TWR-WIFI-AR4100

Lab Guide

Rev. 1.1

Contents

1 Purpose 3

2 Configuring the TWR-WIFI-AR4100 Hardware 3

3 Installing the Development Environment 4

4 Installing the TWR-WIFI-AR4100 MQX Patch 4

5 Building / Flashing the Demo Application 6

5.1 TWR-MCF5225X with CodeWarrior 7.2 6

5.2 TWR-K60N512 with IAR Embedded Workbench 8

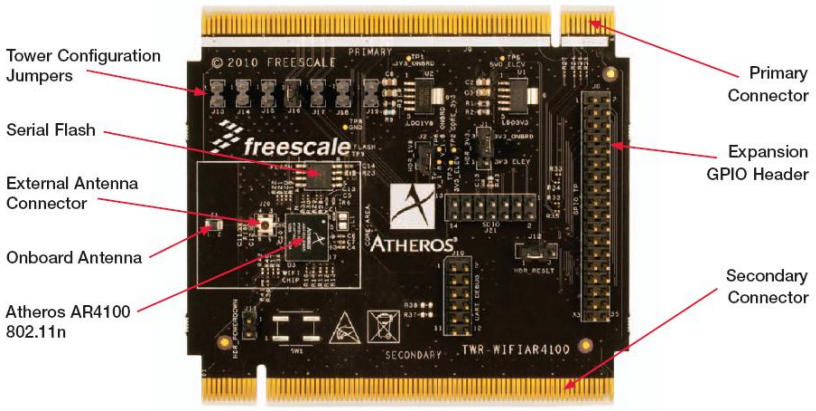
6 Running the Demo 18

7 Refrences 21

1 Purpose

A simple Webserver and HVAC controller has been constructed to demonstrate the use of command and control as well as remote monitoring via a robust, secure, low energy 802.11n WiFi connection. The lab is intended for use on the TWR-MCF5225X-KIT: Tower System Coldfire® V2 MCF5225X Connectivity Module or the TWR-K60N512-KIT: Development Kit

2 Configuring the TWR-WIFI-AR4100 Hardware



TWR-WIFI-AR4100 Jumper Options

The following is a list of all jumper options. The default installed jumper settings are shown in **bold**.

	Option	Setting	Description
J1	AR4100 Power Source Selection	**1-2**	Supply 3.3V to AR4100 via Tower Elevator *(J1 can be used as a measurement point for AR4100 specific power usage)*
		2-3	Not Used (On-board power regulation is not implemented by default)
J2	AR4100 1.8V Power Regulation	**1-2**	Supply 1.8V to the AR4100 *(J2 can be used as a measurement point specific to the AR4100 1.8V)*
J11	AR4100 Power Down	1-2	Power down the AR4100
J12	AR4100 Reset/Power Down Selection	1-2	Tower System RSTOUT_b will control reset / power down of AR4100
		2-3	Tower System GPIO3 will control reset / power down of AR4100
J13	Interrupt Select (IRQ_G)	1-2	Tower System IRQ_G will connect to AR4100 SPI_INT
J14	Interrupt Select (IRQ_E)	1-2	Tower System IRQ_E will connect to AR4100 SPI_INT
J15	Interrupt Select (IRQ_C)	1-2	Tower System IRQ_C will connect to AR4100 SPI_INT
J16	Interrupt Select (IRQ_A)	**1-2**	Tower System IRQ_A will connect to AR4100 SPI_INT
J22	Debug UART RX Enable	1-2	Connects Debug UART RX from AR4100 to J10. This jumper should not be connected until after SW reconfigures signals as UART RX.
J23	TWR-WIFI-AR4100 Power Connection	**1-2**	Supply 3.3V to TWR-WIFI-AR4100 via Tower Elevator *(J23 can be used as a measurement point for the entire TWR-WIFI-AR4100 module)*

3 Installing the Development Environment

When running this demo on the **ColdFire** platform obtain the Code Warrior Development Environment
Code Warrior Landing Page
http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=CW-COLDFIRE
Now Register, Download and Install the evaluation copy of Code Warrior 7.2

When running this demo on the **Kinetis** K60 Platform obtain the IAR Development Environment
IAR Landing Page http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=TWR-K60N512-IAR
Now Register, Download and Install the evaluation copy

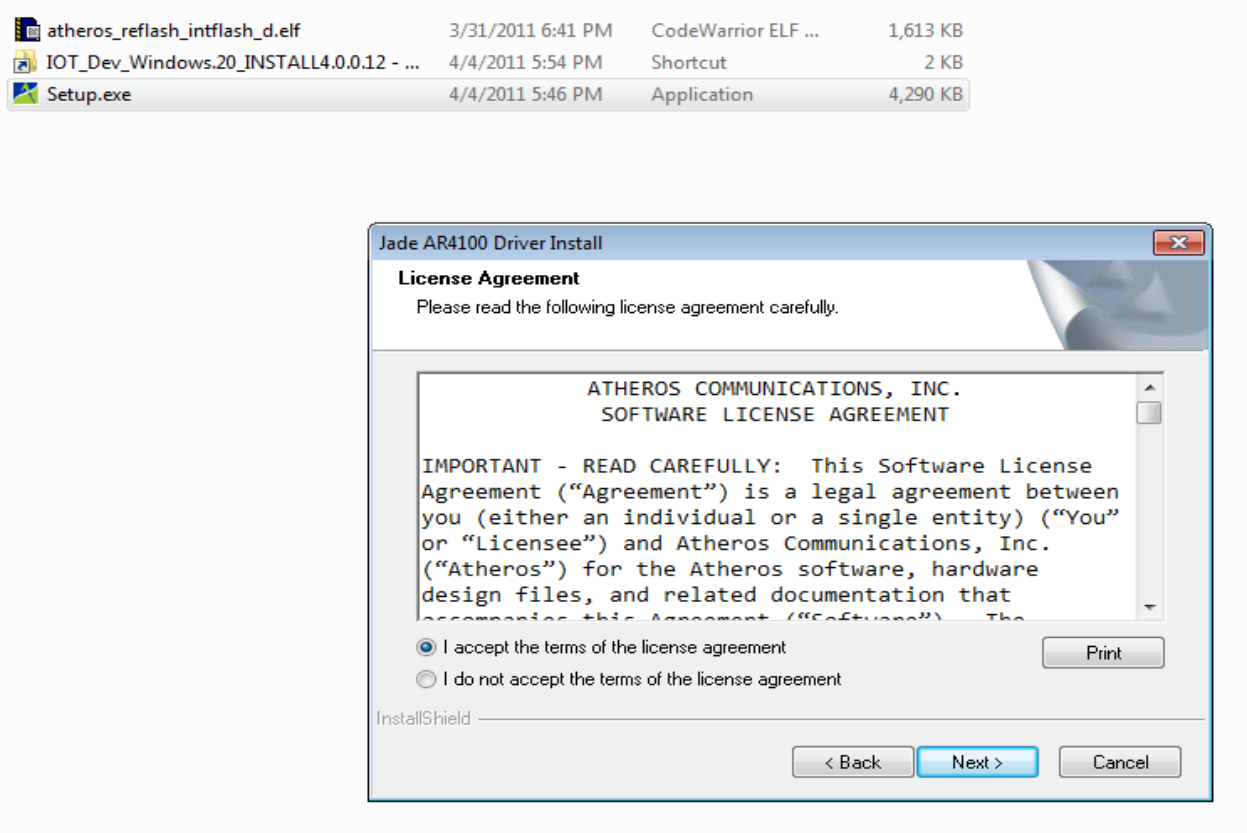
4 Installing the TWR-WIFI-AR4100 MQX Patch

Obtain the Qualcomm Atheros (QCA) Patch and follow the Installation instructions below for the given platform.

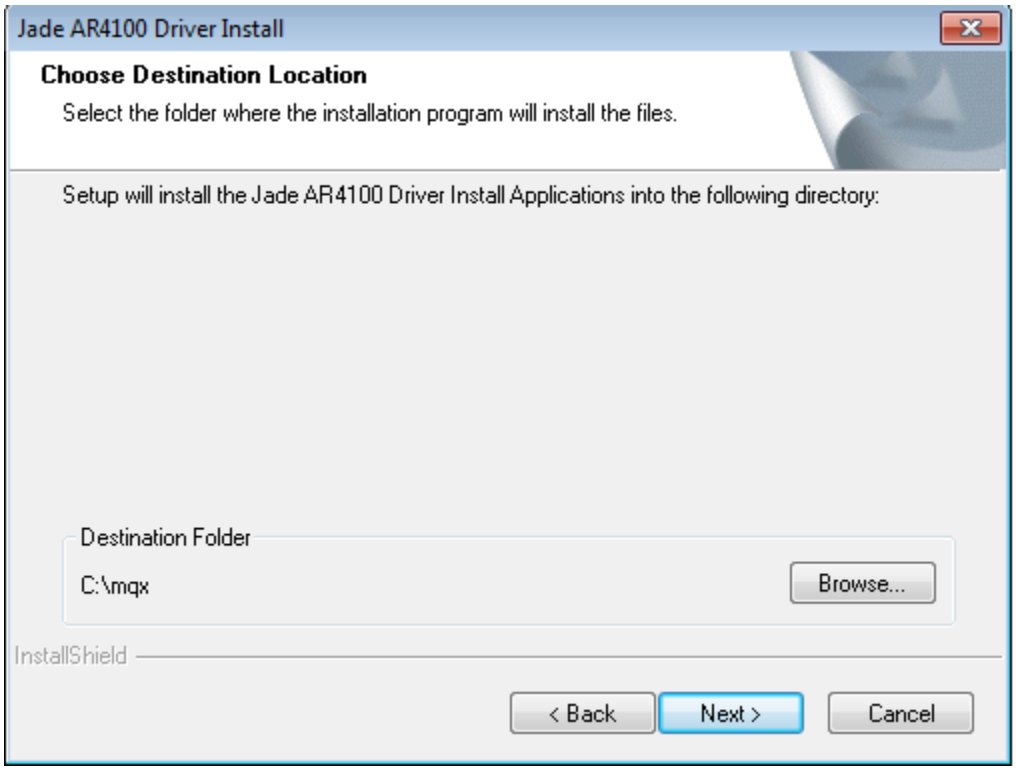
Visit http://freescale.com/towerwifi and select TWR-WIFI-AR4100 from the list of available Tower WiFi modules. The TWR-WIFI-AR4100 MQX patch is available under the "Downloads".

Steps for installing the Qualcomm Atheros MQX Patch

a. To install Qualcomm Atheros patch, please install MQX 3.6.2 first.
   The QCA setup will patch QCA specific changes to the mqx tree.
b. Click setup.exe



c. Browse to the location of installed MQX package (typically C:\Program Files\Freescale\Freescale MQX 3.6).



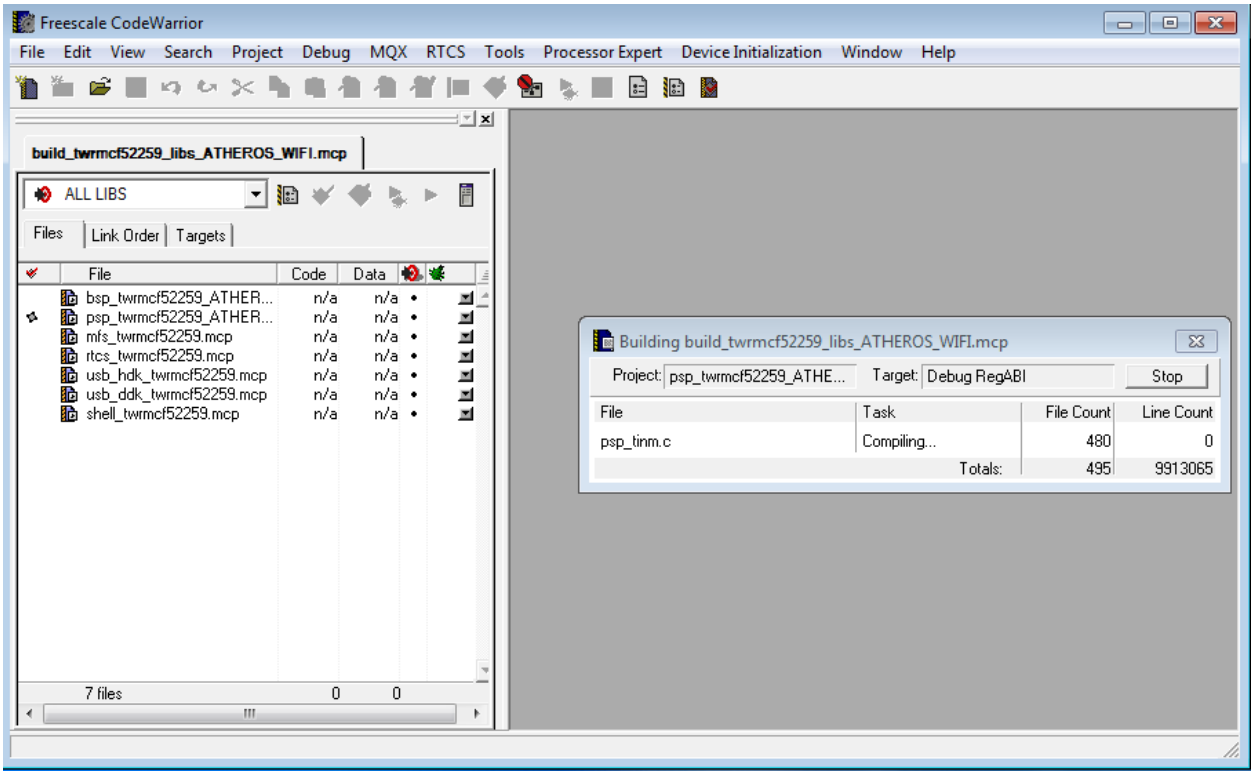
d. Once the package is installed, two new demo applications will be installed in the demo folder (hvac_wifi & web_hvac_wifi).

5 Building / Flashing the Demo Application

5.1 TWR-MCF5225X with CodeWarrior 7.2

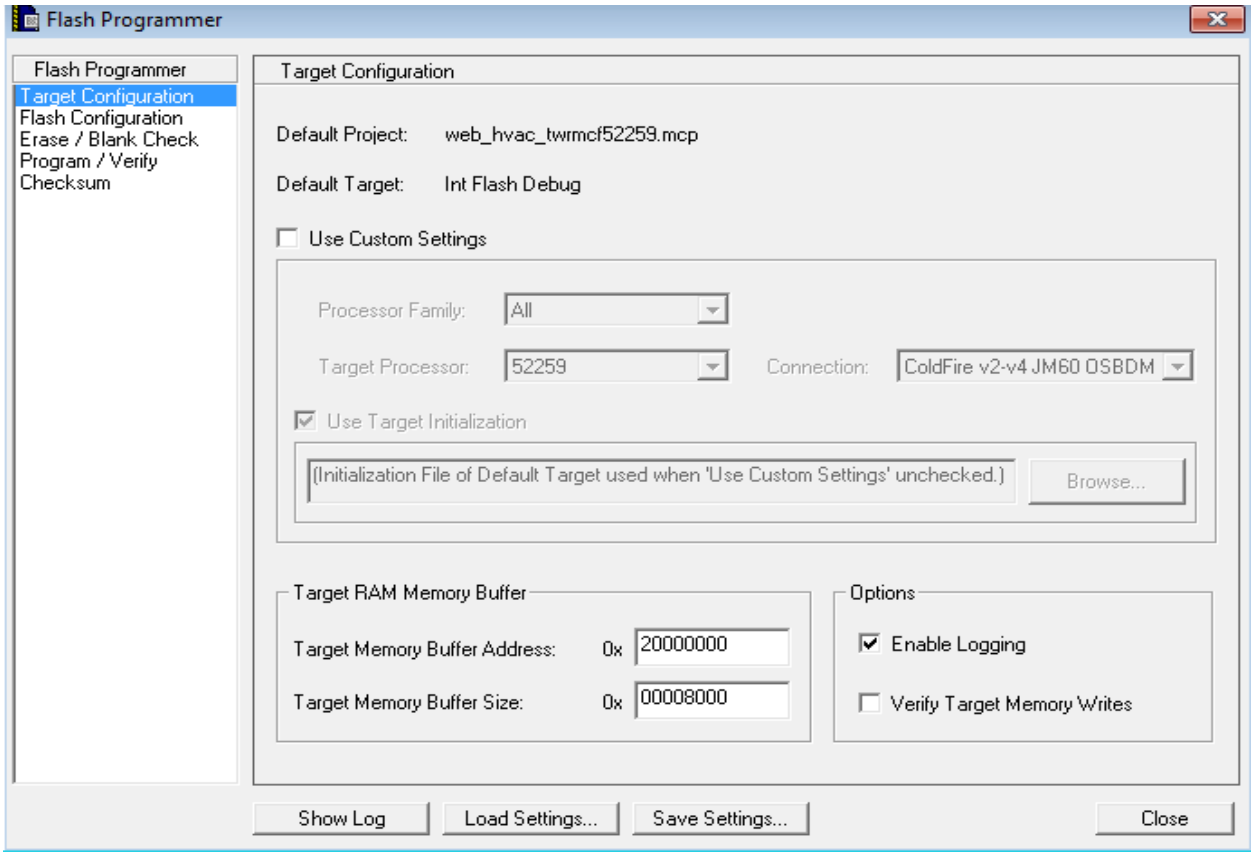
Build the MQX Library

a. Browse to mqx\config\twrmcf52259_ATHEROS_WIFI\cwcf72 and click on project file (.mcp). This will open the project in Code-warrior.
b. Click make to build the libraries.

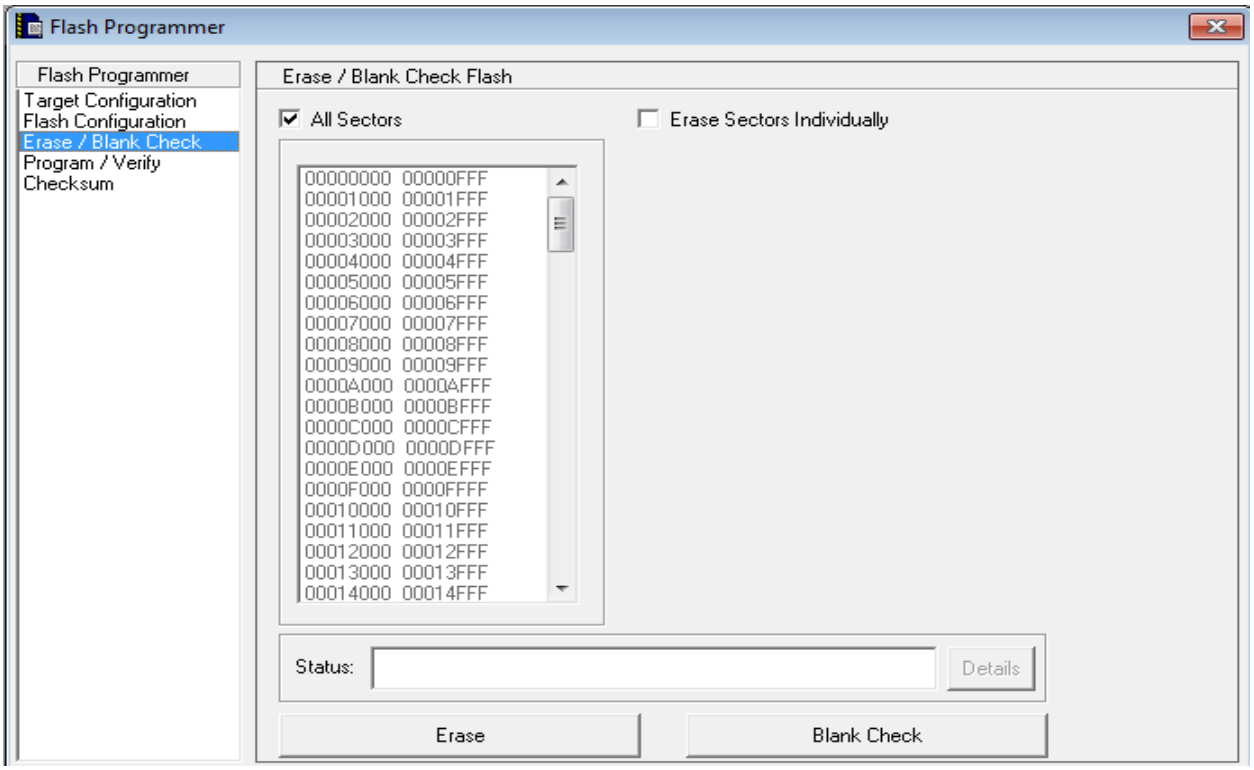


Compile the Demo Application

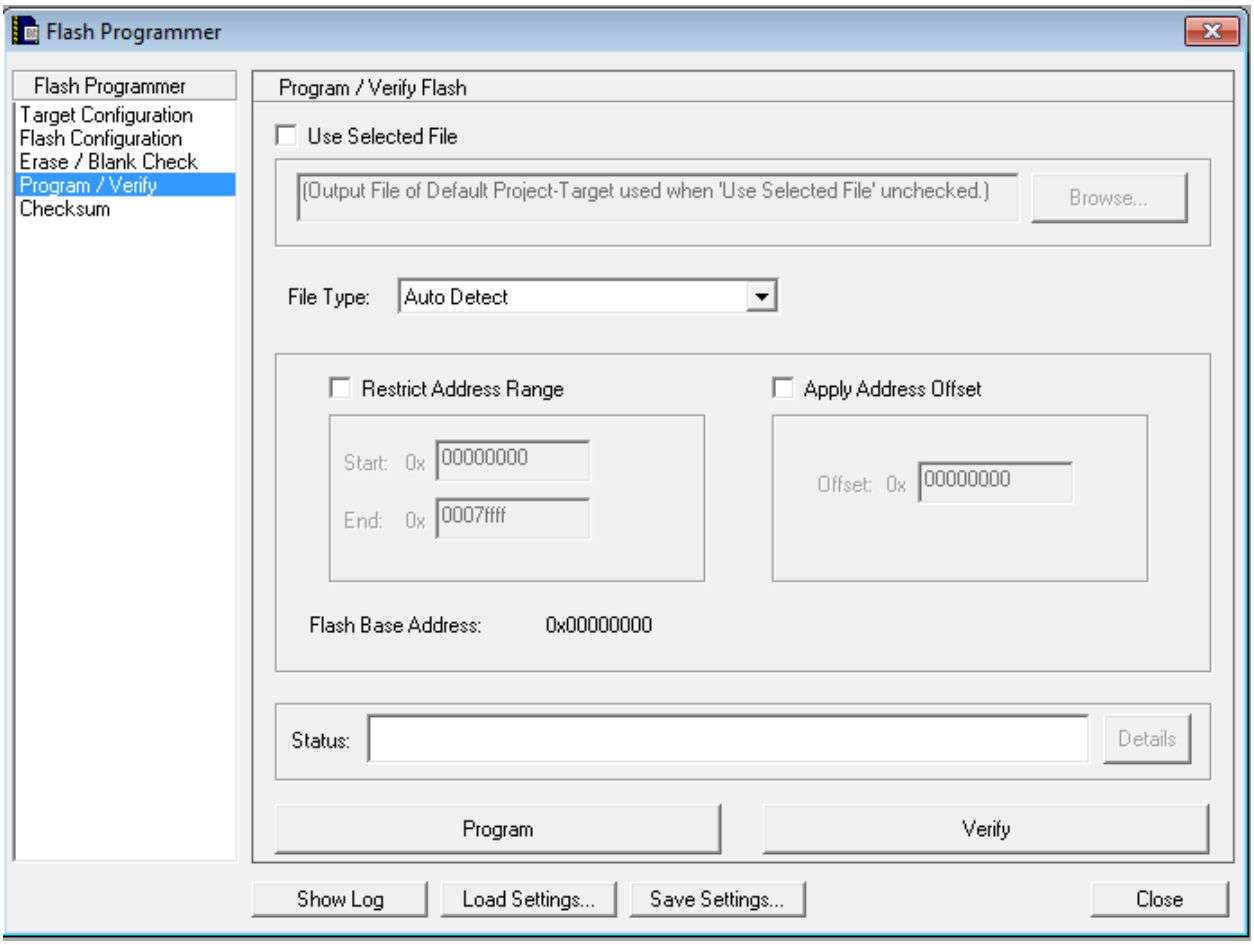
a. Browse to the corresponding cwcf72 folder in the demo and double-click on the project file (.mcp). This will open the project in Code-warrior environment.
b. Click “make”.
c. Open Tools->Flash Programmer. Uncheck “Use Current Settings” check box.
d. In the Flash Programmer window, ensure that Connection is set to “Coldfire v2-v4 JM60 OSBDM”
e. Click “Load Settings” and select MCF52259_INTDLASH.xml



f. Click on Erase/Blank Check tab. Click Erase.



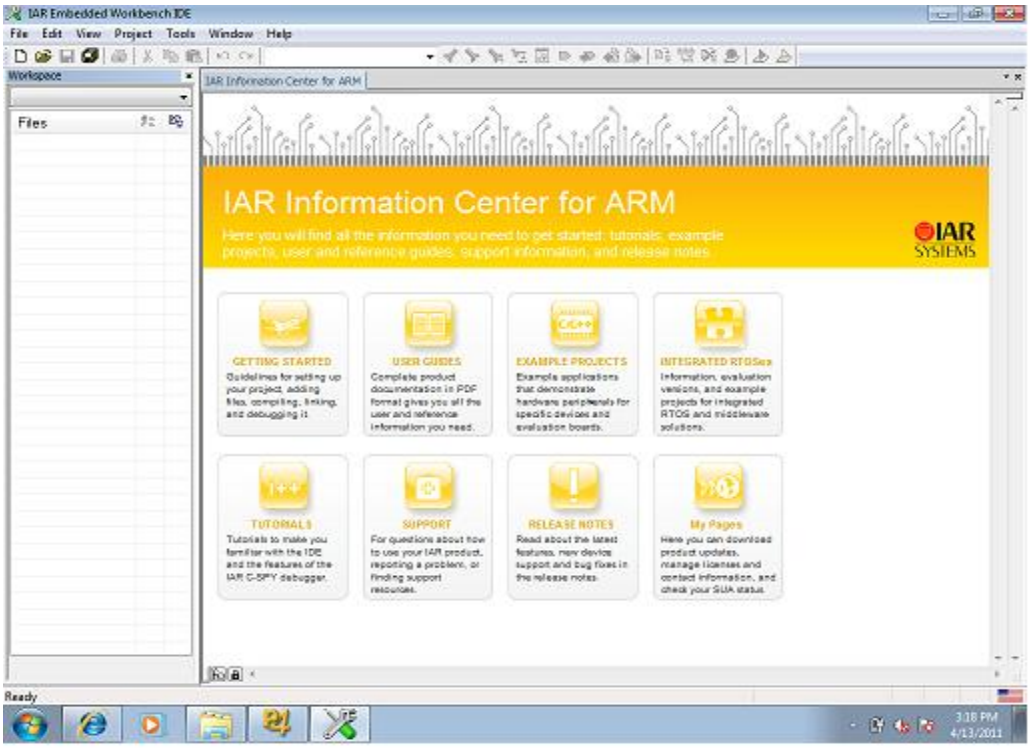
g. Click Program/Verify tab. Click Program, this will download the image to the tower platform. A reset on the microcontroller will initialize the demo application.



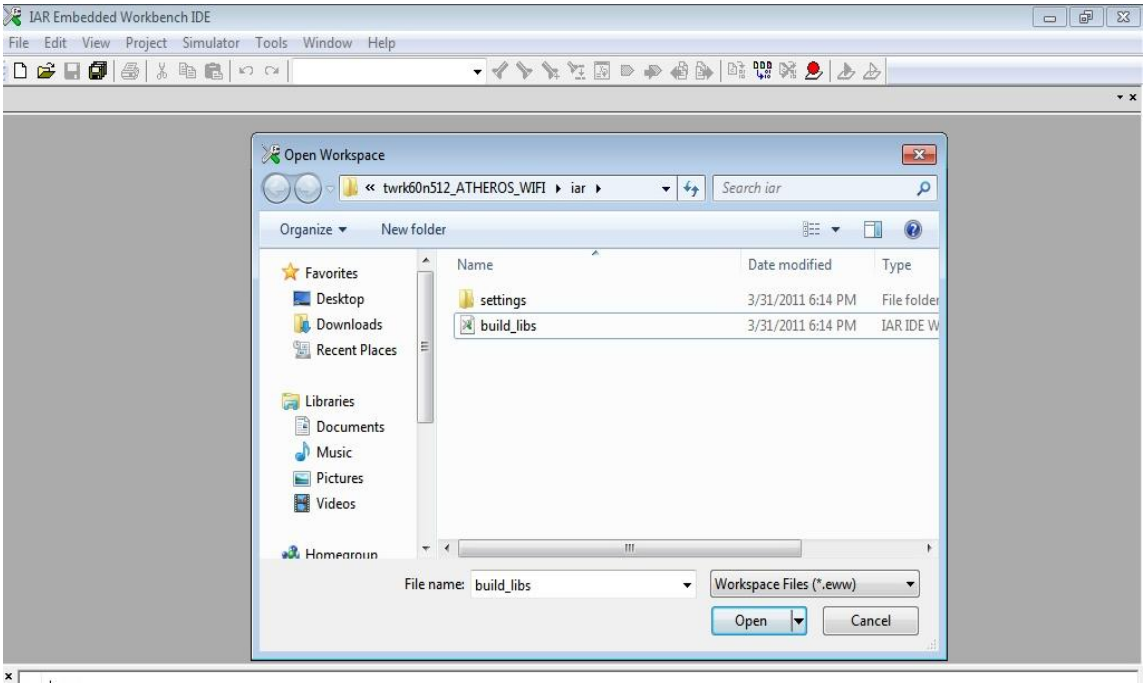
5.2 TWR-K60N512 with IAR Embedded Workbench

Build the MQX Library

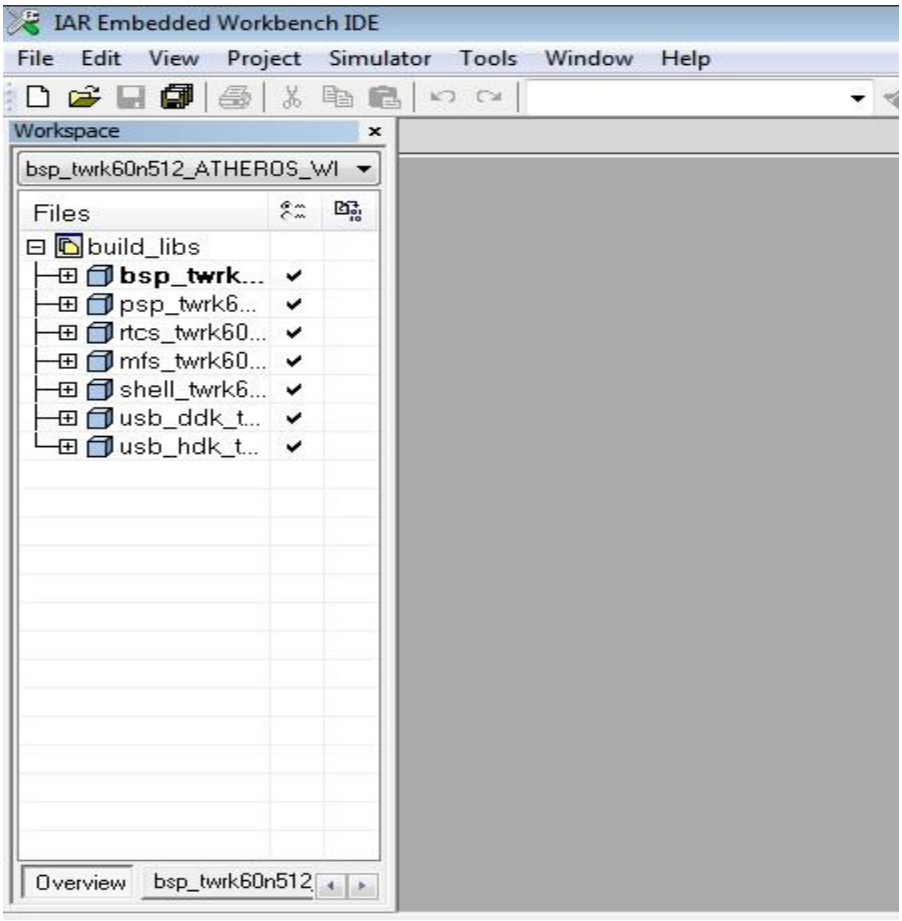
a. Open IAR Embedded workbench IDE.



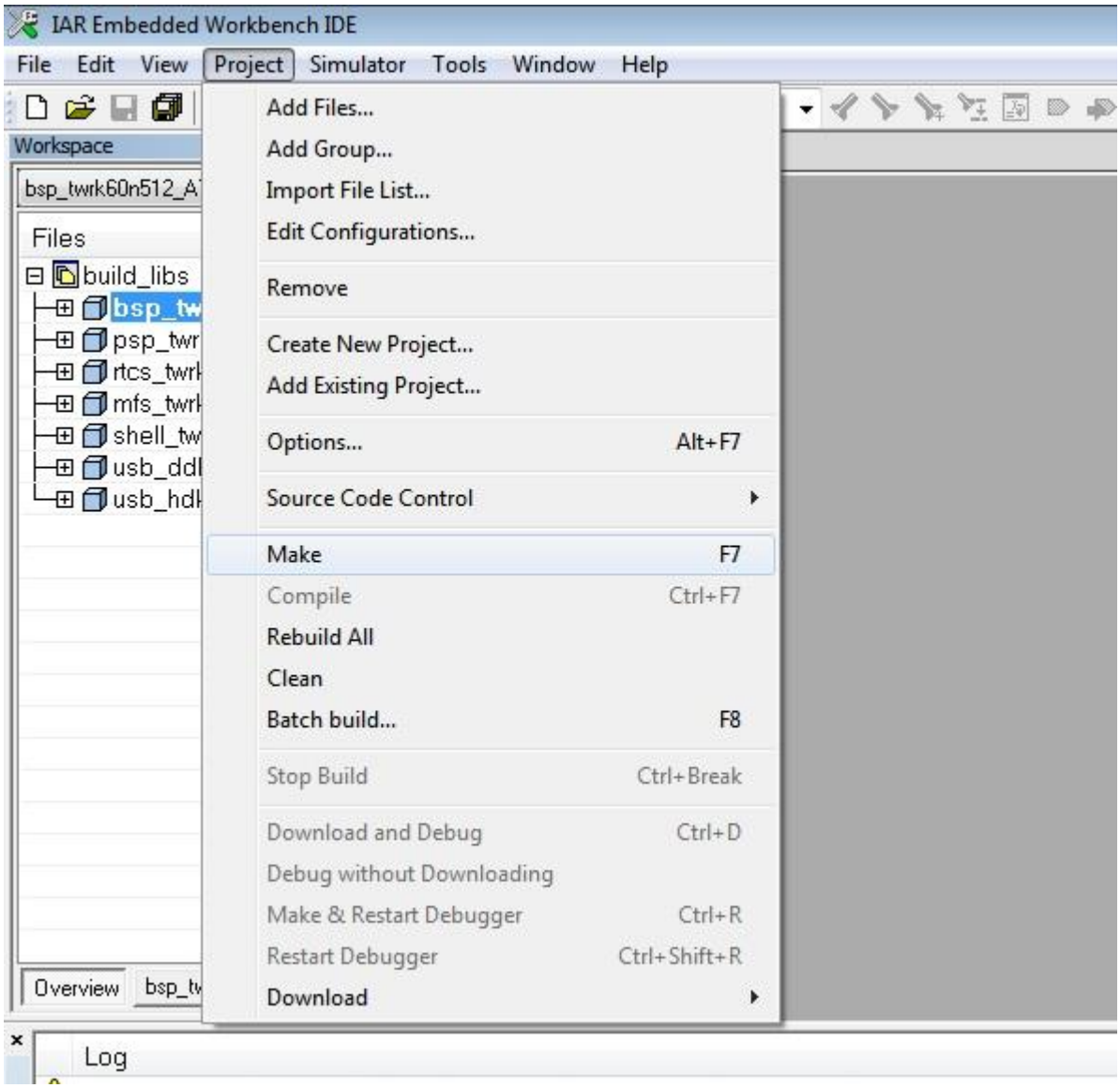
b. Click File->Open->Workspace
c. Browse to mqx\config\twrf60n512_ATHEROS_WIFI\iar folder and select “build_libs”.

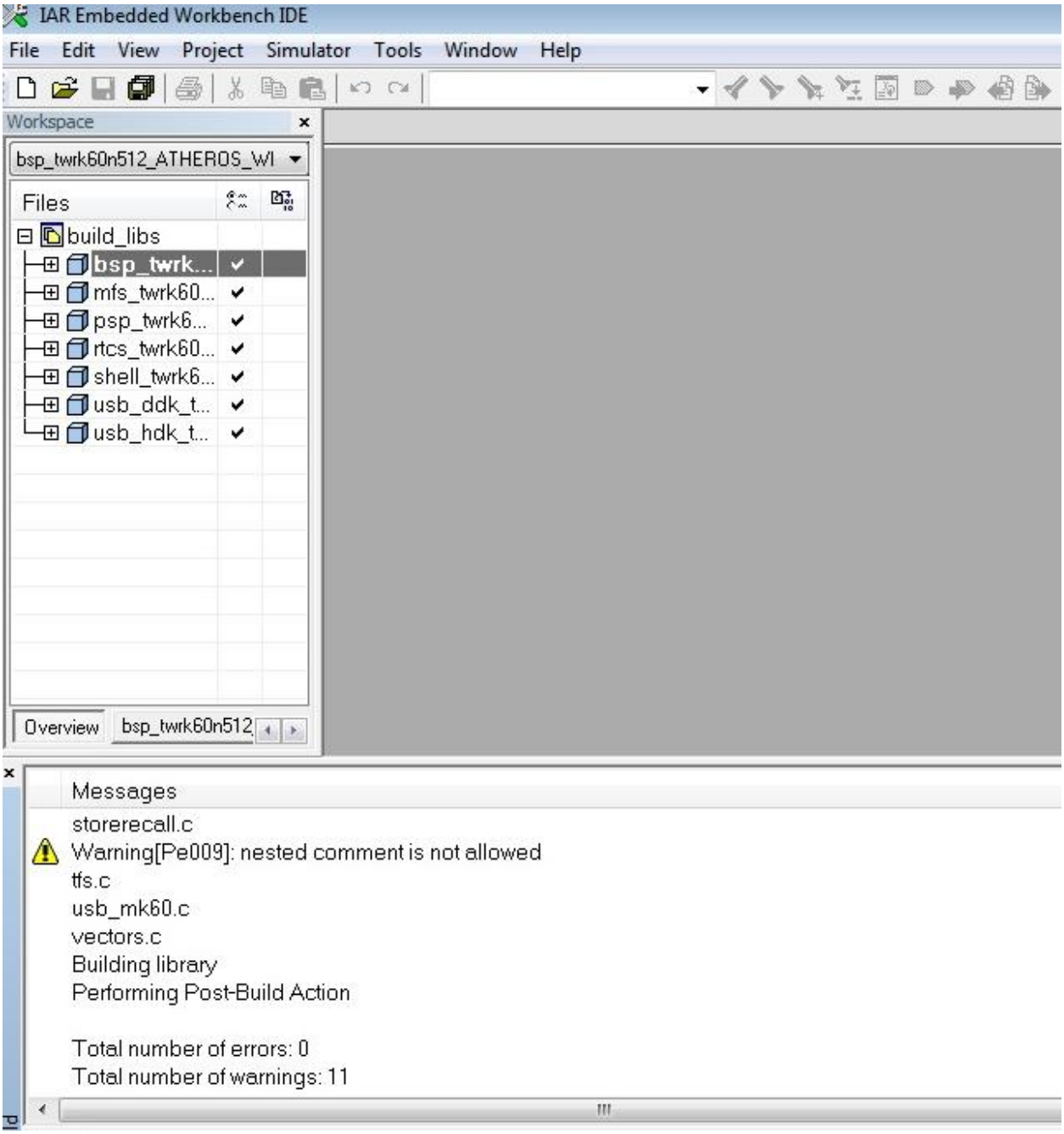


d. Click View->workspace. You will now see all library projects in the workspace pane.



e. Select first project in workspace, click Project->make or press F7.


IAR Embedded Workbench IDE
File Edit View Project Simulator Tools Window Help
Workspace
Files
build_libs
Add Files...
Add Group...
Import File List...
Edit Configurations...
Remove
Create New Project...
Add Existing Project...
Options... Alt+F7
Source Code Control
Make F7
Compile Ctrl+F7
Rebuild All
Clean
Batch build... F8
Stop Build Ctrl+Break
Download and Debug Ctrl+D
Debug without Downloading
Make & Restart Debugger Ctrl+R
Restart Debugger Ctrl+Shift+R
Download
Overview
Log

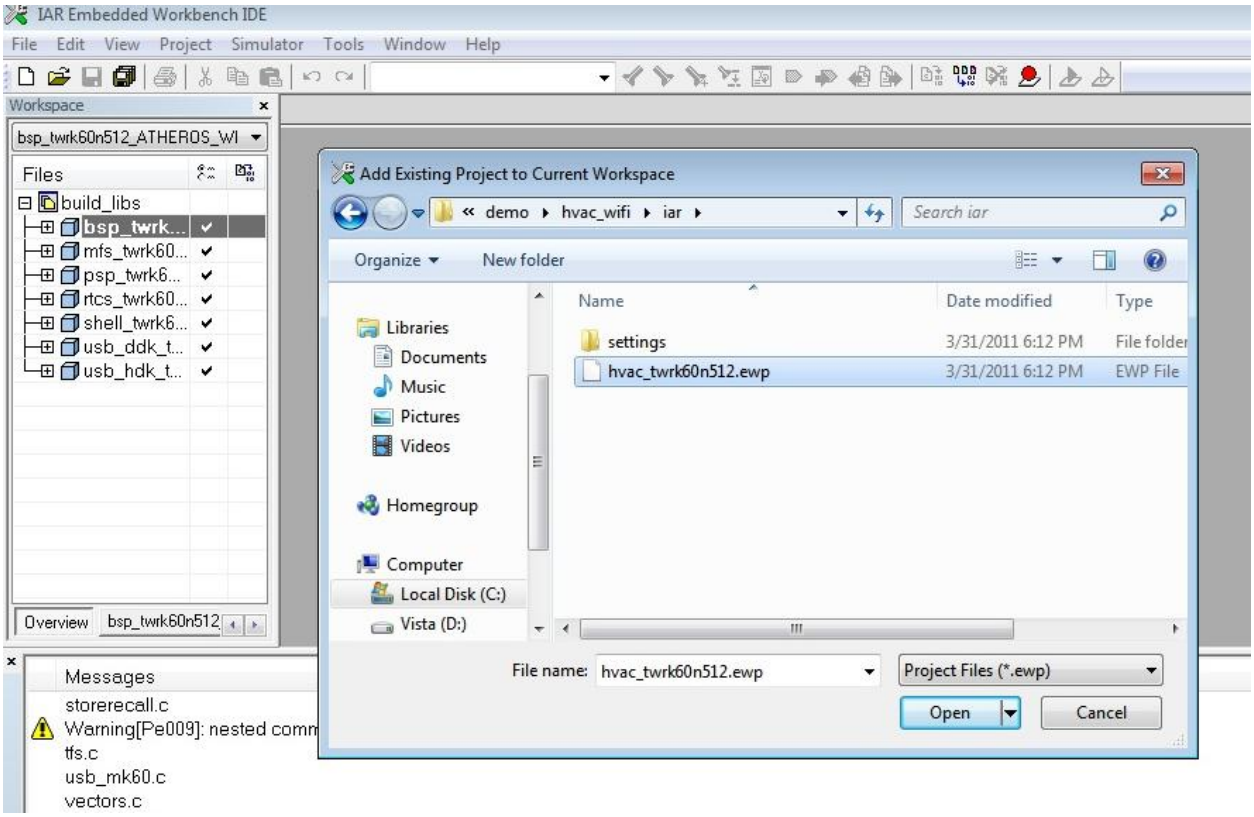


f. Repeat for all libraries.

Compile the Demo Application

a. To build the demo project, in the IDE click on Project->Add Existing Project.
b. Browse to mqx/demo/**web_hvac_wifi**/iar and select hvac_twr60n512.ewp and click open.

(Note: the screenshots that follow incorrectly show the “hvac_wifi”, the next revision of this document will correct show the “web_hvac_wifi”. Please ensure that you are using the **web_hvac_wifi**)



c. This will add the demo project to existing workspace.
d. Select the demo project in workspace, click Project->make or press F7. Once the project is built successfully, next step is download to the flash.

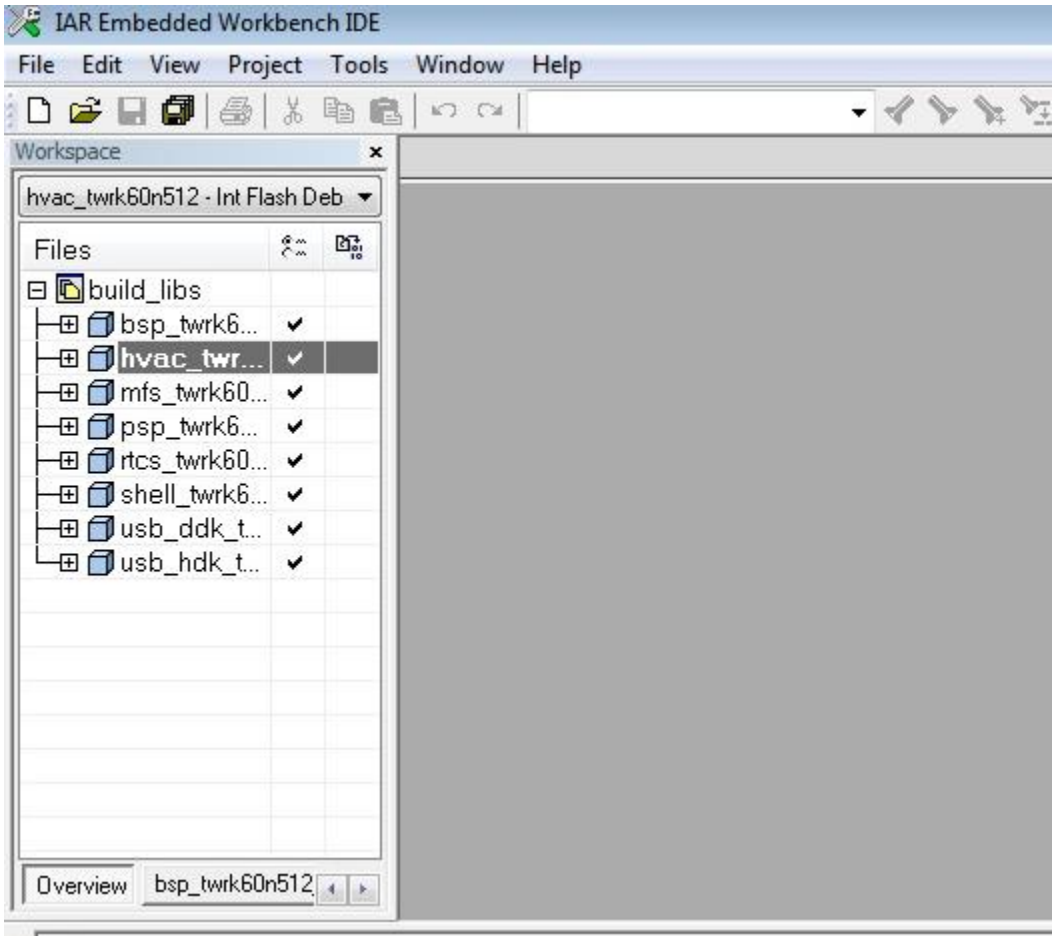
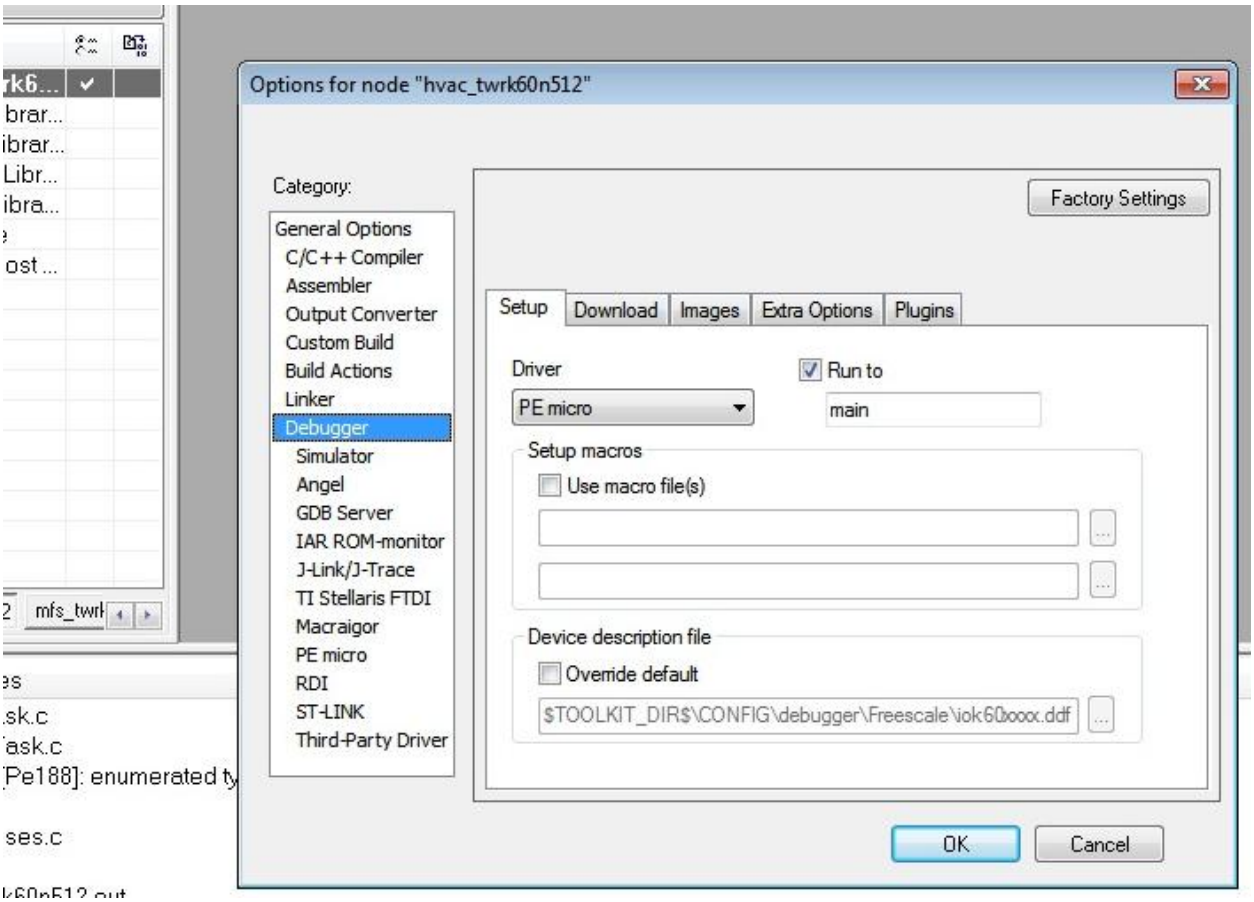
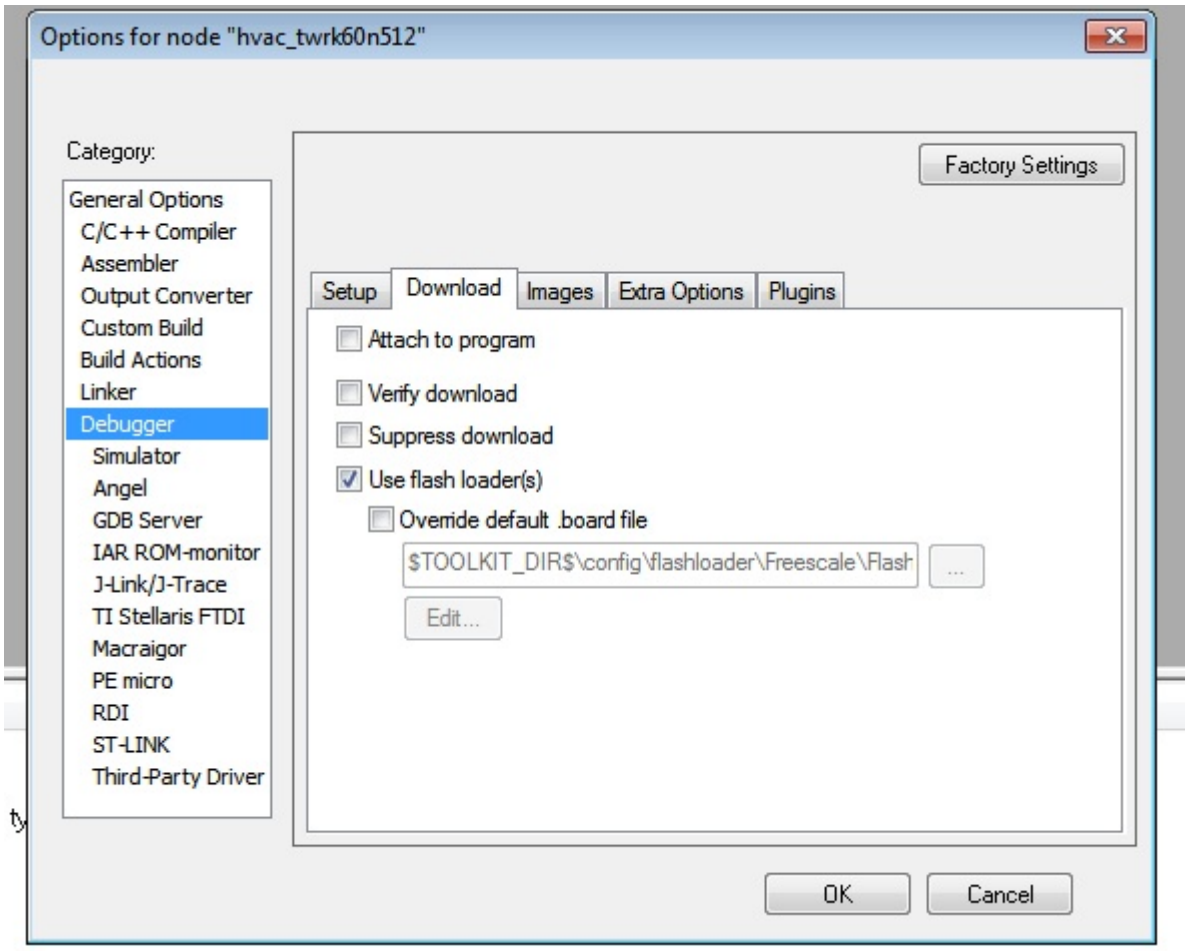


Image download

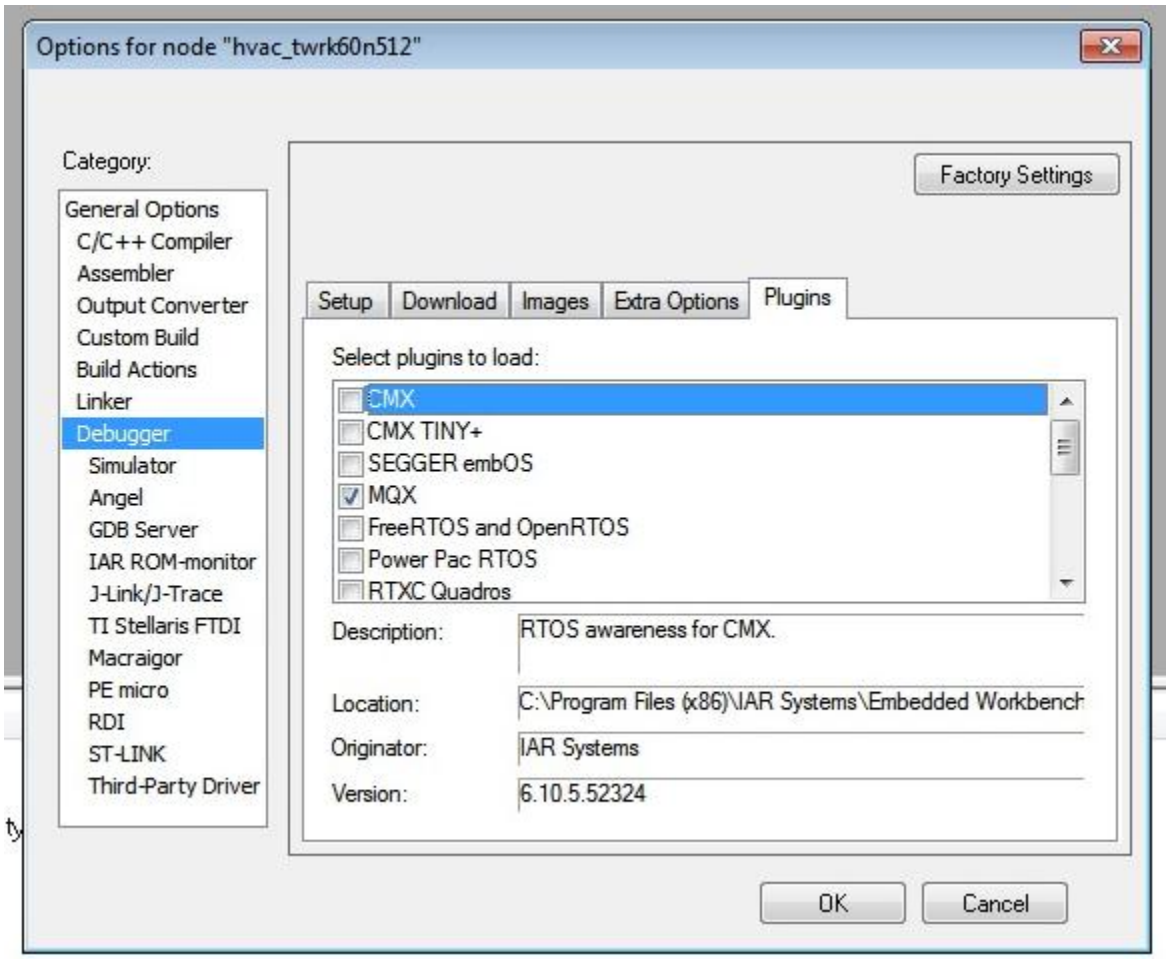
a. First we need to set up the Debugger. Right click on demo project in the workspace and click "Options"
b. In Category, select Debugger. Ensure the following-
   - in Setup tab, PE Micro is selected as Driver.



- In Download tab, “Use Flash Loader” check box is checked.



- In Plugins tab, MQX checkbox is checked.

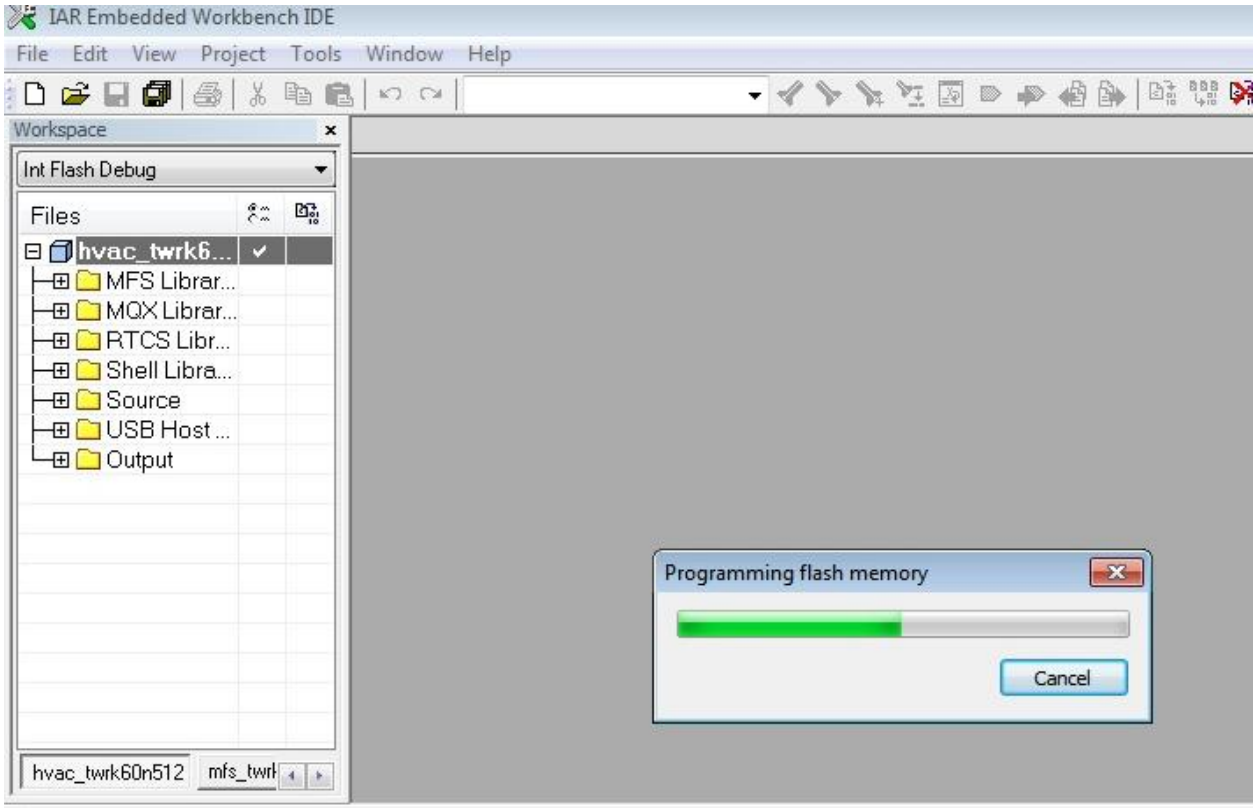


- In category, select PE micro. Ensure that P&E Hardware Interface type is set to OSJtag.
- Now click Project->Download->Download Active Application

  OR

  click Project->Download->Download File…

  Here you can specify the Download image.



This will download the image. The board is now ready for use after a reset.

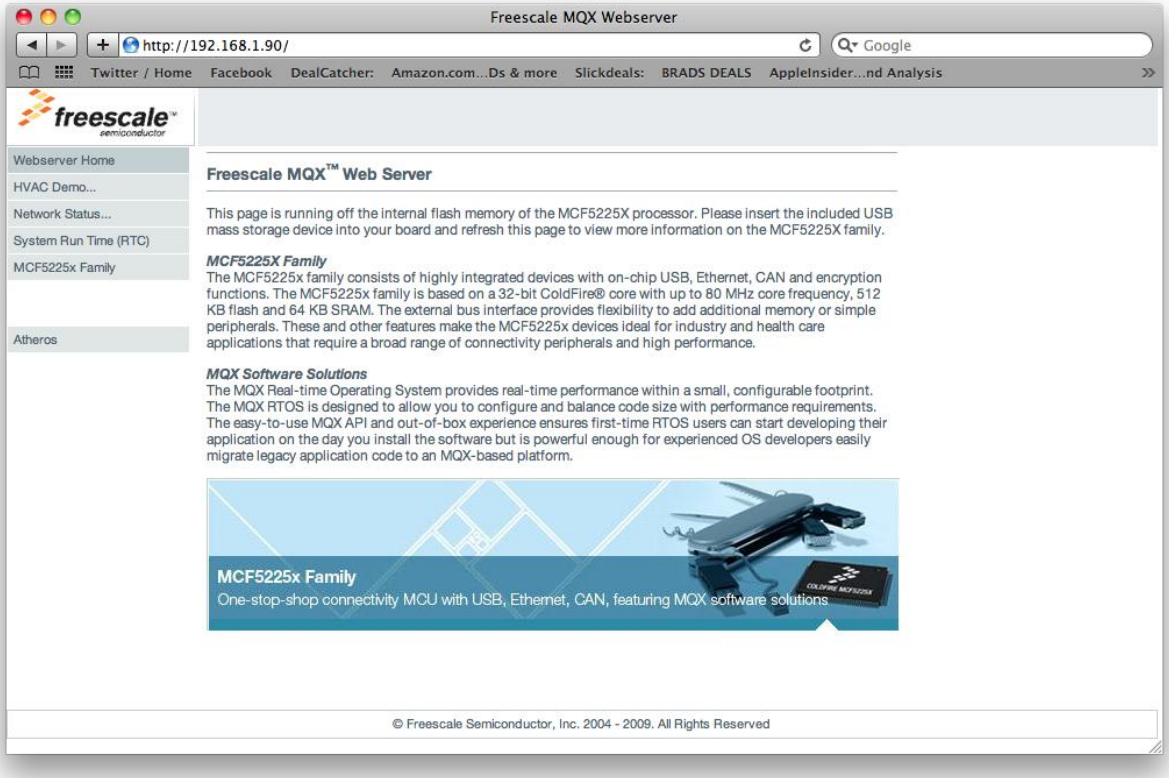
6 Running the Demo

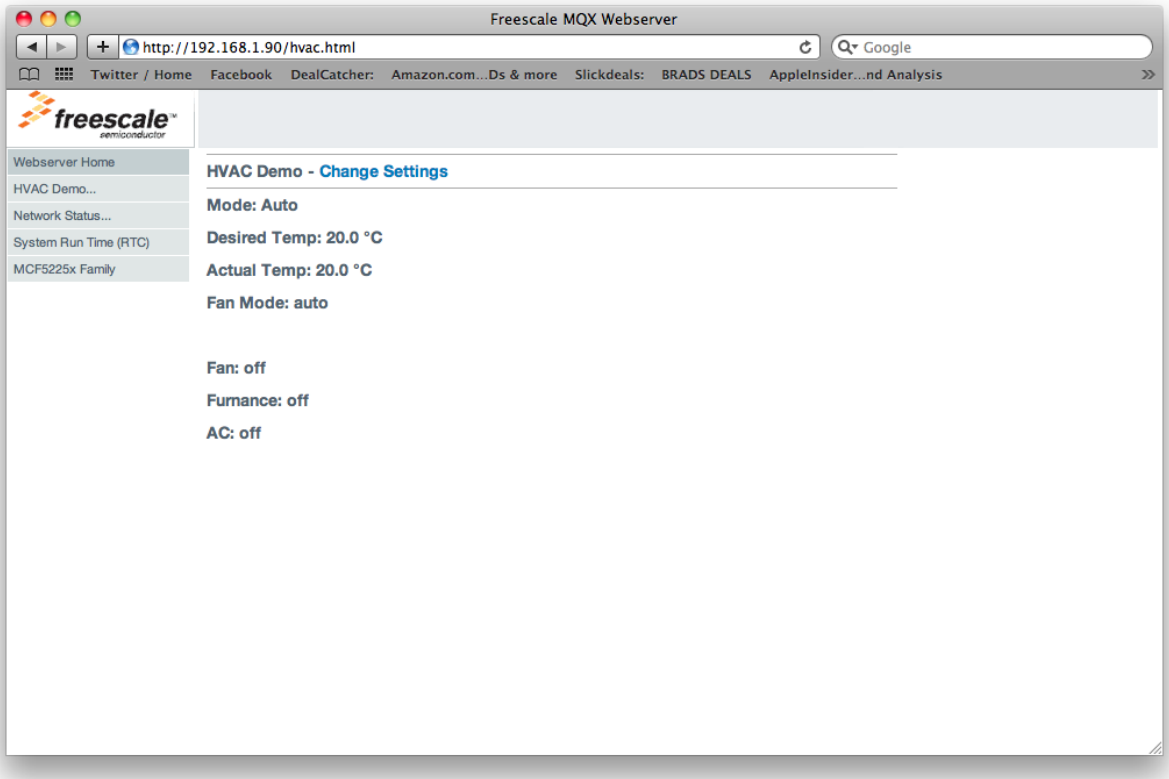
The demo can be configured through the demo 'source.h' file. An example is 'hvac.h' under the projects source directory. The demo file from Atheros is set up to work with a pre-defined variables but if you can change the settings through the definitions in the .h file. An example of things to change is IP address, Security type and keys, etc. Any changes need to be saved and the system needs to be rebuilt (MAKE) and reloaded on the hardware.

The default parameters are-

DEMOCFG_SSID "atheros_demo"
Gateway address- 192.168.1.2
Local Address – 192.168.1.90
No Security.

To access the system place the PC on the same subnet as the tower system and input IP address of the tower system into the internet browser "192.168.1.90" to display the Web Page for the Tower System. You can now navigate to the HVAC DEMO via the right navigation bar on the welcome page.



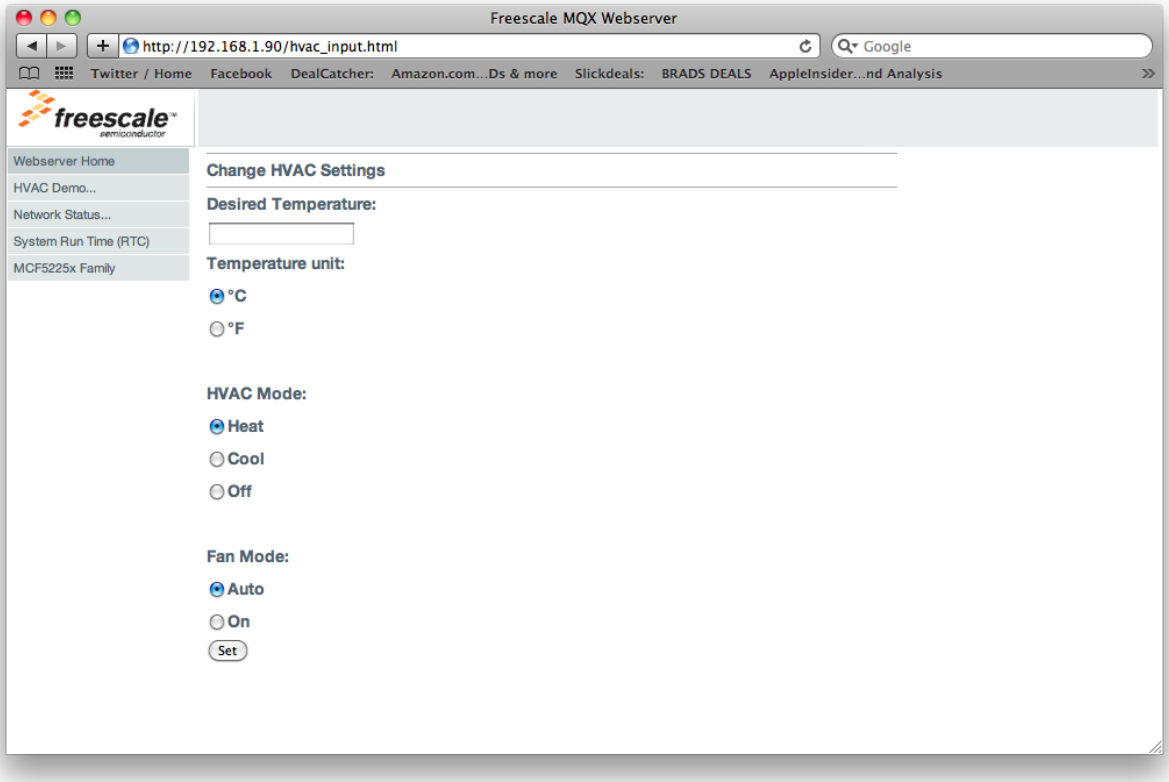


On the Tower System the LEDs represent the current state of the HVAC:
LED1 represents Fan ON/OFF

LED2 represents Furnace ON/OFF
LED3 represents A/C ON/OFF
The Push button Switches change the Temperature and are configured differently on the ColdFire and Kinetis platforms.

ColdFire SW1 Temperature Up
SW3 Temperature Down
Kinetis - SW1 Temperature Up
SW2 Temperature Down

Use the Change Settings page to control the fan (LED 1). The fan on option forces the fan to be on, while fan auto puts the fan into automatic mode so that the fan is only on when the HVAC needs to change temperature.



Since the default settings for the demo have the “desired temp” and “actual temp” at 20°C, either the furnace or the AC do not need to be turned on.
Turn the fan on to automatic mode, and put the HVAC into heat mode using the Change Settings page. This turns on the furnace, and with the fan in automatic mode, the fan will only turn on when the desired temperature is higher than the actual temperature.

On the Coldfire Platform we will use the User configured SW 1 and SW3 however when running on the Kinetis platform we will be replacing SW3 with SW2 and will use SW1 and SW2 for the demo.
Push buttons SW1 and SW3 (Kinetis SW2) on the board are used to change the desired temperature. SW1 increases the desired temp and SW3 (Kinetis SW2) lowers it. Press SW1 once and see the temperature change on the Desired Temperature change on the Web page.

Press SW1 again, to see that the furnace has turned on and the fan has automatically turned on. The furnace and fan LEDs should be on to indicate this status.
Use SW3 (Kinetis SW2) to lower the desired temp such that the furnace and the fan turn off. You can also use the Desired Temperature Window on the Change Settings page to change the desired temperature.
Experiment on your own with changing temperature and fan settings.

7 Refrences

- TWR-WiFI-AR4100 Web Page
  - http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=TWR-WIFI-AR4100
- TWR-MCF5225X-KIT: Tower System Coldfire® V2 MCF5225X Connectivity Module
  - http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=TWR-MCF5225X
- TWR-K60N512-KIT: Development Kit for Kinetis K60
  - http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=TWR-K60N512-KIT