



1U Fastbus showing exterior

FastBus CubeSat Platform

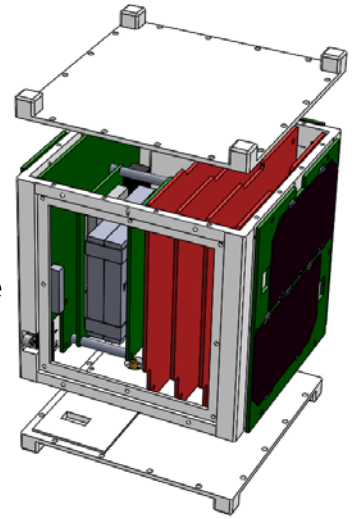
All Subsystems and Structure

All-In-One CubeSat:

1U Option

Simplex Comm., Solar, EPS, Unibody Frame, Online Ground Station, Sensors, and Processor (TRL=9)
All subsystems on top PCB board

Spacecraft Bus ready for experiments and flight!



1U FastBus structure with GaAs solar cells, inhibit switches, Simplex NSL Globalstar radio, and customer payload

Flight Ready

- TRL=9 system, TRL=8 structure
- 4 LEO Flights: TSAT, GEARRS1 & 2...
- ~ 90 day final delivery from kickoff
- Orbit tested from 110 to 700 km
- PPOD and NANORACKS approved
- Critical piece for Mission Success
- Fully supported product
- Compliant with new FCC requirements for shut-off

Unibody, Aluminum Structure

- Efficient assembly & integration flow with custom modifications
- Strong, stiff, precise, & pin aligned structure
- Fits Pumpkin/PC104 PCB boards
- Two access plates for work flow
- Fully enclosed EMI satellite with rad-dose shielding
- Body is excellent thermal short
- Very flexible, functional, agile, & suited for custom modification
- Includes gold anodized endplates & access panels, inhibit switches, EyeStar antenna mounts
- Low Cost

Advanced EPS

- All-in-one Power Distribution
- Certified Li-Poly batteries with protection and cell diagnostics
- MPPT for various Solar Arrays
- 3-Fault Inhibits & Solar inhibit
- Charge meter with diagnostics
- Distribution 4 to 32 connectors
- Current monitors and protection
- Four 1-wire Temp Bus
- Dual processors w/diagnostics
- PCB 7-layer small size and cost
- 6 Analogs, Custom Software

Mechanical Specifications, 1U

Dimensions: 10.3 x 10.3 x 13.5 cm PPOD
 Weight: 0.475 kg (for 1U, 2.2 Ahrs)
 I/O Interface: up to 12 DF-13
 Cooling: Thermal radiator shield
 Electrical Heater Thermostat option
 Enclosure: Open or Shielded

Electrical Specifications, 1U

Output voltage nominal: 5 V & 3.3 V
 Power-up current: 10 mA @ 5 V
 TX Current: 280 mA @ 7.4 V
 Supply Power: 0.6 W in Sun

EPS Battery and Solar Array

Li-Poly Batteries, 2.2 Ahr @ 7.2V
 UL, Nanoracks, ISS, Atlas, SpaceX,
 Safety Report available

EPS Data I/O

Data input: 38,400 bits/s full duplex
 Effective data rates: 32 bits/s
 Handshaking and validated data

Dual Microcontrollers

Ck Freq: 20 MHz
 One-wire Temp and Bus Voltage

Comm Specifications, 1U

EyeStar-S3 Simplex Communication

End to end communication system

Online Ground Station Access

Notes and References

- 1) 100% on-orbit success
- 2) ICD and STEP files available
- 3) AIAA Small Sat Paper: SSC14-WK-6, 2014
First results TSAT/Globalstar, Voss et al.
- 4) AIAA Small Sat Paper: (SSC16-WK-11),
Globalstar link results, Voss et al.
- 5) Custom work available



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Environmental/Flight Testing

Temperature:

Passive heat sink/radiator
 EPS: -40 to +60 C
 Non-Operational: -60 to +100 C
 Surface emissivity/reflectivity

Vibration: (EPS, Bat, Processor, Comm)

Delta: 30g
 Atlas Rocket/PPOD: 28g
 Orbital/Nanoracks: 20g
 SpaceX/PPOD: 20g

Dose Radiation:

9 months in 350 by 700 km orbit
 No dose problems or upsets in SAMA

QA Radio Testing:

Vibration, Vacuum, & Thermal testing
 Multi-day Burn-in
 Final system testing
 Server radio testing
 Certification

In-Orbit Reliability

EPS units worked on 4 of 4 satellites

Customers

AFRL, Nanoracks, several universities

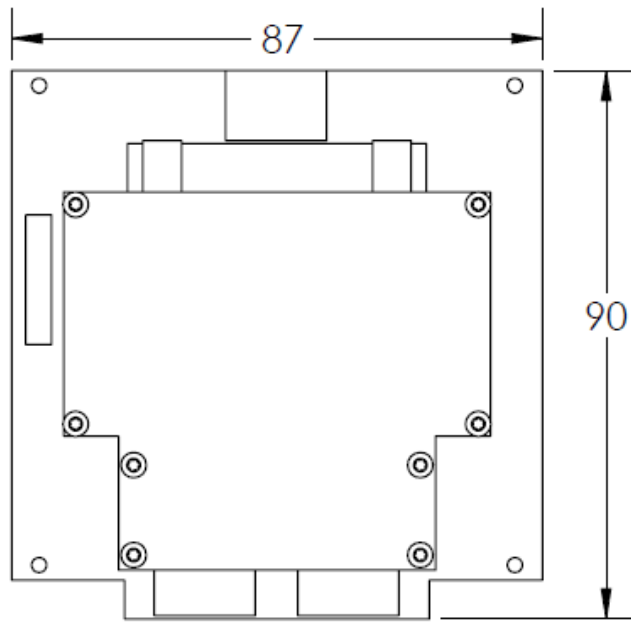
Features

- Fast Delivery: Structure or EPS
- 1U Structure, 3-week delivery
- Anodized surface, bench plate, screws
- Custom Support and Testing
- Academic Rate available

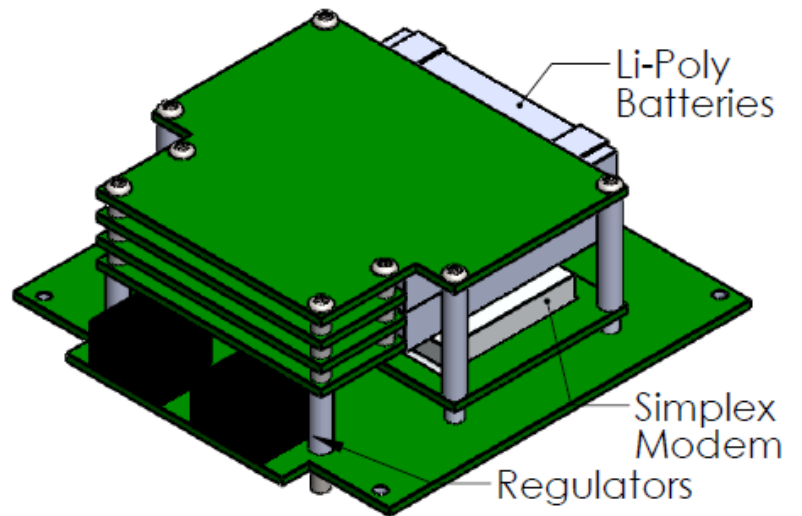
Options

- Inertial-Momentum Unit (IMU)
- Particle Detector – PIN Diode
- 900 MHz crosslink
- Two cells/side or 4 cells/side flip-out
- Precision GPS
- Flip Out Solar Panel

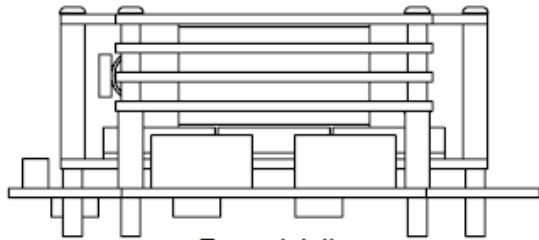
V4.5



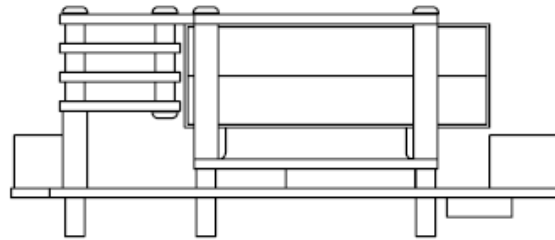
Top View



- NSL All-in-one Subsystem for 1U CubeSat
- Includes Comm., Solar, EPS, Processor...
- Measurements are in mm

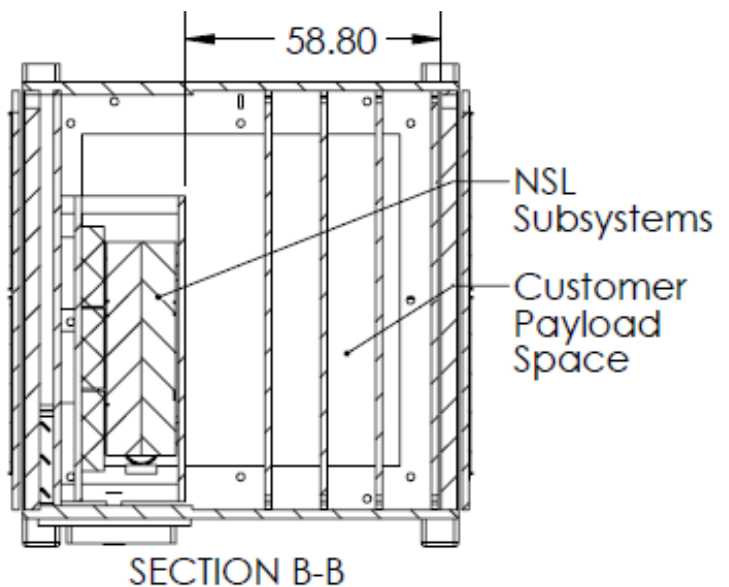
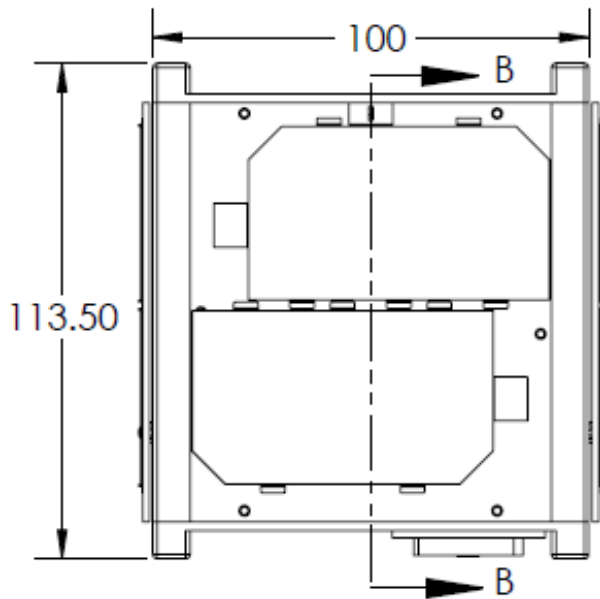


Front View



Side View

- FastBus 1U Satellite
- Structure Measurements are in mm.



1U Unit body Flight structure, stock 2 week delivery, -Includes extra accessory panels, switches, anodized surface, screws, mounting alignment bench plate, and EM test structure use

1U Unit PCB All-in-One Flight PCB and Solar Cell PCBs, stock 3 week delivery and EM test structure