User Guide

Land Survey

eRTK20

Visual Stakeout GNSS Receiver

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Shanghai eSurvey GNSS Co., Ltd.

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Certificate

FCC Warning Statements

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.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This 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, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The device has been evaluated to meet general RF exposure requirement This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum distance 50cm between the radiator & your body.

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1 Before You Start

Dear customers,

Thank you for purchasing our product. Before starting your work, please carefully read the following:

- This user guide is for your product only. If the actual situation does not match with the situation in the user guide, the actual situation shall prevail.
- Improper use of the product can lead to death or injury to persons, damage to property and/or malfunction of the product. For safety and instructions on how to use this product, please carefully read the precautions for safe operation, disclaimers and instructions in the user guide and at all times comply with the same. **Remember that YOU are the key to safety**.
- The information in this user guide is subject to change without notice. We reserve the right to change or improve the product as well the content in the user guide without any obligation to notify you. For any questions, please contact us.

1.1 Precautions for Safe Operation

Precautions in this part are intended to minimize the risk of personal injury and/or damage to property, and all indicate **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**

Precautions can be divided into the following types according to the degree of loss or injury in case of negligence or omission:

Caution	*Indicates a potentially hazardous situation that, if not avoided, may result in INJURY OR PROPERTY DAMAGE OR IRRETRIEVABLE DATA LOSS.*
Warning	*Indicates a potentially hazardous situation that, if not avoided, could result in SERIOUS INJURY OR EVEN DEATH.*
Note	*Indicates supplementary information that can have an effect on system operation, system performance and measurements.*

1.1.1 Caution

The following outlines the cautions that you must avoid when operating the GNSS receiver and any of its components:

- To avoid accidental damage, please only use original supplied parts. Otherwise, damage to the receiver may occur.
- When transporting, please try your best to lighten libration on the receiver.
- Please do not touch the receiver with wet hand. Otherwise, electric shock may occur.
- Please do not obstruct the camera and ensure the camera lens is clean. Otherwise, it will affect the quality of the photos and the success rate of resolution of the coordinates.

1.1.2 Warning

The following outlines the warnings that you must avoid when operating the GNSS receiver and any of its components:

- Please do not disassemble the receiver. Otherwise, fire or electric shock may occur. Only eSurvey authorized distributors can disassemble or reassemble the receiver.
- Please avoid charging the receiver if it appears to be damaged or leaking.
- Please use the charger for **eSurvey** equipment that is specified to use it.
- Please do not cover the charger when charging the receiver. Otherwise, fire may occur.
- Please do not use wet charger, defective power cable, socket or plug, and power cable not specified by eSurvey. Otherwise, fire or electric shock may occur.
- Please do not put the receiver close to burning gas or liquid, and do not put it in the fire or high temperature condition. Otherwise, explosion may occur.
- Please avoid disturbance of severe electrostatic discharge. Otherwise, the receiver may have some degradation of performance like switching on/off automatically, etc.

1.2 Exemptions from Responsibility

It is your responsibility to exercise common sense and navigational judgment while using the GNSS receiver.

We assume no responsibility or liability for any damages to property (including direct or indirect damage), personal injuries or death caused by the following conditions:

- Damages caused by both physical and mental conditions of the operator, including alcohol, drugs, drug anesthesia, dizziness, weakness, nausea and other physical or mental conditions.
- Personal injuries or property loss caused by the operator's subjective intention, and any compensation related to moral damage followed by such condition.
- Damages caused by failure to assemble or operate the GNSS receiver in accordance with the proper guidance in this guide.
- Damages caused by refitting or replacing the original accessories or parts with that not produced by **eSurvey** so as to make the GNSS receiver operate badly.
- Damages caused by use of products not produced by **eSurvey** or imitation of our products.
- Damages caused by the operator's operation error or subjective judgment error.
- Damages caused by collision, capsizing, fire, explosion, lightning, storm, tornado, heavy rain, flood, tsunami, land subsidence, ice subsidence, avalanche, hailstorm, mudslide, landslide, earthquake, etc.
- Damages caused by using unauthorized chargers.
- Losses caused by illegal operations (not compliant with the local regulation and legislation requirements).
- Damages or losses resulting from installation or operation not in accordance with the precautions and instructions in this user guide.
- A change of data, loss of data, etc.
- Wrong transportation.
- Use of non-original parts.
- Usage not explained in the user guide.
- Any purpose other than the intended purpose.

2 eRTK 20 at a Glance

The **eRTK20 Visual Stakeout GNSS Receiver** (hereinafter referred to as **eRTK20**) main body is designed with magnesium alloy material to provide durable usage and better heat dispersion. And when it's fully charged, it can continuously work for 11 hours as UHF base and 20 hours as rover.

It supports AR stakeout function which combines AR technology with RTK positioning data to generate directional and distance guidance for stakeout.

It supports CAD AR stakeout function which can guide the users to find the stakeout target by integrating CAD drawings directly into the stakeout interface.

It is integrated with the TRM230 built-in radio which supports standard radio protocols and FARLINK/Geotalk_Ultra/elink_Ultra which achieves a maximum communication range of 15 km with 2W transmitting power in urban environments.

2.1 Appearance

The eRTK20 main body is as follows:

2.2 Power Button

Through the power button, you can achieve the following:

- Power on the receiver: long press the button until you hear the beep sound and release it. All indicator lights will be on. After the receiver is initialized, the screen will light up.
- Power off the receiver: long press the button and release it until you hear the voice *Power off*?, and press the button again.
- Broadcast the current mode: press the button after powering on. The receiver will broadcast the current working mode, including rover, base or static.
- Self-check: to troubleshoot the receiver when the receiver cannot work normally. Long press the button and release it until you hear the voice *Power off*?, and long press the button until you hear the voice *Self-check*.
- Check the battery status: press the power button to check the indicator light of the battery. See Indicator Lights for details.

2.3 Type-C Port

Through the type-C port, you can charge the receiver and transmit the data.

2.4 SIM Card Slot

To use the device internet, you can insert the SIM card in the SIM card slot.

2.5 Stakeout Cameras

Through the cameras, you can achieve the following operations:

- AR stakeout: it is used to guide you to find the targets based on prompts from the actual scene.
- CAD AR stakeout: it is used to guide you to find the stakeout target by integrating CAD drawings directly into the stakeout interface.
- Points library stakeout: it is used to select multiple points from the points library and tap target point on the interface to do AR stakeout.

2.6 Speaker

Through the speeker, you can hear including but not limited to the following:

- Power off the receiver: *power off*?
- Check the current mode: *rover Bluetooth/static recording/base Bluetooth*.
- Do the self check :*self check*, *GPS selfcheck ok*, *radio selfcheck ok*, *network selfcheck ok*, *Wi-Fi selfcheck* ok, *Bluetooth selfcheck ok*, *sensor selfcheck ok*, *base/rover/static*.

2.7 Indicator Lights

Through the color of the indicator light, you can know the following:

- Satellite status:
  - Off: no receiving satellites.
  - Green: fixed solution.
  - Flashing green: have the solution but not fixed.
  - Flashing red: receiving satellites without solution status.
  - Flashing red and green alternately: the mainboard abnormal.
- Bluetooth status:
  - Off: no Bluetooth communication with the handheld.
  - Blue: Bluetooth communication with the handheld normal.
- Datalink status:
  - Green: datalink connected, but no data transmitted.
  - Flashing green: data in transmitting.
  - Flashing blue:
    - Bluetooth connected and the data in transmitting.
    - Recording the raw data in static mode.
      If the collecting interval is greater than 1 second, it flashes according to the set static collecting interval. Otherwise, it flashes at 1 second intervals.
- Battery Status:
  - In charging:
    - Four indicator lights green: battery level 100%.
    - Three indicator lights green with the fourth one flashing: battery level 75%-100%.
    - Two indicator lights green with the third one flashing: battery level 50%-75%.
    - One indicator light green with the second one flashing: battery level 25%-50%.
    - One indicator light flashing green in every second: battery level<25%.
  - Not in charging:
    - Four indicator lights green: battery level 75%-100%.
    - Three indicator lights green: battery level 50%-75%.
    - Two indicator lights green: battery level 25%-50%.
    - One indicator light green: battery level<25%.

2.8 UHF Port

The UHF port is used to connect a UHF antenna.

The receiver is equiped with a UHF antenna (QT440A) with frequency from 430 MHz to 450 MHz. Alternativelly, you can select other eSurvey models of UHF antennas:

- QT410A: 410~430MHz
- QT450A: 450~470MHz
- QT400-T: 410~470MHz

The UHF antenna and the built-in radio work together, so as to strengthen the signal of the built-in radio.

The built-in radio is 1W/2W. You can freely select low (1W) and high(2W) transmission power through the Working Mode Setting interface of Web UI.The radio supports 8 channels and frequencies from 410 MHz to 470 MHz. Channels 1 to 7 respectively correspond to frequencies 441 MHz to 447 MHz, and channel 8 is customized:

The supported radio protocols include TrimTalk 450S, PCC-GMSK,PCC-4FSK, Satel, Satel_ADL, HITARGET, HZSZ, Trimmark III, South, GEOTALK, GEOMARK, PCCFST, PCCFST_ADL, FARLINK, Geotalk_Ultra, and elink_Ultra.

Note Some of the protocols may require firmware updating.

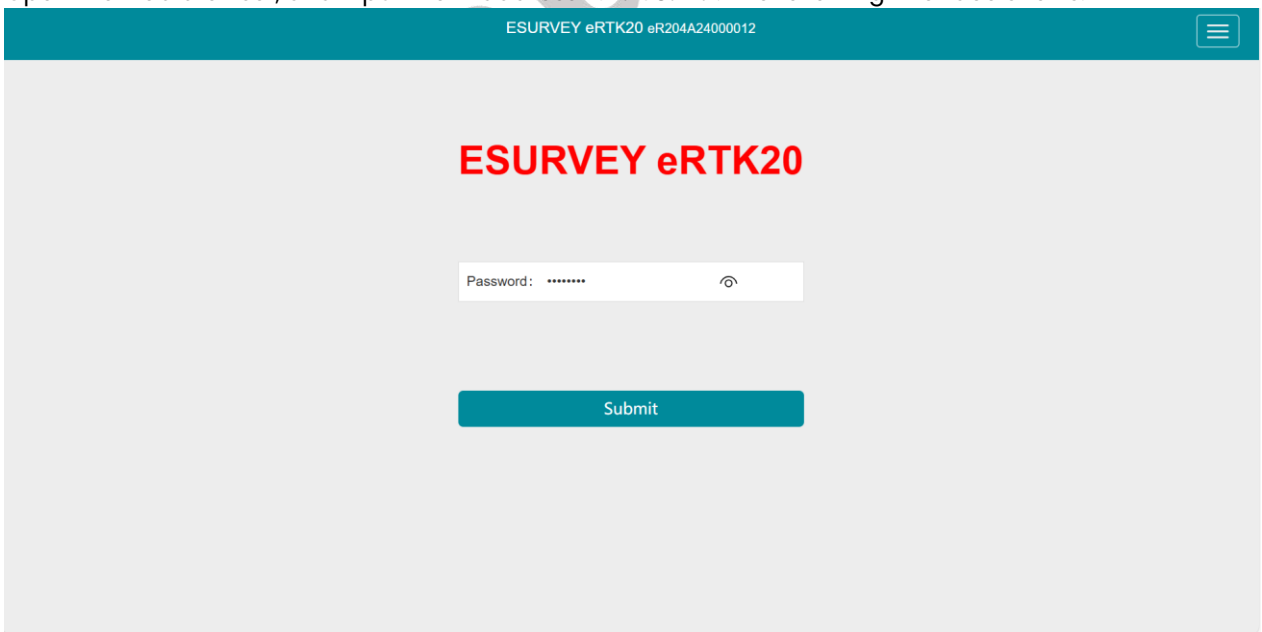
3 Web UI

The receiver Wi-Fi can be used as a hotspot. You can connect to the hotspot with your PC, smartphone, handheld or tablet.

After connecting to the hotspot, you can manage the working status, change the working mode, configure basic settings, download raw data, update firmware and register your receiver, etc.

Taking the interface of your PC as an example, to enter the Web UI, do the following:

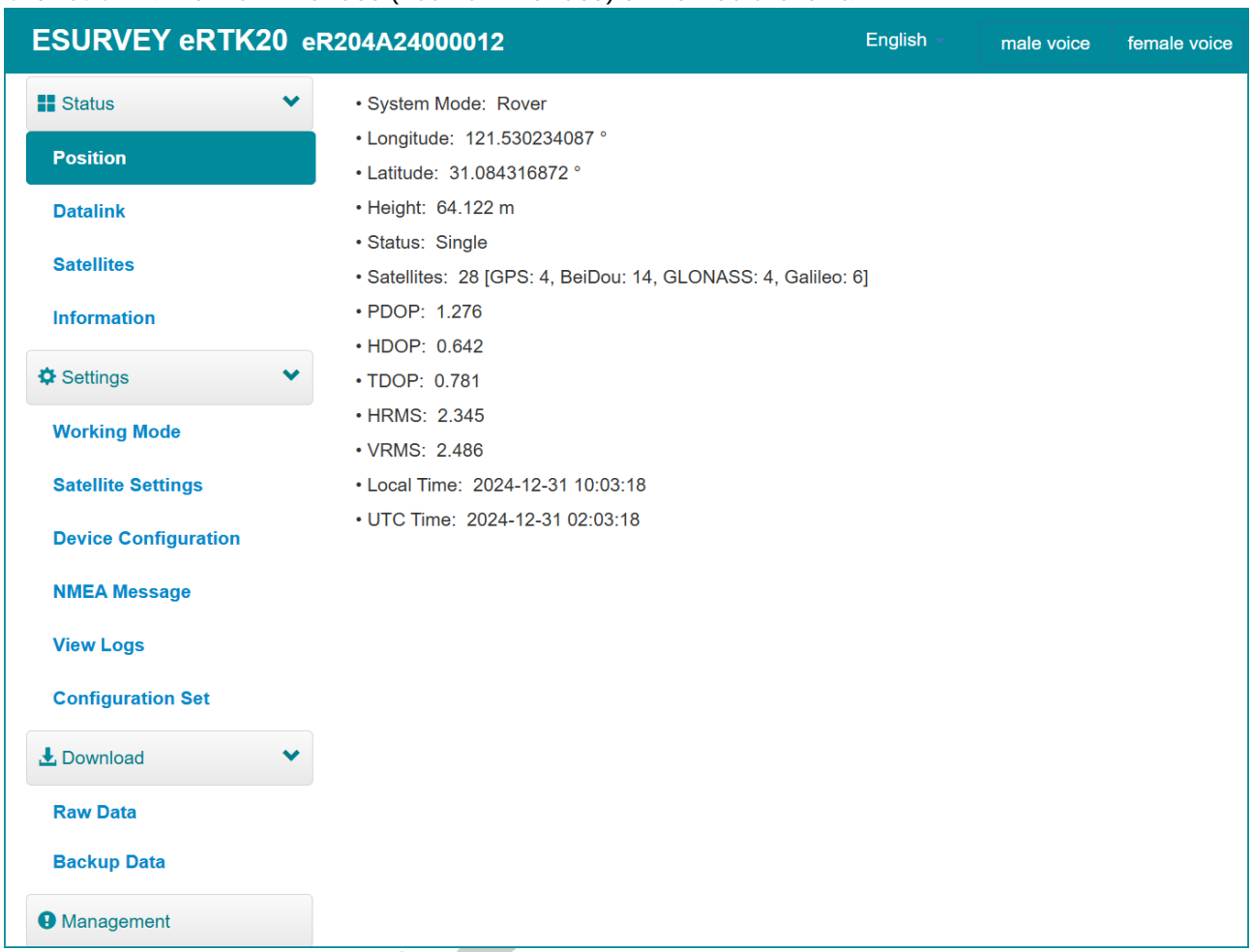
1. Find the receiver Wi-Fi hotspot with your computer.
   Hotspot name: the serial number.
2. Open the web browser, and input the IP address **192.168.10.1**. The following interface shows:



3. **Optional**: To change the language of the web UI, the language in display of the receiver, and the language of the speeker in receiver, click at the top right corner and select the target language., click .
   The supported languages include Chinese, English, Korean, Portuguese, Russian, Turkish, Japanese, Spanish, French, German and Italian. English is the default language.

Note You can freely change the language of the receiver in every interface of the web UI at the top right corner.

4. Enter the password: password.
5. Click **Submit**. The main interface (**Position** interface) of the web UI shows:

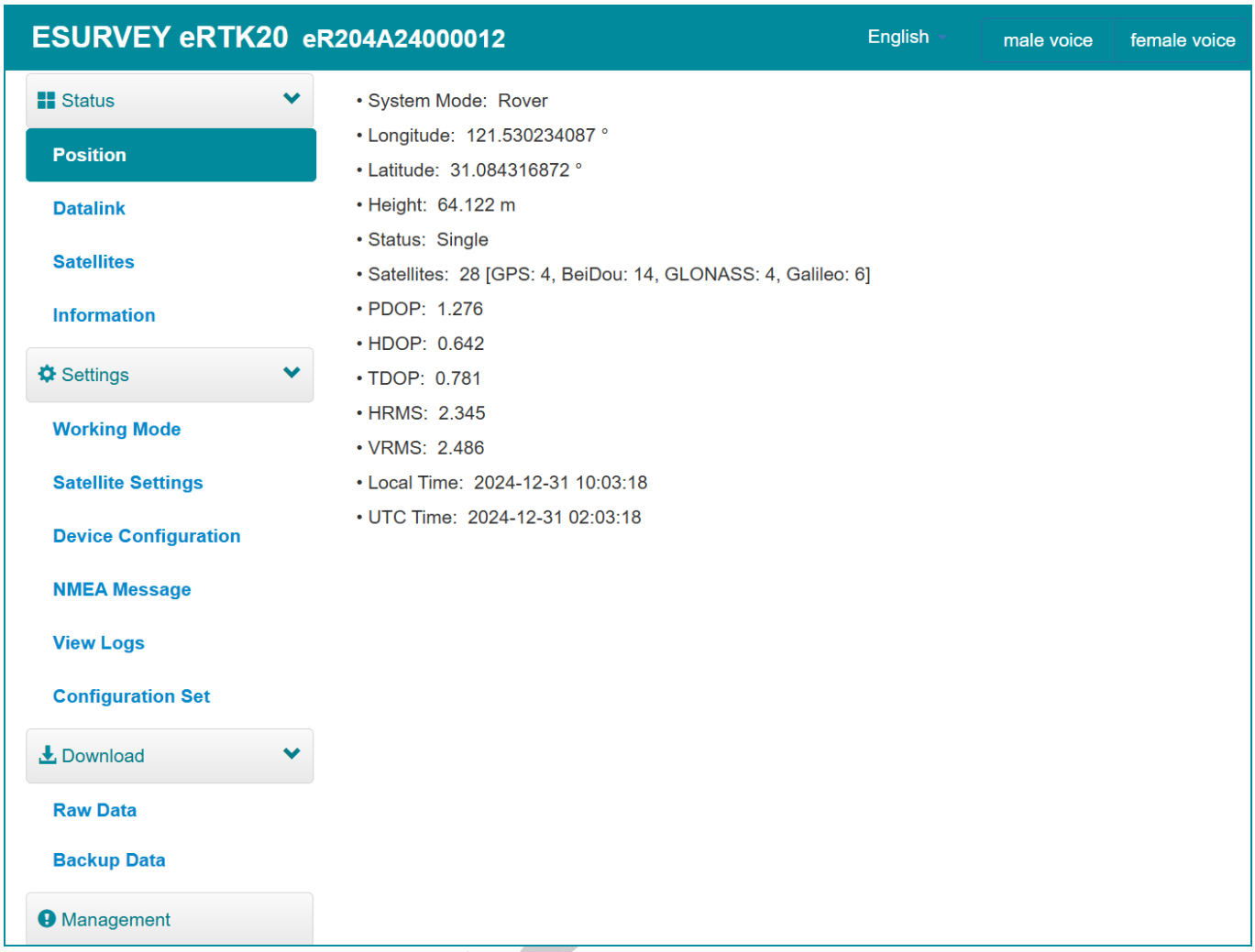


6. **Optional**: To change the gender for broadcasting, click **male voice** or **female voice** at the top right of the corner.

Note You can freely change the gender in every interface of the web UI at the top right corner.

3.1 Position

In the **Position** interface, you can view the following:

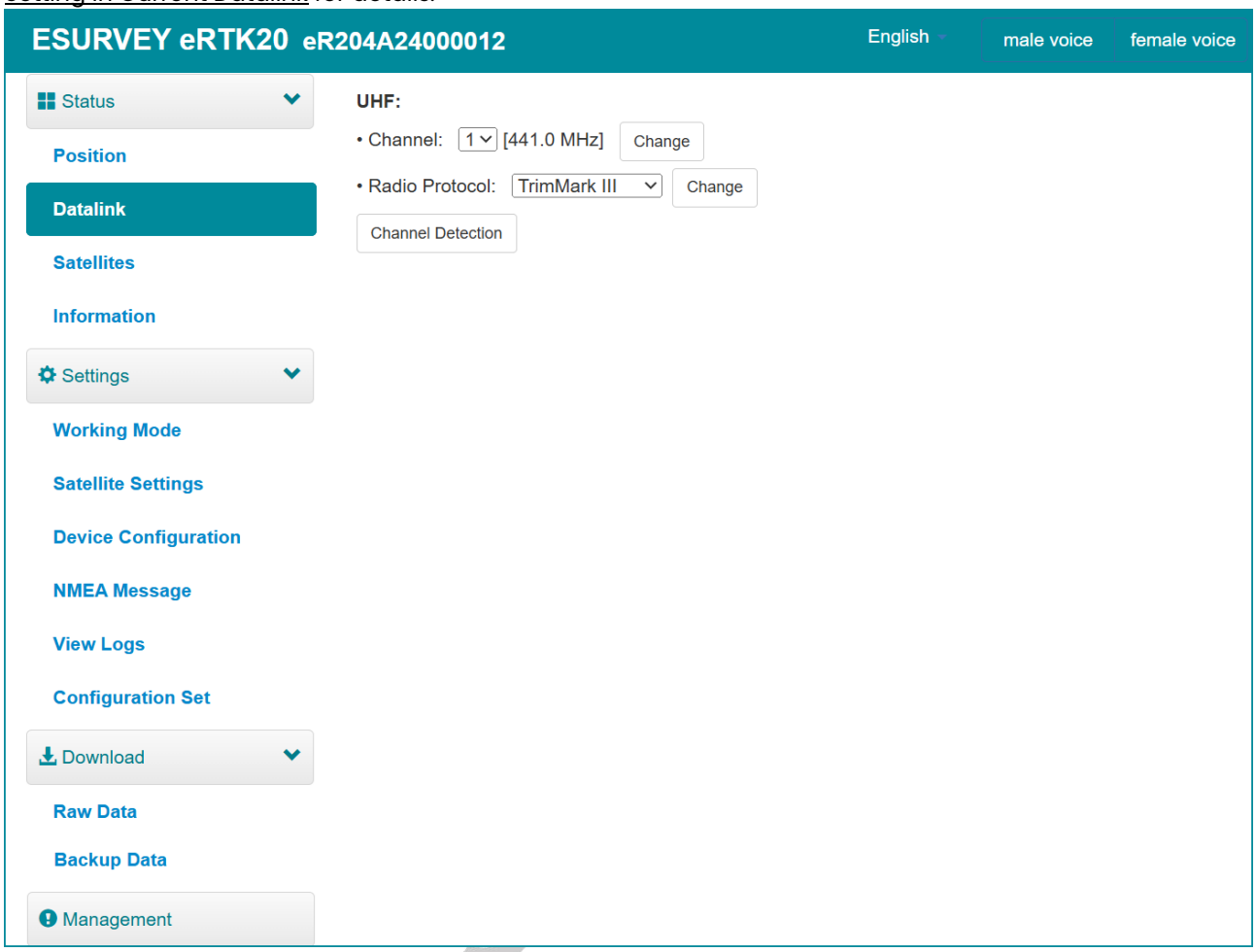


- **System mode**: including rover, base and static.
  Stop record: to stop the current work of the receiver.
- **Coordinates**: including longitude, latitude, and height.
- **Solution status**: including single, float, DGNSS, fixed, and PPP Fixed.
- **Satellite number**: the number of the satellites used, the type of the satellites and the number of satellites used for each type including GPS, BeiDou, GLONASS and Galileo.
- **PDOP**
- **HDOP**
- **TDOP**
- **HRMS**
- **VRMS**
- **Local time**
- **UTC time**

3.2 Datalink

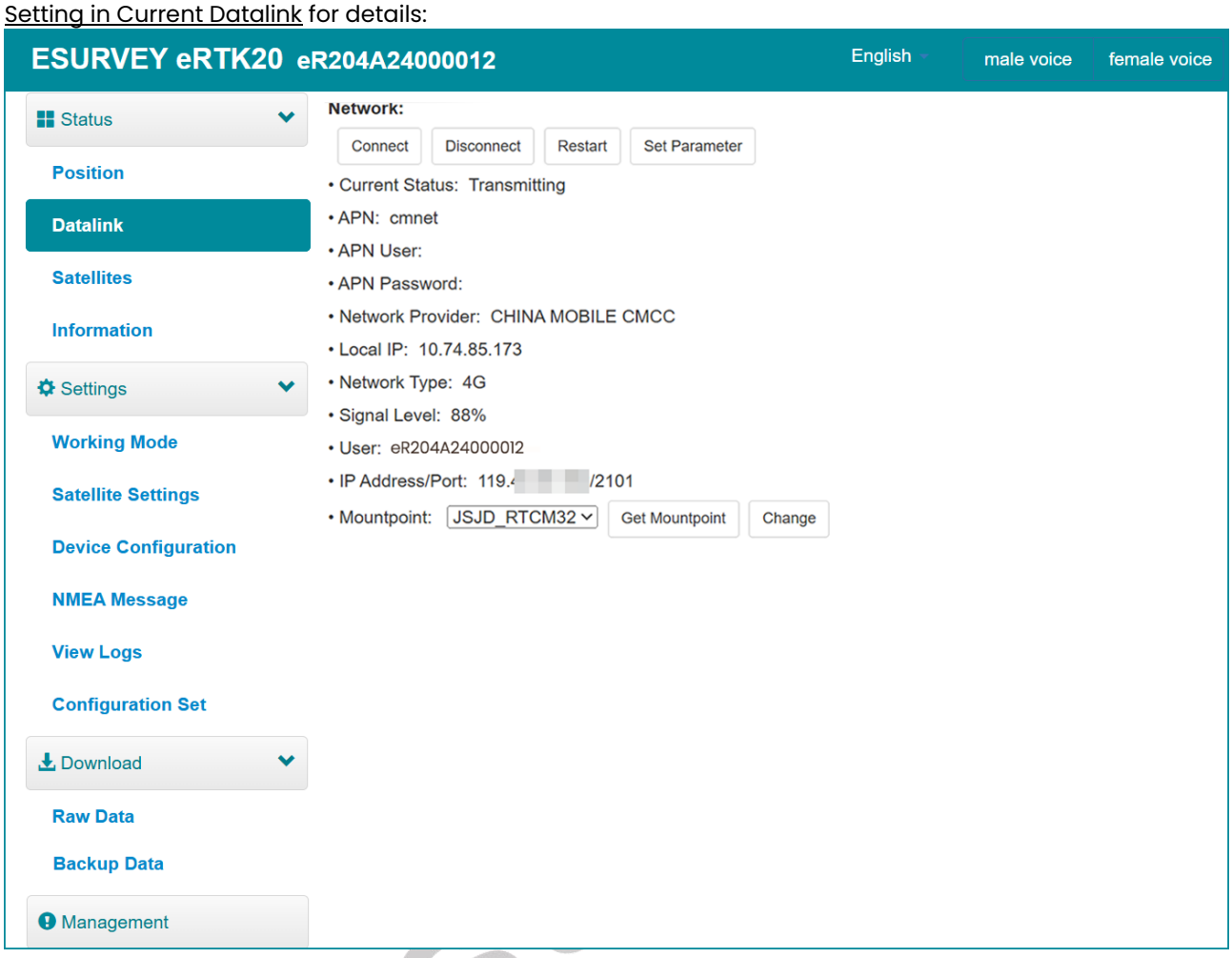
In the **Datalink** interface, you can view the current datalink:

- When the **Current Datalink** is set to **UHF**, you can view and set the channel and radio protocol. See UHF Setting in Current Datalink for details:

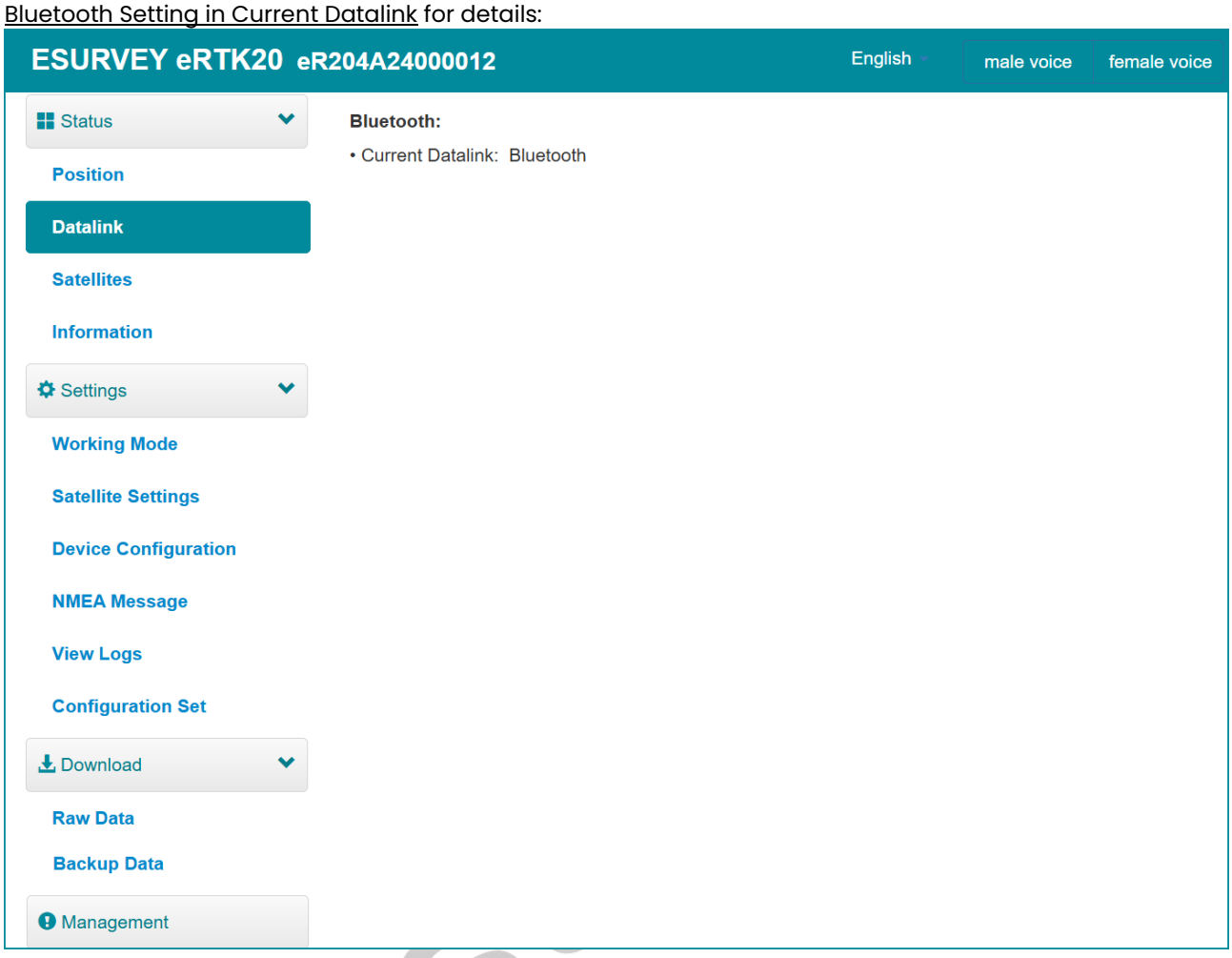


Channel Detection: to view the channels and frequencies.

- When the **Current Datalink** is set to **Network**, you can view the current datalink type - Network. See Network Setting in Current Datalink for details:



- When the **Current Datalink** is set to **Bluetooth**, you can view the current datalink type - Bluetooth. See Bluetooth Setting in Current Datalink for details:



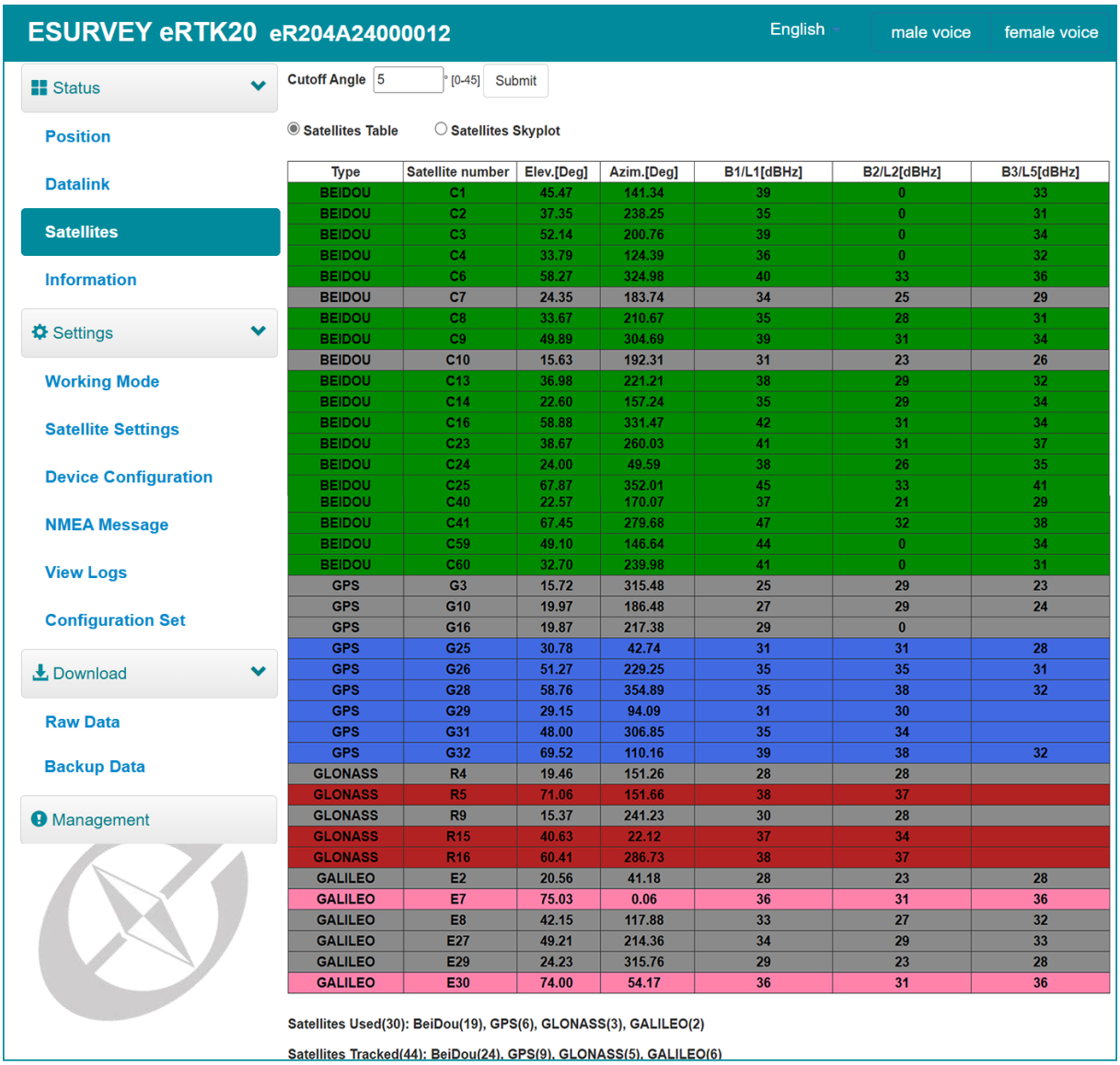
3.3 Satellites

In the **Satellites** interface, you can do the following information:

- Set the cutoff angle: to set the minimum elevation angle of a satellite relative to a GNSS receiver.
- View the tracked satellites in table or skyplot:

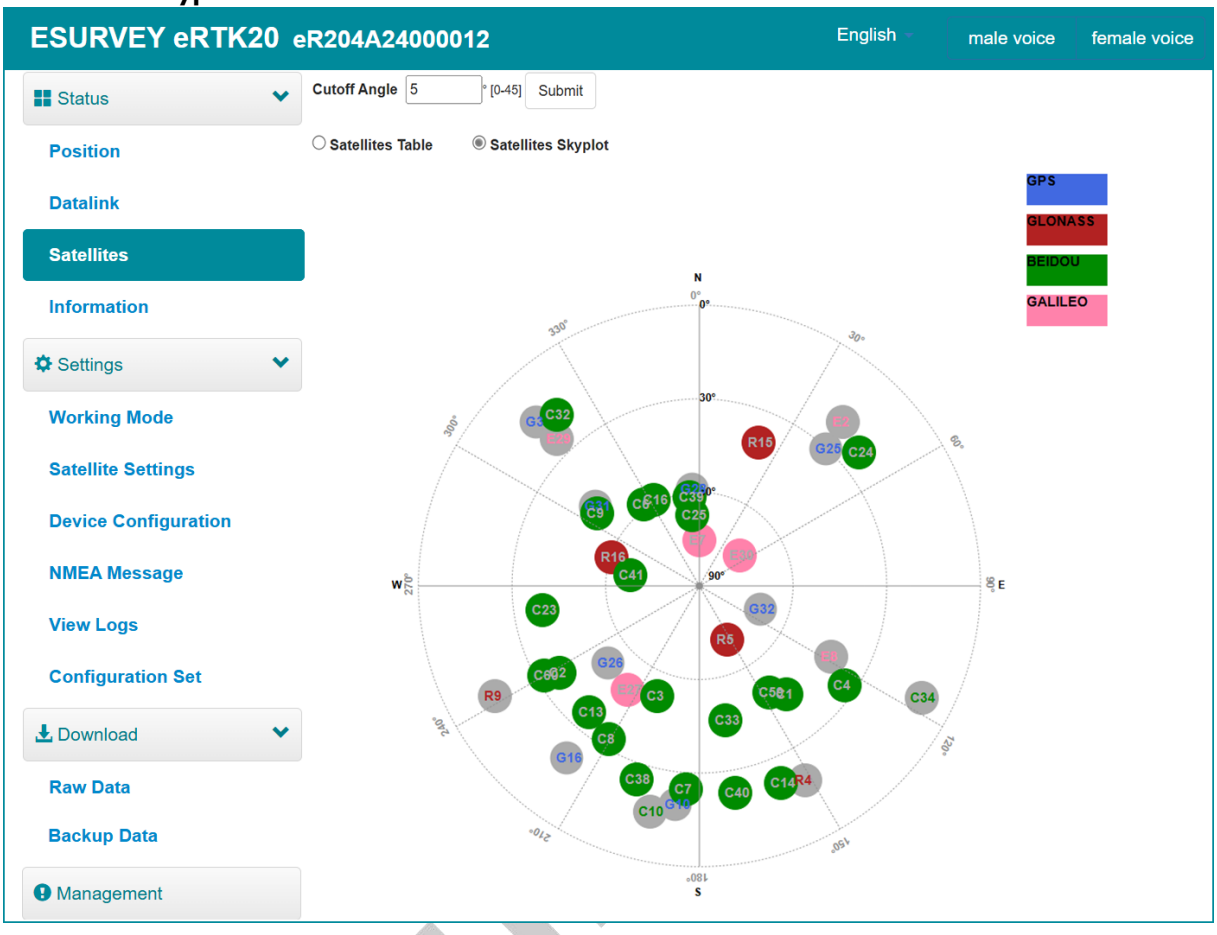
Note Gray: the satellites not involved in resolution.

○ In **satellites table**:



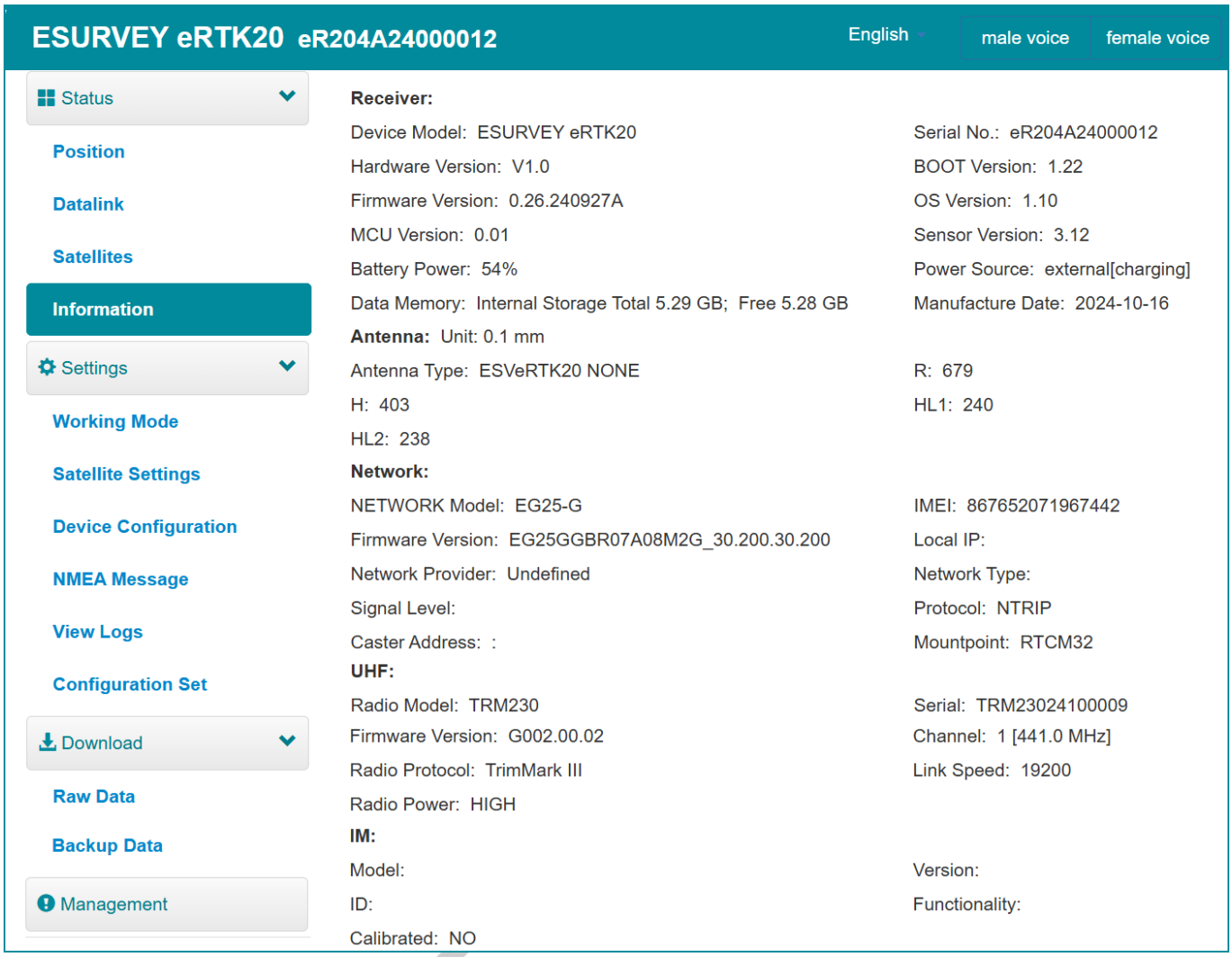
Type	Satellite number	Elev.[Deg]	Azim.[Deg]	B1/L1[dBHz]	B2/L2[dBHz]	B3/L5[dBHz]
BEIDOU	C1	45.47	141.34	39	0	33
BEIDOU	C2	37.35	238.25	35	0	31
BEIDOU	C3	52.14	200.76	39	0	34
BEIDOU	C4	33.79	124.39	36	0	32
BEIDOU	C6	58.27	324.98	40	33	36
BEIDOU	C7	24.35	183.74	34	25	29
BEIDOU	C8	33.67	210.67	35	28	31
BEIDOU	C9	49.89	304.69	39	31	34
BEIDOU	C10	15.63	192.31	31	23	26
BEIDOU	C13	36.98	221.21	38	29	32
BEIDOU	C14	22.60	157.24	35	29	34
BEIDOU	C16	58.88	331.47	42	31	34
BEIDOU	C23	38.67	260.03	41	31	37
BEIDOU	C24	24.00	49.59	38	26	35
BEIDOU	C25	67.87	352.01	45	33	41
BEIDOU	C40	22.57	170.07	37	21	29
BEIDOU	C41	67.45	279.68	47	32	38
BEIDOU	C59	49.10	146.64	44	0	34
BEIDOU	C60	32.70	239.98	41	0	31
GPS	G3	15.72	315.48	25	29	23
GPS	G10	19.97	186.48	27	29	24
GPS	G16	19.87	217.38	29	0	
GPS	G25	30.78	42.74	31	31	28
GPS	G26	51.27	229.25	35	35	31
GPS	G28	58.76	354.89	35	38	32
GPS	G29	29.15	94.09	31	30	
GPS	G31	48.00	306.85	35	34	
GPS	G32	69.52	110.16	39	38	32
GLONASS	R4	19.46	151.26	28	28	
GLONASS	R5	71.06	151.66	38	37	
GLONASS	R9	15.37	241.23	30	28	
GLONASS	R15	40.63	22.12	37	34	
GLONASS	R16	60.41	286.73	38	37	
GALILEO	E2	20.56	41.18	28	23	28
GALILEO	E7	75.03	0.06	36	31	36
GALILEO	E8	42.15	117.88	33	27	32
GALILEO	E27	49.21	214.36	34	29	33
GALILEO	E29	24.23	315.76	29	23	28
GALILEO	E30	74.00	54.17	36	31	36

○ In **satellites skyplot**:

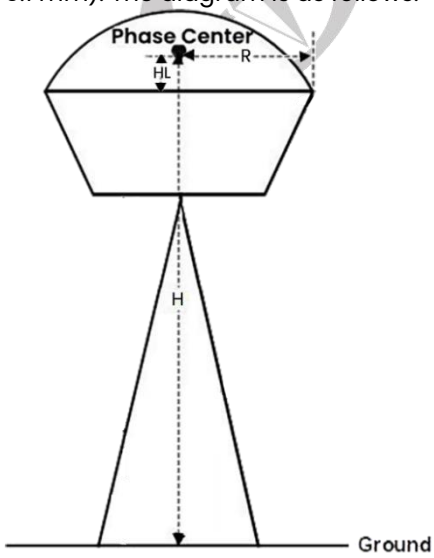


3.4 Information

In the **Information** interface, you can view the following information:



- **Receiver**: the information of receiver mode, serial number, hardware version, boot version, firmware version, OS version, MCU version, sensor version, battery power, power source, data memory, and manufacture date.
- **Antenna**: the information of antenna type, R (unit: 0.1 mm), H (unit: 0.1 mm), HL1 (unit: 0.1 mm), and HL2 (unit: 0.1 mm). The diagram is as follows:



H: the vertical height from the phase center to the ground.
R: the radius of the external antenna.
HL1: the distance from the bottom of the antenna to the phase center of L1.
HL2: the distance from the bottom of the antenna to the phase center of L2.

> **Note** The distance from the bottom of the antenna to the phase centers of different frequencies, such as L1, L2, and L5. Since dual-frequency receivers are commonly used for positioning, only L1 and L2 are usually mentioned.

- **Network**: the information of network model, IMEI, firmware version, local IP, network provider, network type, signal level, protocol, caster address, and mountpoint.
- **UHF**: the information of radio model, serial number, firmware version, channel, radio protocol, and radio power.
- **IM**: the sensor related to visual survey.

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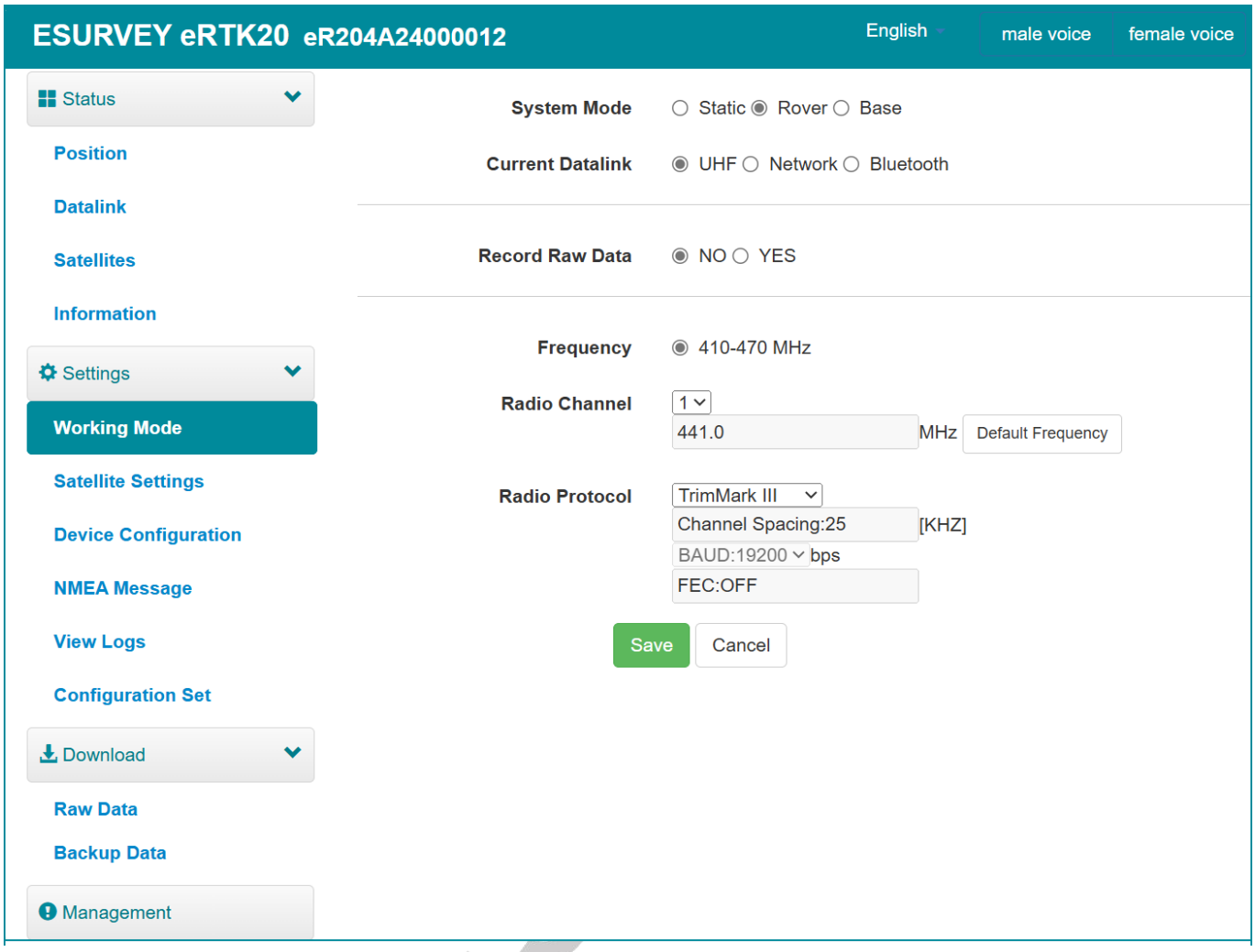
3.5 Working Mode

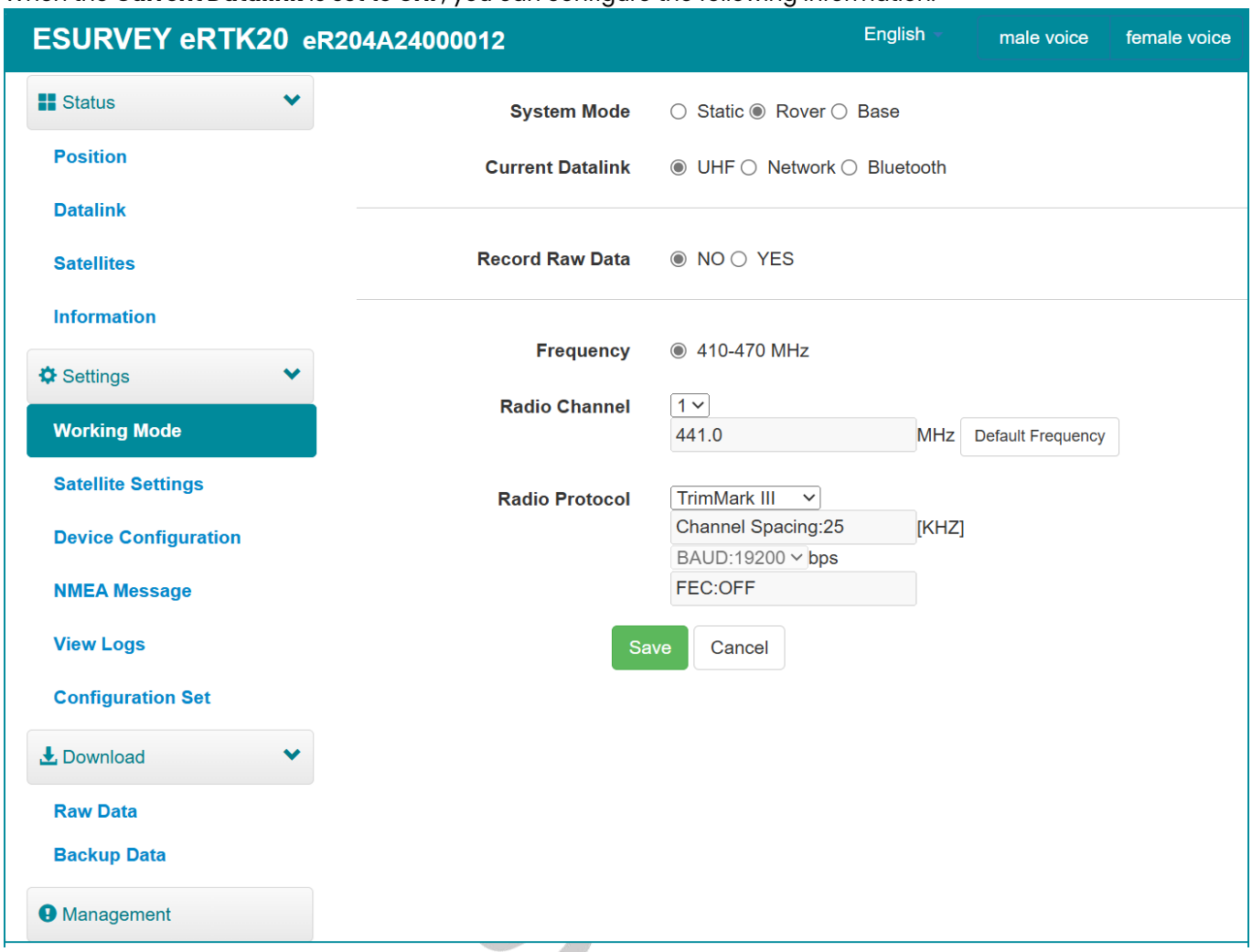
In the **Working Mode** interface, you can configure the following information:



- **System mode**: to select the working mode, including static, rover, and base.
- **Current datalink**: to select the way of datalink, including UHF, Network, and Bluetooth for details.
- **Record raw data**: to select whether to enable recording raw data.

3.5.1 UHF Setting in Current Datalink

When the **Current Datalink** is set to **UHF**, you can configure the following information:

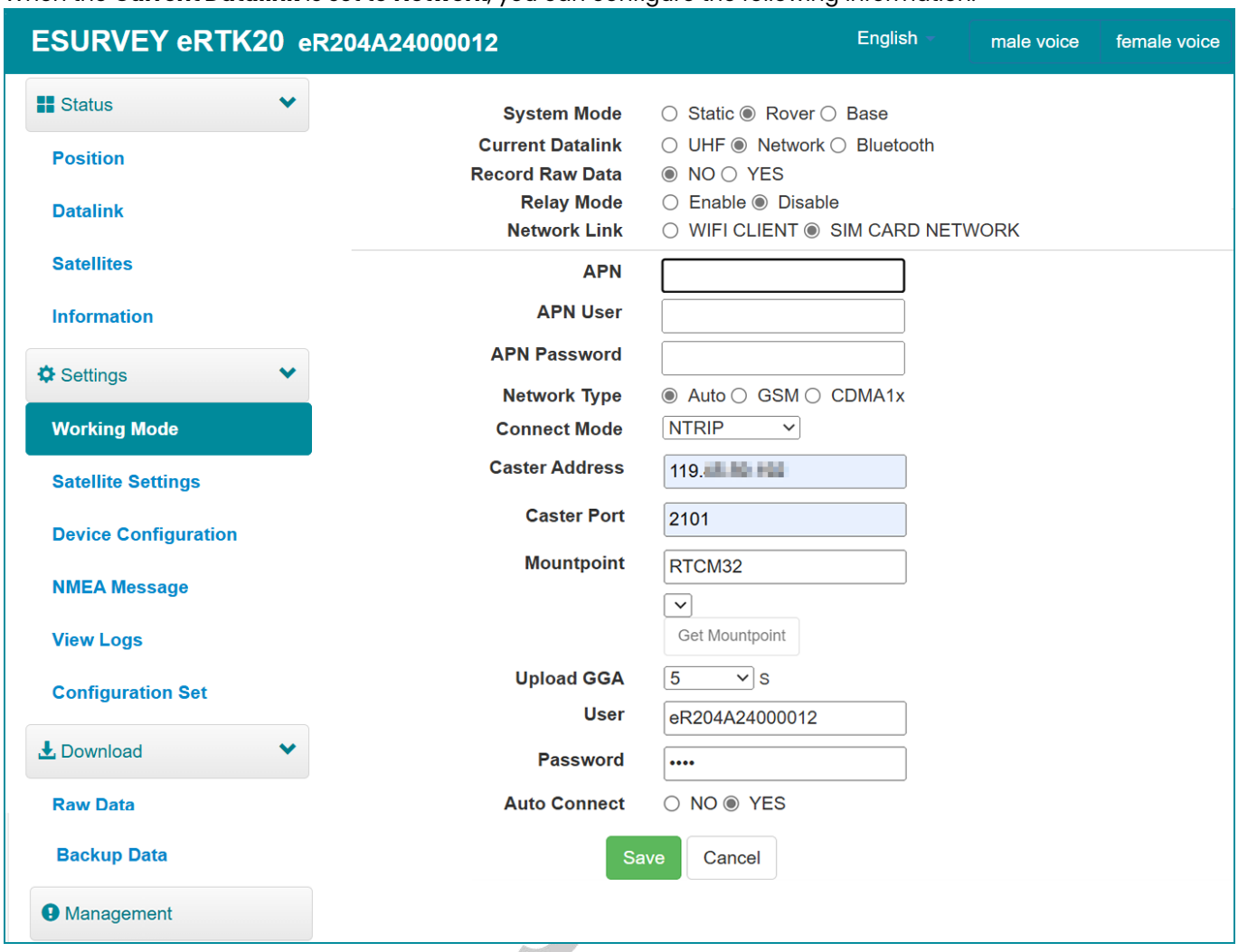


- **Frequency**: the supported frequency range of internal radio is from 410 MHz to 470 MHz.
- **Radio channel**: to select the radio channel.
- **Radio protocol**: to select the radio protocol, including TrimTalk 450S, PCC-GMSK,PCC-4FSK, Satel, Satel_ADL, HITARGET, HZSZ, Trimmark III, South, GEOTALK, GEOMARK, PCCFST, PCCFST_ADL, FARLINK, Geotalk_Ultra, and elink_Ultra. FARLINK/Geotalk_Ultra/elink_Ultra can achieve a maximum communication range of 15 km with 2W transmitting power in urban environments.

Note Please make sure the channel and protocol of the base station and rover station are same when setting the UHF in receiver.

3.5.2 Network Setting in Current Datalink

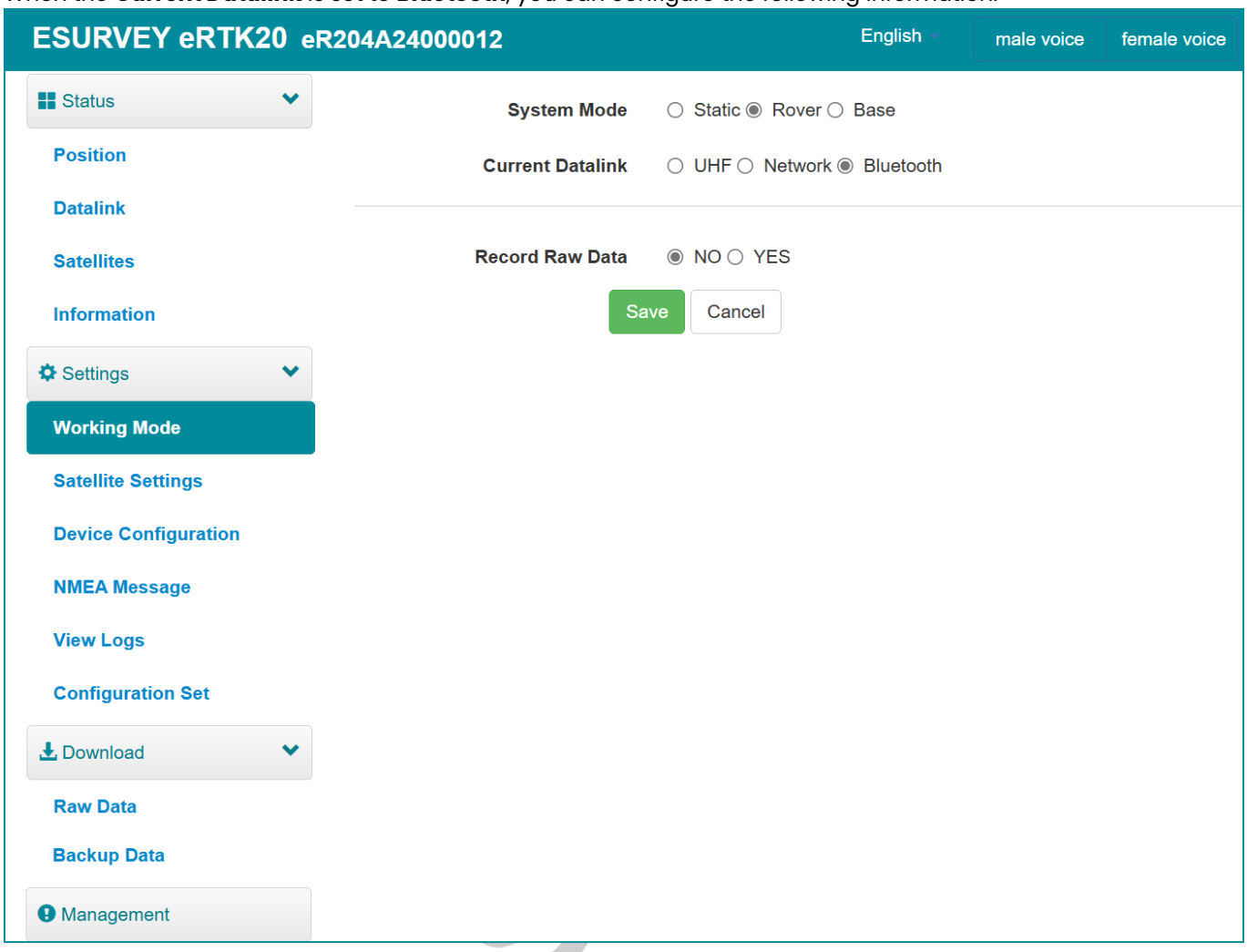
When the **Current Datalink** is set to **Network**, you can configure the following information:



- **Network link**: to select the method for connecting to the network.
  - If you use Wi-Fi, select **WIFI CLIENT**.
  - If you use SIM card, select **SIM CARD NETWORK**.
- **SSID(Wi-Fi)**: to set the Wi-Fi account in if you use Wi-Fi .
- **Password**: to set the password of Wi-Fi account in if you use Wi-Fi.
- **APN**: the Access Point Name, to provide the necessary information for a receiver to connect to the Internet.
- **APN User**: to set the name of user.
- **APN password**: to set the password.
- **Network Type**: to select the network type, including Auto, GSM, and CDMA 1X.
- **Connect Mode**: to select a connecting mode.
- **Caster Address**: to set the caster address of CORS.
- **Caster Port**: to set the port of CORS.
- **Get Mountpoint**: to get the latest mount-point list.
- **Upload GGA**: to set the time interval for uploading GGA data.
- **Auto Connect**: to select whether to automatically enable connecting the network.

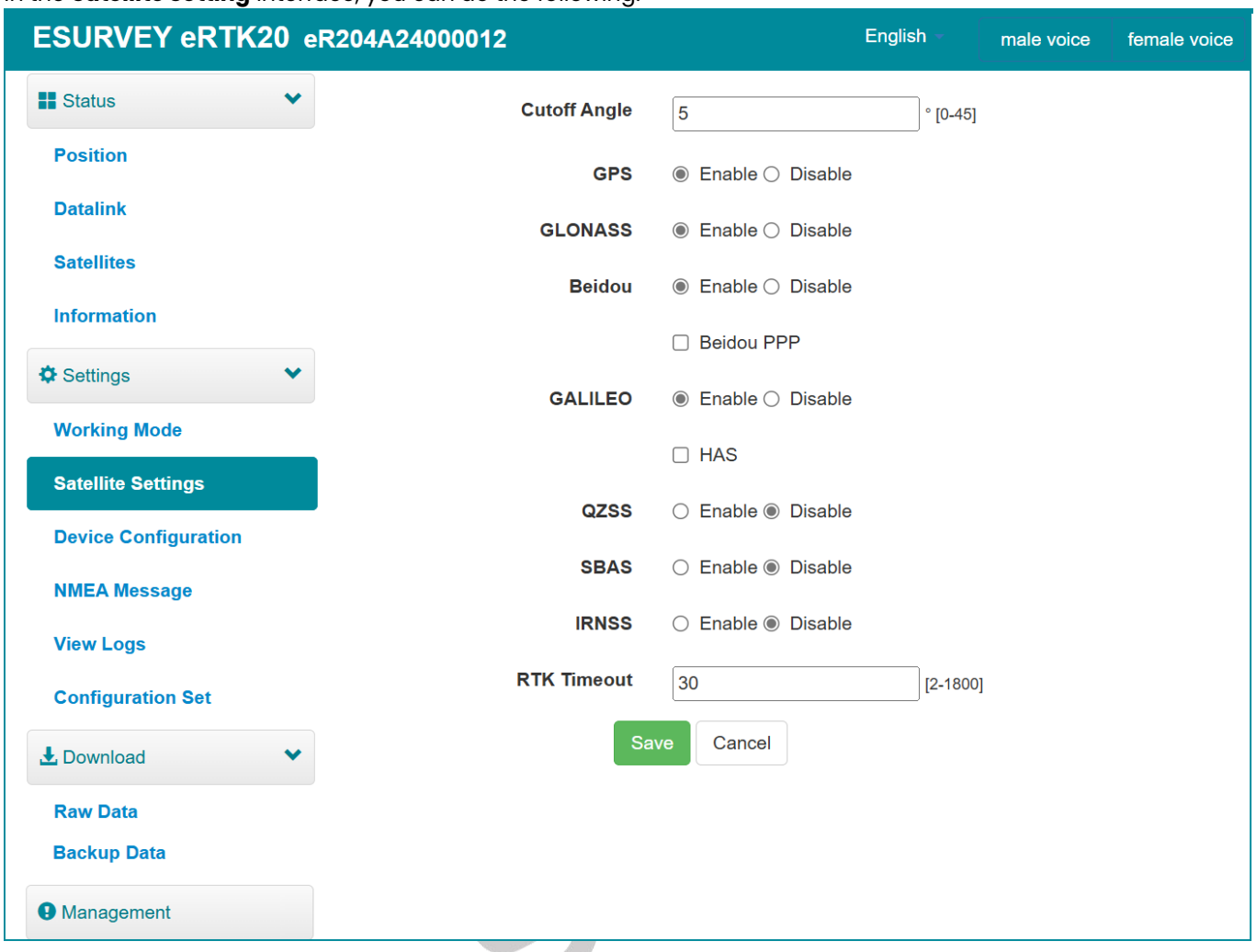
3.5.3 Bluetooth Setting in Current Datalink

When the **Current Datalink** is set to **Bluetooth**, you can configure the following information:



3.6 Satellite Setting

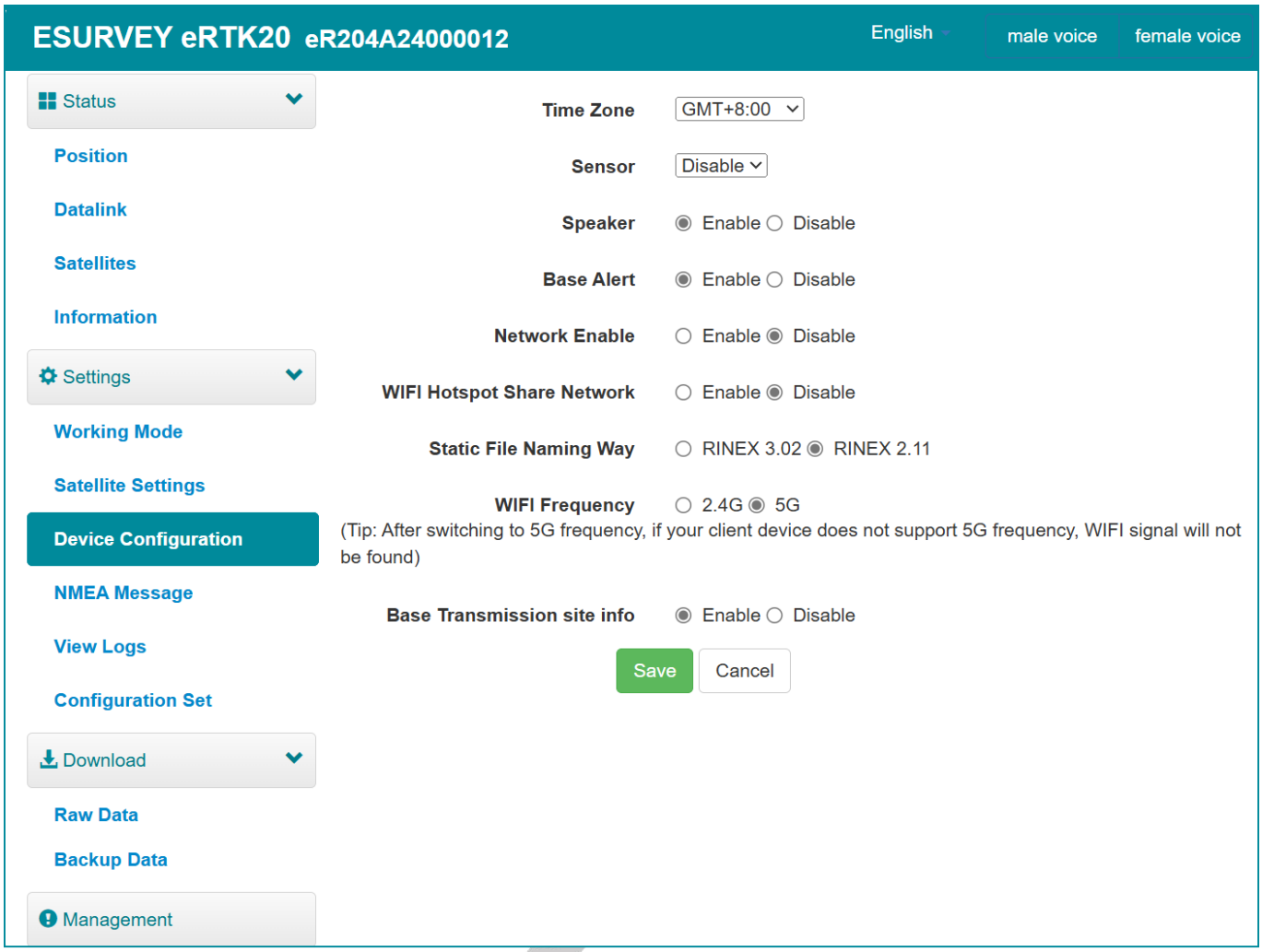
In the **Satellite Setting** interface, you can do the following:



- Set the cutoff angle: to set the minimum elevation angle of a satellite relative to a GNSS receiver.
- Configure the satellites to be used, including GPS, GLONASS, Beidou, GALILEO, QZSS, SBAS and IRNSS.
- Set the RTK timeout: to set the duration of maintaining a fixed solution status when satellite signals are lost.

3.7 Device Configuration

In the **Device Configuration** interface, you can configure the following:



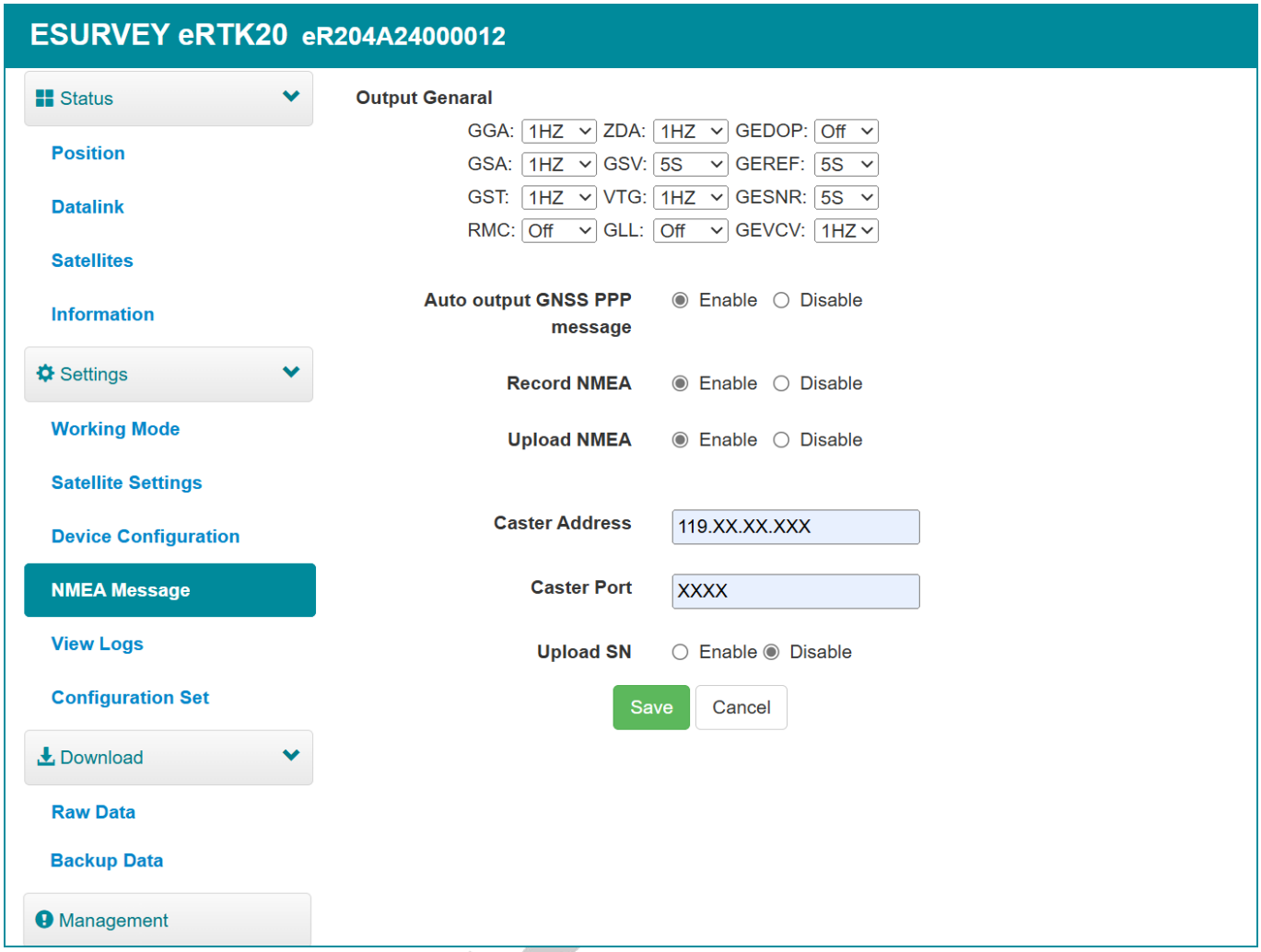
- **Time zone**: to set time zone.
- **Sensor**: to select whether to enable IMU sensor when you need to use IMU tilt measurement function.
- **Speaker**: to select whether to enable speaker.
- **Base alert**: to select whether to enable base alert, which is used to send an alarm *Base moved* when the base station moves.
- **Network enable**: to select whether to enable network.
- **Wi-Fi hotspot share network**: to select whether to enable Wi-Fi Hotspot Share Network. With a SIM card inserted and it enabled, the PC, smartphone, handheld or tablet connected to the hotspot of the receiver can surf the internet by using SIM data.
- **Static file naming way**: to select the naming method of static files, including RINEX 3.02 and RINEX 2.11.
- **Wi-Fi frequency**: to select 2.4G/5G.

  Note: If you need to use the camera, please select 5G.

- **Base transmission site info**: to select whether to enable transmitting all the information of the receiver to the eSurvey rover station when the receiver is working as a base station.

3.8 NMEA Message

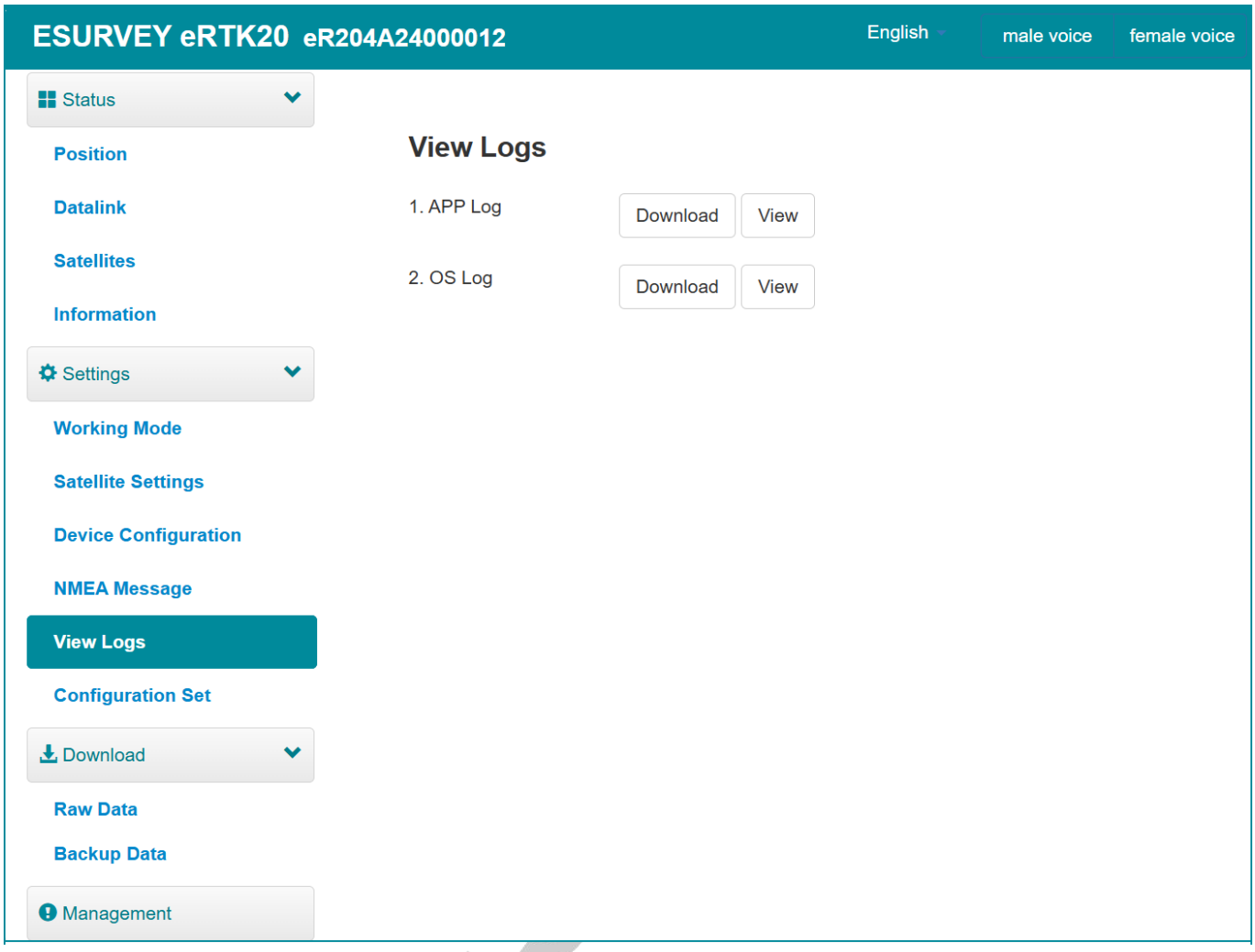
In the **NMEA Message** interface, you can do the following:



- **Output general**: to select data types of NMEA message.
- **Record NMEA**: to select whether to enable saving the NMEA message to receiver.
- **Upload NMEA**: to select whether to enable uploading the NMEA message to the user-defined server. You can set the **Caster Address** and **Caster Port** and enable uploading SN based on your requirements.

3.9 View Logs

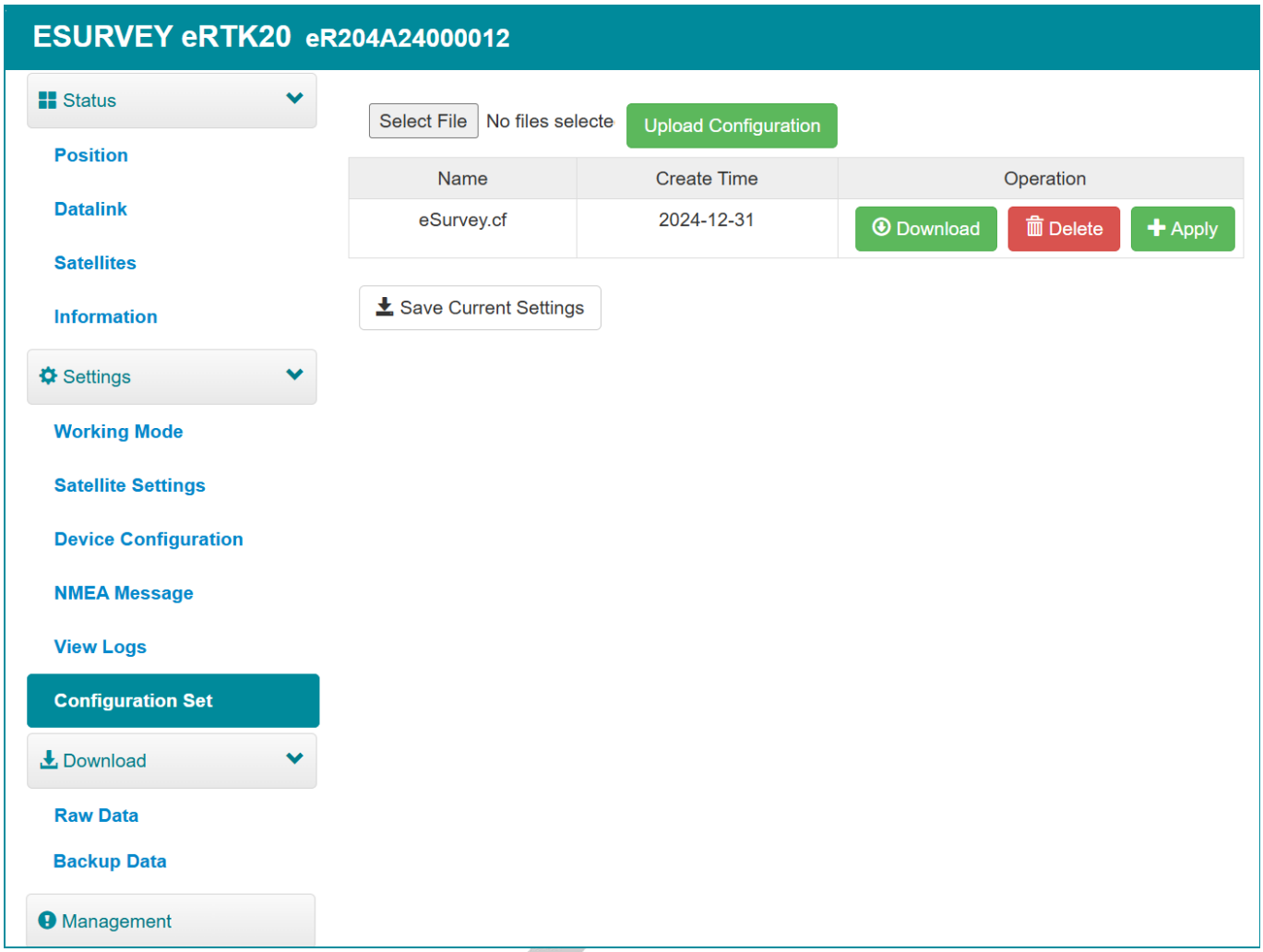
In the **View Logs** interface, you can download or view logs for troubleshooting:



- **App log**: the logs about App.
- **Os log**: the logs about OS.

3.10 Configuration Set

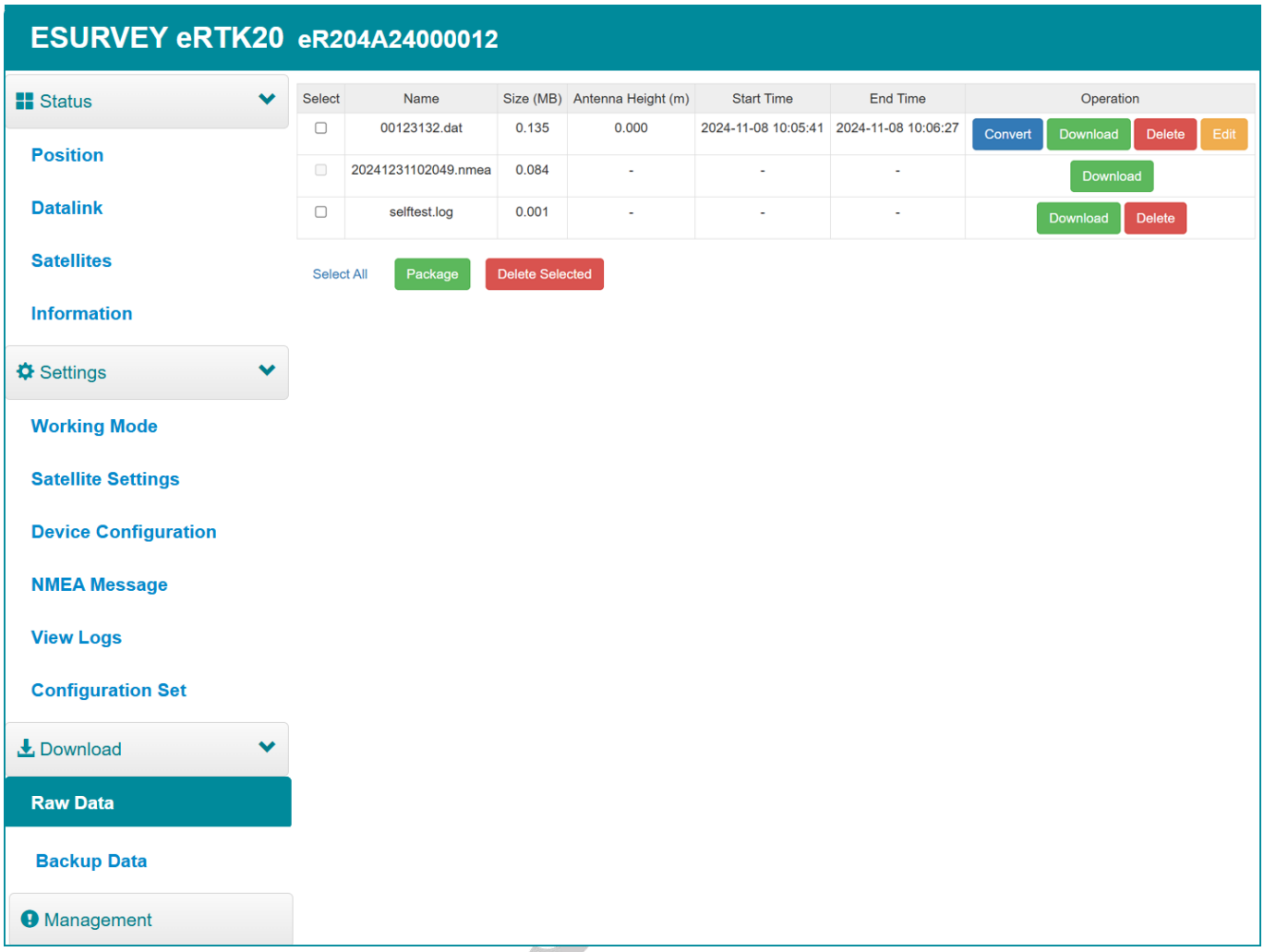
In the **Configuration Set** interface, you can do the following:



- **Save current settings**: to store the current configuration settings in the receiver.
- **Select file**: to select the file of the configuration setting data stored in the computer, mobile phone, tablet, and handheld. The file should be in cf. format.
- **Upload configuration**: to upload the file of the configuration setting data in the in the computer, mobile phone, tablet, and handheld. The file should be in cf. format.
- **Download**: to download the current configuration setting.
- **Delete**: to delete the current configuration setting.
- **Apply**: to apply the current configuration setting.

3.11 Raw Data

In the **Raw Data** interface, you can do the following:

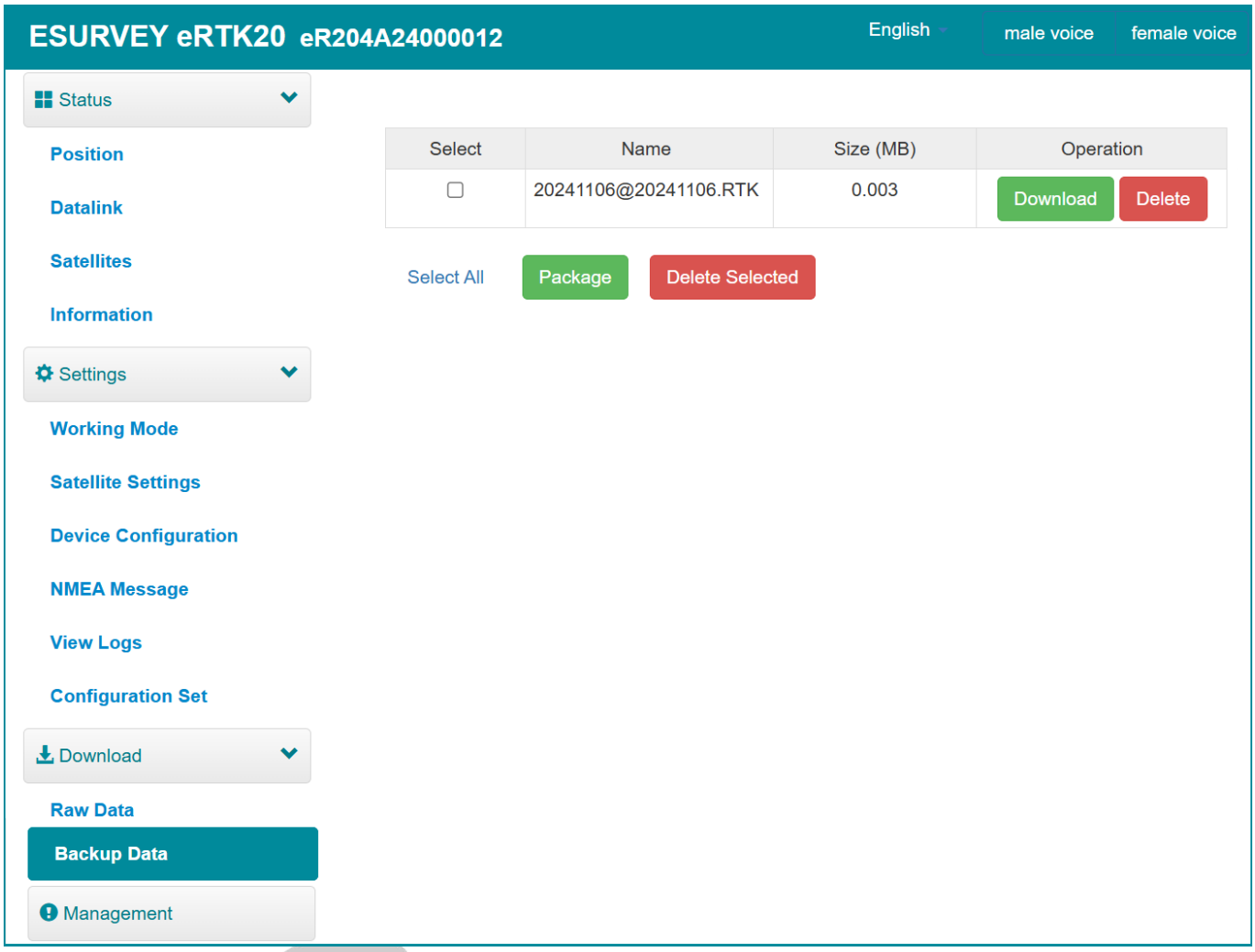


- **Download**: to download raw data.
  Taking the name of the raw data 00123132 as an example:
  - 0012: point name.
  - 313: the 313th day of the current year.
  - 2: the 2nd project.
- **Convert**: to convert data to RINEX format.
- **Package**: to download multiple files by checking the target files and clicking **Package**.
- **Delete/Delete Selected**: to delete the target file or selected files.
- **Edit**: to edit the information of raw data.

3.12 Backup Data

The points collected by receiver will be automatically backed up in the receiver storage to avoid data loss. You can download the data for later use.

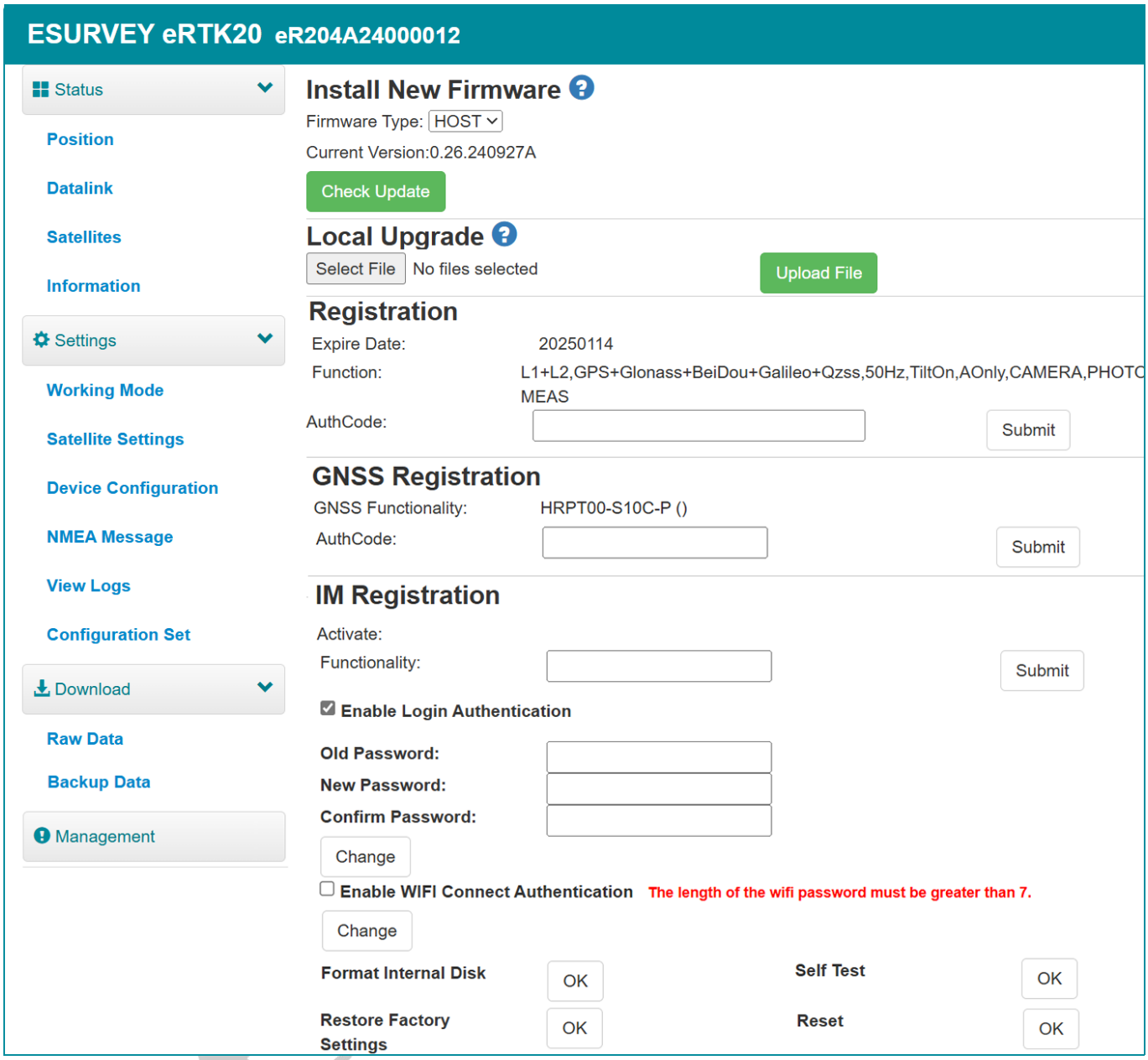
In the **Backup Data** interface, you can do the following:



- **Download**: to download point data.
- **Delete/Delete selected**: to delete the target file or selected files.
- **Package**: to download multiple files by checking the target files and clicking **Package**.
- **Select all**: to select all files.

3.13 Management

In the **Management** interface, you can configure the following:



- **Local upgrade**: to install new firmware.
- **Resgistation**: to register the receiver.
- **GNSS Registraction**: to register the GNSS board.
- **IM**: to register the sensor related to visual survey. It is registered in the factory settings.
- **Security**: to set password of web UI (192.168.10.1) and receiver Wi-Fi.
- **Format internal disk**: to select whether to enable formatting the internal disk in the receiver.
- **Self test**: to do self-test when the receiver fails, including radio failure, Bluetooth connection failure, factory reset, and so on.
- **Restore factory settings**: to restore factory settings.
- **Reset**: to restart the receiver.

4 Basic Operations

4.1 Charge the Receiver

The receiver is equipped with a type-C charger which supports 20W PD quick charge.
It takes about 5 hours to fully charge the receiver.
To charge the receiver, open the cover of type-C port, and connect one end of the power cable to the type-C interface and another end of the power cable to the charger.

4.2 Install the Radio Antenna

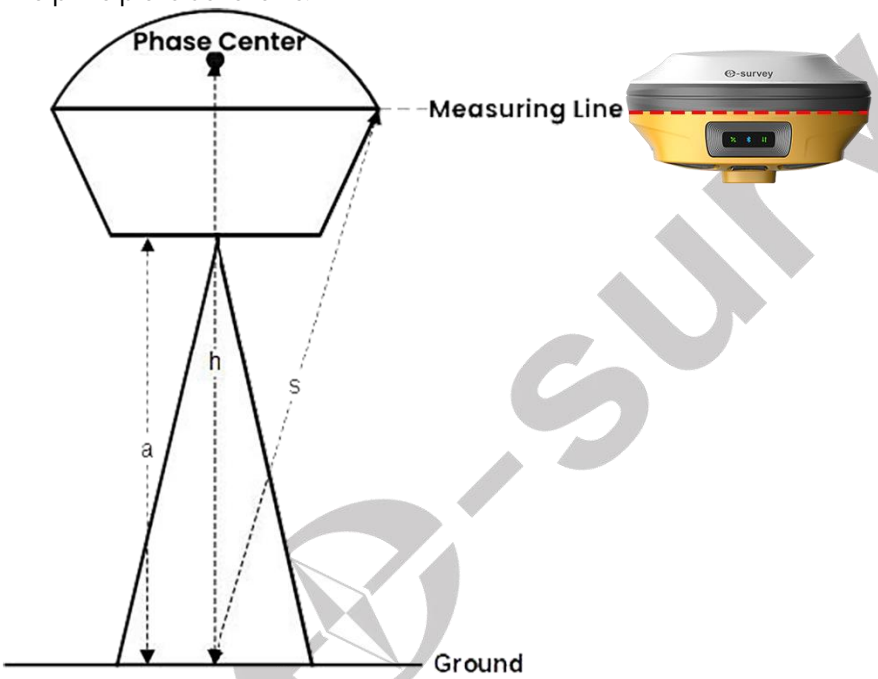
The antenna is required when the datalink is set to internal radio.
To install the radio antenna, open the cover of UHF port, and install the radio antenna.

4.3 Measure Antenna Height

Antenna height refers to the vertical distance between the phase center and the ground. Since the antenna height cannot be directly measured, it is automatically calculated by the SurPad software based on the measured height you input and measurement type you select.

Note No matter what the value of measured height you input and what kind of measurement type you select, the value of antenna height is unique.

The principle is as follows:



- **h**: the vertical height from the phase center to the ground.
- **s**: the slant height from the measuring line to the ground.
- **a**: the pole height, that is, the length of the pole.

To measure antenna height, do one of the following:

- Set the measured height to the slant height and measurement type to slant height.
- Set the measured height to the pole height and measurement type to pole height.

The SurPad software automatically calculates the antenna height.

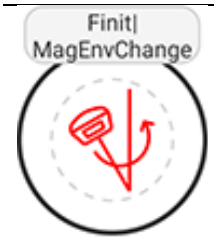
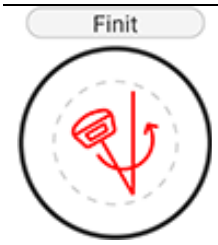
4.4 Start IMU Tilt Measurement

The receiver supports IMU tilt measurement, which is determined by the activation code and service you purchase.

IMU tilt measurement is required when tilt measurement is used and IMU is used.

Before starting IMU tilt measurement, to enable IMU tilt measurement, in SurPad software, tap main menu **Device** → **Device Setting**, and set tilt survey to **Pole Tilt Correction**.

To start IMU tilt measurement in SurPad software, tap main menu **Survey→Point Survey** to enter **Point Survey** interface, and do as the prompt in the interface:

Status	What it means	What to do
	Magnetic calibration is required.	Take the pole and draw a circle towards the ground.
	Initialization is required.	Shake the pole according to the prompt.
	The accuracy of tilt measurement is not enough.	Wait for better signals.
	The tilt angle exceeds 60°.	Make sure the tilt angle is within 0° - 60°.
	Tilt measurement is successfully enabled.	Start survey.

4.5 Start AR Stakeout

It is used to generate directional and distance guidance for stakeout. You can simply follow directions on the screen to find the targerts. Compared to the traditional stakeout, You can more quickly and conveniently find the targets based on prompts from the actual scene.

Note The AR stakeout function is only applicable to the Surpad software.

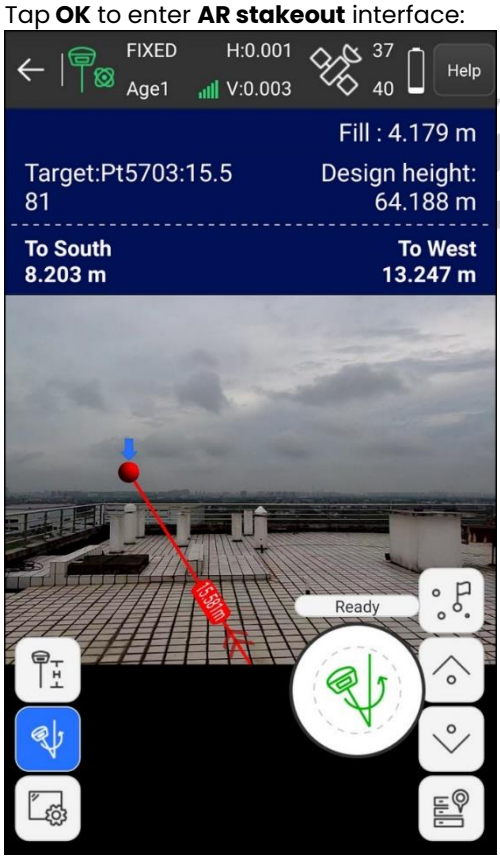
Before starting AR stakeout, do the following:

1. Select Wi-Fi as the communication mode. See Set the Communication in the Surpad software user guide for details.
2. Make sure the working mode is rover and the receiver is is under fixed solution.
3. Enable IMU tilt measurement. See Start IMU Tilt Measurement for details.

To start AR stakeout in the Surpad software, do the following:

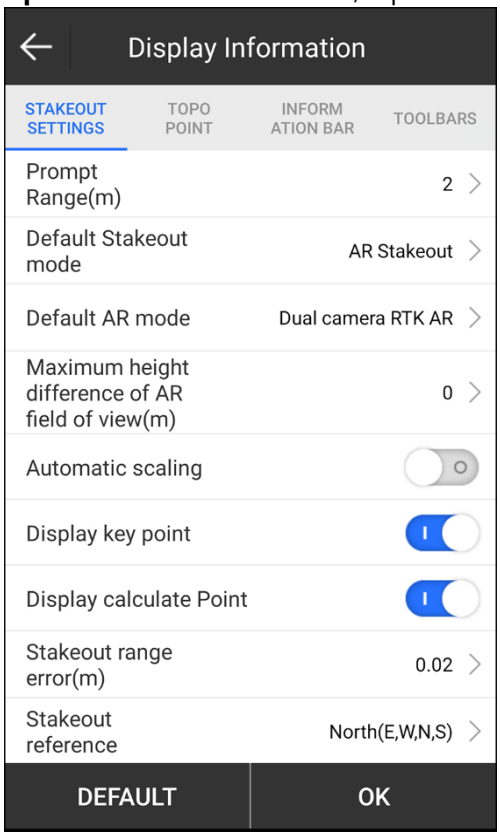
1. Tap main menu **Survey** → **Point Stakeout**. Select the stakeout point:

2. Tap **OK** to enter **AR stakeout** interface:



Survey

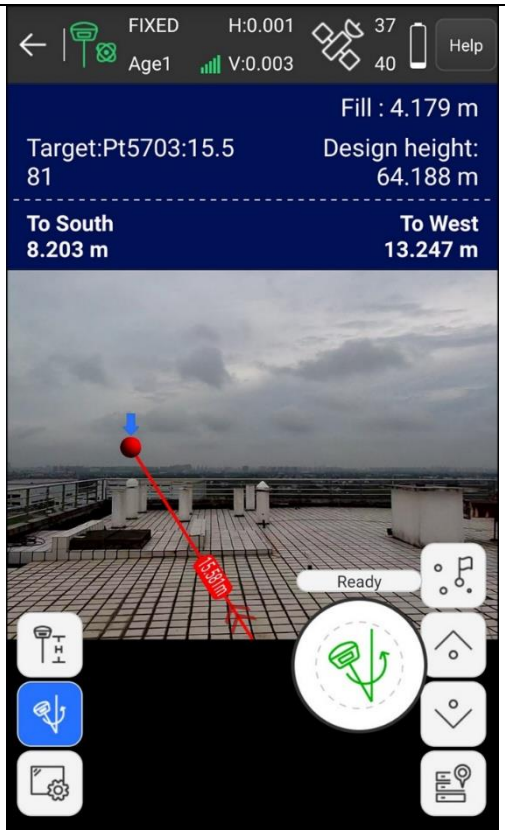
3. **Optional**: To set the AR mode, tap to enter **Display Information** interface:



- **Close AR Prompt range:** to set the distance when the working camera changes from the stakeout camera1 to the stakeout camera2 during the AR stakeout.
- **Default AR mode**:
  - **Phone AR + 3D AR**: to use the camera of the phone and the 3D image generated automatically by the Surpad software.
  - **Dual camera RTK AR**: to simultaneously use the two stakeout cameras of the receiver.

4. Walk slowly with the pole, making sure the direction of the handheld on the line of the direction of the red ball. Find the stakeout point according to the prompt in the interface:

   a. When entering AR stakeout interface, stakeout camera 1 is working. The interface is shown as follows:


FIXED
Age1
H:0.001
V:0.003
37
40
Help
Fill : 4.179 m
Target:Pt5703:15.5
81
Design height:
64.188 m
To South
8.203 m
To West
13.247 m
15.501m
Ready

b. When the distance from the handheld to the stakeout point is less than the value of close AR prompt range, the working camera automatically switches to the stakeout camera 2. The interface is shown as follows:

4.6 Start CAD AR stakeout

It is used to guide the users to find the stakeout target by integrating CAD drawings directly into the stakeout interface.

The CAD AR stakeout includes CAD drawing point and point library stakeout.

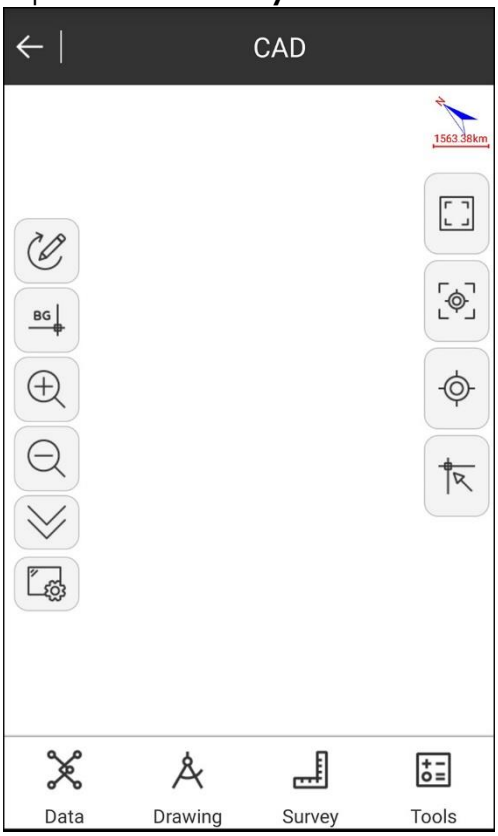
Note The CAD AR stakeout function is only applicable to Surpad software.

Before starting CAD AR stakeout, do the following:

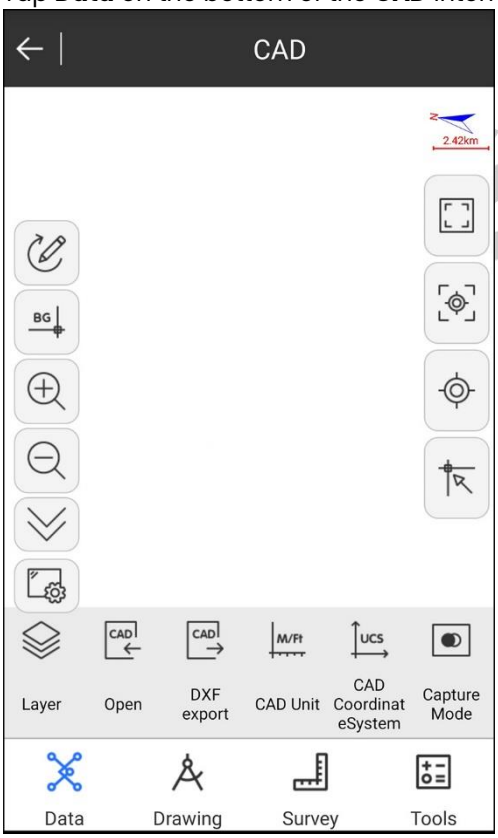
1. Select Wi-Fi as the Communication mode. See Set the Communication in the Surpad user guide for details.
2. Make sure the working mode is rover and the receiver is under fixed solution.
3. Enable the IMU tilt measurement function. See Start IMU Tilt Measurement for details.

To start CAD drawing stakeout, do the following:

1. Tap main menu **Survey** → **CAD** to enter **CAD** interface:



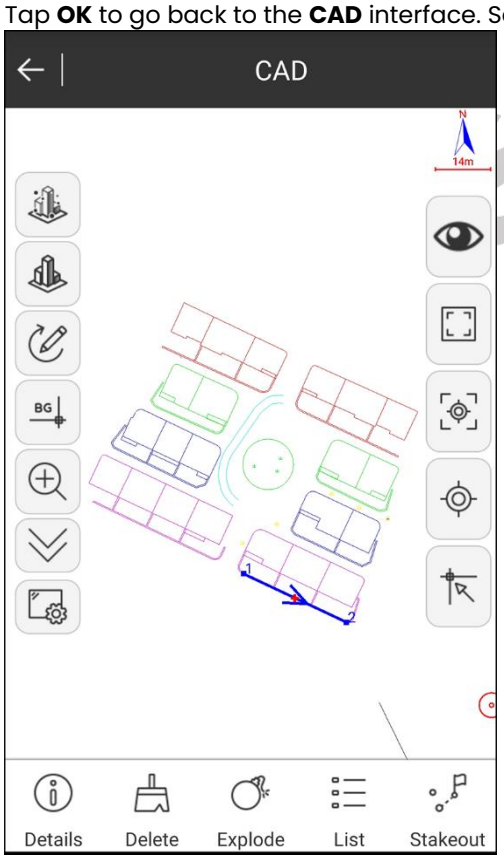
2. Tap **Data** on the bottom of the **CAD** interface:



Survey

3. Tap **Open** and select the file:
   The file should be in DXF* or DWG format.

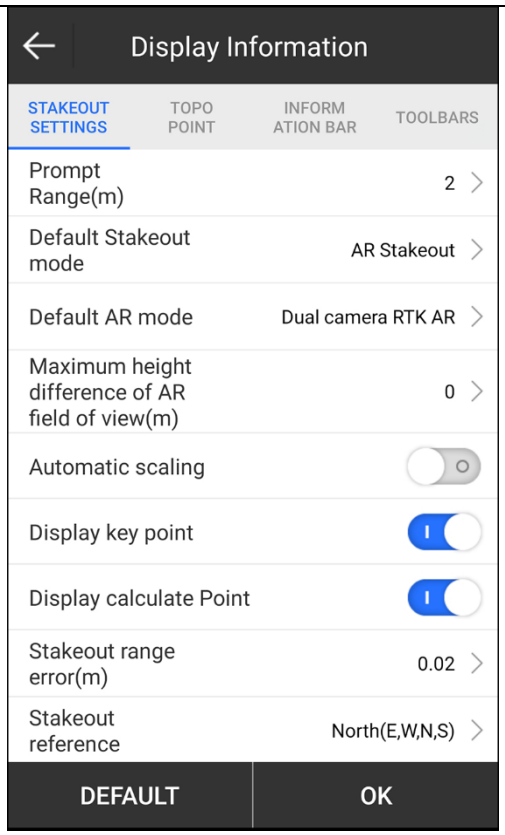
4. Tap **OK** to go back to the **CAD** interface. Select the target figure on the CAD map:



Survey

5. To enter **CAD AR stakeout** interface, do one of the following:
   - To enter **CAD AR stakeout** interface, tap to enter **CAD Drawing Stakeout** interface directly.
   - To enter **CAD AR stakeout** interface, tap **Stakeout** to enter **Stakeout Settings** interface, then tap **OK**:

6. **Optional**: To set the AR mode, tap to enter **Display Information** interface:



- **Close AR Prompt range**: to set the distance when the working camera changes from stakeout camera 1 to the stakeout camera 2 during the AR stakeout.
- **Defaut stakeout mode**:
  - **Phone AR + 3D AR**: to use the camera of the phone and the 3D image generated automatically by Surpad software.
  - **Dual camera RTK AR**: to simultaneously use the two stakeout cameras of the receiver.

7. Hold the pole with the receiver and find the location of the target figure on the CAD drawing according to the prompt on the stakeout interface:
   a. When entering AR stakeout interface, stakeout camera1 is working. The interface is shown as follows:

   b. When the distance from the handheld to the target stakeout point is less than the value of close AR prompt range, the working camera automatically switches to the stakeout camera2. The interface is shown as the follows:

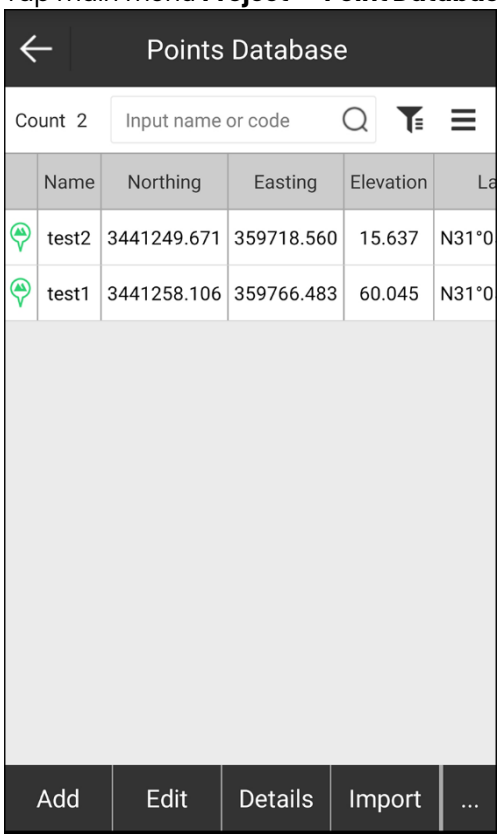
Survey

4.7 Start the Points Library Stakeout

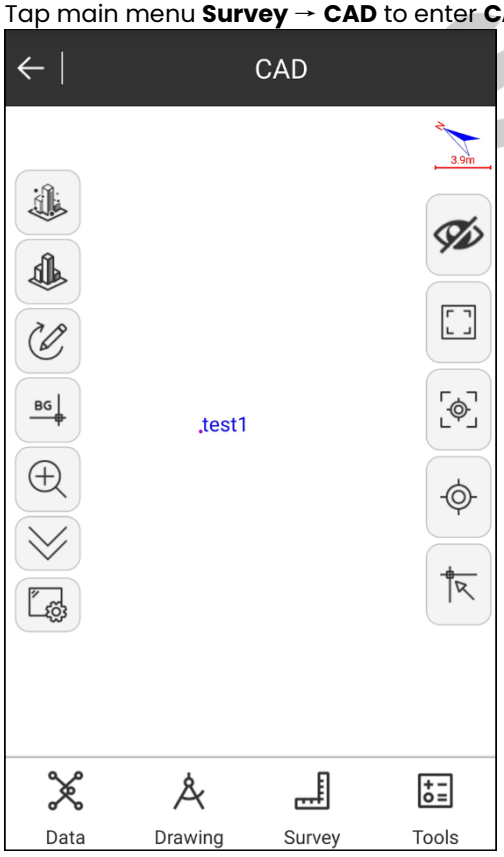
It is used to select multiple points from the points library and tap target point on the interface to do AR stakeout.

To start the points library stakeout, do the following:

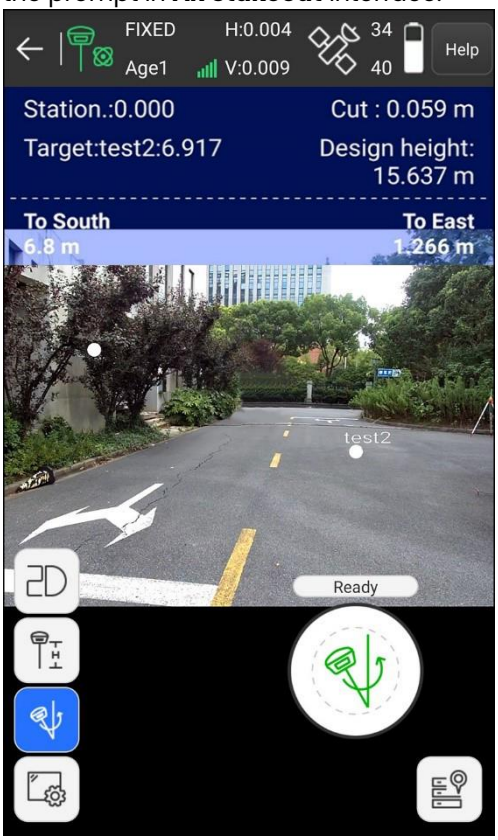
1. Tap main menu **Project** → **Point Database** to add the target point:



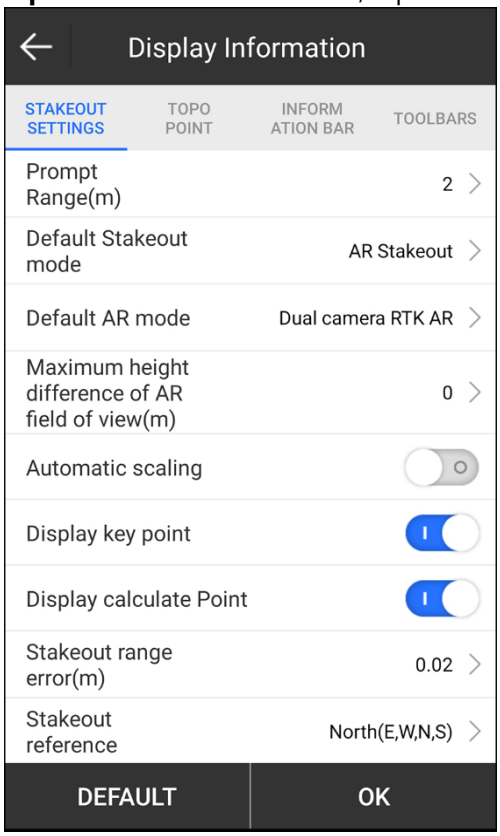
2. Tap main menu **Survey** → **CAD** to enter **CAD** interface:



3. Tap to enter **AR Stakeout** interface. Select the target point and find the target point according to the prompt in **AR Stakeout** interface:



4. **Optional**: To set the AR mode, tap to enter **Display Information** interface:

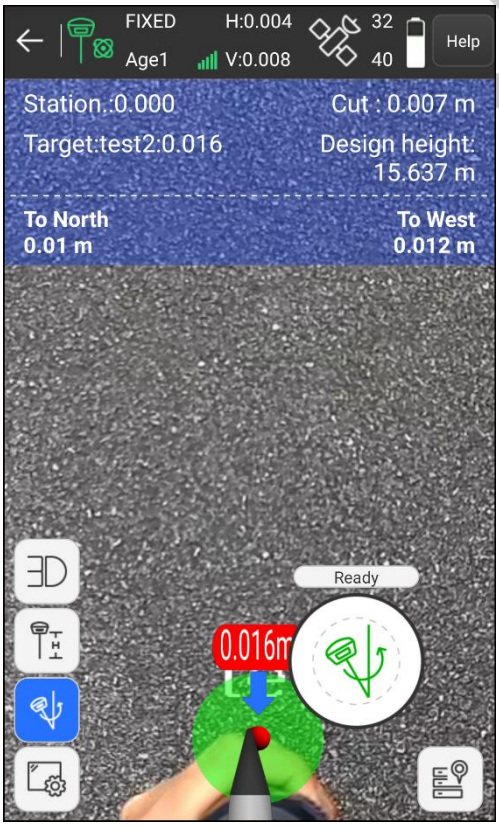


- **Close AR Prompt range**: to set the distance when the working camera changes from stakeout camera 1 to the stake out camera 2 during the AR stakeout.
- **Default AR mode**:
  - **Phone AR + 3D AR**: to use the camera of the phone and the 3D image generated automatically by Surpad software.
  - **Dual camera RTK AR**: to simultaneously use the two stakeout cameras of the receiver.

5. Tap the target point and hold the pole with receiver to find the location of the target point on the CAD drawing according to the prompt on the **AR Stakeout** interface:

a. When entering AR stakeout interface, stakeout camera1 is working. The interface is shown as follows:

b. When the distance from the handheld to the stakeout point is less than the value of close AR prompt range, the working camera automatically switches to the stakeout camera2. The interface is shown as follows:



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