring and control (M&C).
- Remote access for monitoring, troubleshooting and support, using either the main communication link provided by the system or an alternative narrow-band link (for example, Iridium, Inmarsat).

  Support for the industry standard protocols: SNMP for network management and OpenAMIP for antenna-router integration.

1.4 System Configurations

1.4.1 C-Band Configurations

- **OceanTRx™7-300 with C-Band 20W BUC:** Comprises a fully integrated operational system that includes a 20W C-Band BUC and a single band LNB. Available with either linear or circular polarization.
- **OceanTRx™7-300 with C-Band 40W BUC:** The same as above with a 40W C-Band BUC.
- **OceanTRx™7-300 with C-Band 80W BUC:** The same as above with an 80W C-Band BUC.
- **OceanTRx™7-300 with C-Band 100W BUC:** The same as above with a 100W C-Band BUC.
- **OceanTRx™7-300 with C-Band 125W BUC:** The same as above with a 125W C-Band BUC.
- **OceanTRx™7-300 with C-Band 200W BUC:** The same as above with a 200W C-Band BUC.

High power BUCs may require air conditioning.

1.4.2 Ku-Band Configurations

- **OceanTRx™7-300 with Ku-Band 16W BUC:** Comprises a fully integrated operational system that includes a 16W Ku-Band BUC and dual or quad-band LNB. Available with linear polarization.
- **OceanTRx™7-300 with Ku-Band 25W BUC:** The same as above with a 25W Ku-Band BUC.
- **OceanTRx™7-300 with Ku-Band 40W BUC:** The same as above with a 40W Ku-Band BUC.

Other configurations may be available upon request.

1.4.3 Dual-Band Configurations

- **OceanTRx™7-300 with Dual Band:** Comprises a fully integrated operational system with specified C-Band BUC and specified Ku-Band BUC installed. The system also includes field replaceable feeds for use with each band.

1.5 OpenAMIP Protocol

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

1.6 SNMP Protocol

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

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

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

2 Main System Components

The OceanTRx™7-300 system components are divided into two groups:

- ABOVE-DECK EQUIPMENT (ADE)
- BELOW-DECK EQUIPMENT (BDE)

2.1 Above Deck Equipment

The ADE includes the following main assemblies and units:

- 2.7m (106”) RADOME and 1.93m (76”) BASE RING.
- PEDESTAL which supports and positions the ANTENNA.
- 2.2m (87”) light-weight high-efficiency precision composite-material ANTENNA.
- GPS MODULE.
- INERTIAL MEASUREMENT UNIT (IMU) which serves to stabilize the ANTENNA from pitch, roll, and short-term yaw.
- ANTENNA CONTROLLER UNIT (ACU) including a built-in NARROW BAND RECEIVER (NBR).
- Individual SERVO DRIVERS and SERVO MOTORS on each axis.
- RF PACKAGE which includes a BLOCK UP-CONVERTER (BUC) and the RF FRONT END consisting of an ORTHOMODE TRANSDUCER (OMT), RF FILTERS and LOW NOISE BLOCK down-converter (LNB).
- ADMX (the above-deck component of the ADMX/BDMX LINK subsystem).
- Separate POWER SUPPLIES (PS) for the BUC, the SERVO SUBSYSTEM and the ACU (which powers the remaining system components).
- A SHUNT REGULATOR to stabilize DC voltage input to the SERVO DRIVERS.
- AXIS ENCODERS and ZERO HALL SENSORS.

The entire ADE assembly with the exception of the IMU and CONNECTORS PANEL rotates freely on the PEDESTAL’s AZIMUTH AXIS. During rotation of the ANTENNA, the coaxial cable that connects the ADE with the BDE is protected from looping by the ROTARY-JOINT/SLIP-RING ASSEMBLY located in the AZIMUTH AXIS.

The following figure displays the location of the various ADE components. The subsequent sections provide a brief technical description of each component:

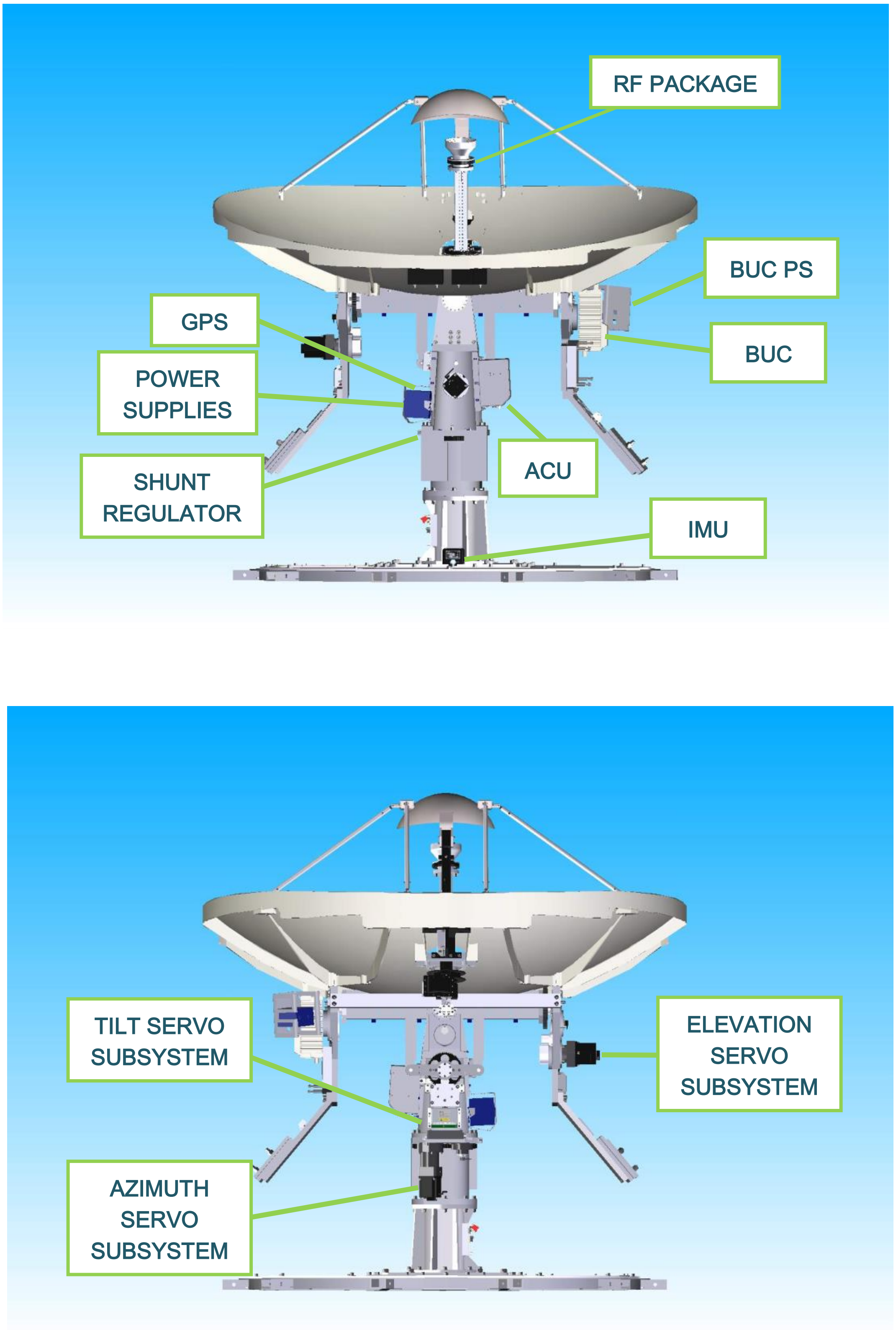


Figure 2-1: Above Deck Equipment (ADE)

2.1.1 Radome and Radome Base

All ADE components are enclosed within a 2.7m (106”) RADOME. The RADOME is mounted on a BASE RING and RADOME BASE.

The RADOME covers and protects the complete ADE. Maintenance access is provided by a service hatch in the RADOME BASE and by a side hatch in one of the RADOME petals.

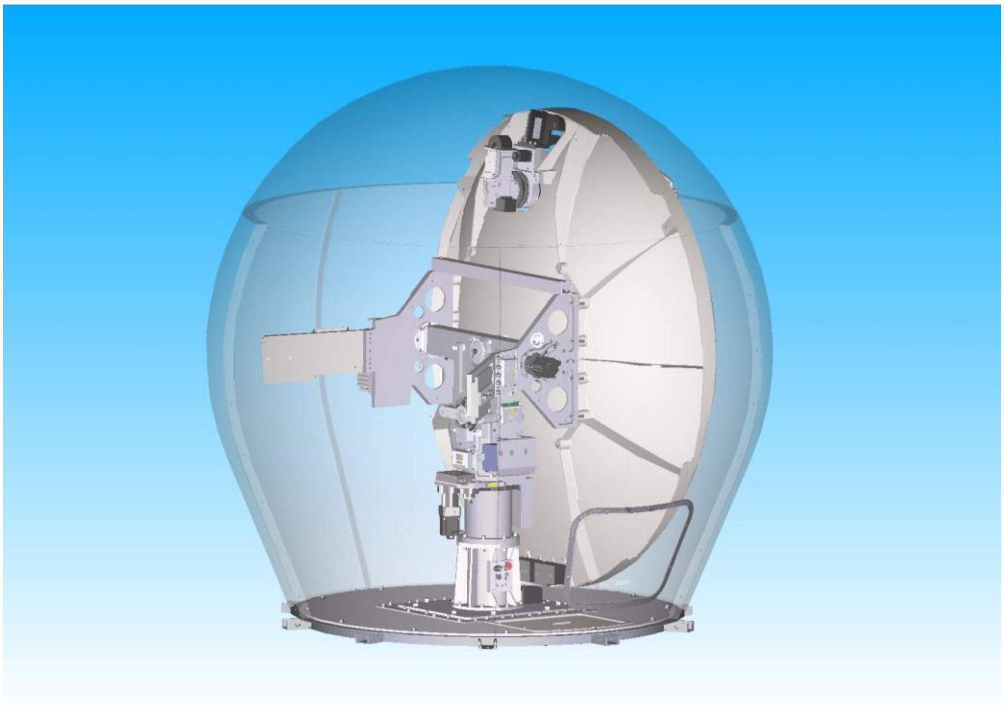


Figure 2-2: ADE in the Radome

2.1.2 Pedestal

The PEDESTAL with its Polarization-over-Elevation-over-Tilt-over-Azimuth positioning mechanism supports the ANTENNA and keeps it pointed at the satellite.

The PEDESTAL contains three rotary axes:

- AZIMUTH AXIS – provides continuous an unlimited 360° rotation. The cables connects the ADE POWER BOX to the components above the TURNTABLE traverse this axis via a single-channel SLIP-RING/ROTARY-JOINT ASSEMBLY.
- TILT AXIS – provides ±30° of horizontal rotation.
- ELEVATION AXIS – provides 150° of vertical rotation (-30° to +120°).

The 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 situated on the RF FEED provides 240° of rotation (±120°).

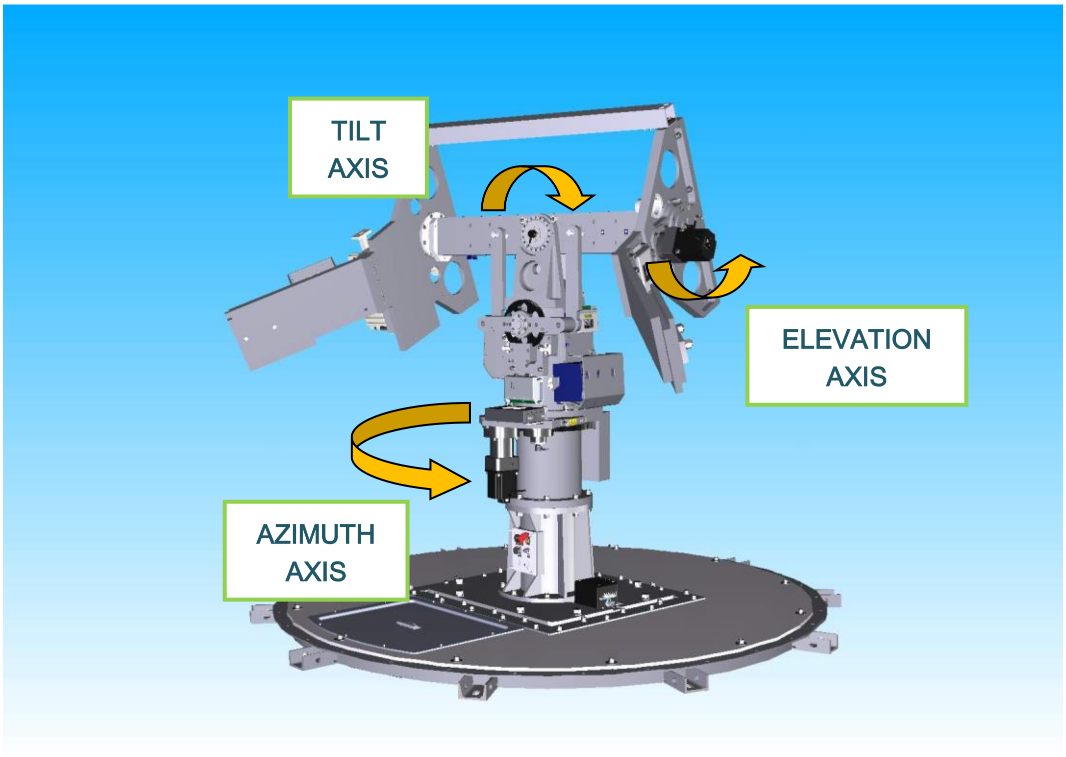


Figure 2-3: The Pedestal and its Axes

2.1.3 Slip-Ring/Rotary-Joint Assembly

The SLIP-RING/ROTARY-JOINT ASSEMBLY includes a Slip-Ring and a Rotary-Joint.

The Slip-Ring is used to pass the following:

- AC power from the POWER CONNECTION BOX to the power supply modules.
- DC power from the ACU to the IMU.
- Communication between the ACU to the IMU.

The Rotary-Joint is used to pass the following, between the POWER CONNECTION BOX and the ADMX:

- Tx and Rx signals
- 10MHz reference signal
- LAN communication

There are two versions of the SLIP-RING/ROTARY-JOINT ASSEMBLY:

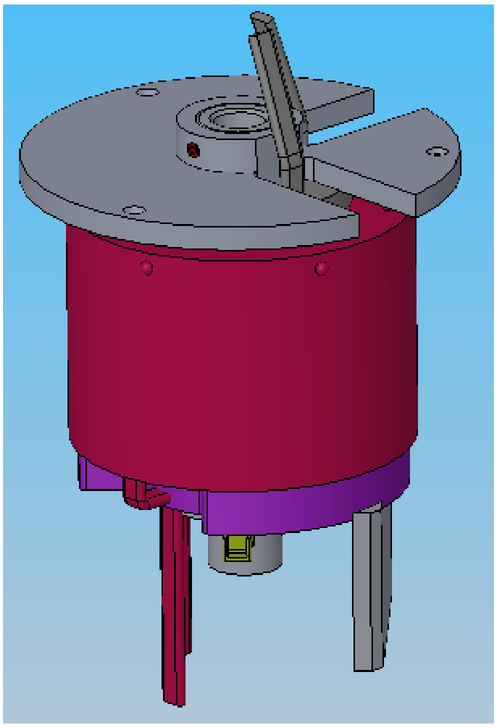


Figure 2-4: Slip-Ring/Rotary-Joint Assembly for OrBand

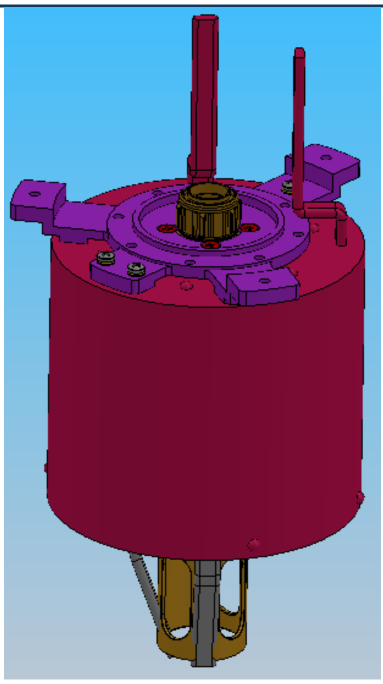


Figure 2-5: Slip-Ring/Rotary-Joint Assembly for OceanTRx™7-300

The SLIP-RING/ROTARY-JOINT ASSEMBLIES have the same mechanical interface and different electrical interfaces.

2.1.4 Servo Subsystem

Each axis is dynamically positioned by its own SERVO DRIVER and SERVO MOTOR as directed by the ACU. Separate incremental encoders are attached to both the motor and the axis itself – the former for driver commutation and the latter for dynamic axis-position feedback. Auto axis initialization uses the ZERO HALL SENSORS. The POLARIZATION SKEW AXIS includes a single encoder on its motor.

The ACU sends positioning coordinates to the SERVO DRIVERS which convert them into positioning commands. These commands are sent to the SERVO MOTORS. As the motors move the ANTENNA into position, the AXIS ENCODERS on each of the PEDESTAL axes return the actual ANTENNA location in a closed position loop.

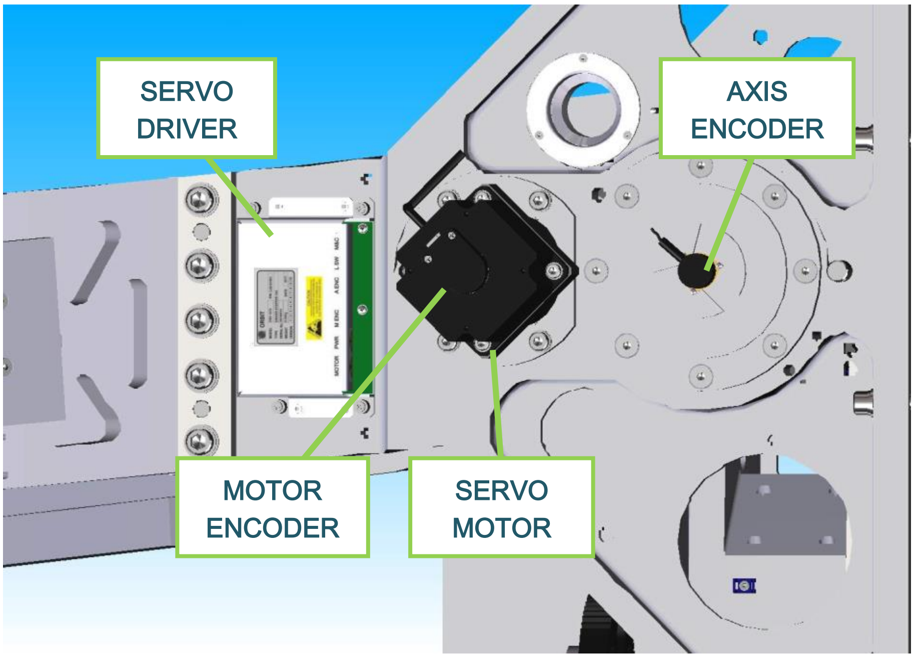


Figure 2-6: Servo Subsystem (Elevation Axis)

When the system power is shut off, a dynamic-braking relay arrests the movement of the PEDESTAL, locking the axes in their current position. In cases where it is necessary to rotate a given axis for maintenance purposes, a mechanical switch on the servo driver of each axis overrides the lock and allows free movement of that axis.

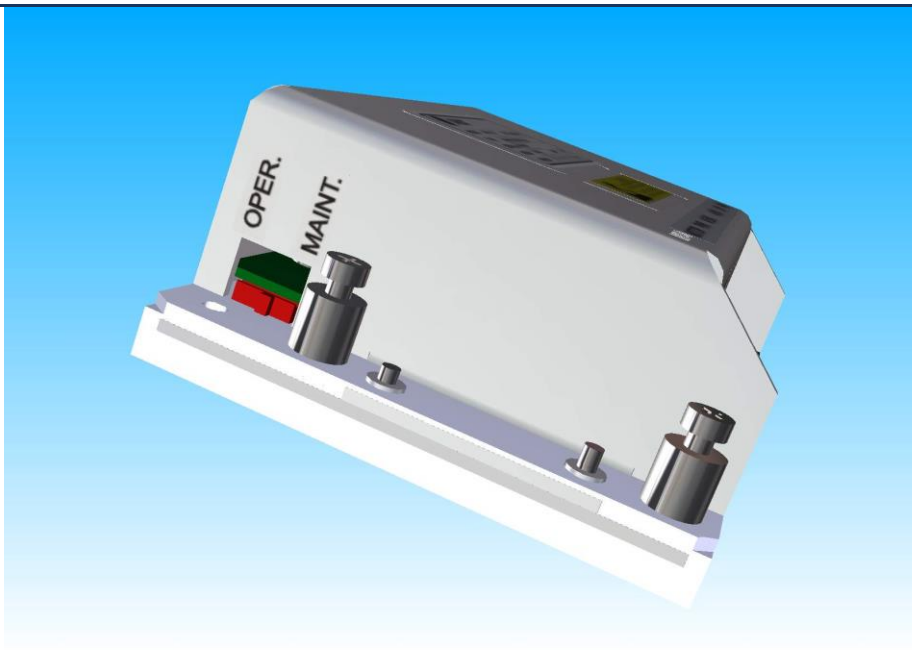


Figure 2-7: Servo Driver Switch

Make sure to restore the mechanical locking switch to its original position before powering up.

The `SERVO DRIVER` connects to the other `SERVO SUBSYTEM` components via its connectors.

Figure 2-8: Servo Driver Connectors

The following table describes each connector:

Table 2-1: Servo Driver Connectors

Connector	Type	Function
MOTOR	8-pin	Connects to the SERVO MOTOR phases
PWR	4-pin	Connects to the POWER SUPPLY to receive DC power
M. ENC	8-pin	Connects to the MOTOR ENCODER
A. ENC	10-pin	Connects to the AXIS ENCODER
L. SW	4-pin	Connects to the HALL SENSOR
M&C	8-pin	Connects to the ACU

2.1.5 Antenna Controller Unit

The ANTENNA CONTROLLER UNIT (ACU) is a real-time tracking controller with an industry standard CPU, on-board Flash memory and SDRAM. This unit controls the positioning of the ANTENNA via the SERVO SUBSYSTEM on the basis of commands received from the CCU.

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

Figure 2-9: Antenna Control Unit

The ACU includes a built-in NARROW BAND RECEIVER (NBR) for step-tracking feedback. A 2-WAY SPLITTER divides the Rx output signal from the LOW NOISE BLOCK (LNB) between the ADMX which communicates the received data to the BDMX and the NBR which uses the signal to stabilize the ANTENNA position.

The ACU is powered by a dedicated +24VDC power supply and supply voltage to the other ADE components (with the exception of the BUC and the SERVO SUBSYSTEM which are fed by their own dedicated power supplies). The ACU contains an internal DC-DC power supply that provides the correct DC voltages to the LNB, ADMX, IMU and the GPS MODULE.

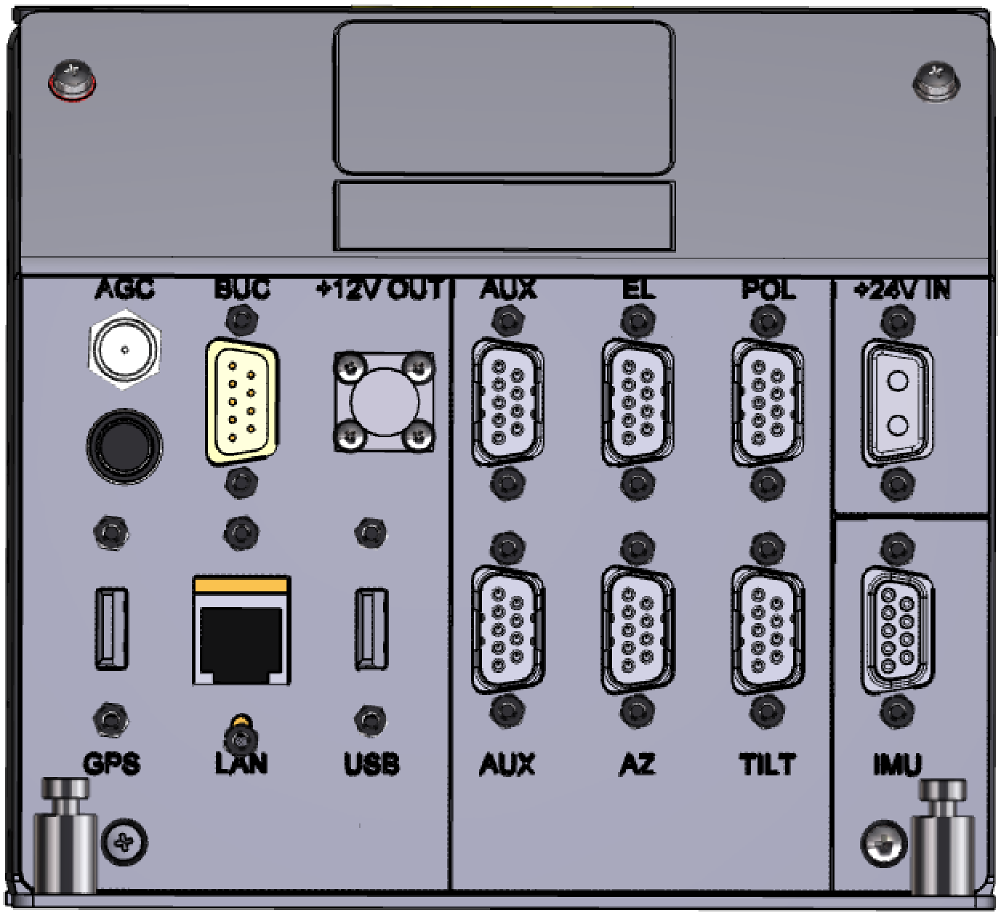


Figure 2-10: ACU Front Panel Connectors

The ACU connects to the other ADE components via its front-panel connectors. The following table describes each connector:

Table 2-2: ACU Front Panel Connectors

Connector	Type	Function
AGC	F-Type	Connects to the LNB via the SPLITTER
BUC	DB9 female, RS232	Connects to the BUC for M&C communication
+12V OUT	2P R03	Connects to the ADMX DC power input
GPS	USB	Connects to the GPS MODULE
LAN	RJ-45	Connects to the ADMX
USB	USB	Auxiliary USB port that can be used to connect to the GPS MODULE
AUX 1	DB9 male, RS422	Auxiliary connection

Connector	Type	Function
EL	DB9 male, RS422	Connects to the Elevation Axis SERVO DRIVER
POL	DB9 male, RS422	Connects to the Polarization Skew Axis SERVO DRIVER
AUX 2	DB9 male, RS422	Auxiliary connection
AZ	DB9 male, RS422	Connects to the Azimuth Axis SERVO DRIVER
TILT	DB9 male, RS422	Connects to the Tilt Axis SERVO DRIVER
+24V IN	F2W2P D-Type	ACU +24VDC power source
IMU	DB9 female, RS422	Connects to the IMU (outputs ±12VDC, +5VDC power and communication)

2.1.6 Power Supply

The system contains several AC-to-DC modules which convert the AC mains input voltage (90-130/200-250VAC, 50/60Hz) to DC voltages for distribution to the system components:

- Two 48VDC modules connected in series provide +96VDC to SERVO DRIVERS and SERVO MOTORS.
- One module provides +48VDC to the BUCs.
- One module provides +24VDC to the ACU which serves as a DC-DC conversion box for the remaining ADE components (for example, ADMX, IMU, GPS).

The AC mains input voltage is connected to the ADE POWER BOX. The power supply modules and other ADE components located above the TURNTABLE receive power from the POWER BOX via the AZIMUTH AXIS SLIP-RING/ROTARY-JOINT ASSEMBLY.

A UPS should be used for both the ADE and BDE power supply (see **UPS** on page 50).

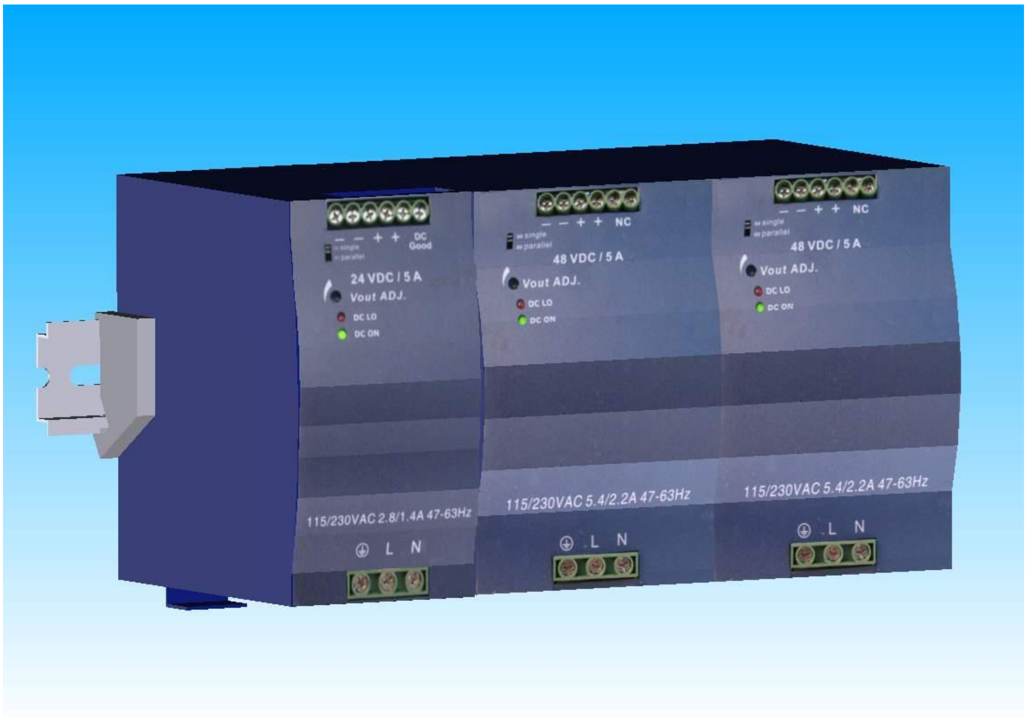


Figure 2-11: Power Supply Units (typical)

2.1.7 Shunt Regulator

The SHUNT REGULATOR is a DC voltage stabilizer that absorbs the excess back-EMF energy reflected from the SERVO MOTORS whenever the system is rapidly decelerated. The unit, which consists of a power resistor and switching circuit, protects the SERVO DRIVER's 96VDC power supply from overvoltage due to electrical feedback.

The OceanTRx™7-300 SYSTEM supports the following shunt regulators:

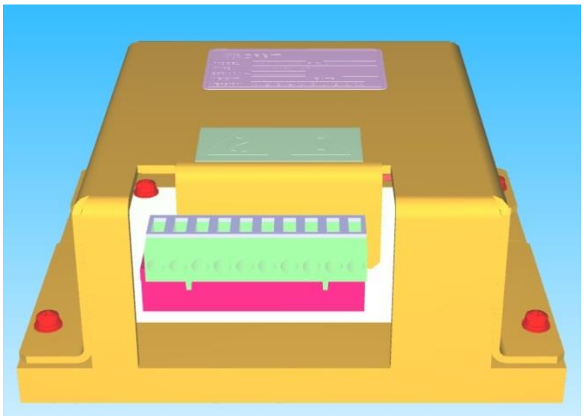


Figure 2-12: Shunt Regulator for OrBand

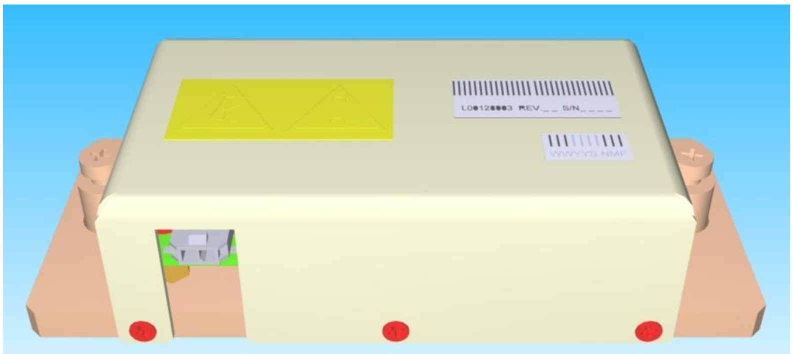


Figure 2-13: Shunt Regulator for OceanTRx™7-300

The SHUNT REGULATORs have the same mechanical interface and different electrical interfaces.

2.1.8 GPS Module

For OrBand Systems:

The GPS MODULE is mounted on the ANTENNA DISH and connected by a USB extender (part of the system MAIN HARNESS) to the ACU.

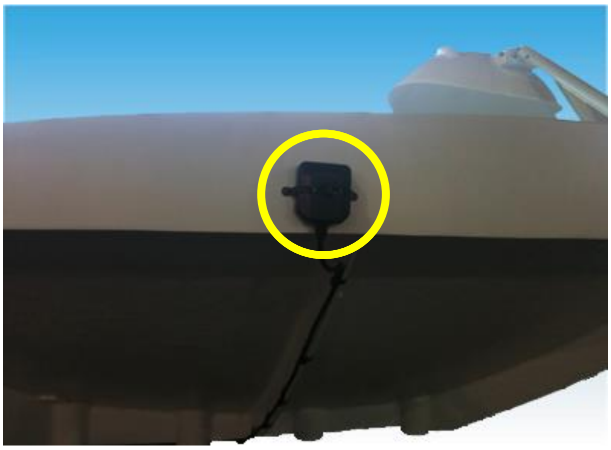


Figure 2-14: GPS Module (typical) for OrBand

For OceanTRxTM7-300 systems:

The GPS MODULE is mounted on the ACU and servo driver POWER SUPPLY MODULE COVER and connected directly to the ACU.

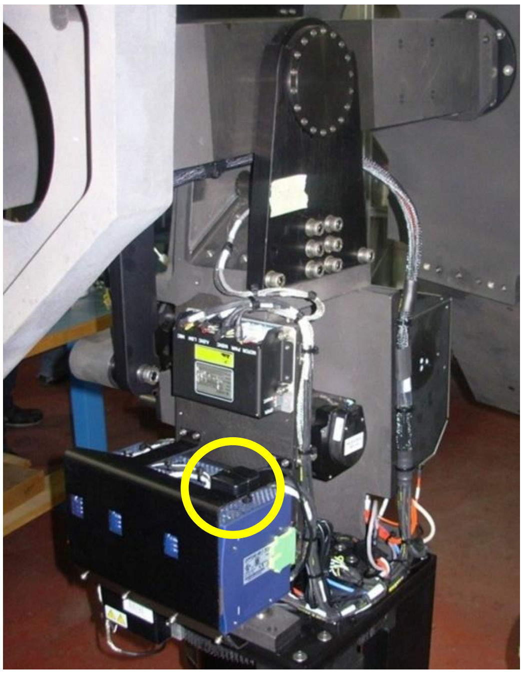


Figure 2-15: GPS Module (typical) for OceanTRx™7-300

2.1.9 Inertial Measurement Unit

A strap-down solid-state INERTIAL MEASUREMENT UNIT (IMU) is installed on the PEDESTAL and provides accurate dynamic readings of the platform's sea movement to the ACU. The ACU stabilizes the ANTENNA accordingly in real-time via the SERVO SUBSYSTEM.

The IMU reports the following data:

- Pitch and Roll – Short-term data is measured by two RATE-GYRO SENSORS that are dynamically integrated by the ACU with long-term data measured by two INCLINOMETERS.
- Yaw Variations – Short-term data that is measured by a RATE-GYRO SENSOR, and dynamically integrated by the ACU with long-term yaw data received from the ship's gyrocompass.

The OceanTRx™7-300 SYSTEM supports the following IMUs:

Figure 2-16: Inertial Measurement Unit for OrBand/OceanTRx™7-300

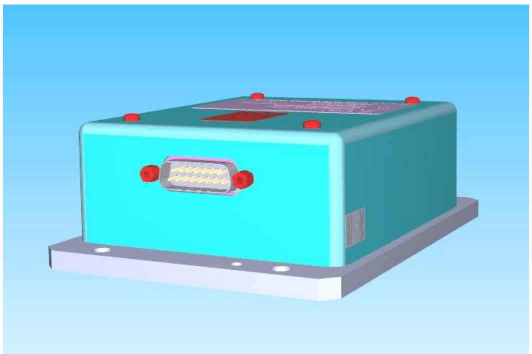


Figure 2-17: Inertial Measurement Unit for OceanTRx™7-300

The IMUs have the same mechanical interface and different electrical interfaces.

2.1.10 RF Package

The RF PACKAGE includes the following components:

- ANTENNA and SUBREFLECTORS
- RF FEED
- BUC
- RF cables that connect the BUC to the RF FEED

2.1.11 Antenna and Sub-reflectors

The OceanTRx™7-300 system provides a high-efficiency dual-offset Gregorian (see: Dual-Offset-Gregorian Antenna on page 207) 2.2m (87”) composite material ANTENNA and SUBREFLECTOR.

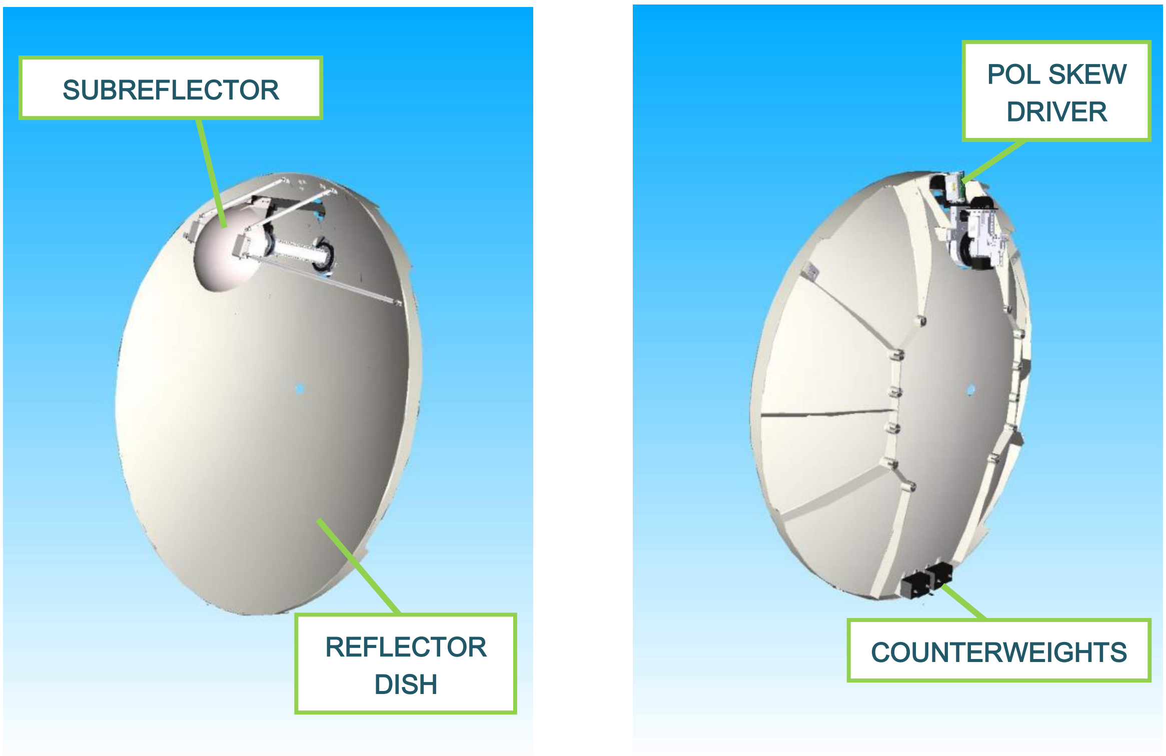


Figure 2-18: 2.2m (87”) Antenna

For Ku-Band systems, the RF Package includes an additional SUBREFLECTOR, mounted on the ANTENNA.

2.1.12 RF Feed

The Tx/Rx RF FEED is mounted on the ANTENNA, and includes the following components:

- FEED HORN – Performs impedance matching between the RF FRONT END and the SUBREFLECTOR.
- RF FRONT END – Filters the signals, separates the Tx and Rx signals and performs polarization separation.
- LOW NOISE BLOCK (LNB) – Down-converts & amplifies the RF signals to L-Band signals.
- Polarization skew servo sub-system – Consists of a polarization skew servo driver and motor and electrically switches the polarization of the RF FEED.

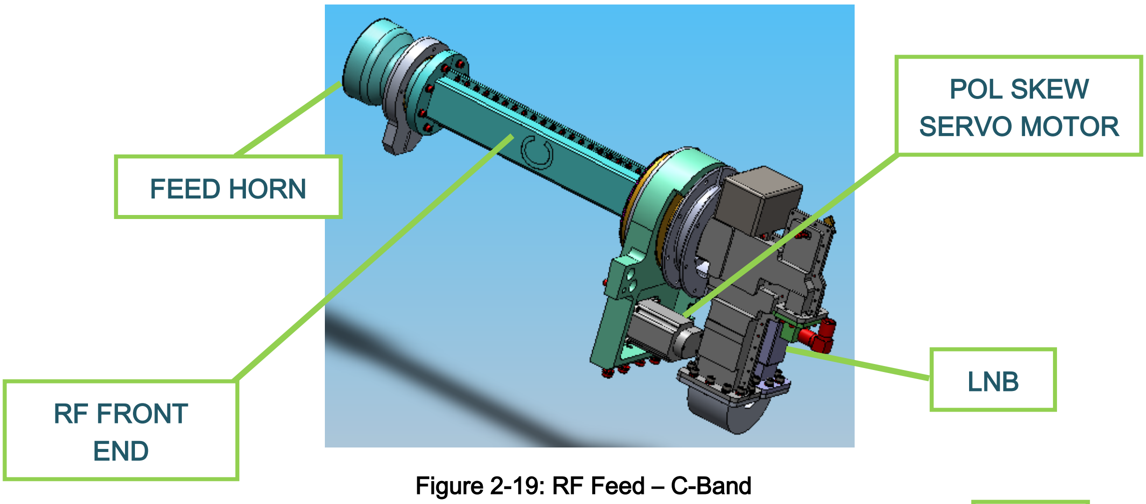


Figure 2-19: RF Feed – C-Band

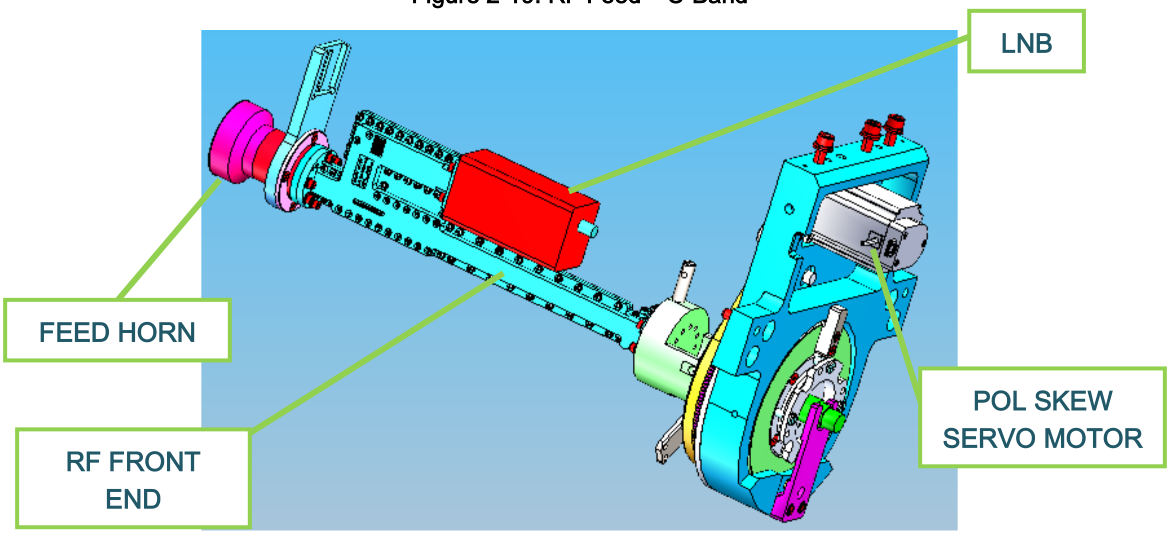


Figure 2-20: RF Feed - Ku-Band

2.1.13 Block Up-Converter

The OceanTRx™7-300 system is supplied with a C-Band and/or Ku-Band BLOCK UP-CONVERTER (BUC) which serves as the system's RF transmitter.

The BUC receives the IF signal from the modem in L-Band via the ADMX, then up-converts and amplifies the IF signal to C-Band or Ku-Band for transmission to the satellite.

The BUC assembly consists of the following components:

- INPUT and OUTPUT POWER MONITORS
- VARIABLE ATTENUATOR
- FREQUENCY UP-CONVERTER
- LOCAL OSCILLATOR (internal or external)
- SOLID STATE POWER AMPLIFIER

The BUC Block is given below:

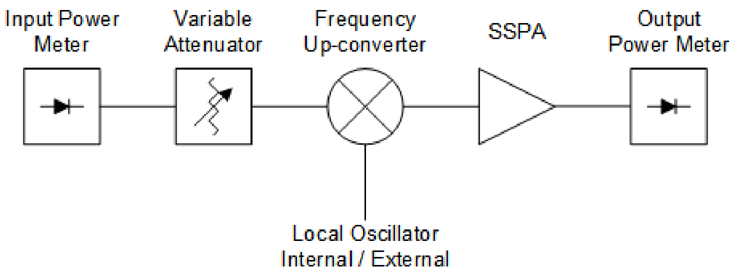


Figure 2-21: BUC Block Diagram

2.1.14 RF Cables

The RF cables connect the BUC to the RF Feed. There are two types of RF cables:

- For C-Band BUCs, the cable is long and flexible.
- For Ku-Band BUCs, the cable is short and not as flexible.

2.1.15 Above Deck Mux

The ADMX (mounted on the PEDESTAL) and the BDMX (inside the BDE CCU) multiplexer modules form the communications link between the ADE and BDE, thus minimizing the physical connection to a single coaxial cable (LMR-200, LMR-400 or LMR-600, depending on the required cable length).

The ADMX also provides integral amplification and attenuation of Tx and Rx paths.

Figure 2-22: ADMx

2.1.16 Power Connection Box

The ADE receives mains AC power via the POWER CONNECTION BOX.

The POWER CONNECTION BOX includes the following interfaces:

- Utility power outlet
- Mains AC power connection
- IMU cable connection
- ADE power ON/OFF switch
- Ground
- ADMX/BDMX coaxial cable connection

There are two versions of the ADE POWER CONNECTION BOX. The newer version (OceanTRx™7-300) uses a D-Type IMU cable connector and includes surge protection.

Figure 2-23: ADE Power Connection Box for OrBand

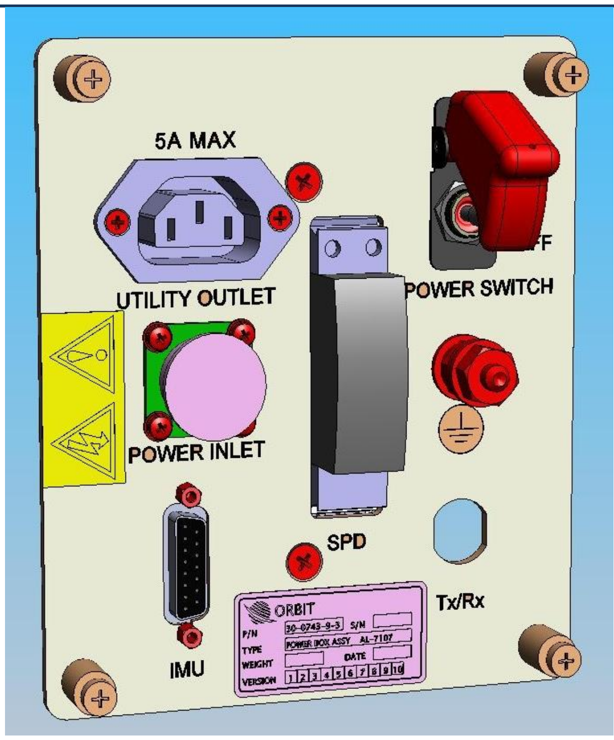


Figure 2-24: ADE Power Connection Box for OceanTRx™7-300

The POWER CONNECTION BOXES have the same mechanical interface and different electrical interfaces.

WARNING!

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

The utility outlet bears the same voltage as the input power. Be careful not to connect a device that uses a different voltage (for example, an 110VAC device where the input is 220VAC).

2.2 Below Deck Equipment

The BDE includes the following main components:

- CENTRAL CONTROL UNIT (CCU)
- DUAL SYSTEM SELECTOR (DSS) (for dual system configurations only)
- MODEM
- BELOW DECK FIBER OPTIC CONVERTER (for dual system configurations with FOC)

2.2.1 Central Control Unit

The CENTRAL CONTROL UNIT (CCU) is the interface between the system, the ship's equipment and the human operator.

The CCU provides the following functions:

- Modem interface
- Conversion of compass inputs
- Integrated Receiver/Decoder (IRD) interface
- Tx and Rx signal attenuation
- De-muxing and muxing of Tx and Rx signals, LAN and 10MHz reference signal
- Ethernet Hub
- Running platform for MtsVLink software
- Transmission of system GPS data to the CFE modem
- SNMP support for network management

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

- CCU – requires 10MHz reference to be supplied by CFE modem
- CCU WITH 10MHZ – includes an internal 10MHz reference source

---

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

Manual monitoring and control is performed by using the provided MtsVLink software running on Windows Embedded CE 6.0 operating system (see **Section 4 System Commissioning** on page 84 for details).

The rear panel includes several connectors that connect to the ADE, the modem and the ship's gyrocompass (NMEA-0183, Synchro or Step-by-Step). An ATTENUATOR SWITCH allows adaptation to various ADE-BDE cable lengths.

The CCU includes the BDMX module that connects to the ADMX via a single coaxial cable. The BDMX provides integral amplification/attenuation of the Tx and Rx paths.

System operation is fully controlled from the CCU. Using the HMI, the operator can select the desired satellite and channel from the CCU's Satellite database. The system automatically extracts the required data and deploys the ACU to acquire and track the selected satellite, while compensating for the platform's Pitch, Roll and Yaw movements.

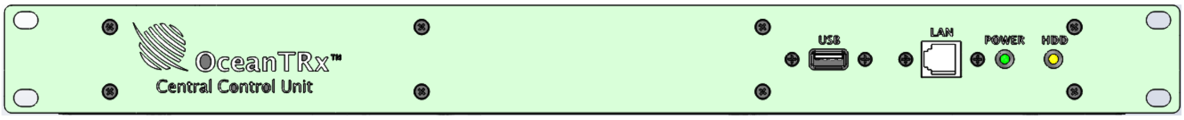


Figure 2-25: Central Control Unit

2.2.2 Dual System Selector

The DUAL SYSTEM SELECTOR (DSS) is used in the dual system configurations. One system is connected to the CCU, and the other system is connected to the DSS. The DSS is connected to the CFE modem and the CCU.

The DSS provides the following functions:

- Modem interface
- Routes Tx and Rx signals between the active system and the modem
- Integrated Receiver/Decoder (IRD) interface
- Tx and Rx signal attenuation
- De-muxing and muxing of Tx and Rx signals, LAN and 10MHz reference signal

Figure 2-26: Dual System Selector

2.2.3 Modem

The modem provides all the functionality required to transmit and receive data in L-Band.

The modem and distribution array items are supplied and installed by a third party. Therefore, they are not described in this manual.

2.3 Fiber Optic Equipment (Optional)

Upon costumer's order request, the BDE can be connected to the ADE via fiber optics. The costumer shall receive Above Deck Fiber Optic Converter (ADFOC) and Below Deck Fiber Optic Converter (BDFOC). The ADFOC and BDFOC provide the required L-Band to optic conversion (and vice versa) between the antenna and the BDE, enabling the L-Band, M&C, and 10MHz signals to be transmitted over fiber optics.

2.3.1 ADFOC

The Above Deck Fiber Optic Converter (ADFOC) unit is installed above the deck, adjacent to each antenna. Each ADFOC performs the following functions:

- LAN conversion - converts the LAN signal to optic signals (and vice-versa), thus allowing communication between the antenna (ACU) and the CCU.
- DL - converts the received L-band signal from the antenna to a fiber-optic signal and forwards it to the BDFOC.
- UL and 10MHz - convert and converges the fiber-optic signals from the BDFOC to the L-band and 10MHz signals.

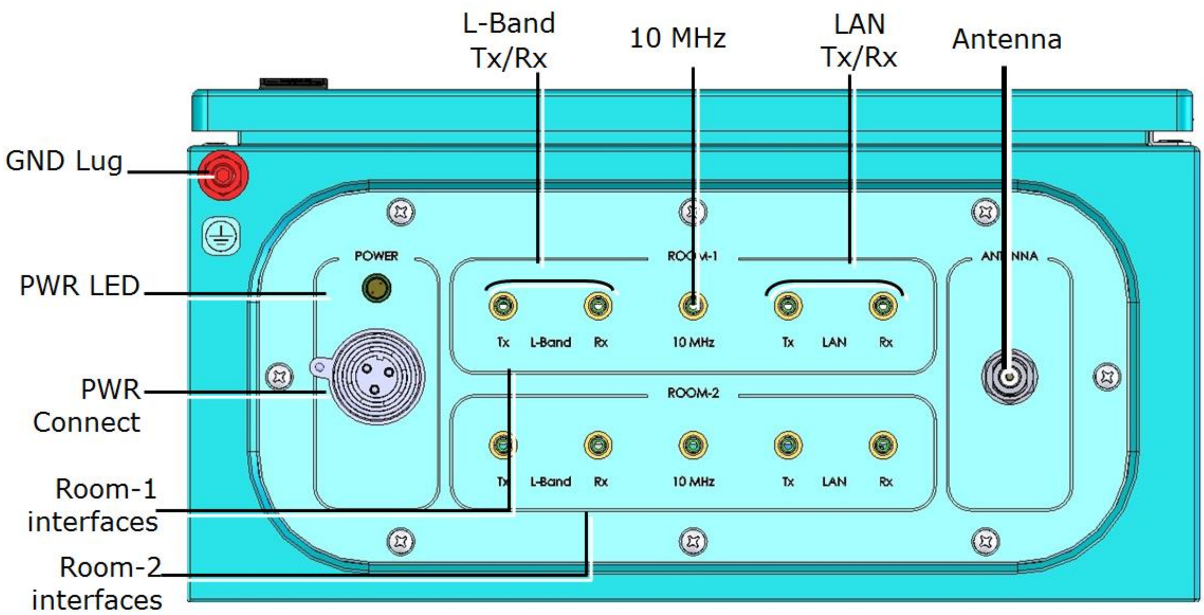


Figure 2-27.ADFOC Front Panel

Table 2-3: ADFOC Port Descriptions

Interface	Description
Power	Green LED – indicates connection to power. Power connector - 3-pin 115/230 VAC power (mate connector supplied)
GND	GND Lug connections
Antenna	N-type female connector. Antenna coax cable connection.
Room-1/2	Five FC/PC optic fiber connectors: • L-band Tx (UL) (Fiber-in) – from BDFOC Tx (UL) • L-band Rx (DL) (Fiber-out) – to BDFOC Rx (DL) • 10MHz (UL) (Fiber-in) – from 10MHz BDFOC • LAN (control) Tx (Fiber-in) – from BDFOC LAN Tx • LAN (control) Rx (Fiber-out) – to BDFOC LAN Rx

2.3.2 BDFOC

Optic to coax converter unit is installed in the communication room rack located below the deck. The BDFOC unit is installed adjacent to the CCU/DSS/OSS. Each BDFOC unit is connected to a dedicated ADFOC unit via fiber cables.

Note In dual-communication room installations, a BDFOC in each room is associated with the same ADFOC unit (and to the corresponding antenna).

Each BDFOC unit performs the following functions:

- LAN conversion - converts the LAN signal to optic signals (and vice-versa), thus allowing communication between the antenna (ACU) and the CCU.
- DownLink (DL) - converts the received fiber-optic signal from the ADFOC to an L-band signal and forwards it to the OSS.
- UpLink (UL) and 10MHz - convert and converges the L-band and 10MHz signals to fiber-optic signals and routes them to the ADFOC.

Figure 2-28.BDFOC Front Panel

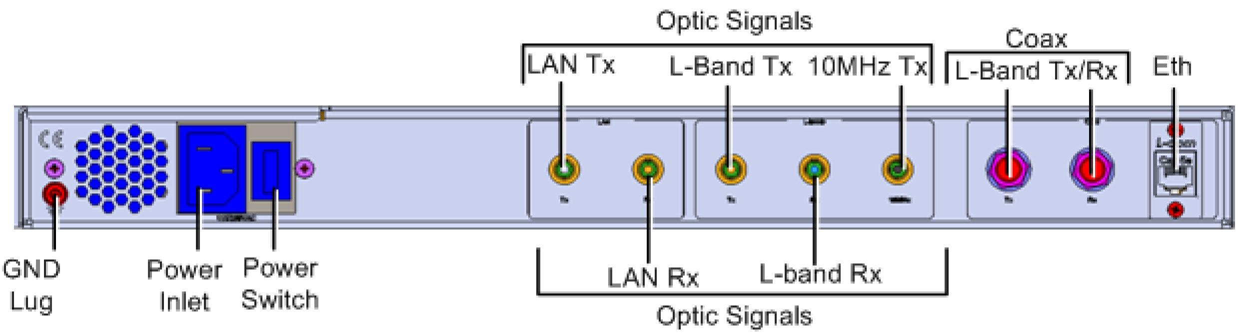


Figure 2-29.BDFOC Rear Panel

Table 2-4: BDFOC Rear panel Interfaces

Interface	Description
Power	Power Inlet: 115/230 VAC Power Switch: On/Off
LAN	FC/PC optic fiber connectors: • LAN (Control) Tx Fiber-out – to ADFOC LAN Tx • LAN (Control) Rx Fiber-in – from ADFOC LAN Rx
L-Band	FC/PC optic fiber connectors: • L-band Tx (UL) Fiber-out – to ADFOC Tx (UL) • 10MHz (UL) Fiber-out – to ADFOC 10MHz • L-band Rx (DL) Fiber-in – from ADFOC Rx (DL)
Coax	Coax L-band connections to OSS: • L-band Tx (UL) + 10MHz Coax-out – to DSS • L-band Rx (DL) + 10MHz Coax-in – from DSS

2.3.1 Connection Diagram

Inside the ADFOC installed a BDMx units used to Mux/de-Mux the signal received from the antenna's ADMx. In the turn these signal are converted to fiber optics and transmitted/received to/from the BDFOC.

Inside the BDFOC installed an ADMx unit used to Mux/de-Mux the signal received from the CCU BDMx. In the turn these signal are converted to fiber optics and transmitted/received to/from the BDFOC.

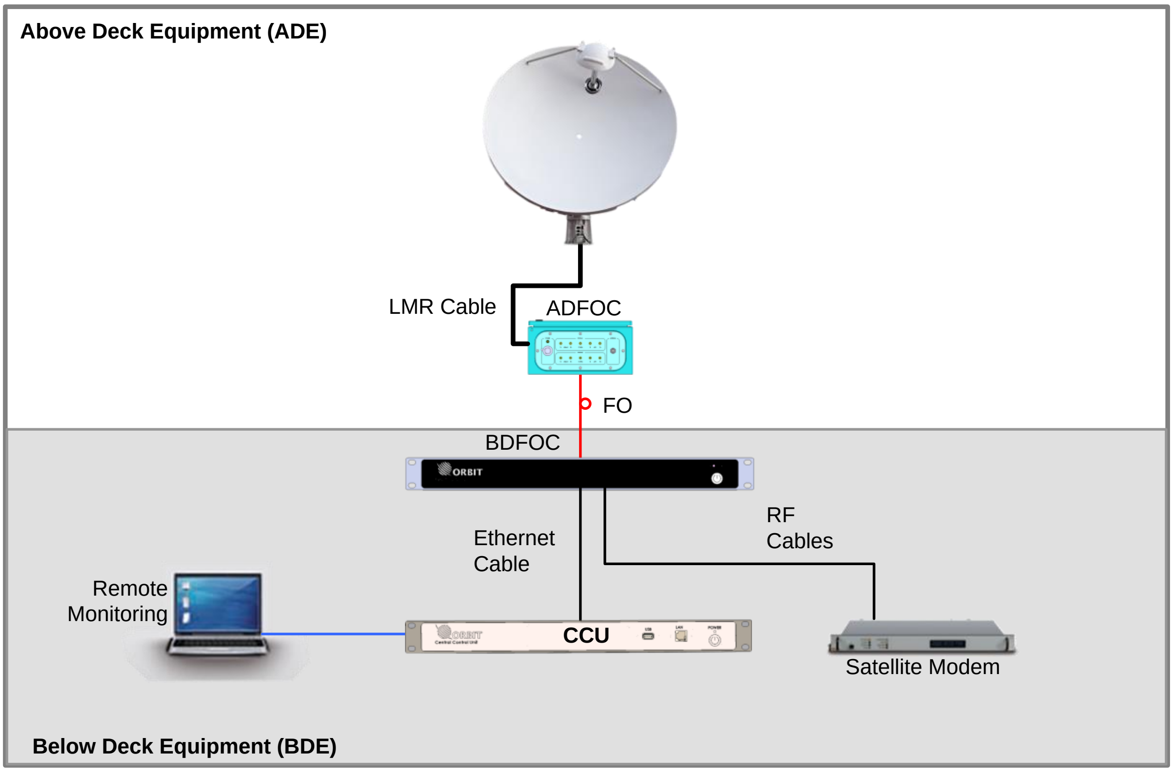


Figure 2-30.ADFOC Front Panel

2.4 ADE-BDE Link (ADMx/BDMx Modules)

The ADMX and the BDMX multiplexer modules form the ADE-to-BDE link, that carries the following multiplexed signals:

- CCU-to-ACU LAN connection for monitor and control (M&C)
- 10MHz reference signal to the BUC and the LNB, as required
- L-Band Tx (to BUC)
- L-Band Rx (from LNB)

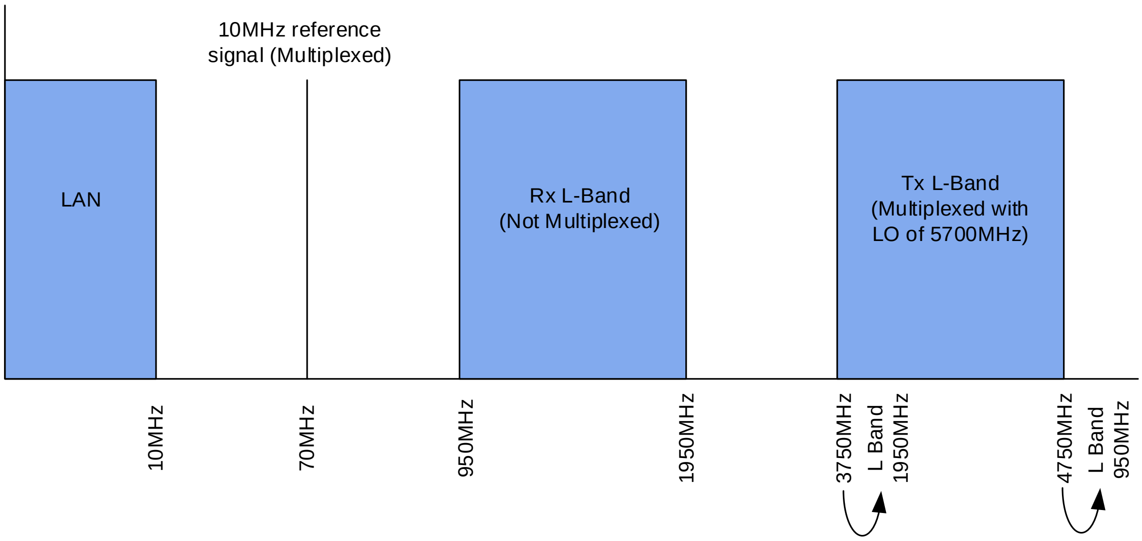


Figure 2-31: ADMx-BDMx Link Frequencies

The 10MHz reference signal from the BDMX is multiplexed to 70MHz. This signal is used to generate the internal ADMX and BDMX 5.7GHz LO. When the signal reaches the ADMX, it is de-multiplexed to 10MHz and transmitted through the Tx and Rx ports.

The Tx signal from the BDMX is multiplexed to a higher frequency range using the internal LO of 5.7GHz. When the signal reaches the ADMX, it is de-multiplexed to the original frequency range using the same LO.

The following figure illustrates the ADMX-BDMX link that includes the various signals that are multiplexed and carried between the ADE and BDE:

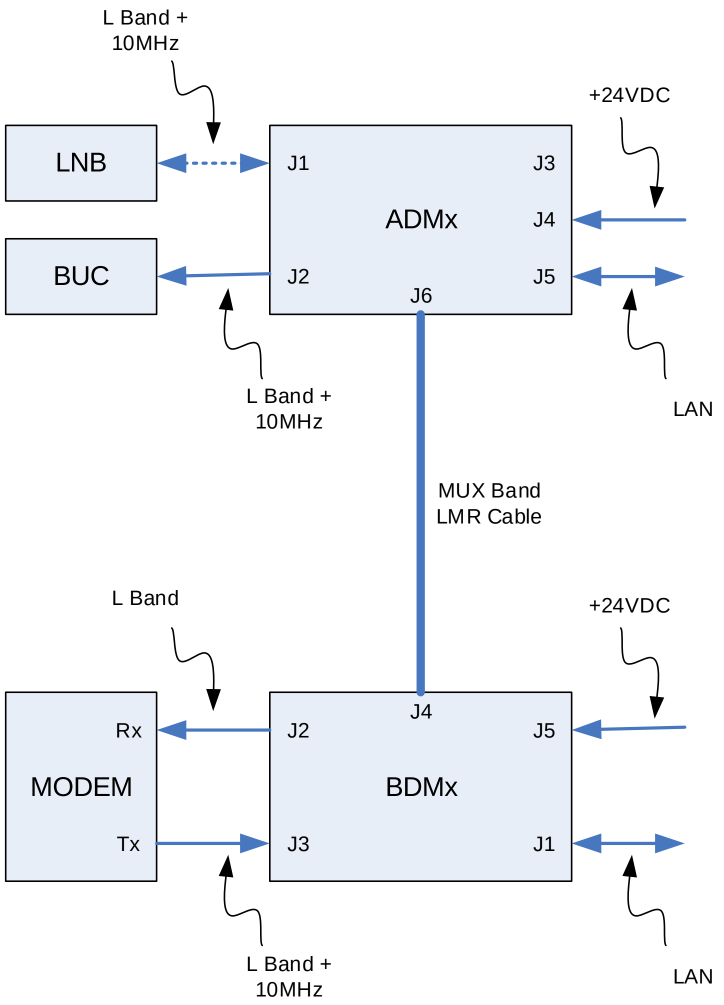


Figure 2-32: ADMx-BDMx Signals

The ADE-BDE connection is designed for best performance when using a Times LMR-200 cable for lengths of up to 30m, an LMR-400 cable for lengths of up to 50m, or an LMR-600 cable for lengths of up to 140m.

To calculate the Tx and RX signal levels between the BDE and the ADE, see **Section 4.6.3 "Calculating Tx/Rx Path Overall Gain**" on page 104.

2.5 ADE Interconnections and Cables

The OceanTRx™7-300 ADE wiring system includes the following:

- Main harness that connects:
  - The ACU to the elevation and polarization SERVO DRIVER M&C
  - Power supplies to all elevation and polarization SERVO DRIVERS
  - The ACU to BUC M&C using the appropriate adapter cable
  - AC power supply to the BUC using the appropriate adaptor cable.
  - Tx coaxial path connecting the BUC to the ADMX.
  - Rx coaxial path connecting the LNB to the ADMX and the ACU via the 2-WAY SPLITTER.
- ADE Cables wiring
  - The ACU to the tilt and azimuth SERVO DRIVER M&C
  - Power supplies to tilt and azimuth SERVO DRIVERS
  - Power supply wiring (AC & DC)
- COAX CABLE between single-channel ROTARY-JOINT and ADMX.
- Slip-ring assembly passing the AC mains power to the power supplies as well as IMU signals to the ACU.

2.6 Block Diagrams

2.6.1 Overall System Architecture

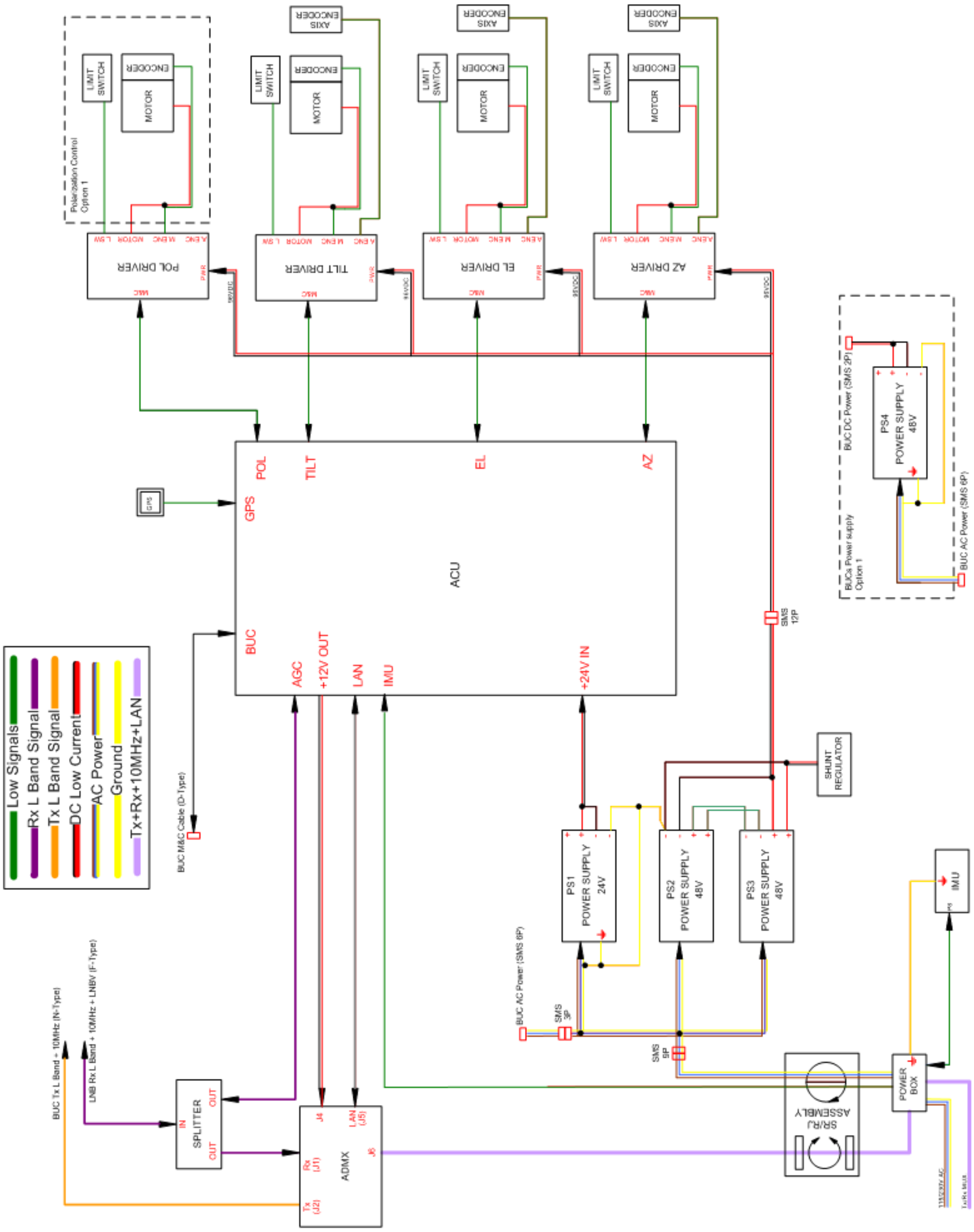


Figure 2-33: OceanTRx™7-300 ADE Connection Block Diagram

3 System Installation

Installation of the OceanTRx™7-300 system consists of the following steps:

- Ship survey and installation planning
- Unpacking the system
- Assembling the Radome
- Installing the ADE
- Installing the BDE

As you perform the installation process, monitor your progress by filling out the Installation Checklist provided in **Installation Checklist**.

3.1 Ship Survey and Installation Planning

Ship survey and installation planning go hand-in-hand, and comprise the first part of the installation process.

The survey serves to familiarize you with the installation site to ensure that all the necessary pre-installation tasks can be carried out properly. It should also provide valuable information on the ship's facilities and the various parameters that affect installation planning. Visit to the ship if organized with an authorized representative of the ship's personnel, the best way to become familiar with the installation site.

3.1.1 Ship Survey

During your visit to the ship, prepare a site survey report that will allow accurate and efficient installation planning. (Use the Pre-installation Checklist form provided in **Pre-Installation Checklist**.) Particular attention should be paid to blockage zones and other interfering equipment, as well as available interfaces with the ship's systems (for example, power, compass, air conditioning vents etc.) and cable layout.

Study the intended locations for above and below-deck equipment. Ensure that the `RADOME` support (supplied by the shipyard) is designed properly and mounted on the deck.

3.1.2 Installation Planning

Installation planning is a crucial stage in the installation process. Correct planning will ensure a successful installation with minimum difficulties prior to and throughout the system operation.

Make sure to complete the following tasks:

- Visit the ship and familiarize yourself with the ship's layout or receive a completed survey report (see **Section 3.1.1 Ship Survey** on page 46).
- Review the following layout data, as may be available:
  - Ship's construction plan
  - Ship's electric mains layout and UPS access (mandatory)
  - Ship's compass interface type, wiring and availability
- Identify the ship's power supply voltage and frequency
- Identify the ship's compass (standard and voltage)

Use the above information and survey report to prepare an installation plan, which should include the following elements:

- Sheltered shore-side assembly site (dock or hanger)
- Crane access, availability, and height
- Location and orientation of the RADOME SUPPORT
- Orientation of the ADE assembly
- Location of the BDE
- Cable runs

The following sections describe the selection and preparation of installation sites for the above-deck equipment (ADE).

3.1.3 System Mast Template

The OceanTRx™7-300 system's base ring must be attached to the mast with 24 holes: 10 located on the circumference of the system base ring and 14 inside the circumference.

OceanTRx™7-300 system can be ordered with a system mast template. The template is designed to ensure that holes are properly positioned.

In addition, when FOCs are used, depending on the antenna support structure, the ADFOC can be mounted directly on the support structure or on a prepared plate.

Below is the ADFOC mechanical dimensions and Interface Control Drawing.

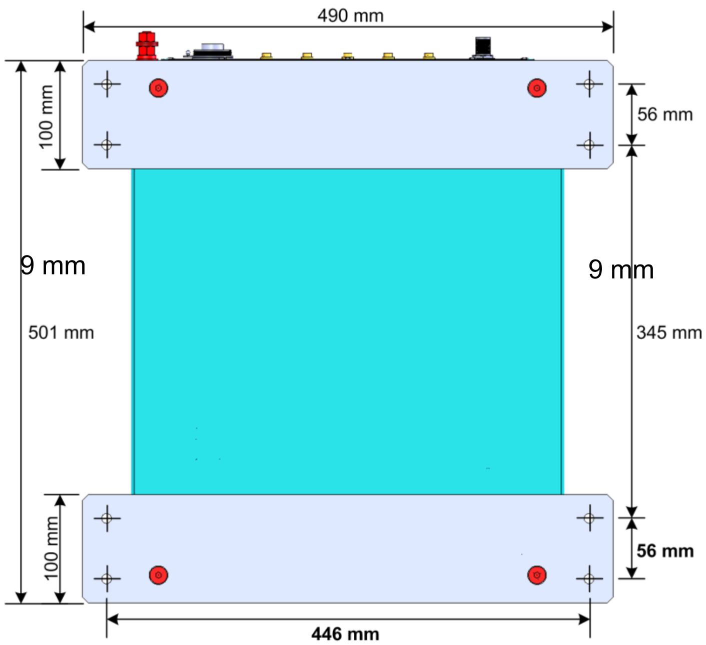


Figure 3-1: ADFOC Rear Panel

3.1.4 Fiber Optic Cables Preparation

- The fiber-optic cables are not supplied with the system.
- Fiber optic cable installation is the responsibility of the customer.
- It is highly recommended, to test fiber-optic insertion loss before the installation.
- During the installation, verify that the fiber-optic connectors are clean.
- Recommended maximum fiber-optic length: 500 meter
- ADFOC and BDFOC fiber-optic performance is calibrated and optimized for 500 meter distance.

3.1.5 System Location and Installation Considerations

System Support Design

The `SYSTEM SUPPORT` connects the system with the deck of the ship. Supplied by the customer, it must conform to the following minimum requirements:

- Location with minimal vibration and signal obstruction.
- Rigid construction & mounting (support must be bolted to the mounting surface).
- Full support of the system – both peripheral and at its center.
- Ease of access to the `RADOME` hatches for maintenance purposes.

Mechanical Design

The system’s support structure must meet the following requirements:

- At the minimum, the system should be mounted no lower than 0.6m (23.5”) above the deck to enable Installation of the screws and for opening the bottom hatch.
- Mechanical stability and support the antenna’s weight about 590Kg (1,300lbs.) and dynamics.
- A level mounting surface (within a few degrees), stable and vibration-free, with a natural resonance frequency of above 30Hz.

- The `SYSTEM SUPPORT` should be designed so that it supports the center of the `RADOME BASE`. This decreases vibrations at the system’s center of gravity, which can cause damage to the motors and gears. The mounting surface should be able to withstand lateral wind loading forces.

The following figure illustrates a suggested support design, consisting of a central support column and surrounding lattice. The support structure is topped by an upside-down replica of the base ring, to ensure precise and stable joining with the ADE assembly:

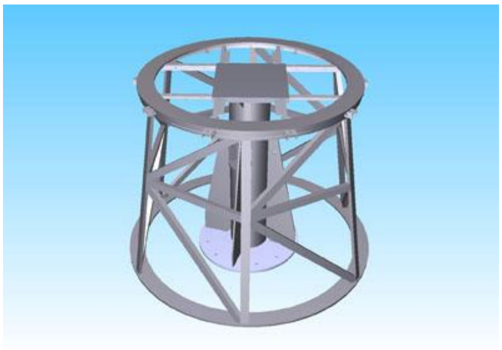


Figure 3-2: System Support (suggested example)

In most cases, preparing for the attachment of Orbit's BASE RING to the SYSTEM SUPPORT, installing the ADE/BDE cables, wiring, installing, and connecting the modem is the responsibility of the shipyard. The remaining installation process is the responsibility of technicians authorized by Orbit Communication Systems Ltd.

Maintenance Access Limitation

To ease access to the bottom hatch located in the RADOME BASE, it is recommended that the SYSTEM SUPPORT is at a height of at least 1.2m above the deck.

Air Conditioning Provision

The RADOME BASE is designed to enable installation of air conditioning ducts. An air conditioning adapter kit for the OceanTRx™7-300 system can be purchased from Orbit Communication Systems Ltd.

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.

Generally, there should be no obstructions to the LOS, with a clear view of the satellite in all directions. However, it is necessary to compromise between the LOS and other considerations.

UPS

The system, including the ADE and the BDE, must be connected to a UPS.

It is recommended to use an On-Line UPS, which functions 100% of the time due to battery backup protection. The UPS should also eliminate incoming power surges and line noise. Alternatively, a Line Interactive UPS can be used. This UPS has enhanced power protection with Automatic Voltage Regulation (AVR).

Ensure that the UPS meets the requirements for ADE and BDE power consumption as described in Table 1-2: System Technical Specifications.

Radiation Considerations

- 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™7-300 system complies with the IEC 60945 standard. The installation should be planned to prevent any radiation level exceeding as defined in the standard. Where there is difficulty calculating the correct conditions, it is recommended to maintain a distance of 10m and 10° from the main lobe of any radar.

BDE Site Considerations

- The distance between the BDE and the Gyrocompass repeater should be considered when choosing the correct interface type and cable.
- The operation of the rack-mounted CCU is largely automatic; however, it is preferable to monitor it periodically. It should therefore be located to facilitate easy access by an operator.
- Consideration should also be given to ensure that there is space around the equipment for the following:
    - The CCU rear panel should have a clearance of at least 30cm to ensure a sufficiently shallow bend in the coaxial cable when connected it to the CCU.
    - The CCU must be located to allow adequate air flow to facilitate heat dissipation.
    - To allow access for technical staff to the rear panel, where the cables are connected.

3.1.6 Pre-Installation Checklist

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

3.2 Unpacking the System

The OceanTRx™7-300 system is packed into two wooden crates – one for the ADE assembly and the BDE and the other for the RADOME – with the following dimensions:

ADE crate:

- **Length:** 2.30m (90.6")
- **Width:** 2.35m (92.5")
- **Height:** 2.24m (88.2")
- **Weight**: ~600Kg (System: 500Kg, Crate: 100Kg)

Radome crate:

- **Length:** 2.30m (90.6")
- **Width:** 2.52m (99.2")
- **Height:** 1.50m (59.1")
- **Weight** : ~350Kg (Radome: 150Kg, Crate: 200Kg)

3.2.1 Crate Contents

The first crate contains the entire ADE assembled on its base plate, as well as a separate package containing the BDE equipment, installation kit, cables, and system documentation.

Figure 3-3: ADE Assembly and CCU in the Shipping Crate

The second crate contains the five side petals and upper dome of the RADOME, together with the hardware (screws, washers and nuts), adhesive seal, and silicone required for assembly.

3.2.2 Unpacking and Visual Inspection

The crate contents may shift during transport. As soon as you open the crate, check for any evidence of external damage. Each crate is equipped with two shock indicators, which turn color if the crate has been exposed to undue shock or vibration in transport. One additional shock indicator is attached to the `PEDESTAL` above the `TILT AXIS SERVO MOTOR`.

Figure 3-4: Shock Indicator on the Packing Crate

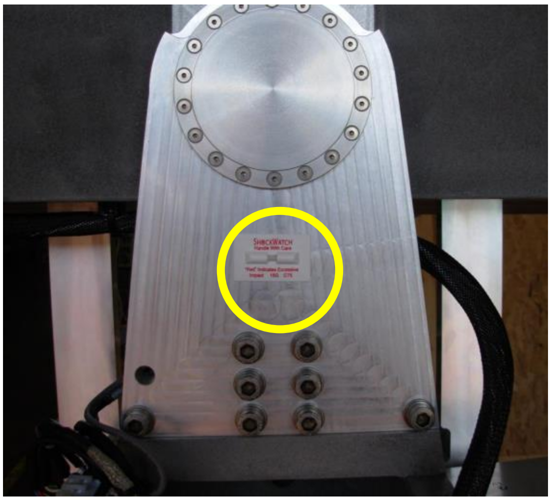


Figure 3-5: Shock Indicator on the Pedestal

➢ **To unpack the system for inspection:**

1. Place the ADE crate on a stable, level surface.
1. Check the shock indicators on the ADE crate. If they have turned red, do not open the crate. Contact the Orbit Communication Systems Ltd. immediately. Otherwise, continue to the next step.
2. Carefully unscrew the screws that hold the top panel of the ADE crate to the side panels.
3. Slide the top panel from ADE crate, ensuring that it remains wholly outside of the crate.
4. Carefully dismantle and remove the side panels of the ADE crate from around the system, ensuring that they do not damage any system components.
5. Check the shock indicator on the PEDESTAL. If it has turned red, contact Orbit Communication Systems Ltd. immediately. Otherwise, continue to the next step.
6. Visually inspect the exterior of the equipment for evidence of any physical damage that might have occurred during shipment or storage.
7. Record the serial numbers of the system and each of its units (for example, ACU, IMU, BUC, CCU), located on each unit's nameplate. This information will be useful if you have to contact the Orbit Service and Support Department.
8. Place the Radome crate on a stable, level surface.
9. Carefully unscrew the screws that hold the top panel of the Radome crate to the side panels.
10. Slide the top panel from the Radome crate, ensuring that it remains wholly outside of the crate.
11. Carefully dismantle and remove the side panels of the Radome crate from around the RADOME, ensuring that they do not damage any of the RADOME components.

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

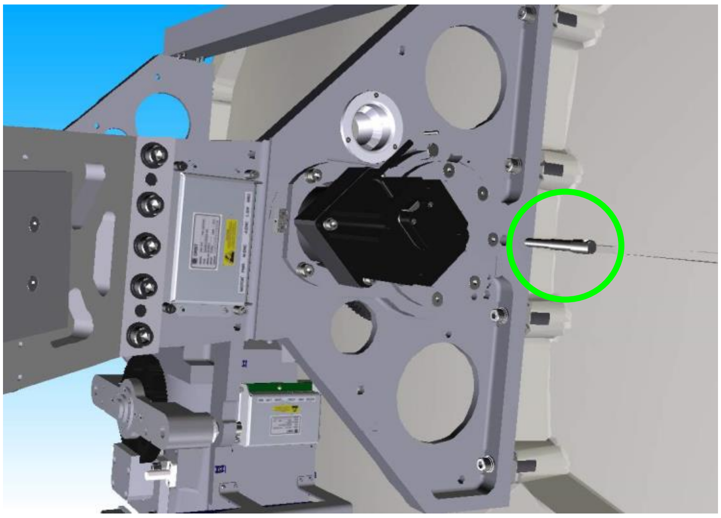
3.2.3 Unlocking the Pedestal Axes

Before assembling the Radome around the antenna, remove the safety locks on the PEDESTAL AXES.

➲ Procedure: Unlocking the Pedestal Axes

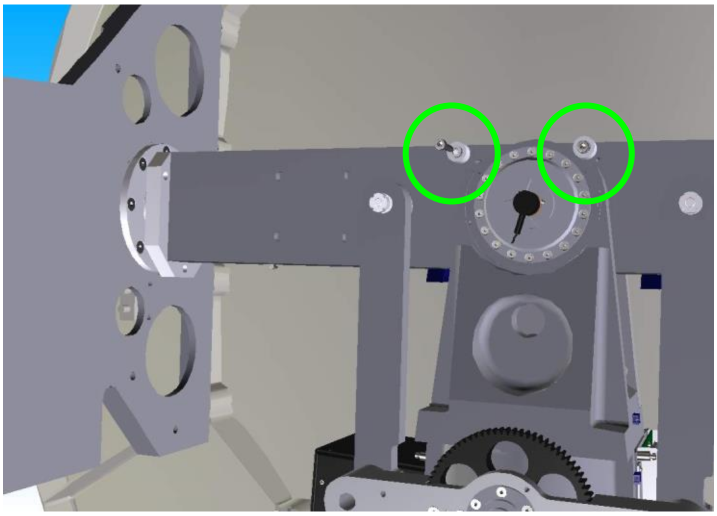
Step 1

Remove the locking pin restricting the ELEVATION AXIS gear wheel.



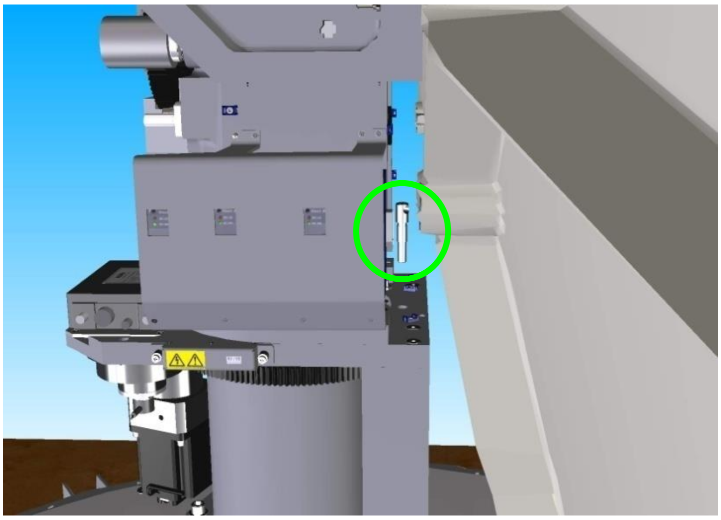
Step 2

Unscrew and remove the rubber plugs restricting the TILT AXIS cylinder.



Step 3

Remove the locking pin restricting the `AZIMUTH AXIS` gear wheel.



Step 4

For C-Band linear systems only, cut and remove the tie-wrap marked ‘Remove Before Operation’, which secures the `RF FEED`.

3.3 Assembling the Radome

Once the unpacking is completed and the locking pins have been removed, the RADOME can be assembled around the ADE.

3.3.1 Preparing the Radome Petals

The RADOME consists of six parts – five side petals and one upper dome.

➢ **To prepare the Radome petals:**

1. Ensure that an adhesive seal is attached to the grooves on the top, bottom, and left side (looking out) of each Radome petal.
2. Use a screwdriver or other sharp implement to punch through the adhesive seal at each screw hole in the top and side of the petal. This will prevent the seal from ripping when the screws are inserted and tightened.

3.3.2 Unlocking the Servo Drivers

The SERVO DRIVERS have mechanical switches with two positions: **MAINT** and **OPER**.

➢ **To unlock the servo drivers:**

1. Move the servo driver switches to the MAINT position.

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

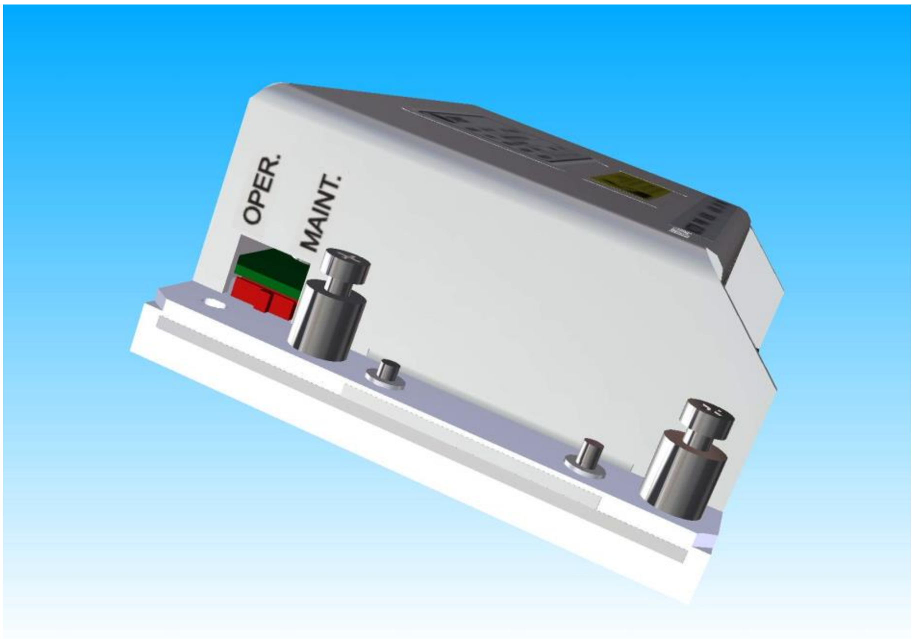


Figure 3-6: Servo Driver Switch

2. When you have completed assembling the RADOME, move these switches to the OPER position.

3.3.3 Assembling the Radome

To prevent gaps in the dome, it is recommended to fit the parts together loosely with the minimum tightening of screws until the RADOME is fully assembled, then to tighten the screws systematically in the manner described in the following procedure.

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

When attaching the petals to one another and to the top section, place a spring washer and a regular washer on the screw, insert the screw through the appropriate hole, place a regular washer on the screw, and close with a nut.

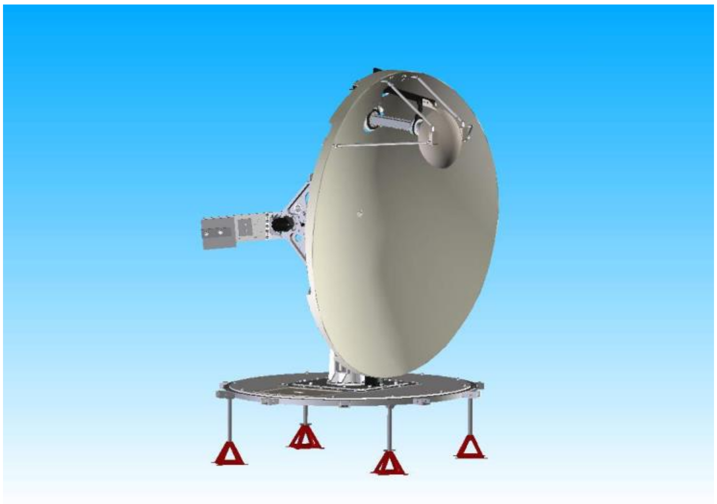
When attaching the petals to the base ring, place a spring washer and a regular washer over the pre-installed screw, and close with a nut.

➲ Procedure: Assembling the Radome

Step 1

Before you begin, prepare the following tools:

1. An 8mm Allen (hex) key
2. A 17mm socket wrench
3. An industrial flashlight
4. A mallet, to coax the RADOME petals and screws into place, as needed.

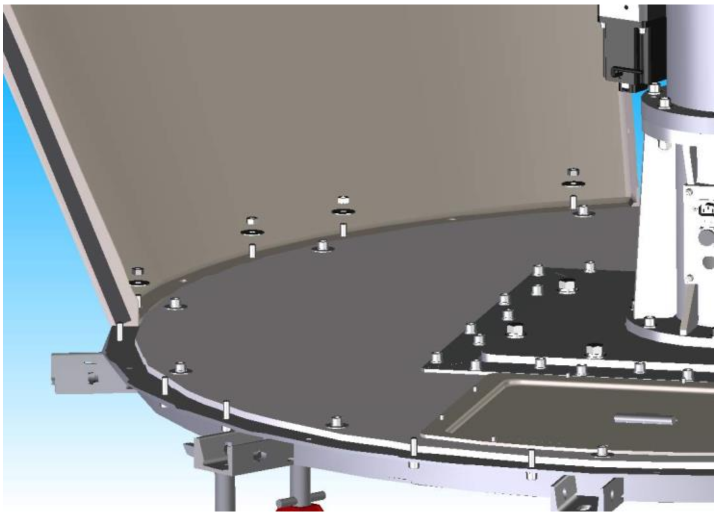


Step 2

Position the first RADOME petal above the BASE RING, and lower it onto the BASE RING screws.

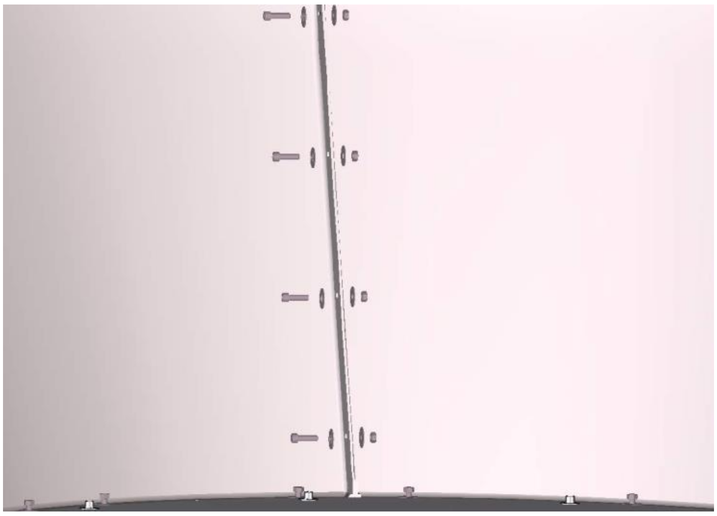
Step 3

Insert the nuts and their washers onto the BASE RING screws and tighten them loosely.



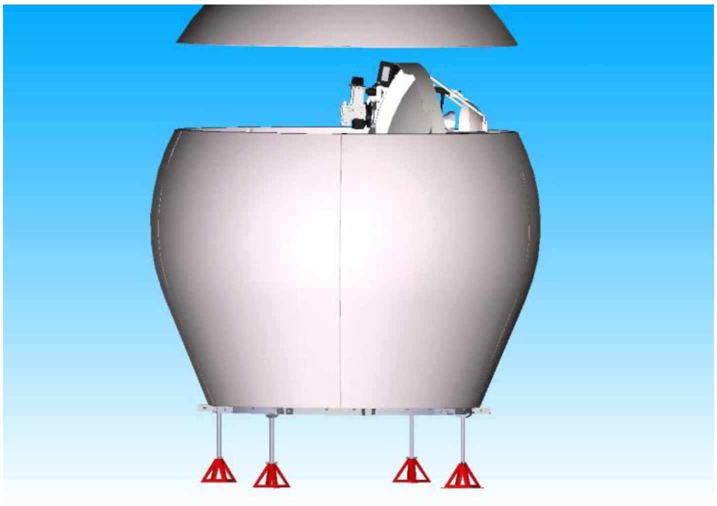
Step 4

Insert the second RADOME petal, screwing it loosely to the first petal and to the BASE RING.



Step 5

When all the RADOME petals are assembled, position the top section into place. Take care not to touch the antenna with the RADOME top section.



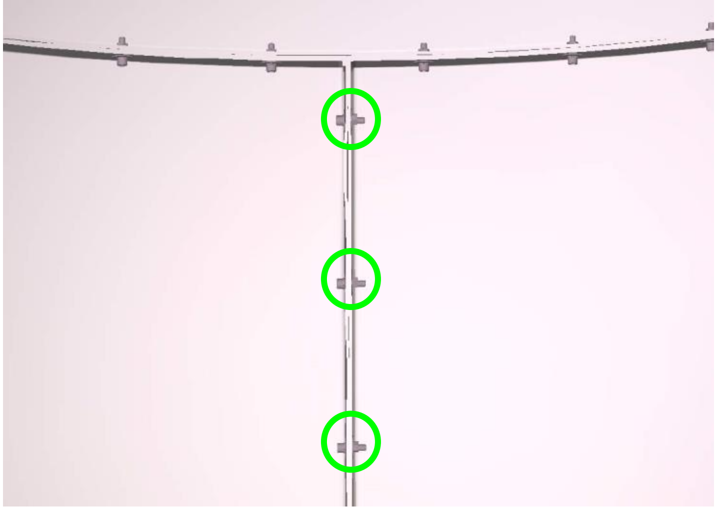
Step 6

Enter the RADOME through the side maintenance hatch. Bring the flashlight, screws, hex key and socket wrench.

Screw the top RADOME section loosely onto the petals.

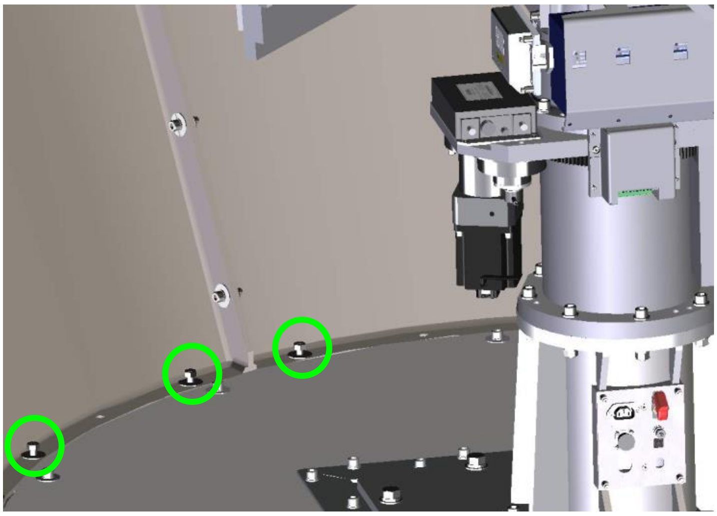
Step 7

Tighten the nuts on the screws connecting the RADOME petals, from the top down. First tighten the top three screws between each petal all around, then the middle three screws, and then the bottom screws.



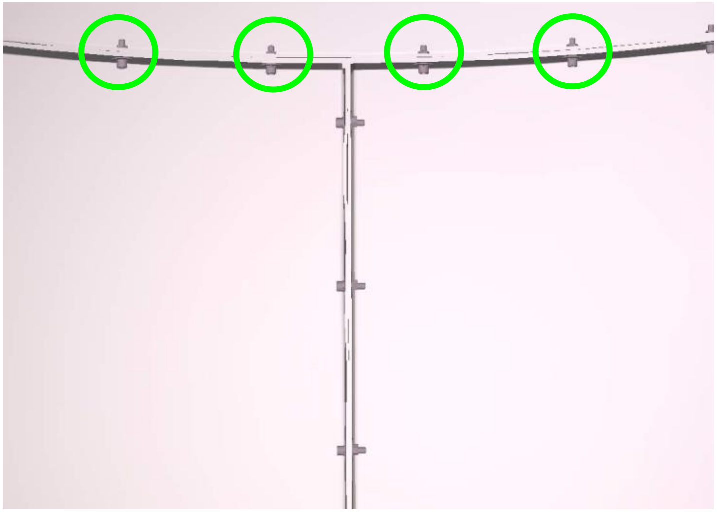
Step 8

Tighten the nuts onto the screws connecting the RADOME petals with the BASE RING.



Step 9

Tighten the nuts onto the screws connecting the RADOME petals with the top section of the RADOME.



Step 10

While standing outside the RADOME, apply silicone all around the RADOME petals.

Make sure the applied silicon will complitly seal the RADOME.

3.4 Installing the ADE

Once the RADOME is assembled and secured, the assembly is ready to be lifted onto the RADOME support structure constructed on the ship.

3.4.1 Lifting Harness

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

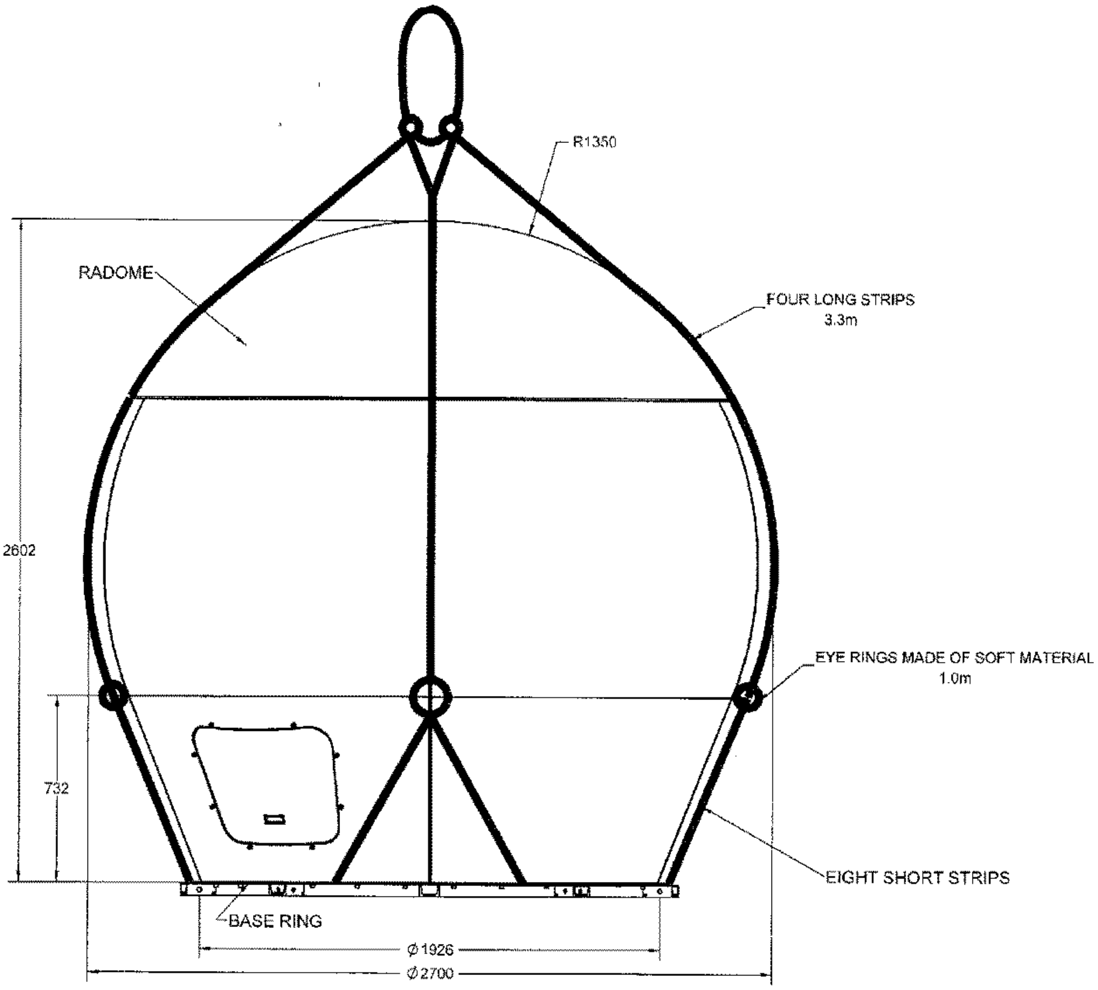


Figure 3-7: Lifting Harness (suggested design)

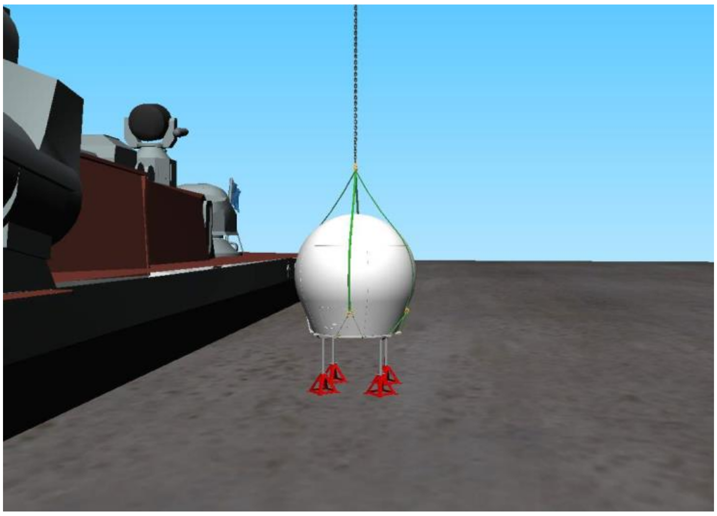
When attaching the system base ring to the SYSTEM SUPPORT, ensure that the used screws are appropriate for the thickness of the SYSTEM SUPPORT.

Twenty-four 60mm and 90mm screws are included in the system installation kit. 14 screws that attach the center of the system base ring to the SYSTEM SUPPORT should not protrude more than 30mm from the SYSTEM SUPPORT. If necessary, use washers below the SYSTEM SUPPORT to ensure that the screws can be tightened properly.

➲ Lifting and Mounting the System onto the Ship

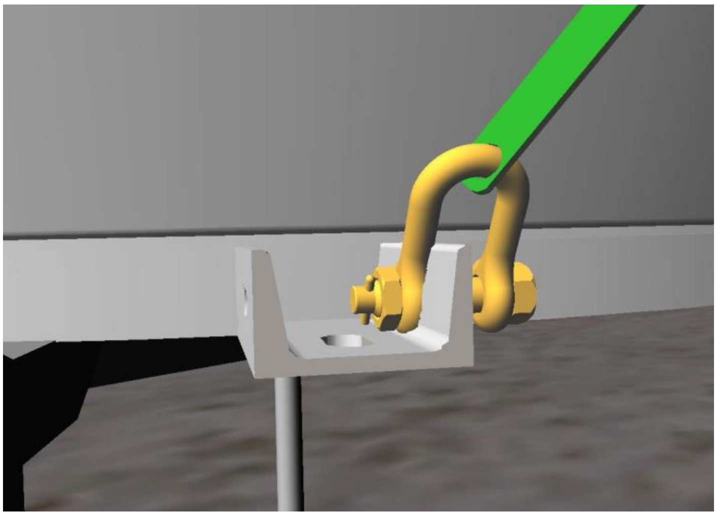
Step 1

Attach the lifting harness to the crane and lower it over the RADOME.

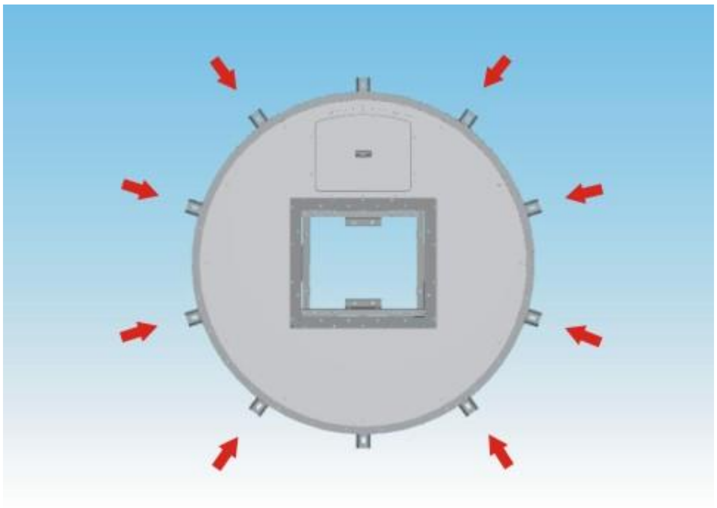


Step 2

Attach the anchor shackles at the end of each short strap to the *right hole* in 8 of the 10 lifting points protruding from the BASE RING.

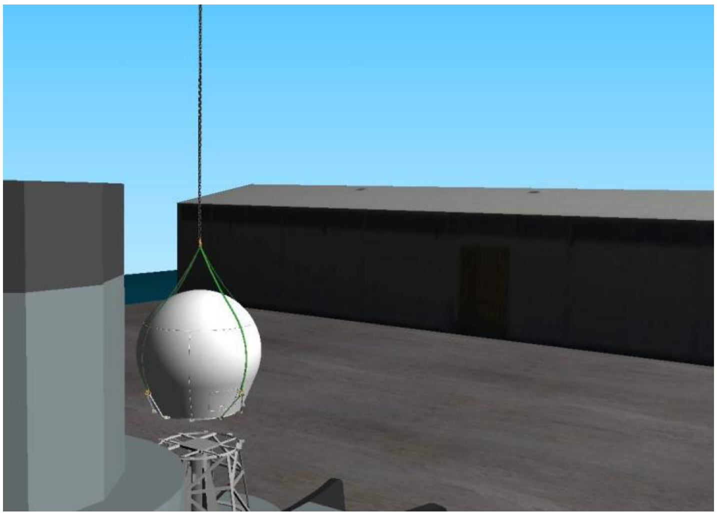


Arrange the straps according to the displayed diagram, in order to distribute the weight of the system properly.



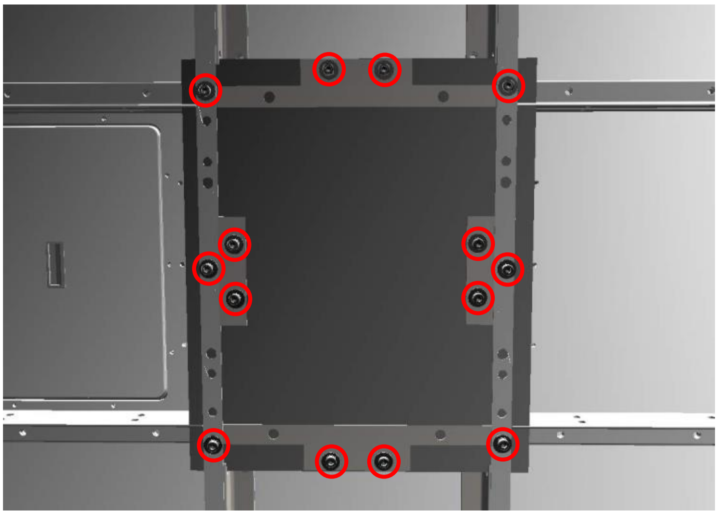
Step 3

Lift the assembly onto the RADOME support structure mounted on the ship.



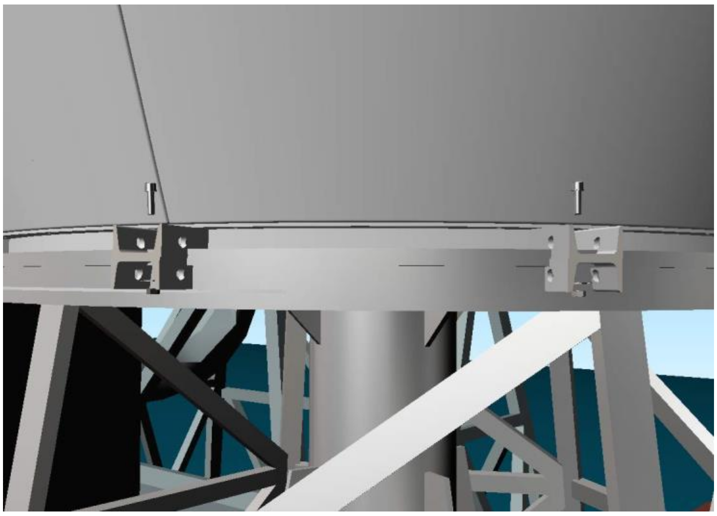
Step 4

Insert M16 screws downwards through the 10 lifting points on the `BASE RING`, and tighten securely.



Step 5

Insert M16 screws with nuts upwards through the `SYSTEM SUPPORT` and into the 14 threaded holes in the center of the `BASE RING`.



3.4.2 ADE Cable Connections

The following cables must be connected to the ADE POWER CONNECTION BOX:

- Mains power supply cable
- LMR coaxial cable for the ADE-BDE link
- Ground wire

Two Holes must be drilled in the radome floor for cable entrance. In the drilled holes Install two cable glands compatible with marine environment.

Pass the power and coax cables through the glands and seal it.

The ADE-BDE and power cables reach the ADE via the RADOME BASE.

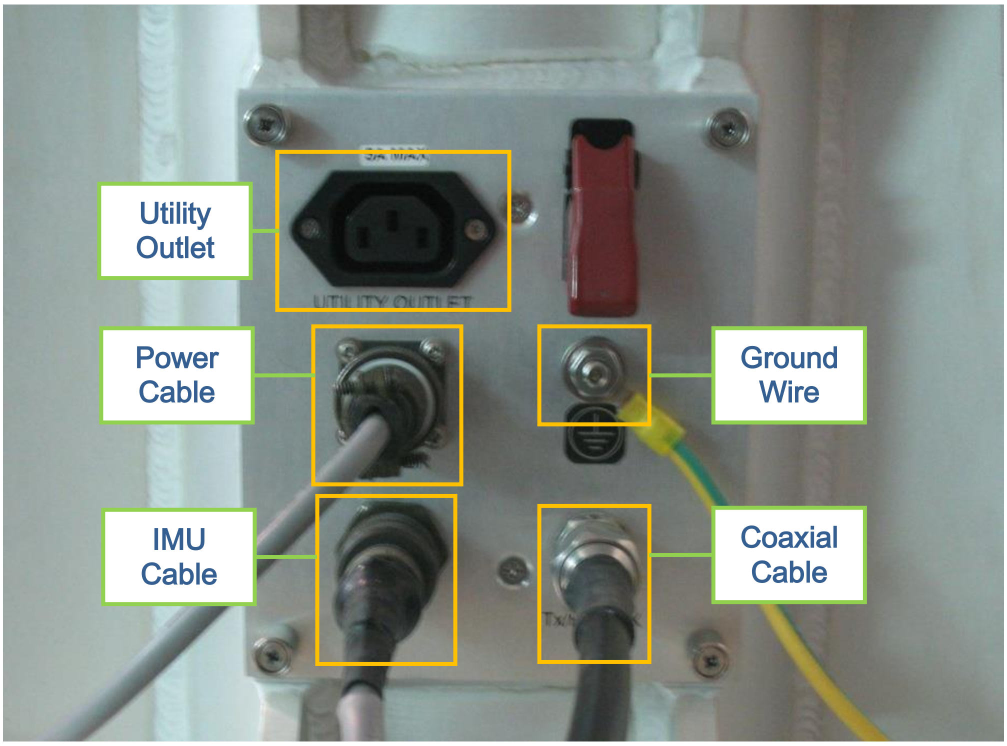


Figure 3-8: Cables Connected with the OrBand ADE Power Box

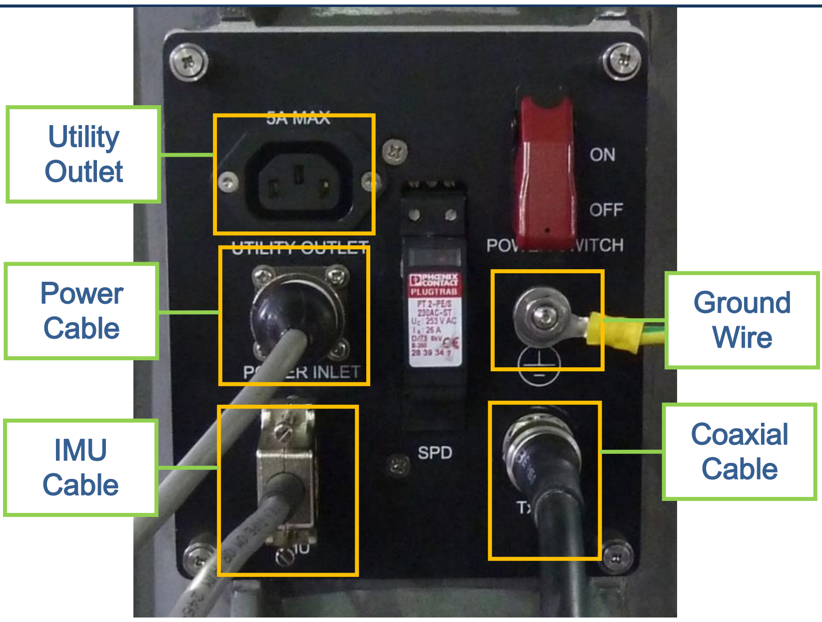


Figure 3-9: Cables Connected with the OceanTRx^{TM}7-300 ADE Power Box

Mains Power Cabling Guidelines

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

- Use a UPS (see **UPS** on page 50).
- Use a 1-phase grounded cable terminating in a 3-contact plug. The cable should be rated for at least 16A.
- Use the shortest possible length of cable permitted by the system's location.
- Use a 16A main circuit breaker on the ship's power source, located as close as possible to the system.

➢ **To connect the ADE to the BDE**

1. Install an N-Type connector on the `ADE` side of the LMR cable (see **Preparing the ADE-BDE Cable** on page 208 for instructions).
2. Attach the cable to the N-Type connector on the `ADE` power box.

3.4.3 ADFOC Mounting

Mount each ADFOC on the inner side of the corresponding support structure (so it optimally sheltered, shaded and covered). One ADFOC is installed per antenna.

Note the following:

- All x8 (9mm) holes must be used to mount the ADFOC.
- The ADFOC must be installed with the connectors facing down.
- The ADFOC must be located so that the connectors can be easily accessed and the cables routed properly (allowing for the required cable radius bend).
- The supplied LMR-200 cable must be used to interconnect the ADFOC to the antenna
- A supplied LMR cable is 6 meters long - when selecting the location of the ADFOC, the cable length must be taken into account.

ADFOC mounting example is given below.

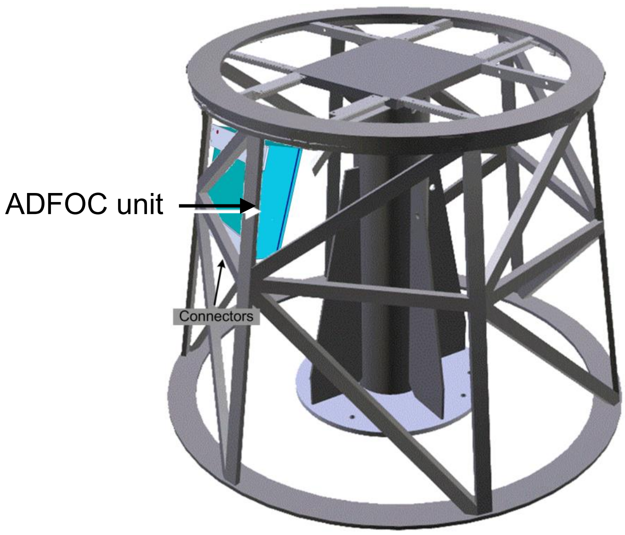


Figure 3-10: Example for ADFOC mounting- Connectors Facing Down

3.4.4 RF Bands

The OceanTRx™7-300 system can support C-Band and Ku-Band. With this configuration, a C-Band BUC and a Ku-Band BUC are installed simultaneously on the PEDESTAL. However, only one RF Feed can be installed at any given time.

For information on disassembling and assembling RF feeds and any other hardware tasks required to switch between C-Band and Ku-Band, see the *OceanTRx™7-300 Maintenance and Troubleshooting Guide*.

3.5 Installing the BDE

3.5.1 Installing the Central Control Unit

The distance between the BDE and the Gyrocompass repeater should be considered when choosing the correct interface type and cable.

Install the CCU in a 19-inch rack. It is recommended to use the supplied rails to install the CCU in the rack.

3.5.2 Central Control Unit Interfaces

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

Table 3-1: CCU Front Panel Interfaces

Interface	Type	Function
USB	USB	General purpose USB port
LAN	RJ-45	Connects to a CFE computer for remote access to the CCU

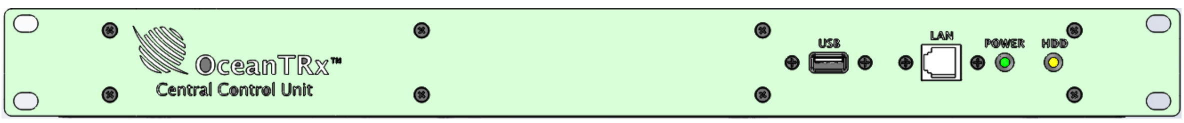


Figure 3-11: CCU Front Panel

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

Table 3-2: CCU Rear Panel Interfaces

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

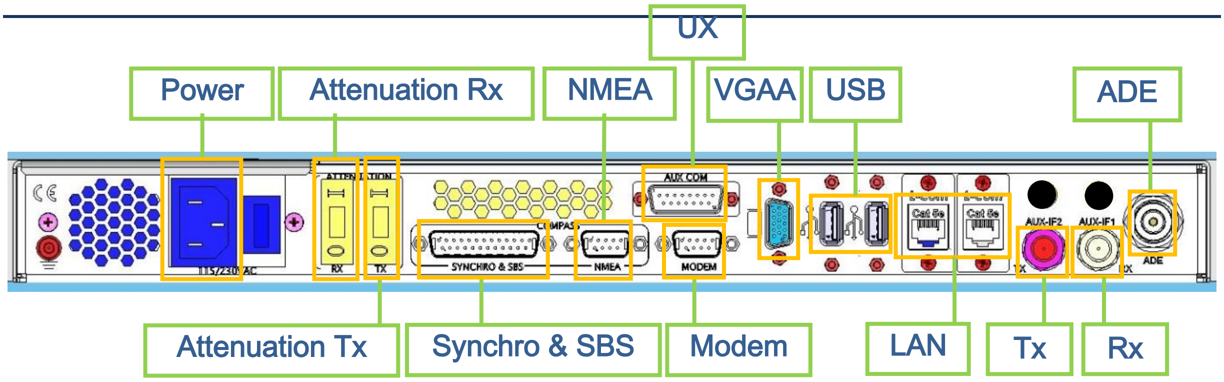


Figure 3-12: CCU without 10MHz Rear Panel

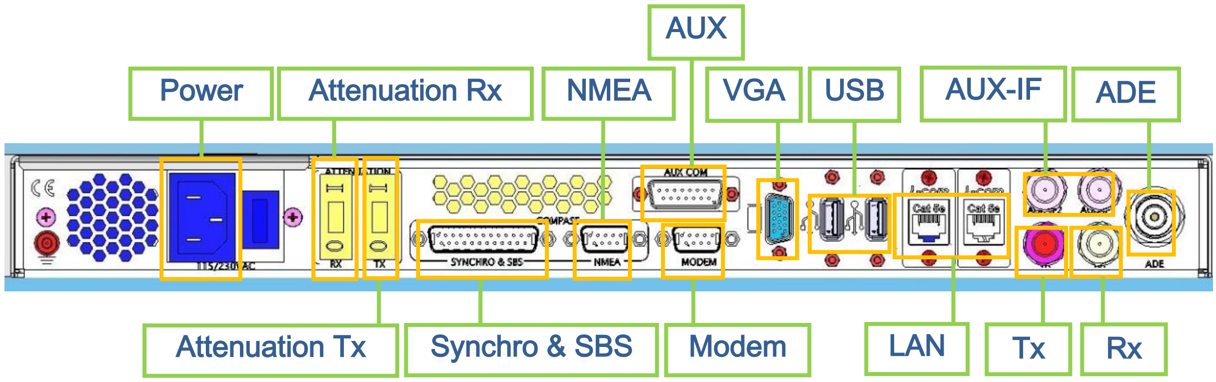


Figure 3-13: CCU with 10MHz Rear Panel

3.5.3 Connecting the CCU Cables

Once the CCU is installed, connect it to the following:

- Power cable
- ADE-BDE LMR coaxial cable
- Modem Tx and Rx ports
- Modem M&C (IRD, GPS output etc. – optional)
- Ship's compass
- HMI devices (optional)

For Dual Systems configurations, the modem Tx and Rx connection is made via DSS. See **Section 3.5.4 Installing the Dual System Selector** on page 79 for information.

Power Cable

➢ **To connect the CCU power cable to the CCU:**

1. Connect the CCU power cable to the UPS that protects the BDE mains power supply.

2. Connect the CCU power cable to the POWER connector on the rear panel of the CCU.

ADE-BDE LMR Coaxial Cable

➢ **To connect the ADE-BDE LMR coaxial cable to the CCU:**

1. Install an N-Type connector on the BDE side of the LMR cable (see "**Preparing the ADE-BDE Cable**" on page 208 for instructions).
2. Connect the cable connector to the ADE connector on the CCU.

Modem Tx and Rx Ports Connection

➢ **To connect the Modem Tx and Rx ports to a CCU without 10MHz:**

1. Connect a cable from the modem's Rx port to the RX connector on the CCU.
2. Connect a cable from the modem's Tx port to the TX connector on the CCU. The modem supplies the 10MHz reference signal with the Tx signal.

The following figure shows the connections:

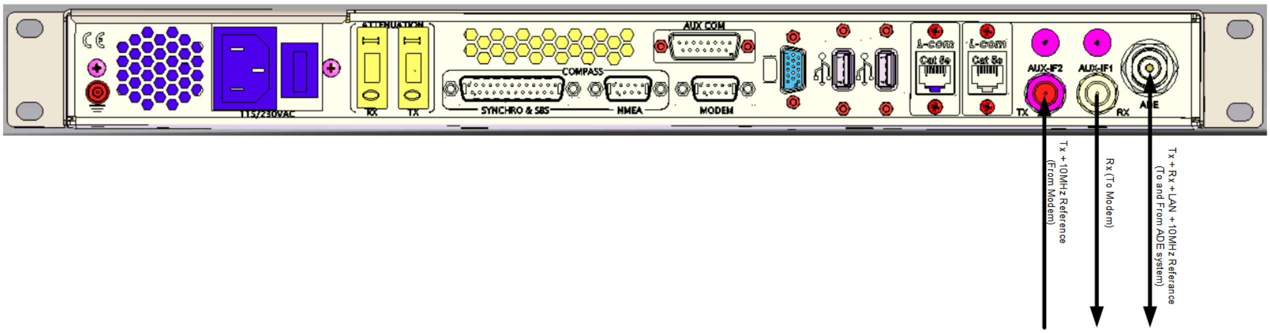


Figure 3-14: CCU without 10 MHz Tx/Rx Modem Connections

➢ **To connect the Modem Tx and Rx ports to a CCU with 10MHz:**

1. Connect a cable from the modem's Rx port to the Rx connector on the CCU.
2. Connect a cable from the modem's Tx port to the AUX-IF1 connector on the CCU. The CCU adds the 10 MHz reference signal to the Tx signal. The combined signal is the output via the AUX-IF2 port.
3. Using the provided cable, connect the AUX-IF2 connector on the CCU to the Tx connector on the CCU.

The following figure shows the Tx connections:

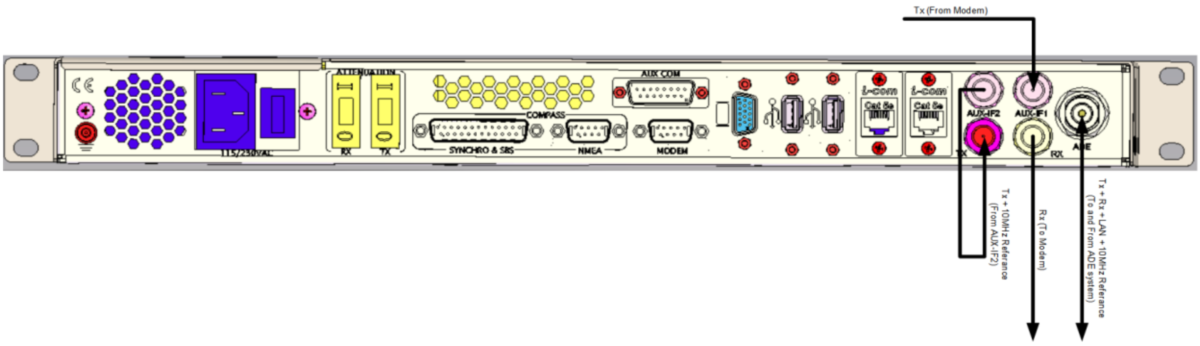


Figure 3-15: CCU with 10 MHz Tx/Rx Modem Connections

Modem M&C Connections (optional)

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

Table 3-3: MODEM Connector Pin-out

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

Pins 7 and 8 should be connected via a ‘dry-contact’ relay.

➢ **To connect the Modem M&C output to the CCU:**

- Connect a RS-232 cable from the modem’s M&C port to the MODEM connector on the CCU.

AUX COM Connection

The CCU can be connected to an external relay to allow activation of the Emcon function when shorting pins 7 & 8. When using DSS, an additional AUX-COM D-type 15-pin cable provides the method for the CCU to pass switching commands to the DSS.

Table 3-4: AUX COM Connector Pin-out

Pin	Signal	Function
1-4	NC	N/A
5	GND	General
6	3.3 VDC	General
7	12 VDC Output	EmCon
8	IRD Indicator	EmCon
9	GND	General
10-14	Data 1-5	DSS
15	5 VDC	General
16	NC	N/A

Ship's Compass Connection

The CCU must be connected to the ship's compass. The CCU supports SYNCHRO, Step-by-Step (SBS), and NMEA compasses.

SYNCHRO and SBS Compass Pin-outs

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

Table 3-5: 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

Pin	Signal	Function	Pin	Signal	Function
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			

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

Synchro Compass

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

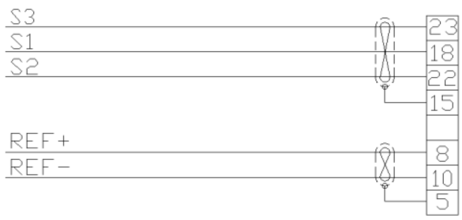


Figure 3-16: Synchro Mating Connector Wiring Diagram

The CCU supports Synchro compasses with a 115 VAC reference.

Step-by-Step Compass

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

Figure 3-17: SBS Mating Connector Wiring Diagram

- The CCU supports SBS compasses with +20VDC to +70VDC.
- The CCU supports dual polarity:
  - **Positive –** A, B, C: +VDC or Open; Common: GND
  - **Negative –** A, B, C: GND or Open; Common: +VDC

NMEA Compass Pin-out

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

Table 3-6: NMEA Connector Pin-out

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

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

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

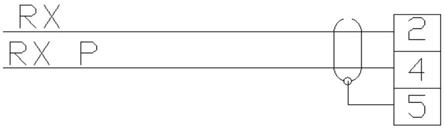


Figure 3-18: RS-422 NMEA-0183 Mating Connector Wiring Diagram

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

➢ **To connect a SYNCHRO or SBS compass to the CCU:**

- Connect a cable from the ship's SYNCHRO or SBS compass to the SYNCHRO & SBS connector on the CCU.

➢ **To connect an NMEA compass to the CCU:**

- Connect a cable from the ship's NMEA compass to the NMEA connector located on the CCU.

HMI Devices (optional)

HMI devices can be connected to the CCU to provide an interface between the operator and the CCU.

➢ **To connect HMI devices to the CCU:**

1. Connect a cable from a VGA video display to the VGA (HD15) connector on the CCU.
2. Connect a keyboard, mouse or keyboard/mouse to the general purpose USB connectors on the CCU.

Note: Alternatively, the CCU can be controlled via a remote connection using a computer attached to the LAN connector on the CCU.

3.5.4 Installing the Dual System Selector

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

Install the DSS in a 19-inch rack near the CCU. It is recommended to use the supplied rails to install the DSS in the rack.

3.5.5 Dual System Selector Interfaces

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

Table 3-7: DSS Front Panel Interface

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

Figure 3-19: DSS Front Panel

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

Table 3-8: DSS Rear panel Interfaces

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

Figure 3-20: DSS Rear Panel

3.5.6 Connecting the DSS Cables

Once the DSS is installed, connect the following:

- Power cable
- ADE-BDE LMR coaxial cable (second system)
- Modem and CCU Tx and Rx ports
- LAN cable
- AUX COM cable

Power Cable

➢ **To connect the DSS power cable to the DSS:**

1. Connect the DSS power cable to the UPS that protects the BDE mains power supply.
2. Connect the DSS power cable to the POWER connector located on rear panel of the DSS.

ADE-BDE LMR Coaxial Cable

➢ **To connect the ADE-BDE LMR coaxial cable from the second system to the DSS:**

1. Install an N-Type connector on the BDE side of the LMR cable (see “**Preparing the ADE-BDE Cable**” on page 208 for instructions).
2. Connect the cable connector to the ADE connector on the DSS.

Modem Tx and Rx Ports Connection

➢ **To connect the Modem Tx and Rx ports when using a CCU without 10MHz:**

1. Connect a cable from the modem’s Rx port to the MODEM RX connector on the DSS.
2. Connect a cable from the CCU RX connector on the DSS to the RX connector on the CCU.
3. Connect a cable from the modem’s Tx port to the MODEM TX connector on the DSS. The modem supplies the 10MHz reference signal for both systems with the Tx signal.
4. Connect a cable from the CCU TX connector on the DSS to the TX connector on the CCU.

The following figure shows the connections:

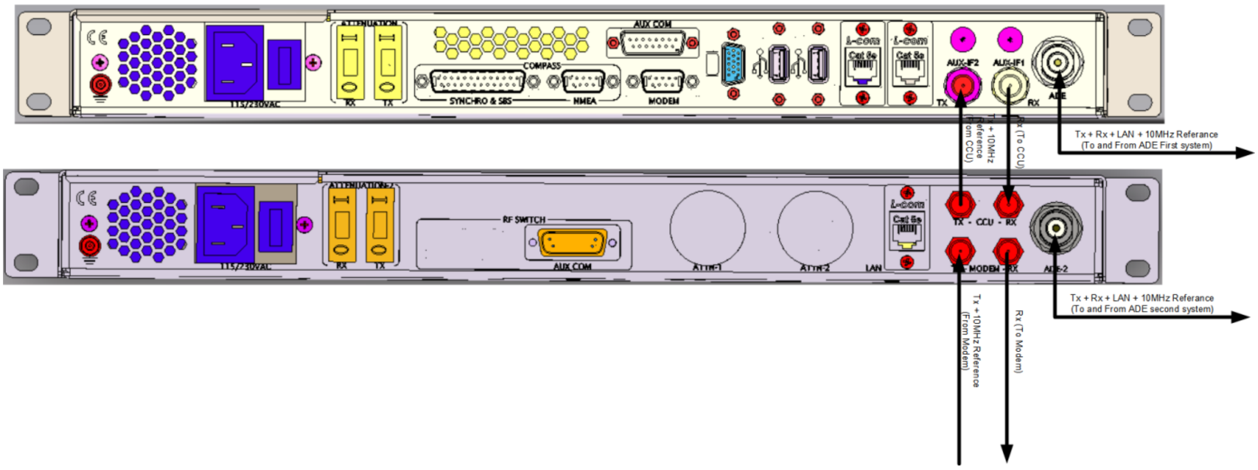


Figure 3-21: DSS Connections with CCU without 10 MHz Tx/Rx Modem Connections

Modem Tx and Rx Ports Connection

➢ **To connect the Modem Tx and Rx ports when using a CCU with 10MHz:**

1. Connect a cable from the modem's Rx port to the MODEM RX connector on the DSS.
2. Connect a cable from the CCU RX connector on the DSS to the RX connector on the CCU.
3. Connect a cable from the modem's Tx port to the AUX-IF1 connector on the CCU. The CCU adds the 10MHz reference signal for both systems to the Tx signal. The combined signal is the output via the AUX-IF2 port.
4. Connect a cable from the AUX-IF2 connector on the CCU to the MODEM TX connector on the DSS.
5. Connect a cable from the CCU TX connector on the DSS to the TX connector on the CCU.

The following figure shows the connections:

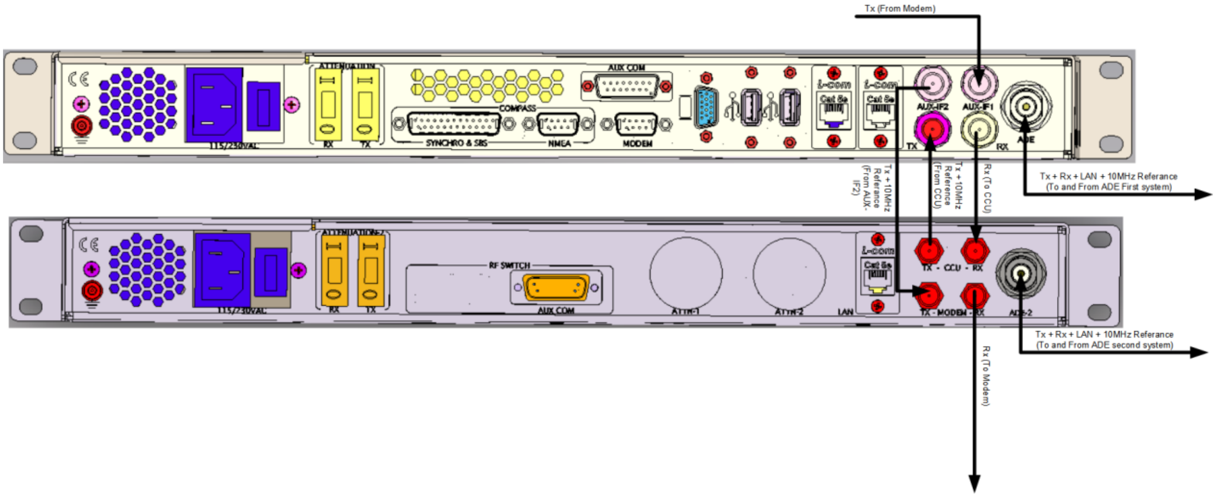


Figure 3-22: DSS Connections with CCU with 10 MHz Tx/Rx Modem Connections

LAN Cable

The LAN cable provides a communication line between the CCU and the second system.

➢ **To connect the LAN cable:**

1. Connect one side of the LAN cable to the LAN connector on the DSS.
2. Connect the other side of the LAN cable to one of the LAN connectors on the CCU.

AUX-COM Cable

The AUX-COM D-Type 15-pin cable provides the method for the CCU to pass switching commands to the DSS.

➢ **To connect the AUX COM cable:**

1. Connect one side of the AUX COM cable to the AUX COM connector located on the DSS.

2. Connect the other side of the AUX COM cable to the AUX COM connector located on the CCU.

4 System Commissioning

This section contains instructions for the commissioning procedures that must be performed after installation of the system. The commissioning process includes the following procedures:

- Starting the System
- Saving System Configuration Changes
- Configuring the System Type
- Enabling the Host Hardware Interface
- Configuring the Compass
- Integrating the Modem
- Configuring IRD Signal Lock
- Configuring the Satellite Database
- Configuring the NBR
- Configuring Polarization and Offset
- Configuring the Cease Tx Function
- Configuring the Restart Mode
- Calibrating and Activating Noise Floor Correction
- Configuring the Display
- Configuring AGC Threshold
- Submitting the Commissioning Checklist

These procedures can be performed using `CCU` MtsVLinkCE software screens or the MtsVLink software running on a CFE computer running Microsoft Windows. The screens and set-ups may differ slightly. The examples given below are snapshots from the `CCU` MtsVlinkCE screens with the differences clearly marked.

Warning!

OceanTRx™7-300 Maritime Satellite Communication System is pre-configured and tested before it is shipped. Tampering with any of the system settings that are not explicitly mentioned in this manual can impair the functioning of the system.

4.1 Starting the System

➤ **To start the system:**

1. Turn on the `ADE` and the `CCU` power switches. For dual system configurations, turn on the `DSS` power switch. The **Banner** window appears for a 10 second countdown:

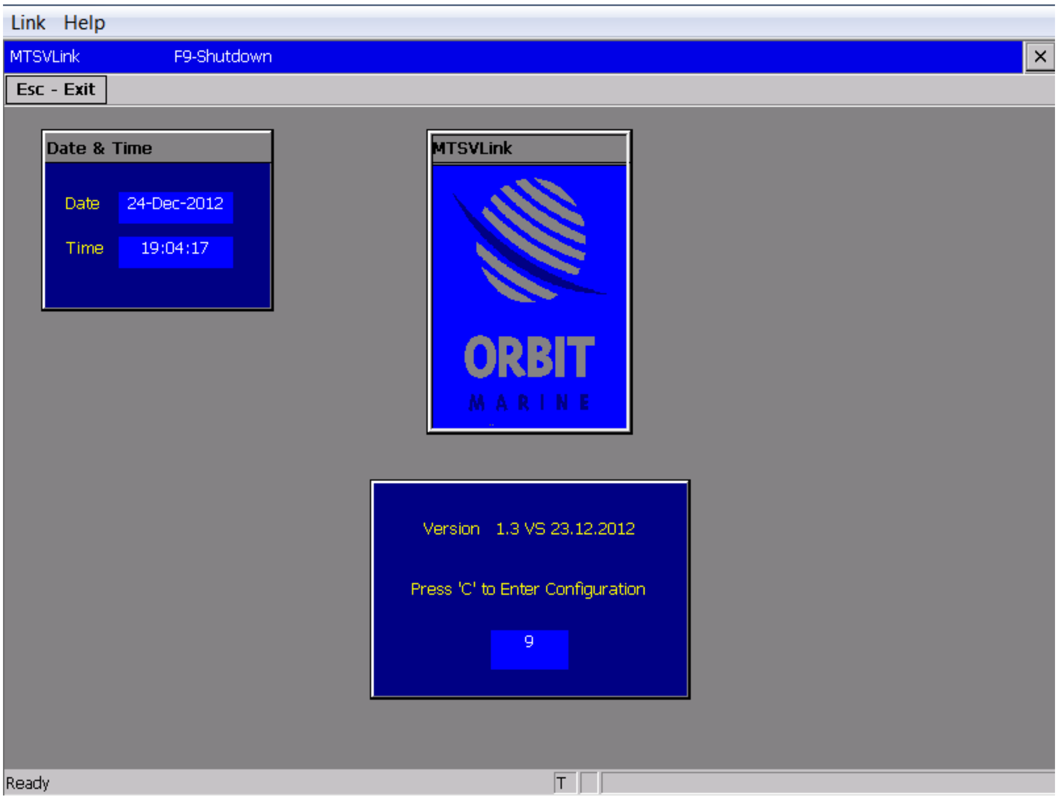


Figure 4-1: Startup Screen

If the countdown is not interrupted, the **Basic Operation** screen is displayed. This screen allows you only to monitor general system status and view system messages.

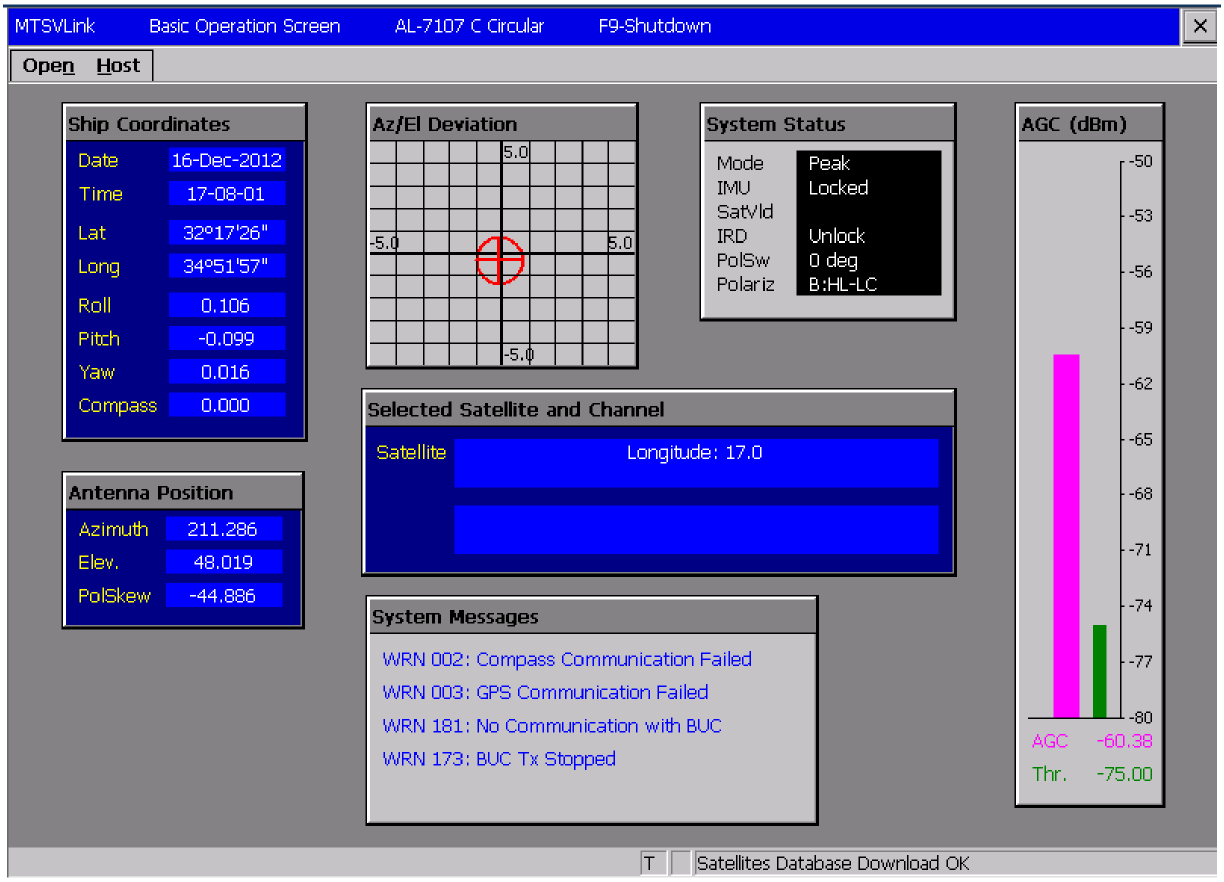


Figure 4-2: Basic Operation Screen

2. To update parameters or perform manual system operations, interrupt the countdown by pressing the <C> key and entering the password: AL-7200.

If the **Basic Operation Screen** already appears, press the <O> key to enter the password. This opens the **Operation Screen**:

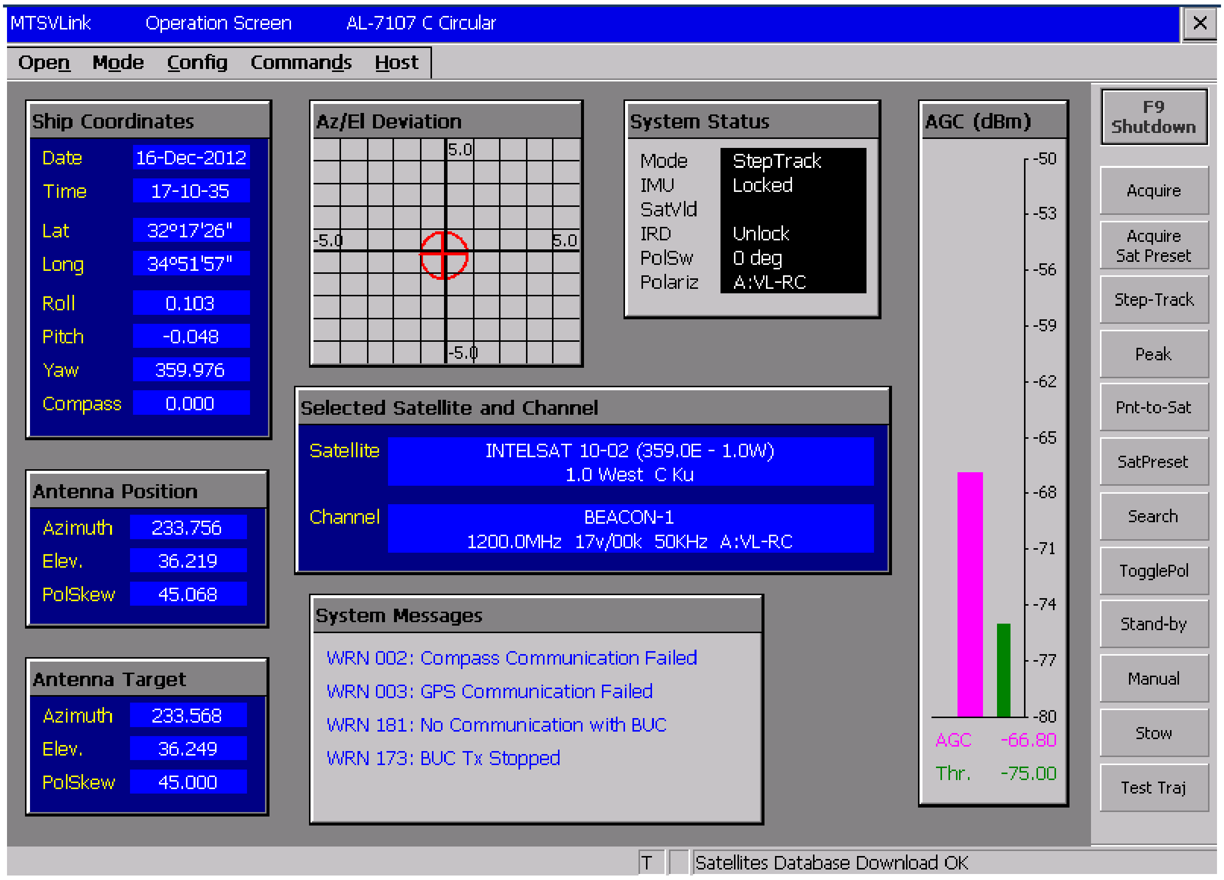


Figure 4-3: Operation Screen

To return to the **Basic Operation Screen**, press the `<U>` key, followed by any letter and the `<Enter>` key.

4.2 Saving System Configuration Changes

System configuration changes made by using the software are stored in the 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.

➢ **To save system configuration changes to non-volatile memory:**

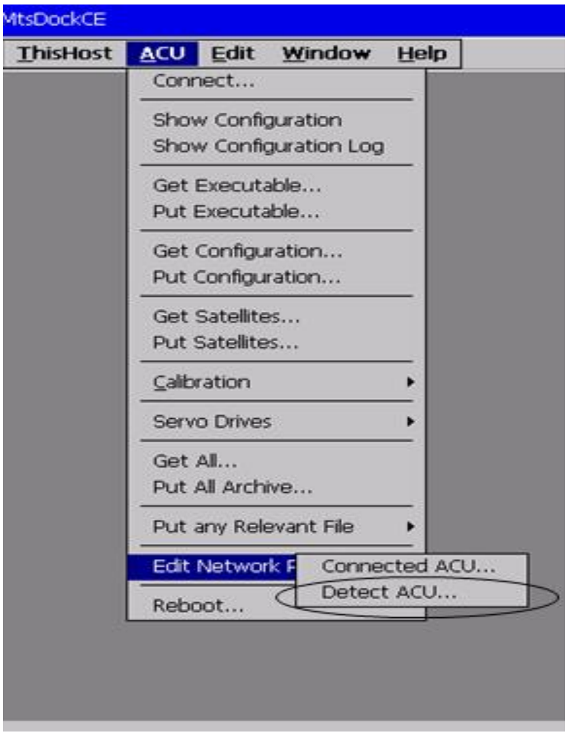
1. Open the **Commands** menu and select **Save Configuration**. A confirmation dialog box appears.
2. Click **Ok (Enter).** Software system configuration changes are saved to non-volatile memory.

4.3 Configuring IP addresses

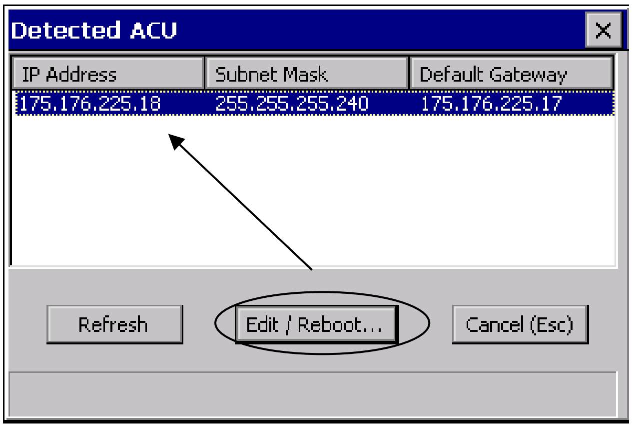
4.3.1 Changing IP address of the ACU

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

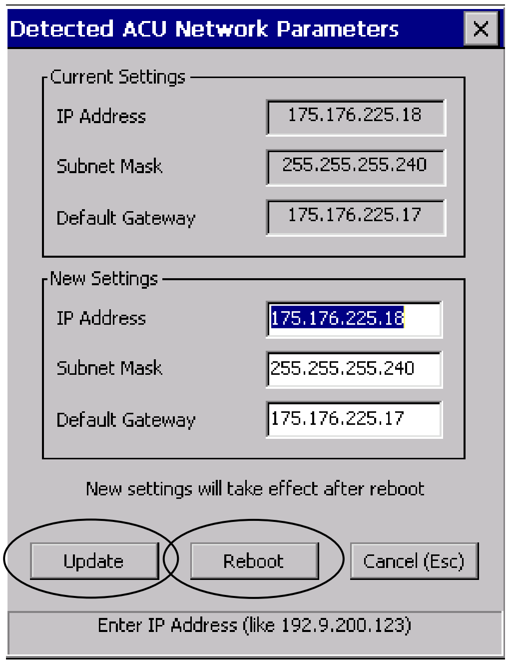
b) On the **MtsDock** menu, select the **ACU** drop-menu, and then select the **Edit network parameters → Detect ACU**.



c) New window [*Detected ACU*] will appear. Select the ACU press **Edit/Reboot**.



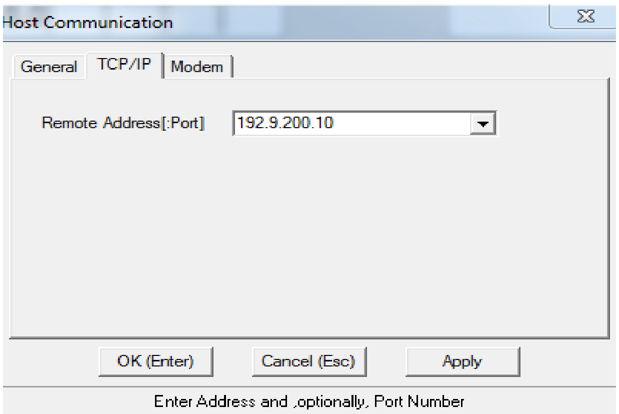
d) In the [*Detected ACU network parameters*] window, enter the ACU/SBC IP address, Subnet mask and default gateway IP (usually modem) in the **New Settings** fields.



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.

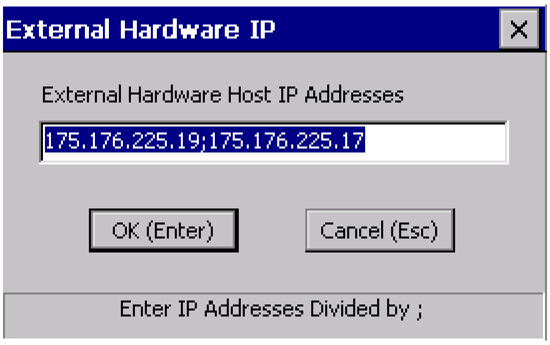
4.3.2 Changing IP address of the CCU

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.

4.4 Enabling the Host Hardware Interface

The CCU host hardware interface must be enabled to allow the CCU to communicate with the external hardware interfaces including the compass, satellite modem etc.

➢ **To enable the CCU host hardware interface:**

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

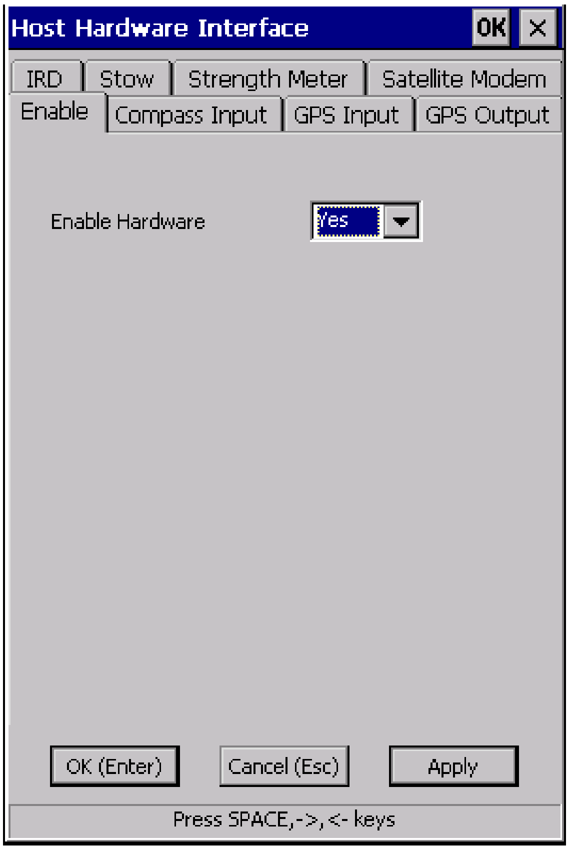


Figure 4-4: Host Hardware Interface Enable Tab

The host hardware configuration can be performed only from the CCU MtsVLinkCE software. However, you can use Remote CCU software to perform the configuration.

2. Open the **Enable** tab and verify that the **Enable Hardware Interface** option is set to ‘Yes’.

3. Click **OK (Enter)**. The **Host Hardware Interface** dialog box closes.

4.5 Configuring the Compass

Before you can begin running the OceanTRx™7-300 system, you need to configure the interface with the ship's compass and align the ANTENNA with the ship's heading.

> **Note:** The compass configuration can be performed only from the CCU MtsVLinkCE software. However, you can use the Remote CCU software to perform the configuration.

4.5.1 Selecting the Compass Interface Type

➢ **To select the compass interface type:**

1. Open the **Config** menu and select **Compass**. The **Compass** dialog box appears:

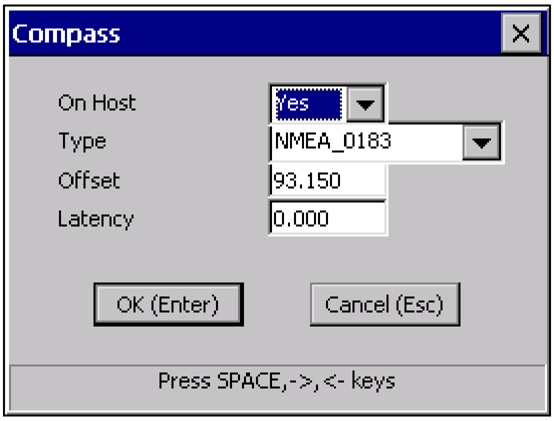


Figure 4-5: Compass Dialog Box

2. The following value is factory preconfigured. Ensure that it has not been changed.

   - Under **On Host – Yes**

3. Select the appropriate compass interface type. The SYSTEM SUPPORTs the following interface types:

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

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

4.5.2 Configuring the Compass Hardware Interface

➢ **To configure the compass hardware interface:**

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

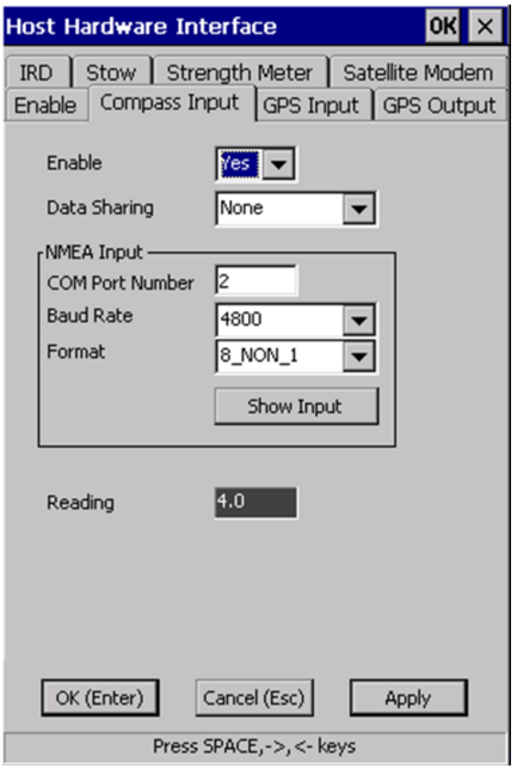


Figure 4-6: Host Hardware Interface Compass Input Tab

2. Click the **Compass Input** tab.
3. The following values are factory preconfigured. Ensure that they have not been changed:
   - Under **Enable – Yes**
   - Under **Data Sharing** –
     - For Single Configuration Systems **– None**
     - For Dual Configuration Systems:
       - First System Compass **– Server**
       - Second System Compass **– Client**
   - Under **COM Port Number – 2**
   - Under **Baud Rate – 4800**
   - Under **Format – 8_NON_1**
4. Click **OK (Enter)**. The **Host Hardware Interface** dialog box closes.

4.5.3 Configuring NMEA-0183 Compass Defaults

This procedure must 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:

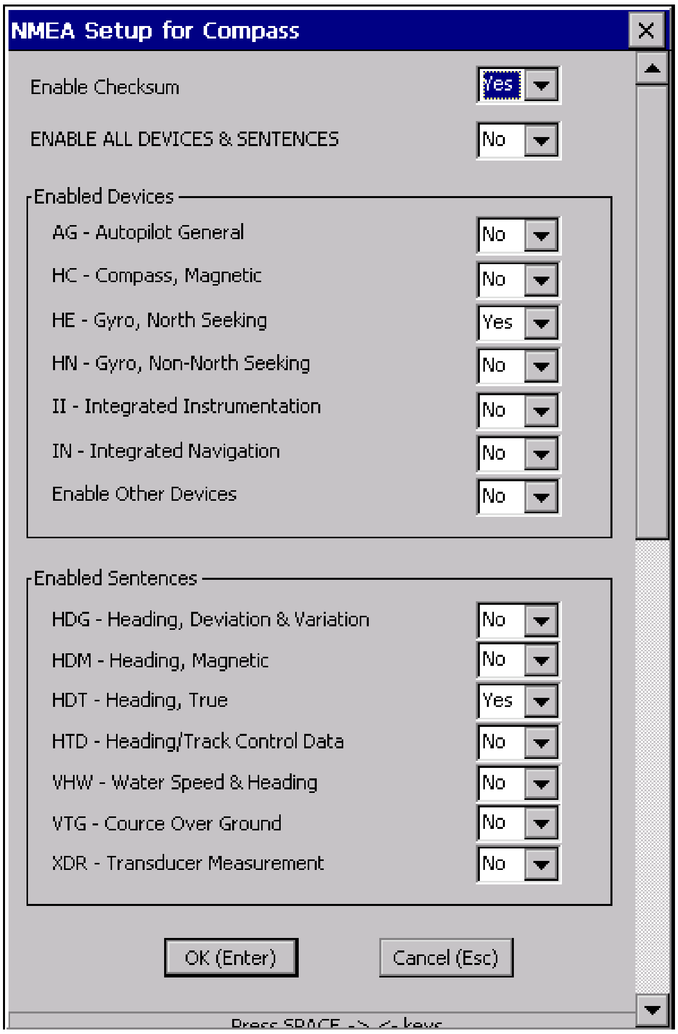


Figure 4-7: NMEA Setup for Compass Dialog Box

2. Make sure that 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.

4.5.4 Setting the Compass Offset

After the system is installed, it must be aligned with the bow-to-stern line of the ship. This is accomplished by setting the *compass offset* so that the system is calibrated with the vessel's gyrocompass.

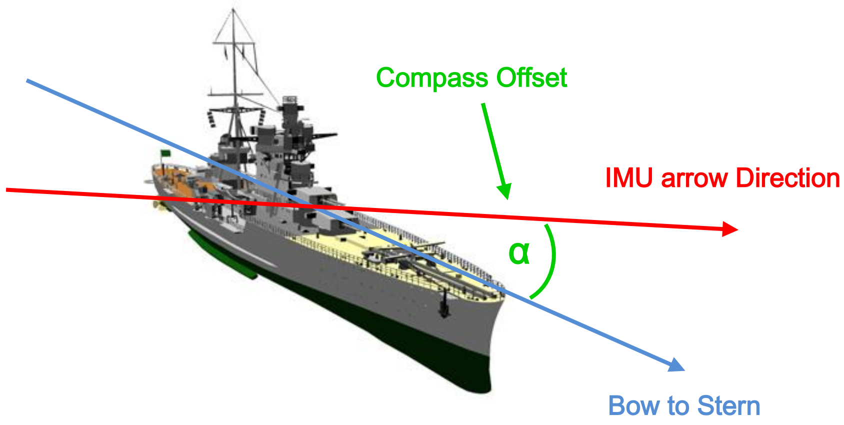


Figure 4-8: Compass Offset Variables

As portrayed in the above figure, the compass offset is the angle between the ship's headings – represented by the bow-to-stern line – and the `IMU` zero direction.

The `IMU` zero direction is marked on top of the `IMU` unit with an arrow.

➢ **To establish the exact compass offset angle:**

1. Make a 'naked-eye' rough estimate for the offset angle. In the above figure, an appropriate estimate would be -30° (the negative value is due to the counter-clockwise rotation from the ship's bow).
2. From the **Operation Screen**, open the **Config** menu and select **Compass**. The **Compass** dialog box appears (see Figure 4-5).
3. Enter the 'naked-eye' estimate in the **Offset** field.
4. If the particular compass 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.
5. Click **OK (Enter)**. The **Compass** dialog box closes.
6. Point the antenna to the desired satellite (see **Section 5.3**: **Selecting a Satellite** on page 162). 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.

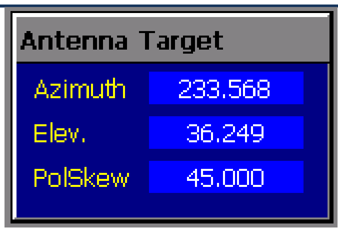


Figure 4-9: Antenna Target Window

7. Using Manual Mode (see **Section 5.4.2 Manual Mode** on page 163), change the antenna's azimuth orientation until it points to the satellite. The amount of movement required depends on the accuracy of your initial estimate (a typical estimate will fall within ±10°).

Use the **Spectrum Analyzer Screen** to determine when you are locked onto the satellite (see **Section 5.7**: **Using the Spectrum Analyzer Screen** on page 175).

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8. Once the satellite is acquired, set the antenna to Step-Track Mode (see **Section 5.4.5**: **Step-Track Mode** on page 166).

9. Determine the azimuth deviation, which measures the distance 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°.

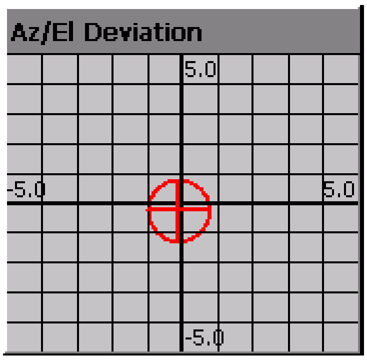


Figure 4-10: Az/El Deviation Window

- Running the **Graphic Data Logger**, which records azimuth deviation as a parameter of the Antenna Step Track subgroup (see **Section 5.9**: **Using the Graphic Data Logger** on page 180).
- Setting the `ANTENNA` to Peak Mode (see **Section 5.4.4**: **Peak Mode** on page 166) and calculating the difference between the resulting azimuth and the nominal azimuth.

10. 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.
11. From the **Operation Screen**, open the **Config** menu and select **Compass**. The **Compass** dialog box appears.
12. Enter the correct compass offset in the **Offset** field.
13. Click **OK (Enter)**. The **Compass** dialog box closes.

4.6 Integrating the Modem

The OceanTRx™7-300 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 under the customer's responsibility. Follow the instructions below and consult with Orbit's Service Department for further assistance.

4.6.1 Configuring the System for a Serial Connection Satellite Modem

To receive monitoring information from a satellite modem via a serial connection, the system must be configured with the satellite modem parameters.

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

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

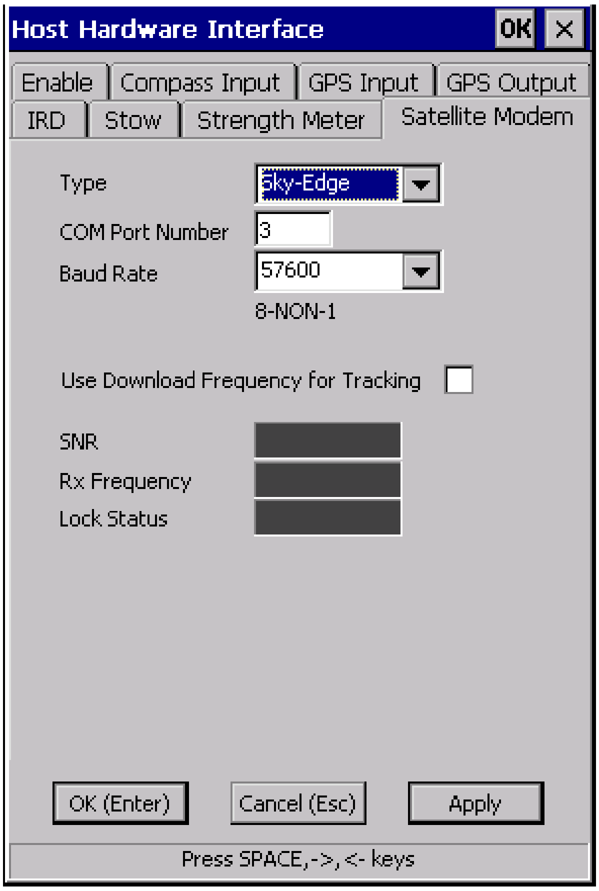


Figure 4-11: Host Hardware Interface Satellite Modem Tab

2. Click the **Satellite Modem** tab.

3. Select the satellite modem type.
4. Select the correct baud rate for the modem.
5. For Sky-Edge modems, check "**Use Download Frequency for Tracking"** to enable using the modem's download frequency as the tracking frequency.
6. Click **OK (Enter)**. The **Host Hardware Interface** dialog box closes.

4.6.2 OpenAMIP Connection

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

4.6.2.1 Interface Requirements

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

4.6.2.2 Protocol Parameters

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

Table 4-1: Communication, Port, and Target Parameters

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

4.6.2.3 Implemented Commands

Table 4-2: Implemented Commands

Command	Value
Modem to ACU command	B p1 p2
ACU action: After receiving **F** command, use parameter **1** to set the LNB control: Compare parameter 1 to the following numbers:	
■ 5150.0 ■ 9750.0 ■ 10250.0 ■ 10750.0 ■ 11250.0	
If closest to:	
5150.0	Set the LNB control to 17v00k or Co17v00k, according to the last P command
9750.0	Set the LNB control to 13v00k or Co13v00k, according to the last P command
10250.0,	Set the LNB control to 13v22k or Co13v22k, according to the last P command
10750.0	Set the LNB control to 17v00k or Co17v00k, according to the last P command
11250.0	Set the LNB control to 17v22k or Co17v22k, according to the last P command
Modem to ACU command	P p1 p2
After receiving "F" command use parameters **1** and **2** to set the LNB Control: Compare parameter 1 to the following numbers:	
■ p1=V and p2=H set polarization to Pol-A: VL-RC and LNB Control to XPol ■ p1=H and p2=V set polarization to Pol-B: HL-LC and LNB control to XPol ■ p1=R and p2=L set polarization to Pol-A: VL-RC and LNB control to XPol ■ p1=L and p2=R set polarization to Pol-B: HL-LC and LNB control to XPol ■ p1=V and p2=V set polarization to Pol-A: VL-RC and LNB control	

Command	Value
to CoPol ■ p1=H and p2=H set polarization to Pol-B: HL-LC and LNB control to CoPol - 2 - ■ p1=R and p2=R set polarization to Pol-A: VL-RC and LNB control to CoPol ■ p1=L and p2=L set polarization to Pol-B: HL-LC and LNB control to CoPol	

Disregard commands corresponding to any other combination of p1 and p1 values.

Table 4-3: Implemented Commands

Command	Value
Modem to ACU command	S p1 p2 p3
ACU Action: After receiving **F** command, set:	
■ Satellite Preset as per parameter 1 ■ Disregard parameter 2 ■ PolSkew Offset as per parameter 3	

The updated PolSkew Offset corresponds to the currently active Frequency Band (Ku, C or X) and as the last XPol/CoPol selection.

Table 4-4: Implemented Commands

Command	Value
Modem to ACU command	H p1 p2
ACU Action: After receiving **F** command, write parameter 1 value to the NBR frequency and use parameter 2 to set the NBR bandwidth as follows:	
■ Compare parameter 2 to the following three numbers: ▪ 0.05 ▪ 0.15 ▪ 0.30	

Command	Value
■ If closest to 0.05, set the NBR bandwidth to 50KHz ■ If closest to 0.15, set the NBR bandwidth to 150KHz ■ If closest to 0.30, set the NBR bandwidth to 300KHz	

Table 4-5: Implemented Commands

Command	Value
Modem to ACU command	F
ACU Action:	
■ Set LNB control according to last B and P commands ■ Set polarization according to last P command ■ Set NBR frequency and bandwidth according to last H command ■ Set PolSkew offset according to last S p3 command ■ Perform acquire sat. preset with satellite longitude given by last S p1 command	

4.6.3 Calculating Tx/Rx Path Overall Gain

Before reaching the BUC, the signal to be transmitted, passes through a path of losses, attenuations, and gains.

To make sure that the signal reaches the BUC with the proper strength, the path, attenuations, and gains need to be calculated and adjusted.

The same calculation and adjustment needs to be made for the receive path, confirming that the received signals can reach the BDE properly.

The attached Excel sheets are designed to simplify these calculations.

4.6.3.1 OceanTRx Single System Configuration

4.6.3.1.1 L-Band Transmission (Tx) Levels

The calculation of the Tx L-Band path accounts for all OceanTRx™ system losses and gains. This includes:

- CCU losses
- CCU attenuation set-up
- 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

In the following example, the LMR-600 cable length is 50m, 20W BUC, BUC internal attenuation is -12 dB, Tx L-Band is 1200MHz, CCU "BDMx" attenuation is "0"dB. As result of this example, the derived modem Tx L-Band Level for P1dB of BUC is: **-14.7 dBm**.

The following image displays the Single OceanTRx L-Band Tx Path:

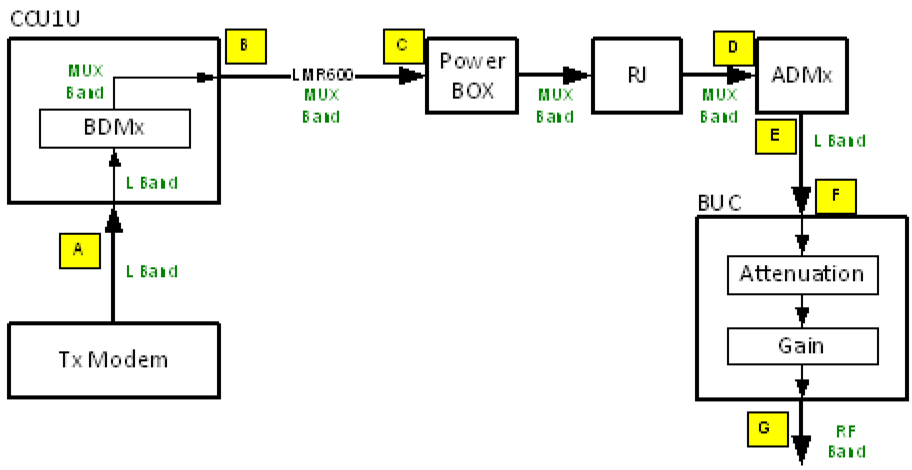


Figure 4-12: Single OceanTRx L-Band Tx Path

The following table displays the OceanTRx total Tx level budget (L-Band from Modem):

Table 4-6: OceanTRx-Total Tx Level Budget (L-Band from Modem)

OceanTRx-Total Tx Level Budget (L-Band from Modem)			
Point	**Parameter**	**Unit**	**Value**
	System type	NA	OceanTRx
	System band	NA	C
G	BUC power	Watts	20.0
G	BUC power (P1dB)	dBm	43.0
	BUC gain (nominal)	dB	74.0
	BUC internal attenuation	dB	-12.0

OceanTRx-Total Tx Level Budget (L-Band from Modem)			
Point	**Parameter**	**Unit**	**Value**
F	Derived input power to BUC for P1dB	dBm	-19.0
C to D, E to F	Total pedestal attenuations: cables (L-Band cables and MUX cable) + Rotary Joint	dB	-7.9
C	Derived input power to pedestal for BUC P1dB (MUX)	dBm	-11.1
	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 CCU	dB	-4.3
A	Derived L-Band (Tx) output from modem for BUC P1dB with standard CCU	dBm	-14.7

Click the below Excel file icon to see the above table (Tx Path levels) in Excel format:

Single OceanTRx
- L-Band Tx Path l

4.6.3.1.2 L-Band receive (Rx) Levels

The calculation of the Rx L-Band path takes into consideration all losses and gains of the OceanTRx™ System.

This includes:

- CCU losses
- CCU attenuation set-up
- LMR Cable loss (according to the length and type)
- Cables / RJ losses / splitter in the pedestal
- LNB gain
- ADMx / BDMx path total gain
- Rx path total gain
- BUC Power
- BUC internal attenuation set-up
- BUC GAIN
- ADMx / BDMx Tx path total gain

The LNB output level is calculated separately according to the satellite EIRP, transponder bandwidth, used bandwidth, OceanTRx™ antenna gain, and downlink frequency.

The following image displays the Single OceanTRx L-Band Rx Path:

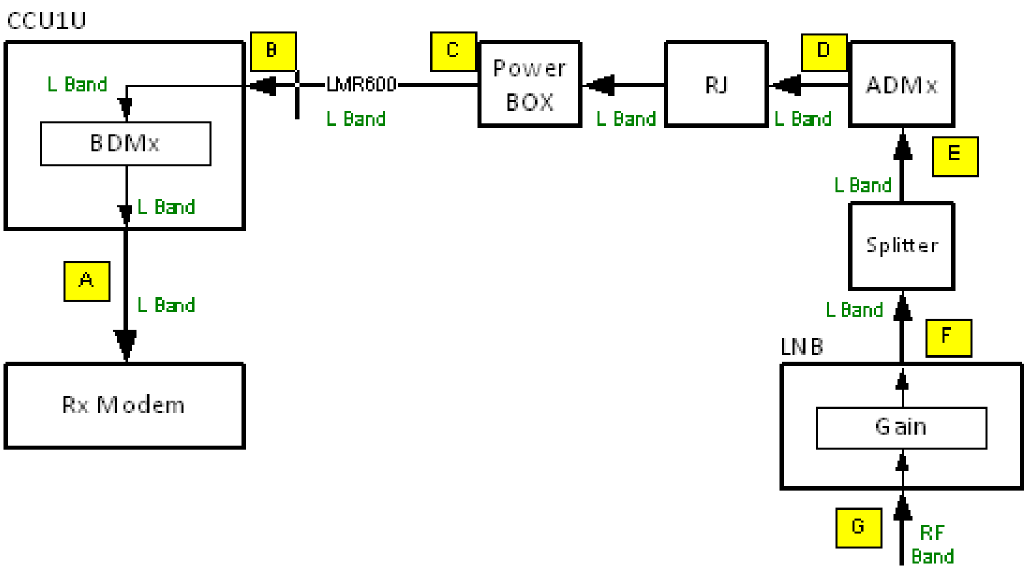


Figure 4-13: Single OceanTRx L-Band Rx Path

In the following example, the LMR-600 cable length is 50m, LNB Gain is 63 dB, Rx C- Band is 3950MHz, CCU "BDMx" attenuation is "-8" dB, Satellite EIRP is 39 dBW, Transponder Bandwidth is 36MHz, and the Used Bandwidth is 1MHz. As result of this example, the derived Rx L-Band Level received in the modem is: **-44.6 dBm**.

The following table displays the OceanTRx total Rx level budget (L-Band from LNB to modem):

Table 4-7: OceanTRx-Total Rx Level Budget (L-Band from LNB to Modem)

OceanTRx-Total Tx Level Budget (L-Band from LNB to Modem)			
Point	**Parameter**	**Unit**	**Value**
	System type	NA	OceanTRx
	System band	NA	C
	Transponder saturation EIRP	dBW	39.0
	Output backup	dB	4.0
	Transponder bandwidth	MHz	36.0
	Terminal used bandwidth (Rx)	MHz	1.0
	Downlink frequency	GHz	3.950
	OceanTRx antenna gain (typical)	dBi	36.5
	Derived fractional used bandwidth	dB	-15.6
	Derived downlink path loss	dB	195.4
	dBW to dBm conversion factor	dB	30.0
	LNB output power	dBm	-46.5
G	Derived LNB Output Power (H15), depends on the Satellite EIRP, BW,Ant. Gain, etc,	dBm	-46.5
F to E, D to C	Total pedestal attenuations: cables (L-Band cables) + rotary joint + splitter	dB	-14.3
C	Derived output level Rx from pedestal	dBm	-60.8

OceanTRx-Total Tx Level Budget (L-Band from LNB to Modem)			
Point	**Parameter**	**Unit**	**Value**
G	Rx C-Band frequency	MHz	3950
	LNB LO frequency (Inverted)	MHz	5150
	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	-8
	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	1.9
	Derived L-Band (Rx) Input to Modem with standard CCU	dBm	-44.6

Click the below Excel file icon to see the above table (Rx Path levels) in Excel format:

Single OceanTRx - L-Band Rx Path l

4.6.3.2 OceanTRx Dual System Configuration

4.6.3.2.1 L-Band Transmission (Tx) Levels

Calculation of Tx L-Band path accounts for all OceanTRx™ system losses and gains.

This includes:

- CCU losses
- CCU attenuation set-up
- DSS losses
- LMR Cable loss (according to the length and type)
- Cables / RJ losses
- BUC power
- BUC internal attenuation
- Set up
- BUC gain
- ADMx / BDMx path total gain

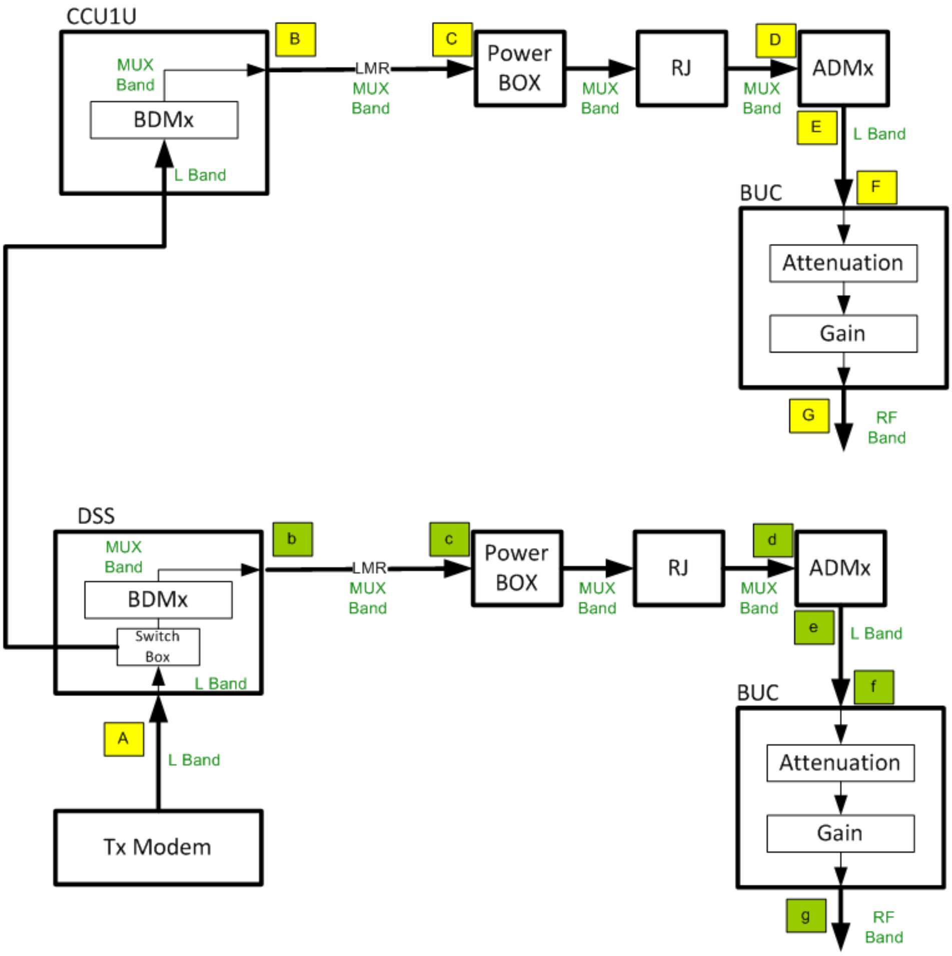


Figure 4-14: Dual OceanTRx L-Band Tx Path

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

- On the first path's system (see yellow letters in Figure 4-14 above), the LMR-600 cable length is 50m, 16W Ku Band BUC, BUC internal attenuation is 0dB, Tx L-Band is 1200MHz, CCU "BDMx" attenuation is "0" dB and the "DSS" attenuation is "-5dB". As result of this example, the derived modem Tx L-Band Level for P1dB of BUC is: **-22.6 dBm**.
- On the second path's system (see green letters in Figure 4-14 above), the LMR-600 cable length is 100m, 40W C band BUC, BUC internal attenuation is 0 dB, Tx L-Band is 1200MHz, CCU "BDMx" attenuation is "0" dB and the "DSS" attenuation is "-5dB". As result of this example, the derived modem Tx L-Band Level for P1dB of BUC is: **-8.4 dBm**.

The following table displays the OceanTRx Total Rx level budget (L-Band from LNB to Modem):

Table 4-8: OceanTRx-Total Rx Level Budget (L-Band from LNB to Modem)

OceanTRx-Total Rx Level Budget (L-Band from LNB to Modem)			
Point	**Parameter**	**Unit**	**Value**
	System 1 type	NA	OceanTRx
	System 1 band	NA	Ku
	System 2 type	NA	OceanTRx
	System 2 band	NA	C
G	BUC power	Watts	16.0
G	BUC power (P1dB)	dBm	42.0
	BUC gain (nominal)	dB	74.0
	BUC internal attenuation	dB	0.0
F	Derived Input power to BUC for P1dB	dBm	-32.0
C to D, E to F	Total pedestal attenuations: cables (L-Band cables and MUX cable) + rotary joint	dB	-7.9
C	Derived Input power to pedestal for BUC P1dB (MUX)	dBm	-24.1

OceanTRx-Total Rx Level Budget (L-Band from LNB to Modem)			
Point	**Parameter**	**Unit**	**Value**
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	-9.3
A	Derived L-Band (Tx) output from modem for BUC P1dB (System1)	dBm	-22.6
G	BUC power	Watts	40.0
G	BUC power (P1dB)	dBm	46.0
	BUC gain (nominal)	dB	74.0
	BUC internal attenuation	dB	0.0
F	Derived input power to BUC for P1dB	dBm	-28.0

OceanTRx-Total Rx Level Budget (L-Band from LNB to Modem)			
Point	**Parameter**	**Unit**	**Value**
C to D, E to F	Total pedestal attenuations: cables (L-Band cables and MUX cable) + rotary joint	dB	-7.9
C	Derived Input power to pedestal for BUC P1dB (Mux)	dBm	-20.1
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	-9.3
A	Derived L-Band (Tx) output from modem for BUC P1dB (System2)	dBm	-8.4

Click the below Excel file icon to see the above table (Tx Path levels) in Excel format:

Dual OceanTRx -
L-Band Tx Path Le

4.6.3.2.2 L-Band Receive (Rx) Levels

Calculation of the Rx L-Band path accounts for all OceanTRx™ systems losses and gains.

This includes:

- CCU losses
- CCU attenuation set-up
- DSS losses
- LMR Cable loss (according to the length and type)
- Cables / RJ losses / pedestal splitter
- LNB gain
- ADMx / BDMx path total gain

The LNB output level is calculated separately according to the satellite EIRP, transponder bandwidth, used bandwidth, OceanTRx™ antenna gain and downlink frequency.

The following image displays the Dual OceanTRx L-Band Rx Path:

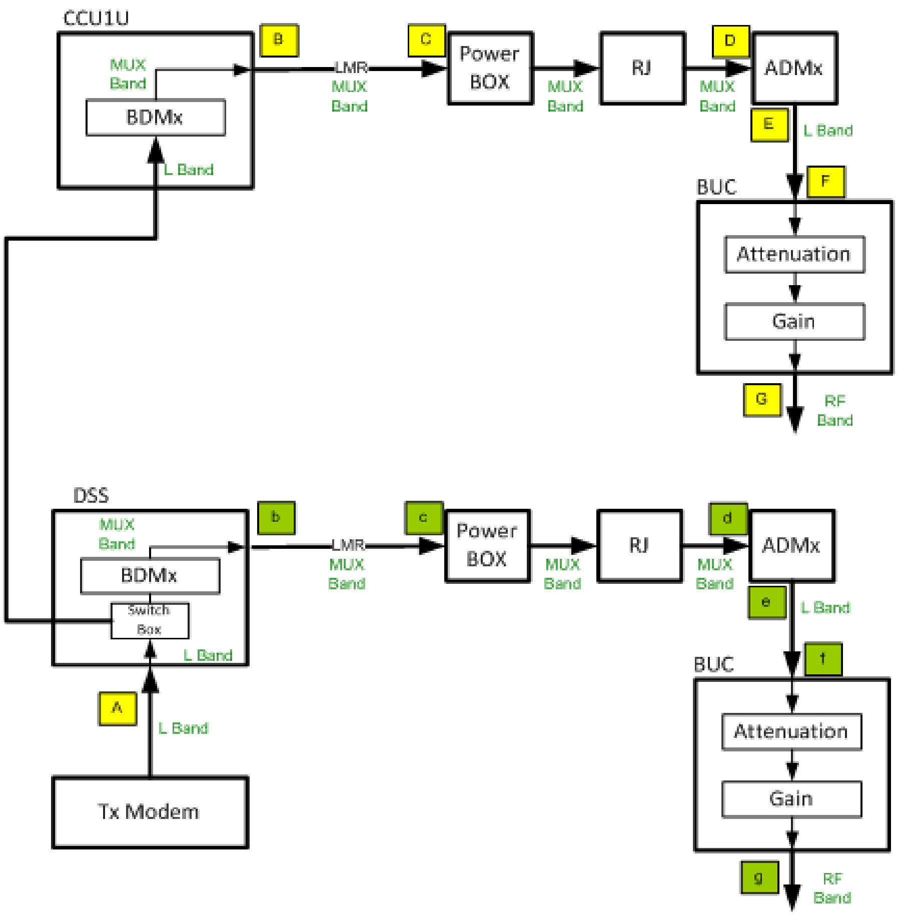


Figure 4-15: Dual OceanTRx L-Band Rx Path

In the following example, the calculations of Tx attenuation are separated into two paths for two systems:

- On the first path's system (Yellow highlighted on the excel sheet), LMR-600 cable length is 50m, LNB Gain is 63 dB, Rx C-Band is 3950MHz, CCU BDMx attenuation is -8 dB, DSS attenuation is -0.2dB dB. Satellite EIRP is 39 dBW, transponder bandwidth is 36MHz, and the Used Bandwidth is 1MHz. As result of this example, the derived Rx L-Band Level received in the modem is: **-44.8 dBm**.
- On the second path's system (Green highlighted on the excel sheet), LMR-600 cable length is 100m, LNB Gain is 63 dB, Rx C-Band is 3950MHz, CCU "BDMx" attenuation is "0" dB, "DSS" attenuation is "-0.2dB" dB. Satellite EIRP is 39 dBW, Transponder Bandwidth is 36MHz, and the Used Bandwidth is 1MHz, As result of this example, the derived Rx L-Band Level received in the modem is: **-41.6dBm**.

The following table displays the OceanTRx Total Rx level budget (L-Band from LNB to Modem):

Table 4-9: OceanTRx-Total Rx Level Budget (L-Band from LNB to Modem)

OceanTRx-Total Rx Level Budget (L-Band from LNB to Modem)			
Point	**Parameter**	**Unit**	**Value**
	System 1 type	NA	OceanTRx
	System 1 band	NA	C
	System 2 type	NA	OceanTRx
	System 2 band	NA	C
	Transponder saturation EIRP	dBW	39.0
	Output backup	dB	4.0
	Transponder bandwidth	MHz	36.0
	Terminal used bandwidth (Rx)	MHz	1.0
	Downlink frequency	GHz	3.950
	OceanTRx antenna gain (typical)	dBi	36.5
	LNB Gain (typical)	dB	63.0
	LNB local oscillator	MHz	5150

OceanTRx-Total Rx Level Budget (L-Band from LNB to Modem)			
Point	**Parameter**	**Unit**	**Value**
	Derived fractional used bandwidth	dB	-15.6
	Derived downlink path loss	dB	195.4
	dBW to dBm conversion factor	dB	30.0
	LNB output power	dBm	-46.5
G	Derived LNB output power (D24), depends on satellite EIRP, BW, Ant. gain, etc.	dBm	-46.5
F to E, D to C	Total pedestal attenuations: cables (L-Band cables) + rotary joint + splitter	dB	-14.3
C	Derived output level Rx from pedestal	dBm	-60.8
G	Rx C-Band frequency	MHz	3950
	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	-8
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	1.7

OceanTRx-Total Rx Level Budget (L-Band from LNB to Modem)			
Point	**Parameter**	**Unit**	**Value**
A	Derived L-Band (Rx) input to modem with standard CCU	dBm	-44.8
	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	3.950
	OceanTRx antenna gain (typical)	dBi	36.5
	LNB Gain (typical)	dB	63.0
	LNB Local oscillator	MHz	5150
	Derived fractional used bandwidth	dB	-15.6
	Derived downlink path loss	dB	195.4
	dBW to dBm conversion factor	dB	30.0
	LNB output power	dBm	-46.5
G	Derived LNB output power (D59), depends on satellite EIRP, BW, Ant. gain, etc,	dBm	-46.5
F to E, D to C	Total pedestal attenuations: cables (L-Band cables) + rotary joint + splitter	dB	-14.3
C	Derived output level Rx from pedestal	dBm	-60.8
G	Rx C-Band frequency	MHz	3950

OceanTRx-Total Rx Level Budget (L-Band from LNB to Modem)

Point	Parameter	Unit	Value
	Rx L Band frequency, depend on LNB LO (D54)	MHz	1200
	LMR cable which 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	4.9
A	Derived L-Band (Rx) input to modem with standard CCU	dBm	-41.6

Click the below Excel file icon to see the above table (Rx Path levels) in Excel format:

Dual OceanTRx - L-Band Rx Path Le

4.7 Configuring IRD Signal Lock

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

4.7.1 Configuring the IRD Lock Hardware Interface

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

1. Open the **Host** menu and select **Hardware Interface**. The **Host Hardware Interface** dialog box appears.
2. Click the **IRD** tab.
3. Select the appropriate IRD source from the **Source** field. The SYSTEM SUPPORTs the following sources:
   - **None** – Use to disable the IRD from the CCU MODEM connector interface.
   - **Digital Input Level** – Use to enable IRD from the IRD Lock Signal on the CCU connector MODEM interface.
   - **Satellite Modem Lock** – Use to enable IRD from the modem's M&C on the CCU MODEM connector interface.
4. If **Digital Input Level** is selected, select the appropriate parameter (Positive/Negative) in the **Locked State Voltage** field to select the polarity of the IRD lock signal.
5. Click **OK (Enter)**. The **Host Hardware Interface** dialog box closes.

4.7.2 Enabling the Satellite Validation

➢ **To enable the IRD Lock Signal:**

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

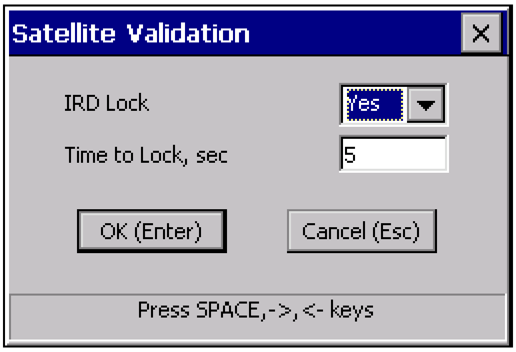


Figure 4-16: Satellite Validation Dialog Box

2. Set the **IRD Lock** option to ‘Yes’.

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

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

4. Click **OK (Enter)**. The **Satellite Validation** dialog box closes.

4.8 Configuring Emission Control

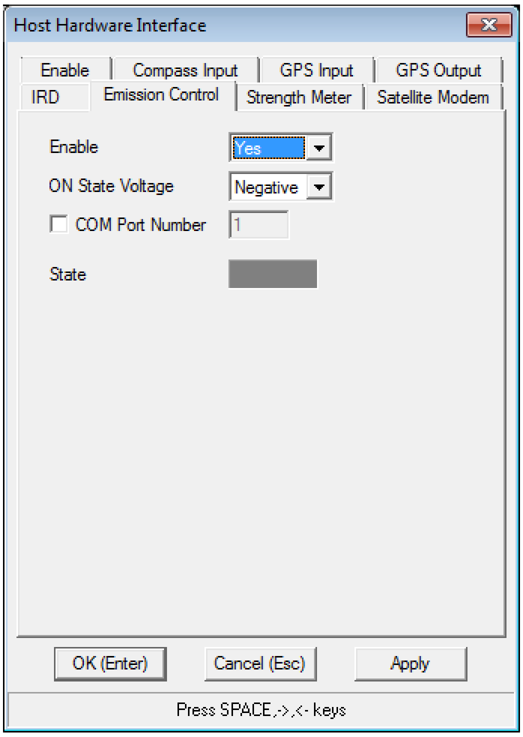
Emission Control (EmCon) function allows stopping all Antenna transmission abruptly once the EmCon switch is activated.

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.

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

1. From the **Host** menu, select the **Hardware Interface**. The following dialog box appears.



2. Click on 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 whether 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!

4.9 Configuring the GPS Output Hardware Interface

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

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

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

	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 and set the following parameters.

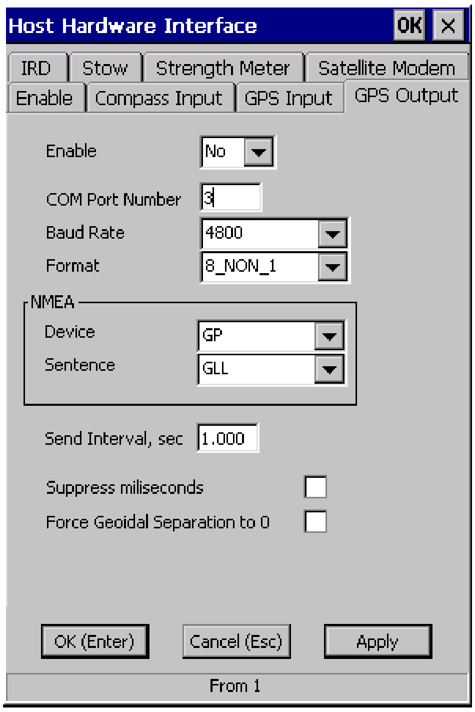


Figure 4-17: Host Hardware Interface GPS Output Tab

- **Enable**: ‘Yes’
- **COM Port Number**: ‘3’

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

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

4. Click **OK (Enter)**. The **Host Hardware Interface** dialog box closes.

4.10 Configuring the Satellite Database

The system software includes a file containing list of available satellites and their tracking data. 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 uses this data to acquire the satellite when selected from the **Satellites** screen (see **Section 5.3**: **Selecting a Satellite** on page 162) or upon activation of the **Acquire** operating mode (see **Section 5.4.8**: **Acquire Mode** on page 167).

4.10.1 Viewing the Satellite Database

➢ **To view the satellite database:**

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

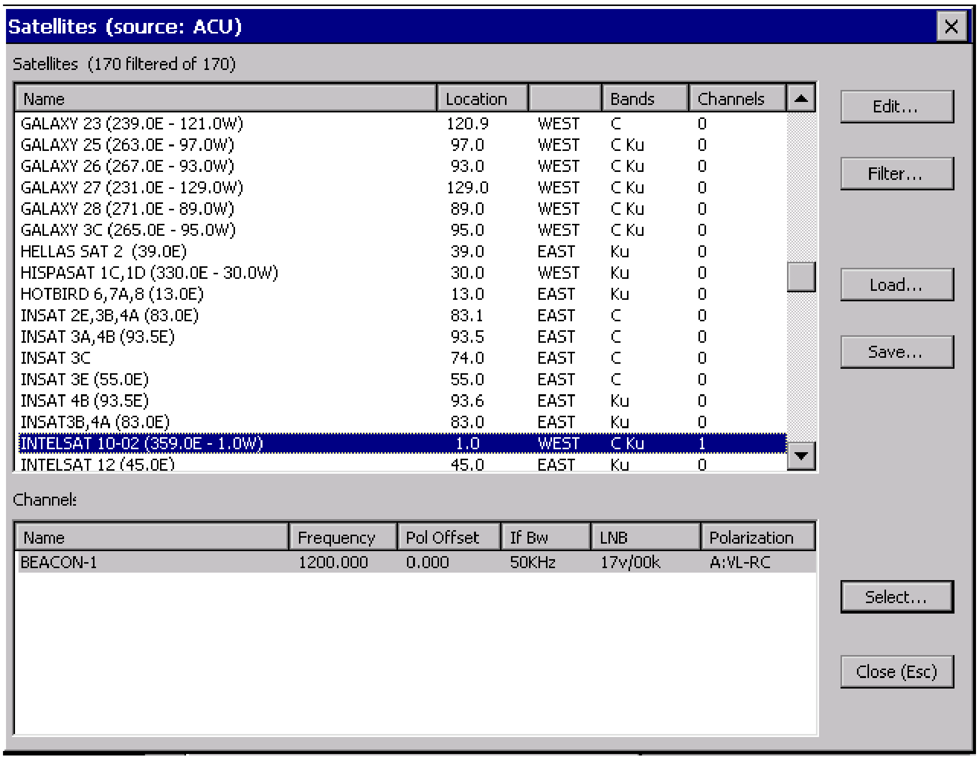


Figure 4-18: Satellites Dialog Box

If the satellite database is empty, load a database (see **Section 4.10.4**: **Loading a Satellite Database** on page 130).

The **Satellites** dialog box displays a list of satellites, a list of defined channels and action buttons.

➢ **To close the satellite database:**

- From the **Satellites** dialog box, click **Close (Esc)**. The **Satellites** dialog box closes.

4.10.2 Editing the Satellite Database

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

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

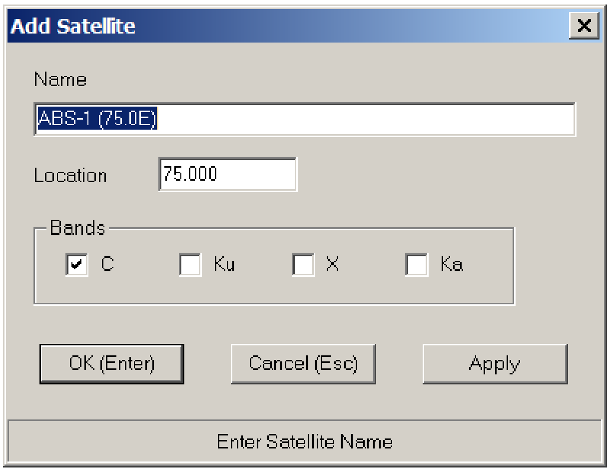


Figure 4-19: Add Satellite Dialog Box

2. Enter name of the satellite in the **Name** field.
3. Enter a location for the satellite in the **Location** field.
4. Select the bands with which the satellite communicates.
5. Click **Apply**. The satellite is added to the database.

   OR

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

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

1. From the **Satellites** dialog box, select a satellite from the list of satellites.
2. Click **Edit** and select **Edit Satellite**. The **Edit Satellite** dialog box appears with the satellite configuration (see Figure 4-19).
3. Edit the satellite configuration.
4. Click **Apply**. The satellite data is modified in the database.

   OR

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

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

1. From the **Satellites** dialog box, select one or more satellites from the list of satellites.
2. Click **Edit** and select **Delete Satellites**. A confirmation dialog box appears.
3. Click **Yes**. The selected satellites are deleted from the database.

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

1. From the **Satellites** dialog box, select a satellite from the list of satellites.
2. Click **Edit** and select **Add Channel**. The **Add Channel** dialog box appears:

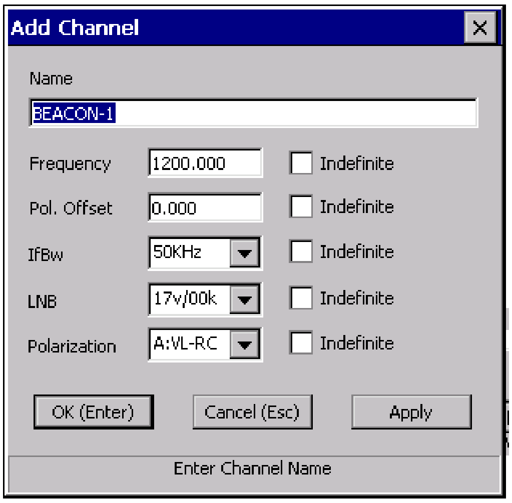


Figure 4-20: Add Channel Dialog Box

3. Enter name of the channel in the **Name** field.
4. Enter frequency for the channel in the **Frequency** field.
5. Enter a polarization offset for the channel in the **Pol. Offset** field.
6. Enter an interface bandwidth for the channel in the **IfBw** field.
7. Enter a LNB voltage for the channel in the **LNB** field.
8. Enter the polarization for the channel in the **Polarization** field.
9. Click **Apply**. The channel is added to the database.

   OR

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

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

1. From the **Satellites** dialog box, select a channel from the list of channels.
2. Click **Edit** and select **Edit Channel**. The **Edit Channel** dialog box appears with the channel configuration (see Figure 4-20).
3. Edit the channel configuration.
4. Click **Apply**. The channel data is modified in the database.

   OR

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

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

1. From the **Satellites** dialog box, select one or more channels from the list of channels.
2. Click **Edit** and select **Delete Channels**. A confirmation dialog box appears.
3. Click **Yes**. The selected channels are deleted from the database.

4.10.3 Filtering the Satellite Database

The list of satellites can be filtered to make it easier to find a specific satellite.

➢ **To filter the list of satellites:**

1. From the **Satellites** dialog box, click **Filter**. The **Satellites List Filter** dialog box appears:

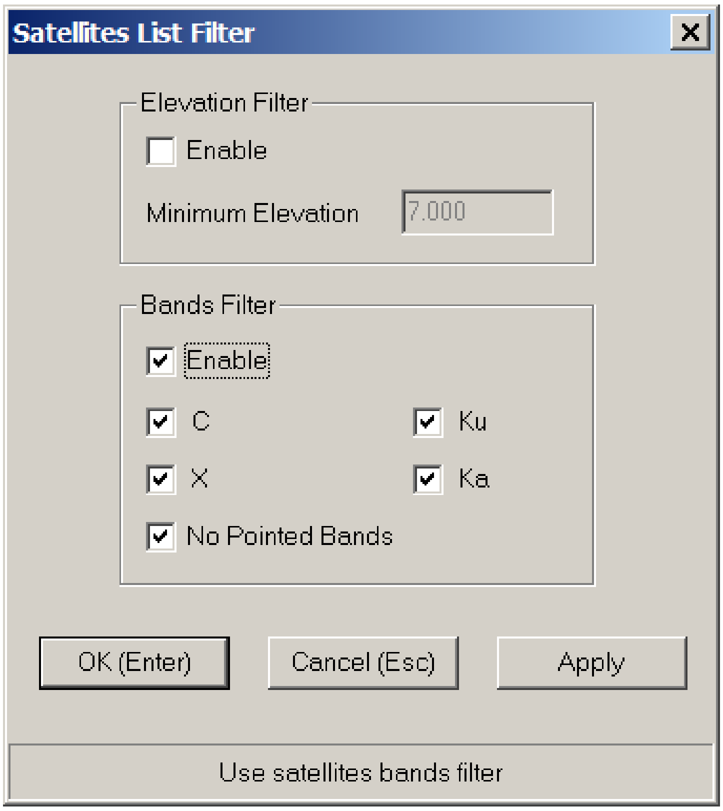


Figure 4-21: Satellites List Filter Dialog Box

2. Enter the parameters to filter the satellites list.
3. Click **Apply**. The satellites list is filtered by the specified parameters.

   OR

   Click **OK (Enter)**. The satellites list is filtered by the specified parameters and the **Satellites List Filter** dialog box closes.

4.10.4 Loading a Satellite Database

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

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

- From the **Satellites** dialog box, click **Load** and select: **Load from Controller**. The **Satellites Database Download** dialog box appears displaying the progress of the download from the ACU. When completed, the **Satellites Database Download** dialog box closes.

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

1. From the **Satellites** dialog box, click **Load** and select **Load from File**. A file browser appears.
2. Browse to the directory in which the database file is saved.
3. Select the database file.
4. Click **Open**. The selected satellite database file is loaded.

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

1. From the **Satellites** dialog box, click **Load** and select **Automatic Loading**. The **Satellites Database Automatic Loading** dialog box appears:

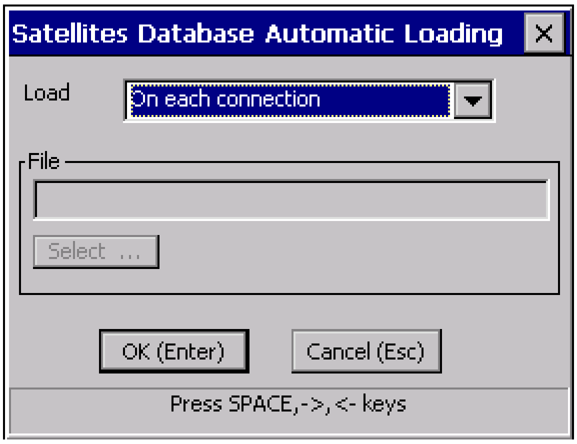


Figure 4-22: Satellites Database Automatic Loading Dialog Box

2. Select an automatic loading action. The available automatic loading actions include the following:

    - **Don't load automatically** – No database is loaded automatically.
    - **On first connection** – The database in the ACU is loaded automatically the first time the ACU connects to the CCU after the system powers up.

- **On each connection** – The database in the ACU is loaded automatically every time the ACU connects to the CCU.
- **On first Satellite Window opening** – The database in the ACU is loaded automatically the first time the **Satellites** dialog box is opened after the system powers up.
- **On start from file** – The database in the specified file is loaded automatically when the system powers up.

3. If **On start from file is selected**, select a database file to open automatically.
4. Click **OK (Enter)**. Automatic satellite database loading is configured.

4.10.5 Saving the Satellite Database

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

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

1. From the **Satellites** dialog box, click **Save** and select **Upload to Controller**. A confirmation dialog box appears.
2. The **Satellites Database Upload** dialog box appears displaying the progress of the upload to the ACU. When completed, the **Satellites Database Upload** dialog box closes.

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

1. From the **Satellites** dialog box, click **Save** and select **Save in File**. A file browser appears.
2. Browse to the directory in which to save the database file.
3. Enter a name for the file in the **File name** field.
4. Click **Save**. The satellite database file is saved to the specified file.

4.11 Configuring the NBR

NARROW BAND RECEIVER (NBR) parameters can be configured manually, without modifying the satellite database. However, it is recommended that you configure NBR parameters using the satellite database (see **Section 4.10.2**: **Editing the Satellite Database** on page 126).

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

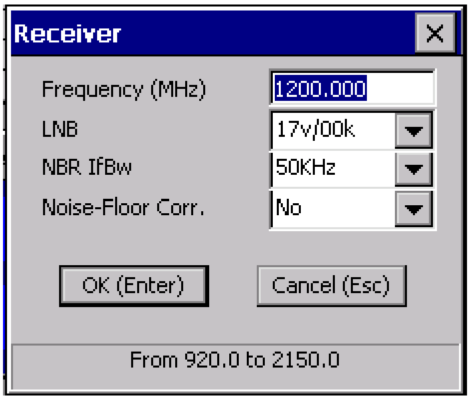


Figure 4-23: Receiver Dialog Box

2. Enter a frequency for the channel in the **Frequency (MHz)** field.
3. Enter a LNB voltage for the channel in the **LNB** field.
4. Enter an intermediate frequency bandwidth for the channel in the **NBR IfBw** field.
5. To turn the noise floor correction on or off, select a value in the **Noise-Floor Corr.** field.
6. Click **OK (Enter)**. The **Receiver** dialog box closes.

4.12 Configuring Polarization and Offset

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

Moreover, for each linear satellite, the polarization offset must be configured. Polarization offset for satellites is configured using the **Satellites** database (see **Section 4.10.2**: **Editing the Satellite Database** on page 126).

The current system polarization can be seen in the **Polariz** parameter of the System Status box on the **Operation Screen**.

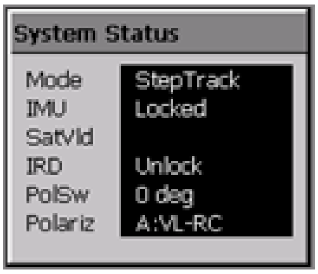


Figure 4-24: System Status Box

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:

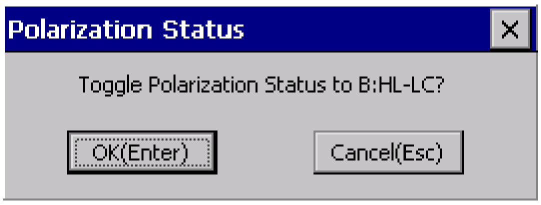


Figure 4-25: Polarization Status Dialog Box

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

4.13 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 under the customer's responsibility. Follow the instructions given below and consult with Orbit's Service Department for further assistance.

4.13.1 Tx Chain Windows

The **Tx Chain** window is displayed on the **Maintenance Screen**, accessed from the **Maint** control on the **Operation Screen** Menu Bar.

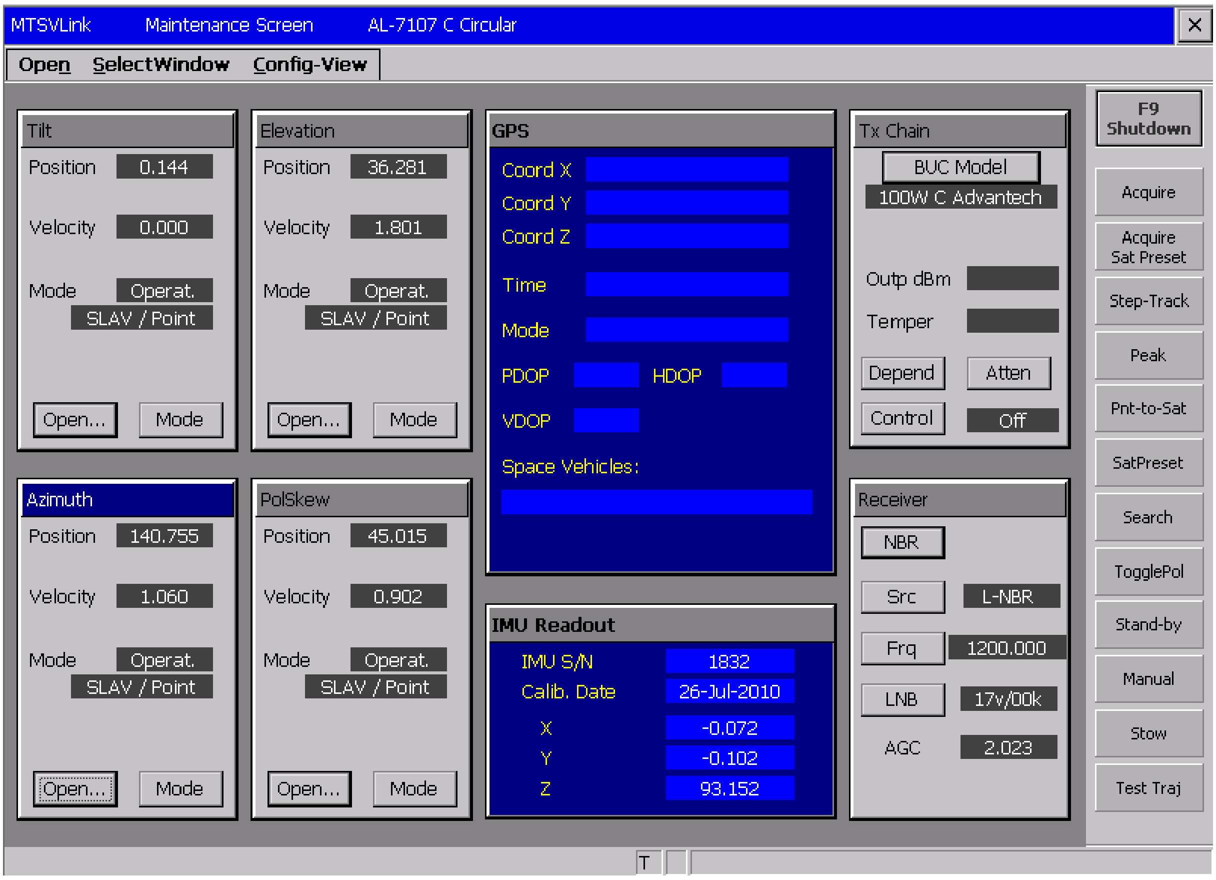


Figure 4-26: Maintenance Screen

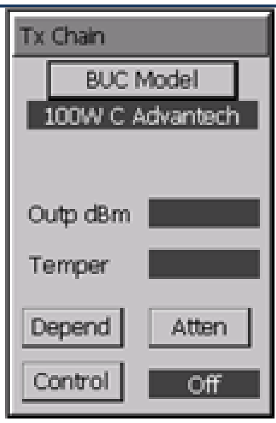


Figure 4-27: Tx Chain Window

The **Tx Chain** window contains the following controls:

- **BUC Model –** Select the relevant BUC model from the pop-up menu.
- **Depend –** This button opens the **Tx Chain Dependency** dialog box.

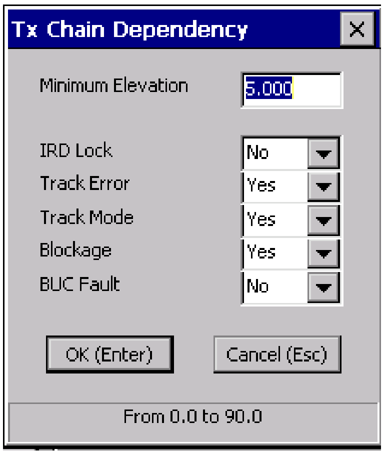


Figure 4-28: Tx Chain Dependency Dialog Box

The **Tx Chain Dependency** dialog box contains the following controls:

- **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.

- 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 2-second delay, in compliance with 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).

- **Atten** – This button opens the **BUC Attenuator** dialog box, which is used to define the attenuator control capability of the Orbit-certified BUC units.

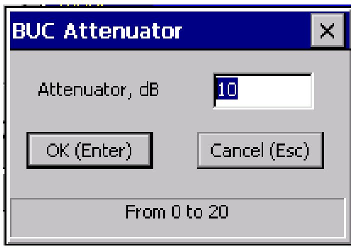


Figure 4-29: BUC Attenuator Dialog Box

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

The default setting is **Auto**.

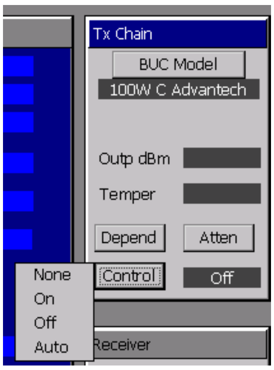


Figure 4-30: Tx Chain Control Menu

4.13.2 Defining Blockage Zones

Blockage zones comprise specific ranges of ANTENNA elevation and azimuth angles within which the ANTENNA's line of sight (LOS) is physically blocked (for example, by the ship's mast).

The CCU displays the warning message WRN 033: Antenna View Blocked when the ANTENNA enters one of the defined zones, and automatically reverts to Point-to-Satellite Mode, on the assumption that the ANTENNA signal is not available for step-tracking. When the ANTENNA leaves the blockage zone, a re-acquisition sequence is initiated automatically.

> **Note:** The warning message may also be read by an external device, such as the iDirect™ modem.

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

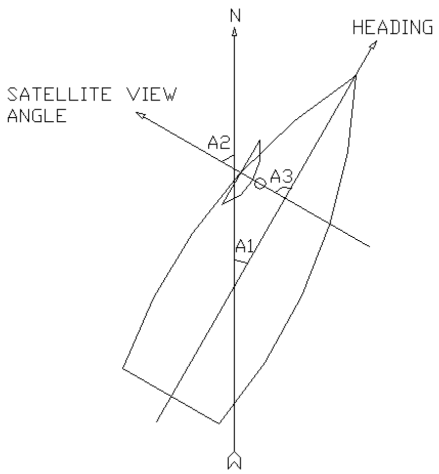


Figure 4-31: Blockage Zone Azimuth Variables

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

In the following simplified model, the ship’s pitch and heading values are assumed as zero:

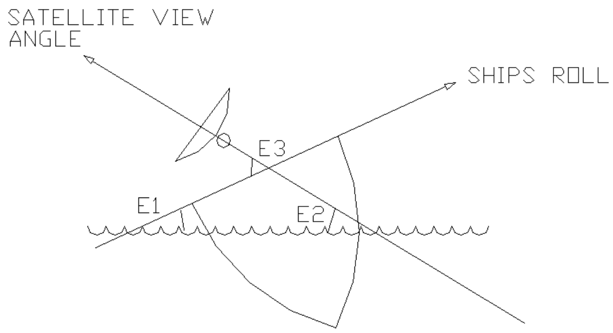


Figure 4-32: Blockage Zone Elevation Variables

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

One can see from the above models that the local azimuth is the ANTENNA azimuth relative to the ship’s bow-to-stern line, rather than to the true north, and that the local elevation is the ANTENNA elevation relative to the ship’s deck, rather than to the horizon.

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

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

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

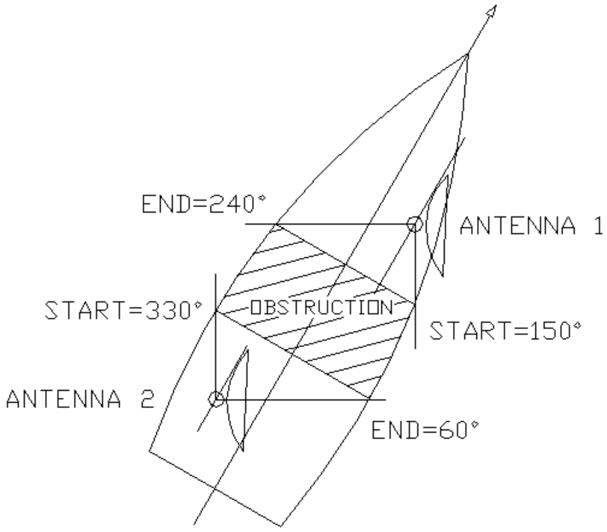


Figure 4-33: Blockage Zone Example

In the above model, `ANTENNA` 1 is blocked within a range of 90°, from 150° to 240° local azimuth. `ANTENNA` 2 is also blocked within a range of 90°, from 330° to 60° degrees local azimuth. The blockage zones for both `ANTENNA`s are defined as follows:

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

- If a zone is to be defined strictly by azimuth angles, the elevation angles should be set from –90 to +90 degrees.
- It is not necessary to enter values for all four zones. The default setting of 0.0000 to 0.0000 effectively disables any unused zones.

➢ **To define blockage zones:**

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

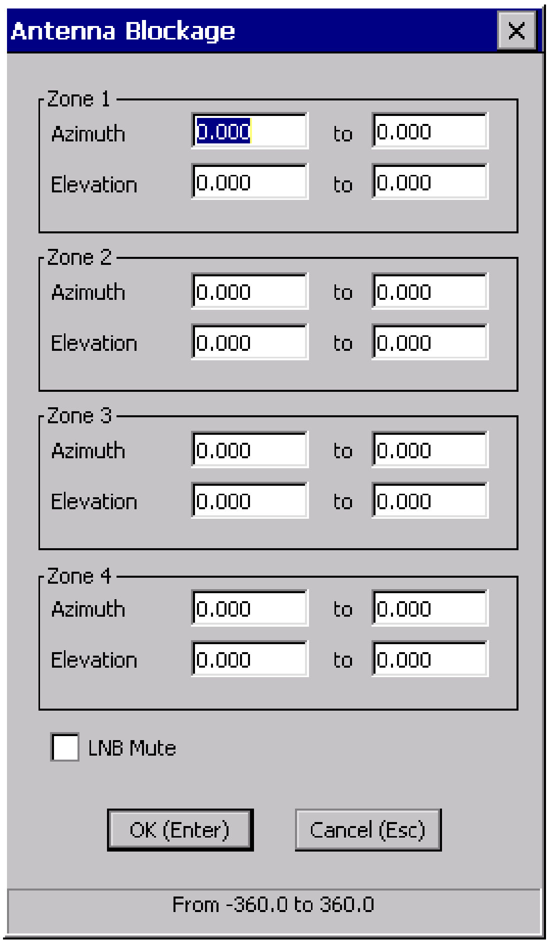


Figure 4-34: Antenna Blockage Dialog Box

2. Define up to four blockage zones, in four angular measurements relative to the `ANTENNA`:
   - In the **Azimuth** and **to** fields, enter the azimuth range of the blockage zone relative to the ship's bow (in a clockwise direction).
   - In the **Elevation** and **to** fields, enter the elevation range of the blockage zone relative to the ship's deck (from bottom to top).
3. To turn off the power to the `LNB` automatically when the antenna is pointed to one of the defined blockage zones, check **LNB Mute**.
4. Click **OK (Enter)**. The **Antenna Blockage** dialog box closes.

4.14 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 purposes 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:

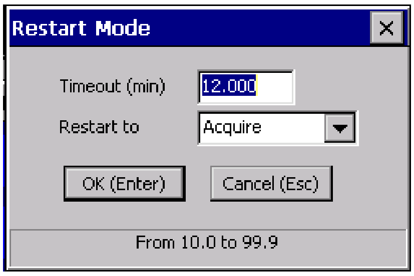


Figure 4-35: Restart Mode Dialog Box

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 the Acquire Mode (see **Section 5.4.8 Acquire Mode** on page 167).
    - **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: 5.4.10 Test Trajectory Mode** on page 169).
    - **AcqSatPreset** – Activates Acquire Satellite Preset Mode (see **Section: 5.4.9 Acquire Satellite Preset Mode** on page 167).
    - **AcqPrTrack –** Activates Acquire Program Track Mode (see **Section: 5.4.13 Acquire Program Track Mode** on page 170**).**
4. In the **Timeout (min)** field, enter the number of minutes after which the system will automatically reboot if it fails to engage the defined operating mode.
5. Click **Ok (Enter)**. The **Restart Mode** dialog box closes.

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

4.15 Calibrating and Activating Noise Floor Correction

4.15.1 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:

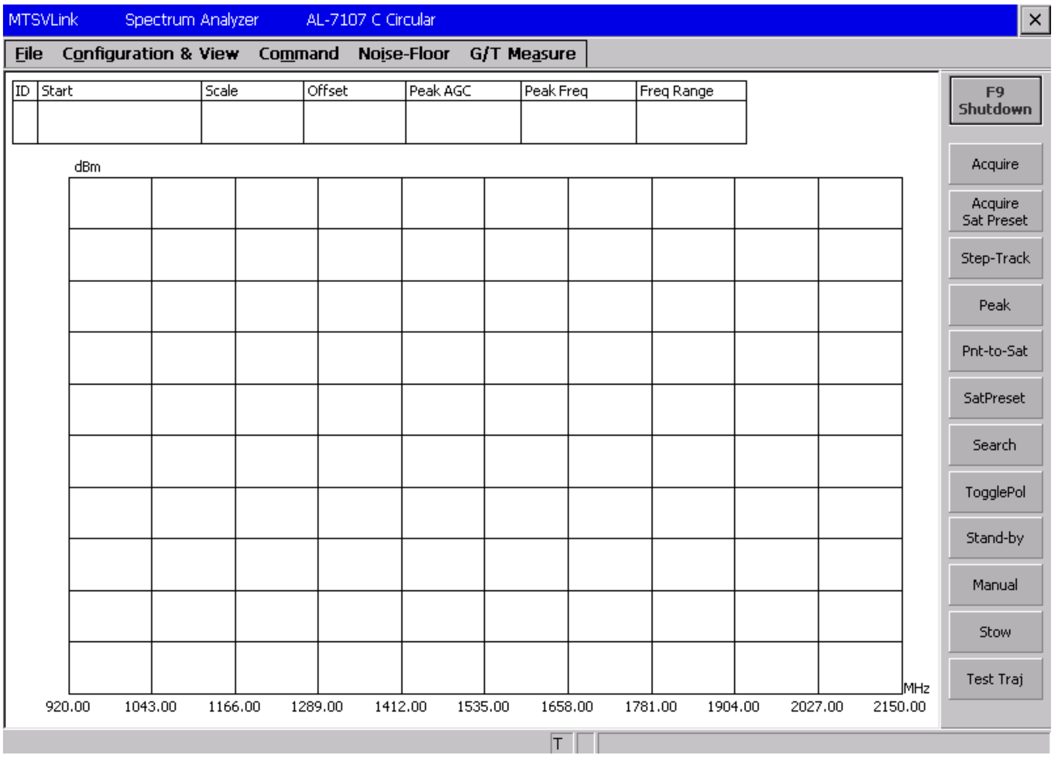


Figure 4-36: Spectrum Analyzer Screen

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

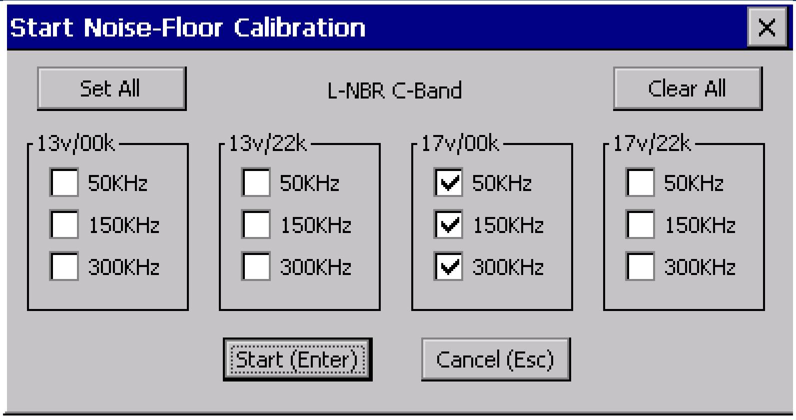


Figure 4-37: Start Noise-Floor Calibration Dialog Box

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

Calibrating an excess number of lines (for example, all lines for a single-band `LNB`) will result in measurement time increase, but it 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 completion of the process, the results (final) are displayed in the **Write Noise-Floor Calibration** dialog box, and may be compared to the examples displayed in the figures below in **Section: 4.15.2 Typical Noise Floor Curves** on page 144**.**
7. Click **Write (Enter)**. The **Write Noise-Floor Calibration** dialog box closes.

Figure 4-38: 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:

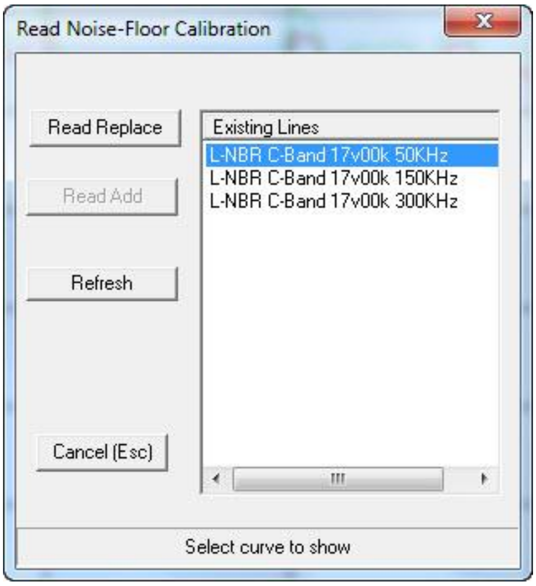


Figure 4-39: Read Noise-Floor Calibration Dialog Box

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.

4.15.2 Typical Noise Floor Curves

Typical noise-floor curves for the various `LNB`s are displayed below for reference:

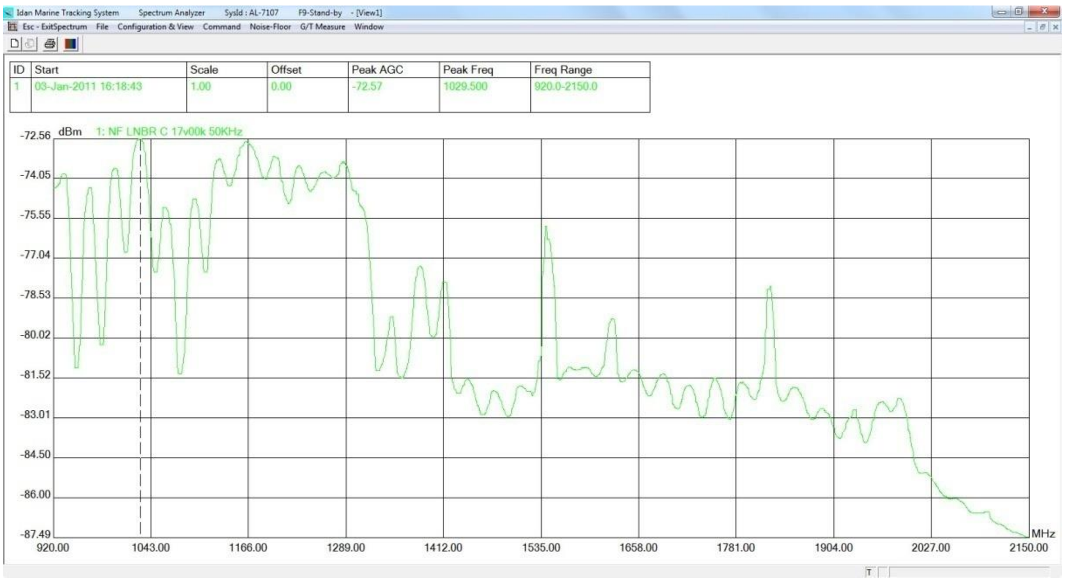


Figure 4-40: C-Band LNB, NBR 50 KHz

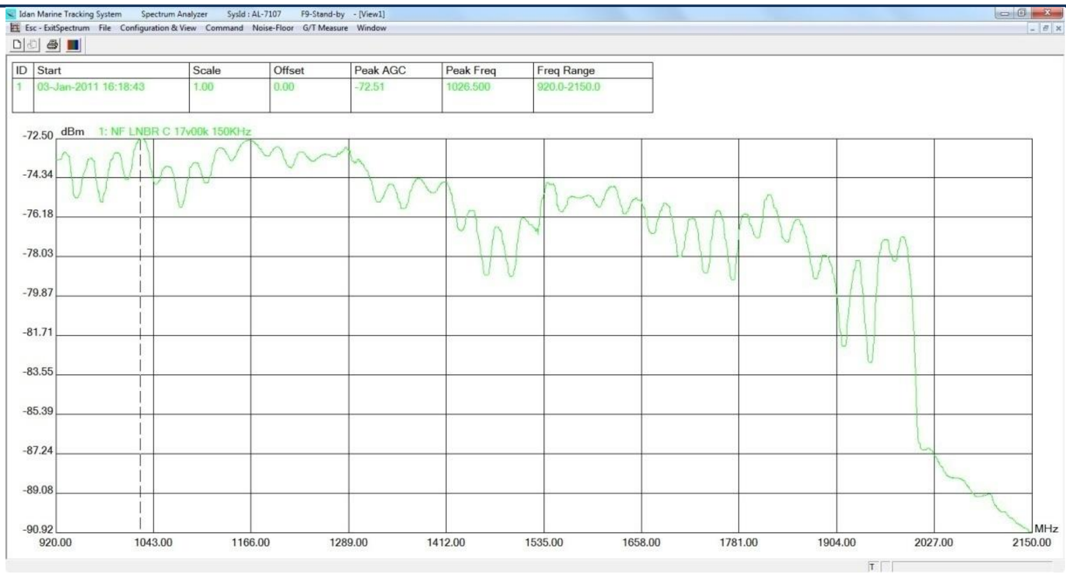


Figure 4-41: C-Band LNB, NBR 150 KHz

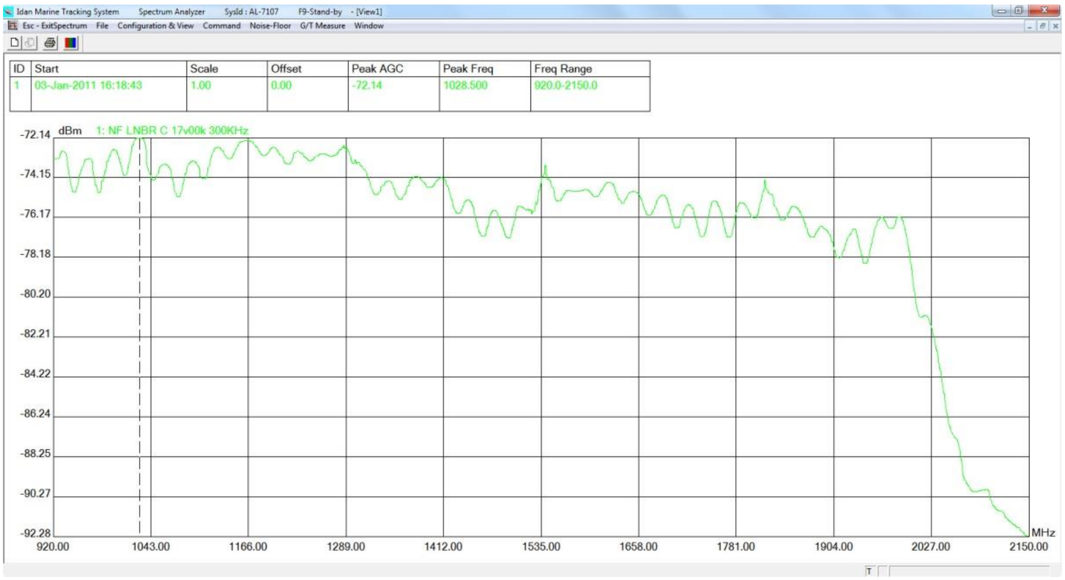


Figure 4-42: C-Band LNB, NBR 300 KHz

4.15.3 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:

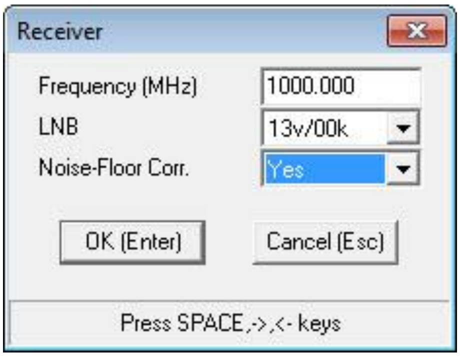


Figure 4-43: Receiver Dialog Box

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

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

---

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

4.16 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:

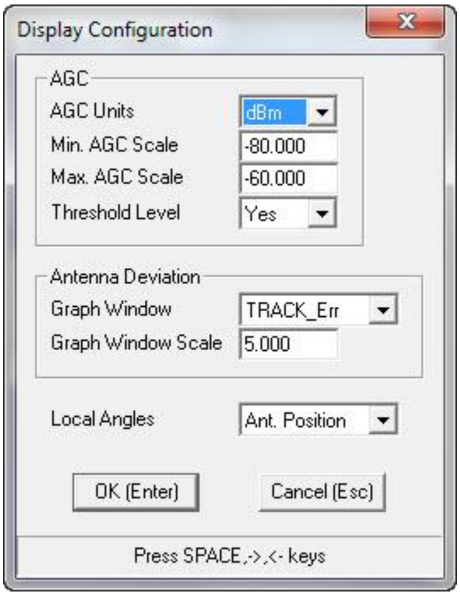


Figure 4-44: Display Configuration Dialog Box

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.

4.17 Configuring AGC Threshold

When not using Noise Floor connection (in which case the default threshold is -74 dBm), 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**.

➢ **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 4-45: 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 -74 dBm.

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.

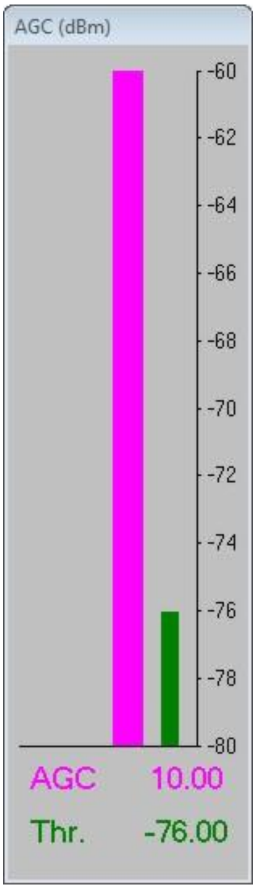


Figure 4-46: AGC (dBm) Window

4.18 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:

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

The Declaration includes:

- G-Shock indicators reported color upon System's arrival – both for crate and system, accompanied with real pictures of the shock indicators and their serial number shown clearly.
- UPS Connectivity to system – approval of UPS connected to system with its model and vendor name.
- Orbit's authorized technician – the name and signature of Orbit's authorized technician responsible for performing the System's installation and commissioning.
- Commissioning Checklist provided in **Commissioning Checklist** (on page 216) - to allow ORBIT to follow up on field installation and commissioning issues.

The Checklist includes:

- Customer information
- Commissioning requirements
- Installation location
- Below Deck Equipment
- System Inspection
- CCU settings
- System Cables
- System Configuration.

5 System Operation

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

- Principles of Operation
- Selecting a Satellite
- Activating Operating Modes

5.1 Dual-Antenna System Operation

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

When 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.

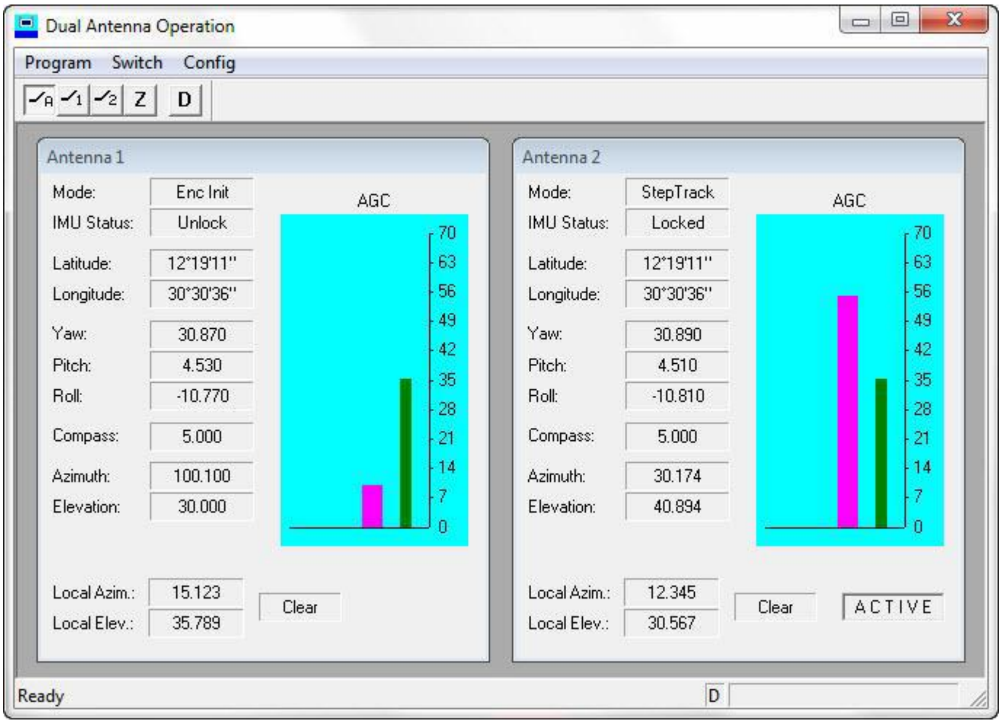


Figure 5-1: DaoLink Dual-Antenna Operation Screen

The DAOLINK Dual Antenna Operation Screen displays two Antenna windows containing monitoring and control fields for each terminal.

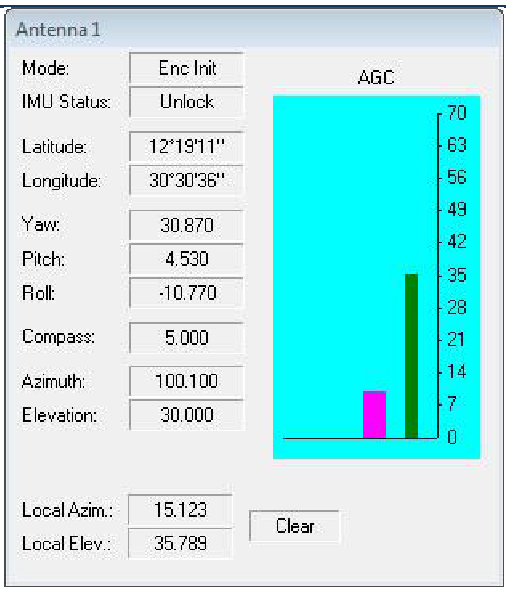


Figure 5-2: Antenna 1 Window

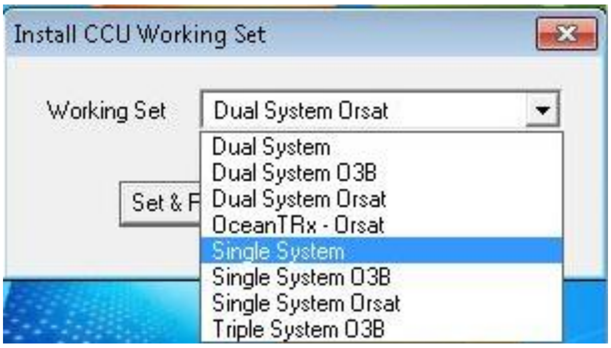
The above window displays the following parameters:

- 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)

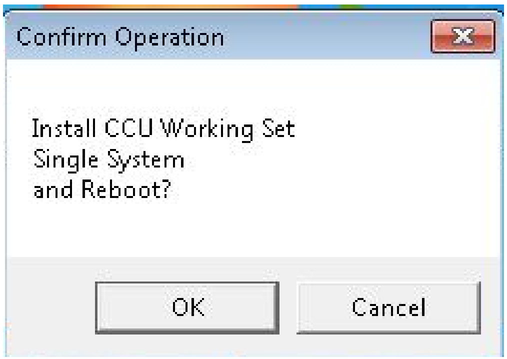
1. On the Windows 7 Embedded task bar, right click on the (CCU manager).

2. Select working sets. List of available CCU modes will show



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.

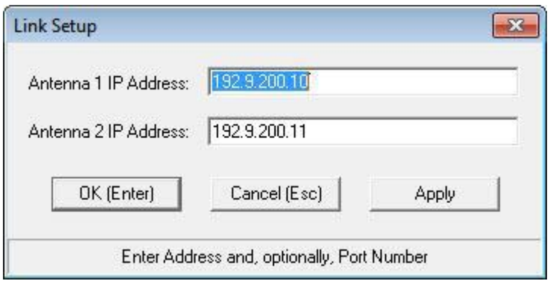


Figure 5-3: Line Setup Dialog Box

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

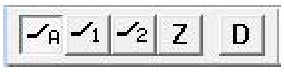
3. Click OK (Enter

➢ To set up AGC-based antenna switching:

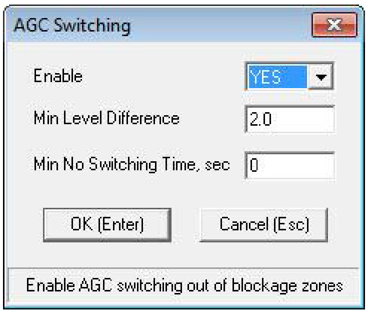
1. Open the Switch menu and select the desired switching method:

- 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 2 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 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 select the Auto switching method, enter 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.

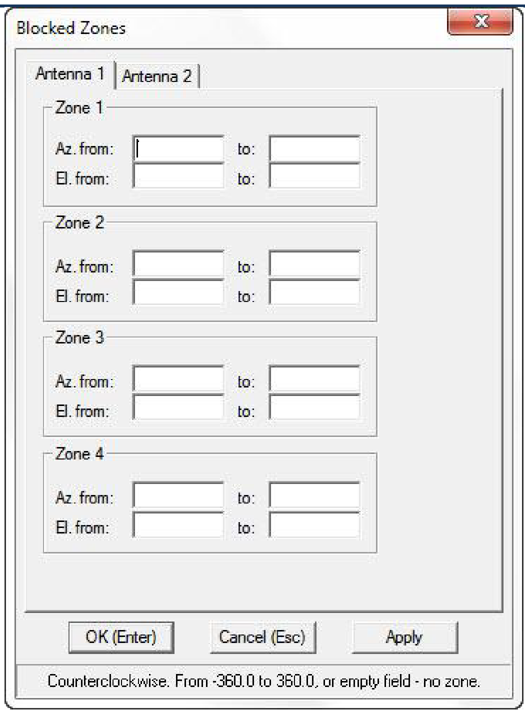


Figure 5-4: Blocked Zones Dialog Box

2. Define the 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.

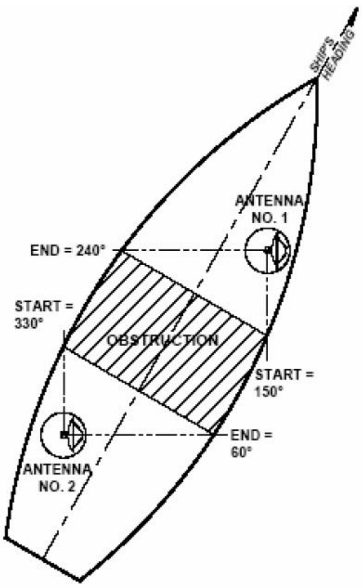


Figure 5-5: Dual Blockage Zones – example

Figure 58: 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:

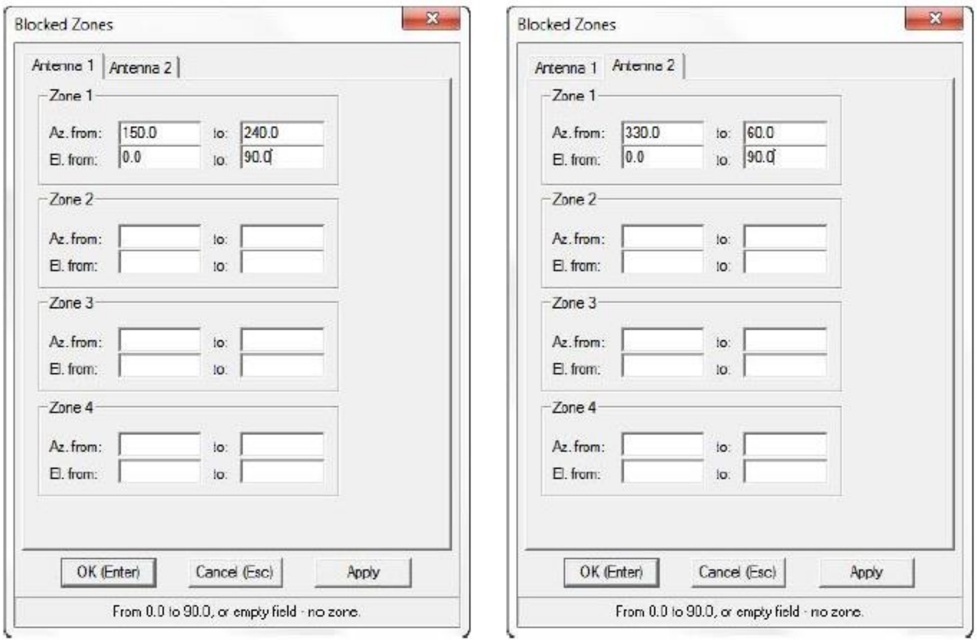


Figure 5-6: Blockage Zone Settings – example

➢ 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.

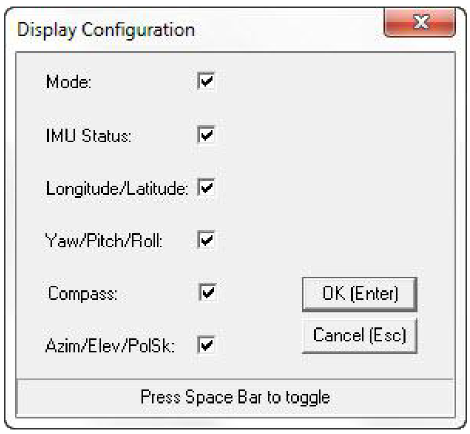


Figure 5-7: Display Configuration Screen

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

3. Click OK (Enter).

5.2 Principles of Operation

5.2.1 Acquisition and Tracking Algorithm

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

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

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

The OceanTRx™7-300 system is designed to acquire and track a selected satellite, defined by the system according to three functional parameters:

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

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

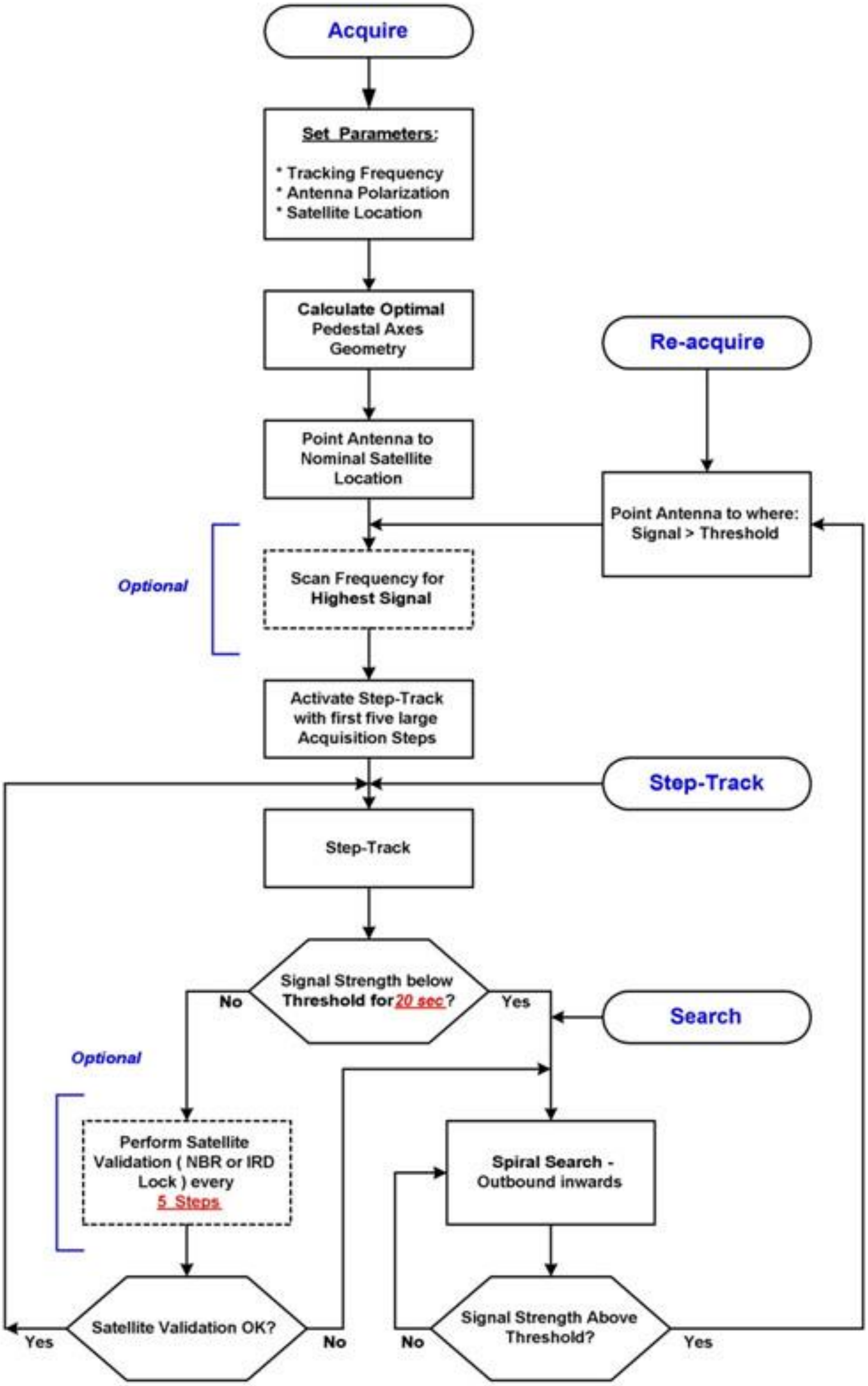


Figure 5-8: OceanTRx™7-300 System – Simplified Acquisition and Tracking Algorithm

5.2.2 Modes of Operation

In principle, after proper installation, configuration, and alignment, the OceanTRx™7-300 system functions in a completely automatic manner. Upon power-up, the system acquires and tracks the last selected satellite without any manual intervention from a human operator. This process entails the utilization of several lower-level modes of operation: satellite acquisition, tracking, validation, searching, and re-acquisition.

Nonetheless, the advanced OceanTRx™7-300 HMI allows you to activate a number of operating modes independently, for purposes of installation, configuration, alignment, and maintenance.

See **Section: 5.4 Activating Operating Modes** on page 162 for information about the modes of operation.

5.2.3 Tracking Receiver Feedback

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

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

The OceanTRx™7-300 system uses a narrow-band tracking receiver (`NBR`) to receive each of the above signals. To achieve optimal performance, the following specifications are recommended:

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

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

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

5.2.4 Satellite Validation

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

- An adjacent satellite producing signals in the same frequency spectrum as the OceanTRx™7-300 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™7-300 system can be configured to perform periodic checks to verify that the ANTENNA is locked on the right satellite, provided the necessary satellite information can be obtained.

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

5.3 Selecting a Satellite

When the power-up sequence is completed, the system is automatically locked onto the last satellite that was selected and saved prior to system shutdown.

> The power-up sequence is fully automatic, provided the system is configured to auto-start (the default setting).

➢ **To select a satellite:**

1. From the **Operation Screen**, click the **Satellite** command on the Menu Bar. The **Satellites** dialog box appears, displaying the satellites in the database (see **Configuring the Satellite Database**: on page 124).
2. Select the desired satellite and click **Select**. A confirmation dialog box appears.
3. Click **OK (Enter)**. The selected satellite and channel appear in the **Selected Satellite and Channel** window on the **Operation Screen**.

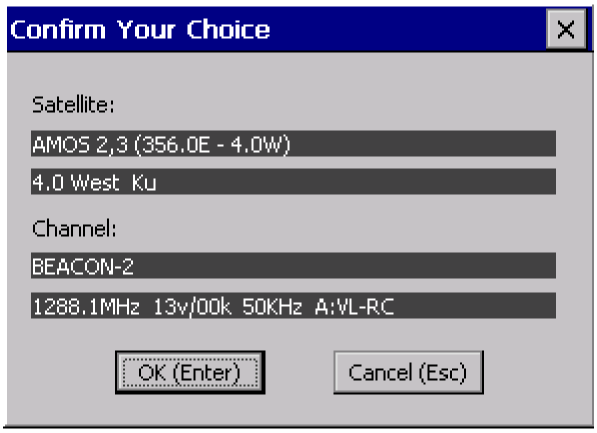


Figure 5-9: Selected Satellite and Channel Window

5.4 Activating Operating Modes

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

5.4.1 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.

5.4.2 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.

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:

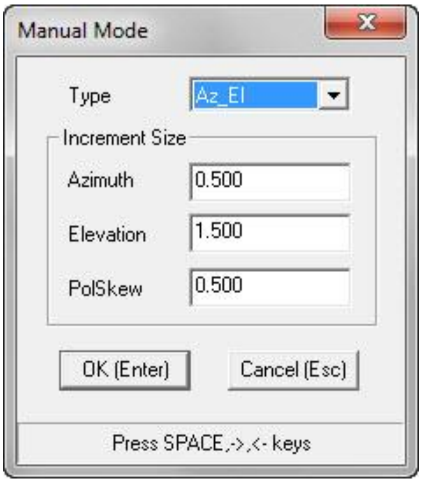


Figure 5-10: Manual Mode Dialog Box

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

   - **Az_El** (Default)

   Incremental values are measured relative to the ANTENNA location the moment Manual Mode is activated. Azimuth angles reference elevation, rather than Earth-horizon. In practical terms, this means that when taking an azimuthal antenna cut, there is no need to translate the horizontal axis by the cosine of elevation. However, when moving the azimuth angle by a considerable amount (more than a few degrees), the elevation angle also changes.

   - **Earth_Az_El**

   Absolute antenna angles are used – azimuth references Earth true north, and the elevation references the horizon. If only the azimuth is moved, the elevation remains constant.

   - **SatArch**

   The azimuth represents the angular displacement along the satellite arch, in reference to the Greenwich Meridian. The azimuth and elevation changes are 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.

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**:

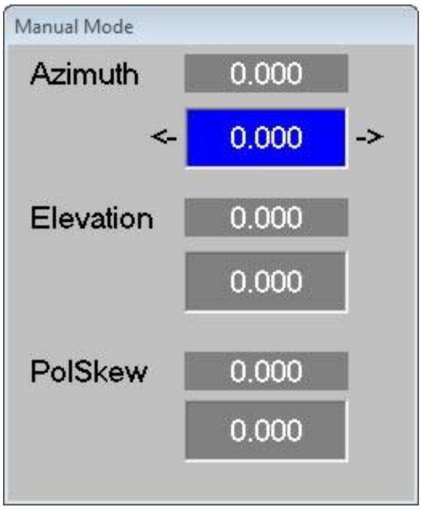


Figure 5-11: Manual Mode Window

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.

5.4.3 Search Mode

Under normal working conditions, when the AGC level falls below the threshold, "Search Mode" is automatically activated from the Acquire and Acquire Satellite Preset Modes. 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.

5.4.4 Peak Mode

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

➤ **To activate Peak Mode:**

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.

5.4.5 Step-Track Mode

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

➤ **To activate Step-Track Mode:**

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

5.4.6 Point to Satellite Mode

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

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

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.

5.4.7 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:

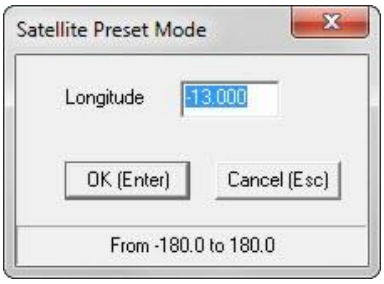


Figure 5-12: 'Satellite Preset Mode' Dialog Box

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.

5.4.8 Acquire Mode

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

➢ **To activate Acquire mode:**

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

5.4.9 Acquire Satellite Preset Mode

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

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

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

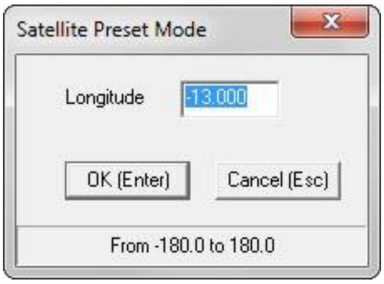


Figure 5-13: 'Satellite Preset Mode' Dialog Box

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.

5.4.10 Test Trajectory Mode

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

➢ **To activate Test Trajectory Mode:**

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 (-90° for azimuth, tilt, and polarization skew, -165° for elevation), then it moves them forwards and back on their test trajectories, until stopped by the operator.

While running the test, you can monitor the following axes parameters in the **Graphic Data Logger** (for instructions, see **Section 5.9**: **Using the Graphic Data Logger** on page 180):

- **Position feedback:** Represents the axis position as reported by the AXIS ENCODER.
- **Position error:** Represents the difference between the commanded position and the actual position.
- **Velocity feedback:** Represents the velocity of the MOTOR ENCODER.

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

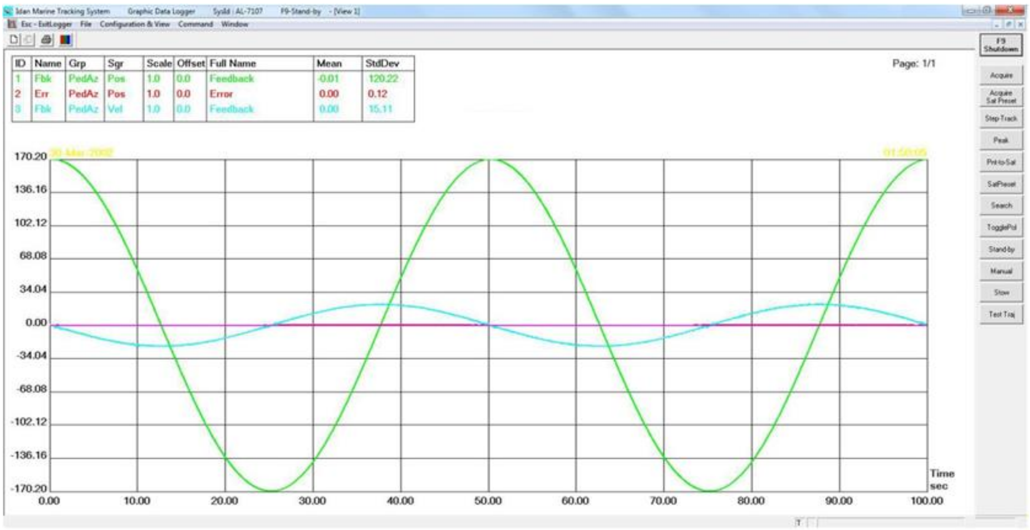


Figure 5-14: Monitoring Axes Test Parameters in the Logger

The actual trajectories for each axis are pre-configured and should not be changed. See the *OceanTRx™7-300 Maintenance and Troubleshooting Guide* for information regarding test trajectories.

5.4.11 Stow Mode

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

➢ **To activate Stow Mode:**

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.

5.4.12 Program Route Mode

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

Note: Reserved for future use.

5.4.13 Acquire Program Track Mode

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

Note: Reserved for future use.

5.5 Manual System Adjustments

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

Warning!

OceanTRx™7-300 Maritime Satellite Communication System is pre-configured and tested before it is shipped. Tampering with any of the system settings that are not explicitly mentioned in this manual can impair the functioning of the system.

5.5.1 Setting the Ship's Heading

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

➢ **To set the heading:**

1. Put the `ANTENNA` into Stand-by Mode (for instructions, see **Section 5.4.1 Stand-by Mode** on page 162).
2. From the **Operation Screen**, open the **Commands** menu and select **Set Compass**. The **Ship Heading** dialog box appears:

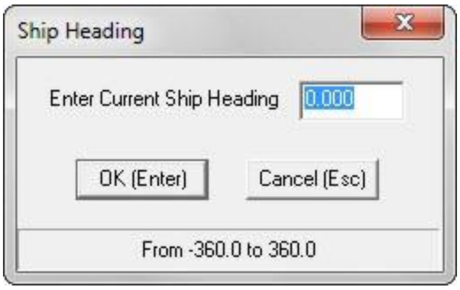


Figure 5-15: Ship Heading Dialog Box

3. Carry out 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 can 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 5-16: Ship Coordinates Window

5.5.2 Setting the GPS Position

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

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

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

Figure 5-17: 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 decimal values, note that 1° of arch is divided into 60 minutes, and each minute is 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 5-18: Ship Coordinates Window

5.5.3 Setting the AGC Threshold

The OceanTRx^{TM}7-300 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 noise-floor correction is deactivated, or the operator wants to introduce a user-defined threshold, the threshold level can be set manually.

See Section **4.17**: **Configuring AGC Threshold** on page 148 for information on setting the AGC threshold.

5.6 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.

5.7 Using the Spectrum Analyzer Screen

The **Spectrum Analyzer Screen** is accessed with the **Spectrum** command from both the **Operation Screen** and **Maintenance Screen**.

➢ **To configure the Spectrum Analyzer Screen:**

1. From the **Spectrum Analyzer Screen**, open the **Configuration & View** menu and select **General Config**. The **Configuration** dialog box appears:

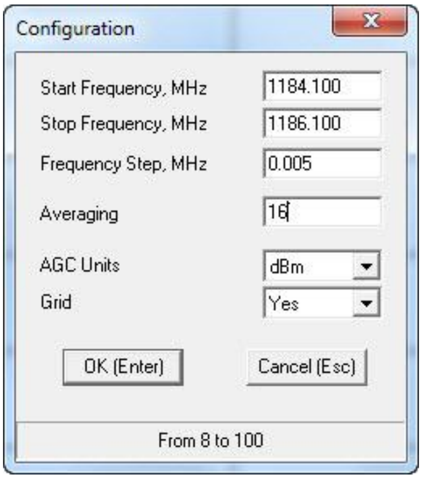


Figure 5-19: Spectrum Analyzer Configuration Dialog Box

2. Set the start and stop frequencies to the relevant range of measurement.
3. The frequency step is set to 1MHz by default. You should decrease the frequency step when measuring smaller frequency spans (the minimal step is 0.005MHz).
4. The Spectrum Analyzer takes a number of measurements for each frequency before advancing to the next frequency. The average power of the measurements is displayed in the Spectrum Analyzer. Set the number of measurements taken for each frequency before

advancing to the next frequency in the **Averaging** field. Valid values are integers in the range 8 – 100.

5. Select an AGC unit from the **AGC Units** list. The selected unit is used by the Spectrum Analyzer when displaying the results. Available units are dBm and dBμV.
6. The Spectrum Analyzer graphs can be displayed with or without a background grid. Select the “Grid” display from the **Grid** list.
7. Click **OK (Enter)**. The **Configuration** dialog box closes.

The spectral scan may take some time. The time required can be calculated by multiplying the amount of measurements to be performed by 2.5 milliseconds.

The number of measurements is in turn a multiplication of measured points by the selected averaging factor (the minimum value is 8). For example, a scan of 1000MHz to 1010MHz with a 0.005MHz step and an averaging factor of 8 will take 40 seconds (0.0025 × 8 × (1010-1000)/0.005).

The maximum number of measured points is limited to 25,000. If the span-to-step ratio exceeds this number, an error message is received.

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

➢ **To run 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, move the system to Peak Mode.

2. Open the **Command** menu and select **Run** (or press <R> from the **Spectrum Analyzer Screen**).

The following figures show examples of Spectrum Analyzer displays.

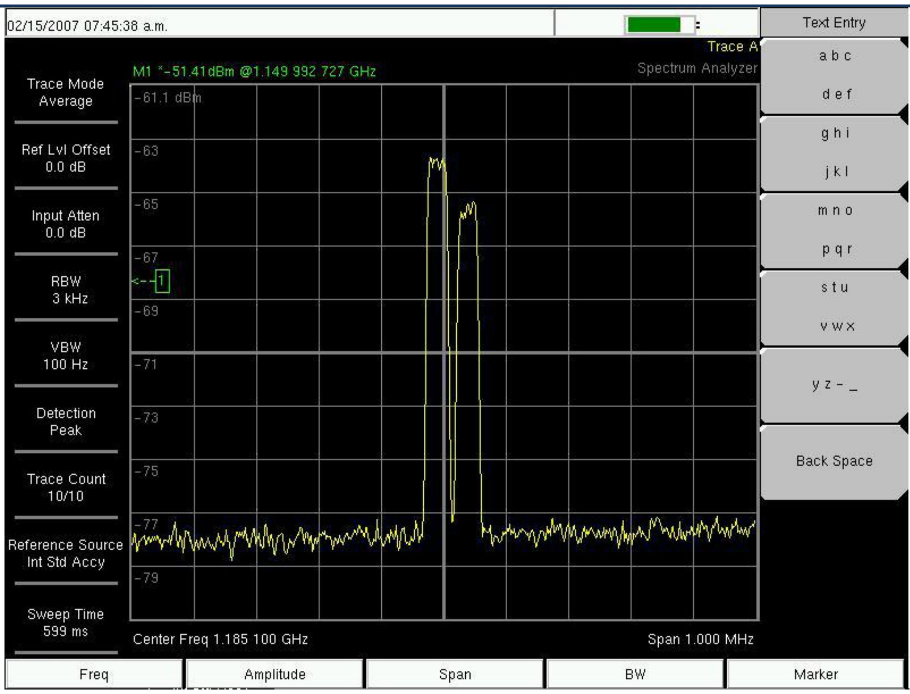


Figure 5-20: Anritsu MS2721A Spectrum Analyzer Display with a 3 KHz RBW

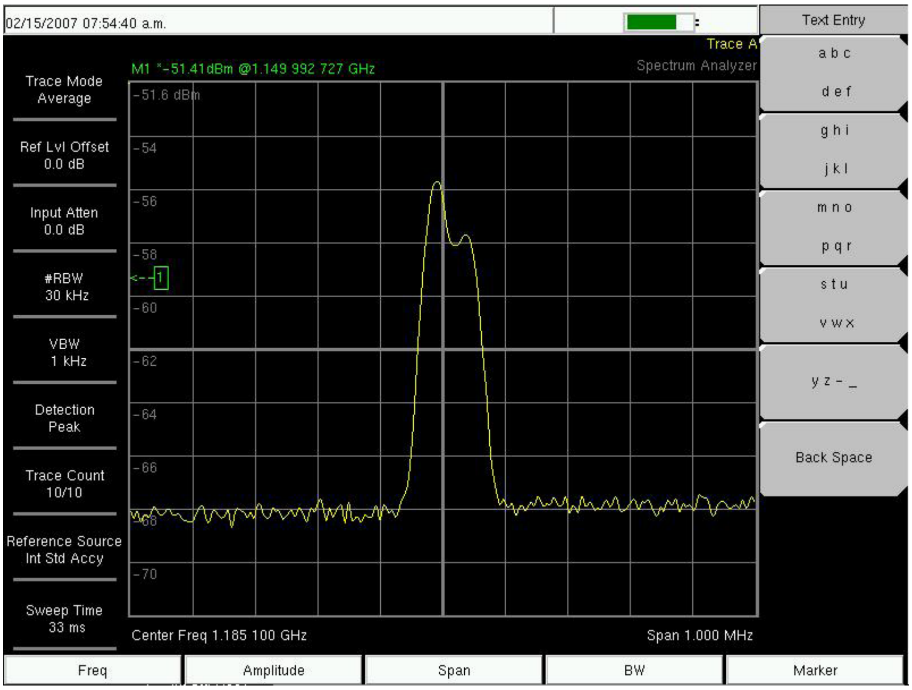


Figure 5-21: Anritsu MS2721A Spectrum Analyzer Display with a 30 KHz RBW

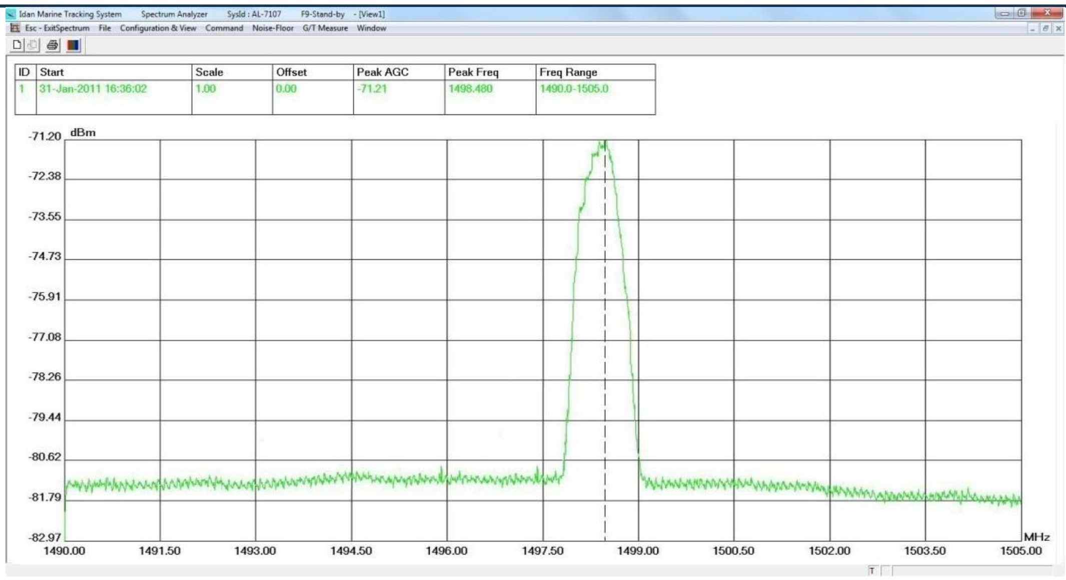


Figure 5-22: MtsVLink Spectrum Analyzer Display with an NBR IfBw of 150 KHz

Wide band scans are also possible, although the scan resolution must be taken into account. In the below figure, a 200MHz scan is taken using an NBR IfBw of 300KHz at a resolution of 0.1MHz with 8-point averaging. This scan will take about a minute.

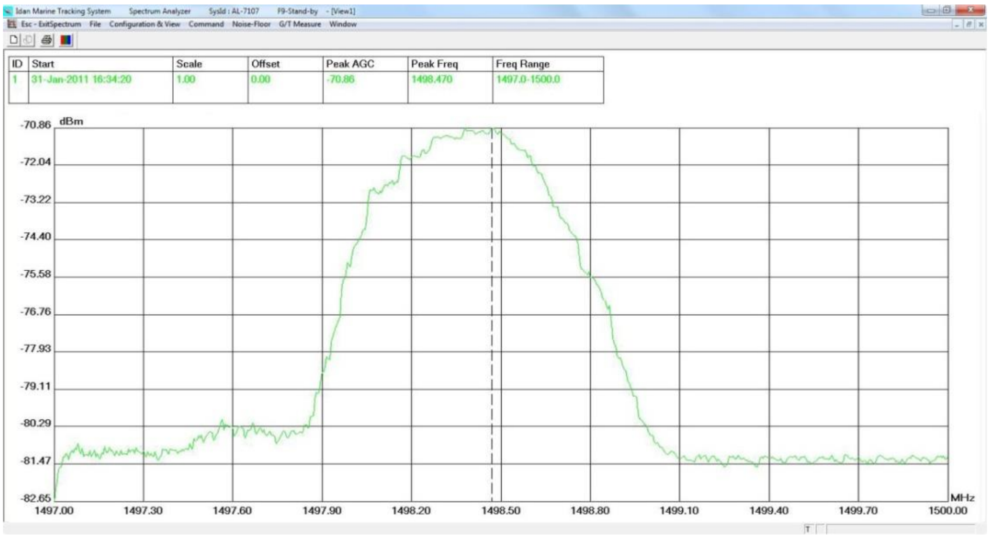


Figure 5-23: MtsVLink Spectrum Analyzer Display with an NBR IfBw of 300 KHz

5.8 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:

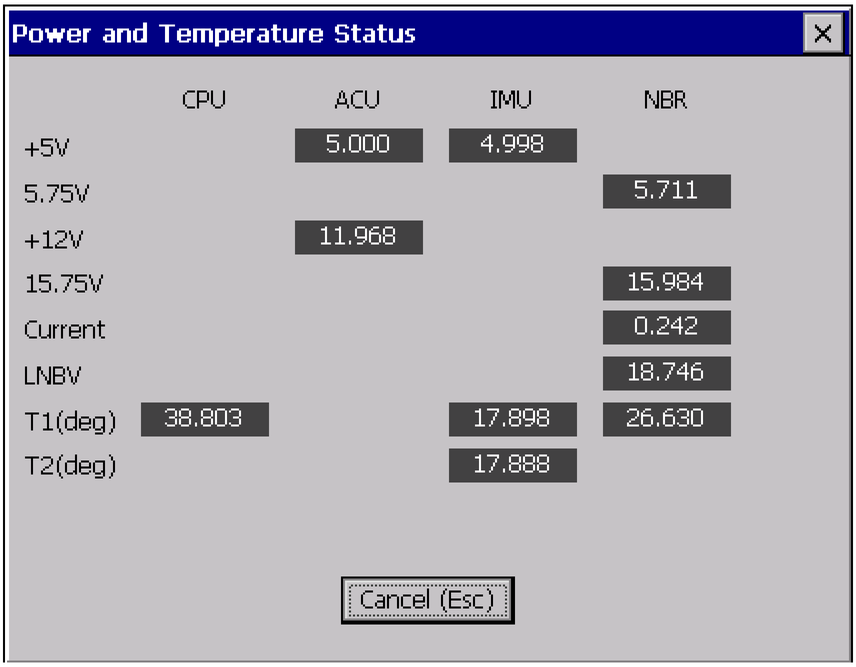


Figure 5-24: Power and Temperature Status Window

When test points are out of the normal range they are highlighted in red on a white background.

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

5.9 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.

5.9.1 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:

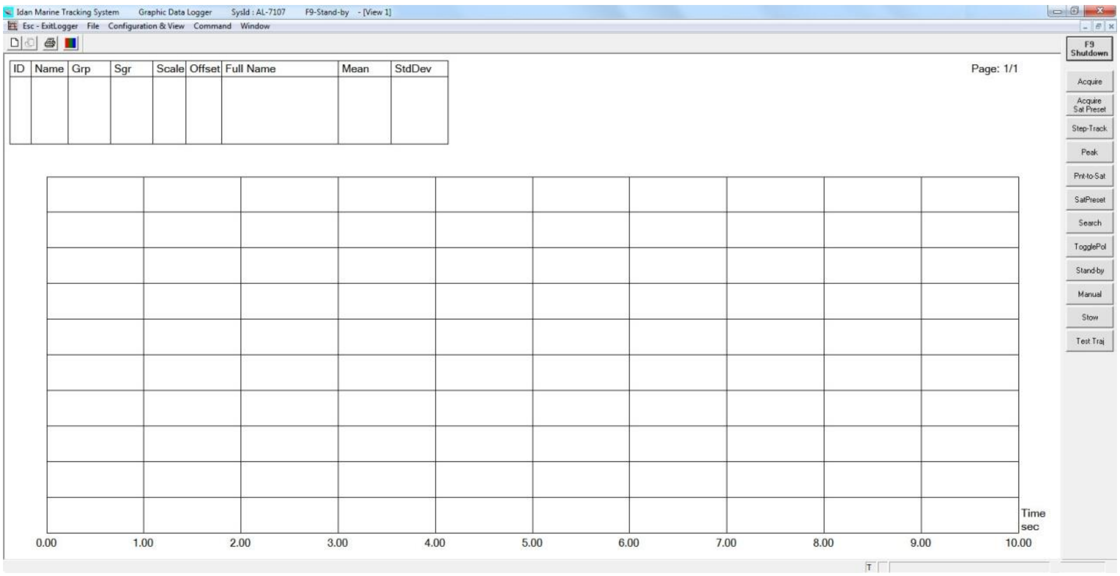


Figure 5-25: Graphic Data Logger Screen

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

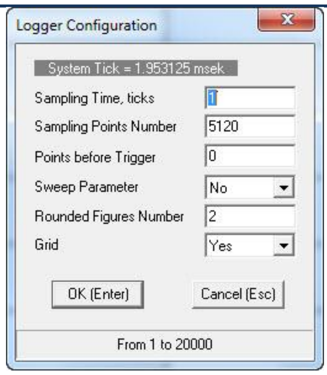


Figure 5-26: Logger Configuration Dialog Box

3. Set the desired sampling time and sampling points.

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.

5.9.2 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:

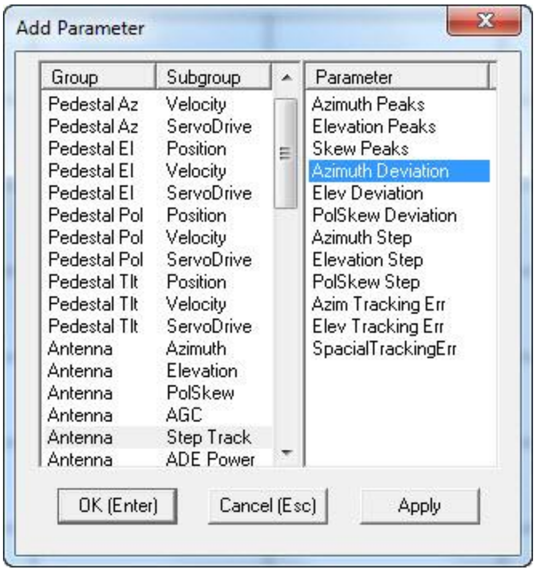


Figure 5-27: Add Parameter Dialog Box

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.

To delete a parameter from the **Logger** control table, open the **Configuration & View** menu and select **Delete** (or press the `<D>` key).

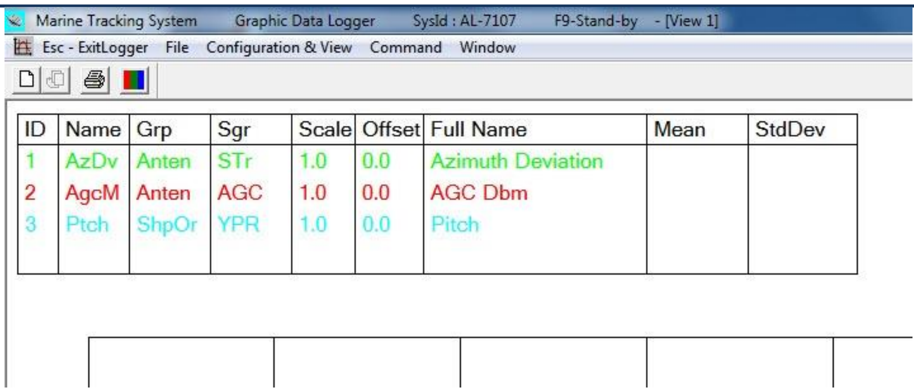


Figure 5-28: Logging Multiple Parameters

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 for a considerable time (i.e. more than a few minutes).

6. When the defined sampling time is complete, the recorded data appear as curves in the **Logger** display, and the mean value and standard deviation for each parameter appear in the **Mean** and **StdDev** columns of the control table, respectively.

5.9.3 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:

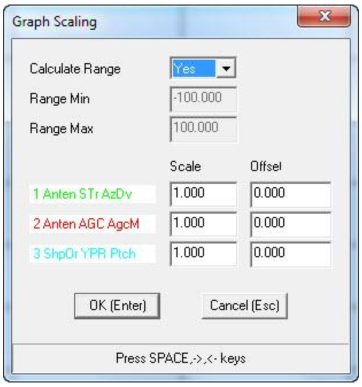


Figure 5-29: Graph Scaling Dialog Box

2. Set the desired **Scale** and **Offset** values for each parameter. For example, the following figures show the **Logger** results before and after scaling:

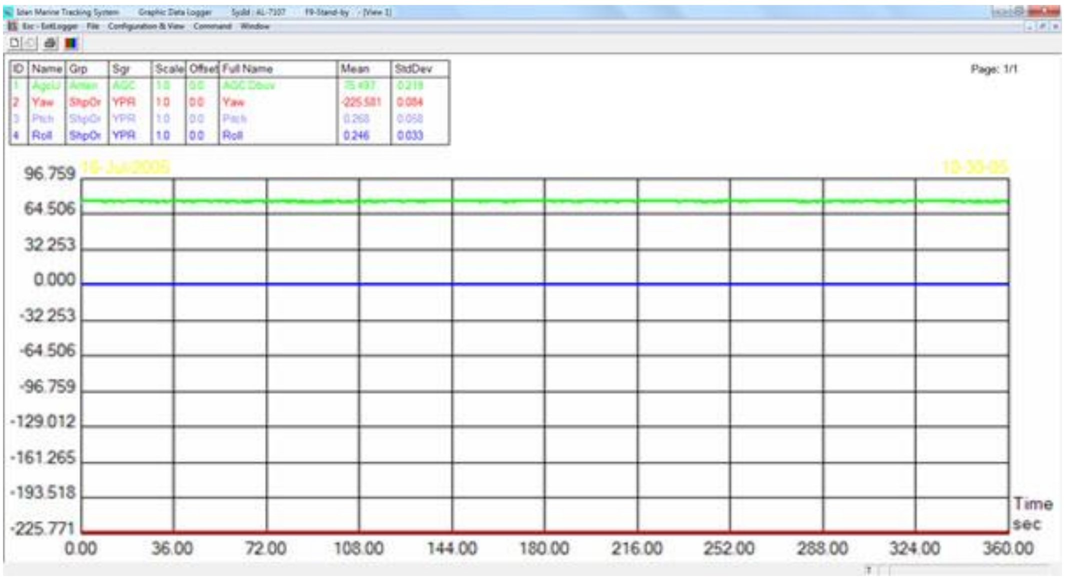


Figure 5-30: Logger Results before Scaling

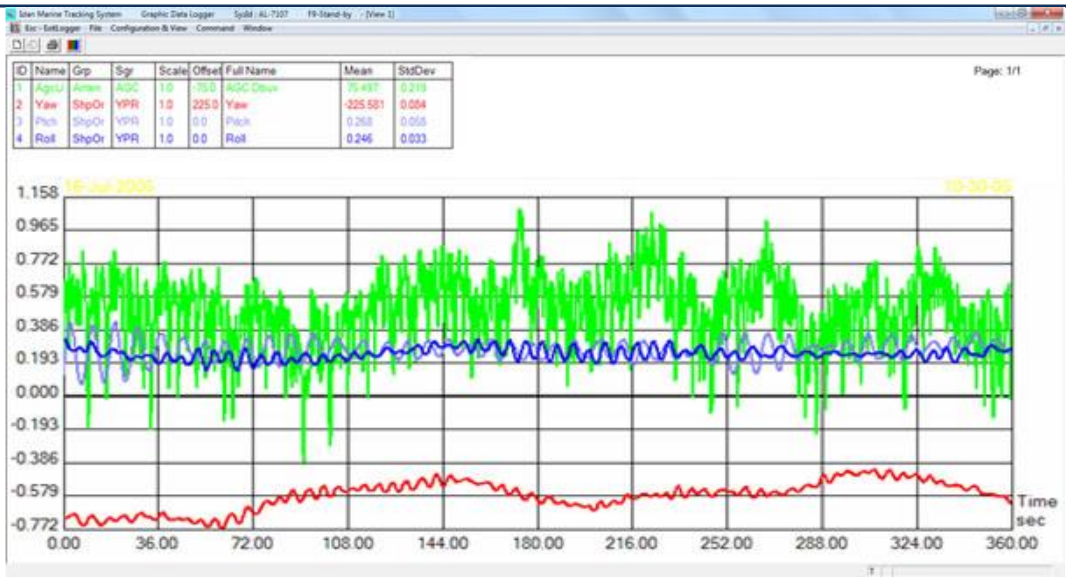


Figure 5-31: Logger Results after Scaling

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 data currently displayed.
   - Select **Add** to add the saved data to the data currently displayed.

➢ **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 **File** menu and select **Restore Setup** (or press <E> key from the **Logger** screen).
2. Retrieve the settings file. The **Logger** is automatically configured according to the saved settings.

5.10 Monitoring the MtsVLink Work Session

➢ **To determine how long 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:

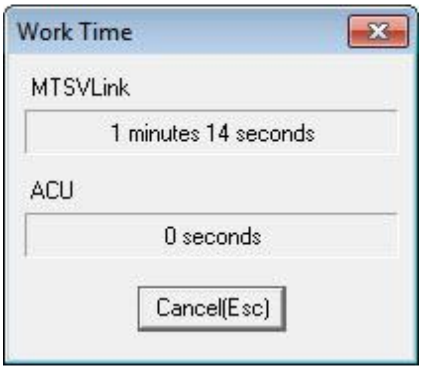


Figure 5-32: Work Time Window

5.11 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:

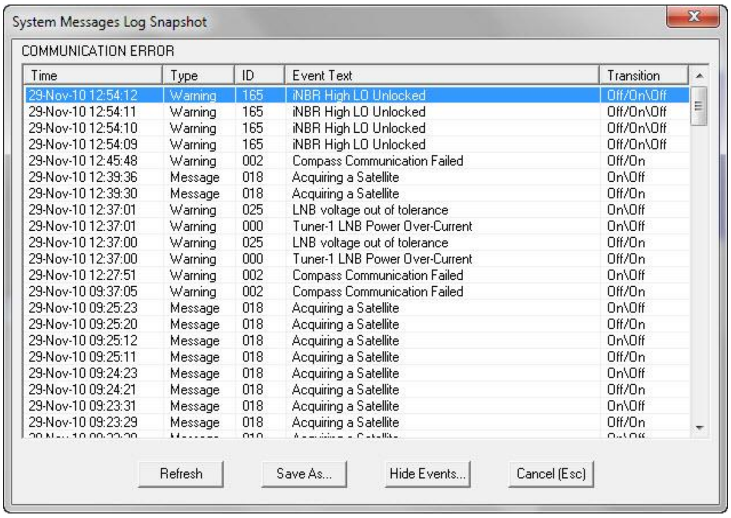


Figure 5-33: System Messages Log Snapshot Window

➢ **To remove a specific message or message type from the display:**

1. Click **Hide Events**. The **Hide Events** dialog box appears:

Figure 5-34: 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 hidden from the **System Messages Log Snapshot** window.

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.

5.12 Downloading the Status Dump File

The **Status Dump** command generates the Status Dump Report, an ASCII file containing the system parameters defined during the commissioning process, as well as system status indications. These parameters and indications can be used to analyze system performance and determine the possible source of system faults.

➢ **To download the Status Dump File:**

1. From the **Operation Screen**, open the **Host** menu and select **Status Dump**. A file browser opens.
2. Browse to the directory where you would like to save the Status Dump File.
3. Click **Save**. The Status Dump File is saved in the specified location.

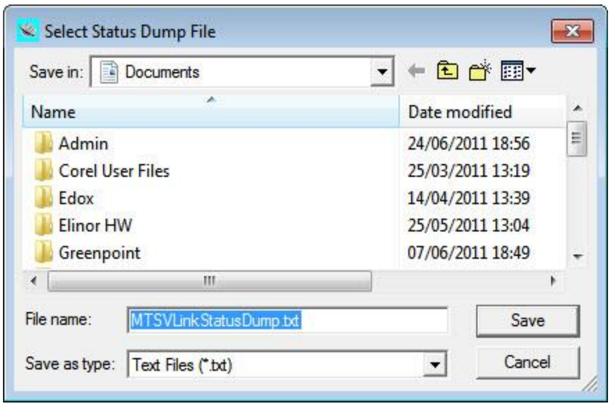


Figure 5-35: Select Status Dump File Dialog Box

A typical status dump report can be viewed in the *OceanTRx™7-300 Maintenance and Troubleshooting Guide.*

5.13 Viewing Software Version Details

➢ **To view software version details:**

- Click the **Version** control on the **Operation Screen** Menu Bar. The **Version** window appears, displaying MtsVLink and ACU software modules version numbers and dates:

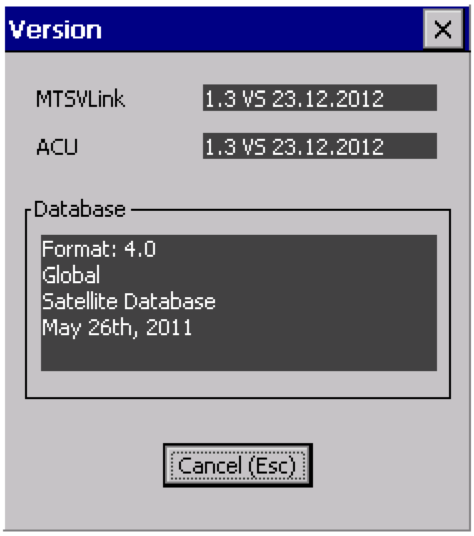


Figure 5-36: Version Window

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.

6 Status Messages

6.1 Introduction

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

- **Message (informative)** – green (for example, System Shutdown)
- **Warning** – blue (for example, Compass Communication Failed)
- **Error** – red (for example, Servo Azimuth Init Error)

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

6.2 Messages (Informative)

Controller Screen Label	Description
009: System Reboots, Axes Jammed	The system will reboot because one or more of the axes is jammed.
016: Auto-Restart in Progress	The system is undergoing initialization, including IMU initialization, encoder initialization, and optionally satellite acquisition.
018: Acquiring a Satellite	The system is currently acquiring a satellite.
020: System Shutdown	The system is about to shut down and reboot.
037: Set Servo Azim Config from File	The ACU successfully wrote the stored configuration file to the azimuth servo driver.
039: Set Servo Elev Config from File	The ACU successfully wrote the stored configuration file to the elevation servo driver.
041: Set Servo Pol Config from File	The ACU successfully wrote the stored configuration file to the polarization skew servo driver.
043: Set Servo Tilt Config from File	The ACU successfully wrote the stored configuration file to the tilt servo driver.
052: COM Port – TCP/IP Bridge	TCP/IP monitoring has been assigned to at least one COM Port.
075: Tilt Init in Progress	The tilt axis is performing its servo initialization procedure.
118: Satellite Recognition Running	The satellite validation option is enabled.
120: Azimuth Init in Progress	The azimuth axis is performing its servo initialization procedure.
133: Elevation Init in Progress	The elevation axis is performing its servo initialization procedure.
146: PolSkew Init in Progress	The polarization skew axis is performing its servo initialization procedure.

6.3 Warning Messages

Controller Screen Label	Description
Tuner-1 LNB Power Over-Current	The controller 13V/18V power supply feeding the LNB is overloaded.
WRN 001: NBR-ACU Communications Fault	There is no communication with the NBR.
WRN 002: Compass Communication Failed	There is no communication with the compass.
WRN 003: GPS Communication Failed	There is no communication with the GPS MODULE.
WRN 004: No GPS Position Updates	There is communication with the GPS MODULE, but no coordinates are being received.
WRN 005: IMU in Preset Mode	The system is disconnected from the IMU and works on manually defined pitch, roll, and yaw values.
WRN 011: Improper Azim SW Version	The Azimuth Servo Driver software version is not compatible with the Release Version.
WRN 012: Improper Elev SW Version	The Elevation Servo Driver software version is not compatible with the Release Version.
WRN 013: Improper Pol SW Version	The Polarization Servo Driver software version is not compatible with the Release Version.
WRN 014: Improper Tilt SW Version	The Tilt Servo Driver software version is not compatible with the Release Version.
WRN 019: System not Initialized	The system did not undergo initialization, including encoder initialization for all axes.
WRN 025: LNB Voltage out of Tolerance	The controller 13V/18V power supply feeding the LNB is exceeding its predefined tolerance levels.
WRN 033: Antenna View Blocked	The ANTENNA has moved into one of the predefined blockage areas.
WRN 034: LNB Supply Voltage Disabled	LNB supply voltage has been switched off by the controller.
WRN 050: No Communications with Host	Communication with the host computer has timed-out.
WRN 056: No Selected Satellite File	No satellite has been selected from the satellite database.

Controller Screen Label	Description
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 is received from the GPS MODULE. Program tracking stopped.
WRN 072: UTC from Internal Clock	UTC Sync was activated but no UTC time is 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 is received from the GPS MODULE for more than a few seconds.
WRN 076: Tilt was not Initialized	The tilt axis has not yet performed its initialization procedure.
WRN 079: Tilt CW Software Limit	The tilt axis has reached its CW software limit.
WRN 080: Tilt CCW Software Limit	The tilt axis has reached its CCW software limit.
WRN 081: Tilt Driver Temperature High	The tilt axis servo-driver temperature is above the alarm temperature setting.
WRN 082: Tilt Driver Memory Error	The tilt axis servo driver failed one of its memory test routines.
WRN 083: Tilt Communication Error	There was a checksum error or timeout on commands received for the tilt axis.
WRN 084: Tilt 96V out of Range	Input 96V power is too high or low on the tilt axis.
WRN 087: System ID Changed	The system ID changed.
WRN 101: Satellite Database is Truncated	The satellite database file is truncated.
WRN 102: Receiver Cal Table not Found	The ACU could not find the internal NBR calibration file in its flash memory (C:\) on power-up.
WRN 121: Azimuth was not Initialized	The azimuth axis has not yet performed its initialization procedure.
WRN 124: Azimuth CW Software Limit	The azimuth axis has reached its CW software limit.
WRN 125: Azimuth CCW Software Limit	The azimuth axis has reached its CCW software limit.

Controller Screen Label	Description
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.
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.

Controller Screen Label	Description
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 instead of measuring real AGC from ACU input.

6.4 Error Messages

Controller screen label	Description
ERR 008: USB Ports not Detected; Reboot	USB bus initialization has failed. If shutdown is enabled for this message, the system will reboot one minute after startup.
ERR 017: Restart Timed Out(Rebooting)	The system was not able to complete the restart routine in the predefined time (normally set to 12 minutes).
ERR 022: CPU Power out of Tolerance	The CPU power supply has exceeded its predefined tolerance levels.
ERR 023: CPU Temp out of Tolerance	The CPU temperature has exceeded its predefined tolerance levels.
ERR 036: Servo Azimuth Config Init Error	The ACU could not compare or save the configuration file in the azimuth servo driver.
ERR 038: Servo Elev Config Init Error	The ACU could not compare or save the configuration file in the elevation servo driver.
ERR 040: Servo PolSkew Config Init Error	The ACU could not compare or save the configuration file in the polarization skew servo driver.
ERR 042: Servo Tilt Config Init Error	The ACU could not compare or save the configuration file in the tilt servo driver.
ERR 053: No Maintenance Config File	The ACU could not find the maintenance configuration file in its flash memory (C:) on power-up.
ERR 054: No Operational Config File	The ACU could not find the operational modes configuration file in its flash memory (C:\) on power-up.
ERR 055: No Satellite Database File	The ACU could not find the satellite database file in its flash memory (C:\) on power-up.
ERR 057: No System Configuration File	The ACU could not find the system parameters configuration file in its flash memory (C:\) on power-up.
ERR 058: No Valid IMU Calibration File	The ACU could not find the IMU calibration file in its flash memory (C:\) on power-up.
ERR 074: Tilt Stuck	The tilt axis is stuck – no motor motion occurs in response to received commands.
ERR 077: Tilt Initialization Failed	The tilt servo driver failed to complete its initialization routine.

Controller screen label	Description
ERR 078: Tilt Encoder Fault	An error occurred between the tilt axis and motor encoders, or an encoder fault detected.
ERR 085: Tilt Overcurrent on 96V	A 96V bus overcurrent trip occurred on 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 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 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 detected.

Controller screen label	Description
ERR 156: PolSkew Overcurrent on 96V Bus	A 96V bus overcurrent trip occurred on the polarization skew axis.
ERR 157: Azimuth Overcurrent on 5V	A 5V peripheral overcurrent trip occurred on the polarization skew axis.

Appendix A: MIB for the Antenna Control Unit

The actual MIB file is provided by ORBIT as part of the system software. The following description is for reference purposes only.

The provided MIB was up to date at publication time. However, the MIB file may have been updated.

Object ID	Node Name	Description
nodeMarineSatcom 2	Acu7107	MIB for Antenna Control Unit of Marine Satellite Communication System OceanTRx™7-300
nodeAcu7107 1	od	Operating Dynamic Data
nodeOd 1	odMode	SET operation assigns new operating mode. GET operation returns current operating mode.
	Mode	**String**
	Stand-by	halt
	Manual	man
	Search	srch
	Peak	peak
	Step-Track	stept
	Sat. Preset	satpr
	Acquire Sat. Preset	acqs
	Test Trajectory	tst2
	Stow	stow
nodeOd 2	odSms	System Messages
nodeOdSms 1	odSmsAll	GET operation returns a hexadecimal value reflecting the state of all system messages, according to their ID.
	ID	**Message**
	0	Tuner-1 LNB Power Over-Current

Object ID	Node Name	Description
	1	NBR-ACU Communications Fault
	2	Compass Communication Failed
	3	GPS Communication Failed
	4	No GPS Position Updates
	5	IMU in Preset Mode
	8	USB Ports not Detected; Reboot
	9	System Reboots, Axes Jammed
	16	Auto-Restart in Progress
	17	Restart Timed Out (REBOOTING)
	18	Acquiring a Satellite
	19	System Not Initialized
	20	System Shutdown
	22	CPU Power Out of Tolerance
	23	CPU Temp Out of Tolerance
	25	LNB Voltage Out of Tolerance
	33	ANTENNA View Blocked
	36	Servo Azimuth Config Init Error
	37	Set Servo Azim Config from File
	38	Servo Elev Config Init Error
	39	Set Servo Elev Config from File
	40	Servo PolSkew Config Init Error
	41	Set Servo Pol Config from File
	42	Servo Tilt Config Init Error
	43	Set Servo Tilt Config from File
	50	No Communications with Host
	52	COM Port - TCP/IP Bridge

Object ID	Node Name	Description
	53	No Maintenance Config. File
	54	No Operational Config. File
	55	No Satellites Database File
	56	No Selected Satellite File
	57	No System Configuration File
	58	No Valid IMU Calibration File
	69	Signal Below Threshold
	70	IMU-ACU Communication Fault
	74	Tilt Stuck
	75	Tilt Init in Progress
	76	Tilt was not Initialized
	77	Tilt Initialization Failed
	78	Tilt Encoder Fault
	79	Tilt CW Software Limit
	80	Tilt CCW Software Limit
	81	Tilt Driver Temperature High
	82	Tilt Driver Memory Error
	83	Tilt Communication Error
	84	Tilt 96V out of Range
	85	Tilt Overcurrent on 96V
	86	Tilt Overcurrent on 5V
	100	Satellite File Read Error
	101	Satellite Database is Truncated
	102	Receiver Cal Table not Found
	118	Satellite Recognition Running
	119	Azimuth Stuck
	120	Azimuth Init in Progress

Object ID	Node Name	Description
	121	Azimuth was not Initialized
	122	Azimuth Initialization Failed
	123	Azimuth Encoder Fault
	124	Azimuth CW Software Limit
	125	Azimuth CCW Software Limit
	126	Azimuth Driver Temperature High
	127	Azimuth Driver Memory Error
	128	Azimuth Communication Error
	129	Azimuth 96V out of Range
	130	Azimuth Overcurrent on 96V
	131	Azimuth Overcurrent on 5V
	132	Elevation Stuck
	133	Elevation Init in Progress
	134	Elevation has not been Initialized
	135	Elevation Initialization Failed
	136	Elevation Encoder Fault
	137	Elevation CW Software Limit
	138	Elevation CCW Software Limit
	139	Elev Driver Temperature High
	140	Elevation Driver Memory Error
	141	Elevation Communication Error
	142	Elevation 96V out of Range
	143	Elevation Overcurrent on 96V
	144	Elevation Overcurrent on 5V
	145	PolSkew Stuck
	146	PolSkew Init in Progress
	147	PolSkew not Initialized

Object ID	Node Name	Description
	148	PolSkew Initialization Failed
	149	PolSkew Encoder Fault Detected
	150	PolSkew CW Software Limit
	151	PolSkew CCW Software Limit
	152	PolSkew Driver Temperature High
	153	PolSkew Driver Memory Error
	154	PolSkew Communication Error
	155	PolSkew 96V out of Range
	156	PolSkew Overcurrent on 96V Bus
	157	PolSkew Overcurrent on 5V
	165	iNBR High LO Unlocked
	166	iNBR Low LO Unlocked
	167	Tracking Error Exceeds Limit
	173	BUC Tx Stopped
	179	NBR Powr/Tempr out of Tolerance
	180	No Noise Floor Table
	181	No Communication with BUC
	182	Simulated AGC
nodeOd 3	odAgc	AGC
OdAgc 1	odAgcM	Current AGC Value in dBm
nodeOd 4	odAntpos	ANTENNA Position
nodeOdAntpos 1	odAntposAz	Current ANTENNA Azimuth
nodeOdAntpos 2	odAntposEl	Current ANTENNA Elevation
nodeOdAntpos 3	odAntposPol	Current Polarization Skew
nodeOd 5	odShipc	Ship Coordinates
nodeOdShipc 1	odShipcLat	Current Ship Coordinates: Latitude

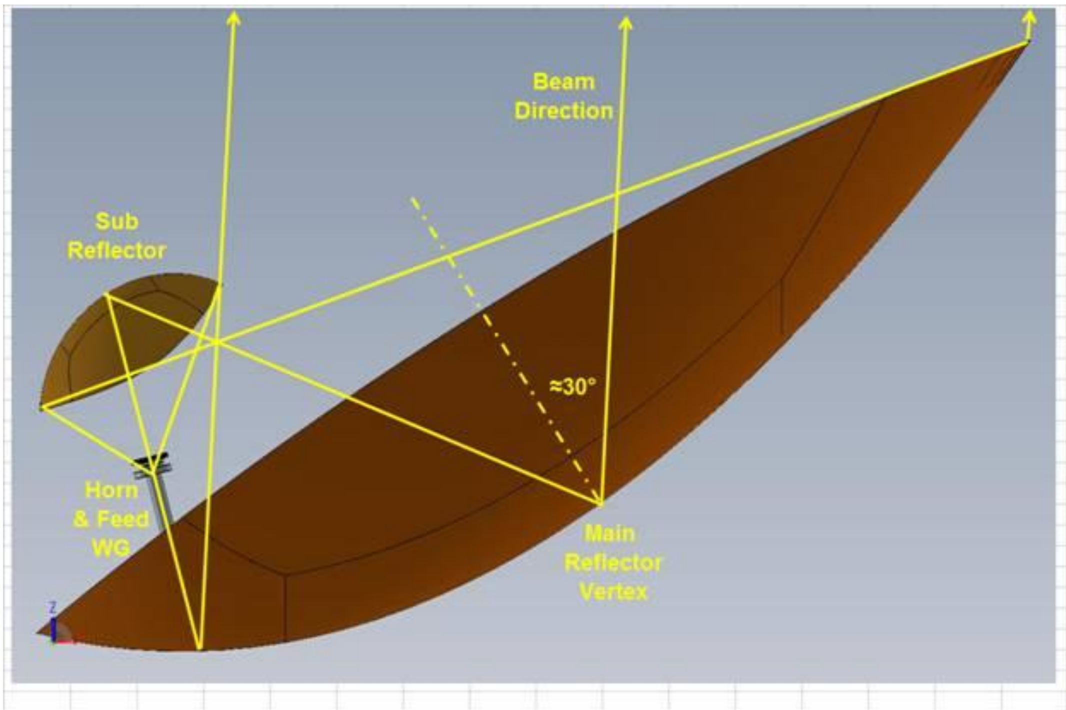
Object ID	Node Name	Description
nodeOdShipc 2	odShipcon	Current Ship Coordinates: Longitude
nodeOd 6	odShipm	Ship Motion
nodeOdShipm 1	odShipmPit	Current Ship Motion: Pitch
nodeOdShipm 2	odShipmRol	Current Ship Motion: Roll
nodeOdShipm 3	odShipmYaw	Current Ship Motion: Yaw
nodeOdShipm 4	odShipmComp	Current Compass Readout
nodeOd 7	odPolst	Current Polarization Status
nodeAcu7107 2	os	Operating Static Data
nodeOs 1	osSatset	Satellite Preset
nodeOsSatset 1	osSatsetLon	Satellite Preset Geostationary Arch Longitude Command (interval: -180.0 – 180.0; res: 0.1°)
nodeOs 2	osPolcmd	Polarization Status Command
	Setting	**String**
	Horizontal (HL-LHCP)	Hl
	Vertical (VL-RHCP)	Vl
nodeAcu7107 3	sc	System Configuration
nodeSc 1	scComp	Compass
nodeScComp 1	scCompOfs	Compass Offset Command (interval: -360.0 – 360.0)
nodeAcu7107 5	ms	Maintenance Static Data
nodeMs 1	msRcv	Receiver
nodeMsRcv 1	msRcvFreq	L-band Tracking Frequency Command (interval: 920.000 – 2150.000
nodeMsRcv 2	msRcvIffr	IF-Band Tracking Frequency Command (interval: 60.000 – 150.000
nodeMsRcv 3	msRcvLnb	Set LNB Command, according to setting.
	Setting	**String**
	13v00KHz	1300

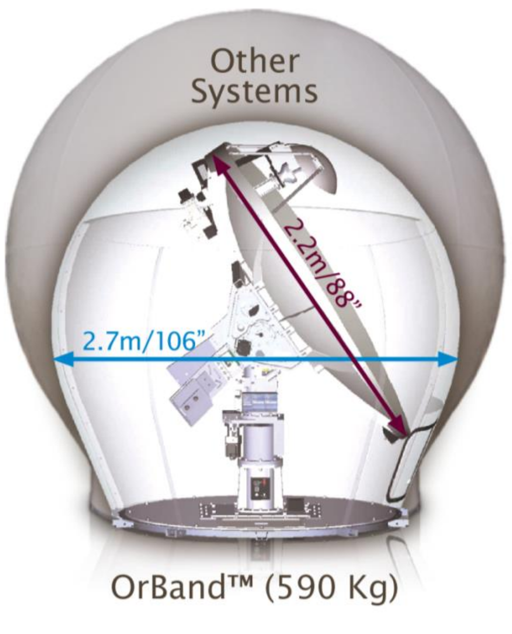
Object ID	Node Name	Description
	13v22KHz	1322
	17v00KHz	1700
	17v22KHz	1722
	Col13v00KHz	co1300
	Col13c22KHz	co1322
	Col17v00KHz	co1700
	Col17v22KHz	co1722
	DISABLE	Dis
nodeMs 2	msAlgn	Alignment Parameters
nodeMsAlgn 1	msAlgnCoplku	Axes Alignment Co-PolSkew Ku-Band Offset Command (Interval: -90.0 to 90; Resolution: 0.1°)
nodeMsAlgn 2	msAlgnCrplc	Axes Alignment Cross-PolSkew C-Band Offset Command (Interval: -90.0 to 90; Resolution: 0.1°)
nodeMsAlgn 3	msAlgnCrplku	Axes Alignment Cross-PolSkew Ku-Band Offset Command (Interval: -90.0 to 90; Resolution: 0.1°)
nodeMsAlgn 4	msAlgnCrplx	Axes Alignment Cross-PolSkew X-Band Offset Command (Interval: -90.0 to 90; Resolution: 0.1°)
nodeMsAlgn 5	msAlgnEl	Axes Alignment Elevation Offset Command (Interval: -90.0 to 90; Resolution: 0.1°)
nodeMs 3	msNbr	Narrow Band Receiver
nodeMsNbr 1	msNbrIfbw	NBR Bandwidth Command (50/150/300KHz)
nodeMs 4	msAntblcTable	ANTENNA Blockage Zones Table
nodeMsAntblcTable 1	msAntblcEntry	Row of ANTENNA Blockage Zones Table
nodeMsAntblcEntry 1	msAntblcZone	Blockage Zone Number
nodeMsAntblcEntry 2	msAntblcAzmin	Obstruction Zone Azimuth Minimum (interval: -360.0 – 360.0; resolution: 0.1°)
nodeMsAntblcEntry 3	msAntblcAzmax	Obstruction Zone Azimuth Maximum (interval: -360.0 – 360.0; resolution: 0.1°)
nodeMsAntblcEntry 4	msAntblcElmin	Obstruction Zone Elevation Minimum (interval: -360.0 – 360.0; resolution: 0.1°)
nodeMsAntblcEntry 5	msAntblcElmax	Obstruction Zone Elevation Maximum (interval:

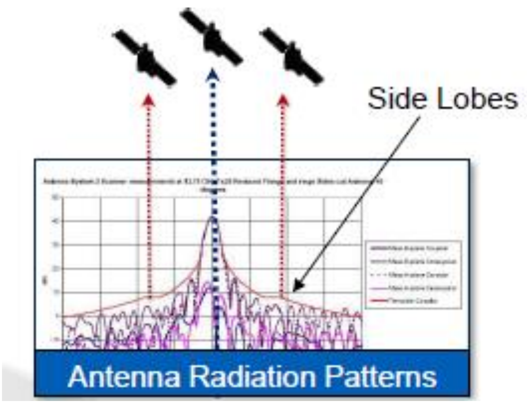
Object ID	Node Name	Description
		-360.0 – 360.0; resolution: 0.1°)
nodeAcu7107 6	cmd	Commands
nodeCmd 1	cmdReboot	ACU Reboot Command (SET)

Appendix B: Dual-Offset-Gregorian Antenna

"Dual-offset Gregorian" antenna has the best mix between excellent regulation compliance (side-lobes, x-pol) and very low dome to antenna size ratio.







Appendix C: Preparing the ADE-BDE Cable

Tools

The following tools are needed to prepare the connectors of the ADE-BDE coaxial cable.

- Prep tool for LMR-400 crimp-style connectors

Part No.: ST-400EZ

Stock No.: 3190-401

- Debarring tool

Part No.: DBT-01

Stock No.: 3190-406

- Crimp tool for LMR-400

Part No.: CT-400/300

Stock No.: 3190-666

or

Part No.: HX-4

Stock No.: 3190-200

- 0.429” hex dyes for EZ-400 crimp connectors

Part No.: Y1719

Stock No.: 3190-202

Preparing the Cable

➲ **Perform the following procedure to prepare the connectors on both sides of the LMR cable.**

1. Flush cut the cable squarely.

2. Slide the heat-shrink boot and crimp ring onto the cable. Strip the cable end using the ST-400-EZ prep/strip tool by inserting the cable into End 1 and rotating the tool. Remove any residual plastic from the center conductor.

3. Insert the cable into End 2 of the ST-400-EZ prep/strip tool and rotate the tool to remove the plastic jacket.

4. Debur the center conductor using the DBT-01 deburring tool.

5. Flare the braid slightly and push the connector body onto the cable until the connector snaps into place, then slide the crimp ring forward, creasing the braid.

6. Temporarily slide the crimp ring back, and remove the connector body from the cable to trim the excess braid at the crease line, then remount the connector and slide the crimp ring forward until it butts up against the connector body.

7. Position the heavy duty HX-4 crimp tool with the appropriate dies (0.429” hex) or the CT-400/300 crimp tool directly behind and adjacent to the connector body and crimp the connector. The HX-4 crimp tool automatically releases when the crimp is complete.

8. Position the heat shrink boot as far forward on the connector body as possible without interfering with the coupling nut and use the heat gun to form a weather-tight seal.

Appendix D: Pre-Installation Checklist

Dear customer, please review and fill out this document in accordance with the *OceanTRx™7-300 Installation and Operation Manual*. For any assistance or questions, please contact the 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
- ☐ Required RADOME lifting harness and crane available
- ☐ UPS – On-line or Line Interactive type
- ☐ Power source available within the range of 90-220VAC

Location Considerations

Mechanical Stability

- [ ] Stable flat surface
- [ ] Natural resonance frequency of above 30 Hz
- [ ] Support for 600 Kg

Maintenance Access

- [ ] RADOME 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

- [ ] RADOME support bolted to mounting surface
- [ ] Both central and peripheral support for the system's base plate

BDE

- [ ] Available 2U height in 19'' rack below deck, with supporting rails
- [ ] Tx/Rx cables between the BDE and the modem
- [ ] ADE-BDE cable:
  - [ ] LMR-200
  - [ ] LMR-400
  - [ ] LMR-600
- [ ] GPS compass cable with correct pin-out for connection with BDE
- [ ] Modem-to-BDE cable with correct pin-out
- [ ] NMS special connection cable with correct pin-out

Appendix E: Installation Checklist

Dear customer, please review and fill out this document, in accordance with the *OceanTRx™7-300 Installation and Operation Manual*. For any assistance or questions, please contact the 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 delivered system includes the following G-Shock detector labels:

- 1 internal (15G) on the system assembly
- 2 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

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

Crate #	Inspection Date	Reported Condition
#1 System	/ /	
#2 Radome	/ /	
#3 Other	/ /	

CHECKLIST

- ☐ System crate is unpacked –4 side walls and top of crate removed
- ☐ RADOME 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 RADOME hatch only: System lifted to a 60cm staging platform or axle stands for RADOME assembly, using a parallel-strap lifting harness
- ☐ RADOME assembled according to instructions
- ☐ 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
- ☐ All other required connections (LAN, NMS)

Appendix F: Commissioning Checklist

Dear customer, please review and fill out this document, in accordance with the *OceanTRx™7-300 Installation and Operation Manual*. For any assistance or questions, please contact the 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 90-220VAC

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 30Hz
- ☐ Support for 600Kg

Maintenance Access

☐ RADOME 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

☐ RADOME support bolted to mounting surface

☐ Both central and peripheral support for the system's base plate

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

☐ Coaxial cable is connected between the ADE and BDE :

☐ LMR-200 ☐ 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 supportgroup@orbit-cs.com
Internal damage		
Antenna moves without obstruction		
Visual inspection		
GPS Module is secured		
Wiring		
Loose or free cable		
Damage on cables		
Dish		
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 the Installation Manual		
Tracking frequency selected		
IF BW filter was set up as per instructions in Installation Manual		
Satellite Acquisition: Selected satellite acquired and system moved 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 – Vertical/ Horizontal	
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 300KHz)	
Tracking Frequency	
LNB Power (13V:00, 13V:22,17V:00 or 17V:22KHz)	
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)	

System Components

System Manufacturer	Orbit Communication Systems Ltd.	
System Model	*OceanTRx™7-300*	
Above Deck Equipment		
Item	**Part Number**	**Serial Number**
Central Control Unit (CCU) With or without 10MHz	L00720001 / L00720004 / L00720002	
Dual System Selector (DSS)	L00720003	
IMU	L01323001	
Antenna Control Unit (ACU)	L00126001 / L00126002	
GPS	E16000006	
Above Deck Multiplexer (ADMx)	25-1184-2	
Slip-Ring / Rotary-Joint Assembly	30-0650-4-1 / 30-0650-4-3	
Axis Encoders (Az, El, Tilt)	30-0719-9-1	
Power Box	30-0743-9-2 / 30-0743-9-3	
Power Supply 1: 24V	E22000031	
Power Supply 2: 48V/5A	E22000022	
Power Supply 3: 48V/5A	E22000022	
Power Supply 4: 48V/10A	E22000021	
Tilt Servo Driver	L00107001 / L00107002	
Elevation Servo Driver	L00107001 / L00107002	
Azimuth Servo Driver	L00107001 / L00107002	
Pol Skew Servo Driver	L00107001 / L00107002	
Shunt Voltage Regulator	L00128001 / L00128003	
Pol Skew Motor	30-0724-9-1	
Pedestal Axis Motor (Az, El, Tilt)	30-0725-9-1	
C-Band Linear Antenna Feed	L00727003	
C-Band Circular Antenna Feed	L00727002	
C-Band BUC (as per BUC type)		

Ku-Band BUC (as per BUC type)		
C-Band LNB (as per BUC type)		
Ku-Band LNB (as per BUC type)		