eS-WiFi Module
AT Command Set

User Manual

eS-WiFi Module
'embedded Serial-to-WiFi'

AT Command Set
Version 2.00

User Manual

Inventek Systems, Inc.

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AT Command Set User Manual
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1. **Introduction**

1.1. Scope

The scope of this document is to introduce users to Inventek Systems' AT Command Set for the eS-WiFi Module product, and to explain how to take advantage of the AT Command Set for WiFi Communications.

AT Command Usage in the User Manual is shown as

Usage: < AT Command > < optional '=' > < data if '=' is used > < Carriage Return (CR) >

or

< AT Command > < CR >

And default values are show as

Default: <AT Command>=<Value>

1.2. Supported Product Versions

This document is covers the following currently available eS-WiFi modules:

        ISM4319-M3-L44-C   (Ceramic Antenna)
        ISM4319-M3-L44-E   (Printed Micro-strip Antenna)
        ISM4319-M3-L44-U   (U.FL Connector to external antenna)

1.3. AT Command Set

In the early 1980's, Hayes Microcomputer Products, Inc. was one of the first modem manufactures to use an 'AT' type Command Set to control operations of their modem products for communication over the Plain Old Telephone Service (POTS).

Since then a number of products have been developed for communications that use the 'AT Command Set' for device control.

'AT' is short for 'AT'tention, and is used to get the attention of a device for set up and control of it's functions. Normally, following the 'AT' command would be other letters and numbers that would control the functions associated with the command. For example, 'ATDT1234567' means ATtention modem Dial with Tone the number following the command, which in this case is 1234567.

Common practice today is to shorten the 'AT' command to just the function command, which using the example above, the shorten command to dial using tone for a number would be DT1234567.

1.3.1. Entering AT Commands

As mentioned above, it is common practice to drop the 'AT' in front of a device control command and just use the device control function command letters and number combinations. Inventek System has adopted this method for controlling the functions of the eS-WiFi module. In addition, Inventek System has added an '=' to the command to delimit the command from its data. For example, the AT Command to set the eS-WiFi module's IP Address would be 'C6=127.0.0.1' instead of 'ATC6=127.0.0.1.

Also, a number of AT Commands for eS-WiFi module only use a single letter or a single letter plus number to execute the command. For instance, '?' will return available help information on the eS-WiFi module. While a 'C0' command would command the eS-WiFi module to joined a network.
The format for entering AT Commands is shown as follows:

< AT Command > < optional '=' > < data if '=' is used > < Carriage Return (CR) >

or

< AT Command > < CR >

All AT Commands must be followed by a <CR> to activate the command.

Empty string values for AT Commands are shown with 'NONE' in the User Manual.

1.4. Supported character sets

Currently, the eS-WiFi module only supports 8 bit ASCII. All AT Commands must be in capital letters; however, data can contain both upper and letter case letters, and numbers.

Future support for binary data transfers to be added.

2. Hardware Interface and Module Operation

The eS-WiFi module supports RS-232 Serial Communications Universal Serial Bus (USB), and Serial Peripheral Interface Bus (SPI). A Micro-Controller or System Host can easily interface up to the eS-WiFi module using one of the support hardware interfaces.

The eS-WiFi module has two modes of operation: Human Readable Mode and Machine Readable Mode.

2.1. RS-232 Serial Communication

2.1.1. Data Mode

When the eS-WiFi module is interfaced serially, the serial interface needs to be configured for 8 bit data, no parity, and one stop bit -- (8-n-1).

2.1.2. Flow Control

The eS-WiFi module doesn't require or support Flow Control, so Flow Control should be 'None'

2.1.3. Supported Baud Rates

The eS-WiFi module support the following serial baud rates:

    1200
    2400
    4800
    9600
    19200
    38400
    57600
    115200
    230400
    460800

     921600

2.1.4. Default Serial Configuration

The eS-WiFi module is shipped with the default serial configuration of 115200 baud, 8 data bits, no party, and 1 stop bits.

2.2. USB (Universal Serial Bus)

(TDB)

2.3. SPI (Serial Peripheral Interface Bus)

(TDB)

2.4. Module Operation Modes

The eS-WiFi module has two modes of operation, Human Readable Mode (verbose) and Machine Readable Mode, that can be used to control the operation of the module. At power up, the eS-WiFi module defaults to Machine Readable Mode. An AT command is used to put the eS-WiFi module into Human Readable Mode or Machine Readable Mode.

2.4.1. Human Readable Mode

In Human Readable Mode, a user can interact with the module via the module's built-in console and a serial terminal program. All AT commands will return detail information related to the operation of the command.

2.4.2. Machine Readable Mode

Machine Readable Mode is intended for direct control of the eS-WiFi module operation via a Micro-Controller or System Host. All AT commands will return short, limited information about operation of the command.

3. AT Command Set Version 2.0

3.1. AT Command Set List of Supported Functions

AT Command	Description
?	Print Help Message
$$$	Enter Command Mode
---	Exit Command mode
B0	Activate Communication Interface Settings
B1	Set Communication Interface
B?	Show Communication Interface Settings
C0	Join a Network
C1	Set Network SSID

AT Command	Description
C2	Set Network Passphrase
C3	Set Network Security Type
C4	Set Network DHCP Mode
C5	Set Network IP Version
C6	Set Network IP Address
C7	Set Network IP Mask
C8	Set Network Gateway
C9	Set Network Primary DNS
CA	Set Network Secondary DNS
CB	Set Network Join Retry Count
CC	Network Auto Connect
CD	Disconnect from Network
C?	Show Network Settings
F0	Scan for Network Access Points
F1	Set Scan Repeat Count
F2	Set Scan Delay (ms)
F?	Show Scan Settings
I0	Application Name
I1	Firmware Version
I2	Platform Software Version
I3	IP Stack Name and Version
I4	RTOS Name and Version
I?	Show Application Information
P0	Activate Transport Settings
P1	Set Transport Protocol
P2	Set Transport Local Port Number
P3	Set Transport Remote Host IP Address

AT Command	Description
P4	Set Transport Remote Port Number
P5	Stop/Start Transport Server
P6	Stop/Start Transport Client
P?	Show Transport Settings
R0	Read Transport Data
R1	Set Read Transport Packet Size (bytes)
R2	Set Read Transport Timeout (ms)
R?	Show Read Transport Settings
S0	Write Transport Data
S1	Set Write Transport Packet Size (bytes)
S2	Set Write Transport Timeout (ms)
S?	Show Write Transport Settings
T0	Ping Target Address
T1	Set Ping Target Address
T2	Set Ping Repeat Count
T3	Set Ping Delay (ms)
T?	Show Ping Settings
U0	Active UART Settings
U1	Set UART COMM Port
U2	Set UART BAUD Rate
U3	Set UART Data Mode
U4	Set UART RX Timeout (ms)
U5	Set UART TX Timeout (ms)
U?	Show UART Settings

Table 3.1: AT Command Set List

4. **AT Command Detail Description**

4.1. '?' Print Help Message

Print Help menu to console.

Usage: ?<CR>

Default Value: None

4.2. '$$$' Enter Command Mode

Command (Human Readable) Mode is entered via '$$$". While in Command mode, all AT Commands return detail text formatted information to the user when the command is executed. Command Mode is helpful when debugging network interfaces or interaction with the eS-WiFi module.

Usage: $$$<CR>

Default Value: None

4.3. '---' Exit Command Mode

Command Mode is exited via '---', which places the eS-WiFi module in Machine Readable mode where AT Commands generate short, limited coma delimited information on the execution of a command. Machine mode is intended for Micro-Controller or Host System control of the eS-WiFi module.

Usage: ---<CR>

Default Value: ---

4.4. Select Communication Interface

Used to select SPI, UART, or USB interface for communication with the eS-WiFi module.

4.4.1. 'B0' Activate Communication Interface Settings

Store Communication Interface Settings to non-volatile memory for power on default selection.

Usage: B0 <CR>

Default Value: None

4.4.2. 'B1' Set Communication Interface

Select interface for communicating with the eS-WiFi module. The Communication Interface modes are listed in Table 4.1.

Interface	Mode Number
UART	0
SPI	1
USB	2

Table 4.1: Communication Interface Modes

Usage: B1=< mode number ><CR>

Default Value: B1=0

4.4.3. 'B?' Show Communication Interface Settings

Return current Communication Interface settings.

Usage: B?<CR>

Default Value: None

4.5. Configure Network Settings

Used to set up the network parameters needed to access a WiFi network.

4.5.1. 'C0' Join a Network

Using the user define parameters of SSID, Passphrase, Security Type, etc. attempt to join a WiFi network for access. A successful Join, returns SSID and IP Address; otherwise, an error message is return. A network can not be re-joined once the eS-WiFi module has joined a network without first closing the current network connection.

Usage: C0<CR>

Default Value: None

4.5.2. 'C1' Set Network SSID

Network Service Set Identifier (SSID) can be up to 32 characters and is an unique identifier (network name) for a wireless network. The eS-WiFi module must use the SSID, Passphrase and WiFi Security to communicate with a wireless network. The SSID is normally supplied by a network administrator.

Usage: C1=<SSID><CR>

Default Value C1=NONE

4.5.3. 'C2' Set Network Passphrase

Network Passphrase can be up to 32 characters and is an unique security keyword for access to a wireless network. The eS-WiFi module must use the Passphrase associated with the network SSID and the WiFi Network Security to communicate with a wireless network. The Passphrase is normally supplied by a network administrator.

Usage: C2=<Passphrase><CR>

Default Value: C2=NONE

4.5.4. 'C3' Set Network Security Type

Select the WiFi Network Security to use for communication with a WiFi network. Below is a list of WiFi Security Modes. The eS-WiFi module must use one the WiFi Security modes with the associated SSID and Passphrase to communicate with a wireless network. The WiFi Security is normally supplied by a network administrator. The Network WiFi Security Modes are listed in Table 4.2.

WiFi Security	WiFi Security Mode	Description
Open	0	No WiFi Security
WEP	1	Wired Equivalent Privacy
WPA	2	WiFi Protected Access
WPA2	3	WiFi Protected Access 2
WPA + WPA2	4	WiFi Protected Access and WiFi Protected Access 2

Table 4.2: Network WiFi Security Modes

Usage: C3=<WiFi Security Modes><CR>

Default Value: C3=0

4.5.5. 'C4' Set Network DHCP

Dynamic Host Configuration Protocol (DHCP) is used to query a network for an available IP Address that would be used for communications on the network. The eS-WiFi module can use DHCP or a user defined IP Address. The eS-WiFi module must have an IP Address to communicate with a wireless network. The Network DHCP Modes are listed in Table 4.3.

DHCP	DHCP Mode
Disabled User supplied IP Address	0
Enabled Network supplied IP Address	1

Table 4.3: Network DHCP Modes

Usage: C4=<DHCP Modes><CR>

Default Value: C4=1

4.5.6. 'C5' Set Network IP Version

Set Network IP Version is used to select between Internet Protocol Version 4 (IPV4) and Internet Protocol Version 6 (IPV6). The IP Version must be set for correct operation of the eS-WiFi module on a wireless network. The Network IP Version settings are listed in Table 4.4.

IP Version	IP Version Mode
IPV4	0
IPV6	1

Table 4.4: Network IP Version Modes

Usage: C5=<IP Version Modes><CR>

Default Value C5=0

4.5.7. 'C6' Set Network IP Address

Set Network IP Address allows the user to define the IP Address that the eS-WiFi module will use on a wireless network. If DHCP is disabled, the IP Address must be set to allow the eS-WiFi module to work correctly on a wireless network. The IP Address must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx for the network address.

If DHCP is enabled, the IP Address will be set by the wireless network on a network join.

Usage: C6=<xxx.xxx.xxx.xxx.><CR>

Default Value: 000.000.000.000

4.5.8. 'C7' Set Network IP Mask

Set Network IP Mask is user define value for the network net mask (subnetting of the network) used on the WiFi Network. If DHCP is disabled, the net mask must be set to allow the eS-WiFi module to work correctly on a wireless network The net mask must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx.

if DHCP is enabled, the Net Mask will be set by the wireless network on a network join.

Usage: C7=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.5.9. 'C8' Set Network Gateway

Set Network Gateway is a user define Gateway IP Address use by the devices on the network to access other networks or as a default gateway when no other IP Address matches any other routes in the network routing table. The Gateway IP Address must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx.

Usage: C8=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.5.10. 'C9' Set Network Primary DNS

Set Network Primary Domain Name System (DNS) is a user define address used for translating human readable domain names into numerical identifiers for network devices. The Primary DNS must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx.

Usage C9=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.5.11. 'CA' Set Network Secondary DNS

Set Network Secondary DNS is used as a back up to the Primary DNS. The Secondary DNS must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx.

Usage: CA=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.5.12. 'CB' Set Network Join Retry Count

Set Network Join Retry Count is a user define value that controls the number of times the eS-WiFi module will attempt to join a wireless network before stopping with a failure notice if the system is unable to join the network.

Input range for Join Retries is 0 to 10.

Usage: CB=<Join Retries><CR>

Default Value: 5

4.5.13. 'CC' Network Auto Connect

Network Auto Connect allows the user to define weather or not the eS-WiFi module will attempt a Join a wireless network after the system is powered up and operational, or after a reset. The Network Auto Connect modes are listed in Table 4.5.

Auto Connect	Auto Connect Mode
Disable Network Auto-Join	0

Auto Connect	Auto Connect Mode
Enable Network Auto-Join	1

Table 4.5: Network Auto Connect Modes

Usage: CC=<Auto Connect Modes><CR>

Default Value: 0

4.5.14. 'CD' Disconnect from Network

To disconnect the eS-WiFi module from a wireless network, the AT Command 'CD' is used. 'CD' will shutdown the network communications and clear the network IP Address, Net Mask, and Gateway Address assigned to the eS-WiFi Module

Usage: CD<CR>

Default Value: None

4.5.15. 'C?' Show Network Settings

Return current Configured Network Settings.

Usage: C?<CR>

Default Value: None

4.6. Scan for Network Access Points

The eS-WiFi module can scan for available networks and return detail information about networks found without having to join a network. The information return on the available networks includes SSID, BSSID, RSSI, Data Rate, Network Type, Security, Radio Band, and Channel. The information return about Network Access Points can be used in Joining one of the networks.

Scanning for Network Access Points is a very handy command for determining what wireless networks are in listening range of the eS-WiFi module.

4.6.1. 'F0' Scan for Network Access Points

Find Networks can be used to scan for available networks and return information about the networks found.

Usage: F0<CR>

Default Value: None

4.6.2. 'F1' Set Scan Repeat Count

Set Repeat Count is a user defined value that controls the number of times to scan for Network Access Points.

Input range for Set Scan Repeat Count is 0 to 255.

Usage: F1=<Set Scan Repeat Count><CR>

Default Value: 0

4.6.3. 'F2' Set Scan Delay

Set Scan Delay is a user defined value that set the amount of time in milliseconds to wait between scans for Network Access Points.

Input range for Set Scan Delay is 0 to 5000, which represents the delay in milliseconds.

Usage: F2=<Set Scan Delay><CR>

Default Value: 1000

4.6.4. 'F?' Show Scan Settings

Return current Scan Settings.

Usage: F?<CR>

Default Value: None

4.7. Software Information

Information about the AT Command application that includes Firmware Version, Wiced Version, IP Stack Name and Version, RTOS Name and Version can be access using the following AT Commands.

4.7.1. 'I0' Application Name

Information about the Application Name running on the eS-WiFi Module can be returned using the AT Command 'I0'.

Usage: I0<CR>

Default Value: None

4.7.2. 'I1' Firmware Version

Information about the Application Firmware Version running on the eS-WiFi Module can be returned using the AT Command 'I1'.

Usage: I1<CR>

Default Value: None

4.7.3. 'I2' Platform Software Version

Information about WiFi Platform Software Version running on the eS-WiFi Module can be returned using the AT Command 'I2'.

Usage: I2<CR>

Default Value: None

4.7.4. 'I3' IP Stack Name and Version

Information about the IP Stack and Version running on the eS-WiFi Module can be returned using the AT Command 'I3'.

Usage: I3<CR>

Default Value: None

4.7.5. 'I4' RTOS Name and Version

Information about the RTOS and Version running on the eS-WiFi Module can be returned using the AT Command 'I4'.

Usage: I4<CR>

Default Value: None

4.7.6. 'I?' Show Applications Information

The AT Command 'I?' will return Application, Firmware, Platform, IP Stack, and FreeRTOS information.

Usage: I?<CR>

Default Value: None

4.8. Transport Communication

Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) are used for point to point or port to port communications on a network. TCP is a guarantee port to port communication protocol that is used to insure data is transfer error free between a server and client. UDP is consider to be faster than TCP for the movement of data over a network; however, UDP does not guarantee the delivery of data between a server and a client. UDP lite is UDP with the partial removable of checksums which may improve network data movement performance but may be more prone to data errors.

The eS-WiFi module supports TCP, UDP, and UDP lite for port to port communication.

The eS-WiFi module can be configured as a server or client on a network for TCP/UDP communication. In Transport server mode, the eS-WiFi module will wait in the background for connection requests. Once a network device request a connection to the server, the server will enter a mode were data can be requested by a client and data delivered to a client.

The eS-WiFi module can also be configured as a client for TCP/UDP communications to make requests to a Transport server on the wireless network.

If UDP or UDP lite is used, it recommended that the user develop their on packet numbering and error checking for data transfers.

4.8.1. 'P0' Activate Transport Settings

Store Transport configurations to non-volatile memory for power on or after a reset default configuration.

Usage: P0 <CR>

Default Value: None

4.8.2. 'P1' Set Transport Protocol

Set Transport Protocol allows the user to enable selection of ether TCP, UDP, or UDP Lite for network port to port communications. The Transport Protocols modes are listed in Table 4.6.

Transport Protocol	Transport Protocol Mode
TCP Enabled	0
UDP Enabled	1
UDP Lite Enabled	2

Table 4.6: Transport Protocol Modes

Usage: P1=<Transport Protocol Modes><CR>

Default Value: P1=0

4.8.3. 'P2' Set Transport Local Port Number

Set Transport Local Port Number allows the user to define the local port that the eS-WiFi module will listen on for Transport communication connections.

Input range for Transport Local Port Number is 0 to 65535.

Usage: P2=<Transport Local Port Number><CR>

Default Value: P2=5024

Refer to documentation on TCP/UDP communications for pre-defined port information.

4.8.4. 'P3' Set Transport Remote Host Port IP Address

Set Transport Remote Host IP Address is a user define address that eS-WiFi module will used to contact a Transport server on the network. The Transport Remote Host IP Address must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx for the network address.

Usage: P3=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.8.5. 'P4' Set Transport Remote Port Number

Set Transport Remote Port Number allows the user to define the port number for a Transport Server on the network that the eS-WiFi module will use to communications with that server.

Input range for Local Port is 0 to 65535.

Usage: P4=<Local Port><CR>

Default Value: P4=5025

4.8.6. 'P5' Stop/Start Transport Server

Stop/Start Transport Server is used to stop or start the eS-WiFi module's Transport Server mode. The AT Command 'P1' is used to select between TCP, UDP or UDP Lite server protocols. The Transport Server modes are listed in Table 4.7.

Transport Server	Transport Server Mode
Server Disable	0
Server Enable	1

Figure 4.7: Transport Server Modes

Usage: P5=<Transport Server Modes><CR>

Default Value: P5=0

4.8.7. 'P6' Stop/Start Transport Client

Stop/Start Transport Client is used to stop or start the eS-WiFi module's Transport Client mode. The AT Command 'P1' is used to select between TCP, UDP or UDP Lite server protocols. The Transport Server modes are listed in Table 4.8.

Transport Client	Transport Client Mode
Client Disable	0
Client Enable	1

Figure 4.8: Transport Server Mode

Usage: P6=<Transport Client Modes><CR>

Default Value: P5=0

4.8.8. 'P?' Show Transport Settings

Return current Transport Communication Settings.

Usage: P?<CR>

Default Value: None

4.1. Receive Transport Data

Once the Transport Protocol has been defined and either the server or client mode has been enabled, Data can be received from a connected server or client using the AT Command 'R0' with AT Command 'R1' setting the size of data to read from the transport protocol stack. For TCP data, multiple reads may been needed to return all of the available data; however, for UDP, data received greater than the number of bytes defined by the AT Command 'R1' will be lost.

4.9.1. 'R0' Read Transport Data

Available receive data is read using the AT Command 'R0'. 'R0' reads the transport buffer for AT Command 'R1' size bytes. Multiple reads may been needed to read all of the available TCP data. UDP data received greater than the bytes size defined by R1 will be lost.

Usage: R0<CR>

Default Value: None

4.9.2. 'R1' Set Read Transport Packet Size (bytes)

The AT Command 'R1' is a user defined value for the packet size of data to return a data read. The AT Command 'R1' should be set before a performing AT Command 'R0'. The input range for AT Command 'R1' is 0 to 1200 bytes.

Usage: R1=<Data Packet Size><CR>

Default Value: R1=1200

4.9.3. 'R2' Set Read Transport Timeout (ms)

The AT Command 'R2' is a user defined value for the amount of time in milliseconds to wait on the Read Transport Data AT Command 'R2' to finish. The input range for R2 is 0 to 30000 milliseconds.

Usage: R2=<Read Transport Timeout><CR>

Default Value: R1=5000

4.9.4. 'R?' Show Read Transport Settings

Return current Receive Transport Data Settings.

Usage: R?<CR>

Default Value: None

fixed

fixed

fixed

fixed

fixed

4.10. Write Transport Data

Once the Transport Protocol has been define and either the server or client mode has been enabled, data can be written to a connected Transport Server or Client using the AT Command 'S0' with AT Command 'S1' defining the size of data to write.

4.10.1. 'S0' Write Transport Data

The At Command 'S0' is used to write data to a Transport Server or Client. The size of the data to write is defined via the AT Command 'S1'. After the AT Command 'S0' is entered any data writing to eS-WiFi module selected communicating interface will be sent to a connected Transport Server or Client. Once the number bytes defined by AT Command 'S1' have been sent, the eS-WiFi module will return back to the AT Command mode waiting for the next 'AT Command'. If more bytes are written to the eS-WiFi module then are defined by the AT Command 'S1', the data will be lost and error message will be returned on the excess data written to the eS-WiFi module selected communication interface.

Usage: S0<CR>

4.10.2. 'S1' Set Write Transport Packet Size (bytes)

AT Command 'S1' is used to define the packet size of data to write to a connect Transport Server or Client. The AT Command 'S1' should be set before a performing AT Command 'S0'.

Usage: S1=<Data Packet Size><CR>

Default Value: S1=1200

4.10.3. 'S2' Set Write Transport Timeout (ms)

The AT Command 'S2' is a user defined value for the amount of time in milliseconds to wait on the Write Transport Data AT Command 'R2' to finish. The input range for S2 is 0 to 30000 milliseconds.

Usage: S2=<Write Transport Timeout><CR>

Default Value: S1=5000

4.10.4. 'S?" Show Write Transport Settings

Return current Write Transport Data Settings.

Usage: S?<CR>

Default Value: None

4.11. Ping IP Target Address

Ping is a network utility for testing the reachability of hosts on a network. Ping will measure the round-trip time to a host or return a timeout if the host is not reachable.

4.11.1. 'T0' Ping IP Target Address

The AT Command 'T0' will Ping a remote host returning the round-trip time or a timeout message. The host IP Address used by Ping must be set up by using the AT Command 'T1'.

Usage: T0<CR>

Default Value: None

4.11.2. 'T1' Set Ping Target Address

The AT Command 'T1' is used to set the IP Address of the host to Ping.

Usage T1=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.11.3. 'T2' Set Ping Repeat Count

The AT Command 'T2' is used to define the number of times to repeat a Ping of a host on the network.

Usage T2=<Repeats><CR>

Default Value: T2=0

4.11.4. 'T3' Set Ping Delay (ms)

The AT Command 'T3' is used to define the amount of time to wait between Pinging a host on the network. The amount of time to wait is defined in milliseconds and is limited to the range of 0 to 5000.

Usage T3=<delay in ms><CR>

Default Value: T3=0

4.11.5. 'T?' Show Ping Settings

Return current Ping Settings.

Usage: T?<CR>

Default Value: None

4.12. Configure UART

The eS-WiFi module can be configured to use it's serial interface for communications with a host computers or a terminal console programs. Currently, the only UART Configuration mode for the eS-WiFi module is the serial interface, which is set to 8 data bits, no parity, one stop bits. The eS-WiFi module can support baud rates from 1200 to 921600 baud. The AT Command 'U2' is used to set the baud rate. The eS-WiFi module interface can also be set up in ASCII or Binary mode for data. In addition, the eS-WiFi module can be configured to generate timeout messages on the serial communications.

4.12.1. 'U0' Activate UART Settings

The AT Command 'U0' is used to store the current eS-WiFi module UART settings in non-volatile memory for power on or after a reset for automatic configuration of the UART.

Usage: U0<CR>

Default Value: None

4.12.2. 'U1' Set UART Comm Port

Currently, the eS-WiFi module only support UART for Micro-Controlling or Host System interfacing. Future versions of the eS-WiFi module will support SPI and UART. Table 4.9 list the eS-Wfif Module Comm Port modes.

Comm Port	Comm Port Mode
UART	0
USB	1

Table 4.9: Comm Port Modes

Usage: U1=<Comm Port Modes><CR>

Default Value: U1=0

4.12.3. 'U2' Set UART Baud Rate

The AT Command 'U2' is used to set the baud rate for the Comm Port selected using the AT Command 'U1'. Table 4.10 list the available eS-WiFi module baud rates.

Baud Rates
1200
2400
4800
9600
19200
38400
57600
115200
230400
460800
921600

Table 4.10: Baud Rates

Usage: U2=<Baud Rate><CR>

Default Value: U2=115200

4.12.4. 'U3' Set UART Data Mode

The eS-WiFi module system interface can be set up for ASCII or Binary data modes. Table 4.11 list the UART Data modes.

Data	Data Mode
ASCII	0
Binary	1

Table 4.11: UART Data Modes

Usage: U3=<Data Modes><CR>

Default Value: U3=0

4.12.5. 'U4' Set RX Timeout

<TDB>

4.12.6. 'U5' Set TX Timeout

<TDB>

4.12.7. 'U?' Show UART Setting

Return current UART Configuration.

Usage: U?<CR>

Default Value: None

5. **Example eS-WiFi Module AT Command Usage**

This section of the eS_WiFi Module User Manual covers example usage of the AT Command Set. Area covered are Changing the Baud Rate, Scanning for Access Points, Joining Networks, transferring data via Transmission Control Protocol using TCP and UDP.

5.1. Entering Human Readable Command Mode

The eS-WiFi Module supports a Human Readable Command Mode for console interaction with the AT-Command set. For the AT Command usage examples that follow, the Human Readable Command Mode will be used. Sending the AT Command '$$$' at the console prompt will put the eS-WiFi Module in human readable mode. Sending the AT Command '---' will take the eS-WiFi Module out of Human Readable mode and back into Machine Readable Mode, which is the default console mode for the eS-WiFI Module.

Entering Human Readable Mode example:

```
>$$$
Entering CMD mode …
OK
>
```

5.2. Changing The Baud Rate

One of the first things that may be useful when using the eS-WiFi Module is to up the data rate of the eS-WiFi Module serial interface for faster interaction with the console and data transfer.

Check Current Baud Rate:

```
>U?
Communication Port:     UART
        Baud Rate:      115200
        Data Width:     8 bit
            Parity:     NONE
         Stop Bits:     1
              Mode:     ASCII
        RX Timeout:     0 ms
        TX Timeout:     0 ms
OK
>
```

Set New Baud:

```
>U2=921600
OK
>
```

Activate Baud Change:

```
>U0
```

At this point the eS-WiFi Module will expect a faster or slower baud depending on the baud used for U2. The next step is to change the baud rate of the system to continue communicating with the eS-WiFI Module. After changing the System baud, sending a <CR> should return the console prompt '>', If not reset the eS-WiFi Module and retry changing the baud.

Check Baud Rate After Change:

```
>U?
Communication Port:       UART
        Baud Rate:        921600
        Data Width:       8 bit
            Parity:       NONE
         Stop Bits:       1
              Mode:       ASCII
        RX Timeout:       0 ms
        TX Timeout:       0 ms
OK
>
```

5.3. Finding Access Points

The first steps in joining a network is to determining available Access Points in the listening range of the eS-WiFi Module. The eS-WiFi Module AT Command Set supports functions for finding Access Points. The AT Command for finding Access Points can be used without joining a network.

Find Access Points:

```
> F0
Waiting for scan results...
#001 SSID          : mars
     BSSID         : CC:33:CC:99:39:00
     RSSI          : -39dBm
     Max Data Rate : 54.0 Mbits/s
     Network Type  : Infrastructure
     Security      : WPA2 AES
     Radio Band    : 2.4GHz
     Channel       : 2
#002 SSID          : jupiter
     BSSID         : EE:99:FF:AA:DD:00
     RSSI          : -90dBm
     Max Data Rate : 54.0 Mbits/s
     Network Type  : Infrastructure
     Security      : WPA2 AES
     Radio Band    : 2.4GHz
     Channel       : 1
#003 SSID          : saturn
     BSSID         : FF:11:00:55:CC:EE
     RSSI          : -90dBm
     Max Data Rate : 54.0 Mbits/s
     Network Type  : Infrastructure
     Security      : WEP
     Radio Band    : 2.4GHz
     Channel       : 6
#004 SSID          : uranus
     BSSID         : 33:44:99:44:11:CC
     RSSI          : -94dBm
     Max Data Rate : 54.0 Mbits/s
     Network Type  : Infrastructure
     Security      : WPA2 AES
     Radio Band    : 2.4GHz
     Channel       : 11
End of scan results
OK
>
```

If needed, the eS-WiFi Module can be set up to scan a number of times for Access Points. This mode can be helpful during set up or debug on a network. The example below sets up the eS-WiFi Module to run 5 Access Point scans.

```
> F1=5
OK
>

> F0
Waiting for scan results...
... (returned data)
End of scan results
Waiting for scan results...
... (returned data)
End of scan results
Waiting for scan results...
... (returned data)
End of scan results
Waiting for scan results...
... (returned data)
End of scan results
Waiting for scan results...
... (returned data)
End of scan results
OK
>
```

The eS-WiFi Module can also be set up using an AT Command to delay between scans. The delay is set in milliseconds. The time range for delay is 0 to 5000 milliseconds.

Delay one second between scans:

```
> F2=1000
OK
>
```

Check current Find settings:

```
> F?
    Scan Repeats:           10
Scan Delay in ms:          1000
OK
>
```

5.4. Join Network Access Point

To join a Network Access Point, the SSID, the PASSWORD, the Security Mode, and the IP Address mode (DHCP or locally assigned IP Address) must be set. See your network administrator for information needed to accessing Access Points on your network.

Using the information returned from previous network scan (F0) and network information supplied by the Network Administrator, the eS-WiFi module can be configured to join an Access Point on the Network.

The following example shows how to join an Access Point using DHCP; however, a locally define IP Address can also be used. Refer to the sections 4.5.5, 4.5.7, and 4.5.8 on setting a local IP Address for the eS-WiFi module.

Set SSID for Access Point:

```
> C1=mars
```

```
Ok
>
```

Set Password for Access Point:

```
> C2=PASSWORD
OK
>
```

Set Security Mode (WPA2 AES) for Access Point:

```
> C3=3
OK
>
```

Set eS-WiFi Module IP Address via DHCP:

```
> C4=1
OK
>
```

Check Network Join settings before joining Access Point:

```
> C?
        SSID:     mars
        PSWD:     PASSWORD
    SECURITY:     WPA2 AES
        DHCP:     Enabled
          IP:     IPV4
     IP ADDR:     0.0.0.0
        MASK:     0.0.0.0
     GW ADDR:     0.0.0.0
        DNS1:     0.0.0.0
        DNS2:     0.0.0.0
Join Retries:     5
Auto Connect:     0
      Status:     Not Connected
OK
>
```

Join Network Access Point mars, using PASSWORD, WPA2 AES, and DHCP:

```
> C0
Joining : mars
Successfully joined : mars
Obtaining IP address via DHCP
Network ready IP: 192.168.1.117
OK
>
```

Check Network Join Settings after joining Access Point:

```
> C?
        SSID:     mars
        PSWD:     PASSWORD
    SECURITY:     WPA2 AES
        DHCP:     Enabled
          IP:     IPV4
     IP ADDR:     192.168.1.117
        MASK:     255.255.255.0
     GW ADDR:     192.168.1.1
        DNS1:     0.0.0.0
```

```
        DNS2:     0.0.0.0
Join Retries:     5
Auto Connect:     0
        Status:   Connected
OK
>
```

5.5. Ping a System on a Network

From time to time there is a need to Ping a system on a network or Ping a system while debugging a connection on the network. The eS-WiFi module can be configured to Ping systems on a network. To Ping a system on a network from the eS-WiFi Module, the IP Address of the system must be set up. In addition to setting up IP Address for the system to ping, the number of times to perform the Ping and the delay between Pings can be set. Assuming that eS-Wifi Module has already joined to a network, the following steps will ping a system on the network.

Set Ping IP Address to 192.168.1.90 for a system on the Network:

```
> T1=192.168.1.90
OK
>
```

Set Ping Repeats to 5:

```
> T2=5
OK
>
```

Set Ping Delay to 500 milliseconds:

```
> T3=500
OK
>
```

Check Ping Settings:

```
> T?
Ping Target Address:      192.168.1.90
        Ping Repeats:     5
          Ping Delay:     500 ms
OK
>
```

Ping 192.168.1.90 on the network for five times with a 500 millisecond delay between pings:

```
> T0
Pinging: 192.168.1.90
Ping Reply 32ms
Pinging: 192.168.1.90
Ping Reply 5ms
Pinging: 192.168.1.90
Ping Reply 3ms
Pinging: 192.168.1.90
Ping Reply 4ms
Pinging: 192.168.1.90
Ping Reply 6ms
OK
>
```

5.6. Transmission Control Protoco

To move data across a network, Transmission Control Protocol is often used. The eS-WiFi Module can be configured to be a Server or Client on a network for Transmission Control Protocol communications. Also, the eS-WiFi Module supports TCP and UDP protocols for data transfer. The examples that follow show TCP and UDP Server, and TCP and UDP Client operational modes of the eS-WiFi module. The following examples also assume that Transmission Control Protocol software is used on the remote Server or remote Client system and that a port number has been set up for use.

5.6.1. TCP Server Set up and Data Transport

The first step in setting up the eS-WiFi Module to be a TCP server on the Network, assuming the eS-WiFi has been joined to a Network, is to set the protocol mode, followed by enabling the TCP server mode. Once the eS-Wifi Module is in TCP server mode, data can then be written to and read from a remote client on the network.

5.6.1.1. TCP Server Set Up

Set protocol to TCP:

```
> P1=0
OK
```

Set local TCP Port Number to 5024:

```
> P2=5024
OK
>
```

Enable TCP Server mode (the eS-WiFi Module will wait for a connection from a remote Client):

```
> P5=1
TCP Task set up
OK
> Waiting on TCP connection ...
> Accepted TCP connection from 192.168.1.107 on port 5024
>
```

Check TCP Server Mode Configuration:

```
> P?
    Transport Protocol:  TCP
        Client IP ADDR:  192.168.1.107
            Local Port:  5024
   Remote Host IP ADDR:  0.0.0.0
      Remote Host Port:  5025
    TCP Server Enabled:  Yes
    UDP Server Enabled:  No
OK
>
```

5.6.1.2. Read and Write TCP Data in Server Mode

The eS-WiFi Module can read and write data over the network using Transmission Control Protocol. To aid in moving data over the network, the eS-WiFi Module's AT Command Set has commands for setting

the Packet Size and for setting the Timeouts for data movement. For TCP communications, multiple reads may be needed to read all available data received. If no data is available, the read will timeout.

Set 1200 byte packet size for Read (range 1 to 1200):

```
> R1=1200
OK
>
```

Set five second timeout for Read in milliseconds (range 0 to 5000):

```
> R2=5000
```

Check Read Configuration:

```
> R?
Number of TCP/UPD bytes to receive per read:    1200
                        TCP/UPD receive timeout:    5000 ms
OK
>
```

Perform Read of Remote Client:

```
> R0
testing... 1234567890
OK
>
```

Write data to Remote Client:

```
> S0
0123456789
timeout detected... bytes sent 10
OK
>
```

The timeout was detected because the packet size was set to 1200 bytes, but only 10 bytes were written to the remote client. After a 5000 millisecond delay and no further data, the 10 bytes were sent.

5.6.2. TCP Client Setup and Data Transport

The first step in setting up the eS-WiFi Module to be a client on a Network, assuming the eS-WiFi has been joined to a Network, is to set the protocol mode, the remote port number, and remote server IP Address. Once the eS-Wifi Module has been set up as a client for TCP data transfer, data can then be written and read from a remote server on the network.

5.6.2.1. TCP Client Set Up

Set protocol to TCP:

```
> P1=0
OK
```

Set remote Server IP Address:

```
> P3=192.168.1.110
OK
```

Set remote TCP Port Number to 5025:

```
> P4=5025
OK
>
```

Enable TCP Client mode:

```
> P6=1
Connecting to 192.168.1.110
OK
>
```

Once the TCP Client mode AT Command returns to the console, a connection has been established with a remote server or an error message will be generated on a connection failure.

Check TCP Client Mode Configuration:

```
> P?
    Transport Protocol:  UDP
        Client IP ADDR:  0.0.0.0
            Local Port:  5024
   Remote Host IP ADDR:  192.168.1.110
     Remote Host Port:   5025
    TCP Server Enabled:  NO
    UDP Server Enabled:  No
OK
>
```

5.6.2.2. Read and Write TCP Data in Client Mode

The eS-WiFi Module can read and write data over the network using Transmission Control Protocol. To aid in moving data over the network, the eS-WiFi Module's AT Command Set has commands for setting the Packet Size and for setting the Timeouts for data movement. For TCP communications, multiple reads may be needed to read all available data received. If no data is available, the read will timeout.

Set 1200 byte packet size for Read:

```
> R1=1200
OK
>
```

Set five second timeout for Read in milliseconds:

```
> R2=5000
```

Check Read Configuration:

```
> R?
Number of TCP/UPD bytes to receive per read:    1200
                    TCP/UPD receive timeout:    5000 ms
OK
>
```

Perform Read of Remote Client:

```
> R0
testing... 1234567890
OK
```

```
>
```

Write data to Remote Client:

```
> S0
0123456789
timeout detected... bytes sent 10
OK
>
```

The timeout was detected because the packet size was set to 1200 bytes, but only 10 bytes were written to the remote client. After a 5000 millisecond delay and no further data, the 10 bytes were sent.

5.6.3. UDP Server Set Up and Data Transport

The first step in setting up the eS-WiFi Module to be a UDP server on the Network, assuming the eS-WiFi has been joined to a Network, is to set the protocol mode, followed by enabling the UDP server mode. Once the eS-Wifi Module is in UDP server mode, data can then be written to and read from a remote client on the network.

5.6.3.1. UDP Server Set Up

Set protocol to UDP:

```
 > P1=1
OK
```

Set local UDP Port Number to 5024:

```
> P2=5024
OK
>
```

Enable UDP Server mode (the eS-WiFi Module will wait for a connection from a remote Client):

```
> P5=1
UDP Task set up
OK
> Waiting on UDP connection ...
> Accepted UDP connection from 192.168.1.110 on port 5024
>
```

Check UDP Server Mode Configuration:

```
> P?
   Transport Protocol:  UDP
        Client IP ADDR:  192.168.1.110
            Local Port:  5024
  Remote Host IP ADDR:  0.0.0.0
     Remote Host Port:  5025
    TCP Server Enabled:  No
    UDP Server Enabled:  Yes
OK
>
```

5.6.3.2. Read and Write UDP Data in Server Mode

The eS-WiFi Module can read and write data over the network using Transmission Control Protocol. To aid in moving data over the network, the eS-WiFi Module's AT Command Set has commands for setting the Packet Size and for setting the Timeouts for data movement. For UDP communications, the number bytes sent to the server must match the number bytes to read -- any additional data sent to the server may be lost.

Set 1200 byte packet size for Read (range 1 to 1200):

```
> R1=1200
OK
>
```

Set five second timeout for Read in milliseconds (range 0 to 5000):

```
> R2=5000
```

Check Read Configuration:

```
> R?
Number of TCP/UPD bytes to receive per read:    1200
                      TCP/UPD receive timeout:    5000 ms
OK
>
```

Perform Read of Remote Client:

```
> R0
testing... 1234567890
OK
>
```

Write data to Remote Client:

```
> S0
0123456789
timeout detected... bytes sent 10
OK
>
```

The timeout was detected because the packet size was set to 1200 bytes, but only 10 bytes were written to the remote client. After a 5000 millisecond delay and no further data, the 10 bytes were sent.

5.6.4. UDP Client Setup and Data Transport

The first step in setting up the eS-WiFi Module to be a client on a Network, assuming the eS-WiFi has been joined to a Network, is to set the protocol mode, the remote port number, and remote server IP Address. Once the eS-Wifi Module has been set up as a client for UDP data transfer, data can then be written and read from a remote server on the network.

5.6.4.1. UDP Client Set Up

Set protocol to UDP:

```
> P1=0
OK
```

Set remote Server IP Address:

```
> P3=192.168.1.110
OK
```

Set remote UDP Port Number to 5025:

```
> P4=5025
OK
>
```

Enable UDP Client mode:

```
> P6=1
Connecting to 192.168.1.110
OK
>
```

Once the UDP Client mode AT Command returns to the console, a connection has been established with a remote server or an error message will be generated on a connection failure.

Check UDP Client Mode Configuration:

```
> P?
   Transport Protocol:  UDP
        Client IP ADDR:  0.0.0.0
            Local Port:  5024
  Remote Host IP ADDR:  192.168.1.110
     Remote Host Port:  5025
    TCP Server Enabled:  NO
    UDP Server Enabled:  No
OK
>
```

5.6.4.2. Read and Write UDP Data in Client Mode

The eS-WiFi Module can read and write data over the network using Transmission Control Protocol. To aid in moving data over the network, the eS-WiFi Module's AT Command Set has commands for setting the Packet Size and for setting the Timeouts for data movement. For UDP communications, the number bytes sent to the server must match the number bytes to read -- any additional data sent to the server may be lost.

Set 1200 byte packet size for Read:

```
> R1=1200
OK
>
```

Set five second timeout for Read in milliseconds:

```
> R2=5000
```

Check Read Configuration:

```
> R?
Number of TCP/UPD bytes to receive per read:    1200
                    TCP/UPD receive timeout:    5000 ms
OK
>
```

Perform Read of Remote Client:

```
> R0
testing... 1234567890

OK
>
```

Write data to Remote Client:

```
> S0
0123456789
timeout detected... bytes sent 10
OK
>
```

The timeout was detected because the packet size was set to 1200 bytes, but only 10 bytes were written to the remote client. After a 5000 millisecond delay and no further data, the 10 bytes were sent.

6. **Document Revision History**

Date	Name	Description	Revision	File Name
12/08/11	Robert Shuler	Initial Creation	0.1	AT Command Set.docx
12/15/11	Robert Shuler	Initial Release	1.0	AT Command Set r1.0.docx
12/15/11	Stephen Profit	Minor corrections/formatting	1.1	AT Command Set r1.1.docx
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