RF-WRN

WiFi abgn module

USER'S MANUAL

Copyright Information

Agency Compliance and Approvals

FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE STATEMENT

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

CAUTION:
Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: VTV-RFWRN ” and "Contains IC: 10524A-RFWRN “

Information for the OEMs and Integrators

The following statement must be included with all versions of this document supplied to an OEM or integrator, but should not be distributed to the end user.

1) This device is intended for OEM integrators only.
2) Please see the full Grant of Equipment document for other restrictions.

This module is intended for OEM integrator.
The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module.
Appropriate measurements (e.g. 15 B compliance) and if applicable additional equipment authorizations (e.g. Verification , Doc) of the host device to be addressed by the integrator/manufacturer.

IMPORTANT NOTE:
This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module.
20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.
Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.
USERS MANUAL OF THE END PRODUCT:
In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than the palm of the hand, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.
LABEL OF THE END PRODUCT:
The final end product must be labeled in a visible area with the following " Contains TX FCC ID: VTV-RFWRN ". If the size of the end product is larger than the palm of the hand, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

This radio transmitter FCC ID: VTV-RFWRN has been approved by FCC to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	WHA YU INDUSTRIAL CO., LTD.	SSR-83420	dipole	2.0 dBi for 2.4 GHz 3.0 dBi for 5 GHz
2	ARISTOTLE ENTERPRISES INC.	RFA-25-P393B-70B140R	FPC	-0.5 dBi for 2.4 GHz 3.3 dBi for 5 GHz

Note: The antenna connector is I-PEX type.

Canada, Industry Canada (IC) Notices

This device complies with Canada licence-exempt RSS standard(s).
Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Canada, avis d'Industry Canada (IC)

Cet appareil est conforme avec Industrie Canada exemptes de licence RSS standard(s).
Son fonctionnement est soumis aux deux conditions suivantes : (1) cet appareil ne doit pas causer d'interférence et (2) cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

Radio Frequency (RF) Exposure Information

The radiated output power of the Wireless Device is below the Industry Canada (IC) radio frequency exposure limits. The Wireless Device should be used in such a manner such that the potential for human contact during normal operation is minimized.

This device has also been evaluated and shown compliant with the IC RF Exposure limits under mobile exposure conditions. (antennas are greater than 20cm from a person's body).

Informations concernant l'exposition aux fréquences radio (RF)

La puissance de sortie émise par l’appareil de sans fil est inférieure à la limite d'exposition aux fréquences radio d'Industry Canada (IC). Utilisez l’appareil de sans fil de façon à minimiser les contacts humains lors du fonctionnement normal.

Ce périphérique a également été évalué et démontré conforme aux limites d'exposition aux RF d'IC dans des conditions d'exposition à des appareils mobiles (antennes sont supérieures à 20 cm à partir du corps d'une personne).

This radio transmitter IC: 10524A-RFWRN has been approved by Industry Canada to operate with

the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet émetteur radio IC: 10524A-RFWRN a été approuvé par Industrie Canada pour fonctionner avec les types d'antennes énumérés ci-dessous avec le gain maximal admissible et impédance d'antenne requise pour chaque type d'antenne indiqué. Types d'antennes n'est pas inclus dans cette liste, ayant un gain supérieur au gain maximal indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil.

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	WHA YU INDUSTRIAL CO., LTD.	SSR-83420	dipole	2.0 dBi for 2.4 GHz 3.0 dBi for 5 GHz
2	ARISTOTLE	RFA-25-P393B-70B140R	FPC	-0.5 dBi for 2.4 GHz

	ENTERPRISES INC.			3.3 dBi for 5 GHz

Note: The antenna connector is I-PEX type.

Pour usage en l’intérieur seulement
This device is restricted to indoor use.

Contents

1. Introduction

Product Introduction

The RF-WRN is an 802.11 a/b/g/n Wi-Fi module which supports 2 dual-band external antennas. The module provides serial UART interface, enabling connection to any embedded design utilizing a 32-bit microcontroller via simple commands.

The RF-WRN Wi-Fi module is compatible with other devices that use 802.11 a/b/g/n technology. For more information, please refer the contents in this document.

2. AT command

The Wi-Fi AT command set represents the frames that are sent from the Host to operate the RS9113-WiSeConnect Module. The command set resembles the standard AT command interface used for modems.

All AT commands start with “at” and are terminated with a carriage return(‘\r’) and a new line(‘\n’) character.

The AT command set for the RS9113-WiSeConnect Module starts with “at+rsi_” followed by the name of the command and any relevant parameters.

In some commands, a ‘?’ character is used after the command to query data from the module.

Appendix A: Sample Flow of Commands for Wi-Fi over UART captures sample flow of commands to configure the module in various functional modes.

Syntax of AT command:

at+rsi_<command_name>[=][parameters][?]\r\n

Example:

at+rsi_command=< parameter1 >,< parameter2 >,< parameter3 >\r\n

Each parameter should be separated by comma (,).

NOTE:

1) All commands are issued from Host to module as a sequence of ASCII characters. All return messages from module to Host consist of OK or ERROR strings, along with some return parameters. The return parameters may be ASCII or Hex on a case by case basis. ERROR is accompanied by <Error code>.

2) A command should NOT be issued by the Host before receiving the response of a previously issued command from the module.

RS9113-WiSeConnect Module support following host interface in AT Command mode:

- UART
- USB-CDC

3. Binary Command

This section explains the Wi-Fi commands that are used to configure RS9113-WiSeConnect

module in Binary Mode.

Following are list of host interfaces supported in Binary Mode:

- UART
- SPI
- USB
- USB-CDC

The Wi-Fi configuration and operation commands are sent to the module and the

responses are read from the module using frame write/frame read (as mentioned in the

preceding sections) so these configuration and operation commands
are called as command

frames.

The command frame is categorized as management or data frames. The management

frames are used to configure the Wi-Fi module to access Wi-Fi connectivity, TCP/IP stack

and operate the module. Data frames are used to send the data.

Management and data frames are exchanged between host and module. Management

frame is sent from Host to the module to configure the module, and also is sent from

module to host to send responses to these commands.

The format of the command frames are divided into two parts:

1) Management/Data Frame descriptor

2) Management/Data Frame Body

Management/Data Frame Descriptor (16 bytes)	Management/Data Frame Body

NOTE:
Management/Data Frame Body (variable length) should be multiples of 4 bytes in case of SPI interface

The following is the frame format for management and data frames in Binary Command Mode. Command frame format is shown below. This description is for a Little Endian System.

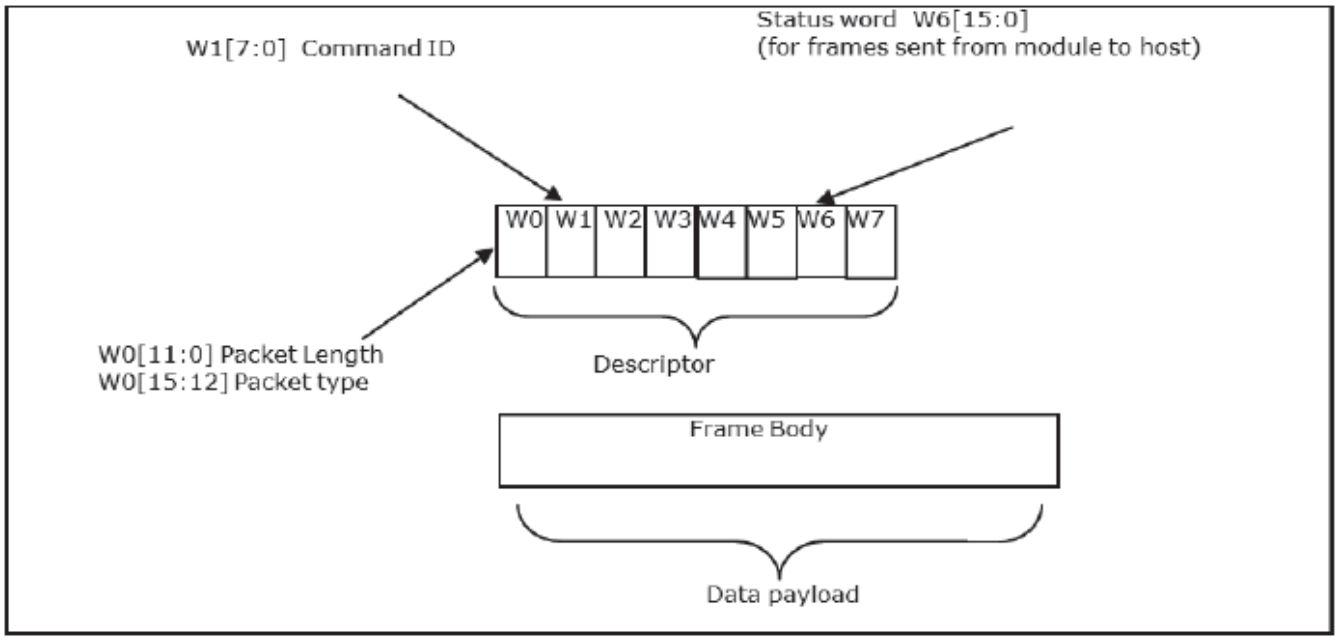


Figure 1: Command Frame Format

The following table provides the general description of the frame descriptor for management and data frames.

Word	Management Frame Descriptor	Data Frame Descriptor
Word0 W0[15:0]	Bits [11:0] – Length of the frame Bits [15:12] – 4 (indicate management packet).	Bits [11:0] – Length of the frame Bits [15:12] – 5 (indicate data packet)
Word1 W1[15:0]	Bits [7:0] - Command ID. Bits[15:8]-Reserved	Bits [7:0] – 0x0 Data type. Note: Any thing other than 0x0 is a management packet. Bits[15:8]-Reserved
Word2 W2[15:0]	Reserved	Reserved
Word3 W3[15:0]	Reserved	Reserved
Word4 W4[15:0]	Reserved	Reserved
Word5 W5 [15:0]	Reserved	Reserved
Word6 W6 [15:0]	1. (0x0000) when sent from host to module. 2. When sent from module to host (as response frame), it contains the status.	Reserved
Word7 W7 [15:0]	Reserved	Reserved

Table 2: Frame Descriptor for Management/Data Frames in Binary Mode

The management frames represent the command frames that are sent from the Host to the RS9113-WiSeConnect Module to configure for Wi-Fi access. These are frame write commands. The following are the types of management requests and responses and the corresponding codes. The first table below is applicable when the Host sends the frames to the module; the second table below is applicable when the module sends the frames to the host. The corresponding code is to be filled in W1 [7:0] mentioned in the table above.

Command	Command ID
Send Data	0x00
Set Operating Mode	0x10
Band	0x11
Init	0x12
Scan	0x13
Join	0x14
Power save mode	0x15
Sleep Timer	0x16
Set Mac address	0x17
Query Network Parameters	0x18
Disconnect	0x19
Antenna Select	0x1B
Soft Reset	0x1C
Set region	0x1D
Config Save	0x20
Config Enable	0x21
Config Get	0x22
User Store configuration	0x23
AP config	0x24
Set WEP Keys	0x25
Debug Prints on UART2	0x26
Ping command	0x29
RSSI Query	0x3A
Multicast Address Filter	0x40
Set IP Parameters	0x41
Socket Create	0x42

Command	Command ID
Socket Close	0x43
DNS Resolution	0x44
Query LTCP Connection Status	0x46
Query WLAN Connection Status	0x48
Query Firmware Version	0x49
Get MAC Address	0x4A
Configure P2P	0x4B
Configure EAP	0x4C
Set Certificate	0x4D
Query GO Param	0x4E
Load Web pages	0x50
HTTP GET	0x51
HTTP POST	0x52
DNS Server	0x55
URL response	0x56
FWUP REQ OK	0x5A
BG scan	0x6A
HT Caps REQ	0x6D
Rejoin params	0x6F
WPS method REQ	0x72
Roam Params REQ	0x7b
PER MODE REQ	0x7C
Webpage Clear REQ	0x7F
SNMP Get response	0x83
SNMP Get next response	0x84
SNMP ENABLE	0x85
SNMP TRAP	0x86
IPv6 Config	0x90
Trigger Auto configuration	0x91
WMM PS REQ	0x97
Firmware upgradation from host	0x99
Webpage Erase REQ	0x9A
JSON erase REQ	0x9B
JSON create REQ	0x9C
PER Stats REQ	0xA2
Transparent Mode REQ	0xA3

Command	Command ID
UART flow control	0xA4
Set PSK/PMK REQ	0xA5
Socket Configuration REQ	0xA7
RF current mode configuration	0xAD
Multicast request	0xB1
Sent Bytes on Socket	0xB2
HTTP Abort	0xB3
Set Region of Access point	0xBD
Power save ACK	0xDE

Table 3: Command IDs for Tx Data Operation

Command	Response ID
Set Operating Mode	0x10
Band	0x11
Init	0x12
Scan	0x13
Join	0x14
Power save mode	0x15
Sleep Timer	0x16
Set Mac address	0x17
Query Network Parameters	0x18
Disconnect	0x19
Antenna select	0x1B
Soft Reset	0x1C
Set region	0x1D
Config save	0x20
Config Enable	0x21
Config Get	0x22
User store configuration	0x23
AP Config	0x24
Set WEP Keys	0x25
Debug Prints on UART2	0x26
Ping command	0x29
Async connection accept request from remote wfd device	0x30
RSSI Query	0x3A

Command	Response ID
Multicast Address filter	0x40
IP Parameters Configure	0x41
Socket Create	0x42
Socket Close	0x43
DNS Resolution	0x44
Query LTCP Connection Status	0x46
Query WLAN Connection Status	0x48
Query Firmware Version	0x49
Get MAC Address	0x4A
Configure P2P	0x4B
Configure EAP	0x4C
Set Certificate	0x4D
Query GO Params	0x4E
Load webpage	0x50
HTTP GET	0x51
HTTP POST	0x52
Roam Params RSP	0x53
Async WFD	0x54
DNS Server	0x55
URL response	0x56
FWUP RSP	0x59
Async TCP Socket Connection Established	0x61
Async Socket Remote Terminate	0x62

DNS Server	0x55
URL response	0x56
FWUP RSP	0x59
Async TCP Socket Connection Established	0x61
Async Socket Remote Terminate	0x62
URL request	0x64
BG scan	0x6a
HT Caps RSP	0x6D
Rejoin params	0x6F
Module state	0x70
WPS method RSP	0x72
Roam Params REQ	0x7b
PER MODE RSP	0x7C
Webpage Clear RSP	0x7F
SNMP GET	0x80
SNMP GET NEXT	0x81
SNMP SET	0x82

Command	Response ID
Card Ready	0x89
WMM PS RSP	0x97
Webpage Erase RSP	0x9A
JSON erase RSP	0x9B
JSON create RSP	0x9C
JSON Update	0x9D
Config IPv6	0xA1
PER Stats	0xA2
Transparent Mode RSP	0xA3
UART flow control RSP	0xA4
Set PSK/PMK RSP	0xA5
Socket Configuration RSP	0xA7
IP Change notify	0xAA
RF current mode configuration	0xAD
Multicast response	0xB1
HTTP Abort	0xB3
Set Region of Access point	0xBD
Station connected Indication	0xC2
Station Disconnected Indication	0xC3
Wakeup indication	0xDD
Sleep indication	0xDE
Receive data	Ignore the response ID field while receiving data from a remote terminal

Table 4: Response IDs for Rx Operation

4. Commands

The following sections will explain RS9113-WiSeConnect commands, their structures, their responses and relevance in AT mode and Binary mode.

4.1 Set Operating Mode

Description:

This is the first command that needs to be sent from the Host after receiving card ready frame from module. This command configures the module in different functional modes.

Command Format:

AT Mode:

at+rsi_opermode=
<oper_mode>,<feature_bit_map>,<tcp_ip_feature_bit_map>,<custom
_feature_bit_map>\r\n

Binary Mode:

The structure of the payload is give below

```
typedef struct
{
uint32 oper_mode;
uint32 feature_bit_map;
uint32 tcp_ip_feature_bit_map;
uint32 custom_feature_bit_map;
} operModeFrameSnd;
```

Command Parameters:

Oper_mode:

Sets the mode of operation. oper_mode contains two parts <wifi_oper_mode, coex_mode>. Lower two bytes represent wifi_oper_mode and higher two bytes represent coex_modes.

oper_mode = ((wifi_oper_mode) | (coex_mode << 16))

Wifi_oper_mode values:

0 - Wi-Fi Client Mode. The module works as a normal client that can connect to an Access

Point with different security modes other than enterprise security.

1 – Wi-Fi Direct™ or Autonomous GO. In this mode, the module either acts as a Wi-Fi Direct

node or as an Autonomous GO (with intent value 16), depending on the inputs supplied for

the command “Configure Wi-Fi Direct Peer-to-Peer Mode”. In Autonomous GO and in Wi-Fi

Direct GO mode, a maximum of 4 client devices are supported.

2 – Enterprise Security Client Mode. The module works as a client that can connect to an

Access Point with WPA/WPA2-Enterprise security.

6 – Access Point mode. In this mode, the module acts as an Access Point, depending on the

inputs supplied for the command “Configure AP Mode”. In Access Point mode, a maximum

of 8 client devices are supported.

8 - PER Mode. This mode is used for calculating packet error rate and mostly used during RF

certification tests.

coex_mode bit values: enables respective protocol

BIT 0 : Enable/Disable WLAN mode.

0 – Disable WLAN mode

1 – Enable WLAN mode

BIT 1 : Enable/Disable ZigBee mode.

0 – Disable ZigBee mode

1 – Enable ZigBee mode

BIT 2 : Enable/Disable BT mode.

0 – Disable BT mode

1 – Enable BT mode

BIT 3 : Enable/Disable BTLE mode.

0 – Disable BTLE mode

1 – Enable BTLE mode

NOTE: In BTLE mode, need to enable BT mode also.

Following table represents possible coex modes supported:

Coex_mode	Description
0	WLAN only mode
3	WLAN and ZigBee coexistence mode.
5	WLAN and BT coexistence mode.
13	WLAN and BTLE coexistence mode.

NOTE: In coexistence mode (3,5,13) module supports only WLAN client mode (Open mode,
PSK security).
Embedded TCP/IP stack is not supported in WLAN+BT mode.
NOTE: In WLAN+BLE mode maximum number of sockets supported are 2
NOTE: In WLAN+ZB mode maximum number of sockets supported are 8
NOTE: In coexistence mode (0) module supports all WLAN modes
and embedded TCP/IP stack.

feature_bit_map: this bitmap is used to enable following WLAN features:
feature_bit_map[0]- To enable open mode
0 - Open Mode Disabled
1- Open Mode enabled (No Security)
feature_bit_map[1]- To enable PSK security
0 - PSK security disabled
1 - PSK security enabled
feature_bit_map[2]-To enable Aggregation
0-Aggregation disabled
1-Aggregation enabled
feature_bit_map[3]-To enable LP GPIO hand shake
0 – LP GPIO hand shake disabled
1 – LP GPIO hand shake enabled
feature_bit_map[4]-To enable ULP GPIO hand shake
0 – ULP GPIO hand shake disabled

1 – ULP GPIO hand shake enabled

feature_bit_map[5]-To select module to host wakeup pin

0 – GPIO_21 is used as module to host wakeup pin

1 – ULP_GPIO_1 is used as module to host wakeup pin

feature_bit_map[6]-To select RF supply voltage

0 – RF voltage is set to 1.9V

1 – RF voltage is set to 3.3V

feature_bit_map[7:31]- Reserved. Should set to be '0'

> NOTE: feature_bit_map[0], feature_bit_map[1] are valid only in Wi-Fi client

tcp_ip_feature_bit_map: To enable TCP/IP related features.

tcp_ip_feature_bit_map[0]- To enable TCP/IP bypass

0 - TCP/IP bypass mode disabled

1 - TCP/IP bypass mode enabled

tcp_ip_feature_bit_map[1]- To enable http server

0 - HTTP server disabled

1 - HTTP server enabled

tcp_ip_feature_bit_map[2]- To enable DHCPv4 client

0 - DHCPv4 client disabled

1 - DHCPv4 client enabled

tcp_ip_feature_bit_map[3]- To enable DHCPv6 client

0 - DHCPv6 client disabled

1 - DHCPv6 client enabled

tcp_ip_feature_bit_map[4]- To enable DHCPv4 server

0 - DHCPv4 server disabled

1 - DHCPv4 server enabled

tcp_ip_feature_bit_map[5]- To enable DHCPv6 server

0 - DHCPv6 server disabled

1 - DHCPv6 server enabled

tcp_ip_feature_bit_map[6]- To enable Dynamic update of web pages (JSON objects)

0 - JSON objects disabled

1 - JSON objects enabled

tcp_ip_feature_bit_map[7]- To enable HTTP client

0 - To disable HTTP client

1 - To enable HTTP client

tcp_ip_feature_bit_map[8]- To enable DNS client

0 - To disable DNS client

1 - To enable DNS client

tcp_ip_feature_bit_map[9]- To enable SNMP agent

0 - To disable SNMP agent

1 - To enable SNMP agent

tcp_ip_feature_bit_map[10]- To enable SSL

0 - To disable SSL

1 - To enable SSL

tcp_ip_feature_bit_map[11]- To enable PING from module(ICMP)

0 - To disable ICMP

1 - To enable ICMP

tcp_ip_feature_bit_map[12]- To enable HTTPS Server

0 - To disable HTTPS Server

1 - To enable HTTPS Server

tcp_ip_feature_bit_map[14]- To send configuration details to host on submitting configurations on wireless configuration page

0 - Do not send configuration details to host

1 - Send configuration details to host

tcp_ip_feature_bit_map[15]- To enable FTP client

0 - To disable FTP client

1 - To enable FTP client

tcp_ip_feature_bit_map[16]- To enable SNTP client

0 - To disable SNTP client

1 - To enable SNTP client

tcp_ip_feature_bit_map[17]- To enable IPv6 mode

0 - To disable IPv6 mode

1 - To enable IPv6 mode

IPv6 will also get enabled if DHCP v6 client/DHCP v6 server is enabled irrespective of tcp_ip_feature_bit_map[17].

tcp_ip_feature_bit_map[19]- To MDNS and DNS-SD

0 - To disable MDNS and DNS-SD

1 - To Enable MDNS and DNS-SD

tcp_ip_feature_bit_map[13], tcp_ip_feature_bit_map[18], tcp_ip_feature_bit_map[20:31]-All set to ‘0’.

NOTE: SSL(tcp_ip_feature_bit_map[10], tcp_ip_feature_bit_map[12]) is supported only in opermode 0

NOTE: tcp_ip_features supported in coex mode

WLAN + BT : TCP IP Bypass

WLAN + BLE : TCP IP Bypass , DHCPV4 Client , HTTP Client , DNS Client , FTP Client

WLAN + ZB : TCP IP Bypass , HTTP Server , DHCPV4 Client , DHCPV6 Client , HTTP Client , DNS Client , SNMP client , FTP Client

custom_feature_bit_map:

This bitmap used to enable following custom features:
BIT[2]: If this bit is set to ‘1’, the DHCP server behavior, when the module is in AP mode, changes. The DHCP server, when it assigns IP addresses to the client nodes, does not send out a Gateway address, and sends only the assigned IP and Subnet values to the client. It is highly recommended to keep this value at ‘0’ as the changed behavior is required in only very specialised use cases and not in normal AP functionality. The default value of this bit is ‘0’.
BIT[5]: If this bit is set to ‘1’, Hidden SSID is enabled in case of AP mode. The default value of this bit is ‘0’.
BIT[6]:To enable/disable DNS server IP address in DHCP offer response in AP mode.
1- In AP mode, DHCP server sends DNS server IP address in DHCP offer
0- Not to include DNS server address in DHCP offer response
BIT[8]: - Enable/Disable DFS channel passive scan support
1- Enable
0-Disable
BIT[9] : – To Enable/disable LED(GPIO_16) after module initialization(INIT).
1- Enable LED support
0– Disable LED support
BIT[10]: Used to enable/disable Asynchronous messages to host to indicate the module state.
1- Enable asynchronous message to host
0-Disable asynchronous message to host
BIT[11] : To enable/disable packet pending (Wakeon wireless) indication in UART mode
1 – Enable packet pending indication
0- Disable packet pending indication
BIT[12]:Used to enable or disable AP blacklist feature in client mode during roaming or rejoin. By default module maintains AP blacklist internally to avoid some access points.
1 – Disable AP black list feature
0 – Enable AP black list feature
BIT[13-16]:Used to set the maximum number of stations or client to support in AP or Wi-Fi Direct mode. Possible values are 1 to 8 in AP mode and 1 to 4 in Wi-Fi Direct mode.
Note1: If these bits are not set, default maximum clients supported is set to 4.
BIT[17] : to select between de-authentication or Null data (with power management bit set) based roaming, Depending on selected method station will send deauth or Null data to connected AP when roam from connected AP to newly selected AP.
0 – To enable de-authentication based roaming
1 – To enable Null data based roaming
BIT[18]: Reserved
BIT[19]: Reserved
BIT[20]: Used to start/stop auto connection process on bootup, until host triggers it using Trigger Auto Configuration command

1 – Enable

0 – Disable

BIT[22]: Used to enable per station power save packet buffer limit in AP mode. When enabled, only two packets per station will be buffered when station is in power save

1 – Enable

0 – Disable

BIT[23] : To enable/disable HTTP/HTTPs authentication

1 - Enable

0 – Disable

BIT[24]: To enable/disable higher clock frequency in module to improve throughputs

1 - Enable

0 – Disable

BIT[25]: To give HTTP server credentials to host in get configuration command

1 – To include HTTP server credentials in get configuration command response

0 – To exclude HTTP server credentials in get configuration command response

BIT[26]: To accept or reject new connection request when maximum clients are connected in case of LTCP.

1 - Reject

0 – Accept

By default this bit value is zero.

When BIT[26] is zero: For a LTCP socket when maximum clients are connected if a new connection request is received, then this connection request will not be rejected. Instead module will maintain this connection request in LTCP pending list.

This request will be served when any of the connected client is disconnected.

When BIT[26] is set: For a LTCP socket when maximum clients are connected if a new connection request is received, then this connection request will be rejected immediately. Module will not maintain this connection request in LTCP pending list.

BIT[0:1],BIT[3:4],BIT[7],BIT[21],BIT[31:27]: Reserved, should be set to all ‘0’.

NOTE: For UART/USB-CDC in AT mode:

When user does not give any tcp_ip_feature_bit_map value then default settings for client mode, Enterprise client mode, WiFi-Direct mode are:

HTTP server, DHCPv4 client, DHCPv6 client and JSON objects are enabled.

When user does not give any tcp_ip_feature_bit_map value then default settings for Access point mode are:

HTTP server, DHCPv4 server, DHCPv6 server and JSON objects are enabled.

Parameters- feature_bit_map, tcp_ip_feature_bit_map and custom_feature_bit_map are optional in opermode command in UART mode for AT mode. If user does not give these parameters then default configuration gets selected, as explained above, based upon the operating mode configured.

If opermode is 8 (PER mode is selected) - feature_bit_map, tcp_ip_feature_bit_map and custom_feature_bit_map can be ignored or not valid. Set to zero.

Response:

AT Mode:

Result Code	Description
OK	Successful execution of the command
ERROR<Error code>	Failure

Binary Mode:

There is no response payload for this command.

Possible error codes: Possible error codes are 0x0021,0x0025,0xFF73,0x002C,0xFF6E,0xFF6F,0xFF70,0xFFC5.

Example:

AT Mode:

When only oper_mode is given in command:

at+rsi_opermode=1\r\n

0x61 0x74 0x2B 0x72 0x73 0x69 0x5F 0x6F 0x70
0x65 0x72 0x6D 0x6F 0x64 0x65 0x3D 0x31 0x0D
0x0A

Response:
OK\r\n

0x4F 0x4B 0x0D 0x0A

When other parameters along with mode_val is given in opermode command:

at+rsi_opermode=1,1,2,0\r\n
0x61 0x74 0x2B 0x72 0x73 0x69 0x5F 0x6F 0x70
0x65 0x72 0x6D 0x6F 0x64 0x65 0x3D 0x31 0x2C
0x31 0x2C 0x32 0x2C 0x30 0x0D 0x0A

By giving above command module is configured in WFD mode with HTTP server enabled in open mode.

Response:
OK\r\n

0x4F 0x4B 0x0D 0x0A

4.2 Band

Description:

This command configures the band in which the module has to be configured.

Command Format:

AT Mode:

at+rsi_band=< bandVal >\r\n

Binary Mode:

typedef struct {
uint8 bandVal;
} bandFrameSnd;

Command Parameters:

The valid values for the parameter for this command are as follows:

bandVal:

0– 2.4 GHz

1- 5 GHz

2- Dual band (2.4 Ghz and 5 Ghz).

NOTE: Dual band is supported in station mode and WiFi Direct mode

Response:

AT Mode:

Result Code	Description
OK	Successful execution of the command
ERROR<Error code>	Failure

Binary Mode:

There is no response payload for this command.

Possible error codes:

Possible error codes are 0x0005, 0x0021, 0x0025, 0x002C, 0x003c.

Relevance:

This command is relevant in all operating modes

Example:

AT Mode:

at+rsi_band=0\r\n

0x61 0x74 0x2B 0x72 0x73 0x69 0x5F 0x62 0x61 0x6E
0x64 0x3D 0x30 0x0D 0x0A

Response:

OK\r\n
0x4F 0x4B 0x0D 0x0A

4.3 Set MAC Address

Description:

This command sets the module's MAC address. This command has to be issued before band command.

Command:

AT Mode:

at+rsi_setmac=< macAddr >\r\n

Binary Mode:

typedef struct {
uint8 macAddr[6];
}setMacAddrFrameSnd;

Command Parameters:

macAddr – Mac address to be set for module.

Response:

AT Mode:

Result Code	Description
OK	Successful execution of the command
ERROR<Error code>	Failure

Binary Mode:

There is no response payload for this command.

Possible error codes:

Possible error codes are 0x0021, 0x0025, 0x002C.

Relevance:

This command is relevant in all operating modes.

Example:

AT Mode:

at+rsi_setmac=001122334455\r\n

0x61 0x74 0x2B 0x72 0x73 0x69 0x5F 0x73 0x65 0x74 0x6D
0x61 0x63 0x3D 0x30 0x30 0x31 0x31 0x32 0x32 0x33 0x33
0x34 0x34 0x35 0x35 0x0D 0x0A

Response:

OK\r\n
0x4F 0x4B 0x0D 0x0A

8.4 Init

Description:

This command programs the module's Baseband and RF components and returns the MAC address of the module to the host.

Command:

AT Mode:

at+rsi_init\r\n

Binary Mode:

No Payload required.

Command Parameters:

No parameters

Response:

AT Mode:

Result Code	Description
OK<macAddress>	macAddress (6 bytes, Hex)
ERROR<Error code>	Failure

Binary Mode:

typedef struct {
uint8 macAddress[6];
}rsi_initResponse;

Response Parameters:

macAddress: The MAC address of the module.

Possible error codes:

Possible error codes are 0x0021, 0x0025, 0x002C,0x0002.

Relevance:

This command is relevant in all operating modes

Example:

AT Mode:

at+rsi_init\r\n

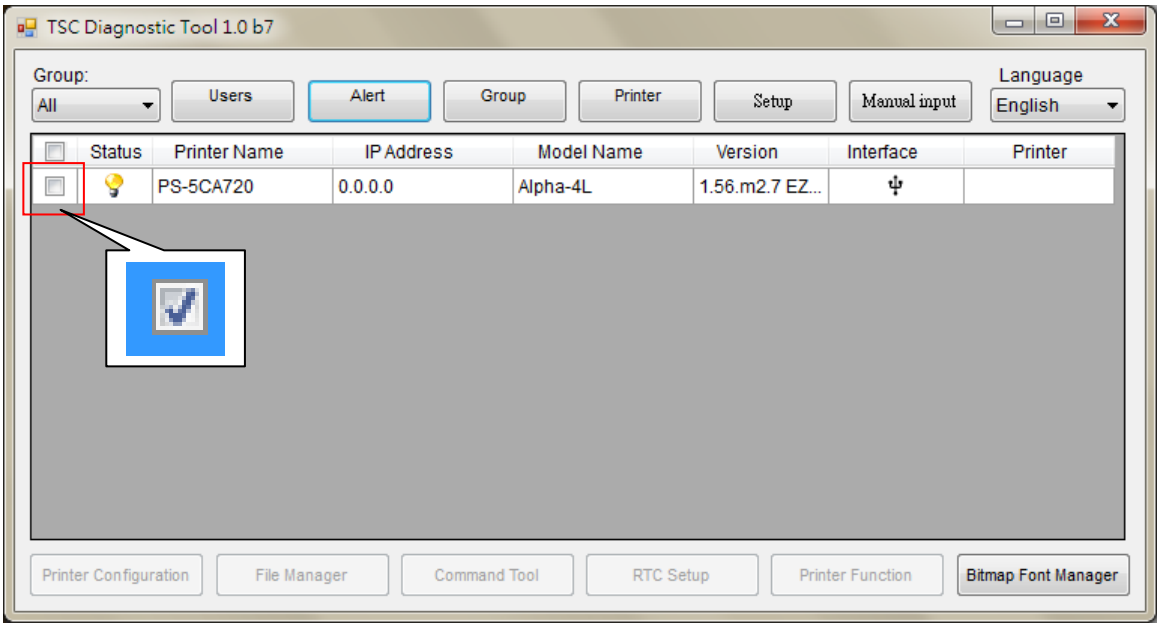
0x61 0x74 0x2B 0x72 0x73 0x69 0x5F 0x69 0x6E
0x69 0x74 0x0D 0x0A

Response:

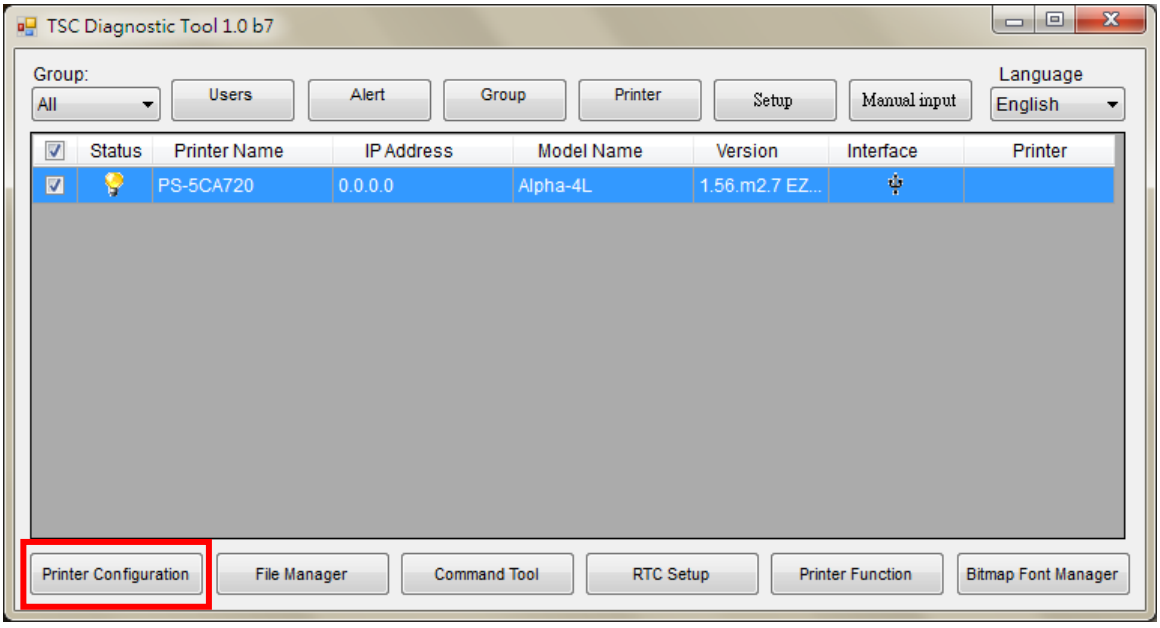
OK<MAC_Address>\r\n
OK 0x00 0x23 0xA7 0x13 0x14 0x15\r\n
0x4F 0x4B 0x00 0x23 0xA7 0x13 0x14 0x15 0x0D 0x0A

5. Setup the WiFi module by TSC DiagTool

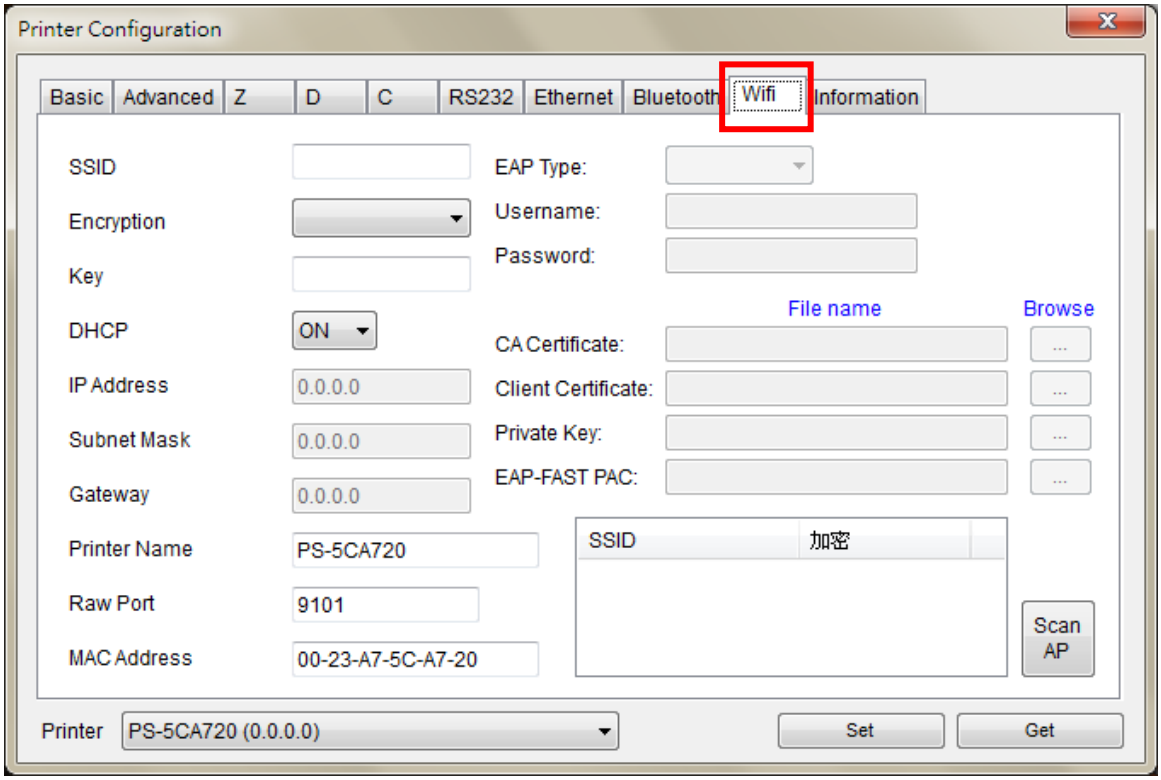
1. Connect the USB cable between printer and computer.
2. Open the TSC DiagTool by double click the icon.
3. Select the printer.



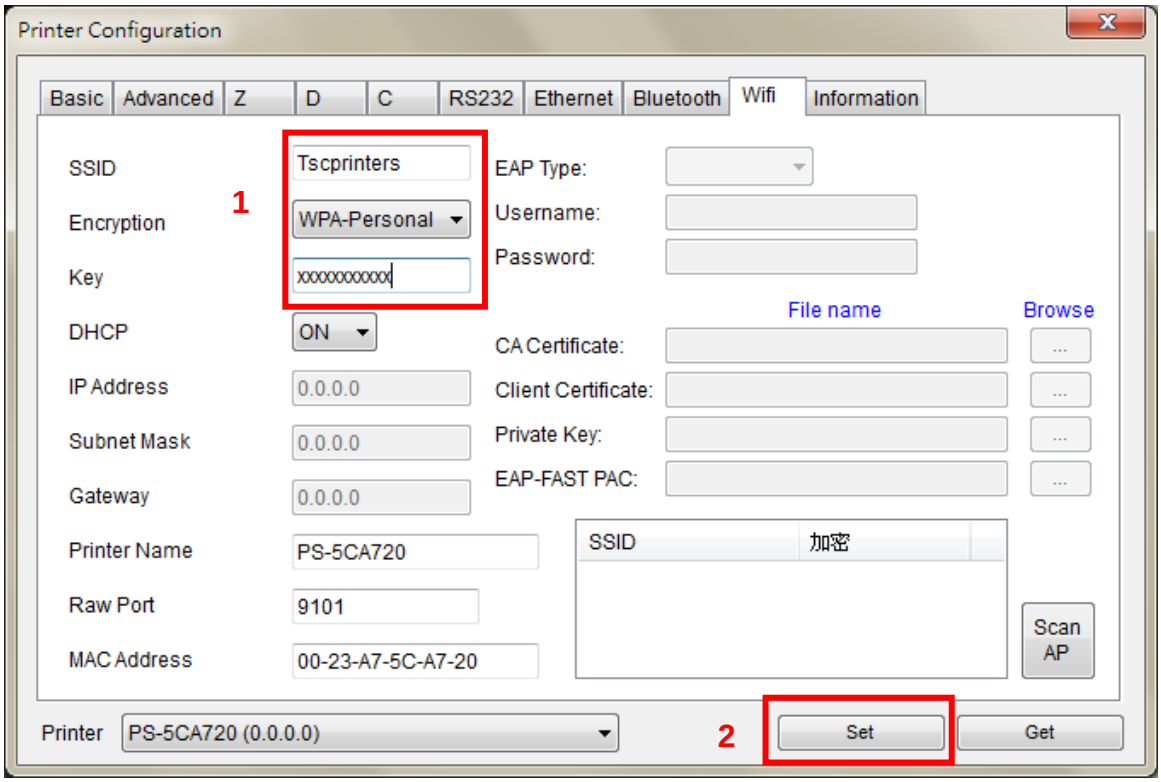
4. Press the “Printer Configuration” button to enter the setting page.



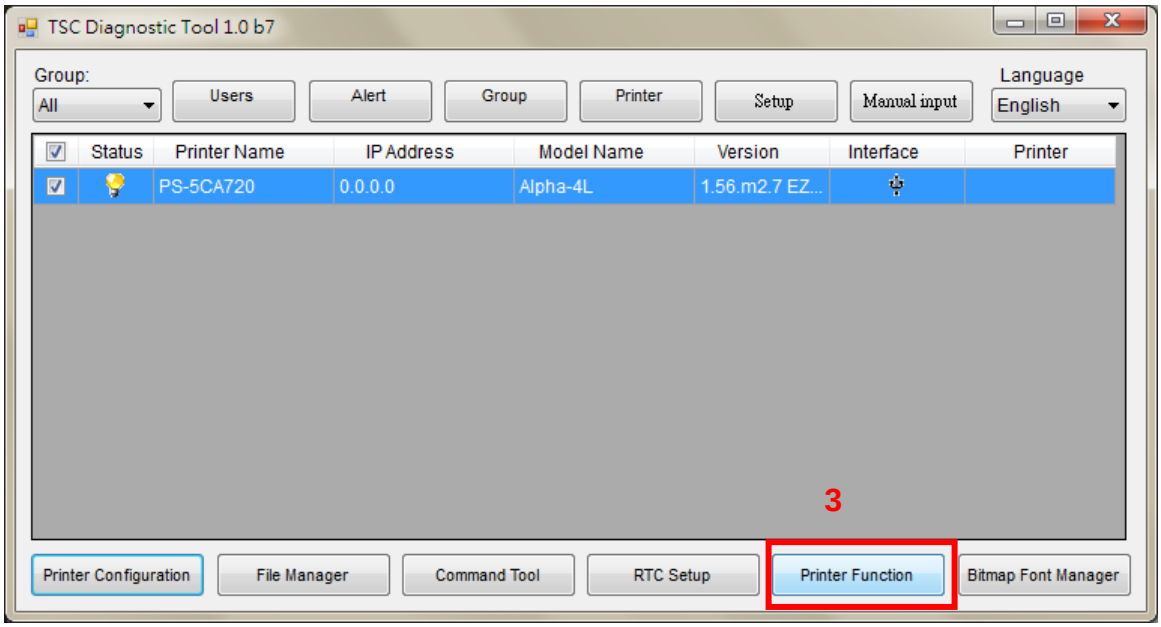
4. Select the “WiFi” tab.



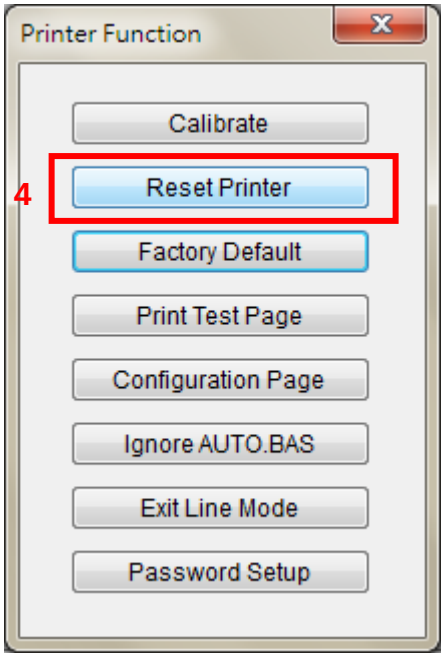
5. Follow the steps below to set the WiFi module settings.
   - **WPA-Personal**
     - **Key-in SSID & Key**



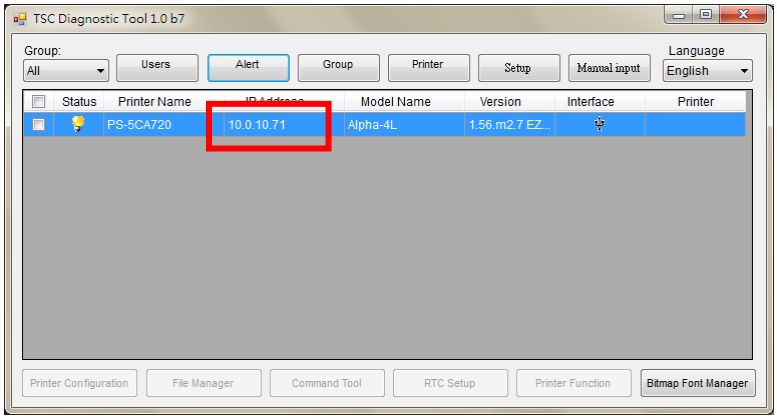
■ **Back DiagTool main page to enter the “Printer Function” function**



■ **Press the “Reset Printer” button to reboot the printer**



■ **The IP address will be fount. The WiFi is ready.**



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