

Wi-Fi® G Demo Board User's Guide

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Object of Declaration: Wi-Fi G Demo Board

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The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).
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Derek Carlson
VP Development Tools

02-May-12
Date

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NOTES:

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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the Wi-Fi G Demo Board. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Warranty Registration
- Recommended Reading
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the Wi-Fi G Demo Board to create a Wi-Fi network and control the demo board functions from the client device web browser.

The manual layout is as follows:

- **Chapter 1. "Overview"** – This chapter provides a brief overview of the demo board, highlighting its features and uses.
- **Chapter 2. "Hardware"** – This chapter provides the hardware description of the Wi-Fi G Demo Board.
- **Chapter 3. "Getting Started"** – This chapter describes what you need to know to start using the Wi-Fi G Demo Board.
- **Chapter 4. "Description of Modes of Operation"** – This chapter provides the modes of operation description of the Wi-Fi G Demo Board.
- **Chapter 5. "Programming"** – This chapter describes what you need and how to program the Wi-Fi G Demo Board.

- **Chapter 6. "Advanced Features"** – This chapter describes the advanced features such as changing transmit power.
- **Chapter 7. "Customizing Web Pages"** – This chapter provides the guidelines on how to customize web page contents.
- **Appendix A. "Wi-Fi G Demo Board Schematic"** – This appendix includes the Wi-Fi G Demo Board schematic.

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CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

WARRANTY REGISTRATION

Please complete the enclosed Warranty Registration Card and mail it promptly. Sending in the Warranty Registration Card entitles users to receive new product updates. Interim software releases are available at the Microchip web site.

RECOMMENDED READING

This user's guide describes how to use the Wi-Fi G Demo Board. The following Microchip documents are available from the Microchip web site (www.microchip.com), and are recommended as supplemental resources.

MRF24WG0MA/MRF24WG0MB Data Sheet (DS70686)

Microchip MRF24W Getting Started Quick Guide for MRF24WB0MA/B, MRF24WG0MA/B for MLA v5 (DS52108)

PIC32MX5XX/6XX/7XX Family Data Sheet (DS61156)

TCPIP Stack Help.chm (This is bundled together with the TCIP/IP source code releases.)

THE MICROCHIP WEB SITE

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The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers, assemblers, linkers and other language tools. These include all MPLAB C compilers; all MPLAB assemblers (including MPASM™ assembler); all MPLAB linkers (including MPLINK™ object linker); and all MPLAB librarians (including MPLIB™ object librarian).
- **Emulators –** The latest information on Microchip in-circuit emulators. This includes the MPLAB REAL ICE™ and MPLAB ICE 2000 in-circuit emulators.
- **In-circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 3 in-circuit debuggers and PICkit™ 3 debug express.
- **MPLAB® IDE** – The latest information on Microchip MPLAB IDE, the Windows® Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 3 in-circuit debugger and MPLAB PM3 device programmers. Also included are nonproduction development programmers such as PICSTART® Plus and PICkit 2 and 3.

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- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at:
http://www.microchip.com/support

DOCUMENT REVISION HISTORY

Revision A (March 2013)

- Initial Release of this Document.

NOTES:

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Chapter 1. Overview

1.1 INTRODUCTION

Thank you for purchasing the Microchip Technology's Wi-Fi G Demonstration kit. The Wi-Fi G Demo Board provides a low-cost and portable development system for Microchip's MRF24WG0MA IEEE 802.11b/g Wi-Fi Transceiver Module.

The Wi-Fi G Demo Board is preloaded with a demo software for the user to explore the features of the MRF24WG0MA Wi-Fi module. It is also expandable through an 8-pin expansion interface, which enables the user to extend its functionality by adding various sensor expansion boards.

The topics discussed in this chapter include:

- Wi-Fi G Demonstration Kit Contents
- Functionality and Features

1.2 Wi-Fi G DEMONSTRATION KIT CONTENTS

The Wi-Fi G Demonstration Kit contains the following:

- Wi-Fi G Demo Board
- 2 AAA Batteries
- Male 1x6 Connector Header HDR-2.54 (J14)
- Wi-Fi G Demo Board Information Sheet (DS52107A)

1.3 FUNCTIONALITY AND FEATURES

The Wi-Fi G Demo Board supports the following network types:

- Infrastructure (client)
- Ad hoc
- Wi-Fi Direct (peer-to-peer as group client)
- SoftAP

The security modes supported are:

- Open
- WEP-40, WEP-104 (Wired Equivalent Privacy)
- WPA (Wi-Fi Protected Access)
- WPA2 (Wi-Fi Protected Access)

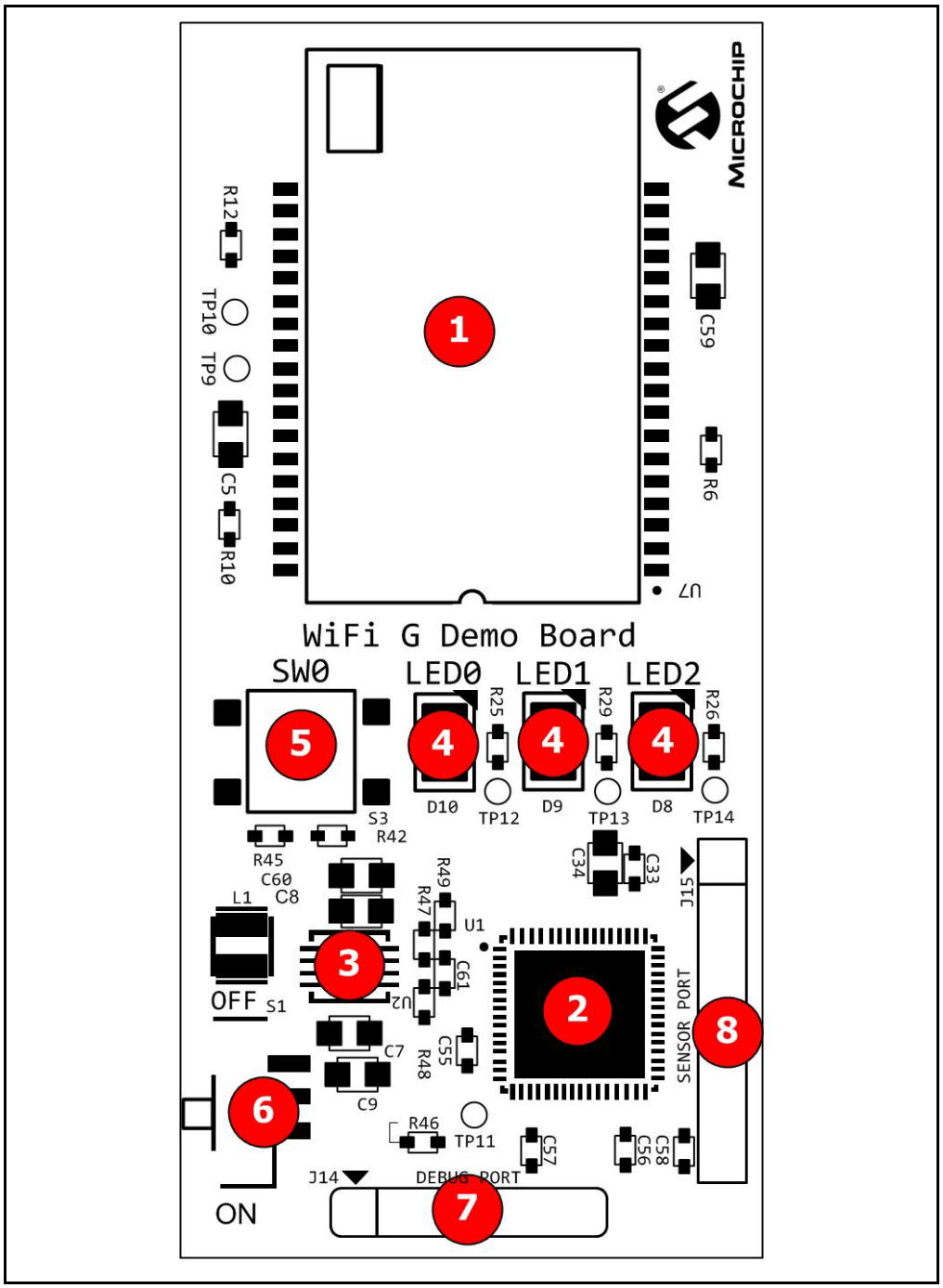
For ease of setup and usability, the following connection methods are also supported.

- WPS-PBC (Wi-Fi Protected Setup Push Button Configuration)
- WPS-PIN (Wi-Fi Protected Setup Personal Information Number)

Note: For Demo Version 1.02, only SoftAP, infrastructure and ad hoc network support are offered. SoftAP supports only open and WEP security at this time. All security modes are supported in other network types. Future versions of the Demo software will include the additional functions noted above.

A representation of the layout for the Wi-Fi G Demo Board is shown in Figure 1-1.

FIGURE 1-1: Wi-Fi® G DEMO BOARD LAYOUT



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The Wi-Fi G Demo Board has the following key features:

1. MRF24WG0MA IEEE 802.11 b/g Wi-Fi Transceiver Module
2. PIC32MX695F512H 32-bit microcontroller
3. MCP1642 +3.3V Boost regulator
4. Three LED status indicators (LED0 - GREEN, LED1 - YELLOW, LED2 - RED)
5. One push-button switch for user input (SW0)
6. Power ON/OFF slider switch (S1)
7. 6-pin programming/debug port (J14)
8. 8-pin expansion port (J15)

NOTES:

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Chapter 2. Hardware

This chapter describes the hardware features of the Wi-Fi G Demo Board.

2.1 HARDWARE FEATURES

The key features of the Wi-Fi G Demo Board are listed below and are introduced in **Section 1.3 "Functionality and Features"**. See Figure 1-1 for their locations on the board.

2.1.1 MRF24WG0MA IEEE 802.11 b/g Wi-Fi Transceiver Module

The MRF24WG0MA IEEE 802.11 b/g Wi-Fi Transceiver Module provides wireless connectivity to the demo board. Host communication is through SPI2 of the PIC processor on the board.

2.1.2 Processor Support

The Wi-Fi G Demo Board is designed with a permanently mounted (soldered) PIC32MX695F512H processor.

2.1.3 Power Supply

The board is powered by 2 AAA batteries. If required, the battery voltage is monitored and boosted by the MCP1642 Synchronous Boost Regulator.

2.1.4 LEDs

The LEDs: LED0 (GREEN), LED1 (YELLOW) and LED2 (RED) are connected to PORTE and PORTF of the PIC32MX695F512H processor. To turn the LEDs ON, the port pins are set high.

2.1.5 Switches

The Wi-Fi G Demo Board has the following switches:

- S1 – Controls the main power to the board. To turn on the board, move S1 slider to the ON position.
- SW0 – It is an active low push-button switch, connected to RD9 of the processor. When idle, the switch is pulled high (+3.3V) and when pressed, it is grounded.

2.1.6 Programming/Debug Port

Connector J14 provides easy access to the PIC32MX695F512H processor's debug pins. This is used to program or reflash the demo board with new firmware.

2.1.7 Expansion Port

Connector J15 provides access to six of the processor's spare I/O pins. These pins can function as general purpose I/O ports or as an SPI, I2C or UART interface to an external circuit design.

TABLE 2-1: J15 EXPANSION PORT PIN CONFIGURATIONS

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Interface
SCK	+3.3V	GND	SDI	SDO	/SS	-*	-*	SPI
-	+3.3V	GND	SDA	SCL	-	-*	-*	I^2C™
RTS	+3.3V	GND	RX	TX	CTS	-*	-*	USART
TX2	+3.3V	GND	RX1	TX1	RX2	-*	-*	DUAL USART

* - Pins 7 and 8 may be used as GPIO or A2D (analog-to-digital) pins.

Chapter 3. Getting Started

3.1 OVERVIEW

The Wi-Fi G Demo application uses a network provisioning mechanism called EasyConfig to enable configuration of an embedded device on a wireless network. EasyConfig utilizes the web server of the TCP/IP stack and a wireless network to enable the user to input the desired network information from a client browser, and then reset the device to connect to the desired network.

3.2 RUNNING THE Wi-Fi G DEMO APPLICATION

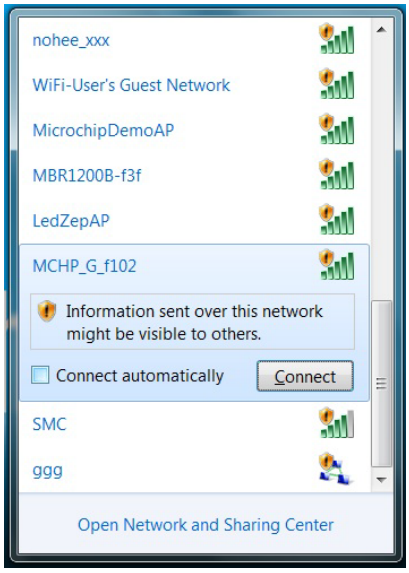
This section describes how to connect to the Wi-Fi G Demo Board to control the on board LEDs and view the status of the SW0 switch from a web browser. It also describes how to connect the Wi-Fi G Demo board to an existing network.

1. After turning the power on, the Wi-Fi G Demo Board broadcasts a SoftAP network with an SSID, `MCHP_G_xxxx`, where, `xxxx` is the last four digits of the MRF24WG0MA IEEE 802.11 b/g Wi-Fi Transceiver Module's MAC address (See Example 3-1).

EXAMPLE 3-1:

```
MRF24WG0MA MAC (SN): 001EC001F102
SSID: MCHP_G_F102
```

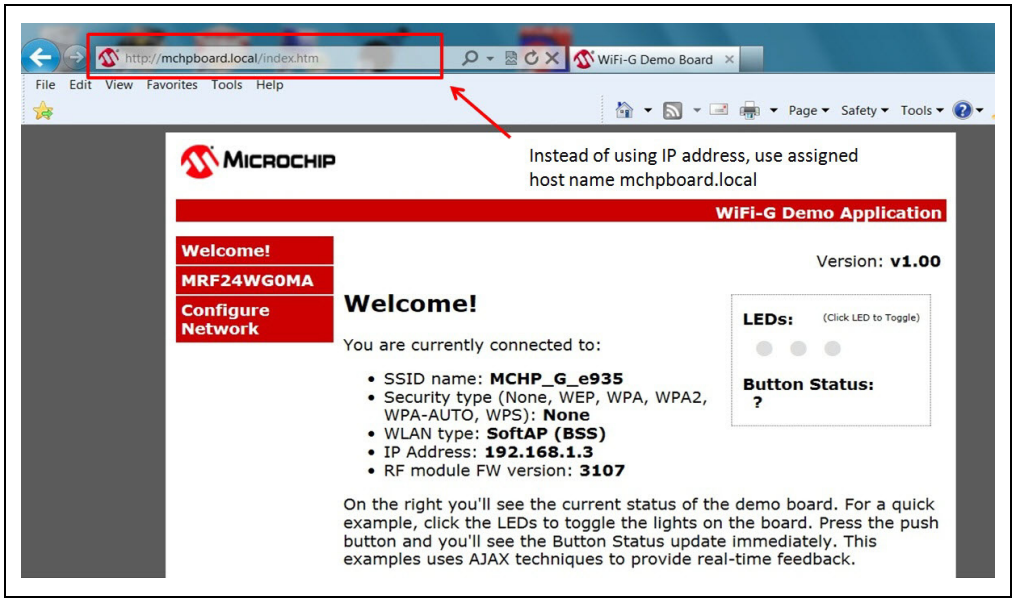
FIGURE 3-1: AVAILABLE WIRELESS NETWORKS



Note: SoftAP is required to transmit beacons within each beacon interval. This increases the transmit power consumption and therefore shorten the battery life.

2. Connect a client device (e.g., laptop, smart devices) to the `MCHP_G_xxxx SoftAP` network.
3. When the client device is connected, use a standard web browser and enter the IP address of the Wi-Fi G Demo Board. The default IP address is http://192.168.1.3. Another alternative is to enter "mchpboard.local" into the web browser. See figure Figure 3-2.

FIGURE 3-2: ACCESSING WEB BROWSER

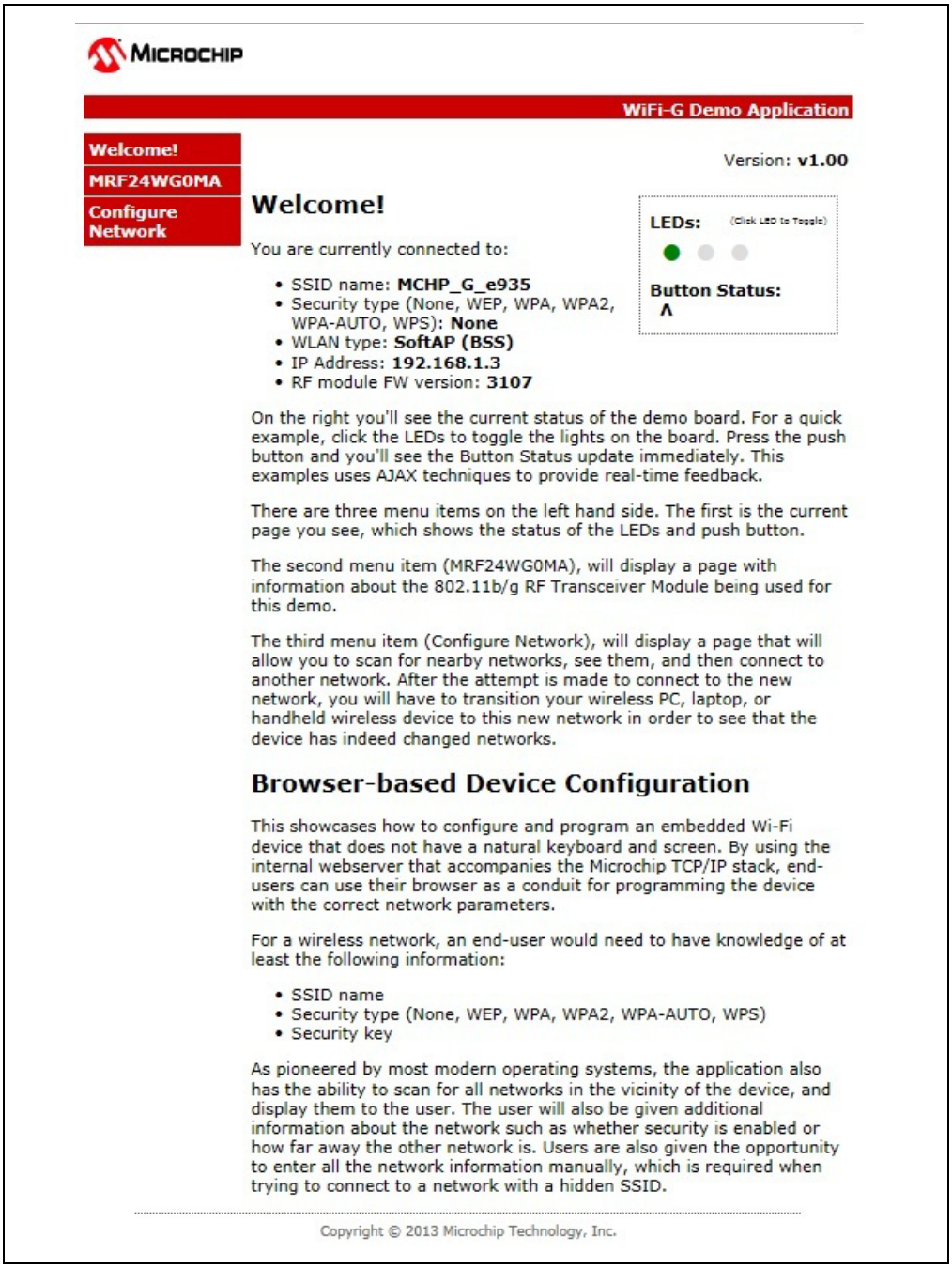


4. The following web pages from the web server that is running on the Wi-Fi G Demo Board are displayed.

a) The `index.htm` web page displays the additional information about the Wi-Fi G Demo Board application. It also displays the continually updating status of the three LEDs (LED0, LED1 and LED2) and push-button on the Wi-Fi G Demo Board, see Figure 3-3. To control the LEDs, click on the LED icon on the web page. To see the status of the push-button, press SW0 on the Wi-Fi G Demo Board.

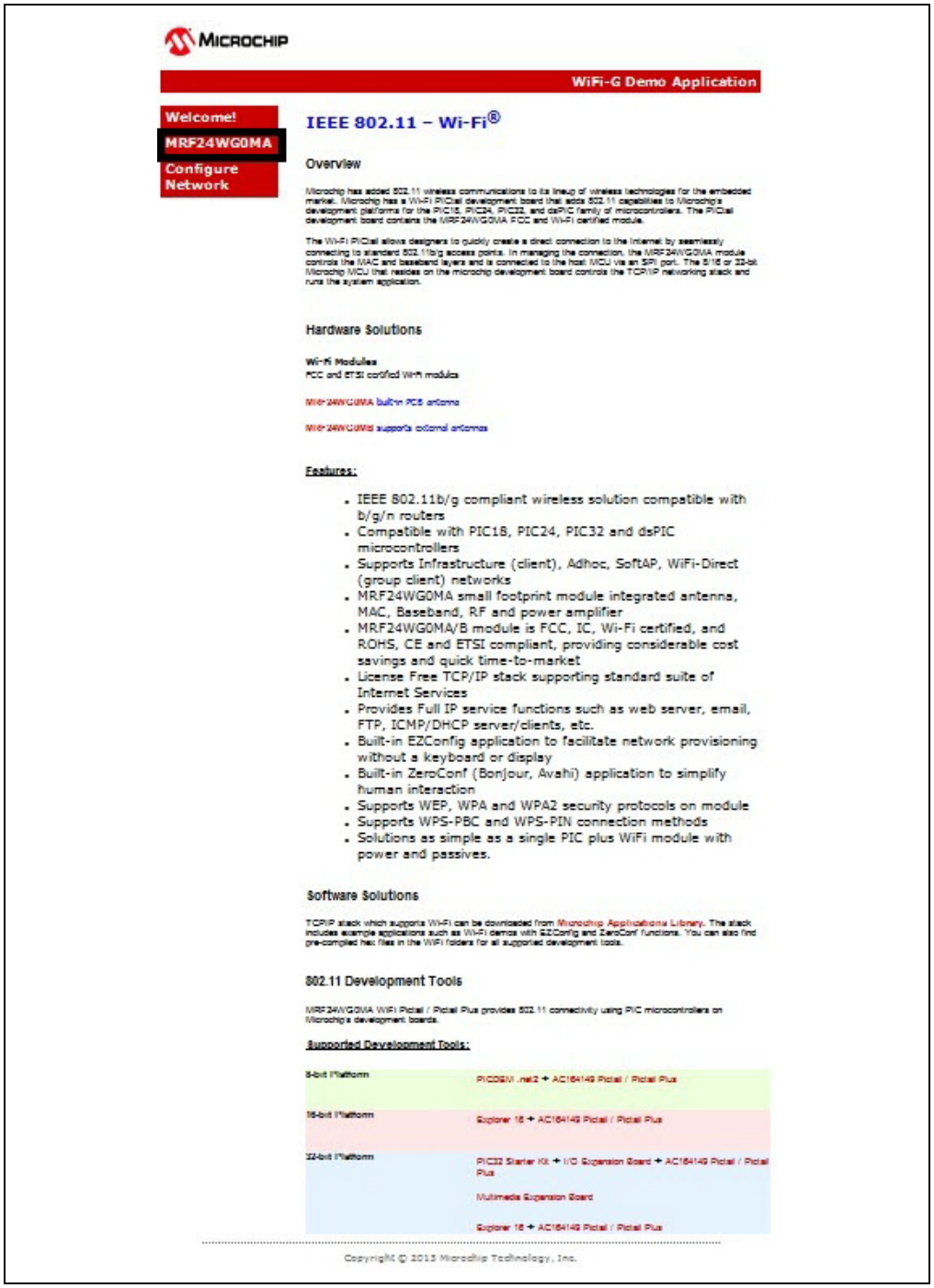
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FIGURE 3-3: SAMPLE INDEX.HTM WEB PAGE



b) The `mrf24wg0ma.htm` web page highlights the features of the MRF24WG0MA IEEE 802.11 b/g Wi-Fi Transceiver Module and the supporting development tools. See Figure 3-4.

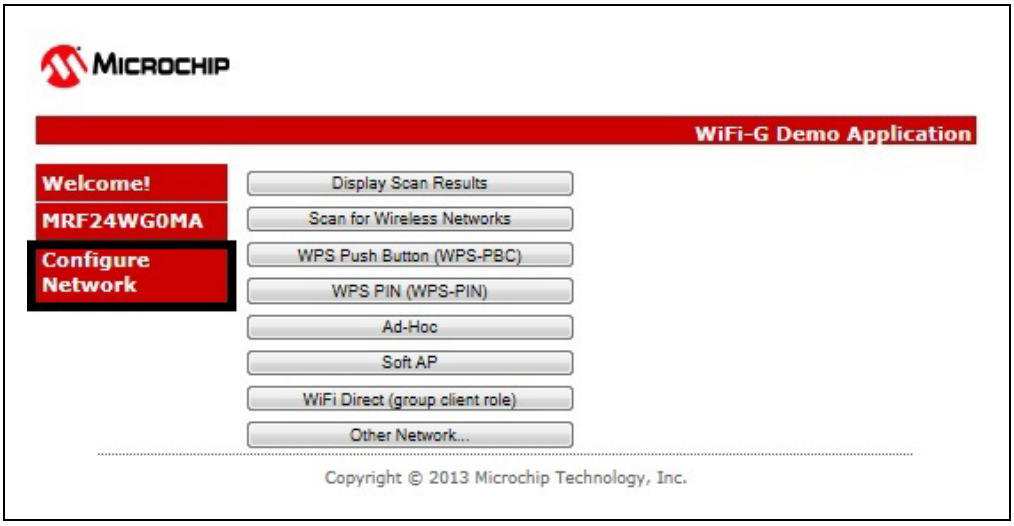
FIGURE 3-4: SAMPLE `MRF24WG0MA.HTM` WEB PAGE



c) The `configure.htm` web page enables the user to scan for nearby networks and connect to the selected network to start up as a group client in Wi-Fi Direct network, or as an ad hoc, or as a SoftAP and to select WPS-PBC or WPS-PIN. See Figure 3-5.

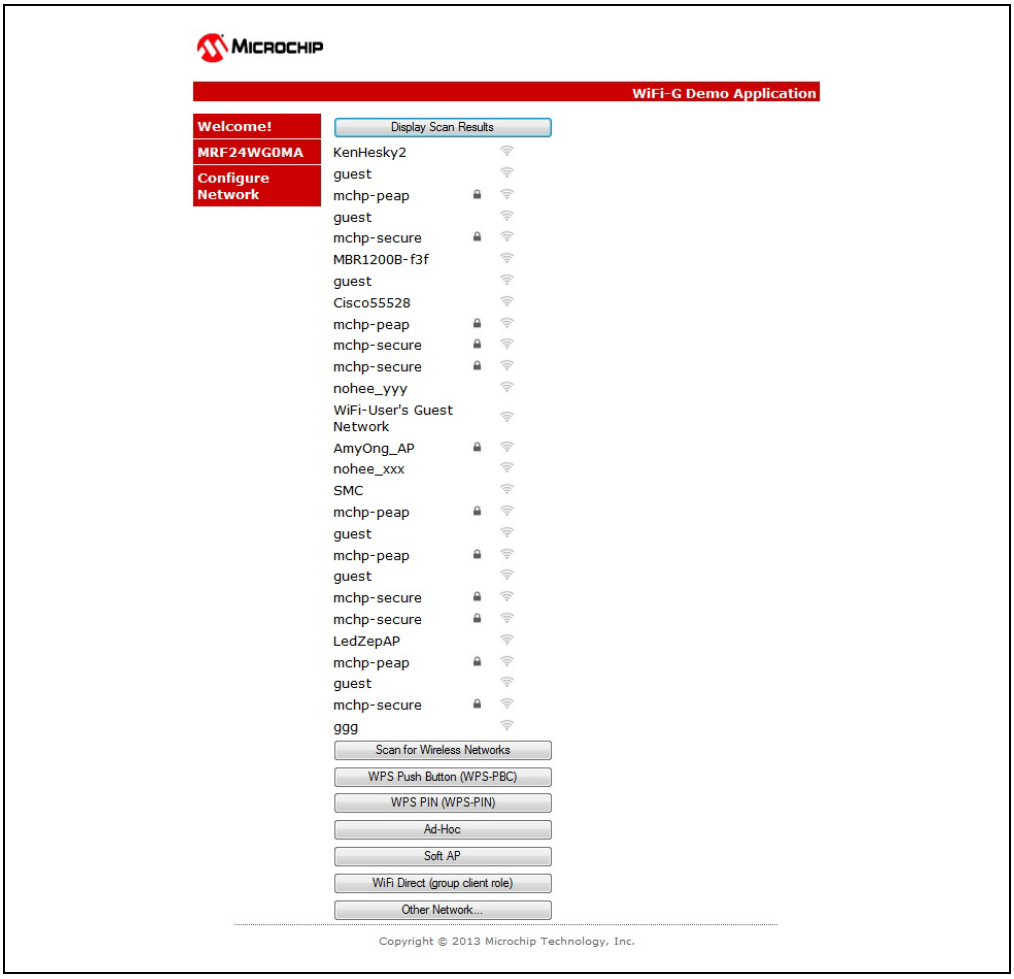
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FIGURE 3-5: SAMPLE CONFIGURE.HTM WEB PAGE



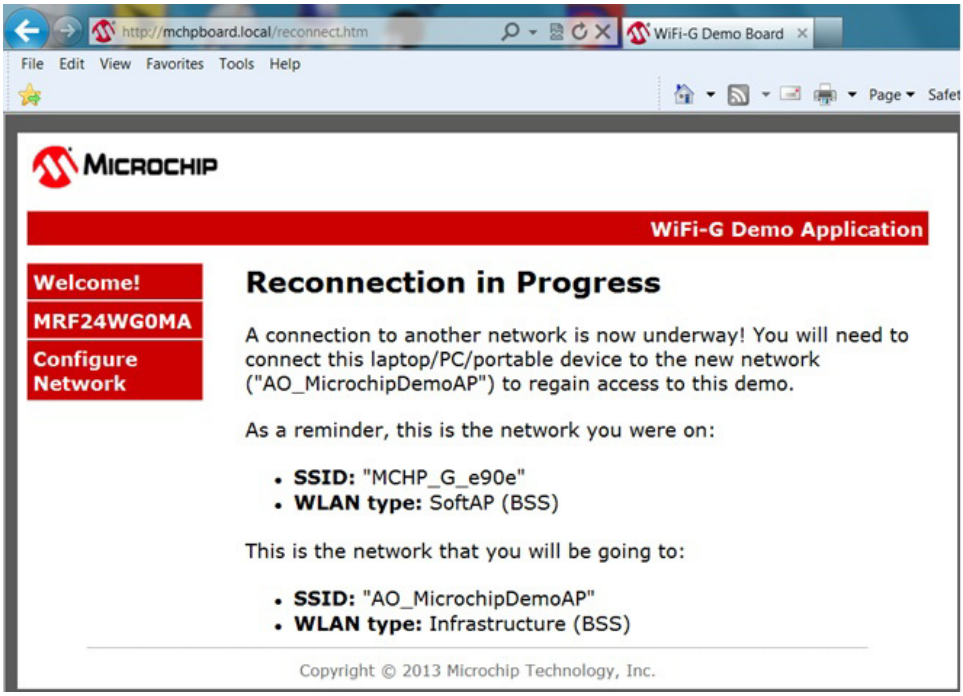
5. To connect the Wi-Fi G Demo board to an existing network, click **Display Scan Results** on the `configure.htm` web page. See Figure 3-6.

FIGURE 3-6: DISPLAY SCAN RESULTS WEB PAGE



6. When a new network is selected, the Wi-Fi G Demo Board resets automatically using the parameters (SSID, security key) of the new network to reconnect to this new network. See Figure 3-7.

FIGURE 3-7: RECONNECTION TO NEW NETWORK



7. To continue using the demo, the client device must be reconnected to the same network where Wi-Fi G Demo Board is redirected to.

Note: This is not applicable for initial release Demo Version 1.02. The demo board always attempts to connect to the last known network. If the user wants to reset the demo board to factory default conditions (startup in SoftAP mode) again, then simply press SW0 for 4 seconds. Do NOT press SW0 immediately on power up, as this initiates a self-test and does not reset the demo board to default factory conditions.

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Chapter 4. Description of Modes of Operation

4.1 SoftAP NETWORK

On starting the demo, the factory default conditions has the product start up as a SoftAP without security. This means that all the network information that is being configured on the device is going over-the-air in the open. For most applications, unless another user is specifically attempting to listen in on this network, the potential security impact is minor. However, for applications that require baseline level of security, WEP can be employed on the network.

SoftAP is the centralized coordinator for the network. With MRF24WG0MA IEEE 802.11 b/g Wi-Fi Transceiver Module firmware version 0x3107 and future releases, it supports Wired Equivalent Privacy (WEP) (40-bit/104-bit) security.

4.2 AD HOC NETWORKS

Ad Hoc networks are peer-to-peer networks with no centralized coordinator for the network. All the devices share the responsibilities of keeping the network running. According to 802.11 specifications, ad hoc network only supports 802.11b rates of 1 Mbps, 2 Mbps, 5.5 Mbps and 11 Mbps.

One downfall of ad hoc networks is that typically security is not employed on them.

The MRF24WG0MA IEEE 802.11 b/g Wi-Fi Transceiver Module can secure an ad hoc network with Wired Equivalent Privacy (WEP) (40-bit/104-bit) security, like most of the laptops and ad hoc devices. Very few devices in the market can secure an ad hoc network with Wi-Fi Protected Access (WPA) level security due to tremendous overhead.

For most applications, unless another user is specifically attempting to listen in on this network, the potential security impact is minor. However, for applications that require baseline level of security, WEP can be employed on the network.

Most Android devices do not support ad hoc networks.

4.3 Wi-Fi DIRECT NETWORKS

Wi-Fi Direct network is a peer-to-peer (P2P) network. It enables the user to configure a secured wireless network between several devices, such as smart devices, laptops or computers with wireless network adapters, without using an access point (AP).

Wi-Fi Direct supports Wi-Fi Protected Setup (WPS) connection method, which is known as the WSC (Wi-Fi Simple Configuration) Config Methods in the Wi-Fi Peer-to-Peer (P2P) Technical Specifications, in particular WPS Push Button method with WPA2.

From the negotiation process, each device determines which devices become group owner (GO) or group client (GC). The GroupOwnerIntent field in the P2P information element (IE) indicates the level of desire to become the GO. The higher the value, the higher the desire to be the GO.

MRF24WG0MA IEEE 802.11 b/g Wi-Fi Transceiver Module only supports the role of GC.

Wi-Fi Direct does not support 802.11b.

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4.4 ZERO CONFIGURATION/BONJOUR

Zero Configuration (Zeroconf) provides a mechanism to simplify the device configuration on a network. The term Zeroconf is titled from the names Bonjour (Apple) and Avahi (Linux), and is an Internet Engineering Task Force (IETF) standard. Zeroconf provides simplified naming conventions, instead of relying on the IP addresses alone.

The Zeroconf is built on the following three core technologies:

4.4.1 Link Local

The first component of Zeroconf is the ability to self-assign an IP address to each member of a network. Usually, a Dynamic Host Configuration Protocol (DHCP) server handles such situations. However, when no DHCP server exists, Zeroconf-enabled devices negotiate the unique IP address amongst themselves.

4.4.2 Multicast DNS

The second component of Zeroconf is the ability to self-assign the host names. Multicast Domain Name System (mDNS) provides the local network with the ability to have the features of a DNS server. User can use the host names to access the devices on the network. When devices select to use the same host name, as in the IP address resolution, each of the devices has the ability to self-assign the Auto-negotiate New Names, usually appending a number at the end of the name.

4.4.3 Service Discovery

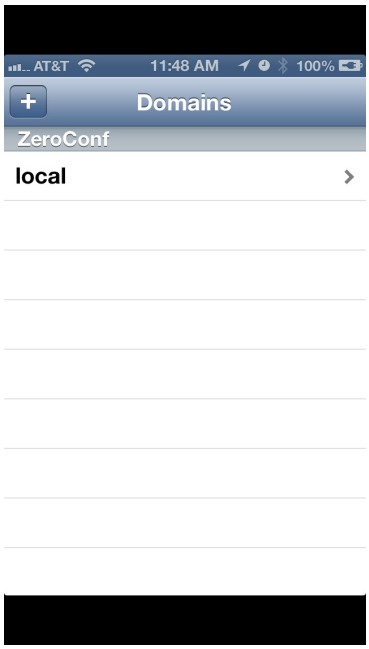
The last component of Zeroconf is service discovery. All Zeroconf devices can broadcast what services they provide. For instance, a printer can broadcast about available printing services. A thermostat can broadcast that it has an HVAC control service. For a specific service, the user can see the list of devices that provide the service, and connect to it. This eliminates the need to know whether something exists on a network (and what its IP or host name is). The user can query the network to see if a certain service exists or not, and easily connect to it.

4.4.4 Zero Configuration & mDNS demonstration

An iPhone and an apps supporting Zero Configuration is used in the demonstration.

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FIGURE 4-1: ZERO CONFIGURATION DOMAIN



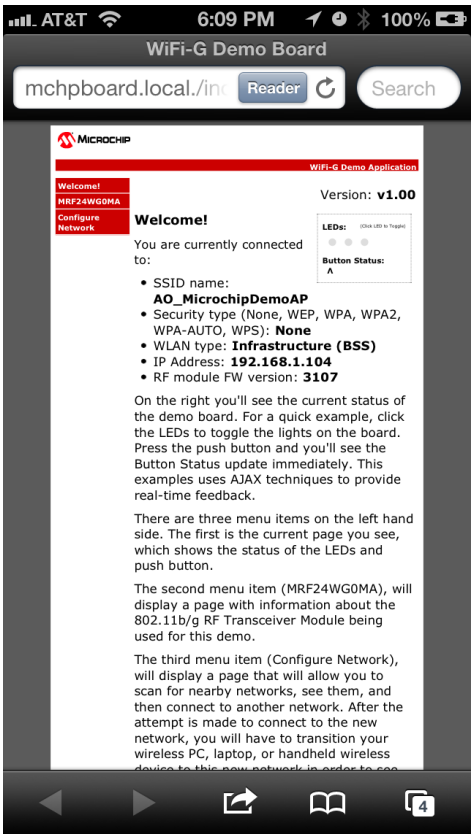
Click on the local domain and determine available services. See Figure 4-2.

FIGURE 4-2: SERVICE DISCOVERY



Click on the service offered, in this case, DemoWebServer. A web browser opens and displays the Wi-Fi G Demo Board web pages. See Figure 4-3.

FIGURE 4-3: DEMO WEB BROWSER



4.5 CONFIGURED VS. UNCONFIGURED STATE

When the Wi-Fi G Demo is in an unconfigured state (i.e, serving the default `MCHP_G_xxxx` SSID in SoftAP mode), the GREEN LED (LED0) blinks twice per second to indicate that it is not configured. After the network is configured, the LED blinks once per second.

Note: When the Wi-Fi G Demo Board is moved to a different network, a new IP address is assigned to it. As the new Wi-Fi G Demo Board does not display the new IP address, the user must obtain the new IP address from the server that assigned it. Refer to your server's documentation for the necessary steps required to obtain the new IP address.

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4.6 DETERMINING NEW IP ADDRESS ASSIGNED

There are two methods to determine the new IP address assigned:

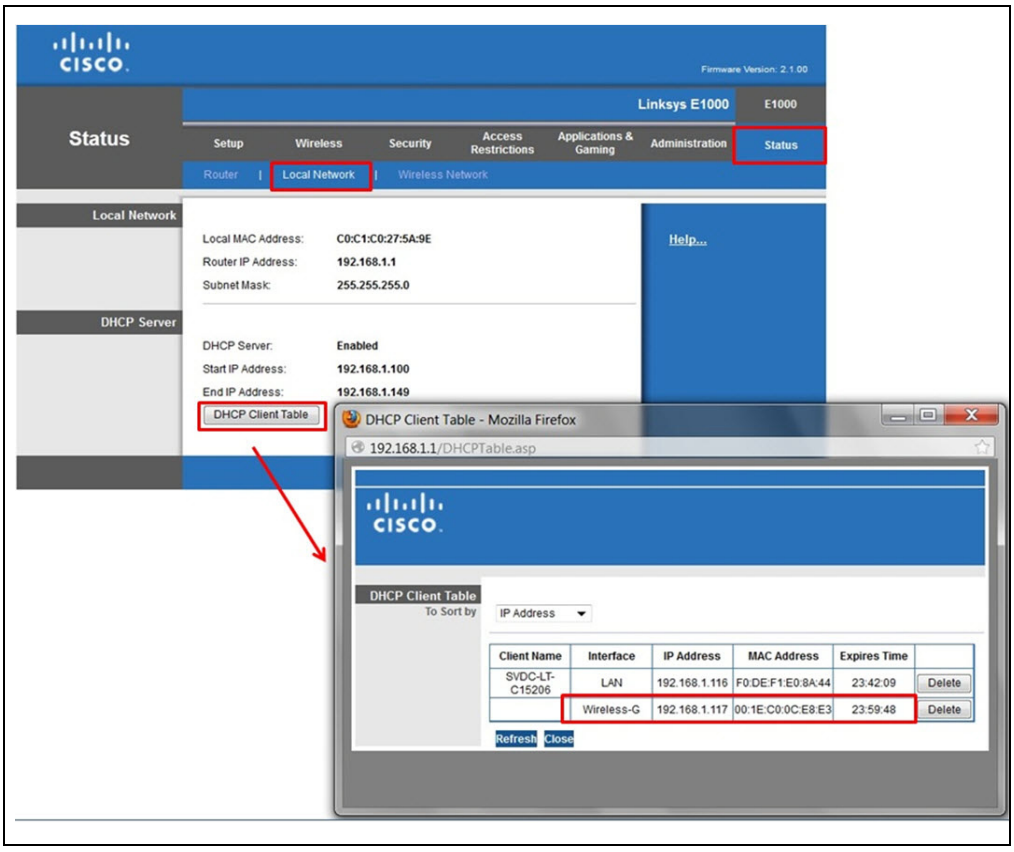
a) Zero Configuration / mDNS

From the zero configuration apps, once this apps redirects and opens up the web browser, the Wi-Fi G Demo web page shows the new assigned IP address. See Figure 4-3.

b) AP DHCP ClientTable

Refer to your AP's documentation for the necessary steps required to obtain the new IP address. As an example, for certain APs, by selecting <Status> and then <Local Network>, an option <DHCP Client Table> is offered. This DHCP Client Table lists the IP address that is assigned to the Wi-Fi G Demo Board. See Figure 4-4.

FIGURE 4-4: DHCP CLIENT TABLE



NOTES:

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Chapter 5. Programming

5.1 SOFTWARE

The required software to program Wi-Fi G Demo Board include:

- Microchip MPLAB® X IDE
- Microchip MPLAB XC32 Compiler

Wi-Fi G Demo Board is based on the Microchip TCPIP stack software. You can download the latest software version from the Microchip web site, as this contains the latest bug fixes and the best support for current versions of the compilers.

Initial release is based on the Microchip TCPIP v5 stack software. Future plan is to add this to Microchip TCPIP V6 stack software. Software updates are available on the Microchip web site.

The initial release will only demo SoftAP with the capability to scan before connection, enabling scan results to be available. From the scan results, another network can be chosen to be redirected to.

Future releases will add more features such as Wi-Fi Protected Setup (WPS), etc.

Refer to the release notes for more information.

5.2 HARDWARE

The following hardware is required to program the Wi-Fi G Demo Board:

- In-circuit debuggers, emulators or programmers such as the PICkit™ 3, MPLAB ICD 3 and MPLAB REAL ICE™ In-Circuit emulator.

  In Figure 5-1, the MPLAB ICD 3 is used.

  In Figure 5-3, the PICkit 3 debugger is used.
- ICD 2 to ICSP Adaptor (Part number AC164110) is needed if the MPLAB ICD 3 or MPLAB REAL ICE In-Circuit Emulator is used.
- Wi-Fi G Demo Board
- Power supply requirements:
  - If programming using PICkit 3 or MPLAB ICD 3, power supply can be supplied from the PICkit 3 or MPLAB ICD 3 itself.
  - If using batteries during programming, note that multiple programming may drain the batteries.
  - +3.3V DC power supply may be needed if MPLAB X IDE is in debugging mode.

The required hardware interconnections include:

- ICD 2 to ICSP Adaptor (Part number AC164110)
  - Connect Wi-Fi G Demo Board J14 pin 1 to ICD 2 to ICSP Adaptor J2 pin1. See Figure 5-2.
- PICkit 3
  - Connect Wi-Fi G Demo Board J14 pin 1 to PICKit3 header pin 1. See Figure 5-3.

- If external power supply is used:
  - Supply Wi-Fi G Demo Board J14 pin 2 with +3.3V.
  - Connect Wi-Fi G Demo Board J14 pin 3 to GND.

  Otherwise, make sure 2 AAA batteries are present.

FIGURE 5-1: Wi-Fi® G DEMO BOARD – MPLAB® ICD 3 HARDWARE INTERFACE

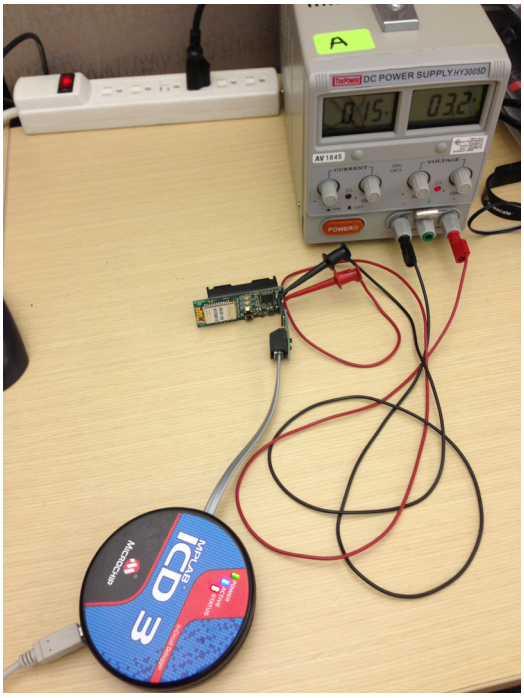


FIGURE 5-2: Wi-Fi® G DEMO BOARD – ICD 2 TO ICSP™ ADAPTOR HARDWARE INTERFACE



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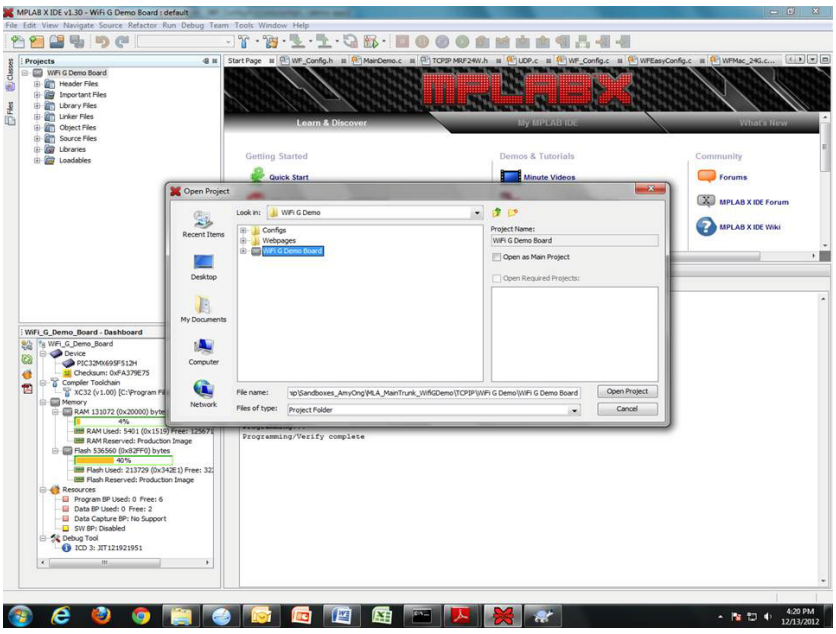
FIGURE 5-3: Wi-Fi® G DEMO BOARD – PICkit™ 3 HARDWARE INTERFACE



5.3 PROGRAMMING SEQUENCES – PROJECT

1. Open MPLAB X IDE.
2. Click on *File>Open Project*. Browse to Wi-Fi G Demo Board directory and open Wi-Fi G Demo Board. See Figure 5-4.

FIGURE 5-4: OPEN Wi-Fi® G DEMO BOARD PROJECT



3. Check the appropriate in-circuit debugger is selected. Click on <Project Properties>. See Figure 5-5. Ensure that right in-circuit debugger is selected. See Figure 5-6.

FIGURE 5-5: PROJECT PROPERTIES

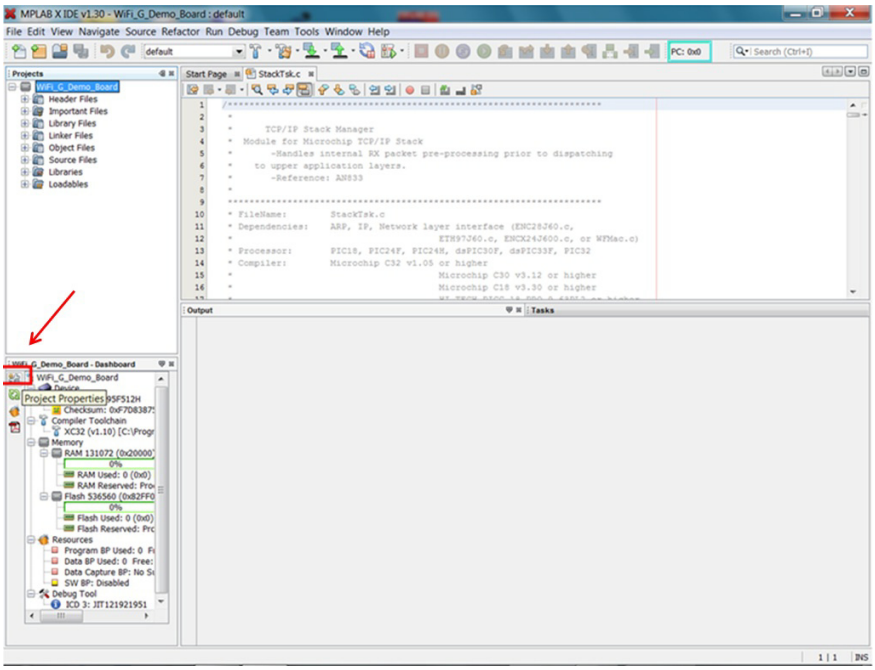
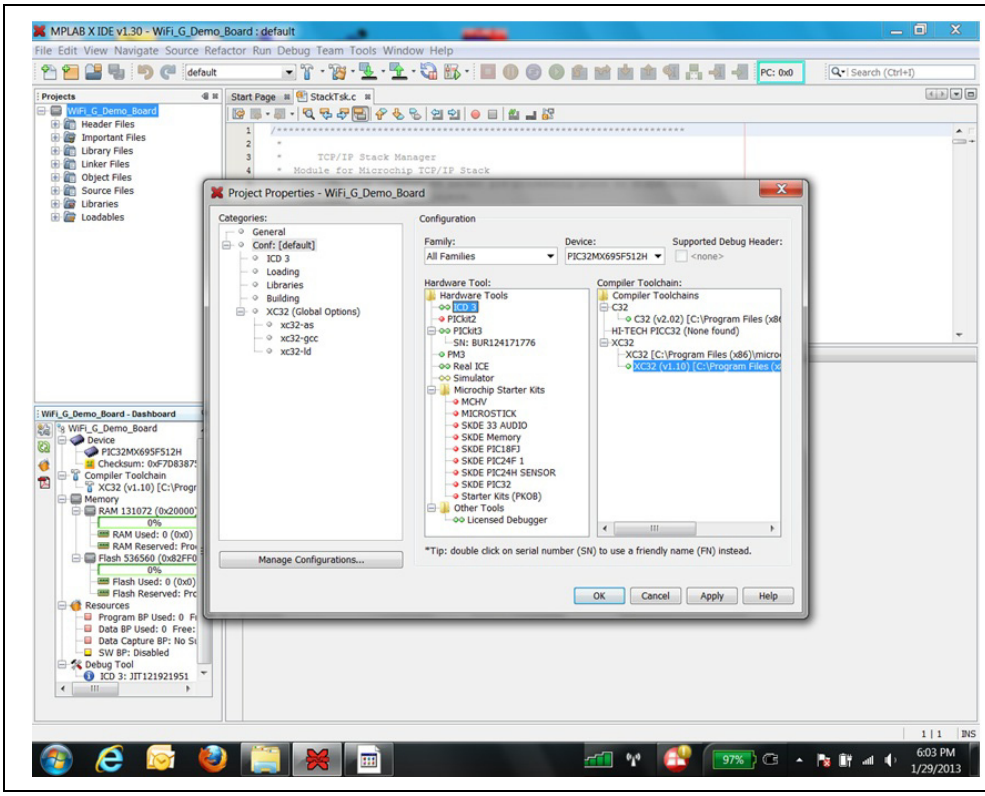


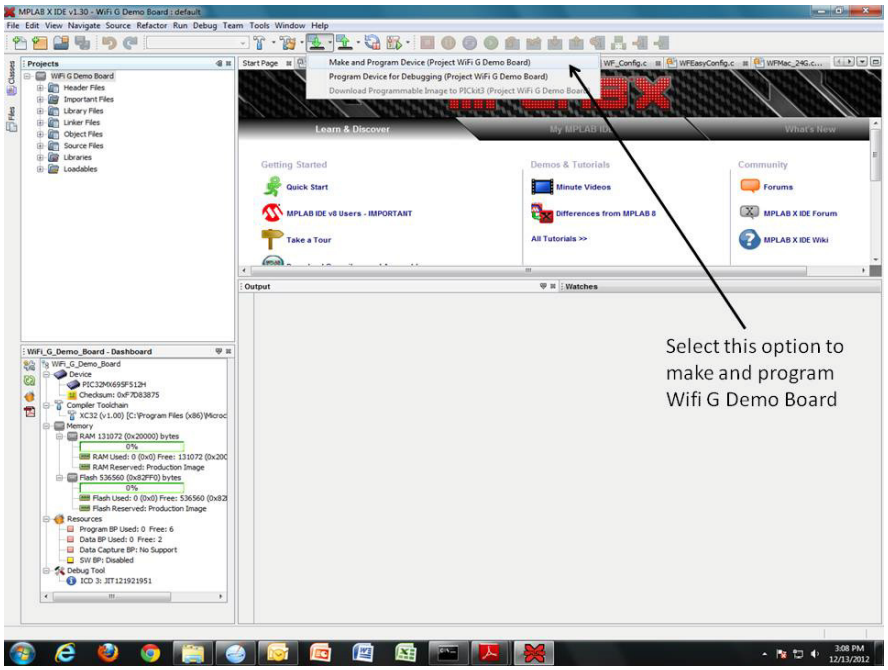
FIGURE 5-6: IN-CIRCUIT DEBUGGER SELECTION



4. Ensure that power switch S1 is set to ON. Select <Make and Program Device (Project Wi-Fi_G_Demo_Board)>. See Figure 5-7.

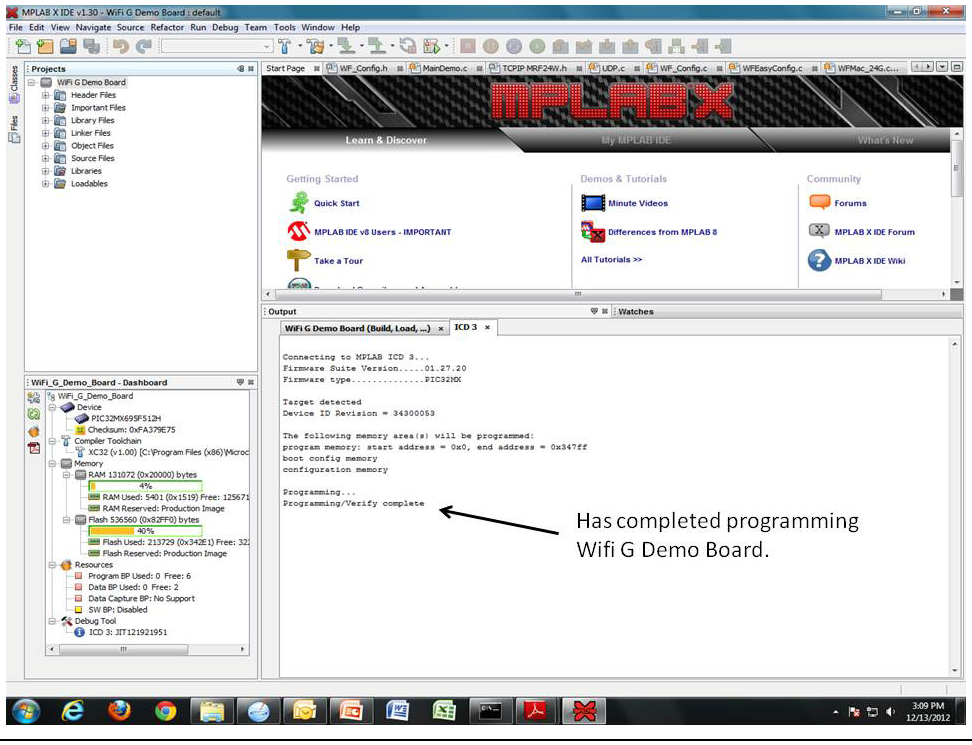
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FIGURE 5-7: MAKE AND PROGRAM DEVICE



5. Wait for programming to complete. See Figure 5-8.

FIGURE 5-8: PROGRAMMING IS COMPLETED

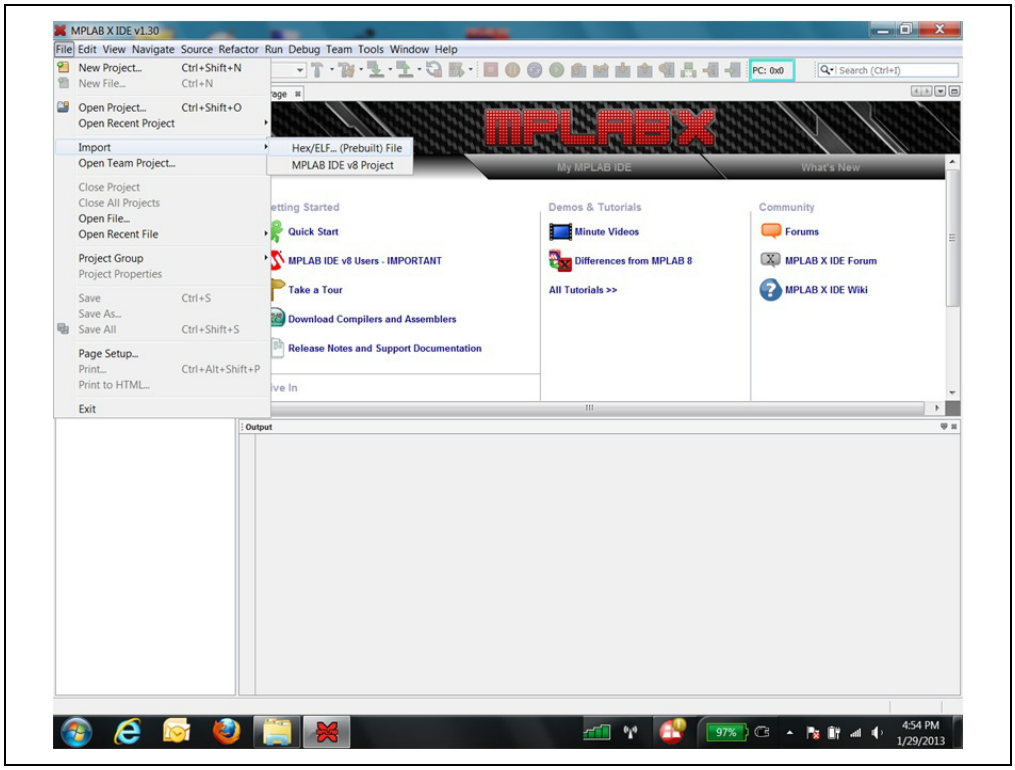


5.4 PROGRAMMING SEQUENCES – HEX FILE

1. Open MPLAB X IDE.
2. Click on *File>Import>Hex/ELF ..(Prebuilt) File*.

   See Figure 5-9.

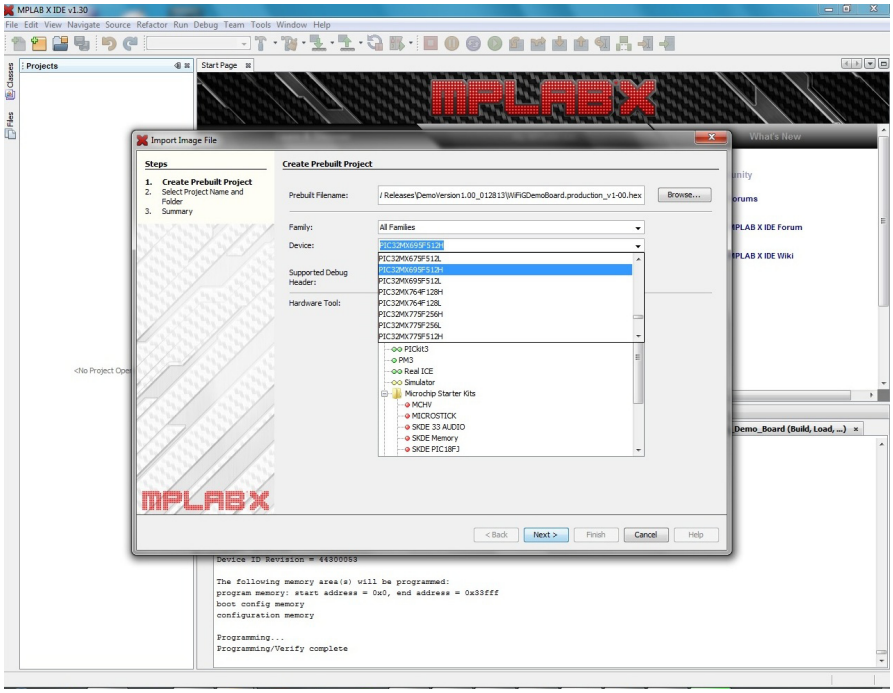
FIGURE 5-9: IMPORT HEX FILE



3. Browse to directory containing this HEX file. Select the correct device <PIC32MX695F512H>. See Figure 5-10.

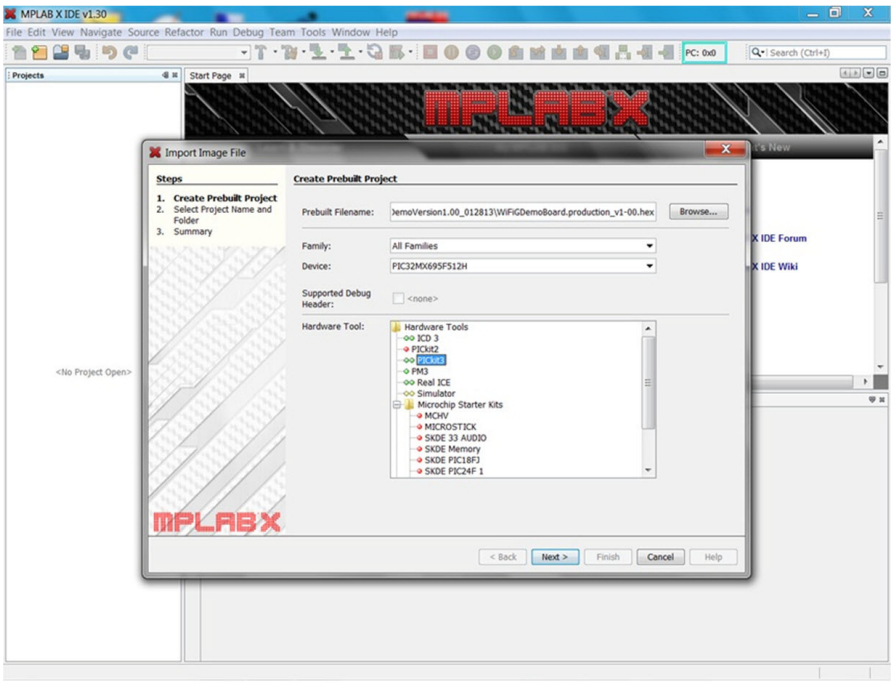
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FIGURE 5-10: IMPORT HEX FILE – SELECT DEVICE PIC32MX695F512H



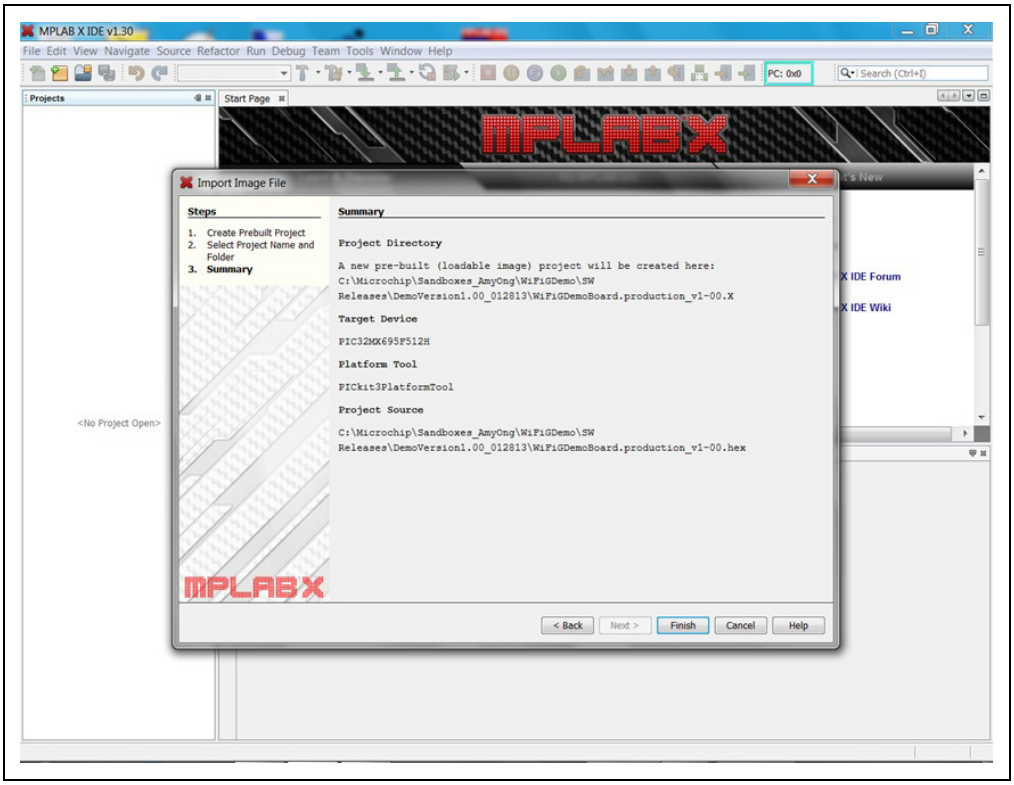
4. Select the correct hardware tool (in-circuit debugger), for example PICkit 3. See Figure 5-11.

FIGURE 5-11: IMPORT HEX FILE – SELECT IN-CIRCUIT DEBUGGER



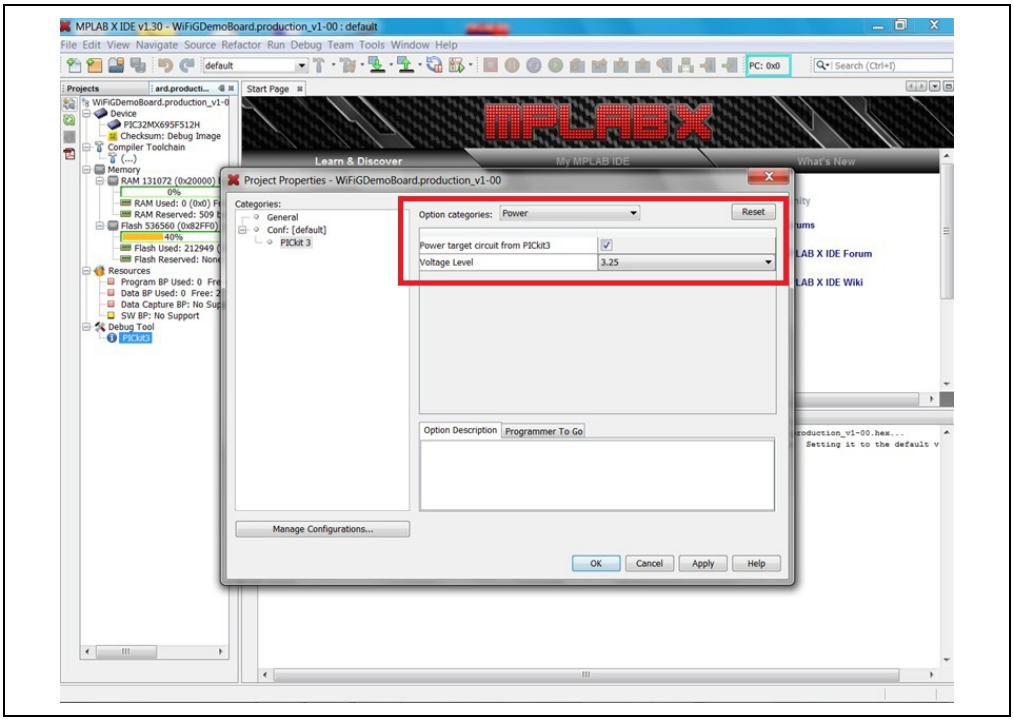
5. A Summary listing the Project Directory, Target Device, Platform Tool and Project Source are displayed. Click on <Finish>. See Figure 5-12.

FIGURE 5-12: IMPORT HEX FILE – COMPLETED



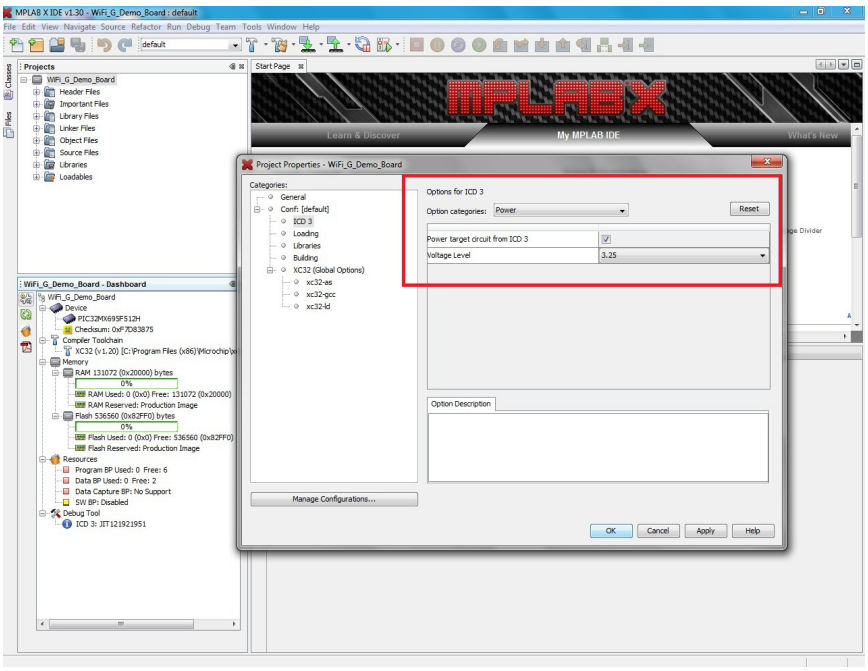
6. Power supply is supplied to Wi-Fi G Demo Board from the in-circuit debugger. Under <Project Properties> and selected in-circuit debugger, click on *Option categories>Power*. Enable option to <Power target circuit from PICkit 3> or <Power target circuit from MPLAB ICD 3>. See Figure 5-13 and Figure 5-14.

FIGURE 5-13: PICkit™ 3 POWER CONFIGURATION



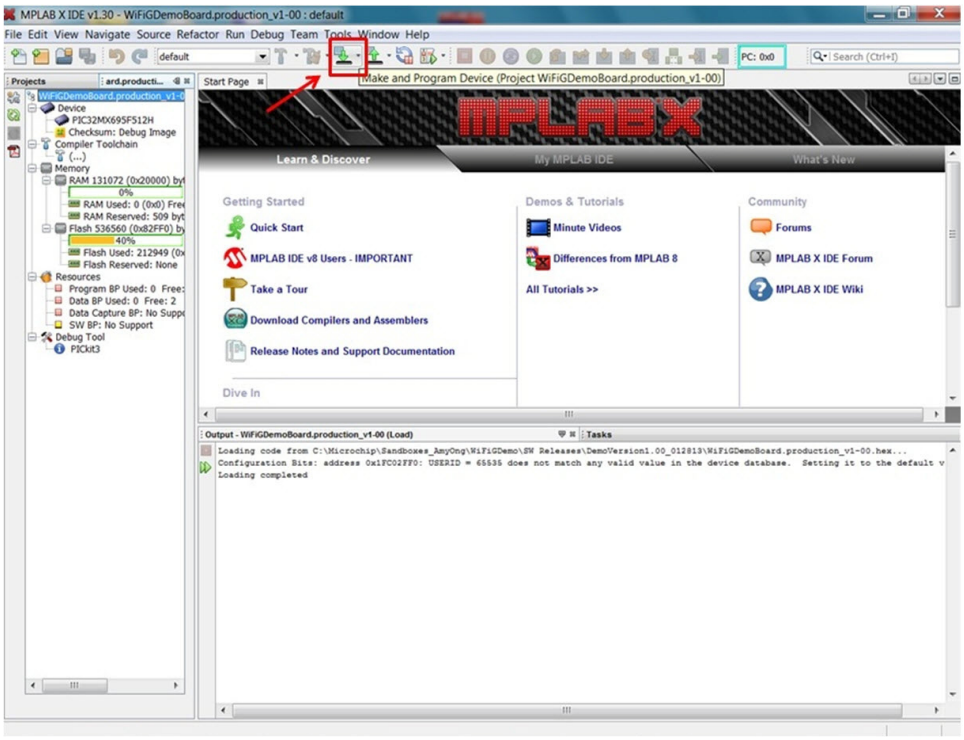
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FIGURE 5-14: MPLAB® ICD 3 POWER CONFIGURATION



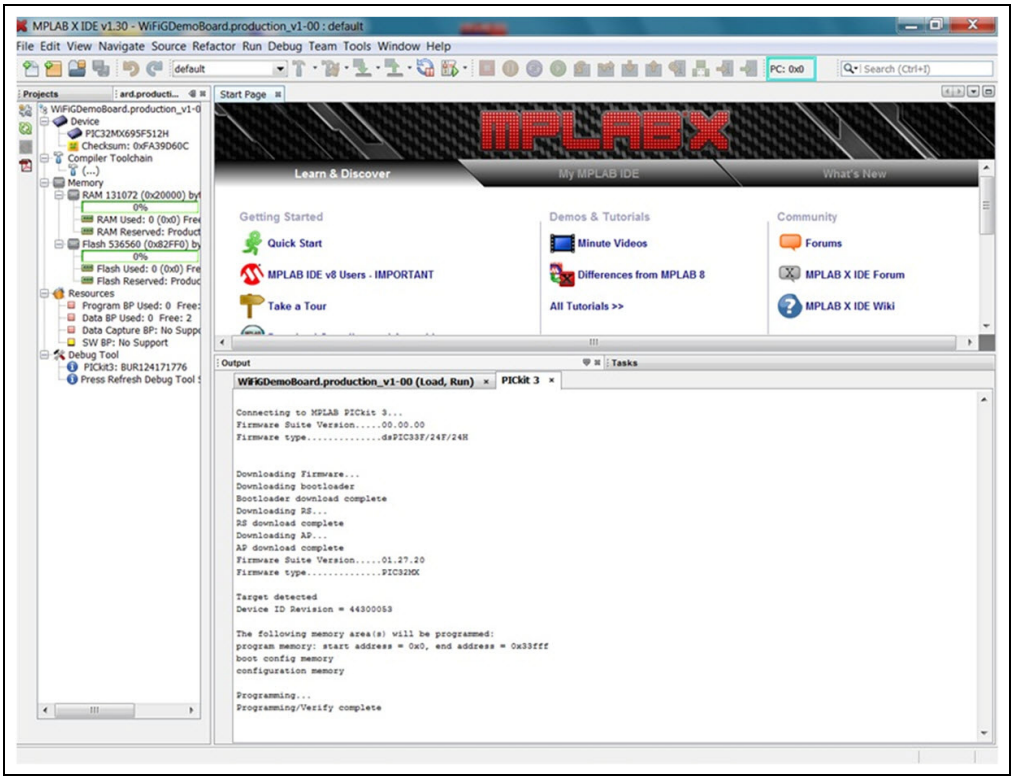
7. Click on <Make and Program Device>. See Figure 5-15.

FIGURE 5-15: MAKE AND PROGRAM DEVICE



8. Once programming is completed, the output panel displays programming completed status. See Figure 5-16.

FIGURE 5-16: PROGRAMMING COMPLETED



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Chapter 6. Advanced Features

6.1 CHANGE TRANSMIT POWER

Wi-Fi APIs are available in source file `WFTxPower.c` to read and write MRF24WG0MA transmit power. MRF24WG0MA has a transmit power range of 0 dBm to 18 dBm.

Invoke function prototype WF_TxPowerGetMax to read back MRF24WG0MA transmit power. Invoke function prototype WF_TxPowerSetMax to set MRF24WG0MA transmit power. No conversion of units is needed as input parameter to WF_TxPowerSetMax is in dBm.

NOTES:

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Chapter 7. Customizing Web Pages

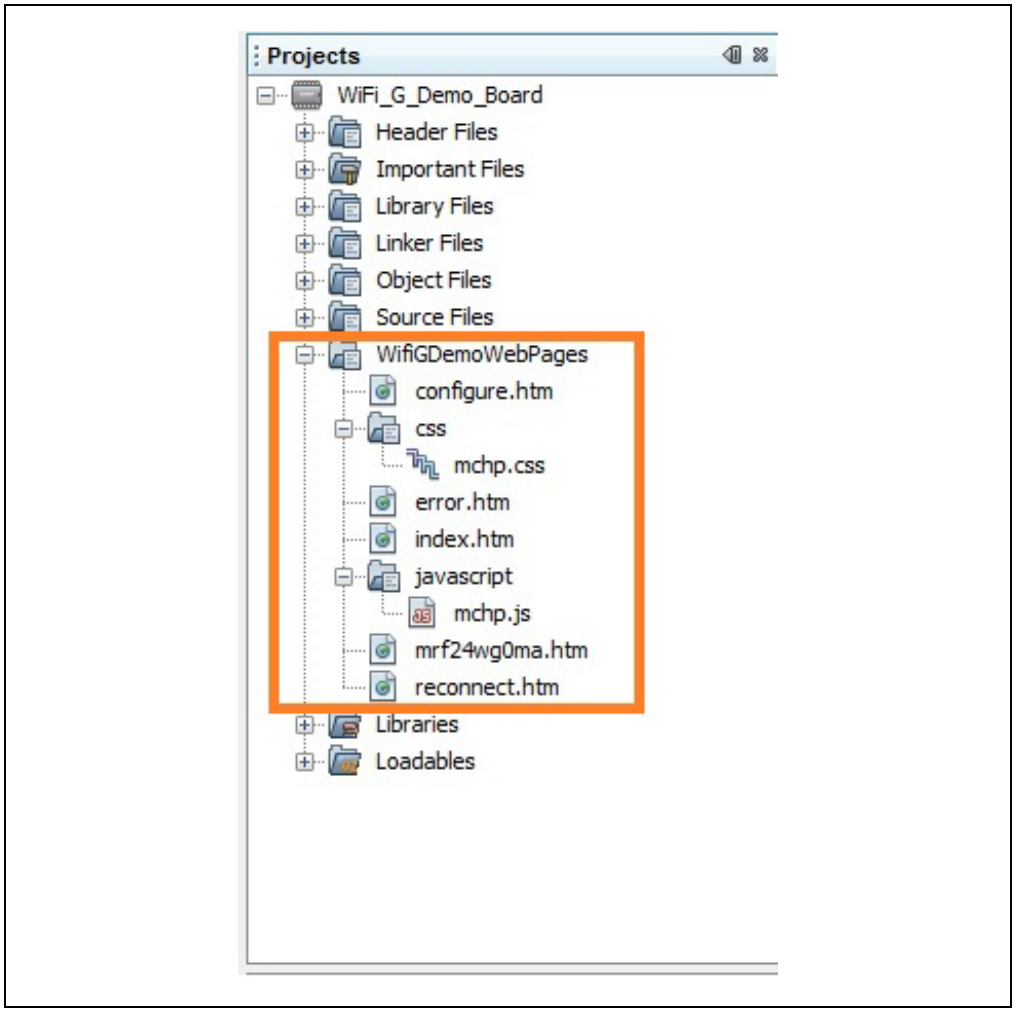
7.1 SOFTWARE REQUIREMENTS

- Microchip MPLAB X IDE

7.2 DIRECTORY LOCATION

`WiFiGDemo` web pages are contained within MPLAB `WiFi_G_Demo_Board` project.

FIGURE 7-1: Wi-Fi® G DEMO BOARD MPLAB® PROJECT DIRECTORY



- Execute or run batch file, based on MPFS utility `MPFS2.jar`, to compile HTM files into a `WiFiGDemoMPFSImg.c` image

```
\TCPIP\WiFiGDemo\Convert WebPages to MPFS.bat
```

This batch file will output five files upon successful completion.

- `WiFiGDemoMPSFSImg.bin`
- `WiFiGDemoMPFSImg.c` (used by Wi-Fi_G_Demo_Board project)
- `WiFiGDemoMPFSImg.s`
- `HTTPPrint.c`
- `HTTPPrint.idx`

- Wi-Fi G Demo HTM files

  `\TCPIP\WiFiGDemo\WiFiGDemoWebPages`

  Web Pages

  - `index.htm`
  - `mrf24wg0ma.htm`
  - `configure.htm`
  - `error.htm`
  - `reconnect.htm`

- Javascript file

  `\TCPIP\WiFiGDemo\WebPages\javascript\mchp.js`

- Source code files (where HTM files and stack source codes interacts)

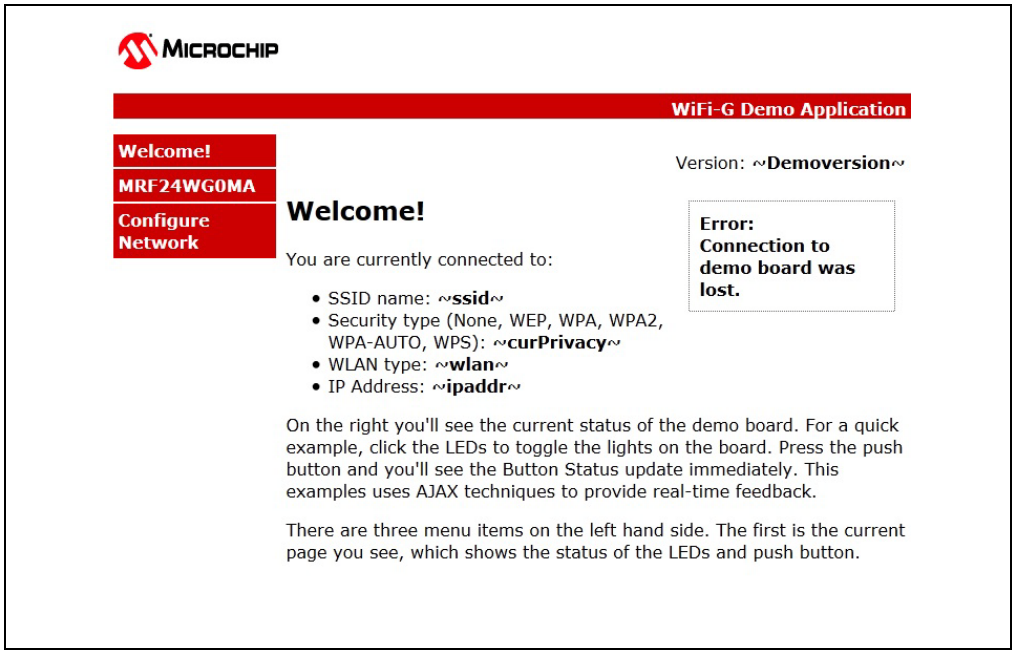
  `\TCPIP\WiFiGDemo\customHTTPApp.c`

7.3 STEPS FOR CUSTOMIZING WEB PAGE CONTENTS

This section illustrates customizing web page contents by adding a new field entry <RF module FW version> to `index.htm`.

1. Click on the selected HTM file to view the original un-modified web page. For example, `index.htm`. See Figure 7-2.

FIGURE 7-2: ORIGINAL UN-MODIFIED `INDEX.HTM`



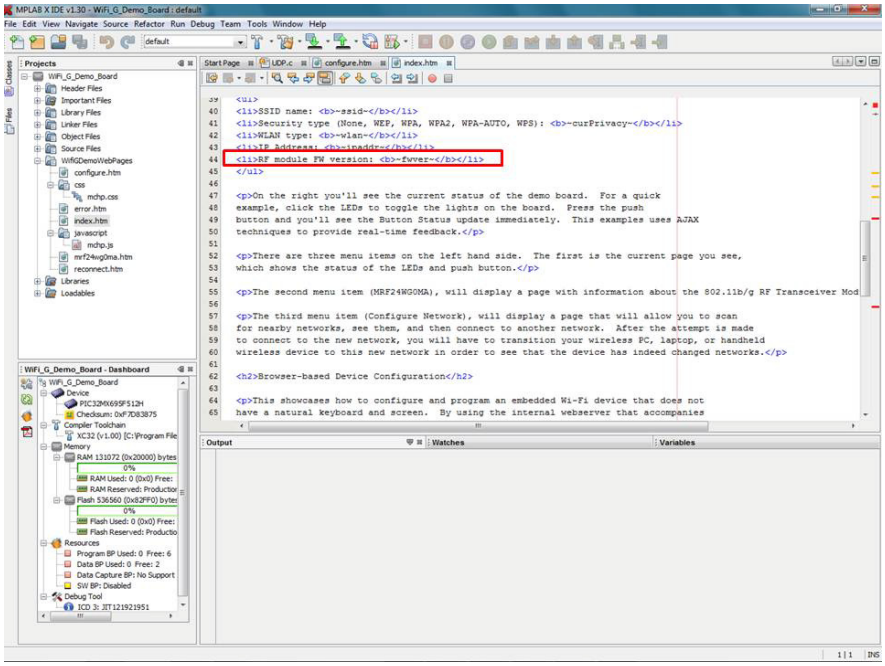
2. Open `index.htm`. Create a new entry by adding the following line:

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```
<li>RF module FW version: <b> fwver~</b><li>
```

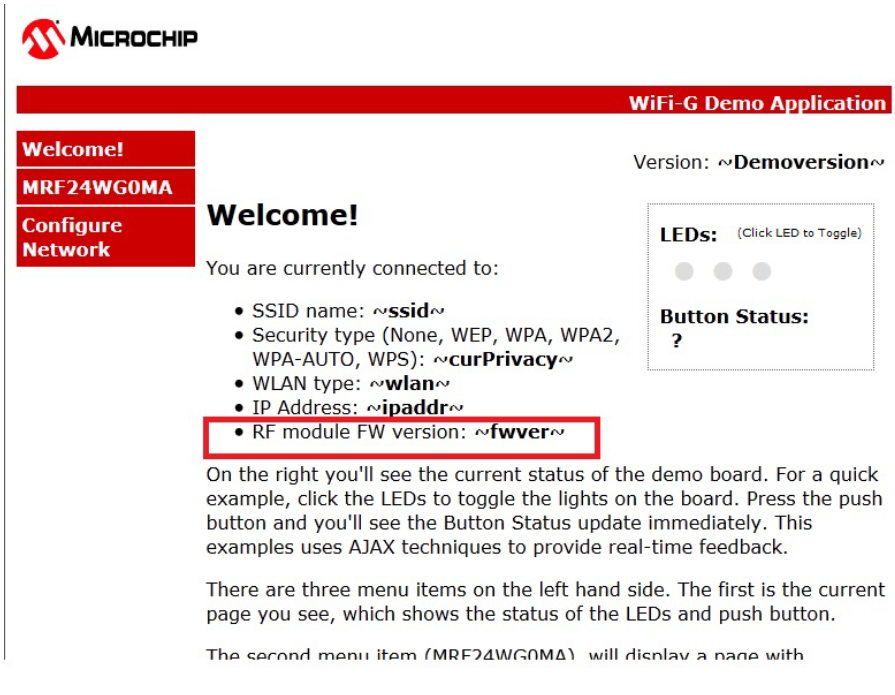
Save the file. See Figure 7-3.

FIGURE 7-3: INSERT NEW ENTRY INTO `INDEX.HTM`



3. Click on the modified `index.htm` to view the changes. See Figure 7-4.

FIGURE 7-4: MODIFIED `INDEX.HTM`



4. For new added functions, such as <RF module FW version>, the corresponding files may need to be changed.

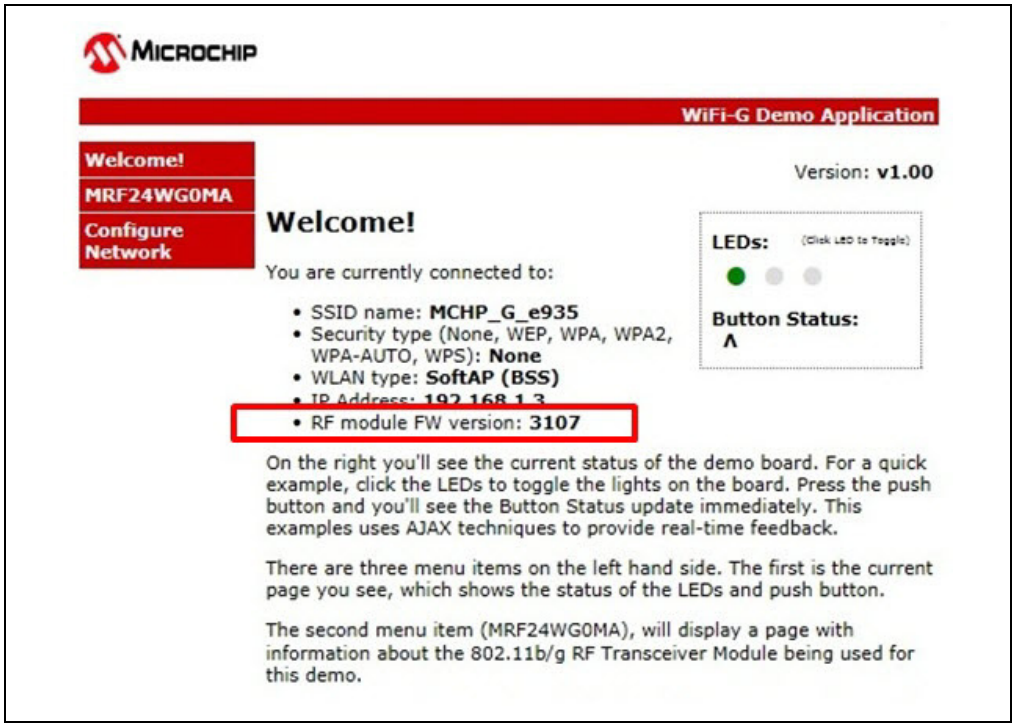
• CustomHTTPApp.c

```
// ========================================
// = Sends the FW version =
// ========================================
void HTTPPrint_fwver(void)
{
    static BOOL firstTime = TRUE;
    static tWFDeviceInfo deviceInfo;
    BYTE fwVerString[8];

    if (firstTime)
    {
        firstTime = FALSE;
        WF_GetDeviceInfo(&deviceInfo); // only call this once, not
        continually
    }
    uitoa((deviceInfo.romVersion << 8) | deviceInfo.patchVersion,
    fwVerString);
    TCPPutString(sktHTTP, fwVerString);
}
```

5. Run the batch file <Convert WebPages to `MPFS.bat`> to generate a new `WiFiGDemoMPFSImg.c` image
6. Rebuild the project. In the build process, the project uses `WiFiGDemoMPF-SImg.c`.
7. Connect to the `WiFiG-Demo` network. The changes are reflected on the `WiFi-GDemo` web page.

FIGURE 7-5: NEW Wi-Fi® G DEMO WEB PAGE



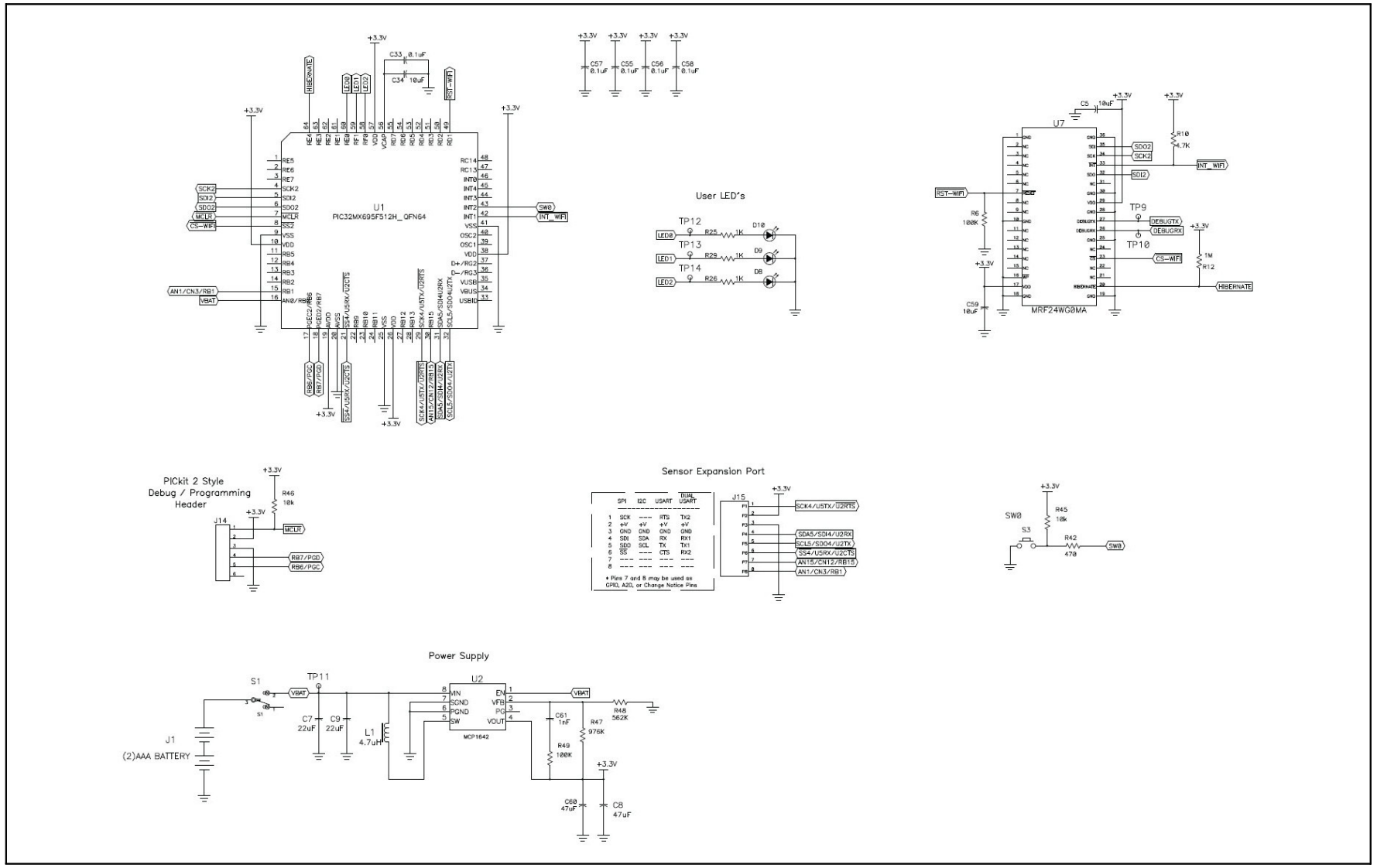
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Appendix A. Wi-Fi G Demo Board Schematic

A.1 INTRODUCTION

This appendix shows the Wi-Fi G Demo Board Schematic.

FIGURE A-1: Wi-Fi® G DEMO BOARD SCHEMATICS



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Fax: 86-23-8980-9500

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Tel: 86-571-2819-3187
Fax: 86-571-2819-3189

China - Hong Kong SAR
Tel: 852-2401-1200
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
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Fax: 86-532-8502-7205

China - Shanghai
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Fax: 86-21-5407-5066

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
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Fax: 86-755-8203-1760

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Fax: 86-27-5980-5118

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

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Fax: 86-592-2388130

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