RS-CY8C001-220X – Wi-Fi® Expansion Board Kit for PSoC® 3/5 Development Kits

User Guide

Version 1.4

Feb 2012

Redpine Signals, Inc.
2107 N.First Street, #680
San Jose, CA95131.
Tel: (408) 748-3385
Fax: (408) 705-2019
Email: info@redpinesignals.com
Website: www.redpinesignals.com

Disclaimer:

The information in this document pertains to information related to Redpine Signals, Inc. products. This information is provided as a service to our customers, and may be used for information purposes only.
Redpine assumes no liabilities or responsibilities for errors or omissions in this document. This document may be changed at any time at Redpine's sole discretion without any prior notice to anyone. Redpine is not committed to updating this document in the future.

About this Document

This document contains details on how to use the RS-CY8C001-220X Wi-Fi Expansion Board Kit for PSoC 3/5 Development Kits.

Table Of Contents

Table of Figures

Table of Tables

1 Introduction

The RS-CY8C001-220X Wi-Fi Expansion Board Kit (EBK) is an expansion board that is designed to work with the Cypress PSoC3® and PSoC5® development kits that have an expansion connector – CY8CKIT-001 (PSoC3/5), CY8CKIT-030 (PSoC3) and CY8CKIT-050 (PSoC5). It allows you to evaluate PSoC's Wi-Fi interface capability by designing your own projects with an easy-to-use Wi-Fi component in Cypress's PSoC Creator™, or altering sample projects provided with this kit.

This document describes the usage of the EBK specifically with the CY8CKIT-001 DVK. Similar steps and procedure can be followed for the CY8CKIT-030 and CY8CKIT-050 DVK's.

The Wi-Fi EBK is based on the Redpine Signals' Connect-io-n™ module, RS9110-N-11-22, which is a complete IEEE 802.11bgn based wireless device server that directly provides a wireless interface to any equipment with a serial or SPI interface for data transfer. It integrates a MAC, baseband processor, RF transceiver with power amplifier, a frequency reference, and an antenna[1] in hardware; and all WLAN protocol and configuration functionality, networking stack in embedded firmware to make a fully self-contained 802.11n WLAN solution for a variety of applications.

The component provided as part of this EBK can also be used to interface with and configure the following modules from Redpine Signals' Connect-io-n family:

- RS9110-N-11-22 – Fully integrated, single-band (2.4 GHz) 802.11n module
- RS9110-N-11-24[2] – Small size, single-band (2.4 GHz) 802.11n module
- RS9110-N-11-26[2] – Fully integrated, dual-band (2.4 and 5 GHz) 802.11n module
- RS9110-N-11-28[2] – Small size, dual-band (2.4 and 5 GHz) 802.11n module

1.1 Kit Contents

This kit contains:

1. RS-CY8C001-220X Wi-Fi Expansion Board
2. Card providing link to the website that hosts the following
    a. Documentation
        i. Component Datasheet
        ii. User Guide (this document)

[1] Option for external antenna available using a u.FL connector on the module. Please refer to the module's datasheet for more details.
[2] The Wi-Fi EBK is presently not available with this module.

iii. Quick Start Guide

iv. PCB Design Files (Schematics and Gerber files)

v. RS9110-N-11-22 Module Datasheet

b. Firmware

i. Component

ii. Example Projects

iii. Wi-Fi Library Source

iv. Wi-Fi Firmware Upgrade

c. Software

i. GUI application

Inspect the contents of the kit and software package. If you need support contact Redpine Signals at http://www.redpinesignals.com/Support

1.2 PSoC Creator

Cypress's PSoC Creator software is a state-of-the-art, easy-to-use software development Integrated Development Environment (IDE). It introduces a game-changing, hardware and software co-design environment based on classical schematic entry and revolutionary embedded design methodology.

With PSoC Creator, you can:

- Create and share user defined, custom peripherals using hierarchical schematic design.
- Automatically place and route select components and integrate simple glue logic normally residing in discrete muxes.
- Trade-off hardware and software design considerations allowing you to focus on what matters and get to market faster.

PSoC Creator also enables you to tap into an entire tools ecosystem with integrated compiler tool chains, RTOS solutions, and production programmers to support both PSoC 3 and PSoC 5.

1.3 Getting Started

To get started, refer to Chapter 3 for a description of the kit operation and how to program the PSoC 3/ PSOC 5 device. An example project is used to explain how to use the Wi-Fi EBK board with the CY8CKIT-001 DVK and PSoC5.Similar procedure is applicable to other projects that accompany the kit. Chapter 4 provides details of the hardware. Chapter 5 guides you to create simple example projects. The Appendix section provides the schematics and BOM associated with the expansion board.

1.4 Additional Learning Resources

Visit www.cypress.comfor additional learning resources in the form of data sheets, technical reference manual, and application notes.

Visit www.redpinesignals.com/Cypress for specific information on the EBK and additional learning resources.

2 Installation

2.1 Software Installation

Please ensure that you have installed the PSoC Programmer and PSoC Creator from the CY8C001-KIT DVK before using the software provided with this EBK. While installing the PSoC Programmer, please select Typical on the Installation Type window.

JRE (Java Runtime Environment) is required for the demo PC application provided along with this kit.

Copy the contents from the link provided in the card inside the kit box. kit. The rest of the document refers to the C:\RS-CY8C001-220X folder as the place where the downloaded contents are copied.

3 Example Projects

3.1 Introduction

The example projects for the RS-CY8C001-220X Wi-Fi EBK are designed to provide a quick understanding of how to use the Wi-Fi driver API to design the application as per user needs.

The example projects are provided in the C:\RS-CY8C001-220XV1.x.x\Firmware\ExampleProjects folder after extracting the contents of the package downloaded from the weblink.There are four example projects provided for the combinations of PSoC3 and PSoC5's communication with the Wi-Fi EBK over SPI and UART on the CY8CKIT-001 DVK. The example project for PSoC5 over SPI (LIB_TestPSoC5_SPI) present in the C:\RS-CY8C001-220X\Firmware\ExampleProjects\PSoC5_SPI folder is used as reference to explain the procedure in this section. A similar approach can be used to bring up the CY8CKIT-001 with PSoC5 over UART and PSoC3 over SPI/UART.

NOTE: The RS-CY8C001-220X EBK ships with firmware for the SPI interface. To change over to UART or to upgrade to a newer firmware, please follow the steps in Section 5.

The example projects allow you to perform the following tasks:

1. Configure the RS-CY8C001-220X Component's network parameters.
2. Connect the kit to an Access Point over Wi-Fi.
3. Connect the kit to a PC's TCP port through the Access Point.
4. Monitor the potentiometer connected to the PSoC on the DVK through a demo application on the PC over Wi-Fi.
5. Control the intensity of LED4 on the DVK through the demo application on the PC over Wi-Fi.
6. Measure the kit's transmit and receive throughputs for TCP and UDP.
7. Reconfigure the kit's network parameters over Wi-Fi from the demo application on the PC.

The details given in the sections below are for creating a network with an Access Point, a PC and the RS-CY8C001-220X EBK connected to the CY8CKIT-001 DVK, as shown in the image below.

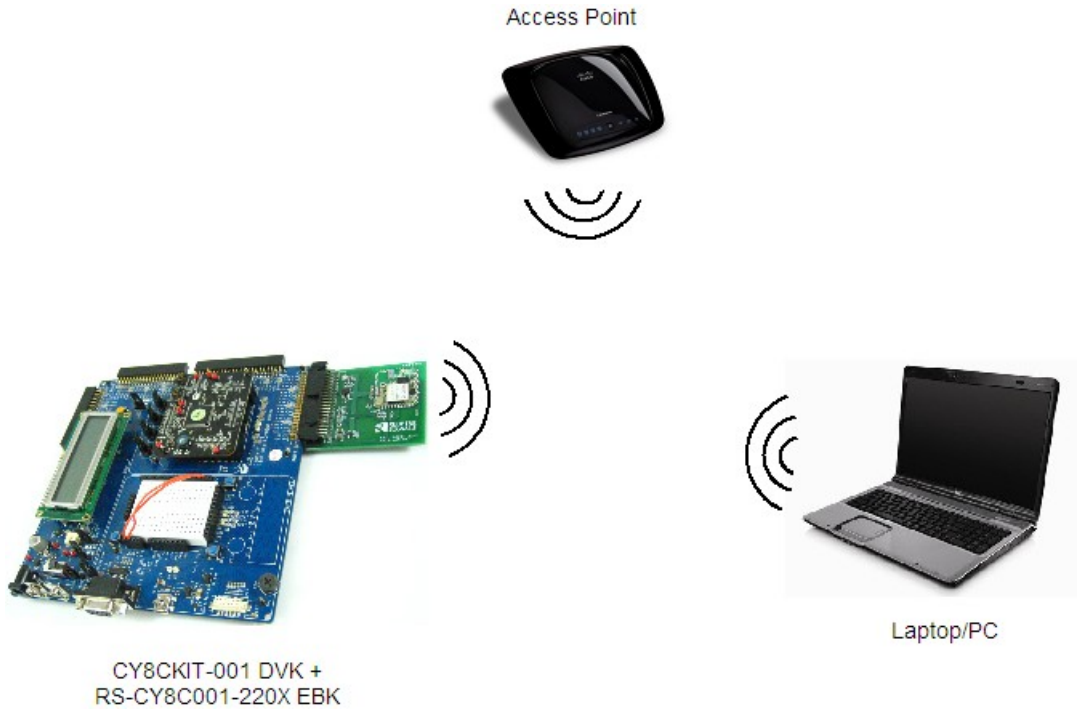


Figure 1: Test Setup 1

The other options available (though not discussed in this document) are as follows:

1. Access Point and two CY8CKIT-001 + RS-CY8C001-220X Kits

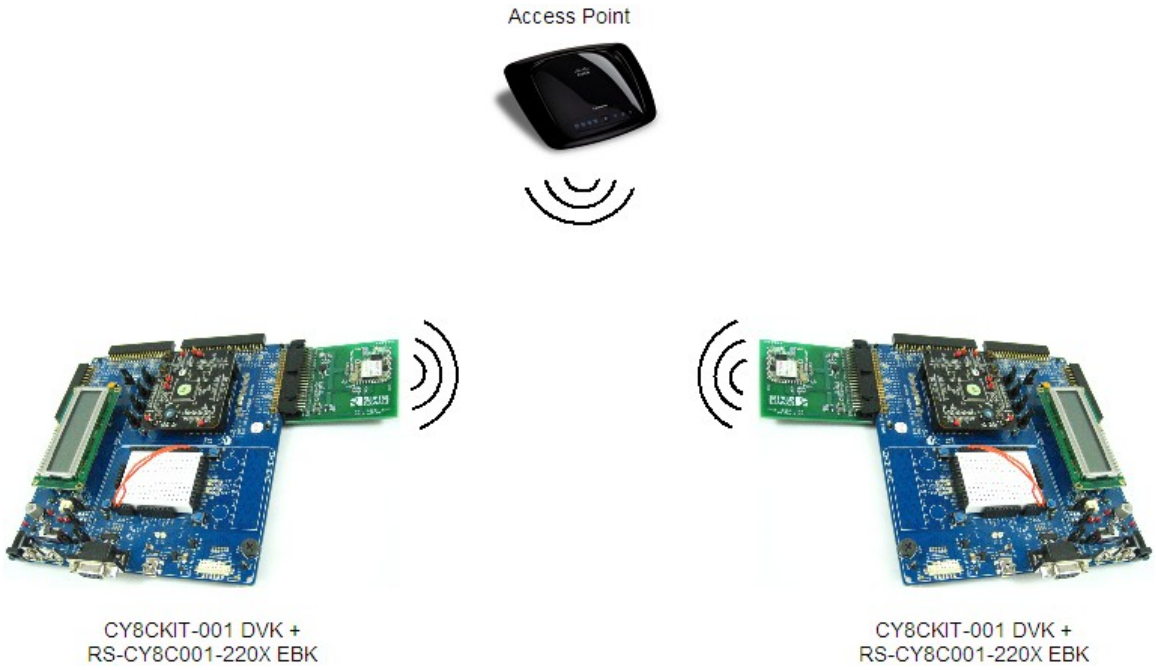


Figure 2: Test Setup 2

2. Two CY8CKIT-001 + RS-CY8C001-220X Kits without any Access Point (connected through an IBSS network).

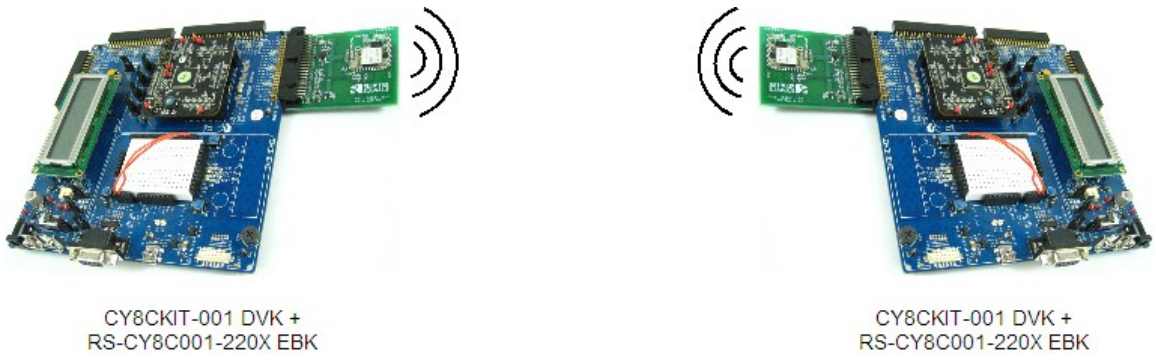


Figure 3: Test Setup 3

3. A CY8CKIT-001 + RS-CY8C001-220X Kit with an Laptop/PC without any Access Point (connected through an IBSS network).

Figure 4: Test Setup 4

NOTE: Test setups 2, 3, 4 can be setup by appropriately configuring the RS-CY8C001-220X Component in the Example Projects. Please refer to the Component Datasheet for more details on the Configuration Parameters.

3.2 Example Project 1: LIB_TestPSoC5_SPI

3.2.1 Project Description

The RS-CY8C001-220X Wi-Fi EBK plugs into the PortB expansion header of the CY8CKIT-001 platform. The Wi-Fi module interfaces with the PSoC device over UART or SPI interfaces. The PSoC device shall be capable of controlling power and reset of the Wi-Fi module.

3.2.2 PSoC Creator Project

The image below shows the components imported into the example project.

They include:

1. RS-CY8C001-220X
2. ADC_DelSig
3. PWM
4. TIMER
5. EEPROM

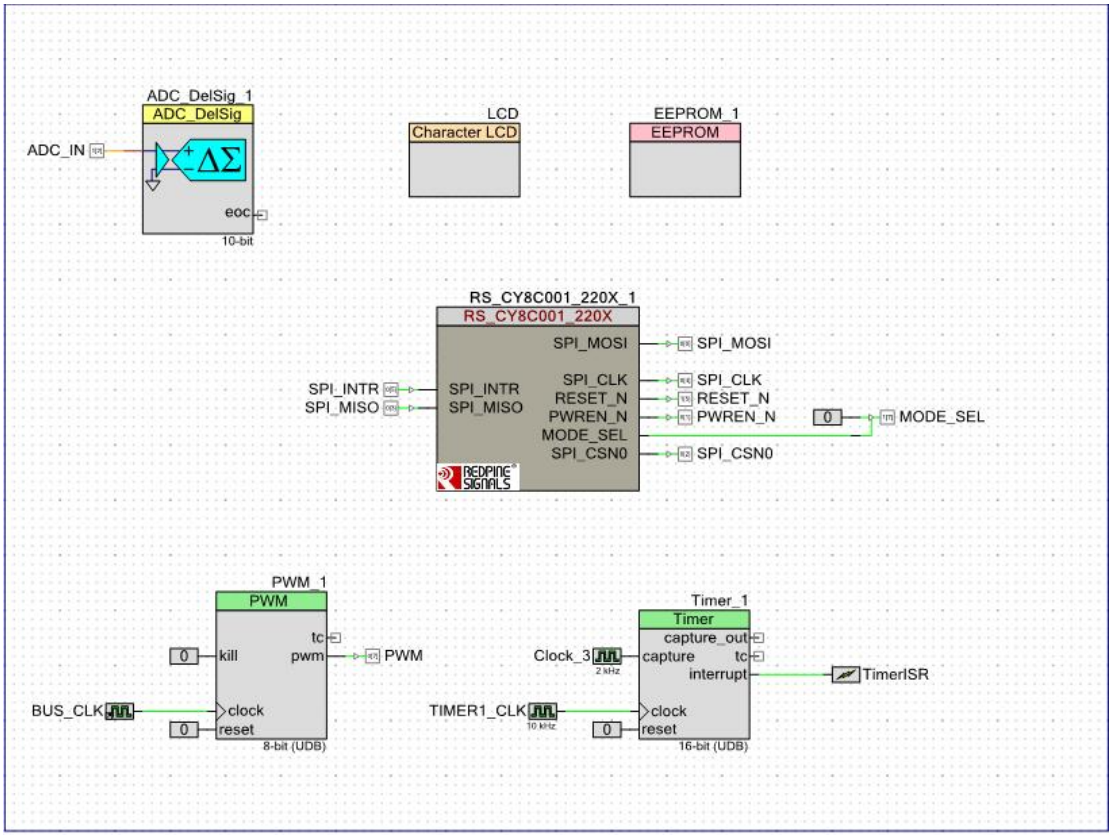


Figure 5: PSoC Creator

3.2.2.1 RS_CY8C001_220X

The RS_CY8C001_220X is the core component in this example project. This component interfaces with the Wi-Fi EBK module and thereby provides Wi-Fi connectivity to the PSoC. The component provides flexibility to choose between PSoC device architectures across SPI or UART interface. The component also provides a configuration window for Wi-Fi and other network related parameters' configuration to make the PSoC device connect to an 802.11 based network. The component provides all the signals necessary to drive the Wi-Fi EBK module.

To configure the RS_CY8C001_220X component, double click on the component. A configuration window appears. The Configuration window as two tabs – Basic and Advanced – whose parameters are explained in the sections below.

3.2.2.1.1Basic Tab

The image below shows a screenshot of the Basic tab.

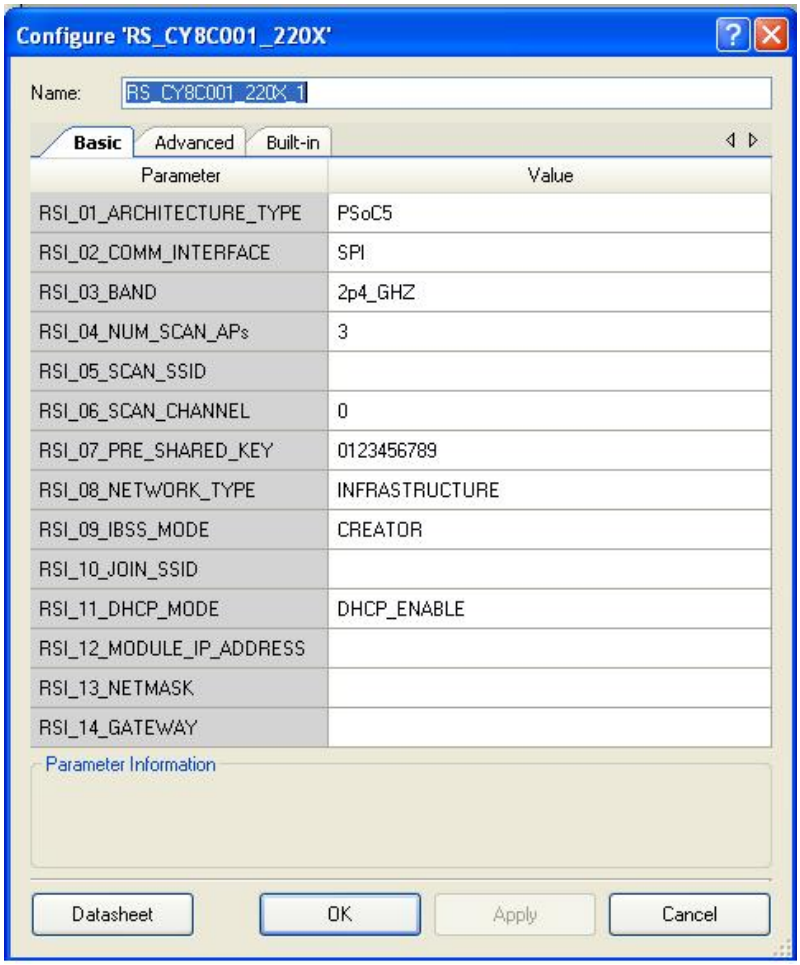


Figure 6: Basic Tab of the RS-CY8C001-220X Configuration Window

The table below describes each parameter of the Basic tab and the possible options for each of them.

Parameter	Options	Description
RSI_01_ARCHITECTURE_TYPE	PSoC3 PSoC5	This option selects whether the component has to be compiled for PSoC3 or PSoC5.
RSI_02_COMM_INTERFACE	SPI UART	This option selects whether the component has to use UART or SPI to communication with the RS9110-N-11-22 module.
RSI_03_BAND	2p4_GHZ 5_GHZ	This option selects whether the Wi-Fi module has to operate in the 2.4GHz or 5GHz band. This option is NOT valid for the RS9110-N-11-22 module which is present on the

Parameter	Options	Description
		RS-CY8C001-220X EBK since that module operates only in the 2.4GHz band. This option is valid only when the RS9110-N-11-26 and RS9110-N-11-28 modules are used which are dual band modules.
RSI_04_NUM_SCAN_APs	1-5	This option allows the user to configure the Wi-Fi module to scan only configured number of access points at a time. PSoC 3/5 SRAM space can be efficiently utilized using this option. This parameter is used only for UART interface.
RSI_05_SCAN_SSID	<string of ASCII characters less than 32 characters in length>	This option allows the user to configure the Wi-Fi module to scan for a particular SSID, especially when the SSID is not being broadcasted. This field can be left empty if the module has to be configured to scan all available networks.
RSI_06_SCAN_CHANNEL	0 to 11	This the channel in which the module will scan for Wi-Fi networks. Selecting 0 configures the module to scan in all channels from 1 to 11. Selecting any other number configures the module to scan in that particular channel.
RSI_07_PRE_SHARED_KEY	<string of characters>	This is the pre-shared key or passphrase for connecting to secure networks. The module supports WEP, WPA/WPA2 (AES & TKIP) security modes. For WEP-64bit, the input has to be a 10-digit hexadecimal number, e.g., 098765ABCD. For WEP-128bit, the input has to be a 26-digit hexadecimal number, e.g., 0123456789ABCDEF0123456789. For WPA/WPA2, the input has to be a string of ASCII characters, less than 32 characters in length.

Parameter	Options	Description
RSI_08_NETWORK_TYPE	INFRASTRUCTURE IBSS	This option selects whether the module connects to an Access Point (INFRASTRUCTURE) or, connects to or creates an Adhoc (IBSS) network. If IBSS is selected, the Advanced tab contains more parameters for the channel, security, etc., that need to be configured for the IBSS network.
RSI_09_IBSS_MODE	CREATOR JOINER	This parameter is valid only if "IBSS" is selected for the RSI_07_NETWORK_TYPE parameter. This option decides whether the Wi-Fi module has to create a new IBSS network or join an existing IBSS network.
RSI_10_JOIN_SSID	<string of ASCII characters less than 32 characters in length>	This parameter configures the Wi-Fi module to connect to a Wi-Fi network (Infrastructure or existing IBSS) or create an IBSS network depending on the inputs selected for the other parameters.
RSI_11_DHCP_MODE	DHCP_DISABLE DHCP_ENABLE	This parameter configures the module to use DHCP to acquire an IP address or to use a static IP address. If IBSS is selected for NETWORK_TYPE, then DHCP_MODE has to be set to DHCP_DISABLE.
RSI_12_MODULE_IP_ADDRESS	<4-byte dot-decimal format>	This parameter is the static IP address to be assigned to the module if DHCP is disabled.
RSI_13_NETMASK	<4-byte dot-decimal format>	This parameter is the subnet mask to be assigned to the module if DHCP is disabled.
RSI_14_GATEWAY	<4-byte dot-decimal format>	This parameter is the gateway IP address to be assigned to the module if DHCP is disabled.

Table 1: Configuration Options for Basic Tab

3.2.2.1.2 Advanced Tab

The image below shows a screenshot of the Advanced tab of the Configuration window.

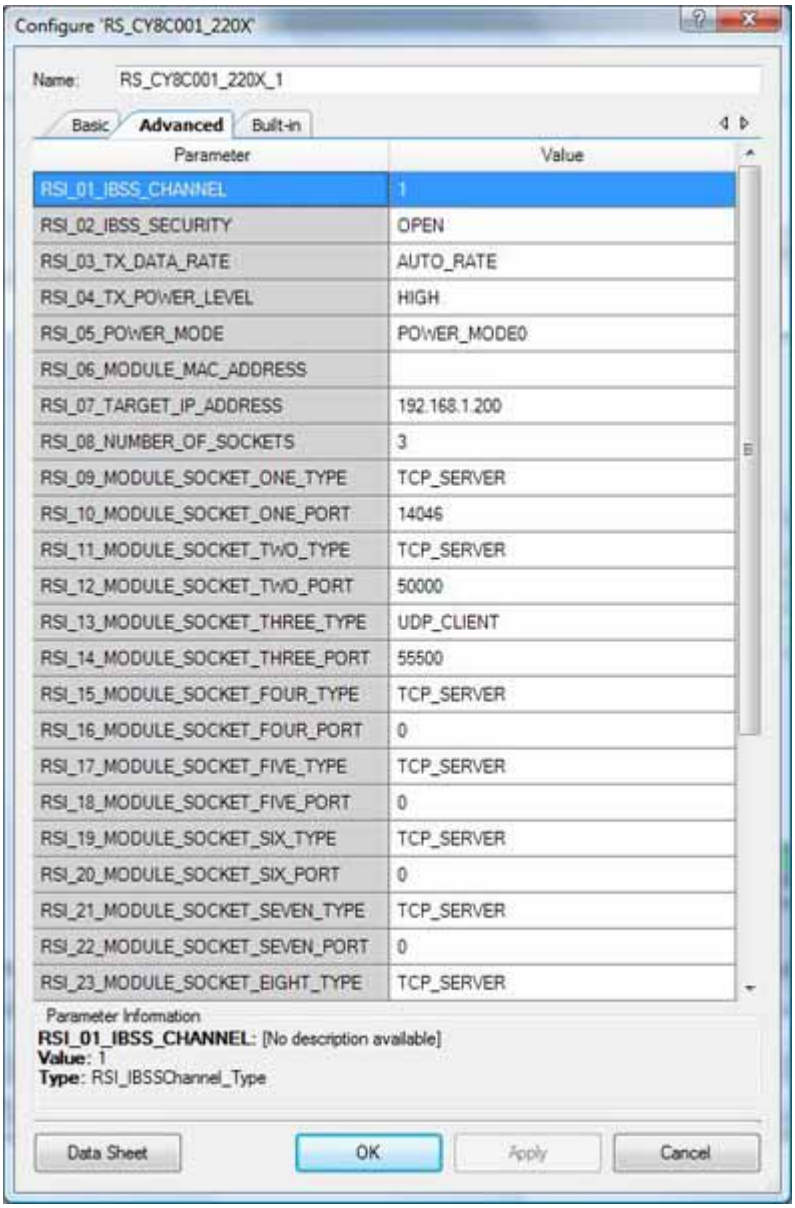


Figure 7: Advanced Tab of the RS-CY8C001-220X Configuration Window

The table below describes each parameter of the Advanced tab and the possible options for each of them.

Parameter	Options	Description
RSI_01_IBSS_CHANNEL	1 to 11	This parameter sets the channel in which the module will create an IBSS network. This parameter is

Parameter	Options	Description
		valid only if the NETWORK_TYPE parameter is set to IBSS and IBSS_MODE is set to CREATOR.
RSI_02_IBSS_SECURITY	OPEN WEP	The module supports WEP security mode (64 and 128-bit) in IBSS. This parameter selects whether the IBSS network is Open or Secure (WEP). This parameter is valid only if NETWORK_TYPE is set to IBSS.
RSI_03_TX_DATA_RATE	Auto Rate 802.11b rates – 1, 2, 5.5 & 11 Mbps 802.11g rates – 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n rates – MCS0 to MCS7	This parameter selects the Transmit Data Rate to be used by the module for data packets.
RSI_04_TX_POWER_LEVEL	HIGH MEDIUM LOW	This parameter selects the transmit power level of the Wi-Fi module. 'HIGH' configures the module to use a transmit power level of greater than 14dB. MEDIUM configures the module to use a transmit power level between 10 and 14dB. LOW configures the module to use a transmit power level between 6 and 10dB.
RSI_05_POWER_MODE	POWER_MODE0 POWER_MODE1 POWER_MODE2	This parameter configures the Power Save mode of the module. Power Mode 0 is for disabling Power Save. Power Mode 1 and Power Mode 2 enable different forms of Power Save. Please refer to the module's datasheet for more details on each of these power modes.
RSI_06_MODULE_MAC_ADDRESS	<6-byte hexadecimal	This parameter is used to override the MAC address stored in the

Parameter	Options	Description
	number, each byte separated by a ':' >	module's non-volatile memory. This field can be left empty if module has to use its own MAC address.
RSI_07_TARGET_IP_ADDRESS	<4-byte dot-decimal format>	This parameter sets the IP address of the remote PC/Laptop with which the module tries to establish TCP or UDP connections based on the socket parameters once the Wireless connection is established with an Access Point.
RSI_08_NUMBER_OF_SOCKETS	1 to 8	This parameter sets the number of sockets that the module has to open. The module supports a maximum of 8 sockets – these can be any combination of TCP Server or Client and UDP Server or Client.
RSI_09_MODULE_SOCKET_ONE_TYPE RSI_10_MODULE_SOCKET_ONE_PORT . . . RSI_23_MODULE_SOCKET_EIGHT_TYPE RSI_24_MODULE_SOCKET_EIGHT_PORT	Type: TCP_SERVER TCP_CLIENT UDP_CLIENT Port: 0 to 65535	These parameters allow the user to configure the type of each socket (TCP_SERVER,TCP_CLIENT or UDP_CLIENT) and the port number to be assigned to them. The values are valid only for the number of sockets selected for the NUMBER_OF_SOCKETS parameter.
RSI_25_TARGET_ONE_PORT . . . RSI_32_TARGET_EIGHT_PORT	0 to 65535	These parameters allow the user to configure the port numbers of the TCP or UDP connections on the remote PC/Laptop whose IP address is configured in the TARGET_IP_ADDRESS parameter.
RSI_33_MAX_PAYLOAD	PSoC3: 1 to 544 PSoC5: 1 to 1400	This parameter configures the maximum size (in bytes) of the data payload that will be transmitted or received. This number depends on the amount of RAM available on the PSoC and hence, is different for PSoC3 and

Parameter	Options	Description
		PSoC5. The maximum payload allowed by the Wi-Fi module is 1400 bytes.

Table 2: Configuration Options for Advanced Tab

3.2.2.2 ADC

The ADC is used to sample an input voltage from the potentiometer on the DVK and control the intensity of a virtual bulb on a GUI running on a remote PC.

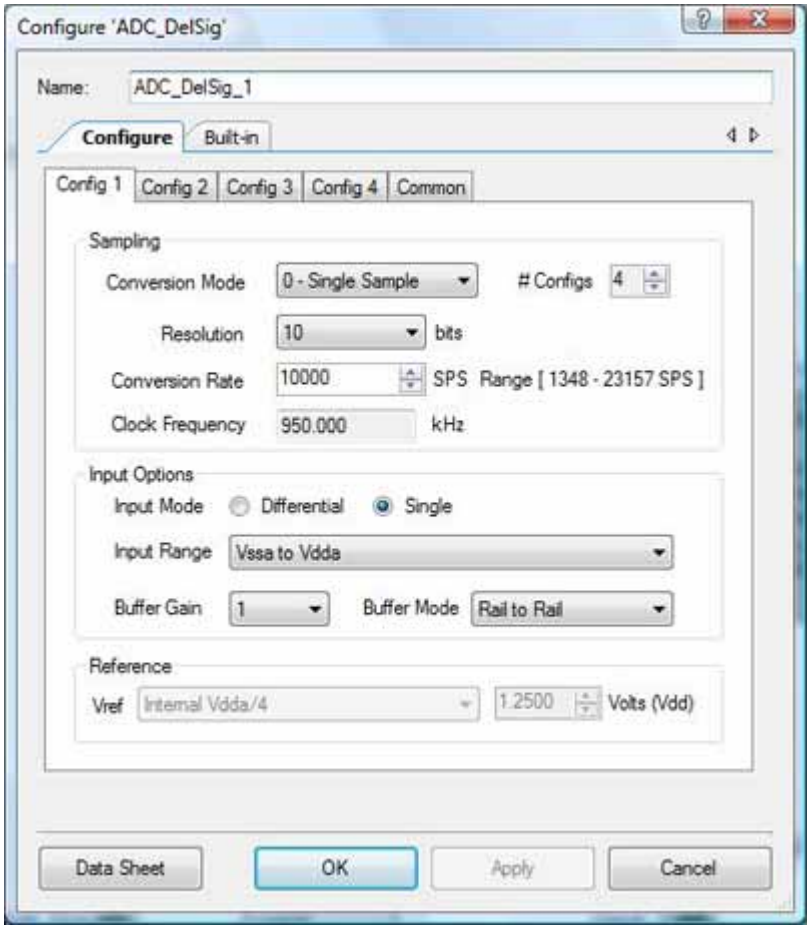


Figure 8: Configuration Window for ADC

The ADC_IN pin is used to read the analog value from the potentiometer. The Pin Drive mode is configured as High-Z, which is the default value. The following figures show the port pin setting.

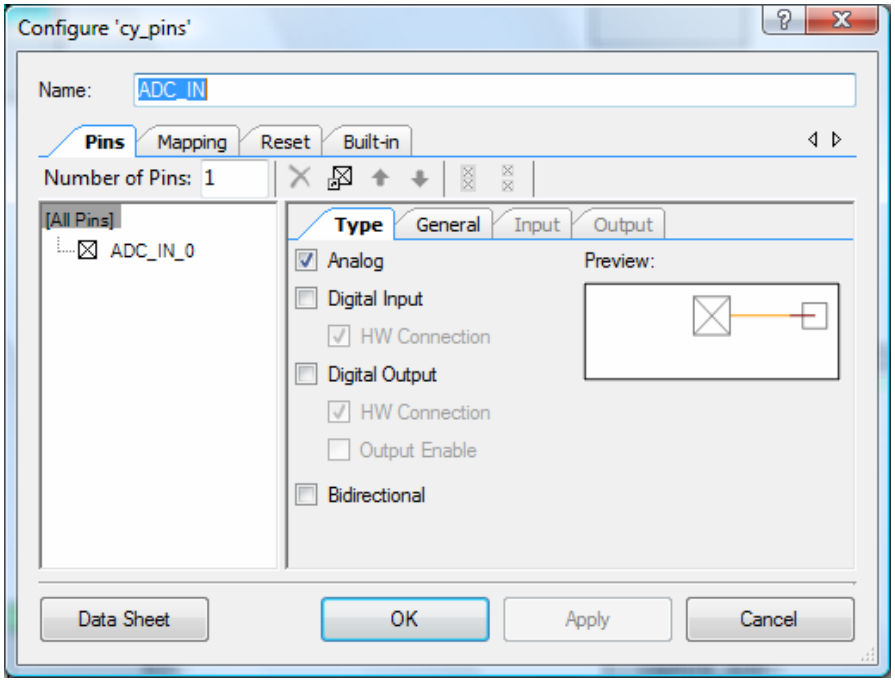


Figure 9: Port Pin Settings for ADC_IN - 1

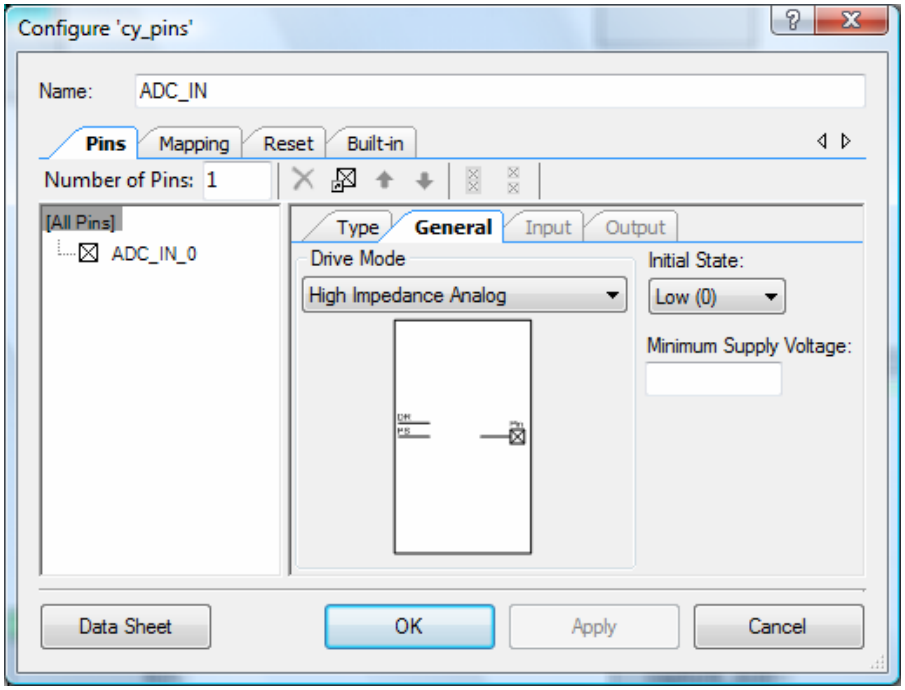


Figure 10: Port Pin Settings for ADC_IN – 2

3.2.2.3 PWM

The PWM is used to vary the brightness of the LED. The image below shows the configuration window of the PWM component.

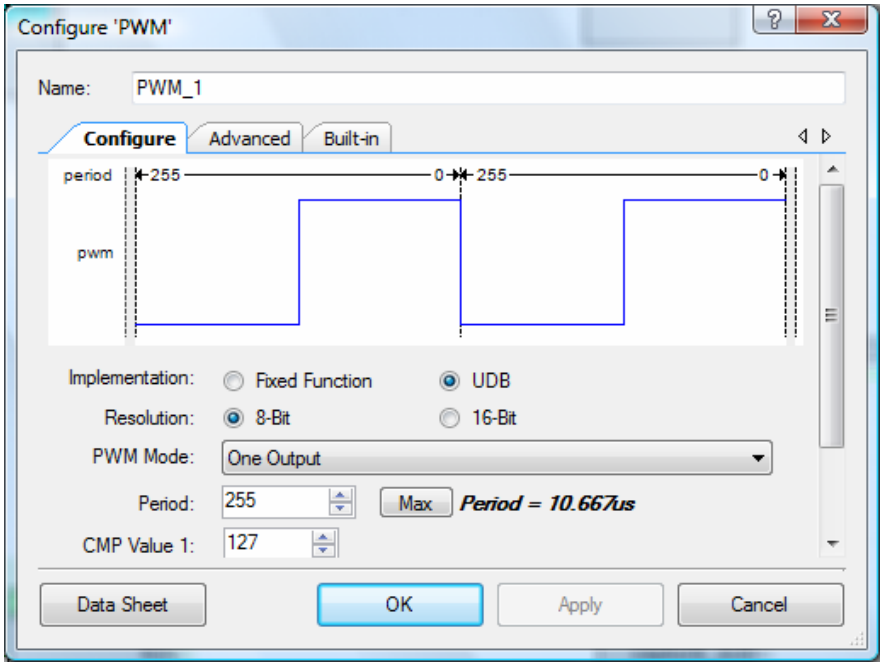


Figure 11: Configuration Window for PWM

The figures below show the port pin settings of the PWM.

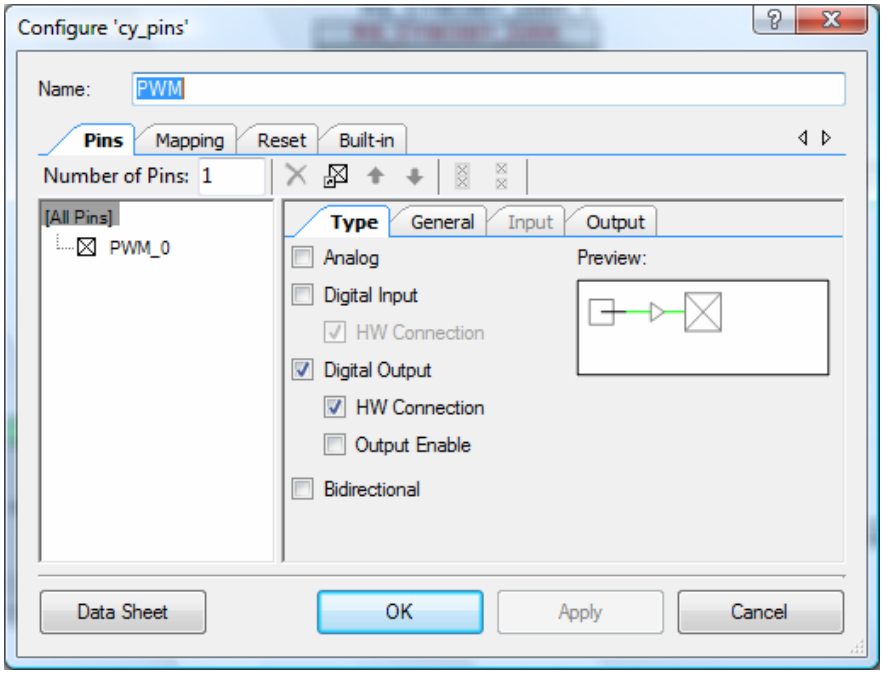


Figure 12: Port Pin Settings for the PWM– 1

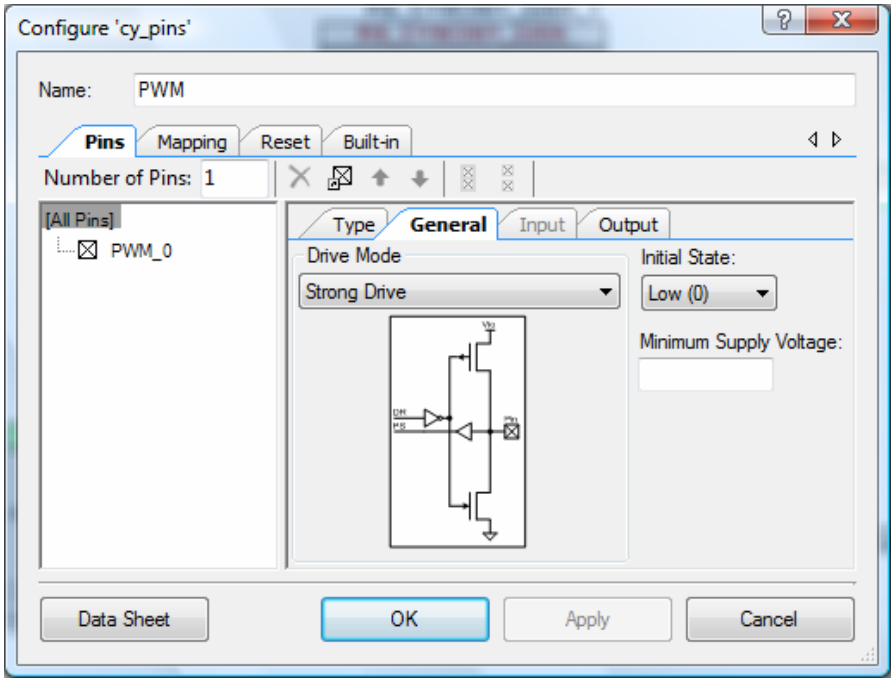


Figure 13: Port Pin Settings for the PWM – 2

3.2.2.4 Timer

The timer module is used to calculate the real time duration for calculating throughput results over SPI or UART interfaces. The following figure shows the configuration window for the Timer.

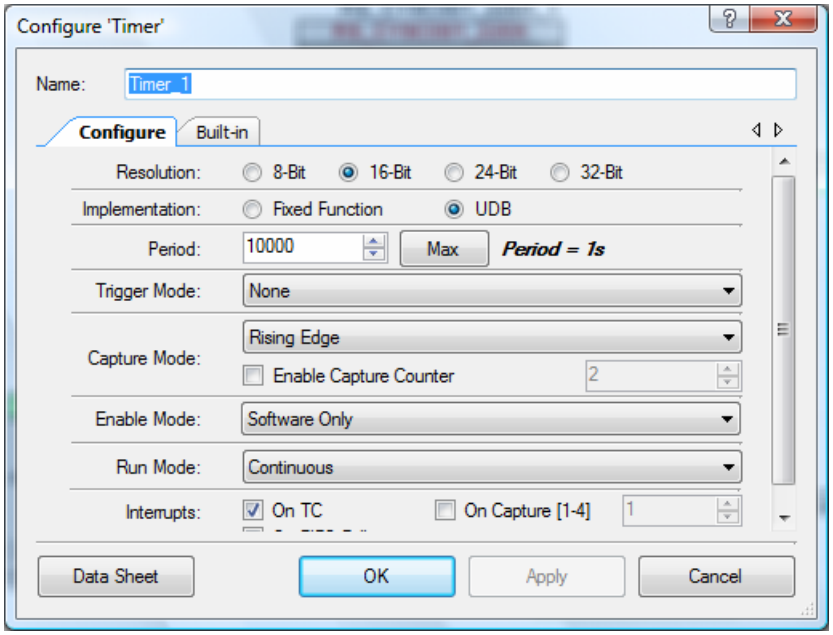


Figure 14: Configuration Window for Timer

The figures below show the clock input configuration for the timer module.

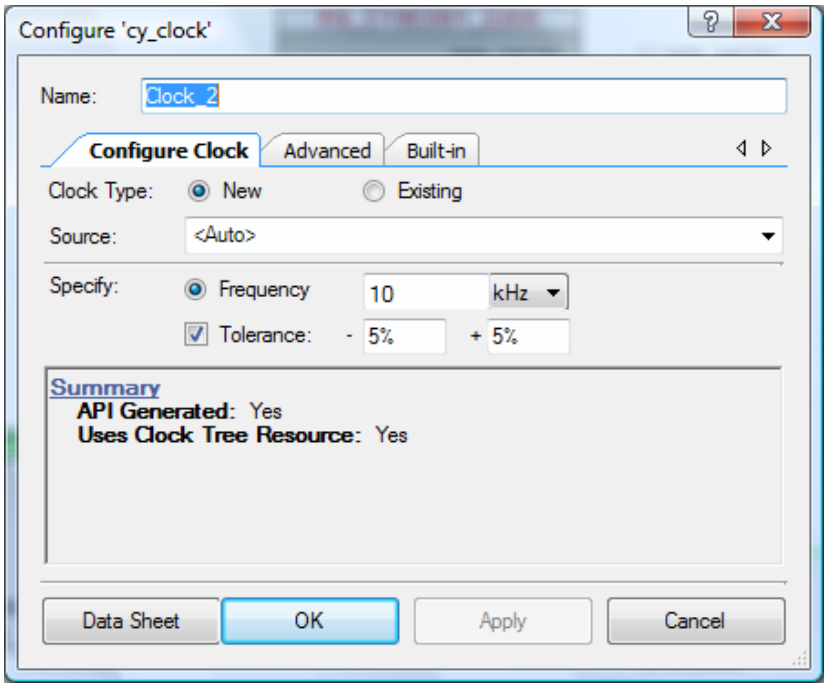


Figure 15: Clock Input Configuration of Timer – 1

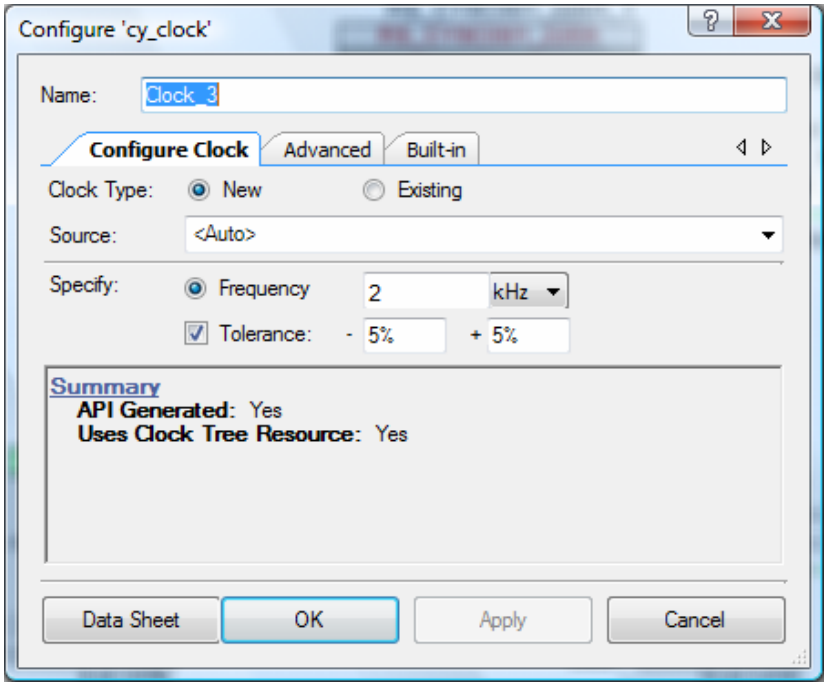


Figure 16: Clock Input Configuration of Timer– 2

3.2.2.5 EEPROM

The EEPROM module does not require to be configured from the schematic. However, it is configurable through software API's provided by the component datasheet.

3.3 Programming PSoC3/5 Device

The first step in using the example projects is to program the PSoC device. The steps below explain the procedure.

1. Plug in the PSoC 5 processor module and the LCD on the CY8CKIT-001 DVK, as shown in the image below.

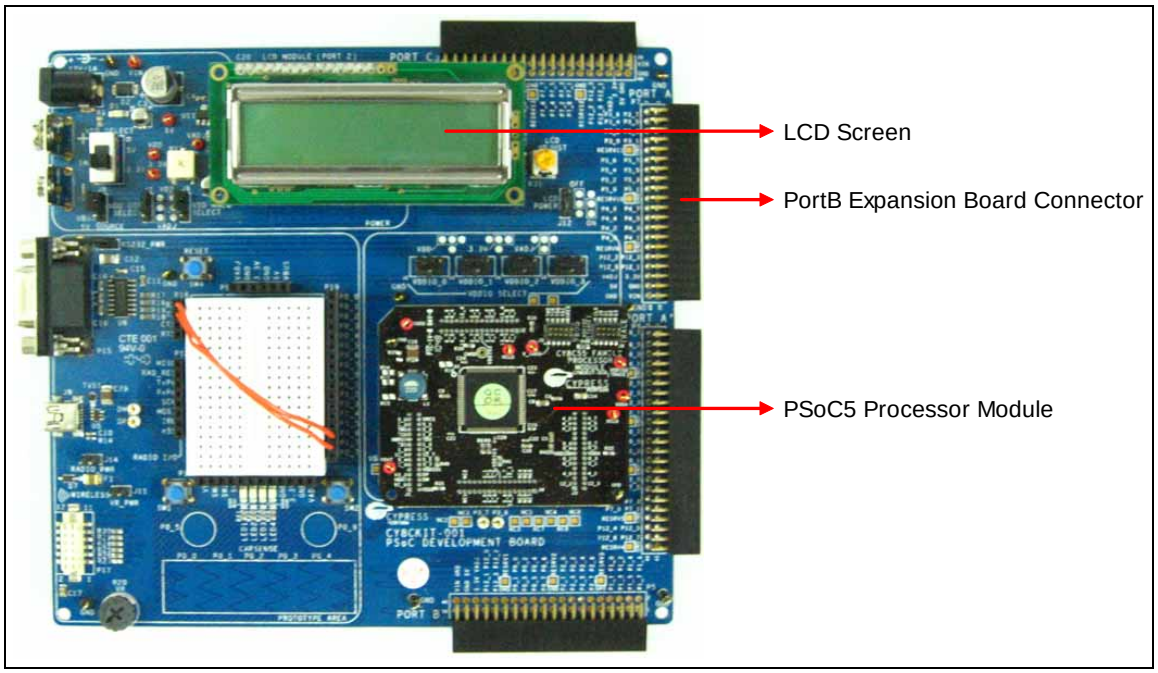


Figure 17: CY8CKIT-001 with PSoC5 Processor Module

2. Connect the Miniprog3 JTAG cable to the JTAG connector, both on MiniProg3 and the PSoC5 processor module. Connect the MiniProg3 to a PC's high speed USB port using a USB cable. The connections are shown in the image below.

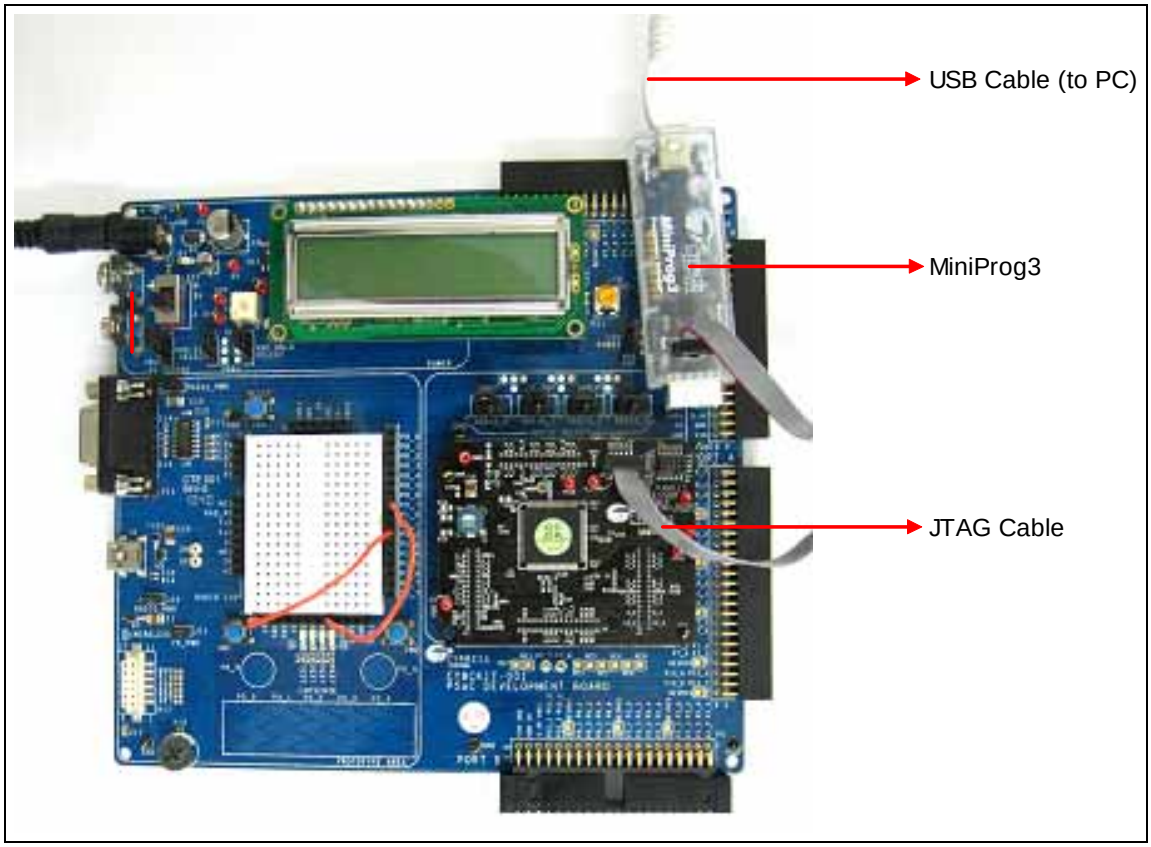


Figure 18: Miniprog3 Connection with CY8CKIT-001 DVK

3. Navigate to the C:\RS-CY8C001-220X\Firmware\ExampleProjects\PSoC5_SPI\LIB_TestPSoC5_SPI folder and double click on the workspace file of the LIB_TestPSoc5 project.

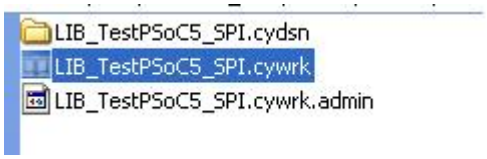


Figure 19: Workspace File of LIB_TestPSoC5_SPI Project

4. The PSoC Creator opens. Click on the components tab of the workspace explorer and double click on the TopDesign.cysch file as indicated in the figure below.

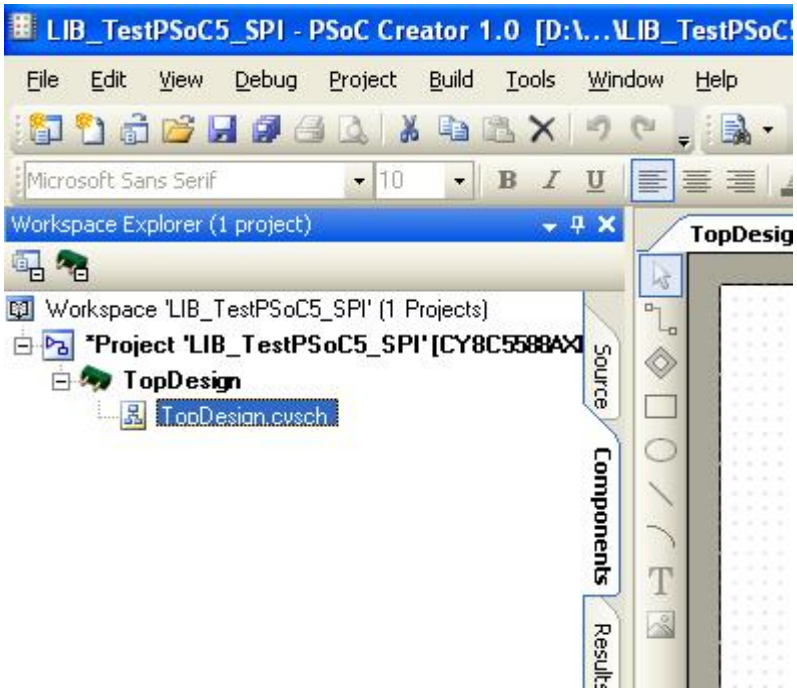


Figure 20: Components Tab of PSoC Creator Workspace Explorer

5. The design workspace opens on the right side, showing the components included in the project, as shown below.

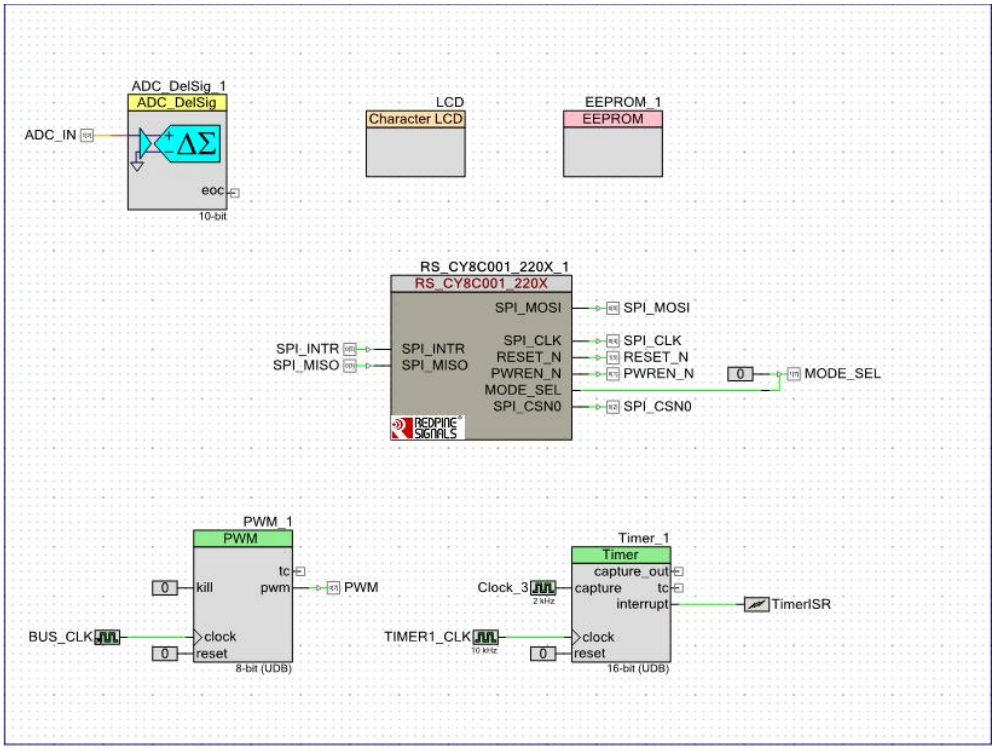


Figure 21: Components of the LIB_TestPSoC5_SPI Project

6. Double click on the RS-CY8C001_220X_1 component in the design workspace. A configuration window appears on the screen as shown in the figure below. There are two tabs in this window – Basic and Advanced. Please refer to Section 3.2.2.1.1 and Section 3.2.2.1.2 and the Component Datasheet for detailed information on each parameter in these tabs.

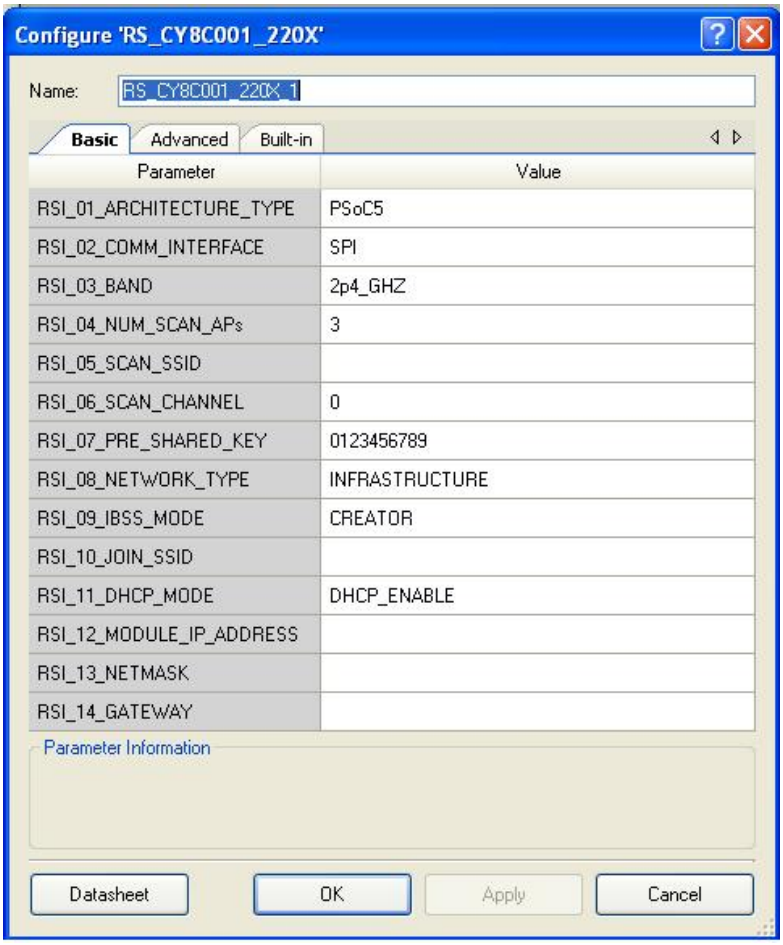


Figure 22: Configuration Window of RS-CY8C001-220X

7. Fill in the following parameters in the Basic tab for the example project to run successfully:
   a. RSI_06_PRE_SHARED_KEY: Enter the Pre-shared key/passphrase of the Access Point, if it's configured for Secure (WEP/WPA/WPA2) mode.
   b. RSI_09_JOIN_SSID: Enter the SSID of the Access Point to which the Wi-Fi EBK has to connect.
   c. RSI_10_DHCP_MODE: Select DHCP_ENABLE if the Access Point supports DHCP. Otherwise, select DHCP_DISABLE.

d. RSI_11_MODULE_IP_ADDRESS: If DHCP is disabled, enter a 4-byte dot-decimal IP address which is in the same subnet as the Access Point.

e. RSI_12_SUBNET_MASK: If DHCP is disabled, enter the subnet mask of the network created by the Access Point.

f. RSI_13_GATEWAY_IP_ADDRESS: If DHCP is disabled, enter the Gateway IP address of the network created by the Access Point.

NOTE: Do not modify any of the other parameters since they are used for the example project and the demo application. You may create a new project for your application.

8. Click File -> Save All and build the project by selecting the Build option as shown in the image below.

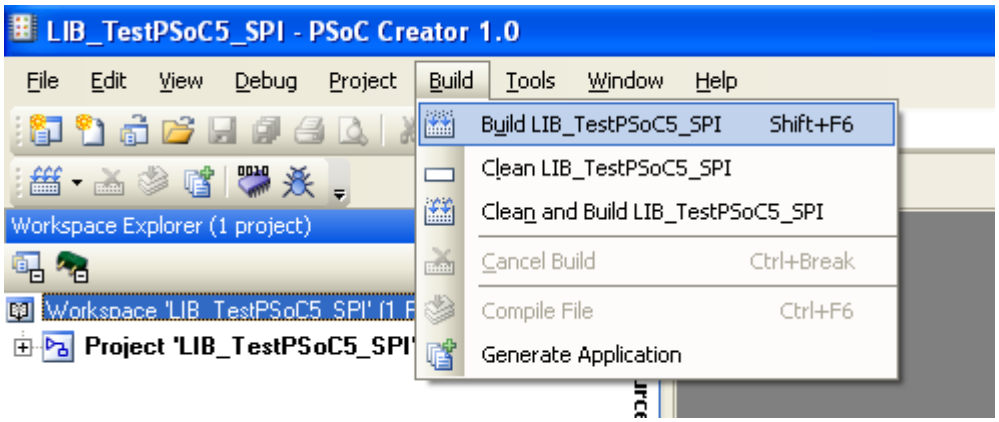


Figure 23: Build the Project

9. Next, click the Program icon as shown in the following figure to download the compiled program into the PSoC device.

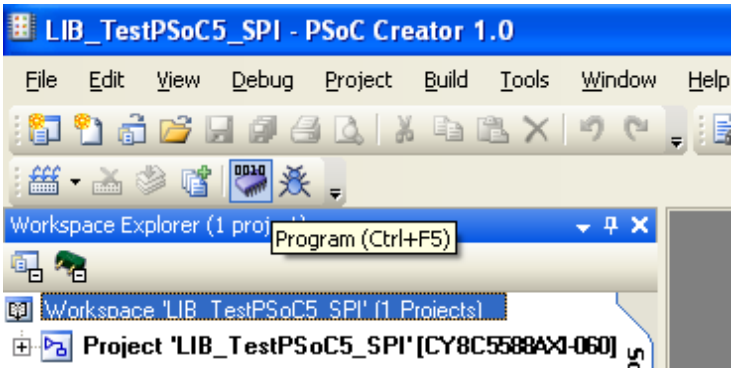


Figure 24: Program the PSoC Device

10. The PSoC device is programmed successfully as shown in the following PSoC Creator figure

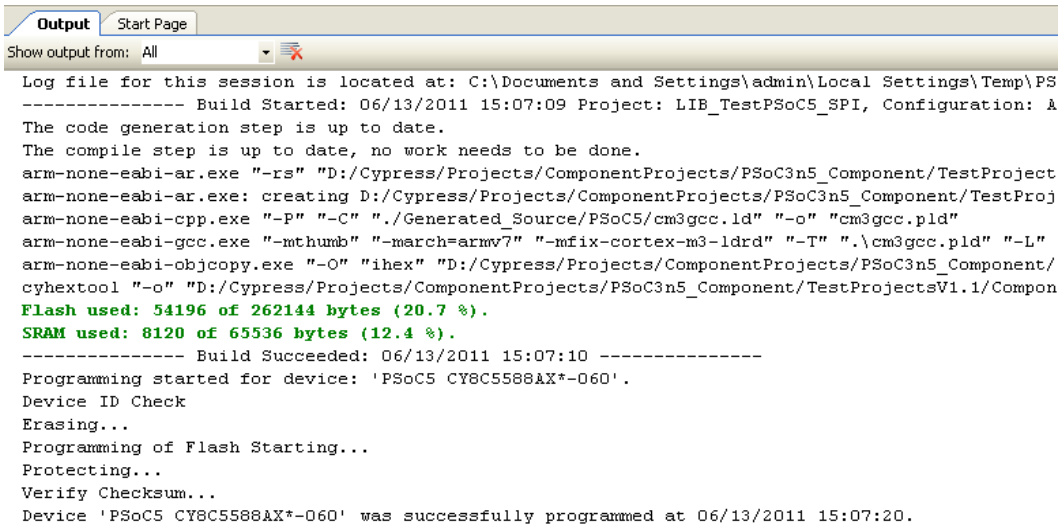


Figure 25: PSoC Device Programmed Successfully

11. Remove power supply to the DVK. Plug in the Wi-Fi EBK into the PortB Expansion Header as shown in the image below.

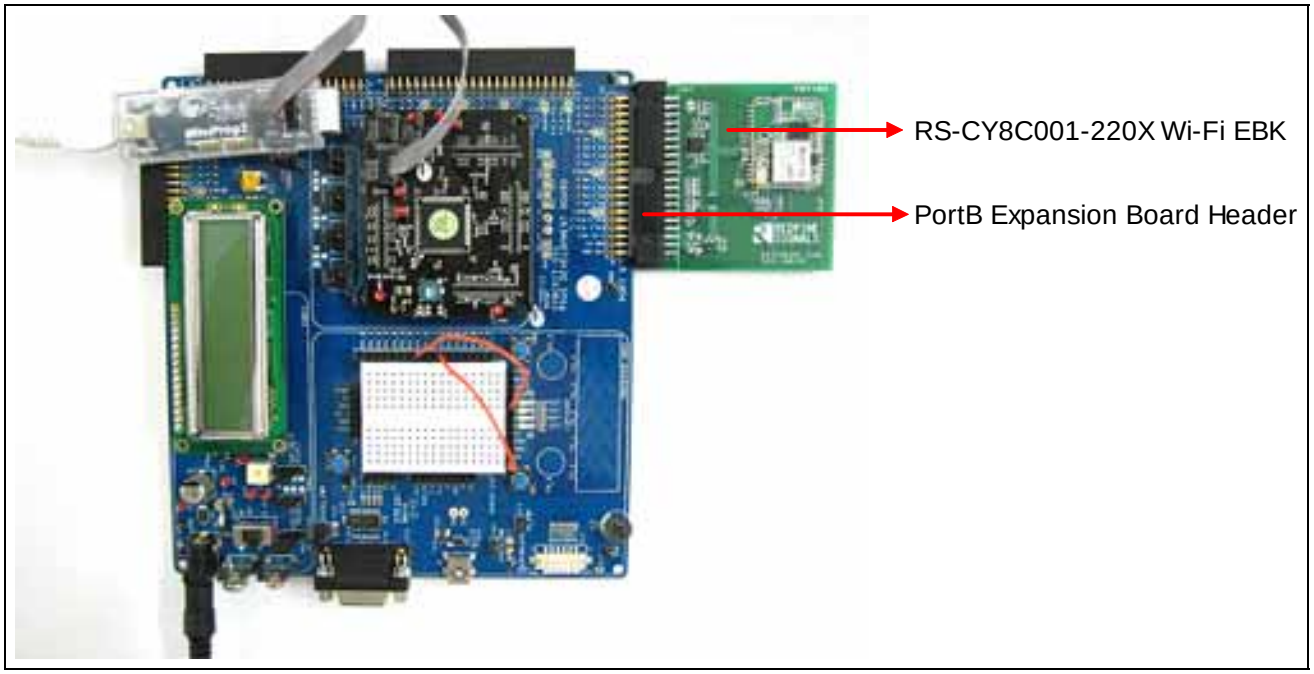


Figure 26: CY8CKIT-001 With PSoC5 Module, MiniProg3 and Wi-Fi EBK

12. Connect the analog input from the potentiometer (VR slot in CY8CKIT-001 DVK) to the P1_2 on the DVK and connect LED4 to P0_7 as shown in the figure below.

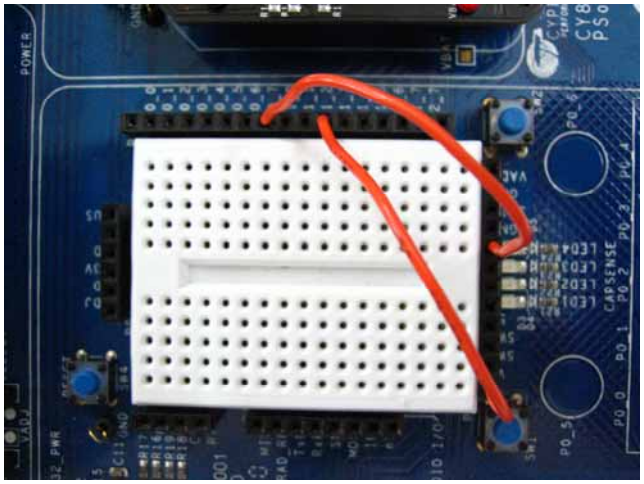


Figure 27: Potentiometer and LED Connections

13. Power the VR by setting the Jumper J11 to ON position as shown in the image below.

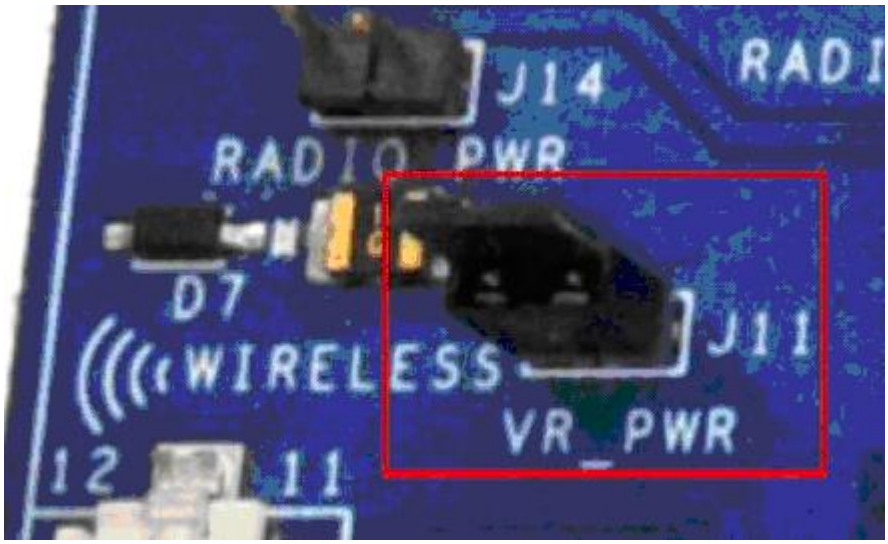


Figure 28: VR_PWR Jumper Setting

14. The remaining jumper settings on the DVK are to left in the default state. Refer to the PSoC Development Kit Board Guide for the default settings of the other jumpers.
15. Power the DVK using either battery connections or a wall power unit. Default settings in the PSoC creator tool are configured to use 12V D.C wall power unit.

3.4 Running the Demo

1. Once the kit is started, it tries to connect to the Access Point configured in the component. If the connection is successful, after a few seconds, you will see the SSID of the Access Point and the IP address of the kit on the LCD screen. The kit also opens two TCP Server and one UDP Client socket for the purpose of the demo.
2. Next, connect the PC to the Access Point over either Wi-Fi or Ethernet.
3. Double-click on the RS-CY8C001-220X_GUI.jar file to open the demo application. A screenshot of the GUI is shown below.

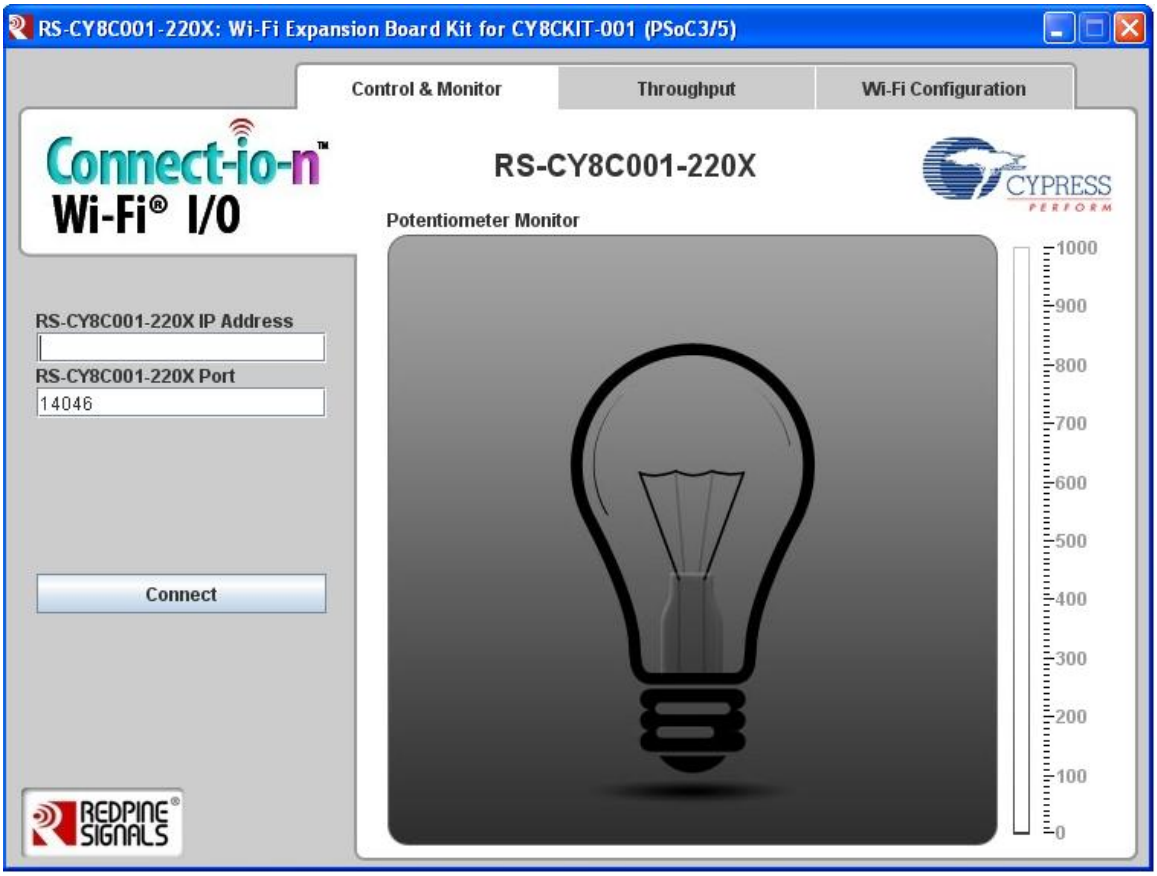


Figure 29: Demo Application GUI Screenshot

4. Enter the IP address of the DVK + EBK kit (as displayed on the LCD screen) in the field labeled “RS-CY8C001-220X IP address”.
5. Next, click on the “Connect” button. The GUI connects to the Kit over TCP (using the TCP server socket, numbered 14046, opened in the kit). This is indicated by the “Connect” button changing to “Disconnect”, as shown in the image below. You will also observe

that a 'slider' labeled "LED Control" appears above the "Disconnect" button.

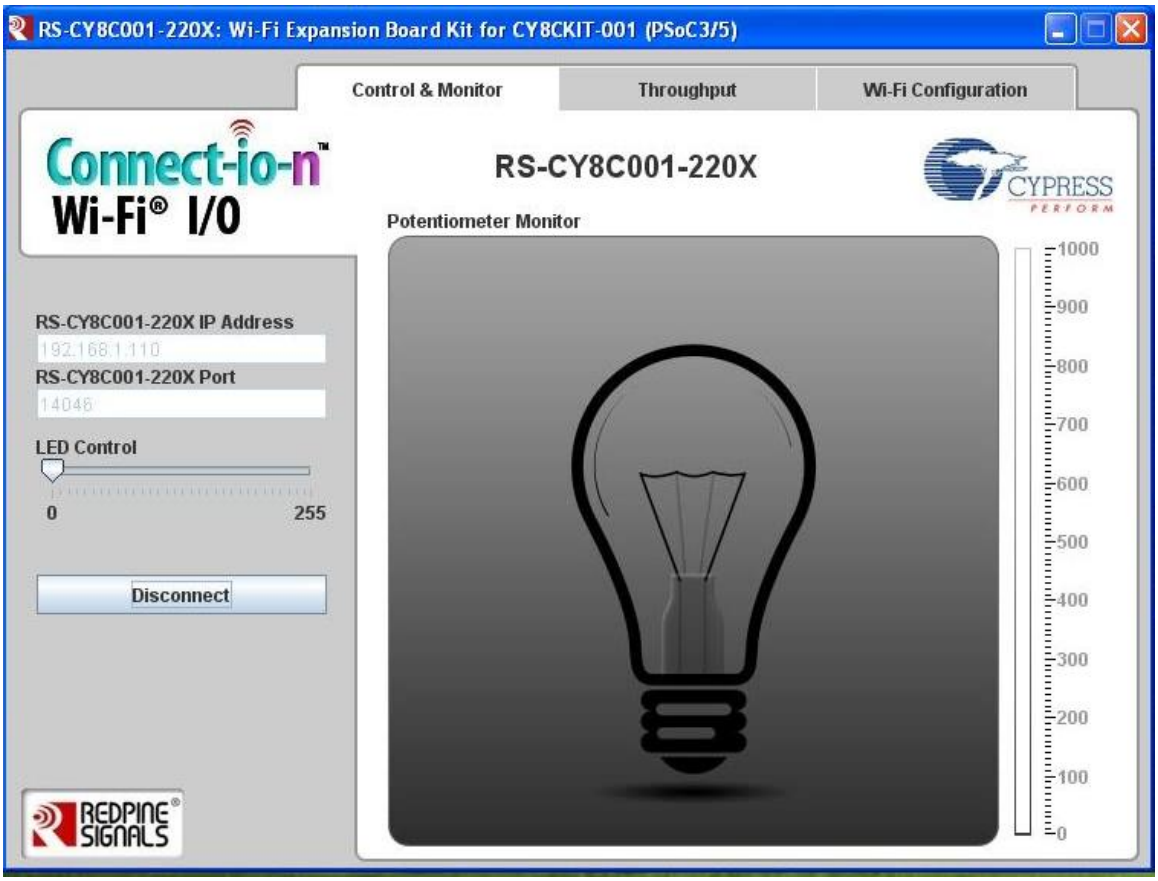


Figure 30: Demo Application "Connected" to the Kit

6. You can now turn the potentiometer knob on the DVK and observe that the intensity of the light bulb's glow changes, as shown in the image below.

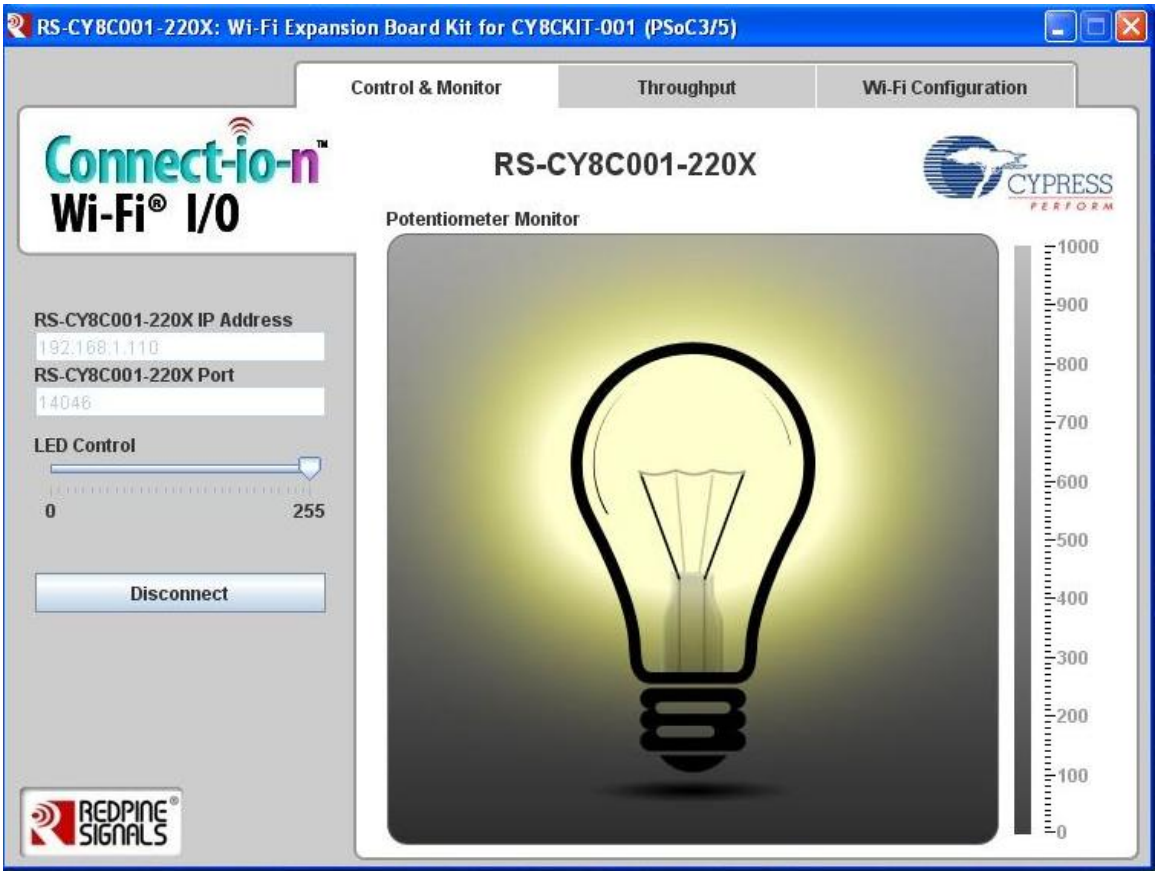


Figure 31: Potentiometer Controlling Light Bulb Intensity

7. Next, you can move the LED Control slider with a mouse from left to right (and vice versa) and observe that the intensity of LED4 brightens (and dims).
8. Click on the "Throughput" tab on the top of the GUI. You will see the following image.

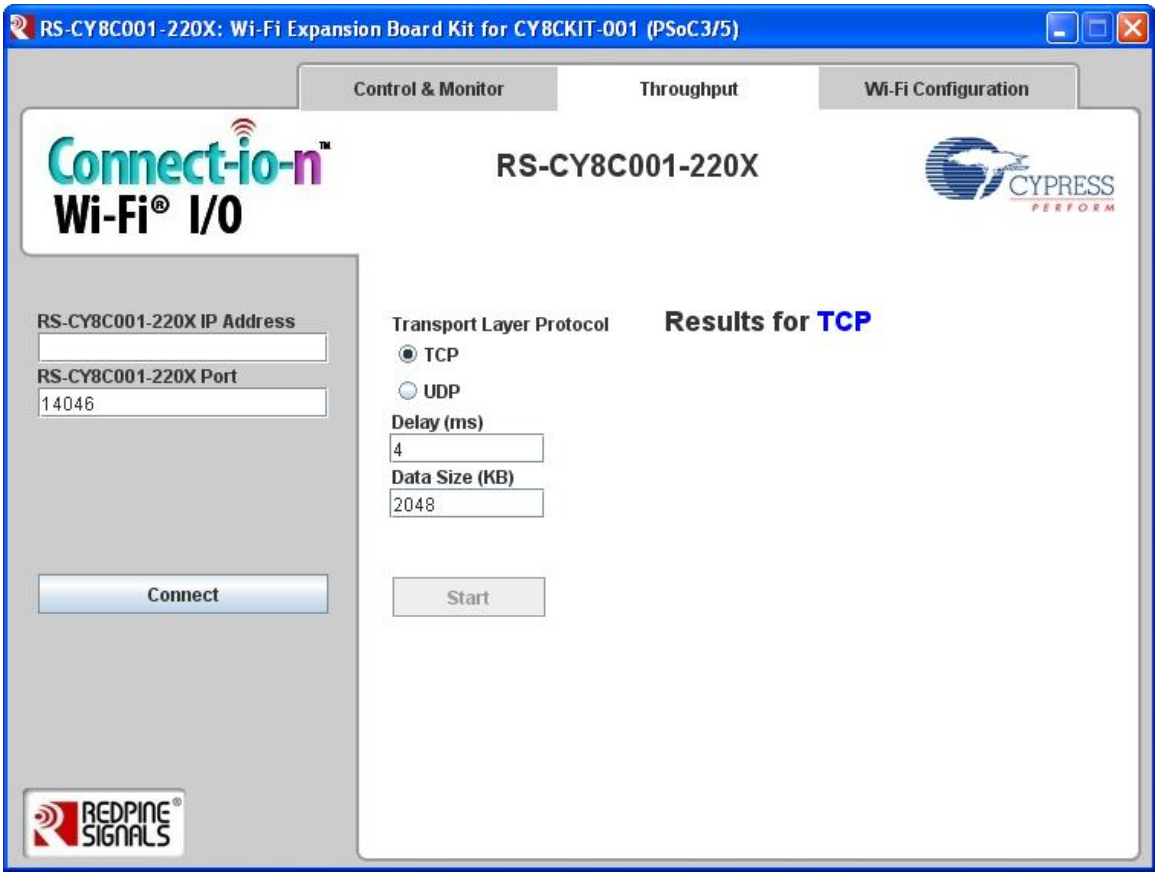


Figure 32: Throughput Tab of GUI

9. Select whether you want to measure TCP or UDP throughputs. Next, enter the delay between each packet transmission for UDP throughput measurements in the field labeled “UDP Delay (ms)”. Since the maximum transmit and receive UDP throughputs that the module can support are 10 Mbps and 5 Mbps, respectively, the ideal value is 4ms. A higher value may result in lower throughputs and a lower value may result in packets being dropped.
10. Enter the amount of data in KB that you want to be exchanged between the PC and the kit for measuring throughput in the field labeled “Data Size (KB)”. This data is sent as packets of 1400 bytes for PSoC5 and 512 bytes for PSoC3, which are the maximum packets sizes supported.
11. Click the “Start” button. The throughput measurement begins and you will see the following image.

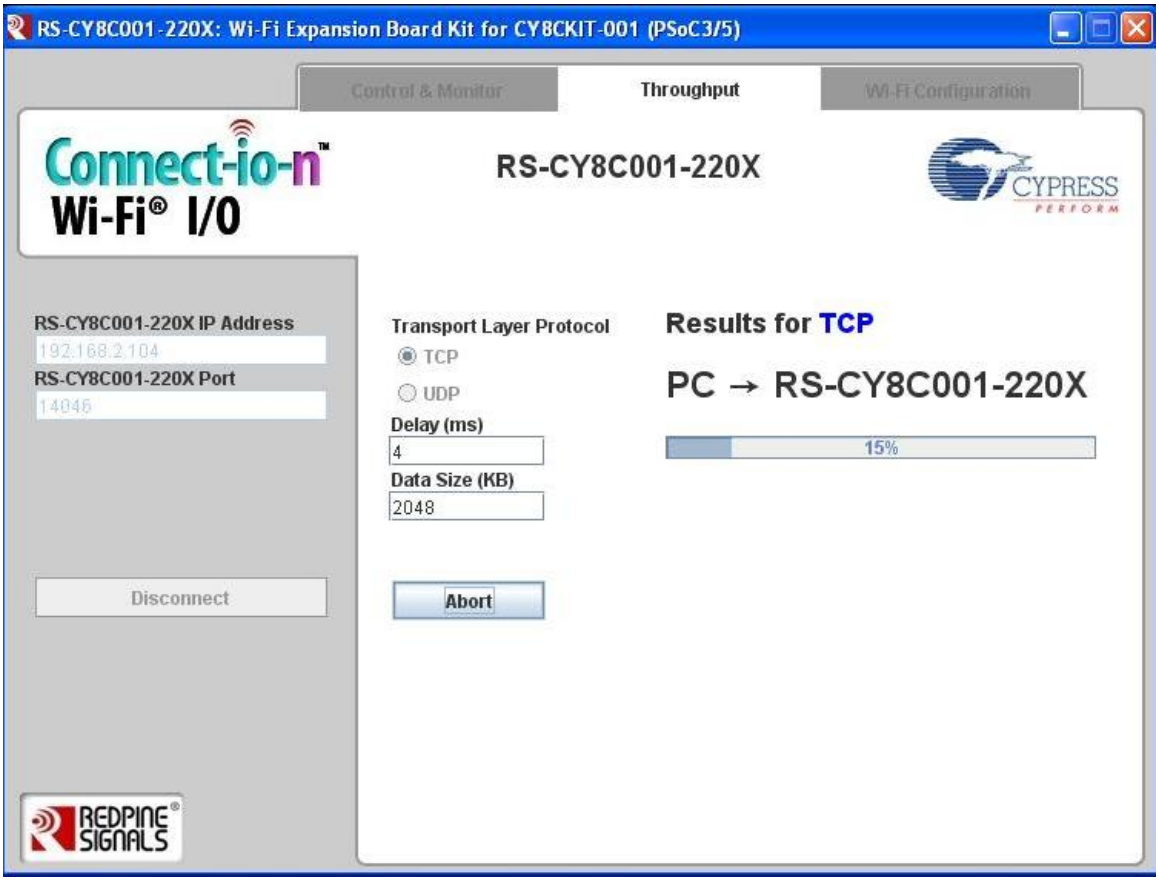


Figure 33: Throughput Measurement in Progress

12. Once the complete data is transmitted and received, the GUI displays the total amount of data successfully received by the PC and the kit and the time it takes to receive that data along with the throughput in Mbps.
13. Next, click on the "Wi-Fi Configuration" tab of the GUI. You will see the image below. You can reconfigure the kit with new network settings using this tab.

IMPORTANT:

Using the Wi-Fi Configuration tab of the GUI, you can reconfigure the network parameters of the kit (without changing parameters through the Component's Configuration window). These new parameters are stored in the PSoC's EEPROM and used at every power-up. However, only the PSoC3's ES3 version supports erasing of the EEPROM through the PSoC Creator.

Hence, if you are using the PSoC5 or any version of the PSoC3 other than ES3, and if you use the Demo Application to configure the kit over Wi-Fi, then the only way to change the parameters in the future will be through the GUI. You cannot reset them by reprogramming the PSoC device from PSoC Creator.

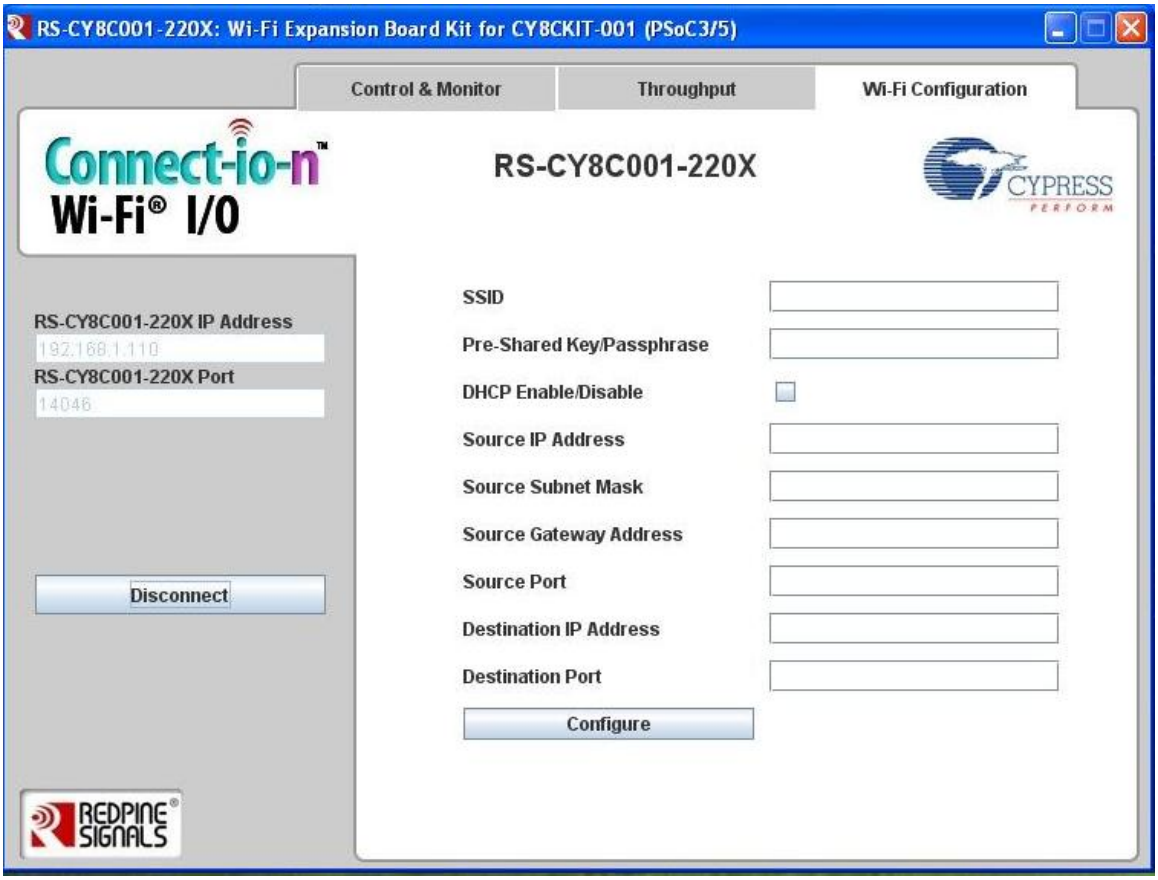


Figure 34: Wi-Fi Configuration Tab of GUI

14. You may enter the SSID of a second Access Point along with other parameters like the Pre-shared Key, DHCP Enable/Disable, etc., in this window and then click on the “Configure” button. The new parameters are sent to the PSoC, which stores them in its EEPROM, resets the Wi-Fi module and configures it with the new parameters.
15. The kit tries to connect to the new Access Point and displays the SSID and IP address if the connection is successful.
16. At the end of this demo, you may click the “Disconnect” button on the left side pane, to disconnect the TCP connection between the PC and the kit.

4 Hardware

4.1 System Block Diagram

The PSoC based Wi-Fi system contains the following components as shown in the diagram below.

- CY8CKIT-001
- Redpine Signals' RS9110-N-11-22 based expansion board.

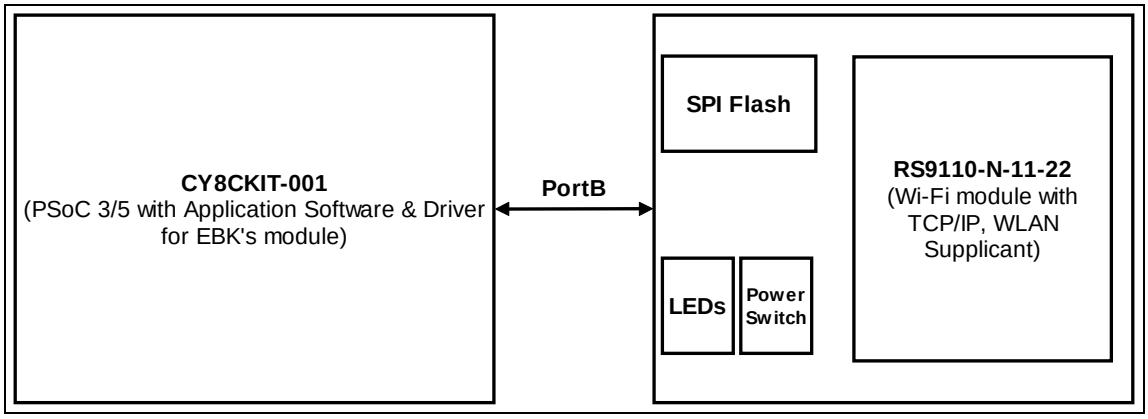


Figure 35: System Block Diagram

4.1.1 System Power

The system is powered by a USB cable or a 12V DC adapter. The Wi-Fi EBK requires 3.3V to get powered up and is available through the PortB Expansion Header on the DVK.

4.1.2 LEDs on the EBK

There are two LEDs on the EBK that are controlled by PSoC.One of them indicates if the Wi-Fi module is powered up and the other indicates data transfer between the PSoC device and the Wi-Fi module.

4.1.3 Power Switch

The power switch is used to control the power to the RS9110-N-11-22 Wi-Fi module.

4.1.4 SPI Flash

The SPI flash component on the Wi-Fi EBK is not used in the example projects. It interfaces to the PSoC's SPI and can be used to store and read data if required by different applications.

4.1.5 PortB Expansion Board Connector

The 40-pin (20x2) connector on PortB of the DVK helps to connect the configured PSoC I/O pins to the RS-CY8C001-220X Wi-Fi EBK.

4.2 Functional Description

4.2.1 CY8CKIT-001 DVK and RS-CY8C001-220X EBK Integration Details

The figure below shows one of the options for a system setup involving the CY8CKIT-001 DVK and the RS-CY8C001-220X EBK with labels for Hardware, Software and Firmware.

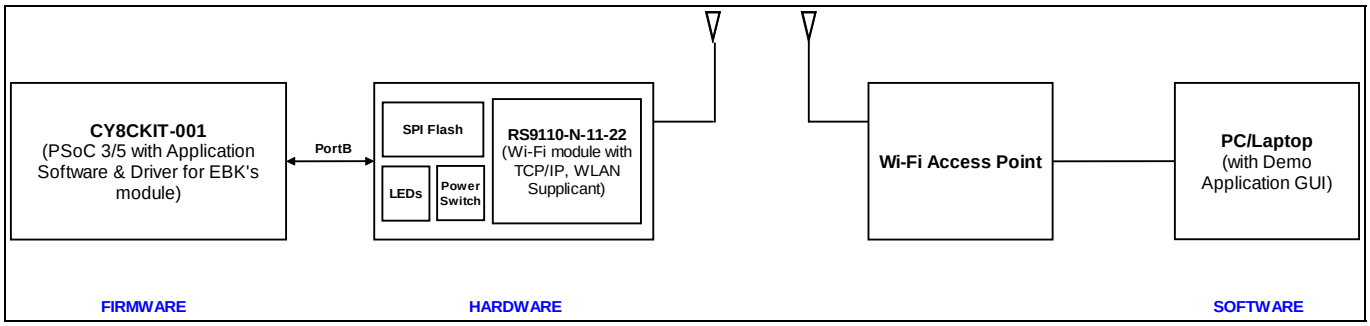


Figure 36: System Setup 1

The controller project runs on the CY8CKIT-001 and is used to control the Wi-Fi EBK interfaced on PortBExpansion Board Connector of the DVK.The integrated system on power up is capable of connect to a remote peer such as a PC or a Laptop via an Access Point. The PC runs a GUI application and the Wi-Fi system is capable of data transfer from PSoC->PC or PC->PSoC.

The other options of system setups are illustrated in the figures below.

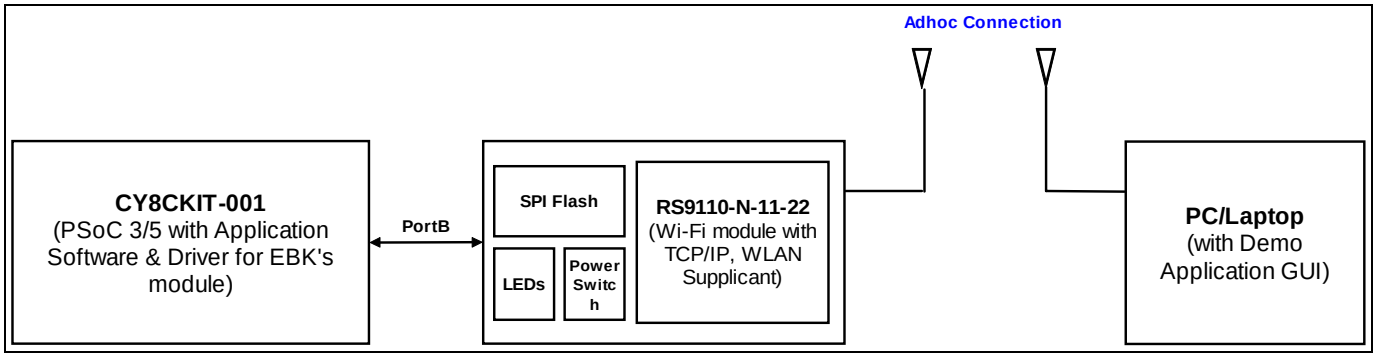


Figure 37: System Setup 2

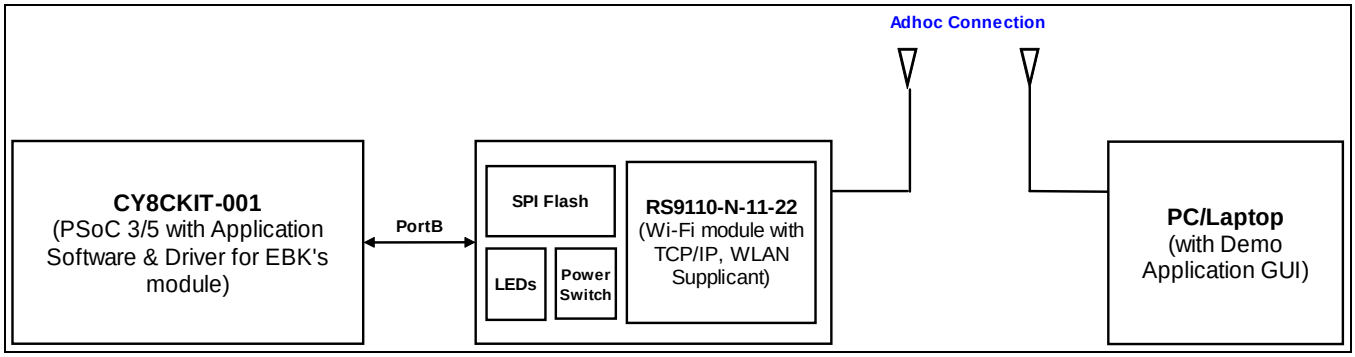


Figure 38: System Setup 3

4.3 Port Options with CY8CKIT-001 DVK

The RS-CY8C001-220X EBK board connects to the CY8CKIT-001 PSoC DVK through the 20x2-pin Port connector. The following table shows the pin assignment for PORTB pins and the corresponding pin assignments for RS-CY8C001-220X Wi-Fi module.

Pin	Port B Pin Name	RS-CY8C001-220X Pin Name
1	P1_7	MODESEL
2	P1_6	LED
3	P1_5	RESET
4	P1_4	JTAG TDI MINIPROG
5	P1_3	JTAG TDO MINIPROG
6	P1_2	ADC_IN
7	P1_1	JTAG TCK MINIPROG
8	P1_0	JTAG TMS MINIPROG
9	GND	GND
10	RESRV 3	NC
11	P2_7	NC
12	P2_6	LCD
13	P2_5	LCD
14	P2_4	LCD
15	P2_3	LCD

Pin	Port B Pin Name	RS-CY8C001-220X Pin Name
16	P2_2	LCD
17	P2_1	LCD
18	P2_0	LCD
19	GND	GND
20	RESRV 2	NC
21	P0_7	NC
22	P0_6	SPI_CSN1
23	P0_5	SPI_INT
24	P0_4	SPI_CLK
25	P0_3	SPI_MISO
26	P0_2	SPI_CSN0
27	P0_1	PWREN
28	P0_0	SPI_MOSI
29	GND	GND
30	RESRV 1	NC
31	P12_3	UART_TX
32	P12_2	UART_RX
33	P12_1	NC
34	P12_0	SCL
35	V3_3	V3_3
36	VADJ	NC
37	GND	GND
38	V5_0	NC
39	VIN	NC
40	GND	GND

Table 3: Pin Assignment on PortB Expansion Board Connector

5 Wi-Fi Module Firmware Upgrade

The RS-CY8C001-220X Kit's software includes separate projects to upgrade the firmware in the RS9110-N-11-22 Wi-Fi module. There are two projects – one each for PSoC3 and PSoC5 – for this purpose.

Firmware upgrade is required when you want to switch between SPI and UART as the communication interface between the PSoC and the RS9110-N-11-22 Wi-Fi module or if a newer version of the firmware is available from Redpine Signals.

The process involves programming the PSoC device and then connecting the DVK to a PC through a serial cable and the DB9 connector on the DVK. The firmware upgrade is then done using the HyperTerminal software on Windows XP or other similar software. The following steps need to be followed for the firmware upgrade.

1. Start the HyperTerminal on the PC by clicking on Start -> All Programs -> Accessories -> Communications -> HyperTerminal
2. In the window that opens, enter a name for the session, e.g., Sample, and click OK as shown in the image below.

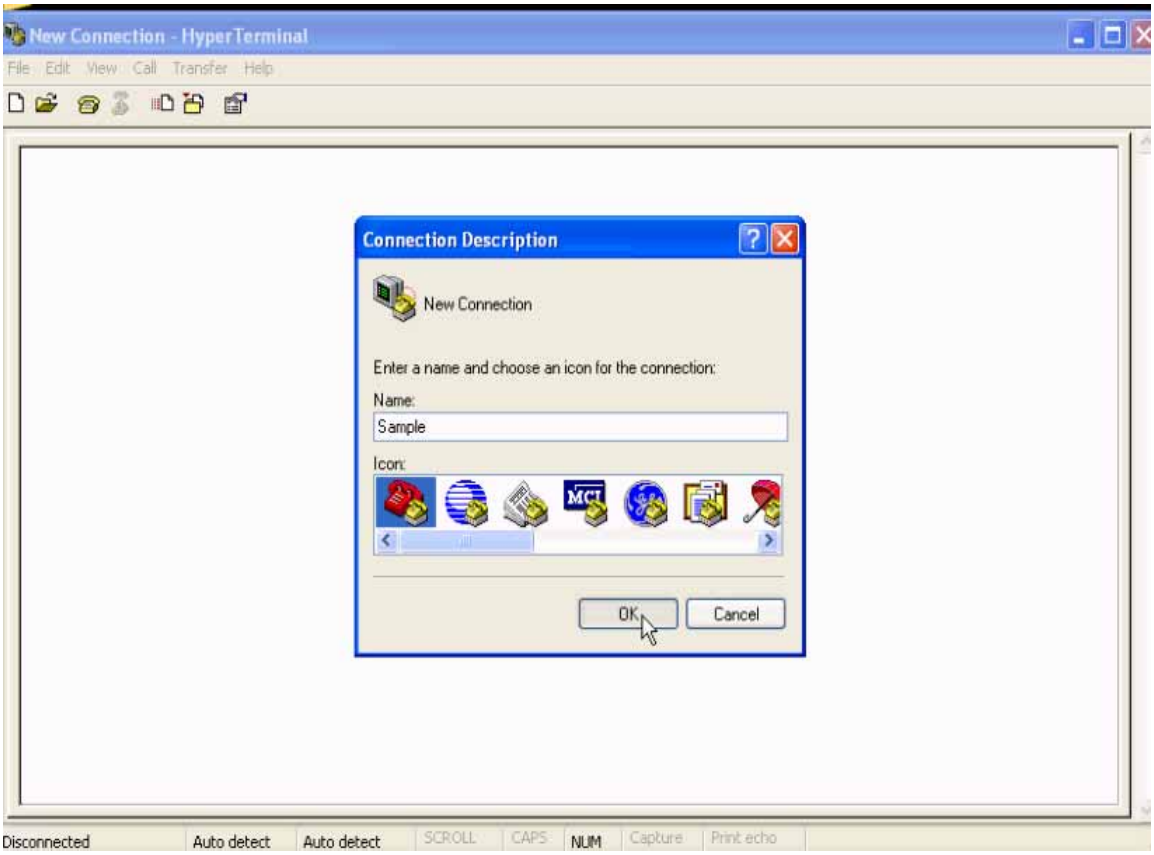


Figure 39: HyperTerminal Start Window

3. In the new dialog box (shown below), select the COM port to which the DVK will be connected and click OK.

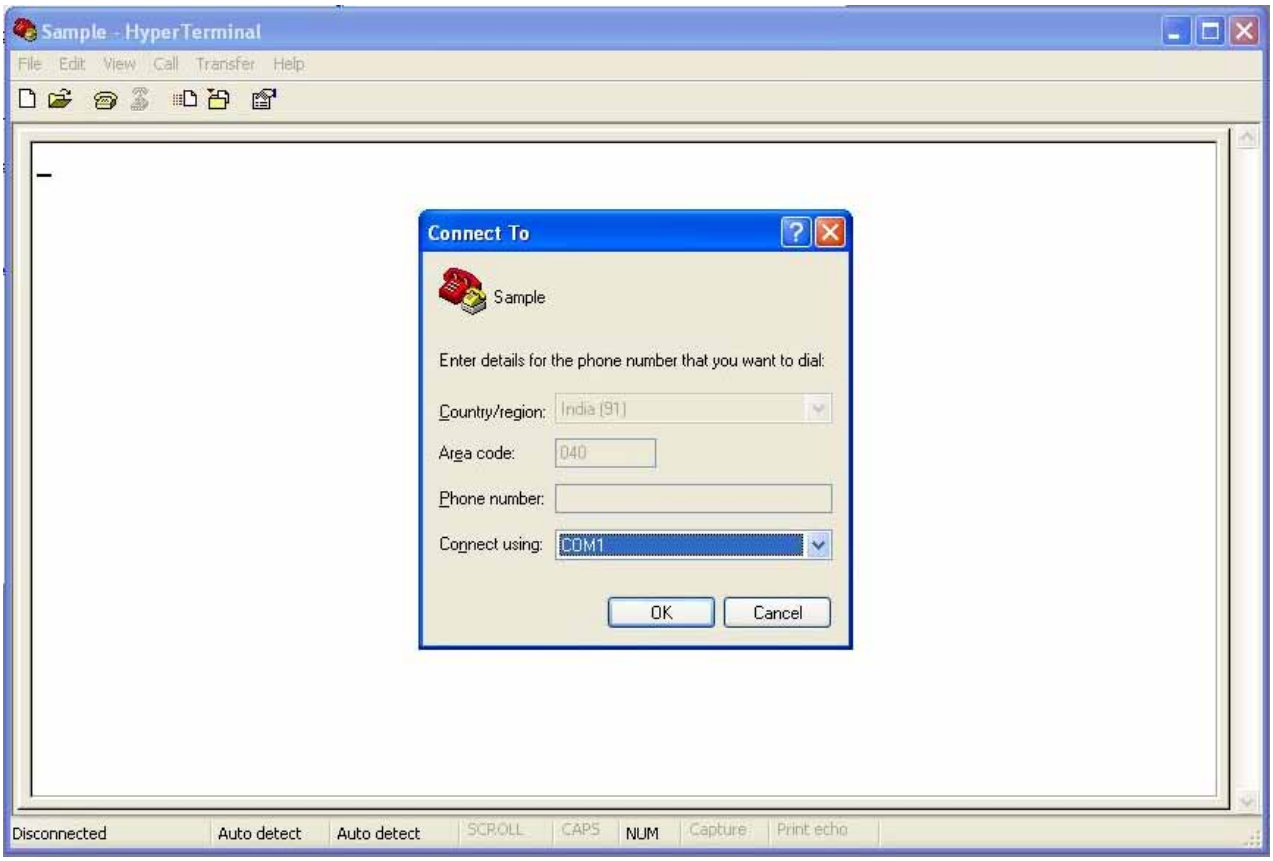


Figure 40: COM Port Selection

4. In the new dialog box that opens, enter the baud rate as 115200, the Data bits as 8, Parity as None, Stop bits as 2 and Flow Control as None, as shown in the image below. Click OK.

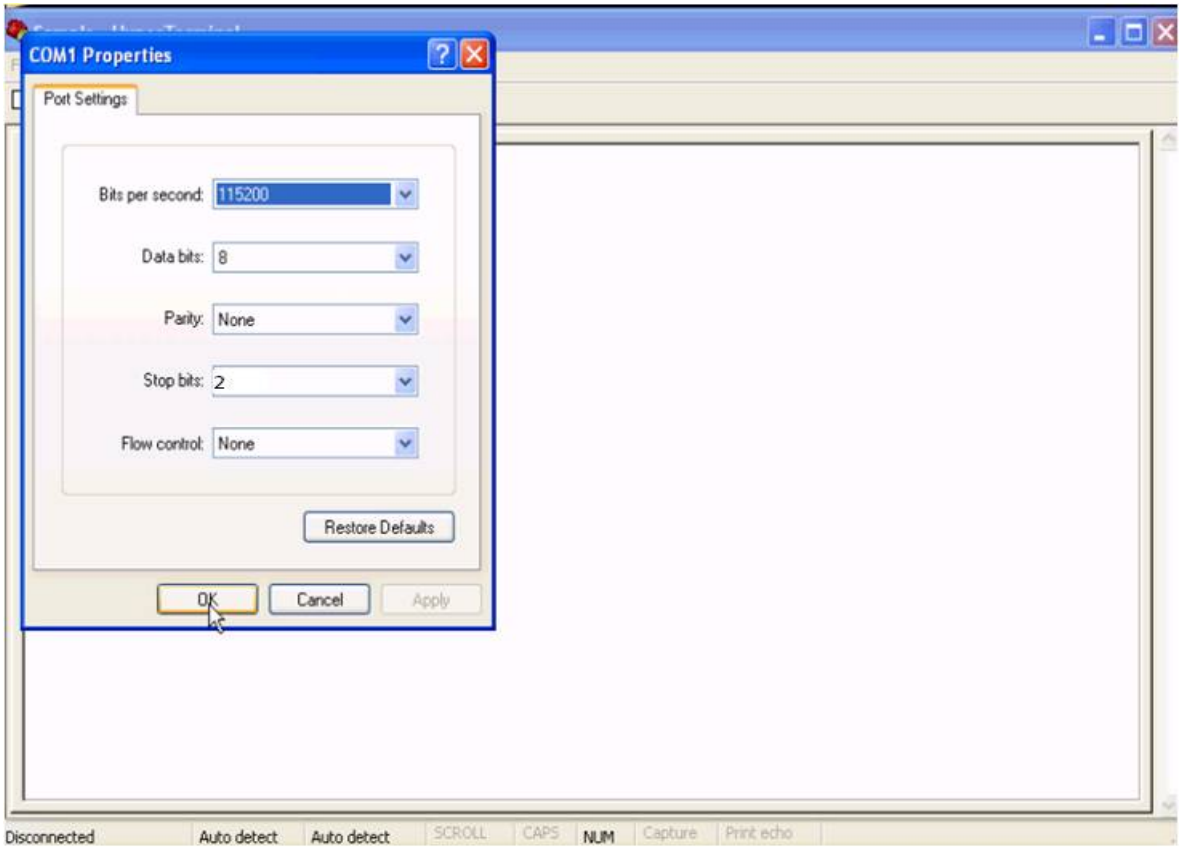


Figure 41: COM Port Settings

5. Click File -> Properties. In the dialog box that opens, click on the Settings tab, followed by the ASCII Setup button. A second dialog box opens, as shown in the image below.

2

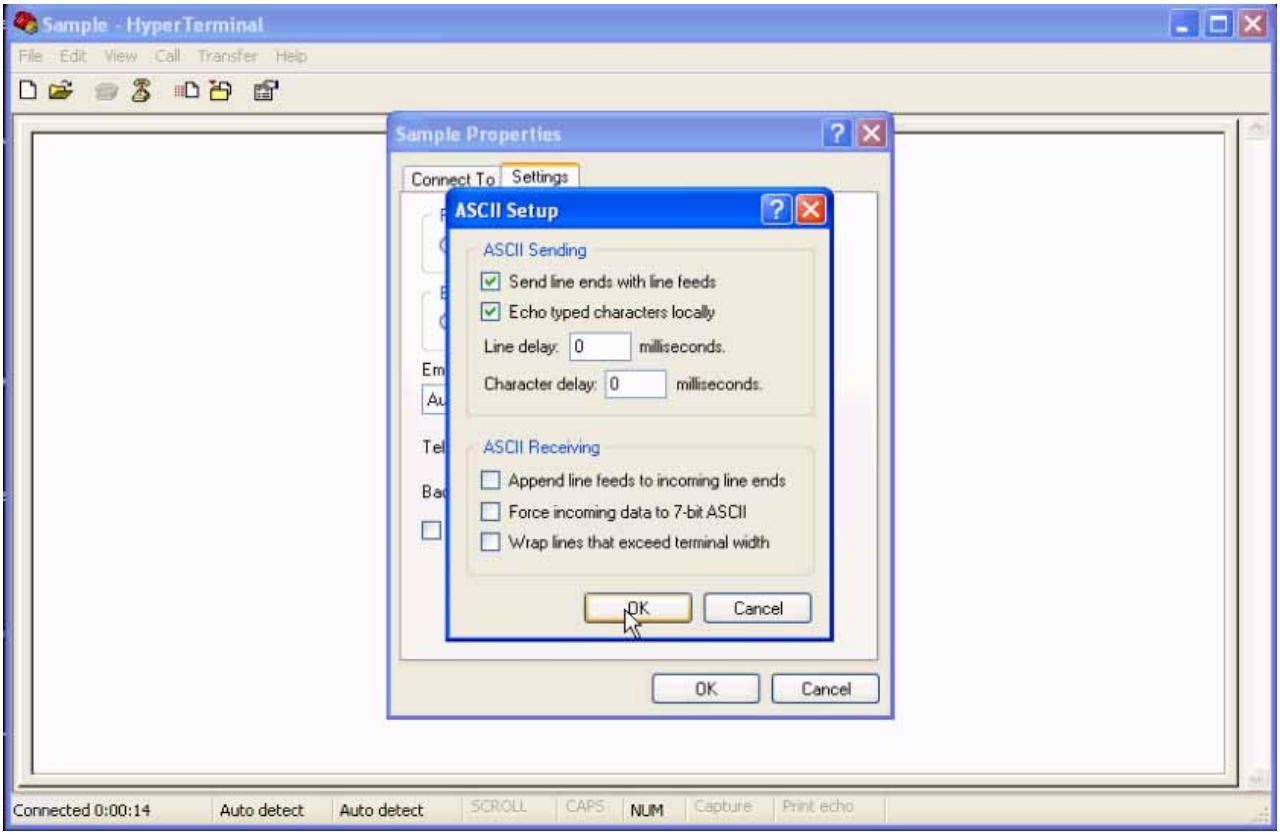


Figure 42: ASCII Setup in HyperTerminal

6. Check the boxes next to “Send line ends with line feeds” and “Echo typed characters locally” and click OK on the two dialog boxes to close them. The HyperTerminal setup is now complete.
7. Next, Plug the Wi-Fi EBK board into PortB of the CY8CKIT-001 DVK and connect the MiniProg3 to the PSoC 3/PSOC5 processor module.
8. Connect the jumper wire from port P1_6 to port TX on the CY8CKIT-001 DVK.
9. Connect the jumper wire from port P1_7 to port RX on the CY8CKIT-001 DVK.
10. Connect the serial cable between the DB9 connector on the CY8CKIT-001 DVK and the serial port of the PC.
11. Power up the DVK.
12. Navigate to the C:\RS-CY8C001-220X\Firmware\Wi-Fi_Upgrade\ PSOC5_WIFI_FMUPGRADE folder for PSoC5 and C:\RS-CY8C001-220X\Firmware\Wi-Fi_Upgrade\ PSOC3_WIFI_FMUPGRADE folder for PSoC3

13. Double-click the project file in the folder (PSOC5_WIFI_FMUPGRADE for PSoC5 and PSOC3_WIFI_FMUPGRADE for PSoC3) to open the project.
14. Build the project and program the PSoC device on the CY8CKIT-001 DVK board.
15. Execute the loaded project
16. After a few seconds, the HyperTerminal shows the text sent by the Wi-Fi module :

    WELCOME TO REDPINE SIGNALS

    Firmware upgrade (y/n)_
17. Enter 'y', immediately to enter the firmware upgrade mode. You should see more text from the module, as shown in the image below. If you do not see this text, restart the board and follow the instructions from step 16.

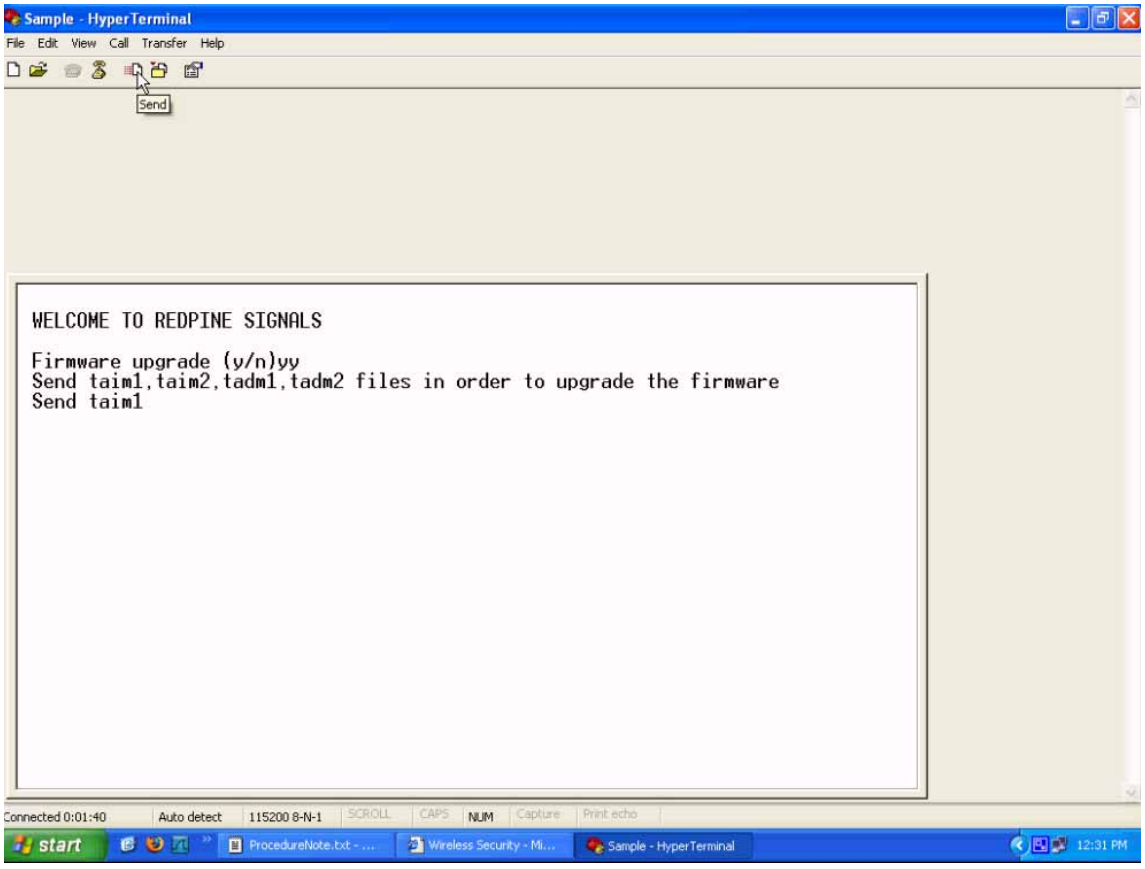


Figure 43: Firmware Upgrade Mode

18. Next, click on Transfer -> Send File… A dialog box opens as shown in the image below.

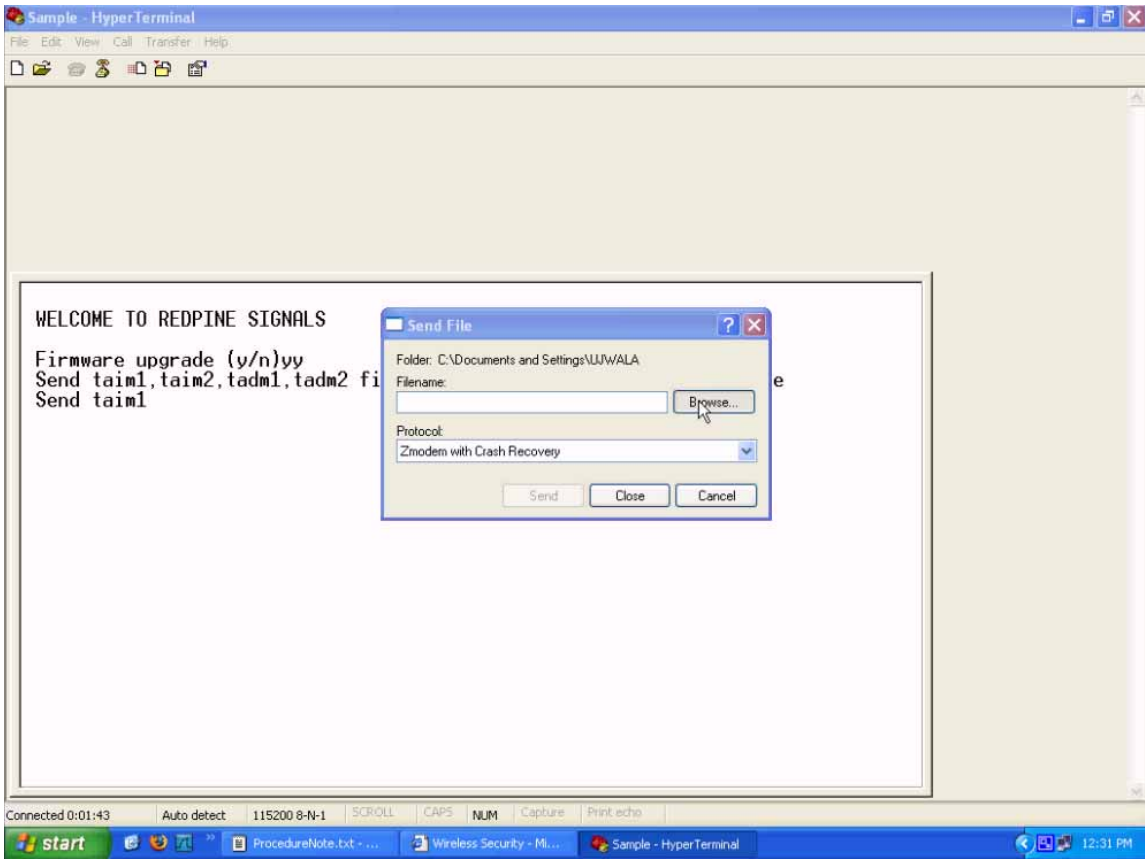


Figure 44: Send File

19. Click on “Browse” and navigate to the C:\RS-CY8C001-220X\Firmware\WiFi_Upgrade\RS9110-N-11-22_FW folder which has the firmware for the RS9110-N-11-22 module. This folder has two sub-folders – SPI and UART. You may select either of them depending on your requirements.
20. Once inside the SPI or UART folder, you will find four files named taim1, taim2, tadm1 and tadm2, which are the same as those requested by the module on the HyperTerminal. Select taim1 and click Open.

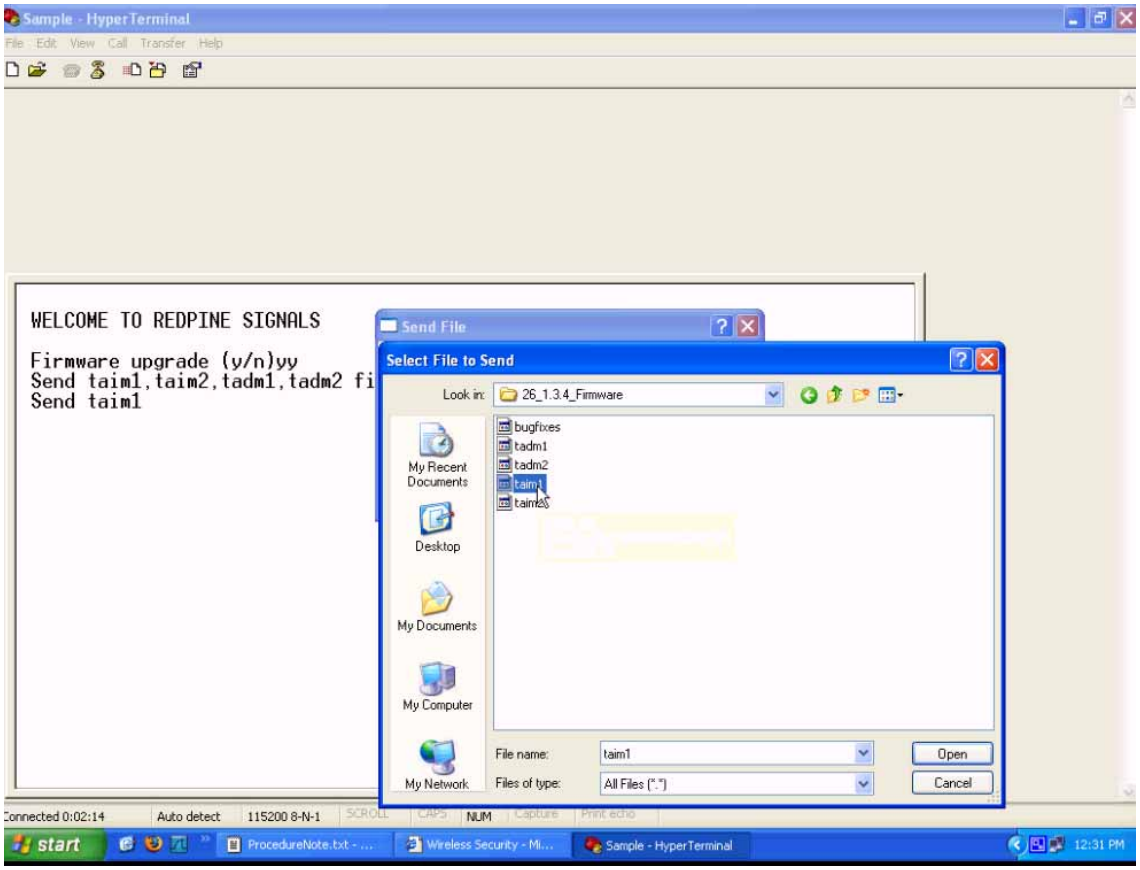


Figure 45: Select taim1 Firmware File First

21. In the Send File dialog box, click the drop-down menu below Protocol and select “Kermit”.

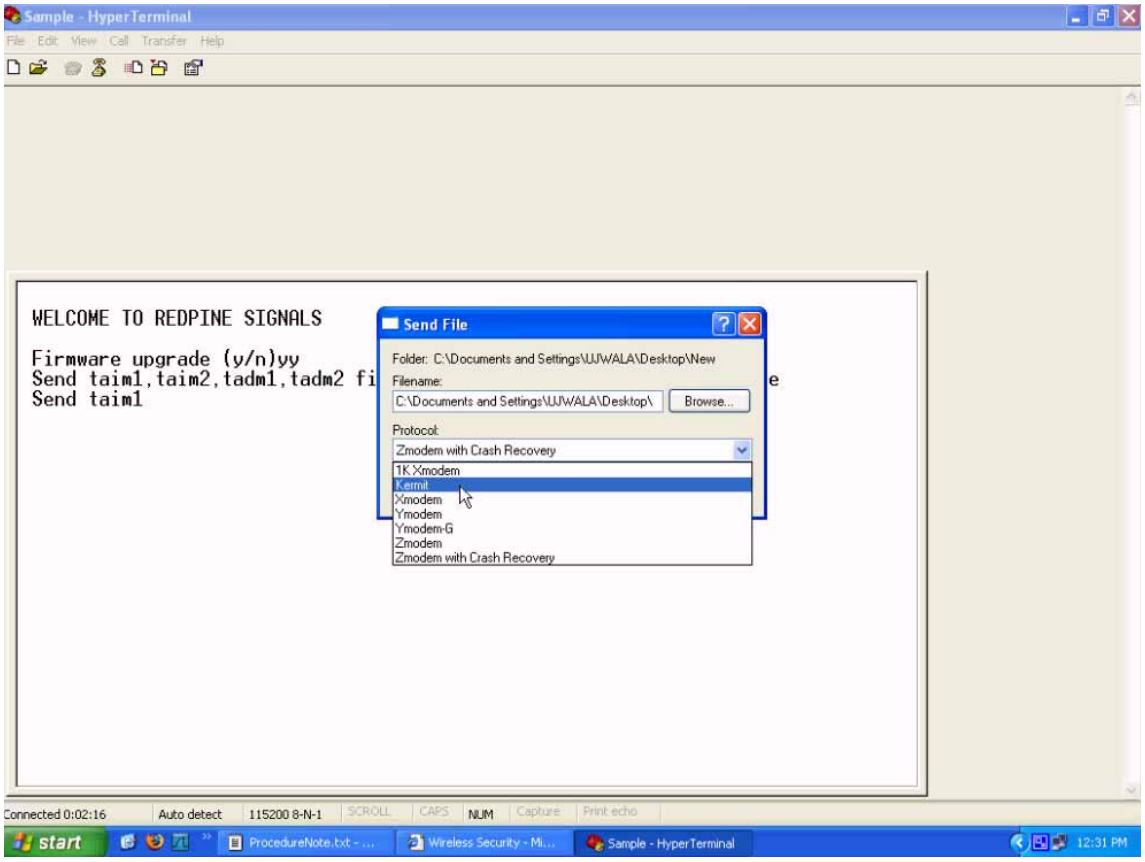


Figure 46: Select Kermit Protocol

22. Now, click Send. You will see a file transfer window open, showing the progress of the transfer.

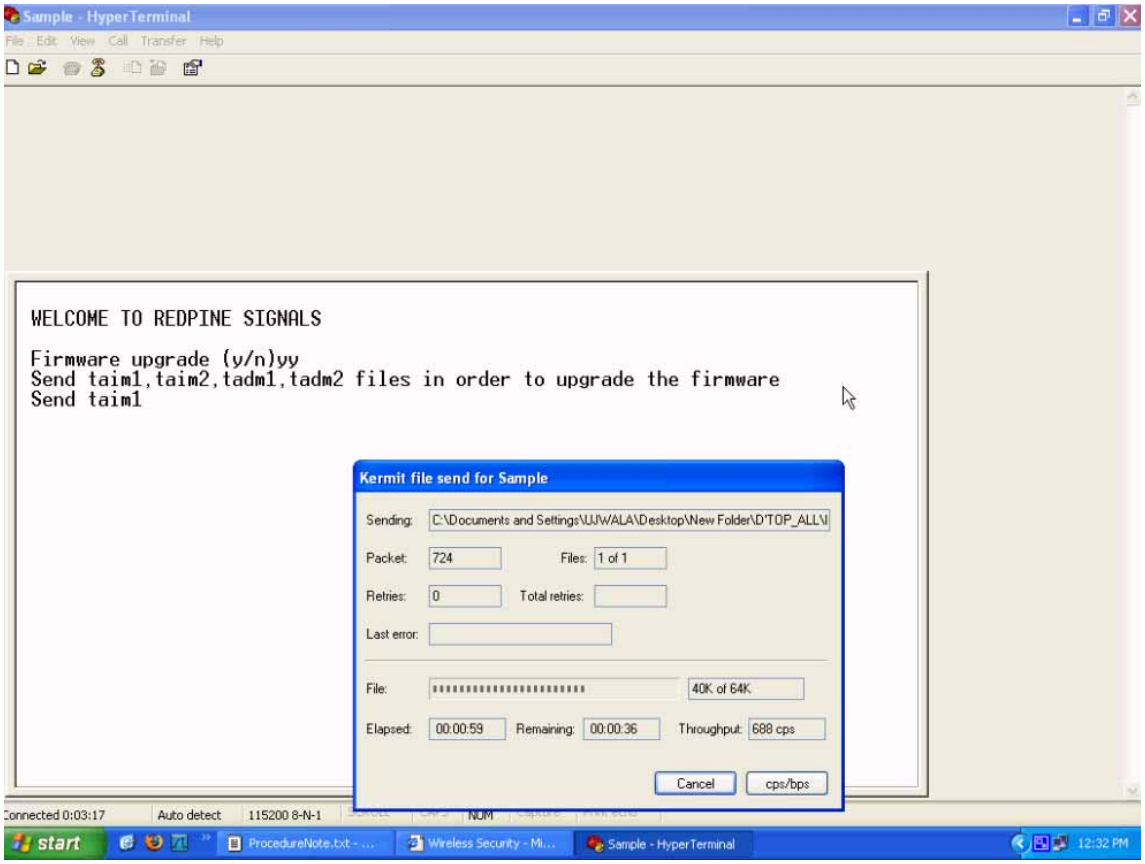


Figure 47: File Transfer Window

23. After the file is transferred completely, wait for a few seconds and you will see a prompt on the HyperTerminal asking for taim2. Send the file in the same way, followed by tadm1 and tadm2.

NOTE: The order in which the files are sent has to be taim1, taim2, tadm1 and tadm2. Otherwise, the firmware inside the module might be corrupted. If, for any reason, the files have been sent in the wrong order or if the firmware upgrade has been interrupted, restart the board and follow the instructions from step 16.

24. After the tadm2 file is sent successfully, you will see a "Firmware Upgradation completed" message on the HyperTerminal, as shown in the image below. You may now turn off the board and reprogram it with one of the example projects to work in the normal demo mode.

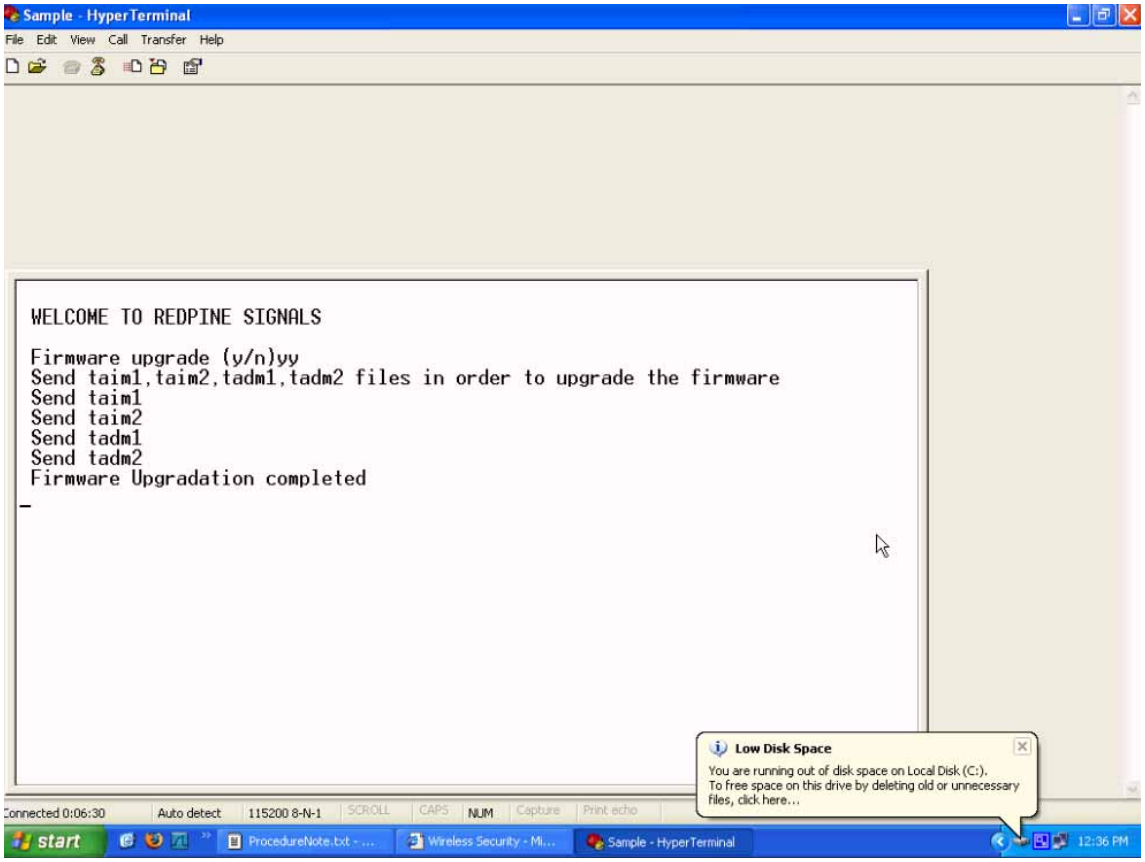
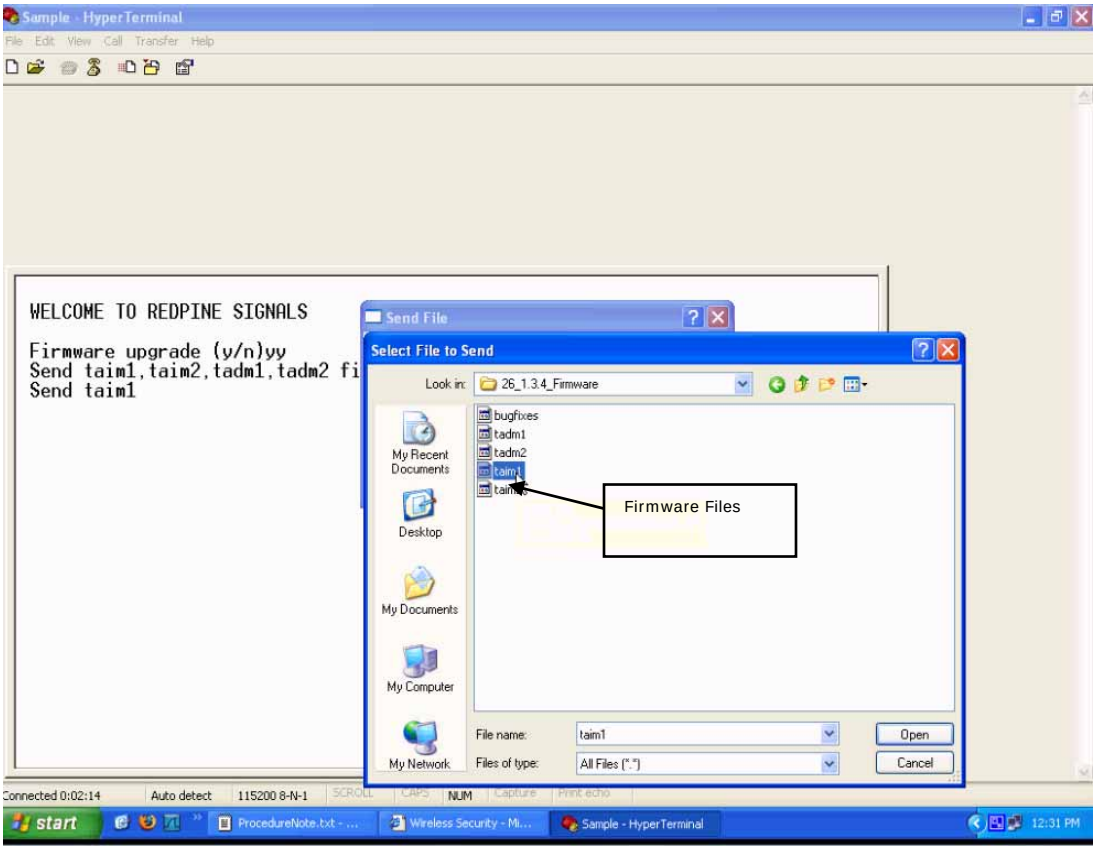
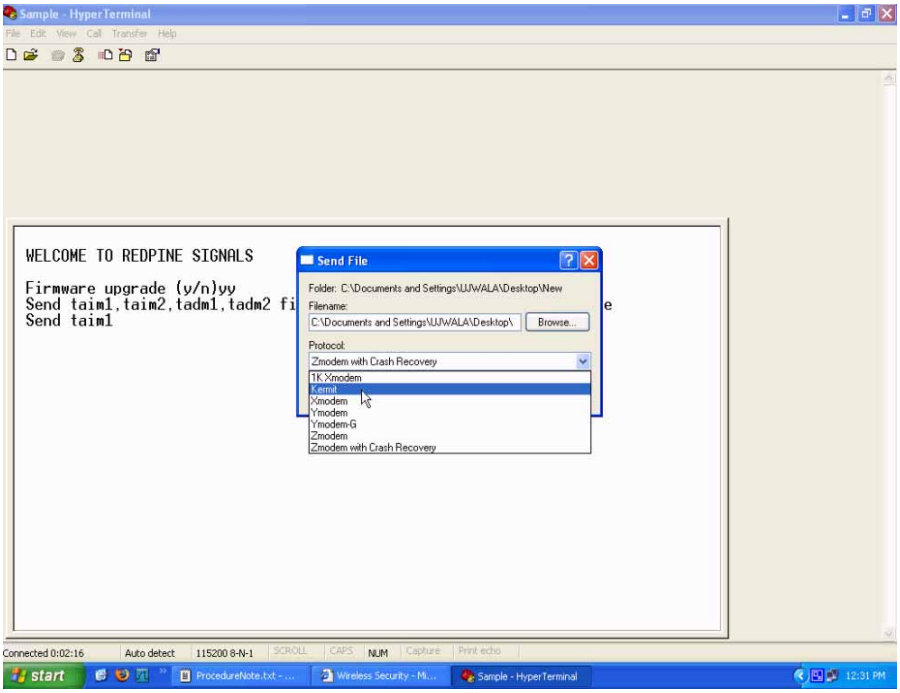
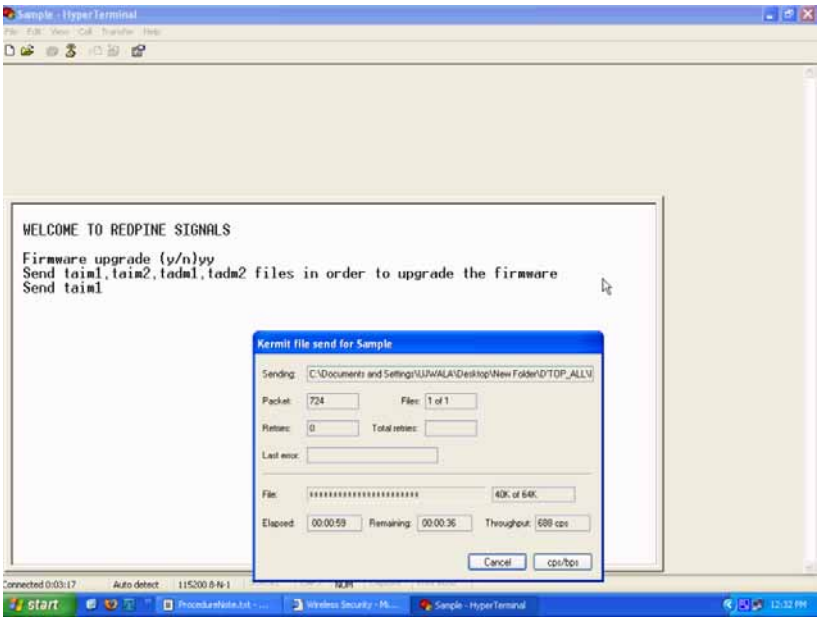
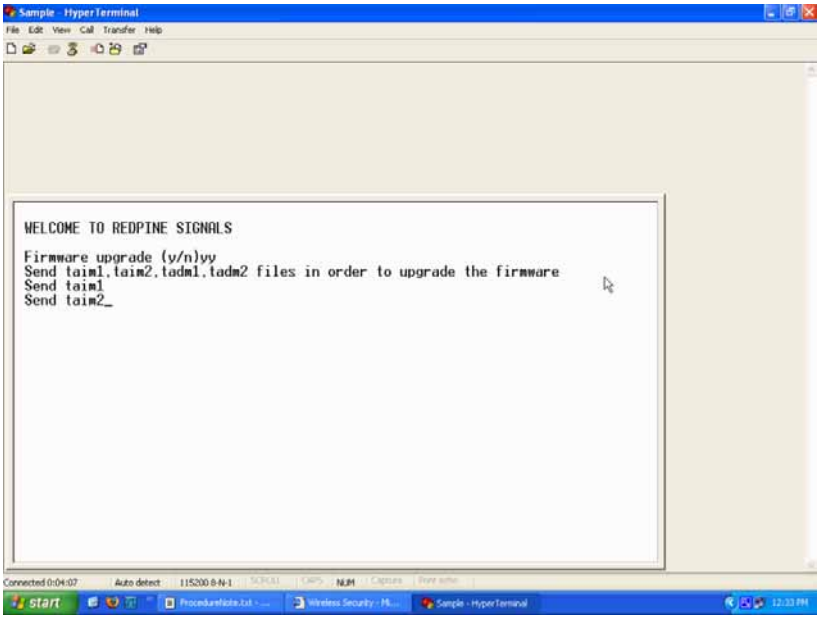


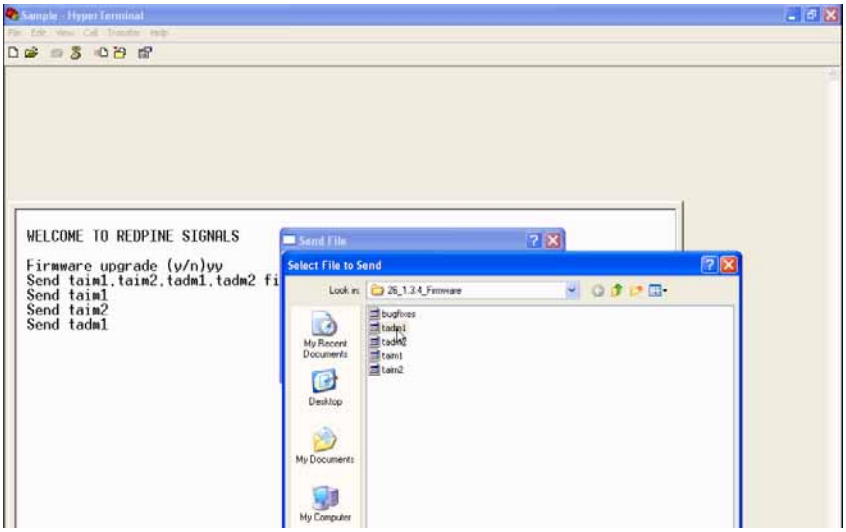
Figure 48: Firmware Upgradation Completed

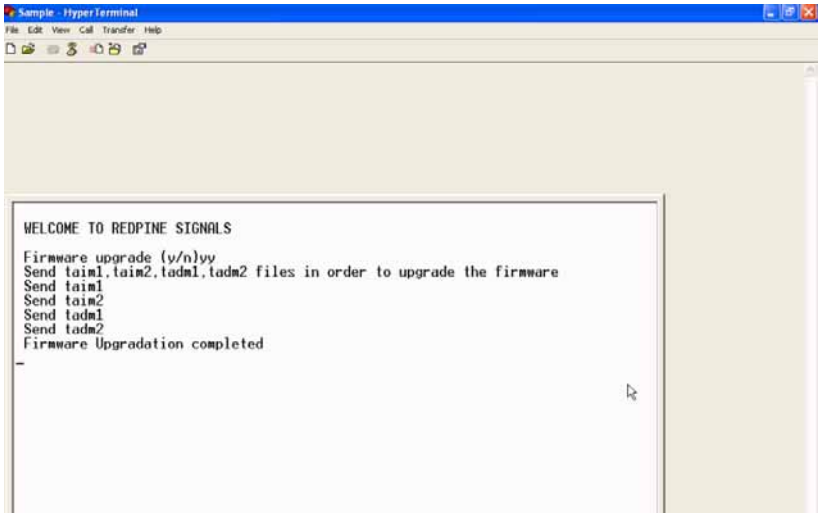












9. Power off the Cypress board and reload the example project.

*****

Revision History

Version No.	Date	Changes
1.0	June 2011	Initial Version