Coming Soon!

CubeSat ADCS Capability

Versatile Compact Avionics Board

CubeSat Attitude Determination and Control

Developed from our experience with the DICE and DIME CubeSat missions, this attitude determination and control board provides an affordable yet robust solution for meeting CubeSat pointing requirements. The Figure below shows the board, which can serve as a controller for spacecraft as small as 1U and as large as 6U.

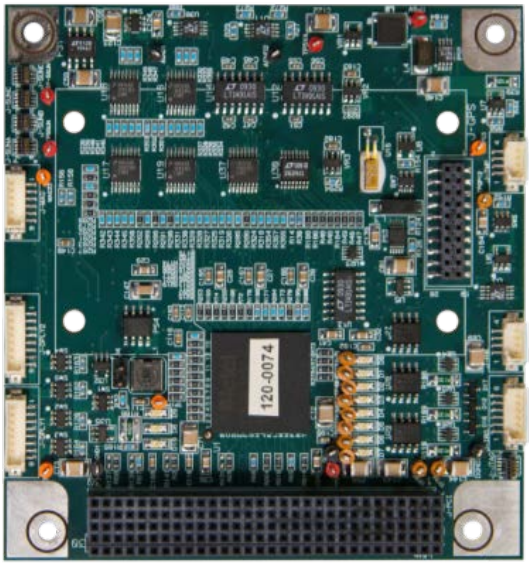

Figure 1: ASTRA's versatile ADCS board.

The configurability of this system enables 3-axis and momentum bias control modes. This is the first commercial CubeSat avionics system designed specifically around a spin-stabilized (2-axis) architecture with magnetic control (no moving parts).

- Most CubeSat attitude systems are either passive/semi-passive for low-level control requirements, or 3-axis systems providing stringent control capabilities.
- A spin-stabilized 2-axis control-system provides a low-cost and robust method for meeting intermediate/low levels of attitude control requirements and is appropriate for many CubeSat missions.

The major-axis (spin-stabilized) method is resilient to many of the operational risks associated with using miniature, COTS, hardware in space such as irregular communications, and on-board computer interruptions.

SYSTEM FEATURES

Multi-axis control

Capable of implementing various control laws (full configurability)

Autonomous operation

Compact: CubeSat compatible

SYSTEM INCLUDES:

- Baseline control and determination software
- Input interface for standard suite of attitude sensors
- Input interface for GPS receiver
- Output interface for control of system actuators, including deployment actuators
- Combination of FPGA and processor for ADCS algorithm processing, and data handling and management
- Real-time clock

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Versatile Compact Avionics Board
For SmallSat and CubeSat Applications

The Versatile Compact Avionics Board* is functionally adaptable and physically robust. It is designed to support multiple control modes with multiple SmallSat and CubeSat configurations, and is suitable for a wide range of extreme temperature and dynamic deployment conditions. The table below lists the board specifications and anticipated performance with an example sensor-actuator suite.

SPECIFICATIONS

Size: <9.0 x 9.0 x 0.5cm

Weight: 100 g

Power: 180 mW Determination;
750 mW Magnetic actuation

Operating temperatures: -40C to +85C

Determination RSS Error: <0.45°
(assuming sensor suite in table to the right)

Control Error: <5°
(assuming sensor and actuator suite in table to the right)

Parameter	Specification		
System Interface			
Power	≤	0.18	W
Mass	≤	100	g
Internal Sampling Rate	≥	50	Hz
Size		1U compatible	
Telemetry Rate	≥	1000	Hz
Comm Interface		UART	
Command and Control		External	
Power Interface		Vbatt (6-12V), 3.3, 5VD	
HK Sensor		8x Analog Temp, 2x General	
Deployment Mechanism		6x Vbat Fire	
Operating Temperature	≤	-40	°C
Operating Temperature	≤	85	°C
Attitude Determination			
3 Axis Magnetometer	≤	0.2	° (1σ)
3 Axis Coarse Sun Sensor	≤	15	° (1σ)
2 Axis Fine Sun Sensor	≤	0.2	° (1σ)
3 Axis Gyro	≤	0.03	° (1σ)
Attitude Control			
Z-axis Torque Moment	≥	0.3	Am^2
X/Y-axis Torque Moment	≥	0.3	Am^2
Algorithms		Integer Math	
Navigation			
Position	≤	0.05	km
Time	≤	0.05	ms

*Product availability anticipated Spring of 2015.

Ask about our consulting and design services to pair your ADCS board with sensors and actuators that are customized for your mission.

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