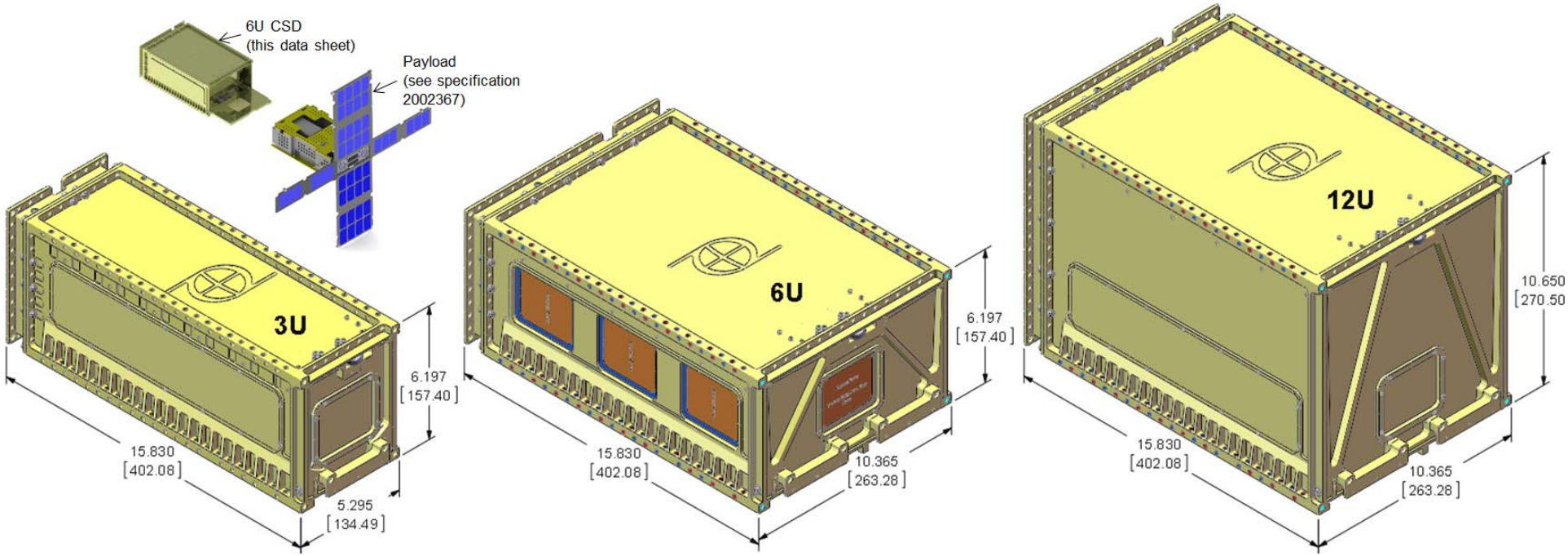

Figure 1: 3U 6U and 12U CSDs. 6U Shown with Access Panels Removed.

FEATURES AND BENEFITS

- **Preloaded Payload Tabs** create a predictable load path to and from the payload.
- **CSD Constrained Deployables** eliminate the payload's need for complex restraint mechanisms.
- **Six Mountable Sides** increase integration options and greatly reduce the need for adjoining structures and interface plates leading to the lightest overall mass.
- **Motor Driven Initiator** creates a reliable and testable deployment mechanism that automatically resets without consumables.
- **Robust Structural Design** withstands extreme environments.
- **Separation Electrical Connector** allows communication and charging between payload and launch vehicle.
- **Conductive External Surfaces** prevent surface charging.
- **Complete Payload Separation** during testing ensures mission success.
- **Completely Reusable Door Latch** allows extensive testing to prove reliability.
- **Manual Door Release** allows the CSD to be operated without electrical interface.
- **P-Pod Compatible Mechanical Interface** ensures compatibility with existing structures.
- **Full Length Ejection Spring** ensures positive force margin throughout payload ejection.
- **Lowest External Volume** versus existing designs increases packaging density on launch vehicle.
- **Largest Internal Volume** versus existing designs accommodates larger payloads.
- **Safe/Arm Access on Front Door** ensures payload access at all times.

COMPATIBILITY

The CSD is compatible with Payloads that meet specification 2002367 Rev A (Ref. 3). The 3U CSD is also compatible with the standard 3U CubeSat (Ref. 5).

TABLE OF CONTENTS

DESCRIPTION

The Canisterized Satellite Dispenser (CSD) is a reliable, testable, and cost-effective deployment mechanism for small secondary or tertiary payloads. It fully encapsulates the payload during launch and thus provides mission assurance for both the primary payload and launch vehicle. All material in the primary load path is Table I for stress corrosion cracking. All external surfaces are electrically conductive chem-film aluminum alloy. This data sheet encompasses 3U, 6U and 12U CSDs.

The CSD is easy to use and operate. The act of closing its door automatically preloads the payload tabs. There are no pyrotechnics. The door initiator is a DC brush motor with substantial flight heritage. The CSD can be cycled in a matter of seconds without consumables. The motor, an excellent torque transducer, provides invaluable feedback to the health of the mechanism by monitoring voltage and current during each operation.

The CSD has unique features that allow mounting to any face. This reduces the necessity for heavy interface structures and allows the CSDs to be densely packaged on the launch vehicle.

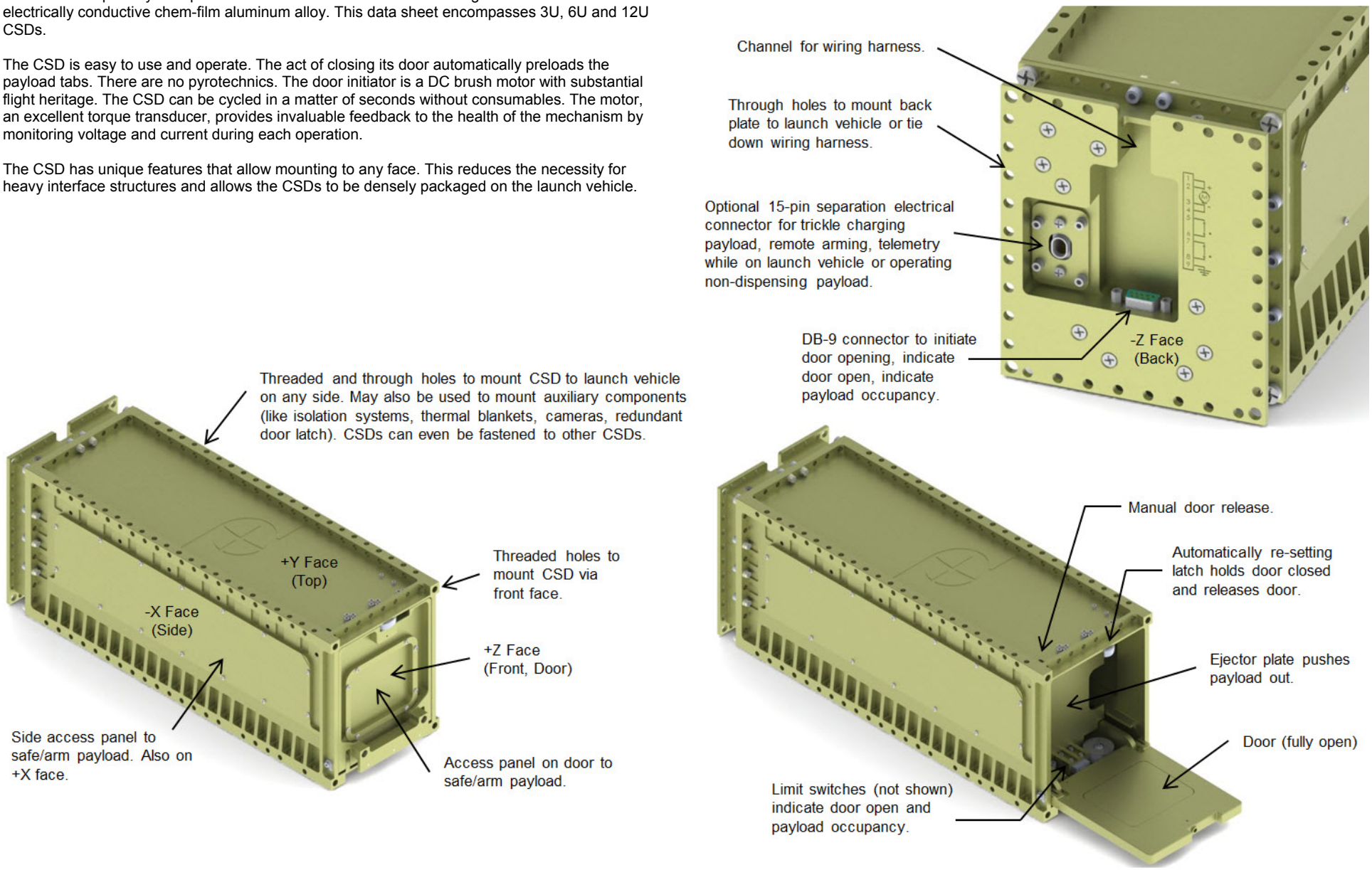

Figure 2: CSD Features (3U Shown).

Preloading the payload to the CSD by virtue of clamping the tabs creates a stiff invariant load path. This allows for accurate dynamic modeling to predict responses in anticipation of vibratory testing and space flight.

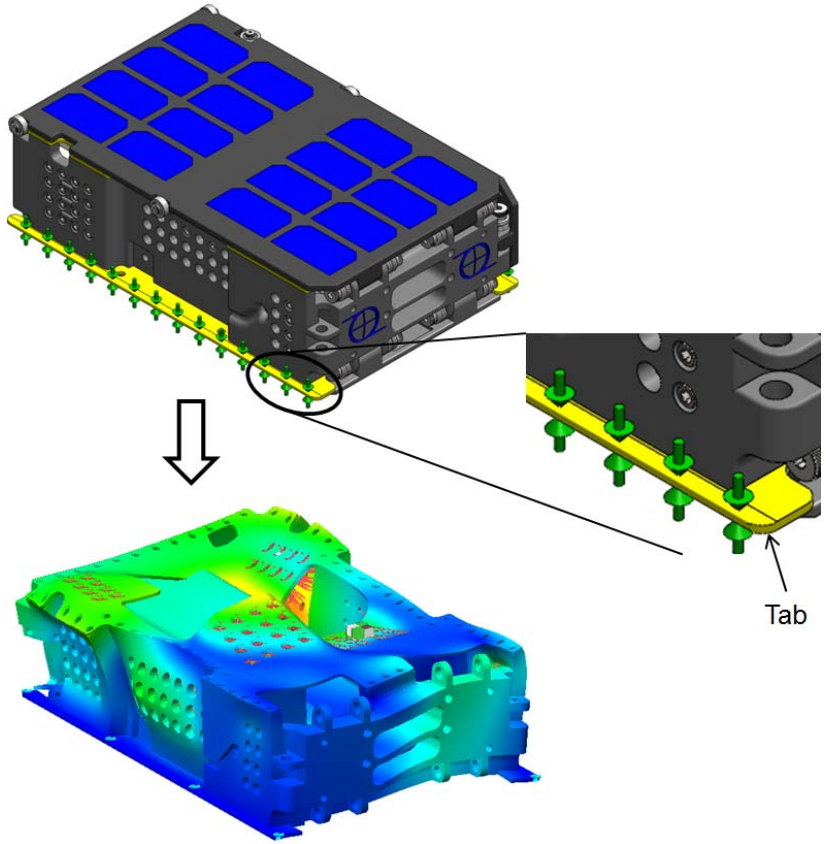

Figure 3: 6U Payload and Predicted Dynamic Response

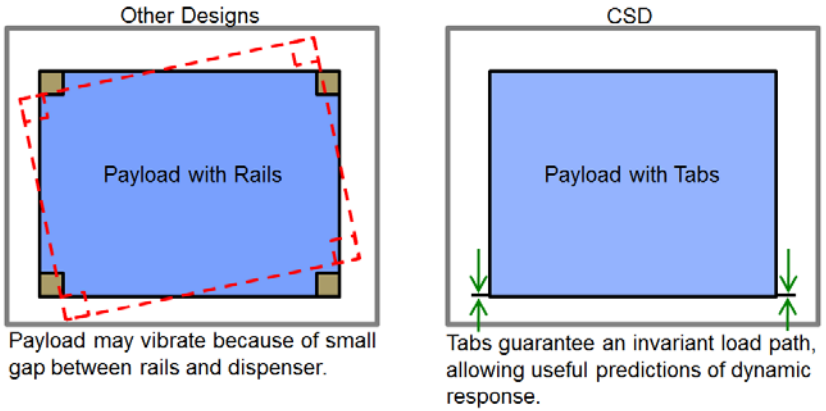

Figure 4: Benefit of Tabs vs. Rails

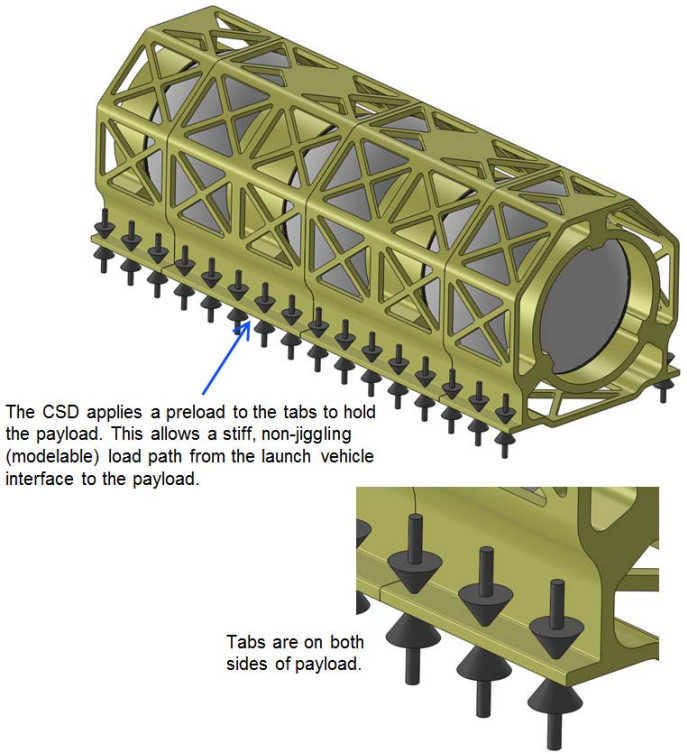

Figure 5: Preloaded Tabs of a 3U Payload (Ref. 2)

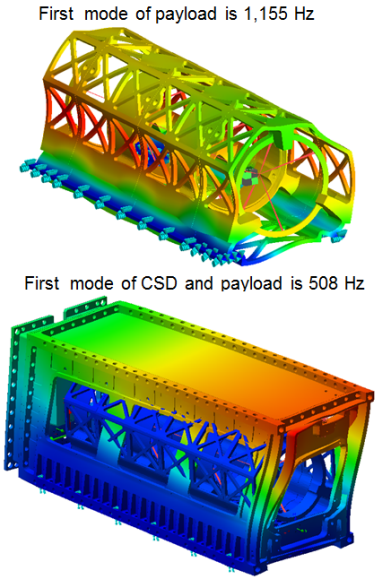

Figure 6: Prediction of 3U Dynamic Response

PARAMETERS

Symbol	Parameter	Conditions	Units	3U		6U		12U	
				Min	Max	Min	Max	Min	Max
M	Mass (1)	Empty	kg	3.45	3.51	4.78	4.89	5.91	6.02
Height	Height, +Y		in [mm]	6.197 [157.40]		6.197 [157.40]		10.650 [270.51]	
Width	Width, ±X		in [mm]	5.295 [134.49]		10.365 [263.27]		10.365 [263.27]	
CM_{XC}	Center of Mass, ±X	Door closed, ejection plate position as if payload installed	in [mm]	-0.09 [-2.1]	-0.01 [-0.3]	-0.05 [-1.2]	0.03 [0.7]	-0.07 [-1.7]	0.01 [0.3]
CM_{YC}	Center of Mass, ±Y	Door closed, ejection plate position as if payload installed	in [mm]	2.42 [61.3]	2.48 [63.1]	2.46 [62.6]	2.55 [64.8]	4.34 [110.3]	4.46 [113.2]
CM_{ZC}	Center of Mass, ±Z	Door closed, ejection plate position as if payload installed	in [mm]	7.65 [194.3]	7.71 [195.9]	7.53 [191.4]	7.66 [194.6]	7.41 [188.2]	7.53 [191.3]
CM_{XO}	Center of Mass, ±X	Door open	in [mm]	-0.086 [-2.2]	-0.013 [-0.3]	-0.049 [-1.2]	0.030 [0.8]	-0.062 [-1.6]	0.009 [0.2]
CM_{YO}	Center of Mass, ±Y	Door open	in [mm]	2.325 [59.1]	2.393 [60.8]	2.322 [59.0]	2.402 [61.0]	3.993 [101.4]	4.084 [103.7]
CM_{ZO}	Center of Mass, ±Z	Door open	in [mm]	8.059 [204.7]	8.148 [207.0]	8.152 [207.1]	8.251 [209.6]	8.466 [215.0]	8.576 [217.8]
I_{XX}	Mass Moment of Inertia	About CM, door closed, empty	$lb*in^2$ [$kg*m^2$]	241.2 [0.071]	261.5 [0.077]	356.9 [0.104]	387.0 [0.113]	597.6 [0.175]	647.9 [0.190]
I_{YY}	Mass Moment of Inertia	About CM, door closed, empty	$lb*in^2$ [$kg*m^2$]	232.8 [0.068]	252.5 [0.074]	440.3 [0.129]	477.4 [0.140]	573.5 [0.168]	621.8 [0.182]
I_{ZZ}	Mass Moment of Inertia	About CM, door closed, empty	$lb*in^2$ [$kg*m^2$]	60.7 [0.018]	65.8 [0.019]	185.4 [0.054]	201.1 [0.059]	369.2 [0.108]	400.3 [0.117]
E	Payload Ejection Energy (2)	See Figure 13.	J	2.7	5.0	2.7	11.0	2.7	11.0
V	Voltage Provided from Launch Vehicle to Open Door	Power to pins 1 & 2, return from pins 3 & 4	Vdc	22	36	22	36	22	36
R_{DI}	Winding Resistance of Door Initiator (3)	-45 to +90 °C, includes internal CSD wiring	ohm	7.4	13.0	7.4	13.0	7.4	13.0
L_{DI}	Inductance of Door Initiator	At terminals	mH	0.452		0.452		0.452	
I_P	Peak Current Draw from Door Initiator (4)	<0.005 sec	A	1.7	4.9	1.7	4.9	1.7	4.9
I_C	Continuous Current Draw from Door Initiator (5)		A	0.1	1.5	0.1	1.5	0.1	1.5
T	Time to Initiate (Open Door) (5)	-45 to +90 °C, <10e-5 torr	sec	0.01	0.05	0.01	0.05	0.01	0.05
R_S	Switch Terminal Resistance	Door and occupancy switches, closed circuit, includes internal CSD wiring, -45 to +90 °C	ohm	0.046	0.107	0.046	0.107	0.046	0.107
I_{SR}	Current Capacity of Switch, Resistive	28 Vdc, <10e-5 torr, door and occupancy switches	A	-	2.5	-	2.5	-	2.5
I_{SI}	Current Capacity of Switch, Inductive	28 Vdc, <10e-5 torr, door and occupancy switches	A	-	1.5	-	1.5	-	1.5
PT	Payload Travel Required for Occupancy Switch Change State	+Z travel from launch position	in [mm]	12.1 [307]	13.2 [335]	13.2 [335]		13.2 [335]	
DP	Door Position for Door Switch Change of State	Angle (0 deg is closed)	deg	0.3	2.0	0.3	2.0	0.1	1.0

Symbol	Parameter	Conditions	Units	3U		6U		12U	
				Min	Max	Min	Max	Min	Max
F_{EP}	Ejection Plate Force on Payload	During launch due to vibration (100g).	N	0	84	0	169	0	307
		During ejection due to spring force.	N	7.0	22.0	7.0	44.0	7.0	44.0
LVF	Launch Vehicle Flatness (6,7)	The structure adjoining the CSD.	in [mm]	0.0	0.005 [0.13]	0.0	0.005 [0.13]	0.0	0.005 [0.13]
TML	Total Mass Loss	Per ASTM E 595-77/84/90	%	0.0	1.0	0.0	1.0	0.0	1.0
CVCM	Collected Volatile Condensable Material	Per ASTM E 595-77/84/90	%	0.0	0.1	0.0	0.1	0.0	0.1
DP	LV De-Pressurization Rate (6)	During launch	psi/ sec	0.0	0.5	0.0	0.5	0.0	0.5
T_S	Survival Temperature	Qualification limits.	°C [°F]	-50 [-58]	+100 [+212]	-50 [-58]	+100 [+212]	-50 [-58]	+100 [+212]
T_O	Operational Temperature	Qualification limits.	°C [°F]	-45 [-49]	+90 [+194]	-45 [-49]	+90 [+194]	-45 [-49]	+90 [+194]
D_X	In-Flight Disconnect Location, $+X_{PL}$	Relative to Payload Origin	in [mm]	1.606 [40.80]	1.616 [41.06]	4.093 [103.96]	4.103 [104.22]	4.093 [103.96]	4.103 [104.22]
L	Life	Allowable number of door closures by customer before refurbishment is required.	-	-	50	-	50	-	50

(1) Min: Includes 1 ejection spring and no in-flight disconnect. Max: Includes 2 (3U) or 4(6U/12U) ejection springs and the in-flight disconnect. Both values are nominal. Assume a ±3% tolerance to account for machining variations.
(2) Payload Ejection Velocity (ΔV) [m/s] = $(1+M_P/M_{LV})*\text{sqrt}(2E/(M_P(1+M_P/M_{LV})))$. Where M_P: payload mass [kg], M_{LV}: mass of CSD + adjoining structure [kg].
(3) Actual winding resistance can be calculated by R_{DI} = 10.3(1+0.004(Temperature [cel]-25)).
(4) Actual Peak Current can be calculated by $I_P = V/R_{DI}$.
(5) Door Initiator will continue to draw current (I_C) until power is cut from LV. This is not detrimental to the CSD. LV may leave power on up to 0.5 secs after door limit switch opens.
(6) These are requirements imposed on the launch vehicle.
(7) This assumes the LV is a stiff structure like and aluminum plate. The flatness requirement can be loosened for more flexible structures Contact PSC.

MECHANICAL INTERFACE

Dimensions apply to all CSD sizes unless the view specifically states otherwise (Ex. “3U only”).

All CSD mounting surfaces are 6061-T6 aluminum alloy with chemical film per MIL-DTL-5541, Class 3.

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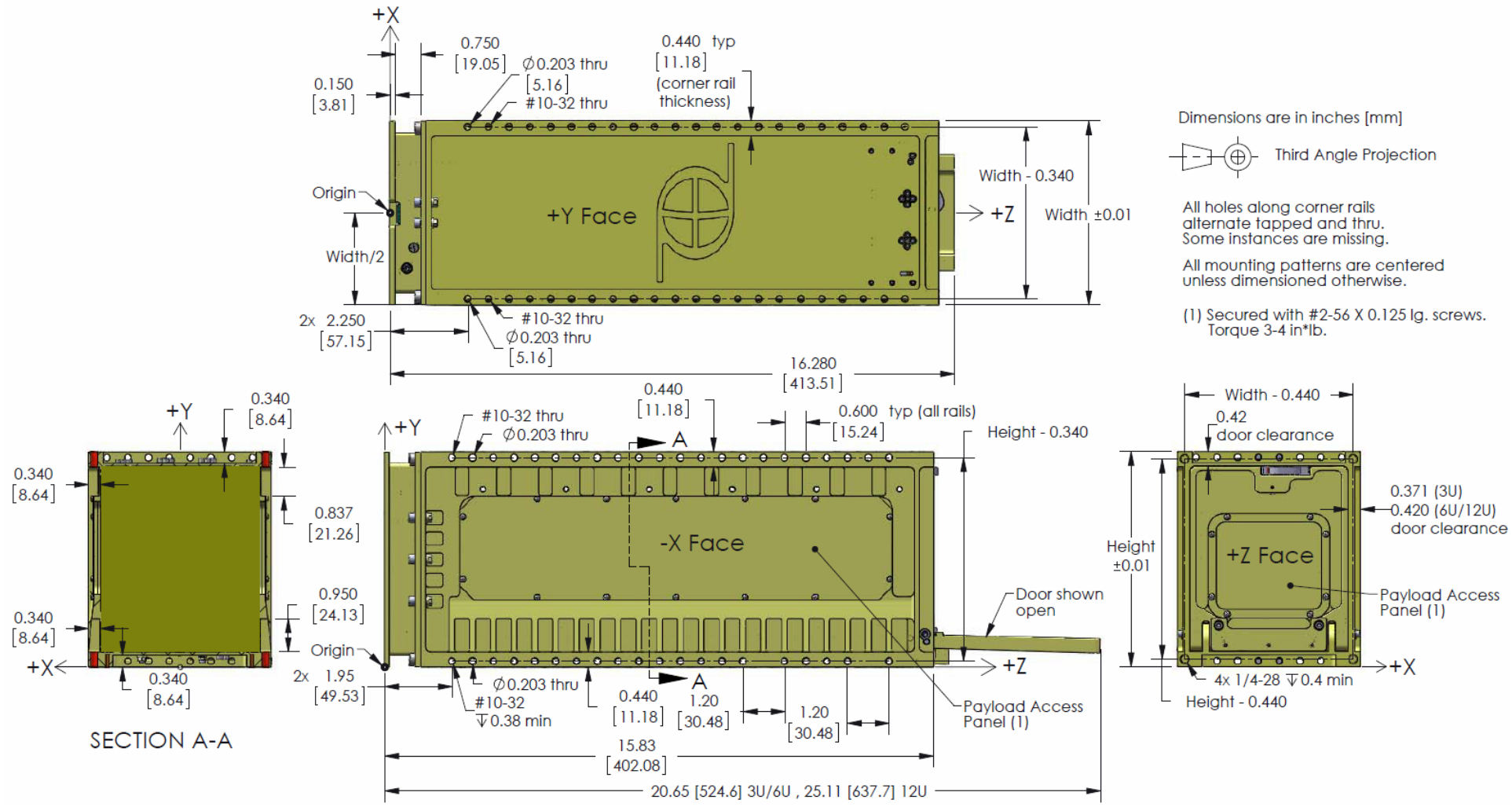


Figure 7: CSD Mechanical Interface Dimensions

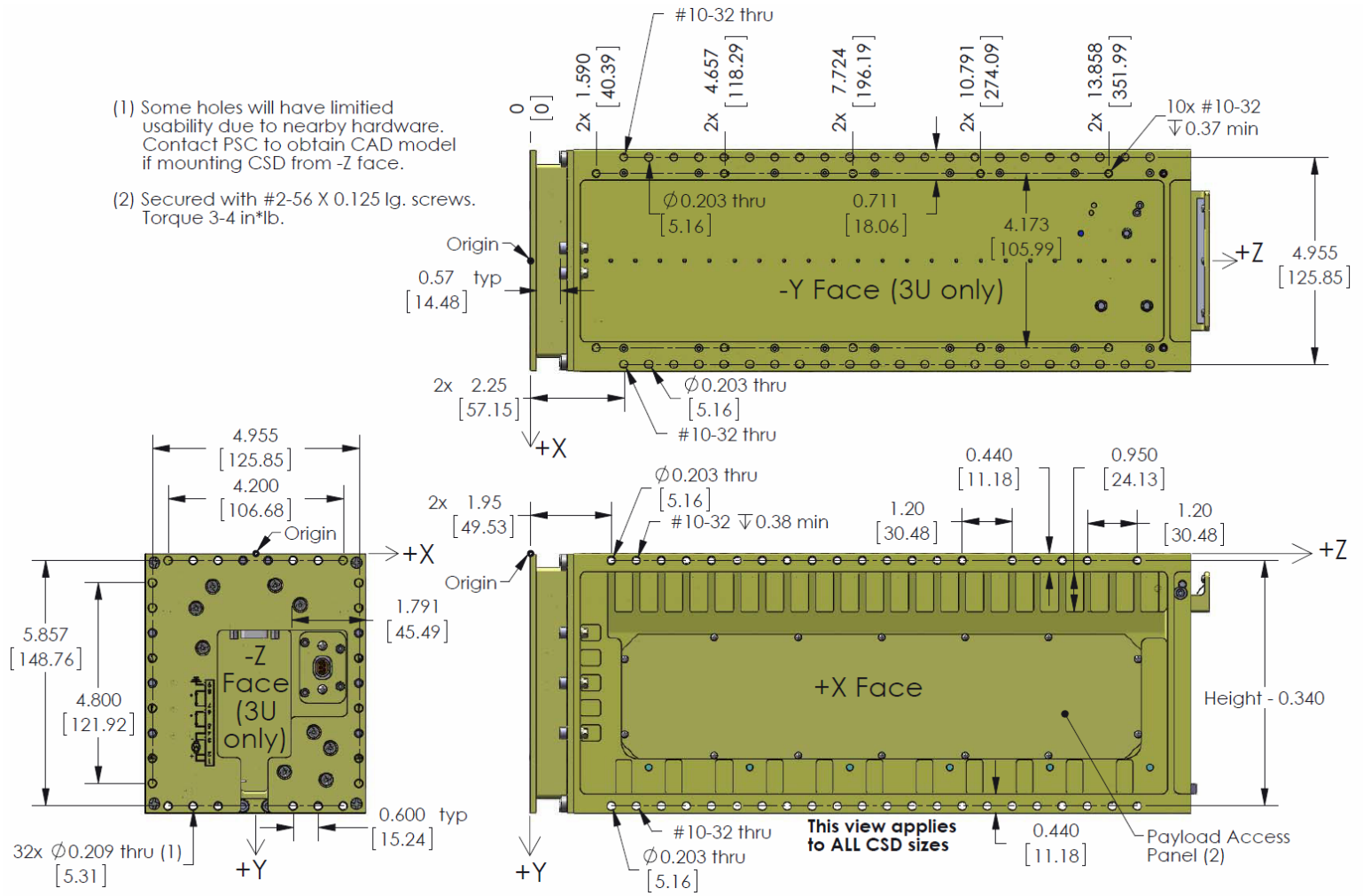
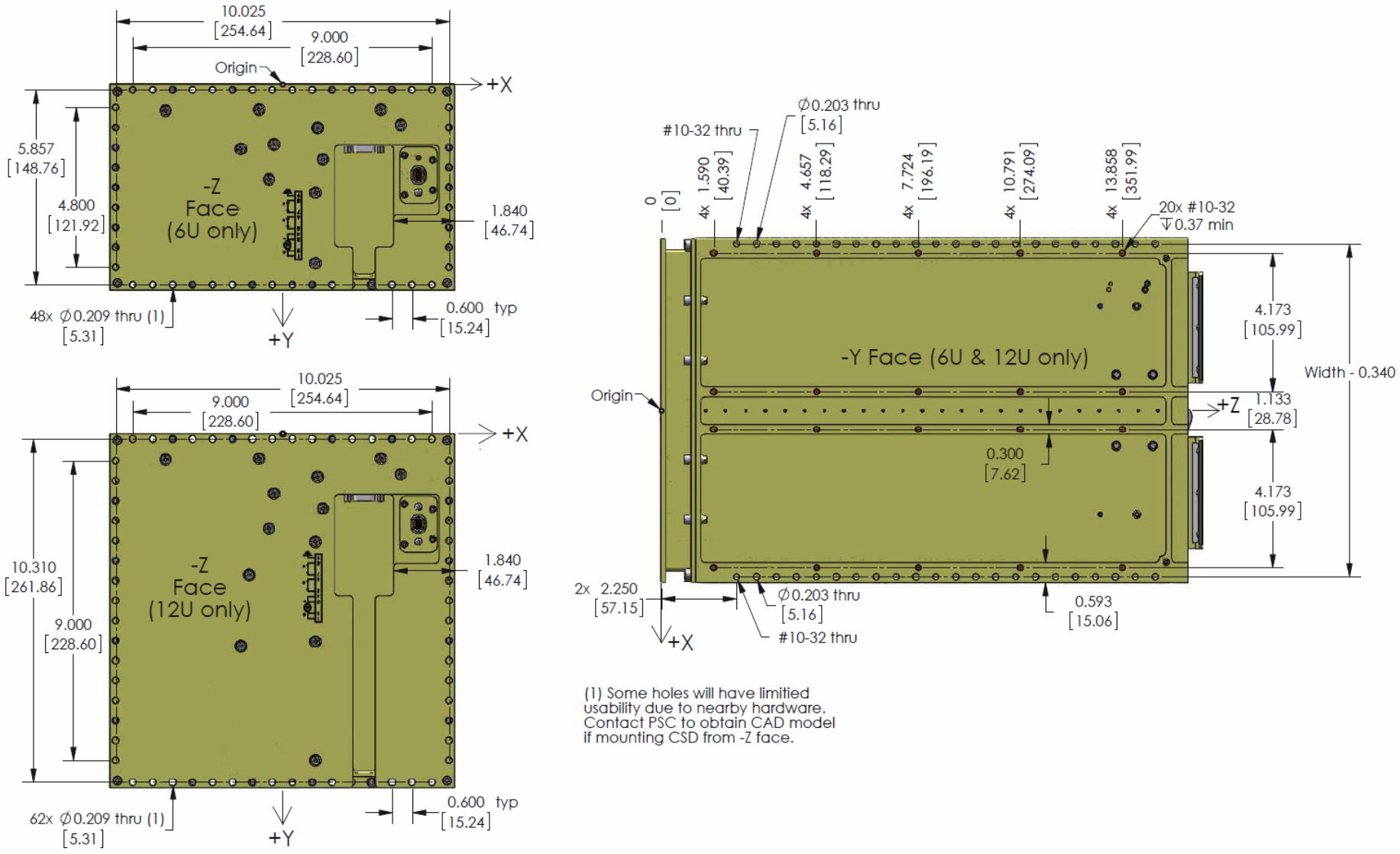


Figure 8: Mechanical Interface Views (cont.). Some views unique to 3U.



(1) Some holes will have limitied usability due to nearby hardware. Contact PSC to obtain CAD model if mounting CSD from -Z face.

Figure 9: Mounting Patterns Unique to 6U and 12U

ELECTRICAL INTERFACE

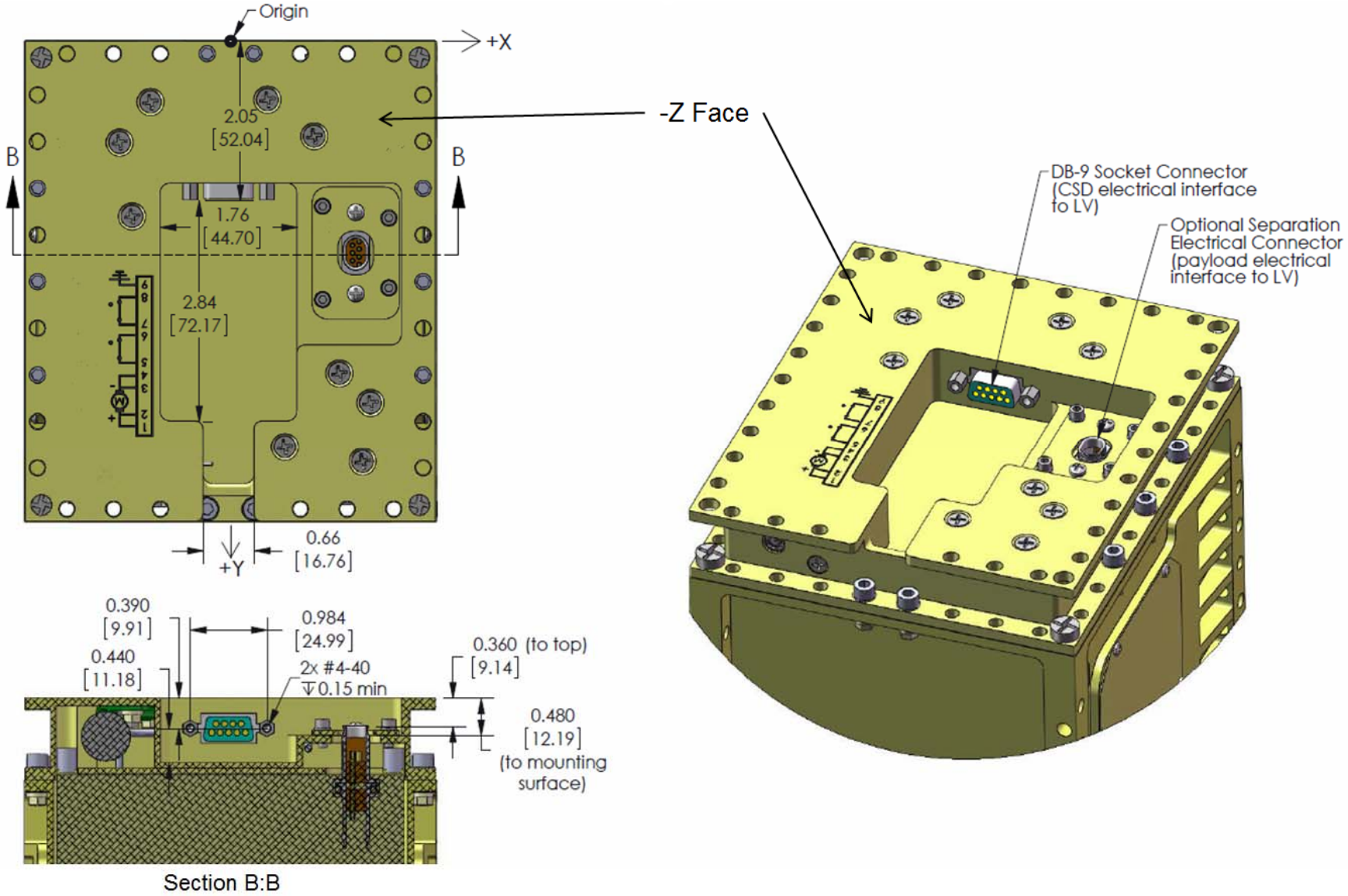


Figure 10: Launch Vehicle Electrical Interface

ELECTRICAL SCHEMATIC

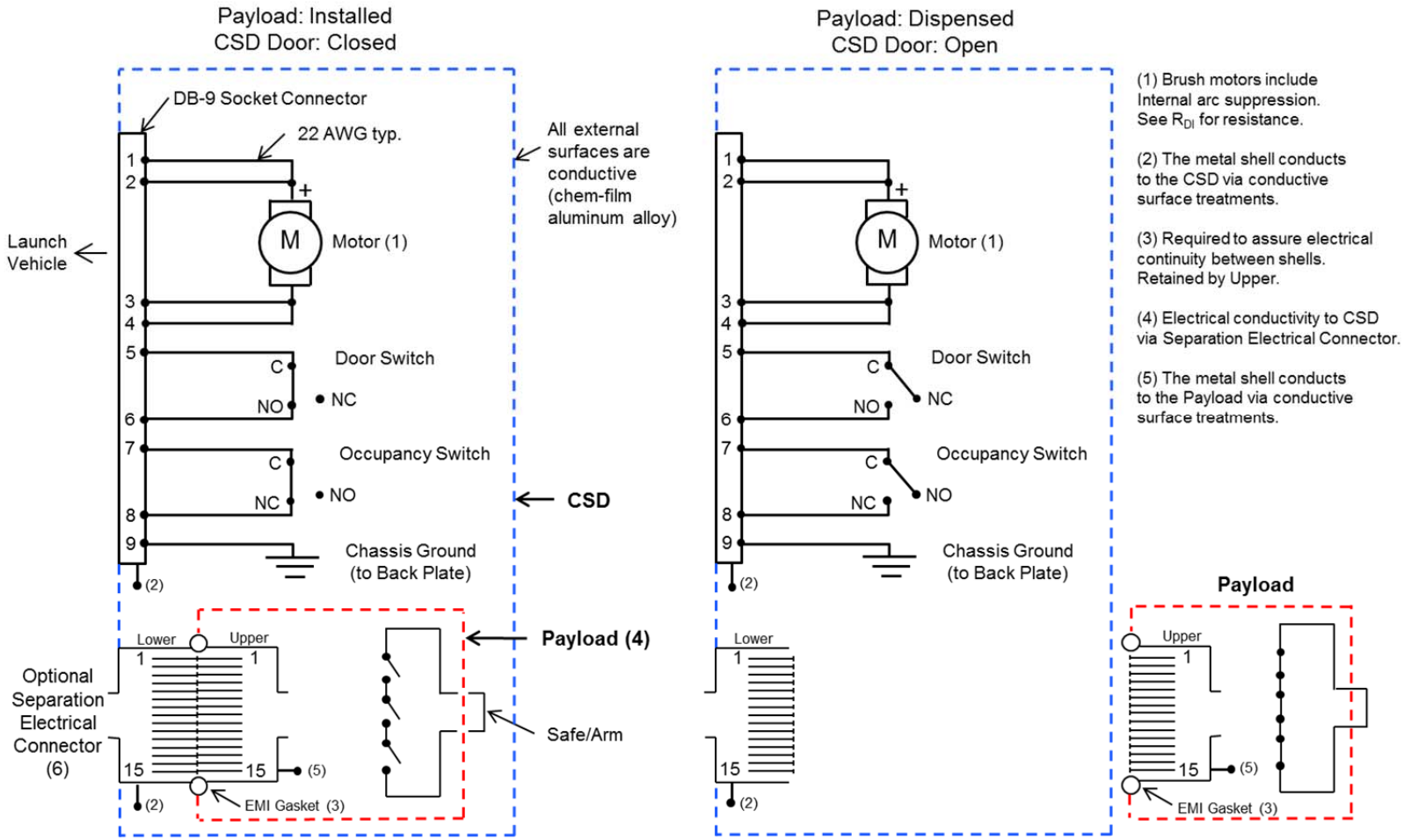
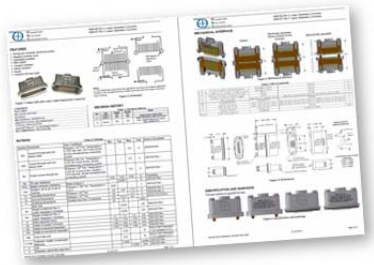


Figure 11: CSD Electrical Schematic

(6) The Separation Electrical Connector is an in-flight disconnect (IFD). It is a custom connector provided by PSC that has significant space-flight heritage. The launch vehicle side of the connector must be removed from the CSD prior to the initial payload installation. It may be re-attached to the CSD after payload installation and door closure. This ensures proper alignment of the connector halves. For more information see PSC document 2001025 Separation Connector Data Sheet (Ref. 4).



PAYLOAD IN CSD

The figure below shows a payload installed in the CSD. It also shows the size and location of access zones relative to the payload origin. Dimensions apply to all CSD sizes.

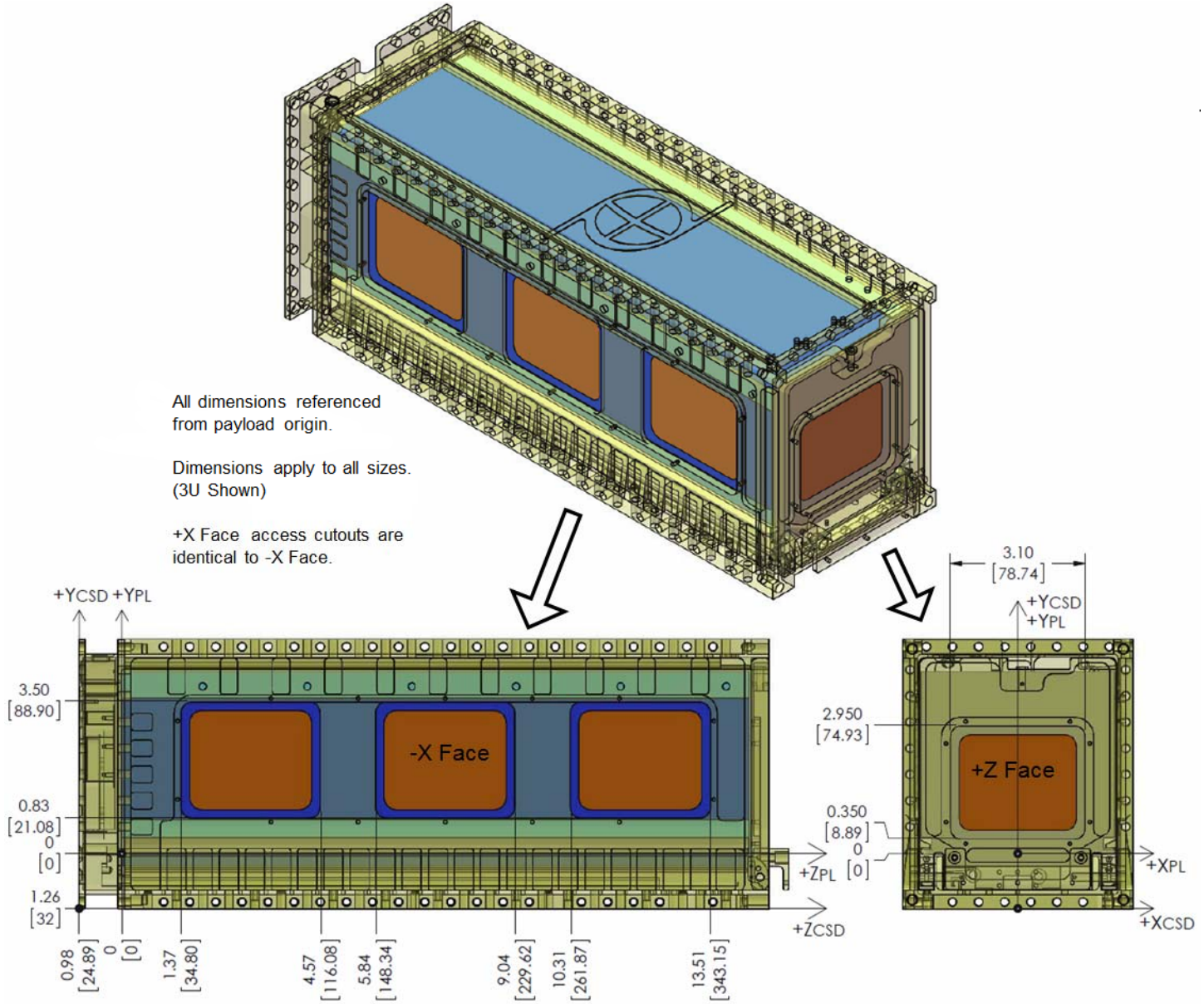


Figure 12: Payload Location in CSD

PAYLOAD EJECTION

The CSD can be configured with multiple ejection springs, qty. 1 or 2 for the 3U, qty. 1 to 4 for the 6U/12U. The default configuration is qty. 2.

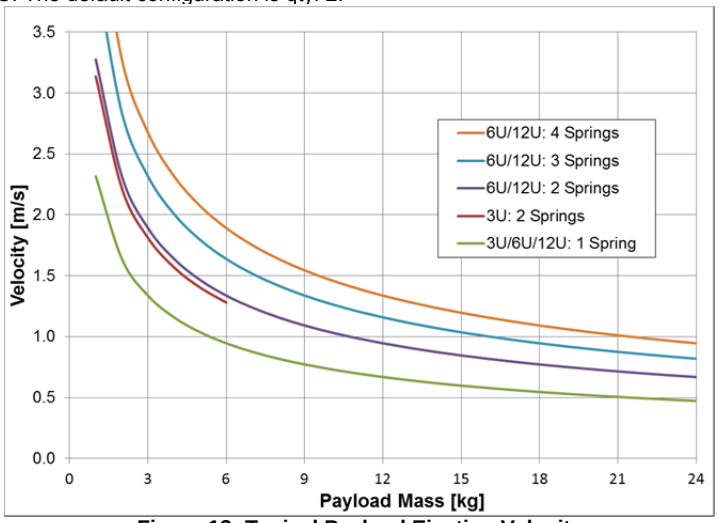


Figure 13: Typical Payload Ejection Velocity

INITIATION ELECTRICAL PROFILES

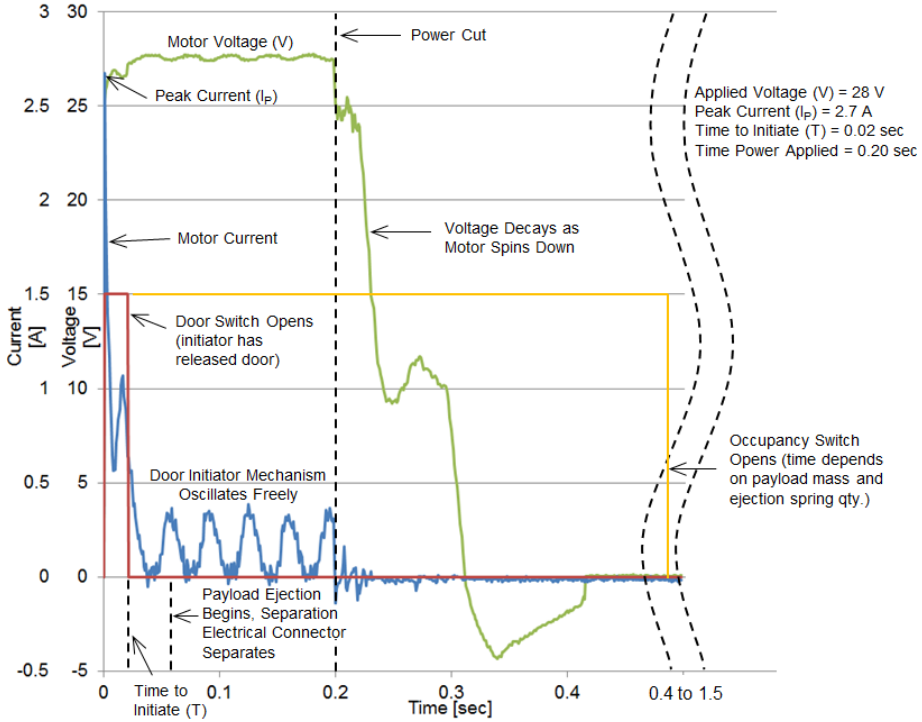


Figure 14: Sample Initiation Electrical Profile

TESTING

All flight CSDs undergo environmental tests to verify workmanship. In addition, the CSDs have been qualified to levels that meet or exceed MIL-STD-1540. PSC records voltage and current during all initiations.

Table 1: Test Levels

Test	Qualification	Flight	EDU
Benchtop Separations (1)	200 separations	10 separations	10 separations
Thermal Vacuum	Temperature: -45°C to +90°C	Temperature: -20°C to +70°C	Not Tested
	Pressure: <10E-5 torr	Pressure: <10E-5 torr	
	Cycles: 27	Cycles: 8	
	9 Separations +90°C: 22V, 28V, 36 V +23°C: 22V, 28V, 36 V -45°C: 22V, 28V, 36V	1 Separation (hot or cold, 22V)	
Strength as Sine Burst (3)	Level: 50g (3U), 40g (6U) Cycles: 5 per axis	Level: 20g Cycles: 5 per axis	Not Tested
Random Vibration (2,3)	Level: 14.1 Grms	Level: 10.0 Grms	Not Tested
	Duration: 3 min/axis	Duration: 1 min/axis	
	Payload Mass: Maximum	Payload Mass: Maximum	
Shock (2,3)	See Figure 15 3 impacts per axis	Not Tested	Not Tested

(1) 1atm, ~23°C.
(2) Full qualification was performed with CSD mounted via –Y face. Contact PSC if planning to mount CSD via any other face.
(3) 3U qualified with 6.1 kg payload. 6U qualified with 9.1 kg payload. Contact PSC if 6U payload is heavier than 9.1 kg.

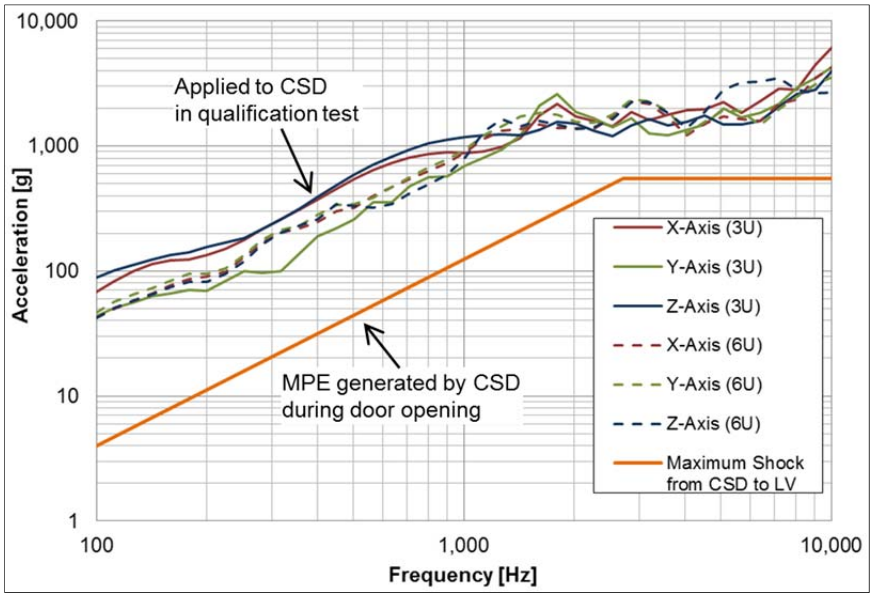


Figure 15: Shock Levels

PAYLOAD INSTALLATION AND OPERATION

CSD operation is straightforward. Closing the door automatically clamps the payload's tabs and secures it for launch. Door closure can be accomplished by one person as it requires less than 40 lbf of compression. After initiation the door can be immediately re-closed. There are no consumables and nothing to adjust or reset. Follow the steps below to ensure the payload is properly installed. An accompanying video is available for customers.

Table 2: Required Equipment

Item	Purpose
Small torque screwdriver with Phillips head and 3/32" hex attachments	torque #2 PNH screws and #4 SHC screws
Small Phillips head screwdriver	remove and re-attach #2 PNH screws holding Access Panels
3/32" hex key	remove and re-attach LV side Separation Electrical Connector
Staking compound	secure Access Panel and Separation Connector screws
DB-9 pin break-out cable	measure CSD motor and switch resistances
Digital multimeter	measure CSD motor and switch resistances

1) Electrical Verification: Verify resistance measurements per Table 3.

Table 3: CSD Resistance Measurements

Object Being Measured	Door Position	Payload State	Pin Connections	Resistance [ohm]	
				Allowable	Measured
Motor	N/A	N/A	1 , 4	7.5 – 11.0	
			2 , 3	7.5 – 11.0	
Door Switch	Closed	N/A	5 , 6	< 0.3	
	Open		5 , 6	> 1E6	
Occupancy Switch	N/A	Removed	7 , 8	> 1E6	
		Installed	7 , 8	< 0.3	
CSD Grounding	N/A	N/A	9, CSD Chassis	< 0.3	

2) **Optional:** Remove all access panels from CSD. Panels are attached with #2-56 Pan Head Philips Screws.

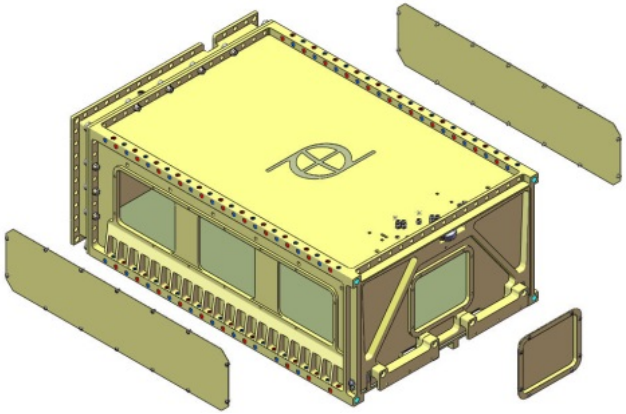


Figure 16: Removing Access Panels

3) **Only required if payload has Separation Electrical Connector:** Remove the four #4 SHC screws holding the Separation Connector plate to the CSD with 3/32 hex key.

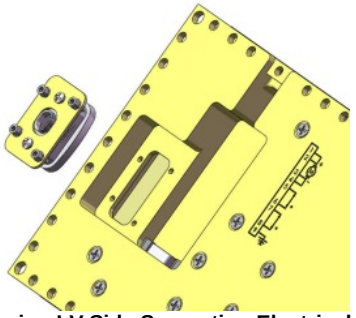


Figure 17: Removing LV Side Separation Electrical Connector

4) Verify indicator mark is pointing toward the -Z face. Contact PSC if otherwise.

Figure 18: Verifying Indicator Position

5) Align payload tabs with tab guides in CSD. Ensure payload is parallel to CSD when inserting to avoid damage to tabs. Vertical orientation is recommended so payload weight ensures ejection plate is fully compressed. Fold panels if necessary and insert payload in CSD.

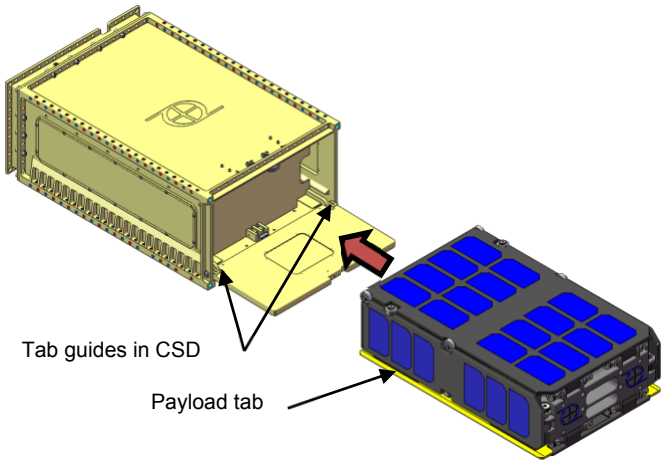


Figure 19: Installing Payload

6) Ensure payload is bottomed out in CSD. If installing horizontally the payload shall be pushed in CSD until door closes ~45 degrees, at which point tabs are preloaded and payload will not move. Close door and push latch over with finger. Latch will audibly "ping" and snap closed.

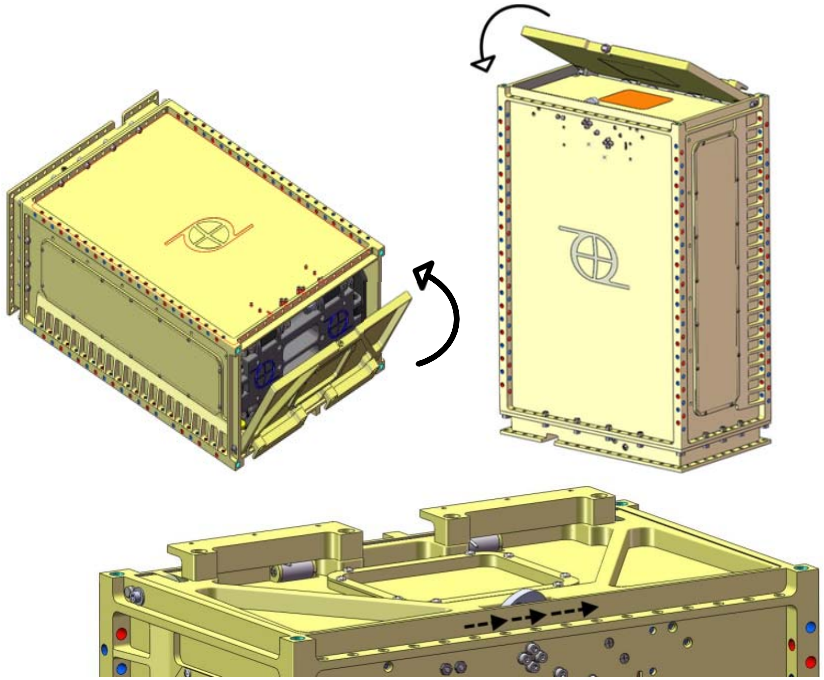


Figure 20: Closing Door and Locking Latch

7) **If Necessary:** Install the Separation Electrical Connector (Ref. 4)to the –Z face. Prior to fastening plate ensure proper keying with payload's connector then push it in place with finger and verify the following:
   a. Plate contacts flush against CSD mounting face.
   b. All 4 mounting holes align.

   Secure plate with the #4-40 SHC Screws and washers.

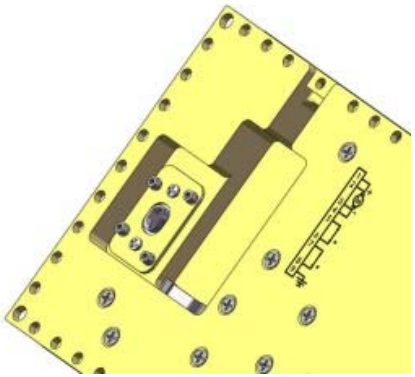


Figure 21: Attach Separation Electrical Connector

8) Electrical Verification: Re-verify resistance measurements per Table 3.

9) Verify payload deployment (inhibit) switches are open.

10) **If Necessary:** Install safe/arm connector and re-attach access panel(s). Recommended torque is 3-4 in*lb. Stake heads of screws.

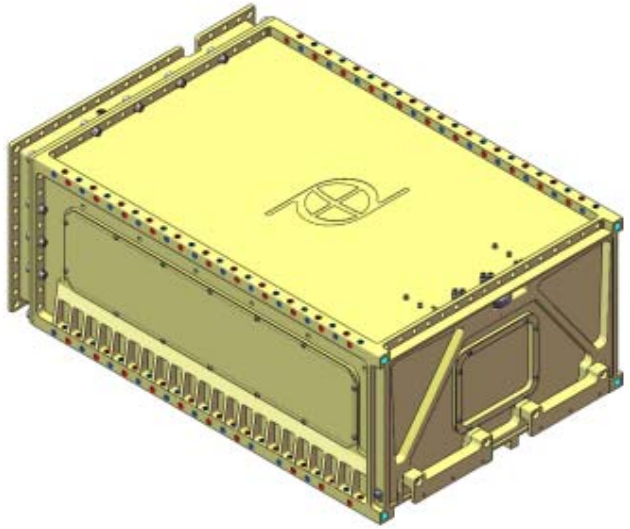


Figure 22: Re-Attach Access Panels

CSD CONSTRAINED DEPLOYABLES

The CSD is capable of constraining deployables. Document 2002206 Payload Specification (Ref. 3) provides details on allowable contact locations of deployables to inside walls of CSD.

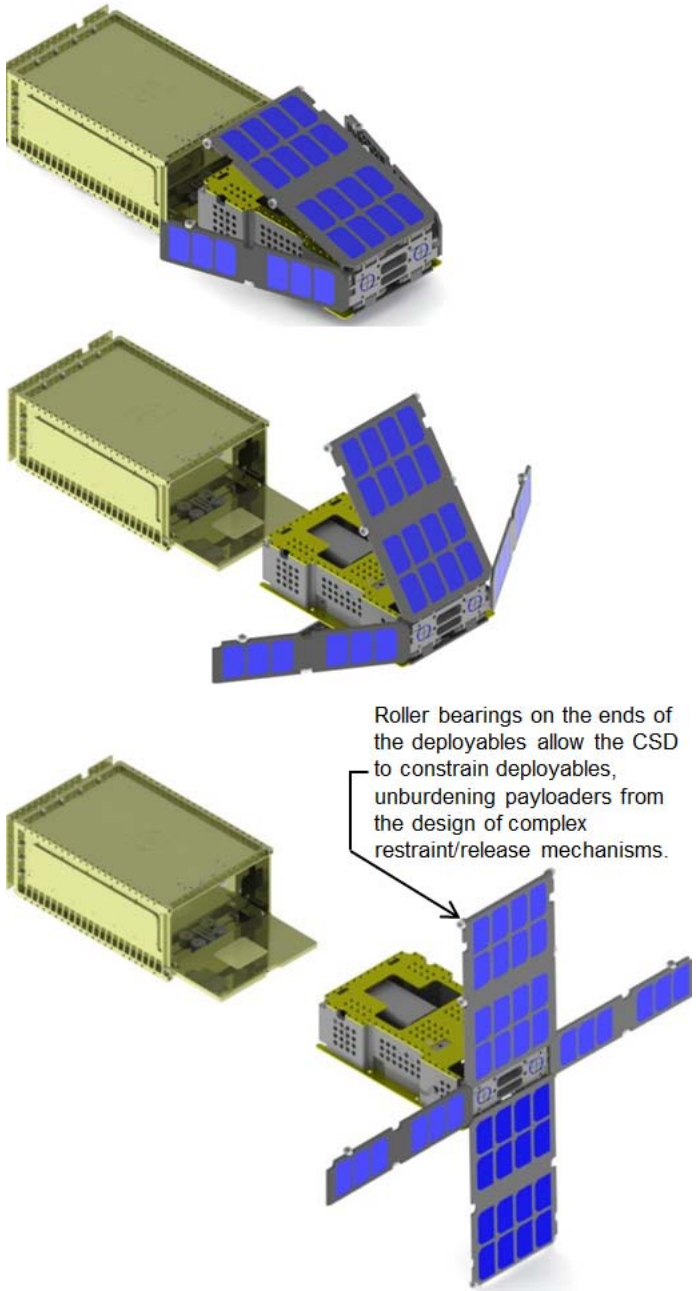


Figure 23: A 6U Payload Ejecting from the CSD.

INTEGRATION TO LAUNCH VEHICLE (LV)

The CSD has numerous through and tapped holes designed for #10-32 fasteners and can be mounted via any of the six faces. However the CSD has only been exposed to random vibration and strength testing when mounting via the -Y, -Z and +Z faces. If mounting via the +/-X faces contact PSC. If mounting via the +Z (door) face contact PSC as there are special considerations and clearances that must be verified to ensure proper operation.

Typical washers will not fit on the CSD. PSC successfully uses shims, McMaster-Carr PN 93574A438, as washers. When mounting via the -Y face, 0.75" long SHC screws will fit. PSC torques the screws with a 5/32" ball point hex key. When mounting via the -Z face, 0.5" long SHC screws will fit. All #10-32 tapped holes on the CSD are at least 0.37” deep. PSC often uses custom wrenches to help turn and torque the fasteners. PSC does not provide these tools but the drawings are available upon request.

1) Determine via which face the CSD is being mounted. If via the –Z, the LV electrical harness will need to be attached first so skip to step 2. The figure below shows the CSD being mounting via the –Y face using the through holes.

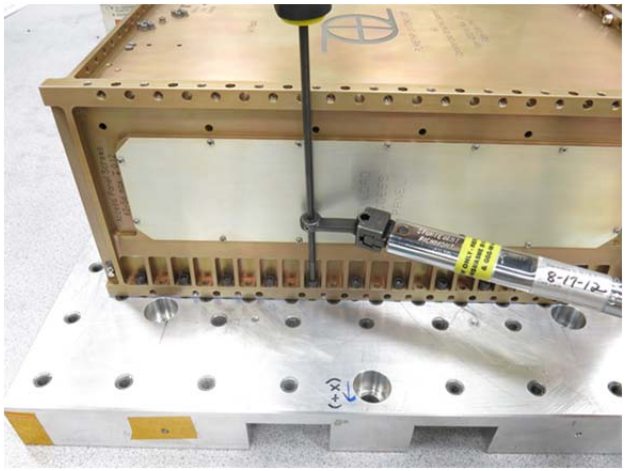


Figure 24: Using Thru Holes to Mount CSD via –Y Face

2) Install the DB-9 socket LV electrical harness to the –Z face. Secure to the #4-40 hex standoffs on the CSD. A ball point hex driver will be required to torque the fasteners. Route the harness through the opening. Harness may be secured to the numerous through holes on the CSD with cable ties to provide strain relief.

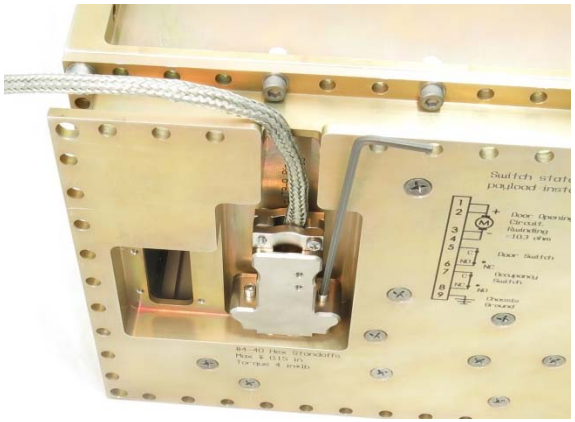


Figure 25: Installing CSD Initiator Electrical Harness

3) Install the Separation Electrical Connector (Ref. 4)**Error! Reference source not found.** to the -Z face. Prior to fastening the plate, ensure proper keying with payload’s connector, push it in place by hand, and verify the following:
   a. Plate makes flush contact with CSD mounting face.
   b. All four mounting holes align.

Secure plate with the #4-40 SHC Screws and washers. The harness may be secured to the numerous through holes on the CSD with cable ties to provide strain relief.

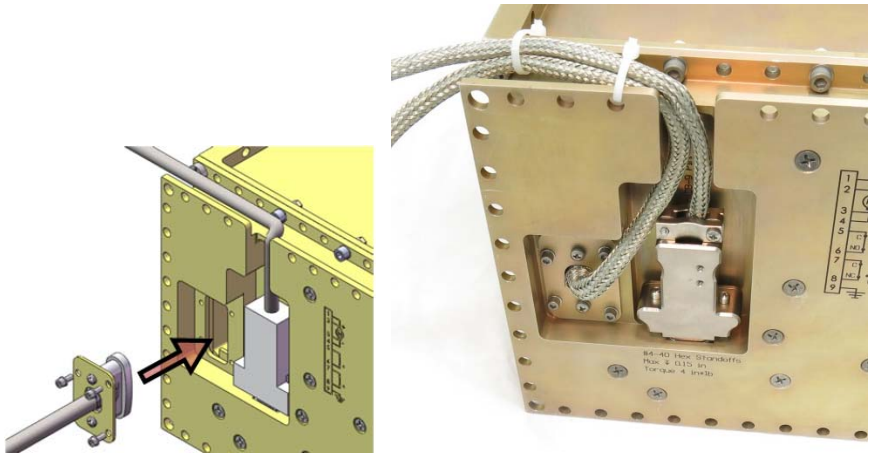


Figure 26: Installing LV Side Separation Electrical Connector

4) If attaching via the -Z face ensure the connector harnesses are not pinched. PSC uses the following tools to start and torque fasteners. PSC does not offer the tools but drawings are available upon request.
    a. 2002399, #10 Access Wrench: Useful to turn screws, especially with high running torque.
    b. 2002398, Reduced Clicker Head: Useful for final torquing.

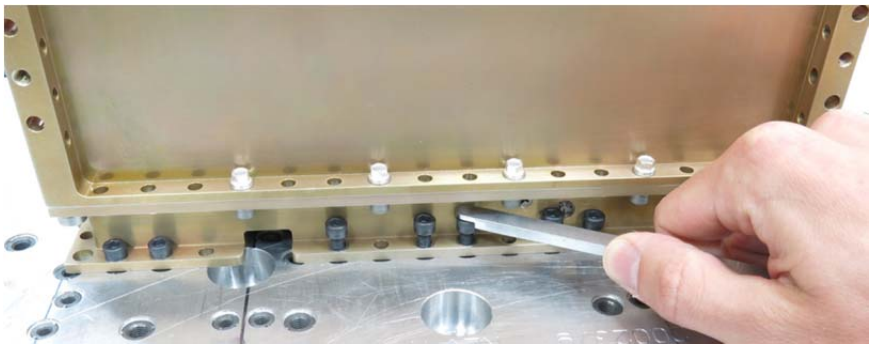


Figure 27: Using Access Wrench to Facilitate Mounting via –Z Face

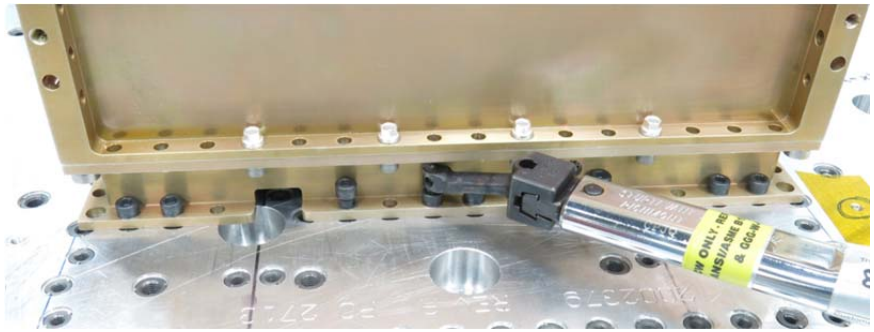


Figure 28: Using Reduced Clicker Head to Torque Fasteners

REDUCING DYNAMIC LOADING ON PAYLOAD

The CSD tightly grips the payload's tabs, creating a direct load path from the launch vehicle to the payload. To reduce these potentially harmful vibratory and shock loads, the use of an isolation system is strongly recommended. A simple, low cost isolation system was successfully demonstrated during qualification testing of the CSDs. The figure below shows the significant reduction in loading during random vibration testing.

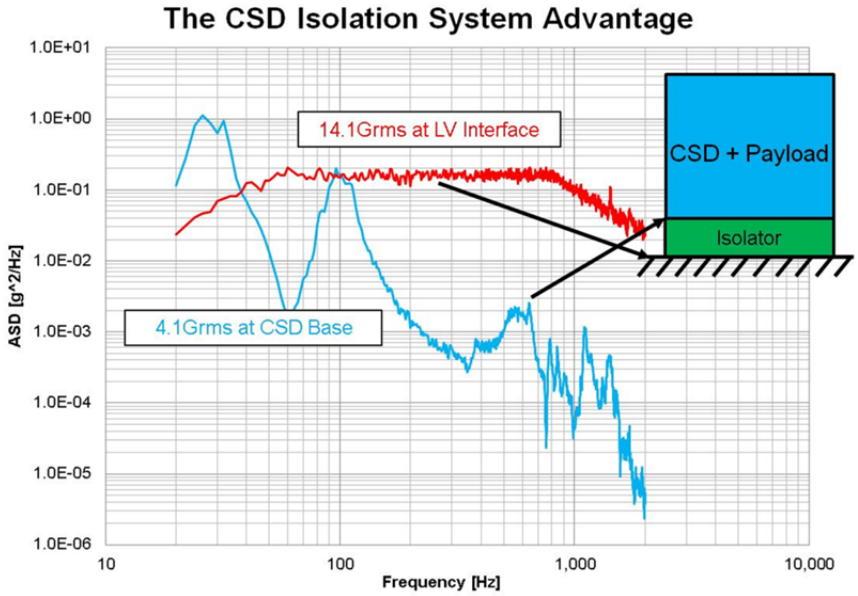


Figure 29: Isolation System Benefits

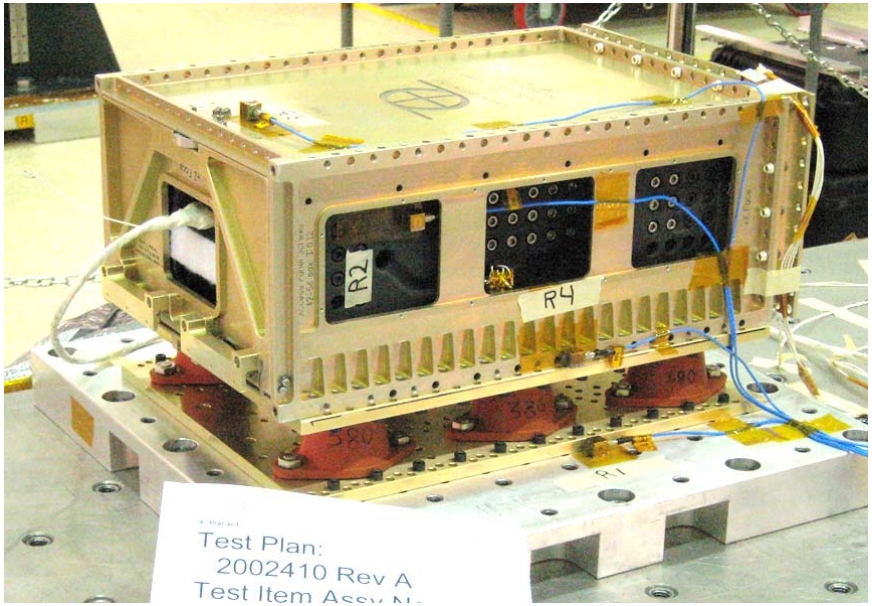


Figure 30: 6U CSD Vibration Testing with Isolation System

TYPICAL APPLICATIONS

Figure 31: CSD Mounted via -Y Face Using Corner Rails

Figure 32: CSD Mounted via -Z Face

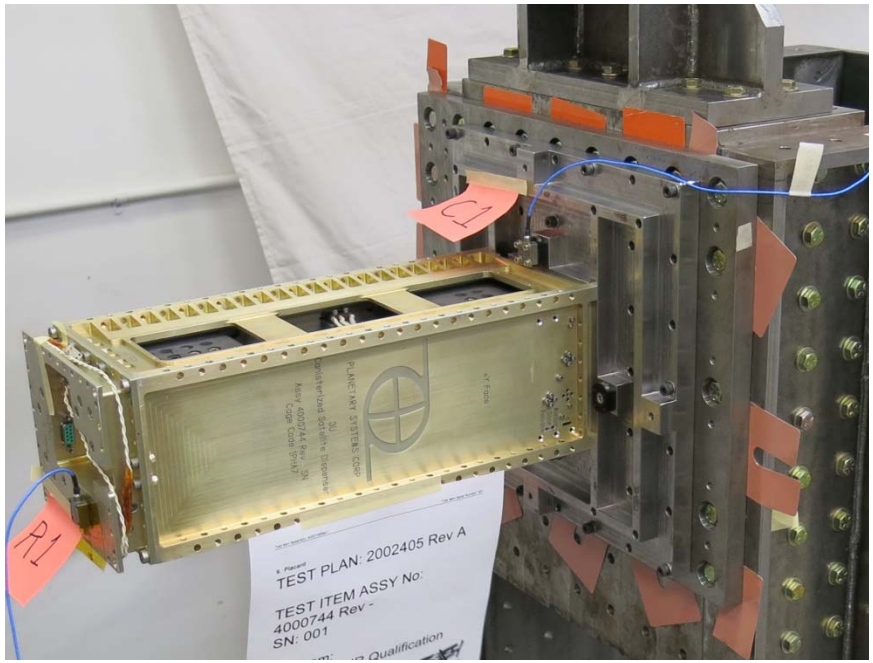


Figure 33: CSD Mounted via +Z (door) Face

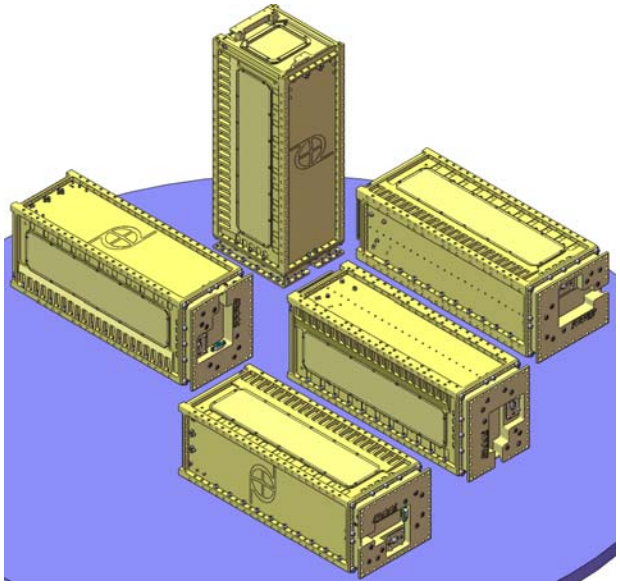


Figure 34: CSDs Mounted on Five Unique Faces

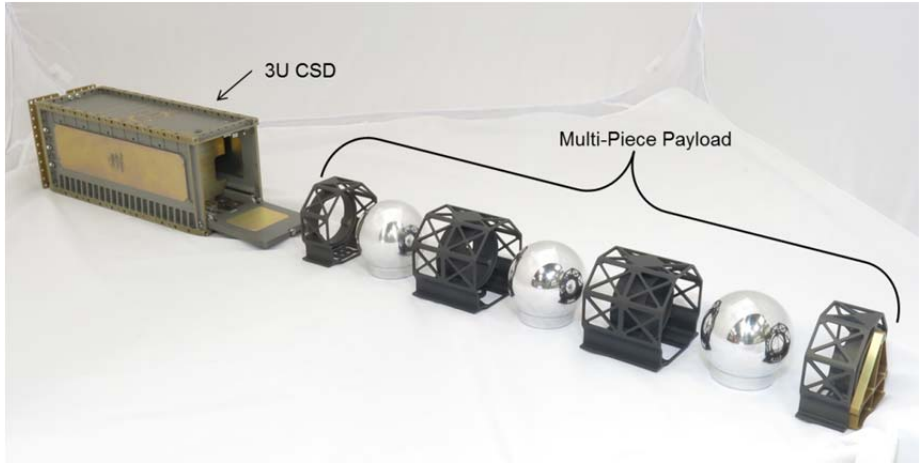


Figure 35: A Single CSD Can Dispense Multiple Payloads (Ref. 2)

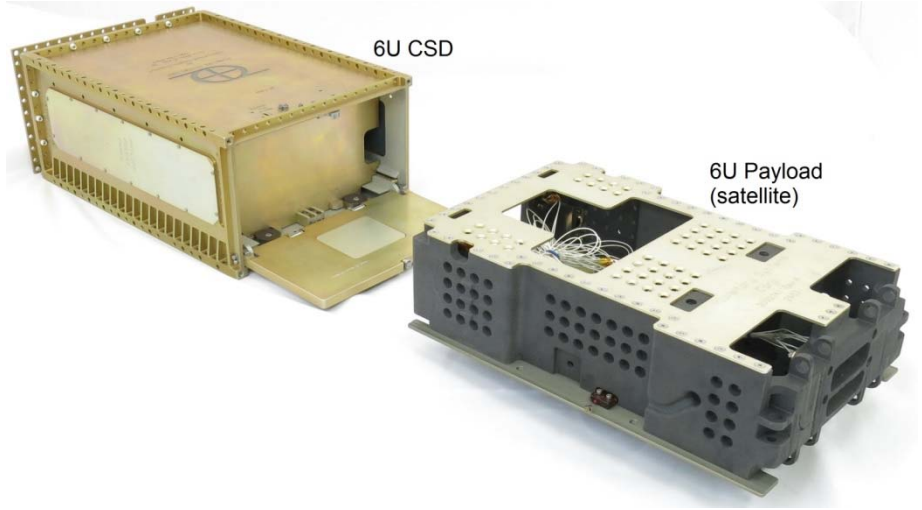


Figure 36: 3D Printed Payload Deploying from 6U CSD

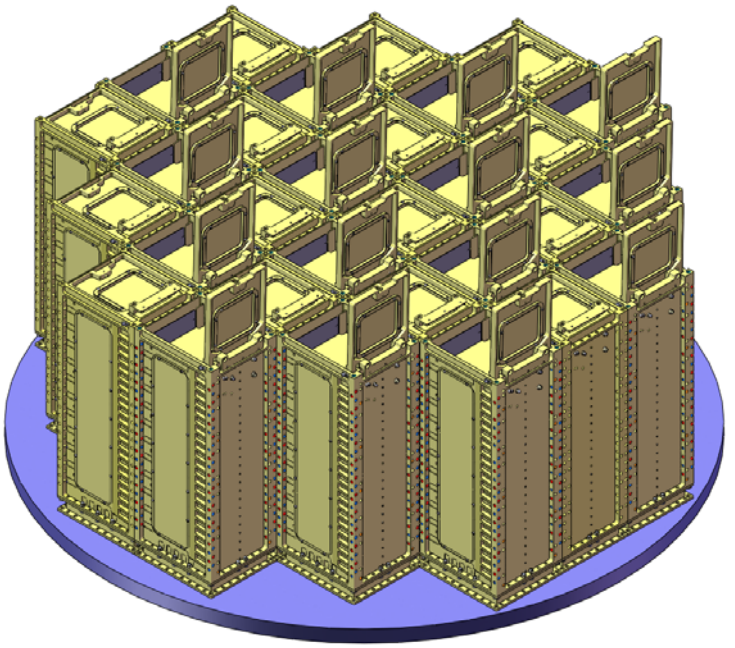


Figure 37: Thirty 3U CSDs Mounted on 41 inch Diameter Plate

As CSDs are added to the plate there is limited wrench access for mounting to the LV. Structural integrity is maintained by bolting the CSDs to each other via the alternating tapped/thru holes along the Rails (a thru hole on one CSD is co-axial to a tapped hole on the adjacent CSD).

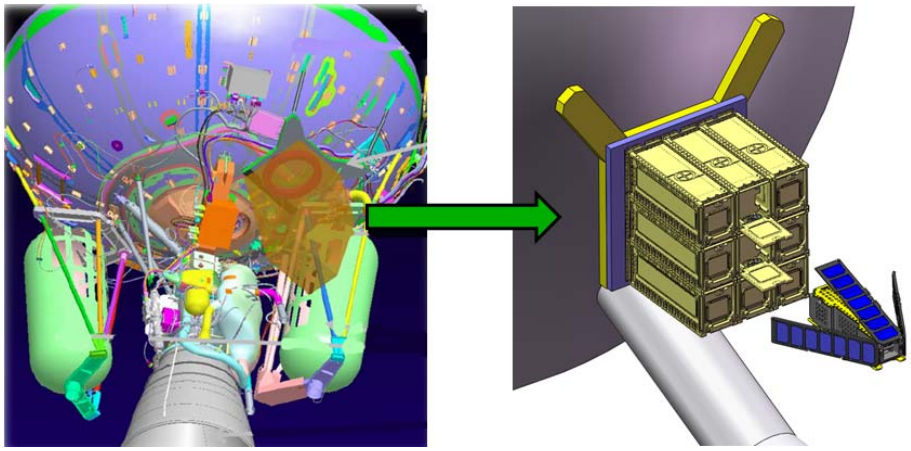


Figure 38: Nine 3U CSDs Mounted to Atlas V Aft Bulkhead Carrier (ABC)

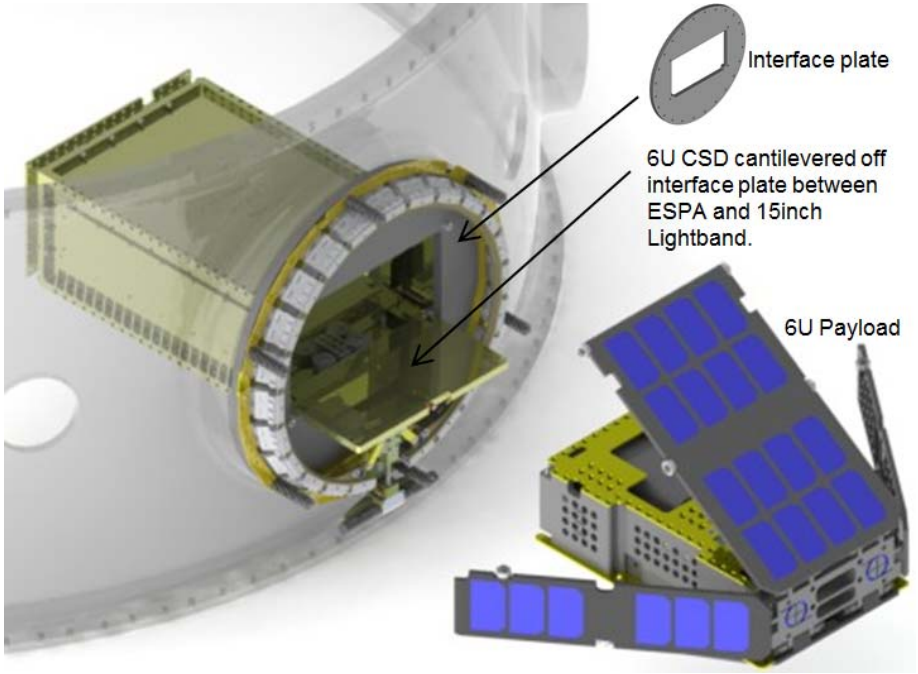


Figure 39: 6U Payload Deploying Through ESPA Port. CSD Mounted Directly via +Z Face.

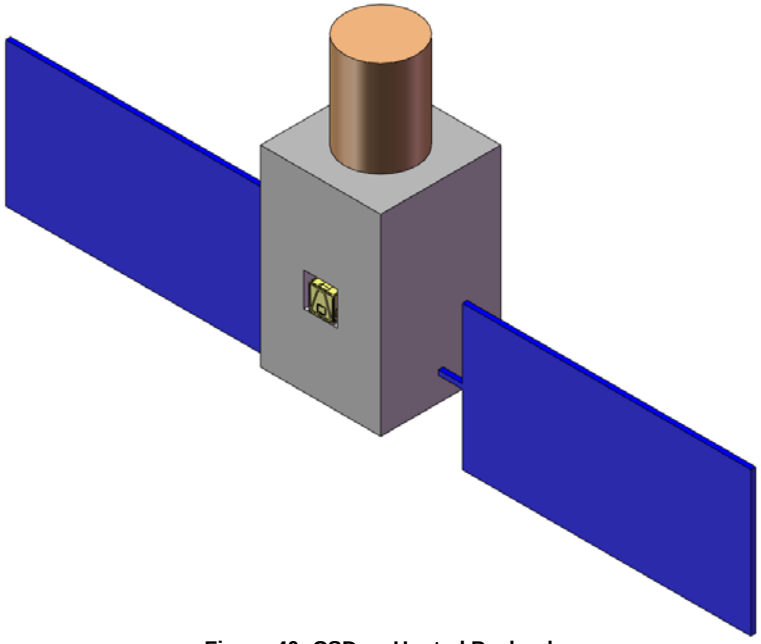


Figure 40: CSD as Hosted Payload

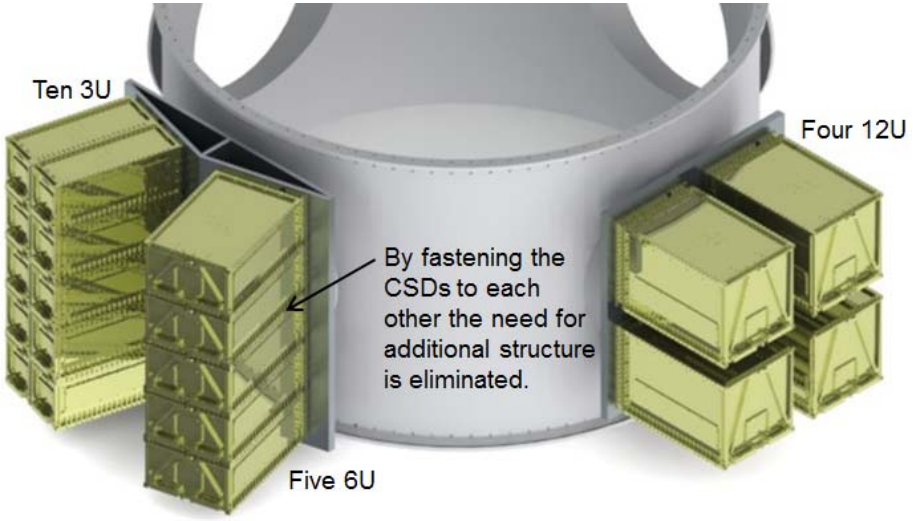


Figure 41: CSDs Mounted to ESPA Grande

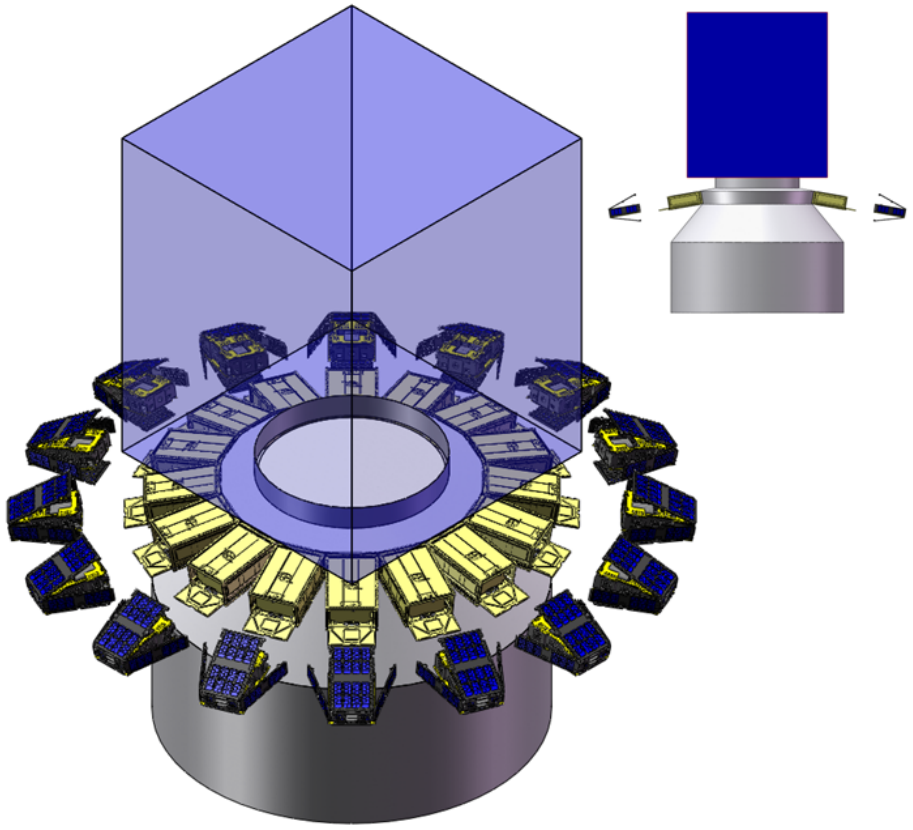


Figure 42: Sixteen 6U CSDs Mounted Underneath Primary Payload

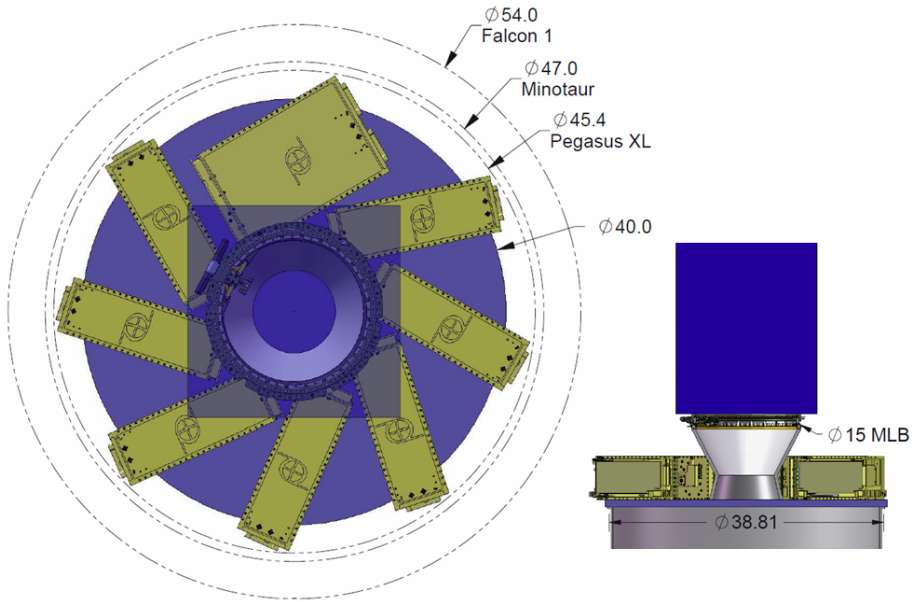


Figure 43: CSDs on Plate with 15 inch Lightband

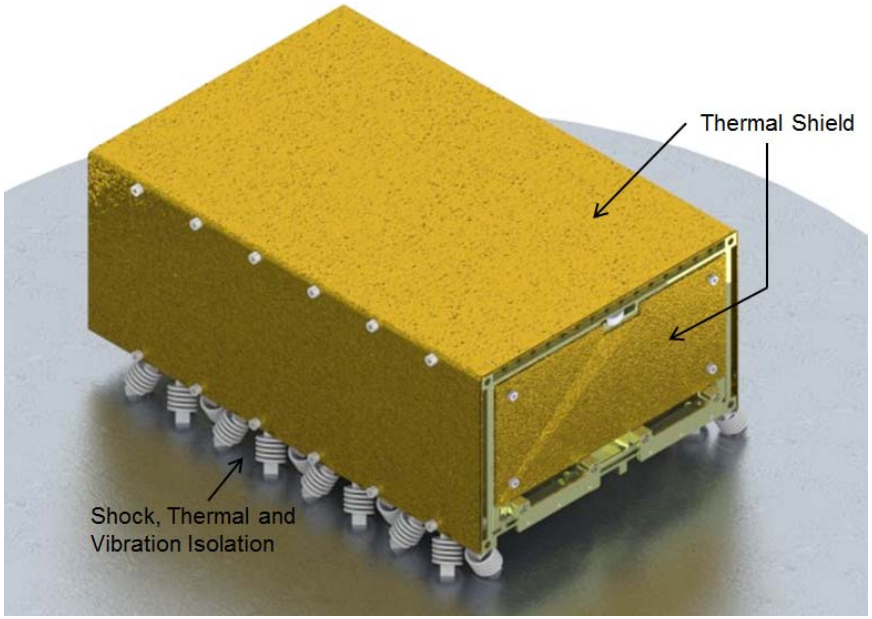


Figure 44: CSDs Easily Accept Bolt-On Vibration and Thermal Isolation

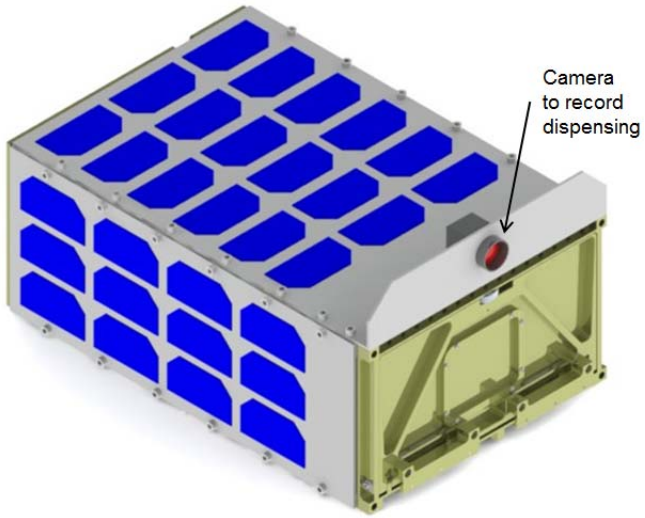


Figure 45: Adding Auxiliary Equipment to the CSD

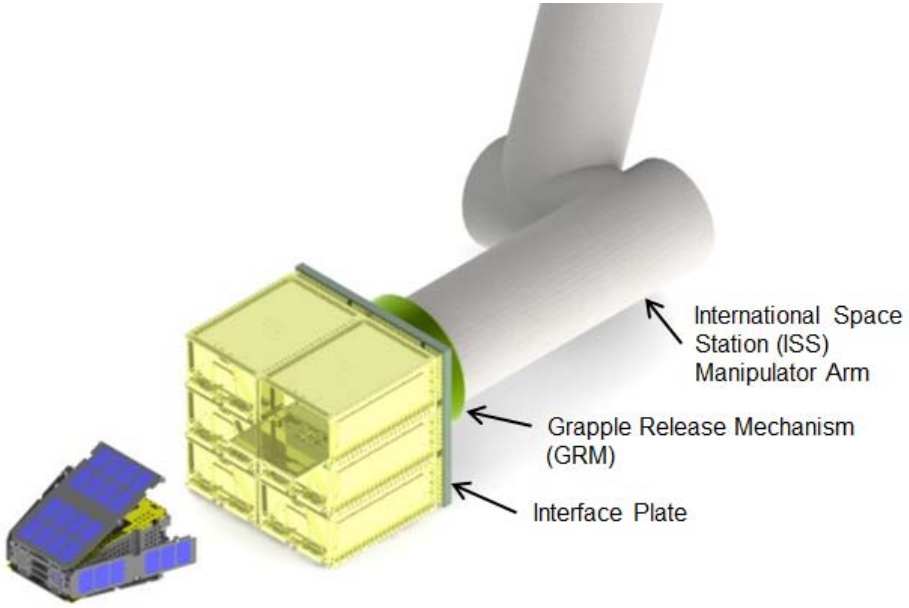


Figure 46: ISS Manipulator Arm Dispensing Six 6U Payloads

TEST SUPPORT EQUIPMENT

Verifying complete separation of the payload from the CSD is the only way to develop complete confidence in proper operation. For all testing PSC employs a custom conveyor mechanism that allows the payload to fully eject. PSC does not offer this for sale but will provide the production drawings to contracted customers upon request.

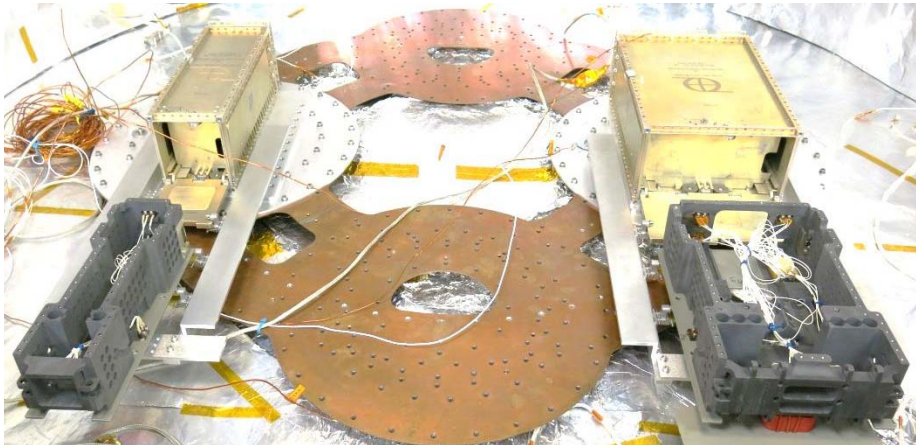


Figure 47: 3U and 6U Payloads Separating on Conveyors in TVAC

SPECIFYING AND ORDERING

Specify the exact CSD configuration using the following system.

Example: CSD-6U-2-SC-FLT

- **End Use**
  - FLT - Flight
  - EDU - Engineering Development Unit
- **Separation Electrical Connector**
  - 00 - None
  - SC - Qty. 1
- **Ejection Spring Qty.**
  - 1, 2, 3, 4 (3&4 not available on 3U)
- **Size**
  - 3U, 6U, 12U

CSDs can also be purchased on the GSA Schedule. The prices listed are for EDU units only. Testing for flight units is an additional cost.

REFERENCES

1) Hevner, Ryan; Holemans, Walter, "An Advanced Standard for CubeSats", Paper SSC11-II-3, *25th Annual AIAA/USU Conference on Small Satellites*, Logan, UT, August 2011.
2) Holemans, Walter; Moore, Gilbert; Kang, Jin, "Counting Down to the Launch of POPACS", Paper SSC12-X-3, *26th Annual AIAA/USU Conference on Small Satellites*, Logan, UT, August 2012.
3) *Payload Specification for 3U, 6U, 12U and 27U*, 2002367 Rev A, Planetary Systems Corp., Silver Spring, MD, August 2013.
4) *Separation Connector Data Sheet*, 2001025 Rev C, Planetary Systems Corp, Silver Spring, MD, July 2013.
5) *CubeSat Design Specification*, Rev 12, California Polytechnic State University, CA, Aug 2009.

CAD MODELS

Simplified CAD models of the CSD, in STEP format, are available at www.planetarysys.com.

TIPS AND CONSIDERATIONS

1) The ejection spring force is often much less than the payload weight. Installing a removable handle to the payload's +Z face aides vertical installation of the payload into the CSD.
2) When deploying horizontally in 1g the payload will stop cantilevered prior to fully ejecting due to friction. To avoid damage either guide the payload on rollers or prematurely stop it >3 inches early and then remove by hand.

ADDITIONAL INFORMATION

Verify this is the latest revision of the specification by visiting www.planetarysys.com. Please contact info@planetarysystemscorp.com with questions or comments. Feedback is welcome in order to realize the full potential of this technology.

PSC does not design or manufacture payloads.

REVISION HISTORY

Revision	Release Date	Created By	Reviewed By
-	25-Jul-2012	RH	WH
A	06-Aug-2013	RH	WH

Changes from previous revision:

- *Compatibility:* CSD now compatible with revision A of the Payload Spec.
- *Parameters:* Updated E, I_C, T, I_{SR}, PT, F_{EP}, L
- *Electrical Schematic:* Updated note 4.
- *Payload Ejection:* Updated ejection velocities.
- *Testing:* Added Strength. Added notes regarding qualification testing. Updated shock levels.
- *Payload Installation and Operation:* Updated with more detail.
- Integration to Launch Vehicle (LV)*:* Updated with more detail.
- Added Reducing Dynamic Loading on Payload.
- Typical Applications*:* Added figures.
- Added *Test Support Equipment.*
- *Specifying and Ordering:* Added GSA Schedule.
- *References:* Updated Payload Spec and Separation Connector revisions. Added CubeSat.
- *CAD Models:* Now available online.