

MODAS

MODULAR AVIONICS SYSTEM

The Space Dynamics Laboratory's **MODular Avionics System (MODAS)** is a compact, robust, flexible avionics system made up of a collection of functional building blocks that can be combined to meet a multitude of space systems requirements. MODAS is based on the industry standard PCI-104 architecture that includes a 32-bit, 33MHz PCI bus in a very compact and robust form factor. The system has been designed from the ground up to excel within the harsh environments of LEO, GEO, and deep space missions. The modules use 100 krad tolerant components along with SEE mitigation techniques such as EDAC, TMR, and TTMR. The MODAS structure is designed to withstand the high vibration and shock environments of launch vehicles.

FLEXIBLE CAPABILITY

The MODAS "Stack" is configured by selecting any combination of functional modules. The PCI-104 form factor does not have a backplane. This allows the structure size to adapt with the number of modules required, resulting in a structure that is only as large as required for the mission.

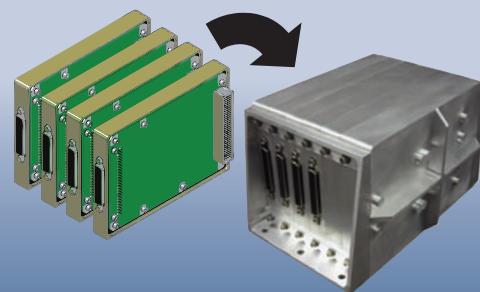
IDEAL FOR PAYLOAD INTERFACES

MODAS provides an efficient interface to multiple payloads/sensors eliminating re-design & qualification of existing avionics. Adding functional modules to the scalable & adaptable architecture, MODAS can accommodate most sensors. The baseline MODAS provides inherent processing capability and data storage for payloads & sensor.

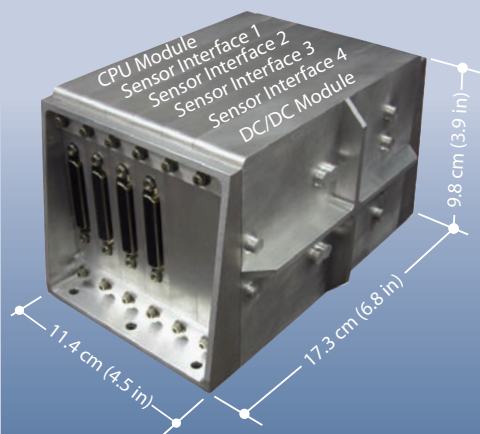
Basic modules for standard interfaces such as RS-422, LVDS, and digital camera interfaces are off-the-shelf. For custom sensor interfaces, a new module is developed by starting with the common PCI front end and simply adding the specific back end interface for the sensor. The computing architecture is already in place. Only the new module need be qualified, significantly reducing the scope of the effort.

IDEAL FOR ON-BOARD DISTRIBUTED COMPUTING

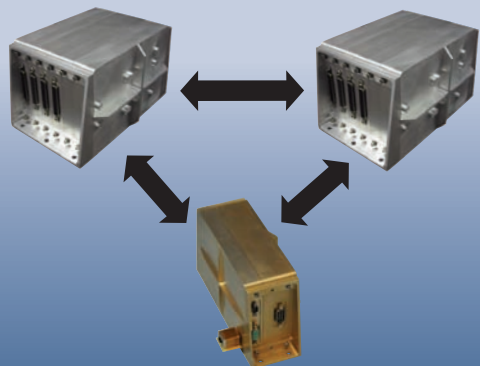
A multi-stack architecture forms a distributed web of processing & control capability. Each stack becomes a hub for payloads, sensors, and I/O to connect into the overall system architecture. The modular design can easily scale up or down depending on the requirements. The electronics are powerful enough to serve as the main system electronics or add capability and payload interface to existing legacy systems. Multiple functional building blocks already exist with others in the design process.



Configure based on interface requirements.



This sample configuration shows a compact, integrated sensor interface package.



Scalable, distributed architecture allows the MODAS to expand to meet interfacing and C&DH requirements.



Space Dynamics
LABORATORY
Utah State University Research Foundation

MODAS

MODULAR AVIONICS SYSTEM

Processing Modules

CPU Module

Texas Instrument 320C6713 DSP
256 Mbyte SDRAM with EDAC
1200 MIPS, 900 MFLOP

Bus Interface Module

Leon III fault tolerant processor (60 MIPS)
256 Mbyte SDRAM with EDAC
4 Space Wire ports

Payload/Sensor Interface Modules

FrameGrabber Module

Supports up to 3 cameras simultaneously
CameraLink Interface
128Mbyte SDRAM for image storage

Digital & Serial I/O

5V & 3.3V Compatible Digital I/O
Synchronous & Asynchronous RS-422 / LVDS
Differential I/O

Payload Interface Module

800 Mbit/sec Data Interface
1Gbyte SDRAM Storage with EDAC
Asynchronous Serial Bi-Directional Port

Temperature Controller

28 Temperature Inputs; 16-bit resolution
2 pressure XDCR inputs
12 heater Controller Outputs

C&DH Modules

Valve Driver Module

10 self timed driver outputs
10 optically coupled feedback monitors
2 RS-422 serial links
Differential I/O

Battery Charge Control Module

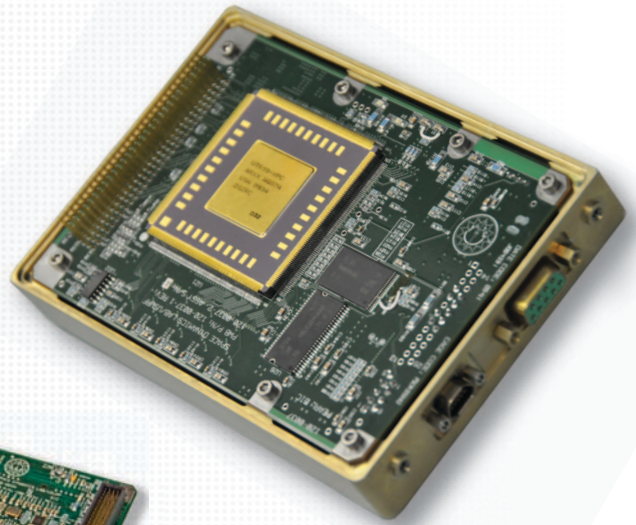
Direct Energy Transfer Architecture (DET)
RS-485 Serial Interface
Controls up to 8 Solar Array strings

DC-DC Module

20 – 40 Volt Input Range
+3.3, +5, +12, -12 Volt Outputs
Mil-STD-461C compatible

Power Switch Module

8 Solid State Relays
Current Monitoring
Rated 4 Amps per Channel
Autonomous Overcurrent Protection



Bus Interface Card (EDU)

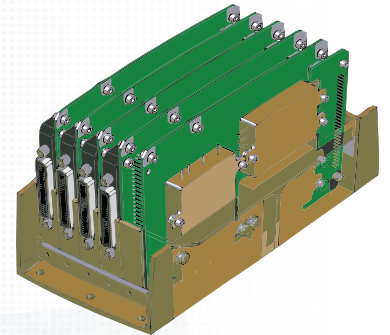
Card Dimensions: 9cm x 12.7cm (3.55 x 5 in)

Backward compatible with standard PCI-104 allows for testing with inexpensive COTS equipment

Up to 1200 MIPS

Mass: <3 kg

Power: <15 W



Space Dynamics
LABORATORY
Utah State University Research Foundation