Instruction Manual for BP4 Portable Base Station

1. Product Overview

The BP4 Portable GNSS Base Station is a high-performance, multi-functional portable base station suitable for long-term continuous operation. Based on a full-system, full-frequency RTK engine and supporting 4G, Wi-Fi, Bluetooth, and LoRa/FSK wireless data links, it can serve as:

- CORS Network Base Station
- Wireless Differential Base Station (LoRa / FSK)
- Dynamic base station dedicated to drone return
- IMU Fusion Positioning / Tilt Measurement Base Station (Optional)
- PPK/Static PPP Measurement Equipment (Optional)

BP4 is equipped with**an automatic coordinate calibration system**, which solves the coordinate drift problem caused by the daily non-fixed installation position of the base station and ensures long-term consistency of measurement coordinates.

2. Product Use

1. CORS base station or portable wireless base station
2. Drone Automatic Return Dynamic Base Station
3. Integrated positioning or tilt measurement base station (customizable) equipped with IMU
4. PPK or static PPP measurement (customizable)

3. Software Features

1. **RTCM Data Upload**
    - Upload via 4G / WiFi
    - Supports NTRIP/MQTT protocols
2. **Wireless Differential Broadcast**

- Built-in LoRa or FSK data transmission module
- Independent offline use, suitable for field measurements and drone systems

3. **Optional Rover Station mode**
   - Supports IMU fusion positioning
   - Supports tilt compensation (custom feature)
4. **Automatic Coordinate Calibration System**
   - Automatically apply for a differential account (within China)
   - Automatically complete RTK fixing and calculate the 1-minute coordinate average
   - Calibration failure automatically falls back to autonomous positioning coordinates
   - Supports professionals to configure "designated coordinates"

4. Base Station Workflow

1. Power On and Positioning

- After the base station is powered on, it first performs autonomous GNSS positioning
- The next calibration process will only be carried out after successful autonomous positioning

2. Automatically apply for a differential account (six-point service)

- If the SIM card is determined to be from a domestic carrier → automatically apply
- Automatically skip the calibration process when outside the country

3. RTK Automatic Calibration Process

1. Obtain Account → Enter RTK Mode
2. Continuously collect coordinates for 1 minute after RTK is fixed
3. Take the average coordinates → Write as "Base Station Working Coordinates"
4. Screen display: **"RTK Calibration"**

4. Exception handling logic

Situation	Behavior
Unable to fix within 5 minutes	Calibration failed → Use autonomous positioning coordinates
Network error / No account	Use self-positioning coordinates
Move within a few meters of the installation point	Continue to use the coordinates from last time
Experts write coordinates through the App	is displayed as "Specified Coordinates"

5. Account release mechanism

- Calibration successful → Release immediately upon completion of calibration
- Calibration failed → Automatic release without fixation for over 5 minutes
- The backend has a timeout recycling mechanism (10 minutes)
- Ensure that the account will not be occupied for a long time

5. Interface Display and Interaction

- **Show coordinate source**

Screen Display	Explanation of Coordinate Source
Locating	Autonomous positioning in progress
Auto calibration in progress	Applying for an account / Calibrating
RTK Calibration	has calculated the reference coordinates via RTK
Autonomous Positioning	Calibration failed, using autonomous positioning
Specify Coordinates	Professionals manually input coordinates

6. Usage Method

1. Base Station Installation Steps

- Install and secure the device using a tripod
- If using an external antenna, connect the GNSS antenna to the TNC interface
- Install the data transmission antenna (if wireless differential is required)
- Wait for positioning / calibration to complete after power-on

2. Three main working modes

① Wireless Differential Base Station (LoRa / FSK)

- The receiver does not require a network
- Suitable for field operations, drone return, and engineering work

② MQTT Network Base Station

- Upload RTCM via 4G/WiFi
- Client RTK subscribes via MQTT
- Low latency, high stability

③ NTRIP Network Base Station

- can serve as Caster, Client
- Compatible with various RTK receivers

7. Status Description and Prompt

Status	Instructions	What should the user do?
Locating	Insufficient satellites or not yet converged	Wait or adjust the antenna to ensure no obstruction
Auto calibration in progress	Getting Account/ Calibrating	No operation required
RTK Calibration	Coordinates have been successfully calibrated	Can operate normally
Autonomous Positioning	Failed to calibrate successfully	Coordinates may differ from the previous day
Specify Coordinates	User-defined coordinates	For professional use only

IX. Safety Precautions

1. When setting up outdoors, ensure that the tripod is stable
2. Do not use in areas with strong radiation or high voltage
3. Avoid long-term exposure to rain, even though the equipment is IP65
4. Users are prohibited from disassembling the hardware
5. Built-in battery (if optional) should be maintained and charged monthly

10. Hardware Specifications

GNSS Performance	
Positioning System	Full system, all frequency points
satellite frequency point	BDS： B1I、BIC、B2I、B2a、B2b、B3I GPS： LIC/A、LIC、L2、L5 GALILEO： E1、E5a、E5b、E6 GLONASS： G1、G2 QZSS： LIC/A、LIC、L2、L5 NavIC： L5 SBAS: LIC/A
RTK accuracy	Plane: 0.7cm + 1ppm Elevation: 2cm + 1ppm
Time taken for first positioning	Cold start: <30s
RTK initialization time	<5s
RTK Initialization Reliability	>99.9%
Data transmission performance	
Operating Frequency	410-470 MHz
carrier power	1.5W or 0.5W
Modulation Mode	GFSK/4FSK
Protocol Version	Transmission protocols such as SOUTH, TRIMTALK TRANSEOT, TRIMMARK3, SATEL, etc.
airspeed	9600bps、19200bps
Physical Specifications	
Show	1.54-inch, color high-brightness TFT-LCD
Support rod thread	5/8-11
External Interface	Aviation Connector, TNC RF Connector, Type-C Interface
Protection Class	IP65
Power Supply	
External power supply	12V
Environmental suitability	
Operating Temperature	-20°C ~70°C
Storage Temperature	-30°C ~85°C