

Note: the version of NUWA app must be upgraded to V2.2.9 or above.



Figure 2.43 WiFi interface

You can open WiFi through switching the power button and the FN button, [Device Info]--[WiFi:OFF] --select [WiFi: AP]--Confirm. SSID & IP & MAC will be automatically set. Please refer to 1.3.1 for detailed button function.

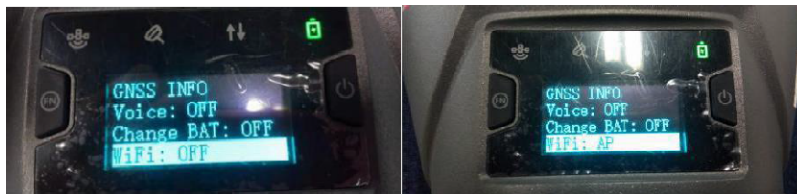


Figure 2.44 Open WiFi

- b. Click the Internet connection icon on the lower right corner of the desktop.

Turn on Wi-Fi connection and search the SSID of Oscar Trek GNSS receiver which is composed of TersusGNSS and an eight digit number such as below. Click [Connect] to complete the Wi-Fi connection.

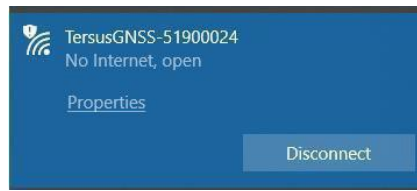


Figure 2.45 Make Wi-Fi connection

- c. Open a web browser and type 192.168.2.1 in the address bar. Type “admin” for the username and password, then click [Sign in] to enter the web UI.

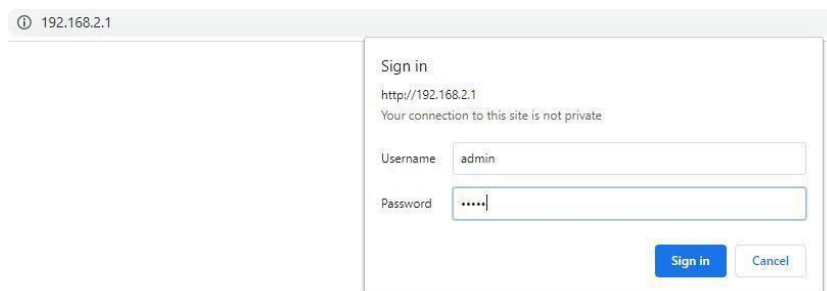


Figure 2.46 Sign in the web UI

- d. When you entered the web UI of Oscar Trek GNSS receiver, you can see five tabs on the left and make corresponding operations such as view positioning info, view satellites info, make device settings, make connectivity settings, and upgrade firmware. [Satellites Info] - [Position Info] - view position information.



Figure 2.47 Main interface of Oscar Trek's web UI

e. configure the working mode and related parameters of the equipment .

[Device Configuration] - [Mode Configuration] - select working mode - next - next - set.

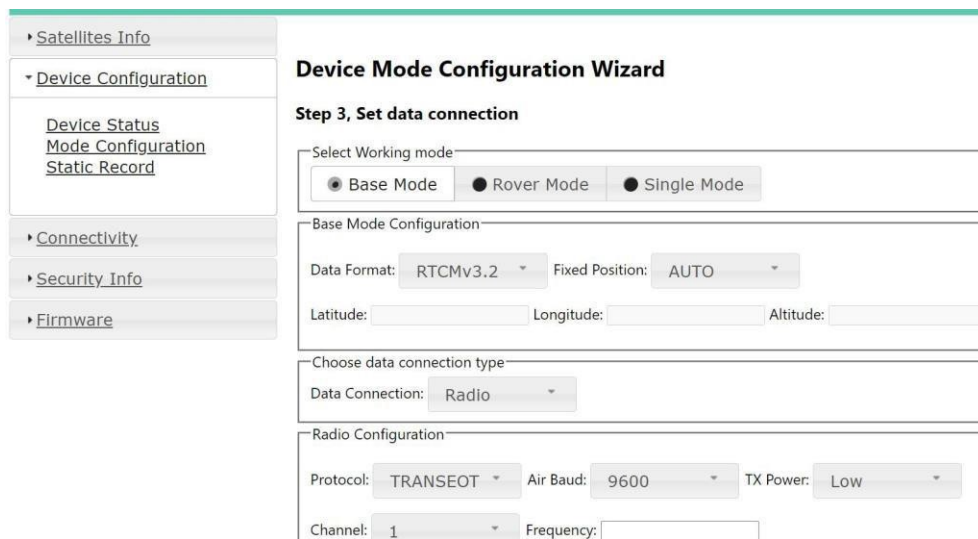
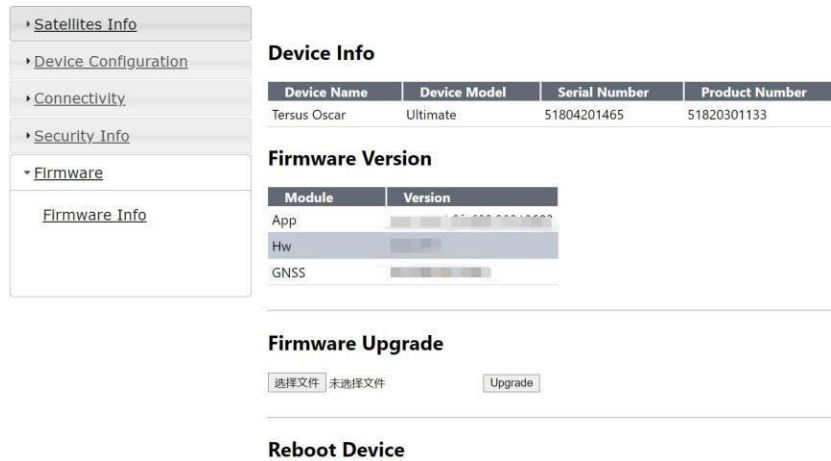


figure 2.48 configure a working mode

f. upgrade device firmware version via web page. [Firmware] - [Firmware Info] - [Firmware Upgrade] - click 【选择文件】 - click [upgrade].

you can use this function to upgrade after the next official version is released.



Device Info

Device Name	Device Model	Serial Number	Product Number
Tersus Oscar	Ultimate	51804201465	51820301133

Firmware Version

Module	Version
App	1.0.0.000.000.000.000
Hw	1.0.0.000.000.000.000
GNSS	1.0.0.000.000.000.000

Firmware Upgrade

选择文件 未选择文件 Upgrade

Reboot Device

figure 2.49 upgrade the firmware

g. manage user logins through web pages.

[Security Info] - [Account Info] - [Add User] - [Add User Dialog] - input Login

Name&Alias Name&Password.



Tersus Oscar GNSS R

Security Info

Account Info

ID	Name	Alias
1	admin	root
2	tersus	tersus
3	test	test

Refresh Add User

Add User Dialog

Login Name:

Alias Name:

Priority: 1

Input Password:

Password Again:

Ok Cancel

figure 2.50 add user login

2.6 Battery change mode

Oscar Trek GNSS receiver can config the battery change mode through the panel options. [Device Info] - [Change BAT] - select [ON]. The interface for opening battery change mode is shown in the figure below.



figure 2.51 change bat

Oscar Trek GNSS receiver also can config the battery change mode through controller. NUWA connects to the Oscar Trek receiver via Bluetooth (see 2.4.1 for the connection method).

Click the device information icon  on the top tool bar of Nuwa to enter the device information interface. Click the button on the right side of the battery

change mode row, and a prompt appears: succeed to config battery change mode, and the battery change mode can be successfully opened, as shown in the figure below.

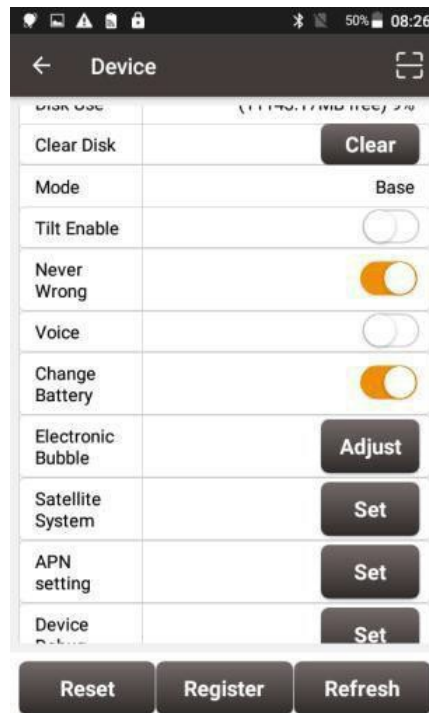


figure 2.52 the battery change mode

When the battery change mode is turned on, turn off the receiver, replace the battery and restart the device, and it will maintain the working mode before shutting down; if the base station is in auto start mode before shutting down, the original auto-start base station coordinates will be maintained; if the base station is started at a known point before shutting down, it will keep the mode of starting at the known point; if it was at rover mode before shutting down, it will keep the rover mode after changing battery.

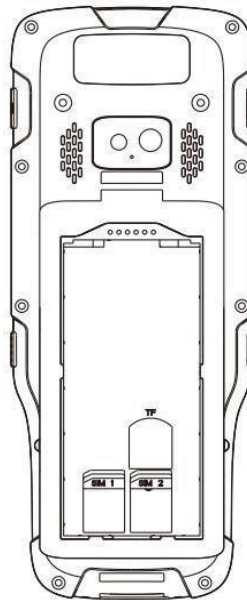
2.7 Operations of TC50 controller

2.7.1 Insert SIM card and SD card

Please note the direction of the card notch when inserting the card, inserting a non-standard card may cause damage to the SIM card slot of the controller.

The controller cannot support two CDMA cards at the same time, when two CDMA cards are installed at the same time, only one card can use the 4G network, the other card will not be able to register the network.

To install the SIM card you need to open the battery cover, remove the battery and open the SIM card cover.



Note: Please power off the controller before plug in or pull out the SIM card.

2.7.2 Using of touch screen

Single Click: To select an icon. For example, click dial to open the keypad which will be displayed on the screen.

Double Click: To zoom-in or zoom-out. For example, to zoom-in or out of a photo, click twice when viewing a photo or browsing on the internet.

Hold: press and hold the screen, icon or input box to get more operation options.

a) Long-Time Click a picture in the gallery list interface, the status bar prompts to select a picture, you select to share or delete it.

b) Long-Time Click the blanks of home screen to add home screen widgets.

c) Long-Time Click the blanks of home screen wallpaper sources can be selected.

d) Long-Time Click the blanks of home screen to home settings.

Slide Upward: Slide up on the main screen (or click the upward arrow icon) to view more applications.

Slide Downward: Slide down on any interface to open the status bar and

message board.

Slide Left and Right: Slide left and right on the main screen to switch the desktop interface.

3. Technical Specifications

This chapter mainly introduces the technical specifications of Oscar Trek GNSS receiver, TC50 Controller , external radio and internal radio whip antenna.

3.1 Oscar Trek GNSS receiver

Table 3.1 Oscar Trek GNSS receiver performance

GNSS Performance		
Position accuracy(RMS)	Single Point Positioning	1.5m (Horizontal)
		3.0m (Vertical)
	DGPS Positioning	0.25m (Horizontal)
		0.5m (Vertical)
	High Precision Static	2.5mm+0.1ppm (Horizontal)
		3.5mm+0.4ppm (Vertical)
	Static & Fast Static	2.5mm+0.5ppm (Horizontal)
		5mm+0.5ppm (Vertical)
	Post Processed Kinematic	2.5mm+1ppm (Horizontal)
		5mm+1ppm (Vertical)

	Real Time Kinematic	8mm+1ppm (Horizontal)
		15mm+1ppm (Vertical)
	Network Real Time Kinematic	8mm+0.5ppm (Horizontal)
		15mm+0.5ppm (Vertical)
Observation accuracy (zenith direction)	C/A code	10cm
	P code	10cm
	Carrier phase	1mm
Time To First Fix (TTFF)	Cold start	<35s
	Warm start	<10s
Reacquisition	<1s	
Tilt compensation accuracy (within 60°)	≤2cm	
Timing accuracy (RMS)	20ns	
Velocity accuracy (RMS)	0.03m/s	
Initialization (typical)	4s	
Initialization reliability	>99.99% for Ultimate, >99.9% for Advanced and Basic	
System & Data		
Operating system	Linux	
Storage	built-in 16GB/8GB	
Data format	CMR, CMR+ (GPS only), RTCM 2.3, RTCM3.0, RTCM3.1, RTCM3.2	
Data output	RINEX, NMEA-0183, Tersus Binary	
Software Support		
Tersus Nuwa, MicroSurvey FieldGenius		
Communication		
Cellular	4G LTE	
Cellular bands	FDD LTE 2,4,5,7,12,13,25,26	
	TDD LTE 38,41	

Network protocols	Ntrip Client, Ntrip Server, Tersus Caster Service (TCS)	
Wi-Fi	2.4G Wi-Fi: 2412~2462 MHz(802.11b/g/n20), 2422~2452 MHz(802.11n40) BLE(1Mbps/2Mbps): 2402-2480 MHz 5G Wi-Fi B1: B1: 5180-5240 MHz, B4: 5745-5825 MHz	
Bluetooth	4.1	
Internal radio	RF transmit power	0.6W/2W
	Frequency	410MHz ~ 470MHz
	Operating mode	Half-duplex
	Channel spacing	12.5KHz
	Modulation type	GMSK
	Air baud rate	4800/9600/19200 bps
	Distance (typical)	>5km
	Radio protocols	TrimTalk450
USB OTG	USB 2.0 x1	
Serial ports	RS232 x1	
COM baud rate	Up to 921600bps	
Electrical		
Input voltage	+9 ~ 28V DC	
Power consumption	Network or radio receive mode	≈ 5W
	Radio transmit mode (0.5W)	≈ 8W
	Radio transmit mode (1W)	≈ 9W
	Radio transmit mode (2W)	≈ 11W
Lithium battery	7.4V 6400mAh x2	
Battery charging temperature:	+10°C ~ +45°C	
Battery working time	Up to 8 hours	
Physical		
Display	1.54" OLED for Ultimate & Advanced versions	
Dimension	157*157*103 mm	
Weight	≈ 1.2kg (without battery), ≈ 1.4kg (with a battery)	
Screw hole for assembly	5/8"x11UNC-2B	
Vibration	MIL-STD-810G,FIG.514.6C-1	

Environmental	
Operating temperature	-40°C to +70°C
Storage temperature	-55°C to +85°C
Relative humidity	100% not condensed
Water & dust proof	IP68
Pole drop onto concrete	2m

The pin definition's view from outside to the serial port is as below.



Figure 3.1 Serial data port of Oscar Trek

Table 3.2 Pin definition of the serial data port

Connector Pin No.	Pin Definition
1	GND
2	GND
3	PWR
4	TXD
5	RXD

The pin definition of the TNC connector is as below:

Table 3.3 Pin definition of the TNC connector

Connector Pin No.	Pin Definition
Inside	Signal
Outside	Ground

The pin definition of the battery contacts is as below:

Table 3.4 Pin definition of the battery contacts

Connector Pin No.	Pin Definition
1	+ Positive
2	Data
3	Clock
4	- Negative

Table 3.5 Default factory configuration for internal radio

Channel	Frequency
00	457.550MHz
01	458.050MHz
02	458.550MHz
03	459.050MHz
04	459.550MHz
05	460.550MHz
06	461.550MHz
07	462.550MHz
08	463.550MHz
09	464.550MHz
Customized frequency	410~470MHz

Table 3.6 Detailed configuration information for internal radio

Protocol	Modulation type	Channel band	Air baud rate	COM baud rate
TrimTalk450	GMSK	12.5 KHz	9600 bps	9600/19200/38400/115200bps

3.2 TC50 controller

Table 3.7 TC50 technical specification

System	
Operating System	Android 8.1
CPU	MT6763 Octa-Core 2.0GHz
Memory	4GB RAM + 64GB ROM
External storage	Micro SD, up to 128GB
Display	5" sunlight-readable capacitive touch screen
Resolution	720x1280
Camera	5MP front, 13MP rear
Flash Light	High light Flash LED

Electrical	
Battery	7000mAh 3.8V
Battery Life	14 hours
Charging Time	<4 hours (fast charge)
Communication	
Wi-Fi	IEEE 802.11a/b/g/n 2.4G&5G
Cellular Mode	Dual SIM Dual Standby
SIM1 & SIM2	FDD-LTE B2/B4/B5/B7/B12/B13/B25/B26 TDD-LTE B38/B41 TDSCDMA B34/B39 WCDMA B2/B4/B5 CDMA1x/CDMA2000 BC0/BC1 GSM B2/B5
Bluetooth	BT4.1 (BLE)
USB	USB Type-C (supports OTG)
GNSS	GPS/GLONASS/BeiDou
Sensors:	G-Sensor, Compass, Light-Sensor, Gyro
Physical	

Dimension	207mmx84mmx20mm
Weight	370g (include battery)
Reliability	
Operating Temperature	-20°C ~ +55°C
Storage Temperature	-30°C ~ +70°C
Humidity	5% ~ 95%
Dustproof & Waterproof	IP68
Shock	1.5m drop onto concrete

3.3 External radio for Oscar Trek

Table 3.8 External radio RS400H3 technical specification

General Specification		
Frequency range	410~470MHz	
Operating mode	Simplex	
Channel width	25KHz, 12.5KHz	
Modulation Type	GMSK/4FSK	
Operating voltage	9~16V DC	
Power consumption	High power (28W)	78W @ DC 12V
	Medium power (22W)	60W @ DC 12V
	Low power (5W)	35W @ DC 12V
	Standby	2W @ DC 12V
Frequency stability	≤±1.0ppm	
Transmitter		
RF output power	High level (28W)	44.5±0.5dBm @ DC 12V

	Medium level (22W)	43.4±0.5dBm @ DC 12V
	Low level (5W)	37±1dBm @ DC 12V
Power stability	±1dBm	
Adjacent channel power	>50dB	
Distance(Typical)	14-16KM	
Antenna		
Antenna Impedance	50 Ohm	
Antenna Interface	TNC female	
Modem		
Air baud rate	4800bps, 9600bps, 19200bps	
Modulation Type	GMSK/4FSK	
Serial port baud rate	9600bps, 19200bps, 38400bps, 57600bps, 115200bps	
Protocol	TRIMTALK, TRIMMK3, TRANSEOT,SOUTH, SATEL	
Environmental		
Temperature	Operating	-40 ~ +65°C
	Storage	-50 ~ +85°C
Dustproof and waterproof	IP67	
Physical Description		
Dimension	175 x 130 x 86.5 mm	
Weight	About 2.0kg	
Data & Power interface	LEMO 5pin	
Installation	Hook	
Mechanical Drawing		

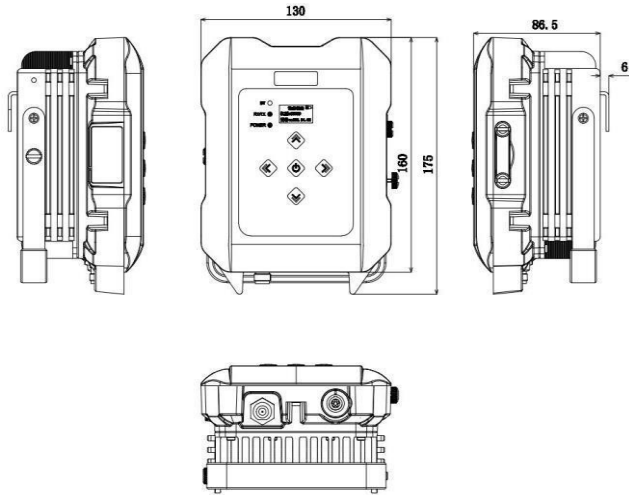
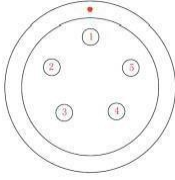
		
Signal Definition		
Data & power interface	 View from outside to radio	Pin 1: PWR (9~16V DC) Pin 2: Power GND Pin 3: RXD Pin 4: Signal GND Pin 5: TXD

Table 3.9 Default factory configuration for Radio RS400H3

Channel	Frequency
00	457.550MHz
01	458.050MHz
02	458.550MHz
03	459.050MHz
04	459.550MHz
05	460.550MHz
06	461.550MHz
07	462.550MHz
08	463.550MHz
09	464.550MHz
Customized frequency	410~470MHz

3.4 Radio whip antenna

The 410-470MHz radio whip antenna is to be installed on the TNC port to transmit or receive signal for the internal radio. This antenna is elastic whip structure, resistant to bending.



Table 3.10 Radio whip antenna technical specification

Technical Specification	
Frequency Range	410~470MHz
Bandwidth	60MHz
Polarization Mode	Vertical
Gain	2dBi
Input Impedance	50Ω
VSWR	≤2.5
Maximum Power	20W
Connector	TNC Male
Antenna Length	168mm
Antenna Weight	About 50g
Extreme Wind Speed	120 Km/h

4. Typical Applications

This chapter introduces typical applications of Oscar Trek GNSS receiver, and solutions for some possible issues.

	Install the radio antenna before switching the radio transceiver to transmit mode, or the radio transceiver may be damaged due to overheating. The energy to be transmitted cannot be emitted out without the antenna, which may cause the temperature rise and overheat of the radio module.
---	--

4.1 Base station operation



Figure 4.1 Oscar Trek as a base - network mode

Table 4.1 Devices of Oscar Trek as a base network mode

NO.	Device Name
1	Oscar Trek GNSS receiver
2	Height measure accessory
3	GNSS antenna connector
4	Tribrach
5	Tripod

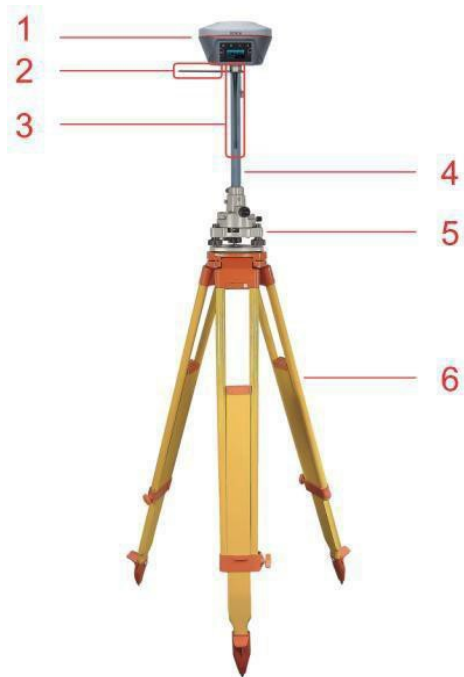


Figure 4.2 Oscar Trek as a base - internal radio

Table 4.2 Devices of Oscar Trek as a base internal radio mode

NO.	Device Name
1	Oscar Trek GNSS receiver
2	Height measure accessory
3	410-470MHz radio whip antenna
4	Extension pole 30cm
5	Tribrach
6	Tripod

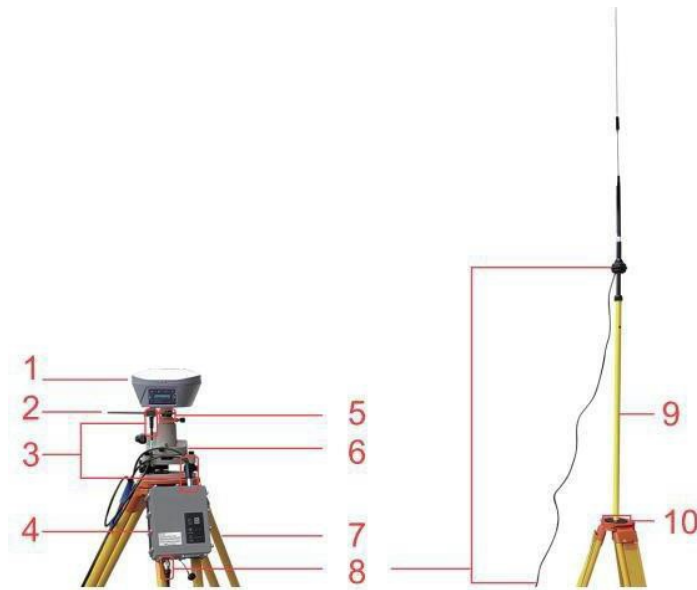


Figure 4.3 Oscar Trek as a base – external radio

Table 4.3 Devices of Oscar Trek as a base external radio mode

NO.	Device Name
1	Oscar Trek GNSS receiver
2	Height measure accessory
3	Serial-5pin to External-Radio-DC-5pin & Bullet-DC
4	External Radio RS400H2
5	GNSS antenna connector
6	Tribrach
7	Tripod
8	High Gain Radio Antenna
9	Telescopic pole for radio antenna
10	Metal plate for radio antenna

Note: Bullet-DC connects to ‘Bullet-DC to Alligator Clips’, and then clip to the external power supply with 12V output.

Detailed steps of button operation:

1. Set up Oscar Trek according section 2.1 Setting up Oscar Trek after all the components above are ready, ensure one battery is installed in Oscar Trek and insert one SIM card when 4G/3G/2G network is required for operation;
2. Long press the power button to power on Oscar Trek;
3. Press FN button to select [Mode Config], press the power button to enter the work mode options;
4. Select [Base Mode] and press the power button;
5. If using Tersus Caster Service, select [TCS] and press the power button to enter TCS network settings; Set the format, server and press the power button to confirm.
6. If using internal radio, select [Internal Radio] and press the power button to enter radio setting; Set protocol, format, power, channel, frequency and press the power button to confirm.
7. If using external radio, select [External Radio] and press the power button to configure; Set Baud rate as 115200, format and press the power button to confirm.
8. Above all, setting Oscar Trek as a base is completed.

Detailed steps of software operation:

1. Set up Oscar Trek according section 2.1 Setting up Oscar Trek after all the components above are ready, ensure one battery and one SIM card are installed in Oscar Trek;
2. Long press power button to power on Oscar Trek;
3. If using an android device without NFC function, ensure Oscar Trek is powered on, and launch Nuwa application on the android device. Click [Project] in the main interface to create a new project or open an existing project and connect Oscar Trek manually.
4. Back to the main interface of Nuwa app, click [Device] -> [Connect] under an opened project.
5. Select [Oscar Trek] for the Device Type, select [Bluetooth] for the Connect Type, click [Connect Config] to search and pair the Bluetooth address of

Oscar Trek, select [Oscar Trek] for the Antenna and click [Connect] to enable communication between the android controller and Oscar Trek.

4. Back to [Device] - > [Base], click [New] to create a new configuration for base.

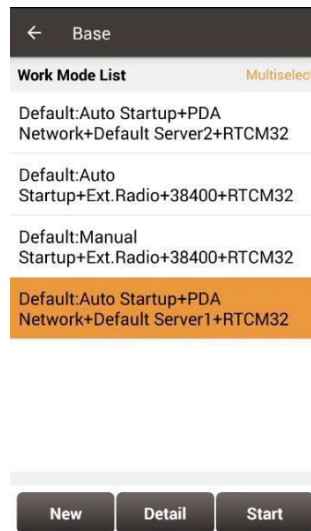
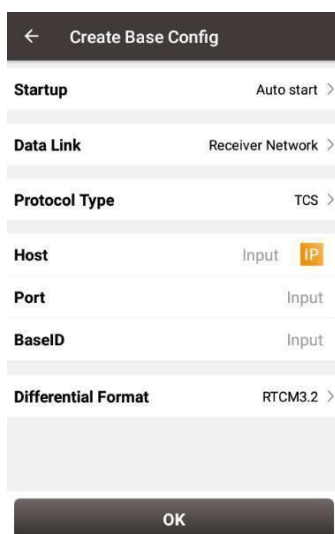


Figure 4.4 Base setting interface

5. Edit the base configuration for Oscar Trek GNSS receiver. The startup mode can be chosen from auto start and manual start. If you choose manual start the base, you can manually type the base coordinate, or click the location icon to obtain the current base coordinate, or select a point from the control point library. The data link has four options: Receiver Network, PDA Network, Internal Radio and External Radio. Both the Receiver Network and PDA Network have three protocol options: Tersus

Caster Service (TCS), Ntrip and TCP.

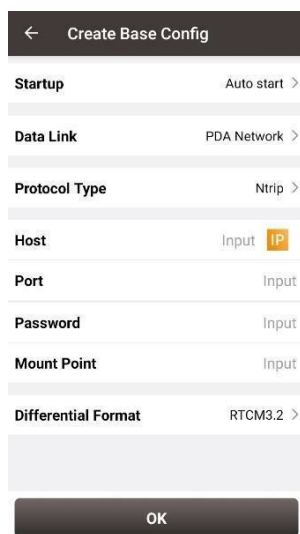


The screenshot shows the 'Create Base Config' screen with the following settings:

- Startup:** Auto start >
- Data Link:** Receiver Network >
- Protocol Type:** TCS >
- Host:** Input IP
- Port:** Input
- BaseID:** Input
- Differential Format:** RTCM3.2 >

An 'OK' button is at the bottom.

Figure 4.5 Base configuration - Receiver Network (TCS)

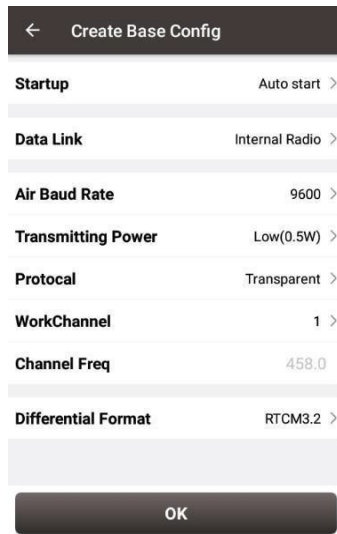


The screenshot shows the 'Create Base Config' screen with the following settings:

- Startup:** Auto start >
- Data Link:** PDA Network >
- Protocol Type:** Ntrip >
- Host:** Input IP
- Port:** Input
- Password:** Input
- Mount Point:** Input
- Differential Format:** RTCM3.2 >

An 'OK' button is at the bottom.

Figure 4.6 Base configuration – PDA Network (Ntrip)

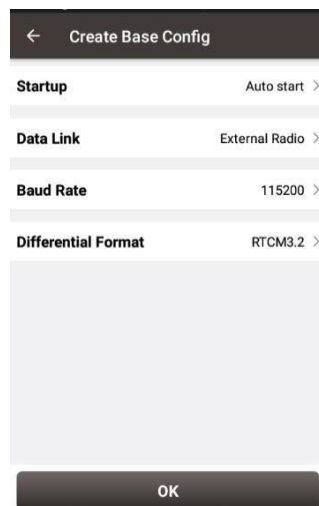


The screenshot shows the 'Create Base Config' screen with the following settings:

Parameter	Value
Startup	Auto start
Data Link	Internal Radio
Air Baud Rate	9600
Transmitting Power	Low(0.5W)
Protocol	Transparent
WorkChannel	1
Channel Freq	458.0
Differential Format	RTCM3.2

An 'OK' button is located at the bottom of the screen.

Figure 4.7 Base configuration - Internal Radio



The screenshot shows the 'Create Base Config' screen with the following settings:

Parameter	Value
Startup	Auto start
Data Link	External Radio
Baud Rate	115200
Differential Format	RTCM3.2

An 'OK' button is located at the bottom of the screen.

Figure 4.8 Base configuration - External Radio

6. After filling the information for the above configuration, click [OK].

Select this configuration in the work mode list and click [Start] to start data transmission for base which is shown as below.

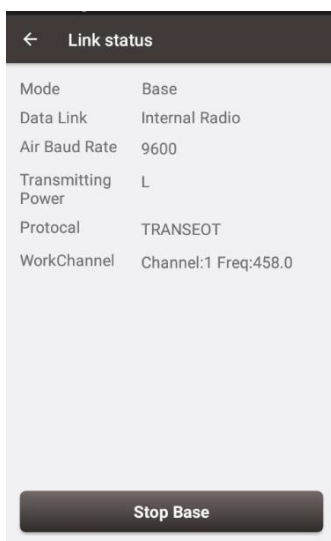


Figure 4.9 Link status of base using internal radio

4.2 Rover operation



Figure 4.10 Oscar Trek as a Rover - Network Mode

Table 4.4 Devices of Oscar Trek as a rover network mode

NO.	Device Name
1	Oscar Trek GNSS receiver
2	Ranging pole
3	Bracket for TC50
4	TC50 Controller



Figure 4.11 Oscar Trek as a Rover - Internal Radio

Table 4.5 Devices of Oscar Trek as a rover internal radio mode

NO.	Device Name
1	Oscar Trek GNSS receiver
2	410-470MHz radio whip antenna
3	Bracket for TC50
4	Ranging pole
5	TC50 Controller

Detailed steps of button operation:

1. Set up Oscar Trek according section 2.1 Setting up Oscar Trek after all the components above are ready, ensure one battery and one SIM card are installed in Oscar Trek;
2. Long press the power button to power on Oscar Trek;
3. Press FN button to select [Mode Config], press the power button to enter the work mode options;
4. Select [Rover Mode] and press power button;
5. If using Tersus Caster Service, select [TCS] and press the power button to enter TCS network settings; Set the Base ID, server and press the power button to confirm.
6. If using internal radio, select [Internal Radio] and press the power button to enter radio setting; Set protocol, channel and frequency same as Base, press the power button to confirm.
7. If using NTRIP Client, select [NTRIP Client] and press the power button to enter NTRIP setting; set IP address with correct port and press the power button to confirm.
8. Above all, setting Oscar Trek as a rover is completed.

Detailed steps of software operation:

1. Set up Oscar Trek according section 2.1 Setting up Oscar Trek after all the components above are ready, ensure one battery and one SIM card are installed in Oscar Trek;
2. Long press the power button to power on Oscar Trek;
3. If using an android device without NFC function, ensure Oscar Trek is powered on, and launch Nuwa application on the android device. Click [Project] in the main interface to create a new project or open an existing project and connect Oscar Trek manually.
4. Back to the main interface of Nuwa app, click [Device] -> [Connect] under an opened project;
5. Select [Oscar Trek] for the Device Type, select [Bluetooth] for the Connect Type, click [Connect Config] to search and pair the Bluetooth address of

Oscar Trek, select [Oscar Trek] for the Antenna and click [Connect] to enable communication between the android controller and Oscar Trek.

6. Back to [Device] - > [Rover], click [New] to create a new configuration for base.

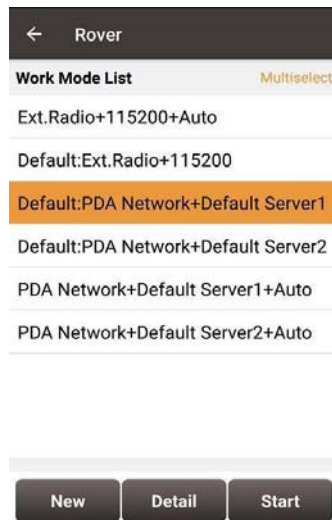
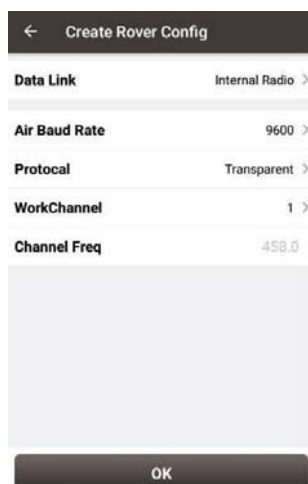


Figure 4.12 Rover setting interface

7. Edit rover configuration for Oscar Trek GNSS receiver under different data link selections. The Receiver Network and PDA Network have three protocol options respectively: Ntrip, TCP and Tersus Caster Service (TCS).



← Create Rover Config

Data Link Internal Radio >

Air Baud Rate 9600 >

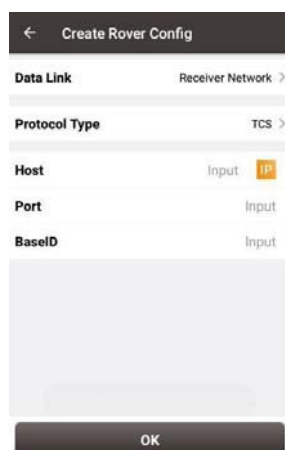
Protocol Transparent >

WorkChannel 1 >

Channel Freq 458.0

OK

Figure 4.13 Rover configuration - Internal Radio



← Create Rover Config

Data Link Receiver Network >

Protocol Type TCS >

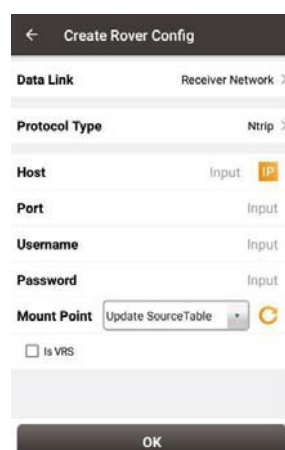
Host Input IP

Port Input

BaseID Input

OK

Figure 4.14 Rover configuration - Receiver Network (TCS)



← Create Rover Config

Data Link Receiver Network >

Protocol Type Ntrip >

Host Input IP

Port Input

Username Input

Password Input

Mount Point Update SourceTable 

☐ Is VRS

OK

Figure 4.15 Rover configuration - Receiver Network (Ntrip)



The screenshot shows the 'Edit Rover Config' screen with the following fields:

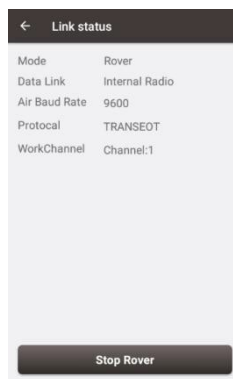
- Name: test
- Data Link: PDANetwork >
- Protocol Type: Ntrip >
- Host: usacaster1.tersus-gnss.com
- Port: 2101
- Username: oscar_share
- Password: *****
- Mount Point: OSCAR_111111(RTC M3)
- ☐ Is VRS

At the bottom, there is an 'OK' button and an Android navigation bar.

Figure 4.16 Rover configuration - PDA Network (Ntrip)

Note: Select PDANetwork when using cellular or Wi-Fi network of a PDA such as TC50 Controller.

- After filling the information for the above configuration, click [OK].
- Select this configuration in the work mode list and click [Start] to start data transmission for rover which is shown as below.



The screenshot shows the 'Link status' screen with the following fields:

- Mode: Rover
- Data Link: Internal Radio
- Air Baud Rate: 9600
- Protocol: TRANSEOT
- WorkChannel: Channel:1

At the bottom, there is a 'Stop Rover' button.

Figure 4.17 Link status of Rover using internal radio

4.3 Static survey

Before performing static survey, ensure one battery is installed in Oscar Trek GNSS receiver.

Detailed steps of button operation:

1. Long press the power button to power on Oscar Trek;
2. Press FN button to select [Mode Config], press the power button to enter the work mode options;
3. Select [Static: OFF] and press the power button to enter configuration options for static survey;
4. Set Frequency, Mask Elevation, Duration, Antenna Height, Measure Type, Data Format and RINEX Format;
5. Turn on static when the cursor is on 'STATIC: OFF', then it becomes 'STATIC: ON', press the power button to confirm;
6. Above all, setting static survey is completed.

Detailed steps of software operation:

1. Long press the power button to power on Oscar Trek;
2. If using an android device without NFC function, ensure Oscar Trek is powered on, and launch Nuwa application on the android device. Click

[Project] in the main interface to create a new project or open an existing project and connect Oscar Trek manually.

3. Back to the main interface of Nuwa app, click [Device] -> [Connect] under an opened project;
4. Select [Oscar Trek] for the Device Type, select [Bluetooth] for the Connect Type, click [Connect Config] to search and pair the Bluetooth address of Oscar Trek, select [Oscar Trek] for the Antenna and click [Connect] to enable communication between the android controller and Oscar Trek.
5. Click [Survey] -> [Static Survey], fill in the parameters of interval, cutoff angle, and etc. Then click [Start] to start static survey.

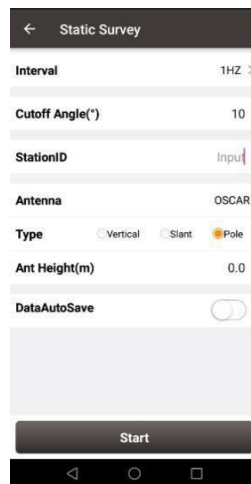


Figure 4.18 Static Survey configuration

6. If the DataAutoSave function is turned on, the static data is recorded automatically in the internal storage when power up Oscar Trek next time.

You can download data file refer to section 2.3.

4.4 Tilt survey and stakeout

Tilt function is only applicable for Oscar Trek GNSS receiver Ultimate version under rover mode.

4.4.1 Tilt initialization

The tilt compensation of Oscar Trek GNSS receiver Ultimate version is free of complex calibration. The tilt compensation will be initialized when the surveyor walks forward naturally for several meters after turning on the tilt compensation

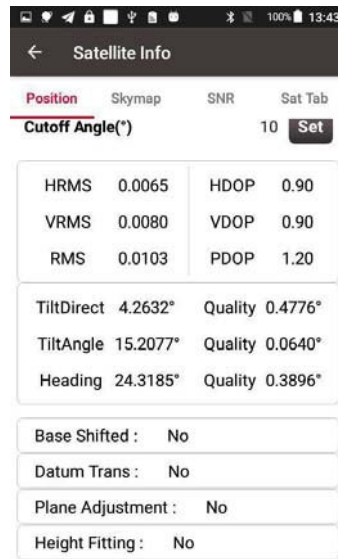
function. You can start tilt survey right after you walk to the survey point.

There are two methods to turn on or off tilt compensation. One is turning on or off tilt compensation on Device Info on the OLED via buttons. Another method is through Nuwa app. After the Oscar Trek GNSS receiver Ultimate version is connect in Nuwa app, and we configure it working as a Rover. Click the device icon  on the top or click [Device] under the device functional group to enter the device information interface. Turn on the [Tilt Enable] on the device interface.

When tilt function is turned on, the tilt LED on the Oscar Trek Ultimate OLED display lights on with steady red, a few seconds later it starts flashing red. At this time, walk a few steps ahead, tilt the pole at any direction, then the tilt LED turns steady green which indicates tilt compensation is valid. Now you can start tilt survey.

When the tilt compensation is valid, click the Satellite info icon to view the detailed information of tilt compensation including tilt status, tilt direction, tilt angle, heading and their quality index. Among them, the tilt direct indicates which direction is tilted, that is, the angle between the projection of the ranging

pole on the ground and the north direction after tilting; the tilt angle indicates the degree of tilt, that is, the angle between the tilted pole and the vertical direction; Heading indicates the surveyor's orientation (the facing of Oscar Trek's back, we consider Oscar Trek's panel is always facing the surveyor).



Satellite Info			
Position	Skymap	SNR	Sat Tab
Cutoff Angle(°)		10	Set
HRMS	0.0065	HDOP	0.90
VRMS	0.0080	VDOP	0.90
RMS	0.0103	PDOP	1.20
TiltDirect	4.2632°	Quality	0.4776°
TiltAngle	15.2077°	Quality	0.0640°
Heading	24.3185°	Quality	0.3896°
Base Shifted : No			
Datum Trans : No			
Plane Adjustment : No			
Height Fitting : No			

Figure 4.19 Detailed information of tilt compensation

4.4.2 Tilt survey

After turning on [Tilt Enable] and tilt initialization is finished, enter Survey interface and start tilt survey.

The tilt status is displayed at the top of the survey interface. When the tilt status is ON, it is considered that the tilt compensation accuracy is high and it is in a usable state. You can start survey using the tilted ranging pole. Please ensure that the antenna height setting is correct which will affect the tilt measurement results.

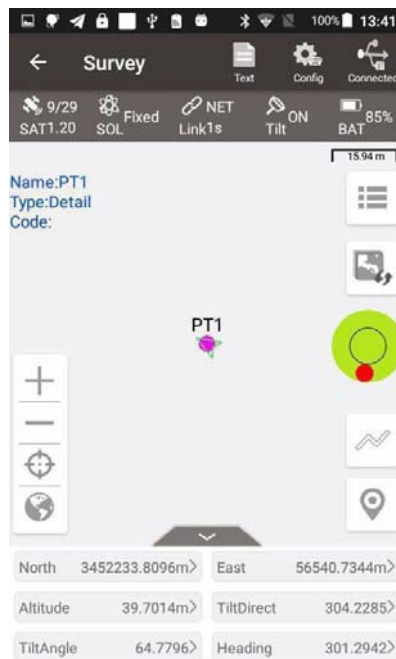


Figure 4.20 Tilt status is ON

When the status is displayed as N/A and blinking, it is considered that the accuracy of tilt compensation is reduced and it is in a state that is not recommended. At this time, the tilt indicator of the Oscar Trek Ultimate OLED display turns flashing red. This may be caused by the surveyor standing for too long, rotating the ranging pole, or hitting the ranging pole to the ground. When the status is N/A, you need to redo the initialization. Generally, you do not need to stand still, just hold the ranging pole and walk forward to the next point, the initialization is complete automatically.

Note: during the tilt survey, please keep the Oscar Trek OLED display facing the surveyor as much as possible. Please do not rotate the pole or hit the pole

to the ground, which will invalidate the initialization or affect the accuracy of the tilt compensation. In addition, during the tilt point survey, if it does not continue at the third epoch reached when it is set smoothing 5 epochs for surveying points, please check whether the tilt compensation is invalid. It is not allowed to continue to complete the survey in the case where the tilt initialization accuracy is low.

4.4.3 Tilt stakeout

After turning on [Tilt Enable] and tilt initialization is finished, enter the Point Stakeout or Line Stakeout interface and start tilt stakeout. The tilt state is also added at the top of the stakeout interface to indicate the current tilt available state.

During the tilt stakeout process, if you enter the threshold range of the stakeout setting, the software will display a virtual tilt ranging pole along with the beep sounds. It is drawn according to the tilt direction angle. When the pole is tilted in a certain direction among east, west, south and north, the virtual tilt ranging pole on the interface will also tilt in a certain direction.



Figure 4.21 Point stakeout when tilt compensation is on

4.5 Issues and solutions

This section lists possible issues and effective solutions to solve them. Please read this section before contacting Tersus technical support.

1. Oscar Trek GNSS receiver cannot receive satellite signals.

Solution:

- (1) Change the survey environment, and restart Oscar Trek in an open space.
- (2) Reset the GNSS module by pressing and holding the FN button, continuously tapping the power button 5 times.

2. The internal UHF radio does not transmit data.

Solution:

- (1) Check whether the receiver is searching satellites normally;
- (2) Check whether the 2W/460MHz radio antenna is installed properly;
- (3) Check whether the radio module's protocol and channel are configured correctly and consistent with the configuration of rover's radio.

3. CORS network is not able to be logged in.

Solution:

Check whether the 4G SIM card is properly installed, and whether it can be used normally.

4. The communication between Nuwa and Oscar Trek fails.

Solution:

- (1) Check whether the Oscar Trek is powered on;
- (2) Re-search and pair the Bluetooth;
- (3) Upgrade Nuwa to the latest version.

5. There is no correction data for rover when using Ntrip work mode.

Solutions:

- (1) Check whether the IP address, port, user name, password is correct;
- (2) Check network. Try to use PDA/controller network to compare. Make sure there is no issue on the contact between the SIM card slot and the SIM card.
- (3) Obtain the SourceTable to check the receiver network module, ensure there is no issue on CORS service.
- (4) Try to log in with the same configuration and get a compared result if there is an extra receiver.
- (5) If still cannot log in, consult your CORS service provider.

6. How to export static observation data from OscarTrek?

Solutions:

- (1) Connect Oscar Trek receiver with a computer through a mini USB cable.
- (2) The computer detects the Oscar Trek receiver as an external disk.
- (3) Open the Record folder, find the trs file and rinex file in its storage according to recording date.
- (4) Copy the static observation data and paste them to the designated folder in your computer.

7. How to calibrate the E-Bubble of Oscar Trek receiver?

Solutions:

- (1) Firstly, install Oscar Trek receiver on the tribrach of a tripod. Adjust the tribrach to enable the bubble to the center.
- (2) Next step, select <Adjust> in the Nuwa under Device Info -> E-Bubble to complete the calibration.

8. How to apply Geoid model file correctly?

Solutions:

- (1) Prepare the Geoid file at first and placed in the path of Internal storage\TersusSurvey\Geoid.
- (2) Next step, launch Nuwa and go to select Project - Current Project and edit Coordinate System. Find the Height Fitting-Adjust Method and select Geoid.
- (3) Last, select the file under Geoid List and apply it.

9. How to configure Oscar Trek serial port output NMEAlog?

Solutions:

There are two ways to realize the NMEAsentences output which you'd like to.

- (1) Nuwa can configure to output NMEA by the NMEA option. It can be specified the Baud Rate, the kind of sentence.

(2) Variable bonus, it can be directly configured on the panel. NMEA can be turned on through Device Info -> Serial.

10. A base receiver is working well, the rover receiver cannot get correction data, how to fix this?

Solutions:

- (1) Check whether the radio antenna connects well with receiver. Carefully check whether the interface is tightened.
- (2) Check whether the air baud rate, Protocol, Bandwidth, Frequency match right with that of the base receiver.
- (3) Switchover the radio frequency to avoid the possible interference from nearby devices.

11. The Oscar Trek rover works at a short distance (not normal distance) at the radio mode?

Solutions:

- (1) Check whether the rover connects a radio antenna.
- (2) Adjust the radio of base at the high power gear.
- (3) Check the environment if there exists radio interference along the propagation line.

5. Visual Positioning

The four steps of visual positioning are outlined below:

1. Prepare; 2.Initialization; 3.Measuring; 4.Storage.

5.1 Prepare

The detailed steps for preparation are as follows:

- 1).Long press the power button to power on Oscar Trek.
- 2).Configure Oscar Trek to work in rover mode using the NUWA app.

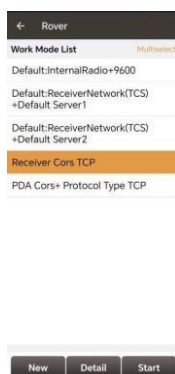


Figure 5.2 Rover setting interface

3).Click [Visual Positioning], follow the text prompt and choose the Wi-Fi of Oscar-Trek.

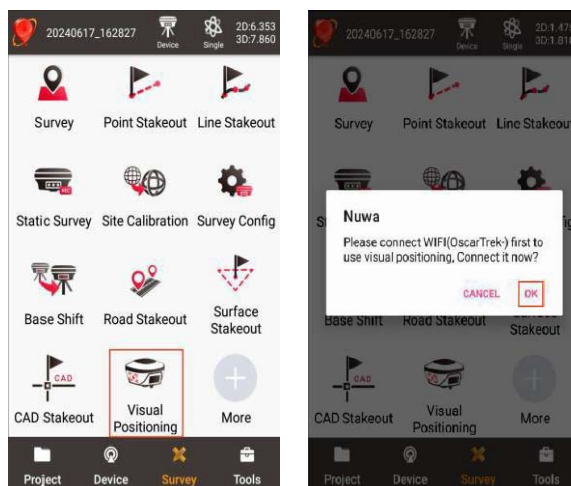


Figure 5.3 Visual Positioning interface



Figure 5.4 Connect Wi-Fi

Note:

- ✧ **Rover configuration has different data link selections, including Internal Radio, Receiver Network, and PDANetwork.**
- ✧ **The Receiver Network and PDA Network have three protocol options respectively: Ntrip, TCP and Tersus Caster Service (TCS).**
- ✧ **Select PDA Network when using a cellular network of a PDA such as TC80 Controller.**
- ✧ **Select Receiver Network, you need to insert a nano SIM card into Oscar Trek GNSS receiver.**
- ✧ **Select Internal Radio, you need to install a 410-470MHz radio whip antenna.**
- ✧ **Ensure that fixed solutions are available after configuring the rover mode.**

5.2 Initialization

Click [Back]-[Visual Positioning], and follow the animated prompts to complete IMU initialization.

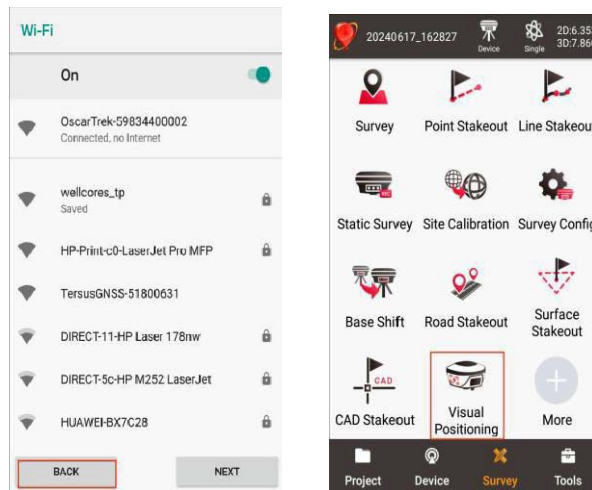


Figure 5.5 Start initialization

The initialization is a two-stage process, shaking and moving.



Figure 5.6 Initialization-shaking



Figure 5.7 Initialization-moving

After the camera indicator in the upper right corner turns to green , users

can still continue the moving initialization process to achieve better performance.

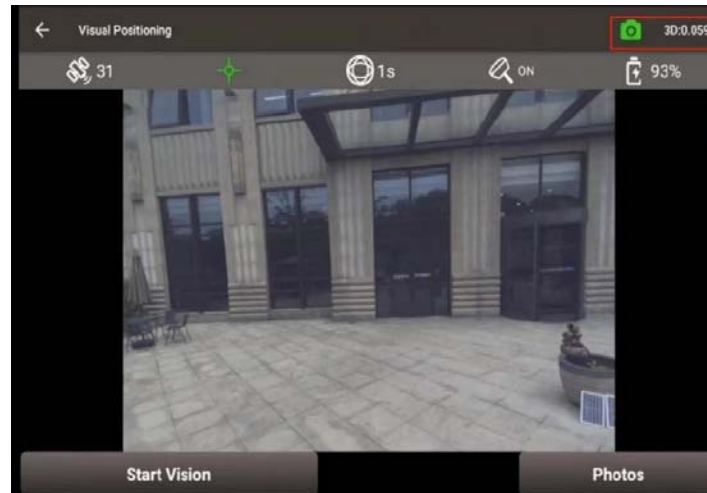


Figure 5.8 Lower 3D value

Above all, the initialization is completed.

Note:

- ✧ **Ensure that the Oscar Trek is located in an open sky environment, without any obstruction to the GNSS antenna, throughout the initialization process.**
- ✧ **Remember not to rotate the receiver violently during the initialization process.**
To improve visual measurement performance, focus on ensuring sufficient moving, as rotation does not enhance it.
- ✧ **During the initialization phase, the camera should be turned back toward the surveyor to avoid obstruction of the view by their body.**
- ✧ **In the moving stage, the camera should not be pointed at non-textured objects,**

such as the sky and white walls.

- ✧ **3D values in the upper right corner indicates the predicted 3D measuring error at 6 meter distance.**

5.3 Measuring

The detailed steps of measuring are as follows:

1).Click [Start Vision] to start capturing images. Make sure the target can be observed by multiple views.

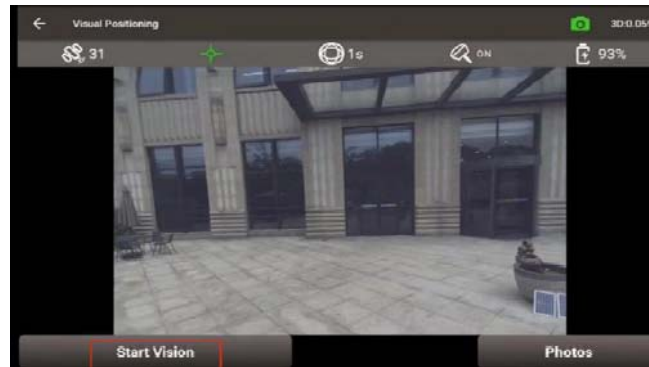


Figure 5.9 Start Vision

2).Click [Stop] to end capturing.

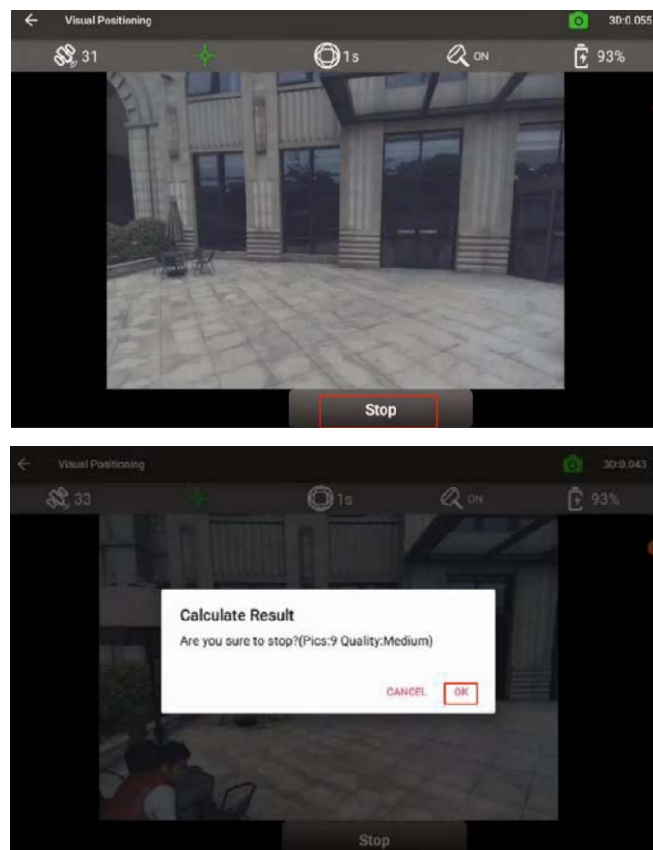


Figure 5.10 Stop vision

3).Click [Photos] to start measuring points from captured images.

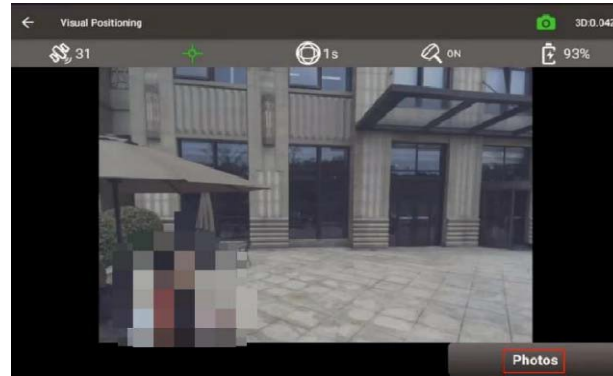


Figure 5.11 Photos

4). Choose a image and then select feature points to measure.

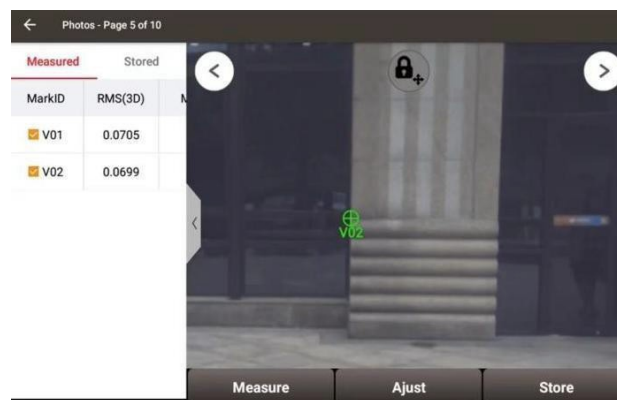


Figure 5.12 Measure

Note:

- ✧ Hold the receiver steady and keep a normal walking speed while capturing images.
- ✧ For optimal accuracy and performance, capture the object of interest from a distance between 2m and 10m.
- ✧ Avoid using it in dark conditions or when directly facing the sun, as it may lead to difficulty in recognizing enough features in the captured images to make a match.
- ✧ Try to select feature points on an image directly in front of the target object. For example, choose an image in the middle of the captured images.
- ✧ Multiple feature points can be selected at a time.

5.4 Storage

Click [Store], save the points and modify point name.

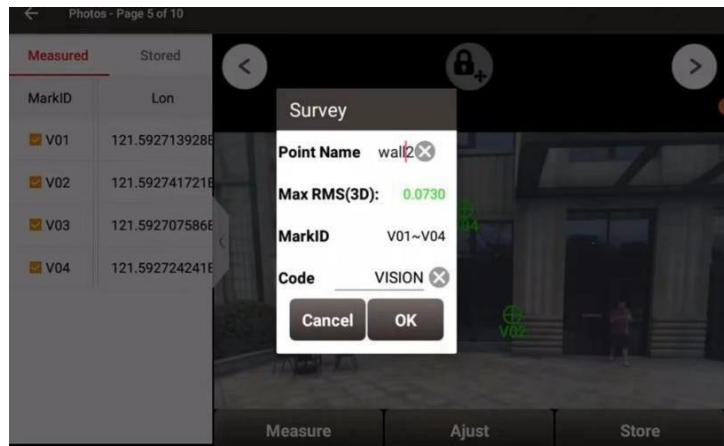


Figure 5.13 Store and modify point name

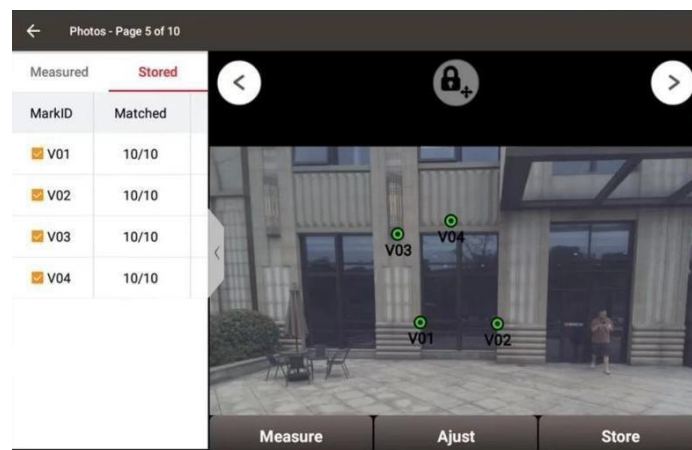


Figure 5.14 Stored

Click [Point], access the point store and check the detail.

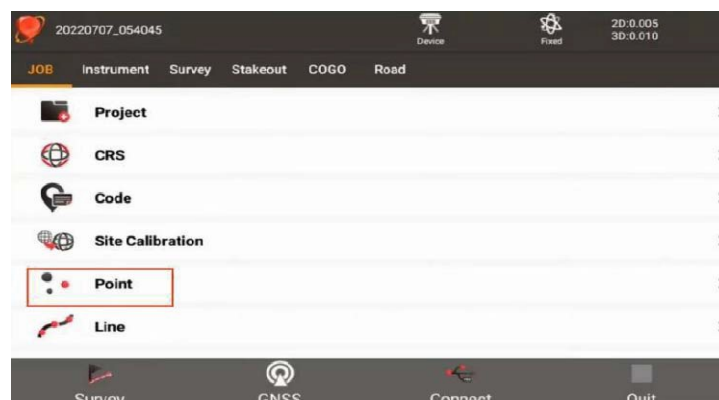
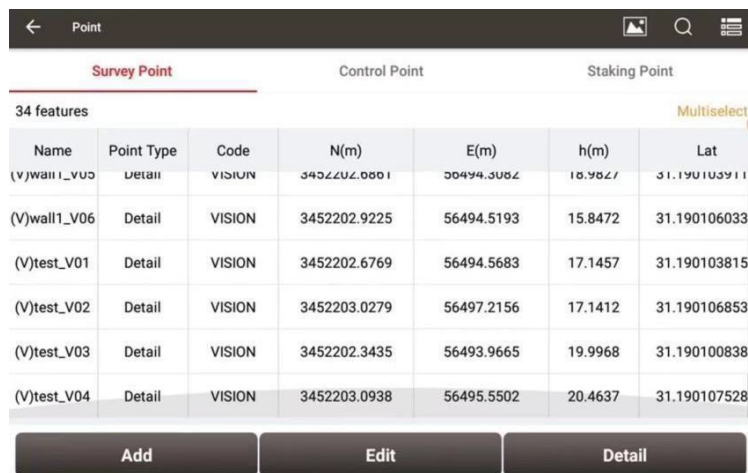
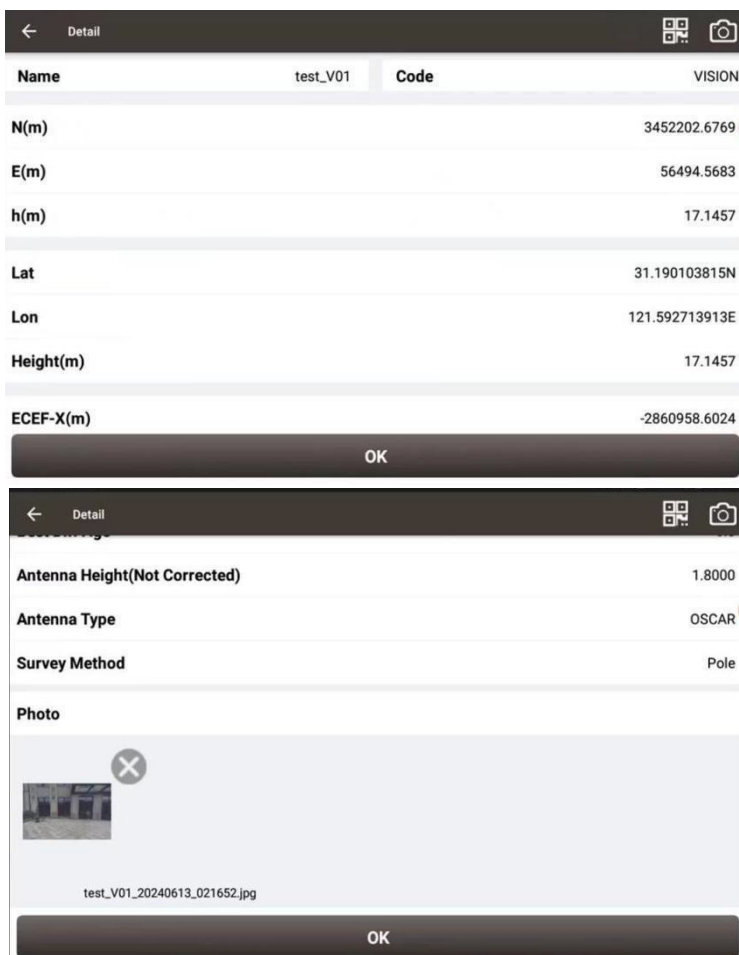


Figure 5.15 Point



Name	Point Type	Code	N(m)	E(m)	h(m)	Lat
(V)wall1_V03	Detail	VISION	3452202.0801	56494.3052	18.9821	31.190103911
(V)wall1_V06	Detail	VISION	3452202.9225	56494.5193	15.8472	31.190106033
(V)test_V01	Detail	VISION	3452202.6769	56494.5683	17.1457	31.190103815
(V)test_V02	Detail	VISION	3452203.0279	56497.2156	17.1412	31.190106853
(V)test_V03	Detail	VISION	3452202.3435	56493.9665	19.9968	31.190100838
(V)test_V04	Detail	VISION	3452203.0938	56495.5502	20.4637	31.190107528

Figure 5.16 Survey Point



Detail

Name: test_V01 Code: VISION

N(m): 3452202.6769

E(m): 56494.5683

h(m): 17.1457

Lat: 31.190103815N

Lon: 121.592713913E

Height(m): 17.1457

ECEF-X(m): -2860958.6024

OK

Detail

Antenna Height(Not Corrected): 1.8000

Antenna Type: OSCAR

Survey Method: Pole

Photo

test_V01_20240613_021652.jpg

OK

Figure 5.17 Detail

Above all, the storage is completed.

6. Terminology

Abbreviation	Description
AC	Alternating Current
BDS	BeiDou Navigation Satellite System
CMR	Compact Measurement Record
DC	Direct Current
eMMC	Embedded Multi Media Card
GLONASS	GLObal NAVigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSM	Global System for Mobile Communications
LED	Light Emitting Diode
OLED	Organic Light-Emitting Diode
PDA	Personal Digital Assistant
PPK	Post-Processing Kinematic
PPS	Pulse Per Second
QZSS	Quasi-Zenith Satellite System
RINEX	Receiver Independent Exchange format
RMS	Root Mean Squares
RTK	Real-Time Kinematic
RTCM	Radio Technical Commission for Maritime Services
SIM	Subscriber Identification Module
TCP	Transmission Control Protocol
UAV	Unmanned Aerial Vehicle, drone
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial BUS
UTC	Universal Time Coordinated

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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.

FCC Radiation Exposure Statement:

This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

Note : 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.