AL-7108

2.4m (94") C-Band Circular and Ku-Band Linear Maritime Stabilized VSAT System

Installation and Operation Manual

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Revision History & Control

Revision History

Revision #	Date	Description
Rev: -	July 2009	Initial version
Rev: A	January 2010	Updated version

List of Effective Pages

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 214 CONSISTING OF THE FOLLOWING:

Safety Precautions

The following general safety information is for installing, operating, and servicing the system.

Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary. Observe the following list of safety precautions when installing, operating and maintaining the System:

Keep well clear of the moving Antenna, at all times.

The Antenna Pedestal is equipped with high torque DC motors that develop considerable forces. These forces can be harmful.

The left ON/OFF switch on the Servo Drive Unit – SDU (next to the green indicator light), will also turn off power to the Antenna drive motors and should be used appropriately.

This equipment contains potentially harmful voltages when connected to the designated power sources. Never remove equipment covers except for maintenance or internal adjustments.

Before removing the covers of any unit, verify that the main POWER switch is in the OFF position. When removing the cover of the SDU, you should also disconnect the power cable from the unit.

There are cases that the CCU receives various voltages from two sources: from the ship's power network and from the compass gyro.

Metal parts accessible to the operator are connected to the chassis' ground to prevent shock, and similar hazards. The chassis' ground conductor must not be removed. All sub-systems (SDU, SBC, IMU) should be firmly connected to the system ground (using the GND posts) to ensure the enclosure is at ground potential.

Only qualified and trained personnel should perform installation, operation and maintenance of this equipment.

Although the Radome panels are not heavy, care should be taking when lifting them since they act as sails during windy conditions. It is recommended that at least two people handle them during installation. **Do not attempt to lift Radome panels when the wind speed exceeds 15 km/hr.**

To prevent shock or fire hazard, when sub-units are open or cables disconnected, do not expose the equipment (with the exception of the Radome) to rain or moisture.

Avoid making unauthorized modifications to the circuitry. Any such changes to the system will void the warranty.

Do not disconnect cables from the equipment while the system is powered-on.

Interfacing this equipment requires the use of high quality connectors and cables.

Use only ORBIT authorized parts for repair.

About this Manual

This manual is designed to guide you through the operating and installation procedures for the AL-7108 system. It is recommended that you familiarize yourself with the information and procedures contained in this manual, to facilitate a smooth operation and installation. The manual comprises the following chapters:

Chapter 1: System Overview.

Chapter 2: Main System Components.

Chapter 3: System specifications.

Chapter 4: Getting Started – Basic Operation

Chapter 5: Error Messages and Troubleshooting.

Chapter 6: Installation Overview.

Chapter 7: Ship survey and installation planning.

Chapter 8: Unpacking procedures.

Chapter 9: Dockside installation procedures.

Chapter 10: Onboard installation procedures.

Chapter 11: System setup and commissioning procedures.

Chapter 12: Appendix A – Installation and Removal of Ku-Band and C-Band Feed Kits.

Conventions Used in this Manual

This text style…	Identfies…	Example
Text	Normal descriptive text.	
Text	Emphasized text.	
Text/**Text**	Words or figures that appear on the screen or that should be typed, or a key to be pressed < >. The name of a file or directory.	400
TEXT	The name of a software or hardware component.	ANTENNA
	The description of a procedure.	➢ **To configure…**

Notations in this Manual

This information is important and should be noted.

Information given in this message warns of a hazard.

Information given in this warning refers to the only safe method of installation or operation and *must be adhered to.*

Acronyms & Abbreviations

ADE	Above Deck Equipment
BDE	Below Deck Equipment
BIT	Built In Test
BUC	Block Up Converter
CCU	Central Control Unit
CFE	Customer Furnished Equipment
F/O	Fiber Optic
IF	Intermediate Frequency
IF-NBR	Intermediate Frequency - Narrow Band Receiver
IMU	Inertial Measurement Unit
IRD	Integrated Receiver-Decoder
LAN	Local Area Network
LHCP	Left Hand Circular Polarization
LNA	Low Noise Amplifier
LNB	Low Noise Block converter
L-NBR	L Band Narrow Band Receiver
MMI	Man-Machine Interface
MTBF	Mean Time Between Failures
NBR	Narrow Band Receiver
OMT	Orthomode Transducer
RHCP	Right Hand Circular Polarization
SBC	Single Board Controller/Computer
SDU	Servo Driver Unit
SSPA	Solid State Power Amplifier

Table of Contents

1 General System Description

1.1 Introduction

This chapter provides a system overview, describes the various configurations that can be supplied, and presents block-diagram description of the system configurations.

1.2 System Overview

The AL-7108 system is a 2.4m (94”) Circular C-Band/Linear Ku-Band Antenna Stabilized Marine Satellite Communication System.

The system is available with C-Band RF package that includes either 20W or 40W BUC, or with Ku-Band Kit that includes a Linear Ku-Band Feed and 8W BUC.

Typically, the system is supplied with a C-Band RF Package. If required, a Ku-Band Feed Kit is available for easy on-field installation instead of the C-Band RF Package.

Specially designed to provide continuous connectivity in mid-ocean or in equatorial areas with heavy rains, Orbit Marine's AL-7108 system ensures superior 2-way high-speed broadband communication for vital onboard communication and entertainment services.

With cost-effective modular design covering various RF packages and multiple modem compatibility, Orbit's advanced AL-7108's 2.4m circular C-Band/Linear Ku-Band antenna delivers global satellite Tx/Rx to offshore and other marine environments.

Providing onboard phone, Internet, streaming video, data, GSM cellular, fax and videoconference systems for cargo, cruise ships & ferries, tankers, fishing boats, oil & gas rigs, buoys & combat vessels, the state-of-the-art AL-7108 is globally deployed by Orbit's commercial, private and military customers.

Using superior stabilizing capabilities, AL-7108's circular polarization maintains boresight directed towards C-Band satellites to provide the best in 2-way communication coverage. For Ku-Band configuration, a linear polarization is used.

Backed by over 50 years of experience and internationally deployed teams of highly skilled engineers, the comprehensive AL-7108 is at the core of Orbit's product line – one of the company's leading solutions for today's expanding maritime needs.

1.3 System Key Features and Benefits

- Stable & Efficient Communication
- No System Balancing Needed
- User Friendly Operation
- Innovative Tracking Technology
- Robust Design
- Proven Reliability (High Mean Time Between Failures - MTBF)
- High Dynamic Accuracy
- Supports Various RF Packages & Modems
- Global Satellite Coverage Database
- Optional: Remote Operation via Telephone Link
- Supports NMEA-0183, Step by Step & Synchro Compass Interfaces
- Built-In GPS Antenna.
- Remote access to the system using a backdoor
- BUC Monitor and Control (M&C) from BDE
- Linear Global Ku-Band Kit (optional).

1.4 System Configurations and Options

1.4.1 System Configurations

The AL-7108 System can be supplied in one of the following configurations:

- **AL-7108-SYS4-C Basic Configuration** – A fully operational basic C-Band system, with L-band NBR and without an RF package (without a BUC and without an LNB). This configuration is supplied to customers that wish to install and integrate their BUC and LNB units (Customer Furnished Equipment – CFE). Mechanical adaptors and cables (Control, RF and power cables) are also CFE.
- **AL-7108-SYS4-C-IFNBR Basic Configuration** – The same as above, with IF-band NBR.

As an option, ORBIT can prepare the basic system for specific BUC and LNB units that will be supplied by the customer (CFE). These preparations include mechanical adaptors, power, control and RF cables. Consult ORBIT for further details.

- **AL-7108-SYS4-C-20W Configuration** – This configuration comprises a fully integrated and operational system, with L-band NBR, including an ORBIT-supplied 20W BUC and LNB.
- **AL-7108-SYS4-C-40W Configuration** – The same as above, with 40W BUC and LNB.

1.4.2 System Options

- The above configurations are based on LAN connection between the ADE and the BDE. All these configurations are also available in Fiber-Optics configuration, either Multi Mode or Single Mode.
- All of the above configurations are available both with L-Band NBR as well as with IF-NBR (IF Frequencies are 70 to 140MHz)
- All of the above systems are also available in Dual System configuration.

1.5 System Architecture

The following Figure depicts an overview of the system, showing the main components and interfaces.

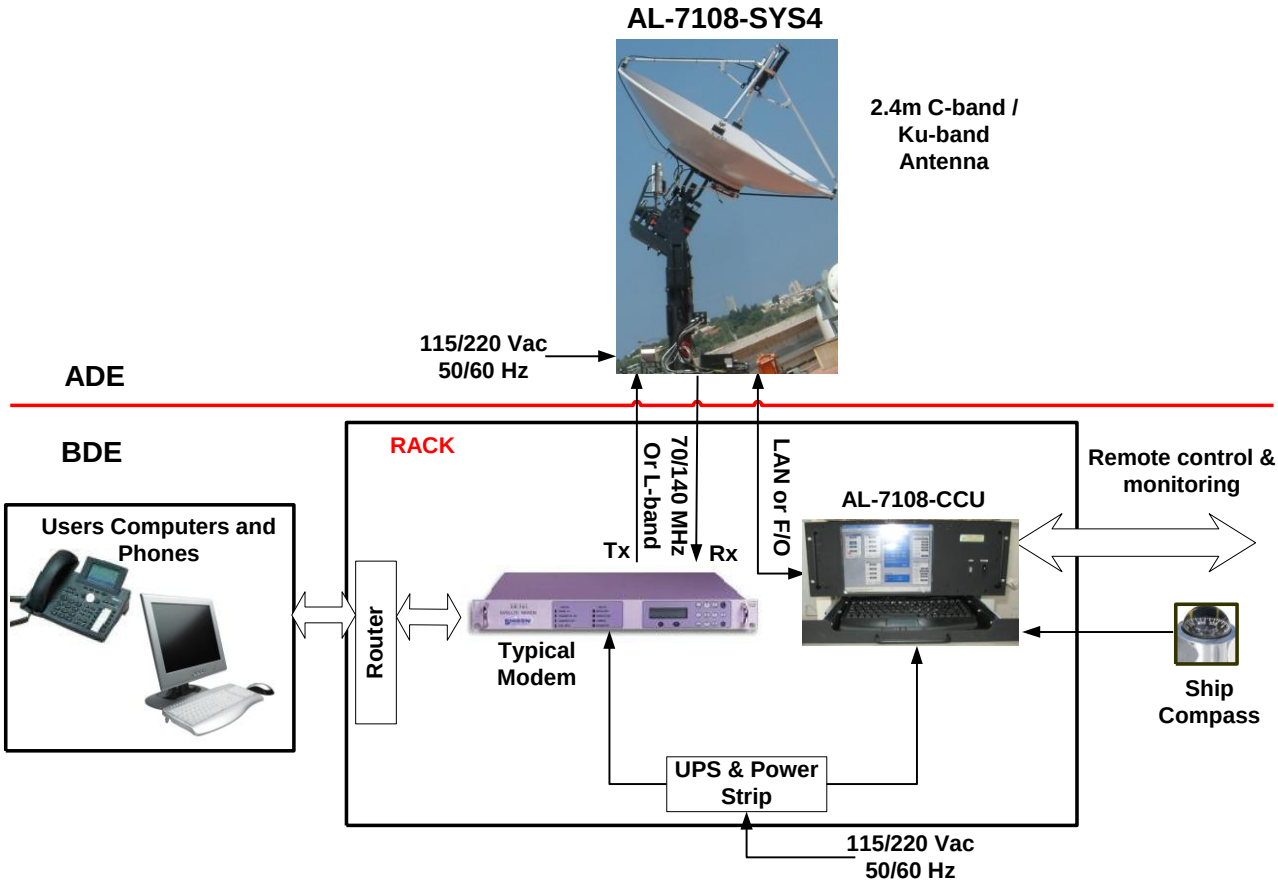


Figure 1-1: AL-7108 System Architecture

2 Main System Components

The system's components are divided into two groups:

- Above Deck Equipment (ADE)
- Below Deck Equipment (BDE)

2.1 Above Deck Equipment

- The **Basic Configuration** ABOVE DECK EQUIPMENT (ADE) comprises the following:
  - The BASE RING: Mounted on the RADOME SUPPORT, it supports the complete Radome Assembly.
  - The BASE PLATE: Secured (together with the RADOME FLOOR) to the BASE RING. It holds the PEDESTAL, the INERTIAL MEASUREMENT UNIT (IMU) and the SERVO DRIVER UNIT (SDU).
  - The PEDESTAL: Mounted on the BASE PLATE. It holds the POSITIONER and the SINGLE BOARD COMPUTER (SBC).
  - The POSITIONER: Mounted on the PEDESTAL. It comprises the DISH, FEED, X and Y AXIS MOTORS and GEARS, as well as the X and Y AXIS ENCODERS.
  - The DISH is mounted on the POSITIONER (via the DISH SUPPORT).
  - The FEED ASSEMBLY is mounted on the DISH.
  - The RADOME is actually mounted on the BASE RING, but in fact, once fully assembled, covers and protects the complete ADE.
- The **20W Configuration** ABOVE DECK EQUIPMENT (ADE) is identical to the Basic Configuration, with the following additional units:
  - 20W BUC installed on a dedicated mount.
  - LNB installed on the Feed.
  - Power Supply Unit (PSU), for the BUC, installed on a plate above the IMU.
- The **40W Configuration** ABOVE DECK EQUIPMENT (ADE) is identical to the Basic Configuration, with the following additional units:
  - 40W BUC installed on a dedicated mount.
  - LNB installed on the Feed.

In all Configurations, ADE-BDE cables (LAN or Fiber Optic, and coax cables) are CFE.

The following Figures depict general views and the location of the main ADE components.

Figure 2-1: System General View (Ku-Band Feed)

Figure 2-2: System General Views (C-Band Feed)

Figure 2-3: Major System Components

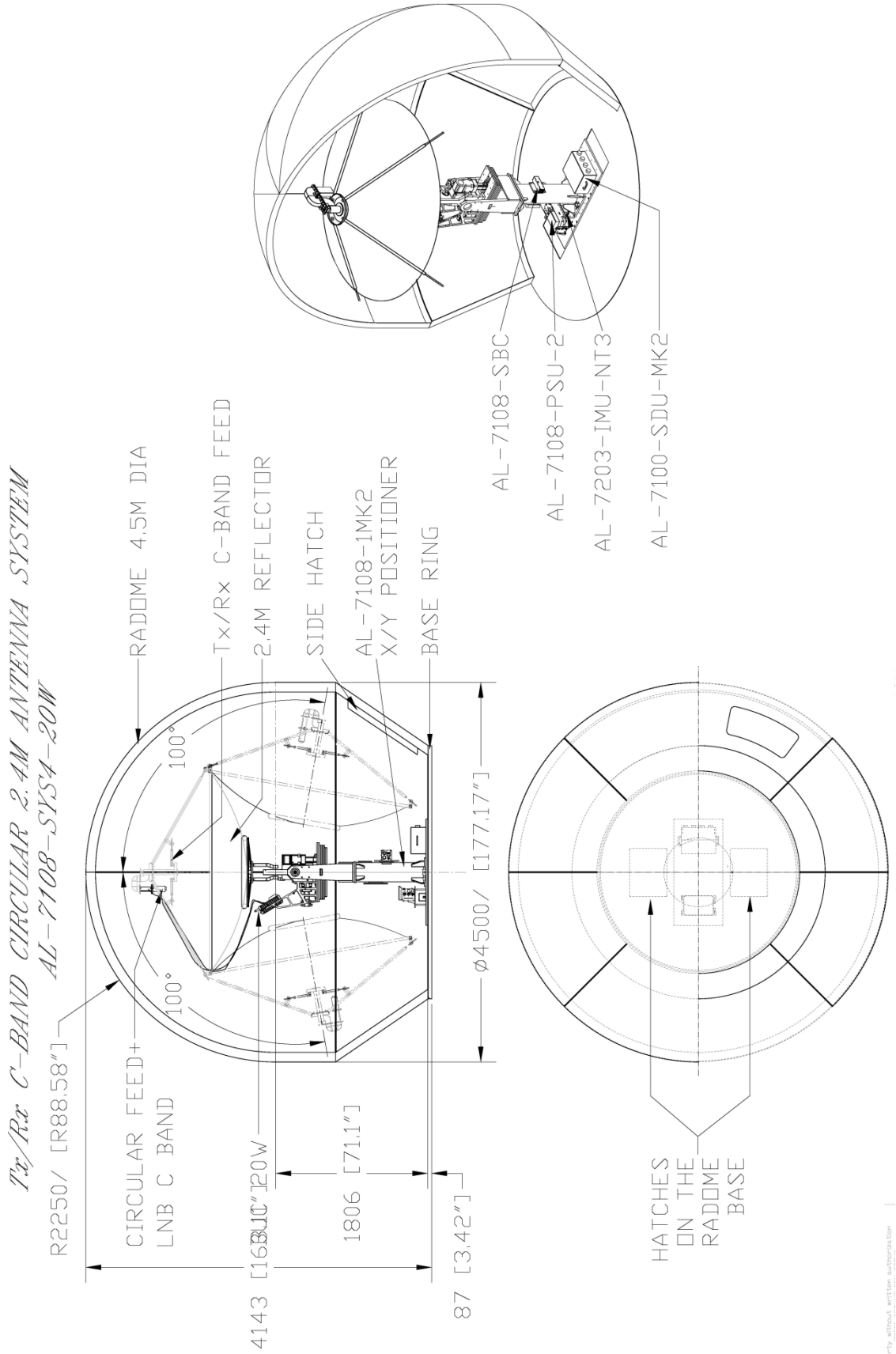


Figure 2-4: 20/40W Configuration - Above Deck Equipment (ADE) Layout and Dimensions

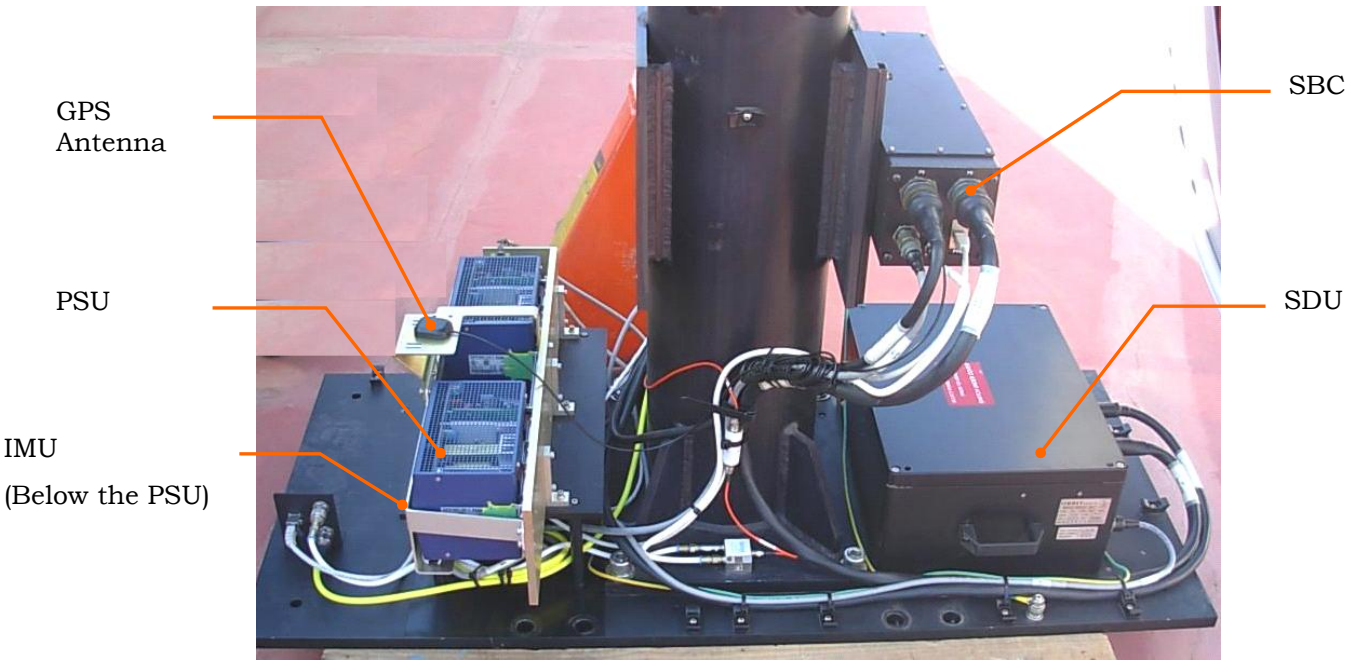


Figure 2-5: ADE General View

Figure 2-6: Connectors Panel and RF Splitter

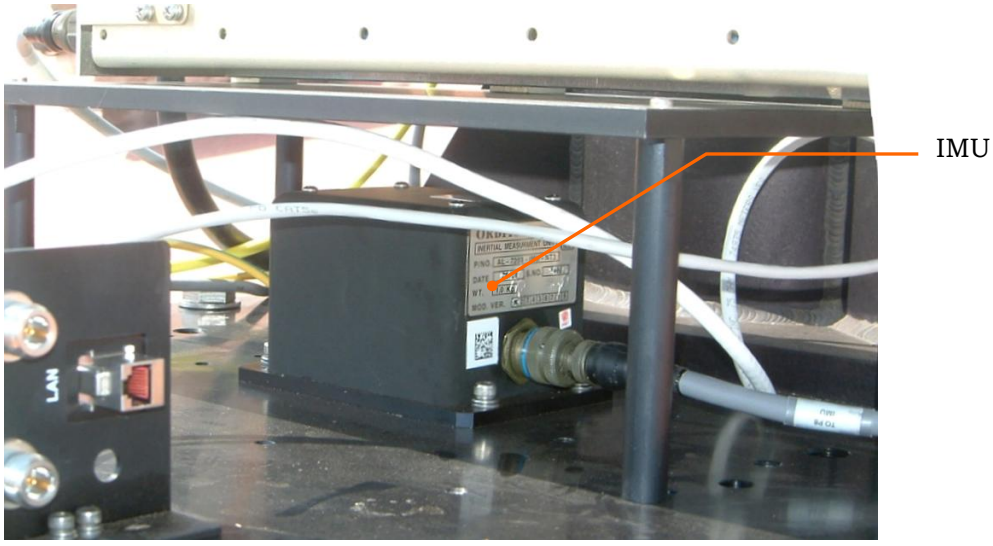


Figure 2-7: IMU

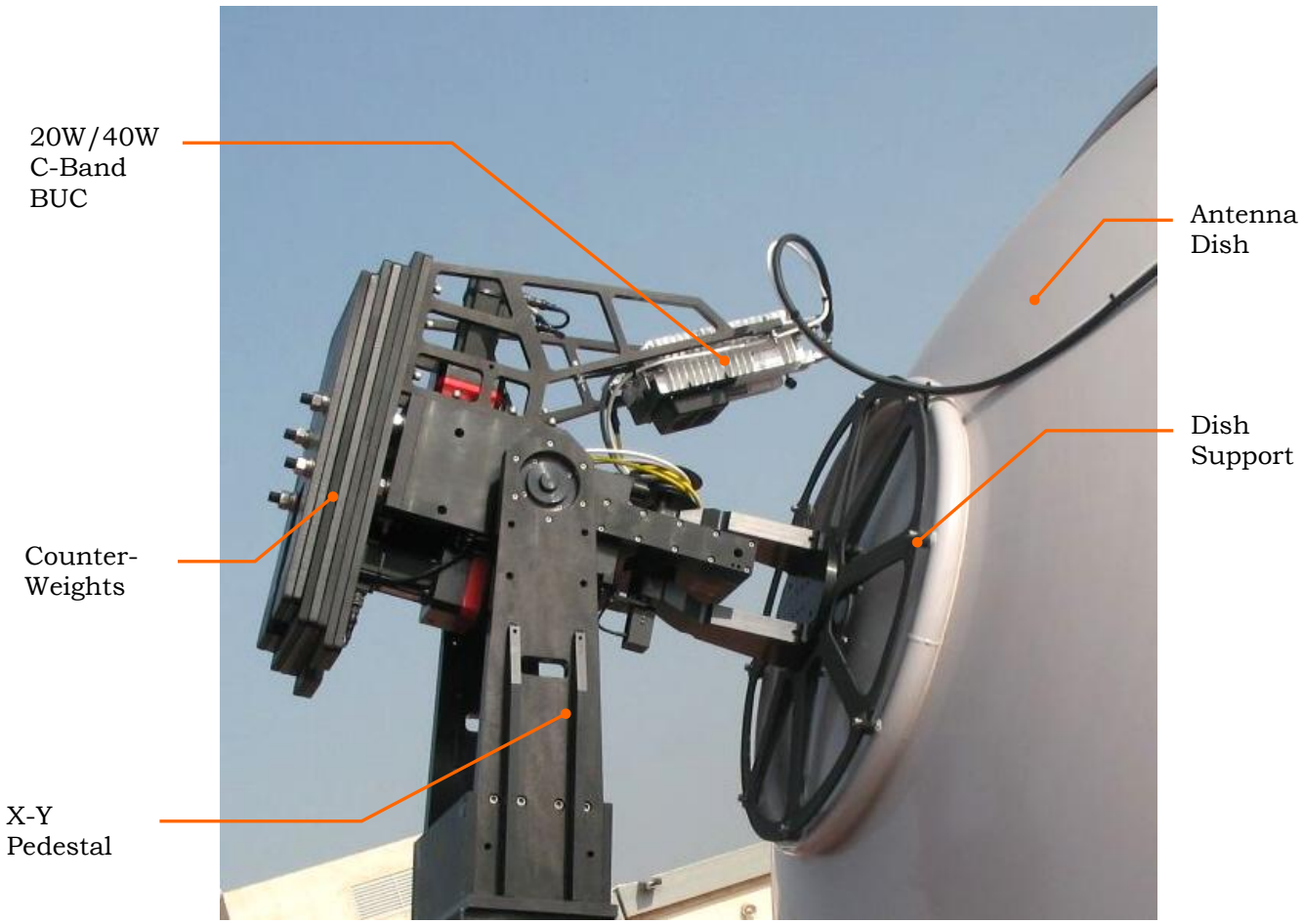


Figure 2-8: 20/40W C-Band Configuration General View

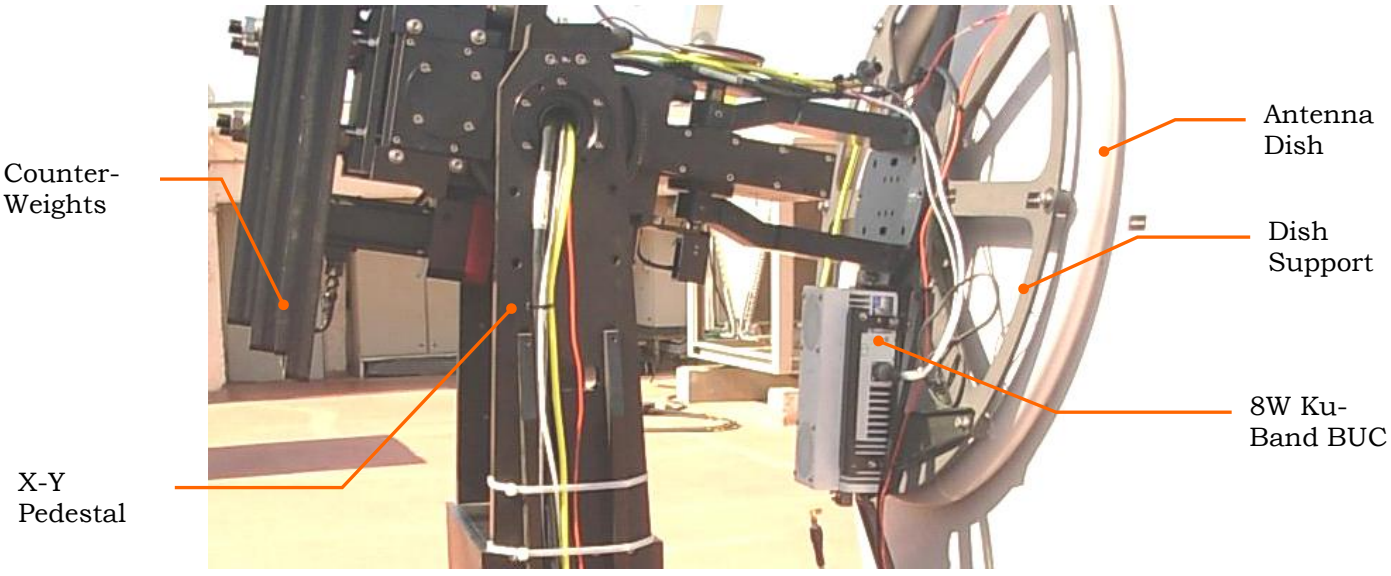


Figure 2-9: 8W Ku-Band Configuration General View

Figure 2-10:20/40W C-Band Feed General View

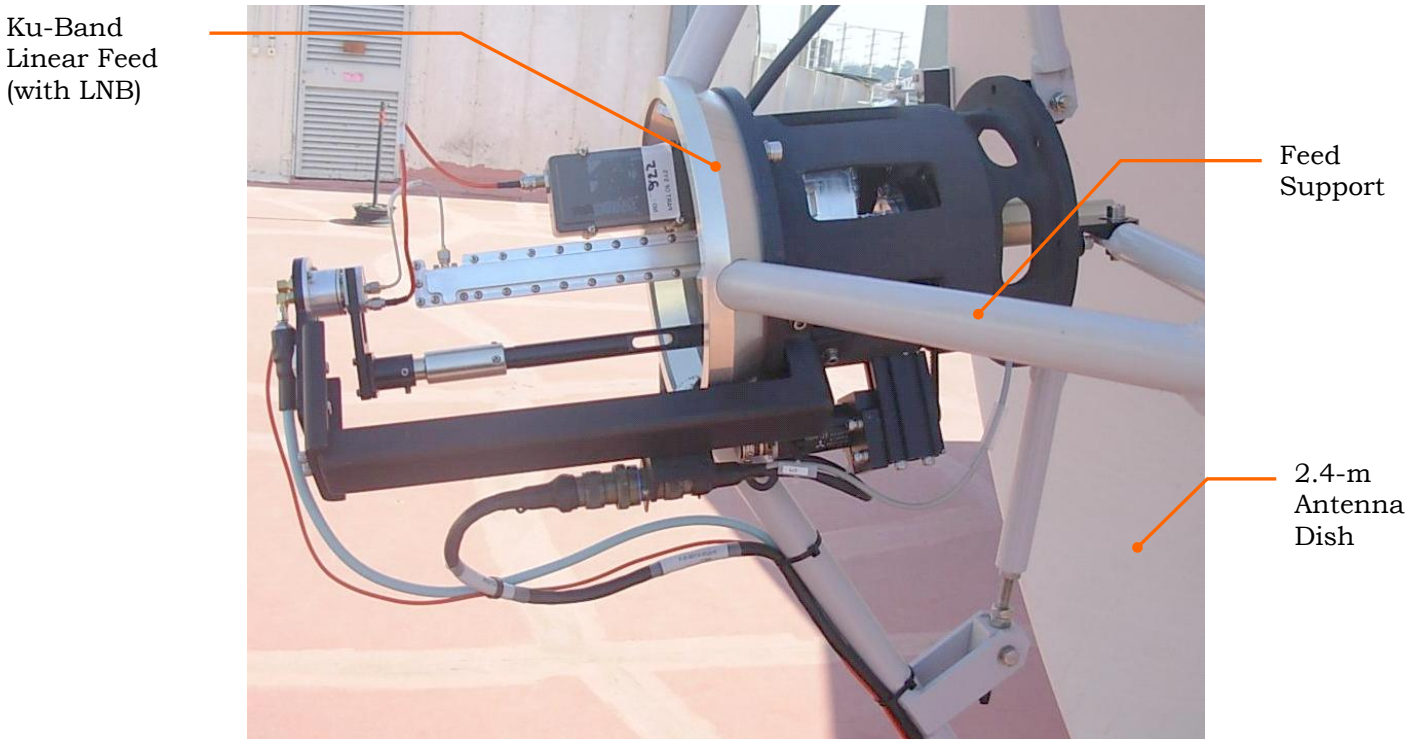


Figure 2-11:8W Ku-Band Feed General View

2.2 Central Control Unit (CCU) - Description and Options

2.2.1 CCU AL-7108-CCU

The Below DECK EQUIPMENT (BDE) includes the Central Control Unit (CCU) AL-7108-CCU. The CCU is a 19" rack-mounted 4U industrial PC supplied with a 1U keyboard and mouse drawer. The CCU is usually located in the Radio or Electronics Room.

The front panel includes a TFT screen, and together with an external keyboard (mounted on a dedicated drawer), they both provide convenient Man-Machine Interface (MMI) with the CCU.

The rear panel includes several connectors, which are used for interface with the ADE, with the modem, and with the ship/vessel, e.g. interface to ship gyro compass (NMEA-0183, Synchro & S.B.S).

The CCU operates under Microsoft's Windows-CE operating system.

2.2.2 CCU Operation

The below-deck CCU controls, monitors and configures the system. Using the CCU's screen, the operator can monitor system status, and using the keyboard and mouse (mounted on a separated drawer), menus and functions can be selected, and operational parameters can be changed.

At any screen, the Up and Down arrow keys are used to select one particular item (the Right and Left arrow keys are not active for this function). The item appearing under the blue highlighted bar is the selected item. The "ENTER" key is then used to activate the selection.

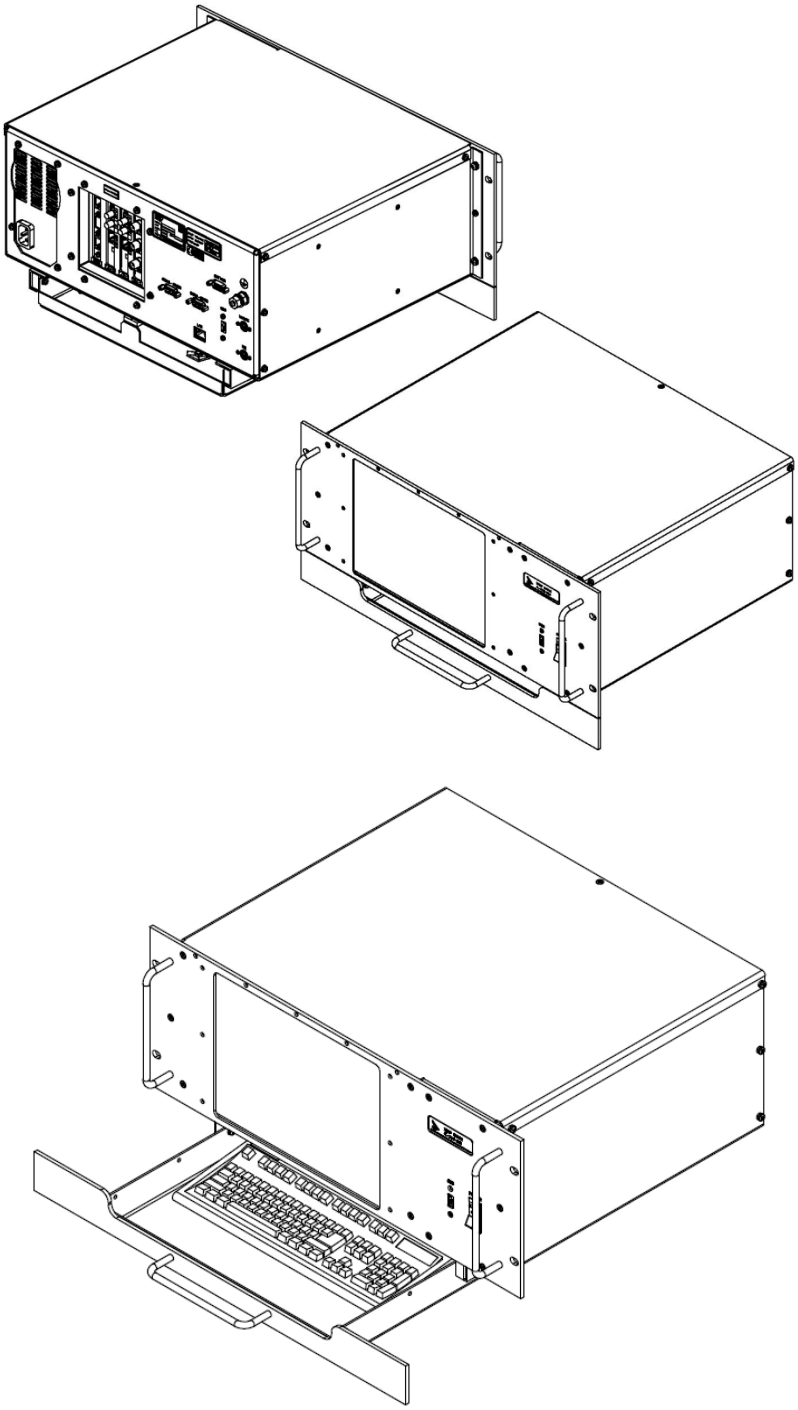


Figure 2-12: CCU General Views

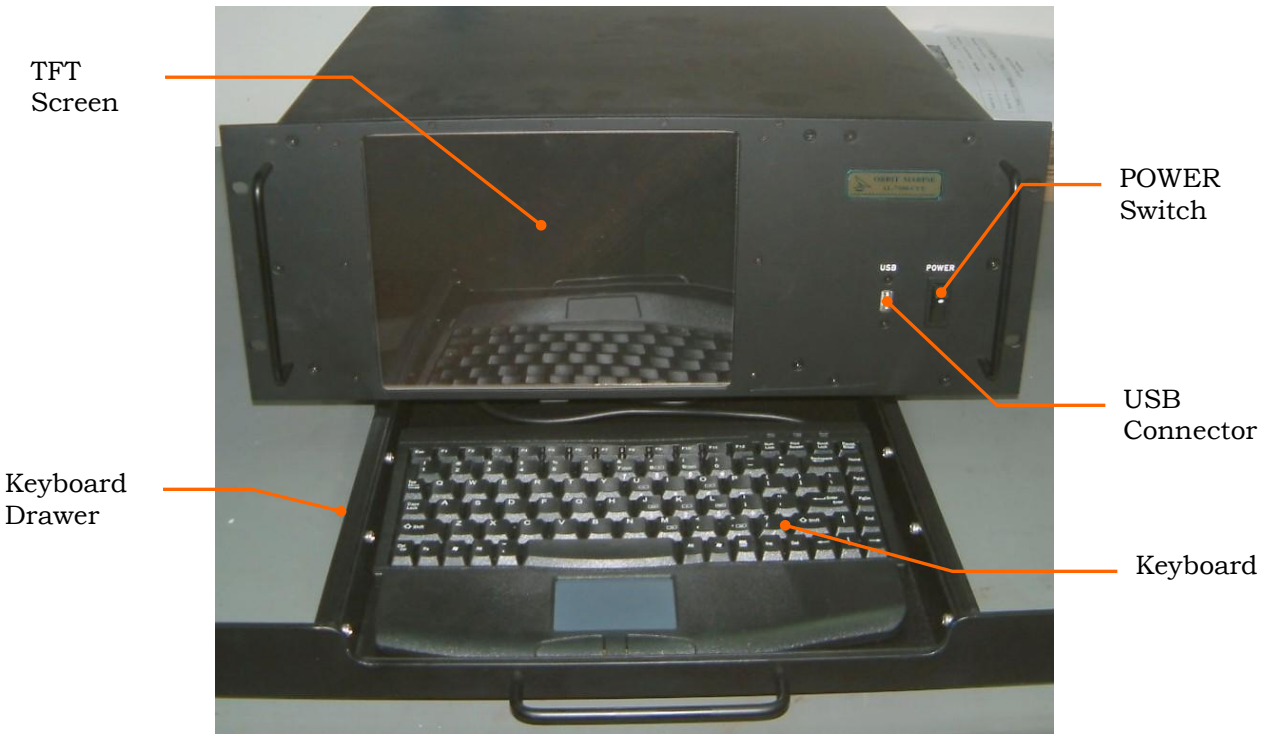


Figure 2-13: CCU Front Panel

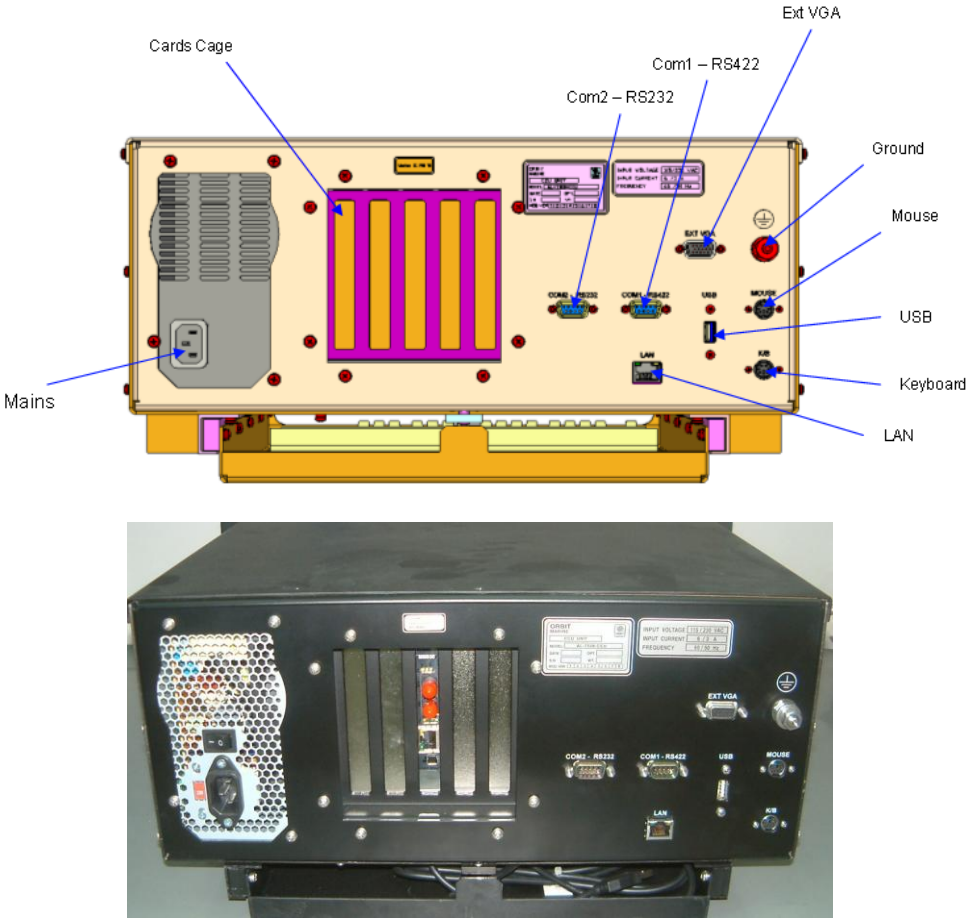


Figure 2-14: CCU Rear Panel

2.2.3 CCU Options - Cards Cage Configurations

The AL-7108-SYS4, in its basic configuration, comes with a CCU that has an RJ-45 Ethernet socket for LAN connectivity. Nevertheless, the system (and the CCU) can be ordered in different configurations that support Fiber Optic communication and dual-LAN.

The CCU cards cage is used for installation of these optional cards, allowing F/O and Dual-LAN configurations.

The following Figure depicts the available CCU cards options.

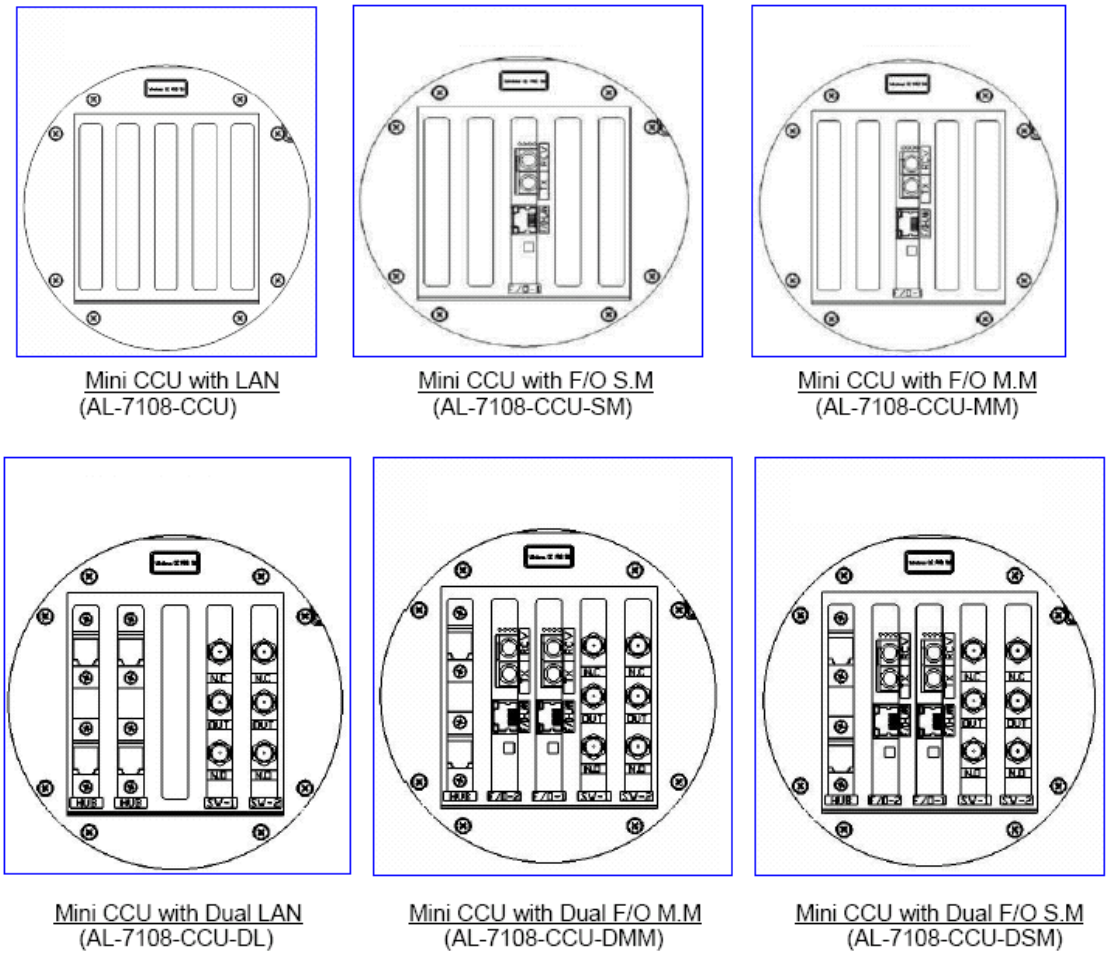


Figure 2-15: CCU Options - Cards Cage for various configurations

2.3 Single Board Controller (SBC) - Description and Options

2.3.1 General

The Single Board Controller (SBC) is a real-time tracking controller, based on an industry-standard CPU with on-board Flash and SDRAM memory that controls system operation according to CCU commands and system modes.

The SBC interfaces with the ADE components via its front-panel connectors.

The SBC runs a Real-Time OS reading all system sensors, performing 3D mathematical transformations, controlling (in closed position and velocity loops) the movement of the axes and providing on-line communication to the Below-decks Central Control Unit (CCU) by the means of standard Ethernet-LAN connection

The SBC is fed by +24VDC and incorporates an internal DC-DC power supply providing +5, +12 and –12VDC voltage to its internal circuits.

The SBC incorporates a Narrow-Band Tracking receiver for Step-track feedback.

Figure 2-16: SBC General View (installed)

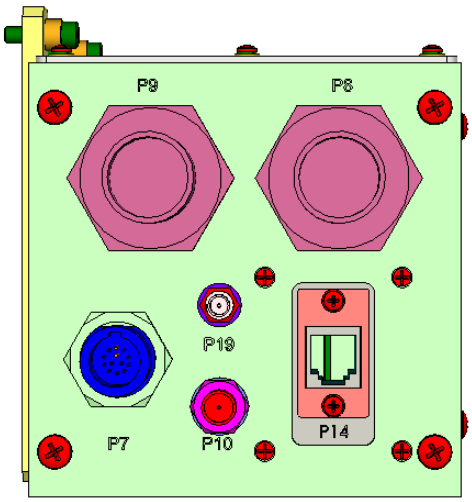
2.3.2 CCU-SBC Operational Concept

The operation of the system is fully controlled from the CCU. Using the CCU, the operator may select the desired satellite and channel from a list displayed on the CCU monitor.

The system automatically extracts the desired satellite information using the satellite database, acquires it and tracks the selected satellite by pointing the antenna towards the satellite, while compensating for the platform pitch, roll and yaw movements.

The SBC and CCU provide distributed control concept – SBC running real-time software for stabilization and control, while the CCU presents the man-machine interface to the operator.

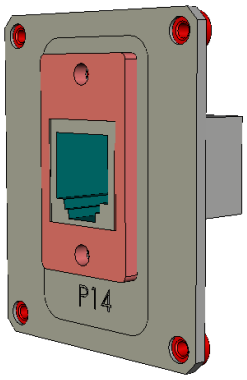
2.3.3 SBC Interfaces

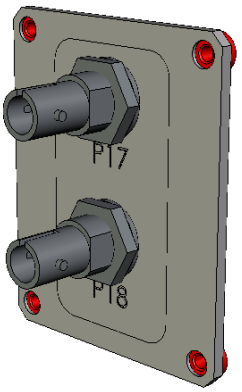


P7	IMU
P8	SDU
P9	Pedestal
P10	IF
P14	LAN
P19	GPS

Figure 2-17: SBC front view

Two options are available for interfacing between the ADE and the BDE. One is for standard LAN cable (P14) and the other is for Fiber Optic connection (P17 and P18).

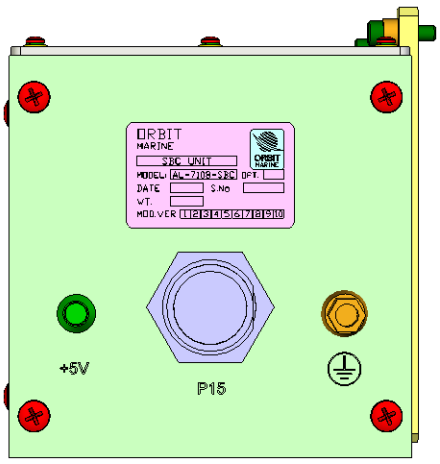




P14	LAN

P17	F/O Tx
P18	F/O Rx

Figure 2-18: SBC interface options



P15	Compass
GND	Ground Stud
+5V	LED

Figure 2-19: SBC rear view

BUC M&C (Relevant for the C-Band 20W and 40W systems, and for the Ku-Band 8W system) - The SBC supports BUC Monitor and Control. This function is implemented from the P15 connector in the SBC.

2.3.4 Narrow Band Receiver (NBR)

The SBC includes a Narrow Band Receiver (NBR) that is used for RF tracking. The use of an NBR instead of a wide band receiver improves significantly the tracking accuracy of the system.

Two NBR types exist, one that operates in L-Band (L-NBR) and the other operates in the 70 to 140MHz IF band (IF-NBR).

NBR Specifications:

Bandwidth: 0 – 70 KHz (50 KHz)

- or -

70 – 180 KHz (150 KHz)

- or -

180 – 400 KHz (300KHz)

Beacon Signal (for the NBR): Min. 10dB C/N per relevant Bandwidth for a given bandwidth that is not less than 25 KHz.

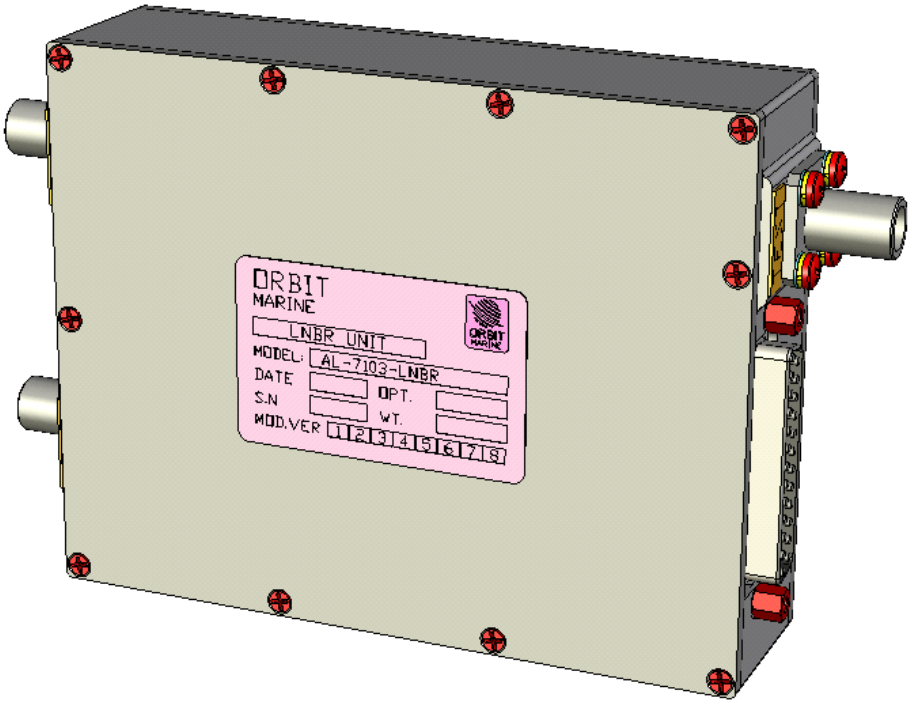


Figure 2-20: NBR Unit General View

2.4 Power Supply Unit (PSU) - Description and Options

2.4.1 General

The power supply is included only in systems that are ordered from Orbit with an RF Package. Note that the Power Supply supports both Ku and C-band BUCs (that are supplied by orbit).

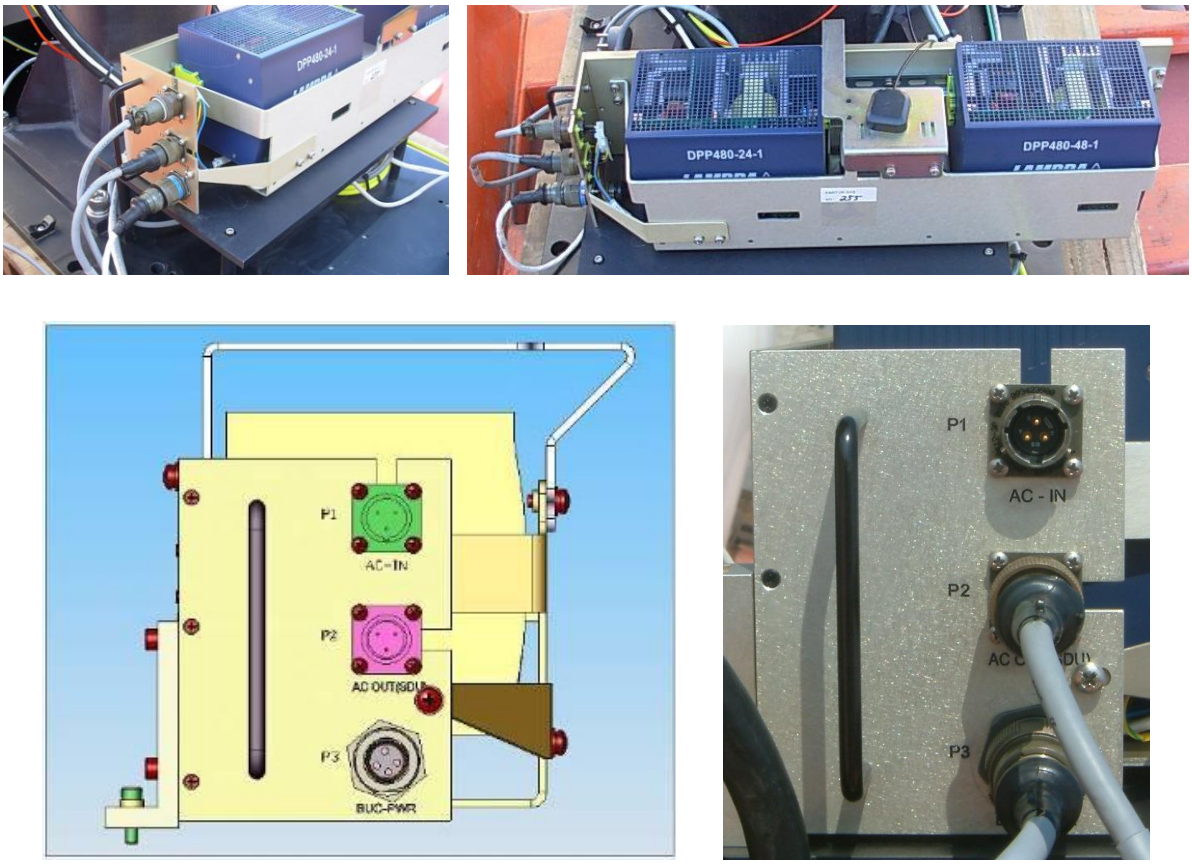


Figure 2-21: PSU AL-7108-PSU

Basic configuration systems, those that are ordered without an RF package, will not include a Power Supply.

2.5 Interconnections and Cables

The following Figures illustrate the AL-7108 interconnection diagrams, for the Basic and the 20W/40W configurations.

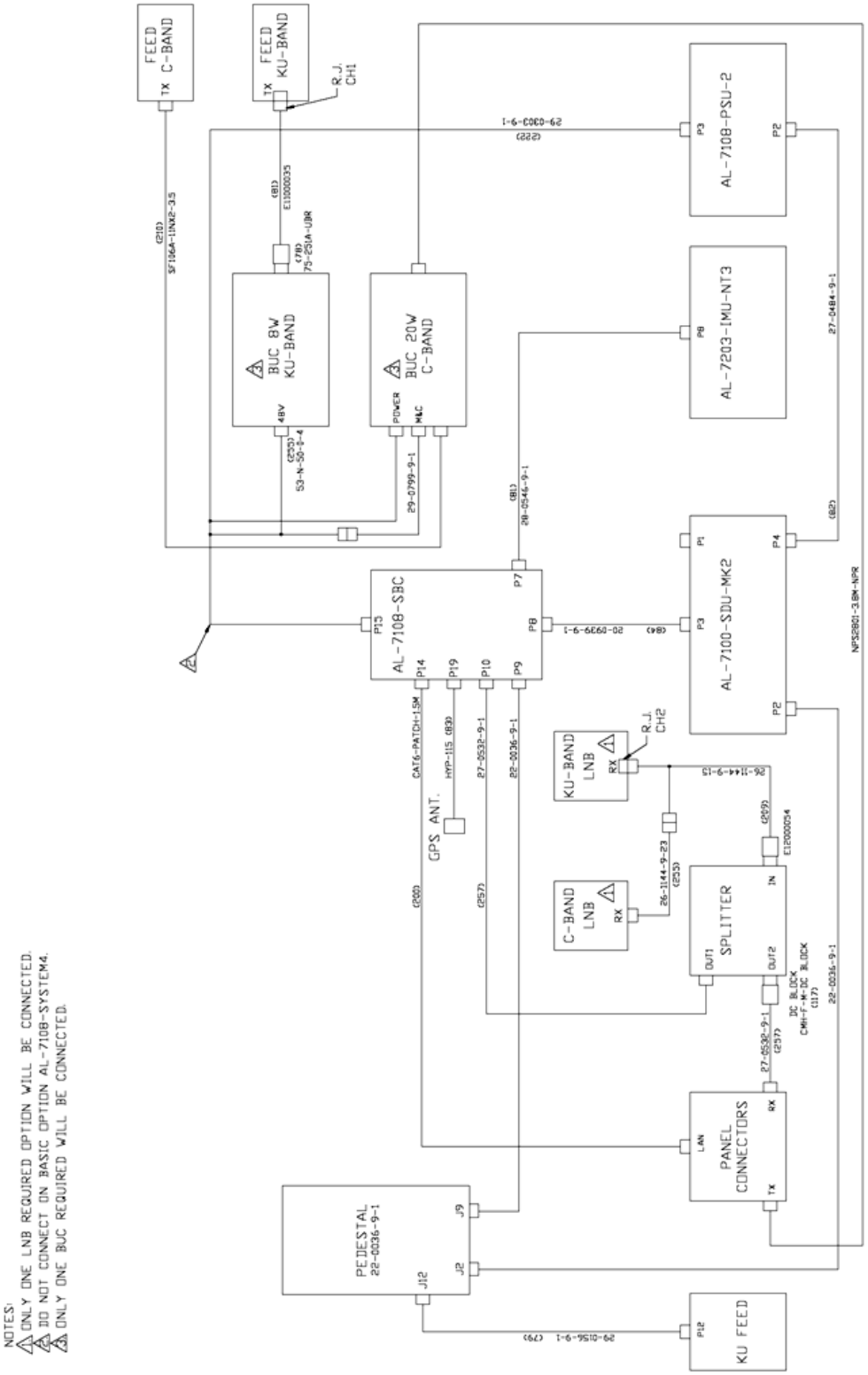


Figure 2-22: AL-7108-SYS4 Interconnection Diagram

3 AL-7108 System – Basic Configuration Specifications

Antenna System Performance

Antenna Type	Prime Focus
Dish Diameter	2.4M (96”)
Radome Size	4.5M (177”)
Freq. Operation	C-Band: Tx: 5.9 – 6.4GHz Rx: 3.7 – 4.2GHz Ku-Band: Tx: 13.75 – 14.5 GHz Rx: 10.95GHz – 12.75GHz
Antenna Polarity	C-Band: Circular L/R Ku-Band: Linear V/H
Antenna Gain (Typical)	C-Band: Tx:41.5dB @ 6.15GHz Rx:38.5dB @ 3.96GHz Ku-Band: Tx: 47.8dBi @ 14.125GHz Rx :46.1dBi @ 11.7GHz
System G/T (Typical)	C-Band: 17.5dB/°K @ 20°EL Ku-Band: 21.0dB/°K @ 20°EL
CrossPol Isolation @ Tx	C-Band: 27dB min Ku-Band: 30dB min
Radome Loss (Typical)	C-Band: 0.3dB Ku-Band: 1.7dB
Elevation Travel	□□□□□from Zenith
Azimuth Travel	Continuous
Polarization Travel	C-Band: N/A Ku-Band: Continuous
Pointing Accuracy	0.1□□RMS

Environmental Conditions

Operating Temperature	-25□□to 70□C
Storage Temperature	-35□□to 75□C
Operating Wind Speed	100 Knots

Physical

Power Requirements	110/220 VAC, 50/60 Hz 1800W (ADE), 200W (BDE)
Weight (ADE, including Radome, without RF equipment)	1150 Kg / 2530 lb.

Ship Motion

Roll	30□□@ 8 sec
Pitch	15□□@ 6 sec
Yaw	□□□□@ 50 sec

Gyro Compass Interface (BDE)

NMEA 0183	RS422 or RS232
Step-by-Step	Both Polarities

Surge	0.2□g
Sway	0.2□g
Heave	0.2□g
Turning Rate	10°/sec

Synchro	1:1, 1:36, 1:60, 1:90, 1:360

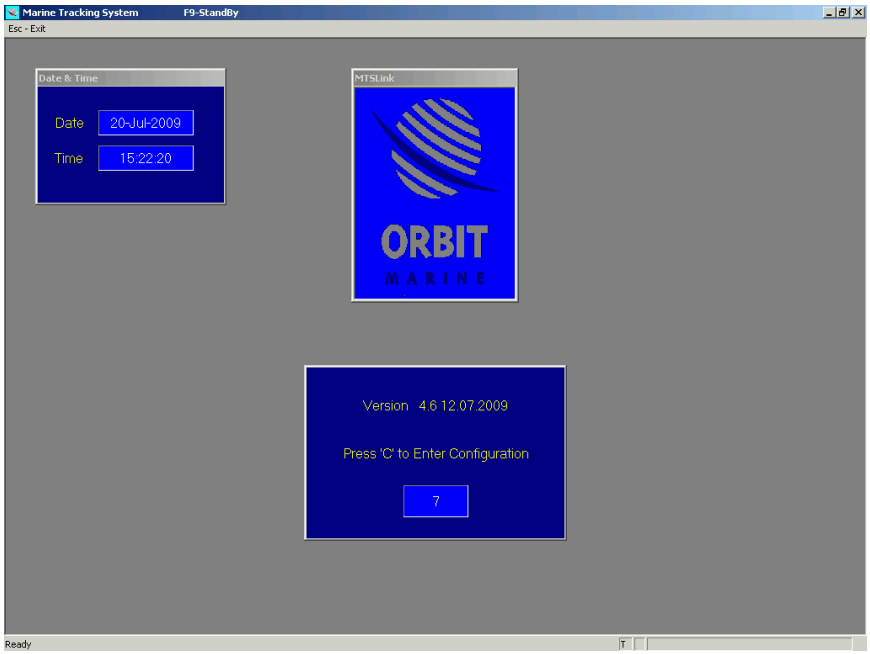
4 Getting Started - Basic System Operation

4.1 System Start-Up

➢ **To Power Up the System:**

Turn the ADE and the CCU's POWER switch ON.

Operating system messages are displayed, and then the Banner/Self-Test screen appears for a period of 10 seconds, during which a 10-to-0 countdown is displayed.



If the 10-second countdown is not disrupted, the system will enter Basic Operation screen. Basic Operation screen only allows monitoring of general system status and messages. For further control and parameters update, the 10-second countdown should be stopped (by pressing any key) and the "AL-7200" password entered:

The power-up sequence is fully automatic, provided that the system is configured to Auto-Start (default setting). At the end of power-up, the system is locked on the satellite that was last selected and saved prior to system shutdown.

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4.2 Basic Operation Screen

If the 10-second after-power-up countdown is not disrupted, the system will automatically revert to Basic Operation screen:

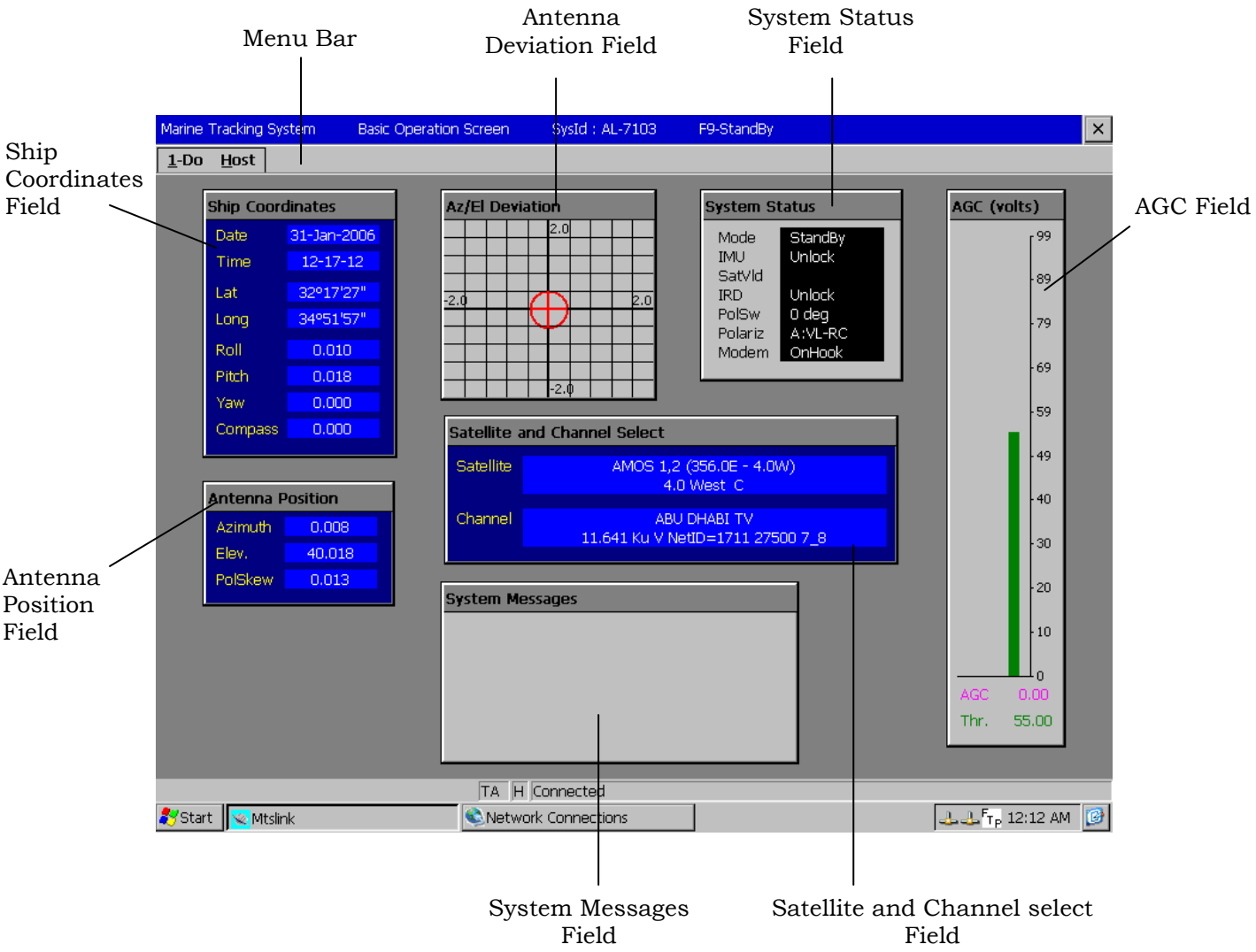


Figure 4-1: Basic Operation Screen

For further control and parameters update, type <O>, then enter the "AL-7200" password:

4.3 Operation Screen

After entering the “AL-7200” password, the following screen will appear:

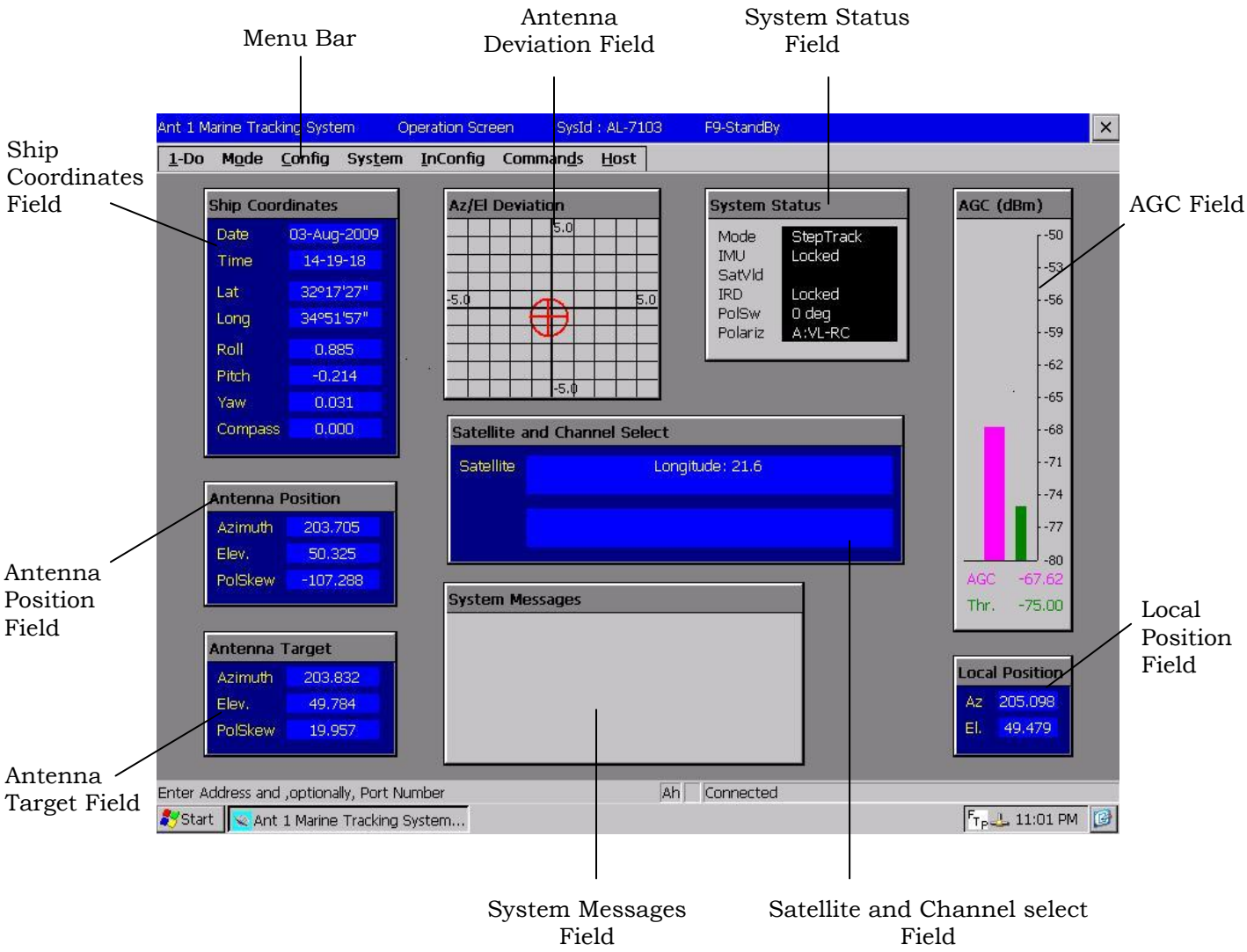


Figure 4-2: Operation Screen

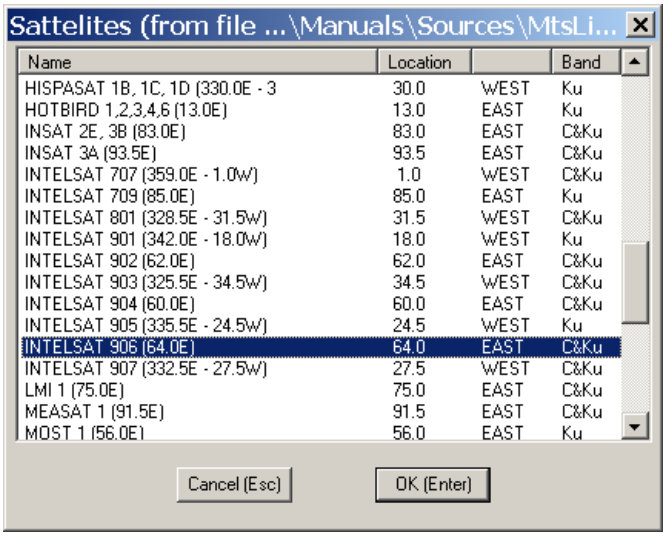
To revert back to Basic Operation type <U>, then hit any key for password:

4.4 Selecting a Satellite and Setting Up Tracking Frequency, NBR Bandwidth and LNB Range

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

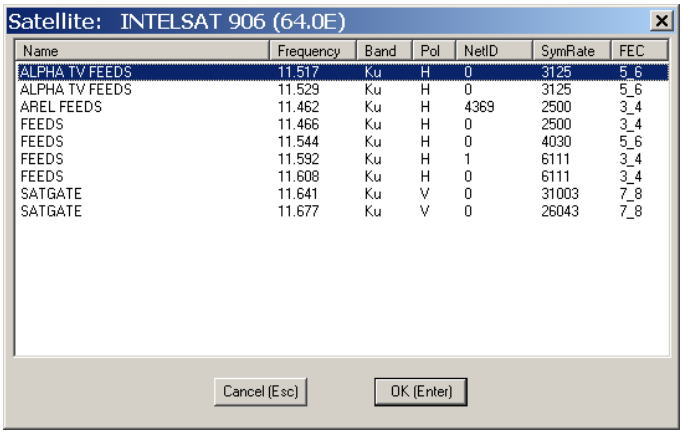
- **Selecting a Satellite and Channel:**

1. At “Operation Screen” type <S>, or type <1> (Do) and click on ”Select Satellite”, the Satellite window appears:



2. Click on the desired satellite, and select it by pressing ENTER or clicking OK.

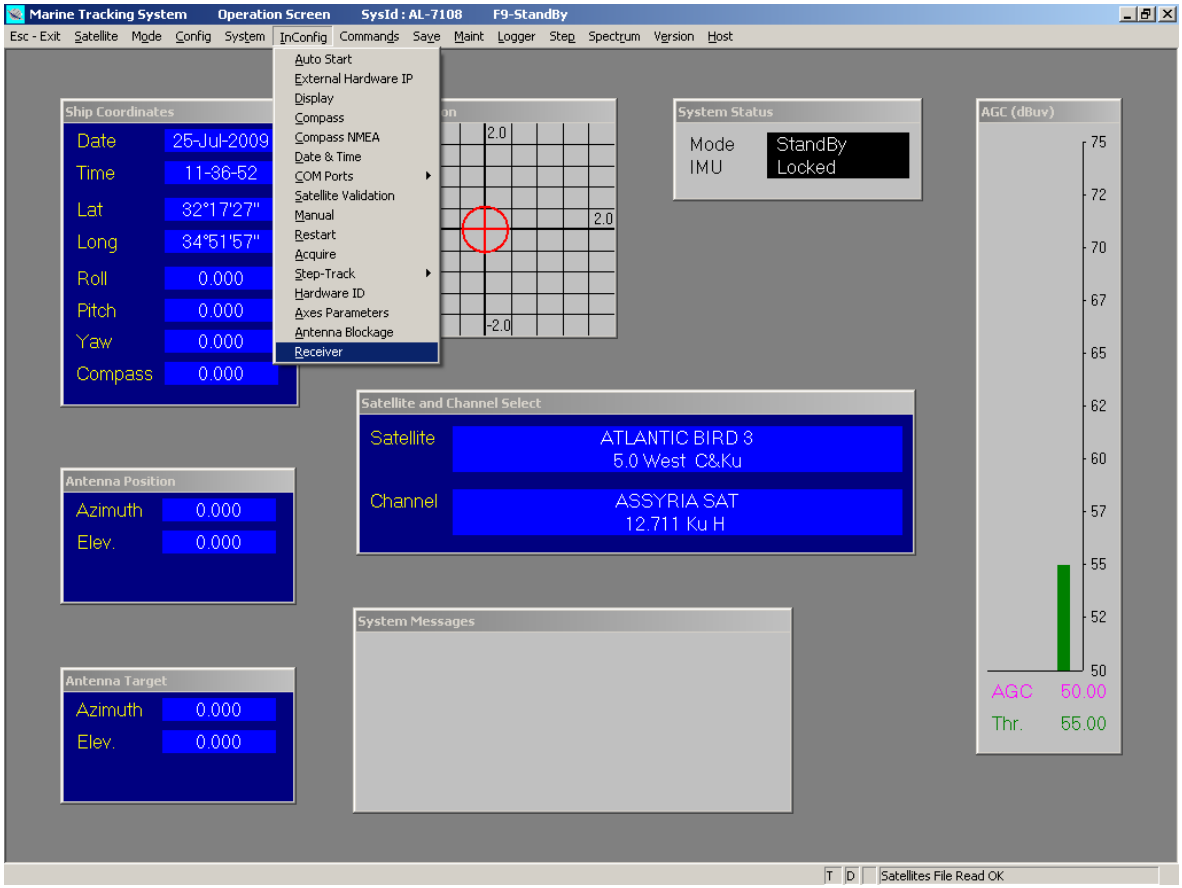
   The SATELLITE window appears, listing the available selected-satellite tracking control channels. **Disregard this window-by pressing enter.**



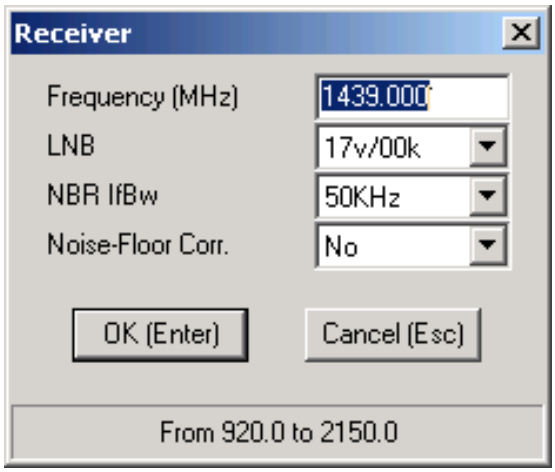
To select the Narrow Band Receiver IF-Bandwidth, perform the following procedure:

Make sure that Narrow Band receiver is activated.

From “Operation Screen” press “I”, then select “Receiver”:



At the Receiver window, select one of the NBR IfBw options: 50 KHz, 150 KHz or 300 KHz.



Save ALL settings to SBC non-volatile memory.

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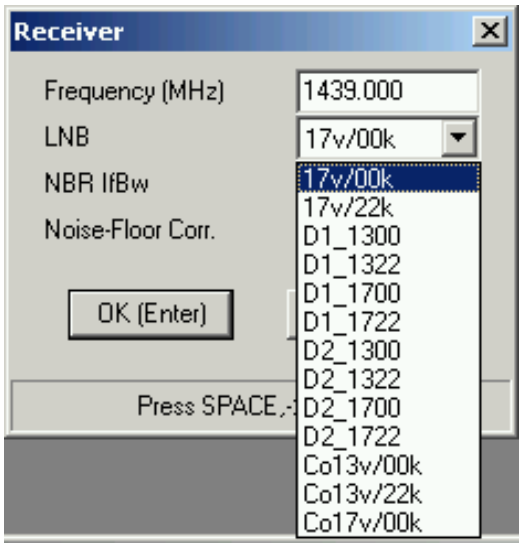
- **Select LNB Control Voltage:**

For NorSat LNB (1X07HA, 1X07HB or 1X07HC) select 17v00k.

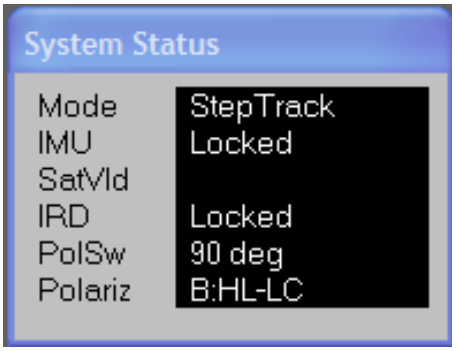
For SMW Q-PLL Type O LNB:

- Use 13v00k to select 10.70-11.20 GHz frequency range
- Use 13v22k to select 11.20-11.70 GHz frequency range
- Use 17v00k to select 11.70-12.20 GHz frequency range
- Use 17v22k to select 12.20-12.75 GHz frequency range.



4.5 Setting the Polarization

Note what the current Polarization of the system is by looking on the System Status window, “Polariz” parameter:



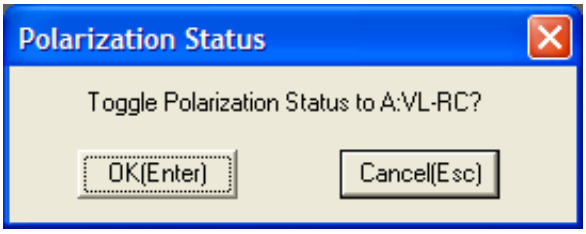
The Polarization may indicate two options:

- “A:VL-RC” -Vertical Rx (or Right-hand Circular Rx in case of Circular Polarized Antenna)
- “B:HL-LC” - Horizontal Rx (or Left-hand Circular Rx in case of Circular Polarized Antenna)

➢ **To flip Polarization (from Vertical to Horizontal or vice versa):**

1. At “Operation Screen” type <D> (or click on “Commands”), and then type <P> (or click on “Polarization”):

   The CONFIRM YOUR CHOICE window appears.



2. To confirm your command, press ENTER or click Ok.

4.6 Acquiring a Satellite

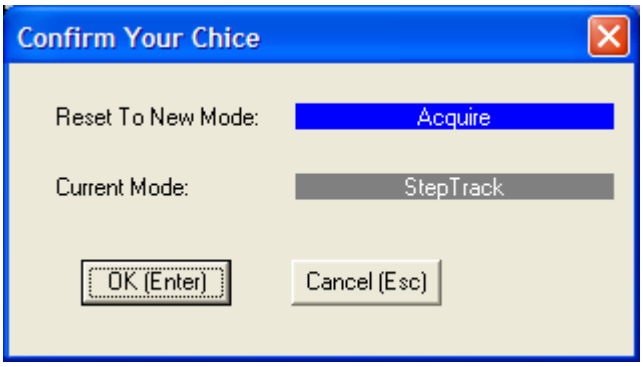
Before Acquiring the Satellite make sure that:

2. The Satellite was selected (as per 4.4 above)
3. The correct Tracking Frequency was set (as per 4.4 above)
4. The appropriate NBR Bandwidth was selected (as per 4.4 above)
5. The correct LNB Range was set (as per 4.4 above)
6. The correct Polarization was set (as per 4.5 above).

Activation of “Acquire” will move the Antenna to the calculated nominal Satellite view Angle according to the system encoders and sensors (“Point-to-Satellite”), then automatically activate the Step-track mode, which utilizes the RF signal feedback.

- To Acquire a Satellite:

  At “Operation Screen” type <O> (or click on “Mode”), and then click on “Acquire”. The Acquire window appears:



To confirm, press ENTER or click OK.

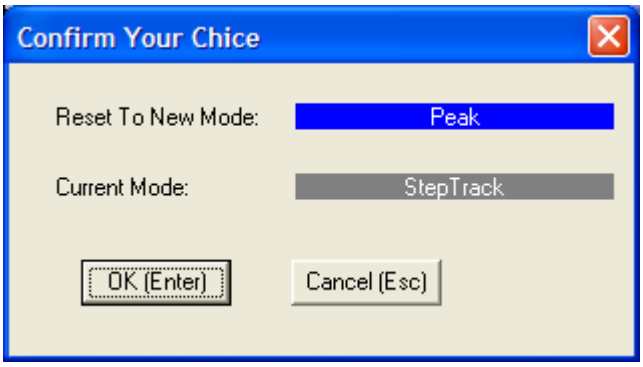
The system will move the Antenna to acquire the selected satellite.

4.7 Peak Function

Activation of “Peak” will hold the Antenna Step-tracking and keep the Antenna stable on the point of maximal reception, as found during the latest Step-track iteration.

- **To Peak the System:**

At “Operation Screen” type <O> (or click on “Mode”), and then click on “Peak”. The Peak window appears:



To confirm, press ENTER or click OK.

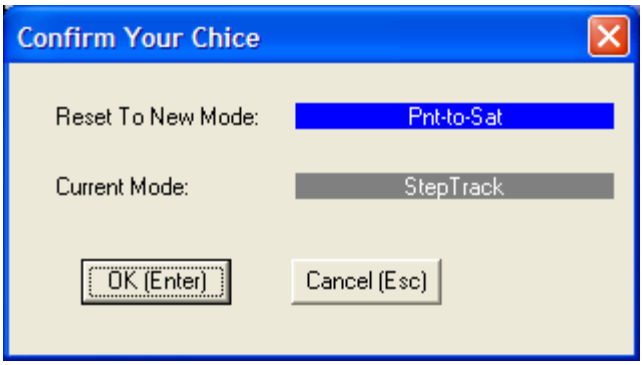
The system will switch to Peak mode.

4.8 Point-to-Satellite Function

Activation of “Point-to-Satellite” will move the Antenna to the calculated nominal Satellite view Angle according to the system encoders and sensors, without taking into account the RF signal feedback.

- **To Point-to-Satellite:**

At “Operation Screen” type <O> (or click on “Mode”), and then click on “Pnt-to-Sat”. The Pnt-to-Sat window appears:



To confirm, press ENTER or click OK.

The system will move the Antenna to the selected satellite view angle.

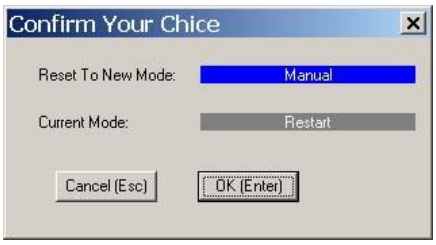
4.9 Moving the Antenna using Manual Mode

The following procedure is used for maintenance and testing purposes, or for finding the satellite when the system does not acquire it automatically.

➢ **To move the Antenna in Manual Mode:**

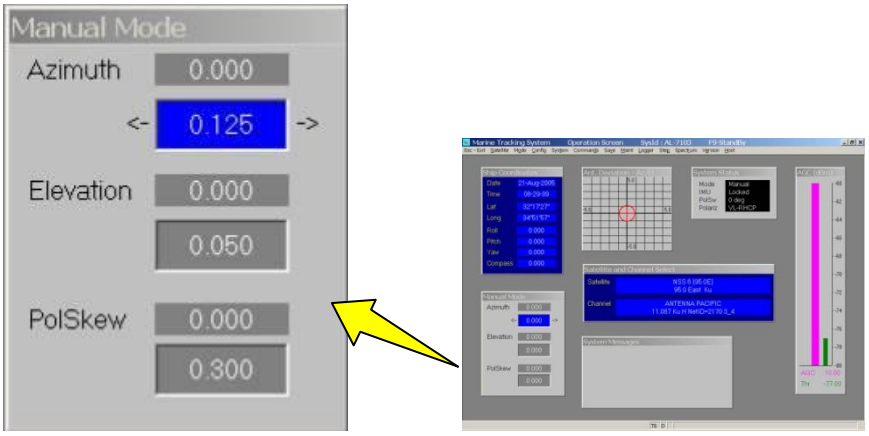
1. At “Operation Screen” type <O> (or click on “Mode”), and then type <M> (or click on “Manual”):

   The CONFIRM YOUR CHOICE window appears.



2. To confirm, press ENTER or click OK.

   MANUAL MODE window appears at the bottom left corner of the OPERATION screen.



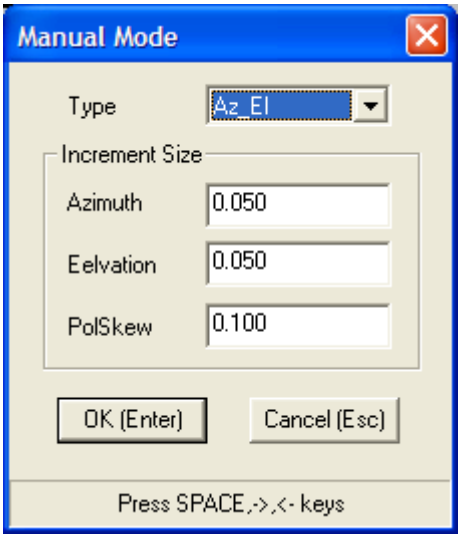
3. To move the antenna to any direction, use the up/down arrow keys or the mouse to highlight the pertaining axis bottom-field, and use the right/left arrows or the mouse to increase/decrease the angle in step increments.

   For each axis (Azimuth, Elevation and PolSkew).

   The MANUAL MODE window provides two display fields: the upper field displays the current angle of the axis, and the bottom one displays the new manually changed angle.

- **Setting up the Manual Mode**

1. At “Operation Screen” type <C> (or click on “Config”) and then type <M> (or click on “Manual”). The following menu will appear:



Increment size:

Size of one step in degrees.

Default settings: 0.05º for Azimuth and Elevation, 0.1º for Polarization Skew

Type:

- Az_El (Default) –

Incremental values measured with respect to Antenna location at the moment the Manual mode was engaged. The manually controlled angles in Azimuth are in terms of Azimuth tilted by Elevation and not Earth-horizon referenced Azimuth.

Effectively that means that when taking an Azimuthal antenna cut, there is no need to translate the Horizontal axis by Cosine of Elevation. However, when moving the Antenna Azimuth by a considerable amount (more than a few degrees) one will notice that the Elevation angles is also changing.

- Earth_Az_El –

Absolute antenna angles presented in Earth referenced Azimuth and Elevation: Azimuth with respect to Earth True North, Elevation with respect to the Horizon.

If only Azimuth is moved – Elevation will be kept constant

- SatArch –

Azimuth field presents the angular displacement in Satellite Arch terms. Antenna Azimuth and Elevation are changing in accordance of the antenna displacement on the Arch.

This mode is most useful in “hunting” for adjacent satellites.

4.10 Restarting/Rebooting the System

If the system did not complete the Auto Start sequence, or you want to initialize the system, use the following steps:

➢ **To restart the system:**

1. At “Operation Screen” type <O> (or click on “Mode”), and then type <R> (or click on “Restart”):

   The CONFIRM YOUR CHOICE window appears.

2. To confirm your command, press ENTER or click OK.

➢ **The system will initialize the Pedestal X, Y and Z encoders and initialize the IMU for 6 minutes.**

- While the Restart is in progress you can not operate the system, a message will appear on the System Messages window: ‘Auto Restart in Progress’, The IMU will countdown for 6 minutes. After the IMU countdown will finish, the system will lock on the last saved satellite.

➢ **To reboot the system:**

At “Operation Screen” type <D> (or click on “Commands”), and then type <R> (or click on “Reboot”):

The CONFIRM YOUR CHOICE window appears.

To confirm your command, press ENTER or click Continue.

Both Restart and Reboot will cause the system to restart its operation. The fundamental difference between the two is that Reboot actually initiates a hardware soft-restart by triggering the SBC CPU reset circuitry, thus causing a full reboot sequence as if the system power was cycled.

4.11 Manual Setting of Heading

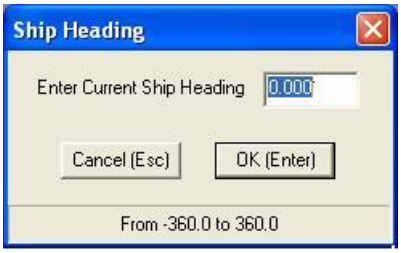
Manual setting of heading is needed if:

- Ship's compass is either inactive or not yet connected (ex: in midst of system installation)

➢ **To Set the Heading:**

1. At "Operation Screen" type <D> (or click on "Commands"), and then click on "Set Compass":

   The SHIP HEADING window appears.



2. To confirm, press ENTER or click OK.

   The system will update the Ships Heading.

For incremental compass types (Step-by-Step, Synchro 36:1, Synchro 360:1), a start value of the compass may be set.

- For absolute type, (NMEA-0183, Synchro 1:1), a default compass value may be set. This value will prevail until a valid compass update is received.
- When entering a Compass value, it might affect the accuracy of the IMU X Y Z sensors. It is then recommended to run the System Restart process again.

4.12 Activating Step-Track Mode

The Step-Track mode is automatically activated under normal working conditions. However, if you need to manually activate it for maintenance and testing purposes, perform the following steps.

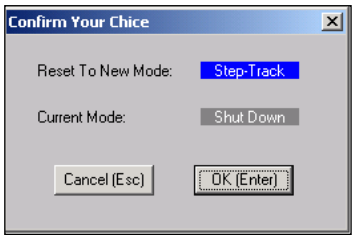
Make sure you are on the correct satellite with the correct tracking channel.

Make sure the AGC is above the Threshold. If the AGC is below the Threshold the system will automatically revert to Search mode.

➢ **To activate the Step-Track Mode:**

1. At “Operation Screen” type <O> (or click on “Mode”), and then click on “Step-track”:

   The CONFIRM YOUR CHOICE window appears.



2. To confirm, press ENTER or click OK.

   The system will switch to STEP TRACK mode.

4.13 Stow the System

➢ **To Stow the system:**

1. At “Operation Screen” type <O> (or click on “Mode”), and then click on “Stow” or “Stow-up”:

   The STOW window appears.

2. To confirm, press ENTER or click OK.

   The system will switch to STOW mode.

The Stow mode is used to move the system into a certain position, to allow an easy accessibility for maintenance on the ADE.

The Stow-up mode us used to put all mechanical axes to zero encoder reading.

4.14 Manual Setting of GPS Lat/Long Location

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

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

1. At "Operation Screen" type <D> (or click on "Commands"), and then click on "Set GPS":

   The CONFIRM YOUR CHOICE window appears.

2. To confirm, press ENTER or click OK.

   The GPS position will update.

The Latitude and Longitude angles are entered in their decimal form, meaning that +32.5125 degree Latitude are actually 32 deg 30 minutes 45 seconds of arch North to Equator, while –128.7523 degrees Longitude are actually 128 degrees 45 minutes and 8 seconds of arch West of Greenwich.

To make those calculations you must remember that 1 degree of arch is divided into 60 minutes, while each minute of arch in turn contains 60 seconds, so that each degree of arch actually contains 3600 seconds.

32.5125 degrees of Latitude are 32 degrees and 0.5125*3600 = 1845 seconds.

1845 seconds are 1845/60 = 30 minutes and 0.75 * 60 = 45 seconds. The fact that 32.5125 Latitude is a positive number means that it's given North of the Equator. 32.5125 degrees of Latitude are therefore 32 degrees 30 minutes and 45 seconds North of Equator.

Similarly it may be shown that –128.7523 degrees translate to 128 degrees 45 minutes and 8 seconds of arch. The fact that it is a negative number means that it is given West of the Greenwich line.

4.15 Clear GPS

The above command is used to initialize GPS data when A GPS-related error message is displayed

➢ **To Clear the GPS:**

1. At “Operation Screen” type <D> (or click on “Commands”), and then click on “Clear GPS”:

   The CONFIRM YOUR CHOICE window appears.

2. To confirm, press ENTER or click OK.

   The GPS receiver is reset. All GPS readings will be lost for a few minutes, until the GPS is relocated.

4.16 Setting AGC Threshold

The system is supplied from factory with Noise Floor Correction calibrated and activated. The AGC values in this case should be set to a constant value of -75 dBm.

The below description refers to a condition, where for some reason, the Noise Floor Correction is deactivated, or a when the operator wants to introduce a user defined threshold.

➢

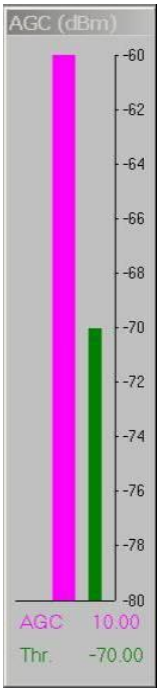
➢ **To set the AGC Threshold:**

1. At “Operation Screen” type <D> (or click on “Commands”), and then click on “Set Threshold”:

   The SET THRESHOLD LEVEL window appears.

2. Type in a new value (in dbm) into the window, and to confirm, press ENTER or click OK.

The THRESHOLD LEVEL is updated.



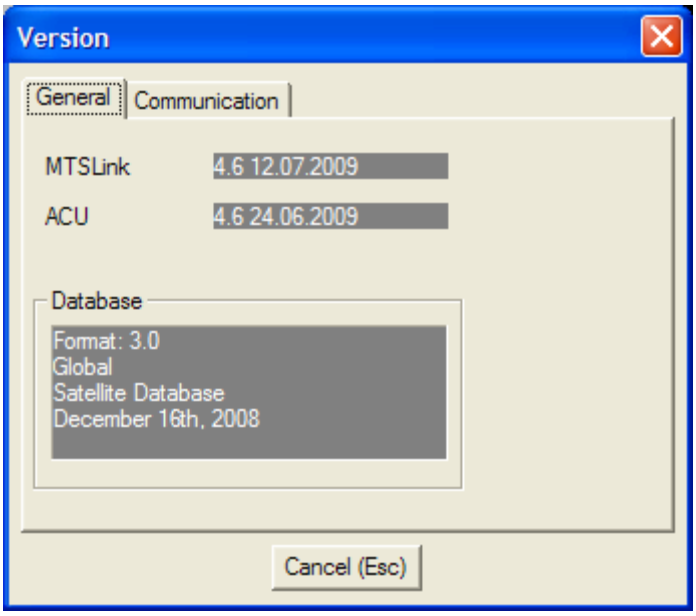
The THRESHOLD LEVEL should be approx 5 dB below the maximum AGC level.

4.17 Viewing Software Version Details

- **To view the software version details:**

  At “Operation Screen” type <E>, or click on “1-Do” and then click on “Show Version”:

  The VERSION window appears, listing version numbers and dates of the PROGRAM and COMMUNICATION software modules.



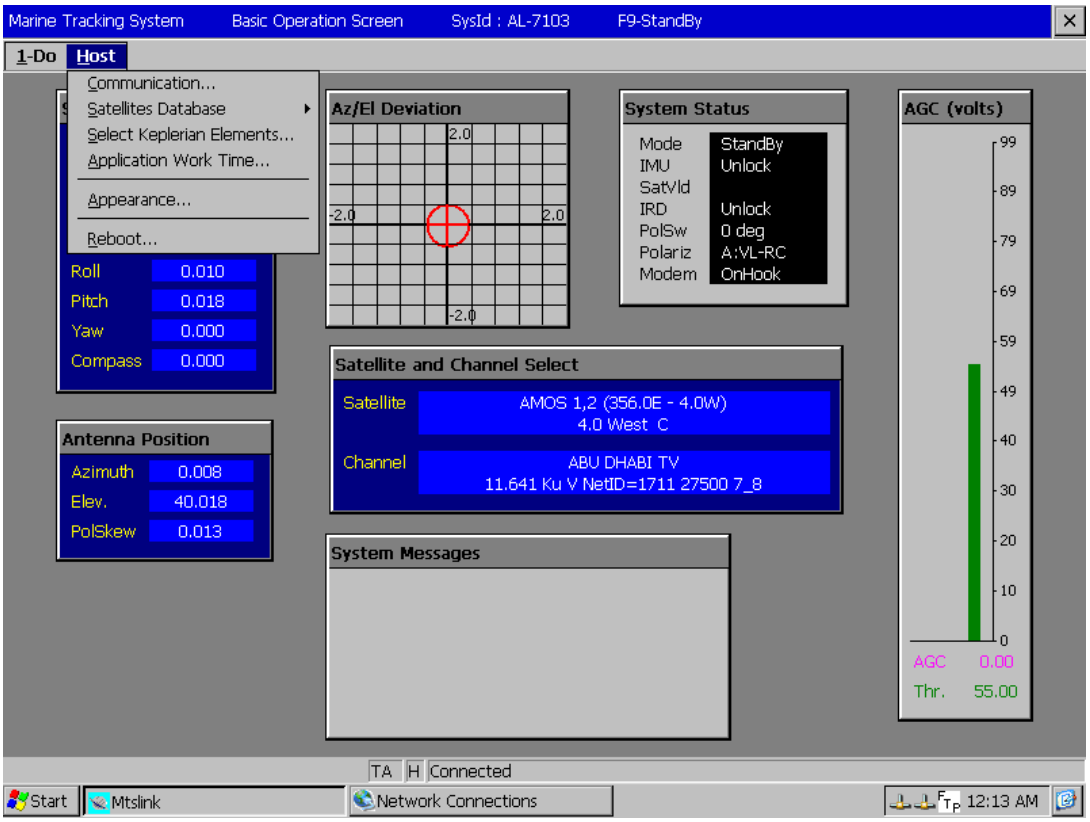
For proper CCU- Controller (SBC) communication, the Program and Communication versions installed on both units should be the same, respectively.

4.18 Using Host Menu

➢ **To use the Host menu:**

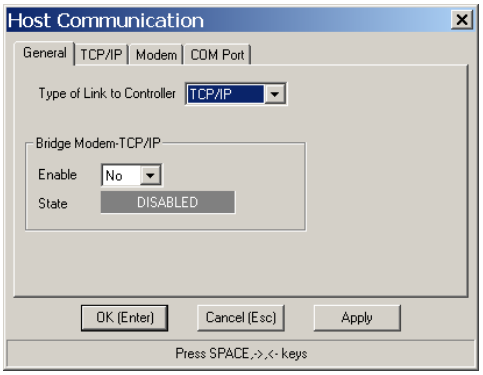
Type <H> or from the menu bar, click HOST.

The HOST sub-menu appears.



1. To use the **COMMUNICATION** functions, click the COMMUNICATION.

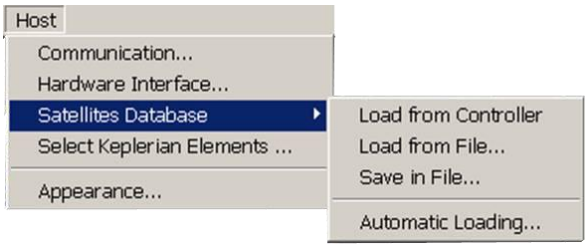
   The HOST COMMUNICATION screen appears.



In order to update the SBC IP address, click on the TCP/IP tab and update.
The SBC IP address by default is always: 192.9.200.10.

2. To use the **SATELLITE DATABASE** functions, click the SATELLITES DATABASE option.

The SATELLITES DATABASE sub-menu appears.



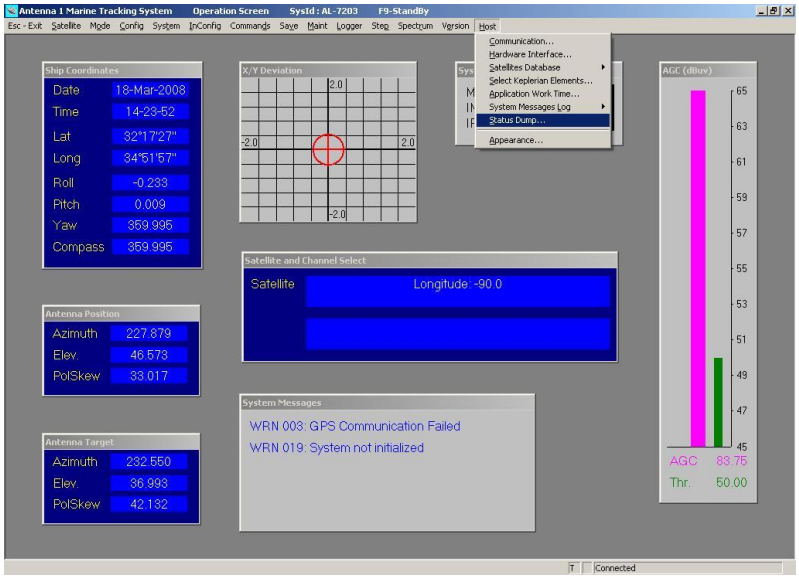
The Satellite data base is loading automatically from the controller (SBC) when the communication between the CCU and SBC is initiated.

4.19 Status Dump

When activated, the Status Dump will produce a “StatusDump.txt” ASCII file containing textual information, which can be used for system’s troubleshooting.

➢ **To activate the status dump:**

1. At “Operation Screen” type <H> (or click on “Host”), and then click on “Status Dump”:



The STATUS DUMP report is created, and the following window appears:

2. Type OK.

The user will select where to store the dump file using a "Save as" browser windows, and can select to store it on the CCU's desktop and then copy it to the disk-on-key using "windows explorer", or select to save it on the disk-on-key directly.

A Typical Status Dump Report is presented in the ERROR MESSAGES & TROUBLESHOOTING chapter.

5 Error Messages & Troubleshooting

5.1 Status Messages

5.1.1 General

In case of a malfunction, the CCU displays a Message, Warning or an Error, depending on the malfunction classification.

The messages are classified into three categories, each identified by a different color:

- Message - green (e.g. System Shut-Down, Pedestal Y Axis Jammed)
- Warning – blue (e.g. Compass Communication Failed)
- Error –red (e.g. Pedestal X Axis Encoder Fault).

5.1.2 Error Messages

Controller screen label: “ERR 015: SDU/IMU Power out of tolerance”

Description: IMU +5VDC, or the Servo Drive power indications exceeded the predefined tolerance limits

Controller screen label: “ERR 017: Restart timed out”

Description: The system was not able to complete the restart routine in the predefined time (normally set to 10 minutes)

Controller screen label: “ERR 036: Pedestal X Axis Jammed”

Description: No movement is recorded from Pedestal X-axis encoder, while the controller produces a steering command

Controller screen label: “ERR 037: Pedestal Y Axis Jammed”

Description: No movement is recorded from Pedestal Y-axis encoder, while the controller produces a steering command

Controller screen label: “ERR 053: No Maintenance Configuration File”

Description: The SBC couldn’t find the Maintenance Configuration file in its Flash memory (disk C:\), on power-up.

Controller screen label: “ERR 054: No Operational Configuration File”

Description: The SBC couldn’t find the Operational modes Configuration file in its Flash memory (disk C:\), on power-up.

Controller screen label: “ERR 055: No Satellite Database File”

Description: The SBC couldn't find the Satellite Database file in its Flash memory (disk C:\), on power-up.

Controller screen label: "ERR 057: No System Configuration File"

Description: The SBC couldn't find the System Parameters Configuration file in its Flash memory (disk C:\), on power-up.

Controller screen label: "ERR 058: No Valid IMU Calibration File"

Description: The SBC couldn't find the IMU Calibration file in its Flash memory (disk C:\), on power-up.

Controller screen label: "ERR 100: Satellite File Read Error"

Description: The SBC couldn't read the Satellite database file from its Flash memory (disk C:\), during operation.

Controller screen label: "ERR 104: Pedestal X NE2 Encoder Fault"

Description: The BiSS digital communication protocol with axis-X NE2 encoder has more then 10% failure rate.

Controller screen label: "ERR 105: Pedestal Y NE2 Encoder Fault"

Description: The BiSS digital communication protocol with axis-Y NE2 encoder has more then 10% failure rate.

Controller screen label: "ERR 106: Pedestal Z NE2 Encoder Fault"

Description: The BiSS digital communication protocol with axis-Z NE2 encoder has more then 10% failure rate.

Controller screen label: "ERR 111: Pedestal X NE2 Enc Init Fault"

Description: The axis-X NE2 encoder initialization has failed.

Controller screen label: "ERR 112: Pedestal Y NE2 Enc Init Fault"

Description: The axis-Y NE2 encoder initialization has failed.

Controller screen label: "ERR 113: Pedestal Z NE2 Enc Init Fault"

Description: The axis-Z NE2 encoder initialization has failed.

Controller screen label: “ERR 119: Pedestal Z Axis Jammed”

Description: No movement is recorded from Pedestal Z-axis encoder, while the controller produces a steering command

Controller screen label: “ERR 121: SBC Pwr/Tmpr out of tolerance”

Description: One of the SBC power indications (+5v,+/-12v,+2.5v etc.) exceeded the predefined tolerance limits. This error will also appear if the SBC internal temperature exceeded its tolerance limits.

Controller screen label: “ERR 165: I/O Bus Fault”

Description: Starting with SBC software Ver4.22 in conjunction with Altera version 0xCDXX, the SBC can recognize a fault in I/O PC Bus by writing to Altera and reading the value back. If the value is not the same – an appropriate message is produced.

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5.1.3 Warning Messages

Controller screen label: “WRN 000: LNB Power Over-Current”

Description: The controller 13/18VDC power supply, feeding the LNB is overloaded

Controller screen label: “WRN 002: Compass Communication Failed”

Description: No valid communication frames were received on the NMEA-0183 compass Com port for over 1.5 seconds.

Controller screen label: “WRN 003: GPS Communication Failed”

Description: No valid communication frames were received on the GPS Com port for over 5 seconds.

Controller screen label: “WRN 004: No GPS Position Updates”

Description: No GPS position-fix frames were received on the GPS Com port for over 30 seconds.

Controller screen label: “WRN 019: System not initialized”

Description: The AL-7108 didn’t undergo the process of initialization which includes all axes Encoder init as well as IMU init.

Controller screen label: “WRN 025: LNB voltage out of tolerance”

Description: The controller 13/18VDC power supply, feeding the LNB, is exceeding its predefined tolerance levels

Controller screen label: “WRN 033: Antenna view blocked”

Description: The Antenna has moved into one of the predefined blockage areas

Controller screen label: “WRN 050: No communications with host”

Description: The communications with the host computer, identified by a predefined IP address, has timed-out (10 seconds).

Controller screen label: “WRN 069: Signal below threshold”

Description: The controller signal strength indication (AGC) on the selected frequency is lower then the predefined threshold level.

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Controller screen label: “WRN 070: IMU-ACU Communication Fault”

Description: The communications between IMU and the controller has timed-out.

Controller screen label: “WRN 102: Receiver Cal Table not Found”

Description: The SBC couldn’t find the internal wide-band receiver linearization calibration file in its Flash memory (disk C:\), on power-up.

Controller screen label: “WRN 138: BUC L-Band Cal Table not Found”

Description: The SBC couldn’t find the BUC Input analogue detector linearization calibration file in its Flash memory (disk C:\), on power-up. This Warning will be issued only if the BUC L-Band Power indicator is enabled.

Controller screen label: “WRN 139: BUC L-Band Cal Table not Found”

Description: The SBC couldn’t find the BUC output analogue detector linearization calibration file in its Flash memory (disk C:\), on power-up. This Warning will be issued only if the BUC Rf-Power indicator is enabled.

Controller screen label: “WRN 140: PolSwitch not connected”

Description: The SBC recognized a situation in which both Forward and Reverse limit sensors of the PolSwitch are ON. This is interpreted as a not connected PolSwitch.

Controller screen label: “WRN 138: BUC L-Band Cal Table not Found”

Description: The SBC couldn’t find the BUC analogue detector linearization calibration file in its Flash memory (disk C:\), on power-up. This Warning will be issued only if the BUC L-Band Power indicator is enabled.

Controller screen label: “WRN 148: X-Axis Forward Limit”

Description: The position encoder readout of the X-axis exceeded its Forward Limit configuration definition.

Controller screen label: “WRN 149: X-Axis Reverse Limit”

Description: The position encoder readout of the X-axis exceeded its Reverse Limit configuration definition.

Controller screen label: “WRN 150: Y-Axis Forward Limit”

Description: The position encoder readout of the Y-axis exceeded its Forward Limit configuration definition.

Controller screen label: “WRN 151: Y-Axis Reverse Limit”

Description: The position encoder readout of the Y-axis exceeded its Reverse Limit configuration definition.

Controller screen label: “WRN 161: iNBR Interface not recognized”

Controller screen label: “WRN 162: iNBR High LO Unlocked”

Controller screen label: “WRN 163: iNBR Low LO Unlocked”

Controller screen label: “WRN 164: Tracking Error Exceeds Limit”

Controller screen label: “WRN 167: Octans-IMU: Alignment in process”

Controller screen label: “WRN 168: Octans-IMU: Anomaly”

Controller screen label: “WRN 169: Octans-IMU: Data not ready”

Controller screen label: “WRN 170: BUC Tx Stopped”

Description: BUC Transmission stopped by the Controller

5.1.4 Messages (Info)

Controller screen label: “016: Auto-Restart in progress”

Description: System is going thru initialization stage including – IMU init, Encoder init and optionally, Satellite acquisition

Controller screen label: “018: Acquiring a Satellite”

Description: System is currently acquiring a satellite

Controller screen label: “019: System no initialized”

Description: Encoder and IMU were not yet initialized.

Controller screen label: “020: System Shutdown”

Description: System was shut down

Controller screen label: “041: System Shutdown, Ped-X Jammed”

Description: System was shut down due to “Pedestal-X Jammed” fault (No. 36)

Controller screen label: “042: System Shutdown, Ped-Y Jammed”

Description: System was shut down due to “Pedestal-Y Jammed” fault (No. 37)

Controller screen label: “045: PolSkew Disabled, Polarizer Jammed”

Description: System was shut down due to the fact that no movement was recorded from Pedestal Z-axis encoder, while the controller produced a steering command

Controller screen label: “046: System Shutdown, Ped-X Encoder”

Description: System was shut down due to “Pedestal-X Encoder Fault” (No. 8), or “Pedestal-X NE2 Encoder Fault” (No. 104), or “Pedestal-X NE2 Enc Init Fault” (No. 111)

Controller screen label: “047: System Shutdown, Ped-Y Encoder”

Description: System was shut down due to “Pedestal-Y Encoder Fault” (No. 9), or “Pedestal-Y NE2 Encoder Fault” (No. 105) or “Pedestal-Y NE2 Enc Init Fault” (No. 112)

Controller screen label: “059: System Shutdown, Power Loss”

Description: System was shut down due to “SDU/IMU power lout of tolerance” (No. 15)

Controller screen label: “060: System Shutdown, Restart Time”

Description: System was shut down due to “Restart time-out” (No. 017)

Controller screen label: “117: IRD Validation in process”

Description: IRD is being re-validated during Step-track operation. Note that this message is presented for a very short time and is barely visible on the controller screen.

Controller screen label: “120: System Shutdown, Ped-Z Jammed”

Description: System was shut down due to “Pedestal-Z Jammed” fault (No. 119)

Controller screen label: “122: System Shutdown, SBC Power/Tempr”

Description: System was shut down due to “SBC Pwr/Tmpr lout of tolerance” (No. 121)

Controller screen label: “125: System Shutdown, Ped-Z Encoder”

Description: System was shut down due to “Pedestal-Z NE2 Encoder Fault” (No. 106) or “Pedestal-Z NE2 Enc Init Fault” (No. 113)

Controller screen label: “141: System Halted, Axes Jammed”

Description: System has experienced multiple jammed-axis faults. More than 6 occurred in two minutes – the system is therefore halted.

Controller screen label: “154: Ax-X Ne2 Enc Reg Read Failed”

Description: While initialization of Axis-X Ne2 encoder, one of the registers was not read correctly (CRC check failed). If not accompanied by other Warning or Error, this is just FYI, as the register is automatically re-read.

Controller screen label: “155: Ax-Y Ne2 Enc Reg Read Failed”

Description: While initialization of Axis-Y Ne2 encoder, one of the registers was not read correctly (CRC check failed). If not accompanied by other Warning or Error, this is just FYI, as the register is automatically re-read.

Controller screen label: “156: Ax-Z Ne2 Enc Reg Read Failed”

Description: While initialization of Axis-Z Ne2 encoder, one of the registers was not read correctly (CRC check failed). If not accompanied by other Warning or Error, this is just FYI, as the register is automatically re-read.

Controller screen label: “157: Ax-X Ne2 Enc Reg Write Failed”

Description: While initialization of Axis-X Ne2 encoder, writing to one of its registers write failed (read-back failed). If not accompanied by other Warning or Error, this is just FYI, as the register is automatically re-written.

Controller screen label: “158: Ax-Y Ne2 Enc Reg Write Failed”

Description: While initialization of Axis-Y Ne2 encoder, writing to one of its registers write failed (read-back failed). If not accompanied by other Warning or Error, this is just FYI, as the register is automatically re-written.

Controller screen label: “159: Ax-Z Ne2 Enc Reg Write Failed”

Description: While initialization of Axis-Z Ne2 encoder, writing to one of its registers write failed (read-back failed). If not accompanied by other Warning or Error, this is just FYI, as the register is automatically re-written.

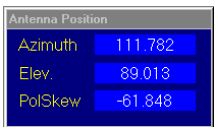
Controller screen label: “160: iNBR Validation in process”

Description: NBR is being re-validated during Step-track operation. Note that this message is presented for a very short time and is barely visible on the controller screen.

5.2 Basic Troubleshooting

- If you experience persistent problems while acquiring a satellite, and ***no error messages appear***, check that all the system parameters are correctly set.
- Check the parameters on the BASIC OPERATION screen in accordance with the following table:

Table 5-1. Basic Troubleshooting

Parameter	Check	Display	Corrective Action
Pitch and Roll	Verify that the readings displayed in the Ship Coordinates fields appear to be abnormal at the dockside (i.e., there is a pitch or roll of 2º and more).		Restart the system.
Latitude and Longitude	Check with Bridge to verify that the parameters displayed in the Ship Coordinates fields are correct.		Carry out a Clear GPS procedure, and check for updates in the Maintenance screen.
Compass heading	Check with Bridge to verify that the parameters displayed in the Ship Coordinates fields are correct.		Check that if necessary, the Compass Offset has been set. For a step-by-step compass, use the Set Compass mode to enter initial values. Otherwise, check that the Compass' wiring is in order.
Visual inspection of antenna	Verify that the antenna appears to be actually pointing in the direction stated in the Antenna Position fields.		Restart the system.

5.3 Troubleshooting Guide

5.3.1 Introduction

Use the following troubleshooting guide when a problem or malfunction is detected during operation.

The troubleshooting guide consists of the following columns:

- **Symptom**: Describes problems and malfunctions that might be detected during operation.
- **Possible Cause**: Describes the most likely reasons to the malfunction symptoms.
- **Corrective Action**: Details the maintenance procedures required to repair the system.

5.3.2 Using the Troubleshooting Guide

- When a malfunction symptom is detected, start with the first possible cause and perform the first appropriate recommended action. If the symptom persists, perform the next recommended action, and so on, until the problem is solved.
- If the symptom persists after performing all recommended actions for a specific possible cause, proceed with the next possible cause.
- Repeat step (2.) until the malfunction symptom disappears.
- In case the malfunction is not eliminated by the troubleshooting procedure, consult Orbit.

Table 5-2. Troubleshooting Guide			
no.	**Symptom**	**Possible Cause**	**Corrective Action**
1	AGC level is not present at all.	LNB cable is disconnected.	Connect the cable to the LNB.
		There is no power supply to the LNB from the SBC.	Measure the voltage on the LNB cable.
2	Error messages such as "PED Y JAMM" appear on the CCU for all axes.	No voltage is supplied to the axes.	At the Maintenance Screen, check the voltages at the axes.
		Cable is disconnected from PSU connector J2.	Check and connect the cable to J2.
3	No TX link at the modem.	There is no 10 MHz - The 10 MHz option is disabled at the modem.	Enable the 10 MHz option at the modem (refer to modem's vendor configuration instructions).
4	The "compass communication failed" error message is displayed.	The compass cable is disconnected from the CCU back panel connector.	Connect the compass cable to the com port located on the back panel of the CCU.
		The pins on the compass cable / connector are changed/crossed.	Change the pins on the compass cable / connector to the right configuration.
		The compass cable is connected to the wrong port.	COM port 1 should be RS-422, and COM port 2 should be RS-232.
5	very low AGC level	Wrong compass offset.	Calculate and enter the right compass offset.
6	Weak AGC level	Polarization is changed from horizontal to vertical or vice versa.	Change the polarization thru the MtsLink software.
7	No data on the CCU screen.	LAN or F/O Link failure - the cable which goes to the back panel of the CCU is disconnected.	Connect the cable which goes to the back panel of the CCU.
8	No display on the CCU screen.	Faulty CCU monitor.	As a temporary solution, connect an external monitor to the EXT VGA connector at the CCU back panel.
			update Orbit regarding this problem

Table 5-2. Troubleshooting Guide			
no.	**Symptom**	**Possible Cause**	**Corrective Action**
9	The "no GPS position update" error message is displayed.	Faulty / Disconnected GPS antenna	Check the GPS antenna connection to the SBC.
		Faulty cable between the SBC front panel to the SBC board	Check the connection between the SBC panel to the SBC board

5.4 Using the Status Dump Function for Troubleshooting

5.4.1 Activating the Status Dump Function

Refer to para. 4.19 in this manual.

5.4.2 Status Dump File Example

The following typical Status Dump Report contains the system parameters and status indications.

These parameters and indications can be used for troubleshooting and analysis of system status.

Orbit Marine Status Dump Report at 18-Mar-2008 12:30:27

****

Controller's Information

****

CPU Kind: PCA6751

VxWorks Software Version: 4.4 24.12.2007

Work Time: 22 hours 11 minutes

SBC IP address: 192.9.200.10

SBC Subnet Mask:

SBC Default Gateway:

External Hardware Host IP Address: 192.9.200.22

System ID: AL-7203

Hardware ID

****

---TYPE----

Receiver: 20-0336

I/O: 20-0720

IMU: SLDSTATE

BUC: Undefined

---EPLD Version---

Receiver: FFFF

I/0: FFFF

---Calibration Files ID---

imusave: 001

System Status

****

Operating Mode: StandBy

IMU status: Unlock

IRD: Unlock

PolSw: 0 deg

Polariz: B:HL-LC

Ship Coordinates

****

Latitude: 32.291 deg

Longitude: 34.866 deg

Compass: 359.995 deg

Axes Offsets
****
--Encoder--
Pedestal-X: 11.000 deg
Pedestal-Y: -43.860 deg
--Allignment--
PolSkew: -23.000 deg
Elevation: -0.231 deg

Antenna Status Target Position
********** **********
Azimuth: 232.550 deg 227.879 deg
Elevation: 36.993 deg 46.573 deg
PolSkew: 42.132 deg 33.017 deg

Current System Messages
****
WRN 003: GPS Communication Failed
WRN 019: System not initialized

Tracking Signal
****
AGC: 83.75 dBuv 6.25 Volts
Thresh: 50.00 dBuv
Tracking Frequency: 1858.000
NBR Selected IF Filter: 50KHz

Compass Setup
****
On Host: NO
Compass Type: SYNCHRO_1_1
Compass Offset: -146.016 deg

Power State Readout
****
Parameter CPU I/O RCVR IMU SDU
--- ---
+5V: 6.248 6.248 0.000
-5V: -6.373

3.3V: 6.248
+12V: 14.971 14.971 12.000
-12V: -15.096
+30V: 38.241
LNBV: 25.219

Local Angles
****
Azimuth: 0.238 deg
Elevation: 44.990 deg

Antenna Blockage
****
Angle	From	To
Zone 0 Azimuth:	0.000 deg	0.000 deg
Zone 0 Elevation:	0.000 deg	0.000 deg
Zone 1 Azimuth:	0.000 deg	0.000 deg
Zone 1 Elevation:	0.000 deg	0.000 deg
Zone 2 Azimuth:	0.000 deg	0.000 deg
Zone 2 Elevation:	0.000 deg	0.000 deg
Zone 3 Azimuth:	0.000 deg	0.000 deg
Zone 3 Elevation:	0.000 deg	0.000 deg

CCU's Information
****
Version: 4.4 1.1.2008
Work Time: 2 minutes 10 seconds
Communication Type: TCP/IP
Remote Address: 192.9.200.10
Hardware Interface Enable: YES

Compass Interface Setup
****
Input Enable: NO
COM Port Number: 1
Baudrate: 4800
Format: 8_NON_1

GPS Interface Setup

****

Output Enable: NO
COM Port Number: 1
Baudrate: 9600
Format: 8_NON_1
NMEA Device: GP
NMEA Sentence: GLL
Interval: 1.000

IRD Interface Setup
****

Interface Enable: YES
COM Port Number: 1

System Massage Log
****

Time	Type	ID	Text	Transition
17-Mar-08 16:21:10	Warning	003	GPS Communication Failed	Off/On
17-Mar-08 16:21:06	Message	114	GPS Pulse per Second	Off/On\Off
17-Mar-08 16:21:06	Warning	019	System not initialized	Off/On
17-Mar-08 16:20:56	----- CONTROLLER START -----			
03-Feb-08 16:05:44	Message	125	System Shut-Down, Ped-Z Encoder	On\Off
03-Feb-08 16:05:42	Message	125	System Shut-Down, Ped-Z Encoder	Off/On
29-Jan-08 19:47:33	Message	118	Satellite Recognition running..	Off/On\Off
29-Jan-08 19:47:18	Message	118	Satellite Recognition running..	Off/On\Off
29-Jan-08 19:47:04	Message	118	Satellite Recognition running..	Off/On\Off
29-Jan-08 19:46:50	Message	118	Satellite Recognition running..	Off/On\Off
29-Jan-08 19:46:36	Message	118	Satellite Recognition running..	Off/On\Off
29-Jan-08 19:46:22	Message	118	Satellite Recognition running..	Off/On\Off
29-Jan-08 19:45:58	Message	118	Satellite Recognition running..	Off/On\Off
29-Jan-08 19:45:45	Message	118	Satellite Recognition running..	Off/On\Off
29-Jan-08 19:45:30	Message	118	Satellite Recognition running..	Off/On\Off
29-Jan-08 19:45:16	Message	118	Satellite Recognition running..	Off/On\Off

****

Contact Detail (Manually)
****

* Vessel Name: _____

* Service Location: _____

* Contact Name (On Board): _____

* Contact Number: _____

* E-Mail Address: _____

* Other Notes:

_____

_____

_____

_____

****

Note: Please send this report via one of the following ways:

1) Via e-mail: support@orbit-ltd.co.il; support@orbitgv.com

2) Via fax: +972-9-8922826

6 Installation Overview

6.1 General

The Installation of the AL-7108 System consists of the following steps:

Step	Subject	Reference
1	Ship Survey & Installation Planning	Chapter 7
2	Preparing the Installation Site & Unpacking the System	Chapter 8
3	Installing the ADE	Chapter 9
4	Onboard installation procedures	Chapter 10
5	System setup and commissioning procedures	Chapter 11

This chapter presents an overview of the above five stages involved when installing the system. The main stages are illustrated in the following Figure.

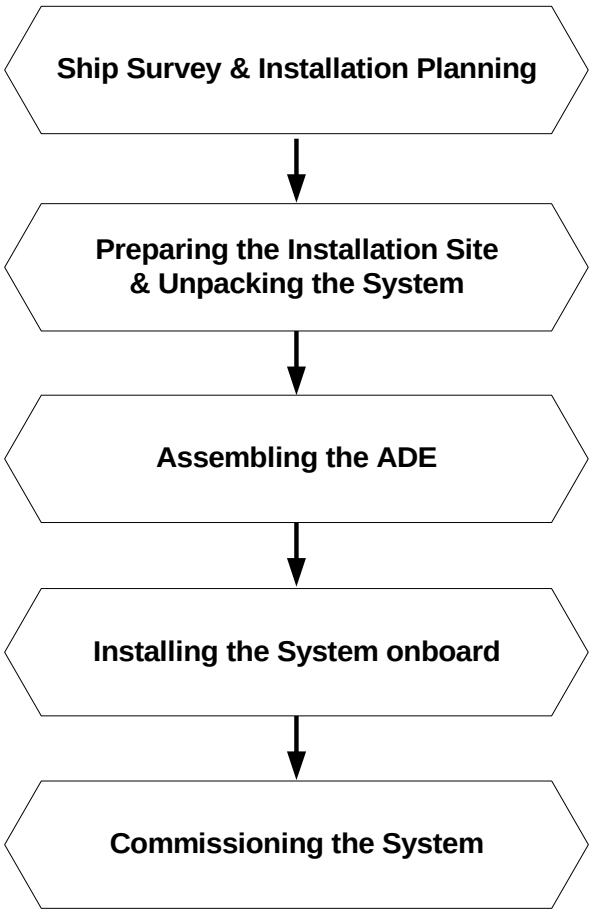


Figure 6-1: The Orbit system workflow

6.2 Ship Survey and Installation Planning

During the Ship Survey and Installation Planning, the following forms should be completed:

- Site Survey Report
- Pre-Installation Report

⇒ *Ship Survey*

A comprehensive survey of the ship on which the system is to be installed, must be made as an initial stage in the workflow.

The survey involves consideration for the following:

- The RADOME SUPPORT: This supports the complete RADOME ASSEMBLY.
- The ABOVE DECK EQUIPMENT (ADE): This comprises:
  - The BASE RING: Mounted on the RADOME SUPPORT, it supports the complete Radome Assembly.
  - The BASE PLATE: Secured (together with the RADOME FLOOR) to the BASE RING. It holds the PEDESTAL, the INERTIAL MEASUREMENT UNIT (IMU) and the SERVO DRIVER UNIT (SDU).
  - The PEDESTAL: Mounted on the BASE PLATE. It holds the POSITIONER and the SBC.
  - The POSITIONER: Mounted on the PEDESTAL. It comprises the DISH, FEED, X and Y AXIS MOTORS and GEARS, as well as the X and Y AXIS ENCODERS.
  - The DISH is mounted on the POSITIONER (via the DISH SUPPORT).
  - The FEED ASSEMBLY is mounted on the DISH.
  - The RADOME is actually mounted on the BASE RING, but in fact, once fully assembled, covers and protects the complete ADE.
- The Below DECK EQUIPMENT (BDE): This comprises the CENTRAL CONTROL UNIT (CCU). The CCU is a 19" rack-mounted 4U industrial PC and is usually located in the Radio Room or the TV Distribution Room.

⇒ *Installation Planning*

The Installation should be preplanned in such a way that the following information is available:

- Shoreside Assembly Site (dockside or hanger)
- Suitability, location and orientation of the RADOME SUPPORT
- Location and orientation of the ADE (directly related to that of the RADOME SUPPORT)
- Location of the BDE

6.3 Preparing the Installation Site & Unpacking the System

You have to prepare the site to facilitate an efficient installation.

Once the System has been delivered, you must follow the unpacking sequence as set out in this manual.

6.4 Assembling the ADE

The ADE assembly procedures (onboard or dockside,) should then be carried out, according to the type of system.

6.5 Installing the System Onboard

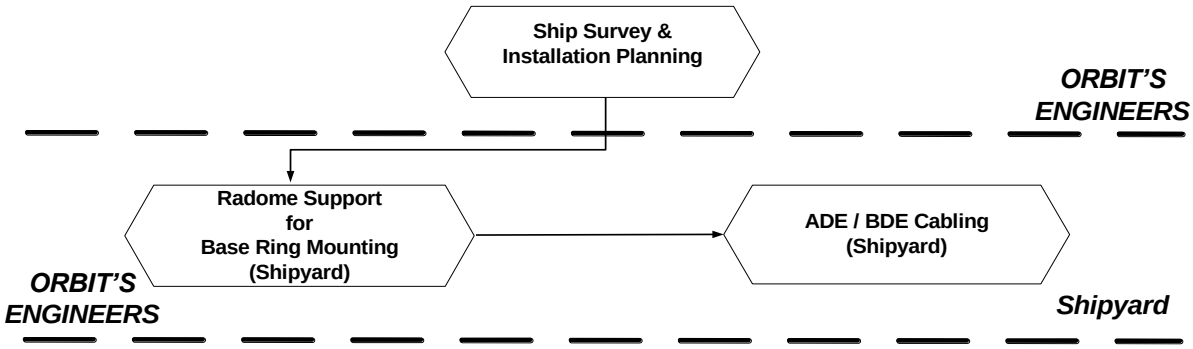
The assembled System is hoisted aboard, installed and connected to the BDE.

6.6 Commissioning the System

Once the System is safely installed onboard, you can then perform the setup and commissioning procedures.

The System Commissioning & Acceptance Test Form should then be completed.

7 Ship Survey & Installation Planning



The Ship Survey and Installation Planning go hand-in-hand, and comprise the first part of the installation process.

The survey provides the opportunity to familiarize yourself with the site and enables you to ensure that all the pre-installation tasks can and will be carried out properly. It also gives you an excellent opportunity to collect valuable information on the ship's facilities and the parameters that will affect installation planning and decisions.

This visit to the ship is best conducted with an authorized representative of the ship's personnel. The Installation Planning requires your checking that all the necessary considerations are taken into account and dealt with.

7.1 Ship Survey

During the visit to the ship, fill out a Site Survey Report, to allow accurate and efficient installation planning. This report, tailored to each system installation, should be detailed to the level that ensures no technical and/or design information is missed.

During the site survey, particular attention should be given to requirements for blockages, and the relation to other interfering equipment. In addition, attention should be given to available interfaces with the ship's systems, (power, gyro, etc.), other cables, intended locations for equipment placement, etc.

Attention should also be given to the location of both equipment groups associated with the system. It is also very important to ensure that the Radome Support (supplied by the shipyard,) is properly designed and mounted on the deck.

The outcome of the survey will determine the feasible system type and it's location on board. Special consideration should be given to weight, and obstructions to Line of Sight

7.2 Installation Planning

After the Ship Survey, the following tasks should be carried out:

- Make a final decision regarding a suitable system and its location.
- Familiarize yourself with the Installation Flow.
- Follow the Installation Plan.

7.2.1 Installation Planning

Installation planning is one of the most important stages in the installation. Correct planning will lead to a successful installation with minimum trouble before and throughout system operation.

Before installation, make sure that:

- You have visited the ship and familiarized yourself with the ship layout, or received a completed Survey Report.
- You have received existing ship's layout, as may be available:
  - Ship's construction plan
  - Ship's electric mains layout and UPS access (if available)
  - Ship's gyro compass interface type, wiring and availability.
- You identify the ship's power supply voltage and frequency, Gyro compass (standard and voltage), and Gyro repeater output (standard and voltage).

The ship's Gyro repeaters may convert the original signals accepted from the compass. Therefore, verify that a known and appropriate signal is supplied to the system.

Using the data you have gathered for the Survey Report, you can now prepare the installation plan, which should include equipment locations, installation details, cable runs, etc.

The two considerations that have now to be taken into account are the ADE and BDE location.

The following paragraphs describe the planning and selecting of the installation sites for the equipment.

Locating the ADE

Special consideration must be given to the selection of the installation location for the ADE, as follows:

The Radome Support

The RADOME SUPPORT is supplied by the client and has to conform with certain minimum requirements, as follows:

- Location with no (or at most, minimum) vibration and signal obstruction.
- Rigid construction and mounting.
- When bolting the Support to the System, full use off *all* the mounting holes in the system interface (BASE RING).
- Full support of the System—both peripheral and at its center.
- The SUPPORT has to be welded or bolted to the BASE RING both around its periphery and at its center.

If the Radome is raised above the deck and a ladder is designed as part of the support, you should pay attention to the Pedestal orientation. Please note that the Pedestal has a grip handle in one side, and the ladder should be located on the same side as the handle, to facilitate climbing into the radome.

The RADOME SUPPORT is the interface between the deck and the System.

If you have to elevate the RADOME, it can be mounted on an optional structure, supporting the RADOME with all the ADE units installed in it.

Although it is advisable to use the above-recommended support, any other construction that supports the weight of the system and fits the BASE RING dimensions, can be used. The following Figure illustrates a typical support design.

Figure7-1: Typical Support

Mechanical Stability

The System's mechanical stability has two aims; to support its weight as well as the Antenna's dynamics. The mounting surface intended for the ADE has to be rigid, flat, and free of vibration. It also has to be a level and stable surface. The mounting surface should be capable of supporting the total equipment weight, details of which can be found in Chapter 8.

- The Radome Support should be designed so that it supports the center of the Radome Base. This forced support under the center of the Radome is designed to decrease vibrations at the system's center of gravity that lies directly above this point.
- The System's instability can cause damage to the motors and gears.

In addition, the mounting surface should be able to withstand lateral wind loading forces, and should be stable with a natural resonance frequency of above 30 Hz.

Radome Dimensions

For details of the RADOME'S dimension, please refer to Chapter 2.

Maintenance Access

Consideration should be given to allow unhindered access to the RADOME HATCHES below the SUPPORT, thus giving sufficient maintenance access for technical staff, their tools and spare parts.

RADOME HATCHES can be located on the RADOME'S side, its base, or on both.

Line Of Sight (LOS)

The LOS is a straight line between the ANTENNA and the satellite. Obstructions to the LOS will typically be the ship's funnels and masts.

Ideally, the optimum ADE site will have no obstructions to the LOS; i.e., it will have a clear view of the horizon/satellite all around. However, it is normal that a compromise will have to be made between the LOS and other considerations.

- It is recommend that you install the system with the X-axis pointing toward, and aligned with, the bow of the vessel. For optimal operation, the system should be installed with the X-axis pointed toward the ship's heading. The X-axis direction is marked on the IMU, located on the mounting plate.
- The Base Ring must also be orientated according to the decision taken during the ship survey.
- The mounting holes in the Base Ring will only align with those of the Radome Support in the originally planned orientation. Once this orientation has been chosen, it cannot be changed.

Distance between ADE and BDE

The system is supplied with a fiber-optic or an Ethernet interface cable, connecting between the SBC and the CCU. The length of the cable depends on the cable-run distance between the SBC and the CCU, as measured during the site survey.

The system supports the following SBC-CCU cables length:

- Fiber optic cables – up to 2,000m (6,500 feet). Note that every connector/adaptor along the cables path introduces a 2-db loss.
- LAN Ethernet via CAT 5 cables - up to 150m (500 feet).

The type of required interface should be clearly marked on the system order.

Other Location Considerations

The mounting location should be located as far away as possible and on a different plane from high-power radar systems or other radiating devices.

The AL-7108 system withstands the IEC 60945 standard. The installer should plan the installation so that there is no disturbing radiation that exceeds this standard condition. In case of difficulty to calculate the right conditions, it is recommended, as a rule of thumb, to keep a distance of 10 meters and 10 degrees from main lobe of any radar. Refer to IEC 60945, section 10.4 (Immunity to radiated radiofrequencies [all equipment categories except submerged]).

The location selected for installation should have a maximum non-blocked hemispheric view down to 10° visibility.

The distance between the Gyro repeater and the ADE should be considered, when choosing the correct interface type and cable.

Power Supply Considerations

It is highly recommended that power supplies to both the ADE and BDE are connected to an appropriately rated UPS.

All equipment must be properly grounded.

Locating the BDE

The rack-mounted CCU operation is largely automatic, but it is preferable to monitor it periodically. It should therefore be located to facilitate easy access by the operator.

In addition, consideration should be given to empty space around the equipment, so as to allow sufficient maintenance access for technical staff to the rear panel, where cables are connected to the equipment. The REAR PANEL should have a clearance of at least 1ft to allow heat dissipation.

7.2.2 Radome Support for Base Ring Mounting

The preparation for attaching Orbit's BASE RING to the RADOME SUPPORT and the installation of the ADE / BDE cables and wiring, is the responsibility of the shipyard. From then on, Orbit's technicians or an authorized dealer, are responsible for the work.

7.2.3 ADE / BDE Cabling

The following table describes the recommended types of cabling that should be used (if required), as well as their maximum lengths. Cables with equivalent specifications can be used.

When routing cables, special attention should be given to the bend radii, the bulkhead penetration method, and proximity to interference sources.

Qty	Qty and Function	Type	Max. Length	Notes
1	Power	3x2.5mmx10A		
1	Gyro NEMEA-0183 Step-by-Step Syncro (option)	 Twisted pair, shielded, digital communication cable – minimum #22 Shielded, 4-core, each rated for at least 100VDC/2A minimum #22 3-phase leads – should be separated from the 2 reference voltage leads. minimum #20.		The maximum length may vary, depending on the Gyro make and model.
2	F/O -or-	**Multi-mode:** 62.5µm core/125µm, with ST connectors. **Single-mode** with ST connectors.or Multi Mode	2,000m 2,000m	Providing there are no interconnections
1	Ethernet	CAT 5	150m.	Providing there are no interconnections
2	L-Band RF	RG-6 or RG-11 coaxial cable.		Depending on cable length and quality. If more than 10dB loss is measured, a line amplifier should be used to compensate.

- The core cross section is according to the cable length—voltage drop is ≤10%.
- All cables are shielded/copper wire mesh.
- All cables indicated with spare cores.

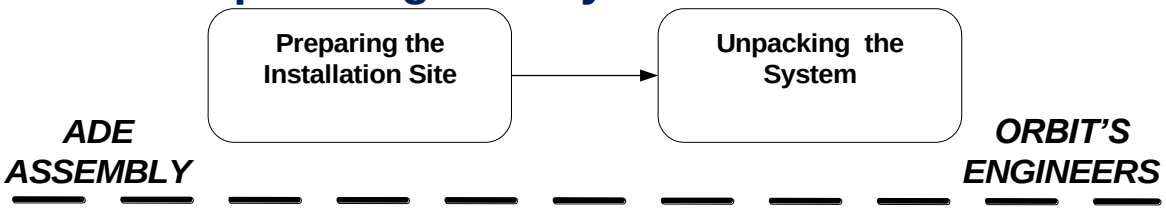
7.2.4 Pre-Installation Checklist

Before sending the installation crew to the site, several installation site details and status require to be addressed and finally verified by the client.

Therefore, the client should fill out a Pre-Installation Checklist.

The checklist assures that the installation site and client-supplied equipment are available and ready for arrival of the installation team.

8 Preparing the Installation Site & Unpacking the System



This chapter describes the site preparation and initial unpacking procedures. Further detailed procedures are described where applicable in the System Installation chapter.

8.1 Preparing the Installation Site

- **To prepare the installation site:**

1. Prepare an installation site of at least 30 sq. m., (320 sq ft.,) with a firm, clean, level surface and clear of any obstacles. The surface must be capable of taking the full weight of the assembled system, including the RF equipment (estimated up to 1380kg/3036lb).
2. Before starting the installation, prepare four or more strong stands with a minimum height of 60 cm (24 in). This will allow sufficient clearance underneath the MOUNTING RING for you to drill holes through to the RADOME BASE.

   The stands will support the weight (estimated up to 1380 kg/3036 lb) of the whole system once it is assembled.

   Ensure that they don't obstruct the holes in the BASE RING's flange.
3. Arrange the stands so that they form a circle approximately matching the circumference of the BASE RING.
4. Verify that the stands are located in a way that allows free access to the two hatches from underneath.

8.2 Unpacking the System

The System is usually packed in two wooden crates, the BASE RING and DISH are packed in one crate and the PEDESTAL and all electronic units and components are packed in a second crate.

The RADOME is supplied in two separate crates.

The shipping crate's contents may have shifted during transportation.

As soon as you open the crate, you must check for evidence of damage and immediately report it to the shipper and Orbit Marine.

For unpacking purposes, you will need access both from the front and back of the crate.

For the sake of good order, only unpack the crate's contents when you are asked to do so.

8.3 Shipping Crates - Packing List

System Crate #1

Dimensions: L 1500 x W 1000 x H 1040 (mm)

Weight: 400 kg.

Contents:

- PEDESTAL (BASE RISER), with the following attached:
  - SINGLE BOARD COMPUTER (SBC) AL-7108-SBC
  - IMU AL-7203-IMU-NT3
  - SERVO DRIVE UNIT AL-7100-SDU-MK2
  - PSU AL-7108-PSU (For 20W configuration only)
  - 20W/40W BUC (For 20W/40W configuration only)
- POSITIONER AL-7108-1-MK2
- AL-7108-CCU
- COUNTERWEIGHTS.
- INSTALLATION KIT (in a carton, comprising nuts, bolts, washers etc.)

System Crate #2

Dimensions: L 3200 x W 2050 x H 1840 (mm)

Weight: 600 kg.

Contents:

- 2.4M ANT.C-BAND CIRC.7108-SYS4 Assy, with LNB
- BASE RING FOR RADOME 4.5M/4.35M
- DISH SUPPORT.

Radome Crates #1 and #2

Dimensions (each): L 3890x W 1800x H 1850 (mm)

Weight (each): 600 kg.

- Before you start to open a crate and take out its contents, you must carefully check for any apparent external damage.
  If Shock and Tilt Watches have been attached to the crate, check that they have not been broken.
- Throughout the unpacking process, you must check all components for shipping damage, and immediately report any such damage to the shippers and support@orbit-ltd.co.il, as units damaged in shipping are not covered under Warranty terms and conditions.
- Throughout the unpacking process, verify that the crate's contents correspond to the relevant Packing List.
- You should make careful note of all component serial numbers (located on their respective nameplates) as the service and support department will request these numbers when you contact them.
- Any damage or missing items should be reported to support@orbit-ltd.co.il

Figure 8-1. System Shipping Crate #1

Figure 8-2. System Shipping Crate #2

9 Installing the ADE

You should carry out the installation of the System at a convenient, covered location, close to the ship.

Components should be unpacked from the shipping crate as and when they are required. Some components or other items will have already been unpacked (see the previous chapter).

Once the installation is completed, the System (including the RADOME,) should be hoisted onto the RADOME SUPPORT on the ship and secured to it.

9.1 Assembling the AL-7108 Base Ring

➢ **To Unpack the Base Ring:**

As shown in the following Figure, the BASE RING is packed under the DISH ASSEMBLY. These items must be removed first.

Figure 9-1: The Opened Shipping Crate

1. Remove the four wooden DISH RETAINERS.

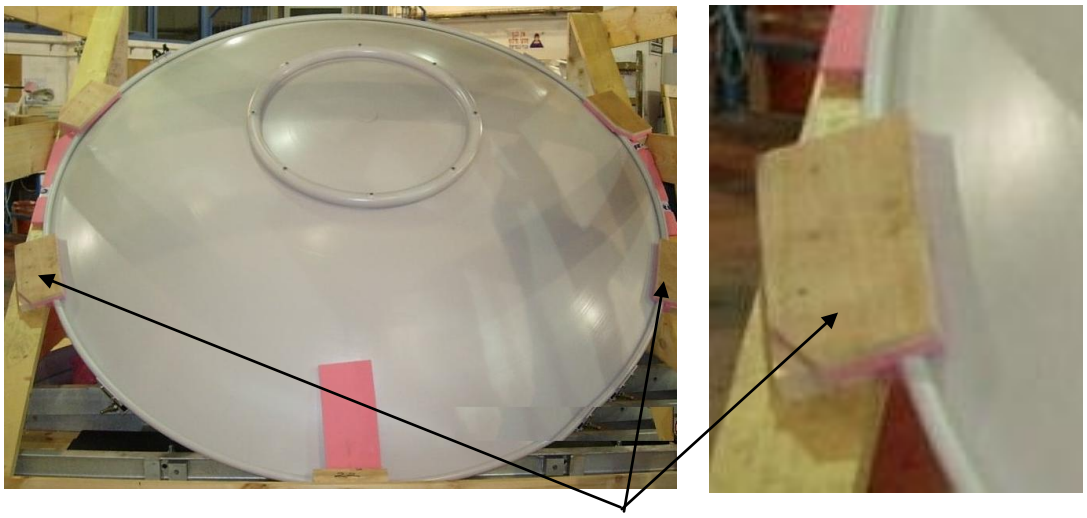


Figure 9-2: Dish Retainers

2. Carefully remove the DISH ASSEMBLY and place it on a clean flat surface, where it won't be accidentally damaged.
3. Remove the BASE RING from the crate.

Extreme care should be taken that the Dish Assembly is located in a safe place and that nobody can accidentally touch it or damage it in any way.

➢ **To assemble the Base Ring:**

The BASE RING for the AL-7108 (P/N 21-0277) is supplied in two halves and must be assembled before proceeding to the next section (using the seven nuts, bolts and washers provided).

1. Remove all securing materials from the BASE RING and, using lifting straps, lift it from the crate.
2. Place the two parts of the BASE RING on a flat surface and with their flanges underneath, so that their straight edges are touching.
3. Prepare the seven (or five) bolts and washers supplied in the INSTALLATION KIT and marked KIT B. RING AL-7X0X.
4. Apply locking compound (LocTite) to the bolts and together with the nuts and washers provided, join the two parts firmly together, as illustrated below.

Where you have to use LocTite to secure certain bolts, you should use either LocTite #270 or #241.

Figure 9-3: Assembling the Base Ring

9.2 Attaching the Radome Base to the Base Ring

The RADOME comprises a three-section base, eight LOWER SECTION PANELS and eight UPPER SECTION PANELS.

The RADOME BASE, *with the glossy side facing down,* has to be perfectly aligned with the BASE RING, so that at the next stage, the BASE PLATE and PEDESTAL can all be assembled together with the eight BASE PLATE bolts provided.

➢ **To align the Radome Base with the Base Ring:**

1. Lower the BASE RING onto the stands, with the flange facing up.

   Ensure that the stands do not obstruct any of the holes on the BASE RING'S flange.

2. Place the sections of the RADOME BASE on the BASE RING so that they exactly cover the ring and the two HATCHES are aligned with the spaces on the ring.

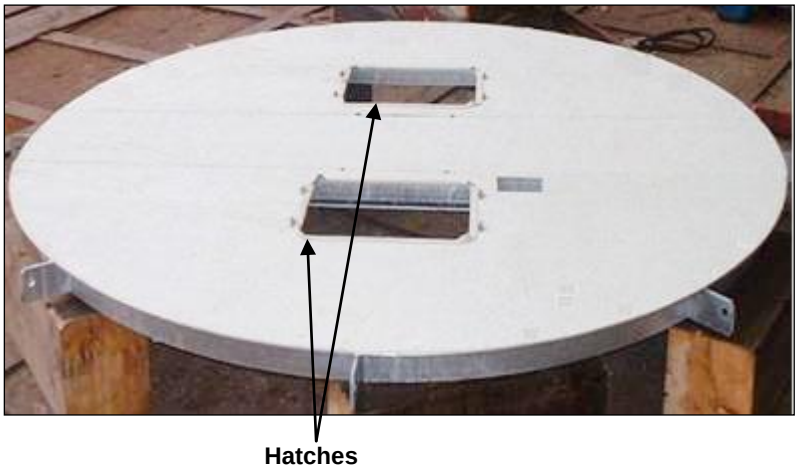


Figure 9-4: The Radome Base with eight Pedestal Base Plate Mounting Holes

From *underneath* the BASE RING, pass a marker pen through each of the eight PEDESTAL BASE PLATE MOUNTING HOLES and mark their location on the underside of the RADOME BASE.

Using a hole saw (whose diameter is larger than the MOUNTING HOLES), drill the eight marked holes in the RADOME BASE.

The eight Mounting Holes in the Base Ring are threaded, so you must take care not to damage them in any way.

Slightly move each semi-circular section of the RADOME BASE away from the center and using a marker pen, mark the location of the eight PEDESTAL BASE PLATE MOUNTING HOLES on the topside of the RADOME BASE.

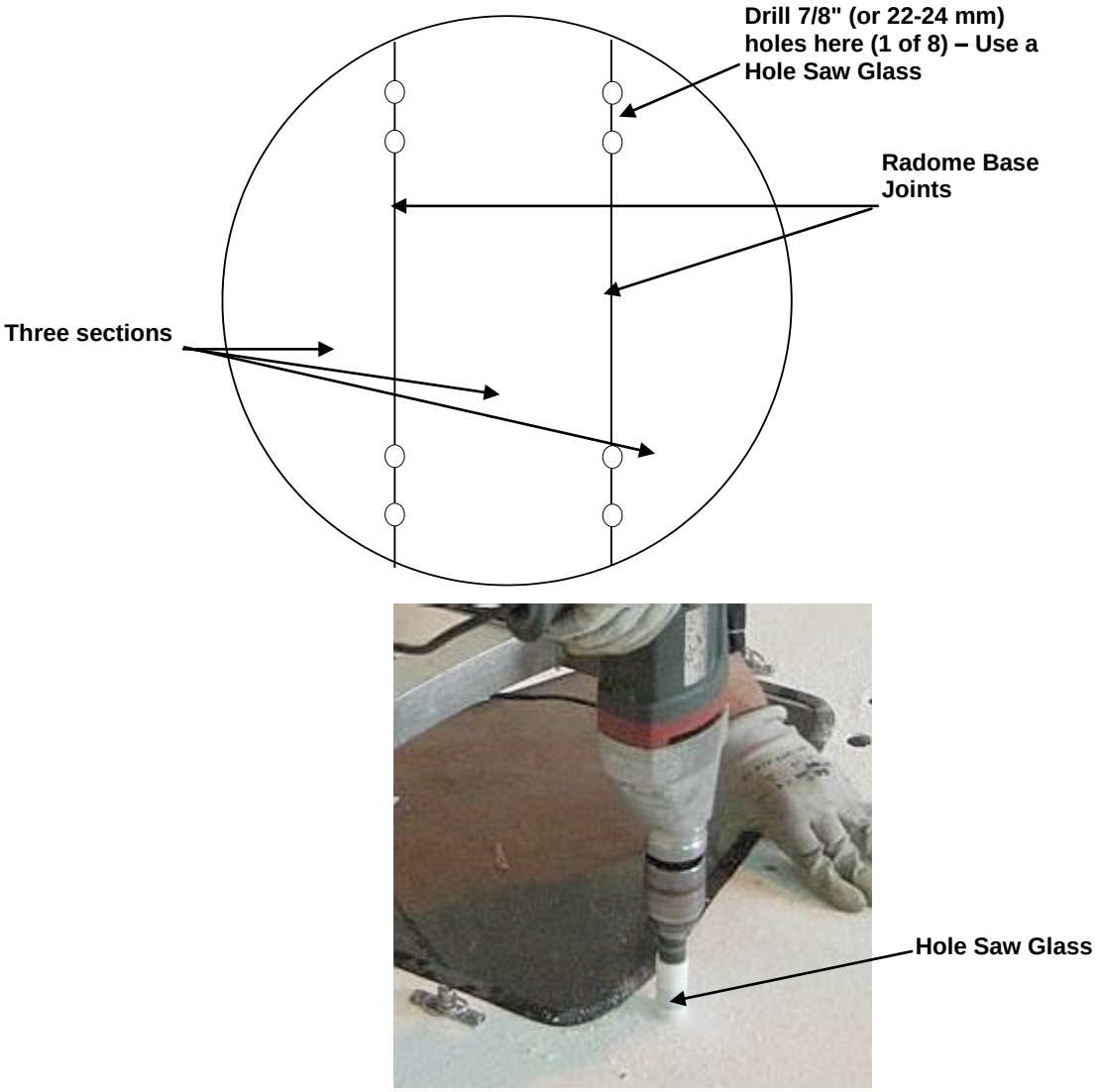
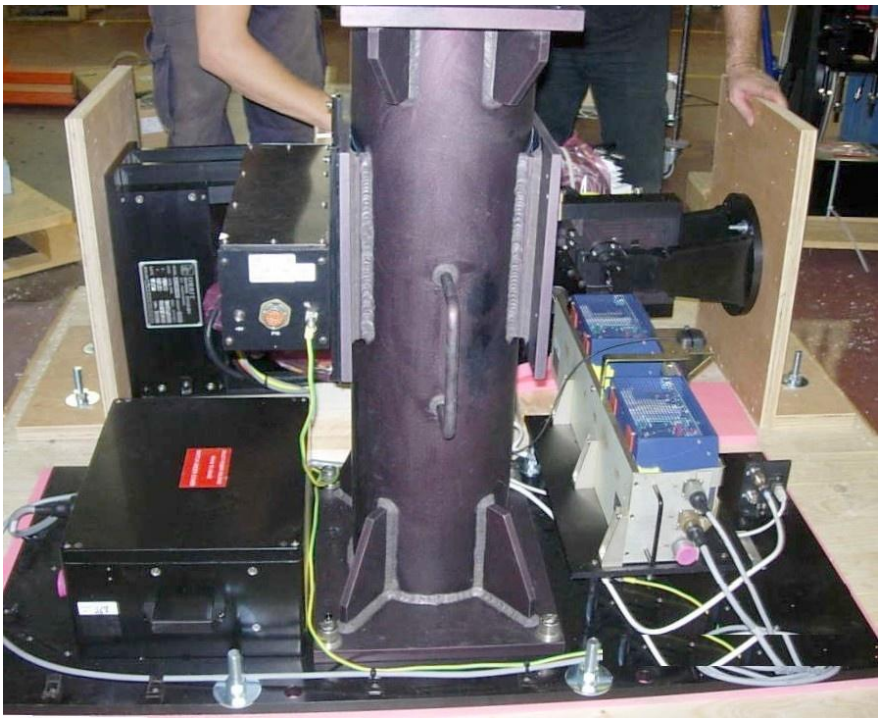


Figure 9-5: Radome Base (3-section) – Eight Pedestal Base Mounting Holes

9.3 Lifting and Attaching the Pedestal to the Radome Base (Base Ring)

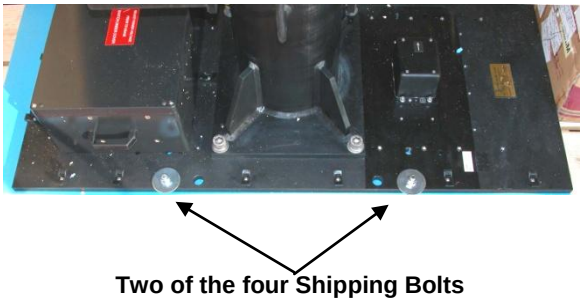
➢ **To install the PEDESTAL on the RADOME BASE:**

The PEDESTAL is lifted from the crate and then lowered onto the BASE RING.



1. Two pairs of shipping bolts are located on opposite sides of the PEDESTAL's BASE PLATE, as illustrated below.

   Remove the four shipping bolts securing the PEDESTAL to the base of the crate.



Two of the four Shipping Bolts

2. Carefully unpack the PEDESTAL from the shipping crate by removing any tie wraps, and nylon sheeting.
3. Using lifting equipment with lifting straps, and avoiding damage to the cables, carefully remove the PEDESTAL from the crate.
4. Check the BASE PLATE for signs of damage and if necessary notify support@orbit-ltd.co.il.

Great care must be taken when lifting the PEDESTAL from the shipping crate, not to cause any damage to the encoders.

5. Lift the PEDESTAL carefully and slowly lower it onto the RADOME BASE, positioning it so that the arrow located on the IMU is pointing to the designated location of the ship's bow, as illustrated below.

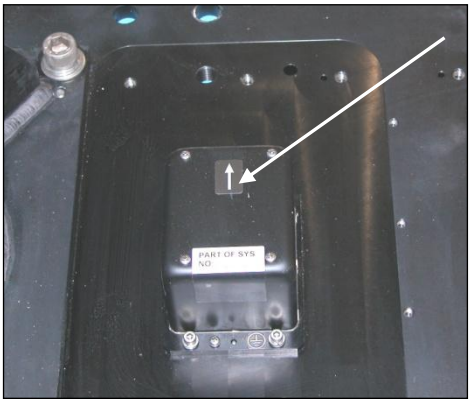
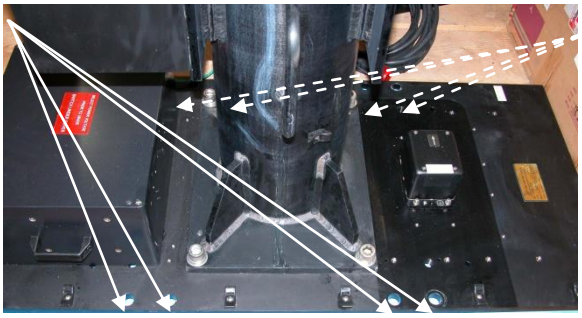


Figure 9-6: IMU Location Arrow

6. The PEDESTAL's BASE PLATE has eight mounting holes. Check that these align with those of the RADOME BASE..

Four rear Mounting Holes



Four front Mounting Holes (not all visible)

Figure 9-7: Base Plate Mounting Holes

7. Apply locking compound (LocTite) to the bolts and using a washer provided, attach the BASE PLATE to the RADOME BASE and BASE RING, from the top.
8. Remove all the lifting brackets and lifting straps after lifting is complete and PEDESTAL is secured.

9.4 Attaching the Positioner to the Pedestal

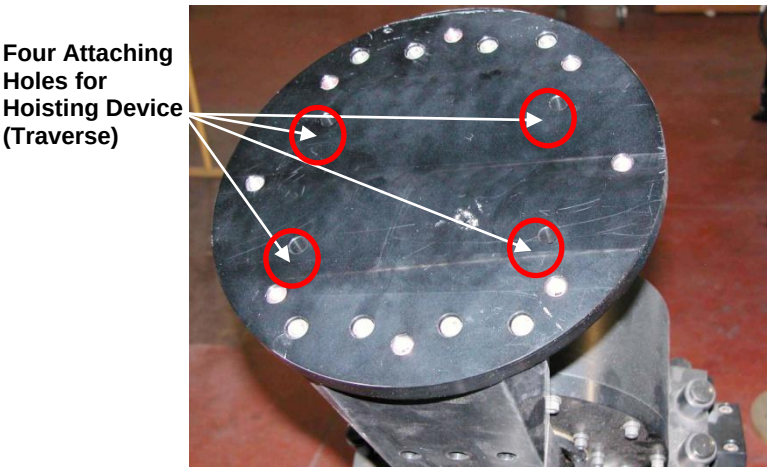
The POSITIONER is lifted from the crate and then lowered onto the PEDESTAL. There are two methods of lifting the Positioner:

- By using the HOISTING DEVICE
- By using lifting strap.

9.4.1 Lifting the Positioner using the Hoisting Device

The HOISTING DEVICE (Part #20-0731-4/1) comprises two components:

- Part #20-0728: TRAVERSE OF HOISTING DEVICE (comprising two parts) for attaching to the PEDESTAL's UPPER MOUNTING PLATE, as illustrated below.



- Part #20-0729: TOP PLATE of HOISTING DEVICE (comprising two parts) for attaching to the PEDESTAL's SIDE ARM, as illustrated below.

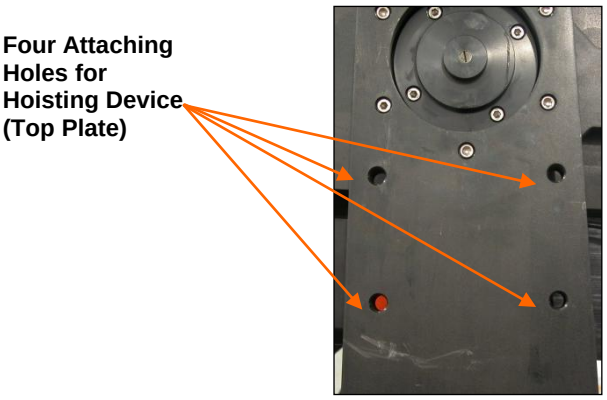


Figure 9-8: Lifting the Positioner using the Hoisting Device

9.4.2 Lifting the Positioner using the Lifting Strap

The lifting straps must be passed between the side arms of the POSITIONER's UPPER MOUNTING PLATE. The following figures illustrate the recommended lifting method. The arrows represent the path of the lifting straps.

➢ **To install the Positioner on the PEDESTAL:**

1. The POSITIONER is secured to the shipping crate, as illustrated below.

2. Remove all the screws from the holding bracket that secures the PETITIONER'S UPPER MOUNTING PLATE to the shipping crate, stand the POSITIONER on its MOUNTING PLATE and remove the holding bracket from the UPPER MOUNTING PLATE, as illustrated below.

3. Remove all wrapping materials from the POSITIONER.
4. Stand the POSITIONER upright on the crate.
5. **When using lifting strap**: pass it between the SIDE ARMS of the UPPER MOUNTING PLATE. Go to step #6.

   When using the HOISTING DEVICE: mount the HOISTING DEVICE's two TOP PLATES on the POSITIONER's SIDE ARMS, using bolts 1/2-13unc (supplied) as shown in as the LOWER BRACKET in the Figure.

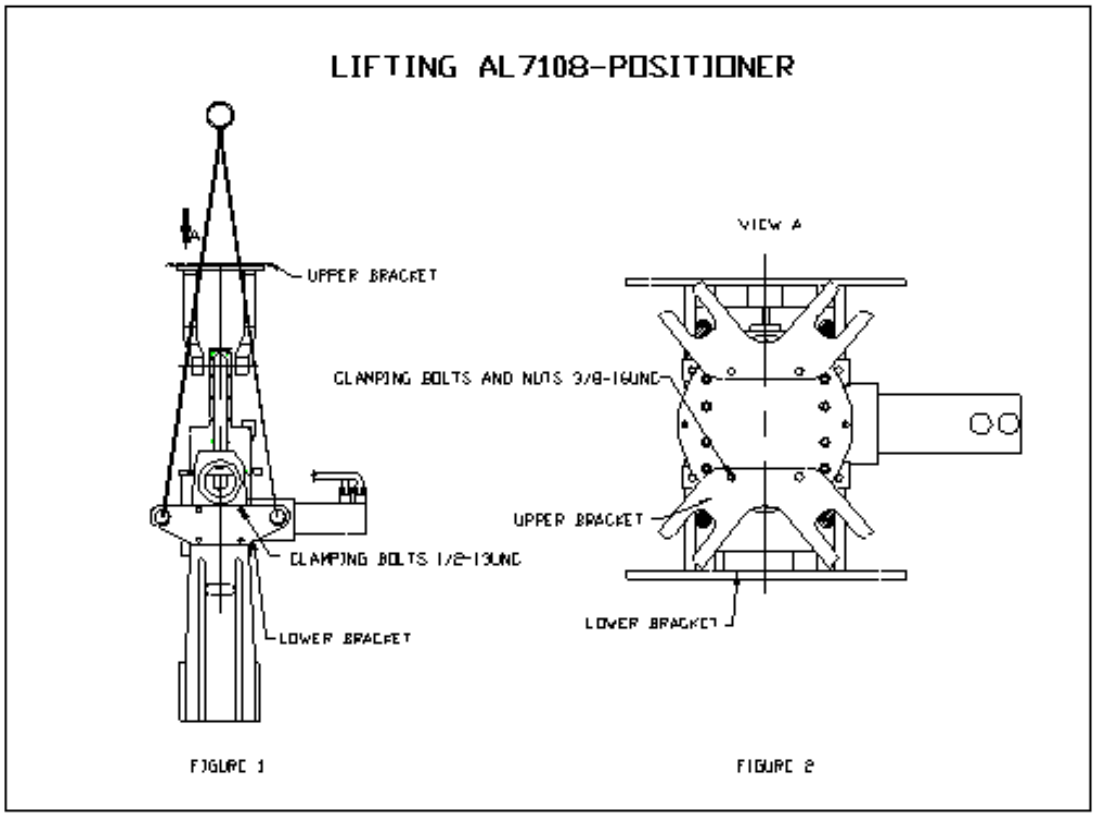


Figure 9-9: Lifting the Positioner

6. Mount the HOISTING DEVICE's two TRAVERSE PLATES on the POSITIONER's UPPER MOUNTING PLATE, using bolts 1/2-13unc (supplied) as shown in as the UPPER BRACKET in the Figure.
7. Attach lifting slings to the four eyes in the lower brackets and make sure that the slings passed through the guide-forks in the upper brackets.
8. Lift the POSITIONER carefully and slowly lower it onto the PEDESTAL, positioning it so that its MOUNTING PLATE engages the two locating pins on the top of the PEDESTAL's MOUNTING PLATE.

   The locating pin configuration is directional, so there is only one orientation in which you can place the POSITIONER's MOUNTING PLATE.

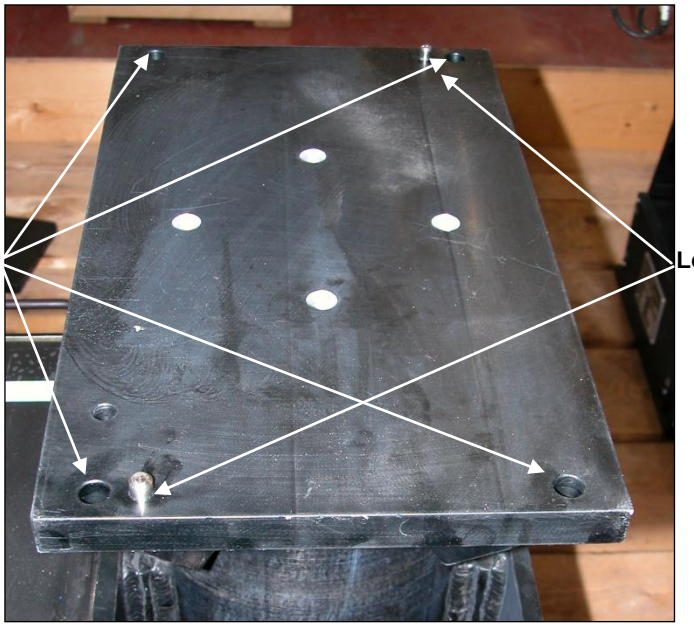


Figure 9-10: Pedestal's Upper Mounting Plate, Mounting Holes and Locating Pins

Depending on the system model, the Locating Pins may be configured differently.

9. Apply locking compound (LocTite) to the four bolts and using the washers provided, fasten the POSITIONER to the PEDESTAL, *from underneath*.
10. Remove all the lifting brackets and lifting straps after lifting is complete and POSITIONER is secured.

When lifting the Positioner, do not touch or apply pressure on the y-axis encoder protection cover, and do not pull its harness.

9.5 Building and Placing the Lower Radome Section on the Radome Base

Although the Radome panels are not heavy, care should be taking when lifting them since they act as sails during windy conditions. It is recommended that at least two people handle them during installation.

The LOWER RADOME SECTION comprises eight panels. The panels have to be attached together, using the self-adhesive seal, nuts, bolts and silicone. After which, the complete section is mounted onto the RADOME BASE.

If ordered, one of the RADOME panels can be supplied with a HATCH that facilitates access to the RADOME once it is completely closed.

The HATCH'S location should have already have been determined during the site survey and agreed with the client.

Verify that the Hatch is correctly oriented to the System, taking into consideration its location on the ship.

It is very important that the Radome panels are securely attached to each other and that the joints are absolutely watertight.

Make sure that where instructed, you place the silicone at the correct angle. This will help ensure that any water that might penetrate the joints will be directed to the outer surface of the Radome.

➢ **To attach the Lower Radome Section Panels together:**

Assemble the Radome panels in the order marked on the panels by the manufacturer.

1. Ensure that the edges of each panel are clean and dry.
2. Stick self-adhesive seal along the entire length of the channel that is located along one flange of a panel, as illustrated below.

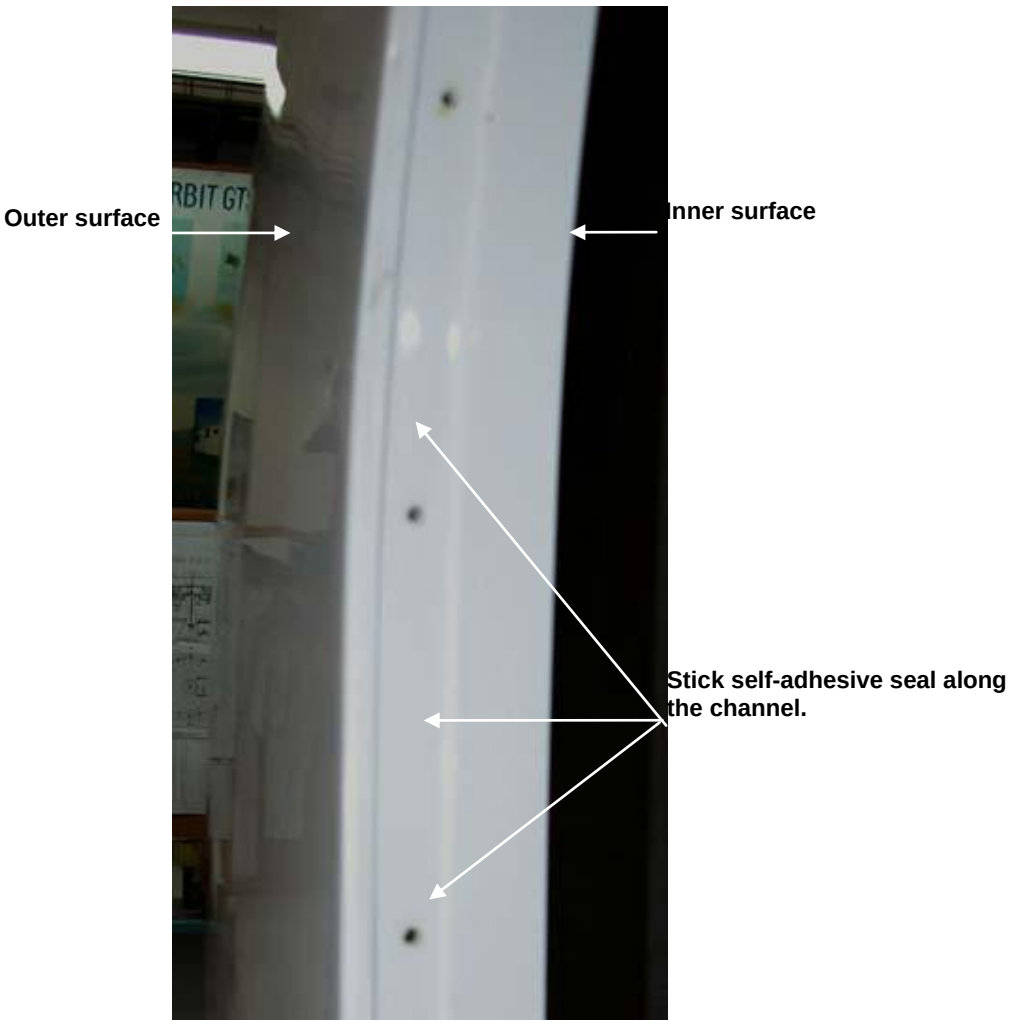


Figure 9-11: Radome panel flange channel

3. Place a continuous layer of silicone on the seal, along the inside edge of the channel and, angled strips at intervals, above each hole, as illustrated below:

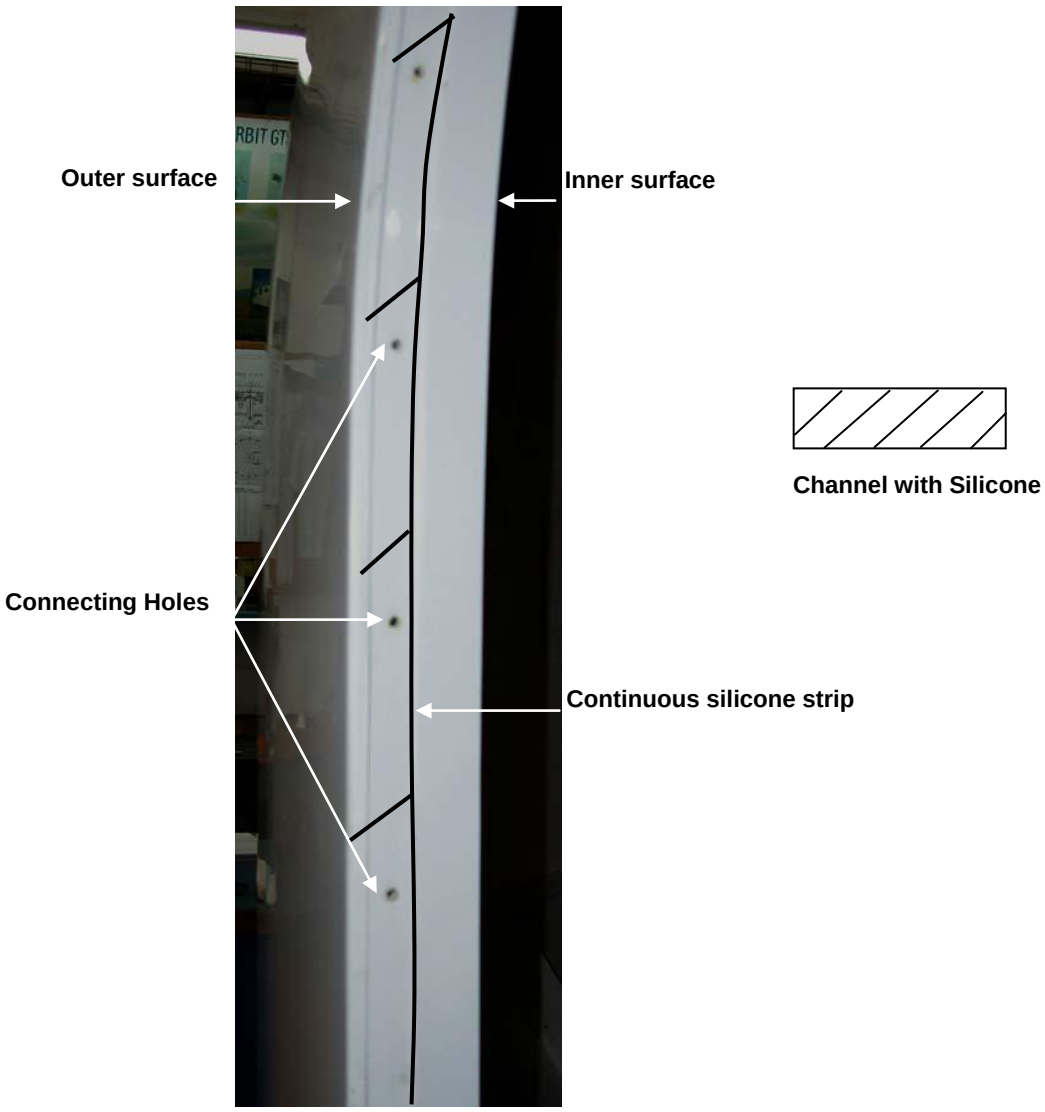


Figure 9-12: Radome panel with silicone applied on the seal

4. Press the next panel's *flat* side against the strip, ensuring the panels are exactly aligned with each other.
5. Pass a thin screwdriver through the holes in the flange, to pierce the sealing strip.
6. Using the 10mm nuts, bolts and washers supplied with the RADOME, firmly secure the panels together, down the entire length of the panel's flange starting with the lowest bolt, then the second bolt from the top of the panel, and then the remainder. If necessary, you can use a thin screwdriver to align the panels.

- All the bolts used to join the Panels should be facing the same way – either clockwise or counter-clockwise.
- Ensure that you have not left any empty holes.

- **To attach the Lower Radome Section to the Radome Base and Base Ring:**

  1. Using the L brackets (to be ordered separately) approximately 1 third of the way up the inner flange, attach lifting straps to the Lower Radome section and lift it using a crane.
  2. Carefully locate and align the lower section with the RADOME BASE, ensuring that the HATCH is positioned as required.

Ensure that the panels' joints are not located exactly above any hole on the Base Ring Flange, so that when you drill through the Ring, the joint does not obstruct the process.

  3. Slightly lift the section allowing you to spread silicone sealant along the upper circumference of the RADOME BASE, and lower the LOWER SECTION again.
  4. Remove the lifting straps and brackets.

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9.6 Securing the Lower Radome Section to the Radome Base (Base Ring)

1. Make sure that the Lower Radome Section is exactly aligned to the RADOME BASE and that the PEDESTAL is in the center of the assembly, by measuring from the PEDESTAL MOUNTING PLATE to the LOWER RADOME SECTION.
2. From underneath the BASE RING'S flange, **at only four places**, drill upward through a hole in the flange (with a drill bit having the same or smaller diameter than the hole), and into the two RADOME layers—BASE and LOWER SECTION.

Base Ring Mounting Hole for the Radome Base

Figure 9-13: Base Ring Mounting Holes

3. Clean the area around the hole.
4. Using a bolt and washer provided, fasten the LOWER RADOME SECTION and the RADOME BASE to the BASE RING, from *underneath,* through a hole in the BASE RING.
5. Ensure that the LOWER RADOME SECTION and the RADOME BASE are aligned with the BASE RING and repeat the previous step at a location directly opposite, i.e., on the other side of the Radome Base.
6. Measure again, to ensure that the system is in the exact center of the lower section of the RADOME.
7. From underneath the BASE RING'S flange, **at the remaining three places**, drill upward through a hole in the flange (with a drill bit having the same or smaller diameter than the hole), and into the two RADOME layers—BASE and LOWER SECTION.
8. Finally, by going from one hole to the next, secure the whole structure.
9. Make a clear mark on the outside panel, exactly opposite the arrow that is located on the IMU, so that the arrow on the IMU points to the mark.
10. This will be used when locating the complete ADE System on the RADOME SUPPORT.
11. One of the *lower* panels also contains the HATCH.
12. To close the HATCH, pass it through the opening, align it and locate it in the seal of the aperture, by pulling it toward you. It is secured to the panel with screws.
13. To open the HATCH, unscrew all the screws and push it out of the aperture.

Figure 9-14: Hatch viewed from the inside

Figure 9-15: Hatch viewed from the outside

9.7 Installing the Circular Dish Support on the Positioner

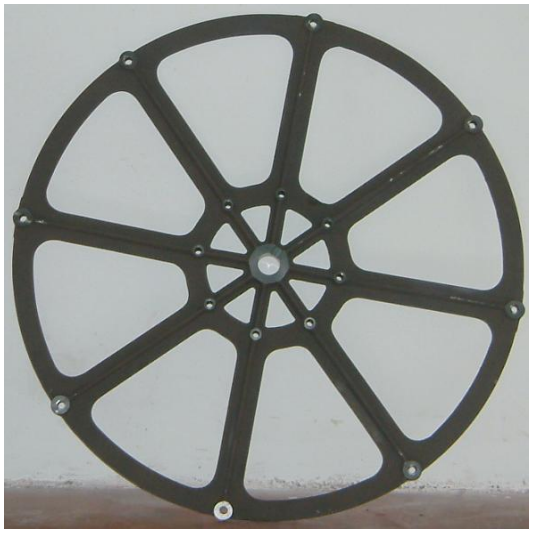


Figure 9-16: Circular Dish Support

➢ **To assemble the Circular Dish Support:**

1. Ensure the POSITIONER's UPPER MOUNTING PLATE is in the horizontal position (parallel with the floor).
2. Take the CIRCULAR DISH SUPPORT with the arrow on one of its arms aligned with that *under* the MOUNTING PLATE, align the eight SUPPORT MOUNTING HOLES with those on the POSITIONER.

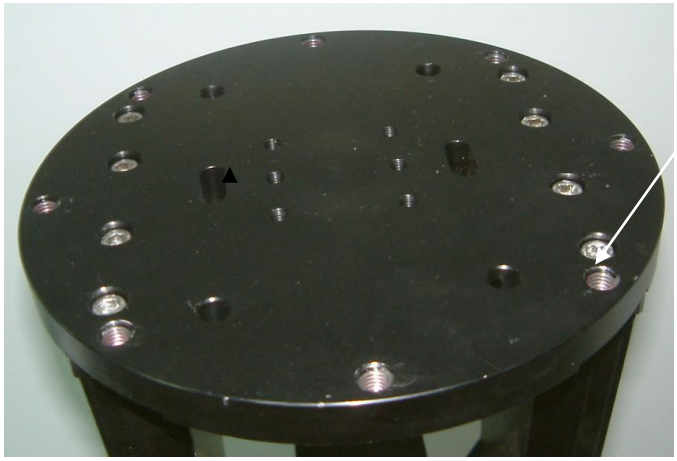


Figure 9-17: Positioner's Upper Mounting Plate – Circular Dish Support (8 holes)

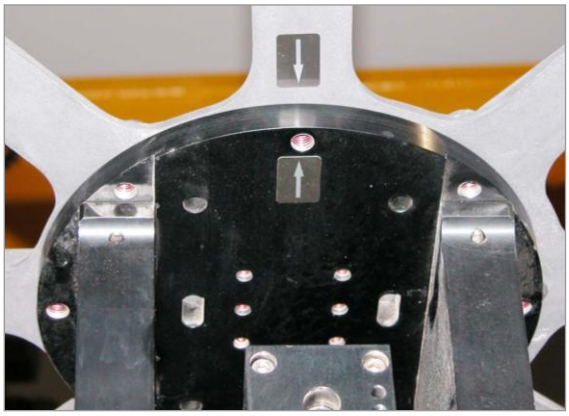


Figure 9-18: Antenna Support Alignment Arrows

Circular Dish Support Mounting Points (8)

Figure 9-19: Circular Dish Support Mounting Points

3. Apply locking compound (LocTite) to the eight bolts and using the flat and spring washers provided, fasten the DISH SUPPORT to the POSITIONER's UPPER MOUNTING PLATE, from the top.

9.8 Attaching the Dish and the Feed

Attaching an AL-7108 Dish to a Circular Support

➢ **To attach the Dish to a Circular Support:**

1. Ensure the DISH SUPPORT is at the zenith point.
2. Align a) the arrow on the back of the DISH with that on one of the SUPPORT'S arms and b) the eight holes in the rear of the DISH with those on the SUPPORT.
3. Apply locking compound (LocTite) to the eight bolts and using the flat and spring washers provided, together with the *thin* spacers provided, fasten the DISH to the DISH SUPPORT, in the following order:

   DISH >DISH SUPPORT > flat washer > spring washer > bolt.

The Feed

The System is supplied with a Tx/Rx C-Band Circular FEED and Quad-Pod Feed Support installed on the antenna dish.

The feed is supplies in either RHCP or LHCP configuration. To verify or tp change the configuration, refer to Appendix A of this Manual.

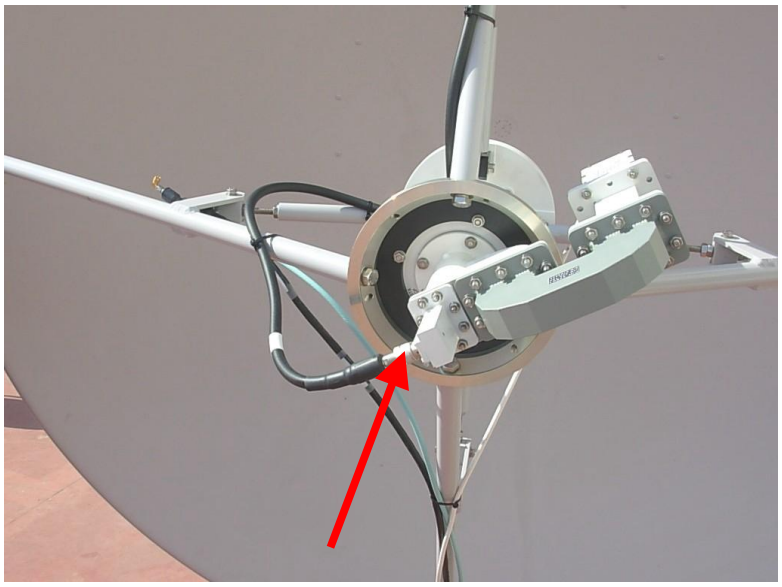


Figure 9-20: Circular Feed and Support

The following figure depicts the feed structure.

Figure 9-21: Circular Feed

9.9 Attaching the Weights

As a counterbalance, a number of WEIGHTS have to be attached to the back of the POSITIONER.

When the system is supplied, the DISH is set at 0°/0°. The weights should be attached once the POSITIONER is attached to the PEDESTAL and the DISH is rotated to the required angle.

The following table gives the necessary weight combination for the system:

Weight - Kgs	Quantity
21	1*
21	1
19.5	3
17.5	2

*These weights contain twelve threaded holes.

Some of the weights have a slot cut into them, so that when you attach them to the POSITIONER, they do not touch the Y-AXIS MOTOR.

You must load the heaviest weights first and the lightest, last. You must also take care to load first, those weights with two holes on each side of the slot. These holes are for the brackets of the optional SSPA.

➢ **To attach the Weights to the Positioner:**

1. Rotate the DISH to 100° on its X-Axes.
2. Release the WEIGHTS from the shipping crate base.
3. Remove the end bolts and washers from each of the four WEIGHT HOLDERS.
4. Load the two heaviest WEIGHTS into position.

   The WEIGHT's slot is to accommodate the Y-AXIS MOTOR.

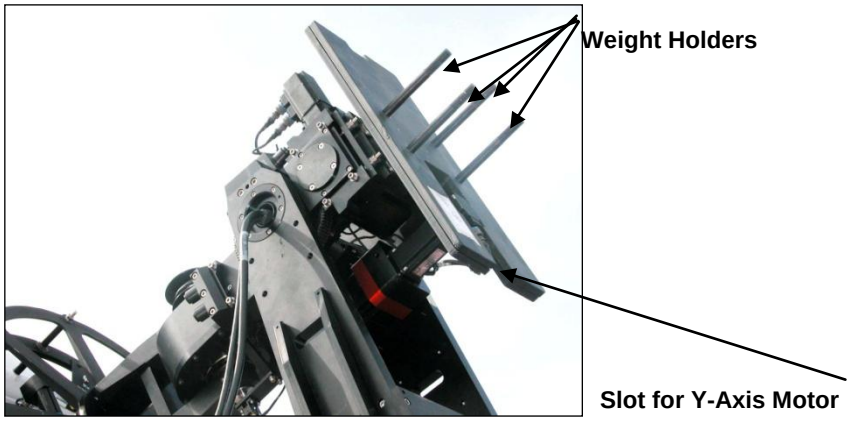


Figure 9-22: Positioner with the first two weights installed

The first two weights contain twelve threaded holes. These holes are used when mounting the optional TRANSMITTER.

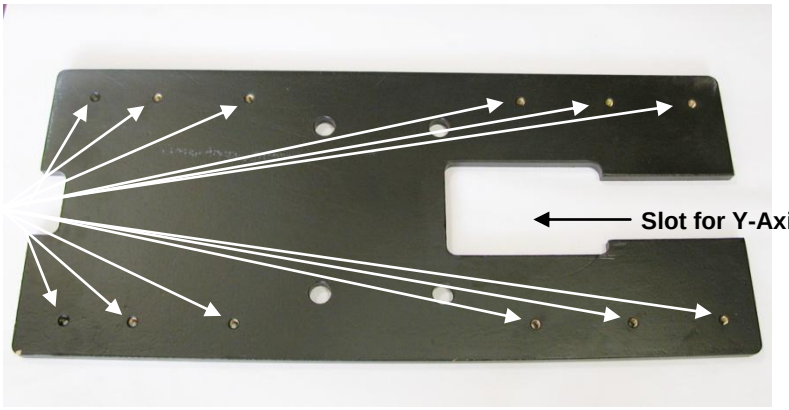


Figure 9-23: Weight with slot and twelve threaded holes

5. Load the remainder of the WEIGHTS – the medium ones first and then the lightest ones.
6. When you have attached all the required WEIGHTS, secure them with the nuts and washers.

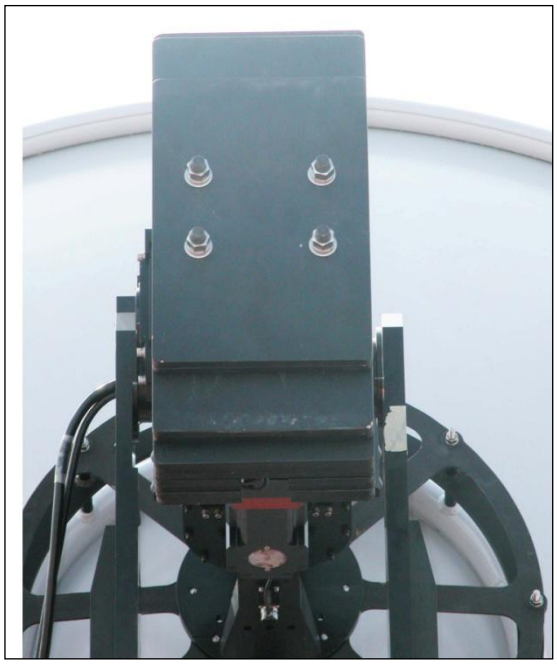


Figure 9-24: Positioner with all the weights installed

Figure 9-25: General View of the Positioner with weights correctly attached

9.10 Installing the Air Conditioner / Heat Exchanger

Where applicable, due to heat dissipation consideration, Tx/Rx systems should be provided with an air conditioning/heat exchanger unit. The unit, provided by the customer, is installed inside the RADOME, and secured with bolts to the RADOME FLOOR.

The unit is fed by the ADE electrical supply via a separated outlet, and it is connected to the ship's water supply system using two flexible pipes: cold water supply pipe is connected to the unit's inlet, and a return pipe is connected to the outlet.

When installing an air conditioning or heat exchanger unit, you must remember to ensure there is sufficient clearance for the Dish to rotate freely.

9.11 Installing the Upper Radome Section

It is strongly recommended to perform the assembly on a flat surface free of obstacles.

Although the Radome panels are not heavy, extra care should be taking when lifting them since they act as sails during windy conditions. It is recommended that at least two people handle them during installation.

It is very important that the Radome panels are securely attached to each other and that the joints are watertight.

Make sure that where instructed, you place the silicone at the correct angle. This will help ensure that any water that might penetrate the joints will be directed to the outer surface of the Radome.

9.11.1 Installation Considerations

You have to decide when to assemble and install the UPPER RADOME. You can either do it after attaching the POSITIONER to the PEDESTAL, or at the end of the entire installation process, i.e., after mounting the DISH, attaching the weights and connecting all the wiring. This is a question of preference.

The DISH must be placed within the radome before the top is installed.

The process of attaching the UPPER PANELS together is similar to that of attaching the LOWER PANELS.

The UPPER RADOME SECTION comprises eight panels. The panels have to be attached together, using self-adhesive seal, nuts and bolts.

In order to lift the UPPER RADOME SECTION onto the UPPER RADOME SECTION, you have to attach four bolts to the panels and then attach the lifting harness to the bolts. This procedure ensures that the RADOME SECTION is kept rigid during the lifting operation.

Assembling the Upper Radome Panels

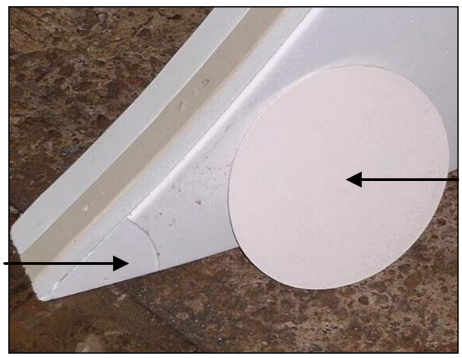
➢ **To assemble the Upper Radome Section Panels:**

Assemble the Radome panels in the order marked on the panels by the manufacturer.

1. Stick self-adhesive seal along the entire length of the channel that is located along one flange of a panel.
2. Place a continuous layer of silicone on the seal, along the inside edge of the channel and, angles strips at intervals.
3. Press the next panel's *flat* side against the strip, ensuring the panels are exactly aligned with each other.
4. Pass a thin screwdriver through the holes in the flange, to pierce the sealing strip, and using the nuts, bolts and washers supplied with the RADOME, firmly secure the panels together, down the entire length of the panel's flange.

- All the nuts used to join the Panels should be facing the same way as those in the lower section – either clockwise or counter-clockwise, where possible.
- Ensure that you have not left any empty holes.

5. Repeat steps 1 – 4, until all the panels are attached together.
6. Apply a large amount of silicone to the top joint of the UPPER SECTION and place the TOP CAP in the CAP INDENT, as illustrated below.



7. Apply more silicone around the circumference of the cap and hold it in place with a weight until the silicone dries.

Attaching the Upper Radome Section to the Lower Section

➢ **To attach the Upper Radome Section to the Lower Section:**

1. Attach four bolts to each alternate panel joint, along the lower surface of the UPPER RADOME SECTION, with the bolts facing down.
2. Attach lifting straps to the four bolts, making sure to insert the bolts downward.
3. Stick sealing tape along the entire length of the circumference channel of the LOWER RADOME SECTION (over the holes).
4. Pass a thin screwdriver through the holes in the channel, to pierce the sealing strip.
5. Apply a layer of silicone between the sealing strip and the inner circumference of the LOWER RADOME SECTION, and over the panel joints.

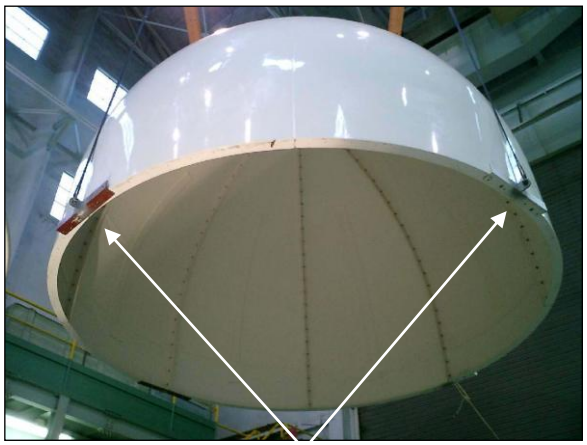


Figure 9-26: Lowering the Radome Upper Section onto the Lower Section

6. Carefully locate and align the UPPER SECTION with the LOWER SECTION, and allow the bolts to go through the holes on the circumference of the LOWER SECTION (to help the alignment).

   You should also use a thin screwdriver to assist the alignment.
7. Using the bolts and washers supplied with the RADOME, attach the Upper RADOME SECTION to the LOWER SECTION, through the empty holes, with the bolts facing downward.

   You are recommended to start bolting the sections together by inserting the bolts, one opposite the other.
8. Remove the four 'lifting bolts, together with the lifting straps.
9. Using the bolts and washers supplied with the RADOME, complete the attaching of the UPPER RADOME SECTION to the LOWER SECTION, through the empty holes, with the bolts facing downward, as illustrated below.

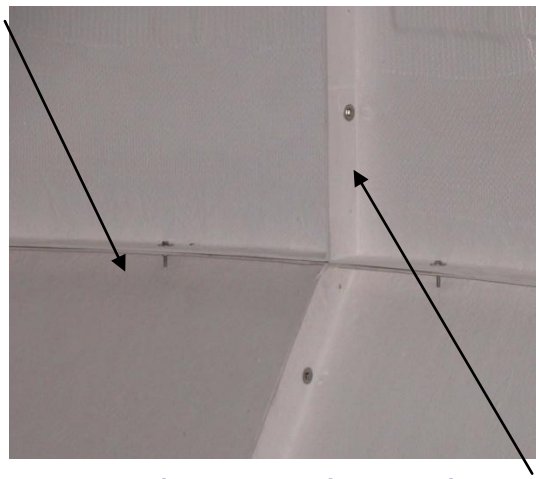


Figure 9-27: Radome Panel – Internal Joins

Water Test

➢ **To check that the Radome is watertight:**

1. Allow the silicone to dry for 24 hours and then spray it with water from a low-pressure hose.
2. From the inside, check that there are no leaks.

   If you discover a leak, repair it both from inside and outside the RADOME.

The following Figure illustrates a partly assembled RADOME.

Figure 9-28: A Partly Assembled Radome

The following Figure illustrates a fully assembled RADOME.

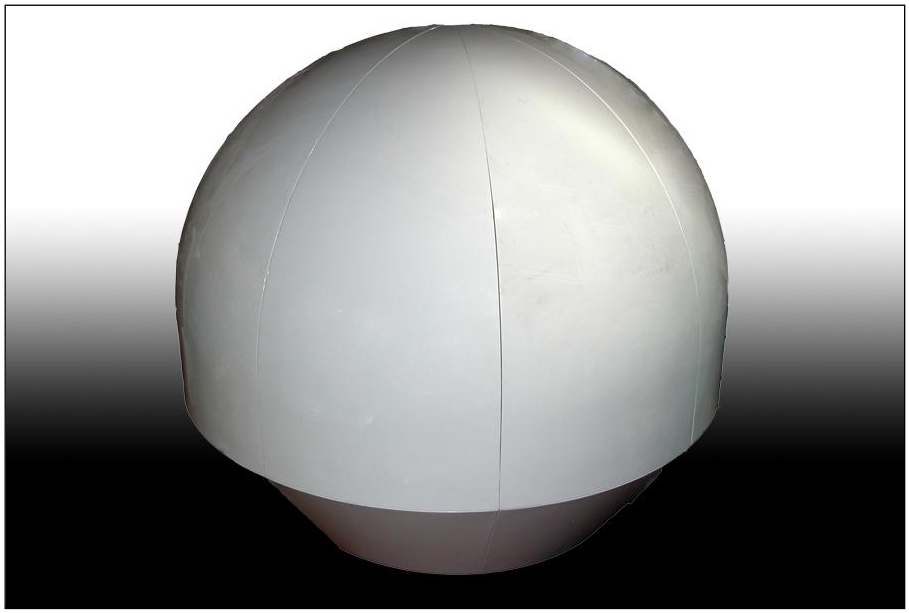


Figure 9-29: Fully Assembled Radome

9.12 Lifting and Mounting the ADE System on the ship

The ADE System has now to be lifted from the installation site and lowered onto the RADOME SUPPORT that has been prepared by the shipyard.

You must only use the optional LIFTING HARNESS (P/N 21-0039). The LIFTING HARNESS has to be attached to the LIFTING POINTS located around the BASE RING. Each LIFTING POINT protrudes from underneath the RADOME.

The LIFTING HARNESS comprises four straps, with each strap splitting into two, exactly at the join between the upper and lower sections of the RADOME. Each strap terminates with a loop. A U-bolt is used to secure the strap to the LIFTING POINT.

The four upper straps have to be located exactly over panel joints, in order to absorb the System's weight—otherwise, the straps can cause damage to the panels.

9.12.1 Lifting the ADE System using a 4—8 strap Lifting Harness

The 4—8 strap Lifting Harness (P/N 21-0039) is Optional

The following figure illustrates the harnessing method, where the straps split into two at the RADOME section joint,

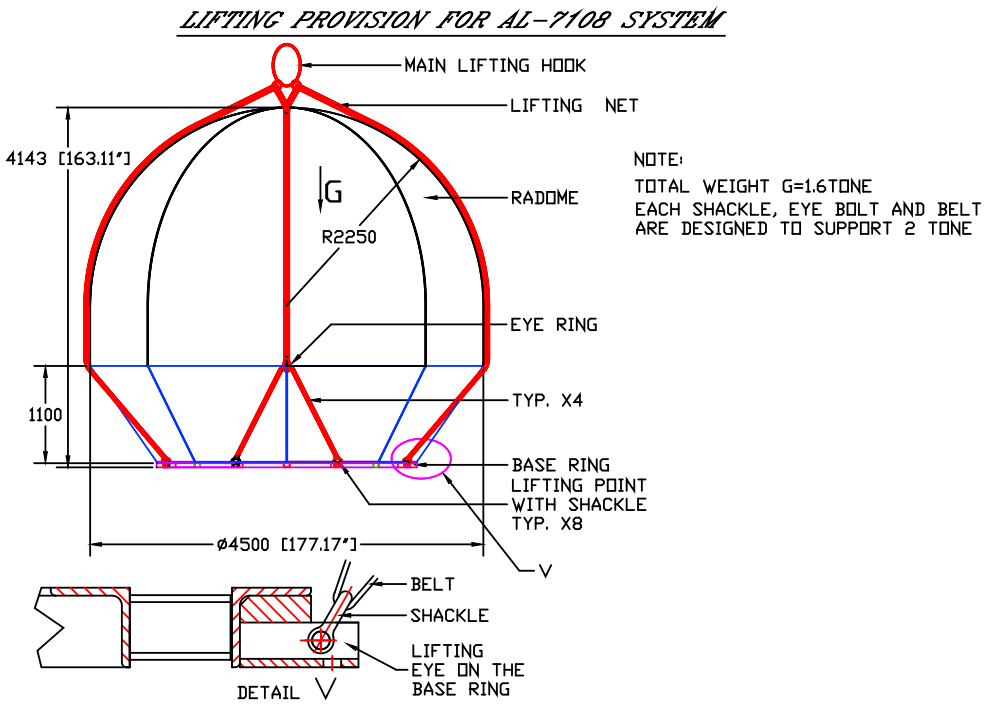


Figure 9-30: Securing the Lifting Harness to the Radome

The following figure shows the correct method of lifting the fully assembled RADOME, with the 4—8-strap lifting straps split into two.

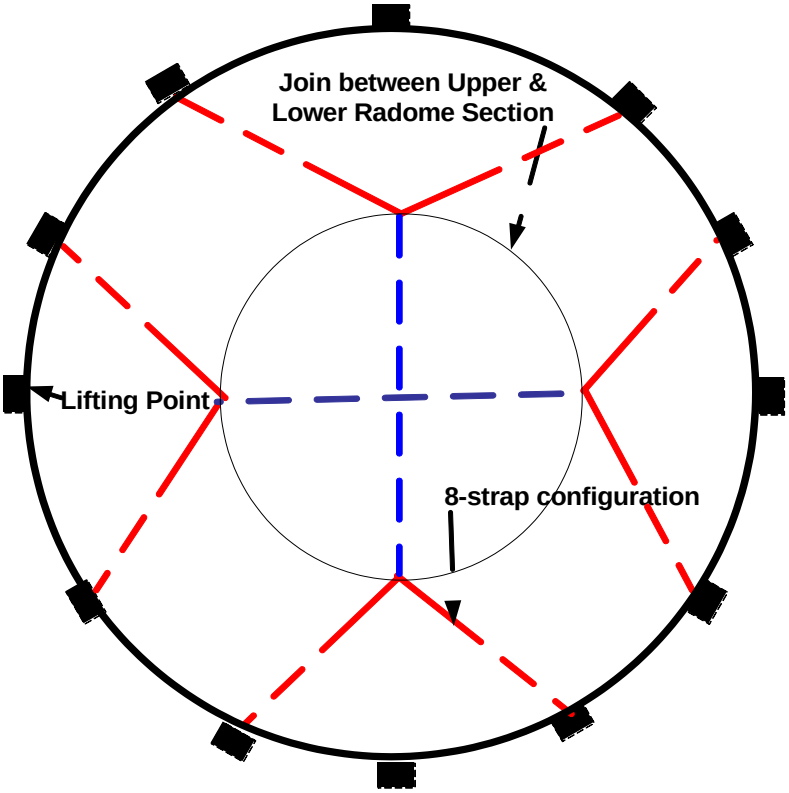


Figure 9-31: Securing the Lifting Harness to the Radome

➢ **To lift the ADE System onto the Radome Support:**

1. Attach the HARNESS' MAIN LIFTING HOOK to the lifting device.
2. Attach either the four or eight lifting straps to the LIFTING POINTS as follows:

a. Attach the strap to the shackle and pass the pin through the shackle and only one of the holes in the LIFTING POINT.

b. Secure the shackle pin.

Figure 9-32:Lifting Point

3. Repeat the previous steps for the remaining straps.
4. Carefully lift the ADE System and bring it to the ship's side.

5. Carefully lower the System onto the onboard RADOME SUPPORT, ensuring that the mark (which indicates the direction of the IMU arrow,) is facing precisely to the direction of the ship's bow.
6. Release the shackle pins and remove the LIFTING STRAPS.
7. Secure the System to the RADOME SUPPORT, using the BASE RING TO VESSEL KIT, as described in below.

9.12.2 Mounting the ADE on board

You should have already made a mark on the outside surface of the Radome, indicaton the orientation of the IMU.

When lowering the ADE, this mark should face the direction of the ship's bow.

The ADE has to be secured to the RADOME SUPPORT in a total of 20 places—twelve around its circumference and 8 underneath it.

➢ **To mount the ADE on the Radome Support:**

1. Using the 12 of the nuts, bolts and washers provided, secure the BASE RING to the RADOME SUPPORT, from the top (mark with the letter 'S').
2. As shown in the Figure, you will find that the holes marked *either* 'A' *or* 'B' underneath the BASE RING align with those on the RADOME SUPPORT. These holes are threaded.

   Using the remaining 8 bolts, secure the underneath of the BASE RING to the RADOME SUPPORT, using either the holes marked 'A' *or* 'B' in the above figure.

For a detailed drawing of the system's mechanical interface with the Radome Support, conatct the Orbit sales department.

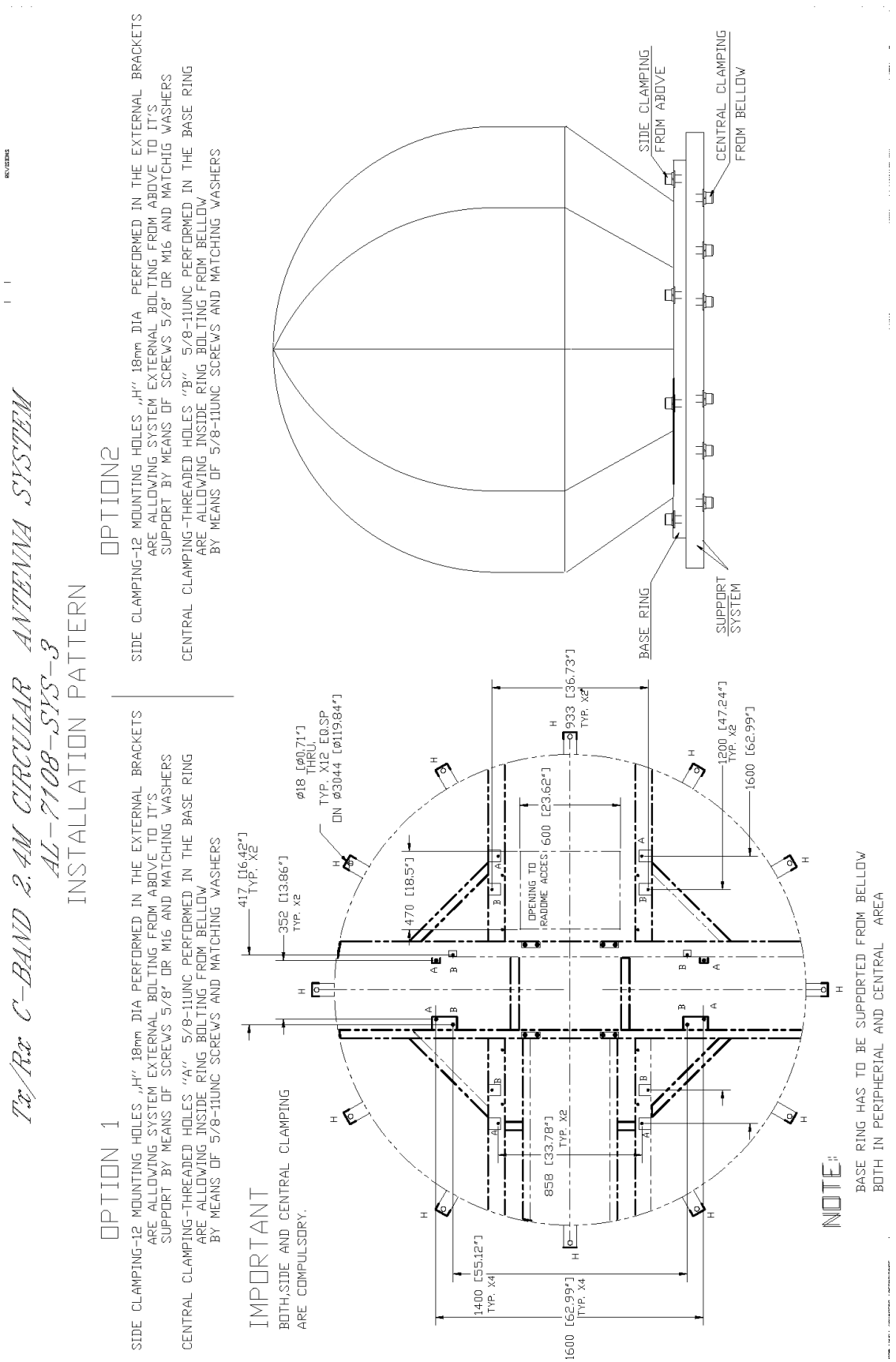


Figure 9-33:The Base Ring interface with the Radome Support

10 Onboard Installation

10.1 Introduction

The On-Ship Installation phase includes the following procedures:

- BDE Installation
- System Cables Connection

10.2 BDE Installation

The BDE units (CCU, Modem, etc.) are typically installed on dedicated 19-inch racks, located in the ship's equipment room(s).

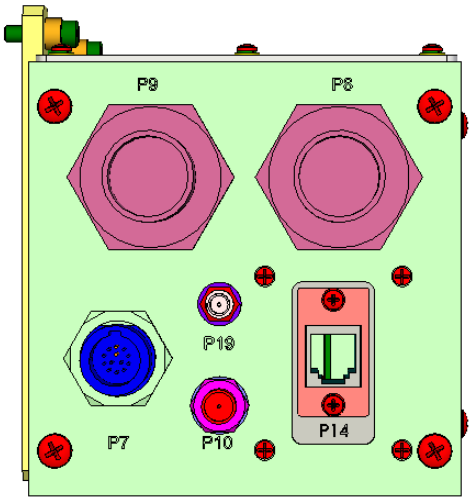
The following figure depicts typical BDE rack installation.

Figure 10-1: Typical BDE Rack Installation

10.3 Connecting System Cables (SBC/CCU Configuration)

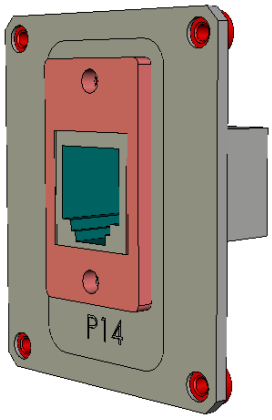
10.3.1 SBC Connectors

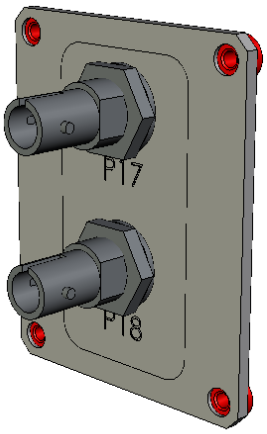
The SBC interfaces with the system via the following front-panel connectors:



P7	IMU
P8	SDU
P9	Pedestal
P10	IF
P14	LAN
P19	GPS

Figure 10-2: SBC front view

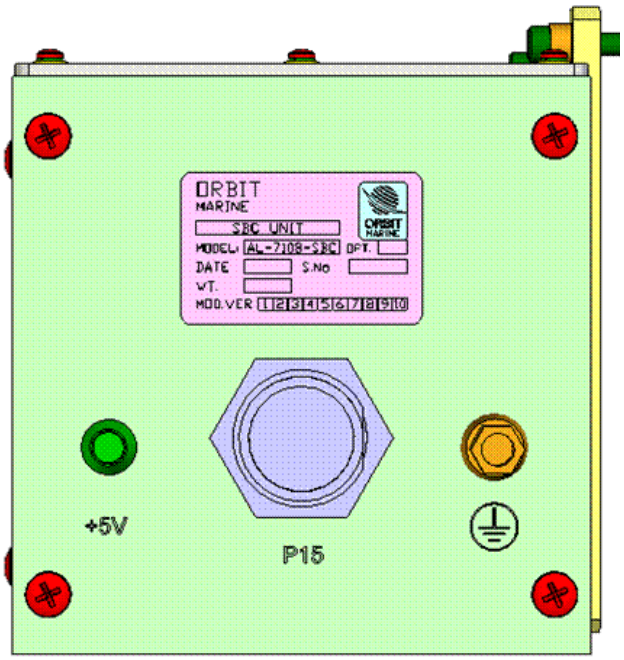




P14	LAN

P17	F/O Tx
P18	F/O Rx

Figure 10-3: SBC interface options



P15	Compass
GND	Ground Stud
+5V	LED

Figure 10-4: SBC rear view

10.3.2 SDU Connectors

The AL-7100-SDU-MK2 Servo Driver Unit is an outdoor, EMI/RFI protected, compact sized box.

The SDU accepts 115/230V, 50/60 Hz mains power and provides power to the ADE.

The SDU contains several fuses, mains voltage selector, Interlock Enable jumper, and two brake-release jumpers (for the pedestal's X- and Y-axis motors).

The SDU is factory-set to 220VAC input voltage. If the system's supply voltage is 110VAC, the input voltage rating should be set accordingly.

Front-Panel Connectors, Controls and Indicators

The SDU front panel includes the following items:

Figure 10-5: SDU Front Panel

- **IMU POWER Connector P1** – Supplies ±5V and ±12V voltages to the IMU.
- **PEDESTAL POWER Connector P2** – Supplies power to the pedestal motors.
- **CONTROL Connector P3** – Accepts motion control (azimuth and elevation) signals from the SBC. These signals are used to position the antenna correctly in order to optimally receive the C-Band/Ku-Band satellite signals. In addition, the SDU supplies +5V and ±12V power supply to the SBC via this connector (when the SBC switch is turned ON).
- **POWER Connector P4** – Mains power inlet (115/230V, 50/60 Hz).
- **INTERLOCK Connector P6** – As an option, the radome's hatch interlock switches can be connected to the SDU via this connector.
- **Grounding Jack.**
- **SDU Power Switch and Indicator** – SDU's ON/OFF switch. In the ON position, the green LED illuminates.
- **SBC Power Switch and Indicator** – Supplies power to the SBC. In the ON position, the green LED illuminates.

10.3.3 IMU Connector

The IMU interfaces with the system via a single connector (P8).

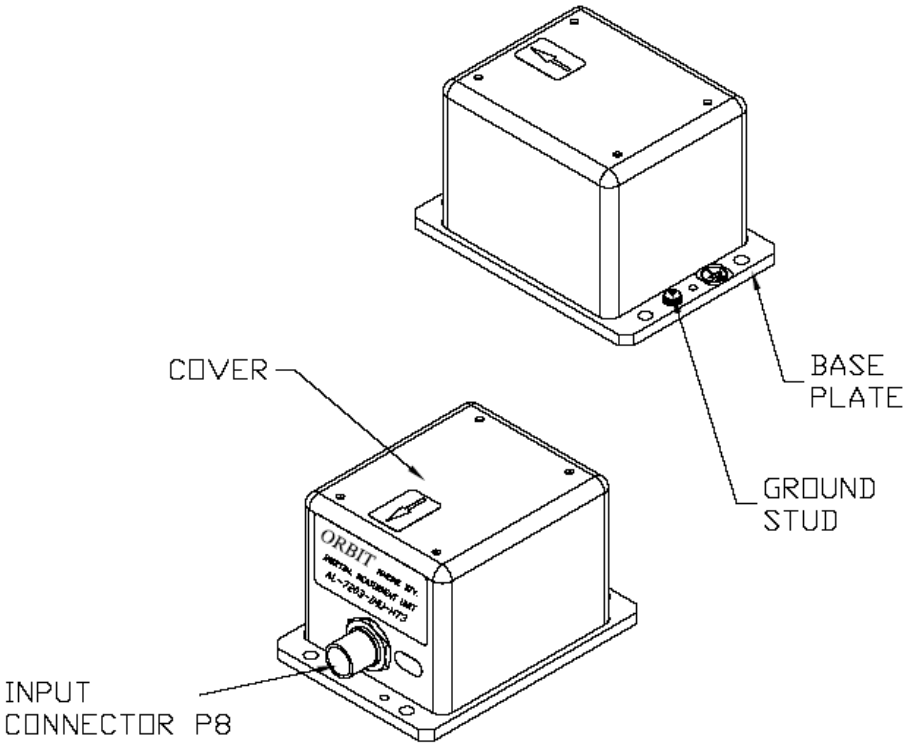


Figure 6. AL-7203-IMU-NT3 General View

10.3.4 Cables

CCU-SBC Communication Cables

The CCU communicates with the SBC using the TCP/IP protocol. The physical connectors can be either two fiber-optic cables, marked TX and RX, or a LAN cable. These cables connect between the SBC (above decks) and the CCU (below decks), and should be laid down via the ship's designated cable guides/ducts. Recommended cables are:

TCP/IP Ethernet Connection Options:

- LAN via CAT 5 cables – for up to 150m ADE-BDE distance
- 850nm, 62.5/125 micron Multi-mode Dual-core optical fiber with ST connectors – for up to 2,000m ADE-BDE distance
- 1300nm, 9/125 micron, Single-mode Dual-core optical fiber ST connectors – up to 2,000 m for cases where the ship has this kind of fiber installed.

10.3.5 CCU Connections

Termination of Compass Feed

The GYRO FEED CABLE from the vessel Gyro should be routed to the CCU, its armor sheathing should be removed (at least 2m), and should be terminated in the appropriate connector for the Gyro signal in question.

Due to the large cross-section of the compass cable wires, it may be quite hard to connect them to the connector. Therefore, connect the compass cable to a junction box and use smaller cross-section wires for the connector.

Note that the default gyro interface in the CCU is NMEA. Other types of gyro interfaces can be supported (optional).

Termination of IRD Cable

If the Modem provides an auxiliary status output, via a pair of normally open relay contacts, then these wires may be routed to the Radome and connected to the SBC via the BEACON 1 Connector P12 or BEACON 2 Connector P13 (Pin 1 - LOCKIND signal; Pin 5 – GND).

The SBC will sense external IRD status as being ‘Locked’.

GPS Antenna Connection

Locate the GPS antenna on the upper face of the mid-seam of the dome panels. Run the cable down the nearest vertical seam, to the connector on the SBC and ensure that there is no play between the Antenna and the Radome.

10.3.6 Connecting CCU Cables

CCU Rear-Panel Connectors Overview

The following Figure shows the CCU rear-panel connectors, and the subsequent Table specifies the type and function of each connector.

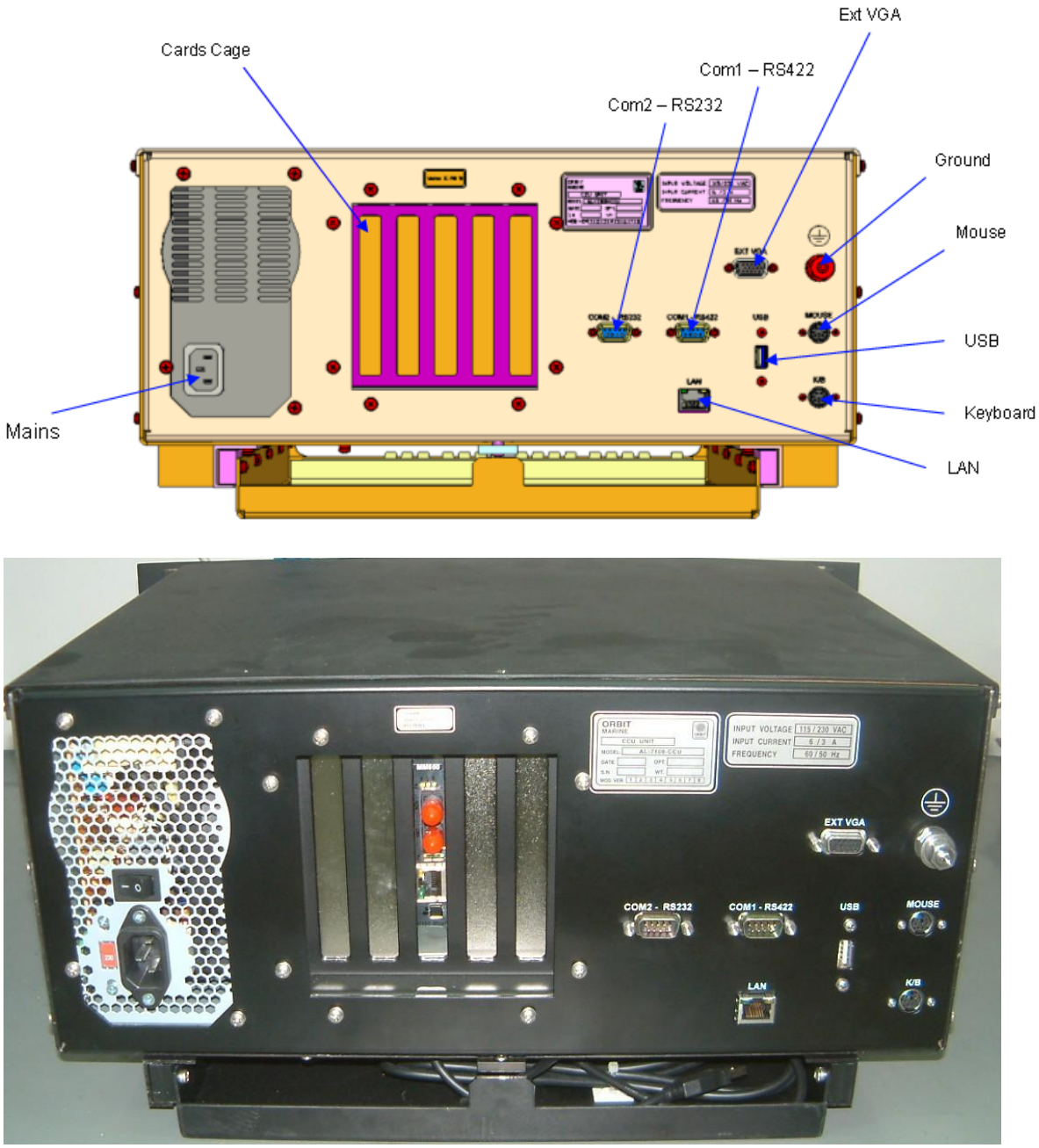


Figure 10-7: CCU Rear Panel Connectors

Table 10-1. CCU Rear Panel Connectors

Connector	Connector Type	Function
Mains	Integrated plug, voltage selector and ON/OFF switch	From ship's Mains power source.
LAN	RJ-45	LAN Connector
K/B	MINI-DIN	Connects CCU to the Keyboard located at CCU drawer.
MOUSE	MINI-DIN	Connects CCU to the mouse located at CCU drawer.
USB		USB port.
COM1-RS422	DB9 male	Connects CCU to customer's Compass (RS-422 port).
COM2-RS232	DB9 male	General-Purpose Serial that can be used for IRD Lock, External AGC, GPS Output, External Beacon Receiver, COMTEC Modem, etc. (RS-232 port).
EXT VGA	DB 15-Pin HD	Connects to an external monitor
Cards Cage		In accordance with the optional configuration. Refer to para. 2.2.3 CCU Options - Cards Cage Configurations.

The following paragraphs provide information and instruction pertinent to the available CCU connections.

General-Purpose Connections (Power, LAN Jumper, KB, Mouse)

The following Figure depicts the general-purpose cables that should be connected to the CCU:

- Power cable
- LAN cable
- Keyboard
- Mouse
- Ground Cable.

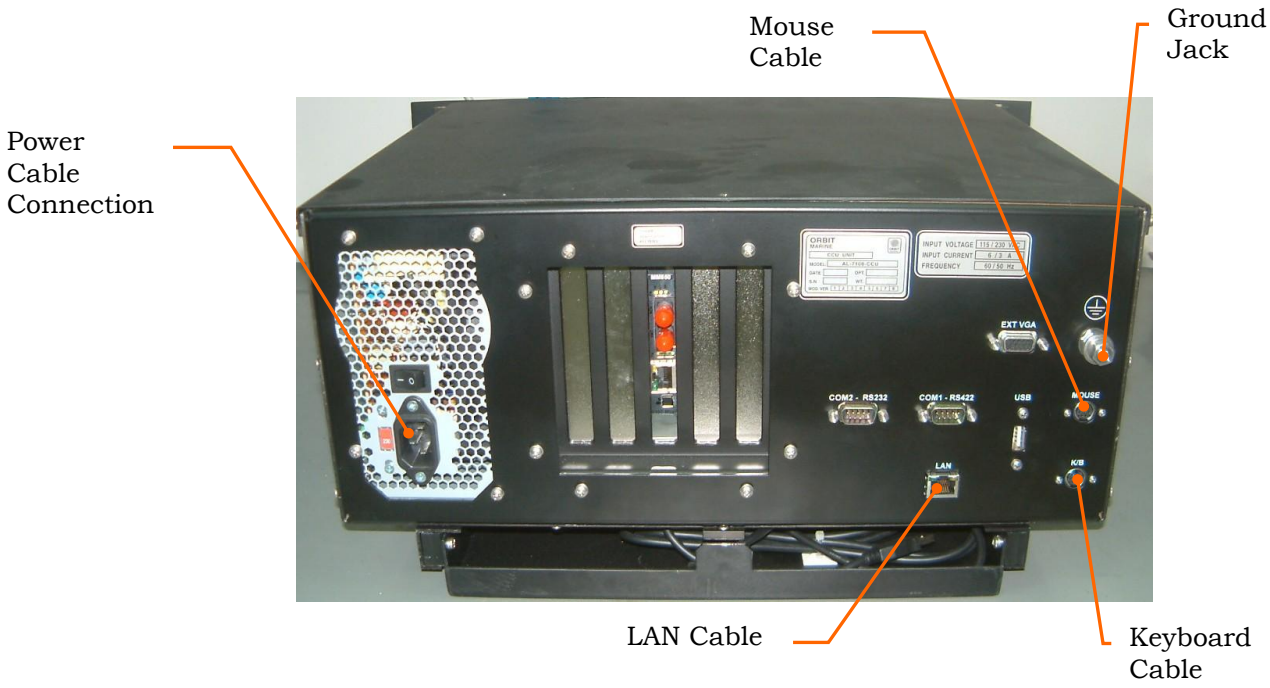


Figure 10-8: CCU Rear Panel – General Purpose Connections

Serial Communication and Compass Connectors

The CCU rear panel includes two communication connectors:

- COM1 – RS-422 - Connects CCU to customer's Compass (RS-422 port).
- COM2 – RS-232 - General-Purpose Serial port.

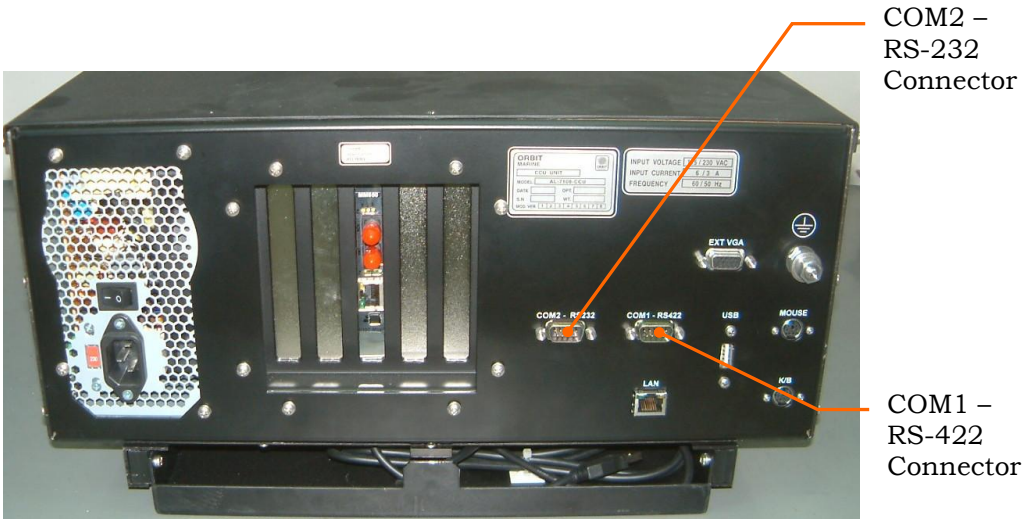


Figure 10-9: CCU Rear Panel – Serial and Compass Connectors

The following Table specifies the communication connector pin-out.

The subsequent paragraphs describe how to use each connector.

Table 10-2. Communication Connectors Pin Out

COM1	RS422
PIN 1	TX +
PIN 2	RX -
PIN 3	TX -
PIN 4	RX +
PIN 5	GND
PIN 6	NC
PIN 7	NC
PIN 8	NC
PIN 9	NC
COM2	RS232
PIN 1	NC
PIN 2	RX
PIN 3	TX
PIN 4	NC
PIN 5	GND
PIN 6	AGC IN
PIN 7	12V
PIN 8	IRD
PIN 9	GND

NMEA-0183 RS-422 Compass Connection

General

The National Marine Electronics Association (NMEA) 0183 standard defines an electrical interface and data protocol for communications between marine instrumentation.

The NMEA-0183 standard is 4800 baud and consists of several different ASCII sentences.

Electrical Interface

This standard allows a single "talker" and several "listeners" on one circuit. The recommended interconnect wiring is a shielded twisted pair, with the shield grounded only at the talker. The standards do not specify the use of any particular connector.

NMEA-0183 recommends that the talker output comply with EIA-422. This is a differential system, having two signal lines, A and B.

The voltages on the "A" line correspond to those on the older TTL single wire, while the "B" voltages are reversed (while "A" is at +5, "B" is at ground, and vice versa).

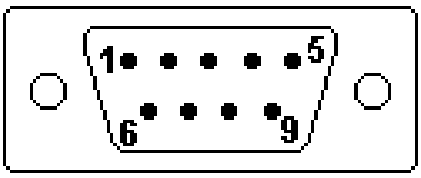
In either case, the recommended receive circuit uses an opto-isolator with suitable protection circuitry. The input should be isolated from the receiver's ground.

In practice, the single wire, or the EIA-422 "A" wire may be directly connected to a computer's RS-232 input.

The following Figure depicts how to connect an RS-422 NMEA-0183 Compass to the CCU's COM1 Connector.

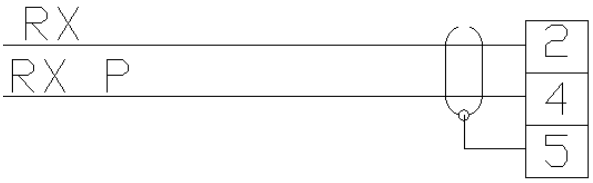
Connecting an RS-422 NMEA-0183 Compass to COM1 Connector:

CCU Connector



COM1-RS422

Mating Connector Wiring Diagram



Mating Connector Pin Out	
Pin	**Signal**
2	RXD-
4	RXD+
5	GND

Figure 10-10: RS-422 NMEA-0183 Compass - Connection Scheme

Compass Configuration Procedures:

To find and enter the system's Offset to Ships Compass, refer to "Finding and Setting of Heading (Compass) Offset".

To set the compass interface, refer to " Setting of Interface to Ship's Compass".

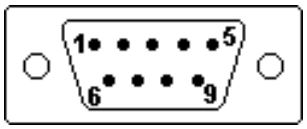
To change the default NMEA-0183 sentence, "Changing the Default NMEA-0183 Compass Sentence".

IRD LOCK Connection

The following Figure depicts how to connect IRD LOCK modem signal to the CCU's COM2 Connector.

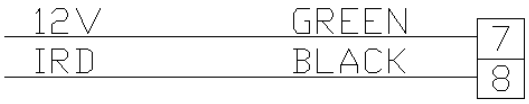
Connecting IRD LOCK to COM2 Connector:

CCU Connector



COM2-RS232

Mating Connector Wiring Diagram



Mating Connector Pin Out	
Pin	**Signal**
7	12VDC OUTPUT
8	IRD INDICATOR

Connect Pin 7 & Pin 8 via "dry-contact" relay.

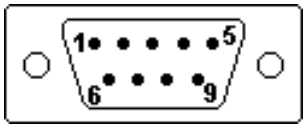
Figure 10-11: IRD LOCK - Connection Scheme

External AGC Connection

The following Figure depicts how to connect External AGC to the CCU's COM2 Connector.

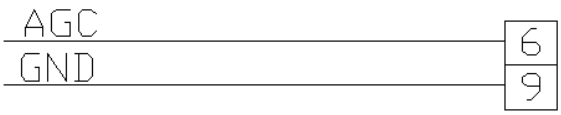
Connecting External AGC to COM2 Connector:

CCU Connector



COM2-RS232

Mating Connector Wiring Diagram



Mating Connector Pin Out	
Pin	**Signal**
6	AGC IN
9	GND

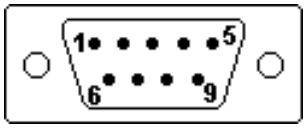
Figure 10-12: External AGC - Connection Scheme

RS-232 Connection

The following Figure depicts how to connect RS-232 to the CCU's COM2 Connector.

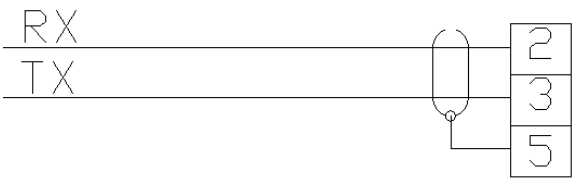
Connecting RS-232 to COM2 Connector:

CCU Connector



COM2-RS232

Mating Connector Wiring Diagram



Mating Connector Pin Out

Pin	Signal
2	RXD
3	TXD
5	GND

Figure 10-13: RS-232 Channel - Connection Scheme

11 Setup and Commissioning

11.1 Introduction

Once the installation is completed as described in the preceding chapters, the system should be energized to perform system setup, functional tests and operability verification (satellite tracking/acquisition and RF aspects of system operation).

11.2 Initial Visual Inspections

Perform the following inspections before starting up the system:

- **Paint and General Finish** – Inspect all paintwork and the general finish.
- **Rack Wiring** – Inspect all internal wiring terminations and labeling as appropriate.
- **Mechanical Completion** – Inspect all metalwork and moving parts and ensure that all edges are smooth and moving parts are operating correctly.

  Check that there are no obstructions in the X- and Y-axis paths.
- **Labeling** – Inspect all equipment labels and equipment tag numbers are correct and that power supplies are properly identified.

11.3 System Power-Up and Setup Procedure

11.3.1 Introduction

This section explains how to set-up the system and verify the ability of the stabilized PEDESTAL to track a carrier under normal operating conditions, prior to Final Commissioning and Acceptance.

11.3.2 Input Voltage, Switches and Fuses Set-up

Before the CCU and the SDU are switched on for the first time, it is imperative that their respective 115/220-VAC selectors are set to the correct power supply:

- The CCU input voltage selector is located on the rear of the CCU (near the power input socket).
- The SDU input voltage selector (S2) is located inside the unit.

In addition check and set the SDU's internal switches and fuses.

Before the system is powered up, verify that the ADE Radome is unoccupied.

➢ **To select the CCU input voltage:**

1. Set the CCU voltage Selector to the pertaining position, in accordance with the input voltage (115 VAC or 230VAC).

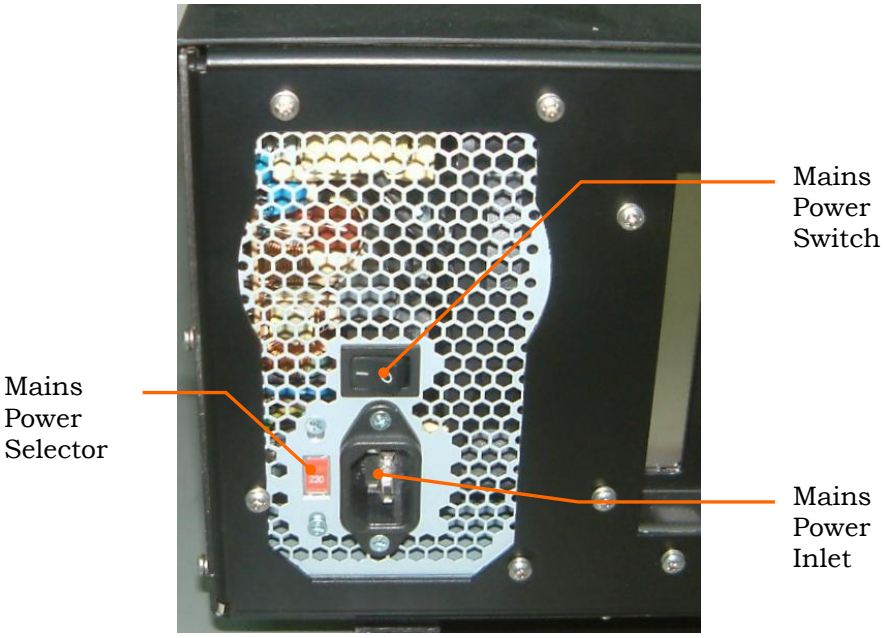


Figure 11-1: CCU Rear Panel Voltage Selector

➢ **Checking and setting the SDU Internal Fuses and Switches:**

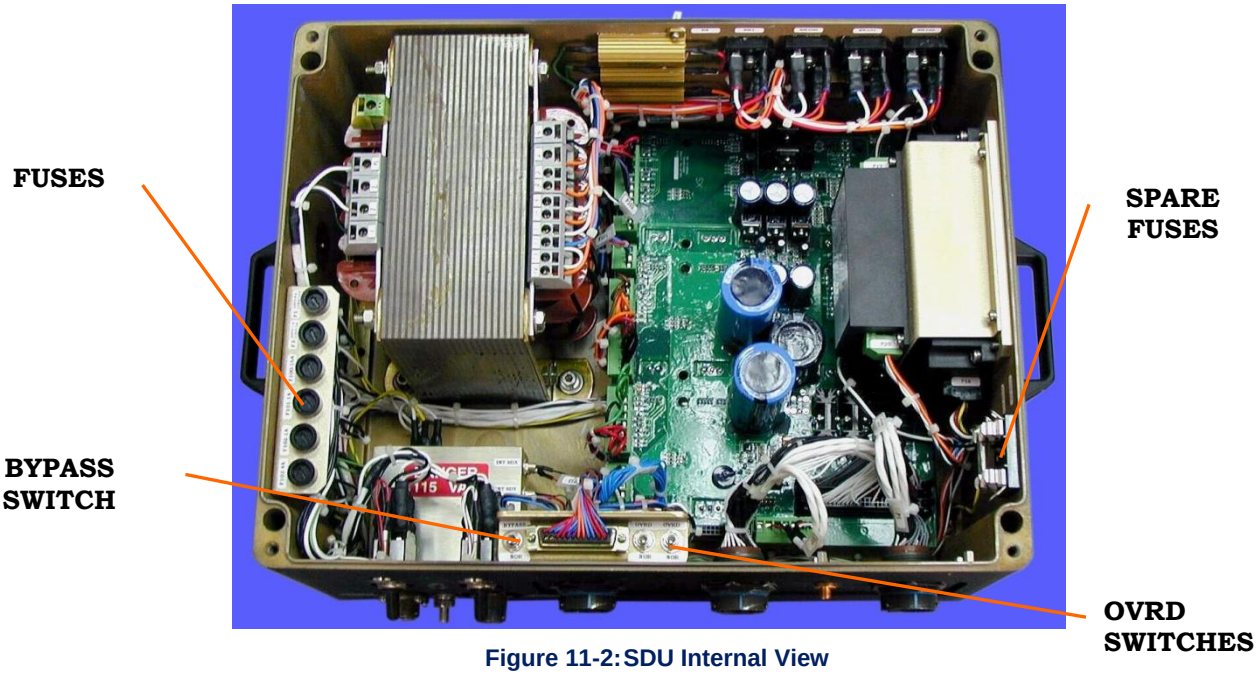


Figure 11-2: SDU Internal View

The SDU box contains the following items:

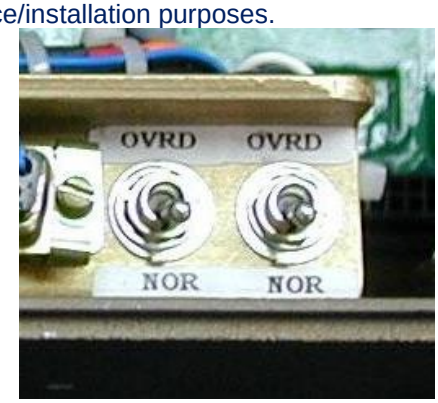
- **Voltage Selector (S2)** – The SDU is equipped with a 115/230V voltage selector.

- **Fuses** – The SDU is equipped with the following fuses:

Fuse	Rating	Protected Power Supply
F1	230V / 8A or 115V / 15A	SDU Main Power Input
F3	230V / 1A or 115V / 2A	SBC Power Supply
F100	230V / 16A	Pedestal Drivers (X, Y axes) Bus Power Supply
F101	230V / 1A	Positioner X-Axis Brake
F102	230V / 1A	Positioner Y-Axis Brake
F103	230V / 4A	Positioner Pol-Axis & IMU Axes (not applicable)

- **Spare Fuses** – Two spare fuses (230V / 8A and 115V / 15A) for fuse F1 are mounted on brackets inside the SDU.

- **BRAKES OVRD Switches** – The two switches, one for the Positioner's X-Axis (right) and the other for the Y-Axis (left), enable to override and release the axes brakes for maintenance/installation purposes.



To release the brake of one of the axes, connect power to the SDU (via connector P1), and set the pertaining switch to the OVRD position. This will supply power to the brake and disengage it to allow free movement of the axis. A **Pedestal X/Y brake override** warning will be displayed by the **MTSLink** software on the CCU screen.

At the end of the maintenance/installation procedure, verify that the OVRD switches are set back to the NOR (normal) position.

- **INTERLOCK BYPASS Switch** – The switch is used to bypass the Radome Hatch Interlock mechanism:

When the system is equipped with an Interlock, setting the switch to the BYPASS position will enable operation when the Radome hatch is open (for maintenance/installation purposes).

At the end of the maintenance/installation procedure, verify that the BYPASS switch is set to the NOR (normal) position.

If the system is not equipped with an Interlock, this switch should be set permanently to the BYPASS position. Setting the switch to NOR (normal) position when an Interlock is not installed will result in Positioner shut-down, followed by a **Pedestal X/Y interlock open** error displayed by the **MTSLink** software on the CCU screen.

11.3.3 Initial Set-up

➢ **To perform initial setup:**

1. Using the relevant terminations detail drawings, ensure that all interconnection cables are correctly terminated between BDE and ADE.
2. Carry out verification checks of the shipboard mains supply, ensuring that the supply is suitably conditioned.
3. For Tx / Rx: apply power to the modem and configure it as required.

   Apply power to the transceiver and configure it as required.
4. Apply power to BDE/ADE equipment and observe the following:

- In the BDE:
  - The CCU has powered up and loaded MTS link.
  - The monitor displays the manufacturer's logo whilst it carries out a self-test routine.

  During the self-test countdown, type 'c' and then enter the password to prevent auto-restart.
- In the ADE:
  - The SDU 2 power LEDs (SDU and SBC) are illuminated (AL-7100-SDU-MK2).
  - The three SBC LEDs are illuminated (+5V, +12V, -12V).

If required, apply power to the spectrum analyzer and configure it as required.

If you have a Laptop, it is recommended to carry out all the tests in the ADE.

11.3.4 Status and Indications Check

➢ **To perform a Status and Indications Test:**

From the OPERATIONS screen:

1. Enter your *case sensitive* password on the BASIC OPERATION screen to enter the OPERATIONS screen (AL_7200).
2. Enter the SYSTEM CONFIGURATION mode.
3. Under GENERAL, verify that the AUTO RESTART option is set to NO.

You are recommended to keep the Auto-Restart disabled throughout the tests and pre-commissioning procedures.

4. On the OPERATIONAL screen, check the following:-
   - Error / warning messages in the message window for. Refer to each as appropriate.
   - Check that the relevant system's ID is displayed.
   - Check that the time and date are displayed.
5. Type 'I' and then 'C' to select and set the compass.
6. Check that the vessel's heading is displayed, and that it matches the ship's compass reading.
7. Check that the on-screen compass is synchronized with the movement of the ship's compass.
8. Type 'S' to select the required satellite and any channel.

For tests and commissioning, you are recommended to select a known accessible satellite.

From the OPERATIONS screen:

1. Type 'M' to enter the MAINTENANCE screen.
2. Monitor the SDU POWER indicators, and verify a reading of 4.7-4.9V on the 5V indicator, and 12V on the 12V indicator.
3. Type 'P' and monitor the POWER PARAMETERS, checking that all voltages displayed are correct.
4. Check for GPS updates.
5. Verify that the X, Y, Z coordinates are displayed, and that the PDOP, HDOP, VDOP, TDOP fields display valid values.

GPS updates commence only 5 minutes after the system is powered-up.

You are recommended to compare the GPS readings with the bridge's reference GPS unit.

11.4 Pre-Commissioning Checks

11.4.1 Introduction

This section explains how to perform the pre-commissioning checks, verifying that the installation is complete and that the system is serviceable.

11.4.2 Checking the Axes Movement in SLEW Mode

This checking procedure verifies that the antenna dish and feed do not collide with the Radome, and that all cables are secured and are not tightened during full axes movement.

➢ **To check the Axes movement:**

1. Type 'M' for MAINTENANCE, then 'S' for SELECT WINDOW and select PEDESTAL X.
2. Select MODE, press ENTER and select SLEW, then perform the following tests:

a. Use the ↑ key to move cursor to the velocity readout.

b. Use the ← and → keys to change the velocity to 1 or –1, and slew the axis by no more than 15 degrees in either direction of the starting position. Monitor the axis' position and velocity displays, and verify that the position tracking is smooth and consistent, and that the actual axis velocity is within ±0.2°/sec of the velocity command.

If any problem arises during slew, shut down the axis immediately.

c. Use ↓ to move the cursor to MODE and select 'Halt' to stop the axis movement.

d. Use ↓ to move the cursor to MODE and select ENC INIT.

e. Ensure that the encoder's position varies steadily and does not jump. In this case you can disregard the warnings that appear in the Axis window (Jmm, Rlm, Flm).

f. Verify that the red Init flag is turned off after the axis movement has stopped, and that the ENCODER finds its 'zero'.

g. Select new mode of SLEW again and slew the axis 80° in either direction around the zero position.

3. Repeat steps (1.) and (2.) for PEDESTAL Y axis and POL axis—if there is a LINEAR FEED.
4. Perform ENC INIT test of all axes: Select 'O' on the OPERATION SCREEN and select ENC INIT.
5. Verify that all axes are moving properly and zeroing.
6. Check that the DISH is at its zenith position.
7. Make sure that the IMU CALIBRATION TABLE matches that of the IMU SERIAL NUMBER in MAINTENANCE>CONFIGURATION>IMU CALIBRATION>IMU S/N.
8. Perform IMU INIT test as follows:

   Press 'D' in the OPERATION SCREEN and select 'IMU Init', then confirm by pressing ENTER twice.

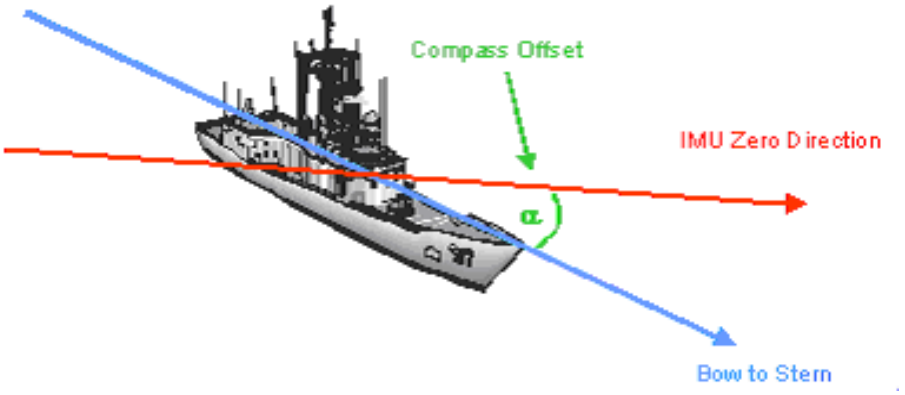
9. Monitor the SHIP COORDINATES window and verify that the displayed values match the ship's Pitch and Roll, taking into consideration the leveling degree of the ADE mounting plate with the ship's deck. Usually, on big ships, the Pitch and Roll values at the shipyard are within 1□0.5°.

Check that there is no obstacle to the axis movement.

You are recommended to visually inspect the Pedestal's leveling within the Radome. IMU Initiation procedure lasts for about 6 minutes. At the end of this procedure, the System Status field indicates that the IMU is "locked", i.e., the antenna is slaved to and stabilized by the information supplied by the IMU.

11.4.3 Finding and Setting of Heading (Compass) Offset

When the system is installed onto a vessel you will find that it is not aligned with the bow of the ship. This means that you will need to set the compass offset so that the system is aligned with the vessel's gyro compass:



IMU Zero Direction

As marked in the drawing above, Compass offset is the angle between the ship's Compass direction, represented by the Bow-to-Stern line and the IMU direction.

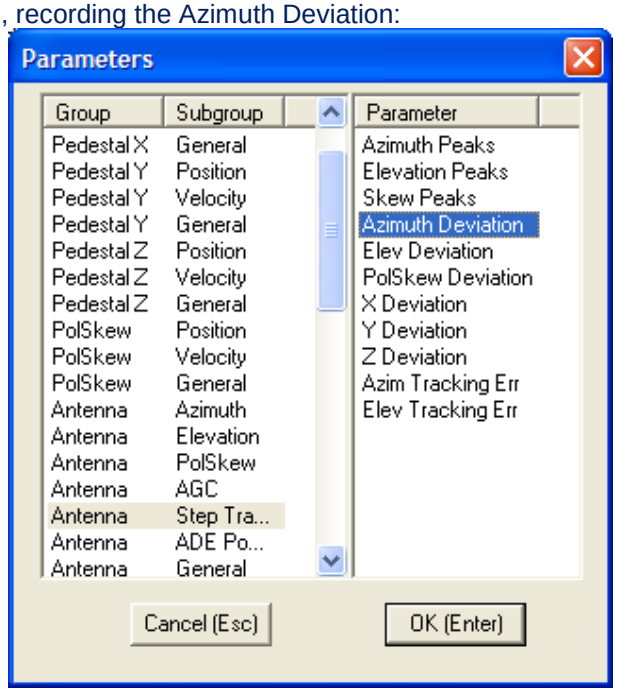
To establish the exact offset angle the following steps should be taken:

1. Make a "naked-eye" rough estimate for the offset angle. Looking on the drawing above that would be something like -30 degrees (negative because the offset in the example is counter-clockwise from ship's bow).
2. Make a "naked-eye" rough estimate for the offset angle. Looking on the drawing above that would be something like -30 degrees (negative because the offset in the example is counter-clockwise from ship's bow).
3. Set the "naked-eye" estimate into the controller (as shown below).
4. Point antenna to satellite. Record the antenna Azimuth at this point as "Nominal Azimuth".
5. Use Manual mode (see appropriate paragraph in this document) to move the antenna Azimuth orientation to point it onto the satellite. The amount of expected movement depends on how accurate was your initial estimate. Most people can tell direction within +/-10 degrees…
6. Once the satellite is acquired (Beacon receiver locked or, SatModem has locked on the Downstream data channel or, Spectrum analyzer screen shows

a recognizable signal pattern or any other way of validating that's the right satellite) put the antenna to Step-track.

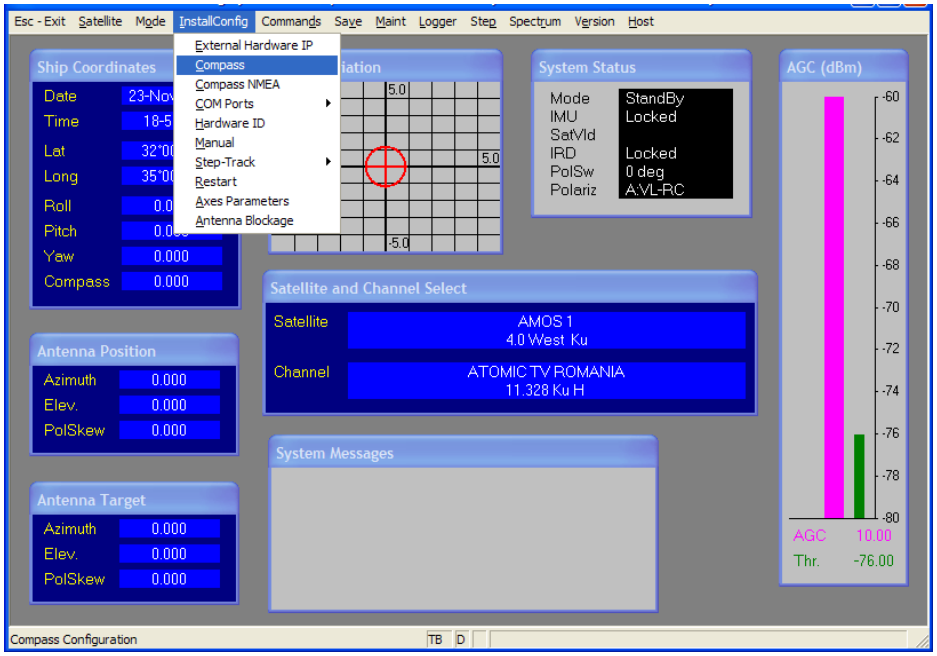
7. Find "Azimuth Deviation", which is how far away is the actual antenna Azimuth from the expected one.
8. To do so you may use the graphical cross hair display, which is calibrated in degrees, showing a total of +/- 5 degrees:

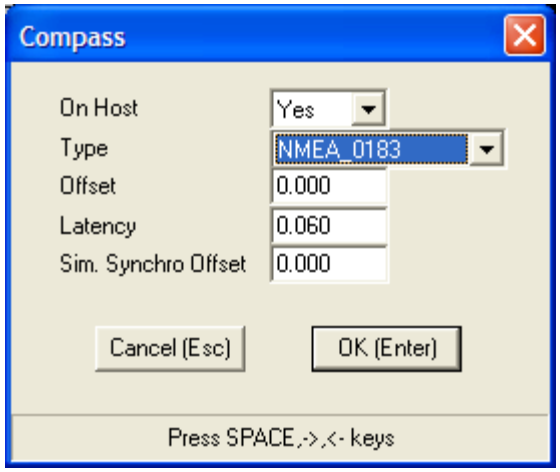
9. Or you can use the Graphical logger (see appropriate paragraph in this document), recording the Azimuth Deviation:



10. Or you may put the antenna to "Peak" mode and find the "Azimuth Deviation" by calculating the difference between the current antenna Azimuth and the "Nominal Azimuth" as noted above.
11. The "Azimuth Deviation" obtained in one of the methods shown above will be used to refine the "naked-eye" offset estimate. This will be given by:
12. Compass Offset Correction = Azimuth Deviation / Cosine (Antenna Elevation)
13. For example, the satellite with the cross-hair mark three notches right of center (+3 degrees), while the antenna Elevation is 41.4 degrees.
14. That means that our initial "naked-eye" estimate of –30 degrees must be corrected by:
15. 3/Cos (41.4) = 4.0 degrees, resulting in overall Compass Offset of –26.0 degrees
16. How to set the Offset to the controller-

17. From “Operation Screen” press “I” then select “Compass”:





18. Enter the Offset (third line from the top), OK and save into ACU non-volatile memory.

11.4.4 Final Commissioning Tests

- If the red crosshair is far from the center of the grid, check if there is a problem such as compass offset, software, elevation, or mechanical alignment.
- Check that there are no messages after acquiring the satellite.
- Check that the system is in Step Track mode and is tracking the satellite (if possible,) when the vessel is moving.
- Verify that the modem is locked and that the signal is without loss.

11.4.5 Configuration of Auto-Restart

➢ **To configure Auto-Restart:**

- Type 'I' for SYSTEM CONFIGURATION, select GENERAL and change AUTO START to YES.

11.4.6 Saving the Configuration Settings

➢ **To save the configuration settings:**

1. Type 'V' for SAVE and select ALL.
2. Initiate the MtsDock application.
3. Click COMMAND and select CONNECT to connect to the SBC.
4. Insert a disk-on-key into the CCU's front-panel USB port.
5. Select PUT CONFIGURATION, and then select USB Drive.

   A zipped configuration file will be copied to the disk-on-key.

The pre-commissioning procedures may take some time, under non-stable ship's power supply. Therefore, you are recommended to save the configuration parameters frequently, using the Save Configuration function.

11.4.7 System Restart Procedure

➢ **To restart the system:**

1. Power down the system.
2. Re-apply the power to the system.
3. Observe the following:
   - The system re-boots.
   - The encoders initiate.
   - The IMU initiates.
   - The system acquires the satellite.
   - The system goes into Step-Track.
   - The modem locks.

11.5 System Acceptance Test

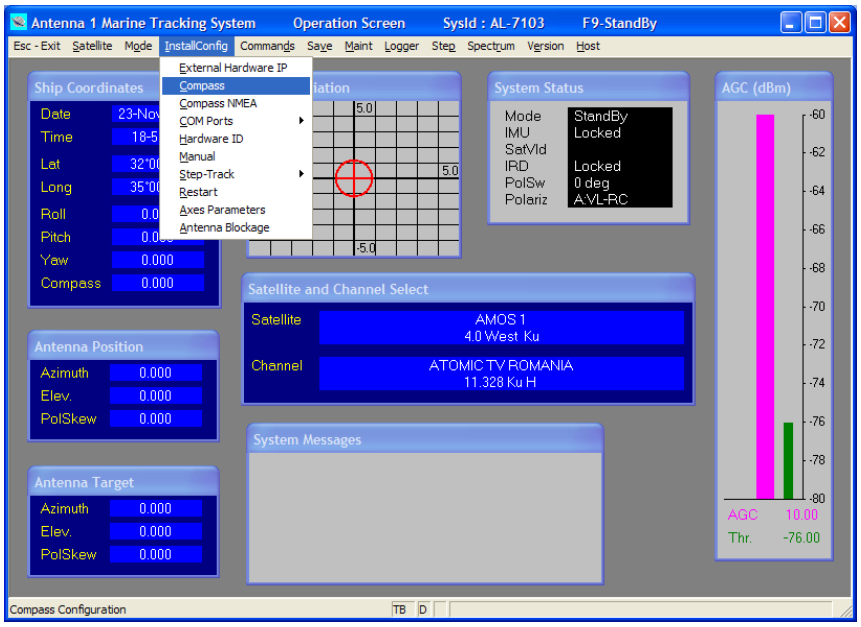
At the end of installation procedure and inspection, perform the Final Commissioning Test.

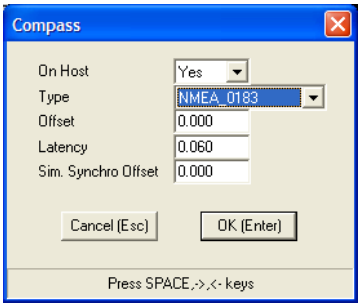
11.5.1 Final Acceptance Test

- If the red crosshair is far from the center of the grid, check if there is a problem such as compass offset, software, elevation, or mechanical alignment.
- Check that there are no messages after acquiring the satellite.
- Check that the system is in Step Track mode and is tracking the satellite (if possible,) when the vessel is moving.
- Verify that the modem is locked and that the signal is without loss.

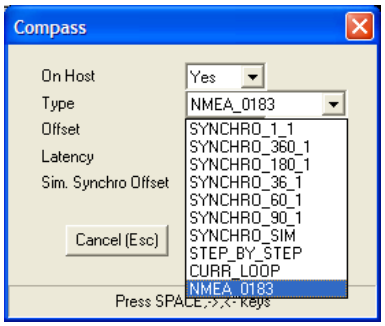
11.6 Setting of Interface to Ship's Compass

From "Operation Screen" press "I" then select "Compass":





Select the pertaining compass type:



Supported interface types:

Synchro, Step-by-Step and NMEA-0183.

(“Current-loop” – is not supported, although listed.)

The default setting is NMEA-0183

For Synchro or Step-by-Step – please contact factory.

Synchro hardware set-up: 115VAC 50-400 Hz Reference, 90VAC S1, S2, S3 Phases

Synchro 1 to 1:

1 degree of ship rotation corresponds to 1-degree displacement of Compass readout

Synchro 360 to 1:

1 degree of ship rotation corresponds to 360 degrees displacement of Compass readout

Synchro 180 to 1:

1 degree of ship rotation corresponds to 180 degrees displacement of Compass readout

Synchro 90 to 1:

1 degree of ship rotation corresponds to 90 degrees displacement of Compass readout

Synchro 60 to 1:

1 degree of ship rotation corresponds to 60 degrees displacement of Compass readout

Synchro 36 to 1:

1 degree of ship rotation corresponds to 36 degrees displacement of Compass readout

Step-by-Step hardware setup: three Lines – A, B, C and Common

Both types of Step-by-Step are supported: Common GND, and Common Hot

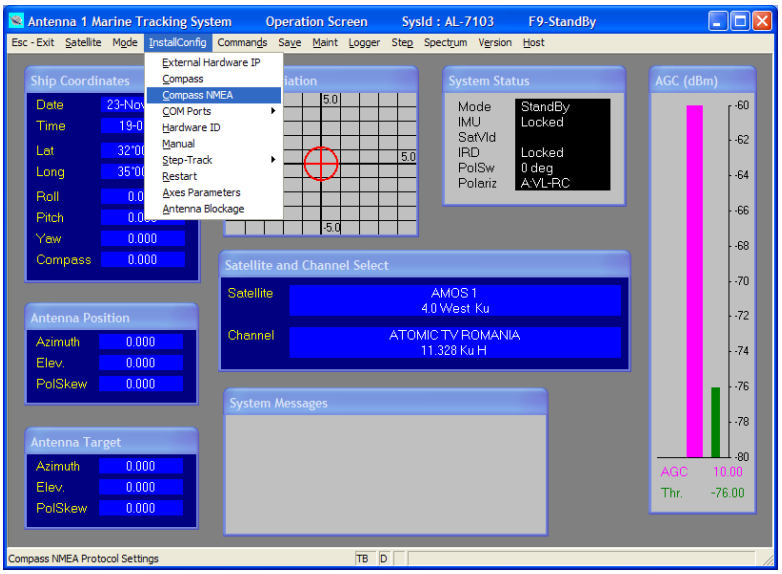
Maximal voltage level allowed for active Line in case of Common GND: 20 to 70VDC

Maximal voltage level allowed for Common Hot: 20 to 70VDC.

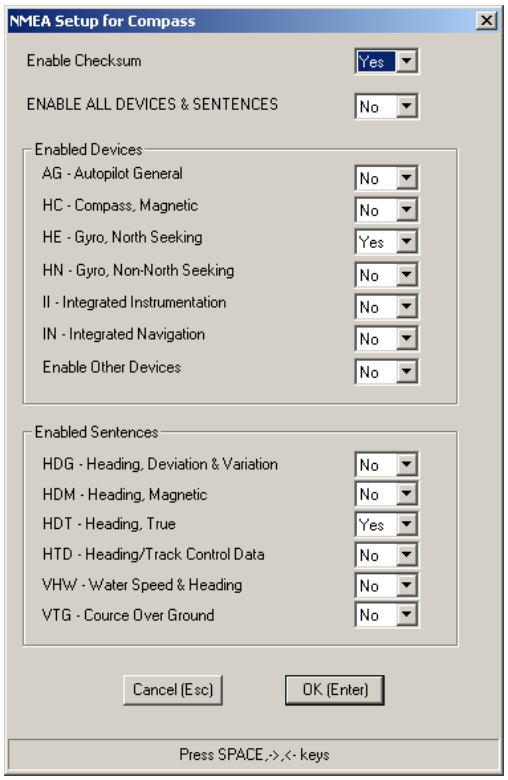
11.7 Changing the Default NMEA-0183 Compass Sentence

When connecting an NMEA-0183 compass, perform the following to change the default sentence:

From “Operation Screen”, press “I”, and then select “Compass NMEA”:



At the NMEA Setup screen, select the relevant NMEA sentence, and then select OK to save into the ACU non-volatile memory.



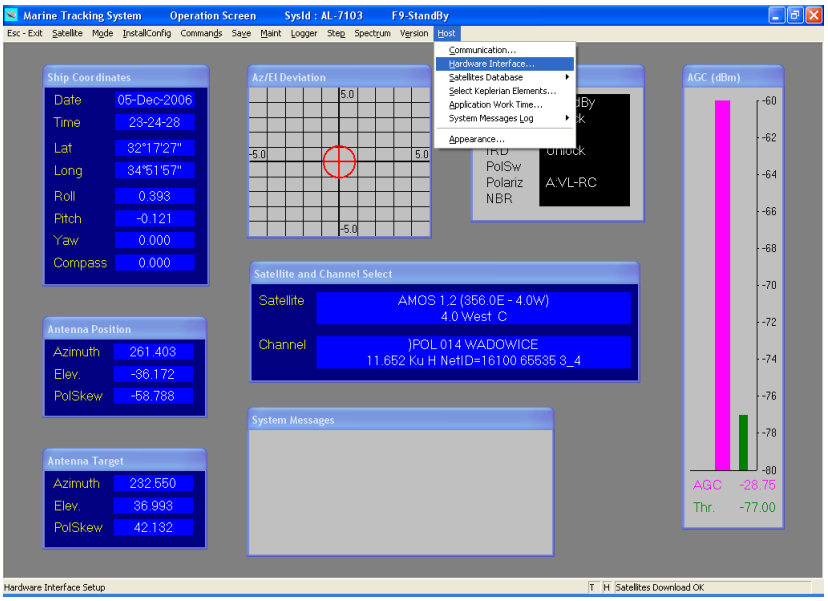
11.8 Setting up the GPS output on CCU COM2

The following procedure specifies how to setup the GPS output on port COM2 of the CCU.

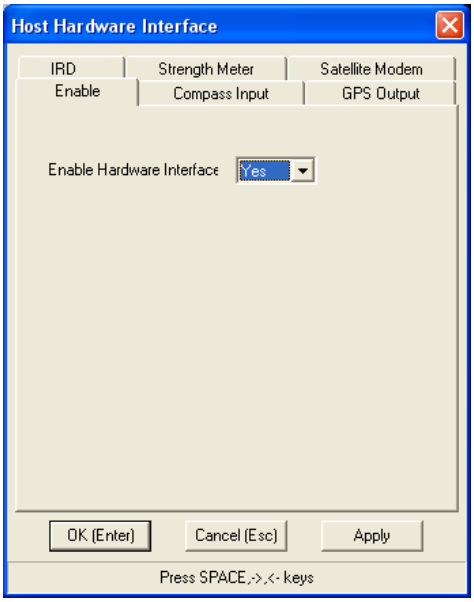
This procedure is needed only if the satellite modem requires GPS updates and can receive the updates in NMEA-0183 format.

➢ **To set up the GPS Output:**

1. From “Operation Screen”, press “H”, then select “Hardware Interface…” for opening the “Host Hardware Interface” window.

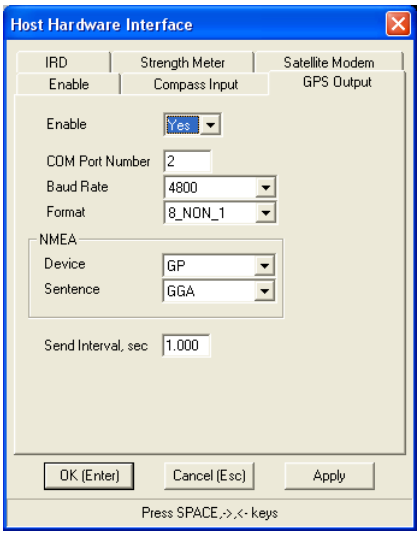


2. Verify that “Enable Hardware Interface” on “Enable” tab is set to “Yes”, and press “Apply”.



3. Select “GPS Output” tab and set parameters as following:

   - Set “Enable” to “Yes”
   - Set “COM Port Number” to “2”
   - Set “Baud Rate” to “4800”
   - Set “Format” to “8_NON_1”
   - Set “Device” to “GP”
   - Set “Sentence” to “GGA”
   - Set “Send Interval” to “1” Second



4. Press “OK” when complete.

11.9 Cease Transmission (Tx) Configuration

To set and configure the Cease-Transmission (Tx) feature, perform the following procedures.

11.9.1 Setting up Cease-Tx Control

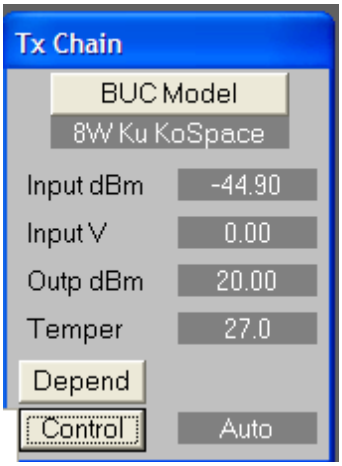
Purpose

The below explains the monitoring and control of the AL-7108 Tx Chain with all BUCs currently defined as valid options.

The Tx-Chain consists of BUC and the logic for automatic control over Tx-enable by the AL-7108 software (“Cease Transmit”).

“Tx Chain” Configuration Screen

“Tx Chain” screen contains the following:



BUC Model:

BUC Model selection list:

“Undefined”, “4W Ku KoSpace”, “4W Ku KoSpace M&C”, “8W Ku KoSpace”, “8W Ku Agilis”, “8W Ku Agilis M&C”, -, “10W C Codan”, “20W C Codan”, “16W Ku Codan”.

Input (dBm):

L-Band signal power measured in dBm. If BUC input losses are taken into consideration, this value has a good correlation of the L-band power injected into the BUC

Input (Volts):

L-Band signal power, in Volts, before the conversion to dBm.

Output (dBm):

BUC output power indication in dBm. This is only presented for BUC’s equipped with a output power monitor compatible with the SBC interface: 10w and 20w Codan, 8w KoSpace. If not active, this display will present a blank field.

~~~~~~

Disclaimer Note:

Neither Input(dBm) nor Output(dBm) are designed as precision measurement devices. The presented values have more of an indicative quality, their accuracy strongly dependent on the BUC brand as well as the current environmental conditions.
~~~~~~

Regardless, those tools have been proven as extremely effective aids for the in-field integration process.

~~~~~~

Temperature (degC):

BUC temperature indication in degC. This is only presented for BUC's equipped with a temperature monitor compatible with the SBC interface: 10w and 20w Codan, 8w KoSpace. If not active, this display will present a blank field.

Control Button: Tx Control

The button presents a select list with the following options: None/On/Off/Auto.

Default: On.

Last selection is saved in non-volatile memory if "Save Maintenance" (or "Save All") is activated.

(Note that in the present version this control has only three states: On/Off/Auto)

Function:

When changed to "On" – The AL-7108 software should send a Tx-On command

When changed to "Off" – The AL-7108 software should send a Tx-Off command

When set to "Auto" – The AL-7108 software will send a Tx-On command if all of the "Tx Dependency"-enabled conditions are true for the duration of minimal time of two consecutive seconds. The AL-7108 software will send a Tx-Off command if one, or more, of the "Tx Dependency"-enabled conditions are false.

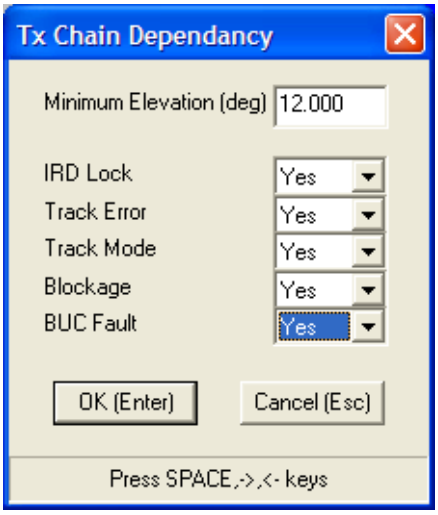
When set to "None" – The AL-7108 software will not send any commands.

When "Tx Control" is set to either On,Off, or None the "Tx Dependency" parameters should be disabled (presented in light gray)

Orbit Communication Ltd. 8D Hatzoran St. P.O.B. 8657, Netanya 42504, Israel, Tel: +(972) 9 892 2777, Fax: +(972) 9 885 5944 www.orbit-cs.com
~~~~~~

Control Button: Tx Dependency

The button opens a configuration sub-screen with the following parameters:



Function:

Min Elevation [deg]: Tx will be stopped if the antenna Elevation angle, relative to the Earth horizon, goes below the dialed value.

IRD Lock: If set to “Yes”, will stop Tx if satellite IRD Lock turns to “Unlock”

Track Error: If set to “Yes”, will stop Tx if the Tracking error produced by the ConScan Step-track, exceeds the Track Error Threshold value, as set in Step-track configuration sub-screen

Track Mode: If set to “Yes”, will stop Tx if the current mode is not Step-track

Blockage: If set to “Yes”, will stop Tx if Antenna view is blocked according to Antenna Blockage Zones settings

BUC Fault: If set to “Yes”, will stop Tx if BUC Fault is identified.

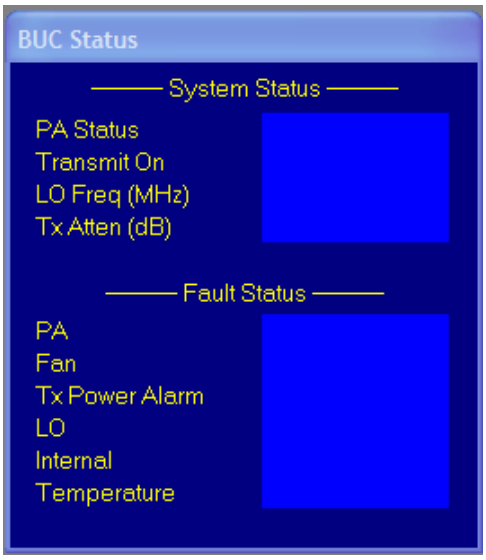
Note that when a Cease-Tx condition is identified, the BUC Tx is stopped immediately (less then 100msec), while when the Cease-Tx condition disappears, the BUC Tx is renewed only after a 2 second delay. This is in compliance with regulatory requirements.

All the above is relevant only if the Control is set to “Auto” and the particular selected BUC has the appropriate interface for Tx Control: 10w and 20w Codan, 4w and 8w KoSpace.

"BUC Status" Screen

BUC Status screen is sequentially accessible thru the "GpsTunerBUC" control label on the Maintenance screen. "BUC Status" screen will present the following status:

For "10W C Codan" and "20W C Codan" Models:



---------- System Status ----------

PA Status: On/Off

Transmit On: On/Off

LO Freq (MHz): 7300, 7375, 7600, 7675

Tx Atten (dB): 0,4,8,12

---------- Fault Status ----------

PA: OK/Failed

Fan: OK/Failed

Tx Power Alarm: OK/Failed

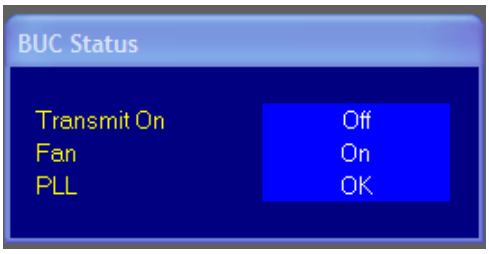
LO: OK/Failed

Internal: OK/Failed

Temperature: OK/Failed

Note that "LO" will indicate "Failed" if there is no 10MHz sync on the BUC input.

For “8W Ku KoSpace”



Tx : On/Off

Fan : On/Off

PLL : OK/Failed

Note that “PLL” will indicate “Failed” if there is no 10MHz sync on the BUC input.

All the rest of the BUC selections will show:

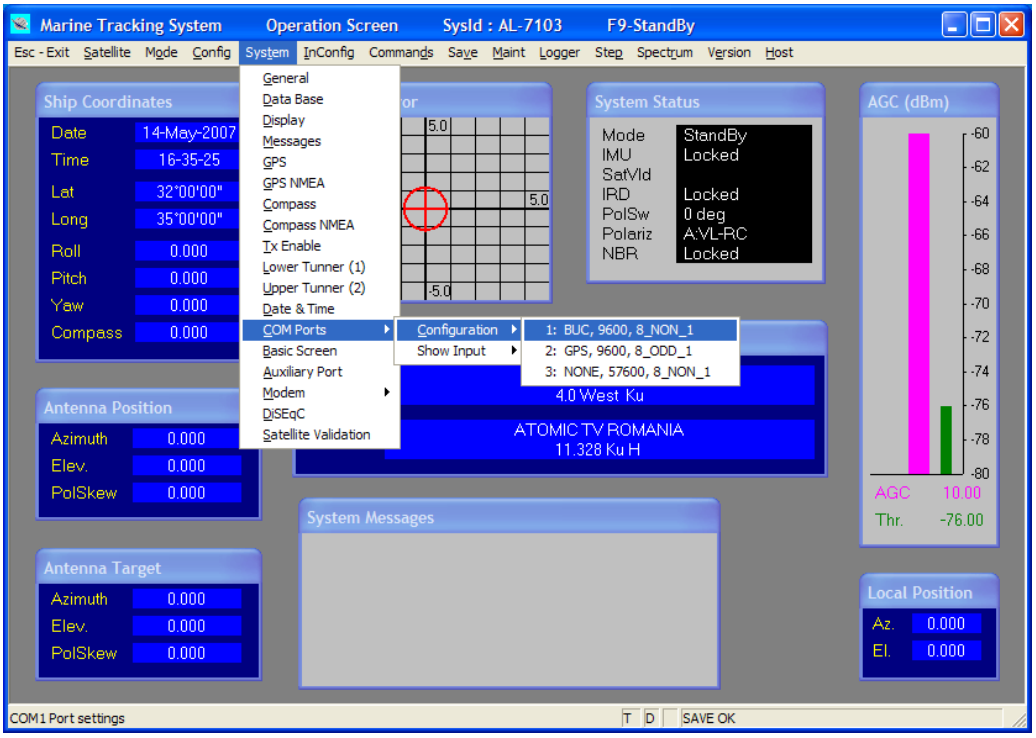
BUC Serial number

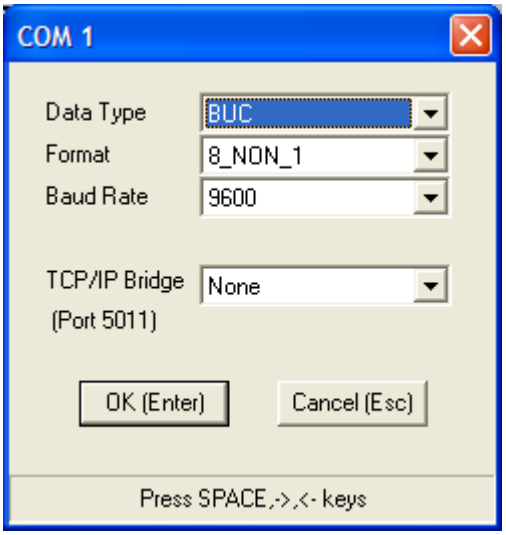
Hardware ID screen presents BUC S/N for BUCs which are able to provide this info.

The list of those BUCs is now extended to: 8W Ku KoSpace, “8W Ku NxGnWv”, 10W C Codan and 20W C Codan.

COM-1 Set-up for BUCs using Comm-link

For selected BUC using a serial communication link to converse with the SBC (such as “8w Ku KoSpace” or “10w/20w C Codan”), the COM-1 port must be set up accordingly:

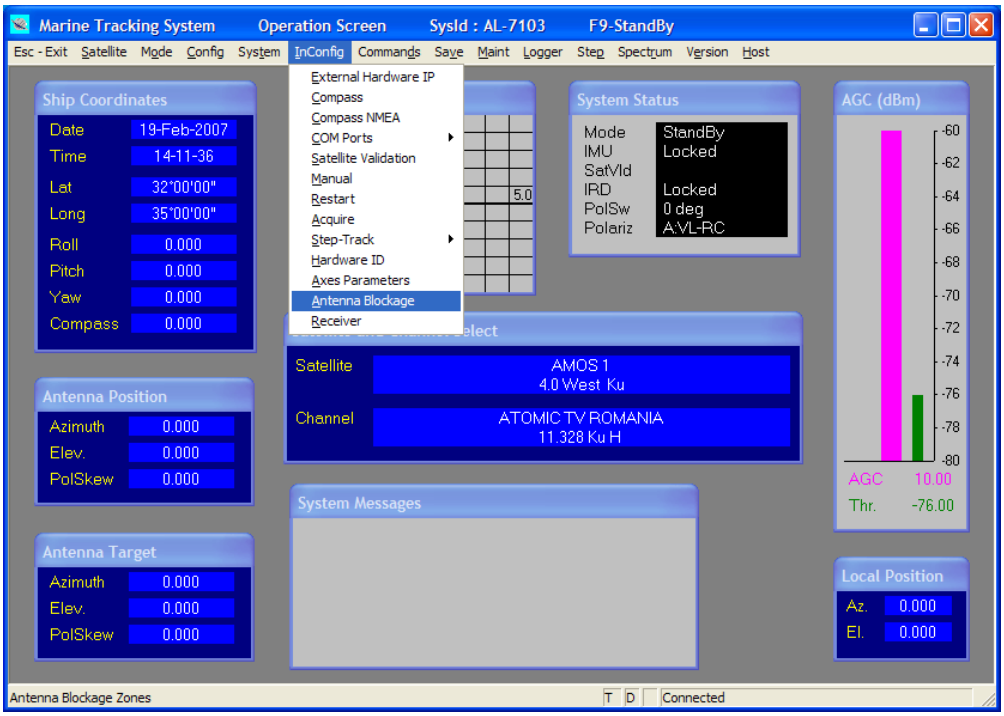


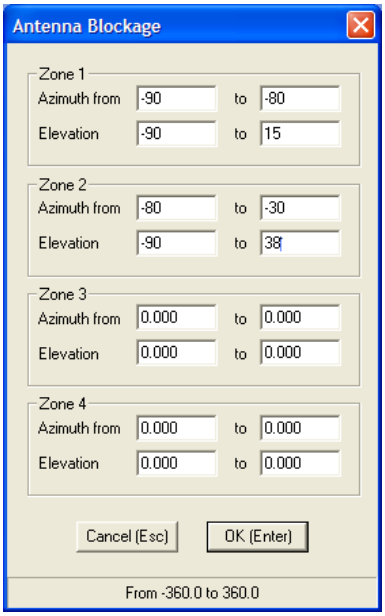


11.10 Enter Blockage Zones Angles

This feature enables to define four Azimuth/Elevation Antenna Blockage Zones, matching the ship's obstructions detected and calculated during the ship survey phase.

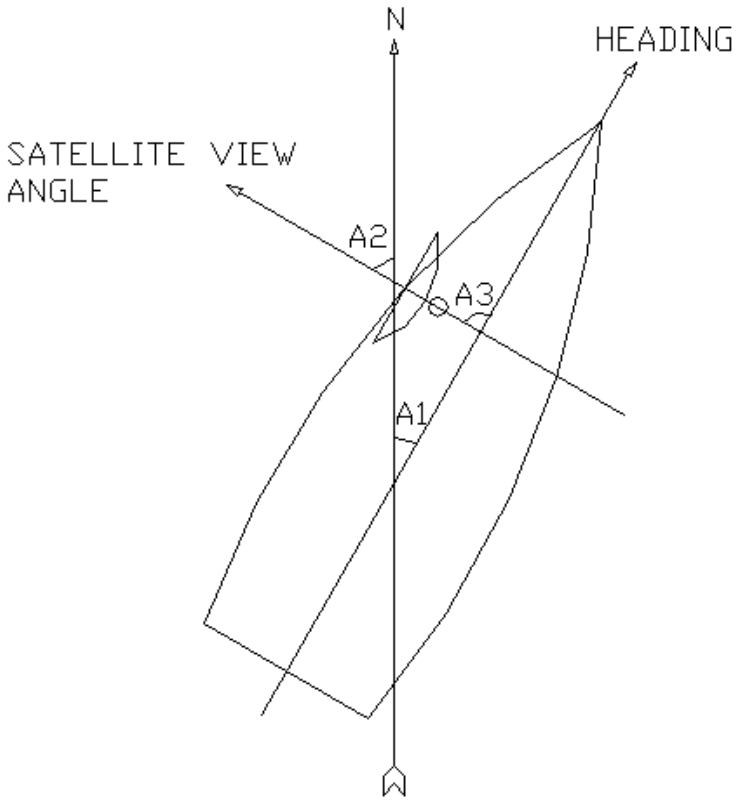
From the "Operation Screen" press "I", then select "Antenna Blockage":





Up to four blockage zones may be defined.

Blockage is given in “Local Position” angles (also see paragraph below), which are Azimuth relative to ships Bow, Elevation relative to ships deck: -

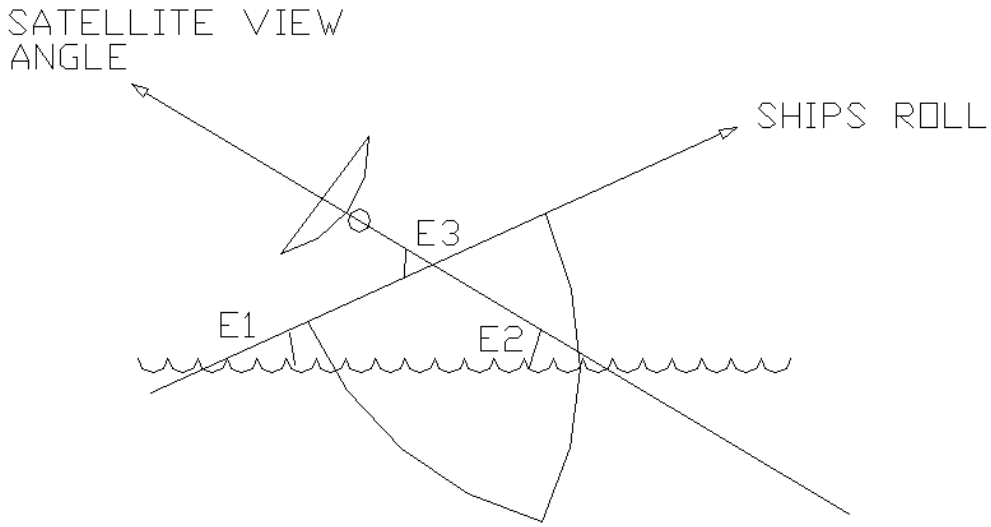


A1 – Ships heading

A2 – Antenna True Azimuth

A3 – Antenna Local Azimuth

Simplified model: Pitch and Roll are zero.



E1 – Ships Roll

E2 – Antenna True Elevation

E3 – Antenna Local Elevation

Simplified model: Pitch and Heading are zero.

One can see that the Local Antenna Azimuth is the Antenna Azimuth with respect to the ships Bow-to-Stern line, rather then the North direction, whereas the Local Antenna Elevation is the Antenna Elevation with respect to the ships deck rather then the horizon level.

The local angles depicted on the diagrams above are only for illustration; the actual mathematical definition of those angles is a bit more complex and takes into consideration ships Pitch, Roll and Heading at all times.

Local angles make the definition of the obstruction zones a whole lot more convenient: survey antenna location and note the corner angles of each obstruction, in Local Azimuth and Elevation.

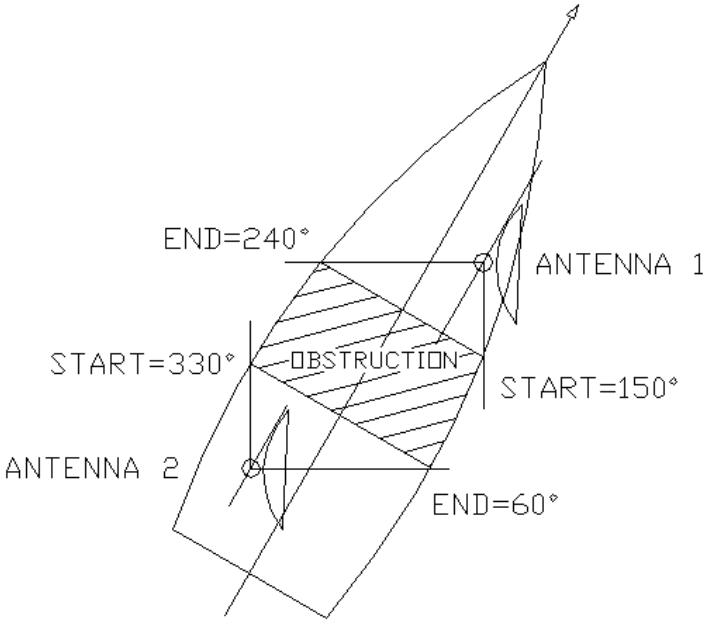
The Obstruction Zone screen allows entering of four angular points defining a single obstruction zone of an antenna: Azimuth Start (from), Azimuth End (to), Elevation Start (from) and Elevation End (to).

Up to four obstruction zones may be entered.

There is no necessity of filling out all the zones, a default setting of a zero value both in “from” and “to” fields will effectively disable the relevant zone.

From the other hand, if a zone is to be defined only in Azimuth, the Elevation angles should be set from –90 to +90 degrees.

An example for a simple obstruction zone setting is presented herein:



In the case above, Antenna 1 is blocked in the range of 90 degrees, starting from 150.0 to 240.0 degrees. Antenna 2 is also blocked in the range of 90 degrees, starting from 330.0 to 60.0 degrees. All of the above, in Local Azimuth terms, of course.

Note that the obstruction zone is defined by a “start” angle, which is always clockwise before an “end” angle.

The obstruction zone setting for both antennas will be as follows:

Antenna 1	Antenna 2
Zone 1	Zone 1
Az from: 150.0 to: 240.0	Az from: 330.0 to 60.0
El from: -90.0 to 90.0	El from: -90 to 90.0
Zone 2	Zone 2
Az from: 0.0 to: 0.0	Az from: 0.0 to 0.0
El from: 0.0 to 0.0	El from: 0.0 to 0.0
Zone 3	Zone 3
Az from: 0.0 to: 0.0	Az from: 0.0 to 0.0
El from: 0.0 to 0.0	El from: 0.0 to 0.0
Zone 4	Zone 4
Az from: 0.0 to: 0.0	Az from: 0.0 to 0.0
El from: 0.0 to 0.0	El from: 0.0 to 0.0

Once set, the CCU will present an “Antenna View Blocked” message when antenna will go in one of the predefined zones. This message may also be read by an external device (such as the iDirect modem in AL-7108-C system), and take action, accordingly

Moreover, when going into antenna blockage zone the controller will automatically revert to “Point-to-Satellite” mode, as it assumes that the Antenna signal is not

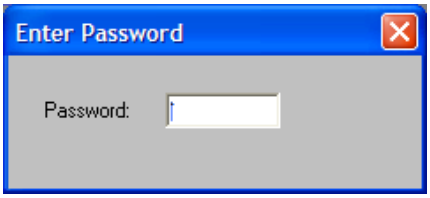
available for Step-tracking. When going out of a blockage zone, the controller will automatically initiate a re-acquisition sequence.

After setting of the Blockage Zones, one must save them in the SBC non-volatile memory.

11.11 Set-up Local Position Antenna Angles Display

Setting-up Local Position display is protected by a High-level password. Please contact Orbit Tech service to get the password. The password will remain valid for a limited amount of time.

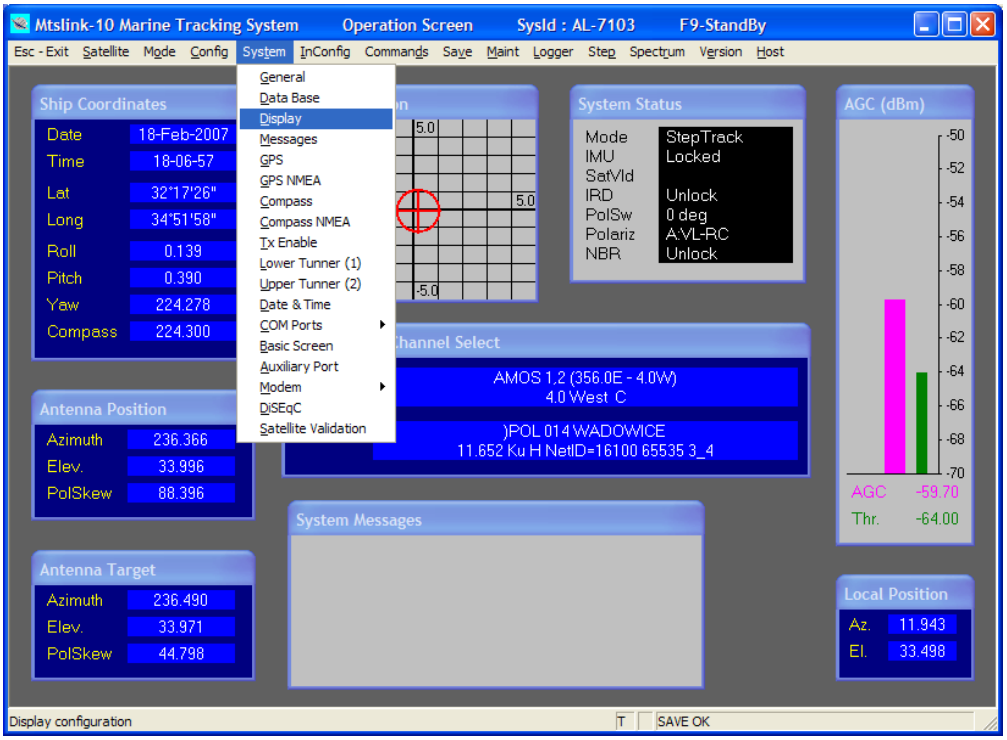
From “Operation Screen” press “U”, the following will appear:

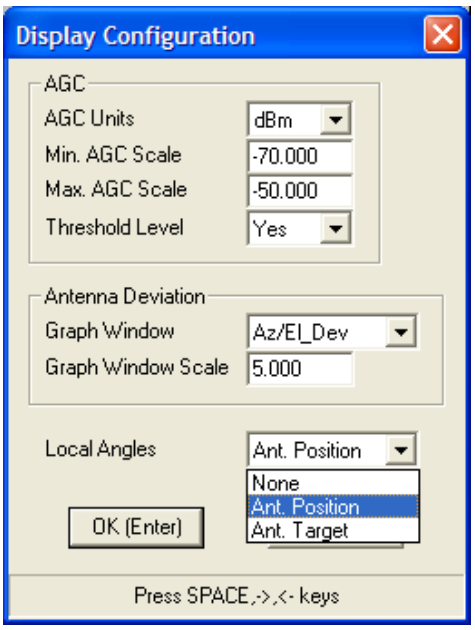


Then type in the valid password

The screen will change to allow access to high-level parameter settings.

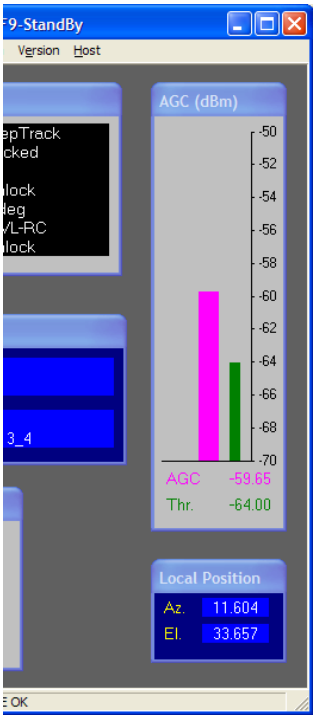
Press “T”, for System configuration, then “D”, for Display menu:





Select “Ant Position” for Local Angles, then “Ok”

This will add a small display window just below the AGC bar:



Save parameters to SBC non-volatile memory.

11.12 Polarization Skew Alignment Procedure

This procedure is applicable for Linear configuration only.

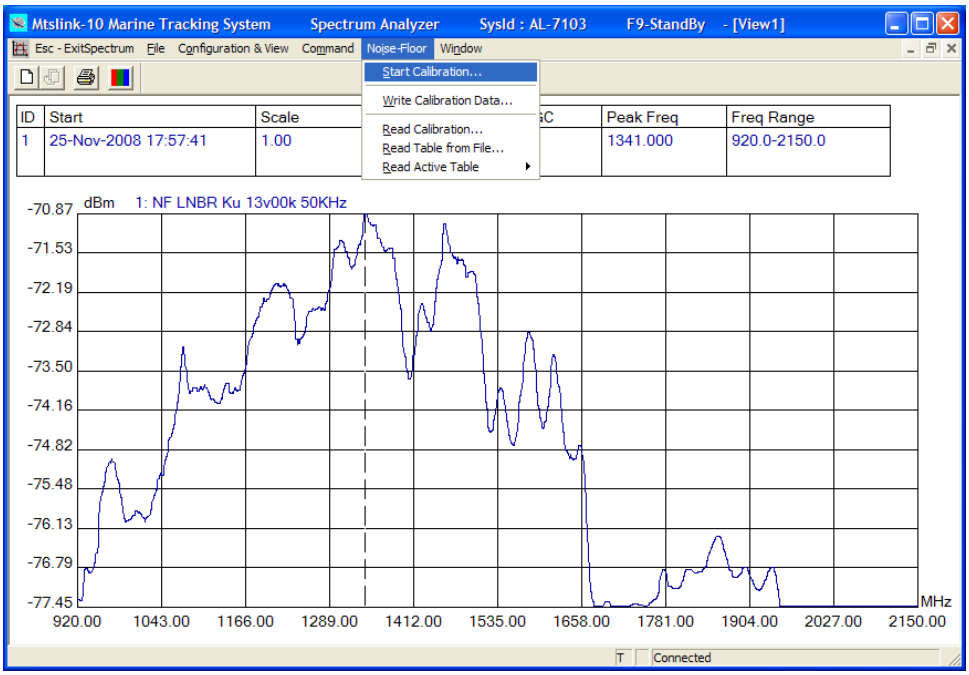
If required, perform the following procedure to align the Polarization Skew.

1. Access InConfig->Axes Parameters and set Alignment Offsets PolSkew to zero.
2. Activate “Acquire”.
3. Wait till the AL-7108 goes thru all the acquisition stages and reaches Step-track.
4. Turn AL-7108 to Peak.
5. Make sure Tracking Signal has at least 8 dB/Hz on the AL-7108 Spectrum Analyzer screen.
6. Change Polarization Switch to the opposite Polarization.
7. Make sure there is no signal on the opposite Polarization – just the noise level.
8. Change Step-Track setup to: “Step-track Axes: Sk”.
9. Make sure that the following parameters are set correctly: “PolSkew Step-type: ON_MIN”, “Axis 3 Sector: 10.0” and “Axis 3 Velocity: 20.0” (in the newly supplied models these are part of the default settings).
10. Set Signal threshold to –80 dBm (write down the original setting!).
11. Activate Step-track.
12. Log “Step-track, PolSkew Deviation” for 2 minutes.
13. Read mean value of the deviation.
14. Insert the mean value into the PolSkew Offset with an opposite sign (if the logged deviation was +2.0 deg, have to enter –2.0 into PolSkew Offset). Note that the offset value should not exceed 5 degrees in either direction. That’s unless the satellite has a known Polarization Skew anomaly (Ex: most of the Eutelsat satellites have 3.5 degree offset from nominal).
15. Turn AL-7108 to Peak.
16. Return the Polarization Switch back to it original position.
17. Return the Step-Track setup back to “Step-track Axes: ConScan”.
18. Return the Signal threshold to its original setting.
19. Activate “Acquire”.
20. To validate that the Polarization Skew is correct, repeat steps 3-13. Make sure that now the recorded PolSkew Deviation mean value is within +/- 0.5 degree. Then repeat steps 15-19.
21. Save settings in non-volatile memory.

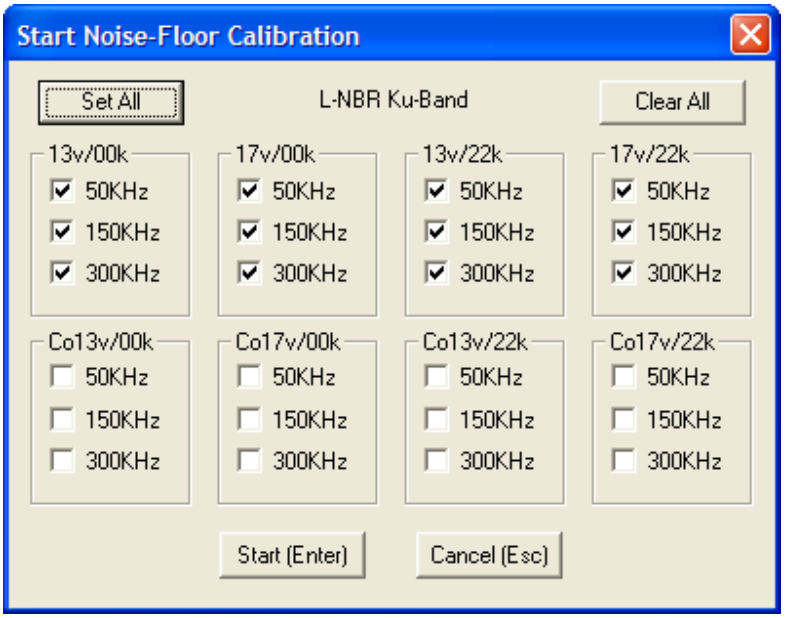
11.13 Noise Floor Calibration

To perform Noise Floor Correction, perform the following steps:

1. Point the antenna away from any radiating source. If not on the Equator, use the “Stow-up” command.
2. Access the Spectrum Analyzer screen (press “R”)
3. Select “Noise-Floor” (press “i”) and then “Start Calibration…”



The following sub-screen will appear:



Check the relevant calibration lines as per the table below:

For Single-band LNB (ex Norsat 1000HA,B or C): three calibration lines –
1. 17v/00KHz 50KHz 2. 17v/00KHz 150KHz 3. 17v/00KHz 300KHz
For Dual-band LNB (ex SMW Q-pll Type-C): six calibration lines –
1. 13v/00KHz 50KHz 2. 13v/00KHz 150KHz 3. 13v/00KHz 300KHz 4. 17v/00KHz 50KHz 5. 17v/00KHz 150KHz 6. 17v/00KHz 300KHz
For Quad-band LNB (ex SMW Q-pll Type-O): twelve calibration lines –
1. 13v/00KHz 50KHz 2. 13v/00KHz 150KHz 3. 13v/00KHz 300KHz 4.17v/00KHz 50KHz 5. 17v/00KHz 150KHz 6. 17v/00KHz 300KHz 7. 13v/22KHz 50KHz 8. 13v/22KHz 150KHz 9. 13v/22KHz 300KHz 10. 17v/22KHz 50KHz 11. 17v/22KHz 150KHz 12. 17v/22KHz 300KHz

In case of CoPol/Xpol antenna feed, all the above should be repeated for CoPol: for example, for CoPol/Xpol feed equipped with two 4-Band LNB's, all 24 lines should be checked in.

Note that calibration of excess number of lines (for example – calibration of all 24 lines for Single-band LNB) does not hurt! The system will simply disregard the surplus information.

4. After checking in all the relevant calibration lines, hit the "Start" button.

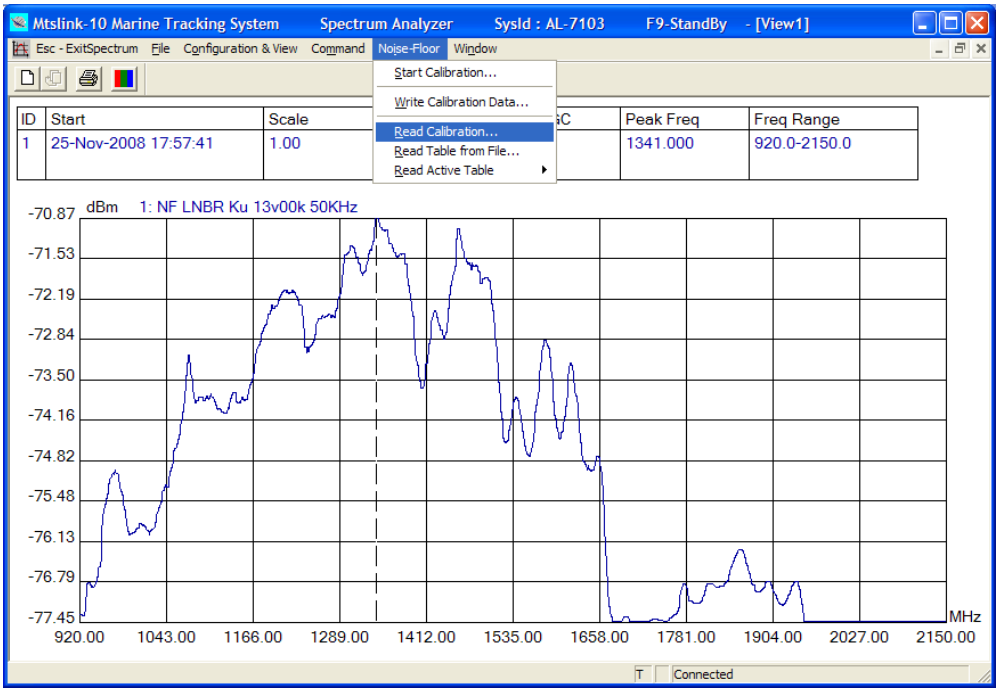
The calibration process will be completed in a fully automatic manner, scanning the calibration lines one by one, each taking about 20 seconds.

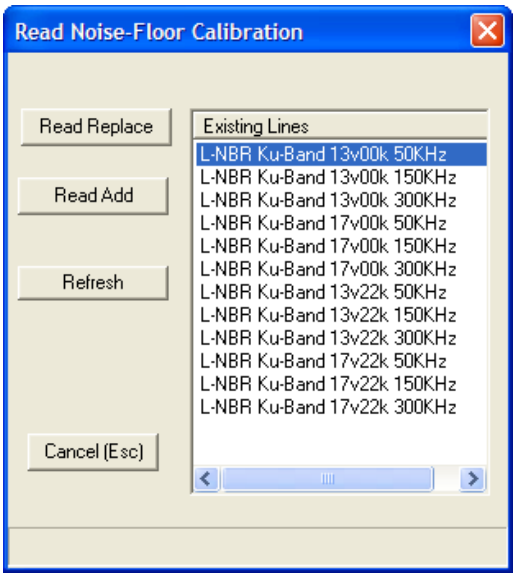
The interim scan-results are presented and may be compared to the examples given below.

The results may also be viewed after the whole process is completed and the following message presented:

Hit “Write” to save the calibration results in the SBC Flash memory.

5. To review the measured data, select “Noise-Floor”, then “Read Calibration…”





The curves may be presented in pairs. Use “Read Replace” to view a single curve, use “Read Add” to add a second curve.

It is recommended to review all the lines and compare to the relevant examples given below. The curves do not have to be identical, but should have a reasonable level of correlation with the examples.

6. Access NBR Set-up in the Receiver Sub-window of the Maintenance screen and make sure that the Noise Floor Correction is set to “Yes”.

Note that the condition of the Noise Floor Correction parameter during the calibration process is not important, the calibration program takes care of it automatically.

If there were no calibration files in the SBC memory before start of the procedure, a "Warning 180 No Noise Floor Table" should be presented.

7. Access the "Src" Set-up in the Receiver Sub-window of the Maintenance screen and change the current selection to a different one, and then return back to original.

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This Paragraph may be skipped when using Software Version 4.51 or higher

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For example if in "L-NBR", momentarily select "Tuner1", then select "L-NBR" again.

This action causes the software to use the new calibration data.

Make sure, that the Warning message disappears and the AGC level is at about –80 dB level.

8. Access the "In-Config -> Display" menu and set the Min AGC Scale to –80 dBm and Max AGC Scale to –60 dBm

9. Access the "Commands -> Set Threshold" and set the Threshold to –75 dBm

10. Save all parameters

12 Appendix A – Installation and Removal of Ku-Band and C-Band Feed Kits

12.1 Overview

12.1.1 Introduction

As an option, a Global Linear Ku Band Kit (Kit29-0015-8W-EX) is available. This kit is available only for installation on those AL-7108-SYS4 systems that were ordered with Orbit's 20W or 40W RF package.

The Kit includes:

- Linear Ku band feed assembly
- 8W Ku Band BUC
- RF Cables
- All hardware necessary for mounting the equipment
- Installation manual.

This chapter/appendix provides information and instructions required to change between C-Band and Ku-Band configurations of the 7108-SYS-4 System.

This document includes the following procedures:

Changing the system configuration from C-Band to Ku-Band

- Removal of C-Band Feed.
- Installation of Ku-Band Feed.

Changing the system configuration from Ku-Band to C-Band

- Removal of Ku-Band Feed.
- Installation of C-Band Feed.

Only authorized and qualified ORBIT technicians should perform the following procedure.

Do not disconnect cables when the system is powered-up.

Do not apply power to the system when the BUC output is not connected to the Feed.

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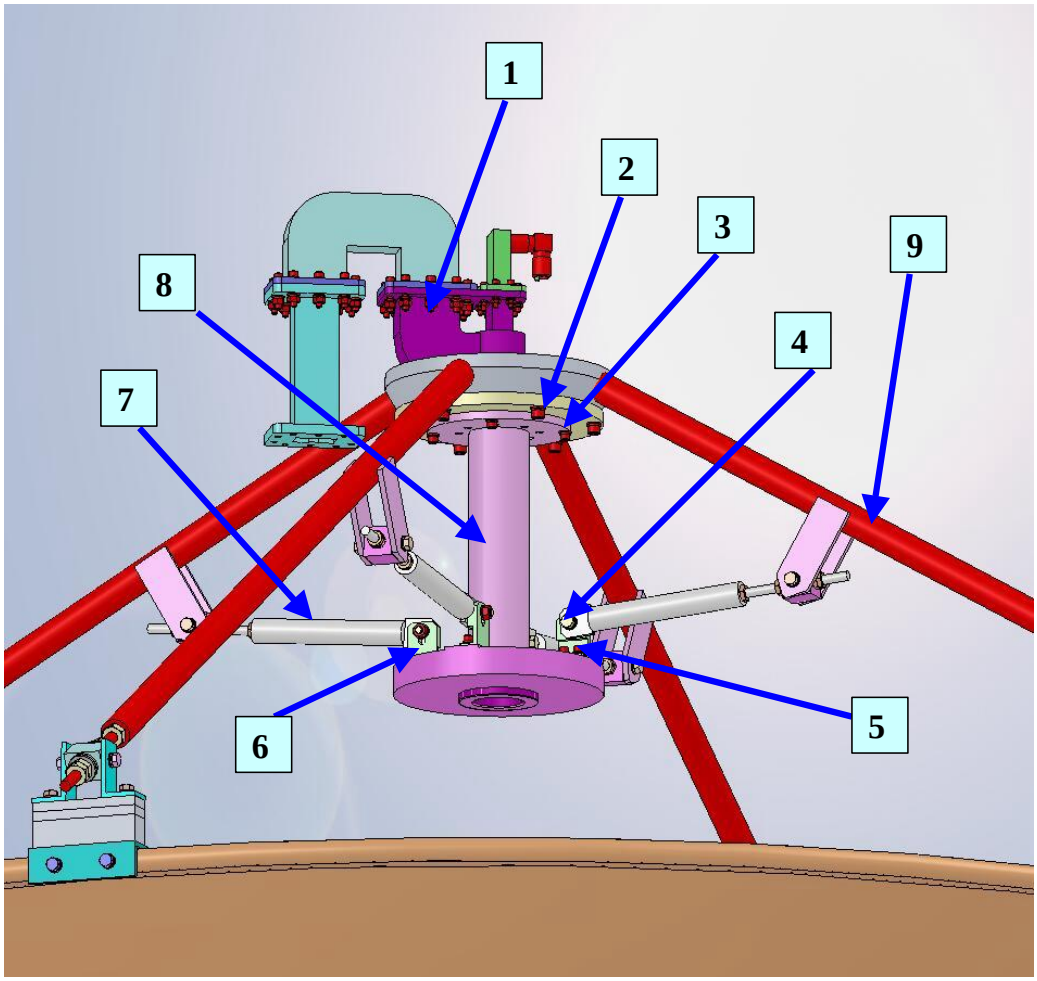
12.2 Changing the System Configuration from C-Band to Ku-Band

12.2.1 Removal of C-Band Feed

General

The following Figure depicts the C-Band Feed general arrangement.



Legend:

1) *OMT (TYPx1)*
2) *Hex socket screw M8x25 + plain washer M8 + spring washer M8 (TYPx6)*
3) *Hex socket screw M6x18 + plain washer M6 + spring washer M6 (TYPx4)*
4) *Hex head screw M8x30 + 2 plain washers M8 + spring washer M8 + hex nut M8 (TYPx4)*
5) *Hex socket screw ¼-20x5/8" + plain washer #1/4 + spring washer #1/4 (TYPx8)*
6) *Adaptor bracket (TYPx4)*
7) *Reinforcement arm (TYPx4)*
8) *Feed (TYPx1)*
9) *Pod leg (TYPx4)*

Figure 12-1: C-Band Feed – General Arrangement

Prior to feed replacement, verify the following:

i. The Antenna inside the radome must be positioned down to it's lowest limit (as shown in the following Figure).

ii. Main AC power is turned off, including SDU power.

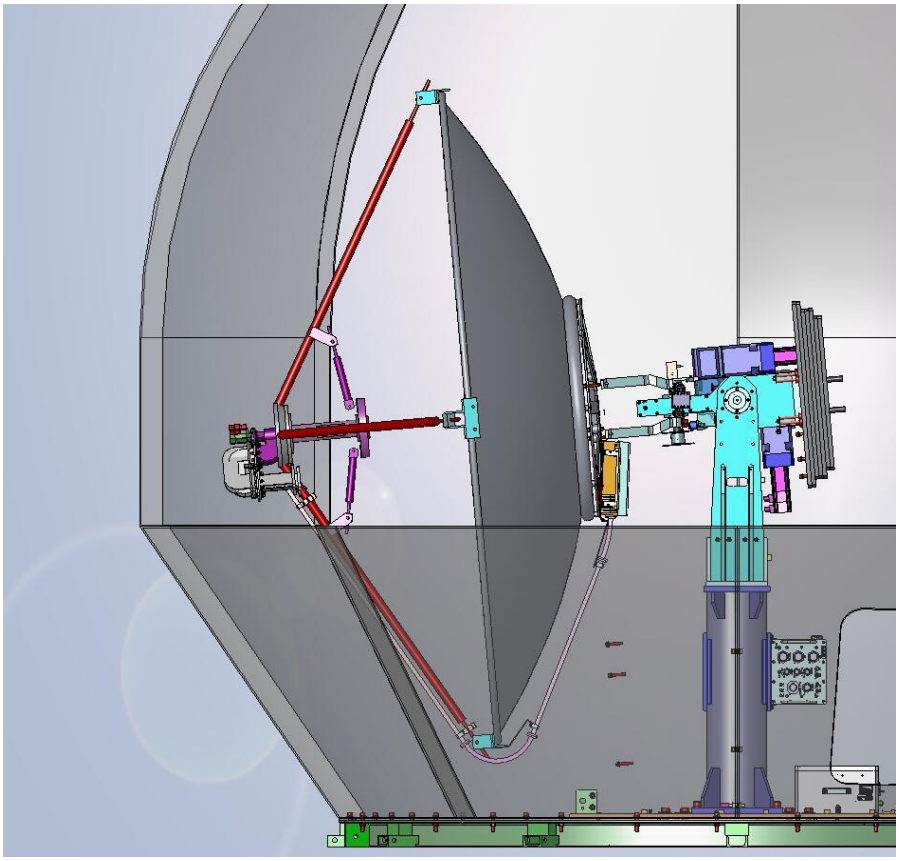


Figure 12-2: Antenna Position for Feed Replacement

C-Band Feed Removal Instructions

Disconnecting cables:

1. Disconnect "c" Tx cable (black) from the feed.

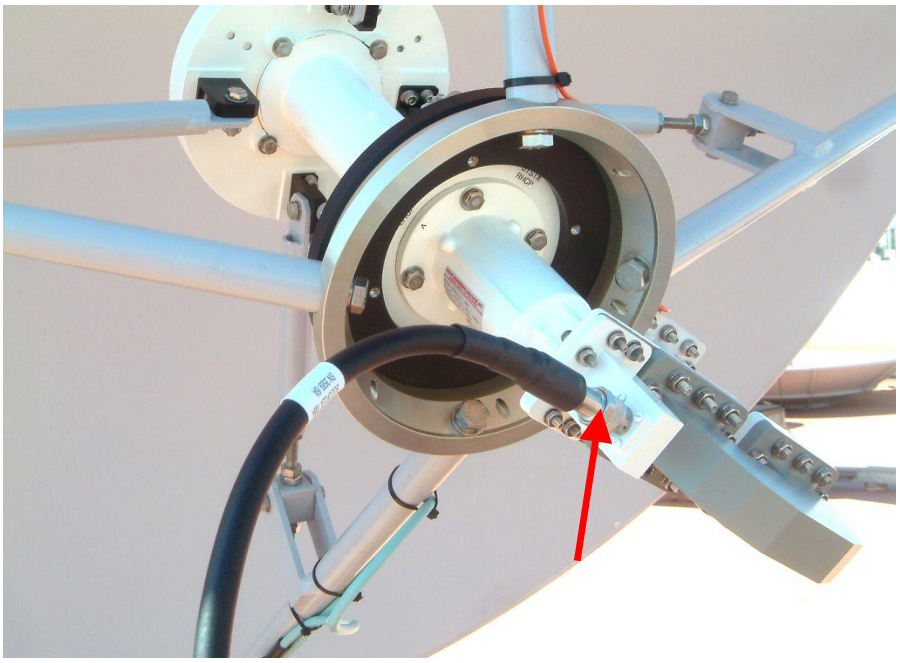


Figure 12-3: Disconnecting C-Band Feed Tx Cable

2. Unplug "n" type connector of the cable from the feed.
3. Disconnect Rx cable from the LNB.

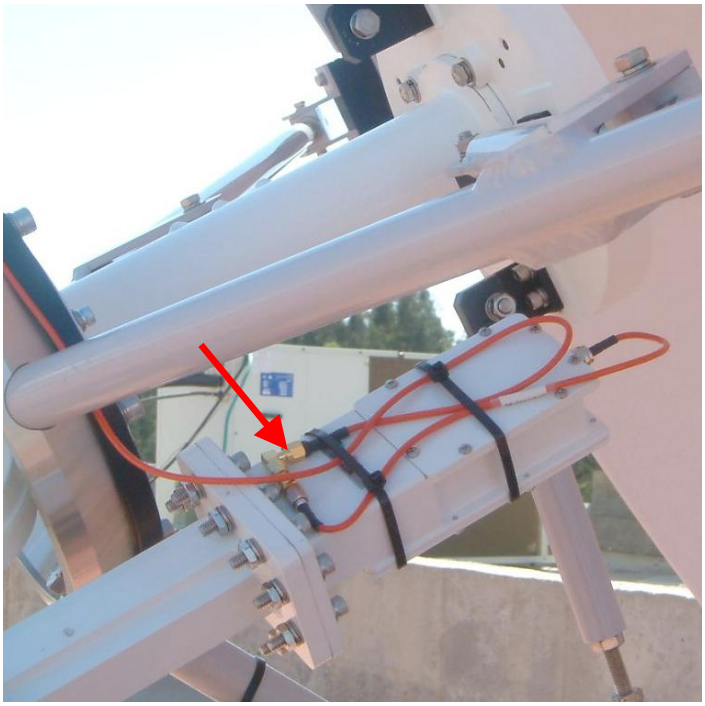


Figure 12-4: Disconnecting C-Band Feed Rx Cable

4. Unplug the "f" type connector of the cable from the LNB.
5. Disconnect "c" Tx cable from the "c" BUC output
6. Disconnect "l band" cable (yellow) from BUC input.

7. Disconnect power cable (black) from BUC connector.
8. Disconnect M&C cable (split) from BUC connector.

Removing the OMT:

Remove and retain¼ inch UNC screws and attached washers (TYPx4)

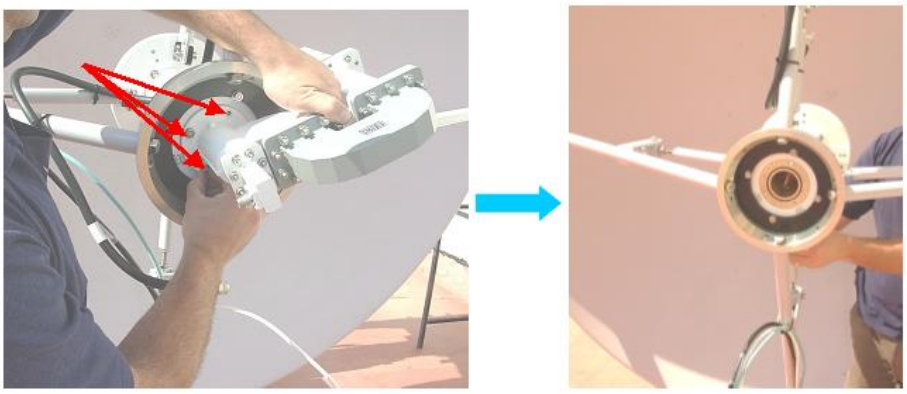


Figure 12-5: Removing the OMT

Removing the Feed Bracket:

1. Remove and retainM8 screws with attached nuts and washers (TYPx4).

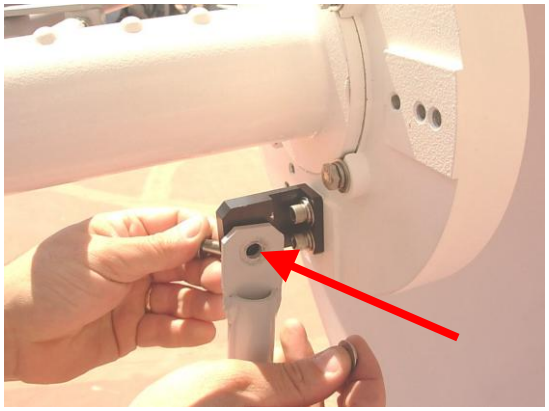


Figure 12-6: Removing the Feed Bracket (1)

2. Remove and retainM6 screws with attached washers (TYPx8). Remove 4 black brackets to be used in "Ku" feed as well.

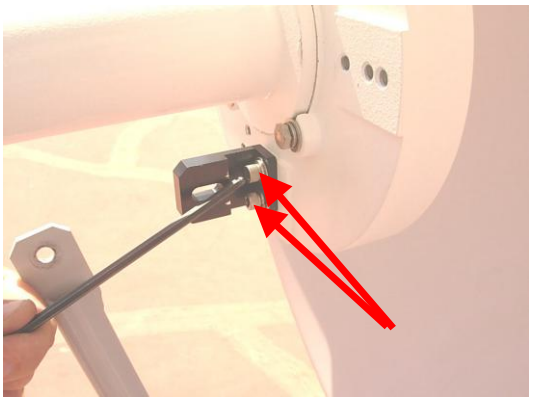


Figure 12-7: Removing the Feed Bracket (2)

Removing the Feed:

1. Remove and retainM8 screws with attached washers (TYPx6). Take out the feed.

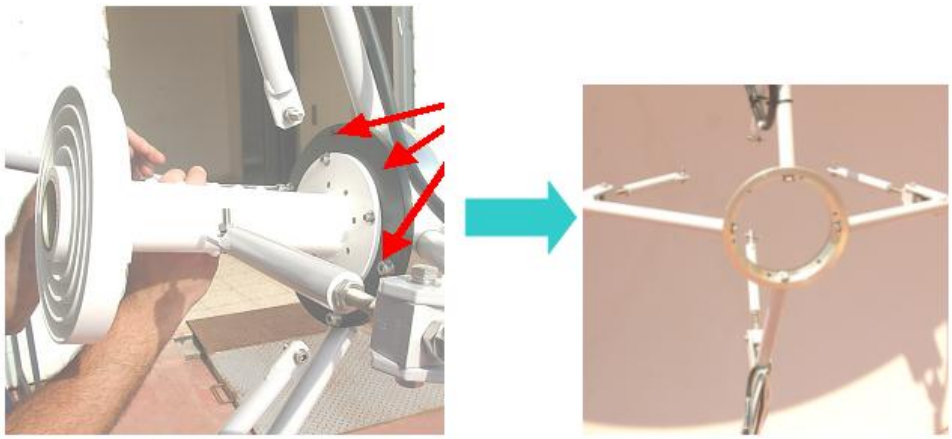


Figure 12-8: Removing the Feed

Feed Storage:

1. Re-assemble the OMT and feed with ¼ inch screws and washers (TYPx4) and put it into the storage box.

Figure 12-9: Feed Storage

12.2.2 Installation of Ku-Band Feed Kit

Ku-Band Feed Kit

The Ku-Band Feed Kit is contained and supplied within two dedicated packing boxes:

Packing Box #1 contains the following items:

- 8W Ku-Band BUC
- Cables
- Instruction sheets.

Packing Box #2 contains the following items:

- Ku-Band Feed Assembly

Figure 12-10: Ku-Band Feed Kit – Packing Boxes

Installation of Ku-Band Feed Kit

Preliminary Steps:

Prior to kit assembling, the following steps are to be done:

1. Turn out 4 fixing short arms of quadropod (see drawing).
2. Fix the “C” TX cable along the quadropod’s leg using gentle tie wraps.
3. Route the polarizing and "Ku" Tx cables and fix it along the cables channel behind the dish and along the quadropod legs using tie wraps.

These cables are sensitive, please use gentle tie wraps with minimal force.

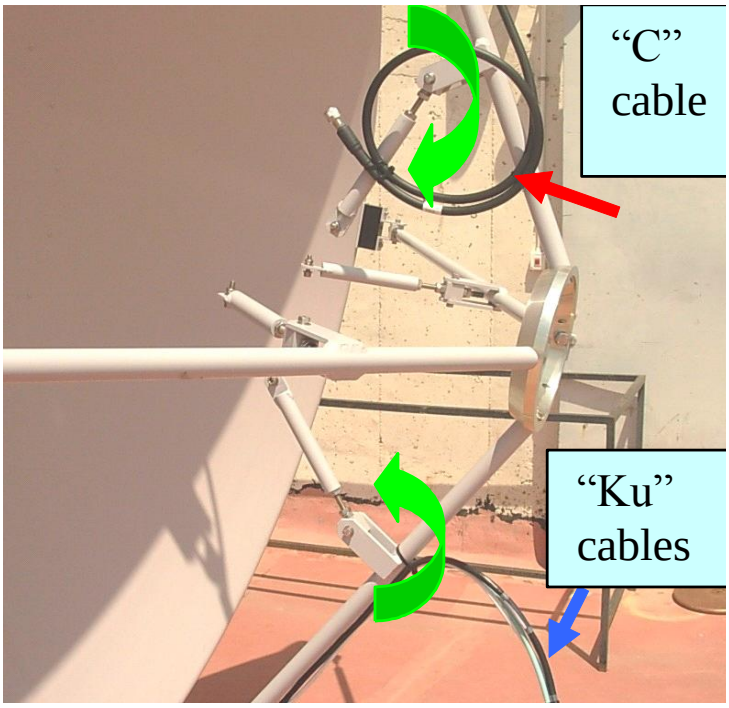


Figure 12-11: Securing the Cables

Assembling the “Ku” feed:

Before feed installation do the following steps:

1. Disconnect the "IF" Rx (red) and "Ku" Tx (silver) cables from rotary joint.

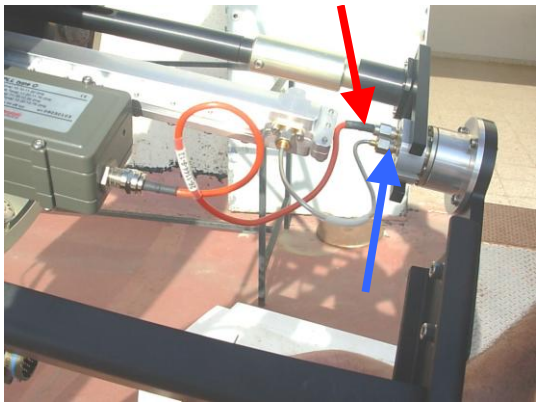


Figure 12-12: Rotary Joint Cables

2. Remove and retain 2 screws M4x16 with attached washers. Remove the rotary joint subassembly from the feed.

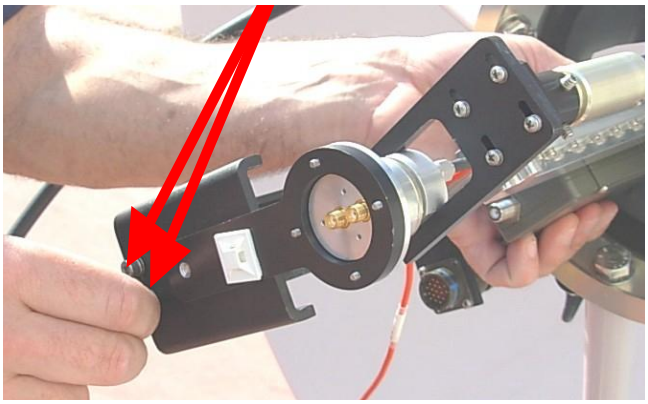


Figure 12-13: Removal of Rotary Joint

"Ku" feed installing and orientation

1. Insert feed through centering ring from dish side towards out

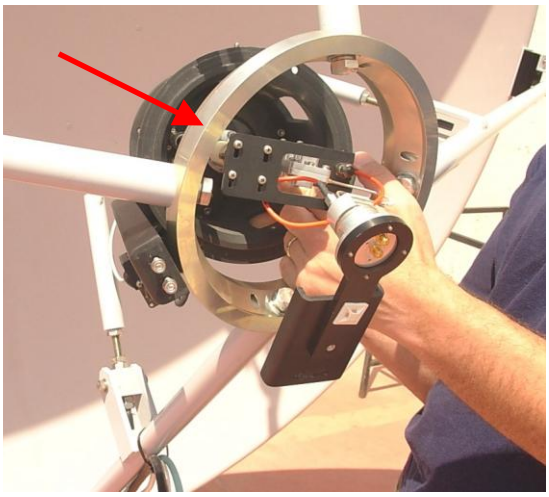


Figure 12-14: Feed Installation

2. Feed must be oriented according to the picture in reference to the pod with the cables. Rotary joint must be placed such that secondary channel is out away from black bracket.

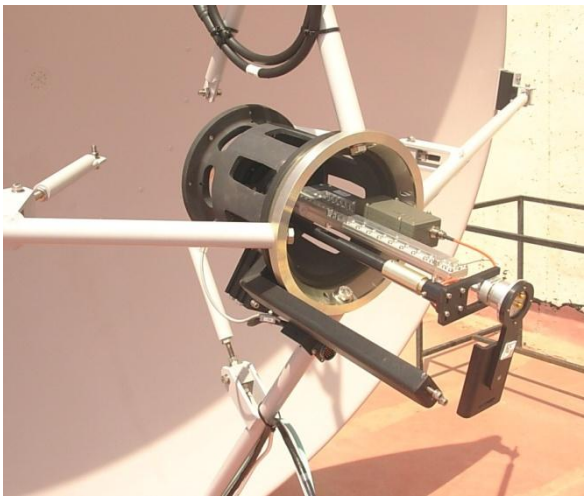


Figure 12-15: Feed Orientation

"Ku" feed tightening

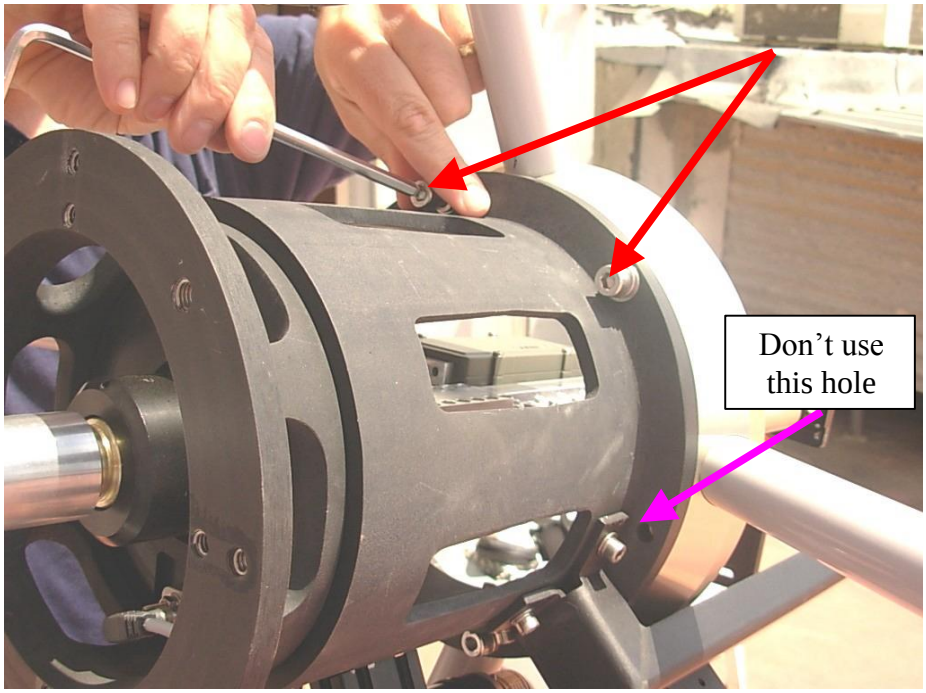


Figure 12-16: Tightening the Feed

Secure the feed to the centering ring byM8x25 screws with attached plain and spring washers (TYPx5)

Rotary joint assembling

Attach (don't secure) the rotary joint subassembly by M4 screws with attached plain and spring washers (TYPx2). Gradually secure them while rotating the feed's axis.

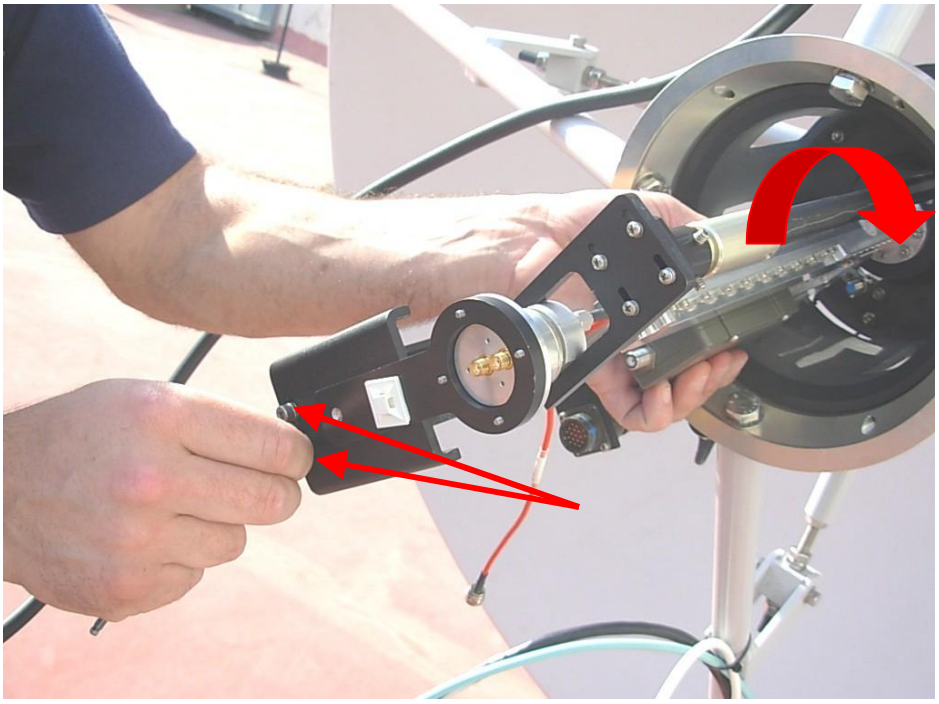


Figure 12-17: Installation of Rotary Joint

Feed's bracket assembling

1. Attach the bracket to the feed's bottom ring byM6 screws (only one screw for each bracket) with plain and spring washers (TYPx4). Don't tight it at this step.

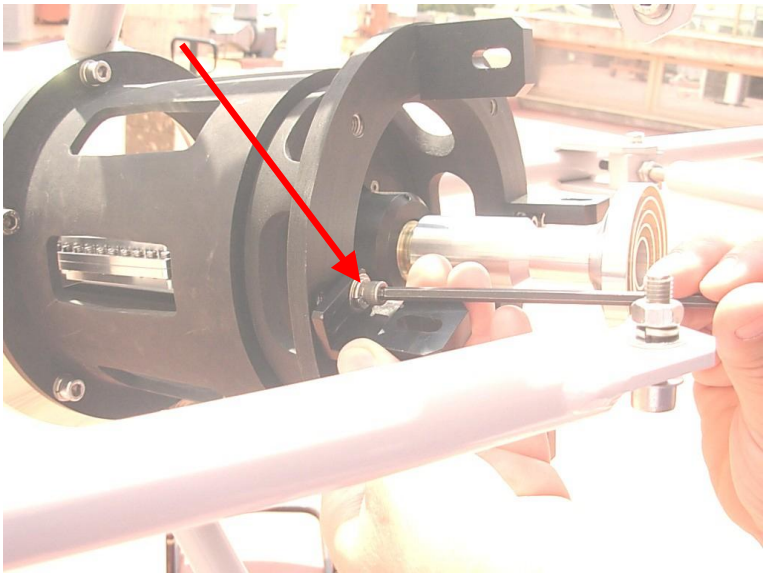


Figure 12-18: Installation of Feed Bracket

2. Attach the reinforcement arm to the bracket and verify the following:

   There must be a clearance of 3mm max between the arm and the bracket. Otherwise, if the clearance is more than 3mm or an overlapping is occurred, spin the bracket around the screw and attach the bracket from the other side of the arm.

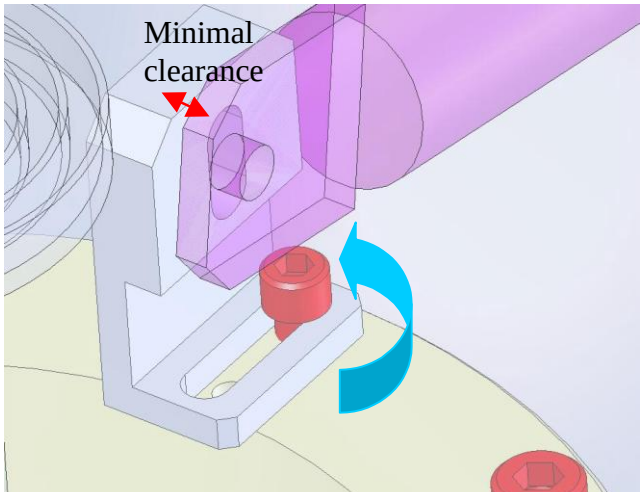


Figure 12-19: Bracket Clearance

Check that it is possible to insert the M8 screw through the holes in arms and bracket without forcing the parts. If not, adjust the arm length by opening & closing the m10 nuts on the arm.

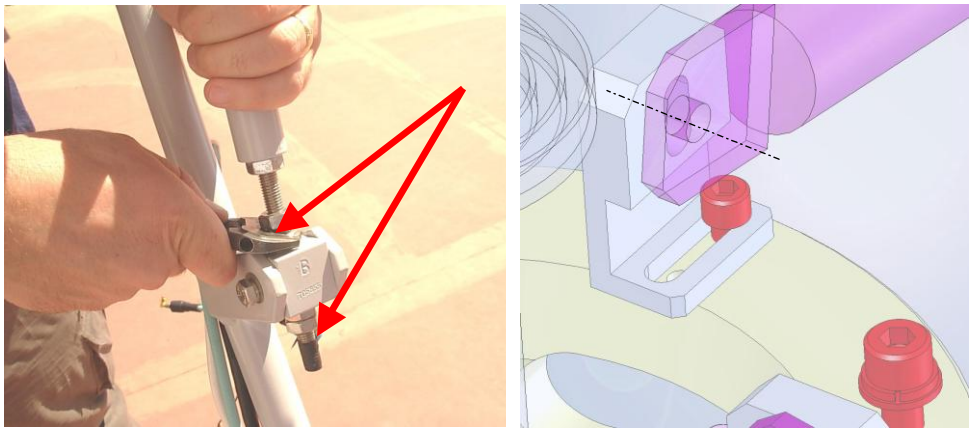


Figure 12-20: Adjusting the Arm Length

After all adjustments are done, secure the second M6 screw of each bracket and M8 screw with attached washers and nuts.(TYPx4)

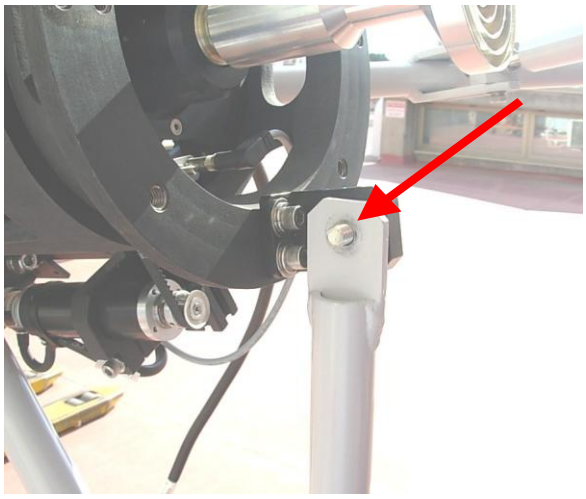


Figure 12-21: Securing the Arm

Cables Connection to Feed

1. Connect the LNB to the rotary joint by "IF" (red) cable to side connector of the rotary joint.
2. Connect the RF chain to the rotary joint by semi rigid (silver) cable to center connector of the rotary joint.

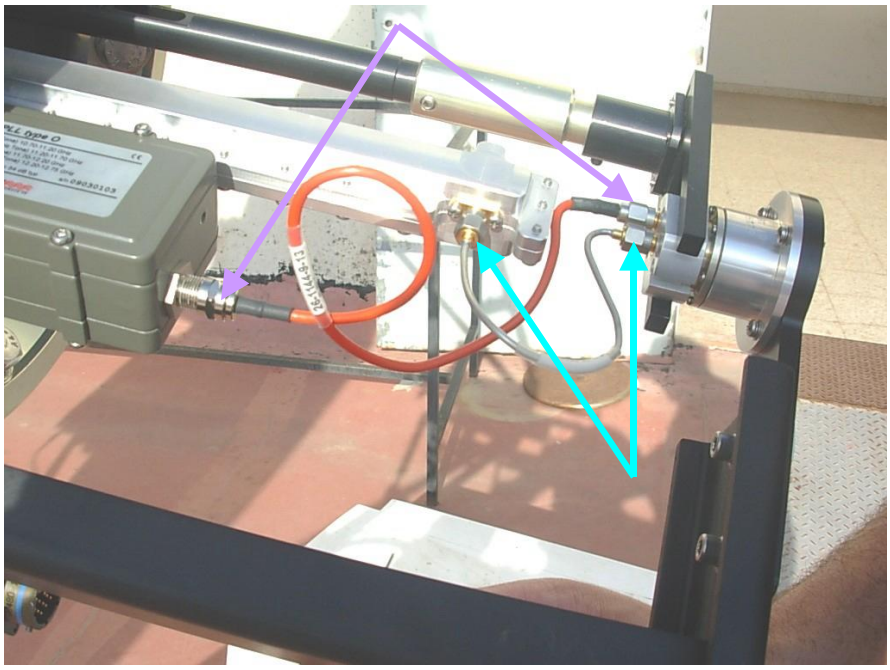


Figure 12-22: Rotary Joint Cables

3. Connect "Tx" cable (grey) to the center connector of the rotary joint.
4. Connect "Rx" cable (white) to the short black cable (used as adaptor) and to the side connector of the rotary joint.

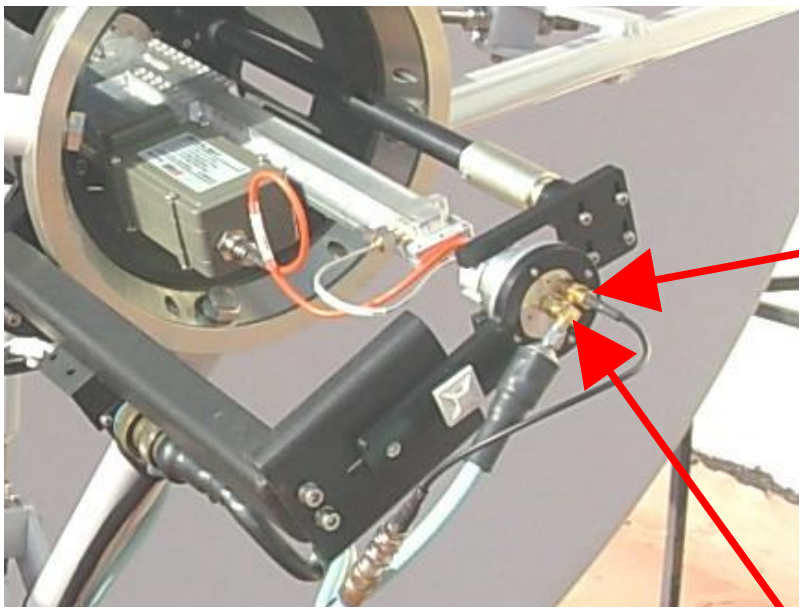


Figure 12-23: Rotary Joint Cables

BUC 8W installation

1. Hardware assembly - Secure the M8 screw with attached plain and spring washer (TYPx8)

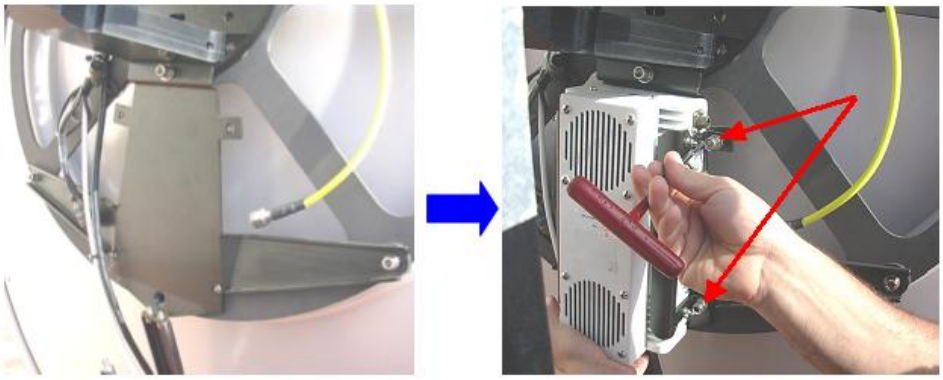


Figure 12-24: BUC Installation

2. BUC cables connection:
   - Connect yellow cable ("n" type) to BUC input connector
   - Connect grey cable (SMA) to BUC output connector
   - Connect "y" shape cable to BUC power & M&C connector.

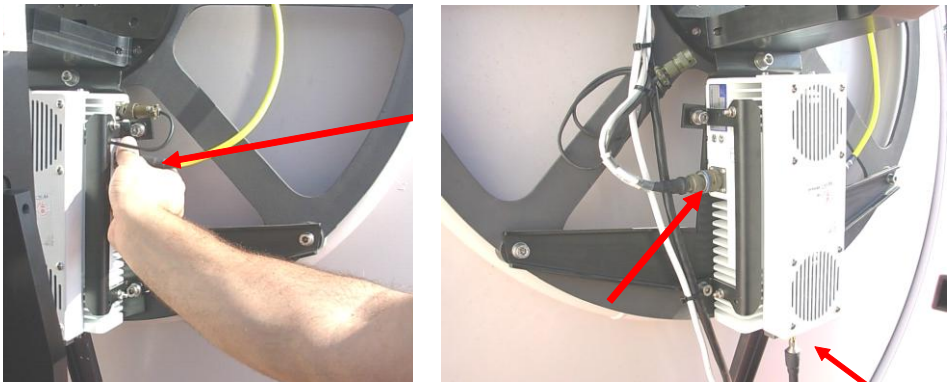


Figure 12-25: BUC Cables Connection

12.2.3 Changing the Software Configuration from C-Band to Ku-Band

Following the installation of the Ku-Band Feed Kit, perform the following procedure to change the software configuration from C-Band to Ku-Band configuration:

i. Apply power to the system.

ii. Access **Maintenance Screen** -> **Receiver** window and set **Band** to **Ku Linear**. Refer to the following Ku-Band Band Setup screens:

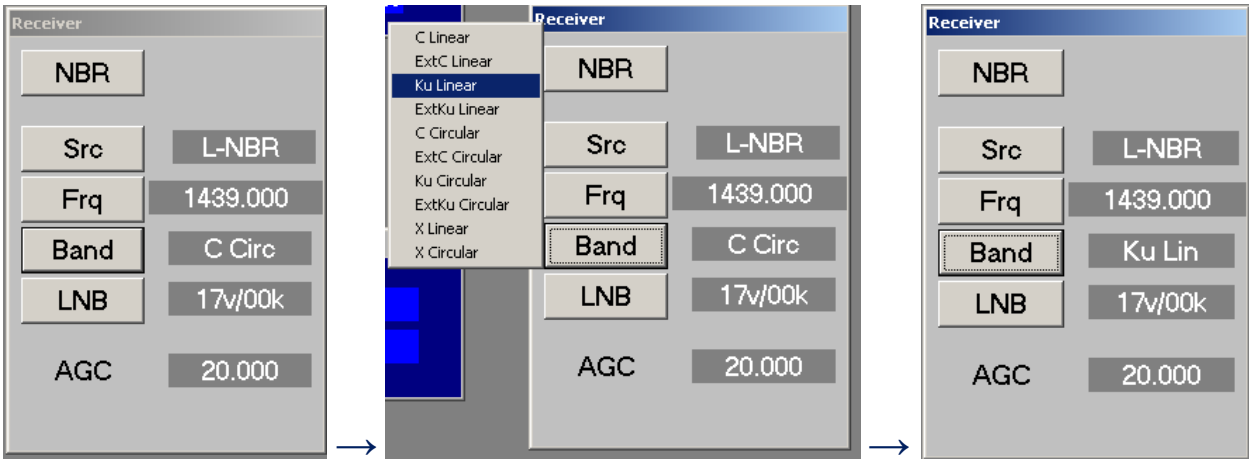


Figure 12-26: Changing Tracking Band Setting

iii. Access **Maintenance Screen** -> **Tx Chain** window and set BUC Model to **8W Ku Agilis M&C**. Refer to the following Ku-Band Tx Chain Setup screens.

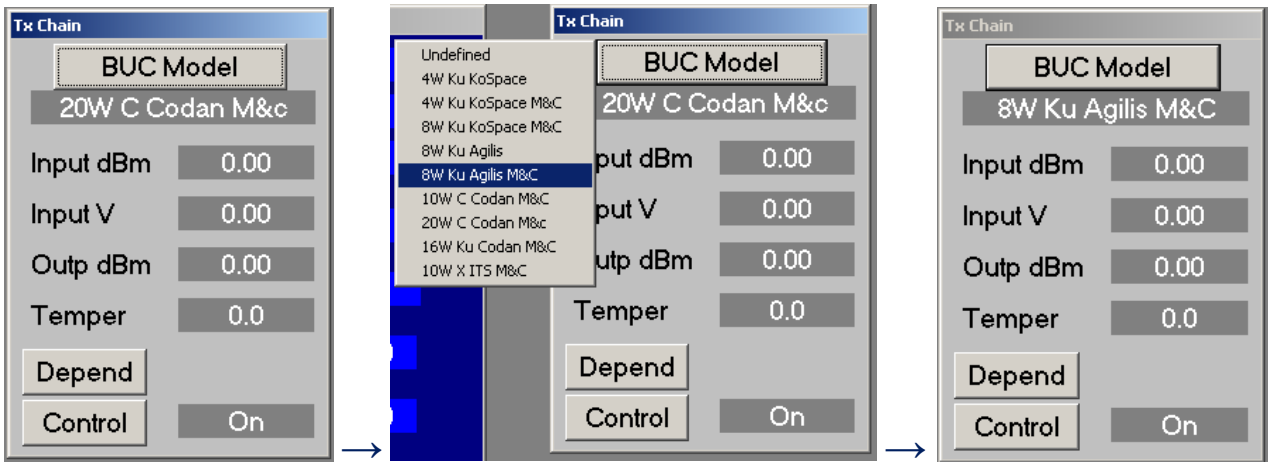


Figure 12-27: Changing BUC Setting

12.3 Changing the System Configuration from Ku-Band to C-Band

12.3.1 Removal of Ku-Band Feed Kit

Removal of Ku-Band Feed Kit

BUC 8W removal

1. BUC cables disconnection:
   - Disconnect yellow cable ("n" type) from BUC input connector
   - Disconnect grey cable (SMA) from BUC output connector
   - Disconnect both connectors of the "y" shape cable. Remove the "y" shape cable and store it with the KU-Band Feed Kit for the next installation.

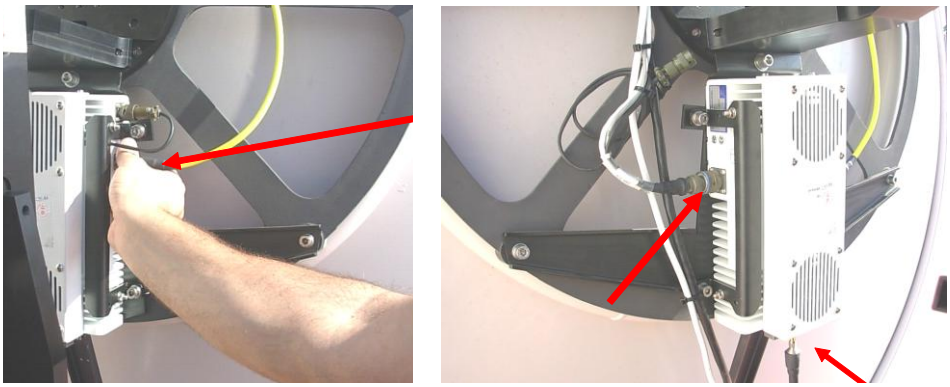


Figure 12-28: BUC Cables Disconnection

2. Hardware removal – Remove the M8 screws and spring washers (TYPx8).
3. Remove the BUC.

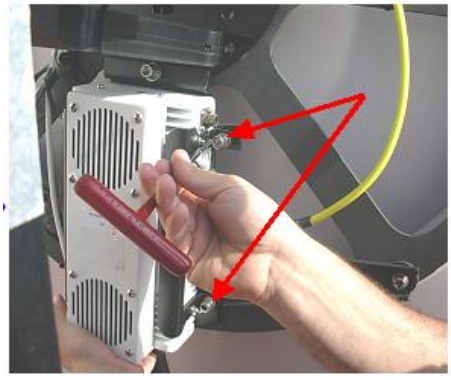


Figure 12-29: BUC Removal

Cables Disconnection from Feed

1. Disconnect the LNB from the rotary joint - “IF" (red) cable from side connector of the rotary joint.
2. Disconnect the RF chain from the rotary joint - semi rigid (silver) cable from center connector of the rotary joint.

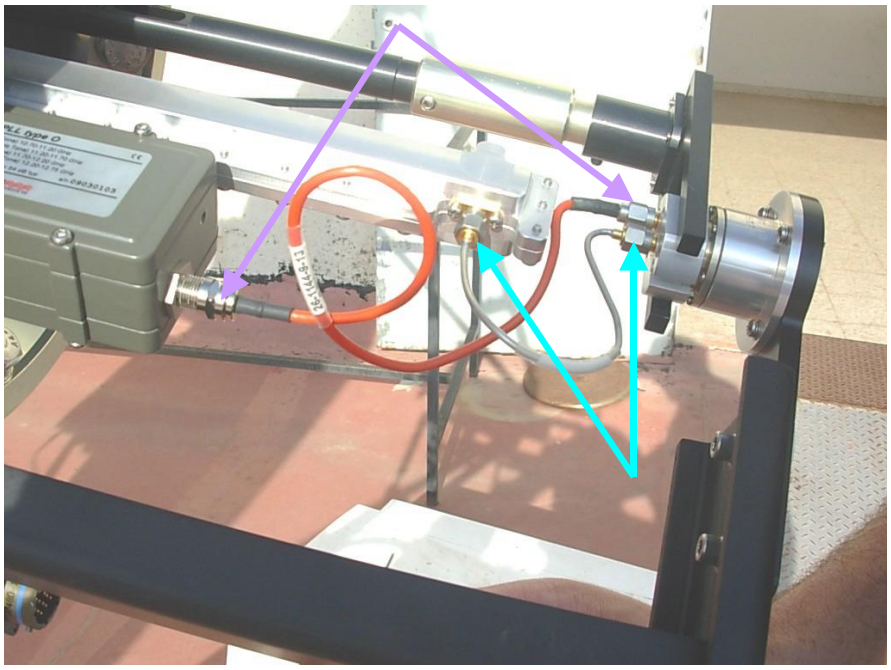


Figure 12-30: Rotary Joint Cables

3. Disconnect "Tx" cable (grey) from the center connector of the rotary joint.
4. Disconnect "Rx" cable (white) from the short black cable (used as adaptor) and from the side connector of the rotary joint.

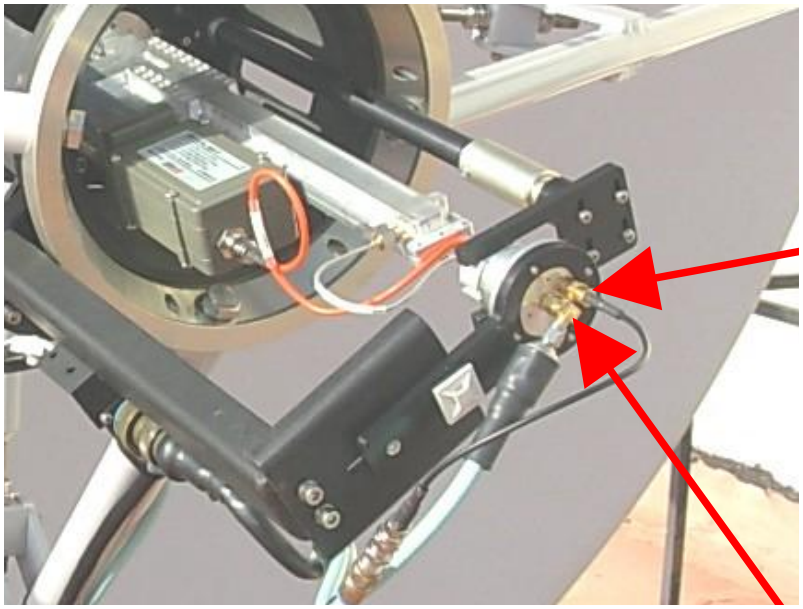


Figure 12-31: Rotary Joint Cables

Feed's bracket removal

1. Remove the bracket from the feed's bottom ring by removing M6 screws (only one screw for each bracket) with plain and spring washers (TYPx4).

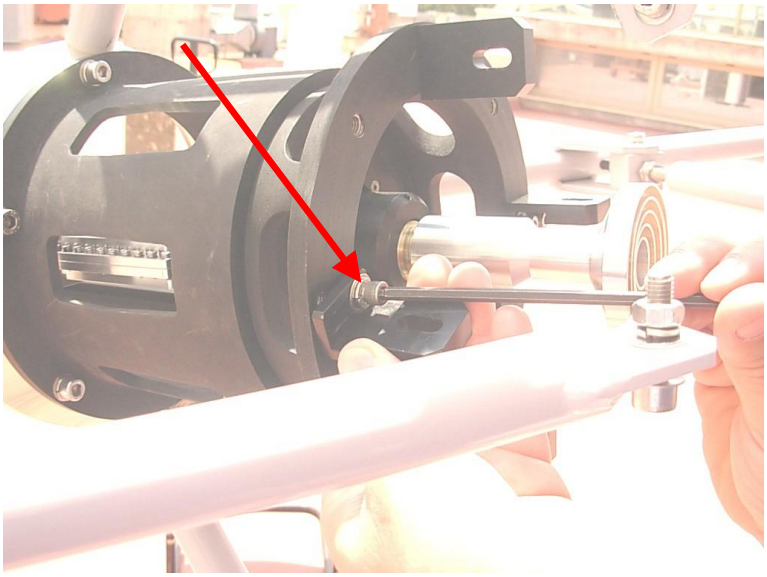


Figure 12-32: Removal of Feed Bracket

2. Remove the reinforcement arm from the bracket.

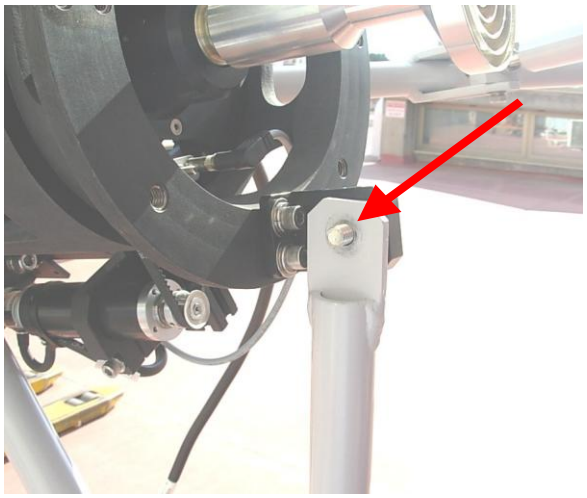


Figure 12-33: Removing the Arm

Rotary joint removal

Remove the rotary joint subassembly by removing M4 screws with spring washers (TYPx2).

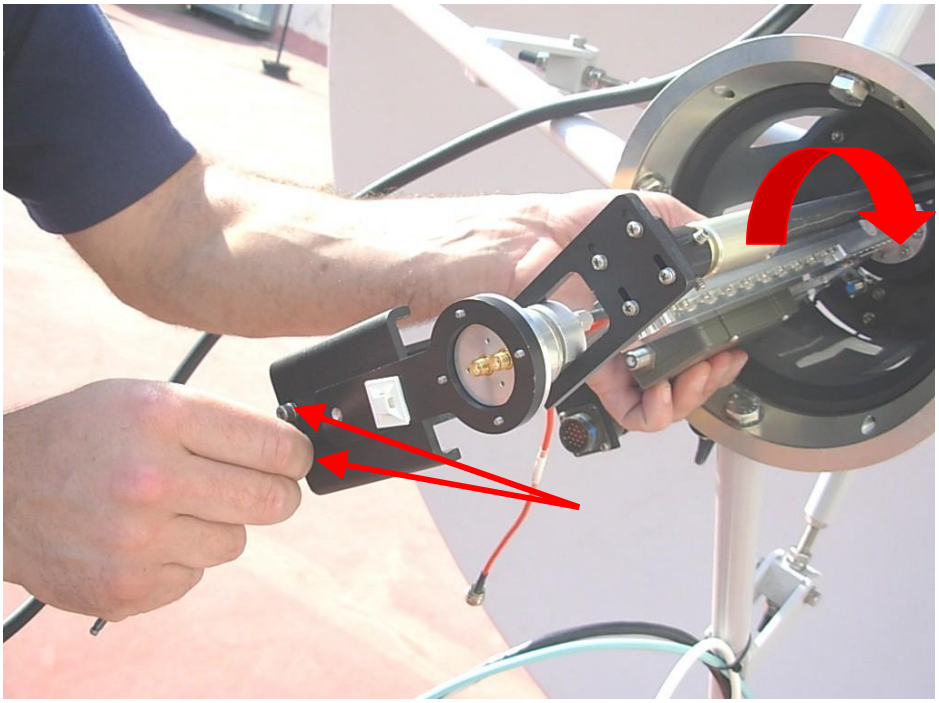


Figure 12-34: Removing the Rotary Joint

"Ku" feed removal

1. Remove the feed from the centering ring by removing M8x25 screws with spring washers (TYPx5)

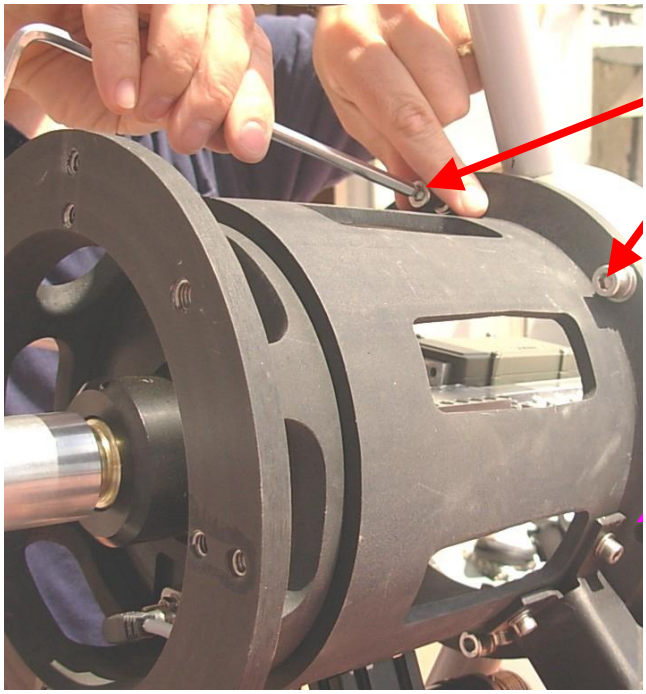


Figure 12-35: Removing the Feed Screws

2. Remove the feed through dish centering ring.

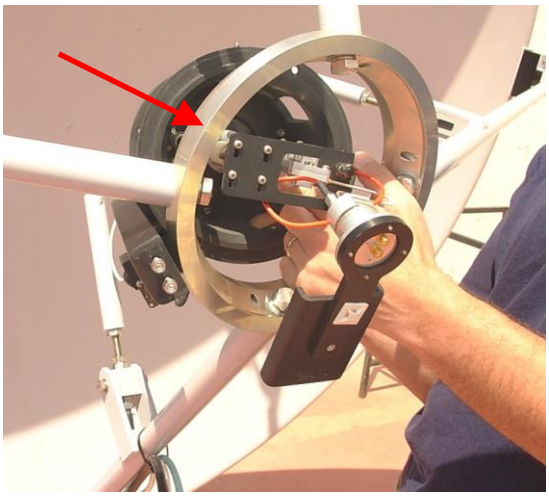


Figure 12-36: Feed Removal

Final Removal Steps:

After kit removal, the following steps are to be done:

1. Turn out 4 fixing short arms of quadropod.
2. Route the polarizing and "Ku" Tx cables and fix it along the cables channel behind the dish and along the quadropod legs using tie wraps.

These cables are sensitive, please use gentle tie wraps with minimal force.

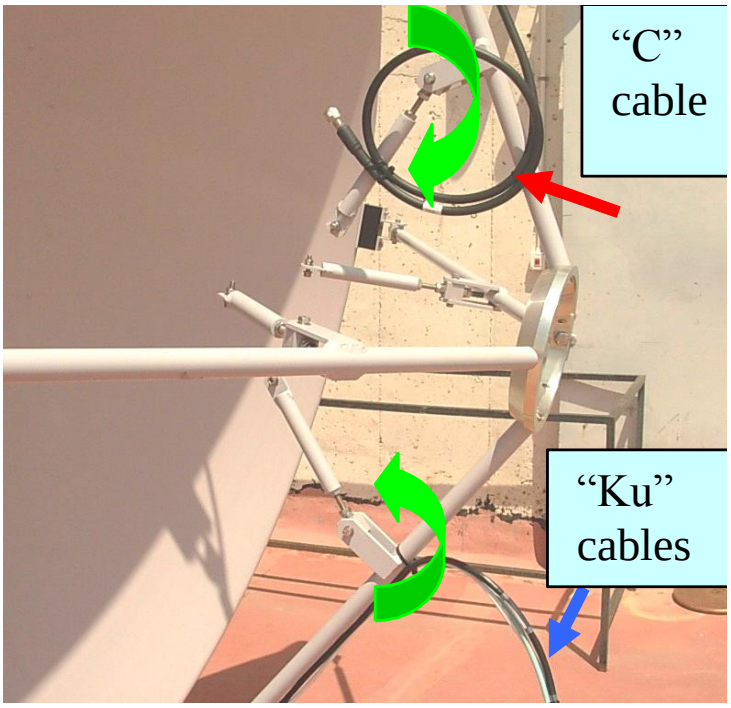
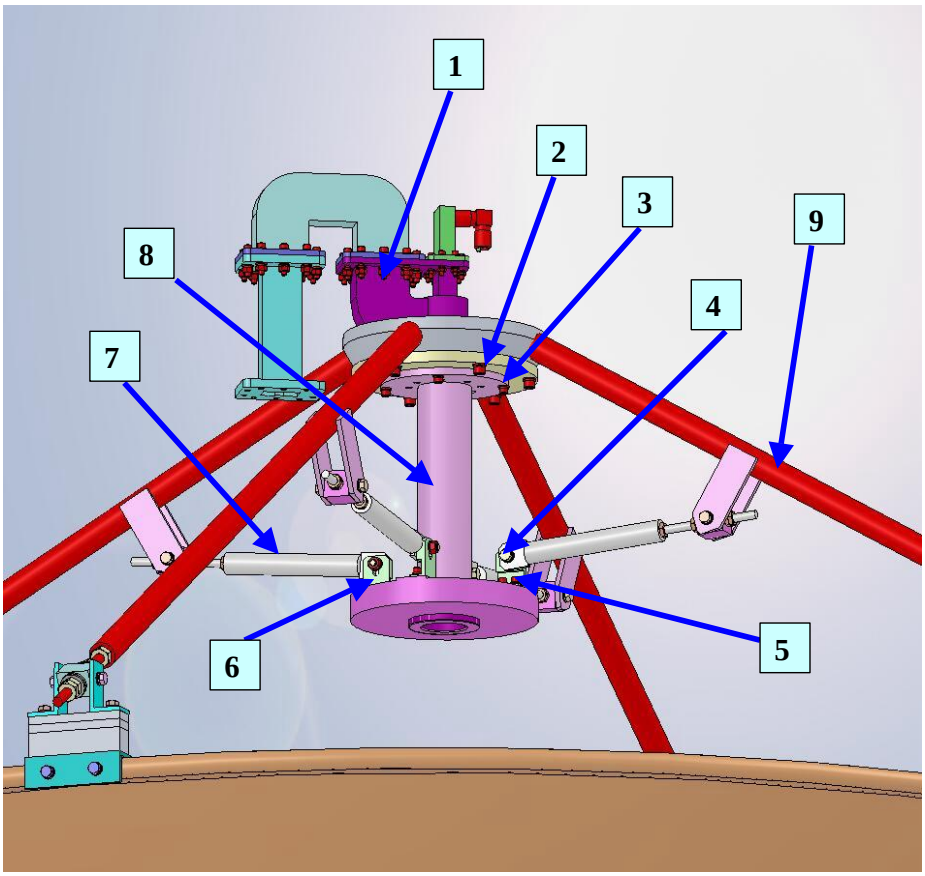


Figure 12-37: Securing the Cables

12.3.2 Installation of C-Band Feed Kit

General

The following Figure depicts the C-Band Feed general arrangement.



Legend:

1) OMT (TYPx1)
2) Hex socket screw M8x25 + plain washer M8 + spring washer M8 (TYPx6)
3) Hex socket screw M6x18 + plain washer M6 + spring washer M6 (TYPx4)
4) Hex head screw M8x30 + 2 plain washers M8 + spring washer M8 + hex nut M8 (TYPx4)
5) Hex socket screw ¼-20x5/8" + plain washer #1/4 + spring washer #1/4 (TYPx8)
6) Adaptor bracket (TYPx4)
7) Reinforcement arm (TYPx4)
8) Feed (TYPx1)
9) Pod leg (TYPx4)

Figure 12-38: C-Band Feed – General Arrangement

Table 12-1. Installation of C-Band Feed

Step	Description	Details

Table 12-1. Installation of C-Band Feed

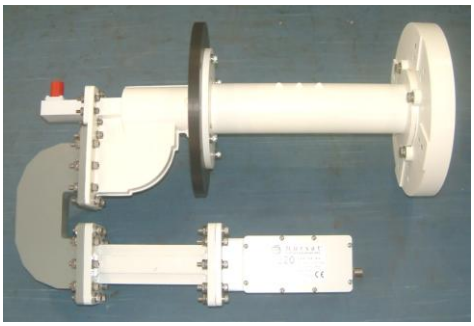
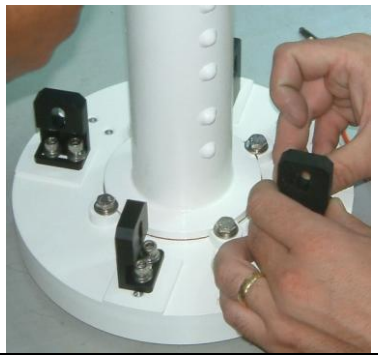
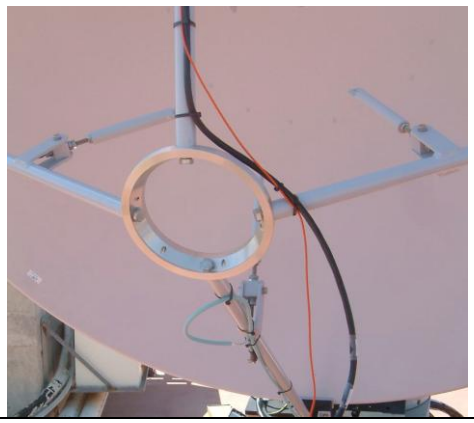
Step	Description	Details
1.	After removing the Ku-Band Feed, place it on a work table. Remove eight screws securing the four adaptor brackets from the Ku-Band Feed.	 
2.	Unpack and place the C-Band Feed on the work table. Install four adaptor brackets on the C-Band Feed. Hand-tighten the eight screws securing the four brackets.	  
3.	Verify that the dish structure, tripod legs and centering ring are intact, free of obstacles, and ready for installation. Verify that the C-Band Feed is intact and ready for installation.	 

Table 12-1. Installation of C-Band Feed

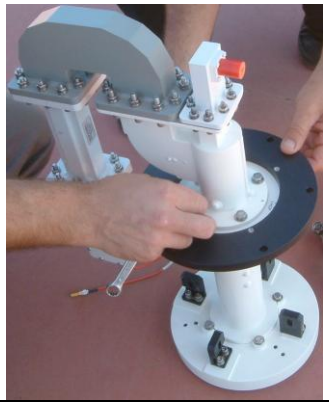
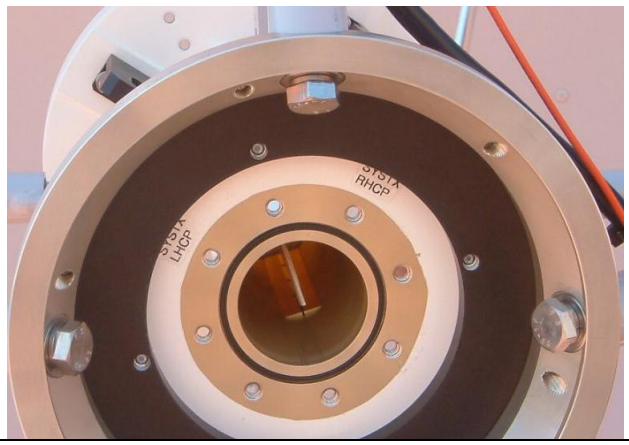
Step	Description	Details
4.	Remove four screws securing the OMT to the feed. Separate the OMT section from the feed.	
5.	Pull the four reinforcement arms slightly towards the centering ring. Place the feed section on the centering ring. Verify proper feed orientation (LHCP and RHCP markings aligned as shown in the Figure).	 

Table 12-1. Installation of C-Band Feed

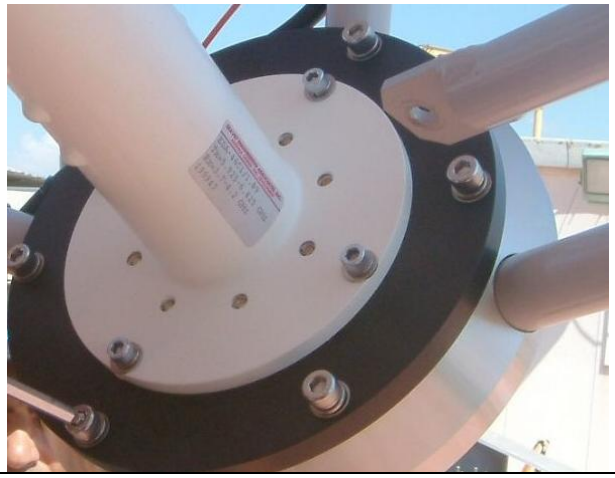
Step	Description	Details
6.	Fasten six screws securing the feed section to the centering ring.	

Table 12-1. Installation of C-Band Feed

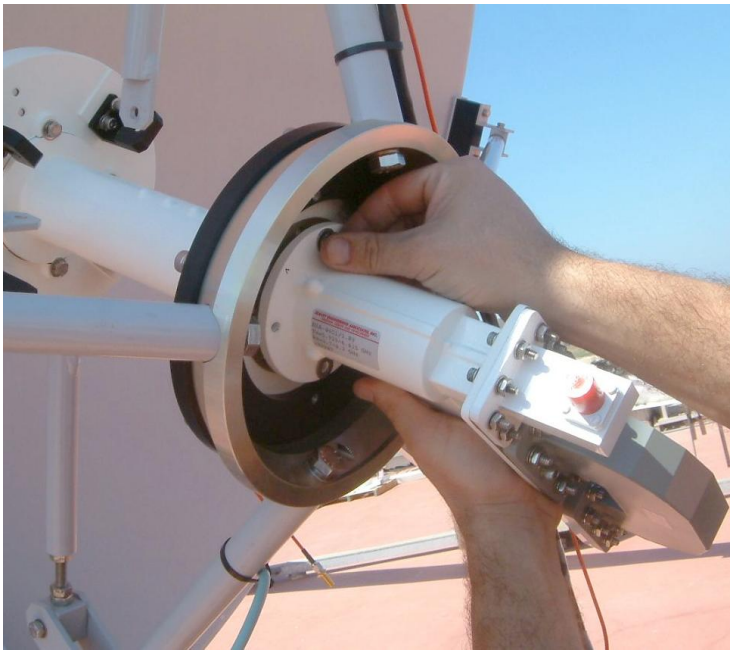
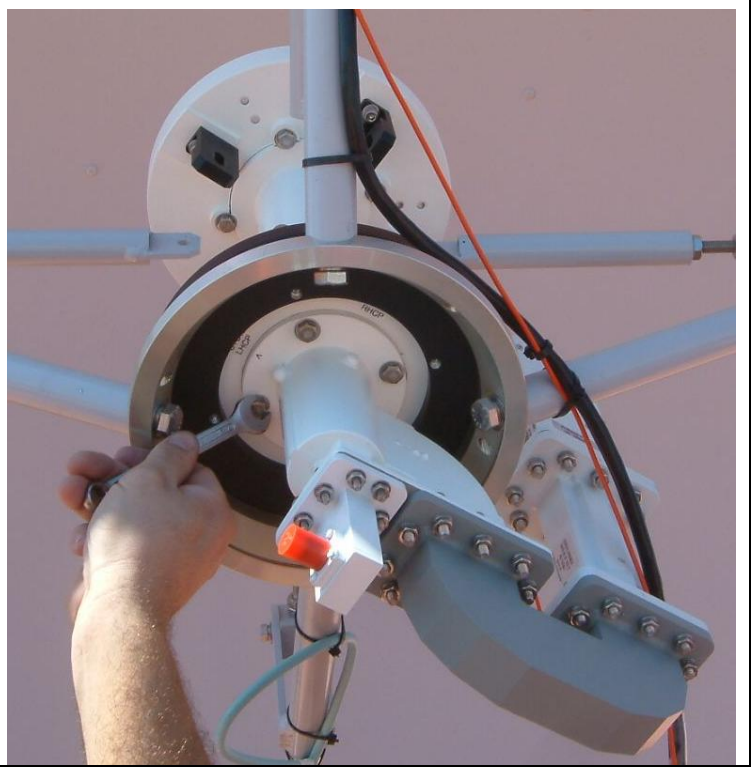
Step	Description	Details
7.	Place the OMT section on the feed section in the orientation shown in the Figure. Fasten four screws securing the OMT section to the feed section.	 

Table 12-1. Installation of C-Band Feed

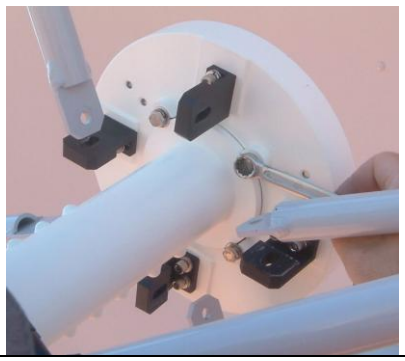
Step	Description	Details
8.	Loosen four screws securing the feed plate. Rotate the feed plate until the four adaptor brackets are aligned with the four reinforcement arms. Fasten four screws securing the feed plate.	 
9.	Using the adjustment nuts of the four reinforcement arms, adjust the arms so that their screw holes are aligned with the adapter brackets holes.	 
10.	Fasten four screws securing the reinforcement arms to the adapter brackets on the feed section. Secure the reinforcement arms adjustment nuts.	  

Table 12-1. Installation of C-Band Feed

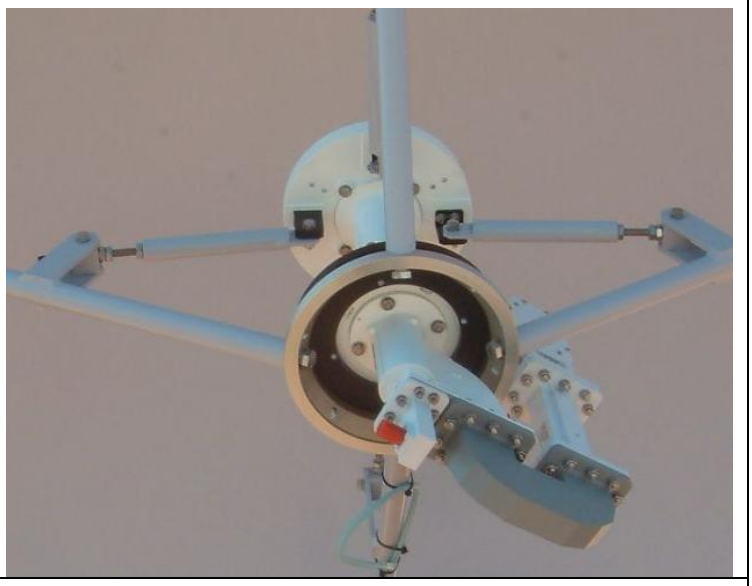
Step	Description	Details
11.	The C-Band Feed mechanical installation is completed. Perform visual inspection to verify that all parts are secured and aligned.	
12.	Connect "c" Rx cable (red) from the BUC to the the feed connector. Secure the cable to the LNB using tie-wraps.	 

Table 12-1. Installation of C-Band Feed

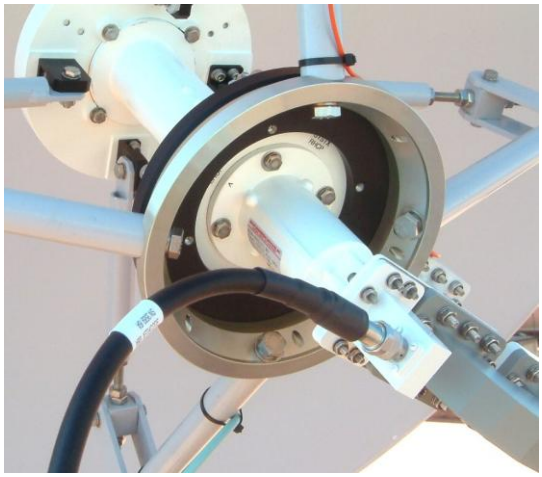
Step	Description	Details
13.	Connect "c" Tx cable (black) between the BUC and the C-Band Feed. Connect the "c" Tx cable (black) to the feed connector.	 

Table 12-1. Installation of C-Band Feed

Step	Description	Details
14.	Secure the feed cables using tie-wraps.	
15.	Move the antenna through its movement envelope and verify that the cables are not pressed pulled.	

12.3.3 Changing the Software Configuration from Ku-Band to C-Band

Following the installation of the C-Band Feed Kit, perform the following procedure to change the software configuration from Ku-Band to C-Band configuration:

iv. Apply power to the system.

v. Access **Maintenance Screen** -> **Receiver** window and set **Band** to **C Circ**. Refer to the following Ku-Band Band Setup screens:

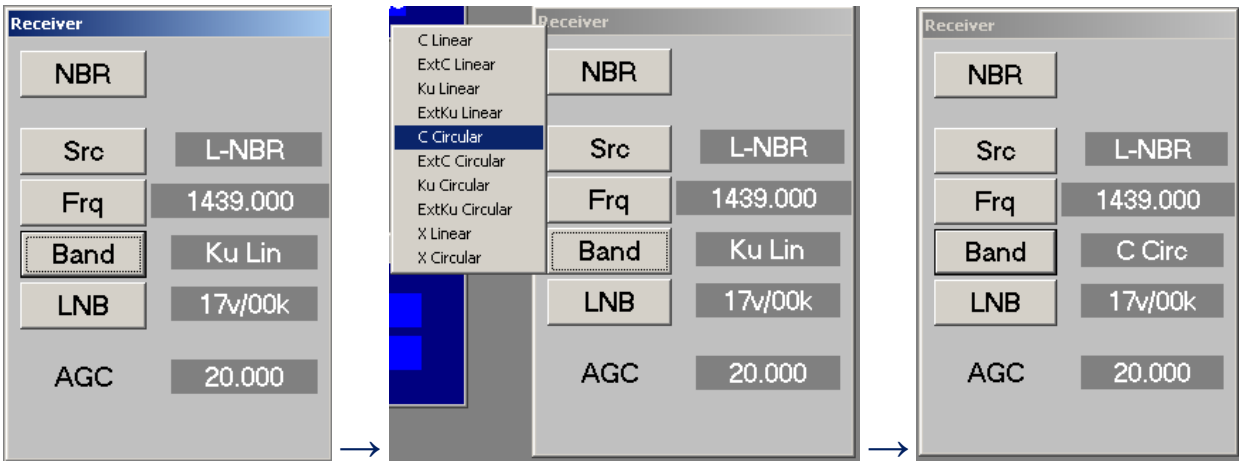


Figure 12-39: Changing Tracking Band Setting

vi. Access **Maintenance Screen** -> **Tx Chain** window and set BUC Model to **20W C Codan M&C**. Refer to the following Ku-Band Tx Chain Setup screens.

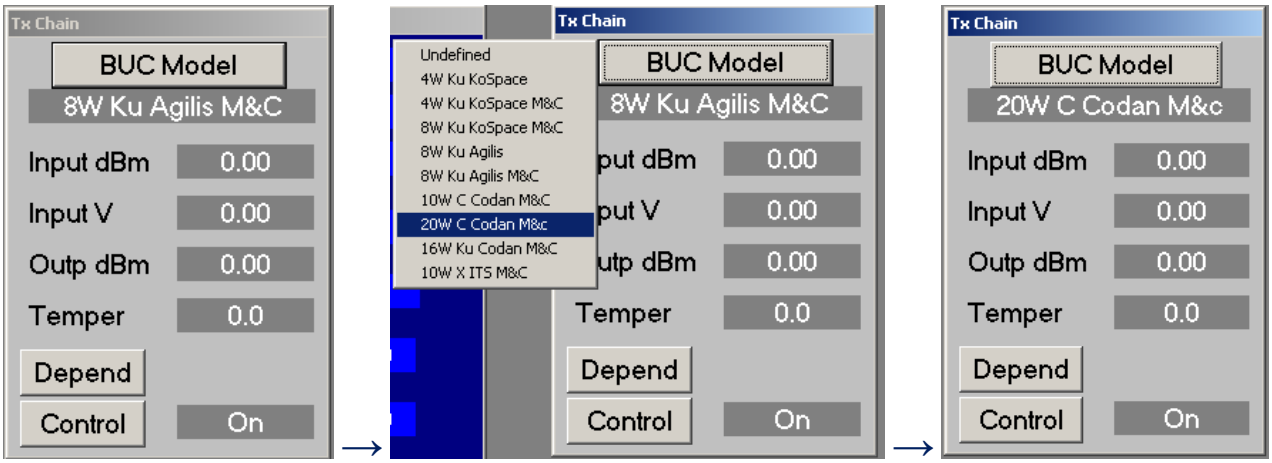


Figure 12-40: Changing BUC Setting