Hi-Target

Surveying the World,Mapping the Future

V30 Plus GNSS RTK System

User Manual

Manual Revision

Revision Date	Revision Level	Description
Jul, 2019	1	V30 Plus GNSS RTK System User Manual

V30 Plus

GNSS RTK System
User Manual

Preface

Introduction

Welcome to the Hi-Target V30 Plus receiver. This introduction describes how to use this product.

Experience Requirement

In order to help you use Hi-Target series products better, Hi-Target suggests you carefully read the instructions. If you are unfamiliar with the products, please refer to http://www.hi-target.com.cn/

Tips for safe use

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

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

Exclusions

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

Hi-Target 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 Hi-Target technology department for help, we will answer your question.

Relevant Information

You can obtain this introduction by:

1. After purchasing Hi-Target products, you will find this manual in the instrument container to guide you on operating the instrument.

2. Log onto the Hi-Target official website, download the electronic version introduction at “Partners” → “Partner Center”.

Advice

If you have any suggestions for this product, please email sales@hi-target.com.cn. Your feedback information will help us to improve the product and service

Contents

Chapter 1

Overview

This chapter contains:

- Foreword
- Features
- Use and Precautions

1.1 Foreword

A new generation of miniaturized V30 Plus GNSS RTK system, condensing our ultimate professional pursuit, with enthusiast performance configuration, using magnesium alloy structure, supporting tilt measurement, using Wi- Fi wireless connection, control distance up to 100 meters; built-in transceiver integrated radio, working distance farther. In addition, equipped with a new generation of quad-core full-strength Android handbook, with Hi-Survey Road professional measurement software, let you enjoy the comfortable work experience brought by professional quality.

Notice: This manual does not represent the standard configuration. The contents of the box are adjusted according to different user requirements. The specific configuration is subject to the outbound order at the time of purchase. Before using the machine, it is recommended that you first check the package of the product for damage; please carefully open the package to confirm whether the contents of the box match the delivery order; if you find any loss of the product and its accessories or If it is damaged, please contact your local office or dealer immediately. Please read the instruction manual carefully before carrying, handling and using.

1.2 Features

1.New design, magnesium alloy structure, smaller size, lighter weight and higher quality;

2.Linux operating system, more powerful and more reliable;

3.The transceiver UHF radio enables switchable working modes between base and rover;

4.Built-in 8G storage space;

5. Support long-distance Wi-Fi connection for remote data transmission;

6. The new generation controller iHand30, rugged, dexterous and super endurance, accessible in various

7. Based on Android system, developed a customized intelligent measurement software: Hi-Survey Road, with richer graphical performance and improved work efficiency;

8. Multi-function by one key, simple and convenient NFC operation, making your measurement quick and easy;

9. Double formats storage of static data (*.GNS / RINEX).

1.3 Use and Precautions

The V30 Plus receiver is designed with chemical and impact resistance, but precision instruments require careful use and maintenance.

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

In order to ensure the continuous tracking observation of the satellite and the quality of the satellite signal, it is required that the space above the station should be as wide as possible, and there should be no obstacles above the 15 ° elevation angle; in order to reduce the interference of various electromagnetic waves on the GNSS satellite signal, There should be no strong electromagnetic interference in the range of about 200 m around the station, such as TV towers, microwave stations, high-voltage transmission lines; in order to avoid or reduce the occurrence of multi-path effects, the station should be away from the terrain and features that strong reflectors. Such as high-rise buildings,waters,..etc.

Chapter 2

Product Introduction

This chapter contains:

- Overall Appearance
- Button & Indicator Lamp
- Static Survey
- Dynamic RTK Survey
- Firmware Upgrade

2.1 Overall Appearance

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

Figure 2-1-1 Front

2.1.1 Upper Cover

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

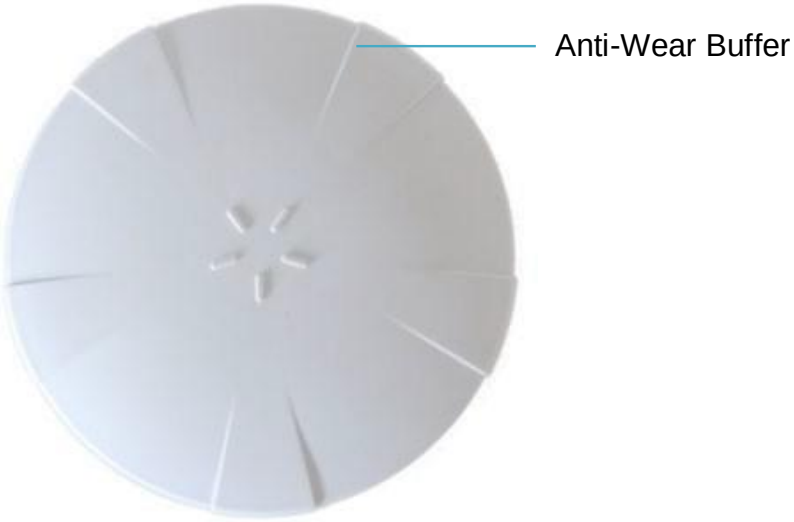

Figure 2-1-2 Upper Cover

Anti-wear Buffer: Wear prevention points can enable the host to avoid scratching.

2.1.2 Bottom Cover

Figure 2-1-3 Bottom Cover

1.Five-pin socket & Protective plug

2.Host label

3.Connection screw

4.Speaker

5.Battery compartment and cover

6.USB socket and protective plug

7.Network/radio antenna interface and protective plug

◇Connection screw: For fixing the instrument to the base or a pole

◇Protective plug: Used for dustproof and waterproof sockets.

◇Five-pin socket: For external data linking and external power supply.

◇Network/Radio antenna interface: Network antenna when using the network, radio antenna when using the radio.

◇USB socket: Connect the host with external devices, to upgrade firmware and download static data. It can also be used as the USB to serial port, in special working modes (you need to install the driver).

◇Speaker: Timely operate the instrument and broadcast the status with voice

◇Battery compartment: Used to place the battery.

◇Battery cover: Cover the battery cover to protect it from dust and water. It protects the battery and the components of the main unit.

2.2 Button & Indicator Lamp

2.2.1 Button Function

Table 2-2-1 Button Function Description

Function	Description
Power-On	Long press the button for 1 second.
Power-Off	In the power-on state, long press button more than 3 seconds and less than 6 seconds, the first voice of the speaker Dingdong, release the button to normal shutdown.
Auto-Set Base	In power off status, long press power button for 6s will enter the state of setting base station automatically, then release it; the receiver will automatically set base mode.
Work Mode Switch	Double click power button to enter the state of work mode switch, every double click will switch to another work mode.
Work Mode	Single click to confirm the current work mode.
State Query	See appendix.
Reset Main Board	In power on status, long press power button for more than 6s when voice prompts the second dingdong, then release it.
Mandatory Power Off	In power on status, long press power button for more than 8s.

Appendix

Table 2-2-2 Detailed Description of the Status Query Function

Function	Description
GSM Base Station	GSM Base Station
UHF Base Station	UHF Base Station, Channel X, Power X
External Base Station	External Base Station
GSM Rover	GSM Rover
UHF Rover	UHF Rover, Channel X
Controller Differential Rover Station	Controller Differential Rover Station
External Rover	External Rover
Static	Static Interval X, Elevation Angel X, Existential Space Surplus X, Satellite Number X

2.2.2 Indicator Lamp

Table 2-2-3 Description of Indicator Lamp Function

Item	Status	Description
Power Light (Yellow)	Long-term Lighting	In Normal Voltage Battery Remaining⩾60%
Power Lamp (Red)	Always On	Battery Remaining: 10% ~ 60%
	Slow Flash	Low Voltage: Battery Remaining < 10%
Signal Lamp (Green)	Off	No GSM Connection
	Always On	GSM Module Connect to Server Successfully
	Slow Flash	Host is Connecting to Server
Data Lamp (Red)	Flash	The data link sends and receives data (The rover station only prompts to receive, and the base station only prompts to transmit) Static acquisition flashes at sampling frequency (More than 1Hz flashes according to flash frequency "200ms"), in this status static data has been collected.
Satellite Lamp (Green)	Always On	Satellites tracked successfully
	Slow Flash	Lose satellites and try re-track
Satellite Lamp (Red)	Fast Flash	The motherboard is abnormal, the green light is off.
	Flash	In temporary static mode, flash according to the sampling interval.
Long-term Lighting Reset Main Board or Static Collecting Error (Insufficient Storage Space)		Anomaly flash of 3 lamps

2.3 Static Survey

V30 Plus receiver can be used for static measurement. It is set by double-clicking the power key to enter the mode switching, every double-clicking, switching one mode of operation. In the mode switching process, click the power key to confirm, the red state light flashes every few seconds (according to the sampling interval) and then collects one

epoch. The collected static measurement data is stored in static/gnss files. Static data files need to be downloaded to the computer and processed with static post-proceed software.

Notice: Working mode switching: You can also switch through the controller, specific operation please refer to the Hi-Survey Road software instructions.

2.3.1 Steps of Static Survey

1. Set up receiver on a control point, centering and leveling strictly.
2. Measure the height of receiver for three times, on condition that the difference of each measuring is less than 3 mm and the final height of the receiver should be the average height. Instrument height should be measured from control point to the upper of measurement bench marker. The radius of the V30 Plus receiver benchmark is 0.130 m, and the phase center is 0.1018 m high.

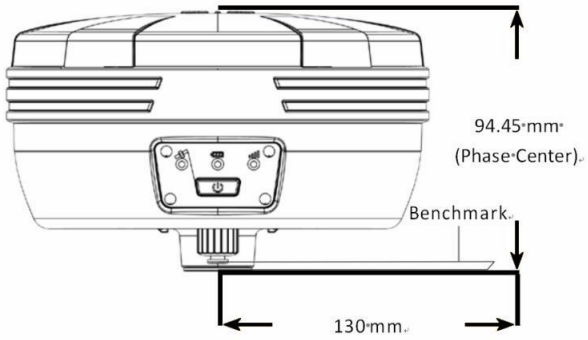

Figure 2-3-1 Benchmark Sketch

3. Record point name, receiver S/N, receiver height, beginning time.
4. Press power button to power on and double click power button to set static collecting mode; then single click power button to confirm it.
5. After the measurement is completed, turn off the machine and record the shutdown time.
6. Download and process data.

Notice: Don’t move the tri-brach or change the collecting set while the receiver is collecting data

2.3.2 Static Data Storage

The collected GNSS static data is stored in the static drive letter in the 8 GB storage of the V30 Plus receiver (effective storage space is about 6.6 GB). There are three folders: log, gnss and rinex. The log folder stores log information. The data format stored in the gnss folder is *.gns; The data format stored in the rinex folder is a standard RINEX format data file. You can connect to your computer using a randomly configured USB cable and use the USB disk to copy static data to your computer.

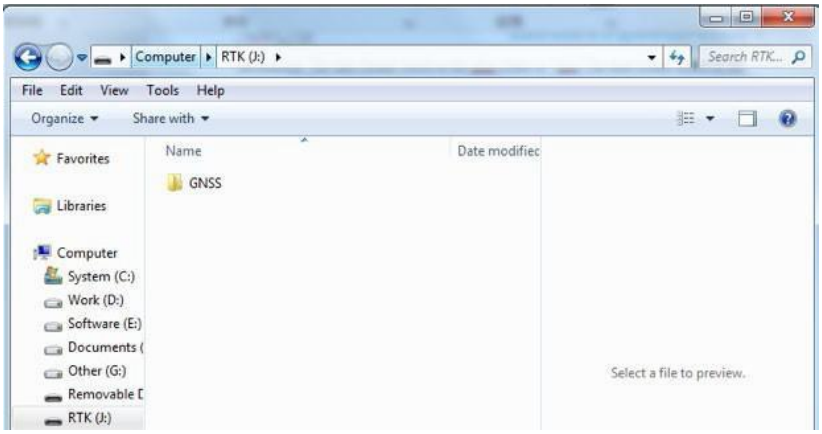

Figure 2-3-2 Static Data Storage

Notice: When the storage space inside and outside the receiver is less than 2 MB, the data lamp (Red Light) fast flashes and then stops recording, meanwhile the existing data files will not be overwritten.

2.3.3 Static Data Download

V30 Plus receiver file management using U disk storage, plug-and-play, direct drag-and-drop download, do not need to download the management software. V30 Plus receiver can only download static data by using U disk mode, and can not write to the V30 Plus receiver.

V30 Plus receiver can download data through U-disk, use Mini USB cable when downloading. Connect the receiver with computer by the Mini USB data cable. After the connection, a static code appears in the computer, then copy the collected static files out by opening the disk.

Figure 2-3-3 Static Drive

After downloading, steps of editing the point name and antenna height are:

1.Select *.GNS static files, double click the mouse;

2.Pop up the Document Edit dialog box, edit the point name and input the antenna height, then click OK.

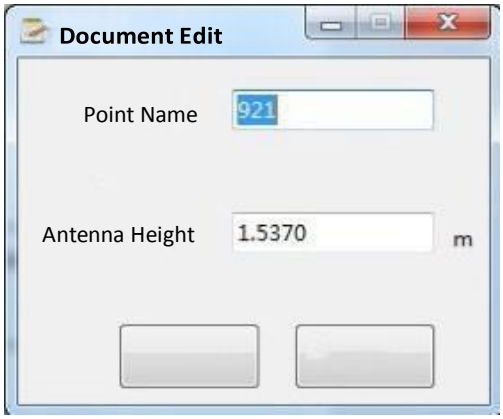

Figure 2-3-4 Edit File

Notice: Static files in removable disks can not be deleted directly, we can use controller software to conduct

2.4 Dynamic RTK Survey

The dynamic RTK measurement can be based on the propagation mode of the differential signal for the radio mode (internal radio, external radio, external station) and network mode.

1. Erection of Instrument

The receiver is mounted on a stable known point 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 selected in the open field of view around, to avoid large buildings and patches within the height of 15 degrees. At the same time, in order to further spread the differential signal, the reference stations should be erected in the higher position.

2. Connect the Device

Start the Hi-Survey measurement software on the hand-held controller and enter the Device interface. Generally, use Bluetooth or Wi-Fi connection.

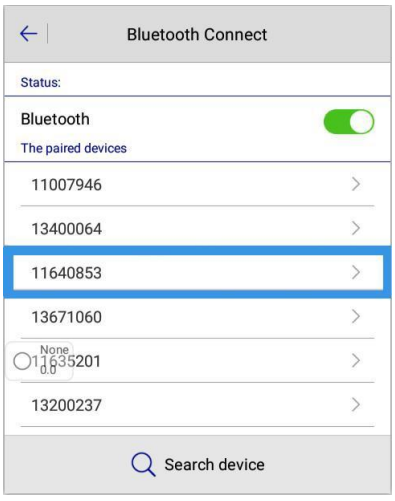

Figure 2-4-1 Bluetooth Connect

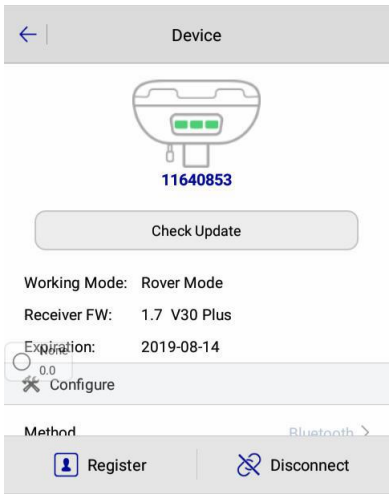

Figure 2-4-2 Device Connect

3. Parameter Sittings of Base Station

The base station parameters include setting the target height, base station coordinates, working mode and corresponding parameters, message format, elevation angle, and so on. After completing the relevant parameter editing, click the Settings button in the upper right corner, and the software prompts Setup Successful!

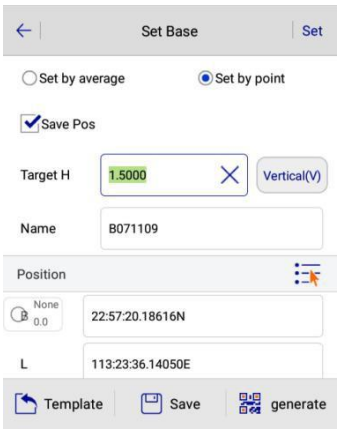

Figure 2-4-3 Receiver Settings

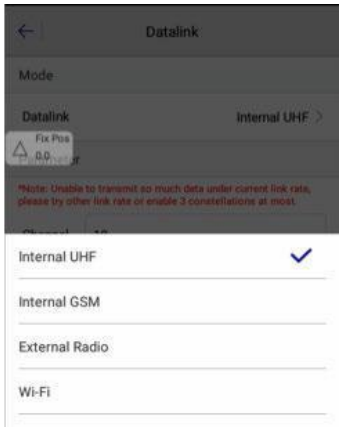

Figure 2-4-4 Choice of Radio

Figure 2-4-5 Other Settings

4. Rover Settings

The mobile station receiver is fixed on the telescopic centering pole, and the handbook is fixed on the handbook carrier. The mobile station settings are basically the same as the base station, mainly including the working mode setting, the altitude angle, and the like. The difference is that the mobile station working mode increases the handbook difference.

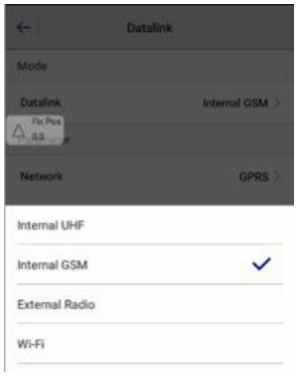

Figure 2-4-6 Choice of Radio

Figure 2-4-7 Other Settings

2.5 Firmware Upgrade

The receiver uses 3G network, and the host firmware can be automatically upgraded through the network (Please refer to: Hi-Survey Road Software User Manual), and the user can also choose to manually upgrade through U disk.

Steps to upgrading the firmware by USB cable:

1. Turn on the receiver, connect the 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;

Figure 2-5-1 Update Drive

Chapter 3

Technical specification

This chapter contains:

- Technical specification

3.1 Technical specification

Configuration		Detailed Indicators
GNSS Configuration	Satellite Signals Tracked Simultaneously	System: Multi-star System Core (UB4B0M)
		Channels: 432
		BDS: B1, B2, B3
		GPS: L1, L2, L5
		GLONASS: L1，L2
		GALILEO: E1, E5a, E5b
		QZSS: L1,L2,L5
		SBAS: L1
	Output Format	ASCII: NMEA-0183, Binary Data
	Positioning Output	1Hz-20Hz
	Static Data Format	GNS and RINEX
	Message Type	CMR, RTCM2.X, RTCM3.0, RTCM3.2
	Network mode	VRS; NTRIP
System Configuration	Operating System	Linux
	Data Storage	Built-in 8G Memory
	Starting Time	3s
Accuracy and Reliability [1]	RTK Single Baseline	Horizontal: 8 mm + 1 ppm RMS
		Vertical: 15 mm + 1 ppm RMS
	Network RTK	Horizontal: 8 mm + 0.5 ppm RMS
		Vertical: 15 mm + 0.5 ppm RMS
	Static and Fast Static	Horizontal: 2.5 mm + 0.5 ppm RMS
		Vertical: 5 mm + 0.5 ppm RMS
	DGPS	Plane accuracy: <=1.5 m RMS
	Initialization Time	< 10s
	Initialization Reliability	> 99.99%
Communication	I/O port	5-pin interface, Mini USB interface, TNC antenna interface, SIM card slot
	Internal 4G Cellular Mobile	TDD-LTE/FDD-LTE/EDGR/WCDMA/GPRS/GSM
	Wi-Fi	802.11b/g, WIFI hotspot service available
	Bluetooth	Bluetooth® 4.0/2.1+EDR,2.4GHz
	External UHF	External UHF:
		Power: 5W/25W available Frequency: 410MHz~470MHz
		Protocol: TRIMTALK450S，TRIMMARK III，TRANSEOT
		Transmission rate: 19.2kbps / 9.6kbps adjustable
		Channel: 8 channels adjustable and configurable
	Internal UHF	Built-in Transceiver Integrated Radio;
		Power: 1W/2W/4W available Frequency: 403MHz~473MHz
		Protocol: HI-TARGET，TRIMTALK450S，SOUTH，CHC，TRIMMARK III，TRANSEOT，SATEL-3AS
		Number of channels: 116 channels (16 are configurable)
User Interface	Button	Single Button
	Indicator Lamp	Satellite Lamp, Signal Lamp, Power Light
Function application	Advanced Features	NFC IGRS, Web UI interaction, U disk firmware upgrade
	Smart application	Intelligent voice, DIY voice, function self-test
	Remote Service	Message push, online upgrade
	Internal Battery	2×5000mAh Lithium-ion Rechargeable And Removable battery RTK rover (Cellular) ≥10 hours[2]
	External Power	6-28V DC External Power Input With Over-Discharge Protection

Physical	Dimensions	Φ164 mm × 83.5 mm
	Weight	≤1.4kg (Includes Battery)
	Power Consumption	4.2W
	Materials	The Shell Is Made of Magnesium Alloy Material
Environment	Water/Dustproof	IP67 It Can Resist Temporary Immersion Under 1 Meter Underwater, Completely Preventing Dust From Entering
	Free Fall	Resistance to natural fall of 2m height rod, free fall of 1.2m
	Humidity	100% Non-condensing
	Operation Temperature	-40°C ~ +65°C
	Storage Temperature	-50°C ~ +85°C

Note:
[1] The measurement accuracy, accuracy, reliability, and initialization time depend on various factors, including the number of satellites, geometric distribution, observation time, atmospheric conditions, and multipath validation, etc. The data are obtained under normal conditions.
[2] Battery working time is related to working environment, working temperature and battery life.

Chapter 4

Accessories and Interfaces

This chapter contains:

- SIM Card Installation
- Data Cable
- Antenna
- Benchmark
- Battery & Charger

4.1 SIM Card Installation

V30 Plus receiver supports the SIM card.

Table 4-1-1 SIM Card Description

SIM Card	GPRS (VRS/intRTK)
	GSM

To implement an RTK work using the V30 Plus receiver, you need to prepare a SIM card and open the data communication service. The number of cards required depends on your RTK measurement system configuration.

The SIM Card Installation Steps Are as Follows:

1. Remove the battery cover and remove the battery to expose the SIM card slot.

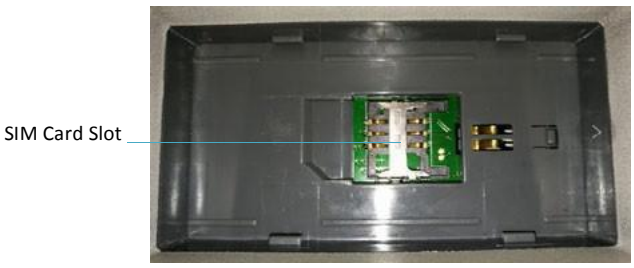

Figure 4-1-1 SIM Card Slot

2. The direction of the gap of the SIM card is the same as that of the card slot.

3. Insert the SIM card into the card holder and insert the front side (with metal contacts) into the card slot.

Figure 4-1-2 Installation

4. The entire SIM card is placed in the card slot. The installation is completed.

Notice: The receiver must be powered off before installing the card! If the SIM card is installed in the power on state, the receiver will not be able to

4.2 Data Cable

1. The Mini USB cable has a standard USB interface on one end and a Mini USB interface on the other end; it is used for connection between the host and external devices for data transmission.

Figure 4-2-1 Mini USB Data Cable

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

Figure 4-2-2 Five-Pin Data Cable

Figure 4-2-3 Five-Pin Plug

Notice: 1.When connecting various plugs of receiver, it shall align the red point in line joint at the red point in receiver socket, or it will damage the receiver socket and plugs of various lines.

2. When plug out the plug, directly grasp the sliding collar and pull out the plug with effort. It shall not rotate the plug.

3. After using the cable, it should be arranged in a place that is not easy to be squeezed to prevent damage to the plug. When installing the differential antenna, make sure that the hand is rotating the fixed nut at the bottom of the differential antenna. Do not hold the upper part of the differential antenna to rotate. Otherwise, It is easy to make the differential antenna contact bad, thus affecting the working distance.

4.3 Antenna

There are UHF internal radio antenna and 3G/GPRS antenna, you can select the appropriate antenna according to the operation mode. The UHF radio antenna is used in the UHF mode, and the external 3G/GPRS antenna is used in the internal GSM mode.

Figure 4-3-1 UHF Radio Antenna (Above) and 3G/GPRS Antenna (Below)

4.4 Benchmark

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

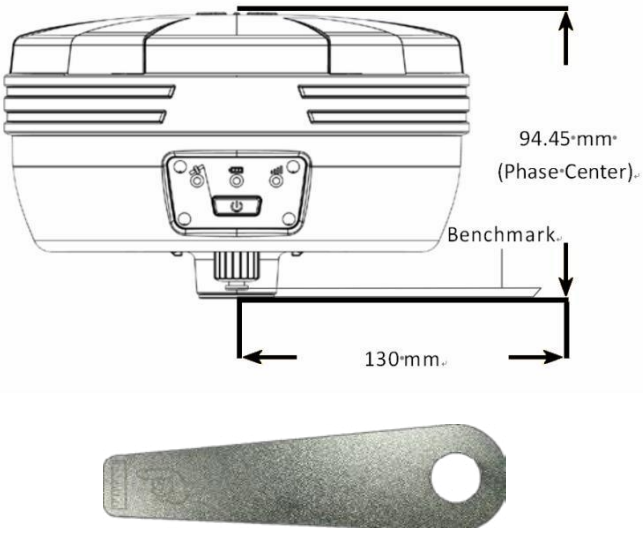

Figure 4-4-1 Benchmark

4.5 Battery & Charger

4.5.1 Battery Installation and Unload

1. Installation

Press the battery cover button gently and press down. The battery cover can be lifted upwards. The battery cover and battery are removed as shown in the figure. To the right is unlocked and locked to the left.

Figure 4-5-1 Unload

Put the on the bottom of the battery marked with Open to the battery compartment, and put into the battery rack.

Figure 4-5-2 Installed Battery

2. Unload

Gently press and push in the direction marked Open, pour out the battery and complete the battery unloading.

4.5.2 Battery and Charger Model

Table 4-5-1 Battery and Charger Model

Name	Model
Lithium-Ion Battery	BL-5000
Battery Charger	CL-8410

4.5.3 Power Supply Mode

Table 4-5-2 Power Supply Mode

Power Supply	Power Supply Mode	Lithium Battery; 5-pin Socket External Power Supply
	Power Supply Range	6V Min and 28V Max

You can also connect the receiver to an external power source through 5-pin socket.

External voltage range for GSM operation mode and UHF rover station is DC 6-28V and the current shall be more than 3000 mA. If there is external power supply, the receiver will choose the higher voltage between the lithium and external power supplies. When an external power supply is required, the specified dedicated power supply must be used.

Notice: 1.Service time of lithium battery will decrease with the reduction of temperature and increase of charging and discharging times. Generally, one new 5000 mAh lithium battery can be used for 10 hours for static data collection, or 8 hours as GPRS rover, or 7 hours as 2W internal transceiver transmitting station.

2.In order to extend the life of the battery, please charge the battery as soon as possible within 24 hours after the battery is exhausted, otherwise the battery life will be shortened.

3.If the battery is not used for a long time, in order to prolong its service time, please charge the battery once per month.

4.5.4 Cautions for Charging

BL-5000 lithium battery must be charged by CL-8410/CL-4400 lithium battery charger. Charging time is about 7 hours. CL-8410 chargers are designed with charging lamps, which becomes red during the charging period, and becomes green after charging. Then continue charging for 1~1.5 hours until the electric quantity of battery is in full state.

Figure 4-5-3 Charger

4.5.5 Operation of Charging

Figure 5-5-5 Method of Charging

1. Put the on the bottom of the battery marked with Open to the battery compartment, and put into the battery rack.

2. Install the battery by gently pressing and pushing it toward the end marked Close.

3.When the power is connected, the charge indicator is displayed in red to start charging.

Notice: 1.Only use battery and charger configured by manufacturer, and do not throw them into the fire or use the metallic short-circuit electrode.

2. In case of heating, deformation, liquid leakage, smell emission or other anomaly phenomenon during the use, charging or storage period of the battery, please stop using and replace it with new one.

3. If the service time of the battery is shortened obviously, please stop using the battery. It indicates that the battery has been aged; please replace it with new one.

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