



Rd-03 use manual

Version V1.1.0

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Document resume

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1. Software Description

This chapter introduces the firmware debugging of the Rd-03 module and the use of PC tools.

The Rd-03 module has already burned the relevant [factory firmware](#). Ai-Thinker provide [visual host computer configuration tool software](#) for Rd-03 module speech, which is convenient for developers to configure parameters of Rd-03 module according to usage scenarios and optimize the sensing effect.

1.1. Firmware configuration

This section introduces how to use the radar serial port debugging tool to debug the firmware of the Rd-03 module.

- Connect the host computer and the Rd-03 radar module through the USB to TTL serial port adapter board, and the pin connection method is shown in Table 1-1.

Table 1-1 Correspondence between Rd-03 and the connecting pins of the USB serial port adapter board

Rd-03	Serial adapter board
RX	TX
OT1	RX
3V3	VCC
GND	GND

- Turn on the device manager and check the serial port number of the serial port where the radar module is located.
- Turn on the serial port debugging tool, select the above serial port number, set the serial port baud rate to 115200, and then click the "Open Serial Port" button to view the current radar detection results at the output port of the serial port debugging tool

1.2. Use of the upper computer

This section introduces the use of the host computer tools for the Rd-03 module to help users understand the meaning of relevant parameters and how to obtain them.

Note: host computer tools and serial port debugging tools cannot be used at the same time!

Before using the functions of the host computer, the user should first connect the Rd-03 module and the host computer, the steps are as follows:

- Obtain host computer tools from Ai-Thinker official website: [host computer tools](#)
- Use the serial port adapter board to connect the Rd-03 module and the host computer according to the method in Table 1-1
- Turn on the host computer tool, click the "Refresh" button, select the serial port number of the radar module in the "Serial Port Number" drop-down box, confirm that the "Baud Rate" is 115200, and click the "Connect Device" button to start connecting the host computer and Rd- 03 module



ICLM_XenD101MM01_HP02Tool(v1.1.0.0)

参数查看/设置

实时数据

数据采集/分析

更新固件

2

1

串口号 COM3

波特率 115200

刷新 连接设备

最大距离门 15 目标消失延迟时间(秒) 30

触发门限

00	41.24	04	30.84	08	23.1	12	19.82
01	41.93	05	30.09	09	21.93	13	27.32
02	41.04	06	29.12	10	26.11	14	26.47
03	32.52	07	25.42	11	20.79	15	24.77

保持门限

00	45.96	04	27.82	08	20.09	12	16.81
01	38.92	05	27.08	09	18.92	13	24.31
02	38.03	06	26.11	10	23.1	14	23.46
03	29.51	07	22.41	11	17.78	15	21.76

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读取传感器设置 写入传感器设置 载入配置文件 保存配置文件

(a) Before the device is connected



(b) After the device is connected

Figure 1-1 XenD101MM01_HP02Tool

As shown in Figure 1-1(a), the host computer tool interface can be divided into three areas: device operation area (Zone1), function button area (Zone2), and function page area (Zone3).

After the upper computer tool is successfully connected to the Rd-03 module, the firmware version number of the Rd-03 module will be displayed in the Zone1 area of the interface, and the current parameter value of the module will be displayed in the function page area of "Parameter View/Setting", as shown in Figure 1 -1(b).

1.2.1. Parameter viewing/setting

The "Parameter View/Setting" page of the upper computer tool is shown in Figure 1-2, which allows users to view the current parameters of the radar and modify the specified parameter configuration to meet the needs of specific application scenarios.

The steps to read the radar parameters through the host computer tool are as follows:

- After connecting the module and the host computer tool, click the "Read Sensor Settings" button on the function page, and the page will pop up a "Read Parameters Success" prompt window, and display all the current parameters of the radar. Click "OK" to close the prompt window



Figure 1-2 The host computer reads the radar parameter interface

The steps to change one or more radar parameters through the host computer tool are as follows:

- After connecting the Rd-03 module and the host computer tools, enter new parameter values for all parameters that need to be changed on the function page
- Click the "Write Sensor Settings" button on the function page, and the host machine will write the parameter values in the current interface to the radar module, and the page will pop up a "parameter write success" prompt window, click "OK" to complete the parameter setting.

See Table 1-2 for the parameter explanation on the "Parameter Setting" page of the upper computer tool.

Table 1-2 Explanation of PC Tool Interface Parameters

Parameter name	Explanation	Parameter range
Maximum range gate	It is used to set the furthest effective detection distance of the radar.	0~15

	One range gate is 70cm.	
Target disappear delay time (seconds)	It takes a period of time T to switch the target state from someone to no one: during this period, if someone is detected, the timing of this period of time will be restarted. The radar will switch to the unmanned state and report unmanned only after detecting that the unmanned state has lasted for a complete T time.	0~65535
Trigger threshold	It is used to set the energy value threshold from unoccupied to occupied state, which can be calculated through the "Generate Threshold" function.	0~65535
Keep threshold	The energy value threshold used to detect human body micro-movement and maintain a human state can be calculated through the "Generate Threshold" function.	0~65535

The upper computer tool supports saving and loading the parameter configuration of the radar:

- Click the "Save Configuration File" button, select the path you want to save, the host computer tool will save the current parameter configuration of the radar in the form of an .xml file in the host computer; the default save address is the folder where the host computer tool is located, the user You can set the save path by yourself
- Click the "Load configuration file" button, the host computer tool will open the radar parameter configuration file under the path specified by the user, and read in the radar parameters, click the "Write sensor settings" button to write the parameters in the configuration file to the radar module

1.2.2. Real-time data

The "real-time data" page of the host computer is shown in Figure 1-3, and its function pages are introduced as follows:

- The colored light icon in the upper left corner indicates whether there are people/no people in the detection area: when the radar detects the existence of a human body, the colored light is red; when no human body is detected, the colored light is green.

- The text display box behind the colorful light shows the radial distance between the target detected by the radar and the radar.
- The "Start/Pause" toggle button is used to start and pause radar detection.
- The "Generate Threshold" button is used to scan the ambient noise and calculate the "Trigger Threshold" and "Hold Threshold" for each range gate
- The "Apply Threshold" button is used to send the "Trigger Threshold" and "Hold Threshold" obtained in the "Generate Threshold" function to the radar
- The "Relative Power VS Range Gate" line graph is used to display the motion energy value (green line), trigger threshold (red line) and hold threshold (yellow line) of each range gate in real time; the black background indicates that the range gate is an effective detection range, the gray background indicates that the range gate is an invalid detection range
- The "Distance VS Time" line graph is used to display the distance change of the target human body detected by the radar in the past 60 seconds in real time; the gray background area indicates that the radar detected the target human body during this time period, and the black background area indicates that the radar did not detect the target human body during this time period. target detected

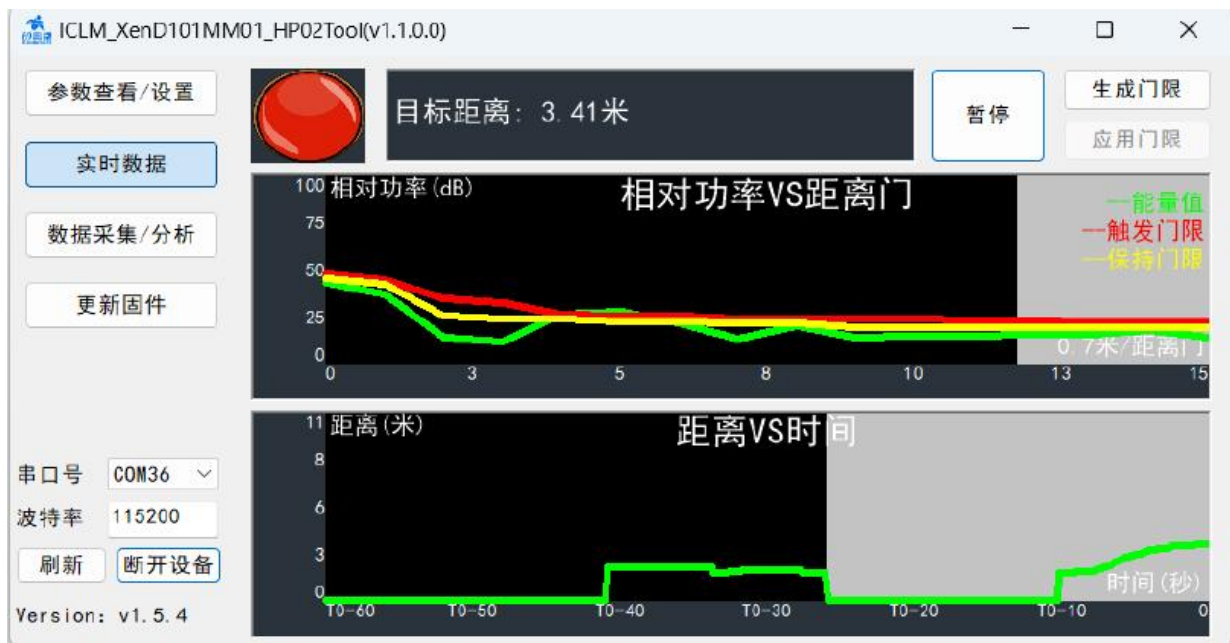


Figure 1-3 "Real-time data" page of the host computer

The steps to view real-time data through the host computer are as follows:

- After connecting the module and the host computer, click the "real-time data" button to switch to the function screen. At this time, the host computer tool automatically turns on

the radar detection function, and the "Start/Pause" switch button displays "Pause". The two line charts start to display the corresponding real-time data information.

- Click the "Start/Pause" switch button to suspend the detection function of the radar. The colored lights on the function page are displayed in green, the target distance is displayed as "0.00 meters", and the two line graphs below stop updating.

The steps to generate/apply the threshold through the host computer are as follows:

1. When the "Start/Pause" button on the "Real-time Data" page displays "Pause", click the "Generate Threshold" button, and the host computer tool will pop up the "Threshold Collection" information window, and the table above displays the triggering of each range gate in real time Energy and keep energy data, the progress bar below shows the scanning progress, as shown in Figure 1-4
2. Click the "Cancel" button to terminate the collection; if the user wants to save and apply the collected data, click "Confirm" after the data collection is completed
3. (Optional) If the user selects "OK" in step 2, the "Apply Threshold" button on the page changes from a gray unclickable state to a clickable state. The threshold data calculated in the system is sent to the radar, and a prompt window of "threshold setting is successful" pops up

After the generated threshold is applied, the user can check the latest radar threshold parameter value on the "Parameter View/Setting" page.



Figure 1-4 Threshold collection

1.2.3. Data Acquisition/Analysis

1.2.4. The "Data Collection/Analysis" page of the upper computer is shown in Figure 1-5, and its function pages are introduced as follows:

- "Range gate scan time (seconds)": used to set the environmental noise scan time for each range gate, the default is 20s, and the value range is 0~65535
- "File save path": used to set the save path of the collected data
- "Select display distance gate": used to select the distance gate to be viewed, the optional range is 0~15
- "Collect Data/Stop Collection" toggle button: used to start and stop data collection. After stopping data collection, the user can see a .bat type file whose file name starts with RadarData and ends with a timestamp in the set file save path
- "Load data" button: used to open the saved radar scan data for users to view and analyze
- "Energy information" line graph: used to display the scanning energy value, trigger threshold, and hold threshold on the range gate selected by the user, the horizontal axis is time, and the vertical axis is energy information represented by relative power
- "Distance information" line chart: used to display the distance information of human targets detected within the radar detection range, the horizontal axis is time, and the

vertical axis is distance

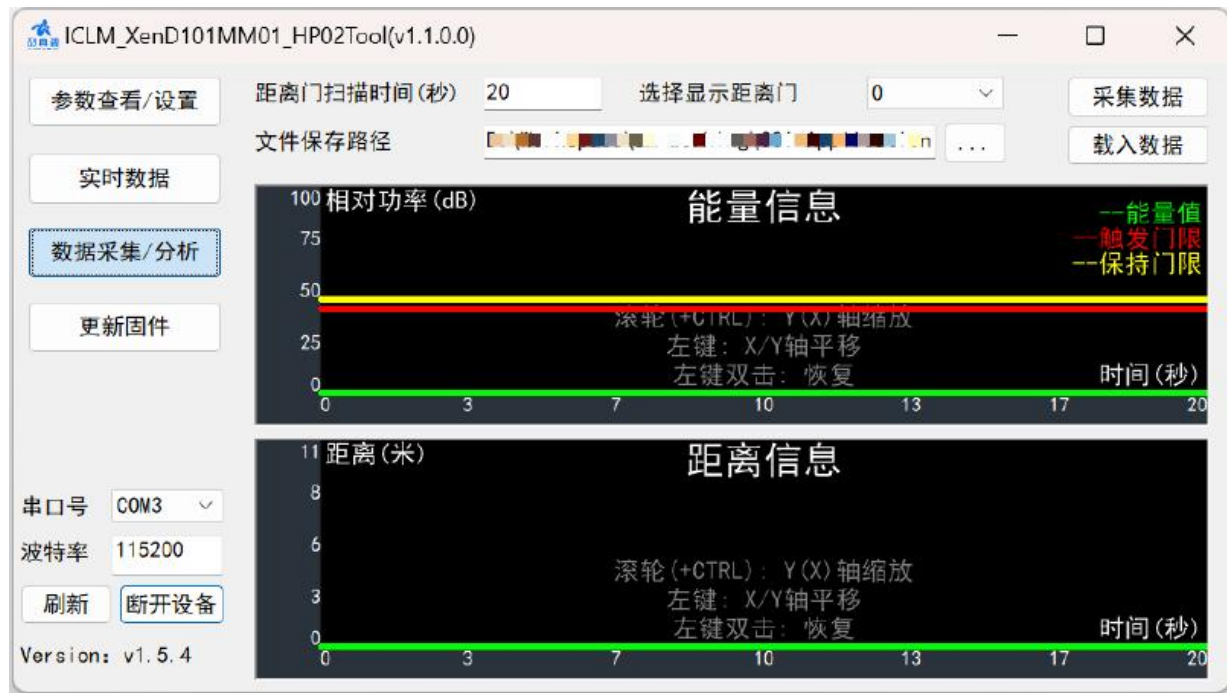


Figure 1-5 Collection/analysis data page

The steps to collect energy data through the host computer are as follows:

1. After connecting the module and the host computer, click the "Data Acquisition/Analysis" function button to switch to the function page
2. Enter the "range gate scan time", set the "file save path", make sure that there is no one in the radar detection range within one scan cycle, click the "collect data/stop collect" switch button to start collecting data
3. After starting to collect data, the user can wait for the upper computer tool to automatically stop collecting after the scan is completed, or click the "collect data/stop collecting" switch button to stop data collection in advance; in both cases, the data collected by the upper computer will be stored Under the file save path set in step 2

The steps to analyze the energy data through the host computer are as follows:

1. After connecting the module and the host computer tool, click the "Data Acquisition/Analysis" function button to switch to the function page
2. Click the "Load Data" button and select the data to be viewed
3. Select the range gate to be viewed, and the user can see the energy information and distance information of the range gate in the data file on the two line graphs
4. If you want to view the specific data of a certain point on the curve, place the mouse cursor

on the position of interest on the curve, and a floating box will appear at the cursor to display the energy value or distance information at that point, as shown in Figure 1-6

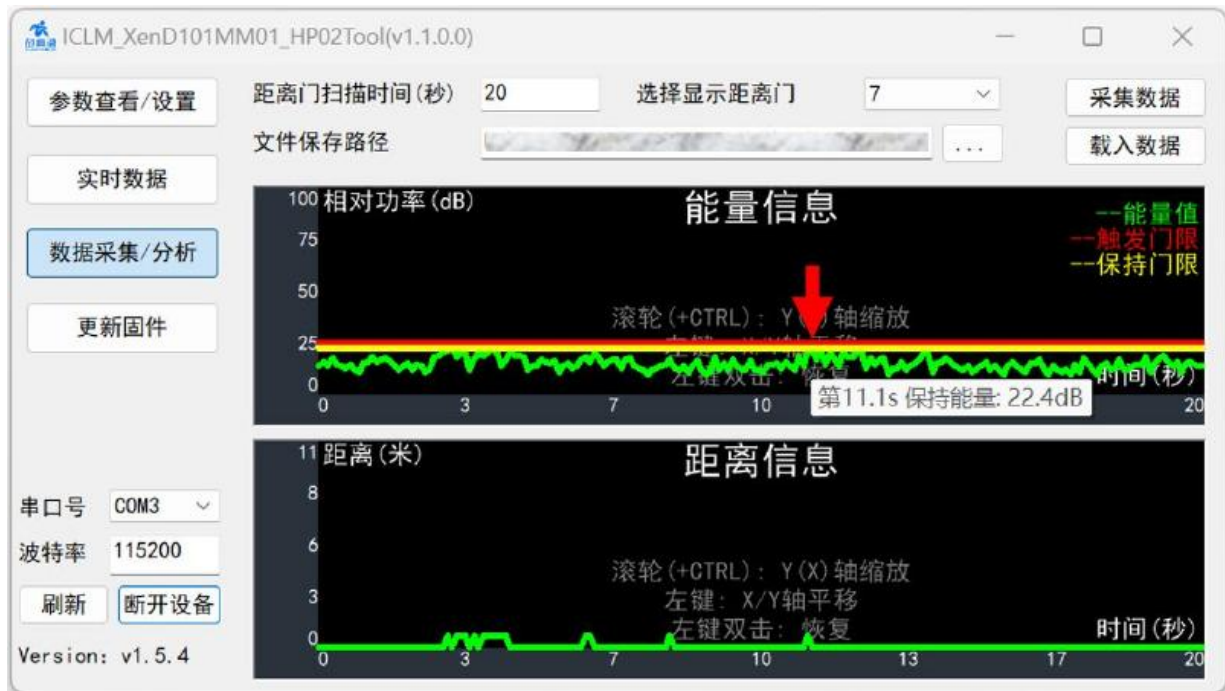


Figure 1-6 host computer data view page

When viewing data, users can zoom, pan and restore the line chart.

1.2.5. Update firmware

The prerequisite for using this function is that the factory firmware must be burned.

The "Update Firmware" page of the upper computer is shown in Figure 1-7. The steps to update the firmware of the radar module through the host computer are as follows:

1. After connecting the module and the host computer, click the "Update Firmware" function button to switch to the function page
2. Click the "Get Firmware Information" button on the function page, and the ID information of the current device will be displayed in the prompt information box on the right
3. Click the "Select bin file path" button, select the required .bin file, and click the "Download" button to start upgrading the firmware. The prompt information box on the right will display the download result in real time, and the bin file information and the current download progress will be displayed when it is delivered.



Figure 1-7 Firmware upgrade of the upper computer

After the firmware upgrade is successful, "Download successful!" will be displayed in the message box on the page. When the firmware upgrade fails, the corresponding business trip information will be displayed in the prompt message box.

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