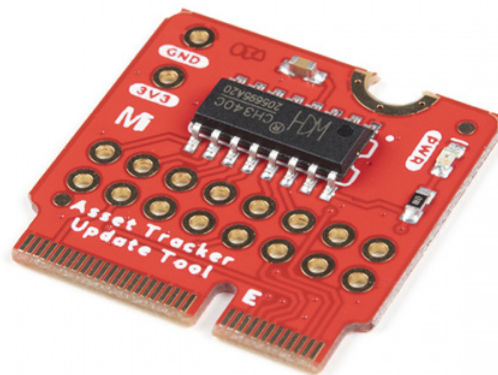


MicroMod Update Tool Hookup Guide

Introduction

Introducing the SparkFun MicroMod Update Tool! This simple little board allows you to interact directly with the SARA-R5 LTE-M / NB-IoT module on the MicroMod Asset Tracker Carrier Board via the module's UART.



SparkFun MicroMod Update Tool
© DEV-17725

Product Showcase: SparkFun MicroMod Asset Tracker Carrier B...





The MicroMod Asset Tracker Carrier Board provides you with a toolkit to monitor and track the location of your assets. Do you want to know where your assets are at all times? Or maybe you just want an update if an asset is moved? If so, this is the product for you!

Built around the u-blox SARA-R510M8S module, the asset tracker offers Secure Cloud LTE-M and NB-IoT data communication for multi-regional use and has an integrated u-blox M8 GNSS receiver for accurate positioning information. The SARA-R5 supports many different forms of data communication from full TCP/IP sockets and packet switched data, through HTTP Get/Put/Post, FTP (the SARA has a built-in file system), Ping, to good old SMS text messaging!

The Update Tool is not a full MicroMod Processor Board, it is much simpler than that. It has a CH340C USB-Serial converter on it which gives you full access to all eight pins of the SARA-R5's UART interface via the Asset Tracker's USB-C connector. Think of it as a bridge from USB to serial.

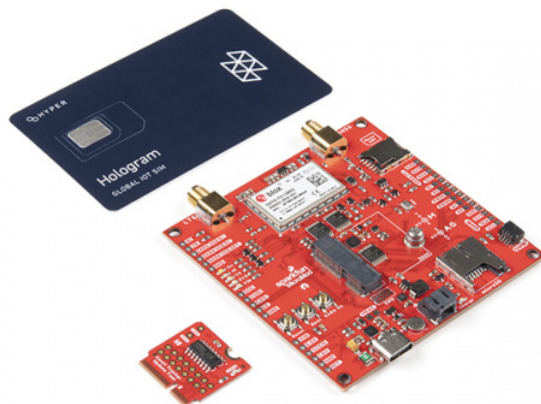
Why is this a good idea? Well, for a start - as the name suggests - it is an ideal way to upgrade the SARA-R5's firmware should you need to. The Update Tool also makes it simple to communicate directly with the SARA using u-blox's sophisticated m-center cellular evaluation software. If you're familiar with u-center, u-blox's GNSS evaluation software, you'll know how excellent their software is. m-center is every bit as good.

The Update Tool features eight pairs of Plated Through Hole connections for the UART signals. You can use these to connect directly to the SARA UART using **3.3V** signals if you want to. The split pads on the rear of the Tool can be opened to isolate the CH340C completely; the pins nearest the M.2 will link straight to the SARA UART.

Required Materials

In order to follow along with this tutorial, you'll want to have the following items.

The Asset Tracker Firmware Update Tool, as the name suggests, is designed to work with the MicroMod Asset Tracker Carrier Board. The Update Tool along with a Hologram eUICC SIM Card are included with the Asset Tracker:



SparkFun MicroMod Asset Tracker Carrier Board

● DEV-17272

You'll also need a USB-C cable to connect the Carrier to your computer. Below are some options for USB cables:



USB 2.0 Cable A to C - 3 Foot
● CAB-15092



USB 3.1 Cable A to C - 3 Foot
● CAB-14743



Reversible USB A to C Cable - 0.8m
● CAB-15425



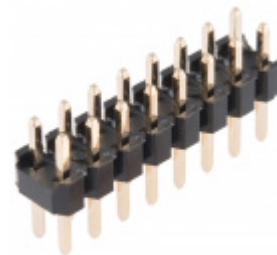
Reversible USB A to C Cable - 2m
● CAB-15424

Optional Extras

If you want to manipulate the UART connections on the Update Tool we recommend soldering a set of headers to your board. Below are a few options:



Break Away Headers - Straight
● PRT-00116



Header - 2x8 (Male, 0.1")
● PRT-13156

If you wish to use the Update Tool to interact directly with the SARA-R5 module on your Asset Tracker and do not have these items already, you may also need LTE and GNSS antennas:



GNSS Multi-Band Magnetic Mount Antenna - 5m (SMA)

● GPS-15192



LTE Hinged External Antenna - 698MHz-2.7GHz, SMA Male

● CEL-16432

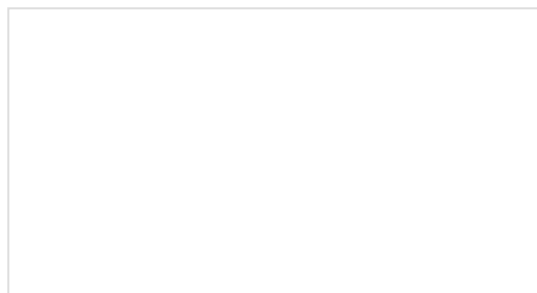
Suggested Reading

If you aren't familiar with the MicroMod ecosystem, we recommend reading here for an overview:

MicroMod

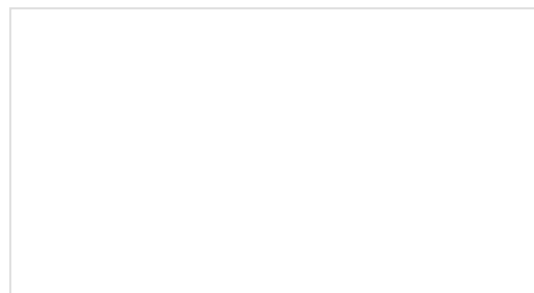
MicroMod Ecosystem

We also recommend reading through the following tutorials if you are not familiar with the concepts covered in them:



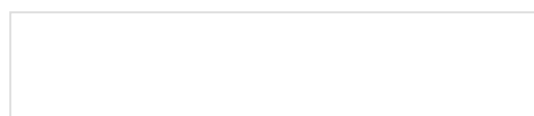
Serial Communication

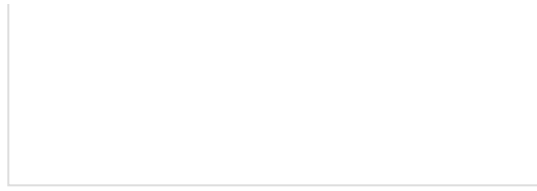
Asynchronous serial communication concepts: packets, signal levels, baud rates, UARTs and more!



How to Work with Jumper Pads and PCB Traces

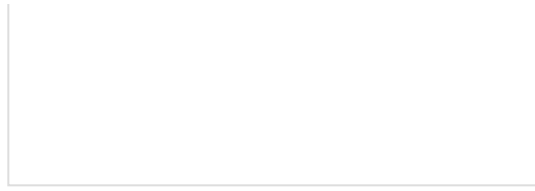
Handling PCB jumper pads and traces is an essential skill. Learn how to cut a PCB trace, add a solder jumper between pads to reroute connections, and repair a trace with the green wire method if a trace is damaged.





How to Install CH340 Drivers

How to install CH340 drivers (if you need them) on Windows, Mac OS X, and Linux.



Getting Started with MicroMod

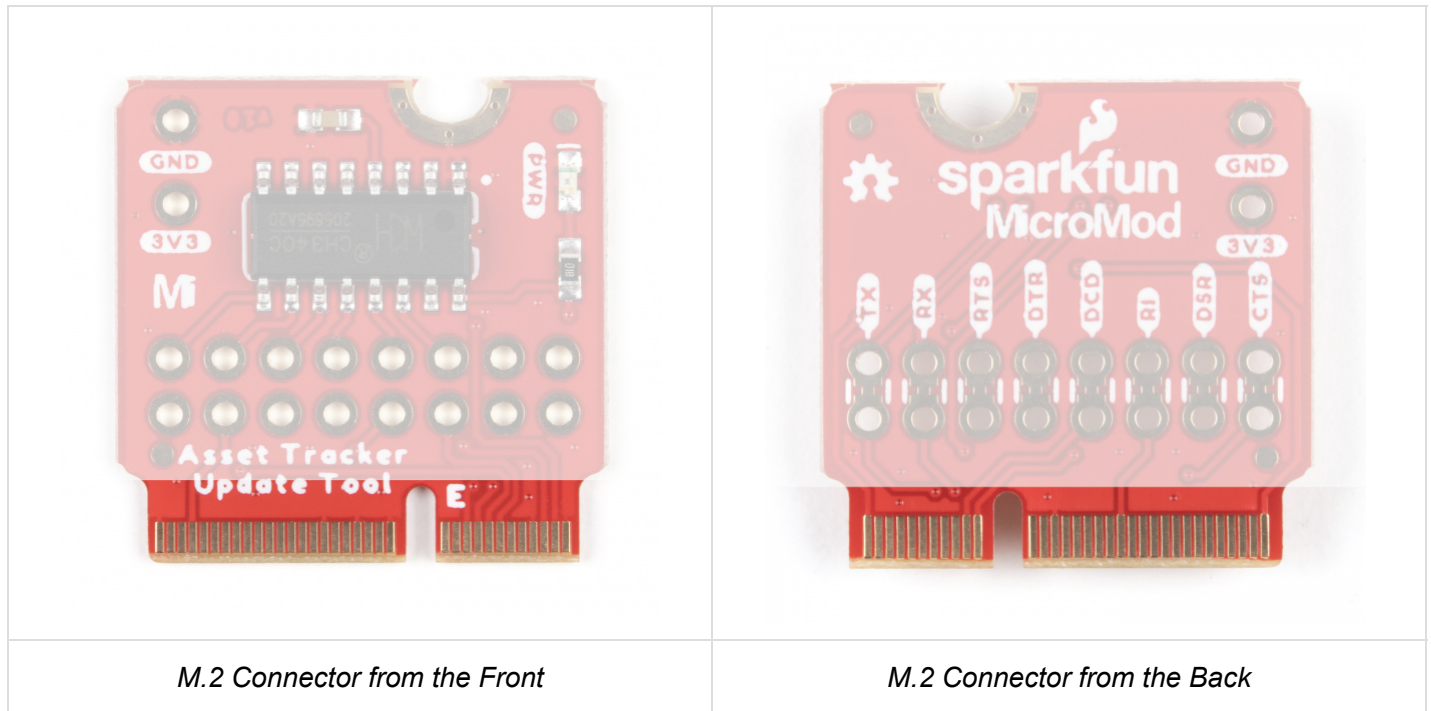
Dive into the world of MicroMod - a compact interface to connect a microcontroller to various peripherals via the M.2 Connector!

Hardware Overview

In this section we'll go over the hardware and components on the MicroMod Update Tool.

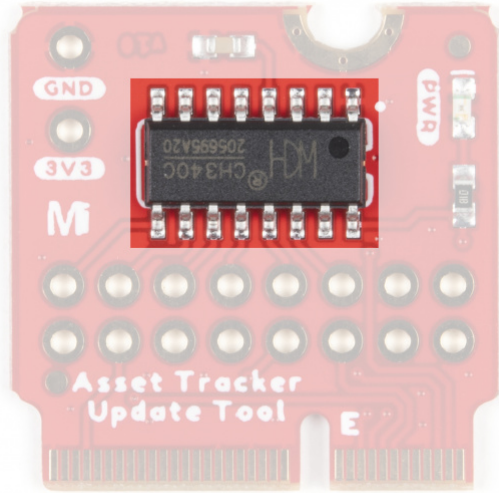
M.2 Connector

All of our MicroMod Processor boards come equipped with the **M.2 MicroMod Connector**, which leverages the M.2 standard and the Update Tool is no different. Just remember this is for use *only* with the MicroMod Asset Tracker Carrier Board.



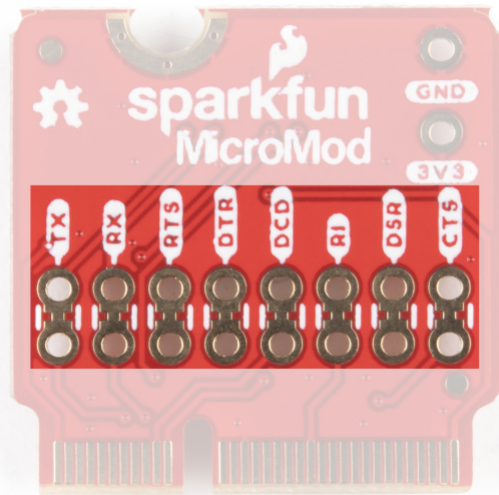
CH340 USB-Serial Converter

The heart of the Asset Tracker Firmware Update Tool is the CH340C USB-Serial converter which we use on *many* of our RedBoards and other breakouts. It converts 8-wire UART serial to USB.



PTH Connections and Jumpers

The Update Tool includes a set of eight jumpers to allow users to connect the SARA-R5 UART pins to a **3.3V** development board. The jumpers can be opened to disconnect the pins from the CH340C to be re-routed to your development board.



Take care to only connect the pins to a **3.3V** RedBoard or Arduino Board or properly shift the logic level down to **3.3V**. Connecting them to a **5V** board may damage the Asset Tracker.

Read on to the Using the PTH Connections for more information.

MicroMod Update Tool Pin Functionality

Since the MicroMod Update Tool serves a specific purpose to communicate directly with the SARA-R5 on the MicroMod Asset Tracker Carrier Board, the pinout is much simpler than other MicroMod Processors. The tables below outline the pin functionality for the Update Tool along with the general MicroMod pinout. If you prefer to refer to the schematic it can be viewed [here](#).

MICROMOD UPDATE TOOL PINOUT TABLE

MICROMOD GENERAL PINOUT TABLE

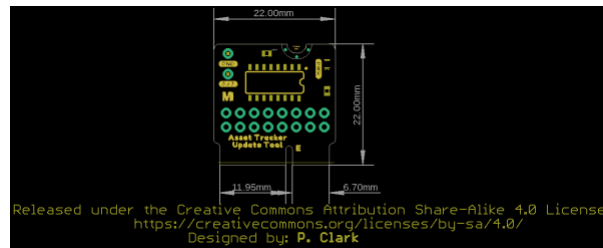
MICROMOD GENERAL PIN DESCRIPTIONS

AUDIO	UART	GPIO/BUS	I ² C	SDIO	SPI	Dedicated
-------	------	----------	------------------	------	-----	-----------

MicroMod Pin Number	Function	Asset Tracker Connection	Notes
75	GND	Ground	
74	3.3V	3.3V	
69	G7	SARA DSR_O / RTS2_I	SARA Data Set Ready / AUX UART Request to Send
48	G4	SARA RI_O / CTS2_O	SARA Ring Indicator / AUX UART Clear to Send
22	TX2	SARA DTR_I / TXD2_I	SARA UART Data Terminal Ready / AUX UART Data Input
20	RX2	SARA DCD_O / RXD2_O	SARA UART Data Carrier Detect / AUX UART Data Output
19	RX1	SARA RXD_I	SARA UART Data Output
17	TX1	SARA TXD_O	SARA UART Data Input
15	CTS1	SARA CTS_O	SARA UART Clear to send
13	RTS1	SARA RTS_I	SARA UART Request to send
5	USB_D-	USB-C	Passthrough to USB-C connector
3	USB_D+	USB-C	Passthrough to USB-C connector
2	3.3V	3.3V	
1	GND	Ground	

Board Dimensions

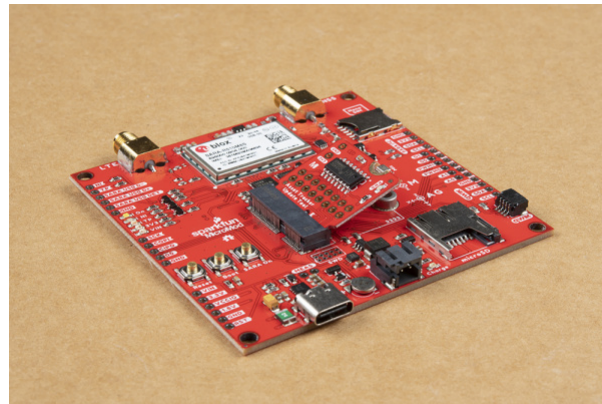
The board measures 22mm x 22mm, with 15mm to the top notch and 12mm to the E key. For more information regarding the processor board physical standards, head on over to the [Getting Started with MicroMod tutorial](#) and check out the [Hardware Overview](#) section.



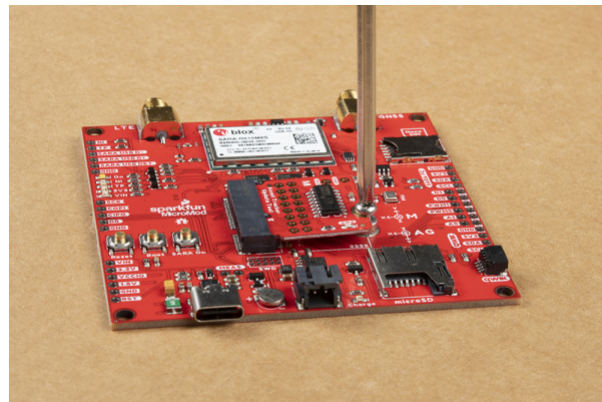
Hardware Assembly

Inserting your Update Tool

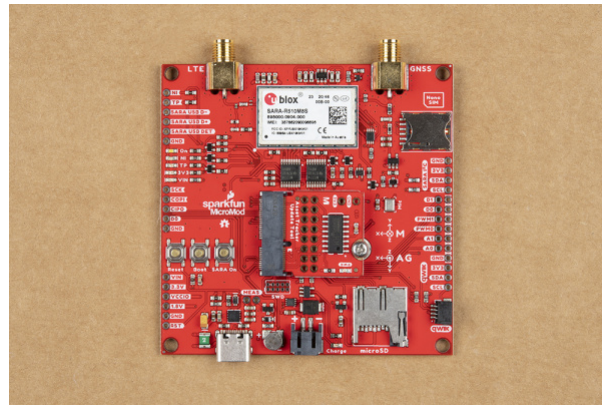
With the M.2 MicroMod connector, connecting your Update Tool to the Asset Tracker is a breeze. Simply match up the key on your Processor's beveled edge connector to the key on the M.2 connector. At a 45° angle, insert the processor board to the M.2 connector. The Update Tool will stick up at an angle as seen here:



Once the update tool is in the socket, gently press the board down, grab the set screw and tighten it with a Phillip's head screwdriver:



Once the Update Tool is secure, your assembled MicroMod Asset Tracker system should look similar to the image below!



Connecting Everything Up

Now is a good time to insert the Nano SIM from your service provider into the Asset Tracker. Make sure the orientation matches the symbol on the PCB; the edge with the trimmed corner is inserted first.

The LTE and GNSS connections simply screw on to the appropriate SMA connectors. Make sure you check the labelling and connect them the right way round. **LTE** is on the **Left**.



With your Update Tool inserted and secured it's time to connect your MicroMod Asset Tracker Carrier Board to your computer using the USB-C connector. Depending on which drivers you already have installed, you may need to install drivers for the CH340. Please refer to our CH340 tutorial for further instructions.

Software Setup

Note: This guide assumes you already have the CH340 drivers installed. If needed, please refer to our [How to Install CH340 Drivers](#) tutorial.

Installing u-blox m-center

You can find the webpage for u-blox's m-center software [here](#). Sadly m-center is only available for Windows and we don't know of an equivalent for Linux. This link will download version 2.03.0 of m-center (but please do check the u-blox website for more recent versions):

U-BLOX M-CENTER FOR WINDOWS (ZIP)

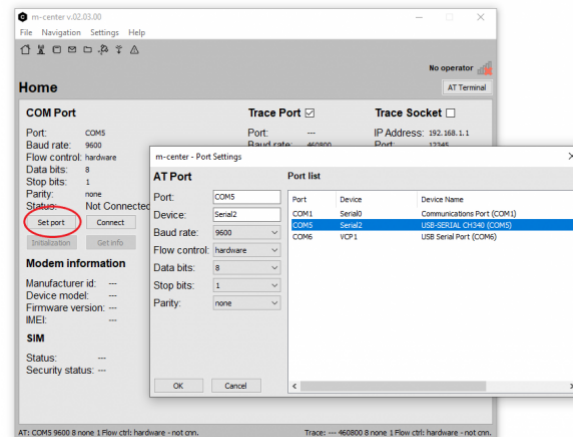
Unzip the file and run the m-center .EXE to install the software.

Using u-blox m-center

Like u-center, m-center is very easy and intuitive to use. Let's go over the features of the software.

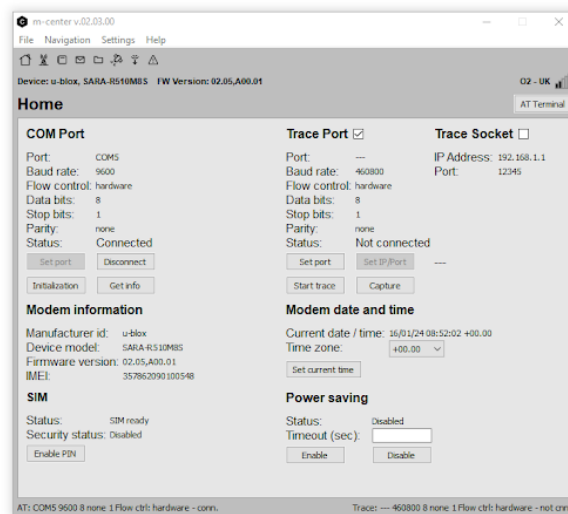
Home

Begin by clicking **Set port** and selecting the port for the CH340 Update Tool:



Having trouble seeing the detail in this screenshot? Click on it for a closer look.

Click **Connect**, followed by **Initialization** to connect to the SARA-R5. The IMEI and firmware version should appear:



The carrier operator name and signal strength will appear in the top right corner of the window. We are told by u-blox that it is normal for the signal strength to appear quite low; LTE communication works with relatively low signal levels.

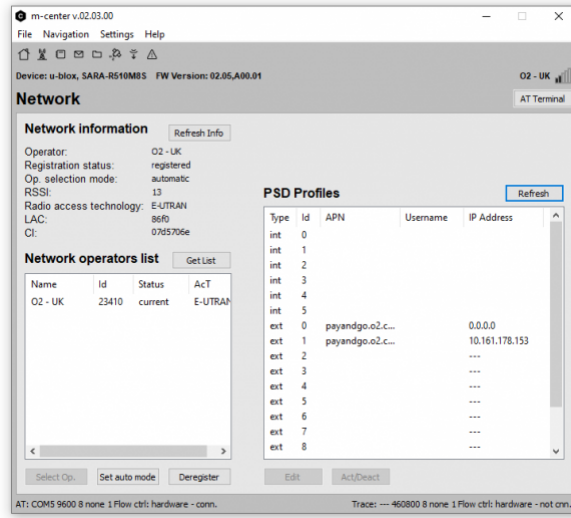
We believe the **Trace Port** option can be used to connect to the SARA-R5's USB diagnostic port via the **SARA USB D+/D-/DET** pins on the Asset Tracker Carrier Board, but we have not tried that yet.

Click **Set current time** to set the SARA's internal clock from the LTE network.

Network

Click the Network icon, next to the Home icon in the top left of the window, to see the network operator settings.

Click **Refresh Info**, **Get List** and **Refresh** to update the network information and Packet Switched Data Profiles.

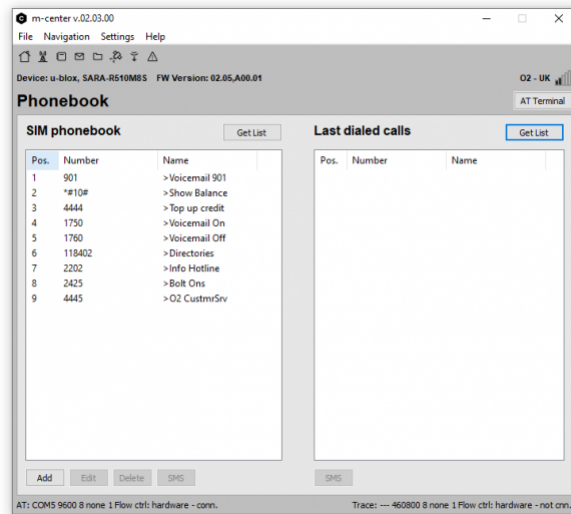


You can choose to deregister from the current operator and connect to a new one if your SIM supports it.

You can also activate and deactivate the Packet Switched Data profile from this page. You will not be able to send and receive data until you have activated a profile.

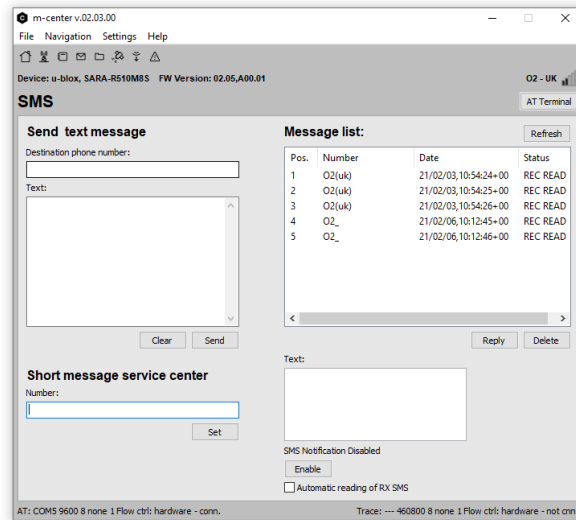
Phonebook

As the name suggests, the phonebook icon opens the SARA's phonebook. You can add and delete numbers here.



SMS

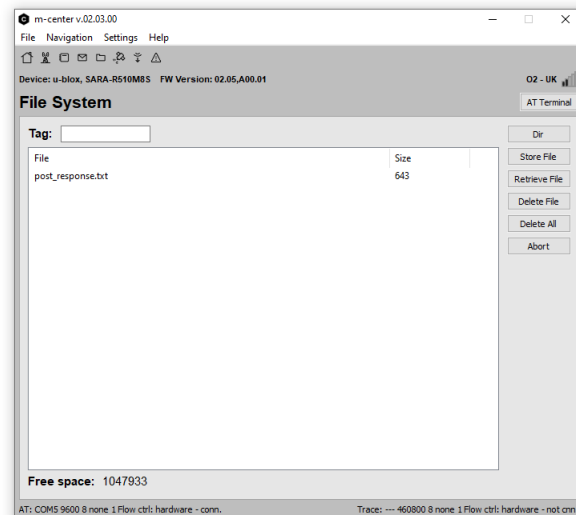
The SMS (envelope) icon will allow you to send text messages and read or reply to any received messages.



File System

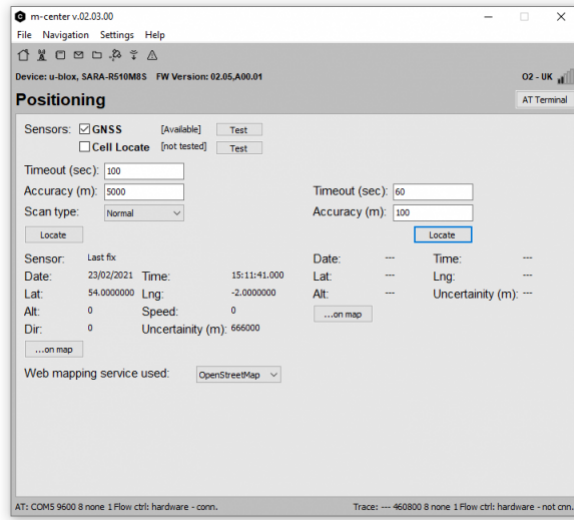
The File System icon provides access to the SARA's internal file system. You can add, retrieve and delete files from here. If you have run the Asset Tracker ThingSpeak (HTTP POST) example, the results of the most recent POST are stored in *post_response.txt*.

Did you know that the SARA-R5 supports FTP transfer too? Of course it does...



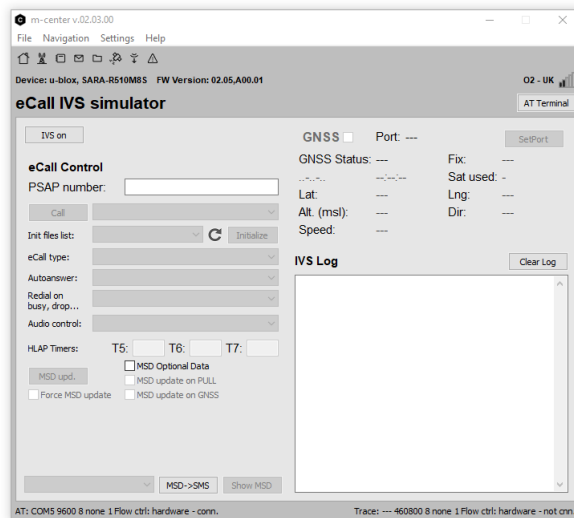
Positioning

The Positioning icon provides access to positioning information derived from either the LTE network, or the SARA-R510M8S's built-in M8 GNSS receiver.



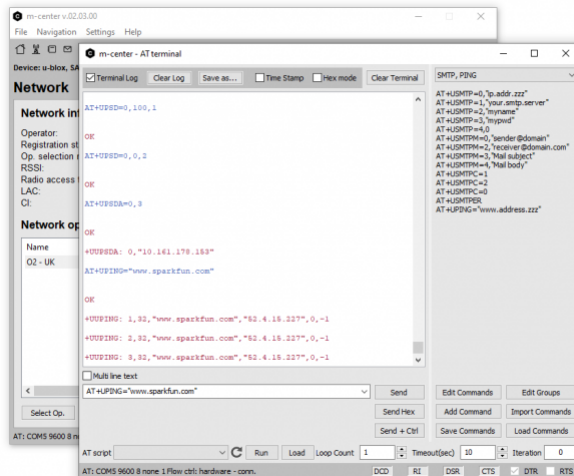
Firmware Over the Air (FOTA) and eCall Simulator

Advanced users can make use of the SARA's Firmware download Over The Air and eCall Simulation functions:



AT Terminal

One of the most important features offered by m-center is the **AT Terminal**. Clicking the button below the signal strength indicator opens a Pandora's Box full of AT Command goodies!



Having trouble seeing the detail in this image? Click on it for a larger view.

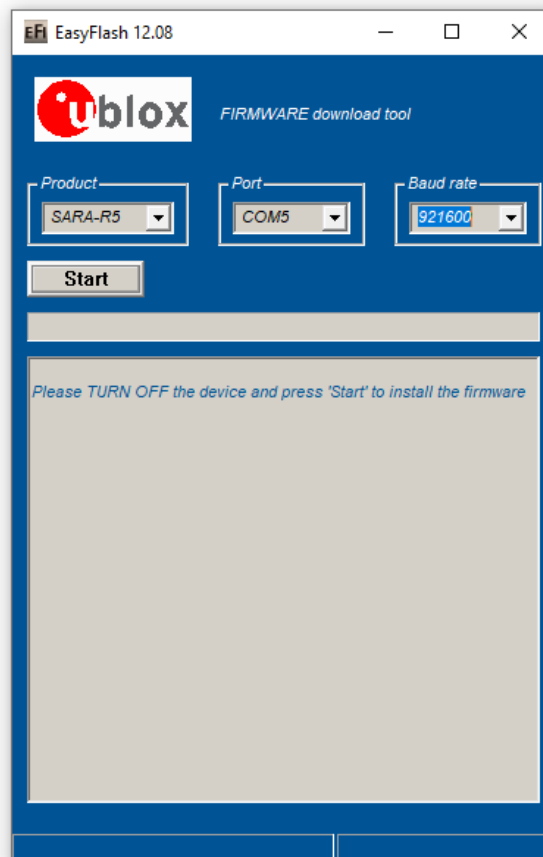
You can either type the AT commands manually into the text box, or select a template message from the drop-down menus, and then click **Send** or hit Enter to send the message. The replies from the SARA are shown in the Terminal window. You can log everything to file too if you wish. Scripts? Yes, you can run those too! This is a very powerful tool.

To manually Ping a server (such as *www.sparkfun.com*) the truncated set of commands is:

- AT+UPSD=0,100,1
 - This instructs the SARA to map the Context ID 1 profile into Profile ID 0.
- AT+UPSD=0,0,2
 - This instructs the SARA to use the "IPv4v6 with IPv4 preferred" protocol for Profile ID 0 (this needs to match the operator's protocol).
- AT+UPSDA=0,3
 - This instructs the SARA to activate Profile ID 0.
- AT+UPING="www.sparkfun.com"
 - This instructs the SARA to ping the SparkFun server

Upgrading the SARA Firmware with u-blox EasyFlash

Just about the only thing that m-center doesn't allow you to do is to upgrade the SARA-R5's firmware. To do that you need to download and install u-blox's EasyFlash update tool.



The link below will download EasyFlash version 12.08 but do check the SARA-R5 resources page for the latest version as of this writing:

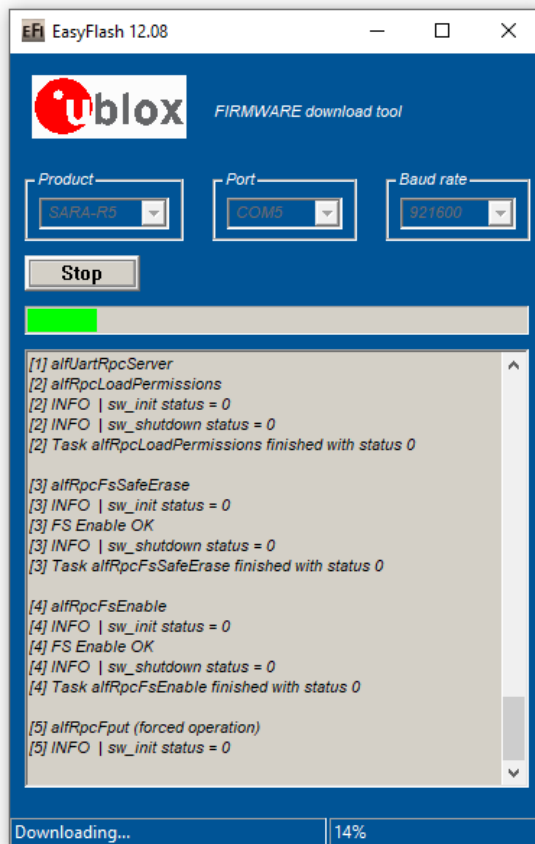
U-BLOX EASYFLASH FOR WINDOWS

Again, EasyFlash only appears to be available for Windows. We are not aware of a version for Linux. Unzip the .ZIP file and run the EasyFlash .MSI installer to install the software. u-blox will make the firmware updates available through the SARA-R5 resources page.

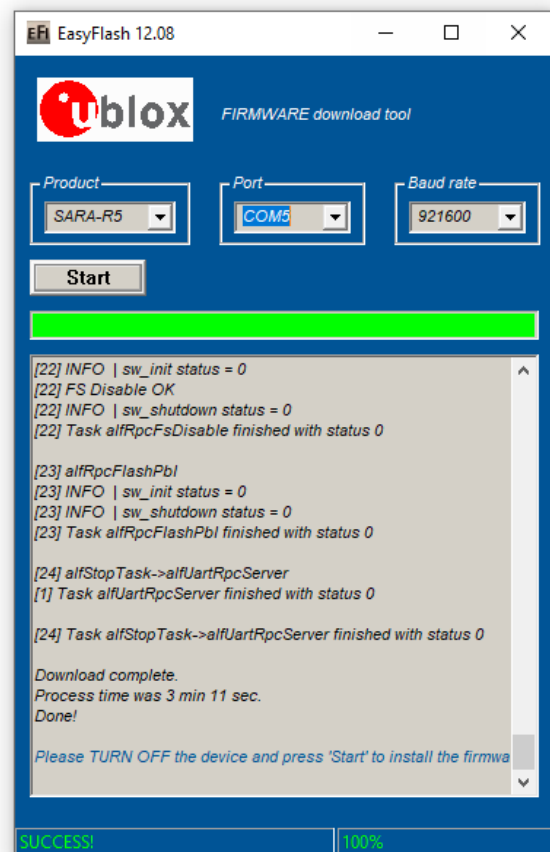
Note: SparkFun is *not* able to give users the latest firmware file. It must come from u-blox.

You need to manually download the .DOF update binary file **and place it in the same folder as the EasyFlash executable**. (That bit is important!). After the .DOF file is downloaded follow these steps:

- Run the EasyFlash executable.
- Select SARA-R5 as the Product.
- Select the COM port your Firmware Update Tool (CH340) is connected to.
- Select **921600** as the Baud Rate.
 - Do not select **3000000** Baud as the CH340 cannot support it.
- Turn the SARA-R5 off by pushing and holding the **SARA On** button on the Asset Tracker for five seconds.
 - Check that the white **On** LED on the Asset Tracker goes out.
- Click the **Start** button on EasyFlash.
- Press the **SARA On** button briefly when instructed to turn the SARA back on again.
- The update process takes around three minutes to complete.
- Turn the SARA off again when instructed to complete the update.

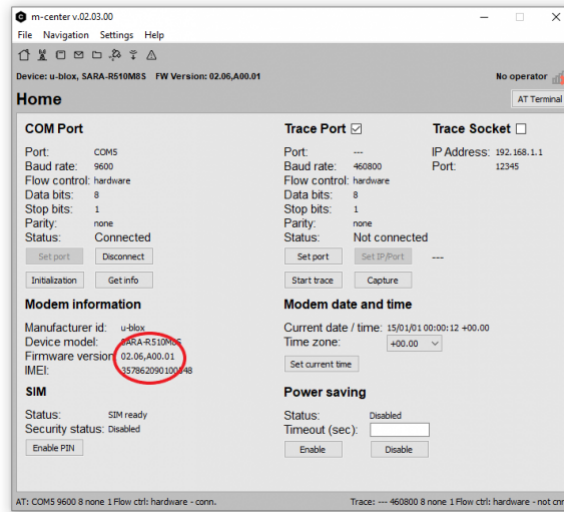


Firmware update in progress



Firmware update completed

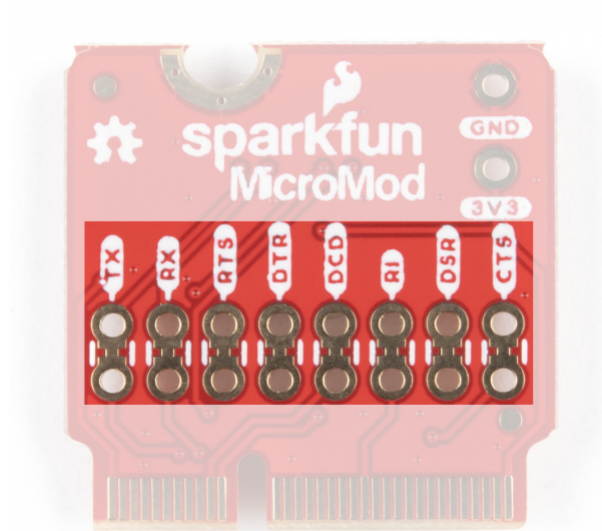
You can confirm that the update was successful by opening m-center and connecting to the SARA-R5. The firmware version is shown on the Home page:



Having trouble seeing the detail in this screenshot? Click on it for a larger view.

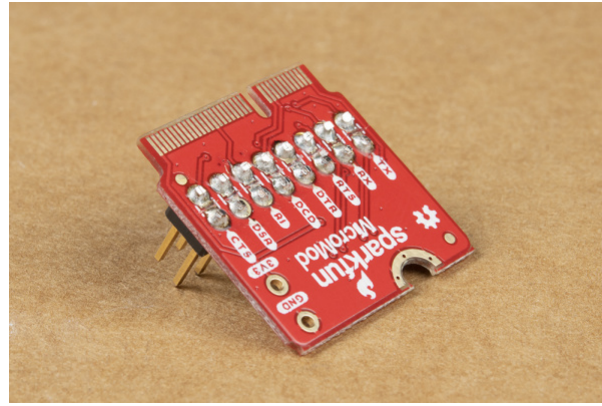
Using the PTH Connections

Want to connect the SARA UART pins to your favourite 3.3V RedBoard or Arduino Board? The Firmware Update Tool lets you do that too!



If you flip the Update Tool over, you will see eight jumpers linking each pair of Plated Through Holes. You can cut the jumpers to disconnect the PTHs from the CH340C. You can then connect the holes closest to the M.2 connector to your **3.3V** board.

Insert 1x8 or 2x8 0.1"-pitch header pins through the front of the Firmware Update Tool and solder them on the back. 2x8 header pins are a good idea as it means you can use header jumper links to reconnect the CH340C again if you want to.



The headers linked above **will** make contact with the IMU and other components and must be clipped prior to installing the Update Tool

Important Notes:

- Take care when selecting which header pins to solder onto the Update Tool. The pins must not protrude from the back of the board by more than 1.25mm or they will collide with the IMU and other components on the Asset Tracker circuit board. Trim the pins if necessary *before* soldering.
- Take care to only connect the pins to a **3.3V** RedBoard or Arduino Board or properly shift the logic level down to **3.3V**. Connecting them to a **5V** board may damage the Asset Tracker.

Troubleshooting

Below we have outlined a few troubleshooting tips for the MicroMod Update Tool and MicroMod Asset Tracker Carrier Board.

LTE Network Availability

The SARA-R5 supports LTE-M and NB-IoT data communication for multi-regional use. Please check the LTE signal availability for your area before purchasing a SARA-R5 product and selecting an LTE service provider / operator.

TP (1PPS) Pin and LED

At the time of writing, we are shipping the SARA-R5 on the Asset Tracker with firmware version 02.06 on it. 02.06 contains a *feature* (which is just a polite name for a bug!) which means the 1 Pulse-Per-Second from the GNSS does work, but the pulse is only ~3 *microseconds* wide and cannot be adjusted. Handy huh? u-blox are aware of this - in fact we told them about it - and a fix is coming but they haven't added it yet. We will keep an eye out for this fix and update this page when it is available.

Just to complicate matters, 3 microseconds is too short for the buffer FET and LED connected to the timing pulse to respond. So, we regret that you cannot currently use the TP PTH. We will share the fix with you as soon as we have it. The SARA firmware is easy to update using the Asset Tracker Firmware Update Tool.

General Troubleshooting

🔔 Not working as expected and need help?

If you need technical assistance and more information on a product that is not working as you expected, we

recommend heading on over to the SparkFun Technical Assistance page for some initial troubleshooting.

SPARKFUN TECHNICAL ASSISTANCE PAGE

If you don't find what you need there, the SparkFun Forums: MicroMod are a great place to find and ask for help. If this is your first visit, you'll need to create a Forum Account to search product forums and post questions.

SPARKFUN FORUMS: MICROMOD

Resources and Going Further

Want more information on the MicroMod Update Tool? Check out these links!

- Schematic (PDF)
- Eagle Files (ZIP)
- Board Dimensions (PNG)
- GitHub Hardware Repo

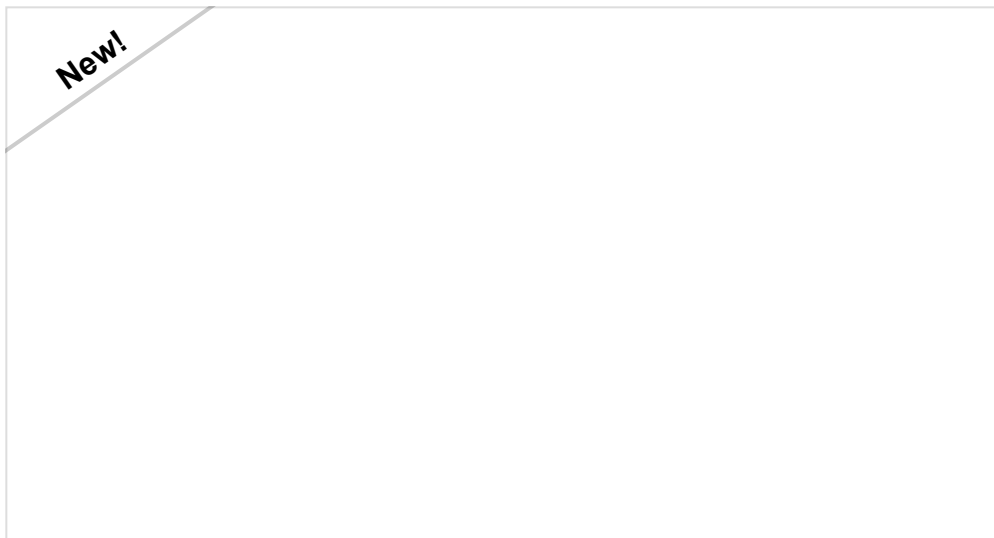
u-blox Documentation and Software:

- u-blox m-center
- u-blox EasyFlash v12.08 Download (ZIP)
- Firmware Update App Note (PDF)

MicroMod Documentation:

- Getting Started with MicroMod
- Designing with MicroMod
- MicroMod Info Page
- MicroMod Forums

If you have not already, be sure to check out our Hookup Guide for the Asset Tracker Carrier Board:



MicroMod Asset Tracker Carrier Board Hookup Guide

FEBRUARY 25, 2021

Get started with the SparkFun MicroMod Asset Tracker Carrier Board following this Hookup Guide. The Asset Tracker uses the u-blox SARA-R510M8S LTE-M / NB-IoT module to provide a host of data communication options.