Introduction to Arduino

Week 3

Questions on last week?

Hardware Pins in More detail

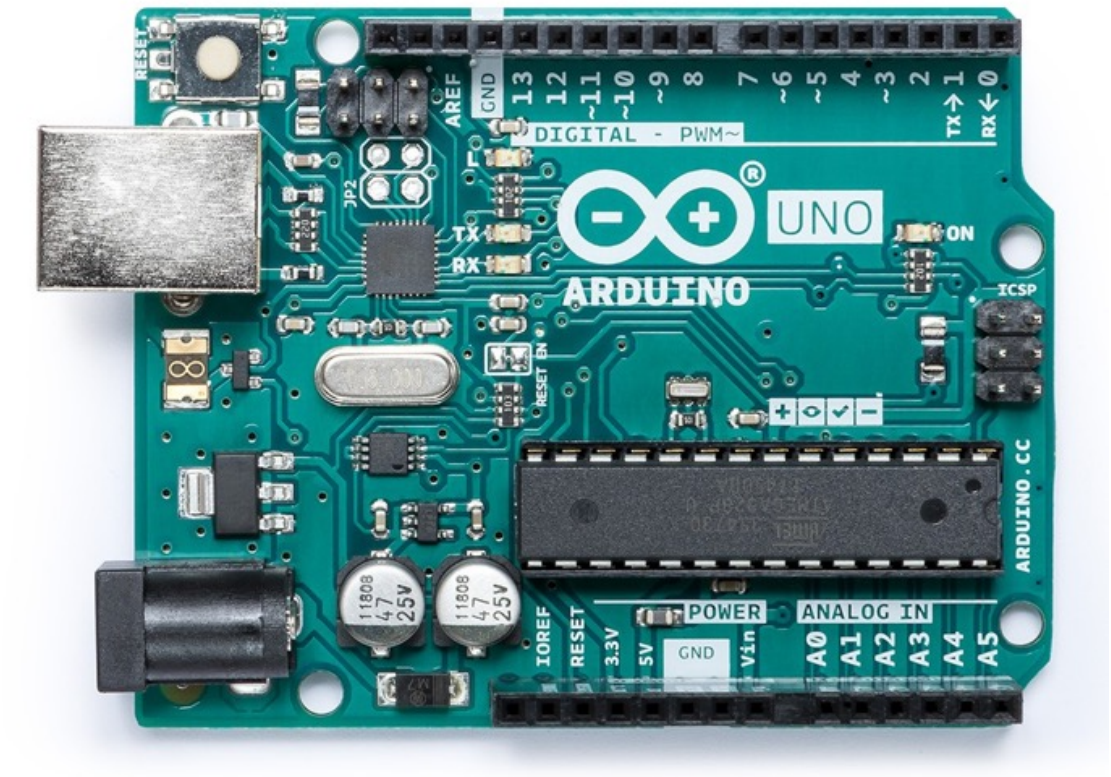
- Digital I/O
- Digital PWM
- Analog I/O
- Aref
- ISCP

Hardware Control

- The Arduino has a set of I/O pins that can be used to control other devices
- There are shields that can plug in on top of the Arduino

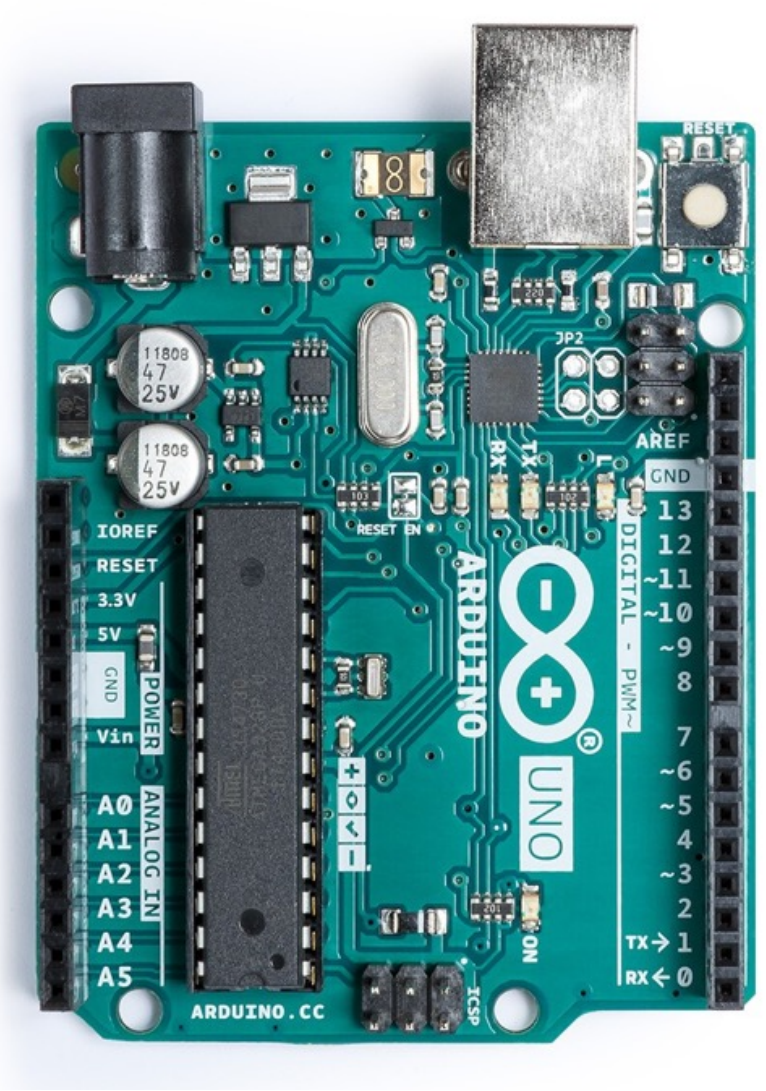
I/O PINS - 1

- 0 Rx Serial Receive
- 1 Tx Serial Transmit
- 2 Digital I/O
- 3 Digital I/O (PWM)
- 4 Digital I/O
- 5 Digital I/O (PWM)
- 6 Digital I/O (PWM)
- 7 Digital I/O
- 8 Digital I/O
- 9 Digital I/O (PWM)
- 10 Digital I/O (PWM)
- 11 Digital I/O (PWM)
- 12 Digital I/O
- 13 Digital I/O
- GND Ground
- Aref Analog Reference

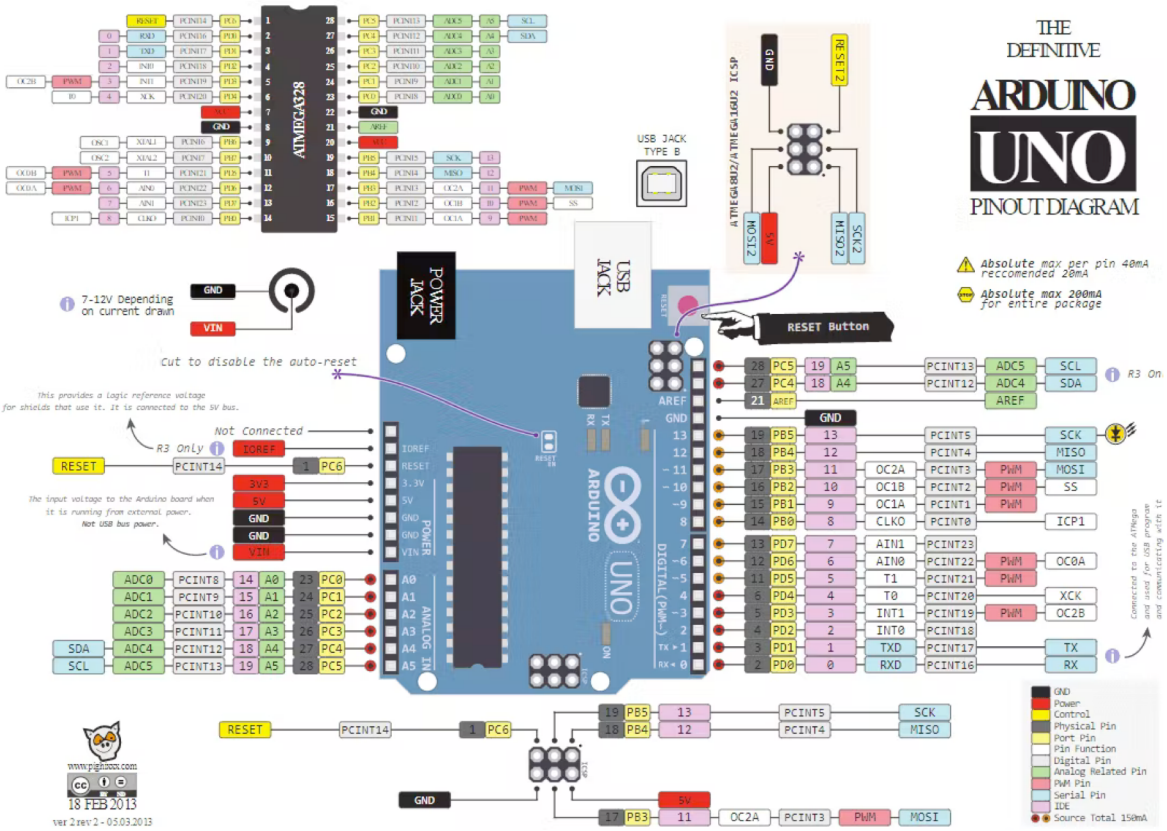


I/O Pins - 2

- A5 Analog 5
- A4 Analog 4
- A3 Analog 3
- A2 Analog 2
- A1 Analog 1
- A0 Analog 0
- Vin V in (7-12 volts)
- GND Ground
- GND Ground
- 5v Regulated 5 volts
- 3.3v Regulated 3.3 volts
- Reset Reset Arduino
- IOREF



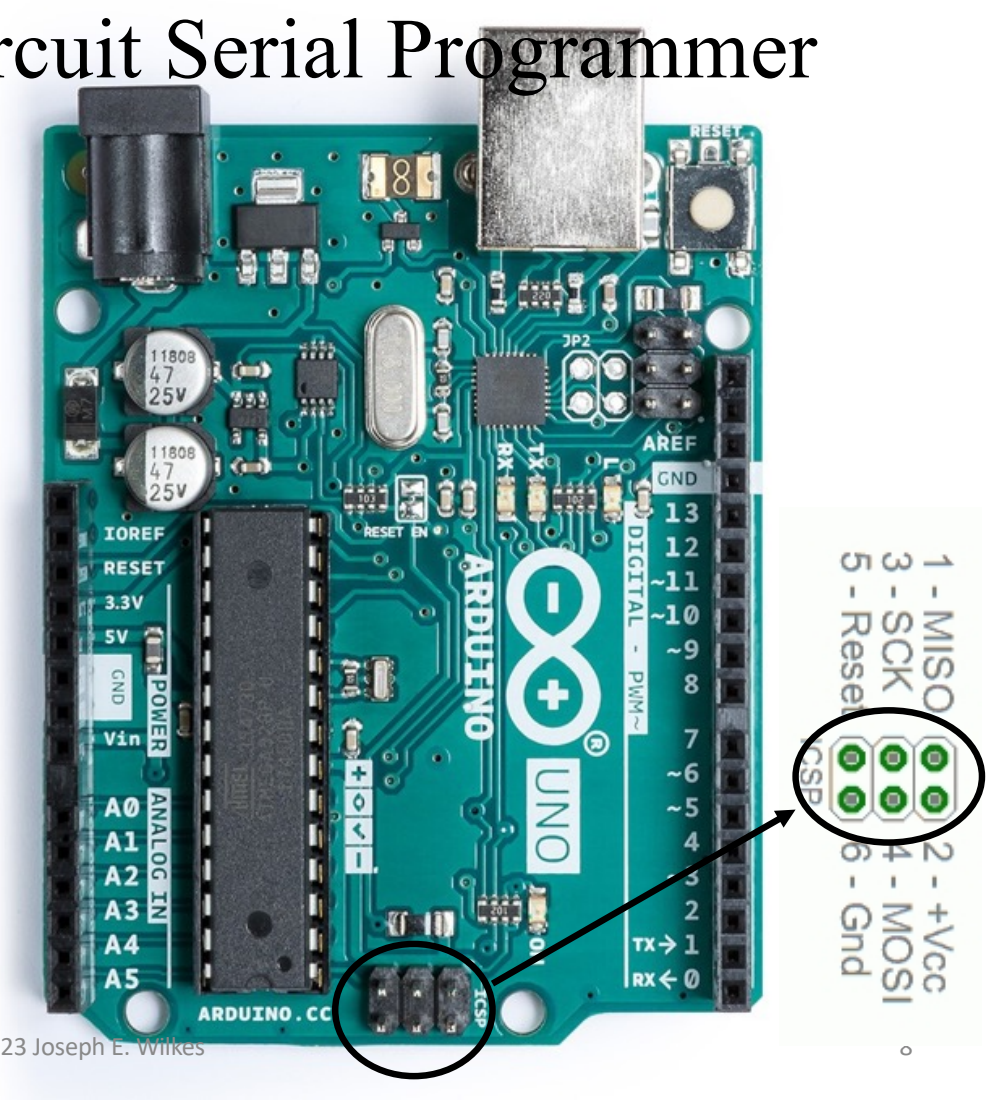
Enhanced Pinout Definitions



https://www.circuito.io/blog/arduino-uno-pinout/

I/O Pins – ISCP (In Circuit Serial Programmer

- ISCP is used to install bootloader
- Normally not needed
- Needed when processor is new
- Needed when bootloader is not working
- 1 MISO
- 2 +5
- 3 SCK
- 4 MOSI
- 5 RESET
- 6 GROUND
- For more information see: https://www.arduino.cc/en/Tutorial/ArduinoISP



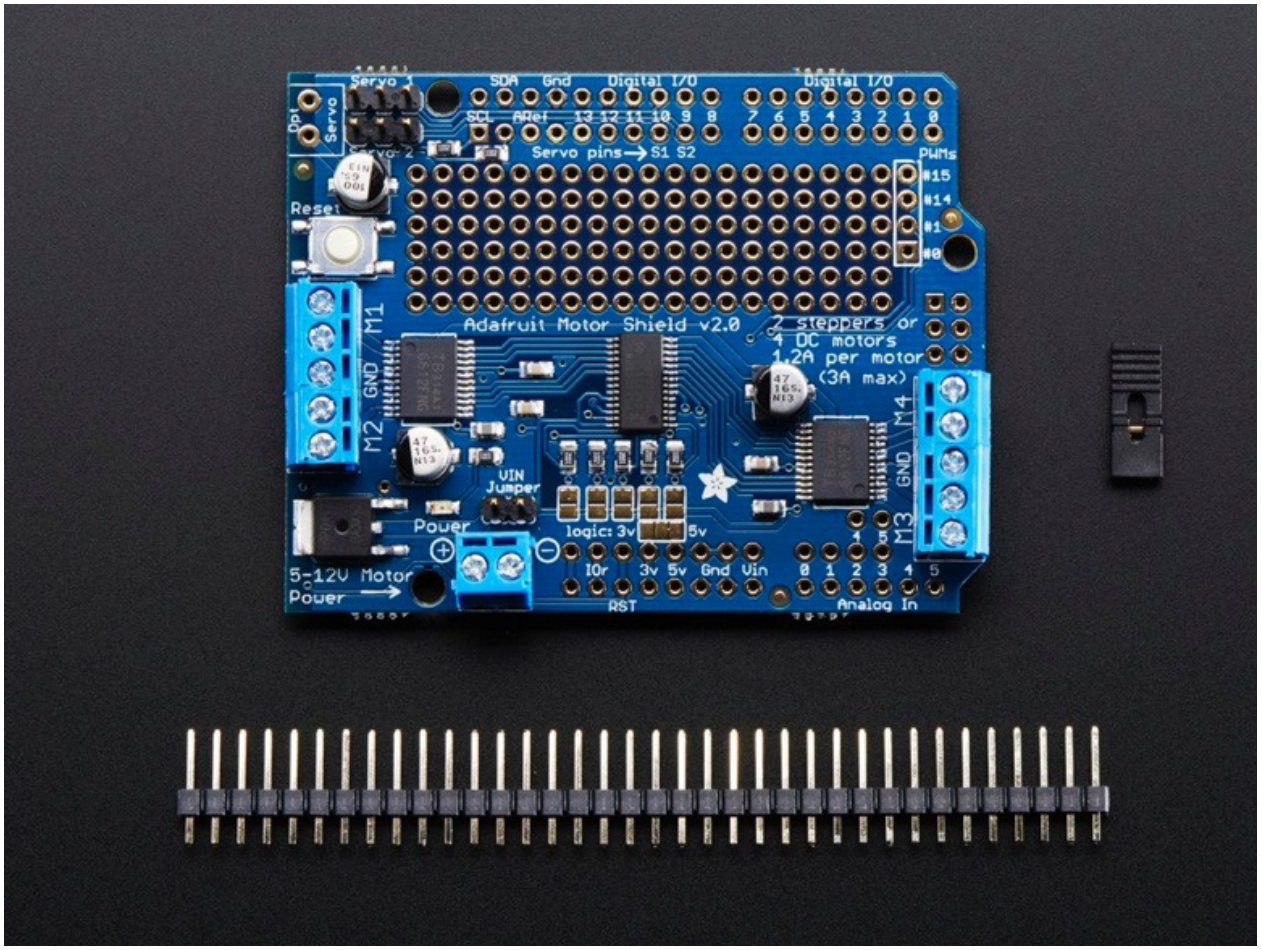
Shields

- There are a large number of boards, called shields, that can be plugged into the Arduino
- If you can't find a shield that does what you want there are blank shields to build you own

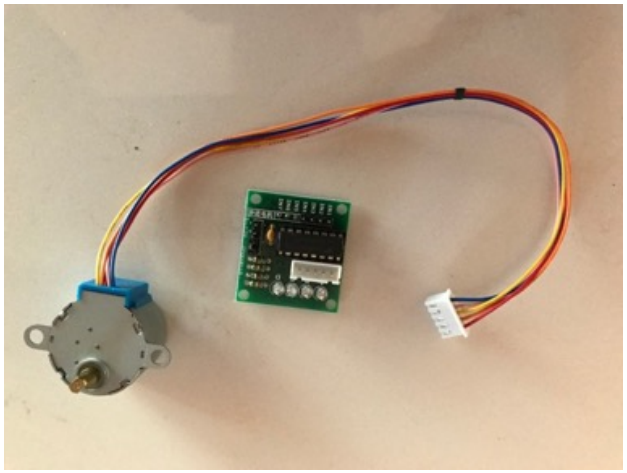
Motor Controller Shield

- Used to control motors
- Often used for robots
- Adafruit shield is a popular shield
- https://www.adafruit.com/product/1438
  - 2 connections for 5V 'hobby' servos connected to the Arduino's high-resolution dedicated timer - no jitter!
  - 4 H-Bridges: TB6612 chipset provides 1.2A per bridge (3A for brief 20ms peaks) with thermal shutdown protection, internal kickback protection diodes. Can run motors on 4.5VDC to 13.5VDC.
  - Up to 4 bi-directional DC motors with individual 8-bit speed selection (so, about 0.5% resolution)
  - Up to 2 stepper motors (unipolar or bipolar) with single coil, double coil, interleaved or micro-stepping.

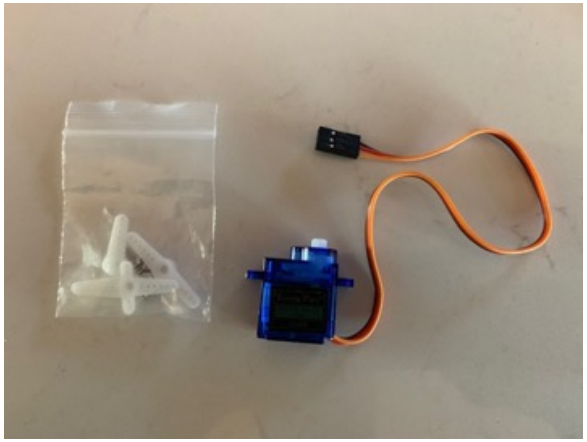
Adafruit Motor Shield



Motor shields included in Kit



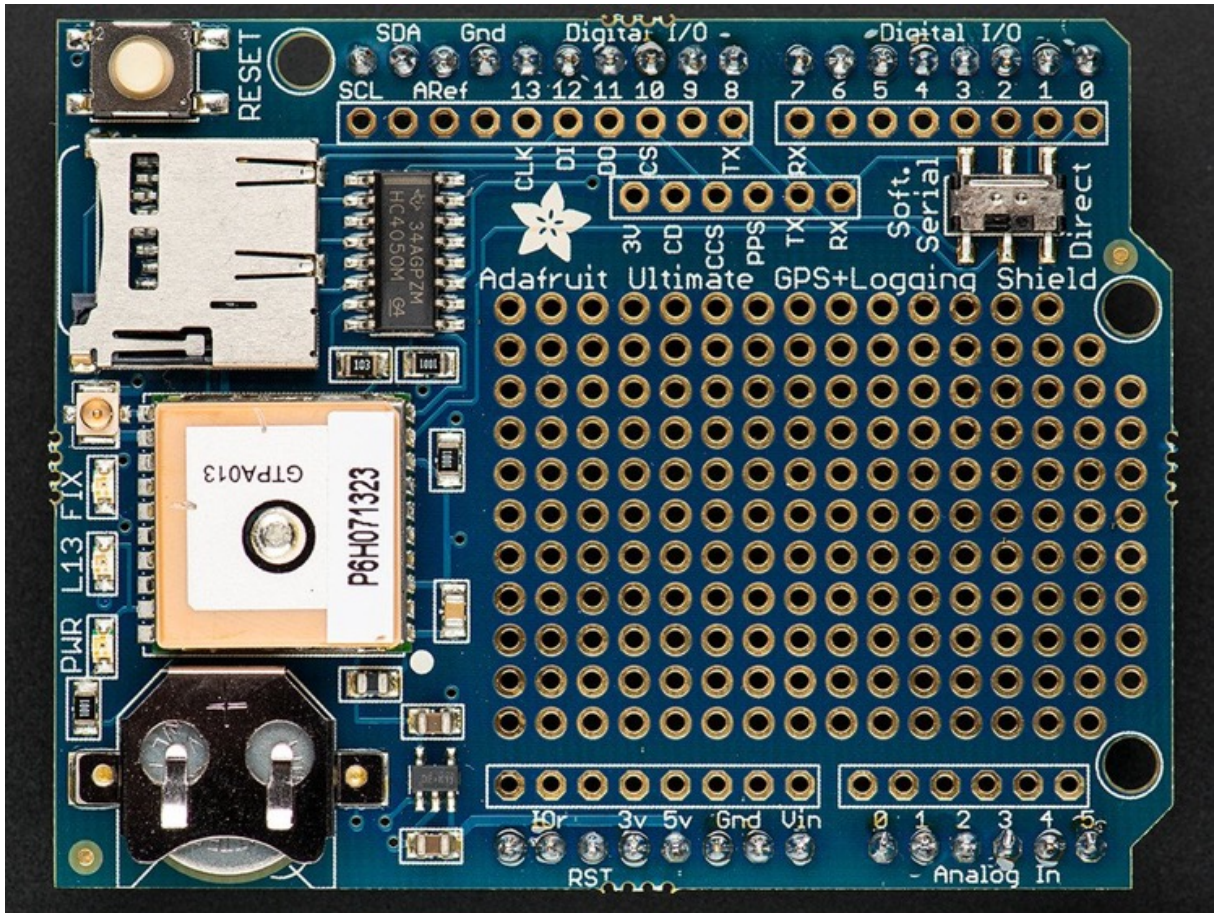
Stepper Motor and motor controller



Servo

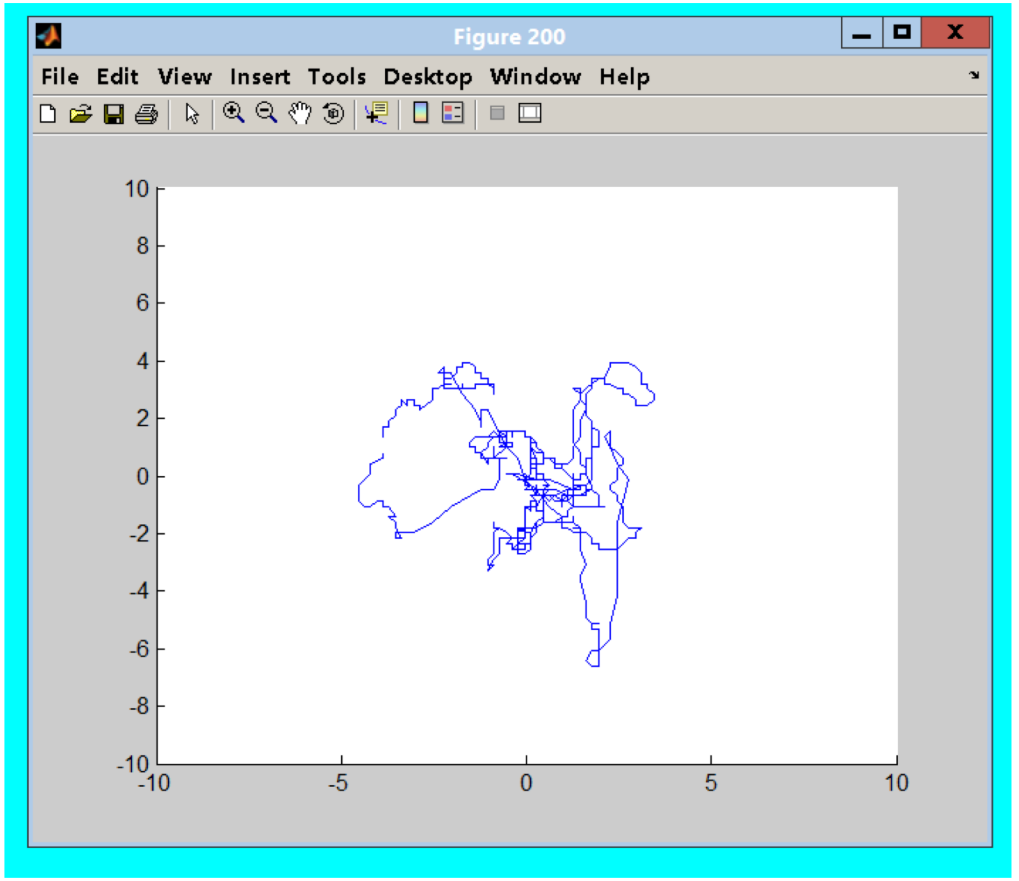
GPS Shield

https://www.adafruit.com/product/1272

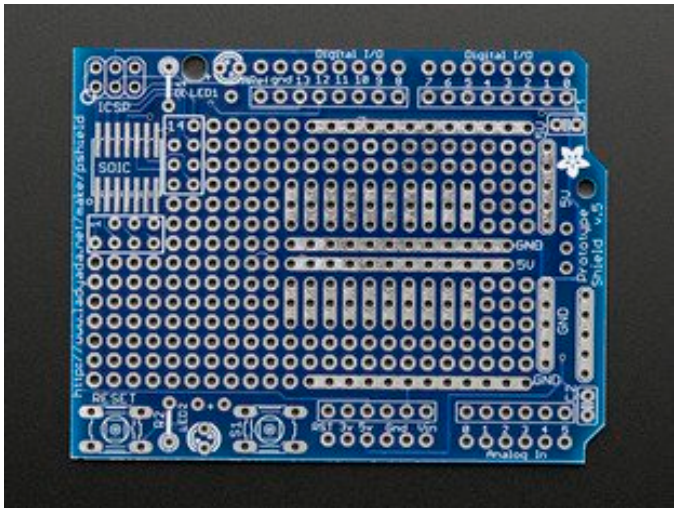


Example Output from GPS Shield

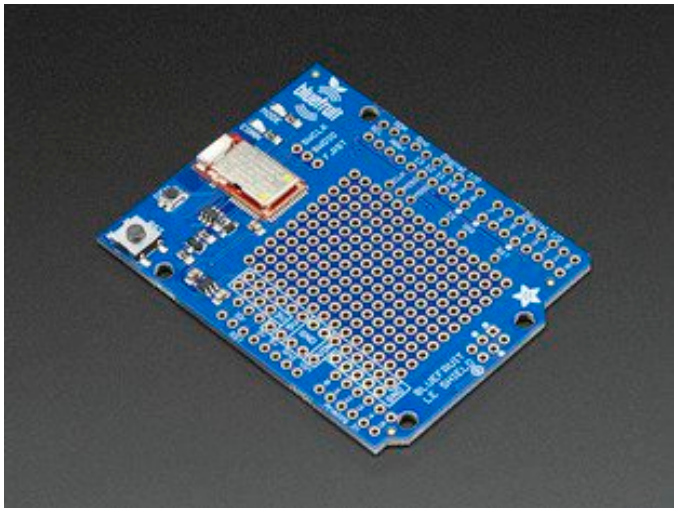
- Output of stationary GPS receiver
- Plot of change in position in meters over a period about 1 hour
- Note that GPS is only accurate to about +- 10 meters
- Car based GPS units snap the location to the closest road to hide the errors



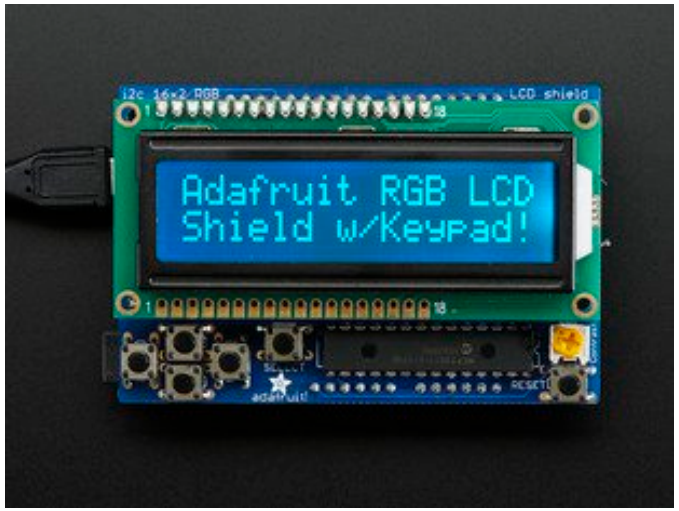
Blank shield



Bluetooth Shield



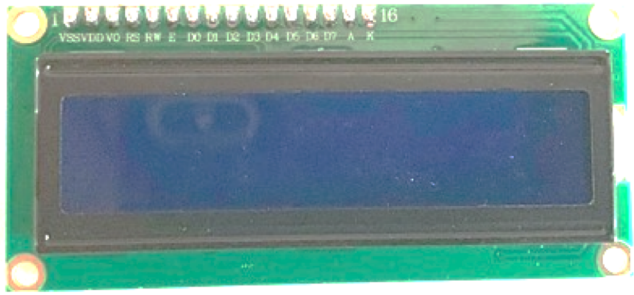
Display Shields



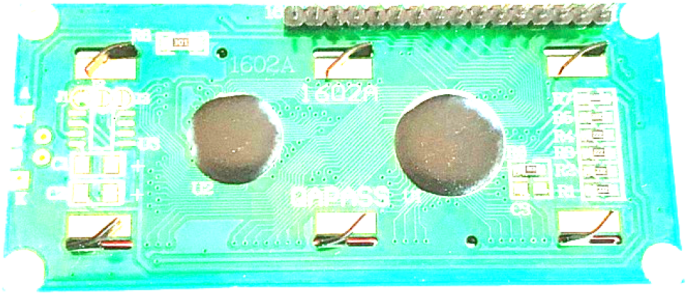
https://www.adafruit.com/product/714

https://www.adafruit.com/product/376

LCD display in kit

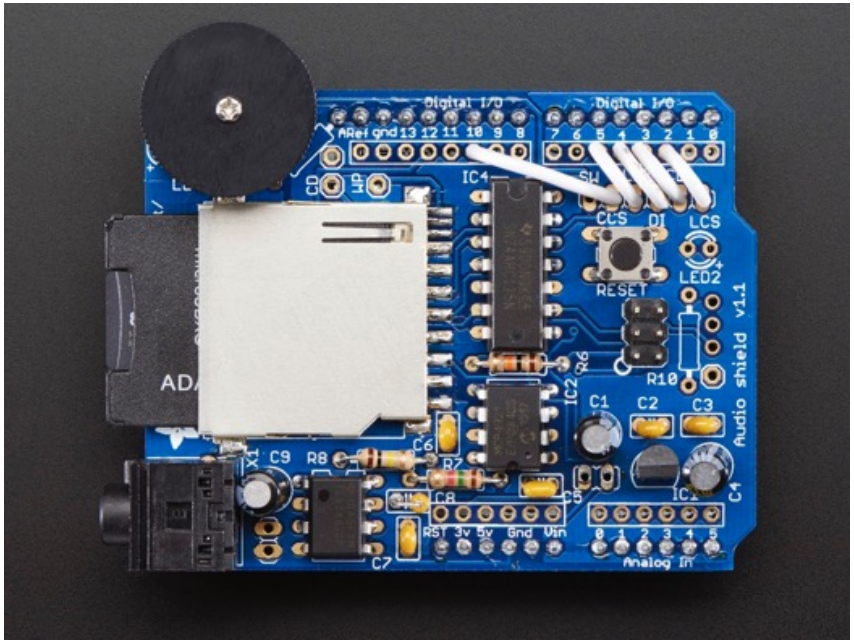


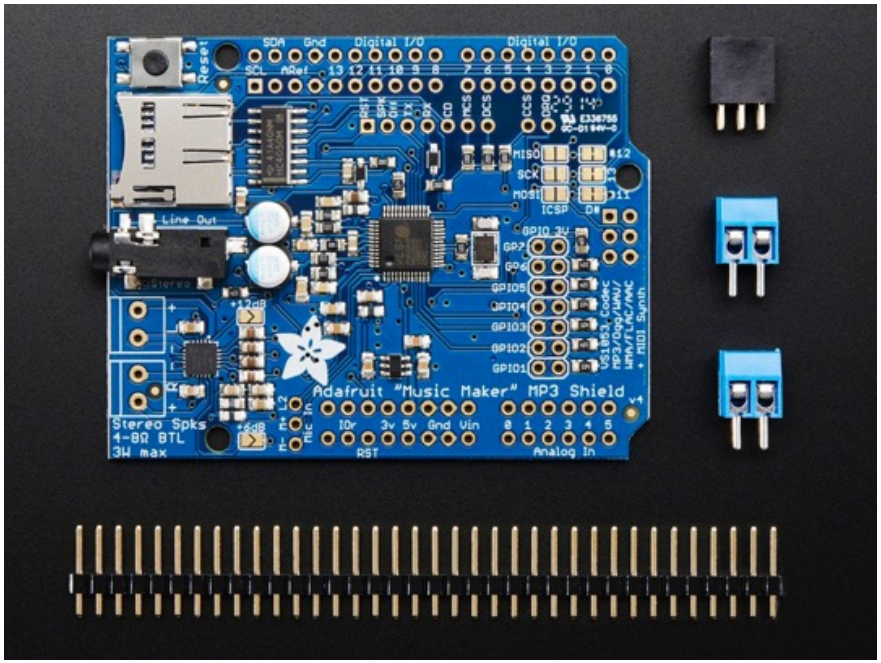
Front View



Rear View

Sound Shields



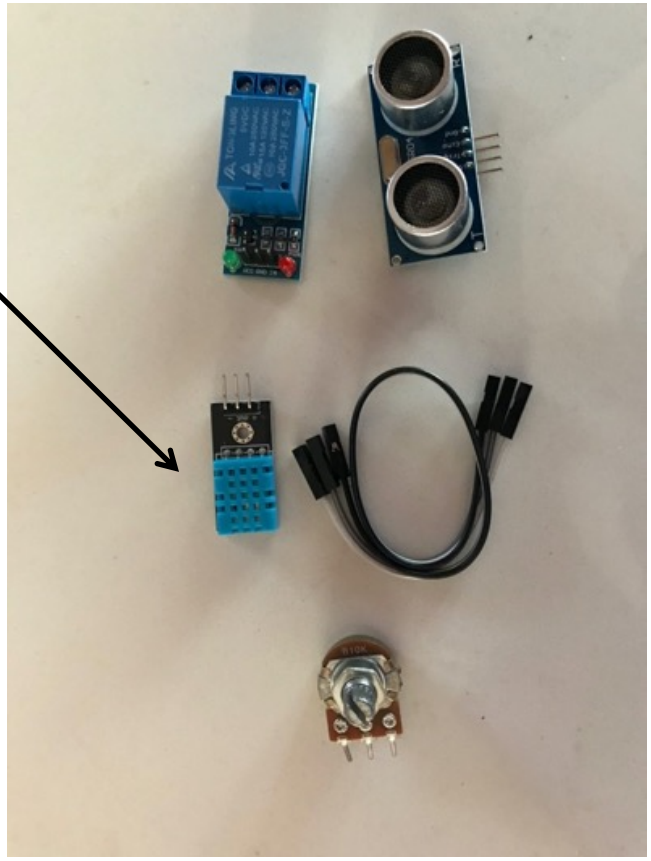


https://www.adafruit.com/product/94

https://www.adafruit.com/product/1788

Temperature, Humidity Sensor in Kit

- We will use this in an experiment later



Questions

Homework

- Examine the starter kit to get familiar with the parts in it
- Start thinking about what project you might want to build with your Arduino
- Places to look for project ideas
  - https://learn.adafruit.com/category/learn-arduino
  - https://www.instructables.com/search/?q=arduino&projects=all
  - https://learn.sparkfun.com/tutorials
  - https://www.sparkfun.com/search/results?term=arduino#tutorials
  - https://www.arduino.cc/education
  - https://www.makerspaces.com/arduino-uno-tutorial-beginners/