



mangOH™ Red

HL78xx Getting Started Guide (Linux)

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Rev 1

Contents subject to change

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Revision History

Revision number	Release date	Changes
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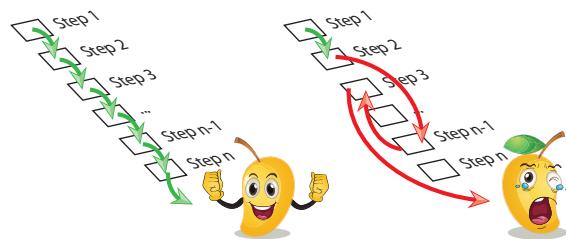
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1: Get Started

Thanks for purchasing the mangOH™ Red HL78xx development kit! Use this guide to prepare your mangOH Red and computer for IoT development.

Important: Follow all steps as described. If you skip, change, or ‘jump around’ steps, your device or development environment may not work properly.



Before you begin, make sure your development machine (the computer you’ll use for mangOH Red application development) meets the following minimum suggested requirements.

Table 1-1: Minimum System Requirements

O/S	Ubuntu 16.04	Important: Use this guide if you are using a Linux system (Ubuntu is recommended).
CPU	Dual core @ 2.6 GHz	
RAM	4 GB	
HDD	10 GB free space	
USB Ports	<ul style="list-style-type: none"> • Preferred—2 (for full functionality) • Minimum—1 	

ubuntu
To get started with a Windows system, or for other mangOH Red resources (guides, tutorials, etc.), visit mangoh.io/mangoh-red-resources.

Note: This guide has been tested on Windows 10 and Ubuntu 16.04. If your system requires command modifications, permission adjustments, etc., visit the mangOH forum at forum.mangoh.io.

When you are ready to begin, work straight through the rest of this guide:

- STEP 1: [Register a mangoh.io Account on page 6](#)
- STEP 2: [Set Up Your mangOH Red on page 7](#)
- STEP 3: [Connect to a Mobile Network on page 14](#)
- STEP 4: [Register Your mangOH Red on AirVantage on page 17](#)

Things to check out after you finish the steps above:

- [Tips on page 23](#)
- [Hardware Tips on page 24](#)
- [Quick Reference—Commands in this Guide on page 28](#)
- [Terminology on page 29](#)

2: Register a mangoh.io Account

The mangOH ecosystem of products, tutorials, documentation and more is constantly evolving.

Please register for a mangoh.io account to:

- Receive notices of new mangOH products, IoT cards, and project code samples
- Receive periodic device-specific notices
- Be automatically included for a chance to win IoT cards in periodic giveaways

If you already have an account, please log in and register your new device so we can provide you with news about your device.

To register for an account:

1. Go to <https://mangoh.io> and click Register.
2. Enter the requested data to create your account.

Some quick notes about your account data:

- Your email address will be your mangoh account login.
- Password requirement—8–29 characters, including at least 1 lowercase letter, 1 uppercase letter, and 1 number
- IoT Applications—We'd like to know what fields you are planning to develop for with your mangOH Red so we can identify potential enhancements to the mangOH ecosystem. Please select all that apply to you.

3. Click Register.

If all required fields are filled correctly, your account is created and you are logged in automatically.

Otherwise, the fields that must be updated are indicated. Fix them, re-enter the password fields, and click Register again.

4. Now that you're logged into your account, click Device Registration:

- a. Select mangOH Red for the Type of mangOH.
- b. Select your SIM card provider (the SIM included in your kit is provided by Sierra Wireless). Your SIM will be activated later in this guide when you register for your AirVantage account.

5. Click Submit.

Now you are ready to [Set Up Your mangOH Red on page 7](#).

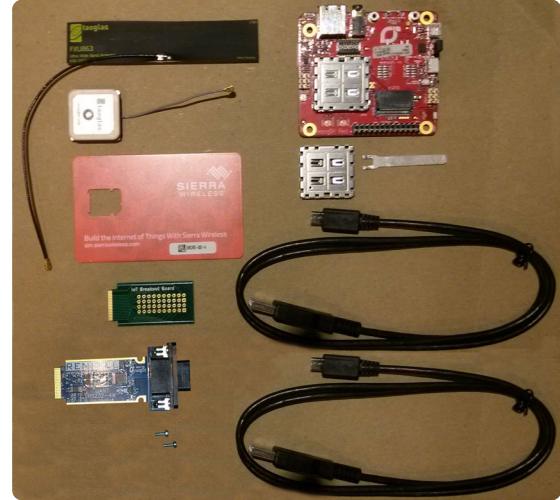


3: Set Up Your mangOH Red

In this chapter, you will assemble and set up your mangOH Red.

The mangOH Red HL78xx kit typically includes:

- (1) mangOH Red board
- (1) HL7800 or HL7802 CF3 module with spacer, pre-installed
- (2) module covers (for 2.5 mm and 4.0 mm height modules)—One pre-installed with the CF3 module, and one for use with a CF3 module of a different height.
- (1) module cover release tool
- (2) micro-USB cables
- (1) Ultra Wide Band antennas (taoglas FXUB63)
- (1) GNSS antenna (taoglas AGGBP.25B)
- (1) micro-SIM card (Sierra Wireless)
- (1) Breakout board (IoT expansion card format)
- (2) M2 screws for IoT card installation
- (1) Renfell UART-RS232 4W IoT Card kit



Note: A USB-Serial converter cable (not included) is required to use the UART-RS232 IoT card.

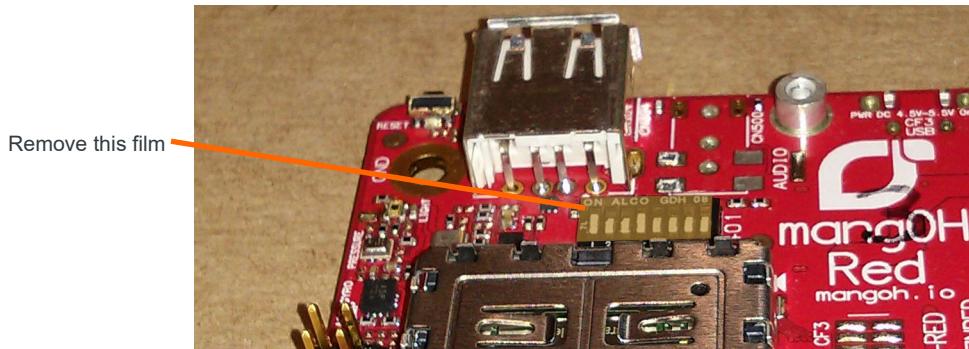
Note: The images used in this guide show the 2.5 mm cover.



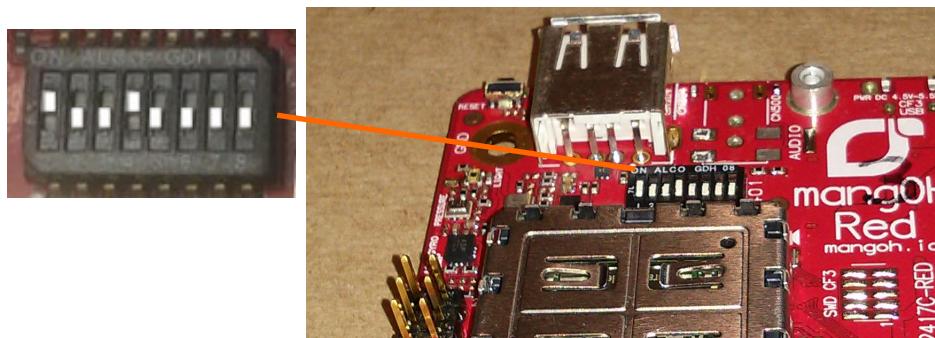
3.1 Assemble Your mangOH—Detailed Steps

To assemble your mangOH Red HL78xx kit:

1. Verify the SW401 dipswitch pins are set correctly:
 - a. Remove the protective film from the dipswitches:



- b. Make sure the dipswitches are set as follows:
 - ON—1,4
(Set 5 ON if you want to enable backup battery charging.)
 - OFF—2,3,5,6,7,8

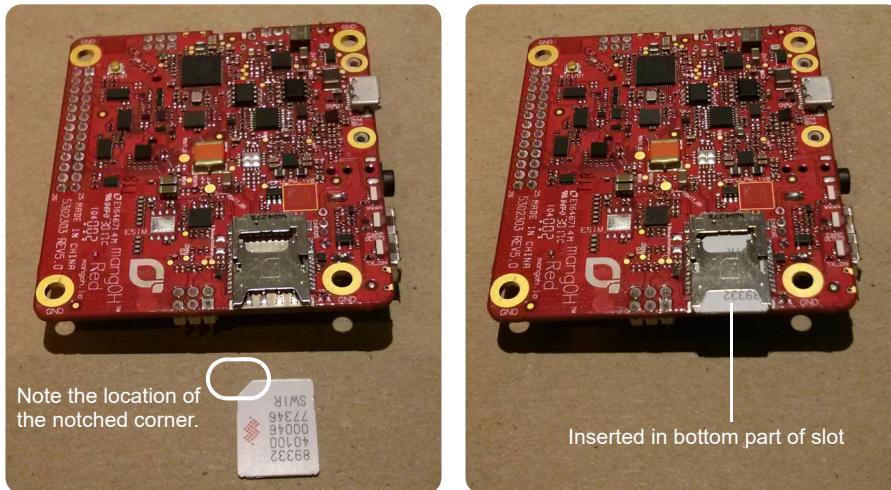


For switch details, see [Dipswitch Settings on page 24](#).

3.1: Assemble Your mangOH—Detailed Steps

2. Insert a micro-SIM in the slot on the bottom side of the mangOH Red. (Either the micro-SIM included with the kit, or one that has been activated by another mobile network provider.)

Note: If you do not have an activated micro-SIM, you can continue the tutorial, but will not be able to complete [Connect to a Mobile Network on page 14](#) and [Register Your mangOH Red on AirVantage on page 17](#).



3. Attach the main antenna.



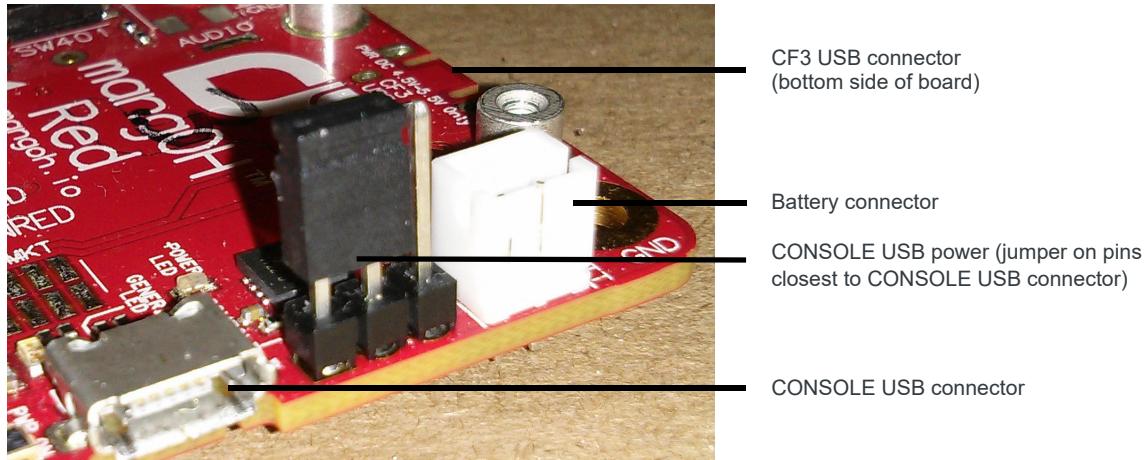
Tip: If you have trouble connecting the antenna, make sure it is positioned directly on the connector and push straight down. The antenna will not connect at an angle.

3.1: Assemble Your mangOH—Detailed Steps

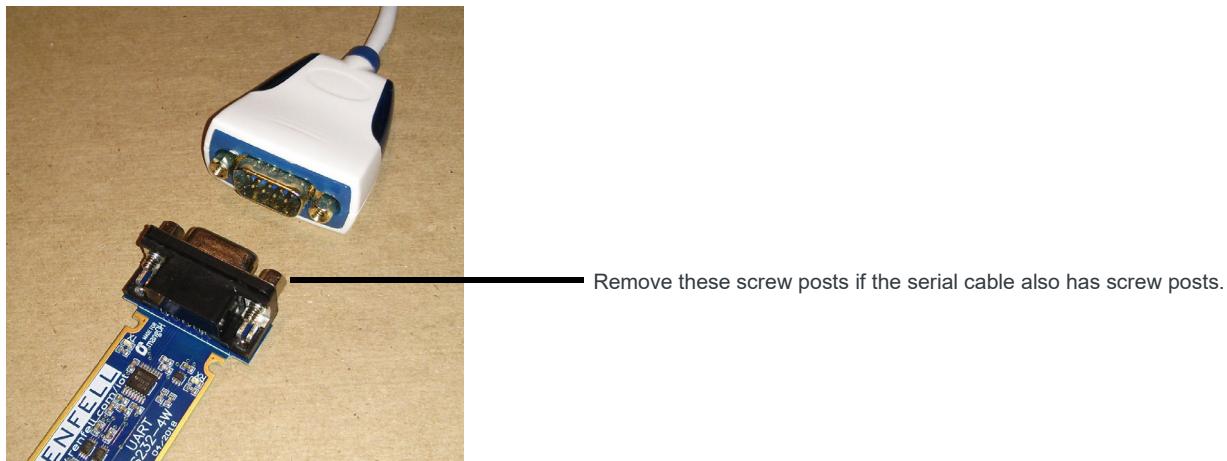
- Move the power select jumper onto the pins closest to the CONSOLE USB connector. (In this guide, power is supplied from the dev machine's USB port to this connector when you connect it in a later step.)

Note: The mangOH Red has two USB connectors. With an HL78xx installed:

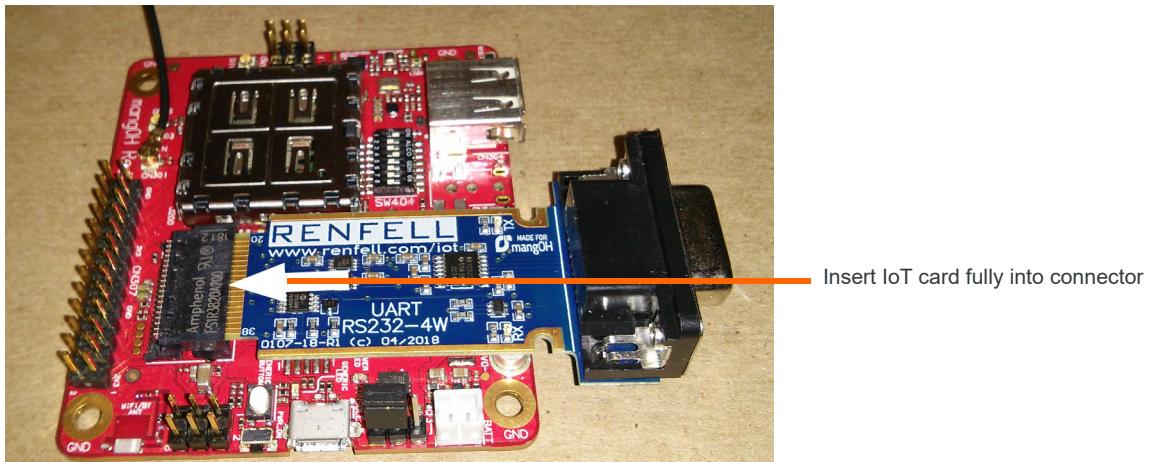
- CF3 USB is used for power. (The connector will be less accessible than the CONSOLE USB when the kit is fully assembled.)
- CONSOLE USB is used for power, and enumerates a serial COM port, however the port is not usable.



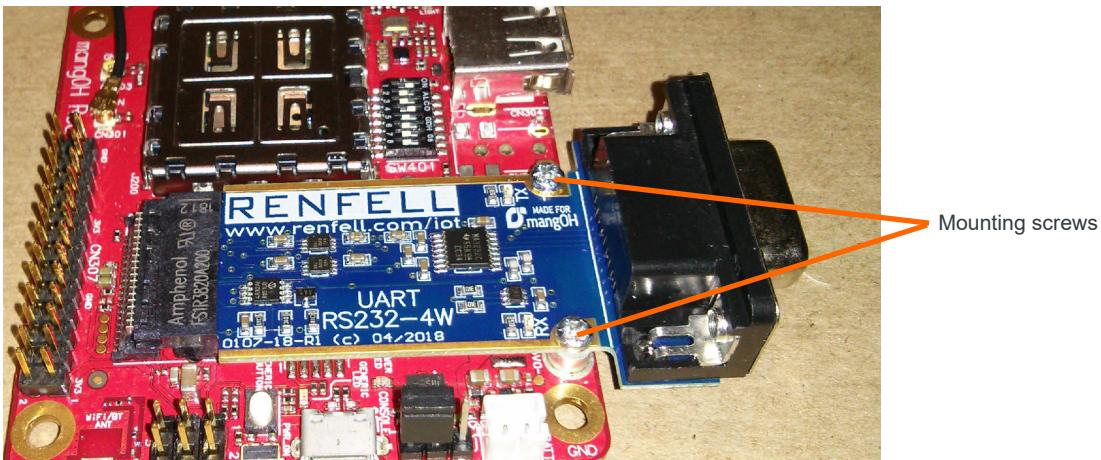
- If your USB-Serial cable has screw posts on the serial end, you must remove the screw posts from the UART-RS232 IoT card.



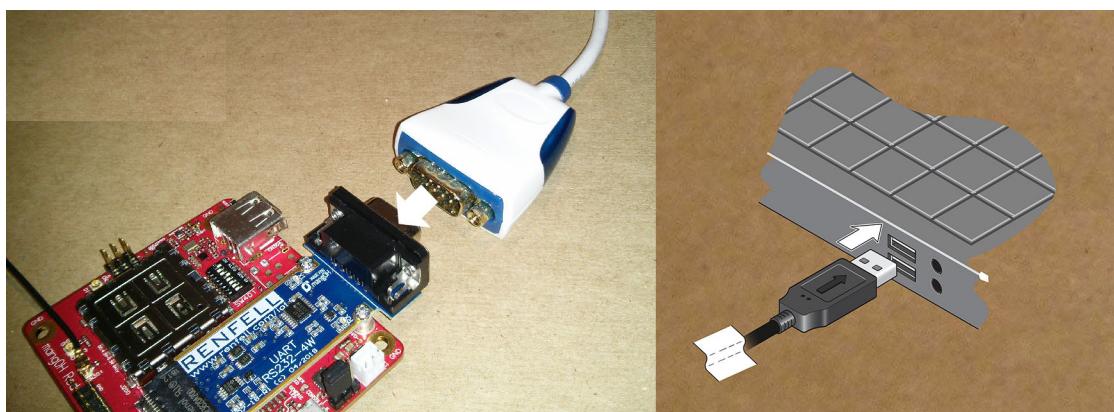
6. Insert the UART RS232-4W IoT card in the IoT connector.



7. Insert the two M2x4 Phillips-head screws into the mounting blocks to firmly secure the IoT card.

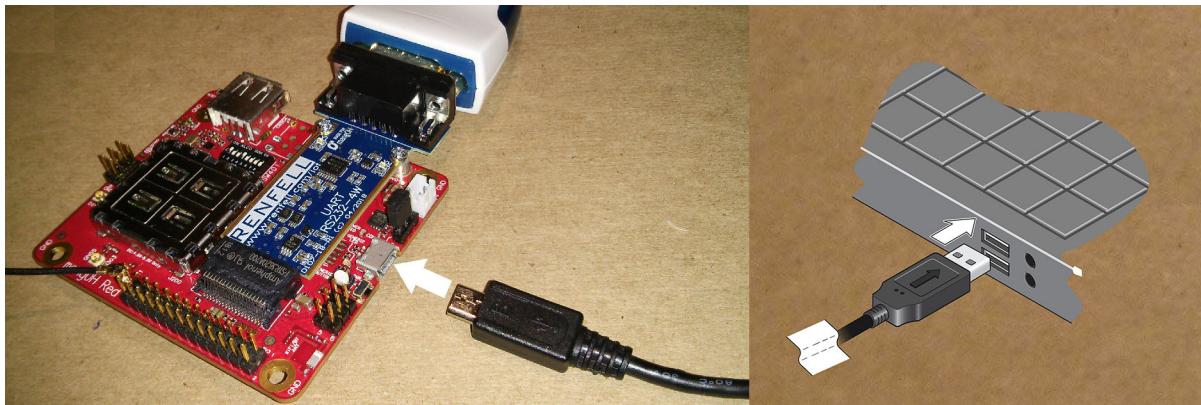


8. Connect the USB-Serial converter cable to the DB9 connector on the IoT card and to a USB port on the dev machine.

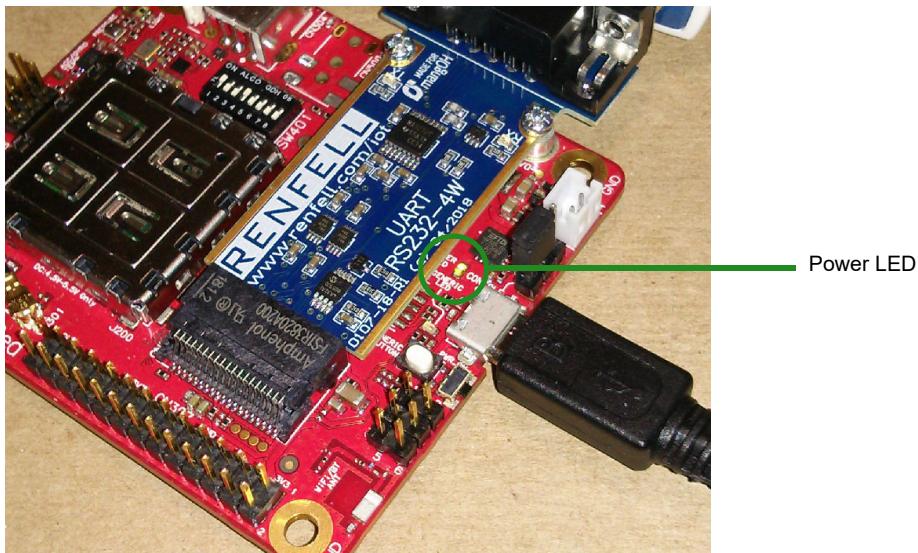


9. Power up the mangOH Red:

- Use a micro-USB cable to connect the CONSOLE USB connector to a USB port on the dev machine.



When the mangOH Red is powered, the Power LED turns solid green.



Tip: If the Power LED does not turn on:

- Make sure the cable is securely connected to the correct USB port (as shown in the image).
 - Make sure the jumper block is on the correct pins (as shown in the image).
-

Note: For future reference, the mangOH Red's power supply (USB port on your dev machine, or an AC adapter) connects to the board via either USB connector—CF3 USB or CONSOLE USB (depending on the jumper position on the power header).

10. Wait 10-15 seconds for the mangOH Red and the IoT card to enumerate.

11. On the dev machine, open a terminal window.

- 12.** Determine which USB ports were enumerated. Use the following command to list all USB ports that have enumerated since the dev machine booted. the last two entries should be the mangOH_Red and the IoT card.

```
$ dmesg | grep ttyUSB
```

```
mangoh@mangoh-ThinkPad-X230:~$ dmesg | grep ttyUSB
[    15.165505] usb 3-1: FTDI USB Serial Device converter now attached to ttyUSB0
[    15.165647] usb 3-2: FTDI USB Serial Device converter now attached to ttyUSB1
```

- 13.** Connect to the mangOH Red over the IoT card's UART connection (in this example, ttyUSB0):

```
$ minicom -D /dev/ttyUSB0
```

```
mangoh@mangoh-ThinkPad-X230:~$ minicom -D /dev/ttyUSB0
<screen clears and is replaced by minicom welcome>
Welcome to minicom 2.7

OPTIONS: I18n
Compiled on Nov 15 2018, 20:18:47.
Port /dev/ttyUSB0, 21:33:36

Press CTRL-A Z for help on special keys
```

- 14.** Type "at" and press Enter. The response "OK" should appear.

If nothing appears when you type, you are connected to the wrong port. Exit from minicom (type CTRL-A, then X, and select Yes to exit), then repeat [Step 13](#) with the correct port.

Now you are ready to [Connect to a Mobile Network on page 14](#).

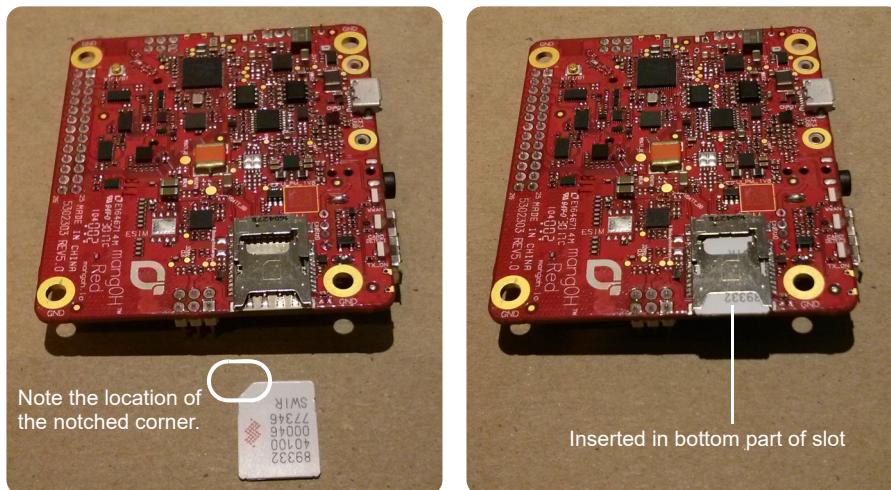


4: Connect to a Mobile Network

In this chapter, you will make sure the mangOH Red can connect to the mobile network (for your SIM provider).

To connect to a mobile network, you must have a micro-SIM in the mangOH Red.

1. If you do not have a micro-SIM in the mangOH Red, insert one before continuing:
 - a. Disconnect power from the mangOH Red (remove the jumper from the power header, or unplug the micro-USB cable that is providing power).
 - b. Insert a micro-SIM in the slot on the bottom side of the mangOH Red. (Either the micro-SIM included with the kit, or one that has been activated by another mobile network provider.)



- c. Reconnect the power (plug in the micro-USB cable or insert the jumper on the power header on the same pins it was removed from in [step a](#)). The Power LED will light immediately.

Note: You must disconnect the power before switching SIMs so the mangOH_Red can detect the SIM while powering on.

- d. Go back to [Step 10 on page 12](#) and, after finishing the procedure, continue to [Step 2](#) below.

-
- 2.** You must be using an activated SIM for the radio to successfully register on the mobile network.

If you are using:

- the Sierra Wireless SIM provided with the kit (the SIM is not activated), you must activate it via AirVantage (in the next chapter). Get the SIM information you will need for activation:

- Get the SIM's ICCID, and the mangOH Red's IMEI and FSN:

```
AT+CCID?
```

```
AT+KGSN=0
```

```
AT+KGSN=3
```

```
AT
```

```
OK
```

```
AT+CCID?
```

```
+CCID: 12345678901234567890
```

ICCID

```
OK
```

```
AT+KGSN=0
```

```
+KGSN: 9876543210987654
```

IMEI

```
OK
```

```
AT+KGSN=3
```

```
+KGSN: 2143658709213
```

FSN

```
OK
```

- an activated SIM—Continue to the next step.
- a non-activated SIM—Activate the SIM with your provider, then continue to the next step.

- 3.** Determine which APN to use for your SIM:

- Sierra Wireless (included with kit)—internet.sierrawireless.com
- Others—Check with the mobile network provider, or search the Internet for "<provider> APN". For example, "Rogers Wireless APN"

Note: If your mobile network operator uses different APNs for 3G and LTE, make sure to use the correct APN for your CF3 module type. (e.g. WP8548 is a 3G module, and WP7603 is an LTE module.)

- 4.** You can now use your mangOH Red with your activated SIM. Refer to the AirPrime HL78xx AT Commands Interface Guide available at source.sierrawireless.com for available commands. For example, to establish and test a data connection using the Sierra Wireless SIM (and then close the connection), you can use the following command sequence (refer to the guide for expected responses and notifications):

```
AT+CGDCONT=1,"IPV4V6","internet.sierrawireless.com"
AT&K3
AT+KCNXCFG=1,"GPRS","internet.sierrawireless.com"
AT+KTCPCFG=1,0,"www.google.com",80
AT+KTCPCNX=1
AT+KTCPRCV=1,1380
AT+KTCPCLOSE=1,1
AT+KTCPDEL=1
```



In the next section—[Register Your mangOH Red on AirVantage on page 17](#), you will set up your free account on the Sierra Wireless AirVantage IoT Acceleration Platform and enable your Sierra Wireless SIM (if being used).

5: Register Your mangOH Red on AirVantage

In this chapter, you will register your device with Sierra Wireless' AirVantage IoT Acceleration platform (a cloud-based service to collect data from your devices), and if you are using the Sierra Wireless SIM provided with the kit, you will register your SIM to activate it.

5.1 Claim Your Free AirVantage Account

Your mangOH Red kit includes a free mangOH-customized account on the AirVantage IoT Acceleration Platform for your CF3 module. This platform provides Sierra Wireless' cloud-based services for over-the-air (OTA) device management, and application enablement (for CF3 modules with application processors). These services provide the infrastructure for you to build, connect, and operate your IoT applications in a single platform.

Note: You can register up to five devices on your free account.

To use AirVantage, you must register your device and then connect your mangOH Red to the AirVantage server.

5.1.1 Register/Log In to AirVantage

1. If you have not recorded your SIM's ICCID and your mangOH Red's IMEI and FSN, connect to your mangOH Red and then use the commands in [Step 2 on page 15](#).
2. In a browser, go to <https://eu.airvantage.net/accounts/signup?type=Mangoh>.

AirVantage® Free Trial for mangOH™

Sign up to activate your 100MB SIM card and enjoy AirVantage features: device management, communication management, device data aggregation and REST APIs to connect to cloud/mobile applications.

[AirVantage Login](#)

If you are already a lucky owner of an AirVantage account, directly register your mangOH™ [here](#).

mangOH™

AirVantage Signup for mangOH™

First name *

Last name *

Email *

Please use your corporate email address

Company *

Phone

I agree to the [Terms of Service](#)

Signup

3. If you already have a mangOH AirVantage account, click the link in the AirVantage Login section and go to [Step 11 on page 20](#). Otherwise, continue to the next step.

4. Enter your registration details, including:

- First and last names
- Email address

Important: Use a valid email address—This is your username for accessing AirVantage, and is needed to complete the registration process.

- Company—Descriptive name to identify this AirVantage account. Use a unique name such as a combination of your company name, the project name, your name, etc.
-

Important: Company name must be unique—if the name has been used by any other person to set up their account, you will have to change this to make it unique.

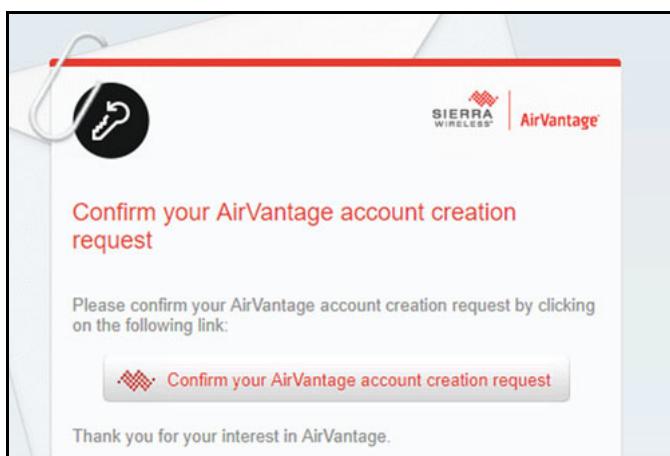
- Phone number—Use international format (for example, for North American phone numbers, use "001" plus the 10-digit area code and phone number).

5. Review the Terms of Service and select "I agree to the Terms of Service".

6. Click Signup.

An email is sent automatically to your email address with a confirmation link.

7. Open the email and click the link to confirm your signup request.



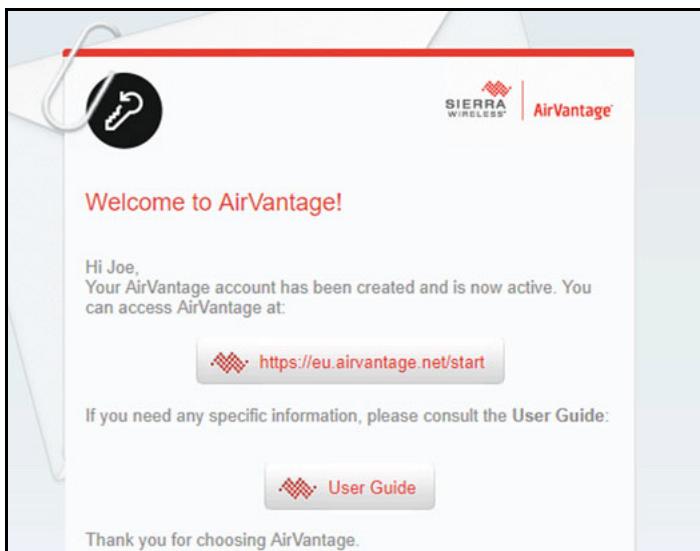
5.1.1: Register/Log In to AirVantage

- When your browser opens to confirm the signup request, enter a password that satisfies the requirements shown on-screen, and re-enter it to confirm.

The screenshot shows a 'Confirm Signup Request' page. At the top, it says 'Enter a password for your account *'. Below is a password input field with '*****' and a 'Save' button. Underneath the first field are 'Password requirements': 'Password must be at least 8 characters long', 'Password must be at most 128 characters long', 'Password must not contain keyboard sequences or repeated characters', and 'Password should contain at least one digit, one alphanumeric and one non-alphanumeric characters'. A red arrow points from the text 'Password requirements' to the fourth requirement.

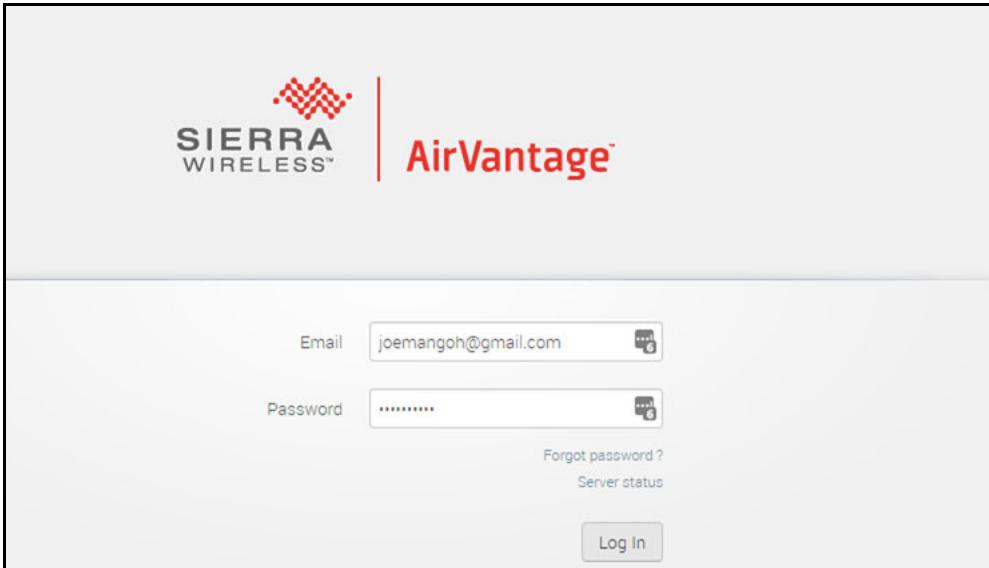
- Click Save.

If your password is acceptable, You will receive an email to confirm your account creation.



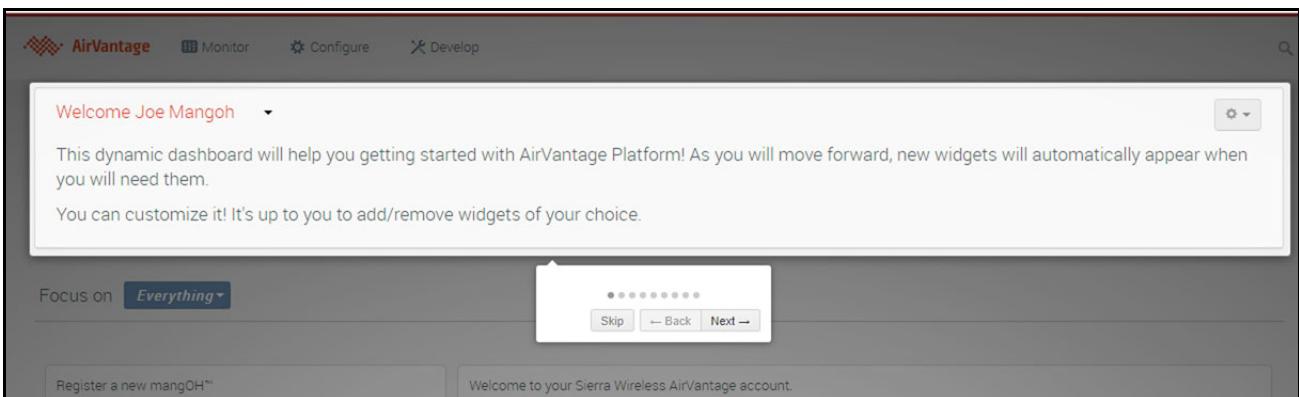
- Click the link to go to <http://eu.airvantage.net/start>. The AirVantage Login screen appears.

11. Enter your account's email address and password, and click Log In.



The image shows the Sierra Wireless AirVantage login interface. At the top left is the Sierra Wireless logo, which consists of a red diamond pattern followed by the text "SIERRA WIRELESS". To its right is the "AirVantage" logo in red. Below the logo is a light gray header bar. The main form area has two input fields: "Email" containing "joemangoh@gmail.com" and "Password" containing a series of dots. To the right of the password field is a small icon showing a user profile with the number "6". Below these fields are links for "Forgot password?" and "Server status". At the bottom is a large "Log In" button.

12. The first time you log in to your AirVantage account, a walkthrough tutorial appears. If you don't want to use it, click Skip. Otherwise, click Next to step through it.



13. In the mangOH tile, click Register.



14. In the Register a new mangOH window, enter your SIM and device's information:

 A screenshot of a 'Register a new mangOH™' dialog box. It contains three input fields: 'SIM ICCID' with the value '89332445501474550147', 'WP IMEI' with the value '357409087928792', and 'WP S/N' with the value 'U3734202060206'. Each field has a small info icon and a placeholder for terminal commands. To the right of the fields is a circular icon with a pencil and paper, labeled 'Example data'. At the bottom are 'Register' and 'Cancel' buttons.

- SIM ICCID—Enter the SIM's ICCID.
- WP IMEI—Enter the module's IMEI.
- WP S/N—Enter the module's FSN.

Note: Your device and SIM are linked in AirVantage. If you change your SIM at some point after registering the device, you will have to unlink the module from the SIM, and then re-register the device with a new SIM:

On the dashboard, select More > Edit, clear the IMEI and Serial Number, and click Save. Then re-register the device with your new SIM ICCID.

15. Click Register.

Note: If you are using a Sierra Wireless SIM provided with the kit, it is now activated and your CF3 module will be able to register on a mobile network.



You have now registered your device and completed the mangOH Red Getting Started tutorial. For more information on the mangOH platform, visit mangoh.io.

6: Tips

6.1 Finding your SIM's APN

Your SIM provider should give you the APN that you use to connect to their network. If you don't have the APN, you should be able to find it online.

If your mobile network operator uses different APNs for 3G and LTE, make sure to use the APN for the correct network based on your CF3 module type (e.g. WP8548 is a 3G-only module—the APN for the network operator's 3G network should be used).

Examples:

- Sierra Wireless—internet.sierrawireless.com
- Rogers Wireless—internet.com (GPRS); Itemobile.apn (LTE)
- Others—Search the Internet for "<provider> APN". For example, "Rogers Wireless APN"

6.2 Using the Linux Terminal program

Ubuntu includes a terminal emulator, which is labeled as "Terminal" in the desktop environment. The emulator allows you to execute command-line programs that interact with the Legato framework tools on your dev machine and the CF3 module in the mangOH Red.

For this tutorial, here are some useful tips:

- Open a terminal window. For example, in the Unity desktop shell used by default on Ubuntu Linux, do this using either of these methods:
 - Click the Search icon and type "terminal", then run the application that is listed.
 - Press Ctrl+Alt+T
- Open a new tab in a window—Press Ctrl+Shift+T
- Change a tab name in a window—Right-click in the tab and select Set Title.
- Copy text from a window—Highlight the text and press Ctrl+Insert.
- Paste text into a window—Press Shift+Insert.
- For in-depth detail, refer to <https://help.ubuntu.com/community/UsingTheTerminal>.

7: Hardware Tips

7.1 Dipswitch Settings

The multi-function dipswitch block (SW401) is used to control module signals.

Note: The 'Default' switch positions are the settings recommended when using this guide.

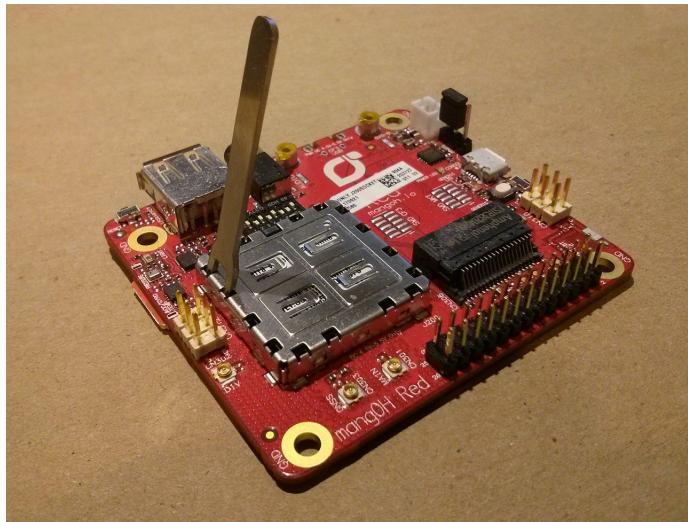
Signal	Dip	On/Off	State
1	PWR_ON	On (Default)	Enable CF3 module's POWER_ON signal
		Off	Disable POWER_ON signal
2	WIFI_UART1_TX	On	Enable CF3 module's firmware download (recovery) mode. <i>Note:</i> Similar functionality to TP1_BOOT
		Off (Default)	Normal operation
3	VCC_3V7_ULPM	On (Default)	While in ULPM, sensors receive power
		Off	While in ULPM, sensors are not powered
4	HL_MODE	On (Default)	When combined with LowPower_RESET, indicates that board is in HL mode.
		Off	When combined with LowPower_RESET, indicates that board is in WP mode.
5	BATT_TS+	On	Enable backup battery charging.
		Off (Default)	Disable backup battery charging.
6	CONS_DIR	On	Console USB connector accesses the Wi-Fi/Bluetooth module's console. <i>Note:</i> To download firmware to the Wi-Fi module, set CONS_DIR OFF and WIFI_UART1_TX ON.
		Off (Default)	Console USB connector access the CF3 module's console.
7	TP1_BOOT	On	Enable CF3 module's TP1 (boot) signal functionality. Pull the signal low to enter download mode for firmware updates.
		Off (Default)	CF3 module functions normally.
8	LowPower_RESET	On	When combined with HL_MODE, indicates that board is in WP mode.
		Off (Default)	When combined with HL_MODE, indicates that board is in HL mode.

8: Removing/Inserting an HL78xx Module

8.1 Removing an HL78xx module

To remove an HL78xx module from the mangOH Red:

1. Remove the module cover using the module cover removal tool—Starting at one corner, insert the tool in the pair of holes and carefully pry the cover away from the module.
2. Repeat at the other locations (pairs of pry holes are on each side).

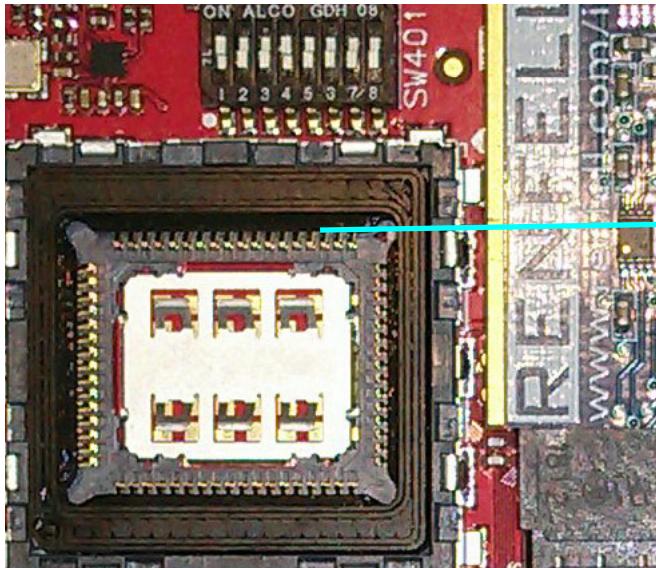


3. Lift the cover off the module.
4. Tip the mangOH Red over to drop the module and spacer out of the socket.

8.2 Inserting an HL78xx module

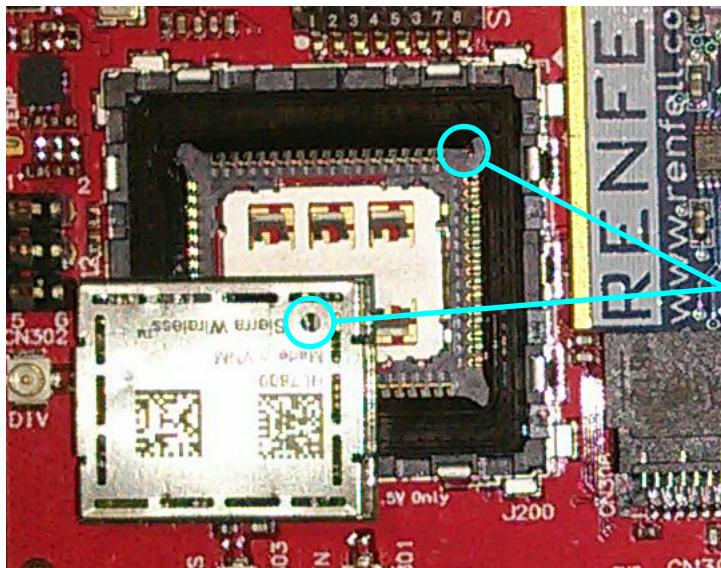
To insert an HL78xx module on the mangOH Red board:

1. Insert the module spacer in the socket—Make sure the face with the smaller opening is at the bottom.



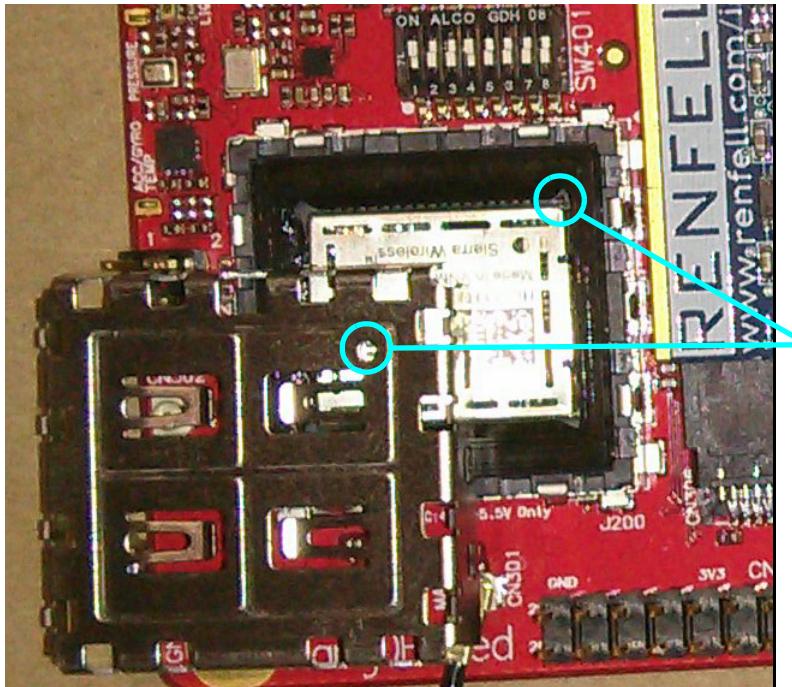
Make sure the face with the 'lip' is at the bottom. This will guide the HL78xx module into its proper position.

2. Insert the HL78xx module—Hold the module above the socket and line up the circle on the module with the triangle on the socket. The module will drop straight into the socket. (Position matters!)



The circle on the module matches the position of the triangle on the socket.

3. Hold the module cover over the module and line up the circle on the module with the triangle on the socket, then press the cover (on the edges) into place.



The circle on the cover
matches the position of the
triangle on the socket.

9: Quick Reference—Commands in this Guide

The following table contains a list of the commands that are used in this guide with explanations of their purposes.

Table 9-1: Commands Used in the Getting Started Guide

Command	Description
apt-get remove <package>	Remove a package from the system.
AT	Tests that AT interface is accessible
AT&K3	Activate hardware flow control
AT+CCID?	Request SIM card identification (ICCID)
AT+CGDCONT=1,"IPV4V6","internet.sierrawireless.com"	Define PDP context (profile)
AT+KCNXCFG=1,"GPRS","internet.sierrawireless.com"	Configure GPRS connection
AT+KGSN=0	Request mangOH Red's IMEI
AT+KGSN=3	Request mangOH Red's FSN
AT+KTCPCFG=1,0,"www.google.com",80	Configure TCP connection
AT+KTCPCLOSE=1,1	Close current TCP connection
AT+KTCPCNX=1	Start TCP connection
AT+KTCPDEL=1	Delete TCP connection
AT+KTCPRCV=1,1380	Receive data through a TCP connection
dmesg grep ttyUSB	Display all messages in the kernel message buffer related to ttyUSB devices.
minicom -D /dev/ttyUSB0	Open a terminal window connected to the specified USB port (in this case, ttyUSB0).

10: Terminology

Here are a few items that you might find helpful:

- Some terminology:
 - "CF3"—The mangOH Red supports CF3 (Common Form Factor) embedded modules, such as the HL78xx, WP8548 and HL8548.
Throughout this tutorial, "CF3" refers to the module that comes with your mangOH Red kit.
 - "Dev(elope) machine"—Your computer
- Command examples—Some steps in this guide require you to enter commands in a terminal window. These commands are shown like this:

`AT <command>`

Note: You can copy commands from this guide and paste them in to your terminal window to save time and avoid typing errors.

- Terminal window tips:
 - minicom exit command—Ctrl+A, then press X