SATLAB
GEOSOLUTIONS

Manual Revision

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Njord

User Manual

Preface

Introduction

Welcome to the SatLab Njord. This introduction describes how to use this product.

Experience Requirement

In order to help you use SatLab series' products better, we suggest you carefully read the instructions. If you are unfamiliar with the products, please refer to http://www.Satlab.com.cn/

Tips for Safe Uses

Notice: The contents here are special operations and need your special attention. Please read them carefully.

Warning: The contents here are very important. Wrong operation may damage the machine, lose data, break the system and endanger your safety.

Exclusions

Before using the product, please read these operating instructions carefully: they will help you to use it better. SatLab Surveying Instrument Co., Ltd assumes no responsibility if you fail to operate the product according to the instructions, or operate it wrongly due to misunderstanding the instructions.

SatLab is committed to constantly perfecting product functions and performance, improving service quality and we reserve the right to change these operating instructions without notice.

We have checked the contents of the instructions the software and hardware, without eliminating the possibility of error. The pictures in the operating instructions are for reference only. In case of non-conformity with products, the products shall prevail.

Technology and Service

If you have any technical issues, please call SatLab's technology department for help.

Relevant Information

You can obtain this introduction by:

1. Purchasing SatLab products: you will find this manual in the instrument container to guide you on operating the instrument.
2. Logging onto the SatLab official website, downloading the electronic version introduction at "Download center" "Partners" "Partner center".

Advice

If you have any comments and suggestions for this product, please email info@Satlab.com.se. Your feedback will help us to improve the product and service.

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Chapter 1

Appearance and interface

This chapter contains:

-Forword

-Features

-Use and precautions

1.1 Foreword

The Njord series is the SatLab's new-generation multi-GNSS, multi-frequency position, position and heading receiver designed specifically for marine and construction applications with the capability of L-Band correction and multiple I/O interfaces for versatile data communication.

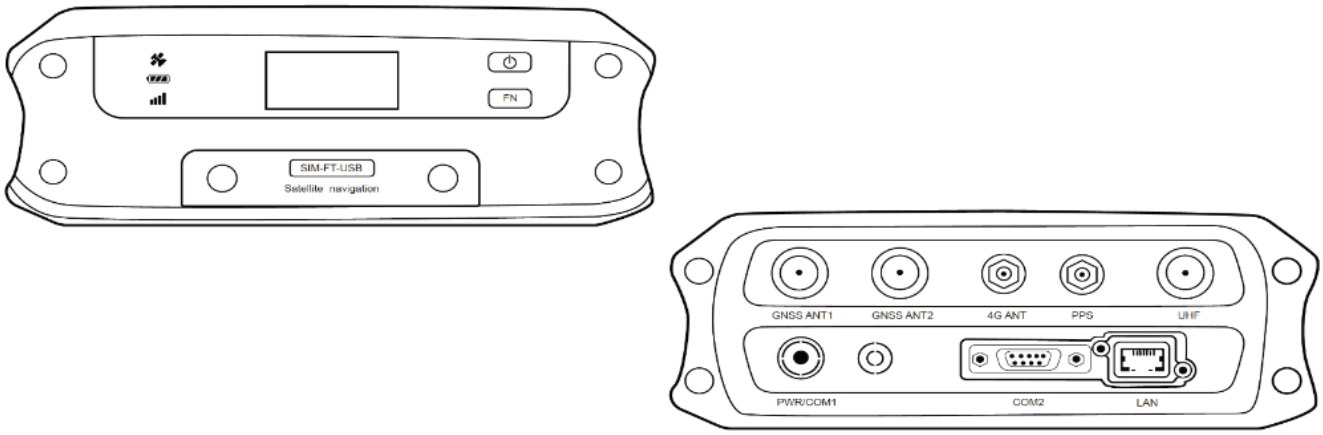


Figure 1-1-1 Front and Rear

1.2 Features

1. Convenient front panel display and configuration

2. Multiple I/O ports for different signals and purposes

3. Radio, cellular internet and cable and other kinds of communication

4. Advanced satellite tracking with multi-frequency, multi-GNSS and L-Band capability

5. RTK XTRa technology provides seamless RTK performance during connection outage

1.3 Use and precautions

The Njord GNSS receiver is designed with chemical and impact resistance, but precision instruments require careful use and maintenance.

Notice: The receiver must be within the specified temperature range when it is used and stored. For detailed requirements, please refer to Chapter 3: Technical specification.

In order to ensure the continuous tracking observation of the satellite and quality of the satellite signal, the space above the station should be as wide as possible, and there should be no obstacles above the 15° elevation angle. To reduce the interference of various electromagnetic waves on the GNSS satellite signal, there should be no strong electromagnetic interference within a range of about 200m around the station, such as TV towers, microwave stations, and high-voltage transmission lines. To avoid or reduce the occurrence of multipath effects, the station should be away from terrain and features with strong reflectors, such as high-rise buildings, water, etc.

Chapter 2

Product introduction

This chapter contains:

- Appearance and I/O ports
- Button & LED
- Display function
- Web management system

2.1 Appearance and I/O ports

Product over all exterior as shown below:

Figure 2-1-1

External interfaces include GNSS antenna interface, 4G antenna interface, PPS interface, UHF interface, standard LAN interface, DB9 interface, small five-pin interface, SIM card and SD card interface, USB interface.

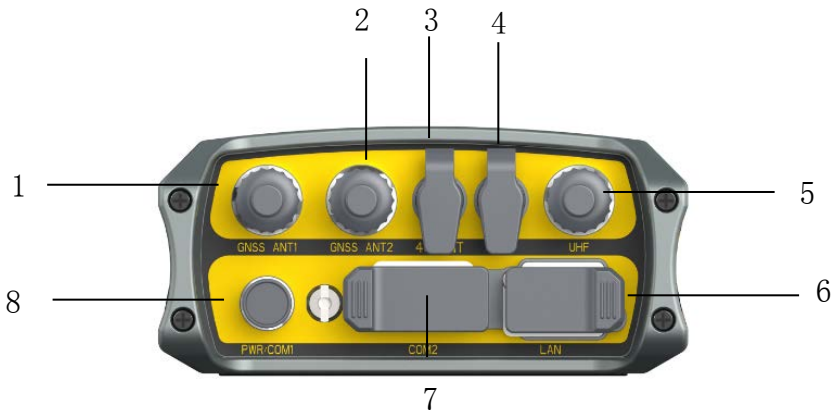
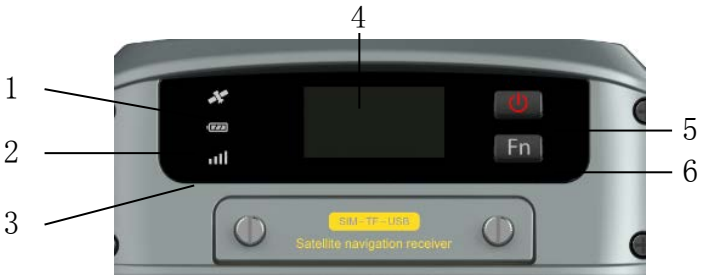


Figure 2-1-2

Figure 2-1-3

1-GNSS Antenna interface: connect to GNSS external antenna; 2-GNSS Antenna interface: connect to GNSS external antenna (positioning version without this interface); 3-4G network antenna interface: used to connect to network antenna in network mode; 4-PPS interface: PPS signal output; 5-UHF interface: connected to the radio antenna in radio mode; 6-LAN port: standard ethernet interface, used for positioning data output; 7-COM2 port: connected to standard DB9 serial port, used for positioning data output and PPS output; 8-PWR COM1 port: receiver power supply and five-pin serial port output; 9-SIM card and SD card interface, the upper part is Nano SIM card slot, the lower part is SD card slot; 10-Mini USB interface, used for firmware upgrade and data download.

2.2 Button & LED



2.2.1 Button function

Figure 2-2-1

1-Satellite light 2-Power light 3-Data light 4-OLED screen

5-Power button 6-FN button (function button)

Table 2-2-1 Button function description

Button	Function	Description
Fn button (function button)	Setting	Click the Fn key to enter the setting interface from the status interface.
	Switch	After entering the setting interface, click the Fn key to switch between the setting interface and its sub-interfaces.
Power button	Power-on	Long press the button for 1 second.
	Power-off	Long press the button for ⩾3 seconds.
	OLED switch	Double-click the power button to turn the OLED on or off.
	Force shutdown (use when the device crashes)	Press the power button for at least 12 seconds.
	Enter	Single click the power button.

2.3 Display function

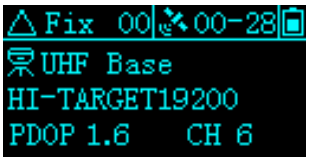
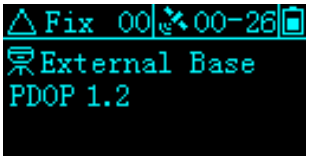
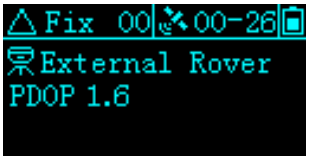
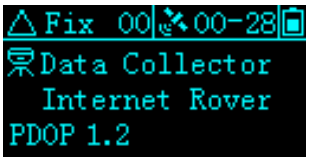
The built-in OLED of receiver can set and display the working mode and working status.

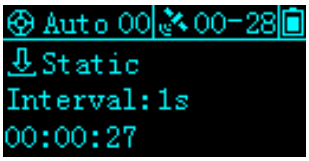
Double-click the power button to turn the OLED on or off.

2.3.1 Status interface

The receiver will display the current working status when it is turned on. The status interface consists of icons and text.

Table 2-3-1 Status interface function description

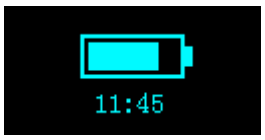
Status	Icons	Text description
Internal UHF base		Display current receiver working mode, satellite information, solution status, radio protocol, PDOP, and channel.
Internal GSM base		Display current receiver working mode, satellite information, solution status, PDOP, network status.
External radio base		Display current receiver working mode, satellite information, solution status, PDOP.
Internal UHF rover		Display current receiver working mode, satellite information, solution status, PDOP, radio protocol, channel.
Internal GSM rover		Display current receiver working mode, satellite information, solution status, PDOP, networking status.
External radio rover		Display current receiver working mode, satellite information, solution status, PDOP.
Data collector internet rover		Display current receiver working mode, satellite information, solution status, PDOP.

Static mode		Display working mode, satellite information, solution status, static collection time and sampling interval.

2.3.2 Standby interface

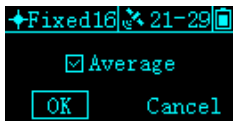
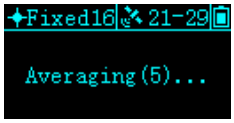
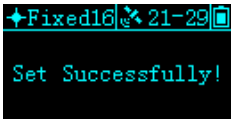
The screen will go on standby if there is no operation for more than 60 seconds, and then turn off after 5 minutes. Double-click the power button to resume the OLED and show the status interface.

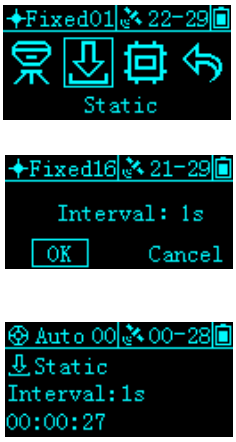
Table 2-3-2 Standby screen

Icons	Description
	Show the external power supply icon when using the five-pin (such as on the external radio base mode). If the time is displayed, the satellite is tracked.
	If the time is not displayed, the satellite is not tracked.
	In the tracked state. Show the power icon and battery power, when using the lithium battery. If the time is displayed, the satellite is tracked.
	If the time is not displayed, the satellite is not tracked.

2.3.3 Settings interface

Table 2-3-3 Settings interface

Function	Description	Picture
Settings interface	Click the function key in the status interface to enter the settings interface.	
Base settings	Click the function button to select the Base icon in the settings interface and click the power button to enter the base station settings. If AVG is selected, it will set the base by using the smoothly measured coordinates and send the RTCM3.2 as correction data.	  

Static	Click the function button to select the Static icon in the settings interface and click the power button to enter the static settings. If the static started, you can set an interval of 1s, 5s, 15s, 30s. If the static recording has started, the screen will display the collected time.	
Reset	Click the function button to select the Reset icon in the settings interface. After clicking the power button, re-click the power button to reset the motherboard. If this is successful, the OLED will show “Reset successfully” and jump to the status interface after 2 seconds. If it fails, the OLED will show: “Reset failed” and jump to the status interface after 2 seconds.	
Back	Click the function button to select the Back icon in the settings interface and click the power button to go back to the status interface.	

2.4 Web management system

Njord has a built-in web management system for real-time control and free configuration of the receiver. The receiver’s Wi-Fi name is its S/N. You can connect it to a controller or phone (password: 12345678) and then input the IP address *192.168.20.1* into the browser to log into the web management system.

Note: The web management system can only be visited when the receiver’s Bluetooth isn’t connected.

2.4.1 Main menu

After logging into the web management system, you can click *Start* to enter the main menu interface. Each option of the main menu contains drop-down menus.

Figure 2-4-1 Home

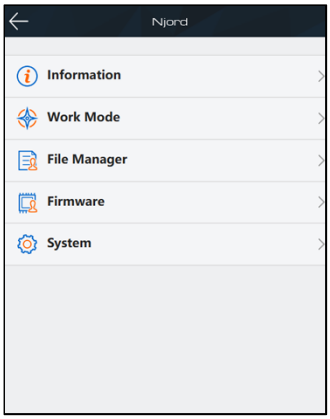


Figure 2-4-2 Main menu

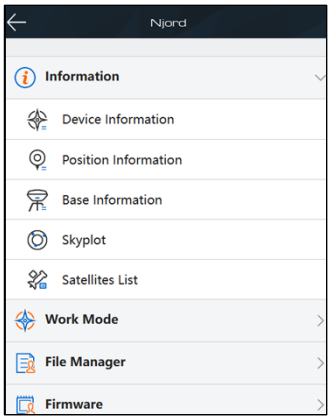


Figure 2-4-3 Information

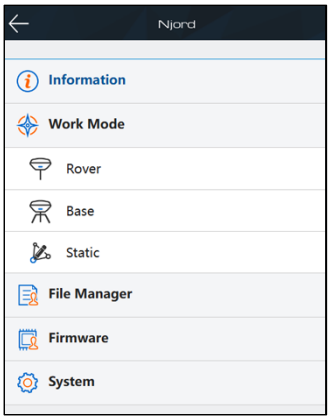


Figure 2-4-4 Work mode

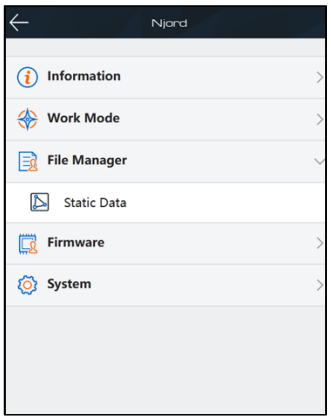


Figure 2-4-5 File manager

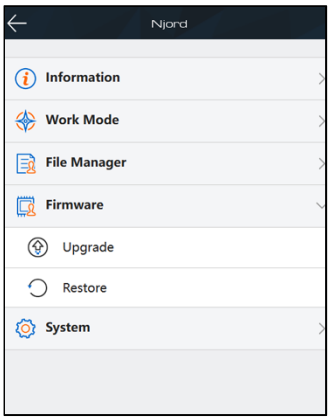


Figure 2-4-6 Firmware

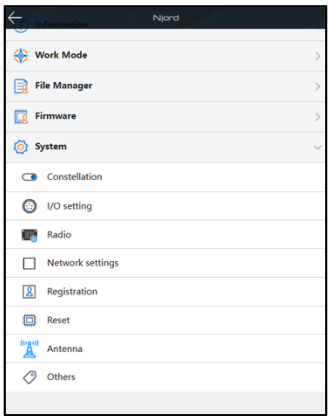


Figure 2-4-7 System

Table 2-4-1 Menu description

Main menu	Sub-menu	Description
Information	Device info	Device model, version, registration info, etc.
	Position info	Coordinates, satellite tracking, solution state, etc.
	Base info	Coordinates and distance to the base.
	Sky plot	Check the sky plot.
	Satellites list	Satellite tracking information.
Work mode	Rover	Data link and parameter settings of the rover.
	Base	Data link and parameter settings of the base.
	Static	Static measurement parameter settings.
File manager	Static data	Download, delete and format static data.
Firmware	Upgrade	Select and upgrade the firmware.
	Restore	Restore the system.
System	Constellation	Switches of the satellite tracking.
	I/O setting	Ethernet, Five-pin, DB9, TCP setting, UDP Broadcast.
	Network settings	IP acquisition method settings
	Radio	Radio frequency list.
	Reset	Reset the motherboard.
	Registration	Receiver and information.
	Antenna	Configurable antenna models and custom antennas
	Others	Power supply settings, Storage mode setting, PPS setting, RTK XTRa

2.4.2 Information

1. Device information

Includes the main information about the device: device model, S/N, firmware version, OEM info, battery power, work mode, configuration parameters, etc.

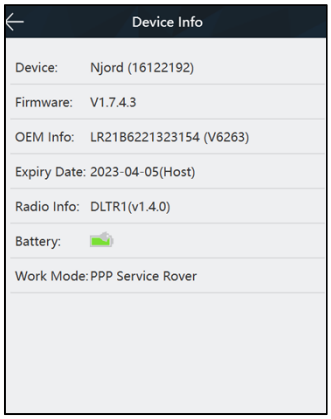


Figure 2-4-8 Device information

2. Position information

Includes the device's position, number of satellites, solution state, latency, PDOP, speed, course and time, etc.

SOG: Speed Over Ground **COG:** Course Over Ground

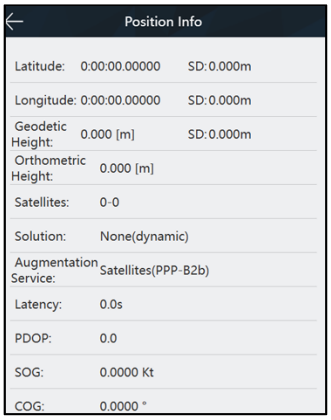


Figure 2-4-9 Position information

3. Base information

Includes the coordinates of the base and baseline length in the rover mode.

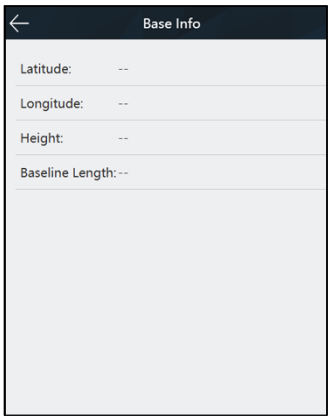


Figure 2-4-10 Base information

4. Sky plot

Displays the visual satellites of the device and the switches of each satellite. The unchecked satellite system will be hidden and the receiver will still capture and track the satellite system.

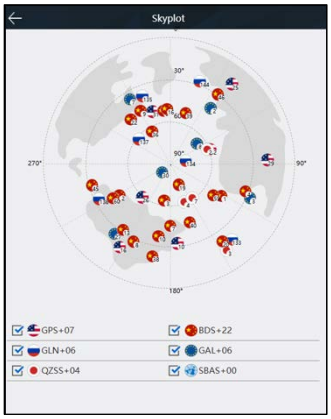


Figure 2-4-11 Sky plot

5. Satellites list

Shows the satellites' tracked information.

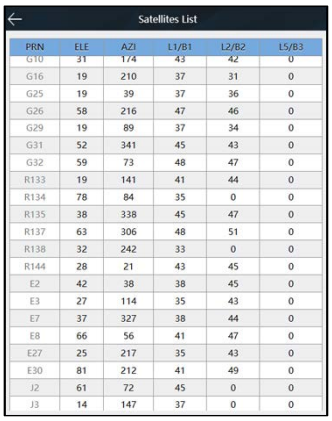


Figure 2-4-12 Satellites list

2.4.3 Work mode

1. Rover

Set up the rover's data link and parameters. The rover station data link includes: *Internal UHF, Internal GSM, External and PPP* (optional function). PPP service mode with PPP mode options, Coordinate System options, Position mode options, GNSS Data Record, and NMEA Data Record.

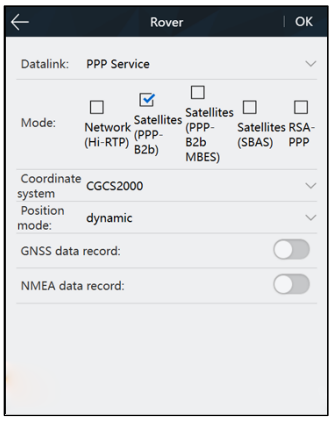


Figure 2-4-13 Rover1

(1) PPP service modes are available for network (Hi-RTP), satellite (PPP-B2b), satellite (PPP-B2b MBES), satellite (SBAS), RSA-PPP. When the network (Hi-RTP) or RSA-PPP mode is checked, then network transmission method (4G or wired network) is required to obtain PPP data.

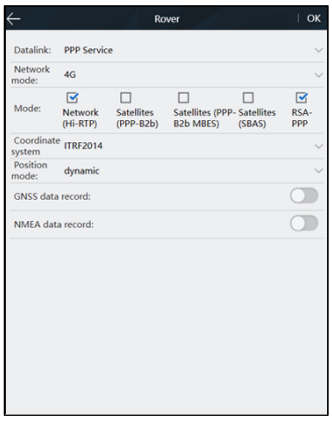


Figure 2-4-14 Rover2

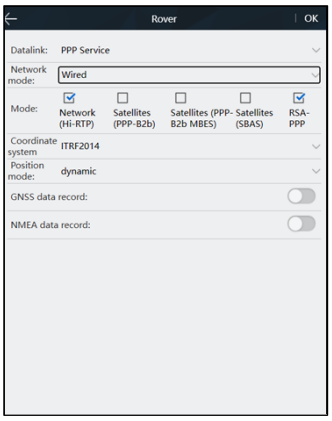


Figure 2-4-15 Rover3

When using 4G network, you need to insert the external SIM card to connect to the network and requires access to 4G network antenna; When using wired network, you can choose the IP acquisition mode to configure the IP address of the Njord for networking.

Dual PPP mode: RSA (PPP) can be combined with any other PPP mode as dual PPP, using dual data streams to output the optimal solution. The accuracy of dual PPP is more reliable than single PPP.

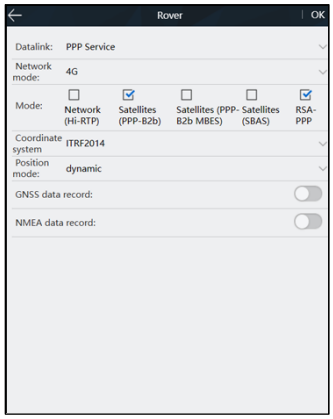


Figure 2-4-16 Rover4

The satellite (PPP-B2b MBES) position mode defaults to Dynamic and the coordinate system defaults to ITRF2014, which cannot be changed.

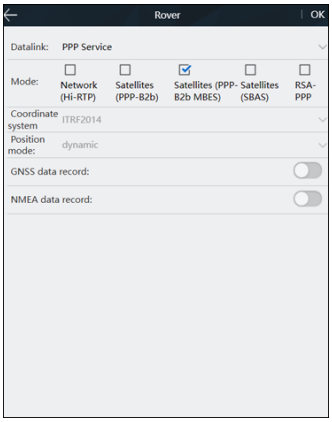


Figure 2-4-17 Rover5

(2) Coordinate system can choose from ITRF2014, CGCS2000, WGS84, ITRF2014 (2010), users can choose the corresponding coordinate system according to their needs.

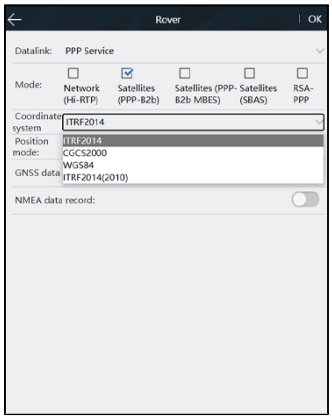


Figure 2-4-18 Rover6

(3) Positioning mode: dynamic, static. The algorithm applied differs depending on the selected mode. When Rover is stationary, please choose Static mode; when Rover moves frequently, choose Dynamic mode.

(4) Data recording switch: GNSS data recording, NMEA data recording. When the GNSS data recording switch is turned on, the Njord will simultaneously store the raw data in the static disk of Njord. The store path is static/gnss. When the NMEA data recording switch is turned on, the Njord will store the data in the static disk of the Njord according to the current setting in the I/O function, the path is static/nmea.

Tips: Data recording switch turns off automatically after reboot. You need to turn it on manually after each power on.

2. Base

Set up the data link and parameters of the base and get the point coordinates by averaging. The base station data link mode includes: *Internal UHF, Internal GSM and External*.

FEC(Forward Error Correction)： It can improve the quality of the radio signal. This function can only be used on SATEL.

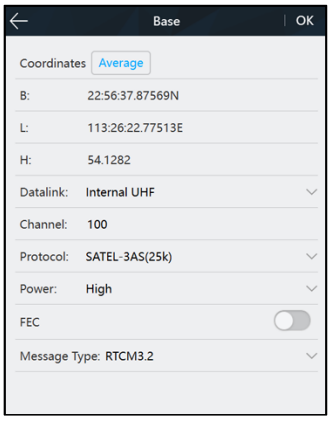


Figure 2-4-19 Base

3. Static

Set up the file name and parameters of the static collection.

Note: After ticking *Static Mode*, you can only cancel it in the setting interface of the base or rover.

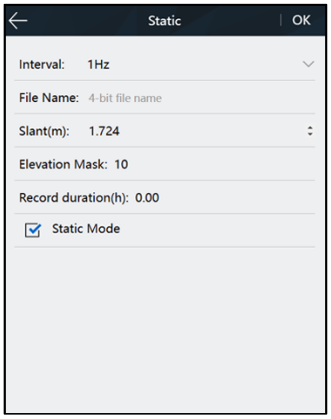


Figure 2-4-20 Static

2.4.4 File manager

1. Static data

Display the static data files, supporting the *Download, Delete and Format* options.

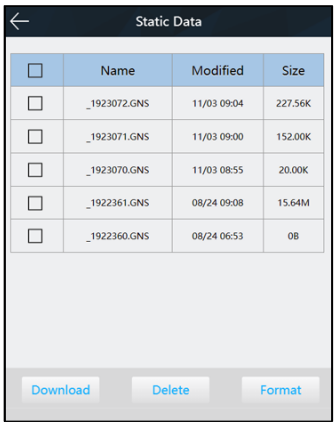


Figure 2-4-21 Static data

2.4.5 Firmware

1. Upgrade

Display specific device version information. Click *Select*, choose the upgrade package and then click *Start*. The receiver will automatically detect it and upgrade the firmware.

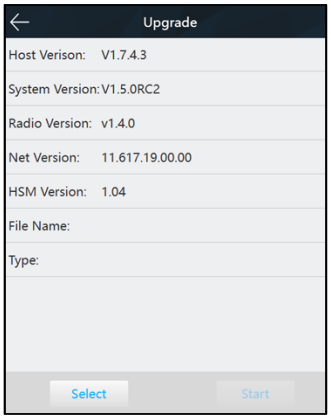


Figure 2-4-22 Upgrade

2. Restore

You can restore the system to the state after the last firmware upgrade.

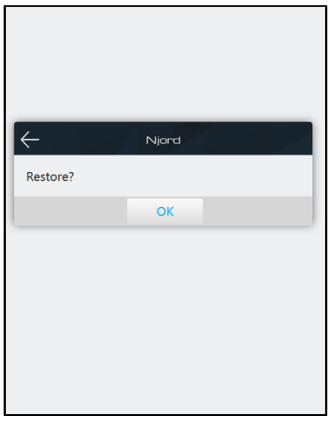


Figure 2-4-23 Restore

2.4.6 System

1. Constellation

Switches of the satellite tracking.

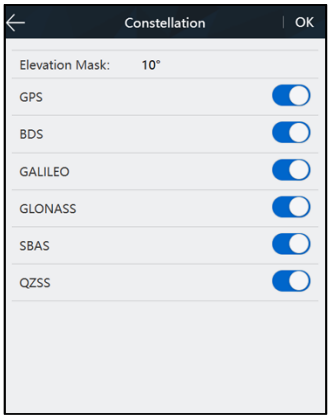


Figure 2-4-24 Constellation

2. I/O Setting

You can set the link rate, select output method, output prefix, NMEA Type and adjust the output frequency (1Hz, 2Hz and 5Hz). I/O setting is available only in the Rover mode.

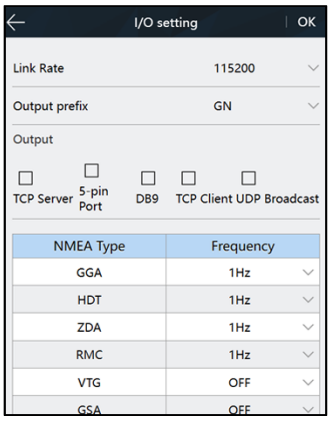


Figure 2-4-25 I/O Setting

Tip：

1）TCP server is used when the receiving device is set to network mode, which is used for wired transmission.

2） Set to select the output data with 5-pin port, pay attention to the selection of baud rate when selecting this mode.

3）Set to select the output data with DB9, pay attention to the selection of baud rate when selecting this mode.

4) TCP client is used when the receiving device is set to network mode, this mode supports the use of 4G connection to the public IP and port.

5）UDP is used when the receiving device is set to network mode, and can only be connected to the switch for transmission within the LAN.

6)

GGA: Positioning data
ZDA: Time and Date Data
GSA: GPS DOP and Active Satellites
RMC: Magnetic declination data
GSV: GPS Satellites in View
HDT: Heading Data
VTG: Track Made Good and Ground Speed
GST: Positioning accuracy data
AVR: Attitude data (Only available in PPP mode)

3. Radio

You can select the radio modulation protocol (HI-TARGET, TRIMTALK450S, TRIMMARKⅢ, TRANSEOT, SOUTH, etc.). You can also customize the frequency of the radio channel 100-115 for HI-TARGET and TRANSEOT protocols and customize the frequency of the radio channel 1-16 for TRIMTALK450S, TRIMMARKⅢ and SOUTH protocols.

Figure 2-4-26 Radio

4. Network settings

You can choose different IP acquisition methods (automatic, manual, DHCP server). The Njord can access the web server through a wired connection.

Figure 2-4-27 network settings

5. Reset

Reset the motherboard.

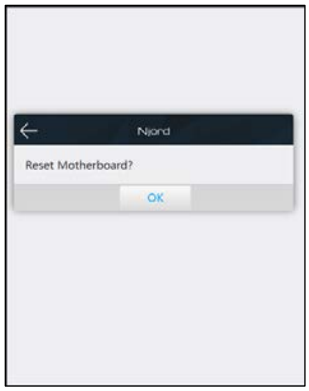


Figure 2-4-28 Reset

6. Registration

Display the registration information of the receiver. Please send the serial number of your devices to the technical person to help you register the receiver.

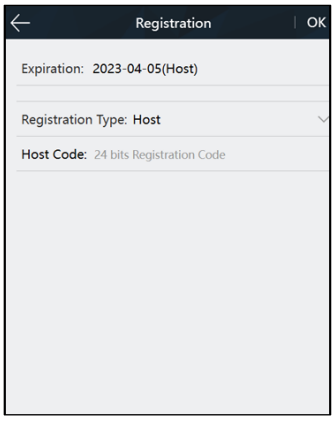


Figure 2-4-29 Registration

7. Antenna

You can set up custom antennas. You can also select the antenna model for configuration

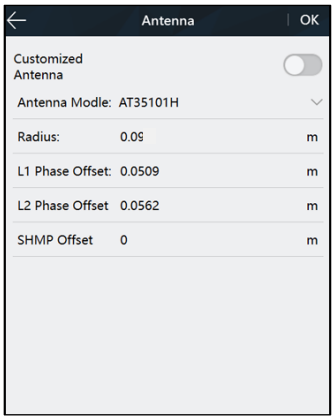


Figure 2-4-30 Antenna

8. Others

You can set the time zone, power supply method, storage method, PPS and RTK XTRa.

Power supply: users can choose 5-pin port or internal battery. Select 5-pin port, if the receiver is off, the receiver will turn on automatically when the power is connected. Select internal battery, the receiver will not turn on automatically.

RTK XTRa. When the receiver differential data is interrupted, the Njord is still able to use the tracked satellite signal to maintain the fix solution state for a period of time. Fix accuracy decreases with increasing time and distance traveled. This mode lasts up to 30 minutes.

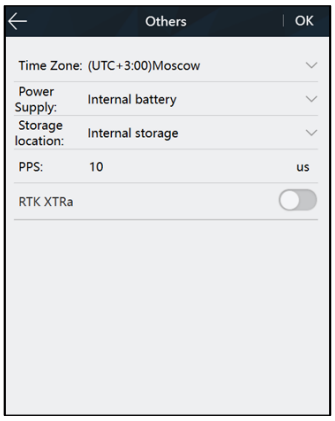


Figure 2-4-31 Others

2.5 Static survey

2.5.1 Static settings

There are three ways to set up the device to work in the static mode:

1. OLED – static settings – to set up the static mode.

2. SatLab Satsurv software – static interface – to set up the static or temporary static mode.

3. Web interface – work mode – to set up the static or temporary static mode.

After completing the settings, the OLED will display the static data collection interface, and the static data will be saved in the receiver's memory card. You can download the static data file to the computer, if necessary, and then use the post-processing software to process the data.

Notice: Temporary static is not supported in PPP mode.

2.5.2 Static data collection steps

1. Set up the antenna on a control point – make sure you center and level carefully.

2. Measure the slant height of the receiver three times in three directions, ensuring that the difference of each measurement is less than 3 mm. Then take the average value as the final height. The receiver is equipped with AT-35101 antenna as standard. When processing static data, the antenna parameters are selected as HITARGET35101H (NONE). Antenna parameters have been certified by NGS.

3. Record the point name, S/N, receiver height and beginning time.

4. Press the power button to power-on and set up the static collecting mode.

5. Turn off the receiver after the static data is collected and record the turn-off time.

6. Download and post-process the static collection data.

Notice: Don't move the tripod or change the collecting set while the receiver is collecting data.

2.5.3 Static data download

1. Download by USB cable

Connect the receiver to a computer with the Mini USB cable and copy the static data to the computer. The static data is in the *GNSS* folder of the *static* drive.

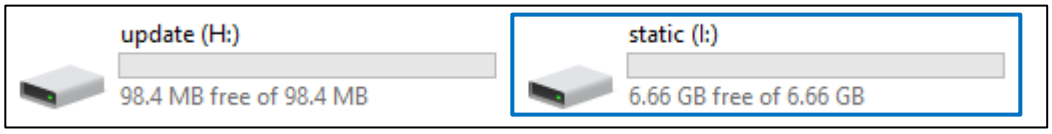


Figure 2-5-1

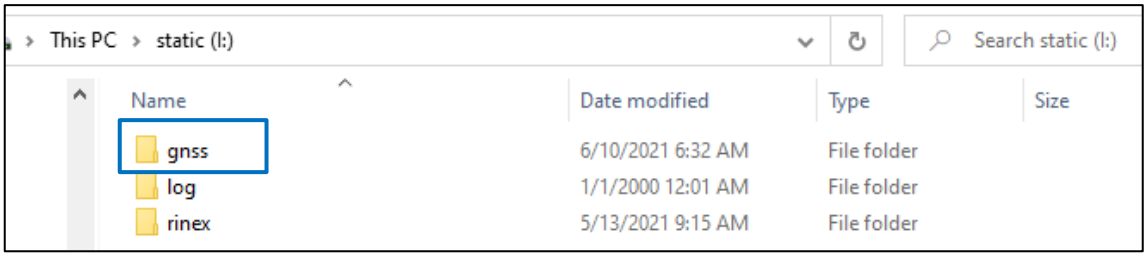


Figure 2-5-2

2. Download in the web management system

The Wi-Fi name of the receiver is its S/N. You can connect it with the controller or phone (Password: 12345678) and input the IP address *192.168.20.1* into the browser to log into the web management system. Now, open the file manager interface and select the static file that needs to be exported. Click *Download* and the file can be downloaded to the controller or phone.

The default save path of the static data to be downloaded from the website is: *device internal storage >MyFavorite*. You can customize the save path according to your needs.

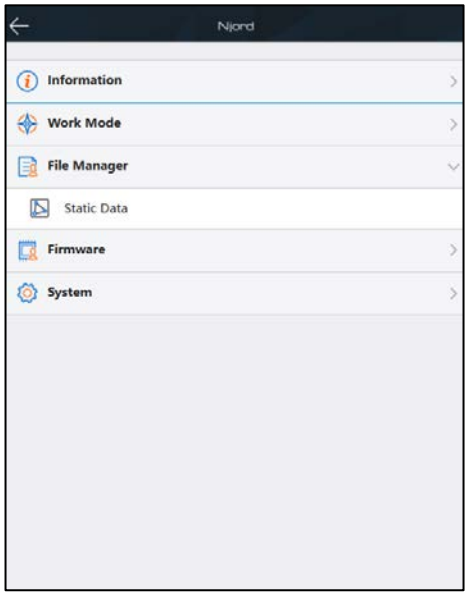


Figure 2-5-3

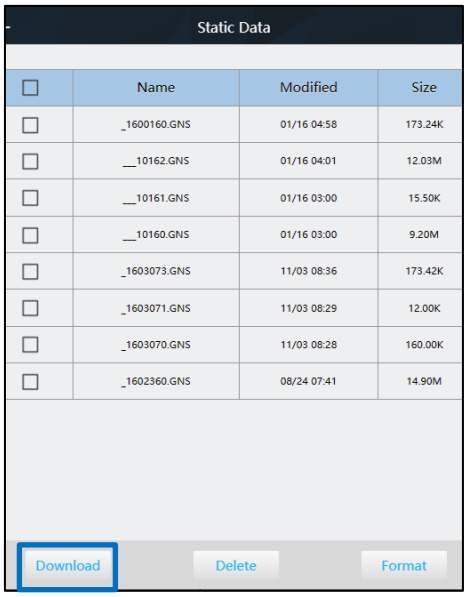


Figure 2-5-4

2.6 Dynamic RTK measurements

2.6.1 Base setting

In SatLab Satsurv measurement software, use Wi-Fi or Bluetooth to connect to the receiver.

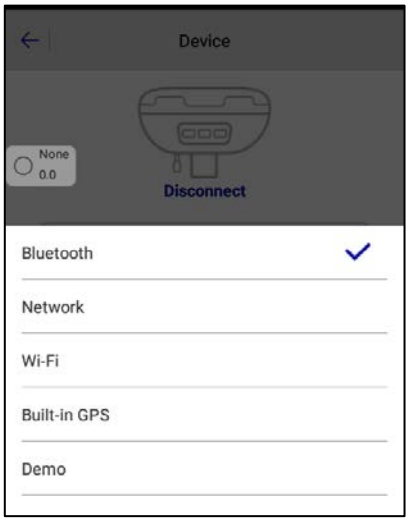


Figure 2-6-1

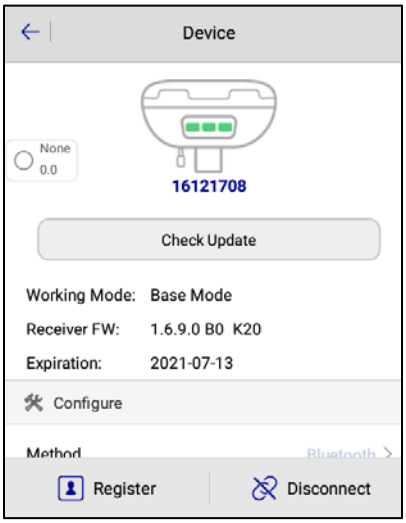


Figure 2-6-2

Parameter setting: the base station parameters include setting the height of the base, coordinates of the base, datalink, correction type, elevation mask, etc. Click the *Set* button in the upper right corner after completing the relevant parameter editing, the software prompts "Set successfully!" (You can also use the built-in WEB to set up the receiver). The receiver supports the following datalink methods: internal UHF, internal GSM, external radio.

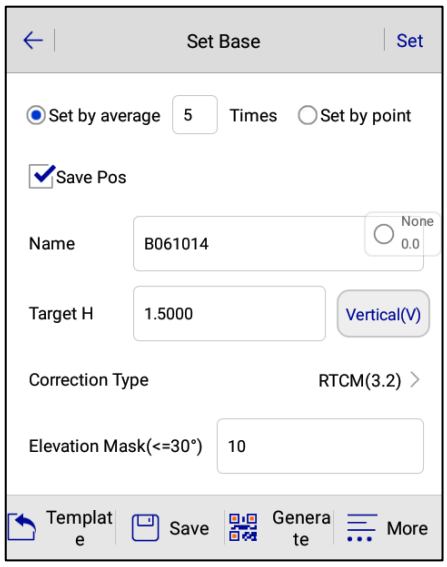


Figure 2-6-3

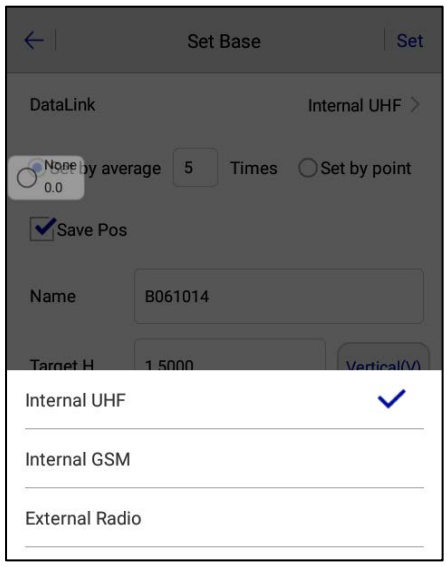


Figure 2-6-4

2.6.2 Rover setting

In SatLab Satsurv measurement software, use Wi-Fi or Bluetooth to connect to the receiver.

Set the datalink, elevation mask, position frequency, etc. The communication parameters are consistent with the base station (you can also use the built-in WEB to set the rover). The receiver supports the following datalink methods: internal UHF, internal GSM, external radio, data collector internet and PPP service.

Figure 2-6-5

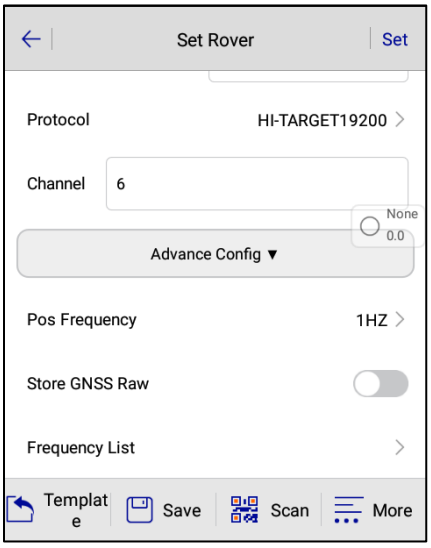
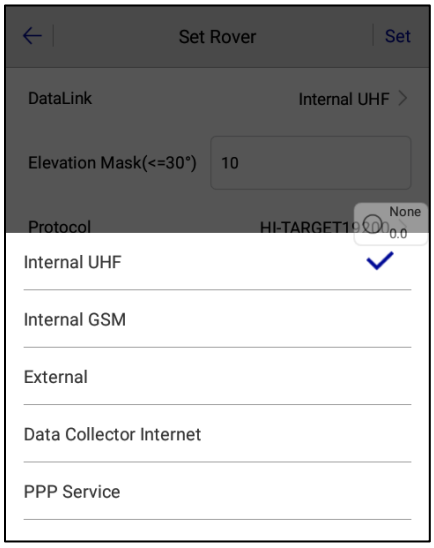


Figure 2-6-6



2.7 Firmware upgrade

You can upgrade the firmware of the receiver, motherboard and other modules by using a USB cable or the web management system.

2.7.1 Upgrade by USB cable

Steps to using a USB cable to upgrade the firmware:

1. Turn on the receiver and connect the receiver and the computer with the Mini-USB cable, computer will show the *update* drive.

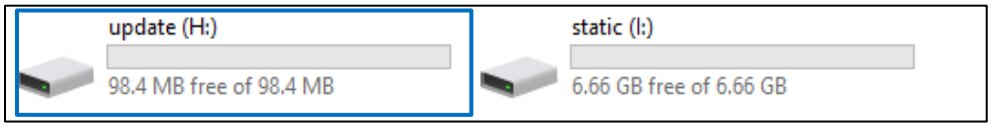


Figure 2-7-1

2. Copy the firmware (which can be downloaded from our official website or the technical team) to the *update* drive. Disconnect the computer and receiver and restart the receiver, which will automatically recognize the firmware and start upgrading the firmware.

3. All LEDs flash yellow during firmware upgrade. If the upgrade is successful, the green light is always on. If the upgrade fails, the red light is always on, then please re-upgrade or contact the technician.

2.7.2 Upgrade by using the web management system

Copy the firmware to the controller or phone and use Wi-Fi to connect it to the receiver. The name of the Wi-Fi is the device's S/N. Now, input *192.168.20.1* in the browser to log in, click *Firmware Upgrade - Select - Documents* to choose the firmware, and then click *"Start"* to upgrade it.

Notice:

1. When the download fails, it will resume downloading if the network recovers within two minutes; otherwise, it will exit the firmware upgrade detection.

2. It is not allowed to forcibly power-off during the upgrade. If the power is forcibly cut off, the instrument may become damaged and be abnormal.

Chapter 3

Technical specification

This chapter contains:

- Technical specification

Table 3-1-1 Technical Specifications

Configuration		Detailed Indicators
GNSS Performance	Signal tracking	BDS：B1/B2/B3/B1C/B2a；GPS: L1/L2/L5；QZSS L1/L2/L5 GLONASS：L1/L2；GALILEO：E1/E5a/E5b
	Positioning Rates	20Hz Max
	Message type	NMEA-0183
		RTCM2.X, RTCM3.0, RTCM3.2
System configuration	CPU&OS	Cortex-A8, AM3358, Linux
	Data storage	8 GB internal storage, support external SD card
Accuracy and reliability[1]	RTK	Horizontal: ±8mm+1ppm RMS
		Vertical: ±15mm+1ppm RMS
	Static	Horizontal: ±2.5mm+0.5ppm RMS
		Vertical: ±5mm+0.5ppm RMS
	Autonomous BDS+GPS+GLONASS	Horizontal: ±3m (RMS)
		Vertical: ±5m (RMS)
	Heading Accuracy	≤0.15°（Navigation edition, 1 meter baseline）
Communication	I/O port	2 GNSS antenna ports, 1 4G antenna port, 1 UHF radio port, 1 PPS output port, 1 RJ45 port, 1 DB9 port, 1 5-pin port, 1 SIM card slot, 1 mini USB port, 1 SD card slot
	Cellular mobile	LTE: 900/1800/1900/2100/2300/2500/2600MHz WCDMA: 850/900/1900/2100MHz； GSM: 900/1800MHz
	Wi-Fi	2.4G, supports 802.11 b/g/n protocol
	Bluetooth	2.4GHz, 4.0/2.1+EDR
	Internal UHF	Power: 2W, 1W, 0.5W
		Frequency: 410MHz~470MHz, -116 dBm
		Protocol: HI-TARGET, TRIMTALK450S, TRIMMARK III, TRANSEOT, SOUTH
		Channels: 116, editable from 100 to 115

User interface	Buttons	Power and FN(Function)
	Display	1.3 inches LED display, 128*64
	Indicators	LED for satellites, data and power
	Web UI	LAN IP: 192.168.20.1
Physical	Internal battery[2]	2500mAh/7.4V internal battery, 3 hours' battery life in rover mode
	Charge time	2.5 hours, 6~28V DC Input
	Dimensions	203mm*129mm*60m
	Weight	1.25kg
	Power consumption	4.5W power consumption in rover mode
Environment	Water/dustproof	IP67
	Free fall	1.2m free drop Anti-vibration GB/T 2423.1 Anti-shock BD/T 2423.5 Salt Fog Test GJB150 11A
	Operation temperature	-40°C ~ +65°C
	Storage temperature	-40°C ~ +65°C

Notice:

1. Measurement accuracy and reliability are affected by many factors, including the satellite's geometric distribution, number of satellites, observation time, satellite ephemeris, ionospheric conditions and multipath.

2. Battery working time is related to the work environment, working temperature and battery life.

Chapter 4

Accessories

This chapter contains:

- Data cable
- Antenna

4.1 Data cable

1. Mini USB cable: To connect the receiver to the PC for upgrading the firmware and downloading static data.

Figure 4-1-1 Type-C cable

2. GNSS Cable (AG-20A): To connect the receiver and external GNSS antenna.

Figure 4-1-2 GNSS Cable

4. 2 Antenna

1. The UHF radio antenna is used in the *Internal UHF* mode.

Figure 4-2-1 UHF radio antenna

2. The 4G Cellular antenna is used in the *Internal GSM* mode.

3. AT-35101 antenna. Radius: 0.0940 m, L1 elevation: 0.05090 m, L2 elevation: 0.05620 m, height from the measuring point to the bottom of the antenna: 0.03960 m.

Figure 4-3-1 AT-35101 antenna

Headquarter:
Järnbrotts Prästväg, 2
421 47 Vastra Frolunda
Goteborg, Sweden
info@satlab.com.se

Regional Offices:
Warsaw, Poland
Jičín, Czech Republic
Ankara, Turkey
Scottsdale, USA
Singapore
Hong Kong
Dubai, UAE

www.satlab.com.se