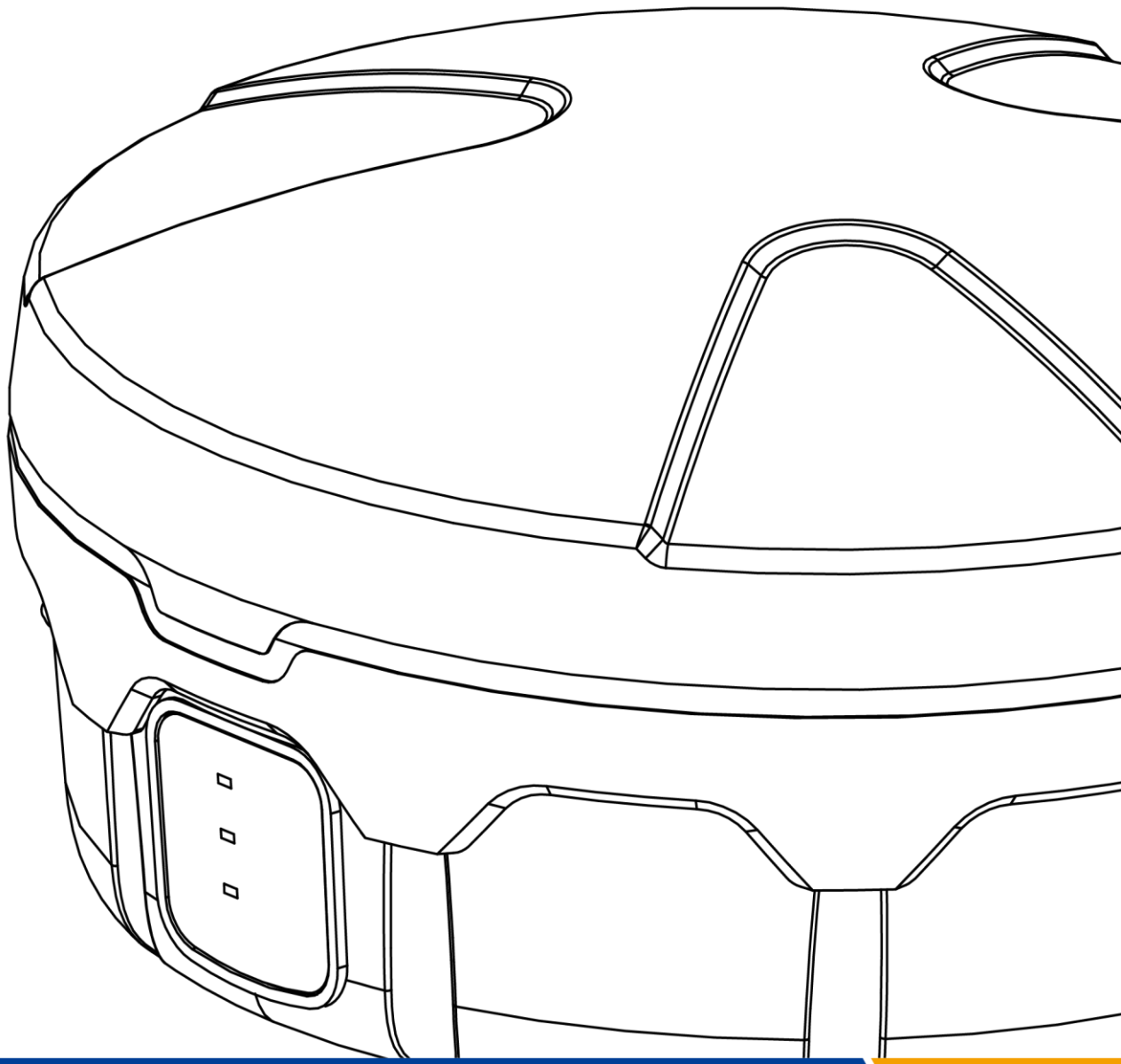
Harxon

a BDStar company

SMART Antenna

User Guide - Rover



Version/Warranty/Return & Repair/Copyright

Version Information

- Version number: a
- Version date: December 1, 2017

Warranty Period

- SMART antenna host: 1 year
- Cables and other accessories: 90 days

Return & Repair

Please contact us if you need to return the product to our factory for repair.

Copyright Information

Disclaimer

Every effort has been made in the preparation of this document to ensure accuracy and integrity of the contents, but Harxon shall not be liable for any possible errors or omissions herein. Harxon may change the technical specifications or functions of its products along with

continuous development of technologies without notifying users in writing.

Contents

List of Figures

List of Tables

Precautions

FCC Caution

§ 15.19 Labeling requirements.

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.

§ 15.105 Information to the user.

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.

§ 15.21 Information to user.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Symbol Conventions

Table 1 Meanings of Symbols in This Manual

Symbol	Description	Remarks
①	Indicates that a note exists for this indicator or item on this page.	If multiple notes exist on a page, the number inside the symbol will increase accordingly.
ⓘ	Indicates some matters that deserve users' attention.	

Product Certification Information

Table 2 Certifications that the Product Has Passed

Standard	Remarks
FCC	Rules and Regulations: FCC Part 15B
CE	RED Article 3.2 Radio RED Article 3.1(b) EMC RED Article 3.1(a) Safety RED Article 3.1(a) Health

RoHS	RoHS Directive 2011/65/EU and its amendment directives – XRF screening test and Wet Chemical Testing (Lead, Cadmium, Mercury, Hexavalent Chromium, PBBs & PBDEs content)
REACH	One hundred and seventy three (173) substances in the Candidate List of Substances of Very High Concern (SVHC) for authorization published by European Chemicals Agency (ECHA) on and before January 12, 2017 regarding Regulation (EC) No 1907/2006 concerning the REACH
IP67	

Acronyms and Abbreviations (A–Z)

APN	Access Point Name
ASCII	American Standard Code for Information Interchange
BT	Bluetooth
CMR	Compact Measurement Record
COG	Course Over Ground
DOP	Dilution of Precision
GAGAN	GPS Aided GEO Augmented Navigation
GGA	Global Positioning System Fix Data. Time, Position and fix related data for a GPS receiver
GLONASS	GLObal NAvigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSA	GPS DOP and active satellites
GSV	Satellites in view
IP	Internet Protocol
MSAS	Multi-Functional Satellite Augmentation System
NMEA	National Marine Electronics Association
NTRIP	Networked Transport of RTCM via Internet Protocol
RMC	Recommended Minimum Navigation Information
RTCM	Radio Technical Commission for Maritime Services

RTK	Real Time Kinematic
SBAS	Satellite-Based Augmentation System
SOG	Speed Over Ground
UTC	Coordinated Universal Time
WAAS	Wide Area Augmentation System
ZDA	Time & Date – UTC, Day, Month, Year and Local Time Zone

User Service

Frequently-Asked Questions (FAQs)

For technical problems, please refer to the section SMART Antenna FAQs, which describes the symptoms and causes of some common problems and corresponding solutions.

Recording Information

If you cannot find any record about your technical problem in this manual, please record relevant information, such as the operating environments before and after the problem occurred, operation steps, symptoms, as well as the product model, hardware version number, and firmware version number.

The product model, hardware version number, and firmware version number information can be queried by using the SMART Antenna Configuration Tools.

Contact Us

Please contact us for more help and support.

Service hotline : +86-755-26989948 (8:30-12:00 & 13:30-18:00)

Sales hotline : +86-755-86578389 (8:30-12:00 & 13:30-18:00)

Fax : +86-755-26989994

Email : sales@harxon.com

1 Overview

The SMART antenna rover is a high-performance GNSS receiver. With a built-in all-band antenna and a high-accuracy GNSS board, the SMART antenna rover can simultaneously track GPS, BDS, and GLONASS signals and supports up to 192 channels. In addition, it provides various functions such as the 3G/4G module (optional), radio module (built-in or external), CAN module (optional), and Bluetooth module (optional). The SMART antenna rover has three LEDs to indicate its own working status. It supports multiple protocols such as RTCM and CMR for differential data reception. The radio module is compatible with mainstream vendors' transmission protocols.

Figure 1 SMART Antenna

1.1 Product Features

The SMART antenna rover has the following functional features:

- High-performance GNSS board capable of simultaneously tracing GPS L1/L2, BDS B1, and GLONSS L1/L2 signals
- High-performance GNSS all-band antenna
- One RS232 port
- One CAN port ①

- Bluetooth module ①
- 3G/4G module ①
- Built-in/external radio ①
- Three status LEDs
- IP67 protection
- Three installation modes: magnet, 5/8-inch screws, or M4 screws

Note:

① *This component is optional.*

1.2 Conventions

The following conventions apply in this document:

- The characters following 0x are a hexadecimal number.
- Sent commands are case-sensitive characters.

2 Assembly and Installation

2.1 Required Accessories

- External radio
- Antenna of the external radio
- Wire bundle for connection between the SMART antenna and the external radio (Data cable)
- Wire bundle for connection between the SMART antenna rover and the computer (SMART antenna configuration cable)
- Wire bundle for connection between the external radio and the computer (Configuration cable of the external radio)

2.2 Required Extra Devices (from the User)

- Computer
- Power supply (to supply power to the SMART antenna or the external radio)

2.3 Product Assembly

2.3.1 Assembling the SMART Antenna Rover

1. Connect the SMART antenna configuration cable to the rover. Figure 2 shows the data interface of the SMART antenna rover. Table 3 defines the data interface of the SMART antenna rover.

Figure 2 SMART Antenna Data Interface

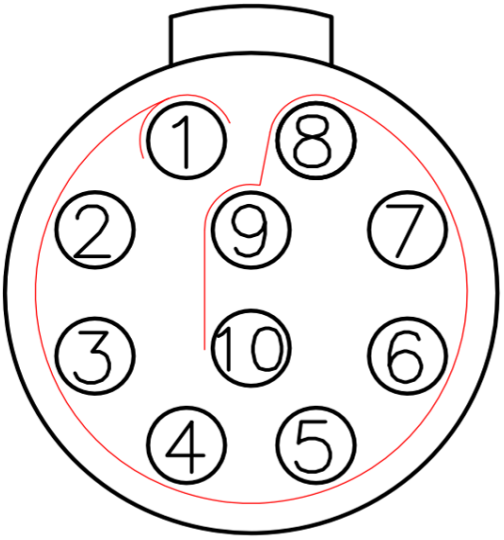


Table 3 Definition of the SMART Antenna Data Interface

Pin	Name	Description	Remarks
1	TXD1	Output	RS232
2	RXD1	Input	RS232
3	NC	Output	
4	VCC	Power supply	DC 9 V to 30 V
5	GND	Ground	
6	NC	Reserved	
7	NC	Reserved	
8	NC	Reserved	
9	CANH	High-level input/output	
10	CANL	Low-level input/output	

2. Connect the SMART antenna configuration cable to the DB9 serial port on the computer.
3. Connect the SMART antenna configuration cable to the power cable.

Switch on the power supply. The power LED on the SMART antenna rover will be steady on.

Figure 3 Assembly Diagram of the SMART Antenna Rover Host

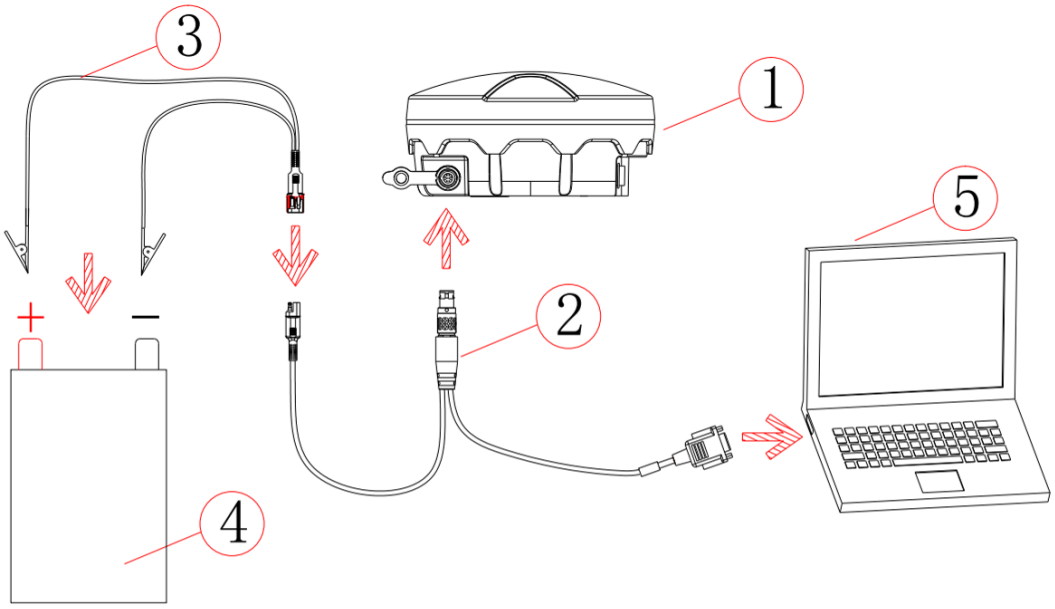


Table 4 List of Components of the SMART Antenna Rover Host

Reference No.	Description	Model
1	SMART antenna rover	All model
2	SMART antenna configuration cable	HJ568
3	Power cable	HJ379
4	Power supply	To be provided by the user
5	Computer	To be provided by the user

2.3.2 Power Supply Requirements

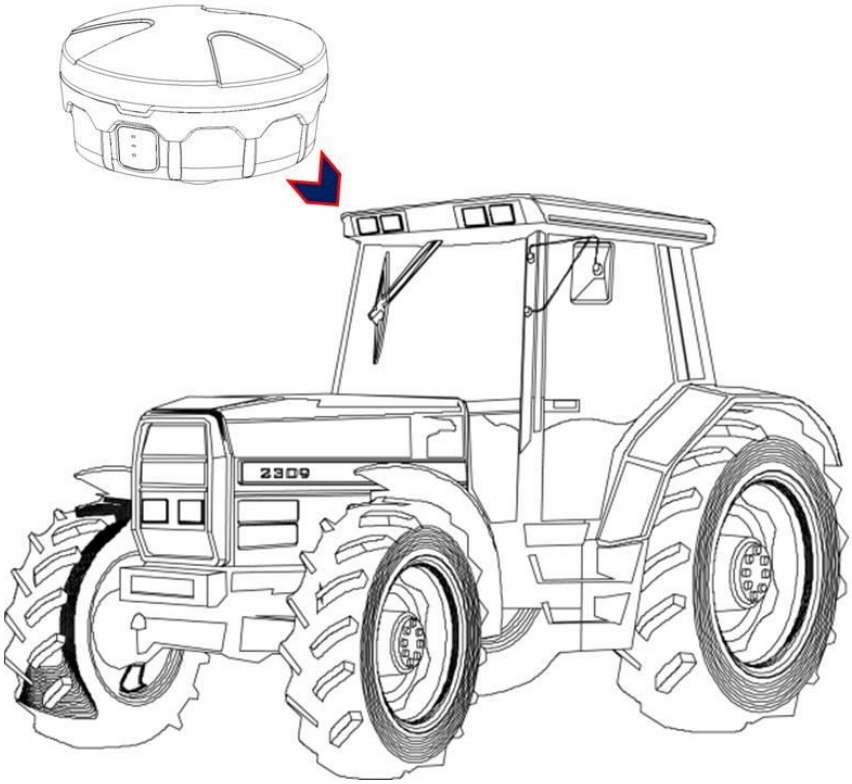
The input voltage of the SMART antenna rover should be DC 9 V to 30 V. For details about the other power supply requirements, see Table 10. The power cable of Harxon SMART antenna has alligator clips at one end to directly bite the positive and negative poles of the power supply.

2.3.3 Installing the SMART Antenna

You need to install the SMART antenna in a safe, stable, and open environment. The SMART antenna supports three installation modes:

- Magnet
- 5/8-inch screws
- M4 screws

Figure 4 Magnetic Adsorption ①



Note:

① *The installation mode shown in the schematic diagram merely expresses the magnetic adsorption manner. The SMART antenna is not necessarily installed on a tractor.*

Figure 5 Installation with 5/8-Inch Screws

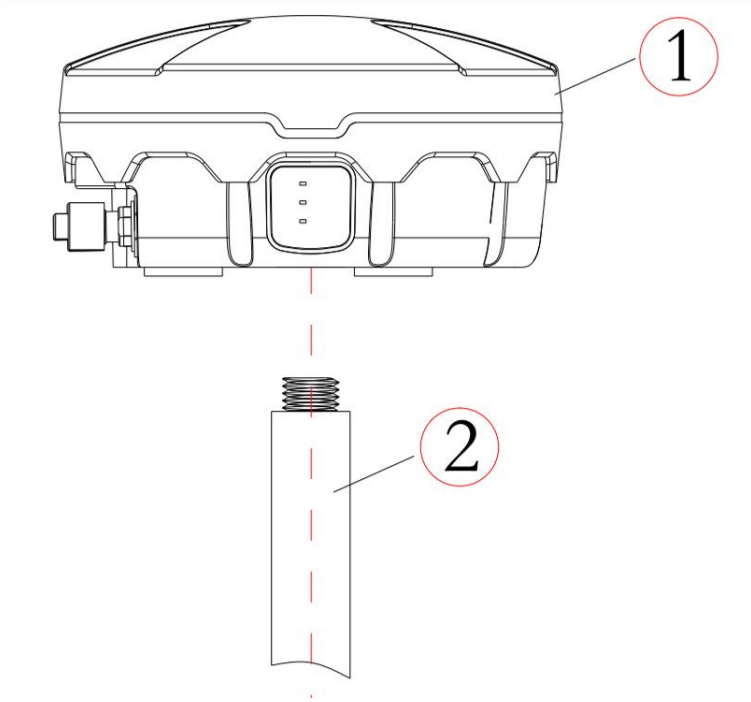
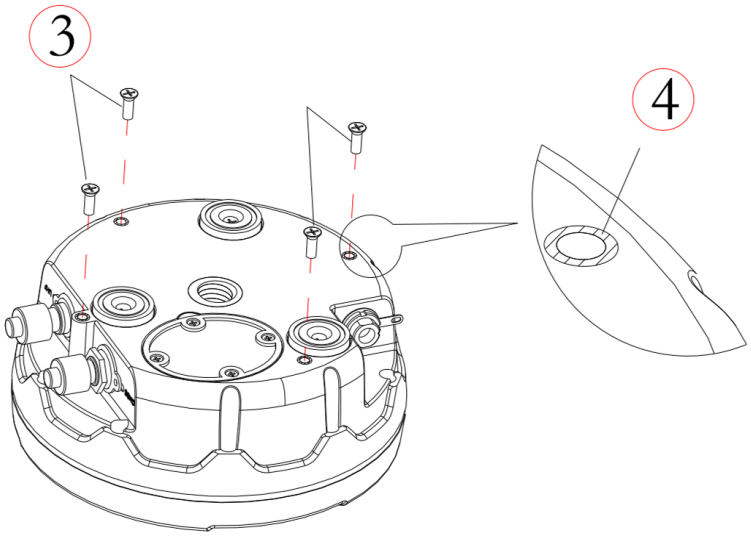


Figure 6 Installation with M4 Screws



2.4 Other Information About the SMART Antenna

This section describes some other information about the SMART antenna rover to help you properly use the SMART antenna rover.

2.4.1 Status Indication

The SMART antenna provides three LEDs to indicate its own working status. Table 5 describes the meanings of the LEDs on the SMART antenna.

Table 5 Definitions of the LEDs

 PWR (Red)	 SAT (Green)	 LINK (Green)	Meaning
OFF	--	--	The power supply is unavailable.
ON	OFF	--	The power supply is available, but single-point positioning fails.
ON	Blinking	--	The power supply is available. The blinking times represent the number of satellites used for the positioning.
ON	Blinking (G1) -> **ON** -> Blinking (G2)	--	The power supply is available. The status **ON** between the two sets of blinking indicates that the rover is already in fixed status.
ON	Blinking (G1) -> **OFF** -> Blinking (G2)	--	The power supply is available. The status **OFF** between the two sets of blinking indicates that the rover is not yet in fixed status.
ON	--	Blinking	The power supply is available, and data is being received on the differential data serial port.

2.4.2 Assembling the Built-in Radio

Note:

If the product you select has the built-in radio, you need to assemble only the antenna of the radio using the method shown in Figure 11.

2.4.3 Assembling the Bluetooth Module

Note:

You do not need to assemble the Bluetooth module of the product.

2.4.4 Assembling the Network Module

Note:

You do not need to assemble the network module of the product.

2.4.5 Assembling the CAN Module

Note:

You do not need to assemble the CAN module of the product.

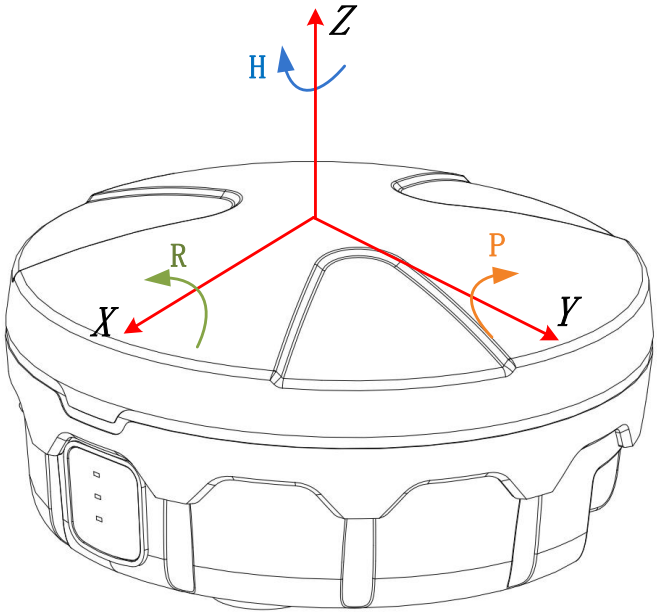
2.4.6 Assembling the Tilt Module

Note:

You do not need to assemble the tilt module of the product, but should pay attention to the coordinate axis direction of the tilt module during the installation and setup of the SMART antenna rover.

Figure 7 shows the attitude angle coordinate system of the SMART antenna rover. Attitude angle information is output through the PSAT statements of the National Marine Electronics Association (NMEA) protocol. When the SMART antenna is horizontally placed, the X axis points to the LEDs on the SMART antenna, the Z axis points to the antenna top, and the Y axis points to a direction according to the right-hand screw rule. Figure 7 shows the attitude angle coordinate system of the SMART antenna rover with the tilt module.

Figure 7 Attitude Angle Coordinate System of the SMART Antenna Rover



H : Heading , R : Roll , P : Pitch ,

2.5 Assembling the External Radio ①

Note:

① *Read this section if the product you select has the external radio; otherwise, simply skip this section.*

2.5.1 Installing the External Radio

1. Connect the configuration cable of the external radio to the external radio. Figure 8 shows the data interface of the external radio. Table 6 defines the data interface of the external radio.

Figure 8 Data Interface of the External Radio

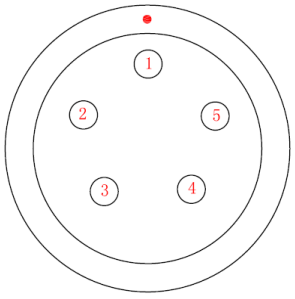


Table 6 Definition of the Data Interface of the External Radio

Pin	Name	Description	Remarks
1	VCC	Power supply	DC 9 V to 16 V
2	PGND	Power ground	
3	TXD	Output	RS232
4	GND	Signal ground	
5	RXD	Input	RS232

2. Connect the configuration cable of the external radio to the DB9 serial port on the computer.

3. Connect the configuration cable of the external radio to the power supply cable. Switch on the power supply. The power LED on the external radio will be steady on.

Figure 9 Assembly Diagram of the External Radio

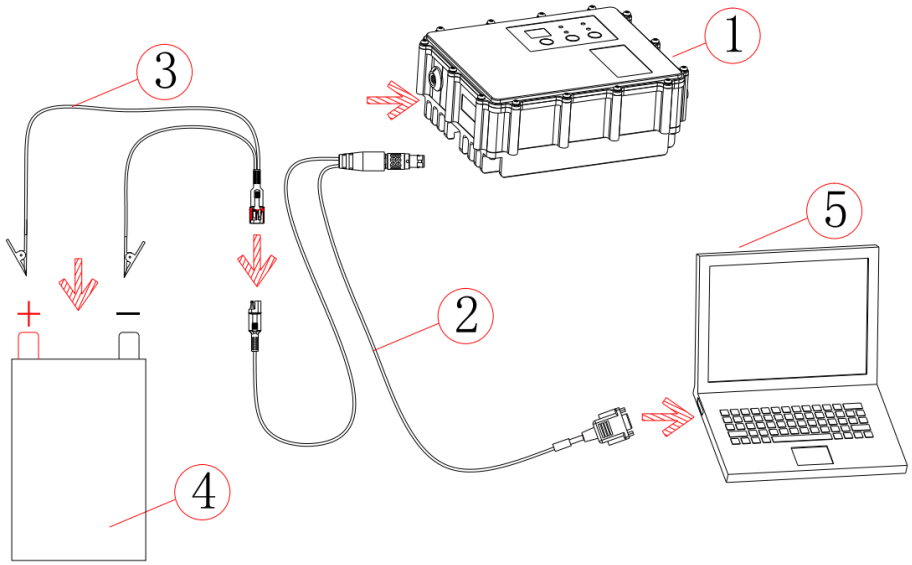


Table 7 List of Components of the External Radio

Reference No.	Description	Model
1	External radio	HX-DU1601
2	Configuration cable of the external	HJ394

	radio	
3	Power cable	HJ379
4	Power supply	To be provided by the user
5	Computer	To be provided by the user

2.5.2 Power Supply Requirements

The input voltage of the external radio should be DC 9 V to 16 V. For details about the other power supply requirements, see Table 11. The power cable of the Harxon external radio has alligator clips at one end to directly bite the positive and negative poles of the power supply.

2.6 Assembling the Rover Kit (with External Radio) ①

Note:

① *Read this section if the product you select has the external radio; otherwise, simply skip this section.*

Figure 10 Assembly Diagram of the SMART Antenna Rover Kit (with External Radio)

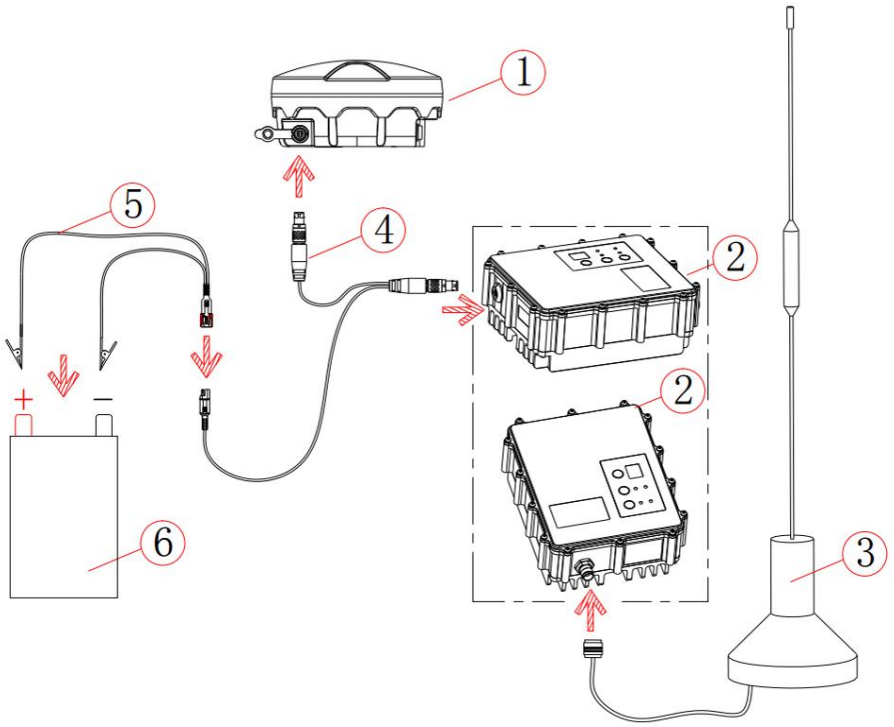


Table 8 List of Components of the SMART Antenna Rover Kit (with External Radio)

Reference No.	Description	Model
1	SMART antenna rover	Host non build-in radio
2	External radio	HX-DU1601 ①
3	Antenna of the radio	QC400SI ②
4	Data cable	HJ681
5	Power cable	HJ379
6	Power supply	To be provided by the user

- Install the antenna of the radio at a relatively high position, so that the radio can better receive differential data broadcast by the base, making possible a longer distance between the rover and the base.
- The input voltage of the SMART antenna rover kit should be DC 9V to 16V.

2.7 Assembling the Rover Kit (with Built-in Radio) ③

Note:

① *Please contact us if you want to select other built-in radios.*

② *The antenna you select for the radio must match the radio. Please contact us if you want to select other antennas for the radio.*

③ *Read this section if the rover kit you select has the built-in radio; otherwise, simply skip this section.*

Figure 11 Assembly Diagram of the SMART Antenna Rover Kit (with Built-in Radio)

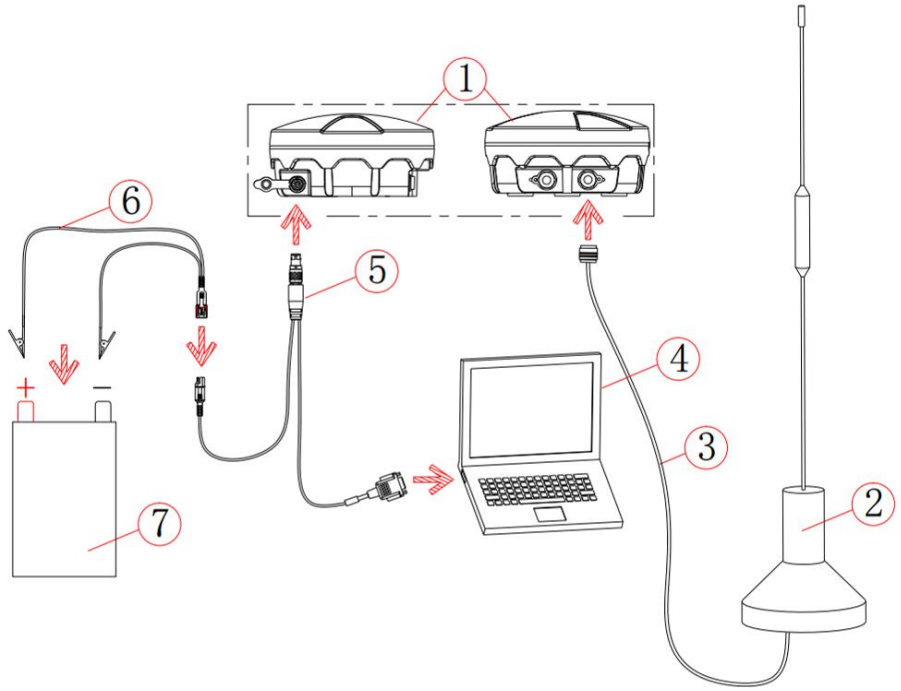


Table 9 List of Components of the SMART Antenna Rover Kit (with Built-in Radio)

Reference No.	Description	Model
1	SMART antenna rover	The host build-in radio
2	Antenna of the radio	QC400SI ①
3	SMART antenna configuration cable	HJ681
4	Power cable	HJ379
5	Power supply	To be provided by the user

- Install the antenna of the radio at a relatively high position, so that the radio can better receive differential data broadcast by the base, making possible a longer distance between the rover and the base.
- The input voltage of the SMART antenna rover kit should be DC 9 V to 30 V.

Note:

① *The antenna you select for the radio must match the radio. Please contact us if you want to select other antennas for the radio.*

3 Operation Instructions

The SMART antenna rover receives differential data and outputs high-accuracy navigation information. The user serial port is the interface for configuring or diagnosing the SMART antenna rover; therefore, when configuring or diagnosing the SMART antenna rover, you need to connect the user serial port to the computer to perform configuration or analysis. If the SMART antenna rover you select has the Bluetooth function, you can perform the analysis or diagnosis by using the Bluetooth tool of a handheld device or a computer. During the production operation, the SMART antenna rover receives differential data generally by using the radio or the network module as the data link and outputs high-accuracy navigation information from the user serial port.

Operations on the SMART antenna include three parts:

- Configuring the rover host
- Configuring the data link
- Setting up the rover

3.1 Configuring the Rover Host

During the configuration of the rover host, the computer sends a configuration command in the form of ASCII codes through the serial port to the user port on the SMART antenna. The SMART antenna receives and parses the command, and then responds to the configuration command. The SMART antenna supports the following functions:

- Configuring the output protocol ①
- Querying device-related information

- Satellite-Based Augmentation System (SBAS) function

3.1.1 Serial Port Default Configuration

The default configuration for the serial port of the SMART antenna rover is as follows:

- Level: RS232
- Baud rate: 115200 bps ②
- Data bits: 8
- Check bits: None
- Stop bits: 1

Note:

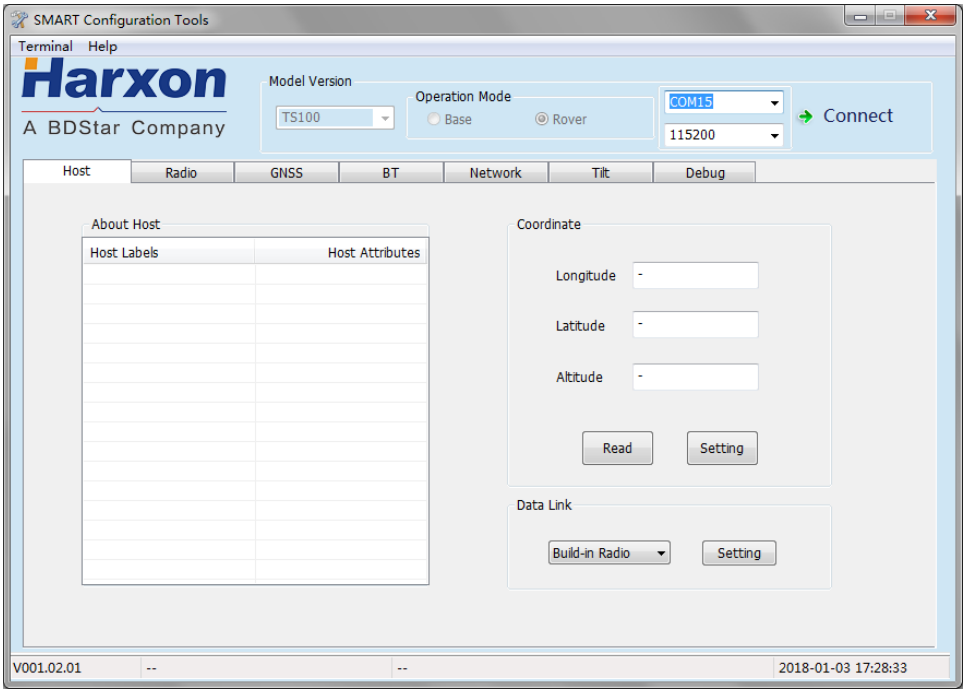
① *You can modify the output protocol only when the SMART antenna works in a special working mode. Please contact us if you want to modify the output protocol.*

② *Currently you cannot modify the baud rate of the user serial port. Please contact us if you want to modify the baud rate.*

3.1.2 Querying Host Parameters of the SMART Antenna Rover

Assemble the SMART antenna rover, as shown in Figure 3. Power on the SMART antenna rover. The PWR LED will be steady on, and the RTK LED and the LINK LED will blink once. When the LINK LED keeps blinking, it indicates that the host of the SMART antenna rover has been properly started. Then start the configuration tools of the SMART antenna. The main window is displayed, as shown in Figure 12.

Figure 12 Main Window of the SMART Antenna Configuration Tools



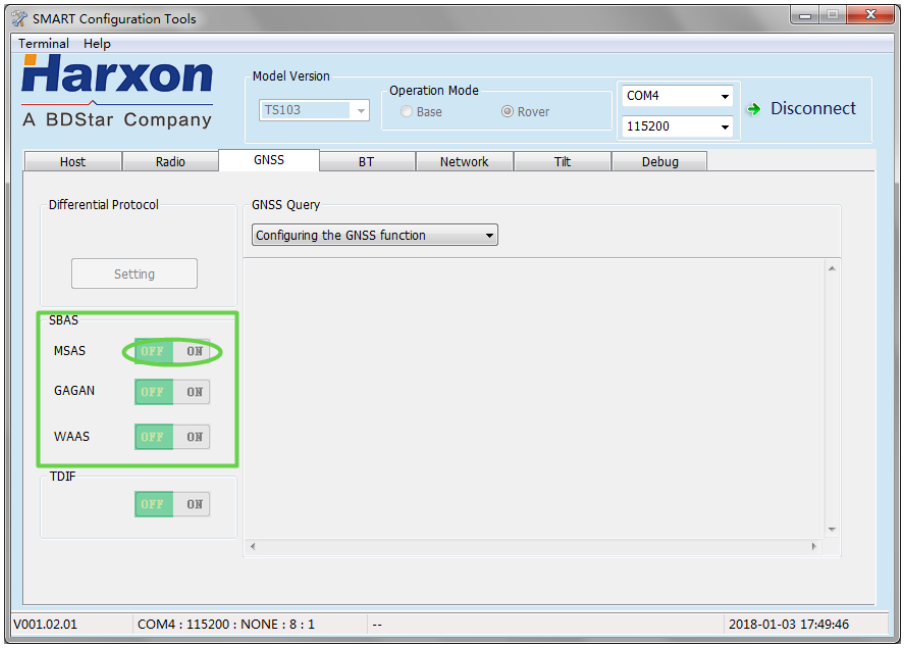
Click **Connect**, and wait for several seconds. The **Host** tab page shows relevant information about the device, including the serial number, hardware version number, firmware version number, and data link. The **GNSS** tab page shows information about SBAS.

3.1.3 Configuring Host Parameters of the SMART Antenna Rover

- Configuring SBAS

If the model of the rover you select supports the SBAS function, you can click **ON** or **OFF** beside a service option in the **SBAS** area on the **GNSS** tab page to enable or disable the corresponding service, as shown in Figure 13.

Figure 13 Configuration Tools — GNSS Settings



3.2 Configuring the External Radio

The external radio is used as the differential link to receive the differential data broadcast by the base. You need to configure the following parameters for the external radio:

- Data port baud rate
- Over-The-Air link rate
- Transmit power
- Data protocol
- Frequency of each channel

The default configuration of the external radio is as follows:

- Data port baud rate: 115200
- Over-The-Air link rate: 9600
- Transmit power: 25 W

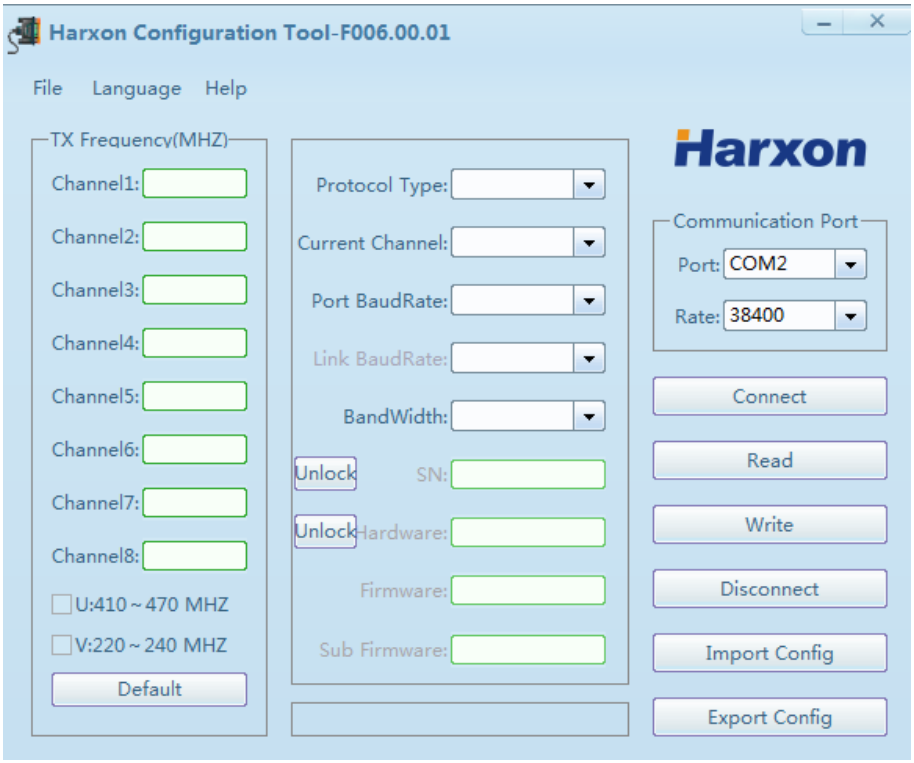
- Data protocol: TRIMTALK
- Default channel: channel 1 (451.125 MHz)

To configure the parameters of the external radio, perform the following steps:

1. Assemble the external radio, as shown in Figure 9.
2. Start the radio configuration tool on the computer, and select the proper serial port number and baud rate.
3. Power on the external radio, and click **Connect** within three seconds after the power-on to access the configuration page for the external radio.
4. Configure the parameters of the external radio according to the requirements and the usage instructions provided with the configuration tool of the external radio.

Start the radio configuration tool on the computer, as shown in Figure 14.

Figure 14 Software Window for Querying/Configuring the Parameters of the External Radio



Click **Connect** within three seconds after powering on the external radio. When a prompt is displayed indicating that the connection is successful, click **Read** to read the parameters of the external radio. After modifying the parameters as necessary, click **Write** to write the parameter settings and finish the parameter configuration. Then click **Disconnect**, close the configuration tools, power off the external radio and assemble the rover kit, as shown in Figure 10.

Note:

Do not set the frequencies of various channels to integers. Ensure that the frequency spacing of two adjacent channels is at least 1 MHz to 2 MHz to avoid mutual interference when multiple radios are operating nearby. For instance, you can set the frequency of channel 1 to 451.125 MHz, the frequency of channel 2 to 452.125 MHz, and the frequency of channel 3 to 453.125 MHz.

3.3 Configuring the Built-in Radio

The built-in radio is integrated inside the host of the SMART antenna

rover and serves as the data link to receive differential data, thereby greatly simplifying the setup of the rover and enabling you to modify its parameters at any time as necessary.

To configure the parameters of the built-in radio, perform the following steps:

- Powering on the built-in radio
- Querying or configuring the parameters of the built-in radio

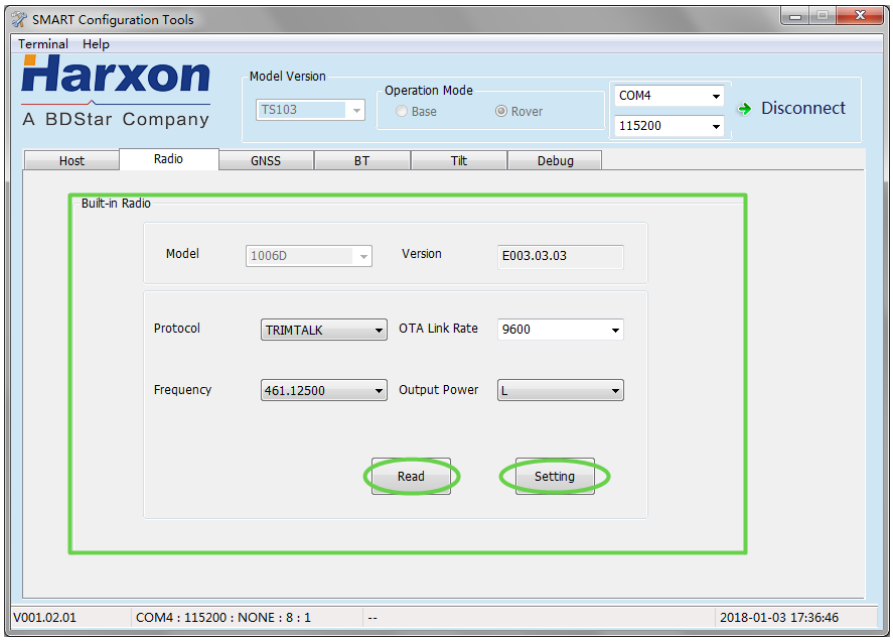
3.3.1 Powering on the Built-In Radio

The built-in radio is integrated inside the SMART antenna host; therefore, simply assemble relevant components as shown in Figure 11 and then switch on the power supply.

3.3.2 Querying or Configuring the Parameters of the Built-In Radio

To query the parameters of the built-in radio, you must use the SMART antenna configuration tools. Open the **Configuration Tools** page on the computer, select the proper serial port, click **Connect**, and then switch to the **Radio** tab page, as shown in Figure 15.

Figure 15 Software Window for Querying/Configuring the Parameters of the Built-in Radio



You can click **Read** to obtain the current parameters of the built-in radio, or **Setting** to set the parameters of the built-in radio. To configure the parameters of the built-in radio, perform the following steps:

1. Click **Read** to obtain the parameters of the built-in radio.
2. Change **Protocol**, **Over-The-Air (OTA) link rate**, and **Frequency** to preset values.
3. Click **Setting** to write the preset values into the built-in radio.
4. Click **Read** to obtain the parameters of the built-in radio and check whether the parameter values are consistent with the preset values.

3.4 Configuring the Bluetooth Module

If the host of the SMART antenna rover integrates a Bluetooth module, you can configure the parameters of the Bluetooth module as necessary. For the SMART antenna integrating the Bluetooth module, you can connect to the SMART antenna host by using the software installed on a handheld device to monitor in real time or configure the SMART antenna, no matter whether the differential link of the SMART antenna is a built-in

radio, an external radio, or a network module and no matter whether the SMART antenna is in configuration mode or normal working mode.

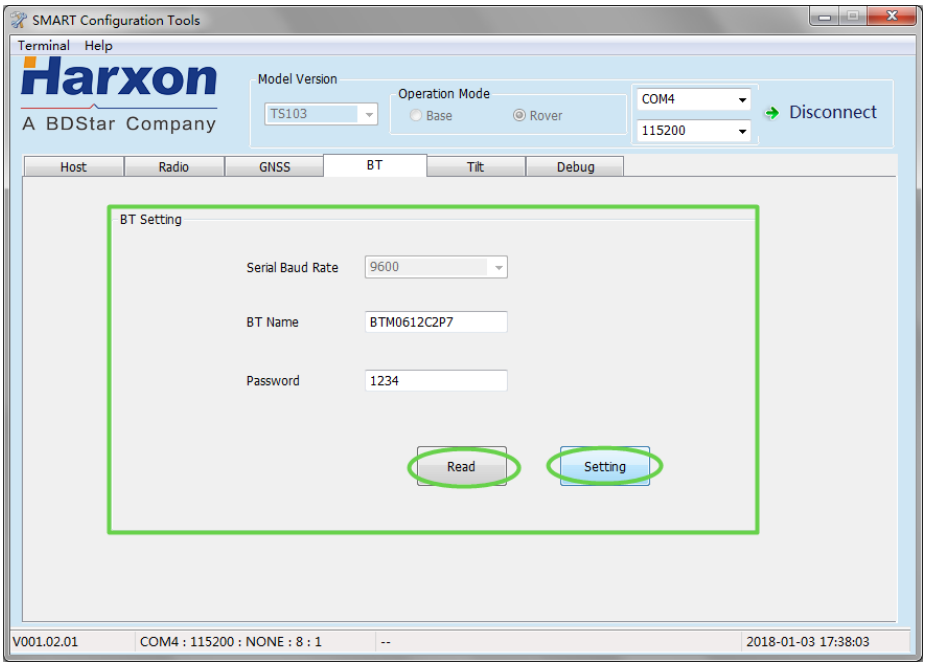
You can perform the following two types of operations on the Bluetooth module:

- Configuring the parameters of the Bluetooth module
- Monitoring the SMART antenna through the Bluetooth module

3.4.1 Configuring the Parameters of the Bluetooth Module

The parameters of the Bluetooth module can be configured only through the configuration tools of the SMART antenna on the computer. Assemble relevant components, as shown in Figure 3. Open the **Configuration Tools** page on the computer, select the proper serial port, click **Connect**, and then switch to the **BT** tab page, as shown in Figure 16.

Figure 16 Bluetooth Module Configuration Window



You can click **Read** to obtain the current parameters of the Bluetooth module, or **Setting** to set the parameters of the Bluetooth module.

To modify the parameters of the Bluetooth module, perform the following steps:

1. Click **Read** to obtain the parameters of the Bluetooth module.
2. Change **BT Name** and **Password** to preset values.
3. Click **Setting** to write the preset values into the Bluetooth module.
4. Click **Read** to obtain the parameters of the Bluetooth module and check whether the parameter values are consistent with the preset values.

3.4.2 Monitoring the SMART Antenna Through the Bluetooth Module

To monitor the running status of the SMART antenna through the Bluetooth module, you need to install software on a handheld device and connect to the SMART antenna. Then you can monitor the data output by the SMART antenna or configure the SMART antenna by using the installed software. The data monitor function with BT can be switched on by send the ***$CFG BT OUT ON\r\n*** command to the SMART antenna host, the command can be sent on the Debug tab page of SMART antenna Configuration Tools. The data monitor function with BT can be switched off by send the ***$CFG BT OUT OFF\r\n*** command to the SMART antenna host.

3.5 Configuring the Network Module

If the host of the SMART antenna rover integrates a network module, you can configure the parameters of the network for the SMART antenna rover host. The network module enables the SMART antenna rover to have the wireless network communication function, so that the SMART antenna rover can receive differential data from the network server or you can remotely monitor the SMART antenna.

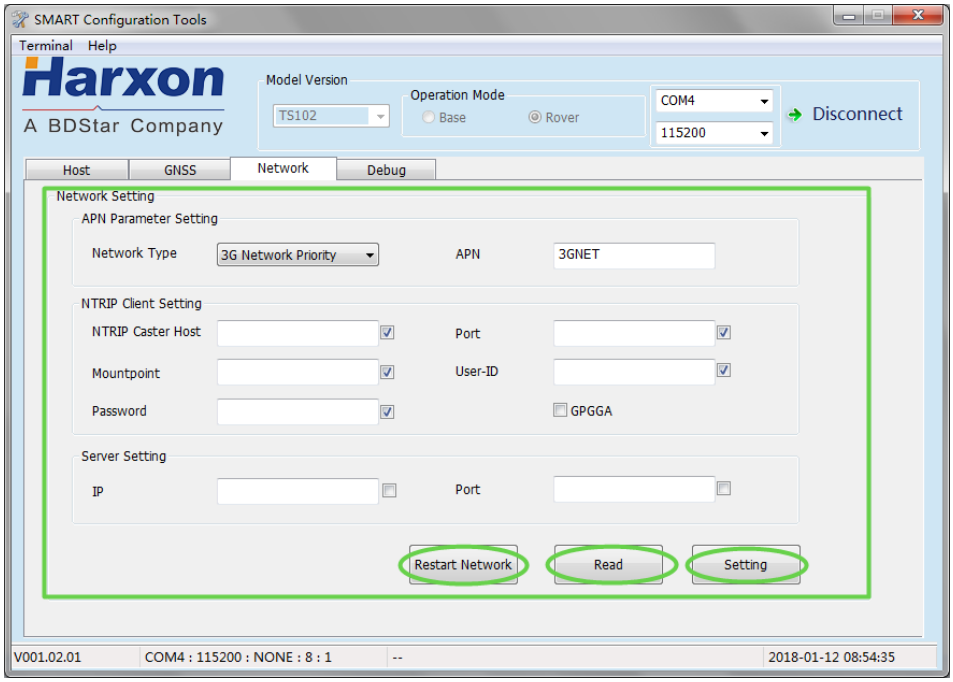
The network configuration of the network module includes the following two parts:

- Configuring the network service parameters
- Configuring the network operator

3.5.1 Configuring the Network Operator

Assemble the SMART antenna, as shown in Figure 3, and power on it. Open the **Configuration Tools** page on the computer, select the proper serial port, click **Connect**, and then switch to the **Network** tab page, as shown in Figure 17.

Figure 17 Network Module Configuration Window



You can click **Restart Network** to restart the network module inside the SMART antenna host, **Read** to obtain the current parameters of the network module, or **Setting** to set the parameters of the network module.

To configure the network operator parameter for the network module, perform the following steps:

1. Click **Read** to obtain the parameters of the network module.
2. Change **Network Type** and **Operator** to preset values.
3. Click **Setting** to write the preset values into the network module.
4. Click **Read** to obtain the parameters of the network module and check whether the parameter values are consistent with the preset values.

3.5.2 Configuring the Network Service Parameters

The network service parameters involve TCP service and NTRIP service. The cable connection is the same as that for configuring the network operator.

- Configuring NTRIP client parameters
  1. Click **Read** to obtain the network service parameters.
  2. Change **IP**, **Port**, **MountPoint, User-ID**, and **Password** to preset values.
  3. Tick the check box for the NTRIP service, and click **Setting** to write the preset values into the network module.
  4. Click **Read** to obtain the NTRIP client parameters and check whether the parameter values are consistent with the preset values.
- Configuring TCP client parameters
  1. Click **Read** to obtain the network service parameters.
  2. Change **IP**, **Port**, **MountPoint**, and **User-ID** to preset values.
  3. Tick the check box for the TCP service, and click **Setting** to write the preset values into the network module.

4. Click **Read** to obtain the TCP client parameters and check whether the parameter values are consistent with the preset values.

Note:

In the same time period, the SMART antenna will use either the TCP service or the NTRIP service but not both.

3.6 Calibrate Tilt

The calibration operation is required when the angle of build-in tilt module output is obviously deviated from the actual angle of the carrier, the pitch and roll angle of the module output will not be near 0 degrees if the carrier remains level. The Tilt calibration window is shown in Figure 18.

The calibration steps are as follows:

1．Keep the carrier level and stationary

2．Click **Calibrate** to calibrate the tilt

3．Up to pop up the "**ok**" prompt box

Criteria of Calibration success :

1．Pop up the "ok" prompt box

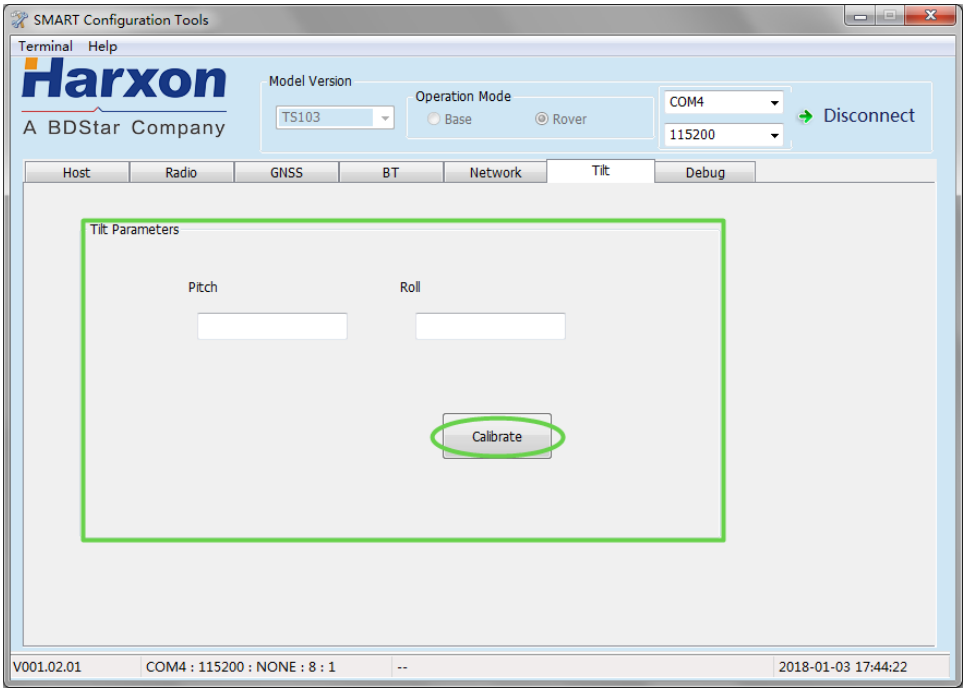
2．After power-on again,the pitch and roll angle of the module output is near 0 degree when the carrier is at the level of static.

Note:

1． Please keep the carrier level and stationary when calibration

2．The calibration parameter will take effect when SMART antenna power-on again

Figure 18 Tilt Calibration Window



3.7 Setting Up the Rover

The host of the SMART antenna rover receives satellite signals and differential data and derives high-accuracy navigation information from the received data during production operation. The external or built-in radio, which serves as the data link of the Real Time Kinematic (RTK) system, receives differential data broadcast by the base. The environment and method for setting up the rover will directly relate to the success of production operation.

The setup of the rover involves the following three parts:

- Setting up the rover kit with a built-in radio
- Setting up the rover kit with an external radio
- Precautions on rover setup

3.7.1 Setting Up the Rover Kit (with Built-in Radio)

For the rover kit with a built-in radio, the SMART antenna host receives satellite signals, receives differential data by using the built-in radio as

the data link, and outputs high-accuracy navigation information.

To set up the rover kit with a built-in radio, perform the following steps:

1. Assemble the SMART antenna rover, as shown in Figure 11.
2. Install and fix the host of the SMART antenna rover onto the carrier of the SMART antenna rover.
3. Connect the antenna of the radio to the RF port on the host of the SMART antenna rover.
4. Power on the host of the SMART antenna rover, and wait for the host to enter the fixed status and receive the differential data. The SAT LED on the SMART antenna rover will indicate the fixed status, and the LINK LED on the SMART antenna rover will blink once every second.

3.7.2 Setting Up the Rover Kit (with External Radio)

For the rover kit with an external radio, the SMART antenna host receives satellite signals, receives differential data by using the external radio as the data link, and outputs high-accuracy navigation information.

To set up the rover kit with an external radio, perform the following steps:

1. Assemble the SMART antenna, as shown in Figure 10.
2. Install and fix the host of the SMART antenna rover onto its mobile carrier.
3. Connect the antenna of the external radio to the antenna port on the external radio, and fix the external radio onto the carrier of the rover host.
4. Power on the host of the SMART antenna rover and the external radio, and wait for the SMART antenna rover kit to work properly. The SAT LED on the SMART antenna rover will indicate the fixed status, the LINK LED on the SMART antenna rover will blink once every second,

and the RX LED on the external radio will also blink once every second.

Note:

For the power supply of the rover, the output voltage must be at least 12 V and the output current must be at least 1 A.

3.7.3 Precautions on Rover Setup

Pay Note to the following matters during rover setup:

1. Ensure that the setup environment is open and free of any objects 5 m taller than the host of the SMART antenna rover within the 50 m distance.
2. Ensure that the SMART antenna rover is not obscured by any other objects.
3. Confirm that the host parameters of the SMART antenna rover are correctly configured.
4. Confirm that the parameters of the external radio are correctly configured. For instance, the baud rate of the data port on the external radio must be consistent with the baud rate of the differential data serial port on the SMART antenna rover host; the settings of the parameters such as the receive frequency, Over-The-Air link rate, and data protocol must be consistent with those of the radio of the base.
5. Confirm that the rover is within the coverage of the transmitting radio of the base.

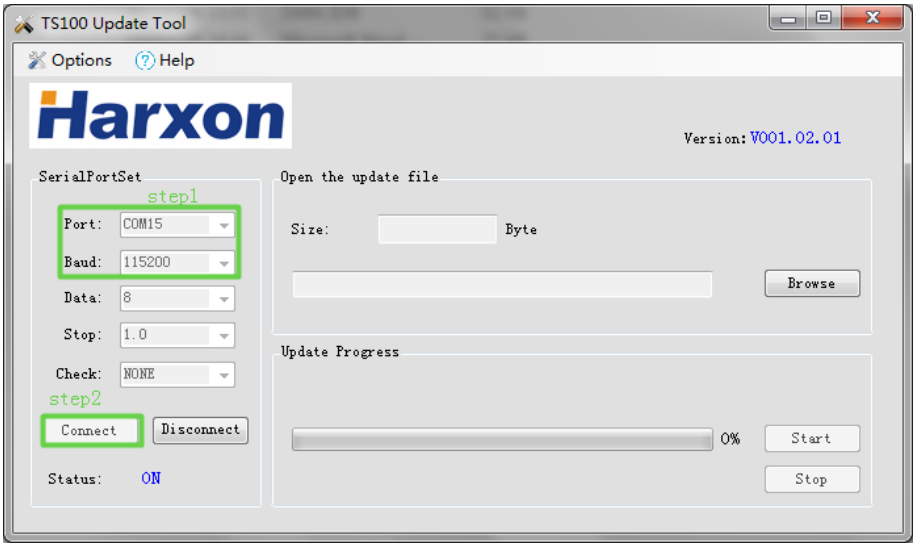
3.8 Firmware Update

3.8.1 Firmware Update for the SMART Antenna Host

The firmware update for the SMART antenna host is to update the application firmware of the main board of the SMART antenna host. To update the firmware of the SMART antenna host, perform the following steps:

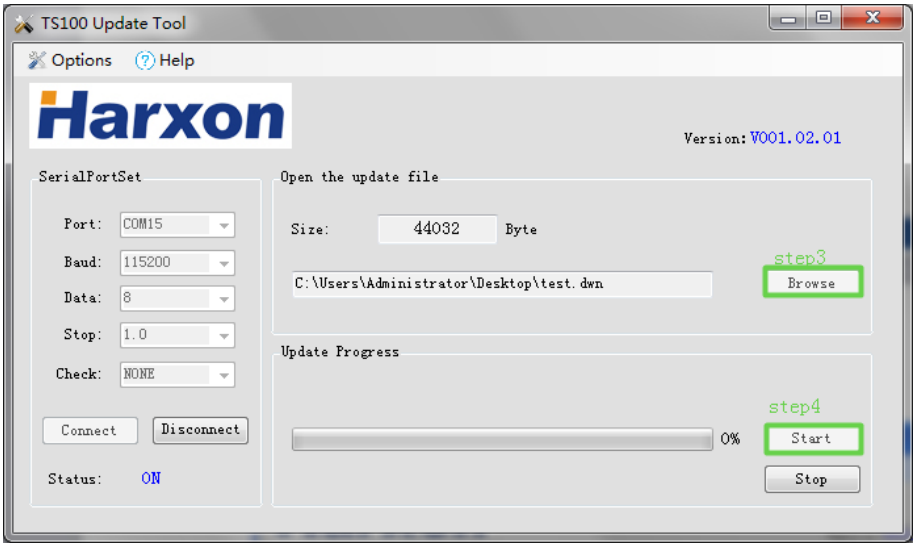
1. Connect the SMART antenna host, as shown in Figure 3. Do not power on the SMART antenna host.
2. Start the SMART antenna update tool on the computer, select the proper serial port and baud rate, and then click **Connect**, as shown in Figure 19.

Figure 19 Connecting the Port for the Host Firmware Update



3. Click **Browse** to select the target firmware file, and then click **Start**, as shown in Figure 20.

Figure 20 Starting the Host Firmware Update



4. Power on the SMART antenna host, and wait for the update tool to finish the firmware update.

Note:

If an application error prompt is displayed, close the update tool and repeat steps 1 to 4 for a retry.

3.8.2 Firmware Update for the Built-in Radio

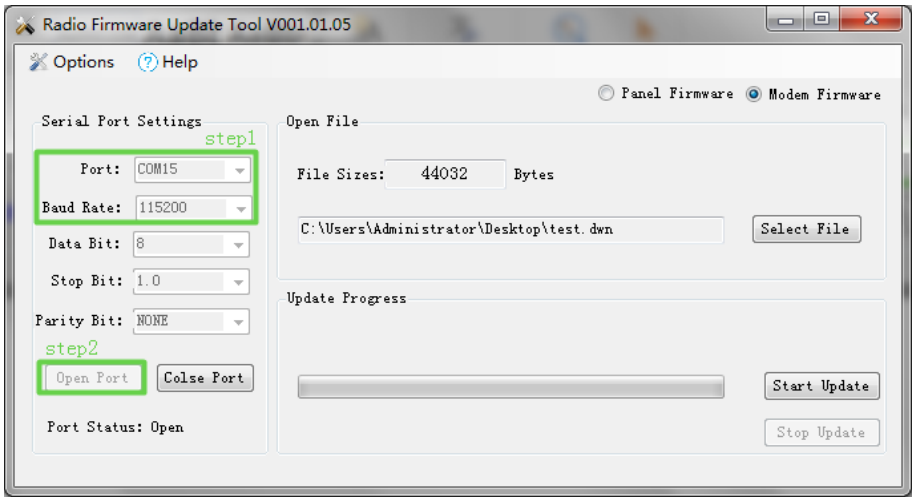
You can update the firmware of the built-in radio of the SMART antenna host using the following method:

1. Connect the SMART antenna, as shown in Figure 3, and power on the SMART antenna.

2. After the SMART antenna works properly, open the serial port tool on the computer and send the ***$CFG UDTU\r\n*** command to the SMART antenna host.

3. Open the firmware update tool for the built-in radio on the computer, and select the proper serial port, as shown in Figure 21.

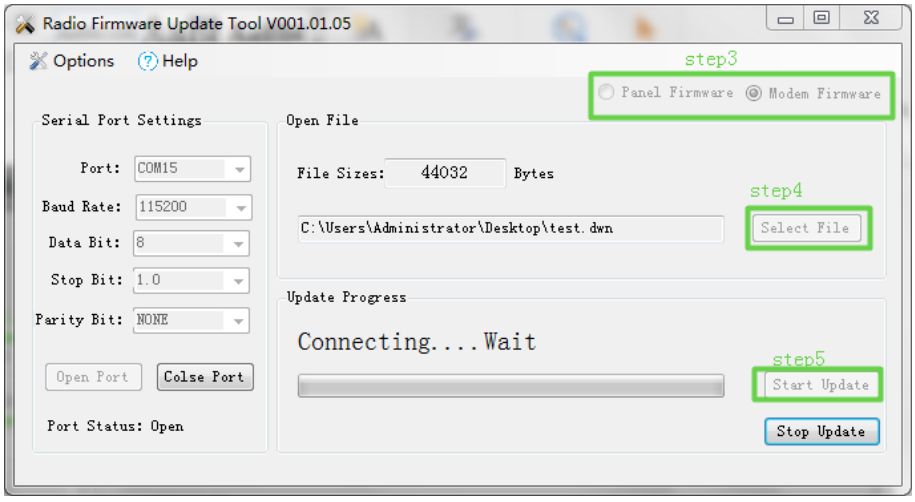
Figure 21 Connecting the Port for the Firmware Update for the Built-in Radio



4. Select **Modem Firmware**, click **Select File** to select the target firmware file, and then click **Start Update**, as shown in Figure 22.

5. Wait for the update tool to finish the firmware update.

Figure 22 Starting the Firmware Update for the Built-in Radio

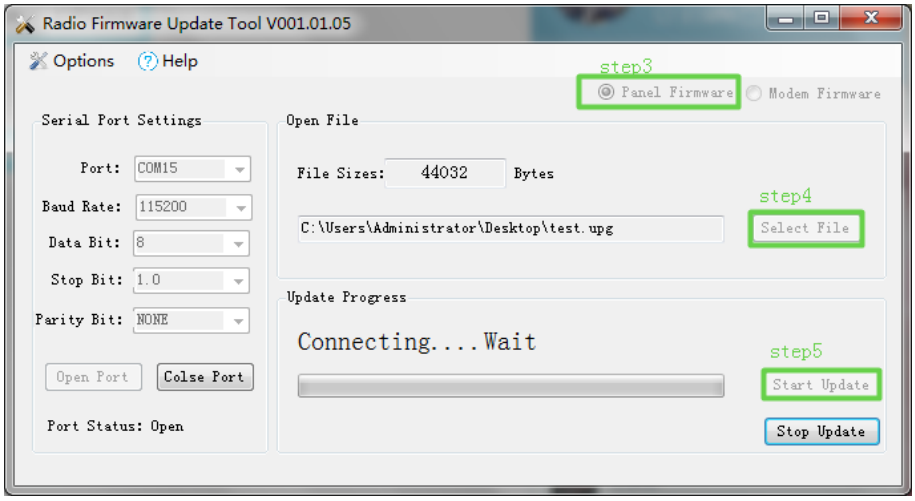


3.8.3 Firmware Update for the External Radio

You can update the firmware of the external radio of the SMART antenna host using the following method:

1. Connect the external radio to the computer, as shown in Figure 9.
2. Open the firmware update tool for the external radio on the computer, and select the proper serial port, as shown in Figure 23.
3. Select **Panel Firmware**, click **Select File** to select the target firmware file, and then click **Start Update**.
4. Wait for the update tool to finish the firmware update.

Figure 23 Starting the Firmware Update for the External Radio



3.8.4 Firmware Update for the CAN Module

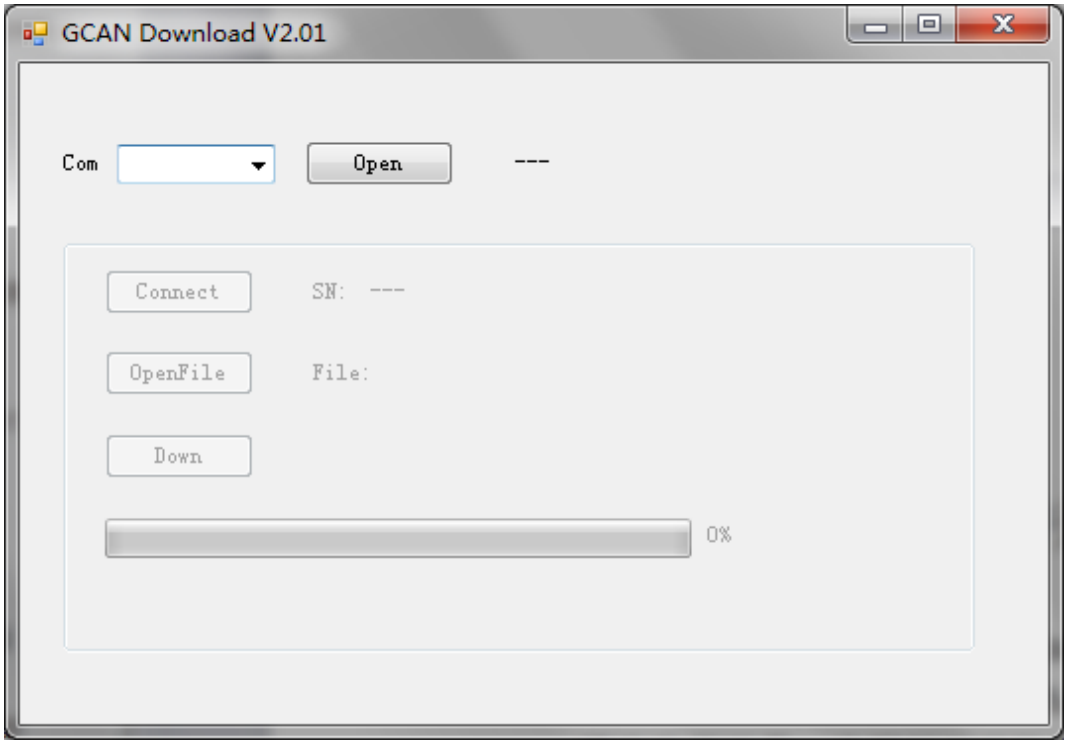
You can update the firmware of the CAN module integrated in the SMART antenna host using the following method:

1. Connect the SMART antenna, as shown in Figure 3, and power on the SMART antenna.
2. After the SMART antenna works properly, open the serial port tool on the computer and send the ***$CFG UCAN\r\n*** command to the SMART antenna host.

3. Open the CAN module update tool on the computer, and select the proper serial port, as shown in Figure 24.

4. Click **Open** and then **Connect** to connect the CAN module of the SMART antenna, click **OpenFile** to select the target firmware file of the CAN module, and then click **Down**. Wait for the update tool to finish the firmware update for the CAN module.

Figure 24 Firmware Update for the CAN Module



3.7.5 Firmware Update for the GNSS Module

You can update the firmware of the GNSS module integrated in the SMART antenna host. In general, the firmware of the built-in GNSS module does not need to be updated. Please contact us if you want to update the firmware of the built-in GNSS module.

Appendix A Technical Specifications

A.1 Specifications of the SMART Antenna Rover

Table 10 Specifications of the SMART Antenna Rover

Specification	Requirements	
Signal Tracking ①	BDS B1, GPS L1/L2, GLONASS L1/L2	
Time to First Fix ①	Cold start: 50s	
Single Point Position Accuracy (RMS) ①	Horizontal:	1.5 m
	Vertical:	2 m
RTK accuracy (RMS) ①	Horizontal:	1 cm + 1 ppm
	Vertical:	2 cm + 1 ppm
Velocity Accuracy (RMS) ①	0.03 m/s	
Timing accuracy (RMS) ①	20 ns	
Data rate (Max.) ①	10 Hz	
Differential protocol ①	RTCM 2.x/3.x, CMR, CMR+	
Data protocol ①	NMEA0183/NMEA2000	
Data port	Serial port (RS232)	
Dimensions	φ 160 mm x 80 mm	
Weight	< 800 g	
Power consumption	< 3.8 W	
RF port impedance	50 ohms	
Protection grade	IP67	
Working temperature	–40°C to +70°C	
Storage temperature	–55°C to +85°C	

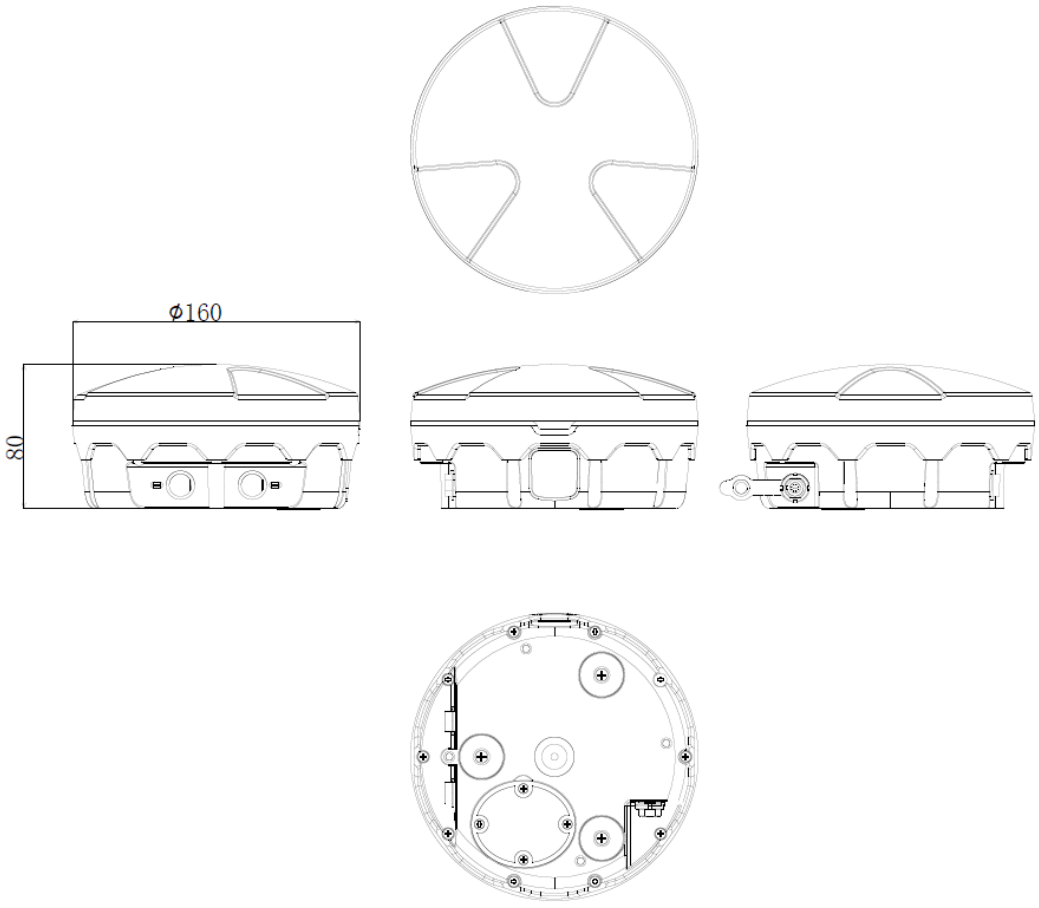
Humidity	95% (non-condensing)
Vibration	GJB150.16-2009, MIL-STD-810
Shock	GJB150.18-2009, MIL-STD-810

Note:

① *These specifications relate to the GNSS board, and may vary according to different GNSS boards. The model list in the product brochure has indicated the GNSS performance of the corresponding product. Please contact us for more help.*

Structural size (mm):

Figure 25 SMART Antenna Host Dimensions



A.2 Specifications of the Radios

A.2.1 Specifications of the External Radio (HX-DU1601D)

Table 11 Specifications of the External Radio (HX-DU1601D)

Specification	**Requirements**	
Frequency range	410 MHz to 470 MHz	
Number of channels	8	
Operation mode	Half-duplex	
Channel spacing	25 KHz	
Operating voltage	9 V to 16 V	
Power consumption (Typical value)	High transmit power	3.6 W @ DC 12 V
	Low transmit power	2.5 W @ DC 12 V
	Standby	0.7 W @ DC 12 V
Frequency stability	< ±1 ppm	
Protection grade	IP67	
ESD	8 KV contact, 15 KV air discharge	
Dimensions	148 mm x 76 mm x 30 mm	
Working temperature	–30°C to +60°C	
Storage temperature	–40°C to +75°C	
Antenna port	TNC, female connector	
Antenna port impedance	50 ohms	
Data port	LEMO 5-pin	
Receiver		
Specification	**Requirements**	
Sensitivity	Better than –115 dBm @ BER10^{-3}, 9600 bps	
Co-channel suppression	> –12 dB	
Adjacent channel selectivity	> 52 dB @ 25 KHz	
Modem		
Specification	**Requirements**	

Specification	Requirements
Over-The-Air (OTA) rate	9600 bps
Modulation mode	GMSK

A.2.2 Specifications of the Built-in Radio (HX-DU1006D)

Table 12 Specifications of the Built-In Radio (HX-DU1006D)

Specification	Requirements
Frequency range	410 MHz to 470 MHz
Operation mode	Half-duplex
Channel spacing	25 KHz
Frequency stability	< ±1 ppm
Receiver	
Specification	**Requirements**
Sensitivity	Better than –115 dBm @ BER10^{-3}, 9600 bps
Co-channel suppression	> –12 dB
Adjacent channel selectivity	> 52 dB @ 25 KHz
Spurious response immunity	> 55 dB
Modem	
Specification	**Requirements**
Over-The-Air (OTA) rate	9600 bps 19200 bps
Modulation mode	GMSK

A.3 Specifications of the Bluetooth Module

Table 13 Specifications of the Bluetooth Module

Parameter	Value	Remarks
Version	2.0 & 4.0	
Default user name	R+SN ①	
Default password	1234	

Transmission distance	10 m	Open area
Working temperature	–20°C to +70°C	

A.4 Specifications of the Network Module

Table 14 Specifications of the Network Module ②

Parameter	Value	Remarks
2G bands	GSM 900, DCS1800	
3G bands	FDD B1, B8	

Note:

① *The user name is a string of at most 13 characters, and the SN differs from the internal serial number of the equipment.*

② *The communication network involves substantial frequency bands, and the same product cannot cover all frequency bands. If the current parameters cannot meet your requirements, please contact us for more help and support.*

A.5 Specifications of the Tilt Module

Table 15 Specifications of the Tilt Module

Parameter	Value	Remarks
Attitude angle measurement stability	0.01°	Pitch angle, roll angle
Attitude angle accuracy	2°	Pitch angle, roll angle

A.6 Accessories of the SMART Antenna Kit

A.6.1 Data Cable (HJ681)

Figure 26 Structural Size of the Data Cable (HJ681)

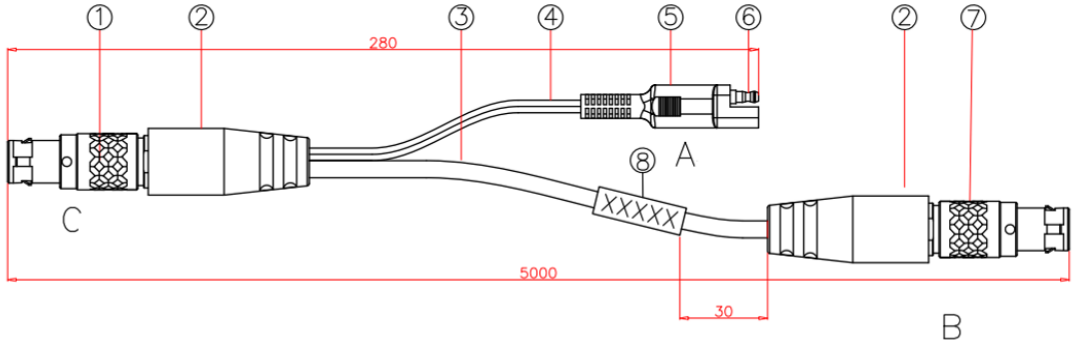


Figure 27 Welding Surface at Port C of the Data Cable (HJ681)

Figure 28 Welding Surface at Port B of the Data Cable (HJ681)

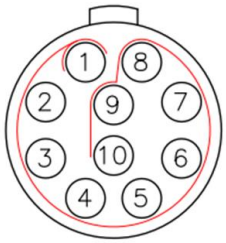


Table 16 List of Components of the Data Cable (HJ681)

No.	Description	Remarks
1	1B connector	1BHTN05P50
2	1B envelop	Black
3	7-pin cable	Black
4	Double-stranded cable	Black
5	Terminal envelop	Black

6	Bullet terminal	One male connector and one female connector
7	1B connector	1BHTN10P50
8	Label	The label content is MI-RD-HJ681.

A.6.2 SMART Antenna Configuration Cable (HJ568) (Optional)

Figure 29 Structural Size of the SMART Antenna Configuration Cable (HJ568)

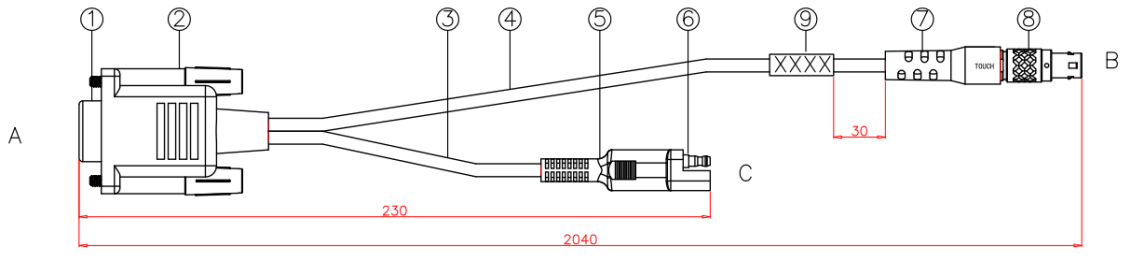


Table 17 List of Components of the SMART Antenna Configuration Cable (HJ568)

No.	Description	Remarks
1	Connector	DB9 female connector
2	Envelop	Black
3	Cable	Black
4	Cable	Black
5	Envelop	Black
6	Bullet terminal	One male connector and one female connector
7	Envelop	Black
8	Connector	1BHTN10P50N
9	Label	The label content is MI-RD-HJ394.

Figure 30 Welding Surface at Port A of the Configuration Cable (HJ568)

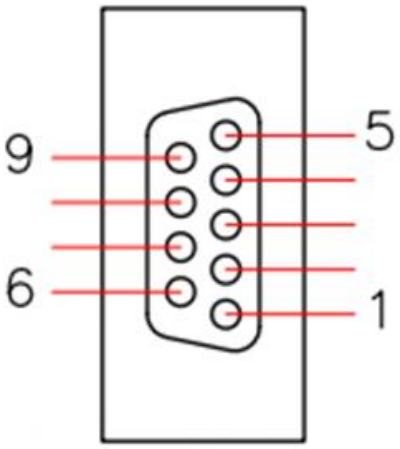


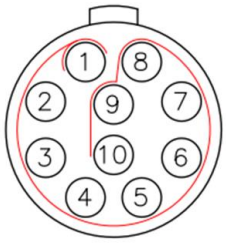
Table 18 Pinouts of Port A of the Configuration Cable (HJ568) ①

Pin	Name	Description	Remarks
2	TXD	Output	
3	RXD	Input	
5	GND	Ground	
1, 4, 6, 7, 8, 9	RSV	Reserved	

Note:

① *Normal communications are available after you connect this Port to the DB9 port on the computer.*

Figure 31 Welding Surface at Port B of the Configuration Cable (HJ568)



A.6.3 Configuration Cable of the External Radio (HJ394) (Optional)

Figure 32 Structural Size of the Configuration Cable of the External Radio (HJ394)

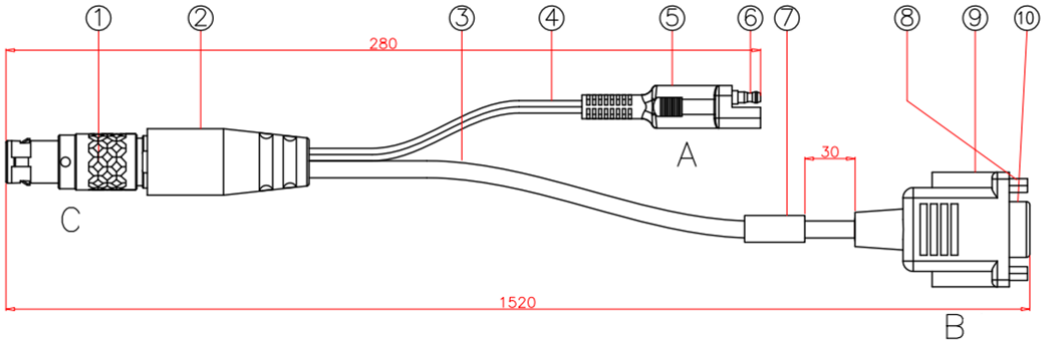


Table 19 List of Components of the Configuration Cable of the External Radio (HJ394)

No.	Description	Remarks
1	Connector	1BHTN05P
2	Envelop	Black
3	Cable	Black
4	Cable	Black
5	Envelop	Black
6	Bullet terminal	One male connector and one female connector
7	Label	The label content is MI-RD-HJ394.
8	Screw with inner threads	
9	Envelop	Black
10	Connector	DB9 female connector

Figure 33 Welding Surface at Port C of the Configuration Cable (HJ394)

Figure 34 Welding Surface at Port B of the Configuration Cable (HJ394)

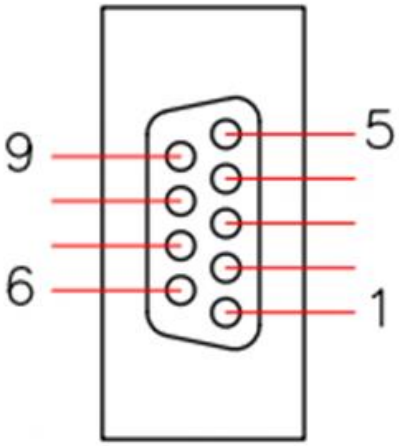


Table 20 Pinouts of Port B of the Configuration Cable (HJ394) ①

Pin	Name	Description	Remarks
2	TXD	Output	
3	RXD	Input	
5	GND	Ground	
1, 4, 6, 7, 8, 9	RSV	Reserved	

Note:

① *Normal communications are available after you connect this Port to the DB9 port on the computer.*

A.6.4 Power Cable (HJ379)

Figure 35 Structural Size of the Power Cable (HJ379)

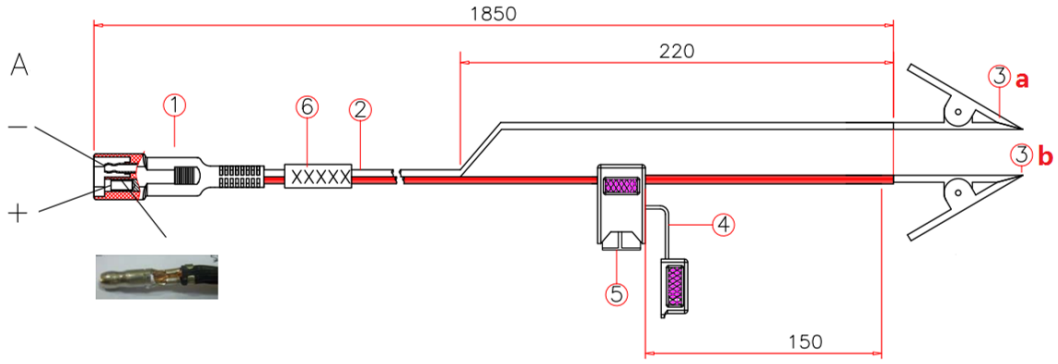


Table 21 List of Components of the Power Cable (HJ379)

No.	Description	Remarks
1	Bullet terminal	One male connector and one female connector
2	Double-row cable	Black
3	a: black alligator clip; b: red alligator clip	
4	Fuse block	One male connector and one female connector
5	Fuse	32 V/15 A
6	Label	The label content is MI-RD-HJ379.

Appendix B Commands

The SMART antenna rover involves the following working modes:

- Normal working mode
- Module configuration mode
- Module pass-through mode
- Module firmware update mode

The host must be in the normal working mode before you can switch it to the other working modes. All commands must start with "$CFG" and end with "\r\ n", and a space character must exist between "$CFG" and the specific command. For details, see Table 22.

Table 22 Syntaxes of SMART Antenna Commands

Command Header ($CFG)	Space Character (0x20)	Command	Parameter (Optional)	Terminator

For instance, a complete process of the pass-through mode of the GNSS module is as follows:

Normal working mode -> GNSS module firmware update mode (**$CFG GNSS\r\n**) -> Update (by using the corresponding update tool) -> Exit the configuration mode and enter the pass-through mode (**$CFG QUIT\r\n**).

Table 23 List of SMART Antenna Firmware Update Commands

No.	Command	Description	Remarks
1	$CFG UDUT\r\n	Enter the firmware update mode for the built-in radio.	After the update is complete using the corresponding update tool, you need to exit the module firmware update mode before the host can enter the

			normal working mode.
2	$CFG UCAN\r\n	Enter the CAN module firmware update mode.	After the update is complete using the corresponding update tool, you need to exit the module firmware update mode before the host can enter the normal working mode.
3	$CFG GNSS\r\n	Enter the GNSS module firmware update mode.	After the update is complete using the corresponding update tool, you need to exit the module firmware update mode before the host can enter the normal working mode.
4	$CFG QUIT\r\n	Exit the configuration mode and enter the normal working mode.	Example: **$CFG QUIT\r\n** "OK" will be returned after the command is successfully executed.

Appendix C Output Protocols

C.1 NMEA0183

Table 24 List of NMEA0183 Output Protocols

No.	Command	Description	Remarks
1	$GPGGA	Global positioning data	Standard: NMEA0183
2	$GPGSA	Satellite PRN data	Standard: NMEA0183
3	$GPGSV	Satellite status information	Standard: NMEA0183
4	$GPRMC	Recommended minimum navigation information (RMC)	Standard: NMEA0183
5	$GPZDA	Time data	Standard: NMEA0183
6	$PSAT	Attitude angle data	

C.1.1 GGA Positioning Result

Example:

$GPGGA,135324.00,5106.9791988,N,11402.3002127,W,2,09,1.0,1047.606,M,,,04,AAAA*1C

Table 25 GGA Positioning Result

Field	Structure	Field Description	Symbol	Example
1	$GPGGA	Log header		$GPGGA
2	utc	UTC time status (A number with decimal places for Hour/Minute/Second/Second)	hhmmss.ss	220417.50
3	lat	Latitude (DDmm.mm)	llll.ll	5106.7194489
4	lat dir	Latitude direction (N = North, S = South)	a	N
5	lon	Longitude (DDDmm.mm)	yyyyy.yy	11402.3589020
6	lon dir	Longitude direction (E = East, W =	a	W

Field	Structure	Field Description	Symbol	Example
		West)		
7	Status of positioning	GPS quality indicator 0 = Invalid 1 = Point positioning 2 = Pseudo-range differential decomposition, omniSTAR HR, omniSTAR XP, omniSTAR VBS, or CDGPS 4 = RTK fixed 5 = RTK float point, omniSTAR HR, omniSTAR XP 6 = Dead reckoning mode 7 = Fixed position 8 = Simulator mode 9 = WAAS	x	1
8	#sats	Total number of satellites in use, which may differ from the number of visible satellites.	xx	08
9	hdop	Horizontal longitude factor	x.x	0.9
10	alt	Altitude of the antenna (above or below the average sea level)	x.x	1080.406
11	units	Unit of the antenna height	M	M
12	null	A field that cannot be used on the OEMV series receivers		Null if currently there is no differential data
13	null	A field that cannot be used on the OEMV series receivers		
14	age	Age of the differential GPS data (within several seconds)	xx	
15	stn ID	Base ID	xxxx	
16	*xx	Checksum	*hh	*48
17	CR][LF]	End of the statement		[CR][LF]

C.1.2 GSA Satellite PRN Data

Example:

$GPGSA,M,3,17,02,30,04,05,10,09,06,31,12,,,1.2,0.8,0.9*35

Table 26 GSA Satellite PRN Data

Field	Structure	Field Description	Symbol	Example
1	$GPGSA	Log header		$GPGSA
2	MA mode	A = Auto 2D/3D M = Manual, forced 2D/3D operation	M	M
3	123 mode	Mode: 1 = Invalid; 2 = 2D; 3 = 3D	x	3
4-15	prn	Total number of satellite PRNs in use. If no PRN is in use, this field will be null. Altogether 12 fields. GPS = 1 to 32 SBAS = 33 to 64 (For the PRN number, 87 is added.) GLO = 65 to 96	xx.xx,.....	18,03,13, 25,16, 24,12, 20,.....
16	pdop	Position dilution of precision	x.x	1.5
17	hdop	Horizontal dilution of precision	x.x	0.9
18	vdop	Vertical dilution of precision	x.x	1.2
19	*xx	Checksum	*hh	*3F
20	[CR][LF]	End of the statement		[CR][LF]

C.1.3 GSV Satellite Status Data

Example:

$GPGSV,3,1,8,18,87,050,48,22,56,250,49,21,55,122,49,03,40,284,47*78

$GPGSV,3,2,11,19,25,314,42,26,24,044,42,24,16,118,43,29,15,039,42*7E

Table 27 GSV Satellite Status Data

Field	Structure	Field Description	Symbol	Example

1	$GPGSV	Log header		$GPGSV
2	#msgs	Total number of messages	x	3
3	msg#	Message No.	x	1
4	#sats	Total number of visible satellites, which may differ from the total number of satellites in use.	xx	09
5	prn	Number of satellite PRNs GPS = 1 to 32 SBAS = 33 to 64 (For the total number of PRNs, the number 87 is added.) GLO = 65 to 96	xx	03
6	elev	Elevation, angle, maximum 90	xx	51
7	azimuth	Azimuth, true angle, 000 to 359	xxx	140
8	SNR	SNR (C/No), 00–99 dB, null if no tracing	xx	42
...				
...				
...				
Variable	*xx	Checksum	*hh	*72
Variable	[CR][LF]	End of the statement		[CR][LF]

C.1.4 RMC Data

Example:

$GPRMC,144326.00,A,5107.0017737,N,11402.3291611,W,0.080,323.3,210307,0.0,E,A*20

Table 28 RMC Data

Field	Structure	Field Description	Symbol	Example
1	$GPRMC	Log header		$GPRMC
2	UTC	UTC of the position	hhmmss.ss	144326.00
3	Pos status	Status of the position	A	A

Field	Structure	Field Description	Symbol	Example
		A = The data is valid V = The data is invalid		
4	lat	Latitude (DDmm.mm)	llll.ll	5107.0017737
5	lat dir	Latitude direction (N = North, S = South)	a	N
6	lon	Longitude (DDDmm.mm)	yyyyy.yy	11402.3291611
7	lon dir	Longitude direction (E = East, W = West)	a	W
8	speed Kn	Speed over the ground in nautical miles per hour	x.x	0.080
9	track true	Dead reckoning, true angle	x.x	323.3
10	date	Date: day/month/year	xxxxxx	210307
11	mag var	Magnetic variable in the unit of degrees	x.x	0.0
12	var dir	Direction of the magnetic variable: east or west	a	E
13	mode ind	Positioning system mode indication	a	A
14	*xx	Checksum	*hh	*20
15	[CR][LF]	End of the statement		[CR][LF]

C.1.5 ZDA Time Data

Example:

$GPZDA,010708.00,05,04,2007,00,00*6C

Table 29 ZDA Time Data

Field	Structure	Field Description	Symbol	Example
1	$GPZDA	Log header		$GPZDA
2	utc	UTC time status (A number with decimal places for Hour/Minute/Second/Second)	HHmmss.ss	010708.00

3	UTC time: day	UTC time: day	xx	05
4	UTC time: month	UTC time: month	xx	04
5	UTC time: year	UTC time: year	xxxx	2007
6	Local time field	Description of the local time field; unit: hour; xx = –13 to 13	xx	00
7	Local time field	Description of the local time field; unit: minute; yy = 0 to 59	xx	00
8	*xx	Checksum	*hh	*6c
9	CR][LF]	End of the statement		[CR][LF]

C.1.6 PSAT Attitude Data

Example:

$PSAT,PHR,070654.00,159.49,29.43,33.27,N*43

Table 30 PSAT Attitude Angle Data

Field	Structure	Field Description	Symbol	Example
1	$	Log header		$
2	PSAT,PHR	Address field value		PSAT,PHR
3	UTC	UTC time status (A number with decimal places for Hour/Minute/Second/Second)	HHmmss.ss	070654.00
4	azimuth	Azimuth in degrees	xxx.xx	159.49
5	pitch	Pitch angle in degrees	xxx.xx	29.43
6	roll	Roll angle in degrees	xxx.xx	33.27
7	mode	Azimuth measuring mode (The value is **N** or **G**) (**N**: GPS is used to measure the azimuth; **G**: gyroscope is used to measure the azimuth)	x	N
8	*xx	Checksum	*xx	*43

9	CR][LF]	End of the statement	[CR][LF]

C.2 NMEA2000

Table 31 List of NMEA2000 Output Protocols

No.	Command	PGN	Length	Meaning
1	VEL	129026 (0x1F802)	8 bytes	COG & SOG — Quick updating
2	PRU	129025 (0x1F801)	8 bytes	Location — Quick updating
3	POS	129029 (0x1F805)	51 bytes	GNSS location data
4	DRU	129027 (0x1F803)	8 bytes	Position Delta, high-accuracy quick updating

Appendix D Substitution Components

Below is a list of available parts for Harxon SMART antenna rover. If you want to purchase more components or ask for help, please contact us.

D.1 SMART Antenna Rover Host

Table 32 List of Optional Hosts for the SMART Antenna Rover

Host	Model
Rover (with external radio)	TS102
Rover (with built-in radio)	TS104
Rover(with Tilt & BT)	TS108
Rover(with built-in radio & 3G/4G & Tilt & BT)	TS108PRO
Rover(with built-in radio & BT)	TS302
Rover(with 3G/4G & Tilt & BT)	TS304
Rover(with built-in radio & 3G/4G & Tilt & BT)	TS308

D.2 Accessories of the SMART Antenna Rover

Table 33 List of Optional Accessories for the SMART Antenna Rover

Accessory	Harxon BOM
Power cable (HJ379)	14.02.020017
Data cable (HJ681)	14.02.020032
Antenna of the radio (QC400SI)	10.19.040007
External radio (HX-DU1601D)	72.02.010003
SMART antenna configuration cable (HJ568) ①	14.02.020034
Configuration cable of the external radio (HJ394) ②	14.02.020039

Note:

① *This cable is used to configure or diagnose the SMART antenna, and is not needed during the normal use of the product; therefore, this accessory is optional and shall be purchased according to actual needs.*

② *This cable is used to configure or diagnose the external radio, and is not needed during the normal use of the product; therefore, this accessory is optional and shall be purchased according to actual needs.*

Appendix E SMART Antenna FAQs

LED Exceptions

- If the PWR LED is normally on but the SAT LED does not blink within 2 minutes, it indicates that point positioning failed probably because there are many obstacles or the SMART antenna rover is problematic. Please ensure that the SMART antenna rover is not obscured and restart the SMART antenna rover to check whether the problem disappears.

- If the PWR LED is normally on but the LINK LED does not blink, do as follows:

  (1) Confirm that the SMART antenna rover is in normal working mode.

  (2) Confirm that the over-the-air link rate, frequencies of transmit channels, and data protocol configured for the radio of the rover are consistent with those configured for the transmitting radio of the base.

  (3) Confirm that the rover is within the coverage of the transmitting radio of the base.

- If both the SAT LED and the LINK LED are blinking but the status between two sets of blinking is OFF, it indicates that the quality of the satellite signals currently being tracked by the SMART antenna is poor and the RTK resolving status is "not fixed". Please ensure that the SMART antenna is not obscured and no interference exists around it.

- If all the LEDs on the SMART antenna host are off, do as follows:

  (1) Check whether the cable connection is consistent with Figure 11 (when the SMART antenna uses its built-in radio as the data link)

or Figure 10 (when the SMART antenna uses its external radio as the data link).

(2) Check whether the voltage of the power supply is normal, whether the SMART antenna is in good contact with the power supply, and whether the positive and negative poles of the power supply are correctly connected.

- If the states of all the LEDs on the SMART antenna host are normal, the RX LED on the external radio blinks once every second and the rover can receive data but cannot enter the fixed status, check the equipment using the following method:

(1) Power off the radio of the base. If the rover can still receive data, it indicates that other radios are transmitting signals on the same frequency band nearby. In this case, you need to adjust the frequencies of both the external radio of the rover and the radio of the base to avoid the interference.

(2) Check that the baud rate of the communication port on the external radio is consistent with that of the differential data serial port on the SMART antenna host.

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