

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: These are the 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

These equipments 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:

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- 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: These equipments 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

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- 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

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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 its termination.**

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 <i>n</i>
	Meaning	<i>n</i> =0 (Input echo disable) ex)ATE0 <i>n</i> =1 (Input echo enable) ex)ATE1
	Response	[OK]
ATV	Format	ATV <i>n</i>
	Meaning	<i>n</i> =0 (ASCII reply disable) ex) ATV0 <i>n</i> =1 (ASCII reply enable) ex) ATV1
	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 <i>n</i>

²No space is allowed between Parameter, comma(,), and next parameter

³The parameter, which is surrounded by [], can be skipped.

	Description	$n=0$ (SW Flow ctrl disable) ex) AT&K0 $n=1$ (SW Flow ctrl enable) ex) AT&K1				
	Response	[OK]				
AT&R	Format	AT&R n				
	Description	$n=0$ (HW Flow ctrl disable) ex) AT&R0 $n=1$ (HW Flow ctrl enable) ex) AT&R1				
	Response	[OK]				
ATS	Format	ATS n,p				
	Description	$n=0$ to 5 p =(timeout value)				
		n	meaning	unit	range	default
		0	Network connection Timeout	10ms	1~65535	1000
		1	Auto Associate Timeout	10ms	0~65535	500
		2	TCP connection Timeout	10ms	0~65535	500
		3	Association Retry Count	NA	NA	NA
		4	Nagle Algorithm Wait Time	10ms	0~65535	10
	5	Scan Time	1ms	0~65535	20	
Response	[OK]					
ATIn	Format	ATIn				
	Description	This command provides version information of WizFi210.				
		n	Meaning			
		0	OEM Identification			
		1	Hardware version			
	2	Software version				
Response	ex)ATi0or ATi2					
	Command	ATi0	ATi1	ATi2		
	Response	WIZnet [OK]	GS1011 [OK]	WizFi210 1.1.0.5(W) [OK]		

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 <i>n</i>
	Meaning	<i>n</i> =0 (Save profile #0) ex) AT&W0 <i>n</i> =1 (Save profile #1) ex) AT&W1
	Response	[OK]
ATZ	Format	ATZ <i>n</i>
	Meaning	<i>n</i> =0 (Load profile #0) ex) ATZ0 <i>n</i> =1 (Load profile #1) ex) ATZ1
	Response	[OK]
AT&Y	Format	AT&Y <i>n</i>
	Meaning	<i>n</i> =0 (Set default configuration to profile #0) ex) AT&Y0 <i>n</i> =1 (Set default configuration to profile #1) ex) AT&Y1
	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>

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

⁴This 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	<pre> 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] </pre>
AT+WM	Format	AT+WM=<i>n</i>
	Meaning	<i>n</i>=0 (infrastructure / Station) <i>n</i>=1 (ad hoc) <i>n</i>=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= <i>WizFiDemoAP</i>
	Response	<pre> IP SubNet Gateway 192.168.3.123: 255.255.255.0: 192.168.3.1 [OK] </pre>
AT+WD	Format	AT+WD
	Meaning	This command makes WizFi210 disassociate from the current AP ex) AT+WD
	Response	[OK]

ATH	Format	ATH							
	Meaning	This command makes WizFi210 disassociate from the current AP ex) ATH							
	Response	[OK]							
AT+WWPS	Format	AT+WWPS= <METHOD>[,PIN]							
	Meaning	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		METHOD	Meaning	1	Set to Limited AP mode with default setting	2	Set to Ad hoc mode with default setting
	METHOD	Meaning							
	1	Set to Limited AP mode with default setting							
2	Set to Ad hoc mode with default setting								
Response									
AT+NSTAT	Format	AT+NSTAT= ?							
	Meaning	Get Current wireless and network status.							
	Response	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]							
AT+WSTATUS	Format	AT+WSTATUS							
	Meaning	Get current Wireless status							
	Response	MODE:0 CHANNEL:11 SSID:"WizFiDemoAP" BSSID:00:23:69:c8:f4:f5 SECURITY:WPA2-PERSONAL [OK]							
AT+WRSSI	Format	AT+WRSSI= ?							
	Meaning	Get current RSSI value as ASCII							
	Response	-53 [OK]							
AT+WRATE	Format	AT+WRATE= ?							

	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+APCLIEN TINFO	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= <i>n</i>
	Meaning	Set Authentication Mode <i>n</i> =0(None) <i>n</i> =1 (Open) <i>n</i> =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= <i>n</i>
	Meaning	Supported a strict security configuration <i>n</i> = 0 (Auto security) <i>n</i> = 1 (Open security) <i>n</i> = 2 (WEP security) <i>n</i> = 4 (WPA-PSK security) <i>n</i> = 8 (WPA2-PSK security) <i>n</i> = 16 (WPA2 Enterprise) <i>n</i> = 64 (WPA2-AES + TKIP security) ex) AT+WSEC=8
	Response	[OK]
AT+WWEP	Format	AT+WWEP <i>n</i> = < <i>key</i> >
	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. <i>n</i> =1 to 4 (Key index) < <i>key</i> >.(Key value in ASCII) ex) AT+WWEP 1= 1234567890

	Response	[OK]
AT+WWPA	Format	AT+WWPA= <i><passphrase></i>
	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. <i><passphrase></i>: (passphrase value in ASCII) ex) AT+WWPA= 12345678
	Response	[OK]
AT+WPAPSK	Format	AT+WPAPSK= <i><SSID></i> , <i><passphrase></i>
	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. <i><SSID></i> : AP's SSID <i><passphrase></i> : Key value for associating to AP ex)AT+WPAPSK= WizFiDemoAP,12345678
	Response	[OK]
AT+WPSK	Format	AT+WPSK= <i><PSK></i>
	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. <i><PSK></i> : Pre Shared Key ex)AT+WPSK=00010203040506070809000102 (?)
	Response	[OK]
AT+WEAPCO NF	Format	AT+ WEAPCONF= <i><Outer Authentication></i> , <i><Inner Authentication></i> , <i><user name></i> , <i><password></i>
	Meaning	This is a command for setting EAP Security mode <i><Outer Authentication></i>

		<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	Mode	Value(in ASCII)	EAP-FAST	43	EAP-TLS	13	EAP-TTLS	21	EAP-PEAP	25	Mode	Value(in ASCII)	EAP-MSCHAP	26	EAP-GTC	6
Mode	Value(in ASCII)																	
EAP-FAST	43																	
EAP-TLS	13																	
EAP-TTLS	21																	
EAP-PEAP	25																	
Mode	Value(in ASCII)																	
EAP-MSCHAP	26																	
EAP-GTC	6																	
	Response	[OK]																
AT+WEAP	Format	AT+WEAP= <Type>, <Format>, <Size>, 0 [OK] ⁵ <= Response from WizFi210 <ESC>W <data of size above>																
	Meaning	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>⁶W<....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...>	Type	Value(in ASCII)	CA certificate	0	Client certificate	1	Private Key	2								
Type	Value(in ASCII)																	
CA certificate	0																	
Client certificate	1																	
Private Key	2																	
	Response	[OK]																

⁵After 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_CLIENT - 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= <i>n</i>
	Meaning	<i>n</i> =0 (802.11 radio disable) <i>n</i> =1 (802.11 radio enable) ex) AT+WRXACTIVE= 1
	Response	[OK]

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

AT+WRXPS	Format	AT+WRXPS= <i>n</i>							
	Meaning	<i>n</i> =0 (Power Save mode disable) <i>n</i> =1 (Power Save mode enable) ex) AT+WRXPS=1							
	Response	[OK]							
AT+MCSTSET	Format	AT+MCSTSET= <i>n</i>							
	Meaning	<i>n</i> =0 (Multicast reception disable) <i>n</i> =1 (Multicast reception enable) ex) AT+MCSTSET=0							
	Response	[OK]							
AT+WP	Format	AT+WP= <power>							
	Meaning	<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>		Device	Power range	WizFi210	0 ~ 7	WizFi220	2 ~ 15
		Device	Power range						
		WizFi210	0 ~ 7						
	WizFi220	2 ~ 15							
According to Value is getting smaller, TX Power is getting stronger. ex) AT+WP=0									
Response	[OK]								
AT+WSYNCI NTRL	Format	AT+WSYNCLNTRL= <i>n</i>							
	Meaning	<i>n</i> =1 to 65535. Set Sync Loss Interval with <i>n</i> ex) AT+WSYNCLNTRL=30							
	Response	[OK]							
AT+EXTPA	Format	AT+EXTPA= <i>n</i>							
	Meaning	<i>n</i> =0 (External PA disable) <i>n</i> =1 (External PA enable) ex) AT+EXTPA=0							
	Response	[OK]							
AT+PSPOLLI NTRL	Format	AT+PSPOLLINTRL= <i>n</i>							
	Meaning	<i>n</i> = 1 to 65535. Set the Keep Alive Timer Interval with <i>n</i> ex) AT+PSPOLLINTRL=45							
	Response	[OK]							
AT+WAPSM	Format	AT+WAPSM= <value>							
	Meaning	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							

		power save mode			
		Default Radio Rx Mode			
		Value	Active Mode	PS Poll Mode	OFF
		0	Receiver is kept active ON throughout the joining procedure. (Default)		
		1	Receiver is active ON throughout the joining procedure	Receiver is active ON but is in PS Poll mode during time consuming key calculation during the joining procedure	Receiver is active ON but turned OFF during time consuming key calculation during the joining procedure
		2		Receiver is kept PS POLL mode throughout the joining procedure	Receiver is kept PS POLL mode throughout the joining procedure
	3	Receiver is kept ON in PS POLL mode but turned OFF during time consuming key calculation during the association procedure			
Response	[OK]				
AT+WIEEEPSPOLL	Format	AT+WIEEEPSPOLL=<n>,[Listen beacon interval]			
	Meaning	<n> is 0, to disable this feature and <n> is 1 for enable this feature. If it is enabled, then the second parameter listens during the beacon interval and at valid beacon intervals where the WLAN wakes up for listening to 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 after the command is issued.			
	Response	[OK]			

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= <i>n</i>
	Meaning	<i>n</i> =0 (DHCP mode disable)

		<i>n</i> =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+DHCPSPR VR	Format	AT+DHCPSPR= <i>n</i>
	Meaning	<i>n</i> =0 (DHCP Server disable) <i>n</i> =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	

AT+NSTCP	Format	AT+NSTCP= <Port>			
	Meaning	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			
	Response				
AT+NSUDP	Format	AT+NSUDP= <Port>			
	Meaning	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			
	Response				
AT+CID	Format	AT+CID= ?			
	Meaning	Get the current connection status with CID			
	Response	<table><tr><td rowspan="2">In case of some Connections</td><td>CIDTYPEMODELOCAL PORTREMOTE PORTREMOTE IP 0TCPCLIENT5238835001192.168. 3.105 [OK]</td></tr><tr><td>In case of no Connection [OK]</td></tr></table>		In case of some Connections	CIDTYPEMODELOCAL PORTREMOTE PORTREMOTE IP 0TCPCLIENT5238835001192.168. 3.105 [OK]
In case of some Connections	CIDTYPEMODELOCAL PORTREMOTE PORTREMOTE IP 0TCPCLIENT5238835001192.168. 3.105 [OK]				
	In case of no Connection [OK]				
AT+NCLOSE	Format	AT+NCLOSE= <CID>			
	Meaning	Close a connection having a specified CID <CID> : Connection ID, 0 ~ F ex)AT+NCLOSE= 1			
	Response	[OK]			
AT+NCLOSE ALL	Format	AT+NCLOSEALL			
	Meaning	Close all connections			
	Response	[OK]			

AT+SETSOCK OPT	Format	AT+SETSOCKOPT= <CID>,<Type>,<Parameter>,<Value>,<Length>	
	Meaning	Set a Socket option having a specified CID	
	Response	[OK]	
AT+SSLOPEN	Format	AT+SSLOPEN= <cid>,<certificate name>(*)	
	Meaning	Open a SSL Connection <cid>: Connection ID <certificate name>: Certificate Name	
	Response	[OK]	
AT+SSLCLOS E	Format	AT+SSLCLOSE= <cid>(*)	
	Meaning	Close a SSL Connection <cid>: Connection ID	
	Response	[OK]	
AT+HTTPCO NF	Format	AT+HTTPCONF= <Param>,<Value>(*)	
	Meaning	Set a specific parameter of configuration information for HTTP Clientwith <Value>.	
		<Param>	
		value	Meaning
		2	HTTP_HEADER_AUTHORIZATION
		3	HTTP_HEADER_CONNECTION
		4	HTTP_HEADER_CONTENT_ENCODING
		5	HTTP_HEADER_CONTENT_LENGTH
		6	HTTP_HEADER_CONTENT_RANGE
		7	HTTP_HEADER_CONTENT_TYPE
		8	HTTP_HEADER_DATE
		9	HTTP_HEADER_EXPIRES
		10	HTTP_HEADER_FROM
		11	HTTP_HEADER_HOST
		12	HTTP_HEADER_IF_MODIFIED_SINCE
		13	HTTP_HEADER_LAST_MODIFIED
		14	HTTP_HEADER_LOCATION
15	HTTP_HEADER_PRAGMA		
16	HTTP_HEADER_RANGE		

		<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/5.0Wr	17	HTTP_HEADER_REFERER	18	HTTP_HEADER_SERVER	19	HTTP_HEADER_TRANSFER_ENCODING	20	HTTP_HEADER_USER_AGENT	21	HTTP_HEADER_WWW_AUTHENTICATE	23	HTTP_HEADER_REQUEST_URL																											
	17	HTTP_HEADER_REFERER																																							
	18	HTTP_HEADER_SERVER																																							
19	HTTP_HEADER_TRANSFER_ENCODING																																								
20	HTTP_HEADER_USER_AGENT																																								
21	HTTP_HEADER_WWW_AUTHENTICATE																																								
23	HTTP_HEADER_REQUEST_URL																																								
Response	[OK]																																								
AT+HTTPCONFDEL	Format	AT+HTTPCONFDEL= <Param>																																							
	Meaning	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>	value	Meaning	2	HTTP_HEADER_AUTHORIZATION	3	HTTP_HEADER_CONNECTION	4	HTTP_HEADER_CONTENT_ENCODING	5	HTTP_HEADER_CONTENT_LENGTH	6	HTTP_HEADER_CONTENT_RANGE	7	HTTP_HEADER_CONTENT_TYPE	8	HTTP_HEADER_DATE	9	HTTP_HEADER_EXPIRES	10	HTTP_HEADER_FROM	11	HTTP_HEADER_HOST	12	HTTP_HEADER_IF_MODIFIED_SINCE	13	HTTP_HEADER_LAST_MODIFIED	14	HTTP_HEADER_LOCATION	15	HTTP_HEADER_PRAGMA	16	HTTP_HEADER_RANGE	17	HTTP_HEADER_REFERER	18	HTTP_HEADER_SERVER	19	HTTP_HEADER_TRANSFER_ENCODING	20
value	Meaning																																								
2	HTTP_HEADER_AUTHORIZATION																																								
3	HTTP_HEADER_CONNECTION																																								
4	HTTP_HEADER_CONTENT_ENCODING																																								
5	HTTP_HEADER_CONTENT_LENGTH																																								
6	HTTP_HEADER_CONTENT_RANGE																																								
7	HTTP_HEADER_CONTENT_TYPE																																								
8	HTTP_HEADER_DATE																																								
9	HTTP_HEADER_EXPIRES																																								
10	HTTP_HEADER_FROM																																								
11	HTTP_HEADER_HOST																																								
12	HTTP_HEADER_IF_MODIFIED_SINCE																																								
13	HTTP_HEADER_LAST_MODIFIED																																								
14	HTTP_HEADER_LOCATION																																								
15	HTTP_HEADER_PRAGMA																																								
16	HTTP_HEADER_RANGE																																								
17	HTTP_HEADER_REFERER																																								
18	HTTP_HEADER_SERVER																																								
19	HTTP_HEADER_TRANSFER_ENCODING																																								
20	HTTP_HEADER_USER_AGENT																																								

		<table><tr><td>21</td><td>HTTP_HEADER_WWW_AUTHENTICATE</td></tr><tr><td>23</td><td>HTTP_HEADER_REQUEST_URL</td></tr></table>	21	HTTP_HEADER_WWW_AUTHENTICATE	23	HTTP_HEADER_REQUEST_URL		
21	HTTP_HEADER_WWW_AUTHENTICATE							
23	HTTP_HEADER_REQUEST_URL							
	Response	[OK]						
AT+HTTPOPEN	Format	AT+HTTPOPEN= <host>[,<Port Number>,<SSL Flag>,<certificate name>,<proxy>](*)						
	Meaning	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	Value	Meaning	0	SSL Disabled(Default)	1	SSL Enabled
	Value	Meaning						
0	SSL Disabled(Default)							
1	SSL Enabled							
Response	␣(Connected Socket's CID) [OK]							
AT+HTTSEND	Format	AT+HTTSEND= <cid>,<Type>,<Timeout>,<Page>,[<Size of content>] <ESC>H<Contents>(*)						
	Meaning	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	Value	Meaning	1	HTTP_METHOD_GET	3	HTTP_METHOD_POST
Value	Meaning							
1	HTTP_METHOD_GET							
3	HTTP_METHOD_POST							

		<i><Size of content> : Actual contents size, this can be omitted in case of GET</i> ex)AT+HTTPSEND=0,1,10,/
	Response	Response data in escaped sequence format from HTTP(S) Server
AT+HTTPCLOSE	Format	AT+HTTPCLOSE= <i><cid>(*)</i>
	Meaning	Close the HTTP client connection. <i><cid> : CID for the HTTP Client socket</i> ex)AT+HTTPCLOSE=0
	Response	[OK]
AT+NRAW	Format	AT+NRAW= <i>n</i>
	Meaning	Enable / Disable Raw Ethernet support. <i>n</i> =0 <i>n</i> =1 <i>n</i> =2
	Response	[OK]
AT+UNSOLICITEDTX	Format	AT+UNSOLICITEDTX= <i><Frame Control>,<Sequence Cntrl>,<Channel>,<Rate>,<WmmInfo>,<Receiver Mac>,<Bssid of AP>,<Frame Length></i>
	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+BCHKST RT	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+BATTLVL SET	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+BCHKST OP	Format	AT+BCHKSTOP
	Meaning	Stop checking battery.
	Response	[OK]
AT+BATTVAL GET	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+PSDPSLE EP	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<i>n</i>
	Meaning	After next reboot or next "AT" command, this will be affected. <i>n</i> =0 (Auto Connect is disable) <i>n</i> =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 exited⁹ 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=<i>n</i>
	Meaning	Auto reconnect interval. <i>n</i> =0 (disable) <i>n</i> =5 to 3600 (interval, seconds)

⁹In 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

	Response	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																																																	
AT+TRACEROUTE	Format	AT+TRACEROUTE= <IP>,[<Interval>],[<MaxHops>],[<MinHops>],[<TOS>]]																																																	
	Meaning	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																																																	
	Response	Tracing Route to 74.125.235.145 over a max hops 30 [OK] <table><tr><td>1</td><td>3 ms</td><td>3 ms</td><td>2 ms</td><td>192.168.3.1</td></tr><tr><td>2</td><td>4 ms</td><td>4 ms</td><td>3 ms</td><td>222.98.173.254</td></tr><tr><td>3</td><td>5 ms</td><td>4 ms</td><td>3 ms</td><td>121.190.34.69</td></tr><tr><td>4</td><td>*</td><td>*</td><td>*</td><td>Request timed out</td></tr><tr><td>5</td><td>3 ms</td><td>3 ms</td><td>7 ms</td><td>112.189.127.21</td></tr><tr><td>6</td><td>5 ms</td><td>4 ms</td><td>5 ms</td><td>125.130.13.233</td></tr><tr><td>7</td><td>38 ms</td><td>10 ms</td><td>7 ms</td><td>112.174.15.133</td></tr><tr><td>8</td><td>5 ms</td><td>5 ms</td><td>5 ms</td><td>112.174.81.102</td></tr><tr><td>9</td><td>5 ms</td><td>5 ms</td><td>4 ms</td><td>112.174.83.50</td></tr><tr><td>10</td><td>101 ms</td><td>73 ms</td><td>71 ms</td><td>72.14.195.22</td></tr></table>	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
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																																															

		1171 ms90 ms72 ms209.85.255.80 1291 ms113 ms93 ms209.85.249.195 1374 ms73 ms73 ms209.85.241.129 1474 ms77 ms77 ms74.125.235.145 Trace Complete																	
AT+BDATA	Format	AT+BDATA= <i>n</i>																	
	Meaning	This command is to set whether Data is handled in Bulk mode. <i>n</i>=1 (Bulk Data mode is enable) <i>n</i>=0 (Bulk Data mode is disable)																	
	Response	[OK]																	
AT+XDUM	Format	AT+XDUM= <i>n</i>																	
	Meaning	This command is to set whether Notification from WizFi210 regarding of some event become enable. <i>n</i>=1 (Notification Message is disable) <i>n</i> =0 (Notification Message is enable)																	
	Response	[OK]																	
AT+XEHT	Format	AT+XEHT= <HW Trigger GPIO>,<ActiveReverse>,<SW Trigger Disable>,<ButtonAction>																	
	Meaning	This command is to set Hardware Trigger handling transition of between command mode and data mode. <HW Trigger GPIO> <table><thead><tr><th>Value</th><th>Meaning</th></tr></thead><tbody><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></tbody></table> <ActiveReverse> <table><thead><tr><th>Value</th><th>Meaning</th></tr></thead><tbody><tr><td>0</td><td>Change to Active Low</td></tr><tr><td>1</td><td>Change to Active High</td></tr></tbody></table> <SW Trigger Disable> <table><thead><tr><th>Value</th><th>Meaning</th></tr></thead><tbody><tr><td>0</td><td>+++ Escape Sequence Enable</td></tr></tbody></table>	Value	Meaning	0	Disable HW Trigger	1	GPIO10	2	GPIO29	Value	Meaning	0	Change to Active Low	1	Change to Active High	Value	Meaning	0
Value	Meaning																		
0	Disable HW Trigger																		
1	GPIO10																		
2	GPIO29																		
Value	Meaning																		
0	Change to Active Low																		
1	Change to Active High																		
Value	Meaning																		
0	+++ Escape Sequence Enable																		

		<table><tr><td>1</td><td>+++ Escape Sequence Disable</td></tr></table>	1	+++ Escape Sequence Disable				
		1	+++ Escape Sequence Disable					
		<ButtonAction> <i>This parameter is to select a button for factory default provisioning</i> <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>	Value	Meaning	1	GPIO10	3	GPIO21
		Value	Meaning					
		1	GPIO10					
3	GPIO21							
ex) AT+XEHT=2,1,0,3 (Default) ex) AT+XEHT=1,0,0,1 (in old EVB)								
Response	[OK]							
AT+RESET	Format	AT+RESET						
	Meaning	The command forcefully reset the WizFi210						
	Response	APP Reset-APP SW Reset						
AT+ERRCOUNT	Format	AT+ERRCOUNT=?						
	Meaning	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						
	Response	APP-WD :0 WLAN-WD :0 WLAN-ABORT :0 WLAN-ASSERT:0 APP-SW-RST :0 WLAN-SW-RST:0 [OK]						

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.

Command	Category	Description																				
AT+NCMAUTO O	Format	AT+NCMAUTO= <Mode>.<Start/Stop>,[Level]																				
	Meaning	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.																				
	Response	[OK]																				
AT+NCMAUTOCONF OCONF	Format	AT+NCMAUTOCONF= <ConfId>,<Value>																				
	Meaning	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>	ConfId	Meaning	0	CPU Wait Period (1 to 65355 msec, default is 1000msec)	1	Power Save Period(not supported) (1 to 65355 msec, default is 1000 msec)	2	Know channel scan period (1 to 65355 msec, default is 1000 msec)	3	Specific channels scan period(not supported) (1 to 65355 msec, default is 1000 msec)	4	All Channel scan Period (1 to 65355 msec, default is 1000)	5	All Channel scan Period (1 to 65355 msec, default is 1000)	8	Known channel scan retry count (1 to 65355, default is 10)	9	Specific channels scan retry count(not supported) (1 to 65355, default is 10)	10	All Channel scan retry count (1 to 65355, default is 10)
		ConfId	Meaning																			
		0	CPU Wait Period (1 to 65355 msec, default is 1000msec)																			
		1	Power Save Period(not supported) (1 to 65355 msec, default is 1000 msec)																			
		2	Know channel scan period (1 to 65355 msec, default is 1000 msec)																			
		3	Specific channels scan period(not supported) (1 to 65355 msec, default is 1000 msec)																			
		4	All Channel scan Period (1 to 65355 msec, default is 1000)																			
		5	All Channel scan Period (1 to 65355 msec, default is 1000)																			
		8	Known channel scan retry count (1 to 65355, default is 10)																			
		9	Specific channels scan retry count(not supported) (1 to 65355, default is 10)																			
10	All Channel scan retry count (1 to 65355, default is 10)																					

		11	L3 Connect retry count (1 to 65355, default is 100)
	Response	[OK]	
AT+APCONF	Format	AT+APCONF=<Enable>	
	Meaning	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.	
	Response	[OK]	

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 AT12 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+DHCPSPVR	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+BATTVLSET	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+WIEEESPOLL	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.

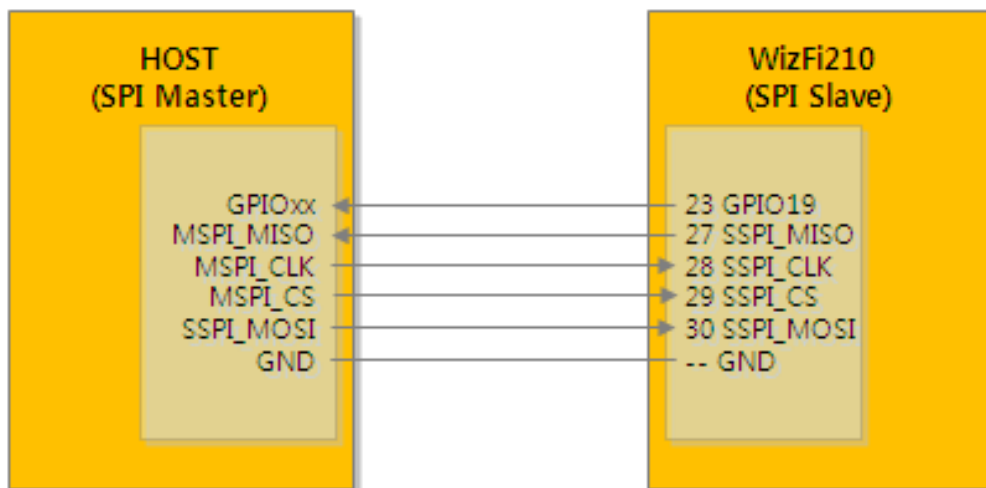


Figure1 Pin connection for SPI between Host and WizFi210

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

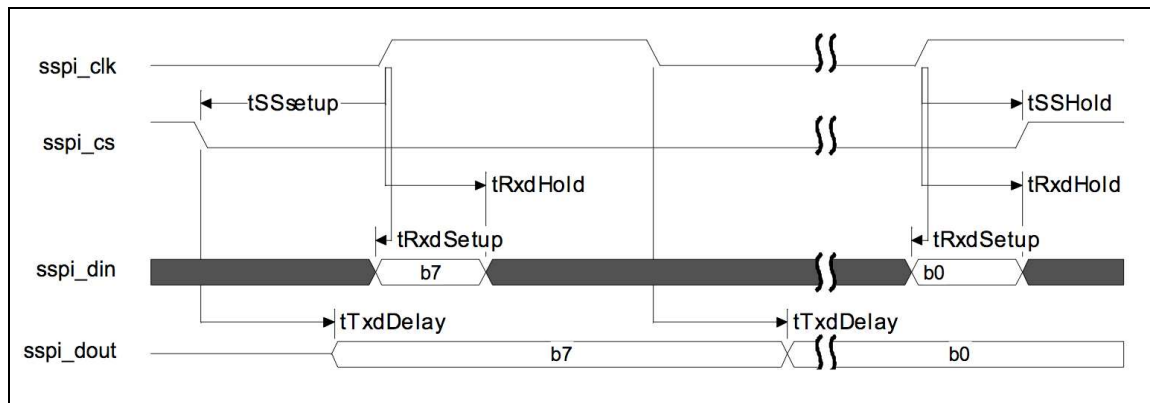


Figure 2 Timing diagram of SPI interface

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), after the 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 be lost when power is lost unless they are saved to a profile using AT+W. The profile used in that 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 new SPI 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, WizFi210 returns 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 confusion and 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 current connection. Use this sequence to send data to a TCP server, TCP client or 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. This sequence 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 remote port is transmitted. WizFi210 expects to receive the following data sequence from Host: <Esc>U<CID> <IP Address>:<port>:<data> <Esc>E

¹⁰If 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 you receive 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. This sequence 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 you receive 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 remote port is transmitted. When WizFi210 received data thru an UDP socket, it send it to host with below format. <Esc>U<CID> <IP Address>:<port>:<data> <Esc>E Example: When WizFi210 receive 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>Wt<data>	When this command is used, the remote address and remote port is transmitted.

¹¹As 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>Wt<data> Example: When WizFi210receive data (e.g. Hello) thru CID 0, WizFi210/220 transfer it to host as below <Esc>y0192.168.1.152Wt0005Hello
<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+WPA=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 operation is 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 WizFi210 is 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+DHCPSPVR=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+DHCPSPVR=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>(GPIO21¹² or GPIO10) button twice consecutively, the WizFi210 is restored to factory default setting and changed to <AP & Web mode>.

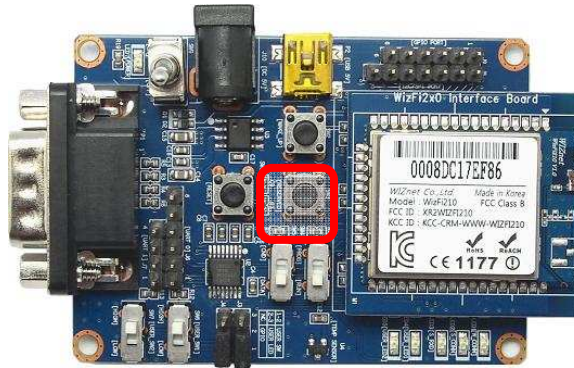


Figure 8 Button corresponding to that pin in WizFi210 Evaluation board

The IP address of WizFi210 is shown below.

IP:192.168.1.1

Subnet:255.255.255.0

Gateway:192.168.1.1

So 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

¹²User 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.

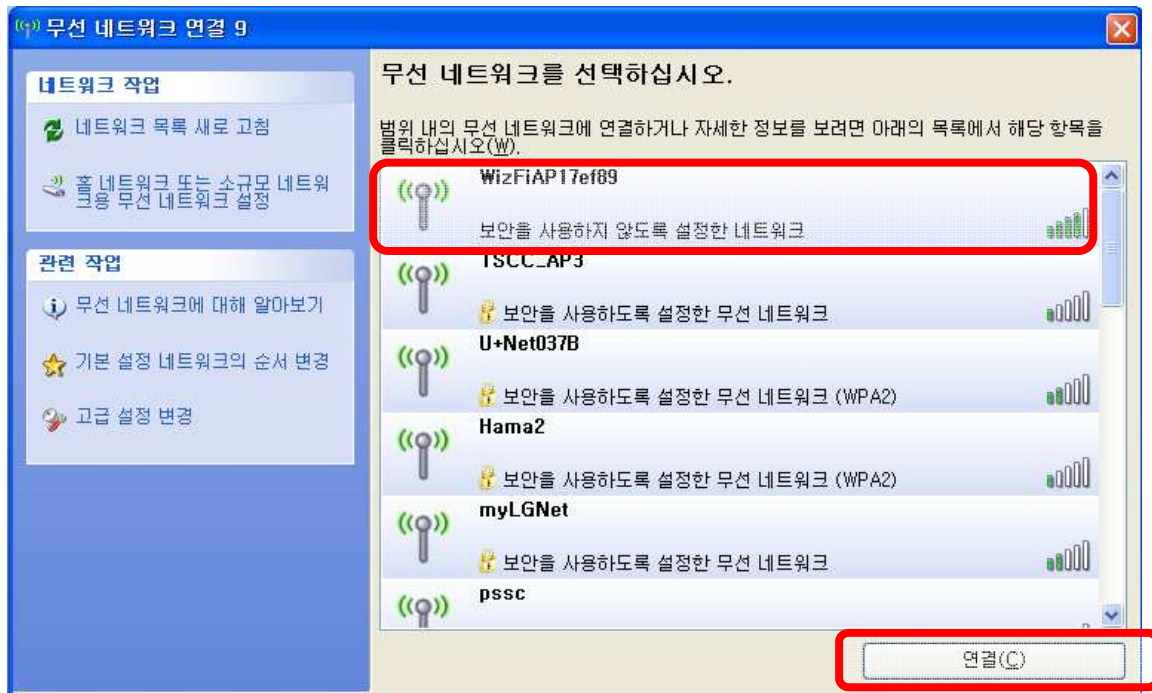


Figure10 Example of APs list

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".

```

C:\WINDOWS\system32\cmd.exe

C:\W>ipconfig

Windows IP Configuration

Ethernet adapter 무선 네트워크 연결 9:

    Connection-specific DNS Suffix  . : 
    IP Address. . . . . : 192.168.1.2
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 
  
```

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, the default ID and Password are admin and admin respectively.

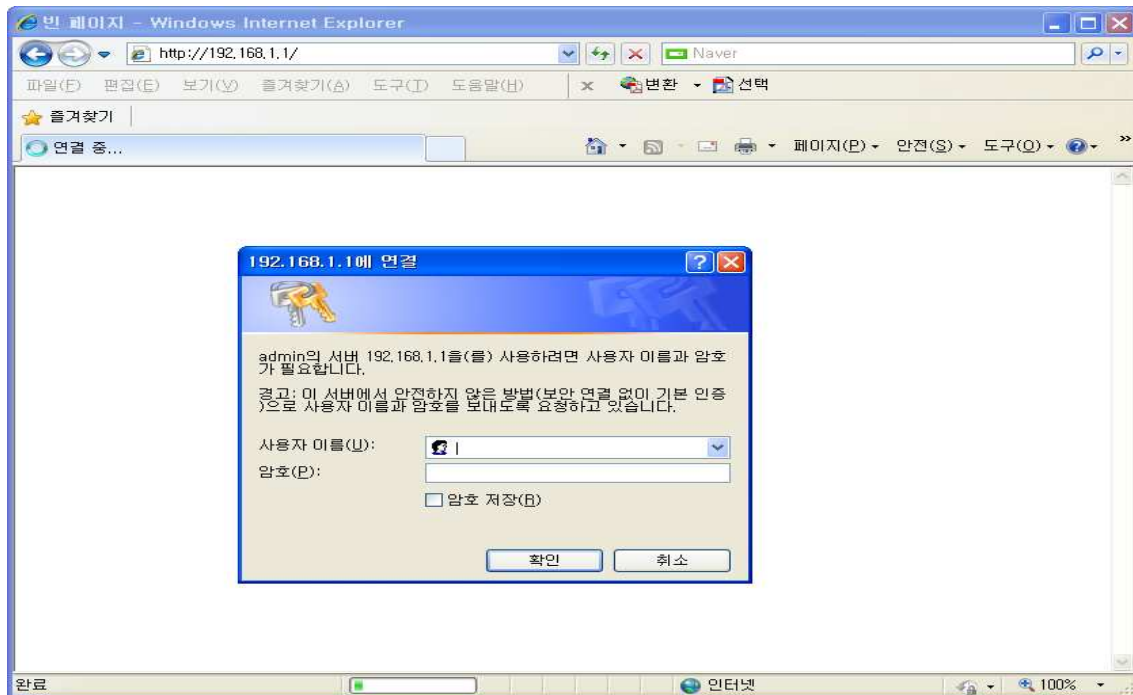


Figure12 Example of connecting to Web Server on WizFi210

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.

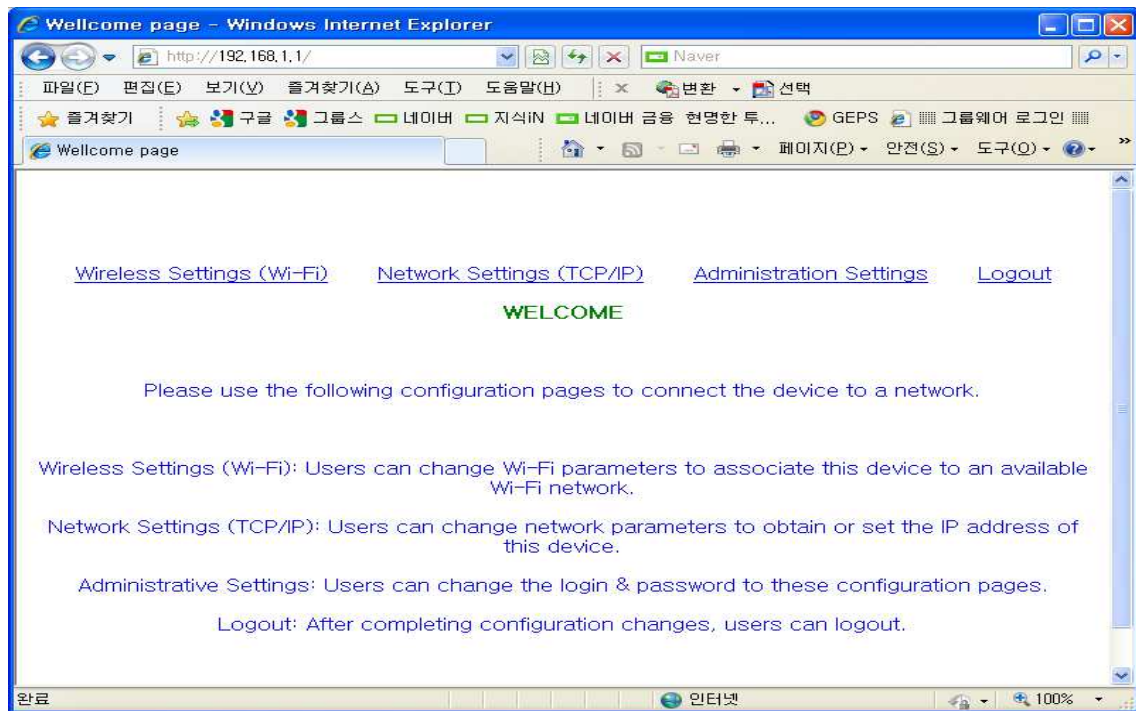


Figure13 Web page for configuration on WizFi210

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

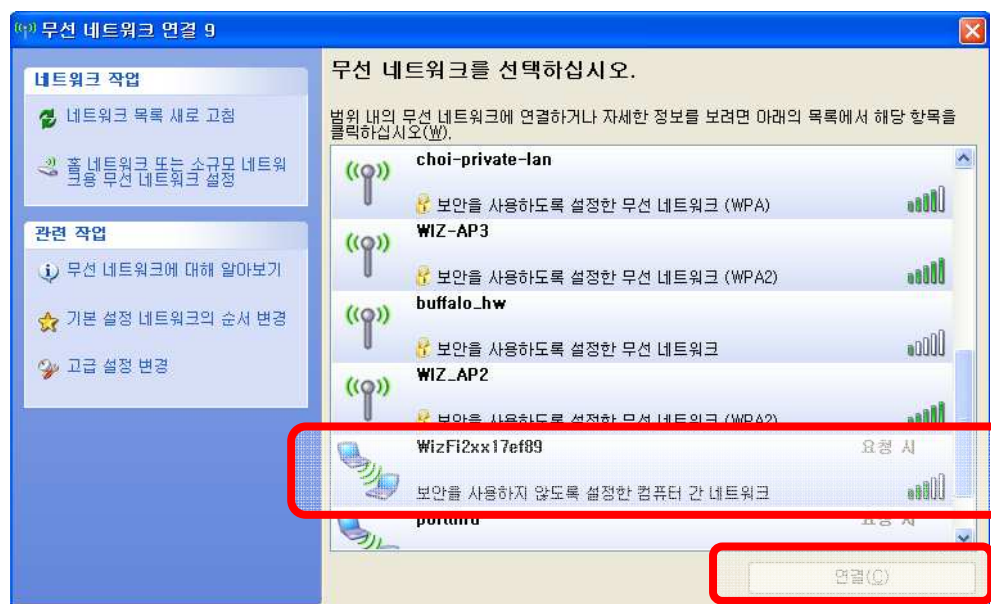
[OK]

7.2.2. Connecting to the WizFi210 with ad-hoc mode

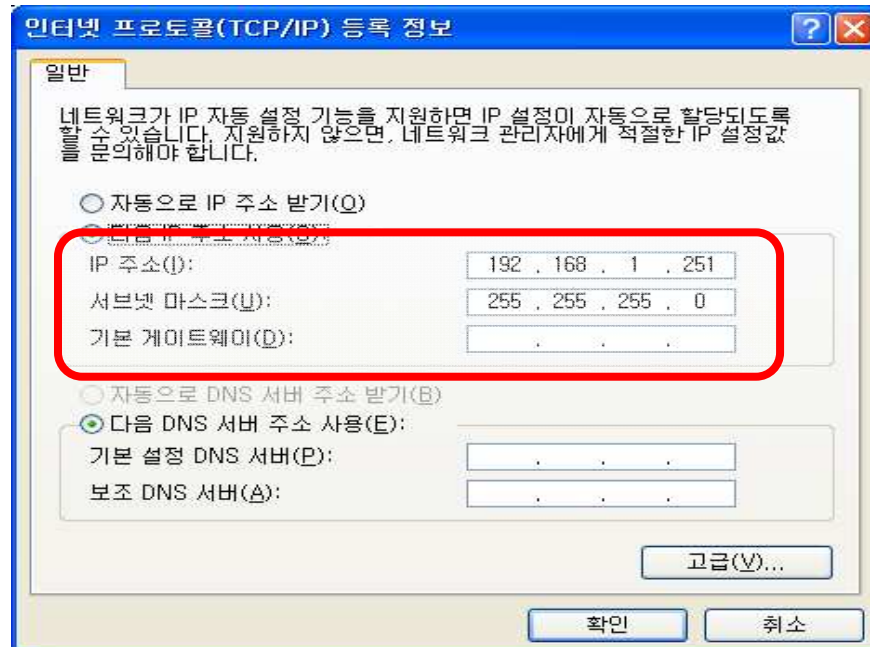
If you scan the AP, you can see <WizFi2xxXXXXXX> in the ad hoc list.

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 methods 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+HTTPOPEN", "AT+HTTPOCLOSE" 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 supports both 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,8013,014
IP:118.129.166.16015 (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

¹³80 is the default port number of normal HTTP server, not HTTPS server.

¹⁴If this value is '0', then it makes WizFi210 use the standard HTTP protocol, not HTTPS protocol

¹⁵The 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.

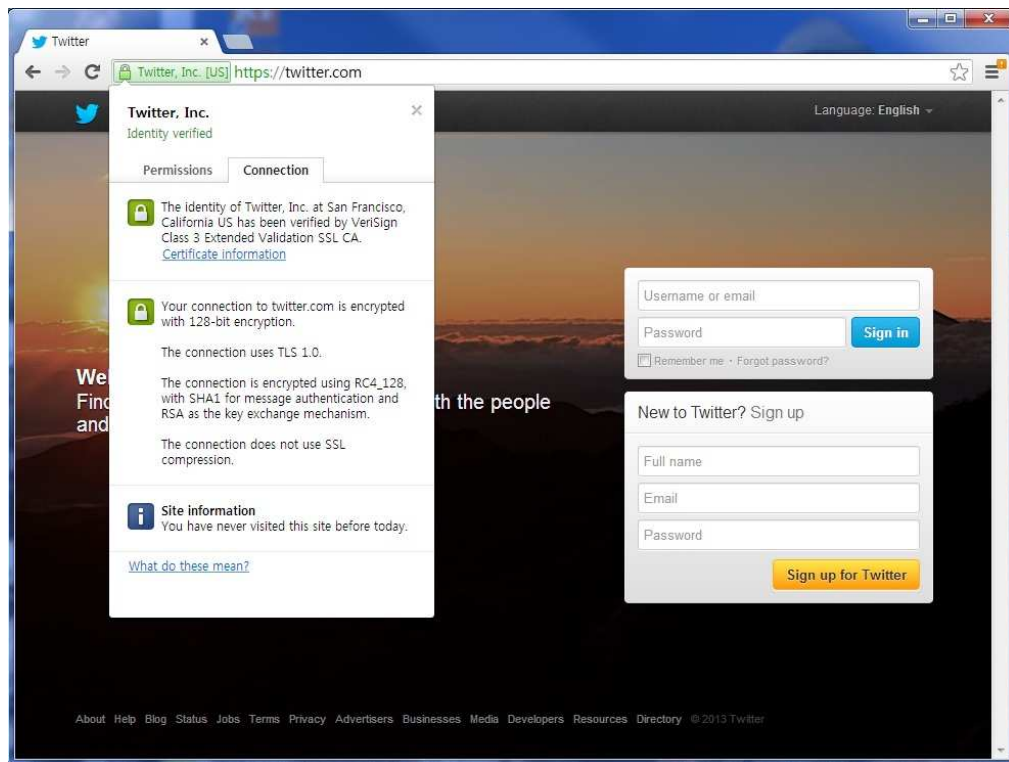


Figure 14 Certificate information view on Twitter.com

- 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:199.59.148.21216 (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

¹⁶The 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

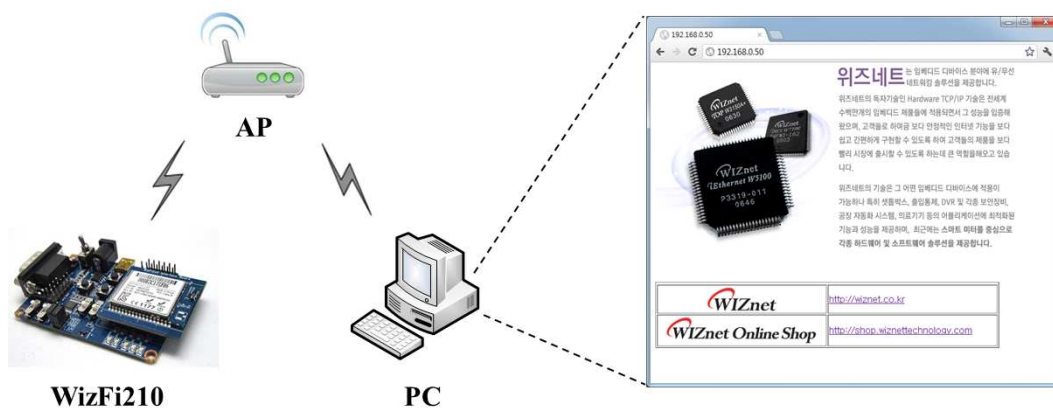


Figure15 Network environment for testing Web server on WizFi210

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

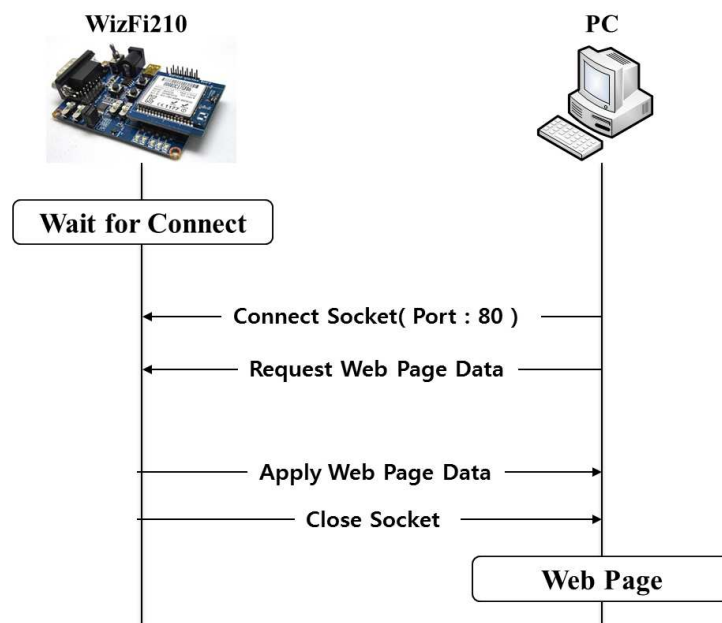


Figure16 Connection flow for test

8.3.3. Example of AT commands for configuring HTTP Server

First, user associates with AP and makes a 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+WPA=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>S117GET /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>E18
```

Figure18Example of received data from web browser

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

```
<ESC>S119<HTML>
<TABLE width="600" style="table-layout:fixed" border=1>
<TR></TD></TR>
<TR></TR>
<TR><TD height="50" width="100" align=center valign=middle></TD>
<TD><a href="http://wiznet.co.kr">http://wiznet.co.kr</a></TD></TR>
<TR>
<TD height= "50" width="100" align=center valign=middle><imgsrc="http://shop....en/images/common/Top_Logo01.gif"></TD>
<TD><a href="http://shop.wiznettechnology.com">http://shop.wiznettechnology.com</a></TD></TR>
<TABLE>
</HTML><ESC>E20
```

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 -nodes** and then type Import Password, **12345678**

```
F:\WiznetProduct\WizFi210\Win2012-10-30(Win2003_Radius)>openssl.exe pkcs12 -in Client_Cert.pfx -out Client_Cert.pem -nodes
Enter Import Password:
MAC verified OK
F:\WiznetProduct\WizFi210\Win2012-10-30(Win2003_Radius)>
```

- ◆ 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**

```
F:\WiznetProduct\WizFi210\Win2012-10-30(Win2003_Radius)>openssl.exe pkcs12 -in Client_Cert.pfx -out Client_Cert.pem -nodes
Enter Import Password:
MAC verified OK
F:\WiznetProduct\WizFi210\Win2012-10-30(Win2003_Radius)>openssl x509 -outform der -in Client_Cert.pem -out Client_Cert.der
F:\WiznetProduct\WizFi210\Win2012-10-30(Win2003_Radius)>openssl rsa -outform der -in Client_Cert.pem -out Client_Cert.key
writing RSA key
F:\WiznetProduct\WizFi210\Win2012-10-30(Win2003_Radius)>
```

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

```

COM5:115200baud - Tera Term VT
File Edit Setup Control Window Help
AT+I2
WizFi210
1:1:0.3(E)
[OK]
AT+WS=WizFiDemoAP
      BSSID          SSID          Channel  Type  RSSI  Security
00:23:69:c8:f4:f5, WizFiDemoAP, 06,  INFRA, -43, WPA2-ENTERPRISE
[OK]
No. Of AP Found:1
[OK]
AT+SETTIME=01/11/2012,09:51:00
1:11:2012 9:51:0
[OK]
AT+WEAPCONF=13,26,8021xuser,Wiznet1206
[OK]
AT+WEAP=0,0,1141,1
[OK]
OK
AT+WEAP=1,0,1500,1
[OK]
OK
AT+WEAP=2,0,607,1
[OK]
OK
AT+NDHCP=1
[OK]
AT+WA=WizFiDemoAP
      IP          SubNet          Gateway
192.168.3.101: 255.255.255.0: 192.168.3.1
[OK]
AT+PING=222.98.173.202,5
Pinging for 222.98.173.202 with 56 bytes of data
[OK]
Reply from 222.98.173.202: bytes=56 time=23 ms TTL 30
Reply from 222.98.173.202: bytes=56 time=2 ms TTL 30
Reply from 222.98.173.202: bytes=56 time=2 ms TTL 30
Reply from 222.98.173.202: bytes=56 time=2 ms TTL 30
Reply from 222.98.173.202: bytes=56 time=3 ms TTL 30
Ping Statistics for 222.98.173.202:
Packets: Sent = 5, Received = 5, Lost = 0 percent
Approximate round trip times in milliseconds
Minimum = 2ms, Maximum = 23ms, Average = 6ms

```

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 its network 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+WPA=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+WPA=12345678 (AT command setting WiFi security)
[OK] (Response)
AT+WA=WizFiDemoAP (AT command setting WiFiasociation 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+WPA=12345678 (AT command setting WiFi security)

[OK] (Response)

AT+WA=WizFiDemoAP (AT command setting WiFiasociation 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 using multi 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)

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

<ESC>Z00004abcd => 1B 5A 30²¹30 30 30 34²²61 62 63 64²³

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+WWE1=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+WWE1=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.