LC2102a
2U CubeSat Structure
User Manual

Document change log

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1 Introduction

The LC-2102a 2U CubeSat Structure is a rigid and modular structure for nanosatellites that fully conforms to the CubeSat specification. It consists of four anodized side frames and a bottom frame, an antenna mounting ring, and panels. The frame and panels are made of 6061 aluminium alloy, while the antenna mounting ring is made of PEEK. The product fits CubeSat-Kit compatible boards and standard PC104 boards. It is easily assembled with 46 screws (plus 44 panel screws).

Illustration 1 is an exploded view of the product with two panels removed. It shows the annotation for the main components of the product. The coordinate systems shown are the CubeSat reference frame and the reference frame for handling and assembly.

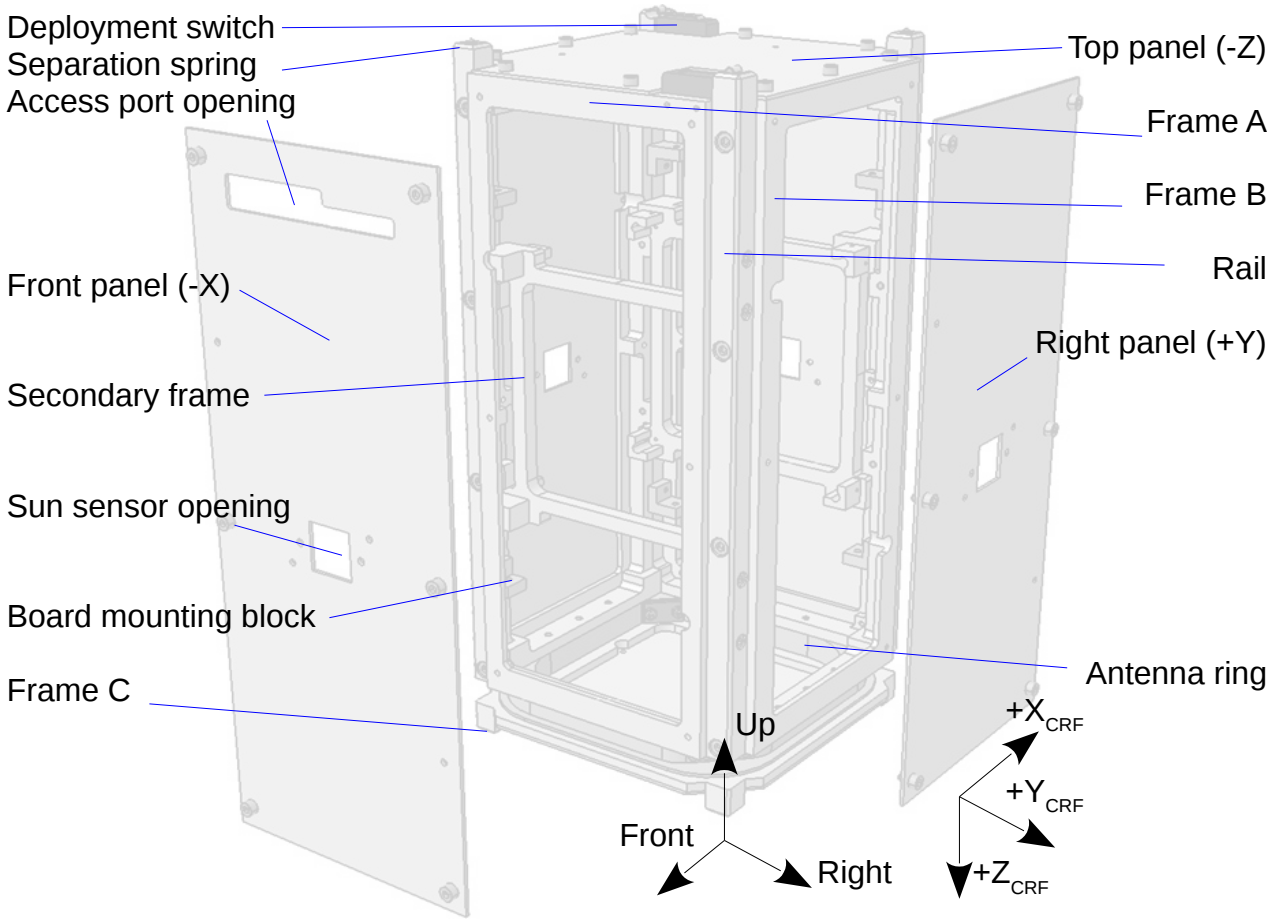

Illustration 1: Exploded view of product

Features:

- Rigid 2 mm 6061 aluminium frame and 1mm 6061 aluminium panels
- Modular design
- Easy to assemble and integrate
- Redundant separation springs and redundant deployment switches
- Antenna mounting ring
- For CubeSat-Kit compatible boards and PC104 boards
- Total mass: 704 grams
- Qualified for PSLV, DNEPR and other launch rockets
- First natural frequency > 400 Hz

2 Applicable and reference documents

Reference	Title	Issue
AD1	CubeSat Design Specification	12 or later

Reference	Title	Issue
RD1	CubeSat Board Specification	

3 Definitions and abbreviations

Term	Definition
Assembly	The process of mating parts to obtain a low level configuration
Integration	The process of physically and functionally combining lower level products to obtain a particular functional configuration
Fixing	The permanent locking of fasteners
Mounting	Mating of parts using fasteners

Abbreviation	Definition
CRF	CubeSat reference frame
ESD	Electrostatic discharge
RBF	Remove-before-flight
SMS	Structure and mechanisms system

4 Specification

4.1 Absolute maximum ratings

Parameter	Min	Max	Unit
Current through deployment switch		10	A

Exceeding the limits specified in the table above may result in permanent damage to the device and harm to products and personal.

4.2 Physical characteristics

Parameter	Min	Nom	Max	Unit
Total mass		704		g
First natural frequency	400			Hz
Centre of gravity, Gx		0.11		mm
Centre of gravity, Gy		0		mm
Centre of gravity, Gz		4.67		mm
Moment of inertia, Ixx		6.00E-003		kg*m**2
Moment of inertia, Iyy		5.00E-003		kg*m**2
Moment of inertia, Izz		3.00E-003		kg*m**2
Moment of inertia, off-diagonal			1.00E-005	kg*m**2

* All values are given with respect to the CubeSat reference frame, with its origin in the geometric centre of the CubeSat

4.3 Other characteristics

4.3.1 Technology readiness level

The product in its configuration has TRL 8 and is qualified for space operation. It has been qualified against typical launch loads and low earth space environment.

4.3.2 Compatibility

The product is in full conformance with the CubeSat Design Specification. It can integrate boards that conform to the CubeSat Board Specification form factor and other custom-made boards.

5 Interfaces

5.1 Mechanical interfaces

5.1.1 External interfaces

The product has interfaces to the deployer during launch and it has interfaces to mechanical ground support equipment during assembly and testing. The external dimensions of the product are shown in Illustration 2. Also shown are the dimensions of the access port opening. These, and any other side panel openings (such as for the sun sensor) are fully customizable. The side panels allow for mounting of components such as sensors and solar panels.

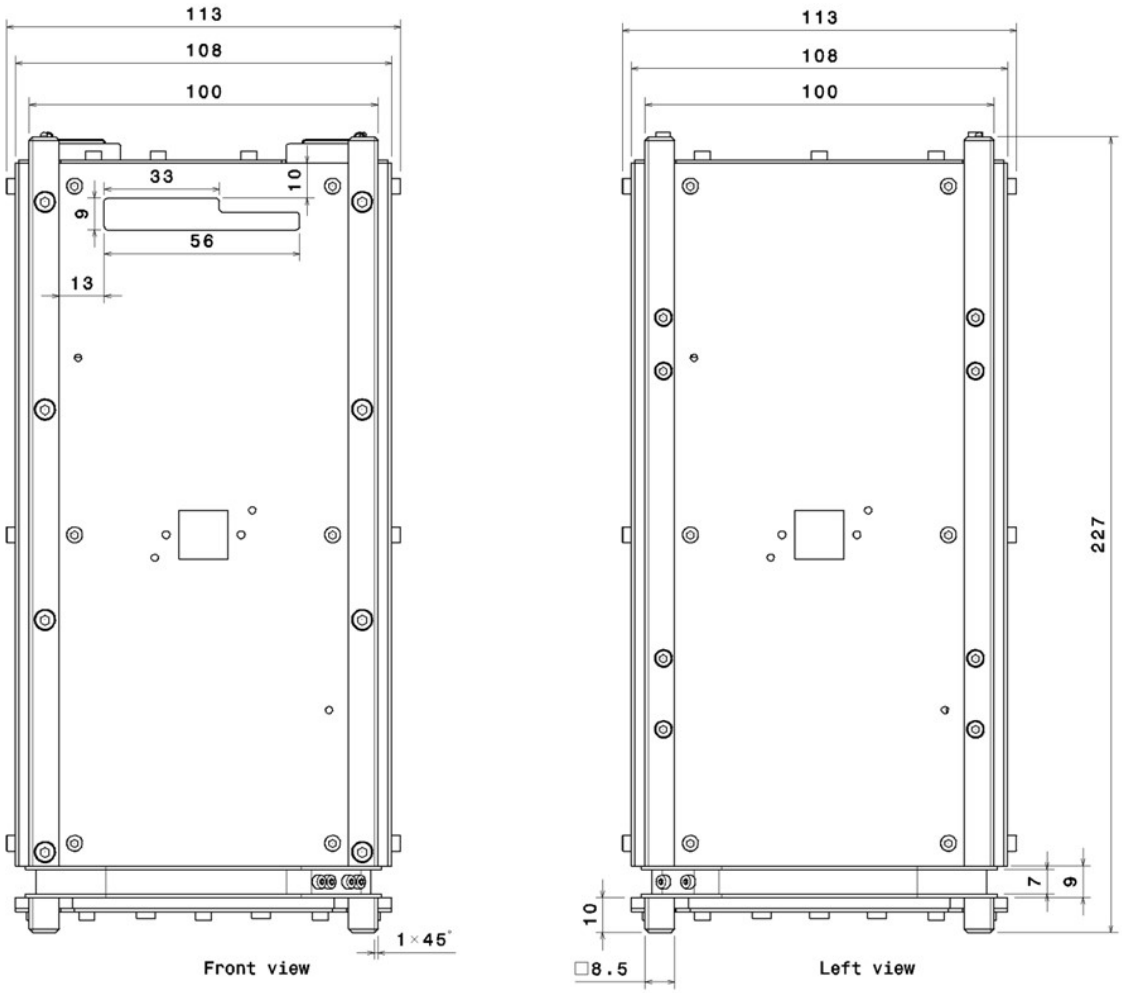

Illustration 2: External dimensions

5.1.2 Internal interfaces

The product interfaces to the interior satellite components through its main structure. The structure provides through-holes for M2.5 screws at each frame A as shown in Illustration 3. These can be used to either mount components (such as payload) directly onto the frame, or by using mounting blocks for the boards as shown in Illustration 4.

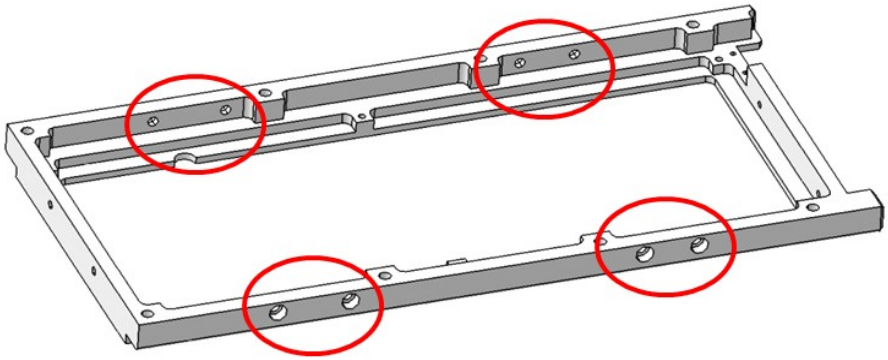

Illustration 3: Mounting holes

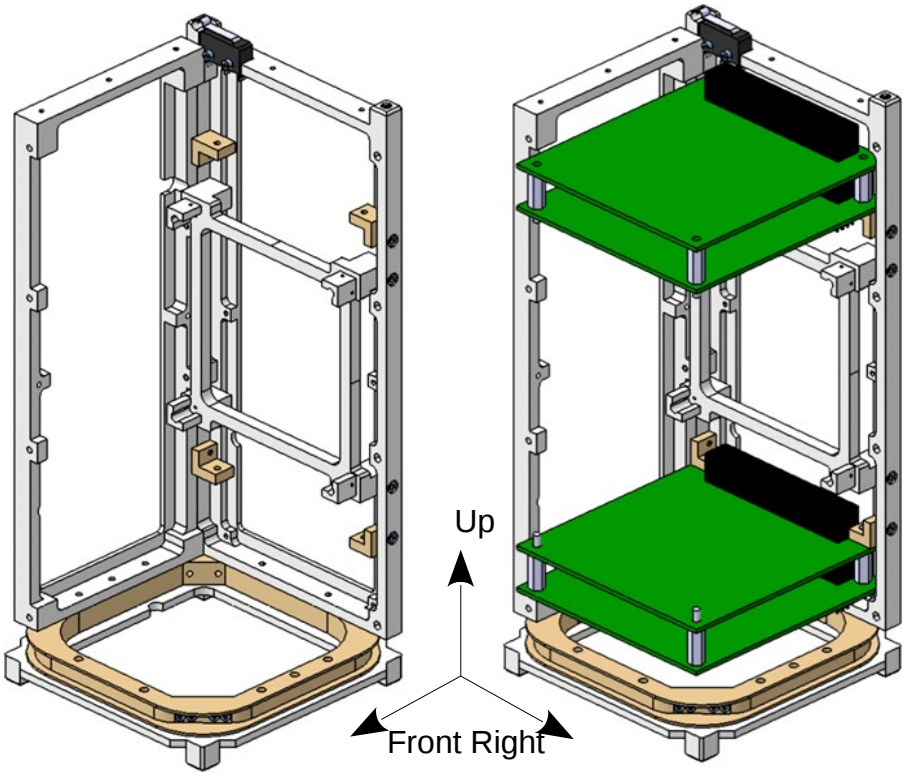

Illustration 4: Example of a mounting configuration for interior components

The interior boards should conform to the board shape as specified in the CubeSat Board Specification and shown in Illustration 5.

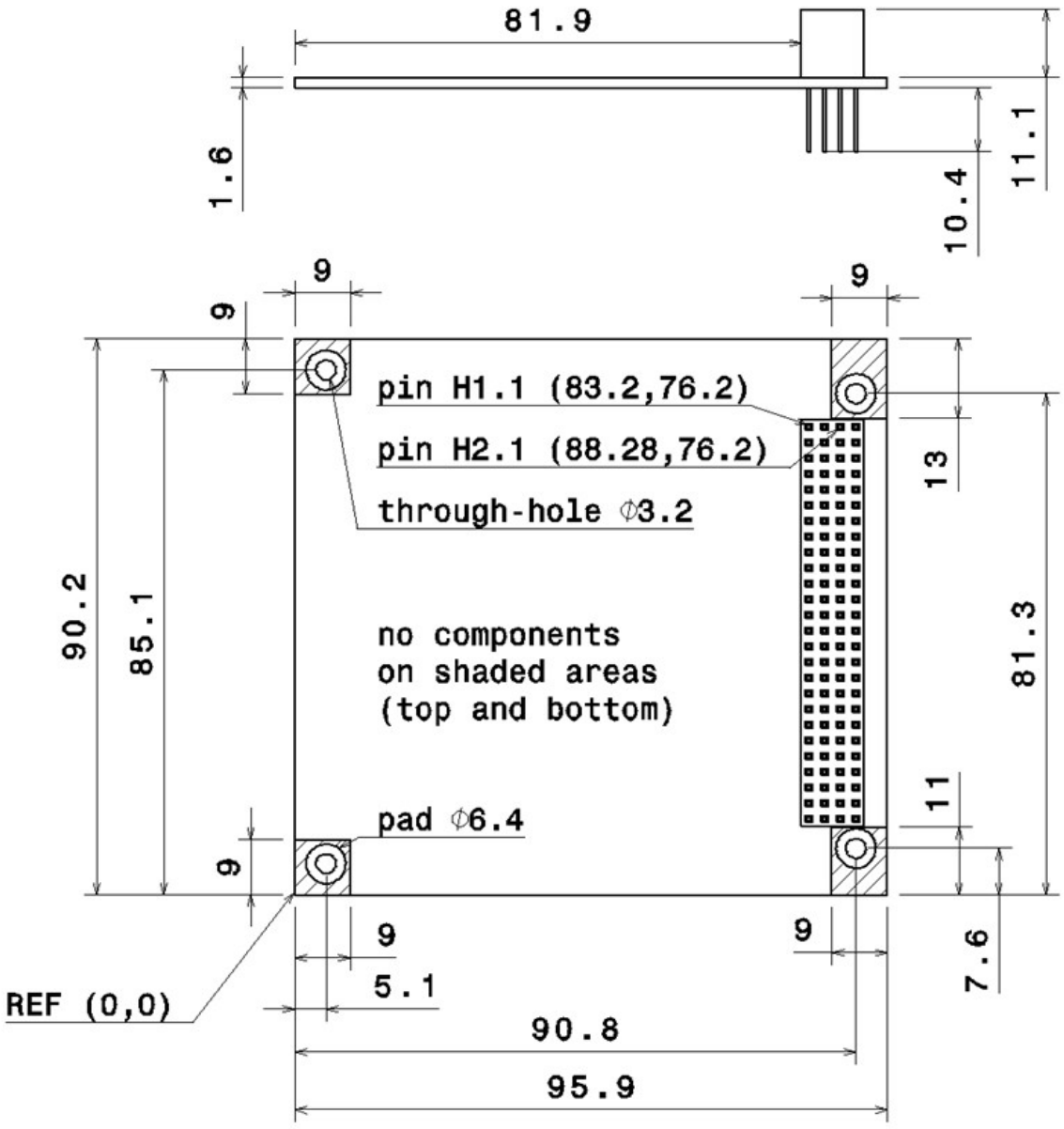

Illustration 5: Recommended shape of interior boards

5.2 Electrical interfaces

The only electrical interfaces of the product are the deployment switches. The functioning of the switch is shown in Illustration 6. Depending on the deployment switch circuit logic of the satellite, not all of the terminals may be used and can be removed.

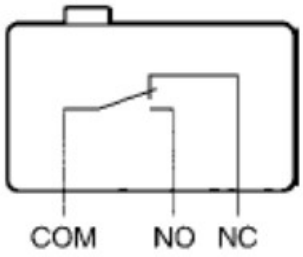

Illustration 6: Deployment switch diagram

6 Design description

6.1 Main structure

The main structure was designed not for optimized (low) weight, but for rigidity and modularity. All screws are easily accessible and the structure can be assembled and disassembled quickly.

6.2 Side panels

The side panels can be customized to fit sensors and solar panels. The current design allows for mounting of attitude sensors and/or cameras in the centre. It also provides an access window to the hosted subsystem boards on the front panel.

6.3 Deployment switches and separation springs

Separation springs are integrated on the top end of two opposite rails. On the two remaining rails, the deployment switches are mounted on top. This mechanism combines robustness with simplicity.

6.4 Antenna ring and deployment

The antenna ring provides for mounting an UHF dipole antenna. The antenna is stored during launch and released upon orbit injection. This is usually done via melting a nylon string that holds the free ends of the dipoles together. The mechanisms requires an external system to provide the power for this mechanism.

7 Handling and storage

Be careful when handling the product and observe cleanliness requirements. To clean the product, use a lightly moist tissue.

Use gloves when handling the product and ensure cleanliness at all times.

Be careful in particular not to break the deployment switch levers.

Store the product in a clean and dry environment at room temperature. The product may be stored in assembled or disassembled configuration.