ESP8266 AT Instruction Set

Version 1.5

Espressif Systems IOT Team

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Table of Contents

1. Preambles

AT commands set is divided into: Basic AT commands, WiFi related AT commands, TCP / IP AT commands.

1.1. User-define AT commands

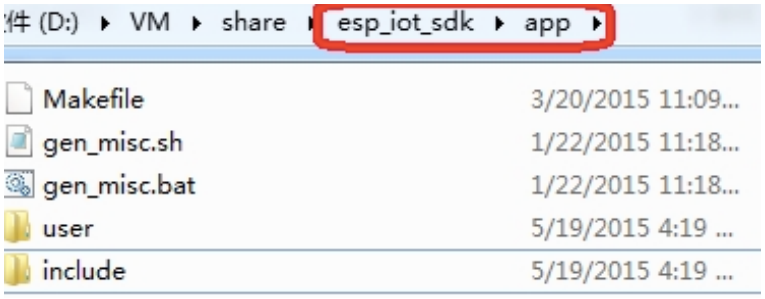
Please use only letters when naming user-define AT commands, do not name it with other characters or numbers.

AT is based on esp_iot_sdk, Espressif Systems AT commands are provided in libat.a. In the example of \esp_iot_sdk\examples\at\user\user_main.c, ways are delivered on how to implement a self-defined AT Command, " AT+TEST".

The structure, **at_funcationType**, is used to define four types of a command, e.g. "AT+TEST".

Definition	Type	Description	
at_testCmd	Test	AT Command	AT+TEST=?
		Registered Callback In Example	at_testCmdTest
		Function Design	Return the value range of parameters
		If at_testCmd is registered as NULL, there will be no testing command.	
at_queryCmd	Query	AT Command	AT+TEST?
		Registered Callback In Example	at_queryCmdTest
		Function Design	Return the current value
		If at_queryCmd is registered as NULL, there will be no query command.	
at_setupCmd	Set	AT Command	AT+TEST=parameter1,parameter2,…
		Registered Callback In Example	at_setupCmdTest
		Function Design	Set configuration
		If at_setupCmd is registered as NULL, there will be no setup command.	
at_exeCmd	Execute	AT Command	AT+TEST
		Registered Callback In Example	at_exeCmdTest
		Function Design	Execute an action
		If at_exeCmd is registered as NULL, there will be no execution command.	

Copy all files in folder "at" to folder "app" in esp_iot_sdk if users need to compile AT.



Introduction of compilation can refer to documentation "2A-ESP8266__IOT_SDK_User_Manual".

1.2. Download AT firmware into Flash

Refer to esp_iot_sdk\bin\at\readme.txt on how to download AT firmware into Flash.

Please use Espressif official Flash download tool and select corresponding Flash size while downloading.

Espressif official Flash download tool: http://bbs.espressif.com/viewtopic.php?f=5&t=433

1. 4Mbit Flash

With the release of ESP8266_NONOS_SDK_V1.5.0, AT_V0.51, AT firmware needs 8Mbit or larger Flash size. Please do not use 4Mbit Flash any more.

2. 8Mbit Flash

If the Flash size is 8Mbit or larger, users can use boot mode which support upgrade AT firmware through WiFi by command "AT+CIUPDATE". Use Espressif Flash download tool and select Flash size : 8Mbit.

bin	Address	Description
esp_init_data_default.bin	0xFC000	Optional. Stores default RF parameter values.
blank.bin	0x7E000	Initialize Flash user parameter area, more details in Appendix.
blank.bin	0xFE000	Initialize Flash system parameter area, more details in Appendix.
boot.bin	0x00000	In \bin\at
user1.1024.new.2.bin	0x01000	In \bin\at\512+512

3. 16Mbit Flash, map: 512KB + 512KB

Use Espressif Flash download tool and select Flash size : 16Mbit.

bin	Address	Description
esp_init_data_default.bin	0x1FC000	Optional. Stores default RF parameter values.
blank.bin	0x7E000	Initialize Flash user parameter area, more details in Appendix.
blank.bin	0x1FE000	Initialize Flash system parameter area, more details in Appendix.
boot.bin	0x00000	In \bin\at
user1.1024.new.2.bin	0x01000	In \bin\at\512+512

4. 16Mbit Flash, map: 1024KB + 1024KB

Use Espressif Flash download tool and select Flash size : 16Mbit-C1.

bin	Address	Description
esp_init_data_default.bin	0x1FC000	Optional. Stores default RF parameter values.
blank.bin	0xFE000	Initialize Flash user parameter area, more details in Appendix.
blank.bin	0x1FE000	Initialize Flash system parameter area, more details in Appendix.
boot.bin	0x00000	In \bin\at
user1.2048.new.5.bin	0x01000	In \bin\at\1024+1024

5. 32Mbit Flash, map: 512KB + 512KB

Use Espressif Flash download tool and select Flash size : 32Mbit.

bin	Address	Description
esp_init_data_default.bin	0x3FC000	Optional. Stores default RF parameter values.
blank.bin	0x7E000	Initialize Flash user parameter area, more details in Appendix.
blank.bin	0x3FE000	Initialize Flash system parameter area, more details in Appendix.
boot.bin	0x00000	In \bin\at
user1.1024.new.2.bin	0x01000	In \bin\at\512+512

6. 32Mbit Flash, map: 1024KB + 1024KB

Use Espressif Flash download tool and select Flash size : 32Mbit-C1.

bin	Address	Description
esp_init_data_default.bin	0x3FC000	Optional. Stores default RF parameter values.
blank.bin	0xFE000	Initialize Flash user parameter area, more details in Appendix.
blank.bin	0x3FE000	Initialize Flash system parameter area, more details in Appendix.
boot.bin	0x00000	In \bin\at
user1.2048.new.5.bin	0x01000	In \bin\at\1024+1024

Notes:

- Please make sure that correct BIN (`/esp_iot_sdk/bin/at`) is already in the chip (ESP8266) before the AT commands listed in this documentation can be used.
- AT has already taken priority 0 and 1 of `system_os_task` , so only one task of priority 2 is allowed to set up by user.
- AT returns messages below to show status of Wi-Fi connection of ESP8266 station
  - WiFi CONNECTED - Wi-Fi connected
  - WiFi GOT IP - ESP8266 station got IP from AP
  - WiFi DISCONNECT - Wi-Fi disconnected

2. Command Description

Each Command set contains four types of AT commands.

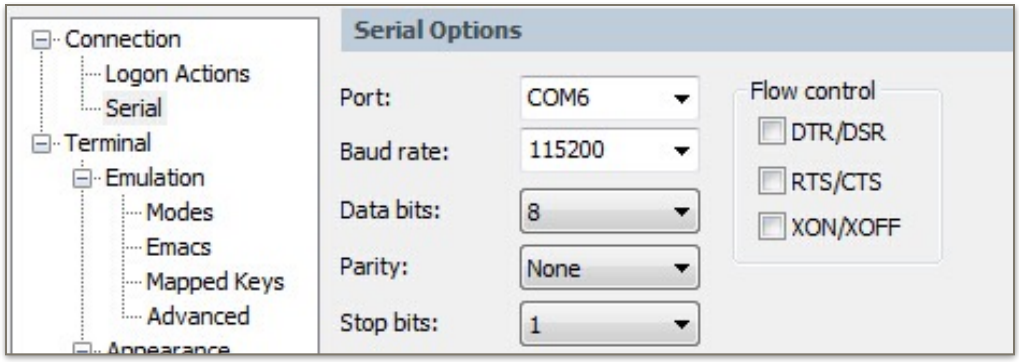
Type	Command Format	DescrIPtion
Test	AT+<x>=?	Query the Set command or internal parameters and its range values.
Query	AT+<x>?	Returns the current value of the parameter.
Set	AT+<x>=<…>	Set the value of user-defined parameters in commands and run.
Execute	AT+<x>	Runs commands with no user-defined parameters.

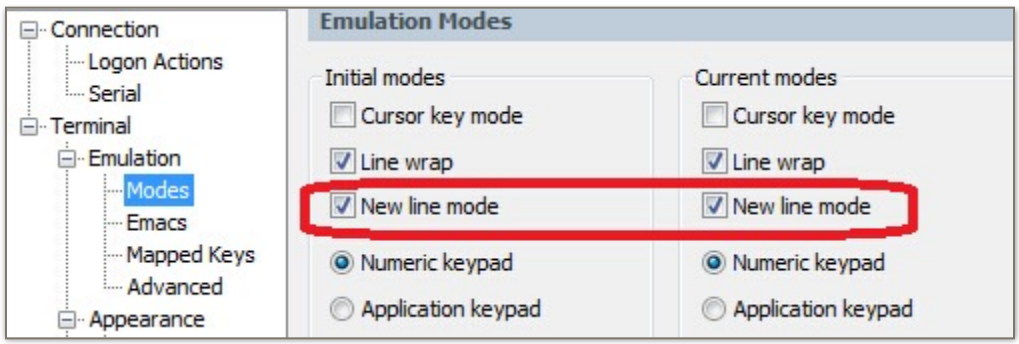
Notes:

1. Not all AT Command has four commands.
2. [] = default value, not required or may not appear
3. String values require double quotation marks, for example:

   ```
   AT+CWSAP="ESP756290","21030826",1,4
   ```

4. Baudrate = 115200
5. AT Commands has to be capitalized, and end with "/r/n"





3. Basic AT Command Set

3.1. Overview

The ESP8266 wireless WiFi modules can be driven via the serial interface using the standard AT commands. Here is a list of some basic AT commands that can be used.

Basic	
Command	**Description**
AT	Test AT startup
AT+RST	Restart module
AT+GMR	View version info
AT+GSLP	Enter deep-sleep mode
ATE	AT commands echo or not
AT+RESTORE	Factory Reset
AT+UART	UART configuration, [@deprecated]
AT+UART_CUR	UART current configuration
AT+UART_DEF	UART default configuration, save to flash
AT+SLEEP	Sleep mode
AT+RFPOWER	Set maximum value of RF TX Power
AT+RFVDD	Set RF TX Power according to VDD33

3.2. Commands

1. AT – Test AT startup

The type of this command is "executed". It's used to test the setup function of your wireless WiFi module.

AT - Test AT startup	
Response	OK
Parameters	null

2. AT+RST – Restart module

The type of this command is "executed". It's used to restart the module.

AT+RST - Restart module	
Response	OK
Parameters	null

3. AT+GMR – View version info

This AT command is used to check the version of AT commands and SDK that you are using, the type of which is "executed".

AT+GMR - View version info	
Response	<AT version info> <SDK version info> <compile time> OK
Parameters	<AT version info> information about AT version <SDK version info> information about SDK version <compile time> time of the bin was compiled

4. AT+GSLP – Enter deep-sleep mode

This command is used to invoke the deep-sleep mode of the module, the type of which is "set". A minor adjustment has to be made before the module enter this deep sleep mode, i.e., connect XPD_DCDC with EXT_RSTB via **0 ohm resistor**.

AT+GSLP=<time>	
Response	<time> OK
Parameters	The time unit of <time> is ms. ESP8266 will wake up after deep sleep <time> ms.

5. ATE – AT commands echo

This command ATE is an AT trigger command echo. It means that entered commands can be echoed back to the sender when ATE command is used. Two parameters are possible. The command returns "OK" in normal cases and "ERROR" when a parameter other than 0 or 1 was specified.

ATE – AT commands echo	
Response	OK
Parameters	ATE0: Switch echo off ATE1: Switch echo on

6. AT+RESTORE – Factory reset

This command is used to reset all parameters saved in flash (according to appendix), restore the factory default settings of the module. The chip will be restarted when this command is executed.

AT+RESTORE – Factory reset	
Response	OK
Notes	Restore factory default settings. The chip will restart.

7. AT+UART – UART configuration

This command sets the UART configuration and writes the new configuration to the flash. It is stored as the default parameter and will also be used as the default baudrate henceforth. [THIS API IS DEPRECATED.]

AT+UART=<baudrate>,<databits>,<stopbits>,<parity>,<flow control> **This command is deprecated, please use AT+UART_CUR or AT+UART_DEF instead.**		
Example	AT+UART=115200,8,1,0,3	
Response	OK	
Parameters	<baudrate>	Baudrate range: 110 to 115200*40 (4.608 Mega)
	<databits>	5: 5 bits data 6: 6 bits data 7: 7 bits data 8: 8 bits data
	<stopbits>	1: 1 bit stop bit 2: 1.5 bit stop bit 3: 2 bit stop bit
	<parity>	0: None 1: Odd 2: EVEN
	<flow control>	0: disable flow control 1: enable RTS 2: enable CTS 3: enable both RTS and CTS
Notes	• This configuration will also store the baudrate as the default rate in the user parameter area in the Flash for boot up. • Flow control needs hardware support: MTCK is UART0 CTS and MTDO is UART0 RTS.	

8. AT+UART_CUR – current UART configuration

This command sets the current UART configuration; it does not write to the flash. Hence there is no change in the default baudrate.

AT+UART_CUR=<baudrate>,<databits>,<stopbits>,<parity>,<flow control>		
Example	AT+UART_CUR=115200,8,1,0,3	
Response	OK	
Parameters	<baudrate>	Baudrate range: 110 to 115200*40 (4.608 Mega)
	<databits>	5: 5 bits data 6: 6 bits data 7: 7 bits data 8: 8 bits data
	<stopbits>	1: 1 bit stop bit 2: 1.5 bit stop bit 3: 2 bit stop bit
	<parity>	0: None 1: Odd 2: EVEN
	<flow control>	0: disable flow control 1: enable RTS 2: enable CTS 3: enable both RTS and CTS
Notes	• This configuration will NOT store in the Flash. • Flow control needs hardware support: MTCK is UART0 CTS and MTDO is UART0 RTS.	

9. AT+UART_DEF – default UART configuration

This command sets the UART configuration and save it to flash. It is stored as the default parameter and will also be used as the default baudrate henceforth.

AT+UART_DEF=<baudrate>,<databits>,<stopbits>,<parity>,<flow control>		
Example	AT+UART_DEF=115200,8,1,0,3	
Response	OK	
Parameters	<baudrate>	Baudrate range: 110 to 115200*40 (4.608 Mega)
	<databits>	5: 5 bits data 6: 6 bits data 7: 7 bits data 8: 8 bits data
	<stopbits>	1: 1 bit stop bit 2: 1.5 bit stop bit 3: 2 bit stop bit
	<parity>	0: None 1: Odd 2: EVEN
	<flow control>	0: disable flow control 1: enable RTS 2: enable CTS 3: enable both RTS and CTS
Notes	• This configuration will be stored in user parameter area in the Flash for boot up. • Flow control needs hardware support: MTCK is UART0 CTS and MTDO is UART0 RTS.	

10. AT+SLEEP – sleep mode

This command sets ESP8266 sleep mode. It can only be used in station mode， default to be modem-sleep mode .

AT+SLEEP – sleep mode	
Command	**AT+SLEEP?**
Response	+SLEEP : <sleep mode> OK
Parameters	<sleep mode> 0 : disable sleep mode 1 : light-sleep mode 2 : modem-sleep mode
Command	**AT+SLEEP=<sleep mode>**
Response	OK
Parameters	The same as above.

11. AT+RFPOWER – set maximum value of RF TX Power

This command sets the maximum value of ESP8266 RF TX power, it is not precise.

AT+RFPOWER – set RF TX Power	
Example	AT+RFPOWER=50
Command	**AT+RFPOWER=<TX power>**
Response	OK
Parameters	<TX power> maximum value of RF TX power, range 0 ~ 82, unit:0.25dBm

12. AT+RFVDD – set RF TX Power according to VDD33

This command sets ESP8266 RF TX power according to VDD33. To get the power voltage of ESP8266 VDD3P3, TOUT pin has to be suspended. TOUT pin has to be suspended to measure VDD33.

AT+RFVDD – set RF TX power according to VDD33	
Command	**AT+RFVDD?**
Response	+RFVDD:<VDD33> OK
Parameters	<VDD33> power voltage of ESP8266 VDD33, unit: 1/1024 V TOUT pin has to be suspended to measure VDD33.
Command	**AT+RFVDD=<VDD33>**
Response	OK
Parameters	<VDD33> power voltage of ESP8266 VDD33, range [1900, 3300]
Command	**AT+RFVDD**
Response	OK
Note	"AT+RFVDD" will automatically set RF TX power according to VDD33. TOUT pin has to be suspended.

4. WiFi Functions Overview

Wi-Fi Connectivity Functions Invoked by AT commands	
Command	**Description**
AT+CWMODE	Wi-Fi mode（sta/AP/sta+AP），[@deprecated]
AT+CWMODE_CUR	Wi-Fi mode（sta/AP/sta+AP） Won't save to Flash
AT+CWMODE_DEF	Wi-Fi default mode（sta/AP/sta+AP） Save to Flash
AT+CWJAP	Connect to AP, [@deprecated]
AT+CWJAP_CUR	Connect to AP, won't save to Flash
AT+CWJAP_DEF	Connect to AP, save to Flash
AT+CWLAPOPT	Set the configuration of command AT+CWLAP
AT+CWLAP	Lists available APs
AT+CWQAP	Disconnect from AP
AT+CWSAP	Set configuration of ESP8266 soft-AP [@deprecated]
AT+CWSAP_CUR	Set configuration of ESP8266 soft-AP Won't save to Flash.
AT+CWSAP_DEF	Set configuration of ESP8266 soft-AP Save to Flash.
AT+CWLIF	Get station's IP which is connected to ESP8266 soft-AP
AT+CWDHCP	Enable/Disable DHCP, [@deprecated]
AT+CWDHCP_CUR	Enable/Disable DHCP, won't save to Flash
AT+CWDHCP_DEF	Enable/Disable DHCP, save to Flash
AT+CWDHCPS_CUR	Set IP range of DHCP server, won't save to Flash
AT+CWDHCPS_DEF	Set IP range of DHCP server, save to Flash
AT+CWAUTOCONN	Connect to AP automatically when power on

AT+CIPSTAMAC	Set MAC address of ESP8266 station [@deprecated]
AT+CIPSTAMAC_CUR	Set MAC address of ESP8266 station Won't save to Flash.
AT+CIPSTAMAC_DEF	Set MAC address of ESP8266 station Save to Flash.
AT+CIPAPMAC	Set MAC address of ESP8266 soft-AP [@deprecated]
AT+CIPAPMAC_CUR	Set MAC address of ESP8266 soft-AP Won't save to Flash.
AT+CIPAPMAC_DEF	Set MAC address of ESP8266 soft-AP Save to Flash.
AT+CIPSTA	Set IP address of ESP8266 station, [@deprecated]
AT+CIPSTA_CUR	Set IP address of ESP8266 station Won't save to Flash.
AT+CIPSTA_DEF	Set IP address of ESP8266 station Save to Flash.
AT+CIPAP	Set IP address of ESP8266 soft-AP, [@deprecated]
AT+CIPAP_CUR	Set IP address of ESP8266 soft-AP Won't save to Flash.
AT+CIPAP_DEF	Set IP address of ESP8266 soft-AP Save to Flash.
AT+CWSTARTSMART	Start SmartConfig
AT+CWSTOPSMART	Stop SmartConfig
AT+CWSTARTDISCOVER	Start the mode that ESP8266 can be found by WeChat
AT+CWSTOPDISCOVER	Stop the mode that ESP8266 can be found by WeChat
AT+WPS	Set WPS function
AT+MDNS	Set MDNS function

4.1. Commands

1. AT+CWMODE – WiFi mode

The function of this AT command is to get the value scope of WiFi mode, including station mode, softAP mode, and station+softAP mode, enquiry about the information of WiFi mode, or set the WiFi mode.

AT+CWMODE - WiFi mode	
This command is deprecated. Please use AT+CWMODE_CUR or AT+CWMODE_DEF instead.	
Command	**AT+CWMODE=?**
Response	+CWMODE:(value scope of <mode>) OK
Parameters	Please refer to AT command settings.
Command	**AT+CWMODE?**
Response	+CWMODE:<mode> OK
Parameters	Please refer to AT command settings.
Command	**AT+CWMODE=<mode>**
Response	OK
Parameters	<mode> 1 : station mode 2 : softAP mode 3 : softAP + station mode
Notes	This setting will be stored in the flash system parameter area. It won't be erased even when the power is off and restarted.

2. AT+CWMODE_CUR – current WiFi mode

There are three WiFi working modes: Station mode, softAP mode, and the co-existence of Station mode and softAP mode. This command is used to acquire the existing WiFi mode, or to set a customised WiFi mode.

AT+CWMODE_CUR - Set WiFi mode（sta/AP/sta+AP）, won't save to Flash	
Example	AT+CWMODE_CUR=3
Command	**AT+CWMODE_CUR=?**
Response	+CWMODE_CUR:(value scope of <mode>) OK
Parameters	<mode> 1 : station mode 2 : softAP mode 3 : softAP + station mode
Command	**AT+CWMODE_CUR?**
Response	+CWMODE_CUR:<mode> OK
Parameters	<mode> 1 : station mode 2 : softAP mode 3 : softAP + station mode
Command	**AT+CWMODE_CUR=<mode>**
Response	OK
Parameters	<mode> 1 : station mode 2 : softAP mode 3 : softAP + station mode
Notes	This configuration will NOT store in Flash.

3. AT+CWMODE_DEF – default WiFi mode

AT+CWMODE_DEF - WiFi mode (sta/AP/sta+AP), save to Flash	
Example	AT+CWMODE_DEF=3
Command	**AT+CWMODE_DEF=?**
Response	+CWMODE_DEF:(value scope of <mode>) OK
Parameters	<mode> 1 : station mode 2 : softAP mode 3 : softAP + station mode
Command	**AT+CWMODE_DEF?**
Response	+CWMODE_DEF:<mode> OK
Parameters	<mode> 1 : station mode 2 : softAP mode 3 : softAP + station mode
Command	**AT+CWMODE_DEF=<mode>**
Response	OK
Parameters	<mode> 1 : station mode 2 : softAP mode 3 : softAP + station mode
Notes	This configuration will store in Flash system parameter area.

4. AT+CWJAP – Connect to AP

AT+CWJAP - Connect to AP [@deprecated]. Please use AT+CWJAP_CUR or AT+CWJAP_DEF instead.	
Example	• AT+CWJAP ="abc"，"0123456789" • If SSID is "ab/,c" and password is "0123456789"/" AT+CWJAP =“ab///,c"，"0123456789/"//" • If several APs have the same SSID as “abc”,target AP can be found by bssid： AT+CWJAP =“abc”,”0123456789”,”ca:d7:19:d8:a6:44”
Command	**AT+CWJAP?**
Response	+CWJAP:<ssid>,<bssid>,<channel>,<rssi> OK
Parameters	<ssid> string, AP’s SSID
Command	**AT+CWJAP=<ssid>,<pwd>[,<bssid>]**
Response	OK or +CWJAP:<error code> FAIL
Parameters	<ssid> string, AP’s SSID <pwd> string, MAX: 64 bytes ASCII [<bssid>] string, AP’s MAC address, for several APs may have the same SSID <error code> only for reference,it’s not reliable <error code> 1 connecting timeout <error code> 2 wrong password <error code> 3 can not found target AP <error code> 4 connect fail This command needs station mode enable. Escape character syntax is needed if "SSID" or "password" contains any special characters (’,’、’"’and’/’)
Notes	This configuration will store in Flash system parameter area.

5. AT+CWJAP_CUR – Connect to AP，for current

AT+CWJAP_CUR – Connect to AP, won't save to Flash	
Example	• AT+CWJAP_CUR ="abc","0123456789" • If SSID is "ab/,c" and password is "0123456789"/" AT+CWJAP_CUR="ab///,c","0123456789/"//" • If several APs have the same SSID as "abc",target AP can be found by bssid: AT+CWJAP_CUR="abc","0123456789","ca:d7:19:d8:a6:44"
Command	**AT+CWJAP_CUR?**
Response	+CWJAP_CUR:<ssid>,<bssid>,<channel>,<rssi> OK
Parameters	<ssid> string, AP's SSID
Command	**AT+CWJAP_CUR=<ssid>,<pwd>[,<bssid>]**
Response	OK or +CWJAP:<error code> FAIL
Parameters	<ssid> string, AP's SSID <pwd> string, MAX: 64 bytes ASCII [<bssid>] string, AP's MAC address, for several APs may have the same SSID <error code> only for reference,it's not reliable <error code> 1 connecting timeout <error code> 2 wrong password <error code> 3 can not found target AP <error code> 4 connect fail This command needs station mode enable. Escape character syntax is needed if "SSID" or "password" contains any special characters(',' 、 '"'and'/')
Notes	This configuration will NOT store in Flash .

6. AT+CWJAP_DEF – Connect to AP，save as default

AT+CWJAP_DEF – Connect to AP and save AP info to flash	
Example	• AT+CWJAP_DEF="abc","0123456789" • If SSID is "ab/,c" and password is "0123456789"/" AT+CWJAP_DEF="ab///,c","0123456789/"//" • If several APs have the same SSID as "abc",target AP can be found by bssid: AT+CWJAP_DEF ="abc","0123456789","ca:d7:19:d8:a6:44"
Command	**AT+CWJAP_DEF?**
Response	+CWJAP_DEF:<ssid>,<bssid>,<channel>,<rssi> OK
Parameters	<ssid> string, AP's SSID
Command	**AT+CWJAP_DEF=<ssid>,<pwd>[,<bssid>]**
Response	OK or +CWJAP:<error code> FAIL
Parameters	<ssid> string, AP's SSID <pwd> string, MAX: 64 bytes ASCII [<bssid>] string, AP's bssid(MAC address), for several APs may have the same SSID <error code> only for reference,it's not reliable <error code> 1 connecting timeout <error code> 2 wrong password <error code> 3 can not found target AP <error code> 4 connect fail This command needs station mode enable. Escape character syntax is needed if "SSID" or "password" contains any special characters (','、'"'and'/')
Notes	This configuration will store in Flash system parameter area.

7. AT+CWLAPOPT – Set configuration for command AT+CWLAP

This command is to set the configuration for command AT+CWLAP, whether the result of AT+CWLAP will be ordered according to <rssi>, and which parameters will be shown in the result of AT+CWLAP.

AT+CWLAPOPT - Set configuration for command AT+CWLAP	
Example	AT+CWLAPOPT=1,127 The first parameter is 1, means that the result of command AT+CWLAP will be listed according to <rssi> The second parameter 127 which is 0x7F, means that all bits in <mask> are 1, so all parameters in the result of AT+CWLAP will be shown.
Command	**AT+CWLAPOPT =<sort_enable>,<mask>**
Response	OK or ERROR
Parameters	<sort_enable> whether the result of AT+CWLAP will be ordered according to <rssi> 0 do not order by <rssi> 1 order by <rssi> <mask> which parameters will be shown in the result of AT+CWLAP, 0 means that do not show the parameter corresponding to the bit, 1 means to show it. bit 0 sets whether <ecn> will be shown in the result of AT+CWLAP , bit 1 sets whether <ssid> will be shown in the result of AT+CWLAP , bit 2 sets whether <rssi> will be shown in the result of AT+CWLAP , bit 3 sets whether <mac> will be shown in the result of AT+CWLAP , bit 4 sets whether <ch> will be shown in the result of AT+CWLAP , bit 5 sets whether <freq offset> will be shown in the result of AT+CWLAP , bit 6 sets whether <freq calibration> will be shown in the result of AT +CWLAP .

8. AT+CWLAP – List available APs

AT+CWLAP - Lists available APs	
Example	• AT+CWLAP List of all available AP's detected by ESP8266 • AT+CWLAP="WiFi","ca:d7:19:d8:a6:44",6 Find AP with specific SSID and MAC at specific channel. • AT+CWLAP="WiFi" Find AP with specific SSID
Command	**AT+CWLAP=<ssid>[,<mac>,<ch>]**
Response	+CWLAP:<ecn>,<ssid>,<rssi>,<mac>,<ch>,<freq offset>, <freq calibration> OK ERROR
Parameters	<ecn> 0 OPEN 1 WEP 2 WPA_PSK 3 WPA2_PSK 4 WPA_WPA2_PSK <ssid> string, SSID of AP <rssi> signal strength <mac> string, MAC address <freq offset> frequency offset of AP，unit：KHz. The value of <freq offset> / 2.4 to get the value as ppm <freq calibration> calibration for frequency offset
Command	**AT+CWLAP**
Response	+CWLAP:<ecn>,<ssid>,<rssi>,<mac>,<ch>,<freq offset>, <freq calibration> OK ERROR
Parameters	The same as above

9. AT+CWQAP – Disconnect from AP

AT+CWQAP - Disconnect from AP	
Command	**AT+ CWQAP**
Response	OK
Parameters	null

10. AT+CWSAP – Configuration of softAP mode

AT+ CWSAP - Configuration of softAP mode [@deprecated]. Please use AT+CWSAP_CUR or AT+CWSAP_DEF instead.	
Example	AT+CWSAP="ESP8266","1234567890",5,3
Command	**AT+CWSAP?**
Response	+CWSAP:<ssid>,<pwd>,<chl>,<ecn>,<max conn>,<ssid hidden>
Parameters	<ssid> string, ESP8266 softAP' SSID <pwd> string, range: 8 ~ 64 bytes ASCII <chl> channel id <ecn> 0 OPEN 2 WPA_PSK 3 WPA2_PSK 4 WPA_WPA2_PSK <max conn> maximum count of stations that allowed to connect to ESP8266 soft-AP range: [1, 4] <ssid hidden> Broadcast SSID by default 0 broadcast SSID of ESP8266 soft-AP 1 do not broadcast SSID of ESP8266 soft-AP
Command	**AT+CWSAP=<ssid>,<pwd>,<chl>,<ecn>,<max conn>,<ssid hidden>**
Response	OK ERROR
Parameters	The same as above.
Notes	This CMD is only available when softAP mode enable. ESP8266 softAP don't support WEP. This configuration will store in Flash system parameter area.

11. AT+CWSAP_CUR – Current config of softAP mode

AT+CWSAP_CUR - Set configuration of softAP mode, won't save to Flash	
Example	AT+CWSAP_CUR="ESP8266","1234567890",5,3
Command	**AT+CWSAP_CUR?**
Response	+CWSAP_CUR:<ssid>,<pwd>,<chl>,<ecn>,<max conn>,<ssid hidden>
Parameters	<ssid> string, ESP8266 softAP' SSID <pwd> string, range: 8 ~ 64 bytes ASCII <chl> channel id <ecn> 0 OPEN 2 WPA_PSK 3 WPA2_PSK 4 WPA_WPA2_PSK <max conn> maximum count of stations that allowed to connect to ESP8266 soft-AP range: [1, 4] <ssid hidden> Broadcast SSID by default 0 broadcast SSID of ESP8266 soft-AP 1 do not broadcast SSID of ESP8266 soft-AP
Command	**AT+CWSAP_CUR=<ssid>,<pwd>,<chl>,<ecn>,<max conn>,<ssid hidden>**
Response	OK ERROR
Parameters	The same as above.
Notes	This command is only available when softAP mode enable. ESP8266 softAP don't support WEP. This configuration will NOT store in Flash.

12. AT+CWSAP_DEF – Default config of softAP mode

AT+ CWSAP_DEF – Set configuration of softAP mode, save to Flash	
Example	AT+CWSAP_DEF="ESP8266","1234567890",5,3
Command	**AT+CWSAP_DEF?**
Response	+CWSAP_DEF:<ssid>,<pwd>,<chl>,<ecn>,<max conn>,<ssid hidden>
Parameters	<ssid> string, ESP8266 softAP' SSID <pwd> string, range: 8 ~ 64 bytes ASCII <chl> channel ID <ecn> 0 OPEN 2 WPA_PSK 3 WPA2_PSK 4 WPA_WPA2_PSK <max conn> maximum count of stations that allowed to connect to ESP8266 soft-AP range: [1, 4] <ssid hidden> Broadcast SSID by default 0 broadcast SSID of ESP8266 soft-AP 1 do not broadcast SSID of ESP8266 soft-AP
Command	**AT+CWSAP_DEF=<ssid>,<pwd>,<chl>,<ecn>,<max conn>,<ssid hidden>**
Response	OK ERROR
Parameters	The same as above.
Notes	This command is only available when softAP mode enable. ESP8266 softAP don't support WEP. This configuration will store in Flash system parameter area.

13. AT+CWLIF – IP of stations

This command is used to get the IP of stations that are connected to ESP8266 softAP.

AT+ CWLIF– IP of stations which are connected to ESP8266 softAP	
Response	<IP addr>,<mac> OK
Parameters	<IP addr> IP address of stations which are connected to ESP8266 softAP <mac> MAC address of stations which are connected to ESP8266 softAP
Notes	This command can not get static IP， it is only available if DHCP is enabled.

14. AT+CWDHCP – Enable/Disable DHCP

AT+ CWDHCP - Enable/Disable DHCP	
[@deprecated]. Please use AT+CWDHCP_CUR or AT+CWDHCP_DEF instead.	
Command	**AT+CWDHCP?**
Response	DHCP disabled or enabled now?
Parameters	Bit0 : 0 - soft-AP DHCP disable 1 - soft-AP DHCP enable bit1 : 0 - station DHCP disable 1 - station DHCP enable
Command	**AT+CWDHCP=<mode>,<en>**
Response	OK
Parameters	<mode> 0 : set ESP8266 soft-AP 1 : set ESP8266 station 2 : set both softAP and station <en> 0 : Disable DHCP 1 : Enable DHCP
Notes	• This configuration will store in Flash user parameter area. • This configuration interact with static IP related AT commands (AT+CIPSTA related and AT+CIPAP related): ▸ If enable DHCP, static IP will be disabled; ▸ If enable static IP, DHCP will be disabled; ▸ This will depends on the last configuration.

15. AT+CWDHCP_CUR – Enable/Disable DHCP

AT+ CWDHCP_CUR – Enable/Disable DHCP, won't save to flash	
Command	**AT+CWDHCP_CUR?**
Response	DHCP disabled or enabled now?
Parameters	Bit0 : 0 - soft-AP DHCP disable 1 - soft-AP DHCP enable bit1 : 0 - station DHCP disable 1 - station DHCP enable
Command	**AT+CWDHCP_CUR=<mode>,<en>**
Response	OK
Parameters	<mode> 0 : set ESP8266 soft-AP 1 : set ESP8266 station 2 : set both softAP and station <en> 0 : Disable DHCP 1 : Enable DHCP
Notes	• This configuration will NOT store in Flash user parameter area. • This configuration interact with static IP related AT commands (AT+CIPSTA related and AT+CIPAP related): ▸ If enable DHCP, static IP will be disabled; ▸ If enable static IP, DHCP will be disabled; ▸ This will depends on the last configuration.

16. AT+CWDHCP_DEF – Enable/Disable DHCP and save to Flash

AT+ CWDHCP_DEF - Enable/Disable DHCP and save to flash	
Command	**AT+CWDHCP_DEF?**
Response	DHCP disabled or enabled now?
Parameters	Bit0 : 0 - soft-AP DHCP disable 1 - soft-AP DHCP enable bit1 : 0 - station DHCP disable 1 - station DHCP enable
Command	**AT+CWDHCP_DEF=<mode>,<en>**
Response	OK
Parameters	<mode> 0 : set ESP8266 soft-AP 1 : set ESP8266 station 2 : set both softAP and station <en> 0 : Disable DHCP 1 : Enable DHCP
Notes	• This configuration will store in Flash user parameter area. • This configuration interact with static IP related AT commands (AT+CIPSTA related and AT+CIPAP related): ▸ If enable DHCP, static IP will be disabled; ▸ If enable static IP, DHCP will be disabled; ▸ This will depends on the last configuration.

17. AT+CWDHCPS_CUR – Set the IP address allocated by ESP8266 soft-AP DHCP, cannot save to flash

This AT command is enabled when ESP8266 runs as soft-AP, and when DHCP server is running normally. The IP address should be on the same network segment with the IP address of ESP8266 soft-AP. This configuration will not be stored in Flash.

AT+CWDHCPS_CUR – Set the IP address allocated by ESP8266 soft-AP DHCP, not be stored in flash	
Example	AT+CWDHCPS_CUR=1,3,"192.168.4.10","192.168.4.15" or AT+CWDHCPS_CUR=0 // Disable the settings and use the default IP range.
Command	**AT+CWDHCPS_CUR?**
Response	+CWDHCPS_CUR=<lease time>,<start IP>,<end IP>
Parameters	<enable> 0 : Disable the settings and use the default IP range. 1 : Enable setting the IP range, parameters below have to be set. <lease time> the unit of lease time is minute, range [1, 2880] <start IP> start IP of the IP range that can be got from ESP8266 soft-AP DHCP server <end IP> end IP of the IP range that can be got from ESP8266 soft-AP DHCP server
Command	**AT+CWDHCPS_CUR=<enable>,<lease time>, <start IP>,<end IP>**
Response	OK
Parameters	The same as above.

18. AT+CWDHCPS_DEF – Set the IP address allocated by ESP8266 soft-AP DHCP, save to flash

This AT command is enabled when ESP8266 runs as soft-AP, and when DHCP server is running normally. The IP address should be on the same network segment with the IP address of ESP8266 soft-AP. This configuration will be stored in Flash user parameter area.

AT+CWDHCPS_DEF – Set the IP address allocated by ESP8266 soft-AP DHCP, can be stored in flash	
Example	AT+CWDHCPS_DEF=1,3,"192.168.4.10","192.168.4.15" or AT+CWDHCPS_DEF=0 // Disable the settings and use the default IP range.
Command	**AT+CWDHCPS_DEF?**
Response	+CWDHCPS_DEF=<lease time>,<start IP>,<end IP>
Parameters	<enable> 0 : Disable the settings and use the default IP range. 1 : Enable setting the IP range, parameters below have to be set. <lease time> the unit of lease time is minute, range [1, 2880] <start IP> start IP of the IP range that can be got from ESP8266 soft-AP DHCP server <end IP> end IP of the IP range that can be got from ESP8266 soft-AP DHCP server
Command	**AT+CWDHCPS_DEF=<enable>,<lease time>, <start IP>,<end IP>**
Response	OK
Parameters	The same as above.

19. AT+CWAUTOCONN – Auto connect to AP or not

ESP8266 station will connect to AP automatically when power on by default.

AT+CWAUTOCONN – Connect to AP automatically or not	
Example	AT+CWAUTOCONN=1
Command	**AT+CWAUTOCONN=<enable>**
Response	OK
Parameters	<enable> 0 : do NOT auto-connect to AP when power on 1 : connect to AP automatically when power on
Notes	This configuration will store in Flash system parameter area.

20. AT+CIPSTAMAC – Set MAC address of station

MAC addresses of ESP8266 soft-AP and station are different，please do NOT set them to be the same. And the bit 0 of the first byte of ESP8266 MAC address can not be 1, for example, MAC address can be “18:fe:35:98:d3:7b”, but can not be “18:fe:35:98:d3:7b”.

AT+ CIPSTAMAC – Set MAC address of ESP8266 station [@deprecated]. Use AT+CIPSTAMAC_CUR or AT+CIPSTAMAC_DEF instead.	
Example	AT+CIPSTAMAC="18:fe:35:98:d3:7b"
Command	**AT+CIPSTAMAC?**
Response	+CIPSTAMAC:<mac> OK
Parameters	<mac> string, MAC address of ESP8266 station
Command	**AT+CIPSTAMAC=<mac>**
Response	OK
Parameters	<mac> string, MAC address of ESP8266 station
Notes	This configuration will store in Flash user parameter area.

21. AT+CIPSTAMAC_CUR – Set MAC address of station

MAC addresses of ESP8266 soft-AP and station are different，please do NOT set them to be the same. And the bit 0 of the first byte of ESP8266 MAC address can not be 1, for example, MAC address can be "18:fe:35:98:d3:7b", but can not be "18:fe:35:98:d3:7b".

AT+ CIPSTAMAC_CUR – Set MAC address of ESP8266 station, won't save to Flash	
Example	AT+CIPSTAMAC_CUR="18:fe:35:98:d3:7b"
Command	**AT+CIPSTAMAC_CUR?**
Response	+CIPSTAMAC_CUR:<mac> OK
Parameters	<mac> string, MAC address of ESP8266 station
Command	**AT+CIPSTAMAC_CUR=<mac>**
Response	OK
Parameters	<mac> string, MAC address of ESP8266 station
Notes	This configuration will NOT store in Flash.

22. AT+CIPSTAMAC_DEF – Set MAC address of station, save as default

MAC addresses of ESP8266 soft-AP and station are different，please do NOT set them to be the same. And the bit 0 of the first byte of ESP8266 MAC address can not be 1, for example, MAC address can be "18:fe:35:98:d3:7b", but can not be "18:fe:35:98:d3:7b".

AT+ CIPSTAMAC_DEF – Set MAC address of ESP8266 station, save to Flash	
Example	AT+CIPSTAMAC_DEF="18:fe:35:98:d3:7b"
Command	**AT+CIPSTAMAC_DEF?**
Response	+CIPSTAMAC_DEF:<mac> OK
Parameters	<mac> string, MAC address of ESP8266 station
Command	**AT+CIPSTAMAC_DEF=<mac>**
Response	OK
Parameters	<mac> string, MAC address of ESP8266 station
Notes	This configuration will store in Flash user parameter area.

23. AT+CIPAPMAC – Set MAC address of softAP

MAC addresses of ESP8266 soft-AP and station are different，please do NOT set them to be the same. And the bit 0 of the first byte of ESP8266 MAC address can not be 1, for example, MAC address can be "1a:fe:36:97:d5:7b", but can not be "15:fe:36:97:d5:7b".

AT+ CIPAPMAC – Set MAC address of ESP8266 softAP [@deprecated]. Use AT+CIPAPMAC_CUR or AT+CIPAPMAC_DEF instead.	
Example	AT+CIPAPMAC="1a:fe:36:97:d5:7b"
Command	**AT+CIPAPMAC?**
Response	+CIPAPMAC:<mac> OK
Parameters	<mac> string, MAC address of ESP8266 softAP
Command	**AT+CIPAPMAC=<mac>**
Response	OK
Parameters	<mac> string, MAC address of ESP8266 softAP
Notes	This configuration will store in Flash user parameter area.

24. AT+CIPAPMAC_CUR – Set MAC address of softAP

MAC addresses of ESP8266 soft-AP and station are different，please do NOT set them to be the same. And the bit 0 of the first byte of ESP8266 MAC address can not be 1, for example, MAC address can be "1a:fe:36:97:d5:7b", but can not be "15:fe:36:97:d5:7b".

AT+CIPAPMAC_CUR – Set MAC addr of ESP8266 softAP, won't save to Flash	
Example	AT+CIPAPMAC_CUR="1a:fe:36:97:d5:7b"
Command	**AT+CIPAPMAC_CUR?**
Response	+CIPAPMAC_CUR:<mac> OK
Parameters	<mac> string, MAC address of ESP8266 soft-AP
Command	**AT+CIPAPMAC_CUR=<mac>**
Response	OK
Parameters	<mac> string, MAC address of ESP8266 soft-AP
Notes	This configuration will not store in Flash.

25. AT+CIPAPMAC_DEF – Set MAC address of softAP and save as default

MAC addresses of ESP8266 soft-AP and station are different，please do NOT set them to be the same. And the bit 0 of the first byte of ESP8266 MAC address can not be 1, for example, MAC address can be "1a:fe:36:97:d5:7b", but can not be "15:fe:36:97:d5:7b".

AT+ CIPAPMAC_DEF – Set MAC address of ESP8266 softAP, save to Flash	
Example	AT+CIPAPMAC_DEF="1a:fe:36:97:d5:7b"
Command	**AT+CIPAPMAC_DEF?**
Response	+CIPAPMAC_DEF:<mac> OK
Parameters	<mac> string, MAC address of ESP8266 soft-AP
Command	**AT+CIPAPMAC_DEF=<mac>**
Response	OK
Parameters	<mac> string, MAC address of ESP8266 soft-AP
Notes	This configuration will store in Flash user parameter area.

26. AT+CIPSTA – Set IP address of station

Only after ESP8266 station connected to AP, station IP can be got and inquiried. This configuration will store in Flash user parameter area.

AT+ CIPSTA – Set IP address of ESP8266 station [@deprecated]. Please use AT+CIPSTA_CUR or AT+CIPSTA_DEF instead.	
Example	AT+CIPSTA="192.168.6.100","192.168.6.1","255.255.255.0"
Command	**AT+CIPSTA?**
Response	+CIPSTA:<IP> OK
Parameters	<IP> string, IP address of ESP8266 station
Command	**AT+CIPSTA=<IP>[,<gateway>,<netmask>]**
Response	OK
Parameters	<IP> string, IP address of ESP8266 station [<gateway>] gateway [<netmask>] netmask
Notes	This configuration interacts with AT+CWDHCP related AT commands: • If enable static IP, DHCP will be disabled; • If enable DHCP, static IP will be disabled; • This will depend on the last configuration.

27. AT+CIPSTA_CUR – Set IP address of station

Only after ESP8266 station connected to AP, station IP can be got and inquiried. This configuration will NOT store in Flash.

AT+CIPSTA_CUR – Set IP address of ESP8266 station, won't save to Flash	
Example	AT+CIPSTA_CUR="192.168.6.100","192.168.6.1","255.255.255.0"
Command	**AT+CIPSTA_CUR?**
Response	+CIPSTA_CUR:<IP> OK
Parameters	Param description <IP> string, IP address of ESP8266 station
Command	**AT+CIPSTA_CUR=<IP>[,<gateway>,<netmask>]**
Response	OK
Parameters	<IP> string, IP address of ESP8266 station [<gateway>] gateway [<netmask>] netmask
Notes	This configuration interacts with DHCP related AT commands (AT+CWDHCP related): • If enable static IP, DHCP will be disabled; • If enable DHCP, static IP will be disabled; • This will depend on the last configuration.

28. AT+CIPSTA_DEF – Set IP address of station and save as default

AT+CIPSTA_DEF - Set IP address of ESP8266 station, save to Flash	
Example	AT+CIPSTA_DEF="192.168.6.100","192.168.6.1","255.255.255.0"
Command	**AT+CIPSTA_DEF?**
Response	+CIPSTA:<IP> OK
Parameters	<IP> string, IP address of ESP8266 station
Command	**AT+CIPSTA_DEF=<IP>[,<gateway>,<netmask>]**
Response	OK
Parameters	<IP> string, IP address of ESP8266 station [<gateway>] gateway [<netmask>] netmask
Notes	This configuration will store in Flash user parameter area. This configuration interacts with DHCP related AT commands (AT+CWDHCP related): • If enable static IP, DHCP will be disabled; • If enable DHCP, static IP will be disabled; • This will depend on the last configuration.

29. AT+ CIPAP – Set IP address of softAP

ESP8266 only support class C IP address. This configuration will store in Flash user parameter area.

AT+ CIPAP – Set IP address of ESP8266 softAP [@deprecated]. Please use AT+CIPAP_CUR or AT+CIPAP_DEF instead.	
Example	AT+CIPAP="192.168.5.1",”192.168.5.1”,”255.255.255.0”
Command	**AT+CIPAP?**
Response	+CIPAP:<IP> OK
Parameters	<IP> string, IP address of ESP8266 softAP
Command	**AT+CIPAP=<IP>[,<gateway>,<netmask>]**
Response	OK
Parameters	<IP> string, IP address of ESP8266 softAP [<gateway>] gateway [<netmask>] netmask
Notes	This configuration interacts with DHCP related AT commands (AT+CWDHCP related): • If enable static IP, DHCP will be disabled; • If enable DHCP, static IP will be disabled; • This will depend on the last configuration.

30. AT+CIPAP_CUR – Set IP address of softAP

ESP8266 only support class C IP address. This configuration will NOT store in Flash.

AT+CIPAP_CUR – Set IP address of ESP8266 softAP, won't save to Flash	
Example	AT+CIPAP_CUR="192.168.5.1",“192.168.5.1”,“255.255.255.0”
Command	**AT+CIPAP_CUR?**
Response	+CIPAP_CUR:<IP> OK
Parameters	<IP> string, IP address of ESP8266 softAP
Command	**AT+CIPAP_CUR=<IP>[,<gateway>,<netmask>]**
Response	OK
Parameters	<IP> string, IP address of ESP8266 softAP [<gateway>] gateway [<netmask>] netmask
Notes	This configuration interacts with DHCP related AT commands (AT+CWDHCP related): • If enable static IP, DHCP will be disabled; • If enable DHCP, static IP will be disabled; • This will depend on the last configuration.

31. AT+CIPAP_DEF – Set IP address of softAP, save as default

ESP8266 only support class C IP address.

AT+ CIPAP_DEF – Set IP address of ESP8266 softAP, save to Flash	
Example	AT+CIPAP_DEF="192.168.5.1",”192.168.5.1”,”255.255.255.0”
Command	**AT+CIPAP_DEF?**
Response	+CIPAP_DEF:<IP> OK
Parameters	<IP> string, IP address of ESP8266 softAP
Command	**AT+CIPAP_DEF=<IP>[,<gateway>,<netmask>]**
Response	OK
Parameters	<IP> string, IP address of ESP8266 softAP [<gateway>] gateway [<netmask>] netmask
Notes	This configuration will store in Flash user parameter area. This configuration interacts with DHCP related AT commands (AT+CWDHCP related): • If enable static IP, DHCP will be disabled; • If enable DHCP, static IP will be disabled; • This will depend on the last configuration.

32. AT+CWSTARTSMART – Start SmartConfig

SmartConfig is only available in station mode. SmartConfig can get protocol type (AirKiss or ESP-TOUCH) automatically by command "AT+CWSTARTSMART". Or users can use command "AT +CWSTARTSMART=<type>" to set a specific protocol type.

AT+CWSTARTSMART - Start SmartConfig	
Example	AT+CWMODE=1 AT+CWSTARTSMART
Command	**AT+CWSTARTSMART**
Response	OK or ERROR
Parameters	none
Notes	The type of SmartConfig will be ESP-Touch + AirKiss, if the command is "AT +CWSTARTSMART"
Command	**AT+CWSTARTSMART=<type>**
Response	OK or ERROR
Parameters	<type> 1 : ESP-Touch 2 : AirKiss 3 : ESP-Touch + AirKiss
Notes	• Message "Smart get WiFi info" means Smart Config get AP's information successfully, then ESP8266 try to connect to target AP， print "WiFi CONNECTED" and "WiFi GOT IP" if succeed; • ESP8266 can't do anything during SmartConfig so please wait till it succeed or use command "AT+CWSTOPSMART" to stop SmartConfig.

33. AT+CWSTOPSMART – stop SmartConfig

AT+CWSTOPSMART stop SmartConfig	
Command	**AT+CWSTOPSMART**
Response	OK or ERROR
Notes	No matter SmartConfig succeed or not, before any other AT commands please always call "AT+CWSTOPSMART" to release the buffer it took first.

34. AT+CWSTARTDISCOVER – Start the mode that ESP8266 can be found by WeChat

The parameter of this command needs to be got from Espressif Cloud. After connected to an AP and got an IP address, ESP8266 can be found by WeChat which is in the same LAN.

WeChat : http://iot.weixin.qq.com

AT+CWSTARTDISCOVER **- Start the mode that ESP8266 can be found by WeChat which is in the same LAN**	
Example	AT+CWSTARTDISCOVER="gh_sdfe235xfs7k","122475",10
Command	**AT+CWSTARTDISCOVER=<WeChat number>,<dev_type>, <time>**
Response	OK or ERROR
Parameters	<WeChat number> got from WeChat <dev_type> got from WeChat <time> time interval that ESP8266 sends packet, range: 0 ~ 24x3600, unit : second. 0 : ESP8266 will not send packet, waiting for WeChat's detection. Otherwise, it is the time interval that ESP8266 sends packet, so the WeChat may find it easier.
Notes	ESP8266 station need to connect to an AP and get an IP address first. Then use this command so that WeChat can find this ESP8266 device.

35. AT+CWSTOPDISCOVER – Stop the mode that ESP8266 can be found by WeChat

AT+CWSTOPDISCOVER **- Stop the mode that ESP8266 can be found by WeChat which is in the same LAN**	
Command	**AT+CWSTOPDISCOVER**
Response	OK or ERROR

36. AT+WPS – Set WPS function

Notice that WPS function can only be used when ESP8266 station is enabled. And WPS function does not support WEP encryption.

AT+WPS – Set WPS function	
Example	AT+CWMODE=1 AT+WPS=1
Command	**AT+WPS=<enable>**
Response	OK or ERROR
Parameter	<enable> 1 : start WPS function 0 : stop WPS function

37. AT+MDNS – Set MDNS function

Do not contain special characters (for example, "." character), or use a protocol name (for example, "http"), when defining "host_name" and "server_name" for MDNS.

AT+MDNS – Set MDNS function	
Example	AT+MDNS=1,"espressif","iot",8080
Command	**AT+MDNS=<enable>, <hostname>, <server_name>,<server_port>**
Response	OK or ERROR
Parameter	<enable> 1 : enable MDNS function 0 : disable MDNS function <hostname> MDNS host name <server_name> MDNS server name <server_port> MDNS server port

5. TCP/IP Related AT Commands

5.1. Overview

TCP/IP	
Command	**Description**
AT+ CIPSTATUS	Get connection status
AT+CIPSTART	Establish TCP connection, UDP transmission or SSL connection
AT+CIPSSLSIZE	Set the size of SSL buffer
AT+CIPSEND	Send data
AT+CIPSENDEX	Send data, if <length> or "\0" is met, data will be sent
AT+CIPSENDBUF	Write data into TCP-send-buffer
AT+CIPBUFRESET	Reset segment ID count
AT+CIPBUFSTATUS	Check status of TCP-send-buffer
AT+CIPCHECKSEQ	Check if a specific segment is sent or not
AT+CIPCLOSE	Close TCP/UDP/SSL connection
AT+CIFSR	Get local IP address
AT+CIPMUX	Set multiple connections mode
AT+CIPSERVER	Configure as server
AT+CIPMODE	Set transmission mode
AT+SAVETRANSLINK	Save transparent transmission link to Flash
AT+CIPSTO	Set timeout when ESP8266 runs as TCP server
AT+CIUPDATE	Upgrade firmware through network
AT+PING	Function PING
AT+CIPDINFO	Show remote IP and remote port with "+IPD"

5.2. TCP/IP

1. AT+CIPSTATUS – Check network connection status

AT+CIPSTATUS – Check network connection status	
Command	**AT+CIPSTATUS**
Response	STATUS:<stat> +CIPSTATUS:<link ID>,<type>,<remote_IP>,<remote_port>, <local_port>,<tetype>
Parameters	<stat> 2 : Got IP 3 : Connected 4 : Disconnected 5 : Wi-Fi connection fail <link ID> ID of the connection (0~4), for multi-connect <type> string, "TCP" or "UDP" <remote_IP> string, remote IP address. <remote_port> remote port number <local_port> ESP8266 local port number <tetype> 0: ESP8266 runs as client 1: ESP8266 runs as server

2. AT+CIPSTART – Establish TCP connection, UDP transmission or SSL connection

Refer to documentation "4B-ESP8266__AT Command Examples" on how to use this command.

AT+CIPSTART – Function 1: Establish TCP connection	
Example	AT+CIPSTART="TCP","iot.espressif.cn",8000 AT+CIPSTART="TCP","192.168.101.110",1000
Single connection (AT+CIPMUX=0)	**AT+CIPSTART=** **<type>,<remote IP>,<remote port>[,<TCP keep alive>]**
Multiple connection (AT+CIPMUX=1)	**AT+CIPSTART=<link ID>,** **<type>,<remote IP>,<remote port>[,<TCP keep alive>]**

Response	OK or ERROR If TCP is connected already, returns ALREADY CONNECT
Parameters	<link ID> ID of network connection (0~4), used for multi-connection <type> string, "TCP" or "UDP" <remote IP> string, remote IP address <remote port> string, remote port number [<TCP keep alive>] detection time interval when TCP is kept alive, this function is closed by default. [<TCP keep alive>] 0 : disable TCP keep-alive [<TCP keep alive>] 1 ~ 7200 : detection time interval, unit: second

AT+CIPSTART – Function 2: Register UDP port, start connection	
Example	AT+CIPSTART="UDP","192.168.101.110",1000,1002,2
Single connection (AT+CIPMUX=0)	**AT+CIPSTART=<type>,<remote IP>,<remote port>[,<UDP local port>,<UDP mode>]**
Multiple connection (AT+CIPMUX=1)	**AT+CIPSTART=<link ID>,<type>,<remote IP>,<remote port>[,<UDP local port>,<UDP mode>]**
Response	OK or ERROR If connection already exists, returns ALREADY CONNECT
Parameters	<link ID> ID of network connection (0~4), used for multi-connection <type> string, "TCP" or "UDP" <remote IP> string, remote IP <remote port> string, remote port [<UDP local port>] UDP port of ESP8266 [<UDP mode>] In UDP transparent transmission, it has to be 0. [<UDP mode>] 0 : destination peer entity of UDP will not change. [<UDP mode>] 1 : destination peer entity of UDP can change once. [<UDP mode>] 2 : destination peer entity of UDP is allowed to change. Note: [<UDP mode>] can only be used when [<UDP local port>] is set.

AT+CIPSTART – Function 3: Establish SSL connection	
Example	AT+CIPSSLSIZE=4096 AT+CIPSTART="SSL","iot.espressif.cn",8443
Single connection (AT+CIPMUX=0)	**AT+CIPSTART=** **<type>,<remote IP>,<remote port>[,<TCP keep alive>]**
Multiple connection (AT+CIPMUX=1)	**AT+CIPSTART=<link ID>** , **<type>,<remote IP>,<remote port>[,<TCP keep alive>]**
Response	OK or ERROR If TCP is connected already, returns ALREADY CONNECT
Parameters	<link ID> ID of network connection (0~4), used for multi-connection <type> string, "SSL" <remote IP> string, remote IP address <remote port> string, remote port number [<TCP keep alive>] detection time interval when TCP is kept alive, this function is closed by default. [<TCP keep alive>] 0 : disable TCP keep-alive [<TCP keep alive>] 1 ~ 7200 : detection time interval, unit: second
Note	1. ESP8266 can only set one SSL connection at most. 2. SSL connection does not support UART-WiFi passthrough mode (transparent transmission). 3. SSL connection needs a lot of memory, otherwise, it may cause system reboot. Users can try command "**AT+CIPSSLSIZE=<size>**" to enlarge the buffer size.

3. AT+CIPSSLSIZE – Set the size of SSL buffer

AT+CIPSSLSIZE – Set the size of SSL buffer	
Command	**AT+CIPSSLSIZE=<size>**
Response	OK or ERROR
Parameters	<size> the size of SSL buffer, range: 2048 ~ 4096

4. AT+CIPSEND – Send data

Please refer to documentation "4B-ESP8266__AT Command Examples" for more examples.

AT+CIPSEND – Send data	
Single connection	(+CIPMUX=0) **AT+CIPSEND=<length>**
Multiple connection	(+CIPMUX=1) **AT+CIPSEND=<link ID>,<length>**
UDP Transmission	**AT+CIPSEND=[<link ID>,]<length>[,<remote IP>,<remote port>]**
Response	Wrap return ">" after set command. Begins receive of serial data, when data length is met, starts transmission of data. If connection cannot be established or gets disconnected during send, returns ERROR If data is transmitted successfully, returns SEND OK
Parameters	<link ID> ID of the connection (0~4), for multi-connect <length> data length, MAX 2048 bytes [<remote IP>] UDP transmission can set remote IP when send data [<remote port>] UDP transmission can set remote port when send data
Command	**AT+CIPSEND**
Response	Wrap return ">" after execute command. Enters unvarnished transmission, 20ms interval between each packet, maximum 2048 bytes per packet. When single packet containing "+++" is received, it returns to normal command mode. Please wait at least 1 second before sending next AT command. This command can only be used in transparent transmission mode which require to be single connection mode. For UDP transparent transmission, <UDP mode> has to be 0 in command "AT +CIPSTART"

5. AT+CIPSENDEX – Send data

AT+CIPSENDEX – Send data	
Single connection	(+CIPMUX=0) **AT+CIPSENDEX=<length>**
Multiple connection	(+CIPMUX=1) **AT+CIPSENDEX=<link ID>,<length>**
UDP Transmission	**AT+CIPSENDEX=[<link ID>,]<length>[,<remote IP>,<remote port>]**
Response	Wrap return ">" after set command. Begins receive of serial data, when data length or "\0" is met, starts transmission of data. So if sending "\0" is needed, please send it as "\\0" If connection cannot be established or gets disconnected during send, returns ERROR If data is transmitted successfully, returns SEND OK
Parameters	<link ID> ID of the connection (0~4), for multi-connect <length> data length, MAX 2048 bytes

6. AT+CIPSENDBUF – Write data into TCP-send-buffer

This command only write data into TCP-send-buffer, so it can be called continually, needn't wait for "SEND OK"; if a TCP segment is sent successfully, it will return <segment ID>,SEND OK. Before data <length> is met, input "+++" can switch back from data mode to command mode, and discard the data received before, cancel the "AT+CIPSENDBUF".

AT+CIPSENDBUF – Write data into TCP-send-buffer	
Single connection	(+CIPMUX=0) **AT+CIPSENDBUF=<length>**
Multiple connection	(+CIPMUX=1) **AT+CIPSENDBUF=<link ID>,<length>**
Response	<current segment ID>,<segment ID of which sent successfully> OK > Wrap return ">" begins receiving of serial data, when data <length> is met, send it; data more than <length> will be discarded, and returns "busy" If connection cannot be established,or it's not a TCP connection , or buffer full, or some other error occurred, returns ERROR If data is transmitted successfully, (1) for single connection, returns <segment ID>,SEND OK (2) for multiple connection, returns <link ID>,<segment ID>,SEND OK
Parameters	<link ID> ID of the connection (0~4), for multi-connect <segment ID> uint32, starts from 1, add 1 every time be called; <length> data length, data more than <length> will be discarded, MAX 2048 bytes

7. AT+CIPBUFSTATUS – Check status of TCP-send-buffer

Please do not user this command on SSL connection.

AT+CIPBUFSTATUS – Check status of TCP-send-buffer	
Example	Single connection: AT+CIPBUFSTATUS returns 20,15,10,200,7 20：means the latest segment ID is 19，next time we call AT +CIPSENDBUF，the segment ID returned will be 20; 15：means TCP segment of which ID is 15 is the latest segment that sent（may not succeed）; 10：means TCP segment of which ID is 10 sent successfully; 200：TCP-send-buffer remain 200 bytes that available; 7：available TCP queue number, it's not reliable；when queue number is 0, no more TCP data can be sent.
Single connection	(+CIPMUX=0) **AT+CIPBUFSTATUS**
Multiple connection	(+CIPMUX=1) **AT+CIPBUFSTATUS=<link ID>**
Response	<next segment ID>, < segment ID of which has sent >, < segment ID of which sent successfully>, <remain buffer size>, <queue number> OK If connection is not established，returns ERROR
Parameters	<link ID> ID of the connection (0~4), for multi-connect <next segment ID> next segment ID will be got by AT+CIPSENDBUF; <segment ID of which has sent> the latest segment that sent（may not succeed）; <segment ID of which sent successfully> the latest segment that sent successfully; <remain buffer size> TCP-send-buffer remain buffer size; <queue number> available TCP queue number, it's not reliable；when queue number is 0, no more TCP data can be sent.

8. AT+CIPCHECKSEQ – Check if specific segment sent successfully or not

AT+CIPCHECKSEQ – Check if specific segment sent successfully or not	
Single connection	(+CIPMUX=0) **AT+CIPCHECKSEQ=<segment ID>**
Multiple connection	(+CIPMUX=1) **AT+CIPCHECKSEQ=<link ID>,<segment ID>**
Response	[<link ID>,]<segment ID> ,<status> OK If connection is not established，returns ERROR
Parameters	<link ID> ID of the connection (0~4), for multi-connect <segment ID> segment ID got by AT+CIPSENDBUF; <status> TRUE, sent successfully; FALSE, send fail
Note	Only keep status of the latest 32 segments at most.

9. AT+CIPBUFRESET – Reset segment ID count

AT+CIPBUFRESET – Reset segment ID count	
Single connection	(+CIPMUX=0) **AT+CIPBUFRESET**
Multiple connection	(+CIPMUX=1) **AT+CIPBUFRESET=<link ID>**
Response	OK If connection is not established or there are still TCP data wait for sending，returns ERROR
Parameters	<link ID> ID of the connection (0~4), for multi-connect

10. AT+CIPCLOSE – Close TCP, UDP or SSL connection

AT+CIPCLOSE - Close TCP, UDP or SSL connection	
Multiple connection	**AT+CIPCLOSE=<link ID>**
Response	OK or ERROR
Parameters	<link ID> ID no. of connection to close, when ID=5, all connections will be closed. (ID=5 has no effect in server mode)
Single connection	**AT+CIPCLOSE**
Response	OK or If no such connection, returns ERROR

11. AT+CIFSR – Get local IP address

AT+CIFSR - Get local IP address	
Command	**AT+ CIFSR**
Response	+ CIFSR:<IP address> OK ERROR
Parameters	<IP address> IP address of ESP8266 softAP IP address of ESP8266 station
Note	Only after ESP8266 station connected to AP, station IP can be got and inquiried.

12. AT+CIPMUX – Enable multiple connections

AT+ CIPMUX – Enable multiple connections or not	
Example	AT+CIPMUX=1
Command	**AT+CIPMUX?**
Response	+ CIPMUX:<mode> OK
Parameters	<mode>0 single connection <mode>1 multiple connection
Command	**AT+CIPMUX=<mode>**
Response	OK If already connected, returns Link is builded
Parameters	The same as above.
Notes	1. "AT+CIPMUX=1" can only be set when transparent transmission disabled ("AT+CIPMODE=0") 2. This mode can only be changed after all connections are disconnected. 3. If TCP server is started, has to delete TCP server first，then change to single connection is allowed.

13. AT+CIPSERVER – Configure as TCP server

Server monitor will automatically be created when Server is created. When a client is connected to the server, it will take up one connection，be gave an id.

AT+CIPSERVER – Configure as TCP server	
Example	AT+CIPMUX=1 AT+CIPSERVER=1,1001
Command	**AT+CIPSERVER=<mode>[,<port>]**
Response	OK
Parameters	<mode> 0 Delete server <mode> 1 Create server <port> port number, default is 333
Notes	Server can only be created when AT+CIPMUX=1

14. AT+CIPMODE – Set transfer mode

UART-WiFi passthrough mode (transparent transmission) can only be enabled in TCP single connection mode or UDP of which remote IP and port won't change (parameter <UDP mode> is 0 when using command "AT+CIPSTART" to create a UDP transmission) .

During UART-WiFi passthrough transmission, if it is TCP connection and the TCP connection breaks, ESP8266 will keep trying to reconnect until "+++" is inputed to quit from transmission. After "+++", please wait at least 1 second before sending next AT command.

If it is a normal TCP transmission and TCP connection breaks, ESP8266 will prompt " [<link ID>,] CLOSED" , and won't try to reconnect. Users can call "AT+CIPSTART" to create a connection again if it's needed.

AT+ CIPMODE – Set transfer mode	
Example	AT+CIPMODE=1
Command	**AT+CIPMODE?**
Response	+ CIPMODE:<mode> OK
Parameters	same as below
Command	**AT+CIPMODE=<mode>**
Response	OK If already connected, returns Link is builded
Parameters	<mode>0 normal mode <mode>1 UART-WiFi passthrough mode
Notes	This configuration would NOT save into Flash.

15. AT+SAVETRANSLINK – Save transparent transmission link to Flash

AT+SAVETRANSLINK – Save transparent transmission link to Flash	
Example	AT+SAVETRANSLINK=1,"192.168.6.110",1002,"TCP"
Command	**AT+SAVETRANSLINK =<mode>,<remote IP>,<remote port>[,<type>][,<TCP keep alive>][,<UDP local port>]**
Response	OK or ERROR
Parameters	<mode> 0：normal mode，cancel enter UART-WiFi passthrough mode when power on 1：save UART-WiFi passthrough mode <remote IP> remote IP <remote port> remote port [<type>] TCP or UDP, default to be "TCP" [<TCP keep alive>] TCP keep alive, default to be disabled 0：disable TCP keep alive 1 ~ 7200：keep-alive detect time interval, unit: 500 ms [<UDP local port>] local port if enter UDP transparent transmission when power on.
Notes	• This command will save the UART-WiFi passthrough mode and its link into Flash user parameter area，ESP8266 will enter UART-WiFi passthrough mode since next power on. • As long as the IP, port numerical conformance to specification, we will save them to Flash

16. AT+CIPSTO – Set TCP server timeout

AT+ CIPSTO - Set TCP server timeout	
Example	AT+CIPMUX=1 AT+CIPSERVER=1,1001 AT+CIPSTO=10
Command	**AT+CIPSTO?**
Response	+ CIPSTO:<time> OK
Parameters	The same as below.
Command	**AT+CIPSTO=<time>**
Response	OK
Parameters	<time> TCP server timeout, range 0~7200 seconds
Notes	ESP8266 as TCP server, will disconnect to TCP client that didn't communicate with it even if timeout. If AT+CIPSTO=0, it will never timeout. We don't recommend that.

17. AT+PING – Function Ping

AT+PING - Function Ping	
Example	AT+PING="192.168.1.1" AT+PING="www.baidu.com"
Command	**AT+PING=<IP>**
Response	+<time> OK Or ERROR // means ping fail
Parameters	Param description <IP> : string, host IP or domain name <time> : response time of ping

18. AT+CIUPDATE – Update through network

Firmware upgrade depends on network condition. It will return ERROR if upgrade fail, please wait a while.

- If using Espressif AT BIN (\esp_iot_sdk\bin\at)，"AT+CIUPDATE" will download new AT BIN from Espressif Cloud.
- If using user-compiled AT BIN，users need to make their own "AT+CIUPDATE" to upgrade，Espressif provide a demo in \esp_iot_sdk\example\at. AT BINs on server have to be named as "user1.bin" and "user2.bin"

AT+ CIUPDATE – update through network	
Command	**AT+CIUPDATE**
Response	+CIUPDATE:<n> OK
Parameters	<n> 1 found server <n> 2 connect server <n> 3 got edition <n> 4 start update

19. AT+CIPDINFO – Show remote IP and port with "+IPD"

AT+CIPDINFO – Show remote IP and port with "+IPD" (received data from network)	
Example	AT+CIPDINFO=1
Command	**AT+CIPDINFO=<mode>**
Response	OK Or ERROR
Parameters	Param description <mode> 0: won't show remote IP and port with "+IPD" <mode> 1: show remote IP and port with "+IPD"

20. +IPD – Receive network data

+IPD – Receive network data	
Single connection	**(+CIPMUX=0)** **+IPD,<len>[,<remote IP>,<remote port>]:<data>**
Multiple connection	**(+CIPMUX=1)** **+IPD,<ID>,<len>[,<remote IP>,<remote port>]:<data>**
Parameters	<remote IP> remote IP, enabled by command "AT+CIPDINFO=1" <remote port> remote port, enabled by command "AT+CIPDINFO=1" <ID> id no. of connection <len> data length <data> data received
Notes	When the module receives network data, it will send the data through the serial port using +IPD command.

6. Appendix

ESP8266 AT commands below will save configuration parameters into flash:

AT Command	*Example*
Save into flash user parameter area	
AT+UART_DEF	AT+UART_DEF=115200,8,1,0,3
AT+CWDHCP_DEF	AT+CWDHCP_DEF=1,1
AT+CIPSTAMAC_DEF	AT+CIPSTAMAC_DEF="18:fe:35:98:d3:7b"
AT+CIPAPMAC_DEF	AT+CIPAPMAC_DEF="1a:fe:36:97:d5:7b"
AT+CIPSTA_DEF	AT+CIPSTA_DEF="192.168.6.100"
AT+CIPAP_DEF	AT+CIPAP_DEF="192.168.5.1"
AT+CWDHCPS_DEF	AT+CWDHCPS_DEF=1,3,"192.168.4.10","192.168.4.15"
AT+SAVETRANSLINK	AT+SAVETRANSLINK =1,"192.168.6.10",1001
Save into flash system parameter area	
AT+CWMODE_DEF	AT+CWMODE_DEF=3
AT+CWJAP_DEF	AT+CWJAP_DEF="abc"，"0123456789"
AT+CWSAP_DEF	AT+CWSAP_DEF="ESP8266","12345678",5,3
AT+CWAUTOCONN	AT+CWAUTOCONN=1

- Only if the configuration changes，we will write the new configuration into Flash.
- To 512KB+512KB Flash Map:

  user parameter area is `0x7C000` ~ `0x80000`, 16KB;
- To 1024KB+1024KB Flash Map:

  user parameter area is `0xFC000` ~ `0x100000`, 16KB;
- System parameter area is always the last 16KB of Flash.

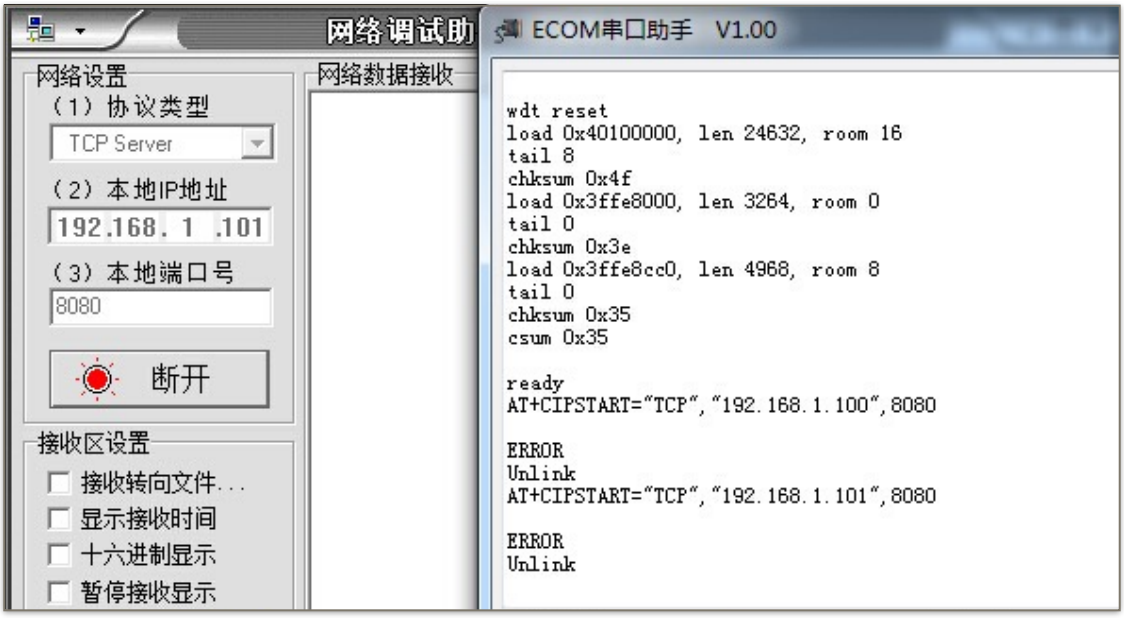
7. Q&A

If you have any questions about AT Commands, please contact us (support-at@espressif.com) with information as follows:

- **Version info of AT** : Using "AT+GMR" to get the version info.

  Hardware Module info: example Ai-thinker ESP-01

- **Screenshot or steps of the test steps,** for example:



- **Log**:

```
ets Jan  8 2013,rst cause: 1, boot mode: (3,3)

load 0x40100000, len 26336, room 16
tail 0
chksum 0xde
load 0x3ffe8000, len 5672, room 8
tail 0
chksum 0x69
load 0x3ffe9630, len 8348, room 8
tail 4
chksum 0xcb
csum 0xcb
SDK version: 0.9.1
addr not ack when tx write cmd
mode : sta(18: fe: 34: 97: d5: 7b) + softAP(1a: fe: 34: 97: d5: 7b)
```