adafruit learning system

Adafruit FONA

Created by lady ada

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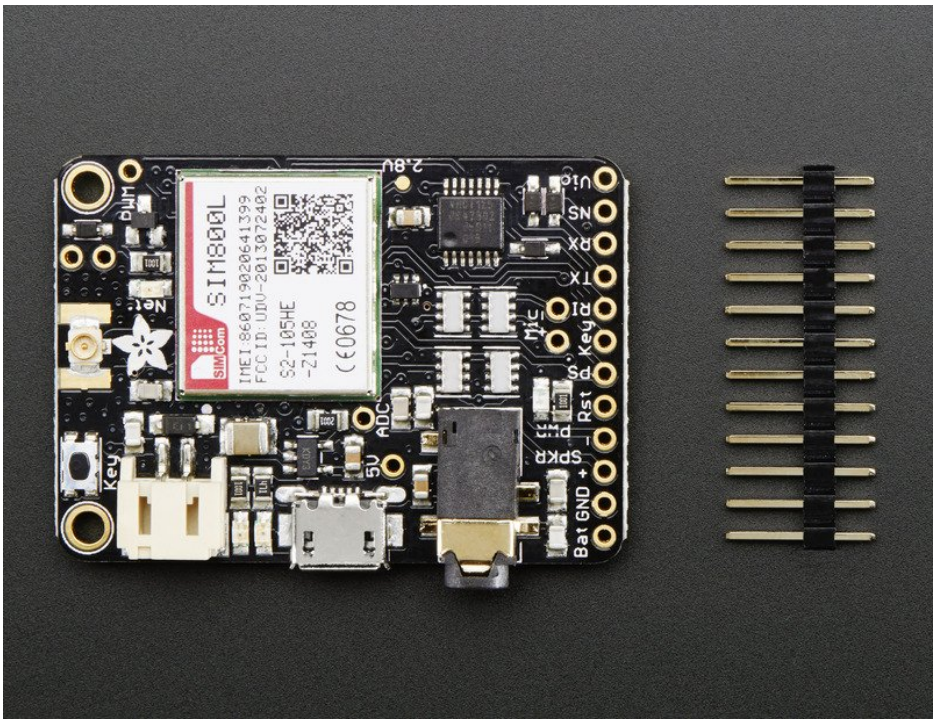
Overview

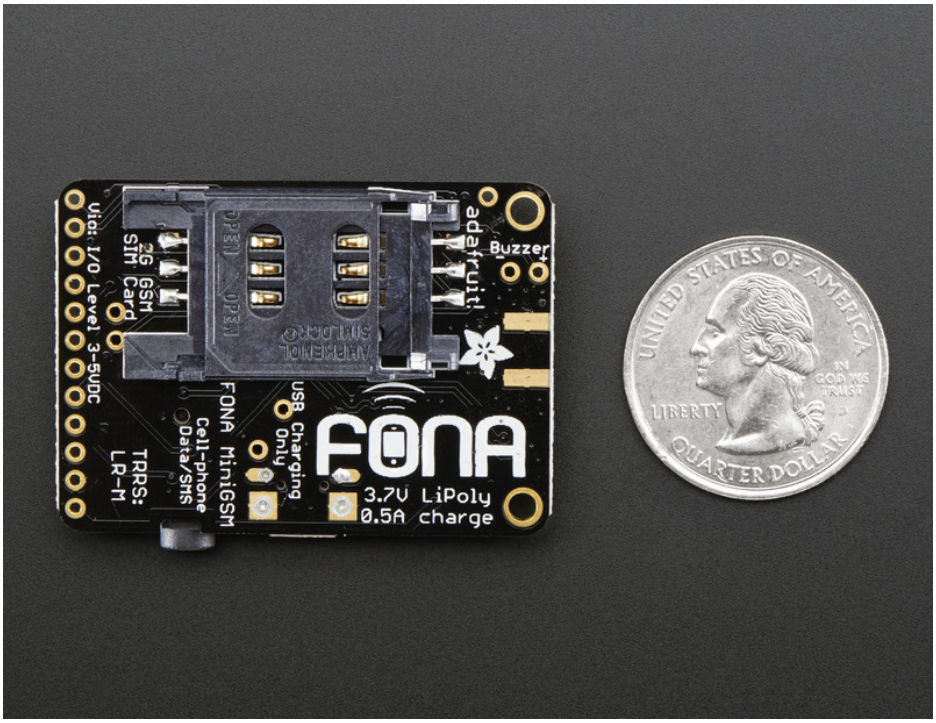
Ring, Ring! Who's that callin'? It's your breadboard! Introducing Adafruit FONA MiniGSM, an adorable all-in-one cellular phone module that lets you add voice, text, SMS and data to your project in an adorable little package.



This module measures only 1.75"x1.25" but packs a surprising amount of technology into it's little frame. At the heart is a GSM cellular module (we use the latest SIM800) the size of a postage stamp. This module can do just about

everything

- Quad-band 850/900/1800/1900MHz - connect onto any global GSM network with any 2G SIM (in the USA, T-Mobile is suggested)
- Make and receive voice calls using a headset OR an external 8Ω speaker + electret microphone
- Send and receive SMS messages
- Send and receive GPRS data (TCP/IP, HTTP, etc.)
- Scan and receive FM radio broadcasts (yeah, we don't exactly know why this was included but it works really well)
- PWM/Buzzer vibrational motor control
- AT command interface with "auto baud" detection



Sounds delicious, right? So we plated this fine module onto a little breakout with all the extras you need to make your next project shine

- Onboard LiPoly battery charging circuitry so you can take your project on the go. Use any 500mAh+ LiPoly or LiIon battery and recharge over the MicroUSB when necessary. Two LEDs let you know when its charging and done
- Standard 4-pole TRRS headphone jack. Use any 'Android' or 'iPhone'-compatible headset with mic
- Breakouts for external 8Ω speaker and electret mic if you don't want to use a headphone
- Level shifting circuitry so you can run it with 2.8V to 5V logic.
- Vibrational motor (buzzer) driver so you can have noiseless notifications
- uFL or SMA connections for external antenna
- Indicator LEDs for power and network connectivity
- Standard SIM slides into the back

This is our Release Candidate for hackers and advanced makers. We're still adding library support for all the various things the FONA can do but there may be updates as FONA is used around the world!

On its own, this module can't do anything. It requires a microcontroller to drive it! We suggest and use an Arduino but any 3-5V microcontroller with a UART can send and receive commands over the RX/TX pins.

You will also need some required accessories to make FONA work. **These are not included!**

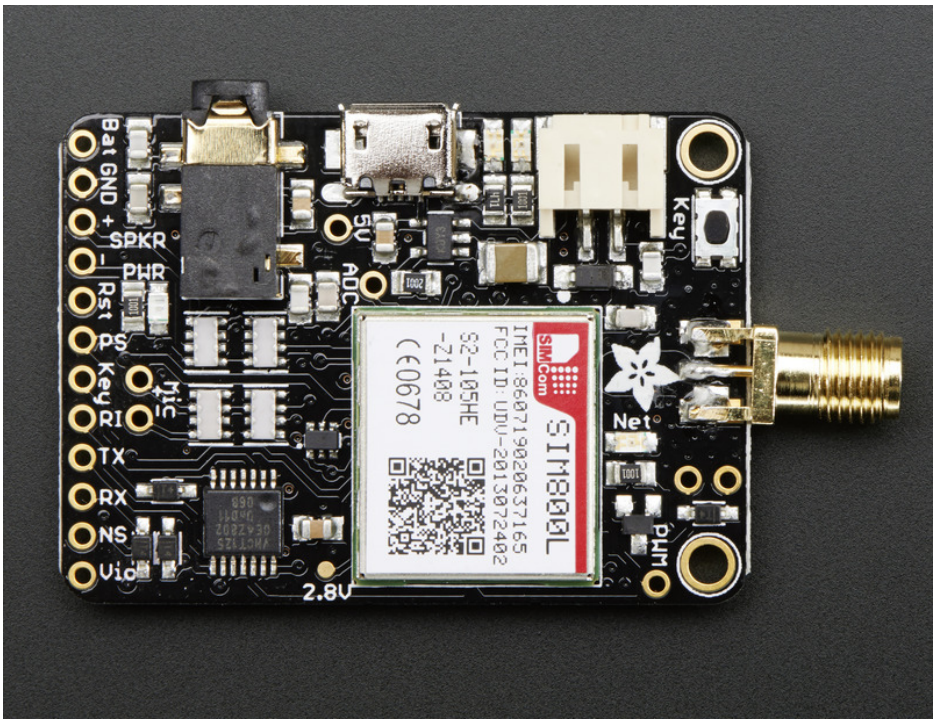
- **SIM Card!** A 2G Mini SIM card is required to do anything on the cellular network. US AT&T no longer sells 2G SIMs and will shut off their 2G network, so for American customers we recommend any T-Mobile or reseller (SIMPLE mobile, etc) that uses the T-Mobile network.
- **Lipoly Battery** - 500mAh or larger! This 500mAh (https://adafru.it/drL)battery, or this 1200mAh (http://adafru.it/258) will work great.
- **MicroUSB cable** for charging the battery.
- **External Antenna** - this straight one (http://adafru.it/1859) or this right-angle one will work well (http://adafru.it/1858).
- **If you have the FONA with uFL connector** - a uFL to SMA adapter cable. (http://adafru.it/851)

There's also some recommended accessories. They are not required but chances are you'll want them!

- **TRRS 4-Pole Headset** - Any 'iPhone' or 'Android' compatible (but not iPhone original) should work. We tried about 10 different ones, and basically the more expensive once are more comfortable and louder but our official iPhone headset mic did not work.
- **External Mic & Speaker** - If you want to talk directly to your FONA, an electret mic (https://adafru.it/dDa) and mini 8 ohm speaker (https://adafru.it/dDb) will do quite nicely.
- **Vibrating motor** - the FONA can drive this directly, just solder a mini vibrating motor disc in! (https://adafru.it/dDc)
- **USB console cable** - the microUSB connector is for charging only, but you can wire up a console cable for direct-connection to the module (https://adafru.it/dDd)if you want to send commands from a terminal (great for testing and tweaking)

Pinouts

There's a lot packed into the FONA MiniGSM, lets go thru all the pins, buttons and indicators and what they do



Connectors

There's three external connectors along the left side, from the top, a mini JST 2-pin, a microUSB and a headphone jack.

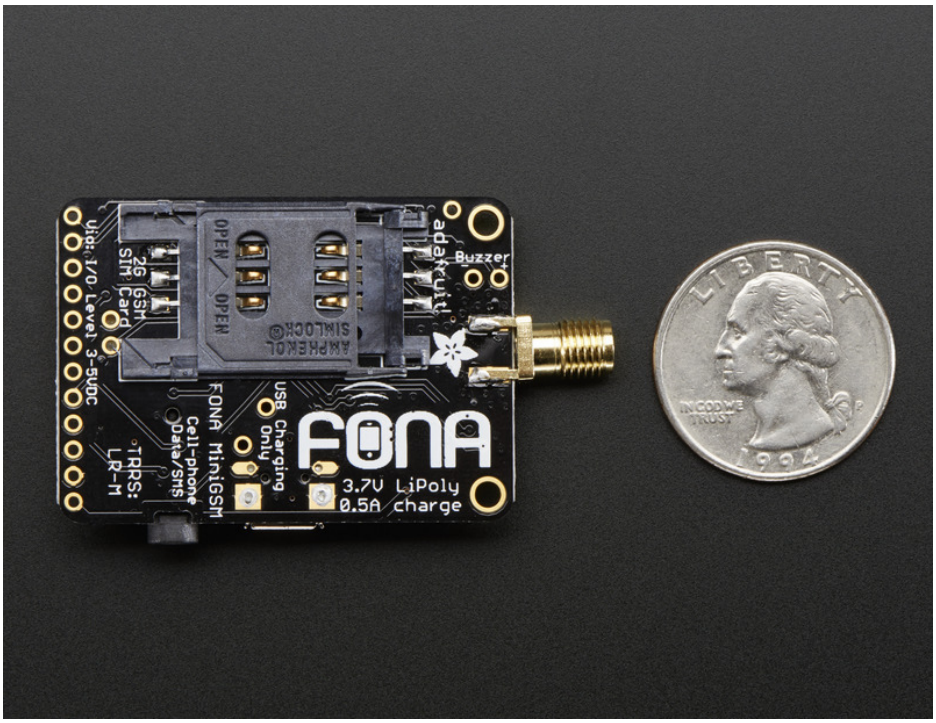
- **JST 2-pin** - this is the battery input connector. It works with any of our Lipoly batteries but since the charge rate is 500mA (and the cellular module can spike high current draw!) we suggest our 500mAh (https://adafru.it/drL) or 1200mAh (http://adafru.it/258)batteries. You can also connect a JST cable here if you have other plans. See the cable photo for polarity, red is + and black is gnd. (http://adafru.it/261)
- **MicroUSB connector** - this is the LiPoly/LiIon battery charging port. The SIM800 has a USB interface but its ONLY for reprogramming the module with an expensive and unavailable IDE. So charge only! The charge rate is 500mA max.
- **Headset jack** - this is a 'standard' TRRS 3.5mm phone headset jack with stereo earphone and mono microphone. Any 'iPhone' or 'Android' compatible (but not iPhone original) should work. (https://adafru.it/fbK) We tried about 10 different ones, and basically the more expensive once are more comfortable and louder but our official iPhone headset mic did not work for unknown reasons. Sleeve is Mic+, first ring is ground, then the second ring and tip are for stereo audio. The module does not have stereo out so we just tied both together.

Antenna port

Up top is the place where you can plug in your antenna. **An antenna is required to use the module for any kind of voice or data communications as well as some SIM commands!**

We have both SMA and uFL versions. You can either use a uFL GSM antenna like this (https://adafru.it/fbL), or use a uFL to SMA adapter (https://adafru.it/fbM) and then an SMA antenna (https://adafru.it/fbN)

If you have an SMA version, you can connect an SMA antenna directly (https://adafru.it/fbN). We suggest a quad band GSM/GPRS antenna, but if you're savvy and know what frequencies are used in your area you can get a single or dual band antenna that's just for your required frequency



SIM Connector (on Back)

A 2G Mini SIM card is **required** to use the module. Nearly any cell phone shop can sell you a SIM card. It must be a 2G GSM card. AT&T in the US does not sell these anymore! They are shutting down their GSM network, and only T-mobile sells and supports a GSM network. If you are in another country, chances are you can just ask for a GSM 2G card. For USA customers, we have a known-working TING SIM card which has a great billing system and works very well! (https://adafru.it/fbO)

MicroSIMs won't fit - so make sure its a "Mini" SIM. **Mini SIMs are 1" x 0.6" / 25mm x 15mm**. These are by far the most common size.

Most cards come with a voice and/or data plan. If you want to make phone calls and SMS's you'll need a voice plan. If you want to transmit data like fetching a webpage, you'll need a data plan.

Bottom Breakouts

The most important pins are broken out at the bottom of the board. Not all of these are required, but they are all hella useful

These are in rough order of most important (not in linear order like we usually do)

These pins are all 3-5V input safe and if they are an output, the logic level is whatever Vio is set to.

- **Vio** - **THIS IS THE MOST IMPORTANT PIN!** This is the pin that you MUST drive with an external voltage from 3V-5V to set the logic level converter. The converter also buffers the indicator LEDs so NOTHING will appear to work unless this pin is powered! You should set the voltage to whatever voltage your microcontroller uses for logic. A 5V micro (like Arduino) should have it be 5V, a 3V logic micro should set it to 3V.
- **VBAT & GND** - these are the same pins as the 2-pin JST connector. Connect to a 3.7V/4.2V Lipoly/LiIon battery. Do not power from a power supply or LDO. Use only a battery, at least 500mA, 1000mAh+ is best since there can be 2A spikes of current

- **Key** - This is also a super important pin (but not as important as Vio). This is the power on/off indicator. Its also tied to the button in the top left. Tie this pin to ground for 2 seconds to turn the module on or off. It's not a level signal so it isn't like "low is off, high is on" - instead you must pulse it for 2 seconds to turn off/on. The module comes by default off. Tie this permanently to ground if you never want your micro to turn off the FONA for power saving
- **PS** - this is the **P**ower **S**tatus pin. It is low when the module is off and high when the module has power. If you're using the **Key** button or pin, you can monitor this pad to see when the module's booted up. This is tied to the **Pwr** LED too.
- **NS** - this is the **N**etwork **S**tatus pin. It pulses to signal the current status of the module. This is also tied to the **Net** LED so for more detail see the LEDs section below.
- **Reset** - this is module hard reset pin. By default it has a high pull-up (module not in reset). If you absolutely got the module in a bad space, toggle this pin low for 100ms to perform a hard reset.
- **RX & TX** - OK now that I made you read all that you can actually use the UART pins. The module uses UART to send and receive commands and data. These pins are auto-baud so whatever baud rate you send "AT" after reset or boot is the baud rate is used. RX is **into** the module, TX is **out of** the module.
- **RI** - this is the **R**ing **I**ndicator. It is basically the 'interrupt' out pin from the module. It is by default high and will pulse low for 120ms when a call is received. It can also be configured to pulse when an SMS is received.
- **SPK+ and -** : This is for connecting an external 8 ohm speaker, max 1W. You can configure the module to route calls and FM radio to the headset *or* the external audio. The two pins are differential so they don't have output DC blocking capacitors. **You cannot connect this to a stereo, powered speakers or other non-differential amplifier** without adding a 100uF+ blocking cap in series to the + pin and then not using the - pin. Instead, your amp should use GND for the - reference
- **MIC + and -**: this is for connecting an external electret microphone, it will bias the mic with 2V. Most electrets will work just fine. No extra circuitry is required for the mic such as a biaser or amplifier, just wire it up directly!

LEDs

- **PWR** - Blue! Lit when the module is booted and running
- **NET** - Red! You can use this for checking the current state without sending an AT command:
  64ms on, 800ms off - the module is running but hasn't made connection to the cellular network yet
  64ms on, 3 seconds off - the module has made contact with the cellular network and can send/receive voice and SMS
  64ms on, 300ms off - the GPRS data connection you requested is active
  By watching the blinks you can get a visual feedback on whats going on.
- **Charging** - Orange! This is next to the microUSB jack. Indicates the onboard lipo charger is charging
- **Done** - Green! This is next to the JST jack. Indicates that the battery charging is done and the battery is full

Other Breakout Pins

We scattered a few other breakouts around the board.

- **Buzzer and PWM** (Top right) - These are tied to the PWM output of the module! The PWM capability is quite nice, it can set any frequency and duty cycle. The **PWM** pin is directly output from the module and is 0-2.8Vpp. The **Buzzer** output has a NPN drive transistor so it can run a small vibration motor. Bz+ is the VBat voltage, Bz- is toggled on and off to ground.
- **ADC** (left middle) - the SIM800 has an ADC that can read 0-2.8VDC from this pin, referenced to ground. It also has an internal battery ADC so you can use this for a sensor or something. You can query the voltage from the UART. 2.8V max, people!
- **5V** (left middle) - this is the USB 5V from the microUSB connector when its in and powered. Good if you need to know when the microUSB is plugged in and/or want to recharge the battery from an external plug.
- **2.8V test point** - We have a test point for the 2.8V internal regulator, its off to the right.

Obtaining a SIM

In order to use the phone parts of FONA you will need a SIM card. Luckily, there's a phone store in every town in America! You can get a pre-paid **or** post-paid SIM but we kinda like the pre-paid kind.

A 2G Mini SIM card is **required** to use the module. Nearly any cell phone shop can sell you a SIM card. It must be a 2G GSM card. AT&T in the US does not sell these anymore! They are shutting down their GSM network, and only T-mobile sells and supports a GSM network. If you are in another country, chances are you can just ask for a GSM 2G card.

MicroSIMs won't fit - so make sure its a "Mini" SIM. Sometimes these are just called plain "SIM" cards since the huge-size SIMs are rarely used. **Mini SIMs are 1" x 0.6" / 25mm x 15mm**. these are by far the most common size.

The only thing to watch for is you need to have a 2G GSM-compatible SIM

In the US, AT&T no longer sells 2G SIMs! We suggest T-Mobile or T-Mobile "distributors"

If you have an *older* AT&T SIM it *may* work. AT&T announced in 2012 that they would shut down their 2G network January 1, 2017. The vast majority of M2M (machine-to-machine) cellular devices use GSM, so the 5 year lead time was to give people plenty of time to migrate from AT&T.

You can read an interesting whitepaper from Aeris about this below:

https://adafru.it/dEh

https://adafru.it/dEh

T-Mobile & TING

T-Mobile does not have any announcement that they will sunset GSM. We can't speak for them but we expect at least 5 years warning as well, probably they will never fully sunset since there's millions of machines with GSM connectivity.

Adafruit now sells the TING SIM card, a 2G GSM SIM that works great with all FONAs, and has a great billing system as well, where you only pay what you use!

If you don't want to use TING, there are dozens of T-Mobile resellers such as Walmart, SIMPLEMOBILE, etc! Just ask the seller if its AT&T or T-Mobile network. If they get cagey just say your apartment has no AT&T coverage.

You do not need to bring in or show your FONA to the Cell Phone store. Just tell them you need a Mini SIM for a GSM phone and it's at home.

Some suggestions from FONA users!

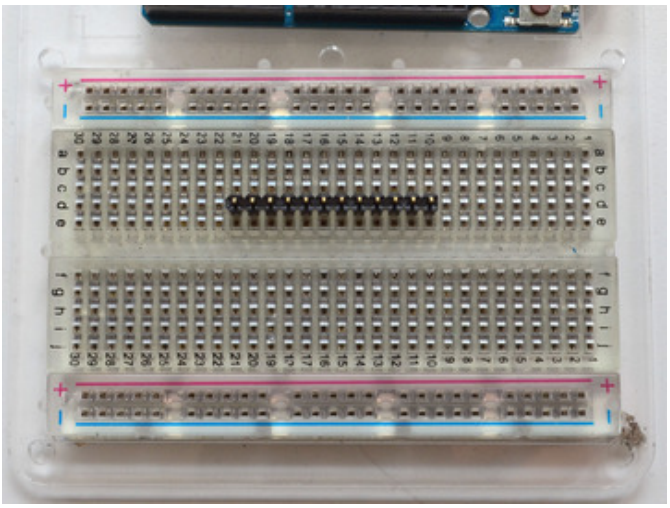
- I've had good luck using the FONA with a SIM from Walmart. Their 'Walmart Family Mobile' is a T-mobile reseller and you can pick up the SIM starter in store pretty easily (https://adafru.it/dEi). The service isn't the cheapest, it's $25 for the SIM and $30/month for unlimited talk+text or $40/month for unlimited talk+text+data but there's no contract as its all prepaid **-tdicola**
- Just want to let the Adafruit team know that it is possible to get pre-paided minutes on T-Mobile and its a pretty good deal. I was paying $100 for 1000 minutes (10c a minute 20 a sms) over the course of the year. (https://adafru.it/dEj) For me it in my usage came out to about $8 a month. Have found this is something that you have to ask for at the store. No evidence in advertising or website **-Paul B.**
- Telna has a good deal you may want to point people to for FONA. I used them for a previous GSM project and they worked great. $20 per year, includes 1000 free txt messages and a bunch of other nice features. (https://adafru.it/dEk)I had a lot more issues with T-Mobile (Their cards go inactive if not used in a month and you have to call to reactivate) **-Tyler C.**
- I pay 2 EUR (a bit less than $3 USD) for 2 hours, unlimited SMS and 50Mb of Data at http://mobile.free.fr/ (https://adafru.it/dEr) **-KTOWN**
- There are specialty "machine 2 machine" SIM sellers that have plans that are tuned for the short bursts of usage used by these kinds of modules. Check out these guys (https://adafru.it/vQA) for example, you can choose data, voice/sms or a combination for a pretty low price!
- Hi, just a update to let you know I have just begun to use the Fona, SIM from ROGERS, which is 2G, 3G, ang 4G. I

pulled my sim out of my phone, and it works well. So if you have Canadians that want to use that product, let them know it works on the west coast ! You can go to Rogers website and see the coverage map and services. - **Steve C**

We haven't tried all of these SIMs so you may need to try it out. For other countries, GSM is very common so you should be able to buy a SIM from any cell phone store.

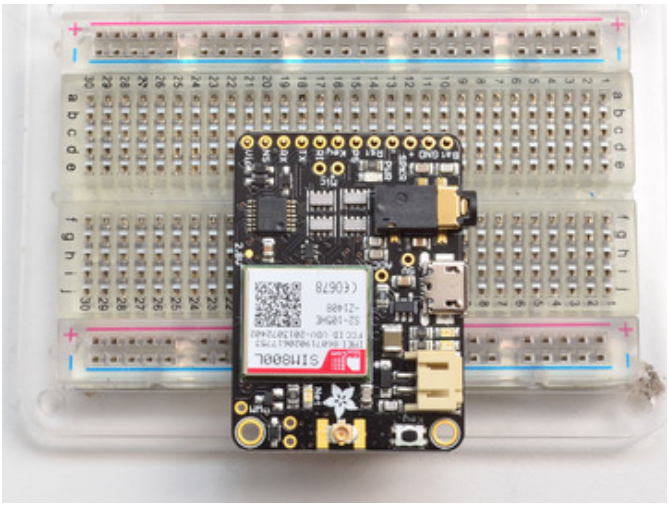
Assembly

Attaching Header



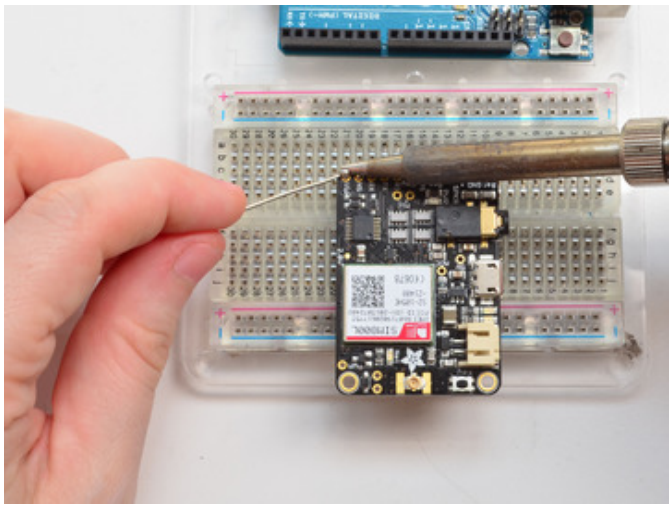
Prepare the header strip:

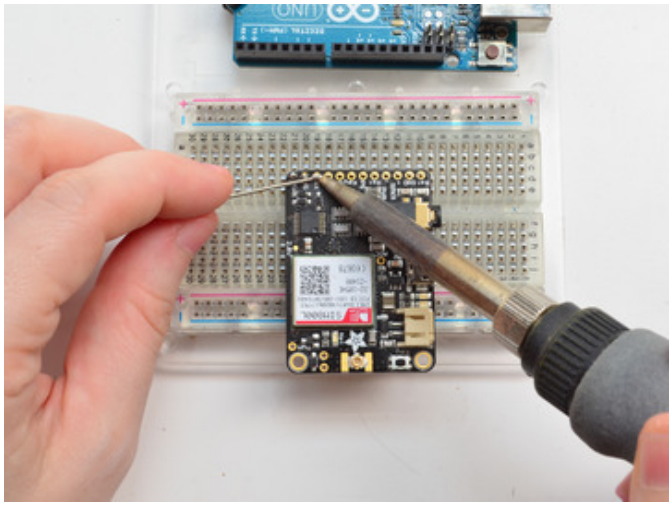
Cut the strip to length if necessary. It will be easier to solder if you insert it into a breadboard - **long pins down**

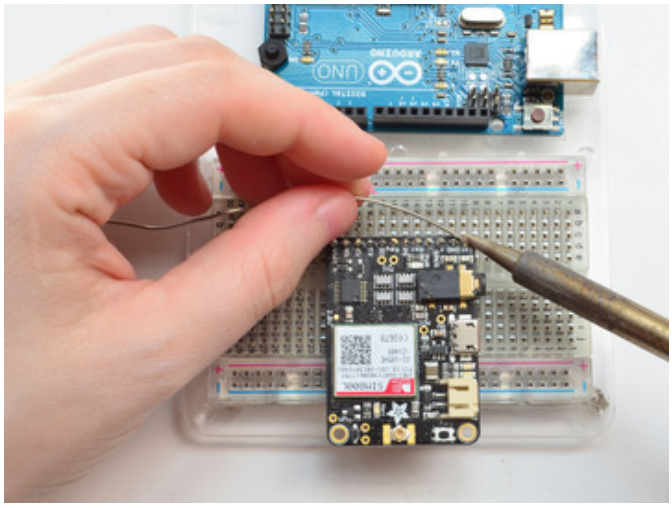


Add the breakout board:

Place the breakout board over the pins so that the short pins poke through the breakout pads







And Solder!

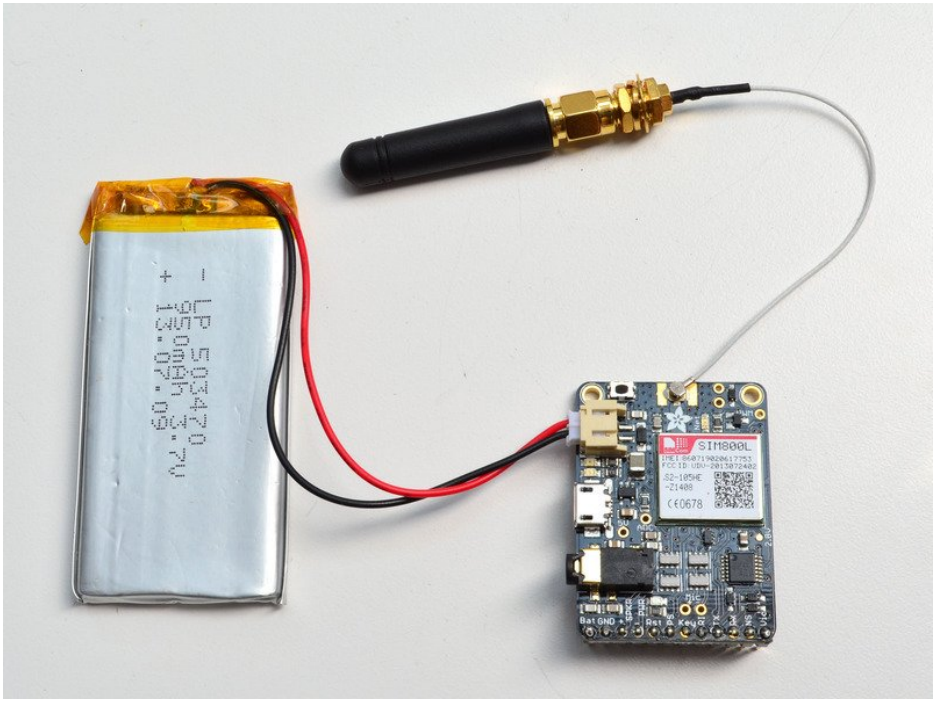
Be sure to solder all pins for reliable electrical contact.

(For tips on soldering, be sure to check out our Guide to Excellent Soldering (https://adafru.it/aTk).

You're done! Check your solder joints visually and continue onto the next steps

Attaching Antenna & Battery

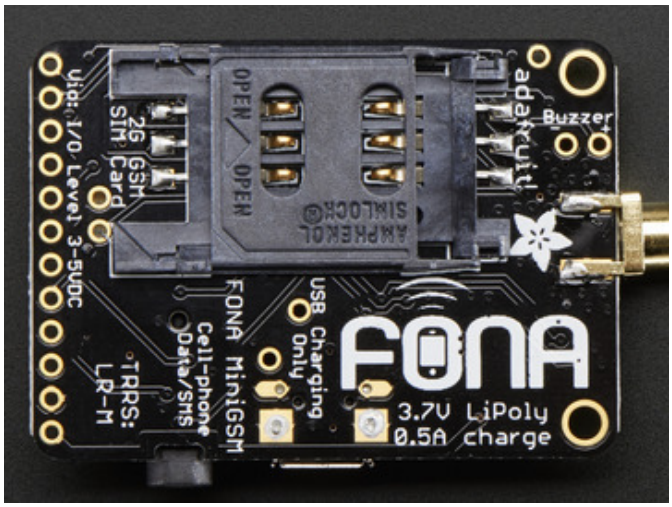
A battery and antenna is required! If you have a uFL FONA, a uFL->SMA cable may be required to connect the antenna. Use any Lipoly or Lilon 3.7V/4.2V battery



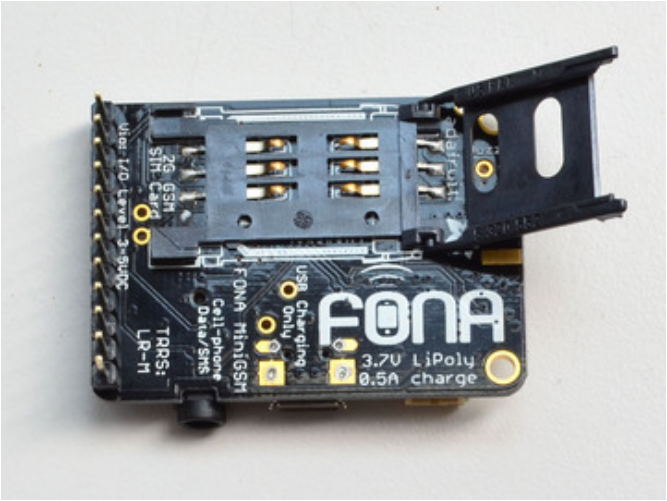
Check polarity for the battery!
Snap the uFL connector on, it will click when placed properly

SIM Card

You **must** insert a SIM card to do anything but the most basic tests. FM radio does work without a SIM but of course you cannot send or receive texts, calls, etc!

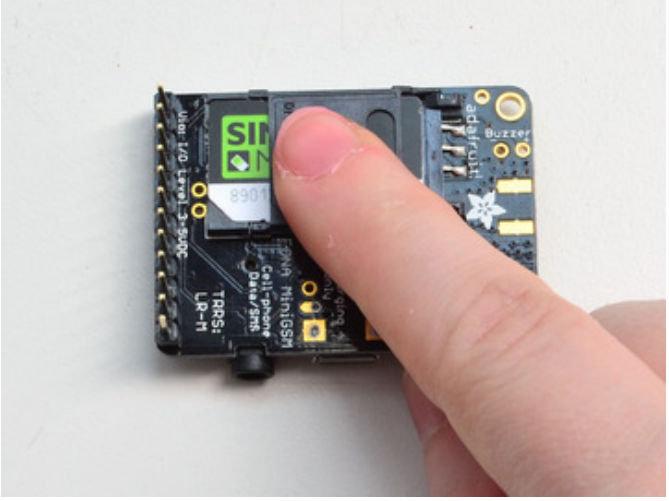


The SIM card holder is on the back. It holds a very-standard "Mini SIM"
Micro SIMs will not work! Make sure you get a "Mini SIM"



Open by sliding the cover towards the antenna

Insert the SIM with the gold pads facing up and the notch on the outer corner



Close the hinge down and slide the cover to lock it in place

Wiring to USB

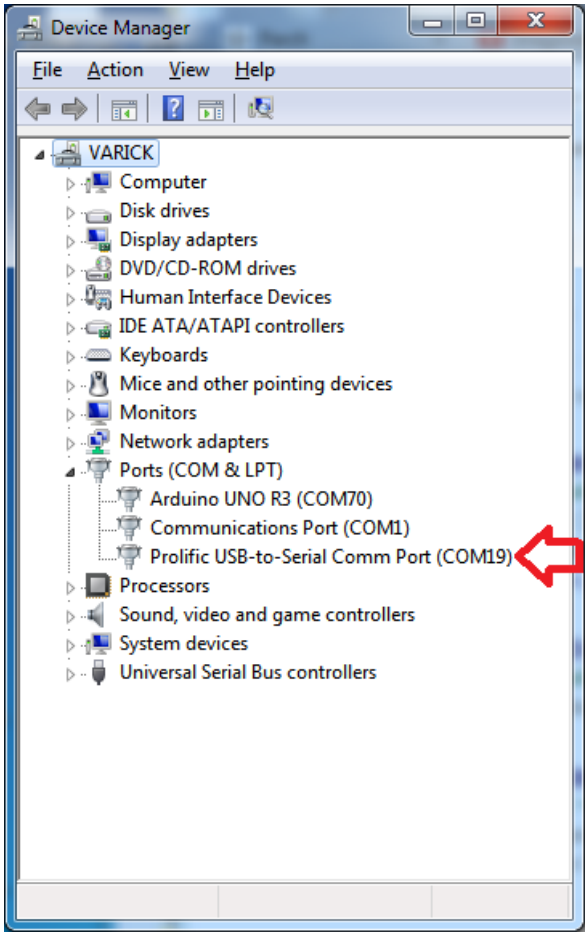
If you have a USB console cable you can wire it up directly and send commands using any Terminal software

For Windows, we suggest Putty (https://adafru.it/aUb)- it's free and open source!

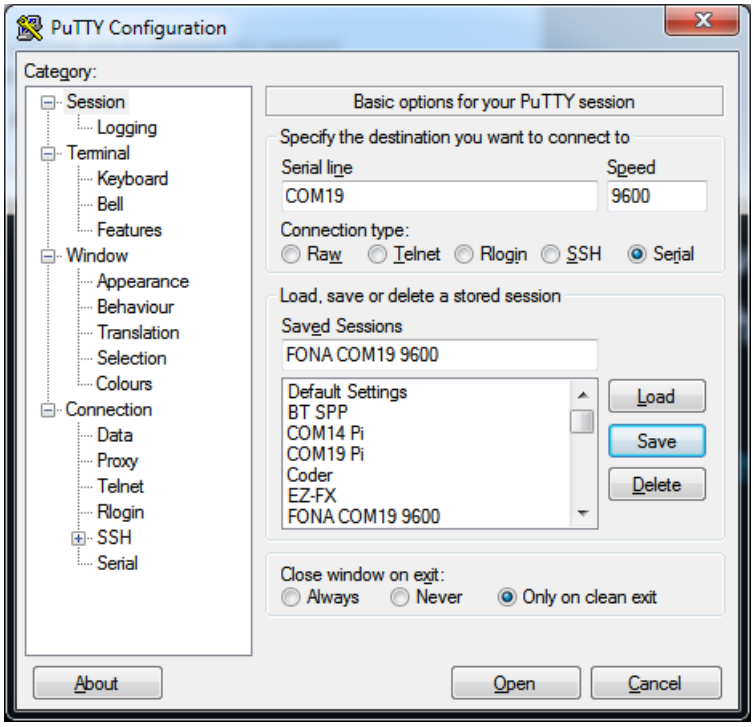
Wire it up

In this example, we're using our USB console cable.

You will have to install the PL2303 driver and determine the COM port before you continue.

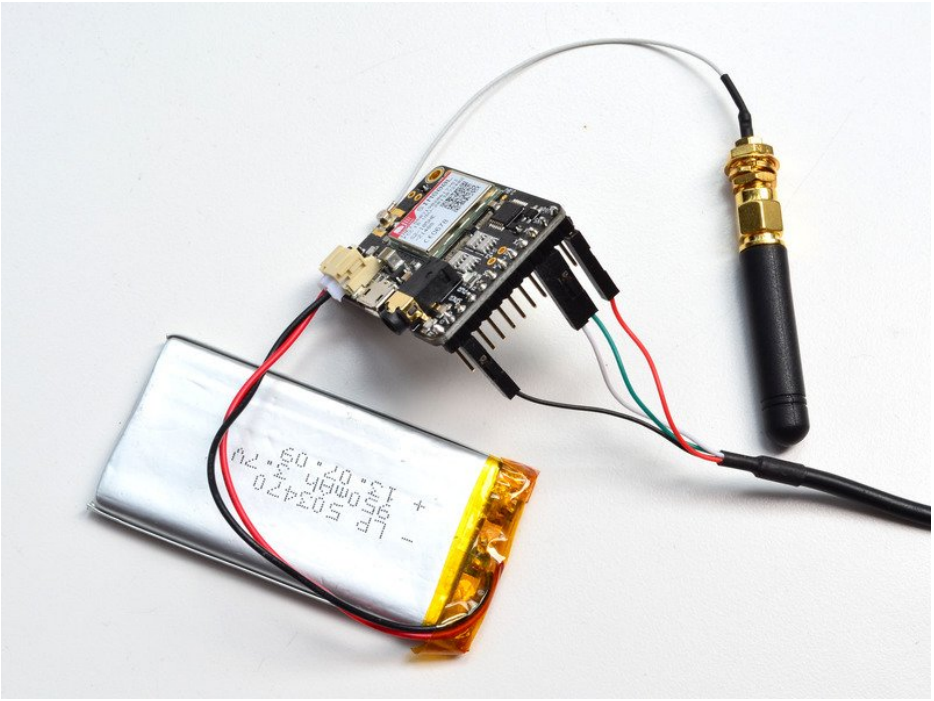


Connect to that COM port at 8N1 (8-bit, no parity bit, 1 stop bit) at 9600 baud. You can actually use any baud rate and it will autodetect but 9600 is supported by any terminal program!



Double Check!

1. You have a Lipoly battery plugged in to the FONA JST
2. You have a working 2G SIM installed in the back
3. Connect **Black** wire to **GND**
4. Connect **White** wire to **TX**
5. Connect **Green** wire to **RX**
6. Connect **Red** wire to **Vio**
7. **You may need to hold down the KEY button for 2 seconds until the PWR LED is lit and the NET LED blinks**



Test Commands

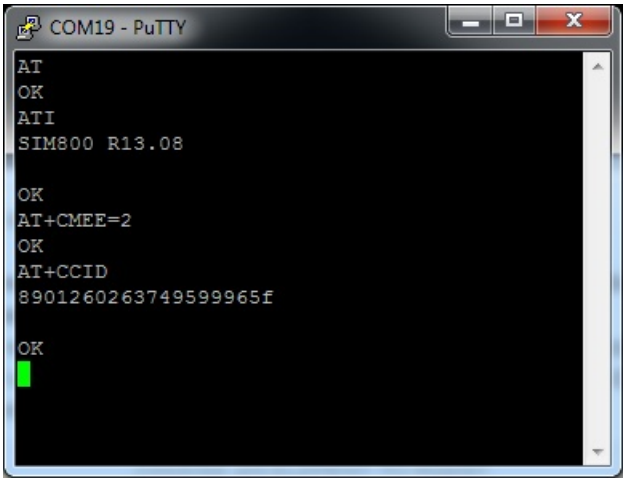
The FONA will *echo* characters back so you can see what you're typing - very handy!

Start by initializing the auto-baud'er by sending **AT** and then return

You may have to try it twice to get it to auto baud. Once it works you should see the **AT** characters echo and then **OK** telling you its OK!

You can then send some commands to query the module and get information about it such as
ATI - Get the module name and revision

AT+CMEE=2 - Turn on verbose errors (handy for when you are trying out commands!)
AT+CCID - get the SIM card number - this tests that the SIM card is found OK and you can verify the number is written on the card

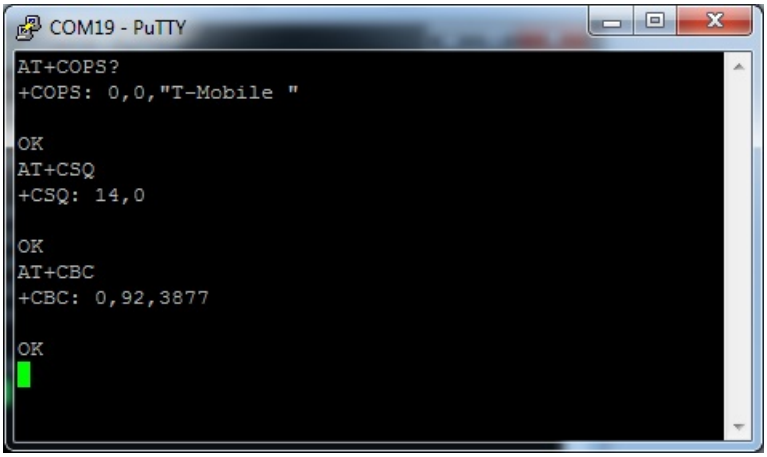


Test Setup

Some tests to verify the setup

- **AT+COPS?** Check that you're connected to the network, in this case T-Mobile
- **AT+CSQ** - Check the 'signal strength' - the first # is dB strength, it should be higher than around 5. Higher is better. Of course it depends on your antenna and location!
- **AT+CBC** - will return the lipo battery state. The second number is the % full (in this case its 92%) and the third number is the actual voltage in mV (in this case, 3.877 V)

If your SIM card is locked with a PIN code, you will need to enter the pin before you can connect to a network via the 'AT+CPIN' command. For example if the pin is 1234 you need to enter 'AT+CPIN=1234".

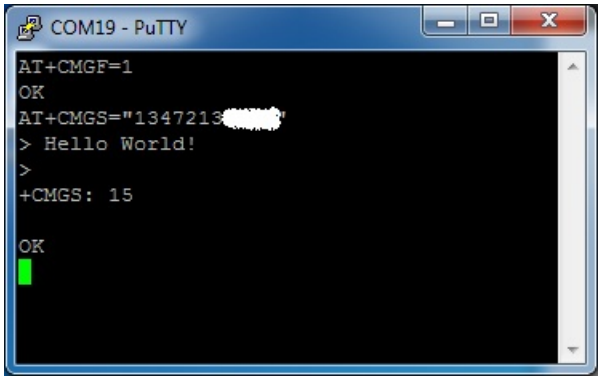


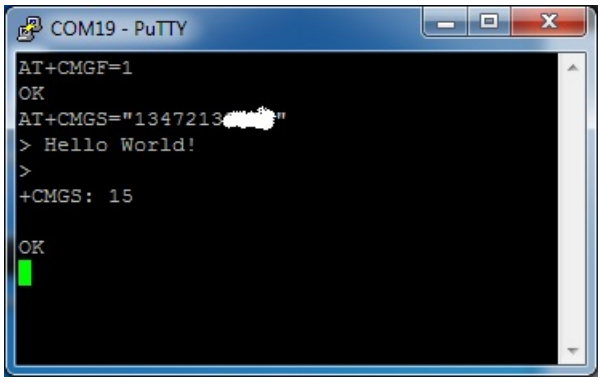
Test Send SMS

Finally, you can try to text your phone! Sending an SMS is pretty darn easy.

- **AT+CMGF=1** - this will set it to TEXT mode not PDU (data) mode. You must do this because otherwise you cannot just type out the message.
- **AT+CMGS="nnnnnn"** - send a text message! You will get a '>' prompt for typing. Type out your message and when you are done send a [Control-Z] on an empty line to send

It may take a few seconds after the Control-Z character for the module to send the SMS (you'll get a +CMGS) and verify it was sent (OK reply)





Test Call

You can also make a phone call, you must have a headset attached to the 4-pole 3.5mm headset connector, with a mic!

To call, dial

- To call, dial **ATD**nnnnn; Don't forget the ; at the end!
- If they pick up you'll hear it in the headset, if no pickup, you'll get a **NO CARRIER** return
- Once you are chatting, you can hang up by sending **ATH**

COM19 - PuTTY
ATD1347213[redacted];
OK
NO CARRIER
ATD1347213[redacted];
OK
ATH
OK

Arduino Wiring

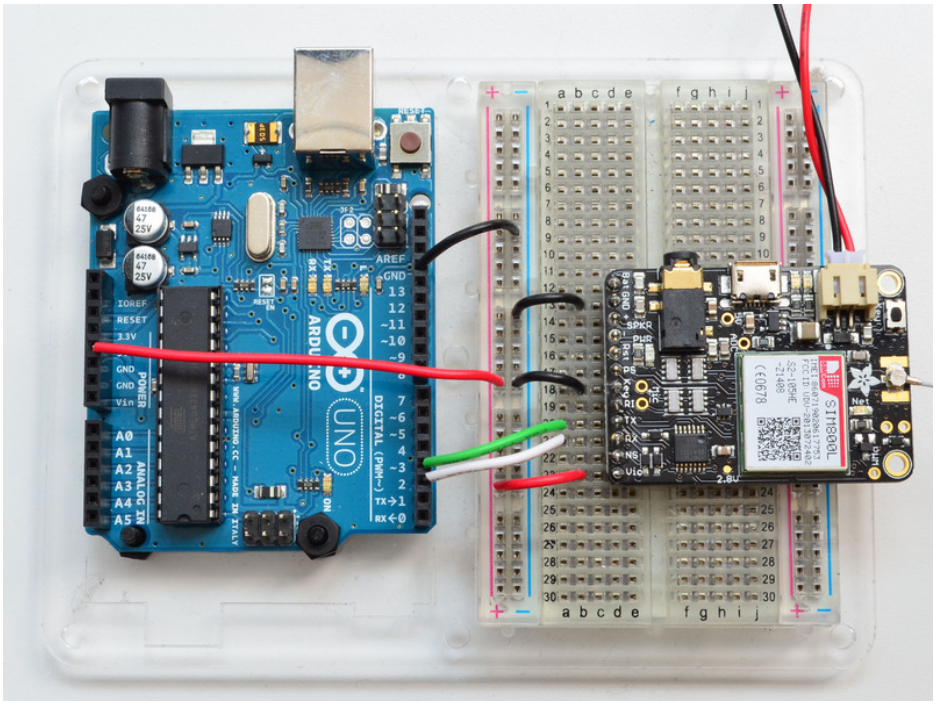
Wire up

After soldering headers to the FONA module, plug it into a breadboard. We'll use an UNO, other Arduinos may be different

- **Vio** connects to **5V (or, with a 3V logic Arduino, 3V)**
- **GND** connects to **GND**
- **Key** connects to **GND** (always on)
- **RX** connects to digital **2**
- **TX** connects to digital **3** (**9** on Leo/Micro, **10** on Mega)
- **RST** connects to digital **4**

We'll be using software serial to talk to the module. The Mega ('2560 based) can't use Digital 3 for FONA TX, so use digital **10** instead. The Leonardo and Micro ('32u4 based) can't use digital 3 for FONA TX, so use digital**9** instead. See this page (https://adafru.it/efC) for other pins you can use for FONA TX (SoftwareSerial Receive) on the Mega, Leonardo, and Micro.

At this time we don't have support for Hardware Serial to talk to the FONA

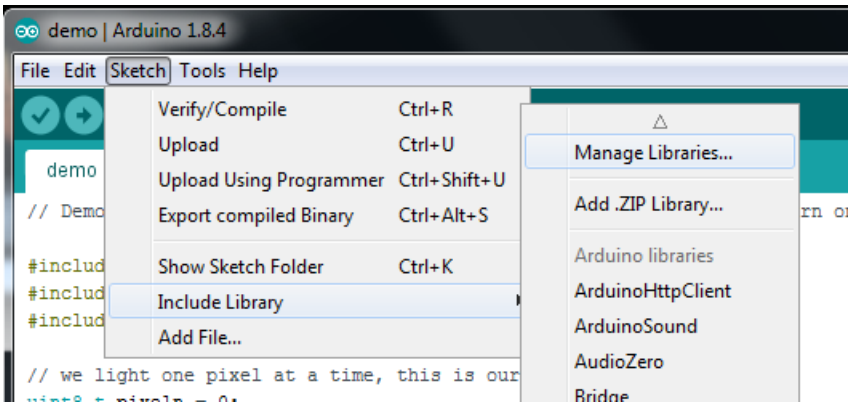


We forgot to add the **#4** to **RST** wire in this image, you'll want to add it though!

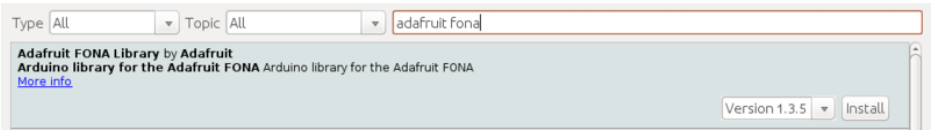
The FONA library is under heavy development! This page may change over time!

Download Adafruit_FONA

Open up the Arduino library manager



Search for the **Adafruit FONA** library and install it



We also have a great tutorial on Arduino library installation at:
http://learn.adafruit.com/adafruit-all-about-arduino-libraries-install-use (https://adafru.it/aYM)

FONA 3G Baud Adjustment

If you have a FONA 3G, the first time you use it you may need to run the **FONA3G_setBaud** example to set the baud rate manually to 4800bps rather than 115200

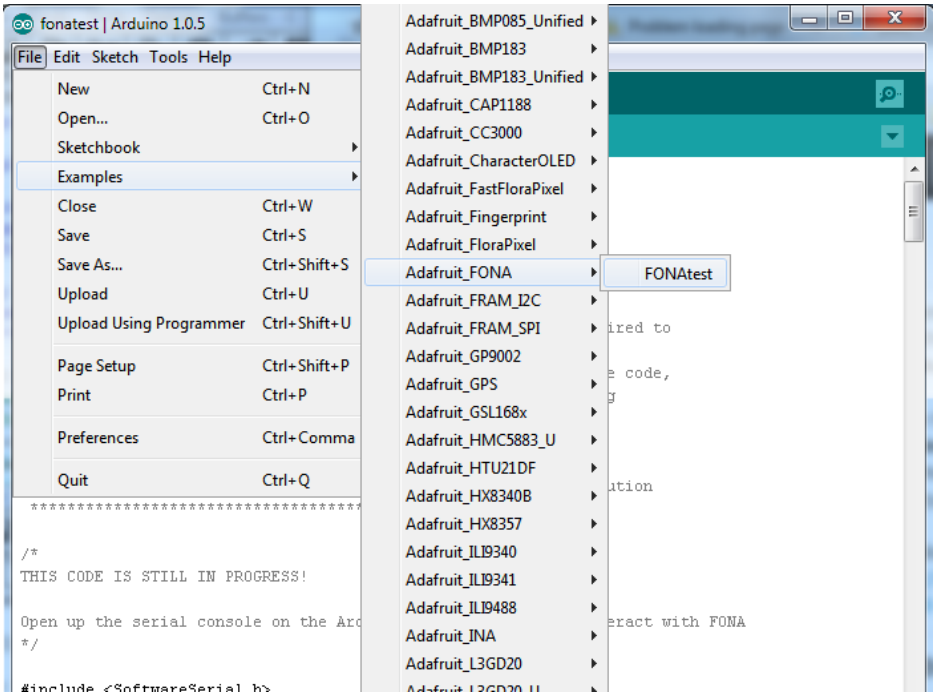
Load Demo

Open up **File->Examples->Adafruit_FONA->FONAtest** and upload to your Arduino wired up to the module.

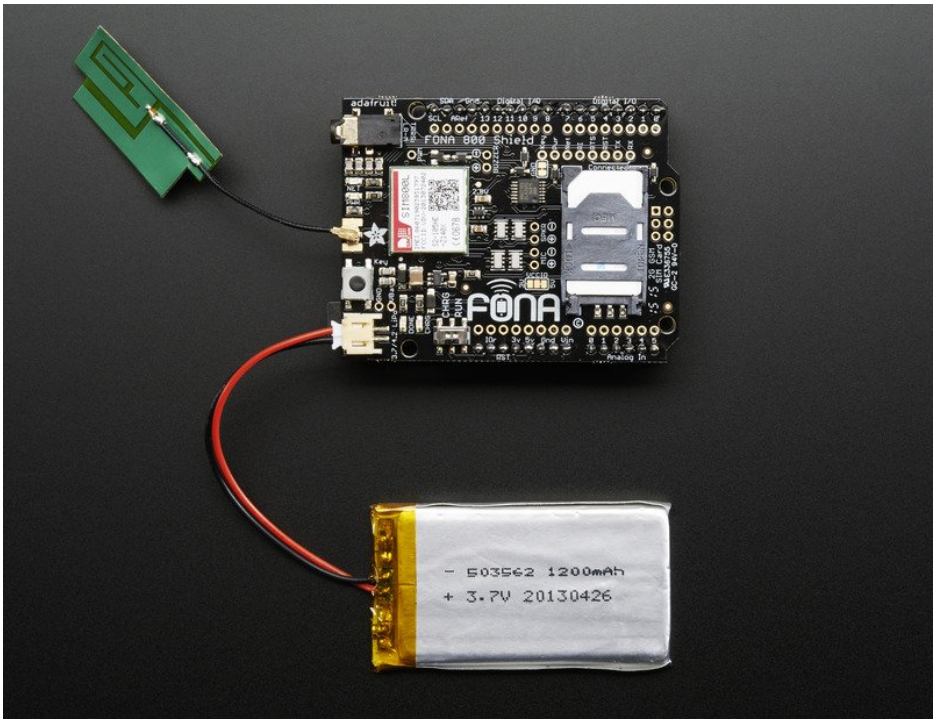
For the FONA 3G, change the constructor used in FONATest to Adafruit_FONA_3G:

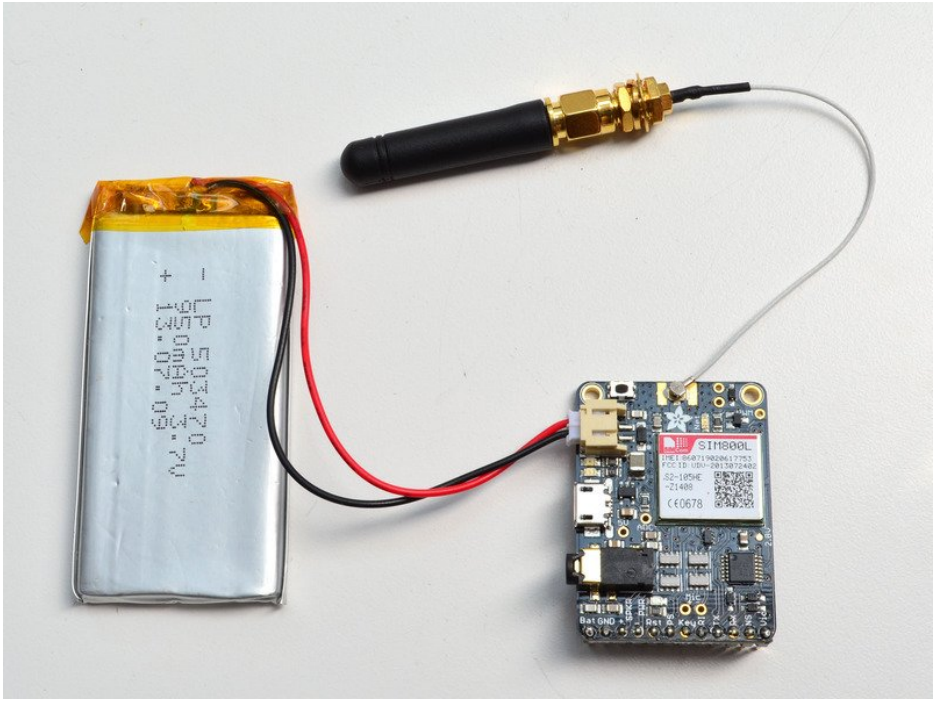
```
// Use this for FONA 800 and 808s
//Adafruit_FONA fona = Adafruit_FONA(FONA_RST);
// Use this one for FONA 3G
Adafruit_FONA_3G fona = Adafruit_FONA_3G(FONA_RST);
```

For Mega, Leonardo, or Micro, change the definition of FONA_TX to the pin you used!

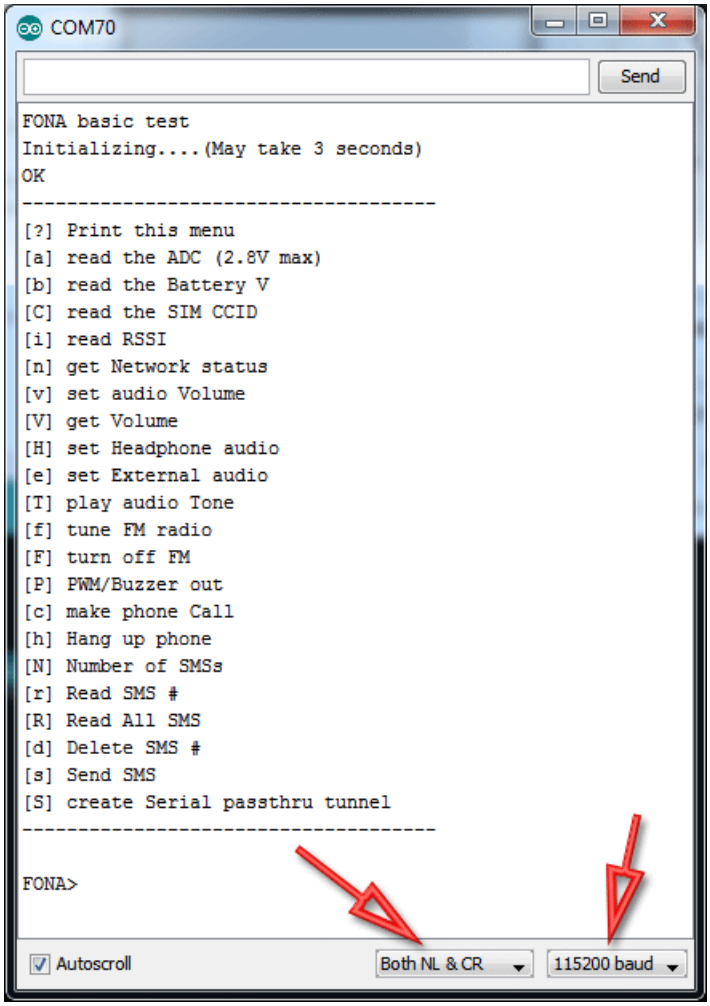


Make sure you have a charged 3.7/4.2V LiPoly or Lilon battery plugged into the JST and an antenna attached





Once uploaded to your Arduino, open up the serial console at **115200 baud speed** to begin the tester sketch



Make sure you also have **Both NL & CR** for the serial command sender option. This means when you send data to the Arduino via the console, it will put a newline/return at the end.

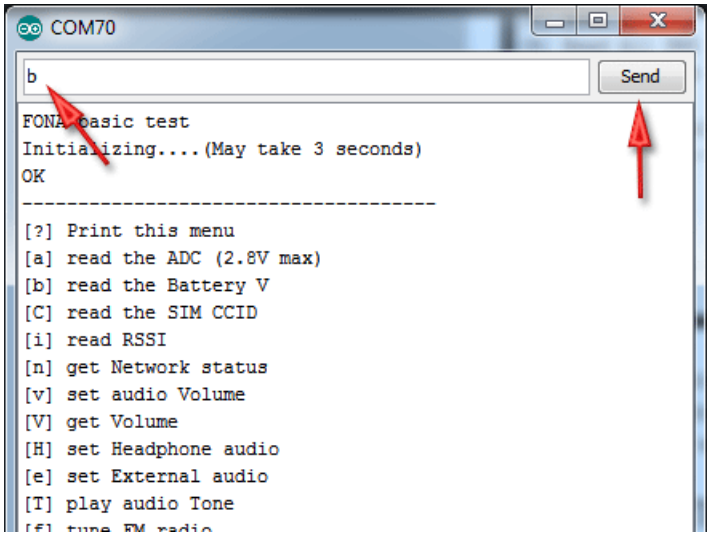
Using the Test Sketch

The test sketch has a menu interface so you can test out just about everything the FONA can do. The menu may change slightly as we add more functionality and update code!

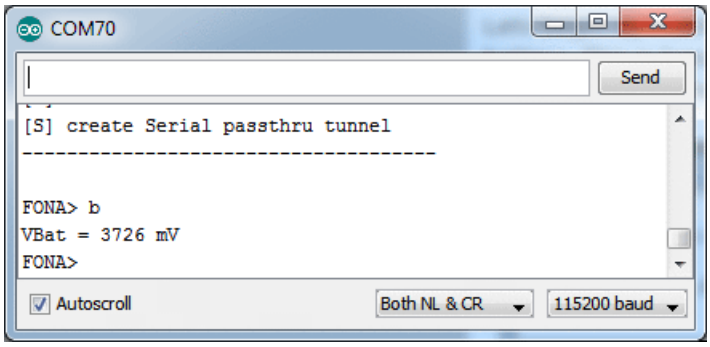
Continue onto the next few sections to see what functionality you can test with the sketch

Battery voltage

Lets begin by reading the battery voltage. That's the lipoly battery. This is handy if you need to track when the battery is low! type **b** into the command window and hit **Send**

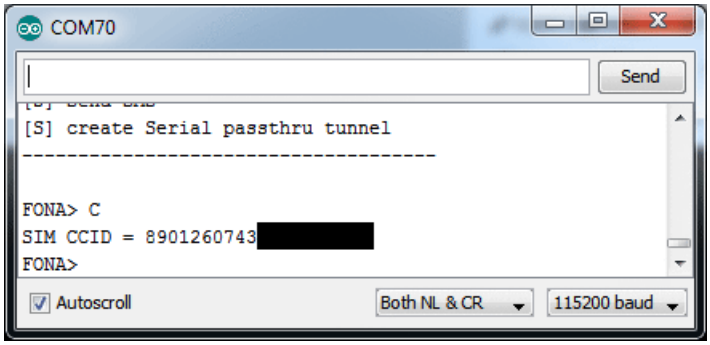


You'll see a print-out of the battery voltage in mV, so in this case its 3.726V



Check SIM CCID

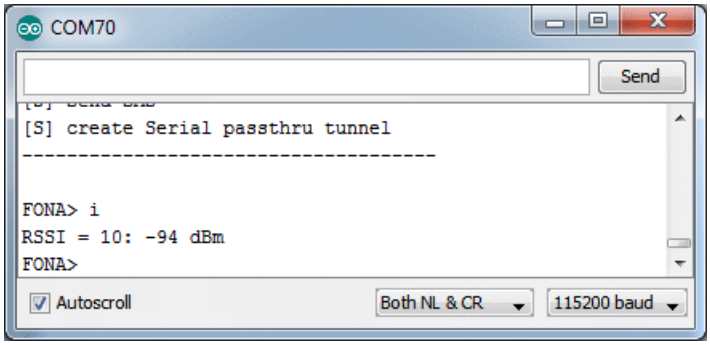
You can verify that the SIM is inserted and correct by reading the CCID, which is the unique identifier printed on it with **C**


COM70
Send
[S] create Serial passthru tunnel
FONA> C
SIM CCID = 8901260743
FONA>
Autoscroll
Both NL & CR
115200 baud

Network Test

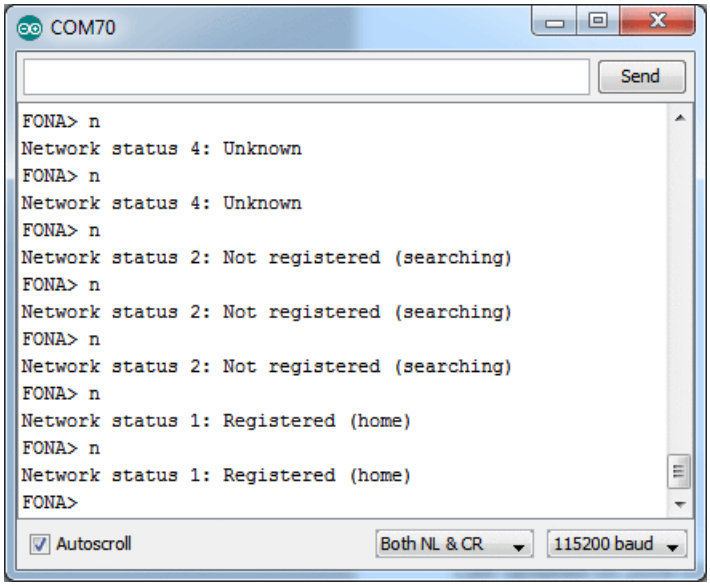
Check RSSI (network signal strength)

You can ask the FONA for the signal strength with the command **i**. The reply is a number, but you can convert it to dBm. Try to have the signal strength higher than 5 in order to make calls, SMSs, etc. In this case, I've got a 10



Checking Network Registration

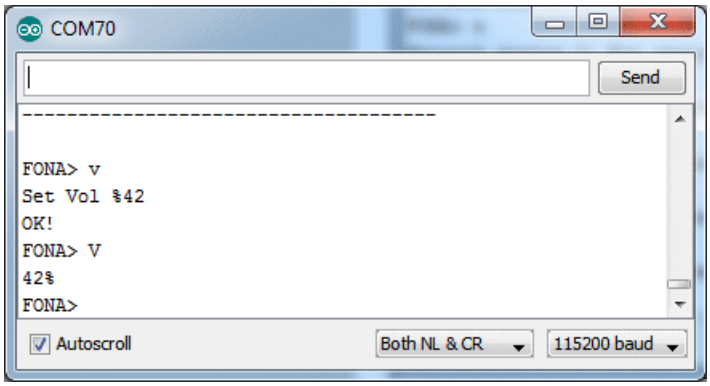
If the FONA has good signal it will immediately try to locate a cell tower and register to it.
You can check the status of the network with **n**
Once it's Home Registered, give it like 5-10 more seconds before trying to access/send SMS's or phone calls.



Audio Settings & Test

Set and Get audio volume

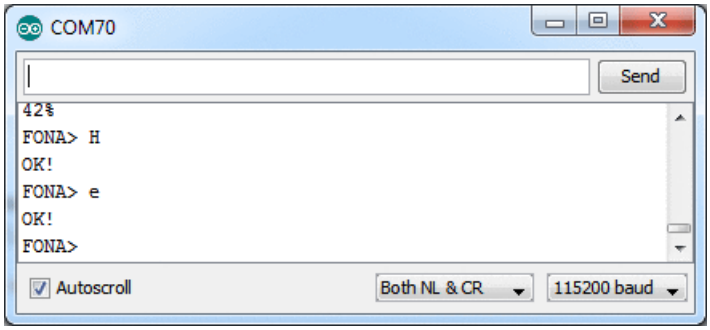
You can set the audio volume with **v** and retrieve it with **V** - its in % so ranges from 0 to 100



Setting Headset or External audio

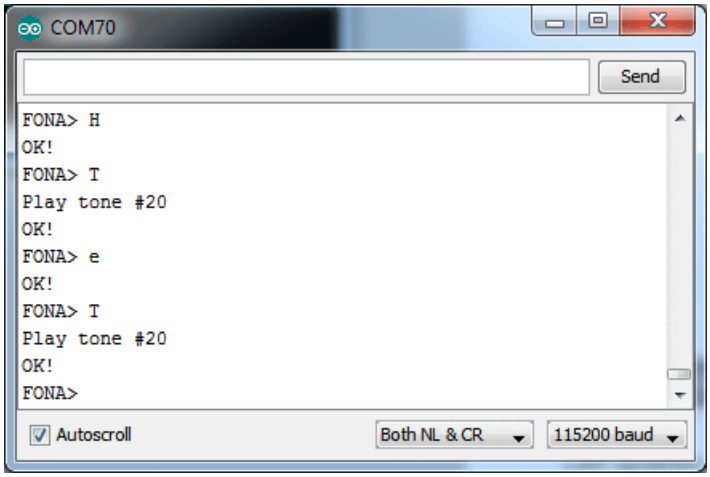
There are two audio paths on the FONA. One is the headset, thru the 3.5mm audio jack. The other is "external" - using the two speaker and mic pins for wiring up external speaker and mic. FM audio, phone calls, tones, etc can be routed to one or the other.
To set the audio to headset, use the command **H**
To set the audio to external, use the command **e**

Note the FONA 808 only has Headset audio, so setting External audio wont do anything. The Feather FONA does not have headphone brought out, so use external only!



Playing Toolkit Tones

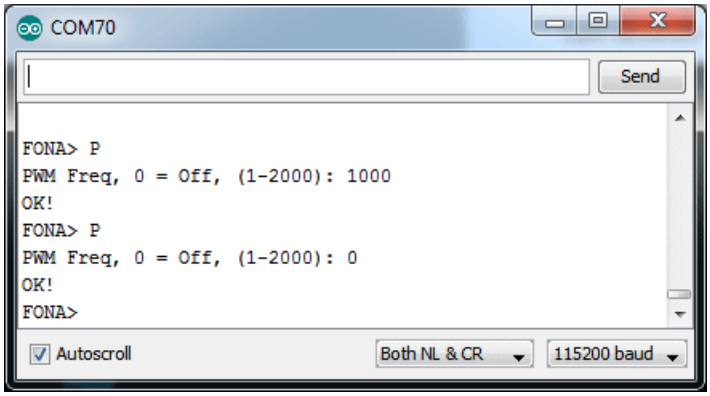
You can test the audio path with the toolkit tones. These are tones that mimic what some phone services sound like. For a full list of tones, you can check the **AT+STTONE** command in the AT command datasheet. We'll use tone #20 which is the American dial tone.
You can switch to headset mode, play a tone, then try it on the external audio mode. This is a very easy way to try out both speakers for debugging


COM70
Send
FONA> H
OK!
FONA> T
Play tone #20
OK!
FONA> e
OK!
FONA> T
Play tone #20
OK!
FONA>
Autoscroll
Both NL & CR
115200 baud

PWM Buzzer is available on the FONA800 and 808 Breakouts and Shields

PWM/Buzzer

There is a single PWM output pin that you can use to control a Piezo or a vibrating motor. The datasheet is a little unclear on how to use it in 'PWM' mode where you have full frequency and duty cycle control. In the mode we're using it, you can set the frequency from 1-2000 Hz and it will have 50% duty cycle. The **PWM** pin is the straight-from-the-module output, 2.8Vpp. The **Buzzer** pins have a PNP driver, so you can use it with a motor buzzer and power from the lipoly battery.

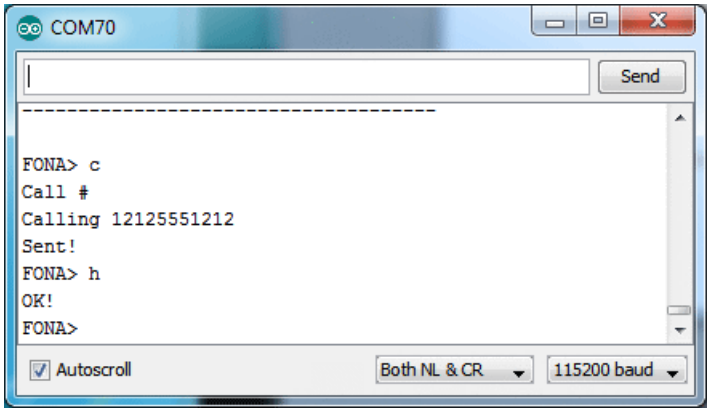


Phone Calls

Make Phone Calls

OK now we're onto the good stuff. You can make a phone call with FONA pretty easily. Make sure you have the right audio interface selected (external or headset!) before you go forward

Make a call with **c** - the call happens in the 'background'. When you're done then you can hang up with **h**

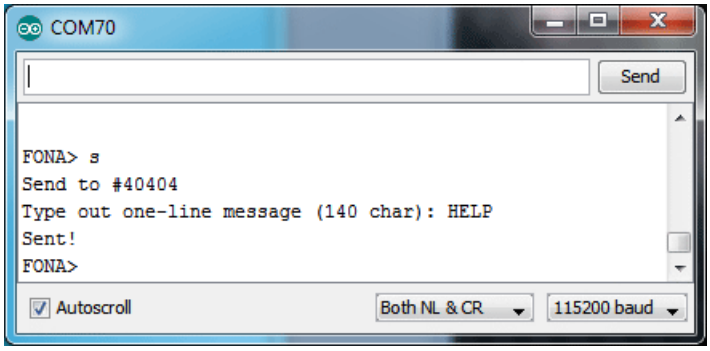


SMS

Send and Read SMS

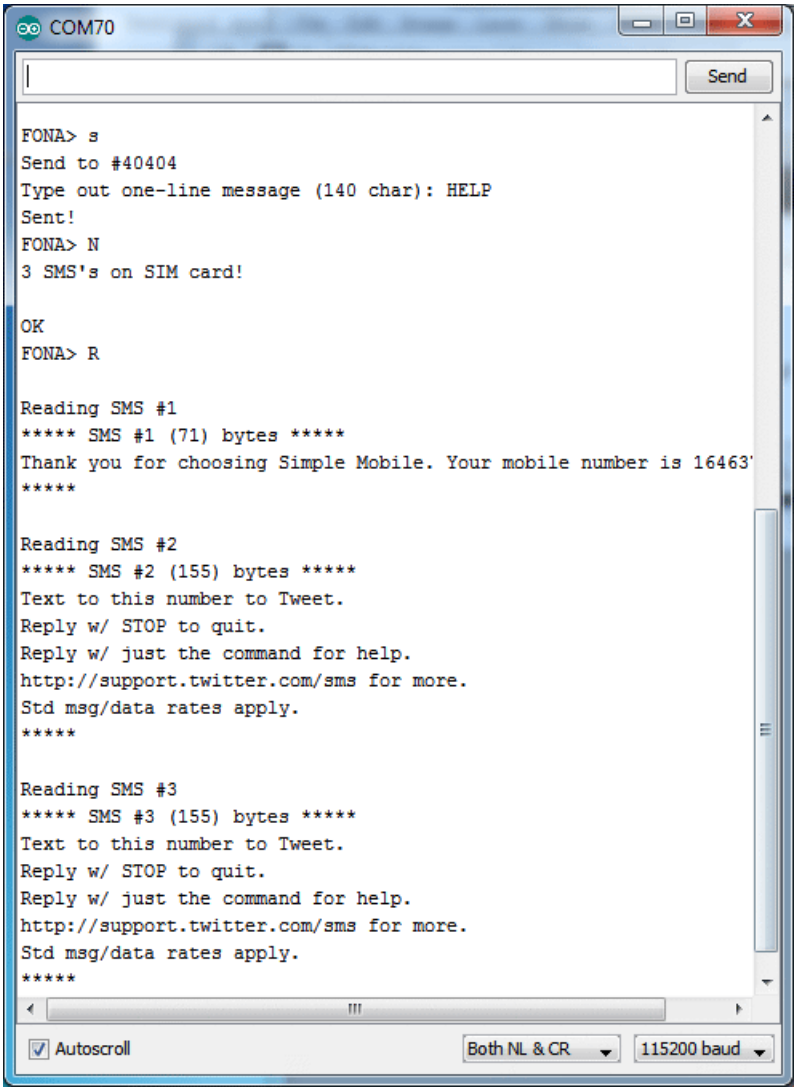
Another easy thing you can do is send and receive SMS messages. Lets start by sending an SMS. We'll use twitter's 40404 short code, which will auto respond, making it easy to verify both sending and receiving

You *can* send multi-line SMS's using the library API but for this example, its easier to parse the data if its a single line!

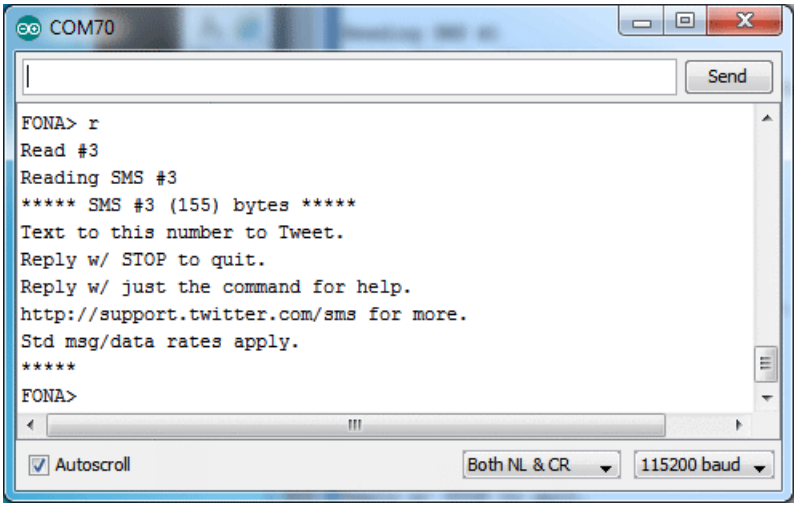


You can then ask the SIM how many SMS's it has with **N** and read all of them with **R**

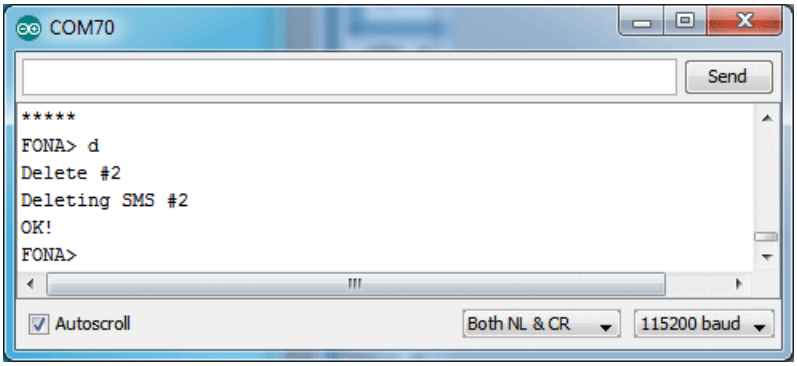
Note that SMS's are referred to by slots but the number does not include empty slots. We'll show this in detail in a bit



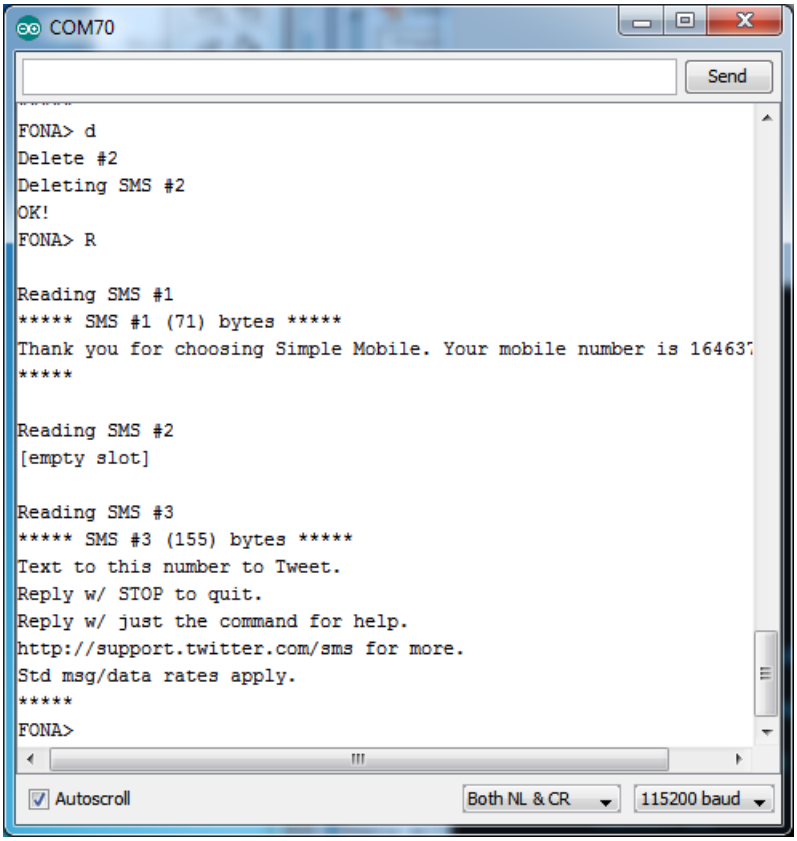
You can read individual SMS's with **r**



And delete SMS's by slot # with **d**



Note that before I deleted SMS #2, so if I read them again, that SMS # will be an empty slot. SMS number #3 doesn't "move slots"!



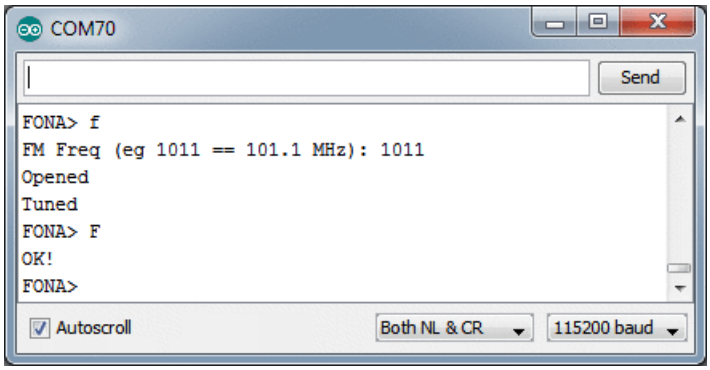
FM radio tuning/listening is only for FONA 800, the FONA 808 and FONA 3G does not contain a tuner

FM Radio (FONA 800 only)

The FONA has an FM receive in it. It uses the headset as the 'antenna' but it works pretty well considering! The FM radio goes thru whatever audio path you have set up

You can open and tune to an FM frequency in units of 100KHz. So if you want to tune to 88.1MHz, type in 881. For 102.3, type in 1023.

Use the **f** command to open and tune, and **F** to close it



Downloads

Datasheets & App notes

- SIM800 Hardware design (https://adafru.it/dBJ) - The 'H differs from the 'L in supporting bluetooth and fax. Otherwise its the same, this is basically the 'datasheet'
- SIM800HL Schematic and PCB Reference Design (https://adafru.it/vQB)
- SIM800 Comm (https://adafru.it/vQC)and Manual (https://adafru.it/vQC) - All the basic commands that the module supports (please note some are not supported by the 800L, such as text to speech or bluetooth)
- SIM800 IP App Note (https://adafru.it/vQD)
- SIM800 TCPIP App Note (https://adafru.it/vQB)
- SIM800 FM Radio details (https://adafru.it/dBL)
- SIM800 IP (FTP & HTTP) support specifics (https://adafru.it/dEw)
- SIM800 E-mail support specifics (https://adafru.it/dEx)
- SIM800 MMS (multimedia message) support specifics (https://adafru.it/dEy)
- SIM800 SSL App Note (https://adafru.it/vQE)
- SIM800 Software Upgrade App Note (https://adafru.it/vQF)
- SIM800 Sleep App Note (https://adafru.it/vRa)
- SIM800 Embedded AT App Note (https://adafru.it/vRb)
- SIM800 Compiling Environments (https://adafru.it/vRc)
- SIM800 Bluetooth App Note (https://adafru.it/vRd)
- SIM800 FS App Note (https://adafru.it/vRe)
- SIM800 GSM Location App Note (https://adafru.it/vRf)
- SIM800 Multiplexer App Note (https://adafru.it/vRA)
- SIM800 NTP App Note (https://adafru.it/vRB)
- SIM800 PCM App Note (https://adafru.it/vRC)
- SIM800 STK App Note (https://adafru.it/vRD)

Reports & Certificates:

- SIM800H GCF I13GC9551_RSE-E Report (https://adafru.it/vQB)
- SIM800H CE Certificate (https://adafru.it/vRE)
- SIM800H CTTL + GCF Test Report (https://adafru.it/vRF)
- I14Z46950-GPM01 Test Report (https://adafru.it/pRB)
- SIM800H PTCRB Test Report (https://adafru.it/vSa)
- SIM800H RoHS Test Report (https://adafru.it/vSb)
- SIM800H REACH Test Report (https://adafru.it/vSc)
- SIM800H GCF I13GC9551 Test Report (https://adafru.it/vSd)
- SIM800H FCC PCB Grant Final (https://adafru.it/vSe)
- SIM800H FCC DSS Grant Final (https://adafru.it/vSf)
- SIM800H CE EMC Test Report (https://adafru.it/vSA)
- SIM800H CE RF-BT Test Report (https://adafru.it/vSB)
- SIM800H CE RF-GSM Test Report (https://adafru.it/vSC)
- SIM800H SAFETY Test Report (https://adafru.it/vSD)
- SIM800H EPL Certificate (https://adafru.it/vSE)
- FCC TCB BT (https://adafru.it/pSB)
- R&TTE Statement of Opinion (https://adafru.it/pSC)
- FCC Part 15B Test Report (https://adafru.it/pSD)
- FCC Part 15C Test Report (https://adafru.it/pSE)
- FCC RF Test Report (https://adafru.it/pSF)

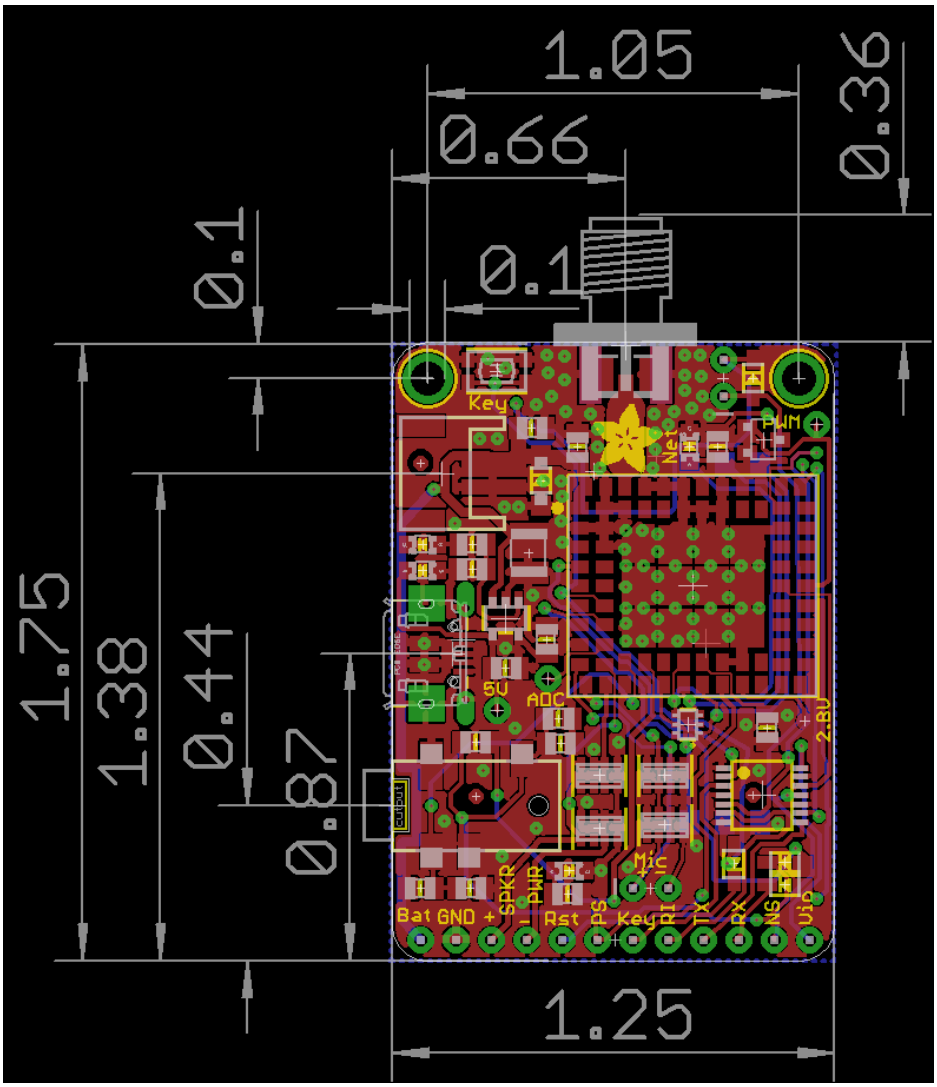
- FCC TCB (https://adafru.it/pTa)

Files

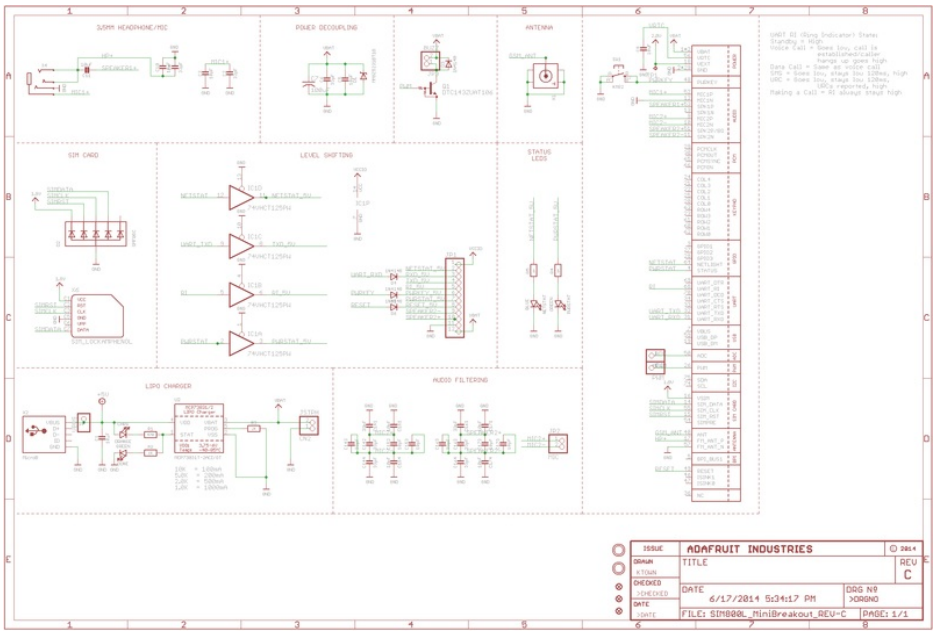
- EagleCAD PCB Files on GitHub (https://adafru.it/ohC)
- Fritzing object in Adafruit Fritzing library (https://adafru.it/aP3)

PCB Print

Dimensions are in inches



Schematic


3.5MM HEADPHONE/MIC
POWER DECOUPLING
ANTENNA
SIM CARD
LEVEL SHIFTING
STATUS LEDS
LIPO CHARGER
AUDIO FILTERING
ADAFRUIT INDUSTRIES
TITLE
REV C
DATE
6/17/2014 5:34:17 PM
FILE: SIM800L_MiniBreakout_REV-C
PAGE: 1/1

Is a Lipo Battery required? Can I run the FONA off of a power supply or just the microUSB port?

The microUSB (on the shield, in CHARGE mode and powered via USB or DC power) is only used to charge the battery. Without a battery installed it will flicker on and off so it cannot be used to power a FONA minus battery.

A 1200mAh+ sized Lithium ion/polymer battery is required, nothing else will be able to easily power the FONA and provide the correct voltage range even during 2 Amp spikes.

I really want to run my FONA without a Lipoly battery!

You can't.

We keep getting people who ask "Hey I know its a requirement but I want to build a buck/boost/linear 3.8V regulator and it wil be OK because I said so" and then they realize it doesn't work well

The FONA design depends on a Lipoly battery. **The battery is not optional. The battery is essential to function. If you do not want a Lipoly battery you will have to use a different cellular module design. All of our FONAs require, depend and will not work without a Lipoly battery**

You can keep the battery topped up with an external 5V power supply for long term usage but **the battery is still required even if plugged into USB**

Ahh! My FONA was working fine then I sent it some command and its not working right anymore?

You can always factory reset the FONA by sending it the

ATZ

command. Say with **fona.println("ATZ")** or using a USB console cable to send commands. If you set an odd fixed baud rate (e.g. you cannot even get an **OK** when you send **AT**), a USB serial console cable will be helpful it quickly changing baud rates in your terminal software to get back to a working AT/OK setup!

I'm using FONA as a voice caller and the other person can't hear me!

Note that you do have to use a compatible headset. Not all CTIA headsets will work, the ones we have in the shop are known to work and so do many other Android but iPhone headsets do not.

You can also use 'external' audio on the FONA (electret mic and speaker soldered to FONA) but **you cannot mix and match**. Either you use headset or you use external audio. You cant use external mic and headset speaker.

You also have to tell the FONA which audio you are using, it does not autodetect. You can use our library and fona.setAudio()

My FONA doesn't work with Arduino Due/ADK/101/Galileo/STM32....

Right now we only know that the FONA library and shields work with Arduino UNO. Any other platforms may require porting work

Can I charge the battery and use FONA at the same time?

Yes! You can use the Lipoly as sort of a 'backup battery' - keep charging it via MicroUSB (on the shield, in CHARGE mode and powered via USB or DC power) during use. If the MicroUSB loses power, the FONA will keep going.

My FONA won't turn on/respond! Or it acts flakey and auto-shuts off sometimes!

We've noticed a lot of problems that are 'weird' that are a results of using batteries with the wrong polarity.

All batteries from adafruit have the right wire colors/polarity for the FONA

Batteries not from Adafruit are not guaranteed to have the right pinout! Using the wrong pinout may damage the FONA and/or make it act 'odd'!

FONA 800/808 requires a 2G SIM, does it work with a dual 2G-3G SIM?

That will work fine, as long as the SIM can register to the 2G network at all, it is acceptable to use

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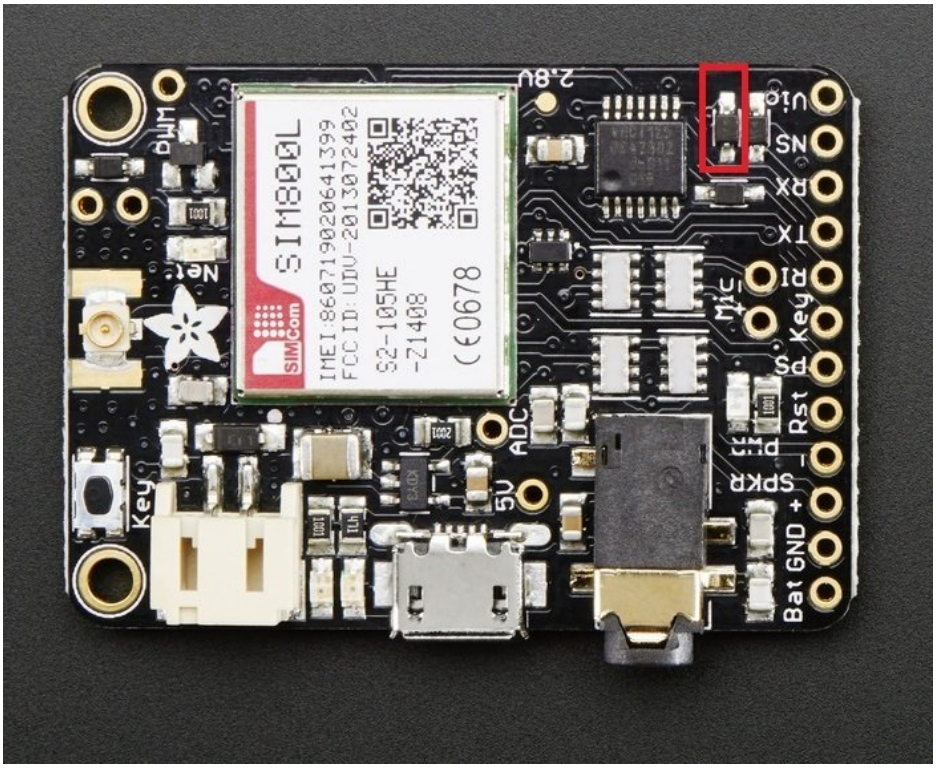
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Mic
Key
Sd
Rst
SPKR
Bat GND +
ADC
5V
Key
PWM

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5V
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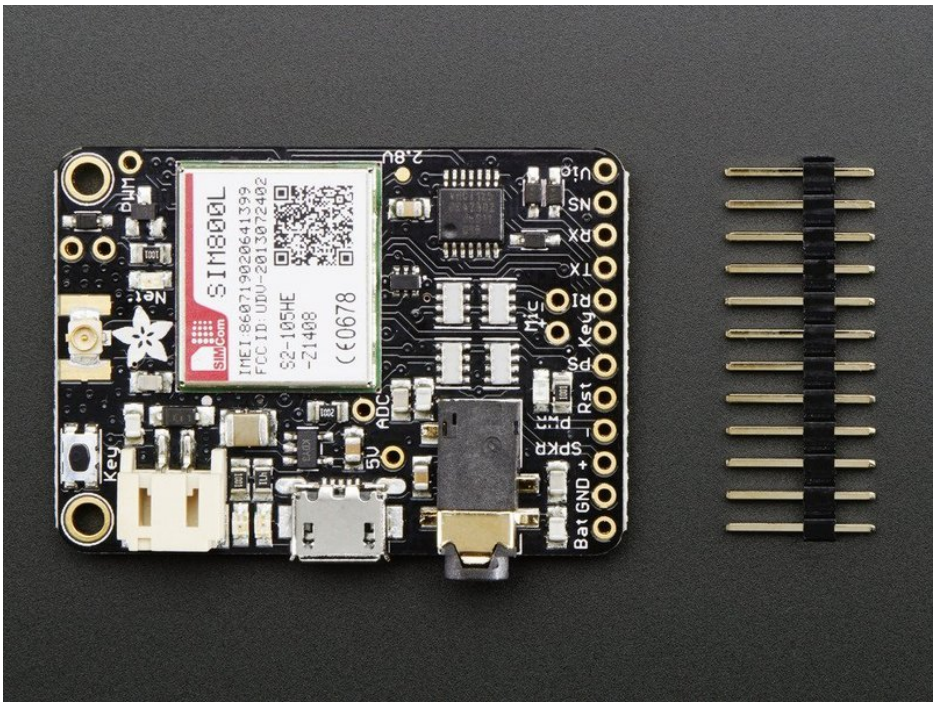
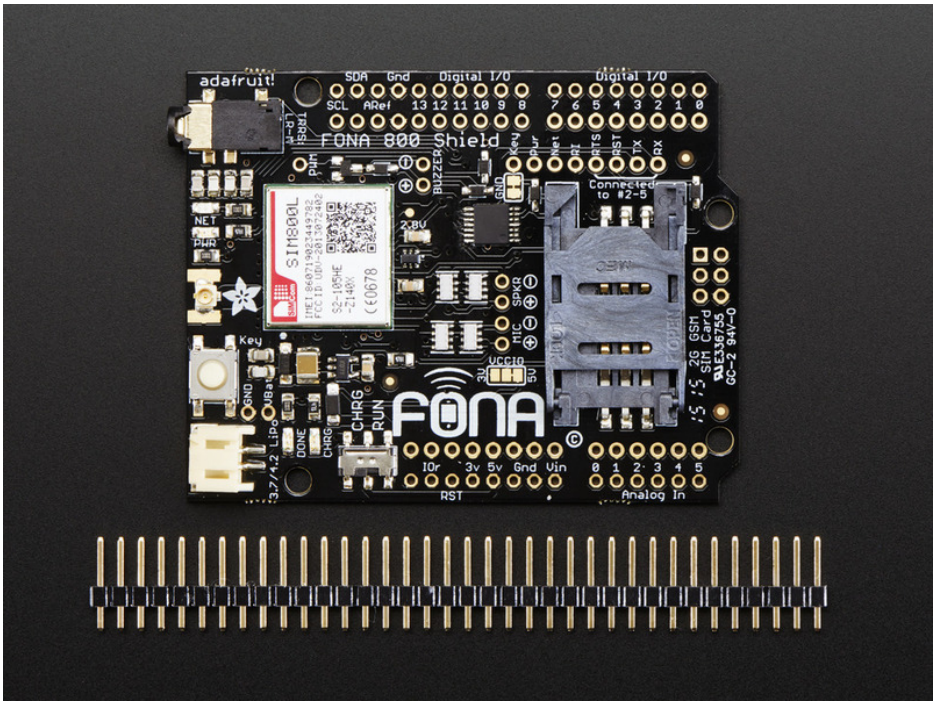
Vio
Rst
RX
TX
RTS
Key
RI
PStat
NS
+Mic-
+SPKR-

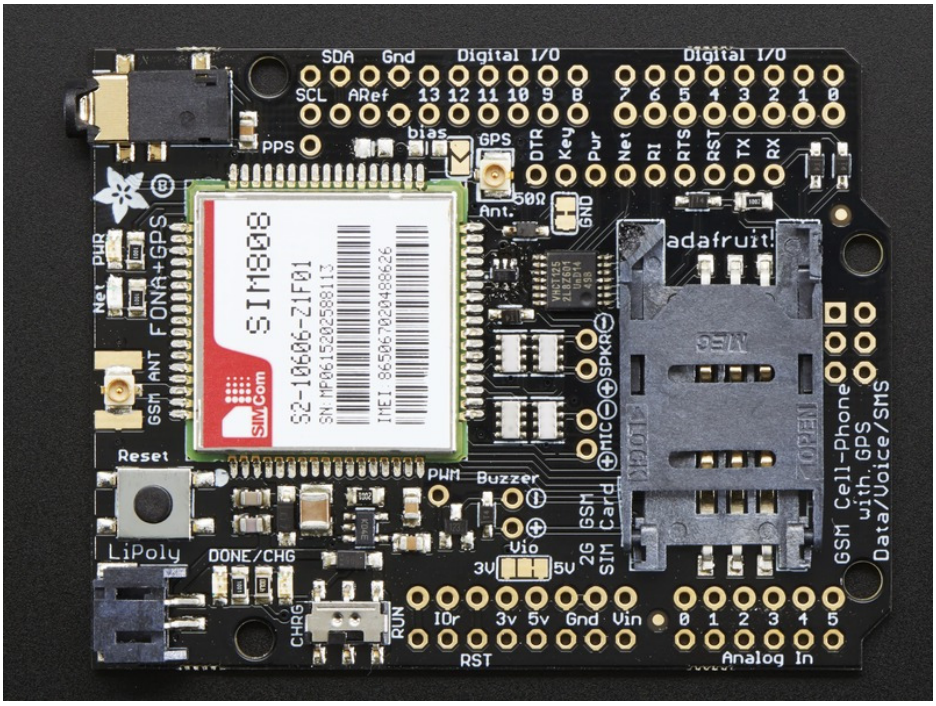
FONA 808 vs FONA 800

We have two different types of GSM modules & shields under the FONA brand name. The FONA 800 (GSM/GPRS)





and the FONA 808 (GSM/GPRS + GPS too)



Here's the key similarities

- Both have a 2G GSM/GPRS cellular core
- Both can do voice, data, text
- Both require a LiPoly battery and GSM antenna
- Both can use a 3.5mm headset
- Both recharge over the microUSB jack
- Both have a buzzer driver

Here's key differences

- Size: the SIM808 based FONA breakout is larger. Shields are the same size
- The 808 has a GPS module integrated as well
- The 800 has external 8 ohm speaker driver (external audio) whereas the 808 has only headset audio and 32 ohm speaker driver
- The 800 has an FM tuner for listening to radio

Handy Commands

Here's a quick list of useful commands that may not be directly supported by the library but are handy for many projects!

RI on SMS receipt

`AT+CFGRI=1`

The RI pin will pulse low for ~100ms when an SMS is received

Factory Reset

`ATZ`

will reset the FONA GSM module to its factory default

Bluetooth commands

Here's a thread if you're interested in the BT support in the SIM800H(https://adafru.it/rva) (there's no antenna for BT in the SIM800 breakout but it is in the FONA feather)

F.A.Q.s

Is a Lipo Battery required? Can I run the FONA off of a power supply or just the microUSB port?

The microUSB (on the shield, in CHARGE mode and powered via USB or DC power) is only used to charge the battery. Without a battery installed it will flicker on and off so it cannot be used to power a FONA minus battery.

A 1200mAh+ sized Lithium ion/polymer battery is required, nothing else will be able to easily power the FONA and provide the correct voltage range even during 2 Amp spikes.

I really want to run my FONA without a Lipoly battery!

You can't.

We keep getting people who ask "Hey I know its a requirement but I want to build a buck/boost/linear 3.8V regulator and it wil be OK because I said so" and then they realize it doesn't work well

The FONA design depends on a Lipoly battery. **The battery is not optional. The battery is essential to function. If you do not want a Lipoly battery you will have to use a different cellular module design. All of our FONAs require, depend and will not work without a Lipoly battery**

You can keep the battery topped up with an external 5V power supply for long term usage but **the battery is still required even if plugged into USB**

Ahh! My FONA was working fine then I sent it some command and its not working right anymore?

You can always factory reset the FONA by sending it the

ATZ

command. Say with **fona.println("ATZ")** or using a USB console cable to send commands. If you set an odd fixed baud rate (e.g. you cannot even get an **OK** when you send **AT**), a USB serial console cable will be helpful it quickly changing baud rates in your terminal software to get back to a working AT/OK setup!

I'm using FONA as a voice caller and the other person can't hear me!

Note that you do have to use a compatible headset. Not all CTIA headsets will work, the ones we have in the shop are known to work and so do many other Android but iPhone headsets do not.

You can also use 'external' audio on the FONA (electret mic and speaker soldered to FONA) but **you cannot mix and match**. Either you use headset or you use external audio. You cant use external mic and headset speaker.

You also have to tell the FONA which audio you are using, it does not autodetect. You can use our library and fona.setAudio()

My FONA doesn't work with Arduino Due/ADK/101/Galileo/STM32....

Right now we only know that the FONA library and shields work with Arduino UNO. Any other platforms may require porting work

Can I charge the battery and use FONA at the same time?

Yes! You can use the Lipoly as sort of a 'backup battery' - keep charging it via MicroUSB (on the shield, in CHARGE mode and powered via USB or DC power) during use. If the MicroUSB loses power, the FONA will keep going.

My FONA won't turn on/respond! Or it acts flakey and auto-shuts off sometimes!

We've noticed a lot of problems that are 'weird' that are a results of using batteries with the wrong polarity.

All batteries from adafruit have the right wire colors/polarity for the FONA

Batteries not from Adafruit are not guaranteed to have the right pinout! Using the wrong pinout may damage the FONA and/or make it act 'odd'!

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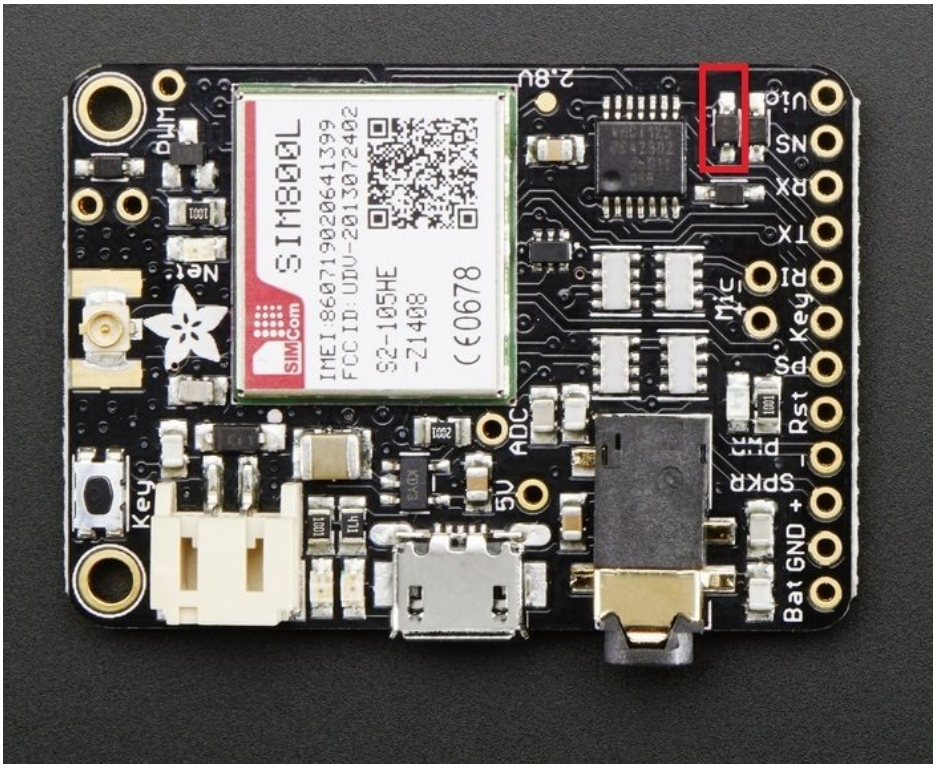
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2.8V
Vio
SNS
RX
TX
RI
Mic
Key
Sd
Rst
SPKR
Bat GND +
ADC
5V
Key
PWM
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GPS ANT
ADC
2.8V
5V BatGND Vio Rst RX TX RTS Key RI PStat NS +Mic- +SPKR-