



Tektronix AH Module AT Instruction Development Guide



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Documents

Confidentiality Level	A	Development Guide of AT Command for TECSIN AH	Document Number	
Issue Date	2023-5-23		Version	V4.3

Module

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1 Overview of STA Module

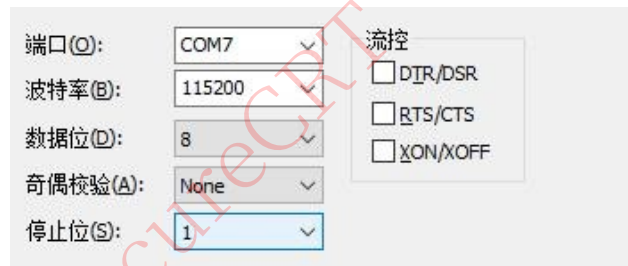
Tecent AH module supports AT command working mode and can send AT command through uart or network port for parameter setting and data communication.

2 Interface

2.1 Serial port setting

The serial port configuration is carried out according to the following figure.

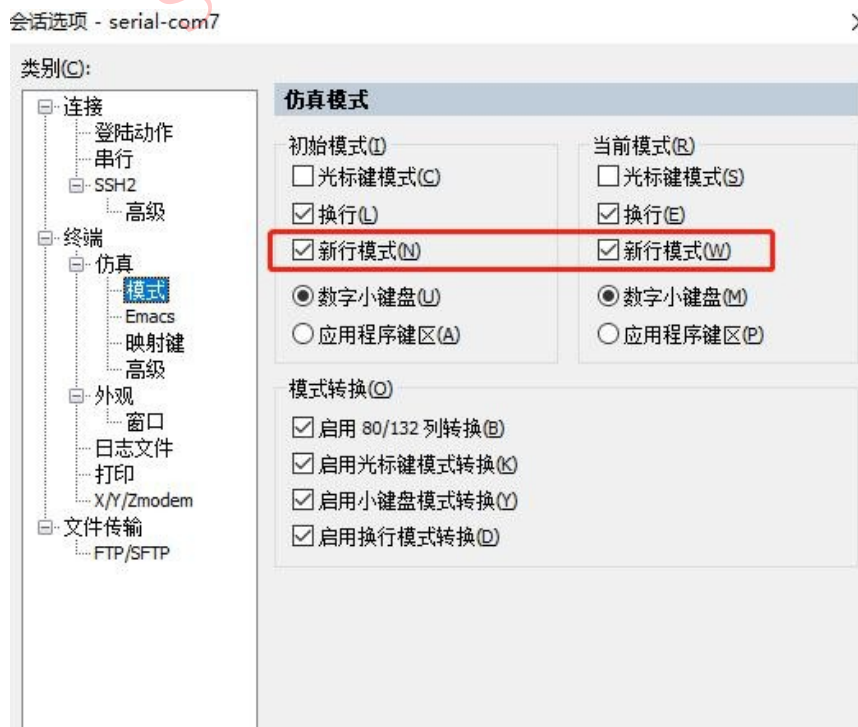
Figure 2-1 Serial Parameter Configuration



The dialog box for serial parameter configuration. It includes fields for Port (COM7), Baud Rate (115200), Data Bits (8), Parity (None), and Stop Bits (1). There is also a section for Flow Control with checkboxes for DTR/DSR, RTS/CTS, and XON/XOFF.

端口(O):	COM7	流控 <input type="checkbox"/> DTR/DSR <input type="checkbox"/> RTS/CTS <input type="checkbox"/> XON/XOFF
波特率(B):	115200	
数据位(D):	8	
奇偶校验(A):	None	
停止位(S):	1	

In addition, please check the new line mode, take SecureCRT as an example:



The SecureCRT Session Options dialog box for serial-com7. The left sidebar shows the tree structure with '仿真' (Simulation) selected. The main area is titled '仿真模式' (Simulation Mode) and contains two columns of options. The 'New Line Mode' (新行模式) options are highlighted with a red box.

仿真模式	
初始模式(I) <input type="checkbox"/> 光标键模式(C) <input checked="" type="checkbox"/> 换行(L) <input checked="" type="checkbox"/> 新行模式(N)	当前模式(R) <input type="checkbox"/> 光标键模式(S) <input checked="" type="checkbox"/> 换行(E) <input checked="" type="checkbox"/> 新行模式(W)
<input checked="" type="radio"/> 数字小键盘(U) <input type="radio"/> 应用程序键区(A)	<input checked="" type="radio"/> 数字小键盘(M) <input type="radio"/> 应用程序键区(P)
模式转换(O) <input checked="" type="checkbox"/> 启用 80/132 列转换(B) <input checked="" type="checkbox"/> 启用光标键模式转换(K) <input checked="" type="checkbox"/> 启用小键盘模式转换(V) <input checked="" type="checkbox"/> 启用换行模式转换(D)	

Figure 2-2 Check New Line Mode

To test if the serial port is working properly, enter AT+, and the following figure will be printed:

```
valid cmds:
0. AT+REG_RD
1. AT+REG_WT
2. AT+TEST_START
3. AT+TX_FC
4. AT+TX_FLAGS
5. AT+TX_DST_ADDR
6. AT+TX_LEN
7. AT+TX_TYPE
8. AT+TX_PHA_AMP
9. AT+TX_STEP
10. AT+TX_CONT
11. AT+TX_START
12. AT+TX_TRIG
13. AT+TX_MCS
14. AT+TX_MCS_MAX
15. AT+TX_BW
16. AT+TX_PWR_AUTO
```

Figure 2-3 Display of AT+ input

If this does not print, the serial port input is incorrect and you need to contact our FAE.

2.2 Netat

For the scenarios where the serial port is not convenient to use, Tectent provides two tools based on the network port for customers to configure the parameters (netat.exe) and check the log (netlog.exe). Note that both tools can only work after the bridge firmware version 12954. The following describes the usage instructions for each.

2.2.1 Netat.exe

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

Connect the bridge device and PC with a cable, double click to input the IP address of PC, it will show the mac of the connected device.

If only one device is connected, it will auto select device 1.

```
select ipaddr for bind:10.10.10.151
----- Discover 1 Device -----
1: fa-de-09-8a-9b-38
>:auto select device 1
```

Figure 2-4 Netat Selects Only One Device

If there are several devices connected to the switch, you can select the device by inputting the number.


```

1>:
----- Discover 3 Device -----
1: f6-de-09-9b-a7-60
2: f6-de-09-60-96-60
3: f6-de-09-99-6f-60

1>:2
select device 2

2>:3
select device 3

```

显示识别了3台设备

默认选择第一台设备，输入数字可以切换选择其他设备

Figure 2-5 Netat Selecting Multiple Devices

After selecting the device, input AT command, then AT command will be executed, the usage is the same as serial port.

2.2.2 Netlog.exe

When you need to check the debugging log of the bridge with the network cable, you can use netlog.exe.

Connect the bridge device and PC with a network cable, double-click it to run netlog.exe, input the IP address of PC, and the log will be printed automatically, only the log of the device connected by the network cable will be displayed, be careful not to connect more than one device with the switch.

3 AT command instruction

3.1 Basic Commands for Networking

3.1.1 AT+MODE: Set working mode.

Execute commands	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		<ul style="list-style-type: none"> ● at+mode=ap: ap mode ● at+mode=sta: sta mode ● at+mode=group: broadcast mode ● at+mode=apsta: relay mode, the device in relay mode acts as a sta to connect to the upper level AP and also acts as an ap to provide connectivity services for other sta. Use at+r_ssid and at+r_psk to set the connection parameters of the upper-level AP.

3.1.2 AT+SSID: Set SSID.

Execute command	Query: AT+SSID?	Set:AT+SSID=ssid_char
Response	+SSID:hgic_ah_test OK	Success: OK Failure: ERROR
Parameter Description		ssid_char Length less than 32 characters
Example: at+ssid=hgic_ah_test		at+ssid=hgic_ah_test

3.1.3 AT+KEYMGMT: Set encryption mode.

Execute command	Query: AT+KEYMGMT?	Set:AT+KEYMGMT=WPA-PSK/NONE
Response	+KEYMGMT:WPA-PSK OK	Success: OK Failure: ERROR
Parameter Description		WPA-PSK:Enable encryption NONE: disable encryption
Example		at+keymgmt=WPA-PSK at+keymgmt=NONE

3.1.4 AT+PSK: set encryption password

Execute command	Query: AT+PSK?	Set:AT+PSK=psk_char
Response	+PSK:baa58569a9edd7c3a55e446bc658ef76a7173d023d256786832474d737756a82 OK	Success: OK Failure: ERROR
Parameter Description		psk_char must be 64 hex characters.
Example		at+psk=baa58569a9edd7c3a55e446bc658ef76a7173d023d256786832474d737756a82

3.1.5 AT+PAIR: Pairing control

Execute command	Query: AT+PAIR=0/1
------------------------	--------------------

Response	OK
Parameter Description	<p>This command enables fast pairing networking when SSID is not set. When starting pairing:</p> <ol style="list-style-type: none"> 1. The AP has configured SSID and password, but the STA has not: During the pairing process, the STA will obtain the SSID and password of the AP. 2. Neither the AP nor the STA is configured with SSID and password: the AP generates a random password for each STA during the pairing process. <p>After successful pairing, a PAIR SUCCESS message is generated, but the pairing will not be exited automatically, you need to execute AT+PAIR=0 to stop pairing.</p> <p>After the pairing is stopped, the connection will be established automatically.</p> <p>If both the AP and STA have set parameters such as SSID, there is no need to start PAIR.</p> <p>parameters, the connection will be established automatically.</p>
Example	<p>AT+PAIR=1 //Start pairing.</p> <p>AT+PAIR=0 //stop pairing</p>

3.1.6 AT+BSS_BW: Set BSS bandwidth

Execute Command	Query: AT+BSS_BW?	Setting: AT+BSS_BW=bss_bw
Response	+BSS_BW:8MHz OK	Success: OK Failure: ERROR
Parameter Description		<p>bss_bw Only the following 4 values are selected:</p> <p>1 : 1MHz</p> <p>2 : 2MHz</p> <p>4 : 4MHz</p> <p>8 : 8MHz</p>
Example		at+bss_bw=4

3.1.7 AT+FREQ_RANGE: Sets the operating frequency range.

Execute the command	Query: AT+FREQ_RANGE?	Setting: AT+FREQ_RANGE=start,end
Response	+FREQ_RANGE:9080-9240 OK	Success: OK Failure: ERROR
Parameter Description		<p>● This command is used to set the range of frequency points to be used continuously, specify the start center frequency point and end center frequency point, and the AH module will calculate the frequency point list automatically.</p> <p>AH module will calculate the frequency point list automatically.</p>

		<p>AH module will calculate the frequency point list automatically.</p> <ul style="list-style-type: none"> The values of start and end are center frequency point*10.
Example		<p>at+freq_range=9080,9240 Setting start freq=908MHz end freq=924MHz The generated channel list is 908M, 916M, 924M.</p> <p>Note that if AT+CHAN_LIST is set at the same time, the parameter takes precedence over the set CHAN_LIST.</p>

3.1.8 AT+CHAN_LIST: Set the working frequency list.

Execute command	Query: AT+CHAN_LIST?	Setting: AT+CHAN_LIST=freq1,freq2
Response	+CHAN_LIST:9080,9240 OK	Success: OK Failure: ERROR
Parameter Description		<ul style="list-style-type: none"> The command sets the non-contiguous frequency list. The specified frequency value is the center frequency*10. Supports up to 16 frequency points, separated by commas.
Example		<p>at+chan_list=9080,9240</p> <p>Set 2 frequency points, respectively: 908MHz, 924MHz</p>

3.2 Status Query Commands

3.2.1 AT+RSSI: check the signal quality RSSI of the device.

Execute command	Query: AT+RSSI?
Response	+RSSI:-30 OK
Parameter Description	AT+RSSI=index/mac_addr

	<p>index: Specifies the index of the queried device, starting from 1.</p> <p>mac_addr: Specify the mac address of the queried device.</p>
Example	<p>AT+RSSI //Unspecified parameter, query the RSSI of the 1st device AT+RSSI=1 //Specify to query the rssi of the 1st device.</p> <p>AT+RSSI=f4:de:09:68:6c:20 //Specify to query RSSI according to MAC address.</p>

3.2.2 AT+CONN_STATE: check connection status

Execute the command	Query: AT+CONN_STATE
Response	<p>+CONNECTED //connected</p> <p>+DISCONNECT //not connected</p>
Parameter Description	
Example	AT+CONN_STATE

3.2.3 AT+WNBCFG: View device parameter information

Execute command	AT+WNBCFG
Response	
Instruction	View device parameter information

3.2.4 AT+STA_INFO: view STA information

Execute command	AT+STA_INFO=ID
Response	<pre>STA1: f6:de:09:79:6c:50 tx1: mcs=0 bw=2MHz snr=86 cnt=7 agg=1 data=0KB(0kbps) dur=4ms dut=32% txq=0 cca=28 ack=0KB(7) drop=0KB(0) per= 0% est_rate=450kbps rx1: mcs=0 bw=2MHz evm(avg:std)=0:0 rssi=0 agc=0 cnt=10 agg=1 data=0KB(2kbps) dur=9ms dut=67% fcsErr=0, freqDev =395Hz adv_dw=0:0:0:0 sta_cnt=1</pre>
Description	<p>View the LMAC statistics of the STA with corresponding ID, including RSSI, EVM, etc.; AP can use this command, but STA doesn't need this command;</p> <p>ID is the serial number of the STA, counting from 1;</p> <p>When using this command, you can turn off the default LMAC printing first: AT+SYSDBG=LMAC,0</p>

3.2.5 AT+SCAN_AP: scan around AP information.

Execute command	AT+SCAN_AP
Response	AT+SCAN_AP: Scan for surrounding AP information
Explanation	Execute this command in STA mode to scan the surrounding AP information.

3.2.6 AT+BSSLIST: Get the list of scanned APs

Execute the command	Query: AT+BSSLIST
Response	[508727]BSS List: [508727]ah_1, freq:7720, signal:-14, en:0, bssid:fa:de:09:83:84:38, repeater:0 [508734]ah_2, freq:7800, signal:-17, en:0, bssid:f6:de:09:6e:5a:50, repeater:0
Explanation	After executing the scan_ap command, you can use this command to get the list of scanned APs (the aps set the ssid to be scanned)

3.3 Advanced Networking Commands

3.3.1 AT+TXPOWER: Set the maximum transmit power.

Execution Commands	Query: AT+TXPOWER?	Setting: AT+TXPOWER=txpower
Response	+TXPOWER:20dbm OK	Success: OK Failure: ERROR
Parameter Description		The command sets the maximum transmit power manually. The range is 6-20 in 1db steps.
Example		at+txpower=20 Set the maximum transmit power to 20dbm.

3.3.2 AT+ACKTMO: set ACK TIMEOUT time

Execute command	Query: AT+ACKTMO?	Setting: AT+ACKTMO=0
Response	+ACKTMO:0 OK	Success: OK Failure: ERROR
Parameter Description	Default value, no additional ACK timeout;	Set to increase the ack timeout value of WiFi protocol parameter of AH module in microseconds, default value is 0. You need to set this parameter only when you are communicating over 1km. The calculation formula is $10 \times (\text{distance in kilometers} - 1)$, for example, 2km. The calculation formula is $10 \times (\text{distance in kilometers} - 1)$, for example, set acktmo=10 for 2km. Set acktmo=10 for example 2km. The modified value is saved by power down;
Example		AT+ACKTMO=100 Increase the ACK packet timeout by 100us.

3.3.3 AT+TX_MCS: set tx mcs

Execute command	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 10 in 1M mode means it is fixed to a certain mcs, other value means the mcs is adjusted automatically; This command will be saved after power off;
Example		AT+TX_MCS=2 Fix the transmission MCS to 2

3.3.4 AT+HEART_INT: set heartbeat packet interval.

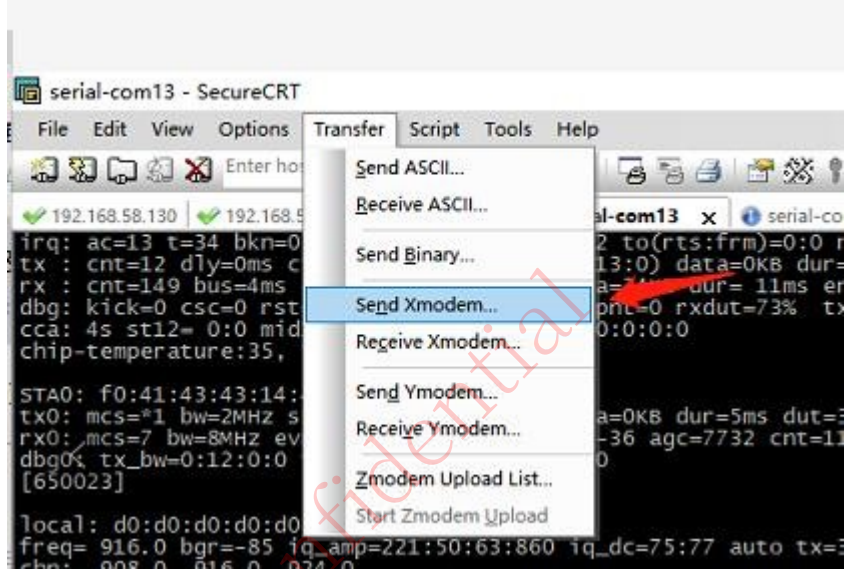
Execute command	Query: AT+HEART_INT?	Set:AT+HEART_INT=500
Response	+HEART_INT:500 OK	Success: OK Failure: ERROR
Parameter Description		Set heartbeat packet interval in mS, the minimum setting is 500; the more STAs you have, the larger heartbeat packet interval you suggest to set, the approximate appropriate length of heartbeat packet is STA_count*50; Earlier software versions need to set the same heartbeat packet interval for AP and STA, otherwise there will be connection problems; this command will be saved in power down; since V1.6.2 version, you only need to set the heartbeat packet interval for AP, and AP will automatically synchronize with STA, this command is invalid for STA. This command is invalid for STA.
Example		AT+HEART_INT=2000 Set heartbeat interval to 2S

3.3.5 AT+UNPAIR: Set to unpair the specified STA.

Execute the command	Query: AT+UNPAIR?	Set:AT+UNPAIR=mac_addr
Response	No response	Success: unpair sta:mac_addr Failure: sta:mac_addr is not exist
Parameter Description		mac_addr is the mac address of the other party.
Example		at+unpair=f6:de:09:75:a3:61

3.4 Debugging Commands

3.4.1 AT+FWUPG: Serial Port Firmware Upgrade

Execute command	AT+FWUPG
Response	After successful execution, the serial port prints: CCCCCCCCCC Indicates that the module has entered the upgrade mode and you can download the firmware using the xmodem protocol.
Explanation	Serial port tools that support xmodem protocol are: secureCRT, xshell 

3.4.2 AT+LOADDEF: Restore factory settings.

Execute command	AT+LOADDEF=1
Response	
Instruction	Restore factory setting

3.4.3 AT+SYSDBG: Setting to print debug information

Execute command	Query: Not supported	Setting: AT+SYSDBG=XXX,VALE
Response		Success: OK
Parameter Description		XXX can select LMAC (air port statistics), WNB (network layer statistics); VALE=0 means turn off the corresponding printing, =1 means turn on the corresponding printing.

		<p>VALE=0 means turn off the corresponding printing, =1 means turn on the corresponding printing.</p> <p>LMAC statistics are turned on by default, and there are many of them, so you can turn them off if necessary;</p> <p>WNB statistics are not turned on by default.</p>
Example		<p>AT+SYSDBG=LMAC,0</p> <p>Turn off LMAC printing.</p>

3.4.4 AT+BAUDRATE: Set the baud rate of UART-BUS.

Execute command	Query: AT+BAUDRATE=?	Setting: AT+BAUDRATE=VALUE
Response	VALUE	Success: OK
Parameter Description		<p>Note that this command sets the baud rate of A10/A11 through UART1 (A12/A13) when UART BUS firmware is selected;</p> <p>The VALUE range is 9600-400K, beyond which the UART-BUS may work.</p> <p>VALUE range is 9600-400K, beyond which the UART-BUS may not work properly;</p>
Example		AT+BAUDRATE=115200

3.5 Multicast Related Commands

3.5.1 AT+JOINGROUP: join multicast network

After setting the working mode of WiFi module to **group**, you can use this command to set WiFi module to join a multicast network. After joining a multicast network, the WiFi module will only receive data from the multicast network. All data communication will be in multicast address. **If the working mode is set to group, but it does not join a multicast network, all data communications are sent and received as broadcast.**

Note The JOINGROUP command can be set only after the GROUP mode is set.

Execute the command	AT+JOING ROUP=?	set:AT+JOINGROUP=11:22:33:44:55:66,3
Response	Failed: ERROR	Success: OK Failure: ERROR
Parameter Description	Does not support the query Query	<p>AT+JOINGROUP=group_addr,AID</p> <p>group_addr: Address of the multicast network to be joined.</p> <p>AID: AID of the device in the multicast network, valid values of AID: 1~N (N is the maximum number of STAs supported by the firmware).</p>

		<p>AID: AID of the device in the multicast network, valid values of AID: 1~N (N is the maximum number of STAs supported by the firmware). The AID of each device in the network should be unique.</p> <ul style="list-style-type: none"> ● Set valid AID: WiFi module will send out heartbeats in the multicast network regularly to announce its presence to other WiFi modules. ● Invalid AID: WiFi module will not send heartbeat and will not notify other WiFi modules. <p>WiFi modules. If all devices have AID set to 0, they are not subject to the AID setting.</p> <p>If all devices are set to AID 0, they are not limited by the maximum number of STAs supported by the firmware.</p>
Example		<p>AT+JOINGROUP=11:22:33:44:55:66,3 join multicast address:11:22:33:44:55:66</p> <p>AID set to 3</p>

3.6 Relay Related Setting Commands

3.6.1 AT+R_SSID: Set the SSID of the relay

Execution Commands	Query: AT+R_SSID?	Setting: AT+R_SSID=repeater_ssid
Response	+R_SSID:repeater_ssid OK	Success: OK Failure: ERROR
Parameter Description		Sets the SSID of the upper level AP to which the repeater is connected.
Example		

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

Execute the command	Query: AT+R_PSK?	Setting: AT+R_PSK=psk_char
Response	+R_PSK:baa58569a9edd7c3a55 e446bc658ef76a7173d023d256786832474d737756a82 OK	Success: OK Failure: ERROR
Parameter Description		The password for the relay to connect to the previous AP. psk_char Must be 64 hex characters.
Example		

3.7 Roaming Related Setting Commands

3.7.1 AT+ROAM: Enable roaming.

Execute the command	Query: AT+ROAM?	Setting: AT+ROAM=0/1
Response	OK	Success: OK Failure: ERROR
Parameter Description	<p>The roaming enable needs to be set only on STA side.</p> <p>The SSIDs of APs in the roaming network can be set by full word matching or fuzzy matching. Full character matching: The SSIDs of all APs are set to the same SSID, the length of SSID is not limited, no more than 32 characters, and the STA is also set to this SSID.</p> <p>Fuzzy Matching: The last 3 characters of SSID of different APs are different, the total length of SSID should be more than 8 characters, which consists of a common string (at the beginning of SSID) and a 3-character ID (at the end of the string). For example, if the common string is HUGE_IC_AH, then you can set the SSID of AP1 to HUGE_IC_AH001, the SSID of AP2 to HUGE_IC_AH002, and so on.</p> <p>The SSID of STA should be set to match the SSID of one of the APs.</p>	
Example		AT+ROAM=1

3.8 Hibernation Related Commands

3.8.1 AT+PS_MODE: Set STA sleep mode.

Execute commands	Query: AT+PS_MODE?	Setting: AT+PS_MODE=0/1/2/3/4
Response	+PS_MODE:0 OK	Success: OK Failure:ERROR
Parameter Description	<p>PS_MODE The following values can be selected:</p> <p>0: No sleep mode is set, the effect is the same as mode 3.</p> <p>1: The module is kept alive with the server when it enters sleep (the module itself is kept alive with the server).</p> <p>2: The module is alive with the server when it enters sleep (the AP is alive with the server instead of the module, and the power consumption is minimized).</p> <p>3: When the module enters sleep, it only keeps connection with the AP, any unicast packet can wake up the module.</p>	

		Any unicast packet can wake up the module. 4: The module enters sleep only with the AP, and can only be woken up by the AP by inputting :at+wakeup. Wakeup can only be woken up by AP by typing :at+wakeup.
Example		AT+PS_MODE=4

3.8.2 AT+DTIM: set sleep DTIM time.

Execute command	Query: AT+DTIM?	Setting: AT+DTIM=1000/2000/3000 etc.
Response	+DTIM:1000 OK	Success: OK Failure: ERROR
Parameter Description		DTIM can choose the following values: 1000: 1S up to receive DTIM packets 2000: 2S up to receive DTIM packets 3000: 3S up to receive DTIM packets. ...
Example		AT+DTIM=1000

3.8.3 AT+DSLEEP: Set to sleep.

Execute command	Query: AT+DSLEEP?	Setting: AT+DSLEEP=1/120 or other value
Response	+DSLEEP:awake OK	Success: OK Failure: undef DEEP_SLEEP
Parameter Description	Cannot read after sleep	In the connected state, setting = 1 causes the device to go to sleep and stay alive; In the unconnected state, setting a non-zero value X means that the device goes into hibernation for X seconds and then wakes up. If the STA retains the connection information of the AP, the STA will connect back to the AP after waking up, and if the connection timeout is exceeded, the STA will enter hibernation again, and then wake up and reconnect again at regular intervals, and then hibernate again when the timeout is exceeded (ps-connect state). If you want the unconnected device to wake up and not sleep again, you need to set the ps-connect state. sleep again, you need to change the ps-mode to 0;
Example		AT+DSLEEP=1

3.8.4 AT+WAKEUP: Set remote wakeup.

Execute command	Query: AT+WAKEUP?	Setting: AT+WAKEUP=mac_addr
Response	Invalid	Success: OK Failure: ERROR
Parameter Description		Enter this command at AP side to wake up the dormant STA.
Example: AT+WAKEUP=11:22:33:44:55:66		AT+WAKEUP=11:22:33:44:55:66

3.8.5 AT+PS_CONNECT: Set PS Connect behavior.

Execute command	Query: AT+PS_CONNECT?	AT+PS_CONNECT=60,3
Response.	+PS_CONNECT=60,3 OK	Success: OK Failure: ERROR
Parameter Description	<p>Sets the sleep interval (in S) and the maximum number of increments for ps connect.</p> <p>(in S), and the maximum increment. The WiFi module of STA will wake up to reconnect with the AP when it is disconnected in sleep state.</p> <p>When STA's WiFi module is disconnected in sleep state, it will wake up to reconnect to the AP, and if the connection fails, the WiFi module will enter the PS Connect mode: sleep/wake up/reconnect cyclically. The intermediate sleep is to prevent the power consumption of reconnecting all the time.</p> <p>Maximum incremental number if set to 1 means no increment.</p> <p>means no increment.</p>	<p>The first connection failure sleeps 1 minute, the second connection failure sleeps 2 minutes, the second connection failure sleeps 2 minutes, the second connection failure sleeps 2 minutes, and the second connection failure sleeps 2 minutes.</p> <p>sleep 1 minute, 2nd connection failure sleep 2 minutes, 3rd connection failure sleep 3 minutes. sleep time sleep 3 minutes. sleep time is incremented by 3 times. After 3 increments of sleep time, loop back to the first interval, and so on.</p>
Example		AT+PS_CONNECT=60,3

3.9 IoT project related commands

3.9.1 AT+TCPTEST: call the tcp traffic.

Execute the command	AT+TCPTEST=ip_addr,port,tcpmode
Response	
Parameter Description	ip_addr: IP address of the other party port: port number

	tcpmode: client sends by default, "s" server receives.
Example	Sender: AT+TCPTEST=10.10.10.3,5002 As receiver: AT+TCPTEST=10.10.10.3,5002,s

3.9.2 AT+IP: query or set ip address

Execute the command	Query: AT+IP=? Setting: AT+IP=ip_addr
Response	+IP:10.10.10.3 (successfully assigned to ip) +IP:0.0.0.0 (not successfully assigned to the ip) Success: OK Failure: ERROR
Parameter Description	Enter this command to set the IP address
Example	AT+IP=10.10.10.3

3.9.3 AT+PING: ping function

Execute command	AT+PING=ip_domain,send_times,pktsize
Response	Pinging 10.10.10.201 with 1024 bytes of data: [57969]qs_end [57981]Reply from 10.10.10.201: bytes=1024 time:13ms TTL=255 [58977][02:40:49:81:69:70] is expired, del it (1000) [58996]Reply from 10.10.10.201: bytes=1024 time:11ms TTL=255 [60008]Reply from 10.10.10.201: bytes=1024 time:8ms TTL=255
Parameter description	"ip_domain" can be IP address or domain name; pktsize: data size of ping packet, default is 32byte; Note that no other at commands can be input while ping.
Example	AT+PING=10.10.10.201,5,1024

3.10 Other commands

3.10.1 AT+TXDATA: send data command.

Execute command	Query: Not supported 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 not in passthrough mode.

	<p>This command is used to send data through the serial port when UART is not in passthrough mode.</p> <p>Execution steps:</p> <ol style="list-style-type: none"> 1. Execute the AT+TXDATA command first, the parameters for sending such as length: length of the data to be sent [Required] txbw: Specify the tx bandwidth of the data [Optional] 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]. 2. After the at+txdata command returns OK, start to send data, and the length of the sent data should meet the length specified by the parameter. <ul style="list-style-type: none"> ● In 1-to-1 mode, AT+TXDATA can send raw data directly. ● In 1-to-many mode, AT+TXDATA can not send raw data directly, but need to add 14Byte Ethernet frame header before raw data before sending. The setting length should also include the Ethernet header length. <p>The 1-to-1 mode or 1-to-many mode is determined by MAX_STA set during firmware compilation, MAX_STA=1 is 1-to-1 mode, MAX_STA>1 is 1-to-many mode, which can be set according to the actual application requirements.</p> <p>It can be set according to the actual application requirements. The default firmware is 1-to-many mode.</p>
<p>Example</p>	<ul style="list-style-type: none"> ● 1-to-1 mode: at+txdata=10 // Need to send 10byte data OK 1234567890 //10byte raw data sent directly ● 1-to-many mode: at+txdata=24 // need to send 10byte data OK <u>2222222222228888888888888899991234567890</u> The first 14 bytes are padded Ethernet frame header (written in hexadecimal), and the last 10 bytes are raw data (written as visible characters, but actually should be written in hexadecimal). ◆ <u>22222222222222</u>: the Ethernet destination address. ◆ <u>888888888888</u>: Ethernet source address.

◆ 9999: Ethernet protocol type Ethernet frame header padding description:

■ Source Address : can be filled with all 0

■ Protocol type: can be filled with all 0

■ Destination address: the padding rules for ap and sta are as follows:

- The uart master at AP side needs to manage the sta devices, record the mac address of each sta device, maintain the mapping table of device ID and mac address, and check ~~the table~~ before sending data to ~~find the MAC address of the device~~ before sending data. If the data is sent by broadcast, the destination address is filled with 0xFF.
- For the uart master on the sta side, you don't need to maintain the mapping table, ~~just fill all 1s.~~

If you use SecureCRT to test this serial command, you need to note that the first 14 bytes of the Ethernet frame header can't be input randomly due to the hexadecimal format, the destination address can be input with the visible character 111111, the source address can be input with the visible character 000000, and the Ethernet protocol type can be input with the visible character 00, and the last input will be: 111111000000001234567890, then the source address and Ethernet protocol type displayed on the receiving end are garbled, because the sending end automatically replaces them with the hexadecimal of the device source address and protocol type, which are usually not visible characters, so they become garbled.

If you use other serial tools that support hexadecimal input, you can set any MAC address, and note that all characters including payload are hexadecimal input.

Example of AP side mapping is as follows:

Device ID	MAC Address
1001	00:1a:2b:3c:4d:5
	E

● Receive data:

When the AH module receives data, it outputs the data on the serial port in the following format:

1. 1 to 1:

		<p>+RXDATA:10\r\n1234567890</p> <p>10byte data received.</p> <p>2. 1 to many:</p> <p>+RXDATA:24\r\n 222222222222288888888888888899991234567890</p> <p>Received 24byte data, which the first 14byte is Ethernet frame header data (written as hexadecimal character form), from the 15th byte onwards is the</p> <p>The first 14byte is the Ethernet header data (written as hexadecimal characters), and from the 15th byte onwards is the real data (written as visible characters, which should be written as hexadecimal characters).</p> <ul style="list-style-type: none"> ● The uart master at the AP side can save the source address of the Ethernet frame header, correlate it with the device ID, and update the mapping table. ● The uart master on the sta side does not need to maintain the mapping table, ignores the Ethernet frame header and receives real data. <p>After receiving +RXDATA, uart master should parse</p> <hr/> <p>to receive data according to the above format.</p>
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4 Example of AT instruction

4.1 Module connection establishment basic instruction

When using AT instruction to initialize the AH module, it is mainly to set parameters such as frequency, bandwidth, SSID and password. The list of simple initialization AT commands is as follows:

```

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

```

4.2 Configure relay network commands

4.2.1 AP Module

1, configure the ssid of the AP, each AP should be configured differently, you can consider ssid1, ssid2 so increment, for example:

```
at+ssid=ssid1
```

2, configure no encryption (to simplify the configuration, temporarily take no encryption as an example)

```
at+keymgmt=none
```

4.2.2 Relay Module

1, configure the role of relay

```
at+mode=apsta
```

2, configure no encryption

```
at+keymgmt=none
```

3, configure the r_ssid of the relay, which is used to allow the relay to connect to the ap, and should be the same as the ssid of the ap you want to connect, 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 the management, you can consider to match the ssid of the ap in front, and add an additional ssid at the end.

In order to facilitate the management, you can consider to match the ssid of ap at the front and add a suffix at the back, such as ssid1_r1, ssid1_r2, ssid2_r1, etc., for example:

```
at+r_ssid=ssid1
```

```
at+ssid=ssid1_r1
```

4.2.3 STA Module

1, configure the ssid of the STA to connect the sta to the relay, it should be the same as the ssid of the relay you want to connect, for example:

```
at+ssid=ssid1_r1
```

2, configure no encryption

```
at+keymgmt=none
```