

PUMPKINTM

SPACE SYSTEMS

Update
Q3 2023

Spacecraft Buses

Pumpkin is currently completing the second 12U SUPERNOVA bus for the USSF SMC EWS RROC12 EO/IR mission. RROC12 is manifested on the Q1 2024 SpaceX Transporter-10 launch.

Part of the SUPERNOVA family of buses, RROC12 includes:

- 12U tabbed structure w/8U payload volume
- 145W BoL dual independently articulated solar arrays
- 280W+ power & 200Wh smart battery energy storage
- GHz-class OBC w/Ethernet-connected payload(s)
- GUTS flight software (FSW):
 - Buildroot-based with full OTA update capability
 - Linux kernel & EXT4 file system
 - C-, Rust- and Python-based microservices
 - GraphQL requests over HTTP/MQTT
 - AES-256 encrypted CCSDS radio support
 - Seamless InfluxDB integration with Grafana
- Fully on-orbit reprogrammable
- ADCS with dual star trackers & four reaction wheels
- S/X-band comms w/demonstrated KSAT compatibility
- Bidirectional Iridium Short Burst Data (SBD) service comms
- 2x2 MPT-based thruster w/micro-impulse control



EWS RROC12
12U SUPERNOVA
stowed (left) & deployed (right)

Power

- AMPS -- Pumpkin's Advanced Modular Power System -- is nearing its production release. AMPS takes Pumpkin's unique, powerful and versatile EPSM1 architecture to a whole new level. Its modular design enables unlimited numbers of inputs, batteries and outputs. Providing power in 400W increments and energy in 200Wh increments and with its wide range of options, AMPS is the next-generation power solution for small satellites.



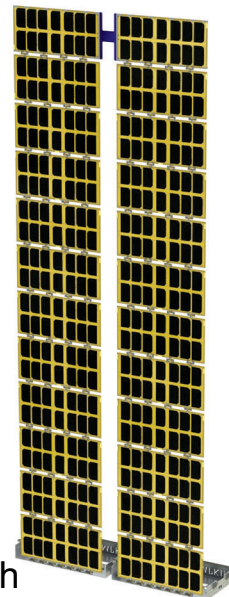
AMPS in a single-slice configuration

Solar Arrays

- In response to customer demand, Pumpkin has updated its space-proven Deployable Clamshell Solar Array (DCSA) from 200W to 375W while maintaining the same user-friendly ICD and while staying within a slightly enlarged footprint of around 9U. Each DCSA presents itself as two independent 35V / 188W BoL arrays that deploy automatically after the user-supplied release mechanism frees the upper clamshell to pivot away from the lower one. Pumpkin's DCSA family of scalable solar arrays are trivially easy to integrate into a wide range of spacecraft.



375W 24-panel DCSA
stowed (above) and deployed (right)



- Pumpkin has been busy improving its GUTS flight software (FSW) with enhancements, including reducing on-orbit incremental upgrade times to the root FS from 10m to 45s, on-orbit SupMCU reflashing via the FSW, radio service upgrades that support primary (S/X-band) and backup (Iridium) radios, faster downlink rates (70+Mbps) and rewriting the telemetry & SupMCU interface services in Rust instead of Python for better performance. GUTS FSW runs on SUPERNOVA buses and on the RS3 SUPERNOVA Satellite Simulator (available to rent or buy).

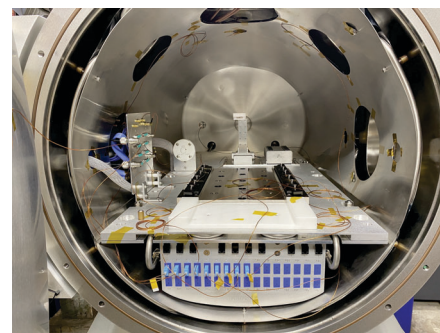
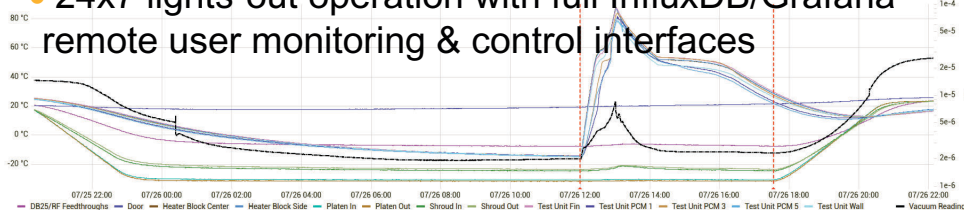
Rackmount
SUPERNOVA Satellite
Simulator (RS3)



Testing

Pumpkin now offers TVAC testing at its San Francisco HQ:

- 50C to +60C platen & shroud temperature range
- Large selection of pre-existing thermocouple, fiber, Ethernet, RF, GPIO/power & GNSS feedthroughs
- >1000W of programmable PSUs
- 24x7 lights-out operation with full InfluxDB/Grafana remote user monitoring & control interfaces



View into Pumpkin's 488 liter
1E-6 Torr-class TVAC
chamber

Pumpkin Space Systems serves demanding government, commercial and educational customers with P-POD and CSD-compatible nanosatellite spacecraft and buses. Our integrated designs are based on our own flight-proven CubeSat Kit™ and SUPERNOVA™ components and have completed flight qualification.



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