



**LaACES
Student
Ballooning
Course**

Expanding the Arduino Mega Useful Peripherals



Expanding the Arduino Mega

- You can enhance your project by adding additional boards to the microcontroller
 - Arduino has a standard pin footprint and boards designed to match this are called “Shields”
 - Commercial shields are available to perform specific tasks
 - They can be used for prototyping before adding a more permanent component to your PCB
 - Custom shields can be designed, like the MegaSat



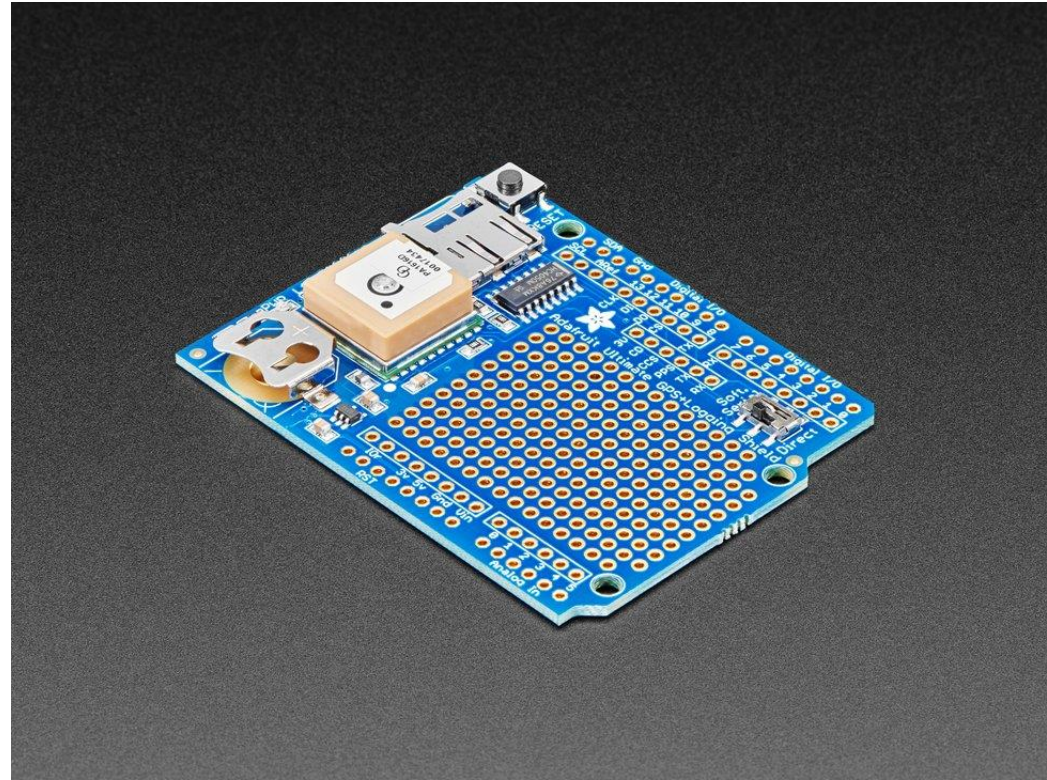
Commercial Shields

- Using a shield can simplify a project because there is less assembly required and discrete components are already soldered on
- More information is available online to help with troubleshooting because many others have purchased and used the same shield(s)
- There is existing documentation on the device
- Because the design is complete, you will not be able to easily make changes



Adafruit Ultimate GPS Logger Shield

- This shield is a datalogger, and it incorporates GPS with an SD card for storage
- Footprint designed for Arduino Uno but useable with other boards (Like Mega)





Proto-Shields

- Proto-shields are blank boards that connect to the pins on the microcontroller
- They contain holes for soldering in components and may have traces connecting those holes pattern similar to the bread board
- Can be used to test your circuit before making it permanent on your PCB
- You are limited on space and the wiring can get messy



Arduino Mega Proto-Shield

- There's minimal assembly required and several rows of empty sockets for soldering in components
- It connects directly to the Mega in the same manner as the datalogger
- You can use this to test your circuit before soldering

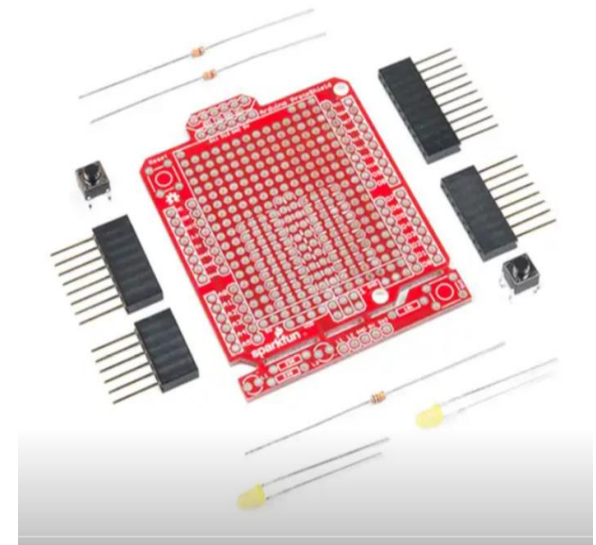


Figure 1: Arduino Mega Protoshield (not assembled)



Custom PCB Shields

- You can customize a shield for your microcontroller using PCB software
- This allows for more complex designs with custom functions
- There is a learning curve for PCB design software and PCB boards require time and money to manufacture

MegaSat

- The MegaSat was designed as a custom shield for students to have a base payload
- Contains a base set of sensors and interfaces

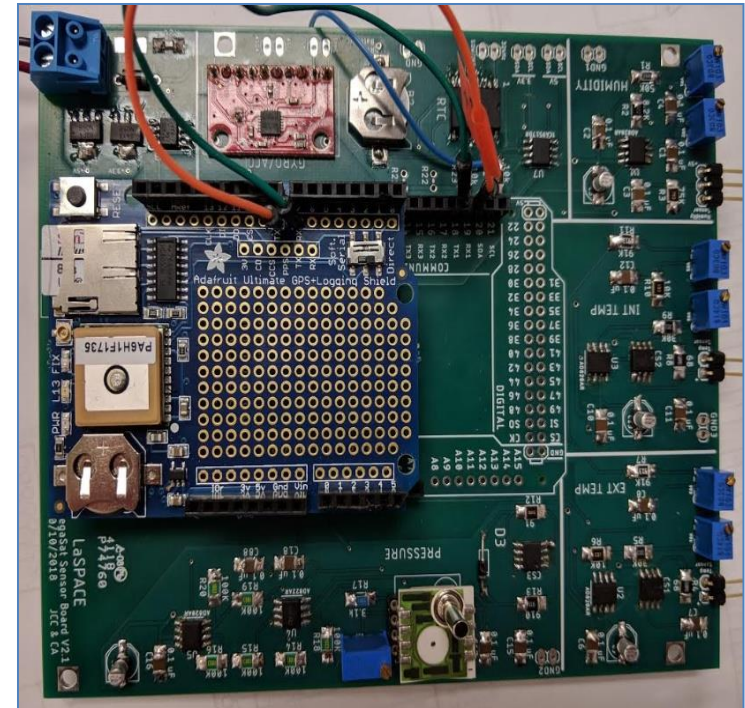


Figure 2: MegaSat prototype with datalogger and accelerometer breakout board



External Breakout Boards

- External boards are different from shields because they do not stack directly on the microcontroller
- They can be made to connect directly to a PCB and usually act as modules to perform specific tasks
- These have to be wired correctly and may increase the complexity of your design

SparkFun Triple Axis

Accelerometer and Gyroscope Breakout

- The MegaSat uses a breakout board to further enhance your experience
- The accelerometer/gyroscope microchip is very small and would be difficult for a beginner to solder
- Breakout boards come with all components soldered in place and are easy to incorporate into your PCB design

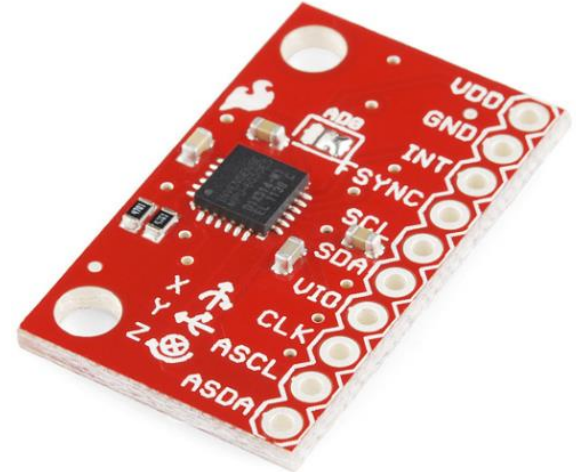


Figure 3: Sparkfun accelerometer/gyroscope breakout board



Expansion

- Several predesigned shield are available from retailers such as Adafruit, Sparkfun, and Amazon
- When using multiple shield keep in mind which pins are being used by which shields
- Make sure you select a shield that is compatible with your microcontroller
 - There are differences between the Arduino Mega and other Arduino microcontrollers, such as the UNO, so most shields are not automatically interchangeable