AK968

Dalang Communication Technology Co., Ltd Product Specification

Product Name:	GNSS Receiver
Product Model:	AK968
Version Number:	V 1.0
Revision Date:	2024.05.23

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1 Product Application Scenarios

Our company's AK968 Beidou/GPS/Galileo/GLONASS Quad-Constellation Dual-Frequency RTK Integrated Module is a low-cost, low-power, high-performance real-time dynamic differential positioning module. Utilizing its highly reliable carrier phase differential technology, it provides real-time centimeter-level positioning accuracy for UAVs, automobiles, and surveying users. The module can be configured to operate in "Rover" or "Base Station" mode, eliminating various measurement errors through common view observation and outputting high-precision positioning results. When configured as a "Base Station," it can output RTCM2.x/3.x standard data streams, compatible with commercial rovers, and provide network RTK reference designs. When configured as a "Rover," it supports RTCM2.x/3.x differential data formats, can connect to other base stations or the National BeiDou Ground-Based Augmentation System, and offers static relative positioning accuracy of <1 cm, medium dynamic relative positioning accuracy of <2 cm, with an output rate of 1-10Hz. This module is highly cost-effective and suitable for various applications. See Figure 1for details.

Figure 1 Product Application Scenarios

2 Features

In this chapter, we will delve into and comprehensively elaborate on the functionalities and operating principles of the AK968, detailing how it plays a pivotal role in various applications as follows:

1.**Advanced Positioning Core:** The AK968-IST is designed based on the advanced U-blox F9P module, which maintains stable and high-precision positioning performance even under extreme environmental conditions, ensuring reliability and accuracy in challenging situations.

2. Multi-System Satellite Support: The device supports real-time kinematic (RTK) calculations with the four major global satellite navigation systems: BeiDou, GPS, Galileo, and GLONASS. This multi-mode integration significantly enhances the speed and accuracy of positioning calculations, providing fast and reliable positioning initialization.

3. High-Frequency Data Output: Supports data update rates up to 10Hz, meeting the dynamic data processing needs of high-speed moving environments, such as drones during flight missions, and ensuring the coherence and timeliness of data transmission.

4. Broad System Compatibility: Fully compatible with mainstream automatic flight control systems like Pixhawk and APM, allowing for easy integration into various drone systems without the need for cumbersome system matching adjustments.

5. Optimized Antenna Design: The built-in combination of 40*40*4 and 50*50*4 antennas provides high gain and precise output, greatly enhancing interference resistance in complex environments.

6. Industrial Grade RF Circuit: Features an industrial-grade low-noise RF circuit design that enhances suppression of multipath interference, ensuring clear and accurate signals in variable environments.

7. High-Precision Magnetic Compass: Integrates an industrial-grade iSentek IST8310 magnetic compass, offering additional directional positioning support and enhancing the overall accuracy and stability of the navigation system, particularly in angle and direction measurement.

3 Structural Characteristic

In this section, we will conduct an in-depth analysis of the product's design details, presenting its aesthetic features and precise interface specifications through detailed structural diagrams. This perspective aims to provide a comprehensive framework, thereby enhancing the understanding and perception of the product's architecture. Refer to Figure 2,Table 1.

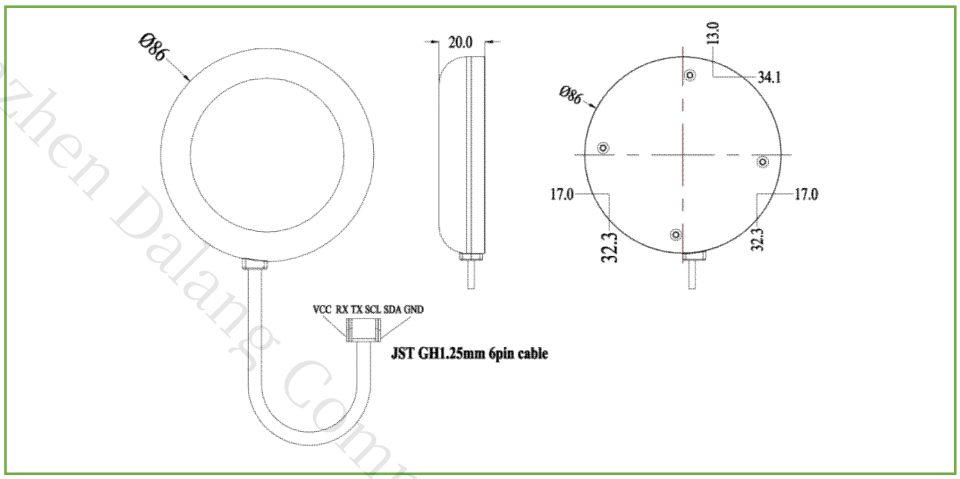


Figure 2 Schematic Diagram

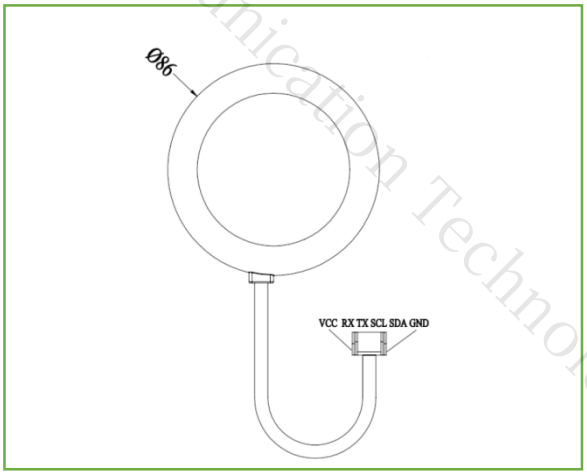


Table 1 PIN Function

No.	Name	Signal Description
1	VCC	Main power input, +3.3V~5V
2	RX	Receive – This pin is used in serial communication to receive data from another device.
3	TX	Transmit – This pin is used in serial communication to send data to another device.
4	SCL	Serial Clock – In the I²C communication protocol, this is the clock signal line used to synchronize data transmission.
5	SDA	Serial Data – In the I²C communication protocol, this is the line used for data transmission.
6	GND	Ground pin, used for connecting to the circuit's ground, providing the reference voltage needed for the circuit loop.
Note: Typically, VCC and GND are used to supply power, TX and RX are used for serial communication, and SCL and SDA are used for I²C communication. These interfaces allow the receiver to supply power and exchange data with external devices.		

4 Specifications

In this section, we will provide a detailed list and explanation of the product's chip features, sensitivity, accuracy, operating principles, and other technical details, as detailed in Table 2.

Table 2 Product Specifications

Chip characteristics	chip	UBLOX-F9P
	working frequency	BDS: B1 B2 GPS: L1 L2 GLONASS: G1 G2 GALILEO: E1 E5b QZSS: L1 L2
	Receiving channel	184 search channel
Sensitivity	track	-167 dBm
	Re capture	-160 dBm
	cold boot	-148 dBm
	Hot start	-157 dBm
First positioning time TTFF	cold boot	26s
	Hot start	2s
	Re capture	2s
Accuracy	RTK horizontal accuracy	0.01 m + 1 ppm CEP
	RTK vertical accuracy	0.01 m + 1 ppm CEP
	Single point horizontal accuracy	1.5m CEP
	Single point vertical accuracy	1.5m CEP
	Speed accuracy	0.05m/s
	1PPS time accuracy	RMS 30ns
		99% 60ns
Convergence time	Convergence time	≤10s
Output data	Baud rate	38400bps (default) [Optional: 4800-921600]
	Output interface	TTL
	Output Protocol	NMEA0183，RTCM 3.3，UBX
	update frequency	Default 1Hz (0.25Hz-10Hz)

	Carrier phase output	Support, output RAWX statement
	FLASH	built-in
Working conditions	height	＜50,000m
	speed	500m/s
	Gravitational acceleration	≤4g
Environment	working temperature	-35℃+80℃
	Storage temperature	-40℃-+85℃
Electrical specifications	working voltage	3.3V-5V DC
	power waste	＜180mW @3.3V
Physical parameters	size	Φ86*22mm
	weight	145g
	Connector	GH1.25 6pin self-locking connector
Compass	Compass	IST8310

5 Product Photos

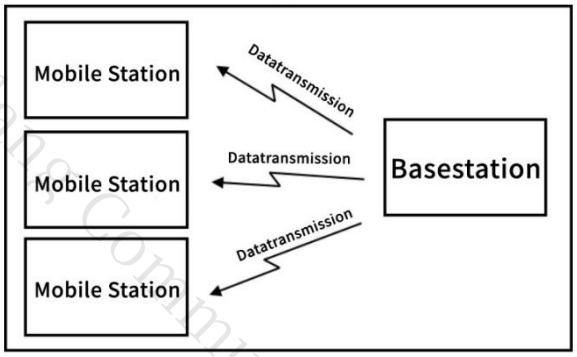
In this chapter, we will showcase real-life images of the product, as shown in Figure 4. These images provide a detailed view of our product from various angles and perspectives. We believe that through authentic representation, we can better convey the value and concept of the product, thereby enhancing your trust and satisfaction.

Figure 4 Product Images

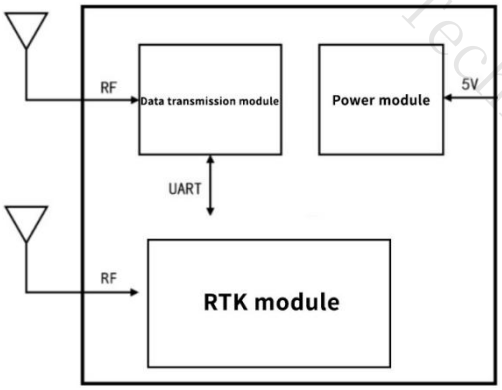
6 Typical applications

6.1 Application of high-precision positioning for medium and short distances

In high-precision positioning applications for medium to short distances (<3km), the module can be combined with a data transmission module to form a complete high-precision positioning system with only a small amount of external circuits. It is suitable for applications with a large number of mobile stations in a small range, and the module is fully compatible with other automatic flight control systems such as Pixhawk and APM. The schematic diagram is as follows:



The reference station is stationary and fixed, and differential data is broadcasted to all mobile stations through a data transmission module. The circuit diagrams of the mobile station and the reference station are as follows:



3) If the antenna coordinates have been accurately determined through other surveying methods, please use the # set position command to input the antenna coordinates into the reference station module in latitude, longitude, and altitude format;

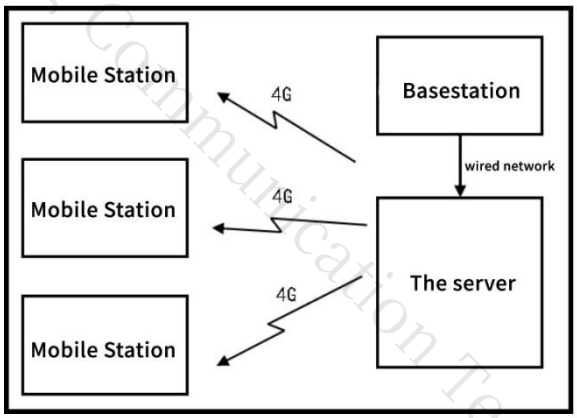
4) If the antenna coordinates are unknown, please wait patiently for about 5 minutes. The module will calculate the antenna position as accurately as possible. After the calculation is completed, the differential data port will begin to output data. At this point, the base station has already recorded the coordinates and broadcasted them wirelessly to ensure that the base station do

es not lose power, as the coordinates will be recalculated after a power outage and the repeata bility of the mobile station measurement points cannot be guaranteed;

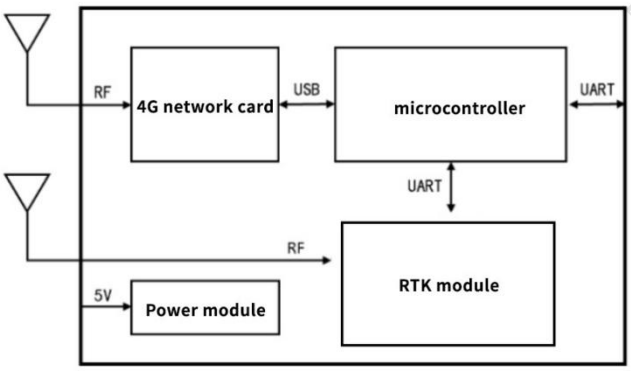
5) Install the mobile station antenna on the mobile carrier, confirm receipt of differential data, and wait for about 120 seconds to obtain high-precision positioning results.

6.2 Application of Medium to Long Range High Precision Positioning

In the application of high-precision positioning over medium to long distances (<10km), com mon data transmission modules are difficult to provide reliable differential data connections a nd suffer from serious packet loss problems. For this purpose, the company provides a solutio n based on 4G network (as shown in the figure below). The benchmark station sends differenti al data to the server through a wired network and is cached by the server. Mobile stations acce ss servers through 4G networks to obtain differential data. This solution can greatly expand th e coverage area of base stations, and mobile stations equipped with 4G network cards can sim ultaneously transmit positioning results back to designated servers.



The circuit diagram of the mobile station is as follows:



In practical applications, the number of mobile stations that a server can access simultaneousl y is limited only by server performance and is more suitable for a large number of users. Requ irements between the server and the base station: the server can be directly accessed from the

public network (with a public IP address), and a network connection can be established betwe en the base station and the server (either through the public network or local area network).

6.3 High precision positioning application without reference station

In high-precision positioning applications without reference stations, the module needs to coo perate with the 4G communication module to obtain differential data. We provide Qianxun wi th differential data sources nationwide, and users can obtain high-precision positioning results without deploying base stations. The circuit diagram is as follows: