

# Dalang

## AK979P





**Dalang Communication  
Technology Co., Ltd  
Product Specification**

Product Name: GNSS Receiver

Product Model: AK979P

Version Number: V 1.0

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# 1 Product Application Scenarios

AK900P A high-performance GNSS RTK receiver boasting centimeter-level positioning accuracy, built-in 1W wireless radio and Bluetooth connectivity. It supports dual-band all-constellation tracking and mode switching between base station and rover, making it a reliable and efficient tool perfect for professional applications like drone operations, land surveying, and precision agriculture. Engineered with industrial-grade durability, it delivers consistent performance even in harsh outdoor environments.



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 K979P, detailing how it plays a pivotal role in various applications as follows:

- 1. Built in advanced full system full frequency GNSS module.**
- 2. Supports BDS, GPS, GLONASS, Galileo, and QZSS.**
- 3. Can be used as a base station or mobile station.**
- 4. Supports Bluetooth 2.0 full transparency function.**
- 5. Adopt on-board standard 9-36V wide voltage input.**
- 6. Adopt industrial grade 1W wireless radio module.**

### 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, Figure 3, Table 1, Table 2, Figure 4, Table 3.

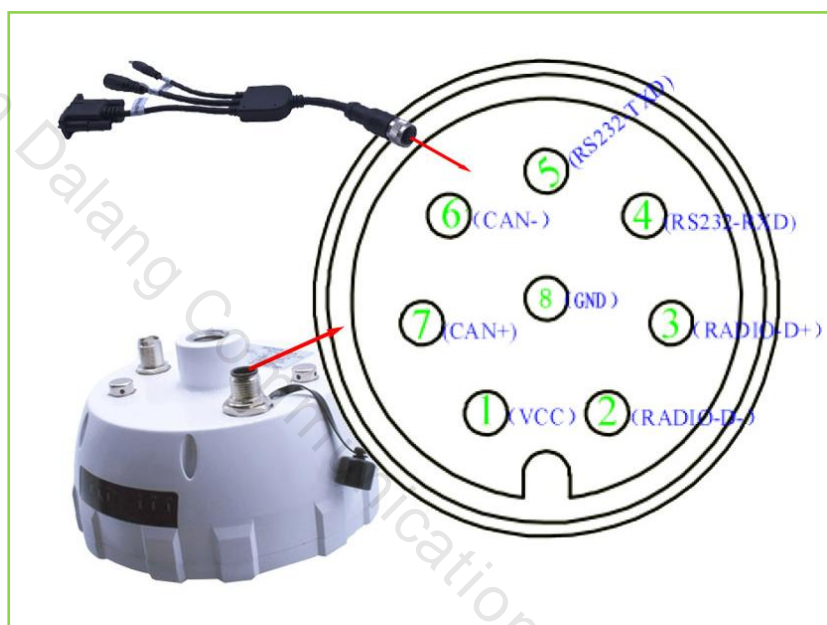


Figure 2 Structural Diagram (unit: mm)

Table 1 Interface Definition

M12-8P MALE Introduce		
NO.	Name	Function Description
1	VCC	Input voltage 9~36V (typically 12V), current 3A
2	RADIO-D-	Radio port USB D-
3	RADIO-D+	Radio port USB D+
4	RS232-RXD	GNSS module RS232 RXD
5	RS232-TXD	GNSS module RS232 TXD
6	CAN-	Not connected
7	CAN+	Not connected
8	GND	Circuit board ground



Figure3 Product Structure Diagram

Table 2 Indicator Light Display Definition

NO.	Name	Indicator Light Description
1	BT	Blue light (HC02)
2	RX	Data transmission
3	TX	Data reception
4	VCC	Power light. Red during normal operation
5	PPS	Green light flashes during positioning
6	SAT	RTK light. Light flashes when connected to RTK data



Figure4 Complete K979 schematic diagram

Table 3 Cable Connection Definition

NO.	Name	Function Description
1	Radio Antenna	Male SMA, receives and transmits 902~928MHz radio signals
2	Connecting	Cable 8-core aviation connector to Type C; DC-DC power supply; Female DB9
3	Receiver	Built-in GNSS module, radio module, Bluetooth module (HC02)
4	base	M90SD strong magnetic suction cup

## 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 4.

Table 4 Product Specifications

Specification parameters						
GNSS module	1	working frequency	BDS: B1I B2I B3I B1C B2a B2b GPS: L1 C/A L1C L2P (Y) L2C L5 GLONASS: L1 L2 Galileo: E1 E5a E5b E6 QZSS: L1 L2 L5 L6			
	2	Receiving channel	1408 channel			
	3	Single point positioning (RMS)	Plane: 1.5m			
			Elevation: 2.5m			
	4	DGPS(RMS)	Plane: 0.4m+1ppm			
			Elevation: 0.8m+1ppm			
	5	RTK(RMS)	Flat: 0.008m+1ppm			
			Elevation: 0.015m+1ppm			
	6	Observation accuracy(RMS)	BDS	GPS	GLONASS	Galileo
	7	B1I/B1C/L1C/L1 C/A/E1/G1 pseudorange	10cm	10cm	10cm	10cm
	8	B1I/B1C/L1C/L1 C/A/E1/G1 Carrier Phase	1mm	1mm	1mm	1mm
	9	B3I/L2P(Y)/L2C/G2 pseudorange	10cm	10cm	10cm	10cm
	10	B3I/L2P(Y)/L2C/G2Carrier Phase	1mm	1mm	1mm	1mm
	11	B2I/B2a/ B2b/L5/E5a/E5b pseudorange	10cm	10cm	10cm	10cm
	12	B2I/B2a/ B2b/L5/E5a/E5b Carrier Phase	1mm	1mm	1mm	1mm
	13	Time accuracy (RMS)	10ns			
	14	Speed accuracy (RMS)	0.03m/s			
15	cold boot	<10s				
16	Initialization time	<5s (typical value)				
17	Initialize reliability	>99.9%				
Radio module	1	Frequency range	902~928MHz			
	2	transmission mode	frequency hopping			

	3	Error Detection	32-bit CRC, optional retransmission and forward error correction	
	4	Distance	60 kilometers (maximum)	
	5	sensitivity	Link Rate	10-6BER 10-3BER
			57.6 kbps	-111 dBm -114 dBm
			115.2 kbps	-110 dBm -113 dBm
			172 kbps	-108 dBm -111 dBm
			230 kbps	-107 dBm -110 dBm
	276 kbps	-106 dBm -109 dBm		
	6	Transmission power	100mW to 1W (20-30dBm)	
	7	Link speed	Up to 276 kbps	
8	Serial Port Baud Rate	Up to 230.4 kbps		
9	working voltage	DC5.0~36V		
10	Working current	1~500mA/12V		
<b>Data format</b>	1	Differential data	RTCM3.X	
	2	Output format	NMEA-0183, RTCM3.X	
	3	Data update rate	1Hz, 2Hz, 5Hz, 10Hz, 20Hz	
<b>Interface</b>	1	Radio interface	TNC ports	
	2	Data and power interface	8-core LEMO ports	
	3	bluetooth interface	2.0 full transparency	
<b>Data format</b>	1	Differential data	RTCM3.X	
	2	output format	NMEA-0183, RTCM3.X	
	3	Data update rate	1Hz-20Hz(default 1Hz)	
<b>Power supply</b>	1	Power Supply	DC +9V ~ +36V	
	2	power waste	<3W	
	3	indicator light	1 power light, 1 satellite light, 1 differential light	
<b>Physical parameters</b>	1	size	138mm * 23mm * 90mm	
	2	weight	1kg	
	3	Shell material	ABS+PC+UV	
<b>Environmental Specifications</b>	1	working temperature	-40°C ~ +70°C	
	2	Storage temperature	-55°C ~ +85°C	
	3	humidity	100% fully sealed, anti condensation	
	4	Protection grade	IP67	
	5	Seismic resistance	Resist the impact of a 1-meter free fall	

## 5 Product Photos

In this chapter, we will showcase real-life images of the product, as shown in Figure 5. 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.

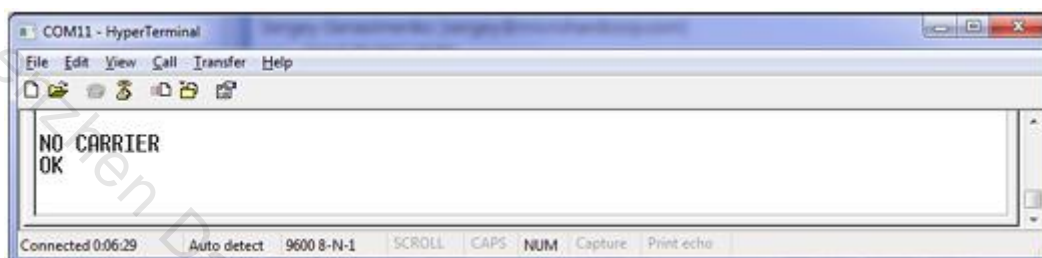


Figure 5 Product Images

## 6 Common configuration methods

There are two methods to enter the setup mode for AK979P:

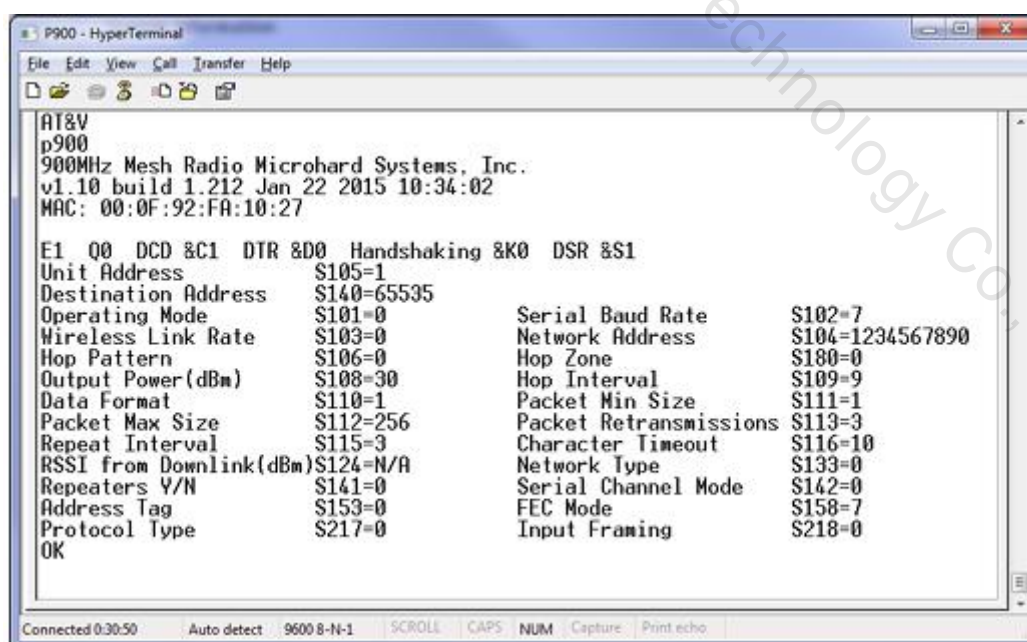
1. Open the serial port, configure the baud rate to 9600, press and hold the CONFIG button to power on, release the CONFIG button, and after powering on, the terminal session window should display "NO CARRIER OK", as shown below:



AK979P is currently in command mode and can be configured or queried using AT commands. AT&V will display the current configuration and can use AT&V=? Command, where XX X=register number. Using AT&V=? Command.

After making any changes, send the AT&W command to save the modifications.

2. Pause for 1 second after power on, then enter "+++" (no carriage return or line break) on the serial port, pause for another 1 second, and the serial port responds with "NO CARRIER OK". The P900 is now in command mode and can be configured or queried using the AT command. As shown in the figure, enter the AT&V command to query the current configuration, as shown below: (The displayed data varies depending on the network and device type).



Exit from setup mode and enter data mode with input command: 'ATA (with carriage return and line break)'

Note: Use the first method to enter the setting mode with a baud rate of "9600", and use the second method to enter the baud rate as the original configuration baud rate. All commands except for the "+++" command do not have a carriage return line break, and all other commands need to add a carriage return line break. After configuration is complete, unplug the TYPE-C data cable, and the terminal serial port will automatically switch back to the working serial port.

### AK979P Configuration Commands

ATS101=0 - Master Station

ATS101=1 - Repeater

ATS101=2 - Slave Station

AT&F7 - Point-to-Multipoint Master

AT&F8 - Point-to-Multipoint Slave

AT&F9 - Point-to-Multipoint Repeater

AT&F10 - Point-to-Point Master

AT&F11 - Point-to-Point Slave

AT&F12 - Point-to-Point Repeater

### Example: Configuring Host Mode

#### AT&F7 Point to Multipoint Master

```

P900 - HyperTerminal
File Edit View Call Transfer Help
AT&F7
OK
AT&W
OK
AT&V
p900
900MHz Mesh Radio Microhard Systems, Inc.
v1.10 build 1.212 Jan 22 2015 10:34:02
MAC: 00:0F:92:FA:10:27
E1 Q0 DCD &C1 DTR &D0 Handshaking &K0 DSR &S1
Unit Address          S105=1
Destination Address   S140=65535
Operating Mode        S101=0
Wireless Link Rate    S103=0
Hop Pattern           S106=0
Output Power(dBm)     S108=30
Data Format            S110=1
Packet Max Size       S112=256
Repeat Interval       S115=3
RSSI from Downlink(dBm) S124=N/A
Repeaters Y/N         S141=0
Address Tag           S153=0
Protocol Type         S217=0
Serial Baud Rate      S102=7
Network Address       S104=1234567890
Hop Zone              S180=0
Hop Interval          S109=9
Packet Min Size       S111=1
Packet Retransmissions S113=3
Character Timeout     S116=10
Network Type          S133=0
Serial Channel Mode   S142=0
FEC Mode              S158=7
Input Framing         S218=0
Connected 1:10:58   Auto detect 9600 8-N-1 SCROLL CAPS NUM Capture Print echo

```

- A) AT&F7- Set the factory default values for point to multipoint master stations.
- B) AT&W - Save Configuration.
- C) AT&V - Query current configuration.
- D) Each unit in a point to multipoint network must have a unique unit address. Automatically set to 1, should not be changed.
- E) The default destination address for the 140-PMP network is 65535, which means that data is broadcasted from the master device to all other devices.
- F) The operation mode defines the device type and is set to 0, which is the main mode.
- G) The wireless link rate must be set to the same value for each unit in the system. Higher link rates may lead to higher throughput, but typically lower link rates provide better sensitivity and overall robustness.
- H) S133- For point to multipoint operations, the network type must be set to 0. The content displayed by AT&V commands will vary depending on the network type.
- I) The serial baud rate (and data format S110) must match the baud rate of the connected device.
- J) S10- Each unit in the network must have the same network address. This is a strong recommendation not to use the default setting 1234567890. To change the network address, you can use the AT S104=XXXXXXXX command.
- K) This register is used to inform the master device whether there is one or more repeaters in the system. This only applies to the primary radio equipment..

Whenever a register changes, AT&W must be used to save the configuration

After completing the setup, issue the ATA command to exit the setup and disconnect the TYP E-C configuration cable.

**slave mode:****AT&F8 Point to Multipoint Slave**

```

AT&F8
OK
AT&V
p900
900MHz Mesh Radio Microhard Systems, Inc.
v1.10 build 1.212 Jan 22 2015 10:34:02
MAC: 00:0F:92:FA:10:27

E1 Q0 DCD &C1 DTR &D0 Handshaking &K0 DSR &S1
Unit Address S105=2
Destination Address S140=1
Operating Mode S101=2
Wireless Link Rate S103=0
Hop Pattern S106=0
Output Power(dBm) S108=30
Data Format S110=1
Packet Max Size S112=256
Repeat Interval S115=3
Roaming S118=1
Network Type S133=0
Sleep mode S143=0
FEC Mode S158=7
Input Framing S218=0
Serial Baud Rate S102=7
Network Address S104=1234567890
Hop Zone S180=0
Hop Interval S109=9
Packet Min Size S111=1
Packet Retransmissions S113=3
Character Timeout S116=10
RSSI from Uplink(dBm) S123=N/A
Serial Channel Mode S142=0
Address Tag S153=0
Protocol Type S217=0
Sync timeout S248=512
OK

```

- A) AT&F8- Factory default values for setting point to multipoint slave devices.
- B) AT&W - Save Configuration.
- C) AT&V - Query Configuration.
- D) In point to multipoint networks, each unit must have a unique unit address. The address of the remote station will be automatically set to 2. If multiple slave stations are added, this address needs to be modified for each added unit.
- E) The destination address is the final destination to which all data will be sent. In a point to multipoint network, the address is set to 1, which is the unit address of the main station and should not be changed.
- F) The operation mode defines the device type and is set to 2, which is the slave (remote).
- G) The wireless link rate of each device in the S10 system must be set to the same value.
- H) S133- For point to multipoint operations, the network type must be set to 0.
- I) The serial baud rate (and data format S110) of 102 must match the baud rate of the connected device.
- J) S10- Each unit in the network must have the same network address. To change the network address, you can use the AT S104=XXXXXXX command.
- K) Normally, this register is set to the main device's frequency hopping mode (106), or if the device is to communicate through a relay, it is set to match the auxiliary frequency hopping mode (S206).
- L) S118- If the slave station is connected through a relay, please enter the unit address of the relay here. Or set it to 65535 for roaming.

## Relay Mode:

### AT&F9 Point to Multipoint Repeater

```

P900 - HyperTerminal
File Edit View Call Transfer Help
AT&F9 A
OK
AT&W B
OK

AT&V C
p900
900MHz Mesh Radio Microhard Systems, Inc.
v1.10 build 1.212 Jan 22 2015 10:34:02
MAC: 00:0F:92:FA:10:27

E1 00 DCD &C1 DTR &D0 Handshaking &K0 DSR &S1
Unit Address D S105=3
Destination Address E S140=1
Operating Mode F S101=1 Serial Baud Rate I S102=7
Wireless Link Rate G S103=0 Network Address J S104=1234567890
Hop Pattern K S106=0 Secondary Hop Pattern L S206=1
Hop Zone S180=0 Secondary Zone S181=0
Output Power(dBm) S108=30 Hop Interval S109=9
Data Format S110=1 Packet Min Size S111=1
Packet Max Size S112=256 Packet Retransmissions S113=3
Repeat Interval S115=3 Character Timeout S116=10
Roaming S118=1 RSSI from Uplink(dBm) S123=N/A
RSSI from Downlink(dBm) S124=N/A Network Type H S133=0
Serial Channel Mode S142=0 Address Tag S153=0
FEC Mode S158=7 Protocol Type S217=0
Input Framing S218=0 Sync timeout S248=512
OK

```

- A) AT&F9- Set the factory default values for point to multipoint repeater devices.
- B) AT&W - Save Configuration.
- C) AT&V - Query Configuration.
- D) In point to multipoint networks, each unit must have a unique unit address. The address of the repeater will be automatically set to 3.
- E) The destination address is the final destination to which all data needs to be sent. In a point to multipoint network, the address is set to 1, which is the unit address of the main station and should not be changed.
- F) The S101-T operating mode defines the unit type, set to 1, which is the repeater.
- G) The wireless link rate must be set to the same value for each unit in the system.
- H) S133- For point to multipoint operations, the network type must be set to 0.
- I) The serial baud rate (and data format S110) of 102 must match the baud rate of the connected device.
- J) S10- Each unit in the network must have the same network address. To change the network address, you can use the AT S104=XXXXXXXX command.

K) S106- Normally, it should be set as the main device's frequency hopping mode (106), or if the device is to communicate through another relay, it should be set to match the device's auxiliary frequency hopping mode (S206).

L) S206- This is a secondary jump mode used for communication with downstream units.

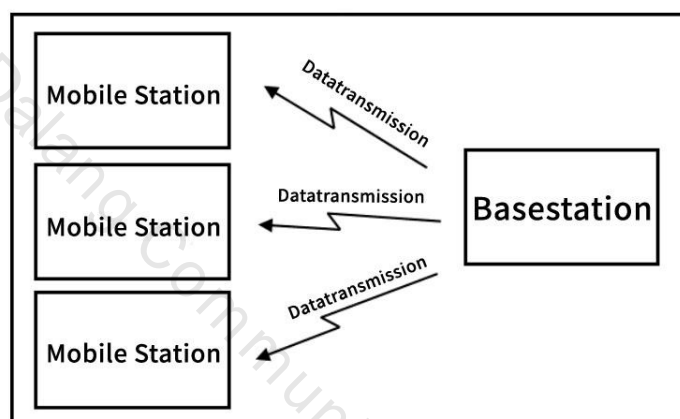
**The point-to-point mode configuration and point to multi mode of AT&F10/AT&F11/AT&F12 are basically the same.**

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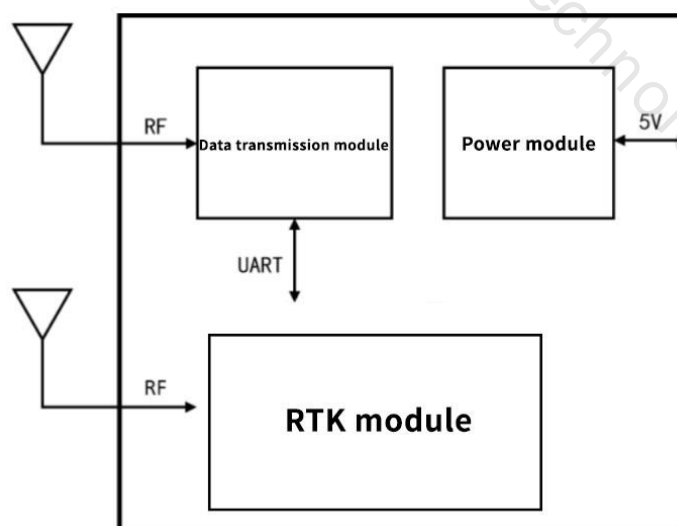
## 7 Typical applications

### Application of high-precision positioning for medium to 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 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.