



**Hi3861 V100 / Hi3861L V100 AT Commands**

## **User Guide**

<b>Issue</b>	<b>01</b>
<b>Date</b>	<b>2020-04-30</b>

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# About This Document

## Purpose

This document describes the AT command formats, scenarios, and parameter examples of Hi3861 V100/Hi3861L V100.

## Related Versions

The following table lists the product versions related to this document.

Product Name	Version
Hi3861	V100
Hi3861L	V100



## Intended Audience

The document is intended for:



- Technical support engineers
- Software development engineers

## Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



Symbol	Description
 CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
 NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

## Change History

Issue	Date	Change Description
01	2020-04-30	<p>This issue is the first official release.</p> <ul style="list-style-type: none"><li>• In <a href="#">2.2.16 AT+DUMP</a>, the note is updated.</li><li>• In <a href="#">3.2.3 AT+RECONN</a>, the note is updated.</li><li>• In <a href="#">3.2.6 AT+SCANSSID</a>, the note about the value of <code>&lt;ssid&gt;</code> containing special characters is updated.</li><li>• In <a href="#">3.2.7 AT+SCANPRSSID</a>, the note about the value of <code>&lt;ssid&gt;</code> containing special characters is updated.</li><li>• In <a href="#">3.2.9 AT+CONN</a>, the note about the value of <code>&lt;ssid&gt;</code> containing special characters is updated.</li><li>• In <a href="#">3.2.10 AT+FCONN</a>, the note about the values of <code>&lt;ssid&gt;</code> and <code>&lt;passwd&gt;</code> containing special characters is updated.</li><li>• In <a href="#">4.2.1 AT+STARTAP</a>, the note about the values of <code>&lt;ssid&gt;</code> and <code>&lt;passwd&gt;</code> containing special characters is updated.</li><li>• In <a href="#">6.2.5 AT+SETRPWR</a>, the sample is updated.</li><li>• In <a href="#">6.1 Overview</a>, the description of the <b>AT+SIGMA</b> command is deleted. The descriptions of the <b>AT+FTM</b> and <b>AT+FTMERASE</b> commands are added.</li><li>• Section 6.2.13 "AT+FTMOK" is deleted.</li><li>• Section 6.2.14 "AT+SIGMA" is deleted.</li><li>• <a href="#">6.2.13 AT+FTM</a> is added.</li><li>• <a href="#">6.2.14 AT+FTMERASE</a> is added.</li><li>• In <a href="#">8.3 Testing the Throughput</a>, the sample and note are updated.</li></ul>



Issue	Date	Change Description
00B09	2020-04-21	<ul style="list-style-type: none"><li>• <a href="#">2.2.24 AT+RDTEMP</a> is added.</li><li>• In <a href="#">6.1 Overview</a>, the descriptions of the <b>AT+CALBPWR</b>, <b>AT+CALRPWR</b>, <b>AT+WCALDATA</b>, and <b>AT+EFUSEMAC</b> commands are deleted.</li></ul>
00B08	2020-04-07	<ul style="list-style-type: none"><li>• In <a href="#">6.1 Overview</a>, the description of the <b>AT+FTMOK</b> command is added.</li><li>• Section 6.2.13 "AT+FTMOK" is added.</li><li>• In <a href="#">A Table for Querying I/O Working Modes</a>, the note for IO0 and IO1 is added.</li></ul>
00B07	2020-03-25	<ul style="list-style-type: none"><li>• In <a href="#">2.2.17 AT+ARP</a>, the parameter description is updated.</li><li>• In <a href="#">2.2.18 AT+SLP</a>, the parameter description, sample, and note are updated.</li><li>• In <a href="#">2.2.19 AT+PS</a>, the title, parameter description, sample, and note are updated.</li><li>• In <a href="#">6.2.1 AT+ALT</a> and <a href="#">8.6 Low Power Test</a>, the parameter description is updated.</li><li>• In <a href="#">8.6 Low Power Test</a>, the <b>AT+SLP=2</b> command is added.</li></ul>
00B06	2020-03-19	<ul style="list-style-type: none"><li>• In <a href="#">4.2.2 AT+SETAPADV</a>, the note is updated.</li><li>• In <a href="#">4.2.3 AT+STOPAP</a>, the note is updated.</li><li>• In <a href="#">6.1 Overview</a>, the description of the <b>AT+SETRPWR</b> and <b>AT+RCALDATA</b> commands is added, and the description of the <b>AT+WCALDATA</b> command is updated.</li><li>• In section 6.2.6 "AT+CALRPWR", the note is updated.</li><li>• <a href="#">6.2.5 AT+SETRPWR</a> is added.</li><li>• In section 6.2.9 "AT+WCALDATA", the meaning, format, parameter description, sample, and note are updated.</li><li>• <a href="#">6.2.7 AT+RCALDATA</a> is added.</li><li>• In section 6.2.11 "AT+EFUSEMAC", the format, parameter description, sample, and note are updated.</li><li>• In <a href="#">7.2.4 AT+WTGPIO</a>, the sample is updated.</li></ul>



Issue	Date	Change Description
00B05	2020-02-26	<ul style="list-style-type: none"><li>• In <a href="#">2.2.4 AT+IPERF</a>, the parameter description and sample are updated.</li><li>• In <a href="#">2.2.22 AT+SETUART</a>, the parameter description and note are updated.</li><li>• In <a href="#">5.1 Overview</a>, the description of the <b>+IPD</b> command is updated.</li><li>• In <a href="#">5.2.4 AT+IPCLOSE</a>, the title is updated.</li><li>• In <a href="#">5.2.5 +IPD</a>, the title is updated.</li><li>• In <a href="#">7.2.2 AT+GETIOMODE</a>, the response and sample are updated.</li><li>• In <a href="#">7.2.5 AT+RDGPIO</a>, the response and sample are updated.</li></ul>
00B04	2020-02-12	<ul style="list-style-type: none"><li>• In <a href="#">2.2.10 AT+CSV</a>, the response and parameter description are updated.</li><li>• In <a href="#">2.2.11 AT+RST</a>, the format, response, parameter description, sample, and note are updated.</li><li>• In <a href="#">2.2.13 AT+DHCPS</a>, the note is updated.</li><li>• In <a href="#">2.2.20 AT+WKGPIO</a> and <a href="#">About This Document</a>, the sample is updated.</li><li>• In <a href="#">2.2.21 AT+USLP</a>, the sample is updated.</li><li>• In <a href="#">2.2.22 AT+SETUART</a>, the format, parameter description, and note are updated.</li><li>• In <a href="#">3.2.1 AT+STARTSTA</a>, the note is updated.</li><li>• In <a href="#">3.2.3 AT+RECONN</a>, the format, parameter description, sample, and note are updated.</li><li>• In <a href="#">4.2.2 AT+SETAPADV</a>, the sample and note are updated.</li><li>• In <a href="#">6 AT Commands Related to Testing and Debugging</a>, the <b>AT+TRC</b>, <b>AT+SETRATE</b>, <b>AT+ARLOG</b>, <b>AT+VAPINFO</b>, and <b>AT+USRINFO</b> commands are added.</li></ul>



Issue	Date	Change Description
00B03	2020-01-15	<ul style="list-style-type: none"><li>• In <a href="#">1.3 Precautions</a>, the note about AT commands and parameter formats is updated.</li><li>• In <a href="#">2 General AT Commands</a>, the <b>AT+DUMP</b>, <b>AT+ARP</b>, <b>AT+SLP</b>, <b>AT+PS</b>, <b>AT+WKGPIO</b>, <b>AT+USLP</b>, <b>AT+SETUART</b>, and <b>AT+XTALCOM</b> commands are added. The <b>AT+WREG</b> and <b>AT+RREG</b> commands are deleted.</li><li>• In <a href="#">2.2.4 AT+IPERF</a>, the sample is updated.</li><li>• In <a href="#">2.2.6 AT+PING</a>, the response, parameter description, and sample are updated.</li><li>• In <a href="#">2.2.9 AT+NETSTAT</a>, the response and parameter description are updated.</li><li>• In <a href="#">2.2.19 AT+PS</a>, the note is updated.</li><li>• In <a href="#">3.2.10 AT+FCNN</a>, the note is updated.</li><li>• <a href="#">5 AT Commands Related to TCP/IP</a> is added.</li><li>• In <a href="#">6 AT Commands Related to Testing and Debugging</a>, the <b>AT+TPC</b>, <b>AT+CALBPWR</b>, <b>AT+CALRPWR</b>, <b>AT+CALFREQ</b>, <b>AT+WCALDATA</b>, and <b>AT+EFUSEMAC</b> commands are added.</li><li>• In <a href="#">6.2.1 AT+ALTX</a>, the note is updated.</li><li>• In <a href="#">6.2.2 AT+ALRX</a>, the format, parameter description, sample, and note are updated.</li><li>• In <a href="#">7.2.1 AT+SETIOMODE</a>, the note is updated.</li><li>• In <a href="#">7.2.3 AT+GPIODIR</a>, the note is updated.</li><li>• In <a href="#">7.2.4 AT+WTGPIO</a>, the note is updated.</li><li>• In <a href="#">7.2.5 AT+RDGPIO</a>, the note is updated.</li><li>• In <a href="#">8.1 Starting and Stopping the SoftAP</a>, the sample is updated.</li><li>• <a href="#">8.4 TCP/IP-based Data TX and RX</a> is added.</li><li>• In <a href="#">8.5 Testing the RF</a>, the sample is updated.</li><li>• <a href="#">8.6 Low Power Test</a> is added.</li><li>• In <a href="#">A Table for Querying I/O Working Modes</a>, the I/O numbers and working modes 3, 4, 5, and 6 are added.</li></ul>



Issue	Date	Change Description
00B0 2	2019-12- 19	<ul style="list-style-type: none"><li>• In <a href="#">3.2.6 AT+SCANSSID</a> and <a href="#">3.2.7 AT+SCANPRSSID</a>, the note is updated.</li><li>• In <a href="#">3.2.8 AT+SCANRESULT</a>, the description of &lt;ssid&gt; is updated.</li><li>• In <a href="#">3.2.9 AT+CONN</a> and <a href="#">3.2.10 AT+FCNN</a>, the note is updated.</li><li>• In <a href="#">4.2.1 AT+STARTAP</a>, the note is updated.</li><li>• In <a href="#">6.1 Overview</a>, the description of the <b>AT+SIGMA</b> command is added.</li><li>• In <a href="#">6.2.1 AT+ALTX</a>, the sample and note are updated.</li><li>• In <a href="#">6.2.2 AT+ALRX</a>, the sample and note are updated.</li><li>• Section 6.2.8 "AT+SIGMA" is added.</li><li>• In <a href="#">8.1 Starting and Stopping the SoftAP</a>, the samples are updated.</li><li>• In <a href="#">8.2 Starting and Stopping the STA</a>, the samples are updated.</li></ul>
00B0 1	2019-11- 15	This issue is the first draft release.





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# 1 Command Introduction

## 1.1 Overview

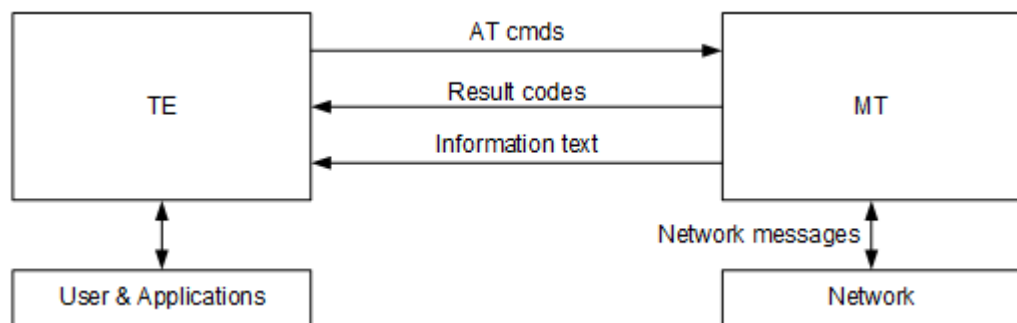
## 1.2 Command Types

## 1.3 Precautions

## 1.1 Overview

AT commands are used for the control information interaction between terminal equipment (TE), such as a PC, and a mobile terminal (MT), as shown in [Figure 1-1](#).

**Figure 1-1** AT commands



## 1.2 Command Types

[Table 1-1](#) describes the AT command types.



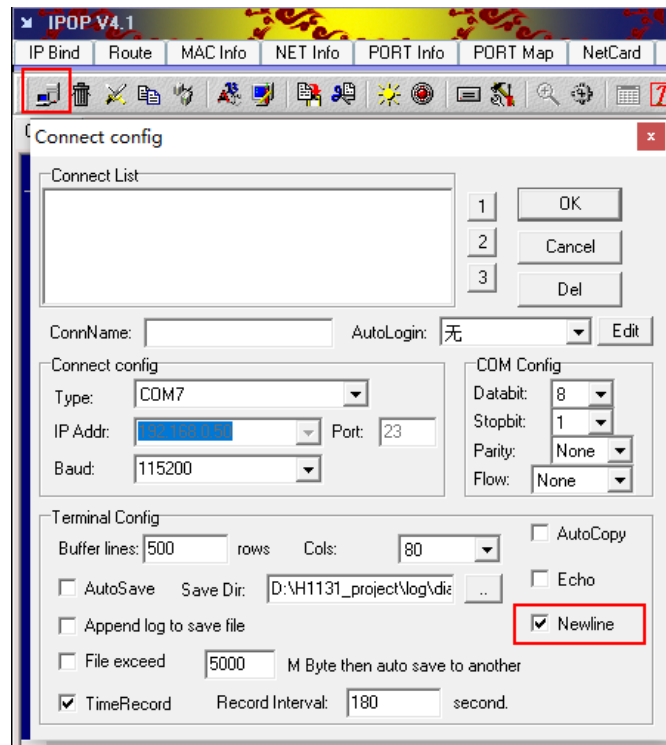
**Table 1-1** AT command types

Type	Format	Purpose
Test commands	AT+<cmd>=?	To test parameters and value ranges of set commands
Read commands	AT+<cmd>?	To read the current value of a parameter
Set commands	AT +<cmd>=<parameter>, ...	To set parameter values
Execution commands	AT+<cmd>	To carry out an operation

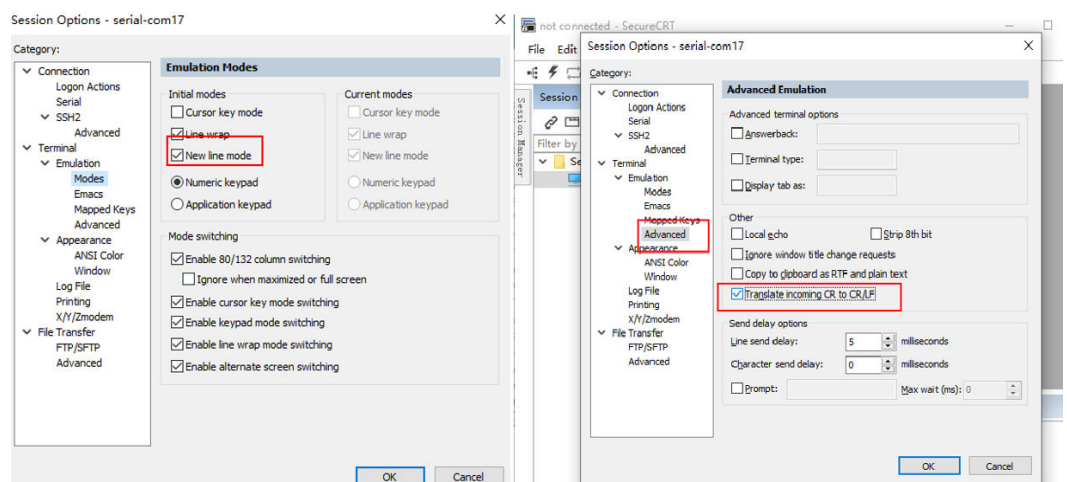
## 1.3 Precautions

- The AT commands do not necessarily fall within the mentioned four types.
- If an AT command exists in the document but is not supported by the current software version, **ERROR:TBD** is returned.
- Use double quotation marks to indicate a string, for example: AT+SCANSSID="hisilicon".
- By default, the serial port communication supports the 115200 bit/s baud rate, 8 data bits, 1 stop bit, and no parity bits.
- Parameters in [] are optional.
- Parameters in a command are separated by commas (,). Avoid using commas (,) as part of the parameters.
- Parameters in the AT commands cannot contain redundant spaces.
- AT commands must be capitalized and end with a carriage return (CR)/line feed (LF). Some serial port tools support only CR when users press **Enter**. As a result, AT commands cannot be identified. To manually type AT commands, translate the incoming CR to CR/LF in the serial port tool. [Figure 1-2](#) and [Figure 1-3](#) show the configuration examples by using IPOP V4.1 and SecureCRT8.1.

**Figure 1-2 IPOP V4.1 CR+LF configuration example**



**Figure 1-3 SecureCRT8.1 CR+LF configuration example**





# 2 General AT Commands

## [2.1 Overview](#)

## [2.2 Description](#)

## 2.1 Overview

Command	Description
AT	Tests the AT function.
AT+HELP	Views the currently available AT commands.
AT+MAC	Manages the MAC address.
AT+IPERF	Test the performance.
AT+SYSINFO	Views the system information.
AT+PING	Tests the IPv4 network connection.
AT+PING6	Tests the IPv6 network connection.
AT+DNS	Sets the DNS server address of the board.
AT+NETSTAT	Checks the network status.
AT+CSV	Views the software version.
AT+RST	Resets the board.
AT+DHCP	Runs the DHCP client command.
AT+DHCPs	Runs the DHCPs server command.
AT+IFCFG	Configures an interface.
AT+CC	Sets the country code.
AT+DUMP	Reads the latest exception information.



Command	Description
AT+ARP	Sets the ARP offload.
AT+SLP	Sets the system low-power.
AT+PS	Sets the Wi-Fi low-power.
AT+WKGPIO	Sets the GPIO wakeup source in light sleep or deep sleep mode.
AT+USLP	Enters ultra-deep sleep mode.
AT+SETUART	Sets the UART port function.
AT+XTALCOM	Obtains the frequency offset compensation coefficient of a crystal oscillator.

## 2.2 Description

### 2.2.1 AT

Forma t	AT
Respo nse	OK
Param eter Descri ption	-
Sampl e	AT
Note	-

### 2.2.2 AT+HELP

Forma t	AT+HELP
Respo nse	+HELP: <i>Displays the supported AT commands.</i> OK





<b>Parameter Description</b>	-
<b>Sample</b>	AT+HELP
<b>Note</b>	-

## 2.2.3 AT+MAC

<b>Format</b>	Set command: AT+MAC=<MAC>	Read command: AT+MAC?
<b>Response</b>	OK <i>or</i> ERROR	+MAC: <MAC> OK <i>or</i> ERROR
<b>Parameter Description</b>	<MAC>: MAC address	-
<b>Sample</b>	AT+MAC=90:2B:D2:E4:CE:28	AT+MAC?
<b>Note</b>	This command is valid before <b>AT+STARTSTA</b> or <b>AT+STARTAP</b> is executed.	

## 2.2.4 AT+IPERF

<b>Format</b>	AT+IPERF=<-x>
<b>Response</b>	+IPERF: <Interval> <Bandwidth> OK <i>or</i> ERROR



<b>Parameter Description</b>	<p><b>&lt;-x&gt;</b>: parameter type</p> <p><b>-s</b>: start in server mode</p> <p><b>-c,IP</b>: start in client mode. <b>IP</b> indicates the IP address of the server.</p> <p><b>-u</b>: User Datagram Protocol (UDP)</p> <p><b>-i,sec</b>: report display interval, in seconds</p> <p><b>-t,sec</b>: test duration, 30 seconds by default</p> <p><b>-b,Bandwidth</b>: UDP TX bandwidth, in bit/s. The parameter value can be 10 kbit/s or 20 Mbit/s. The default value is 1 Mbit/s.</p> <p><b>-l,length</b>: length of TX data at a time, in bytes</p> <p><b>-B,IP</b>: IP address of a host. This parameter is used when the host has multiple IP addresses or interfaces.</p> <p><b>-S,value</b>: type of service (TOS). <b>value</b> corresponds to tid0–tid7, respectively. The mapping between the value and the termination ID is as follows:</p> <p>0–31: tid0</p> <p>32–63: tid1</p> <p>64–95: tid2</p> <p>96–127: tid3</p> <p>128–159: tid4</p> <p>160–191: tid5</p> <p>192–223: tid6</p> <p>224–255: tid7</p> <p><b>-p,portNum</b>: number of the port used by the server or the port connected to the client</p> <p><b>-k</b>: killing or stopping the iPerf service</p> <p><b>&lt;Interval&gt;</b>: statistical interval, in seconds</p> <p><b>&lt;Bandwidth&gt;</b>: testing the throughput and displaying the average throughput within the statistical interval</p> <p><b>-V</b>: binding an IPv6 address</p>
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<b>Sample</b>	<p><b>AT+IPERF=-s,-i,1:</b> Starts iPerf in server mode, uses the TCP by default, and displays the report at an interval of 1s.</p> <p><b>AT+IPERF=-s,-u,-i,1:</b> Starts iPerf in server mode, uses the UDP, and displays the report at an interval of 1s.</p> <p><b>AT+IPERF=-c,192.168.3.1,-t,5,-i,1:</b> Starts iPerf in client mode, uses the TCP by default, performs the test for 5s, and displays the report at an interval of 1s.</p> <p><b>AT+IPERF=-c,192.168.3.1,-u,-b,10M,-t,5,-i,1:</b> Starts iPerf in client mode, uses the UDP, sets the transmit bandwidth to 10 Mbit/s, performs the test for 5s, and displays the report at an interval of 1s.</p> <p><b>AT+IPERF=-c,192.168.3.1,-u,-b,10M,-t,5,-i,1,-l,1000,-B,192.168.3.2,-p,5001,-S,28:</b> Starts iPerf in client mode, uses the UDP, sets the transmit bandwidth to 10 Mbit/s, performs the test for 5s, displays the report at an interval of 1s. The maximum size of a packet sent at a time is 1000 bytes. The IP address of the host bound to the iPerf command is 192.168.3.2. The port number is 5001 and the TOS is 28.</p> <p><b>AT+IPERF=-k:</b> Manually stops an iPerf test.</p> <p><b>AT+IPERF=-V,-s,-t,20:</b> Starts iPerf in server mode, uses the TCP by default, binds the local IPv6 address, and performs the test for 20s.</p> <p><b>AT+IPERF=-V,-c,FD00::EA11:31FF:FE24:8403,-t,50,-i,1:</b> Starts iPerf in client mode, sends it to the <b>FD00::EA11:31FF:FE24:8403</b> address, performs the test for 50s, and displays the report at an interval of 1s.</p>
<b>Note</b>	<ul style="list-style-type: none"><li>• <b>-c</b> or <b>-s</b> must be used as the first parameter.</li><li>• When <b>-s</b> is used, the next startup can be performed only after the <b>-k</b> command is executed.</li><li>• Only one execution is supported. Multiple instances cannot be executed at the same time.</li></ul>

## 2.2.5 AT+SYSINFO

<b>Format</b>	AT+SYSINFO
<b>Response</b>	<p>+SYSINFO:</p> <p><i>Displays information about memory usage, system resources, task scheduling, and system running time.</i></p> <p>OK</p> <p>or</p> <p>ERROR</p>
<b>Parameter Description</b>	-
<b>Sample</b>	AT+SYSINFO



Note	-
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## 2.2.6 AT+PING

Format	AT+PING=[<-x>,<IP>
Response	+PING: <index> Reply from <IP>: time<time> ms TTL=<TTL> <tx_count> packets transmitted, <rx_count> received, <loss_count> loss[, average time <average_time> ms.] OK <i>or</i> ERROR
Parameter Description	<-x>: parameter type -n,count: count of packets to be sent. The default value is 4. -t: host specified by the ping command until <b>AT+PING=-k</b> is executed -w,timeout: interval between two consecutive ping packets, in ms -l,size: length of data sent at a time, in bytes. The default value is 48. -k: stopping a ping packet. No parameter is carried after -k. <IP>: IP address of the destination host <index>: index of a ping packet <time>: ping packet time <TTL>: time to live (TTL) <tx_count>: count of TX packets <rx_count>: count of RX packets <loss_count>: count of lost packets <average_time>: average duration of ping packets
Sample	<b>AT+PING=192.168.3.1</b> : Pings <b>192.168.3.1</b> . Four packets are pinged by default. <b>AT+PING=-n,6,192.168.3.1</b> : Pings <b>192.168.3.1</b> . Six packets are pinged. <b>AT+PING=-w,1,192.168.3.1</b> : Pings <b>ping 192.168.3.1</b> . The interval between two consecutive ping packets is 1 ms. <b>AT+PING=-l,100,192.168.3.1</b> : Pings <b>192.168.3.1</b> . The maximum length of a packet sent at a time is set to 100 bytes. <b>AT+PING=-t,192.168.3.1</b> : Pings <b>192.168.3.1</b> until the -k command is executed. <b>AT+PING=-k</b> : Stops a ping packet.
Note	If <rx_count> of a pinged packet is 0, the information of <average_time> is not displayed.



## 2.2.7 AT+PING6

<b>Format</b>	AT+PING6=[<-x>,-I,<ifname>,< IP>
<b>Response</b>	+PING6: PING6 <IP> with <tx_len> bytes of data. <rx_len> bytes from <IP> : icmp_seq=<index> time=<time> ms <tx_count> packets transmitted, <rx_count> received, <loss_ratio> packet loss, time <total_time>ms OK <i>or</i> ERROR
<b>Parameter Description</b>	<-x>: parameter type -c,count: execution count. The default value is 4. -k: stopping a ping packet. The -I and IP parameters are not carried after the -k command. <ifname>: name of the network adapter < IP >: IPv6 address of the destination host <tx_len>: TX packet length <rx_len>: RX packet length <index>: index of a TX packet <time>: duration for pinging a packet at a time <tx_count>: total count of TX packets <rx_count>: total count of RX packets <loss_ratio>: packet loss ratio <total_time>: total duration for ping required packets
<b>Sample</b>	AT+PING6=-I,wlan0,2001:a:b:c:d:e:f:b AT+PING6=-c,100,-I,wlan0,2001:a:b:c:d:e:f:b AT+PING6=-k
<b>Note</b>	-

## 2.2.8 AT+DNS

<b>Format</b>	Set command: AT+DNS=<dns_num>,<IP>	Read command: AT+DNS?
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<b>Response</b>	OK <i>or</i> ERROR	+DNS: <Dns1_IP> <Dns2_IP> OK <i>or</i> ERROR
<b>Parameter Description</b>	<dns_num>: number of the domain name server (DNS) to be selected 1: DNS 1 2: DNS 2 <IP>: IP address of the server <Dns1_IP>: IP address of DNS 1 <Dns2_IP>: IP address of DNS 2	
<b>Sample</b>	AT+DNS? AT+DNS=1,192.168.3.1 AT+DNS=2,192.168.3.2	
<b>Note</b>	-	

## 2.2.9 AT+NETSTAT

<b>Format</b>	AT+NETSTAT
<b>Response</b>	+NETSTAT:<Protocol>,<resvQ>,<sendQ>,<localAddr:Port>,<foreignAddr:Port>,<State> OK <i>or</i> ERROR



<b>Parameter Description</b>	<p><b>&lt;Protocol&gt;</b>: protocol type</p> <p>0: TCP IPv6</p> <p>1: other TCP</p> <p>2: UDP IPv6</p> <p>3: other UDP</p> <p><b>&lt;resvQ&gt;</b>: amount of data that is not read by users</p> <p><b>&lt;sendQ&gt;</b>: amount of data that has been sent but not acknowledged for a TCP connection, or amount of data that has been cached due to incomplete IP address resolution for a UDP connection</p> <p><b>&lt;localAddr:Port&gt;</b>: local IP address and port number</p> <p><b>&lt;foreignAddr:Port&gt;</b>: remote IP address and port number</p> <p><b>&lt;State&gt;</b>: TCP connection state. This parameter is meaningless for the UDP. The default value is <b>0</b>.</p> <p>The TCP connection states are described as follows:</p> <p><b>0</b>: CLOSED. No connection is available.</p> <p><b>1</b>: LISTEN. Listen to the connection request from a remote TCP port.</p> <p><b>2</b>: SYN_SENT. Wait for the matching after a connection request is sent.</p> <p><b>3</b>: SYN_RCVD. Wait for the final acknowledgment after a connection request is sent.</p> <p><b>4</b>: ESTABLISHED. A connection is established.</p> <p><b>5</b>: FIN_WAIT_1. Wait for a remote TCP connection interrupt request or an acknowledgment of the previous connection interrupt request.</p> <p><b>6</b>: FIN_WAIT_2. Wait for a connection interrupt request from the remote TCP port.</p> <p><b>7</b>: CLOSE_WAIT. Wait for a connection interrupt request from a local user.</p> <p><b>8</b>: CLOSING. Wait for the remote TCP port to confirm the connection interrupt.</p> <p><b>9</b>: LAST_ACK. Wait for acknowledging the TCP connection interrupt request sent to the remote TCP port.</p> <p><b>10</b>: TIME_WAIT. Wait for enough time to ensure that the remote TCP port receives an acknowledgment of the connection interrupt request.</p>
<b>Sample</b>	AT+NETSTAT
<b>Note</b>	-

## 2.2.10 AT+CSV

<b>Format</b>	AT+CSV
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<b>Response</b>	+CSV:<sdk_version> OK <i>or</i> ERROR
<b>Parameter Description</b>	<sdk_version>: software version
<b>Sample</b>	AT+CSV
<b>Note</b>	-

## 2.2.11 AT+RST

<b>Format</b>	Set command: AT+RST=<delay_us>	Execution command: AT+RST
<b>Response</b>	+RST:<delay_us> OK <i>or</i> ERROR	OK <i>or</i> ERROR
<b>Parameter Description</b>	<delay_us>: restart delay, in $\mu$ s	-
<b>Sample</b>	AT+RST=1000000	AT+RST
<b>Note</b>	-	

## 2.2.12 AT+DHCP

<b>Format</b>	AT+DHCP=<ifname>,<stat>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<ifname>: name of the network adapter <stat>: DHCP switch 0: stop 1: start





<b>Sample</b>	AT+DHCP=wlan0,1
<b>Note</b>	-

## 2.2.13 AT+DHCP

<b>Format</b>	AT+DHCP=<ifname>,<stat>
<b>Response</b>	OK or ERROR
<b>Parameter Description</b>	<ifname>: name of the network adapter <stat>: DHCP switch 0: stop 1: start
<b>Sample</b>	AT+DHCP=ap0,1
<b>Note</b>	The <b>AT+DHCP=ap0,1</b> command can be issued only after the IP address of the SoftAP is configured successfully.

## 2.2.14 AT+IFCFG

<b>Format</b>	Set command: AT +IFCFG=<ifname>,<IP>,netmask,<netmask>, gateway,<gateway> AT+IFCFG=<ifname>[,<switch>]	Execution command: AT+ IFCFG
<b>Response</b>	OK or ERROR	+IFCFG:<ifname>,ip=<IP>,netmask =<netmask>,gateway =<gateway>, ip6=<IP6>, HWaddr =<HWaddr>,MTU=<MTU value>, LinkStatus =<LinkStatus>, RunStatus =<RunStatus> OK or ERROR



<b>Parameter Description</b>	<b>&lt;ifname&gt;</b> : name of the network adapter <b>&lt;IP&gt;</b> : IP address <b>&lt;netmask&gt;</b> : subnet mask <b>&lt;gateway&gt;</b> : IP address of the gateway <b>&lt;switch&gt;</b> : network adapter switch <b>up</b> : enabling the network adapter <b>down</b> : disabling the network adapter <b>&lt;IP6&gt;</b> : IPv6 address <b>&lt;HWaddr&gt;</b> : hardware address <b>&lt;MTU value&gt;</b> : maximum transmission unit (MTU), that is, the maximum length of a data frame <b>&lt;LinkStatus&gt;</b> : link status of the network adapter 0: not connected 1: connected <b>&lt;RunStatus&gt;</b> : running status of the network adapter 0: not running 1: running
<b>Sample</b>	<b>AT+IFCFG=ap0,192.168.3.1,netmask,255.255.255.0,gateway,192.168.3.2</b> : Configures the IP address, subnet mask, and gateway of AP0. <b>AT+IFCFG=ap0,up</b> : Enables AP0. <b>AT+IFCFG=ap0,down</b> : Disables AP0. <b>AT+IFCFG</b> : Queries configuration information of the network adapter.
<b>Note</b>	<ul style="list-style-type: none"><li>• The valid <b>&lt;HWaddr&gt;</b> can be queried only after the STA or SOFTAP is started.</li><li>• When configuring the IP address, ensure that <b>&lt;ifname&gt;</b> is followed by <b>&lt;IP&gt;</b>.</li><li>• When enabling or disabling the network adapter, ensure that <b>&lt;ifname&gt;</b> is followed by <b>&lt;switch&gt;</b>.</li><li>• You cannot enable or disable the network adapter or configure the IP address, subnet mask, or gateway of the network adapter by using the same command.</li></ul>

## 2.2.15 AT+CC

<b>Format</b>	Set command: AT+CC=<country_code>	Read command: AT+CC?
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<b>Response</b>	OK <i>or</i> ERROR	+CC:<country_code> OK <i>or</i> ERROR
<b>Parameter Description</b>	<country_code>: country code	
<b>Sample</b>	AT+IFCFG=wlan0,down AT+CC=CN AT+IFCFG=wlan0,up	AT+CC?
<b>Note</b>	Before setting the country code, shut down all network devices. For example, run the <b>AT+IFCFG=wlan0,down</b> command. After the setting is complete, start the network device, for example, run <b>AT+IFCFG=wlan0,up</b> (assume that the name of the network device is <b>wlan0</b> ).	

## 2.2.16 AT+DUMP

<b>Format</b>	AT+DUMP
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	-
<b>Sample</b>	AT+DUMP
<b>Note</b>	<ul style="list-style-type: none"><li>• "latest reboot reason" indicates the reason for the latest reboot. For details about the values of <b>eid</b> and <b>rid</b>, see the <i>Hi3861 V100/Hi3861L V100 FAQs</i>.</li><li>• "latest crash info" indicates the latest crash information stored in the flash memory. If no crash information is stored in the flash memory, "No crash dump found!" is displayed. In <b>app_main</b>, <b>hi_syserr_record_crash_info</b> is called to specify whether to save crash information when a crash occurs. For details about the crash information, see the <i>Hi3861 V100/Hi3861L V100 FAQs</i>.</li><li>• In scenarios where exceptions may occur frequently, you are advised not to store crash information. This prevents frequent flash write operations from damaging the flash service life.</li></ul>



## 2.2.17 AT+ARP

<b>Format</b>	AT+ARP=<switch>[,<IP>]
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<switch>: ARP offload enable 0: ARP offload is disabled. 1: ARP offload is enabled. <IP>: IP address allocated by <b>AT+DHCP</b> after the STA is successfully associated with the AP
<b>Sample</b>	<b>AT+ARP=1,192.168.140.1</b> : ARP offload is enabled. <b>AT+ARP=0</b> : ARP offload is disabled.
<b>Note</b>	<ul style="list-style-type: none"><li>When &lt;switch&gt; is set to <b>1</b>, the command must carry the &lt;IP&gt; parameter.</li><li>When &lt;switch&gt; is set to <b>0</b>, the command does not carry the &lt;IP&gt; parameter.</li></ul>

## 2.2.18 AT+SLP

<b>Format</b>	AT+SLP=<sleep_mode>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<sleep_mode>: low-power mode enable for the entire system 0: The low-power mode is disabled. 1: The light sleep mode is used. 2: The deep sleep mode is used.
<b>Sample</b>	<b>AT+SLP=2</b> : The deep sleep mode is used. <b>AT+SLP=1</b> : The light sleep mode is used. <b>AT+SLP=0</b> : The low-power mode is disabled.
<b>Note</b>	After the light sleep mode or deep sleep mode is set, the system enters the sleep mode only when no service puts a veto upon it.



## 2.2.19 AT+PS

<b>Format</b>	AT+PS=<switch> [,<slp_period>]
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<p><b>&lt;switch&gt;</b>: low-power enable for the Wi-Fi subsystem</p> <p><b>0</b>: disabled</p> <p><b>1</b>: enabled</p> <p><b>&lt;slp_period&gt;</b>: (optional) expected Wi-Fi sleep time, which is calculated based on the DTIM interval and beacon interval of the associated AP and the configured <b>slp_period</b> value</p> <ul style="list-style-type: none"><li>• If <b>slp_period</b> is set to <b>0</b> or <b>slp_period</b> is less than or equal to <b>dtim*beacon</b> configured for the AP, the expected sleep time is the value of <b>dtim*beacon</b> configured for the AP.</li><li>• If <b>slp_period</b> is greater than <b>dtim*beacon</b> configured for the AP, the expected sleep time is <b>k*(dtim*beacon)</b>, and <b>k</b> is the rounded-down value of <b>slp_period/(dtim*beacon)</b>. The unit of the expected sleep time is ms, and the value range is 33–4000 ms.</li></ul>
<b>Sample</b>	<p><b>AT+PS=1,1000</b>: The low power consumption of the Wi-Fi subsystem is enabled, and the expected sleep time is set to 1000 ms. (The sleep time is valid when the STA is associated with the AP.)</p> <p><b>AT+PS=1</b>: The low power consumption of the Wi-Fi subsystem is enabled. (The default expected sleep time is determined by the DTIM interval and beacon interval of the associated AP.)</p> <p><b>AT+PS=0</b>: The low power consumption of the Wi-Fi subsystem is disabled.</p>



<b>Note</b>	<ul style="list-style-type: none"><li>• The <b>AT+PS</b> command can be used to implement low power consumption of the entire system or only the Wi-Fi subsystem.<ul style="list-style-type: none"><li>- Low power consumption of the entire system: When an STA is associated with an AP and the IP address is successfully obtained, run the <b>AT+SLP</b> command to configure the low-power mode and then run the <b>AT+ARP=1,&lt;IP&gt;</b> and <b>AT+PS=1 [,&lt;slp_period&gt;]</b> commands in sequences. When an STA is not associated with an AP or is not started, run the <b>AT+SLP</b> command to configure the low-power mode, and run the <b>AT+PS=1 [,&lt;slp_period&gt;]</b> command.</li><li>- Low power consumption of the Wi-Fi subsystem: When an STA is associated with an AP and the IP address is successfully obtained, run the <b>AT+ARP=1,&lt;IP&gt;</b> command, and then run the <b>AT+PS=1 [,&lt;slp_period&gt;]</b> command.</li></ul></li><li>• When <b>&lt;switch&gt;</b> of the Wi-Fi subsystem is set to <b>0</b>, the command does not contain the <b>&lt;slp_period&gt;</b> parameter.</li><li>• To reset the expected sleep time, run the <b>AT+PS=0</b> command to disable the low power consumption of the Wi-Fi subsystem.</li></ul>
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## 2.2.20 AT+WKGPIO

<b>Format</b>	AT+WKGPIO=<gpio_num>,<int_type>,<int_polarity>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<p><b>&lt;gpio_num&gt;</b>: ID of the wakeup GPIO. Value range: 0–14.</p> <p><b>&lt;int_type&gt;</b>: GPIO interrupt-triggered mode</p> <p><b>0</b>: level-triggered</p> <p><b>1</b>: edge-triggered</p> <p><b>&lt;int_polarity&gt;</b>: GPIO interrupt trigger condition</p> <p><b>0</b>: falling edge or low level</p> <p><b>1</b>: rising edge or high level</p> <p>When the interrupt trigger mode is level-triggered, <b>0</b> indicates that the interrupt is triggered by a low level, <b>1</b> indicates that the interrupt is triggered by a high level. When the interrupt trigger mode is edge-triggered, <b>0</b> indicates that the interrupt is triggered on the falling edge, and <b>1</b> indicates that the interrupt is triggered on the rising edge.</p>
<b>Sample</b>	<b>AT+WKGPIO=0,1,1</b> : Sets GPIO0 as the wakeup source and triggers an interrupt on the rising edge.



<b>Note</b>	<ul style="list-style-type: none"><li>• If the GPIO pin is multiplexed as other functions, <b>ERROR</b> is returned.</li><li>• The Wi-Fi service is also one of the wakeup sources of light sleep and deep sleep modes.</li><li>• In addition to the preceding wakeup sources, other system interrupts (such as UART and I<sup>2</sup>C interface interrupts) cause light sleep wakeup.</li></ul>
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## 2.2.21 AT+USLP

<b>Format</b>	AT+USLP=<gpio_num>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<p><b>&lt;gpio_num&gt;</b>: Only the following GPIO pins can be used as wakeup sources in ultra-deep sleep mode:</p> <p><b>0</b>: All supported GPIO3, GPIO5, GPIO7, and GPIO14 can be registered as the wakeup sources.</p> <p><b>3</b>: GPIO3 is registered as the wakeup source.</p> <p><b>5</b>: GPIO5 is registered as the wakeup source.</p> <p><b>7</b>: GPIO7 is registered as the wakeup source.</p> <p><b>14</b>: GPIO14 is registered as the wakeup source.</p>
<b>Sample</b>	<b>AT+USLP=7</b> : The system enters the ultra-deep sleep mode and the GPIO7 pin is registered as the wakeup source.
<b>Note</b>	<ul style="list-style-type: none"><li>• Even if the currently registered GPIO pin is multiplexed as another working mode, the pin can still be woken up from the ultra-deep sleep mode when it meets the wakeup condition (high level).</li><li>• After wakeup, you need to run this command again to enter the ultra-deep sleep mode.</li><li>• The GPIO3 and GPIO5 pins of the Hi3861/Hi3861L demo board and module board are multiplexed as the debugging serial port (UART0) TX and AT command communication serial port (UART1) RX respectively by default. When data is transmitted over the UART port, high level is generated, causing wakeup from the ultra-deep sleep mode. Therefore, you are advised not to set the wakeup source to mode 0, mode 3, or mode 5 when the default I/O multiplexing mode is used.</li></ul>



## 2.2.22 AT+SETUART

<b>Format</b>	AT+SETUART=<at_uart_port>,[<debug_uart_port>], [<sigma_uart_port>]
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<p><b>&lt;at_uart_port&gt;</b>: UART port for AT command interaction. The value ranges from 0 to 2, and the default value is <b>1</b>.</p> <p><b>&lt;debug_uart_port&gt;</b>: UART port for shell command interaction or diag communication. The value ranges from 0 to 2, and the default value is <b>0</b>.</p> <p><b>&lt;sigma_uart_port&gt;</b>: UART port for command input of the sigma test. The value ranges from 0 to 2, and the default value is <b>2</b>.</p> <p>The values are as follows:</p> <p><b>0</b>: UART_PORT_0</p> <p><b>1</b>: UART_PORT_1</p> <p><b>2</b>: UART_PORT_2</p>
<b>Sample</b>	AT+SETUART=1,0,2
<b>Note</b>	<ul style="list-style-type: none"><li>• Shell command interaction and diag communication share the same UART port. Therefore, the two tasks cannot be started at the same time.</li><li>• The values of the three parameters must be unique.</li><li>• When the AT, shell/diag, and sigma tasks are started, the system checks whether the UART ports are mutually exclusive. Therefore, the UART port configurations of the tasks to be started must be different.</li><li>• This command takes effect only after the board is restarted.</li></ul>

## 2.2.23 AT+XTALCOM

<b>Format</b>	AT+XTALCOM?
<b>Response</b>	+XTALCOM: <high_threshold>,<low_threshold>,<compensation_ppm> OK <i>or</i> ERROR





<b>Parameter Description</b>	<p><b>&lt;high_threshold&gt;</b>: temperature threshold for triggering high-temperature frequency offset compensation. The value range is [-40, +140], and the unit is °C.</p> <p><b>&lt;low_threshold&gt;</b>: temperature threshold for exiting high-temperature frequency offset compensation. The value range is [-40, +140], and the unit is °C.</p> <p><b>&lt;compensation_ppm&gt;</b>: frequency adjustment coefficient. The value range is [-10000, +10000], and the unit is ppm.</p>
<b>Sample</b>	AT+XTALCOM?
<b>Note</b>	-

## 2.2.24 AT+RDTEMP

<b>Format</b>	AT+RDTEMP?
<b>Response</b>	+RDTEMP: <temp> OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;temp&gt;</b> : PN junction temperature of the chip. The value range is [-40, +140], and the unit is °C.
<b>Sample</b>	AT+RDTEMP?
<b>Note</b>	-



# 3 AT Commands Related to STA

## [3.1 Overview](#)

## [3.2 Description](#)

### 3.1 Overview

Command	Description
AT+STARTSTA	Starts the STA.
AT+STOPSTA	Stops the STA.
AT+RECONN	Configures the reconnection policy.
AT+SCAN	Starts STA scanning.
AT+SCANCHN	Specifies the channel to be scanned.
AT+SCANSSID	Specifies the service set identifier (SSID) for scanning.
AT+SCANPRSSID	Specifies the SSID prefix for scanning.
AT+SCANRESULT	Views the STA scanning results.
AT+CONN	Initiates a connection to the AP.
AT+FCONN	Initiates a fast connection to the AP.
AT+DISCONN	Disconnects from the AP.
AT+STASTAT	Views the STA status.
AT+PBC	Sets the WPS PBC connection.
AT+PIN	Sets the wps_pin connection.
AT+PINSHOW	Shows the generated PIN code.



## 3.2 Description

### 3.2.1 AT+STARTSTA

<b>Format</b>	Execution command with parameters: AT+STARTSTA=[<protocol_mode>],[<bw>],[<pmf>]	Execution command without parameters AT+STARTSTA
<b>Response</b>	OK <i>or</i> ERROR	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;protocol_mode&gt;</b> : protocol type. Default value: <b>0</b> . 0: 802.11b + 802.11g + 802.11n 1: 802.11b + 802.11g 2: 802.11b <b>&lt;bw&gt;</b> : bandwidth. Default value: <b>20</b> . 5: 5 MHz bandwidth 10: 10 MHz bandwidth 20: 20 MHz bandwidth <b>&lt;pmf&gt;</b> : management frame protection policy. Default value: <b>1</b> . 0: no protection 1: adaptive 2: forced protection	-
<b>Sample</b>	AT+STARTSTA=1,5,1 AT+STARTSTA=,10,	AT+STARTSTA
<b>Note</b>	<ul style="list-style-type: none"><li>• To issue a command with parameters, the parameters can be omitted, but the commas (,) used to separate parameters cannot be omitted. If a parameter is omitted, its default value is used.</li><li>• To issue a command without parameters, the preceding parameters use the default values.</li><li>• The STA cannot be started repeatedly.</li><li>• If <b>&lt;bw&gt;</b> is set to <b>5</b> or <b>10</b>, the <b>&lt;protocol_mode&gt;</b> parameter cannot be set to <b>2</b>.</li></ul>	



### 3.2.2 AT+STOPSTA

<b>Format</b>	AT+STOPSTA
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	-
<b>Sample</b>	AT+STOPSTA
<b>Note</b>	The <b>AT+DHCP=wlan0,0</b> command must be executed before the <b>AT+STOPSTA</b> command to disable the DHCP service.

### 3.2.3 AT+RECONN

<b>Format</b>	AT+RECONN=<enable>[,<period>,<count>[,<timeout>]]
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;enable&gt;</b> : enabling reconnection 0: not reconnected 1: reconnected <b>&lt;period&gt;</b> : reconnection interval, in seconds. Value range: 1–65535. <b>&lt;count&gt;</b> : maximum number of reconnections. Value range: 1–65535. <b>&lt;timeout&gt;</b> : timeout interval for a single reconnection. The value ranges from 1 to 65535. The default <b>value is 2</b> . If the value is <b>65535</b> , the number of reconnections is unlimited.
<b>Sample</b>	AT+RECONN=1,10,3600,5 AT+RECONN=1,10,3600, AT+RECONN=0



<b>Note</b>	<ul style="list-style-type: none"><li>• When <b>&lt;enable&gt;</b> is set to <b>0</b> (disabled), you do not need to enter the following parameters. Otherwise, <b>ERROR</b> is returned.</li><li>• This command can be used only after <b>AT+STARTSTA</b> is executed. After <b>AT+STOPSTA</b> is executed to stop the STA, the parameters configured by this command are restored to the default values.</li><li>• After the <b>AT+RECONN</b> command is delivered, if a SoftAP or mesh interface is added, disabled, or deleted, you must run the <b>AT+RECONN</b> command again.</li></ul>
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### 3.2.4 AT+SCAN

<b>Format</b>	AT+SCAN
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	-
<b>Sample</b>	AT+SCAN
<b>Note</b>	<ul style="list-style-type: none"><li>• This command is a non-blocking command.</li><li>• If <b>OK</b> is returned, the scanning is started successfully. The scanning result is reported through <b>+NOTICE</b> as follows: <b>+NOTICE:SCANFINISH</b>, which indicates that the scanning is finished</li></ul>

### 3.2.5 AT+SCANCHN

<b>Format</b>	AT+SCANCHN=<chn>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;chn&gt;</b> : channel ID. Value range: 1-14
<b>Sample</b>	AT+SCANCHN=3



<b>Note</b>	<ul style="list-style-type: none"><li>• This command is a non-blocking command.</li><li>• If <b>OK</b> is returned, the scanning is started successfully. The scanning result is reported through <b>+NOTICE</b> as follows: <b>+NOTICE:SCANFINISH</b>, which indicates that the scanning is finished</li><li>• The value range of <b>&lt;chn&gt;</b> varies according to the region. In China, the value range is 1–13.</li></ul>
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## 3.2.6 AT+SCANSSID

<b>Format</b>	AT+SCANSSID=<ssid>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;ssid&gt;</b> : service set identifier, that is, the router name. The parameter value must be enclosed in double quotation marks.
<b>Sample</b>	AT+SCANSSID="hisilicon" <b>AT+SCANSSID=P"\xe4\xb8\xad\xe5\x9b\xbd"</b> : Sets the SSID to <b>China</b> and starts scanning.
<b>Note</b>	<ul style="list-style-type: none"><li>• This command is a non-blocking command.</li><li>• If <b>OK</b> is returned, the scanning is started successfully. The scanning result is reported through <b>+NOTICE</b> as follows: <b>+NOTICE:SCANFINISH</b>, which indicates that the scanning is finished</li><li>• If the value of <b>&lt;ssid&gt;</b> is a string in non-ASCII format (for example, "China"), input the code in the following format: <b>P"\xe4\xb8\xad\xe5\x9b\xbd"</b></li><li>• If the value of <b>&lt;ssid&gt;</b> contains any special character, escape it by using a backslash (\). For example, if the SSID name is <b>ab,c</b>, the command parameter must be <b>ab\,c</b>. If the SSID contains double quotation marks, escape is optional. For example, if the SSID name is <b>ab"c</b>, the command parameter can be <b>ab\"c</b> or <b>ab"c</b>.</li></ul>

## 3.2.7 AT+SCANPRSSID

<b>Format</b>	AT+SCANPRSSID=<prssid>
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<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;prssid&gt;</b> : prefix of the service set identifier, that is, the prefix of the router name. The parameter value must be enclosed in double quotation marks.
<b>Sample</b>	AT+SCANPRSSID="hisi" <b>AT+SCANSSID=P"\xe4\xb8\xad\xe5\x9b\xbd"</b> : Sets the SSID prefix to <b>China</b> and starts scanning.
<b>Note</b>	<ul style="list-style-type: none"><li>• This command is a non-blocking command.</li><li>• If <b>OK</b> is returned, the scanning is started successfully. The scanning result is reported through <b>+NOTICE</b> as follows: <b>+NOTICE:SCANFINISH</b>, which indicates that the scanning is finished</li><li>• If the value of <b>&lt;ssid&gt;</b> is a string in non-ASCII format (for example, "China"), input the code in the following format: <b>P"\xe4\xb8\xad\xe5\x9b\xbd"</b></li><li>• If the value of <b>&lt;ssid&gt;</b> contains any special character, escape it by using a backslash (\). For example, if the SSID name is <b>ab,c</b>, the command parameter must be <b>ab\,c</b>. If the SSID contains double quotation marks, escape is optional. For example, if the SSID name is <b>ab"c</b>, the command parameter can be <b>ab\"c</b> or <b>ab"c</b>.</li></ul>

### 3.2.8 AT+SCANRESULT

<b>Format</b>	AT+SCANRESULT
<b>Response</b>	+SCANRESULT:<ssid>,<bssid>,<chn>,<rssi>,<auth_type>[,<service_type>] OK <i>or</i> ERROR



<b>Parameter Description</b>	<p><b>&lt;ssid&gt;</b>: service set identifier, that is, the router name</p> <p><b>&lt;bssid&gt;</b>: basic service set identifier, which is usually the MAC address of the router</p> <p><b>&lt;chn&gt;</b>: channel ID. Value range: 1–14</p> <p><b>&lt;rssi&gt;</b>: signal strength</p> <p><b>&lt;auth_type&gt;</b>: authentication type</p> <p>0: OPEN</p> <p>1: WEP</p> <p>2: WPA2_PSK</p> <p>3: WPA_WPA2_PSK</p> <p>4: WPA_PSK</p> <p>5: WPA</p> <p>6: WPA2</p> <p>7: SAE</p> <p>8: unknown</p> <p><b>&lt;service_type&gt;</b>: network type</p> <p>1: WPS</p> <p>2: MESH</p>
<b>Sample</b>	AT+SCANRESULT
<b>Note</b>	<ul style="list-style-type: none"><li>• The value range of <b>&lt;chn&gt;</b> varies according to the region. In China, the value range is 1–13.</li><li>• The scanning result can be queried only after the scanning command is executed and <b>+NOTICE:SCANFINISH</b> is returned.</li><li>• If the value of <b>&lt;ssid&gt;</b> is a string in non-ASCII format (for example, "China"), input the code in the following format: <b>P"\xe4\xb8\xad\xe5\x9b\xbd"</b></li></ul>

### 3.2.9 AT+CONN

<b>Format</b>	AT+CONN=<ssid>,<bssid>,<auth_type>[,<passwd>]
<b>Response</b>	OK <i>or</i> ERROR





<b>Parameter Description</b>	<p><b>&lt;ssid&gt;</b>: service set identifier, that is, the router name. The parameter value must be enclosed in double quotation marks.</p> <p><b>&lt;bssid&gt;</b>: basic service set identifier, which is usually the MAC address of the router</p> <p><b>&lt;auth_type&gt;</b>: authentication type</p> <p>0: OPEN</p> <p>1: WEP</p> <p>2: WPA2_PSK</p> <p>3: WPA_WPA2_PSK</p> <p><b>&lt;passwd&gt;</b>: password. The parameter value must be enclosed in double quotation marks. If the authentication type of the peer network is WEP and the password is in ASCLL format, the password must be enclosed in nested double quotation marks.</p>
<b>Sample</b>	<p><b>AT+CONN="hisilicon",,3,"123456789"</b>: Connect to the router whose name is <b>hisilicon</b>.</p> <p><b>AT+CONN=,90:2B:D2:E4:CE:28,3,"123456789"</b>: Connect to the router whose <b>bssid</b> is <b>90:2B:D2:E4:CE:28</b>.</p> <p><b>AT+CONN= P"\xe4\xb8\xad\xe5\x9b\xbd",,3,"123456789"</b>: Connect to the router whose name is <b>China</b>.</p> <p><b>AT+CONN="hisilicon",,1,""1234567890123""</b>: Connect to the router whose name is <b>hisilicon</b>. If the authentication type of the peer network is WEP and the password is in ASCLL format, the password must be enclosed in nested double quotation marks.</p>
<b>Note</b>	<ul style="list-style-type: none"><li>• <b>&lt;ssid&gt;</b> and <b>&lt;bssid&gt;</b> cannot be both null.</li><li>• If both <b>&lt;ssid&gt;</b> and <b>&lt;bssid&gt;</b> are not null and they do not match, the connection fails.</li><li>• If the value of <b>&lt;ssid&gt;</b> is a string in non-ASCII format (for example, "China"), input the code in the following format: <b>P"\xe4\xb8\xad\xe5\x9b\xbd"</b></li><li>• If the values of <b>&lt;ssid&gt;</b> and <b>&lt;passwd&gt;</b> contain any special character, escape it by using a backslash (\). For example, if the SSID name is <b>ab,c</b>, the command parameter must be <b>ab\,c</b>. If the SSID contains double quotation marks, escape is optional. For example, if the SSID name is <b>ab"c</b>, the command parameter can be <b>ab\"c</b> or <b>ab"c</b>.</li><li>• When <b>&lt;auth_type&gt;</b> is set to <b>OPEN</b>, the <b>&lt;passwd&gt;</b> parameter and the comma before it are not required.</li><li>• This command is a non-blocking command.</li><li>• If <b>OK</b> is returned, the connection command is successfully issued and the connection result is reported through <b>+NOTICE</b> as follows: <b>+NOTICE:CONNECTED</b>: indicates that the connection succeeds. <b>+NOTICE:DISCONNECTED</b>: indicates that the connection fails.</li></ul>



## 3.2.10 AT+FCONN

<b>Format</b>	AT+FCONN=<ssid>,<bssid>,<chn>,<auth_type>[,<passwd>]
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<p><b>&lt;ssid&gt;</b>: service set identifier, that is, the router name. The parameter value must be enclosed in double quotation marks.</p> <p><b>&lt;bssid&gt;</b>: basic service set identifier, which is usually the MAC address of the router</p> <p><b>&lt;chn&gt;</b>: channel ID. Value range: 1-14</p> <p><b>&lt;auth_type&gt;</b>: authentication type</p> <p>0: OPEN</p> <p>1: WEP</p> <p>2: WPA2_PSK</p> <p>3: WPA_WPA2_PSK</p> <p><b>&lt;passwd&gt;</b>: password. The parameter value must be enclosed in double quotation marks. If the authentication type of the peer network is WEP and the password is in ASCLL format, the password must be enclosed in nested double quotation marks.</p>
<b>Sample</b>	<p><b>AT+FCONN="hisilicon",,6,3,"123456789"</b>: Connect to the router whose name is <b>hisilicon</b> and specify the channel ID <b>6</b>.</p> <p><b>AT+FCONN= P"\xe4\xb8\xad\xe5\x9b\xbd",,6,3,"123456789"</b>: Connect to the router whose name is <b>China</b> and specify the channel ID <b>6</b>.</p> <p><b>AT+FCONN=,90:2B:D2:E4:CE:28,6,3,"123456789"</b>: Connect the router whose <b>bssid</b> is <b>90:2B:D2:E4:CE:28</b> and specify the channel ID <b>6</b>.</p> <p><b>AT+FCONN="hisilicon",,6,1,""1234567890123""</b>: Connect to the router whose name is <b>hisilicon</b>. If the authentication type of the peer network is WEP and the password is in ASCLL format, the password must be enclosed in nested double quotation marks.</p>



<b>Note</b>	<ul style="list-style-type: none"><li>• <b>&lt;ssid&gt;</b> and <b>&lt;bssid&gt;</b> cannot be both null.</li><li>• If both <b>&lt;ssid&gt;</b> and <b>&lt;bssid&gt;</b> are not null and they do not match, the connection fails.</li><li>• If the value of <b>&lt;ssid&gt;</b> is a string in non-ASCII format (for example, "China"), input the code in the following format: <b>P"\xe4\x8\xad\xe5\x9b\xbd"</b></li><li>• If the values of <b>&lt;ssid&gt;</b> and <b>&lt;passwd&gt;</b> contain any special character, escape it by using a backslash (\). For example, if the SSID name is <b>ab,c</b>, the command parameter must be <b>ab\,c</b>. If the SSID contains double quotation marks, escape is optional. For example, if the SSID name is <b>ab"c</b>, the command parameter can be <b>ab\"c</b> or <b>ab"c</b>.</li><li>• When <b>&lt;auth_type&gt;</b> is set to <b>OPEN</b>, the <b>&lt;passwd&gt;</b> parameter and the comma before it are not required.</li><li>• The value range of <b>&lt;chn&gt;</b> varies according to the region. In China, the value range is 1–13.</li><li>• This command is a blocking command. The connection result is returned before <b>OK</b> or <b>ERROR</b> is returned.</li><li>• The connection result is reported through <b>+NOTICE</b> as follows: <b>+NOTICE:CONNECTED</b>: indicates that the connection succeeds. <b>+NOTICE:DISCONNECTED</b>: indicates that the connection fails. <b>+NOTICE:NETWORK NOT FIND</b>: indicates that the network is not found.</li></ul>
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### 3.2.11 AT+DISCONN

<b>Format</b>	AT+DISCONN
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	-
<b>Sample</b>	AT+DISCONN
<b>Note</b>	<ul style="list-style-type: none"><li>• This command is a non-blocking command.</li><li>• If <b>OK</b> is returned, the disconnection command is successfully issued and the disconnection result is reported through <b>+NOTICE</b> as follows: <b>+NOTICE:DISCONNECTED</b>: indicates that the connection tears down.</li></ul>



### 3.2.12 AT+STASTAT

<b>Format</b>	AT+STASTAT
<b>Response</b>	+STASTAT: <status>,<ssid>, <bssid >,<chn> OK <i>or</i> ERROR
<b>Parameter Description</b>	<status>: current connection status 0: disconnected 1: connected <ssid>: service set identifier, that is, the router name <bssid>: basic service set identifier, which is usually the MAC address of the router <chn>: channel ID. Value range: 1-14
<b>Sample</b>	AT+STASTAT
<b>Note</b>	The value range of <chn> varies according to the region. In China, the value range is 1-13. If the value of <ssid> is a string in non-ASCII format (for example, "China"), input the code in the following format: <b>P"\xe4\xb8\xad\xe5\x9b\xbd"</b>

### 3.2.13 AT+PBC

<b>Format</b>	AT+PBC
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	-
<b>Sample</b>	AT+PBC
<b>Note</b>	<ul style="list-style-type: none"><li>• This command is a non-blocking command.</li><li>• If <b>OK</b> is returned, the PBC connection command is successfully issued and the connection result is reported through <b>+NOTICE</b> as follows: <b>+NOTICE:CONNECTED</b>: indicates that the connection succeeds. <b>+NOTICE:DISCONNECTED</b>: indicates that the connection fails.</li></ul>



### 3.2.14 AT+PIN

<b>Format</b>	AT+PIN=<pin>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<pin>: pin code
<b>Sample</b>	AT+PIN=03882368
<b>Note</b>	<ul style="list-style-type: none"><li>• This command is a non-blocking command.</li><li>• If <b>OK</b> is returned, the PIN connection command is successfully issued and the connection result is reported through <b>+NOTICE</b> as follows: <b>+NOTICE:CONNECTED</b>: indicates that the connection succeeds. <b>+NOTICE:DISCONNECTED</b>: indicates that the connection fails.</li></ul>

### 3.2.15 AT+PINSHOW

<b>Read Command</b>	AT+PINSHOW
<b>Response</b>	+PINSHOW:<pin> OK <i>or</i> ERROR
<b>Parameter Description</b>	<pin>: pin code
<b>Sample</b>	AT+PINSHOW
<b>Note</b>	-



# 4 AT Commands Related to SoftAP

## [4.1 Overview](#)

## [4.2 Description](#)

### 4.1 Overview

Command	Description
AT+STARTAP	Starts the SoftAP in common mode.
AT+SETAPADV	Sets the SoftAP startup parameters.
AT+STOPAP	Disables the SoftAP.
AT+APSCAN	Starts SoftAP scanning.
AT+SHOWSTA	Displays information about the current STA connected to the AP.
AT+DEAUTHSTA	Disconnects the STA from the AP.

### 4.2 Description

#### 4.2.1 AT+STARTAP

<b>Format</b>	AT+STARTAP=<ssid>,<ssid_hide>,<chn>,<auth_type>[,<passwd>]
<b>Response</b>	OK or ERROR



<b>Parameter Description</b>	<p><b>&lt;ssid&gt;</b>: service set identifier, that is, the router name. The parameter value must be enclosed in double quotation marks.</p> <p><b>&lt;ssid_hide&gt;</b>: whether to hide the SSID</p> <p>0: no</p> <p>1: yes</p> <p><b>&lt;chn&gt;</b>: channel ID. Value range: 1–14</p> <p><b>&lt;auth_type&gt;</b>: authentication type</p> <p>0: OPEN</p> <p>2: WPA2_PSK</p> <p>3: WPA_WPA2_PSK</p> <p><b>&lt;passwd&gt;</b>: password. The parameter value must be enclosed in double quotation marks. The password must contain at least eight characters.</p>
<b>Sample</b>	<p>AT+STARTAP="hisilicon",0,6,2,"123456789"</p> <p>AT+STARTAP="hisilicon",0,6,0</p>
<b>Note</b>	<ul style="list-style-type: none"><li>• The value range of <b>&lt;chn&gt;</b> varies according to the region. In China, the value range is 1–13.</li><li>• When <b>&lt;auth_type&gt;</b> is set to <b>OPEN</b>, the <b>&lt;passwd&gt;</b> parameter and the comma before it are not required.</li><li>• If the values of <b>&lt;ssid&gt;</b> and <b>&lt;passwd&gt;</b> contain any special character, escape it by using a backslash (\). For example, if the SSID name is <b>ab,c</b>, the command parameter must be <b>ab\,c</b>. If the SSID contains double quotation marks, escape is optional. For example, if the SSID name is <b>ab"c</b>, the command parameter can be <b>ab\"c</b> or <b>ab"c</b>.</li></ul>

## 4.2.2 AT+SETAPADV

<b>Format</b>	AT+SETAPADV=[<protocol_mode>],[<bw>],[<bcn_period>],[<dtim_period>],[<group_rekey>],[<sgi>]
<b>Response</b>	OK or ERROR



<b>Parameter Description</b>	<p><b>&lt;protocol_mode&gt;</b>: protocol type. Default value: <b>0</b>.</p> <p>0: 802.11b + 802.11g + 802.11n 1: 802.11b + 802.11g 2: 802.11b</p> <p><b>&lt;bw&gt;</b>: bandwidth. Default value: <b>20</b>.</p> <p>5: 5 MHz bandwidth 10: 10 MHz bandwidth 20: 20 MHz bandwidth</p> <p><b>&lt;bcn_period&gt;</b>: beacon period, in ms. Value range: 33–1000. Default value: <b>100</b></p> <p><b>&lt;dtim_period&gt;</b>: DTIM period. Value range: 1–30. Default value: <b>1</b></p> <p><b>&lt;group_rekey&gt;</b>: update time of the multicast key, in seconds. Value range: 30–86400. Default value: <b>86400</b></p> <p><b>&lt;sgi&gt;</b>: short GI enable. Default value: <b>1</b></p> <p>0: disabled 1: enabled</p>
<b>Sample</b>	<p>AT+SETAPADV=2,20,100,2,3600,1</p> <p>AT+SETAPADV=,,100,2,3600,</p>
<b>Note</b>	<ul style="list-style-type: none"><li>• This command must be issued before <b>AT+STARTAP</b>.</li><li>• If you do not need to change the default values of the preceding parameters, do not run this command.</li><li>• The <b>AT+STOPAP</b> command does not change the value of <b>&lt;bw&gt;</b>. Other values are restored to the default values.</li><li>• The parameters can be omitted, but the commas (,) corresponding to the parameters cannot be omitted. The omitted parameters use the default values.</li><li>• The <b>&lt;group_rekey&gt;</b> parameter is dependent on the <b>&lt;auth_type&gt;</b> parameter in the <b>AT+STARTAP</b> command. The configured value of the <b>&lt;group_rekey&gt;</b> parameter takes effect only when the <b>&lt;auth_type&gt;</b> parameter is set to <b>WPA_WPA2_PSK</b>. If the <b>&lt;auth_type&gt;</b> parameter is set to <b>WPA2_PSK</b>, the <b>&lt;group_rekey&gt;</b> parameter is set to <b>86400</b> by default.</li><li>• If <b>&lt;bw&gt;</b> is set to <b>5</b> or <b>10</b>, the <b>&lt;protocol_mode&gt;</b> parameter cannot be set to <b>2</b>.</li></ul>

## 4.2.3 AT+STOPAP

<b>Format</b>	AT+STOPAP
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<b>Response</b>	OK or ERROR
<b>Parameter Description</b>	-
<b>Sample</b>	AT+STOPAP
<b>Note</b>	The <b>AT+DHCP5=ap0</b> command must be executed before the <b>AT+STOPAP</b> command. <b>0</b> indicates that the DHCP service is disabled.

## 4.2.4 AT+APSCAN

<b>Format</b>	AT+APSCAN
<b>Response</b>	OK or ERROR
<b>Parameter Description</b>	-
<b>Sample</b>	AT+APSCAN
<b>Note</b>	<ul style="list-style-type: none"><li>• This command is a non-blocking command.</li><li>• If <b>OK</b> is returned, the scanning is started successfully. The scanning result is reported through <b>+NOTICE</b> as follows: <b>+NOTICE:SCANFINISH</b>, which indicates that the scanning is finished</li></ul>

## 4.2.5 AT+SHOWSTA

<b>Format</b>	AT+SHOWSTA
<b>Response</b>	+SHOWSTA:<STA_MAC> OK or ERROR
<b>Parameter Description</b>	<STA_MAC>: MAC address of the connected STA
<b>Sample</b>	AT+SHOWSTA
<b>Note</b>	-



## 4.2.6 AT+DEAUTHSTA

<b>Format</b>	AT+DEAUTHSTA=<MAC>
<b>Response</b>	OK or ERROR
<b>Parameter Description</b>	<MAC>: MAC address of the STA to be disconnected
<b>Sample</b>	AT+DEAUTHSTA=90:2B:D2:E4:CE:28
<b>Note</b>	-



# 5 AT Commands Related to TCP/IP

## 5.1 Overview

### 5.2 Description

## 5.1 Overview

Command	Description
AT+IPSTART	Creates a socket and starts a TCP connection.
AT+IPSEND	Sends TCP/UDP data.
AT+IPLISTEN	Starts TCP listening.
AT+IPCLOSE	Deletes the socket and stops the TCP connection.
+IPD	Reports the received TCP/UDP data from the peer end.

## 5.2 Description

### 5.2.1 AT+IPSTART

Format	TCP: AT +IPSTART=<link_ID>,<IP_protocol>,<remote_IP>,<remote_port>	UDP: AT+IPSTART=<link_ID>,<IP_protocol>,<local_port>
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<b>Response</b>	OK <i>or</i> <b>ERROR</b> If the connection has been created, the return is: <b>invalid link</b> <b>ERROR</b>
<b>Parameter Description</b>	<link_ID>: network connection ID, bound to the local socket. The value ranges from 0 to 7. A maximum of four TCP connections and four UDP transmission are supported. <IP_protocol>: IP protocol type <b>TCP</b> : TCP connection <b>UDP</b> : UDP listening <remote_IP>: remote IP address <remote_port>: remote port number <local_port>: local port number
<b>Sample</b>	AT+IPSTART=0,tcp,192.168.3.1,5001 AT+IPSTART=0,udp,5001
<b>Note</b>	-

## 5.2.2 AT+IPSEND

<b>Format</b>	Sends TCP data: AT+IPSEND=<link_ID>,<len>	Sends UDP data: AT +IPSEND=<link_ID>,<len> ,<remote IP>,<remote port>
<b>Response</b>	After the command is executed successfully, the system returns >. The system enters the state of waiting for data input. At this time, the input characters are considered as the data to be sent. When the number of characters reaches the value of <b>len</b> or <b>\0</b> is encountered, the data is automatically sent. After the data is sent, the system enters the state of waiting for the AT command.  If the data is sent successfully, the return is: <b>SEND x bytes</b> <b>OK</b> If the data fails to be sent, the return is: <b>ERROR</b>	



<b>Parameter Description</b>	<b>&lt;link ID&gt;</b> : network connection ID, which is bound to the local socket. Value range: 0–7. <b>&lt;len&gt;</b> : length of the data to be sent. The maximum length is 1024. <b>&lt;remote_IP&gt;</b> : remote IP address <b>&lt;remote_port&gt;</b> : remote port number
<b>Sample</b>	AT+IPSEND=0,9 >data test SEND 9 bytes OK AT+IPSEND=0,9,192.168.3.1,5001 >data test SEND 9 bytes OK
<b>Note</b>	\0 are characters representing the end of sending. To send \0, escape it to \\0.

### 5.2.3 AT+IPLISTEN

<b>Format</b>	AT+IPLISTEN=<control>[,<local_port>]
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;control&gt;</b> : 0: TCP listening is disabled. 1: TCP listening is enabled. <b>&lt;local_port&gt;</b> : local port number
<b>Sample</b>	AT+IPLISTEN=1,5001 AT+IPLISTEN=0
<b>Note</b>	If the value of <b>&lt;control&gt;</b> is 0, the <b>&lt;local_port&gt;</b> parameter is not required.

### 5.2.4 AT+IPCLOSE

<b>Format</b>	AT+IPCLOSE=<link_ID>
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<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;link_ID&gt;</b> : network connection ID, which is bound to the local socket. Value range: 0–7.
<b>Sample</b>	AT+IPCLOSE=0
<b>Note</b>	-

## 5.2.5 +IPD

<b>Format</b>	+IPD,<link_ID>,<len>,<remote_IP>,<remote_port>:<data>
<b>Response</b>	When the system is in the TCP connection state or UDP listening state, if the system receives remote TCP/UDP data, it reports <b>+IPD,&lt;link_ID&gt;,&lt;len&gt;,&lt;remote_IP&gt;,&lt;remote_port&gt;:&lt;data&gt;</b> .
<b>Parameter Description</b>	<b>&lt;link_ID&gt;</b> : network connection ID, which is bound to the local socket. Value range: 0–7. <b>&lt;len&gt;</b> : length of the received data <b>&lt;remote_IP&gt;</b> : remote IP address <b>&lt;remote_port&gt;</b> : remote port number <b>&lt;data&gt;</b> : received data
<b>Sample</b>	+IPD,0,4,192.168.3.1,5001:abcd
<b>Note</b>	If the length of data received at a time exceeds the maximum of 1024 bytes, the data is reported multiple times.



# 6 AT Commands Related to Testing and Debugging

## [6.1 Overview](#)

## [6.2 Description](#)

### 6.1 Overview

Command	Description
AT+ALTX	Sets the always TX function.
AT+ALRX	Sets the always RX function.
AT+RXINFO	Queries the always RX.
AT+TPC	Controls the transmit power automatically.
AT+SETRPWR	Sets the rate and power.
AT+CALFREQ	Compensates the frequency offset at room temperature.
AT+RCALDATA	Queries the compensation information of the factory test.
AT+TRC	Controls the transmit rate automatically.
AT+SETRATE	Sets the transmission rate.
AT+ARLOG	Sets the output of the frame rate log.
AT+VAPINFO	Outputs VAP log information.
AT+USRINFO	Outputs user log information.
AT+FTMOK	Ends the factory test mode.
AT+FTM	Switches the factory test/service model.



Command	Description
AT+FTMERASE	Erases the factory test mode.

## 6.2 Description

### 6.2.1 AT+ALTX

<b>Format</b>	AT+ALTX=<control>[,<protocol_mode>,<bw>,<chn>,<rate>]
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<p><b>&lt;control&gt;</b>: enable 0: disabled 1: The modulation signal is always transmitted. 2: The DC signal is always transmitted (used for frequency offset measurement during CE certification).</p> <p><b>&lt;protocol_mode&gt;</b>: protocol type 0: 802.11n 1: 802.11g 2: 802.11b</p> <p><b>&lt;bw&gt;</b>: bandwidth 5: 5 MHz bandwidth 10: 10 MHz bandwidth 20: 20 MHz bandwidth</p> <p><b>&lt;chn&gt;</b>: channel ID. Value range: 1–14</p> <p><b>&lt;rate&gt;</b>: transmission rate 802.11b supports 1, 2, 5.5, and 11. 802.11g supports 6, 9, 12, 18, 24, 36, 48, and 54. 802.11n supports 0, 1, 2, 3, 4, 5, 6, and 7, indicating MCS0–7.</p>
<b>Sample</b>	AT+ALTX=1,0,5,1,7 AT+ALTX=0





<b>Note</b>	<ul style="list-style-type: none"><li>• The value range of <b>&lt;chn&gt;</b> varies according to the region. In China, the value range is 1–13.</li><li>• When <b>&lt;control&gt;</b> is set to <b>0</b>, do not set other parameters.</li><li>• Restart the device before and after the always TX function test.</li><li>• If <b>&lt;bw&gt;</b> is set to <b>5</b> or <b>10</b>, the <b>&lt;protocol_mode&gt;</b> parameter cannot be set to <b>2</b>.</li><li>• Before running the <b>AT+ALTX</b> command, run the <b>AT+IFCFG=wlan0,down</b> command to disable the network adapter wlan0. Do not run <b>AT+IFCFG=wlan0,up</b> before running <b>AT+ALTX</b>.</li></ul>
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## 6.2.2 AT+ALRX

<b>Format</b>	AT+ALRX=<control>[,<protocol_mode>,<bw>,<chn>,<mac_filter>]
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;control&gt;</b> : enable 0: disabled 1: enabled <b>&lt;protocol_mode&gt;</b> : protocol type 0: 802.11n 1: 802.11g 2: 802.11b <b>&lt;bw&gt;</b> : bandwidth 5: 5 MHz bandwidth 10: 10 MHz bandwidth 20: 20 MHz bandwidth <b>&lt;chn&gt;</b> : channel ID. Value range: 1–14 <b>&lt;mac_filter&gt;</b> : MAC address filtering switch 0: disabled 1: enabled
<b>Sample</b>	AT+ALRX=1,0,20,1,1 AT+ALRX=0



<b>Note</b>	<ul style="list-style-type: none"><li>• The value range of <b>&lt;chn&gt;</b> varies according to the region. In China, the value range is 1–13.</li><li>• When <b>&lt;control&gt;</b> is set to <b>0</b>, do not set other parameters.</li><li>• Restart the device before and after the RX function test.</li><li>• If <b>&lt;bw&gt;</b> is set to <b>5</b> or <b>10</b>, the <b>&lt;protocol_mode&gt;</b> parameter cannot be set to <b>2</b>.</li><li>• Before running the <b>AT+ALRX</b> command, run the <b>AT+IFCFG=wlan0,down</b> command to disable the network adapter wlan0. Do not run <b>AT+IFCFG=wlan0,up</b> before running <b>AT+ALRX</b>.</li></ul>
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## 6.2.3 AT+RXINFO

<b>Format</b>	AT+RXINFO
<b>Response</b>	+ RXINFO:<pktnums> OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;pktnums&gt;</b> : number of successfully received packets
<b>Sample</b>	AT+RXINFO
<b>Note</b>	This command should be executed after the instrument sends packets. Then, the current statistics will be cleared.

## 6.2.4 AT+TPC

<b>Format</b>	AT+TPC=<control>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;control&gt;</b> : automatic control switch of the transmit power <b>0</b> : disabled <b>1</b> : enabled
<b>Sample</b>	AT+TPC=0 AT+TPC=1
<b>Note</b>	-



## 6.2.5 AT+SETRPWR

<b>Format</b>	AT+SETRPWR=<protocol_mode>,<rate>,<val>
<b>Response</b>	OK <i>or</i> ERROR



<b>Parameter Description</b>	<p><b>&lt;protocol_mode&gt;</b>: protocol type</p> <p><b>0</b>: 802.11n</p> <p><b>1</b>: 802.11g</p> <p><b>2</b>: 802.11b</p> <p><b>&lt;rate&gt;</b>: rate</p> <p>The value ranges from 0 to 8 in the 802.11n scenario.</p> <p>The value ranges from 0 to 8 in the 802.11g scenario.</p> <p>The value ranges from 0 to 4 in the 802.11b scenario.</p> <p>The mapping between rates 0 to 8 and actual rates in the 802.11n scenario is as follows:</p> <p><b>0</b>: 6.5 Mbit/s</p> <p><b>1</b>: 13 Mbit/s</p> <p><b>2</b>: 19.5 Mbit/s</p> <p><b>3</b>: 26 Mbit/s</p> <p><b>4</b>: 39 Mbit/s</p> <p><b>5</b>: 52 Mbit/s</p> <p><b>6</b>: 58.5 Mbit/s</p> <p><b>7</b>: 65 Mbit/s</p> <p><b>8</b>: all the preceding rates</p> <p>The mapping between rates 0 to 8 and actual rates in the 802.11g scenario is as follows:</p> <p><b>0</b>: 6 Mbit/s</p> <p><b>1</b>: 9 Mbit/s</p> <p><b>2</b>: 12 Mbit/s</p> <p><b>3</b>: 18 Mbit/s</p> <p><b>4</b>: 24 Mbit/s</p> <p><b>5</b>: 36 Mbit/s</p> <p><b>6</b>: 48 Mbit/s</p> <p><b>7</b>: 54 Mbit/s</p> <p><b>8</b>: all the preceding rates</p> <p>The mapping between rates 0 to 4 and actual rates in the 802.11b scenario is as follows:</p> <p><b>0</b>: 1 Mbit/s</p> <p><b>1</b>: 2 Mbit/s</p> <p><b>2</b>: 5.5 Mbit/s</p> <p><b>3</b>: 11 Mbit/s</p> <p><b>4</b>: all the preceding rates</p> <p><b>&lt;val&gt;</b>: power value, in 0.1 dBm. The value ranges from -100 to +40.</p>
<b>Sample</b>	AT+SETRPWR=2,4,-40



<b>Note</b>	This command is used for R&D debugging and does not affect the parameters written to the eFUSE. It cannot be used together with <b>AT+CALRPWR</b> or used for factory tests.
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## 6.2.6 AT+CALFREQ

<b>Format</b>	AT+CALFREQ=<val>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<val>: frequency offset compensation value, in ppm. The value ranges from -128 to +127.
<b>Sample</b>	AT+CALFREQ=10
<b>Note</b>	-

## 6.2.7 AT+RCALDATA

<b>Format</b>	AT+RCALDATA
<b>Response</b>	+ <b>RCALDATA</b> : compensation information list of the factory test OK <i>or</i> ERROR



<b>Parameter Description</b>	<p>+RCALDATA:Efuse cali chance(s) left:1 times. #Number of remaining times that the calibration value can be written</p> <p>+RCALDATA:freq_offset 5 #Compensation value of the current frequency offset</p> <p>+RCALDATA:band_pwr_offset_0 0 #Power compensation value of the current bandwidth</p> <p>+RCALDATA:band_pwr_offset_1 -1</p> <p>+RCALDATA:band_pwr_offset_2 0</p> <p>+RCALDATA:rate_pwr_offset_11n 0x0 #Power compensation value of each 802.11n rate. Each byte indicates a rate.</p> <p>+RCALDATA:rate_pwr_offset_11g 0x0</p> <p>+RCALDATA:rate_pwr_offset_11b 0x0</p> <p>+RCALDATA:dbb_scale_0 0x65656565 # DBB scale value after bandwidth power compensation</p> <p>+RCALDATA:dbb_scale_1 0x60606161</p> <p>+RCALDATA:dbb_scale_2 0x494d5959</p> <p>+RCALDATA:dbb_scale_3 0x51595959</p> <p>+RCALDATA:dbb_scale_4 0x49495151</p> <p>+RCALDATA:freq_and_band_pwr_hybrid_offset 0x0500ff00 # Combination value by byte</p>
<b>Sample</b>	<p>AT+RCALDATA</p> <p>+RCALDATA:Efuse cali chance(s) left:1 times.</p> <p>+RCALDATA:freq_offset 5</p> <p>+RCALDATA:band_pwr_offset_0 0</p> <p>+RCALDATA:band_pwr_offset_1 -1</p> <p>+RCALDATA:band_pwr_offset_2 0</p> <p>+RCALDATA:rate_pwr_offset_11n 0x0</p> <p>+RCALDATA:rate_pwr_offset_11g 0x0</p> <p>+RCALDATA:rate_pwr_offset_11b 0x0</p> <p>+RCALDATA:dbb_scale_0 0x65656565</p> <p>+RCALDATA:dbb_scale_1 0x60606161</p> <p>+RCALDATA:dbb_scale_2 0x494d5959</p> <p>+RCALDATA:dbb_scale_3 0x51595959</p> <p>+RCALDATA:dbb_scale_4 0x49495151</p> <p>+RCALDATA:freq_and_band_pwr_hybrid_offset 0x0500ff00</p> <p>OK</p>
<b>Note</b>	-



## 6.2.8 AT+TRC

<b>Format</b>	AT+TRC=<control>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;control&gt;</b> : automatic control of the transmit rate. The default value is <b>1</b> . <b>0</b> : disabled <b>1</b> : enabled
<b>Sample</b>	AT+TRC=0 AT+TRC=1
<b>Note</b>	-

## 6.2.9 AT+SETRATE

<b>Format</b>	AT+SETRATE=<ifname>,<frame_type>,<rate>[,<sgi_control>]
<b>Response</b>	OK <i>or</i> ERROR



<b>Parameter Description</b>	<p><b>&lt;ifname&gt;</b>: name of the network adapter</p> <p><b>&lt;frame_type&gt;</b>: frame type</p> <p><b>0</b>: unicast data frame</p> <p><b>&lt;rate&gt;</b>: transmission rate</p> <p>In 802.11b mode, the value range is 0–3, corresponding to the rates of 1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s, and 11 Mbit/s, respectively.</p> <p>In 802.11g mode, the value range is 0x18–0x1F. The mapping between the parameters and rates is as follows:</p> <p><b>0x1B</b>: 6 Mbit/s</p> <p><b>0x1F</b>: 9 Mbit/s</p> <p><b>0x1A</b>: 12 Mbit/s</p> <p><b>0x1E</b>: 18 Mbit/s</p> <p><b>0x19</b>: 24 Mbit/s</p> <p><b>0x1D</b>: 36 Mbit/s</p> <p><b>0x18</b>: 48 Mbit/s</p> <p><b>0x1C</b>: 54 Mbit/s</p> <p>In 802.11n mode, the value range is 0x20–0x27, corresponding to the rates of MCS0 to MCS7.</p> <p><b>&lt;sgi_control&gt;</b>: short GI enable. After short GI is enabled, data is forcibly sent at the short GI.</p> <p><b>0</b>: disabled</p> <p><b>1</b>: enabled</p>
<b>Sample</b>	<p>AT+SETRATE=wlan0,0,0</p> <p>AT+SETRATE=wlan0,0,0x18</p> <p>AT+SETRATE=ap0,0,0x20</p>
<b>Note</b>	<ul style="list-style-type: none"><li>• <b>&lt;frame_type&gt;</b> supports only unicast data frames.</li><li>• Before running this command, set <b>AT+TRC=0</b>.</li><li>• To set the TX rate of the STA, run the <b>AT+SETRATE</b> command after the STA is connected to the peer AP.</li><li>• The value of <b>&lt;rate&gt;</b> depends on the current protocol type (802.11b, 802.11bg, or 802.11bgn). If they do not match, <b>ERROR</b> is returned.</li><li>• The <b>&lt;sgi_control&gt;</b> parameter takes effect when the protocol type is 802.11gbn. When this parameter is issued in 802.11b or 802.11bg mode, <b>ERROR</b> is returned.</li></ul>

## 6.2.10 AT+ARLOG

<b>Format</b>	AT+ARLOG=<control>
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<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;control&gt;</b> : output of the frame rate log <b>0</b> : disabled <b>1</b> : enabled
<b>Sample</b>	AT+ARLOG=0 AT+ARLOG=1
<b>Note</b>	<ul style="list-style-type: none"><li>After the command is executed successfully, the debugging information about the frame rate is displayed in the HSO log.</li><li>This command is used only when automatic control of the transmit rate is enabled.</li></ul>

## 6.2.11 AT+VAPINFO

<b>Format</b>	AT+VAPINFO=<ifname>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;ifname&gt;</b> : name of the network adapter
<b>Sample</b>	AT+VAPINFO=wlan0 AT+VAPINFO=ap0
<b>Note</b>	After the command is executed successfully, the debugging information about the VAP is displayed in the HSO log.

## 6.2.12 AT+USRINFO

<b>Format</b>	AT+USRINFO=<ifname>,<MAC>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;ifname&gt;</b> : name of the network adapter <b>&lt;MAC&gt;</b> : MAC address of the connected user



<b>Sample</b>	AT+USRINFO=ap0,90:2B:D2:E4:CE:28 AT+USRINFO=wlan0,90:2B:D2:E4:CE:28
<b>Note</b>	<ul style="list-style-type: none"><li>After the command is executed successfully, the debugging information about the user is displayed in the HSO log.</li><li>If <b>&lt;ifname&gt;</b> is set to <b>wlan0</b>, the debugging information about the peer AP is displayed.</li></ul>

## 6.2.13 AT+FTM

<b>Format</b>	AT+FTM=<mode>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;mode&gt;</b> : service mode or factory test mode <b>0</b> : service mode <b>1</b> : factory test mode <b>?</b> : service mode or factory test mode
<b>Sample</b>	AT+FTM
<b>Note</b>	<ul style="list-style-type: none"><li>This command is only used to switch between the factory test mode and the service mode. <b>AT+FTM=1</b> indicates the factory test mode, and <b>AT+FTM=0</b> indicates the service mode. If the binary file for the factory test is invalid, the mode cannot be switched.</li><li><b>AT+FTM=?</b> indicates whether to check the factory test mode or service mode.</li></ul>

## 6.2.14 AT+FTMERASE

<b>Format</b>	AT+FTMERASE
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	None
<b>Sample</b>	AT+FTMERASE
<b>Note</b>	<b>AT+FTMERASE</b> : erases the factory test mode.



# 7 AT Commands Related to I/O

## [7.1 Overview](#)

## [7.2 Description](#)

### 7.1 Overview

Command	Description
AT+SETIOMODE	Sets the I/O working mode.
AT+GETIOMODE	Queries the I/O working mode.
AT+GPIODIR	Sets the GPIO to input or output mode.
AT+WTGPIO	Sets the GPIO output level.
AT+RDGPIO	Reads the GPIO level status.

### 7.2 Description

#### 7.2.1 AT+SETIOMODE

Format	AT +SETIOMODE=<pin>,<work_mode>,<pull_up>[,<power_capability>]
Response	OK <i>or</i> ERROR



<b>Parameter Description</b>	<p><b>&lt;pin&gt;</b>: I/O number. Value range: 0–14</p> <p><b>&lt;work_mode&gt;</b>: I/O multiplexing. Value range: 0–7. For details, see <a href="#">A Table for Querying I/O Working Modes</a>.</p> <p><b>&lt;pull_up&gt;</b>: pull-up/pull-down</p> <p>0: floating</p> <p>1: pull-up</p> <p>2: pull-down</p> <p><b>&lt;power_capability&gt;</b>: I/O drive capability level. I/O12 supports the drive capability levels of 0–7, and the default value is <b>7</b>. Other I/Os support the drive capability levels of 0–3, and the default value is <b>3</b>. A smaller value indicates a higher drive capability.</p>
<b>Sample</b>	AT+SETIOMODE=0,0,0,3
<b>Note</b>	<ul style="list-style-type: none"><li>For the Hi3861/Hi3861L demo board and module board, I/O3 and I/O4 are the debugging serial ports (UART0) and I/O5 and I/O6 are the AT command communication serial ports (UART1) by default. You can also multiplex other I/O pins that support the UART function as UART0 and UART1 on condition that the hardware of these I/O pins is connected.</li><li>If the I/O is already multiplexed as UART0 or UART1, you are not advised to run this command to change the working mode. Otherwise, the UART function and AT commands will become invalid. In this case, you can reset the hardware to restore them.</li></ul>

## 7.2.2 AT+GETIOMODE

<b>Format</b>	AT+GETIOMODE=<pin>
<b>Response</b>	+GETIOMODE: <pin>,<work_mode>,<pull_up>,<power_capability> OK <i>or</i> ERROR



<b>Parameter Description</b>	<p><b>&lt;pin&gt;</b>: I/O number. Value range: 0–14</p> <p><b>&lt;work_mode&gt;</b>: I/O multiplexing. Value range: 0–7. For details, see <a href="#">A Table for Querying I/O Working Modes</a>.</p> <p><b>&lt;pull_up&gt;</b>: pull-up/pull-down</p> <p>0: floating</p> <p>1: pull-up</p> <p>2: pull-down</p> <p><b>&lt;power_capability&gt;</b>: I/O drive capability level. IO12 supports the drive capability levels of 0–7. Other I/Os support the drive capability levels of 0–3. A smaller value indicates a higher drive capability.</p>
<b>Sample</b>	AT+GETIOMODE=0
<b>Note</b>	-

### 7.2.3 AT+GPIODIR

<b>Format</b>	AT+GPIODIR=<pin>,<mode>
<b>Response</b>	OK <i>or</i> ERROR
<b>Parameter Description</b>	<p><b>&lt;pin&gt;</b>: GPIO number. Value range: 0–14</p> <p><b>&lt;mode&gt;</b>: working mode</p> <p>0: input</p> <p>1: output</p>
<b>Sample</b>	AT+GPIODIR=0,1
<b>Note</b>	If the I/O pin does not work in GPIO mode, <b>ERROR</b> is returned.

### 7.2.4 AT+WTGPIO

<b>Format</b>	AT+WTGPIO=<pin>,<level>
<b>Response</b>	OK <i>or</i> ERROR



<b>Parameter Description</b>	<b>&lt;pin&gt;</b> : GPIO number. Value range: 0–14 <b>&lt;level&gt;</b> : output level 0: low level 1: high level
<b>Sample</b>	AT+WTGPIO=0,1
<b>Note</b>	<ul style="list-style-type: none"><li>• If the I/O pin does not work in GPIO mode, <b>ERROR</b> is returned.</li><li>• This command is valid only when the GPIO is set to output mode. If the GPIO is set to input mode, <b>ERROR</b> is returned.</li></ul>

## 7.2.5 AT+RDGPIO

<b>Format</b>	AT+RDGPIO=<pin>
<b>Response</b>	+RDGPIO: <pin>,<mode>,<level> OK <i>or</i> ERROR
<b>Parameter Description</b>	<b>&lt;pin&gt;</b> : GPIO number. Value range: 0–14 <b>&lt;mode&gt;</b> : working mode 0: input 1: output <b>&lt;level&gt;</b> : level 0: low level 1: high level
<b>Sample</b>	AT+RDGPIO=0
<b>Note</b>	If the I/O pin does not work in GPIO mode, <b>ERROR</b> is returned.



# 8 Application Scenario Samples

[8.1 Starting and Stopping the SoftAP](#)

[8.2 Starting and Stopping the STA](#)

[8.3 Testing the Throughput](#)

[8.4 TCP/IP-based Data TX and RX](#)

[8.5 Testing the RF](#)

[8.6 Low Power Test](#)

## 8.1 Starting and Stopping the SoftAP

### Sample for starting the SoftAP

```
AT+MAC=90:2B:D2:E4:CE:28
AT+STARTAP="hisilicon",0,6,2,"123456789"
AT+IFCFG=ap0,192.168.3.1,netmask,255.255.255.0,gateway,192.168.3.2
AT+DHCPS=ap0,1
```

Note: The command for setting the MAC address is optional. If the MAC address is not set, a random MAC address is used. The configured MAC address is the address of the STA, and the address of the SoftAP is the address of the STA plus 1.

### Sample for stopping the SoftAP

```
AT+DHCPS=ap0,0
AT+STOPAP
```

Note: -



## 8.2 Starting and Stopping the STA

### Sample for starting the STA

```
AT+MAC=90:2B:D2:E4:CE:28
AT+STARTSTA
AT+SCAN
AT+SCANRESULT
AT+CONN="hisilicon",1a:01:f1:c9:7c:92,3,"123456789"
AT+STASTAT
AT+DHCP=wlan0,1
```

Note: The command for setting the MAC address is optional. If the MAC address is not set, a random MAC address is used. The configured MAC address is the address of the STA, and the address of the SoftAP is the address of the STA plus 1.

### Sample for stopping the STA

```
AT+DHCP=wlan0,0
AT+STOPSTA
```

Note: -

## 8.3 Testing the Throughput

### Sample

```
AT+IPERF=-s,-i,1 /* Start iPerf in server mode, use the TCP by default, and
display the report at an interval of 1s.
AT+IPERF=-s,-u,-i,1 /* Start iPerf in server mode, use the UDP, and display the
report at an interval of 1s.
AT+IPERF=-c,192.168.3.1,-t,5,-i,1 /* Start iPerf in client mode, use the TCP by
default, perform the test for 5s, and display the report at an interval of 1s.
AT+IPERF=-c,192.168.3.1,-u,-b,10M,-t,5,-i,1 /* Start iPerf in client mode, use the
UDP, set the transmit bandwidth to 10 Mbit/s, perform the test for 5s, and
display the report at an interval of 1s.
```

Note: Before starting the **AT+IPERF** test, ensure that the local device has obtained the IP address and the peer IP address can be pinged.





## 8.4 TCP/IP-based Data TX and RX

### 8.4.1 TCP Server

**The test machine functions as the TCP server to receive data.**

Prerequisites:

- The test machine has started the STA and has been associated with a commercial router.
- A PC has been connected to a commercial router in wired or wireless mode.
- The network connection between the tester and the PC is normal.



**The test machine functions as the TCP server to receive data.**

1. The test machine starts the STA and associates with a commercial router.  
AT+STARTSTA  
AT+SCAN  
AT+SCANRESULT  
AT+CONN="hisilicon",,2,"123456789"  
AT+DHCP=wlan0,1  
AT+IFCFG /\* Query the IP address of the local host. For example, the IP address of the local host is 192.168.1.102.\*/  
*+IFCFG:wlan0,ip=192.168.1.102,netmask=255.255.255.0,gateway=192.168.1.1,ip6=FE80  
::922B:D2FF:FEE4:CE28,HWaddr=90:2b:d2:e4:ce:  
28,MTU=1500,LinkStatus=1,RunStatus=1  
+IFCFG:lo,ip=127.0.0.1,netmask=255.0.0.0,gateway=127.0.0.1,ip6==:  
1,HWaddr=00,MTU  
=16436,LinkStatus=1,RunStatus=1  
OK*
2. The PC connects to the commercial router in wired or wireless mode and the TCP test software is started. In this example, the PC is connected to the commercial router in wired mode and the IP address is **192.168.1.110**.
3. The test machine enables TCP server listening.  
AT+IPLISTEN=1,5001 /\* Enable TCP listening. The listening port number is 5001. \*/
4. The TCP test software on the PC is used as the TCP client to connect to the test machine. The IP address of the test machine is **192.168.1.102** and the port number is **5001**.
5. After the preceding operation, the test machine reports **0,CONNECT**, where **0** is the randomly allocated link ID. The link ID ranges from 0 to 7.
6. The test machine sends TCP data.  
AT+IPSEND=0,5  
>SEND 5 bytes  
OK  
/\* Send TCP data. The parameters are described as follows:  
**0**: link ID allocated in the previous step  
**5**: length of the data to be sent  
After the command is executed, the system returns > to wait for the user to input the data to be sent. After the user inputs five pieces of data, the system automatically triggers data sending. After the data is sent, the return is:  
SEND 5 bytes  
OK  
\*/
7. The test machine receives TCP data.  
The TCP test software on the PC is used to send TCP data. The test machine reports the following information:



**The test machine functions as the TCP server to receive data.**

+IPD,0,5,192.168.1.110,53251:12345

Parameter description:

**0:** link ID

**5:** length of the received data

**192.168.1.110:** remote IP address

**53251:** remote port number

**12345:** received remote data

8. Close the connection.

AT+IPCLOSE=0 /\* 0: link ID \*/

link 0 CLOSED

OK

9. Disable TCP server listening.

AT+IPLISTEN=0

OK

Note: -

## 8.4.2 TCP Client

**The test machine functions as the TCP client to transmit data.**

Prerequisites:

- The test machine has started the STA and has been associated with a commercial router.
- A PC has been connected to a commercial router in wired or wireless mode.
- The network connection between the tester and the PC is normal.



**The test machine functions as the TCP client to transmit data.**

1. The test machine starts the STA and associates with a commercial router.  
AT+STARTSTA  
AT+SCAN  
AT+SCANRESULT  
AT+CONN="hisilicon",,2,"123456789"  
AT+DHCP=wlan0,1  
AT+IFCFG /\* Query the IP address of the local host. For example, the IP address of the local host is 192.168.1.102.\*/  
*+IFCFG:wlan0,ip=192.168.1.102,netmask=255.255.255.0,gateway=192.168.1.1,ip6=FE80  
::922B:D2FF:FEE4:CE28,HWaddr=90:2b:d2:e4:ce:  
28,MTU=1500,LinkStatus=1,RunStatus=1  
+IFCFG:lo,ip=127.0.0.1,netmask=255.0.0.0,gateway=127.0.0.1,ip6==:  
1,HWaddr=00,MTU  
=16436,LinkStatus=1,RunStatus=1  
OK*
2. The PC connects to the commercial router in wired or wireless mode. Start the TCP test software and enable TCP server listening. The IP address of the PC is **192.168.1.110**, and the listening port number is **5001**.
3. The test machine starts TCP client connection.  
AT+IPSTART=0,tcp,192.168.1.110,5001  
OK  
/\* Parameter description:  
**0**: link ID  
**tcp**: TCP connection  
**192.168.1.110**: remote IP address  
**5001**: remote port number  
\*/
4. The test machine sends TCP data.  
AT+IPSEND=0,5  
>SEND 5 bytes  
OK  
/\* Send TCP data. The parameters are described as follows:  
**0**: link ID used for the connection established in the previous step  
**5**: length of the data to be sent  
After the command is executed, the system returns > to wait for the user to input the data to be sent. After the user inputs five pieces of data, the system automatically triggers data sending. After the data is sent, the return is:  
SEND 5 bytes  
OK  
\*/



**The test machine functions as the TCP client to transmit data.**

5. The test machine receives TCP data.  
The TCP test software on the PC is used to send TCP data. The test machine reports the following information:  
**+IPD,0,5,192.168.1.110,53251:12345**  
Parameter description:  
**0:** link ID  
**5:** length of the received data  
**192.168.1.110:** remote IP address  
**53251:** remote port number  
**12345:** received remote data
6. Close the connection.  
**AT+IPCLOSE=0 /\* 0: link ID \*/**  
**link 0 CLOSED**  
**OK**

Note: -

### 8.4.3 UDP

**The test machine starts UDP listening to transmit and receive data.**

Prerequisites:

- The test machine has started the STA and has been associated with a commercial router.
- A PC has been connected to a commercial router in wired or wireless mode.
- The network connection between the tester and the PC is normal.



**The test machine starts UDP listening to transmit and receive data.**

1. The test machine starts the STA and associates with a commercial router.  
AT+STARTSTA  
AT+SCAN  
AT+SCANRESULT  
AT+CONN="hisilicon",,2,"123456789"  
AT+DHCP=wlan0,1  
AT+IFCFG /\* Query the IP address of the local host. For example, the IP address of the local host is 192.168.1.102.\*/  
*+IFCFG:wlan0,ip=192.168.1.102,netmask=255.255.255.0,gateway=192.168.1.1,ip6=FE80  
::922B:D2FF:FEE4:CE28,HWaddr=90:2b:d2:e4:ce:  
28,MTU=1500,LinkStatus=1,RunStatus=1  
+IFCFG:lo,ip=127.0.0.1,netmask=255.0.0.0,gateway=127.0.0.1,ip6==:  
1,HWaddr=00,MTU  
=16436,LinkStatus=1,RunStatus=1  
OK*
2. The test machine enables UDP listening.  
AT+IPSTART=0,udp,5001  
OK  
/\* Parameter description:  
**0**: link ID  
**udp**: UDP listening  
**5001**: listening port number of the test machine  
\*/
3. The PC starts UDP listening. Specifically, the UDP test software on the PC is used to start UDP listening. The IP address of the PC is **192.168.1.110**, and the UDP listening port number is **5002**.
4. The test machine sends UDP data.  
AT+IPSEND=0,5,192.168.1.110,5002  
>SEND 5 bytes  
OK  
/\* Sends UDP data.  
Parameter description:  
**0**: link ID used for listening in the previous step  
**5**: length of the data to be sent  
**192.168.1.110**: remote IP address  
**5002**: remote port number  
After the command is executed, the system returns > to wait for the user to input the data to be sent. After the user inputs five pieces of data, the system automatically triggers data sending. After the data is sent, the return is:  
SEND 5 bytes



**The test machine starts UDP listening to transmit and receive data.**

OK

\*/

5. The test machine receives UDP data.

The UDP test software on the PC is used to send UDP data. The test machine reports the following information:

+IPD,0,5,192.168.1.110,53251:12345

Parameter description:

**0:** link ID

**5:** length of the received data

**192.168.1.110:** remote IP address

**53251:** remote port number

**12345:** received remote data

6. Close the connection.

AT+IPCLOSE=0 /\* 0 is the link ID.\*/

link 0 CLOSED

OK

Note: -

## 8.5 Testing the RF

### 8.5.1 Testing the RF TX

**Sample**

AT+RST

AT+STARTSTA

AT+IFCFG=wlan0,down

AT+ALTX=1,0,5,1,7

AT+IFCFG=wlan0,up

Note: -



## 8.5.2 Testing the RF RX

Sample
AT+RST AT+MAC=90:2B:D2:E4:CE:28 AT+STARTSTA AT+IFCFG=wlan0,down AT+ALRX=1,0,20,1,1 AT+IFCFG=wlan0,up ... AT+RXINFO
Note: The <b>AT+RXINFO</b> command is used to view the RX result.

## 8.6 Low Power Test

Sample for an associated STA
AT+RST AT+MAC=90:2B:D2:E4:CE:28 AT+STARTSTA AT+CONN="hisilicon",,0 AT+DHCP=wlan0,1 AT+IFCFG AT+SLP=2 AT+ARP=1,192.168.3.1 AT+PS=1,1000
Note: <b>192.168.3.1</b> is the IP address obtained after the STA is associated.





# A Table for Querying I/O Working Modes

IO Number/ Working Mode	0	1	2	3	4	5	6	7
0 <sup>[1]</sup>	GPI O0	Reserved	UART1_TXD	SPI1_CK	JTAG_TDO	PWM3_OUT	I2C1_SDA	Reserved
1 <sup>[1]</sup>	GPI O1	Reserved	UART1_RXD	SPI1_RXD	JTAG_TCK	PWM4_OUT	I2C1_SCL	BT_FREQ
2	GPI O2	Reserved	UART1_RTS_N	SPI1_TXD	JTAG_TRST_N	PWM2_OUT	Reserved	SSI_CLK
3	GPI O3	UART0_TXD	UART1_CTS_N	SPI1_CSN	JTAG_TDI	PWM5_OUT	I2C1_SDA	SSI_DATA
4	GPI O4	Reserved	UART0_RXD	Reserved	JTAG_TMS	PWM1_OUT	I2C1_SCL	Reserved
5	GPI O5	Reserved	UART1_RXD	SPI0_CSN	Reserved	PWM2_OUT	I2S0_MCLK	BT_STATUS
6	GPI O6	Reserved	UART1_TXD	SPI0_CK	Reserved	PWM3_OUT	I2S0_TX	COEX_SWITCH
7	GPI O7	Reserved	UART1_CTS_N	SPI0_RXD	Reserved	PWM0_OUT	I2S0_BCLK	BT_ACTIVE



IO Number/ Working Mode	0	1	2	3	4	5	6	7
8	GPI O8	Reserved	UART1_RTS_N	SPI0_TXD	Reserved	PWM1_OUT	I2S0_WS	WLAN_ACTIVE
9	GPI O9	I2C0_SCL	UART2_RTS_N	SDIO_D2	SPI0_TXD	PWM0_OUT	Reserved	I2S0_MCLK
10	GPI O10	I2C0_SDA	UART2_CTS_N	SDIO_D3	SPI0_CLK	PWM1_OUT	Reserved	I2S0_TX
11	GPI O11	Reserved	UART2_TXD	SDIO_CMD	SPI0_RXD	PWM2_OUT	RF_TX_EN_EXT	I2S0_RX
12	GPI O12	Reserved	UART2_RXD	SDIO_CLK	SPI0_CSN	PWM3_OUT	RF_RX_EN_EXT	I2S0_BCLK
13	SSI_DATA	UART0_TXD	UART2_RTS_N	SDIO_D0	GPIO13	PWM4_OUT	I2C0_SDA	I2S0_WS
14	SSI_CLK	UART0_RXD	UART2_CTS_N	SDIO_D1	GPIO14	PWM5_OUT	I2C0_SCL	Reserved

[1]: The Hi3861L V100 module board uses IO0 and IO1 to connect to the clock signal of the external crystal oscillator. If IO0 and IO1 are set, the external clock signal is abnormal.