RAK413 UART-WIFI Module

Programming Manual V2.0

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Content

1 Overview

1.1 Module Overview

RAK413 module is a Wi-Fi module that fully compliant with IEEE 802.11b/g/n wireless standards, with internally integrated TCP / IP protocol stack, supporting numerous protocols such as ARP, IP, ICMP, TCP, UDP, DHCP CLIENT, DHCP SERVER, DNS and other etc. It supports AP mode, Station mode and Ad-hoc and mode. Users can easily and quickly use it to networking and data transmission. The baud rate of module serial port is up to 921600bps, which can fully meet the low-rate applications.

RAK413 supports storing parameters, and by the customer commands it determines whether to enable automatic networking to realize easy networking and reduce time for system to networking. The module has built-in WEB server, supporting wireless network parameters configuration, supporting wireless firmware upgrade. It also supports WPS and EasyConfig one-key networking, significantly reducing software development effort.

RAK413 has four power management modes, among which the minimum standby power consumption is 2uA, fully meet customer’ s requirement for low power design.

1.2 Device Features

- Support IEEE 802.11b/g/n wireless standards
- Support UART communication with data flow control, with the maximum baud rate of 921600bps
- Minimalist hardware peripheral circuit design
- Support Station, Ad-hoc and AP modes
- Support DHCP SERVER / DHCPCLIENT
- Support OPEN, WEP, WPA-PSK, WPA2-PSK and WPS encryption
- Support TCP, UDP protocols, with maximum 8 UDP/TCP connections
- Support webpage-based parameter configuration
- Support WPS and EasyConfigone-key to network connection
- Support parameter storage, customer orders loading after boot
- Support parameters store in Deep Sleep State, with connection time as fastest as 300ms
- Support wireless upgrade firmware
- On-board ceramic antenna or U.FL antenna connector
- Operating voltage: 3.3V
- 4 kinds power working modes, with minimum power consumption as 1-2uA
- Small package size: 28.75mmX23.14mmX3.40mm
- FCC, RoHS and CE compliant

1.3 Key Application

- Portable products
- Home appliances and electrical appliances
- Industrial sensors
- Sales terminals
- Buildings automation
- Logistics and freight management
- Home security and automation
- Medical applications, such as patient monitoring, medical diagnostics
- Metering (stop timing, measuring instruments, meters, etc.)

2 Functional Description

2.1 HW Interface

- Baud rate: 9600~921600bps
- Interface actual throughput up to 600kbps
- support hardware flow control, ensuring reliability of data transmission

2.2 Wireless Driver

- Compliant with IEEE 802.11b/g/n standards
- Support AP, STA Mode and ADHOC Mode
- Support WEP, WPA/WPA2-PSK encryption
- Fast networking, allowing module to be added to network within 1 sec after power up
- Support WPS and EasyConfigone-key to network connection
- Support wireless configuration and firmware upgrade

2.3 TCP/IP

- DHCP Client and Server features
- DNS Client and Server functions
- TCP Client, TCP Server, UDP Client, UDP Server and Multicast functions
- 8-way socket applications

2.4 Power Consumption

The module supports four power consumption modes:

- Full speed working mode, with approx 80mA average power consumption, peak current less than 310mA
- Power-saving mode, with approx 10mA average power consumption, peak current <310mA, DTIM = 100ms
- Deep sleep mode, with approx 5mA average power consumption, peak current <310mA, DTIM = 100ms(maximum support to 115200bps)
- Standby mode, with power consumption<2uA

3 UART Operation

3.1 UART Parameter

The module starts with default UART parameters, then user host needs to configure the same parameters to communicate properly. Automatic baud rate is not supported at present. The UART default parameters are as follows:

Baud rate ----- 115200

Data bit ----- 8

Stop bit ----- 1

Parity ----- N/A

Flow control -----N/A

RAK413 supports the following baud rates:

9600 bps

19200 bps

38400 bps

57600 bps

115200 bps

230400 bps

460800 bps

921600 bps

Note: Modifying the UART configuration parameters is currently effective,After modulereset, it is back to 115200 as default, user needs to reset the parameters as needed.

3.2 Boot

RAK413 start time is about 210ms, after a normal start, the module automatically prints boot information:

ASCII------- Welcome to RAK413\r\n

HEX-------- 57 65 6C 63 6F 6D 65 20 74 6F 20 52 41 4B 34 31 33 0D 0A

3.3 Power Mode

RAK413 supports four power modes, shown as the following table:

Mode	Control Part	Wireless Part	Wake-up Type	Average Power Consumption (AP)
0	Normal	Normal	No need	80mA
1	Sleep_Mode	Power_Save	No need	10mA
2	Deep_Sleep	Power_Save	UART wake up	5mA
3	Deep_Sleep	Shut_down	UART wake up, Reset	2uA

pwrmode=0------------Mode 0

Module works under the maximum performance, control part and wireless part are fully opened.

pwrmode=1----------Mode 1

The control part enters into shallow sleep, the wireless part maintains the current connection status, and enters a low-power mode. The communication is normal, but this will reduce performance of module, the speed of sending and receiving is reduced.

pwrmode=2----------Mode 2

The control part enters into a deep sleep, the wireless part maintains the current wireless connection status, and enters a low-power mode.The remote data or host initiates communications to wake up control part, then enters into mode 1. If no sending and receiving data, it automatically enters into Mode 2.

pwrmode=3----------Mode 3

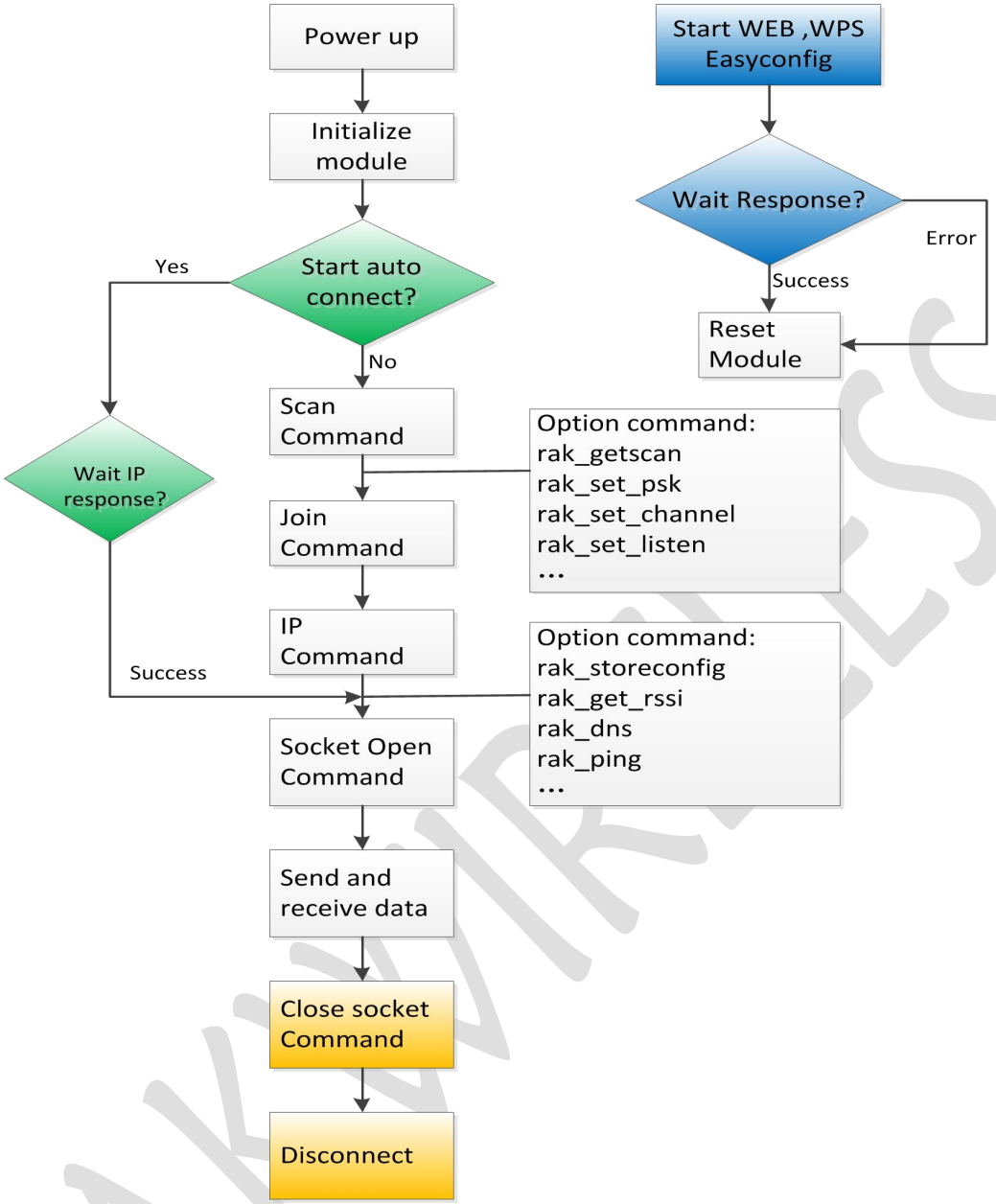
When enters into this mode, module firstly saves current connective status to RAM, and shuts down the power of wireless part, then control part enters into deep state. In this state, module cannot respond to any command or wireless data, lowering consumption to minimum.User can initiate communication or reset module. It enters into mode 0 by default after start.

3.4 Operational Process

RAK413 SPI command operation feature completes a few basic steps of WIFI communication, including network scanning, joining network and obtaining an IP address, and eventually establishing Socket communication. RAK413 provides a variety of convenient operation to implement networking, so that customers can easily complete the network configuration, and concentrate on the management of socket and their own data protocols.

To realize automatic networking management, customers can take advantage of WEB, WPS and EasyConfig configuration features. The module will automatically store paramenters after a successful configuration, and these automatic networking commands can be used any time, letting the module automatically complete networking operation, and returning the results.

The basic operation of the process is as follows:



4 Command Encyclopedia

4.1 Syntax

Host to module:

at+<command>=<para 1>,<para 2>,.....<para n>\r\n

All at commands, including parameters, are ASICII code, such as:

at+psk=lthonway\r\n

at+connect=LTHonway\r\n

1. After each command is executed, the module will send a return value, as the following format
2. If the command is successful, the return value

   OK\r\n or OK<para 1><para 2>.....<para n>\r\n

   Note: In addition to OK, the other parameters are in hexadecimal, for example,

   OK\r\n HEX=4F 4B 0D 0A----------n/a

   OK@\r\n HEX=4F 4B 64 0D 0A----------parameter =0x64
3. If the command fails, the return value

   ERROR<code>

   Note:

   ERROR is the ASCII code,<code>is hexadecimal, for example,

   ERROR ?\r\n HEX=45 52 52 4F 52 FE 0D 0A----------<code>=oxFE

AT command syntax description

AT command begins with "at +" (all lowercase) and end with "\ r \ n", the maximum command length is 80 bytes, all other commands beginning with any other format are wrong.

Note:

The AT command syntax above does not apply to receiving and sending data commands at + recv_data and at + send_data, for detailed instructions, please refer to at + recv_data, at + send_data

Error Code:

Code	Description
-1	Parameter input error (parameter is not recognized / missing parameter / command too long / other illegal parameter)
-10	Module is busy (wait until module processing is completed)
-11	System error (restart module)
-12	Fatal Error (contact factory)
other	See specific command

AT commands are grouped into four parts: module management commands, network operation commands, socket operation command sand save parameter commands, the following table is the command Encyclopedia:

AT Command	Description
Module Management Commands	
at+ascii=<mode>\r\n	Open ASCII display
at+mac\r\n	Check module MAC address
at+version\r\n	Check software version
at+pwrmode=<mode>\r\n	Set module power mode
at+wake_up\r\n	Wake the power module 2 and 3 mode
at+set_hostname=<name>\r\n	Set module’s host name
at+get_hostname\r\n	Acquire module’s host name
at+reset\r\n	Reset module
Network Operation Commands	
at+scan=<channel>,<ssid>\r\n	Scan wireless networks
at+get_scan=<scan_num>\r\n	Reads a specified number of scan results
at+psk=<passphrase>\r\n	Set network password
at+channel=< channel >\r\n	Set network channel
at+ap=<ssid>\r\n	Create a name for AP network
at+adhoc=<ssid>\r\n	Create a name for ADHOC network
at+connect=<ssid>\r\n	Connecting specified network
at+ipstatic=<ip>,<mask>,<gateway>,<dnsserver1 >,<dns server2>\r\n	Configure Static IP Address
at+ipdhcp=<mode>\r\n	IP DHCP or opening DHCPSever in AP mode
at+easy_config\r\n	Connecting network by Easyconfig

at+wps\r\n	Connecting Network by WPS
at+con_status\r\n	Get network connection status
at+ipconfig\r\n	Query module IP information
at+rssi\r\n	Get network signal strength of module
at+dns=< domain > \r\n	DNS
at+ping=<host>, <count>, <size>\r\n	Ping hosts in the network
at+apconfig=<hidden>,<contry code>\r\n	AP Network Advanced Settings
at+listen=<listen interval>\r\n	Setting Network Listening Intervals
at+disc\r\n	Disconnect the current wireless network
at+set_filter=<mode>,<mac>,<index>\r\n	The source MAC address filtering options
at+promisc=<mode>\r\n \r\n	Caught scanning
Socket Operation Commands	
at+ltcp=<local_port>\r\n	Establish TCP Server
at+tcp=<dest_ip>,<dest_port>,<module_port>\r\n	Establish TCP Client
at+ludp=<local port>\r\n	Establish UDP Server
at+udp=<dest_ip>,<dest_port>,<local_port>\r\n	Establish UDP Client
at+multicast=<dest_ip>,<dest_port>,<local_port>\r\n	Create UDP multicast communication
at+cls=< flag>\r\n	Close an opened socket handle
at+send_data=<flag>,<dest_port>,<dest_ip>,<data_length> ,<data_stream>\r\n	Send data via an opened socket handle
at+recv_data=<flag><dest_port><dest_ip><data_length><data_stream>\r\n at+recv_data=<socket_status><flag><dest_port><dest_ip>\r\n	Receiving data Receiving network, socket connection information
at+http_get=<ip/domain>:<port>/<url>\r\n	HTTP GET command
at+http_post=<ip/domain>:<port>/<url>,<data>\r\n	HTTP POST command
Save parameters commands	
at+storeconfig\r\n	Storing Network Configuration Parameters (with parameter)
at+get_storeconfig\r\n	Getting Saved Network Parameters
at+web_config=web_param\r\n	Modifying Web Configuration

at+get_webconfig\r\n	Getting Web-saved Parameters
at+uartconfig=<baud rate>,<data bits>,<stop bits>,<parity>,<flow ctrol>\r\n	Configuring UART Parameters
at+auto_connect\r\n	Starting WEB Configuration
at+start_web\r\n	Starting Automatic Connection

4.2 Module Management Commands

4.2.1 HEX to ASCII Display

Command

at+ascii=<mode>\r\n

Description

This command converts all return value into ASCII display, facilitating debug, getting familiar with AT commands. When programming, user doesn’ t need to open this display.

Parameter

Parameter	Value	Description
<mode>	0	Disable conversion
	1	Enable conversion

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Open successfully
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator

4.2.2 Checking Module MAC Address

Command

at+mac\r\n

Description

It is used to check module MAC address.

Parameter

Null

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	OK
MAC	HEX	6	
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	ERROR
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.2.3 Checking Software Version

Command

at+version\r\n

Description

It is used to check module’ s version, including versions of host and WLAN.

For example: 1.0.1-2.1.27

Parameter instructions

Null

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	OK
	STRING		String
Command failed			
ERROR	ASCII	5	ERROR
<CODE>	HEX	1	See ERROR list

\r\n	ASCII	2	Terminator
Note			

4.2.4 Setting Power Mode

Command

at+pwrmode=<mode>\r\n

Description

It is used to set module power mode.

Parameter instructions

Parameter	Value	Description
< mode>	0	Set power mode 0
	1	Set power mode 1
	2	Set power mode 2
	3	Set power mode 3

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Configuration is successful
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.2.5 Wake

Command

at+wake_up\r\n

Description

Power 2, 3 mode to wake up the module, the module returns OK, wake up to indicate normal power mode.

Parameter

NULL

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	wake successfully
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.2.6 Reset

Command

at+reset \r\n

Description

Internal reset module drives, but does not change the status of the hardware interface module.

Note that the baud rate, after executing this command will not be restored to the status of a hardware reset (default 11520).

Parameter

Null

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Reset successfully
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator

Note	

4.2.7 Set module’s host name

Command

at+set_hostname=<name>\r\n

Description

Host name setting module, the module is set to return OK indicates success.

Parameter

Parameter	Value	Description
<name>	Host name	The maximum length is 32 Bytes

e.g.:

at+set_hostname=RAK413\r\n----------The host name is set to RAK413

Return value

Parameter	Format	Length(byte)	Description
Command successful			
OK	ASCII	2	Setting Success
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.2.8 Acquisition module host name

Command

at+get_hostname\r\n

Description

Get the hostname of module, the module returns OK indicates success.

Parameter

NULL

e.g.:

at+get_hostname\r\n----------Get the hostname

Return value

Parameter	Format	Length(byte)	Description
Command successful			
OK	ASCII	2	Get Success
<name>	HEX	32	Host name
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.3 Network Operation Commands

4.3.1 Scanning wireless networks

Command

at+scan=<channel>,<ssid>\r\n

Description

It is used to scan wireless networks via this command and get wireless access information, including encrypted information, channel, signal strength, BSSID and so on. If users does not specify the SSID then this command can be ignored. Run 'connect' command, the module automatically identifies it.

Parameter

Scan command includes two parameters, <channel>is specified channel, in the range of 1-13, if set to 0, then scan all channels, <ssid>is the specified SSID, and this parameter is optional.

Note:

If a channel is specified, the scanning time can be reduced!

Parameter	Value	Description
<channel>	1-13	Scanning specified channel(s)(1-13), scan all channels if value is 0

<ssid>	Network Name	Specified SSID(optional)

e.g.:

at+scan=0 \r\n----------scan all channels

at+scan=0,LTHonway\r\n----------among all channels, scan the network named "LTHonway"

at+scan=8,LTHonway\r\n----------in channel 8, scan the network named "LTHonway"

at+scan=6 \r\n----------in channel 6, scan all SSID

Return value

If the command is successful, then OK is returned as well as the number of wireless network scanned (maximum 16), if user needs to use the network information, call the command at + get_scan to get it.

Note:

When at + ascii = 1, the module will return all the information! Just for the purpose of facilitating debug.

Parameter	Format	Length (byte)	Description	
Command successful				
OK	ASCII	2	Get scanned network	
<SCAN NUM>	HEX	1	Number of scanned network	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE=-2	1. Available SSID not found 2. Specified SSID not found
\r\n	ASCII	2	Terminator	
Note				

4.3.2 Getting Scanned Information

Command

at+get_scan=<scan_num>\r\n

Description

It is used to get the scanned network information. It must be called after commandat+scan.

Note:

If the wireless network information is not needed, this command can be omitted!

All the scanning information has been read, if it is read again, the module will return error -2, then it needs to call at + scan command to rescan!

This command is invalid under at + ascii = 1 mode!

Parameter

<scan_num> gets the number of network information. If scan_num is greater than the actual number of scanned network information, then returns the actual number.

Parameter	Value	Description
<scan_num>	> 0	Get the number of scanned network information

e.g.:

at+get_scan=10\r\n----------get 10 wireless networks

Return value

Parameter	Format	Length (byte)	Description							
Command successful										
OK	ASCII	2	Get correct information							
<SSID>	HEX	33	SSID							
<BSSID>	HEX	6	BSSID							
<CHANNEL>	HEX	1	Channel							
<RSSI>	HEX	1	Channel intensity (negative value)							
<Security Mode>	HEX	1	Encryption methods							
			bit7	b6	b5	b4	b3	b2	b1	b0
			WPA2	WPA	WEP	802.1X	PSK	WEP	TKIP	CCMP
\r\n	ASCII	2	Terminator							
Command failed										
ERROR	ASCII	5	Error							
<CODE>	HEX	1	0XFE=-2	All scanned information has been read						
\r\n	ASCII	2	Terminator							

Note	<Security Mode>, encryption is valid when bit=1, encryption is invalid when bit=0, If several bit value is 1, then it is applying hybrid Encryption method

4.3.3 Setting Password

Command

at+psk=<passphrase>\r\n

Description

If the module is working in station mode, this command is used to enter the network password, RAK413 supports encryption methods including WEP, WPA-PSK, WPA2-PSK and WPA-PSK + WPA2-PSK, among which WPA2-PSK and WPA2-PSK support TKIP, CCMP and TKIP + CCMP encryption algorithm.

In the WEP encryption, passwords must be 5 or 13-byte ASCII characters or 10 or 26-byte hexadecimal characters (0-9, a-f). In the WPA/WPA2 encryption method RAK413 supports byte length of 8-63 ASCII characters or 64 bytes of hexadecimal characters (0-9, a-f).

If the module is operating in AP or Ad-hoc mode, this command is used to set network password.

In AP mode, network encryption methods is by default WAP2-PSK-CCMP, and does not support other encryption methods, the password must be 8-63 bytes of ASCII characters or 64 bytes of hexadecimal characters (0 - 9, a-f).

In Ad-hoc mode, network encryption method is by default WEP, and does not support other encryption methods.The password must be 5 or 13-byte ASCII characters or 10 or 26-byte hexadecimal characters (0-9, a-f).

Note:

1. If network to be connected is OPEN, this command can be omitted !
2. RAK413 does not support password character containing a comma (,).

Parameter

Parameter	Value	Description
<passphrase>	password	Enter or set a password

e.g.:

at+psk=lthonway\r\n----------8-byte character password, in WPA2 or WPA mode

at+psk=2a334e5d12\r\n------10-byte hexadecimal password, in WEP mode

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Set successfully
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.3.4 Setting Channel

Command

at+channel=< channel >\r\n

Description

It is used to set network channels in ad-hoc and AP mode. This parameter must be called before the establishment of a network.

Parameter

Parameter	Value	Description
<channel>	0-13	Set channel

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	OK
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	ERROR
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.3.5 Creating AP Network

Command

at+ap=<ssid>\r\n

Description

Via this command user can create a wireless access point (AP), to which other wireless devices can connect for sending and receiving data.

Before this command, user can use at + apconfig, at + channel to configure other wireless parameters, the network default channel is 6 (2437MHZ).

After the AP is created, the module will automatically open DHCP SERVER, user must call 'at + ipdhcp = 1' command after completing configuration of a static IP (at + ipstatic), then the module will automatically set DHCP SERVER parameters, including the IP address range and lease time.

Parameter

The maximum length of SSID is 32 bytes.

Parameter	Value	Description
<SSID>	SSID	The SSID to be connected, max length is 32

e.g.:

at+ap=LTHonway\r\n----------create SSID named 'LTHonway'

Return value

Parameter	Format	Length (byte)	Description	
Command successful				
OK	ASCII	2	Connection is successful	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE=-2	Failed to create
\r\n	ASCII	2	Terminator	
Note				

4.3.6 Creating Ad-hoc Network

Command

at+adhoc=<ssid>\r\n

Description

With this command user can create / add a peer to peer network (Ad-hoc). If it is to build a network, before using this command, user can set/input password and channel settings via 'at + psk', 'at + channel' commands. In Ad-hoc mode, network encryption method is by default WEP, and does not support other encryption methods. Network default channel is 10 (2457MHZ).

Parameter

Parameter	Value	Description
<ssid>	ssid	Network identifier

Note:

In Ad-hoc mode, DHCP SERVER is not available.

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	OK
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	ERROR
<CODE>	HEX	1	0XFE=-2 failed to create
\r\n	ASCII	2	Terminator
Note			

4.3.7 Connecting Wireless Network

Command

at+connect=<ssid>\r\n

Description

It is used to connect a specified network. If the network is encrypted, this command must be called after at + psk command. If the network password is empty, commands at + scan and at + psk are not needed.

Parameter

The maximum length of SSID is 32 bytes.

Parameter	Value	Description
<SSID>	SSID	The SSID to be connected, max length is 32

e.g.:

at+connect=LTHonway\r\n----------connect network with SSID named 'LTHonway'

Return value

Parameter	Format	Length (byte)	Description	
Command successful				
OK	ASCII	2	Connection is successful	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE=-2	SSID not found
<CODE>	HEX	1	0XFD=-3	Connection is failed
\r\n	ASCII	2	Terminator	
Note				

4.3.8 Configuring Static IP Address

Command

at+ipstatic=<ip>,<mask>,<gateway>,<dns server1 >,<dns server2>\r\n

Description

This command is used to assign static IP address for module.

Parameter

Parameter	Value	Description
<IP>	0.0.0.0-255.255.255.255	Set IP
<NETMASK>	0.0.0.0-255.255.255.255	Set subnet mask
<GATEWAY>	0.0.0.0-255.255.255.255	Set gateway
<DNS SERVER1>	0.0.0.0-255.255.255.255(可为 0)	DNS server 1
<DNS SERVER2>	0.0.0.0-255.255.255.255(可为 0)	DNS server 2

e.g.:

at+ipstatic=192.168.9.5,255.255.255.0,192.168.9.1,0,0\r\n----------set IP=192.168.9.5

subnet mask=255.255.255.0

gateway =192.168.9.1

dnsserver 1=0

dnsserver 2=0

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	IP is set successfully
\r\n	ASCII	2	Terminator
Command error			
ERROR	ASCII	5	Error
<CODE>	HEX	1	0XFE=-2 IP error
\r\n	ASCII	2	Terminator

4.3.9 Setting DHCP Mode

Command

at+ipdhcp=<mode>\r\n

Description

This command is used to set DHCP working mode.

Parameter

If <mode> = 0, then the module operates in DHCP CLIENT mode, which will get IP address from DHCP SERVER.

If <mode> = 1, the module will automatically set DHCP SERVER parameters, including the IP address range and lease duration, this function must be used after at + ipstatic effective in AP mode.

Parameter	Value	Description
<mode>	0	=0 DHCP CLIENT
	1	=1 DHCP SERVER

e.g.:

at+ipdhcp=0\r\n ----------module operates in DHCP Client mode

at+ipdhcp=1\r\n ----------module operates in DHCP SERVER model

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Command successful
<MAC>	HEX	6	MAC address
<IP>	HEX	4	IP address
<NETMASK>	HEX	4	Subnet mask
<GATEWAY>	HEX	4	gateway
<DNS1>	HEX	4	DNS server 1
<DNS2>	HEX	4	DNS server 2
\r\n	ASCII	2	Terminator
Command error			
ERROR	ASCII	5	Error
<CODE>	HEX	1	0XFC=-4 Get Address Timeout (<mode>=0 valid)
\r\n	ASCII	2	Terminator
Note			

4.3.10 Connecting Network by WPS

Command

at+wps\r\n

Description

After the success of WPS, the user can select the current parameters of the network, save to the internal module at + storeconfig command, you can use the automatic network reset command at + auto_connect (as detailed in the command description).

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Connected to network
<MAC>	HEX	6	MAC address
<IP>	HEX	4	IP address

<NETMASK>	HEX	4	Subnet mask	
<GATEWAY>	HEX	4	gateway	
<DNS SERVER1>	HEX	4	DNS server 1	
<DNS SERVER2>	HEX	4	DNS server 2	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE =-2	AP not found
			0XFD=-3	Connection failed
			0XFC=-4	Get IP address failed
			0XFB=-5	WPS failed
\r\n	ASCII	2	Terminator	
Note				

4.3.11 Connecting Network by Easyconfig

Command

at+easy_config\r\n

Description

This command turns EasyConfig function module, complete with phone APP software module automatically to the specified network. After successful, the user can select the current parameters of the network, save to the internal module at + storeconfig command, you can use the automatic network reset command at + auto_connect (as detailed in the command description).

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Connected to network
<MAC>	HEX	6	MAC address
<IP>	HEX	4	IP address
<NETMASK>	HEX	4	Subnet mask
<GATEWAY>	HEX	4	gateway
<DNS SERVER1>	HEX	4	DNS server 1

<DNS SERVER2>	HEX	4	DNS server 2	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE =-2	AP not found
			0XFD=-3	Connection failed
			0XFC =-4	Get IP address failed
			0XFA=-6	Easy config failed
\r\n	ASCII	2	Terminator	
Note				

4.3.12 Getting Network Connection Status

Command

at+con_status\r\n

Description

It is used to get module network status.

If the module is working in Station mode, this command is used to get wireless network connection status.

If the module is working in AP mode, this command is used to determine the device's connection status.

Parameter

Null

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Command successful
1	ASCII	1	Wi-Fi is connected / device has been connected 0. Not connected.
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error

<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.3.13 Querying module IP information

Command

at+ipconfig\r\n

Description

It is used to get module IP information, including MAC address, IP address, subnet mask, gateway, and DNS server.

Parameter

Null

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Query successfully
<MAC>	HEX	6	MAC address
<IP>	HEX	4	IP address
<NETMASK>	HEX	4	Subnet mask
<GATEWAY>	HEX	4	Gateway
<DNS SERVER1>	HEX	4	DNS Server 1
<DNS SERVER2>	HEX	4	DNS Server 2
\r\n	ASCII	2	Terminator
Command error			
ERROR	ASCII	5	Error
<CODE>	HEX	1	0XFC=-4 query failed
\r\n	ASCII	2	Terminator
Note			

4.3.14 Getting Network Signal Strength

Command

at+rssi\r\n

Description

It is used to get the current signal strength of the network, valid in STA mode.

Parameter

Null

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	OK
<RSSI>	HEX	1	signal strength(negative value)
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	ERROR
<CODE>	HEX	1	0XFE=-2 no network connection
\r\n	ASCII	2	Terminator
Note			

4.3.15 DNS

Command

at+dns=<domain> \r\n

Description

It is used to convert domain to the corresponding IP address, the domain must be configured available DNS server.

Parameter

Null

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Query successfully
<IP>	HEX	4	IP address
\r\n	ASCII	2	Terminator

Command error			
ERROR	ASCII	5	Error
<CODE>	HEX	1	0XFD=-3 DNS resolution failed
\r\n	ASCII	2	Terminator
Note			

4.3.16 Setting Network Listening Intervals

Command

at+listen=<listen interval>\r\n

Description

It is used to set module beacon interval in Station mode.

Note:

In power saving mode, reducing power consumption can be realized via increasing parameter values, but by this way it may cause delay in receiving wireless data!

Parameter

Parameter	Value	Description
<listen interval>	20-1000	Need to refer to the wireless router settings for specific parameters

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	OK
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	ERROR
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.3.17 AP Network Advanced Settings

Command

at+apconfig=<hidden>,<contry code>\r\n

Description

It is used to set up parameters for a wireless access point, such as the country code, whether network name is hidden or not.

Parameter

Parameter	Value	Description
<hidden>	0	Network name is visible(optional)
	1	Network name is hidden(optional)
<contry code >	Country code	Country code, e.g. CN CN (China) Support 1 to 13 channels JP (Japan) Support 1 to 14 channels US (USA) Support 1 to 11 channels

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Set successfully
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.3.18 PING

Command

at+ping=<host>, <count>, <size>\r\n

Description

It is used to run the ping command to check if the network is connected.

Parameter

Parameter	Description
<HOST>	Specified host
<COUNT>	Number of packets, default is 1 (optional)
<SIZE>	Packet size, maximum 1000bytes, default is 64bytes(optional)

e.g.:

at+ping =192.168.9.5\r\n----------run ping

Return value

Parameter	Format	Length (byte)	Description	
Command successful				
OK	ASCII	2	Network is connected	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE =-2	Unable to access target host
\r\n	ASCII	2	Terminator	
Note				

4.3.19 Disconnecting Current Wireless Network

Command

at+disc\r\n

Description

It is used to disconnect the current wireless network.

Parameter

Null

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Disconnected
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error

<CODE>	HEX	1	0XFE=-2	Network is disconnected
\r\n	ASCII	2	Terminator	
Note				

4.3.20 The source MAC address filtering options

Command

at+set_filter=<mode>,<mac>,<index>\r\n

Description

The main combination at + promisc command used together, used when caught scanning to MAC address filtering.

Parameter

Parameter	Value	Description
No parameters		Clean all filter MAC
mode	0-2	mode = 0, To empty the current index of the MAC mode = 1 , Filter the current index of the MAC mode = 2 , Don't filter the current index of the MAC
mac	The MAC address of 6 bytes	Mac address, does not distinguish between uppercase lowercase
index	0-31	Optional parameters, omit the default index = 0

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Open successfully
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator

4.3.21 Caught scanning

Command

at+promisc=<mode>\r\n

Description

The main combination at + set_filter command, closed caught function or on a different channel not filter out the MAC address to caught.

Parameter

Parameter	Value	Description
mode	0-3	mode=0 , Close the caught function mode=1 , In the sixth channel caught mode=2 , In the first, sixth and eleventh channel caught mode=3 , In the channel 13 caught

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Open successfully
\r\n	ASCII	2	Terminator
Open caught command execution success			
RSSI	HEX	2	signal strength
The source MAC address	HEX	6	The source MAC address
Destination MAC address	HEX	6	Destination MAC address
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator

4.4 Socket Operation Commands

4.4.1 Establishing TCP Server

Command

at+ltcp=<local_port>\r\n

Description

Module as a TCP server and create a listening port, if the operation is successful, the module will return a hexadecimal identifier (Socket ID), is used to manage the connection. Establish a TCP server can connect up to seven clients. Establish a TCP server on a different port, allows you to create up to four. Close TCP server identifier to connect to the TCP sever the client connection will be closed.

Parameter

Parameter	Value	Description
<local_port>	1-65535	Create local port number

e.g.:

at+ltcp=25000 \r\n----------establish TCP SERVER

Return value

Parameter	Format	Length (byte)	Description	
Command successful				
OK	ASCII	2	Created successfully	
<FLAG>	HEX	1	=0x08~0x0B port id for ports management	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE= -2	Failed to create port
			0XFD= -3	Failed to bind port
			0XFB= -5	Listen error
\r\n	ASCII	2	Terminator	
Note	Port identifier (0x08 ~ 0x0B) is only used to remove TCP Sever. Communication port identifier when is used for sending data, is the identifier (0x00 ~ 0x07) returned when TCP-Client is connected.			

4.4.2 Establishing TCP Client

Command

at+tcp=<dest_ip>,<dest_port>,<module_port>\r\n

Description

This command is to create a TCP CLIENT and connect with the remote TCP SERVER, if the operation is successful, the module will return a hexadecimal identifier that is used to manage the connection. This command can create up to eight connections.

Parameter

Parameter	Value	Description
<destip>	0.0.0.-255.255.255.255	Target IP address
<dest port>	1-65535	Target port
<local port>	1-65535	Local port (can be Null)

e.g.:

at+tcp=192.168.9.5,25000,25001\r\n-------connection to Server w/ fixed port

at+tcp=192.168.9.5,25000\r\n----------------connection to Server w/ default port

Return value

Parameter	Format	Length (byte)	Description	
Command successful				
OK	ASCII	2	Connection successful	
<FLAG>	HEX	1	=0x00~0x07 port ID for port management	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE= -2	Create local port error
			0XFD= -3	Bind local port error
			0XFC= -4	TCP SERVER connection error
\r\n	ASCII	2	Terminator	
Note				

4.4.3 Establishing UDP Connection

Command

at+udp=<dest_ip>,<dest_port>,<local_port>\r\n

Description

This command is to create a UDP port on the module and set the remote IP address and port number. If the operation is successful, the module will return a hexadecimal identifier that is used to manage the connection. This command can create up to eight connections.

Parameter

Parameter	Value	Description
<destip>	0.0.0.0-255.255.255.255	Target IP address
<dest port>	1-65535	Target port
<local port>	1-65535	Local port

e.g.: at+udp=192.168.9.5,25000,25001\r\n----------connect to target port

Return value

Parameter	Format	Length (byte)	Description	
Command successful				
OK	ASCII	2	Set successfully	
<FLAG>	HEX	1	=0x00~0x07 port ID for ports management	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE= -2	Create local port error
<CODE>	HEX	1	0XFD= -3	Bind local port error
<CODE>	HEX	1	0XFC= -4	Connect target port error
\r\n	ASCII	2	Terminator	
Note				

4.4.4 Establishing UDP Server

Command

at+ludp=<local port>\r\n

Description

Returns a hexadecimal after this command is to create a UDP listening locally on the specified port, create success identifier (Socket ID), waiting to receive the remote port data. If the

remote port to send data to this port, the received data will be included in each other's IP and port information; if other modules need to reply to a message, you need to specify each other's IP and port number information when sending data, only reply. UDP server applications more flexible, capable of receiving unicast and broadcast messages and can send data to the specified IP and port initiative.

Note: The port number LSB first.

Parameter

Parameter	Value	Description
<local port>	1-65535	Create local port

e.g.:

at+ludp =25000\r\n--------------------create local port 25000

Return value

Parameter	Format	Length (byte)	Description	
Command successful				
OK	ASCII	2	Created successfully	
<FLAG>	HEX	1	=0x00~0x07 port ID for ports management	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE= -2	Create local port error
<CODE>	HEX	1	0XFD= -3	Bind local port error
\r\n	ASCII	2	Terminator	
Note				

4.4.5 Creating Multicast Communication

Command

at+multicast=<dest_ip>,<local_port>\r\n

Description

This command is created on the module a UDP multicast socket, you can specify join multicast routing IP, data communication within the group, generally applicable to more than

one main group from applications. When Socket Communications, received first, after the corresponding socket descriptor to transmit data.

Note: The port number LSB first.

Parameter

Parameter	Value	Description
<destip>	224.0.0.1-239.255.255.255	Target multicast IP address
<local port>	1-65535	Local port number

e.g.:

at+multicast=224.255.255.252,25000\r\n----------added to multicast IP 224.255.225.252

Return value

Parameter	Format	Length (byte)	Description	
Command successful				
OK	ASCII	2	Created successfully	
<FLAG>	HEX	1	=0x00~0x07 port ID for ports management	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE= -2	Create local port error
<CODE>	HEX	1	0XFD= -3	Bind local port error
\r\n	ASCII	2	Terminator	
Note				

4.4.6 Closing Created Port

Command

at+cls=< flag>\r\n

Description

By identifier corresponding to close port monitoring or connection.

Parameter

Parameter	Value	Description
< flag >	0-11	Close correspondent port

e.g.:

at+cls=0\r\n----------close the connection with port id =0

Return value

Parameter	Format	Length (byte)	Description	
Command successful				
OK	ASCII	2	Closed successfully	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE= -2	Specified port does not exist
<CODE>	HEX	1	0XFD= -3	Close failed
\r\n	ASCII	2	Terminator	
Note				

4.4.7 Sending Data

Command

at+send_data=< flag>,<dest_port>,<dest_ip>,<data_length> ,<data_stream>\r\n

Description

This command is used to send data to the target (port identifier), the maximum data length is 1000, <data_stream>can be data in any format, module will send data without any treatment. If the connection is a TCP connection, then the destination IP and destination port can be omitted, entered with value 0. When the connection is UDP, if not specified, the value can be 0. If it needs to send data to specified target as LUDP, fill in the target IP, and target port number.

Parameter

Parameter	Value	Description
< flag>	0-11	Connection ID (ASCII)
<dest port>	1-65535	Target port
<destip>	0.0.0.-255.255.255.255	Target IP address
<data_length>	1-1000	Data length, max is 1000 bytes (ASCII)
<data_stream>	data	Data to be sent (HEX)

e.g.:

at+send_data=0,0,0,4,ABCD\ r\n----------send 4bytes data to port with ID = 0 ,data content

is 'ABCD'

Return value

Parameter	Format	Length (byte)	Description	
Command successful				
OK	ASCII	2	Sent successfully	
\r\n	ASCII	2	Terminator	
Command failed				
ERROR	ASCII	5	Sent failed	
<CODE>	HEX	1	0XFE=-2	Specified port does not exist
			0XFD=-3	Data sent error
\r\n	ASCII	2	Terminator	
Note				

4.4.8 Receiving Data

Command

at+recv_data=<flag><dest_port><dest_ip><data_length><data_stream>\r\n

or

at+recv_data=<socket_status><flag><dest_port><dest_ip>\r\n

Description

This command is used to send data to the host, including the destination port, destination IP, port identifier, data length and data content. This command can also be used to receive information of TCP connection and disconnection.

Parameter

Null

Return value

Receiving data from network

Parameter	Format	Length (byte)	Description
Data received successfully			
<CMD>	ASCII	13	Command header
< flag>	HEX	1	=0X00-0X07 port ID

<dest_port>	HEX	2	Target port
<dest_ip>	HEX	4	Target IP
<data_length>	HEX	2	Data length
<data_stream>	HEX	<data_length>	data
\r\n	ASCII	2	Terminator
Receiving data failed			
<CMD>	ASCII	13	Command header
<CODE>	HEX	1	=0XFF receiving data failed
\r\n	ASCII	2	Terminator
Note			

TCP connection status

Parameter	Format	Length (byte)	Description
TCP connection			
<CMD>	ASCII	13	Command header
<socket_status>	HEX	1	=0X80 TCP client connected
< flag>	HEX	1	=0X00-0X07 port ID
<dest_port>	HEX	2	Target port
<dest_ip>	HEX	4	Target IP
\r\n	ASCII	2	Terminator
TCP disconnection			
<CMD>	ASCII	13	Command head
<socket_status>	HEX	1	=0X81 TCP client disconnected
< flag>	HEX	1	=0X00-0X07 port ID
<dest_port>	HEX	2	Target port
<dest_ip>	HEX	4	Target IP
\r\n	ASCII	2	Terminator
Note			

Network Connection Status

Parameter	Format	Length (byte)	Description
Network Connection			

<CMD>	ASCII	13	Command header
< net_status>	HEX	1	=0X82 Automatic network connection is successful
<ip_address>	HEX	4	IP address
\r\n	ASCII	2	Terminator
Note	AP Mode: When the client terminal is connecting to the AP , the host will receive the data packet. STA mode:The module connected successfully to the router. If the connecting is disconnected anomaly, the module will receives the packet after the module auto-connected to router successfully.		
Network disconnect			
<CMD>	ASCII	13	Command header
< net_status>	HEX	1	=0X83 The network is disconnected
\r\n	ASCII	2	Terminator
Note	When the network disconnected , RAK413 module will auto-connect AP and inform the host from the command. After disconnecting the network module, the internal reconnection interval is: 2s , 4s, 8s, 16s , 32s, 1min, 1min, 1min.... AP Mode: When Client terminal disconnected AP ,The host will receive the data packet. STA mode: This module' s netwok is connecting successfully to AP.If there is a network anomaly disconnection, the host will receive this data packet.		

4.4.9 HTTP GET

Command

at+http_get=<ip/domain>:<port>/<url>\r\n

Description

Use the HTTP get command request Webpage, request frame format is as follows:

GET /<url> HTTP/1.1\r\n

Host: <ip/domain>:<port>\r\n

Accept: */*\r\n

User-Agent: RAKWireless\r\n

Content-Type: */*\r\n

Connection: Keep-Alive\r\n

\r\n

Parameter

Parameter	Value	Description
<IP>	0.0.0.0-255.255.255.255	The host IP address
<port>	1-65535	The host server port (optional)
<url>	Webpage address (the maximum length of 80byte)	Webpage address (optional)

e.g.:

at+http_get=192.168.9.1:8080/index.html\r\n

at+http_get=www.baidu.com\r\n

Return values

Parameter	Format	Length (byte)	Description	
The command completed successfully				
OK	ASCII	2	Request success	
<status_code>	HEX	2	The status code	
<page_len>	HEX	2	Webpage length	
<data>	HEX		Webpage data	
Command execution error				
ERROR	ASCII	5	Error	
<CODE>	HEX	1	0XFE=-2	Request error
\r\n	ASCII	2	At the end of	
Remarks				

4.4.10 HTTP POST

Command

at+http_post=<ip/domain>:<port>/<url>,<data>\r\n

Description

Use the HTTP post to submit Webpage content, request frame format is as follows:

POST /<url>HTTP/1.1\r\n

Host:<ip/domain>:<port>\r\n

Accept: */*\asr\n

User-Agent: RAKWireless

Content-Type: */*

Content-Length: XXX \r\n

Connection: Keep-Alive\r\n

\r\n

<data>

Parameter

Parameter	Value	Description
<IP>	0.0.0.0-255.255.255.255	The host IP address
<port>	1-65535	The host server port (optional)
<url>	Webpage address	Webpage address (optional)
<data>	data	Data (optional)

e.g.:

at+http_post=192.168.9.1:8080/index.html，123456\r\n

Return values

Parameter	Format	Length (byte)	Description
The command completed successfully			
OK	ASCII	2	Request success
<status_code>	HEX	2	The status code
<page_len>	HEX	2	Webpage length
<data>	HEX		Webpage data
Command execution error			
ERROR	ASCII	5	error

<CODE>	HEX	1	0XFE=-2	Webpage address (optional)
\r\n	ASCII	2	At the end of	
Remarks				

4.5 Save Parameters Commands

4.5.1 Configuring UART Parameters

Command

at+uartconfig=<baud rate>,<data bits>,<stop bits>,<parity>,<flow ctrol>\r\n

Description

UART configuration parameters, the current status is valid after the reset to default parameter is 115200 baud.

NOTE: Software reset the baud rate unchanged at + rest.

Parameter

This command includes five parameters, including baud rate, data bits, stop bits, parity, and flow control switch.

Parameter	Value	Description
<baud rate>	For details, see 2.1	Baud rate
	6	6 data bits
	7	7 data bits
	8	8 data bits
<stop bits>	1	1 stop bit
	1.5	1.5 stop bits
	2	2 stop bits
<parity>	0	No parity
	1	Odd check
	2	Even check
<flow ctrol>	0	Close
	1	Open

e.g.:

at+uartconfig=115200,8,1,0,1\r\n-------set UART asbaud =115200

data bit =8 bits

stop bit =1 bit

parity= no parity

flow control=open

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Set successfully
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.5.2 Storing Network Configuration Parameters

Command

at+storeconfig\r\n orat+storeconfig=param_struct\r\n

Description

It is used to save user parameters, including password, SSID, IP address, and scan information.This command may have or have no parameters structure. Without parameters, it needs to run commands scan, connect and IP correctly to get data, then they can be successfully saved.

Parameter

param_struct:

```
typedefstruct
{
    uint32_t    feature_bitmap;
    uint8_t     net_type;
    uint8_t     channel;
    uint8_t     sec_mode;
    uint8_t     dhcp_mode;
    char        ssid[33];
```

```
    char            psk[65];
    uint8_tdummy[2];
    ip_param_tip_param;
    ap_config_tap_config;
}config_t;

typedefstruct
{
    A_UINT32 addr;
    A_UINT32 mask;
    A_UINT32 gw;
    A_UINT32 dnsrv1;
    A_UINT32 dnsrv2;
}ip_param_t;

typedefstruct
{
   uint8_t hidden;
char country[3];
}ap_config_t
```

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Set successfully
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	0XFE=-2
\r\n	ASCII	2	Terminator
Note			

4.5.3 Getting Saved Network Parameters

Command

at+get_storeconfig\r\n

Description

This command is used to get user-saved network parameters and return the saved parameter structure.

Parameter

Null

Return value

param_struct:

```
typedefstruct
{
    uint32_t feature_bitmap;
    uint8_t net_type;
    uint8_t channel;
    uint8_t sec_mode;
    uint8_t dhcp_mode;
    char ssid[33];
   char psk[65];
   uint8_t dummy[2];
    ip_param_tip_param;
   ap_config_tap_config;
}rak_cfg_t;

typedefstruct
{
    A_UINT32 addr;
    A_UINT32 mask;
    A_UINT32 gw;
    A_UINT32 dnsrv1;
```

```
    A_UINT32 dnsrv2;
}ip_param_t;

typedefstruct
{
    uint8_t   hidden;
    uint8_t   countryCode[3];
}ap_config_t;
```

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Set successfully
feature_bitmap	HEX	4	Feature switch
net_type	HEX	1	Network types: 0:STA, 1:AP , 2: ADHOC
channel	HEX	1	Network channel
sec_mode	HEX	1	Security mode
dhcp_mode	HEX	1	Get network IP address method 0: static set 1: DHCP client
ssid	ASCII	33	Created network SSID
psk	ASCII	65	Password
dummy	HEX	2	Null
addr	HEX	4	IP address
mask	HEX	4	Subnet mask
gw	HEX	4	Default gateway
dnsrv1	HEX	4	DNS server 1
dnsrv2	HEX	4	DNS server 2
hidden	HEX	1	AP advanced settings, SSID is hidden or not
country	ASCII	3	AP advanced settings, country code CN (China) Support 1 to 13 channels JP (Japan) Support 1 to 14 channels US (USA) Support 1 to 11 channels
\r\n	ASCII	2	Terminator

Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	0XFE=-2
\r\n	ASCII	2	Terminator
Note			

4.5.4 Modifying Web Configuration

Command

at+web_config=web_param\r\n

Description

It is used to modify the network parameters when starting WEB,the factory default is to establish AP.According to the actual requirement, user can modify the part of the parameters.

Parameter

web_param:

typedefstruct

{

config_tweb_params;

charuser_name[17];

charuser_psk[17];

}web_t

Return value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Reset successfully
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.5.5 Getting Web-saved Parameters

Command

at+get_webconfig\r\n

Description

It is used to get the configuration parameters when starting Web, and return a structure parameter.

Parameter

Null

Return value

web_param:

typedefstruct

{

config_tweb_params;

charuser_name[17];

charuser_psk[17];

}web_t

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Set successfully
feature_bitmap	HEX	4	Feature switch
net_type	HEX	1	Network types: 0:STA, 1:AP , 2: ADHOC
channel	HEX	1	Network channel
sec_mode	HEX	1	Security mode
dhcp_mode	HEX	1	Get network IP address method 0: static set 1: DHCP client
ssid	ASCII	33	Created network SSID
psk	ASCII	65	Password
dummy	HEX	2	Null
addr	HEX	4	IP address
mask	HEX	4	Subnet mask

gw	HEX	4	Default gateway
dnsrv1	HEX	4	DNS server 1
dnsrv2	HEX	4	DNS server 2
hidden	HEX	1	AP advanced settings, SSID is hidden or not
country	ASCII	3	AP advanced settings, country code CN (China) Support 1 to 13 channels JP (Japan) Support 1 to 14 channels US (USA) Support 1 to 11 channels
user_name	ASCII	17	Web authentication user name
user_psk	ASCII	17	Web authentication password
\r\n	ASCII	2	Terminator
Command failed			
ERROR	ASCII	5	Error
<CODE>	HEX	1	0XFE=-2
\r\n	ASCII	2	Terminator
Note			

4.5.6 Starting WEB Configuration

Command

at+start_web\r\n

Description

It is used to open the embedded WEB service.Module will start the default WEB parameters, typically is AP mode, when the user is added, user can configure the module parameters via wireless browser.

Parameter

Null

Return Value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Started WEB successfully
\r\n	ASCII	2	Terminator
Command failed			

ERROR	ASCII	5	Error
<CODE>	HEX	1	See ERROR list
\r\n	ASCII	2	Terminator
Note			

4.5.7 Starting Automatic Connection

Command

at+auto_connect\r\n

Description

This command is used to make module automatically get connected, complete scan and assign IP after having saved the parameters .When successful, the MAC and IP information are returned.

Parameter

Null

Return Value

Parameter	Format	Length (byte)	Description
Command successful			
OK	ASCII	2	Query successfully
<MAC>	HEX	6	MAC address
<IP>	HEX	4	IP address
<NETMASK>	HEX	4	Subnet mask
<GATEWAY>	HEX	4	gateway
<DNS SERVER1>	HEX	4	DNS server 1
<DNS SERVER2>	HEX	4	DNS server 2
\r\n	ASCII	2	Terminator
Command error			
ERROR	ASCII	5	Error
<CODE>	HEX	1	0XFE =-2AP not found
			0XFD=-3 connection failed
			0XFC=-4 get IP failed
\r\n	ASCII	2	Terminator
Note			

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6 Revision History

Version	Author	Modification content	Date
V1.0		Initial Draft	2014-03-11
V1.1		Increasing the HTTP GET and HTTP POST command	2014-03-28
V1.2		Update the contact way,Update the document format	2014-04-06
V1.3		Update the Send data length	2014-08-03
V1.4		1. Add at + wake_up, at + ltcp_status = <ltcp_flag> two command 2. Query module changes the return value of the MAC (MAC 6) Description 3. Modify the reset, ltcp, ludp, multicast, cls, uart, auto_connect (delete enabled) Command Description 4.Increase wake_up, ltcp_status Command Description 5. The channel parameter value to modify the 0 ~ 13—> 1 ~ 13 6. Modify the WPS, Easyconfig Command Description 7. Increase the network connection status (4.4.9) 8. Modify get_storeconfig, get_webconfig command some parameters (nettype dhcp_mode, nettype dhcp_mode) Description	2014-08-22
V1.5		1. AP advanced parameters, at + get_storeconfig and at + get_webconfig command the country code Description 2. Add at + set_hostname = <name>, at +get_hostname two commands and their description 3. Add at + mac command terminator 4. In order to increase the received data network connection status Remarks	2014-08-28
V1.6		Delete at + ltcp_status = <ltcp_flag> command Modify wrong word	2014-09-14
V1.7		1.Correct a description of the modified 4.4.8 network connection state parameters	2015-03-12
V1.8		Add at+set_filter=<mode>,<mac>,<index> 、 at+promisc=<mode> two commands and their description	2015-10-26
V1.9		Command to modify the udp multicast: at + multicast = < dest_ip >, < local_port > \ r \ n	2016-01-30

V2.0	Shi Feifei	Update the contact way,Update the document format	2016-02-25