

Bradford Avionics System

A Modular, Scalable, Low-Volume, Lightweight and Cost-Effective SmallSat Avionics Stack Solution for Earth Orbits and Deep Space Applications



Example Avionics System Configuration

The Bradford Space Avionics System is a pre-integrated and scalable avionics assembly designed specifically for the needs of deep space, cislunar, lunar surface, and high-performance Earth-orbit SmallSats including OTVs and highly agile missions.

The Bradford Avionics System reduces integration risk and complexity through the use of a highly modularised stack that enables spacecraft attitude control, payload interfacing and data processing, power distribution and conditioning and navigation-enabled, high data rate radio communication. Through the configuration and addition of modules, the capabilities can be tailored to varied mission requirements without additional NRE and with short lead-times. The product offers a range of standard interfaces and complete flight software allowing for low cost and short timescale deployment. In keeping with SmallSat market needs, the Bradford Avionics System provides a more cost effective solution than the traditional deep-space hardware products while providing equivalently high performance and dependability.

The system's size and feature set has been optimised for mini and micro satellites and it is built to accommodate the needs of demanding spacecraft & missions, including 1500W of power handling, application-based computing platform, terabit-range data storage and megabit data rates at cislunar ranges. The system is designed with a focus on mass-efficiency to achieve high specific performance to best suit missions with high ΔV needs, and it is designed to provide a reliability similar to that of traditional aerospace to enable 5+ year lifetimes.

MAIN FEATURES

- Internal redundancies of key functions by design
- Optional additional redundancies possible through duplication of modules
- Short delivery times (<3 months after receipt of configuration)
- Radiation: qualified up to 30kRad total ionizing dose, and mitigations against SEEs.
- Operational temperature range: -40°C to $+60^{\circ}\text{C}$
- Operational life: > 5 years
- Mass: Depends on configuration; from 250g to 5 kg
- Dimensions: W163.5mm, H120mm, Length depends on configuration – typical assembly; L180mm
- ITAR-free

Propulsion Control

- Scalable electronic controller for thrusters between 1 and 22N
- Fuel system management
- Green and standard Hydrazine Monopropellant compatible
- Thruster sensor data collection & electrical actuator control

Interfaces: Thrusters

Platform Controller

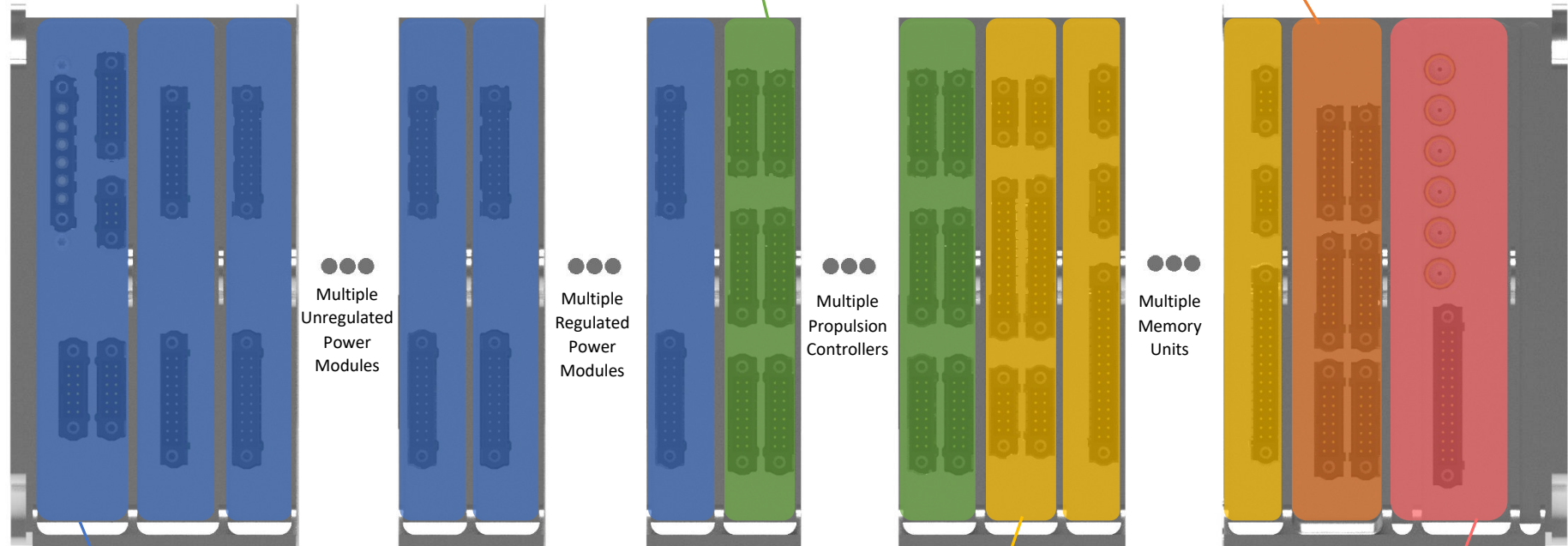
- Safety critical microprocessors + watchdog
- TT&C and payload data storage
- Complete SW functionality out-of-the-box
- Modular architecture and SDK for customer code expansion

Interfaces: All standard digital interfaces

Customer Specific Modules

According to customer needs, additional avionics modules can be designed in the same form-factor as the existing modules and be integrated in the Bradford Avionics System.

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Power Conditioning & Distribution

- Solar Array Management
- Battery Management (any ~28V battery)
- 150W - 1500W power continuous throughput
- Any number of load outputs

Interfaces: Solar Array, Battery, Unregulated & Regulated Loads

Payload Data Handling

- SoC-based general processor
- High-rate payload interfacing
- Linux software environment
- Scalable mass non-volatile data storage (TB range)

Interface: Payloads

Communications

- TT&C, data downlink and navigational capabilities
- S and/or Ka-band operation
- 40 MB/s or multi-AU range usage
- Dual simultaneous reception + duplex transmission

Interfaces: Converters, Antennae