PUMPKIN INCORPORATED

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Deployable Solar Panel End Hinge

Hardware Revision: A

Means of Attaching Deployable Solar Panels to a CubeSat Kit™ Structure

Applications

- CubeSat Kit™ nanosatellites
- MISC 3™ nanosatellites
- Independent projects

Features

- For use with CubeSat Kit™ base and cover plates
- Can also be used in custom configurations
- Customizable deployment angle 45º-180º
- Compatible with any thickness deployable
- Multiple structure mounting options
- Hard-Anodized 7075-AL hinge parts
- Stainless steel hardware
- Compact volume
- Low mass

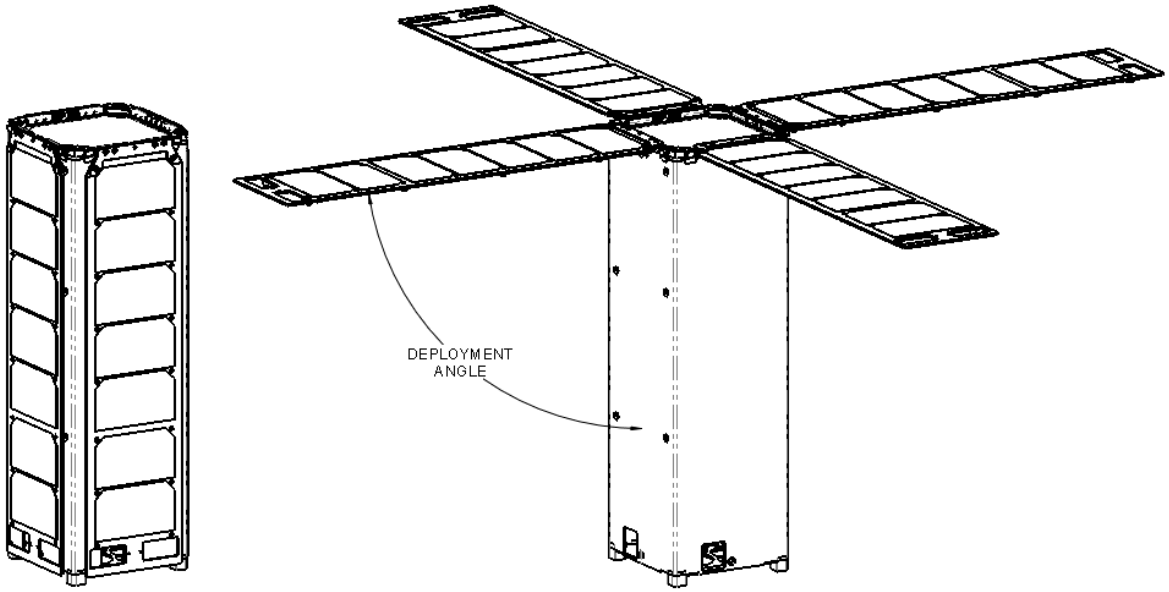
ORDERING INFORMATION

Pumpkin P/N 710-00650

Option Code	Configuration
/F0 (standard)	Offset Hinge Standard
/F1	Offset Hinge Ejection
/F2	Offset Hinge Top Mount (Single Side)
/F3	Offset Hinge Ejection (Single Side)
/Axxx	Deployment angle [in degrees]

Contact factory for availability of optional configurations.
Option code /F0 shown.

Lead time for assembly is 6-8 weeks from ARO



CHANGELOG

Rev.	Date	Author	Comments
A	20180620	JMM	Initial release of hardware Rev A.
A	20181115	JMM	Added brace notes, mounting notes, deployment angle definition

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Units
Operating temperature	T_A	-200 to +200	°C
Deployable Mass (per set)	m	350	g

PHYSICAL CHARACTERISTICS

Parameter	Conditions / Notes	Symbol	Min	Typ	Max	Units
Mass	Complete set of 2 feet, 2 hinges, 2 springs, 2 spacers, and 4 shoulder screws			12		g
Spring force	Per spring			0.0027		in*lb/ deg
Panel mounting hole				M2		
Structure mounting hole				Varies		

HINGE ASSEMBLY COMPONENTS

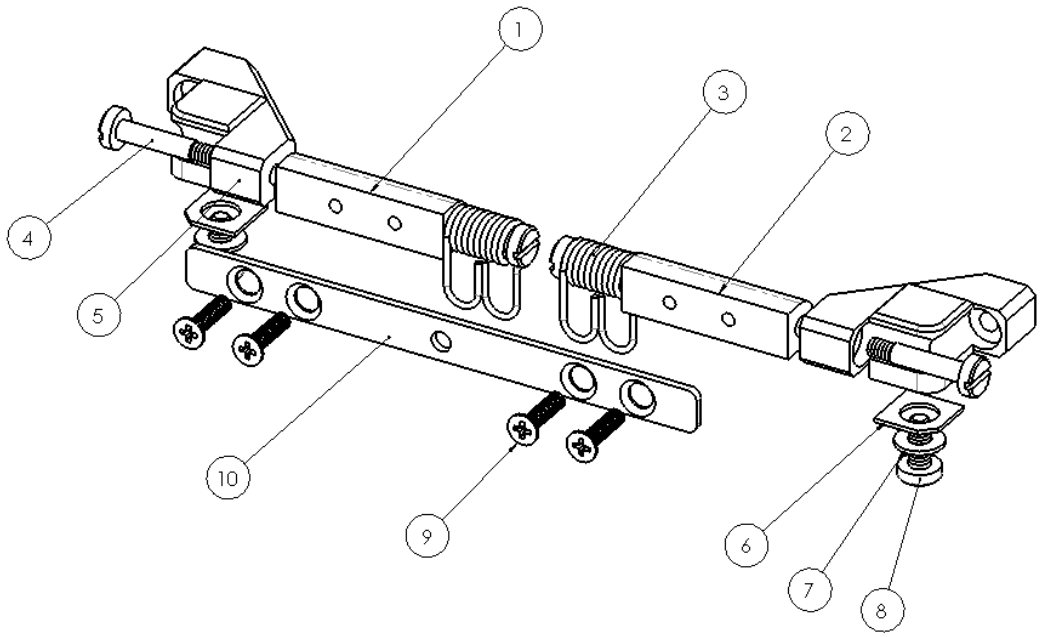


Figure 1: Exploded view of the standard deployable solar panel end hinge set (option /F0 shown)

Item No.	Part	P/N	Material	Finish	Qty	Notes
1	Hinge, Panel Left	TBD	7075-AL	Hard Anodized MIL-A-8625F	1	Customer desired deployment angle
2	Hinge, Panel Right	TBD			1	
3	Spring, End Hinge	703-00477	17-7 SST	Passivated	2	
4	Shoulder Screw, 2-56	N/A	18-8 SST	Passivated	4	
5	Foot	TBD	7075-AL	Hard Anodized MIL-A-8625F	2	Customer selected. See FEET OPTIONS
6	Spacer, Ejection Foot	703-00350	300 SST	Passivated	2	
7	Washer, M2.5 Flat	N/A	316 SST	Passivated	2	
8	Screw, M2.5x6mm	N/A	18-8 SST	Passivated	2	
9	Screw, M2x8mm	N/A	18-8 SST	Passivated	4	
10	Panel Brace	N/A	7075-AL	Hard Anodized MIL-A-8625F	1	Customer supplied. See PANEL BRACE

Table 1: Standard assembly components list for Figure 1 exploded view

FEET OPTIONS

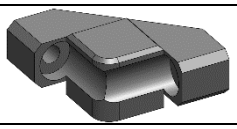
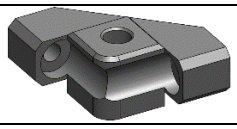
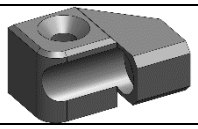
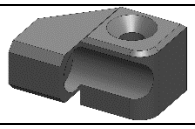
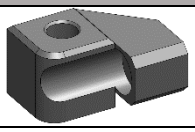
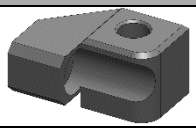
Option				
Option Code	**/F0**	**/F1**	**/F2**	**/F2**
Part Name	Foot, Offset Hinge Standard	Foot, Offset Hinge Ejection	Foot, Offset Hinge Top Mount Left	Foot, Offset Hinge Top Mount Right
Part Number	703-00470	703-00502	703-00625	703-00626
Handed	No	No	Left	Right
Mounting	M2.5 blind tap	8-32 thru tap	M2.5 countersink	M2.5 countersink
Notes		Compatible with 8-32 ejection spring plunger		
Option				
Option Code	**/F3**	**/F3**		
Part Name	Foot, Offset Hinge Ejection Left	Foot, Offset Hinge Ejection Right		
Part Number	703-00627	703-00628		
Handed	Left	Right		
Mounting	8-32 thru tap	8-32 thru tap		
Notes	Compatible with 8-32 ejection spring plunger	Compatible with 8-32 ejection spring plunger		

Table 2: Deployable end hinge foot options[1]

For more information regarding deployable panels and how they integrate with the deployable end hinge set, please refer to *PMDSAS Design Guidelines.*

PANEL BRACE

A panel brace is a thin aluminum part that is ***required*** for proper alignment of the hinge set. The panel brace also helps to distribute the clamping load of the four M2 screws where the deployable panel connects to the hinge set assembly. Due to the variation in customer deployables, this part is not provided with the hinge set. The following mechanical details are the minimum set of features required in order to properly use the hinge set. The M2 flathead screws (Item No. 9 in Figure 1) aid in aligning the two hinges relative to each other when the brace implements the countersinks shown in Figure 2. The use of flathead screws and countersinks in the brace is strongly recommended.

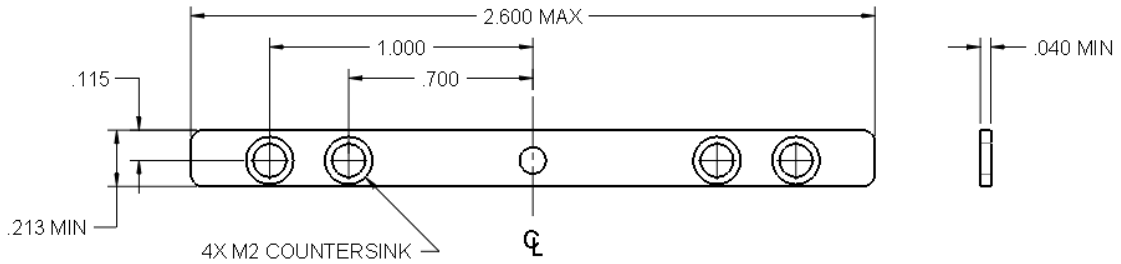
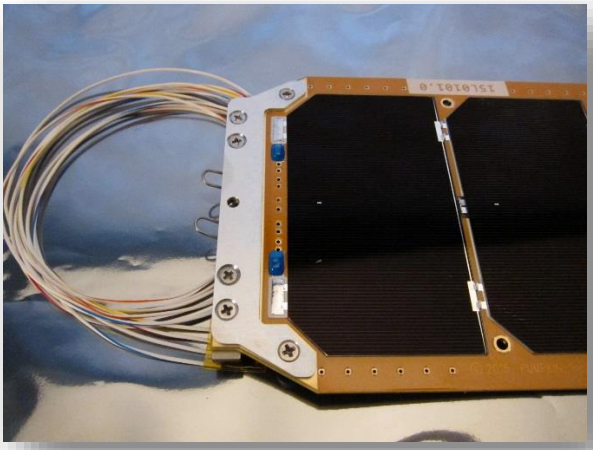


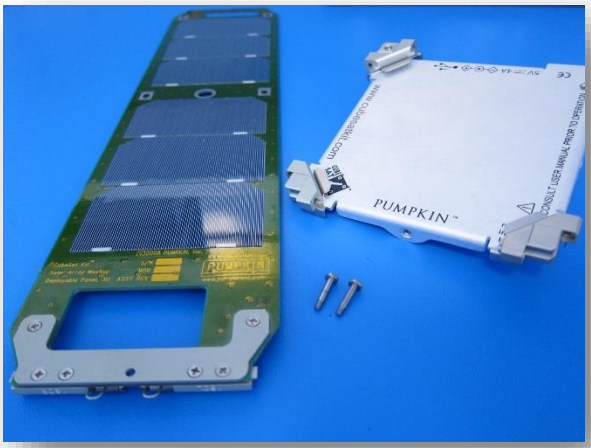
Figure 2: Required panel brace features

[1] When a handed part is selected customers will receive 1x left handed part and 1x right handed part of the same type.

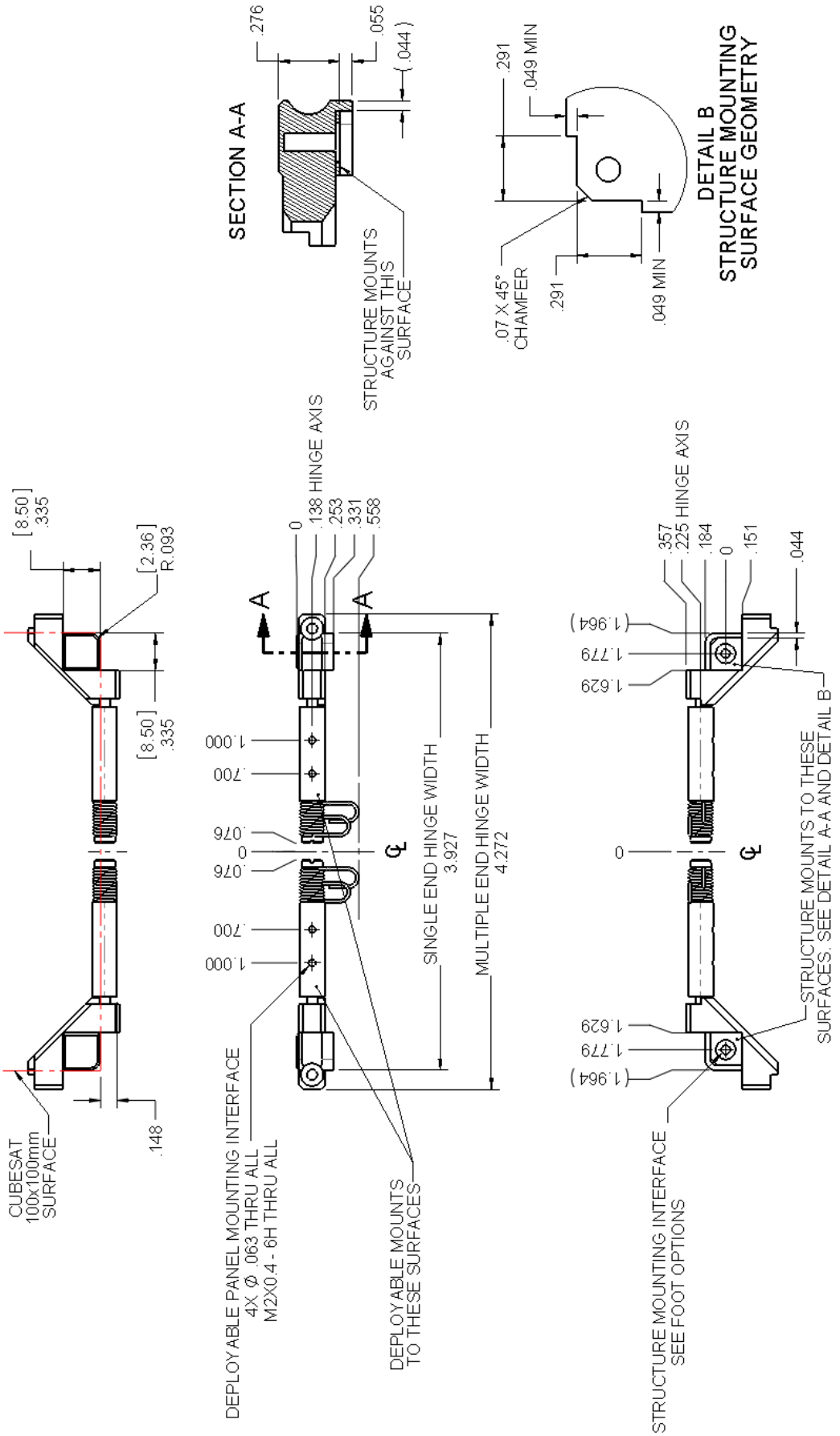
Panel Brace Examples

As long as the minimum set of features is met, the design of the panel brace can be designed to meet the requirements of the customer's application. The following images show examples of Pumpkin-made panel braces.





MECHANICAL INTERFACE



ASSEMBLY NOTES

Pumpkin ***requires*** the application of vacuum safe lubricant to the two shoulder screws that mount through the feet in the regions shown in Figure 3. Pumpkin recommends customers use Braycote 601 EF High Vacuum Grease[2].

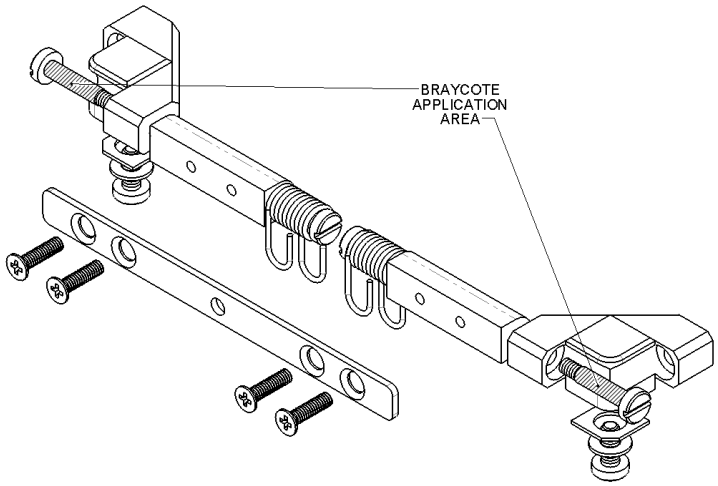
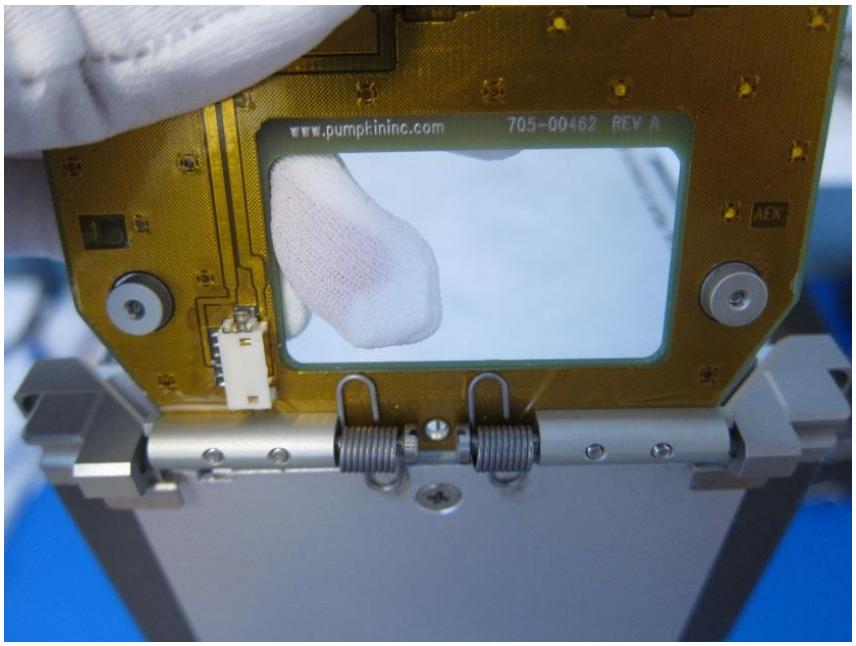


Figure 3: Braycote application area

If thread locking is desired, customers can apply thread locking compound to the male threads on the items 4, 8, and 9 in Figure 1. Extreme care must be exercised to insure that no thread locker is present in the bores of the feet (item 5 in Figure 1). Pumpkin recommends the use of Loctite 222MS™ Purple thread locker for these parts.

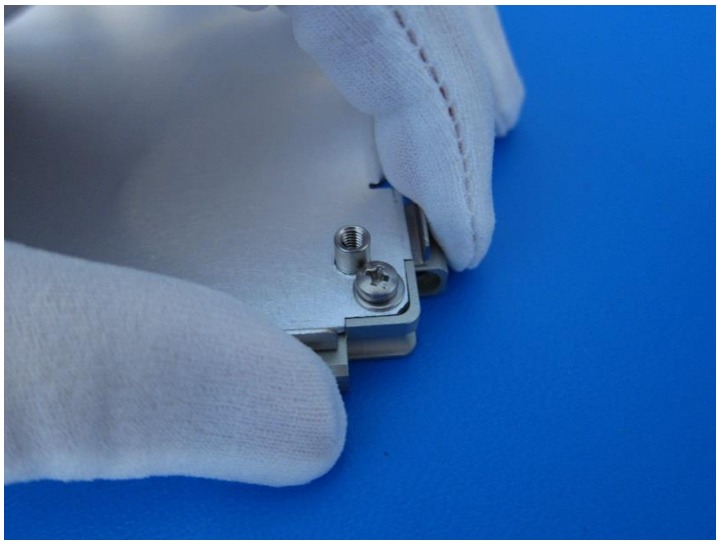
SAMPLE INSTALLATION



The image above shows one side of a CubeSat Kit™ chassis with one end hinge set mounted with a deployable panel (not included). The hinge set mounts to a Cover Plate (shown, not included) or Base Plate (not included) and is held in place via the M2.5 foot screw (not visible).

[2] Braycote 601EF can be purchased from SPI Supplies https://www.2spi.com/item/z05086/

This assembly can be repeated for the remaining three sides of the CubeSat or used stand-alone for a single end deployable.



The image above shows the underside of a Cover Plate with the M2.5 foot screw fastened into the foot.

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