Power supply

Jupiter runs from a single external LiPo battery, anything from 1S to 3S, connected through the XT30 input, with an absolute maximum input of 16 V DC. What happens between that connector and the electronics is a deliberately layered design: firing current and electronics current are separated at the first opportunity, the electronics are double-regulated for a clean measurement environment, and every rail that matters is monitored continuously. This page walks the power through the board in the order it flows.
A input range from 3V to 16V is the suggested limits, although you may find the buck boost still functions down to around 2 volts it's unsafe to rely on this.

Input protection

Straight after the XT30, the input passes through a pair of DMP3013SFV MOSFETs in parallel providing reverse-polarity protection. MOSFETs are used here instead of a simple diode for a reason: a diode protecting a high-current input drops voltage and burns it as heat at exactly the moment you're drawing hardest, while a MOSFET conducts with almost no loss at all. Paralleling the pair halves an already tiny path resistance to a few milliohms at most and shares the current between two devices each rated far beyond the job, giving the protection stage 50 to 60 A of continuous capability and over 110 A in burst: whatever else limits a firing circuit, this stage will never be it. The comparison numbers tell the story: at a hard 20 A firing draw the entire protection stage drops well under a tenth of a volt and dissipates a fraction of a watt, where a protection diode would be dropping half a volt and cooking off ten watts. Connect the battery backwards and nothing conducts, nothing is damaged, and nothing needs replacing; connect it correctly and the protection is effectively invisible.
We suggest grabbing yourself a nice XT30 2S or 3S lipo to power this board, although you can of course use anything from a 9V PP3, to LifePO4's, LiPo's and even AA batteries.

The rail splits: firing current and electronics current

Immediately after the protection, the power divides into two routes that never remix. One route runs through a wide 2 oz copper pour directly to the high-current output switches: pyro firing current comes from the battery by the shortest, heaviest path on the board, and never passes through any regulator. The other route feeds a 3 A buck-boost converter, a TPS63070, which produces the main 4.2 V rail for everything else. Buck-boost matters because of the battery range: a 1S pack sits below 4.2 V and a 3S pack far above it, and this topology regulates smoothly from either side, so the electronics see an identical rail whatever battery you fly. Its inductor is a shielded, low-magnetic-signature part, chosen so the converter's switching field stays out of the onboard magnetometer.

Low-noise and efficient modes

The buck-boost has two operating characters. In efficient mode it uses power-save switching, squeezing the best battery life out of long pad waits at the cost of slightly more ripple on the rail. In low-noise mode it switches at a constant rate, trading a little efficiency for the cleanest possible rail, which is what precision sensors prefer. The buckboost setting selects between always low-noise, always efficient, or the hybrid default: efficient while sitting on the pad, where battery life is what matters, switching automatically to low-noise the moment the flight begins, where measurement quality is what matters. Most users never need to touch it.

Double regulation: the LDO stage

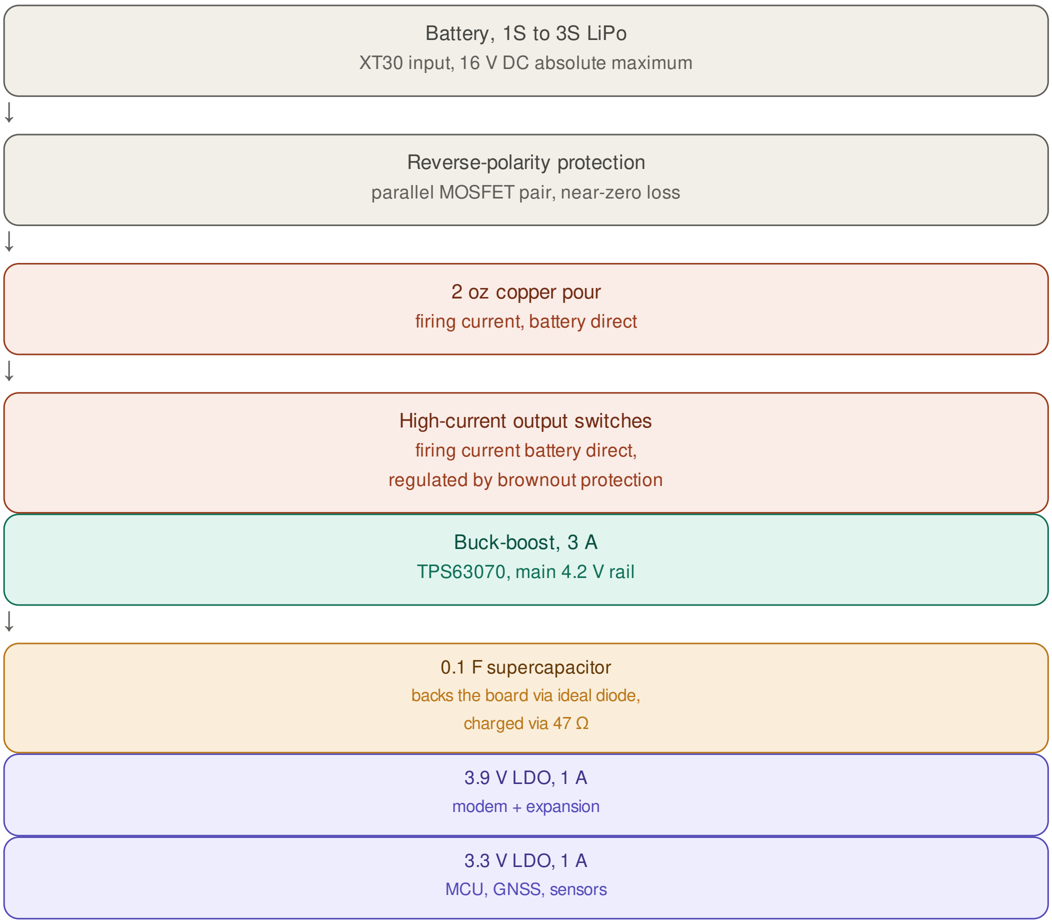
The 4.2 V rail does not power the electronics directly. It feeds two low-dropout linear regulators, each rated at 1 A, which strip the switching converter's residue and deliver genuinely quiet power. The first produces a 3.9 V rail for the cellular modem and for the output regulators on the expansion ports, which in turn provide current-limited 3.3 V supplies to whatever you plug in, so a fault on an expansion board is contained rather than shared. The second produces the 3.3 V rail for the microcontroller, the GNSS receiver and every sensor on the board. The sensors therefore live two regulation stages away from any switching activity, which is a large part of why Jupiter's barometric and inertial data is as clean as it is.

Expansion power

The expansion ports get the same isolation philosophy as everything else on the board. Expansion ports 1 and 2 each have their own dedicated MIC5365-3.3YC5 regulator, and ports 3 and 4 share a third, each one a 3.3 V LDO rated at 150 mA with built-in current limiting and thermal shutdown. The point of giving accessories their own regulators rather than a tap off the main rail is containment: a fault or dead short on an expansion accessory runs its own regulator into its current limit and, if held there, its thermal shutdown, and that is where the event ends. The port browns out, or its shared pair does, the main 3.3 V and 3.9 V rails never move, and the flight computer neither crashes nor notices beyond logging it. Remove the fault and the regulator simply recovers. An accessory can cost you itself; it cannot cost you the flight.

The supercapacitor

The supply also maintains an onboard 0.1 F supercapacitor on the main 4.2 V rail, charged gently through a 47 Ω resistor so charging never loads the rail, and discharging without restriction through an ideal diode, with a backup Schottky diode in parallel as a belt-and-braces second path. Its role is subtler than a simple reserve, and it is emphatically not part of the firing circuit: the capacitor backs the main board, never the outputs. Its deeper job is measurement. In essence it is a live battery-capability monitor: when the high-current outputs load the battery, the way this reservoir behaves under that load tells the system exactly what the battery can actually deliver, moment to moment, on the pad and in flight. The brownout protection system uses that knowledge to actively regulate the high-current outputs, stabilising the total power draw so the board's own supply can never be dragged down: firing an output, any output, into any load, on any battery, cannot brown out the computer, by construction rather than by hope. The full mechanism has its own page: Brownout protection covers the capacitor and the regulation system in detail.



Monitoring

Three voltages are watched continuously at 50 Hz: the battery input, the main 4.2 V rail, and the supercapacitor. All three are recorded in the flight log at that same rate, so every flight carries the complete power story alongside the motion data, and a marginal battery or a sagging rail is visible in the data rather than a mystery.

USB power

One behaviour is designed in for bench safety: when USB power is connected, the buck-boost converter is shut down, which isolates the high-current output stage entirely. Nothing can fire on USB power alone. If you deliberately want the outputs live while working over USB, connect the battery as well; without it, you can configure, download and test on the bench with the pyro side physically unpowered.