TITAN™

Where Technology Meets Innovation

TR7

GNSS RTK System

User Manual

TITAN

Where Technology Meets Innovation

Manual Revision

Revision Date	Revision Number	Description
May. 2019	1	A1 version

Preface

Introduction

Welcome to the TITAN TR7 receiver. This introduction describes how to use this product.

Tips for safe use

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

Exclusions

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

SatLab 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 Satlab's technology department for help.

Relevant Information

You can obtain this introduction by:

1. Purchasing Satlab products: you will find this manual in the instrument container to guide you on operating the instrument.

2. Logging onto the Satlab official website, downloading the electronic version introduction at Partners →Partner center.

Advice

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

Contents

Chapter 1

Overview

This Section Describes

      - **Features**

Features

1. It supports full constellation and multiple channels, can fix a position quickly and reliably.

2. The LED screen can do a better display, and operate against water.

3. With 16GB internal mass storage, it supports OTG functions.

4. Full band support for cellular mobile network with a built-in 4G network antenna.

5. With a omni-directional wireless radio antenna and internal UHF radio, it supports multiple radio protocols.

6. It supports WiFi, bluetooth and NFC (near field communication).

7. It support tilt survey with the internal electronic bubble.

8. With a high-capacity lithium-ion smart battery, it supports a quick charge and power display with the LED.

9. Stronger with innovative designs and magnesium alloy structure.

10. Double format storage of static data (*.GNS / RINEX).

11. The new generation controller THC30 with ergonomic design supports 4G, OTG, quick charge by dedicated charger and so on.

12. With the new TR7 software with new UI, multiple base maps and so on.

Chapter 2

Product Introduction

This Section Describes

- Hardware structure
- Button & LED
- Touch display
- Web management system
- Static measurement
- Real Time Kinematic (RTK) surveying
- Tilt survey 2.0
- Firmware upgrade

2.1 Hardware structure

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

Upper cover

Lower cover

Control Panel

Figure 2-1-1 Front
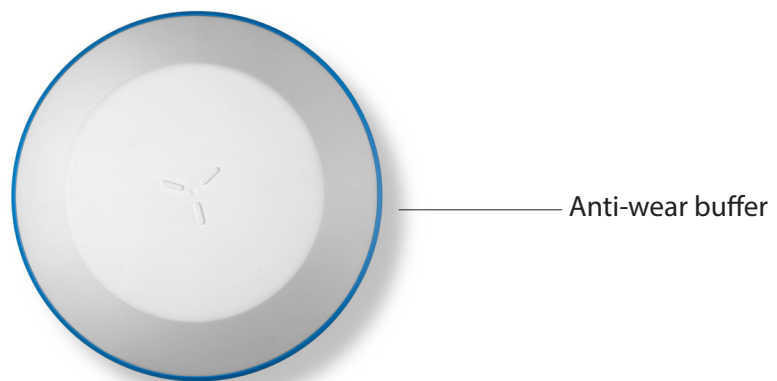
2.1.1 Upper cover

Anti-wear buffer

Figure 2-1-2 Upper cover

- Anti-wear buffer: Wear prevention points can enable the host to avoid scratches.

2.1.2 Bottom cover

The bottom cover includes a five-pin socket, a power light & button, a Mini USB socket, a speaker, a battery compartment, a connection screw, etc.
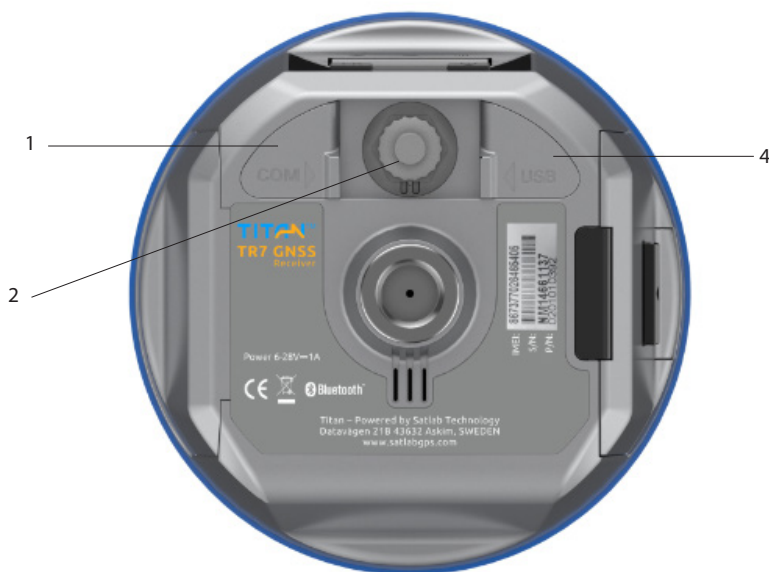

Figure 2-1-3 Bottom cover
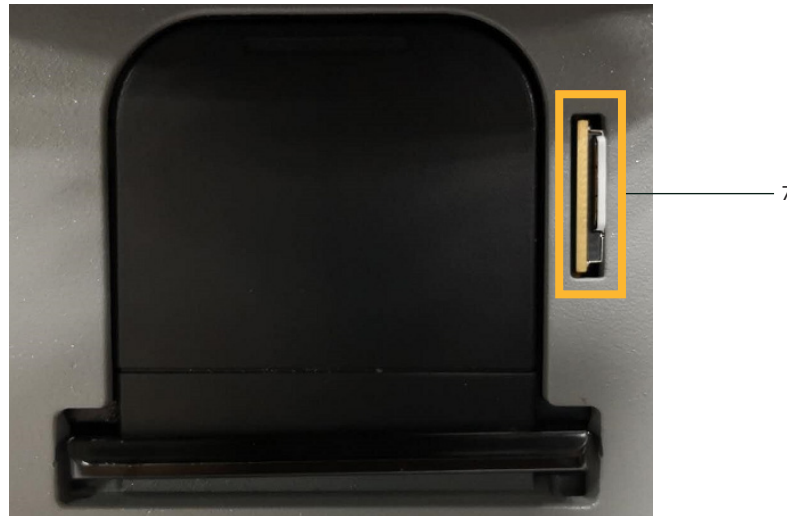

Figure 2-1-4 Bottom cover

Figure 2-5 Nano SIM slot

1- Five-pin interface   2-Network/Radio antenna interface   3-Rubber buffer

4-USB socket and plug   5-Power light & button

6-Battery slot cover   7-Nano SIM slot

- USB socket: connect the host with external devices, to upgrade firmware and download static data. It supports OTG.

- Five-pin interface: for external data linking and external power supply.

- Battery compartment cover: dustproof and waterproof. It should be closed when working.

- Nano SIM card slot: install available Nano SIM card when using network

- Rubber plug: for proof against dust and water

Notice: 1. Please cover the rubber plug to protect from dust and water when you don't use the five-pin socket and USB interface.

2. When the speaker is flooded, the sound may be silent or hoarse, but it will return to normal after drying.

2.1.3 Control panel

The control panel includes Fn button, power button and LED screen. The 3 status LEDs correspond to satellite LED, power LED and data LED. Only 2 buttons totally deal the basic functions of the TR7.
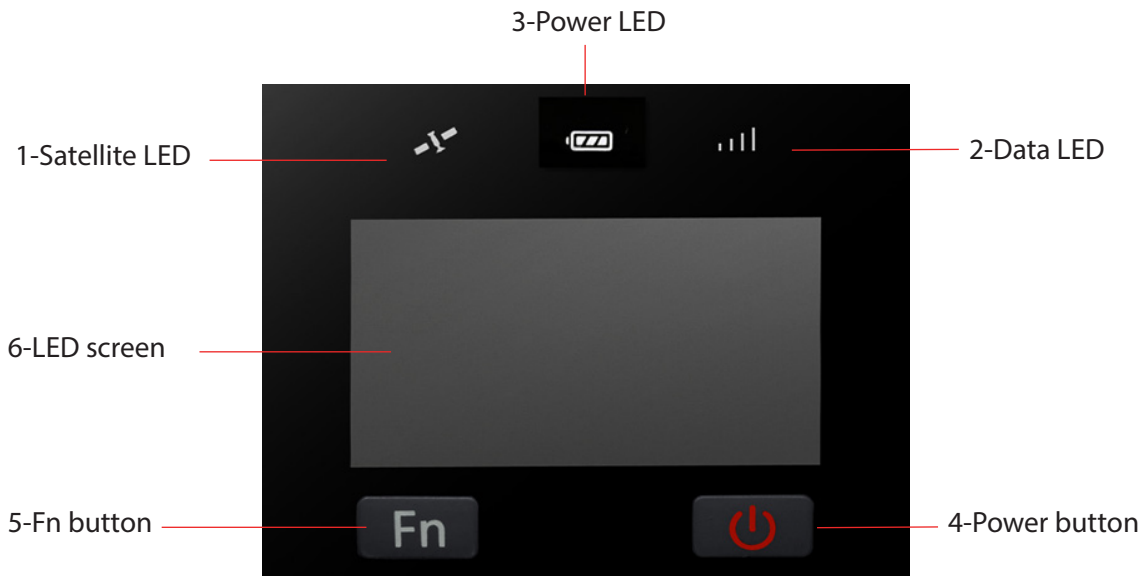

Figure 2-1

2.2 Button & LED

2.2.1 Button

Table 2.2.1 Fn button function description

Function	Description
Setting	Click the Fn button at the first time to change the interface from status to setting.
Cutover/Select	Click the Fn button again to make a choice along the setting and its sub-interface.

Table 2.2.2 Power button function description

Function	Description
Power-on	Press the button for 1 second.
Power-off	Press the button for at least 3 seconds.
OLED screen switch	Double click the power button to open or close the OLED display.
Forced shutdown (Do it in the case of a host crash)	Press the power button for at least 12 seconds.
Check the current status (When the OLED screen is sleeping)	Click the power button to voice broadcast the current working status.
Confirm (When the OLED screen is awake)	Click the power button to confirm status cooperating with the Fn button.

2.2.2 LED

When the screen display is on:

The power LED, data LED and satellite LED will be off.

When the screen display is off:

The power LED, data LED and satellite LED will work according to the current host's status.

Table 2.2.3 LED function description

Item	LED status	Description
Power indicator	Long-term lighting	Power sufficient
	Flash	Battery low
Data signal light	Flash	1. RTK mode: flash at the differential data interval. 2. Static mode: Sampling interval >1S: flash at the sampling interval; Sampling interval ≤1S: flash once per second.
	Off	1. RTK mode: no differential data. 2. Static mode: sampling has not started.
Satellite signal light	Long-term lighting	Satellite tracked
	Flash	Satellite not tracked

2.2.3 OLED screen display function

The host has a built-in OLED display. The OLED screen displays the state by double-clicking the power button to turn off the OLED screen display. Double-click the power button in the OLED screen to turn off the display.

2.2.4 Status interface

When the host is powered on, the current working status is displayed. The status interface consists of icons and text.
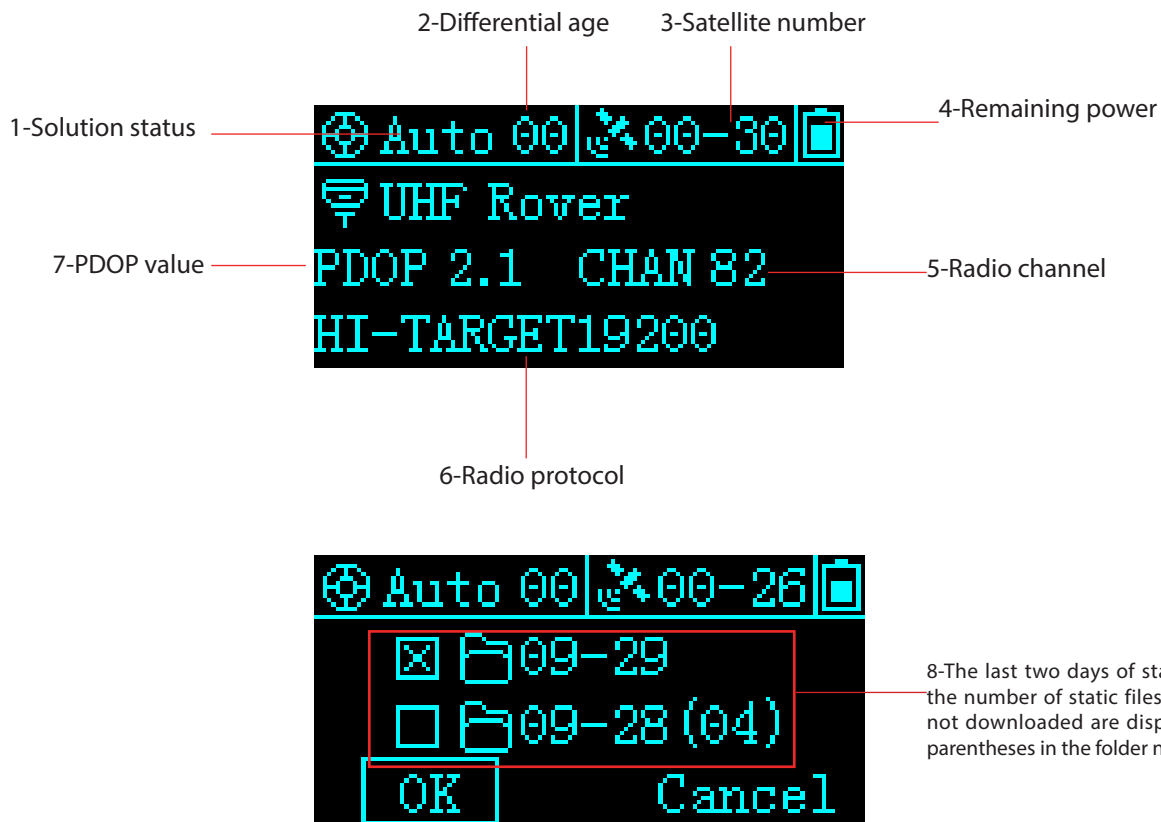
Table 2.3 Status Interface Function Description

Working Status	Icon	contents
UHF Base	△Fix 00 ⚲00-30 🔋 📡UHF Base PDOP 1.6 CHAN 82 HI-TARGET19200	Display current receiver operating mode, satellite information, solution status, PDOP, radio protocol
GSM Base	△Fix 00 ⚲00-35 🔋 📡GSM Base PDOP 1.6 Disconnect	Display current receiver operating mode, satellite information, solution status, PDOP, networking status

External Base	△ Fix 00 ⚡00-33 🔋 📡 External Base PDOP 1.3	Display current receiver operating mode, satellite information, solution status, PDOP
UHF Rover	⊕ Auto 00 ⚡00-30 🔋 📶 UHF Rover PDOP 2.1 CHAN 82 HI-TARGET19200	Display current receiver operating mode, satellite information, solution status, PDOP, radio protocol
GSM Rover	⊕ Auto 00 ⚡00-31 🔋 📶 GSM Rover PDOP 1.6 NO SIM Card	Display current receiver operating mode, satellite information, solution status, PDOP, networking status
Data Collector Internet Rover	✦ Fixed02 ⚡18-28 🔋 📶 Data Collector Internet Rover PDOP 1.9	Display current receiver operating mode, satellite information, solution status, PDOP
External Rover	⊕ Auto 00 ⚡00-31 🔋 📶 External Rover PDOP 1.6	Display current receiver operating mode, satellite information, solution status, PDOP
Static	⊕ Auto 00 ⚡00-30 🔋 ⬇ Static Interval:1s 00:00:12	Display working mode, satellite information, solution status, static acquisition duration and sampling interval

2.2.5 Sleep Interface

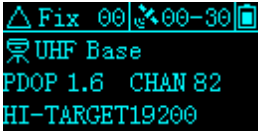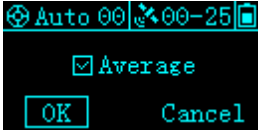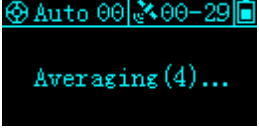If there is no operation for more than 60s, the display will enter the sleep interface. After 5 minutes of standby, the display is turned off. Double-click the power button or click the display to re-open the display and display the status interface.

Table 2.4 Description of the standby interface

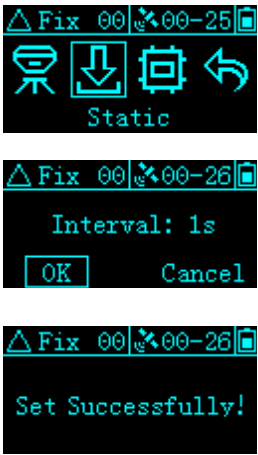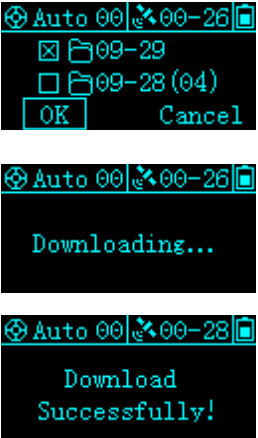|		
Standby interface	🔋⚡ 11:46	When the small five-core power supply (such as the external radio base station mode) displays the external power supply icon and local time (if the star is not locked, only the external power supply icon and ---:--)
	🔋 11:45	When using a lithium battery, display battery power and local time (such as unlocked star display --:--)

2.2.6 Setting interface

Table 2.5 Instructions for setting interface

Function	Button operation	Contents
Close/open OLED screen	Double-click Power button	
Select menu item	Single-click Fn	Click the Fn button and the selection box will automatically jump to the next option.
Confirmation	Single-click Power button	Click the power button to confirm the menu content of the current selection box and enter the lower menu.
Show/close the initial interface	Double-click Power button	Display current receiver operating mode, satellite information, PDOP, and other information
	Single-click Fn	In RTK mode, from left to right, it means: Base station, static, reset, return
Smooth base station	Click the Fn button to select the base station, then click the power button to confirm	Enter the base station setting interface, the screen can choose smooth acquisition, select smooth, the host automatically smoothes the 10 point coordinates and sets the station and transmits it with RTCM3.2 differential message; if no smoothing is selected, the host sets the coordinates once.

△Fix 00 00-25 Static △Fix 00 00-26 Interval: 1s OK Cancel △Fix 00 00-26 Set Successfully! Static Collection	Click the Fn button to select Static, then click the power button to confirm	Click the FN button to select Static, and then click the power button to confirm: static acquisition is not enabled, the collection interval setting interface is displayed, and 1S/5S/10S/15S/30S can be set. Static acquisition is enabled, and "Stop recording?" is displayed. Select "Confirm" or "Cancel", select the confirmation and display the collection interval setting interface, stop recording at the same time, and the voice broadcast "stop recording", select "Cancel" and return to the setting interface.
⊕Auto 00 00-26 Reset ⊕Auto 00 00-25 Reset Motherboard? OK Cancel ○None 00 00-00 Resetting... ○None 00 00-00 Reset Successfully! Reset the motherboard	Click the Fn button to select Reset, then click the power button to confirm	Enter reset motherboard setting interface, display "Reset motherboard?", select "confirm" or "cancel", select confirm, "reset motherboard"; reset success, voice broadcast "reset success", OLED screen display "reset success", After 2S, it jumps to the status interface; if the reset fails, the voice broadcasts "Reset failed", the OLED screen displays "Reset failed", and then jumps back to the reset interface after 2S. During the reset process of the motherboard, double-click the power button to turn off the display of the OLED screen.
⊕Auto 00 00-27 Back Return	Click the Fn button to select Back, then click the power button to confirm	Return to the status screen.
⊕Auto 00 00-26 ⊠ 09-29 □ 09-28(04) OK Cancel ⊕Auto 00 00-26 Downloading... ⊕Auto 00 00-28 Download Successfully! OTG		After using the OTG function, the U disk is connected to the host through the OTG cable. The OLED screen displays the last two days of static files. The folder is displayed by the day. The number of static files that are not downloaded is displayed in the parentheses of the folder name. The maximum number is 99. "...", after pulling out the USB flash drive, it automatically jumps back to the status interface.

Notice: 1.OLED screen without any operation for more than 60s, enter the standby interface, the standby interface shows the host power and local time (such as the instrument does not lock the satellite, only display the power, the time is displayed as: -----), after 5 minutes standby OLED The screen is closed, and the OLED screen display can be re-awakened by double-clicking the power button, and the state interface is returned after waking up; when the OLED screen is already lit, double-clicking the power button can turn off the OLED screen display.

2. After the registration code expires, the base station setting function of the setting interface is not available. When the customer operates the base station after the registration code expires, the "registration code expired" is displayed. Click "Back" to return to the setting interface, and no station operation is performed. Other functions: Static, reset function is available.

2.3 Web Management System

TR7 has a built-in WEB management system that allows real-time monitoring and free configuration of the host. The name of the receiver WiFi hotspot is the instrument Serial Number. Connect the hotspot via the controller WiFi (no password required), and enter the IP address 192.168.20.1 in the controller browser to log in.

Note: The host can be connected to the WiFi in the Bluetooth idle state. , for WEB login)

2.3.1 Main Menu

After logging in to the WEB management system, click Start to enter the main menu page. Each column of the main menu contains a drop-down menu.
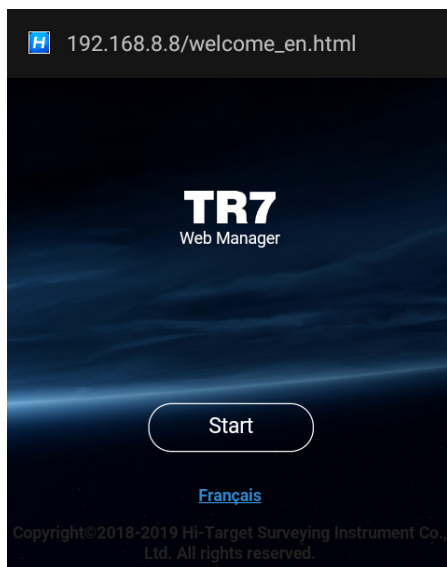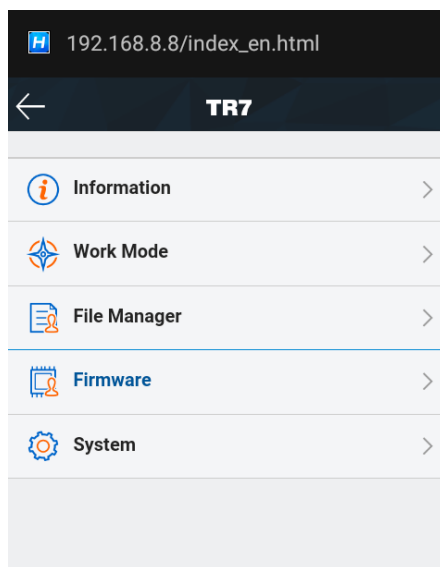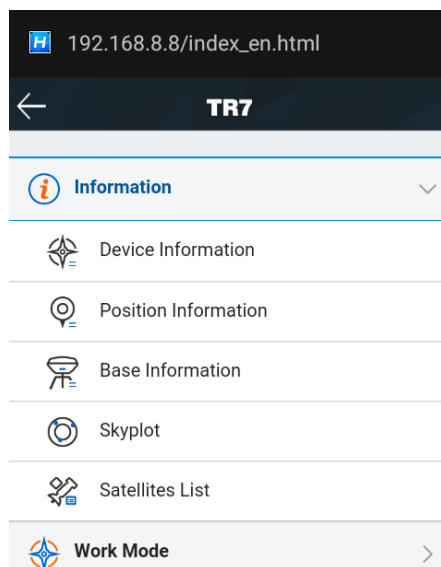

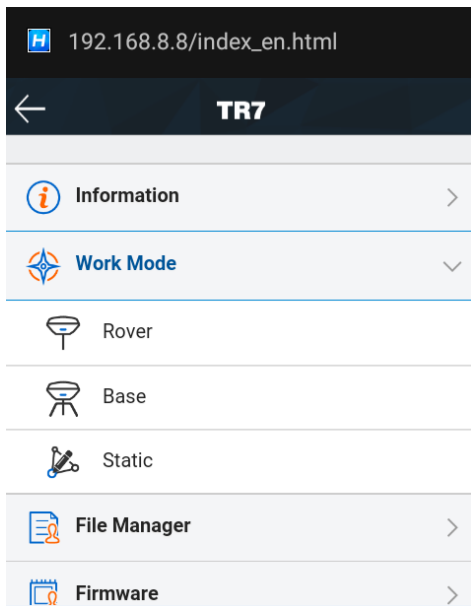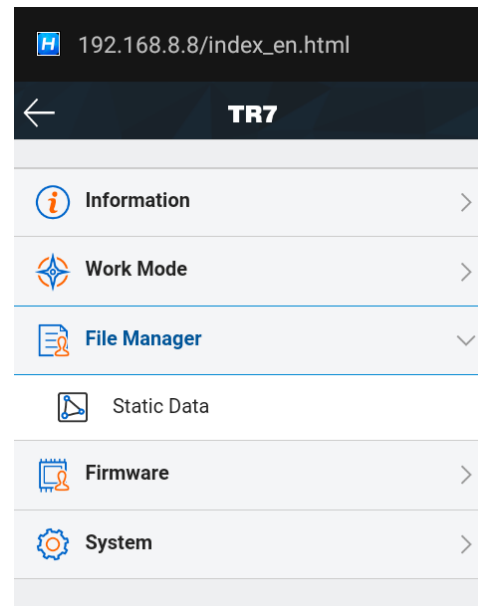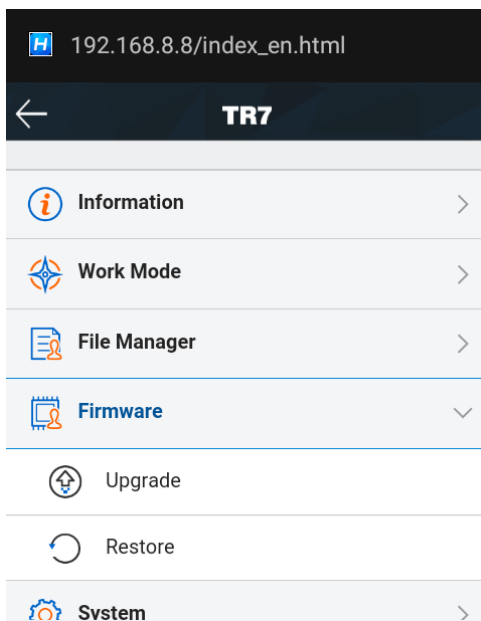*Figure 2-6*   *Figure 2-7*   *Figure 2-8*

Figure 2-9

Figure 2-10

Figure 2-11

Figure 2-12
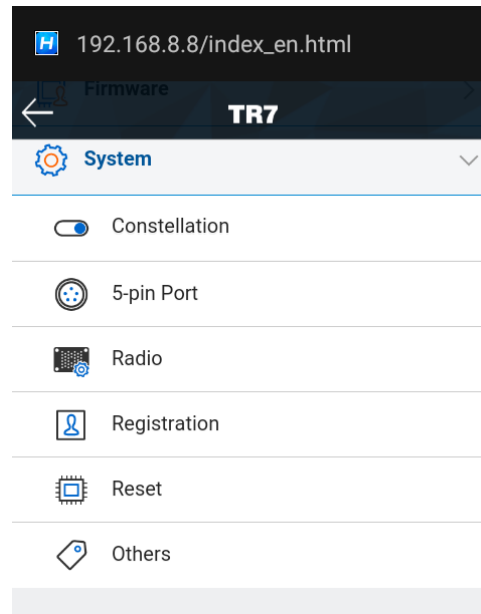
main menu	Submenu	Function
Information	Device information	Device model, version information, registration information, etc.
	Position information	Device positioning coordinates, device search star, solution status, etc.
	Base information	Base station coordinates and base station level
	Skyplot	View satellite starry map
	Satellite list	Satellite tracking information
Work Mode	Rover	Mobile station data link, parameter setting
	Base	Base station data link, parameter setting
	Static	Static measurement parameter setting
File Manager	Static data	Static file download, delete, format
Firmware	Upgrade	Firmware selection and upgrade
	Restore	Restore system
System	Constellation	Satellite system tracking switch
	5-pin port	Small five-core serial output settings
	Radio	Radio frequency table
	Registration	Host registration information and registration
	Reset board	Reset the motherboard to its initial state
	Others	Static RINEX recording switch and volume adjustment

2.3.2 Information View

- Equipment information

Displays the main information of the current device: device model, serial number, firmware version, motherboard information, expiration date, power, working mode, and configuration parameters.

- Location information

Displays the current device location information, satellite status, solution status, differential age and PDOP, real time.
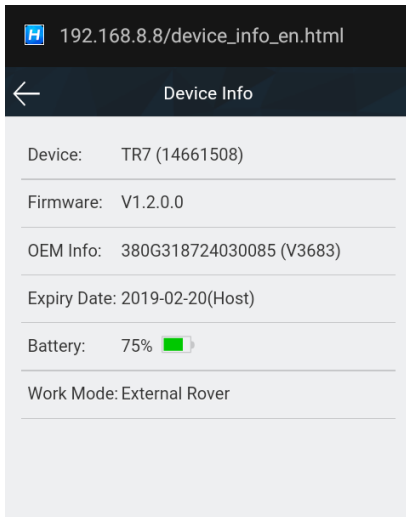

	192.168.8.8/device_info_en.html

Device Info

Device:	TR7 (14661508)
Firmware:	V1.2.0.0
OEM Info:	380G318724030085 (V3683)
Expiry Date:	2019-02-20(Host)
Battery:	75%
Work Mode:	External Rover

	192.168.8.8/location_info_en.html

Position Info

Latitude:	22:59:00.79515N
Longitude:	113:22:03.54249E
Height:	34.6838m
Satellites:	0-28
Solution:	Auto
Latency:	0.0
PDOP:	1.5
Time:	2019-01-25 11:54:13

	192.168.8.8/base_station_info_en.html

Base Info

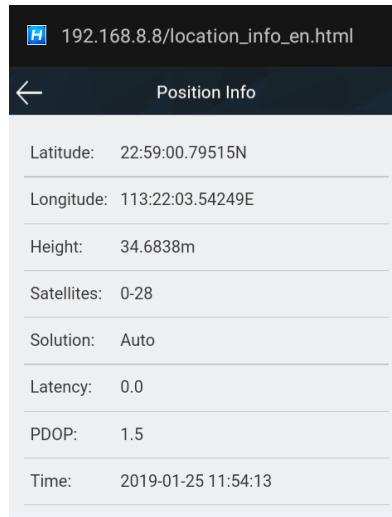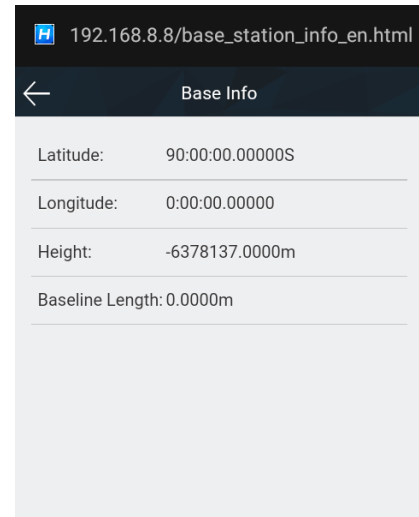| Latitude: | 90:00:00.00000S |
Longitude:	0:00:00.00000
Height:	-6378137.0000m
Baseline Length:	0.0000m

Figure 2-13   *Figure 2-14*   *Figure 2-15*

- Base station information

The coordinates and horizontal distance of base station displayed in rover.

- Satellite sky map

A visual satellite starry map of the display device, with an auxiliary switch to view the distribution of each satellite.

- Satellite tracking list
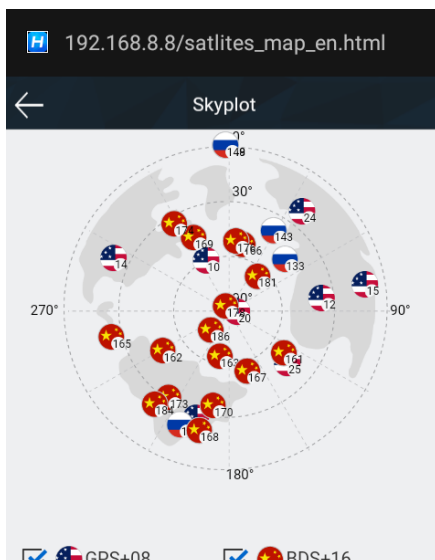
Display the tracked satellite information in a list.

	192.168.8.8/satlites_map_en.html

Skyplot

GPS+08   BDS+16

	192.168.8.8/satlites_table_en.html

Satellites List

PRN	ELE	AZI	L1	L2	L3
G10	63	337	49	48	0
G12	36	85	46	46	0
G14	22	294	42	32	0
G15	10	81	38	40	0
G20	82	117	45	40	0
G21	25	195	45	36	0
G24	22	39	39	46	0
G25	43	132	44	47	0
R133	48	52	45	45	0
R137	19	201	44	44	0
R143	40	32	44	44	0
R148	0	0	0	0	0

Figure 2-16 Sky Plot   *Figure 2-17 Satellite tracking list*

2.3.3 Working mode

- Rover

Set the data link of the mobile station and the configuration parameters corresponding to the data link. The mobile station data link mode includes:Internal UHF, internal GSM and external radio.

- Base station

Set the data link of the base station and the configuration parameters corresponding to the data link to smooth the base station coordinates. The base data link mode includes: built-in radio, built-in network, and external radio.

- Static

Set the file name and configuration parameters of the static acquisition.

Note: After checking Static Mode acquisition, you can uncheck Static Mode in the base station or mobile station mode.

2.3.4 File management

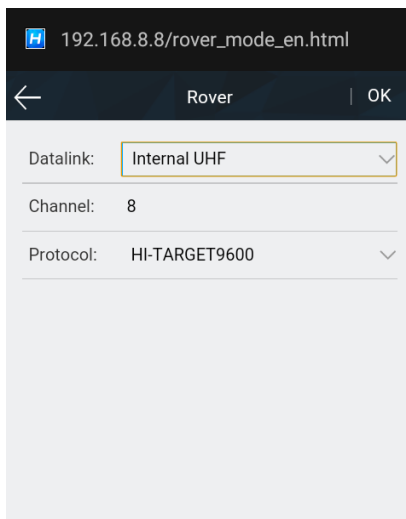Static file:To show static data files and supports Download and Delete and Format options.
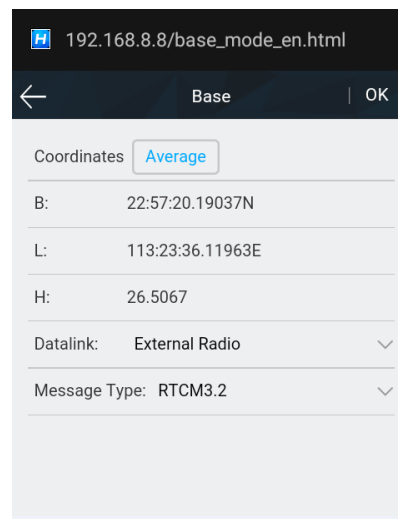

Figure 2-18

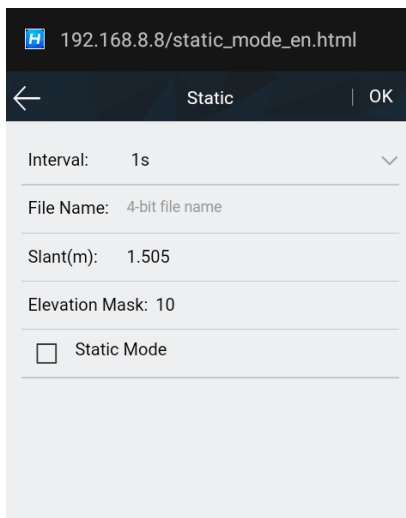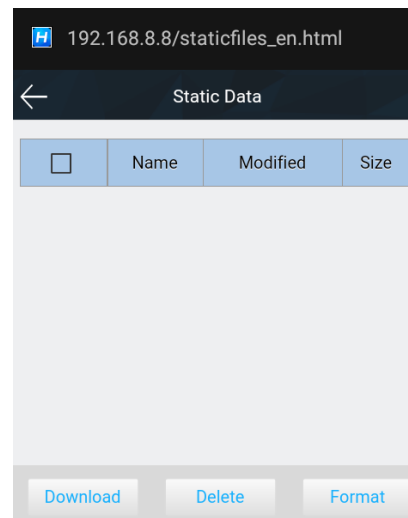*Figure 2-19 Base station setting*

Figure 2-20

Figure 2-21

2.3.5 Firmware management

- Update

Display the specific device version information, click Select, select corresponding upgrade package and click Upgrade, the host will automatically detect the upgrade package and upgrade.

Restore the system

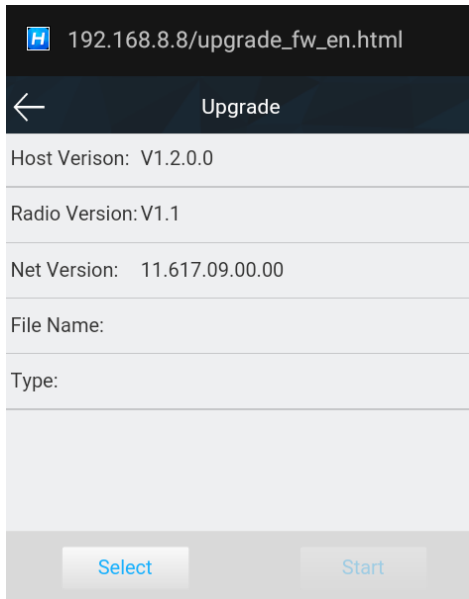Restore the system to its state after the most recent upgrade of the firmware.
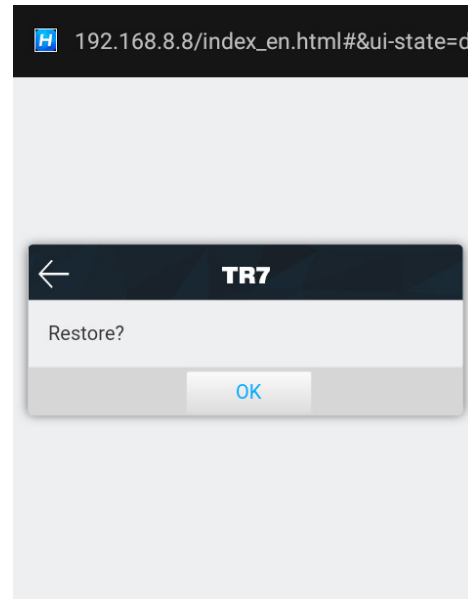
Figure 2-22

Figure 2-23 Restore

2.3.6 System settings

- Constellation

Switches of the satellite tracking.

- 5-pin port

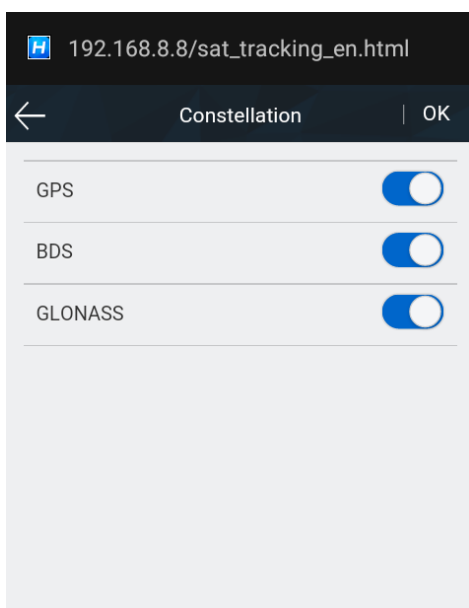Baud rate setting switches and message type switches and output frequency adjustments.

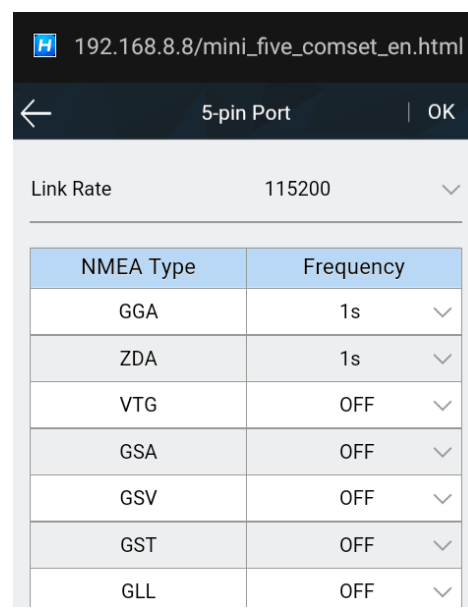*Figure 2-24 Constellation tracking switch*

Figure 2-25 Port output setting

- - Radio setting

HIT Radio

Optional radio modulation protocol (HI-TARGET, TRIMTALK450S, SOUTH, CHC) User-defined settings of 100 to 115 radio channels.

- Registration

Display the registration validity period of the host; Select the registration type, input the registration code and then you can register device online.
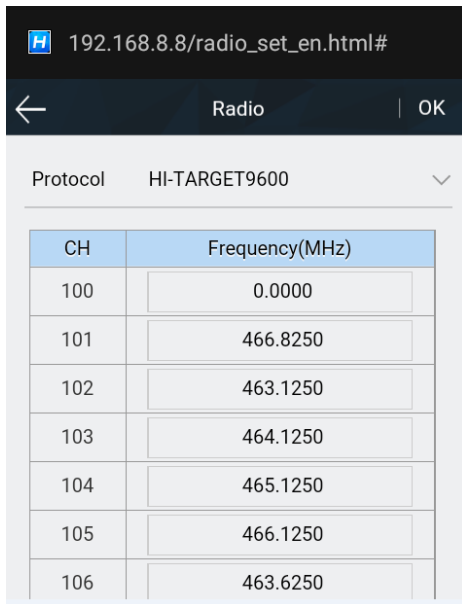

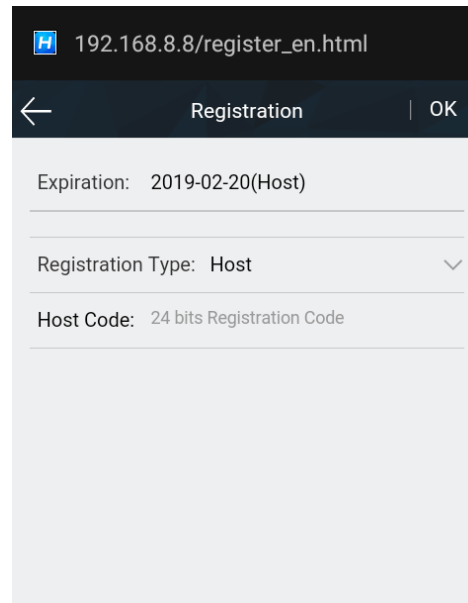*Figure 2-26 Protocol setting*

Figure 2-27 Registration

- Reset the motherboard

Restore the motherboard to its original state

- Other settings

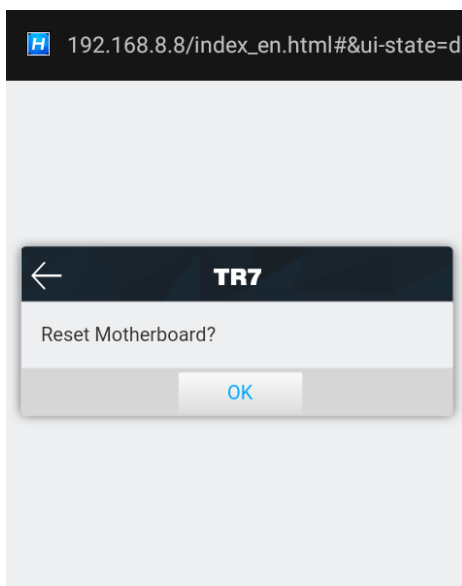Static RINEX switch and device speaking volume adjustment.

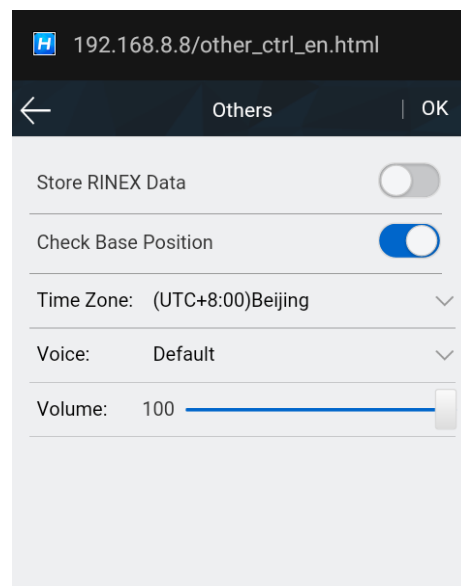*Figure 2-28 Reset the motherboard*

Figure 2-29 Other settings

2.4 Static mode

2.4.1 Static settings

TR7 receivers can be used for static survey; There are three ways to set up the device to work in the static mode:

- OLED – Static settings – to set up static mode.

- TSI software – Static collection – to set up static or temporary static mode.

- WEB interface – Work Mode – to set up static or temporary static mode.

After doing the settings, the OLED will display the static data collection interface, and the static measurement data will be saved in the host's memory card; Users can download static data files to their computers as needed, then the data will be processed using static post-processing software.

2.4.2 Static mode steps

1.Erect the instrument on the measuring point, the tripod needs to be strictly centering and leveling;

2.Measure the height of the receiver three times, ensuring that the difference of each measurement is less than 3mm. The final height of the receiver should be the average height. The height of the instrument is measured from the center of the measuring point, to the top of the benchmark of the instrument. The radius of the TR7 receiver benchmark is 0.130m, and the phase center is 0.1211m high;

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 mode;

5.Turn off the receiver after static data is collected and record the turn off time;
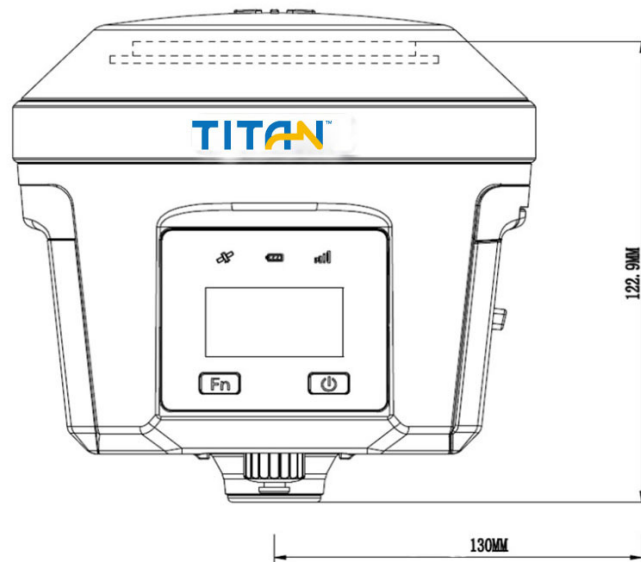
6.Download and post-process the static data;

Figure 2-30 Dimensions

⚠️ **Notice:** Don't move the tribrach or change the collecting settings while the receiver is collecting data.

2.4.3 Static data download

1. Download the static data by USB cable

Connect the receiver with computer by the Mini USB data cable, and copy the static data to computer. The static measurement data is in the gnss folder of the static drive.

Figure 2-31

2. Download static data via OTG and a USB drive.

Insert the OTG cable first, then insert the USB drive, and you can select static data file and download the static data of host directly by clicking FN.
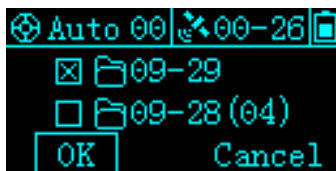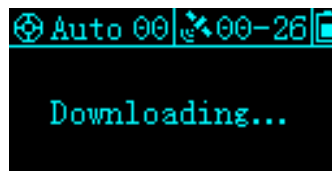
Figure 2-32   *Figure 2-33*

Notice: Don't move OTG cable or USB drive during static files download.

3. Download static data through the WEB management system

Open the WiFi of the controller and connect the device WiFi(the device WiFi name is the S/N), and then input the IP address 192.168.20.1 in the browser, to log into the WEB management system. Then, open the file manager interface, and select the static file that needs to be exported. Click Download and Save, the file can be download to the controller.

The default save path for WEB-side downloaded static data on the controller is: Store> MyFavorite; Meanwhile, you can customize the save path as needed.

Figure 2-34   *Figure 2-35*   *Figure 2-36*

2.5 Dynamic RTK surveying

2.5.1 Base setting

The dynamic RTK surveying can be in the radio mode (internal radio, external radio) and network mode depending on how the differential signal is transmitted.
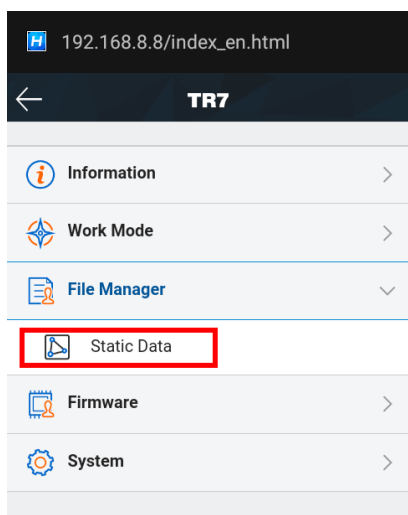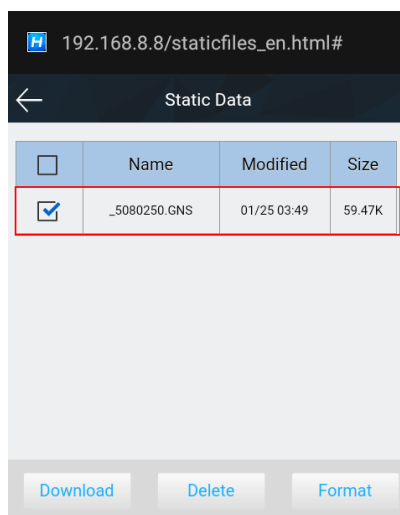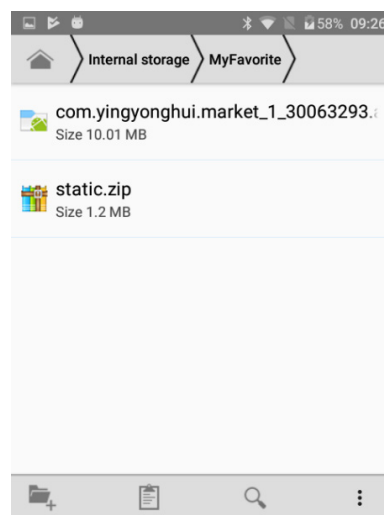
- Erection

The receiver is located at a stable known or unknown point. In order for the receiver to be able to search for a large number of satellites and high quality satellites, the base station should generally be wide open in the surrounding area, avoiding huge buildings and slabs at locations with elevation angles greater than 15 degrees, keeping away from strong signal reflections such as houses, hillsides, and large-area water surfaces, keeping away from high-power equipment (high-voltage lines, radio stations, transformers, etc.). Meanwhile, in order to make the differential signal spread farther, the base station should generally be placed at a high position.

- Device Connection

Strat the TSI software on thecontroller and enter the Device interface, generally using Bluetooth or WiFi.
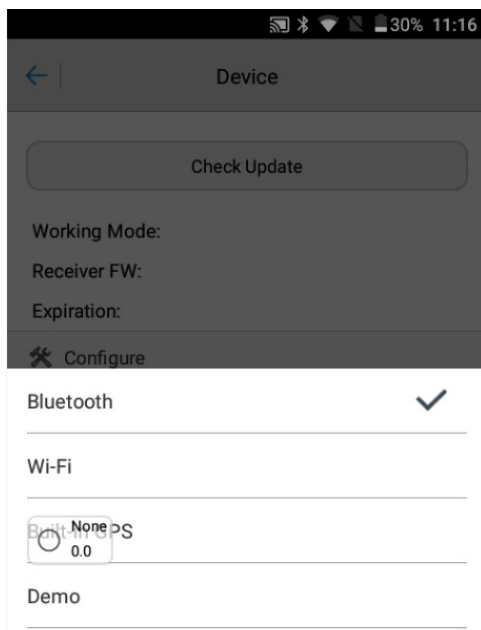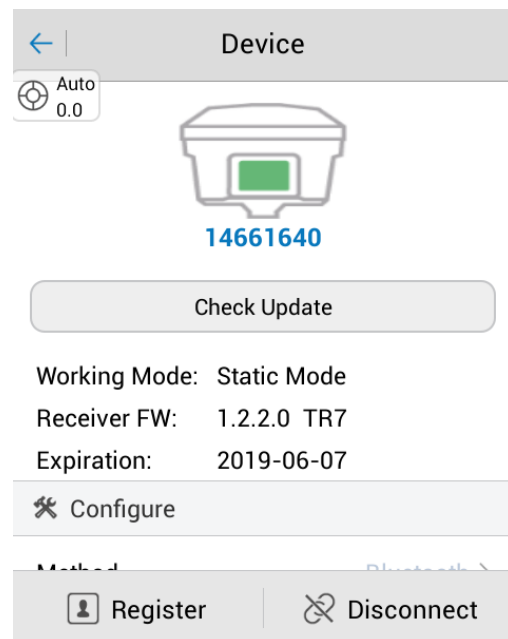
| Figure 2-37 | Figure 2-38 |

2.5.2 Base station parameters setting

The base station parameters include setting the base target height, base station coordinates, operating mode and corresponding parameters, message format, altitude angle, etc. After completing the relevant parameter editing, click the Set in the upper right corner, and the software prompts Set.

2.5.3 Rover setting

The rover settings are basically the same as the base station, mainly includes operating mode settings, altitude angle, etc. The difference is that the rover operating mode increases the data collector internet.
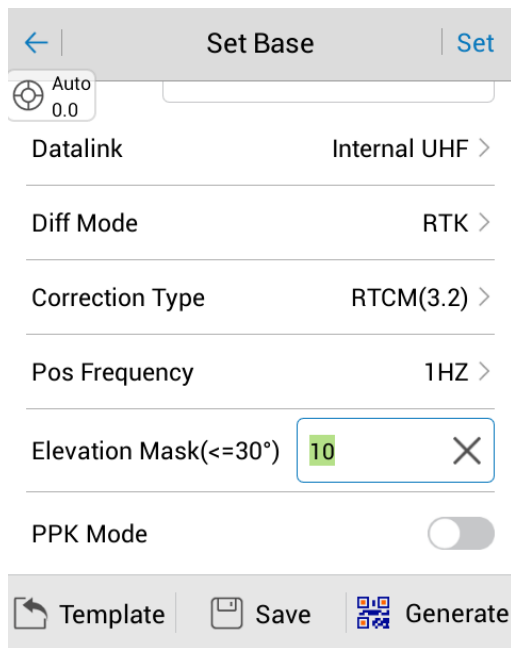
Figure 2-39
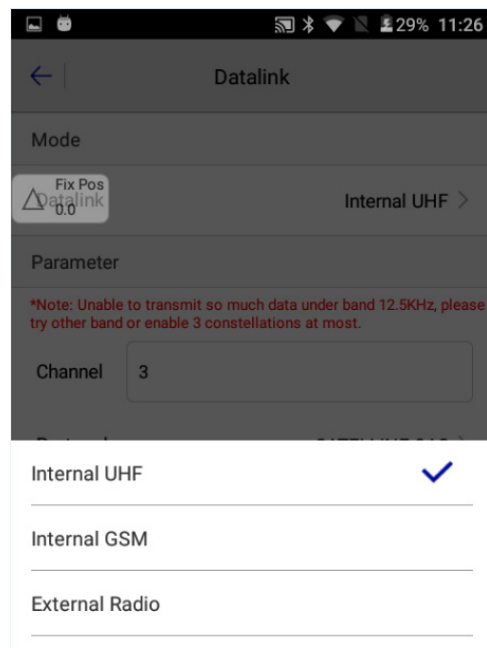
Figure 2-40
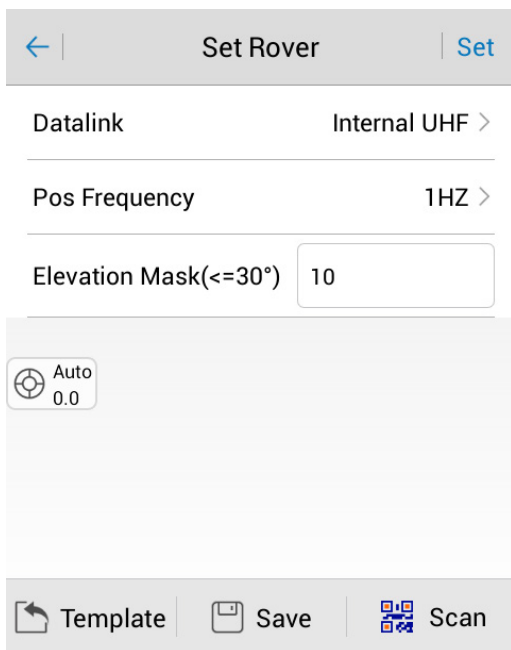
Figure 2-41
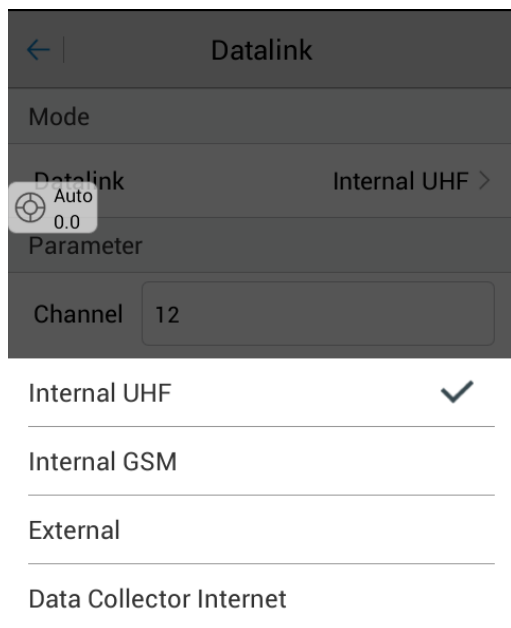
Figure 2-42

2.6 Firmware upgrade

You can upgrade TR7 firmware via USB cable, Web UI, OTG, or remote online, etc.

2.6.1 Upgrade by USB cable

Steps to upgrading the firmware by USB cable:

1. Turn on the receiver, connect the random receiver and computer with the cable attached. It will show the update drive after clicking the computer.

2. Copy the firmware (download from our official website or get it from the technical team) to the update drive. Disconnect the computer and receiver, and restart the receiver.

3. There will be different prompt voice of upgrade successes or failures. If it fails, please re-upgrade it or contact our technical team.

Figure 2-43

2.6.2 Upgrade by OTG

Insert OTG when the USB drive connected with OTG is stored with a firmware that matches the instrument, and the prompt voice is broadcast new firmware found. When the prompt voice is broadcast again dingdong means that firmware copy is complete, then unplug the OTG; Firmware upgrade when the host is restarted next time after the firmware copy is completed, the upgrade process will be the same as the USB data line upgrade function.

2.6.3 Upgrade by WEB UI management system

Copy the firmware to the hand-hold, and open the switch of WiFi, and connect it by WiFi (the WiFi name is the S/N). Input 192.168.20.1 to log in, click firmware upgrade – folder – file to choose the firmware, then click start to upgrade the firmware.

2.6.4 Remote online upgrade

It supports the remote online upgrade.

Make sure the host has been connected the internet (with the usable SIM card). When detecting that there is a motherboard or host firmware higher than the current version of the host on the server, the host will send the firmware information to the TSI software. Click the Update button on the TSI pop-up window to start the upgrade, then the host automatically restarts and upgrade the host or motherboard firmware to complete it; Or click Device – Check Update in TSI software to check it.

> **Notice:** 1. After the download failed, if the network recovers within two minutes, it will resume downloading; otherwise, it will exit the firmware upgrade detection.
> 2. It is not allowed to forcibly power off during the upgrade. If the power is forcibly cut off, the instrument may be damaged and the instrument may be abnormal.

2.7 Tilt Survey 2.0

After connecting the receiver with the TSI software, active the tilt survey function Slope Method 2.0 in Data interface of the Surveying configure tab, then surveyor can carry out the tilt survey.

In this mode, when the user collect detail points in Detail Survey interface, the software will remind users to shake the receiver to complete the tilt survey. At this time, the host can complete the collecting by shaking the host at a uniform speed and waiting for the progress bar to reach 100%.
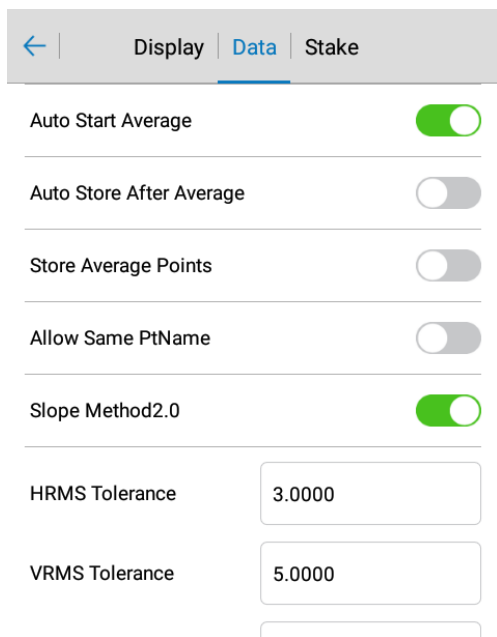

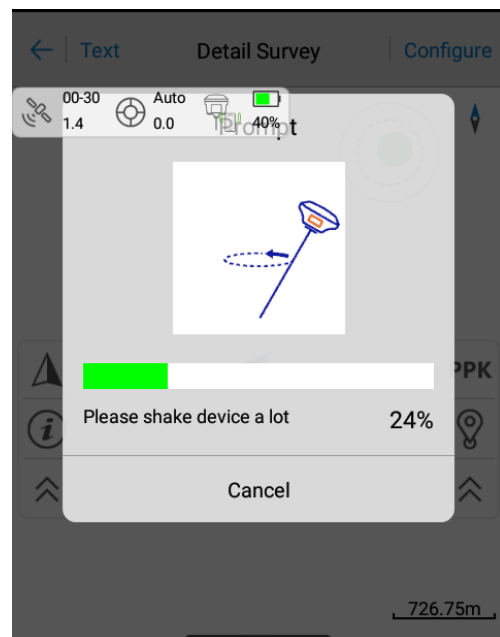*Figure 2-7-1 Active the tilt survey function*

Figure2-7-2 Tilt survey progress

Chapter 3

Technical Specifications

This Section Describes

    - Technical Specifications

3.1 Technical Specifications

Below are the technical specifications of the product:

Table 3-1 Specifications of TR7

System configuration	Processor	Cotex-A5 Core Processor
	Operating system	Linux 3.2.0
	Start-up time	3 Seconds
	Data storage	RAM: 128MB; ROM: 16GB internal storage, support OTG.
GNSS specification	Signal tracking	BDS：B1、B2、B3 GPS：L1、L2C/L2P、L5 GLONASS：L1、L2
	Number of channels	440
	Positioning accuracy/ precision	RTK Positioning Precision: Horizontal: $\pm\left(8\mathrm{mm}+1\times10^{-6}\mathrm{D}\right)$ Vertical: $\pm\left(15\mathrm{mm}+1\times10^{-6}\mathrm{D}\right)$ Static Precision: Horizontal: $\pm\left(2.5\mathrm{mm}+0.5\times10^{-6}\mathrm{D}\right)$ Vertical $\pm\left(5\mathrm{mm}+0.5\times10^{-6}\mathrm{D}\right)$
	Time for initialization	Typically, < 10 s
	Initialization reliability	> 99.99%
	Data update frequency	Positioning Data: 20Hz(GNSS Board), Original Data: 20Hz(GNSS Board)
	Differential Message	RTCM3.2、RTCM3.0、CMR、RTCM2.X
Network specification	Network standard	4G cellular mobile network (TDD-LTE, FDD-LTE, WCDMA, EDGE, GPRS, GSM)；3G(TD-SCDMA, WCDMA, CDMA 2000); 2G (GSM, CDMA)
	support band	FDD LTE: Band 1, Band 2, Band 3, Band 4, Band 5, Band 7, Band 8, Band 20, all bands with diversity WCDMA/HSDPA/HSUPA/HSPA+: Band 1, Band 2, Band 5, Band 8, all bands with diversity GSM/GPRS/EDGE: 850 MHz/900 MHz/1800 MHz/1900 MHz
	Data service	GPRS、EDGE、WCDMA CS、WCDMA PS、HSPA+、DC-HSPA+、LTE FDD

Radio parameter	Protocols	TRIMTALK 450S,HI-TARGET19200/9600,SOUTH19200/9600,CHC19200/9600
	Modulation	4FSK、GMSK
	Frequency range	403-473MHz
	Channel spacing	25KHz
	Receiving sensitivity	-116 dBm
	Number of channels	100(Default)+16(Custom)
	Transmit power	4W/2W/1W(Optional)
Data Communications	Bluetooth	2.4GHz, HSP/HFP/OPP/PBAP, V2.1(Transmission distance ≥ 15 meters under unobstructed conditions)
	WIFI	2.4GHz, 802.11 b/g/n, Support WAPI, AP(Signal coverage radius ≥ 30 meters under unobstructed conditions)
	NFC	ISO1443 protocols, NFC Electronic Tags, Support Bluetooth flash pairing
	Serial communication	1 RS232 serial por: 3 threads, 19200 bps, 8-bit, 1stop bit
User interface	Screen	Dimensions: 1.54-inch, Resolution: 128*64
	Button	2 buttons
	Indicator	3 status LEDs (green): 1 for satellite, 1 for data, 1 for power
External interface		1 battery compartment; 1 TNC aerial interface/slot; 1 Lemo five-pin socket(contain 1 triple-line RS232、1 external power input); 1 Mini USB interface; 1 Nano SIM card slot
Electrical		Total power consumption: 4.2W (Static mode) Internal battery: 6800mAh/7.4V; Duration: can be greater or equal to 11 hours under static mode, and be greater or equal to 9 hours under active mode. Charging time: single ≤ 3.5h, double ≤ 6.5h Power supply: powered by five-pin socket or internal lithium-ion, DC 6-28VDC/2A.
Protection		Shock and vibration: Designed to survive a 2m natural fall onto concrete Water/dustproof: IP67
Temperature		-40℃ to 75℃ (without battery) -20℃ to 45℃ (with battery)
standards and regulations		JJF 1347-2012 Global Positioning System (GPS) Receiver (Geological Type) Type Evaluation Outline Q/ZHHD 3-2017 Dual-Frequency Real-Time Dynamic GNSS (GPS) Receiver

Chapter 4

Accessories

This Section Describes

- **SIM card installation**
- **Data cable**
- **Antenna**
- **Benchmark**
- **Battery & Charger**

4.1 SIM card installation

TR7 receiver supports Nano SIM card, the SIM card installation method is as follows:

1, Remove the battery cover without removing the battery, and the Nano-SIM card slot is exposed in flank.

2, Nano-SIM card notch direction is consistent with the card slot

3, Insert the Nano-SIM card into the deck with the front side (with metal contacts on one side) down.

4, The entire Nano-SIM card is placed in the card insert and the installation is completed.

Figure 4-1

Figure 4-2

4.2 Data cable

Mini USB data cable: Connect the TR7 host and the computer to upgrade the firmware and download static data.

Five-pin data cable (DG-3): to connect the host and external radio to transmit differential data.

OTG cable: for USB flash disk's OTG firmware upgrade and static data download.
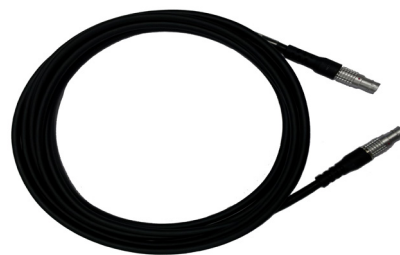

Figure 4-3 Mini USB data cable

Figure 4-4 Five-pin data cable (DG-3)

Figure 4-5 OTG cable

4.3 Antenna

There is one standard radio antenna and one 4G network, you can select the appropriate antenna according to the operation mode. The UHF radio antenna is used in the internal UHF mode, and the external 4G antenna is used in the internal GSM mode.

Figure 4-6 4G antenna

Figure 4-7 4G Radio antenna

4.4 Benchmark

The benchmark is used to measure the height of the instrument.

Figure 4-8 Benchmark

4.5 Battery & charger

- Installation

1, Lightly press the metal button on the battery cover and push it down.

Figure 4-9

2,The battery cover can be opened when it bounced upward.

Figure 4-10

3, Align the side of the battery with the metal piece down on the battery compartment and push it in gently (the battery installation is completed).

Figure 4-11 Steps of unload the battery

- Remove

Gently press the battery lever, the battery will automatically pop up, pour out the battery, and complete the battery unloading.
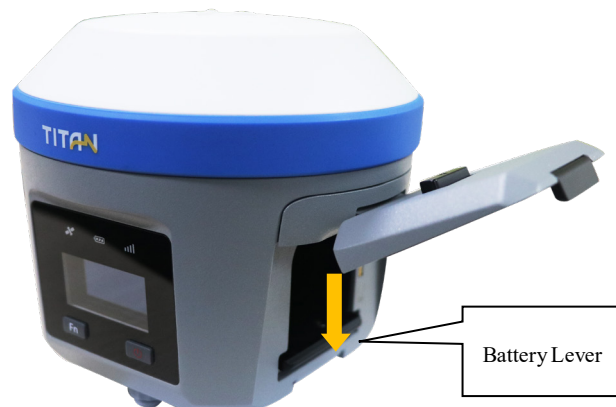

Figure 4-12 Steps of unload the battery

- Battery and charger model

Battery: The host is equipped with the 6800mAh/7.4V intelligent lithium battery, with a power indicator function.

There are 4 indicator lights in all:

Table4.1 indicator lights description

Operation	Battery power	LED indicator
Charging	0-25%	LED 1 flashes, the flashing frequency is 1Hz.
	25%-50%	LED 1 is in long-term lighting; LED 2 flashes, the flashing frequency is 1Hz.
	50%-75%	LED 1 and 2 are in long-term lighting; LED 3 flashes, the flashing frequency is 1Hz
	75%-100%	LED 1, 2 and 3 are in long-term lighting; LED 4 flashes, the flashing frequency is 1Hz.
	Full (trickle charge)	All LED lights off. (charging current ≤150mA)

Figure 4-13 Battery

Figure 4-14 Charger

Charger: Use the standard charger to charge the battery, the indicator will turn off when the battery is fully charged.

Warning: 1, Use only batteries and chargers that are factory-configured. Do not throw them into fire or short-circuit the electrodes with metal.

2, Replace the battery if it is found to be hot, deformed, leaking, smelling, or otherwise abnormal during use, charging, or storage.

3, If the usage time is significantly shortened, please stop using the battery. The battery has deteriorated. Please replace it with a new one.

Instructional safeguard

Notice: - element 1a: not available

- element 2: "CAUTION" or equivalent word or text

- element 3: "Risk of explosion if the battery is replaced by an incorrect type" or equivalent text

- element 4: optional

- high or low extreme temperatures that a battery can be subjected to during use, storage or transportation; and

- low air pressure at high altitude.

- replacement of a battery with an incorrect type that can defeat a safeguard (for example, in the case of some lithium battery types);

- disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery, that can result in an explosion;

- leaving a battery in an extremely high temperature surrounding environment that can result in an explosion or the leakage of flammable liquid or gas;

- a battery subjected to extremely low air pressure that may result in an explosion or the leakage of flammable liquid or gas.

WARNING

HOT SURFACE

DO NOT TOUCH