EWM550-7G9T10SP User Manual

UWB Ranging and Positioning Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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1 Product Overview

1.1 Product Introduction



The EWM550-7G9T10SP is a brand-new domestically produced ultra-wideband (UWB) wireless ranging module launched by Chengdu Ebyte. It supports UART serial communication , data pass-through, and one-to-many bidirectional ranging. It operates by default in the 7737.2~8237.2MHz frequency band, i.e., the CH9 channel, with a center frequency of 7987.2MHz and a bandwidth of 499.2MHz .

The EWM550-7G9T10SP offers UART-based universal AT commands and flexible parameter configuration capabilities. Users can configure various parameters of the module according to their needs. It is suitable for meeting customers' requirements for high-precision ranging, tracking management, and other applications.

1.2 Features and Functions

- The domestically produced chip solution uses the domestically produced MK8000 chip;
- Maximum communication distance up to 130m (CH9 band, maximum power in clear, open conditions);
- It supports serial communication and can output ranging information via serial port;
- Supports one-to-many ranging, up to 1-to-5 ranging, with configurable ranging gaps;
- Supports AT command configuration parameters;
- It supports data pass-through with a transmission rate of 6.8Mbps;
- Onboard antenna design is adopted;
- It uses a stamp-hole seal and measures only 14*24mm;
- Low cost and flexible application;
- Industrial-grade standard design, supporting long-term use at temperatures ranging from -40°C to + 85 °C;

1.3 Application Scenarios

- Distance Management
- Pet location
- Follow Positioning
- Transportation
- Industrial production
- Petrochemical and mining positioning

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2. Operating Parameters

2.1 Specifications

Parameter name	Parameter value			Remark
Operating frequency band	7737.2~8237.2MHz (CH9)			CH9 is the default, and it can be configured as CH5.
Transmit power	10dBm			@3.3V, Channel 9. Maximum transmission power
Antenna type	PCB onboard antenna			Dedicated antenna design
Packaging method	surface mount			-
Interface method	Stamp perforation (1.27mm spacing)			-
Communication interface	UART serial port			Supports AT commands
Serial port configuration	921600 bps 8N1			-
Distance measurement algorithm	TWR			-
Distance measurement	130m			In a clear and open environment
Distance measurement accuracy	30cm			-
Weight	1.2g			±0.1g
External dimensions	14 * 24 mm			-
	Minimum value	Typical value	Maximum value	Remark
Operating voltage (V)	1.8	3.3	3.6	Output power can be guaranteed with a voltage of ≥3.3V; there is a risk of burnout if the voltage exceeds 3.6V .
Operating temperature (°C)	-40	-	+85	Industrial-grade design
Operating humidity (%)	10	-	90	-
Dormant current (uA)	7.9	8.0	8.1	Power off mode
Emitting current (mA)	42.0	43.3	44.6	@3.3V, transmitting at maximum power
Received current (mA)	6.4	6.6	6.8	

2.2 Serial Port Configuration Parameters

The serial port baud rate is 921600 bps, with 8 data bits, 1 stop bit, and no parity. The parameter settings are shown in the following figure :

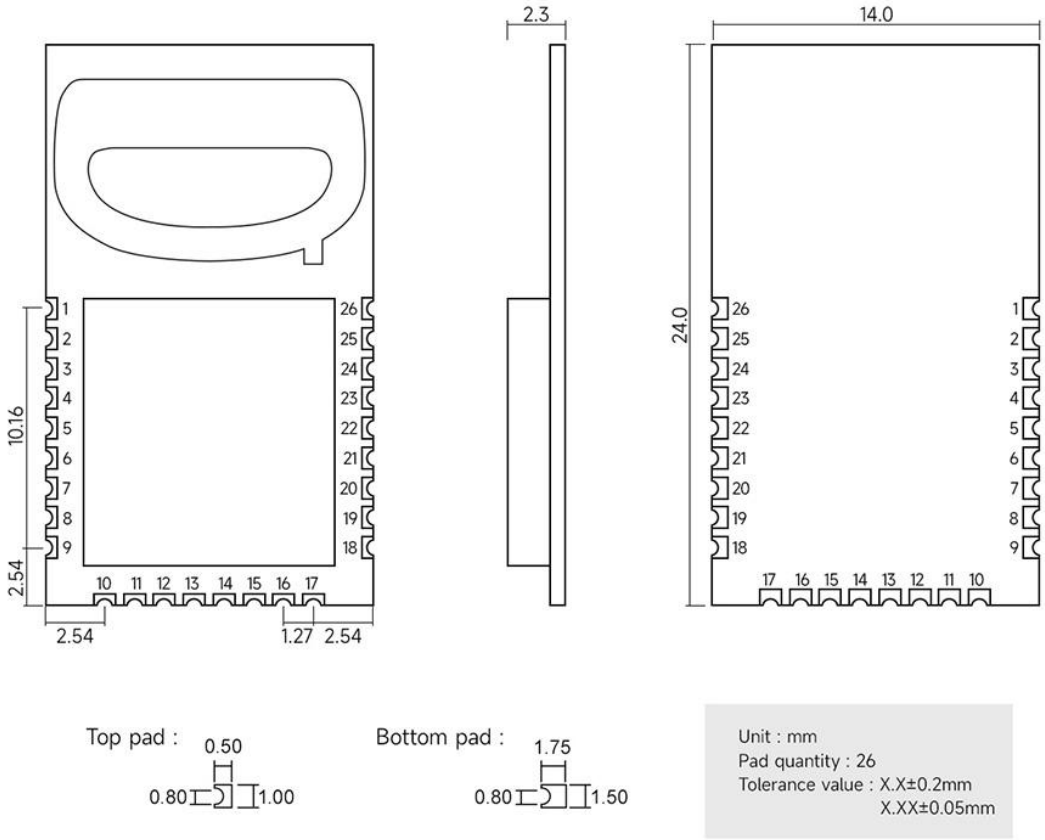
Project	Parameter value
Baud rate	921600 bps
Data bits	8
Stop bit	1
Check bit	None

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3 Mechanical Dimensions and Pin Definitions

3.1 EWM550-7G9T10SP Mechanical Dimensions and Pin Definitions



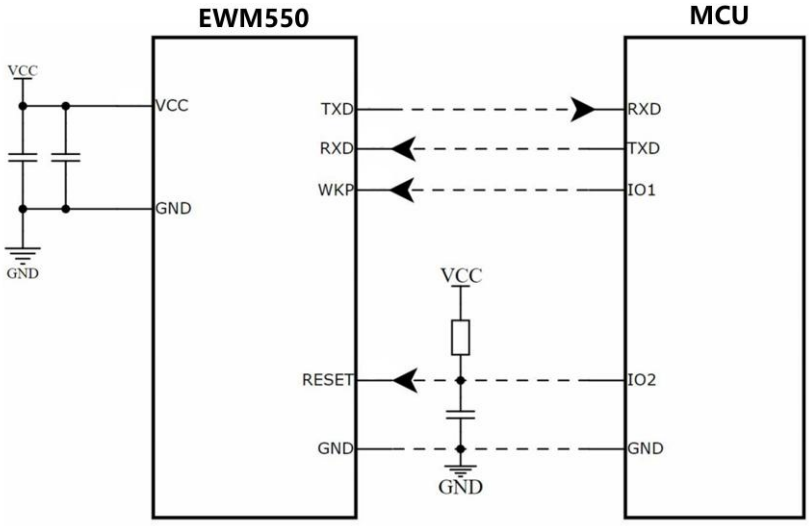
Pin number	Pin Name	Pin direction	Pin Applications
1	GND	-	Module ground wire
2	GND	-	Module ground wire
3	RSTN	-	Reset pin, low level reset
4	IO0	-	Reserved pins
5	IO1	-	Reserved pins
6	IO2	Input	Upon power-on, pull the button low for 1 second and restore factory settings.
7	IO3	-	Reserved pins
8	IO4	-	Reserved pins
9	GND	-	Module ground wire
10	GND	-	Module ground wire
11	TXD	Output	Data serial port
12	RXD	Input	Data serial port
13	IO7	-	Reserved pins
14	IO8	-	Reserved pins
15	IO9	-	Reserved pins

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16	IO10	-	Reserved pins
17	VCC	-	Power input
18	VCC	-	Power input
19	IO11	-	Reserved pins
20	IO12	-	Reserved pins
21	IO13	-	Reserved pins
22	IO14	-	Reserved pins
23	SWCLK	Input	Programming interface
24	SWDIO	Input	Programming interface
25	WKP	Input	Sleep/wake-up pin, low level wakes up the module
26	GND	-	Module ground wire

4 Recommended Connection Diagram



5 Instructions and Factory Parameters

5.1 AT Command Table

Serial Number	Instruction	Description
1	+++	Enter AT mode
2	AT+EXIT	Exit AT mode
3	AT+ROLE	Query/Configure Roles
4	AT+CH	Query/Configure Channel
5	AT+BAUD	Query/Configure Baud Rate
6	AT+POWER	Query/Configure Power Level
7	AT+SLEEP	Enter hibernation mode
8	AT+RESPONDER_NUM	Set the number of slave devices
9	AT+SRCADDR	Query/Configure Source Address
10	AT+DSTADDR	Query/Configure Target Address

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11	AT+INTV	Query/Configure Print Gaps
12	AT+RESTORE	Factory reset
13	AT+RESET	Reset
14	AT+VERSION	Version number lookup

5.2 AT Command Description

5.2.1 Enter AT Mode

Instruction	Response	Example
+++	AT_MODE	**Send** : +++ **Return** : AT_MODE

Note: Distance measurement information printing will pause after entering AT mode until exiting AT mode.

5.2.2 Exit AT Mode

Instruction	Response	Example
AT+EXIT	No return	**Send** : AT+EXIT **No return**

Note: Exiting AT mode will restore the printing distance information.

5.2.3 Query/Configuration Mode (Role)

Instruction	Response	Example
AT+ROLE=?	ROLE :<MODE>	**Send** : AT+ROLE=? **Return** : ROLE:0
AT+ROLE=<MODE>	+OK	**Send:** AT+ROLE=1 **Return:** +OK
<MODE>	0: Responder Tag Mode 1: Initiator Base Station Mode 2: Transmode	

5.2.4 Query/Configure Channels

Instruction	Response	Example
AT+CH=?	CH: <CHANNEL>	**Send** : AT+CH=? **Return** : CH:9
AT+CH=<CHANNEL>	+OK	**Send:** AT+CH=9 **Return:** +OK
<CHANNEL>	5: CH5 Channel 5; 9: CH9 Channel 9	

5.2.5 Query /Configure Baud Rate

Instruction	Response	Example
AT+BAUD=?	BAUD: < Baud Rate >	**Send** : AT+BAUD=? **Return** : BAUD:7
AT+BAUD = < Baud Rate >	+OK	**Send** : AT+BAUD=0 **Return** : +OK

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<Baud Rate>	0→9600; 1→19200; 2→38400; 3→57600; 4→115200; 5→230400; 6→460800; 7→921600; 8→1000000; 9→2000000;

5.2.6 Query /Configure Power Level

instruction	response	Example
AT + POWER = ?	POWER: <Power Level>	**Send** : AT+ POWER = ? **Return** : POWER: <3>
AT+ POWER = <Power Level>	+OK	**Send** : AT+ POWER=1 **Return** : + OK
< Power Level >	It has four power levels, from 0 to 3, with the 3rd level having the highest power.	

5.2.7 Hibernation Mode

Instruction	Response	Example
AT+SLEEP = <Sleep Parameters>	+OK	**Send** : AT+SLEEP=0 **Return** : +OK
<Sleep Parameters>	0: Indicates power-down mode. Once entered, UWB will stop all operations. 1: Indicates periodic sleep mode. When in this mode, UWB will output normally with lower power consumption, but the serial port will no longer receive data. **Note: Pull the WKP pin low to wake up the module.**	

5.2.8 Query /Configure the Number of Tags (Slave Devices)

Instruction	Response	Example
AT+RESPONDER_NUM = ?	RESPONDER_NUM :<Quantity>	**Send** : AT+RESPONDER_NUM=? **Returns** : RESPONDER_NUM:5
AT+RESPONDER_NUM=<Quantity>	+OK	**Send** : AT+RESPONDER_NUM=3 **Return** : +OK
<Quantity>	Value range: 1-5 The default value is 1, and the maximum value is 5. **Note: This command will not take effect in pass-through mode, regardless of master-slave relationship.**	

5.2.9 Query /Configure Source Address

Instruction	Response	Example
AT+SRCADDR= ?	SRC_ADDR:<source address>	**Send** : AT+SRCADDR= ? **Return** : SRC_ADDR:1111
AT+SRCADDR= <source address>	+OK	**Send** : AT+SRCADDR= 1111 **Return** : +OK
<source address>	4 bytes, representing its own address, ranging from 0000 to FFFF (works in conjunction with DSTADDR).	

5.2.10 Query/Configure Target Address

Instruction	Response	Example
AT+ DSTADDR = ?	DST_ADDR:<target address>	**Send** : AT+ DSTADDR = ?

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		Returned : DST_ADDR: 11112222333344445555
AT+ DSTADDR = <target address>	+OK	**Send** : AT+SRCADDR= 11112222333344445555 **Return** : +OK
<Target Address>	20 bytes, range 0000 0000 0000 0000 0000 - FFFF FFFF FFFF FFFF FFFF **For base station equipment,** the source addresses of all tag devices must be bound to this target address. If the source address is inconsistent with the source address of the tag device, the distance information will not be output correctly. Each 4 bytes corresponds to one tag device. Any part exceeding the configured number of tags (slave devices) will not be effective. For **tag devices,** the source address of the base station equipment must be bound to this target address. If the source address is inconsistent with the source address of the base station equipment, the distance information will not be output correctly. Only the first 4 bytes are valid.	

5.2.11 Query/Configure Print Interval

Instruction	Response	Example
AT+INTV=?	INTV: <Printing gap>	**Send** : AT+INTV=? **Return** : INTV:500
AT+INTV = <print gap>	+OK	**Send** : AT+INTV=1000 **Return** : +OK
<Printing gap>	The value range is 30-2000 ms. For one-to-many distance measurement, it is recommended that the printing interval be no less than 100 ms.	

5.2.12 Restore factory settings

Instruction	Response	Example
AT+RESTORE	+OK	**Send** : AT+RESTORE **Return** : +OK

5.2.13 Reset

Instruction	Response	Example
AT+RESET	+OK	**Send** : AT+RESET **Return** : +OK

5.2.14 Version number lookup

Instruction	Response	Example
AT+VERSION	VERSION:7530-0-11	**Send** : AT+VERSION **Return** : VERSION:7530-0-11

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6 Quick Guide

6.1 Example of a one-to-many ranging configuration

Taking 1 base station with 3 tags as an example, the following commands can be used to configure each device:

Base station (host)	Tag (Slave 1)	Tag (Slave 2)	Tag (Slave 3)
+++	+++	+++	+++
AT+ROLE=1	AT+ROLE=0	AT+ROLE=0	AT+ROLE=0
AT+RESPONDERR_NUM=3	AT+RESPONDER_NUM=3	AT+RESPONDER_NUM=3	AT+RESPONDER_NUM=3
AT+SRCADDR=0000	AT+SRCADDR=1111	AT+SRCADDR=2222	AT+SRCADDR=3333
AT+DSTADDR=1111222233334444	AT+DSTADDR=0000222233334444	AT+DSTADDR=0000222233334444	AT+DSTADDR=0000222233334444
5555	5555	5555	5555
AT+RESET	AT+RESET	AT+RESET	AT+RESET

Notice:

1. A restart is required for the commands to take effect immediately after the settings are configured;
2. When acting as a base station (host), any portion of the target address exceeding the configured number of tags (slave devices) will not be effective;
3. When used as a tag (slave), only the first 4 bytes of the target address are effective;

6.2 Ranging Data Packet Format Example

Role	Data Example	Data Interpretation
Base station (Host)	P0,AA00,10cm,20dB\r\n	P0 represents slave device 1, AA00 is the slave device address, 10cm is the distance information, and 20dB is the SNR (signal-to-noise ratio).
	LP1,2222,20cm,20dB\r\n	P1 indicates slave device 2, L indicates the module is currently in sleep mode, 2222 is the slave address, 20cm is the distance information, and 20dB is the signal-to-noise ratio.
Label (Slave)	P,1111,10cm\r\n	P represents the header, 1111 represents the host address, and 10cm represents the distance information.

6.3 Example of transparent transmission configuration

The following instructions can be used to achieve broadcast transmission, taking 3 devices as an example :

Emission	Receive 1	Receive 2
+++	+++	+++
AT+ROLE=2	AT+ROLE=2	AT+ROLE=2
AT+SRCADDR=1111	AT+SRCADDR=1111	AT+SRCADDR=1111
AT+DSTADDR=11110000000000000000	AT+DSTADDR=11110000000000000000	AT+DSTADDR=11110000000000000000
AT+RESET	AT+RESET	AT+RESET

The following instructions can be used to achieve fixed-point transparent transmission , taking 3 devices as an example :

Emission	Receive 1	Receive 2
+++	+++	+++
AT+ROLE=2	AT+ROLE=2	AT+ROLE=2
AT+SRCADDR=1111	AT+SRCADDR=2222	AT+SRCADDR=3333
AT+DSTADDR=22220000000000000000	AT+DSTADDR=11110000000000000000	AT+DSTADDR=11110000000000000000

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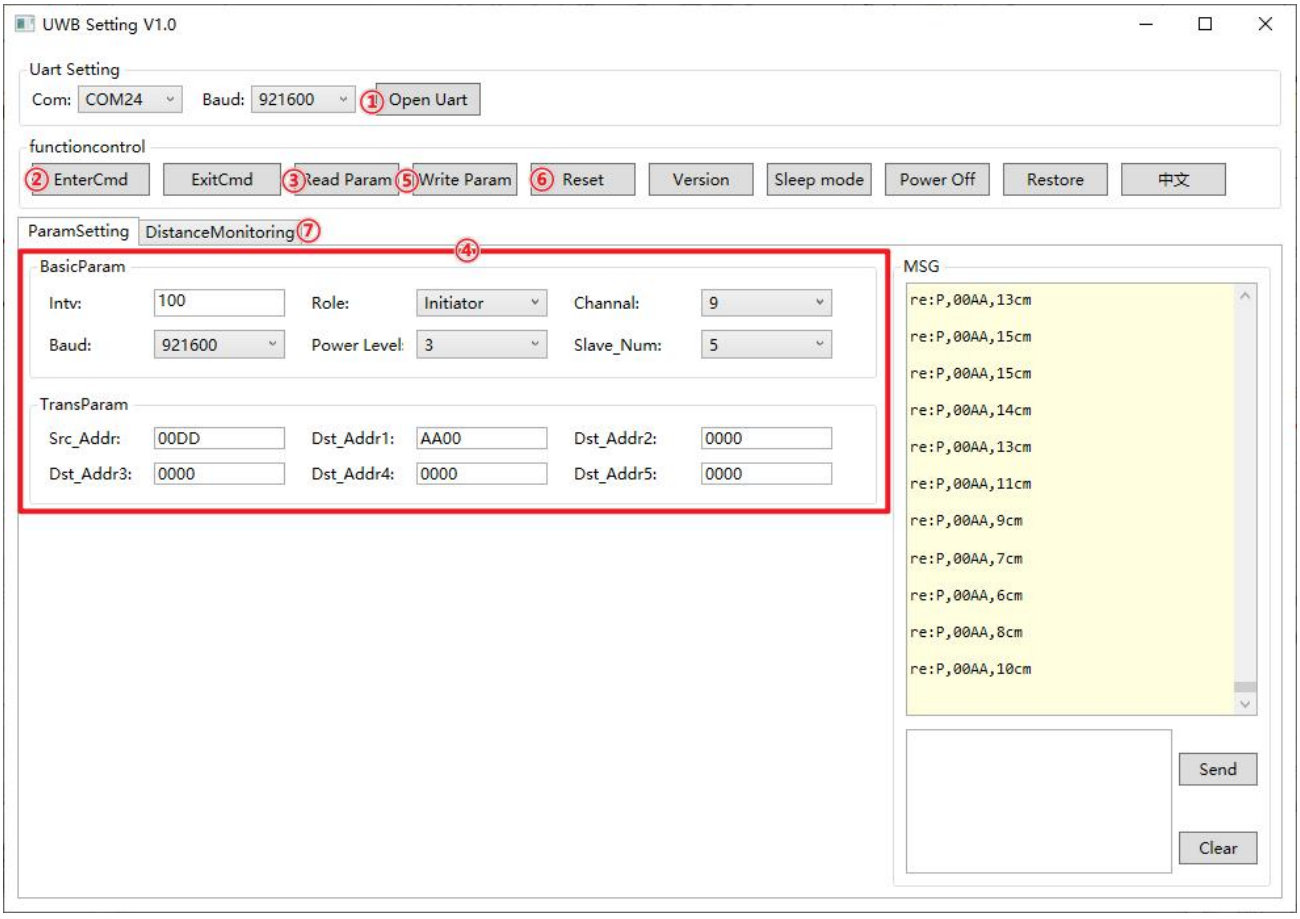
AT+RESET	AT+RESET	AT+RESET

Notice:

1. A restart is required for the commands to take effect immediately after the settings are configured;
2. In pass-through mode, only the first 4 bytes of the target address are effective;
3. After the pass-through mode is started, you can use the "+++" command to exit and enter AT mode;
4. In transparent transmission mode, there is no distinction between master and slave machines.

7. Host Computer Operation

7.1 Communication Configuration



① Open the serial port: Select the correct serial port channel and baud rate, then open the serial port.

② Enter configuration mode: Click to enter configuration mode. The module will turn off distance printing and wait for the user to perform parameter reading, configuration, writing and other operations.

③ Read parameters: Read the working parameters of the current module;

④ Setting parameters: Please refer to the parameter introduction in the AT command section and set the parameters according to your needs;

⑤ Write parameters: After setting, the parameters need to be written to the module;

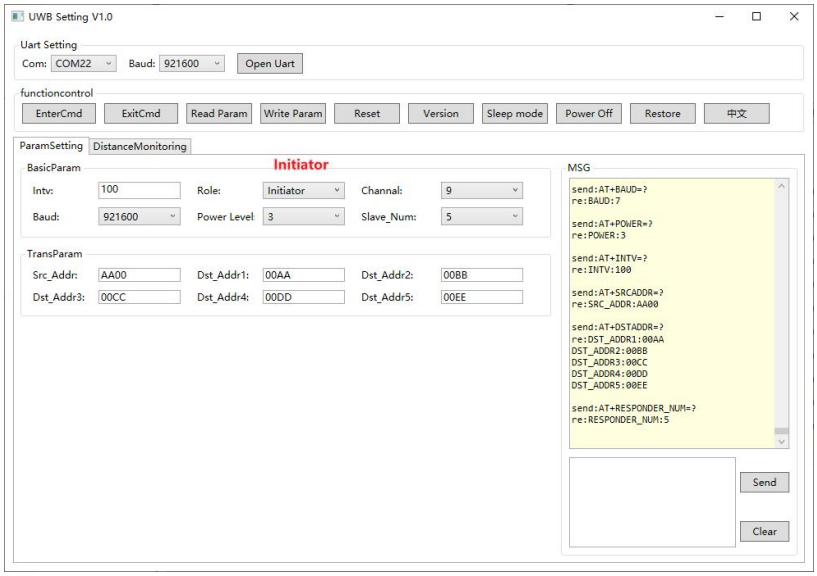
⑥ Module Reset: The parameters take effect after reset and the module automatically enters the distance printing state;

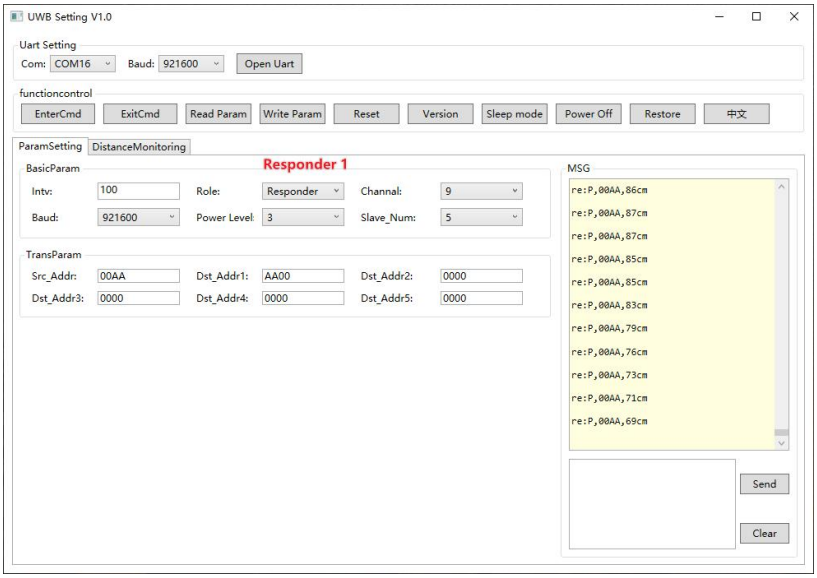
⑦ View distance monitoring curve: You can switch to the distance monitoring page.

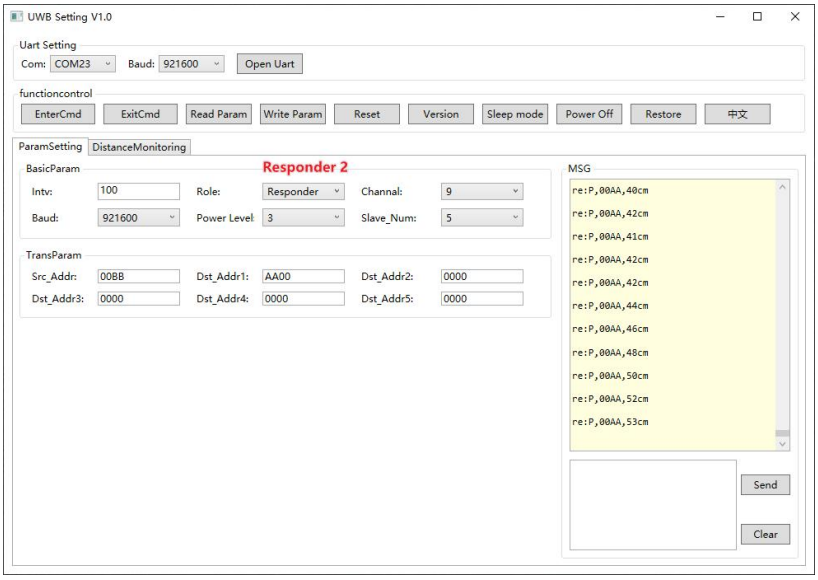
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Settings reference:

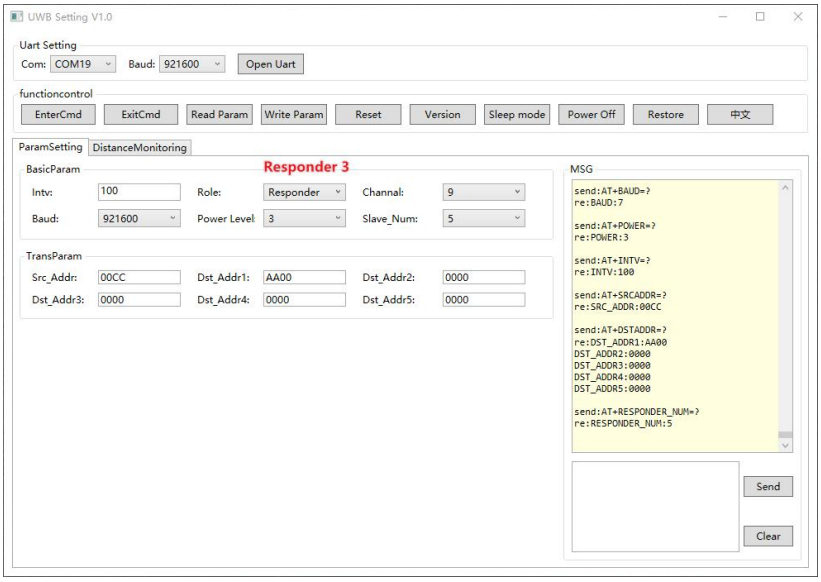


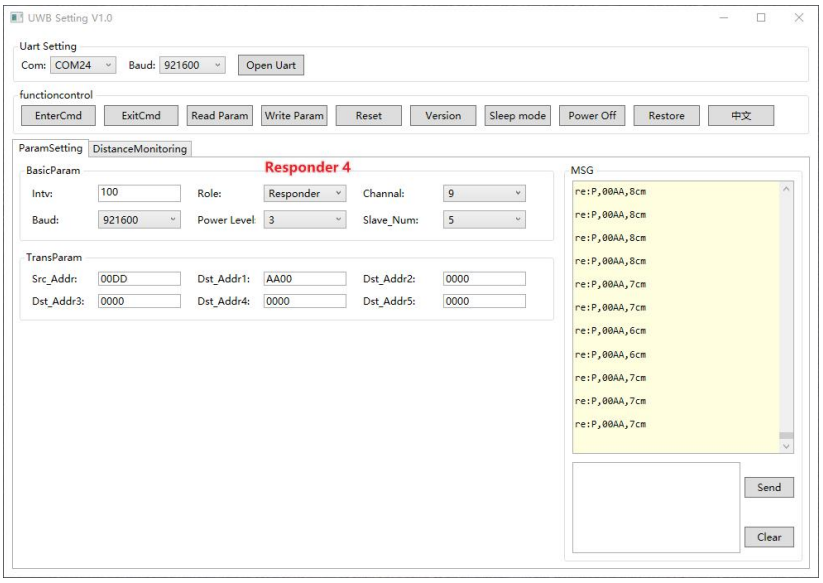


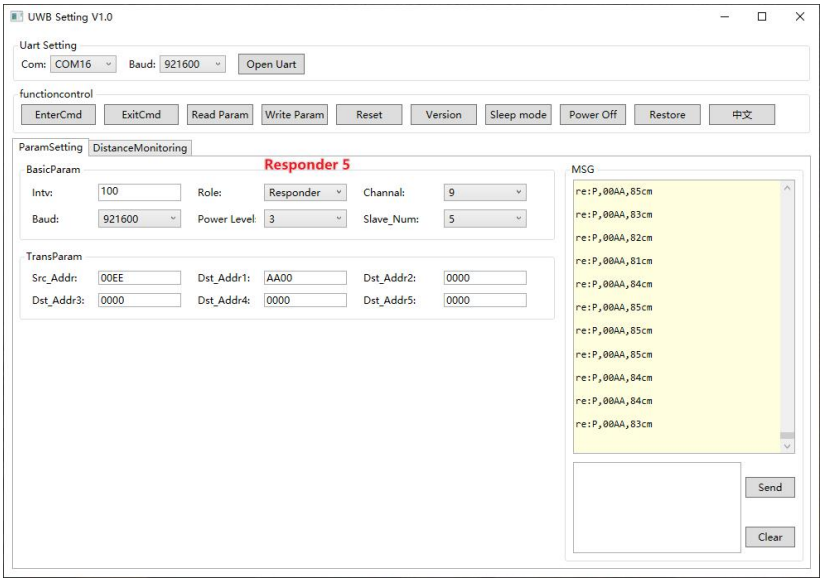


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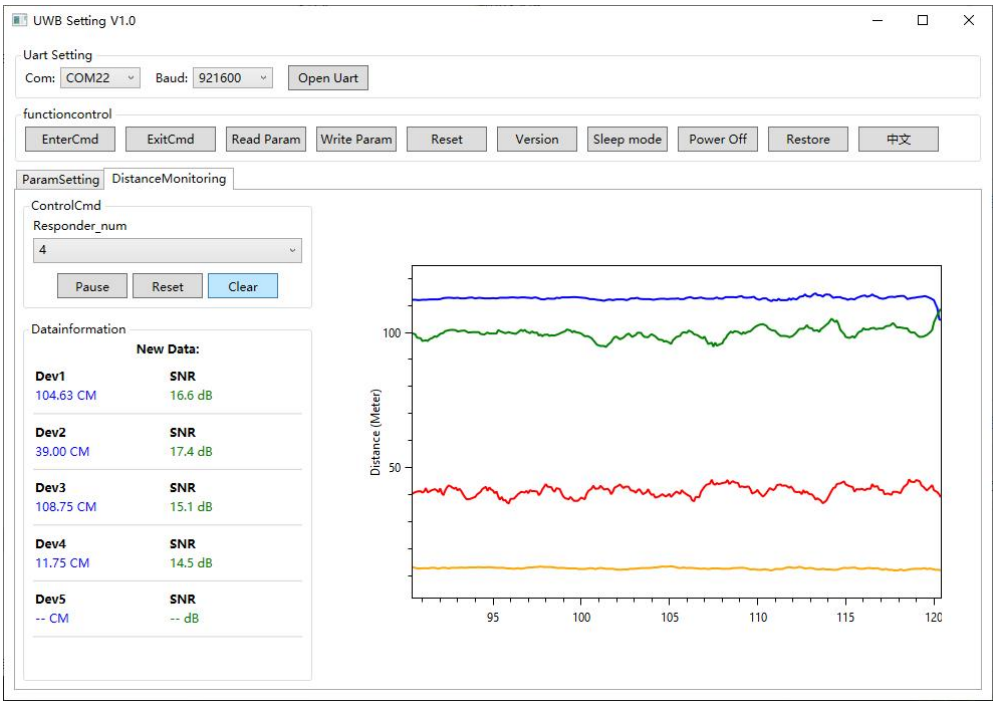


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7.2 Distance Monitoring

Select the correct number of slave devices to display, as shown in the figure:



Notice:

1. The best distance measurement effect can be obtained when the modules are horizontally facing each other.
2. Supports up to 1 to 5 bidirectional ranging; distance monitoring curves are only displayed on the base station (host) side.
3. If the ranging becomes choppy or fluctuates significantly, please adjust the module angle and remove any obstacles in the middle to ensure effectiveness;

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8 Version Notes

Hardware version differentiation method:

EWM5550-7G9T10SP module includes both **a 1-to-1 ranging version** and a **1-to-many ranging** version , **which are incompatible** . You can check the firmware version number using the AT command AT+VERSION . Version number 7530-0-11 is the 1-to-many ranging version , and version number 7530-0-10 is the 1-to-1 ranging version .

The modules can also be distinguished by their production batch number (SN code). Modules with a production batch number ≥ 5202255 are 1-to-many ranging versions , while the rest are 1-to-1 ranging versions .

SN code explanation: S **5202255** S00001, 5202255 is the production batch, and 00001 is the production serial number.



Example:

1. The user's module production batch is 5202256 , 5202256 ≥ 5202255 , and the module with production batch 5202256 is a **1-to-many ranging** version module;

2. The user's module production batch is 5202254 , 5202254 < 5202255. The module with production batch 5202254 is a **1-to-1 ranging version** module.

9 Hardware Design

- It is recommended to use a DC regulated power supply to power this module, with the power supply ripple coefficient as small as possible, and the module must be reliably grounded;
- Please ensure the correct connection of the power supply positive and negative terminals. Reversing the connection may cause permanent damage to the module.
- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module.
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently.
- When designing power supply circuits for modules, it is often recommended to retain a margin of more than 30% to ensure long-term stable operation of the entire unit.
- The module should be kept as far away as possible from power supplies, transformers, high-frequency traces, and other parts with high electromagnetic interference.
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid the area under the module. If it is absolutely necessary to run under the module, assuming the module is soldered on the Top Layer, lay ground copper on the Top Layer of the module contact area (all copper and well grounded), and run the traces close to the digital part of the module on the Bottom Layer .
- Assuming the module is soldered or placed in the Top Layer, it is also wrong to arbitrarily route traces in the Bottom Layer or other layers, as this will affect the module's stray emissions and receiver sensitivity to varying degrees .
- If there are devices around the module that cause significant electromagnetic interference, it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.
- If there are traces around the module that cause significant electromagnetic interference (high-frequency digital,

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high-frequency analog, power supply traces), it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.

- The antenna mounting structure has a significant impact on module performance; it is essential to ensure that the antenna is exposed and preferably vertically upward.
- When the module is installed inside the housing, a high-quality antenna extension cable can be used to extend the antenna to the outside of the housing.
- Antennas should never be installed inside a metal casing, as this will greatly reduce the transmission distance.

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10 Frequently Asked Questions

10.1 The module does not respond upon power-up .

- When there are obstacles in line-of-sight communication, the communication distance will be reduced accordingly ;
- Temperature, humidity, and co-channel interference can all lead to increased packet loss rates in communications .
- The ground absorbs and reflects radio waves, and the test results are poor when the ground is close to the ground .
- Seawater has a strong ability to absorb radio waves, so testing results are poor at the seaside .
- If there are metal objects near the antenna, or if it is placed inside a metal casing, the signal attenuation will be very severe .
- Power register settings are incorrect; air speed is set too high (the higher the air speed, the shorter the distance) .
- At room temperature, the power supply voltage is lower than the recommended value; the lower the voltage, the lower the power output .
- The antenna may be poorly matched with the module or have quality issues.

10.2 Module is easily damaged

- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module .
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently .
- Please ensure anti-static operation during installation and use, as high-frequency devices are sensitive to electrostatic discharge .
- Please ensure that the humidity is not too high during installation and use, as some components are humidity-sensitive .
- Unless there are special requirements, it is not recommended to use it at excessively high or low temperatures.

10.3 Transmission distance is short/becoming shorter

- The module's transmission performance deteriorated (low transmit power, decreased receive sensitivity) , the module was damaged, and it was returned to the factory for repair .
- If the antenna is loose, rusted, or damaged , tighten the antenna connection or replace the antenna .
- If a new source of interference is identified , priority should be given to changing the channel and adjusting/ upgrading the antenna.

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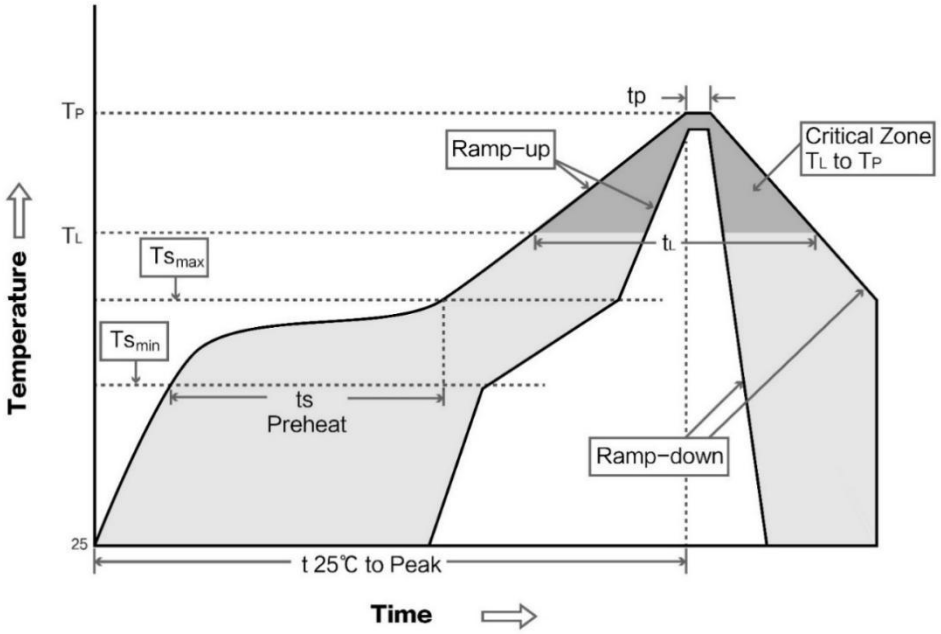
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11 Welding Operation Instructions

11.1 Reflow soldering temperature

Profile Feature	Curve characteristics	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Solder paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min (Tsmin)	Minimum preheating temperature	100 ℃	150 ℃
Preheat temperature max (Tsmax)	Maximum preheating temperature	150 ℃	200 ℃
Preheat Time (Tsmin to Tsmax)(ts)	preheating time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average rate of ascent	3 ℃ /second max	3 ℃ /second max
Liquidous Temperature (TL)	Liquid phase temperature	183 ℃	217 ℃
Time(tL)Maintained Above(TL)	Time above the liquidus line	60-90 sec	30-90 sec
Peak temperature (Tp)	Peak temperature	220-235 ℃	230-250 ℃
Aveage ramp-down rate（Tp to Tsmax）	Average rate of descent	6 ℃ /second max	6 ℃ /second max
Time 25 ℃ to peak temperature	from 25 ℃ to peak temperature	6 minutes max	8 minutes max

11.2 Reflow Soldering Profile



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Revision History

Version	Revision Date	Revision Notes	Maintainer
1.0	2025-07-28	Initial version	Lei
2.0	2025-12-10	Upgrade to 1-to-many ranging version	Lei
2.1	2026-03-20	Correct the error description	Lei

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