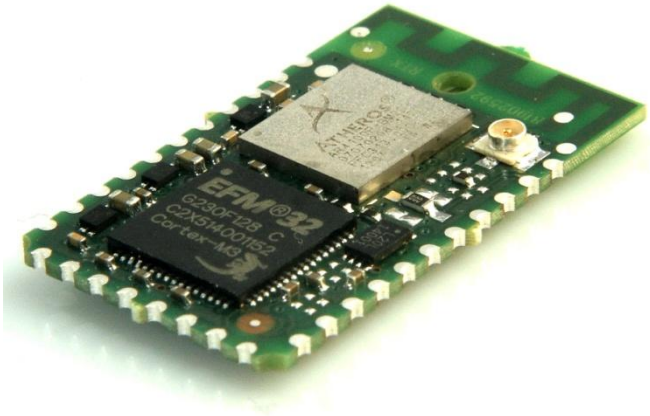
RTX41xx

Wi-Fi Module

Variants covered by this document:
RTX4100
RTX4140



User Guide UG1

Module Evaluation

CONTENT

1 Introduction

1.1 General Description

The RTX41xx (RTX4100 or RTX4140) Wi-Fi Module is a small form-factor, single stream, 802.11b/g/n Wi-Fi module with on-board low power application processor. It is targeted at applications that send infrequent data packets over the network. Typically, 802.11 applications addressed by a RTX41xx module will place a priority on low power consumption, ease of development, and system integration.

This document serves as a quick start guide for installing and using the tools necessary for evaluating the Wireless Sensor Application Board (WSAB) and RTX41xx. The information in this document does not cover building custom applications for the RTX41xx using the SDK.

1.2 Document History

V1.0 Official release	MAD	2012-07-03
V1.1 Detailed Installation procedure of FTDI cable	MAD	2012-08-15
V1.2 Update to match Terminal v1.49	MAD	2012-09-06
V1.3 Terminal Application updated including softAP	MAD	2012-09-11
V1.4 Ipconfig command updated	MAD	2012-10-02
V1.5 removed EVK references	TM	2013-02-19
V1.6 Added RTX4140	TM	2013-06-06

Disclaimer: This document can be subject to change without prior notice.

1.3 SW/HW Version

This document is applicable for the following versions.

- SDK Version 1.3.0.27 (or newer)
- Platform Version 1.3.0.22 (or newer)
- WSAB version V3RA (or newer)

1.4 Document References

[AN1]. RTX4100_Application_note_Current_Consumption_AN1.pdf.
[DS1]. RTX4100_Datasheet_DS1.pdf.
[DS2]. RTX4140_Datasheet_DS2.pdf.
[QS1]. RTX4100_Quick_Start_Guide_Readme_First_QS1.pdf.
[UG6]. RTX4100_User_Guide_WSAB_UG6.pdf.

2 RTX41xx Evaluation

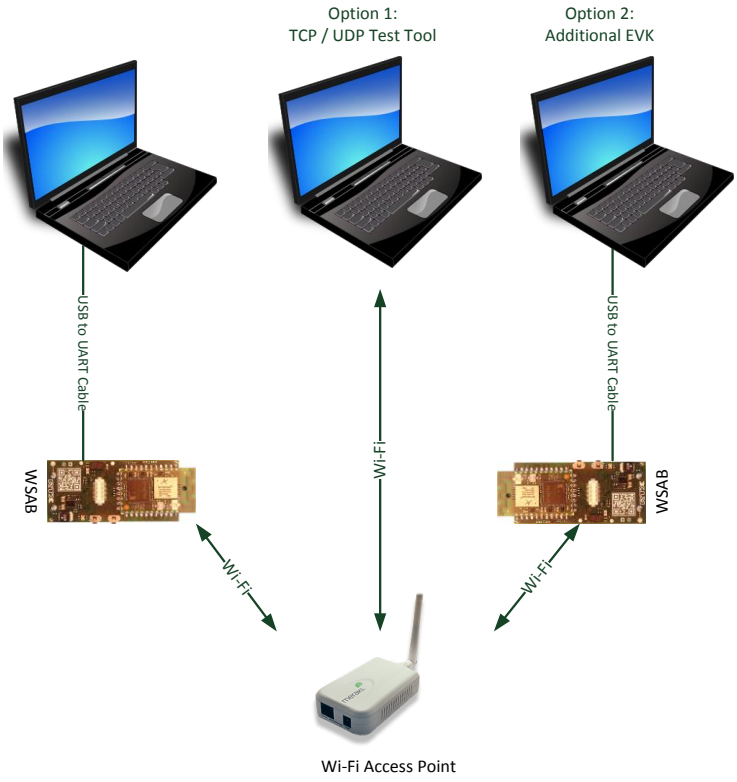
The RTX4100 and RTX4140 Development Kit (DVK) comes with one Wireless Sensor Application Board (WSAB) including a RTX4100/RTX4140 module. The RTX41xx module is pre-loaded with a simple application that allows you to connect your PC to a WSAB and control the WSAB Wi-Fi operation through a terminal reference application pre-loaded in the module.

Through the preloaded Terminal application in the RTX41xx, you can connect to another client or server on the network through a Wi-Fi Access Point, and send data with low speed and low power to the other device on the network.

This document describes how to setup and use the terminal reference application in order to evaluate the main features of the RTX41xx module.

If you have two DVKs, you can also connect to another RTX41xx on the same network, as illustrated below.

It is assumed that the DVK user has a Wi-Fi Access Point available.

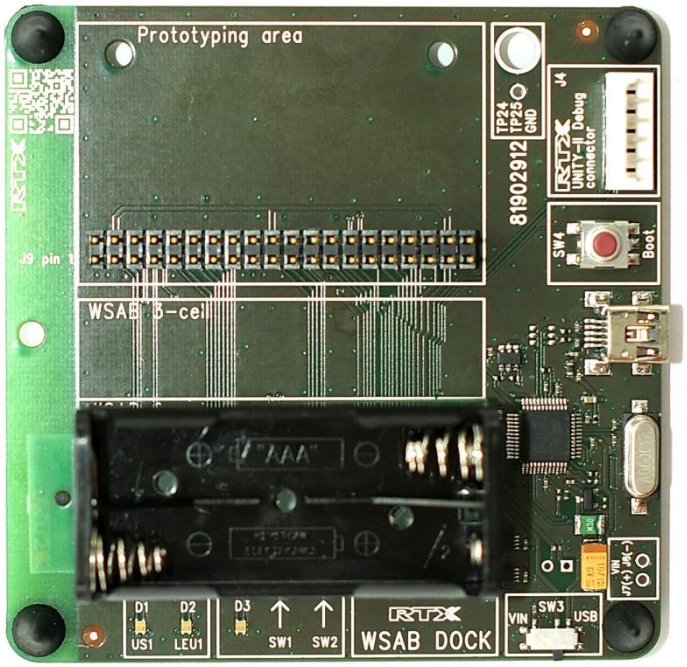


2.1 Power Consumption

Please refer to the Current Consumption Application Note ([AN1]) for information on current consumption figures.

3 Hardware installation

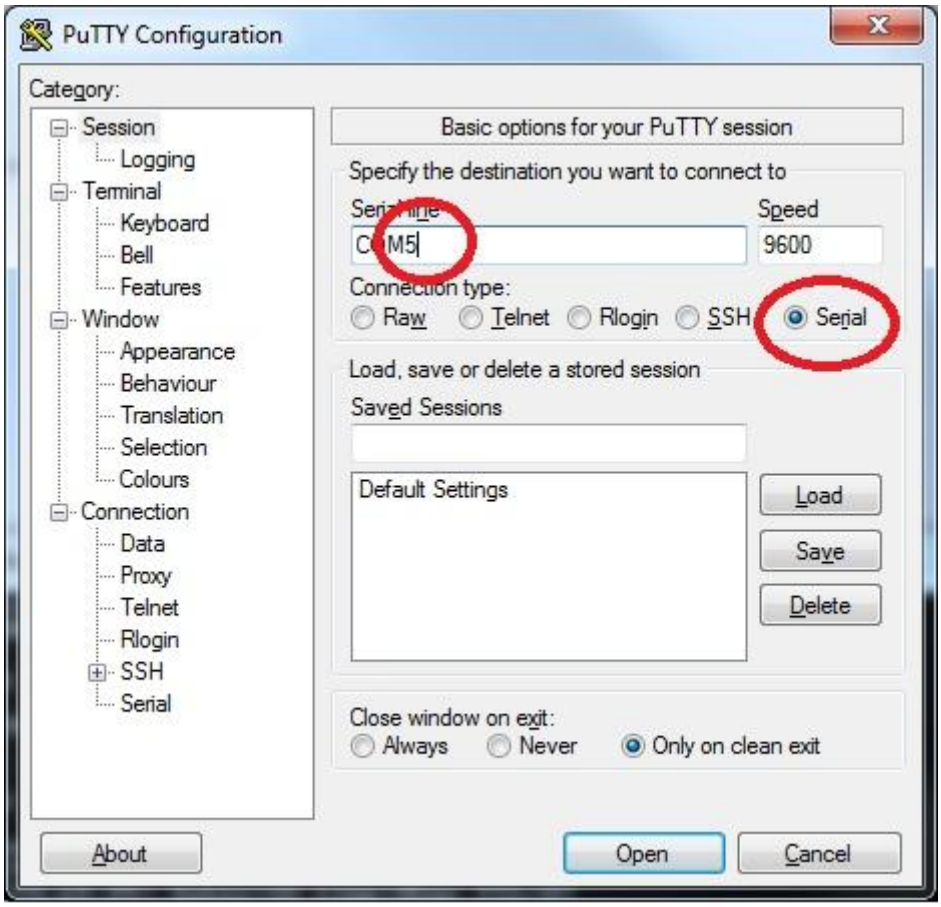
In order to follow this guide the WSAB, the Docking Station and the USB cable provided with the DVK is required. PC drivers must be installed on the PC, please refer to theTools Installation User Guide ([UG2]) for further installation instructions



4 Installing the PC Terminal Program

After installing the Virtual COM Port on your PC, it is time to install a PC terminal program.

The RTX41xx relies on a terminal program on the PC to communicate with the terminal application in the RTX41xx.
RTX recommends *Putty* (can be downloaded from www.putty.org). The screen shot below depicts the Putty setup screen. Select "Serial" and insert the correct COM port. The speed is 9600 bps.



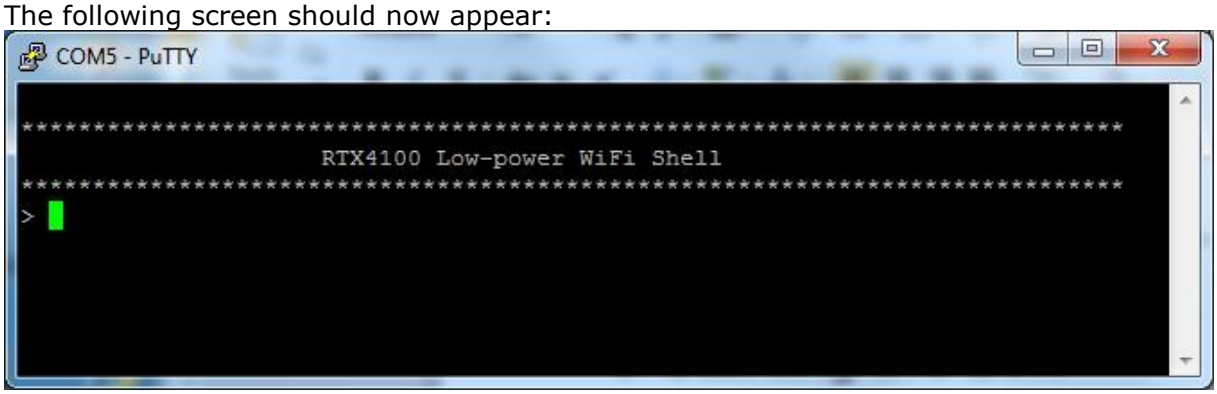
Click the "Open" button to launch the terminal screen.

5 Starting the Terminal Application

With Putty installed, follow the below steps to start-up the WSAB and the terminal application:

1. On the Docking Station set SW3 in 'VIN' position
2. On the WSAB set the power switch to 'EXT' position
3. Insert the WSAB into the Docking Station
4. Insert the USB cable into the Docking Station and to a free USB port on the PC
5. Launch Putty at 9600 bps and configure it for the correct COM port
6. On the Docking Station set SW3 in 'USB' position

The following screen should now appear:



Type `help` to show the available commands.

The following section explains the most important commands in details.

5.1 Important Commands

Important Note: The commands can take some parameters, defined between <>. When a parameter is *optional* it is defined between [<>].

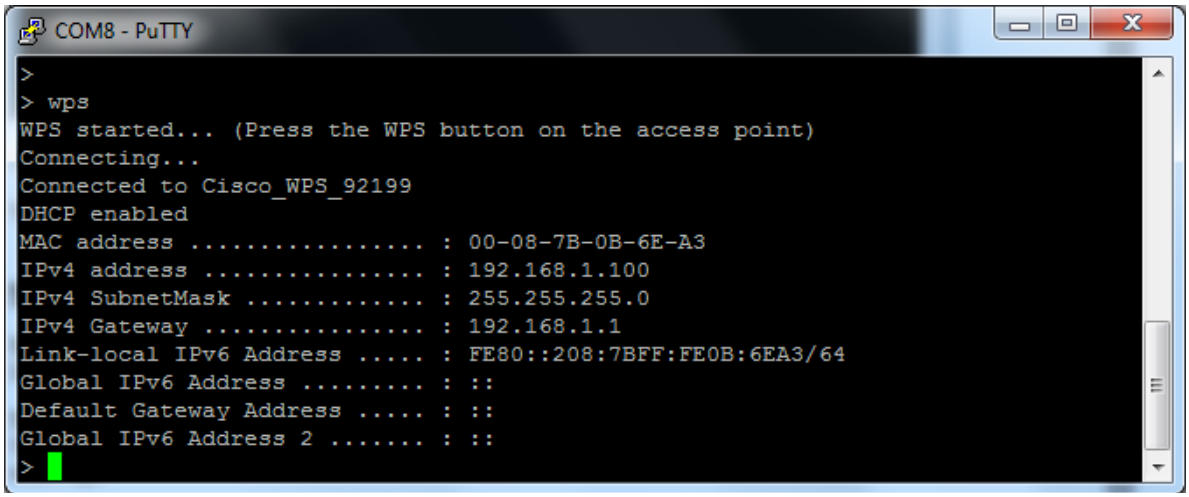
5.1.1 Scan

Scans for Access Points (SSID) nearby. A list will be shown with the available APs.

5.1.2 WPS

The RTX41xx terminal application always tries to connect to the latest known SSID during start-up.
The `WPS` command clears the internal list of SSIDs and initiates searching for WPS enabled Access Points. Send the `WPS` command and press the WPS button on your Access Point to connect using WPA2 authentication.

The figure below shows the WPS procedure and subsequent connect to an Access Point with SSID "Cisco_WPS_92199" (WPS button pressed on AP):



5.1.3 SNTP

The sntp command take the following argument:

```
sntp [<server name/IP>]
```

where:

`<server name/IP>` : needs to be a valid time server, e.g. Time1.Stupi.SE

If a time server is not given as an argument, the SNTP command will contact time.nist.gov using SNTP to get the current date and time in GMT format.

5.1.4 Ping

If you know the IP address, you can ping a host on the local net or the internet. In the example below, www.google.com is ping'ed.

5.1.5 Connect

The Connect command initiate an association to the last known Access Point and initiate the DHCP client procedure to obtain an IP address.

5.1.6 Disc

The Disc command will disconnect from the current Access Point.
Use the Connect command or power cycle to re-connect.

5.1.7 WiFi

The Wifi command can configure various parameters of the Wi-Fi connection.

The following configuration options are supported:

- `wifi on` : Turn Wifi ON.
- `wifi off` : Turn Wifi OFF.

- `wifi suspend <time>`
  `<time>` : Suspend time in ms.

- `wifi keepalive <time>`
  `<time>` : Interval in seconds when the module stay alive.
  Entering the command `wifi keepalive` without parameters will return the keep alive interval in seconds.

- `wifi txpower <dBm>`
  `<dBm>` : Transmission power in dBm.
  Entering the command `wifi txpower` without parameters will return the transmission power level.

- `wifi mode <mode>`
  `<mode>` : b, bg, g or n.
  Entering the command `wifi mode` without parameters will return the wifi mode:
  - 0x01 for b
  - 0x02 for b & g
  - 0x03 (or 0xff, default) for n
  - 0x04 for g

- `wifi listen <time>`
  `<time>` : Listen interval in ms.

Listen sets the listening interval from a WiFi STA (client). The listening interval (default value: 100 ms) can greatly affect the power consumption. Increasing to e.g. 1000 ms causes the power consumption to decrease but also affects the wake-up time of the Wi-Fi client when receiving data from the Access Point.
A too long listening interval also causes the WPS procedure to fail or take very long time, so use with caution.
Entering the command `wifi listen` without parameters will return the listening interval in miliseconds.

- `wifi setap <ssid> [<mode>] [<index>] [<key>]`

Setup manually a connection from your RTX4100 module to an AP,

where:
- `<ssid>` : SSID of the access point
- `<mode>` : Security mode; must be one of: none, wpa, wpa2, or wep
- `<index>` : WEP key index. Used for WEP only
- `<key>` : hex WEP key **or** pass phrase

Note: In WPA or WPA2 mode, the `[<index>]` parameter should be omitted (a '0' will return an error).

- `wifi setsoftap <ssid> <mode> <hidden> [<key>] [<channel> <inact> <country> <beacon>]`

Setup manually the parameter of your RTX4100 module to run it as a soft AP, where:

- `<ssid>` : SSID of the access point
- `<mode>` : Security mode; must be one of: none, wpa2
- `<hidden>` : '`true`' if you want the AP hidden, type anything else otherwise.
- `<key>` : Pass phrase (for wpa2 only), has to be at least 8 characters.
- `<channel>` : Central frequency of the channel used (2437 (channel 6) by default)
- `<inact>` : Connection inactivity period (5 minutes by default), time before the module gets disconnected.
- `<country>` : Country regulations parameter (FF (worldwide, minimum requirements) by default)
- `<beacon>` : Beacon interval (100ms by default)

Other RTX41xx modules will have to use the `ipconfig` command to fix a static IP, then use the `wifi setap` command to select the soft AP, and finally the `connect` command to establish the connection with this soft AP.

- `wifi psprofile <profile>`

Setup the state of power save mode in the module, where:

`<profile>` : Power save mode, either maxpower, high, medium or low.

maxpower: No power saving.
high: Set to power save with 200ms idle period.
medium: Set to power save with 100ms idle period.
low: Set to power save with 1ms idle period.

Entering the command `wifi psprofile` without parameters will return the profile currently in use:

- 0x00 for maxpower
- 0x01 for low
- 0x02 for medium
- 0x03 for high

Note: The settings are stored in NVS and will remain active after a power cycle.

5.1.8 Soft AP

The Soft AP command allows you to turn your RTX41xx module into a soft Access Point. Other modules can connect to it as they would any access point. While in Soft AP mode, the RTX41xx module cannot serve as a direct gateway to access Internet. The module can be either in client mode or AP mode (not both at same time).
To run your module as a soft AP, you first need to define its parameters using the command `wifi setsoftap`.
If the parameters have been set previously (e.g. before a power cycle), you can run it using the command `softap`.

5.1.9 Tcp

The tcp command takes the following arguments:

```
tcp server <port> [<mode>] [<s>] [<n>] [<d>]
```

The tcp server command sets a TCP server listening at a specific port number.

```
tcp client <IP> <port> [<mode>] [<s>] [<n>] [<d>]
```

The tcp client command will establish a TCP/IP connection to a server,

where:

- `<IP>` : Destination IP <A.B.C.D>
- `<port>` : Destination port
- `<mode>` : Send, receive (default), or uart
- `<s>` : Packet size in bytes (for send only)
- `<n>` : Number of packets (for send only)
- `<d>` : Number of ms to wait between each TX (for send only)

The mode option (if omitted: receive) will operate as follows:

- `<mode>` = send: When connected to a remote IP device, the local device will send 'n' packets with 's' bytes in each packet to the other device and stop (n = 0: Infinite number of packets).

- `<mode>` = receive (default): When connected to remote a IP device, the local device will listen for incoming packets, and print a '.' for each packet received on port.

- `<mode>` = uart: Characters received on the terminal will be sent to a remote IP device, and characters received on TCP connection will be echoed to the terminal.

Example:

```
>tcp client 192.168.1.100 10000 uart
```

Establishes a TCP connection to a server listening at 192.168.1.100, port 10000 and connects the terminal program to send and receive characters.

5.1.10 Udp

The udp command takes the following arguments:

```
udp server <port> [<mode>]
```

The udp server command sets a UDP server listening at a specific port number.

```
udp client <IP> <port> [<mode>] [<s>] [<n>] [<d>]
```

The udp client command will establish a UDP/IP connection to a server,

where:

- `<IP>` : Destination IP <A.B.C.D>
- `<port>` : Destination port
- `<mode>` : Send (client only), receive (default – server only), or uart
- `<s>` : Packet size in bytes (for send only)

- <n> : Number of packets (for send only)
- <d> : Number of ms to wait between each TX (for send only)

The mode option (if omitted: receive) will operate as follows:

- <mode> = send (client only): When connected to a remote IP device, the local device will send 'n' packets with 's' bytes in each packet to the other device and stop (n = 0: Infinite number of packets).

- <mode> = receive (default, server only): When connected to remote a IP device, the local device will listen for incoming packets, and print a '.' for each packet received on port.

- <mode> = uart: Characters received on the terminal will be sent to a remote IP device, and characters received on TCP connection will be echoed to the terminal.

Example:

```
>udp client 192.168.1.100 10000 uart
```
Establishes a UDP connection to a server listening at 192.168.1.100, port 10000 and connects the terminal program to send and receive characters.

5.1.11 Dns

The dns command takes the following arguments:

```
dns add <ip>
dns resolve <name> <type>
dns resolvecname <name>
```

where,
- <ip> : Destination IP <A.B.C.D>
- <name> : Address of the webpage to resolve
- <type> : ipv4 (default) or ipv6

Note: only IPV4 is supported at this stage.

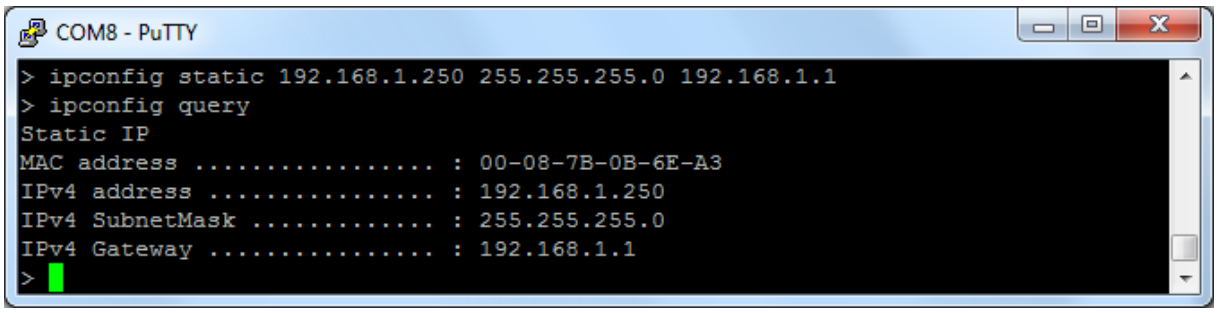
5.1.12 ipconfig

The ipconfig command allows you to monitor the ip configuration of your module. The command takes the following arguments:

```
ipconfig query
ipconfig dhcp
ipconfig static <IP> [<subnet> <gateway>]
```

where,

- `<IP>` : IP address of the module <A.B.C.D>
- `[<subnet>]`: Subnet mask <A.B.C.D> (*by default 255.255.255.0*)
- `[<gateway>]`: Gateway IP address <A.B.C.D> (*by default 192.168.1.1*)



The static IP is stored in the NVS, so that it remains valid after a power cycle. If you want to have an automatic IP again, use the command `ipconfig dhcp`.

5.1.13 Version

Prints the current SW version number.

5.1.14 Led

Turns ON or OFF the WSAB LED functionality. Make sure to turn OFF during current measurements.

```
led <on|off>
```

5.1.15 lfcal

The lf clock in the RTX4100 module is calibrated to the hf clock with regular intervals. Calibration period can be set between 1 to 3600 seconds.

Caution: setting timeout to 0 turns OFF the calibration. This could make the UART communication to the PC fail due to baudrate mismatch.

```
lfcal <timeout [secs]>
```

6 PC Tool for TCP and UDP Test

If you have one DVK only, the DVK can be used with a PC tool for testing the TCP and UDP connections.

A GUI based tool for Windows™ can be downloaded free of charge from
www.simplecomtools.com

SKU: FW_TCPTESTTOOL

http://www.simplecomtools.com/ProductCart/pc/viewPrd.asp?idproduct=7&idcategory=5

This allows you to send and receive both TCP and UDP packets.

Note: When sending data from the DVK to a PC running the test tools, please observe your local firewall status. This may prevent incoming connection (for TCP) or even receiving data. A good test is to try to "ping" from the DVK to the IP address of your PC. If this ping fails, you most likely have a firewall enabled on your PC, and it should be disabled for the test to work properly.

7 Changing Antenna Configurations

The Wireless Sensor Application Board can easily be modified to support the external U.FL antenna connector or edge connector.
Refer to the WSAB User Guide for instructions ([UG6]).

8 Abbreviations

The following abbreviations are used in this document:

API	**Application Programming Interface**
BSP	**Board Support Package**
CoLA	**Co-Located Application**
DVK	**Development Kit**
SDK	**Software Development Kit**
UART	**Universal Asynchronous Receiver/Transmitter**
Wi-Fi	**Wireless Fidelity**
WSAB	**Wireless Sensor Application Board**

9 Liability Disclaimer

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