USER MANUAL

WAYFARER 1.2M KU-BAND DRIVE-AWAY ANTENNA

TABLE OF CONTENTS

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Acronyms

ACU	Antenna Control Unit
AGC	Antenna Gain Control
DAGC	Antenna Gain Control for DVB signal strength
BAGC	Antenna Gain Control for beacon signal strength
M&C	Monitor and Control
IFL	Interfacility Link
OMT	Orthomode Transducer
LNB	Low-noise Block Downconverter
BUC	Block Upconverter
LO	Local Oscillator
CCW	Counter clockwise
CW	Clockwise
IDU	Indoor Unit
ODU	Outdoor Unit

Caution

Caution	**Grounding the Terminal** Ground the system with a grounding conductor in accordance to national and local electrical codes.
Danger	**FCC Radio Frequency Exposure Information for Mobile Transmitting Devices** 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.
Danger	**Electrical Hazards in Wet and Windy Conditions** 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. 1. Check cable connectors and power cords for damage or tears. Replace cables and cords as needed. 2. Disconnect the terminal from its power source before you move it. 3. Disconnect the terminal from its power source if you suspect a power malfunction
Warning	**Hot Surfaces** When transmitting, do not touch the BUC as it may result in burns or injury.
Danger	**Hazards of Microwave Radiation in Electromagnetic Fields** When the power is on, the area directly in front of the antenna is an Area of Restricted Occupancy. Observe the following safety precautions: 1. Limit human exposure time to the area directly in front of the main antenna assembly. 2. Never place any part of your body between the antenna and the Feed Horn assembly. 3. Never place any part of your body in line with the direction of the antenna transmission path. 4. Locate the terminal as far as possible from ungrounded metal.

Danger	**Dielectric Heating**
	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.
	The severity of burns may vary from minor to major. Burns or other damage may result in long term injury or even death.
	The vital organs of the body are highly susceptible to dielectric heating.
	The eyes are also highly susceptible to dielectric heating. Do not look directly into devices radiating RF energy.
	You must not stand directly in the path of RF radiating devices
Warning	**Unintentional Radio Interference**
	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.
	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.
Warning	**Changes or Modifications to Equipment**
	Changes or modifications to this equipment, not expressly approved by the manufacturer could void the user's authority to operate the equipment.
	Accessories and Devices
	Use of non-approved accessories or devices may lead to a degradation in performance, damage to equipment, or potential hazards
	Servicing the Equipment
	Do not service the equipment alone unless another person is present to administer first-aid.

Warning 	**Manual Adjustment of Terminal** Disconnect the hand crank before turning on the terminal. Do not operate the hand crank when the terminal is on. If the hand crank is used while the terminal is on, the terminal will attempt to correct its position. The hand crank will be driven back to its original position, which can cause potential injury to the operator and damage to the terminal.
Warning 	**Transportation** Before transportation, ensure all mounting screws are tightened and the terminal is stowed.

List of Contents

The system is packaged in a wooden crate where the antenna is fastened to the bottom pallet and all accessories are stored in corrugated boxes fastened onto the crate lid.

COMPONENTS	QUANTITY
Antenna (Optionally Integrated with BUC and LNB)	1
Antenna Control Unit (ACU)	1
Antenna M&C Cable	1
Antenna Power Cable	1
ACU Console Cable	1
ACU AC Cable	1
BUC M&C Cable (Unconnectorized)	1
BUC AC Cable (Unconnectorized)	1
Tx Cable	1
Long Rx Cable	1
Short Rx Cable	2
2-Way N Type DC Block Splitter	1
Flexible Waveguide (Optionally Pre-Integrated onto Antenna)	1
Hand Crank	1

1. Overview

The Norsat Wayfarer is an industrial strength transportable satellite communication system built strong for the most demanding users working with the most challenging applications and environments. The Wayfarer is manually operated, integrated, and versatile enough for deployment virtually anywhere, including mobile field offices, field vehicles, or directly on the ground. A complete satellite solution, the Wayfarer includes everything to meet your communication needs.

2. System Overview

The system consists of the terminal, ACU, BUC, and LNB (BUC and LNB not included with terminal). 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 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, 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.
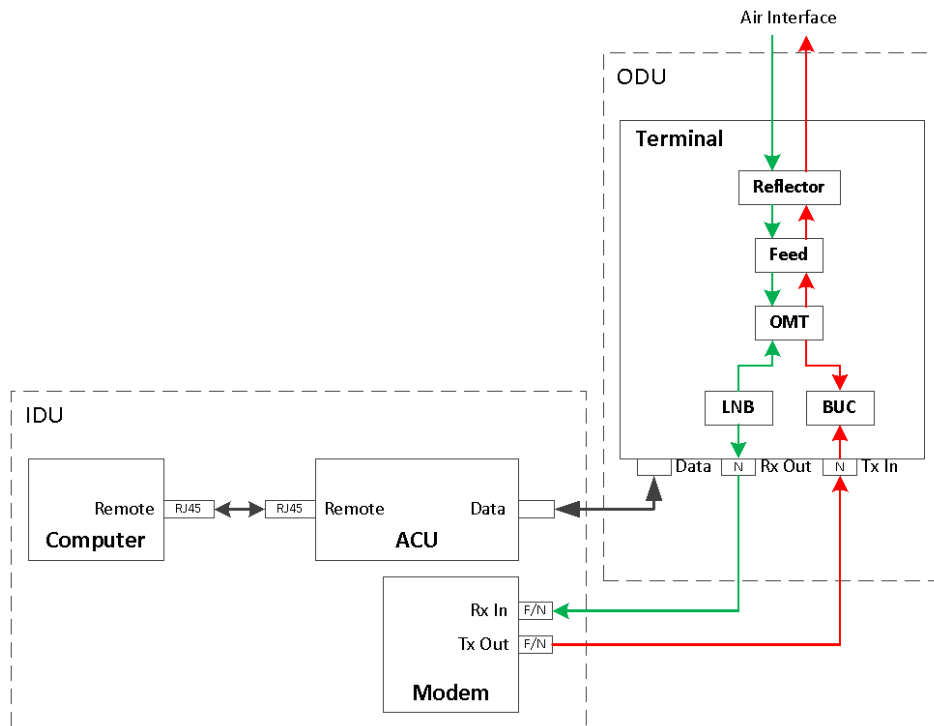
3. Hardware

3.1 Crate Dimensions

The system is packaged in a single wooden crate that contains the antenna and up to two corrugated boxes. The corrugated boxes contain the ACU, cables, and antenna accessories.

The antenna and corrugated boxes are secured onto the wooden crate for protection during transportation.

CRATE NUMBER	DIMENSIONS	WEIGHT
1	2.2 m x 1.7 m x 0.8 m	≤ 190 kg

3.2 Antenna Dimensions

All dimensions are in centimeters

121

176

38

2021-10-13 050197 Rev C

Ø176

107

2021-10-13 050197 Rev C

R141

28

25
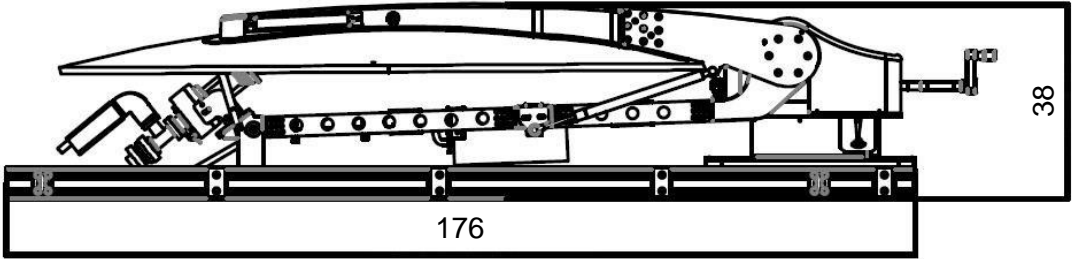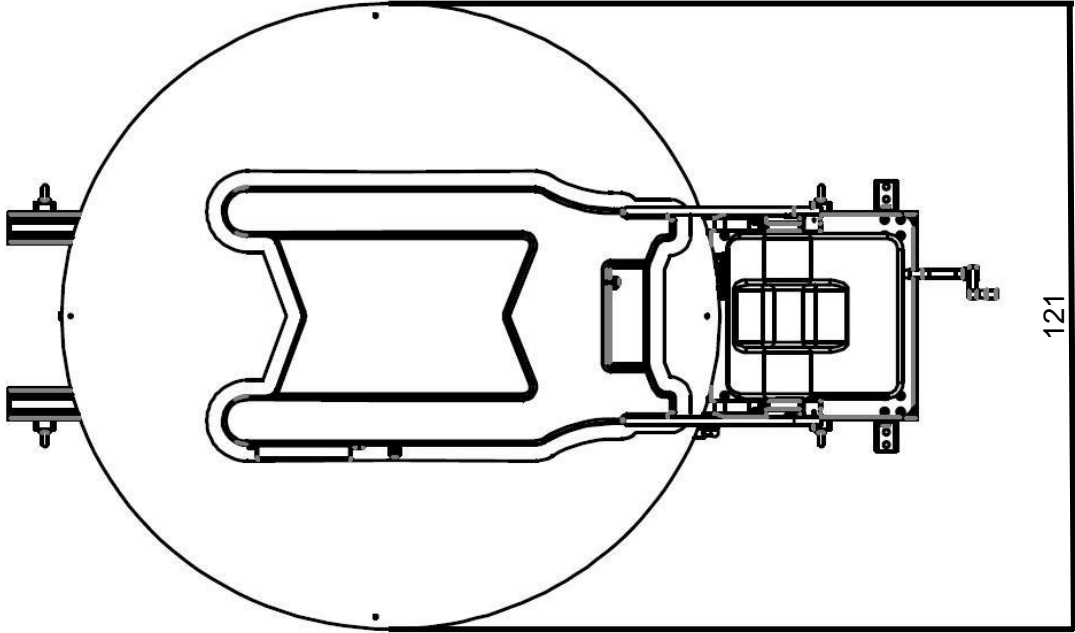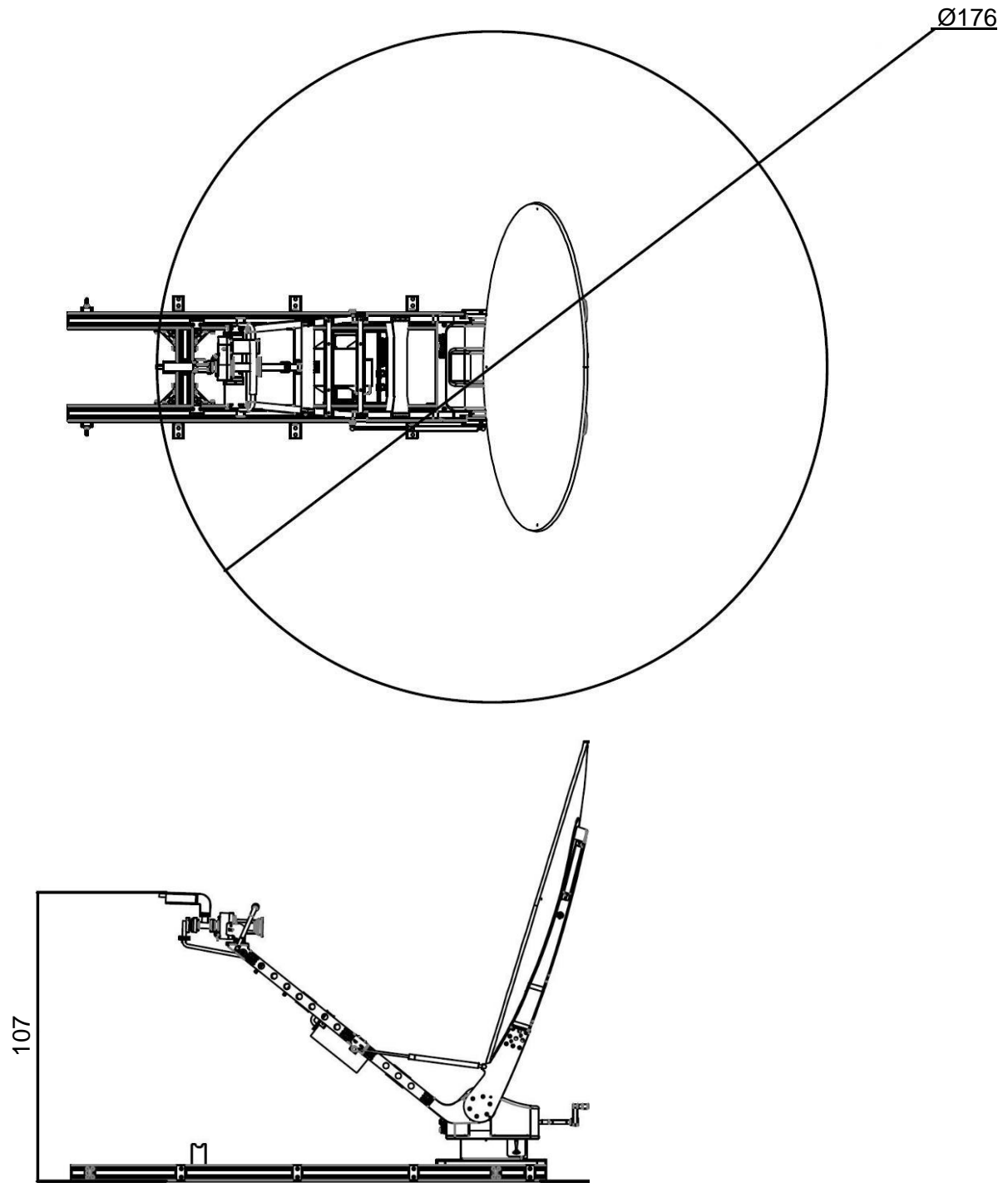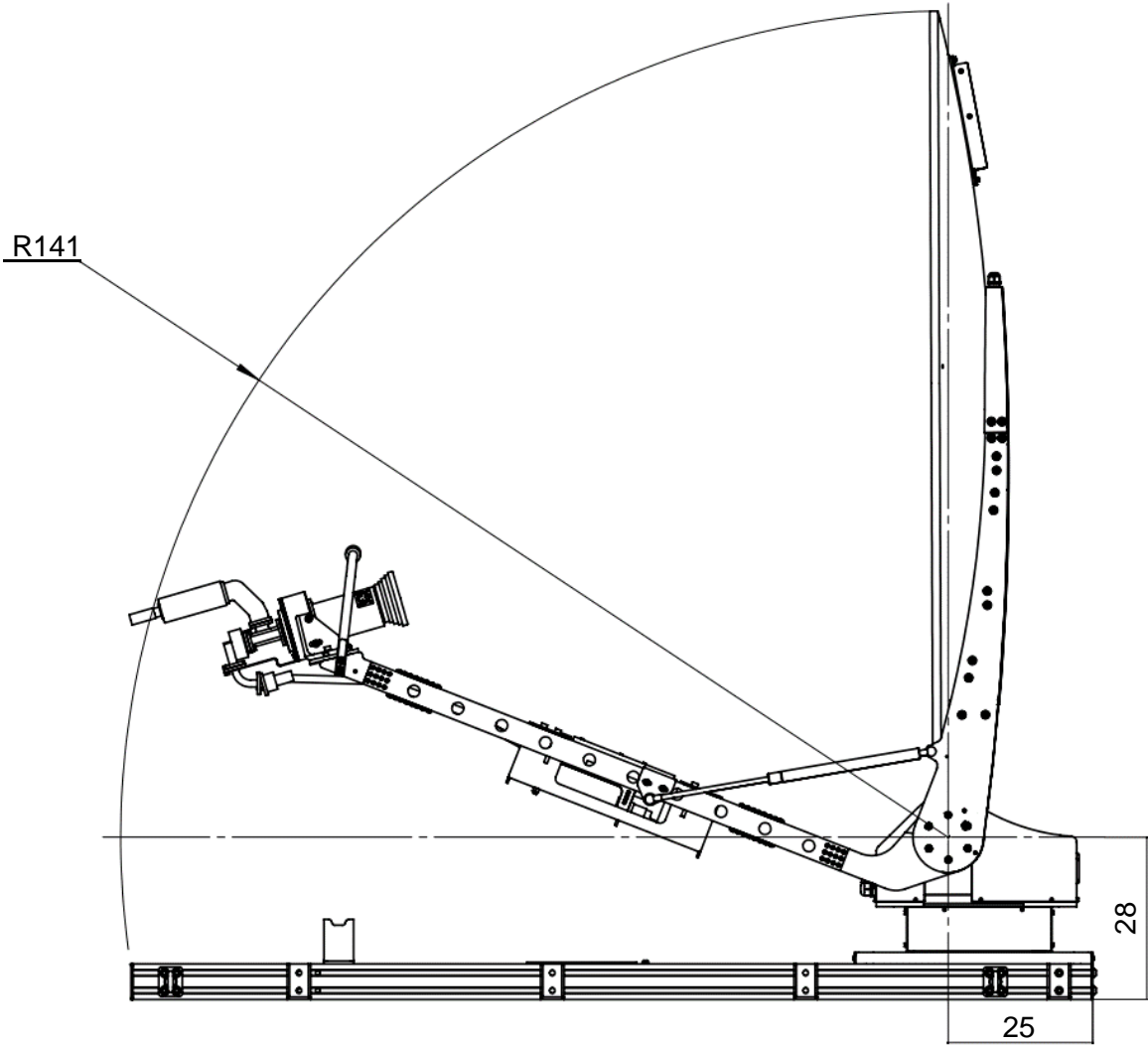
3.3 System Components

3.3.1 Antenna Overview
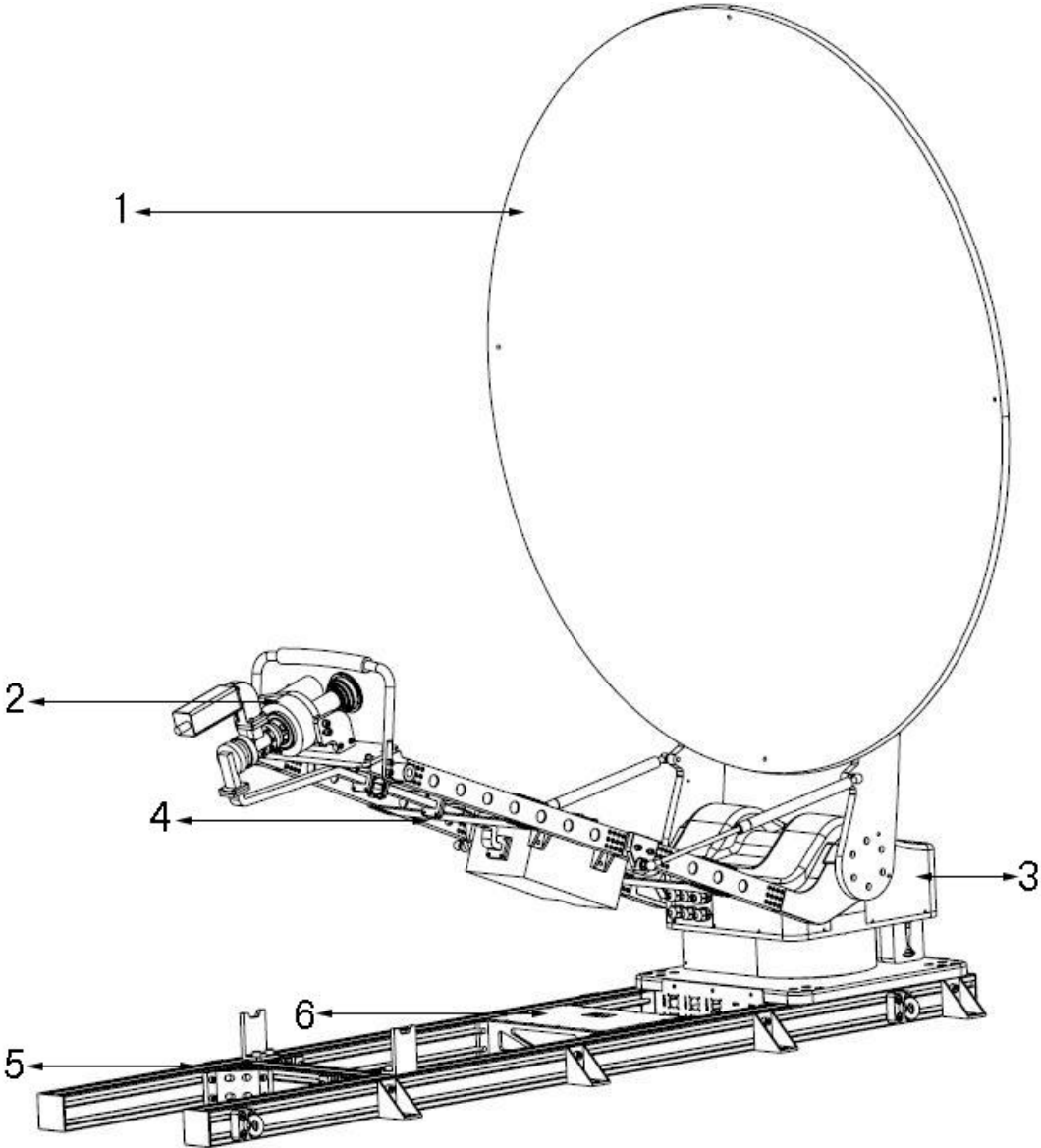
ITEM NO.	COMPONENT
1	Reflector
2	Feed
3	Turntable
4	Boom Arm
5	Roof Mount
6	Pedestal Control Unit

3.3.2 Turntable (Azimuth and Elevation)
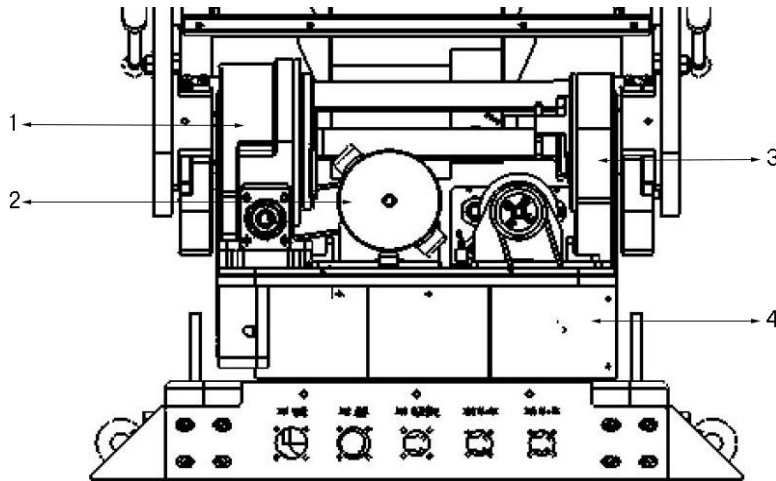
ITEM NO.	COMPONENT
1	Elevation Gearbox
2	Elevation Motor
3	Azimuth Motor
4	Azimuth Gearbox

The turntable consists of two main structures: The azimuth and elevation modules, where each module consists of a motor and gearbox. Both gearboxes' transmissions are self-locking in the event of power loss.

The azimuth and elevation include two shafts for manual manipulation through the included hand crack. Refer to Section 3.3.6 for more information about the hand crank.

Refer to Section 5.3 for more information about the ports found on the turntable.

3.3.3 Feed Assembly
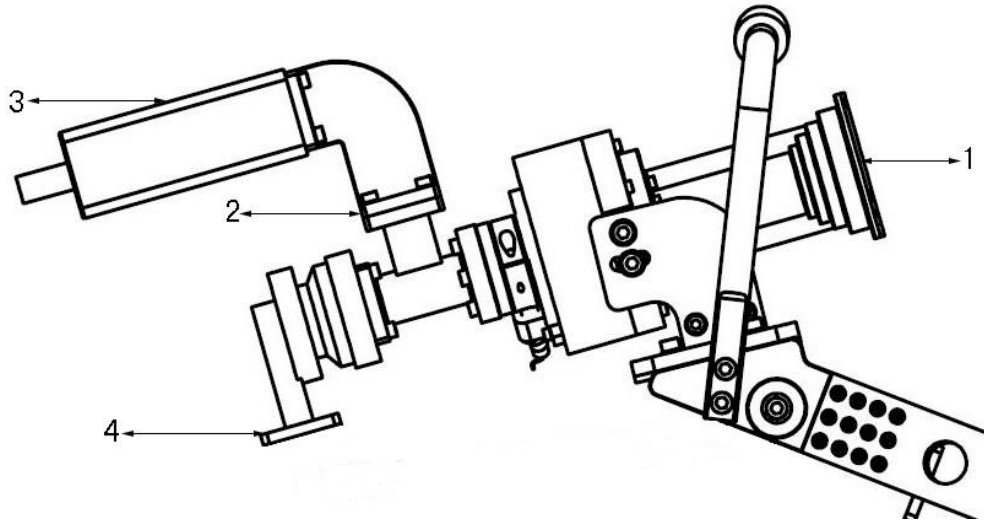
ITEM NO.	COMPONENT
1	Feed Horn
2	Polarization Module
3	LNB (Not Included with Antenna)
4	Rotary Joint

The feed assembly consists of the polarization module, which is connected to the feed horn, LNB, and rotary joint.

The polarization module includes the polarization motor, gearbox, OMT and filters. The polarization module allows for the adjustment of the polarization angle and the isolation of the Tx and Rx signals received and transmitted from the feed horn. The rotary joint on the feed assembly is then connected to the BUC through the flexible waveguide included with the terminal.

The installation position of the feed assembly onto the boom arm has been adjusted in the factory. In the case of maintenance, mark the feed assembly so it can be re-assembled in the same position.

3.3.4 GPS Receiver
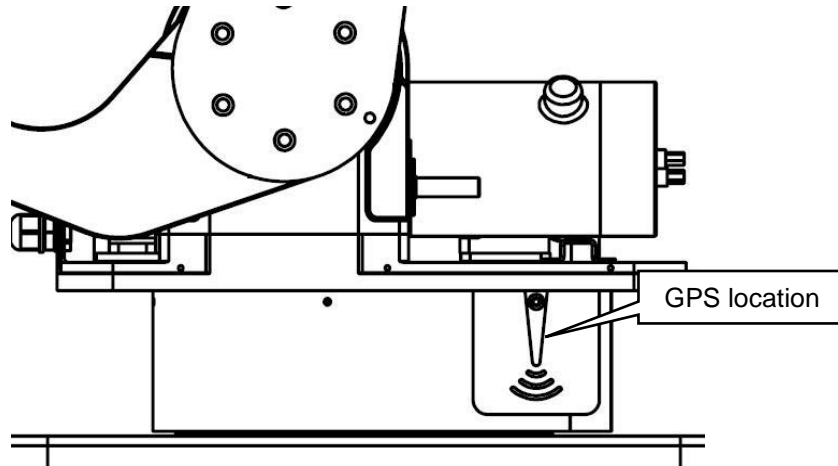
GPS location

A GPS receiver is installed on the side of the antenna. It determines the longitude and latitude of the antenna's current location and relays that information to the ACU, which can then output it to an external modem.

The GPS information is transmitted through serial communication with the following parameters using GPGLL sentences (NMEA version 2.1).

PARAMETER	VALUE
Baud Rate	4800
Data Bits	None
Parity	1
Stop Bit	None

3.3.5 3D Compass

3D compass
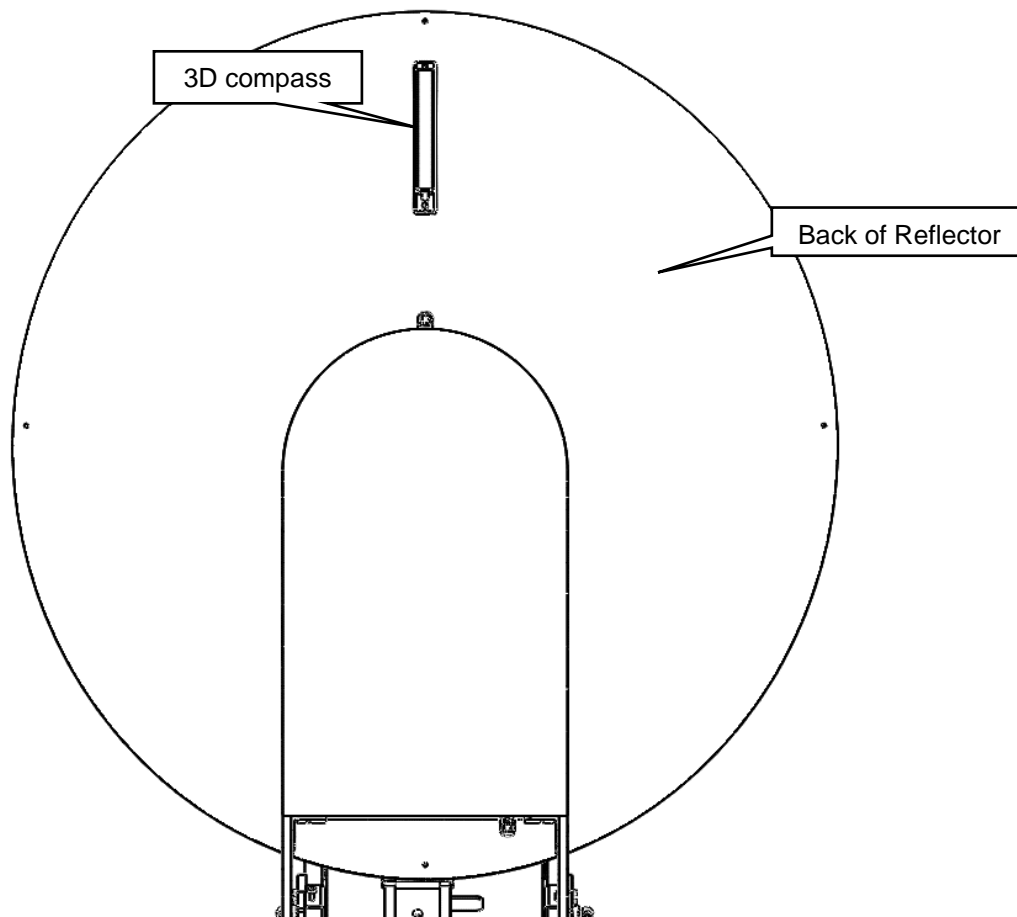
Back of Reflector

A 3D compass is installed on the back of the reflector. It determines the heading, pitch, and roll of the antenna. The compass is calibrated from the factory with the ability for software compensation.

3.3.6 Hand Crank
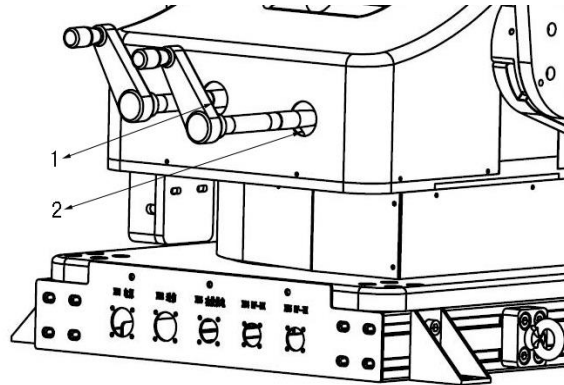
ITEM NO.	LOCATION
1	Elevation
2	Azimuth

One hand crank is included with the terminal to manually drive the antenna in case of emergency. Remove the two plastic covers on the rear of the turntable to reveal the elevation and azimuth shafts that the hand cranks connect with.

Do not operate the hand crank while the terminal is on. Refer to the Caution section for more information.

3.3.7 ACU

The ACU is a 1RU rack mount unit includes the power supply, user interface, cooling fans, and the receiver. The user interface consists of an LCD display with directional and confirmation buttons and a power switch. The receiver supports beacon, DVB-S/S2/S2X and ACM.

Refer to Section 5.2 for more information.

4. Installation

4.1 Roof Mount

The antenna is pre-installed onto the roof mount. The roof mount is made from extruded aluminum with a series of L brackets along each side that can either move along the rail or be removed by loosening or removing the mounting screw. Each L bracket includes two 11mm diameter thru-holes.

The roof mount is also pre-installed with four hoist rings that can be used to lift the terminal.

Verify the installation site can support the roof mount before proceeding. Refer to the figure below for key dimensions of the roof mount. All dimensions shown below are in millimetres.

4.2 Unboxing

1. Remove the nuts from the bolt that secure the top half of the crate onto the bottom plate.

2. Carefully remove the walls and top plate from the bottom plate.

   Note: The terminal by default is shipped in its stowed position.
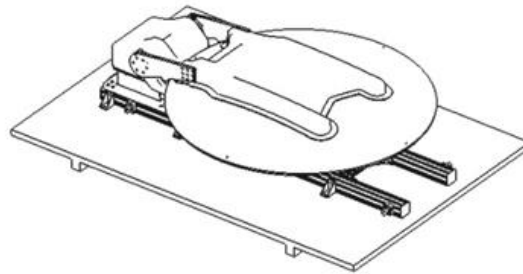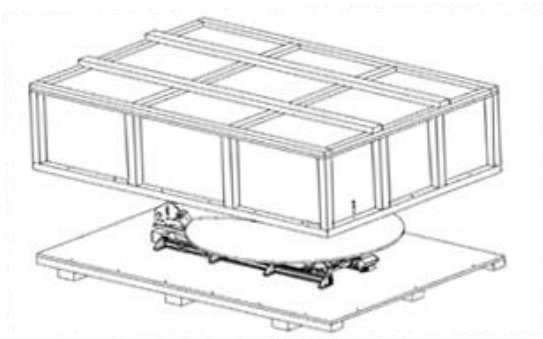
3. Rest the top half of the crate with the top plate against the ground.

4. Remove the corrugated boxes attached to the inside of the walls of the crate.

5. Open the corrugated boxes to retrieve the ACU, cables, and antenna accessories. Refer to the List of Contents for the full list of accessories.

4.3 Installation

1. Remove the nuts and bolts that secure the antenna onto the bottom plate.

2. Use the hoist rings on the roof mount to lift the antenna for vehicle mounting.
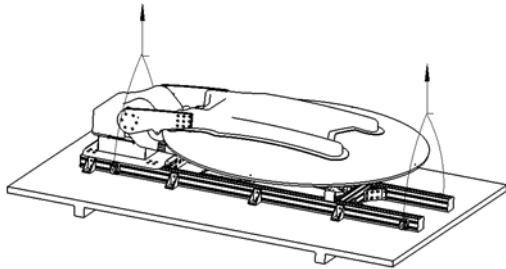
3. Position the antenna so the front of the terminal faces towards the read of the vehicle.
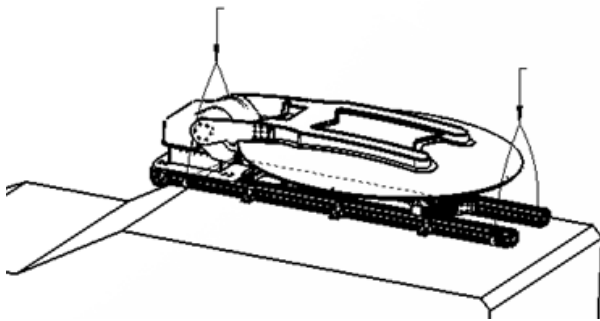
4. Mount the antenna onto the vehicle using the L-brackets on the roof mount.

   Note: The positions of the L-brackets can be adjusted by loosening its mounting screw.

4.4 Cable Connection

1. Install the ACU and modem securely inside the vehicle.

2. Connect the cables according to the figure and table below in the order that they are listed.

   Note: All multi-pinned connectors are keyed such that there is only one mating connector on the system.

   Note: In this configuration, the LNB will be powered by the ACU. Should the LNB be powered by the modem instead of the ACU, connect the modem to the DC PASS of the splitter and the ACU to the DC BLOCK instead.

   Note: BUC M&C and BUC Power is optional depending on the BUC configuration.

   Note: The ODU and IDU refer to the terminal itself and ACU respectively.

SIGNAL	FROM	TO	CABLE
ODU Power	IDU – XS1 DC Output	ODU – XS1 DC Input	Power Cable
ODU Data	IDU – XS2 M&C	ODU – XS2 M&C	Data Cable
Remote	IDU – XS4 Remote	Laptop – Ethernet	Remote Cable
GPS	IDU – XS5 Modem	Modem – Console	Modem Cable
BUC M&C	ODU – XS6 BUC Monitor	Laptop	BUC M&C Cable
Rx from ODU	ODU – XS4 RF-RX	Splitter – DC Pass	N-to-N Cable
Rx to ACU	ACU – XS3 Rx	Splitter – DC Pass	N-to-N Cable
Rx to Modem	Modem – Rx In	Splitter – DC Block	N-to-N Cable
Tx Out	Modem – Tx Out	ODU – XS5 RF TX	N-to-N Cable
IDU Power	AC Power Source	IDU – 220VAC Input	AC Cable
BUC Power	AC Power Source	ODU – XS3 BUC Power	BUC AC Cable

Outdoor Unit (ODU)

XS1 Power XS2 M&C XS3 BUC Power XS4 RF-RX XS5 RF-TX XS6 BUC Monitor

Indoor Unit (IDU)

Rx Cable

Tx Cable

PD5020

Power Cable

Data Cable

Rx Cable

Rx Cable

Modem

Modem Cable

To Ground

BUC M&C Cable

ACU

AC Cable

LinkControl

Remote Cable

BUC AC Cable

220V AC Source

2021-10-13 050197 Rev C
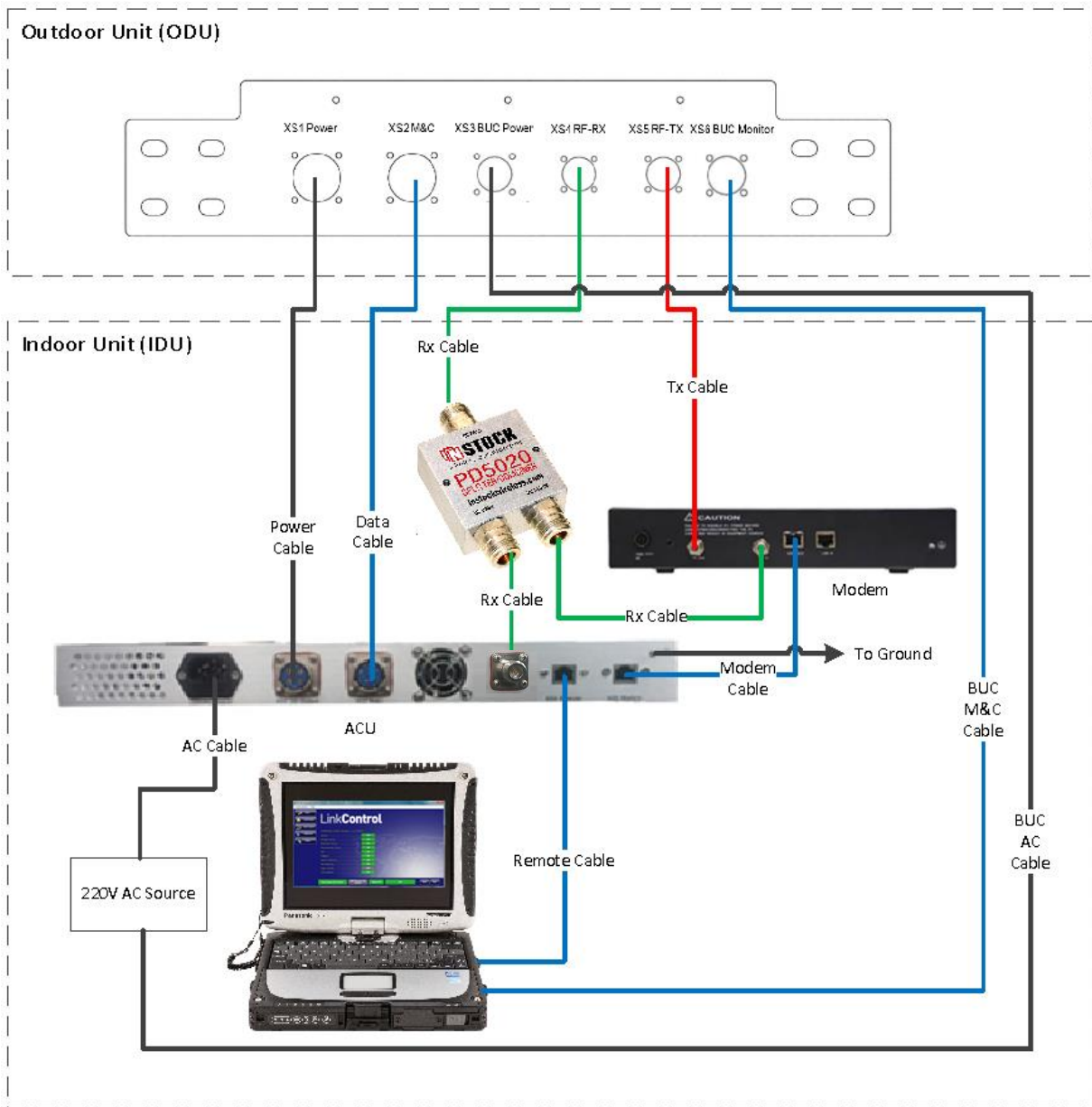
5. Electrical

5.1 Power Supply

The system power supply is integrated with ACU and it accepts 110-240V AC input with rated current at 3A. The ACU has a built-in 5A Fuse which effectively protects the device from over-current.

The BUC is powered independently with its own power supply. This allows flexible power supply solutions for different BUCs integrated to the system. The turntable includes unconnectorized passthrough cables to integrate the BUC power supply into the antenna.

The LNB can be powered by 15V DC from the antenna control unit, or through external power supply (LNB controller). Ensure the DC block is connected correctly in a setup with external power supply.

5.2 Antenna Control Unit

5.2.1 Front Panel

Refer to the figure and table below for the component on the front panel of the ACU.
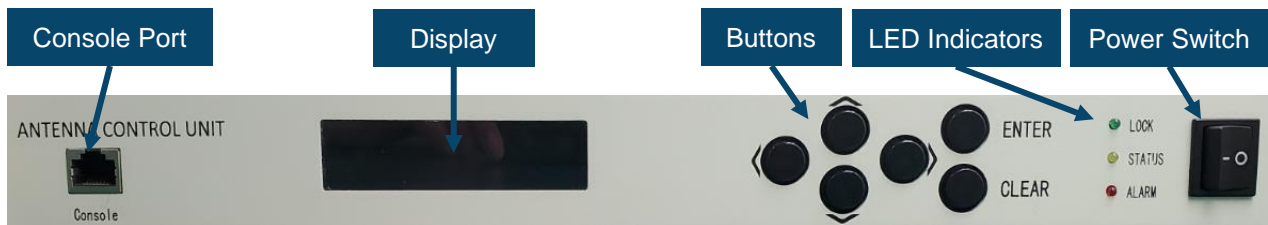
COMPONENT	FUNCTION
Console Port	Enables firmware upgrade
Display	Outputs text information to user
Buttons	Provides input for the user interface
LED Indicators	Displays lock, stow, and alarm status of the system
Power Switch	Turns on and off power of the system

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

5.2.2 Back Panel

Refer to the figure and table below for the component on the rear panel of the ACU.
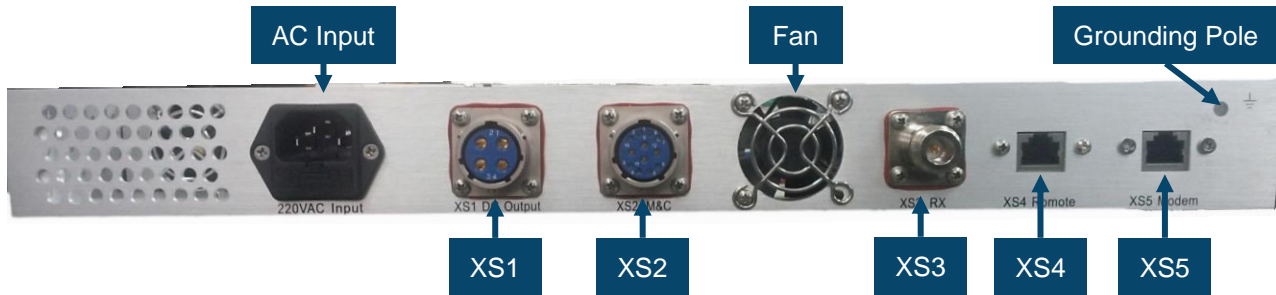
COMPONENT	FUNCTION
220 VAC Input	Accepts 110-220 VAC input
XS1 DC Output	Outputs 24 VDC for antenna
XS2 M&C	Provides monitor and control for antenna
XS3 Rx	Accepts RF signal output from LNB
XS4 Remote	Allows for remote control of antenna through IP address
XS5 Modem	Outputs GPS coordinates to modem and accepts Rx lock from modem
Fan	Cools the ACU
Grounding	Grounds the ACU

Refer to the table below for the pinout of XS5 Modem.

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

5.3 Antenna Panel

Refer to the figure and table below for the component on the antenna panel.
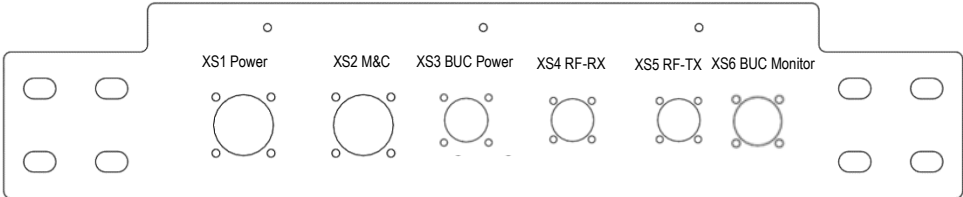
PORT	FUNCTION
XS1 Power	Accepts DC power from the ACU
XS2 M&C	Provides monitor and control for antenna
XS3 BUC Power	Provides power feedthrough to BUC
XS4 RF-RX	Provides RF signal feedthrough for Rx to LNB
XS5 RF-TX	Provides RF signal feedthrough for Tx to BUC
XS6 BUC Monitor	Provides monitor and control feedthrough to BUC

6. Operation

For auto-acquisition using LinkControl, refer to the LinkControl user manual. The following section relates to operation of the terminal exclusively though the ACU.

6.1 Checking Terminal Status

1. Inspect the LED indicators on the ACU front panel. If the Alarm LED is inactive, skip to the next step, otherwise continue with this section.

2. Navigate to: Home > Info

3. Toggle through to the Alarm page using the directional keys.

Sat	**Ant**	**Sensor**	**Limit**	**Alarm**	**About**
		Error Code			
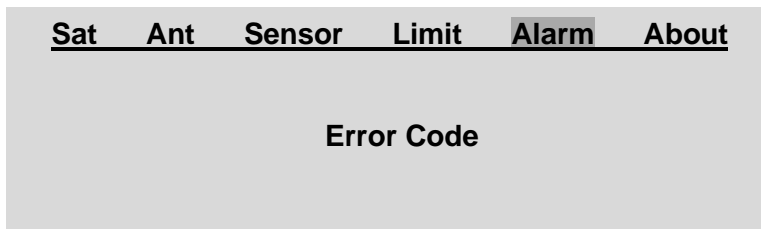
4. Refer to Section 7 to look up the error code description and troubleshooting steps.

5. If there are no errors, proceed to the next section.

6.2 Configuring ACU

Note: Each section assumes the user is starting from the Home screen. If the ACU is in a different menu, continually press the Clear key until the ACU return to the Home screen.

6.2.1 Configuring Satellite Profile

1. Navigate to: Home > Config > Sat-Select

Sat name: Sat2	
SatLon: 87.00W	**Beacon: 11701.00**
Band: Ku	**DVB Freq: 12044.00**
Pol mode: V	**Sym Rate: 3200.000**

2. Highlight the Name field and cycle through all the profiles.

3. If a profile for the target satellite does not exist, cycle to a profile to overwrite and set the following parameters to the target satellite:
   a. SatLon   (Satellite Longitude)
   b. Band   (Frequency Band)
   c. Pol Mode (Polarization)
   d. Beacon   (Beacon Frequency)
   e. DVB Freq (DVB Carrier Frequency)
   f. Sym Rate (Symbol Rate)

4. Cycle to the target satellite profile.

5. Press the Enter key to set it as the active profile.

6.2.2 Configuring Receiver

1. Navigate to: Home > Config > Receiver

Beacon	**DVB**		**:DVB**
18v	**13v**	**OFF**	**:13v**
22kHz	**OFF**		**:22kHz**

2. Select to the receiver setting corresponding with the active satellite profile.

3. Select the voltage and tone corresponding with the LNB.

4. Press the Enter key to save.

6.2.3 Configuring LNB LO Frequency

1. Navigate to: Home > Config > Option

    Note: Password for Option menu is "←←←←".

<div style="background:#d9d9d9; padding:1em; text-align:center;">

Angle-adjust   **Compass-cali.**

Receiver-set   **Advanced**

</div>

2. Select Receiver-set.

<div style="background:#d9d9d9; padding:1em; text-align:center;">

Amplify :   1.0 scale(0.4-2.0)

Lof. :   G<10.75GHZ>

Lock-hold: 7.0 scale(4.0V-8.0V)

</div>
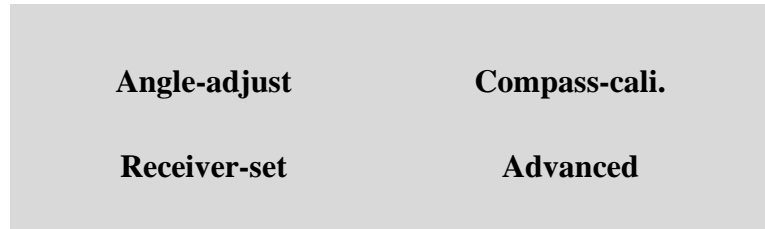
3. Select Lof and cycle through all the options until the setting that corresponds with the installed LNB is selected.

4. Press the Enter key to save.

6.2.4 Configuring LNB Magnification

Note: Refer to the previous section for images of the Receive-set menu.

1. Navigate to: Home > Config > Option

    Note: Password for Option menu is "←←←←"

2. Select Receiver-set.

3. Adjust the Amplify value according to the following conditions:
    a. If the AGC value is below the threshold, increase the value.
    b. If the AGC value is maxed out, decrease the value.

    Note: The default value of the Lock-hold is 7.0 and does not need to be adjusted.

4. Press the Enter key to save.

6.2.5 Adjusting for Magnetic Declination

1. Navigate to: Home > Config > Option

   Note: Password for Option menu is "←←←←"

Angle-adjust	**Compass-cali.**
Receiver-set	**Advanced**

2. Select Angle-adjust.

Angle-adjust			
Se-scale	**EL**	**PL**	**AZ**
20.00	**-2.38**	**0.00**	**16.65**

3. Adjust the AZ value as needed to offset the read azimuth angle to account for magnetic declination.

4. Press the Enter key to save.

6.3 Auto-Acquire

1. Ensure that the terminal is properly configured for the target satellite, as outlined in Section 6.2.

2. Navigate to: Home > Control.

Deploy		**Search**
Manual	**Stow**	**Track**
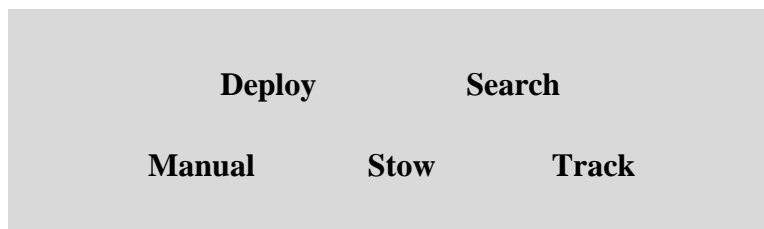
3. Select Search.

   Note: The terminal will now begin pointing to the target satellite. To stop the terminal at any moment during the auto-acquire, press the Clear key.

Horizon V Search…		**DAGC 0.00V**
AZ: Target: 180. 00		**Real: 179. 00**
EL: Target: 28. 70		**Real:-37. 00**
PL: Target: 0. 00		**Real:-0. 00**
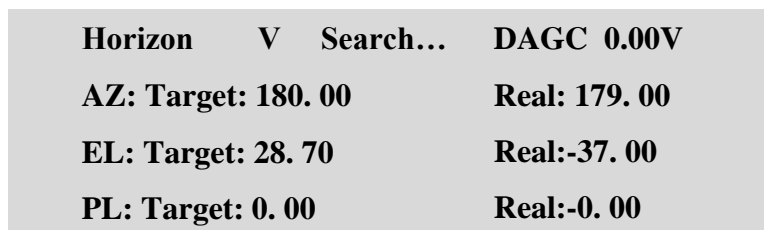
4. Observe the AGC value as the terminal points to the target satellite.

5. If the auto-acquire failed, refer to Section 6.2.4 to adjust the LNB magnification as needed based upon the observed AGC during pointing.

6. The ACU will beep upon successful auto-acquire and the Lock LED will activate.

7. System Troubleshooting

Refer to the tables below for the error codes as state by the ACU. User may use the troubleshooting information to identify the issue and contact manufacturer when necessary.

When troubleshooting, disconnect the system from the remote computer and operate only through the ACU.

CODE	DESCRIPTION	TROUBLESHOOTING
E0	Azimuth drive exception	1. Turn off the system 2. Disconnect power and data cables from ACU to antenna 3. Verify cables are not damaged 4. Reconnect power and data cables from ACU to antenna 5. Turn on the system 6. Contact manufacturer if alarm remains after reboot
E1	Elevation drive exception	
E2	Polarization drive exception	
E3	GPS not connected	1. Turn off the system 2. Disconnect power and data cables from ACU to antenna 3. Verify the power and data cables are not damaged 4. Verify the GPS cable behind the turntable is not damaged 5. Reconnect power and data cables from ACU to antenna 6. Turn on the system 7. Contact manufacturer if alarm remains after reboot
E4	Compass not connected	1. Turn off the system 2. Disconnect power and data cables from ACU to antenna 3. Verify the power and data cables are not damaged 4. Verify the compass cable behind the reflector is not damaged 5. Reconnect power and data cables from ACU to antenna 6. Turn on the system 7. Contact manufacturer if alarm remains after reboot
E5	Beacon receiver not connected	1. Power cycle the system 2. Contact manufacturer if alarm remains after reboot
E6	DVB receiver not connected	

CODE	DESCRIPTION	TROUBLESHOOTING
E7	Polarization zeroing failure	1. Power cycle the system 2. Contact manufacturer if alarm remains after reboot
E8	Azimuth zeroing failure	1. Turn off the system 2. Manually stow antenna using the included hand crank 3. Turn on the system 4. Deploy the system 5. Contact manufacturer if alarm remains after reboot
E9	El Zeroing Failure	
E10	Azimuth Tracking Error	1. Turn off the system 2. Disconnect power and data cables from ACU to antenna 3. Verify cables are not damaged 4. Reconnect power and data cables from ACU to antenna 5. Turn on the system 6. Contact manufacturer if alarm remains after reboot
E11	Elevation Tracking Error	
E12	Inclinometer not connected	1. Turn off the system 2. Disconnect power and data cables from ACU to antenna 3. Verify the power and data cables are not damaged 4. Verify the compass cable behind the reflector is not damaged 5. Reconnect power and data cables from ACU to antenna 6. Turn on the system 7. Contact manufacturer if alarm remains after reboot
E13	Beacon/DVB Receiver Settings Invalid	1. Apply a valid satellite profile 2. Verify the set receive mode matches the satellite profile 3. Power cycle the system 4. Contact manufacturer if alarm remains after reboot
E14	Reset antenna angles	1. Turn off the system 2. Manually stow antenna using the included hand crank 3. Turn on the system 4. Contact manufacturer if alarm remains after reboot
E15	Limit switch error	1. Turn off the system 2. Disconnect power and data cables from ACU to antenna 3. Verify the power and data cables are not damaged 4. Reconnect power and data cables from ACU to antenna 5. Turn on the system 6. Contact manufacturer if alarm remains after reboot
E16	Stow error	

CODE	DESCRIPTION	TROUBLESHOOTING
E17	Data out of Bounds 1	1. Apply a valid satellite profile 2. Set the receiver mode to matches the satellite profile 3. Verify the location reported by the GPS is consistent with its actual position 4. Deploy the system 5. Power cycle the system 6. Contact manufacturer if alarm remains after reboot
E18	Data out of Bounds 2	1. Apply a valid satellite profile 2. Set the receiver mode to matches the satellite profile 3. Power cycle the system 4. Contact manufacturer if alarm remains after reboot
E19	Data Out of Bounds 3	1. Ensure every parameter in the Settings menu meets the acceptable ranges specified by Appendix B 2. Power cycle the system 3. Contact manufacturer if alarm remains after reboot
E20	Hardware Error 1	1. Turn off the system 2. Disconnect power and data cables from ACU to antenna 3. Verify the power and data cables are not damaged 4. Reconnect power and data cables from ACU to antenna 5. Turn on the system 6. Contact manufacturer if alarm remains after reboot
E21	CAN communication exception	
E22	Communication exception	
W1	GPS not locked	1. Ensure antenna is within sight to GPS satellites 2. Wait for a couple minutes for GPS lock 3. Power cycle the system 4. Contact manufacturer if alarm remains after reboot
W2	Limited Elevation motion	1. Turn off the system 2. Manually move the elevation to the deployed position 3. Turn on the system 4. Deploy the system 5. Contact manufacturer if alarm remains after reboot

8. System Maintenance

Regular maintenance is recommended per the schedule below.

NO.	DESCRIPTION	FREQUENCY
1	Inspect and clean integrity of Feed Horn window, replace when damaged	Once per month
2	Inspect OMT and waveguide sealing, if there is a leakage, dry out the components and seal with RTV or replace damaged parts.	Once per month
3	Inspect screws and nuts, tighten, or replace screws upon loosening or rusting	Once per month
4	Inspect system for any noise during operation, clean up the transmission and lubricate when necessary	Once per month
5	Inspect paint integrity of the antenna, touch up when required	Once per month
6	Inspect wear and tear of timing belt and lubricate gears and transmissions. Replace	Once per year
7	Calibrate compass to ensure correct heading	Once per year
8	Clean the reflector surface	Every 3 months

9. Technical Specifications

SPECIFICATION	
Reflector Aperture	1.2m
Reflector Material	Carbon Fibre
Reflector Type	Offset
Tx Frequency	13.75 to 14.5 GHz
Rx Frequency	10.70 to 12.75 GHz
Tx Gain	42.6+20lg(f/14.25) dBi
Rx Gain	41.5+20lg(f/12.5) dBi
Polarization	Linear
Cross Polarization (On-Axis)	≥ 35 dB
Rx/Tx Isolation	Rx ≥ 40dB; Tx ≥ 85 dB
Sidelobe	≤-14 dB (First Side Lobe)
Azimuth Range	± 200°
Elevation Range	10° to 90°
Polarization Range	± 90°
Azimuth Speed	0.1°/s to 6°/s
Elevation Speed	0.1°/s to 6°/s
Polarization Speed	0.1°/s to 6°/s
Feed Interface	WR75
Power Supply	AC110-230V, 50/60Hz, Rated 200W, 500W Max
Weight	≤ 85kg (Terminal Only with no Accessories)
Stowed Size	176cm (L) x 121cm (W) x 38cm (H)
Wind Load – Operational	72km/h
Wind Load – Survival	90km/h
Temperature	-30°C to +55°C
Humidity	0 to 95%
Water Ingress	IP65

Appendix A – Magnetic Declination Map

US/UK World Magnetic Model - Epoch 2015.0
Main Field Declination (D)

Main field declination (D)
Contour interval: 2 degrees, red contours positive (east); blue negative (west); green (agonic) zero line.
Mercator Projection.
: Position of dip poles

Map developed by NOAA/NGDC & CIRES
http://ngdc.noaa.gov/geomag/WMM
Map reviewed by NGA and BGS
Published December 2014
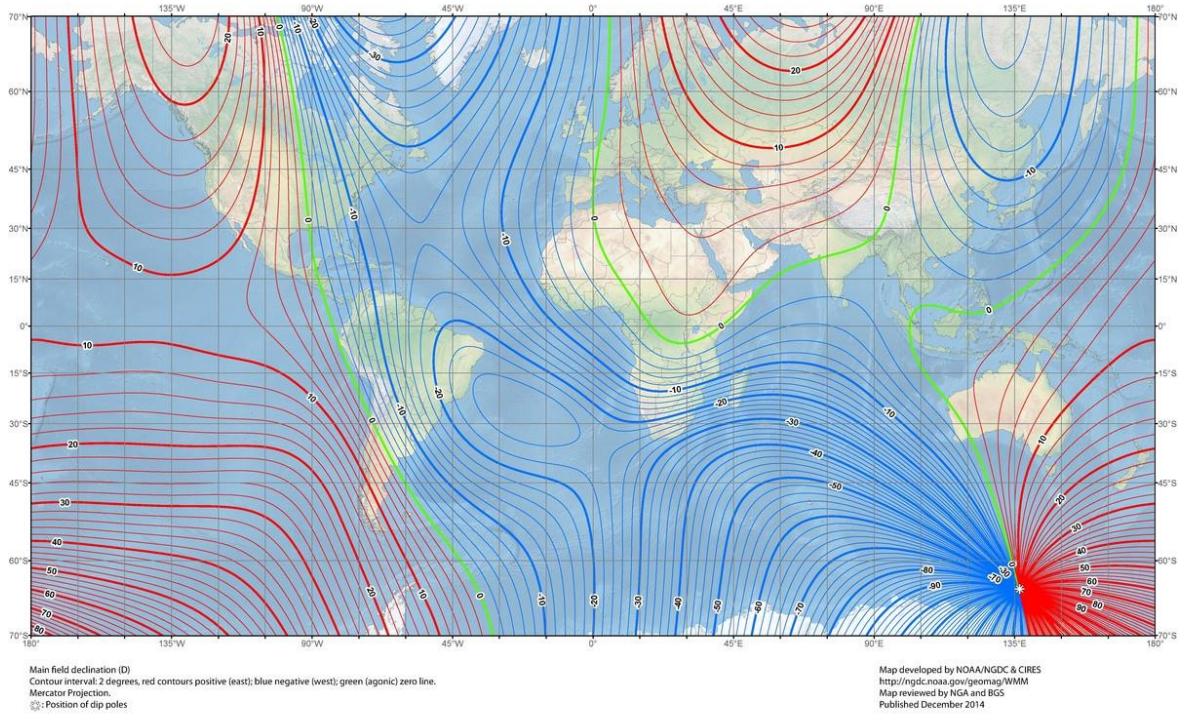
*US/UK World Magnetic Model - Epoch 2015.0 Main Field
Declination. (2014, December).*

Retrieved from http://ngdc.noaa.gov/geomag/WMM

Appendix B – ACU Menus

Menu Overview

This section provides a detailed breakdown and description for all menu options for the ACU. It is recommended for first time user to read through this section to understand how to configure the antenna.

Refer to the diagram below for a breakdown of the system menu options:

```
Home
 ├── Control
 │     ├── Deploy
 │     ├── Search
 │     ├── Manual ── Speed Control
 │     │            Position Control
 │     ├── Stow
 │     └── Track
 │
 ├── Setting
 │     ├── Sat-Select
 │     ├── Local-Pos
 │     ├── En-Limit
 │     ├── Option ── Angle-adjust
 │     │            Compass-cali
 │     │            Receiver-set
 │     │            Advanced
 │     ├── Lang.
 │     ├── Receiver
 │     └── En-Track
 │
 └── Info
       ├── Sat
       ├── Ant
       ├── Sensor
       ├── Limit
       ├── Alarm
       └── About
```
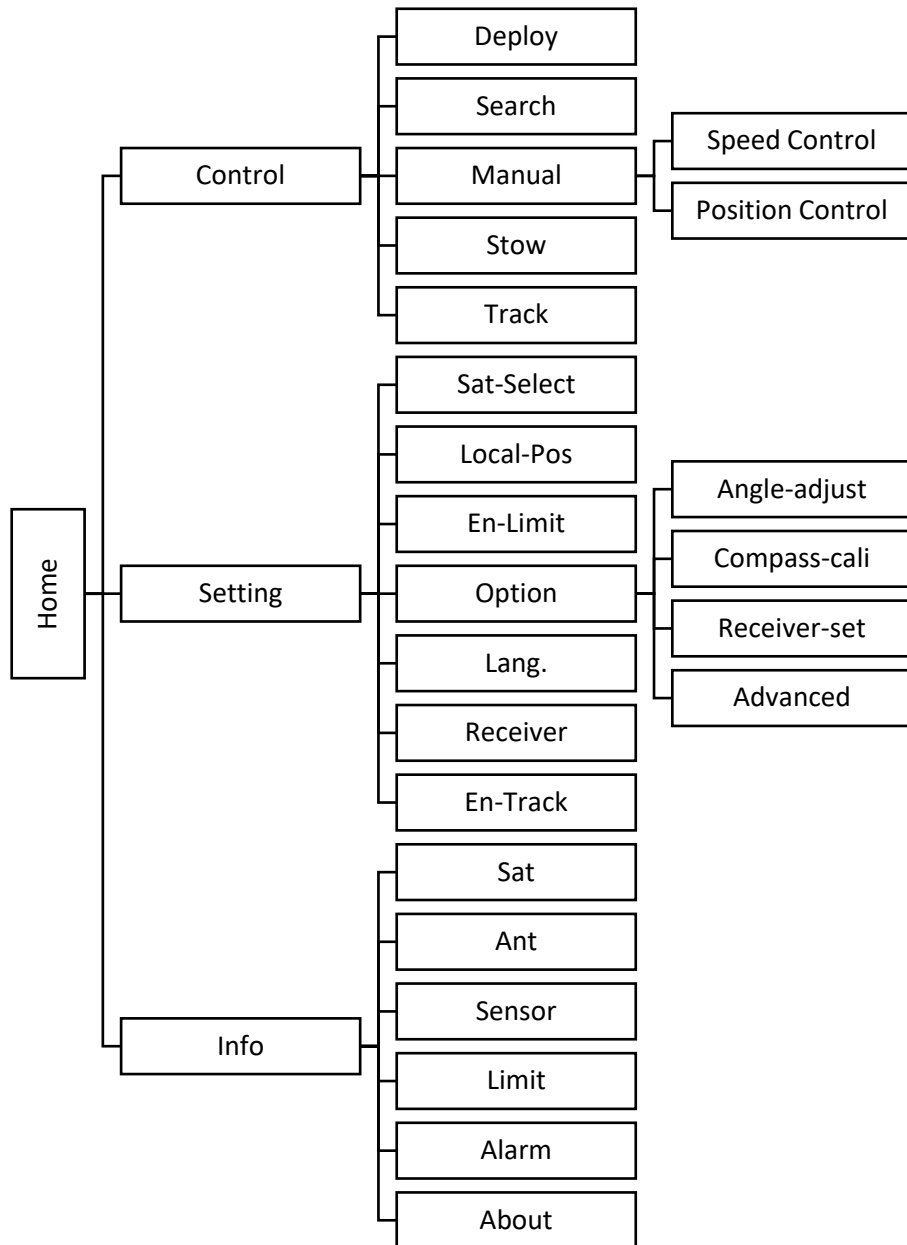
Control Menus

Control

Deploy   Search

Manual   Stow   Track

FIELD	DESCRIPTION
Deploy	Moves the antenna into its deployed position.
Search	Initiates auto-acquisition to the currently enabled satellite profile. When the operation is complete, the **Lock** indicator will light up.
Manual	Enables manual movement of the antenna either through speed control or position control.
Stow	Moves the antenna into its stowed position.
Track	Feature is currently not implemented.

Deploy

Note: Antenna starts deploying upon entering menu. Press the Clear key to exit the menu and stop the operation.

Resetting…

AZ: Target: 180. 00   Real: 179. 00

EL: Target: 28. 70   Real: -48. 00

PL: Target: 0. 00   Real: -0. 00

FIELD	DESCRIPTION
AZ	Shows target and current (real) azimuth angle.
EL	Shows target and current (real) elevation angle.
PL	Shows target and current (real) polarization angle.

Search

Note: Antenna starts deploying upon entering menu. Press the Clear key to exit the menu and stop the operation.

Horizon	V	Search...	DAGC 0.00V
AZ: Target: 180. 00			Real: 179. 00
EL: Target: 28. 70			Real:-37. 00
PL: Target: 0. 00			Real:-0. 00

FIELD	DESCRIPTION
Satellite Name	Displays satellite profile name in upper left-hand corner
State	Displays "Search" when initiating search and "Lock" upon completion
BAGC/DAGC	Shows signal strength of beacon or DVB carrrier
AZ	Shows target and current (real) azimuth angle.
EL	Shows target and current (real) elevation angle.
PL	Shows target and current (real) polarization angle.

Manual

Speed Control	**Position Control**

FIELD	DESCRIPTION
Speed Control	Moves antenna axis at a target speed
Position Control	Moves antenna look angle to a target position

Speed Control

Operate:	AZ Right	AZ:179. 00
Speed: 0. 00 °/s		EL:-31. 72
AGC: 0. 00V		PL:-0. 00
Enter go		Clear stop

FIELD	DESCRIPTION
Operate	Selects axis to move antenna.
Speed	Defines target speed (from 0 to 6 deg/s)
AGC	Shows signal strength.
AZ	Shows current azimuth angle.
EL	Shows current elevation angle.
PL	Shows current polarization angle.
LIM	Displays limit switch status if a limit switch is triggered.

Position Control

AZ: Target: 184. 20	Real:184. 20
EL: Target: 28. 70	Real: 28. 70
PL: Target: 0. 00	Real:0. 00
AGC: 0. 00V	"Enter" to Start

FIELD	DESCRIPTION
AZ Target	Defines target azimuth position (from 0 to 360 deg)
EL Target	Defines target azimuth position (from 0 to 90 deg)
PL Target	Defines target azimuth position (from -90 to 90 deg)
AZ Real	Shows current azimuth angle.
EL Real	Shows current elevation angle.
PL Real	Shows current polarization angle.

Stow

Note: Antenna starts deploying upon entering menu. Press the Clear key to exit the menu and stop the operation.

> **Stowing…**
>
> **AZ: Target: 180. 00**   **Real: 179. 00**
>
> **EL: Target: 28. 70**   **Real: -48. 00**
>
> **PL: Target: 0. 00**   **Real: -0. 00**

FIELD	DESCRIPTION
AZ	Shows target and current (real) azimuth angle.
EL	Shows target and current (real) elevation angle.
PL	Shows target and current (real) polarization angle.

Track

This feature is currently not implemented and will simply display the look angle of the antenna and signal strength.

> **Tracking…**   ‖   ×
>
> **AZ: Target: 180. 00**   **Real: 179. 00**
>
> **EL: Target: 28. 70**   **Real: -48. 00**
>
> **PL: Target: 0. 00**   **Real: -0. 00**

FIELD	DESCRIPTION
Satellite Name	Displays satellite profile name in upper left-hand corner
State	Displays "Search" when initiating search and "Lock" upon completion
BAGC/DAGC	Shows signal strength of beacon or DVB carrrier
AZ	Shows target and current (real) azimuth angle.
EL	Shows target and current (real) elevation angle.
PL	Shows target and current (real) polarization angle.

Setting Menus

Setting

Sat- Select   Local- Pos   En- Limit

Option   Lang.   Receiver   En- Track

FIELD	DESCRIPTION
Sat-Select	Selects current satellite profile.
Local-Pos	Manually input antenna location.
En-Limit	Toggle software limit switches.
Option	Configure antenna parameters.
Lang.	Selects ACU language.
Receiver	Selects receiver mode.
En-Track	Toggle tracking status.

Sat-Select

Note: Each polarization mode has its own profile settings.

Sat name: Sat2

SatLon: 87.00W   Beacon: 11701.00

Band: Ku   DVB Freq: 12044.00

Pol mode: V   Sym Rate: 3200.000

FIELD	DESCRIPTION
Sat name	Displays name of currently selected satellite profile – Not user editable.
SatLon	Sets longitude of satellite (from 0 to 180 degrees, west or west).
Beacon	Sets beacon frequency of satellite (from 0.00 to 99999.99).
Band	Defaults to Ku – Not user editable.
DVB Freq	Set DVB frequency of satellite (from 0.00 to 99999.99).
Pol mode	Selects polarization of satellite (horizontal or vertical).
Sym Rate	Set symbol rate of satellite (from 0.00 to 99999.99).

Local-Pos

> **Input Pos. :**   **Lon: 123.04W**
>
>   **Lat :   49.11N**
>
>   **Ant. Head: 180.00 (0-359)**

FIELD	DESCRIPTION
Lon	Sets longitude of antenna (from 0 to 180 degrees, west or west).
Lat	Sets latitude of antenna (from 0 to 90 degrees, north or south).
Ant. Head	Sets heading of antenna at reset position (from 0 to 359 degrees).

En-Limit
Password: ↑↓←→

> **SoftLimit: ENABLE**   **DISABLE: Enable**
>
> **Exce Stow: ENABLE**   **DISABLE: Disable**

FIELD	DESCRIPTION
SoftLimit	These values are factory set.
Exce Stow	Do not modify any of these values unless specified by the manufacturer.

Option
Password: ←←←←

> **Angle-adjust**   **Compass-cali.**
>
> **Receiver-set**   **Advanced**

FIELD	DESCRIPTION
Angle-adjust	Set search parameter and azimuth, elevation, and polarization offsets.
Compass-cali	Calibrate compass.
Receiver-set	Set receiver mode.
Advanced	Set movement calibration parameters.

Angle-adjust

<table>
<tr><td colspan="4" align="center">**Angle-adjust**</td></tr>
<tr><td align="center">**Se-scale**
20.00</td><td align="center">**EL**
-2.38</td><td align="center">**PL**
0.00</td><td align="center">**AZ**
16.65</td></tr>
</table>

FIELD	DESCRIPTION
Se-scale	Sets azimuth search window (from 0 to 40 degrees)
EL	Sets elevation offset (from -20 to 20 degrees)
PL	Sets polarization offset (from -20 to 20 degrees)
AZ	Sets azimuth offset (from -30 to 30 degrees)

Compass-cali

Password: ←←←→

Do not re-calibrate the compass unless specified by the manufacturer. To calibrate the compass, perform the steps listed by the ACU.

> **1. At Deploy pos. Enter Start.**
> **2. Vehicle run one circle ESC end**
>
> **Head:15.60**
>
> **Pitch:-80.20**   **Stop**

FIELD	DESCRIPTION
Head	Displays heading of antenna.
Pitch	Displays pitch of antenna.

Receiver-set

> **Amplify :   1.0 scale(0.4-2.0)**
>
> **Lof. :   G<10.75GHZ>**
>
> **Lock-hold: 7.0 scale(4.0V-8.0V)**

FIELD	DESCRIPTION
Amplify	Sets amplification of AGC value (from 0.4 to 2.0).
Lof	Sets LNB local oscillation from a list of preset values.
Lock-hold	Sets threshold of which AGC value needs to exceed before lock status is achieved (from 4.0 to 8.0).

Advanced

Password: ←←←→

azMid	**STOW-set**	**Up-set**	**Down-set**
1.40	**1.60**	**89.90**	**9.92**
Protect	**elMid**		
0.00	**0.0**		

FIELD	DESCRIPTION
azMid	These values are factory set. Do not modify any of these values unless specified by the manufacturer.
STOW-set	
Up-set	
Down-set	
Protect	
elMid	

Lang.

中文	**English**

FIELD	DESCRIPTION
中文	Sets ACU language as Chinese.
English	Sets ACU language as English.

Receiver

Beacon	**DVB**		**:DVB**
18v	**13v**	**OFF**	**:13v**
22kHz	**OFF**		**:22kHz**

FIELD	DESCRIPTION
Beacon / DVB	Set signal mode of receiver
18v / 13v / OFF	Set voltage transmitted to LNB
22kHz / OFF	Set tone transmitted to LNB

En-Track
Password: ←←←←

This feature is currently not implemented so enabling tracking does not enable the functionality.

Track-enable	**Track-disable**
Track-status	

FIELD	DESCRIPTION
Track-enable	Enable tracking.
Track-disable	Disable tracking.
Track-status	Displays tracking status.

Info Menus

Sat

Sat	Ant	Sensor	Limit	Alarm	About

Horizon(89.00W)   Rate:3200.00

Freq:12044.00   Pol Mode:V

AGC:0.00V   Receiver: Dvb

FIELD	DESCRIPTION
Satellite Name	Displays satellite profile name in upper left-hand corner.
Freq	Displays frequency of satellite profile.
BAGC/DAGC	Displays signal strength.
Rate	Displays symbol rate of satellite profile.
Pol Mode	Displays polarization of satellite profile.
Receiver	Displays receiver mode.

Ant

Sat	Ant	Sensor	Limit	Alarm	About

AZ: Target :136.09   Real: 179.00

EL :Target :24.01   Real: -52.90

PL: Target :-27.00   Real: -0.00

FIELD	DESCRIPTION
AZ	Shows target and current (real) azimuth angle.
EL	Shows target and current (real) elevation angle.
PL	Shows target and current (real) polarization angle.

Sensor

| Sat | Ant | **Sensor** | Limit | Alarm | About |

Head : 198.80   **Lon:123.04W**   **Speed:**

Pitch: -81.70   **Lat:49.11N**   **0.0Km/h**

Roll: -14.80   **GPS:Lock**   **0**

FIELD	DESCRIPTION
Head	Displays heading of antenna.
Lon	Displays longitudinal position of antenna.
Pitch	Displays pitch of antenna.
Lat	Displays latitudinal position of antenna.
Roll	Displays roll of antenna.
GPS Lock	Displays status of GPS (lock indicated GPS status is known).
Speed	Displays speed of antenna.

Limit

Note: The presence of any letter next to the limit switch indicates the switch has been activated, so in the example below, this is the expected status for the antenna after deploying.

| Sat | Ant | Sensor | **Limit** | Alarm | About |

AZ: **Left : -**   **Right : -**   **Zero: H**

EL: **UP: -**   **Down: H**   **Zero: H**

PL: **CW: -**   **CCW: -**   **Zero: -**

FIELD	DESCRIPTION
AZ	Displays azimuth limit switches status (Left, Right, Zero).
EL	Displays elevation limit switches status (Up, Down, Zero).
PL	Displays polarization limit switches status (CW, CCW) (Zero not used).

Alarm

Sat	**Ant**	**Sensor**	**Limit**	**Alarm**	**About**

Error Code

FIELD	DESCRIPTION
Error Code	Display error code if the Alarm LED is active.

About

Sat	**Ant**	**Sensor**	**Limit**	**Alarm**	**About**

Hv: APT10V1.0/MCB10V1.0

Sv: d.bf1211. 1. 3. OR/uc060. 1. 4. 6R

FIELD	DESCRIPTION
Hv	Displays hardware revision.
Sv	Displays software revision.
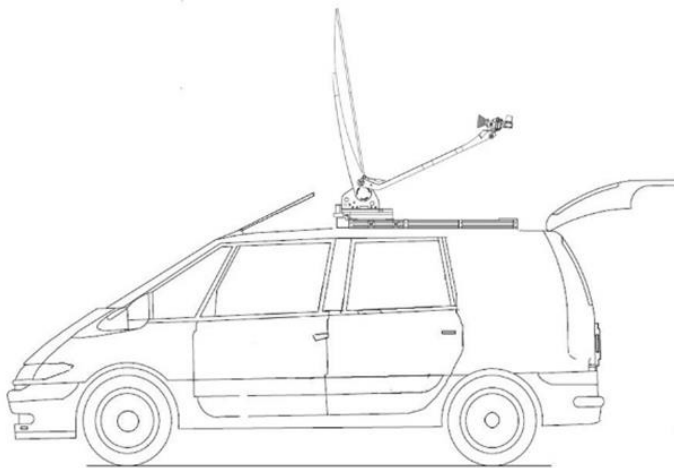
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