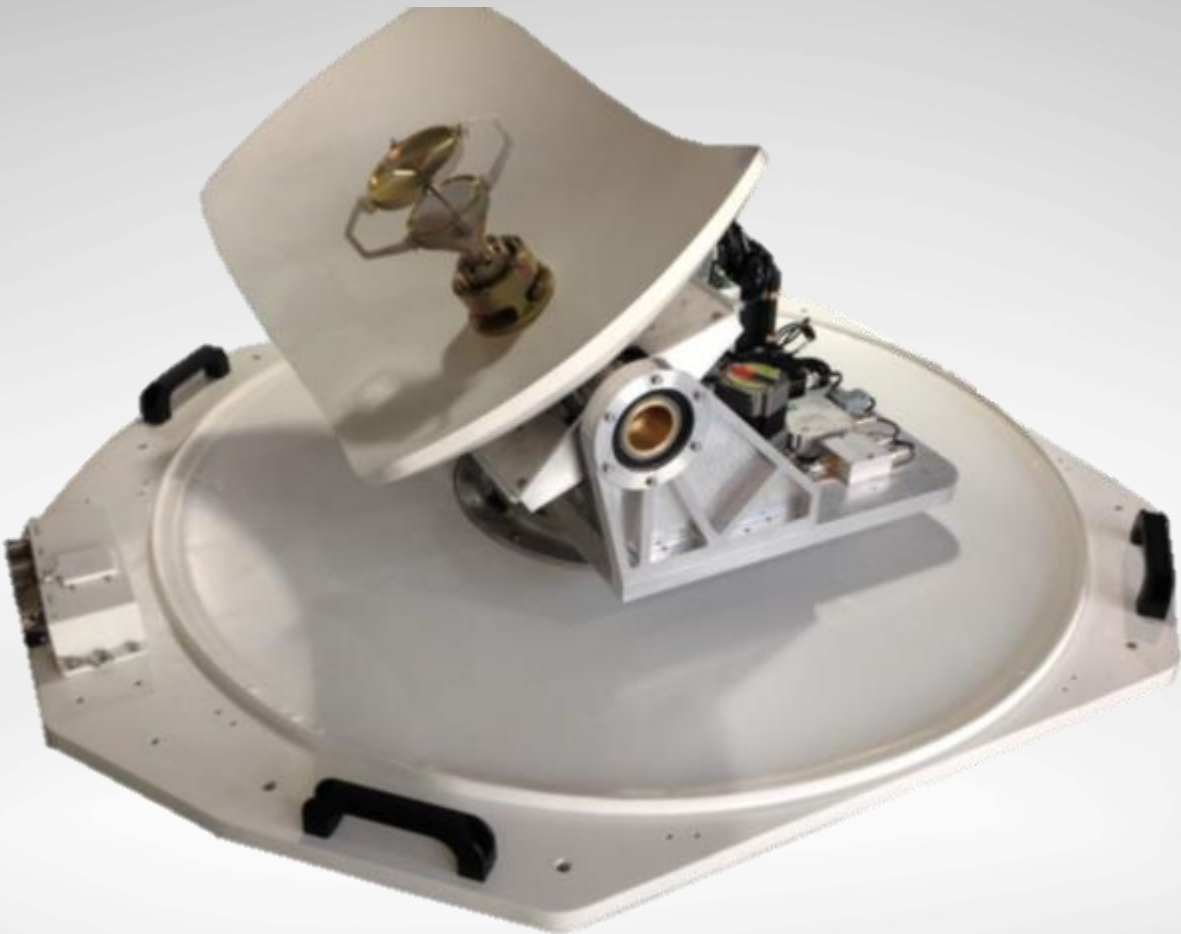




# USER MANUAL

0.55M KU-BAND  
COMS ON THE MOVE ANTENNA





# TABLE OF CONTENTS

|                                             |    |
|---------------------------------------------|----|
| Acronyms.....                               | 4  |
| Safety .....                                | 5  |
| List of Contents .....                      | 7  |
| 1. Product Overview.....                    | 8  |
| 2. System Overview .....                    | 8  |
| 3. Hardware .....                           | 9  |
| 3.1 Crate Dimensions .....                  | 9  |
| 3.2 Antenna Dimensions.....                 | 10 |
| 3.3 Introduction to System Components ..... | 11 |
| 4. Assembly .....                           | 16 |
| 4.1 Installation Requirements.....          | 16 |
| 4.2 Opening the Crate.....                  | 17 |
| 4.3 Preparing the Antenna .....             | 19 |
| 4.4 Installing the Antenna .....            | 21 |
| 4.5 Cable Connection .....                  | 22 |
| 4.6 System Grounding .....                  | 24 |
| 5. Operation .....                          | 25 |
| 5.1 Antenna Control Unit.....               | 25 |
| 5.2 Auto-Acquire .....                      | 26 |
| 5.3 LinkControl .....                       | 30 |
| 6. System Troubleshooting.....              | 31 |
| 6.1 Limit Codes.....                        | 31 |
| 6.2 Check Codes .....                       | 32 |
| 7. System Maintenance .....                 | 33 |
| 8. Technical Specifications .....           | 35 |
| Appendix A – ACU Menus.....                 | 36 |
| Menu Layout .....                           | 36 |
| Home Screen .....                           | 37 |
| Control Menus.....                          | 37 |
| Setting Menus .....                         | 41 |
| Info Menus .....                            | 48 |
| Appendix B – Firmware Upgrade .....         | 52 |

## Acronyms

|      |                               |
|------|-------------------------------|
| ACU  | Antenna Control Unit          |
| AGC  | Automatic Gain Control        |
| AZ   | Azimuth                       |
| BUC  | Block Upconverter             |
| COTM | Communications on the Move    |
| EL   | Elevation                     |
| IDU  | Indoor Unit                   |
| LNB  | Low-noise Block Downconverter |
| ODU  | Outdoor Unit                  |
| OMT  | Orthomode Transducer          |
| POL  | Polarization                  |
| RF   | Radio Frequency               |
| SSPA | Solid-State Power Amplifier   |

## Safety

|                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Caution</p>    | <p><b>Grounding the Terminal</b></p> <p>Ground the system with a grounding conductor in accordance to national and local electrical codes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>Danger</p>     | <p><b>FCC Radio Frequency Exposure Information for Mobile Transmitting Devices</b></p> <p>When the power is on, do not stand within the line of sight of the terminal to the satellite and maintain an off-axis clearance distance of a full reflector diameter length from the centre of the beam.</p>                                                                                                                                                                                                                                                                                                                                                   |
| <p>Danger</p>     | <p><b>Electrical Hazards in Wet and Windy Conditions</b></p> <p>While the terminal is designed for outdoor use (e.g. optional waterproof power supply), observe the following safety precautions during windy and wet weather conditions. Some steps may not apply depending on the BUC configuration.</p> <p>Check cable connectors and power cords for damage or tears. Replace cables and cords as needed.</p> <p>Disconnect the terminal from its power source before you move it.</p> <p>Disconnect the terminal from its power source if you suspect a power malfunction</p>                                                                        |
| <p>Warning</p>  | <p><b>Hot Surfaces</b></p> <p>When transmitting, do not touch the BUC as it may result in burns or injury.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>Danger</p>   | <p><b>Hazards of Microwave Radiation in Electromagnetic Fields</b></p> <p>When the power is on, the area directly in front of the antenna is an Area of Restricted Occupancy. Observe the following safety precautions:</p> <ol style="list-style-type: none"> <li>1. Limit human exposure time to the area directly in front of the main antenna assembly.</li> <li>2. Never place any part of your body between the antenna and the Feed Horn assembly.</li> <li>3. Never place any part of your body in line with the direction of the antenna transmission path.</li> <li>4. Locate the terminal as far as possible from ungrounded metal.</li> </ol> |

|                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Danger</p>     | <p><b>Dielectric Heating</b></p> <p>Dielectric heating is the heating of an insulating material caused by placing it in a high frequency electric field. When a human enters a Radio Frequency (RF) field, the body acts as dielectric. If the power in the RF field exceeds 10 milliwatts per centimetre, the individual will have a noticeable rise in body temperature.</p> <p>The severity of burns may vary from minor to major. Burns or other damage may result in long term injury or even death.</p> <p>The vital organs of the body are highly susceptible to dielectric heating.</p> <p>The eyes are also highly susceptible to dielectric heating. Do not look directly into devices radiating RF energy.</p> <p>You must not stand directly in the path of RF radiating devices</p> |
| <p>Warning</p>    | <p><b>Unintentional Radio Interference</b></p> <p>This equipment generates, uses, and radiates radio frequency energy. If you install and use the device according to the instruction manual, the device will not cause harmful interference to radio communications.</p> <p>If you operate the device in a residential area, it is likely to cause harmful interference to radio communications; you will correct the interference at your own expense.</p>                                                                                                                                                                                                                                                                                                                                     |
| <p>Warning</p>  | <p><b>Changes or Modifications to Equipment</b></p> <p>Changes or modifications to this equipment, not expressly approved by the manufacturer could void the user's authority to operate the equipment.</p> <p><b>Accessories and Devices</b></p> <p>Use of non-approved accessories or devices may lead to a degradation in performance, damage to equipment, or potential hazards</p> <p><b>Servicing the Equipment</b></p> <p>Do not service the equipment alone unless another person is present to administer first-aid</p>                                                                                                                                                                                                                                                                 |

# List of Contents

**Note:** The list of contents below does not include the accessories that may come with the BUC and LNB.

| COMPONENTS                                       | QUANTITY |
|--------------------------------------------------|----------|
| Antenna (Optionally Integrated with BUC and LNB) | 1        |
| Antenna Control Unit (ACU)                       | 1        |
| Data Cable                                       | 1        |
| Power Cable                                      | 1        |
| ACU AC Cable                                     | 1        |
| ACU Console Cable                                | 1        |
| ACU Modem Cable                                  | 1        |
| N-Type Male to Male Tx Cable                     | 1        |
| N-Type Male to Male Rx Cable                     | 1        |
| N-Type Female to F-Type Male Adapter             | 3        |

# 1. Product Overview

The Norsat COTM is a compact vehicle roof mounted antenna system compatible with the Norsat ATOM series BUC and Norsat quad-band PLLs. The Norsat COTM is capable of pointing and tracking antennas through the antenna control unit and through a computer using the Norsat LinkControl software.

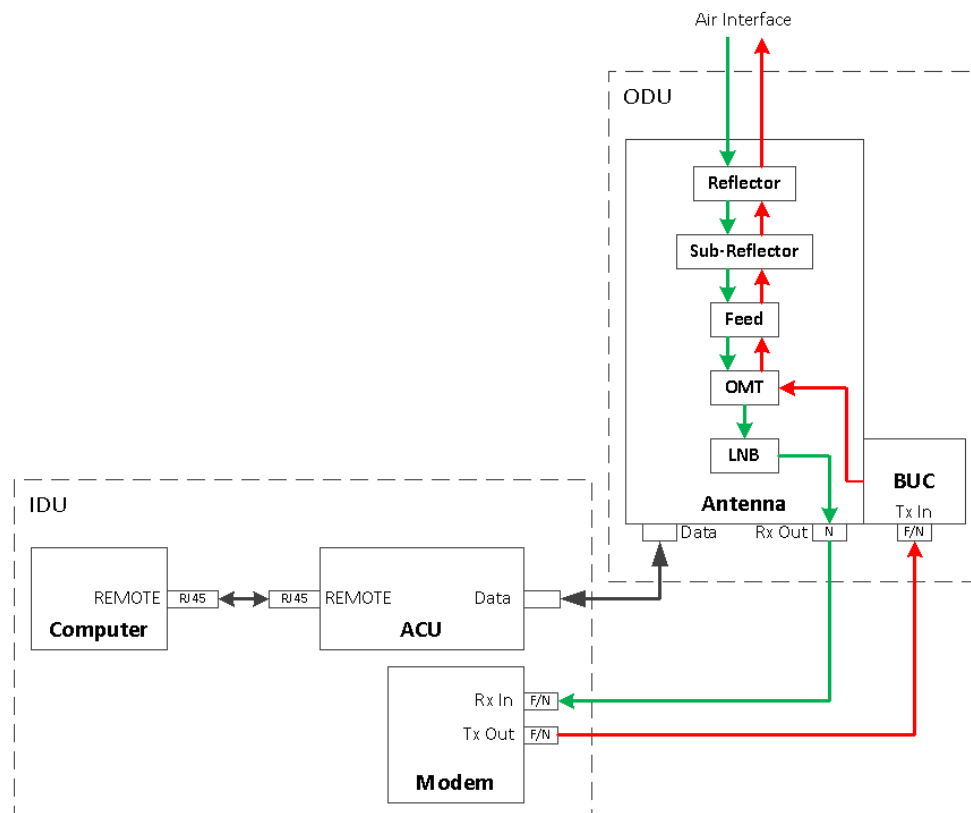
## 2. System Overview

The system consists of the terminal, ACU, BUC, and LNB. The terminal connects to the ACU to provide tracking and manual pointing functionality. A computer can also connect to the ACU to enable the same functionality through LinkControl.

On the transmit side, the terminal contains a BUC or SSPA to convert the L-Band Tx signals from the modem to Ku-Band RF signals and amplify them to the specified power levels. The amplified signals are passed through the output waveguide to the OMT before entering the feed. The feed projects the RF energy onto a hyperboloid sub-reflector that then reflects it onto the parabolic reflector up to a satellite.

On the receive side, the receive RF energy is gathered by the reflector and focused on the feed through the hyperboloid sub-reflector, which directs the energy to the OMT. The OMT then splits the receive signal and passes it to the LNB, which outputs L-Band Rx signals to the modem.

Refer to the block diagram below for a simplified representation of the system.



## 3. Hardware

### 3.1 Crate Dimensions

The system is packaged in a single wooden crate that contains the antenna and a corrugated box. The corrugated box contains the ACU, cables, and antenna accessories.

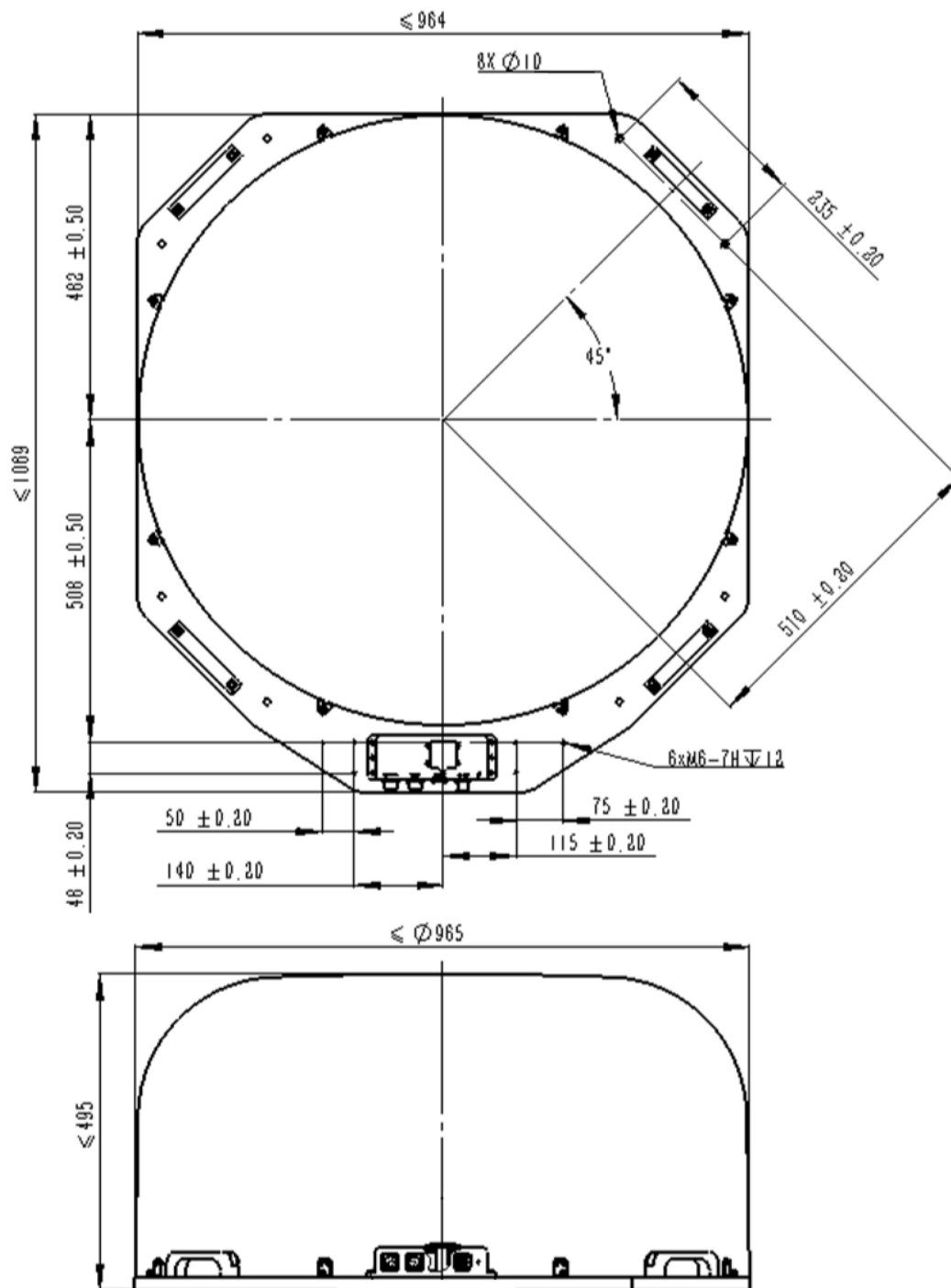
The antenna and corrugated box are secured onto the wooden crate for protection during transport.

| CRATE NUMBER | DIMENSIONS              | WEIGHT   |
|--------------|-------------------------|----------|
| 1            | 1.3 m x 1.25 m x 0.68 m | ≤ 160 kg |



## 3.2 Antenna Dimensions

All dimensions are in millimeters.

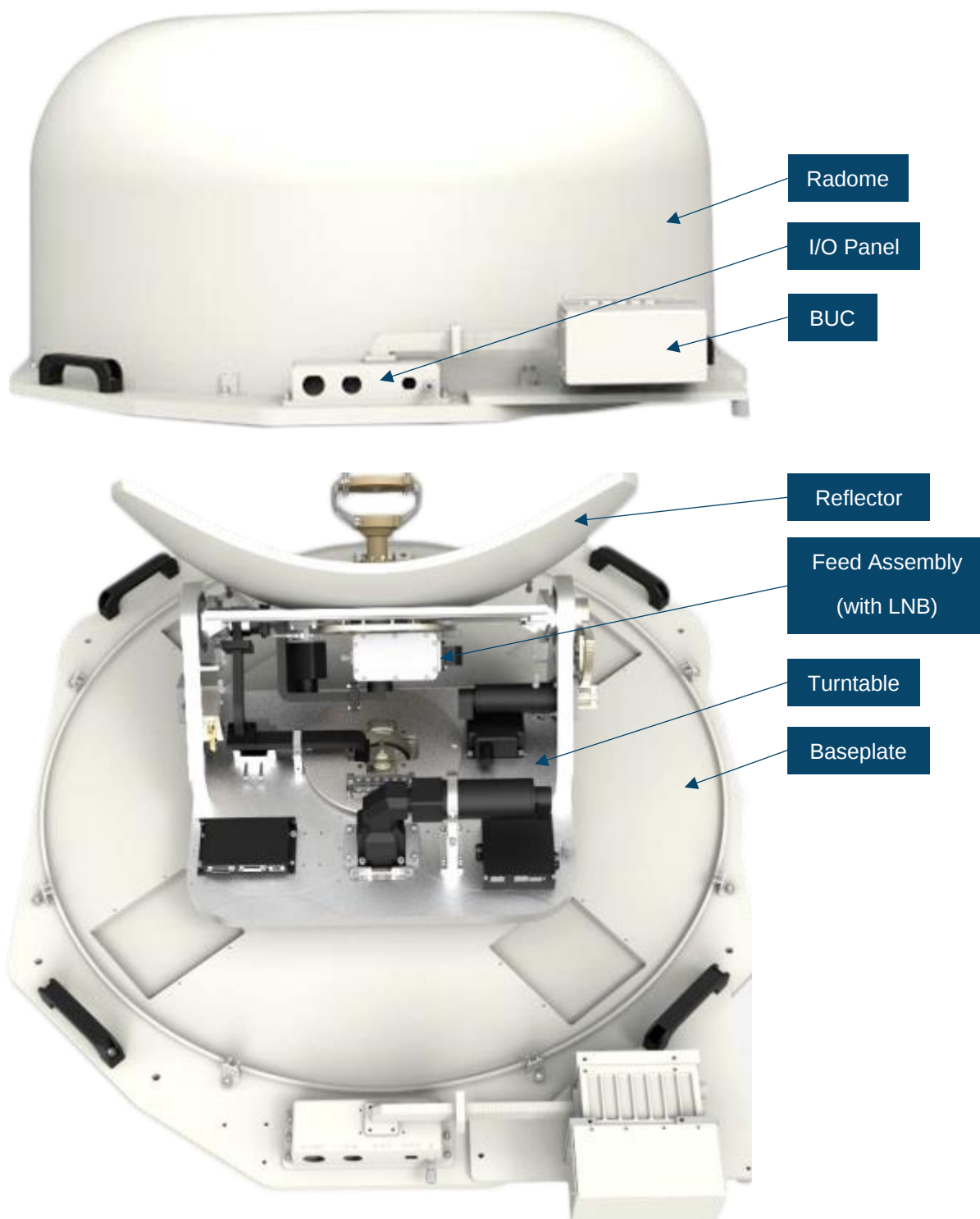


## 3.3 Introduction to System Components

### 3.3.1 Antenna

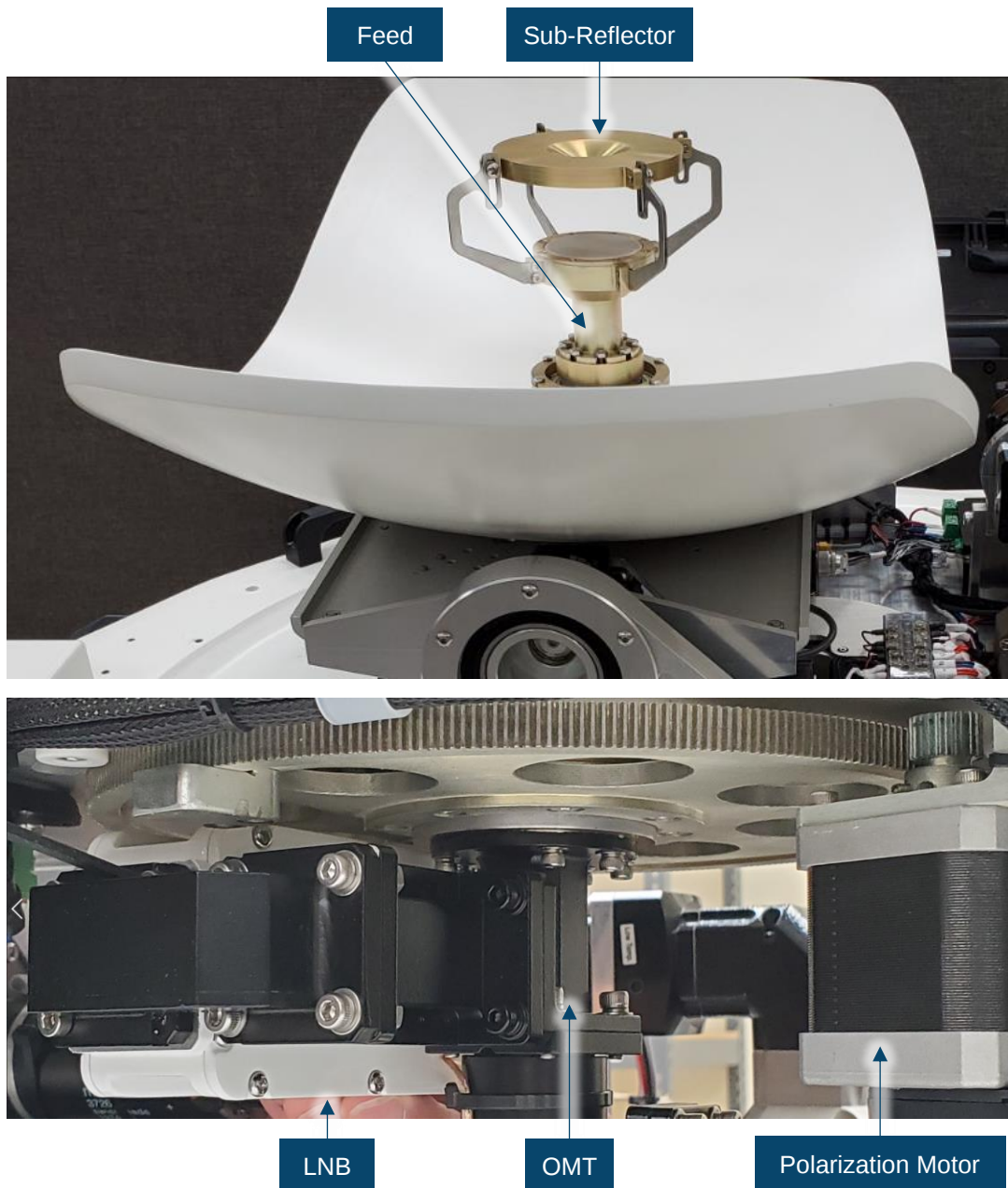
Refer to the figures below for the key components for the antenna.

**Note:** The BUC and LNB are not included with the antenna itself.



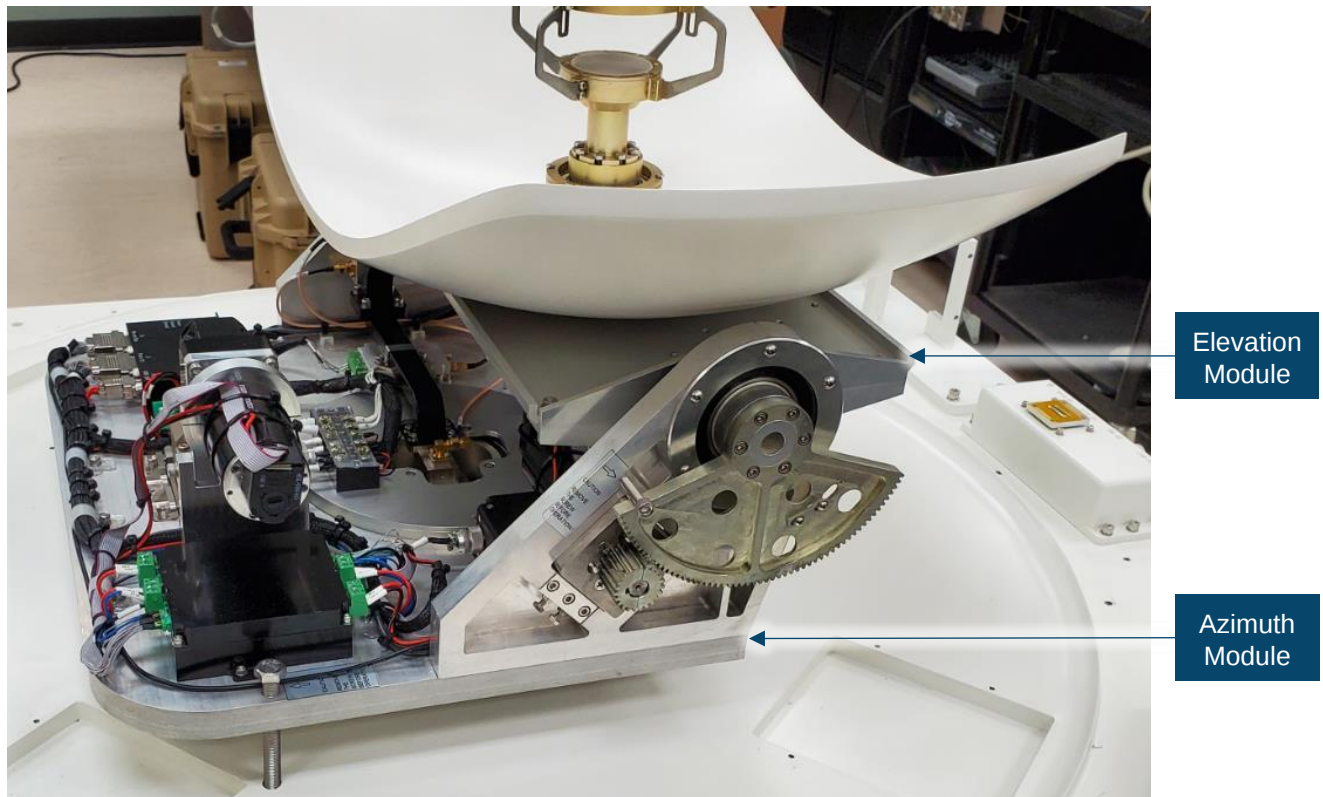
### 3.3.1.1 Feed Assembly

The Feed Assembly consists of the polarization motor, feed, sub reflector, OMT, and LNB. This assembly drives polarization angle and isolate the Tx/Rx signals. The Feed Assembly is mounted onto the Elevation module of the Turntable.



### 3.3.1.2 Turntable

The Turntable consists of two main structures: The Azimuth module and the Elevation module, which drive the azimuth and elevation respectively.



### 3.3.1.3 I/O Panel

Refer to the figure and table below for the ports on the antenna I/O panel.



| PORT                                                                                | INTERFACE                             | PARAMETER          |
|-------------------------------------------------------------------------------------|---------------------------------------|--------------------|
| <b>XS1 DC INPUT</b>                                                                 | 4-Pin Male Connector                  | Internal to System |
| <b>XS2 M&amp;C</b>                                                                  | 10-Pin Female Connector               | Internal to System |
| <b>XS3 RF-TX</b>                                                                    | WR75 Flat Flange with M4 Tapped Holes | 13.75 – 14.50 GHz  |
| <b>XS4 RF-RX</b>                                                                    | Female N-Connector                    | 950 – 2000 MHz     |
|  | M4 Tapped Hole                        | GND                |

### 3.3.2 Antenna Control Unit (ACU)

The Antenna Control Unit is a 1RU rack mount unit. Refer to Section 5.1 for operation of the ACU.

#### 3.3.2.1 Front Panel



| PORT    | INTERFACE | PARAMETER |
|---------|-----------|-----------|
| Console | RJ45      | Serial    |

#### 3.3.2.2 Rear Panel



| PORT           | INTERFACE               | PARAMETER          |
|----------------|-------------------------|--------------------|
| 220 VAC Input  | IEC C13                 | 110 VAC to 220 VAC |
| XS1 DC Output  | 4-Pin Female Connector  | Internal to System |
| XS2 M&C        | 12-Pin Female Connector | Internal to System |
| XS3 Rx         | None                    | Not Used           |
| XS4 Remote     | RJ45                    | Ethernet           |
| XS5 Modem      | RJ45                    | Serial             |
| Grounding Pole | Stud and Cap            | GND                |

XS5 Modem Port can output GPS coordinates to compatible modems using GPGLL sentences (NMEA 2.1). A rollover RJ45 to RJ45 cable is included with the antenna. Refer to the table below for the pinout of XS5 Modem Port.

| PIN | Signal             |
|-----|--------------------|
| 1   | Not Connected      |
| 2   | Not Connected      |
| 3   | Tx (GPS Send)      |
| 4   | Not Connected      |
| 5   | GND                |
| 6   | Rx                 |
| 7   | Modem Lock Receive |
| 8   | Not Connected      |

## 4. Assembly

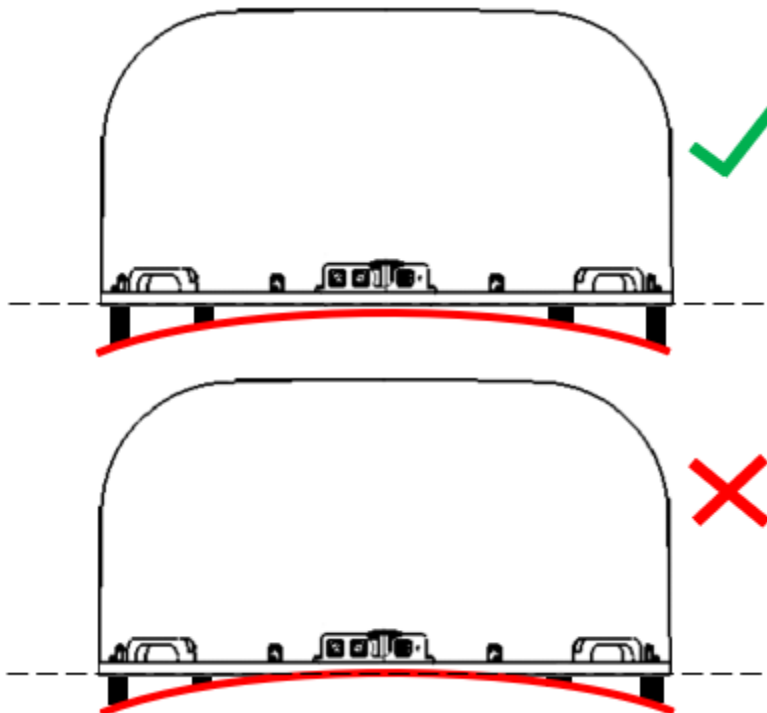
### 4.1 Installation Requirements

1. Verify the vehicle roof can support the weight and dimensions listed in the table below:

| PARAMETER | VALUE   |
|-----------|---------|
| LENGTH    | 1069 mm |
| WIDTH     | 964 mm  |
| HEIGHT    | 495 mm  |
| WEIGHT    | 60 kg   |

2. The mounting points for the antenna baseplate on the vehicle roof must match the dimensions shown in Section 3.2.
3. The antenna baseplate must be coincident to the vehicle mount.
4. The vehicle roof must not protrude into the antenna baseplate. If it does, spacers must be added until the vehicle roof clears the baseplate.

Refer to the image below for an example of correct and incorrect mounting. The dashed line represents the baseplate bottom. In the incorrect example, the vehicle roof is interfering with the baseplate.



5. Verify the vehicle is on level ground.
6. It is recommended to have four people when carrying the antenna.

## 4.2 Opening the Crate

1. Remove the lid of the crate to reveal the antenna and corrugated box. The corrugated box contains the ACU, cables, and antenna accessories.

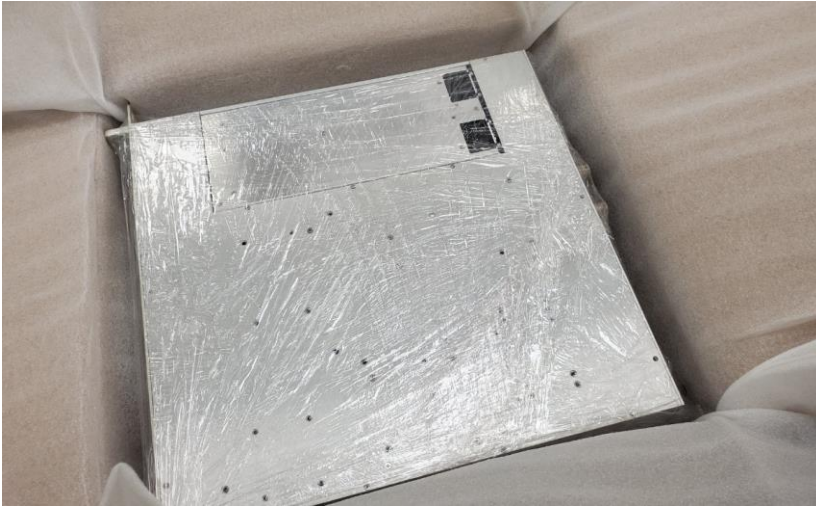


2. Remove the four (4) nuts that secure the antenna onto the bottom of the crate.

**Note:** Do not remove any screws on the antenna.



3. Remove the antenna and the corrugated box from the crate.
4. Open and remove the ACU from the corrugated box.



5. Underneath the ACU lies the cables and antenna accessories.

**Note:** If the BUC is already integrated onto the antenna, the flexible and rigid waveguide will not be present inside the corrugated box.

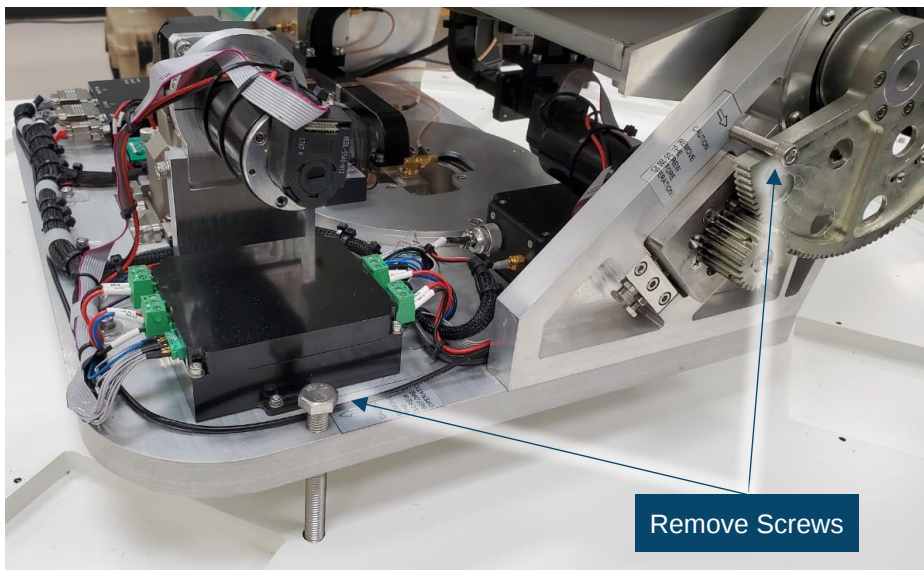


### 4.3 Preparing the Antenna

1. Remove the eight (8) screws along the perimeter of the radome that secure the radome to the antenna baseplate.



2. Remove the radome from the antenna.
3. Remove the locking screws on the turntable as indicated by the "CAUTION – REMOVE THE SCREW BEFORE OPERATION" labels.



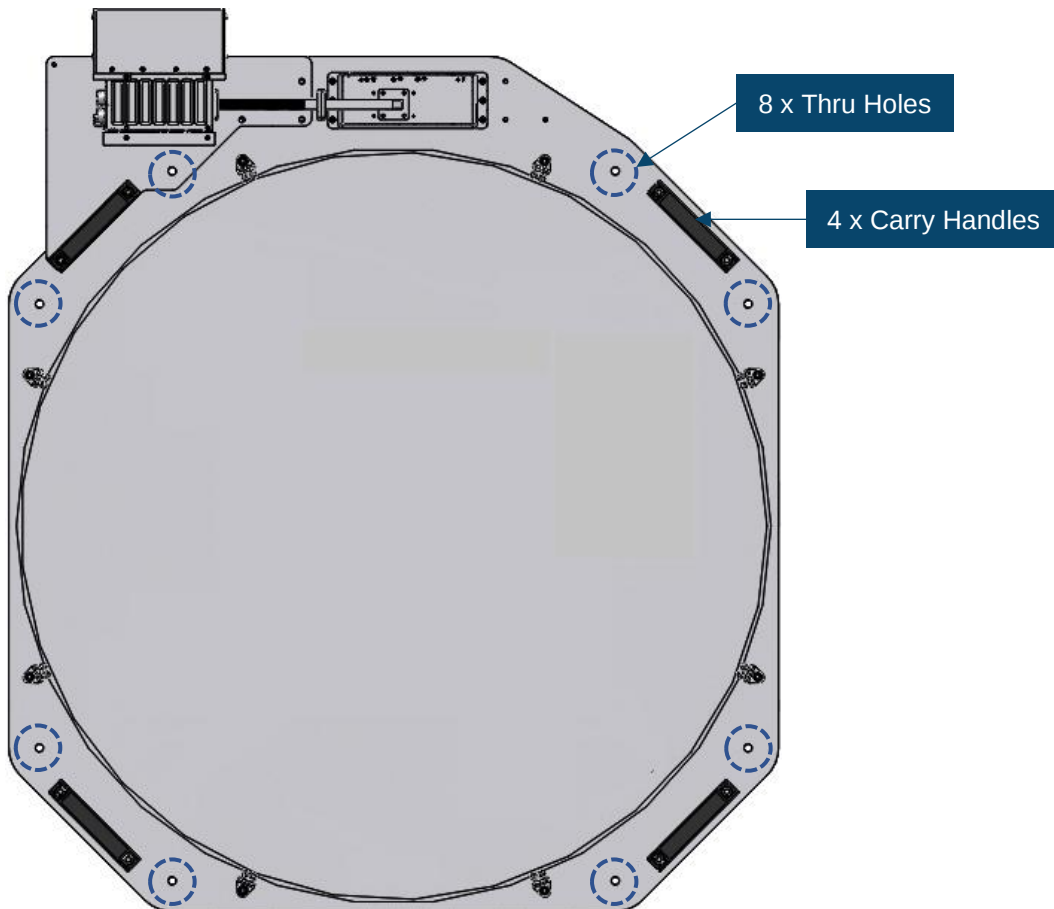
4. Place the radome back onto the antenna baseplate and align the black arrow on both components.



5. Reattach the radome using the eight (8) removed screws.

## 4.4 Installing the Antenna

1. Install the ACU, BUC power supply and customer supplied modem into a fixed rack inside the vehicle
2. Use the handles along the corners of the antenna baseplate to lift the antenna.



3. Mount the antenna onto the vehicle roof using the thru-holes beside the carry handles as indicated by the dashed blue circles.

Gradually tighten the mounting screw to 25 Nm in an evenly distributed manner to ensure the antenna installs flat.

## 4.5 Cable Connection

The cable connection in this section is for IP communication to the computer. For serial communication, omit the remote cable and instead connect the ACU to the computer as described in Steps 1 and 2 of Appendix B.

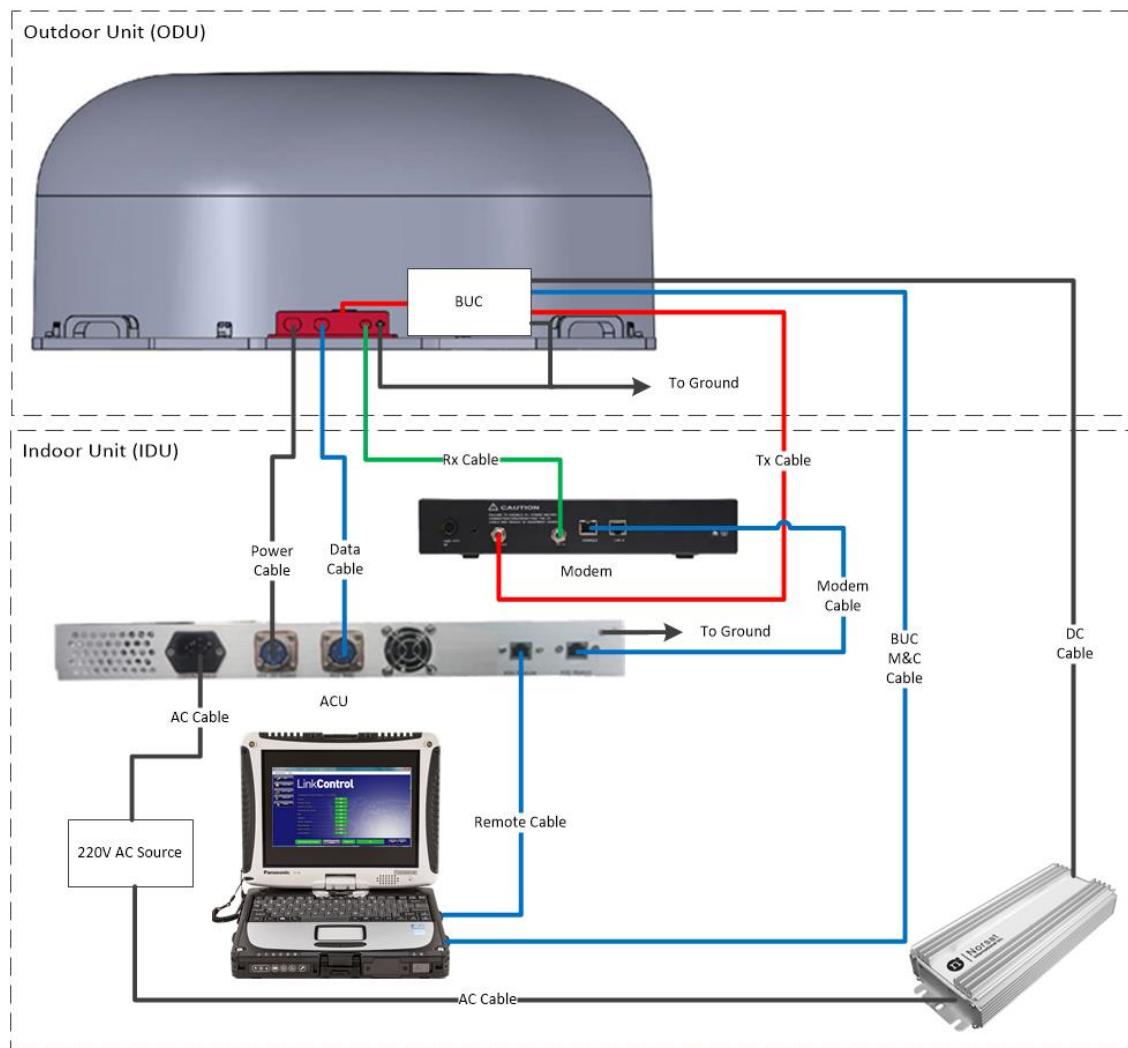
1. Connect the cables according to the table and the figure on the next page in the order that they appear in the table.

**Note:** All multi-pinned connectors are keyed such that each cable end can only be installed between the intended interfaces.

**Note:** Do not fold or bend the cables during installation.

2. After installation, secure the cables onto the vehicle body to prevent shaking during vehicle use.
3. System grounding instructions will be provided in the next section.

| SIGNAL              | FROM                | TO                   | CABLE           |
|---------------------|---------------------|----------------------|-----------------|
| <b>ODU DC Power</b> | ACU – XS1 DC Output | ODU – XS1 DC Input   | Power Cable     |
| <b>ODU Data</b>     | ACU – XS2 M&C       | ODU – XS2 M&C        | Data Cable      |
| <b>Remote</b>       | ACU – XS4 Remote    | Laptop – Ethernet    | Remote Cable    |
| <b>GPS</b>          | ACU – XS5 Modem     | Modem – Console Port | Modem Cable     |
| <b>BUC M&amp;C</b>  | BUC – M&C           | Laptop – Ethernet    | BUC M&C Cable   |
| <b>Rx Out</b>       | Modem – Rx Out      | ODU – XS4 RF-RX      | N-to-N Rx Cable |
| <b>Tx In</b>        | Modem – Tx Out      | BUC – RF In          | N-to-N Tx Cable |
| <b>IDU AC Power</b> | AC Power Source     | ACU – 220VAC Input   | AC Cable        |
| <b>BUC Power</b>    | AC Power Source     | BUC – DC In          | BUC PSU         |



**Note:** The ODU and IDU refer to components placed outside and inside the vehicle respectively.

## 4.6 System Grounding

### 4.6.1 Antenna

1. Locate the grounding screw on the I/O panel.



2. Remove the grounding screw.
3. Attach the grounding wire onto the grounding screw.
4. Re-attach the grounding screw into the I/O panel.
5. Attach the other end of the grounding wire to ground.

### 4.6.2 ACU

1. Locate the grounding pole on the rear of the ACU.

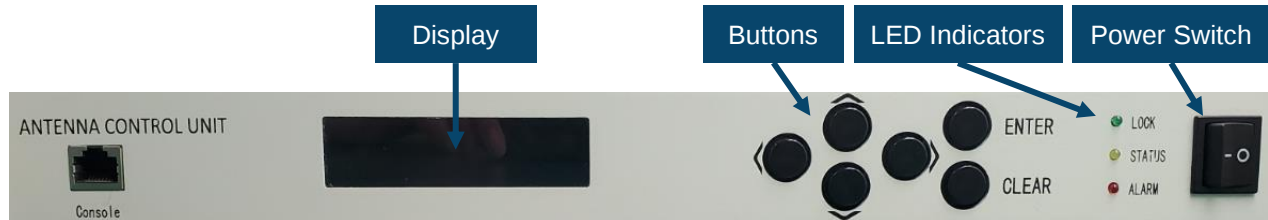


2. Remove the cap on the grounding pole to reveal the grounding stud.
3. Attach the grounding wire onto the grounding stud.
4. Re-attach the cap of the grounding pole.
5. Attach the other end of the grounding wire to ground.

## 5. Operation

### 5.1 Antenna Control Unit

Refer to the figure and table below for the user interface elements on the front panel of the ACU.



| COMPONENT             | FUNCTION                                            |
|-----------------------|-----------------------------------------------------|
| <b>Display</b>        | Outputs text information to user                    |
| <b>Buttons</b>        | Provides input for the user interface               |
| <b>LED Indicators</b> | Displays lock, stow, and alarm status of the system |
| <b>Power Switch</b>   | Turns on and off power of the system                |

Refer to the table below for the functionality of each button on the front panel.

| ICON  | NAME  | FUNCTION                                                          |
|-------|-------|-------------------------------------------------------------------|
| ^     | Up    | Toggles cursor up                                                 |
|       |       | Increases number on display                                       |
| v     | Down  | Toggles cursor down                                               |
|       |       | Decreases number on display                                       |
| <     | Left  | Toggles cursor left                                               |
|       |       | Selects the left or previous option                               |
| >     | Right | Toggles cursor right                                              |
|       |       | Selects the right or next option                                  |
| Enter | Enter | Menu Interface: Enters the cursor activation menu                 |
|       |       | Setup Interface: Saves the parameters under the current interface |
|       |       | Manual Control Interface: Starts motion                           |
| Clear | Clear | Menu Interface: Return to previous menu                           |
|       |       | Setup Interface: Cancels selection                                |
|       |       | Manual Control Interface: Stops motion                            |

Refer to the table below for the functionality of each LED indicator on the front panel.

| COLOUR | TEXT   | FUNCTION                                  |
|--------|--------|-------------------------------------------|
| Green  | LOCK   | Indicates satellite lock                  |
| Yellow | STATUS | Indicates when system is in standby state |
| Red    | ALARM  | Indicates system error                    |

Refer to Appendix A for a breakdown of the menu options and more information regarding each menu option.

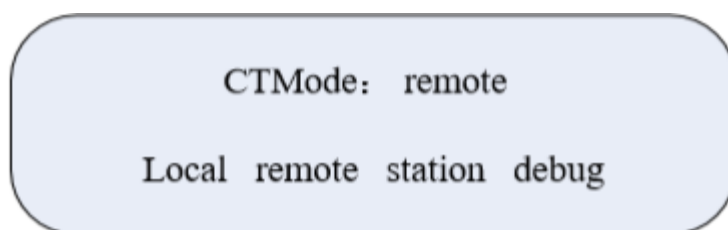
## 5.2 Auto-Acquire

This section will outline how to perform an auto-acquire using the antenna only. For operation of LinkControl, refer to the LinkControl user manual.

### 5.2.1 Configuring Control Mode

Antenna operation can be performed either through the ACU or through a computer using the LinkControl software. Operation of either requires the control mode to be configured properly. To configure the control mode, perform the following steps:

1. On the ACU, navigate to: Home Screen -> Setting -> ACU Set -> Ctr Mode.



2. Set the CTMode to Local for control through the ACU.

**Note:** Refer to Appendix A for the use of all other modes.

3. Press the Enter key to save.

### 5.2.2 Configuring Satellite Profiles

1. Navigate to: Home Screen -> Setting -> SchS Set -> Sate Set.

Set info of Satellites

Name: Asia9      lon: +122.00  
Frq: 12250.200    Pol: H

2. Highlight the Name field and toggle through all the profiles.
3. If a profile for the target satellite does not exist, toggle to a profile to overwrite and set the following parameters to the target satellite:
  - a. Frq (Center Frequency of Beacon)
  - b. Lon (Longitude)
    - i. "+" indicates East
    - ii. "-" indicates West
  - c. Pol (Polarization)
    - i. "V" indicates Vertical
    - ii. "H" indicates Horizontal

**Note:** Names are not editable.

4. Toggle back to the target satellite profile.
5. Press the Enter key to set it as the active profile.

### 5.2.3 Configuring LNB Band

1. Navigate to: Home Screen -> Setting -> APTC Set -> Band Set

CurBand: Band 1

Band1 (13V)    Band2 (13V22K)  
Band3 (18V)    Band3(18V22K)

2. Select the desired frequency band.
3. Press the Enter key to save.

4. Navigate to: Home Screen -> Setting -> APTC Set -> Lo Set

Local Oscillator: 9750 MHz

5. Select the LO frequency corresponding with the selected frequency band.
6. Press the Enter key to save.

#### 5.2.4 Configuring Position Mode

1. Navigate to: Home Screen -> Setting -> SchS Set -> Psn Mode.

PST Mode: BD+GPS

local: Xi An

lon: +108.95

lat: +034.27

2. Set the PST Mode is set to BD+GPS.
3. Press the Enter key to save.
4. Navigate to: Home Screen -> Info -> Position.

Position

LON: +000.00 Hight:

LAN: +000.00 Time: 00:00:00

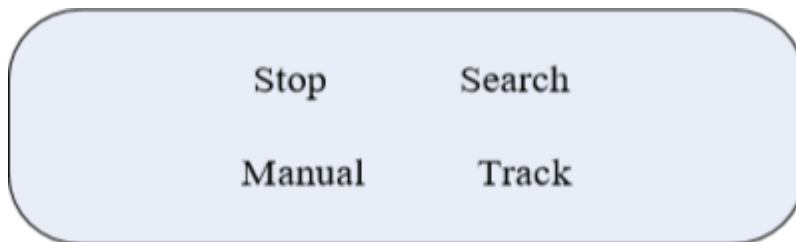
State: Invalid

5. If the state is invalid, perform the following steps to manually set the location. Otherwise, position mode configuration is complete.
  - a. Navigate back to: Home Screen -> Setting -> SchS Set -> Psn Mode.
  - b. Set the PST Mode to Manual.
  - c. Highlight the Local field and toggle through all the profiles.
  - d. If a profile for the current locale does not exist, toggle to a profile to overwrite and set the longitude and latitude accordingly.
    - i. "+" indicates East and North for longitude and latitude respectively
    - ii. "-" indicates West and South for longitude and latitude respectively
  - e. Toggle back to the current locale profile.
  - f. Press the Enter key to set it as the current locale.

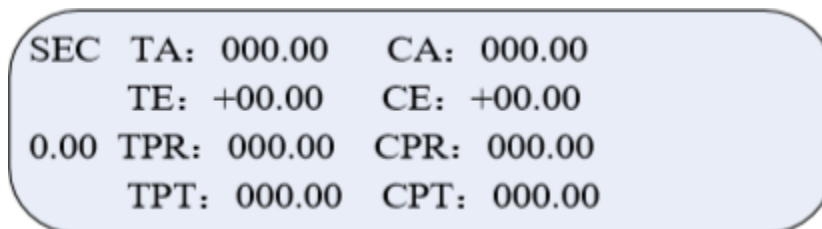
### 5.2.5 Starting Auto-Acquire

**Note:** Upon successfully setting all previous parameters, the antenna may automatically begin auto-acquire.

1. Navigate to: Home Screen -> Control.



2. Select Search.



3. Press the Enter key to start the auto-acquire.
4. Observe the AGC during the auto-acquire and record the peak value observed.

5. If the search fails, adjust the AGC threshold by performing the following steps:
  - a. Navigate to: Home Screen -> Setting -> SchS Set -> SchS Trd.
  - b. Set the lock threshold 1-2 V lower than the observed peak AGC reading.

Lock Threshold: 0.0

**Note:** AGC indicates signal strength of the target satellite beacon.

### 5.3 LinkControl

The ACU can be controlled through LinkControl. Refer to the LinkControl user manual for more information.

The IP address, mask, and port of the antenna can be found by performing the steps below. This information will be used when configuring the device profile on LinkControl.

1. On the ACU, navigate to: Home Screen -> Setting -> ACU Set -> Net Set.

Net Ref  
ACU-IP:192.168.001.003  
Mask :255.255.255.000  
PORT :6003

## 6. System Troubleshooting

If the alarms persist after the recommended troubleshooting steps, contact the manufacturer.

### 6.1 Limit Codes

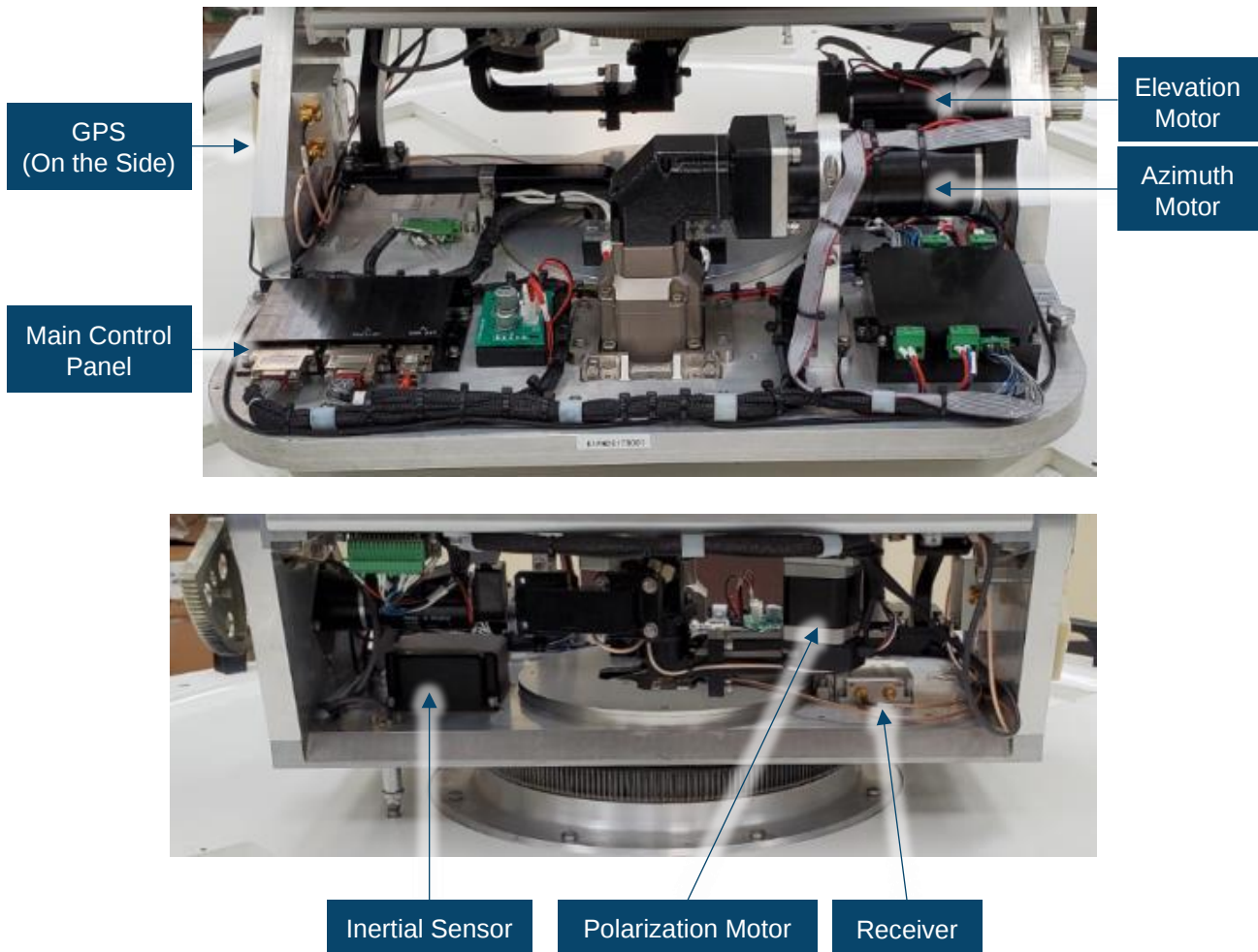
**Note:** Error codes L4 and L5 are not used.

| BIT | ERROR MESSAGE                        | DESCRIPTION                                                                           | TROUBLESHOOTING                             |
|-----|--------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------|
| L0  | Pitch upper limit                    | Elevation has reached the upper software movement limit and stopped movement          | 1. Move the pitch in the negative direction |
| L1  | Pitch lower limit                    | Elevation has reached the lower software movement limit and stopped movement          | 1. Move the pitch in the positive direction |
| L2  | Receiving polarization inverse limit | Receive polarization has reached the counterclockwise most limit and stopped movement | 1. Move the polarization clockwise          |
| L3  | Receiving polarization sequence      | Receive polarization has reached the clockwise most limit and stopped movement        | 1. Move the polarization counterclockwise   |
| L6  | AZ zero                              | Terminal failed to zero azimuth                                                       | 1. Reboot system<br>2. Stow the terminal    |
| L7  | EL Zero                              | Terminal failed to zero elevation                                                     |                                             |
| L8  | Rx polarization zero                 | Terminal failed to zero Rx polarization                                               |                                             |

## 6.2 Check Codes

**Note:** Error code E3 and E6 are not used.

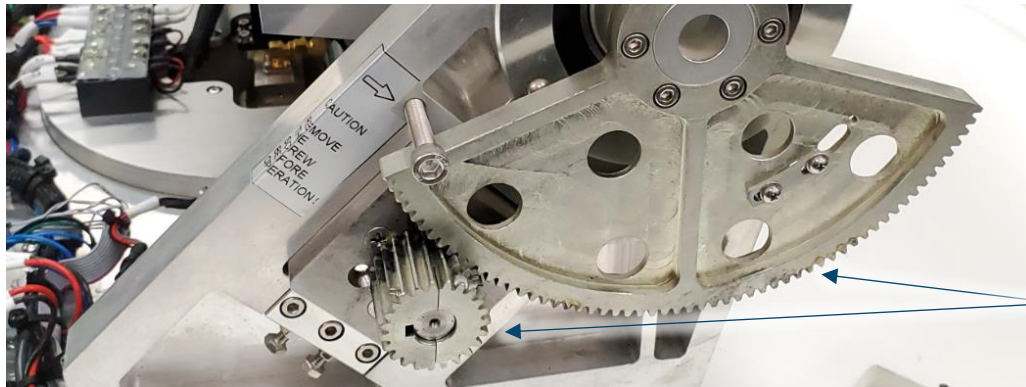
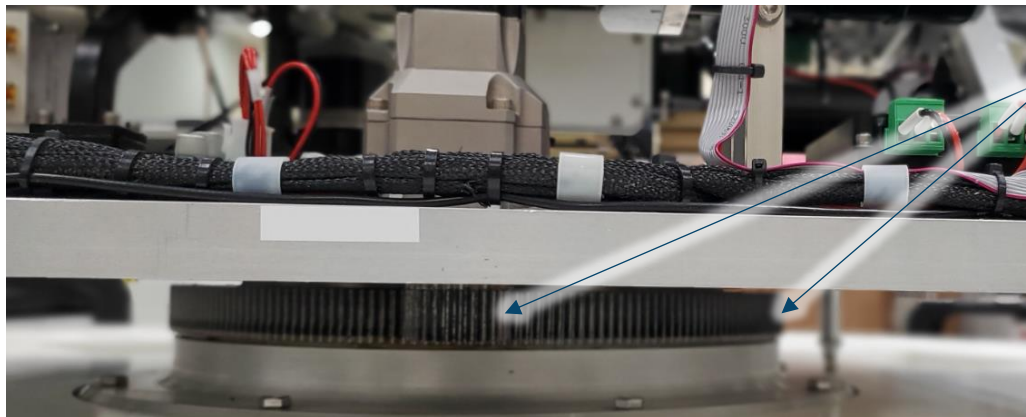
| BIT | ERROR MESSAGE                    | TROUBLESHOOTING                                                                                                                                                                                                                               |
|-----|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E0  | AZ motor is abnormal             | <ol style="list-style-type: none"> <li>1. Check the cable connections between the IDU, ODU, and power supply</li> <li>2. Remove radome and check cable connections along affected drive motors</li> <li>3. Power cycle the antenna</li> </ol> |
| E1  | EL motor is abnormal             |                                                                                                                                                                                                                                               |
| E2  | Receive POL motor is abnormal    |                                                                                                                                                                                                                                               |
| E4  | GPS is not connected             | <ol style="list-style-type: none"> <li>1. Remove radome and check cable connections between the main control panel and the affected sensor</li> </ol>                                                                                         |
| E5  | Beacon receiver is not connected |                                                                                                                                                                                                                                               |
| E7  | Inertial Guidance error          | <ol style="list-style-type: none"> <li>1. Contact manufacturer technical support</li> </ol>                                                                                                                                                   |
| E8  | Zero seeking error               |                                                                                                                                                                                                                                               |



## 7. System Maintenance

| COMPONENT                | PROCEDURE                                                                                                                                                                                                                  |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Daily</b>             |                                                                                                                                                                                                                            |
| <b>Radome</b>            | <ol style="list-style-type: none"> <li>1. Inspect the surface for damage</li> <li>2. Clean the surface with a damp cloth to remove excessive dust and debris</li> <li>3. Wipe down the surface with a dry cloth</li> </ol> |
| <b>Antenna</b>           | <ol style="list-style-type: none"> <li>1. Verify the antenna assembly is not loose on the vehicle roof</li> </ol>                                                                                                          |
| <b>BUC Fan</b>           | <ol style="list-style-type: none"> <li>1. Verify the BUC fan inlet and outlet are not blocked by dust or debris</li> </ol>                                                                                                 |
| <b>Weekly</b>            |                                                                                                                                                                                                                            |
| <b>Cable</b>             | <ol style="list-style-type: none"> <li>1. Verify IDU to ODU cables are fastened</li> <li>2. Verify BUC power supply cables are fastened</li> <li>3. Inspect all cables for damage</li> </ol>                               |
| <b>Outdoor Connector</b> | <ol style="list-style-type: none"> <li>1. Inspect the grommet condition in all connectors and caps</li> </ol>                                                                                                              |
| <b>BUC Fan</b>           | <ol style="list-style-type: none"> <li>1. Inspect the fan for abnormal or inconsistent noises</li> <li>2. Place hand on exhaust and verify air flow</li> <li>3. Clean the fan as needed</li> </ol>                         |
| <b>Monthly</b>           |                                                                                                                                                                                                                            |
| <b>ACU Fan</b>           | <ol style="list-style-type: none"> <li>1. Inspect the fan for abnormal or inconsistent noises</li> <li>2. Place hand on exhaust and verify air flow</li> <li>3. Clean the fan as needed</li> </ol>                         |

| COMPONENT           | PROCEDURE                                                                                                                                                                                                                                                                                                                                                  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Semi-Annual</b>  |                                                                                                                                                                                                                                                                                                                                                            |
| <b>Transmission</b> | <ol style="list-style-type: none"> <li>1. Ensure the terminal is powered off</li> <li>2. Remove the radome</li> <li>3. Lubricate all the exposed teeth of the AZ, EL, and POL gears (See figure below)</li> <li>4. Use MIL-G-3278A or equivalent low temperature grease and grease applicator for lubrication (Do not apply the grease by hand)</li> </ol> |

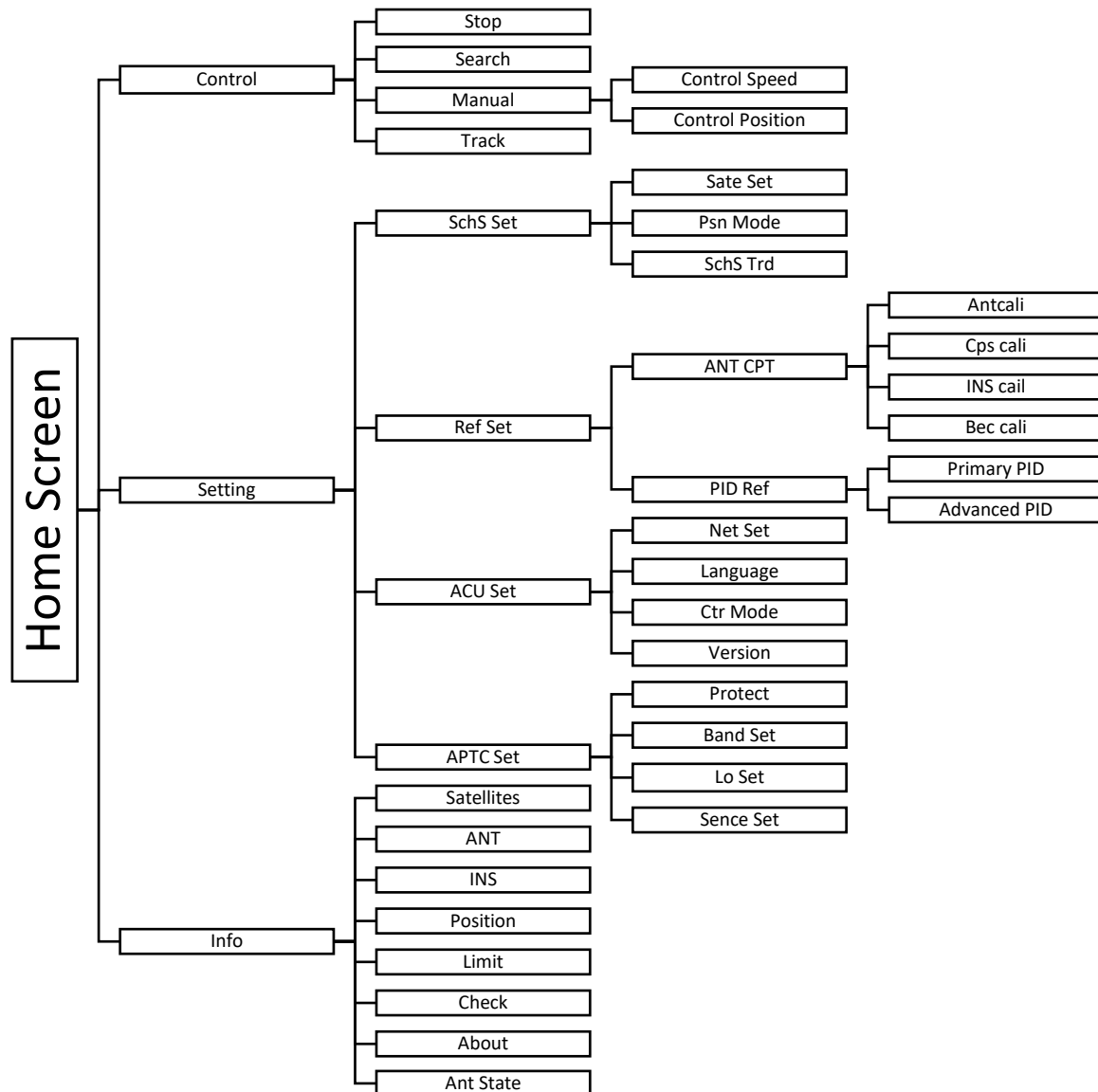


## 8. Technical Specifications

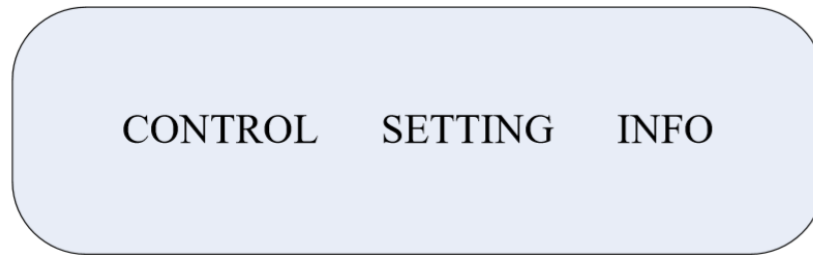
| ELECTRICAL                                |                               |
|-------------------------------------------|-------------------------------|
| Reflector Aperture                        | 0.5m                          |
| Reflector Material                        | Carbon Fiber                  |
| Feed Configuration                        | Center Fed                    |
| Tx Frequency                              | 13.75 – 14.50 GHz             |
| Rx Frequency                              | 10.7 – 12.75 GHz              |
| Tx Gain                                   | $35.0 + 20 \log(f/14.25)$ dBi |
| Rx Gain                                   | $34.0 + 20 \log(f/12.50)$ dBi |
| Polarization                              | Linear                        |
| Tx VSWR                                   | 1.5                           |
| Rx VSWR                                   | 1.5                           |
| Cross Polarization (On-Axis)              | 30 dB                         |
| Tx/Rx Isolation (Port Isolation)          | 85 dB                         |
| Sidelobe                                  | -14 dB                        |
| Power Capacity                            | 100W                          |
| Maximum Power Consumption (excluding BUC) | 300W                          |
| Power Supply Input                        | 220 VAC, 50 Hz                |
| PERFORMANCE                               |                               |
| Auto Acquisition Time                     | ≤ 3 mins                      |
| Blockage Recovery Time                    | ≤ 5 secs                      |
| Radome Insertion Loss                     | ≤ 0.3 dB                      |
| Tracking Accuracy                         | ≤ 0.5 dB (RMS)                |
| MECHANICAL                                |                               |
| Azimuth Range                             | 0° – 360°, Continuous         |
| Elevation Range                           | 0° – 90°                      |
| Polarization Range                        | ± 90°                         |
| Azimuth Speed                             | ≤ 60°/s                       |
| Elevation Speed                           | ≤ 60°/s                       |
| Polarization Speed                        | ≤ 40°/s                       |
| Terminal and ACU Weight                   | ≤ 53 kg                       |
| ENVIRONMENTAL                             |                               |
| Operational Wind Load                     | 21 m/s                        |
| Survival Wind Load                        | 35 m/s                        |
| Operational Temperature                   | -40°C to +55°C                |
| Storage Temperature                       | -50°C to +70°C                |
| Humidity                                  | 0 – 95%                       |

# Appendix A – ACU Menus

## Menu Layout



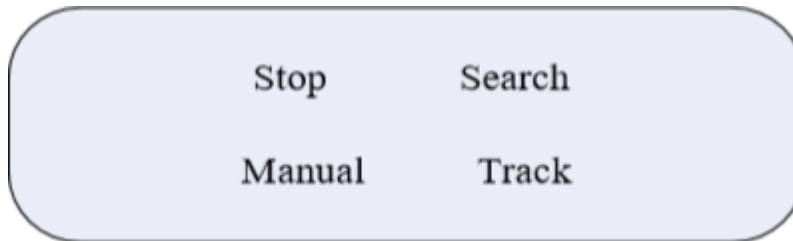
## Home Screen



| NAME           | DESCRIPTION                                        | PARAMETERS |
|----------------|----------------------------------------------------|------------|
| <b>CONTROL</b> | Perform auto-acquire, tracking, or manual movement | n/a        |
| <b>SETTING</b> | Edit antenna parameters and settings               | n/a        |
| <b>INFO</b>    | View antenna status                                | n/a        |

## Control Menus

### Control



| NAME          | DESCRIPTION                                                                                                                                        | PARAMETERS |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Stop</b>   | Antenna ceases all motion and enters standby mode. After entering standby mode, the STATUS indicator will light up.                                | n/a        |
| <b>Search</b> | Antenna searches for the active satellite profile. Upon successful pointing, the LOCK indicator will light up and the antenna will start tracking. | n/a        |
| <b>Manual</b> | Provides the user with manual control of the azimuth, elevation, and polarization via. speed or position control.                                  | n/a        |
| <b>Track</b>  | Unused as the antenna tracks upon completion of Search.                                                                                            | n/a        |

## Stop

**Note:** For polarization angles -40 to -90 deg, add 180 deg to obtain the positive equivalent.

Stop    TA: 000.00      CA: 000.00  
         TE: +00.00      CE: +00.00  
0.00    TPR: 000.00      CPR: 000.00  
         TPT: 000.00      CPT: 000.00

| NAME | DESCRIPTION                   | PARAMETERS     |
|------|-------------------------------|----------------|
| TA   | Target Azimuth                | n/a            |
| TE   | Target Elevation              | 0 to 90 deg    |
| TPR  | Target Receive Polarization   | -40 to 140 deg |
| TPT  | Target Transmit Polarization  | n/a            |
| CA   | Current Azimuth               | 0 to 360 deg   |
| CE   | Current Elevation             | 0 to 90 deg    |
| CPR  | Current Receive Polarization  | -40 to 140 deg |
| CPT  | Current Transmit Polarization | -n/a           |

## Search

**Note:** For polarization angles -40 to -90 deg, add 180 deg to obtain the positive equivalent.

SEC    TA: 000.00      CA: 000.00  
         TE: +00.00      CE: +00.00  
0.00    TPR: 000.00      CPR: 000.00  
         TPT: 000.00      CPT: 000.00

| NAME | DESCRIPTION                   | PARAMETERS     |
|------|-------------------------------|----------------|
| TA   | Target Azimuth                | n/a            |
| TE   | Target Elevation              | 0 to 90 deg    |
| TPR  | Target Receive Polarization   | -40 to 140 deg |
| TPT  | Target Transmit Polarization  | n/a            |
| CA   | Current Azimuth               | 0 to 360 deg   |
| CE   | Current Elevation             | 0 to 90 deg    |
| CPR  | Current Receive Polarization  | -40 to 140 deg |
| CPT  | Current Transmit Polarization | -n/a           |

Control Speed      Control Position

| NAME                    | DESCRIPTION                                                                                       | PARAMETERS |
|-------------------------|---------------------------------------------------------------------------------------------------|------------|
| <b>Control Speed</b>    | Select an axis (azimuth, elevation, or polarization) and set it to move at a target angular speed | n/a        |
| <b>Control Position</b> | Set and move antenna to target azimuth, elevation, and polarization                               | n/a        |

### Control Speed

**Note:** For polarization angles -40 to -90 deg, add 180 deg to obtain the positive equivalent.

Ctr Mode: Azim inc      CA: 000.00  
 Speed : 0.00 deg/s      CE: +00.00  
 AGC : 0.00              CPR: 000.00  
 Etr Key Start            CPT: 000.00

| NAME            | DESCRIPTION                   | PARAMETERS                                                                                                                                                                                                 |
|-----------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ctr Mode</b> | Motor and Direction Selection | One of the following: <ul style="list-style-type: none"> <li>• Increase AZ</li> <li>• Decrease AZ</li> <li>• Increase EL</li> <li>• Decrease EL</li> <li>• Increase POL</li> <li>• Decrease POL</li> </ul> |
| <b>Speed</b>    | Target Angular Speed          | 0 to 60 deg/s (for AZ/EL)<br>0 to 40 deg/s (for POL)                                                                                                                                                       |
| <b>AGC</b>      | Automatic Gain Control        | 0 to 10 V                                                                                                                                                                                                  |
| <b>CA</b>       | Current Azimuth               | 0 to 360 deg                                                                                                                                                                                               |
| <b>CE</b>       | Current Elevation             | 0 to 90 deg                                                                                                                                                                                                |
| <b>CPR</b>      | Current Receive Polarization  | -40 to 140 deg                                                                                                                                                                                             |
| <b>CPT</b>      | Current Transmit Polarization | n/a                                                                                                                                                                                                        |

## Control Position

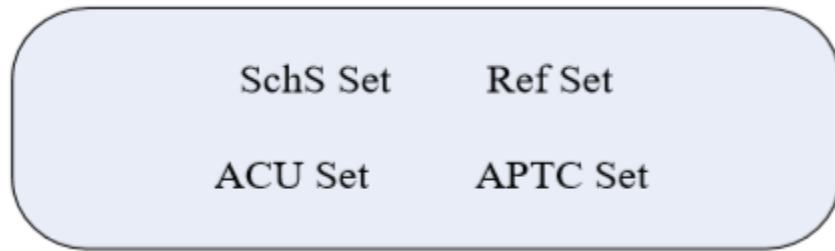
**Note:** For polarization angles -40 to -90 deg, add 180 deg to obtain the positive equivalent.

Pos TA: 000.00 CA: 000.00  
TE: +00.00 CE: +00.00  
0.00 TPR: 000.00 CPR: 000.00  
TPT: 000.00 CPT: 000.00

| NAME | DESCRIPTION                   | PARAMETERS     |
|------|-------------------------------|----------------|
| TA   | Target Azimuth                | 0 to 360 deg   |
| TE   | Target Elevation              | 0 to 90 deg    |
| TPR  | Target Receive Polarization   | -40 to 140 deg |
| TPT  | Target Transmit Polarization  | n/a            |
| CA   | Current Azimuth               | 0 to 360 deg   |
| CE   | Current Elevation             | 0 to 90 deg    |
| CPR  | Current Receive Polarization  | -40 to 140 deg |
| CPT  | Current Transmit Polarization | n/a            |

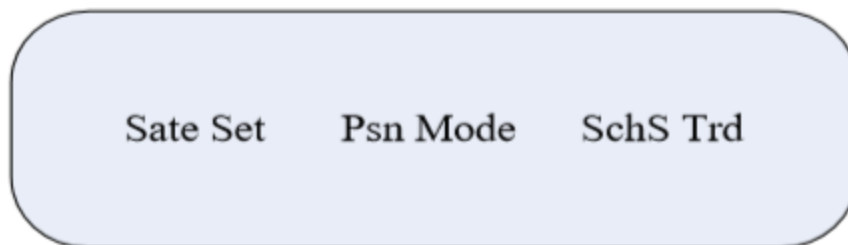
## Setting Menus

### Setting



| NAME     | DESCRIPTION                          | PARAMETERS |
|----------|--------------------------------------|------------|
| SchS Set | Edit satellite and location settings | n/a        |
| Ref Set  | Edit antenna parameters              | n/a        |
| ACU Set  | Edit ACU settings                    | n/a        |
| APTC Set | Edit pointing parameters             | n/a        |

### SchS Set



| NAME     | DESCRIPTION                                                                               | PARAMETERS |
|----------|-------------------------------------------------------------------------------------------|------------|
| Sate Set | Select or edit active satellite profile                                                   | n/a        |
| Psn Mode | Select geolocation source or manually enter longitude and latitude information of antenna | n/a        |
| SchS Trd | Adjust AGC threshold                                                                      | n/a        |

## Sate Set

**Note:** Use the left/right keys to toggle between the different satellite profiles.

Set info of Satellites

Name: Asia9      lon: +122.00  
Frq: 12250.200    Pol: H

| NAME        | DESCRIPTION                                                                                                                                                                            | PARAMETERS                                                                                                                                                                       |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Name</b> | Name of Active Satellite Profile                                                                                                                                                       | List of stored satellite profiles                                                                                                                                                |
| <b>Frq</b>  | Frequency of Active Satellite Profile                                                                                                                                                  | Dependent on active profile                                                                                                                                                      |
| <b>Lon</b>  | Longitude of Active Satellite Profile<br><b>Note:</b> Negative is West and Positive is East                                                                                            | -180 to +180 deg                                                                                                                                                                 |
| <b>Pol</b>  | Polarization of Active Satellite Profile<br><b>Note:</b> The ACU provides options for both linear and circular polarizations. Select the option that matches the system configuration. | One of the following: <ul style="list-style-type: none"><li>• H (Horizontal)</li><li>• V (Vertical)</li><li>• D (Right Hand Circular)</li><li>• L (Left Hand Circular)</li></ul> |

## Psn Mode

PST Mode: BD+GPS  
local: Xi An  
lon: +108.95  
lat: +034.27

| NAME            | DESCRIPTION                                                                  | PARAMETERS                                                                                                                 |
|-----------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>PST Mode</b> | Positioning Mode                                                             | One of the following: <ul style="list-style-type: none"><li>• Manual</li><li>• BD</li><li>• GPS</li><li>• BD+GPS</li></ul> |
| <b>Local</b>    | Name of Location                                                             | List of preset location names                                                                                              |
| <b>Lon</b>      | Longitude of Location<br><b>Note:</b> Negative is West and Positive is East  | -180 to 180 deg                                                                                                            |
| <b>lat</b>      | Latitude of Location<br><b>Note:</b> Negative is South and Positive is North | -90 to 90 deg                                                                                                              |

## SchS Trd Mode

Lock Threshold: 0.0

| NAME           | DESCRIPTION                                          | PARAMETERS |
|----------------|------------------------------------------------------|------------|
| Lock Threshold | Minimum AGC value required to achieve satellite lock | 0.0 to 9.9 |

## Ref Set

ANT CPT      PID Ref

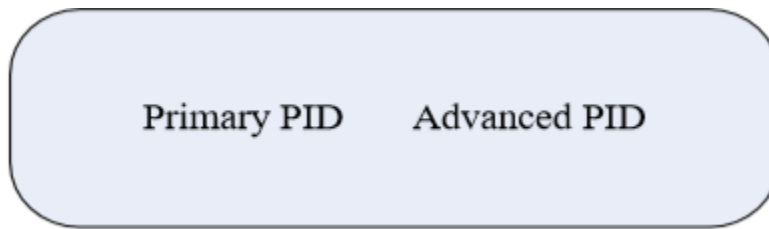
| NAME    | DESCRIPTION                           | PARAMETERS |
|---------|---------------------------------------|------------|
| ANT CPT | Edit antenna configuration parameters | n/a        |
| PID Ref | Edit PID parameters                   | n/a        |

## ANT CPT

Antcali    Cps cali  
INS cail    Bec cali

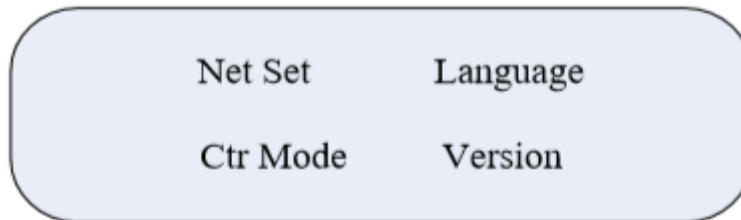
All items in this menu are either password protected or unavailable to the user.

## PID Ref



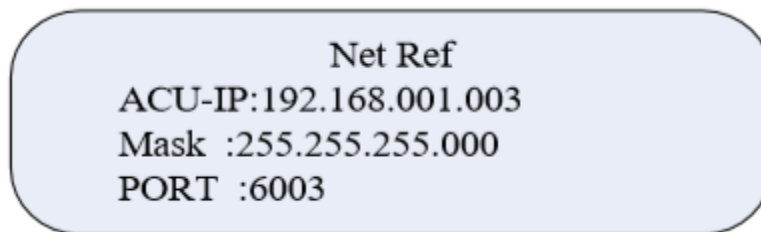
All items in this menu are either password protected or unavailable to the user.

## ACU Set



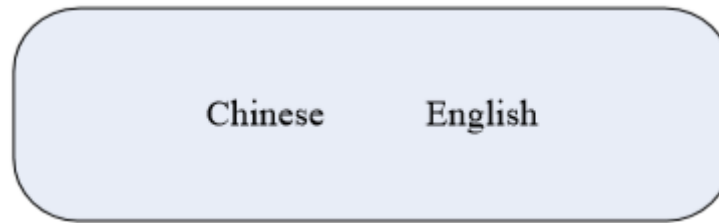
| NAME            | DESCRIPTION                                                         | PARAMETERS |
|-----------------|---------------------------------------------------------------------|------------|
| <b>Net Set</b>  | Edit network settings                                               | n/a        |
| <b>Ctr Mode</b> | Edit control modes                                                  | n/a        |
| <b>Language</b> | Select language of ACU                                              | n/a        |
| <b>Version</b>  | Select software and hardware version of ACU<br>(Password protected) | n/a        |

## Net Set



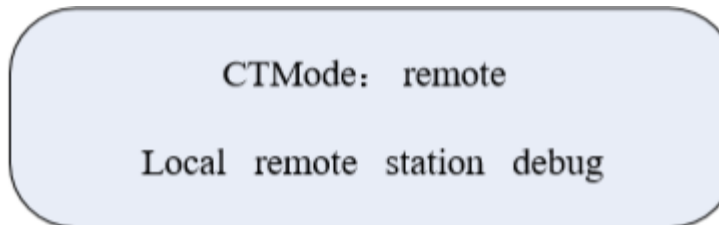
| NAME          | DESCRIPTION                    | PARAMETERS                    |
|---------------|--------------------------------|-------------------------------|
| <b>ACU-IP</b> | IP Address of ACU Remote Port  | 0.0.0.0 to<br>255.255.255.255 |
| <b>Mask</b>   | Subnet Mask of ACU Remote Port | 0.0.0.0 to<br>255.255.255.255 |
| <b>PORT</b>   | Port of ACU Remote Port        | 0 to 9999                     |

## Language



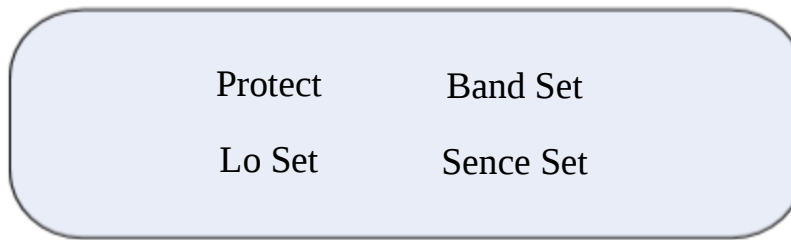
| NAME           | DESCRIPTION                                 | PARAMETERS |
|----------------|---------------------------------------------|------------|
| <b>Chinese</b> | Select to change language of ACU to Chinese | n/a        |
| <b>English</b> | Select to change language of ACU to English | n/a        |

## Ctr Mode



| NAME           | DESCRIPTION                                                                                                                                                                                                                            | PARAMETERS                                                                                                                            |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>CTMode</b>  | Current controller mode                                                                                                                                                                                                                | One of the following: <ul style="list-style-type: none"> <li>• Local</li> <li>• Remote</li> <li>• Station</li> <li>• Debug</li> </ul> |
| <b>Local</b>   | Sets control of the antenna to the ACU                                                                                                                                                                                                 | n/a                                                                                                                                   |
| <b>Remote</b>  | Sets control of the antenna via. the Console port with the following parameters: <ul style="list-style-type: none"> <li>• Baud Rate: 115200</li> <li>• Data Bits: 8</li> <li>• Stop Bit: 1</li> <li>• Calibration Bit: none</li> </ul> | n/a                                                                                                                                   |
| <b>Station</b> | Sets control of the antenna via. the Remote port with the following parameters: <ul style="list-style-type: none"> <li>• Baud Rate: 115200</li> <li>• Data Bits: 8</li> <li>• Stop Bit: 1</li> <li>• Calibration Bit: none</li> </ul>  | n/a                                                                                                                                   |
| <b>debug</b>   | Sends a test signal through the Console port with the following parameters: <ul style="list-style-type: none"> <li>• Baud Rate: 115200</li> <li>• Data Bits: 8</li> <li>• Stop Bit: 1</li> <li>• Calibration Bit: none</li> </ul>      | n/a                                                                                                                                   |

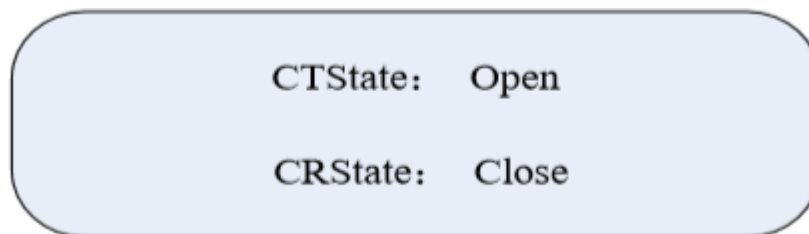
## APTC Set



| NAME             | DESCRIPTION                                   | PARAMETERS |
|------------------|-----------------------------------------------|------------|
| <b>Protect</b>   | Toggle protection of adjacent satellite state | n/a        |
| <b>Band Set</b>  | Select receive frequency band of antenna      | n/a        |
| <b>Lo Set</b>    | Set local oscillator frequency                | n/a        |
| <b>Sence Set</b> | Edit sensor settings of antenna               | n/a        |

## Protect

**Note:** This menu is not applicable to the system.



| NAME           | DESCRIPTION                                   | PARAMETERS    |
|----------------|-----------------------------------------------|---------------|
| <b>CTState</b> | Protection of adjacent satellite for transmit | Open or Close |
| <b>CRState</b> | Protection of adjacent satellite for receive  | Open or Close |

## Band Set

CurBand: Band 1

Band1 (13V)   Band2 (13V22K)

Band3 (18V)   Band3(18V22K)

| NAME    | DESCRIPTION                               | PARAMETERS                                                                                                                |
|---------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| CurBand | Current receive frequency band of antenna | One of the following: <ul style="list-style-type: none"><li>Band 1</li><li>Band 2</li><li>Band 3</li><li>Band 4</li></ul> |
| Band 1  | Select to change LNB to Band 1 frequency  | n/a                                                                                                                       |
| Band 2  | Select to change LNB to Band 2 frequency  | n/a                                                                                                                       |
| Band 3  | Select to change LNB to Band 3 frequency  | n/a                                                                                                                       |
| Band 4  | Select to change LNB to Band 4 frequency  | n/a                                                                                                                       |

## Lo Set

Local Oscillator: 11300 MHz

| NAME             | DESCRIPTION                | PARAMETERS        |
|------------------|----------------------------|-------------------|
| Local Oscillator | Set local oscillator value | 9750 to 11300 MHz |

## Sence Set

INS Set   Psn Set   Beacon Set

All items in this menu are either password protected or unavailable to the user.

## Info Menus

### Info

There is no main menu for the Info menus. Instead the up/down or left/right keys to toggle between the different Info menus.

| NAME              | DESCRIPTION                                             | PARAMETERS |
|-------------------|---------------------------------------------------------|------------|
| <b>Satellites</b> | View the active satellite profile parameters            | n/a        |
| <b>ANT</b>        | View the target and current look angle of the antenna   | n/a        |
| <b>INS</b>        | View the internal data of the antenna                   | n/a        |
| <b>Position</b>   | View the geolocational data of the antenna              | n/a        |
| <b>Limit</b>      | View the status of limit switches on the terminal       | n/a        |
| <b>Check</b>      | View the status of the terminal                         | n/a        |
| <b>About</b>      | View the software information of the antenna            | n/a        |
| <b>Ant State</b>  | Puts the antenna in a state where it records its status | n/a        |

### Satellites

Satellites

name: Asia9

lon: +122.00

Frq: 12250.200

pol: H

AGC:0.00

| NAME        | DESCRIPTION                                                                                 | PARAMETERS                        |
|-------------|---------------------------------------------------------------------------------------------|-----------------------------------|
| <b>Name</b> | Name of Active Satellite Profile                                                            | List of stored satellite profiles |
| <b>Frq</b>  | Frequency of Active Satellite Profile                                                       | Dependent on active profile       |
| <b>AGC</b>  | Signal Strength                                                                             | 0 to 10 V                         |
| <b>Lon</b>  | Longitude of Active Satellite Profile<br><b>Note:</b> Negative is West and Positive is East | -180 to +180 deg                  |
| <b>pol</b>  | Polarization of Active Satellite Profile                                                    | H (Horizontal) or V (Vertical)    |

## ANT

ANT TA:000.00 CA:000.00  
Init TE:+00.00 CE:+00.00  
TR:000.00 CR:000.00  
0.00 TT:000.00 CT:000.00

| NAME | DESCRIPTION                   | PARAMETERS    |
|------|-------------------------------|---------------|
| TA   | Target Azimuth                | 0 to 360 deg  |
| TE   | Target Elevation              | 0 to 90 deg   |
| TPR  | Target Receive Polarization   | -90 to 90 deg |
| TPT  | Target Transmit Polarization  | -90 to 90 deg |
| CA   | Current Azimuth               | 0 to 360 deg  |
| CE   | Current Elevation             | 0 to 90 deg   |
| CPR  | Current Receive Polarization  | -90 to 90 deg |
| CPT  | Current Transmit Polarization | -90 to 90 deg |

## INS

**Note:** The Antenna Reference Marking is the black arrow beside the Antenna I/O Panel

INS  
HA: 000.00  
PA: +00.00  
RH: +00.00

| NAME | DESCRIPTION                                   | PARAMETERS       |
|------|-----------------------------------------------|------------------|
| HA   | Heading Relative to Antenna Reference Marking | 0 to 360.00      |
| PA   | Pitch Relative to Antenna Reference Marking   | -90.00 to +90.00 |
| RH   | Roll Relative to Antenna Reference Marking    | -90.00 to +90.00 |

## Position

Position

LON: +000.00    Hight:

LAN: +000.00    Time: 00:00:00

State: Invalid

| NAME  | DESCRIPTION               | PARAMETERS           |
|-------|---------------------------|----------------------|
| LON   | Antenna longitude reading | -180.00 to 180.00    |
| LAN   | Antenna latitude reading  | -180.00 to 180.00    |
| Sate  | GPS state                 | Invalid or Valid     |
| Hight | Antenna Height            | n/a                  |
| Time  | Time                      | 00:00:00 to 23:59:99 |

## Limit

Limit

No Limit

| NAME     | DESCRIPTION   | PARAMETERS |
|----------|---------------|------------|
| No Limit | Error Message | L0 to L9   |

## Check

Check

no error

| NAME     | DESCRIPTION   | PARAMETERS |
|----------|---------------|------------|
| No error | Error Message | E0 to E8   |

## About

### About

ACU-V: HX.MCB10V1.0.A.901R.002

APTC-V: APTC—V1.0

APTCMode: Shipboard

| NAME     | DESCRIPTION     | PARAMETERS |
|----------|-----------------|------------|
| ACU-V    | ACU Version     | n/a        |
| APTC-V   | Antenna Version | n/a        |
| APTCMode | Antenna Mode    | n/a        |

## Ant State

### Ant State

| NAME | DESCRIPTION                                                                                                          | PARAMETERS |
|------|----------------------------------------------------------------------------------------------------------------------|------------|
| n/a  | Displays a log of the status of the antenna<br><b>Note:</b> Use the Up/Down buttons to cycle between the log entries | n/a        |

## Appendix B – Firmware Upgrade

**Note:** Instructions to upload the firmware upgrade shall be included with the firmware upgrade.

1. Connect the RJ-45 connector of the firmware cable to the Console port on the front of the ACU.



2. Connect the DB-9 RS232 connector of the firmware cable to a computer.

**Note:** If the computer does not have a DB-9 port, use a DB-9 to USB adapter to connect the firmware cable to the USB port of the computer.



3. Follow the instructions provided with the firmware upgrade software to upload the firmware upgrade.



**Norsat**  
International Inc.

## ABOUT NORSAT

Norsat International Inc., founded in 1977, is a leading provider of innovative communication solutions that enable the transmission of data, audio and video for remote and challenging applications. Norsat's products and services include customizable satellite components, portable satellite terminals, maritime solutions and satellite networks. The company's products and services are used extensively by telecommunications services providers, emergency services and homeland security agencies, military organizations, health care providers and Fortune 1000 companies.

110 – 4020 Viking Way | Richmond | British Columbia | Canada

V6V 2L4 | [support@norsat.com](mailto:support@norsat.com)

[www.norsat.com](http://www.norsat.com)