# 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.

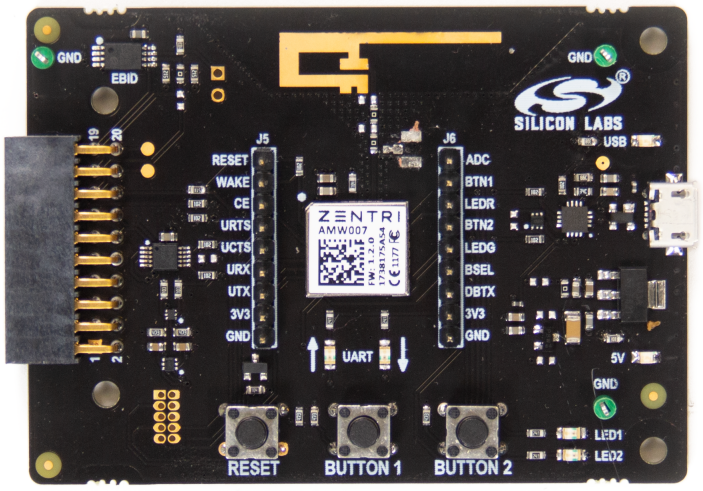
The evaluation board includes everything a developer needs to exercise the AMW007's UART interface and demonstrate data transfer over Wi-Fi. The board can operate stand-alone by connecting a PC to the on-board CP2102N USB-to-UART bridge device. Alternatively, the board can be connected to a Silicon Labs 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 Gecko OS 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, either install Simplicity Studio, available at https://www.silabs.com/products/development-tools/software/simplicity-studio to use Xpress Configurator or install a terminal program (e.g. Tera Term).

For most userss labeled AMW007, it will not be necessary to install a virtual comm port driver in order to interface with the AMW007 kit using the on-board USB-to-UART bridge. Please see the section below for details.

AMW007 evaluation boards labeled AMW007-E04.2 or higher that are connected to Windows and Linux machines should be configured to this driver automatically. However, if the board is not automatically recognized by the operating system, please download and install the latest version of the CP210x VCP driver: https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

### 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. If using a utility like CoolTerm, make sure the settings are configured to 115200, 8N1.

Note that AMW007 kits labeled AMW007-E04.2 and higher that are connected to Windows or Linux machines do not require a driver to be installed in order to communicate with the board. However, if using a Mac or if the driver does not automatically install, please download and install the driver from https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers.

### 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 a header with the version information for the device. Ensure this version is 2.1.5 or newer. If you find you are using an older version of firmware, perform an over the air update on the board as described on docs.silabs.com.

### 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 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.

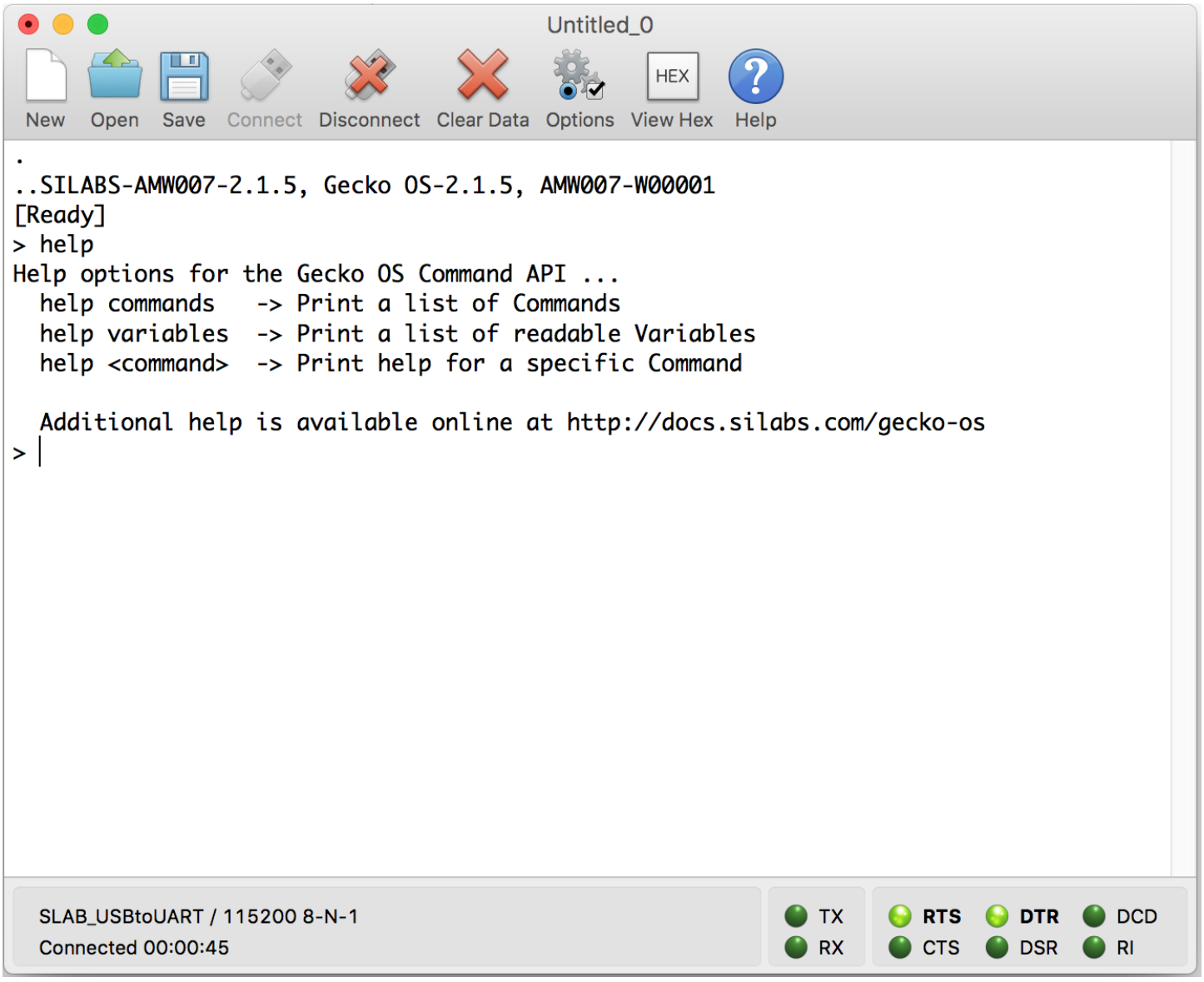



**Figure 1.1. help**

Commands used:

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

### Claiming Your Device

The Zentri Device Management Service (ZentriDMS) tracks GeckoOS devices, their owners, their firmware configuration and many other details. The DMS handles Over-the-Air (OTA) updates, providing a secure way to update devices in the field. You need a free DMS account before using DMS features like OTA.

To create an account go to the DMS Signup page. The DMS username (your email address) and password you register are used when you claim your device. To claim your device, in the terminal, issue the dms claim command:

| GeckoOS command | Description |
|---|---|
| `dms claim YOUR_DMS_USERNAME YOUR_DMS_PASSWORD`<br>`Request POST /claim`<br>`Connecting (https): ota.zentri.com:443`<br>`Starting TLS`<br>`{"result":"ok"}` | claims your device. GeckoOS response shows a successful result |

Once you have successfully claimed your device, you can OTA.

### Performing an OTA

Use OTA to update to the latest version of your device's GeckoOS product, or to load a development GeckoOS device with a specific GeckoOS product or version. You need to claim your device before performing an OTA. See above.

To OTA, in the GeckoOS terminal, issue the ota command:

| Gecko OS command | Description |
|---|---|
| `ota`<br>`Disassociated]`<br>`UUID: 06413041000000002E0049001951343438333231`<br>`Connecting to network`<br>`Security type from probe: WPA2-AES`<br>`Request POST /ota`<br>`Connecting (https): ota.zentri.com:443`<br>`Starting TLS`<br>`Bundle size: 729088, Free space: 823296, Core size: 425984`<br>`Bundle version: ZENTRI-AMW106-3.4.1.0, 2017-09-01T03:14:19Z, ZentriOS-W-3.4.1.0` | Updates your device via the DMS server<br><br>GeckoOS displays progress messages |

For full details of the DMS claim and OTA update process, see docs.silabs.com.

## 2. Kit Block Diagram

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

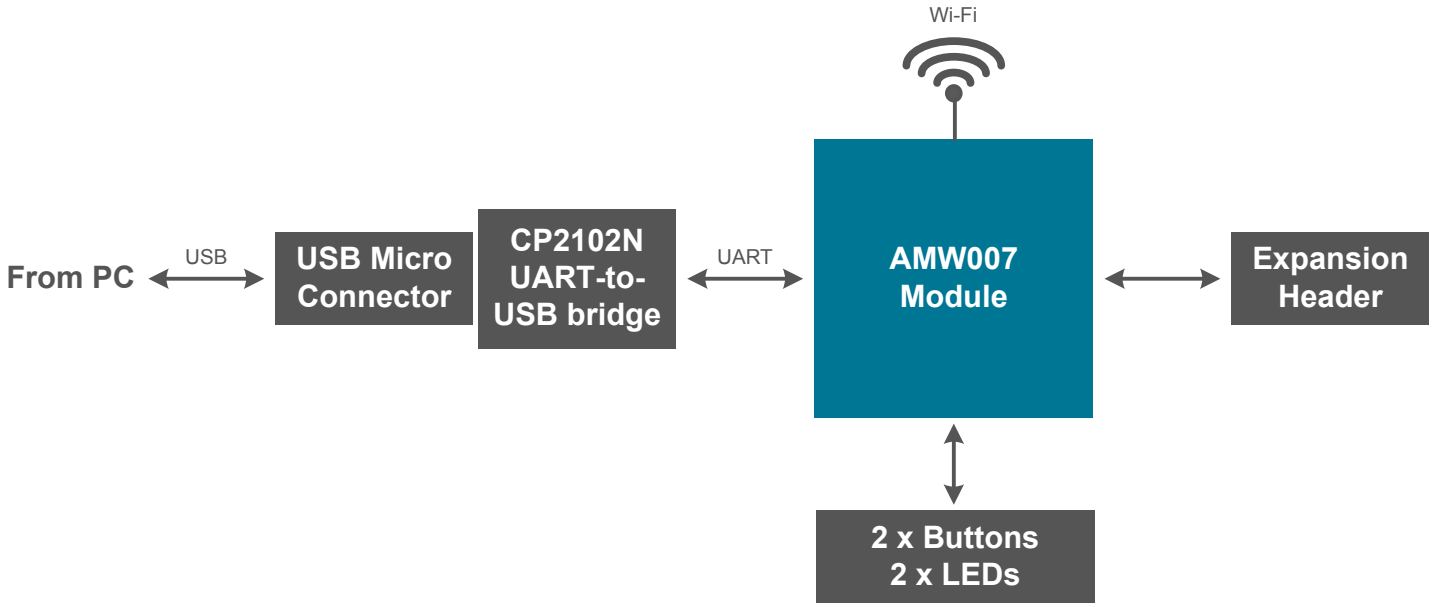



**Figure 2.1. AMW007 Evaluation Board Block Diagram**

## 3. Kit Hardware Layout

The layout of the AMW007 evaluation board is shown below.

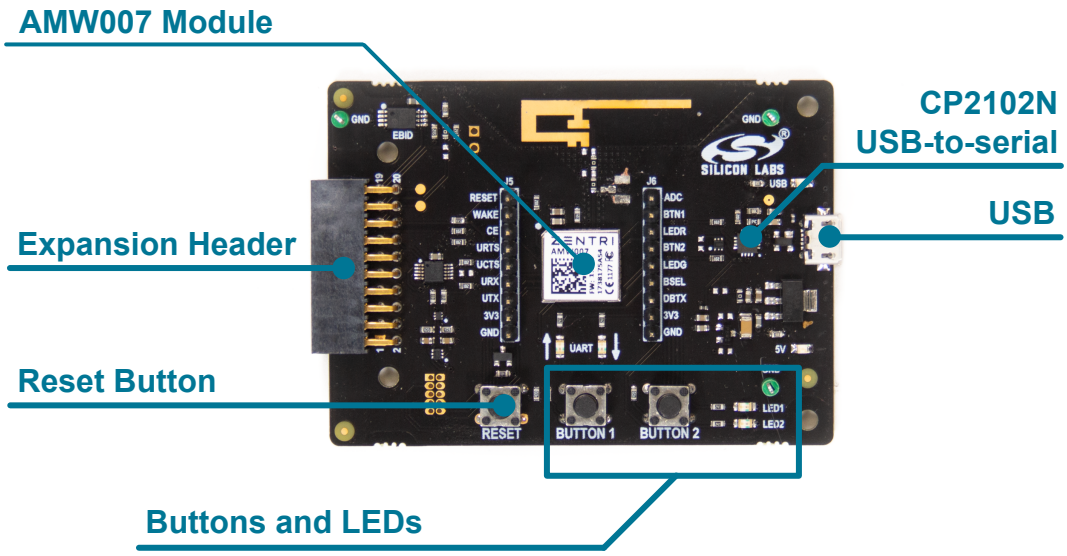



**Figure 3.1. AMW007 Evaluation Board Hardware Layout**

# 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.

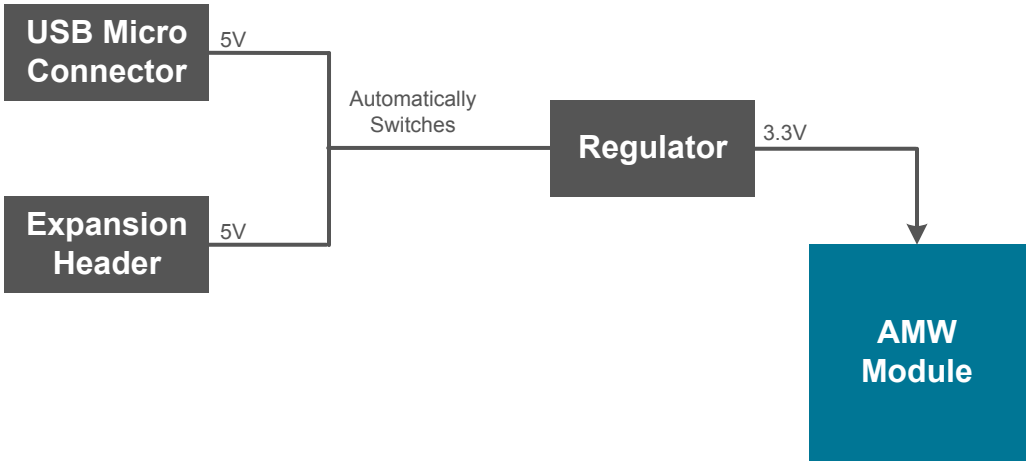



**Figure 4.1. AMW007 Power Supply**

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 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 AMW007 expansion board's COM port using a terminal program.
2. Set/Get commands access variables that configure operation and features in the device. Type [**set setup.web.ssid**] to [**"GeckoOS #"**], where [**#**] is a unique SSID that will be easy to see on a list of other SSIDs as shown in Figure 1.3. Ensure this SSID does not match any nearby SSIDs. Note that you will need quotes around the network name if it contains spaces.

   **Note:** The [**Get/Set**] commands access variables that configure operation and features in the device. [**Get**] reads a variable from RAM and [**Set**] writes a new value to that variable in RAM.

3. To read the password on the network, call [**get setup.web.passkey**]. The default password is "password". Set the password for the network by calling [**set setup.web.passkey**].
4. Type [**save**] to save the new SSID values.

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

5. Type [**setup web**] to enable the module as a Wi-Fi access point.

   **Note:** By default, Gecko OS evaluation boards are configured to enter Setup Web mode when you hold down Button 2, press Reset, and continue to hold down Button 2 for at least three seconds.

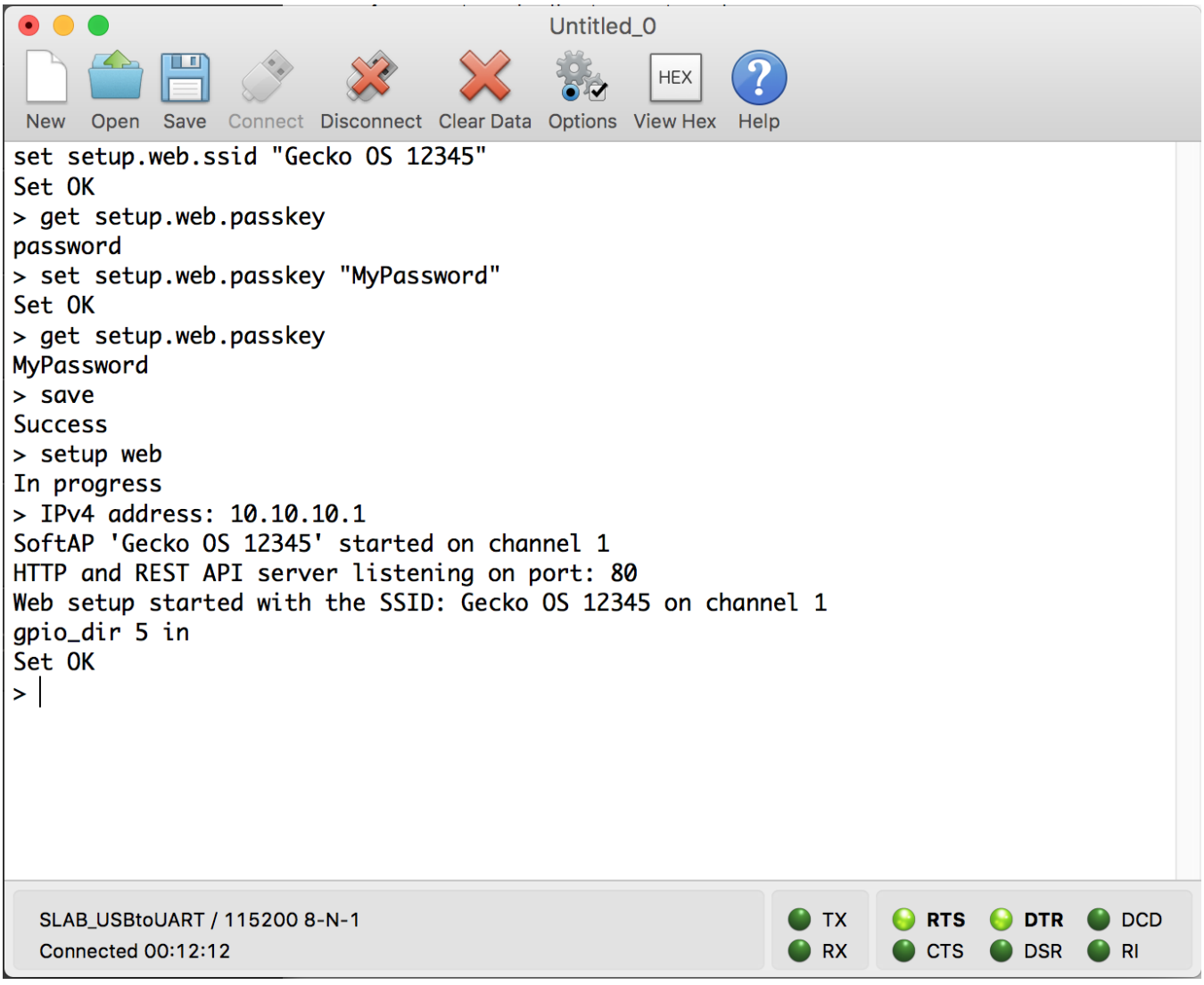



**Figure 4.2. setup web / set setup.web.ssid / save / get setup.web.passkey**

6. Configure GPIO 5 to be an input by executing the command 'gpio_dir 5 in'. Note that this is done to illustrate additional capability in step 9 of this QSG. This command is not typically required to configure your device.
7. Using your computer or phone, connect to the Gecko OS access point [**Gecko OS #**] using the password.

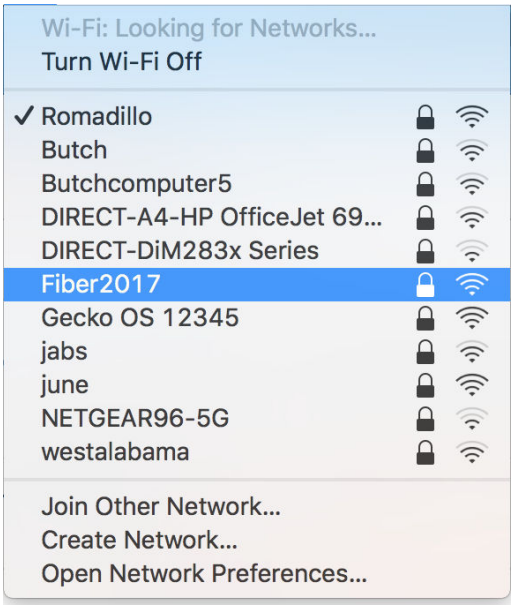



**Figure 4.3. Connecting to the Gecko OS Access Point**

8. Using a web browser, go to setup.com.
9. Click the [**GPIOs**] area on the left side of the browser.

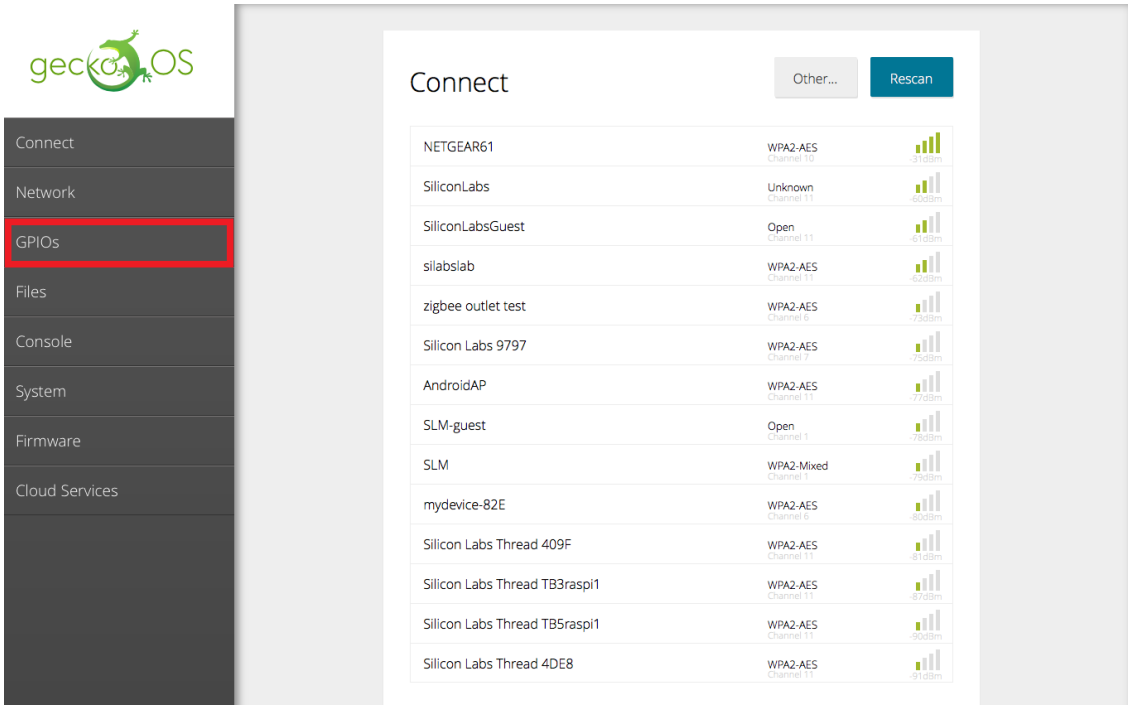



**Figure 4.4. Navigating to the Module's index.html**

10. Press and hold the [**BUTTON 2**] switch on the AMW007 board to change the GPIO toggle on the webpage. Note that the GPIO state is able to be read because that GPIO was configured as an input earlier in this tutorial.

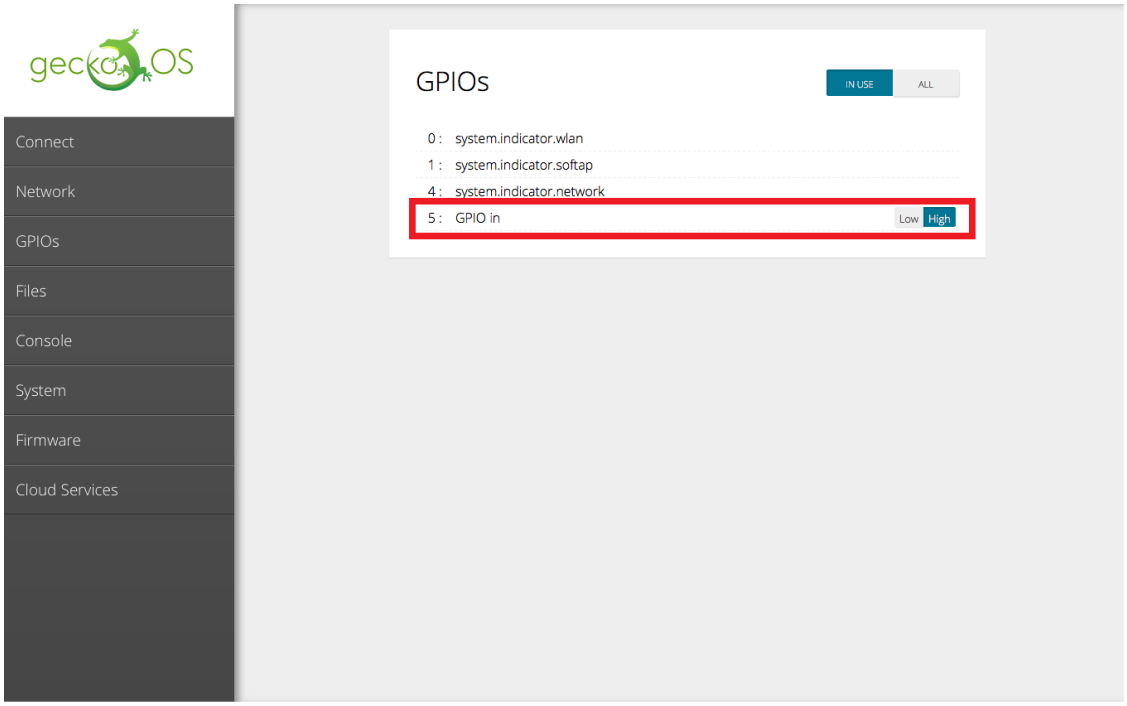



**Figure 4.5. Toggling the GPIO Using the Buttons**

Please see https://docs.silabs.com/ for a complete description of all commands and variables used in this tutorial.

### 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 AMW007 expansion board 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.

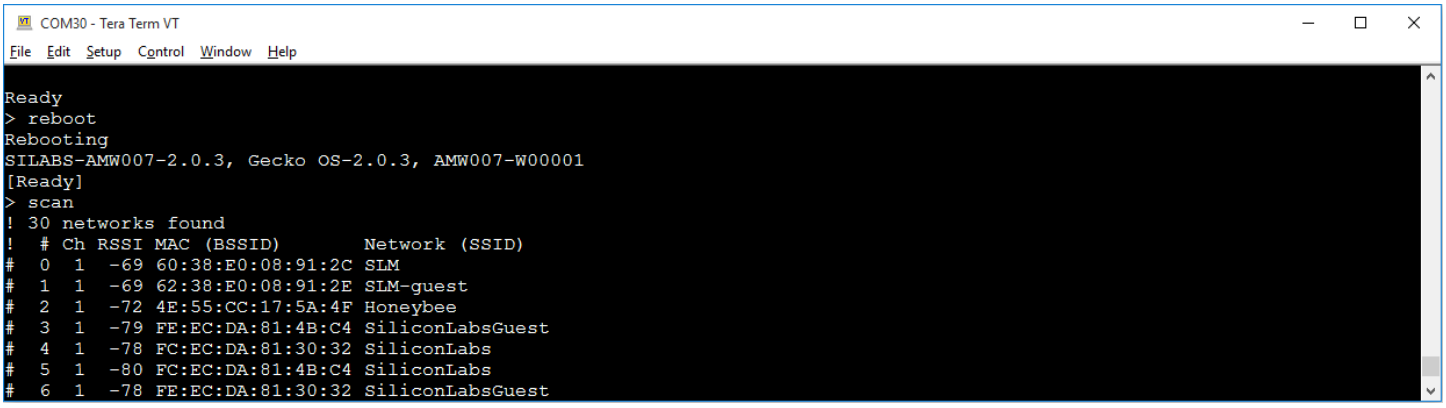



**Figure 4.6. scan**

Please see https://docs.silabs.com/ for a complete description of all commands and variables used in this tutorial.

### 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.

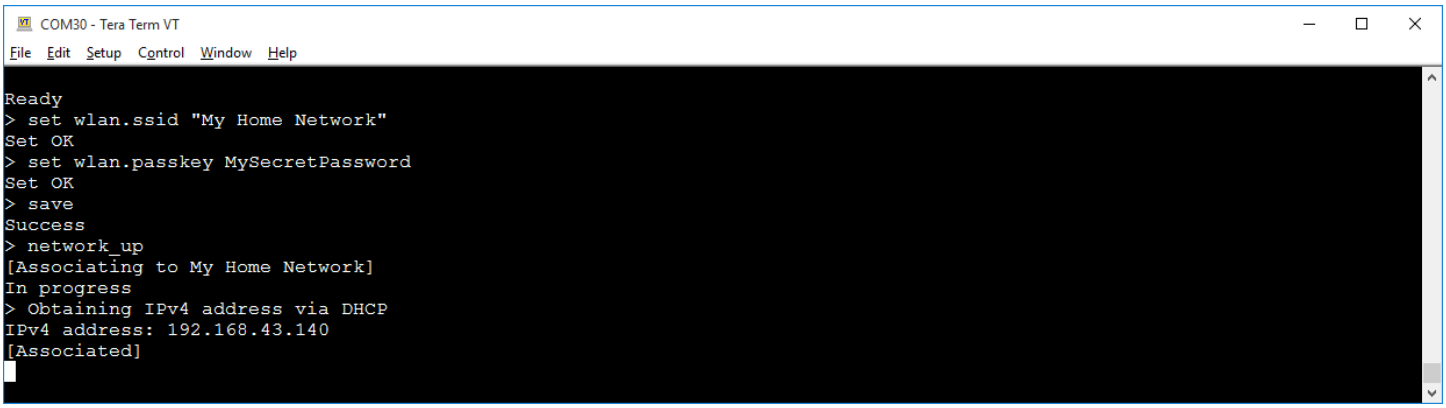



**Figure 4.7. set wlan.ssid / set wlan.passkey / save / network_up**

**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.

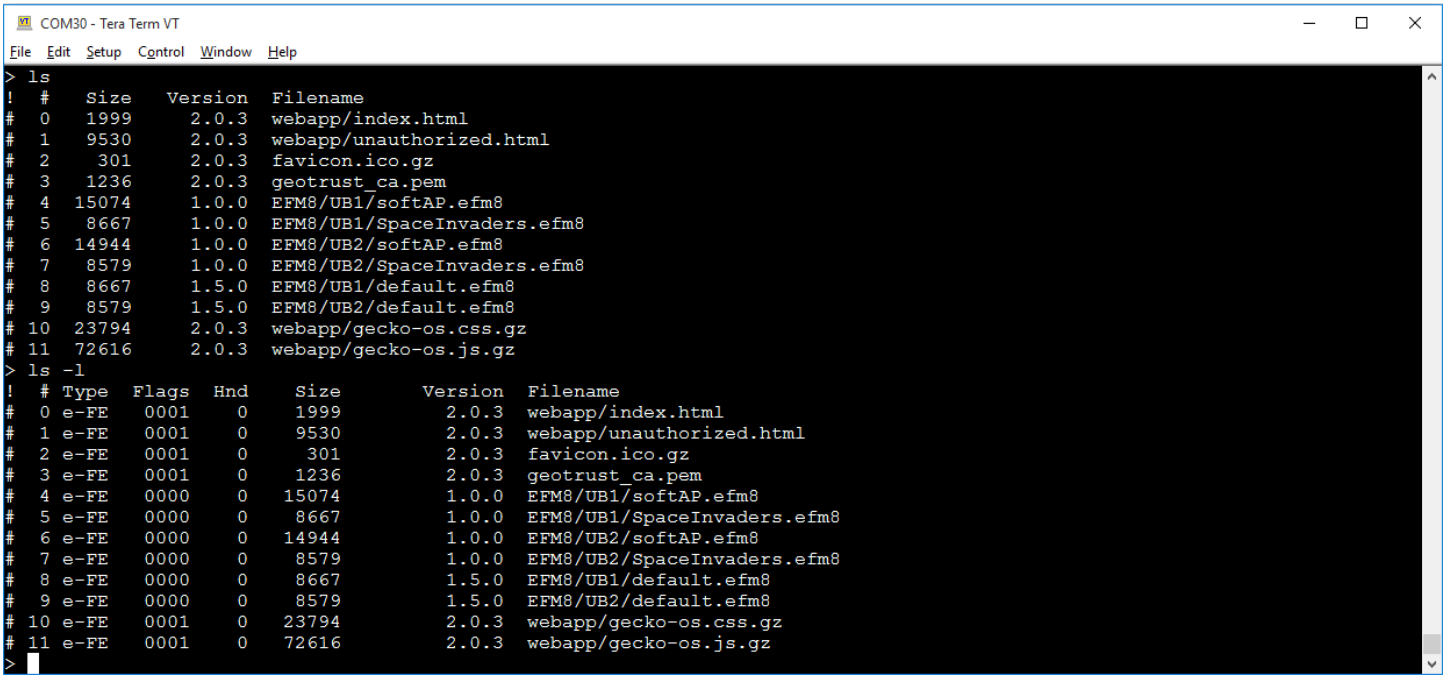



**Figure 4.8. ls / ls -l**

Please see https://docs.silabs.com/ for a complete description of all commands and variables used in this tutorial.

### Reading from a File

Data sources like files and network sockets 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/index.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.

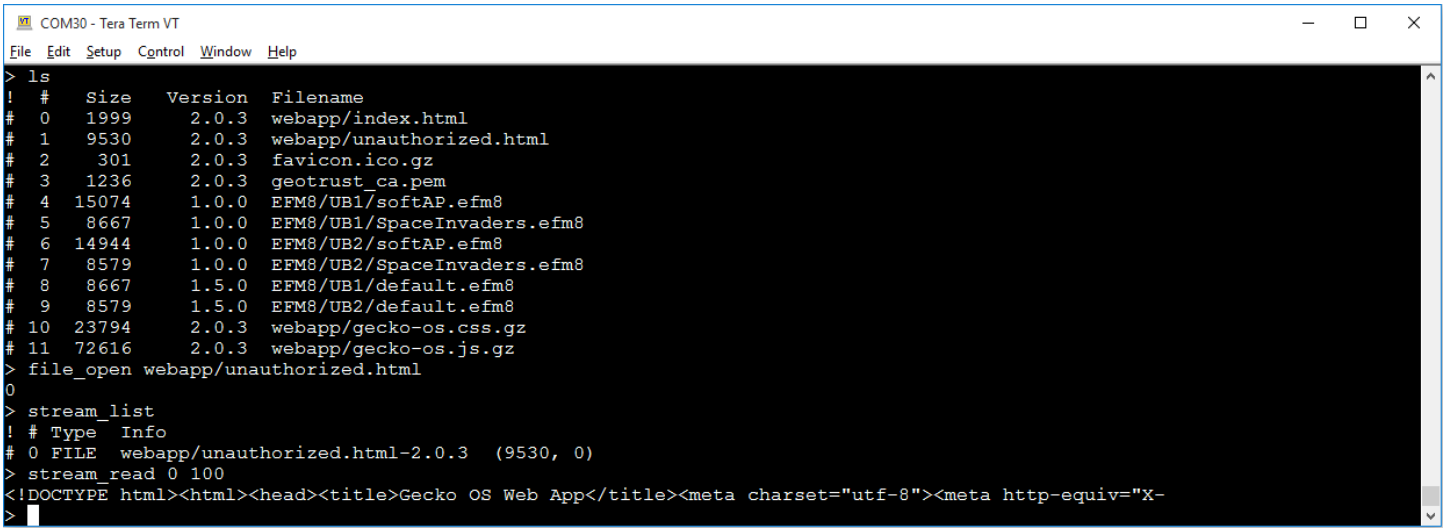



**Figure 4.9. ls / file_open / stream_list / stream_read**

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).

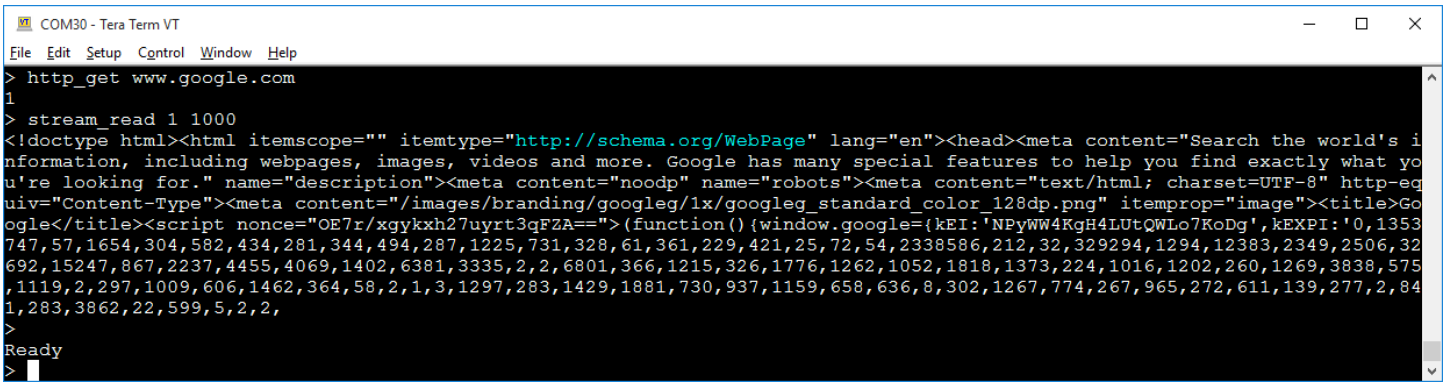



**Figure 4.10. http_get / stream_read**

Please see https://docs.silabs.com/ for a complete description of all commands and variables used in this tutorial.

### 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.

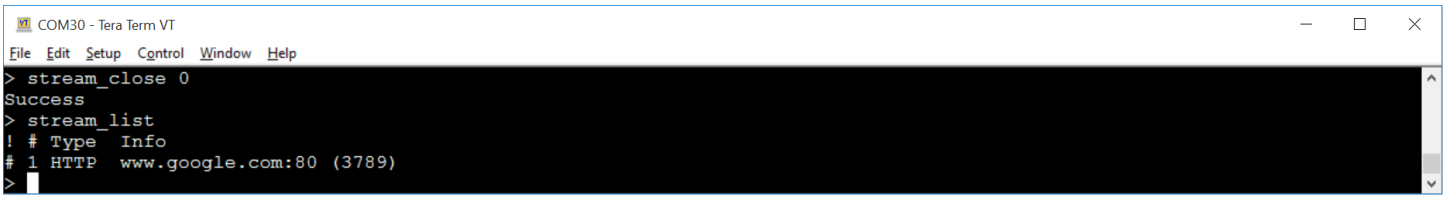



**Figure 4.11. stream_close / stream_list**

Please see https://docs.silabs.com/ for a complete description of all commands and variables used in this tutorial.

# 5. Peripherals

The starter kit has a set of peripherals that showcase some of the features of the AMW007 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 connections 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.

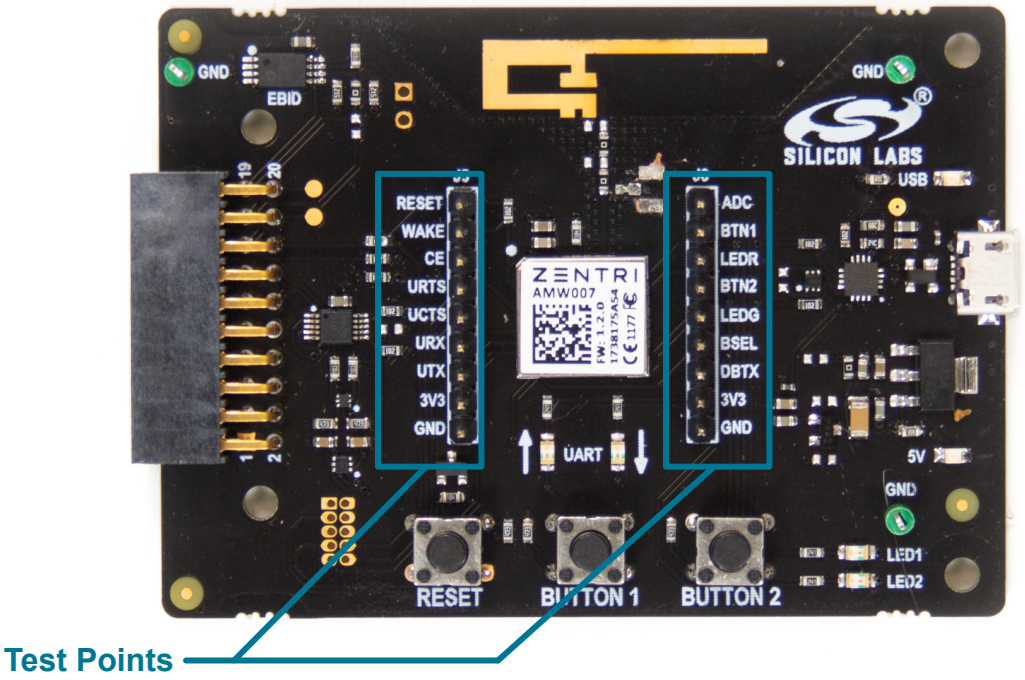
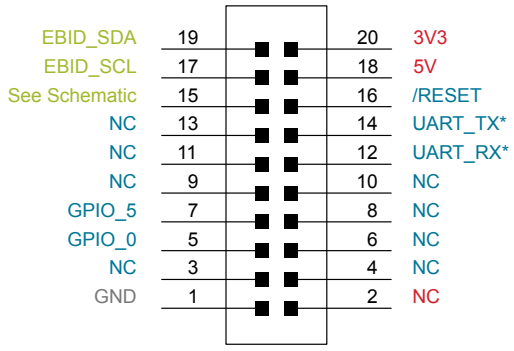



**Figure 6.1. Test Points**

## 6.2 Expansion Header

On the left hand side of the board is a female expansion header to connect to a Silicon Labs EFM8 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.




Top-side view, with connector on left side of the board

- AMW007 pin
- Power
- Ground
- Reserved (Board Identification)

* Only when CP2102N UART-to-USB bridge is unpowered

**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.

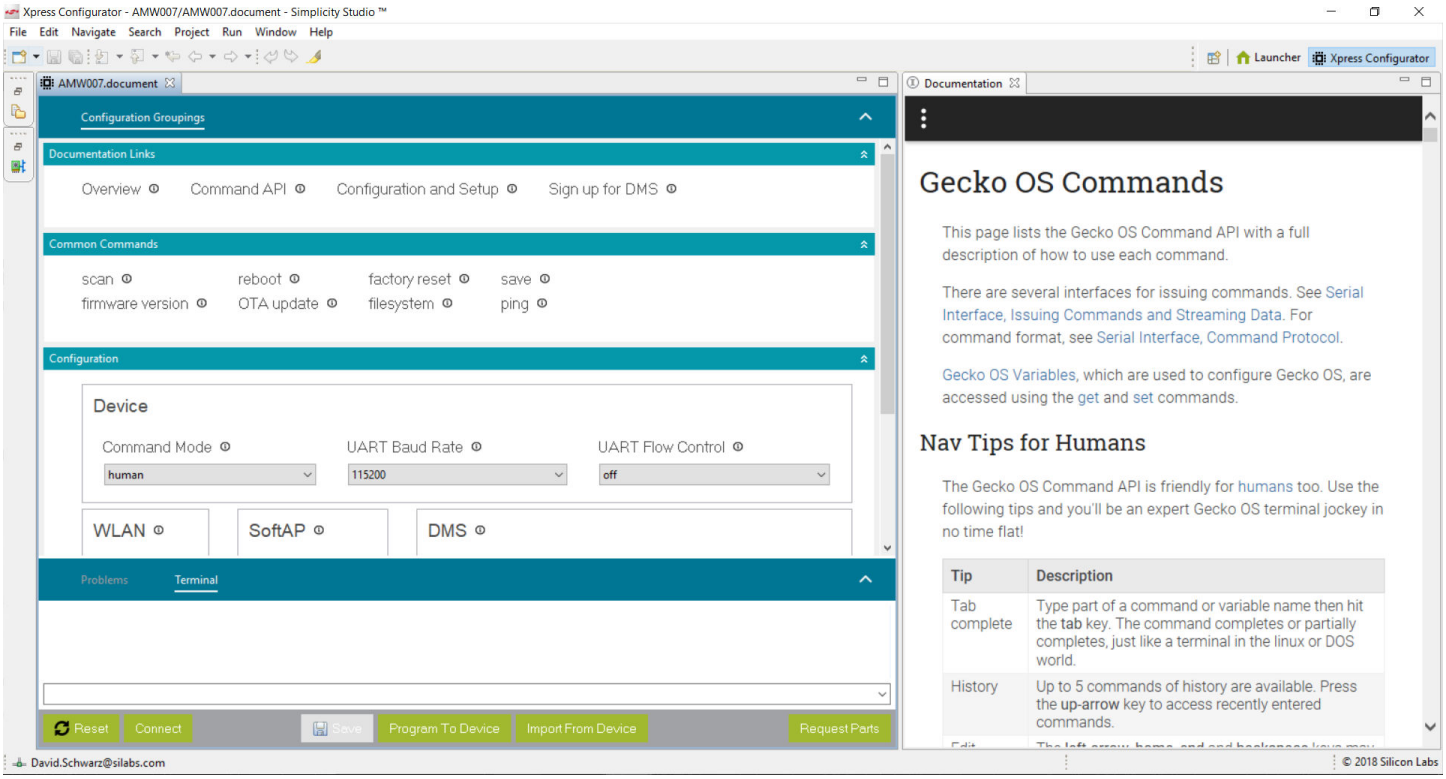
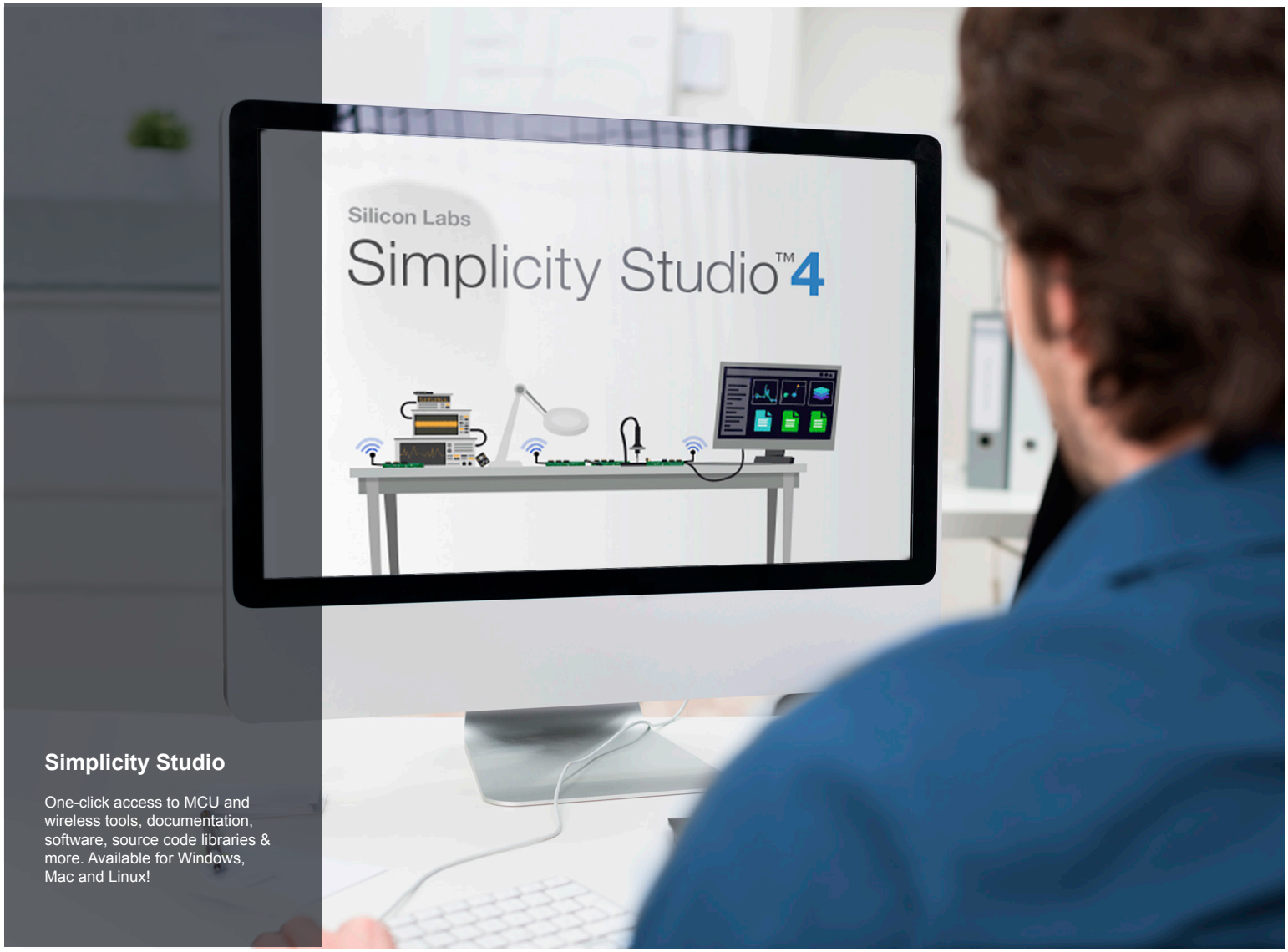



**Figure 7.1. Simplicity Studio Xpress Configurator**

# 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.




## 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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*www.silabs.com/IoT*

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