

SEN0521

5. 8G Microwave Radar Module

User manual version 1.0

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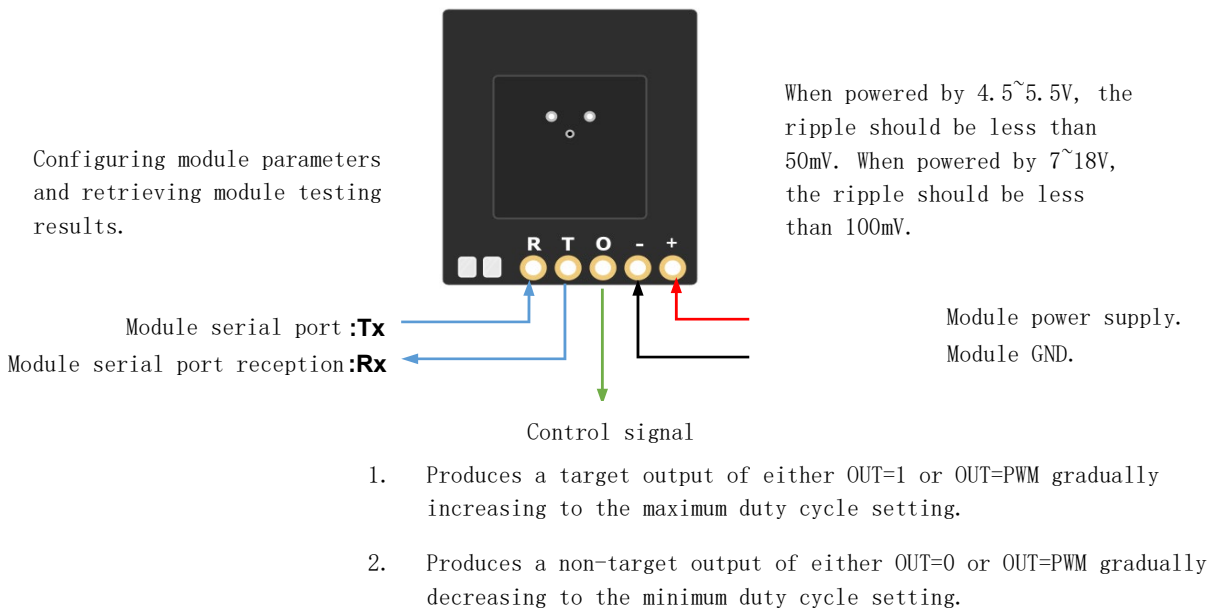
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1. Instructions For Operation

1.1 Interface Definition

Pin number	Definition	Explanation
1	VCC	Power supply of the module; power supply range from 4.5 to 5.5V;
2	GND	Module ground.
3	OUT	Output signal; can output I/O digital signals or PWM control signals.
4	TXD	Module serial port transmission; used to configure module operating parameters.
5	RXD	Module serial port reception; used for configuring module operating parameters.

1.2 Connection Method.



1. Basic Usage.

Connect the VCC pin to the power source (DC 4.5–5.5V, typical 5V), the GND pin to the ground, and the OUT pin to the output.

When there is movement, slight movement, or stationary targets within the effective detection area, the OUT pin outputs a high level (5V). Otherwise, the OUT pin outputs a low level (0V).

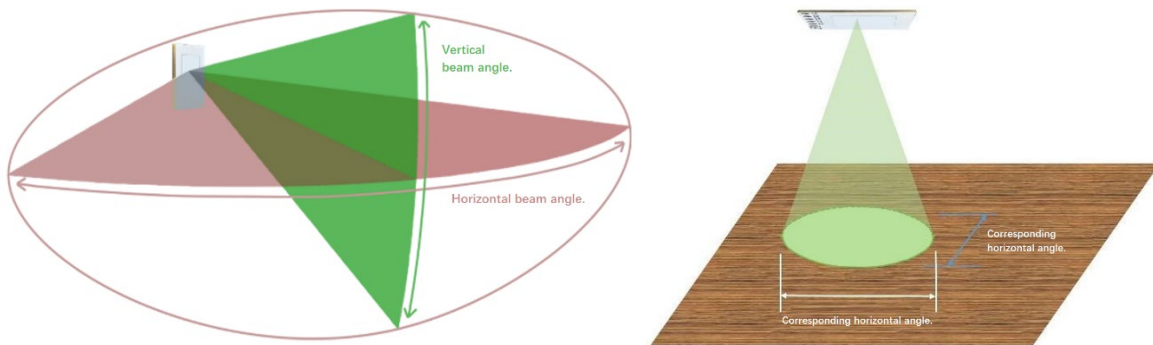
2. Advanced Usage

You can configure parameters such as detection sensitivity, detection distance, detection time, etc. through the serial Tx and Rx pins. Please refer to the following chapters for detailed information.

The default configuration parameters of the 5.8G Microwave Radar module may not be suitable for all customers' actual scenarios. If the test results differ greatly from the indicators described in the module parameter table, it is essential to use a serial tool to reconfigure the module parameters to make the module's working parameters suitable for the actual usage scenario, thereby achieving better testing results and performance.

1.3 Explanation of the Detection Area.

The area in which the 5.8G Microwave Radar module emits energy signals is mainly determined by the emission beam angle. The 3D schematic diagram of the beam angle is illustrated in the two images shown below.



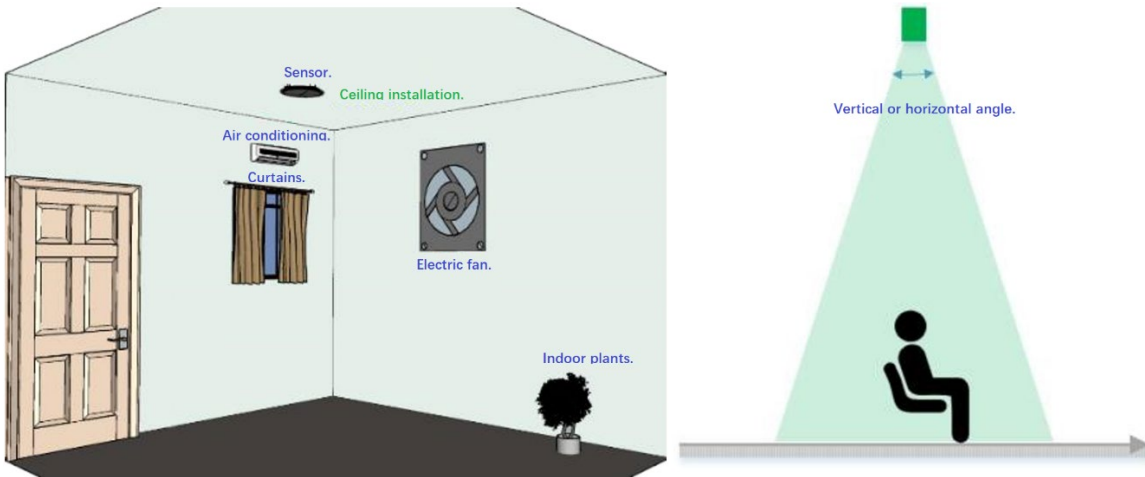
Special Note: For example, if the beam angle is 120° , it does not mean that energy signals beyond 120° cannot be detected. 120° only represents a measurement taken at a fixed distance (such as 2 meters, 4 meters, or other appropriate distances), wherein the measured radiation energy is 3 dB (or 0.5 times) lower than that at the 0° front-facing position. Therefore, radiation signals do exist at positions such as 130° and 140° , albeit with lower energies than the position at 120° . Furthermore, large objects with strong reflective energy may still be detected at close distances and larger angle positions, such as 130° .

1.4 Installation Method:

Installation methods mainly include "ceiling-mounted", "downward-sloping", and "forward-facing" mounting. Due to microwave radar's sensitivity to objects in relative motion (emitting waves directly forward along the beam), the "forward-facing" installation method provides the best detection distance and results, making it easier to detect slight movements and the presence of people. It also provides better detection distance and results than the "ceiling-mounted" method.

The module for detecting slight movements is highly sensitive to installation methods. Improper installation can result in electromagnetic waves emitted by the module being unable to or unreasonably illuminating the target to be detected, which directly affects its performance and function and may even cause abnormal operation (false reporting or missed detection). Therefore, a reasonable installation method plays a crucial role in the normal use of the module.

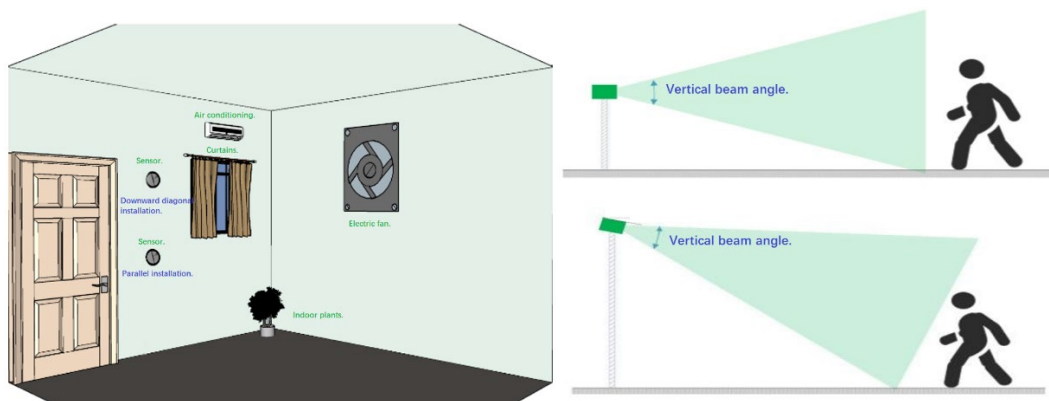
1.4.1 Ceiling-Mounted Installation



Attention needs to be paid to ceiling-mounted installation concerning objects within the module's detection range such as "air conditioning", "curtains", "fans", or "indoor plants". If their oscillation frequencies fall within the range of breathing frequencies, they may cause false alarms from the module.

It is also important to take into account the occurrence of multipath reflections similar to specular reflections when the beam is projected onto the ground or walls, or when it passes through doors, indirectly detecting the above-mentioned obstructions. Proper parameter configuration, such as sensitivity and distance filtering, can help to decrease some of the interference.

1.4.2 Installation at an oblique angle downwards or parallel forwards



When installing at an oblique angle downwards or parallel forwards, one must pay attention to the direct detection of "air conditioners", "curtains", "fans", or "plants", as their swinging frequencies may fall within the respiration frequency range, which could result in false alarms from the module.

At the same time, it is necessary to be aware of multipath reflections that occur when the beam is irradiated onto the ground, walls, or doors, which indirectly detect the above-mentioned interferences in a manner similar to mirror reflections. Appropriate parameter configurations for sensitivity and distance filtering can reduce some of the interference.

2. Module Features: Supplement

1. Within 5 seconds of initialization, the system will not detect any targets.

After the module is powered on or restarts, a self-calibration and initialization process will take place for 5 seconds, during which no target detection will occur.

2. After the transition from manned to unmanned mode, there is a default protection time of 1 second (blocking time).

When the module detects a change from manned to unmanned state, it triggers a self-protection mode that lasts for 1 second by default. During this period, the detection sensitivity is automatically adjusted to a lower level with a relatively high trigger threshold. The purpose of this mechanism is to prevent the interference from high-power actuators controlled through coordinated operations, which otherwise may disrupt the module's system during the transition of states.

3. Subtle breathing movements or finger movements may sustain the presence of a person, but there is a possibility that they may not trigger the module.

When the module's output is set to unmanned state due to micro-movements, larger movements are required to trigger the module compared to pure subtle breathing movements. On the other hand, when the module's output is set to manned state, even very slight breathing movements can sustain the status of detecting a person's presence.

3. Important Notes:

1. Suitable installation location.

- (1) Please note that the module should not be directly exposed to "air conditioners", "curtains", "fans" or "plants" as the oscillation frequency of these objects may fall within the breathing rate range, which may cause the module to malfunction.
- (2) At the same time, attention should be paid to the potential multiple reflections of the module's beam on the ground, walls or doors that may indirectly detect the aforementioned interference as mirror reflections.

(3) Appropriate configurations of detection distance, sensitivity, and delay time parameters can eliminate interference from certain objects.

2. Installation of Multiple Modules:

When installing multiple modules together, ensure a distance of at least 1 meter between them and have them facing the same or opposite direction, avoiding any mutual irradiation among the modules.

3. Reasonable distance parameter testing

(1) The module's maximum detection distance can reach up to 11 meters, with a default factory setting of 6 meters. However, excessive detection distances may result in unwanted target interference in scenarios with low installation height or narrow spaces due to the effects of secondary and multiple reflections, as well as L-shaped and right-angle reflections, leading to the detection of unnecessary targets and affecting normal operation.

(2) In scenarios with low installation height and narrow spaces, such as bathrooms, toilets, and kitchens, it is recommended to set the detection distance to be smaller than the installation height and lower the sensitivity accordingly.

4. Optimal sensitivity parameters.

The module can be set to 10 levels of sensitivity ranging from 0 to 9, with 9 being the highest sensitivity and 0 being the lowest. The default sensitivity upon factory setting is 7. Lower sensitivity levels require greater movement or breathing amplitudes and closer proximity in order to be detected. Conversely, higher sensitivity levels in complex situations where weak and interference signals are present within a wider range of angles can lead to an increase in false positives. In scenarios with low installation height and narrow spaces, it is recommended to lower the sensitivity.

5. Reasonable delay time parameters. There are two parameters for delay time:

(1) The first parameter is confirmation delay. Configuring the optimal parameter value can greatly reduce false positives. Although a larger value is more reliable, it will take longer for the module to report the detected target when it actually appears, and it may trigger only when someone walks underneath it. For scenarios with low real-time triggering requirements and no motion, this value can be increased to reduce false positives.

(2) The second parameter is disappearance delay (the time delay after the target disappears). The larger the configured parameter value, the easier it is to reduce the missed detection rate caused by accidental target disappearance or natural electromagnetic interference in the environment. Although a larger value is more reliable, it will take longer for the module to report that the target has disappeared after it actually disappears. It is recommended that the target disappearance confirmation time (delay time) should not be set too short. The

default is 15 seconds. If the time is set shorter, there may be a certain probability of a missed detection due to occasional pauses in breathing.

Note: The actual delay time after the target disappears varies despite the set delay time (it cannot be precisely delayed for the set time after the target disappears).

4. Communication Protocol

If the user is using the 5.8G microwave radar module solely as a trigger switch, using only the module's OUT pin, and the configuration parameters meet the performance and functional requirements, then it is not necessary to use a serial port or worry about the communication protocol.

The 5.8G microwave radar module adopts serial communication, with ASCII code strings as the data and commands for interaction with the module, making it easy to understand and debug.

(1) Serial Port Parameters:

The default baud rate is 115200 bps, with 1 stop bit, 8 data bits, no parity bit, and no flow control.

(2) Parameter Configuration Command:

The command is in the format of ASCII code string, with carriage return and line feed as the ending characters. Each command and parameter, as well as each parameter and parameter, should be separated by one or more spaces.

(3) The response for the command to read configuration parameters starts with the string "Response" and ends with a carriage return and line feed. Each command and parameter, as well as each parameter and parameter, should be separated by one or more spaces.

(4) Proactively reporting data.

The ASCII code string format starts with the character '\$' and ends with '*', with multiple parameters separated by ',' and placeholder parameters (reserved) represented by spaces.

Important notes to consider:

- (1) The module must be in a stopped state when configuring parameters. After configuring the parameters, the "save parameters" command must be sent to save the new parameters to the module's Flash memory. Then send the "start module" command, "reset and restart" command, or directly power off and restart, for all new configured parameters to take effect.
- (2) The "leapMMW:/>" shown in later descriptions is simply the command prompt printed by the module. The command string after "leapMMW:/>" is the actual command.

4.1 Common Configuration Commands.

4.1.1 Configuring Detection Range: setRange、getRange

Describe:	
<ul style="list-style-type: none"> ■ The 5.8GHz microwave radar module supports a maximum detection distance of up to 11m. ■ The 5.8GHz microwave radar module has a transition zone of 1m, which means that if the maximum detection distance is set to 3 meters, it may detect targets between 3 and 4 meters. At around 4 meters, significant movement may be necessary for detection, and it's possible that targets may not be detected at this distance (depending on the target's characteristics). However, beyond 4 meters, such as at 4.5 meters, no targets will be detected. Therefore, users need to pay special attention to this feature when configuring the maximum distance parameter to accurately define the detection area. <p>Note: The 5.8GHz microwave radar module is not designed specifically for distance measurement and the current version has not been calibrated for distance, so the distance can only be used for reference and may involve some deviation or error.</p>	
Configuration parameter command:	
Send command: setRange par1 par2	
Command to read configuration parameters:	
Send command: getRange Response to command: Response par1 par2	
Parameter item:	
par1	The nearest detection distance, in meters (m): Range of values: 0~11; Default is 0m, not recommended to be modified.
par2	The farthest detection distance, in meters (m): Range of values: par1 < par2 ≤ 11; Default is 6m.
Result of command execution:	
Done	The command was executed successfully.
Error	The command failed to execute.
Example:	
The detection distance for configuration is between 0 to 6 meters.	leapMMW:> setRange 0 6
The detection distance for configuration is between 0 to 11 meters.	leapMMW:> setRange 0 11
The detection distance for configuration is between 0 to 2.8 meters.	leapMMW:> setRange 0 2.8

4.1.2 Configuration Detection Sensitivity:setSensitivity、getSensitivity

Describe:	
<p>The 5.8GHz microwave radar module has 10 levels of sensitivity, with higher numbers indicating greater sensitivity and lower numbers indicating less sensitivity. 9 is the highest level of sensitivity, and the default sensitivity value of the module is 7.</p> <p>Note: Please configure the sensitivity according to the actual operating environment and requirements. Lower sensitivity requires larger target movement or closer distance to be detected, while higher sensitivity requires a cleaner environment and may result in more false alarms in the presence of interference.</p>	
Configuration parameter command:	
Send command:setSensitivity par1	
Read configuration parameters command:	
Send command:getSensitivity Command response:Response par1	
Parameter item:	
par1	Check sensitivity: Range of values is from 0 to 9, with a default of 7.
Command execution result:	
Done	Command execution successful.
Error	Command execution failed.
Example:	
Set detection sensitivity to 6.	leapMMW:/> setSensitivity 6
Set detection sensitivity to 0.	leapMMW:/> setSensitivity 0

4.1.3 Configure Output Delay Time:setLatency、getLatency

Describe:

<p>Output delay time configuration: Confirmation delay - used to configure the confirmation time when a target is detected; Disappearance delay - used to configure the confirmation time after a target has disappeared.</p> <p>Note:</p> <p>(1) Confirmation delay: Configuring the optimal parameter value can greatly reduce false alarm rates. Although a larger value is more reliable, it takes longer for the module to report that a target has been detected when a real target appears.</p> <p>(2) Disappearance delay: The larger the configured parameter value, the easier it is to reduce missed reports caused by targets disappearing accidentally. Although a larger value is more reliable, it takes longer for the module to report that the target has disappeared after the target has actually disappeared.</p>	
<p>Command for configuring parameters:</p>	
<p>Sending the command: <code>setLatency par1 par2</code></p>	
<p>Command for reading configuration parameters:</p>	
<p>Sending the command: <code>getLatency</code> Command response: <code>Response par1 par2</code></p>	
<p>Parameter options:</p>	
<p>par1</p>	<p>Confirming delay; Upon detecting the target, output a valid target signal (the OUT pin goes high) after a duration of par1, measured in seconds (s): Value range: 0 to 100, with a default value of 0.050 seconds.</p> <p>Note: For scenarios where high detection response speed is not required, it is recommended to set a delay greater than 0.5 seconds, which can significantly reduce false positive rates.</p>
<p>par2</p>	<p>Disappearance delay: If a target is not detected, invalid target signal will be triggered (OUT pin output low level) after continuously holding for par2 duration, in units of seconds (s). Value range: 0.5 to 1500, default 15 seconds.</p> <p>Note: For scenarios that do not require a fast response after the target disappears, it is recommended to set the disappearance delay greater than 15 seconds, which can significantly reduce the missed detection rate. It can also be set even longer, such as 30 seconds, 60 seconds, 90 seconds, etc.</p>
<p>Command execution result:</p>	
<p>Done</p>	<p>Command executed successfully.</p>
<p>Error</p>	<p>Command execution failed.</p>
<p>Example:</p>	
<p>The configuration requires the target to persist for at least 0.5 seconds to be considered existing; the target is considered non-</p>	<pre>leapMMW:/> setLatency 0.5 15</pre>

existent if it does not exist for 15 seconds.	
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4.1.4 Configuration Lock Time:setInhibit、getInhibit

Describe:	
<ul style="list-style-type: none"> ■ The default lock time for configuration is 1 second, which activates the lock detection function. ■ After the module detects the target, the default lock detection function lasts for 1 second, while the OUT pin outputs a control signal. After the duration of the control signal ends, the default lock detection function will last for another 1 second before allowing a target to be detected again. ■ The lock time is primarily used to address the issue of controlling high-power appliances (such as relays, motors, fans, lighting, etc.) that may produce power fluctuations or radiation when the control signal changes on the OUT pin, which could interfere with the radar module. During the lock time, targets are not detected, thereby avoiding sudden interference. 	
Command for configuring parameters:	
Send command:setInhibit par1	
Command for reading configuration parameters:	
Send command:getInhibit Command response:Response par1	
Parameter item:	
par1	Block time, in seconds: Value range: 0.1~255; default 1.
Command execution result:	
Done	Command executed successfully.
Error	Command execution failed.
Example:	
Set the blocking time to 0.5 seconds, i.e., do not detect the target for 0.5 seconds.	leapMMW:> setInhibit 0.5
Set the blocking time to 3 seconds, i.e., do not detect the target for 3 seconds.	leapMMW:> setInhibit 3

4.1.5 Configure the baud rate for the serial port:setUart、getUart

Describe:	
<p>After configuring the baud rate for the serial port, it is necessary to reset and restart the module (the parameters need to be saved first) for the new configuration to take effect. Once the new configuration is effective, the serial port on the user side also needs to be changed to the new baud rate for normal communication with the module.</p> <p>Note: To make the baud rate take effect, a reset and restart command (resetSystem 0) is needed, instead of the start command (sensorStart).</p>	
Command for configuring parameters:	
Sending command: setUart par1	
Command for reading configuration parameters:	
Sending command:getUart Command response:Response par1	
Parameter options:	
par1	Baud rate of serial port, unit in bps: Value range: 4800~115200; default 115200. Note: Do not exceed the maximum baud rate of the serial port used by the device, otherwise reconnection to the module will not be possible.
Command execution result:	
Done	Command executed successfully.
Error	Command execution failed.
Example:	
Configure the serial port baud rate to 57600 bps.	leapMMW:> setUart 57600

4.1.6 Configure the polarity of the output I/O port:setGpioMode、getGpioMode

Describe:	
<p>Configure the level of the effective signal output by the I/O pin after detecting the target, whether it is high-level effective or low-level effective.</p>	
Configure parameter command:	
Send command:setGpioMode par1 par2	
Read configuration parameter command:	

Send command: <code>getGpioMode par1</code> Command response: <code>Response par1 par2</code>	
Parameter item:	
par1	GPIO pin number configured: 1: Output pin.
par2	When the configured GPIO pin detects the target, the signal level output by the pin is:
	0: Outputs a low level signal when the target is detected and a high level signal when there is no target. 1: Outputs a high level signal when the target is detected and a low level signal when there is no target (default state).
Command execution result:	
Done	The command was executed successfully.
Error	The command execution was unsuccessful.
Example:	
The OUT pin configuration detects the target and outputs a low-level voltage.	<code>leapMMW:> setGpioMode 1 0</code>
Upon detecting the target, the OUT pin configuration outputs a high-level voltage.	<code>leapMMW:> setGpioMode 1 1</code>

4.1.7 Configuring PWM Output:`setPwm`、`getPwm`

Describe:
<ul style="list-style-type: none"> ■ The PWM control signal is output through the OUT pin configuration of the module. Both high and low-level signals, as well as PWM signals, are represented using PWM parameters. A duty cycle of 100% signifies that the I/O signal is continuously high, while a duty cycle of 0% signifies that the I/O signal is continuously low. ■ The toggling of high-level signals is controlled by the <code>setGpioMode</code> command.
Configuration parameter command:
Send command: <code>setPwm par1 par2 par3</code>
Read configuration parameter command:

Send command: getPwm	
Command response: Response par1 par2 par3	
Parameter items:	
par1	Duty cycle of OUT pin signal output when no target is detected: Value range from 0 to 100.
par2	Duty cycle of OUT pin signal output when a target is detected: Value range from 0 to 100.
par3	Time required for the duty cycle to transition from par1 to par2: Value range from 0 to 255. Corresponding time value is par3*64ms. Note: If par3=20, then the transition from par1 to par2 will take 20*64ms=1.28s.
Command execution result:	
Done	The command was executed successfully.
Error	The command execution failed.
Example:	
When the target is detected, the OUT pin outputs a high level signal (100% duty cycle); otherwise, it outputs a low level signal (0% duty cycle).	leapMMW:> setPwm 0 100
When the target is detected, the OUT pin outputs a high level signal (100% duty cycle); otherwise, it outputs a low level signal (0% duty cycle). The transition is completed over a period of 1.984 seconds (approximately 2 seconds).	leapMMW:> setPwm 0 100 31
The OUT pin outputs a low level signal (0% duty cycle) when the target is detected; otherwise, it outputs a high level signal (100% duty cycle).	leapMMW:> setPwm 100 0
When the target is detected, the OUT pin outputs a PWM signal with a duty cycle of 90%;	leapMMW:> setPwm 10 90

otherwise, it outputs a PWM signal with a duty cycle of 10%.	
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4.1.8 Echo Configuration:setEcho、getEcho

Describe:	
Configure whether or not to enable echo in the module. When echo is enabled, the command string transmitted to the module will be output exactly as it was received.	
Configure parameter command:	
Sending command:setEcho par1	
Read configuration parameter command:	
Sending command:getEcho Command response:Response par1	
Parameter item:	
par1	Whether to enable echo: 0: Turn off echo and disable prompt printing (i.e. no longer outputting the prompt: leapMMW:/>) 1: Turn on echo (default)
Command execution result:	
Done	The command has been executed successfully.
Error	The command has failed to execute.
Example:	
Disable serial port echo.	leapMMW:/> setEcho 0

4.1.9 Configure the output data mode:setUartOutput、getUartOutput

Describe:	
<ul style="list-style-type: none"> ■ Configure the data output mode for the module; ■ In passive output data mode, the module will only output data after receiving the "getOutput" command. 	
Configure parameter command:	
Send command:setUartOutput par1 par2 par3 par4	
Read configuration parameter command:	
Send command:getUartOutput par1 Command response:Response par1 par2 par3 par4	

Parameter items:	
par1	Data/message types: 1. Detection result output, namely \$JYBSS message data. 2. Target point cloud output, namely \$JYRPO message data.
par2	Enable or disable the output of message corresponding to par1:
	0: The message corresponding to par1 type is not included in the serial output data. 1: The message corresponding to par1 type is included in the serial output data.
par3, par4	Serial data output mode and period, with the period unit being second: (1) When par4 is set between 0.025 and 1500: - The value represents the period of actively outputting data. - When par3 = 0, data is actively outputted based on the period set by par4 (default parameter). - When par3 = 1, data is outputted immediately when changes occur, or outputted based on the period set by par4 if there's no change. (2) When par4 is set to >1500: - Data is passively outputted. - When par3 = 0, data is not actively outputted and can only be retrieved using the getOutput query command. - When par3 = 1, data is outputted immediately when changes occur, or not outputted if there's no change.
Note: (1) Parameters par3 and par4 apply to all types of data/messages in par1. (2) If the configuration of "serial data output mode and period" parameter is not	
Command execution result:	
Done	The command executed successfully.
Error	The command execution has failed.
Example:	
Enable output of target detection results.	leapMMW:> setUartOutput 1 1
Disable output of target detection results.	leapMMW:> setUartOutput 1 0
Enable output of target point cloud data.	leapMMW:> setUartOutput 2 1
Disable output of target point cloud data.	leapMMW:> setUartOutput 2 0

Enable active output of target detection results with a frequency of 5 seconds, and immediate output of data when there is a change.	<code>leapMMW:/> setUartOutput 1 1 1 5</code>
Disable active output of target detection results. The module will only output data when a "getOutput" command is issued to query it.	<code>leapMMW:/> setUartOutput 1 1 0 1600</code>

4.2 Control Commands.

4.2.1 Stop:sensorStop

Describe:	
Stop the module from running while it is in the running state.	
Note: Before configuring parameters, it is necessary to send a stop command to stop the module and enter the parameter configuration mode.	
Command:	
sensorStop	
Parameter item:	
Empty.	No parameters.
Response:	
Done	Command executed successfully.
Error	Command execution failed. The module is not in running state.
Example:	
Stop Module.	<code>leapMMW:/> sensorStop</code>

4.2.2 Start:sensorStart

Describe:

<p>When the module is in a non-started state and the configured parameters have been saved, starting the module initiates its operation.</p> <p>Note: After the parameter settings have been completed and saved, it is necessary to send a start command (<code>sensorStart</code>) to initiate the module's operation with the new parameters. (The serial port baud rate configuration requires a reset and restart command, <code>resetSystem 0</code>.)</p>	
Command:	
<code>sensorStart</code>	
Parameter:	
Empty.	No parameters.
Response:	
Done	Command executed successfully.
Error	Command execution failed.
Example:	
Start module.	<code>leapMMW:/> sensorStart</code>

4.2.3 Save Configuration:`saveConfig`

Describe:	
<p>After configuring module parameters through the serial port, this command is necessary to save the new configuration parameters to flash memory.</p> <p>Note: After configuring all the parameters, this command must be sent, otherwise the new parameters will not take effect and the module will lose the new parameters after restart.</p>	
Command:	
<code>saveConfig</code>	
Parameter items:	
Empty.	No parameters.
Response:	
Done	The command was executed successfully.
Error	The command execution has failed.
Example:	
Save all parameters for configuration.	<code>leapMMW:/> saveConfig</code>

4.2.4 Factory Reset:resetCfg

Describe:	
Restore all current configuration parameter values of the module to the default factory settings.	
Command:	
resetCfg	
Parameters:	
Empty.	No parameters.
Response:	
Done	The command was executed successfully.
Error	The command execution has failed.
Example:	
Restore configuration parameters to factory default values.	leapMMW:> resetCfg

4.2.5 Reset and reboot:resetSystem

Describe:	
The module performs a software reset and begins running again.	
Command:	
resetSystem par1	
Parameter:	
par1	Operating mode (this parameter can be omitted, and the default value is 0): 0: Normal software restart 1: Software restart and enter bootloader
Response:	
None.	There is no string printing during normal software reboot.
reset enter bootloader!	The response when software reboots and enters bootloader mode is:
Example:	
Normal reboot.	leapMMW:> resetSystem
Normal reboot.	leapMMW:> resetSystem 0

Enter bootloader mode.	leapMMW:/> resetSystem 1
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4.3 Initiate data reporting.

4.3.1 Output of detection results:\$JYBSS

Describe:	
<p>The 5.8 GHz microwave radar module outputs the results of detecting the presence of people in a fixed cycle or through passive inquiry.</p> <p>Note: The output of detection results is controlled by the configuration command "setUartOutput" and can be turned off, set to output at a certain interval or output during inquiry mode.</p>	
Response:	
\$JYBSS, par1, par2, par3, par4*	
Parameter Item:	
par1	Detection Results: 0: No presence 1: Presence detected (person is present, still, moving, or slightly moving, etc.)
par2	Placeholder Parameter: Reserved, replaced by blank space.
par3	Placeholder Parameter: Reserved, replaced by blank space.
par4	Placeholder Parameter: Reserved, replaced by blank space.
Example:	
Someone has been detected.	\$JYBSS, 1, , , *
No one has been detected.	\$JYBSS, 0, , , *

4.3.2 Point Cloud Target Output:\$JYRPO

Describe:

- One point cloud target output corresponds to one string message. Multiple targets result in multiple string messages. If there are no targets, no messages will be outputted.
- The current version only outputs one point cloud target, which is the target closest to the module's distance.

Note: The detection result output is controlled by the configuration command `setUartOutput`, which can turn off the output, set the output period, query-only output mode, etc.

Response:

\$JYRPO, par1, par2, par3, par4, par5, par6, par7*

Parameter items:

par1	<p>Total number of point cloud targets: Integer type, value range: 1~8.</p> <p>Note: The current version only takes a value of 1, indicating support for only one point cloud target.</p>
par2	<p>Point cloud target number: integer type, with a value range of 1 to the total number of point cloud targets.</p>
par3	<p>Current distance to point cloud target: single precision floating-point type, with unit in meters.</p>
par4	<p>Placeholder parameter: reserved, replaced with empty spa</p>
par5	<p>Current signal-to-noise ratio of point cloud target (signal amplitude divided by threshold): single precision floating-point type, with unitless value.</p> <p>Note: for reference only, a higher signal-to-noise ratio indicates a higher reliability of the currently detected target.</p>
par6	<p>Placeholder parameter: reserved, replaced with a space.</p>
par7	<p>Placeholder parameter: reserved, replaced with a space.</p>

Example:

Output 1 point cloud target with a distance of 0.882 meters from the distance module.

\$JYRPO, 1, 1, 0.882, , 1.562, , *

4.4 Other Commands

4.4.1 Read Hardware Version Information: getHWV

Describe:	
Read the hardware version information of the module.	
Command:	
getHWV	
Parameters:	
None.	
Response:	
[Version Information] Done	See example.
Example:	
Read hardware version information.	leapMMW:/> getHWV
	HardwareVersion:JYSJ_5807_A01 Done

4.4.2 Read Software Version Information: getSWV

Describe:	
Read software version information of the module.	
Command:	
getSWV	
Parameter options:	
None.	
Response:	
[Version Information] Done	See example.
Example:	

Read software version information.	<pre> leapMMW:/> getSWV SoftwareVersion:JYSJ_02.08.08.010827 Done </pre>
------------------------------------	-----------------------------------------------------------------------------

4.5 Configuration Example: Complete Process.

1. Configure detection distance to 3 meters.

```

leapMMW:/> sensorStop
leapMMW:/> setRange 0 3 Done
leapMMW:/> saveConfig save cfg
complete Done leapMMW:/>
sensorStart
Done

```

2. Configure sensitivity to 6; higher numbers indicate greater sensitivity.

```

leapMMW:/> sensorStop
leapMMW:/> setSensitivity 6
Done leapMMW:/> saveConfig
save cfg complete
Done

```

```

leapMMW:/> sensorStart
Done

```

3. Configure delay time.

- (1) Confirm that the delay is set to 2 seconds, i.e. the target must persist for 2 seconds before being detected.
- (2) Set the disappearance delay to 15 seconds, meaning that the target must be absent for 15 seconds before being considered as absent.

```

leapMMW:/> sensorStop leapMMW:/>
setLatency 2 15
Done leapMMW:/> saveConfig
save cfg complete
Done
leapMMW:/> sensorStart

```


Done

4. Command for configuring multiple parameters, such as sensitivity and delay time parameters being configured simultaneously.
 - (1) Configure the sensitivity to 5.
 - (2) Delay time configuration: Confirm that the delay is set to 0.5 seconds and disappear delay is set to 5 seconds.

```
leapMMW:> sensorStop
leapMMW:> setSensitivity 5
Done
leapMMW:> setLatency 0.5 5
Done leapMMW:> saveConfig
save cfg complete
Done
leapMMW:> sensorStart
Done
```

5. Declaration.

Please carefully review this statement before using the product described in this document. Using the product constitutes acceptance and acknowledgement of the contents of this statement. Customers who use the millimeter-wave human presence detection module must perform tests to confirm that the product meets their application needs, based on the product features, performance, and functionality described in this document. Chengdu Jiechipenny Technology Co., Ltd. assumes no liability for any damages or injuries resulting from improper use.

As this product is constantly updated and iterated upon, the documentation may be subject to change without prior notice. We regretfully inform you that we will not provide any separate notifications. Therefore, we kindly ask that you confirm the updated information and any errata through appropriate channels before applying the product. We appreciate your understanding.