



The Ultimate GPS Logger Shield – SD Card Changes 2024

LaACES Student Ballooning Course



Background



- Adafruit updated the PCB for the shield in August 2023 to connect SD card pins to the 2x3 Header in the center of the Arduino
- LaSPACE received shields with this design during restock of parts in 2024
- With no change in part number and only minor visible changes, new boards were mixed in LaSPACE spare stock
- 2024 GPS boards shipped to teams appear to be ~50/50 mix of old and new

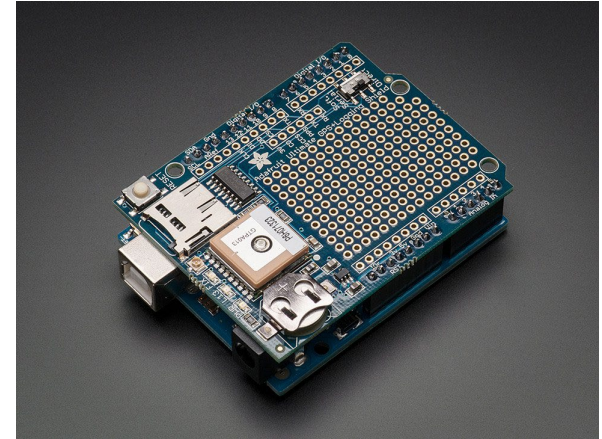


Figure 1: Shown is the Adafruit Ultimate GPS Logger Shield. It is stacked on an Arduino Uno

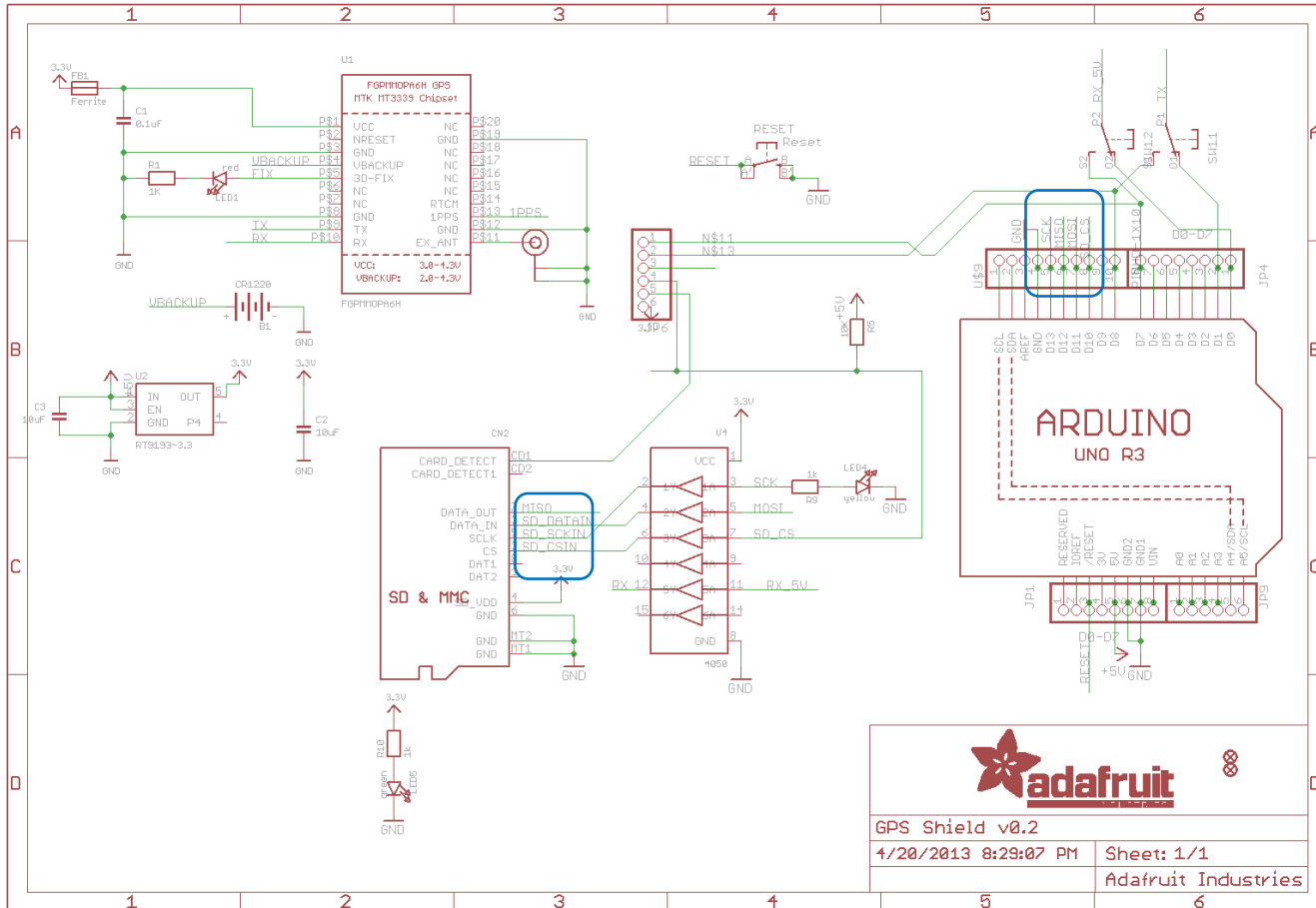
Revision History.

- **As of Aug 20, 2023** – we've updated this PCB with a dedicated SPI port instead of pins 11, 12, 13. This makes it
- **As of July 26, 2023** - We no longer include the 12mm
- **As of June 22, 2021** - The original GPS module is no longer the same shape and performance. This module can now be slightly changed and the power draw has increased.

Figure 2: Update text on Adafruit website in November 11, 2024
<https://www.adafruit.com/product/1272>

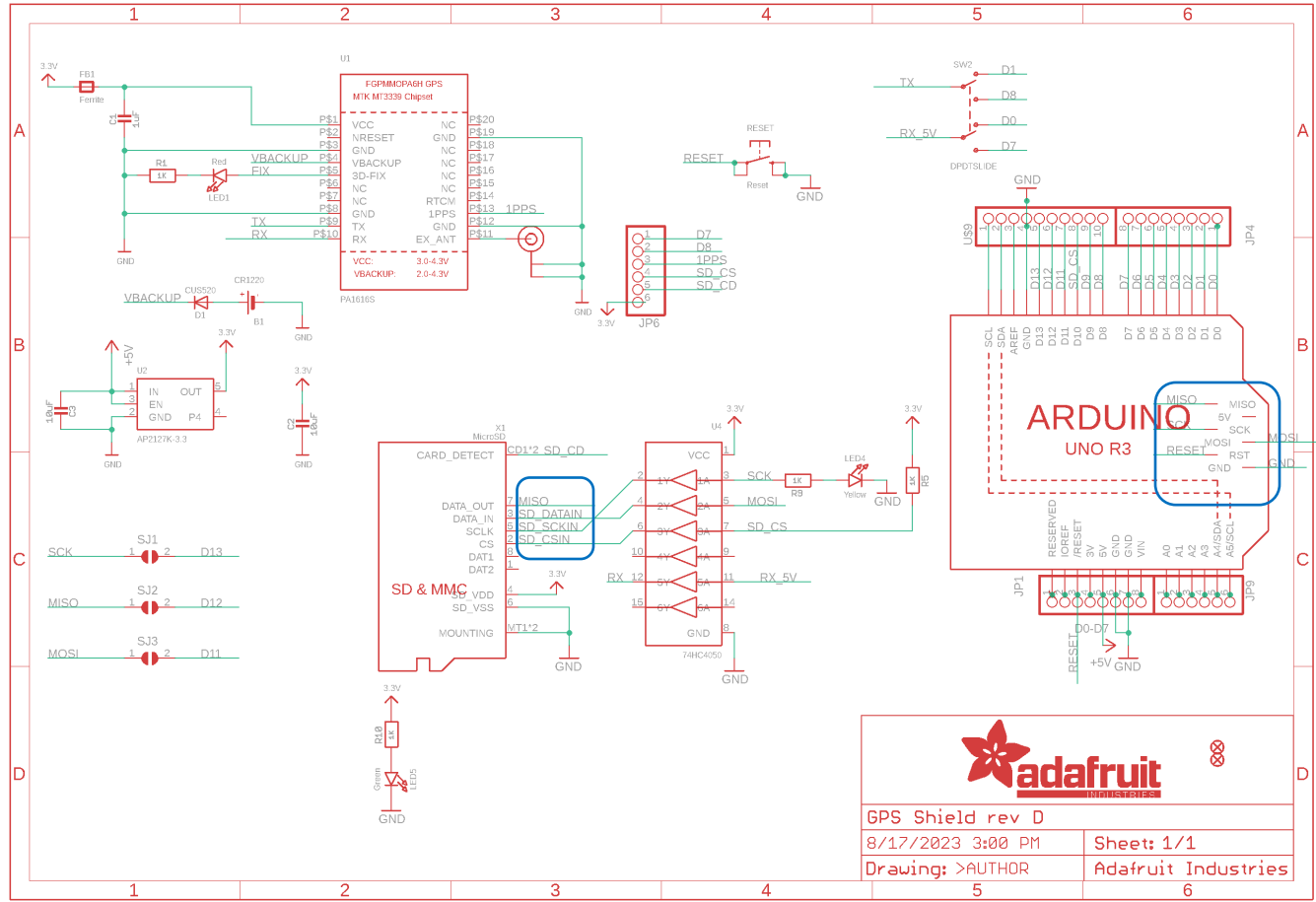


Old Shield Schematic (Relevant Pins circled in blue)





New Shield Schematic (Relevant Pins circled in blue)





Relevant Changes

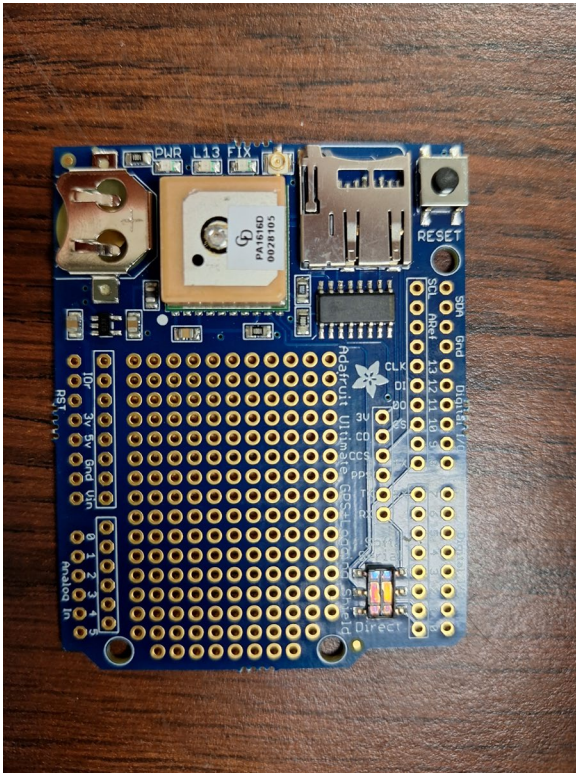


- SD Card SPI interface moved from pins 11-13 to ICSP header in middle of Arduino
- Chip Select Pin (CS) remains on pin 10
- ICSP pins are connected to pins 50-52 (Hardwired on Arduino PCB) on the double header on the Arduino Mega board itself
- Note: 6 Pin Header by USB port labels ICSP1 on some Arduinos is unrelated

Identifying Revision

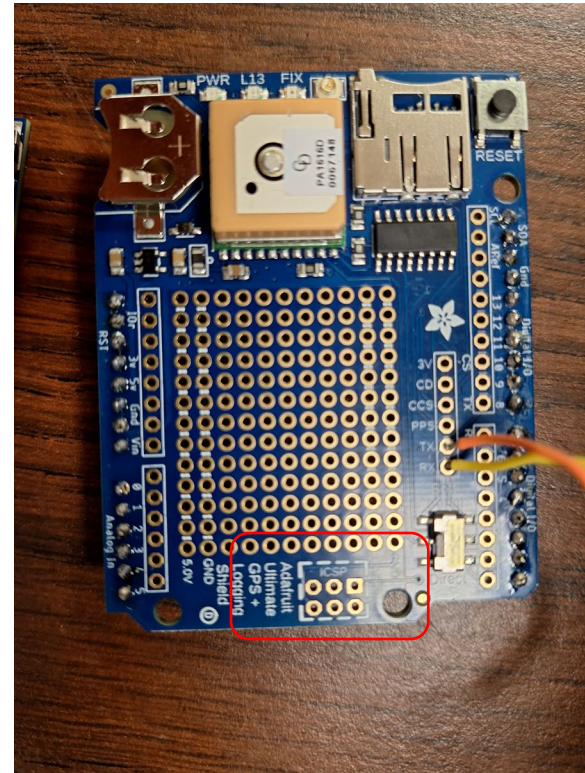
Old Revision

Lacks 6 Header below GPS



New Revision

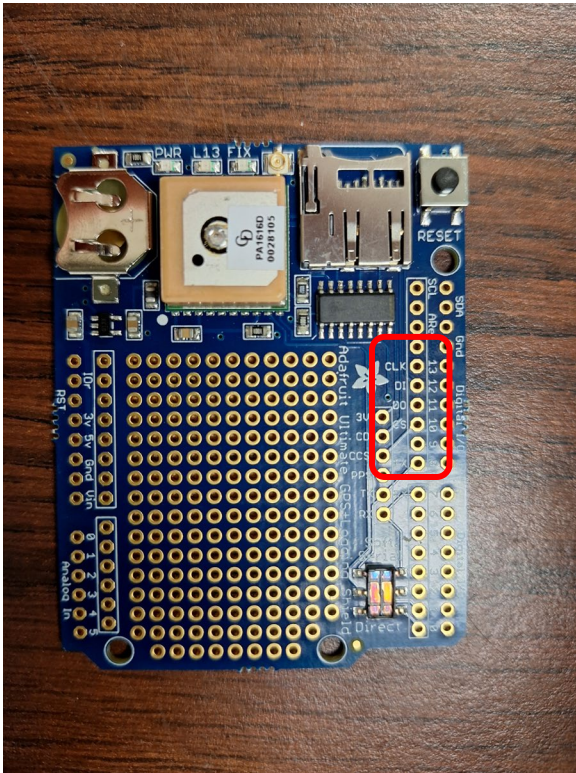
Modified Prototyping Area with 6 Pin ICSP header



Identifying Revision

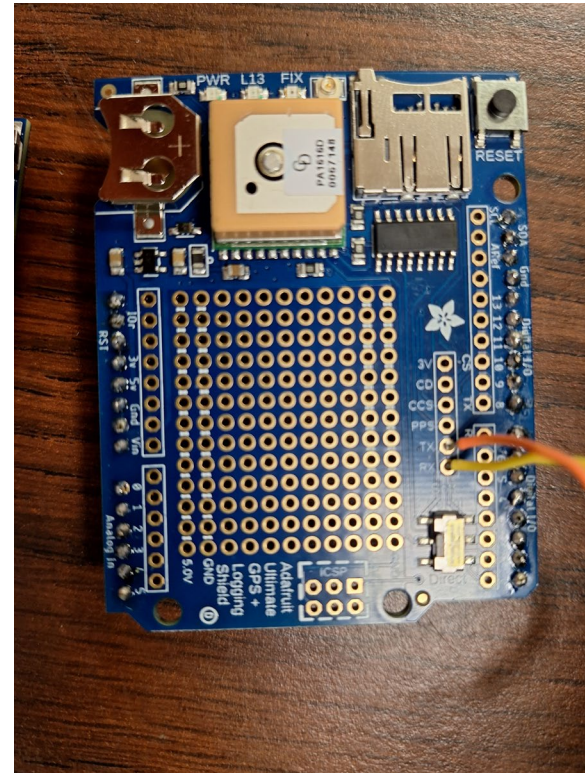
Old Revision

Pins 11, 12, 13 Labeled DO, DI, CLK



New Revision

Modified Prototyping Area with 6 Pin ICSP header





Impacts



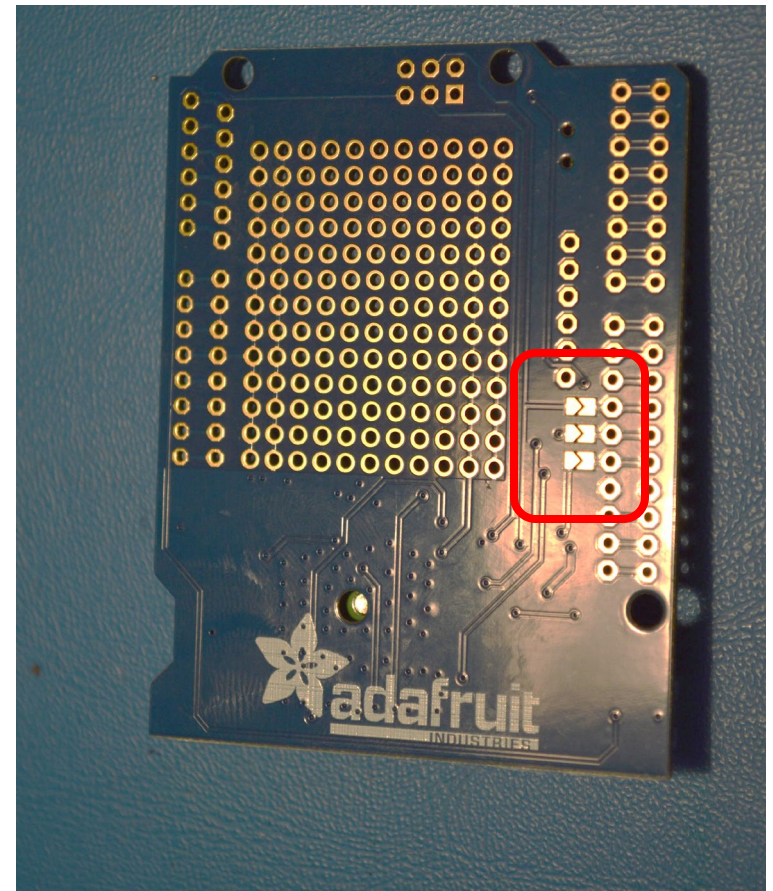
- An unmodified Shield will not work with sample code, activities and previous flight code designed for pins 10-13
- No changes in GPS interface
- Overall this is a good change as it allows us to use the Megas Hardware SPI pins
 - Will no longer need manually installed old SD card library
 - Can also use SDFat library
 - Allow faster read/write speed and remove some limitations (2 GB limit, 8.3 file names)



Solution 1 - Jumpers



- New board revision also has jumpers on the back side to restore previous configuration
 - These are SJ1, SJ2, and SJ3 on the new schematic
- The chevron shaped pads circled in red to the right

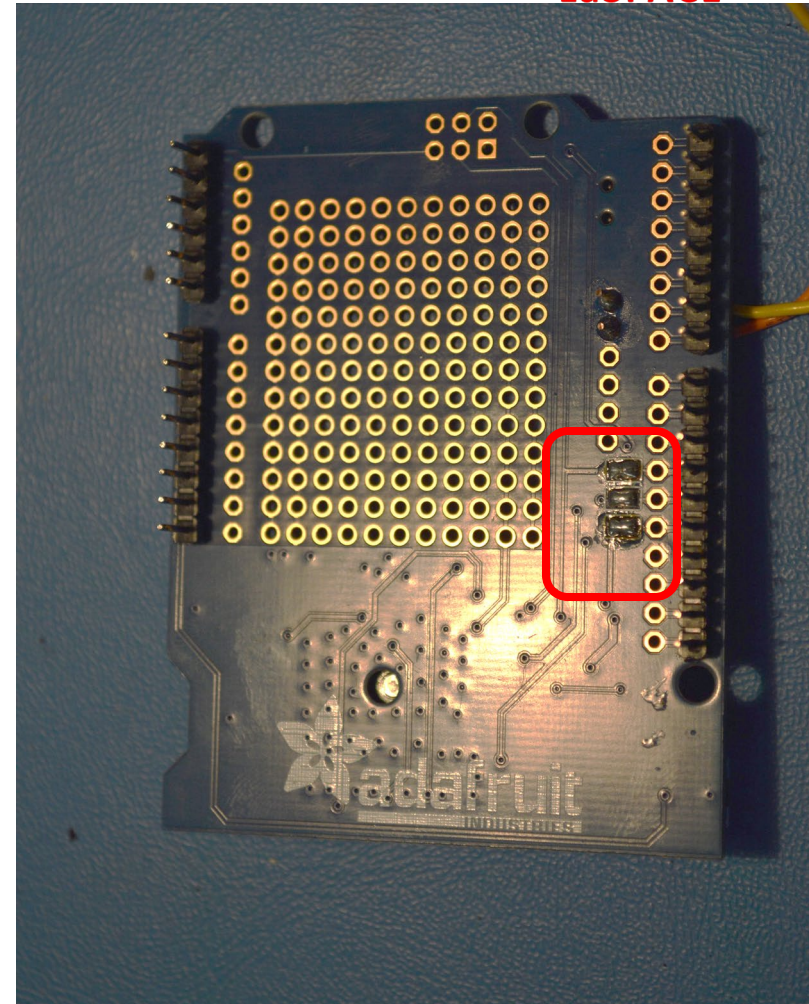




Solution 1 - Soldered

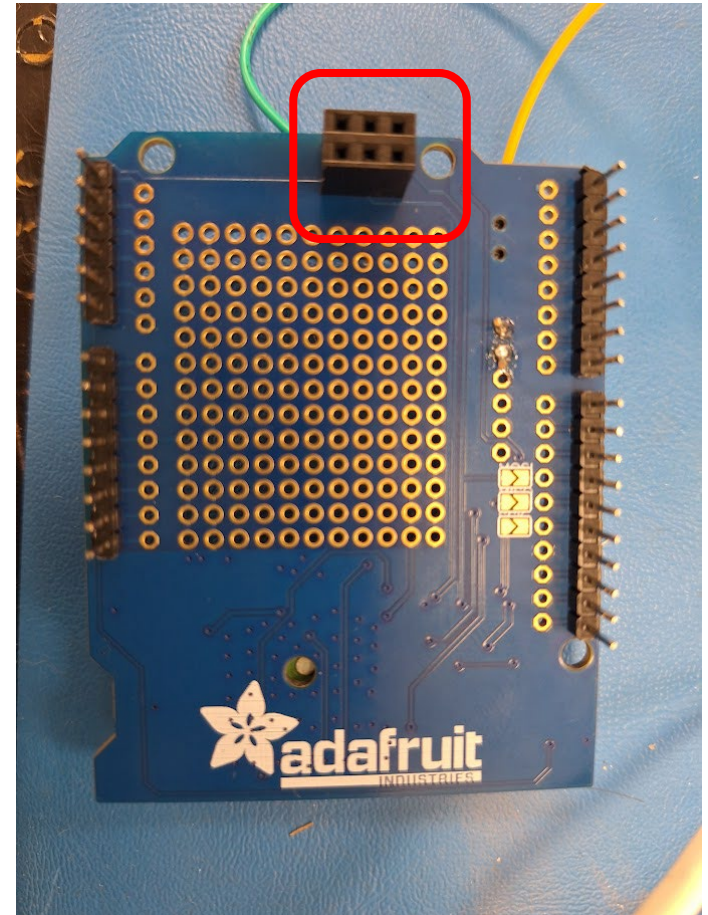


- Bridge across the triangular cutout to restore the connection to pins 11-13
- This configuration will be compatible code examples and any previous flight code



Solution 2 – 6 Pin header

- Solder 6 pin header into ICSP socket – [Example part](#)
- Note ICSP on Arduino has Male Pins stickup so should solder with female header facing down
- This will provide connection to ICSP pins on Arduino Mega





Solution 2 – Software



- You now have 2 options in software

- Use default SD library, just pass a single argument for CS pin instead of all 4 pins

```
Serial.println("Initializing SD card...");
if (!SD.begin(CS)) { // Initialize communication with SD card
  Serial.println("Initialization failed :("); // If initialization failed, print it
  while(1); // and enter a forever while loop
}
Serial.println("Initialization successful!"); // If initialization successful, print
}
```

- Use SD manual SD card library as described in LaACES activities and change pin definitions from 11-13 to 51-53

```
/* SD Card & Files *****:
#define CS 10 // SPI chip :
#define MOSI 51 // SPI master
#define MISO 50 // SPI master
#define CLK 52 // SPI clock
```



Caveats



- I have not had a chance to do much testing
- In particular using the default SD library with old code may have some gotchas
- Solution 1 and 2 are not mutually exclusive just be aware that doing both will connect the 11-13 pin to the 50-52 pins
- Solution 2 is not compatible with the NSU designed Mini-MegaSAT board since the board does not physically have space for the 6 pin header (Full Size MegaSAT works though)



LaSPACE Actions



- I am ordering more GPS shields to have enough to replace all old shields
- I am ordering and will add 6 pin headers to MegaSAT kits
- Can provide both to teams in ~ 1 week
- Plan to update materials/code to remove old boards for 2025