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AH module **AT** command development guide

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Revision history

date	Version	describe	Revised by
2022-2-23	V3.0	Adjust the order of commands; Modify logo;	WE
2021-9-2	V2.2.1 Fixed the clerical error of ACKTMO;		WE
2021-8-24	V2.2 added: AT+WAKEUP/AT+HEART_INT;		YOU
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2021-4-29	V1.10 Added instructions for using the AT+DSLEEP command.		YOU
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2020-11-18	V1.4 adds AT+PAIR/AT+CONN_STATE command		YOU
2020-11-10	V1.3 Add AT+RSSI usage instructions		YOU
2020-10-24	V1.2 adds AT command terminator description and serial port tool setting description		YOU
2020-9-22	V1.1 adds AT+KEYMGMT/AT+AGGCNT commands		YOU
2020-09-16	V1.0 first version		YOU

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1 Overview

The AH module supports AT command working mode. AT commands can be sent through uart or network port, and parameters can be set.

configuration, data communication.

2 Interface description

2.1 Serial port settings

Serial port configuration is as shown below.

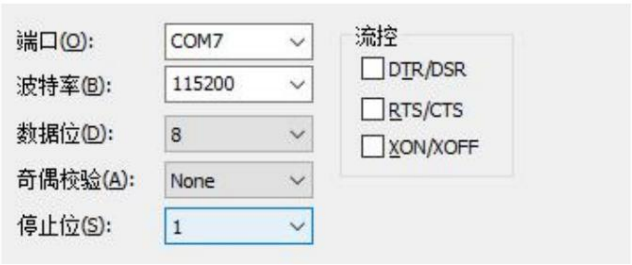

Figure 2-1 Serial port parameter configuration

In addition, please pay attention to selecting the new line mode, taking SecureCRT as an example:

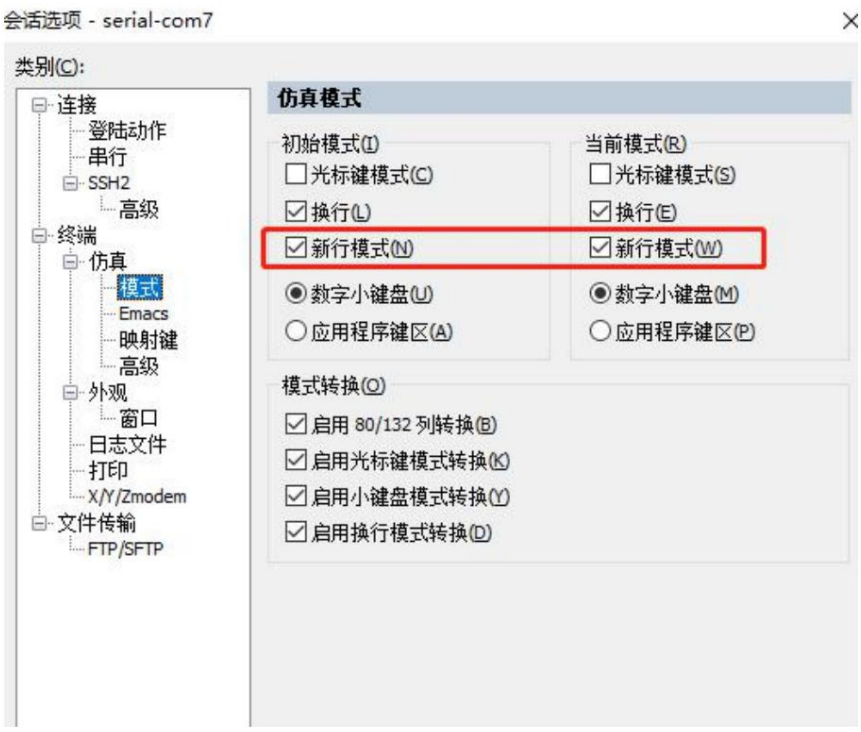

Figure 2-2 Select New Line Mode

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To test whether the serial port is normal, enter AT+, and it will print as shown below:

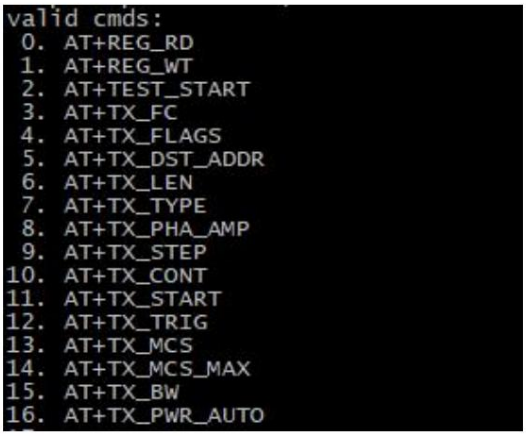

Figure 2-3 Echo of inputting AT+

If there is no such print, it means that the serial port input is incorrect and you need to contact our FAE.

2.2 Network port

For scenarios where the serial port is inconvenient, we provide two network port-based tools to facilitate customers to configure parameters (netat.exe) and view logs (netlog.exe). Note that both tools require bridge firmware version 12954 or later to work. Instructions for use are introduced below.

2.2.1 **Netat.exe**

When you need to use AT+ commands to configure network bridge parameters, you can use netat.exe.

Connect the bridge device and PC with a network cable. Double-click to run, enter the IP address of the pc, and the mac of the connected

device will be displayed. If only one device is connected, device 1 will be auto selected.

Figure 2-4 Netat selects only one device

If several devices are connected through the switch, you can select the device by entering a number

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Figure 2-5 Netat selects multiple devices

After selecting the device, enter the AT command to execute the AT command. The usage is the same as the serial port.

2.2.2 **Netlog.exe**

When you need to use a network cable to view the debugging log of the network bridge, you can use

netlog.exe. Connect the bridge device and PC with a network cable. Double-click to run netlog.exe, enter the IP address of the pc, and the log will be

printed automatically. Only the log of the device connected to the network cable will be displayed. When using, be careful not to use a switch to connect multiple devices.

3 **AT** command usage instructions

3.1 Basic networking commands

3.1.1AT+MODE: Set working mode

Execute instructions	Query: AT+MODE?	Setting:AT+MODE=ap/sta
response	+MODE:ap/sta OK	Success: OK Failure: ERROR
Parameter Description		Support ap/sta/group/apsta 4 modes
Example		ÿ at+mode=ap: ap mode ÿ at+mode=staÿsta model ÿ at+mode=group: broadcast mode ÿ at+mode=apsta: relay mode, relay mode setting The device not only serves as a sta to connect to the upper-level AP, but also serves as an ap. Provide connection services for other sta. Use at+r_ssid and at+r_psk set the connection parameters of the upper level AP.

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3.1.2AT+SSID: Set SSID

Execute instructions	Query: AT+SSID?	Setting:AT+SSID=ssid_char
response	+SSID:hgic_ah_test OK	Success: OK Failure: ERROR
Parameter Description		ssid_char length is less than 32 characters
Example		at+ssid=hgic_ah_test

3.1.3AT+KEYMGMT: Set encryption mode

Execute instructions	Query: AT+KEYMGMT?	Setting:AT+KEYMGMT=WPA-PSK/NONE
response	+KEYMGMT:WPA-PSK OK	Success: OK Failure: ERROR
Parameter Description		WPA-PSK: Turn on encryption NONE: Turn off encryption
Example		at+keymgmt=WPA-PSK at+keymgmt=NONE

3.1.4AT+PSK: Set encryption password

Execute instructions	Query: AT+PSK?	Setting:AT+PSK=psk_char
response	+PSK:baa58569a9edd7c3a55e4 46bc658ef76a7173d023d25678 6832474d737756a82 OK	Success: OK Failure: ERROR
Parameter Description		psk_char must be 64 hex characters.
Example		at+psk=baa58569a9edd7c3a55e446bc6 58ef76a7173d023d256786832474d7377 56a82

3.1.5AT+PAIR: pairing control

Execute instructions	Query: AT+PAIR=0/1

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response	OK
Parameter Description	This command enables fast pairing networking. When initiating pairing: 1. The AP is configured with SSID and password: During the pairing process, the STA will obtain the SSID and password of the AP. code. 2. The AP is not configured with SSID and password: During the pairing process, the AP will generate a random SSID for each STA. password. After successful pairing, a PAIR SUCCESS message will be generated, and you need to execute AT+PAIR=0 to stop pairing. The connection is automatically established after pairing is stopped.
Example	AT+PAIR=1 //Start pairing AT+PAIR=0 //Stop pairing

3.1.6AT+BSS_BW: Set BSS bandwidth

Execute instructions	Query: AT+BSS_BW?	Setting:AT+BSS_BW=bss_bw
response	+BSS_BW:8MHz OK	Success: OK Failure: ERROR
Parameter Description		bss_bw only selects the following 4 values: 1 : 1MHz 2: 2MHz 4 : 4MHz 8 : MHz
Example		at+bss_bw=4

3.1.7AT+FREQ_RANGE: Set the working frequency range

Execute instructions	Query: AT+FREQ_RANGE?	Setting:AT+FREQ_RANGE=start,end
response	+FREQ_RANGE:9080-9240 OK	Success: OK Failure: ERROR
Parameter Description		ÿThis command is used to set the frequency point for continuous use Range, specify the starting center frequency point and ending center frequency Heart frequency point, the AH module will automatically calculate the frequency point sequence surface. ÿ The value of start and end is the center frequency point*10.

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Example		at+freq_range=9080,9240 set up start freq=908MHz end freq=924MHz The generated channel list is 908M, 916M,924M Note that if AT+CHAN_LIST is set at the same time, The parameters take priority with the set CHAN_LIST.

3.1.8AT+CHAN_LIST: Set the working frequency list

Execute instructions	Query: AT+CHAN_LIST?	Setting:AT+CHAN_LIST=freq1,freq2
response	+CHAN_LIST:9080,9240 OK	Success: OK Failure: ERROR
Parameter Description		ÿThis command is used to set non-continuous frequency point columns surface. ÿ The specified frequency point value is the center frequency point*10. ÿ Supports up to 16 frequency points, separated by commas
Example		at+chan_list=9080,9240 Set 2 frequency points, namely: 908MHz, 924MHz

3.2 Status query command

3.2.1AT+RSSI: Check the device signal quality RSSI

Execute instructions	Query: AT+RSSI?
response	+RSSI:-30 OK
Parameter Description	AT+RSSI=index/mac_addr index: Specifies the device index to be queried, starting from 1. mac_addr: Specifies the mac address of the device to be queried.
Example	AT+RSSI //If no parameters are specified, query the RSSI of the first device

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	AT+RSSI=1 //Specify to query the rssi of the first device AT+RSSI=f4:de:09:68:6c:20 //Specify to query RSSI based on MAC address

3.2.2AT+CONN_STATE: View connection status

Execute instructions	Query: AT+CONN_STATE
response	+CONNECTED //Connected +DISCONNECT //Not connected
Parameter Description	
Example	AT+CONN_STATE

3.2.3AT+WNBCFG: View device parameter information

Execute instructions	AT+WNBCFG
response	
illustrate	View device parameter information

3.3 Advanced networking commands

3.3.1AT+TXPOWER: Set the maximum transmit power

Execute instructions	Query: AT+TXPOWER?	Setting:AT+TXPOWER=txpower
response	+TXPOWER:20dbm OK	Success: OK Failure: ERROR
Parameter Description		This command is used to manually set the maximum transmit power. The range is 6~20, 1db step.
Example		at+txpower=20 Set the maximum transmit power to 20dbm

3.3.2AT+ACKTMO: Set ACK TIMEOUT time

Execute instructions	Query: AT+ACKTMO?	Setting:AT+ACKTMO=0
response	+ACKTMO:0 OK	Success: OK Failure: ERROR

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Parameter Description	Default value, no additional ACK timeout is added time;	If the communication distance exceeds 3km, each additional 3km requires To increase the ACK timeout of 20us; Modified values are saved when power is turned off;
Example		AT+ACKTMO=100 Add 100us ACK packet timeout

3.3.3AT+TX_MCS: Set tx mcs

Execute instructions	Query: AT+TX_MCS?	Setting:AT+TX_MCS=255
response	+TX_MCS:255 OK	Success: OK Failure: ERROR
Parameter Description		Set tx mcs, the range is 0~7 or 1M mode When 10, it means fixed to a certain mcs, other values mean mcs automatic adjustment; This command will be saved after power off;
Example		AT+TX_MCS=2 Fixed transmission MCS is 2

3.4 Debugging commands

3.4.1AT+FWUPG: Serial port firmware upgrade

Execute instructions	AT+FWUPG
response	After successful execution, the serial port prints: CCCCCCCCCC Indicates that the module has entered upgrade mode and the firmware can be downloaded using the xmodem protocol.
illustrate	Serial port tools that support xmodem protocol include: secureCRT, xshell

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	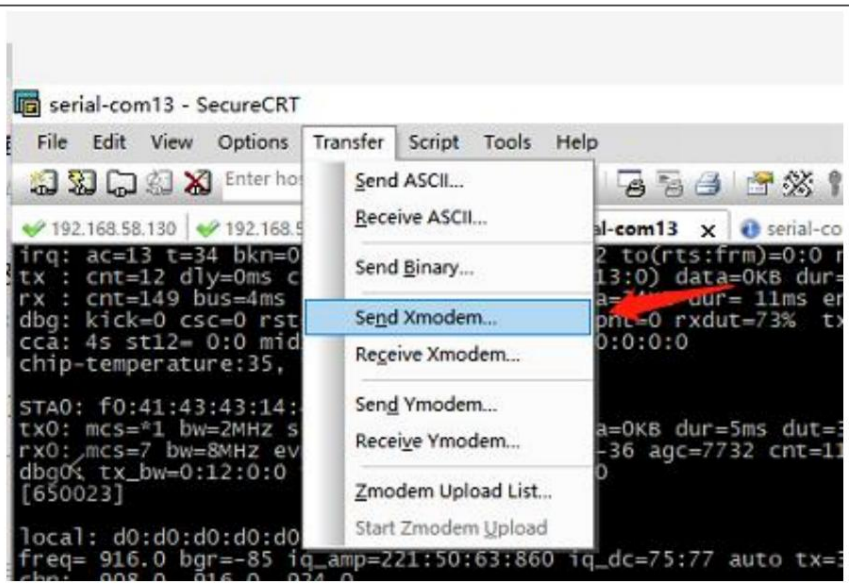

3.4.2AT+LOADDEF: Restore factory settings

Execute instructions	AT+LOADDEF=1
response	
illustrate	reset

3.5 Multicast related commands

3.5.1AT+JOINGROUP: Join the multicast network

After setting the working mode of the WiFi module to group, you can use this command to set the WiFi module to join a multicast network.

network. After joining a multicast network, the WiFi module will only receive data in that multicast network. All data communications are multicast

address for communication. If the working mode is set to group, but no multicast network is added, all data communications

All are sent and received in the form of broadcast.

Execute instructions		Setting:AT+JOINGROUP=11:22:33:44:55:66,3
response		Success: OK Failure: ERROR
Parameter Description		AT+JOINGROUP=group_addr,AID group_addr: The address of the multicast network to be joined AID: The AID of the device in the multicast network. Valid AID values: 1~255. net The AID of each device in the network should remain unique.

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		ý Set effective AID: The WiFi module will send heartbeats in the multicast network regularly. Jump to announce your presence to other WiFi modules. ý Set invalid AID: The WiFi module will not send heartbeats and will not notify other WiFi module.
Example		AT+JOINGROUP=11:22:33:44:55:66,3 Join multicast address:11:22:33:44:55:66 AID is set to 3

3.6 Relay related setting commands

3.6.1AT+R_SSID: Set the SSID of the relay

Execute instructions	Query:AT+R_SSID?	Setting:AT+R_SSID=repeater_ssid
response	+R_SSID:repeater_ssid OK	Success: OK Failure: ERROR
Parameter Description		Set the SSID of the upper level AP that the relay connects to.
Example		

3.6.2AT+R_PSK: Set the encryption password of the relay

Execute instructions	Query: AT+R_PSK?	Setting:AT+R_PSK=psk_char
response	+R_PSK:baa58569a9edd7c3a55 e446bc658ef76a7173d023d256 786832474d737756a82 OK	Success: OK Failure: ERROR
Parameter Description		The password for the relay to connect to the upper level AP. psk_char Must be 64 hex characters.
Example		

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3.7 Roaming related setting commands

3.7.1AT+ROAM: Set roaming enablement

Execute instructions	Query: AT+ROAM?	Setting:AT+ROAM=0/1
response	OK	Success: OK Failure: ERROR
Parameter Description	Roaming enablement only needs to be set on the STA side. The SSID of the AP in the roaming network can be set by full word matching or fuzzy matching. Whole-word matching: The SSIDs of all APs are set to the same SSID. The length of the SSID is not limited and does not exceed More than 32 characters are sufficient. STA is also set to this SSID. Fuzzy matching: The last three characters of SSID of different APs are different. The total length of SSID must be greater than 8 characters, consisting of a common string (at the beginning of the SSID) and a 3-character ID (at the end of the string) to compose. For example, the common string is HUGE_IC_AH, then the SSID of AP1 can be set to HUGE_IC_AH001, the SSID of AP2 is HUGE_IC_AH002, and so on. SSID of STA It should be set to be consistent with the SSID of one of the APs.	
Example		AT+ROAM=1

3.8 Other commands

3.8.1AT+TXDATA: Send data command

Execute instructions	Query: Unsupported setting: AT+TXDATA=length,txbw,txmcs,priority	
response		Success: OK Failure: ERROR
Parameter Description		This command is used to send data through the serial port when the UART is in non-transparent transmission mode. deliver. Steps: 1. First execute the AT+TXDATA command to set the parameters for data transmission, such as: length: the length of data to be sent [required] txbw: Specify the tx bandwidth of the data [optional] txmcs: Specify the tx mcs of the data [optional] priority: Specify the priority of the data, 0~7 [optional]

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		2. After executing the at+txdata command and returning OK, start sending data. The length of the sent data must meet the length specified by the parameter. ÿ In 1-to-1 mode, AT+TXDATA can directly send the original data according to. ÿ In 1-to-many mode, AT+TXDATA cannot send original data directly. It is necessary to add the original data + 14Byte Ethernet frame header before sending. set up The length setting should also include the Ethernet frame header length. The 1-to-1 mode or 1-to-many mode is determined when the firmware is compiled. , set according to actual application requirements. The default firmware is one-to-many model.
Example		ÿ 1 to 1 mode: at+txdata=10 //10byte data needs to be sent OK 1234567890 //10byte original data is sent directly ÿ 1 to many mode: at+txdata=24 //Need to send 10byte data OK 222222222228888888888899991234567890 The first 14 bytes are the filled Ethernet frame header, and the last 10 bytes are the original initial data. ÿ 222222222222: is the Ethernet destination address ÿ 888888888888: is the Ethernet source address ÿ 9999: Ethernet protocol type Ethernet frame header filling instructions: ÿ Source address: You can fill in all 0s ÿ Protocol type: You can fill in all 0's ÿ Destination address: The filling rules for ap and sta are as follows: ÿ The AP end uart master needs to manage the sta device, remember Record the mac address of each sta device, maintain the device ID and Mac address mapping table, check before sending data table, data can only be sent after finding the MAC address of the device.

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deliver. If it is a broadcast transmission, the destination address is filled with all

0xFFÿ

ÿ The uart master on the sta side does not need to maintain the mapping table.

Just fill in all 0s.

The AP side mapping representation is as follows:

Device ID	MAC address
1001	00:1A:2B:3C:4D:5 AND

ÿ Receive data:

After receiving the data, the AH module will output the data on the serial port with the following format:

1. 1 to 1:

+RXDATA:10\r\n

1234567890

Received 10byte data.

2. 1 to many:

+RXDATA:24\r\n

222222222222888888888888999912345678 90

Received 24byte data, of which the first 14byte is the Ethernet frame header

Data, starting from the 15th byte is real data.

ÿ The uart master on the AP side can save the source address of the Ethernet frame header.

Associate with the device ID and update the mapping table.

ÿ The uart master on the sta side does not need to maintain the mapping table and ignores the Ethernet

Network frame header, just receive the real data.

After the uart master receives +RXDATA, please parse it according to the above format.

Receive data.

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4 **AT** command usage examples

4.1 Basic instructions for module establishment of connection

When using the AT command to initialize the AH module, it mainly sets the frequency, bandwidth, SSID and password. code and other parameters. The simple initialization AT command list is as follows:

```
AT+CHAN_LIST=9080,9160,9240 #Set 3 frequency points#Set 8M
AT+BSS_BW=8 #Set bandwidth
AT+SSID=hgic_ah_test #SSID
AT+KEY_MGMT=WPA-PSK #Enable encryption
AT+PSK=baa58569a9edd7c3a55e446bc658ef76a7173d023d256786832474d737756a82
AT+MODE=ap #Set to AP mode
```

4.2 Configure relay network instructions

4.2.1AP module

1. Configure the ssid of the AP. Each AP should be configured differently. You can consider ssid1 and ssid2 increasing in this way, for example:

   at+ssid=ssid1

2. Configure without encryption (in order to simplify the configuration, we will use non-encryption as an example for now) at+keymgmt=none

4.2.2 Relay module

1. Configure the relay role

   at+mode=apsta 2. Configure no encryption

   at+keymgmt=none 3. Configure the r_ssid of the relay, which is used to connect the relay to the ap. It should be consistent with the ssid of the ap you want to connect to, for example:

   at+r_ssid=ssid1

4. Configure the ssid of the relay, which is used to connect the relay to the sta. In order to facilitate management, you can consider the ssid of the ap to be consistent with the ssid of the ap, and add a suffix at the end, such as ssid1_r1, ssid1_r2, ssid2_r1, etc., for example:

   at+ssid=ssid1_r1

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4.2.3STA module

1. Configure the SSID of the STA to allow the STA to connect to the relay. It should be consistent with the SSID of the relay you want to connect to, for example:

at+ssid=ssid1_r1 2,

configure no encryption

at+keymgmt=none