



AMW006-A02 Wi-Fi Shield Reference Guide



AMW006-A02
'Mantis'

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1 Introduction

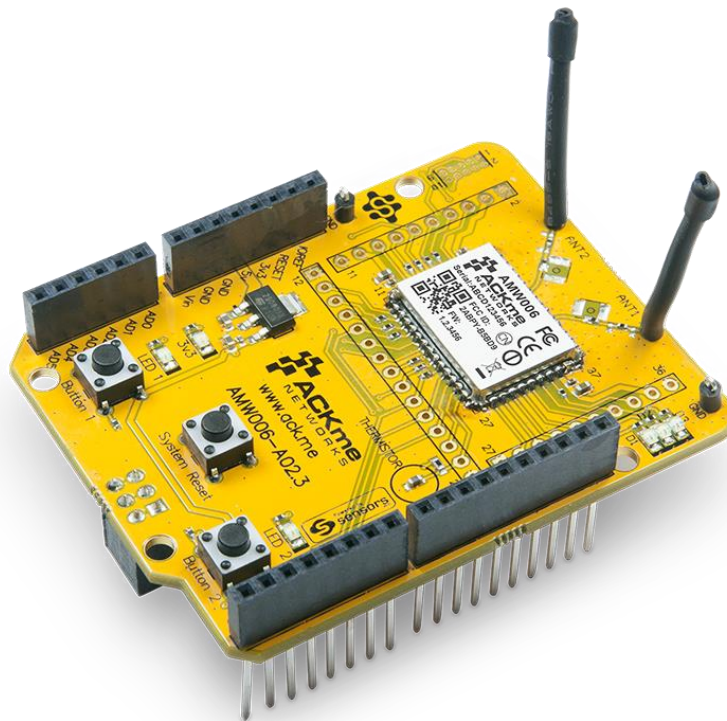
The AMW006 'Numbat' module is a fully certified small form factor, low power Wi-Fi networking module perfectly suited to deeply embedded applications requiring medium/high data throughput in medium to high volume.

The module runs WiConnect firmware, ACKme Networks easy-to-use and reliable serial Wi-Fi networking application that includes an embedded TCP/IP networking stack with SSL/TLS/HTTPS security together with an extensive array of features that vastly simplify development of connected devices.

Evaluation of WiConnect and the AMW006 module using the AMW006-A02 'Mantis' Wi-Fi shield, shown in Figure 1, is available with 3.3V tolerant Arduino compatible boards listed below.

- Arduino
- STM32 Nucleo

Figure 1. AMW006-A02 'Mantis' Evaluation Board



1.1 Platform Support

ACKme provides software to support each platform available to evaluate Mantis

Arduino

An Arduino library for use with WiConnect is currently under development.

Nucleo

ACKme provides an online open source WiConnect mbed™ library for use with the STM32 Nucleo and Mantis Wi-Fi shield. The mbed library together with the examples provided, makes it very easy to create connected applications.

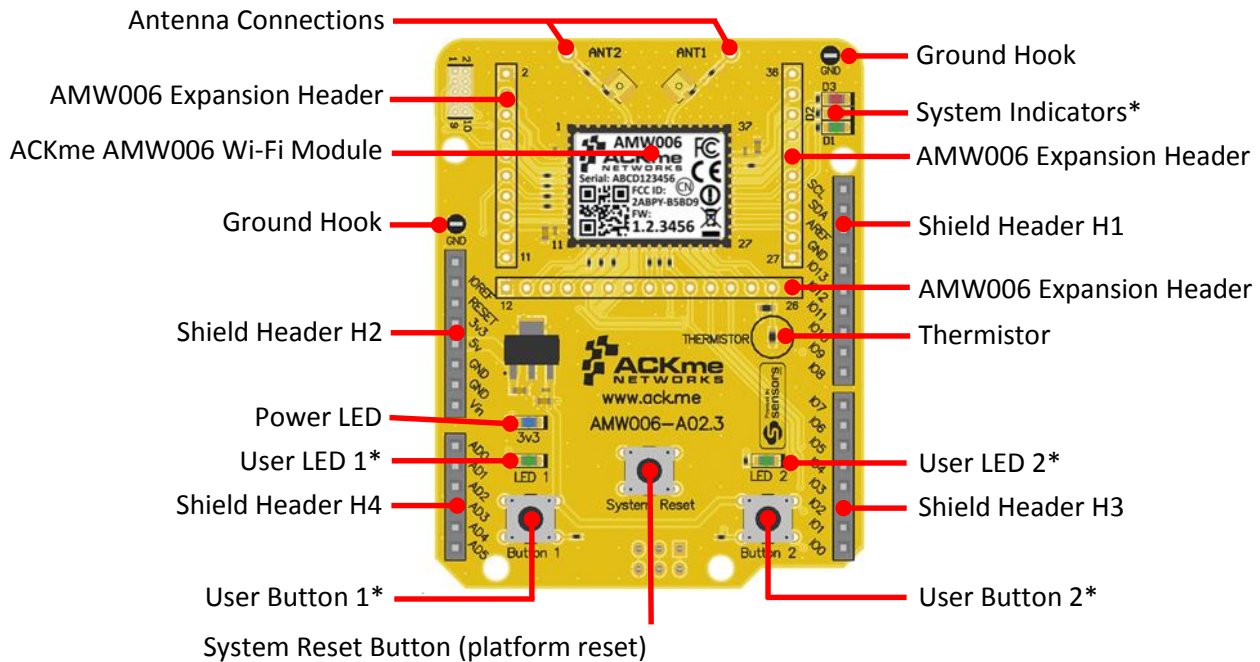
The WiConnect mbed library and examples are available on the mbed website at:

<http://developer.mbed.org/teams/ACKme/>

2 Feature Identification

The Mantis evaluation board, shown in Figure 2, comes complete with a surface mount AMW006 ‘Numbat’ module. Each pin on the module is connected to the expansion header (not populated), a number of module pins also connect to the Wi-Fi shield headers. Schematics for the board are provided in Appendix B.

Figure 2. AMW006-A02 Features – TOP VIEW



* User configurable

Figure 3. AMW006-A02 Features – BOTTOM VIEW

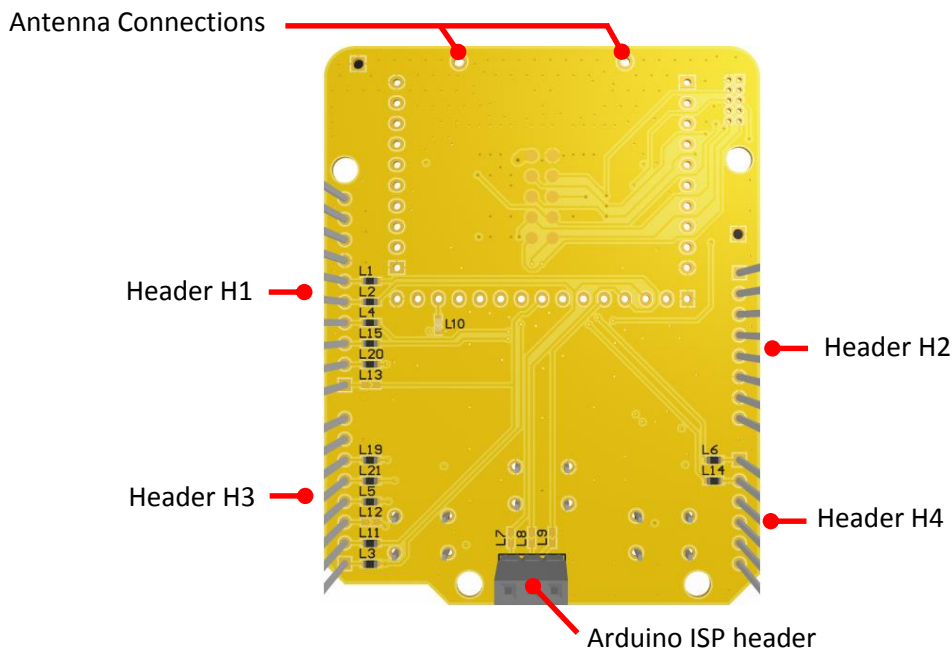
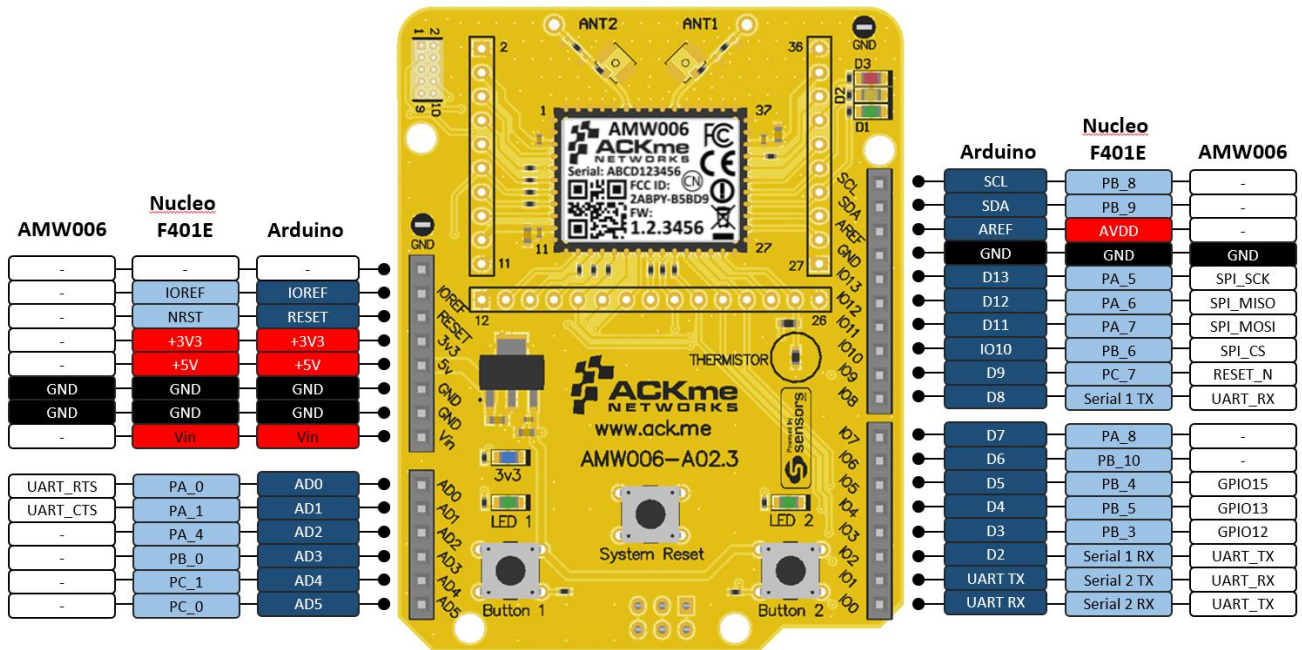


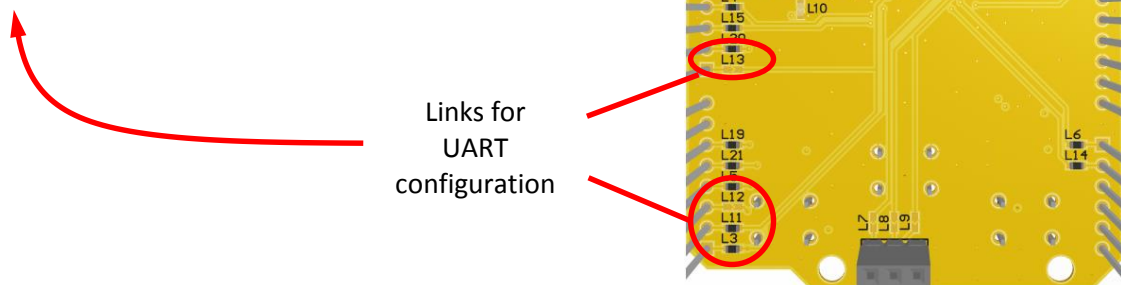
Figure 4. AMW006-A02 Shield Connections for Arduino & Nucleo



Shield connections for the Mantis board are shown in Figure 4. The UART used for communications between Mantis and Arduino is typically different to the UART used between Mantis and STM32 Nucleo. The Nucleo uses Serial 1 because Serial 2 is already configured for UART debugging via ST-Link on the Nucleo board. Figure 5 shows selection options, further details for Arduino are provided in Section 4 and for Nucleo, see Section 5.

Figure 5. AMW006-A02 UART Link Selection for Arduino & Nucleo

Mantis Link	Mantis IO	Arduino	Nucleo
L13	IO 8	✗	✓
L12	IO 2	✗	✓
L11	IO 1	✓	✗
L3	IO 0	✓	✗



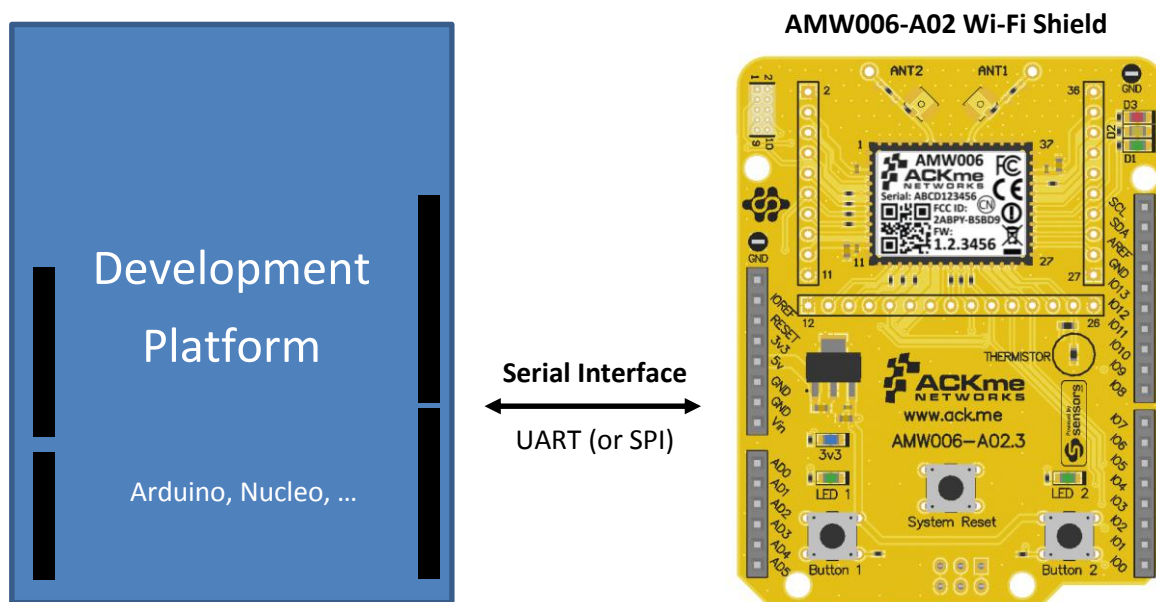
3 Getting Started

Referring to Figure 6, there are two important decisions you need to make in order to get started with your shiny new Mantis board.

Firstly, you need to choose which serial interface to use to communicate with Mantis. At the current time, WiConnect does not support SPI (but it will soon!), so we've made the first decision for you – you will be using a UART serial interface.

Secondly, you'll need to decide which development platform Mantis will be plugged into. Due to slightly different pin configurations for each platform, it may be necessary to change a couple of links on the Mantis board to correctly connect the development platform UART with the Mantis (AMW006) UART.

Figure 6. Serial communication with Mantis



NOTE! It may be necessary to configure links on the underside of the board

3.1 Platform Overview

To help you choose a platform that suits your needs, we have provided a summary of the various options available.

Arduino

A software library for the Arduino platform is coming soon.

STM32 Nucleo

The STM32 Nucleo platform, described in Section 4, provides a seamless development path using the WiConnect mbed library provided as full source on the mbed website at <http://developer.mbed.org/teams/ACKme>

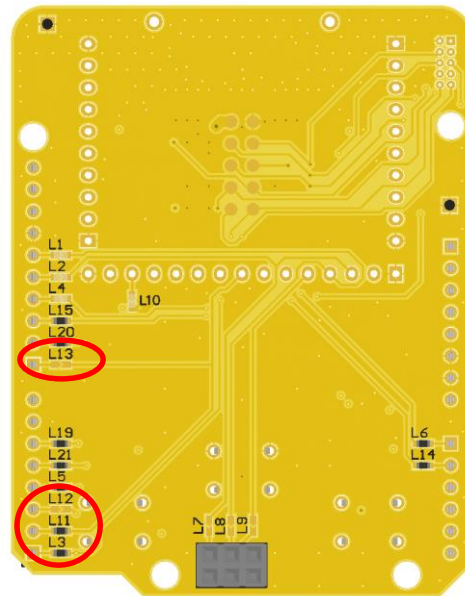
4 Using Mantis with Arduino



The Mantis board is designed to work seamlessly with the Arduino development board. Before plugging Mantis into the Arduino, it is necessary to check that the correct UART is configured on the Mantis board for use with Arduino.

Figure 7. AMW006-A02 Configured for use with Arduino – BOTTOM VIEW

Mantis Link	Add link?
L13	✘
L12	✘
L11	✔
L3	✔



4.1 Using the Arduino Library

An Arduino library for WiConnect is currently under development.

Information about the WiConnect Arduino library is available online at <http://wiconnect.ack.me/arduino>.

Information about the WiConnect API and serial command interface is available at <http://wiconnect.ack.me>.

4.2 Arduino References

- Arduino website:
<http://arduino.cc/>

5 Using Mantis with Nucleo

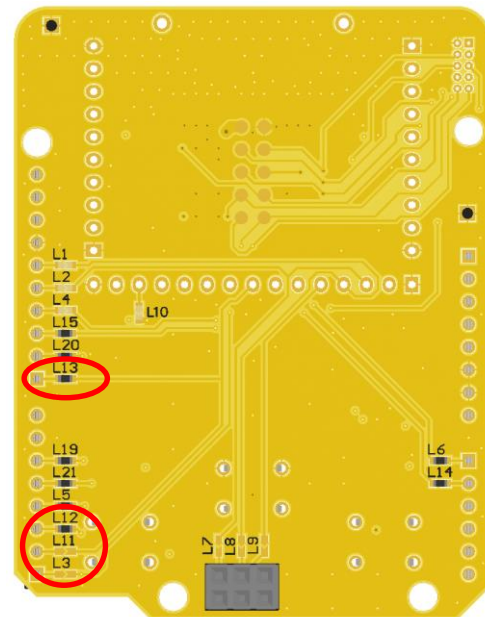


The Mantis board is designed to work seamlessly with an STM32F401 Nucleo development board. Before plugging the Mantis board into the Nucleo, it is necessary to check that the correct UART is configured on the Mantis board.

Figure 8 shows the resistor selection required to use the Nucleo Serial 1 UART (not the Serial 2 UART used with the ST-Link programming interface).

Figure 8. AMW006-A02 configured for use with STM32 Nucleo – BOTTOM VIEW

Mantis Link	Serial	Add link?
L13	1	✓
L12	1	✓
L11	2	✗
L3	2	✗



5.1 Using the WiConnect mbed™ Library

ACKme provides a WiConnect library for the STM32 Nucleo that runs on the STM32 MCU and controls WiConnect running on the Numbat Wi-Fi module. The library is a programming API for the WiConnect serial command set.

Information about the WiConnect mbed library is available on the WiConnect wiki at <http://wiconnect.ack.me/mbed>.

Information about the WiConnect API and serial command interface is available at <http://wiconnect.ack.me>.

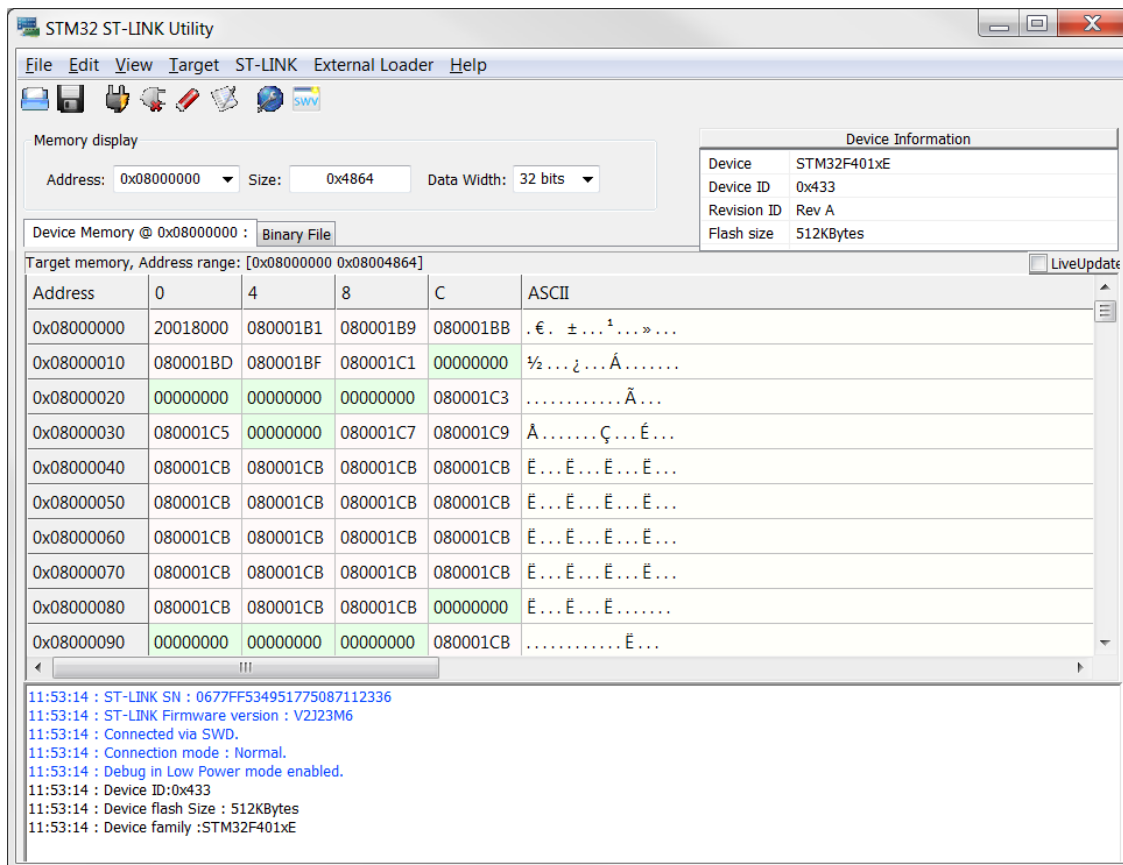
5.1.1 Verifying Operation and Programming of the Nucleo Board

The procedures in this section verify that key features of the Nucleo board work, and that you can successfully program the board. For this section the AMW006-A02 (Mantis) Wi-Fi shield should NOT be installed on the Nucleo board.

Set up the Nucleo (standalone, without Mantis)

These instructions are for a standalone STM32F401 Nucleo on Windows. The instructions may vary slightly for other Nucleo boards and other operating systems.

- Plug in the Nucleo USB cable to supply power and a serial connection, and verify the ST-Link (programming interface) drivers are loaded. Drivers are available here: <https://developer.mbed.org/teams/st/wiki/ST-Link-Driver>
- Download, install and run the ST-Link software that enables programming of the Nucleo: <http://www.st.com/web/en/catalog/tools/PF258168>
- Connect to the Nucleo board by selecting **Target** → **Connect**. If the ST-Link utility displays an error, check the installation and operation of the drivers, and the USB connection between the Nucleo board and your computer. After successful connection, the ST-Link display looks similar to this:



Connect a Terminal Emulator to the Nucleo board

Open a terminal emulator, such as TeraTerm, and create a serial connection to the Nucleo board with the following serial and terminal settings:

- Serial:
 - Baud: 115200
 - Data: 8 bit
 - Parity: none
 - Stop: 1 bit
 - Flow control: none
- Terminal type:
 - VT100



Note! The terminal does not display any messages or respond to character entry until the board is programmed.

Set up an mbed account

The mbed site provides a compiler for ARM processors, including the ARM in the STM32 on your Nucleo board. It also offers access to the WiConnect mbed™ library, ACKme demo apps, and a large community of programmers sharing programs and information. With an mbed account you can use the compiler, store your code in online repositories, and share code with others.

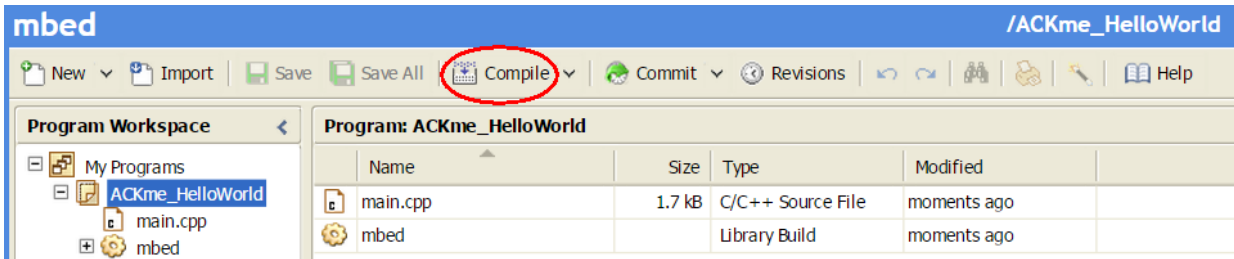
- Go to <http://developer.mbed.org>
- Create an account, following the instructions on-site.

Compile the ACKme_HelloWorld app

The ACKme_HelloWorld app verifies the operation of key features of the Nucleo board, without the ACKme shield installed. It blinks the Nucleo board user LED, and increases the blink rate when you press the User button. It prints to a serial terminal connected to the USB port, and echoes characters entered at the terminal.

- Go the mbed platforms page (<https://developer.mbed.org/platforms>) and add the Nucleo platform to your compiler.
 - For example, in the case of the Nucleo F401RE board, go to page: <https://developer.mbed.org/platforms/ST-Nucleo-F401RE/>
 - Click the **Add to your mbed Compiler** button
- Click on **Compiler**, in the top right hand corner of the mbed home or platforms page, to open the mbed online compiler in your browser.
- Click on **Import**. The Import Wizard appears. Select the Programs tab. In the Search box enter 'ACKme_HelloWorld'. In the search results, double click the app, or select it and click Import, to import it into your Program Workspace.

- Click **Compile**. The app compiles, reporting any errors and warnings. When the compile is completed successfully, your browser automatically downloads the resulting bin file.

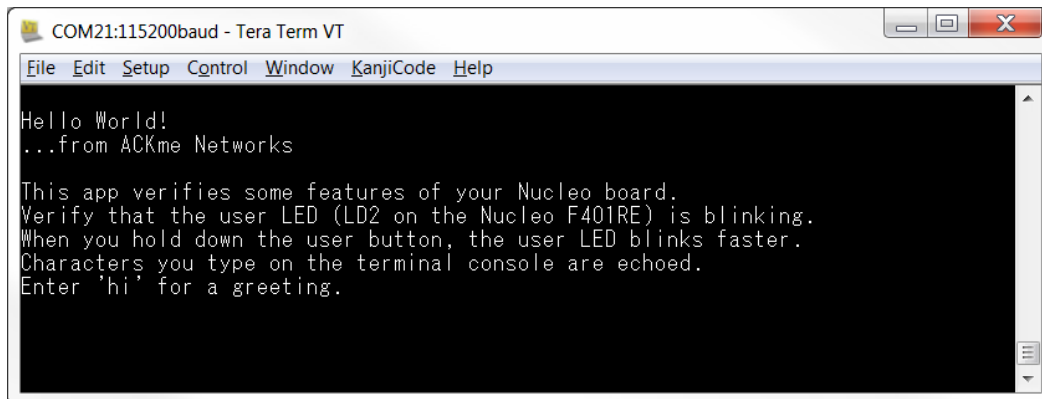


Program the Nucleo board with the compiled binary file

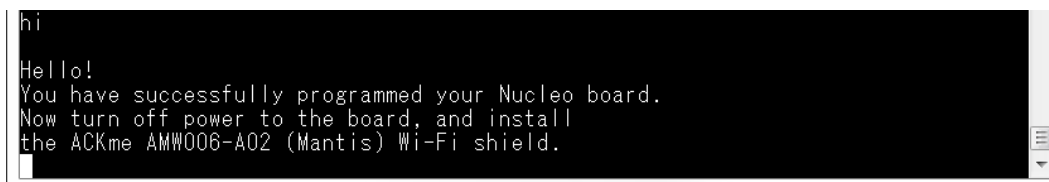
- Drag and drop the downloaded bin file onto the ST-Link GUI (or use the **File** → **Open** menu)
- On the GUI, press Ctrl+P to program the board (or use the equivalent menu option or icons)

Verify operation of the app

- Once the download completes, switch to the terminal window. You may have to press the reset button on the Nucleo board to restart the Hello World app.
- The terminal outputs text like this:



- Type 'hi' followed by Enter to see the following terminal output:



5.1.2 Installing the AMW006-A02 Mantis and Verifying Wi-Fi Operation

The procedures in this section verify that the AMW006-A02 (Mantis) Wi-Fi shield is operating correctly. The **wiconnect-web_setup_example** provides a simple, quick way to save the SSID and password of your local wireless network on the Mantis. If you can successfully run the web setup using the Mantis soft Access Point, and then join your local network, Wi-Fi is working.

Install the AMW006-A02 Mantis shield

Plug the Mantis shield into the Nucleo board.

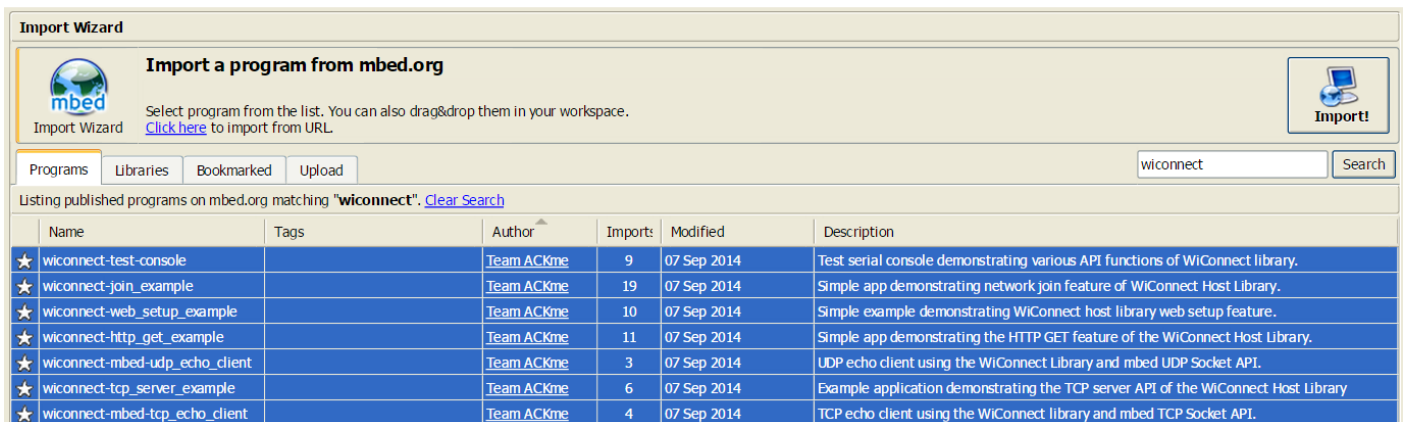
Note! The System Reset button on the Mantis shield is wired to the Nucleo reset button, so you can use it to reset the Nucleo board.



Import the WiConnect Example Apps

In the mbed site online compiler:

- Click on **Import**
- In the Import Wizard dialog, select the **Programs** tab
- Enter 'wiconnect' into the search box
- Click on author to order results alphabetically by author
- Highlight all wiconnect-* examples (shift-click to select all)
- Click the **Import** icon in the top right hand corner and wait for all files to import into your online compiler Program Workspace.



The screenshot shows the 'Import Wizard' interface on the mbed website. The title is 'Import a program from mbed.org'. Below the title, there is a search bar containing the text 'wiconnect' and a 'Search' button. The search results are displayed in a table with columns: Name, Tags, Author, Imports, Modified, and Description. The results list several programs, all authored by 'Team ACKme', including 'wiconnect-test-console', 'wiconnect-join_example', 'wiconnect-web_setup_example', 'wiconnect-http_get_example', 'wiconnect-mbed-udp_echo_client', 'wiconnect-tcp_server_example', and 'wiconnect-mbed-tcp_echo_client'.

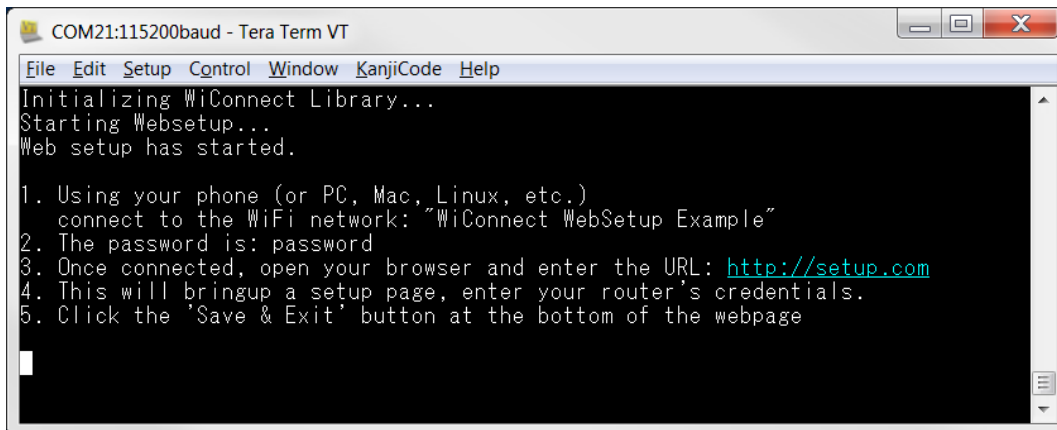
Name	Tags	Author	Imports	Modified	Description
★ wiconnect-test-console		Team ACKme	9	07 Sep 2014	Test serial console demonstrating various API functions of WiConnect library.
★ wiconnect-join_example		Team ACKme	19	07 Sep 2014	Simple app demonstrating network join feature of WiConnect Host Library.
★ wiconnect-web_setup_example		Team ACKme	10	07 Sep 2014	Simple example demonstrating WiConnect host library web setup feature.
★ wiconnect-http_get_example		Team ACKme	11	07 Sep 2014	Simple app demonstrating the HTTP GET feature of the WiConnect Host Library.
★ wiconnect-mbed-udp_echo_client		Team ACKme	3	07 Sep 2014	UDP echo client using the WiConnect Library and mbed UDP Socket API.
★ wiconnect-tcp_server_example		Team ACKme	6	07 Sep 2014	Example application demonstrating the TCP server API of the WiConnect Host Library
★ wiconnect-mbed-tcp_echo_client		Team ACKme	4	07 Sep 2014	TCP echo client using the WiConnect library and mbed TCP Socket API.

Compile the wiconnect-web_setup example

- Select the root of the **wiconnect-web_setup_example**
- Click **Compile** and wait for the bin file to be created and downloaded
- Follow the instructions above in the procedure step **Program the Nucleo board with the compiled binary file**

Run Web Setup

- **Note:** A terminal connection to the Nucleo board is not required to use the WiConnect Web Setup app. The app runs an Access Point and web server on the Mantis board.
- If you open a terminal connection to the Nucleo board, as described above in **Connect a Terminal Emulator to the Nucleo board**, the terminal display is similar to the following.

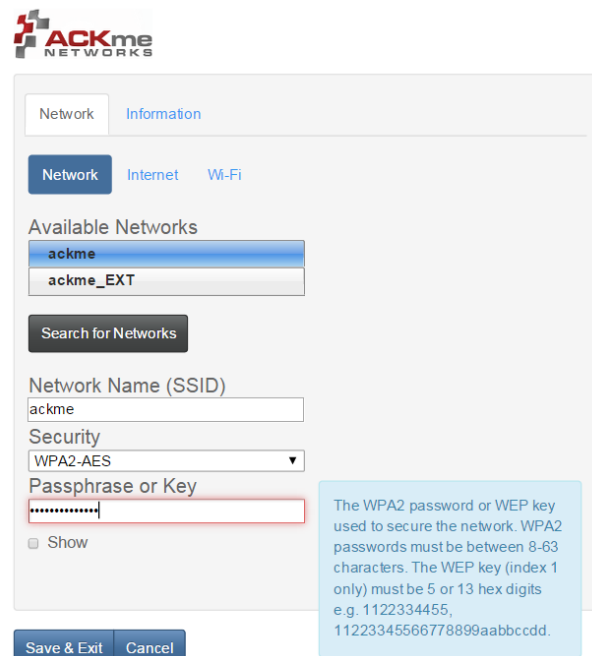
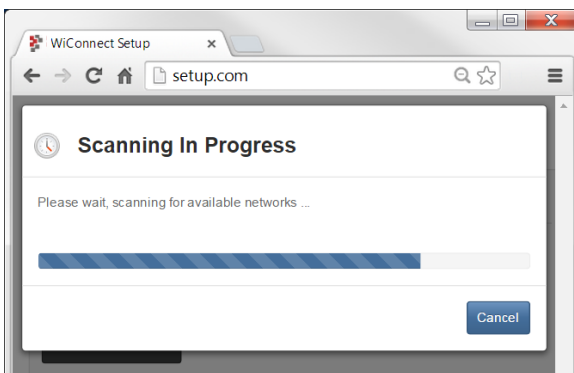


```

COM21:115200baud - Tera Term VT
File Edit Setup Control Window KanjiCode Help
Initializing WiConnect Library...
Starting Websetup...
Web setup has started.

1. Using your phone (or PC, Mac, Linux, etc.)
   connect to the WiFi network: "WiConnect WebSetup Example"
2. The password is: password
3. Once connected, open your browser and enter the URL: http://setup.com
4. This will bringup a setup page, enter your router's credentials.
5. Click the 'Save & Exit' button at the bottom of the webpage
  
```

- A red flashing LED on the Mantis indicates the softAP is running.
- Connect your computer or phone to the Wi-Fi network “WiConnect WebSetup Example”. Enter the password “password”.
- Open a web browser and navigate to **setup.com**. The setup web server page displays a scan dialog, then setup page as shown:



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- **Note:** for security reasons, the soft AP and web server time out after a few minutes. Press the Mantis System Reset button to bring them back up, then reconnect to the network and open setup.com again.
- A scan populates the list of Available Networks. To scan again, click **Search for Networks**.
- In the Available Networks list, click the network you wish to join, then enter the Passphrase or Key.
- Click **Save & Exit** to save the network SSID and passphrase to the Mantis flash memory.
- The module now automatically joins the chosen network whenever you issue a command that requires network access.

5.1.3 Using the WiConnect Example Apps

Before using any of the WiConnect Example Apps, verify success with the procedures outlined above.

Follow the procedure described in **Import the wiconnect example apps** above to import WiConnect example applications into your mbed Program Workspace. For each example, examine the code, compile the app and program the Nucleo as desired. The available apps are described in the following table.

WiConnect Example App	Description	Notes
wiconnect-http_get_example	Simple app demonstrating the HTTP GET feature of the WiConnect Host Library	Requires connection to the internet, e.g. prior web setup. Issues an http get request for the ack.me home page and displays the html on the terminal. Requirements: terminal, Internet Access
wiconnect-join_example	Simple app demonstrating the network join feature of WiConnect Host Library	You can modify this example to use the network SSID and password of your local wireless network. Requirements: terminal, local network
wiconnect-mbed-tcp_echo_client	TCP echo client using the WiConnect library and mbed TCP Socket API	Edit the following defines in main.cpp: <pre>#define NETWORK_SSID "?" #define NETWORK_PASSWORD "?" #define ECHO_SERVER_ADDRESS "?" #define ECHO_SERVER_PORT ?</pre> Run the supplied python script <code>tcp_echo_server.py</code> on a host accessible from the network specified. Modify the script if necessary to match the port specified. Requirements: terminal, local network access, host with python running TCP server python script

<p>wiconnect-mbed-udp_echo_client</p>	<p>UDP echo client using the WiConnect Library and mbed UDP Socket API</p>	<p>Edit the following defines in main.cpp: <pre>#define NETWORK_SSID "?" #define NETWORK_PASSWORD "?" #define ECHO_SERVER_ADDRESS "?" #define ECHO_SERVER_PORT ?</pre> <p>Run the supplied python script <code>tcp_echo_server.py</code> on a host accessible from the network specified. Modify the script if necessary to match the port specified.</p> <p>Requirements: terminal, local network, host with python running TCP server python script.</p> </p>
<p>wiconnect-tcp_server_example</p>	<p>Example application demonstrating the TCP server API of the WiConnect Host Library</p>	<p>Edit the following defines in example.cpp: <pre>#define TCP_SERVER_PORT ? #define TCP_SERVER_MAX_CLIENTS ? #define NETWORK_SSID "?" #define NETWORK_PASSWORD "?"</pre> <p>Run the supplied <code>tcp_client.py</code> script on a host accessible from the network specified. Edit the script <code>ECHO_SERVER_ADDRESS</code> and <code>ECHO_PORT</code> to match the port setting in <code>example.cpp</code> and the reported ip address of the Mantis module.</p> <p>Requirements: terminal, local network, host with python</p> </p>
<p>wiconnect-test-console</p>	<p>Test serial console demonstrating various API functions of WiConnect library.</p>	<p>Terminal displays: <pre>Initializing WiConnect... [INFO] WiConnect test app ready...</pre> <p>Enter help to see available commands. <pre>> help</pre> <p>Requirements: terminal</p> </p></p>
<p>wiconnect-web_setup_example</p>	<p>Simple example demonstrating WiConnect host library web setup feature.</p>	<p>Described above.</p>


5.1.4 STM32 Nucleo References

- STM32 Nucleo Page on mbed:
<http://developer.mbed.org/platforms/ST-Nucleo-F401RE/>
- Nucleo User Manual:
http://www.st.com/web/en/resource/technical/document/user_manual/DM00105823.pdf
- Nucleo Software Tools Manual:
http://www.st.com/st-web-ui/static/active/en/resource/technical/document/user_manual/DM00105928.pdf

6 Ordering Information

Table 4 provides ordering information for AMW006 evaluation boards.

Table 1. Ordering Information

Part Number	Picture	Description
AMW006-A02		Wi-Fi Shield with onboard ACKme AMW006 'Numbat' module

7 Revision History & Glossary

7.1 Revision History

Table 2: Document Revision History

Revision	Date	Change Description
ARG-MW006-A01-100R	2014-10-20	Initial version

7.2 Glossary

In most cases, acronyms and abbreviations are defined on first use. A comprehensive list of acronyms and other terms used in ACKme Networks documents are provided on the ACKme Networks website at <http://ack.me/FAQs/Glossary>.

APPENDIX A – Configuring a Terminal Application

The following instructions describe how to obtain and install a serial terminal application for use on computers running a Windows® or OS X operations system. ACKme recommends using PuTTY for Windows® systems and CoolTerm for OS X systems, however other equivalent applications may work equally well. The instructions refer specifically to the Nucleo platform, setup for other platforms will vary.

Plug the evaluation board into the computer using a USB cable before continuing.

Verify USB-Serial Driver Installation

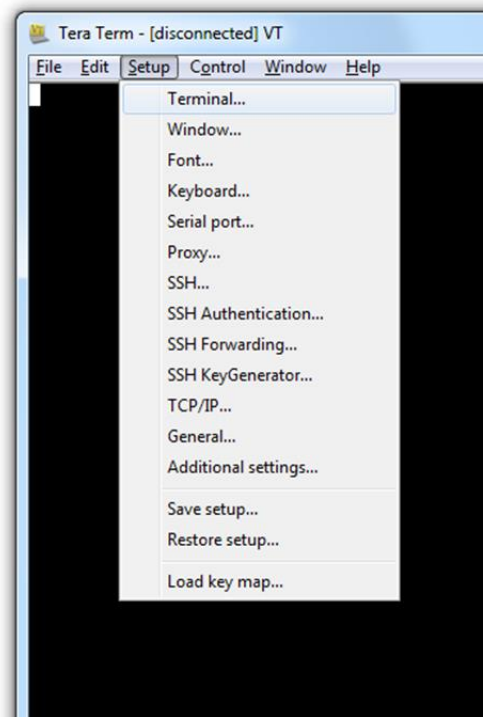
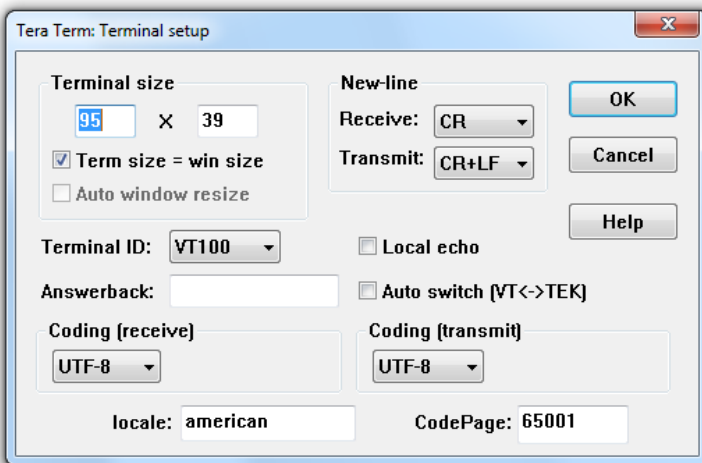
The Nucleo USB ST-Link drivers are available here:

<https://developer.mbed.org/teams/st/wiki/ST-Link-Driver>

Set Up Tera Term for Windows®

Tera Term is available as a free download from <http://ttssh2.sourceforge.jp> and from the resources section of the [ACKme website](#). Download and install Tera Term now if you have not already done so. The following procedure describes how to establish a UART serial connection between Tera Term and the evaluation board.

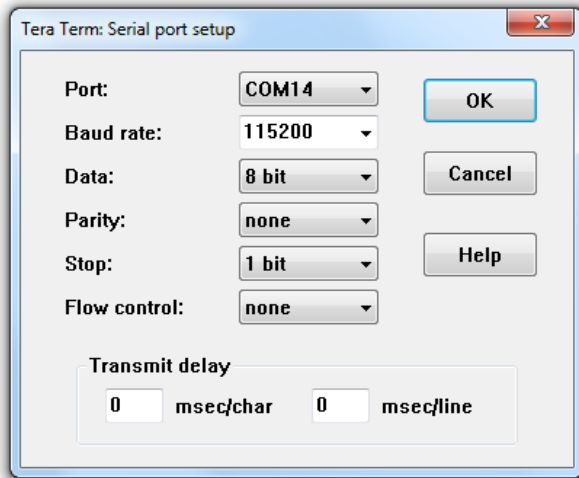
1. Start the Tera Term application and click on the **Setup** tab. A dropdown appears providing options to configure Tera Term as shown in the screen capture on the right. Select **Terminal**.
2. Terminal Setup. In the **New-line** section of the **Setup Terminal** dialog box (see the screen capture below), ensure that:



- **Receive:** is set to **CR**
- **Transmit:** is set to **CR+LF**

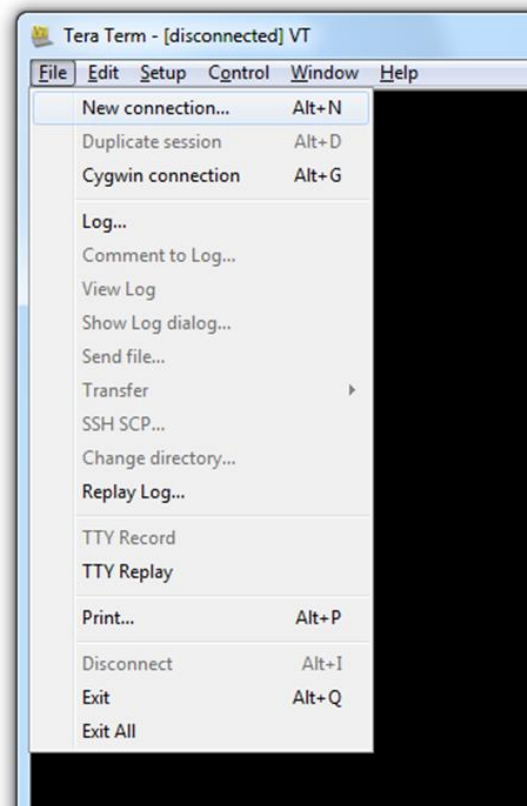
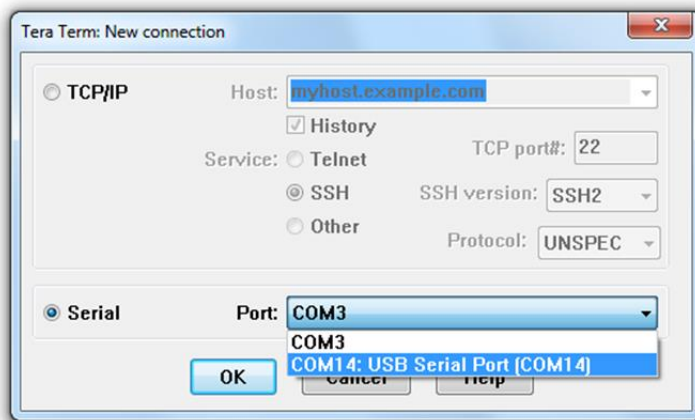
Close the **Terminal Setup** dialog box by selecting **OK**.

3. Serial Port Setup. Select the **Setup** tab again from the main window, then select **Serial port**. A **Setup serial port** dialog box appears. Ensure the settings in the dialog box match the settings shown in the following screen capture. The **COM Port** shown in the example (COM14) will almost certainly be different for your evaluation board, be sure to choose the COM port that matches your board.



When the serial port has been correctly setup, close the **Serial port** setup dialog box by selecting **OK**.

4. **New Connection.** From the Tera Term application menu, setup a new connection with the evaluation board by selecting **File | New connection** (or by pressing **Alt + N**) as shown in the screen capture on the right. A New connection dialog box appears as shown in the following screen capture. Check the **Serial** radio button, then click the **Port:** dropdown menu and select the COM port that matches your evaluation board. The COM port description for the evaluation board includes the text **COMxx: USB Serial Port (COMxx)**.



Once the correct COM port has been selected, close the **New connection** dialog box by selecting **OK**.

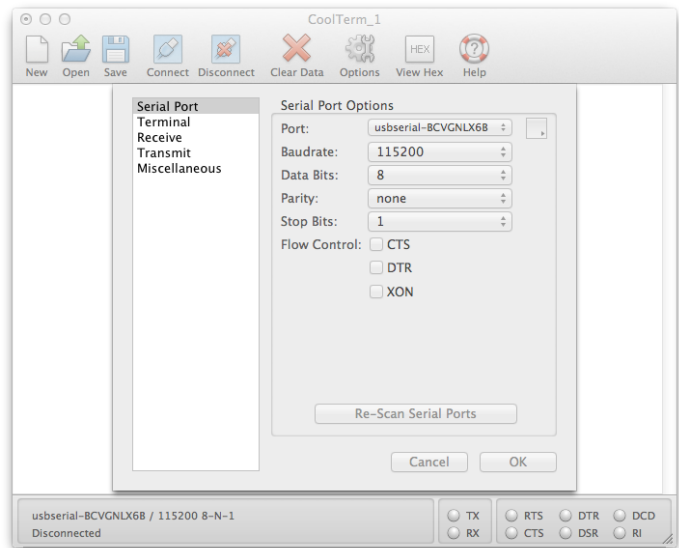
5. **Testing the connection.** If Tera Term was able to connect successfully, the text in the application title bar indicates which COM port is connected, and the baud rate of the connection. For the example documented above, Tera Term displays 'COM14:115200baud'. The Tera Term screen remains blank unless the Nucleo is programmed to send characters to the terminal.

Set Up CoolTerm for OS X

CoolTerm is available as a free download from <http://freeware.the-meiers.org/CoolTermMac.zip>. Download and install CoolTerm now if you have not already done so.

The following procedure describes how to establish a UART serial interface between CoolTerm and the evaluation board.

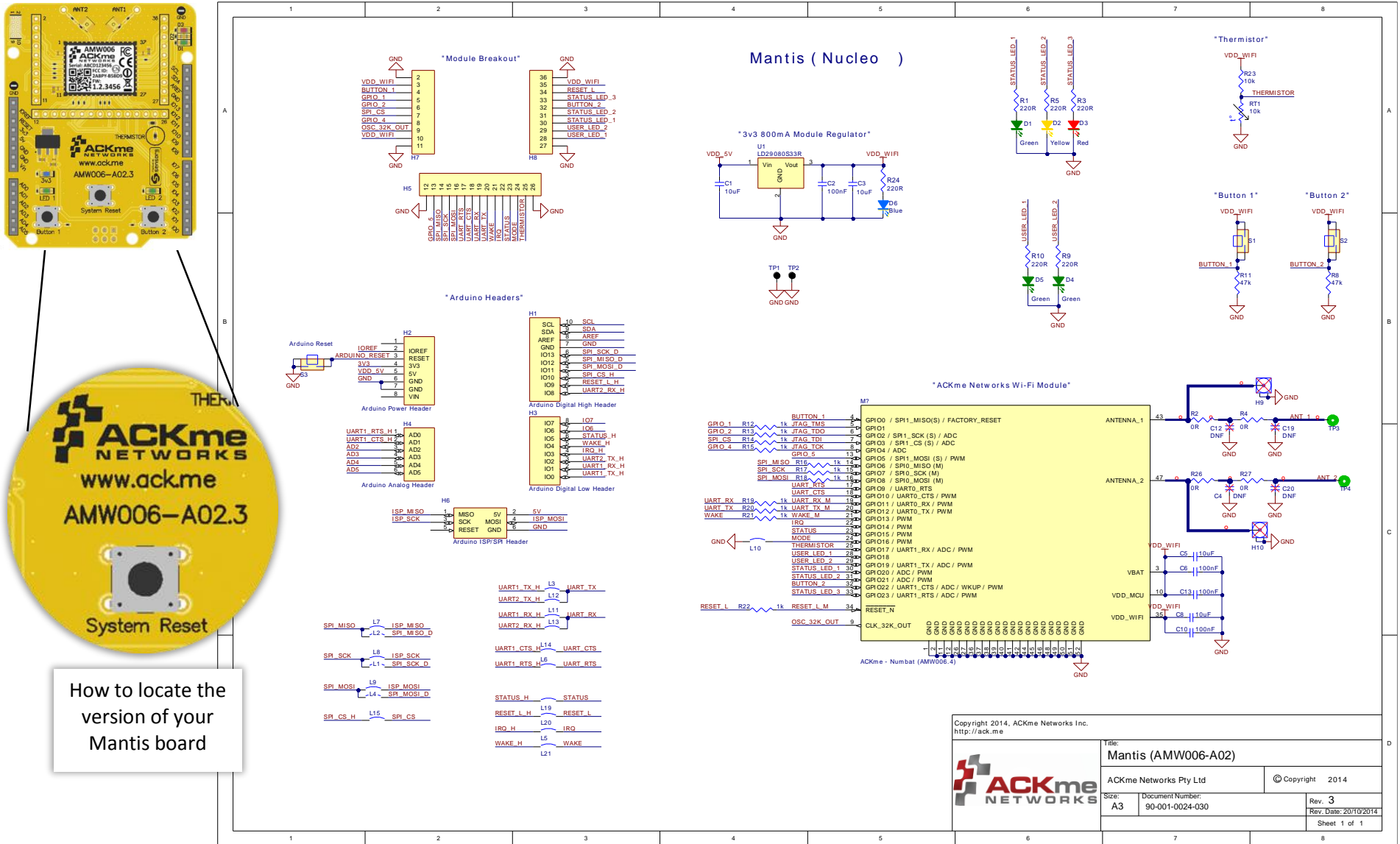
1. Start the CoolTerm application and click the **Options** menu icon. The CoolTerm Configuration window opens. Set the Serial Port configuration options as follows:
 - Port: **usbserial-XXXXXXXX**
 - Baudrate: **115200**
 - Data bits: **8**
 - Parity: **none**
 - Stop bits: **1**
 - Flow control : Deselect all options
2. Click **OK**.
3. Click the **Connect** menu icon. The CoolTerm application connects to the evaluation board.



The Tera Term screen remains blank unless the Nucleo is programmed to send characters to the terminal.

Appendix B – Mantis Wi-Fi Shield Schematics

The schematic on this page is for Mantis version 3 - AMW006-A02.3. Schematics for other board revisions are available at <http://ack.me/resources/show>



Further Information

For information about WiConnect and the WiConnect serial API

- <http://wiconnect.ack.me>

For information about the WiConnect Arduino library

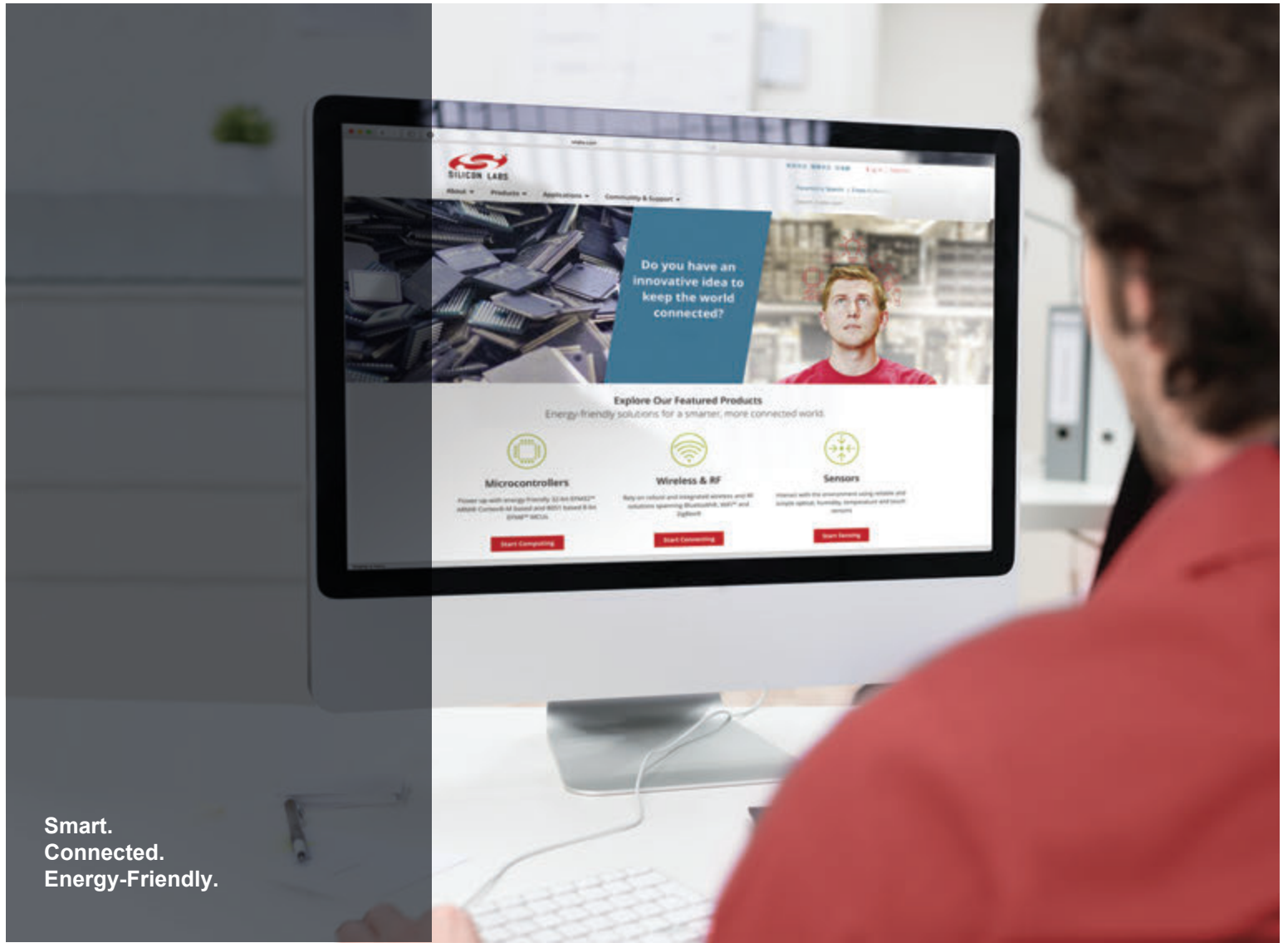
- <http://wiconnect.ack.me/arduino>

For information about the WiConnect mbed library

- <http://wiconnect.ack.me/mbed>

For AMW006-A03 schematics and related documentation

- <http://ack.me/resources/show>



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