AK727

大朗通信科技有限公司

Dalang Communication Technology Co., Ltd Product Specification

Product Name:	GNSS Receiver
Product Model:	AK727
Version Number:	V 1.0
Revision Date:	2024.05.22

大朗通信科技有限公司

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1 Product Application Scenarios

The AK727 module employs a full-system, full-frequency RTK engine, providing real-time centimeter-level differential positioning accuracy, suitable for UAVS, automobiles, and surveying applications. The module supports both "Rover" and "Base Station" modes, utilizing carrier phase differential technology to accurately eliminate various errors, achieving high-precision positioning. In Base Station mode, it outputs data streams that conform to RTCM2.x/3.x standards, compatible with most commercial rovers, and supports network RTK reference designs. In Rover mode, it is compatible with RTCM2.x/3.x data formats, capable of connecting to various base stations or the National BeiDou Ground-Based Augmentation System. This module achieves static positioning accuracy as low as 1 cm and dynamic positioning accuracy as low as 2cm, with an output rate of 1-10Hz, balancing high performance and cost-effectiveness. 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 AK727, detailing how it plays a pivotal role in various applications as follows:

1.Advanced Positioning Core: The AK727 is designed based on the advanced U-blox F9P module, ensuring stable and high-precision positioning performance even under extreme environmental conditions, thus guaranteeing reliability and accuracy in challenging situations.

2.Multi-System Satellite Support: This device supports real-time dynamic RTK (Real-Time Kinematic) solutions from four global satellite navigation systems:BeiDou,GPS,Galileo,and GLONASS. This multi-mode feature significantly enhances the speed and accuracy of positioning solutions, providing fast and reliable initialization capabilities.

3.High-Frequency Data Output: The AK727supports up to a 10Hz data update rate, meeting the dynamic data processing needs in high-speed moving environments, such as UAVs during flight missions, ensuring the continuity and timeliness of data transmission.

4.Extensive System Compatibility: Fully compatible with mainstream autopilot systems like Pixhawk and APM, the device can be easily integrated into various UAV systems without the need for complex system adjustments.

5.Optimized Antenna Design: The built-in four-arm helical antenna balances weight and performance with a lightweight design, while providing high gain and high precision output. It
also significantly enhances anti-interference capabilities in complex environments.

6.Industrial-Grade RF Circuit: Employing industrial-grade low-noise RF circuit design, the AK727-F9P strengthens multipath interference suppression, ensuring clear and accurate signals even in variable environments.

7.High-Precision Magnetometer: Integrated with the industrial-grade iSentek IST8310 magnetometer, the device provides additional directional positioning support, enhancing the overall accuracy and stability of the navigation system, especially in angle and direction measurements.

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.

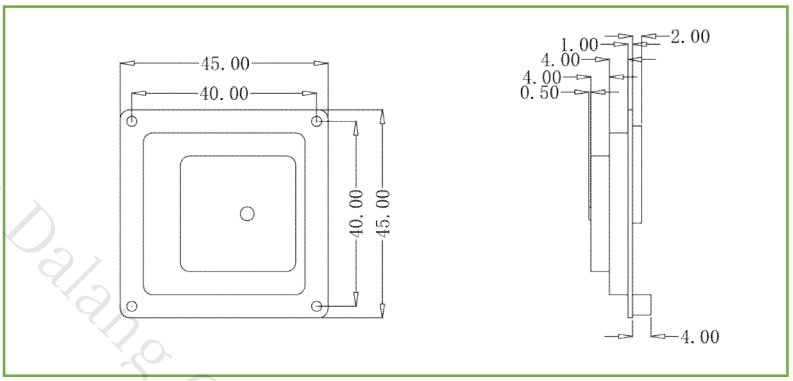


Figure 2 Schematic Diagram

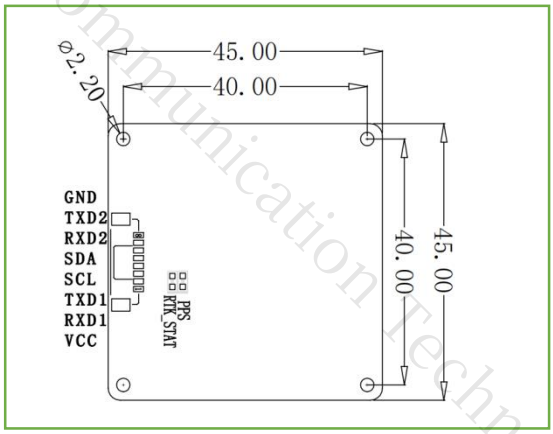


Table 1 PIN Function

NO.	Signal Name	Signal Description
1	VCC	Main power supply input, +3.3V to +5V
2	RXD1	First serial receive data pin, used for receiving serial date streams.
3	TXD1	First serial transmit data pin, used for receiving serial date streams.
4	SCL	Clock line in the l2C communication protocol, used for synchronizing data transfer.
5	SDA	Data line in the l2C communication protocol, used for bidirectional data transfer.
6	RXD2	Serial receive data pin, similar to RXD1, used for receiving another serial data stream.
7	TXD2	Serial transmit data pin, similar to TXD1, used for sending another serial data stream.
8	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 for power supply, TX and RX are used for serial communication, while SCL and SDA are used for I²C communication. These interfaces allow the receiver to exchange power supply and 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
Electrical specifications	working voltage	3V-5.5V DC
	power waste	＜180mW @3.3V
Physical parameters	size	Φ45*45MM
	weight	35.8g
	Connector	GH1.25mm 8-pin
Environment	working temperature	-35℃+80℃
	Storage temperature	-40℃-+85℃
Compass	Campass	IST8310

5 Product Photos

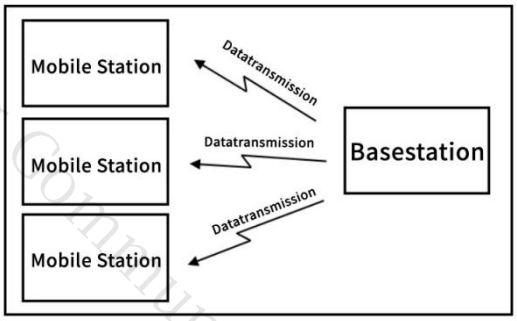
In this chapter, we will showcase real-life images of the product, as shown in Figure 4. These images provide a detailed view of our product from various angles and perspectives. We believe that through authentic representation, we can better convey the value and concept of the product, thereby enhancing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

Figure 4 Product Images

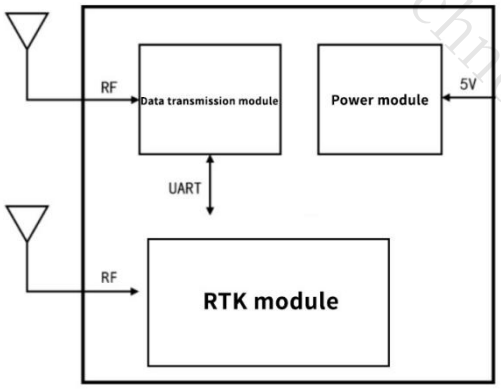
6 Typical Applications

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;

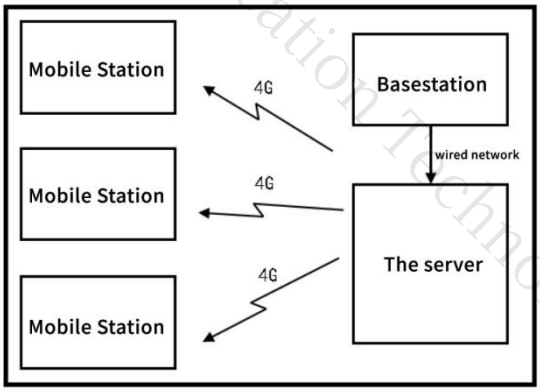
4) If the antenna coordinates are unknown, please wait patiently for about 5 minutes. The module will calculate the antenna position as accurately as possible. After the calculation is c

ompleted, 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 does not lose power, as the coordinates will be recalculated after a power outage and the repeatability of the mobile station measurement points cannot be guaranteed;

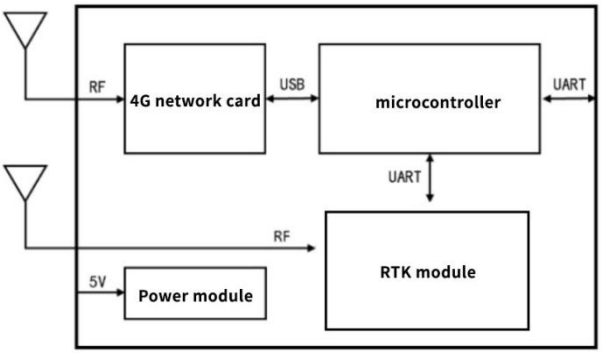
5) Install the mobile station antenna on the mobile carrier, confirm receipt of differential data, and wait for about 120 seconds to obtain high-precision positioning results.

6.2 Application of Medium to Long Range High Precision Positioning

In the application of high-precision positioning over medium to long distances (<10km), common data transmission modules are difficult to provide reliable differential data connections and suffer from serious packet loss problems. For this purpose, the company provides a solution based on 4G network (as shown in the figure below). The benchmark station sends differential data to the server through a wired network and is cached by the server. Mobile stations access servers through 4G networks to obtain differential data. This solution can greatly expand the coverage area of base stations, and mobile stations equipped with 4G network cards can simultaneously 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 simultaneously is limited only by server performance and is more suitable for a large number of users. Requirements 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 between 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 cooperate with the 4G communication module to obtain differential data. We provide Qianxun with differential data sources nationwide, and users can obtain high-precision positioning results without deploying base stations. The circuit diagram is as follows: