UG370: Wireless Xpress AMW007 Kit User's Guide

The AMW007 evaluation board is an excellent starting point to get familiar with the AMW007 Wi-Fi module.

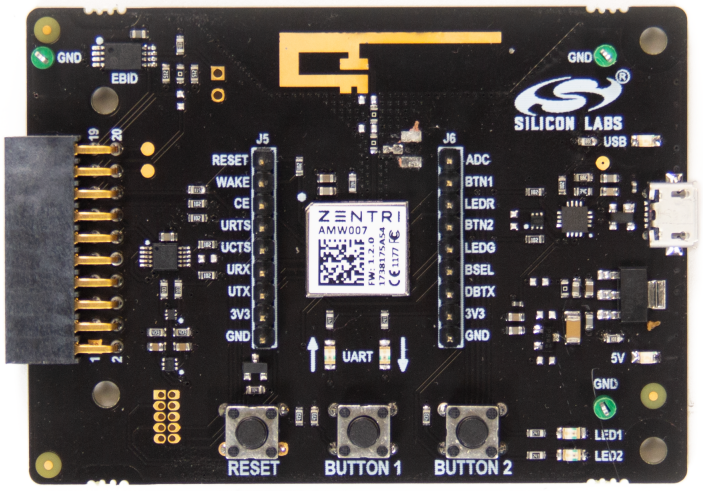
The evaluation board includes everything a developer needs to exercise the AMW007's UART interface and demonstrate data transfer over Wi-Fi. The board can operate stand-alone by connecting a PC to the on-board CP2102N USB-to-UART bridge device. Alternatively, the board can be connected to a Silicon Labs EFM8 or EFM32 starter kit, where a EFM8 or EFM32 microntroller can communicate with the AMW007 over UART.

The kit includes the following:

- AMW007 Evaluation Board
- 1 x micro USB cable
- Getting Started card

KEY FEATURES

- The AMW007 can connect to an existing Wi-Fi network or be a Wi-Fi access point.
- UART interface and flow control pins use GeckoOS command API to connect and communicate across Wi-Fi
- Breakout test points for easy interface with prototype boards
- Power sources include USB and EXP Header



1. Getting Started

Software

To set up the software for the AMW007 kit:

1. Install the CP210x Virtual COM Port (VCP) driver, available at: https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers
2. Install Simplicity Studio, available at: https://www.silabs.com/products/development-tools/software/simplicity-studio.
3. Install a terminal program (e.g. Tera Term).

Hardware

To set up the hardware for the AMW007 kit:

1. Connect the micro USB cable to AMW007 board and the other end to the PC.
2. Ensure the two blue LEDs labeled USB and 5V near the USB connector are on.
3. Connect to the virtual COM port using the terminal program.
   - For Windows, use a terminal program (e.g. Tera Term) set to 115200, 8N1.
   - For a Mac, the terminal can be accessed using [**[tty.usbserial**]]. There may be a modifier at the end of this for your computer. Type [**[tty.usbserial_modifier 115200,8n1]**] to set the connection to the right settings.

Check the Version

After connecting the board to the PC and opening the terminal program, press the [**[RESET]**] button on the board. You should see aheader with the version information for the device. Ensure this version is 1.0.0.4 or newer.

help

The [**help**] command provides information both for commands and variables on the device.

Variables are system-level variables that determine the configuration of the AMW007 module.

Commands are actions that the can be taken.

1. Type [**help**] to see the options for the help command.
2. Type [**help commands**] to see a list of commands supported by this module.

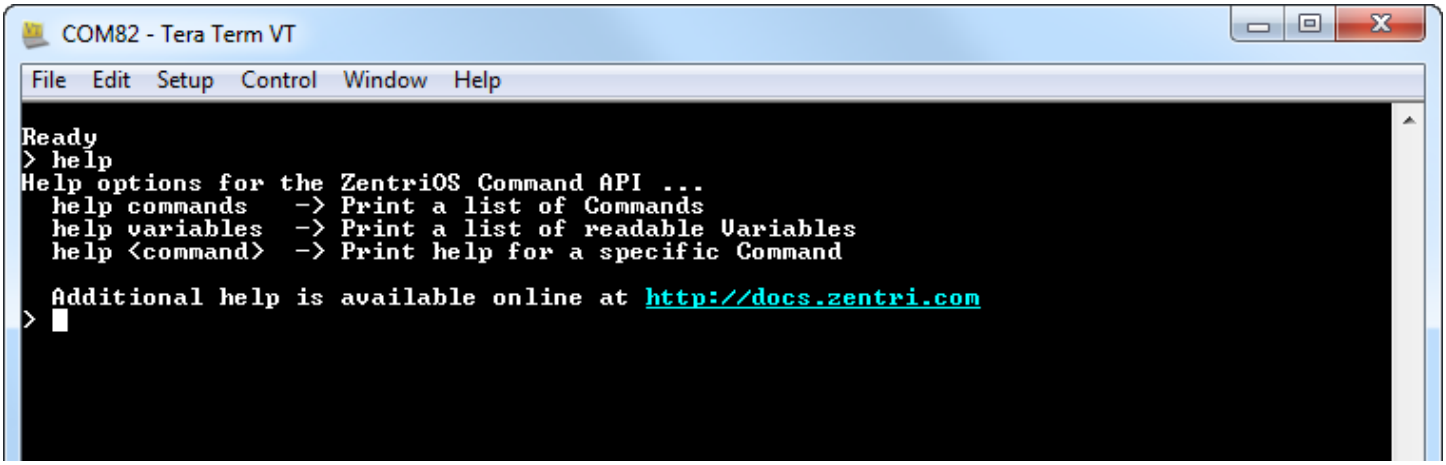


Figure 1.1. help

Commands used:

- https://docs.silabs.com/gecko-os/latest/cmd/commands#help

2. Kit Block Diagram

An overview of the AMW007 evaluation board is shown in the figure below.

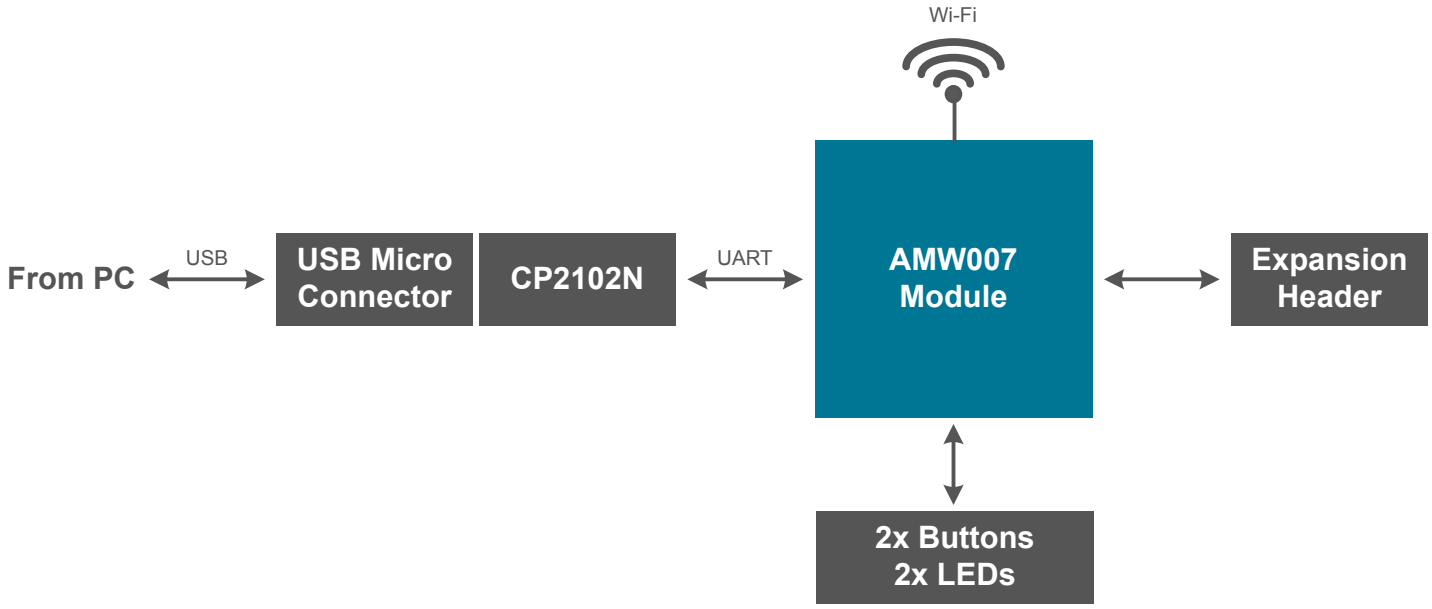


Figure 2.1. AMW007 Evaluation Board Block Diagram

3. Kit Hardware Layout

The layout of the AMW007 evaluation board is shown below.

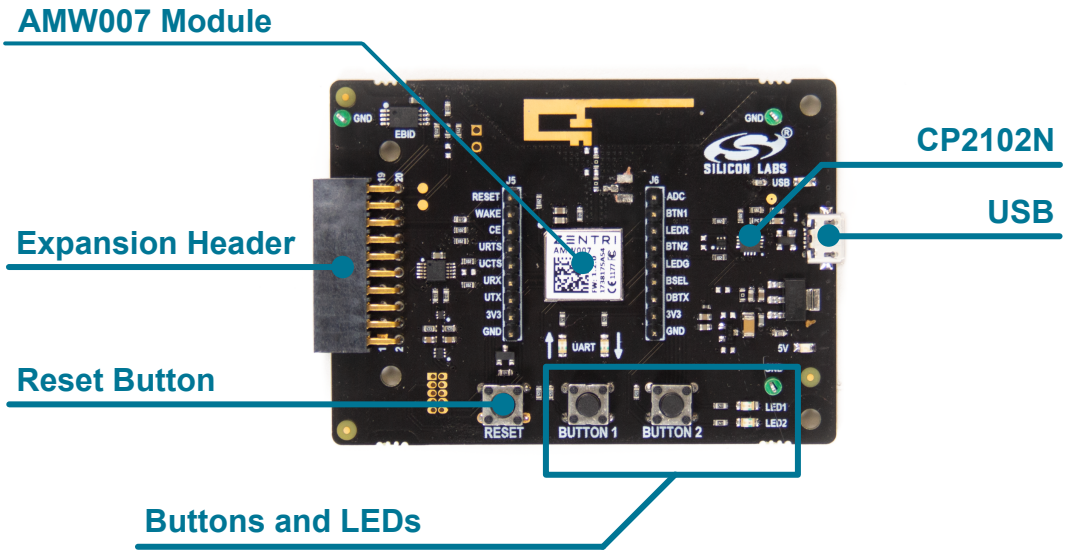


Figure 3.1. AMW007 Evaluation Board Hardware Layout

4. Power and Operation

4.1 Power Selection

The AMW007 evaluation board is designed to be powered by two different sources:

- External regulator via 5V from USB connector
- External regulator via 5V from expansion header

The figure shows how the different power sources are connected to the AMW007.

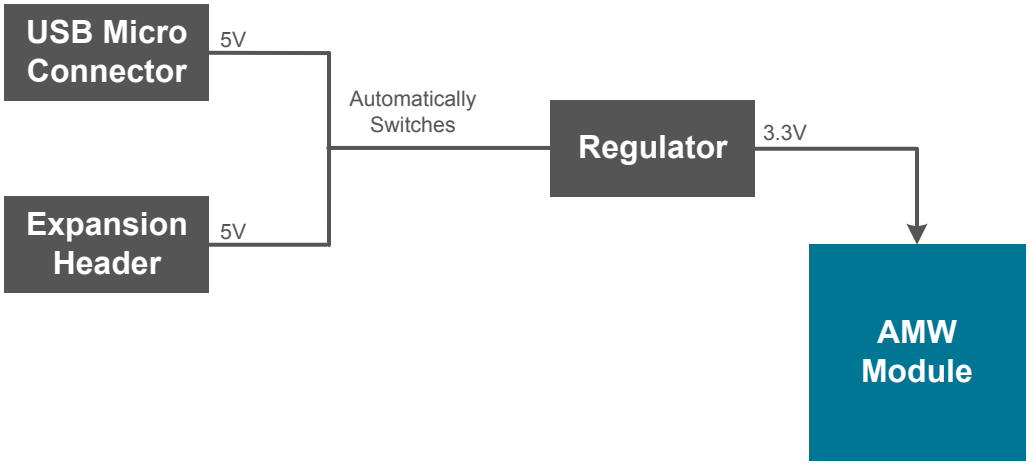


Figure 4.1. AMW007 Power Supply

When the USB is connected, the AMW007 is powered from the external regulator, and the external regulator is powered by the USB cable.

The external regulator also be powered externally through the 5V and GND pins of the expansion header when the board is attached to a power supply or an EFM MCU Starter Kit.

When power is provided through the USB or an external power supply, the AMW007 module can act as a stand alone device. When it is connected to an EFM MCU Starter Kit through the expansion header, the AMW007 acts as a peripheral to the MCU.

4.2 Stand-alone

In stand-alone mode, the AMW007 on the evaluation board can be communicated with using the CP2102N USB-to-UART bridge device. Simply connect to the CP2102N's virtual COM port in a terminal program and send commands to the AMW007.

Note: By default, the AMW007 communicates at 115200 baud, though this is a configurable setting.

4.2.1 AMW007 as an Access Point

To set up the AMW007 as an access point using a terminal program:

1. Connect to the CP2102N's COM port using a terminal program.
2. Type [**set setup.web.ssid**] to [**"ZentriOS #"**], where [**#**] is a unique number, such as a phone number. Ensure this SSID does not match any nearby SSIDs.

   Note: Use quotes around the network name if it contains spaces.

3. Type [**save**] to save the new SSID value.
4. Type [**setup web**] to enable the module as a Wi-Fi access point.
5. Reading the online docs for the [**setup**] command, the password for the network is the value of the [**setup.web.passkey**] variable. The default value is [**password**].

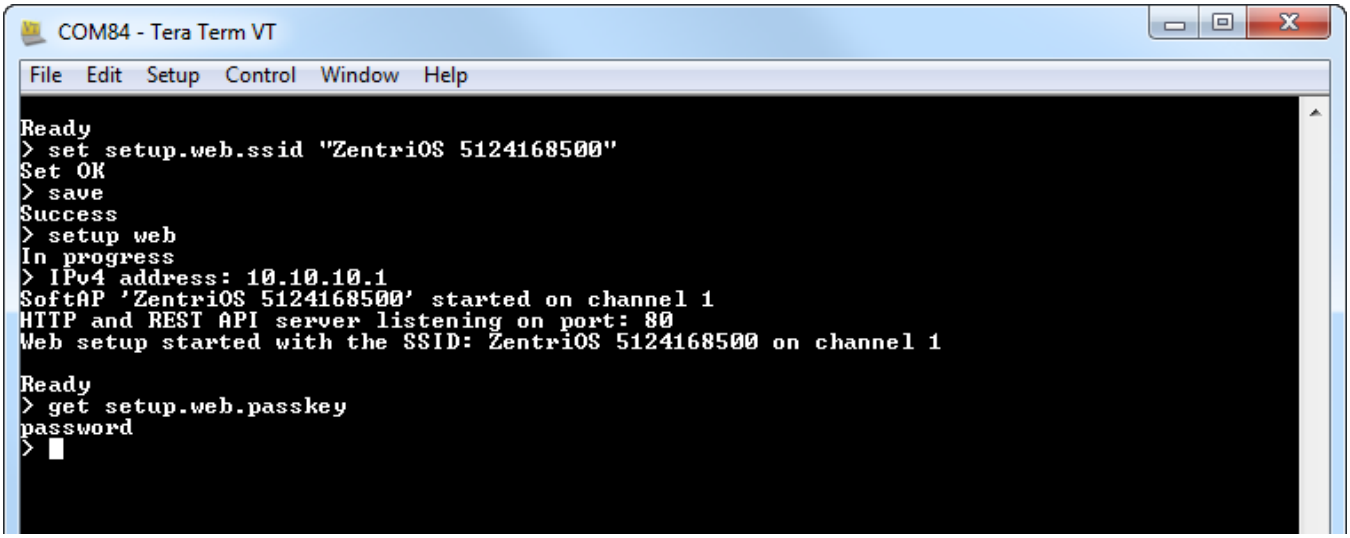


Figure 4.2. setup web / set setup.web.ssid / save / get setup.web.passkey

6. Using your computer or phone, connect to the ZentriOS access point [**ZentriOS #**] using the password.

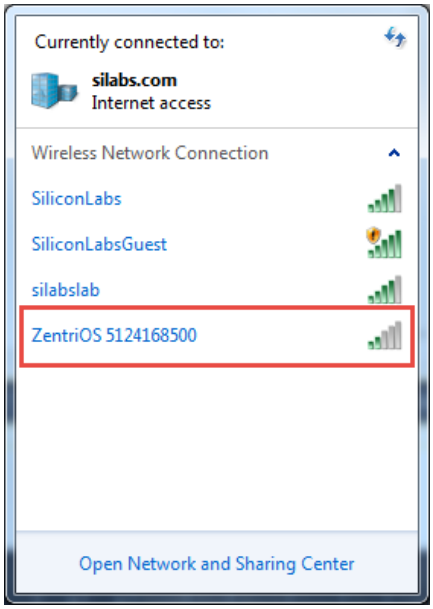


Figure 4.3. Connecting to the ZentriOS Access Point

7. Using a web browser, navigate to the IPv4 address listed. In this example, it's 10.10.10.1.

8. Click the [**GPIOs**] area on the left side of the browser.

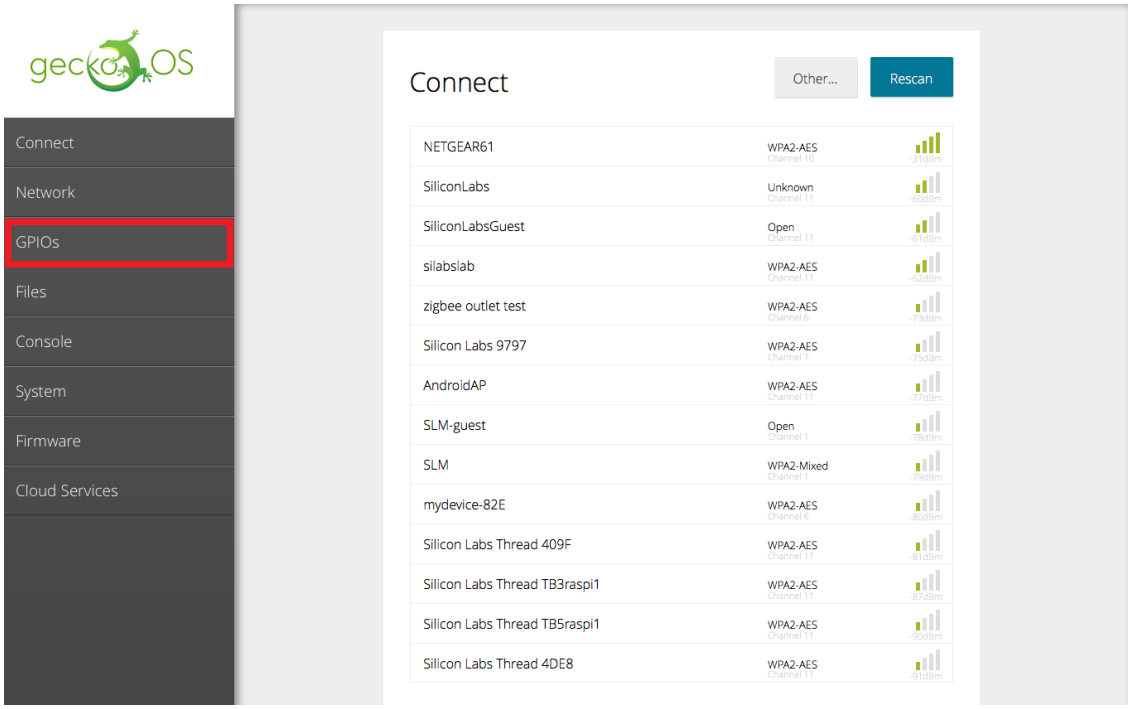


Figure 4.4. Navigating to the Module's index.html

9. Press and hold the [**BUTTON 2**] switch on the AMW007 board to change the GPIO toggle on the webpage.

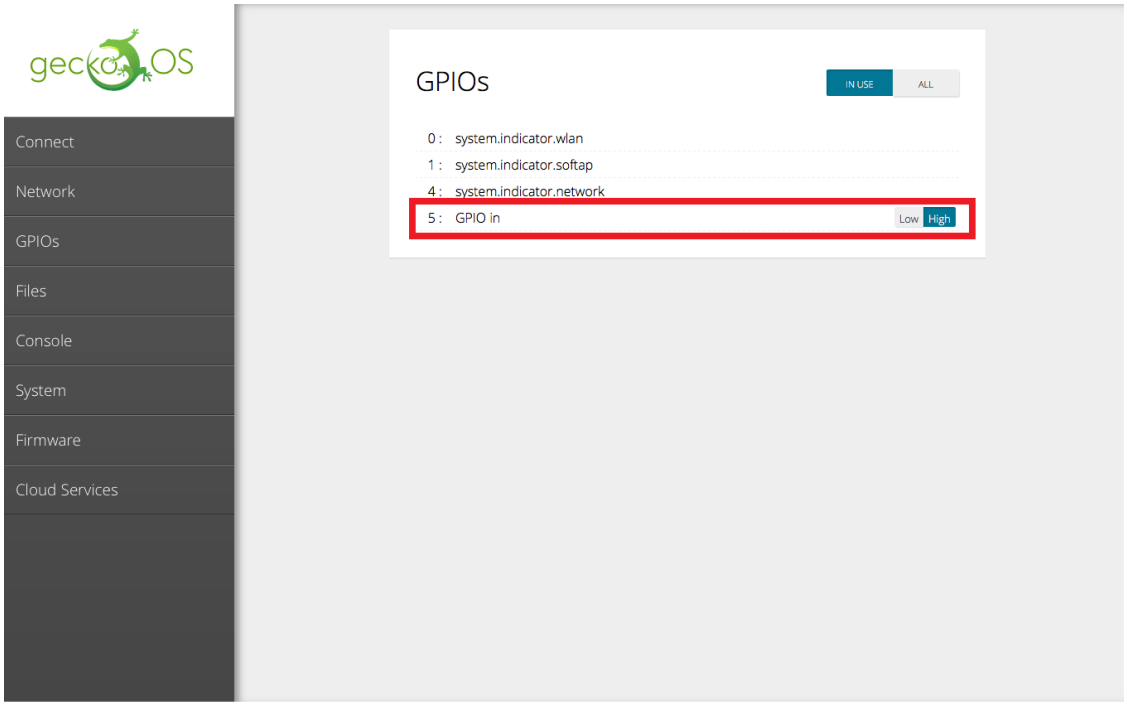


Figure 4.5. Toggling the GPIO Using the Buttons

Note: The [**save**] command saves the [**ssid**] variable to flash.

Commands used:

- https://docs.silabs.com/gecko-os/latest/cmd/commands#setup
- https://docs.silabs.com/gecko-os/latest/cmd/commands#set

- https://docs.silabs.com/gecko-os/latest/cmd/commands#get

4.2.2 Connecting to an Existing Network

Connecting to an Existing Network using a Terminal Program

To connect to an existing Wi-Fi network using a terminal program:

1. Connect to the CP2102N's COM port using a terminal program.
2. If the AMW007 was previously configured as an access point, type [**reboot**] to disable the AMW007 as an access point.
3. Use the [**scan**] command to find all the networks in range.

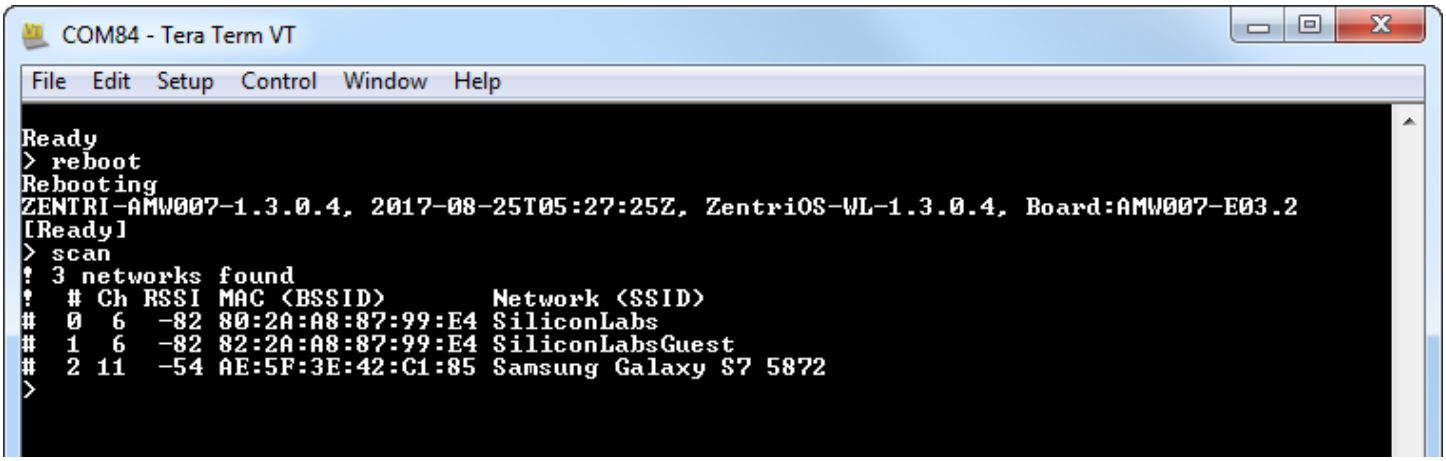


Figure 4.6. scan

Commands used:

- https://docs.silabs.com/gecko-os/latest/cmd/commands#reboot
- https://docs.silabs.com/gecko-os/latest/cmd/commands#wlan-scan

Connecting to a Network

The [**wlan.ssid**] and [**wlan.passkey**] variables set the Wi-Fi network name and password, respectively.

1. Type [**set wlan.ssid "Wi-Fi network name"**]. The [**"Wi-Fi network name"**] value is the name of the network you'd like to connect to.

   Note: Use quotes around the network name if it contains spaces.

2. Type [**set wlan.passkey password**]. The [**password**] value is the password for the network defined by the ssid.
3. Type [**save**] to save the new values.
4. Type [**network_up**] to turn on the network.

You should now be connected to the network.

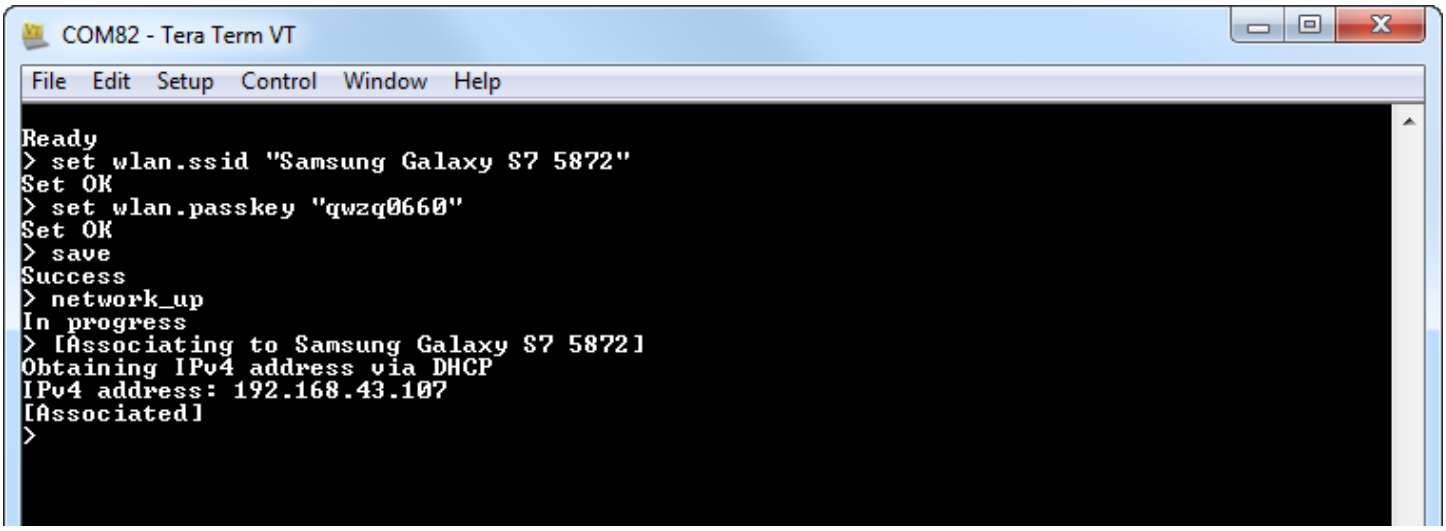


Figure 4.7. set wlan.ssid / set wlan.passkey / save / network_up

Note: To automatically join the network defined by [**ssid**] and [**passkey**] each time the module is powered on or rebooted, type [**set wlan.auto_join.enabled 1**].

Commands used:

- https://docs.silabs.com/gecko-os/latest/cmd/commands#set
- https://docs.silabs.com/gecko-os/latest/cmd/commands#save
- https://docs.silabs.com/gecko-os/latest/cmd/commands#network-up

Looking for Files

GeckoOS includes full operating system commands like [**ls -l**]. To test this out:

1. Type [**ls**] to get a basic file list.
2. Type [**ls -l**] to view the type, flags, and other information for files in the operating system filesystem.

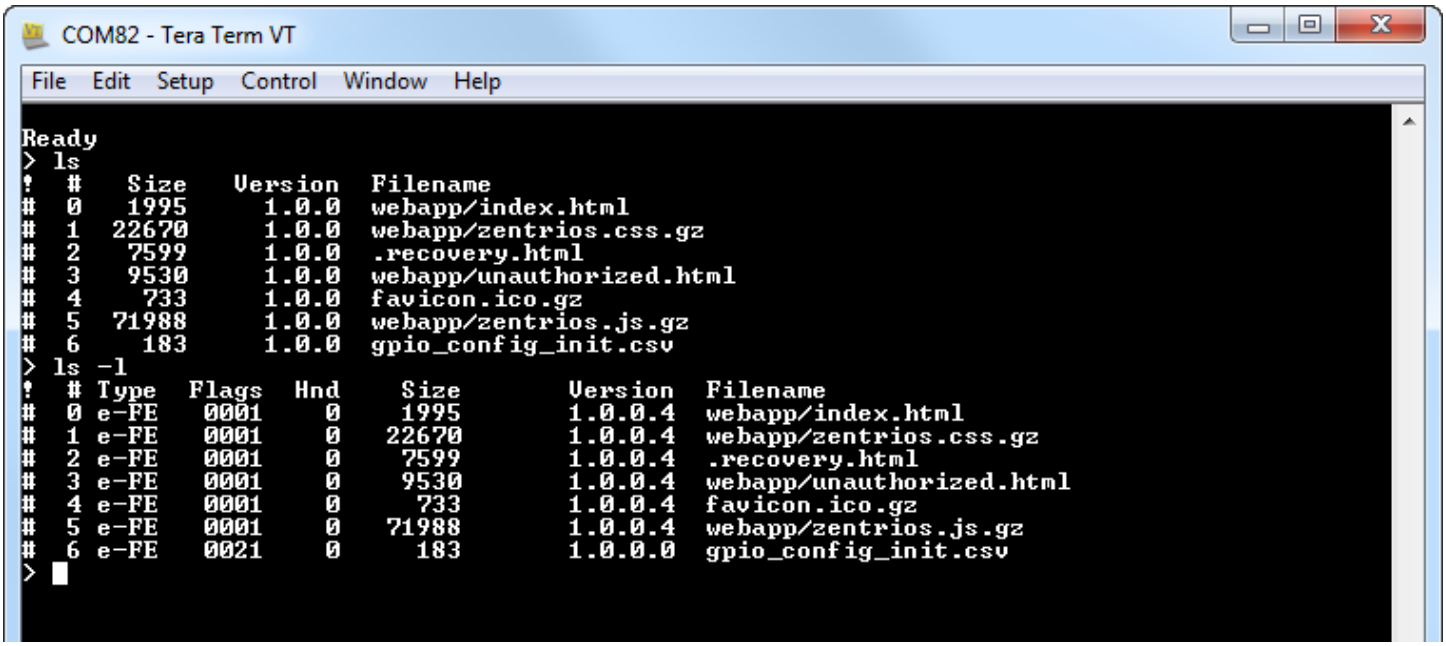


Figure 4.8. ls / ls -l

Commands used:

- https://docs.silabs.com/gecko-os/latest/cmd/commands#ls

Reading from a File

Data sources like files are called streams in GeckoOS. To read from one of these files:

1. Type [**ls**] to get a list of the files, if you don't already have it.
2. Use [**file_open**] to open the file. Type [**file_open webapp/unauthorized.html**] to open this file.
3. Type [**stream_list**] to view all of the open streams. Since we only have one stream open at the moment, it should have the handle of [**0**].
4. Type [**stream_read 0 100**] to read 100 bytes from stream 0, or unauthorized.html.

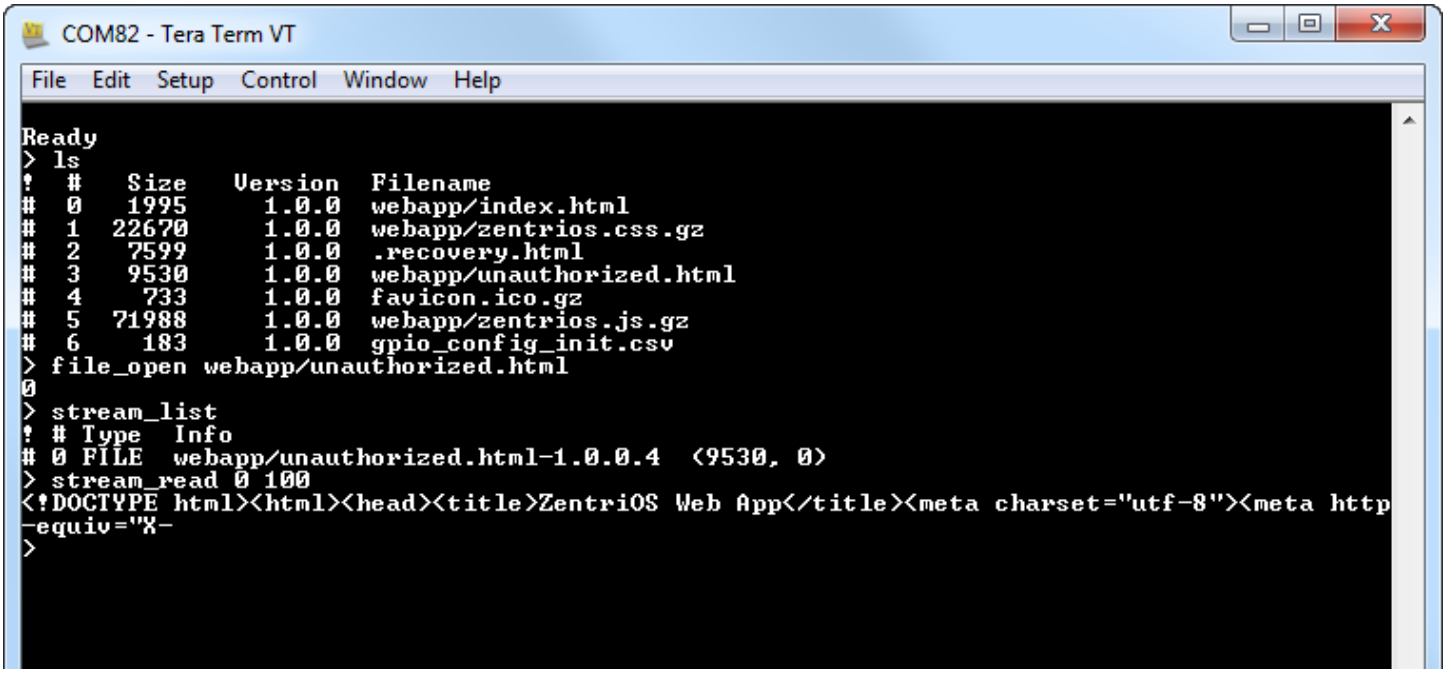


Figure 4.9. ls / file_open / stream_list / stream_read

Commands used:

- https://docs.silabs.com/gecko-os/latest/cmd/commands#ls
- https://docs.silabs.com/gecko-os/latest/cmd/commands#file-open
- https://docs.silabs.com/gecko-os/latest/cmd/commands#stream-list
- https://docs.silabs.com/gecko-os/latest/cmd/commands#stream-read

Reading from a Website

To read data from a website:

1. Type [**http_get www.google.com**] to open a stream with the Google homepage. This should now be stream [**1**].
2. Type [**stream_read 1 1000**] to read the first 1000 bytes from the site (stream 1).

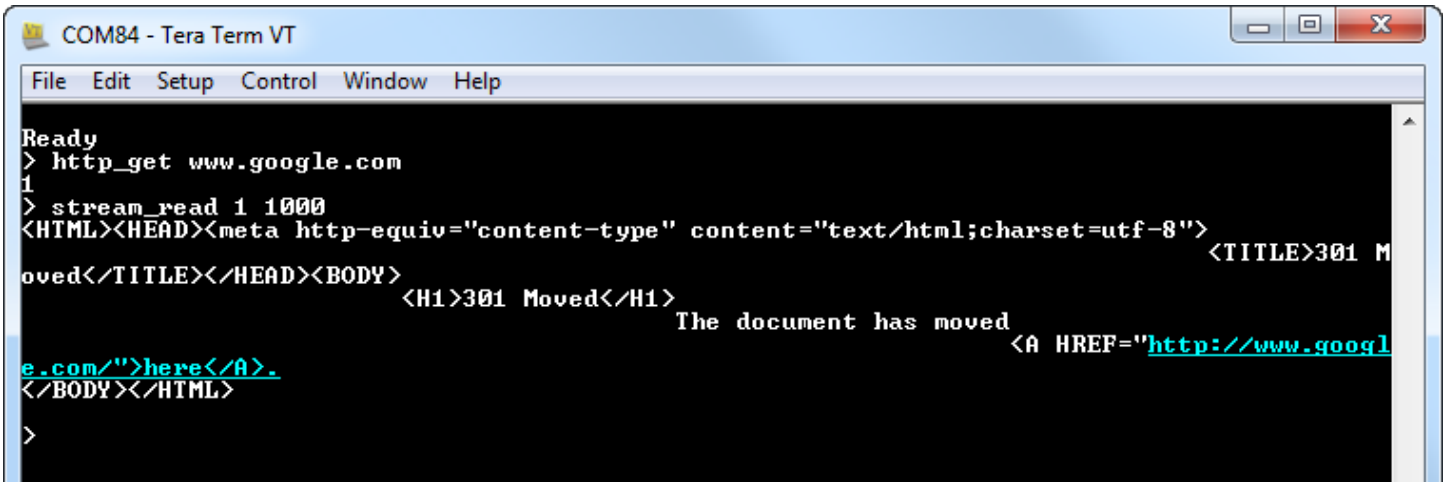


Figure 4.10. http_get / stream_read

Commands used:

- https://docs.silabs.com/gecko-os/latest/cmd/commands#http-get
- https://docs.silabs.com/gecko-os/latest/cmd/commands#stream-read

Closing a Stream

To close a stream:

1. Type [**stream_close 0**] to close the open stream to the unauthorized.html file.
2. Type [**stream_list**] to view the open streams. The open stream to the website should be the only item in the list.

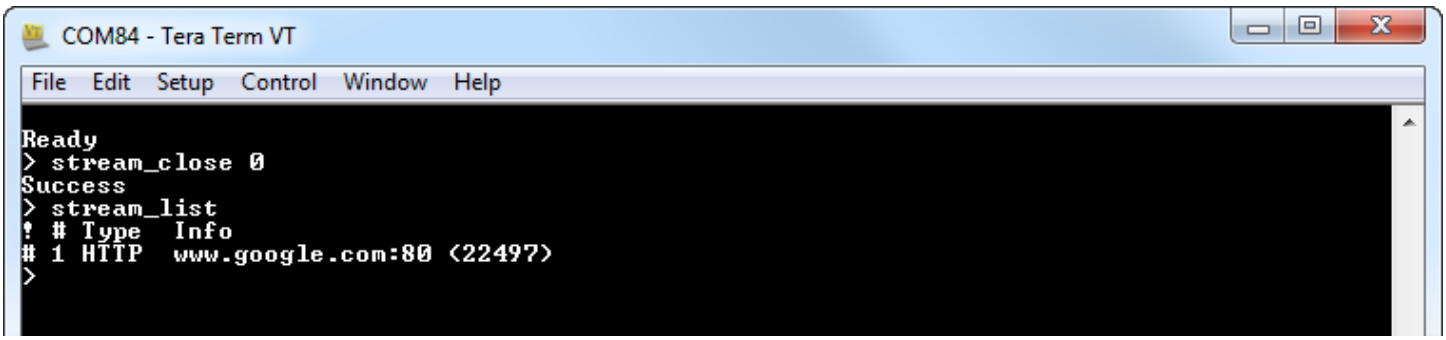


Figure 4.11. stream_close / stream_list

Commands used:

- https://docs.silabs.com/gecko-os/latest/cmd/commands#stream-close
- https://docs.silabs.com/gecko-os/latest/cmd/commands#stream-list

4.3 Connected to the Expansion Header

The AMW007 evaluation board is designed to quickly attach to any EFM32 and EFM8 MCU starter kit to jumpstart the development of Wi-Fi-connected applications. Attach the evaluation board to the STK through the expansion header to connect power and communication pins.

To see how the board works in conjunction with the MCU starter kit, go to the starter kit's Demos under Getting Started in Simplicity Studio and run [**AMW007 demo**]. Starter kits currently offering BGX demo firmware are EFM8UB1.

4.3.1 Recovering EFM8 Firmware Images

The AMW007 on the evaluation board is preprogrammed with three firmware images for both EFM8UB1 and EFM8UB2:

- default.efm8
- SpaceInvaders.efm8
- softAP.efm8

If these firmware images were deleted by the user, they can be restored using the following commands preceeded with ">":

```
> dms claim username@gmail.com **********
Request POST /claim
Connecting (https): ota.zentri.com:443
Starting TLS
{"result":"ok","product":"SILABS-
EFM8STK","user":"username@gmail.com","token":"R1diVHdiZlVielJGdU1IdU9tajFNN1Ew"}
Success

> dms activate 0Z0THQ-EFM8
Request POST /activate
Connecting (https): ota.zentri.com:443
Starting TLS
{"result":"ok","product":"0Z0THQ-EFM8"}
Success

> ota
UUID: 08266E56D7F728000000201709192114024A2CFC
Connecting to network
Obtaining IPv4 address via DHCP
Request POST /ota
Connecting (https): ota.zentri.com:443
Starting TLS
IPv4 address: 10.1.54.27
[Associated]
Bundle size: 564710
Bundle version: 0Z0THQ-EFM8-1.0.0.4, 2018-08-30T18:24:00Z, ZentriOS-WL-3.0.0.0-test
Bundle ID: 1a26ee99-2d8a-4125-9253-ae62934f6372
Downloading new firmware...
Downloading: ZentriOS-WL (OK)
Downloading: EFM8/UB1/default.efm8 (OK)
Downloading: EFM8/UB2/default.efm8 (OK)
Downloading: EFM8/UB2/SpaceInvaders.efm8 (OK)
Downloading: EFM8/UB1/SpaceInvaders.efm8 (OK)
Downloading: EFM8/UB1/softAP.efm8 (OK)
Downloading: EFM8/UB2/softAP.efm8 (OK)
Setting boot image
Booting to new image
[Associating to silabslab]
Obtaining IPv4 address via DHCP
Posting OTA result to DMS
Request POST /ota/result
Connecting (https): ota.zentri.com:443
Starting TLS
IPv4 address: 10.1.54.27
[Associated]
OTA completed successfully
[Ready]

> ls
!  #   Size   Version  Filename
#  0   7599     1.4.0  .recovery.html
#  1   1995     1.4.0  webapp/index.html
#  2    733     1.4.0  favicon.ico.gz
#  3  22670     1.4.0  webapp/zentrios.css.gz
#  4   9530     1.4.0  webapp/unauthorized.html
#  5   1236     1.4.0  geotrust_ca.pem
#  6  71988     1.4.0  webapp/zentrios.js.gz
#  7   8667     1.6.0  EFM8/UB1/default.efm8
#  8   8579     1.6.0  EFM8/UB2/default.efm8
#  9   8579     1.6.0  EFM8/UB2/SpaceInvaders.efm8
# 10   8667     1.6.0  EFM8/UB1/SpaceInvaders.efm8
```

```
# 11  15083     1.6.0  EFM8/UB1/softAP.efm8
# 12  14953     1.6.0  EFM8/UB2/softAP.efm8
```

5. Peripherals

The starter kit has a set of peripherals that showcase some of the features of the AMW module.

Be aware that some I/O routed to peripherals are also routed to the breakout pads. This must be taken into consideration when using the breakout pads for your application.

5.1 Push Buttons and LEDs

The board includes 2 active-high LEDs and 2 mechanical buttons to exercise I/O capabilities of the AMW007. The connects are shown in the following table.

Table 5.1. LEDs and Buttons Connected to AMW007

AMW007 Pin	LED/Button
GPIO0	BUTTON1
GPIO1	LED1 (red)
GPIO4	LED2 (green)
GPIO5	BUTTON2

6. Connectors

6.1 Test Points

The test points located to the left and right of the module. Test points are available for the AMW007's power/ground pins, UART pins, all GPIOs, reset pin, wake pin, chip enable pin, boot select pin, and debug TX pin.

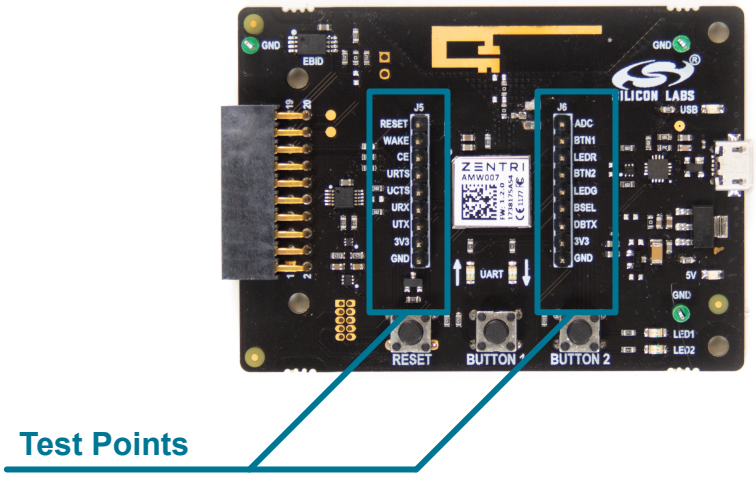


Figure 6.1. Test Points

6.2 Expansion Header

On the left hand side of the board is a female expansion header to connect to a Silicon Labs EFM8 or EFM32 Starter Kit (STK). The connecter contains a number of output and communication pins that can be used to communicate with the MCU on the STK. Additionally, the 3V3 and 5V power rails are also available. The figure below shows the pin assignment of the expansion header.

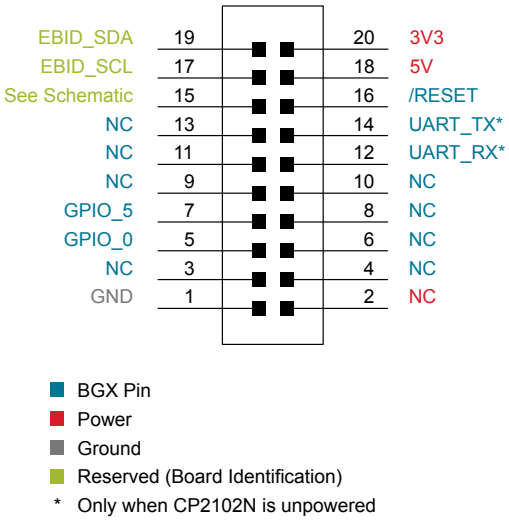


Figure 6.2. Expansion Header

7. Simplicity Studio

Simplicity Studio contains tools to configure and evaluate the AMW007.

7.1 Xpress Configurator

Xpress Configurator is a GUI tool used to configure parameters of the AMW007, save those values, and export settings in a number of useful ways.

Note: All configuration of the AMW007 executes across the serial interface, and any step taken by Xpress Configurator can be reproduced by an embedded host connected to the AMW007's UART interface.

All communication between the AMW007 expansion board and the Xpress Configurator can be seen in the terminal window embedded in the Xpress Configurator tool.

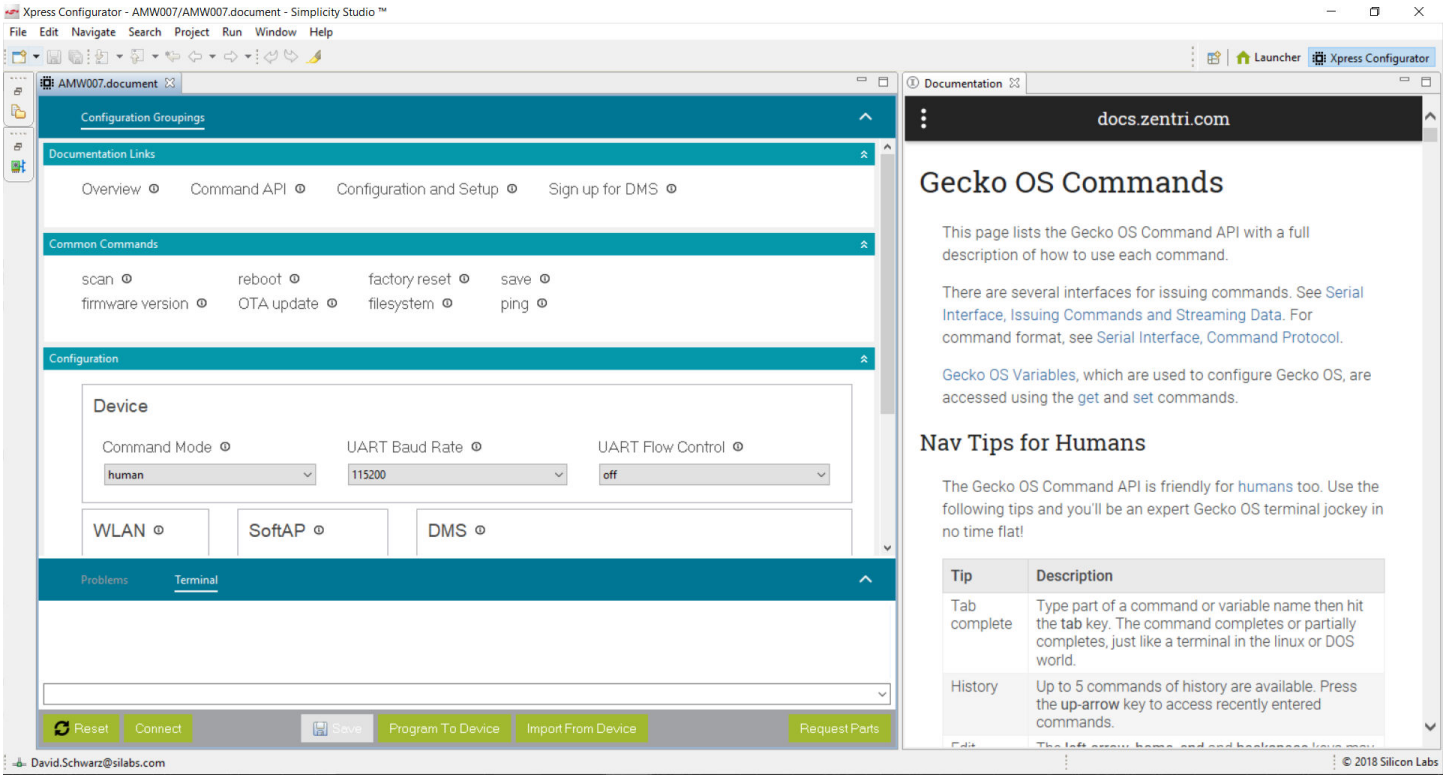


Figure 7.1. Simplicity Studio Xpress Configurator

8. Schematics, Assembly Drawings, and BOM

8.1 Board Files

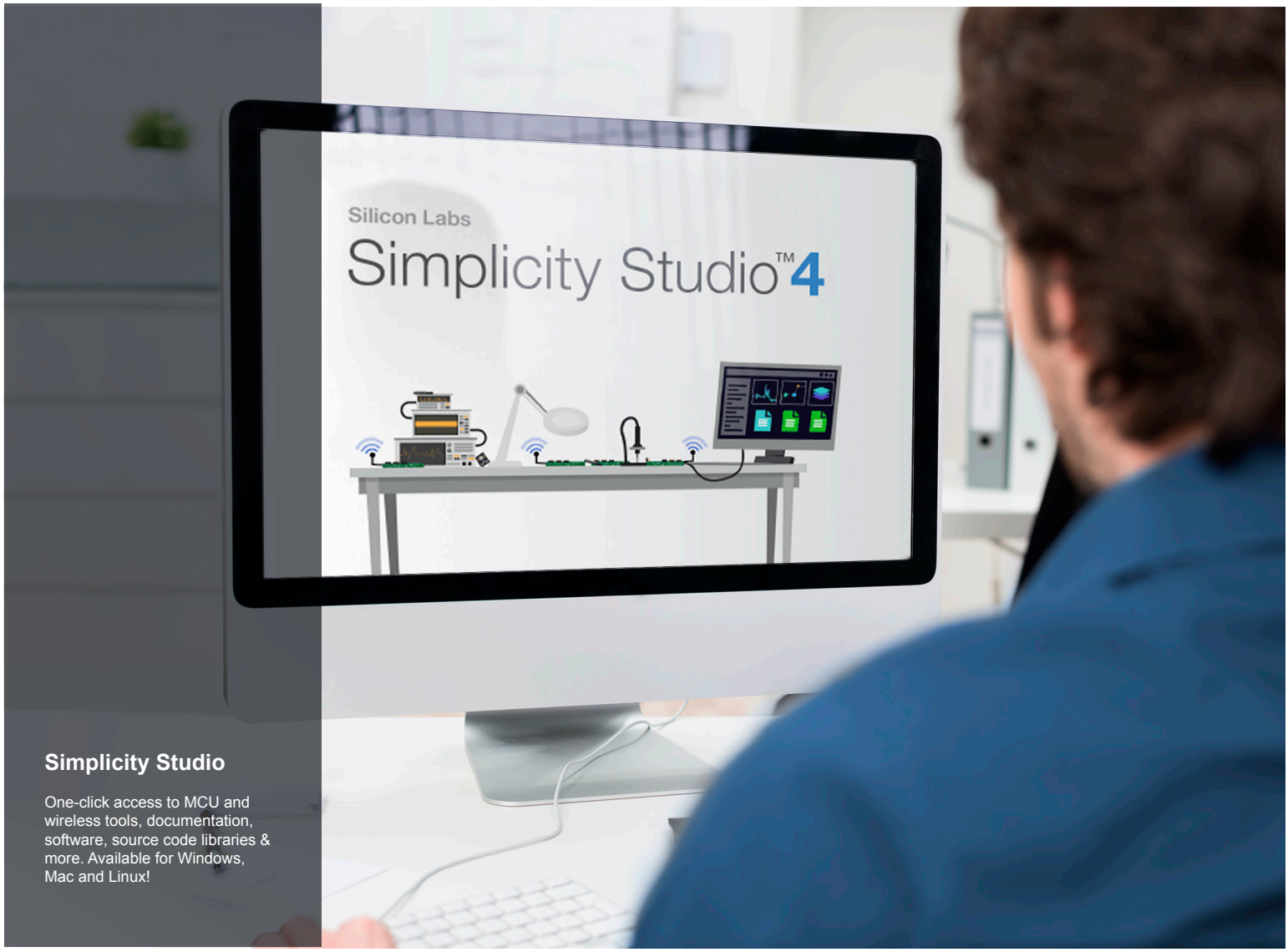
The schematics, assembly drawings and bill of materials (BOM) for the AMW007 evaluation board are available through Simplicity Studio when the kit documentation package has been installed. To access these documents, click the [**Kit Documentation**] tile after selecting the device in the left pane.

8.2 Board Revision History

- Revision 5.1 — Initial production revision.

Revision 5.1 Boards

These boards do not currently have any known issues.



Simplicity Studio

One-click access to MCU and wireless tools, documentation, software, source code libraries & more. Available for Windows, Mac and Linux!

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Silicon Laboratories Inc.
400 West Cesar Chavez
Austin, TX 78701
USA

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