eS-WiFi Module
AT Command Set
“IWIN”

User Manual

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

AT Command Set

IWIN User Manual

Inventek Systems, Inc.

Inventek System, Inc.
AT Command Set Copyright and Company Information

Contact Information:
Telephone: 978-667-1962
Fax: 978-667-1949

Location/Mailing Address:
Inventek Systems
2 Republic Road,
Billerica, MA 01862

Hours of Operation
Monday - Friday
U.S. EST 08:00 a.m. - 05:00 p.m.

Send E-mail inquiries to:
Sales Support:
Sales@inventeksys.com

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Inventek Systems is a USA-based, full-service wireless solutions provider focused on 802.11 b/g/n WiFi embedded solutions, GPS embedded modules and antennas. We provide a wide range of standard and custom embedded options ranging from low cost system-in-a-package (SiP) products to modular based custom solutions. We provide complete services from consulting to custom design to cost effective high volume manufacturing.

Technical support:
Engineering@inventeksys.com

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 System's AT Command Set called IWIN for the eS-WiFi Module product, and to explain how to take advantage of the AT Command Set for Wi-Fi Communications.

When you purchase the Inventek module we have programmed our latest firmware for either UART,SPI or USB onto the module. When you order your production parts, you need to specify your firmware build that you have qualified, details are found in the product specifications.

The AT Command set is very simple to use and the default firmware is set for UART, 115K baud and you can download a free demo software program from the Inventek web site to exercise the module.

1.2 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>

1.3 Supported Product Versions

This document 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)
ISM4319-M3G-L44-E	(Printed Micro-strip Antenna)
ISM43362-M3G-L44-E	(Printed Micro-strip Antenna)
ISM43362-M3G-L44-U	(U.FL Connector to external antenna)

ISM43340-M4G-L44 & ISM43341-M4G-L44 in process (adding BT/NFC)

1.4. 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.

1.4.1 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 the 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.

The

Supported character sets:

The eS-WiFi module supports sending and receiving binary or ASCII data.
All AT Commands must be in capital letters; however, data can contain binary bytes (0x00 to 0xFF).

1.4.2 eS-WiFi Command Formats

All AT commands sent to the module must be formatted as follows:

Command	Delimiter	payload	Delimiter
2 Character Command	=	Req Data	\r[1]
2 Character Command	=	F1,F2,F3[2]	\r[1]
2 Character Command	\r[1]		

Note 1: \r = Carriage Return

For example:

- P1=0\r
- PK=1,3000\r
- I?\r

All AT command responses from the module will follow this format:

Response Formats					
Delimeter	***Payload***	***Delimeter***	***Return***	***Delimeter***	***Prompt***
\r\n[1]	Data	\r\n[1]	OK	\r\n[1]	>sp[3]
\r\n[1]	Error Type	\r\n[1]	Usage	\r\n[1]	>sp[3]

Notes:
1: \r = Carriage Return, \n=New Line
3: sp =>space

For example:

- \r\nDATA\r\nOK\r\n>sp
- \r\nERROR\r\nUSAGE\r\n>sp

ASCII
- ODOADATA0D0AOKODOA3E20
- ODOADATA0D0AUSAGEODOA3E20

AT command to send Data can follow either of these formats:

Command	Delimiter	payload
S0	\r[1]	Binary data
		1-1460 bytes

Note 1: \r = Carriage Return

Command	Payload Size	Delimiter	Payload
S3	Number of Bytes to be sent	\r[1]	Binary data
			(1-1460 bytes)

Note 1: \r = Carriage Return

For example:

- S0DATA\r
- S3=77\rDATA77byteslong

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 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. We recommend using Machine Readable for your application.

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 supports the following serial baud rates:

Basic Rates:1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600

Extended Rates: 1152000, 1382400, 1612800, 1834200, 2073600

2.1.2 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.

Using the AT commands you can change the default settings and save them using the AT command "Z1" and upon reset the module will default to your preferred baud rate. Users should save your default settings in what we defined as "USER SPACE".

2.2 USB (Universal Serial Bus)

The eS-WiFi module supports USB (Contact Inventek for firmware)

2.3 SPI (Serial Peripheral Interface Bus)

The eS-WiFi module supports SPI (Contact Inventek for firmware)

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. This is the recommend mode of operation for your application

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
A0	Activate Access Point
A1	Set Access Point Security Mode
A2	Set Access Point Security Key
AA	Get AP DHCP Cache Address(es)
AC	Set Access Point Channel
AD	Activate Access Point Direct Connect Mode
AE	Exit Access Point Direct Connect Mode
AL	Set Access Point Lease Time
AR	Get Client RSSI (SoftAP Only)
AS	Set Access Point SSID
AT	Set Maximum Number of AP Clients
A?	Show Access Point Settings
B2	Set SPI Mode
B3	Set SPI Ready Pin
B?	Show Communication Interface Settings
C0	Join a Network
C1	Set Network SSID
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
CE	Set Authorization Type
CF	Set/Clear Packet Filters (PBM Only)
CJ	Join/Leave IGMP Group
CM	Add/Remove MAC To/From MCAST Allow List (PBM Only)
CN	Set Country Code (See Appendix A for Codes)
CR	Get RSSS of Associated Network Access Point
CS	Get Connection Status
CT	Set WPS PB pin
CW	Connect using WPS Pin or PBC
C?	Show Network Settings
D0	DNS Lookup
D1	Enable mDNS
D2	Enable mDNS Service
E2	HID Keep-alive
F0	Scan for Network Access Points
F1	Set Scan Repeat Count
F2	Set Scan Delay (ms)

F3	Set Scan Channel
F4	Set Scan BBSID
F5	Set Scan SSID
F?	Show Scan Settings
G2	Read GPIO/ADC
G3	Write GPIO
G4	GPIO Setup
GT	Set UTC time
G?	Show GPIO Settings
I?	Show Application Information
MF	Test External Serial Flash
MR	Message Read (SPI Only)
MS	Suppress Async Message DHCP
MT	Set Message Type
P0	Set/Display Communication Socket
P1	Set Transport Protocol
P2	Set Transport Local Port Number
P3	Set Transport Remote Host IP Address
P4	Set Transport Remote Port Number
P5	Stop/Start Transport Server
P6	Stop/Start Transport Client
P7	Start/Stop Request TCP Loop
P8	Set Listen Backlogs
P9	SSL Certificate Authentication
PB	Certificate Verification Action
PC	Security Certificates
PD	Security Keys
PK	TCP Keep-Alive
PR	Read Mode, Packet Bypass Mode
PS	Raw Ethernet Packet Statistics
PT	USB HID RX Sequencing
PW	Write Packet, Packet Bypass Mode
PX	Enable UART Streaming Mode
PY	Set TCP API Message Timeout
PZ	Test Root CA Verification
P?	Show Transport Settings
R0	Read Transport Data
R1	Set Read Transport Packet Size (bytes)
R2	Set Read Transport Timeout (ms)
R3	Receive Mode
R?	Show Read Transport Settings
S0	Write Transport Data
S1	Set Write Transport Packet Size (bytes)
S2	Set Write Transport Timeout (ms)
S3	Set Write Transport Timeout (ms)
S?	Write Transport Data w/Packet Size
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
U2	Set UART BAUD Rate
U?	Show UART Settings
Z0	Reset to Factory Defaults
Z1	Save Current Settings
Z2	Clear Current Settings

Z3	**Set Factory/User Space**
Z4	**Set MAC Address**
Z5	**Get MAC Address**
Z6	**Set Access Point IP Address**
Z7	**Set WPS (WiFi Protected Setup) Pin Number**
Z8	**Get WPS (WiFi Protected Setup) Pin Number**
Z9	**Set USB VID/PID**
ZC	**Clear Factor Lock Switch**
ZD	**Flash Dump**
ZF	**Set Factory Lock Switch**
ZN	**Set Product Name**
ZO	**OTA Firmware Update**
ZP	**Power Management**
ZR	**Reset Module**
ZS	**Get Serial Number**
ZT	**Set Serial Number**
ZU	**Firmware Upgrade (M3G Only, use STM32F205 boot loader)**
ZV	**Set OTA Method**
Z?	**Show System 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

Response from eS-WiFi:

```
>
Entering CMD Mode
OK
>
```

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. This document is focused on users connecting the eS-WiFi to a microcontroller so the responses document will not be in Command Mode.

Usage: ---<CR>

Default Value: ---

Response from eS-WiFi:

```
>
Exiting CMD Mode
OK
>
```

4.4 Access Point

Used to setup the internal Access Point (Network Access). The eS-WiFi runs a Soft Access Point that allows a user to setup a connection to a local network as a STA (Client) on that network or serve up a HTML page to a user.

4.4.1 'A?' Show Access Point Settings

Returns Access Point Settings
Usage: A? <CR>

Response from eS-WiFi:

```
>
Es-WiFi,192.168.10.1,1,0,,1,24,0
OK
>
```

Field	1	2	3	4	5	6	7
Function	SSID	IP Address	Channel	Security Type	Security Key	AP DHCP	Lease Time

Field	8
Function	Status

Default Value: None

The following commands are used to setup the Access Point. A typical application will send a sequence of commands to setup the Access point and then have your settings saved in flash memory by using the "Z1" command:

Here is an example of setting up the Access Point information that needs to be saved into Flash upon completion:

```
AS=0,ABC            (Mac address OFF, SSID)
Z6=192.168.10.1     (IP Address)
AC=1                (Channel 1-13 (Japan 14- select country code))
A1=2                (WPA)
A2=Password         (Security Key)
AL=24               (Lease Time – Note: AP DHCP is default to ON)
Z1                  (Saves setting to flash –USER SAPCE)
```

If you reset the eS-WiFi module you can type A? You will see that all the settings above have been saved: ABC,192.168.10.1,2,Password,1,24,0

If you want to reset the device to the factory defaults you can issue the following three AT commands

```
Z3=0    Set Factory User Space
Z2      Erases Flash
ZR      Reset
```

4.4.2 'A0' Activate Access Point

The A0 at command is a blocking command. Once it is issued, the module is expecting that someone will connect to the access point. This command starts the following functions:

1. Starts the Access Point
2. Starts a DHCP Server
3. Starts a DNS Server
4. Starts a Web Server

Usage: A0<CR>

Default Value: None

	Responses from module	Description
1	[AP] SSID: eS-WiFi_AP_0022F40BBC0F IP: 192.168.10.1 [WEB SVR] Server started >	Once the module receives the AT command “AO”. A web server starts running. Use a web browser to on your PC or phone to located the eS-WiFi access point
2	[AP DHCP] Assigned AC:72:89:55:CE:36 has 192.168.10.100 >	Connect the PC or phone to the Access Point. Once you Join the Access point with your phone, you will be assigned an IP address
3	[JOIN] SSID [DHCP] 192.168.2.18 OK >	On the web page select what network you want to “Join”. The module will Join that network as a STA (Client) on the network and shutdown the AP running on the module.

4.4.3 'A1' Set Access Point Security Mode

Set the security mode for the Access Point running on the eS-WIFI module.

Usage: A1=<Mode><CR>

WiFi Security	Wi-Fi Security Mode	Description
Open	**0**	**No WiFi Security**
Reserved	**1**	**Not Valid**
WPA	**2**	**WiFi Protected Access**
WPA2	**3**	**WiFi Protected Access 2**
WPA + WPA2	**4**	**WiFi Protected Access and WiFi Protected Access 2**

Default Value = 0 (Open)

4.4.4 'A2' Set Security Key

Security Key can be up to 32 characters and is an unique security keyword for access to a wireless network. A system (PC, Smartphone, Tablet, etc) must use the Security Key to associate with the eS-WiFi Access Point to communicate with the eS-WiFi Module.

Usage: A2=<Key><CR>

Default Value: None

4.4.5 'AA' Get AP DHCP Cached Address(es)

Gets the MAC and IP addresses in the AP DHCP cache

Usage: AA=<Channel><CR>

Default Value: None

4.4.6 'AC' Set Access Point Channel

Set the channel the Access Point will broadcast on. The channels are from 1 to 13 based upon the Country Code setting for the eS-WiFi module. A setting of 0 selects the auto-channel algorithm.

Usage: AC=<Channel><CR>

Default Value: C1.3.x=1, C2.4.0=0

4.4.7 'AD' Activate Access Point Direct Connect Mode

Starts the Access Point, DHCP Server, and minimal CSO (Connection Support Only) Web Server. The CSO Web Server handles the support for connecting Apple devices with iOS6 and other devices that require addition support to connect to a captive network.

Usage: AD<CR>

Default Value: None

This mode is used to establish a IPV4 “Direct Connection” to a PC, Smartphone or IOT appliance. Once your PC, smart phone or IOT device joins the eS-WiFi, the eS-WiFi will issue an IP Address and create a wireless network connection between the eS-Wi-Fi and the Smartphone or IOT appliance. The “ Direct Connection” is an Infrastructure connection that has advantages over Adhoc, for example Android does not support Adhoc natively

Once you have established this infrastructure connection you can setup a Peer to Peer connection using UDP, UDP Lite or TCP.

	Responses	DESCRIPTION
1	[AP] SSID: eS-WiFi_AP_0022F40BBC0F IP: 192.168.10.1 [WEB SVR] CSO Server started OK >	AT command “AD” starts the access point on the eS-Wifi module and DHCP server
2	[AP DHCP] Assigned AC:72:89:55:CE:36 has 192.168.10.100 >	Type in the AP ip address into your browser (192.168.10.1) and you have a connection between module and phone or PC

4.4.8 'AE' Exit Access Point Direct Connect Mode

Shuts down the Access Point, DHCP Server, and Web Server when the connected using the Direct Connect mode. This is used for both the 'A0' and 'AD' commands. For the 'A0' command this is only needed when a Direct Connection has been made through the Network Access Web Page.

Usage: AE<CR>

Default Value: None

It is important to create and tear down networks properly. You should shut down the UDP, UDP Lite or TCP prior to issuing the AE command.

4.4.9 'AL' Set Access Point DHCP Lease Time

Set the lease time given by the DHCP Server when an IP address has been assigned.

Usage: AL=<Lease Time><CR>

Value	Lease Time
0	30 mins.
1-254	1-254 hrs.
255	~136 hrs

Default Value: 0 (30 mins.)

4.4.10 'AR' Get Client RSSI (SoftAP Only, Direct Connect Mode)

Gets the Client RSSI values for all clients connected to the SoftAP in direct connect mode.
i.e. "A0" then select "Direct Connect" from the Configuration page or "AD"

Usage: AR<CR>

Default Value: None

Please note that it may take more than one issuance of the command to return a non-zero value.

	Responses	Description
1	> AR 0,AC:72:89:55:CE:36,0 OK > AR 0,AC:72:89:55:CE:36,-40 OK >	0 is the 1st client attached (MAX=4 clients) AC:72:89:55:CE is Mac Address -40 is the RSSI of the client

4.4.11 'AS' Set Access Point SSID

Sets the Access Point SSID. It can be up to 32 characters in total length (including MAC if enabled).

Usage: AS=<MAC Mode>, <SSID><CR>

Value	MAC Mode
0	No MAC.
1	Use MAC.

Default Value: MAC Mode = 1, SSID = eS-WiFi_AP

4.4.12 'AT' Set Maximum Number of AP Clients

Sets the maximum number of AP client that will give an IP address. Please note the AP it's self is considered one of the clients so the total of client equals 5.

Usage: AT=<Number of Clients><CR>

Value	MAC Mode
1-4	Number of Clients

Default Value: 4

4.5 Select Communication Interface

Firmware loaded on the module determines the Host interface: Option are SPI, UART, or USB interface for communication with the eS-WiFi module.

4.5.1 'B?' Show Communication Interface Settings

Return current Communication Interface settings.

Usage: B?<CR>

Value	Host Interface
0	UART.
1	SPI
2	USB – HID
3	USB -VCP

Field	1	2	3	4	5	6	7
Function	Host Interface	N/A	N/A	N/A	N/A	N/A	N/A

Default Value: None

Response from eS-WiFi in UART Mode:

```
>
0
OK
>
```

4.5.2 'B2' Set SPI Mode

Set the SPI mode for phase and polarity

Usage: B2=<value><CR>

Value	Mode
0	CPOL = 0, CPHA = 0
1	CPOL = 0, CPHA = 1
2	CPOL = 1, CPHA =0
3	CPOL = 1, CPHA = 1

Default: 0

4.5.3 'B3' Set SPI Ready Pin

Sets whether the WKUP pin is has the SDRDY signal for design that didn't implement the SDRDY pin.

Usage: B3=<value><CR>

Value	Ready Pin
0	SDRDY(ADC0) Only
1	SDRDY(ADC0) and WKUP

Default: 0

4.6 Configure Network Settings

Used to set up the network parameters needed to access a Wi-Fi network. The eS-WiFi can connect to a network using three techniques depending upon your application:

1. Your microcontroller can issue a series of AT commands starting with “C1” as outlined in this section
2. You can setup a “Direct Connection” a private network as detailed in section above.
3. You can start the Access Point and a web server running on eS-WiFi and the user will be able to connect to the Web Site and enter the password and

4.6.1 ‘C0’ Join a Network

Using the user defined 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 cannot 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

	Responses
C1.3.x	[JOIN] SSID [DHCP] 192.168.2.18 OK >

	Responses
2.4.0	[JOIN] SSID,192.168.2.18,0,0 OK >

4.6.2 ‘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

4.6.3 'C2' Set Network Passphrase

Network Passphrase can be up to 32(63/64 for WPA2, C2.4.0 or greater) characters and is a 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

4.6.4 '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 TKIP**
WPA2	**3**	**WiFi Protected Access 2 AES**
WPA + WPA2	**4**	**WiFi Protected Access and WiFi Protected Access 2**
WPA2 TKIP	**5**	**WiFi Protected Access 2 TKIP**

Table 4.2: Network WiFi Security Modes

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

Default Value: C3=0

4.6.4 '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

The following commands are used to configure the eS-WiFi to join a wireless network. Here is an example of the AT commands:

C1=Inventek	(SSID)
C2=Password	(Router Passphrase)
C3=2	(WPA)
C4=1	(DHCP)
C0	(eS-WiFi joins the network)
CC=1	(Auto Connect On (Automatically connects on power up)
Z1	(Saves setting to flash)

In the above scenario as soon as power is applied to the eS-WiFi the module will automatically connect to the Inventek router with the password and settings you entered. If you want to change to another network you simple make the changes to the AT command and save your new settings into flash using the "Z1" command.

4.6.5 '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

4.6.6 '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

4.6.7 'C7' Set Network IP Mask

Set Network IP Mask is a user defined 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

4.6.8 'C8' Set Network Gateway

Set Network Gateway is a user defined Gateway IP Address used 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: 255.255.255.255

4.6.9 'C9' Set Network Primary DNS

Set Network Primary Domain Name System (DNS) is a user defined 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: 255.255.255.255

4.6.10 '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: 255.255.255.255

4.6.11 'CB' Set Network Join Retry Count

Set Network Join Retry Count is a user defined 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

4.6.12 '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. You must save the "CC" AT command with the Z1 command to save the setting.

Auto Connect	Auto Connect Mode
Disable Network Auto-Join	**0**
Enable Network Auto-Join	**1**

Table 4.5: Network Auto Connect Modes

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

Default Value: 0

4.6.13 'CD' Disconnect from Network

To disconnect the eS-WiFi module from a wireless network, the AT Command 'CD' is used. 'CD' will shut down 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

4.6.14 'CE' Set Authorization Type

Set the authorization type for WEP security.

Usage: CE=<Type><CR>

Type	IP Version Mode
0	Open
1	Shared Key

Default Value: 0 (Open)

4.6.15 'CF' Set/Clear Packet Filter (Packet Bypass Mode)

Set/Clear the packet filters when operating in the PBM (Packet Bypass Mode). The PBM sends the received Ethernet packet directly to host interface bypassing the module's TCP/IP Stack.

Usage: CF=<Mode Byte><CR>

Bits	Filter
00	No Filtering
01	ARP
02	SNMP
40	IPv4
80	Multicast

Note: The filters remove the packets that are not directed to or are not part a Multicast group that has been enabled to the eS-WiFi module. The packets sent are RAW 802.3 Ethernet packets with the Wi-Fi headers stripped off. We insert our AT command format at the end of each packet as detailed in section 1.4.2.

Default Value: 00 (No Filtering)

4.6.16 'CJ' Join/Leave IGMP Group

Join or leave a IGMP group.

Usage: CJ=<Action>,<Group IP Address><CR>

Action	Join/Leave
0	Leave
1	Join

Default Value: None

4.6.17 'CM' Add/Remove MAC Address To/From Multicast Allow List (Packet Bypass Mode)

Adds or removes a MAC address to or from the multicast allow list while in PBM.
Usage: CM=<MAC Address><CR>

Default Value: None

4.6.18 'CN' Set Country Code

Set the country code for the eS-WiFi module. The country code is a two letter code representing a country which selects which channels are valid to use.

Usage: CN=<Code><CR>

Please see Appendix A for the list of Country Code supported.

Default Value: 'US'

4.6.19 'CR' Get RSSI of Associated Access Point

Get the RSSI on the currently associated Access Point.
Usage: CR<CR>

Response	Description
0	No Associated AP
All other values	RSSI (dB)

Default Value: None

4.6.20 'CS' Connection Status

Gets the current wireless network connection status.

Usage: CS<CR>

Response	Status
0	Not Connected
1	Connected

Default Value: None

4.6.21 'CW' Connect using WPS Pin or PBC

Connects to an access point using WPS (WiFi Protected Setup) Pin or PBC (Push Button Configuration) methods. Once connected the SSID, Password/Security Key, Security Type settings will be populated and then can be saved using the "Z1" command for use later. Please note when using the Pin method the pin must be set using the "Z7" command.

Usage: CW=<value><CR>

Response	Method
0	Pin
1	PBC

Default Value: None

	Responses
1	[WPS] Searching... [WPS] Associated [WPS] SSID [DHCP] 192.168.2.18 OK >

4.6.22 'C?' Show Network Settings

Return current Configured Network Settings.

Usage: C?<CR>

Field	1	2	3	4	5	6	7
Function	SSID	Password	Security Type	DHCP	IP Version	IP Address	Mask

Field	8	9	10	11	12	13	14
Function	Gateway	DNS1	DNS2	Retries	Auto-Connect	Authent-ication	Country Code

Field	15
Function	Status

Default Value: None

4.7 DNS Commands

4.7.1 'D0' DNS Lookup

This command performs a DNS lookup of a Domain Name to get its IPv4 address. The Domain Name is limited to 64 characters.

Usage: D0=<Domain Name><CR>

Default Value: None

	Example
1	> D0=www.yahoo.com 98.139.183.24 OK >

4.7.2 'D1' Set mDNS State and Name

This command Enables/Disables the use of mDNS and sets the Device name. This is supported in C2.4.0 or greater.

Usage: D1=<0/1>,<Device Name><CR>

Default: None

	Example
1	> D1=1,es-WiFi43362 OK >

4.7.3 'D2' Set mDNS Services

This command sets up the 2 available services. The status will be displayed as part of the Join message (2). This is supported in C2.4.0 or greater.

Usage: D2=<Service # 0/1>,<Instance(32chars)>,<Service(32Chars)>,<Port>,<TTL>

Default: None

	Example
1	> D2=0,0 OK > C0 [JOIN] SSID,192.168.2.18,0,0 OK >

	Example
2	> D1=1,test-1234 OK > D2=0,1,web_service,_web_service._tcp.local,80,60 OK > C0 [JOIN] istest.001,10.0.0.3,1,0 OK > mDNS Listener: Listening for multicast messages on '224.0.0.251'... Press CTRL + C to quit Port 80 is open on 10.0.0.3

4.8 USB Commands

4.8.1 'E2' HID Keep-alive

Enables/ Disable the HID Keep-alive. When Enabled the eS-WiFi module will send a data packet with a zero number of valid bytes. The allow systems that have a blocking read function to release.

Usage: E2<CR>

Default Value: None

4.9 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 returned on the available networks includes SSID, BSSID, RSSI, Data Rate, Network Type, Security, Radio Band, and Channel. The information returned 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.

4.9.1 '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

	Responses
1	#001,"SSID1",08:86:3B:2B:7E:2E,-51,54.0,Infrastructure,WPA2 AES,2.4GHz,1 #002,"SSID2",C0:C1:C0:88:9F:6A,-53,54.0,Infrastructure,WPA2 AES,2.4GHz,6 #003,"SSID3",00:24:B2:B1:E9:FD,-61,54.0,Infrastructure,Open,2.4GHz,11 OK >

4.9.2 '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

4.9.3 'F2' Set Scan Delay

Set Scan Delay is a user defined value that sets 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

4.9.4 'F3' Set Scan Channel

Set Scan Channel to scan for.

Input range 0=None 1 to 14

Usage: F3=<Channel><CR>

Default Value: 1

4.9.5 'F4' Set Scan BSSID

Set Scan Channel to scan for.

Usage: F4=<XX.XX.XX.XX.XX.XX><CR>

Default Value: None

4.9.6 'F5' Set Scan SSID

Set Scan Channel to scan for.

Input range #=Clear, <32 character SSID>

Usage: F5=<32 character SSID><CR>

Default Value: None

4.9.7 'F?' Show Scan Settings

Returns current Scan Settings.

Usage: F?<CR>

Field	1	2
Function	Repeat (1+Repeat)	Delay (ms)

Default Value: None

4.10 GPIO / ADC Information

You can setup the GPIO to Control an LED, Read a Button, Digital Input or Digital Output. The output is a 3.3V CMOS. On the evaluation board there are switches and LED's you can control as shown in the table below. The process is configure the pins as yo like with the AT command G4 then read and write as needed.

An couple of examples:

1. Issue and AT command to see if you are connected to the network. Once you know you are connected you can light an LED.
2. Setup GPIO2 as an A/D, connect a temperature sensor and reads the value

A user can setup and read the state of GPIO's 1-7 with the AT command. Some Firmware revision may use some of the GPIO's for special functions so please contact Inventek for details. For example the SPI firmware uses the GPIO2 (ADC) for the SPI ready function.

4.10.1 'G2' Read GPIO/ADC

Reads the current value of the specified GPIO or ACD pin

Usage: G2=<Pin Number>,<Value><CR>

Value	Type	Description
2	Button	This tells you what pin to read and what type of GPIO it is configured for
3	Digital Input	
5	ADC	

Default Value: None

1. G4=0,2 This configures GPIO0 as button with de-bounce features enabled
2. G2=0,2 = This function reads GPIO and

4.10.2 'G3' Write GPIO

Writes the current value of the specified GPIO pin.

Usage: G3=<Pin Number>,<Type Value>,<Value><CR>

Type Value	Type
1	LED
4	Digital Output

Value	Output
0	Low
1	High

Default Value: None

4.10.3 'G4' GPIO Setup

Sets the type of the specified GPIO pin.

Usage: G4=<Pin Number>,<Value><CR>

Value	Type	Firmware Loaded
1	LED	UART Firmware : GPIO0-GPIO4 and ADC0-ADC4 can be configured using the “G4” command SPI Firmware: GPIO0-GPIO4 can be used. ADC0-ADC4 are used by the SPI interface
2	Button	
3	Digital Input	
4	Digital Output	
5	ADC	

Default Value: None

4.10.4 'G?' Show GPIO Settings

The AT Command 'G?' will return the GPIO pin type. To confirm your settings and the sequence of returned states from this request will be grouped by type, not by pin number.

Usage: G?<CR>

Pin Number	0	1	2	3	4	5	6	7	8	9	10	11	12
Function	GPIO0	GPIO1	GPIO2	GPIO3	GPIO4	ADC0	ADC1	ADC2	ADC3	ADC4	CFG1	CFG2	Wakeup
Default	DIN	DIN	DIN	DIN	DIN	ADC	ADC	ADC	ADC	ADC	DIN	DIN	DIN
COMMENTS						USED FOR SPI	USED FOR SPI	USED FOR SPI	USED FOR SPI	USED FOR SPI	NFC only	NFC only	
Inventek EVB	SW1	SW2		RED LED	Green LED	Temp sensor							

Default Value: As shown above

4.11 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.

4.11.1 'I?' Show Applications Information

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

Usage: I?<CR>

Field	1	2	3	4	5	6	7
Function	Product ID	FW Revision	API Revision	Stack Revision	RTOS Revision	CPU Clock	Product Name

Default Value: None

4.12 Miscellaneous Command

4.12.1 'MF' Test External Serial Flash

Does an erase, write, read, and verify test on the external serial flash used for Factory Reset or Over-The-Air (OTA) firmware updates.

Usage: MF<CR>

Value	Output
0	Failed
1	Passed

Default Value: None

4.12.2 'MR' Message Read (SPI Only)

This command reads any asynchronous message that occur based on asynchronous event such as a device connecting the Soft AP(Access Point) A0 and AD commands, TCP connection message from the P5 command. The message will have a Start Of Message Asynchronous [SOMA] and End Of Message Asynchronous [EOMA] delimiters.

	Responses
1	[SOMA][AP DHCP] Assigned AC:72:89:55:CE:36 has 192.168.10.100[EOMA] OK >
2	[SOMA][TCP SVR] Accepted 192.168.2.2:5024[EOMA] OK >

4.12.3 'MS' Suppress Async Message DHCP

Suppresses the DHCP assigned messages from being sent to the host.

Usage: MS=<Disable/Supress><CR>

Value	Output
0	Disabled
1	Suppress

Default Value: 0

4.12.4 'MT' Set Message Type

Set the message type. Normal: full messages including usage on error or Simple: No usage on error.

Usage: MS=<Disable/Simple><CR>

Value	Output
0	Disabled
1	Simple

Default Value: 0

	Example
1	> MT ERROR: Unknown Error Usage: MT <0=Normal/1=Simple> > MT=1 OK > MT ERROR >

4.13 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 transferred 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 is recommended that the user develop their own packet numbering and error checking for data transfers.

4.13.1 'P0' Set/Display Communication Socket

Set/Display the communication socket for TCP, UDP, or UDP Lite communications. All the Px commands for communications are duplicated for each socket. The Rx and Sx are tied to the communication socket selected by 'P0'.

Usage Set: P0=<Communication Socket 0 to 3><CR>

Usage Display: P0<CR>

	Responses
1	> P0=1 OK >
2	> P0 1 OK >

Example:

```
P0=1<CR>                //Set Socket 1
P1=0<CR>                //TCP
P3=192.168.2.2<CR>      //Remote Host
P4=8002<CR>             //Remote Port
P6=1<CR>                //Start Client connection
S3=4<CR>1234                  //Send Data
R0<CR>                        //Receive Data
P0=2<CR>                //Set Socket 2
P1=0<CR>                //TCP
P3=192.168.2.3<CR>      //Remote Host
P4=8002<CR>             //Remote Port
P6=1<CR>                //Start Client connection
```

```
S3=4<CR>4321          //Send Data
R0<CR>                //Receive Data
P0=1<CR>          //Set Socket 1
```

4.13.2 '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**
TCP-SSL	**3**

Table 4.6: Transport Protocol Modes

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

Default Value: P1=0

4.13.3 '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.

4.13.4 'P3' Set Transport Remote Host Port IP Address

Set Transport Remote Host IP Address is a user defined 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

4.13.5 '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 for communications with that server.

Input range for Local Port is 0 to 65535.

Usage: P4=<Local Port><CR>

Default Value: P4=5025

4.13.6 '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**
Multi-Accept Server Close Socket	**10**
Multi-Accept Server Enable	**11**

Figure 4.7: Transport Server Modes

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

Default Value: P5=0

4.13.7 '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

4.13.8 'P7' Start/Stop Request TCP Loop

Controls the Request TCP Loop. Closing socket allows the next listen backlog to be handled.

Usage: P7=<Value><CR>

Value	Loop Function
0	Stop
1	Start
2	Close Socket
3	Get Next Connection

Default Value: P7=0

4.13.9 'P8' Set Listen Backlogs

Set the number of listen backlogs (TCP connection requests) that can be queued.

Usage: P8=<value><CR>

Range: 1 to 6 backlogs

Default Value: P8=1

4.13.10 'PA' Set Custom Certificate Authority

Set a custom certificate authority name for simple verification of the SSL certificate

Usage: PA=<index 0/1><Custom CA, 63 characters max><CR>

Default Value: None

4.13.12 'PB' Set Root CA Verification Results

Set the TCP API message timeout to the stack.

Usage: PB=<value><CR>

Value	TCP Keep-Alive
0	Terminate SSL Connection, Error Message
1	Error Message, Don't terminate SSL Connection

Default Value: 0

4.13.13 'PC' Write Security Certificates

Writes a security certificates to flash.

Usage: PC=<Certificate 0/1>,<Number of Bytes>\r<Byte of certificate><CR>

Default Value: None

4.13.14 'PD' Write Security Key

Writes a security keys to flash.

Usage: PD=<Key 0/1>,<Number of Bytes>\r<Byte of key><CR>

Default Value: None

4.13.15 'PK' TCP Keep-Alive

Enables/Disables and sets the TCP Keep-Alive Time-to-Idle. This is useful in detecting broken TCP connections. If enabled and a TCP connection is broken the S0/S3 commands will respond with a -1 once the broken connection is detected.

Usage: PK=<value1>,<value2><CR>

Value1	TCP Keep-Alive
0	Disable
1	Enable

Value2 Range: 250ms to 7200000ms (default is 7200000ms)

4.13.16 'PR' Packet Bypass Mode (PBM) Read Mode

Set the Packet Bypass Mode (PBM). In this mode Ethernet packets are forwarded from the WiFi interface, bypass the internal TCI/IP stack and are presented to the host interface.

Usage: PR=<Value><CR>

Value	Bypass Mode
0	Normal (No Bypass)
1	Forward All
2	Forward Non-ARP
3	Copy All
4	Copy Non-ARP

Note: In all mode the packets forwarded or copied can be filtered with the PF command.

Default Value: PR=0

4.13.17 'PS' Raw Ethernet (PBM)/USB HID Packet Statistics

Send the raw ether packet statistics to the host..

Usage: PS<CR>

Default Value: None

Returns: Receive Packets, Write Packets, Command Packets, Current Packet (CP), Last Packet(LP)

4.13.18 'PT' USB HID RX Sequencing

When enabled add a sequence number of CP(current packet) of PT (Packets Total) as the second and third bytes of the USB HID packet..

Usage: PT=<0/1><CR>

Default Value: None

4.13.19 'PW' Packet Bypass Mode (PBM) Write Packet

This writes Ethernet packets directly to the WiFi interface bypassing the internal TCP/IP stack.

Usage: PW=<NOB>,<DATA><CR>

NOB = Number of Bytes to send.

Data = Ethernet Packet (1516 Bytes Max.)

Default Value: None

4.13.20 'PY' Set TCP API Message Timeout

Set the TCP API message timeout to the stack.

Usage: PY=<Timeout in ms><CR>

Range: #=Restore Default, 0-65535, ?-Info

Default Value: 10000

4.13.21 'PX' Set TCP Streaming Mode

Set the TCP to automatically stream data as a Client or a server.

USAGE PX=0{0=Server Mode;1=Client Mode},GPIO

Examples
Usage: PX=<1,0><CR> (Client Mode with GPIO 0 as escape) or
Usage: PX=<0,0><CR> (Server Mode with GPIO 0 as the escape)

Streaming Mode allows raw, un-formatted data to be sent to and from our modules over Wi-Fi via the serial port. Data shows up on the UART and automatically streams wireless as either a client or a server. You need to perform simple initial AT command setup to define the mode and anything that shows up on the UART automatically is sent.

Here is a simple setup procedure for: Client Setup

Plug your eS-Wifi module into the PC and start a terminal program (Teraterm) default baud rate is 115,200 to communicate with the module. Also open Hercules as a server connected to the same network network.

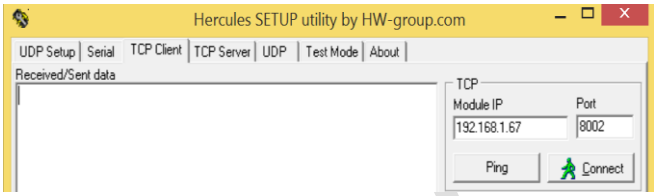
1. Join the eS-WiFi module to a network using AT commands
   - C1= SSID \r
   - C2= Password \r
   - C3= 0 \r
   - C0 \r
2. P0=0\r
3. P3=192.168.1.xx\r
4. P4=8002
5. S1=7
6. S2=1000

7. PX= 1,0

“Client must initiate first”

Type away… data streams anything that shows up on the UART!!!

Server Setup: You need to add the following command for Server Mode:
P2=8002 LOCAL PORT
PX=0,0 Server Mode PX=0{0=Server Mode;1=Client Mode},GPIO



4.13.22 ‘P?’ Show Transport Settings

Return current Transport Communication Settings.

Usage: P?<CR>

Field	1	2	3	4	5	6	7
Function	Protocol	Client IP	Local Port	Host IP	Remote Port	TCP Server	UDP Server

Field	8	9	10
Function	TCP Backlogs	Accept Loop	Read Mode

Default Value: None

4.14 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 have 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.

4.14.1 ‘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

Responses
Data sent will be received.
Blank Response (“\r\n\r\nOK\r\n> “) No data received.
Response=”-1”

Any one of the following reasons will cause a "-1" response: 1. Connection to the network (AP) has been lost 2. Other side has closed the connection 3. Other side has lost it connection to the network

4.14.2 '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 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

4.14.3 '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

4.14.4 'R3' Set Receive Mode

The AT Command R3 sets the receive mode. In receive mode = 1 the CRLF(Carriage Return/ Line Feed) delineation are removed from the Read response.

Usage: R3=<Value><CR>

Value	Receive Mode
0	Normal
1	No Delineation

Default Value: None

4.14.5 'R?' Show Read Transport Settings

Return current Receive Transport Data Settings.

Usage: R?<CR>

Field	1	2	3
Function	Number of Bytes	Timeout	Receive Mode

Default Value: None

4.15 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.

4.15.1 '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 the eS-WiFi module's 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 than 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><Data>

4.15.2 'S1' Set Write Transport Packet Size (bytes)

AT Command 'S1' is used to define the packet size of data to write to a connected Transport Server or Client. The AT Command 'S1' should be set before a performing AT Command 'S0'. We recommend you use the S3 function for most applications since it combines the S0 & S1 commands

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

Default Value: S1=1200

4.15.3 '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

4.15.4 'S3' Write Transport Data

The AT Command 'S3' is used to write data to a Transport Server or Client. The size of the data to write is defined by the first parameter. After the AT Command 'S3' is entered (i.e. the <CR> is received by the eS-WiFi, any data writing to the eS-WiFi module's selected communicating interface will be sent to a connected Transport Server or Client. Once the number bytes defined by the first parameter 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 than are defined by first parameter, 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: S3=<Data Packet Size<CR><Data>

4.15.5 'S?" Show Write Transport Settings

Return current Write Transport Data Settings.

Usage: S?<CR>

Field	1	2
Function	Number of Bytes	Timeout

Default Value: None

4.16 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.

4.16.1 '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

4.16.2 '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

4.16.3 '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>

Range: 0-65534, 65535=Continuous

Default Value: T2=0

4.16.4 '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

4.16.5 'T?' Show Ping Settings

Return current Ping Settings.

Usage: T?<CR>

Field	1	2	3
Function	Target IP Address	Repeats (1+Repeats)	Delay

Default Value: None

4.17 Configure UART

The eS-WiFi module can be configured to use its serial interface for communications with a host computer or 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 modules can support baud rates from 1200 to 2073600 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.

4.17.1 '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

4.17.2 '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.

Basic Baud Rates
1200
2400
4800
9600
19200
38400
57600
115200
230400
460800
921600
1152000
1382400
1612800
1843200
2073600
2304000
2764800
3686400
3916800

Table 4.10: Basic Baud Rates

Usage: U2=<Baud Rate><CR>

Default Value: U2=115200

4.17.3 'U?' Show UART Setting

Return current UART Configuration.

Usage: U?<CR>

Field	1	2	3	4	5	6
Function	Port	Baud Rate	Data Width	Parity	Stop Bit(s)	Mode

Default Value: None

4.18 WLAN

4.18.1 'WL' Set GPIOs for Link Status and Activity

Sets the GPIO pins for WLAN link status and activity. The link status can also be used as an IRQ to the host processor to indicate if the module is connected to a wireless network.

Usage: WL=<Arg1><Activity GPIO, 0-9>,<Polarity 0=Active Low/1=Active High><CR>

Arg1:

- # to clear(reset) GPIO pin to original settings
- ? to show current values
- Link GPIO, 0-9

Examples:
> WL=#

OK
> WL=4,3,1

OK
> WL=?
4,3,1
OK
>

Note: GPIOs 0-4 are GPIO0-4 and GPIOs 5-9 are ADC0-4.

Default Value: Link = 255,Activity=255

Link Activity	Link Status	State
Off	Off	No connection
Off	On	Connected
On	Off	Connection lost
Flashing	Off	WPS In-progress
Flashing	On	Connected with link activity

4.19 System Information Flash

The AT commands can be saved into flash to initialize the systems, such as customer Mac address, out the auto connect to join a network once the SSID and password have been saved into “User Space”.

We architected the flash memory to have two banks of flash, partitioned as :

1. Factory Default Space
2. Customer “User Space

We recommend that customers save there default settings in “User Space” and if you have trouble with flash in the field or a flash error, you can switch to “Factory space” and do a reset , this will erase the flash in the “User Space” , this starting the module in a known state.

4.19.1 'Z0' Reset To Factory Defaults

Reset the current user space settings to factory default. The setting are not saved until a 'Z1' command is issued. You cannot be connected to a Network when trying to reset eS-WiFi to defaults.

Usage: Z0<CR>

Default Value: None

4.19.2 'Z1' Save Current Settings

Saves the current user setting to the space selected with the 'Z3' command.

Usage: Z1<CR>

Default Value: None

4.19.3 'Z2' Clear Saved Settings

Clears the save settings space based upon the space selected with the 'Z3' command.

Usage: Z2<CR>

Default Value: None

	Responses
1	[EEPROM] Erasing [EEPROM] Complete OK >
2	[EEPROM] Erasing user sections [EEPROM] Complete OK >

4.19.4 'Z3' Set Factory/User Space

Selects the space that will be used by the 'Z1' and 'Z2' commands.

Usage: Z3=<Value><CR>

Value	Space
0	Factory
1	User

Default Value: None

4.19.5 'Z4' Set MAC Address

Sets the MAC address.

Usage: Z4=<XX:XX:XX:XX:XX:XX><CR>

Default Value: None

4.19.6 'Z5' Get MAC Address

Gets the MAC address.

Usage: Z5<CR>

Default Value: None

4.19.7 'Z6' Set Access Point IP Address

Sets the Access Point IP address.

Usage: Z6=<XXX.XXX.XXX.XXX><CR>

Default value: 192.168.10.1

4.19.8 'Z7' Set WPS Pin

Sets the 8 digit numeric WPS (WiFi Protected Setup) pin number.

Usage: Z7=<XXXXXXXX><CR>

Default Value: None

4.19.9 'Z8' Get WPS Pin

Gets the WPS (WiFi Protected Setup) pin number.

Usage: Z8<CR>

Default Value: 12345678

4.19.10 'Z9' Set USB VID/PID

Sets the USB VID (Vendor ID) and the PID (Product ID) (Valid only when firmware supports USB).

Usage: Z9=<XXXX,XXXX><CR>

Default Value: None

4.19.11 'ZC' Clear Factory Lock Switch

Clears the Factory Lock switch, allowing the factory flash space to be changed.

Usage: ZC=0<CR>

Default Value: None

4.19.12 'ZD' Flash Dump

Dumps the selected space from the 'Z3' command to the host interface.

Usage: ZD<CR>

Default Vale: None

	Responses
1	FLASH Dump: 0000 | 7F 00 00 04 73 73 69 64 FF FF FF FF FF FF FF FF | ☐..ssid..... 0010 | FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF | .... 0020 | FF FF FF FF 08 70 61 73 73 77 6F 72 64 FF FF FF | .....password... 0030 | FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF | .... 0040 | FF FF FF FF FF FF 00 05 00 00 01 C2 00 FF FF FF | ....┬.... 0050 | FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF | .... 0060 | FF 00 00 00 00 00 00 00 00 00 00 00 00 13 88 | ....ê 0070 | 13 88 01 05 B4 05 B4 C0 A8 0A 01 00 01 00 00 00 | .ê..┤.┤└¿..... 0080 | 00 00 00 00 00 FF FF FF FF FF FF 18 49 6E 76 65 | ....Inve 0090 | 6E 74 65 6B 20 53 79 73 74 65 6D 73 20 65 53 2D | ntek.Systems.eS- 00A0 | 57 69 46 69 FF FF FF FF FF FF FF FF FF 0A 65 53 | WiFi.........eS 00B0 | 2D 57 69 46 69 5F 41 50 FF FF FF FF FF FF FF FF | -WiFi_AP........ 00C0 | FF FF FF FF FF FF FF FF FF FF FF FF FF FF 01 01 | .... 00D0 | 55 53 18 00 00 FF FF FF FF FF FF FF FF FF FF FF | US.............. 00E0 | FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF | .... 00F0 | FF FF FF FF FF FF FF FF FF FF FF FF FF F9 AB 0F 00 | ....·½.. OK >

4.19.13 'ZF' Set Factory Lock Switch

Sets the Factory Lock switch, making the Factory space not changable.

Usage: ZF=1<CR>

Default Value: 0 (Unlocked)

4.19.14 'ZN' Set Product Name

Sets the Product Name reported by the Access Point web pages, the 'I?' and 'Z?' commands. The name can be up to 32 alphanumeric characters long.

Usage: ZN=<Product Name><CR>

Default Value: Inventek Systems eS-WiFi

4.19.15 'ZO' OTA Firmware Update

Get the URL for the update firmware, downloads to external serial flash and then updates the micro-processors on board flash and re-boots.

Usage: Z0=<1 - 128><CR><URL Bytes(http://domain:port/bin_file_path)>

Default Value: None

4.19.16 'ZP' Power Management

Enable/Disable Power Management features.

Usage: ZP=<Feature>, <Value><CR>

Feature	Value	Description
0	None	Wi-Fi On, All Power Save Off
1	0	Power Save Off
1	1	Power Save On
2	1-60	Beacon Interval (sec)
3	0	WiFi Radio Off
3	1	WiFi Radio On
4	None	Reset WiFi Radio
5	None	Stop Mode
6	0-3600000	Sleep in ms

Default Value: Feature 0 (WiFi On, All Power Save Off)

4.19.17 'ZR' Reset Module

Software reset of the module. The equivalent of using the RTSN pin.

Usage: ZR<CR>

Default Value: None

4.19.18 'ZU' Firmware Upgrade (M3G Only, uses STM32F205 boot loader)

Starts the STM32F205 built in boot loader to upgrade the firmware.

Usage: ZU<CR>

Default Value: None

.

4.19.19 'ZV' Set OTA Method

Selects the method for the OTA download.

Usage: ZV=<Value><CR>

Value	Space
0	Internet Server
1	Reserved

Default Value: None

4.19.20 'Z?' Show System Settings

Returns current system settings.

Usage: Z?<CR>

Field	1	2	3	4	5	6	7
Function	Config-ration	WPS Pin	VID/PID	MAC	AP IP Address	PS Mode	Radio Mode

Field	8	9	10
Function	Current Beacon	Previous Beacon	Product Name

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. Areas covered include Changing the Baud Rate, Scanning for Access Points, Joining Networks and 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 into 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 rate depending on the baud rate 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
>
```

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.

5.3 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 defined IP Address can also be used. Refer to the sections 4.6.4, 4.6.6, and 4.6.7 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
>
```

Turn on auto connect

"CC"

Save settings in Flash above:

"Z1"

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 Protocol

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 Communication Socket:

```
> P0=0
OK
```

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
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 Communication Socket:

```
> P0=0
OK
```

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
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
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 Communication Socket:

```
> P0=0
OK
```

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
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. Appendix A

Country	Code	Country	Code	Country	Code
AFGHANISTAN	AF	GREECE	GR	OMAN	OM
ALBANIA	AL	GRENADA	GD	PAKISTAN	PK
ALGERIA	DZ	GUADELOUPE	GP	PALAU	PW
AMERICAN_SAMOA	AS	GUAM	GU	PANAMA	PA
ANGOLA	AO	GUATEMALA	GT	PAPUA_NEW_GUINEA	PG
ANGUILLA	AI	GUERNSEY	GG	PARAGUAY	PY
ANTIGUA_AND_BARBUDA	AG	GUINEA	GN	PERU	PE
ARGENTINA	AR	GUINEA_BISSAU	GW	PHILIPPINES	PH
ARMENIA	AM	GUYANA	GY	POLAND	PL
ARUBA	AW	HAITI	HT	PORTUGAL	PT
AUSTRALIA	AU	HOLY_SEE_VATICAN_CITY_STATE	VA	PUETO_RICO	PR
AUSTRIA	AT	HONDURAS	HN	QATAR	QA
AZERBAIJAN	AZ	HONG_KONG	HK	REUNION	RE
BAHAMAS	BS	HUNGARY	HU	ROMANIA	RO
BAHRAIN	BH	ICELAND	IS	RUSSIAN_FEDERATION	RU
BAKER_ISLAND	0B	INDIA	IN	RWANDA	RW
BANGLADESH	BD	INDONESIA	ID	SAINT_KITTS_AND_NEVIS	KN
BARBADOS	BB	IRAN_ISLAMIC_REPUBLIC_OF	IR	SAINT_LUCIA	LC
BELARUS	BY	IRAQ	IQ	SAINT_PIERRE_AND_MIQUELON	PM
BELGIUM	BE	IRELAND	IE	SAINT_VINCENT_AND_THE_GRENADINES	VC
BELIZE	BZ	ISRAEL	IL	SAMOA	WS
BENIN	BJ	ITALY	IT	SANIT_MARTIN_SINT_MARTEEN	MF
BERMUDA	BM	JAMAICA	JM	SAO_TOME_AND_PRINCIPE	ST
BHUTAN	BT	JAPAN	JP	SAUDI_ARABIA	SA
BOLIVIA	BO	JERSEY	JE	SENEGAL	SN
BOSNIA_AND_HERZEGOVINA	BA	JORDAN	JO	SERBIA	RS
BOTSWANA	BW	KAZAKHSTAN	KZ	SEYCHELLES	SC
BRAZIL	BR	KENYA	KE	SIERRA_LEONE	SL
BRITISH_INDIAN_OCEAN_TERRITORY	IO	KIRIBATI	KI	SINGAPORE	SG
BRUNEI_DARUSSALAM	BN	KOREA_REPUBLIC_OF	KR	SLOVAKIA	SK
BULGARIA	BG	KOSOVO	0A	SLOVENIA	SI
BURKINA_FASO	BF	KUWAIT	KW	SOLOMON_ISLANDS	SB
BURUNDI	BI	KYRGYZSTAN	KG	SOMALIA	SO
CAMBODIA	KH	LAO_PEOPLES_DEMOCRATIC_REPUBIC	LA	SOUTH_AFRICA	ZA
CAMEROON	CM	LATVIA	LV	SPAIN	ES
CANADA	CA	LEBANON	LB	SRI_LANKA	LK
CAPE_VERDE	CV	LESOTHO	LS	SURINAME	SR
CAYMAN_ISLANDS	KY	LIBERIA	LR	SWAZILAND	SZ
CENTRAL_AFRICAN_REPUBLIC	CF	LIBYAN_ARAB_JAMAHIRIYA	LY	SWEDEN	SE
CHAD	TD	LIECHTENSTEIN	LI	SWITZERLAND	CH
CHILE	CL	LITHUANIA	LT	SYRIAN_ARAB_REPUBLIC	SY
CHINA	CN	LUXEMBOURG	LU	TAIWAN_PROVINCE_OF_CHINA	TW
CHRISTMAS_ISLAND	CX	MACAO	MO	TAJIKISTAN	TJ
COLOMBIA	CO	MACEDONIA_FORMER_YUGOSLAV_REPUBLIC_OF	MK	TANZANIA_UNITED_REPUBLIC_OF	TZ
COMOROS	KM	MADAGASCAR	MG	THAILAND	TH
CONGO	CG	MALAWI	MW	TOGO	TG
CONGO_THE_DEMOCRATIC_REPUBLIC_OF_THE	CD	MALAYSIA	MY	TONGA	TO
COSTA_RICA	CR	MALDIVES	MV	TRINIDAD_AND_TOBAGO	TT
COTE_DIVOIRE	CI	MALI	ML	TUNISIA	TN
CROATIA	HR	MALTA	MT	TURKEY	TR
CUBA	CU	MAN_ISLE_OF	IM	TURKMENISTAN	TM
CYPRUS	CY	MARTINIQUE	MQ	TURKS_AND_CAICOS_ISLANDS	TC
CZECH_REPUBLIC	CZ	MAURITANIA	MR	TUVALU	TV

Country	Code	Country	Code	Country	Code
DENMARK	DK	MAURITIUS	MU	UGANDA	UG
DJIBOUTI	DJ	MAYOTTE	YT	UKRAINE	UA
DOMINICA	DM	MEXICO	MX	UNITED_ARAB_EMIRATES	AE
DOMINICAN_REPUBLIC	DO	MICRONESIA_FEDERATED_STATES_OF	FM	UNITED_KINGDOM	GB
ECUADOR	EC	MOLDOVA_REPUBLIC_OF	MD	UNITED_STATES	US
EGYPT	EG	MONACO	MC	UNITED_STATES_REV4	US
EL_SALVADOR	SV	MONGOLIA	MN	UNITED_STATES_NO_DFS	Q2
EQUATORIAL_GUINEA	GQ	MONTENEGRO	ME	UNITED_STATES_MINOR_OUTLYING_ISLANDS	UM
ERITREA	ER	MONTSERRAT	MS	URUGUAY	UY
ESTONIA	EE	MOROCCO	MA	UZBEKISTAN	UZ
ETHIOPIA	ET	MOZAMBIQUE	MZ	VANUATU	VU
FALKLAND_ISLANDS_MALVINAS	FK	MYANMAR	MM	VENEZUELA	VE
FAROE_ISLANDS	FO	NAMIBIA	NA	VIET_NAM	VN
FIJI	FJ	NAURU	NR	VIRGIN_ISLANDS_BRITISH	VG
FINLAND	FI	NEPAL	NP	VIRGIN_ISLANDS_US	VI
FRANCE	FR	NETHERLANDS	NL	WALLIS_AND_FUTUNA	WF
FRENCH_GUINA	GF	NETHERLANDS_ANTILLES	AN	WEST_BANK	0C
FRENCH_POLYNESIA	PF	NEW_CALEDONIA	NC	WESTERN_SAHARA	EH
FRENCH_SOUTHERN_TERRITORIES	TF	NEW_ZEALAND	NZ	YEMEN	YE
GABON	GA	NICARAGUA	NI	ZAMBIA	ZM
GAMBIA	GM	NIGER	NE	ZIMBABWE	ZW
GEORGIA	GE	NIGERIA	NG		
GERMANY	DE	NORFOLK_ISLAND	NF		
GHANA	GH	NORTHERN_MARIANA_ISLANDS	MP		
GIBRALTAR	GI	NORWAY	NO		

7. Document Revision History

Date	Name	Description	Revision	File Name
12/08/11	RES	Initial Creation	0.1	AT Command Set.docx
12/15/11	RES	Initial Release	1.0	AT Command Set r1.0.docx
12/15/11	SEP	Minor corrections/formatting	1.1	AT Command Set r1.1.docx
1/2/2012	RES	Added Usage Examples	1.2	AT Command Set r1.2.docx
3/12/2012	MFT	Changed Logo	1.3	AT Command Set r1.3.docx
11/21/2012	SEP	Update with new commands	1.4	AT Command Set r1.4.docx
2/5/2013	MFT	Update AT Command List	2.0	AT Command Set 2.0.docx
5/9/2013	SEP	Update AT Command List	2.1	AT Command Set 2.1.docx
6/16/2014	SEP	Updated for C2.4.0.X release	2.2	AT_Command_Set_ DOC_UM_20035-2.2.docx
3/10/2015	SEP	Updated for C2.5.0.X release	4.1	AT_Command_Set_ DOC_UM_20035-4.1.docx
5/21/2015	MFT	Streaming mode added	4.2	AT_Command_Set_ DOC_UM_20035-4.2.docx

Inventek Systems
2 Republic Road
Billerica, MA 01862
www.inventeksys.com