AL-7208

2.4m (96”) Quad Ku-Band and Dual C-Band Maritime Stabilized TVRO System

Installation and Operation Manual

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Revision History & Control

Revision History

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Title	Revision -
ii – xii	Revision -
1 – 156	Revision -

Safety Precautions

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

Specific warnings and cautions are found where they apply throughout the manual, but may not appear in this summary. Observe the following 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 if necessary.

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) must be firmly connected to the system ground (using the GND posts) to ensure the enclosure is at ground potential.

Only qualified and trained personnel are allowed to 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-7208 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 consists of 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 – Ship Survey Report.

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 < >.	400
	The name of a file or directory.	
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
CCU	Central Control Unit
CFE	Customer Furnished Equipment
F/O	Fiber Optic
IF	Intermediate Frequency
IMU	Inertial Measurement Unit
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
TVRO	TV Receive Only

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1 General System Description

1.1 Introduction

This chapter provides a system overview, describes the system structure, and presents block-diagram description of the system.

1.2 System Overview

The AL-7208 system is a 2.4m (96”) Quad Ku-Band & Dual C-Band Antenna Stabilized Marine TVRO System.

The system is specially designed to provide continuous connectivity in mid-ocean or in equatorial areas under heavy rains, Orbit Marine's AL-7208 system ensures comprehensive global reception for a full range of data and TV services.

Providing on-board TV and data systems for cargo, cruise ships and ferries, tankers, oil and gas rigs, and combat vessels, the state-of-the-art AL-7207 is globally deployed by Orbit's commercial, private and military customers.

Using superior stabilizing capabilities, the AL-7208 maintains a boresight directed towards Ku-Band and/or C-Band satellites to provide the best reception.

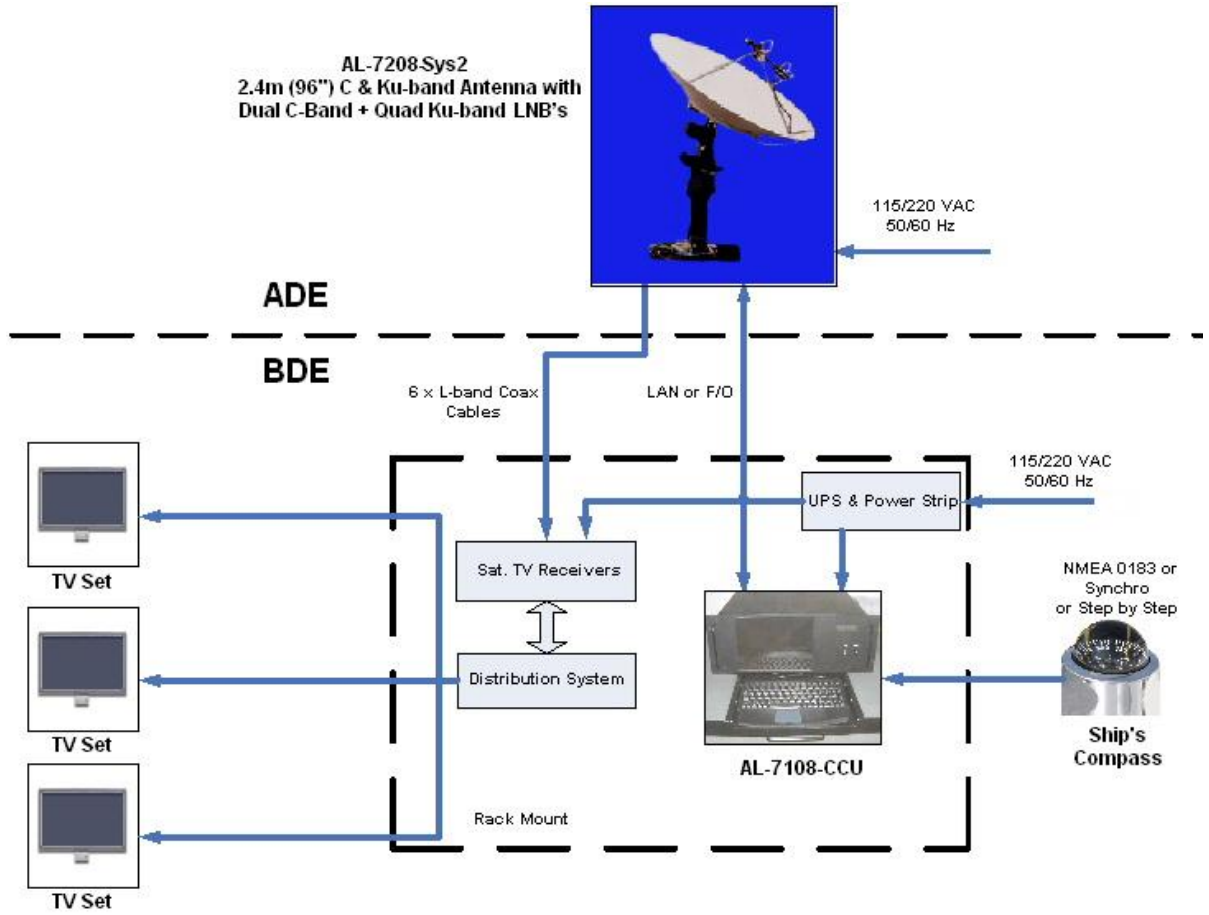
Backed by over 50 years of experience and internationally deployed teams of highly skilled engineers, the comprehensive AL-7208 is at the core of Orbit's product line – one of the company's leading solutions for today's expanding maritime needs.

1.3 System Key Features and Benefits

- POL/X/Y Configuration; Continuous Azimuth Rotation.
- Ku-Band and C-Band Integrated Feed Assembly.
- Supporting both Circular or Linear C-Band, and Linear Ku-Band.
- Stable and Efficient Satellite Reception.
- No System Balancing Needed.
- User Friendly Operation.
- Innovative Tracking Technology.
- Robust Design.
- Proven Reliability (High Mean Time between Failures - MTBF).
- High Dynamic Accuracy.
- Global Satellite Coverage Database.
- Supports NMEA-0183, Step by Step & Synchro Compass Interfaces.
- Built-in GPS Antenna.
- Remote access to the system using a backdoor.

1.4 System Architecture

The following figure is an overview of the system, showing the main components and interfaces.



The power to the system must be supplied throgh a UPS unit.

The following equipment is not supplied nor supported by Orbit: TV receivers, distribution systems, TV sets.

Figure 1-1: AL-7208 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 ABOVE DECK EQUIPMENT (ADE) comprises the following:
  - The BASE RING: Mounted on the RADOME SUPPORT, it supports the complete Radome and System 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 BASE RISER: Mounted on the BASE PLATE. It holds the POSITIONER and the SINGLE BOARD COMPUTER (SBC).
  - The X-Y PEDESTAL: Mounted on the BASE RISER. 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 X-Y PEDESTAL (via the DISH SUPPORT).
  - The FEED ASSEMBLY is mounted on the DISH.
  - The RADOME is mounted on the BASE RING. It covers and protects the complete ADE.

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

The following figures show general views and the location of the main ADE components.

Figure 2-1: System General Views

Figure 2-2: ADE Major System Components Location

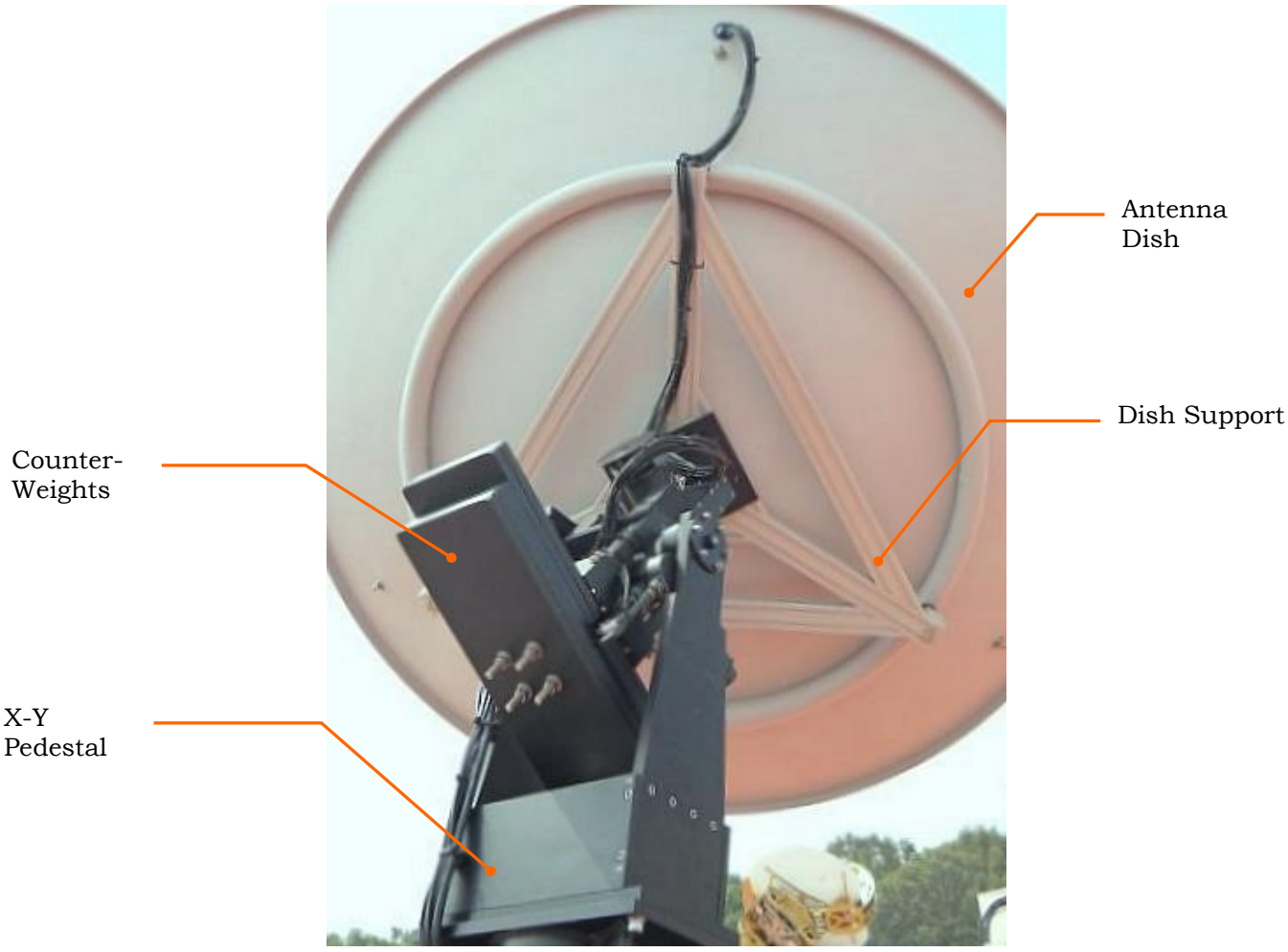


Figure 2-3: Antenna Dish General View

Figure 2-4: Feed General View

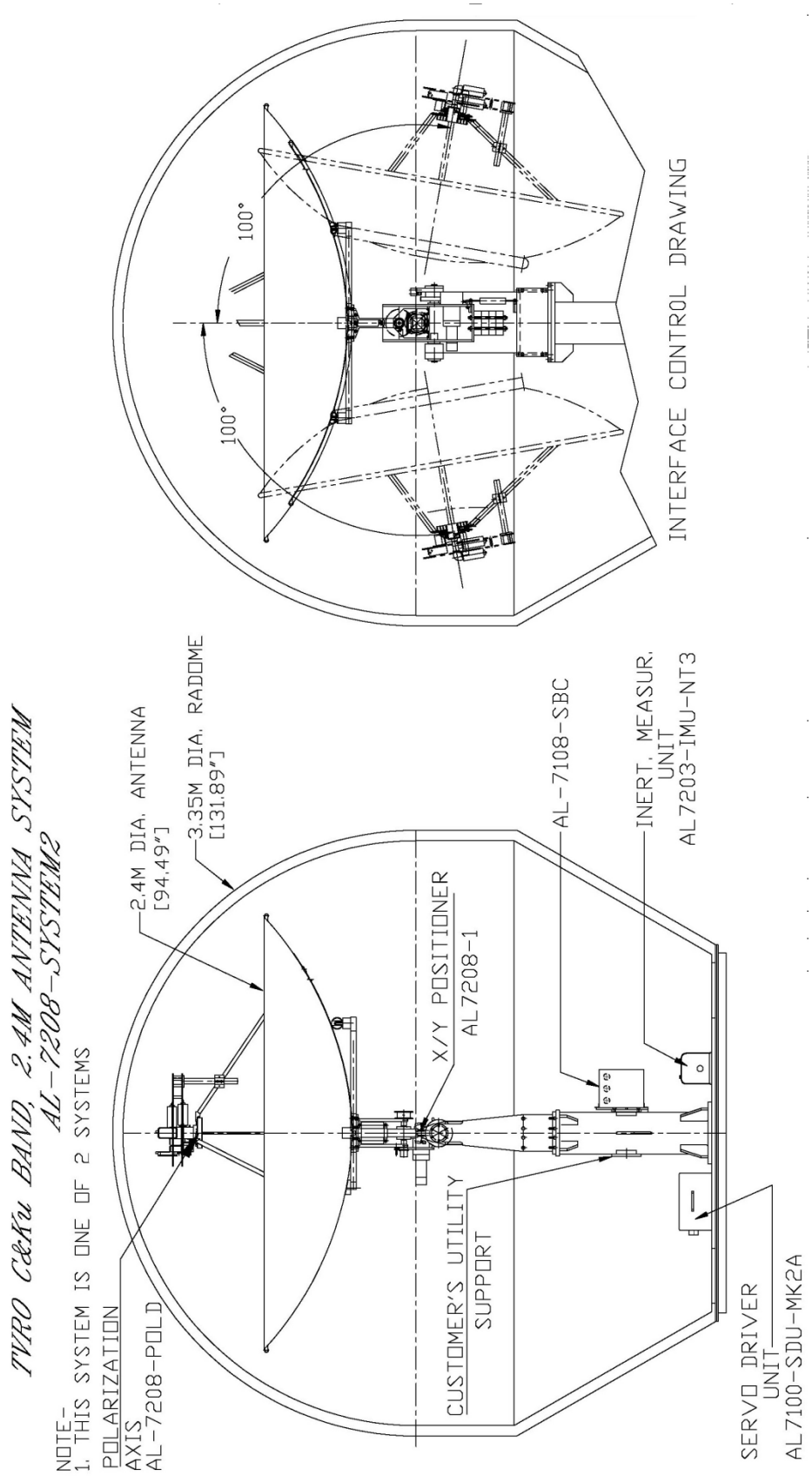


Figure 2-5: Above Deck Equipment (ADE) Layout and Dimensions (1 of 2)

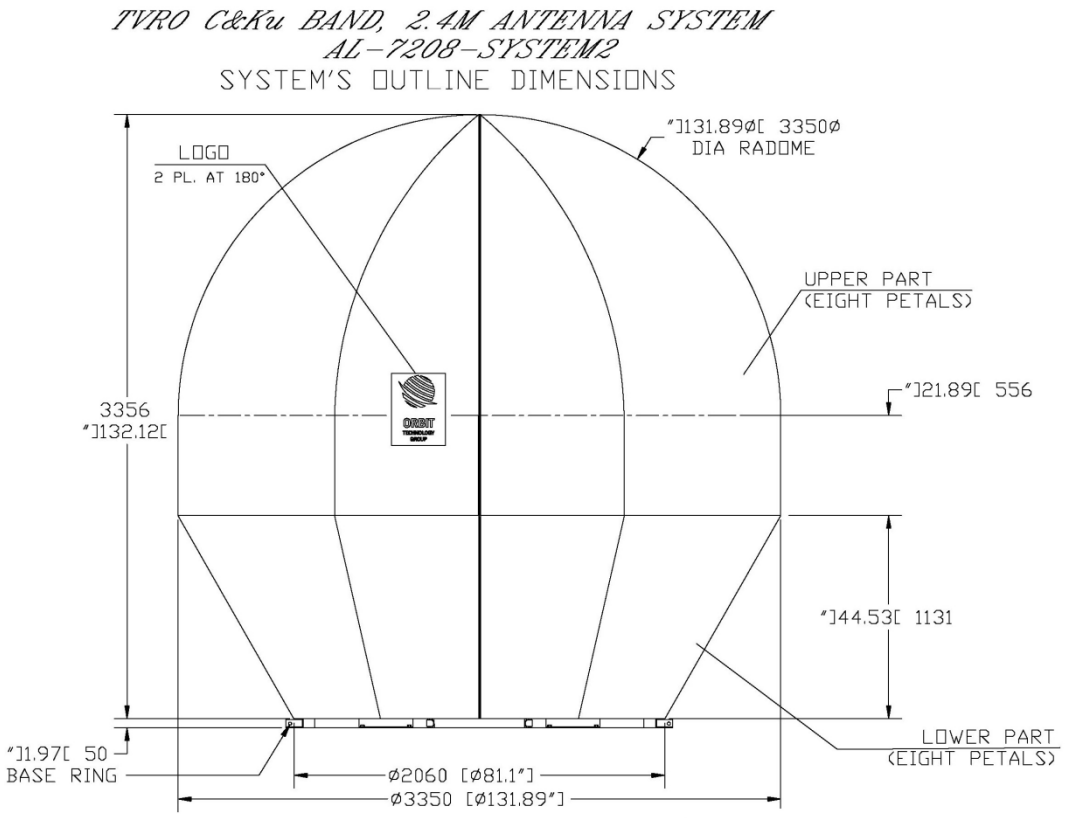


Figure 2-6: Above Deck Equipment (ADE) Layout and Dimensions (2 of 2)

Figure 2-7: Above Deck Equipment (ADE) with Radome

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2.2 Central Control Unit (CCU) - Description and Options

2.2.1 CCU General Description

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

The front panel includes a TFT screen, 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 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 separate drawer), menus and functions can be selected, and operational parameters can be changed.

In 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.

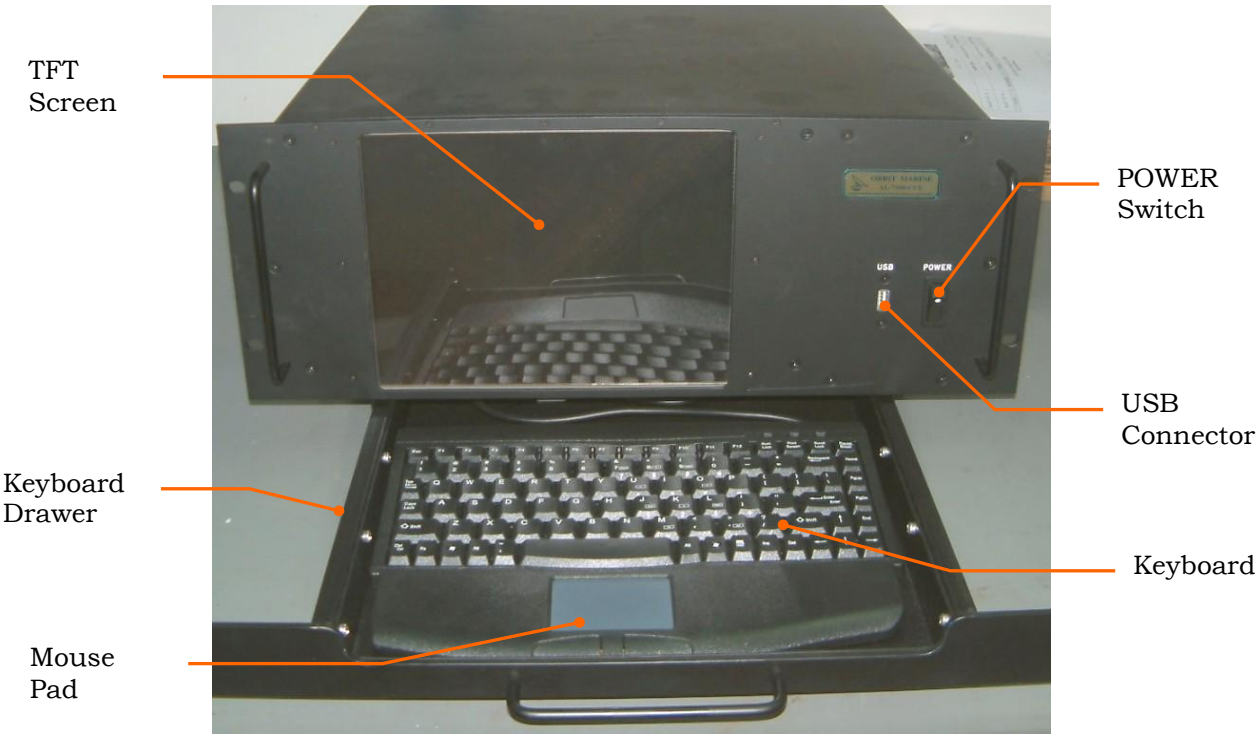


Figure 2-8: CCU Front Panel

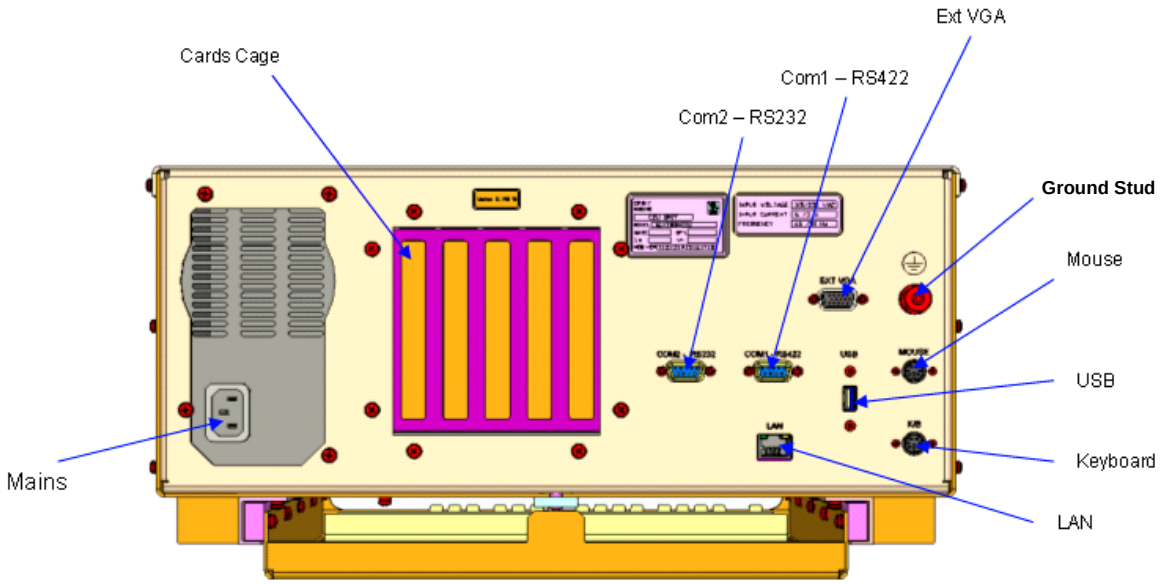


Figure 2-9: CCU Rear Panel

2.2.3 CCU Options - Cards Cage Configurations

The AL-7208 system consists of a CCU that has an RJ-45 Ethernet socket for LAN connectivity between the ADE and the BDE. 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.

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 (NBR) for Step-track feedback.

Figure 2-10: SBC General View (installed)

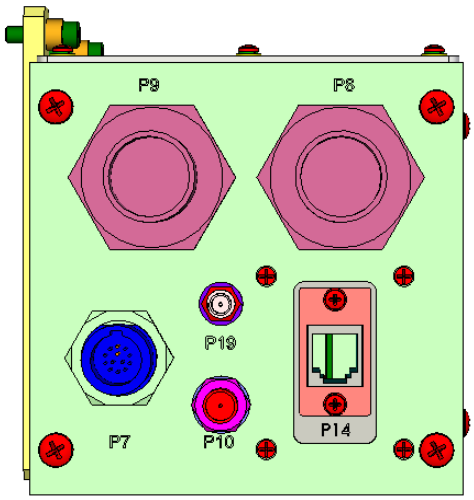
2.3.2 CCU-SBC Operational Concept

The system is fully controlled by the CCU. Using the CCU, the operator can 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	L-Band
P14	LAN
P19	GPS

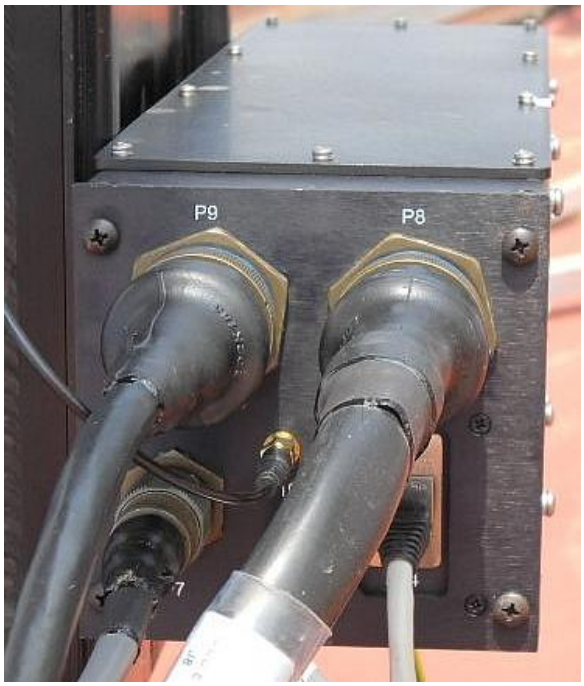
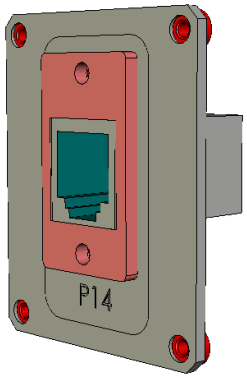
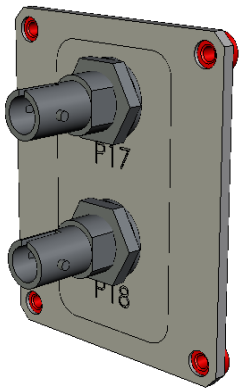


Figure 2-11:SBC front view

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).

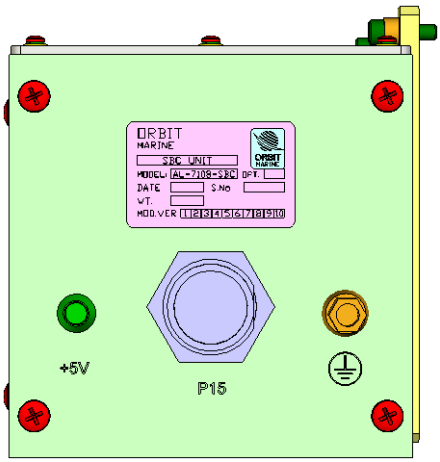




P14	LAN

P17	F/O Tx
P18	F/O Rx

Figure 2-12: SBC interface options



P15	Ship's Compass
GND	Ground Stud
+5V	LED

Figure 2-13: SBC rear view

2.3.4 Narrow Band Receiver (NBR)

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

Two NBR operates in L-Band (L-NBR).

L-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.

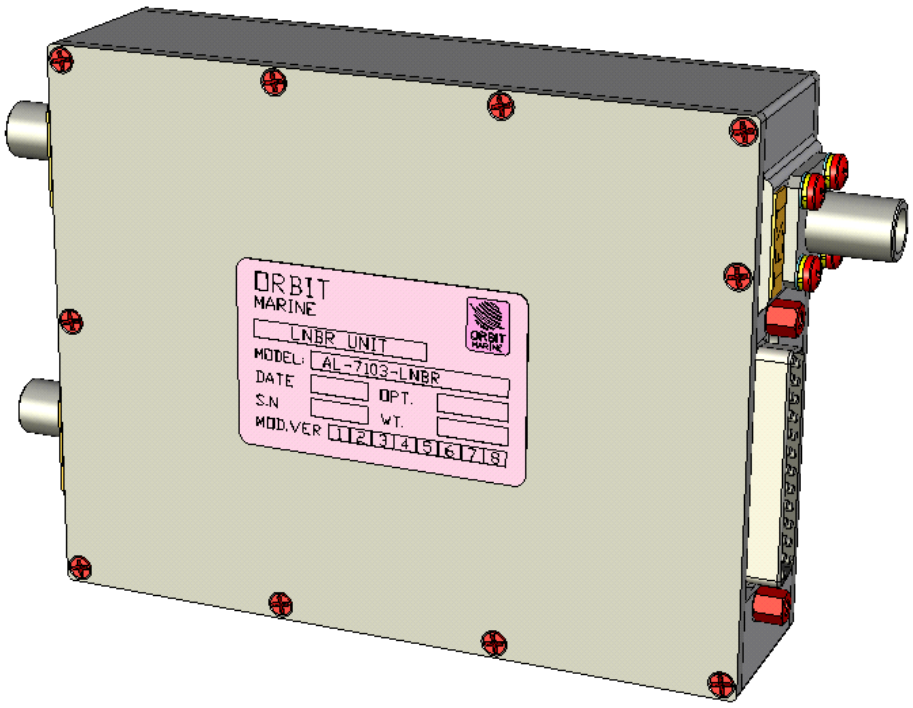


Figure 2-14: NBR Unit General View

2.4 Interconnections and Cables

The following figure illustrates the AL-7208 interconnection diagram.

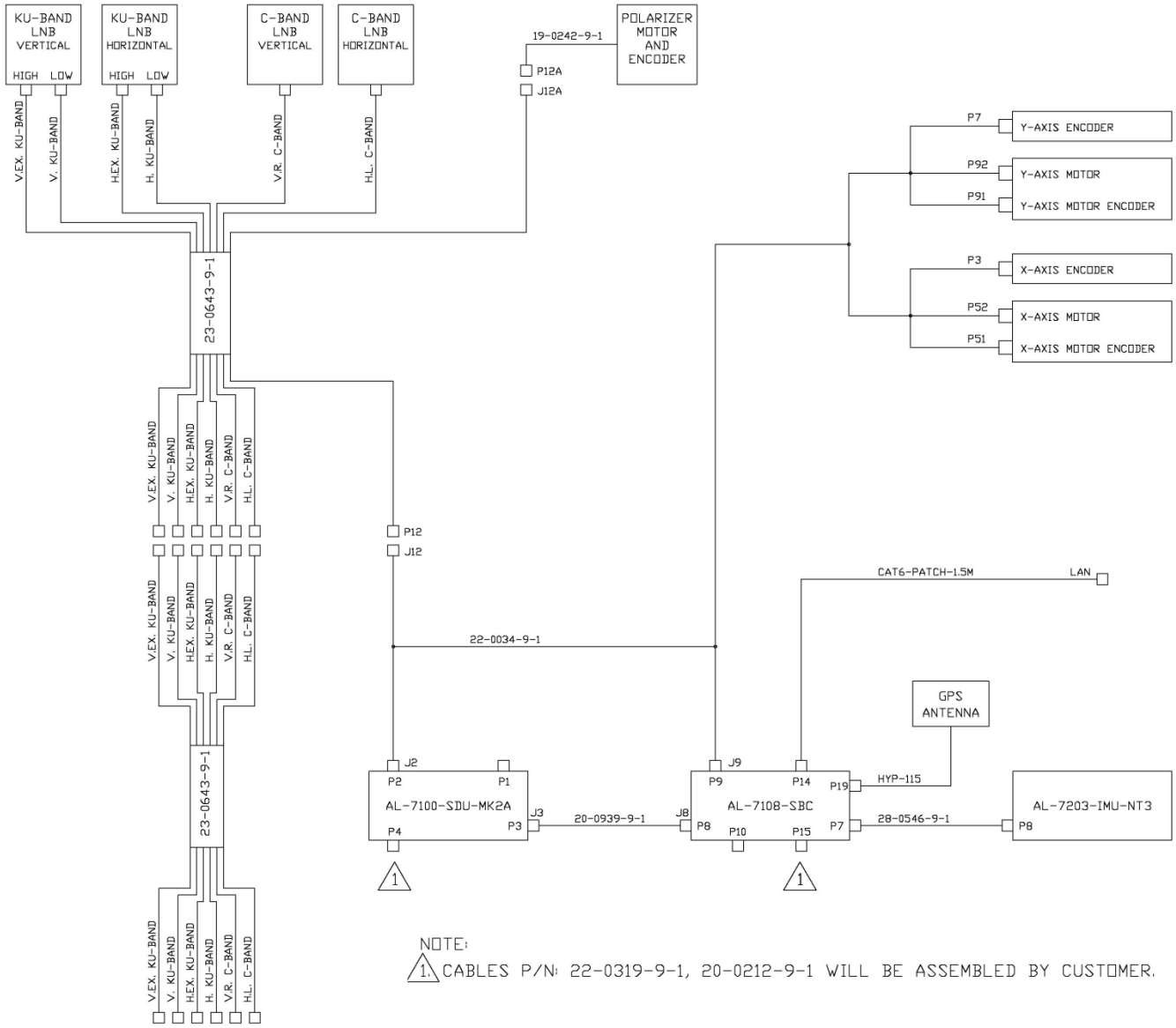


Figure 2-15: AL-7208 Interconnection Diagram

The default connection between ADE and BDE is LAN, unless otherwise ordered. Fiber Optic connection is also available (either multi-mode or single-mode).

3 AL-7208 System Specifications

Antenna System Performance	
Antenna Type	Prime Focus
Dish Diameter	2.4M (96”)
Radome Size	3.35M (132”)
Freq. Operation	C-Band: Rx: 3.7 – 4.2GHz Ku-Band: Rx: 10.7GHz – 12.75GHz
Antenna Polarity	C-Band: Linear/Circular Ku-Band: Linear
Antenna Gain (Typical)	C-Band: Rx:30dB @ 4.2GHz Ku-Band: Rx :47dBi @ 12.75GHz
EIRP Level (Min.)	C-Band: 29 dBW Ku-Band: 36 dBW
Elevation Travel	□□□□□from Zenith
Azimuth Travel	Continuous
Polarization Travel	270□□□mechanical)
Pointing Accuracy	0.1□□RMS
Ship Motion	
Roll	30□□@ 8 sec
Pitch	15□□@ 6 sec
Yaw	□□□□@ 50 sec
Surge	0.2□g
Sway	0.2□g
Heave	0.2□g
Turning Rate	10°/sec
LNB Types	
Ku-Band	QUAD: • Vertical High • Vertical Low • Horizontal High • Horizontal Low
C-Band	DUAL (Vertical; Horizontal)
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 1100W (ADE), 200W (BDE)
Weight (ADE, including Radome, without RF equipment)	610 Kg / 1345 lb.
Gyro Compass Interface (BDE)	
NMEA 0183	RS422 or RS232
Step-by-Step	Both Polarities
Synchro	1:1, 1:36, 1:60, 1:90, 1:360

4 Basic System Operation

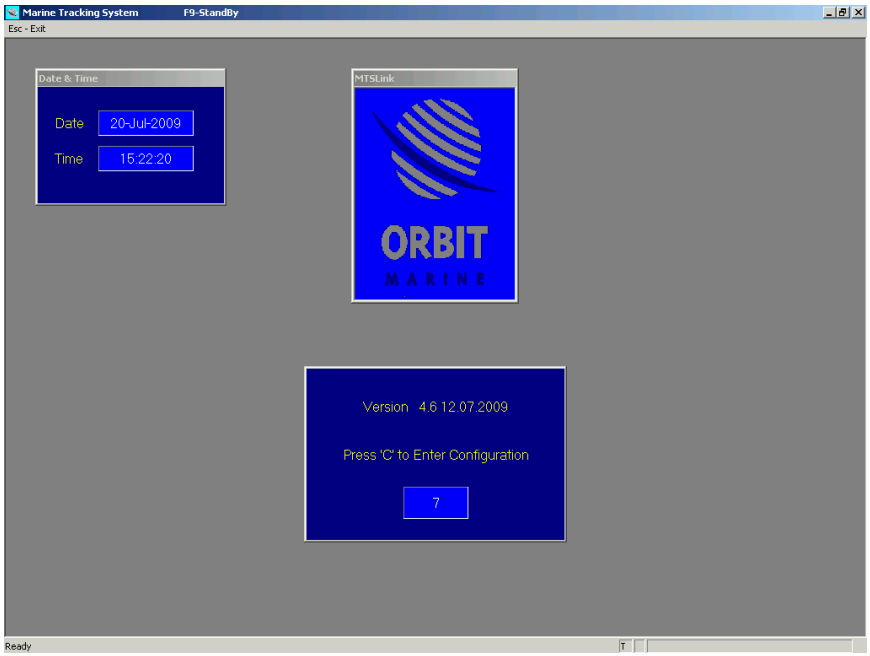
Sections 4.4 thru 4.6 contain detailed sequence for selecting, configuring and acquiring the desired satellite.

4.1 System Start-Up

➢ **To Power Up the System:**

Turn the ADE and the CCU 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 interrupted, the system opens the Basic Operation screen. This screen only allows monitoring of general system status and messages. To control and update parameters, stop the 10-second countdown by pressing any key and enter the “AL-7200” password:

The power-up sequence is fully automatic, when 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.

4.2 Basic Operation Screen

When the 10-second after-power-up countdown is not interrupted, the system automatically opens the Basic Operation screen:

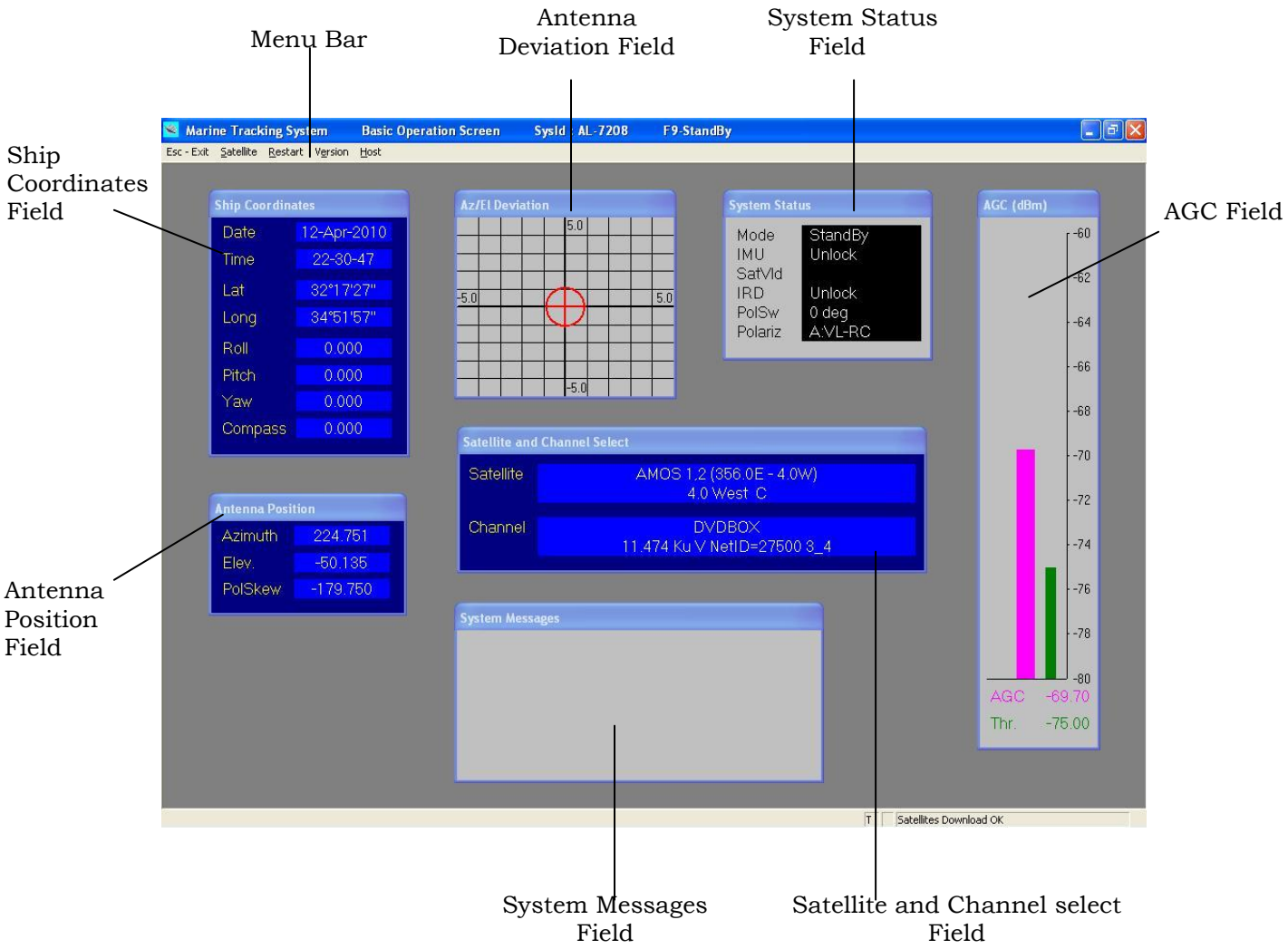


Figure 4-1: Basic Operation Screen

To control and update parameters, type <O>, then enter the “AL-7200” password:

4.3 Operation Screen

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

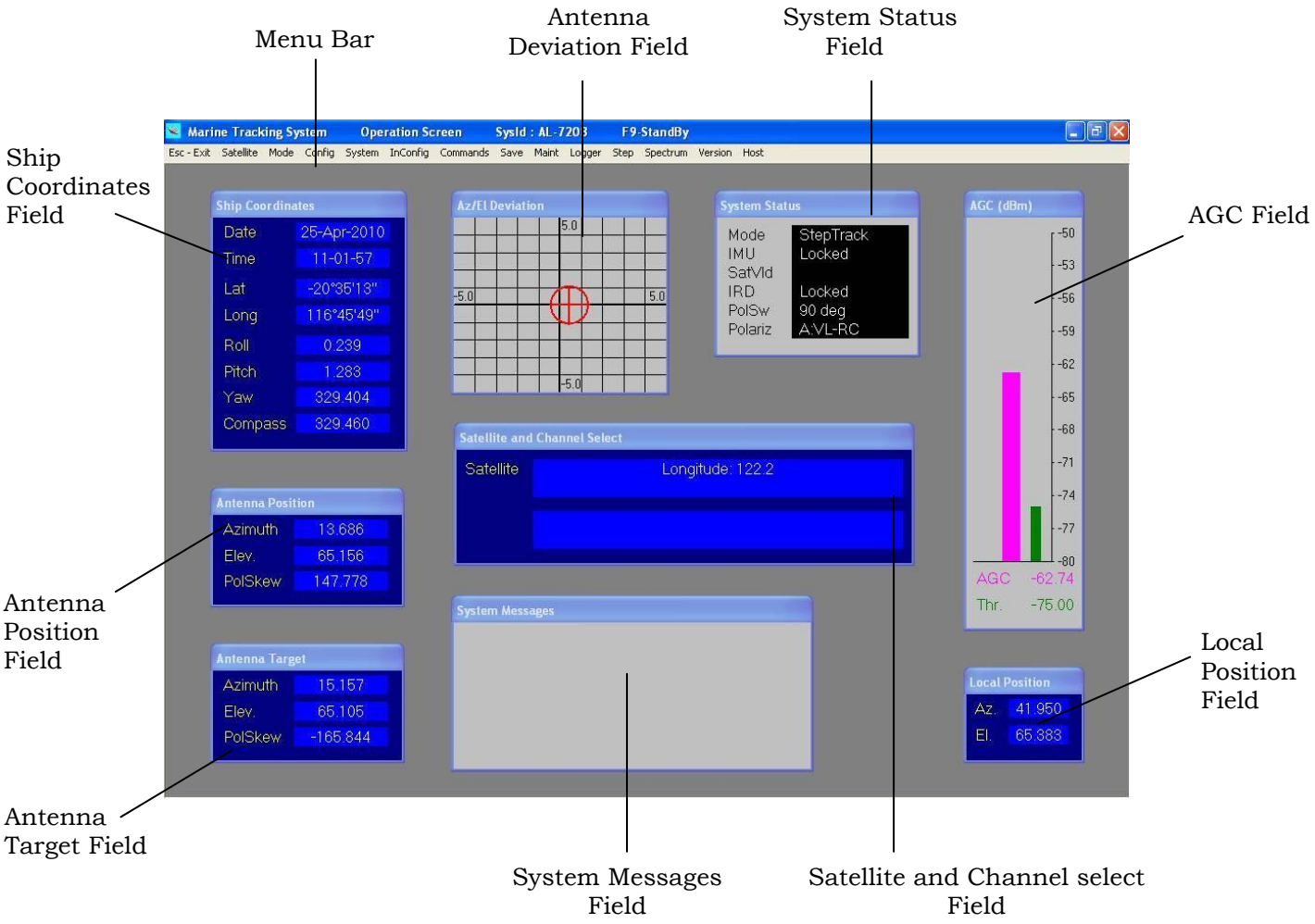


Figure 4-2: Operation Screen

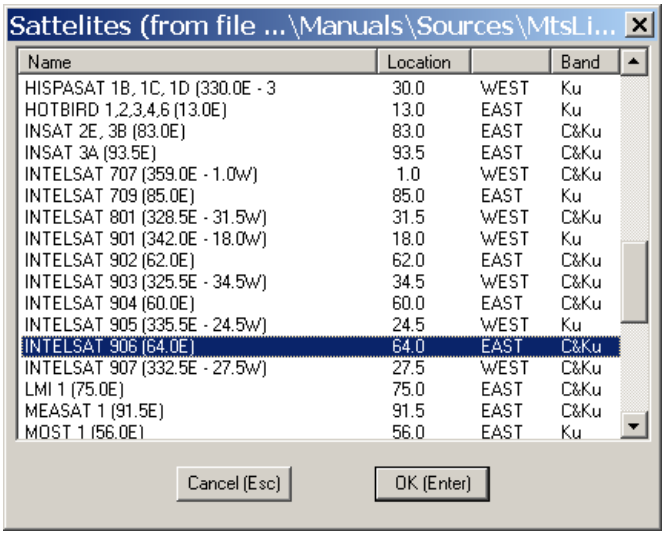
To revert back to Basic Operation type <U>, then hit any key for password:

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.

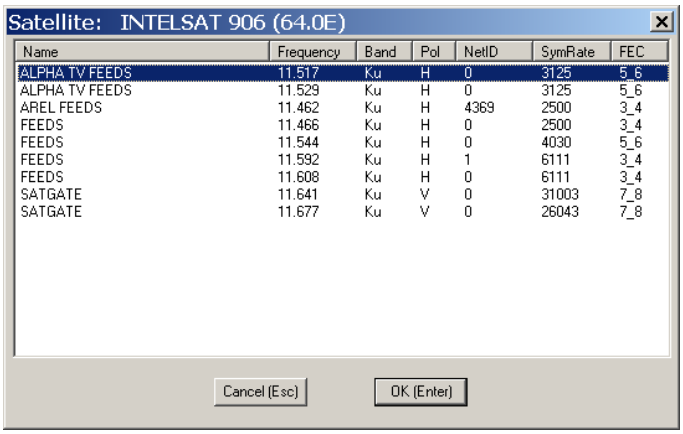
➢ **Selecting a Satellite and Channel:**

1. In “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.

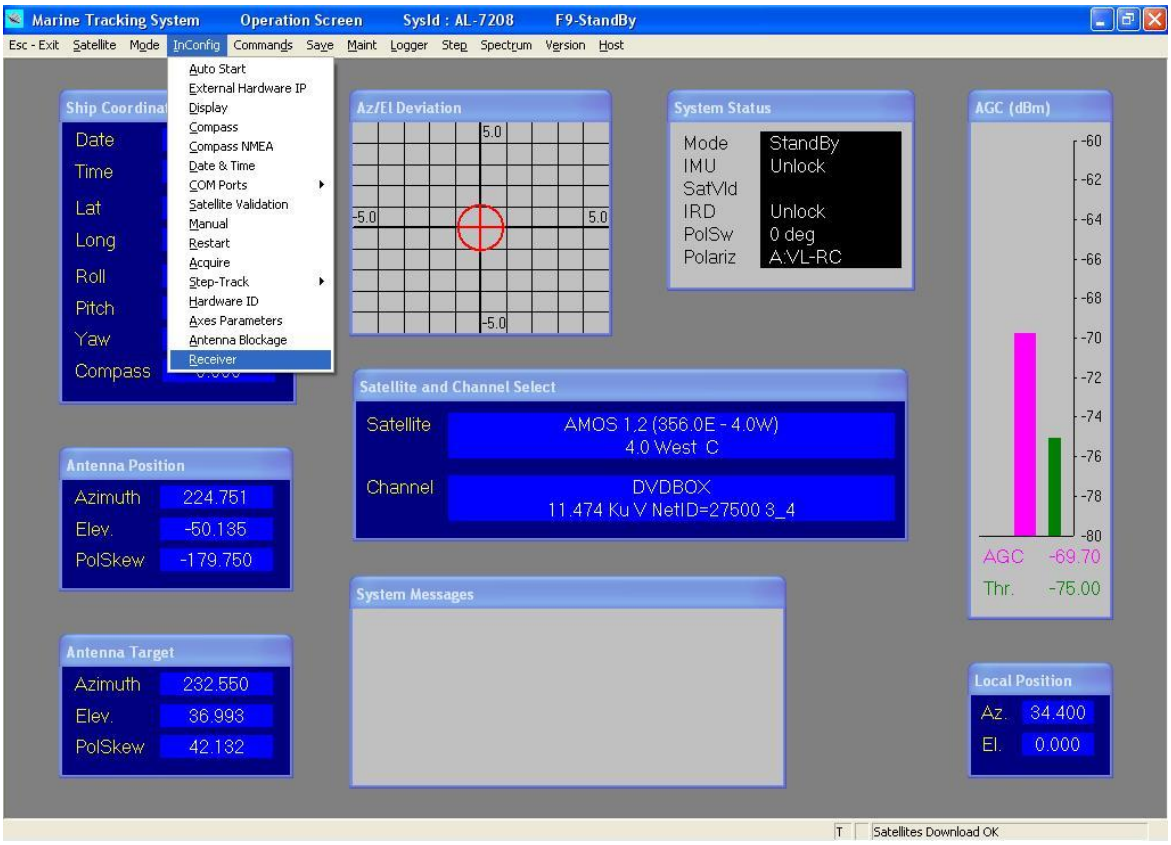
   The SATELLITE window appears, listing the available selected-satellite tracking control channels. **Disregard this window-by pressing enter.**



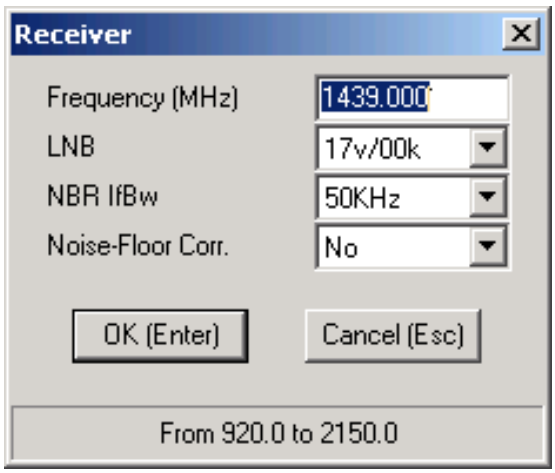
To select the Narrow Band Receiver IF-Bandwidth, do the following:

Make sure that Narrow Band receiver is activated.

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



In 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.

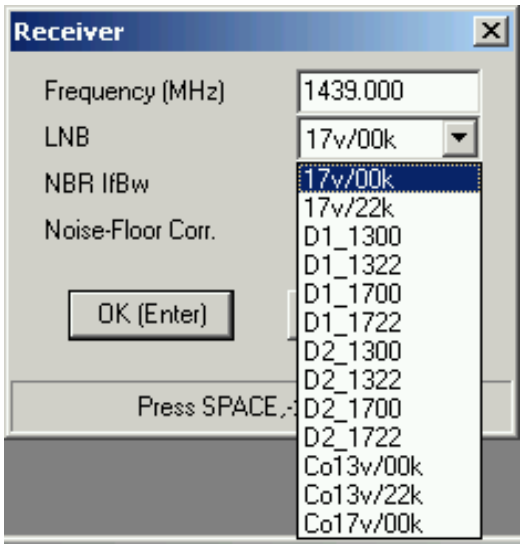
Orbit Communication Ltd. 8D Hatzoran St. P.O.B. 8657, Netanya 42504, Israel, Tel: +(972) 9 892 2777, Fax: +(972) 9 885 5944 www.orbit-cs.com

➢ **Select LNB Control Voltage:**

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

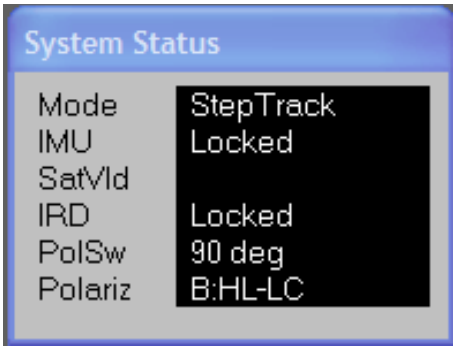
For SMW Q-PLL Type O LNB:

- 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 (Ku-Band Only)

Verify the current Polarization of the system is by looking in the System Status window, “Polariz” parameter:



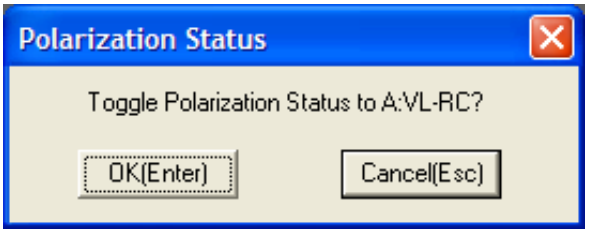
The Polarization can indicate two options:

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

   The CONFIRM YOUR CHOICE window opens.



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

4.6 Acquiring a Satellite

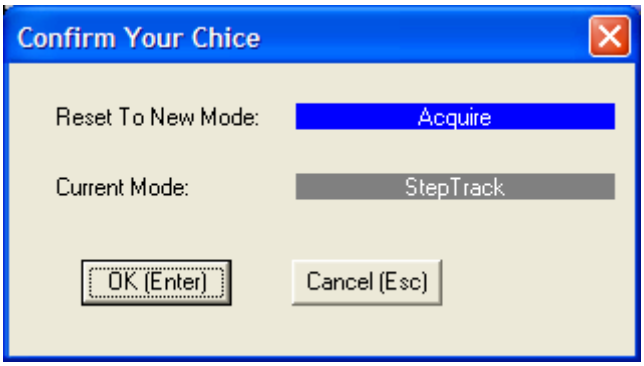
Before acquiring the Satellite make sure that:

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

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

➢ To Acquire a Satellite:

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



To confirm, press ENTER or click OK.

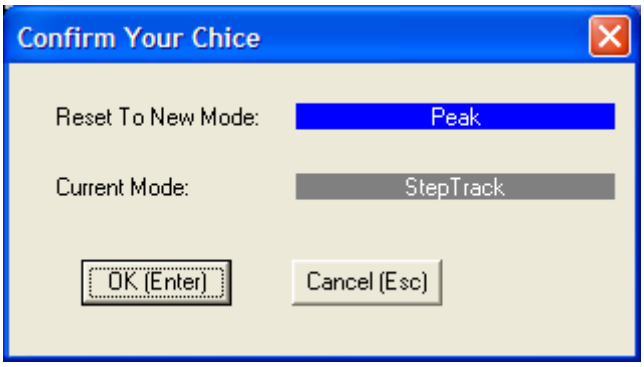
The system moves the Antenna to acquire the selected satellite.

4.7 Peak Function

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

➢ **To Peak the System:**

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



To confirm, press ENTER or click OK.

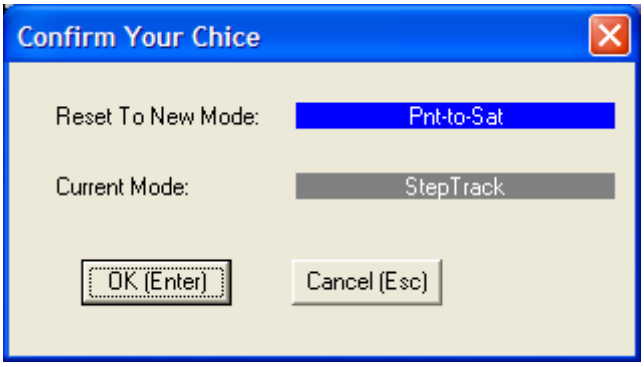
The system switches to Peak mode.

4.8 Point-to-Satellite Function

Activation of “Point-to-Satellite” moves 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:**

In the “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 moves 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 to find the satellite when the system does not acquire it automatically.

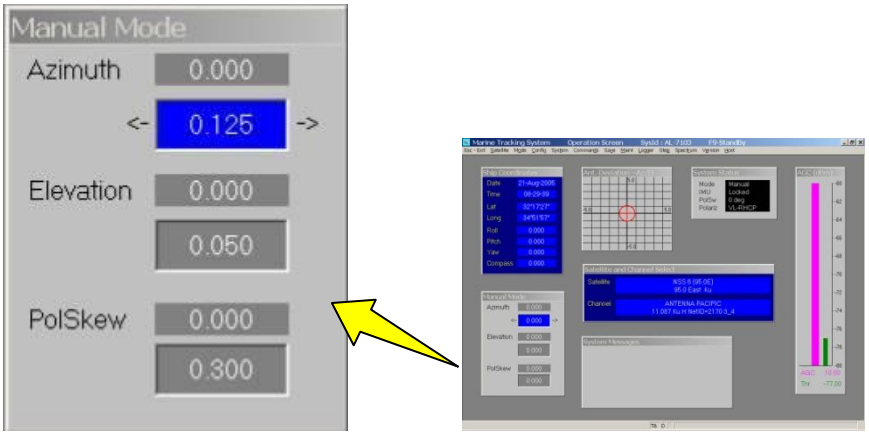
➢ **To move the Antenna in Manual Mode:**

1. In the "Operation Screen" type <O> (or click on "Mode"), and then type <M> (or click on "Manual"):

   The CONFIRM YOUR CHOICE window opens.

2. To confirm, press ENTER or click OK.

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



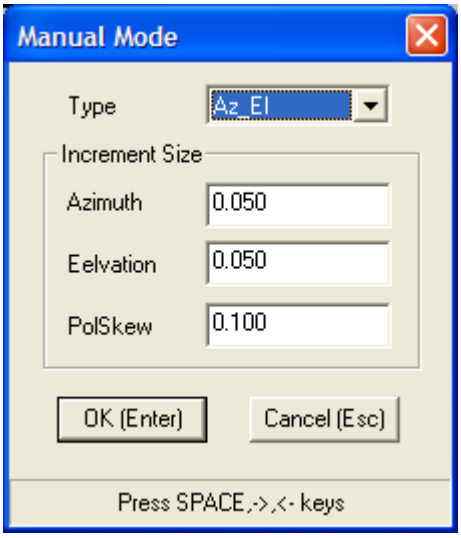
3. The MANUAL MODE window provides two display fields: the upper field displays the current angle of the axis, and the bottom one displays the new manually changed angle.

   For each axis the following fields are used: Azimuth, Elevation and PolSkew.

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

- **Setting up the Manual Mode**

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



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 when Manual mode was engaged. The manually controlled angles in Azimuth are in terms of Azimuth tilted by Elevation and not Earth-horizon referenced Azimuth.

Therefore, 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) the Elevation angles will also noticeably change.

- 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 is kept constant

- SatArch –

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

This mode is most useful when “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, do following:

➢ **To restart the system:**

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

   The CONFIRM YOUR CHOICE window opens.

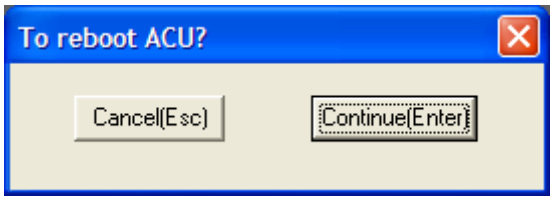
2. Press ENTER or click OK. The system initializes the Pedestal X, Y and Z encoders and initializes the IMU for 6 minutes.

You can not operate the system, while the Restart is in progress. A message appears in the System Messages window: ‘Auto Restart in Progress’, The IMU counts down for 6 minutes. At the end of the IMU countdown, the system locks on the last saved satellite.

➢ **To reboot the system:**

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

The CONFIRM YOUR CHOICE window opens.



Press ENTER or click Continue.

Both Restart and Reboot cause the system to restart its operation. The difference between the two is that Reboot 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

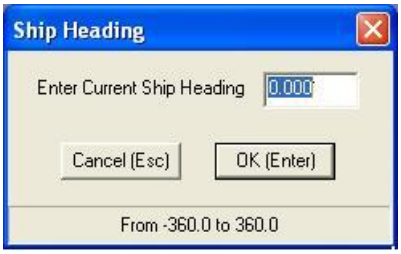
Manual setting of heading is needed if:

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

➢ **To Set the Heading:**

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

   The SHIP HEADING window opens.



2. Press ENTER or click OK.

   The system updates the Ships Heading.

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

- For absolute type, (NMEA-0183, Synchro 1:1), a default compass value can be set. This value prevails until a valid compass update is received.
- When entering a Compass value, this can 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, do the following.

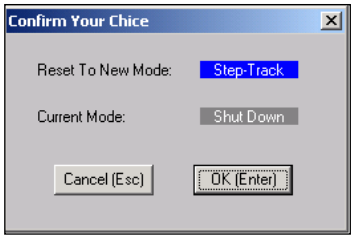
Make sure you are on the correct satellite with the correct tracking channel.

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

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

1. In the "Operation Screen" type <O> (or click on "Mode"), and then click on "Step-track":

   The CONFIRM YOUR CHOICE window opens.



2. Press ENTER or click OK.

   The system switches to STEP TRACK mode.

4.13 Stow the System

➢ **To Stow the system:**

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

   The STOW window opens.

2. Press ENTER or click OK.

   The system switches to STOW mode.

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

The Stow-up mode is used to place all mechanical axes to zero encoder reading.

4.14 Manual Setting of GPS Lat/Long Location

You can enter the ship's position manually if there are no GPS position updates, or the GPS is malfunctioning/disconnected.

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

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

   The CONFIRM YOUR CHOICE window opens.

2. Press ENTER or click OK.

   The GPS position updates.

The Latitude and Longitude angles are entered in their decimal form, for example, +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.

For those calculations, remember that 1 degree of arch is divided into 60 minutes, while each minute of arch 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 is North of the Equator. 32.5125 degrees of Latitude are therefore 32 degrees 30 minutes and 45 seconds North of Equator.

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

4.15 Clear GPS

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

➢ **To Clear the GPS:**

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

   The CONFIRM YOUR CHOICE window opens.

2. Press ENTER or click OK.

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

4.16 Setting AGC Threshold

The system is supplied from the 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 description below refers to a condition, where the Noise Floor Correction is deactivated, or a when the operator wants to introduce a user-defined threshold.

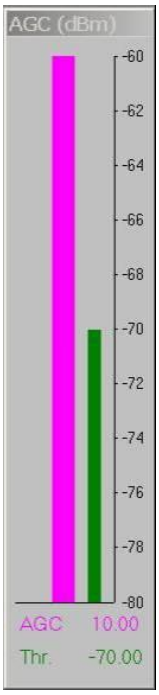
➢ **To set the AGC Threshold:**

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

   The SET THRESHOLD LEVEL window opens.

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

The THRESHOLD LEVEL is updated.



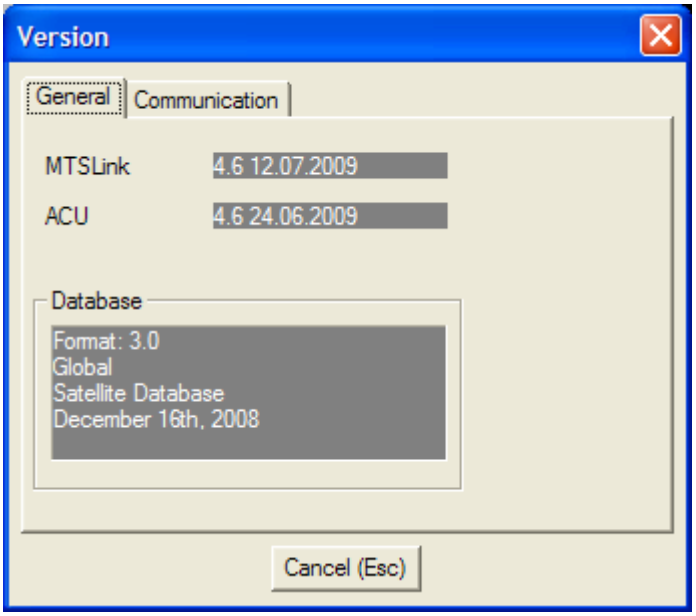
The THRESHOLD LEVEL should be approx 5 dB below the maximum AGC level.

4.17 Viewing Software Version Details

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

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

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



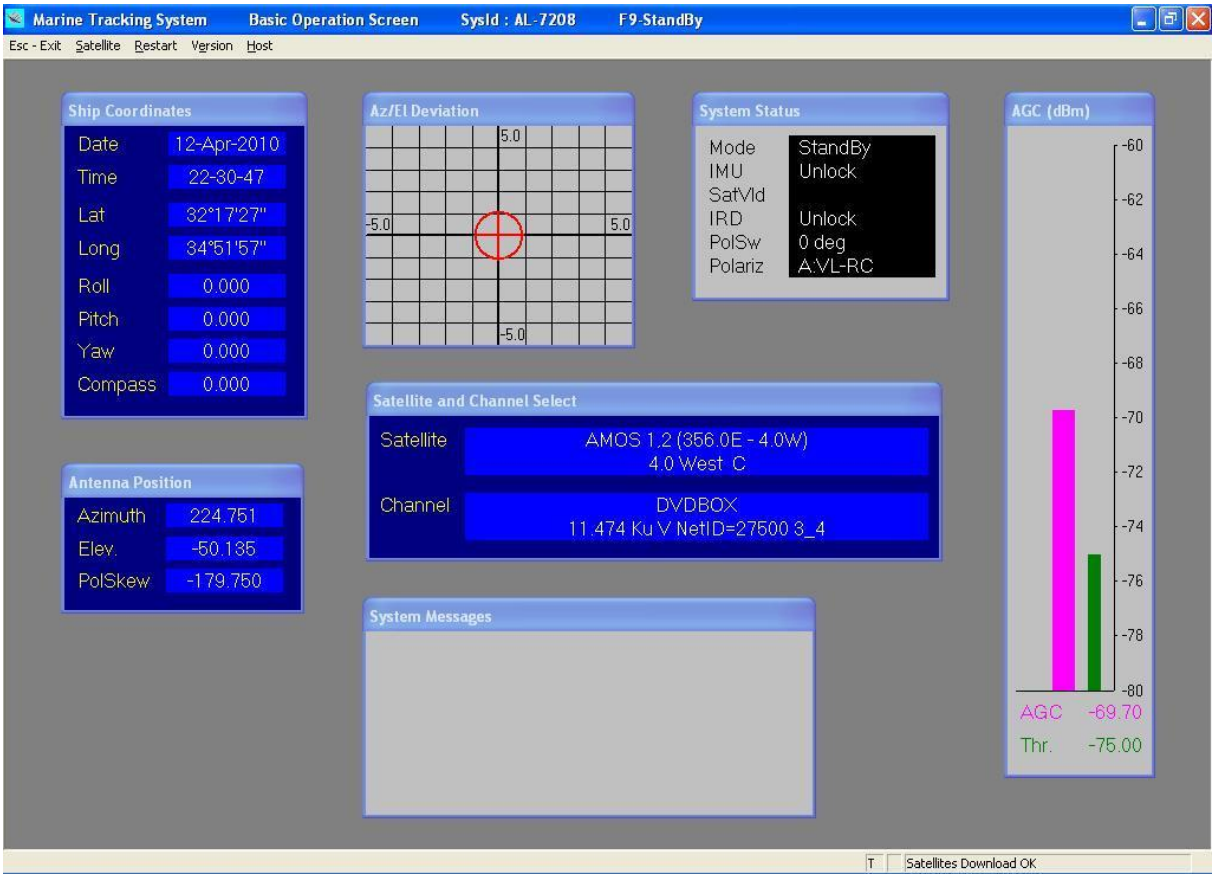
For proper CCU- Controller (SBC) communication, the same Program and Communication versions should installed on both units.

4.18 Using Host Menu

➢ **To use the Host menu:**

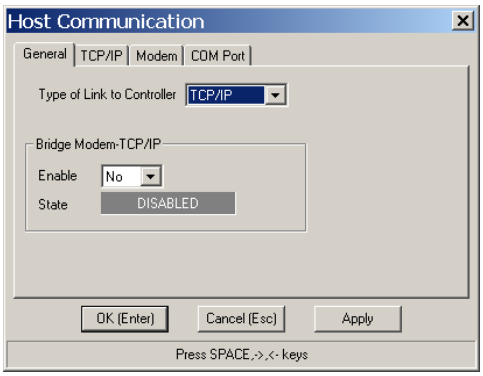
Type <H> or click HOST in the menu bar.

The HOST sub-menu appears.



1. Click COMMUNICATION to use the **COMMUNICATION** functions.

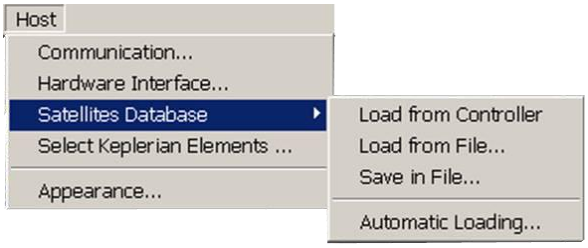
   The HOST COMMUNICATION screen opens.



To update the SBC IP address, click on the TCP/IP tab and update.
By default, the SBC IP address is always: 192.9.200.10.

2. Click SATELLITES DATABASE to use the **SATELLITE DATABASE** functions,.

   The SATELLITES DATABASE sub-menu opens.



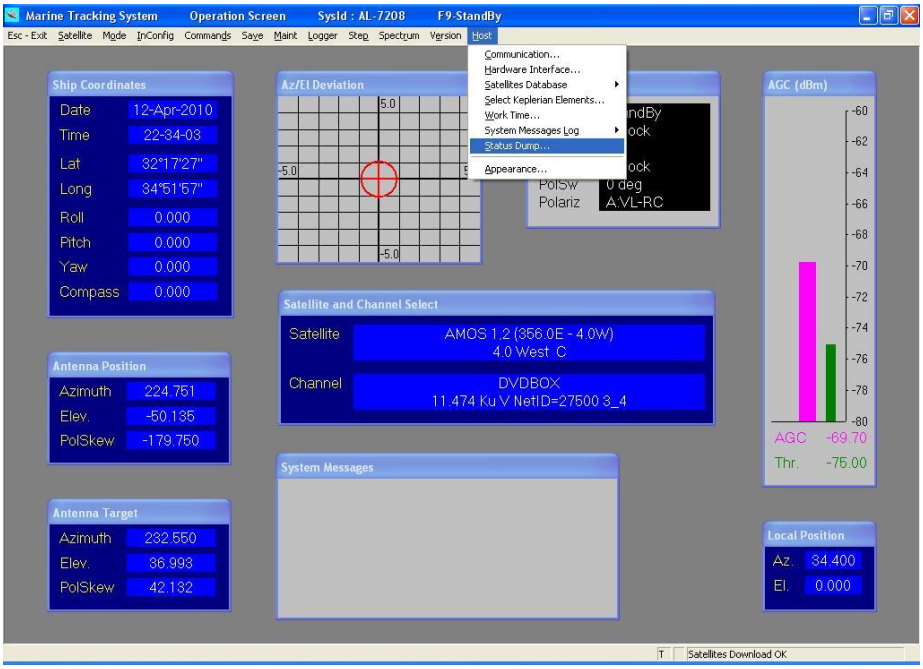
The Satellite database loads automatically from the controller (SBC) when communication is initiated between the CCU and SBC.

4.19 Status Dump

When activated, Status Dump produce a “StatusDump.txt” ASCII file that contains text information which can be used for system troubleshooting.

➢ **To activate the status dump:**

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



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

2. Type OK.

Using the "Save as" window, select a location to save the file. You can save the file on the CCU's desktop then copy it to a flash drive, or save it to a flash drive 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 malfunction, the CCU displays a Message, Warning or Error message,.

The messages are classified into three categories, identified by different colors:

- Error (indicate system malfunctions; the system is shut-down) – red (e.g. Pedestal X Axis Encoder Fault).
- Warning (indicate external devices malfunctions) – blue (e.g. Compass Communication Failed)
- Message (indication only) - green (e.g. System Shut-Down, Pedestal Y Axis Jammed)

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: During power up, the SBC could not find the Maintenance Configuration file in its Flash memory (disk C:\).

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

Description: During power up, the SBC could not find the Operational modes Configuration file in its Flash memory (disk C:\).

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

Description: During power up, the SBC could not find the Satellite Database file in its Flash memory (disk C:\).

Controller screen label: “ERR 057: No System Configuration File”

Description: During power up, the SBC could not find the System Parameters Configuration file in its Flash memory (disk C:\).

Controller screen label: “ERR 058: No Valid IMU Calibration File”

Description: During power up, the SBC could not find the IMU Calibration file in its Flash memory (disk C:\).

Controller screen label: “ERR 100: Satellite File Read Error”

Description: During power up, the SBC could not read the Satellite database file from its Flash memory (disk C:\), during operation.

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 also appears 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 identical – an appropriate message is produced.

5.1.3 Warning Messages

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

Description: The controller 13/18VDC power supply to 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-7207 did not initialize all axes Encoder init and IMU init.

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

Description: The controller 13/18VDC power supply to 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: 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.

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

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

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

Description: During power up, the SBC could not find the internal wide-band receiver linearization calibration file in its Flash memory (disk C:\).

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

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

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

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

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

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

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

Description: The position encoder readout of the Y-axis exceeds 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”

5.1.4 Messages (Info)

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

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

Controller screen label: “018: Acquiring a Satellite”

Description: System is acquiring a satellite

Controller screen label: “019: System no initialized”

Description: Encoder and IMU are 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: “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 I out 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: “122: System Shutdown, SBC Power/Tempr”

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

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 Troubleshooting Guide

5.2.1 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 may 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.

5.2.2 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.

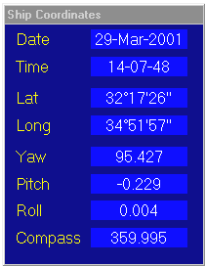
Table 5-1. Troubleshooting Guide			
no.	**Symptom**	**Possible Cause**	**Corrective Action**
1	AGC level is not present at all.	LNB cable is disconnected.	Connect the cable to the LNB.
		There is no power supply to the LNB from the SBC.	Measure the voltage on the LNB cable.
2	Error messages such as "PED Y JAMM" appear on the CCU for all axes.	No voltage is supplied to the axes.	In the Maintenance Screen, check the voltages at the axes.
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 correct 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 correct compass offset.
6	Weak AGC level	Polarization is changed from horizontal to vertical or vice versa.	Change the polarization using 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
9	The "no GPS position update" error message is displayed.	Faulty / Disconnected GPS antenna	Check the GPS antenna connection to the SBC.

Table 5-1. Troubleshooting Guide			
no.	**Symptom**	**Possible Cause**	**Corrective Action**
		Faulty cable between the SBC front panel to the SBC board	Check the connection between the SBC panel to the SBC board

5.3 Troubleshooting Tips

- 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 5-2. 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.		If necessary, check that 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 shown in the Antenna Position fields.		Restart the system.

5.4 Using Status Dump Function for Troubleshooting

5.4.1 Introduction

The Status Dump function produces a “StatusDump.txt” ASCII file that contains text information which can be used for system troubleshooting.

5.4.2 Activating the Status Dump Function

Refer to para. 4.19 in this manual.

5.4.3 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.

- EXAMPLE -

```
Orbit Marine Status Dump Report at 28-Mar-2010 16:41:38
************************************************************
Controller's Information
************************
CPU Kind:               SOM4450
VxWorks Software Version: 4.6 6.08.2009
Work Time:              18 minutes 55 seconds
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-7208

Hardware ID
***********
---TYPE----
Receiver:         29_0001
I/O:              29-0001
IMU:              SLDSTATE
BUC:              Undefined
---EPLD Version---
Receiver:         DEC2
I/0:              DEC2
I/0:              DEC2
---Serial Number---
SBC:              0831
---Calibration Files ID---
imusave:          1660
nbrsave:          U104
nbralcsv:         U104
bucltab:          REV D

System Status
*************
Operating Mode:     StandBy
IMU status:         Locked
IRD:              Unlock
PolSw:            0 deg
```

Polariz: A:VL-RC

Ship Coordinates

- EXAMPLE -

****

Latitude: 32.291 deg

Longitude: 34.866 deg

Compass: 265.500 deg

Axes Offsets

****

--Encoder--

Pedestal-X: -37.351 deg

Pedestal-Y: 48.633 deg

--Allignment--

PolSkew: 46.000 deg

Elevation: -0.320 deg

Antenna Status	Target	Position
**********	**********	
Azimuth:	237.330 deg	179.283 deg
Elevation:	33.275 deg	69.486 deg
PolSkew:	45.347 deg	60.081 deg

Current System Messages

****

Tracking Signal

****

AGC: -68.79 dBm 3.00 Volts

Thresh: -75.00 dBm

Tracking Frequency: 1288.100

NBR Selected IF Filter: 300KHz

Compass Setup

****

On Host: YES

Compass Type: NMEA_0183

Compass Offset: 3.834 deg

- EXAMPLE -

Power State Readout

****

Parameter	CPU	SBC	IMU	SDU	NBR
+5V:	4.978	4.998		5.742	
-5V:	-4.950				
2.5V:	2.480				
3.3V:	3.292				
+12V:	12.100		12.000		
-12V:	-11.988				
+30V:			15.764		
LNBV:	18.685	26.647		0.227	
T(degC):	39.000	26.723		29.508	

Local Angles

****

Azimuth: 344.485 deg

Elevation: 43.137 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

****

CPU Kind: SOM4450

Version: 4.6 6.08.2009

Work Time: 36 minutes 14 seconds
IP Address: 192.9.200.22
Subnet Mask: 255.255.255.0
Default Gateway:
Communication Type: TCP/IP
Remote Address: 192.9.200.10
Hardware Interface Enable: YES

- EXAMPLE -

Compass Interface Setup
****
Input Enable: YES
COM Port Number: 1
Baudrate: 4800
Format: 8_NON_1

GPS Interface Setup
****
Output Enable: NO
COM Port Number: 1
Baudrate: 4800
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

****

Contact Detail (Manually)

****

- EXAMPLE -

* 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

6.2 General

Installation of the AL-7207 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

The main steps are illustrated in the following Figure.

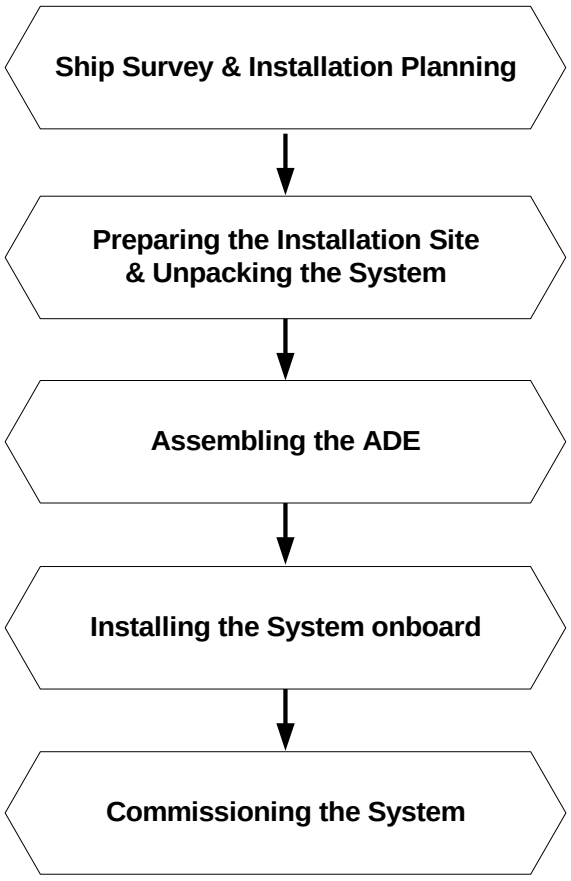
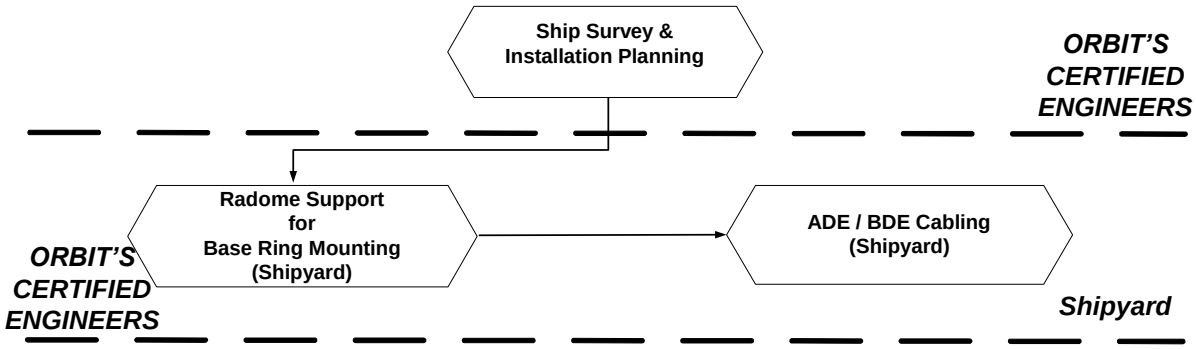


Figure 6-1: The Orbit system workflow

7 Ship Survey & Installation Planning



Ship Survey and Installation Planning go hand-in-hand, and consist of 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 should be conducted with an authorized representative of the ship's personnel. Installation Planning requires you to check that all the necessary parameters are considered and addressed.

7.1 Ship/Site Survey

(Refer to Appendix A for a Site Survey form)

During the visit to the ship, complete a Site Survey Report to allow accurate and efficient installation planning. This report, which is tailored to each system installation, should contain a level of detail necessary to ensure that no technical and/or design information is overlooked.

During the site survey, particular attention should be given to requirements for blockages, and the relation to other interfering equipment such as radar, etc. 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 the two 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

The following tasks should be carried out after the Ship Survey,:

- 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 help ensure a successful installation with minimum problems before and during 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 gathered for the Survey Report, prepare the installation plan. This should include equipment locations, installation details, cable runs, etc.

ADE and BDE location are two issues that should be taken into account.

The following describes 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:

Radome Support

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

- Location with no (or minimal) 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 must be welded or bolted to the BASE RING 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, pay attention to the Pedestal orientation. Note that the Pedestal has a grip handle in one side. Te ladder should be located on the same side as the handle, to facilitate climbing into the radome.

You must provide unhindered access to the RADOME BOTTOM HATCH for maintenance byu technical staff, their tools and spare parts.

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

If it is necessary to elevate the RADOME, it can be mounted on an optional structure that supports the RADOME with all the ADE units installed in it.

Although it is advisable to use the -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 is necessary to support its weight and for the Antenna's dynamics. The ADE mounting surface must be rigid, flat, and free of vibration. It also must be a level and stable surface. The mounting surface must be capable of supporting the total equipment weight, details of which can be found in Chapter 8.

- The Radome Support must 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.
- Lack of stability in the system can cause damage to the motors and gears.

The mounting surface must be able to withstand lateral wind loading forces, and it must be stable with a natural resonance frequency of above 30 Hz.

Radome Dimensions

For details of the RADOME dimensions, refer to Chapter 2.

Maintenance Access

You must consider unhindered access to the RADOME HATCHES below the SUPPORT for maintenance by 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 typically are the ship's funnels and masts.

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

- It is recommend that you install the system with the X-axis pointing towards 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 mounting plate.
- The Base Ring must also be oriented 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, that connects 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:

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

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

Other Location Considerations

The mounting location should be located at least 10m from high-power radar systems or other radiating devices, and on a different plane from these systems or devices.

The AL-7207 system withstands the IEC 60945 standard. The installer should plan the installation so that there is no interfering radiation that exceeds this standard condition. 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 radio frequencies [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, sufficient space should be provided around the equipment to allow 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. Orbit's technicians or an authorized dealer, are responsible for the work afterwards.

7.2.3 ADE / BDE Cabling

The following table describes the recommended types of cabling to be used (if required), and 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	When there are no interconnections
1	Ethernet	CAT 5	150m.	When 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.

8 Preparing the Installation Site & Unpacking the System

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

8.1 Preparing the Installation Site

➢ **To prepare the installation site:**

1. At the installation site (e.g. dock-side) organize an installation-preparation site of at about 30 sq. m. (320 sq ft.) with a firm, clean, level surface and clear of any obstacles. The surface must be capable of supporting the full weight of the assembled system (estimated up to 610 kg/1345 lb).
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 must support the weight (estimated up to 610 kg/1345 lb) of the whole system once it is assembled.

   Ensure that the stands to not 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 positioned to allow free access to the two hatches from underneath.

8.2 Unpacking the System

The System is 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 contents may shift during transportation.

When you open the crate, check the contents and immediately report any damage to the shipper and Orbit.

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

To maintain good order, only unpack a crate's contents when you are instructed 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-MK2A
- Positioner AL-7208-1
- 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 Antenna., C-Band Circular & KU-Band Linear. Assy, with LNBs
- Base Ring for Radome 3.35M
- Dish Support.

Radome Crates #1 and #2

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

Weight (total): ~600 kg.

- Before opening a crate or removing any of its contents, carefully check for any obvious external damage.
  If Shock and Tilt Watches have been attached to the crate, check that they have not been broken.
- During the unpacking process, check all components, and immediately report any damage to the shippers and support@orbit-ltd.co.il. Units damaged during shipping are not covered under Warranty terms and conditions.
- During the unpacking process, verify that the crate's contents correspond to the relevant Packing List.
- Make careful note of all component serial numbers (located on their respective nameplates). 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

Perform the installation of the System at a convenient, covered location, close to the ship.

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

After 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-7208 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.

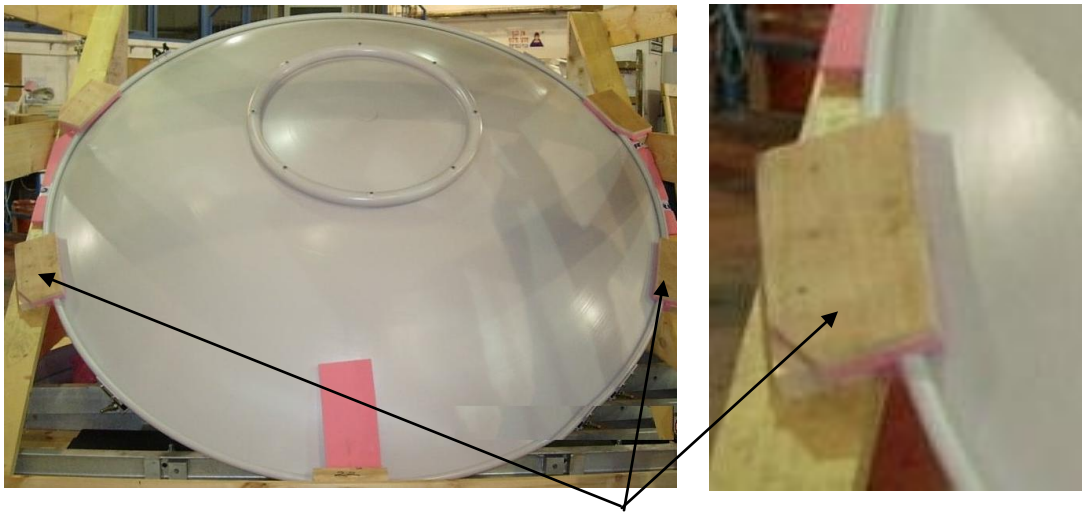


Figure 9-2: Dish Retainers

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 it cannot be accidentally touched or damaged it in any way.

- **Base Ring Drawing:**

The following Figure depicts the structure and dimensions of the BASE RING (P/N 21-0306).

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

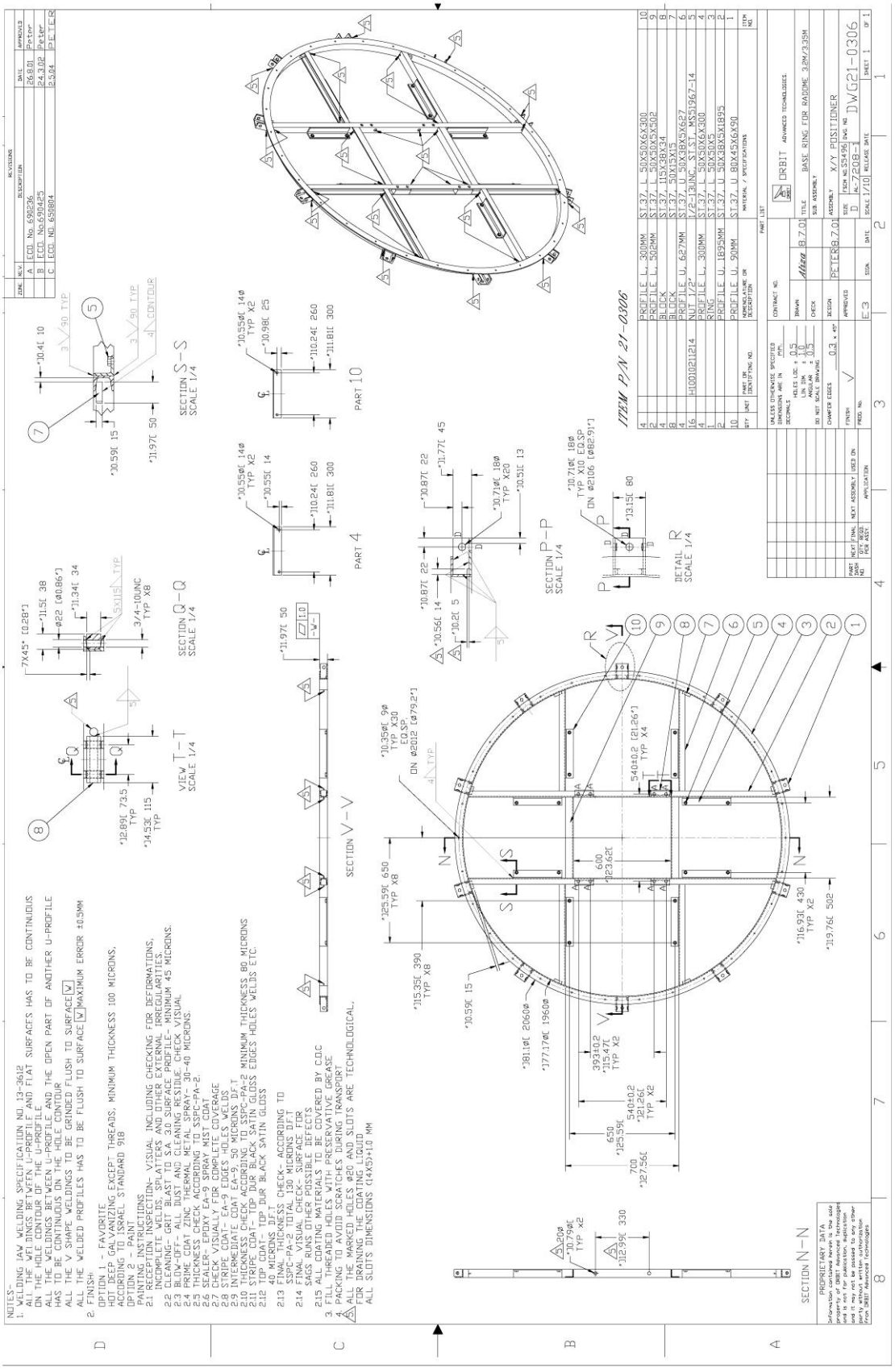


Figure 9-3: Base Ring Structure

9.2 Attaching the Radome Base to the Base Ring

The RADOME consists of a two-section base, eight LOWER SECTION PANELS and eight UPPER SECTION PANELS.

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

When placing and securing the Base Plate sections on the Base Ring, verify that the Radome Base is perfectly aligned with the Base Ring.

➢ **To align the Radome Base Plate 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 PLATE on the BASE RING so that they exactly cover the ring and the two HATCHES are aligned with the spaces on the ring.

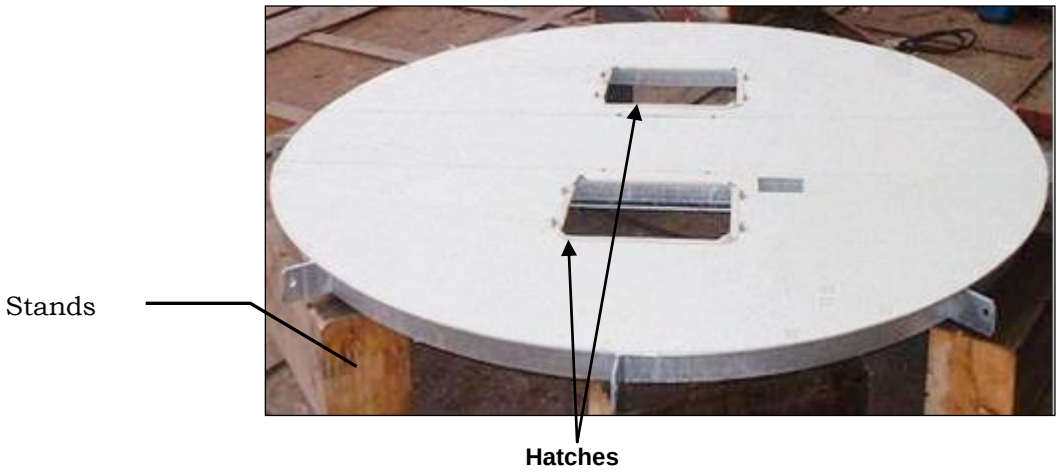


Figure 9-4: The Radome Base with eight Pedestal Base Plate Mounting Holes

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 drill mounted 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, be careful not to damage them in any way.

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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.

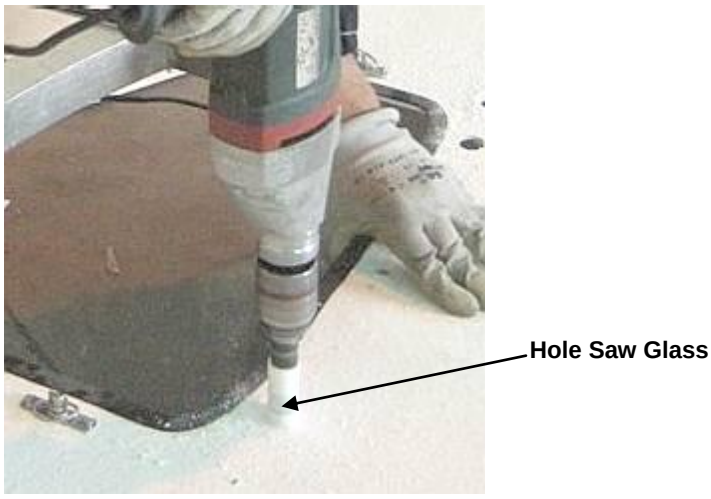


Figure 9-5: Radome Base (3-section) – Eight Pedestal Base Mounting Holes

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.

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.

Be very careful not to damage the encoders when lifting the PEDESTAL from the shipping crate.

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

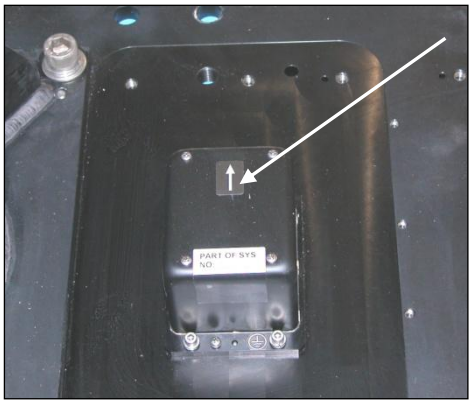


Figure 9-6: IMU Location Arrow

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

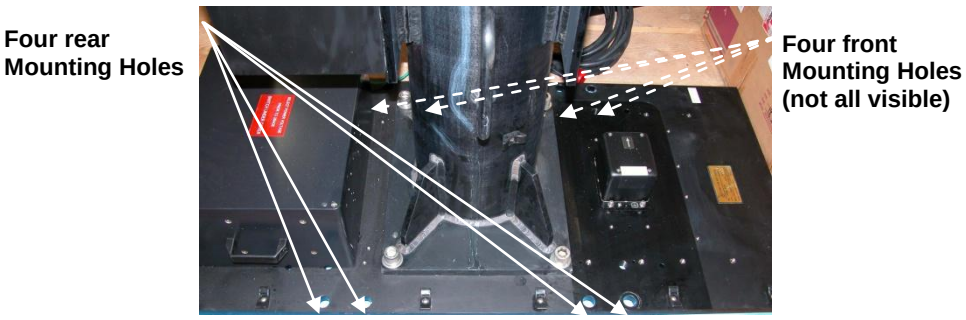


Figure 9-7: Base Plate Mounting Holes

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

9.4.1 The Positioner

The POSITIONER is mounted on the PEDESTAL.

It contains the following main components:

- MOTOR, GEAR and ENCODER for the X-Axis
- MOTOR, GEAR and ENCODER for the Y-Axis
- UPPER MOUNTING PLATE

There are three types of POSITIONER and each one is made for specific systems, as described in chapter 8.

- The 7208-1 POSITIONER is illustrated in the following two figures:

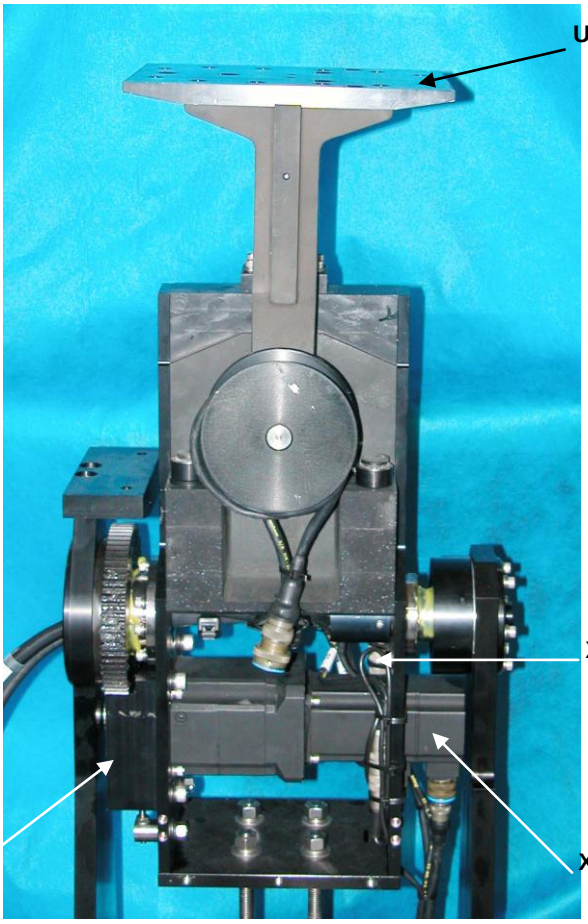


Figure 9-8: Positioner 7208-1: for the Triangular Dish Support (X-Axis)

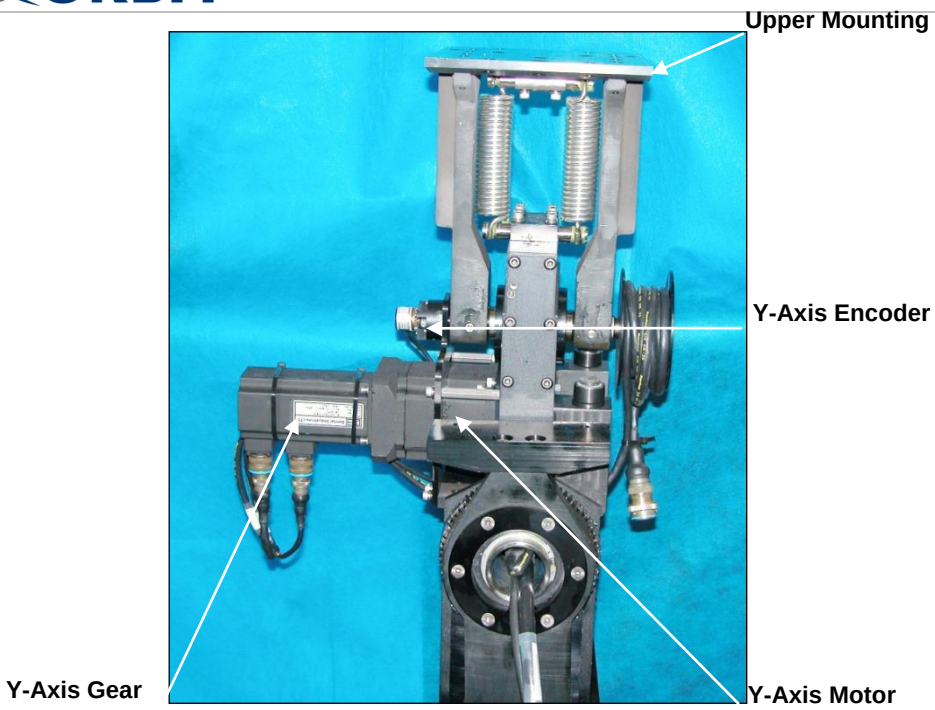


Figure 9-9: Positioner 7208-1: for the Triangular Dish Support (Y-Axis)

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

- Using the HOISTING DEVICE
- Using lifting strap.

9.4.2 Lifting the Positioner using the Hoisting Device

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

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

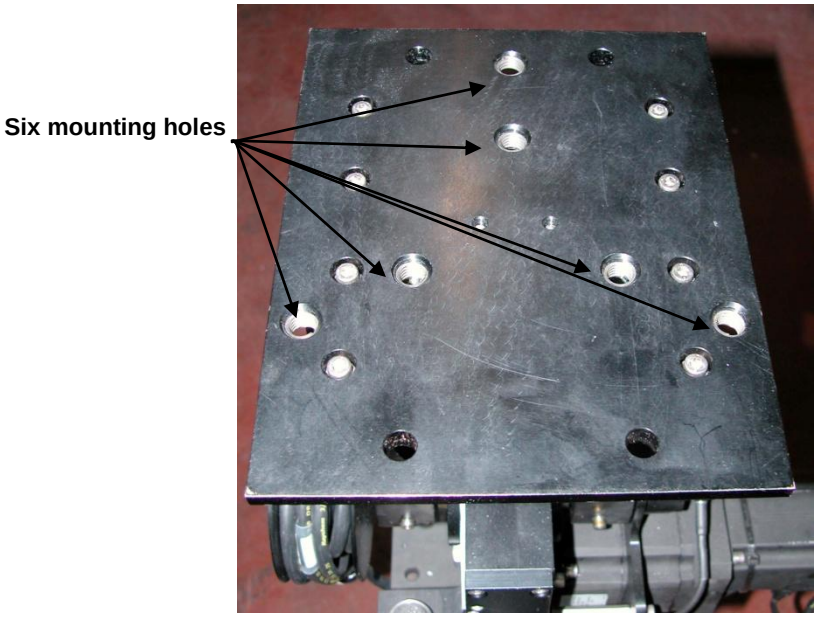


Figure 9-10: Positioner's Upper Mounting Plate

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

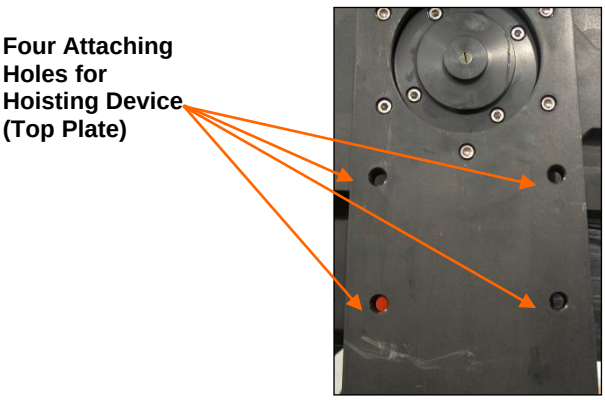


Figure 9-11: Lifting the Positioner using the Hoisting Device

9.4.3 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.

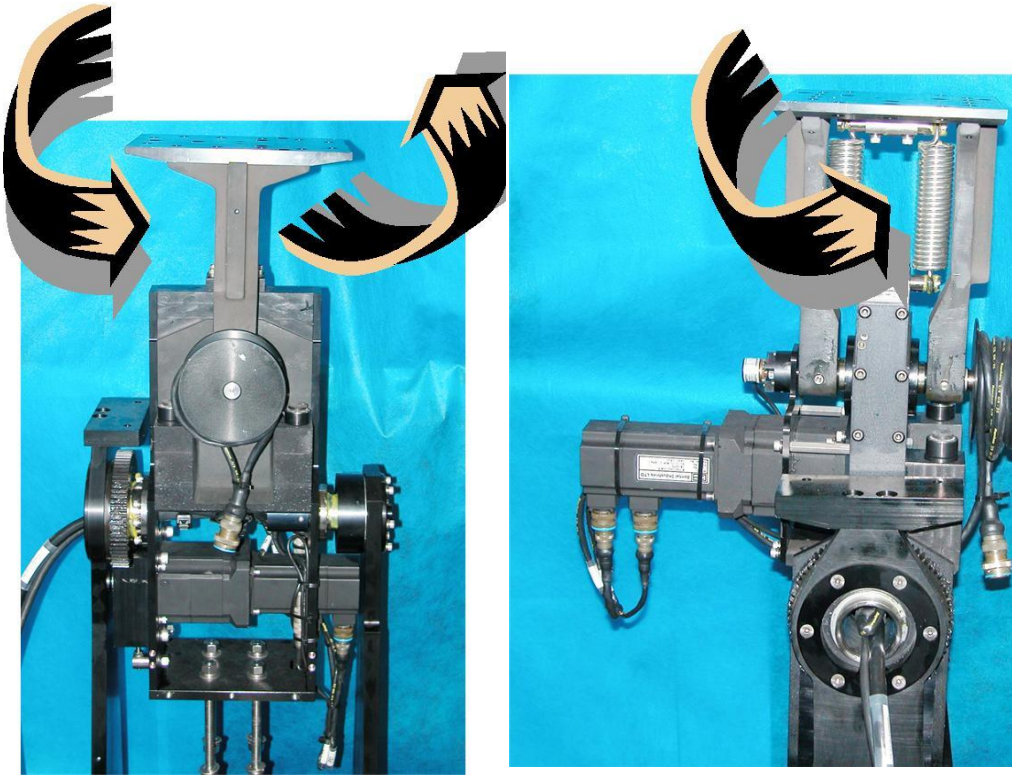


Figure 9-12: Lifting the Positioner using lifting strap

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

1. The POSITIONER is secured to the shipping crate.
   Remove all the screws from the holding bracket that secures the PETITIONER'S UPPER MOUNTING PLATE to the shipping crate,
2. Stand the POSITIONER on its MOUNTING PLATE and remove the holding bracket from the UPPER MOUNTING PLATE.
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.

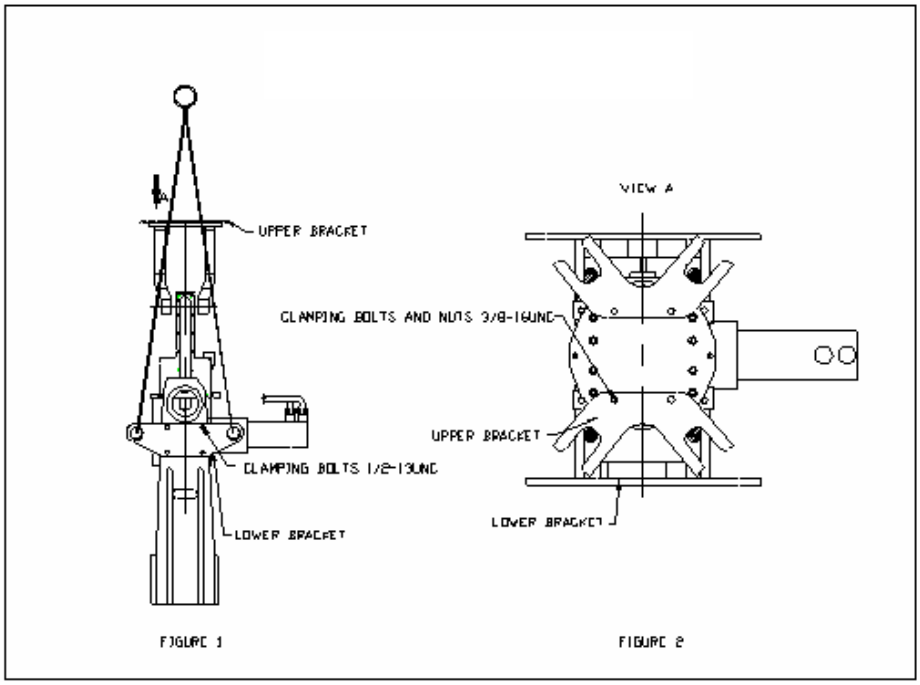


Figure 9-13:Lifting the Positioner

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. There is only one orientation in which you can place the POSITIONER's MOUNTING PLATE.

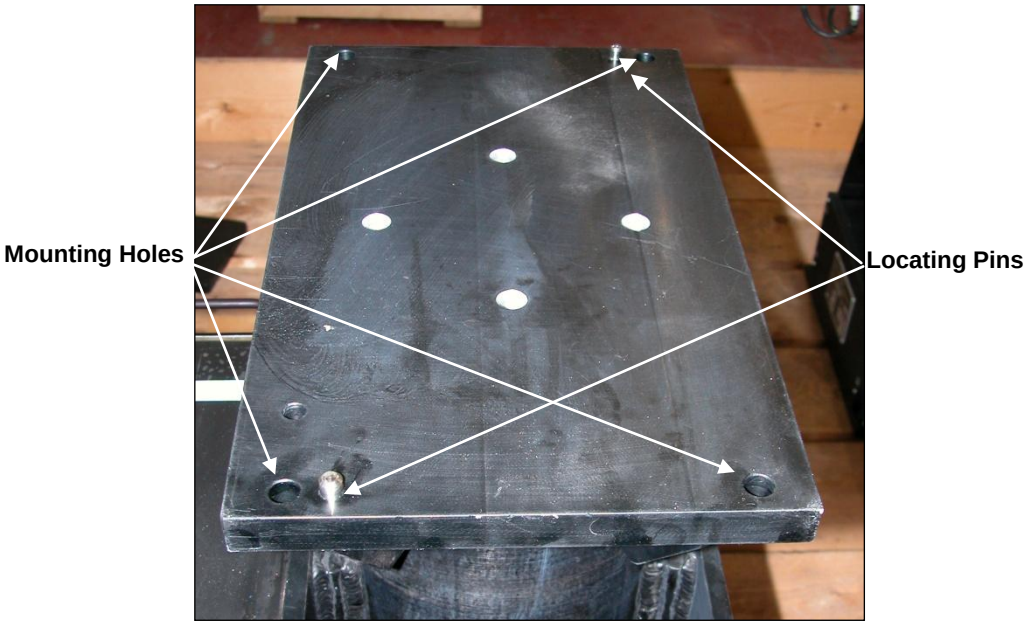


Figure 9-14: Pedestal's Upper Mounting Plate, Mounting Holes and Locating Pins

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 consists of eight panels. The panels must be attached together using the self-adhesive seal, nuts, bolts and silicone. The complete section is then 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 location should be pre-determined during the site survey and agreed with the customer.

Verify that the Hatch is correctly oriented on 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.

Where instructed, make sure that you place the silicone at the correct angle. This will help ensure that any water that penetrates the joints is directed to the outer surface of the Radome.

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

Assemble the Radome panels in the order of the numbers 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.

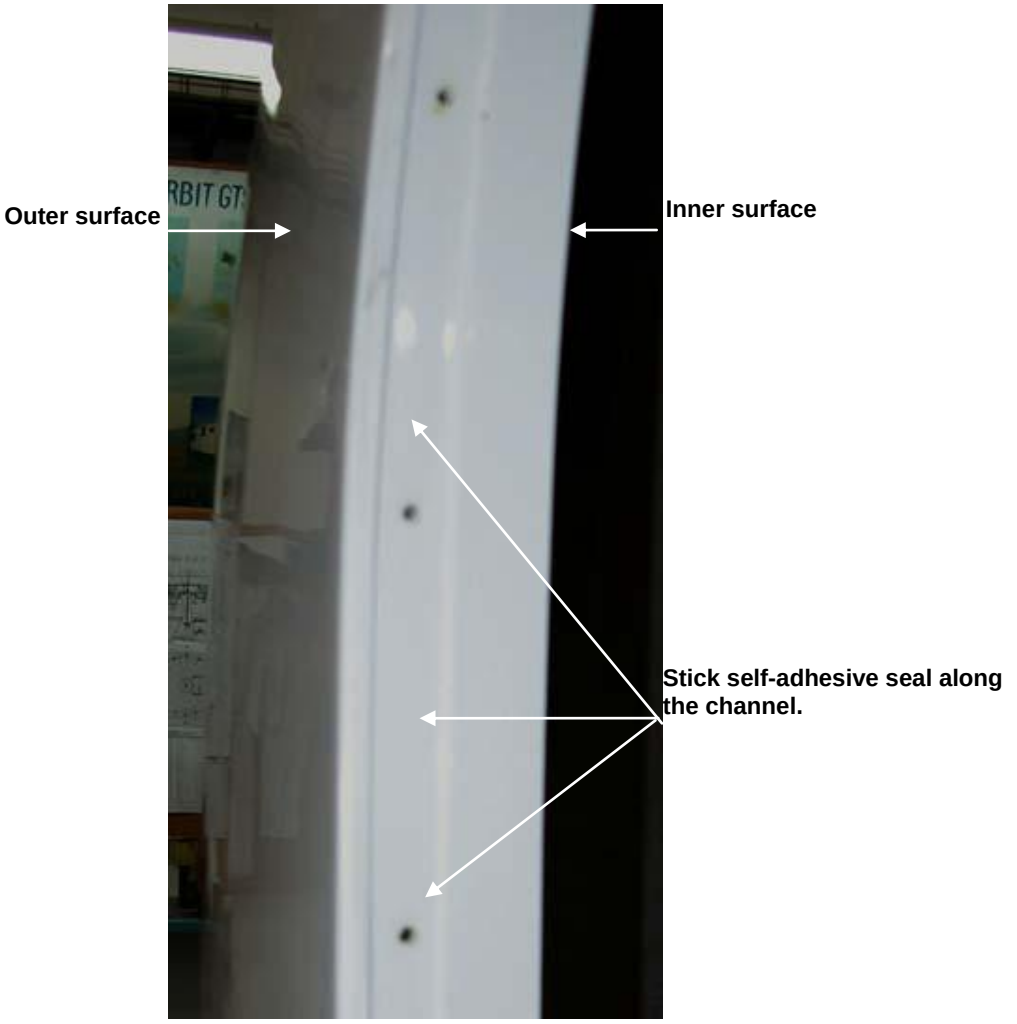


Figure 9-15: Radome panel flange channel

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:

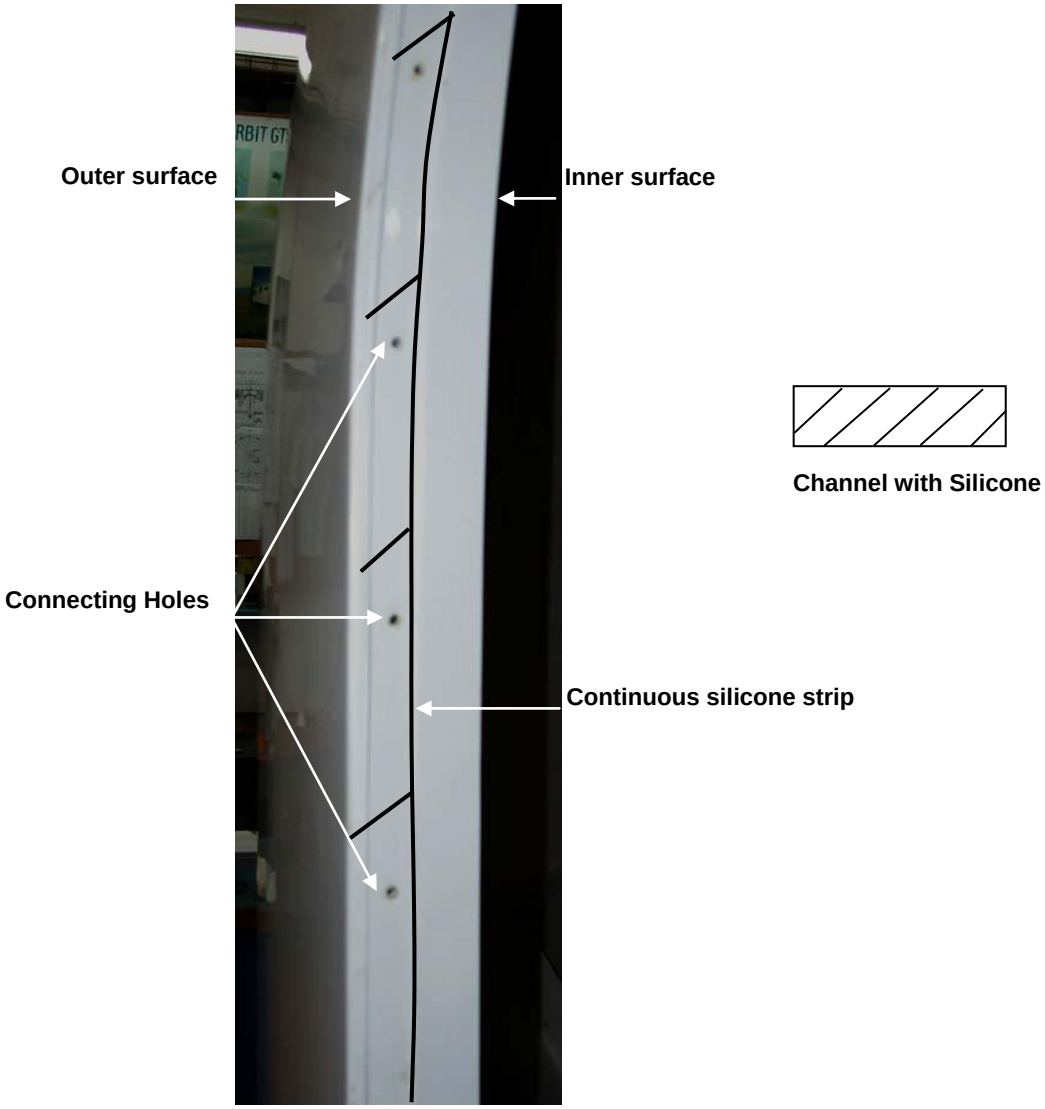


Figure 9-16: Radome panel with silicone applied on the seal

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 in the same direction – 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 position and align the lower section with the RADOME BASE, ensuring that the HATCH is positioned as required.

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

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.

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.

Before securing the Lower Radome Section to the Base Plate, verify that the Lower Radome Section is exactly aligned to the RADOME BASE.

2. From underneath the BASE RING'S flange, **at only four places**, drill upward through a hole in the flange (with a drill bit that is 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 9-17: 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 that is 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.

Figure 9-18: Lower Radome Section Secured to Radome Base

9. Make a clear mark on the outside panel, exactly opposite the arrow on the IMU, so that the arrow on the IMU points to the mark. This will be used when positioning the complete ADE System on the RADOME SUPPORT.
10. One of the *lower* panels also contains the HATCH.
    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.
11. To open the HATCH, unscrew all the screws and push it out of the aperture.

Figure 9-19: Hatch viewed from the inside

Figure 9-20: Hatch viewed from the outside

9.7 Installing the Dish Support on the Positioner

The following table describes the assembly flow for the system:

System	Assembly Flow
AL-7207/8	Triangular Dish Support > Positioner. Dish > Triangular Dish Support Feed > Tripod Feed Support Tripod Feed Support > Dish

Figure 9-21: Triangular Dish Support for AL-7207/8

Installing the Triangular Dish Support on the Positioner

➢ **To install the Triangular Dish Support AL-7207/8 on the Positioner:**

1. Ensure the POSITIONER's UPPER MOUNTING PLATE is horizontal to the floor.

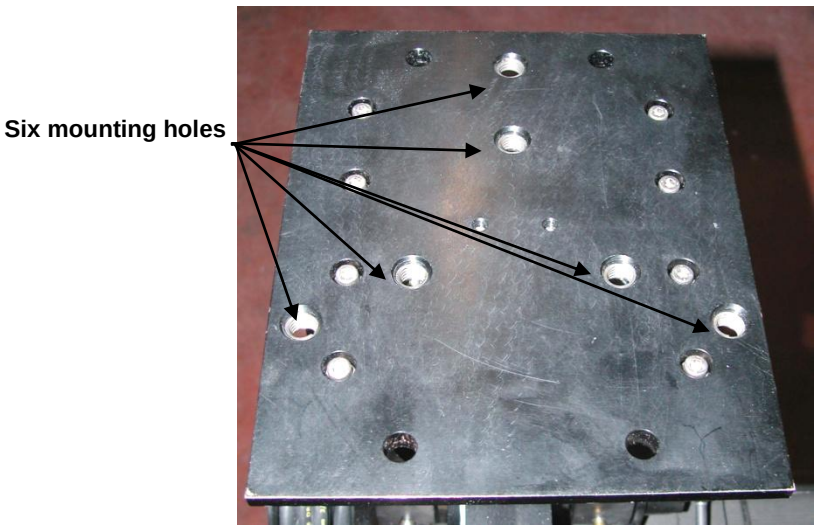


Figure 9-22: Positioner's Upper Mounting Plate – Triangular Dish Support (6 holes)

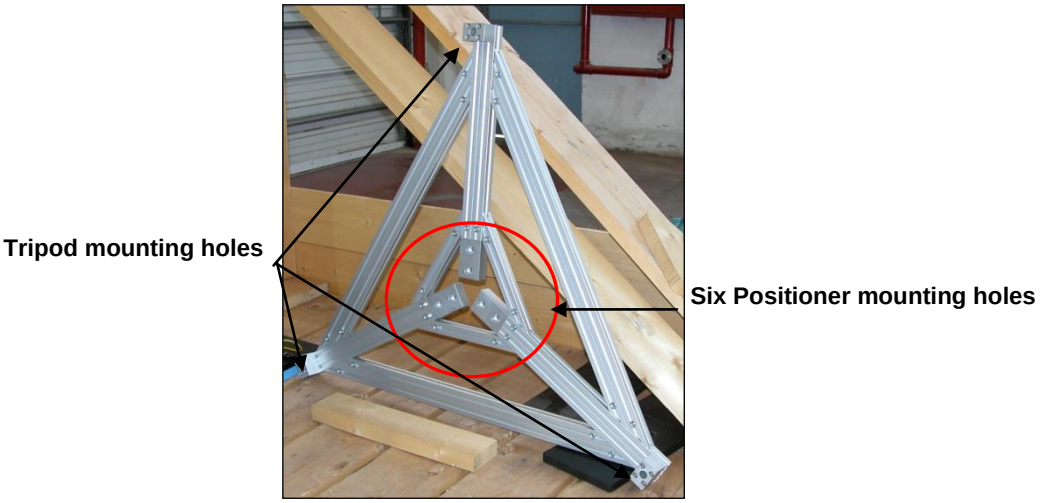


Figure 9-23: Triangular Dish Support (6 holes)

2. A sticker is attached to the TRIANGULAR DISH SUPPORT and under the MOUNTING PLATE. The arrows on the stickers facilitate alignment to the support.

   Take the TRIANGULAR DISH SUPPORT and a) with the TRIPOD MOUNTING HOLES facing up, and b) the arrow on one of its arms aligned with that *under* the MOUNTING PLATE, align the six SUPPORT MOUNTING HOLES with those on the POSITIONER.

3. Apply locking compound (LocTite) to the six 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 to the Dish Support

Attaching the Dish to a Triangular Support

➢ **To attach a Dish to a Triangular 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 three holes in the rear of the DISH with those on the SUPPORT.
3. Apply locking compound (LocTite) to the three bolts and using the flat and spring washers, together with the *thick* spacers provided, fasten the DISH to the DISH SUPPORT, in the following order:

   DISH > 45mm SPACER > DISH SUPPORT > flat washer > spring washer > bolt.

9.9 Attaching the Feed to the Dish

9.9.1 The Feed

The System is supplied with the following FEED and respective FEED SUPPORT:

System	Feed Type
AL-7207/8/9	TVRO: Digital Feed (#AL-7208-POLD) equipped with: 2 x C-Band (LNB), 2 x ExKu and Ku Band (LNB) switched by DiSEqC Switch.

System	Feed Type	Feed Support Type
AL-7207/8/9	TVRO	Tripod (assembled *after* the Dish is mounted on the Positioner)

The following sections describe the installation procedures of the FEED.

Two technicians are needed for the Feed installation procedure.

9.9.2 Attaching the Feed Supports to the TVRO Feed

The TVRO FEED is delivered connected with the CABLE CARRIER.

Each attaching point on the Feed and the Dish is marked with a number . You must only attach to it and the SUPPORT with the corresponding number, as illustrated in the following two figures:

Figure 9-24: Attaching Point on the Dish

Attaching point for Feed Support #3

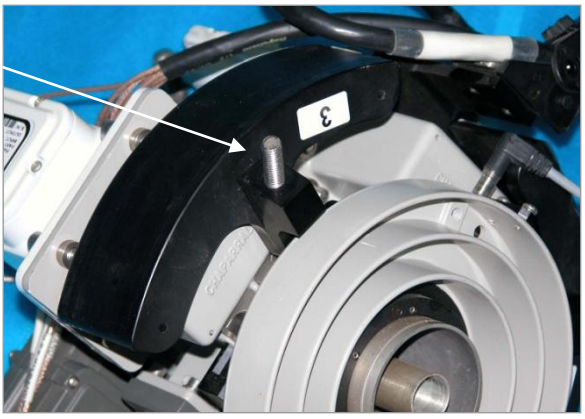


Figure 9-25: Attaching Point on the Feed

Attaching the Feed Support to the Feed

➢ **To attach the Feed Support to the Feed:**

The free end of the CABLE CARRIER is attached to the CABLE MOUNTING BRACKET that in turn, is attached to SUPPORT #1.

Cable Mounting Bracket

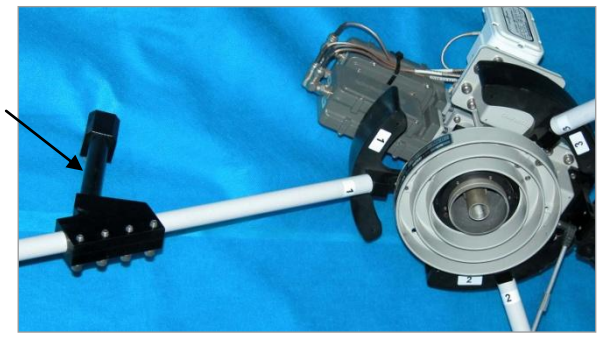
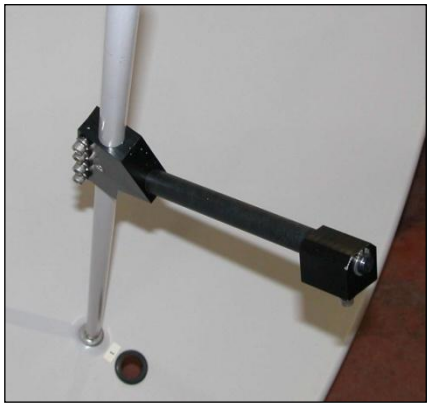


Figure 9-26: Support Mounting Bracket

➢ **To attach the Feed Supports to the Feed:**

1. Place the FEED on its side, on a clean even surface.
2. Each SUPPORT ARM is clearly numbered.

   Fasten SUPPORT #1 to its corresponding attaching point on the FEED and hand-tighten it.



3. Fasten the other two SUPPORTS and hand-tighten them.

Attaching the Feed Support to the Dish

➢ **To attach the Feed Support to the Dish:**

1. Attach the FEED SUPPORT to the DISH so that the numbers on the SUPPORTS correspond with those on the DISH.

   There are a number of nuts and washers (flat, spring and spherical) attached to each SUPPORT and care should be taken to assemble them in the correct order.

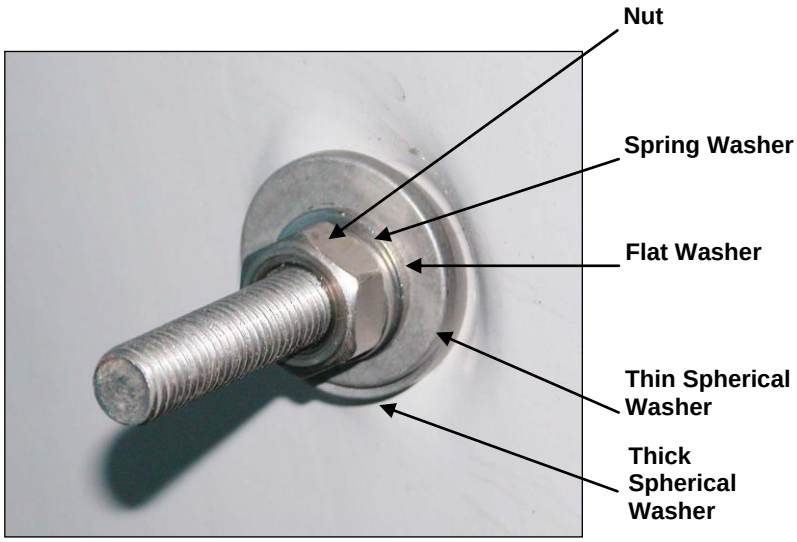


Figure 9-27: Fastening the Support at the rear of the Dish.

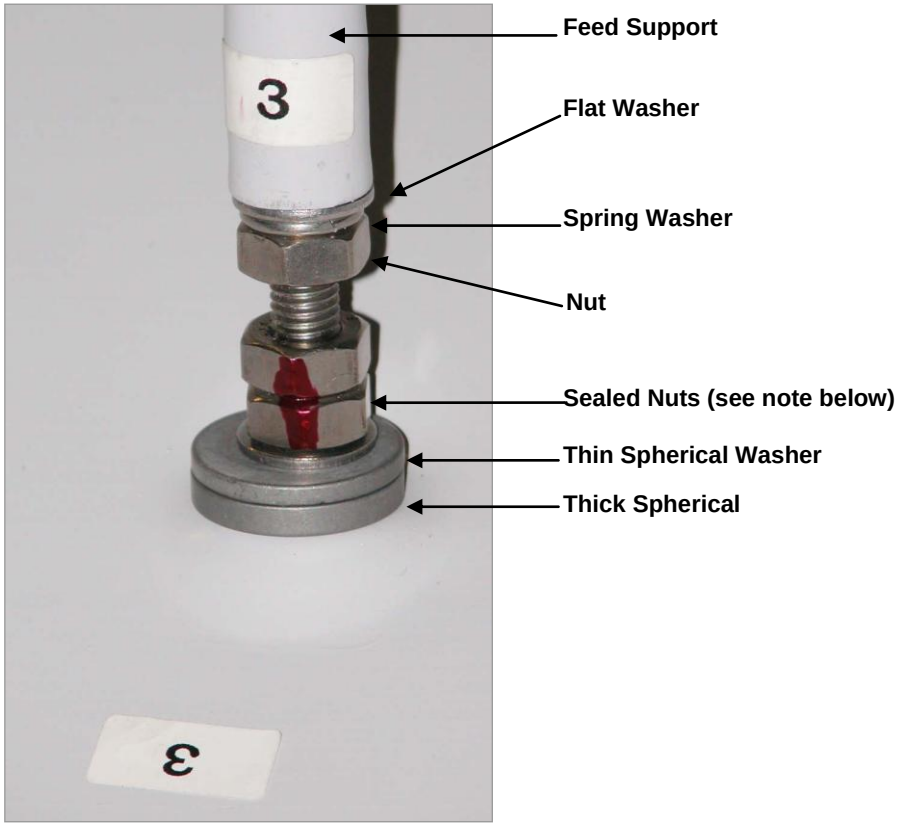


Figure 9-28: Fastening the Support on the front of the Dish.

Do not to attempt to loosen the two nuts that are sealed together, or to break their seal.

Attaching the Cable Carrier to the Cable Mounting Bracket

➢ **To attach the Cable Carrier to the Cable Mounting Bracket:**

- Using the screws and washers provided, fasten the Cable Carrier to the CABLE MOUNTING BRACKET.

  Ensure that the FEED can rotate through 520°, in both directions, with no interference.

TVRO – Digital

The cables from the TVRO DIGITAL FEED, consist of six RF CABLES, a POLARIZER cable, together with a SENSOR cable (wrapped with the POLARIZER cable).

The six RF CABLES connect the LNBs to the POSITIONER HARNESS via the CARRIER CABLE that also includes the POLARIZER CABLE.

➢ **To connect the Cables:**

1. Connect the CABLES from the CABLE CARRIER as follows:

Cable name	Connect to…
J12A / P12	MS Connector – Sensor Cable
No label on cable	Sensor
V EX KU BAND	High Vertical KU Band LNB
V KU BAND	Low Vertical KU Band LNB
H EX KU BAND	High Horizontal KU Band LNB
H KU BAND	Low Horizontal KU Band LNB
H L C BAND	Horizontal (left) C Band LNB (always opposite the KU LNBs)
V R C BAND	Vertical (right) C Band LNB

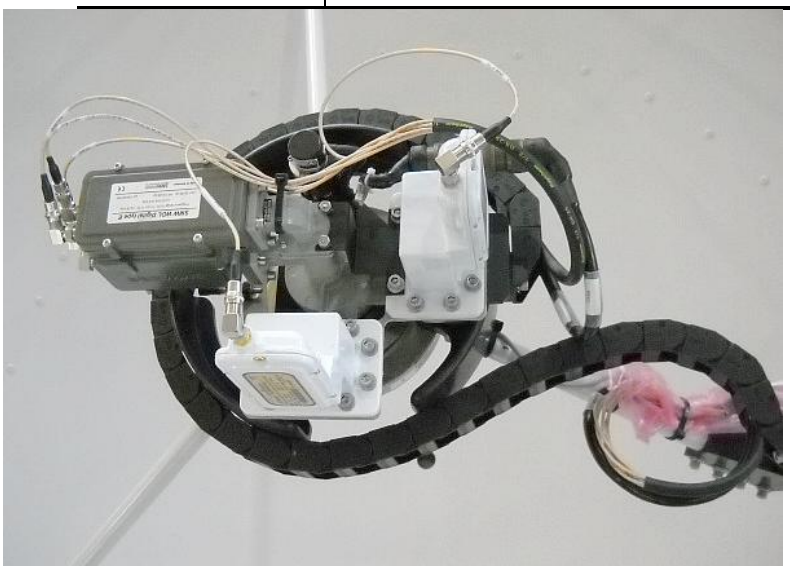


Figure 9-29: AL-7208-POLD Feed Assembly

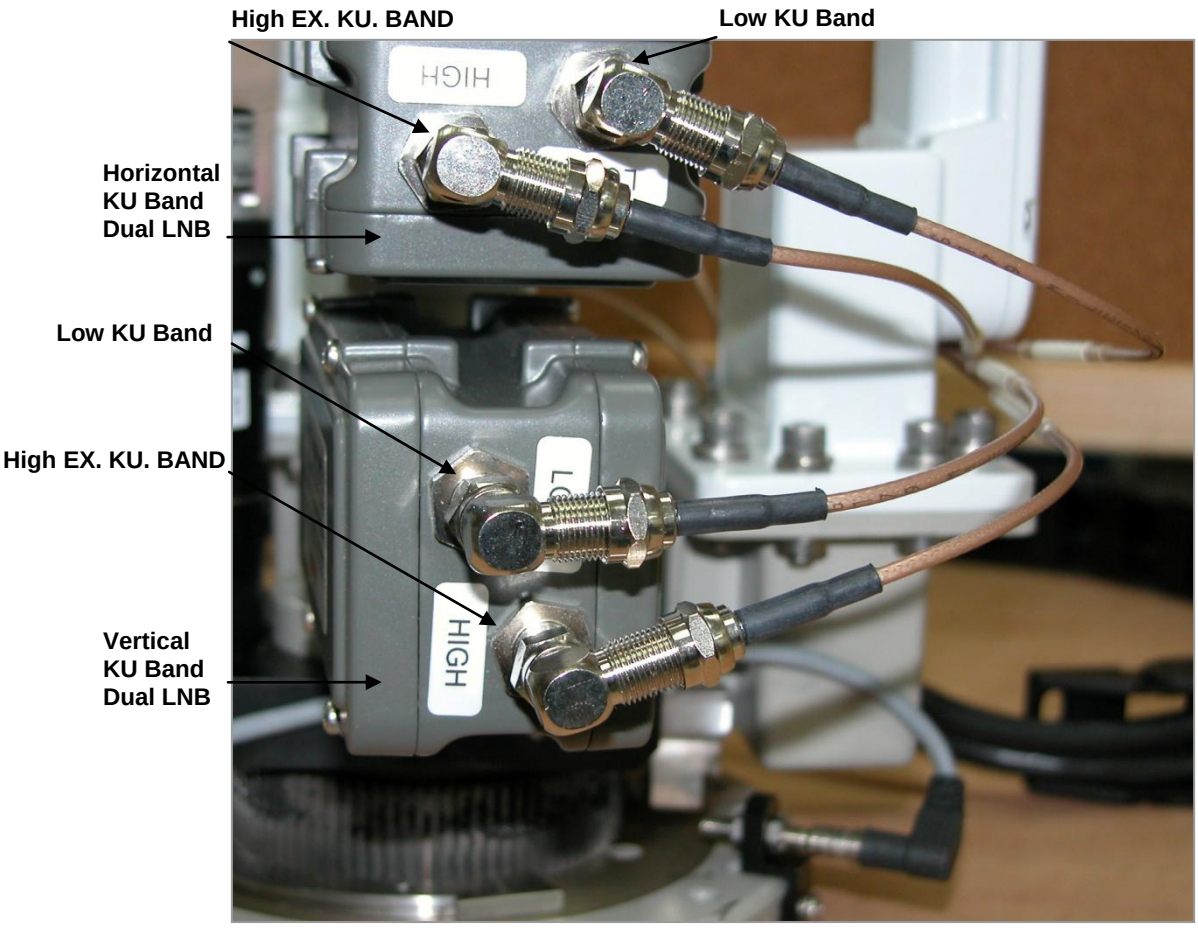


Figure 9-30: KU Band Cable Connections

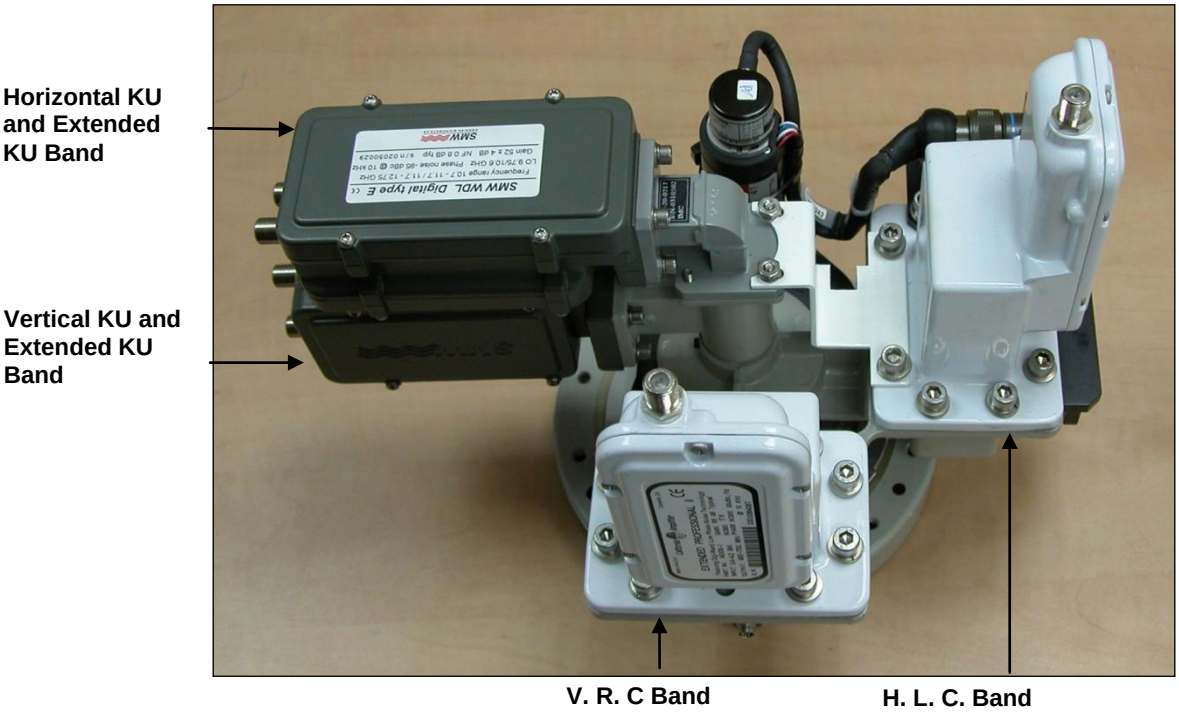


Figure 9-31: C-Band Cable Connections (as viewed from the left side of the photo)

2. Connect the angled J12A connector to the FEED.
3. Connect the P12 connector to the POSITIONER'S PEDESTAL HARNESS via the POLARIZER EXTENSION CABLE.
4. Connect the cables in the CABLE CARRIER to the RF EXTENSION CABLES, according to the labels on each cable.
5. Pass the extension cables down through the CABLE APERTURE adjacent to SUPPORT #1, along the route of the PEDESTAL HARNESS, and connect them to the DiSEqC SWITCH, and to the LCU.
6. Attach the DiSEqC SWITCH to a convenient location on the RADOME FLOOR.

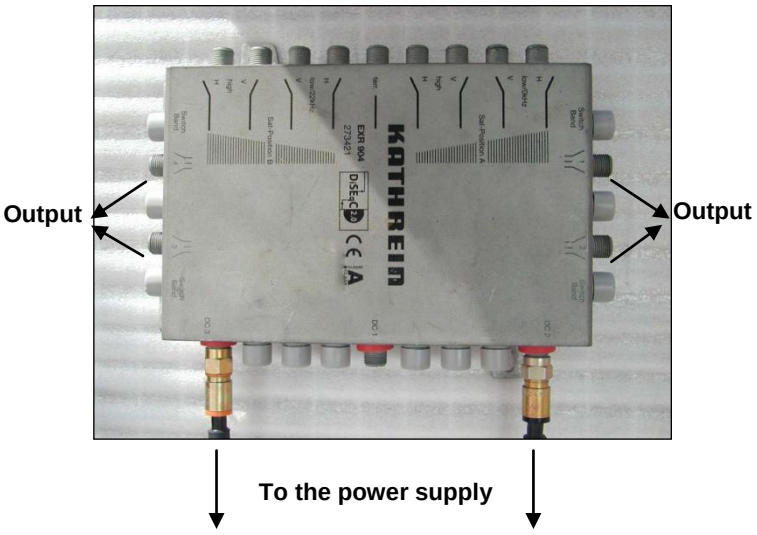


Figure 9-32: DiSEqC Switch

7. Connect the other end of the EXTENSION CABLES to the DiSEqC SWITCH.

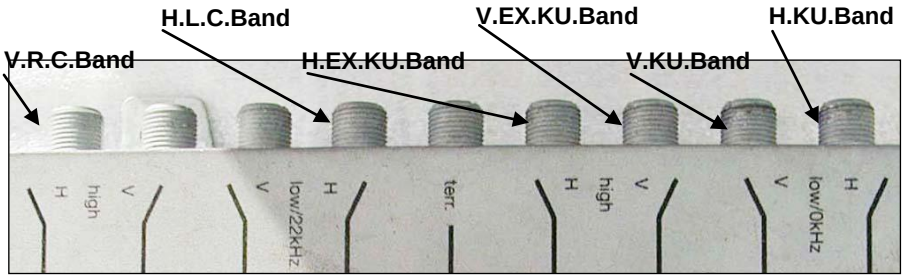
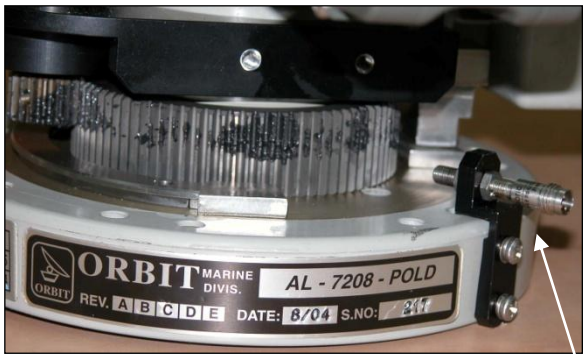


Figure 9-33: DiSEqC Switch connectors

8. Connect the switch to the power supply.

➢ **To connect the Sensor cable and the P12 connector:**

1. The SENSOR cable has a 3-pin female connector.
   Connect it to the SENSOR on the base of the FEED.



Feed's Sensor

2. Connect the cable P12 connector to the POSITIONER.

9.10 Attaching the Weights

A number of WEIGHTS must be attached to the back of the POSITIONER for Counterbalance.

The system is supplied with the DISH set at 0°/0°. The weights must be fastened after the POSITIONER is attached to the PEDESTAL and the DISH is rotated to the required angle.

The following table lists 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.

There is a slot cut in some of the weights. This prevents them from touching the Y-AXIS MOTOR when they are fastenedto the POSITIONER.

Load the heaviest weights first and the lightest last. Also, first load the weights with two holes on each side of the slot. These holes are used for optional equipment brackets.

➢ **To fasten 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 used to accommodate the Y-AXIS MOTOR.

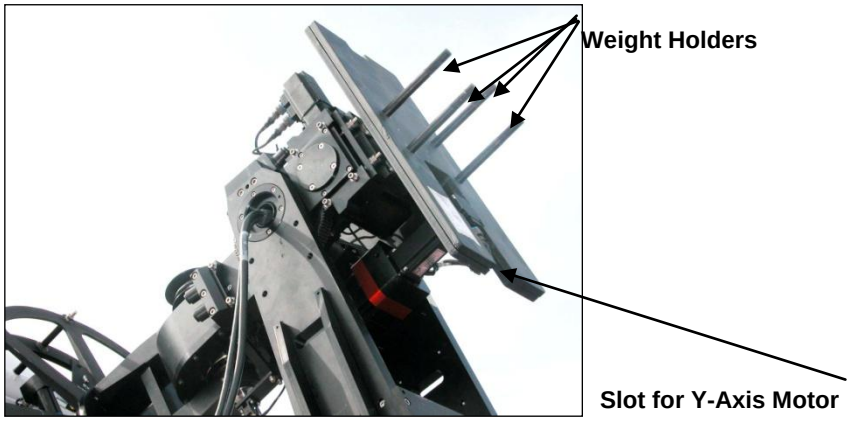


Figure 9-34: Positioner with the first two weights installed

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

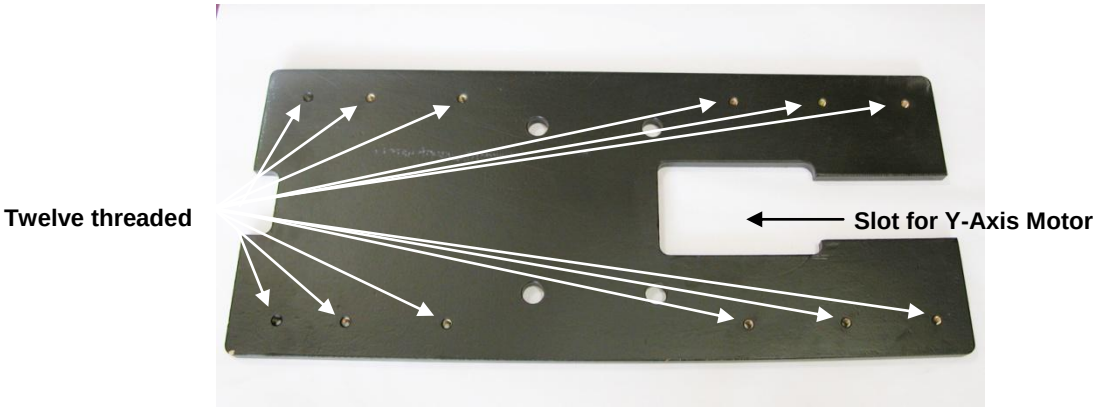


Figure 9-35: Weight with slot and twelve threaded holes

5. Load the remaining 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 9-36: Positioner with all the weights installed

9.11 Installing the Upper Radome Section

Perform 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 important that the Radome panels be securely attached to each other and that the joints are watertight.

Make sure that you place the silicone at the correct angle where instructed. This helps ensure that any water that may penetrate the joints is directed to the outer surface of the Radome.

9.11.1 Installation Considerations

Determine when to assemble and install the UPPER RADOME. You can do it after attaching the POSITIONER to the PEDESTAL, or at the end of the entire installation process, after mounting the DISH, attaching the weights and connecting all the wiring.

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

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

The UPPER RADOME SECTION contains eight panels. The panels must be attached together, using self-adhesive seal, nuts and bolts.

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

Assembling the Upper Radome Panels

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

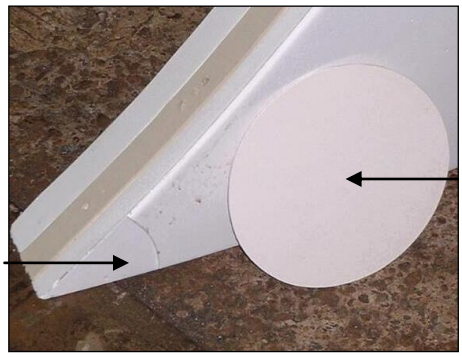
Assemble the Radome panels in the order marked on the panels by the manufacturer.

1. Stick self-adhesive seal along the entire length of the channel along one flange of a panel.
2. Put 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 must be facing the same direction as those in the lower section – either clockwise or counter-clockwise.
- 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.

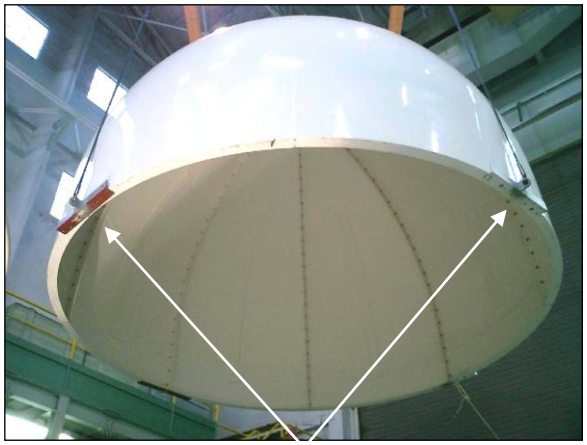


7. Apply more silicone around the circumference of the cap and hold it in place with a weight until the silicone dries.

Attaching the Upper Radome Section to the Lower Section

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

1. Fasten 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.



Lifting Bolts

Figure 9-37: Lowering the Radome Upper Section onto the Lower Section

6. Carefully position 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 can also use a thin screwdriver to assist the alignment.

7. Using the bolts and washers supplied with the RADOME, fasten the Upper RADOME SECTION to the LOWER SECTION, through the empty holes, with the bolts facing downward.

   You can 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 fastening the UPPER RADOME SECTION to the LOWER SECTION, through the empty holes, with the bolts facing downward, as illustrated below.

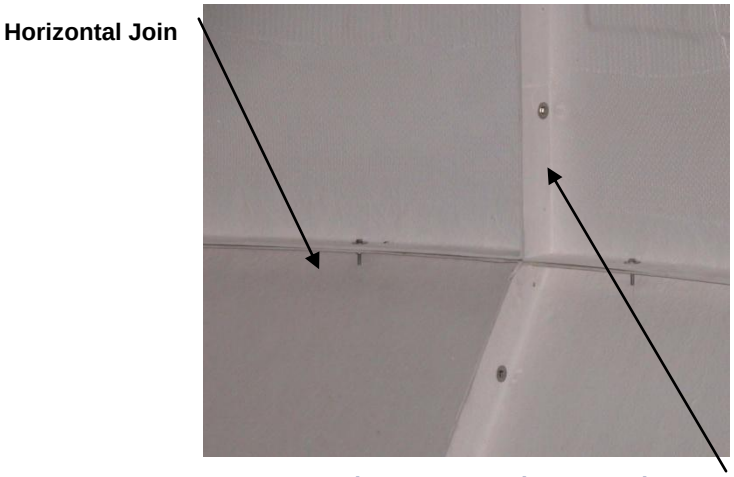


Figure 9-38: Radome Panel – Internal Joins

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 9-39: A Partly Assembled Radome

The following Figure illustrates a fully assembled RADOME.

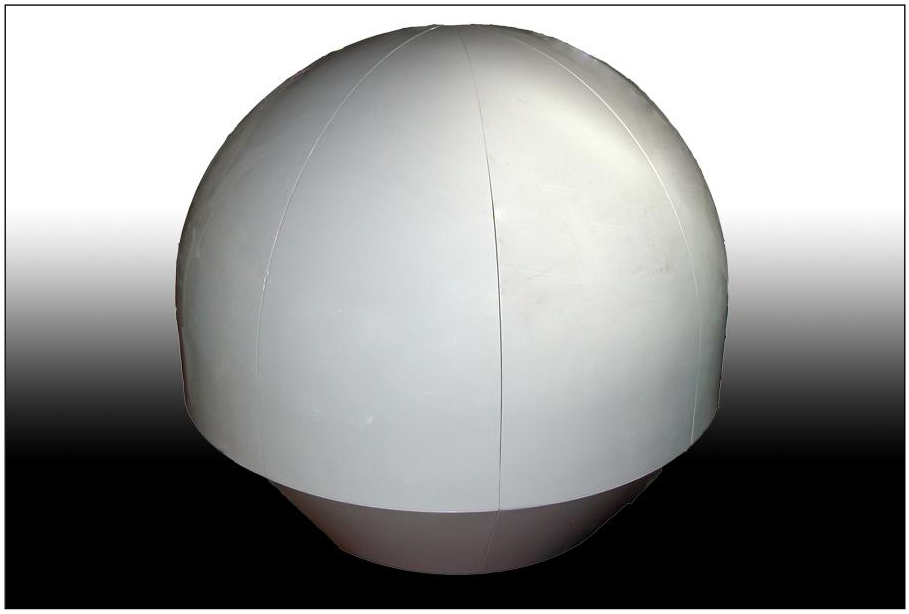


Figure 9-40: Fully Assembled Radome

9.12 Lifting and Mounting the ADE System on the ship

The ADE System must 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 must be attached to the LIFTING POINTS located around the BASE RING. Each LIFTING POINT protrudes from underneath the RADOME.

The LIFTING HARNESS contains 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 must 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,

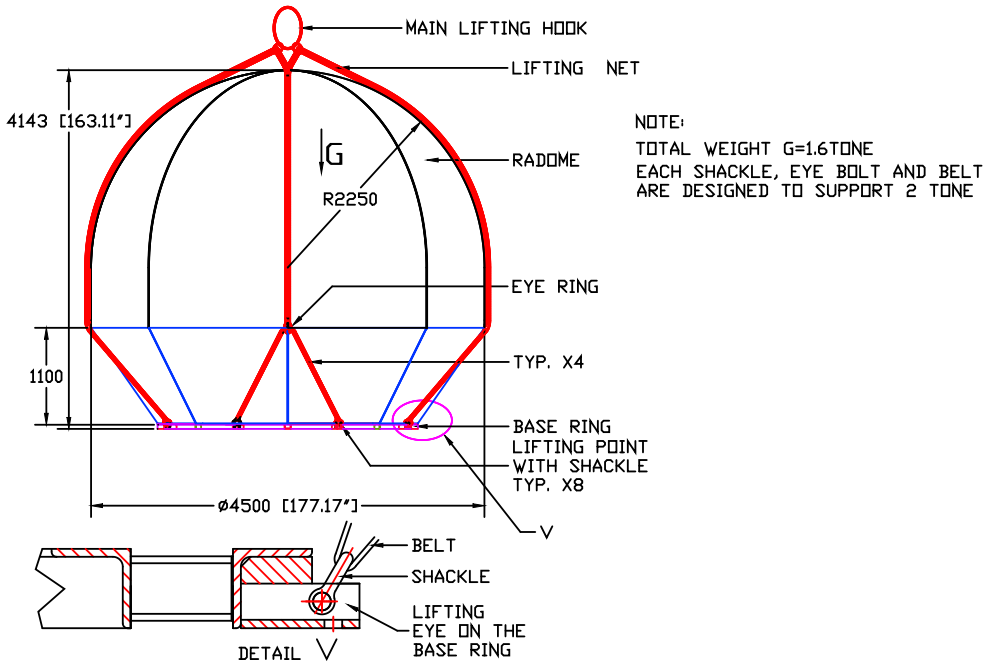


Figure 9-41: Securing the Lifting Harness to the Radome

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

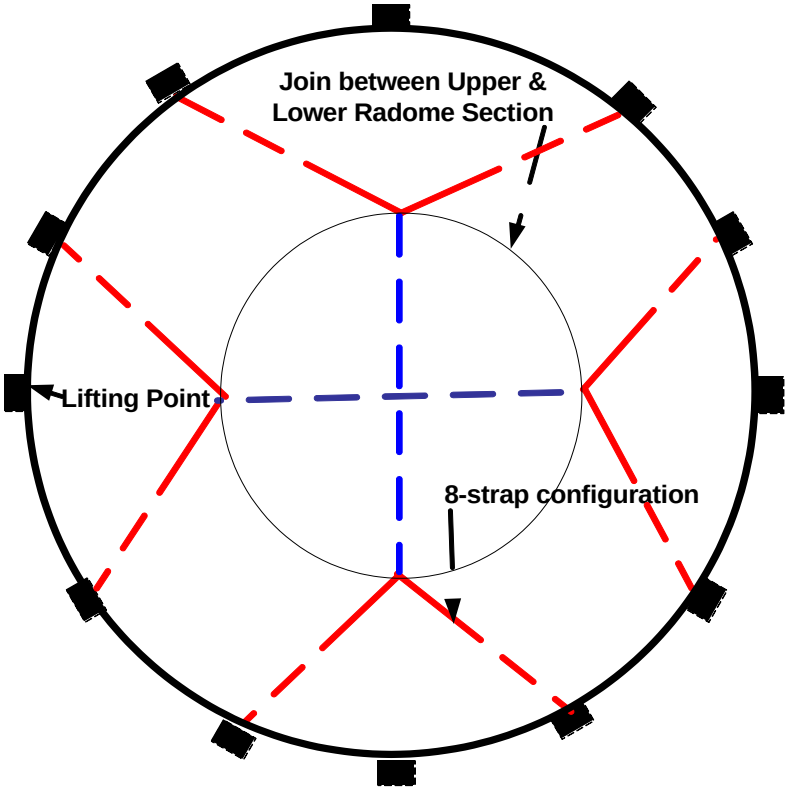


Figure 9-42: Securing the Lifting Harness to the Radome

➢ **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.

Pass the pin through only one of these holes.

Figure 9-43: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.

Figure 9-44: Lifting the ADE onto the Support

9.12.2 Mounting the ADE on board

You should have previously marked the outside surface of the Radome, indicating the orientation of the IMU.

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

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

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

1. Using 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, 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 lower part 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.

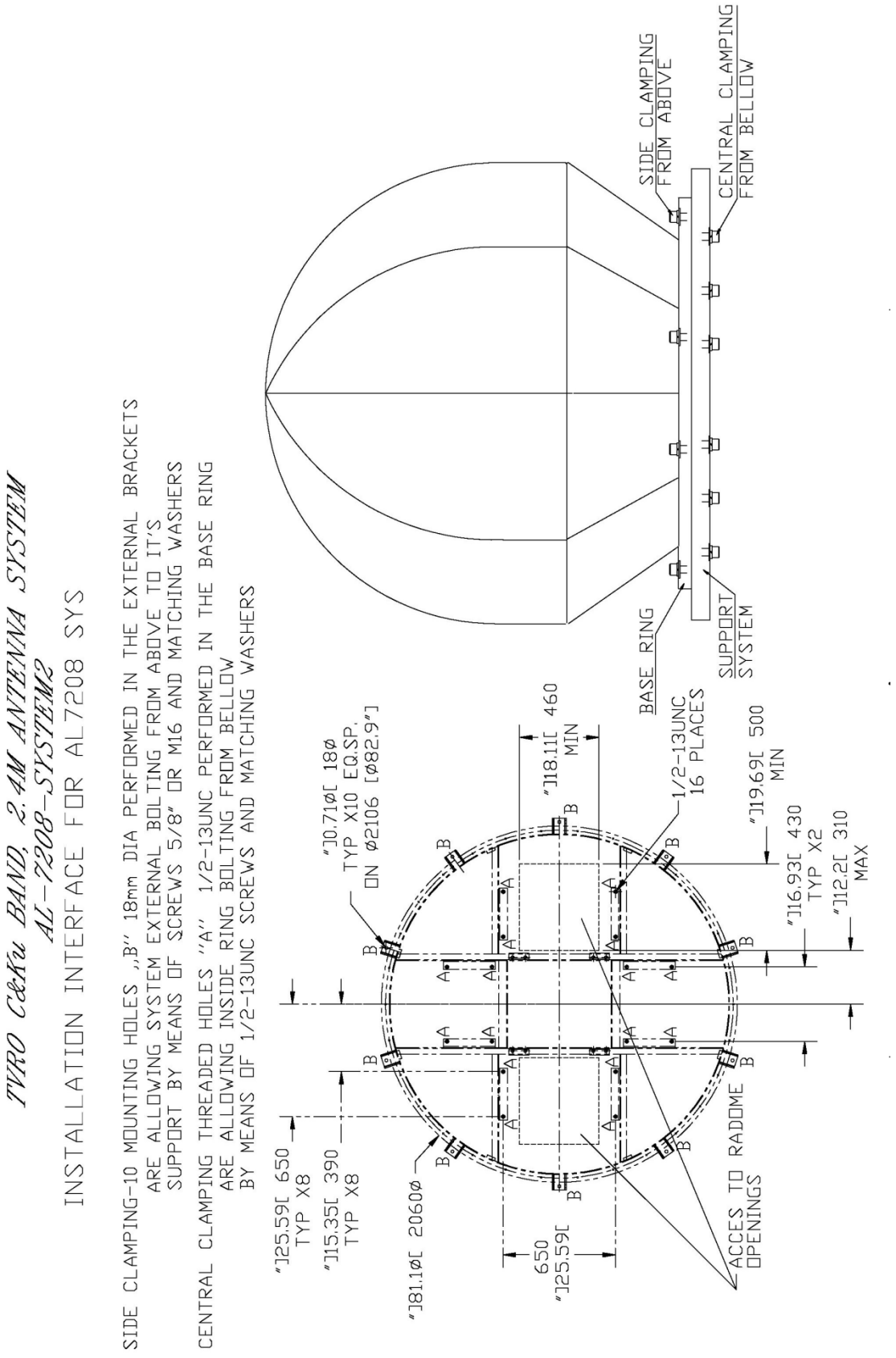


Figure 9-45: The Base Ring interface with the Radome Support

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

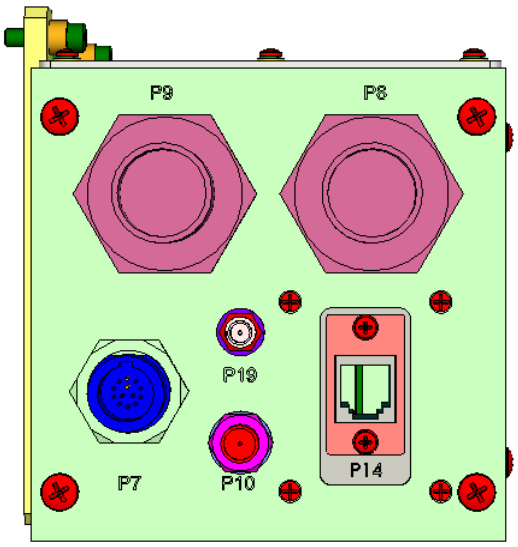
The following figure depicts typical BDE rack installation.

Figure 10-1: Typical BDE Rack Installation

10.3 Connecting System Cables

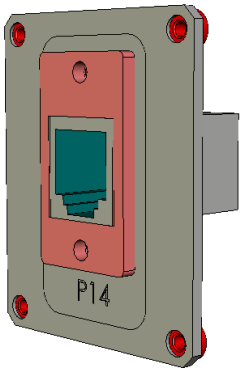
10.3.1 SBC Connectors

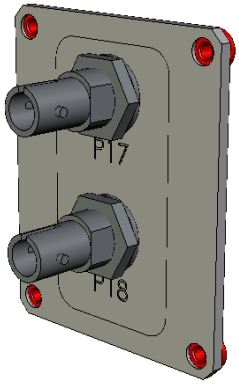
The SBC interfaces with the system via the following front-panel connectors:



P7	IMU
P8	SDU
P9	Pedestal
P10	L-Band
P14	LAN
P19	GPS

Figure 10-2: SBC front view

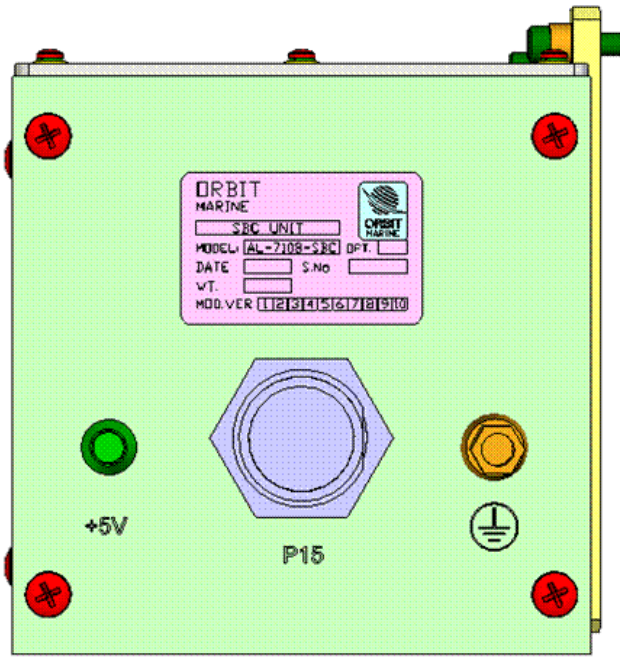




P14	LAN

P17	F/O Tx
P18	F/O Rx

Figure 10-3: SBC interface options



P15	Ship's Compass
GND	Ground Stud
+5V	LED

Figure 10-4: SBC rear view

10.3.2 SDU Connectors

The AL-7100-SDU-MK2A 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 break-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** – Receives 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).

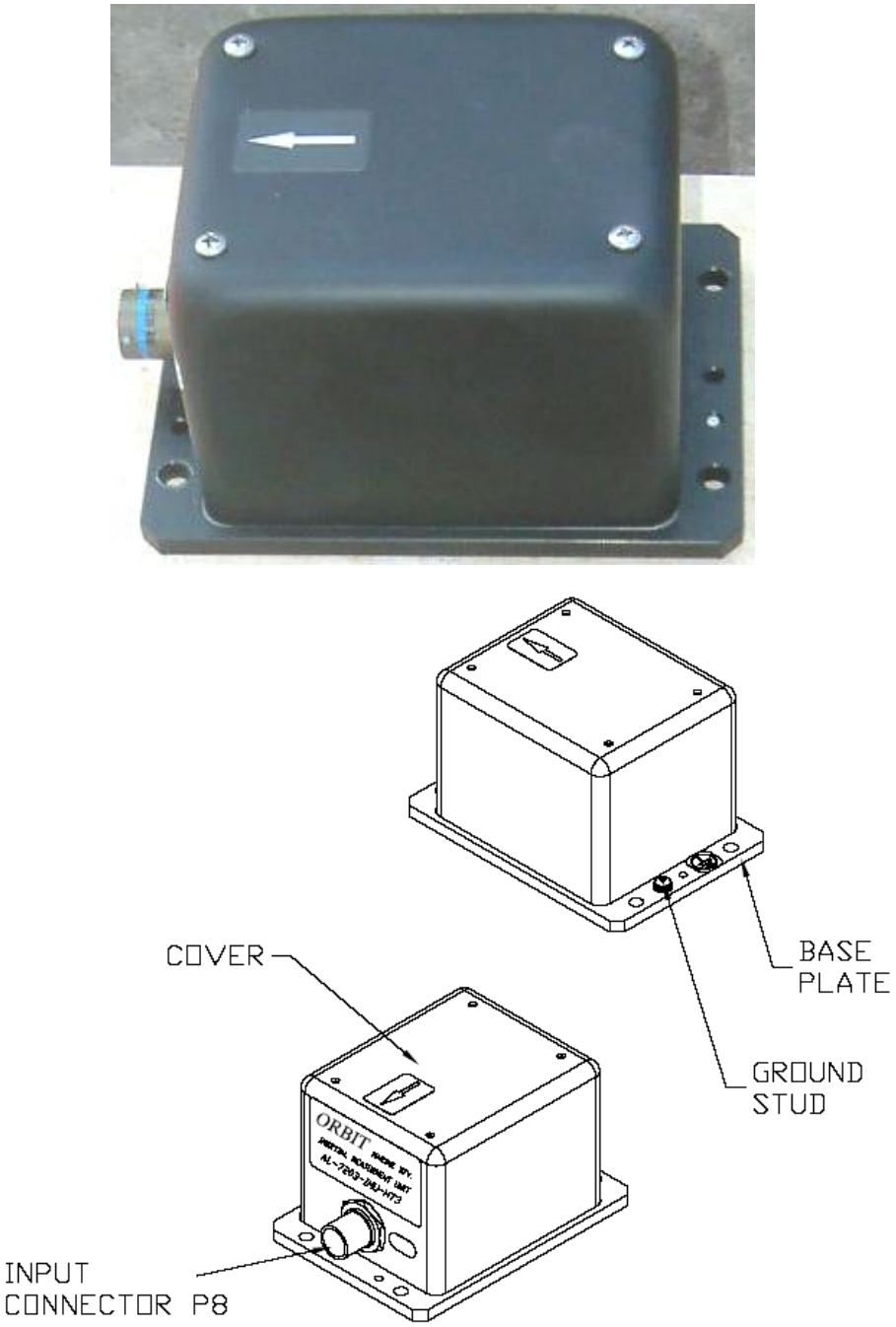


Figure 6. AL-7203-IMU-NT3 General View

10.3.4 Cables

CCU-SBC Communication Cables

The CCU communicates with the SBC using 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 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 Port (RS-232 interface).
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 instructions about the available CCU connections.

The following paragraphs provide information and instructions about 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.

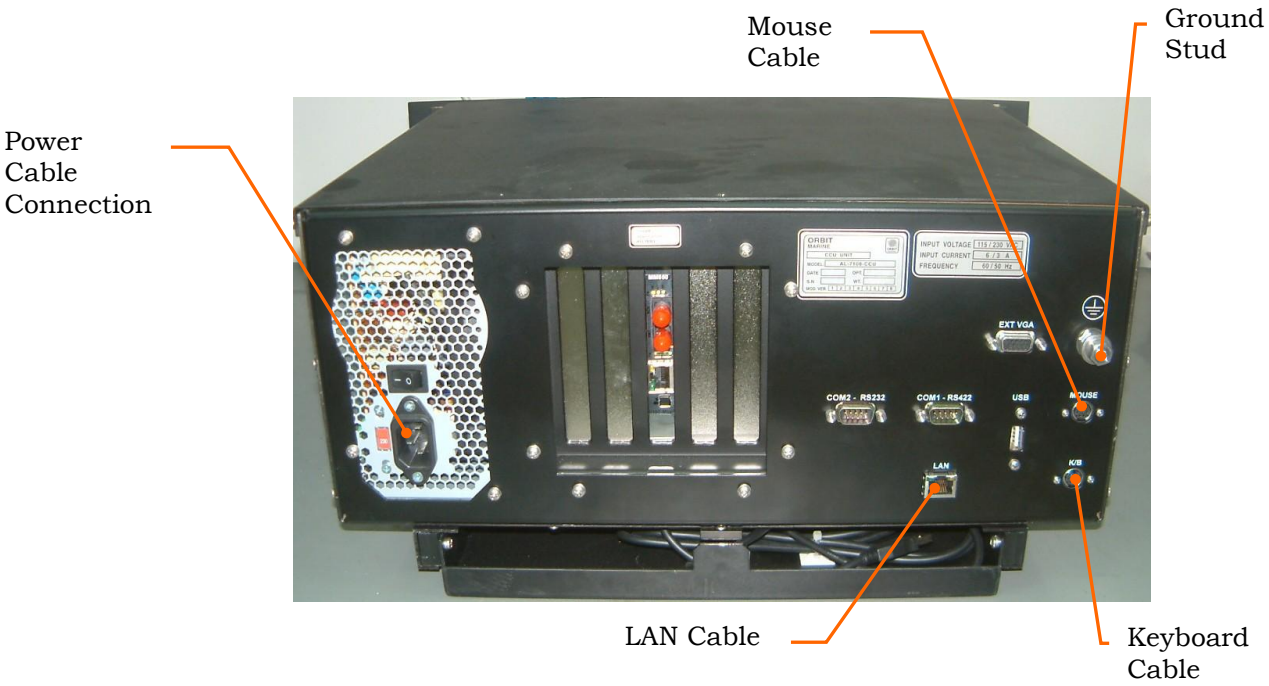


Figure 10-8: CCU Rear Panel – General Purpose Connections

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 following 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

The GYRO FEED CABLE from the vessel Gyro must be routed to the CCU, its armor sheathing removed (at least 2m), and 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 difficult 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 ordered and supported (optional).

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.

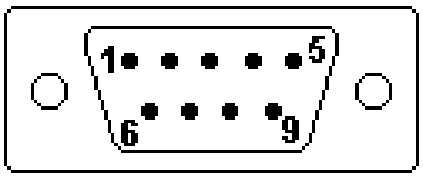
In practice, the single wire, or the EIA-422 "A" wire may be directly connected to a computer's RS-232 input.

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

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

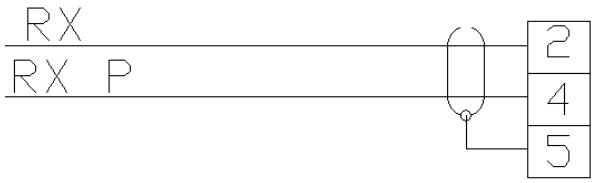
Connecting an RS-422 NMEA-0183 Compass to COM1 Connector:

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".

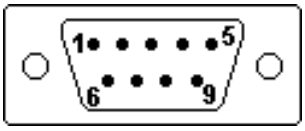
To change the default NMEA-0183 sentence, "Changing the Default NMEA-0183 Compass Sentence".

External AGC Connection

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

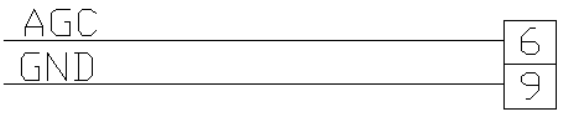
Connecting External AGC to COM2 Connector:

CCU Connector



COM2-RS232

Mating Connector Wiring Diagram



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

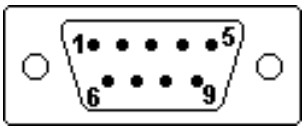
Figure 10-11: External AGC - Connection Scheme

RS-232 Connection

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

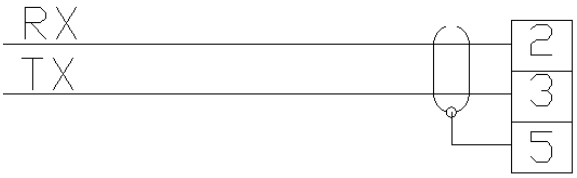
Connecting RS-232 to COM2 Connector:

CCU Connector



COM2-RS232

Mating Connector Wiring Diagram



Mating Connector Pin Out	
Pin	**Signal**
2	RXD
3	TXD
5	GND

Figure 10-12: RS-232 Channel - Connection Scheme

GPS Antenna Connection

Position 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 P19 connector on the SBC and ensure that there is no play between the Antenna and the Radome.

11 Setup and Commissioning

11.1 Introduction

After the installation is completed as described in the preceding chapters, the system must be powered 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, their respective 115/220-VAC selectors must be 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.

Check and set the SDU's internal switches and fuses.

Before the system is powered up, verify that no personnel are present in the ADE Radome.

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

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

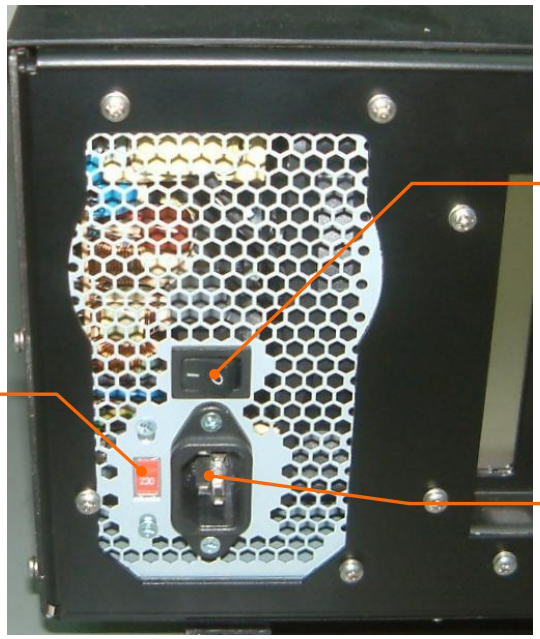


Figure 11-1: CCU Rear Panel Voltage Selector

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

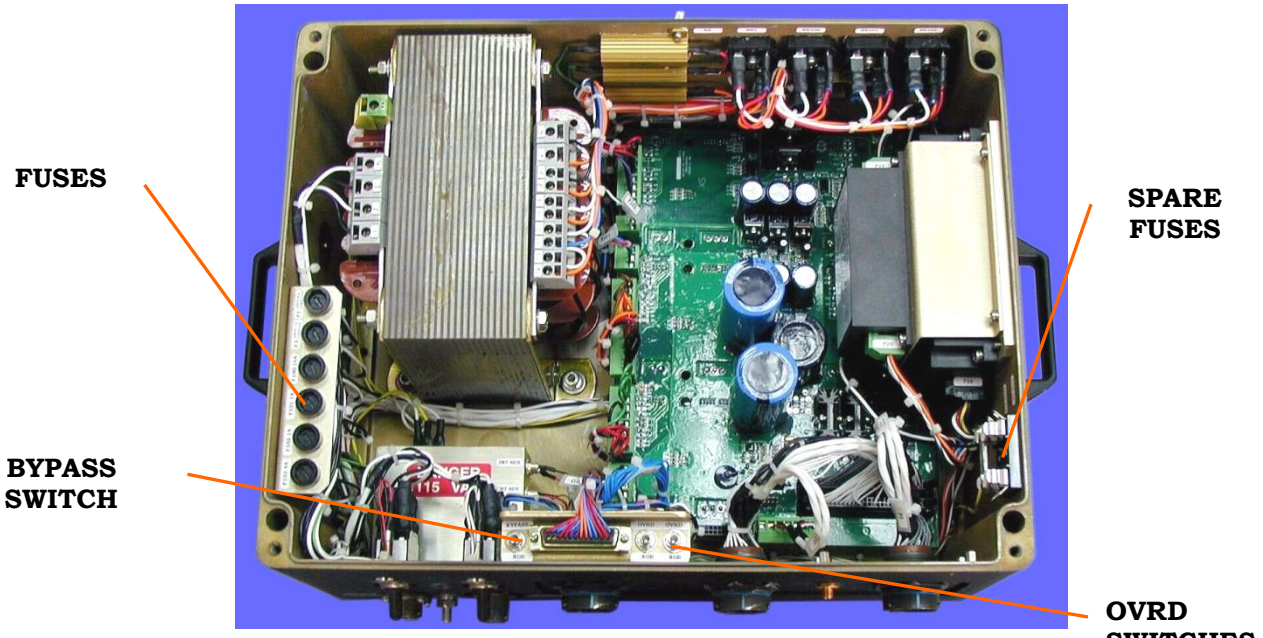


Figure 11-2: SDU Internal View

The SDU box contains the following:

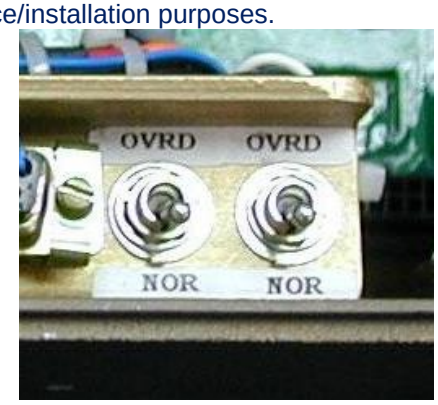
- **Voltage Selector (S2)** – The SDU is equipped with a 115/230V voltage selector.

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

Fuse	Rating	Protected Power Supply
F1	230V / 5A or 115V / 10A	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 / 5A and 115V / 10A) 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 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 required 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 enables 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 permanently set 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. Apply power to BDE/ADE equipment and check the following:

- In the BDE:
  - The CCU has powered up and loaded MTS link.
  - The monitor displays the manufacturer's logo while it performs 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 two power LEDs (SDU and SBC) are illuminated (AL-7100-SDU-MK2A).
  - The three SBC +5V LED is illuminated.

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

If you have a laptop computer, perform 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 should keep the Auto-Restart disabled during the tests and pre-commissioning procedures.

4. On the OPERATIONAL screen, check the following:-
   - Error / warning messages in the message window. 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 heading is displayed, and that it matches the ship compass reading.
7. Check that the on-screen compass is synchronized with the movement of the ship compass.
8. Type 'S' to select the required satellite and any channel.

For tests and commissioning, you should 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 start only 5 minutes after the system is powered-up.

You should 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 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 occurs 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 ignore 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.

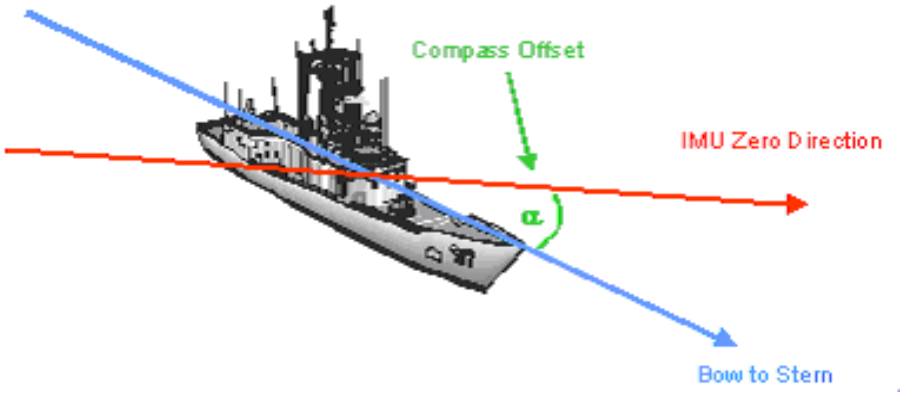
9. Monitor the SHIP COORDINATES window and verify that the displayed values match the ship’s Pitch and Roll, taking into consideration the leveling degree of the ADE mounting plate with the ship’s deck. Usually, on large ships, the Pitch and Roll values at the shipyard are within 1□0.5°.

Check that there is no obstacle to the axis movement.

You should 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 it is not aligned with the bow of the ship. You will need to set the compass offset so that the system is aligned with the vessel's gyro compass:



IMU Zero Direction

As shown 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.

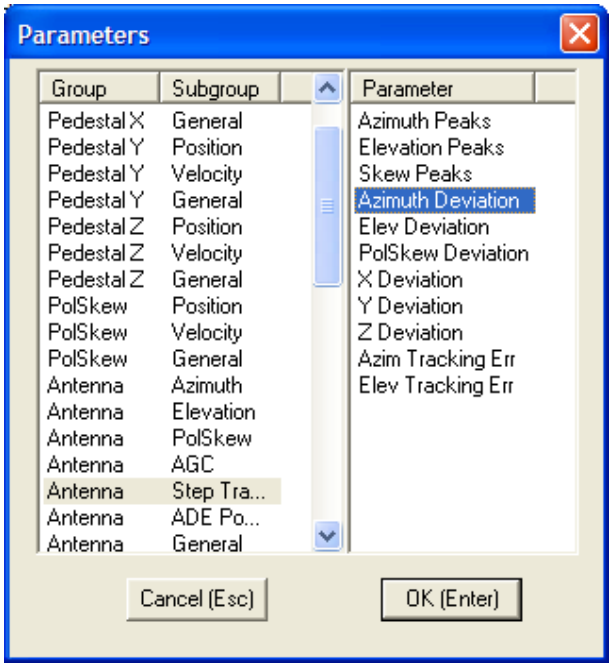
To determine the exact offset angle the following steps should be taken:

1. Make a "naked-eye" rough estimate for the offset angle. In the drawing above, this is approximately -30 degrees (negative because the offset in the example is counter-clockwise from ship's bow).
2. Set the "naked-eye" estimate into the controller (as shown below).
3. Point antenna to satellite. Record the antenna Azimuth at this point as "Nominal Azimuth".
4. Use Manual mode (see appropriate section in this document) to move the antenna Azimuth orientation to point it onto the satellite. The amount of expected movement depends on the accuracy of your initial estimate. Generally the direction will be within +/-10 degrees…
5. After the satellite is acquired manually as explained above, put the antenna to Step-track.

6. Find “Azimuth Deviation”. This is the difference between the actual antenna Azimuth from the expected one.

   To do so you may use the graphical cross hair display, which is calibrated in degrees, showing a total of +/- 5 degrees:

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



   Or you can 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.

7. The “Azimuth Deviation” obtained in one of the methods shown above will be used to refine the “naked-eye” offset estimate. This will be calculated by: Compass Offset Correction = Azimuth Deviation / Cosine (Antenna Elevation)

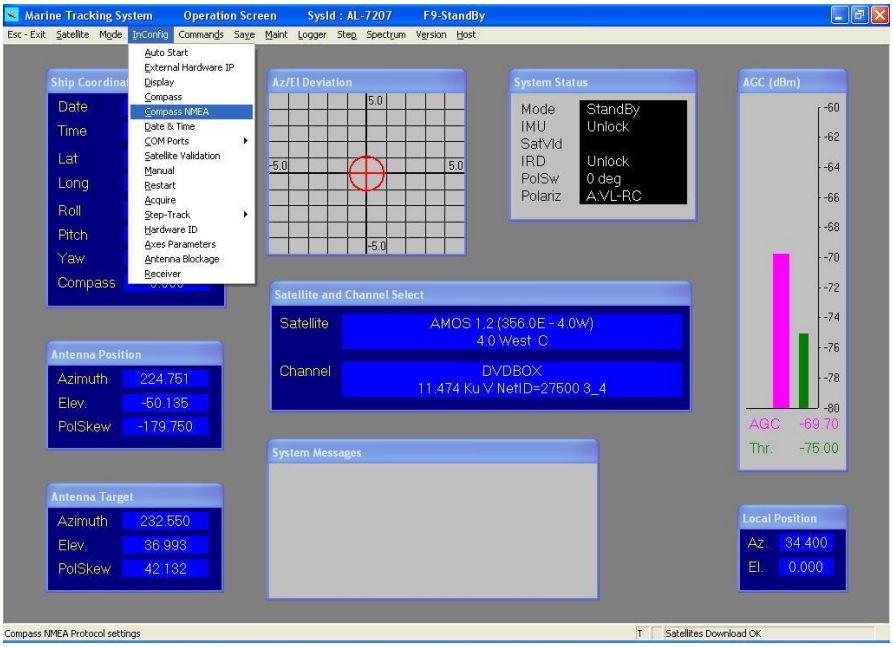
   For example, the satellite with the cross-hair mark three notches right of center (+3 degrees), while the antenna Elevation is 41.4 degrees.

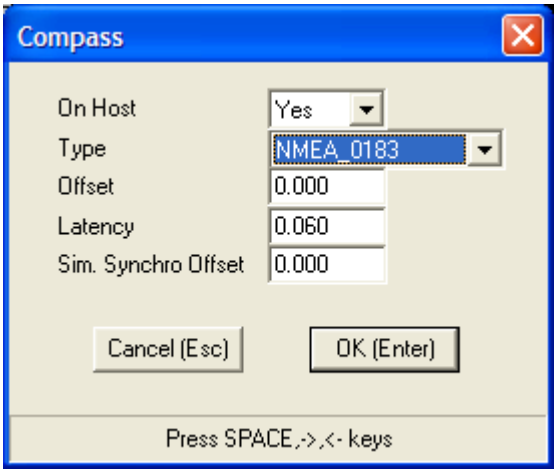
   That means that our initial “naked-eye” estimate of –30 degrees must be corrected by:

3/Cos (41.4) = 4.0 degrees, resulting in overall Compass Offset of –26.0 degrees

To set the Offset to the controller-

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





2. 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 no messages appear 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 TV sets display clear pictures.

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 (flash drive) 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 (flash drive).

The pre-commissioning procedures may take some time, under non-stable ship's power supply. Therefore, you shouldsave 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. Turn on 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.

11.5 System Acceptance Test

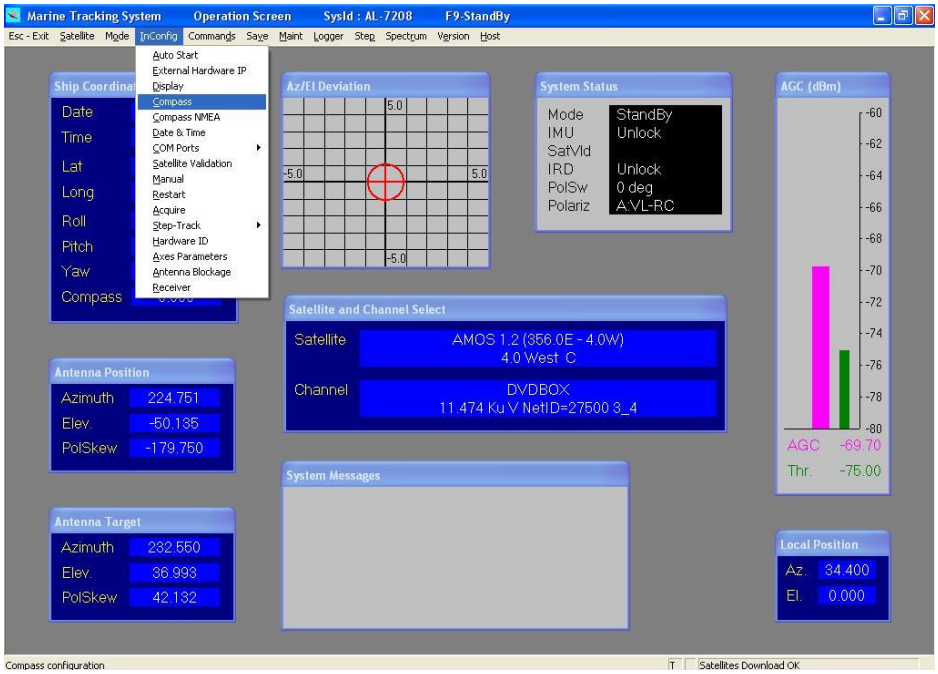
At the end of installation procedure and inspection, perform the Final Commissioning Test.

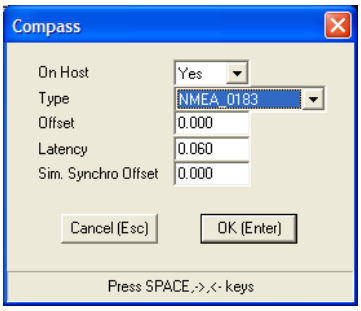
11.5.1 Final Acceptance Test

- 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 no messages appear 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 TV sets display clear pictures.

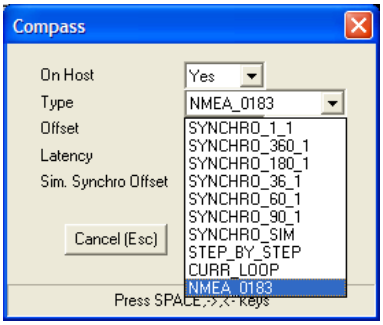
11.6 Setting of Interface to Ship's Compass

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





Select the required 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.

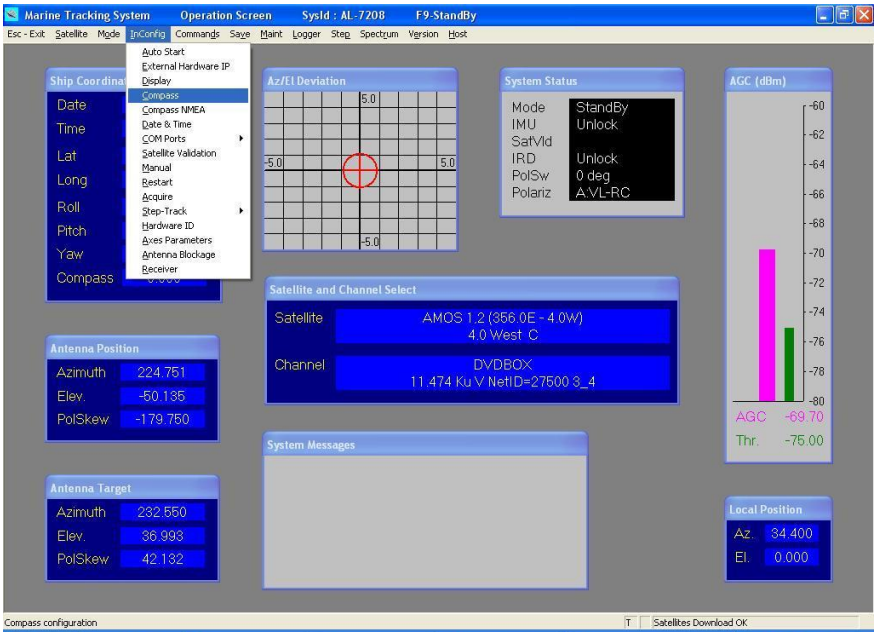
Maximal voltage level allowed for active Line in case of Common GND: 20 to 70VDC.

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

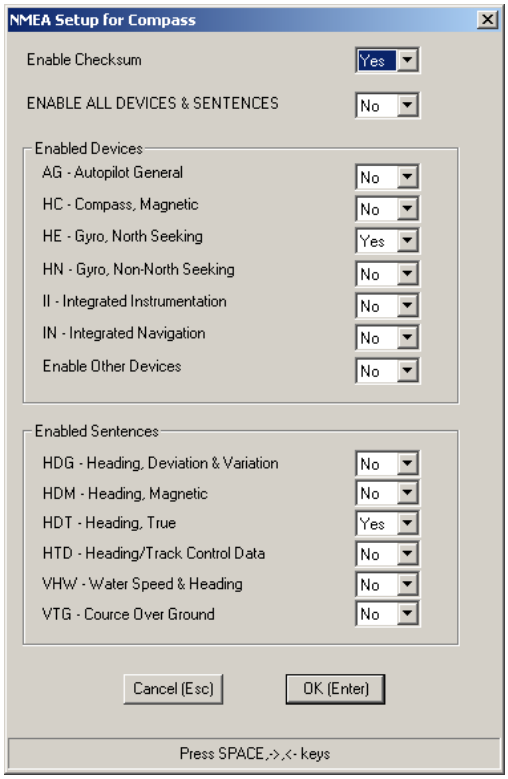
11.7 Changing the Default NMEA-0183 Compass Sentence

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

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



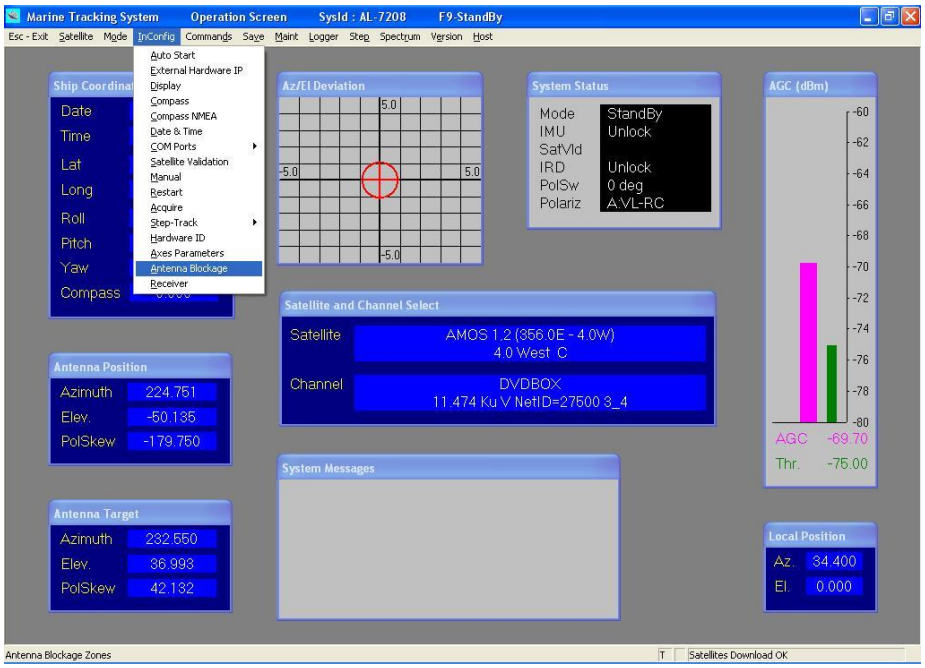
In the NMEA Setup screen, select the relevant NMEA sentence, and then click OK to save into the ACU non-volatile memory.

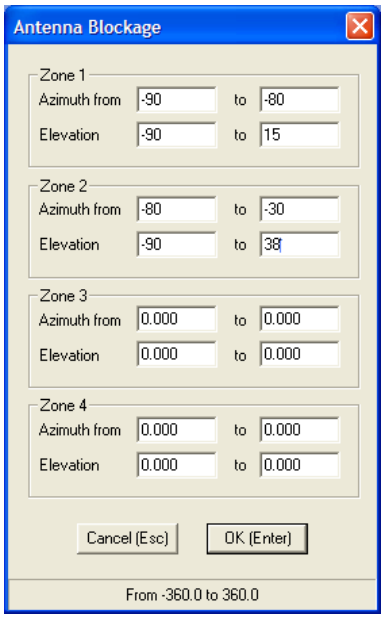


11.8 Enter Blockage Zones Angles

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

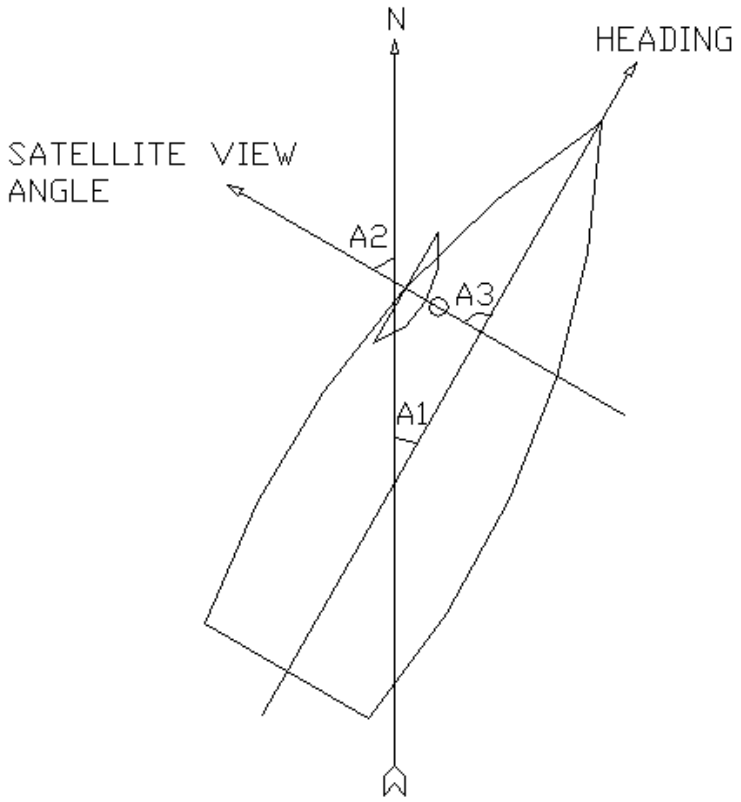
From the "Operation Screen" press "I", then select "Antenna Blockage":





Up to four blockage zones can 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: -

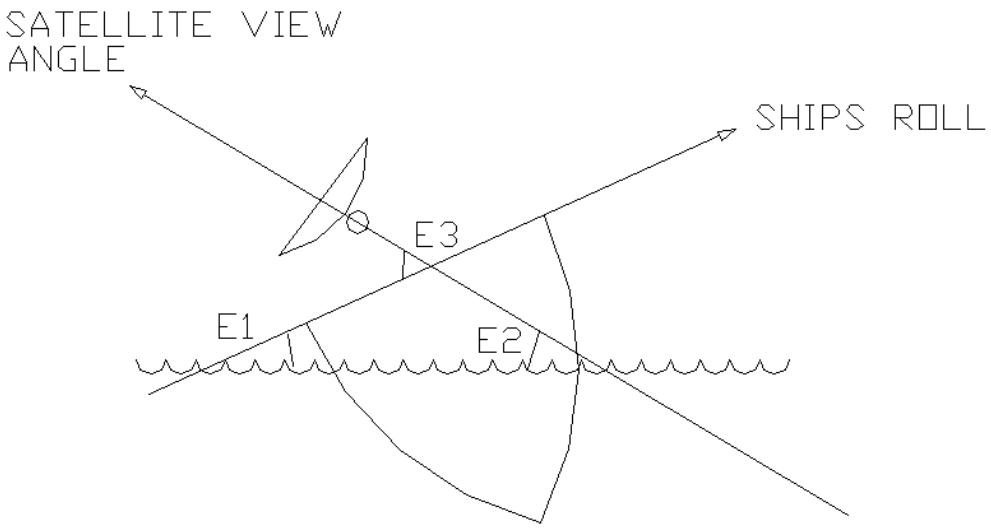


A1 – Ships heading

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.

The Local Antenna Azimuth is the Antenna Azimuth with respect to the ships Bow-to-Stern line, instead of the North direction, while the Local Antenna Elevation is the Antenna Elevation with respect to the ships deck instead of the horizon level.

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

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

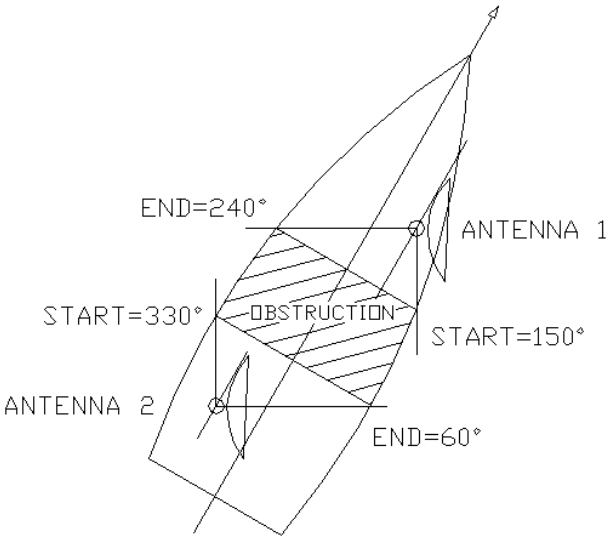
The Obstruction Zone screen allows you to enter four angular points defining a single obstruction zone of an antenna: Azimuth Start (from), Azimuth End (to), Elevation Start (from) and Elevation End (to).

Up to four obstruction zones can be entered.

There is no need to fill all the zones, a default setting of a zero value in the “from” and “to” fields effectively disables the relevant zone.

However, if a zone must 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 below:



In this case, 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, are described in Local Azimuth terms.

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 show an “Antenna View Blocked” message when antenna points to one of the predefined zones.

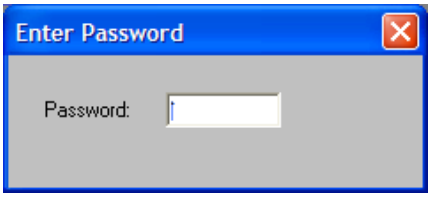
Moreover, when going into antenna blockage zone the controller will automatically revert to “Point-to-Satellite” mode, since it assumes that the Antenna signal is not available for Step-tracking. When going out of a blockage zone, the controller will automatically initiate a re-acquisition sequence.

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

11.9 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 obtain the password. The password remains valid for a limited time.

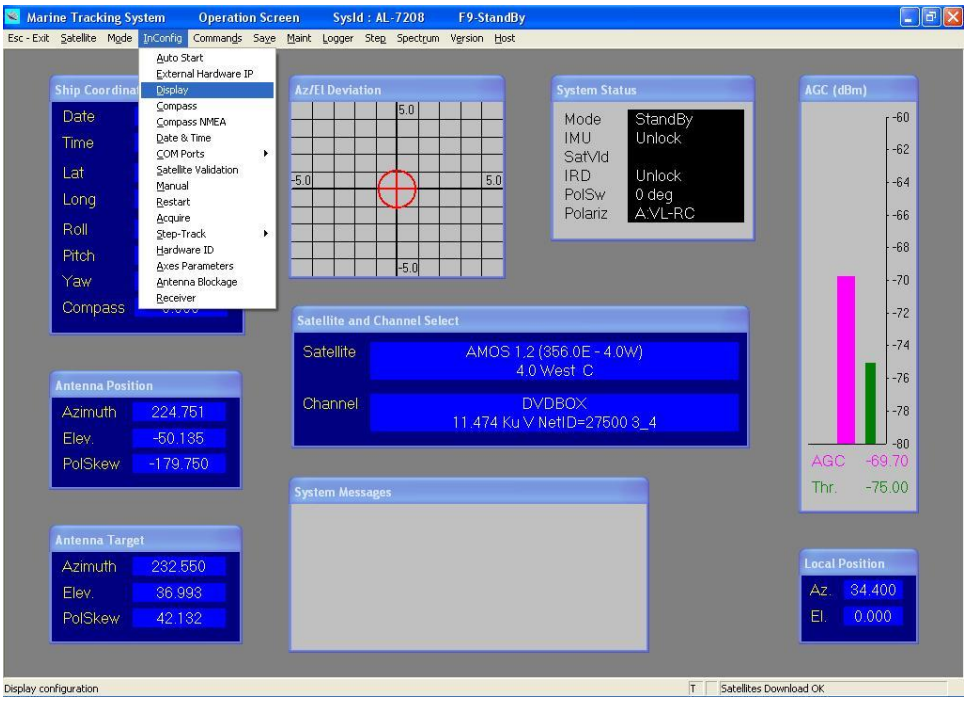
In “Operation Screen” press “U”, the following opens:

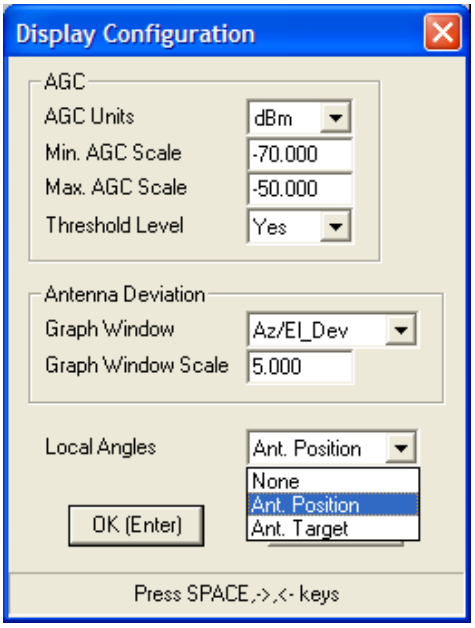


Type in the valid password

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

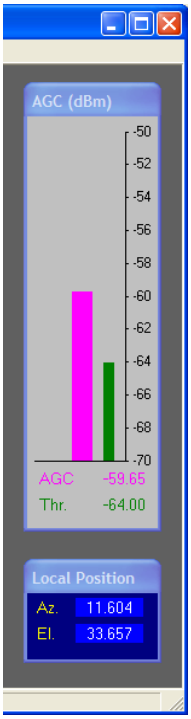
Press “T”, for System configuration, then “D”, for Display menu:





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

This adds a small display window just below the AGC bar:

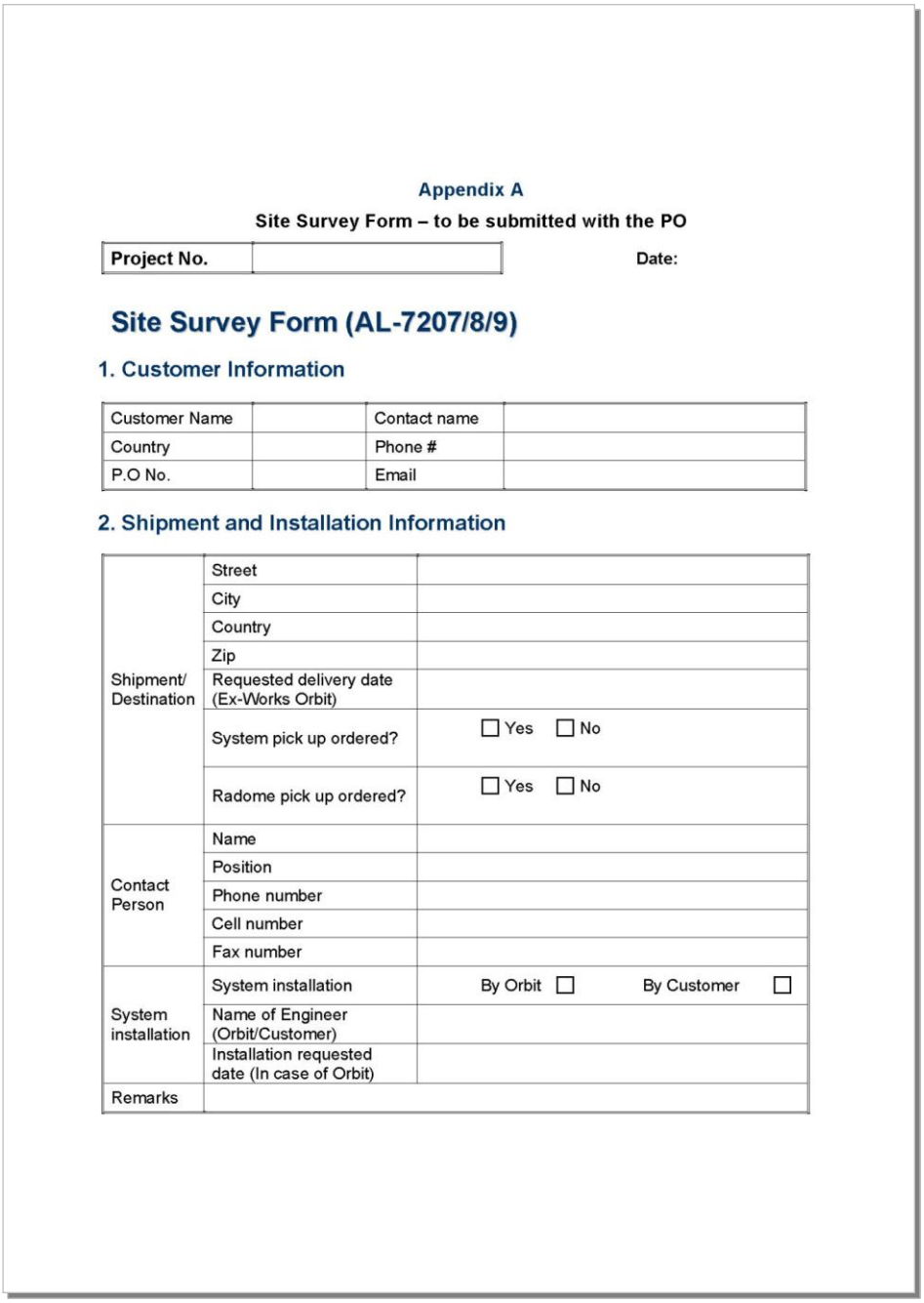


Save parameters to SBC non-volatile memory.

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

12 Appendix – Site/Ship Survey Form

This Appendix contains an example of a Site/Ship Survey form.



Appendix A

Site Survey Form – to be submitted with the PO

Project No.		**Date:**

Site Survey Form (AL-7207/8/9)

1. Customer Information

Customer Name		Contact name	
Country		Phone #	
P.O No.		Email	

2. Shipment and Installation Information

Shipment/ Destination	Street	
	City	
	Country	
	Zip	
	Requested delivery date (Ex-Works Orbit)	
	System pick up ordered?	☐ Yes ☐ No
	Radome pick up ordered?	☐ Yes ☐ No
Contact Person	Name	
	Position	
	Phone number	
	Cell number	
	Fax number	
System installation	System installation	By Orbit ☐ By Customer ☐
	Name of Engineer (Orbit/Customer)	
	Installation requested date (In case of Orbit)	
Remarks		

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3. System Design Consideration

3.1. General

Vessel Name	
Vessel Size	
Vessel type	
Sailing Area	
Installation Location	Please indicate the approximate mounting location of the antenna. (Please add ship drawing and photos).
Installation - Infrastructure	Please indicate the mast/vessel Radome support structure.
Installation - Obstacles and Interference	Please indicate potential blockages such as masts, funnels, etc. Indicate transmitting devices such as Radar, UHF, HF, INMARSAT, etc. (Please add photos).
Radome Hatch location:	Bottom (Standard): ☐ Side: ☐ Both: ☐
Was a Radome lifting harness **ordered**?	☐ Yes ☐ No
Was a system lifting kit **ordered**? (Recommended for large systems)	☐ Yes ☐ No
Installation - ADE to BDE	Please indicate cable distance between Above deck equipment to Below deck equipment
Control cable in usage	Single Mode Fiber Optic: ☐ Multi Mode Fiber Optic: ☐ CAT5/ LAN: ☐
What is the input Voltage for the system?	☐ 220VAC ☐ 110VAC ☐ 50Hz ☐ 60Hz
Note! Usage of a UPS is Required in order to avoid damages to system.	
Vessel Compass type in use?	Synchro ☐ Type _____ Step-by-Step ☐ NMEA-0183 ☐
***Note!** Orbit systems do not support Magnetic compass.*	

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E-mail: group@orbit-ltd.co.il

3.2. For TVRO systems

Who will supply and install the distribution system	Orbit ☐	Customer ☐
Who will provide the DISEQC Switch	Orbit ☐	Customer ☐
Was the DISECQ switch ordered	☐ Yes	☐ No

4. Orbit's Confirmation (to be filled in by Orbit Sales Operations)

	Sales Operations	Relevant S & M Director
Name & Signature		
Date		

End of document