HSA-MUF ESA50 HSA-PUF Hybrid Steering ESA Terminal &

ESA-MUF Full Dimension ESA Terminal

User Manual

Name: Hybrid Electronic Steering Terminal

Model Number：HSA-MUF ESA50 HSA-PUF

Name：Full Dimension Electronic Steering Terminal

Model Number：ESA-MUF

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Contents

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Operating Instructions

The HSA-MUF ESA50 HSA-PUF two-dimensional hybrid steering phased array terminals are satellite earth station antenna system for the implementation of Ku-band. The HSA-FUF full dimensional electronic steering phased array terminal is satellite earth station antenna system for the implementation of Ku-band. The use requires the setting of satellite parameters according to the different use cases and automatic alignment to the satellite.
The user manual provides operational instructions for the terminal for applications in Ku-band. But should take into account the specific modem and antenna electrical performance parameters. This manual is intended to provide technical support for personnel who responsible for the installation, commissioning and operation of hybrid steering phased array terminals.

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Electronic Emission Notices

Operation is subject to the following two conditions:
1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Safety Considerations

For the following safety considerations, "Instrument" means the ‘HSA-MUF, ESA50, ESA-MUF, HSA-PUF’ units, components and their cables.
It is necessary to read the instructions carefully before using the HSA-MUF, ESA50, ESA-MUF, HSA-PUF. The HSA-MUF, ESA50, ESA-MUF, HSA-PUF usage shall be carried out in accordance with the described steps and methods to ensure the safety and accuracy of equipment operation.

For the following safety reasons, the "Operating Manual" is intended for the components of the portable satellite communication station and its cables. The manual must be read carefully before using the portable satellite communication station. The terminal should be used in accordance with the steps and methods described to ensure safe and accurate operation of the equipment.

Radio

The instrument transmits radio energy during normal operation. To avoid possible harmful exposure to this energy, do not stand or work for extended periods of time in front of its antenna. The long-term characteristics or the possible physiological effects of Radio Frequency Electromagnetic fields have not been yet fully investigated.

The device emits radio energy during normal operation. To avoid possible harmful exposure, do not stand in front of the antenna or work for long periods of time. The potential physiological effects caused by radiofrequency electromagnetic fields have not been fully studied.

Caution

1. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.
2. Before connecting this instrument to the power line, make sure that the voltage of the power source matches the requirements of the instrument.

Disposal of Electronic and Electrical Waste

Pursuant to the WEEE EU Directive electronic and electrical waste must not be disposed of with unsorted waste. Please contact your local recycling authority for disposal of this product.

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The HSA-MUF, ESA50, ESA-MUF, HSA-PUF is a full satellite earth station system for communication in Ku-band. The satellite parameters shall be selected only according to the specific user conditions required.

The China Starwin HSA-MUF, ESA50, ESA-MUF, HSA-PUF User Manual provides operational instructions, for the device, which are standard for applications in Ku-band. However, the specific modem and antenna electrical performance parameters need to be taken in account. This manual is intended for technicians responsible for the installing, setting up and operating of the HSA-MUF, ESA50, ESA-MUF, HSA-PUF and for system administrators who are responsible for managing the system.

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1 Introducing

1.1 Introducing HSA-MUF and ESA50 Terminal

HSA-MUF and ESA50 actually refer to the same product, in order to differentiate the promotion strategy for different customers, and mainly used as an earth station for satellite communications in COTM scenarios.

The HSA-MUF and ESA50 terminal is a two-dimensional Ku band hybrid steering phased array terminal, with a fully dimension phased-array antenna (768 units each for Tx and Rx, with integrated FPGA beam processing circuit) on the antenna panel, compensate mechanical adjustment with mature and advanced motorized turntable; The antenna body adopts an integrated design, integrating the self-developed Ku band distributed transmit driven power amplifier, low loss receiving combined network, single Tx/Rx Ku band frequency conversion transceiver (built-in low phase noise local oscillation source), power management module, modem module, etc.; The two-dimensional hybrid steering (electric steering + mechanic steering) method can ensure that the phased array panel is always aligned with the satellite roughly in the normal direction, the Tx/Rx performance is basically equivalent to the dual channel number of full electronic steering performance, with highly integrated, low cost, low power consumption, high performance, fast satellite tracking and satellite switching characteristics, etc. The appearance is shown in Figure 1-1.

Figure 1-1 HSA-MUF and ESA50 COTM Terminal

Compared to full electronic steering phased array terminals, HSA-MUF and ESA50 terminals of COTM in different satellite environments of HTS, GEO, MEO and LEO, through the innovative application of phased array technology and the combination of the compensating effect of mechanical adjustment, making full use of hybrid steering technology, under the condition of limited number of array unit channels. Higher Tx/Rx performance, lower array channel cost, and overall power consumption are also lower.

The HSA-MUF and ESA50 terminal integrates mature and advanced two-dimensional mechanical steering technology, full electronic steering phased array technology and a miniaturized integrated design. Enhancing the practicality, scale and competitiveness of the production and application of this satellite terminal, which can quickly capture satellites anywhere and anytime to establish stable and reliable satellite communication links for vehicles, trains, vessels and aircraft.

1.2 Introducing HSA-PUF Terminal

HSA-PUF is a portable communication equipment, mainly used as an earth station for satellite communication in COTP scenarios.
The HSA-PUF terminal is a two-dimensional Ku band hybrid steering phased array terminal, with a fully dimension phased-array antenna (768 units each for Tx and Rx, with integrated FPGA beam processing circuit) on the antenna panel, compensate mechanical adjustment with mature and advanced motorized turntable; The antenna body adopts an integrated design, integrating the self-developed Ku band distributed transmit driven power amplifier, low loss receiving combined network, single Tx/Rx Ku band frequency conversion transceiver (built-in low phase noise local oscillation source), power management module, modem module, etc.; The two-dimensional hybrid steering (electric steering + mechanic steering) method can ensure that the phased array panel is always aligned with the satellite roughly in the normal direction, the Tx/Rx performance is basically equivalent to the dual channel number of full electronic steering performance, with highly integrated, low cost, low power consumption, high performance, fast satellite tracking and satellite switching characteristics, etc. The appearance is shown in Figure 1-2.

Figure 1-2 HSA-PUF COTP Terminal

Compared to full electronic steering phased array terminals, HSA-PUF terminals of COTP in different satellite environments of HTS, GEO, MEO and LEO, through the innovative application of phased array technology and the combination of the compensating effect of mechanical adjustment, making full use of hybrid steering technology, under the condition of limited number of array unit channels. Higher Tx/Rx performance, lower array channel cost, and overall power consumption are also lower.

The HSA-PUF terminal integrates mature and advanced two-dimensional mechanical steering technology, full electronic steering phased array technology and a miniaturized integrated design. Enhancing the practicality, scale and competitiveness of the production and application of this satellite terminal, which can quickly capture satellites anywhere and anytime to establish stable and reliable satellite communication links for COTP scenarios.

1.3 Introducing ESA-MUF Terminal

As a full dimension ESA terminal ESA-MUF mainly used as an earth station for satellite communications in COTM scenarios and scenes with extremely demanding contour height restrictions. The ESA-MUF terminal is a electronic steering phased array terminal, with a fully dimension phased-array antenna (768 units each for Tx and Rx, with integrated FPGA beam processing circuit) on the antenna panel; The antenna body adopts an integrated design, integrating the self-developed Ku band distributed transmit driven power amplifier, low loss receiving combined network, single Tx/Rx Ku band frequency conversion transceiver (built-in low phase noise local oscillation source), power management module, modem module, etc.The appearance is shown in Figure 1-3.

Figure 1-3 ESA-MUF COTM Terminal

Starwin Ku-band full dimension ESA terminal integrates the electronic steering phased array antenna, control unit, up&down converter and satellite router into one unit under one radome and the wireless access function is also included, which makes the terminal easy to deploy. The electronic steering beam enables high speed satellite tracking. No moving mechanical parts design ensures the high reliability of the terminal. These special features enable Ku-Band ESA terminal to deliver the innovative universal broadband solutions for COTM (Communication On The Move), making satellite communication simple & easy.

2 Terminal Features

2.1 HSA-MUF and ESA50 Terminal Features

- Unique Design: With mechanic and electronic steering combined system, wider EL scan angle with low loss from EIRP and G/T in normal direction;
- High Integration: All in one, fully 2D phased array, ACU, satellite Modem, Up & Down converter are all integrated in one outdoor unit;
- Proven technology of beam forming to track and switch among multi orbit networks of GEO, LEO and MEO;
- Convenience: With ultra-portability without complex installation, cabling, connection and commission processing on site;
- Flexible and Scalable: Manifold application for mobile broadband connectivity under GEO, MEO and LEO.
  -Mobile (Vehicle&Train -COTM)
  -Maritime (Shipping Vessels-COTM)
  -Aero (Airplane and UAV-COTM)

2.2 HSA-PUF Terminal Features

- Unique Design: With mechanic and electronic steering combined system, wider EL scan angle with low loss from EIRP and G/T in normal direction;
- High Integration: all in one, fully 2D phased array, ACU, satellite Modem, Up & Down converter are all integrated in one outdoor unit;
- Proven technology of beam forming to track and switch among multi orbit networks of GEO, LEO and MEO;
- Convenience: With ultra-portability without complex installation, cabling, connection and commission processing on site;
- Flexible and Scalable: Manifold application for mobile broadband connectivity under GEO, MEO and LEO.
  -Land (Fixed Platform-COTP)

2.3 ESA-MUF Terminal Features

- High speed tracking: Fully electronic steering satellite beam
- High integration: All in one, phased array, ACU, satellite Modem, Up&Down Converter are all integrated in one outdoor unit
- High reliability: Solid State circuit, no moving mechanical parts inside
- Simple Setting up: No need satellite technician for installation, cabling, connection and commission etc.
- Easy Operation: Access satellite broadband in wireless way by smartphone or laptop.
- Scalable Option: Can be scalable per request
- Wide application: Work for mobile broadband connectivity under GEO, MEO and LEO.
  -Mobile (Vehicle&Train -COTM)
  -Maritime (Shipping Vessels-COTM)
  -Aero (Airplane and UAV-COTM)
- Cost Effectiveness: Fully R&D and production by Starwin come down production cost

3 Technical Specification

3.1 HSA-MUF and ESA50 Technical Specification

Ku Band Hybrid ESA Terminal			
Overall Specifications of Terminal			
Model	HSA-MUF ESA50	**Dynamic Capture Time of First Boot**	≤ 2.5min
Name	ElephantWin	**Static Capture Time of First Boot**	≤ 2min
Type	Ku band Hybrid ESA COTM Terminal	**Mechanical Steering Type**	Auto
Tx	13.75 ~ 14.5 GHz	**Recapture Time After Loss**	< 15sec (Duration of occlusion ≤5min)
Rx	10.7 ~ 12.75 GHz		<25sec (Duration of occlusion >5min)
Tracking Accuracy	≤ 0.2°	**Applicable Satellite Type**	HTS GEO, MEO and LEO
Rx LO.	9.75/10.6 GHz	**Tx LO.**	12.8 GHz
Scan Mode	Hybrid Steering (2D Electronic Steering + 2D Mechanical Steering)	**Beam Switching Time**	≤ 3ms
IF Specifications			
Input Power (Modem Output)		-35 ~ 0dBm	
IF Input (Modem Output)		0.95 GHz ~ 1.7 GHz	
IF Output (Modem Input)		0.95 GHz~2.15 GHz	
Internal Modem	Customized	**External Modem**	Customized
RF Specifications			
EIRP	≥ 43dBW@ Normal	**G/T**	≥ 9.5dB/K@ Normal
Polarization	Full polarization, automatic switching	**Azimuth Range**	Unlimited
X-Pol Isolation	>30dB@90°	**Hybrid Elevation Steering Range**	70°~ 110° @ Scanning Gain Loss ≤ 0.1dB (90° means the antenna is horizontal) **Note**

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		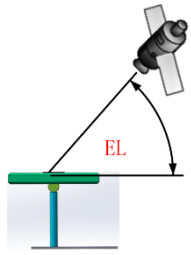	
Scanning Gain Loss (Hybrid Steering)	≤ 0.1dB@ Elevation from 70-110°		
	≤ 0.8dB@ Elevation 60°		
	≤ 2dB@ Elevation 45°		
	≤ 3dB@ Elevation 30°		
	≤ 4.5dB@ Elevation 15°		
Interface			
Power Interface	Waterproof Quick Plug	**Network Interface**	Waterproof Quick Plug
IF Interface (Tx)	SMA	**IF Interface (Rx)**	SMA
Physical Dimensions and Electrical Specifications			
Outline Dimension	595×485×180mm	**Power Input (With Adapter)**	AC 90 ~ 264V/50Hz
Weight	≤ 13.5kg	**Power Input (Without Adapter)**	DC 28V±5%
Power Consumption	≤ 350 W		
Environmental Specifications			
Wind Speed	150km/h	**Ingress Protection**	IP66
Operation Temperature	-25°C ~ +55°C (Standard) -40 °C ~ +70 °C (Customizable)	**Storage Temperature**	-40 °C to +85 °C
Humidity	5 ~ 95%		

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3.2 HSA-PUF Technical Specification

Ku Band Hybrid ESA Terminal			
Overall Specifications of Terminal			
Model	HSA-PUF	**Static Capture Time of First Boot**	≤ 2min
Name	KoalaWin		
Type	Ku band Hybrid ESA COTP Terminal	**Mechanical Steering Type**	Auto
Tx	13.75 ~ 14.5 GHz	**Recapture Time After Loss**	< 15sec (Duration of occlusion ≤5min)
Rx	10.7 ~ 12.75 GHz		<25sec (Duration of occlusion >5min)
Tracking Accuracy	≤ 0.2°	**Applicable Satellite Type**	HTS GEO, MEO and LEO
Rx LO.	9.75/10.6 GHz	**Tx LO.**	12.8 GHz
Scan Mode	Hybrid Steering (2D Electronic Steering + 2D Mechanical Steering)	**Beam Switching Time**	≤ 3ms
IF Specifications			
Input Power (Modem Output)		-35 ~ 0dBm	
IF Input (Modem Output)		0.95 GHz ~ 1.7 GHz	
IF Output (Modem Input)		0.95 GHz~2.15 GHz	
Internal Modem	Customized	**External Modem**	Customized
RF Specifications			
EIRP	≥ 43dBW@ Normal	**G/T**	≥ 9.5dB/K@ Normal
Polarization	Full polarization, automatic switching	**Azimuth Range**	Unlimited
X-Pol Isolation	>30dB@90°	**Hybrid Elevation Steering Range**	0°~ 180° (90° means the antenna is horizontal)

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		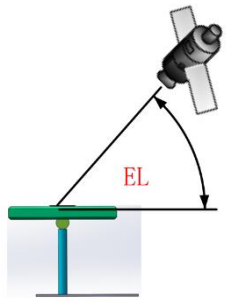	
Interface			
Power Interface	Waterproof Quick Plug	**Network Interface**	Waterproof Quick Plug
IF Interface (Tx)	SMA	**IF Interface (Rx)**	SMA
Physical Dimensions and Electrical Specifications			
Outline Dimension	595×585×350mm	**Power Input (With Adapter)**	AC 90 ~ 264V/50Hz
Weight	≤ 15 kg	**Power Input (Without Adapter)**	DC 28V±5%
Power Consumption	≤ 350 W		
Environmental Specifications			
Wind Speed	The terminal works normally when the wind speed is in the range of 17.2-20.7m/s (61.92-74.52Km/h) (33.5-40.3 mph)	**Ingress Protection**	IP66
Operation Temperature	-25°C ~ +55°C (Standard) -40 °C ~ +70 °C (Customizable)	**Storage Temperature**	-40 °C to +85 °C
Humidity	6 ~ 95%		

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3.3 ESA-MUF Technical Specification

Ku band Full Dimension ESA Terminal	
Overall Specifications	
Model No.	ESA-MUF
Antenna Type	Electronic Steering Phased Array
RF Performance	
Frequency Range	TX 13.75~14.50 GHz, RX 10.70~12.75 GHz
EIRP	≥ 43 dBW @ Normal (Normal direction =Elevation 90°) ≥ 42 dBW@ 30° (30°off axial angel= Elevation angle 60°) ≥ 38.5dBW@ 60° (60°off axial angel= Elevation angle 30°)
G/T	≥ 9.5 dB/K @ Normal (Normal direction =Elevation 90°) ≥ 8.5 dB/K@ 30° (30°off axial angel= Elevation angle 60°) ≥ 5 dB/K@ 60° (60°off axial angel= Elevation angle 30°)
Applicable Satellite Type	for GEO (HTS), MEO and LEO (Optional)
Polarization	Full polarization, automatic switching
Axis Ratio	≤3dB (Electronically Controlled)
X-Pol Isolation	>30dB@ Normal
Coverage	0-360° @ azimuth, off axis angle 0° to 60°
Integrated Tracking System	
Tracking Accuracy	<0.2°
Integrated Tracking Type	<DVB-S, DVB-S2, DVB-S2X
Beam Switching Time	≤3ms (any position)
Dynamic Capture Time of First Boot	≤ 2.5min
Static Capture Time of First Boot	≤ 2min
Recapture Time After Loss	<15sec (Duration of occlusion ≤5min) <25sec (Duration of occlusion >5min)
Scan Mode	Electronic Steering + 2D
Integrated Ku Up-Down Converter	
IF Frequency	RX: 950 ~ 2150 MHz, TX: 950 ~ 1700 MHz

IF Input Power (Modem Output)	-35 ~ 0dBm
LO.	Rx: 9.75/10.6 GHz, Tx: 12.8 GHz
Phase Noise	≤-60dBc/Hz (@100Hz), ≤-70dBc/Hz (@1kHz) ≤-80dBc/Hz (@10kHz), ≤-90dBc/Hz (@100kHz) ≤-120dBc/Hz (@1MHz)
Modem	
Internal /External Modem	**Customizable**
Mechanical	
Dimensions	≤595x485x60mm
Weight	≤10kg
Environmental	
Operating Temperature	-25°C ~ +55°C (Standard), -40 °C ~ +70 °C (Customizable)
Storage Temperature	-40 °C ~ +85 °C
Humidity	5 ~ 95%
Wind Speed	150km/h
Ingress Protection	IP66
Power	
DC Power Supply	(With Adapter) AC 90 ~ 264V/50~60Hz (Without Adapter) 28VDC±5%
Power Consumption	≤300W
Interfaces	
IF TX/IF RX	SMA
Network Interface	Waterproof Quick Plug
Power Interface	Waterproof Quick Plug

4 Packing List

(1) External Packing of Terminal as Follows:

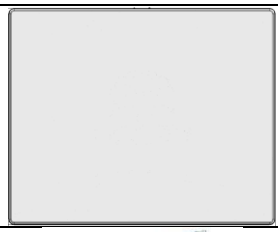
- Terminal
- Power adapters (adapters are configured according to the user's location)
- Network cable
- RF cable
- Mounting accessories
- Other customized accessories
- User manuals

(2) Internal Packing of Terminal as Follows:

- Fully electronic steering phased array antenna
- Converter components
- GPS module
- Heat dissipation components
- Satellite searching control and power supply module
- Wireless router
- Modem module

4.1 Unpacking and Inspection

When you receive the system containers, unpack and inspect the components and hardware to ensure that all parts have been received in good condition. The box should contain the items listed as below:

Item	Photo	Part Name	Quantity	Remarks
1		Terminal	1	Standard
2		Network Cable	1	Standard
3		Power Adapter	1	Standard
4		RF Cable	2	Standard
5		Carton Box	1	Standard
6	/	Mounting Accessories	1	Standard
8	/	User Manual	1	Standard

4.2 Freight Damage

If any parts appear to have been damaged in transit, immediately contact the freight carrier.

4.3 Material-Missing or Damage

If any parts appear to be missing or damaged, but not as a result of handling in transit, contact your dealer or distributor.

4.4 Terminal Access Details

- **Terminal Serial NO.(S/ N)：**

  XXXXXXXXXXXXX (XXXX is the number of the following equipment)

- **Modem:IQ200 (Take the IQ200 as example)**

  IP:192.168.0.1

  User: admin Password: iDirect

- **DVB:**

  IP:192.168.0.2

  User: N/A Password: N/A

- **Wi-Fi Router:**

  SSID: HI_LINKxxxxx Password：12345678

  Default IP Address: 192.168.0.254

  Login Username：admin Login Password: admin

4.5 Matters Needing Attention

(1) The Terminal is a valuable instrument - treat it with care.

(2) Store the Terminal in a dry environment.

(3) After use in rainy and snowy weather, the Terminal shall be dried and stored.

5 Terminal Mechanical Layout

5.1 HSA-MUF and ESA50 Terminal Mechanical Layout

i. HSA-MUF and ESA50 Structure Diagram

As shown in Figure 5-1, the Terminal mainly consists of the antenna body and the electrically adjustable turntable.

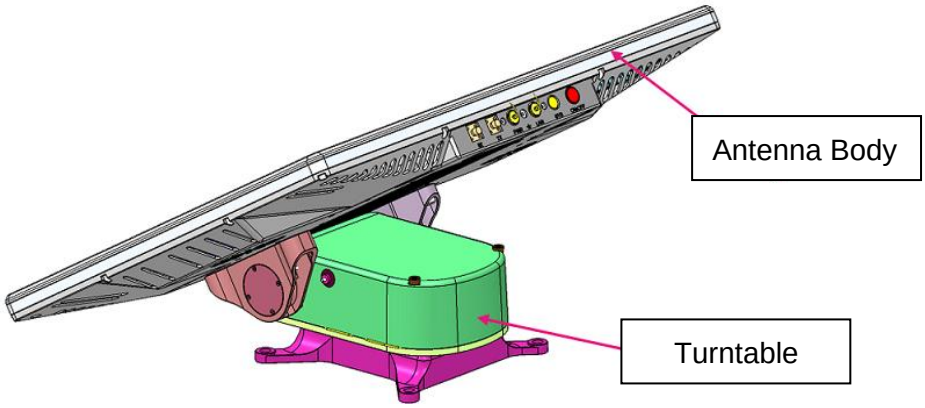


Figure 5-1 Terminal Structure Diagram

ii. Terminal Dimensions

Terminal appearance and dimension drawing (unit: mm), as shown in Figure 5-2.

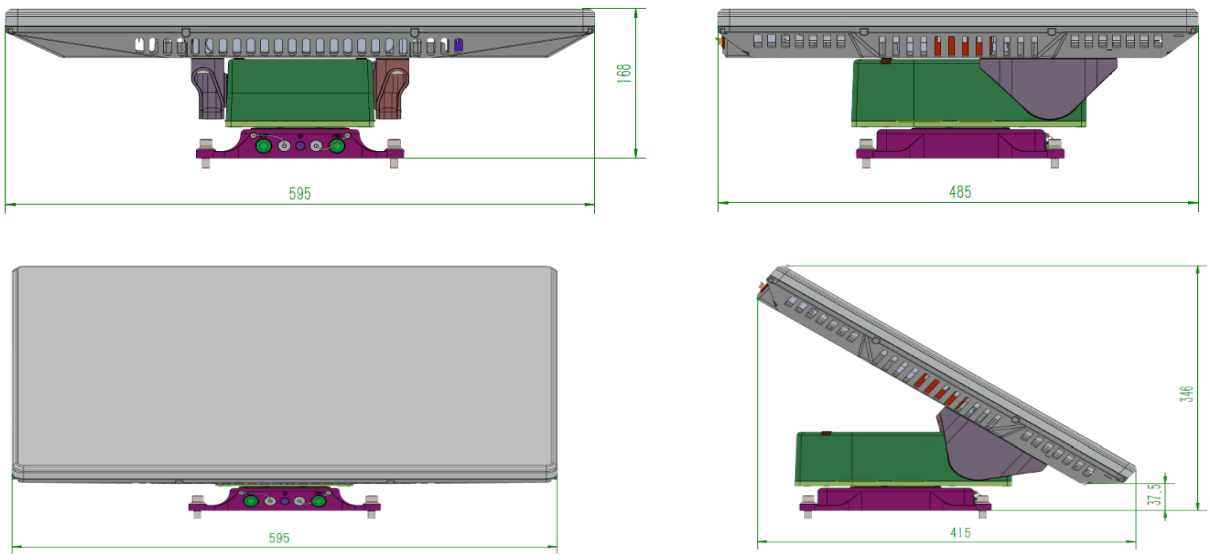


Figure 5-2 Terminal Dimensions

iii. Terminal Installation

Remove the ESA50 terminal and mounting profile from the box, fix the mounting profile to the surface to be mounted (e.g. vehicle luggage rack) with screws and nuts, align the 4 fixing holes of the terminal turntable with the holes in the mounting profile, the screws pass through 4 mounting holes and tighten

them with nuts as shown in Figure 5-3.

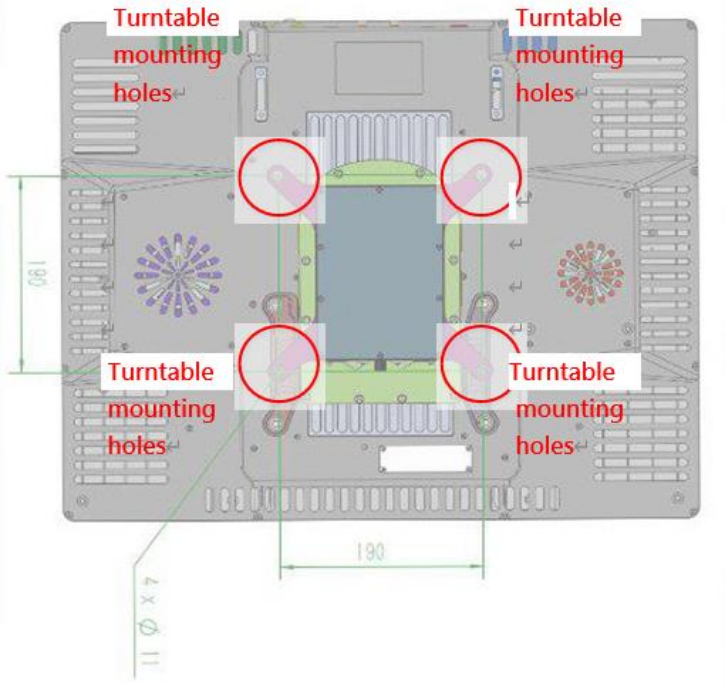


Fig. 5-3 Terminal Installation

5.2 HSA-PUF Terminal Mechanical Layout

i. HAS-PUF Structure Diagram

As shown in Figure 5-4, the Terminal mainly consists of the antenna body and the electrically adjustable turntable.

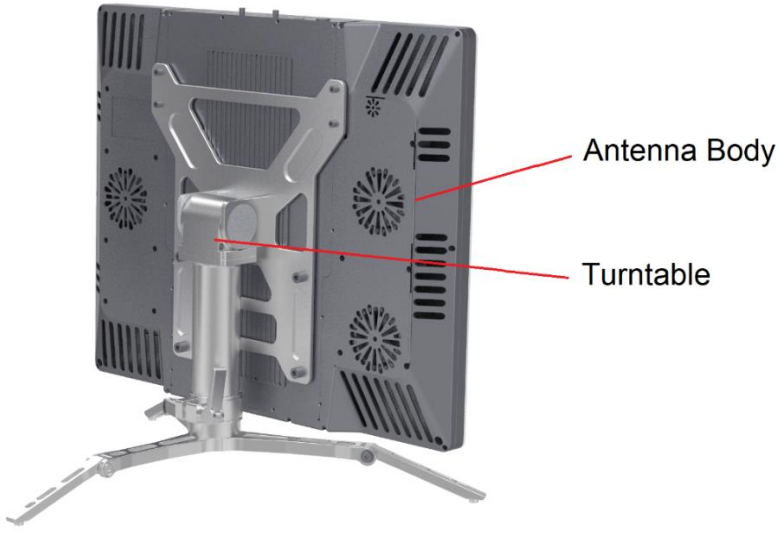


Figure 5-4 Terminal Structure Diagram

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ii. Terminal Dimensions

Terminal appearance and dimension drawing (unit: mm), as shown in Figure 5-5.

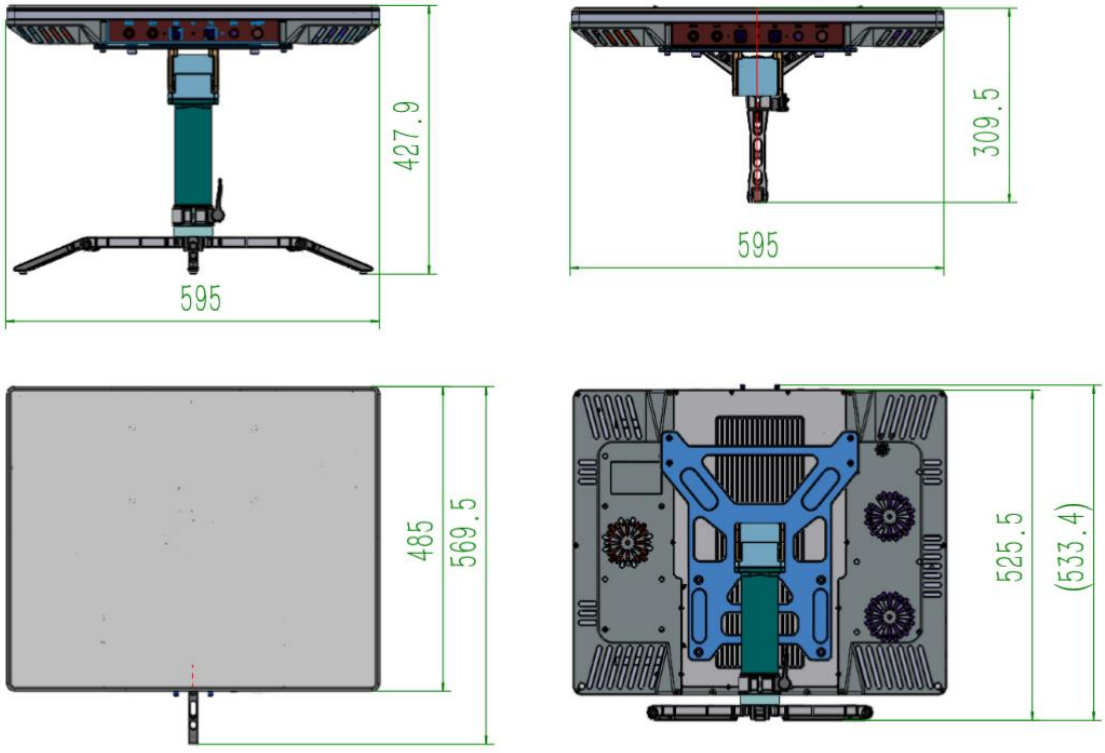

Figure 5-5 Terminal Dimensions

iii. Terminal Installation

Remove the HSA-PUF terminal and mounting profile from the box, fix the mounting profile to the surface to be mounted (e.g. vehicle luggage rack) with screws and nuts, align the 4 fixing holes of the terminal turntable with the holes in the mounting profile, the screws pass through 4 mounting holes and tighten them with nuts as shown in Figure 5-6.

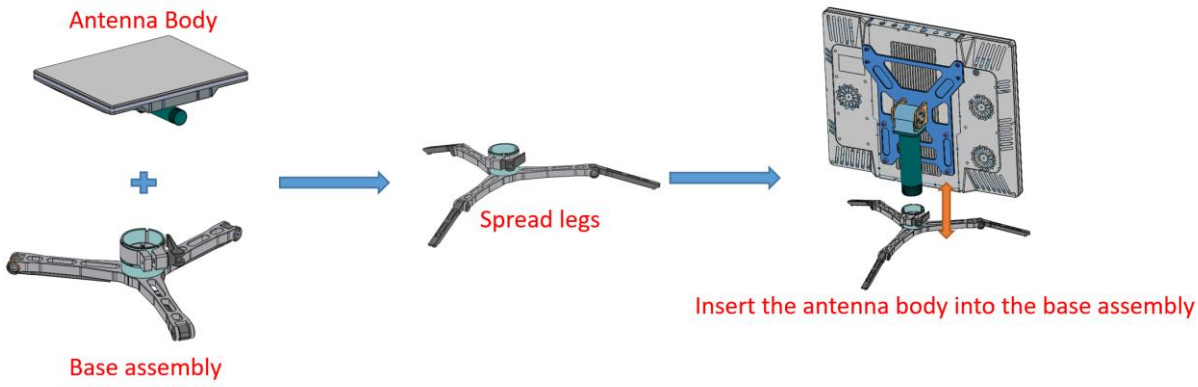

Fig. 5-6 Terminal Installation

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5.3 ESA-MUF Terminal Mechanical Layout

i. ESA-MUF Structure Diagram

As shown in Figure 5-7, the Terminal mainly consists of the antenna body.

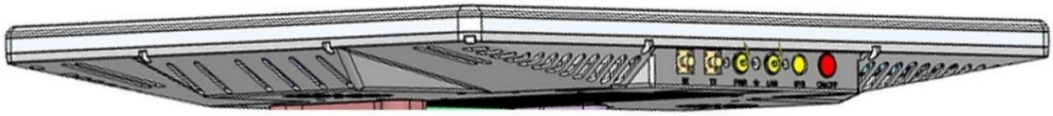

Figure 5-7 Terminal Structure Diagram

ii. Terminal Dimensions

Terminal appearance and dimension drawing (unit: mm), as shown in Figure 5-8.

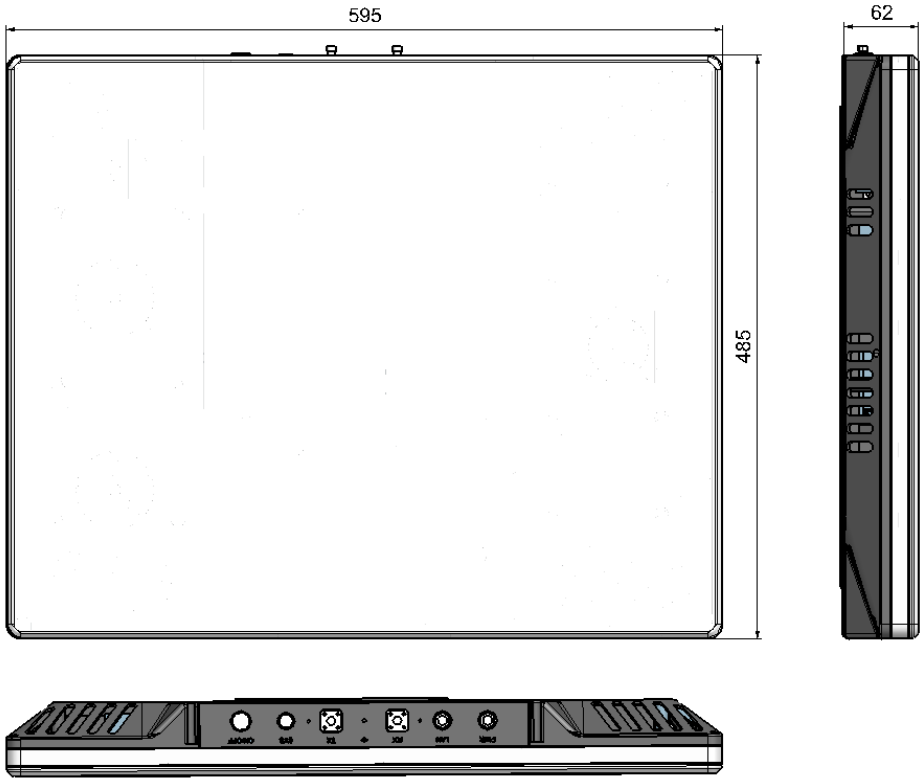

Figure 5-8 Terminal Dimensions

iii. Terminal Installation

Remove the ESA50 terminal and mounting profile from the box, fix the mounting profile to the surface to be mounted (e.g. vehicle luggage rack) with screws and nuts, align the 4 fixing holes of the terminal turntable with the holes in the mounting profile, the screws pass through 4 mounting holes and tighten them with nuts as shown in Figure 5-9.

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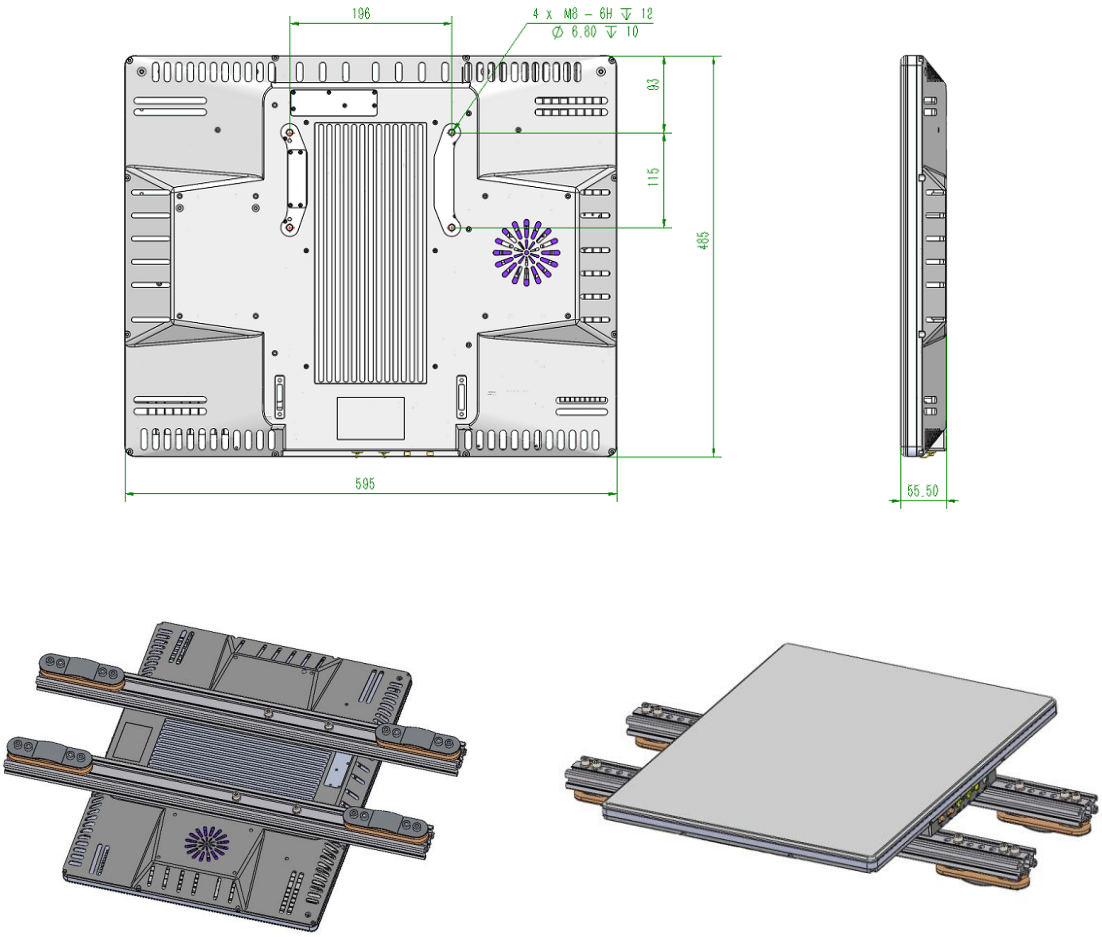

Fig. 5-9 Terminal Installation

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6 Interface Definition and Access

6.1 HSA-MUF and ESA50 Interface Definition and Access

i. Interface Definition

There are five main interfaces between the main body of the terminal and the physical interface of the turntable as follows:

Power Port: Industrial grade waterproof aviation plug, connected with an adapter;

LAN Port: Industrial grade waterproof aviation plug, connected with a network cable;

RF Port: SMA interface, connected with an RF cable when an external modem is used;

Switch Button: When the Terminal off, press once briefly to switch the Terminal on, press once more briefly to switch the Terminal off;

Status Indicator:

Description of the Indicator Status	
Green Quick Flash	Aligning Satellite
Green Slow Flash	Satellite Alignment Completed
Always on red	Fault Prompt

The specific interfaces are defined as shown in Figure 6-1 below.

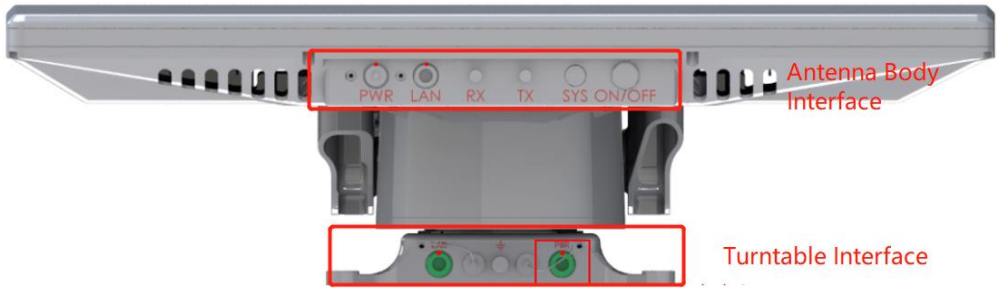

Figure 6-1 HSA-MUF and ESA50 Interface Definition

PWR (Antenna Body)	Power Supply Cable Port
LAN (Antenna Body)	Network Cable Connect Port
RX	RF Rx Port
TX	RF Tx Port
SYS	Status Indicator
ON/OFF	Power On or Off the Terminal
LAN (Turntable)	Network Cable Connect Port
PWR (Turntable)	Power Supply Cable Port

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ii. Power Supply Access

Insert the red dot on the aviation plug end of the matching power adapter, aligning it with the red dot on the PWR connector of the turntable, and then insert the plug end of the adapter connect to 220V AC power. As shown in Figure 6-2.

Figure 6-2 Power Supply Access

iii. Data Access

The ESA50 Terminal has two types of data access: Wired access and Wireless access.

Wired Access: Use the matching network cable access to insert the red dot of the aviation plug end of the cable against the red dot of the LAN port of the Terminal, and another end into the RJ45 interface of the wired network equipment, as shown in Figure 6-3.

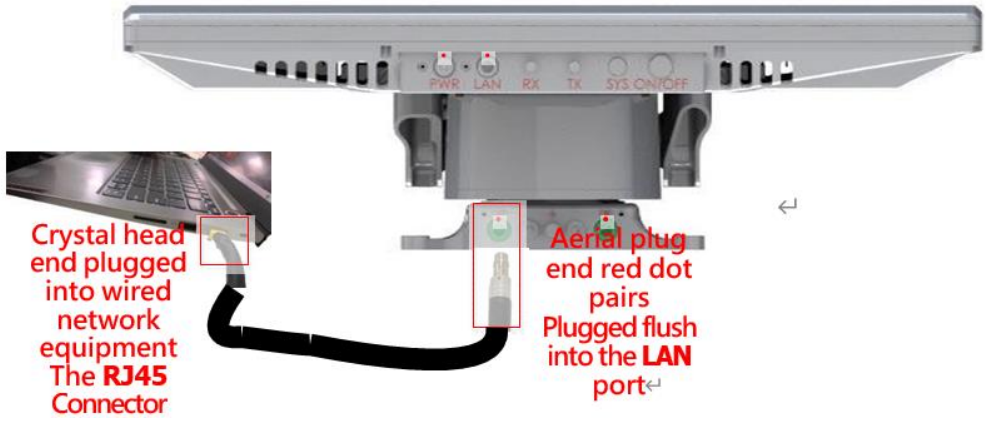
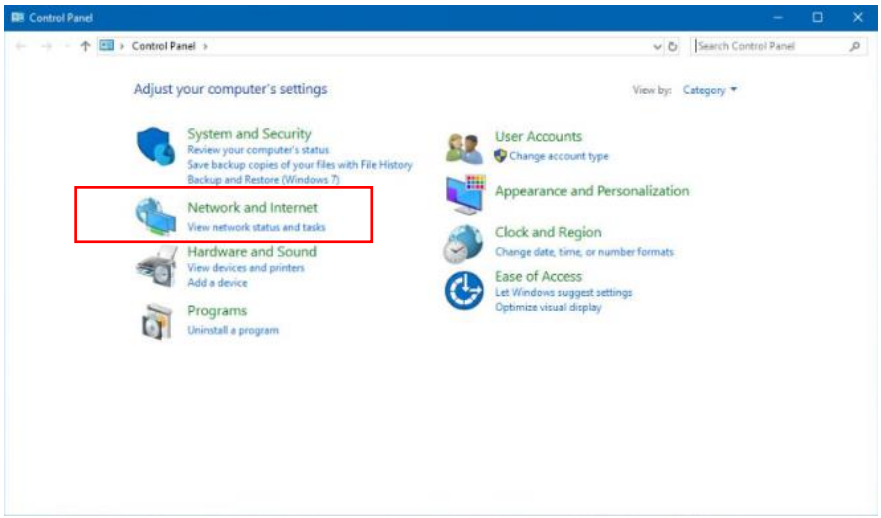


Figure 6-3 Data Access

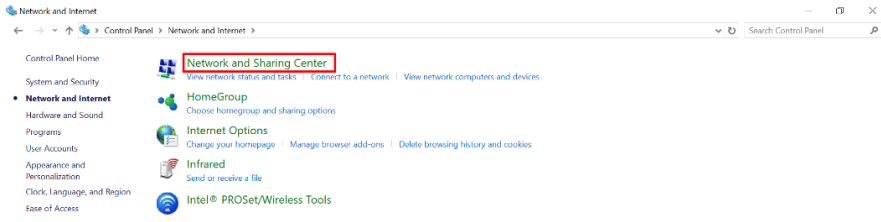
Wireless Access (WiFi Access): Refer to the Terminal WiFi SSID and password described in ***Section 4.4 User access information***, use a device with WiFi function to search for the WiFi SSID issued by the ESA50 Terminal and enter the corresponding password to connect.

Before carrying out service data transmission, the IP transfer mode of the wired network equipment needs to be set to DHCP, as follows.

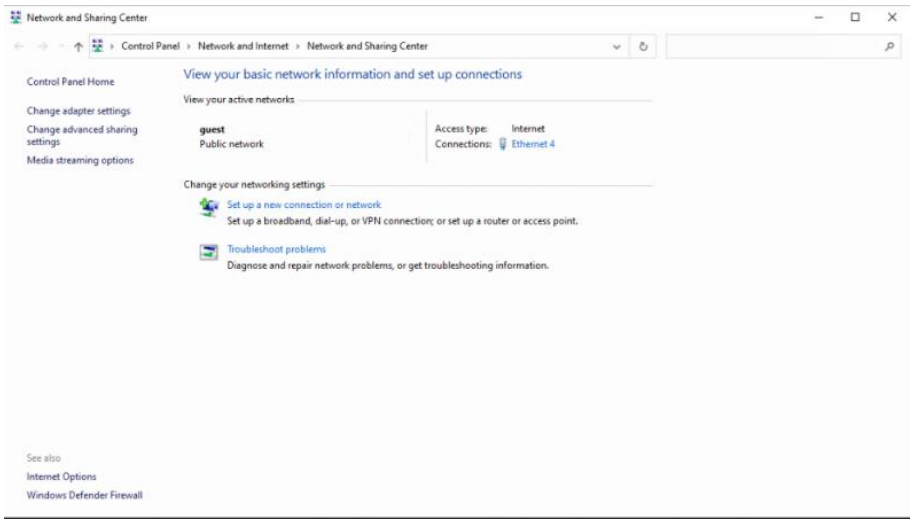
(1) In the Control Panel, click on "Network and Internet"



(2) Click on "Network and Sharing Centre" and go to the next level.



(3) Click on "Change adapter settings" to access the network adapter menu.



(4) Right-click on "Ethernet" and select "Properties".

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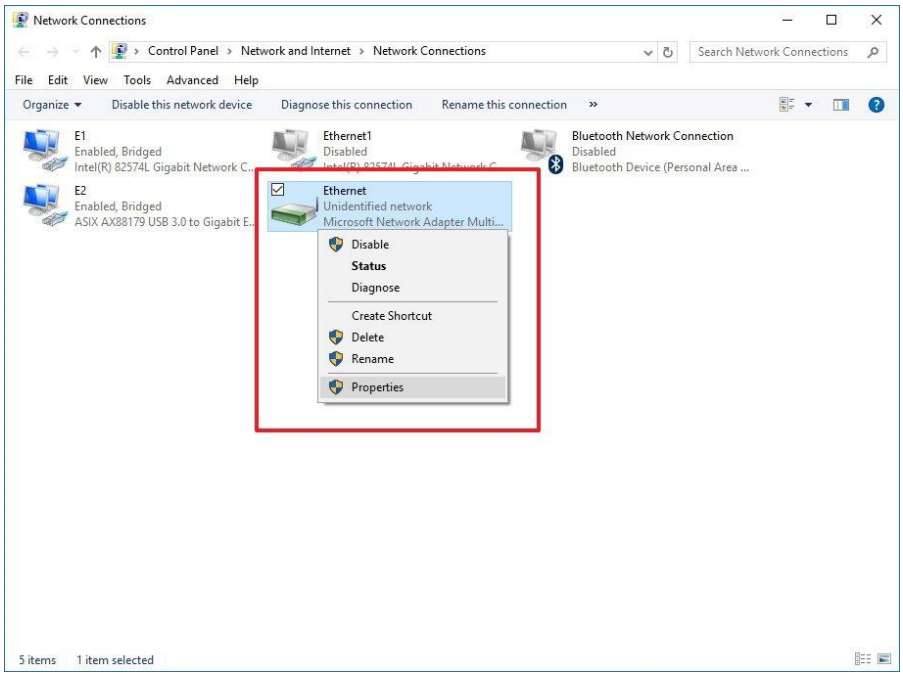
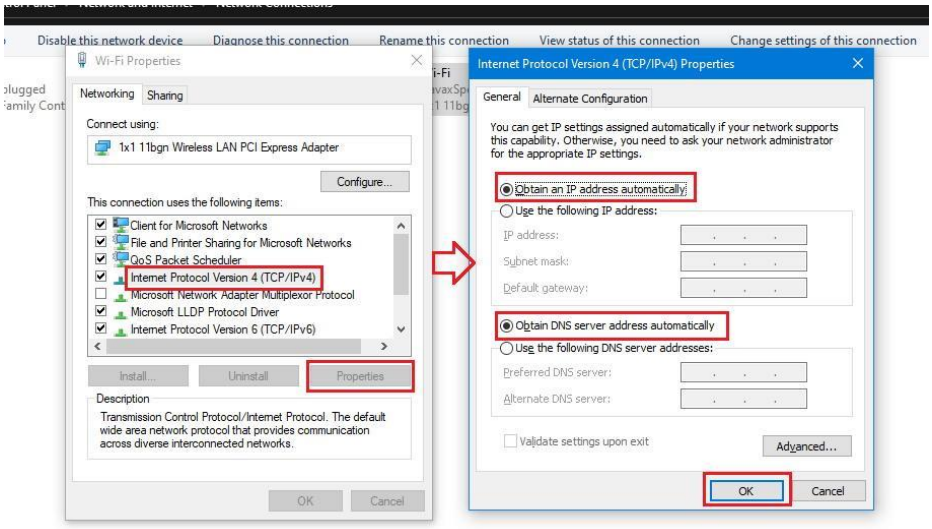


(5) Double-click on "Internet Protocol Version 4 (TCP/IPV4)" to go to the next level of general settings.

(6) Click on the radio button before "Obtain IP address automatically", click on the radio button before "Obtain DNS server automatically" and finally click on the confirm button.



iv. RF Cable Access

When external modem is connected, one end of the RF cable is connected to the terminal RF transmitting port and the other end is connected to the modem RF transmitting port; Then the other RF cable is connected to the terminal RF receiving port at one end and the modem RF receiving port at the other end. As shown in Figure 6-4.

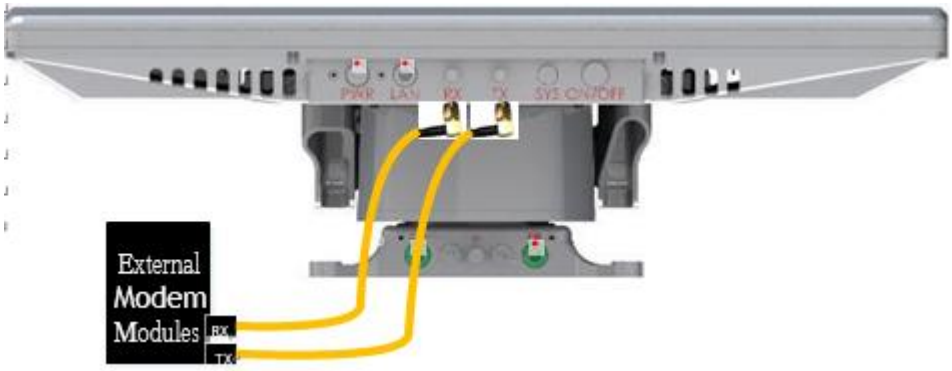


Figure 6-4 RF cable access

6.2 HSA-PUF Interface Definition and Access

i. Interface Definition

There are five main interfaces between the main body of the terminal and the physical interface of the turntable as follows:

Power Port: Industrial grade waterproof aviation plug, connected with an adapter;

LAN Port: Industrial grade waterproof aviation plug, connected with a network cable;

RF Port: SMA interface, connected with an RF cable when an external modem is used;

Switch Button: When the Terminal off, press once briefly to switch the Terminal on, press once more briefly to switch the Terminal off;

Status Indicator:

Description of the Indicator Status	
Green Quick Flash	Aligning Satellite
Green Slow Flash	Satellite Alignment Completed
Always on red	Fault Prompt

The specific interfaces are defined as shown in Figure 6-5 below.

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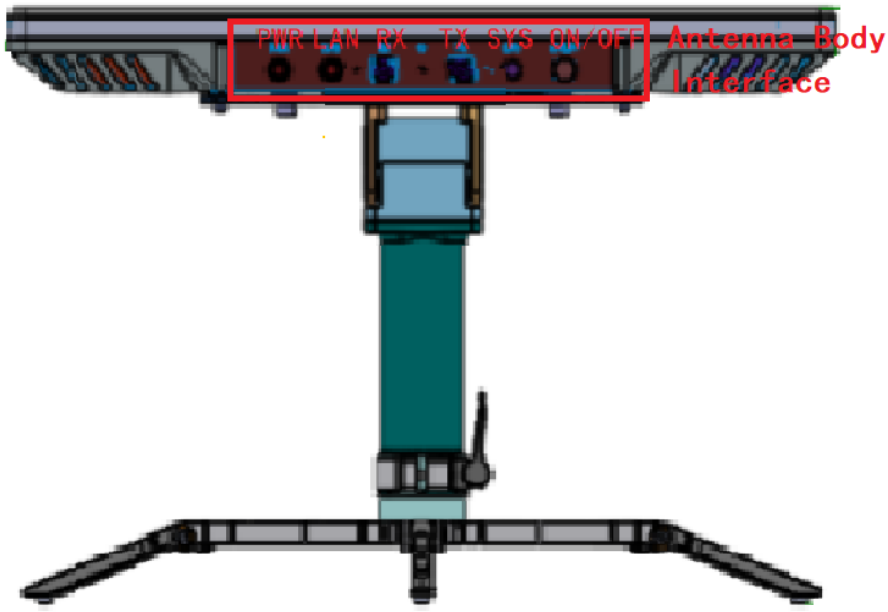

Figure 6-5 HSA-PUF Interface Definition

PWR (Antenna Body)	Power Supply Cable Port
LAN (Antenna Body)	Network Cable Connect Port
RX	RF Rx Port
TX	RF Tx Port
SYS	Status Indicator
ON/OFF	Power On or Off the Terminal
LAN (Turntable)	Network Cable Connect Port
PWR (Turntable)	Power Supply Cable Port

ii. Power Supply Access

Insert the red dot on the aviation plug end of the matching power adapter, aligning it with the red dot on the PWR connector of the turntable, and then insert the plug end of the adapter connect to 220V AC power. As shown in Figure 6-6.

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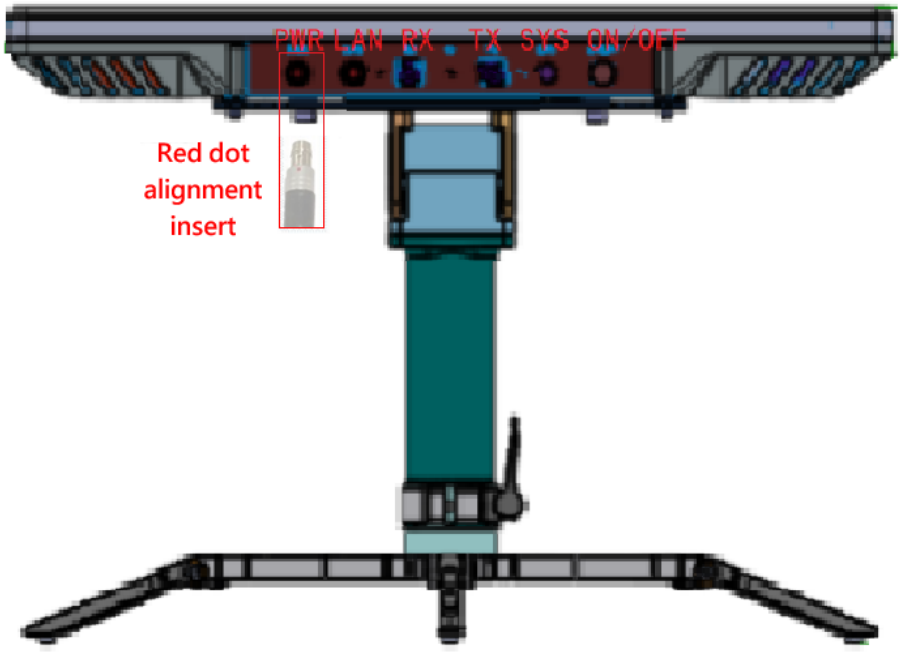

Figure 6-6 Power Supply Access

iii. Data Access

The ESA50 Terminal has two types of data access: Wired access and Wireless access.

Wired Access: Use the matching network cable access to insert the red dot of the aviation plug end of the cable against the red dot of the LAN port of the Terminal, and another end into the RJ45 interface of the wired network equipment, as shown in Figure 6-7.

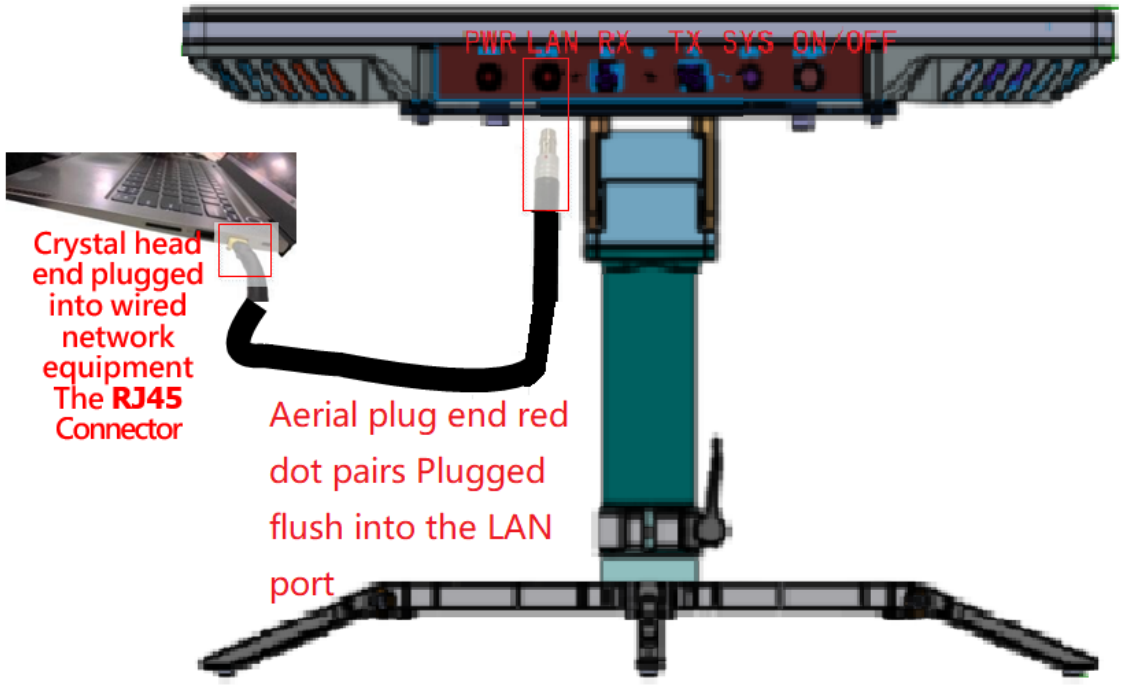

Figure 6-7 Data Access

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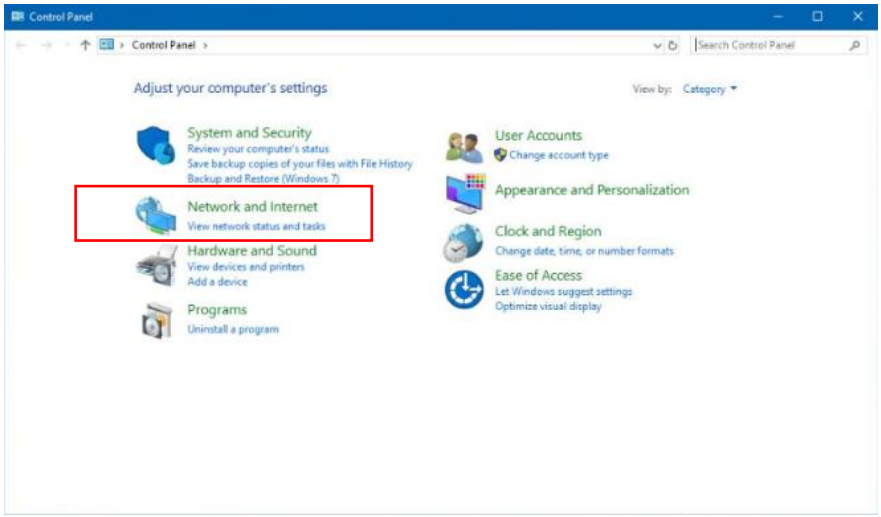
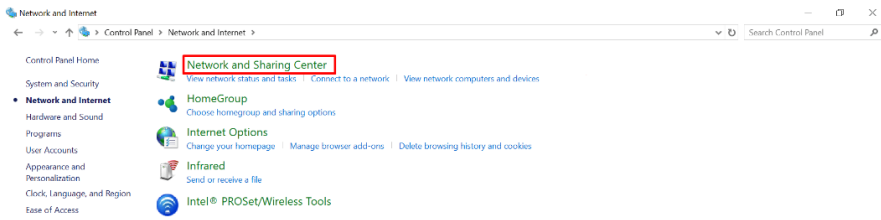
Wireless Access (WiFi Access): Refer to the Terminal WiFi SSID and password described in ***Section 4.4 User access information***, use a device with WiFi function to search for the WiFi SSID issued by the ESA50 Terminal and enter the corresponding password to connect.

Before carrying out service data transmission, the IP transfer mode of the wired network equipment needs to be set to DHCP, as follows.

(7) In the Control Panel, click on "Network and Internet"



(8) Click on "Network and Sharing Centre" and go to the next level.



(9) Click on "Change adapter settings" to access the network adapter menu.

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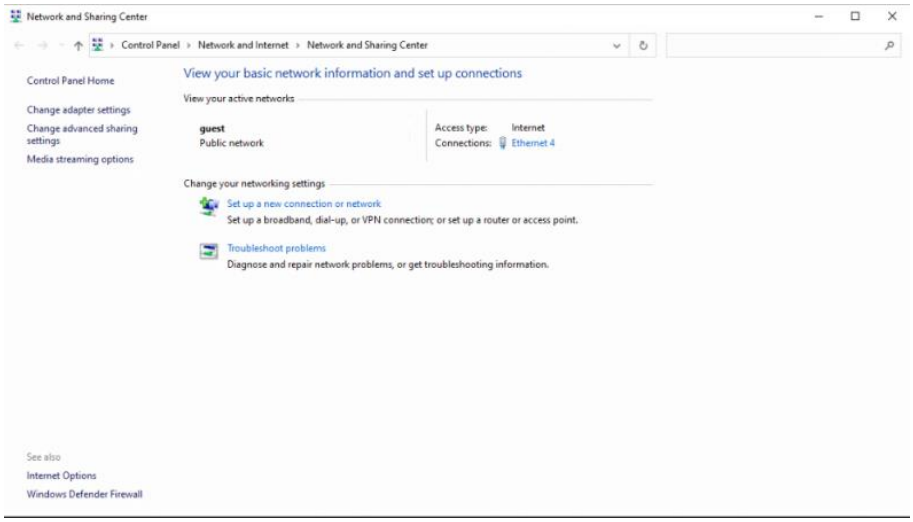
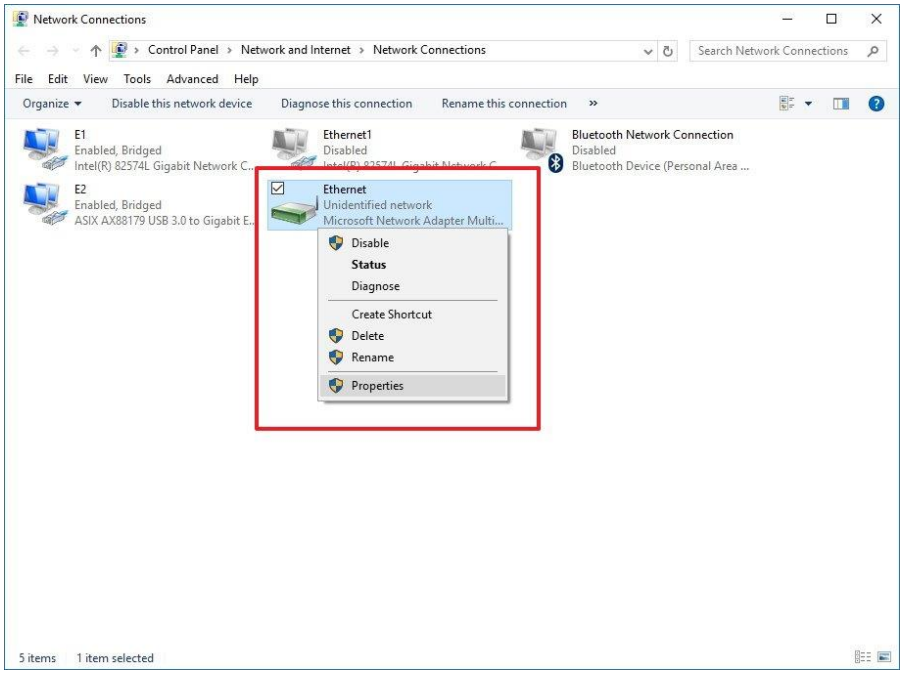
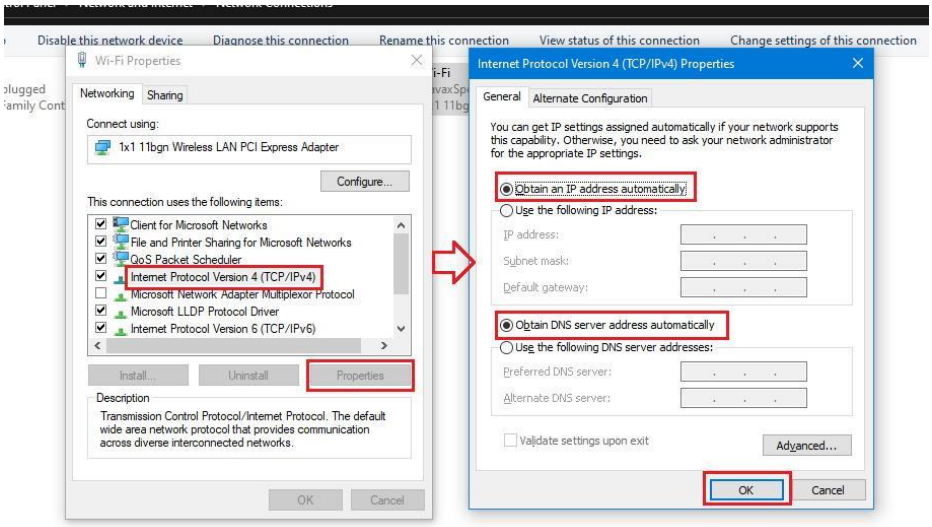


(10) Right-click on "Ethernet" and select "Properties".



(11) Double-click on "Internet Protocol Version 4 (TCP/IPV4)" to go to the next level of general settings.

(12) Click on the radio button before "Obtain IP address automatically", click on the radio button before "Obtain DNS server automatically" and finally click on the confirm button.



iv. RF Cable Access

When external modem is connected, one end of the RF cable is connected to the terminal RF transmitting port and the other end is connected to the modem RF transmitting port; Then the other RF cable is connected to the terminal RF receiving port at one end and the modem RF receiving port at the other end. As shown in Figure 6-8.

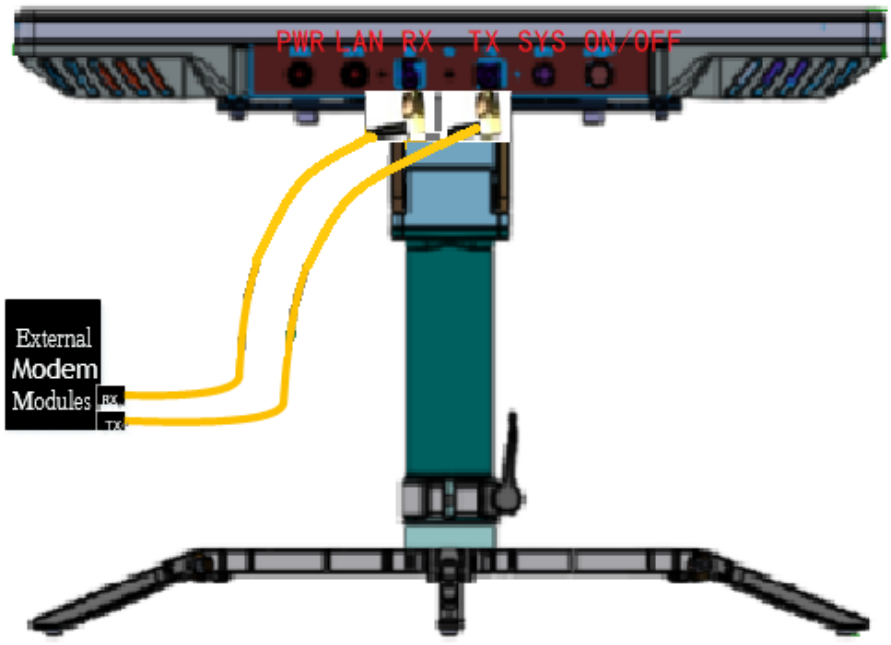


Figure 6-8 RF cable access

6.3 ESA-MUF Interface Definition and Access

i. Interface Definition

There are five main interfaces between the main body of the terminal and the physical interface of the turntable as follows:

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Power Port: Industrial grade waterproof aviation plug, connected with an adapter;

LAN Port: Industrial grade waterproof aviation plug, connected with a network cable;

RF Port: SMA interface, connected with an RF cable when an external modem is used;

Switch Button: When the Terminal off, press once briefly to switch the Terminal on, press once more briefly to switch the Terminal off;

Status Indicator:

Description of the Indicator Status	
Green Quick Flash	Aligning Satellite
Green Slow Flash	Satellite Alignment Completed
Always on red	Fault Prompt

The specific interfaces are defined as shown in Figure 6-9 below.

Figure 6-9 ESA-MUF Interface Definition

PWR (Antenna Body)	Power Supply Cable Port
LAN (Antenna Body)	Network Cable Connect Port
RX	RF Rx Port
TX	RF Tx Port
SYS	Status Indicator
ON/OFF	Power On or Off the Terminal
LAN (Turntable)	Network Cable Connect Port
PWR (Turntable)	Power Supply Cable Port

ii. Power Supply Access

Insert the red dot on the aviation plug end of the matching power adapter, aligning it with the red dot on the PWR connector of the turntable, and then insert the plug end of the adapter connect to 220V AC power. As shown in Figure 6-10.

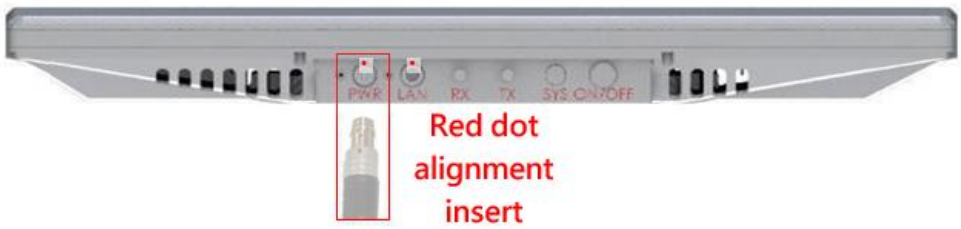

Figure 6-10 Power Supply Access

iii. Data Access

The ESA50 Terminal has two types of data access: Wired access and Wireless access.

Wired Access: Use the matching network cable access to insert the red dot of the aviation plug end of the cable against the red dot of the LAN port of the Terminal, and another end into the RJ45 interface of the wired network equipment, as shown in Figure 6-11.

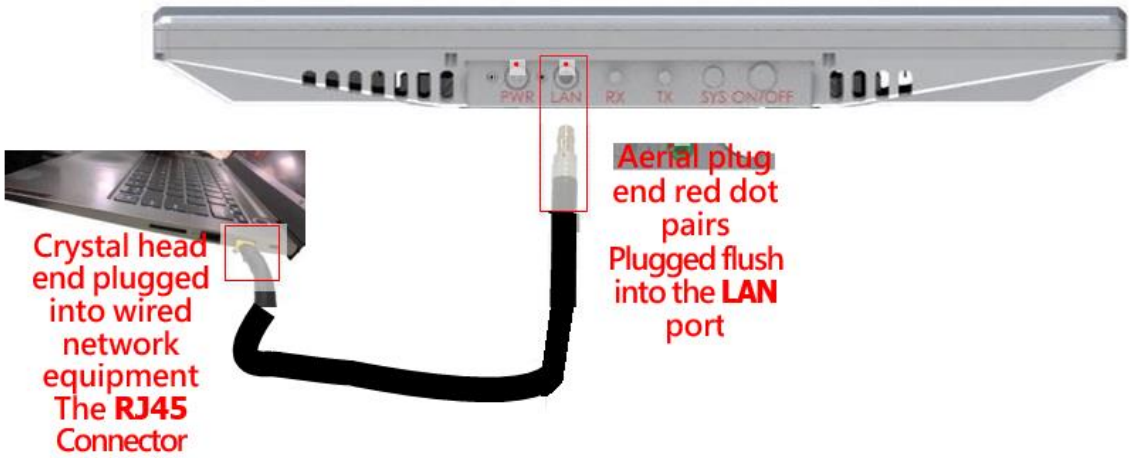

Figure 6-11 Data Access

Wireless Access (WiFi Access): Refer to the Terminal WiFi SSID and password described in ***Section 4.4 User access information***, use a device with WiFi function to search for the WiFi SSID issued by the ESA50 Terminal and enter the corresponding password to connect.

Before carrying out service data transmission, the IP transfer mode of the wired network equipment needs to be set to DHCP, as follows.

(13) In the Control Panel, click on "Network and Internet"

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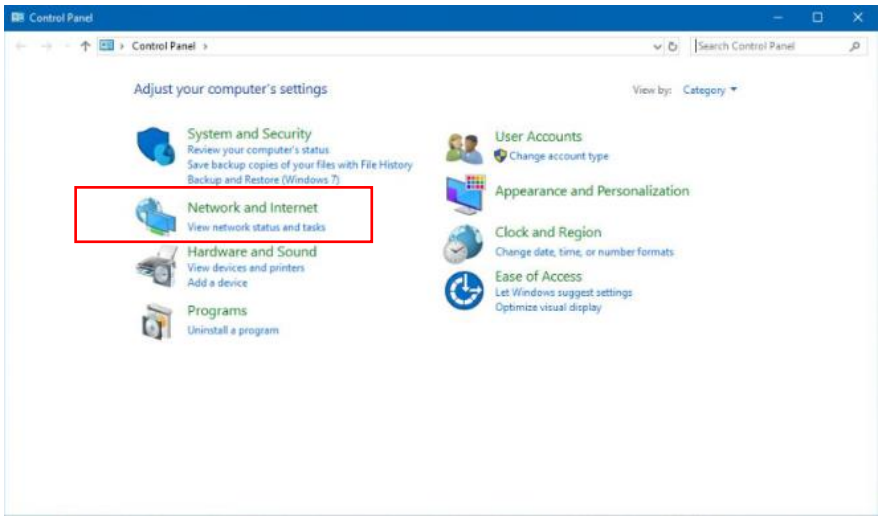
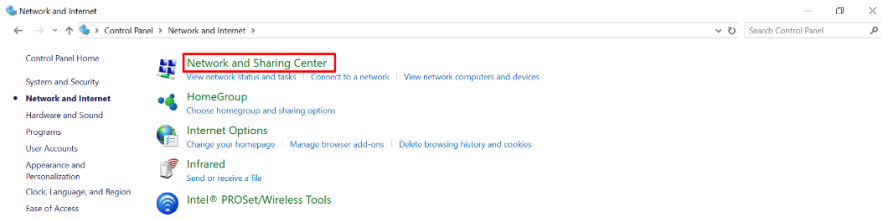
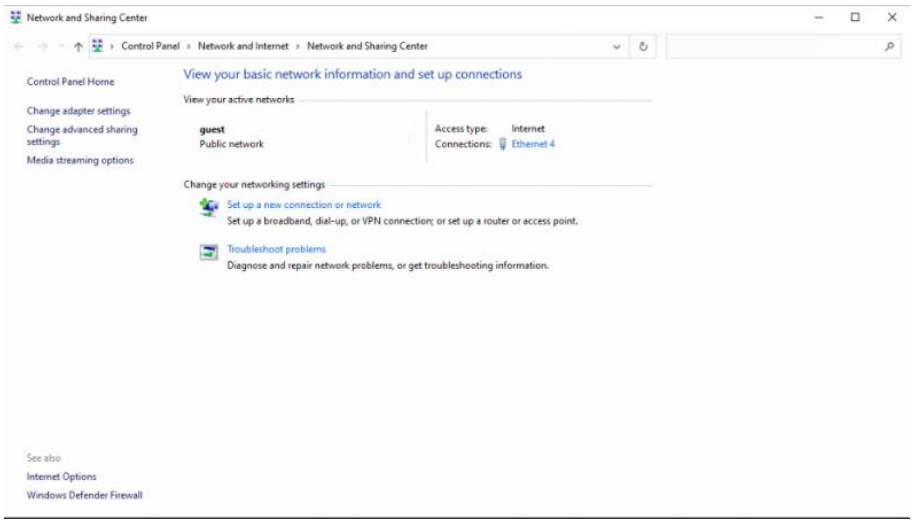


(14) Click on "Network and Sharing Centre" and go to the next level.



(15) Click on "Change adapter settings" to access the network adapter menu.



(16) Right-click on "Ethernet" and select "Properties".

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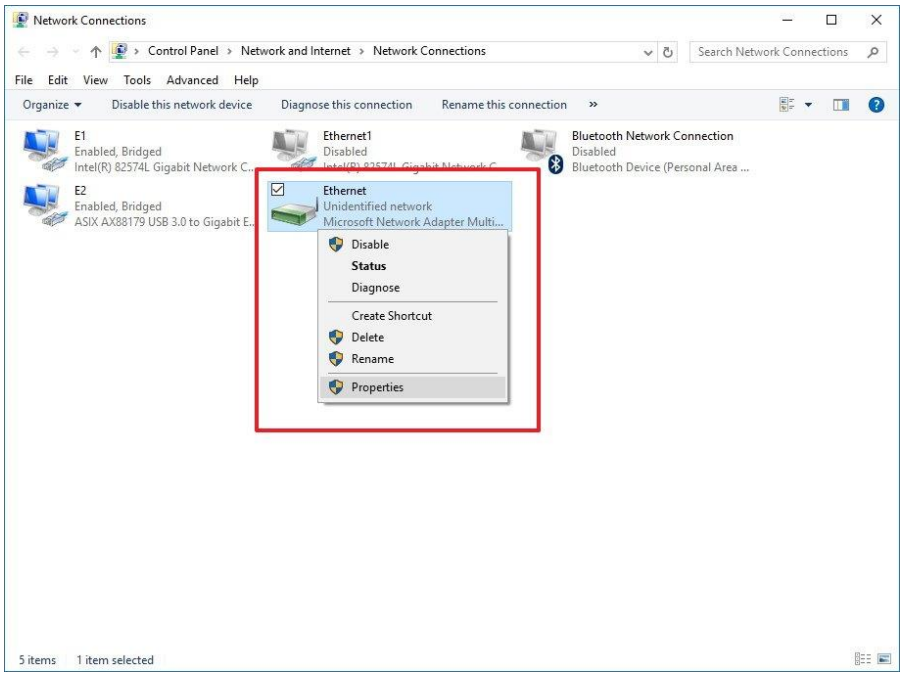
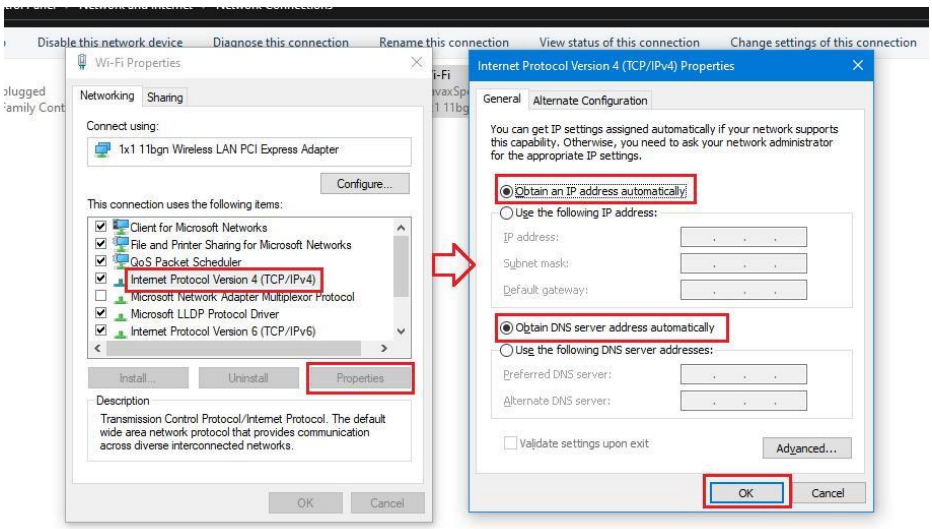


(17) Double-click on "Internet Protocol Version 4 (TCP/IPV4)" to go to the next level of general settings.

(18) Click on the radio button before "Obtain IP address automatically", click on the radio button before "Obtain DNS server automatically" and finally click on the confirm button.



iv. RF Cable Access

When external modem is connected, one end of the RF cable is connected to the terminal RF transmitting

port and the other end is connected to the modem RF transmitting port; Then the other RF cable is connected to the terminal RF receiving port at one end and the modem RF receiving port at the other end. As shown in Figure 6-12.

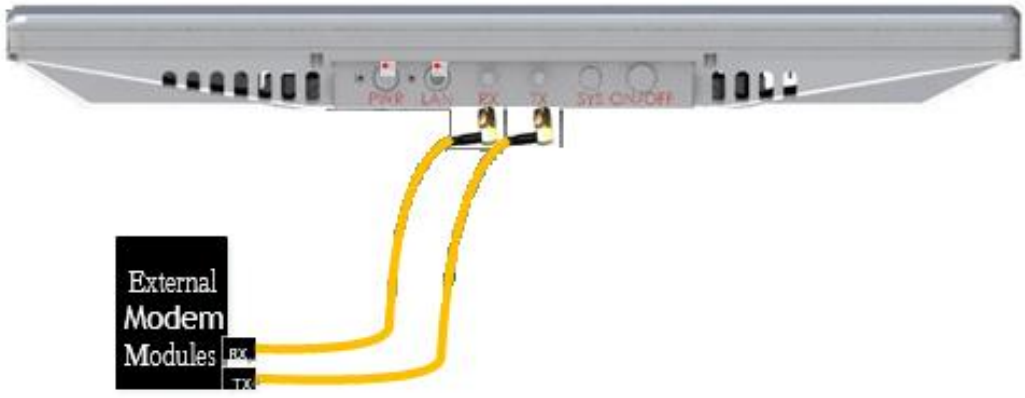


Figure 6-12 RF cable access

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7 Terminal Alignment

The terminal is equipped with the function of automaticaly acquiring location information. In case of obstruction or weak GPS signal, the automatic acquisition of satelite information may be delayed and alignment cannot be performed until the location information is determined. In this case, the GPS location information can be entered manually by refer to ***Section 8.4***.

7.1 Basic Alignment Operation

Note: Do not artificially block the movement of the Terminal panel after it has moved up; If there is any abnormal movement, power should be disconnected immediately.

a) Switch on the power, press the ON/OFF button briefly to switch on, the terminal body will start elevation calibration and start acquiring GPS in a horizontal position.

b) After the GPS has obtained the position information, the terminal will start to align the satellite automatically, at this time the terminal light flashes green; After the satellite have been successfully aligned, the Terminal will automatically control the network access, at this time the light flashes green slowly.

Note: For the setting of satellite searching parameters, refer to *Section 8.3* for satellite parameter settings.

7.2 Status Checking

For the description of checking the status of satellite alignment, refer to ***Section 8.3*** and ***8.4***.

8 Terminal Web UI Using Guidance

8.1 Web Login

① After performing the data access operation according to ***Section 6.2.2***, open the Edge browser or Chrome and enter 192.168.0.2 in the URL bar to enter the login screen as shown in Figure 8-1.

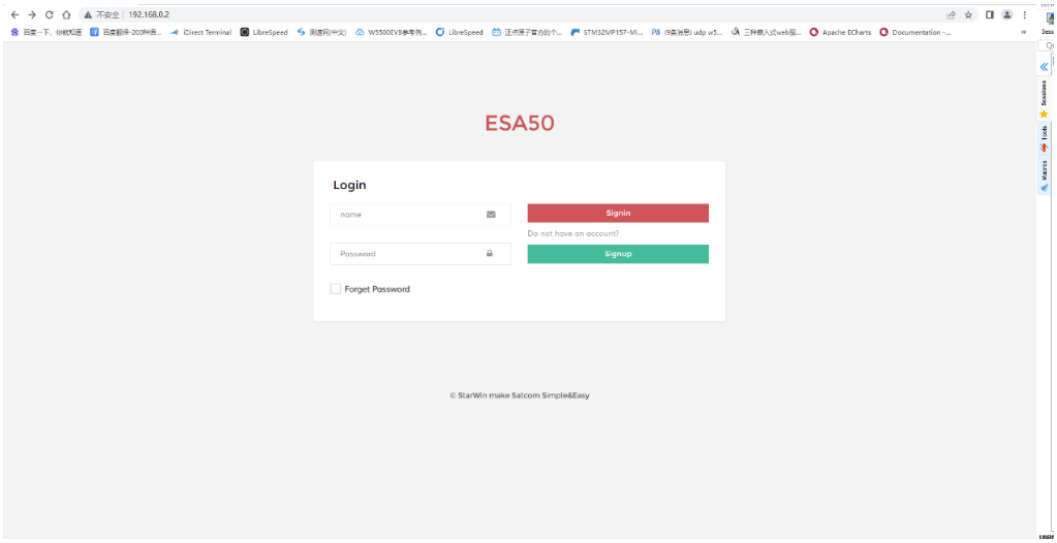

Figure 8-1 Login Interface

② Click on the Signin button (no account password required) to access the main screen, as shown in Figure 8-2.

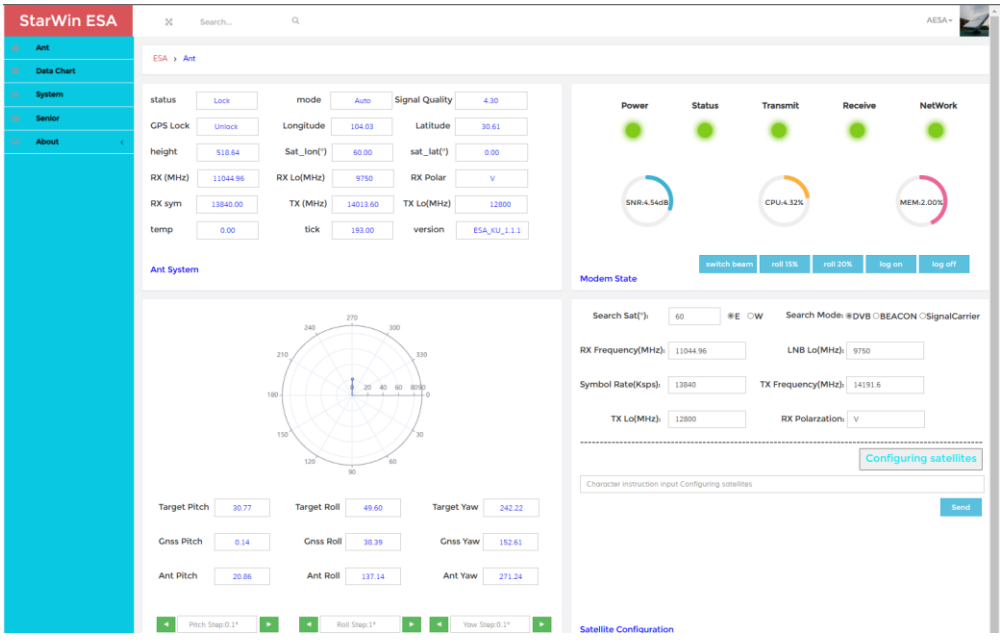

Figure 8-2 Main Interface

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8.2 Web Page Introduction

The main interface is divided into left and right sides, with the left side being the contents bar and the right side being the information display bar, as shown in Figure 8-3 below.

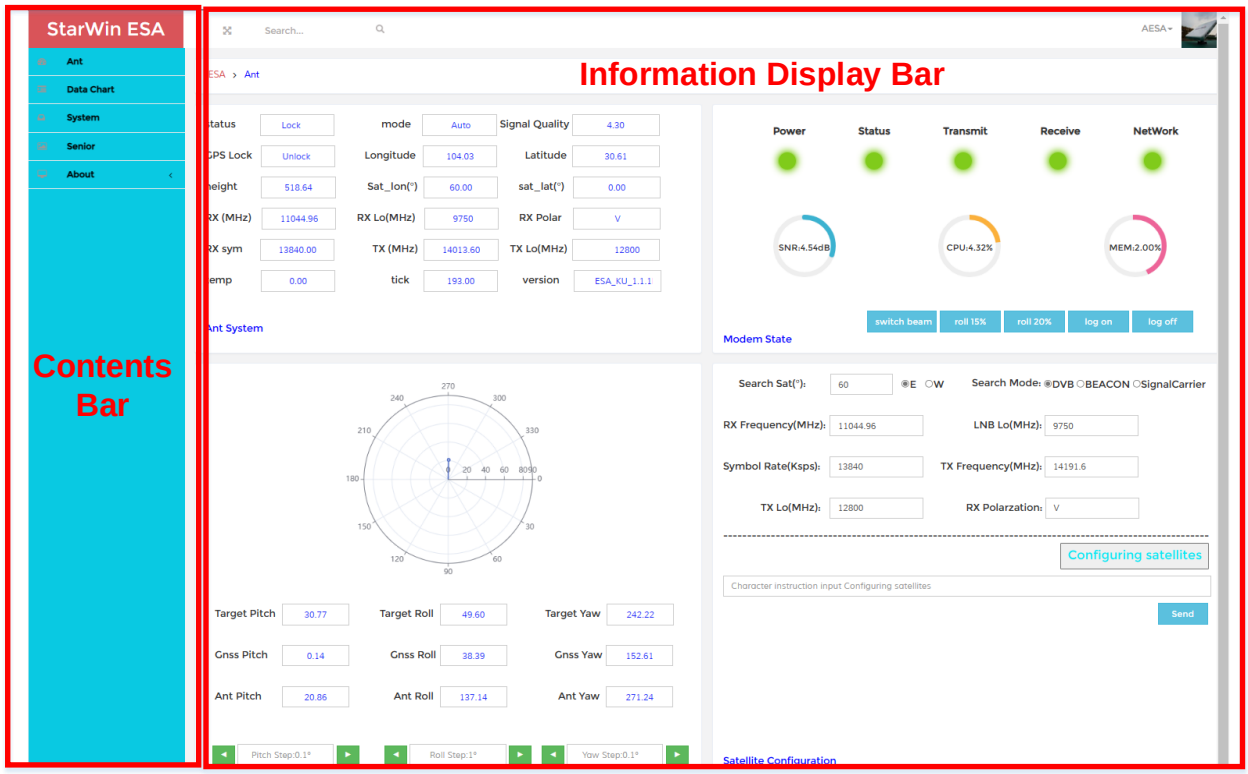

Figure 8-3 Web Page Introduction

The contents bar shows the framework of the interface contained in the page and serves as navigation; The information display bar, which is used to show the content of the selected interface. The comparison table of the meaning of the contents bar is as follows:

Ant	Antenna Main Control Interface
Data Chart	Dynamic Data Interface
System	Firmware Interface
Senior	Space-Earth Integrated Interface
About	FAQ

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8.3 Antenna Main Control Interface (Ant)

The interface, which consists of four main modules, Ant System, Modem State, Attitude Control and Satellite Configuration, as shown in Figure 8-4.

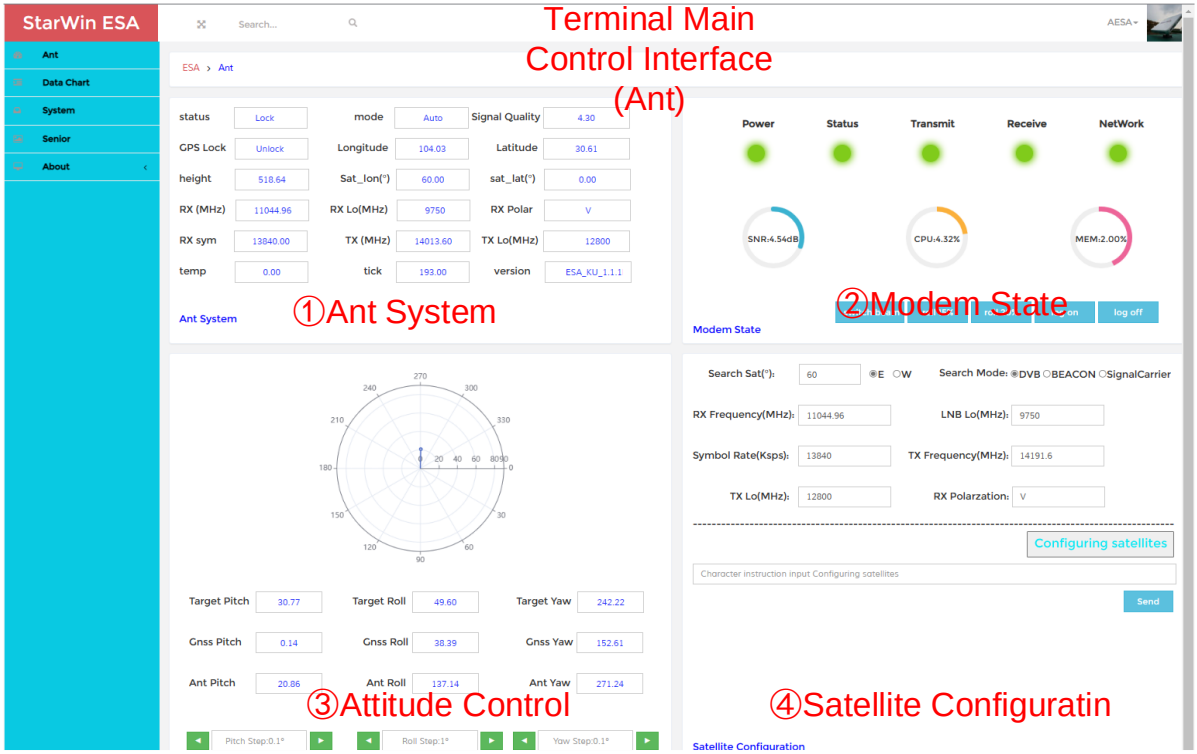

Figure 8-4 Composition of the antenna main control interface

In this interface, you can view antenna status information, Modem status, real-time attitude information, satellite information; switch beams, configure satellite parameters, manually control the attitude of the equipment and other operations. The detailed content functions are shown in Table 8.1 below.

Table 8.1 Antenna Main Control Interface Menu

Modules	Contents	Role	Remarks
Ant System	Terminal Status	Real-time display of antenna status and parameter status	
	Working Mode		
	Signal Quality		
	GPS Lock Status		
	GPS Latitude and Longitude		
	Longitude of the satellite being used		
	Rx Frequency		
	Rx Local Oscillation		

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	Rx Symbol Rate		
	Rx Polarization		
	Tx Frequency		
	Tx Local Oscillation		

	Panel Temperature		
	Running Time Stamp		
	Software Versions		
Modem State	Modem Power Status Indicator	Real-Time Display	
	Rx Status Indicator		
	Tx Status Indicator		
	Network Access Status Indicator		
	SNR Display		
	CPU Percentage Display		
	MEM Percentage Display		
	Switching Beams	Control	
	15%, 20% roll-off	Modify and adapt to different satellites	
	OpenAMIP's log printing on and off	Control	Print window for kernel user terminals
Attitude Control	Attitude Target Angle	Real-time calculation display	
	Attitude Real-Time Angle	Real-time display	
	Antenna Pointing Angle	Real-time calculation display	

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	Tri-axis angle setting	Manual Control	Press the left button to decrease and the right button to increase, filling in the step values in between; Judge whether the modification is successful by viewing the real-time angle
Satellite Configuration	Terminal Longitude	Satellite Parameters Configuration	
	Search Mode		Mode fixed to DVB, no other modes available
	Rx Frequency		
	Rx Local Oscillation		
	Polarization		
	Symbol Information Rate		
	Tx Frequency		
	Tx Local Oscillation		If the transmitting parameters cannot be determined, the antenna default parameters
	Satellite Alignment Calculation	Calculate the standard alignment satellite angle	Function not open
	Configuring Satellites	Configure satellite parameter issue button	
	Character Instruction Input Configuring Satellites	Near-orbiting satellites, input Ephemeris characters	Click “send” to send

8.4 Dynamic Data Interface (Data Chart)

The interface, which is divided into four main modules: AGC&SNR display, Internal and External Modem Switching, GPS Configuration, and Log Printing, as shown in Figure 8-5.

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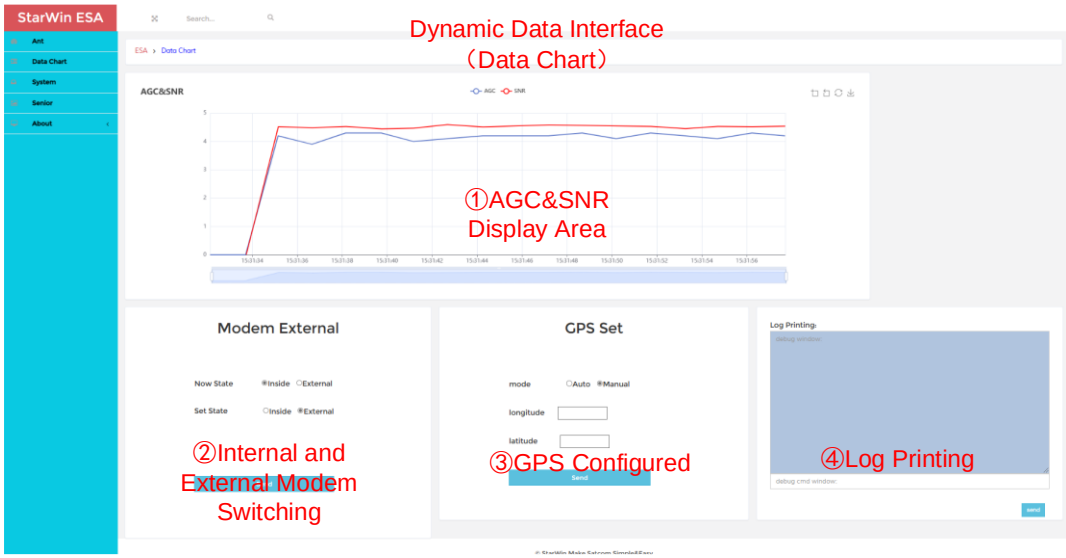

Figure 8-5 Data Dynamic Interface Composition

In this page, you can view the status graph of AGC&SNR; GPS settings, Modem internal and external, etc. See Table 8.2 for specific content functions.

Table 8.2 Data Dynamic Interface Menu

Modules	Contents	Function	Remarks
AGC&SNR	Real-time curves for AGC and SNR	Real-time display and check	
GPS Configuration	Mode Selection	Switching configurations	Automatic and Manual Modes
	GPS latitude and longitude	Input	
	Send Button	Issue Parameters	
Log Print	Printed Content Display Box	Display	
	Command Input	Control	
Internal and External Modem Switching	Current Status	Real-time display and check	
	Setting status	Internal and External Options	
	Send Button	Issue Parameters	

8.5 Firmware Interface (System)

This interface is mainly used for firmware burning and is not open to the public, as shown in Figure 8-6.

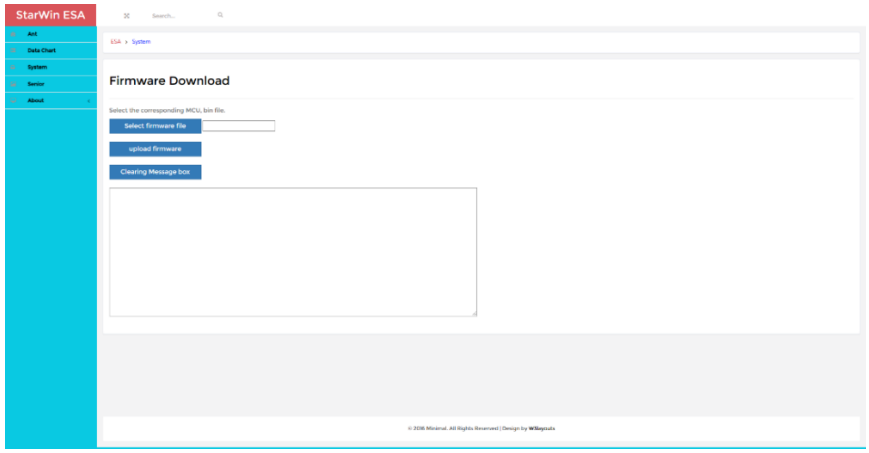

Figure 8-6 Firmware Interface

8.6 Space-Earth Integrated (Senior)

This interface mainly shows the integrated, global satellite terminal use, as shown in Figure 8- 7.

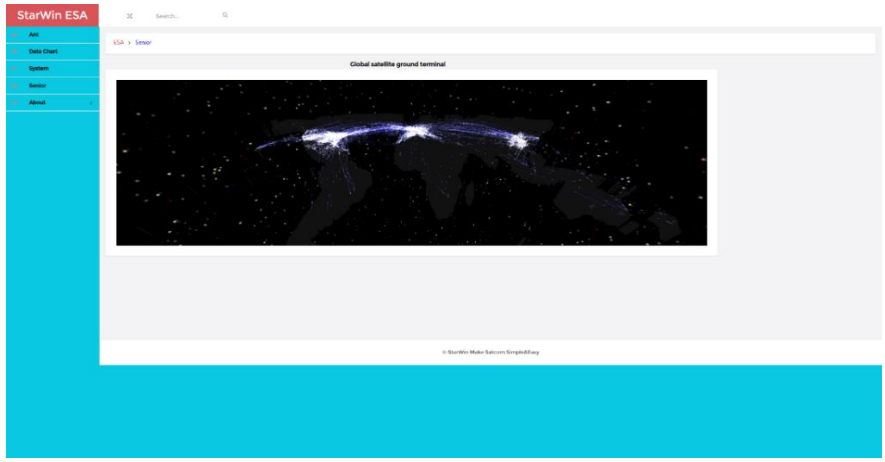

Figure 8-7 Space-Earth Integrated

8.7 FAQ

This page mainly displays some of the FAQs, as shown in Figure 8-8.

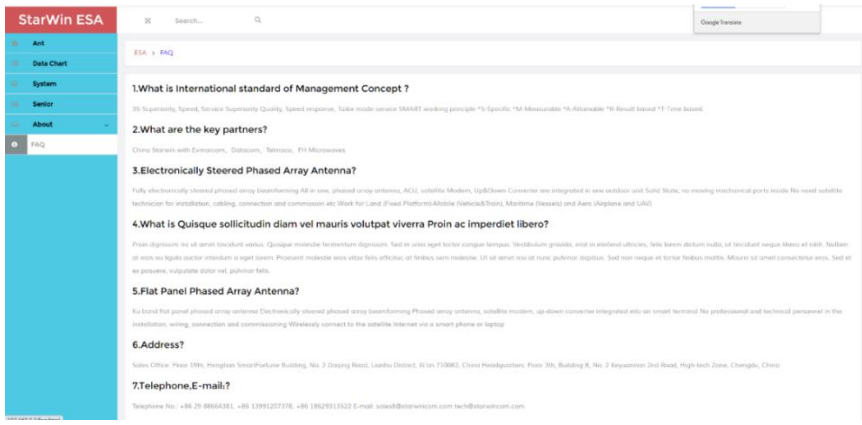

Figure 8-8 Frequently Asked Questions Page

9 Troubleshooting and Maintenance

9.1 Troubleshooting

Item	Problem and Indication	Corrective Action
1	Indicator light flashes red	Contact supplier
2	Antenna not working	Press the “POWER ON/OFF” button； Or reconnect the power
3	No GNSS signals acquisition	Verify the terminal is under the open sky/has an unobstructed view. Reboot
4	Terminal can not lock the satellite	Check whether the Terminal configuration parameters, and Modem configuration parameters are correct
5	Terminal aligns to the wrong satellite	Check web to re-enter satellite information
6	The display indicates the terminal is in normal operational state but there is no data transfer	Verify that LAN or Wi-Fi are properly connected

9.2 Maintenance

The Terminals parameters and performance can remain stable and provide normal operation for at least 10 years under a regular maintenance schedule. The periodical maintenance work includes:

1. Antenna system - it is highly recommended that a comprehensive examination of the entire system is completed, periodically, along with a thorough check of all the adjustment mechanisms.
2. Visual verification of terminal protective casing surface damages. If there is a damage, the special spray (NOT included in the standard system configuration) should be applied.
3. Check that all the screw fastenings are tight.
4. Close check of the antenna to look for any damage or cracks.
5. Regular cleaning of the terminal and antenna radome surfaces. Remove all dust, dirt, condensed salt and other contamination that may harm the signal quality and the terminal’s performance.

10 Technical Service Contact

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Emergency Support

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11 Production Spec

Product Name:	Hybrid Electronic Steering Terminal FulI Dimension Electronic Steering Terminal
Model No.:	HSA-MUF, ESA50,,HSA-PUF, ESA-MUF
Software	KU_1.12B
Hardware	HSA43095MUF-V2.0
Wi-Fi Specification:	802.11b/g/n-HT20: 2412 ~ 2462MHz 802.11n-HT40: 2422 ~ 2452MHz
Satellite Specification:	Transmit: 13.75~14.50GHz Receive: 10.70~12.75GHz
GNSS Specification:	GPS, BDS

Statement: There are no restrictions of use in Member States.

EU declaration of conformity

China Starwin Science & Technology Co., Ltd hereby declares that the device is in compliance with the essential requirements and other relevant requirements of RED Directive 2014/53/EU.

Technical Service Contact Information

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FCC Statement

The device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

Danger: FCC Radio Frequency Exposure Information

In order to comply with RF exposure requirements, antennas must be installed to ensure a minimum separation distance of at least 185cm(For out range of +5 degreeson-axis) and 3100cm(For +5 dearees on-axis) away from the body of the user, and must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with accepted multi-transmitter product procedures.

Appendix 1 Other Statements

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Ltd. shall not be liable to the Buyer or any third party for any lost profits, loss of use, business interruption or any indirect, special, incidental, punitive or consequential damages of any kind, whether for breach of contract, tort (including negligence), strict liability or otherwise and whether based on this Agreement or otherwise, even if advised of the possibility of such damages.

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Notes on electromagnetic emissions

The operation of the equipment is influenced by the following two conditions.

- This equipment does not cause harmful interference.
- Other disturbances that this equipment is bound to pick up, including those that may cause unintended operation.

Note

- To avoid electric shock, do not carry out any maintenance operations unless you are qualified to do so.
- Before connecting the unit to the mains, make sure that the mains voltage is appropriate for the unit.

Disposal of Electronic and Electrical Waste

According to the WEEE EU Directive, electronic and electrical waste must not be disposed of together with unsorted waste. Please contact your local recycling facility to dispose of this product.

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- Some of the equipment specified in this manual is manufactured and warranted by a third party. All such equipment must be installed and handled in full compliance with the instructions provided by the manufacturer accompanying this manual, or as subsequently provided by China Starwin Science & Technology Co., Ltd.
- Failure to follow these instructions may result in serious damage, personal injury, rendering the user unable to operate the equipment and voiding the warranty provided by such manufacturer.

Instructions

The use of this terminal requires a clear view of the sky above to maximise the reception and transmission of the signal. Other factors such as satellite coverage areas and weather also have an impact on signal quality. You must be within the coverage area of the satellite in order to transmit and receive signals properly. When you use it outside the satellite coverage area, the signal will be weak or lost.

The terminal needs a clear line of sight pointing in the direction of the satellite for uninterrupted signal reception and transmission. Objects such as buildings, mountains, bridges, tunnels and trees that obstruct this view can cause signal loss. However, once the antenna has a clear line of sight again, the signal is quickly restored. Adverse weather conditions may also interfere with signal reception and transmission. Stray signals from radio or TV broadcast towers may also affect the satellite signal.

If necessary, clean the radome with a clean soft cloth. Some aftermarket water repellents can also be used to help reduce the accumulation of rain and dew on the terminal Water.

Appendix 2 Technical Service Contact Information

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