PRECISE X GNSS Receiver

User Manual

X

GNSS Receiver
User Manual

Preface

Introduction

Welcome to the PRECISE X GNSS receiver. This introduction describes how to use this product.

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 generally very important as the wrong operation may damage the machine. This can lead to the loss of data, or even 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. Zhuhai Precise Technology Co., Ltd. assumes no responsibility if you fail to operate the product according to the instructions or operate wrongly due to misunderstanding the instructions.

Precise is committed to constantly perfecting product functions and performance, improving service quality and reserves the rights to change these operating instructions without notice.

We have checked the contents of the instructions and the software & hardware, without eliminating the possibility of deviation. 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 technical support for help, we will answer your question.

Contents

Chapter 1 ..... **1**

1.1 Foreword 2

1.2 Features 2

1.3 Use and precautions 2

Chapter 2 ..... **3**

2.1 Hardware structure 4

2.2 Button and light 5

2.4 Static survey 16

2.5 tilt survey 18

2.6 Firmware upgrade 19

2.7 AR Stakeout 21

Chapter 3 ..... **22**

Technical specifications 22

3.1 Technical specifications 23

Chapter 4 ..... **26**

4.1 Data cable 27

4.2 Antenna 27

4.3 Battery 27

Chapter 1

Overview

This chapter contains:

- Foreword
- Features
- Use and precautions

1.1 Foreword

PRECISE X GNSS receiver brings superior performance and high efficiency that will support your fieldwork with reliable solutions. Equipped with an upgraded high-definition starlight camera, PRECISE X brings out an excellent visual stakeout experience in low-light conditions. The compact and lightweight design makes PRECISE X a feasible and portable choice for engineering personnel in collecting data and improving positional accuracy.

1.2 Features

1. EASY-Fix: High-spec hardware ensures hassle-free positioning and settlement.

2. EASY-Surveying: IMU overcoming conventional terrain constraints while enhancing surveying flexibility and precision.

3. EASY-Stakeout: Real-time, precise AR visual marking enhance accuracy and simplifies staking.

4. EASY-Connecting: Versatile communication protocols enhance streamlined surveying and field operations.

5. EASY-Power: Extended endurance for uninterrupted field performance.

6. EASY-Durability: Waterproof and heat-Resistant design and extended product lifespan.

7. It can bring accurate and reliable results and boost efficient fieldwork with a self-developed built-in IMU and core algorithm.

1.3 Use and precautions

The PRECISE X GNSS receiver is designed to have 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.

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, with 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 Precise X GNSS receiver 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:

- Hardware structure
- Button and light
- Web management system
- Static measurement
- Real Time Kinematic (RTK) surveying
- Tilt survey
- Firmware upgrade
- AR Stakeout

2.1 Hardware structure

The product's appearance is divided into three parts, the upper cover, bottom cover and control cover.

2.1.1 Upper cover

2.1.2 Bottom cover

2.1.3 Control cover

2.2 Button and light

2.2.1 Button Function

Function	Description
Power-on	Long press the power button until both lights of battery and power have been lit. Then you could release button.
Power-off	In the power-on state, long press the power button for one second until you hear “power off”.
Query current status	Press the power button once to voice the product’s current working status.
Reset motherboard	Hold the button until the power light started flashing, then tap the button multiple times until the light turn rainbow color.

2.2.2 The logic of light flashing

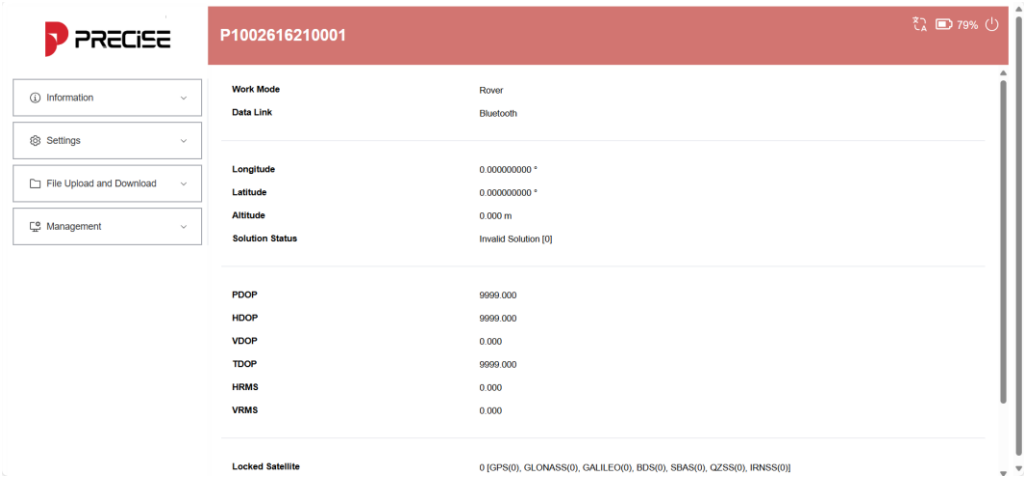
Light flashing	Logic
Data transmission	flashing
Constellations receiving	Always on
Different data link	Bluetooth: bule color WIFI: green color

2.3 WEB management system

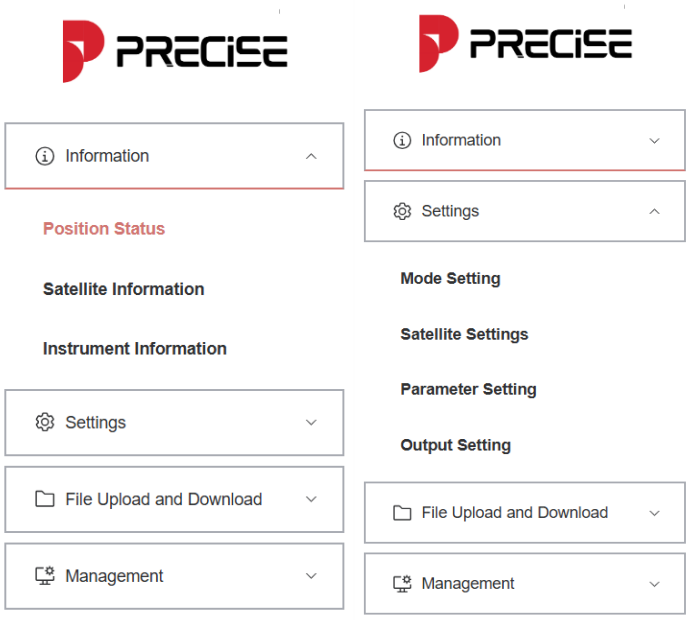
PRECISE X has a built-in web management system that can be used to set the receiver's working mode, data output, as well as view receiver information and satellite information. The receiver’s Wi-Fi name is S/N of GNSS receiver. You can connect the GNSS receiver to a controller, mobile phone and PC via WIFI (the default password is password) and then input the IP address 192.168.10.1 into the browser to log onto the web management system.

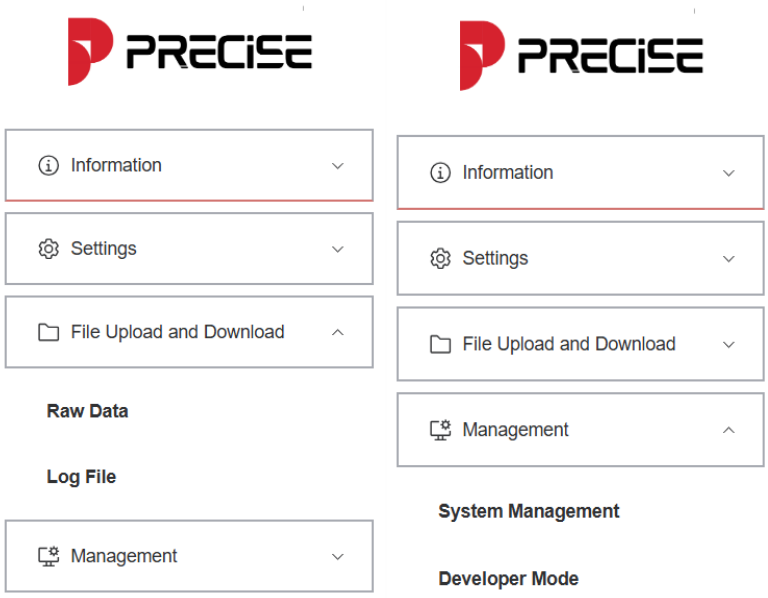
2.3.1 Main menu

After logging into the web management system, you will see the whole web. Each option of the main menu contains drop-down menus.



All options of main menu





All descriptions of options

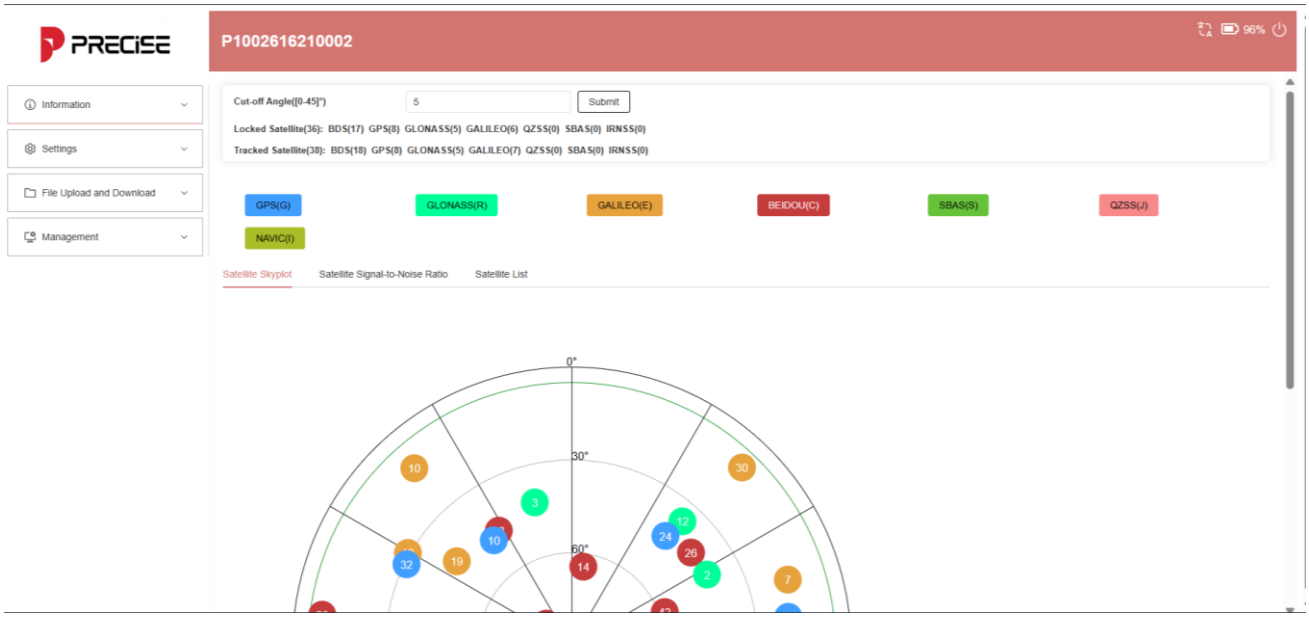
Main menu	Sub-menu	Description
Information	Position status	Work mode, position information, PDOP, Locked and tracked Satellite, Time.
	Satellite information	Cut-off angle, Locked and tracked Satellite of all GNSS constellations.
	Instrument information	Device information, Antenna, GNSS board, Network Module, Radio.
Settings	Mode setting	Many settings of work mode, Base, Radio.
	Satellite setting	adjust the parameters of satellites signal and all the constellations of GNSS.
	Parameter setting	Time zone, Senor, Voice, WIFI Client, Base station.
	Output setting	Adjust the capturing time of NEMA data and record and upload network NMEA.
File upload and download	Raw data	Raw data download, delete and edit.
	Log file	Log file of OS and APP
Management	System management	Upgrade, registration, security and operation of system and device
	Developer mode	Enter password to enable developer mode.

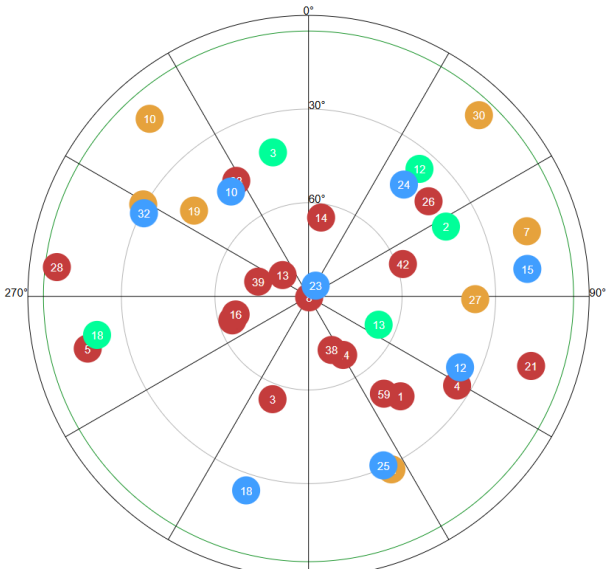
2.3.2 Information

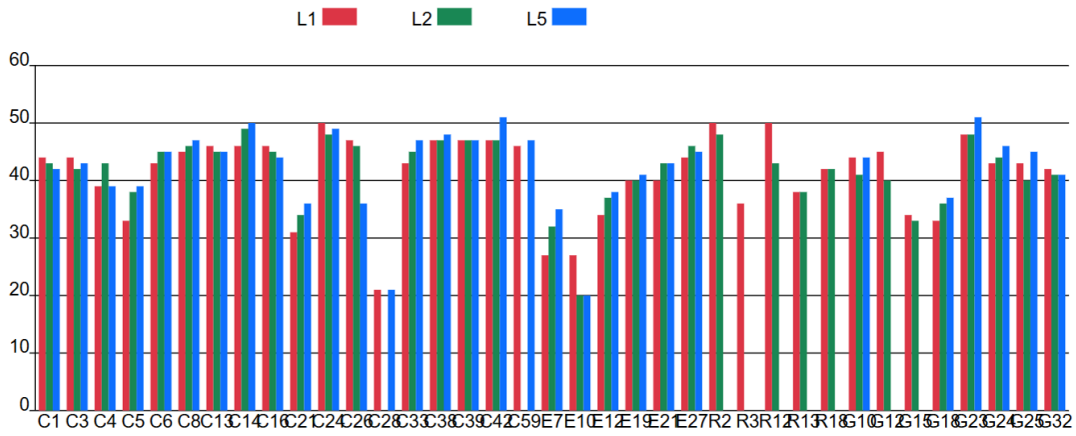
The “information” includes Position status, Satellite information, Instrument information

1. Position statuts

2. Satellite information



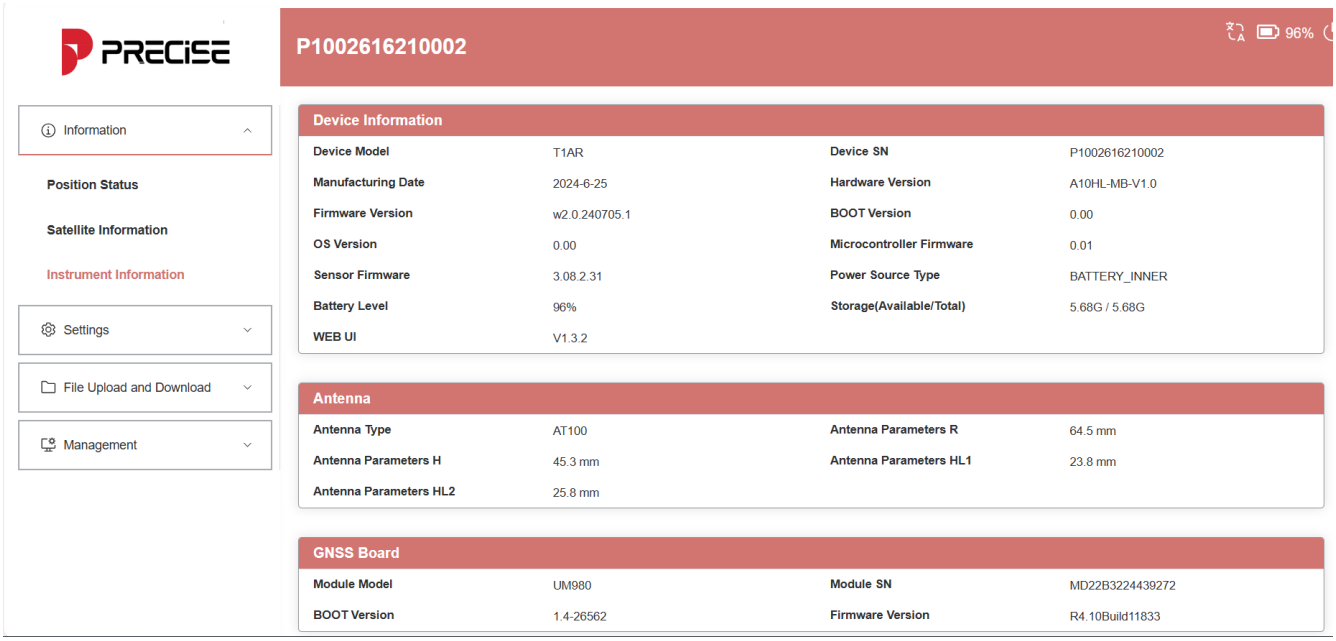




Satellite System	Satellite Number	Elevation Angle	Azimuth Angle	L1(dB)	L2(dB)	L5(dB)	Locked Satellite
BEIDOU	1	46.46	137.35	44	42	42	true
BEIDOU	3	55.10	199.29	45	42	43	true
BEIDOU	4	34.43	120.95	39	42	39	true
BEIDOU	5	17.25	256.71	32	37	38	true
BEIDOU	6	64.43	253.08	43	45	45	true
BEIDOU	8	89.42	168.24	45	46	46	true
BEIDOU	13	79.32	308.47	46	44	45	true
BEIDOU	14	64.67	9.97	46	48	50	true
BEIDOU	16	65.94	256.52	46	45	44	true
BEIDOU	21	15.01	107.65	32	33	37	true
BEIDOU	24	68.49	148.80	50	48	49	true
BEIDOU	26	40.59	51.30	46	46	35	true
BEIDOU	28	8.65	276.32	20	0	25	false

GALILEO	7	16.71	73.80	23	33	35	true
GALILEO	10	13.85	317.83	21	20		false
GALILEO	12	29.44	298.58	37	38	37	true
GALILEO	19	44.36	307.46	39	40	41	true
GALILEO	21	28.93	154.15	41	42	43	true
GALILEO	27	36.66	90.42	44	46	46	true
GALILEO	30	10.12	43.00	0	0		true
GLONASS	2	40.44	63.94	41	45		true
GLONASS	3	42.89	347.02	36	27		false
GLONASS	12	35.39	40.58	50	45		true
GLONASS	13	66.29	109.28	38	38		true
GLONASS	18	20.72	259.10	42	43		true
GPS	10	48.74	323.48	44	39	42	true
GPS	12	36.64	114.48	46	40		true
GPS	15	19.00	83.30	35	31		true

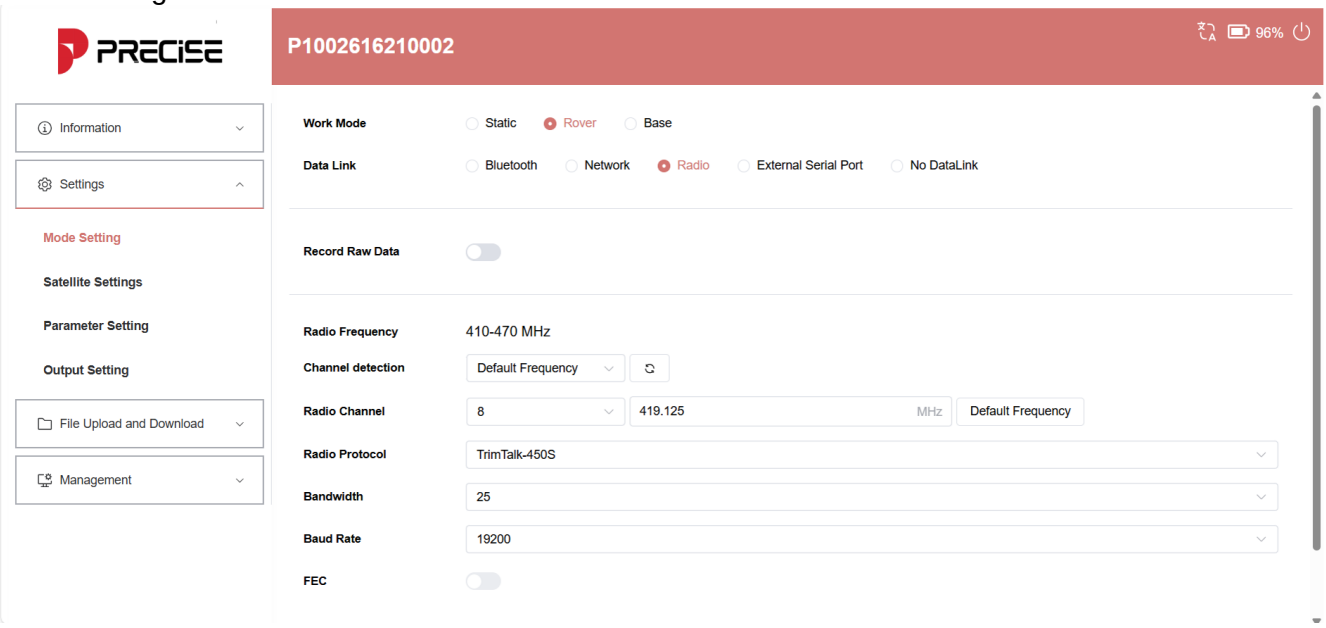
3. Instrument information



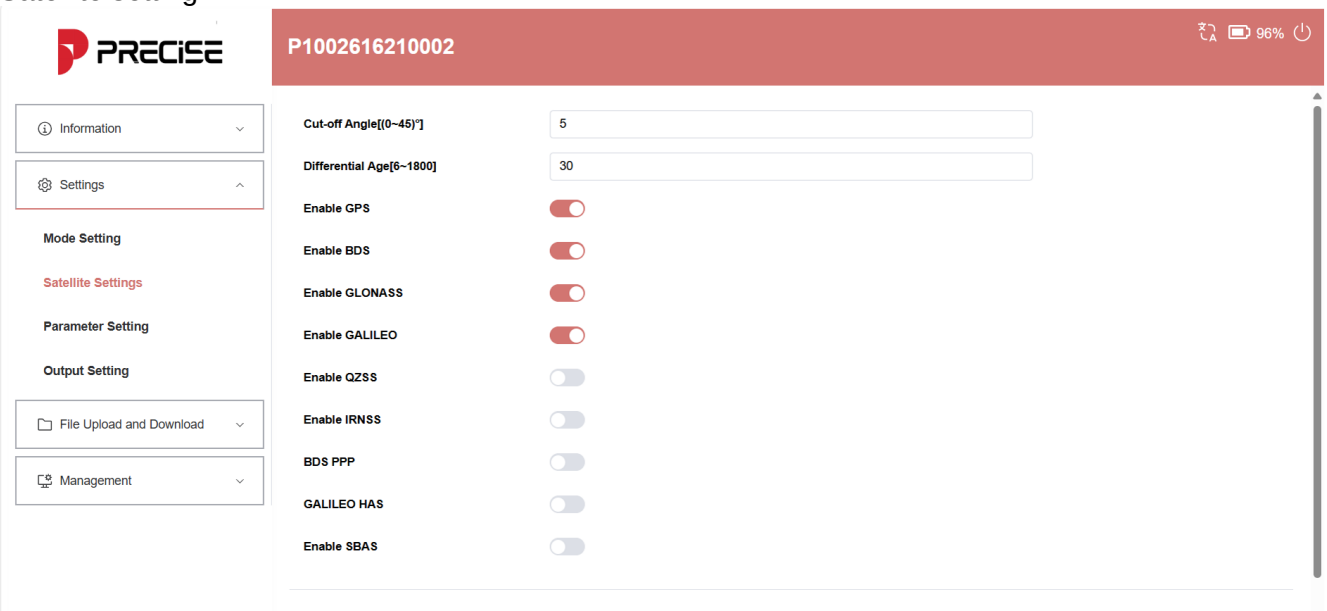
2.3.3 Settings

The “settings” includes Mode setting, Satellite setting, Parameter setting, Output setting

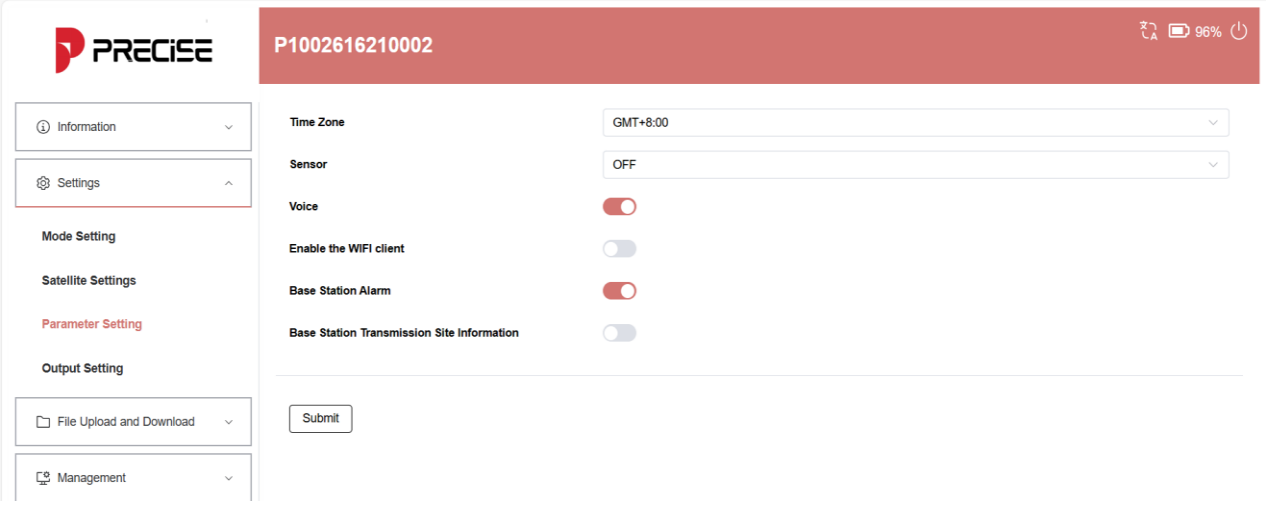
1. Mode setting



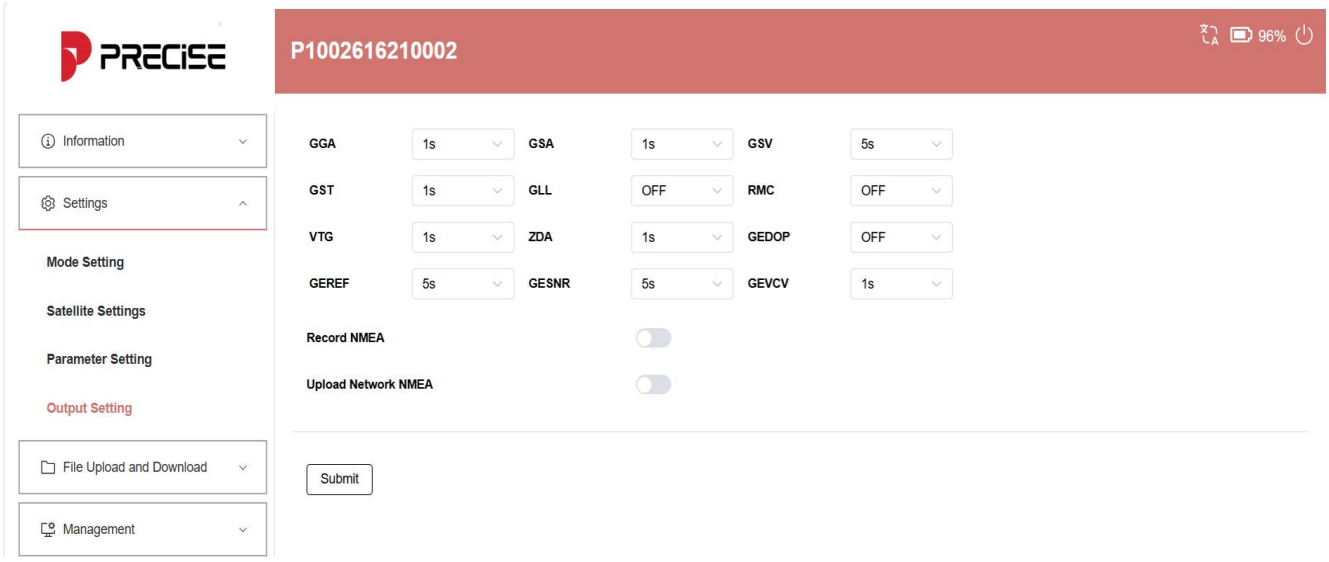
2. Satellite setting



3. Parameter setting



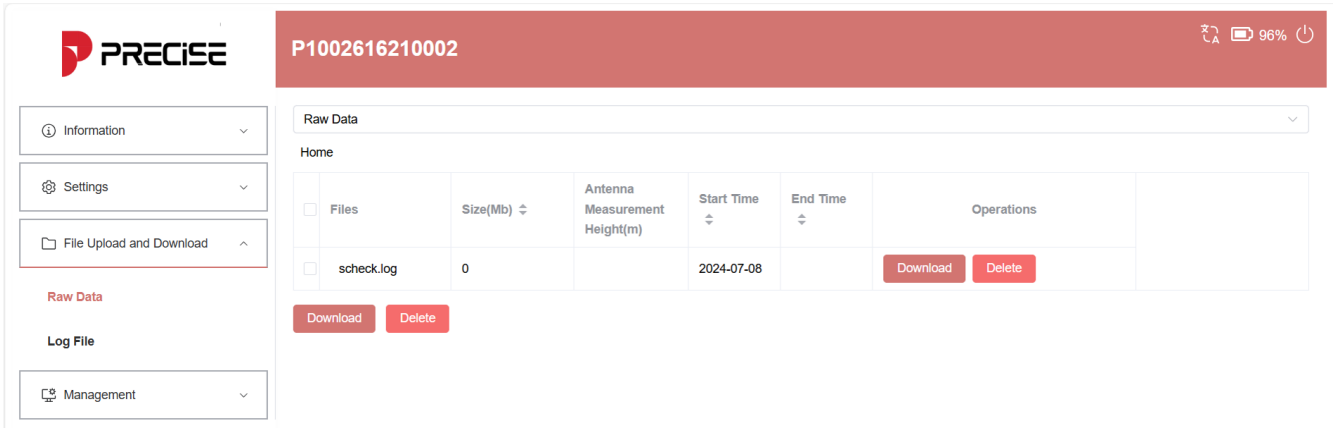
4.Output setting



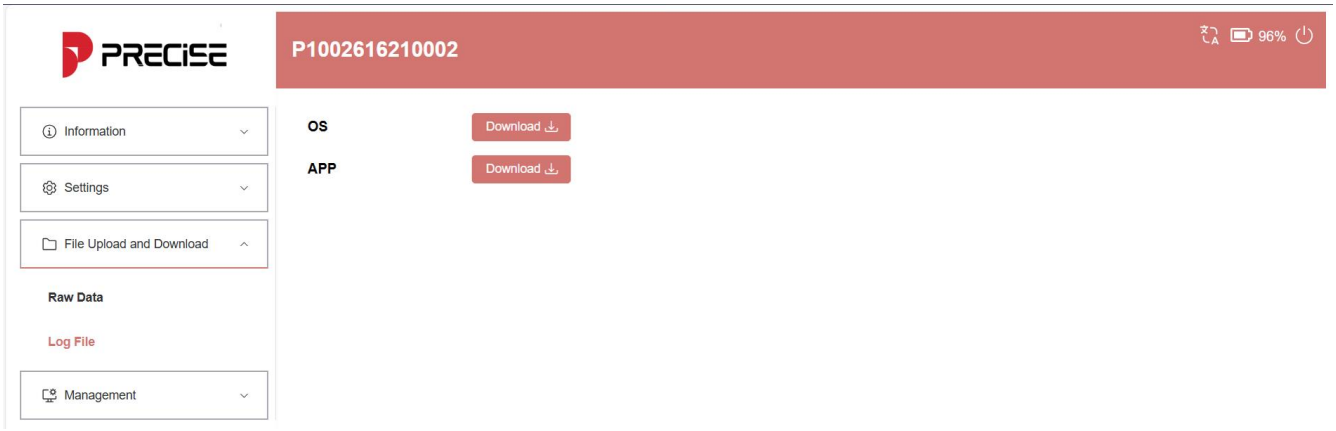
2.3.4 File upload and download

The “File upload and download” includes Raw data, Log file.

1. Raw data



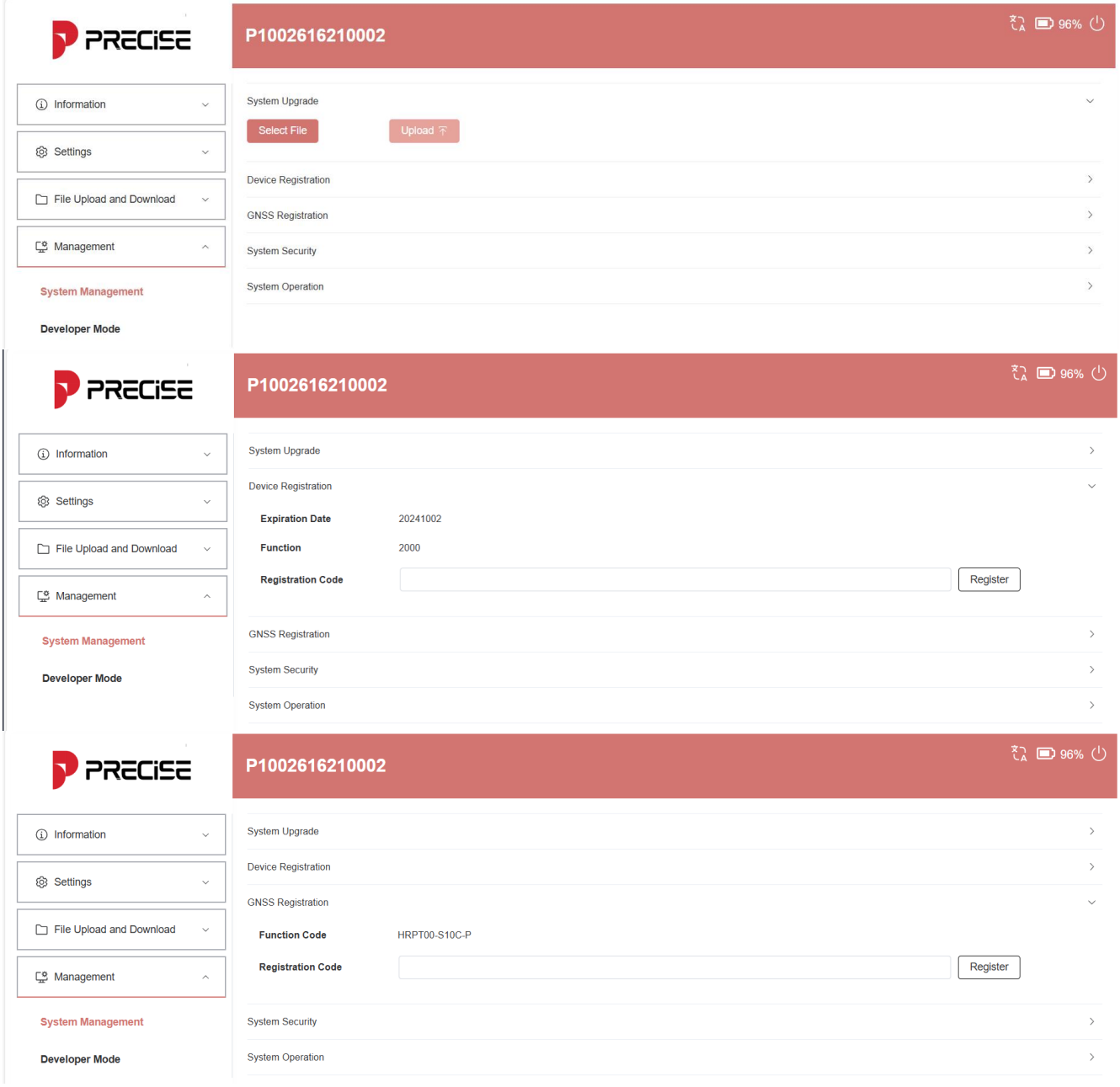
2.Log file

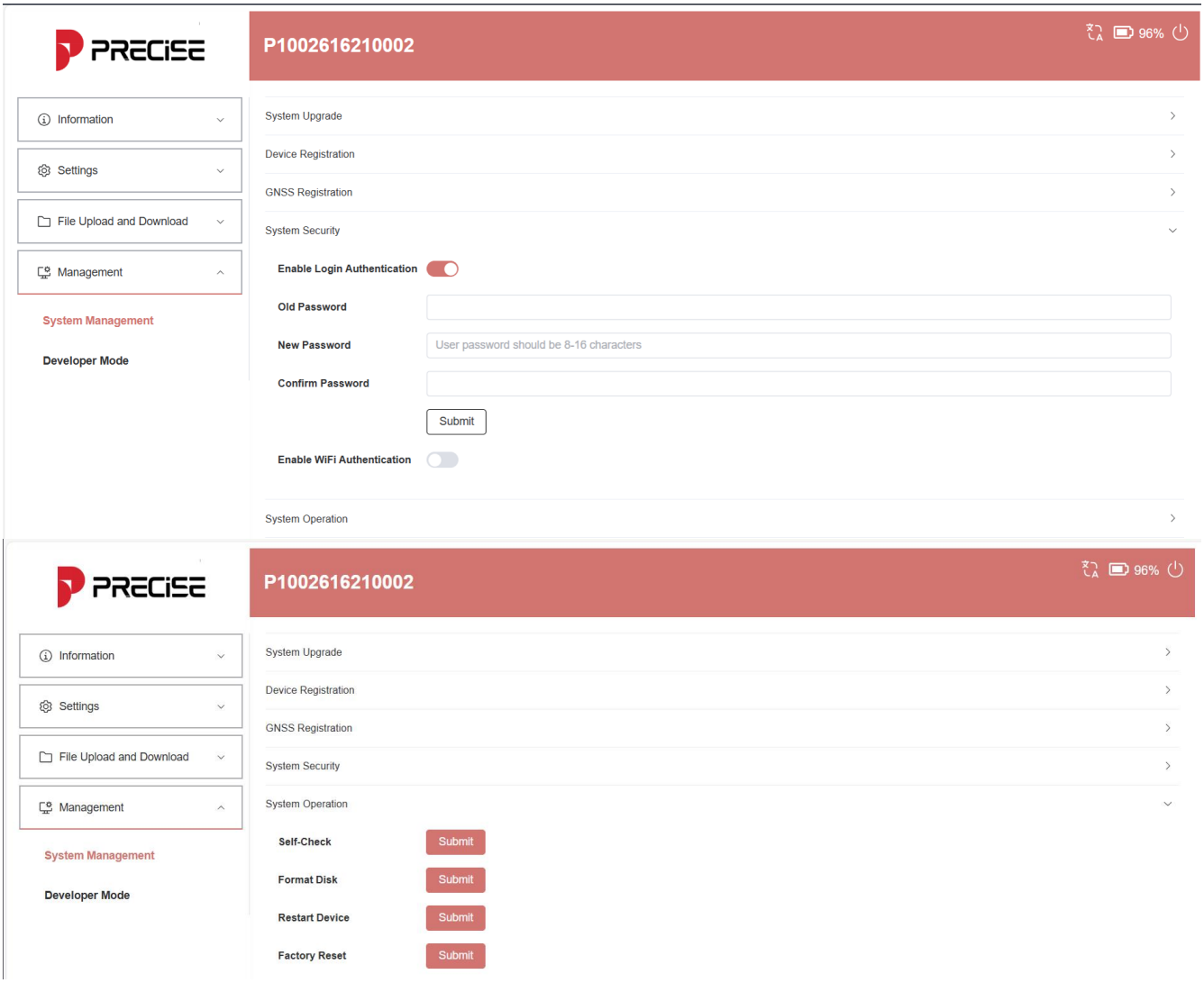


2.3.5 Management

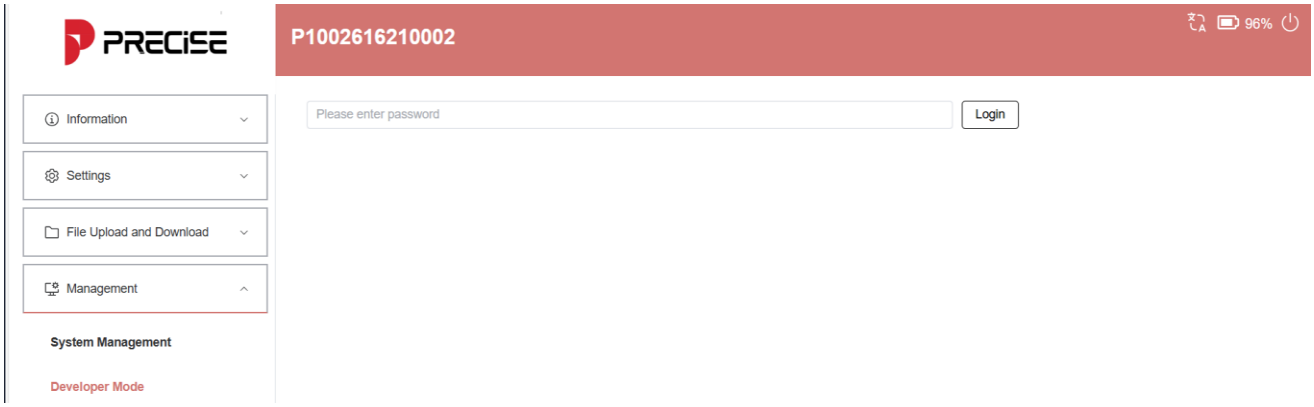
The “Management” includes System management, Developer mode

1. System management





2.Developer mode



2.4 Static survey

Static survey is a kind of positioning survey, which is mainly used to establish various control networks.

2.4.1 Static settings

Currently, there are two ways to set a Static mode.

1. Using Web interface
   Settings—Mode settings—Work mode—Static

2. Using software on handheld controller
   Device—Static

Users can download the static data file to the computer, if necessary, and then use the static post processing software to process the data

2.4.2 Steps of Static data collections

1. Making sure the GNSS receiver has been established on control point with a tripod and the tripod has been centered and leveled. The benchmark must be installed.

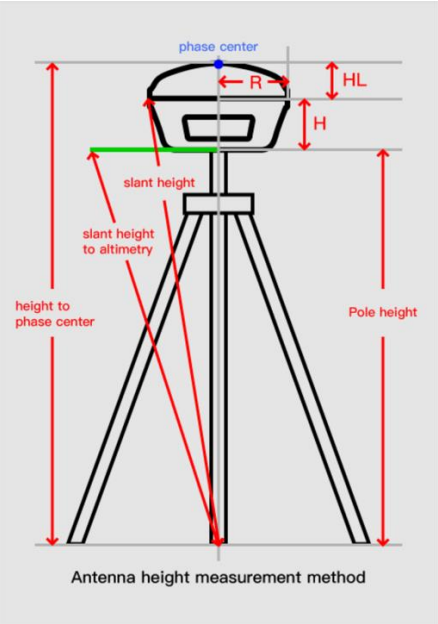
2. Measure the slant height of the receiver three times in three directions, ensuring that the difference of each measurement is less than 3mm, and then take the average value as the final height. The slant height of the receiver is measured from the center of the measuring point to the upper part of the top of the benchmark.

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.

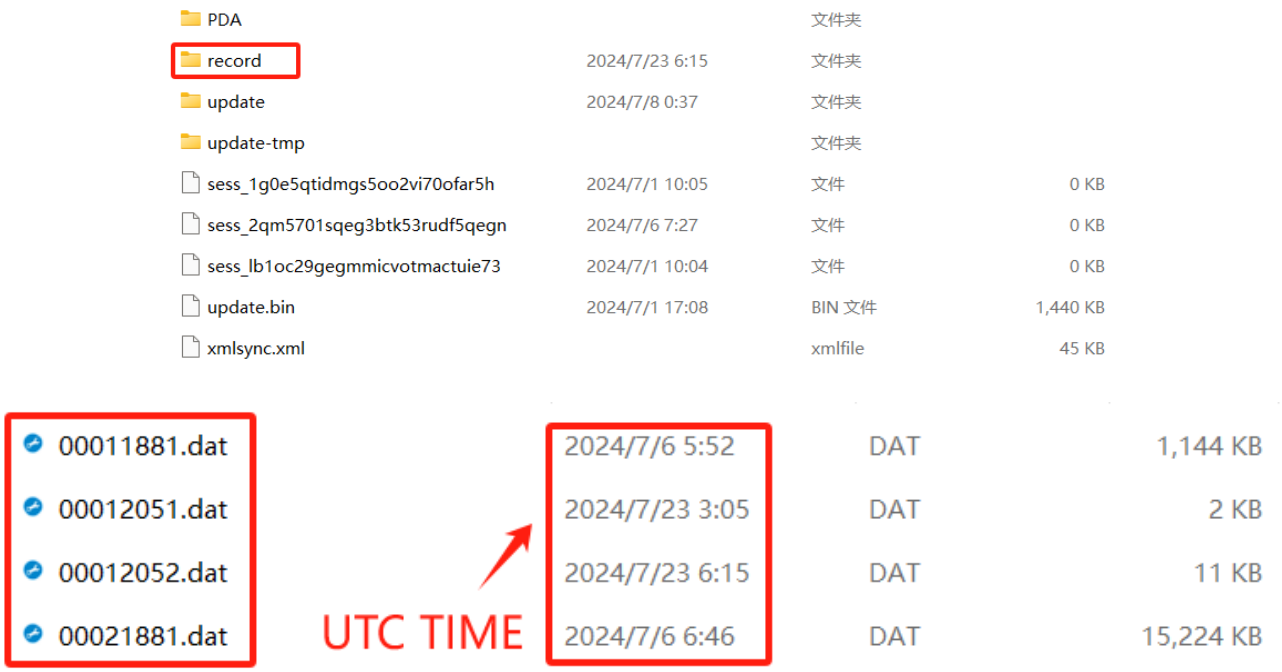


H+HL=72mm

2.4.3 Static data download

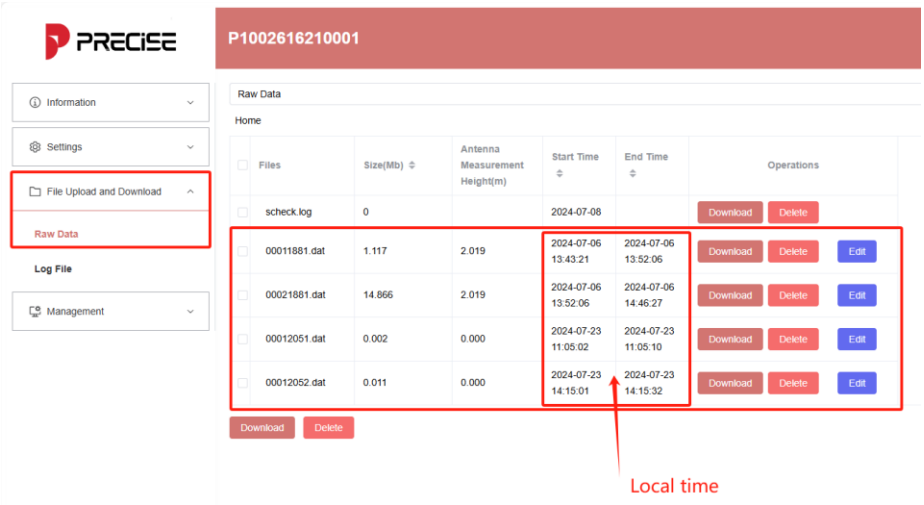
1. Download by USB cable

Connect the GNSS receiver to a computer with the Type-C USB cable and copy the static data to the computer. Currently, it is only supported original data. So, it could be “Static to RINEX” with post processing software.

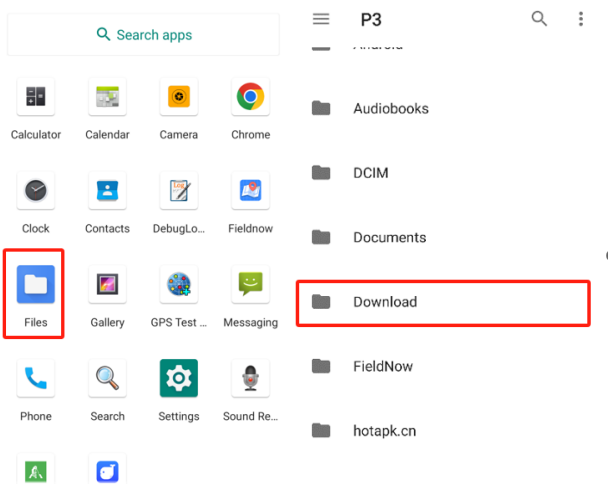


2. Download in the web management system

The Wi-Fi name of the receiver is its S/N. You can connect it to a controller or phone (the default password is: password) and then input the IP address 192.168.10.1 into the browser to log into the WEB management system. Now, open the “Raw Data of File Upload and Download” interface and select the static file that needs to be exported. Click Download and the file can be downloaded to the computer.



It is also could be downloaded on your controller or your mobile phone. In controller, the default path of static data downloaded is “Files--Download”



2.5 tilt survey

2.5.1 Calibration-free tilt survey

Normally, it does not need to calibrate every time in your work, unless the tilt survey is not available.

Connect the receiver in the xField software to open the Device→ IMU Calibration. Click the Tilt Survey icon and follow the prompt on the xField interface to finish the initialization.

Shake the receiver back and forth (once every second) for initialization until Shake is marked with When all the initialization items are ticked, the receiver prompts “Tilt compensation started” and the tilt survey icon becomes illuminated. This means that the tilt survey initialization is now complete, and you can perform the tilt survey on the receiver.

Notice :

1. Make sure the actual pole height is consistent with the set pole height before the tilt survey.

2. When turning on the Tilt Survey switch, you will need the initialization operation before normal use.

3. To meet most the users’ operational needs, the maximum measurement angle of the tilt survey is 60°.

4. To ensure the measurement accuracy, do not turn the device quickly during the measurement process.

5. The data quality is not good in the occluded environment. If the accuracy requirements are high, please try to use this function in an open environment.

6. When you enter the tilt survey for the first time every 7 days, you need to complete the static calibration according to the prompts. Just let the device stand for about 10s to complete this.

2.6 Firmware upgrade

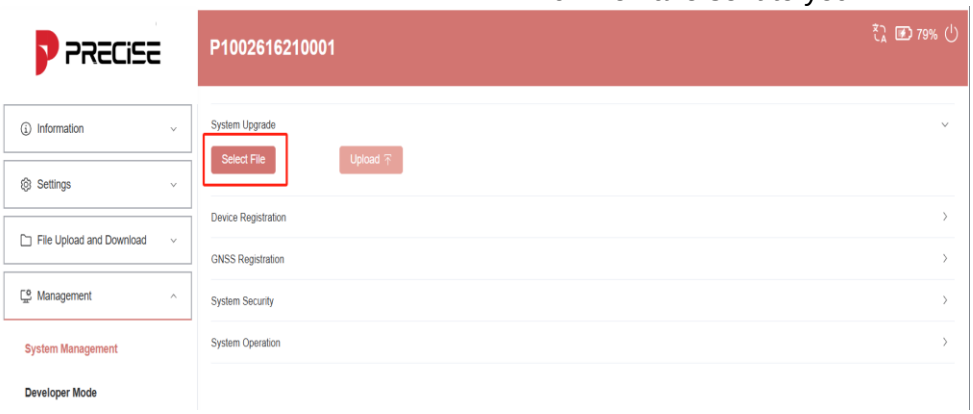
2.6.1 Website Upgrade

1. Connect the GNSS receiver to your computer with WLAN and open the browser.

2. Input 192.168.10.1 in the URL bar.

3. Select the “Management—System Management—System Upgrade”

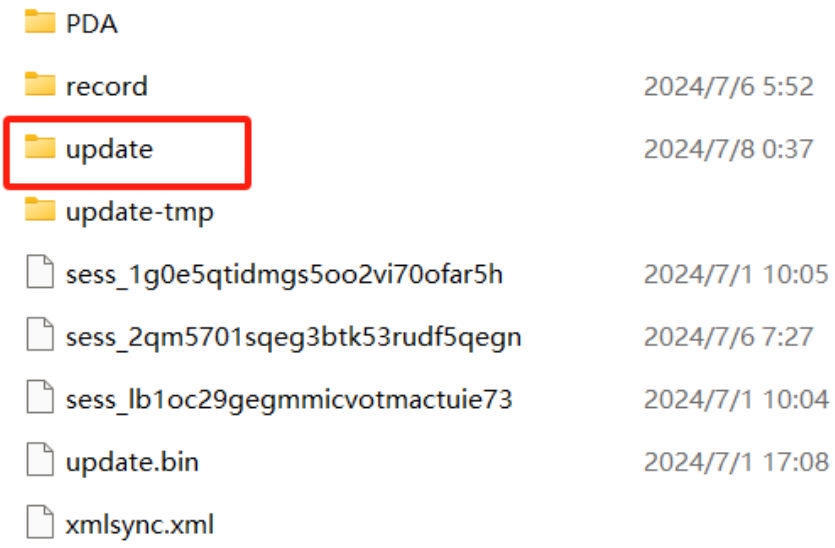
4. Click the “select file” and find the new file of firmware which we have sent to you.



5. Click the “Upload” and wait for a while until it is finished.

2.6.2 Through USB interface

1. Plug the USB cable into the GNSS receiver and your computer.
2. Open “My Computer” on Windows and find the GNSS receiver disk.
3. Drag the new firmware file which we have sent to you into a file folder which called “update”.



4. Waiting for the progress bar to finish. The updating is successful. GNSS receiver will restart and have a self-checking function.

2.7 AR Stakeout

Precise X supports AR stakeout function. The PC2 controller and the software xField or later versions are required.

2.7.1 AR Stakeout Instructions

1. Device Preparation before AR stakeout:

(1) Use the PC2 controller to connect the Precise X via WIFI.

(2) The receiver has entered the tilt survey mode.

(3) The solution state is fixed solution.

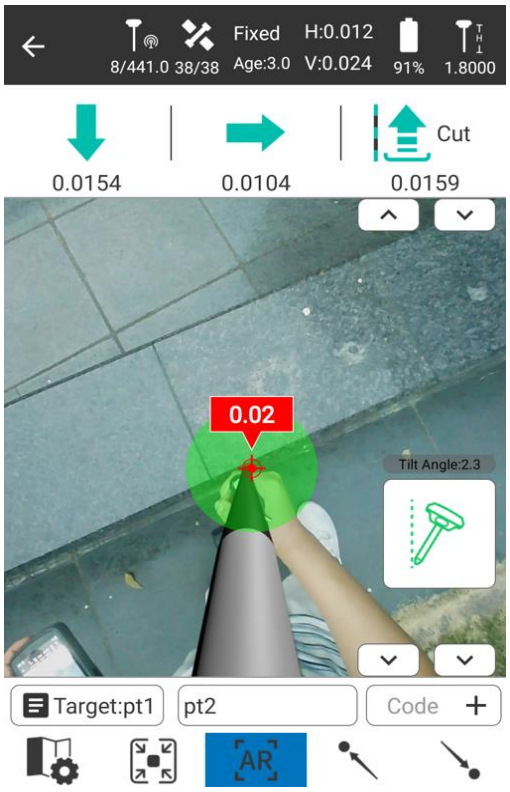
2. Stakeout Process After entering the point stakeout interface:

(1) Input the stakeout point; Precise X GNSS System User Manual

(2) Click the AR stakeout button.

(3) Complete the prompts for the stakeout.

(4) The stakeout is successful.



Chapter 3

Technical specifications

This chapter contains:

- Technical specifications

3.1 Technical specifications

Configuration		Detailed indicators
Satellite performence	Channels	1808
	GPS	L1C/A, L2P(Y), L2C, L5
	BDS	B1I, B2I, B3I, B1C, B2a, B2b
	GLONASS	L1, L2
	Galileo	E1, E5a, E5b, E6
	QZSS	L1, L2, L5, L6
	SBAS	L1, L5
	L-BAND	B2b PPP
	Positioning rate	1-20hz
Accuracy	Code differential	Horizontal:0.4m(RMS) Vertical:0.8m(RMS)
	Static	Horizontal:2.5mm±0.5ppm(RMS) Vertical:5mm±0.5ppm(RMS)
	Real-time kinematic	Horizontal:8mm±1ppm(RMS) Vertical:15mm±1ppm(RMS)
	Network PPK	Horizontal:8mm±0.5ppm(RMS) Vertical:15mm±0.5ppm(RMS)
IMU Measurement	Tilt Accuracy (No tilt angle limit)	2cm within 60°
Camera	Optical format	1/5”
	Pixel size	1.75*1.75 μm
	Active pixel array	1616*1232
	Sensor	2 mega CMOS imaging sensors

Data storage	Type & Storage	SSD 8GB External USB Pen drive
	Data Tranfer	Type-C USB Transfer Supports FTP/HTTP download
	Differential Format	RTCM 2.1, RTCM 2.2,RTCM 3.0,RTCM 3.1,RTCM 3.2,NMEA 0183CMR,CMR+
	Static Data Format	DAT, RINEX 2.X, RINEX 3.x,BINEX
	GPS Output Format	VRS, FKP, MAC
	Network Model	Ntrip fully supportable
COMMUNICATION	I/O	Type-C(OTG+Fast Charge+Ethernet)
	Antenna Port	All-in-one port for radio/GPRS antenna
	Network Modem	Nano-SIM card LTE FDD, LTE TDD, UMTS, GSM
	UHF Radio	2W Tx/Rx 410-470MHz
	ProtocolWiFi	RightLink, TrimTalk, Hi-target, SOUTH,CHCIEEE 802.11 a/b/g/n/acHotspot/Data Link
	Bluetooth	Bluetooth 2.1 + EDR and 4.0
	NFC	Available
INTERFACES	Button	1
	LED Indicator	Data Link,Satellite, Bluetooth,Power
POWER SUPPLY	Battery	Internal Li-on Battery 7.2V,6,800mAh
	Operating Time	Static mode 20h Rover mode 15h
PHYSICAL	Dimension	74mm(H),128mm(W)

	Weight	740g
	Operating Temp	-30°C to 65°C
	Storage Temp	-40°C to 80°C
	Proof	IP68 water and dust proof 2m drop on hard surface40G 10ms sawtooth wave

Notice:

[1] The measurement accuracy, precision, reliability and initialization time depend on various factors, including tilt angle, number of satellites, geometric distribution, observation time, atmospheric conditions and multi-path validation, etc. The data are derived under normal conditions.

[2] Irregular operations such as rapid rotation and high-intensity vibration may affect the inertial navigation accuracy.

[3] The battery operating time is related to the operating environment, operating temperature and battery life.

Chapter 4

Accessories and interfaces

This chapter contains:

- Data cable
- Antenna
- Battery & charger

4.1 Data cable

Type-C cable: To connect the receiver to the PC for upgrading the firmware and downloading static data.

4.2 Antenna

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

4.3 Battery

4.3.1 Battery: The receiver has a built-in 6800mAh/7.2V battery.

Notice: If the battery needs to be stored for a long time, it should be charged to about 70% and then placed in a dry, low temperature environment. It is recommended that you charge and discharge the battery every 3 months. If you do not have the conditions that are needed for charging and discharging, take out the battery after 3 months and charge it to about 70% before storing it once more.

4.3.2 Charger: To charge the receiver, use the standard charger. When it is in charge, the battery button light will turn flashing.

Notice: Please use this product's standard charger to charge the receiver. We will not be responsible for any accidents that occur during the charging process or any damage to the instrument if you use other chargers instead.