WizFi210Programmers' Guide

(Version 1.31)

WizFi220 operates same as described in this documents

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Certification Information

CE for Class B ITE

INFORMATION TO THE USER
Hereby, WIZnet. Declares that these WizFi210 and WizFi220 are in compliance with the essential requirements
and other relevant provisions of directive 1999/5/EC.

WARNING: Thesearethe class B products. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC for Class B ITE

INFORMATION TO THE USER
Theseequipments have been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no Guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

WARNING: Theseequipments may generate or use radio frequency energy. Changes or modifications to this equipment may cause harmful interference unless the modifications are expressly approved in the instruction manual. The user could lose the authority to operate this equipment if an unauthorized change or modification is made.

TELEC

010-100040

Equipment : Wireless Module
Model : WizFi210 UFL antenna type, WizFi210 Chip antenna type
Made in Korea

KCC for Class B ITE

INFORMATION TO THE USER
이기기는가정용(B급)
으로전자파적합등록을한기기로서주거지역에서는물론모든지역에서사용할수있습니다.

- Trade Name or Applicant : WIZnet Co., Ltd.
- Equipment Name : Wireless LAN Module
- Model Number : WizFi210 / WizFi220
- Manufacturer / Country of Origin : WIZnet, Co., Ltd. / KOREA
- Certification Number : KCC-CRM-WWW-WIZFI210 / KCC-CRM-WWW-WIZFI220

WARNING:
해당무선설비는운용중전파혼신의가능성이있으므로인명안전과관련된서비스는할수없습니다.

Document Revision History

Date	Revision	Changes
2011-03-24	V1.0	Official Release
2011-05-24	V1.01	Changed Power Consumption and RF Output Power Added Auto Reconnect AT Command(AT+XAR) Added Certification Information
2011-09-05	V1.10	Changed Evaluation Board Changed GPIO number(HW Trigger, Button) Changed AT+XEHT Command Added Limited AP Feature Added WizFi220 Specs
2012-01-11	V1.11	Added UART baud rate(460800, 921600bps) Added EXT_nRESET description Added FAQ Added AT+DHCPSRVR Command Added Product contents
2012-10-24	V1.12	Added AT+WAUTO Option(2 for Limited AP mode) Added FAQ(Reducing the disassociation event) Removed unused AT Commands Removed some features for customizing f/w
2013-03-08	V1.13	Added AT+XRESET Command Added max/min power value of AT+WP command
2013-03-12	V1.14	Added explanation of AT+XRESET Command Added FAQ
2013-05-06	V1.2	Divided two documents, Datasheet for Hardware Engineer and Programmers' guide for Software Engineer. More detail information included in datasheet.
2013-10-08	V1.3	Added AT+WSEC Command Added AT+TCERTDEL Command
2014-06-24	V1.31	Removed Standard Library description

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1. Overview

This document provides programmers with all command and explanation about WizFi210 control.

Basically programmers can control WizFi210 with commands set, known as AT command - the character string format.

In this document, we describe what AT command are used, how each command operates and how programmers have to handle those commands to get the response as expected.

2. AT Command Set

This section provides a list of WizFi210 AT commands and their effects. Parameters are generally in ASCII characters, e.g. ATEn with n=1 means series of ASCII characters ‘A’, ‘T’, ‘E’, and ‘1’. The mandatory parameters are denoted by <> and optional parameters by [ ]. If a parameter is mandatory, any associated sub-parameters are also mandatory; sub-parameters of an optional parameter are optional. Parameters must always be provided in the order given in the command description. When an optional parameter is not supplied, the comma delimiters must still be included in the command. Every command starts with the characters “AT”; any other initial characters will cause an error return.

In the most cases, valid commands return the characters OK. Invalid inputs return ERROR: INVALID INPUT.

Some commands are not supported according to the firmware version on WizFi210.

When user issues an AT command, **“Carriage Return(0x0D)” must follows the AT command to inform itstermination**.

The possible responses sent by WizFi210 to the serial host are described below.

If you send “AT” string and Line Feed to WizFi210, ***AT\r (0x61 0x74 0x0d)***

You can get the following data.

AT\r (0x61 0x74 0x0d)[1] + \r\n[OK]\r\n (0x0d 0x0a 0x5b 0x4f 0x4b 0x5d 0x0d 0x0a)

[1] This is **echo back** of what I sent to WizFi210 from it.

ASCII CHAR	Response	ASCII STRING	Meaning
0	S2W_SUCCESS	[OK]	Command Request Success.
1	S2W_FAILURE	[ERROR]	Command Request Failed.
2	S2W_EINVAL	[ERROR: INVALID INPUT]	Invalid Command or Option or Parameter.
3	S2W_SOCK_FAIL	[ERROR: SOCKET FAILURE]	Socket Operation Failed.
4	S2W_ENOCID	[ERROR: NO CID]	All allowed CID's in use, so there was no CID to assign to the new connection.
5	S2W_EBADCID	[ERROR: INVALID CID]	Invalid Connection Identifier.
6	S2W_ENOTSUP	[ERROR: NOT SUPPORTED]	Operation or Feature not supported.
7	S2W_CON_SUCCESS	[CONNECT <CID><info>]	TCP/IP connection successful. <CID> = the new CID in hexadecimal format.
8	S2W_ECIDCLOSE	[DISCONNECT <CID>]	TCP/IP connection with the given CID is closed. This response is sent to the host when a connection is closed either by the remote device or by the serial host.
9	S2W_LINK_LOST	[DISASSOCIATED]	Not associated to a wireless network.
A	S2W_DISASSO_EVT	[Disassociation Event]	Wireless network association lost.

Table1 List of response for AT commands

2.1. AT command category and description

2.1.1. Basic commands

This category is for basic commands

Command	Category	Description
AT	**Format**	**AT**
	Meaning	This command is to check whether WizFi210 is in command mode
	Response	[OK]
ATE	**Format**	**ATE*n***
	Meaning	***n***=0 (Input echo disable) ex)ATE*0* ***n***=1 (Input echo enable) ex)ATE*1*
	Response	**[OK]**
ATV	**Format**	**ATV*n***
	Meaning	***n***=0 (ASCII reply disable) ex) ATV*0* ***n***=1 (ASCII reply enable) ex) ATV*1*
	Response	**[OK]**

Table2 Basic commands

2.1.2. UART / Adapter interface configuration

This category is for commands related to UART setting.

Command	Category	Description
ATB	**Format**	**ATB*<baudrate>[[,[2]<bitsperchar>]*[3]*[,<parity>][,<stopbits>]]***
	Description	***<baudrate>*** : 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 ***<bitsperchar>*** : 5, 6, 7, or 8 ***<parity>*** : n = no parity e = even parity o = odd parity ***<stopbits>*** : 1, 2 or 1.5(in case of a 5-bit character) ※ UART parameters are immediately reset to values provided. ex) ATB=9600,8,n,1
	Response	***[OK]***
AT&K	**Format**	**AT&K*n***

[2]No space is allowed between Parameter, comma(,), and next parameter
[3]The parameter, which is surrounded by [], can be skipped.

<table>
<tr><td></td><td>Description</td><td>n=0 (SW Flow ctrl disable) ex) AT&K0
n=1 (SW Flow ctrl enable) ex) AT&K1</td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td>AT&R</td><td>Format</td><td>AT&Rn</td></tr>
<tr><td></td><td>Description</td><td>n=0 (HW Flow ctrl disable) ex) AT&R0
n=1 (HW Flow ctrl enable) ex) AT&R1</td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td>ATS</td><td>Format</td><td>ATSn,p</td></tr>
<tr><td></td><td>Description</td><td>n=0 to 5
p=(timeout value)
<table>
<tr><th>n</th><th>meaning</th><th>unit</th><th>range</th><th>default</th></tr>
<tr><td>0</td><td>Network connection Timeout</td><td>10ms</td><td>1~65535</td><td>1000</td></tr>
<tr><td>1</td><td>Auto Associate Timeout</td><td>10ms</td><td>0~65535</td><td>500</td></tr>
<tr><td>2</td><td>TCP connection Timeout</td><td>10ms</td><td>0~65535</td><td>500</td></tr>
<tr><td>3</td><td>Association Retry Count</td><td>NA</td><td>NA</td><td>NA</td></tr>
<tr><td>4</td><td>Nagle Algorithm Wait Time</td><td>10ms</td><td>0~65535</td><td>10</td></tr>
<tr><td>5</td><td>Scan Time</td><td>1ms</td><td>0~65535</td><td>20</td></tr>
</table></td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td>ATIn</td><td>Format</td><td>ATIn</td></tr>
<tr><td></td><td>Description</td><td>This command provides version information of WizFi210.
<table>
<tr><th>n</th><th>Meaning</th></tr>
<tr><td>0</td><td>OEM Identification</td></tr>
<tr><td>1</td><td>Hardware version</td></tr>
<tr><td>2</td><td>Software version</td></tr>
</table>
ex)ATI0or ATI2</td></tr>
<tr><td></td><td>Response</td><td>
<table>
<tr><th>Command</th><th>ATI0</th><th>ATI1</th><th>ATI2</th></tr>
<tr><td>Response</td><td>WIZnet

[OK]</td><td>GS1011

[OK]</td><td>WizFi210
1.1.0.5(W)
[OK]</td></tr>
</table></td></tr>
</table>

Table3 UART/Adapter interface commands

2.1.3. Profile management

This category is for commands related to managing a profile which have configuration information.

Command	Category	Description
AT&W	**Format**	**AT&W*n***
	Meaning	***n***=0 (Save profile #0) ex) AT&W*0* ***n***=1 (Save profile #1) ex) AT&W*1*
	Response	[OK]
ATZ	**Format**	**ATZ*n***
	Meaning	***n***=0 (Load profile #0) ex) ATZ*0* ***n***=1 (Load profile #1) ex) ATZ*1*
	Response	[OK]
AT&Y	**Format**	**AT&Y*n***
	Meaning	***n***=0 (Set default configurationto profile #0) ex) AT&Y*0* ***n***=1 (Set default configuration to profile #1) ex) AT&Y*1*
	Response	[OK]
AT&F	**Format**	**AT&F**
	Meaning	**Restore profile to factory default values**
	Response	[OK]
AT&V	**Format**	**AT&V**
	Meaning	**Current and saved profile parameter values as ASCII.**
	Response	[OK]

Table4 List of commands for Profile Management

2.1.4. WiFi interface

This category is for commands related to WiFi interface setting.

Command	Category	Description
AT+NMAC	**Format**	**AT+NMAC= *<MAC Address>***
	Meaning	**Set the adapter's MAC address with <MAC Address>** **Store it to Flash memory** ***<MAC Address>***: colon-delimited 6-byte hexadecimal number ex) AT+NMAC2=*00:08:DC:11:22:33*
	Response	[OK]
AT+NMAC2	**Format**	**AT+NMAC2= *<MAC Address>***

<table>
<tr><td></td><td>Meaning</td><td>Set the adapter's MAC address with <MAC Address>
Store it to non-volatile RAM

<MAC Address>: 6-byte colon-delimited hexadecimal number

ex) AT+NMAC2=00:08:DC:11:22:33</td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td>AT+NMAC</td><td>Format</td><td>AT+NMAC=?</td></tr>
<tr><td></td><td>Meaning</td><td>Get the current adapter's MAC Address stored in Flash memory</td></tr>
<tr><td></td><td>Response</td><td>00:08:dc:17:aa:1d
[OK]</td></tr>
<tr><td>AT+NMAC2</td><td>Format</td><td>AT+NMAC2=?</td></tr>
<tr><td></td><td>Meaning</td><td>Get the current adapter's MAC Address stored in non-volatile RAM</td></tr>
<tr><td></td><td>Response</td><td>00:08:dc:17:aa:1d
[OK]</td></tr>
<tr><td>AT+WREGDOMAIN</td><td>Format</td><td>AT+WREGDOMAIN=<Regulatory Domain></td></tr>
<tr><td></td><td>Meaning</td><td>Set Regulatory Domain with specified value in parameter.
<table><tr><th>Parameter</th><th>Domain</th><th>Channel Range</th></tr><tr><td>0</td><td>FCC</td><td>1 ~ 11</td></tr><tr><td>1</td><td>ETSI</td><td>1 ~ 13</td></tr><tr><td>2</td><td>TELEC</td><td>1 ~ 14</td></tr></table>ex) AT+WREGDOMAIN=0</td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td>AT+WREGDOMAIN</td><td>Format</td><td>AT+WREGDOMAIN=?</td></tr>
<tr><td></td><td>Meaning</td><td>Get Regulatory Domain set in configuration value.</td></tr>
<tr><td></td><td>Response</td><td>REG_DOMAIN=FCC[4]

[OK]</td></tr>
<tr><td>AT+WS</td><td>Format</td><td>AT+WS=[<SSID>[,<BSSID>][,<Channel>][,<Scan Time>]]</td></tr>
<tr><td></td><td>Meaning</td><td>This command is to get AP list which WizFi210 can associate with. User can provide some condition like SSID and channel for filtering.

[<SSID>[,<BSSID>][,<Channel>][,<Scan Time>]].</td></tr>
</table>

[4]This can be changed according to your setting

		The response for this command has the format like below.**<SSID>,<BSSID>,<Channel>,<RSSI>,<Mode>,<Security>** ex) AT+WS ex) AT+WS=,,5
	Response	BSSID SSID Channel Type RSSI Security 00:0a:79:c7:f3:1b, swpark , 01, INFRA , -81 , WEP 02:17:c3:b2:35:0d, , 01, INFRA , -79 , WPA2-PERSONAL cc:b2:55:d2:21:bc, JeongGW , 01, INFRA , -36 , WPA2-PERSONAL 00:26:66:7b:9d:b0, Wiznet_Kaizen , 01, INFRA , -44 , WPA2-PERSONAL 00:40:5a:c4:6f:a1, 3PA-W , 02, INFRA , -38 , WPA2-PERSONAL 00:08:9f:09:d1:d8, Danal_ENT_AP_03 , 03, INFRA , -85 , WPA2-PERSONAL 10:6f:3f:25:c3:8c, BUFF_SJCHUN , 04, INFRA , -78 , WPA2-PERSONAL No.Of AP Found:7 [OK]
AT+WM	**Format**	**AT+WM=*n***
	Meaning	***n***=0 (infrastructure / Station) ***n***=1 (ad hoc) ***n***=2 (limited AP)
	Response	[OK]
AT+WA	**Format**	**AT+WA=*<SSID>[,[<BSSID>][,<Ch>]]***
	Meaning	**This command make WizFi210 associate to an AP specified with parameters. SSID among parameters should not be omitted at least.** ***<SSID>***: the SSID of AP WizFi210 will associate with ***<BSSID>***:the BSSID of AP WizFi210 will associate with. Option ***<Ch>***: the Channel of AP WizFi210 will associate with. Option ex) AT_WA=*WizFiDemoAP*
	Response	IP SubNet Gateway 192.168.3.123: 255.255.255.0: 192.168.3.1 [OK]
AT+WD	**Format**	**AT+WD**
	Meaning	**This command makes WizFi210 disassociate from the current AP** ex) AT+WD
	Response	[OK]

<table>
<tr><td>ATH</td><td>Format</td><td>ATH</td></tr>
<tr><td></td><td>Meaning</td><td>This command makes WizFi210 disassociate from the current AP

ex) ATH</td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td>AT+WWPS</td><td>Format</td><td>AT+WWPS=<METHOD>[,PIN]</td></tr>
<tr><td></td><td>Meaning</td><td>This command make WizFi210 startup itself with the stored provision information.

<METHOD>
<table><tr><th>METHOD</th><th>Meaning</th></tr><tr><td>1</td><td>Set to Limited AP mode with default setting</td></tr><tr><td>2</td><td>Set to Ad hoc mode with default setting</td></tr></table>
<PIN> : PIN value which WizFi210 needs in Limited AP mode</td></tr>
<tr><td></td><td>Response</td><td></td></tr>
<tr><td>AT+NSTAT</td><td>Format</td><td>AT+NSTAT=?</td></tr>
<tr><td></td><td>Meaning</td><td>Get Current wireless and network status.</td></tr>
<tr><td></td><td>Response</td><td>MAC=00:08:dc:17:aa:1d
WSTATE=CONNECTED MODE=AP
BSSID=00:23:69:c8:f4:f5 SSID="WizFiDemoAP" CHANNEL=11
SECURITY=WPA2-PERSONAL RSSI=-48
IP addr=192.168.3.123 SubNet=255.255.255.0 Gateway=192.168.3.1
DNS1=168.126.63.1 DNS2=168.126.63.2
RxCount=10 TxCount=1245

[OK]</td></tr>
<tr><td>AT+WSTATUS</td><td>Format</td><td>AT+WSTATUS</td></tr>
<tr><td></td><td>Meaning</td><td>Get current Wireless status</td></tr>
<tr><td></td><td>Response</td><td>MODE:0 CHANNEL:11 SSID:"WizFiDemoAP"
BSSID:00:23:69:c8:f4:f5 SECURITY:WPA2-PERSONAL

[OK]</td></tr>
<tr><td>AT+WRSSI</td><td>Format</td><td>AT+WRSSI=?</td></tr>
<tr><td></td><td>Meaning</td><td>Get current RSSI value as ASCII</td></tr>
<tr><td></td><td>Response</td><td>-53

[OK]</td></tr>
<tr><td>AT+WRATE</td><td>Format</td><td>AT+WRATE=?</td></tr>
</table>

	Meaning	**Get current transmit rate as ASCII**
	Response	11 [OK]
AT+WRETRY	**Format**	**AT+WRETRY=** ***<retrycount>***
	Meaning	**Set 802.11 TX retry count with** ***<retrycount>*** ***<retrycount>***: Retry Count ex) AT+WRETRY=*5*
	Response	[OK]
AT+WST	**Format**	AT+WST=<Min scan time>,<Max scan time>
	Meaning	**Set the minimum and maximum scan time per channel** <Min scan time> : the minimum scan time per channel <Max scan time> : the maximum scan time per channel. The Max scan time should be always greater than or equal to Min scan time. Both parameters are in milliseconds. The allowed range of Min and Max scan time is 5 to 16000
	Response	[OK]
AT+WST	**Format**	AT+WST=?
	Meaning	**To view the scan time.** This command returns the min and max scan time in milliseconds to the serial interface. By default, minimum and maximum scans time are set to 150 milliseconds
	Response	MinScanTime=150 MaxScanTime=150 [OK]
AT+APCLIENTINFO	**Format**	AT+APCLIENTINFO=?
	Meaning	**Get the information about the clients associated to the adapter when it act as a Limited AP.**
	Response	No.Of Stations Connected=1 No MacAddr IP 1 00:08:DC:00:00:00 192.168.13.101 [OK]

Table5 List of commands for WiFi interface

2.1.5. WiFi security

This category is for commands related to WiFi security

Command	Category	Description
AT+WAUTH	**Format**	**AT+WAUTH=*n***
	Meaning	**Set Authentication Mode** ***n***=0(None) ***n***=1 (Open) ***n***=2 (Shared with WEP) If WizFi210 will be used as Limited AP, you must put this command with parameter '1' ex) AT+WAUTH=1
	Response	[OK]
AT+WSEC	**Format**	**AT+WSEC=n**
	Meaning	**Supported a strict security configuration** **n** = 0 (Auto security) **n** = 1 (Open security) **n** = 2 (WEP security) **n** = 4 (WPA-PSK security) **n** = 8 (WPA2-PSK security) **n** = 16 (WPA2 Enterprise) **n** = 64 (WPA2-AES + TKIP security) ex) AT+WSEC=8
	Response	[OK]
AT+WWEP	**Format**	**AT+WWEP*n*= *<key>***
	Meaning	**When AP, which WizFi210 will associate with, is using WEP Security, this command transfer WEP key to WizFi210.** Butwhen WizFi210 operates as Limited AP, it uses KEY, which transferred, as its own key. ***n***=1 to 4 (Key index) ***<key>:***(Key value in ASCII) ex) AT+WWEP*1=1234567890*

	Response	[OK]
AT+WWPA	**Format**	**AT+WWPA= *<passphrase>***
	Meaning	**When AP, which WizFi210 will associate with, is using WPA Security, this command transfer WPA passphrase to WizFi210.** ButWhen WizFi210 operates as Limited AP, this command is not meaningless, as WizFi210 doesn't support WPA Security. ***<passphrase>:*** (passphrase value in ASCII) ex) AT+WWPA=*12345678*
	Response	[OK]
AT+WPAPSK	**Format**	**AT+WPAPSK= *<SSID>,<passphrase>***
	Meaning	**When AP, which WizFi210 will associate with, is using WPA2PSK Security, this command transfer SSID and passphrase to WizFi210.**ButWhen WizFi210 operates as Limited AP, this command is not meaningless, as WizFi210 doesn't support WPA2PSK Security. ***<SSID> : AP's SSID*** ***<passphrase> : Key value for associating to AP*** ex)AT+WPAPSK=*WizFiDemoAP,12345678*
	Response	[OK]
AT+WPSK	**Format**	**AT+WPSK= *<PSK>***
	Meaning	**When AP, which WizFi210 will associate with, is using WPA2(Pre Shared Key) Security, this command transfer Pre Shared Key to WizFi210.** ButWhen WizFi210 operates as Limited AP, this command is not meaningless, as WizFi210 doesn't support this security. ***<PSK> : Pre Shared Key*** ex)AT+WPSK=000102030405060708090001O2 (?)
	Response	[OK]
AT+WEAPCONF	**Format**	**AT+ WEAPCONF= *<Outer Authentication>,<Inner Authentication>,<user name>,<password>***
	Meaning	**This is a command for setting EAP Security mode** ***<Outer Authentication>***

<table>
<tr><td></td><td></td><td>
<table>
<tr><th>Mode</th><th>Value(in ASCII)</th></tr>
<tr><td>EAP-FAST</td><td>43</td></tr>
<tr><td>EAP-TLS</td><td>13</td></tr>
<tr><td>EAP-TTLS</td><td>21</td></tr>
<tr><td>EAP-PEAP</td><td>25</td></tr>
</table>
<Inner Authentication>
<table>
<tr><th>Mode</th><th>Value(in ASCII)</th></tr>
<tr><td>EAP-MSCHAP</td><td>26</td></tr>
<tr><td>EAP-GTC</td><td>6</td></tr>
</table>
<user name>: User Name
<password>: Password

ex) AT+WEAPCONF=43,26,guest,1234
</td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td>AT+WEAP</td><td>Format</td><td>AT+WEAP=<Type>,<Format>,<Size>,0
[OK][5]<= Response from WizFi210
<ESC>W <data of size above></td></tr>
<tr><td></td><td>Meaning</td><td>This is a command to set which certificate WizFi210 will use.
You can use only one of three type and more than two types with multiple of this command having different parameter.
<Type>
<table>
<tr><th>Type</th><th>Value(in ASCII)</th></tr>
<tr><td>CA certificate</td><td>0</td></tr>
<tr><td>Client certificate</td><td>1</td></tr>
<tr><td>Private Key</td><td>2</td></tr>
</table>
<Format>
0 : Binary, 1: Hex
<Size>: size of the file to be transferred

ex) AT+WEAP=2,0,100,0<ESC>[6]W<....data....>[7]
ex) AT+WEAP=0,0,100,0<ESC>W<...data...>
AT+WEAP=1,0,200,0<ESC>W<...data...>
AT+WEAP=2,0,150,0<ESC>W<...data...></td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
</table>

[5]After receiving this reply, user has to send data following escape sequence
[6]<ESC> means ESC Char in ASCII Table, its value is 0x1B in HEX code.
[7]<…data…> means real data of 100 bytes to transfer, as its size field has 100.

AT+TCERTADD	**Format**	**AT+TCERTADD=*<Name>,<Format>,<Size>,<Location>*** [OK][8]<= Response from WizFi210 ***<ESC>W<Certificate data in binary>***
	Meaning	**The Command to configure the certificate for SSL/HTTPS connection** This command enables the adapter to receive the certificate for SSL/HTTPS connection. It stores the certificate in flash or ram depends on the parameter. ***<Name>***: Name of the certificate ***<Format>* :** 0 : Binary, 1 : Hex ***<Size>***: Size of the file to be transferred ***<Location>*** 0 : Flash, 1 : Ram
	Response	[OK]
AT+TCERTDEL	**Format**	**AT+TCERTDEL=<certificate name>** [OK]
	Meaning	**This command deletes the SSL/HTTPS/EAP-TLS certificate stored in flash/ram by name.** In the case of EAP-TLS certificate names are: - **TLS_CA** - **TLS_CLIEN**T - **TLS_KEY**
	Response	[OK]

Table6 List of commands for WiFi Security

2.1.6. Wireless configuration

This category is for commands related to configure RF signal of WizFi210/220

Command	Category	Description
AT+WRXACTIVE	**Format**	**AT+WRXACTIVE=*n***
	Meaning	***n***=0 (802.11 radio disable) ***n***=1 (802.11 radio enable) ex) AT+WRXACTIVE=*1*
	Response	[OK]

[8]After receiving this reply, user has to send data following escape sequence

<table>
<tr><td rowspan="3">AT+WRXPS</td><td>Format</td><td>AT+WRXPS=n</td></tr>
<tr><td>Meaning</td><td>n=0 (Power Save mode disable)
n=1 (Power Save mode enable)
ex) AT+WRXPS=1</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="3">AT+MCSTSET</td><td>Format</td><td>AT+MCSTSET=n</td></tr>
<tr><td>Meaning</td><td>n=0 (Multicast reception disable)
n=1 (Multicast reception enable)
ex) AT+MCSTSET=0</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="3">AT+WP</td><td>Format</td><td>AT+WP=<<i>power</i>></td></tr>
<tr><td>Meaning</td><td><table><tr><th>Device</th><th>Power range</th></tr><tr><td>WizFi210</td><td>0 ~ 7</td></tr><tr><td>WizFi220</td><td>2 ~ 15</td></tr></table>According to Value is getting smaller, TX Power is getting stronger.
ex) AT+WP=0</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="3">AT+WSYNCI
NTRL</td><td>Format</td><td>AT+WSYNCINTRL=n</td></tr>
<tr><td>Meaning</td><td>n=1 to 65535.
Set Sync Loss Interval with n
ex) AT+WSYNCINTRL=30</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="3">AT+EXTPA</td><td>Format</td><td>AT+EXTPA=n</td></tr>
<tr><td>Meaning</td><td>n=0 (External PA disable)
n=1 (External PA enable)
ex) AT+EXTPA=0</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="3">AT+PSPOLLI
NTRL</td><td>Format</td><td>AT+PSPOLLINTRL=n</td></tr>
<tr><td>Meaning</td><td>n= 1 to 65535.
Set the Keep Alive Timer Interval with n
ex) AT+PSPOLLINTRL=45</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="2">AT+WAPSM</td><td>Format</td><td>AT+WAPSM=<value></td></tr>
<tr><td>Meaning</td><td>The command to configure 802.11 Power Save Mode to be used during the association is
Based on the <value>provided, the following scheme is adopted for</td></tr>
</table>

<table>
<tr><td></td><td></td><td>power save mode<table><tr><th colspan="4">Default Radio Rx Mode</th></tr><tr><td>Value</td><td>Active Mode</td><td>PS Poll Mode</td><td>OFF</td></tr><tr><td>0</td><td colspan="3">Receiver is kept active ON throughout the joining procedure. (Default)</td></tr><tr><td>1</td><td rowspan="3">Receiver is active ON throughout the joiningprocedure</td><td>Receiver is active ON but isin PS Poll mode during timeconsuming key calculationduring the joining procedure</td><td>Receiver is active ONbut turned OFF duringtime consuming keycalculation during thejoining procedure</td></tr><tr><td>2</td><td rowspan="2">Receiver is kept PS POLLmode throughout the joiningprocedure</td><td>Receiver is kept PS POLL mode throughoutthe joining procedure</td></tr><tr><td>3</td><td>Receiver is kept ON inPS POLL mode butturned OFF during timeconsuming keycalculation during theassociation procedure</td></tr></table></td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td>AT+WIEEEPS POLL</td><td>Format</td><td>AT+WIEEEPSPOLL=<n>,[Listen beacon interval]</td></tr>
<tr><td></td><td>Meaning</td><td><n> is 0, to disable this feature and <n> is 1 for enable this feature.
If it is enabled, then the second parameterlistens during the beacon interval and at valid beacon intervals where the WLAN wakes up for listeningto the beacon. Although this is a 16bit value, the maximum recommended is 10.
On execution of this command, the adapter will set the listen interval for n beacons. This command
accepts interval from 1 to 65535 beacons.
The parameters set using this command will come in to force only at the time of Association done afterthe command is issued.</td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
</table>

Table7 List of commands for Wireless(RF) configuration

2.1.7. Network interface

This category is for commands related to Network information setting.

Command	Category	Description
AT+NDHCP	**Format**	**AT+NDHCP= *n***
	Meaning	***n***=0 (DHCP mode disable)

		n =1 (DHCP mode enable) If DHCP mode is disabled, Users have to use "AT+NSET=..." command to set the adapter's static network information.
	Response	[OK]
AT+DHCPSRVR	**Format**	**AT+DHCPSRVR= *n***
	Meaning	***n*** =0 (DHCP Server disable) ***n*** =1 (DHCP Server enable) Prior to start the DHCP server, the adapter should be configured with a valid static ip address using "AT+NSET=..."
	Response	[OK]
AT+NSET	**Format**	**AT+NSET= *<Src Address>,<Net-mask>,<Gateway>***
	Meaning	***<Src Address>,<Net-mask>,<Gateway>*** Set static network information; overrides previous values. ex)AT+NSET=*192.168.3.100,255.255.255.0,192.168.3.1*
	Response	[OK]
AT+DNSLOOKUP	**Format**	**AT+DNSLOOKUP= *<URL>,[<retry>,[<timeout=S>]***
	Meaning	***<URL>,[<retry>,[<timeout=S>]*** Query DNS server for address of hostname URL Ex)AT+DNSLOOKUP=*google.com*
	Response	[OK]
AT+DNSSET	**Format**	**AT+DNSSET= *<DNS1 IP>,[<DNS2 IP>]***
	Meaning	***<DNS1 IP>,[<DNS2 IP>]*** Set the DNS server addresses to be used. Ex)AT+DNSSET=*192.168.3.1*
	Response	[OK]
AT+STORENWCONN	**Format**	**AT+STORENWCONN**
	Meaning	**Store network connection parameters prior to transition to Standby**
	Response	[OK]
AT+RESTORENWCONN	**Format**	**AT+RESTORENWCONN**
	Meaning	**Restore network connection parameters after wake from Standby.**
	Response	[OK]
AT+NARP	**Format**	**AT+NARP=?**
	Meaning	The interface get the ARP entries present in the adapter's network stack and send to the serial interface in the following format MACaddress<space>:<space>IP address The Macaddress format is xx:xx:xx:xx:xx:xx and the IP address format is xxx.xxx.xxx.xxx

	Response	00:26:66:7b:9d:b1 : 192.168.12.1 [OK]
AT+NARPCHACHEEN	**Format**	**AT+NARPCHACHEEN=<Enable>**
	Meaning	The adapter support caching of the ARP entries(max 8)in its nonvolatile memory and available across standby wakeup cycle. <Enable> : 1 to start the caching and 0 to stop the caching.
	Response	[OK]
AT+NARPCHACHEDEL	**Format**	**AT+NARPCHACHEDEL**
	Meaning	No Parameter Delete ARP entries
	Response	[OK]

Table8 List of commands for Network interface

2.1.8. Connection management

This category is for commands related to handling TCP and UDP socket.

Command	Category	Description
AT+NCTCP	**Format**	**AT+NCTCP=*<DestAddress>,<Port>***
	Meaning	**Create TCP Client socket and make it try to connect to Destination with Dest Address and Port** ***<DestAddress>***: Server's IP address ***<Port>***: Server's Listen port number ex)AT+NCTCP=*192.168.3.200,5000*
	Response	[OK]
AT+NCUDP	**Format**	**AT+NCUDP=*<DestAddress>,<Port> [<,Src.Port>]***
	Meaning	**Open an UDP Socket with destination address and port number. Use this command whenever you already know peer's IP address and port number.** **You can specify source port optionally if you want this socket has a specific port number.** ***<DestAddress>***: Peer's IP address ***<Port>***: Peer's port number ***[<,Src.Port>]***: Local port number ex)AT+NCUDP=*192.168.3.200,5000*
	Response	

<table>
<tr><td rowspan="3">AT+NSTCP</td><td>Format</td><td>AT+NSTCP=<Port></td></tr>
<tr><td>Meaning</td><td>Create a TCP server socket and Listen for peer system to connect. If a connection is established with this server socket, you will get another <CID> for communication with the peer system.

<Port>: Local Listen port number

ex) AT+NSTCP=5000</td></tr>
<tr><td>Response</td><td></td></tr>
<tr><td rowspan="3">AT+NSUDP</td><td>Format</td><td>AT+NSUDP=<Port></td></tr>
<tr><td>Meaning</td><td>Open an UDP Socket with source port. You can use this command for application which many unknown devices send UDP data to your already known socket first.

<Port>: Local port number

ex)AT+NSUDP=5000</td></tr>
<tr><td>Response</td><td></td></tr>
<tr><td rowspan="3">AT+CID</td><td>Format</td><td>AT+CID=?</td></tr>
<tr><td>Meaning</td><td>Get the current connection status with CID</td></tr>
<tr><td>Response</td><td><table>
<tr><td>In case of some Connections</td><td>CIDTYPEMODELOCAL PORTREMOTE PORTREMOTE IP
0TCPCLIENT52388 35001192.168. 3.105

[OK]</td></tr>
<tr><td>In case of no Connection</td><td>No valid Cids

[OK]</td></tr>
</table></td></tr>
<tr><td rowspan="3">AT+NCLOSE</td><td>Format</td><td>AT+NCLOSE=<CID></td></tr>
<tr><td>Meaning</td><td><CID> : Connection ID, 0 ~ F

ex)AT+NCLOSE=1</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="3">AT+NCLOSE ALL</td><td>Format</td><td>AT+NCLOSEALL</td></tr>
<tr><td>Meaning</td><td>Close all connections</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
</table>

<table>
<tr><td rowspan="3">AT+SETSOCKOPT</td><td>Format</td><td>AT+SETSOCKOPT=<CID>,<Type>,<Parameter>,<Value>,<Length></td></tr>
<tr><td>Meaning</td><td>Set a Socket option having a specified CID</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="3">AT+SSLOPEN</td><td>Format</td><td>AT+SSLOPEN=<cid>,<certificate name>(*)</td></tr>
<tr><td>Meaning</td><td>Open a SSL Connection

<cid>: Connection ID
<certificate name>: Certificate Name</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="3">AT+SSLCLOSE</td><td>Format</td><td>AT+SSLCLOSE=<cid>(*)</td></tr>
<tr><td>Meaning</td><td>Close a SSL Connection

<cid>: Connection ID</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="2">AT+HTTPCONF</td><td>Format</td><td>AT+HTTPCONF=<Param>,<Value>(*)</td></tr>
<tr><td>Meaning</td><td>Set a specific parameter of configuration information for HTTP Clientwith <Value>.

<Param>
<table>
<tr><th>value</th><th>Meaning</th></tr>
<tr><td>2</td><td>HTTP_HEADER_AUTHORIZATION</td></tr>
<tr><td>3</td><td>HTTP_HEADER_CONNECTION</td></tr>
<tr><td>4</td><td>HTTP_HEADER_CONTENT_ENCODING</td></tr>
<tr><td>5</td><td>HTTP_HEADER_CONTENT_LENGTH</td></tr>
<tr><td>6</td><td>HTTP_HEADER_CONTENT_RANGE</td></tr>
<tr><td>7</td><td>HTTP_HEADER_CONTENT_TYPE</td></tr>
<tr><td>8</td><td>HTTP_HEADER_DATE</td></tr>
<tr><td>9</td><td>HTTP_HEADER_EXPIRES</td></tr>
<tr><td>10</td><td>HTTP_HEADER_FROM</td></tr>
<tr><td>11</td><td>HTTP_HEADER_HOST</td></tr>
<tr><td>12</td><td>HTTP_HEADER_IF_MODIFIED_SINCE</td></tr>
<tr><td>13</td><td>HTTP_HEADER_LAST_MODIFIED</td></tr>
<tr><td>14</td><td>HTTP_HEADER_LOCATION</td></tr>
<tr><td>15</td><td>HTTP_HEADER_PRAGMA</td></tr>
<tr><td>16</td><td>HTTP_HEADER_RANGE</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>17</td><td>HTTP_HEADER_REFERER</td></tr>
<tr><td>18</td><td>HTTP_HEADER_SERVER</td></tr>
<tr><td>19</td><td>HTTP_HEADER_TRANSFER_ENCODING</td></tr>
<tr><td>20</td><td>HTTP_HEADER_USER_AGENT</td></tr>
<tr><td>21</td><td>HTTP_HEADER_WWW_AUTHENTICATE</td></tr>
<tr><td>23</td><td>HTTP_HEADER_REQUEST_URL</td></tr>
</table>

<Value>: a string value for a corresponding parameter above.

ex)AT+HTTPCONF=20,User-Agent: Mozilla/5.0₩r
</td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td>AT+HTTPCONFDEL</td><td>Format</td><td>AT+HTTPCONFDEL=<Param></td></tr>
<tr><td></td><td>Meaning</td><td>Remove an http client configuration.
Upon reception of this command the adapter removes the HTTP configuration specified by the param.
The ‘param’ is the HTTP header and is one of the following:
<Param>
<table>
<tr><th>value</th><th>Meaning</th></tr>
<tr><td>2</td><td>HTTP_HEADER_AUTHORIZATION</td></tr>
<tr><td>3</td><td>HTTP_HEADER_CONNECTION</td></tr>
<tr><td>4</td><td>HTTP_HEADER_CONTENT_ENCODING</td></tr>
<tr><td>5</td><td>HTTP_HEADER_CONTENT_LENGTH</td></tr>
<tr><td>6</td><td>HTTP_HEADER_CONTENT_RANGE</td></tr>
<tr><td>7</td><td>HTTP_HEADER_CONTENT_TYPE</td></tr>
<tr><td>8</td><td>HTTP_HEADER_DATE</td></tr>
<tr><td>9</td><td>HTTP_HEADER_EXPIRES</td></tr>
<tr><td>10</td><td>HTTP_HEADER_FROM</td></tr>
<tr><td>11</td><td>HTTP_HEADER_HOST</td></tr>
<tr><td>12</td><td>HTTP_HEADER_IF_MODIFIED_SINCE</td></tr>
<tr><td>13</td><td>HTTP_HEADER_LAST_MODIFIED</td></tr>
<tr><td>14</td><td>HTTP_HEADER_LOCATION</td></tr>
<tr><td>15</td><td>HTTP_HEADER_PRAGMA</td></tr>
<tr><td>16</td><td>HTTP_HEADER_RANGE</td></tr>
<tr><td>17</td><td>HTTP_HEADER_REFERER</td></tr>
<tr><td>18</td><td>HTTP_HEADER_SERVER</td></tr>
<tr><td>19</td><td>HTTP_HEADER_TRANSFER_ENCODING</td></tr>
<tr><td>20</td><td>HTTP_HEADER_USER_AGENT</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td></td><td><table><tr><td>21</td><td>HTTP_HEADER_WWW_AUTHENTICATE</td></tr><tr><td>23</td><td>HTTP_HEADER_REQUEST_URL</td></tr></table></td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td>AT+HTTPOPEN</td><td>Format</td><td>AT+HTTPOPEN=<host>[,<Port Number>,<SSL Flag>,<certificate name>,<proxy>](*)</td></tr>
<tr><td></td><td>Meaning</td><td>Open an HTTP Client connection. This command opens an HTTP Client socket on WizFi210 and tries to connect to the server specified by the host name or IP address in <host> field.

<host>: Domain name or IP address of the Server
<Port Number>: a port number on which the Server is listening
In default, 80 for HTTP and 443 for HTTPS
<SSL Flag><table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>SSL Disabled(Default)</td></tr><tr><td>1</td><td>SSL Enabled</td></tr></table><certificate name>
The name of CA Certificate to be used in SSL enabled.
CA Certificate should be provided to WizFi210 in advance.
<proxy>
0 : not using a proxy server
1: using a proxy server</td></tr>
<tr><td></td><td>Response</td><td>0(Connected Socket's CID)
[OK]</td></tr>
<tr><td>AT+HTTPSEND</td><td>Format</td><td>AT+HTTPSEND=<cid>,<Type>,<Timeout>,<Page>,[<Size of content>]

<ESC>H<Contents>(*)</td></tr>
<tr><td></td><td>Meaning</td><td>Send GET/POST HTTP data on the HTTP client connection to peer system.

<cid> : CID for the HTTP Client socket
<Type><table><tr><th>Value</th><th>Meaning</th></tr><tr><td>1</td><td>HTTP_METHOD_GET</td></tr><tr><td>3</td><td>HTTP_METHOD_POST</td></tr></table><Timeout> : Timeout value in seconds
<Page> : The page or script name being accessed</td></tr>
</table>

		<Size of content> : Actual contents size, this can be omitted in case of GET ex)AT+HTTPSEND=0,1,10,/
	Response	Response data in escaped sequence format from HTTP(S) Server
AT+HTTPCLOSE	**Format**	**AT+HTTPCLOSE=*<cid>*(*)**
	Meaning	**Close the HTTP client connection.** ***<cid> : CID for the HTTP Client socket*** ex)AT+HTTPCLOSE=0
	Response	[OK]
AT+NRAW	**Format**	**AT+NRAW=*n***
	Meaning	**Enable / Disable Raw Ethernet support.** ***n***=0 ***n***=1 ***n***=2
	Response	[OK]
AT+UNSOLICITEDTX	**Format**	**AT+UNSOLICITEDTX= *<Frame Control>,<Sequence Cntrl>,<Channel>,<Rate>,<WmmInfo>, <Receiver Mac>,<Bssid of AP>,<Frame Length>***
	Meaning	**Unsolicited data transmission.**
	Response	[OK]

Table9 List of commands for Connection Management

(*) is specialized functions for HTTP Client/SSL,not the part of standard firmware. If you want these functions, we can use the WizFi210 firmware for Enterprise.

2.1.9. Battery check

This category is for commands related to handling Battery when user use Battery with WizFi210/220.

Command	Category	Description
AT+BCHKSTRT	**Format**	**AT+BCHKSTRT=*<Batt.chk.freq>***
	Meaning	**Start checking battery** **each 0 <Batt.chk.freq≤ 100 packets transmitted.** ***<Batt.chk.freq>***: Battery Check Frequency
	Response	[OK]
AT+BATTLVLSET	**Format**	**AT+ BATTLVLSET=*<Warning Level>,<Warning Freq>,<Standby Level>***
	Meaning	**Set the battery warning/standby level to enable WizFi210/220's internal battery measuring logic.**
	Response	[OK]
AT+BCHK	**Format**	**AT+BCHK=*<Batt.chk.freq>***
	Meaning	**Reset value of battery check frequency.** ***<Batt.chk.freq>***: Battery Check Frequency
	Response	[OK]
AT+BCHKSTOP	**Format**	**AT+BCHKSTOP**
	Meaning	**Stop checking battery.**
	Response	[OK]
AT+BATTVALGET	**Format**	**AT+BATTVALGET**
	Meaning	**Retrieve the most recent battery check value.**
	Response	[OK]

Table10 List of commands for Battery check

2.1.10. Power state management

This category is for commands related to Power saving mode.

Command	Category	Description
AT+PSDPSLEEP	**Format**	**AT+PSDPSLEEP**
	Meaning	**Enable SOC Deep Sleep power saving mode.**
	Response	[OK]
AT+PSSTBY	**Format**	**AT+PSSTBY=*<x>[,<DelayTime>,<Alarm1 pol.>,<Alarm2 pol.>]***
	Meaning	**Request transition to Standby for x milliseconds.** ***<x>[,<DelayTime>,<Alarm1 pol.>,<Alarm2 pol.>]*** ex)AT+PSSTBY=*60000,1000,1,1* ex) AT+PSSTBY=*5000*
	Response	[OK]

Table11 List of commands for Power state management

2.1.11. Auto connection

This category is for commands related to Auto Connection mode.

Command	Category	Description
AT+WAUTO	**Format**	**AT+WAUTO=*<mode>,<SSID>,[BSSID],[channel]***
	Meaning	**Sets WiFi parameters to be used for Auto Connect.** **Mode is 0 for Infrastructure, 1 for Ad-hoc mode and 2 for Limited-AP mode.** ***<mode>***: Operating mode ***<SSID>***: SSID of AP which WizFi210 will associate with ***[BSSID]***: BSSID of AP which WizFi210 will associate with. ***[channel]***: Channel of AP which WizFi210 will associate with. Ex) AT+WAUTO=0,WizFiDemoAP
	Response	[OK]
AT+NAUTO	**Format**	**AT+NAUTO=*<Type>,<Protocol>,<Destination IP>,<Destination Port>***
	Meaning	**Sets network parameters to be used for Auto Connect.** ***<Type>***: 0 for Client, 1 for Server ***<Protocol>***: 0 for UDP, 1 for TCP ***<Destination IP>***: Server's IP address

		<Destination Port>: Server's Listen port num or Local port num ex)AT+NAUTO=0,1,192.168.3.101,5000 (TCP/Client) ex) AT+NAUTO=1,1, ,5001 (TCP/Server) ex) AT+NAUTO=0,0,192.168.3.101,5002(UDP, Port is 5002)
	Response	[OK]
ATC	**Format**	**ATC*n***
	Meaning	**After next reboot or next "AT" command, this will be affected.** ***n***=0 (Auto Connect is disable) ***n***=1 (Auto Connect is enable)
	Response	[OK]
ATA	**Format**	**ATA**
	Meaning	**Start Auto Connect, including association.**
	Response	[OK]
ATA2	**Format**	**ATA2**
	Meaning	**Start Auto Connect using existing association.**
	Response	[OK]
ATO	**Format**	**ATO**
	Meaning	**Return to a previous Auto Connect session, returns an error if no such session exists.** **We use this command normally when using data mode for exchanging data.** **You already exchanged data on a previous Auto Connect session in Data mode, and you exited[9] out AT command mode shortly in order to execute any AT command without terminating that session. After execution, You use this command to return into Data mode.**
	Response	No Response. Just change to Data mode
AT+XAR	**Format**	**AT+XAR=*n***
	Meaning	**Auto reconnect interval.** ***n***=0 (disable) ***n***=5 to 3600 (interval, seconds)

[9] In order to exit from Data mode to AT command mode, you have to write +++(0x2B 0x2B 0x2B) without any followed char during more than 2 seconds.

		ex) AT+XAR=*0*, AT+XAR=*10*
	Response	[OK]

Table12 List of commands for Auto Connection

2.1.12. Provisioning

This category is for commands related to WPS.

Command	Category	Description
AT+WEBPROV	**Format**	**AT+WEBPROV=*<user name>,<passwd>***
	Meaning	**Provisioning through web pages.** ***<user name>***: user name ***<passwd>***: password
	Response	[OK]
AT+WEBLOGOADD	**Format**	**AT+WEBLOGOADD=*<size>***
	Meaning	**Adding the Logo that will appear on the web pages used for provisioning.** ***<size>***: maximum size is 1788 bytes
	Response	[OK]

Table13 List of commands for Provisioning

2.1.13. Miscellaneous

This category is for commands related to general setting.

Command	Category	Description
AT+FWUP	**Format**	**AT+FWUP=*<SrvIp>,<SrvPort>,<SrcPort>,[<retry>]***
	Meaning	**Get a firmware upgrade from the server address/port to the adapter port SrcPort.** ***<SrvIp>***: Server's IP address ***<SrvPort>***: Server's Port number ***<SrcPort>***: Local port number of WizFi210 ***<retry>***: retry count ex)AT+FWUP=192.168.3.200,667,667
	Response	[OK]

AT+SETTIME	**Format**	**AT+SETTIME=*<dd/mm/yyyy>,<HH:MM:SS>***
	Meaning	**Set the adaptor system time.** ***<dd/mm/yyyy>***: Date ***<HH:MM:SS>***: Time ex) AT+SETTIME=11/04/2013,09:00:00
	Response	[OK]
AT+GETTIME	**Format**	**AT+ GETTIME=*?***
	Meaning	**Upon reception of this command the adaptor sends the current system time in milliseconds since epoch(1970) to the serial interface. The time format comes on the serial interface as follows:**
	Response	[OK]
AT+DGPIO	**Format**	**AT+DGPIO=*<GPIO-NO>,<SET/RESET(0/1)>***
	Meaning	**Set or reset (high/low) a GPIO pin** ***<GPIO-NO>***: GPIO number ***<SET/RESET(0/1)>***: GPIO value to set ex) AT+DGPIO=31,0
	Response	[OK]
AT+XGPIO	**Format**	**AT+XGPIO=<GPIO-NO>**
	Meaning	Get a GPIO pin status(high/low).
	Response	GPIO-No is High or GPIO-No is Low.
AT+PING	**Format**	**AT+PING=*<IP>,[[Trails],[<Interval>],[<Len>],[<TOS>],[<TTL>],[<PAYLOAD>]]***
	Meaning	**PING the IP address provided. Trails = 0 will ping until <Esc> C is issued.** ***<IP>*** : Target's IP address ***<Trails>***: Option ***<Interval>***: Option ***<Len>***: Option ***<TOS>***: Option ***<TTL>***: Option ***<PAYLOAD>***: Option Ex)AT+PING=192.168.3.1,5

<table>
<tr><td></td><td>Response</td><td>Pinging for 192.168.3.1 with 56 bytes of data

[OK]

Reply from 192.168.3.1: bytes=56 time=17 ms TTL 30
Reply from 192.168.3.1: bytes=56 time=4 ms TTL 30
Reply from 192.168.3.1: bytes=56 time=2 ms TTL 30
Reply from 192.168.3.1: bytes=56 time=2 ms TTL 30
Reply from 192.168.3.1: bytes=56 time=3 ms TTL 30

Ping Statistics for 192.168.3.1:
Packets: Sent = 5, Received = 5, Lost = 0 percent
Approximate round trip times in milliseconds
Minimum = 2ms, Maximum = 17ms, Average = 5ms</td></tr>
<tr><td rowspan="3">AT+TRACEROUTE</td><td>Format</td><td>AT+TRACEROUTE=<IP>,[[<Interval>],[<MaxHops>],[<MinHops>],[<TOS>]]</td></tr>
<tr><td>Meaning</td><td>Trace the route to the IP address provided.

<IP>: Target's IP address
<Interval>: Option
<MaxHops>: Option
<MinHops>: Option
<TOS>: Option

Ex)AT+TRACEROUTE=74.125.155.103</td></tr>
<tr><td>Response</td><td>Tracing Route to 74.125.235.145 over a max hops 30

[OK]

1 3 ms 3 ms 2 ms 192.168.3.1
2 4 ms 4 ms 3 ms 222.98.173.254
3 5 ms 4 ms 3 ms 121.190.34.69
4 * * * Request timed out
5 3 ms 3 ms 7 ms 112.189.127.21
6 5 ms 4 ms 5 ms 125.130.13.233
7 38 ms 10 ms 7 ms 112.174.15.133
8 5 ms 5 ms 5 ms 112.174.81.102
9 5 ms 5 ms 4 ms 112.174.83.50
10 101 ms 73 ms 71 ms 72.14.195.22</td></tr>
</table>

<table>
<tr><td></td><td></td><td>11 71 ms 90 ms 72 ms 209.85.255.80
12 91 ms 113 ms 93 ms 209.85.249.195
13 74 ms 73 ms 73 ms 209.85.241.129
14 74 ms 77 ms 77 ms 74.125.235.145

Trace Complete</td></tr>
<tr><td rowspan="3">AT+BDATA</td><td>Format</td><td>AT+BDATA=n</td></tr>
<tr><td>Meaning</td><td>This command is to set whether Data is handled in Bulk mode.

n=1 (Bulk Data mode is enable)
n=0 (Bulk Data mode is disable)</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="3">AT+XDUM</td><td>Format</td><td>AT+XDUM=n</td></tr>
<tr><td>Meaning</td><td>This command is to set whether Notification from WizFi210 regarding of some event become enable.

n=1 (Notification Message is disable)
n =0 (Notification Message is enable)</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="2">AT+XEHT</td><td>Format</td><td>AT+XEHT=<HW Trigger GPIO>,<ActiveReverse>,<SW Trigger Disable>,<ButtonAction></td></tr>
<tr><td>Meaning</td><td>This command is to set Hardware Trigger handling transition of between command mode and data mode.

<HW Trigger GPIO>
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>0</td><td>Disable HW Trigger</td></tr>
<tr><td>1</td><td>GPIO10</td></tr>
<tr><td>2</td><td>GPIO29</td></tr>
</table>
<ActiveReverse>
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>0</td><td>Change to Active Low</td></tr>
<tr><td>1</td><td>Change to Active High</td></tr>
</table>
<SW Trigger Disable>
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>0</td><td>+++ Escape Sequence Enable</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>1</td><td>+++ Escape Sequence Disable</td></tr>
</table>

<ButtonAction>
This parameter is to select a button for factory default provisioning
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>1</td><td>GPIO10</td></tr>
<tr><td>3</td><td>GPIO21</td></tr>
</table>

ex) AT+XEHT=2,1,0,3 (Default)
ex) AT+XEHT=1,0,0,1 (in old EVB)
</td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td>AT+RESET</td><td>Format</td><td>AT+RESET</td></tr>
<tr><td></td><td>Meaning</td><td>The command forcefully reset the WizFi210</td></tr>
<tr><td></td><td>Response</td><td>APP Reset-APP SW Reset</td></tr>
<tr><td>AT+ERRCOUNT</td><td>Format</td><td>AT+ERRCOUNT=?</td></tr>
<tr><td></td><td>Meaning</td><td>Get the error count statistics.
This command returns error count information to the interface followed by the standard command response
The error counts include:
- Watchdog reset counts
- Software reset counts
- WLAN abort/assert counts</td></tr>
<tr><td></td><td>Response</td><td>APP-WD :0
WLAN-WD :0
WLAN-ABORT :0
WLAN-ASSERT:0
APP-SW-RST :0
WLAN-SW-RST:0

[OK]</td></tr>
</table>

Table14 List of commands for Miscellaneous

2.1.14. Network Connection Manager(NCM)

The WizFi210 supports network connection manager which manage L2, L3 and L4 level connection automatically.

<table>
<tr><th>Command</th><th>Category</th><th>Description</th></tr>
<tr><td rowspan="2">AT+NCMAUTO</td><td>Format</td><td>AT+NCMAUTO=<Mode>.<Start/Stop>,[Level]</td></tr>
<tr><td>Meaning</td><td>This command start the NCM by connecting to the AP(if the mode configured as station) or create a limited AP(if the mode configured as limited AP) with the pre-configured parameters.
<Mode> : 0 is for station mode and 1 is for limited AP mode
<Start/Stop> : 1 is for start the NCM and 0 is for stop the NCM
<Level> : 0 is for L2+L3 Connection and 1 is for L2+L3+L4 connection

Once it connected any of the L2,L3 and L4 disconnection triggers the NCM and it starts do the L2,L3 and L4 re-connection.</td></tr>
<tr><td></td><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="2">AT+NCMAUTOCONF</td><td>Format</td><td>AT+NCMAUTOCONF=<ConfID>,<Value></td></tr>
<tr><td>Meaning</td><td>The NCM use some configurable parameters for its state machine.
<ConfId>:The id corresponding to the NCM Configuration parameters.
<table>
<tr><th>ConfId</th><th>Meaning</th></tr>
<tr><td>0</td><td>CPU Wait Period
(1 to 65355 msec, default is 1000msec)</td></tr>
<tr><td>1</td><td>Power Save Period(not supported)
(1 to 65355 msec, default is 1000 msec)</td></tr>
<tr><td>2</td><td>Know channel scan period
(1 to 65355 msec, default is 1000 msec)</td></tr>
<tr><td>3</td><td>Specific channels scan period(not supported)
(1 to 65355 msec, default is 1000 msec)</td></tr>
<tr><td>4</td><td>All Channel scan Period
(1 to 65355 msec, default is 1000)</td></tr>
<tr><td>5</td><td>All Channel scan Period
(1 to 65355 msec, default is 1000)</td></tr>
<tr><td>8</td><td>Known channel scan retry count
(1 to 65355, default is 10)</td></tr>
<tr><td>9</td><td>Specific channels scan retry count(not supported) (1 to 65355, default is 10)</td></tr>
<tr><td>10</td><td>All Channel scan retry count
(1 to 65355, default is 10)</td></tr>
</table></td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td></td><td><table><tr><td>11</td><td>L3 Connect retry count
(1 to 65355, default is 100)</td></tr></table></td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
<tr><td rowspan="3">AT+APCONF</td><td>Format</td><td>AT+APCONF=<Enable></td></tr>
<tr><td>Meaning</td><td>The NCM AP parameters can be configured using the auto connect commands specified in section 2.1.5 and 2.1.11. However, these commands are used for both station and Limited AP mode. To distinguish the parameters for Limited AP mode, WizFi210 provides a command:
AT+APCONF=<Enable>
Enable: 1 if for limited AP mode and 0 is for station mode, with default value as 0.
Once it enabled, the parameters configured using commands goes to limited AP.</td></tr>
<tr><td>Response</td><td>[OK]</td></tr>
</table>

Table 15 List of commands for Network Connection Manager

2.1.15. Summary of commands supported by firmware version

WizFi210 has some limitation of system resources like computing power and memory, so WizFi210 supply some kind of firmware and hardware according to the main function.

WizFi210 has four firmware categories like Standard UART, Standard SPI, Enterprise UART and Enterprise SPI. The Enterprise version can be supported on specific hardware version. Use can check the version of firmware and hardware using ATI2 command.

Now, we summarize those information here.

AT command	Standard version		Enterprise version	
	H/W Rev 1.00		H/W Rev 1.01	
	UART V1.1.0.x(W)	SPI V1.1.0.x(SPI)	UART V1.2.0.x (S2WEAP)	SPI V1.2.0.x (S2WEAP-SPI)
AT+WA	Yes	Yes	Yes	Yes
AT+NARP	No	NO	Yes	Yes
AT+NARPCHACHEEN	NO	NO	Yes	Yes
AT+NARPCHACHEDEL	NO	NO	Yes	Yes
AT+NDHCP	Yes	Yes	Yes	Yes
AT+NSTAT	Yes	Yes	Yes	Yes
AT+CID	Yes	Yes	Yes	Yes
AT+DNS	Yes	Yes	Yes	Yes
AT+DHCPSRVR	Yes	Yes	Yes	Yes
AT+PSSTBY	Yes	Yes	Yes	Yes
AT+NCLOSEALL	Yes	Yes	Yes	Yes
AT+NCLOSE	Yes	Yes	Yes	Yes
AT+WRXACTIVE	Yes	Yes	Yes	Yes
AT+WRETRY	Yes	Yes	Yes	Yes
AT+NAUTO	Yes	Yes	Yes	Yes
AT+NCTCP	Yes	Yes	Yes	Yes
AT+SSLOPEN	No	No	Yes	Yes
AT+SSLCLOSE	No	No	Yes	Yes
AT+NCUDP	Yes	Yes	Yes	Yes
AT+NSTCP	Yes	Yes	Yes	Yes
AT+NSUDP	Yes	Yes	Yes	Yes

AT+SETSOCKOPT	Yes	Yes	Yes	Yes
AT+NMAC2	Yes	Yes	Yes	Yes
AT+NMAC	Yes	Yes	Yes	Yes
AT+WSYNCINTRL	Yes	Yes	Yes	Yes
AT+WSTATUS	Yes	Yes	Yes	Yes
AT+WST	No	No	Yes	Yes
AT+WSEC	Yes	Yes	Yes	Yes
AT+WS	Yes	Yes	Yes	Yes
AT+WAUTH	Yes	Yes	Yes	Yes
AT+WAUTO	Yes	Yes	Yes	Yes
AT+WRATE	Yes	Yes	Yes	Yes
AT+WRSSI	Yes	Yes	Yes	Yes
AT+NSET	Yes	Yes	Yes	Yes
AT+WWPA	Yes	Yes	Yes	Yes
AT+WWEP	Yes	Yes	Yes	Yes
AT+WEAPCONF	No	No	Yes	Yes
AT+WEAP	No	No	Yes	Yes
AT+WM	Yes	Yes	Yes	Yes
AT+WRXPS	Yes	Yes	Yes	Yes
AT+WP	Yes	Yes	Yes	Yes
AT+WD	Yes	Yes	Yes	Yes
AT+WAPSM	No	No	Yes	Yes
AT+HTTPSEND	No	No	Yes	Yes
AT+HTTPOPEN	No	No	Yes	Yes
AT+HTTPCLOSE	No	No	Yes	Yes
AT+HTTPCONF	No	No	Yes	Yes
AT+HTTPCONFDEL	No	No	Yes	Yes
AT+TCERTADD	No	No	Yes	Yes
AT+TCERTDEL	No	No	Yes	Yes
ATB	Yes	No	Yes	No
AT&K	Yes	No	Yes	No
AT&R	Yes	No	Yes	No
AT&F	Yes	Yes	Yes	Yes
AT&V	Yes	Yes	Yes	Yes
AT&W	Yes	Yes	Yes	Yes
AT&Y	Yes	Yes	Yes	Yes

ATA2	Yes	Yes	Yes	Yes
ATA	Yes	Yes	Yes	Yes
ATC	Yes	Yes	Yes	Yes
ATH	Yes	Yes	Yes	Yes
ATI	Yes	Yes	Yes	Yes
ATO	Yes	Yes	Yes	Yes
ATS	Yes	Yes	Yes	Yes
ATE	Yes	Yes	Yes	Yes
ATV	Yes	Yes	Yes	Yes
ATZ	Yes	Yes	Yes	Yes
AT+PSDPSLEEP	Yes	Yes	Yes	Yes
AT+STORENWCONN	Yes	Yes	Yes	Yes
AT+RESTORENWCONN	Yes	Yes	Yes	Yes
AT+WPAPSK	Yes	Yes	Yes	Yes
AT+WPSK	Yes	Yes	Yes	Yes
AT+VER	Yes	Yes	Yes	Yes
AT+DNSLOOKUP	Yes	Yes	Yes	Yes
AT+DNSSET	Yes	Yes	Yes	Yes
AT+MCSTSET	Yes	Yes	Yes	Yes
AT+BCHKSTRT	Yes	Yes	Yes	Yes
AT+BATTVALGET	Yes	Yes	Yes	Yes
AT+BCHK	Yes	Yes	Yes	Yes
AT+BCHKSTOP	Yes	Yes	Yes	Yes
AT+BATTLVLSET	Yes	Yes	Yes	Yes
AT+TRACEROUTE	Yes	Yes	No	No
AT+ERRCOUNT	Yes	Yes	Yes	Yes
AT+SETTIME	Yes	Yes	Yes	Yes
AT+GETTIME	Yes	Yes	Yes	Yes
AT+DGPIO	Yes	Yes	Yes	Yes
AT+WWPS	Yes	Yes	No	No
AT+BDATA	Yes	Yes	Yes	Yes
AT+EXTPA	Yes	Yes	Yes	Yes
AT+PSPOLLINTRL	Yes	Yes	Yes	Yes
AT+UNSOLICITEDTX	Yes	Yes	Yes	Yes
AT+SPICONF	No	Yes	No	Yes
AT+WREGDOMAIN	Yes	Yes	Yes	Yes

AT+WIEEEPSPOLL	No	No	Yes	Yes
AT+APCLIENTINFO	No	No	Yes	Yes
AT+RESET	No	No	Yes	Yes
AT+APCONF	No	No	Yes	Yes
AT+NCMAUTO	No	No	Yes	Yes
AT+NCMAUTOCONF	No	No	Yes	Yes
AT+XDUM	Yes	Yes	No	No
AT+XEHT	Yes	Yes	No	No
AT+XAR	Yes	Yes	No	No
AT+XRESET	Yes	Yes	No	No
AT+XGPIO	Yes	Yes	No	No

Table 16 AT Command List

3. Communication Interface

3.1. UART

WizFi210 provides UART interface, which can communicate with a host processor and be used for updating WizFi210's firmware. When using WizFi210 via UART, we don't need some special operation for that. All of things users have to do is to follow Chapter4 and later.

3.2. SPI

WizFi210 provides alternative communication interface, SPI. When using SPI, WizFi210 requests some additional operation like byte stuffing. So, programmers using SPI interface have to do handle it in their code. This 3.2 SPI section explains how for WizFi210 to operate in SPI mode and how for users to handle in their code.

3.2.1. Pin connections for SPI

As shown below picture, Pin connection for SPI is the same as any normal SPI device's except for connecting WizFi210's pin number 23(GPIO19) to a GPIO pin of host processor. This pin's direction is from WizFi210 to host processor.

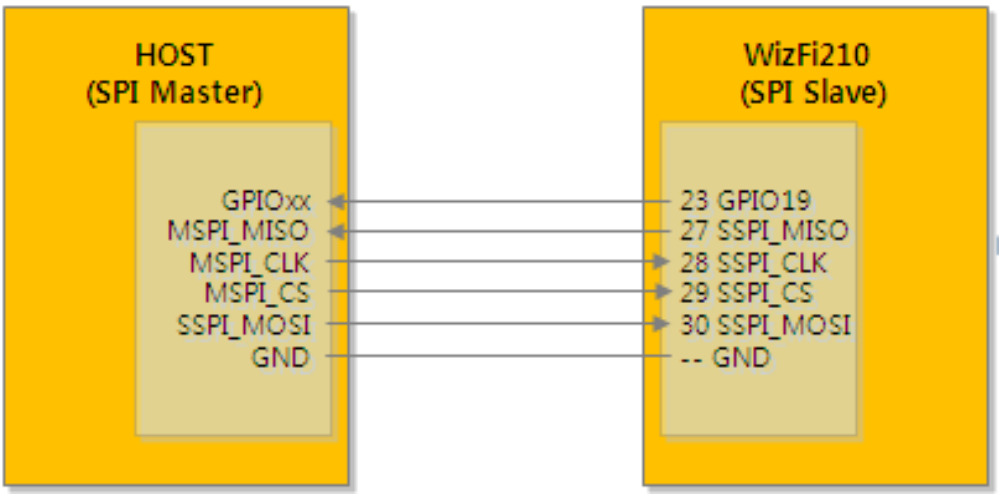


Figure1 Pin connection for SPI between Host and WizFi210

Host App (SPI Master)	WizFi210 (SPI Slave)	Remarks
MSPI_MISO	SSPI_MISO (27)	SPI Master In/Slave Out
MSPI_CLK	SSPI_CLK (28)	SPI Clock
MSPI_CS	SSPI_CS (29)	SPI Chip Select
MSPI_MOSI	SSPI_MOSI (30)	SPI Master Out/Slave In
Allocate your GPIO	GPIO#19 (23)	Host wake-up signal
GND	GND	Common ground

Table 17 Pin description of SPI interface

3.2.2. SPI interface details

In case of SPI interface, additional task is required to handle SPI data transfer and SPI Interface of WizFi210 follows as below.

- Only Motorola mode is supported
- Only 8 bit SPI data word size is supported
- By default SPI Mode#0 is selected (CPOL =0 and CPH=0)

Motorola SPI Format with CPL=0, CPH=0 is like Figure 2 below

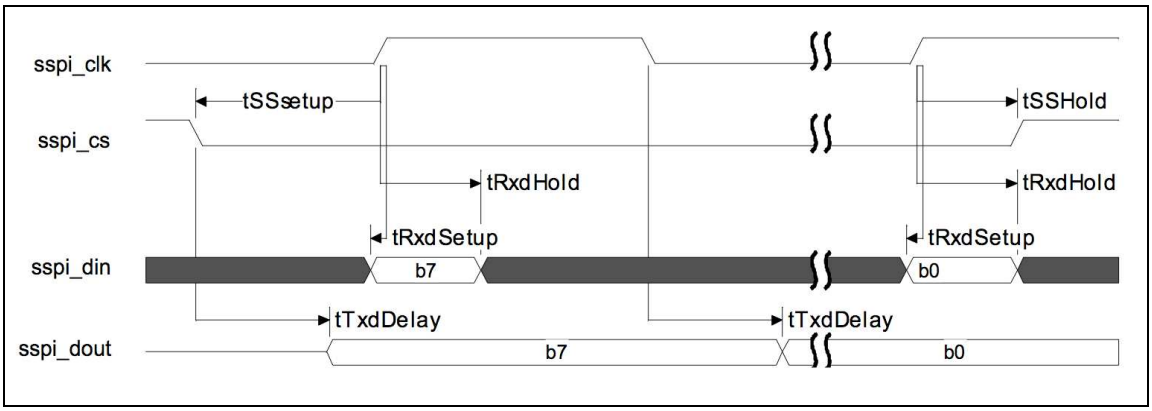


Figure 2 Timing diagram of SPI interface

Note: In case of continuous back-to-back transmissions, the Chip Select (CS) signal must be pulsed HIGH between each byte (8 bit) transfer.

Parameter	Description	Minimum	Maximum	Unit
tSSetup	Minimum time between falling edge of Select line and first rising edge of SPI clock.	4 core SPI clock periods + 68 ns		mixed
tTxdDelay	Delay in Slave asserting TX line after falling edge of SPI clock, or the first bit after falling edge of the Select line.		4 core SPI clock periods + 68 ns	mixed
tRxdSetup	Time before rising edge of SPI clock by which received data must be ready	15		ns
tRxdHold	Time for which received data must be stable after rising edge of SPI clock	3 core SPI clock periods + 14 ns		mixed
tSSHold	Time for which the Select line will be held after the sampling edge for the final bit to be transferred	3 core SPI clock periods + 14 ns		mixed

Table18 Timing information of SPI interface

3.2.3. Host Wake-Up Signal Handling

We name the pin number 23 of WizFi210 as “Host wake-up signal”. Host wake-up signal is ACTIVE HIGH signal. Host processor must give the SPI clock and SPI read operation, as long as host wake-up signal is HIGH.

Whenever WizFi210 wants to transfer the data it asserts (HIGH) host wake-up signal. Once all the data transferred from WizFi210 it again de-asserts (LOW) the signal.

Host processor will detect the host wake-up signal transition (LOW to HIGH) as edge triggered interrupt and process the incoming data.

3.2.4. SPI data handling

WizFi210 provides seven special control characters like SPI_XON(0xFD), SPI_XOFF(0xFA), Control_ESCAPE(0xFB), SPI_IDLE(0xF5), SPI_LINK_READY(0xF3), SPI_LINK_FAIL_1(0x00) and SPI_LINK_FAIL_2(0xFF) for informing WizFi210’s communication status in SPI mode.

So, to distinguish between SPI control characters and user data, the SPI data transfer layer of WizFi210 makes use of an octet (or byte) stuffing procedure about user data. When sending or receiving SPI control characters, WizFi210 and host processor send those characters itself without byte stuffing to a peer device. But when sending user data having the same character to SPI control characters, WizFi210 and host processor should do byte stuffing in order to distinguish it with SPI control characters.

The scheme of byte stuffing is to add a prefix byte(the Control Escape octet) and change a real data byte. The Control Escape octet is defined as binary ***11111011*** (hexadecimal ***0xFB***), most significant bit first.

Each special control character is replaced by a two octet sequence consisting of the Control Escape octet followed by the original octet exclusive-or (***XOR***) with hexadecimal ***0x20***. Receiving implementations must correctly process all Control Escape sequences.

Escaped data is transmitted on the link as follows:

Pattern	Encoded as	Description
0xFD	0xFB 0xDD	***SPI_XON***
0xFA	0xFB 0xDA	***SPI_XOFF***
0xFB	0xFB 0xDB	Control ESCAPE
0xF5	0xFB 0xD5	***SPI _IDLE***
0xF3	0xFB 0xD3	SPI_LINK_READY
0x00	0xFB 0x20	SPI_LINK_FAIL_1(ALL ZERO)
0xFF	0xFB 0xDF	SPI_LINK_FAIL_2(ALL ONE)

Table19 Byte stuffing for special data of SPI

One dedicated GPIO signal known as host wake-up is available for data ready indication from Slave WizFi210 to Master Host processor. Master host processor must provide clock as long as host wake-up signal is active. Host processor can make use of GPIO interrupt (edge triggered low-to-high transition) to receive the data from WizFi210.

Since SPI data transfer works in full duplex mode, special fill character (***SPI _IDLE***) will be transmitted during idle period (if there is no more data to transmit). These idle fill pattern shall be dropped at receiving end.

3.2.5. SPI Interface Parameters

The command to set the SPI clock phase and clock polarity parameter is as follows:

AT+SPICONF=<clockpolarity>, <clockphase>

If clock polarity is 0, then inactive state of serial clock is low.

If clock polarity is 1, then inactive state of serial clock is high.

If clock phase is 0, then data is captured on the first toggling edge of the serial clock (clock phase zero),after the falling edge of slave select signal.

If clock phase is 1, then data is captured on the second edge of the serial clock (clock phase

180), afterthe falling edge of slave select signal.Default is clock polarity 0 and clock phase 0.

The new SPI parameters take effect after node reset/restart. However, they are stored in RAM and will belost when power is lost unless they are saved to a profile using AT&W. The profile used inthat command must also be set as the power-on profile using AT&Y.

This command returns the standard command response to the serial interface with the newSPI configuration

4. Command mode & Data mode

4.1. AT command mode

AT command mode is default communication mode between WizFi210 and user's system.
WizFi210 treats all received data from user as AT command. If all received data follows correct command format, WizFi210returns a reply to user's system.

Transition from AT command mode to Data mode is done by Auto Connection command. After executing auto connection commands like ATA, ATA2 and ATO, and TCP connection with the peer system is established, or UDP socket is open, then WizFi210 becomes Data mode.

Transition from Data mode to AT command mode can be done by two method. One is using SW escape sequence(it is +++) or HW Trigger and the other is to close the established Auto Connection session.
Using SW escape sequence is not to close the established Auto Connection session, It just only to transit its mode to AT command mode in order to execute some AT command.

4.2. Data mode

In Data mode, except the case that Notification Message is enabled using AT+XDUM=0, user has to handle all received data as just data, and must write data that transfers to the peer system, on serial interface.

4.3. Data communication in AT command mode

Transition between AT command mode and Data mode can make some confusionand problem because of data carried with SW trigger characters, +++. In addition, there is a restriction – only one socket(TCP or UDP) can be used in Data mode.

If user wants to use multi sockets concurrently or handle data robustly, user has to use the method of "Data communication in AT command mode"

4.3.1. Data Handling

In AT Command mode, data transfers are managed using various escape sequences. Each escape sequence starts with the ASCII character <ESC>(0x1B). The encoding of data and related commands are described below. This encoding is used for both transmitted and received data.

The network destination, or destination source, for a given data packet is established by means of a Connection Identifier, and represented as a single hexadecimal number. Data is transferred on a per CID basis. Data is normally buffered until the end-of-data escape sequence is received. However, if the amount of data exceeds the size of the data buffer, the data received, thus far, is sent immediately. The data buffer size depends on the implementation, but is usually one MTU.

4.3.2.Escape Sequences

4.3.2.1. Sending data using Escape Sequence

Escape Sequence	Description
<Esc>S<CID><data>[10]<Esc>E	This escape sequence selects the specified Connection ID as the currentconnection. Use this sequence to senddata to a TCP server, TCP clientor UDP socket in WizFi210/220. Example: To send user data (e.g. Hello) on CID 1, the format will be: **<Esc>S1Hello<Esc>E**
<Esc>Z<CID><data length><data>	To improve data transfer speed, user can use this bulk data transfer. Thissequence is used to send data on TCP client, TCP server or UDP socket in WizFi210/220. **<data length> is always 4 bytes**, and **last <ESC> and 'E' character is omitted** because user will receive data up to specified byte count at <data length> Example: To send user data (e.g. Hello) on CID 1, the format will be: **<Esc>Z10005Hello**
<Esc>U<CID><IP Address>:<port>:<data><Esc>E	When this command is used, the remote address and remoteport is transmitted. WizFi210 expects to receive the following data sequence from Host: <Esc>U<CID><IP Address>:<port>:<data><Esc>E

[10]If you have some <ESC>(0x1B in Hex) in your data to send, you have to add to it with one more <ESC>. So **We recommend you use Bulk data transfer mode.**

	Example: When WizFi210 sends data (e.g. Hello) on CID 0 with destination IP(192.168.1.1) and destination port number(52), the format will be: **<Esc>U0192.168.1.1:52:Hello<Esc>E**

Table20 Escape Sequence for sending data in command mode

4.3.2.2. Receiving data using Escape Sequence

Escape Sequence	Description
<Esc>S<CID><data>[11]<Esc>E	WizFi210/220 send data in this escape sequence to user whenever Bulk data option is disable and a TCP socket is involved. Example: When youreceive data thru CID 1 TCP socket from peer system, user will receive from WizFi210/220 as below. **<Esc>S1Hello<Esc>E**
<Esc>Z<CID><data length><data>	To improve data transfer speed, user can use this bulk data transfer. Thissequence is used to receive data on TCP client or TCP server **<data length> is always 4 bytes**, and **last <ESC> and 'E' character is omitted** because user will receive data up to specified byte count in <data length> Example: When youreceive data thru CID 1 TCP socket from peer system, user will receive from WizFi210/220 as below. **<Esc>Z10005Hello**
<Esc>U<CID><IP Address>:<port>:<data><Esc>E	When this command is used, the remote address and remoteport is transmitted. When WizFi210received data thru an UDP socket, it send it to host with below format. <Esc>U<CID><IP Address>:<port>:<data><Esc>E Example: When WizFi210receive data (e.g. Hello) thru CID 0, WizFi210/220 transfer it to host as below **<Esc>U0192.168.1.1:52:Hello<Esc>E**
<Esc>y<CID><IP Address><port>₩t<data	When this command is used, the remote address and remoteport is transmitted.

[11] As there may be some <ESC> in data to receive, you have to preprocess <ESC><ESC>. So **We recommend you use Bulk data transfer mode.**

length><data>	When WizFi210received data thru an UDP socket under BULK mode, it send it to host with below format. <Esc>y<CID><IP Address><port>₩t<data> Example: When WizFi210receive data (e.g. Hello) thru CID 0, WizFi210/220 transfer it to host as below **<Esc>y0192.168.1.152₩t0005Hello**
<Esc>O	"OK": This sequence is sent to the serial host by theWizFi210/220 upon successful completion of thecommands.
<Esc>F	"FAILURE": This sequence is sent to the host by theWizFi210/220 Adapter if an command failed.

Table21 Escape Sequence for receiving data in command mode

5. Using multi sockets

WizFi210/220 supports up to 16 sockets concurrently.

Sometimes user needs to use more than one socket simultaneously. If we use WizFi210, we can do it easily.

But there is the restriction to use multi sockets with WizFi210.

- **Auto Connection mode is not allowed**.
  So you must not use AT commands set related to Auto Connection mode.About that, refer to "***2.11 Auto Connection***"
- **Data mode is not allowed**.
  Because Data mode is the result of Auto Connection, if Auto Connection mode is not allowed then it is impossible to enter Data mode. So user has to handle data in AT command mode.

Now, we will see the list of AT commands set to use multi sockets and some examples.

5.1. Associate with AP.

```
AT+WD   (Sent AT+WD command followed 0x0d in order to disassociate from previous association)
[OK]
AT+NDHCP=0
[OK]
AT+NSET=192.168.3.213,255.255.255.0,192.168.3.1
[OK]
AT+WWPA=12345678
[OK]
AT+WA=WizFiDemoAP
    IP              SubNet          Gateway
 192.168.3.213: 255.255.255.0: 192.168.3.1
[OK]
```

Figure 3 Commands set for associating with AP when using multi sockets

5.1.1. TCP Client multi-connections

For this example, first we make TCP Client connections with the "AT+NCTCP" command.

Then, the operation is processed as below.

① <CID 0> socket receives the <AAAA>.

② <CID 1> socket receives the <BBBB>.

③ <CID 2> socket receives the <CCCC>.

④ <CID 3> socket receives the <DDDD>.

```
AT+NCTCP=192.168.3.102,4000     (Sent AT command followed 0x0d)
[OK]
AT+NCTCP=192.168.3.102,4001
[OK]
AT+NCTCP=192.168.3.102,4002
[OK]
AT+NCTCP=192.168.3.102,4003
[OK]
<ESC>S0AAAA<ESC>E<ESC>S1BBBB<ESC>E<ESC>S2CCCC<ESC>E<ESC>S3DDDD<ESC>E
```

Figure 4 Command sequence and response for TCP Client multi sockets

As we can see, after connections established, we can get some data from peer system following the format of escape sequence.

5.1.2. TCP Server multi-connections

For this example, first we make TCP Server connections with the [AT+NSTCP] command.

Then, the operationis processed as below.

① <CID 6> socket receives the <SSSSS>.

② <CID 7> socket receives the <TTTTT>.

```
AT+NSTCP=5001      (Sent AT command followed 0x0d)
[OK]
AT+NSTCP=5002
[OK]
[CONNECT 4 6 192.168.3.102 1744]
[CONNECT 5 7 192.168.3.102 1751]
<ESC>S6SSSSS<ESC>E<ESC>S7TTTTT<ESC>E
```

Figure 5 Commands sequence for using TCP Server sockets

6. Operation Mode

WizFi210 can operate as Station, Limited AP or Ad-hoc.

6.1. Station Mode

Station Mode is the default operating mode of WizFi210. When operating in Station Mode, WizFi210 should associate with another AP in order to communicate with other device.

Below is an example to explain the sequence of AT commands to set WizFi210 as Station Mode.

```
AT+WD        (Sent AT command followed 0x0d)

[OK]

AT+WM=0      (AT command echoed back by WizFi210)

[OK]    (Response which means executed successfully)

AT+NDHCP=0

[OK]

AT+NSET=192.168.55.101,255.255.255.0,192.168.55.1

[OK]

AT+WA=LimitedAP
    IP              SubNet          Gateway
 192.168.55.101: 255.255.255.0: 192.168.55.1
[OK]

AT+NAUTO=0,1,192.168.55.1,5000

[OK]

ATA2

[OK]
```

Figure 6 Example of using commands for Station Mode

In order to Set it as Station mode, user should use AT+WM=0. If user has notset WizFi210 as another mode before, user doesn't need to use this AT+WM=0, because the default is the Station mode.

Then, user uses AT+WA=<SSID> to join AP which its SSID is <SSID>.

6.2. Limited AP Mode

WizFi210 can operate in Limited AP Mode. WizFi210 doesn't have any other Ethernet or WiFi interface for Uplink, so any device can't access to Internet via WizFi210 which is operating as Limited AP. The lack of resources in WizFi210 restricts the number of devices able to join

WizFi210.

However, Limited AP Mode of WizFi210is useful when the mobile device, that having WiFi capability, directly connects to WizFi210 and communicate with it without any other Access Point.

Below is an example to explain the sequence of AT commands to set WizFi210/220 as Limited AP Mode.

```
AT+WD        (Sent AT command followed 0x0d)
[OK]
AT+WM=2      (AT command echoed back by WizFi210)
[OK]    (Response which means executed successfully)
AT+WAUTH=0
[OK]
AT+NDHCP=0
[OK]
AT+NSET=192.168.55.1,255.255.255.0,192.168.55.1
[OK]
AT+DHCPSRVR=1
[OK]
AT+WA=LimitedAP,,8,
    IP            SubNet          Gateway
 192.168.55.1: 255.255.255.0: 192.168.55.1
[OK]
AT+NAUTO=1,1,,5000
[OK]
ATA2
[OK]
```

Figure 7 Example of using commands for Limited AP Mode

In order to set it as Limited AP mode, we should use **AT+WM=2**.

AT+WA=<SSID>... has **WizFi210/220 configure itself with parameter values**, not join AP having <SSID>

And if we need to allocate IP address to devices joined WizFi210 dynamically, we should use **AT+DHCPSRVR=1**to enable DHCP Server inside WizFi210.

7. Using Factory default provisioning

7.1. Factory default #1 :<Limited AP & Web configuration>

7.1.1. Changing mode to <Limited AP & Web mode>

If you click the <Reserved Button>(GPIO21[12] or GPIO10) button twice consecutively, the WizFi210 is restored to factory default setting and changed to <AP & Web mode>.

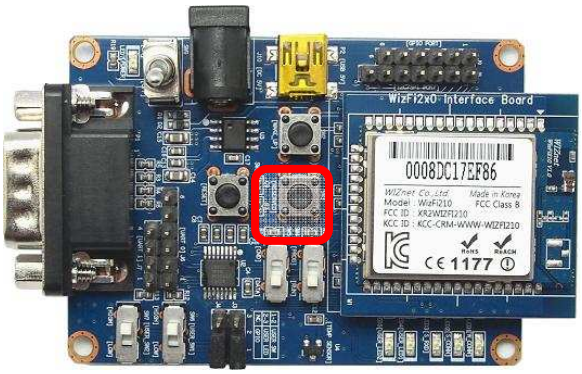


Figure 8 Button corresponding to that pin in WizFi210 Evaluation board

The IP address of WizFi210 is shown below.

IP:192.168.1.1

Subnet:255.255.255.0

Gateway:192.168.1.1

S the URL address of Wizfi210 is http://192.168.1.1

Instead of clicking the <Reserved Button>, you can use the <AT Command> as below.

```
AT+XDUM=0       (Sent AT command followed 0x0d)

[OK]

AT+XCONFIG=1  (AT command echoed back by WizFi210)
APP Reset-APP SW Reset
Factory Default, Limited AP and WEB Daemon start

[OK]    (Response which means executed successfully)

    IP            SubNet          Gateway
 192.168.1.1: 255.255.255.0: 192.168.1.1

[OK]
```

Figure 9 Example of using AT command instead of Hardware pin

[12]User can do this using GPIO of Host processor, In order to know its timing information, refer to Datasheet of WizFi210.

7.1.2. Connect to the WizFi210 (Limited AP)

If you scan the AP on your PC, you can see <WizFiAPXXXXXX> in the AP list.

The MAC address of WizFi210 is attached to the position of <XXXXXX>.

Now, do connect your PC to the WizFi210.

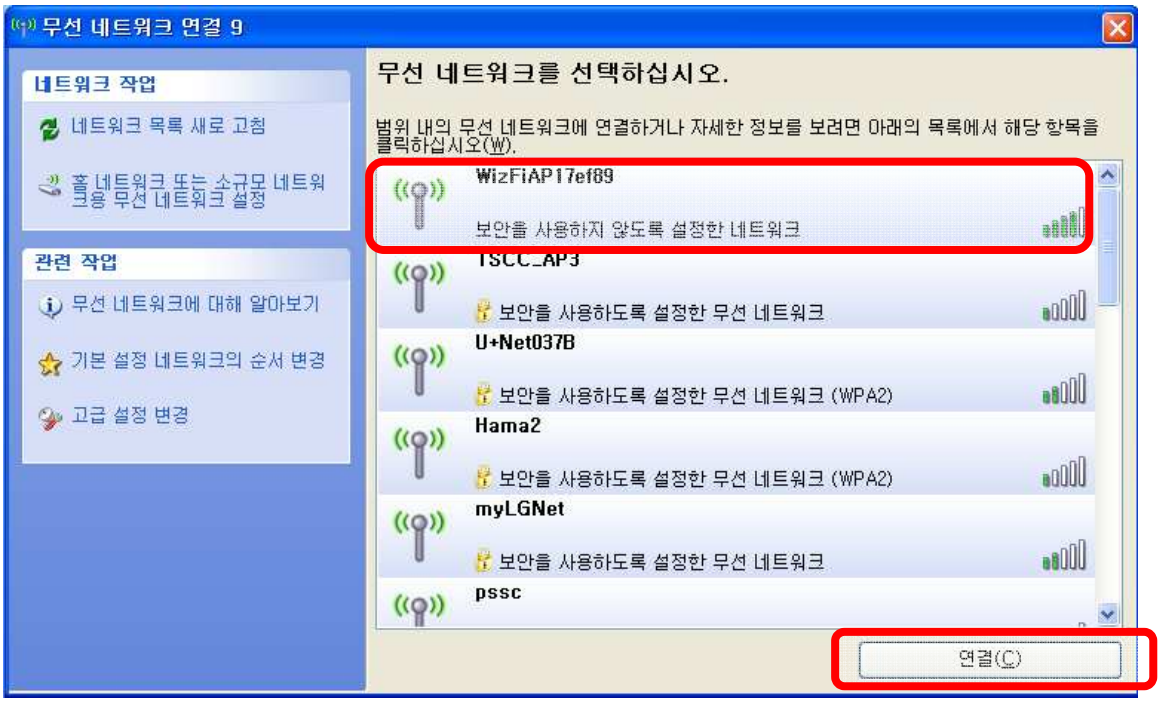


Figure10 Example of APs list

In Limited AP mode, WizFi210 has the DHCP server, so you don't need use the <static IP address>.

You can verify the IP address of your PC on DOS command console writing "ipconfig".

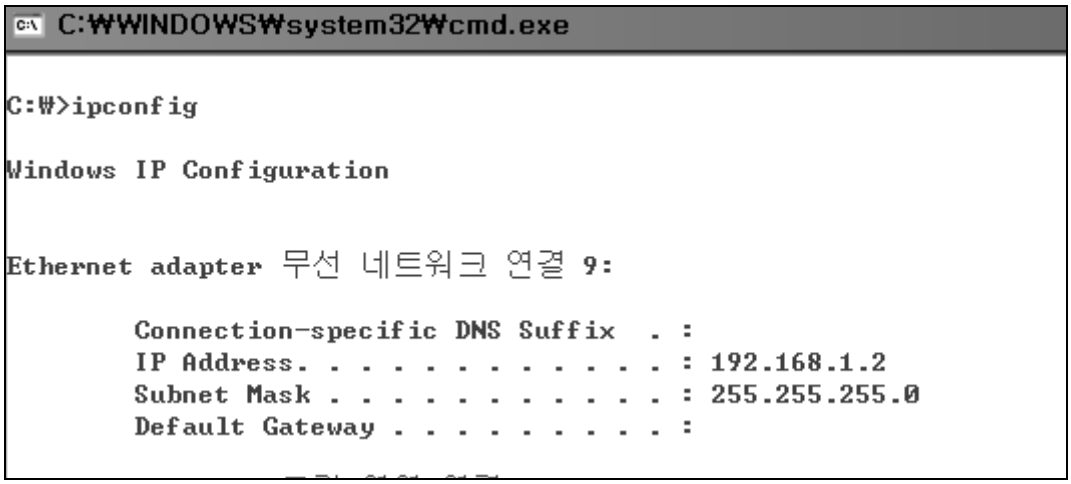


Figure11 Example of executing ipconfig on Dos command line

7.1.3. Connect to the Web server

This web server is implemented in WizFi210. So, you don't need any effort to handle user's HTTP request at your host processor. WizFi210 provides a web page for setting WizFi210.

Users can connect to the web server,thedefault ID and Password areadmin and admin respectively.

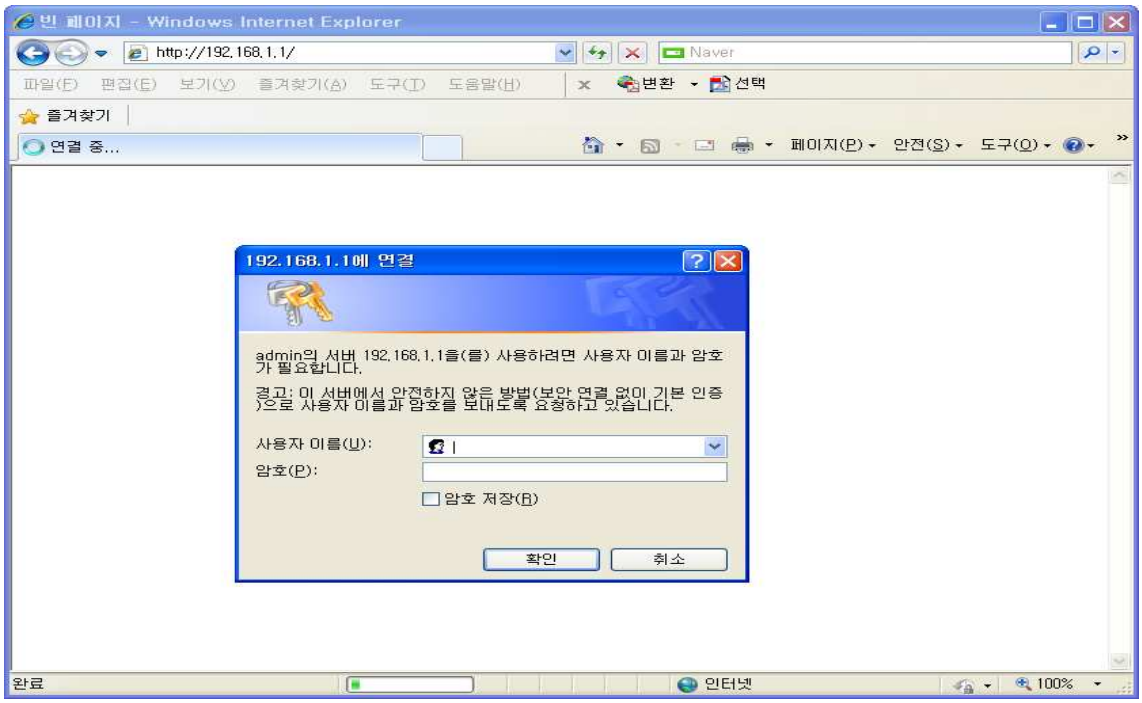


Figure12 Example of connecting to Web Server on WizFi210

Then you can see the default web page on WizFi210 and you can configure the WizFi210 at the web browser via WiFi, if you need.

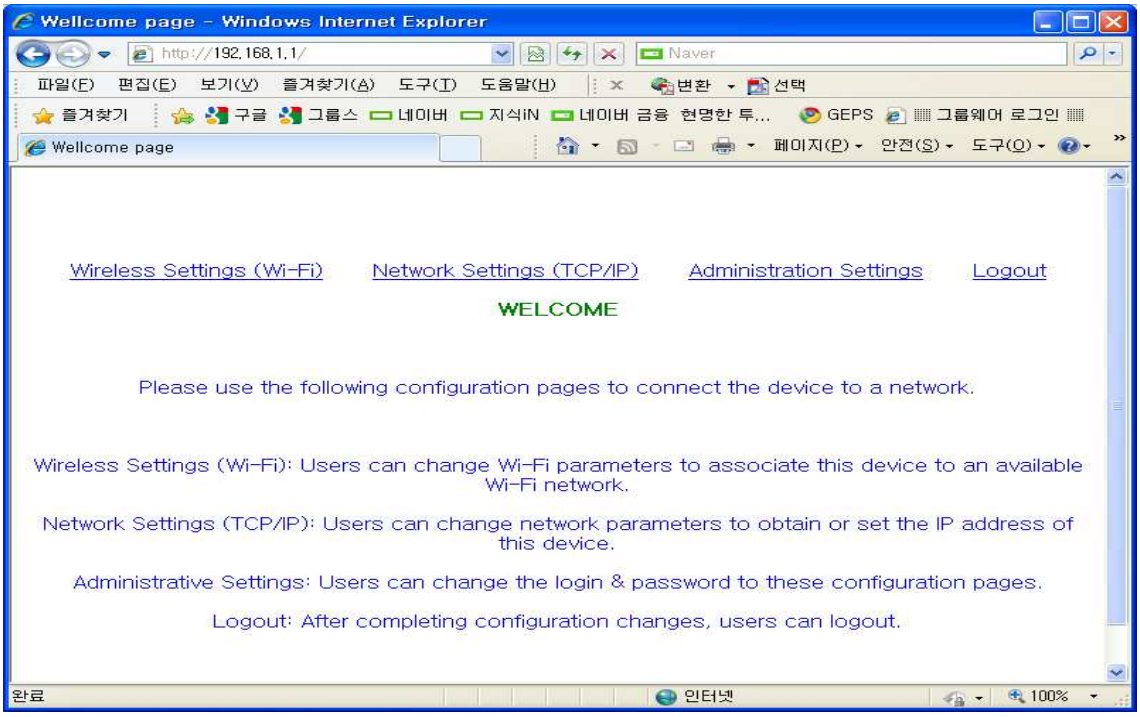


Figure13 Web page for configuration on WizFi210

7.2. Factory default #2 : <Ad-hoc Configuration>

7.2.1. Changing mode to <ad hoc & Configuration-Tool mode>

If you click the <Reserved Button>(GPIO21 or GPIO10) button three times consecutively, the WizFi210 is restored to factory and changed ad hoc mode.

The IP address of WizFi210 is shown below.

IP:192.168.1.101/Subnet:255.255.255.0/Gateway:192.168.1.1

Instead of clicking the <Reserved Button>, you can use the <AT Command> as below.

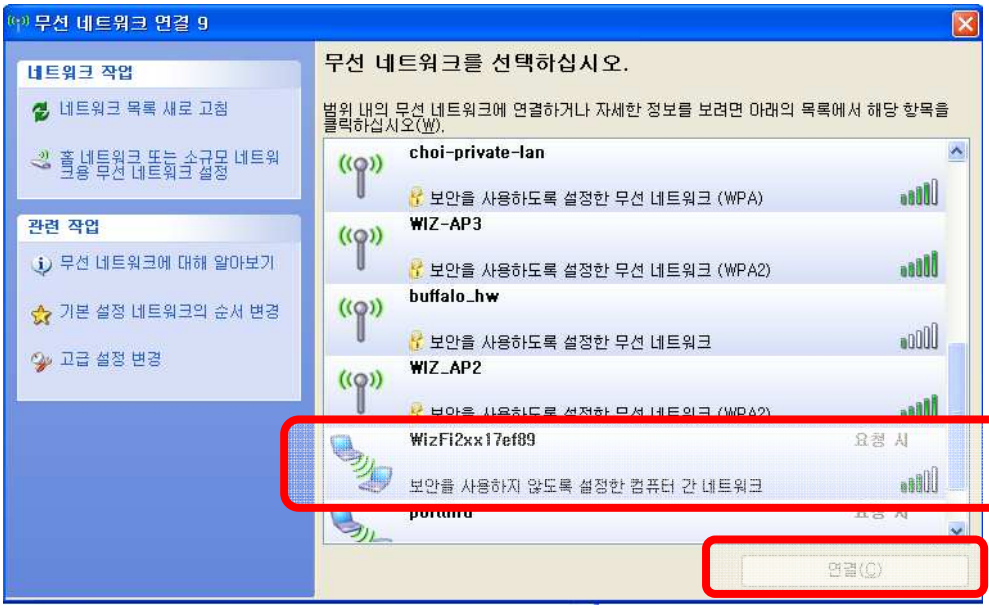
```
AT+XDUM=0       (Sent AT command followed 0x0d)

[OK]

AT+XCONFIG=2  (AT command echoed back by WizFi210)
APP Reset-APP SW Reset
Factory Default and ad hoc Mode (for Air Command)

[OK]    (Response which means executed successfully)

    IP            SubNet          Gateway
192.168.1.101: 255.255.255.0: 192.168.1.1

[OK]
```

7.2.2. Connecting to the WizFi210 with ad-hoc mode

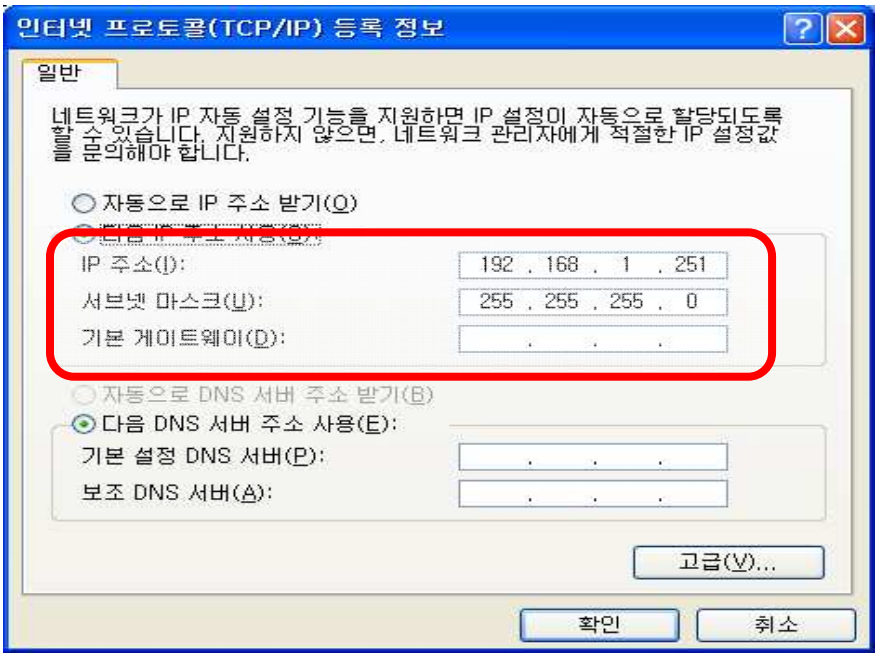
If you scan the AP, you can see <WizFi2xxXXXXXX> in the ad hoc list.

The MAC address of WizFi210 is attached to the position of <XXXXXX>.

Now, connect your PC to the WizFi210.



In ad hoc mode, you need to use Static IP address as below, because WizFi210 can't allocate it any IP address dynamically.



And in most cases, you need to disable the ethernet adapter.

8. Transmitting and Receiving HTML Data

There are two method to transmit and receive HTML data. One is using WizFi210 with built-in capabilities, and the other is to have users' host processor parse received HTML data and make HTML data to send to the peer system under the condition which WizFi210 just operates as communication device, we call this mode "Emulating".

You can see two sections to describe how to implement and use these two methods.

8.1. Operating as HTTP Client using WizFi210 functions

As described above, WizFi210 has capabilities to support HTTP Client. If you want to make WizFi210 operate as HTTP Server, you can just implement it with emulation of HTTP Server.

When using these capabilities, users don't need to make any HTTP request data to communicate with peer's Web server, all users have to do is give some AT commands like "AT+HTTPCOPEN", "AT+HTTPCCLOSE" and so on.

And there are two modes to connect to any Web Server. One is the normal HTTP Client function and the other is the secure HTTP Client function as named HTTPS Client.
WizFi210 supportsboth of options with the same command but the difference is whether a corresponding option flag is set or not and in order to use HTTPS Client, users should do something like registering Certificate, in advance.

8.1.1. Communicating with Web Server using normal HTTP

Now, we explain how to communicate with a normal Web Server, www.wiznet.co.kr, with a simple example.

Getting HTML Data

In order to connect to a HTTP server and get some HTML Data, users have to do as follow.

① Do some configuration you need using "AT+HTTPCONF" command.

```
AT+HTTPCONF=20,User-Agent: Mozilla/5.0

[OK]

AT+HTTPCONF=3,close

[OK]

AT+HTTPCONF=11,www.wiznet.co.kr

[OK]    (Response which means executed successfully)
```

② Then, connect to that HTTP server you want using "AT+HTTPOPEN" command.

```
AT+HTTPOPEN=www.wiznet.co.kr,80[13],0[14]
IP:118.129.166.1600[15]      (Response from WizFi210)
[OK]            (Response from WizFi210)
```

③ Next, send a query data to get HTML data to that HTTP server using "AT+HTTPSEND" command.

```
AT+HTTPSEND=0,1,10,/

<ESC>H0..... (Data from WizFi210 to Host processor)

[DISCONNECT 0]   (Notification message from WizFi210)
```

8.1.2. Communicating with Secure Web Server using HTTPS

Now, we explain how to communicate with a Secured Web Server, m.twitter.com, with a simple example.

Normally, When registering our own tweet or getting mentions from others on twitter.com, we need a secure session known as HTTPS. In order to do this, we need something to do as below.

① Certificate from the Secured Web Server, like twitter.com

② A secure TCP/IP Session, this means TLS(SSL) function is supported.

As an example, we will describe how to connect to twitter.com and register user's own tweet on it, step by step.

Getting Twitter Certificate

You have to get twitter certificate using a Web browser in your PC, as WizFi210 doesn't operate as a real Web browser. You can do this in the same way that you connect to other secure Web

[13] 80 is the default port number of normal HTTP server, not HTTPS server.
[14] If this value is '0', then it makes WizFi210 use the standard HTTP protocol, not HTTPS protocol
[15] The CID number of a socket connected to mobile.twitter.com

server.

① Using a web browser, connect to https://twitter.com

After a connection, if you click an image of lock at the beginning of URL address field, you can see the certificate information of Twitter.com.

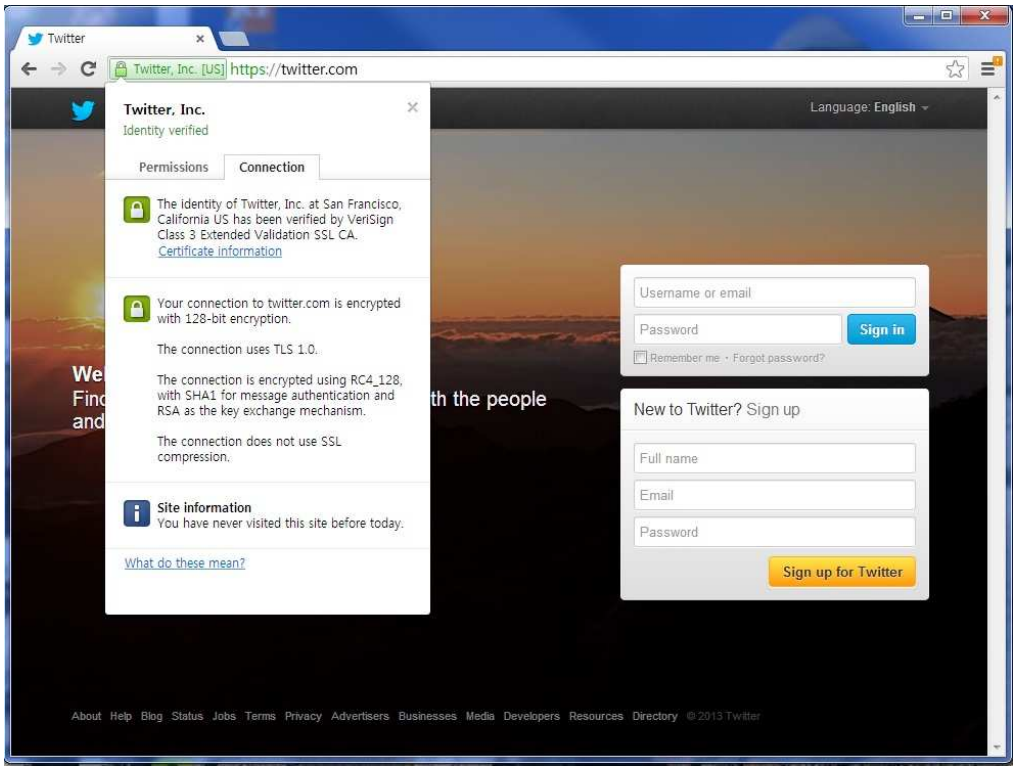


Figure 14 Certificate information view on Twitter.com

② Click “Connection” Tab and then click “Certificate information” link to save Certificate into a file.

③ After a dialog box was shown, Click Next

④ Select “DER encoded binary X.509(.CER)” combo box and click the Next button.

⑤ Then, give the location and file name to it and click the Next button.

⑥ Finally, click “Finish” button.

Registering Certificate to WizFi210 inside

Before using a TLS(SSL) session, users should register the Certificate of the secure Web server, which WizFi210 will connect to, to WizFi210 inside.

The command to use for registering Certificate is “AT+TCERTADD”.

```
AT+TCERTADD=twitter-cert.cer,0,1664,0
<ESC>W<data in certificate>

[OK]    (Response which means executed successfully)
```

Getting HTML Data

In order to connect to a HTTPS server and get some HTML Data, users have to do as follow.

① First, set WizFi210 with current time information using “AT+SETTIME” command.

```
AT+SETTIME=10/04/2013,16:38:00

[OK]    (Response which means executed successfully)
```

② Then, do some configuration you need using “AT+HTTPCONF” command.

```
AT+HTTPCONF=20,User-Agent: Mozilla/5.0

[OK]

AT+HTTPCONF=3,close

[OK]

AT+HTTPCONF=11,mobile.twitter.com

[OK]    (Response which means executed successfully)
```

③ Then, connect to a HTTPS server you want using “AT+HTTPOPEN” command.

```
AT+HTTPOPEN=mobile.twitter.com,443,1
IP:199.59.148.2120[16]    (Response from WizFi210)
[OK]            (Response from WizFi210)
```

④ Next, send a query data to get HTML data to a HTTPS server using “AT+HTTPSEND” command.

```
AT+HTTPSEND=0,1,10,/signup

<ESC>H0..... (Data from WizFi210 to Host processor)

[DISCONNECT 0]   (Notification message from WizFi210)
```

8.2. Emulating HTTP Server or HTTP Client

If users want to use their system with WizFi210 as HTTP Server or customize their system’s interaction to peer’s web server, they can emulate HTTP server or HTTP client on their host

[16]The CID number of a socket connected to mobile.twitter.com

processor, not WizFi210 itself.

8.2.1. Emulating HTTP Server

In order to emulate HTTP Server on users' host processor, they need a HTML Parser and HTML Page data.

WizFi210 just operates as a communication device, and users' host processor should process all of things of a real HTTP Server. In this circumstance, users' host processor have WizFi210 open and listen a socket with 80 or other port number like 8080. Then if any client connects to the WizFi210's listen port, WizFi210 informs host processor it with a corresponding CID and bypasses all data from that client system to host processor.

To emulate HTTP Server, users' application operating on host processor should parse received data to get and/or extract proper information from those, and make a proper response and send back to WizFi210 in order to reply to that client system.
How to make a HTML parser and HTML pages and how to operate under corresponding rule is up to you and your systems' requirement.

8.2.2. Emulating HTTP Client

In order to emulate HTTP Client on users' host processor, they need a HTML Parser and HTML Page data.

WizFi210 just operates as a communication device, and users' host processor should process all of things which a real Web browser does. In this circumstance, users' host processor have WizFi210 connect to a Web server which users want to connect with "AT+NCTCP" command. Then if WizFi210 connected to the specified Web server, WizFi210 informs host processor with a corresponding CID.

To emulate HTTP Client like any web browser, users' application operating on host processor should make and send a HTML page containing any users' request. Then Web server send its response to WizFi210. WizFi210 will bypass those data with escape sequence. Then users'application can process it according to its intention, like extracting some information. After all data is finished, Web server will close its current connection.

8.3. Making and Testing the environment for HTTP Server

8.3.1. Configuring the Environment for Web Server Test

In the case of Web Server using WizFi210, You must constitute environment as bellows

1. Associate WizFi210 with AP
2. Associate PC with AP
3. View Web Page on PC

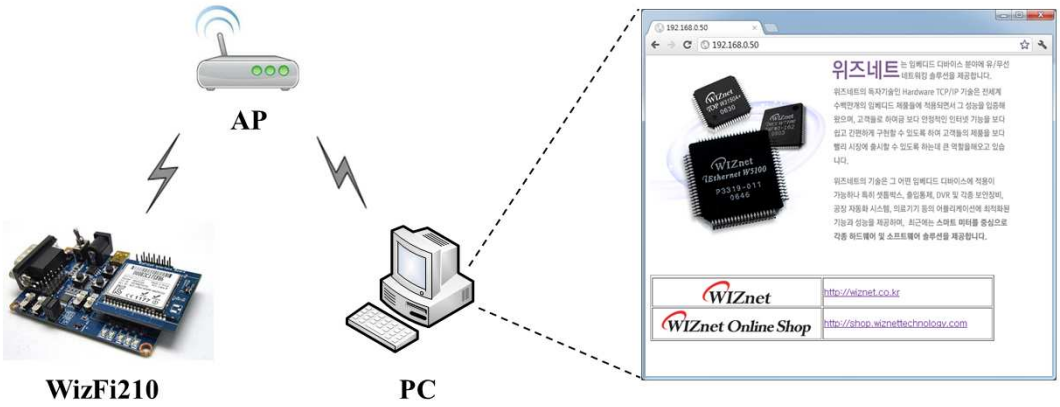


Figure15 Network environment for testing Web server on WizFi210

8.3.2. HTTP Protocol for Web Server Test

In case of Web Server, You can test web server protocol as below.

1. WizFi210 is waiting for TCP connection of PC.
2. PC will send TCP connection packet and request web page data.
3. WizFi210 will apply web page data and close TCP connection.
4. You will view web page on PC

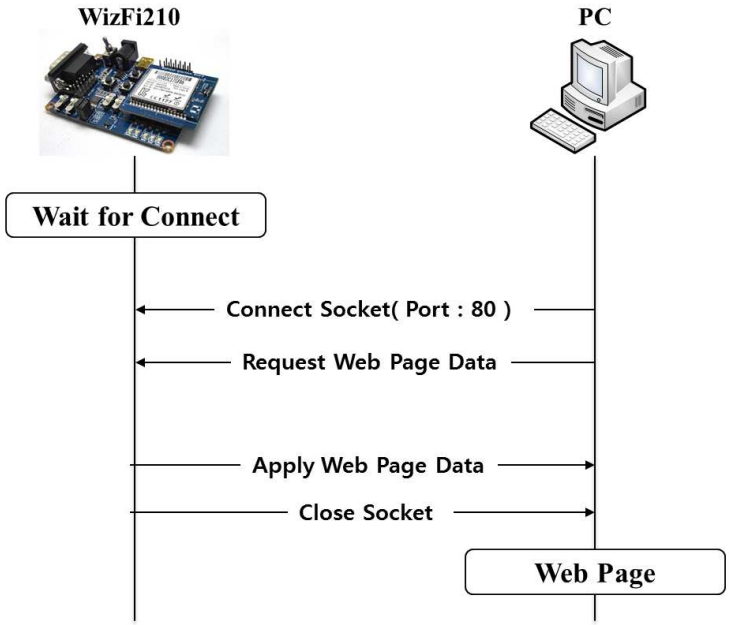


Figure16 Connection flow for test

8.3.3. Example of AT commands for configuring HTTP Server

First, user associates with AP and makesa TCP server socket (port:80) listen to connect from clients as below

```
AT+WD        (Sent AT command followed 0x0d)

[OK]    (Response which means executed successfully)

AT+WM=0     (Sent AT command followed 0x0d)

[OK]    (Response which means executed successfully)

AT+WWPA=12345678 (Sent AT command followed 0x0d)

[OK]            (Response which means executed successfully)

AT+NDHCP=0          (Sent AT command followed 0x0d)

[OK]            (Response which means executed successfully)

AT+NSET=192.168.3.50,255.255.255.0,192.168.3.1 (Sent AT command followed 0x0d)

[OK]            (Response which means executed successfully)

AT+WA=WizFiDemoAP     (Sent AT command followed 0x0d)
    IP              SubNet          Gateway
 192.168.3.50: 255.255.255.0: 192.168.3.1
[OK]            (Response which means executed successfully)

AT+NSTCP=80         (Sent AT command followed 0x0d)

[CONNECT 0]         (If user make XDUM be enable with AT+XDUM=0, you can get this reply)
[OK]            (Response which means executed successfully)
```

Figure 17 Example of commands for Web server on WizFi210

If any client connected to WizFi210 with WizFi210's IP address and port number 80, a connection is established successfully and a client browser or application device send WizFi210 some html data, then WizFi210 bypasses that data with escape sequence to host processor via serial interface under escape sequence scheme.

Users will see serial message in WizFi210 as below.

[CONNECT 0 1 192.168.3.114 3609] (This is a notification message from WizFi210)

<ESC>S1[17]GET /HTTP/1.1\r\n
Host: 192.168.3.50\r\n
Connection: keep-alive\r\n
User-Agent: Mozilla/5.0 (Windows NT 6.1)AppleWebKit/536.5 (KHTML, like Gecko) Chrome/19.0.1084.56 Safari/536.6\r\n
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8\r\n
Accept-Encoding: gzip,deflate,sdch\r\n
Accept-Language: ko-KR,ko;q=0.8,en-US;q=0.6,en=q=0.4\r\n
Accept-Charset: windows-949,utf-8;q=0.7,*;q=0.3<ESC>E[18]

Figure18Example of received data from web browser

Users can send HTML data to clients using WizFi210's escape sequence like below.

<ESC>S1[19]<HTML>
<TABLE width="600" style="table-layout:fixed" border=1>
<TR><img src="http://wiznet.co.kr/Sub_Modules/images/kr/sub/Overview_01.gif"></TD></TR>
<TR><img src="http://wiznet.co.kr/Admin_Root/UpLoad_Files/ProductImgs/Dtl_1138_20111005131932.jpg"></TR>
<TR><TD height="50" width="100" align=center valign=middle><img src="http://wiznet.co.kr/Sub_Modules/images/en/sub2/comm/logo.gif"></TD>
<TD>http://wiznet.co.kr</TD></TR>
<TR>
<TD height= "50" width="100" align=center valign=middle><imagsrc="http://shop....en/images/common/Top_Logo01.gif"></TD>
<TD>http://shop.wiznettechnology.com</TD></TR>
<TABLE>
</HTML><ESC>E[20]

Figure19 Example of Escape sequence for transmitting data

Close TCP connection with PC.

AT+NCLOSE=1 (Sent AT command followed 0x0d)

[OK] (Response which means executed successfully)

Figure 20 AT command for close the TCP connection

[17] Escape sequence for handling data in AT command mode. This means data will follow
[18] Escape sequence for handling data in AT command mode. This follows the end of data.
[19] Escape sequence for handling data in AT command mode. This means data will follow
[20] Escape sequence for handling data in AT command mode. This follows the end of data.

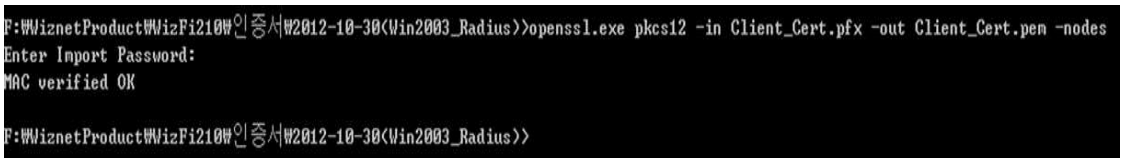
9. Using Enterprise Security

9.1. EAP-TLS

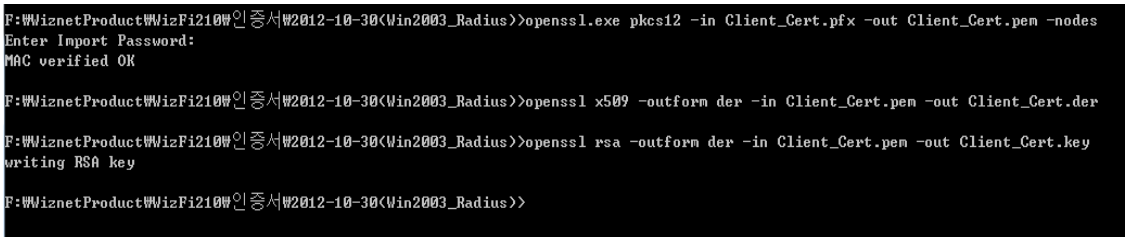
In regard to Enterprise mode of WizFi210, Please refer to an Application note in details. This section only introduces WizFi210 can handle the enterprise mode.

9.1.1. Connect to RADIUS Server using WizFi210

- Click **Start,** click Run, type **cmd**, and then click **OK**
- Convert certificate file into the binary file.
  - type openssl.exe pkcs12 –in Client_Cert.pfx–out Client_Cert.pem -nodesand then type Import Password, 12345678



  - type openssl.exe x509 –outform der –in Client_Cert.pem–out Client_Cert.der
  - type openssl.exe rsa–outform der –in Client_Cert.pem–out Client_Cert.key



- If type command to WizFi210 as below, you will succeed to connect RADIUS Server.

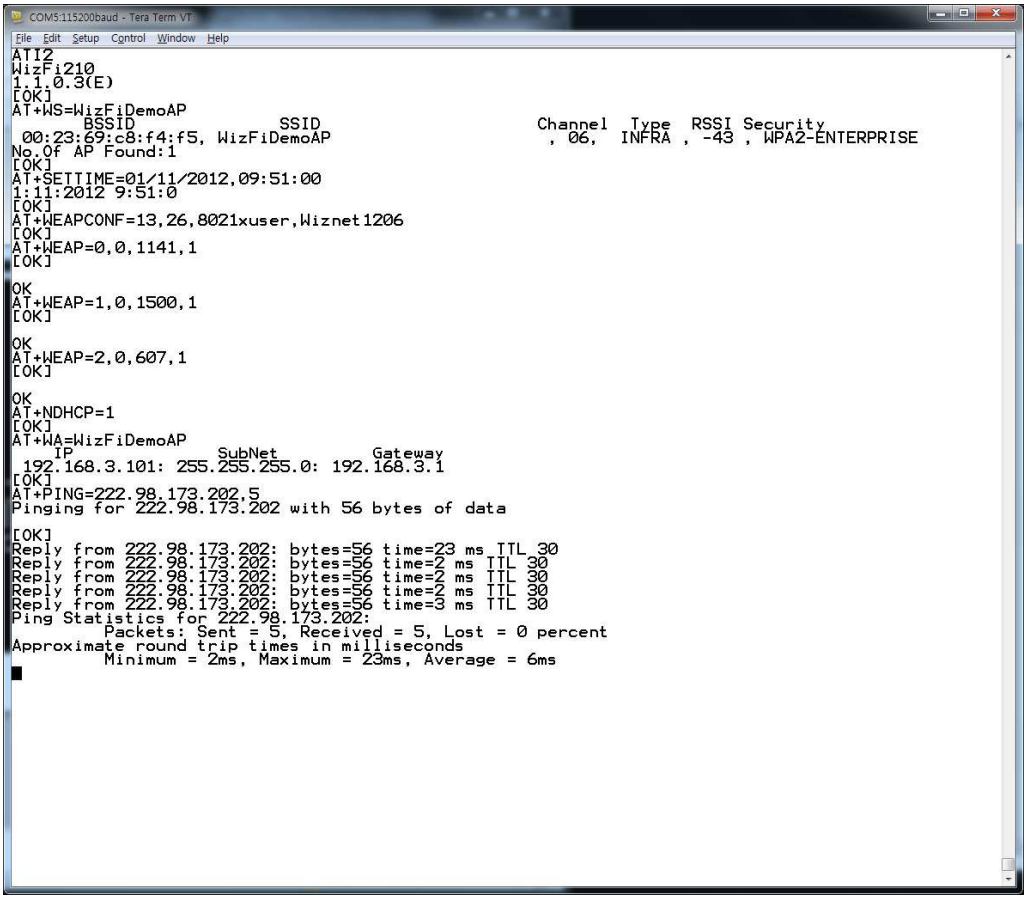


Figure21 Example of commands for using EAP-TLS

10. Examples

Now, we show many examples of AT commands set for handling WizFi210 according to usage of WizFi210 and itsnetwork configuration.

If user uses WizFi210 with UART firmware, he can use these examples without any modification. Otherwise, if they use it with SPI interface, then he has to add byte stuffing function to UART AT commands and responses. For it, refer to “3.2 SPI” section.

10.1. Station Mode, TCP Client and Auto Connection

This is the popular example that user handles WizFi210 for their application.

WizFi210 operates as a WiFi Station to associate with another AP to communicate with a peer system, After associating with AP, it makes a TCP client socket and connect to a server socket on the peer system.

10.1.1. Example 1 of commands sequence

Using “AT+WAUTO”, “AT+NAUTO” and “ATA”

AT (Sent AT command followed 0x0d)

AT (AT command echoed back by WizFi210)
[OK] (Response which means executed successfully)

ATE0 (Sent AT command followed 0x0d, this make echo back be disable)

ATE0 (AT command echoed back by WizFi210)
[OK] (Response which means executed successfully)

AT+WD (AT command making disassociation from previous AP association)

[OK] (Response)

AT+NDHCP=1 (AT command makingDHCP mode be enable)

[OK] (Response)

AT+WWPA=12345678 (AT command setting WiFi security)

[OK] (Response)

AT+WAUTO=0,WizFiDemoAP (AT command setting WiFiassociation information)

[OK] (Response)

AT+NAUTO=0,1,192.168.3.105,5000 (AT command setting TCP/UDP Socket information)

[OK] (Response)

ATA (AT command executing Auto Connection including AP association and Socket connection)
IP SubNet Gateway (Response)
192.168.3.104: 255.255.255.0: 192.168.3.1 (Response with IP addr)
[OK] (Response)***<=At this point, association is doneand TCP connection is established***.

Figure22 Example of commands for Station Mode and Auto connection

10.1.2. Example 2 of commands sequence

Using “AT+WA”, “AT+NAUTO” and “ATA2”

AT (Sent AT command followed 0x0d)

AT (AT command echoed back by WizFi210)
[OK] (Response which means executed successfully)

ATE0 (Sent AT command followed 0x0d, this make echo back be disable)

ATE0 (AT command echoed back by WizFi210)
[OK] (Response which means executed successfully)

AT+WD (AT command making disassociation from previous AP association)

[OK] (Response)

AT+NDHCP=1 (AT command makingDHCP mode be enable)

[OK] (Response)

AT+WWPA=12345678 (AT command setting WiFi security)

[OK] (Response)

AT+WA=WizFiDemoAP (AT command setting WiFiassociation information)
IP SubNet Gateway (Response)
192.168.3.104: 255.255.255.0: 192.168.3.1 (Response with IP addr)

[OK] (Response)***<=At this point, association is done***.

AT+NAUTO=0,1,192.168.3.105,5000 (AT command setting TCP/UDP Socket information)

[OK] (Response)

ATA2 (AT command executing Auto Connection except association as association already done)
[OK] (Response)***<=At this point, TCP connection is established.***

Figure23 Example of commands for Station Mode and Auto connection

10.1.3. exchanging data with a peer system

After ATA or ATA2, you can send data just by writing on serial interface, and treat all from serial interface as pure data.

10.1.4. Closing TCP connection

In order to disconnect the TCP connection, you have to transit to AT command mode first using SW escape characters (+++)or HW trigger(GPIO10 or GPIO29, depending on your setting with AT+XEHT command).

After transition to AT command mode, you can disconnect by using AT+NCLOSE=<CID> or AT+NCLOSEALL, also can disassociate from AP using AT+WD command.

10.2. Station Mode, UDP socket and Auto Connection

This is the same exactly with 10.1 except using an UDP socket.

To make an UDP socket, you have to use **AT+NAUTO=*<type>*,*0*,*<Dest IP>*,*<Dest port>***

10.3. Station Mode and Multi sockets

10.3.1. Example of commands sequence

AT (Sent AT command followed 0x0d)

AT (AT command echoed back by WizFi210)
[OK] (Response which means executed successfully)

ATE0 (Sent AT command followed 0x0d, this make echo back be disable)

ATE0 (AT command echoed back by WizFi210)
[OK] (Response which means executed successfully)

AT+XDUM=0 (Sent AT command followed 0x0d, **this make Notificaion messages be enable**)

[OK] (Response)

AT+BDATA=1 (**this make BULK mode be enable, Otherwise use *AT+BDATA=0***)

[OK]

AT+WD (AT command making disassociation from previous AP association)

[OK] (Response)

AT+NDHCP=1 (AT command makingDHCP mode be enable)

[OK] (Response)

AT+WWPA=12345678 (AT command setting WiFi security)

[OK] (Response)

AT+WA=WizFiDemoAP (AT command setting WiFiassociation information)
IP SubNet Gateway (Response)
192.168.3.104: 255.255.255.0: 192.168.3.1 (Response with IP addr)

[OK] (Response)**<=*At this point, association is done***.

AT+NCTCP=192.168.3.105,5000 (AT command connecting witha TCP Client Socket)

[CONNECT 0] (Notification Message from WizFi210 by issuing a command, **AT+XDUM=0**)

[OK] **<=*At this point, a TCP connection is done***.

AT+NCTCP=192.168.3.105,5001 (AT command connecting witha TCP Client Socket)

[CONNECT 1] (Notification Message from WizFi210)

[OK] (Response)**<=*At this point, another TCP connection is done***.

Figure24 Example of commands for Station Mode and Multi sockets

10.3.2. Exchanging data with a peer system

When usingmulti sockets, you have to use ESCAPE SEQUENCE to send and/or receive data to/from peer devices. For details of ESCAPE SEQUENCE, refer to 4.3.2 Escape Sequences.

Sending data to a Socket with CID 0 under not using BULK mode

<ESC>S0abcd<ESC>E => 1B 53 30 61 62 63 64 1B 45 (in HEX, no space)

Sednig data to a Socket with CID 0 under using BULK mode

<ESC>Z00004abcd => 1B 5A 30[21]30 30 30 34[22]61 62 63 64[23]

Receiving data from a UDP Socket under not using BULK mode

<Esc>U0192.168.1.1:52:Hello<Esc>E

1B 55 30 31 39 32 2E 31 36 38 2E 31 2E 31 3A 35 32 3A 48 65 6C 6C 6F 1B 45 (in HEX)

Receiving data from a UDP Socket under using BULK mode

<Esc>y0192.168.1.152\t0005Hello

1B 79 30 31 39 32 2E 31 36 38 2E 31 2E 31 20 35 32 09 30 30 30 35 48 65 6C 6C 6F (in HEX)

Figure25 Example of exchanging data in multi sockets mode

10.3.3. Closing TCP connection and UDP socket

AT+NCLOSE=0 (Sent AT command followed 0x0d)

[DISCONNECT 0] <= (Notification Message by issuing a command, **AT+XDUM=0**)

[OK] (Response)

AT+NCLOSE=1 (Sent AT command followed 0x0d)

[DISCONNECT 1] <= (Notification Message by issuing a command, **AT+XDUM=0**)

[OK] (Response)

Figure26 Example of commands for closing sockets

[21] CID
[22] Data Length
[23] Data

10.4. Limited AP, TCP Server and Auto Connection

10.4.1. Example of commands sequence

AT (Sent AT command followed 0x0d)

AT (AT command echoed back by WizFi210)
[OK] (Response which means executed successfully)

ATE0 (Sent AT command followed 0x0d, this make echo back be disable)

ATE0 (AT command echoed back by WizFi210)
[OK] (Response which means executed successfully)

AT+XDUM=0 (Sent AT command followed 0x0d, **this make Notificaion messages be enable**)

[OK] (Response)

AT+BDATA=1 (**this make BULK mode be enable, Otherwise use *AT+BDATA=0***)

[OK]

AT+WD (AT command making disassociation from previous AP association)

[OK] (Response)

AT+WM=2 **(AT command making WizFi210 Operating Mode as LimitedAP mode)**

[OK] (Response)

AT+WAUTH=1 **(AT command making WizFi210 Operating Mode as LimitedAP mode)**

[OK]

AT+WWEP1=1234567890 (AT command setting WiFi security. **LimitedAP mode supports only WEP**)

[OK] (Response)

AT+NSET=192.168.55.1,255.255.255.0,192.168.55.1(AT command setting the network information of WizFi210 itself , **You have to use this always when you use LimitedAP mode**)

[OK] (Response)

AT+WA=LimitedAP (AT command setting WiFiassociation information)
IP SubNet Gateway (Response)
192.168.55.1: 255.255.255.0: 192.168.55.1 (Response with IP addr)

[OK] (Response)***<=At this point, AP is started***.

AT+NAUTO=0,1,192.168.3.105,5000 (AT command setting TCP/UDP Socket information)

[OK] (Response)

ATA2 (AT command executing Auto Connection except association as association already done)

[OK] (Response)***<=At this point, TCP connection is established.***

Figure27 Example of commands for Limited AP Mode and Auto Connection

10.4.2. Exchanging data with a peer system

Exchanging data with its peer system is the same to 10.1.3. Refer to it.

10.4.3. Closing TCP connection and UDP socket

Closing TCP connections and UDP sockets is the same to 10.1.4. Refer to it.

10.5. Limited AP and Multi sockets

10.5.1. Example of commands sequence

AT (Sent AT command followed 0x0d)

AT (AT command echoed back by WizFi210)
[OK] (Response which means executed successfully)

ATE0 (Sent AT command followed 0x0d, this make echo back be disable)

ATE0 (AT command echoed back by WizFi210)
[OK] (Response which means executed successfully)

AT+XDUM=0 (Sent AT command followed 0x0d, **this make Notificaion messages be enable**)

[OK] (Response)

AT+BDATA=1 (**this make BULK mode be enable, Otherwise use *AT+BDATA=0***)

[OK]

AT+WD (AT command making disassociation from previous AP association)

[OK] (Response)

AT+WM=2 **(AT command making WizFi210 Operating Mode as LimitedAP mode)**

[OK] (Response)

AT+WAUTH=1 **(AT command making WizFi210 Operating Mode as LimitedAP mode)**

[OK]

AT+WWEP1=1234567890 (AT command setting WiFi security. **LimitedAP mode supports only WEP**)

[OK] (Response)

AT+NSET=192.168.55.1,255.255.255.0,192.168.55.1(AT command setting the network information of WizFi210 itself , **You have to use this always when you use LimitedAP mode**)

[OK] (Response)

AT+WA=LimitedAP (AT command setting WiFiassociation information)
IP SubNet Gateway (Response)
192.168.55.1: 255.255.255.0: 192.168.55.1 (Response with IP addr)

[OK] (Response)**<=*At this point, AP is started***.

AT+NCTCP=192.168.3.105,5000 (AT command connecting witha TCP Client Socket)

[CONNECT 0] (Notification Message from WizFi210 by issuing a command, **AT+XDUM=0**)

[OK] **<=*At this point, a TCP connection is done***.

AT+NCTCP=192.168.3.105,5001 (AT command connecting witha TCP Client Socket)

[CONNECT 1] (Notification Message from WizFi210)

[OK] (Response)**<=*At this point, another TCP connection is done***.

Figure28 Example of commands for Limited AP Mode and Auto Connection

10.5.2. Exchanging data with a peer system

Exchanging data with its peer system is the same to 10.3.2. Refer to it.

10.5.3. Closing TCP connection and UDP socket

Closing TCP connections and UDP sockets are the same to 10.3.3. Refer to it.