

A12

RTK High Precision Positioning Terminal



Table of Contents

1. Product Introduction	3
2. Product Features	3
3. Product Specifications	3
4. Key Functions	6
5. Product Indicator Definitions	8
6. Product External Interfaces	10
7. Product Dimensions	12
8. Product Pictures	13
9. Packing List	14
10. Installation Instructions	15
11. Troubleshooting	23
12. A12 Series Comparison	24

Revision History

Version	Date	Modified by	Revision Contents
V1.0	2022.8.8	ZZF	Initial Version
V1.1	2022.8.15	ZZF	Updated terminal interface pin definitions
V1.2	2022.9.21	TS	Corrected pin definitions, added RJ45 Ethernet port support
V1.3	2022.11.03	ZZF	Added terminal wiring definitions
V1.4	2025.2.5	CX	Template modification
V1.5	2025.5.9	CX	Roll angle function removed

1. Product Introduction

The A12 is a full-band RTK positioning vehicle-mounted terminal. It features a built-in TF card slot for data storage and a SIM card slot. It supports connecting to various peripherals like digital fuel level sensors (dipsticks) via an RS232 interface for data acquisition, uploading data to the fleet management platform. It also supports dual-antenna positioning, providing orientation, pitch, and heading information, and integrates an IMU (Inertial Measurement Unit) to automatically calculate latitude and longitude data in environments without satellite signals. Additionally, remote vehicle power cut-off and restoration can be achieved through an optional 12V/24V relay.

This product is suitable for Intelligent Transportation Systems, IoV (Internet of Vehicles), intelligent driving, logistics, freight companies, and long-distance transport.

2. Product Features

4G Cat.1	Full-band RTK positioning
Remote Firmware Upgrade	Built-in TF Card Slot
Bluetooth Communication(custom)	Wi-Fi Communication
IMU Navigation	Heading Angle
Pitch Angle	Support for Multiple Peripheral Interfaces

3. Product Specifications

Category	Attribute	Description
Main Features	4G Band	Support Local 4G bands
	Operator	Support Local Main Operators
	Communication Mode	TCP、UDP
	Wi-Fi	Customizable as per customer request
	Bluetooth	Customizable as per customer request

IMU	Positioning Accuracy	Centimeter-level accuracy maintained after 3 seconds of GNSS antenna signal loss
		Meter-level accuracy maintained after 10 seconds of GNSS antenna signal loss
Attitude Features	Heading Accuracy	$(0.15/R)^{\circ}$, where R is the baseline length in meters. Baseline 0.5m = 0.3° error RSR (approximately 66% of values within this range)
	Pitch Angle	$(0.25/R)^{\circ}$, where R is the baseline length in meters. Baseline 0.5m = 0.5° error RSR (approximately 66% of values within this range)
Electrical Characteristics	Operating Voltage	9V ~ 36V
	Operating Current	$\leq 300\text{mA}$ @ DC12V
	Built-in Backup Battery	350mAh @ 3.7V
	Voltage Detection	Supported
	Operating Time on Backup	≥ 10 minutes (can continue communication for 10 minutes after main power is disconnected)
Environmental Characteristics	Operating Temperature	$-20^{\circ}\text{C} \sim +75^{\circ}\text{C}$
	Storage	$-40^{\circ}\text{C} \sim +75^{\circ}\text{C}$

	Temperature	
	Operating Humidity	10%~85%RH (non-condensing)
Mechanical Characteristics	IP Rating	IP66
	Dimensions	108×92×30.5mm
	Weight	270 g
	Material	Aluminum Alloy
GNSS Features	Constellations & Bands	GPS: L1C/A, L2P, L2C
		BDS-2: B1I, B2I, B3I
		BDS-3: B1I, B3I
		GLONASS: G1, G2
		Galileo: E1, E5b
		QZSS*: L1C/A, L2C
	RTK Accuracy	2cm±1ppm
	Velocity Accuracy	≤ 0.02m/s (PDOP ≤4)
	Time To First Fix (TTFF)	Cold Start ≤35 sec
		Hot Start ≤10 sec
	Sensitivity	Tracking: -155dBm
		Acquisition: -138dBm
	Update Rate	1 ~ 10Hz (default 1Hz)
	Baud rate	115200 ~ 230400bps (default 115200bps)
	Data Format	NMEA 0183

	Differential Data	RTCM3.3/3.2/3.1/3.0
Other	Explosion-Proof Certification	Can assist customers with explosion-proof certification

4. Key Functions

Category	Attribute	Description	Status
Main Functions	RTK Positioning	Supports NTRIP protocol. Receives differential signals from base stations to achieve high-precision RTK positioning, accuracy up to centimeter level.	✓
	JT/T 808	Support JT/T 808-2013	✓
	SMS Configuration	Supports remote adjustment of device working parameters via SMS. Users can easily configure the device without connecting to a platform.	✓
	JT/T 808 Platform Configuration	Supports configuring device parameters via the data platform. (Note: This feature requires platform support.)	✓
	Remote Firmware Upgrade (FOTA)	Supports remote firmware upgrades.	✓
	Peripheral Expansion	Supports CAN, RS232 interface, speaker, external alarm, relay, digital fuel level sensor	—

		(dipstick), fuel circuit controller, temperature detection.	
	Attitude Output	Supports pushing heading angle, pitch angle, and other attitude information to a designated platform.	✓
	Blind Zone Data Retransmission	When the device is offline, the positioning data is saved locally and automatically transmitted to the platform after network recovery.	—
	Dual IP Transmission	The device supports dual IP configuration, allowing the positioning data to be transmitted to two IP addresses simultaneously.	✓
	TF Card	The TF card is used to store device operation logs.	✓
(Function Status: ✓implemented —reserved)			

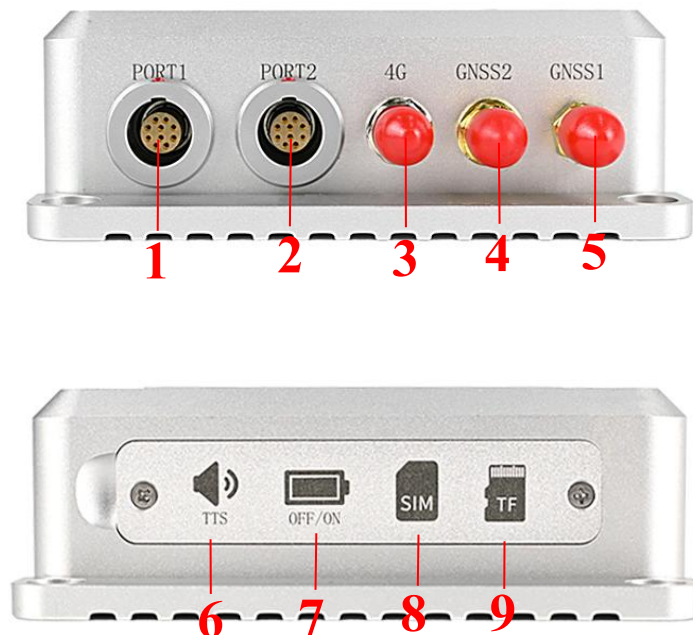
5. Product Indicator Definitions



No.	Icon	Indicator	Color	State Description	LED Display	Function Status
1	PWR	Power	Red	Power Off	Off	✓
				Power On	Steady On	✓
2	4G	Communi cation	Red	No SIM Card	Flashes every 2 seconds	✓
				Network Searching / SIM Overdue	Steady On	✓
				Network Registered Successfully	Flashes every 1 second	✓
				Connected to Server Successfully	flashes 5 times per second	✓
3	GNSS	Positionin g	Yellow	Not Fixed	Flashes every 2 seconds	✓

				2D Fix	Flashes every 1 second	✓
				Single Point	flashes 2 times per second	✓
				Float	flashes 5 times per second	✓
				Fixed	Steady On	✓
4	TF	TF	Yellow	No TF card Detected	Off	✓
				TF card Detected	Steady ON	✓
				No TF Card in use	Flashes every 1 second	✓
				TF card write error	Flashes every 200 ms	✓
				TF card open error	Flashes every 400 ms	✓
5	Wi-Fi	Wi-Fi	Red	\	\	—
6	BT	Bluetooth	Blue	\	\	—
(Function status: ✓ implemented — reserved)						

6. 6.Product External Interfaces



No.	Name	Function	Status
1	PORT1	Power Cable (Pinout details in Table 1)	✓
2	PORT2	Reserved	—
3	4G	Communication Antenna (SMA Female)	✓
4	GNSS2	Orientation/Heading Antenna (SMA Female)	✓
5	GNSS1	Positioning Antenna (SMA Female)	✓
6	TTS	TTS Interface (Text-To-Speech)	✓
7	OFF/ON	Used to enable the device's backup battery	✓
8	SIM	SIM Card Slot	✓
9	TF	TF Card Slot	✓
(Function Status: ✓implemented —reserved)			

Figure 1: Aviation Connector Pinout Definition

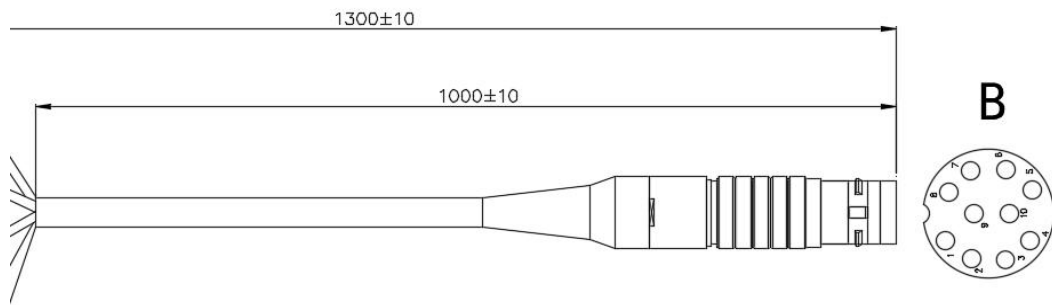
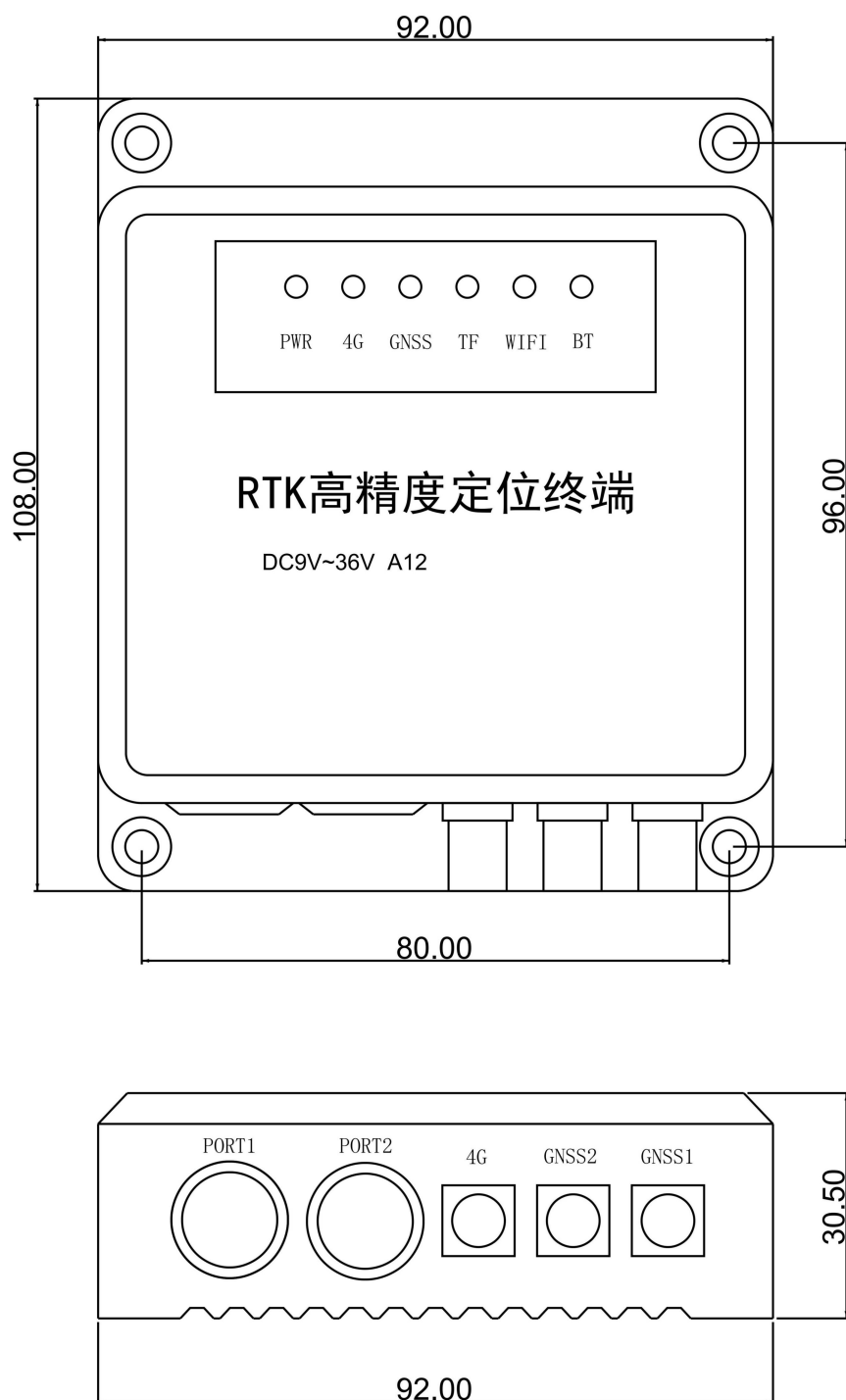


Table 1: Aviation Connector Pinout Definition

No.	Color	Function	Status
1	Red	Power Input (DC9-36V)	✓
2	Black	GND	✓
3	Blue	MCU RX (RS232 Level 9600bps)	✓
4	Green	MCU TX (RS232 Level 9600bps)	✓
5	Yellow	GNSS TX (RS232 Level 115200bps)	✓
6	Orange	GNSS RX (RS232 Level 115200bps)	✓
7	Purple	BOOT0 (Firmware Upgrade Mode Control)	✓
8	Brown	Reserved	—
9	Gray	Reserved	—
10	White	Reserved	—
(Function Status: ✓implemented —Reserved)			

7. Product Dimensions



8. 8.Product Pictures



Top View



Bottom View



Front View



Rear View

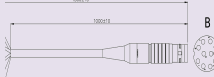
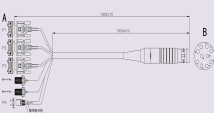


Side View



Third-angle View

9. Packing List

No.	Name	Quantity	Unit	Remark	Pic
1	Terminal Device	1	Unit	Standard	
2	Aviation Connector Harness (Bare Wires)	1	pcs	Standard	
3	Mushroom Head Antenna with Magnetic Base	2	set	Standard	
4	SMA to TNC Antenna Cable (5 meters)	2	pcs	Standard	
5	Communication Antenna	1	pcs	Standard	
6	Aviation Connector to DB9 (One-to-Three Splitter)	1	pcs	Optional	
7	RS232 to USB Cable	1	pcs	Optional	

10. Installation Instructions

10.1 Insert SIM Card



Insert the SIM card into the slot

10.2 Power-On Method



A. Connect the "Aviation Connector" to the terminal's "PORT1".

B. Connect the "Red and Black wires" to a DC 9V ~ 36V power supply.

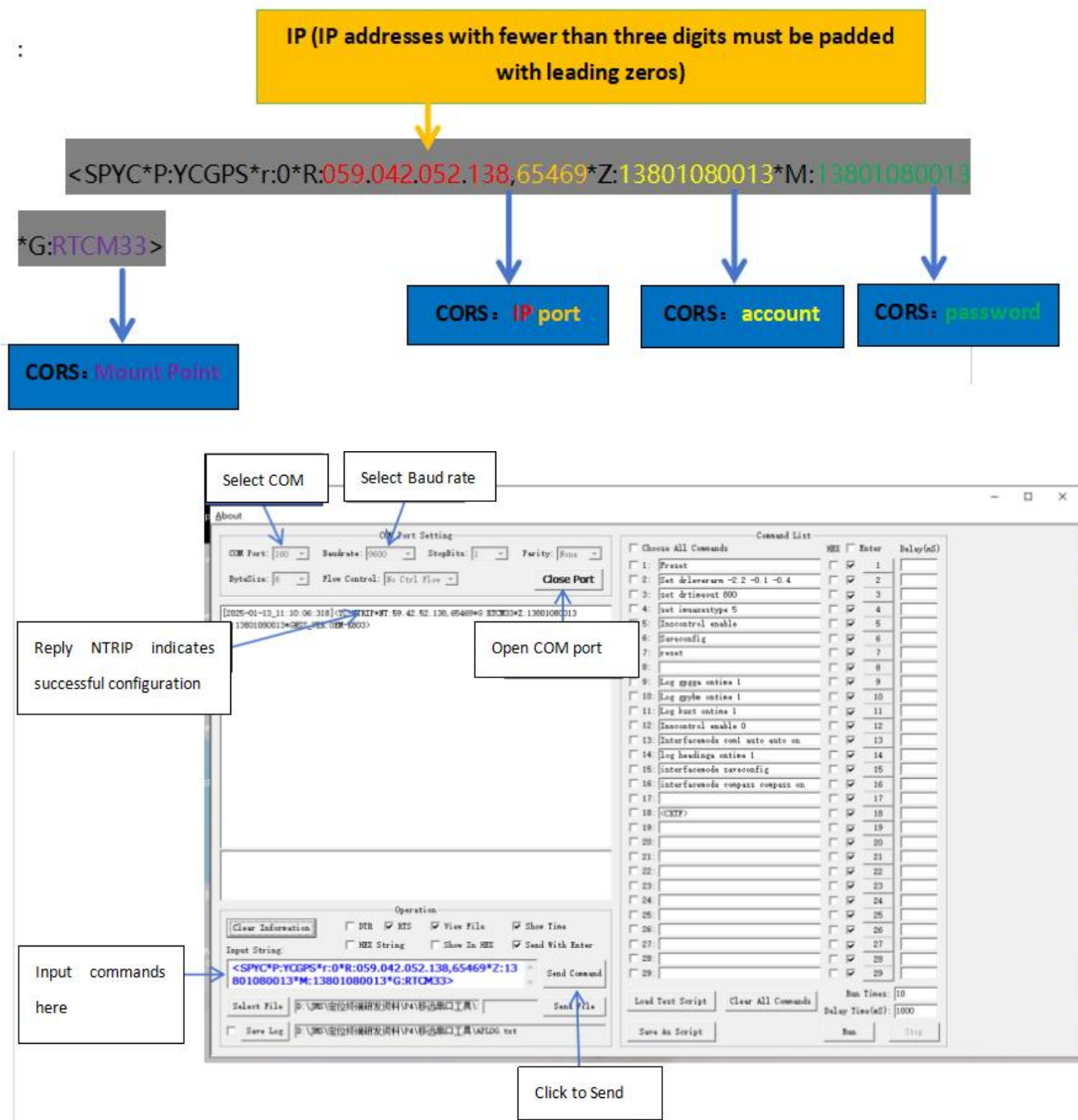
The device beeps and LEDs light up indicating successful startup.

10.3 Configuring NTRIP Account (via MCU Serial Port)

A. The device's blue and green wires are the MCU serial port (Baud rate 9600). If connect to a computer, need to use an RS232-to-USB cable.

Pinout Details refer to "Table 1: Aviation Connector Pinout Definition".

B. Modify command examples as needed based on implementation.



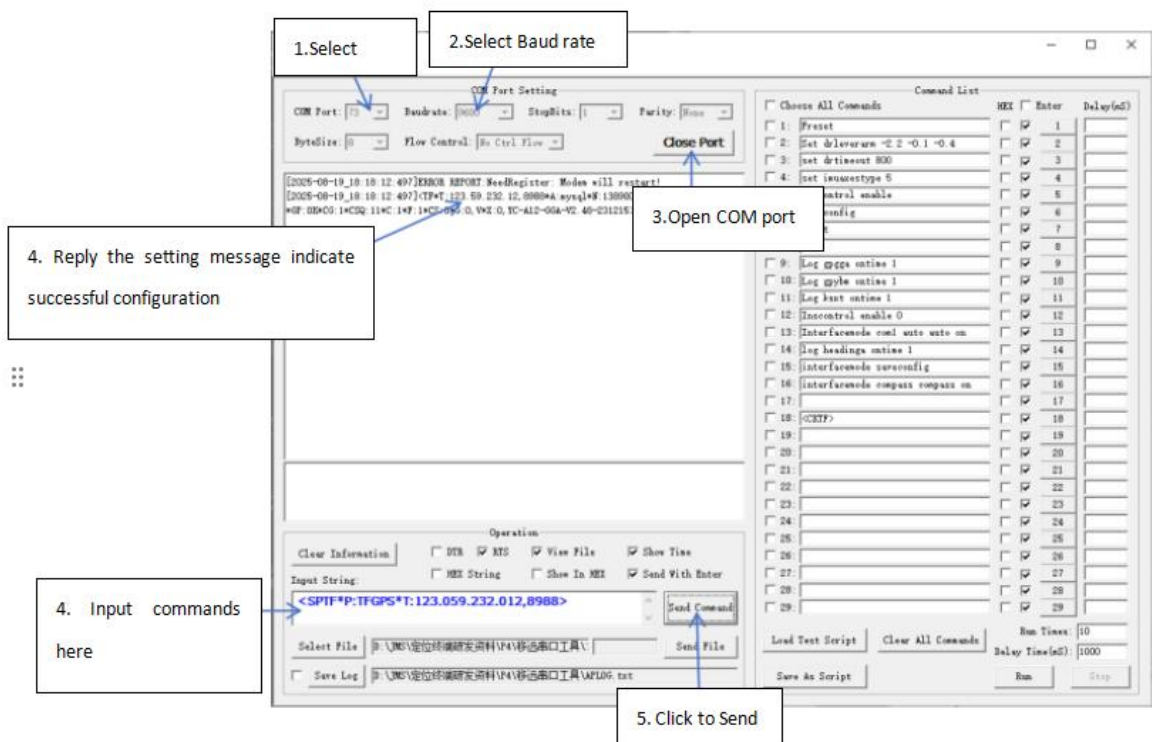
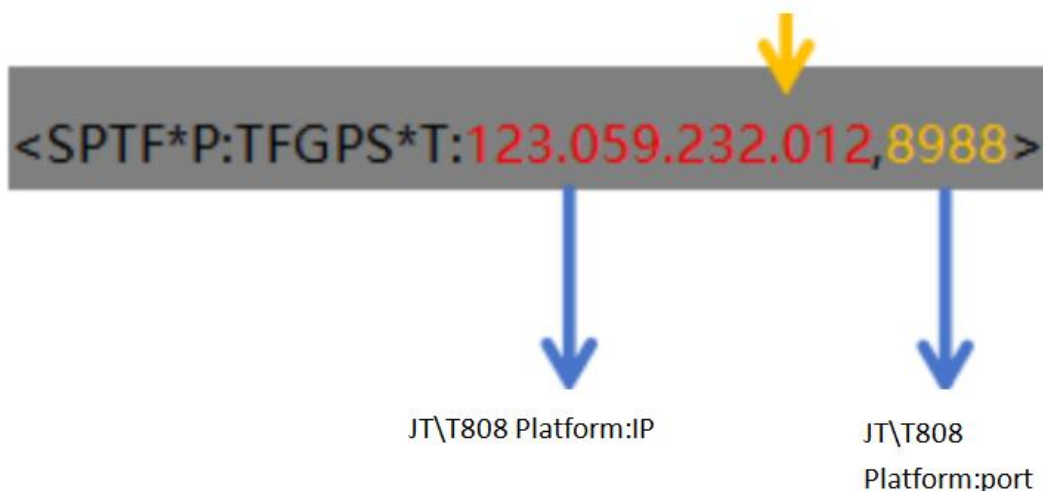
10.4 Setting JT/T808-2013 Platform (via MCU Serial Port)

A. The device's blue and green wires are the MCU serial port (Baud

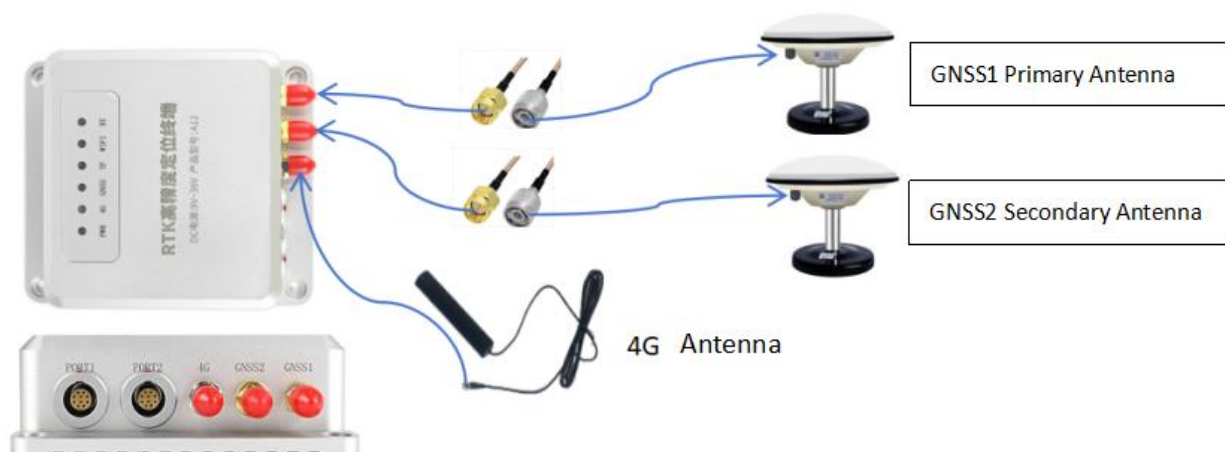
rate 9600). If connect to a computer, need to use an RS232-to-USB cable. Pinout Details refer to "Table 1: Aviation Connector Pinout Definition".

B. Modify command examples as needed based on implementation (These parameters can be configured optionally).

If the IP address is less than three digits, add leading zeros



10.5 Antenna Connection Method

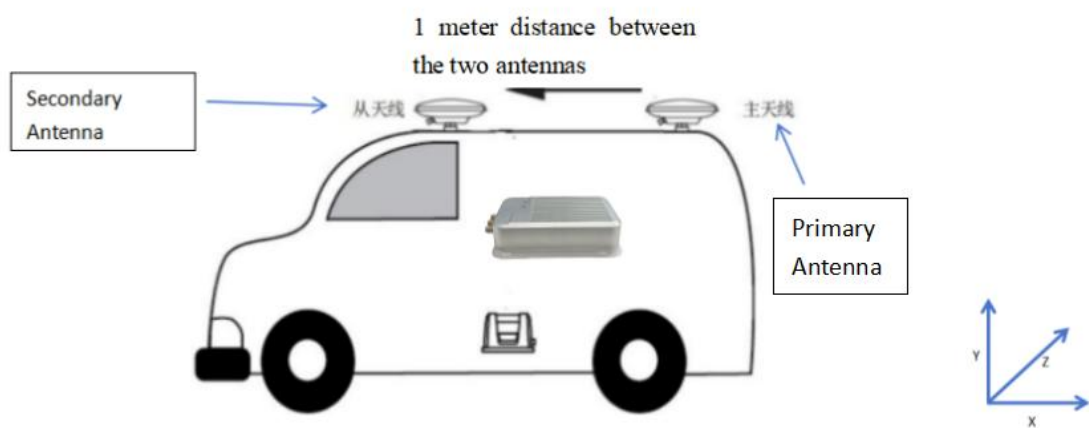


10.6 Recommended Installation Method

A. Place both antennas on the roof, with the secondary antenna in front and the primary antenna at the rear. A spacing of 1 meter is recommended between them.

B. Place the terminal with the LEDs side facing up and the indicator arrow pointing towards the vehicle's front. Place the terminal even and ensure rigid connection to the vehicle to prevent detachment during travel.

C. If using the integrated navigation function, measure the X, Y, Z offset from the primary antenna to the terminal for later use.



10.7 Configuring Integrated Navigation Parameters (via MCU Serial Port)

A. The device's blue and green wires are the MCU serial port (Baud rate 9600). If connect to a PC, need to use an RS232-to-USB cable. Pinout Details refer to "Table 1: Aviation Connector Pinout Definition".

B. Command configuration:

<SPGD*P:GDGPS*E:1>	Enable integrated navigation (E:1 to enable, E:0 to disable)
<SPGD*P:GDGPS*N:5>	Set terminal axis orientation (Default: orientation 5)
<SPGD*P:GDGPS*X:1*Y:1*Z:1>	Lever arm configuration. Fill in X, Y, Z offset error (in meters) from the terminal to primary antenna

After configuring the above commands, the device's power must be

disconnected and reconnected for the settings to take effect.

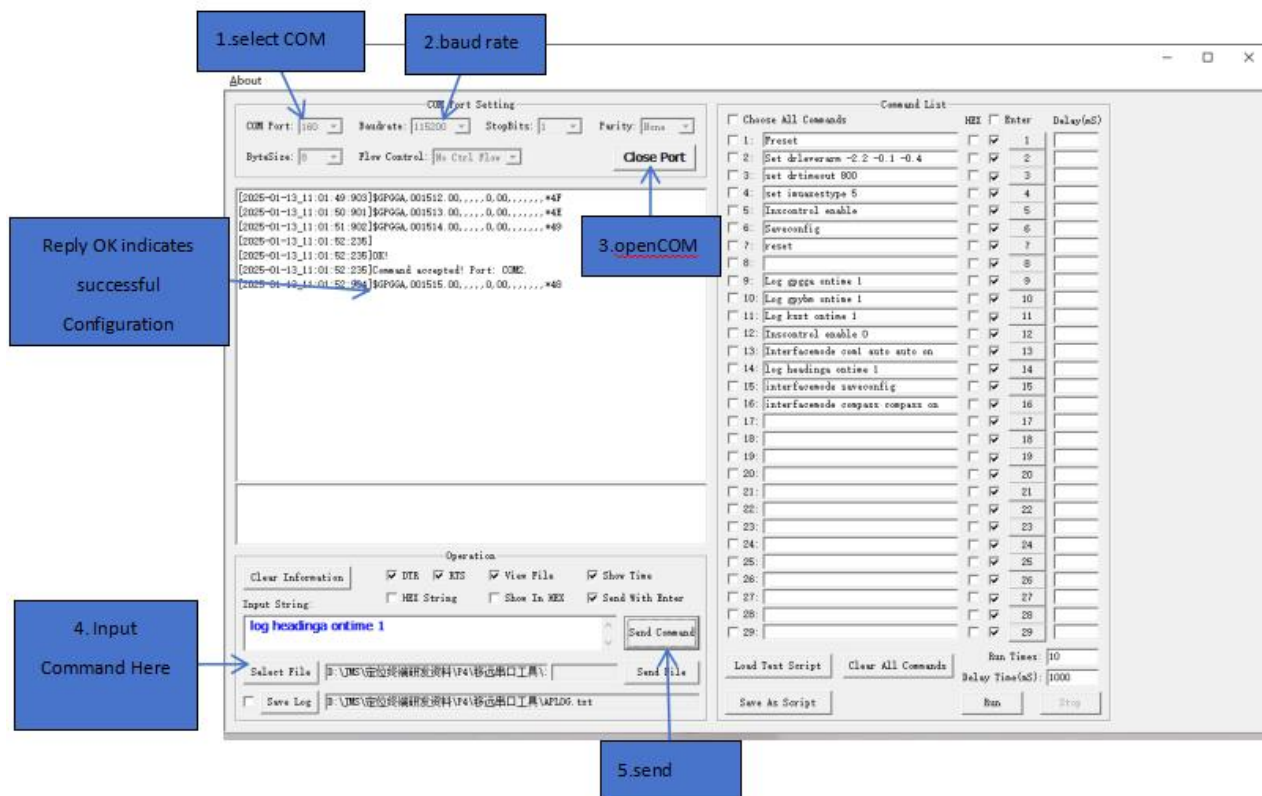
Note: The axis orientation parameter must not be configured incorrectly; otherwise, the latitude and longitude output by the integrated navigation will be abnormal.

10.8 Configuring GNSS Serial Port to Output NMEA Protocol

A. The device's yellow and orange wires are the GNSS serial port (Baud rate 115200). If connect to a PC, need to use an RS232-to-USB cable. Pinout Details refer to "Table 1: Aviation Connector Pinout Definition".

B. Command configuration:

LOG COM1 GPGGA ONTIME 1 \n\r	Latitude/Longitude sentence
LOG COM1 GPYBM ONTIME 1 \n\r	Attitude sentence
LOG COM1 SYSRTS ONTIME 1 \n\r	Integrated navigation initialization status sentence
LOG COM1 GPGSV ONTIME 1 \n\r	
LOG COM1 GPRMC ONTIME 1 \n\r	
Unlogall \n\r	Clear all sentences
SAVECONFIG \n\r	Save commands



C.Message Structure Examples

报文结构 (ASCII) :

```
$GPGGA,024941.00,3110.4693903,N,12123.2621695,E,1,16,0.6,57.0924,M,0.00
0,M,99,AAAA*55
```

字段	结构	描述	样式	示例
1	\$GPGGA	报文头		\$GPGGA
2	utc	定位的 UTC 时间 (时/分/秒/小数秒)	hhmmss.ss	202134.00
3	lat	纬度 (DDmm.mmmmmmm)	IIII.IIIII	3110.4693903
4	latdir	纬度方向 (N: 北纬, S: 南纬)	a	N
5	lon	经度 (DDDmm.mmmmmmm)	yyyyy.yyyyyyy	12123.2621695
6	lon dir	经度方向 (E: 东经, W: 西经)	a	W
7	GPS qual	解状态 0: 初始化 1: GPS 定位 2: 码差分 (包含 SBAS 解) 4: RTK 固定解 5: RTK 浮点解 6: 组合导航结果 7: 人工输入固定值	x	1

报文结构（ASCII）：

\$GPYBM,SN00520429,070326.00,+31.170243388,+121.398934274,15.286,346.
840,1.290,0.000,-0.002,0.003,0.002,3449917.897,538032.213,-451.861,1088.741,4,4,
12,1,,,,*4B

字段	结构	描述	格式
1	\$GPYBM	报文头	
2	Serial NO.	设备序列号	SNxxxxxxxx,x=0-9
3	utc	UTC 时间（时/分/秒/小数秒）	hhmmss.ss
4	Lat	纬度，度	+：北纬，-：南纬 dd.ddd dddd ddd
5	Lon	经度，度	+：东经，-：西经 ddd.ddd dddd ddd
6	ElpHeight	椭球高	.xxx（m）
7	Heading	航向角	0-360° .xxx（度）
8	Pitch	俯仰角	-90~90° .xxx（度）
9	Vel N	北方向速度	.xxx（m/s）
10	Vel E	东方向速度	.xxx（m/s）
11	Vel D	地向速度	.xxx（m/s）
12	Vel G	地面速度	.xxx（m/s）
13	Coordinate Northing	高斯投影坐标 X 轴 参考 PTNL 和 PJL	.xxx（m）
14	Coordinate Easting	高斯投影坐标 Y 轴 参考 PTNL 和 PJK	.xxx（m）
15	North Distance	基站坐标系下的移动站 X 坐标（基站坐标为原点）	+：北，-：南 .xxx（m）

19	SVn	主站天线收星数	
20	Diff Age	差分延迟	
21	Station ID	基准站 ID	0000
22	Baseline length	主站和从站内之间的距离（双天线基线长）	.xxx（米）
23	Solution sv	从站参与解算的卫星数	
24	rolling	横滚角（仅带有惯导模块的板卡或整机支持）	.xxx（度）
25	*xx	校验值	*hh
26	[CR][LF]	语句终止符	

\$SYSRTS,184099.00,030809.00,34,35,,AT,45,92,1,4,50,44,88,1,4,47,44,92,53,M,ATR,0,,1,9,2217,,*1B

18	基站信噪比	0~100 (dB) 如基站差分数据为分包发送,此项会根据分包策略循环显示,“基站信号质量评分”和“基站搜星数”两项与此相同	xx	41
19	基站信号质量评分	0~100,空旷无遮挡和干扰环境下,评分≥85	xx	85
20	基站搜星数	0~256	xx	48
21	提示符	M		M
22	场景模式	Survey、Robot、Car、Air、Space	X	Survey
23	电离层活跃指数	0~200 (mm) >50 表示当前电离层较为活跃	x	0
24	干扰指示	0: 无干扰、1: 有干扰	x	
25	欺骗指示	0: 无干扰、1: 有干扰	x	
26	IMU 开关	0: IMU 关闭; 1: IMU 打开,初始化不成功; 2: IMU 打开,初始化成功; 3: IMU 打开,且组合状态安置角估算完毕,进入车辆运动学约束模型;	x	0
27	系统时间指示	0~9 0 表示系统时间不可用,1 表示系统时间正在调整中,可用但不稳定,9 表示系统时间稳定可用	xx	9

Status value = 3 indicates successful calibration.

11. Troubleshooting

Phenomenon	Cause analysis	Method
Device not on line	SIM card out of credit/suspended	Contact network operator to pay the bill
	Poor SIM card contact	Reinstall the SIM card
	Incorrect setting of on-line parameters	Refer to the manual 10.4 to reset the parameters.
	SIM card locked	Contact network operator to unlock
	Vehicle in underground parking lot or	Leave the area with poor signal

	tunnel with weak signal	
	Changing device may cause SIM lock	Contact network operator to unlock
Device unable to locate	Vehicle in underground parking lot, garage, tunnel Move to an open area	Move to an open area
	Antenna not installed/antenna face not pointing upwards	Re-adjust antenna position
Unable to Get Fixed Solution	SIM card out of credit/suspended	Contact network operator to recharge
	Poor SIM card contact	Reinstall the SIM card
	Incorrect RTK account settings	Refer to section 10.3 for configuration.
	Incorrect RTK mount point configuration	Use the WGS84 coordinate system mount point by default.

12. A12 Series Comparison

Model No.	Positioning Solution	Others
A12	Multi-Constellation & Multi-Band	Default version
A12 Pro	Multi- Constellation & Multi- Band	Upgraded IMU accuracy, supports roll angle
A12 mini	Dual Band	Supports Ethernet port