Avionics Spring Progress Update

V1 Hardware Current Status

✅Battery board update

✅Z-axis camera/torque board design

✅X/Y-axis solar + sun sensor board design

⌛Radiator boards

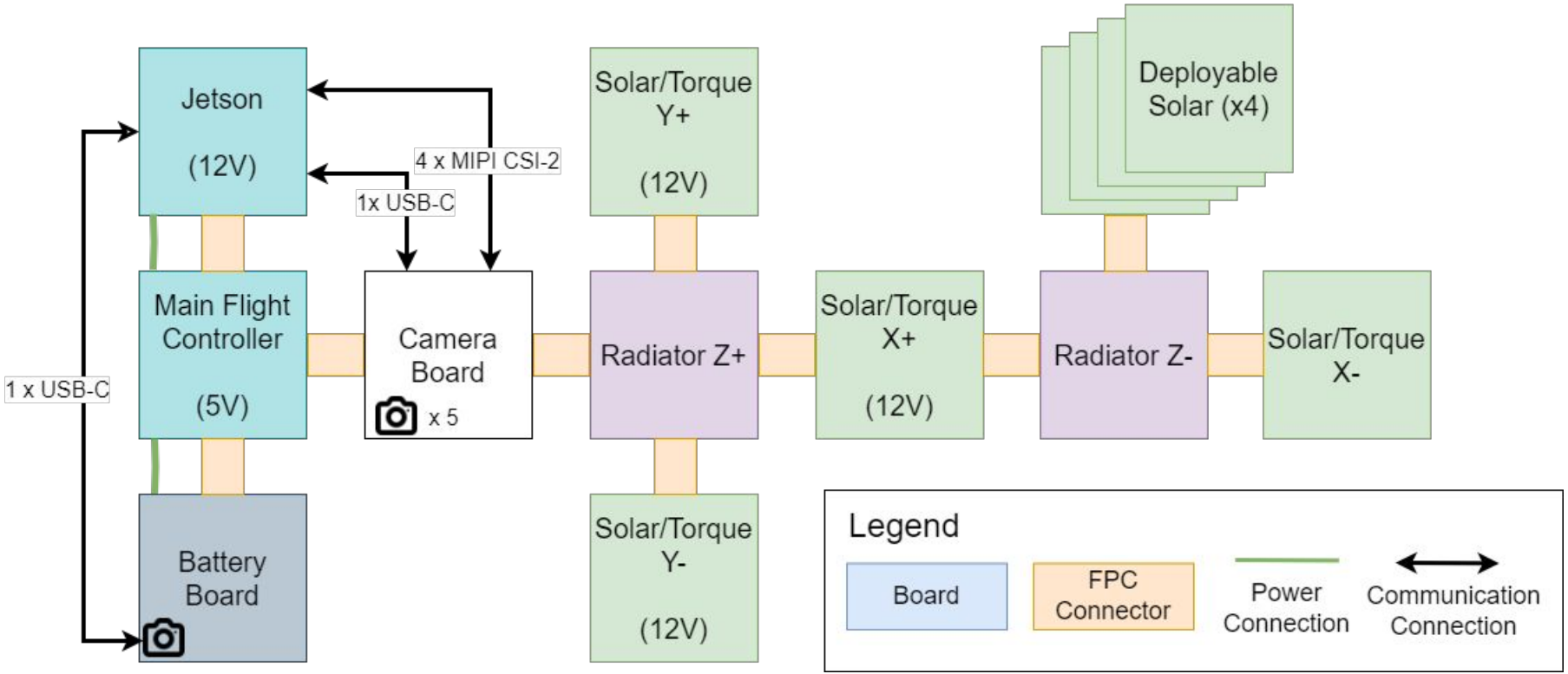
⌛Deployable solar board design

⌛Jetson/PyCubed communication interface (HW)

✅Inter-board connectors/interface

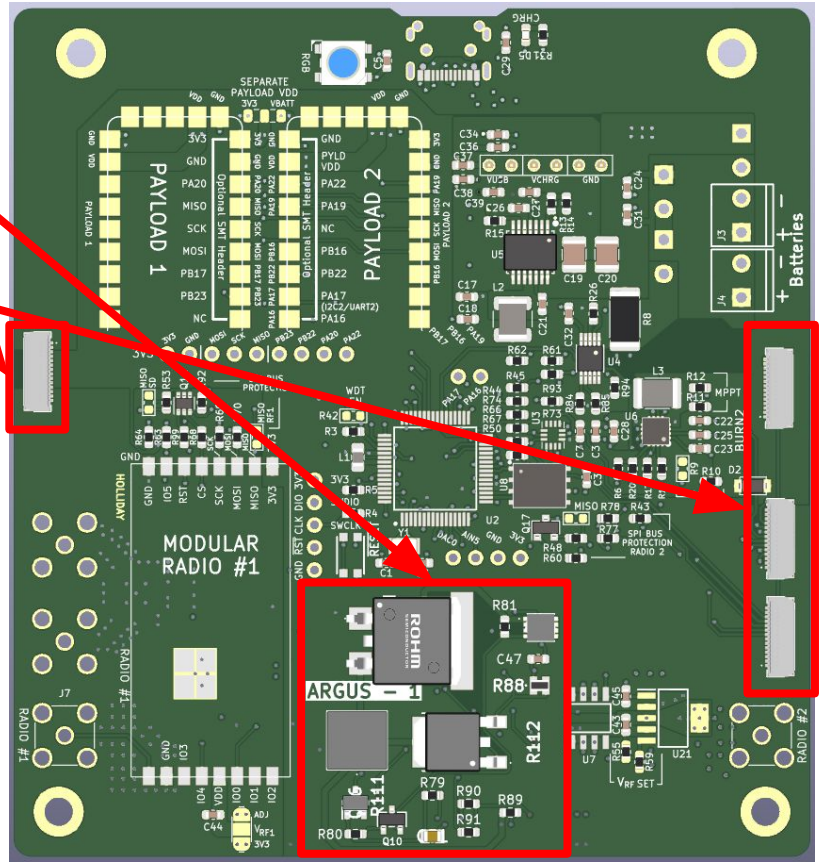
⌛Design Review

Hardware Stack Layout



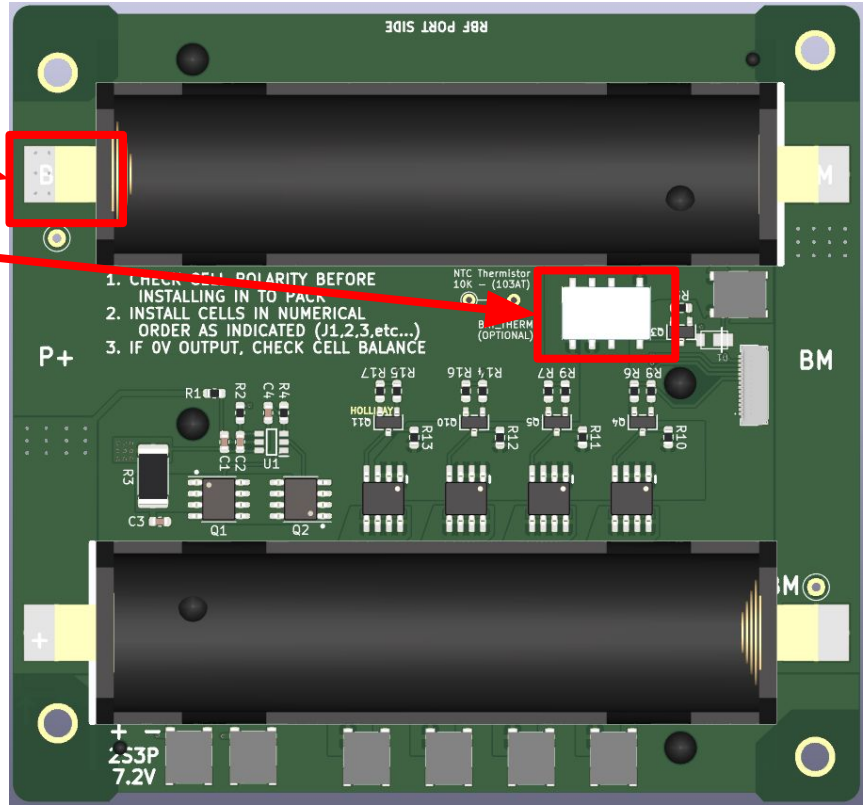
PyCubed

1. Jetson power converters + switch
2. Jetson communication connector
3. FPC ports for external boards + battery board
4. Burn wire headers removed



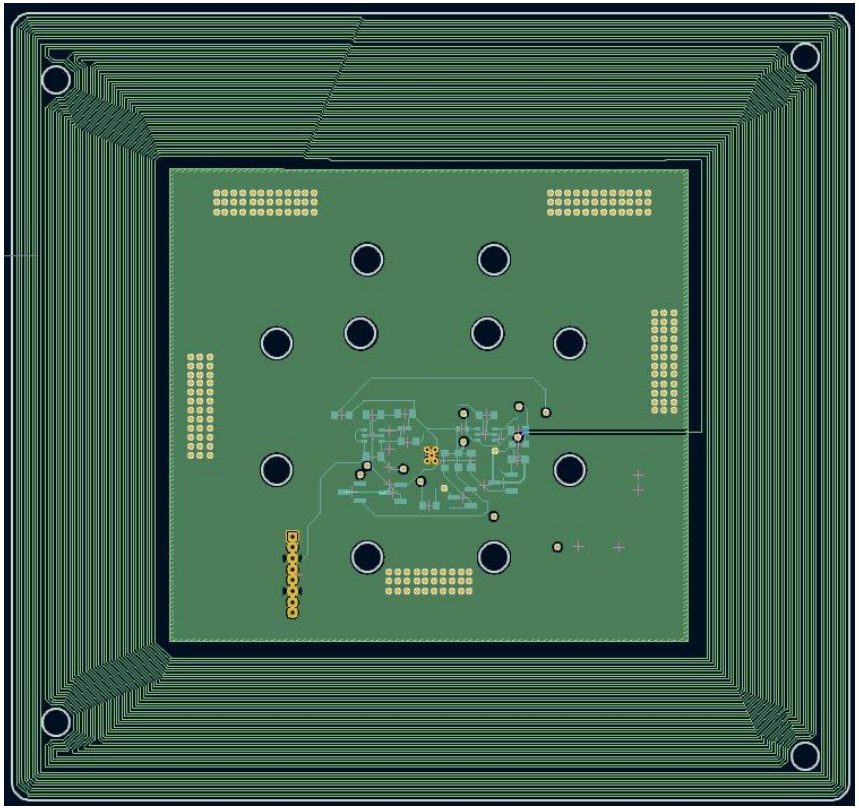
Battery Board

1. Added headers for connecting burn wires to battery output
2. Added relay for enabling burn wires
3. Shifted battery mounts to make room for camera (z-)



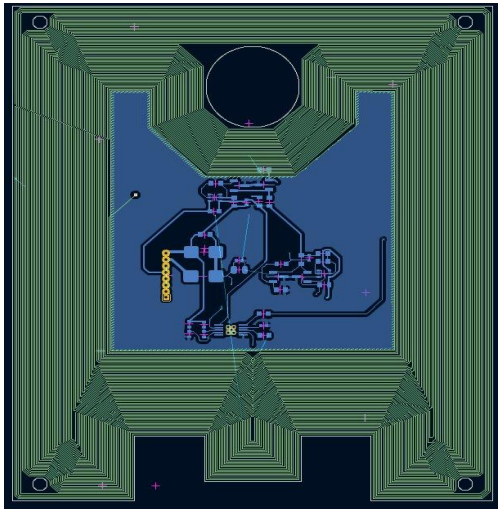
Camera Board

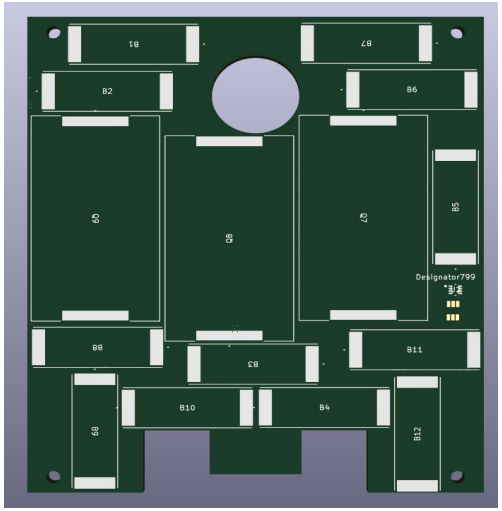
- Mounting holes for camera attachments
- FPC connectors for camera to Jetson
- FPC connectors for PyCubed to external boards
- Z+/- torque coils embedded



Solar Boards (X/Y)

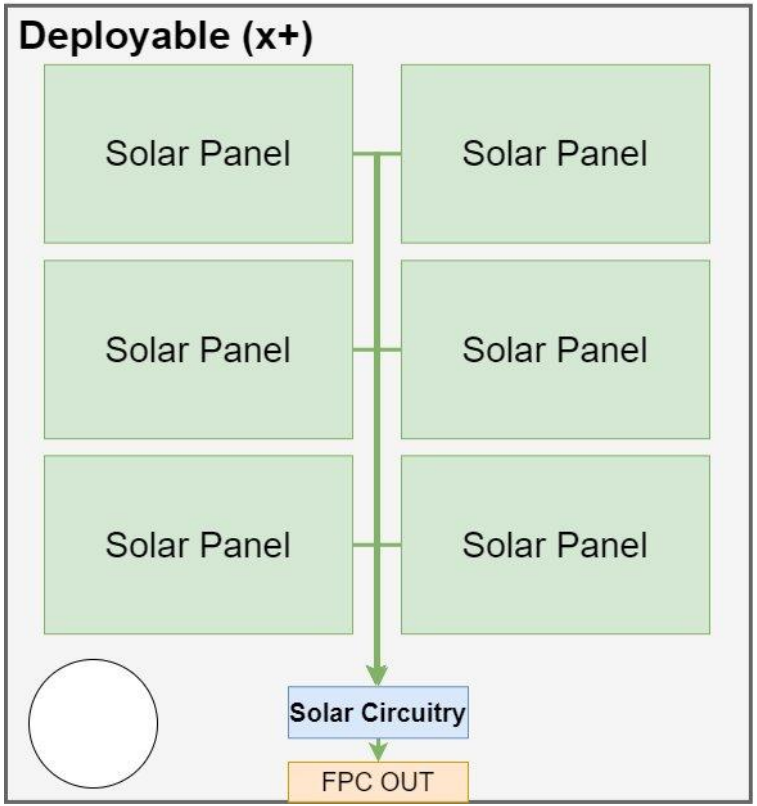
- FPC connectors for interfacing with other boards in chain
- I2C sun sensor
- Torque coils
- Camera and deployment mechanism cutouts
- Silicon solar cells





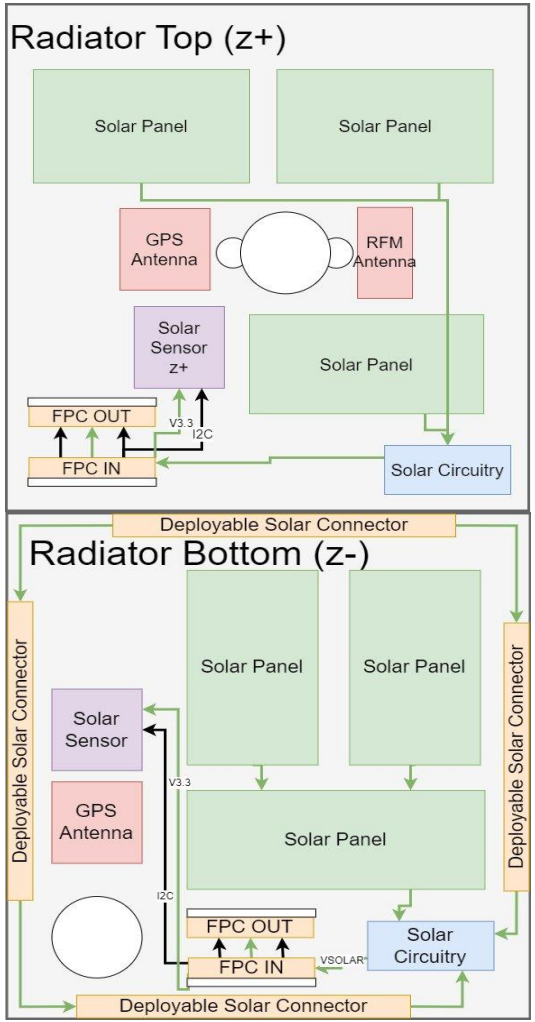
Deployables

- In progress
- Cutouts for camera and solar sensors
- Solar panels on both faces

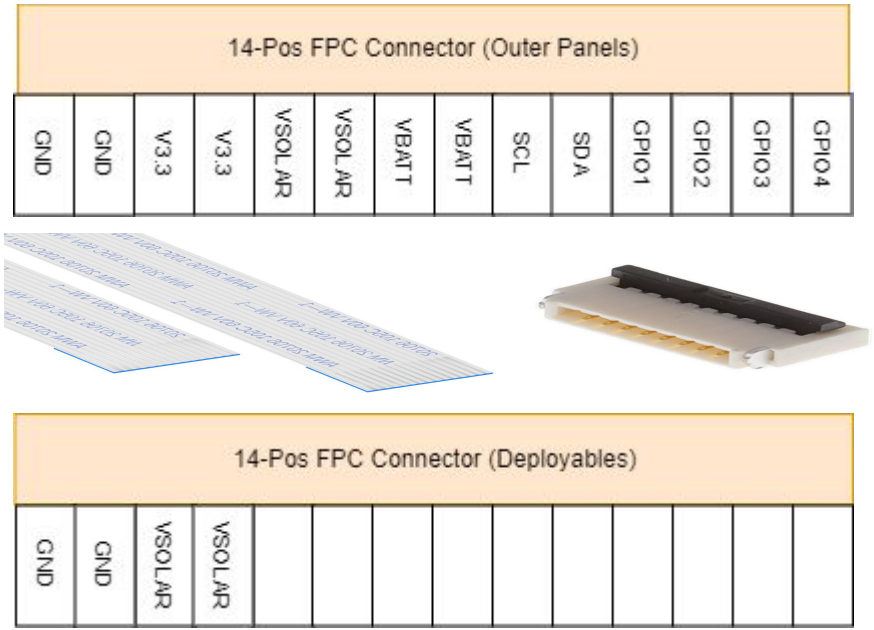


Radiator boards

- In progress, need cutouts
- Cutouts for cameras
- Solar sensor
- GPS and radio antenna mounts



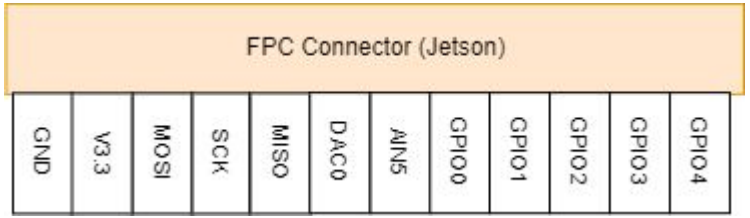
Solar Board Connectors

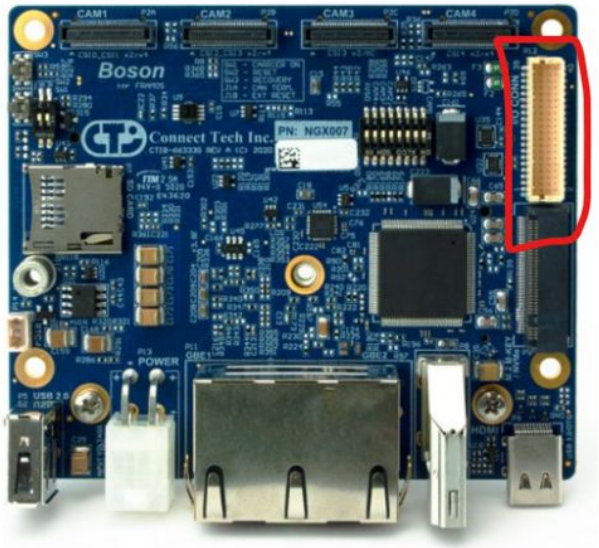


- Power connections
  - Doubled-up for potential high currents
- GPIOs for sensors detection successful deployment of solar panels

- Same connector for durability
- Limited channel use for solar input only

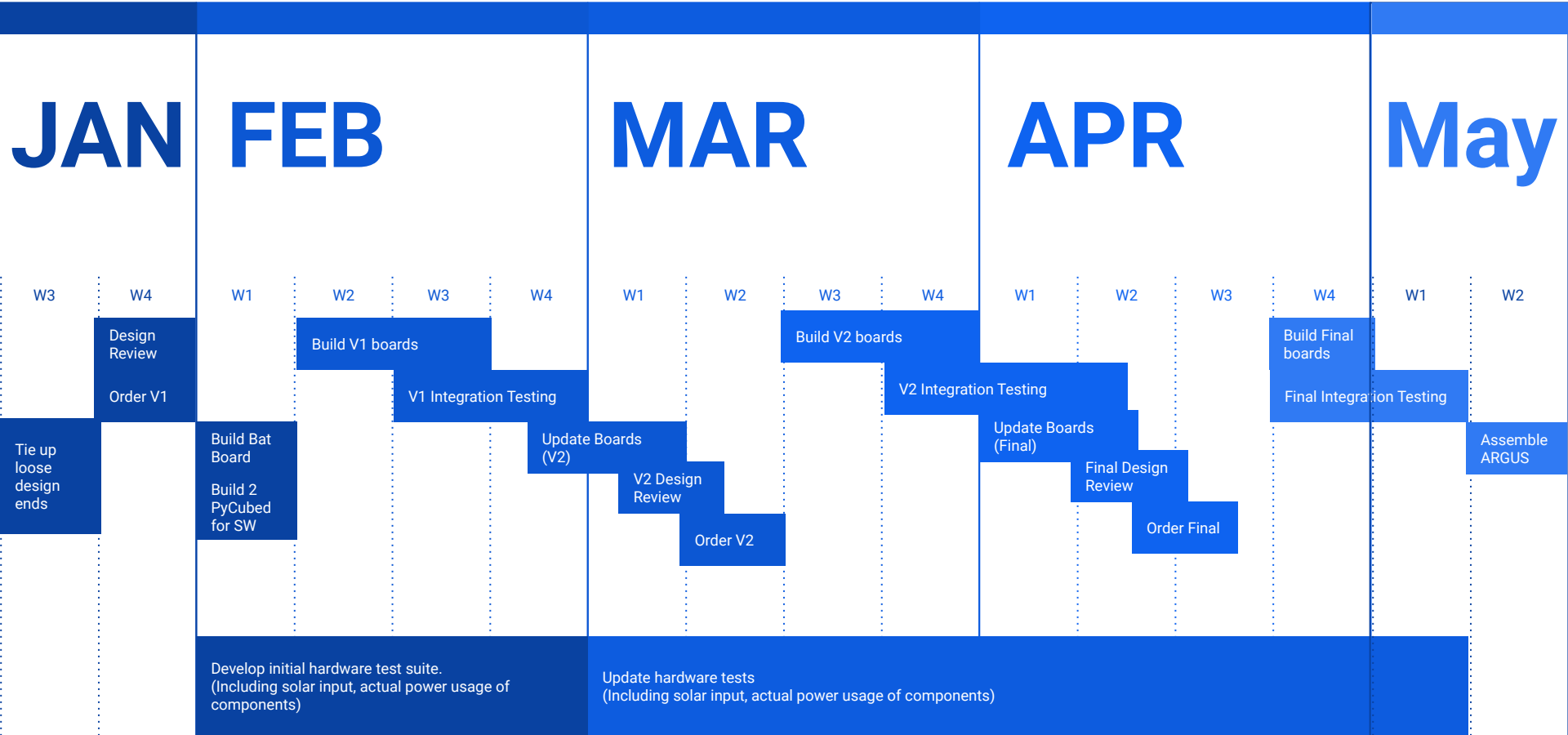
Jetson Connector



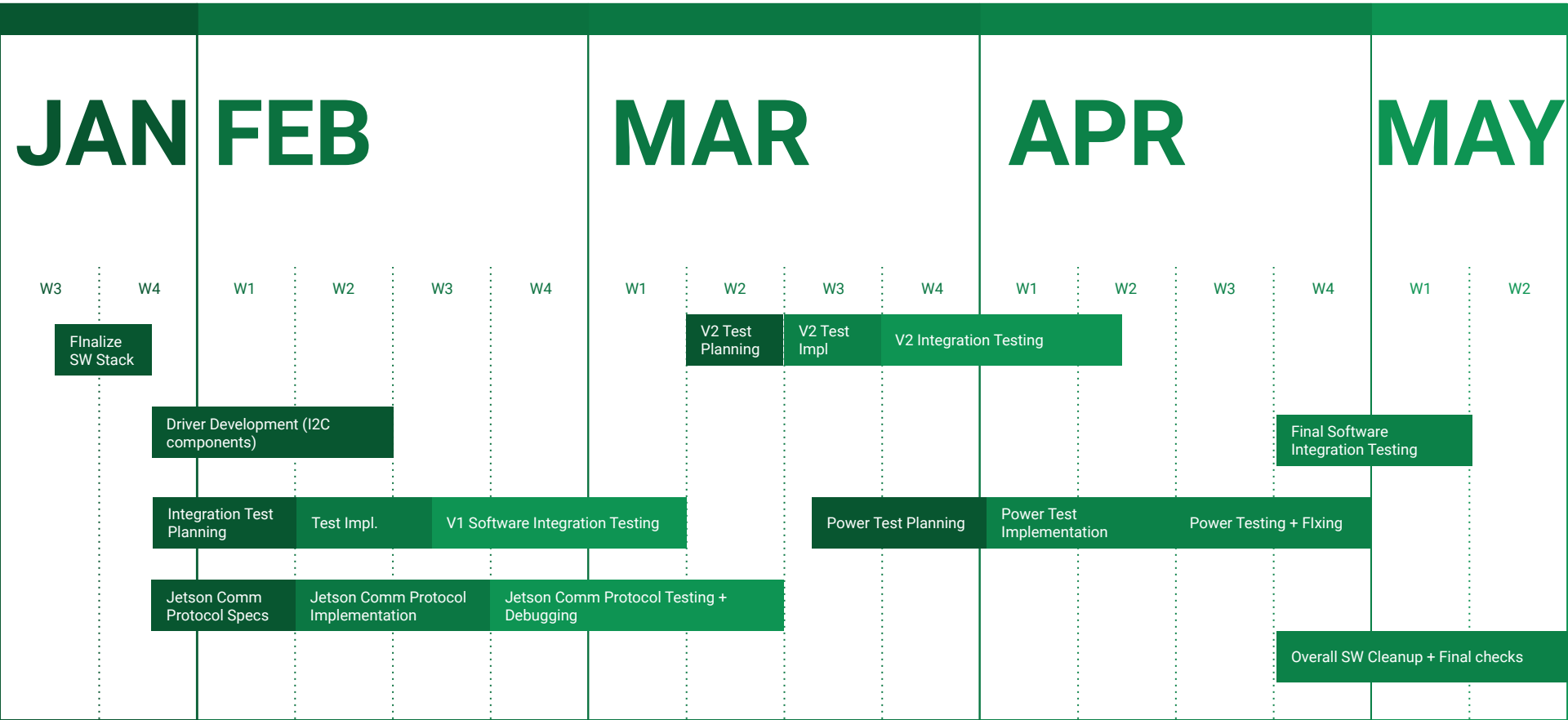


- UART communication lines
- GPIOs for signaling
- Female connector on PyCubed side still undecided

Hardware Timeline



Software Timeline



FPrime/Zephyr

Pros:

+ Unified platform with GDS
+ Built-in test framework
+ Modularized code

Cons:

- No drivers developed
- Need to finish configuring Zephyr for PyCubed
- Zephyr does not have hardware support for external MRAM
- Packed timeline, leaving limited time for testing

CircuitPython

Pros:

+ Drivers already developed for nearly all components
+ Configured for PyCubed HW
+ Fast bring-up, can start writing high-level code today
+ Leaves significant time for testing

Cons:

- No strong-typing
- Not as energy-efficient as C
- Possible undefined behavior due to lack of maturity
- Possible high mem usage

Embedded C

Pros:

+ Strong typing
+ Better control over memory
+ Energy-efficient
+ Directly compatible with Artibeus internal comms code

Cons:

- Slowed development time
- Many drivers need to be built from scratch
- Requires some register-level configuration