

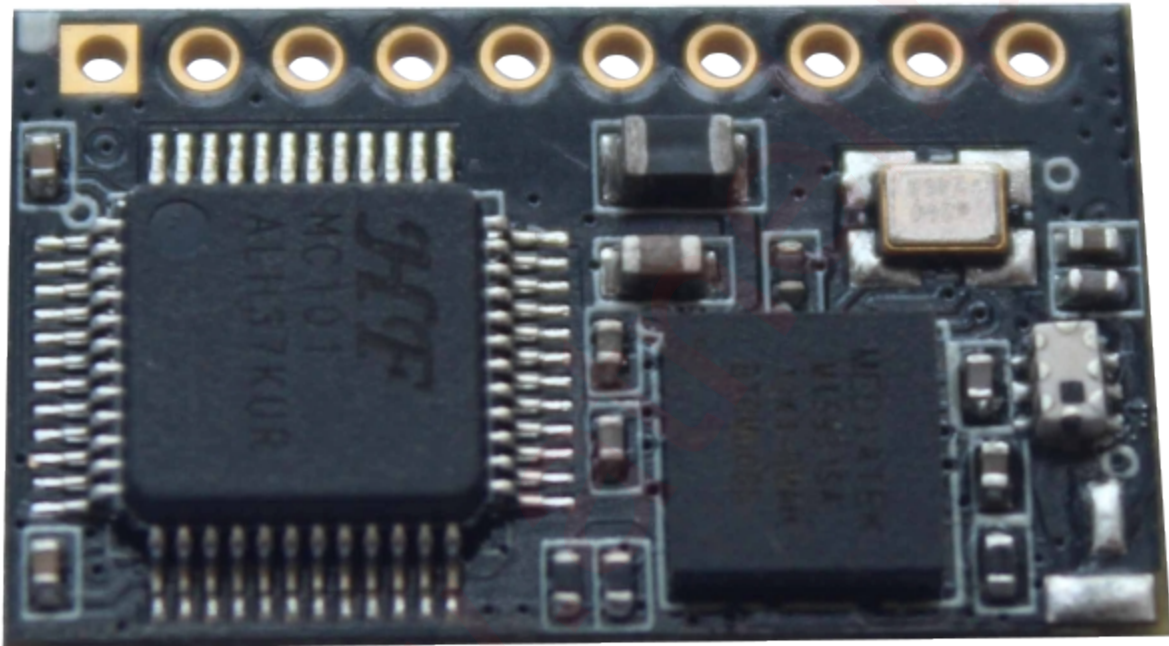
# ATNEL-WiFi232-T

## Low Power Wi-Fi Module

### User Manual

v1.2

2015-05-21



#### Overview of Characteristic

- Support IEEE802.11b/g/n Wireless Standards.
- Support wireless security: WEP, WPA, WPA2.
- Based on Self-developed High Cost Effective MCU.
- Ultra-Low-Power for Battery Applications with Excellent Power Save.
- Support UART/PWM/GPIO Data Communication Interface.
- Support Work As STA/AP/AP+STA Mode.
- Support Wireless and Remote Firmware Upgrade Function.
- Support WPS Function.
- Support Multi-TCP Link (up to 5 channel) Application.
- Support Dial Switch Power Control.
- Support External U.FL or Pad Interface Antenna Option.
- Single +3.3V Power Supply.
- Smallest Size: 22mm x 13.5mm x 6mm, 1x10 2mm Connector.
- FCC/CE Certificated

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# 1 PRODUCT OVERVIEW

## 1.1 General Description

The ATNEL-WIFI232-T is a fully self-contained small form-factor, 802.11b/g/n Wi-Fi module, which provide a wireless interface to any equipment with a Serial interface for data transfer. ATNEL-WIFI232-T have integrate MAC, baseband processor, RF transceiver with power amplifier in hardware and all Wi-Fi protocol and configuration functionality and networking stack, in embedded firmware to make a fully self-contained 802.11b/g/n Wi-Fi solution for a variety of applications.

The ATNEL-WIFI232-T employs the lowest power consumption embedded architecture. It has been optimized for all kinds of client applications in the home automation, smart grid, handheld device, personal medical application and industrial control that have lower data rates, and transmit or receive data on an infrequent basis. The ATNEL-WIFI232-T integrates all Wi-Fi functionality into a low-profile module package that can be easily mounted on main PCB with application specific circuits. Module provides external antenna connector or Pad Interface Antenna.

### 1.1.1 Device Features

- Wi-Fi 2.4GHz wireless connection with support for WEP security mode as well as WPA/WPA2.
- Based on Self-developed High Cost Performance MCU.
- Ultra-low-power operation with all kinds of power-save modes.
- Includes all the protocol and configuration functions for Wi-Fi connectivity.
- Support AP / STA / AP+STA Mode.
- Support Wireless and Remote Firmware Upgrade Function.
- Support WPS Function.
- Support External U.FL or Pad Interface antenna connector.
- Support Dial Switch to Control Power.
- Support Max 3 Channel PWM Output.
- Compact module.
- Full IPv4 and IPv6 stack..
- Low power RTOS and drivers.
- FCC Certified..
- RoHS and CE compliant.
- Single +3.3V Power Supply.

### 1.1.2 Device Parameters

Table 1. ATNEL-WIFI232-T Module Technical Specifications

Class	Item	Parameters
Wireless Parameters	Certification	FCC/CE
	Wireless standard	802.11 b/g/n
	Frequency range	2.412-2.484GHz
	Transmit Power	802.11b: +16 +/-2dBm (@11Mbps)
		802.11g: +14 +/-2dBm (@54Mbps)
		802.11n: +13 +/-2dBm (@HT20, MCS7)
	Receiver Sensitivity	802.11b: -93 dBm (@11Mbps, CCK)
		802.11g: -85 dBm (@54Mbps, OFDM)
802.11n: -82 dBm (@HT20, MCS7)		
Antenna Option	External: U.FL Connector	
	External: Pad connector	
Hardware Parameters	Data Interface	UART
		PWM, GPIO
	Operating Voltage	3.3V: 2.8-3.6V
	Operating Current	Peak [Continuous TX]: ~200mA
		Normal [Wi-Fi ON, DTIM=100ms]: - Average: ~12mA, Peak: 200mA
		- Standby: <200uA PWR-SW: <10uA
	Operating Temp.	-40C- 85C
	Storage Temp.	-45C- 125C
Dimension	22mm x 13.5mm x 6mm	
External Interface	1x10, 2mm DIP	
Software Parameters	Network Type	STA / AP / STA+AP
	Security Mechanisms	WEP / WPA-PSK / WPA2-PSK
	Encryption	WEP64 / WEP128 / TKIP / AES
	Update Firmware	Local Wireless, Remote
	Customization	Web Page Upgrade
	Network Protocol	IPv4, IPv6, TCP / UDP / FTP / HTTP
	User Configuration	AT+instruction set

### 1.1.3 Key Application

- Remote equipment monitoring
- Asset tracking and telemetry
- Security
- Industrial sensors and controls
- Home automation
- Mechanical devices

## 1.2 Hardware Introduction

### 1.2.1 Pins Definition

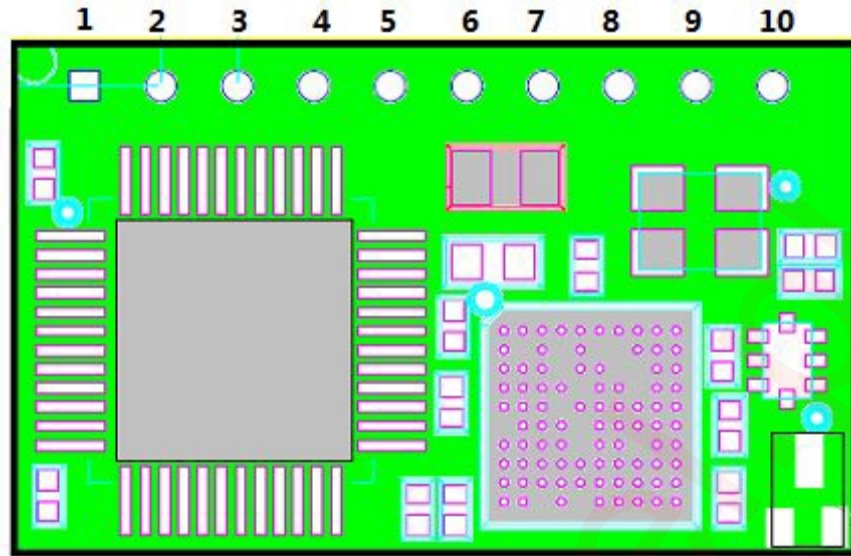


Figure 1. External Interface Pins Map

Table 2 - External Interface Pins Definition

Pin	Name	Description	Signal type	Comments
1	GND	GND	Power supply	GND
2	VCC	3.3V Power	Power supply	3.3V@250mA
3	nReload	Restore Configuration	I	Detailed functions see <a href="#">notes</a> .
4	EXT_RESE_T	Module Reset	I	"Low" effective reset input.
5	UART_RX	UART RX	I	UART Receiver
6	UART_TX	UART TX	O	UART Transmitter
7	PWR_SW	Power Control Switch	I, PU	"0" – Sleep Mode (Lowest Power Consumption). "1" – Normal mode.
8	PWM3	PWM Channel 3 / WPS	I/O	Can be configured as WPS/GPIO18.
9	PWM2	PWM Channel 2	I/O	Can be configured as nReady/GPIO12.
10	PWM1	PWM Channel 1	I/O	Can be configured as nLink/GPIO11. Detailed functions see <a href="#">notes</a>

Description:

- I - Input,
- O - Output,
- PU - Pull-up,
- I/O - Input/Output GPIO

**Notes:**

- nReload Pin (Button) function□
  1. When this pin is set to “low” during module boot up, the module will enter wireless firmware and config upgrade mode.
  2. After module is powered up, long press this button (“Low” > 3s) to make the module recover to factory setting.
- nLink Pin function:
  1. At wireless firmware and config upgrade mode, this LED used to indicate configure and upgrade status.
  2. At normal mode, it's Wi-Fi link status indicator. We recommend using this pin to connect the signaling LED.

**1.2.2 Electrical Characteristic****Table 3. Absolute Maximum Ratings**

Parameter	Min.	Typ.	Max.	Unit
Storage temperature range	-45		125	C
Maximum soldering Temperature			260	C
Supply voltage	0		3.8	V
Voltage on any I/O pin	0		3.3	V
ESD (Human Body Model HBM)			2	kV
ESD (Charged Device Model, CDM)			1	kV

**Table 4. Power Supply & Power Consumption**

Parameter	Condition	Min.	Typ.	Max.	Unit
Operating Supply voltage		2.8	3.3	3.8	V
Supply current, peak	Continuous Tx		200		mA
Supply current, IEEE PS	DTIM=100ms		12		mA
Output high voltage	Sourcing 6mA	2.8			V
Output low voltage	Sinking 6mA			0.2	V
Input high voltage		2.2			V
Input low voltage				0.8	V

### 1.2.3 Mechanical Size

ATNEL-WIFI232-T modules physical size (Unit: mm)

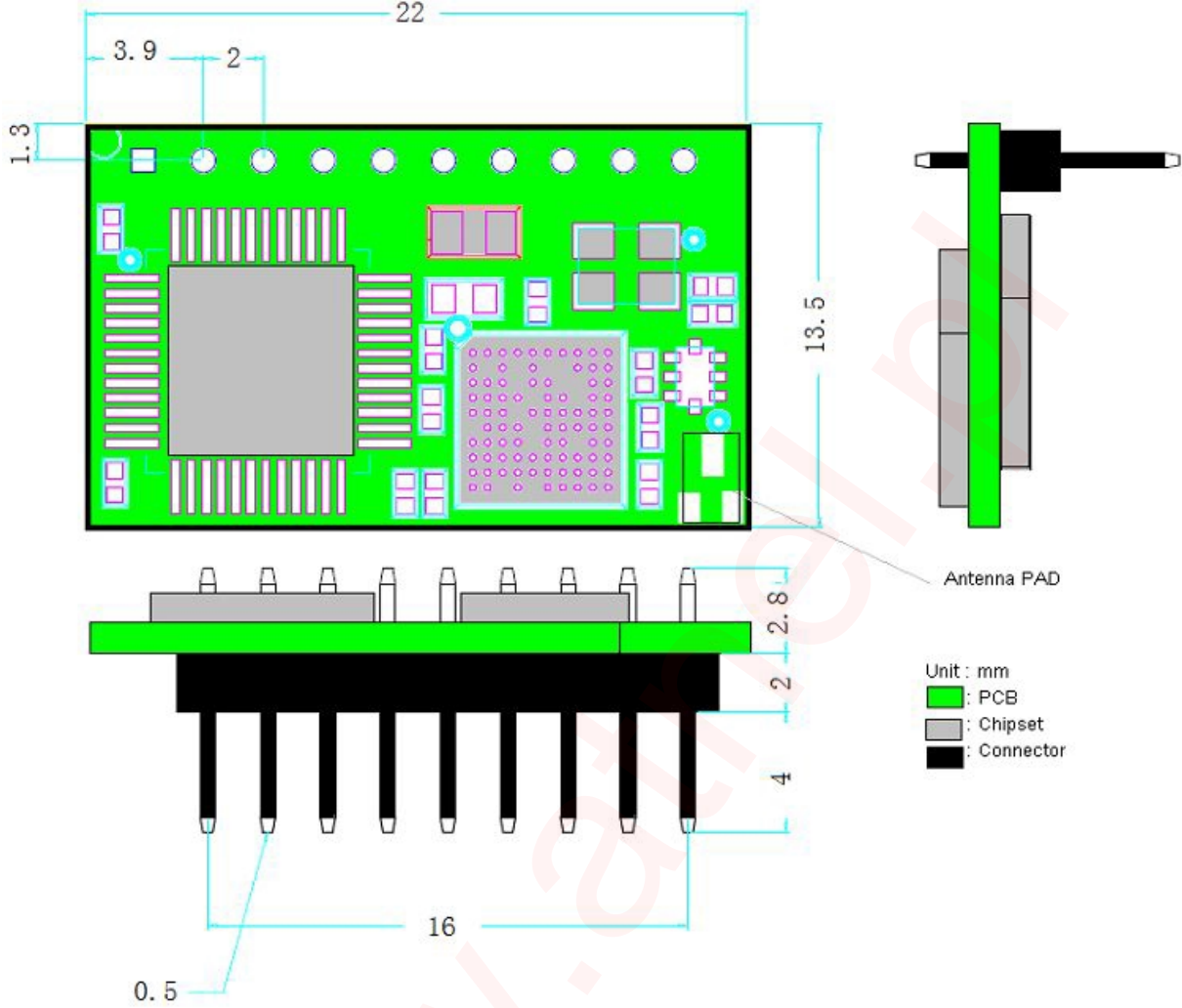


Figure 2. ATNEL-WIFI232-T Mechanical Dimension

### 1.2.4 External Antenna

ATNEL-WIFI232-T supports two way of external antenna as the following picture show. The U.FL interface or the PAD interface. The user may choose one of them. The antenna parameters required as follows:



Figure 3. External U.FL antenna



### 1.3 Typical Application

#### 1.3.1 Hardware Typical Application

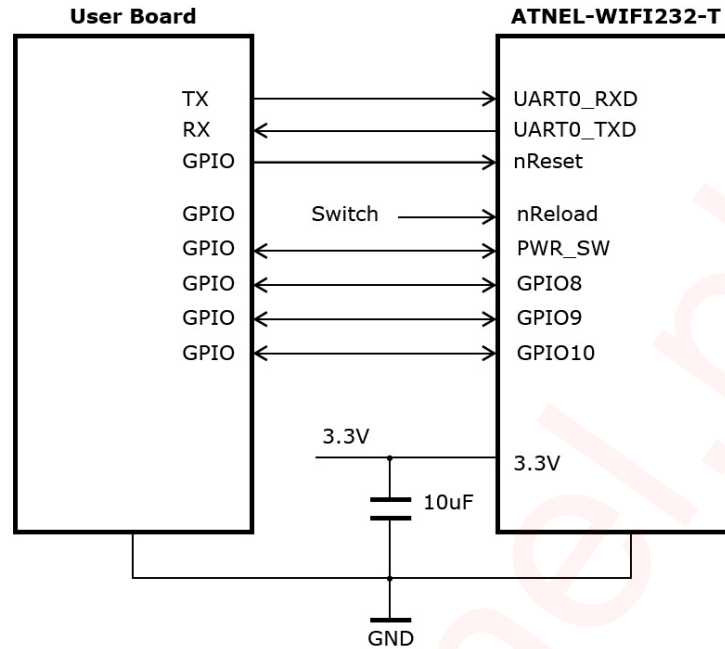


Figure 4. ATNEL-WIFI232-T Hardware Typical Application

#### 1.3.2 PWM Driver Application Hardware Typical Connection

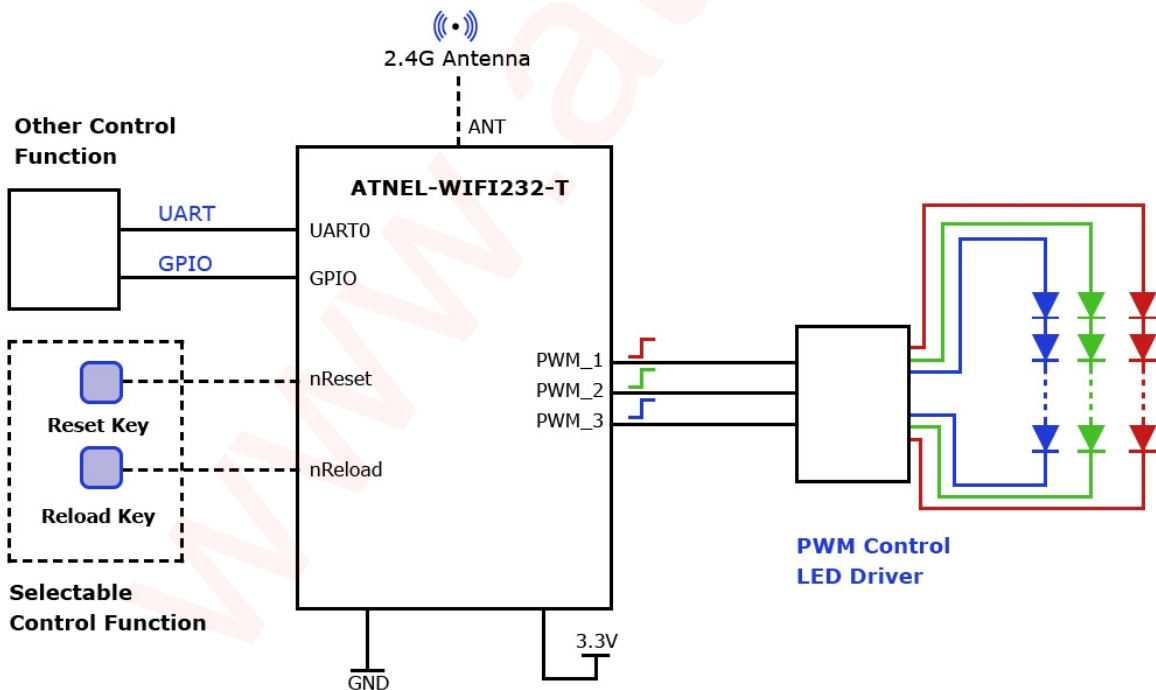


Figure 5. ATNEL-WIFI232-T PWM Application Hardware Connection

## Pin Function:

- **nReload** - Input. Module restore to factory default configuration. Logics "0" effective. (This pin is recommend to connect to button, is used to enter wireless upgrade mode) User can set signal "0" more than 3s through button or MCU pin, then release, module will restore to factory default configuration and re-start boot up process. If nReload function not required, can leave this pin open.
- **nReset** - Input. Module hardware reset signal. Logics "0" effective. There is pull-up resistor internal and no external pull-up required.
- **UART\_TX / UART\_RX** - Serial port data transmit and receive signal.
- **WPS** - WPS function start pin, input GPIO, low effective. Can be connected to key
- **nReady** - Module startup success indicator pin, output GPIO, low effective. Can be connected to led.
- **nLink**- Module WI-FI connection output status indication. This pin is recommend to connect to LED. When module connects to AP, this pin will output "0". This signal used to judge if module already at Wi-Fi connection status or module is in wireless upgrade mode. There is pull-up resistor internal and no external pull-up required. If nLink function not required, can leave this pin open.
- **PWMn**- PWM control signal output. It can also be configured as GPIO output. "AT+LPTIO=on" command configure:
  - PWM1 pin as nLink,
  - PWM2 pin as nReady,
  - PWM3 pin as WPS function.

## 2 FUNCTIONAL DESCRIPTION

### 2.1 Wireless Networking

ATNEL-WIFI232-T module can be configured as both wireless STA and AP base on network type. Logically there are two interfaces in ATNEL-WIFI232-T. One is for STA, and another is for AP. When ATNEL-WIFI232-T works as AP, other STA equipments are able to connect to wireless LAN via ATNEL-WIFI232-T module. Wireless Networking with ATNEL-WIFI232-T is very flexible.

#### Notes:

**AP (access point):** that is the wireless Access Point, the founder of a wireless network and the center of the network nodes. The wireless router we use at home or in office may be an AP.

**STA (station):** that is each terminal connects to a wireless network (such as laptops, PDA, cell phone and other networking devices) can be called with a STA device.

#### 2.1.1 Basic Wireless Network Based On AP (Infrastructure)

Infrastructure: it's also called basic network. It built by AP and many STAs which join in. The characters of network of this type are that AP is the center, and all communication between STAs is transmitted through the AP. The figure following shows such type of networking.



Figure 6. ATNEL-WIFI232-T Basic Wireless Network Structure.

#### 2.1.2 Wireless Network Based On AP+STA

ATNEL-WIFI232-T module support AP+STA network mode, means module support one AP interface and one STA interface at the same time, as following figure.

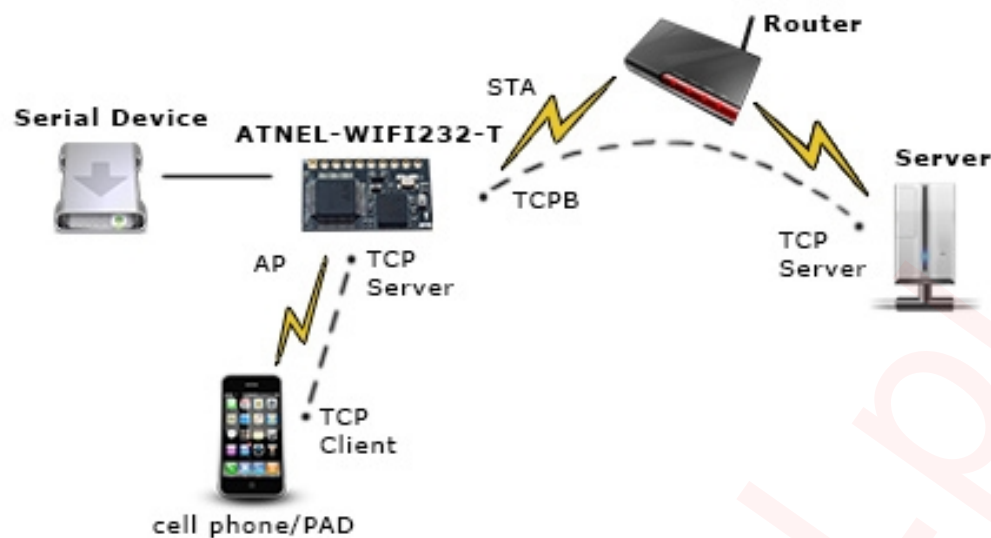


Figure 7. AP+STA Network Structure

When module enables AP+STA function, Module's STA interface can connect with router and connect to TCP server in the network. At the same time, module's AP interface is also active and permit phone/PAD to connect through TCPB, then phone/PAD can control user device and setting the module parameters,

The advantage of AP+STA mode is:

- Users can easily setting and track user device through Phone/PAD and not change the original network setting.
- Users can easily setting module's parameters through Wi-Fi when module works as STA mode.

## 2.2 Work Mode : Transparent Transmission Mode

ATNEL-WIFI232-T module support serial interface transparent transmission mode. The benefit of this mode is achieves a plug and play serial data port, and reduces user complexity furthest. In this mode, user should only configure the necessary parameters. After power on, module can automatically connect to the default wireless network and server.

As in this mode, the module's serial port always work in the transparent transmission mode, so users only need to think of it as a virtual serial cable, and send and receive data as using a simple serial. In other words, the serial cable of user original serial devices is directly replaced with the module; user devices can support wireless data transmission without any changes.

The transparent transmission mode can be fully compatible with user's original software platform and reduce the software development effort for integrate wireless data transmission.

The parameters which need to configure include:

- **Wireless Network Parameters**
  - Wireless Network Name □ SSID □
  - Security Mode

- Encryption Key
- **TCP/UDP Linking Parameters**
  - Protocol Type
  - Link Type  Server or Client
  - Target Port ID Number
  - Target Port IP Address
- **Serial Port Parameters**
  - Baud Rate
  - Data Bit
  - Parity (Check) Bit
  - Stop Bit
  - Hardware Flow Control

## 2.3 UART Frame Scheme

### 2.3.1 UART Free-Frame

ATNEL-WIFI232-T support UART free-frame function. If user select open this function, module will check the intervals between any two bytes when receiving UART data. If this interval time exceeds defined value (50ms default), ATNEL-WIFI232-T will think it as the end of one frame and transfer this free-frame to Wi-Fi port, or ATNEL-WIFI232-T will receive UART data until 1000 bytes, then transfer 1000 bytes frame to Wi-Fi port.

ATNEL-WIFI232-T default interval time is 50ms. User can also set this interval to fast (10ms) through AT command. But user have to consider if user MCU can send UART data with 10ms interval ,or the UART data may be divide as fragment.

Through AT command: AT+UARTTE=fash/normal, user can set the interval time: fast (10ms) and normal (50ms).

### 2.3.2 UART Auto-Frame

ATNEL-WiFi232-T support UART auto-frame function. If user select open this function and setting auto-frame trigger length and auto-frame trigger time parameters, then module will auto framing the data which received from UART port and transmitting to the network as pre-defined data structure.

- **Auto-frame trigger length:** The fixed data length that module used to transmitting to the network.
- **Auto-frame trigger time:** After the trigger time, if UART port received data can't reach auto-frame trigger length, then module will transmitting available data to the network and bypass the auto-frame trigger length condition.

Detailed UART auto-frame function can refer to AT+instruction set "UARTF/UARTFT/UARTFL" introduction.

## 2.4 Encryption

Encryption is a method of scrambling a message that makes it unreadable to unwanted parties, adding a degree of secure communications. There are different protocols for providing encryption, and the ATNEL-WiFi232-T module supports following:

- WEP
- WPA-PSK/TKIP
- WPA-PSK/AES
- WPA2-PSK/TKIP
- WPA2-PSK/AES

## 2.5 Parameters Configuration

ATNEL-WiFi232-T module supports two methods to configuration parameters: **Web Accessing** and **AT+instruction set**.

Web accessing means users can configure parameters through Web browser. When ATNEL-WiFi232-T module connected to wireless network, parameters configuration is done on a PC connected to the same wireless network.

AT+instruction set configuration means user configure parameters through serial interface

## 2.6 Reporting MAC

If reporting mac function is on (AT+WRRPTMAC=ON), Socket A or B is set as TCP client, module will report it's MAC when is link server first. Socket A or B is set as UDP client, the module will add MAC to the HEAD of UDP package.

## 2.7 Firmware Update

ATNEL-WiFi232-T module supports two on-line upgrade methods:

- Webpage Wi-Fi Upgrade
- Remote Upgrade

Webpage based Wi-Fi upgrade, please refer to [3.1.8](#) firmware upgrade page, user can upload firmware file from PC to ATNEL-WiFi232-T. ATNEL-WiFi232-T module also support upgrade from remote HTTP server, keep module connects to AP router before execute remote HTTP upgrade. Remote upgrade have two methods: **Direct Download and Upgrade**, **Configure File Based Upgrade**.

### 2.7.1 Direct Download and Upgrade

AT+UPURL command to set the remote directory and file name, such as:  
AT+UPURL=http://10.10.100.100:80/firmware.bin

After execute this command, the module will directly download the file from remote directory and start upgrade application.

**Notes:** please contact with ATNEL technical support before upgrade firmware, or else it may result in permanent damage to the module.

### 2.7.2 Configure File Based Upgrade

AT+UPURL command to set the remote directory which the configuration file located.

AT+UPFILE command to set the configuration file name, such as AT+UPFILE=config.txt

AT+UPST command to start remote Application upgrade. After execute this command, the module will firstly download configuration file ("config.txt"), then download the upgrade file base on the URL address listed in the configure file.

General "config.txt" file format as following example:  
[URL]="http://10.10.100.100:80/firmware.bin"

[URL]= the URL address of Application.

**Notes:** please contact with ATNEL technical support before upgrade firmware, or else it may result in permanent damage to the module.

## 2.8 GPIO/PWM Function

ATNEL-WIFI232-T module can provide a few pins GPIOs, which include max 3 PWM channel. User devices can read/write GPIO/PWM pins status.

Table 5. ATNEL-WIFI232-T GPIO/PWM Pin Mapping Table

Pin	Configured Function	GPIO/PWM Index	Default Setting	Type
8	PWM3	18	GPIO18	I/O
9	PWM2	12	GPIO12	I/O
10	PWM1	11	GPIO11	I/O

GPIO/PWM function and transparent transmit, WPS, nReady, nLink function can't be used simultaneously. User can select the function be AT command: AT+TMODE and AT+LPTIO. The setting parameters are as follows.

Funkcja	AT+TMODE	AT+LPTIO
GPIO/PWM	Pwm	off
Tryb Transparentny, WPS, nReady, nLink	throughput	on

**Note:** After setting, restart the module to take effect.

When module works at PWM mode, PC and other equipments can setup connection (TCP/UDP) through Wi-Fi, then read/write GPIO/PWM information through command.

- GPIO n OUT 0, Set GPIO n as output and set '0', response GPIO OK or GPIO NOK;
- GPIO n OUT 1, Set GPIO n as output and set '1', response GPIO OK or GPIO NOK;
- GPIO n GET, Read GPIO n pin status, response +ok=1 or GPIO NOK
- GPIO n SET, Save GPIO n set, response GPIO OK or GPIO NOK
- PWM n frequency duty, Set PWM n Channel output, response GPIO OK or GPIO NOK
- PWM n GET, Read PWM n Channel set, response +ok=frequency duty or PWM NOK
- PWM n SET, Save PWM n Channel set, response PWM OK or PWM NOK

**Notes:** Please refer to [Appendix A](#) for details to use GPIO/PWM.

## 2.9 Socket A

Socket A has four work mode: TCP Server, TCP Client, UDP Client, UDP Server. The setting method, please refer to the AT+NETP command instruction.

When ATNEL-WIFI232-T module configured as TCP Server, it supports Multi-TCP link connection, and maximum 5 TCP clients permit to connect to ATNEL-WIFI232-T module. User can realize multi-TCP link connection at each work mode.

Multi-TCP link connection will work as following structure:

Upstream: All data from different TCP connection or client will be transmitted to the serial port as a sequence.

Downstream: All data from serial port (user) will be duplicate and broadcast to every TCP connection or client.

Detailed multi-TCP link data transmission structure as following figure:

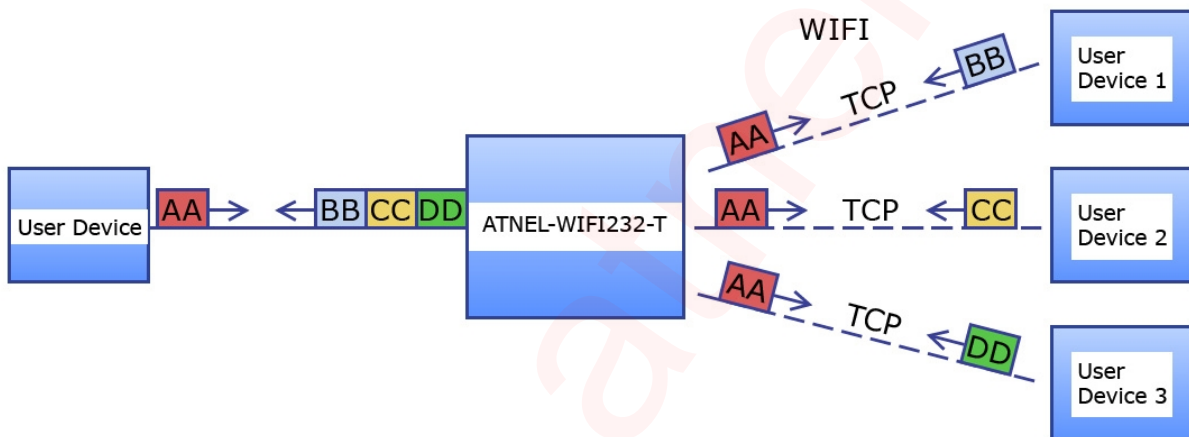


Figure 8. Multi-TCP Link Data Transmission Structure

## 2.10 SOCKET B Function

ATNEL-WIFI232-T support double socket communication, the socket B function is disabled by default.

After the module is started, send command "AT+SOCKB" to set the connection parameter, send command "AT+TCPDISB=on" to try to connect with TCP server, the module will stop connecting after three failures. Send command "AT+TCPDISB=on" to make connection. Send command "AT+TCPDISB=off" to close connection. Send command "AT+TCPLKB" to inquire TCP connection.



## 3 OPERATION GUIDELINE

### 3.1 Configuration via Web Accessing

When first use ATNEL-WIFI232-T modules, user may need some configuration. User can connect to ATNEL-WIFI232-T module's wireless interface with following default setting information and configure the module through laptop.

Table 6. ATNEL-WIFI232-T Web Access Default Setting

Parameters	Default Setting
SSID	ATNEL-WIFI232-T
IP Adress	10.10.100.254
Subnet Mask	255.255.255.0
User Name	Admin
Password	Admin

#### 3.1.1 Open Web Management Interface

Step 1: Connect laptop to SSID "ATNEL-WIFI232-T" of ATNEL-WIFI232-T module via wireless LAN card;

Step 2: After wireless connection OK. Open Web browser and access "**http://10.10.100.254**";

Step 3: Then input user name and password in the page as following and click "OK" button.

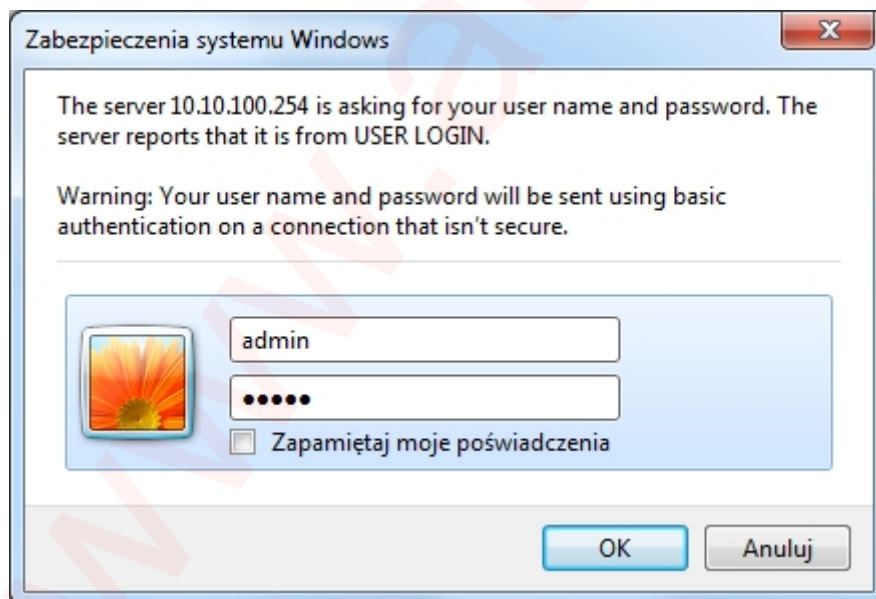


Figure 9. Open Web Management page

The ATNEL-WIFI232-T web management page support English and Polish language. User can select language environment at the top right corner. The main menu include nine pages: System, Work Mode, STA Setting, AP Setting, Other Setting, Account, Upgrade SW, Restart, Restore.

#### 3.1.2 System Page

At this page, user can check current device's important information and status such as: device ID (MID), software version, wireless work mode and related Wi-Fi parameters.

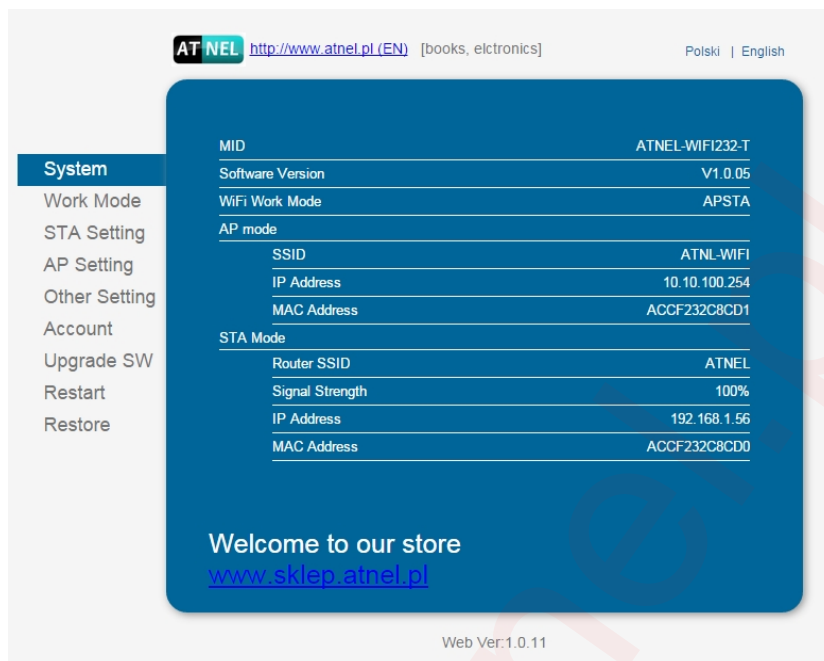


Figure 10. System Web Page

### 3.1.3 Work Mode Page

ATNEL-WIFI232-T module can work at AP mode to simplify user's configuration, can also work at STA to connect remote server through AP router. Also, it can configure at AP+STA mode which provides very flexible application for customers.

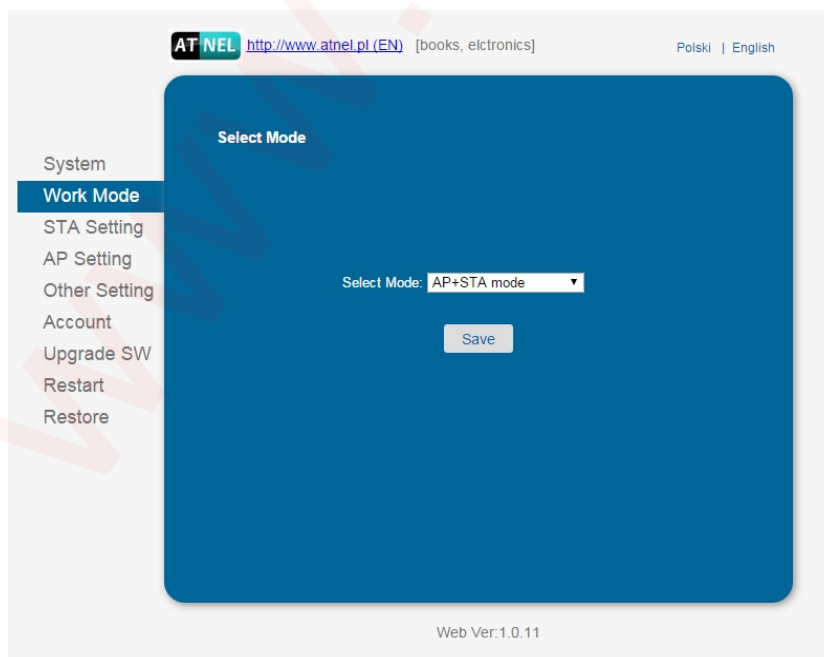


Figure 11. Work Mode Page

### 3.1.4 STA Setting Page

User can push “Scan” button to auto search Wi-Fi AP router nearby, and can connect with associate AP through some settings. Please note the encryption information input here must be fully same with Wi-Fi AP router’s configurations, and then it can link with AP correctly.

The screenshot shows the STA Setting Page with the following configuration details:

Network Name "SSID" <small>Note: case sensitive</small>	ATNEL	Scan
Encryption Method	WPA2PSK	
Encryption Algorithm	AES	
Password	.....	Show passwords
Obtain an IP address automatically	Disable	
IP Address	192.168.1.56	
Subnet Mask	255.255.255.0	
Gateway Address	192.168.1.1	
DNS Server Address	192.168.1.1	

Web Ver: 1.0.11

Figure 12. STA Setting Page

### 3.1.5 AP Setting Page

When user select module works at AP and AP+STA mode, then need setting this page and provide wireless and network parameters. Most of the system support DHCP to achieve IP address, so we suggest to “Enable” DHCP server in most applications.

The screenshot shows the AP Setting Page with the following configuration details:

<b>Wireless AP Setting</b>		
Network Mode	11bgn	
Network Name(SSID)	ATNL-WIFI	
Module MAC Address	ACCF232C8CD1	
Select Channel	2412MHz(channel 1)	Save
<b>Wireless AP Security Setting</b>		
Encryption Mode	WPA2-PSK	
WPA Encryption	<input type="radio"/> TKIP <input checked="" type="radio"/> AES <input type="radio"/> TKIPAES	
Password	.....	Show Passwords
Save		
<b>Network Parameters Setting</b>		
IP Address (DHCP Gateway Setting)	10.10.100.254	
Subnet Mask	255.255.255.0	
DHCP Server	Enable	Save

Figure 13. AP Setting Page

### 3.1.6 Other Setting Page

ATNEL-WIFI232-T usually works at data transparent transmission mode. At this mode, the user device which connected with ATNEL-WIFI232-T will connect and communicate with remote PC or server. At this page, user need setting serial port communication parameters and defines TCP related protocol parameters.

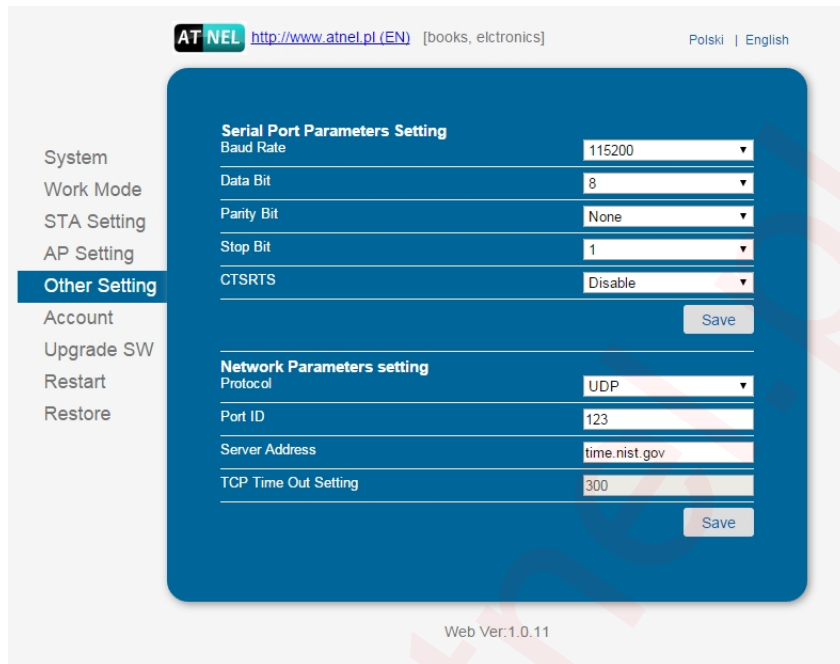


Figure 14. Other Setting Page

### 3.1.7 Account Management Page

This page set web server's user name and password.

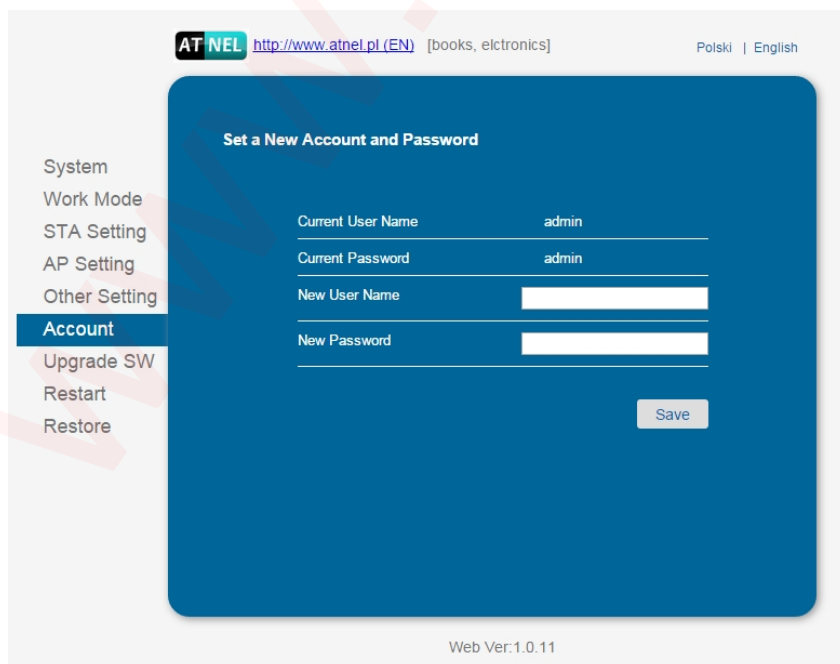


Figure 15. Account Page

### 3.1.8 Upgrade Software Page

User can upgrade new software (firmware) version through Wi-Fi.

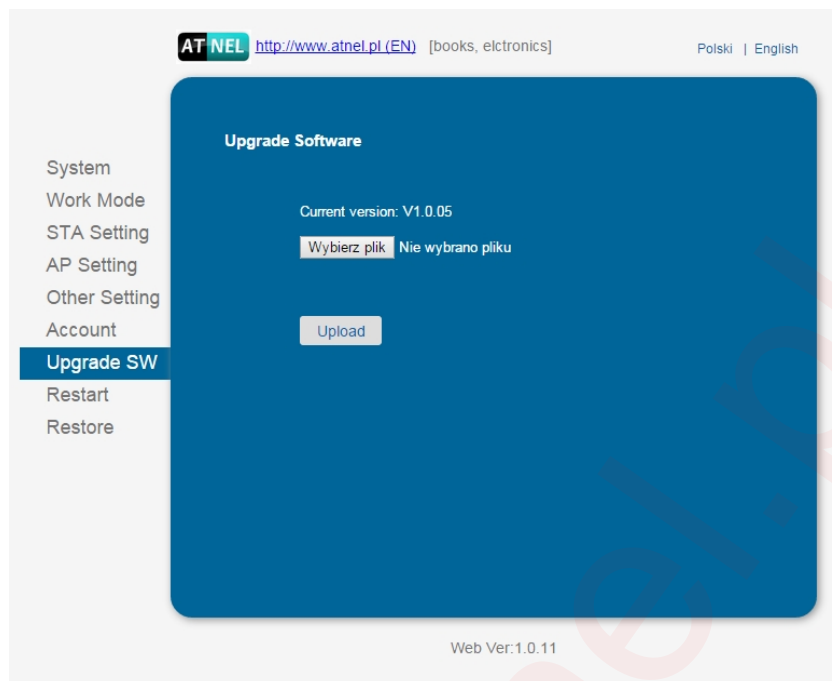


Figure 16. Upgrade SW page

### 3.1.9 Restart Page

Most of the setting and configuration can only effective after system restart. User shall restart after finish all setting.

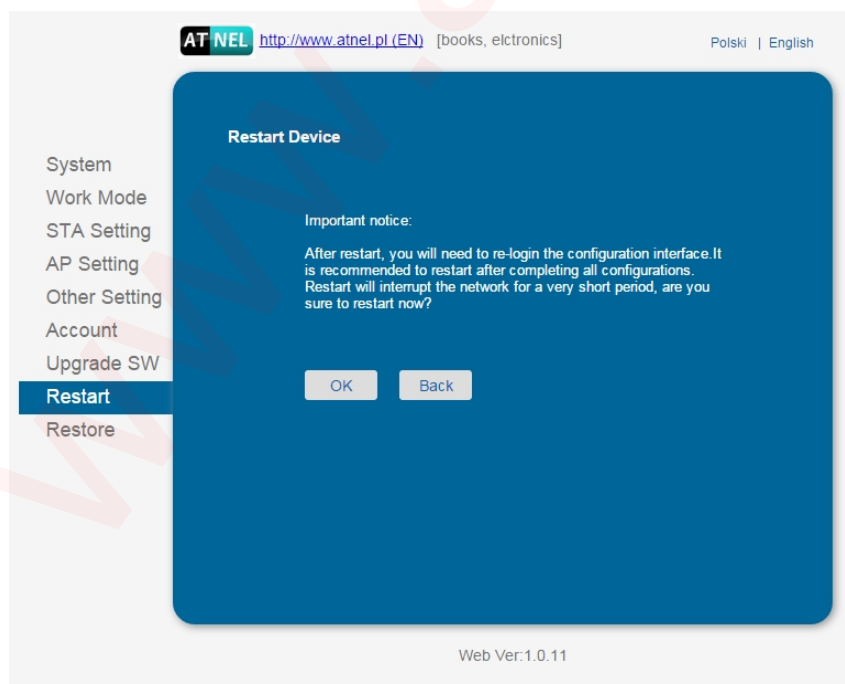


Figure 17. Restart Page

### 3.1.10 Restore Page

After module restore factory default setting, all user configuration profile will lose.

User can access <http://10.10.100.254> to set again, and user name and password is "admin". ATNEL-WIFI232-T will restore to AP mode for factory default setting.

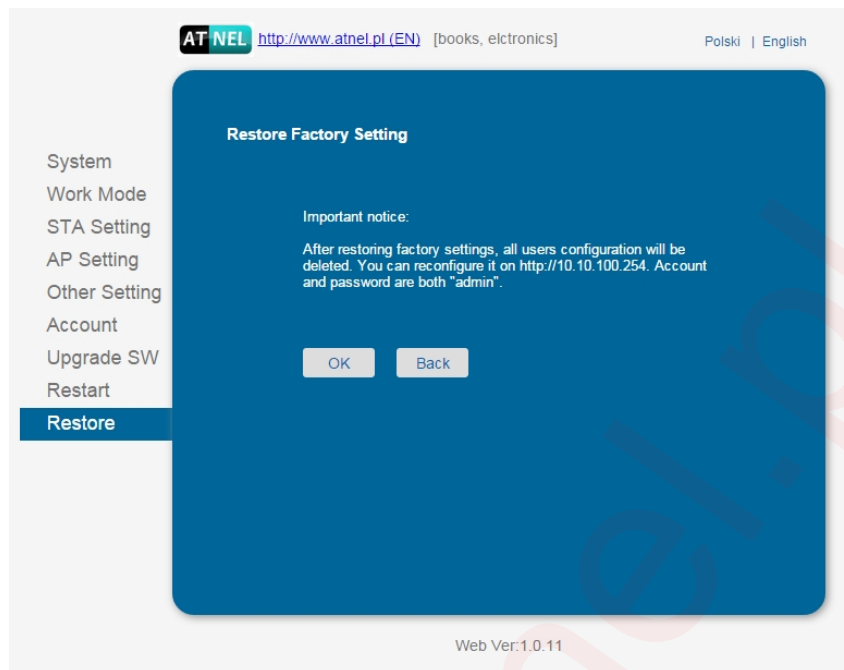


Figure 18. Restore Page

## 3.2 Usage Introduction

### 3.2.1 Configuration Software

ATNEL Company use software tools debugging and applying ATNEL-WIFI232-T module. (User can also select other tools used to debug serial port).



Figure 19. ATB-WIFI Config software

### 3.2.2 Network Connection

User can select two methods to connect ATNEL-WIFI232-T module base on dedicated application.

- **Use ATNEL-WiFi232-T STA interface.** ATNEL-WIFI232-T and debug PC2 connect to a wireless AP, another PC1 (or user device) connect to ATNEL-WIFI232-T module with serial port:



Figure 20. STA Interface Debug Connection

- **Use ATNEL-WiFi232-T AP interface.** Debug PC2 connect to ATNEL-WIFI232-T through wireless connection, another PC1 (or user device) connect to ATNEL-WIFI232-T module with serial port.



Figure 21. AP Interface Debug Connection

### 3.2.3 Default Parameter Setting:

- Default SSID: ATNEL-WIFI232-T;
- Default security mode: open, none;
- User UART parameter setting: 115200, 8, 1, None;
- Default network parameter setting: TCP, Server, 8899, 10.10.100.254;
- Module IP address: DHCP, 0.0.0.0, 0.0.0.0, 0.0.0.0;

## 3.3 Module Debug

ATNEL Company provides software to quickly start working with modules ATNEL-WIFI232-T and adapt to the user devices.

### 3.3.1 ATB WIFI Config

ATB WIFI Config is configuration software for the module ATNEL-WIFI232-T. It may also be used for user communication with the module, and connected to user device. The software can also be used to control GPIO and PWM connectors on the module.

ATB WIFI Config Software features:

- Configuration AP and STA mode;
- Terminal Serial port;
- UDP Terminal;
- Support GPIO and PWM function;
- Configuration UART;

- Configuration Wi-Fi module;

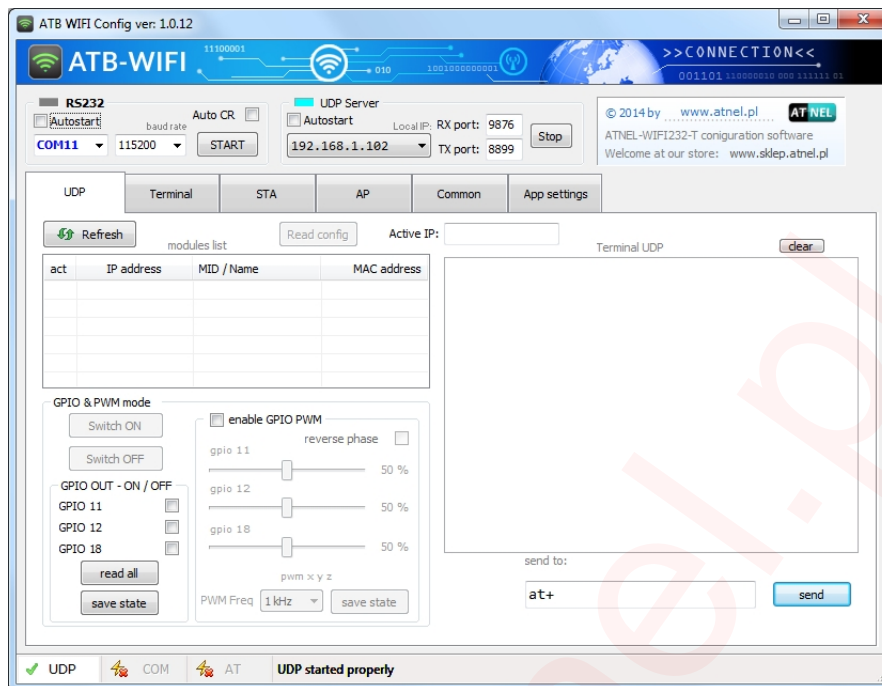


Figure 22. ATB WIFI Config Software

### 3.3.2 ATB-UDP Server

ATB-UDP Server is communication software for the module ATNEL-WIFI232-T. This software is a small program for communicating with the module and the device connected to the network via UDP protocol.

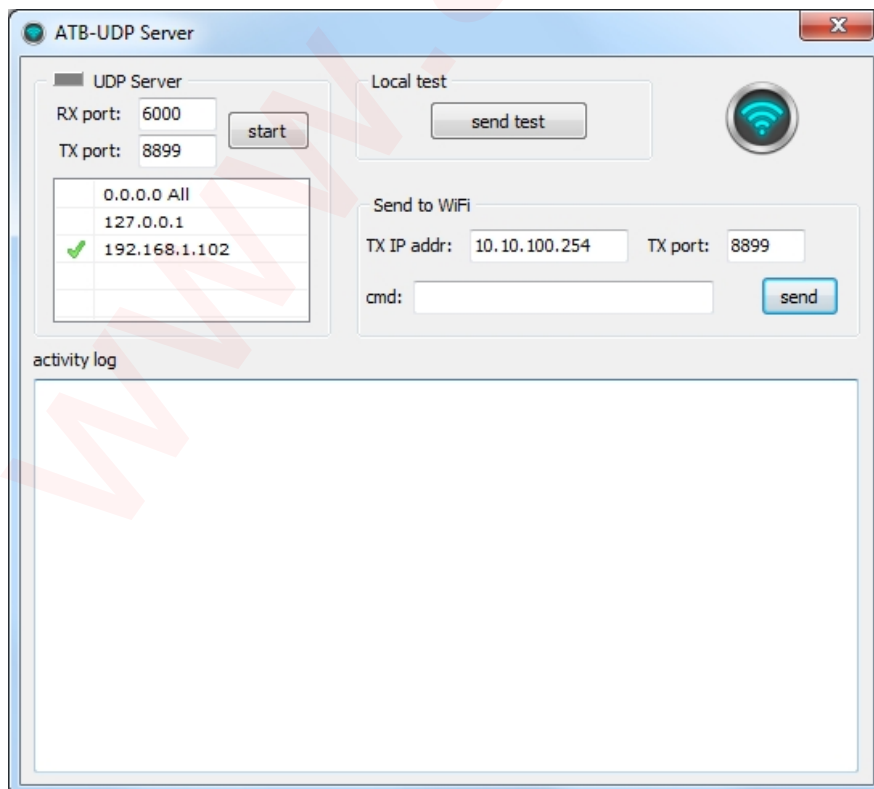


Figure 23. ATB-UDP Server Software



## 3.4 Typical Application Examples

### 3.4.1 Wireless Control Application



Figure 24. Wireless Control Application

For this wireless control application, ATNEL-WIFI232-T works as Ad-Hoc mode. Module's serial port connects to user device. So, control agent (Smartphone for this example) can manage and control the user device through the wireless connection with ATNEL-WIFI232-T module.

### 3.4.2 Remote Management Application

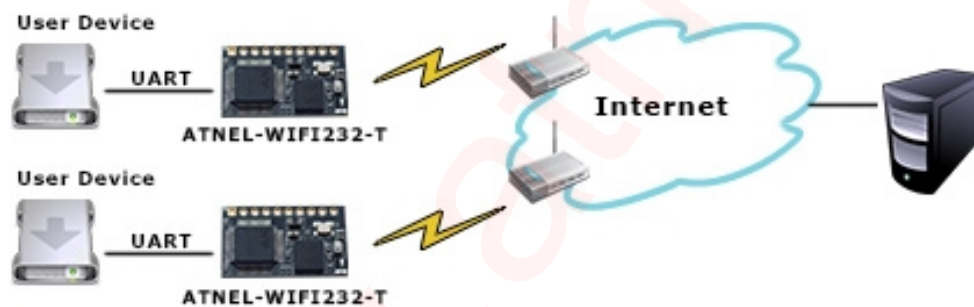


Figure 25. Remote Management Application

For this remote management application, ATNEL-WIFI232-T works as STA mode and connects to Internet through wireless AP. Module configured as TCP Client and communicates with remote TCP server at Internet. Module's serial port connects to user device. So, user device's data or sampling information can send to remote TCP server for storage or processing. Also remote TCP server can send command to control and manage the user device through the wireless network.

### 3.4.3 Transparent Serial Port Application

For this transparent serial port application, two ATNEL-WIFI232-T modules connect as below figures to build up a transparent serial port connection. ATNEL-WIFI232-T works as Ad-Hoc mode for connect to each other.



Figure 26. Transparent Serial Port Application

www.atnel.pl

## 4 AT+INSTRUCTION INTRODUCTION

### 4.1 Configuration

When ATNEL-WIFI232-T power up, it will default works as transparent transmission mode, then user can switch to configuration mode by serial port command. ATNEL - WIFI232-T UART default parameters setting as below figure.

Serial Port Parameters Setting	
Baud Rate	115200
Data Bit	8
Parity Bit	None
Stop Bit	1
CTSRTS	Disable

Save

Figure 27. ATNEL -WIFI232-T Default UART Port Parameters

In configuration mode, user can setting the module through AT+instruction set, which cover all web page setting function.

#### 4.1.1 Switch to Configuration Mode

Two steps for switching from transparent transmission mode to configuration mode.

1. UART input “+++”, after module receive “+++”, and feedback “a” as confirmation.
2. UART input “a”, after module receive “a” and feedback “+ok” to go into AT+instruction set configuration mode.

#### Notes:

1. When user input “+++” (No “Enter” key required), the UART port will display feedback information “a”, and not display input information “+++” as above UART display.
2. Any other input or wrong step to UART port will cause the module still works as original mode (transparent transmission).
3. “+++” and “a” should be input in a certain period of time to make the module switch to configuration module. Like the following sequence.

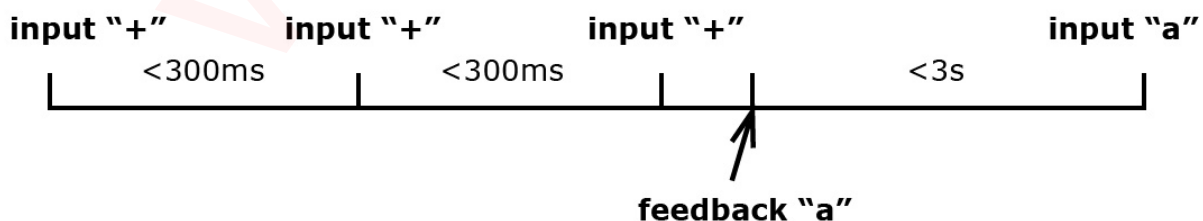


Figure 28. Switch to Configuration Mode sequence

## 4.2 AT+Instruction Set Overview

User can input AT+Instruction through hyper terminal or other serial port terminal, also can program the AT+Instruction to script. User can also input "AT+H" to list all AT+Instruction and description to start.

```

AT+H
AT+: NoNE command, reply "+ok".
AT+ASWD: Set/Query WiFi configuration code.
AT+E: Echo ON/Off, to turn on/off command line echo function.
AT+ENTM: Goto Through MOde.
AT+NETP: Set/Get the Net Protocol Parameters.
AT+MSLP: Set/Query deep sleep mode parameters.
AT+PING: General PING command.
AT+WMODE: Set/Get the WIFI Operation Mode (AP or STA).
AT+WSLK: Get Link Status of the Module (Only for STA Mode).
AT+WSLQ: Get Link Quality of the Module (Only for STA Mode).
AT+WSCAN: Get The AP site Survey (only for STA Mode).
AT+TCPLK: Get The state of TCP link.
AT+TCPTO: Set/Get TCP time out.
AT+TCPDIS: Connect/Dis-connect the TCP Client link
AT+RECV: Recv data from WIFI
AT+SEND: Send data to WIFI
AT+WEBU: Set/Get the Login Parameters of WEB page.
AT+WEBVER: Get WEB version.
AT+WSDNS: Set/Get the DNS Server address.
AT+WADMN: Set/Get the domain name of WEB page.
AT+WEBSWITCH: Set/Get the parameters of WEB page.
AT+PLANG: Set/Get the language of WEB page.
AT+UPURL: Set/Get the path of remote upgrade.
AT+UPFILE: Set/Get the file name of config file for remote upgrade.
AT+UPST: Start the remote upgrade.
AT+UPWEB: Start the remote upgrade webpages.
AT+UPCFG: Start the remote upgrade default setting.
AT+UPAUTO: Start the remote upgrade by config file.
AT+LOGSW: Enable/Disable upload logs.
AT+LOGPORT: Set/Get the UDP port for upload logs.
AT+SOCKB: Set/Get Parameters of socket_b.
AT+TCPLKB: Get The state of TCP_B link.
AT+TCPTOB: Set/Get TCP_B time out.
AT+TCPDISB: Connect/Dis-connect the TCP_B Client link.
AT+RCVB: Recv data from socket_b
AT+SNDB: Send data to socket_b
AT+RELD: Reload the default setting and reboot.
AT+SLPEN: Put on/off the GPIO7.
AT+RLDEN: Put on/off the GPIO45.
AT+Z: Reset the Module.
AT+MID: Get The Module ID.
AT+VER: Get application version.
AT+USERVER: get user version
AT+CUSTOMER: get customer version
AT+RPTMAC: get Report MAC State
AT+WRRPTMAC: set Report MAC State
AT+GMT: get time
AT+WANN: Set/Get The WAN setting if in STA mode.
AT+LANN: Set/Get The LAN setting if in ADHOC mode.
AT+UART: Set/Get the UART0/UART1 Parameters.
AT+WSSSID: Set/Get the AP's SSID of WIFI STA Mode.
AT+WAP: Set/Get the AP parameters.
AT+WSKEY: Set/Get the Security Parameters of WIFI STA Mode.
AT+WKEY: Set/Get the Security Parameters of WIFI AP Mode.
AT+NTPSER: Set/Get NTP Server address.
AT+UDPLCPT: Set/Get local UDP port.
AT+NDBGL:set/get debug level
AT+WPSBTNEN:enable/disable wps button
AT+WALKIND:enable/disable LED indication of AP connection
AT+WADHCP:enable/disable AP dhcp server and set ip address pool
AT+MDCH: Put on/off automatic switching WIFI mode.
AT+H:show help
+ok

```

#### 4.2.1 Instruction Syntax Format

AT+Instruction protocol is based on the instruction of ASCII command style, the description of syntax format as follow.

- **Format Description**
  - < >: Means the parts must be included
  - [ ]: Means the optional part
- **Command Message**

**AT+<CMD>[op][para-1,para-2,para-3,para-4...]<CR>**

- AT+: Prefix of command message;
- CMD: Command string;
- [op]: Symbol of command operator,
  - "=" : The command requires parameters input;
  - "NULL": Query the current command parameters setting;
- [para-n]: Parameters input for setting if required;
- <CR>:"Enter" Key, it's 0x0a or 0x0d in ASCII;

**Notes:** When input AT+Instruction, "AT+<CMD>" character will display capital letter automatic and other parts will not change as you input.

- **Response Message**

**+<RSP>[op] [para-1,para-2,para-3,para-4...]<CR><LF><CR><LF>**

- +: Prefix of response message;
- RSP: Response string;
  - "ok" : Success
  - "ERR": Failure
- [op] : =
- [para-n]: Parameters if query command or Error code when error happened;
- <CR>: ASCII 0x0d;
- <LF>: ASCII 0x0a;

- **Error Code**

Error Code	Description
-1	Invalid Command Format
-2	Invalid Command
-3	Invalid Operation Symbol
-4	Invalid Parameter
-5	Operation Not Permitted

## 4.2.2 AT+Instruction Set

Table X. AT+Instruction Set List

<b>Instruction</b>	<b>Description</b>
<b>Management Instruction Set</b>	
E	Open/Close show back function
WMODE	Set/Query Wi-Fi work mode (AP/STA/APSTA)
ENTM	Set module into transparent transition mode
TMODE	Set/Query module data transfer mode
MID	Query module ID information
VER	Query module software version information
RELD	Restore to factory default setting
Z	Re-start module
H	Help
<b>Configure Parameters Instruction Set</b>	
CFGTF	Copy User Parameters to Factory Default Parameters
<b>UART Instruction Set</b>	
UART	Set/Query serial port parameters
UARTF	Open/Close UART auto-frame function
UARTFT	Set/Query UART auto-frame trigger time
UARTFL	Set/Query UART auto-frame trigger length
UARTTE	Set/Query UART free-frame trigger time between two bytes
<b>Network Command</b>	
PING	Network "Ping" Instruction
UDPLCPT	Set/Query UDP local port
<b>Socket A Command</b>	
SEND	Send Data at Command Mode
RECV	Receive Data at Command Mode
NETP	Set/Query network protocol parameters
MAXSK	Set/Query TCP Client connection number
TCPLK	Query if TCP link already build-up
TCPTO	Set/Query TCP timeout
TCPDIS	Open/Close TCP link
<b>Socket B Command</b>	
SOCKB	Set/Query SOCKB parameters
TCPDISB	Open/Close SOCKB TCP link
TCPTOB	Set/Query SOCKB TCP timeout
TCPLKB	Query if SOCKB TCP link already build-up
SNDB	Send data to SOCKB in Command Mode
RCVB	Receive data from SOCKB in Command Mode
<b>Wi-Fi STA Instruction Set (Effective when module works as STA)</b>	
WSKEY	Set/Query STA security parameters
WSSSID	Set/Query associated AP SSID parameters
WANN	Set/Query STA's network parameters
WSMAC	Set/Query STA's MAC address
WSLK	Query STA Wi-Fi link status
WSLQ	Query STA Wi-Fi signal strength
WSCAN	Scan AP
WSDNS	Set/Query STA's Static DNS server address

<b>Wi-Fi AP Instruction Set (Effective when module works as AP)</b>	
LANN	Set/Query AP's network parameters
WAP	Set/Query AP Wi-Fi parameters
WAKEY	Set/Query AP security parameters
WAMAC	Set/Query AP MAC address
WADHCP	Set/Query AP DHCP Server status
WADMN	Set/Query AP webpage domain name
WALK	Query MAC address of STA device connecting to module AP
WALKIND	Enable/Disable indication of connection status.
<b>Webpage Management Instruction Set</b>	
PLANG	Set/Query Webpage Language Option
WEBU	Set/Query Webpage User name and Code
<b>Network Time Set</b>	
NTPEN	Enable/Disable NTP time function
NTPSER	Set/Query NTP server IP
GMT	Query of time from NTP server
<b>Others Instruction Set</b>	
WRMID	Set module ID
RLDEN	Set/Query GPIO45 status
ASWD	Set/Query Wi-Fi configuration code
MDCH	Set Wi-Fi Auto Switch Function
TXPWR	Set/Query Wi-Fi Transmit Power
WPS	Start WPS function
WPSTNEN	Enable/Disable GPIO15 WPS function
LPTIO	Enable/Disable module WPS, nReady, nLink pin function
WIFI	Enable/Disable Wi-Fi
RPTMAC	Query the reporting MAC enable or disable
WRRPTMAC	Set the reporting MAC enable or disable
WOL	WakeOnLan for remote client
REMOTE	Get IP address of remote client (only in TCP mode)

#### 4.2.2.1 AT+E

- Function: Open/Close show back function;
- Format:

**AT+E<CR>**  
**+ok<CR><LF><CR><LF>**

- Parameters:  
Status: echo status  
- on: Open echo;  
- off: Close echo;

When ATNEL-WIFI232-T module firstly switch from transparent transmission to configuration mode, show back status is open, input "AT+E" to close show back function, input "AT+E" again to open show back function.

#### 4.2.2.2 AT+WMODE

- Function: Set/Query WI-FI work mode;
- Format:

Query Operation:  
**AT+WMODE<CR>**  
**+ok=<mode><CR><LF><CR><LF>**

Set Operation:

**AT+WMODE=<mode><CR>**  
**+ok<CR><LF><CR><LF>**

- Parameters:
  - mode: Wi-Fi work mode:
    - AP;
    - STA;
    - APSTA;

#### 4.2.2.3 AT+ENTM

- Function: Set module into transparent transmission mode;
- Format:

**AT+ENTM<CR>**  
**+ok<CR><LF><CR><LF>**

When operate this command, module switch from configuration mode to transparent transmission mode.

#### 4.2.2.4 AT+TMODE

- Function: Set/Query module data transfer mode;
- Format:

Query Operation:

**AT+TMODE<CR>**  
**+ok=<tmode><CR><LF><CR><LF>**

Set Operation:

**AT+TMODE=<tmode><CR>**  
**+ok<CR><LF><CR><LF>**

- Parameters:
  - tmode: data transfer mode, include:
    - throughput: throughput mode;
    - cmd: command mode;
    - pwm: PWM/GPIO mode;

#### 4.2.2.5 AT+MID

- Function: Query module ID information;
- Format:

Query Operation:

**AT+MID<CR>**  
**+ok=<module\_id><CR><LF><CR><LF>**

- Parameters:
  - module\_id: Module ID information:
    - ATNEL-WIFI232-T;

Notes: User can set this parameter through AT+WRMID.

#### 4.2.2.6 AT+VER

- Function: Query module software version information;
- Format:

Query Operation:

**AT+VER<CR>**  
**+ok=<ver><CR><LF><CR><LF>**



- Parameters:  
ver: Module software version information;

#### 4.2.2.7 AT+RELD

- Function: module restore to factory default setting;
- Format:

Set Operation:

**AT+RELD<CR>**

**+ok=rebooting...<CR><LF><CR><LF>**

When operate this command, module will restore to factory default setting and reboot.

#### 4.2.2.8 AT+FCLR

- Function: Erase factory setting;
- Format:

Query Operation:

**AT+FCLR<CR>**

**+ok=<status><CR><LF><CR><LF>**

#### 4.2.2.9 AT+Z

- Function: Re-start module;
- Format:

**AT+Z<CR>**

#### 4.2.2.10 AT+H

- Function: Help;
- Format:

Query Operation:

**AT+H<CR>**

**+ok=<command help><CR><LF><CR><LF>**

- Parameters:  
command help: command introduction;

#### 4.2.2.11 AT+CFGTF

- Function: Copy User Parameters to Factory Default Parameters;
- Format:

Query Operation:

**AT+CFGTF<CR>**

**+ok=<status><CR><LF><CR><LF>**

- Parameters:  
status: feedback operation status;

#### 4.2.2.12 AT+UART

- Function: Set/Query serial port parameters;
- Format:

Query Operation:

**AT+UART<CR>**

**+ok=<baudrate,data\_bits,stop\_bit,parity><CR><LF><CR><LF>**

Set Operation:

**AT+UART=<baudrate,data\_bits,stop\_bit,parity><CR>  
+ok<CR><LF><CR><LF>**

- Parameters:
  - baudrate:
    - 300; 600; 1200; 1800; 2400; 4800; 9600; 19200; 38400; 57600; 115200; 230400; 380400; 460800;
  - data\_bits:
    - 5,6,7,8;
  - stop\_bits:
    - 1; 2;
  - parity:
    - NONE;
    - EVEN;
    - ODD;
  - Flowctrl: (CTSRTS)
    - NFC: No hardware flow control;
    - FC: hardware flow control;

#### 4.2.2.13 AT+UARTF

- Function: Open/Close UART auto-frame function;
- Format:
  - Query Operation:
    - AT+UARTF<CR>**
    - +ok=<para><CR><LF><CR><LF>**
  - Set Operation:
    - AT+UARTF=<para ><CR>**
    - +ok<CR><LF><CR><LF>**
- Parameters:
  - para:
    - disable - Close auto-frame function;
    - enable - Open auto-frame function;

#### 4.2.2.14 AT+UARTFT

- Function: Set/Query UART auto-frame trigger time;
- Format:
  - Query Operation:
    - AT+UARTFT<CR>**
    - +ok=<time><CR><LF><CR><LF>**
  - Set Operation:
    - AT+UARTFT=<time ><CR>**
    - +ok<CR><LF><CR><LF>**
- Parameters:
  - time: Range 100 ~10000; Unit: ms. Auto-frame trigger time;

#### 4.2.2.15 AT+UARTFL

- Function: Set/Query UART auto-frame trigger length;
- Format:
  - Query Operation:
    - AT+UARTFL<CR>**

**+ok=<len><CR><LF><CR><LF>**  
 Set Operation:  
**AT+UARTFL=<len ><CR>**  
**+ok<CR><LF><CR><LF>**

- Parameters:  
len: Range 8 ~1000; Unit: Byte. Auto-frame trigger length;

#### 4.2.2.16 AT+UARTTE

- Function: Set/Query UART free-frame trigger time between two bytes;
- Format:  
Query Operation:  
**AT+UARTTE<CR>**  
**+ok=<mode><CR><LF><CR><LF>**  
Set Operation:  
**AT+UARTTE=<mode><CR>**  
**+ok<CR><LF><CR><LF>**
- Parameters:  
mode:  
- fast: free-frame trigger time between two bytes is 10ms;  
- normal: free-frame trigger time between two bytes is 50ms;

#### 4.2.2.17 AT+PING

- Function: Network "PING" Instruction;
- Format:  
Set Operation:  
**AT+PING=<IP\_address ><CR>**  
**+ok=<sta><CR><LF><CR><LF>**
- Parameters:  
sta: feedback result  
- Success;  
- Timeout;  
- Unknown host;

#### 4.2.2.18 AT+UDPLCPT

- Function: Set/Query UDP local port of Socket A and Socket B;
- Format:  
Query Operation  
**AT+UDPLCPT<CR>**  
**+ok=<porta,portb><CR><LF><CR><LF>**  
Set Operation  
**AT+UDPLCPT=<porta,portb><CR>**  
**+ok<CR><LF><CR><LF>**
- Parameters  
porta: UDP local port of Socket A, 0: do not fix local UDP port;  
portb: UDP local port of Socket B, 0: do not fix local UDP port;

#### 4.2.2.19 AT+SEND

- Function: Send Data to SOCKETETA at Command Mode;
- Format:

**AT+SEND=<data\_lenth><CR>  
+ok<CR><LF><CR><LF>**

- Parameters:

data\_lenth: Lenth of send data. Range: 0~1000 Byte;

The UART port will wait 3 seconds for input after this command is sent OK. The data received from UART port is sent to Socket A. If the interval of two bytes is more than 10ms, the data will be sent instantly.

#### 4.2.2.20 AT+RECV

- Function: Receive Data from SOCKETA at Command Mode;
- Format:

**AT+RECV=<data\_lenth,time\_out><CR>  
+ok=<data\_lenth, data\_content><CR><LF><CR><LF>**

- Parameters:

data\_lenth: Lenth of receive data. Range: 0~1000 Byte;

timeout: wait for timeout, 0~10sec;

data\_content: contents of receive data;

If not receive any data in 3 second, then feedback +ok=0.

#### 4.2.2.21 AT+NETP

- Function: Set/Query network protocol parameters;
- Format:

Query Operation:

**AT+NETP<CR>  
+ok=<protocol,CS,port,IP><CR><LF><CR><LF>**

Set Operation:

**AT+NETP=<protocol,CS,port,IP><CR>  
+ok<CR><LF><CR><LF>**

- Parameters:

protocol:

- TCP;

- UDP;

CS: Network mode

- SERVER;

- CLIENT;

Port: protocol port ID: Decimal digit and less than 65535;

IP: Server's IP address when module set as client;

If set as UDP SERVER, the module will save the IP address and port of the latest UDP packet received. The data will be sent to the saved IP address and port. If the module hasn't saved any IP address and port when power up. The data will be sent to the IP address and port which is set by this command.

If set as UDP CLIENT, the data will always be sent to the IP address and port set by this command.

#### 4.2.2.22 AT+MAXSK

- Function: Set/ Query TCP Client connection number;
- Format:

Query Operation:

**AT+MAXSK<CR>**

**+ok=<num><CR><LF><CR><LF>**

Set Operation:

**AT+MAXSK=<num><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - num: TCP Client connection number. Range: 1~5. 5 is the default value it means when the module work in TCP server, it accepts max 5 TCP client connect to it.

#### 4.2.2.23 AT+TCPLK

- Function: Query if TCP link already build-up;
- Format:

**AT+TCPLK<CR>**

**+ok=<sta><CR><LF><CR><LF>**

- Parameters:
  - sta.: if module already setup TCP link
    - on: TCP link setup;
    - off: TCP link not setup;

#### 4.2.2.24 AT+TCPTO

- Function: Set/Query TCP timeout;
- Format:

Query Operation:

**AT+TCPTO<CR>**

**+ok=<time><CR><LF><CR><LF>**

Set Operation:

**AT+TCPTO=<time ><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - time: TCP timeout time
    - <= 600, (600s);
    - >=0, (0 means no timeout);
    - Default, 300s;

Module begin to count time when TCP channel don't receive any data, cleaner time counter when TCP channel receiver any data. If the time counter reaches the TCPTO, the TCP channel will be break. If the module work in TCP Client, it will connect the TCP Server instantly and when the module work in TCP Server, the TCP client device should make the connection itself.

#### 4.2.2.25 AT+TCPDIS

- Function: Open/Close TCP link;
- Format:

Query Opera:

**AT+TCPDIS<CR>**

**+ok=<sta><CR><LF><CR><LF>**

Set Operation:

**AT+TCPDIS =<on/off><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:

- on, TCP link open;
- off □ TCP link close;

When setting, “off” means close TCP link. After finish this command, module disconnect TCP link and not connect again. “On” means open TCP link. After finish this command, module re-connect TCP server right away.

#### 4.2.2.26 AT+SOCKB

- Function: Set/Query SOCKETB parameters;
- Format:

Query Operation:

**AT+SOCKB<CR>**

**+ok=<protocol,port,IP><CR><LF><CR><LF>**

Set Operation:

**AT+SOCKB=<protocol,port,IP><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:

Protocol: Protocol type

- TCP: Only for TCP Client;

- UDP;

Port: Protocol Port in decimal, less than 65535;

IP: Destination IP address, domain name is support;

If set as UDP SERVER, the module will save the IP address and port of the latest UDP Packet receiver. The data will be send to the saved IP address and port. If the module hasn't saved any IP address and port when power up. The data will be sent to the IP address and port witch is set by this command.

If set as UDP Client, the data will always be sent to the IP address and port set by this command.

#### 4.2.2.27 AT+TCPDISB

- Function: Open/Close TCP SOCKETB connection;
- Format:

Query Operation:

**AT+TCPDISB<CR>**

**+ok=<sta><CR><LF><CR><LF>**

Set Operation:

**AT+TCPDISB =<on/off><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:

- on, TCP link open;

- off □ TCP link close;

When setting, “off” means close TCP link. After finish this command, module disconnect TCP link and not connect again. “On” means open TCP link. After finish this command, module reconnect TCP server right away.

#### 4.2.2.28 AT+TCPTOB

- Function: Set/Query Operation TCP SOCKETB timeout;
- Format:

Query Operation:

**AT+TCPTOB<CR>**

**+ok=<time><CR><LF><CR><LF>**  
 Set Operation:  
**AT+TCPTOB=<time ><CR>**  
**+ok<CR><LF><CR><LF>**

- Parameters
  - Time: TCP timeout
  - <= 600:600s;
  - 0 means no timeout;
  - Default:300s;

If the SOCKETB TCP don't receive any data from TCP server for TCP timeout setting, the module will break and reconnect the TCP server. IF it receive data from server, the timeout counter will be clear.

#### 4.2.2.29 AT+TCPLKB

- Function: Query TCP SOCKETB connection status;
- Format:
  - AT+TCPLKB<CR>**
  - +ok=<sta><CR><LF><CR><LF>**
- Parameters:
  - sta.: TCP connection status of SOCKETB
  - on: TCP connected;
  - off: TCP disconnected;

#### 4.2.2.30 AT+SNDB

- Function: Send data to SOCKETB at Command Mode;
- Format:
  - AT+SNDB=<data\_lenth ><CR>**
  - +ok<CR><LF><CR><LF>**
- Parameters:

data\_lenth: Lenth of send data. Range: 0~1000 Byte;

The UART port will wait 3 seconds for input after this command is sent OK. The data received from UART port is sent to socket. If the interval of two bytes is more than 10ms, the data will be sent instantly.

#### 4.2.2.31 AT+RCVB

- Function: Receive data from SOCKB at Command Mode;
  - Format:
    - AT+RCVB=<data\_lenth><CR>**
    - +ok=<data\_lenth, data\_content><CR><LF><CR><LF>**
  - Parameters:
    - data\_lenth: Lenth of receive data. Range: 0~1000 Byte;
    - data\_content: contents of receive data;
- If not receive any data in 3 second, then feedback +ok=0.

#### 4.2.2.32 AT+WSKEY

- Function: Set/Query STA security parameters;
- Format:
  - Query Operation:
  - AT+WSKEY<CR>**

**+ok=<auth,encry,key><CR><LF><CR><LF>**

Set Operation:

**AT+WSKEY=< auth,encry,key><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - auth: Authentication mode
    - OPEN;
    - SHARED;
    - WPAPSK;
    - WPA2PSK;
  - encry:Encryption algorithm
    - NONE: When "auth=OPEN", effective;
    - WEP: When "auth=OPEN" or "SHARED", effective;
    - TKIP: When "auth= WPAPSK" or "WPA2PSK", effective;
    - AES: When "auth= WPAPSK" "WPA2PSK", effective;
  - key: password, ASCII code, shall less than 64 bit and greater than 8bit;

#### 4.2.2.33 AT+WSSSID

- Function: Set/Query Wi-Fi associated AP SSID parameters;
- Format:
  - Query Operation:
    - AT+WSSSID<CR>**
    - +ok=<ap's ssid><CR><LF><CR><LF>**
  - Set Operation:
    - AT+WSSSID=<ap's ssid ><CR>**
    - +ok<CR><LF><CR><LF>**
- Parameters:
  - ap's ssid: AP's SSID (Within 32 character);

#### 4.2.2.34 AT+WANN

- Function: Set/Query STA network setting;
- Format:
  - Query Operation:
    - AT+WANN<CR>**
    - +ok=<mode,address,mask,gateway><CR><LF><CR><LF>**
  - Set Operation:
    - AT+WANN=< mode,address,mask,gateway ><CR>**
    - +ok<CR><LF><CR><LF>**
- Parameters:
  - mode: STA's IP network setting
    - static: Static IP;
    - DHCP: Dynamic IP;
  - address: STA IP address;
  - mask: STA subnet mask;
  - gateway: STA gateway address;

#### 4.2.2.35 AT+WSMAC

- Function: Set/Query STA MAC address parameters;
- Format:



Query Operation:

**AT+WSMAC<CR>**

**+ok=<mac\_address><CR><LF><CR><LF>**

Set Operation:

**AT+WSMAC=<code,mac\_address><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - code: security code
    - 8888 (default value);
  - mac\_address: STA MAC address, such as ACCF23FF1234;

#### 4.2.2.36 AT+WSLK

- Function: Query STA Wi-Fi link status;
- Format:
  - Query Operation:
    - AT+WSLK<CR>**
    - +ok=<ret><CR><LF><CR><LF>**
- Parameters:
  - ret:
    - "Disconnected", if no Wi-Fi connection;
    - "AP' SSID (AP's MAC)", if Wi-Fi connection available;

#### 4.2.2.37 AT+WSLQ

- Function: Query STA Wi-Fi signal strength;
- Format:
  - Query Operation:
    - AT+WSLQ<CR>**
    - +ok=<ret><CR><LF><CR><LF>**
- Parameters:
  - ret:
    - "Disconnected", if no Wi-Fi connection;
    - "AP's [Wi-Fi signal strength]" , if Wi-Fi connection available;

#### 4.2.2.38 AT+WSCAN

- Function: Scan AP;
- Format:
  - AT+WSCAN<CR>**
  - +ok=<ap\_site><CR><LF><CR><LF>**
- Parameters:
  - ap\_site: AP searched;

#### 4.2.2.39 AT+WSDNS

- Function: Set/Query STA static DNS server address;
- Format:
  - Query Operation:
    - AT+WSDNS<CR>**
    - +ok=<address><CR><LF><CR><LF>**
  - Set Operation:
    - AT+WSDNS =<address><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:  
address: STA's DNS server address; Effective right away.

#### 4.2.2.40 AT+LANN

- Function: Set/Query AP's network parameters;
- Format:  
Query Operation:  
**AT+LANN<CR>**  
**+ok=<ipaddress,mask><CR><LF><CR><LF>**  
Set Operation:  
**AT+LANN=< ipaddress,mask><CR>**  
**+ok<CR><LF><CR><LF>**
- Parameters:  
ipaddress: AP's IP address;  
mask: AP's net mask;

#### 4.2.2.41 AT+WAP

- Function: Set/Query AP Wi-Fi parameters;
- Format:  
Query Operation:  
**AT+WAP<CR>**  
**+ok=<wifi\_mode,ssid,channel><CR><LF><CR><LF>**  
Set Operation:  
**AT+WAP =<wifi\_mode,ssid,channel><CR>**  
**+ok<CR><LF><CR><LF>**
- Parameters:  
wifi\_mode: Wi-Fi mode, include:  
- 11B;  
- 11BG;  
- 11BGN (Default Value);  
ssid: SSID at AP mode;  
channel: Wi-Fi channel selection:  
- AUTO;  
- CH1~CH11; (Default CH1);

#### 4.2.2.42 AT+WAKEKEY

- Function: Set/Query AP Wi-Fi security parameters;
- Format:  
Query Operation:  
**AT+WAKEKEY<CR>**  
**+ok=<auth,encry,key><CR><LF><CR><LF>**  
Set Operation:  
**AT+WAKEKEY=< auth,encry,key><CR>**  
**+ok<CR><LF><CR><LF>**
- Parameters:  
auth: include  
- OPEN;  
- WPA2PSK;

ency: include

- NONE: When “auth=OPEN” available;
- AES: When “auth=WPA2PSK” available;

key: security code, ASCII code, smaller than 64bit and bigger than 8 bit;

#### 4.2.2.43 AT+WAMAC

- Function: Query AP MAC address parameters;
- Format:

Query Operation:

**AT+WAMAC<CR>**

**+ok=<mac\_address><CR><LF><CR><LF>**

- Parameters:

mac\_address: AP's MAC address;

Note: Module AP mode's MAC address is related to STA mode's MAC address. If user need change to others, please contact with ATNEL technical people.

#### 4.2.2.44 AT+WADHCP

- Function: Set/Query AP DHCP server status;
- Format:

Query Operation:

**AT+WADHCP<CR>**

**+ok=<status><CR><LF><CR><LF>**

Set Operation:

**AT+WADHCP=<status><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:

status: AP's DHCP server function status

- on: DHCP Server Open;

- off: DHCP Server Close:

#### 4.2.2.45 AT+WADMN

- Function: Set/Query AP webpage domain name;
- Format:

Query Operation:

**AT+WADMN<CR>**

**+ok=<domain\_name><CR><LF><CR><LF>**

Set Operation:

**AT+WADMN =<domain\_name><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:

domain\_name: Webpage domain name (within 20 characters, can't all numbers);

#### 4.2.2.46 AT+WALK

- Function: Query MAC address of STA device connecting to module AP;
- Format:

Query Operation:

**AT+WALK<CR>**

**+ok=<status><CR><LF><CR><LF>**

- Parameters:
  - status: MAC address of STA device connecting to module AP;
  - No Connection: No STA device connecting to module AP;

#### 4.2.2.47 AT+WALKIND

- Function: Enable/Disable indication of module AP connection status;
- Format:
  - Query Operation:
 

```
AT+WALKIND<CR>
+ok=<status><CR><LF><CR><LF>
```
  - Set Operation:
 

```
AT+WALKIND=<status><CR>
+ok<status><CR><LF><CR><LF>
```
- Parameters:
  - status: Indication of module AP connection status
    - on: Enable nLink indication function. When STA device connecting to module AP, nLink output Low, otherwise output High;
    - off: Disable nLink indication function (default mode);

#### 4.2.2.48 AT+PLANG

- Function: Set/ Query webpage language option;
- Format:
  - Query Operation:
 

```
AT+PLANG<CR>
+ok=<language><CR><LF><CR><LF>
```
  - Set Operation:
 

```
AT+PLANG=<language><CR>
+ok<CR><LF><CR><LF>
```
- Parameters:
  - language: webpage's language
    - PL: Polish Version (Default);
    - EN: English Version;

#### 4.2.2.49 AT+WEBU

- Function: Set/ Query webpage user name and password;
- Format:
  - Query Operation:
 

```
AT+WEBU<CR>
+ok=<username,password><CR><LF><CR><LF>
```
  - Set Operation:
 

```
AT+WEBU=<username,password><CR>
+ok<CR><LF><CR><LF>
```
- Parameters:
  - username: User Name, within 15 characters, not support empty;
  - password: password, within 15 characters, support empty;

#### 4.2.2.50 AT+NTPEN

- Function: Enable/Disable network time function;
- Format:

Query Operation:

**AT+NTPEN<CR>**  
**+ok=<status><CR><LF><CR><LF>**

Set Operation:

**AT+NTPEN=<status><CR>**  
**+ok<CR><LF><CR><LF>**

- Parameters:
  - Status: status of time function
  - on: Enable time function;
  - off: Disable time function;

#### 4.2.2.51 AT+NTPSER

- Function: Set/Query NTP server IP address;
- Format:

Query Operation:

**AT+NTPSER<CR>**  
**+ok=<ipaddress><CR><LF><CR><LF>**

Set Operation:

**AT+NTPSER=< ipaddress><CR>**  
**+ok<CR><LF><CR><LF>**

- Parameters:
  - ipaddress: NTP network server IP address, 132.163.4.101 (default value).

#### 4.2.2.52 AT+GMT

- Function: Query of time from NTP server;
- Format:

Query Operation:

**AT+GMT=<zone><CR>**  
**+ok=<time><CR><LF><CR><LF>**

- Parameters:
  - zone: Select time zone: -12~0~12;
  - time: time from NTP server in format:  
YYYY-MM-DD<0x20>hh:mm:ss;

#### 4.2.2.53 AT+WRMID

- Function: Set module ID;
- Format:

Set Operation:

**AT+WRMID=<wrmid><CR>**  
**+ok<CR><LF><CR><LF>**

- Parameters:
  - wrmid: set module's ID (within 20 characters);

#### 4.2.2.54 AT+RLDEN

- Function: Set/Query GPIO45 function status;
- Format:

Query Operation:

**AT+RLDEN<CR>**

**+ok=<status><CR><LF><CR><LF>**

Set Operation:

**AT+RLDEN=<status><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:

status: The status of module's GPIO45(nReload) function

- on: GPIO45 function (nReload) is enabled:

- off: GPIO45 function is disabled:

#### 4.2.2.55 AT+ASWD

- Function: Set/Query Wi-Fi Configuration Password;

- Format:

Query Operation:

**AT+ASWD<CR>**

**+ok=<aswd><CR><LF><CR><LF>**

Set Operation:

**AT+ASWD=<aswd><CR><LF><CR><LF>**

- Parameters:

aswd: Wi-Fi Configuration Password (within 20 characters). Default value: HF-A11ASSISTHREAD;

#### 4.2.2.56 AT+MDCH

- Function: Set Wi-Fi Auto Switch Function;

- Format:

Query Operation:

**AT+MDCH<CR>**

**+ok=<mode><CR><LF><CR><LF>**

Set Operation:

**AT+MDCH=<mode><CR><LF><CR><LF>**

- Parameters:

mode: Wi-Fi Auto Switch Mode

- off: Disable Wi-Fi auto switch;

- on: Enable Wi-Fi auto switch; When the module(STA mode) fail to connect to router, it will switch to AP mode itself in one minute.

- auto: Enable Wi-Fi auto detect function; The module will reset itself when encounter any abnormal. The default time interval is 10 minutes.

- 3-120: unit: minute; Set the time interval to reset itself when abnormal.

#### 4.2.2.57 AT+TXPWR

- Function: Set/Query Wi-Fi Transmit Power, Real Transmit Power=Default Transmit Power(16dBm) – [Setting Value] \* 0.5dBm;

- Format:

Query Operation:

**AT+TXPWR<CR>**

**+ok=<num><CR><LF><CR><LF>**

Set Operation:

**AT+TXPWR=<num><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:

num: [Setting Value]. The default is 0, it can be sent from 0 ~ 24. If set to 24, the module transmit power will be at a minimum of 4dBm. Reboot to make this setting change valid. It will not restore to default if reload the module.

#### 4.2.2.58 AT+WPS

- Function: Start WPS function;
- Format:

Query Operation:

**AT+WPS<CR>**

**+ok=<status><CR><LF><CR><LF>**

- Parameters:

status: WPS status. The module will reboot and work in STA mode connecting to specific router when WPS communication is OK;  
- WPS Scan Failed: WPS communication is failed;

Note: The router WPS function must be open first then enable module WPS Scan function. The module will quit WPS scan status if there is no WPS routers in 5 seconds. If the router's WPS is enabled, the module will reboot and enter WPS mode without reply +ok.

#### 4.2.2.59 AT+WPSBTNEN

- Function: Enable/Disable WPS function;
- Format:

Query Operation:

**AT+WPSBTNEN<CR>**

**+ok+<status><CR><LF><CR><LF>**

Set Operation:

**AT+WPSBTNEN=<status><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:

status:

- on: Enable WPS button function;
- off: Disable WPS button function;

#### 4.2.2.60 AT+LPTIO

- Function: Enable/Disable module WPS, nReady, nLink pin function;
- Format:

Query Operation:

**AT+LPTIO<CR>**

**+ok=<status><CR><LF><CR><LF>**

Set Operation:

**AT+LPTIO=<status><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters□

status: WPS, nReady, nLink pin function status.

- on/lpt100: WPS, nReady, nLink function is enable for pin (pin8, pin9, pin10);
- off/lpb100: WPS, nReady, nLink function is disable for pin (pin8, pin9, pin10);

## 4.2.2.61 AT+WIFI

- Function: Enable/Disable Wi-Fi Command;
- Format:
  - Query Operation:  
**AT+WIFI<CR>**  
**+ok=<status><CR>< LF><CR>< LF>**
  - Set Operation:  
**AT+WIFI=<status><CR>**  
**+ok<CR>< LF><CR>< LF>**
- Parameters 
  - status: Wi-Fi
  - UP: Enable Wi-Fi chip (default status);
  - DOWN: Disable Wi-Fi chip;

## 4.2.2.62 AT+RPTMAC

- Funkcja: Query the reporting MAC enable or disable
- Format:
  - Query Operation:  
**AT+RPTMAC<CR>**  
**+ok=<status><CR>< LF><CR>< LF>**
- Parameters:
  - status:
    - on: enable reporting MAC.
    - off: disable reporting MAC.

## 4.2.2.63 AT+WRRPTMAC

- Function: Set the reporting MAC enable or disable
- Format:
  - Query Operation:  
**AT+WRRPTMAC=<status><CR>**  
**+ok<CR>< LF><CR>< LF>**
  - Set Operation:
- Parameters:
  - status:
    - on: enable reporting MAC.
    - off: disable reporting MAC.

## 4.2.2.64 AT+WOL

- Function: Wake On Lan
- Format:
  - Query Operation:  
none
  - Set Operation:  
**AT+WOL=<MAC,port><CR>**  
**+ok<CR>< LF><CR>< LF>**
- Parameters:
  - MAC: MAC address of remote client.



- port: port.

#### 4.2.2.65 AT+REMOTE

- Function: Query remote client ip address (only in TCP mode)
- Format:  
Query Operation:  
**AT+REMOTE=<status><CR>**  
**+ok<CR>< LF><CR>< LF>**
- Parameters:  
status:  
- remote ip address

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## 5 APPENDIX A: CONTROL GPIO/PWM FUNCTION WITH NETWORK COMMANDS

Send command data to control module's GPIO, PWM port after make network connection with TCP or UDP protocol. The status of GPIO and PWM won't be changed when you restart module if you using command GPIO/PWM <channel> SET.

### 5.1 Network Command

#### 5.1.1 GPIO <channel> OUT <value>

- Function: Set GPIO Channel value temporarily;
- Parameters:
  - channel: GPIO Channel number, it can be 11, 12, 18(GPIO Number )
  - value: GPIO Channel value, 1(high voltage), 0(low voltage)
- Return Data:
  - GPIO OK: Command successful
  - GPIO NOK: Command failed

#### 5.1.2 GPIO <channel> GET

- Function: Query GPIO Channel value;
- Parameters:
  - channel: GPIO Channel number, it can be 11, 12, 18(GPIO Number );
- Return Data:
  - +ok=<value>
  - value: GPIO Channel value;
  - GPIO NOK: Command failed;

#### 5.1.3 GPIO <channel> SET

- Function: Save GPIO Channel setting;
- Parameters:
  - channel: GPIO Channel number, it can be 11, 12, 18(GPIO Number);
- Return Data:
  - GPIO OK: Command successful;
  - GPIO NOK: Command failed;

#### 5.1.4 PWM <channel frequency duty>

- Function: Set PWM Channel output temporarily;
- Parameters:
  - channel: PWM Channel number, it can be 11, 12, 18(GPIO Number);
  - frequency: PWM Channel frequency, it can be 500~60000;
  - duty: PWM Channel duty, it can be 0~100;
- Return Data:
  - PWM OK: Command successful;
  - PWM NOK: Command failed;

### 5.1.5 PWM <channel> GET

- Function: Query PWM Channel output;
- Parameters:  
channel: PWM Channel number, it can be 11, 12, 18(GPIO Number);
- Return Data:  
+ok=<frequency duty>  
frequency: PWM Channel frequency;  
duty: PWM Channel duty;  
PWM NOK: Command failed;

### 5.1.6 PWM <channel> SET

- Function: Save PWM Channel setting;
- Parameters:  
channel: PWM Channel number, it can be 11, 12, 18(GPIO Number);
- Return Data:  
PWM OK: Command successful;  
PWM NOK: Command failed;

## 6 APPENDIX B: CONTACT INFORMATION

### ATNEL

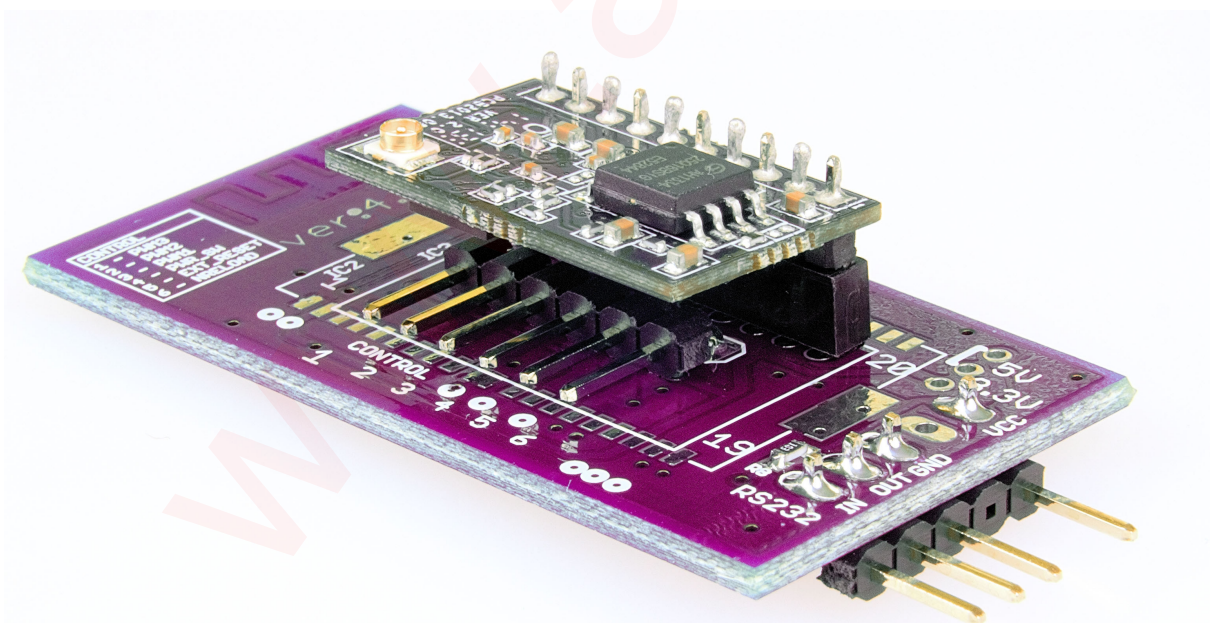
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