

OMC Black Glass Assembly Procedure

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Calum Torrie

E15000214-v6

DOCUMENT OUTLINE

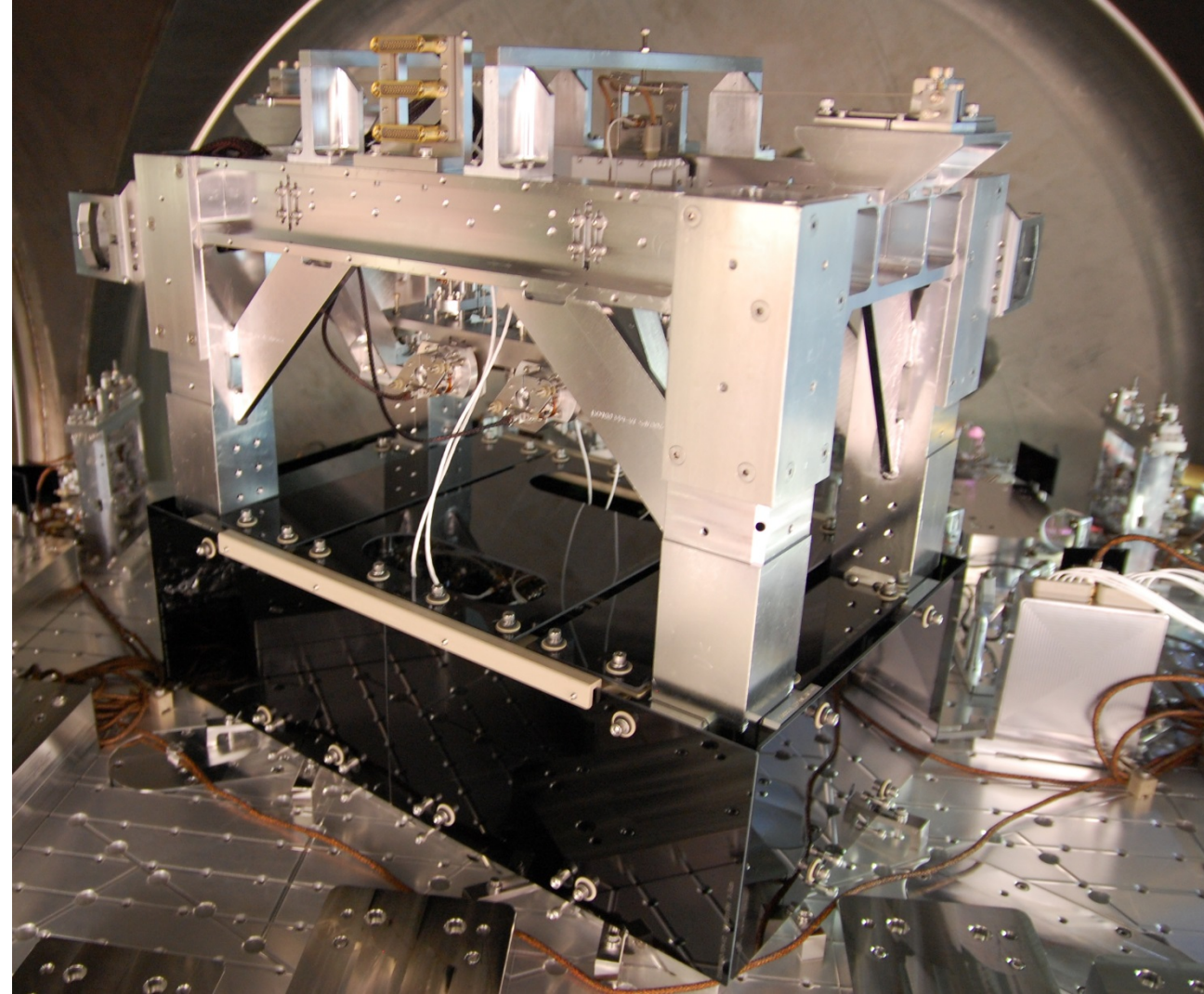
- The Basics
- Glass Inspection & Cleaning
- Prep:
 - Non-Glass Parts
 - Glass
 - In Chamber
- Assembly Procedure

THE BASICS

THE BASICS

Overview

- This document summarizes the prep work and installation procedure for the OMC Black Glass Shroud.
- Black Glass
 - Total panels: 26
 - Each panel has a coated side labeled “S1”
 - Glass Bolt Assy ([D1500105](#)) used on all panels
 - Inner vertical panels (6 total) have C-Clamp Assy, aka brackets
 - Refer to [E1500213](#) for a collection of associated documents
- EQ Stop Assy ([D1201441](#))
 - Installed assy ([v3](#)) will be replaced with an updated version ([v5](#))
 - EQ Stop Temporary Stabilizer Assy ([D1500156](#)) used during the replacement
 - New, compact EQ Stop Knobs ([D1201474](#)) require threaded bumper ([D1201440](#)) from old stops



THE BASICS

Black Glass BOM*

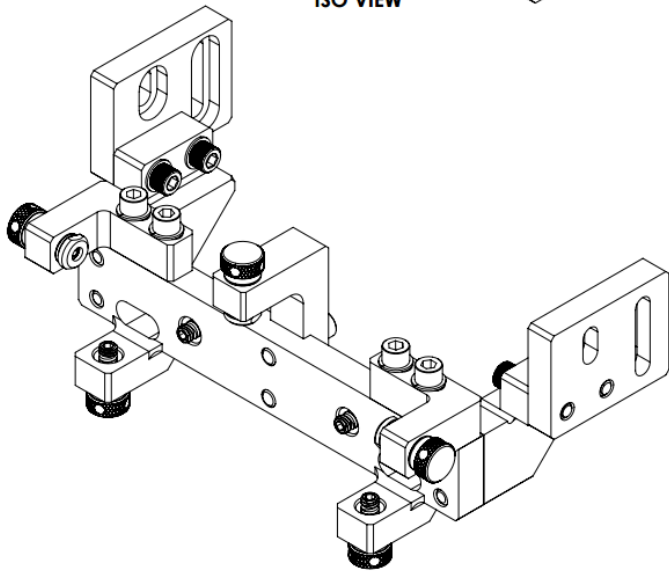
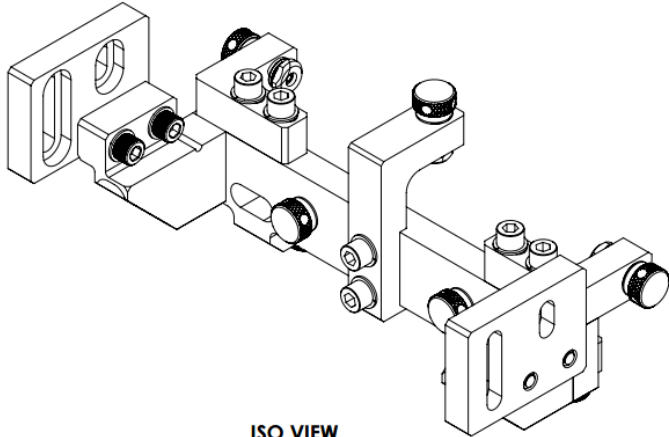
ITEM NO.	PART NUMBER	DESCRIPTION	QTY	S1	QTY - C-CLAMP ASSY (BRACKETS)														
					QTY - BOLT ASSY (D1500105)					C-CLAMPS (D1500058)		STIFFENERS (D1500147)				C-Clamp Jaw (D1500148)	C-Clamp Screw (D1500144)	Screw, SHC 4-40 X 0.5 (67)	
					Basic (36)	-1 (37)	-2 (38)	-3 (39)	-4 (No #)	-101 (LH) (34)	-102 (RH) (35)	-3495 (63)	-3620 (64)	-5370 (65)	-4620 (66)	(68)	(58)	(67)	
1	10	D1500042-101	Outer Panel (-X Side) RH	1	Shoulder	3	-	-	-	-									
2	11	D1500042-102	Outer Panel (-X Side) LH	1	Shoulder	3	-	-	-	-									
3	12	D1500043-101	Outer Panel (REFL AIR) RH	1	Shoulder	3	-	-	-	-									
4	13	D1500043-102	Outer Panel (REFL AIR) LH	1	Shoulder	3	-	-	-	-									
5	14	D1500044	Outer Panel (TRANS AIR)	1	Shoulder	4	-	-	-	-									
6	15	D1500045	Outer Panel (-Y Side)	1	Shoulder	4	-	-	-	-									
7	16	D1500046-101	Outer Panel (TOP)	1	Shoulder	4	-	-	-	-									
8	17	D1500046-102	Outer Panel (TOP)	1	Shoulder	4	-	-	-	-									
9	18	D1500046-103	Outer Panel (TOP)	1	Shoulder	4	-	-	-	-									
10	19	D1500046-104	Outer Panel (TOP)	1	Shoulder	4	-	-	-	-									
11	20	D1500047-101	Inner Panel (BOT)	1	Head	-	3	-	-	-									
12	21	D1500047-102	Inner Panel (BOT)	1	Head	-	3	-	-	-									
13	22	D1500048	Horz Panel (-X Side)	1	Head	2	-	-	2	-									
14	23	D1500049	Horz Panel (REFL AIR)	1	Head	2	-	-	2	-									
15	24	D1500050	Horz Panel (-Y Side)	1	Head	-	-	2	-	-									
16	25	D1500051	Horz Panel (TRANS AIR)	1	Head	-	-	2	-	-									
17	26	D1500052	Vert Panel (TRANS AIR)	1	Head	-	-	2	-	-	2	-	-	-	1	1	4	6	
18	27	D1500053	Vert Panel (-Y Side)	1	Head	-	-	2	-	-	1	1	1	-	-	1	4	6	
19	28	D1500054-101	Vert Panel (REFL AIR)	1	Head	-	-	2	-	-	2	-	-	1	-	1	4	6	
20	29	D1500054-102	Vert Panel (REFL AIR)	1	Head	-	-	2	-	-	-	2	-	1	-	1	4	6	
21	30	D1500055-101	Vert Panel (-X Side)	1	Head	-	-	2	-	-	-	2	-	-	1	-	1	4	6
22	31	D1500055-102	Vert Panel (-X Side)	1	Head	-	-	2	-	-	2	-	-	1	-	1	4	6	
23	40	D1500116	Top Horz Panel (Inner)	2	Head	-	-	-	-	6									
24	57	D1500143	Top Panel Extn	2	Shoulder	4	-	-	-	-									
						44	6	16	4	6	7	5	1	2	2	1	6	24	36

* Qty for final assy, not prep work

(#) denotes the item no. per the top level OMC assy drawing ([D0900295](#))

THE BASICS

EQ Stop Assy BOM*

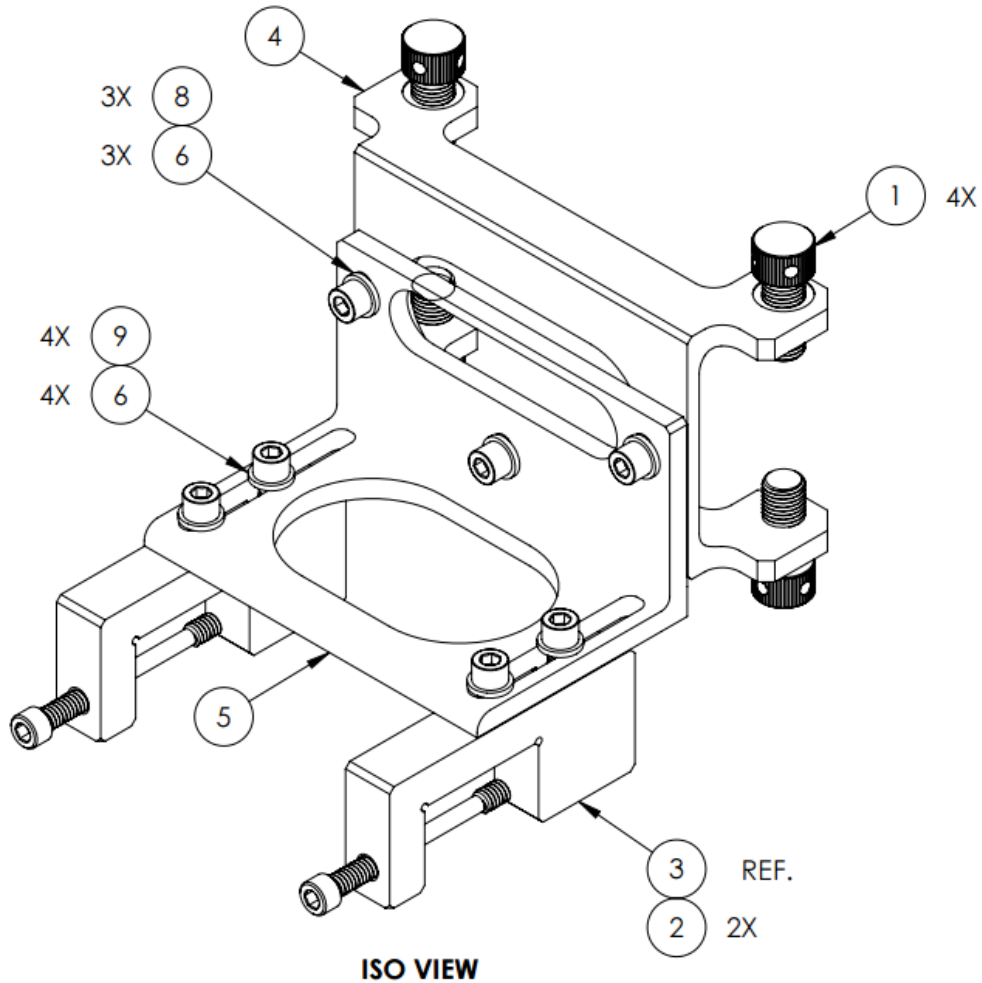


ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY
7	D1201441	EQ Stop Assy	-	2
7.1	D1201471	Main Bar	6061-T6 Al	2
7.2	D1201472	Left Support (Bracket)	6061-T6 Al	2
7.3	D1201473	Right Support (Bracket)	6061-T6 Al	2
7.4	D1201474	EQ Stop Knob	-	14
7.4.1	D1201440	Threaded Bumper, EQ Stop	Semitron ESD 480	14
7.4.2	D1500149	Thumb Screw, EQ Stop	18-8 SSTL	14
7.4.3	91318A410	Hollow-Lock Set Screw, 1/4"-20 X 1/8" LG	18-8 SSTL	14
7.5	D1201475	Top Bracket	6061-T6 Al	2
7.6	D1201476	Side Bracket	6061-T6 Al	4
7.7	D1201478-101	Horizontal Adjust (LH)	6061-T6 Al	2
7.8	D1201478-102	Horizontal Adjust (RH)	6061-T6 Al	2
7.9	Thread Insert	Helicoil 1/4"-20 x 1Dia	Nitronic 60	28
7.10	Holokrome_78060	SHCS, 1/4-20 X .875 LG.	18-8 SSTL	4
7.11	Holokrome_78062	Screw, SHC, 1/4-20 x 1.0 LG.	18-8 SSTL	8
7.12	WFV-25	Vented Washer, .255 ID X .468 OD X .032 THK #1/4	18-8 SSTL	20
7.13	95966A529	Screw, SHC, 1/4-20 X 1.0 LG. (Captive)	18-8 SSTL	8
7.14	93615A422	Screw, LSHC, 1/4"-20 x 1.25" LG.	18-8 SSTL	8

* Qty for final assy, not prep work

THE BASICS

Temp EQ Stop Stabilizer Assy BOM



ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY
69	D1500156	EQ Stop Temp Stabilizer Assy	-	2
69.1	Q104-222-15	Thumbscrew, 7/16-20 X 1.0 LG.	PEEK	8
69.2	D1500144	C-Clamp Screw	316 SSSL	4
69.3	D1500150	C-Clamp	6061-T6 Al	4
69.4	D1500151	U-Channel	6061-T6 Al	2
69.5	D1500154	L-Bracket	6061-T6 Al	2
69.6	NAS620-C416	Washer, Flat, 1/4	300 SSSL	14
69.7	95630A470	Washer, Flat, 1/4	PTFE (general)	8
69.8	MS16995-48	Screw, SHC, 1/4-20 X .50 LG.	300 SSSL	6
69.9	MS16995-49	Screw, SHC, 1/4-20 X .63 LG.	300 SSSL	8
69.10	Thread Insert	Helicoil 1/4"-20 x 1Dia	Nitronic 60	8

GLASS INSPECTION & CLEANING

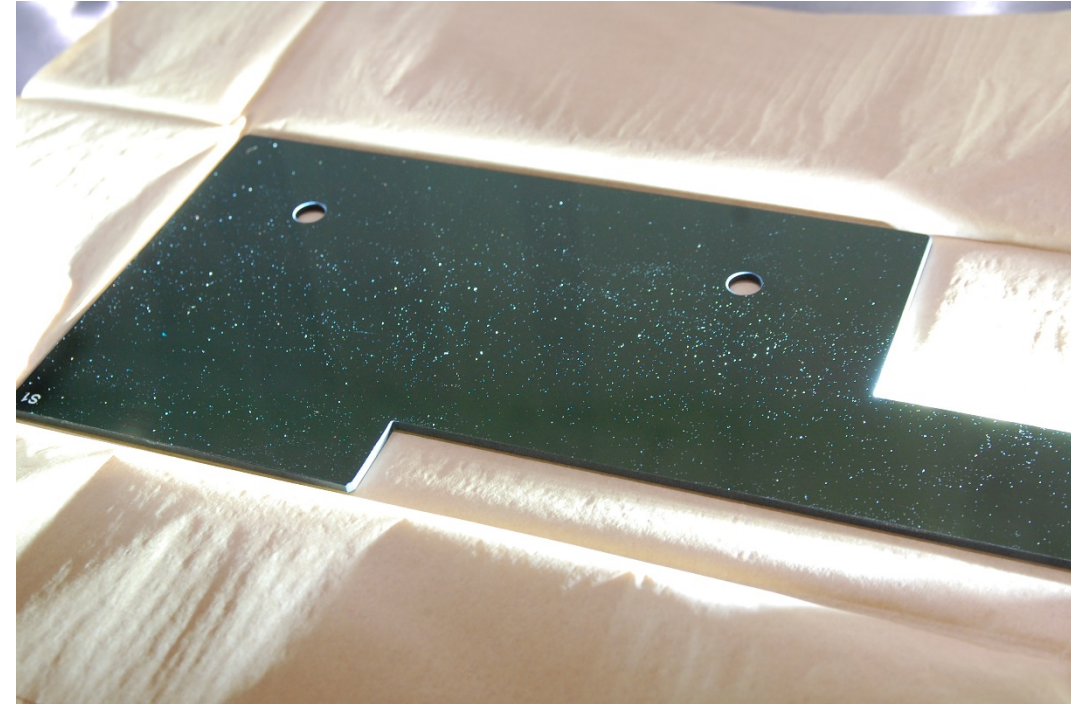
GLASS INSPECTION & CLEANING TOOLS & MATERIALS

- Safety eyewear
- Vectra Alpha 10 wipes
- Berkshire wipes
- Large metal pans
- Methanol
- Glass funnel
- Glass bottle
- Methanol squeeze bottle
- Flashlight array
- A lot of table space

GLASS INSPECTION & CLEANING PROCEDURE

Per [L1500091](#):

1. Pour methanol into a clean squeeze bottle and into a small glass bottle.
 - Do not use an old batch or bottle of methanol.
2. Line the bottom and sides of the clean metal pans with Vectra Alpha 10 wipes.
 - Panels will be rinsed in the pan, so ensure there is enough padding to protect the glass.
3. Carefully unpack the glass.
4. Immediately after unpacking, inspect 100% of panels with a high intensity white light at incident angle.

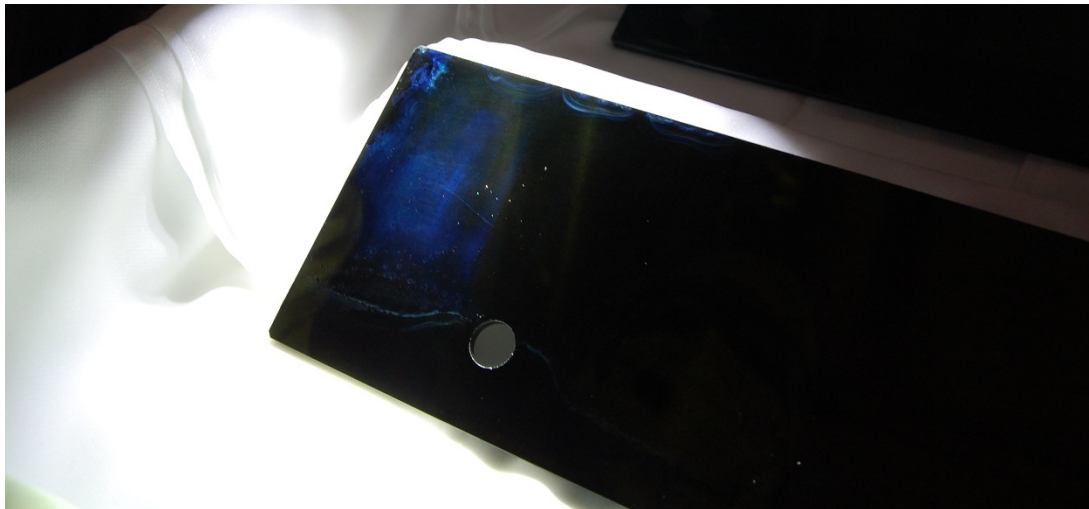


GLASS INSPECTION & CLEANING PROCEDURE

5. Lean panel(s) against padded wall of a metal pan or prop up with wipes.
6. Wipe edges with a methanol saturated Berkshire wipe.
7. Rinse each side 2x with methanol from the squeeze bottle. Allow to dry between rinses.



Immediately replace gloves if they come into contact with methanol. Inspection revealed a blue residue on a panel that was handled with gloved hands while it was wet.



GLASS INSPECTION & CLEANING PROCEDURE

8. Inspect both sides.
 - If particles or other contaminants are still visible, repeat Step 7.
9. Lay out 2 sets of clean Vectra Alpha 10 wipes in an area away from the methanol rinsing.
10. Place the panel on the first set of clean wipes with the uncoated side facing up.
11. Drag wipe the uncoated side 2x with a methanol saturated Berkshire wipe.
12. Inspect the uncoated side.
 - If the surface does not appear clean, repeat Step 11.
13. Turn the panel over to the coated side, and place it on the second set of clean wipes.
 - Discard the first set of wipes.
14. Drag wipe the coated side 2x with a methanol saturated Berkshire wipe.
15. Inspect the coated side.
 - If the surface does not appear clean, repeat Step 14.
16. Line clean pans or aluminum foil boats (for storing glass) with Vectra Alpha 10 wipes.

GLASS INSPECTION & CLEANING PROCEDURE

17. Place the now clean panel in the pan/boat with the coated side facing up.
18. Cover class with Vectra Alpha 10 wipes to keep clean.

PREP – NON-GLASS PARTS

Pre-Assembly

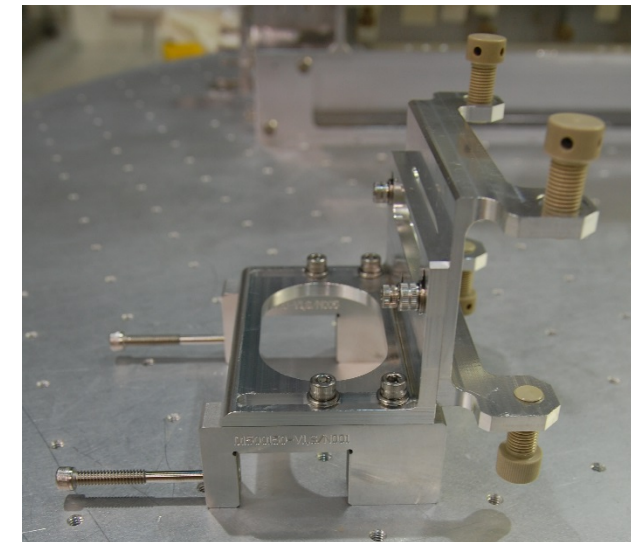
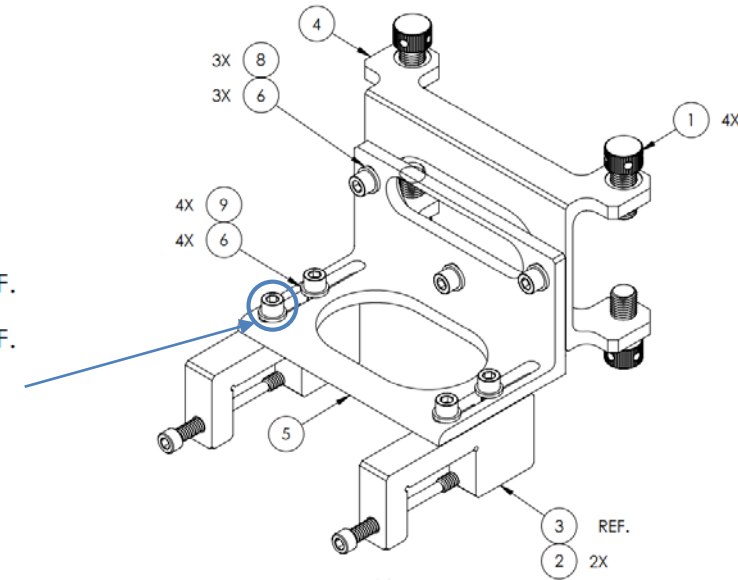
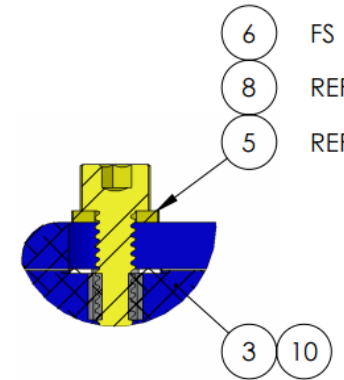
Note – BOM quantities in this section are for prep work only, and may not reflect the top level total.

PREP – TEMP STABILIZER ASSY

D1500156

- Have enough parts to make 2 assy but only 1 was required during practice at Caltech and install at LHO.
- BOM (table below)
 - Item no. are for assy, not top level OMC
 - Qty for 1 assy
- Position:
 - EQ Stops (1) – retracted
 - C-Clamp screws (2) – retracted
 - U-Channel (4) – slide all the way down
 - L-Bracket (5) – retracted
 - C-Clamps must be aligned to U-Channel

ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY
1	Q104-222-15	Thumbscrew, 7/16-20 X 1.0 LG.	PEEK	4
2	D1500144	C-Clamp Screw	316 SSSL	2
3	D1500150	C-Clamp	6061-T6 Al	2
4	D1500151	U-Channel	6061-T6 Al	1
5	D1500154	L-Bracket	6061-T6 Al	1
6	NAS620-C416	Washer, Flat, 1/4	300 SSSL	7
7	95630A470	Washer, Flat, 1/4	PTFE (general)	4
8	MS16995-48	Screw, SHC, 1/4-20 X .50 LG.	300 SSSL	3
9	MS16995-49	Screw, SHC, 1/4-20 X .63 LG.	300 SSSL	4
10	Thread Insert	Helicoil 1/4"-20 x 1Dia	Nitronic 60	4



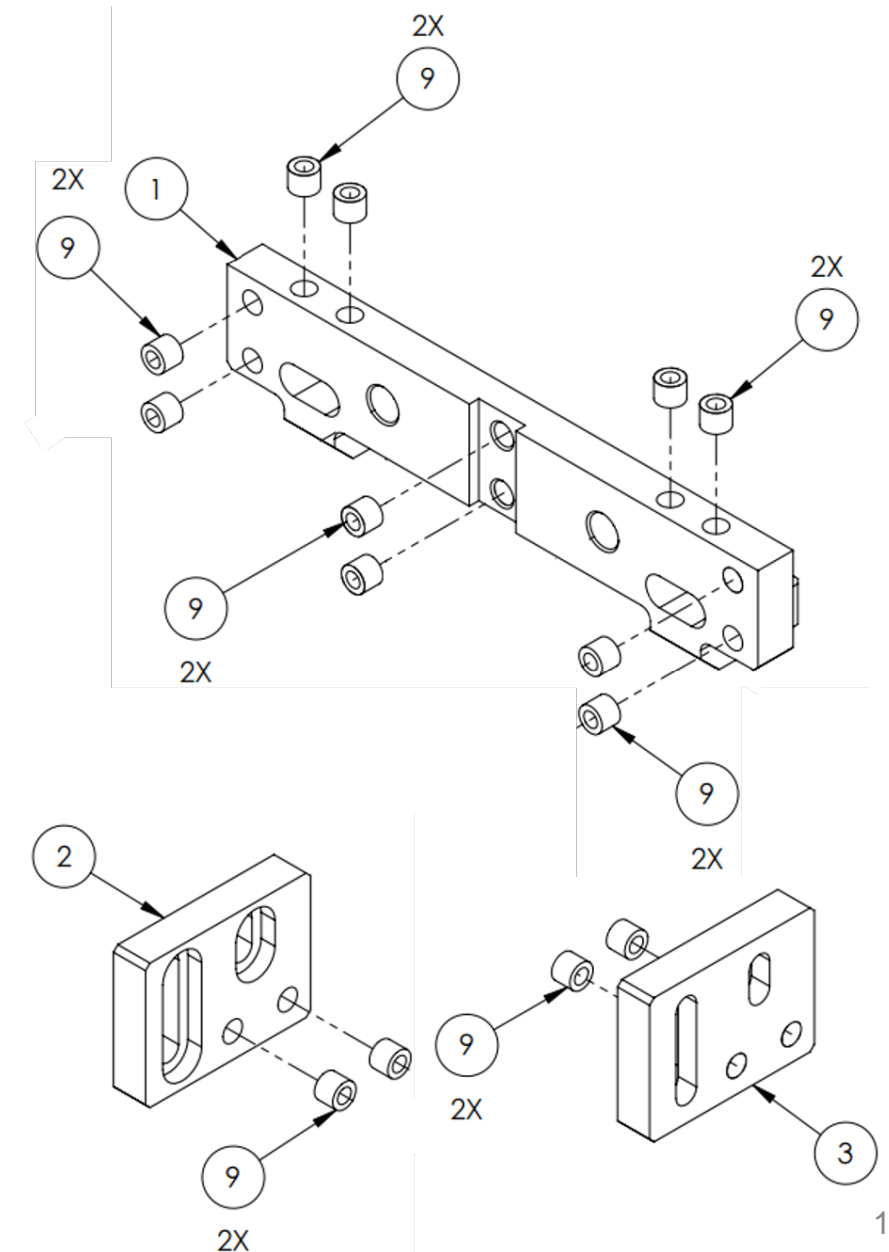
PREP – EQ STOP ASSY

Overview

D1201441

- Total: 2
- Partially assembled
- BOM (table below):
 - Item no are for assy, not top level OMC
 - Qty for 1 assy
- Helicoil:
 - Main Bar (1)
 - Left & Right Supports (2 & 3)

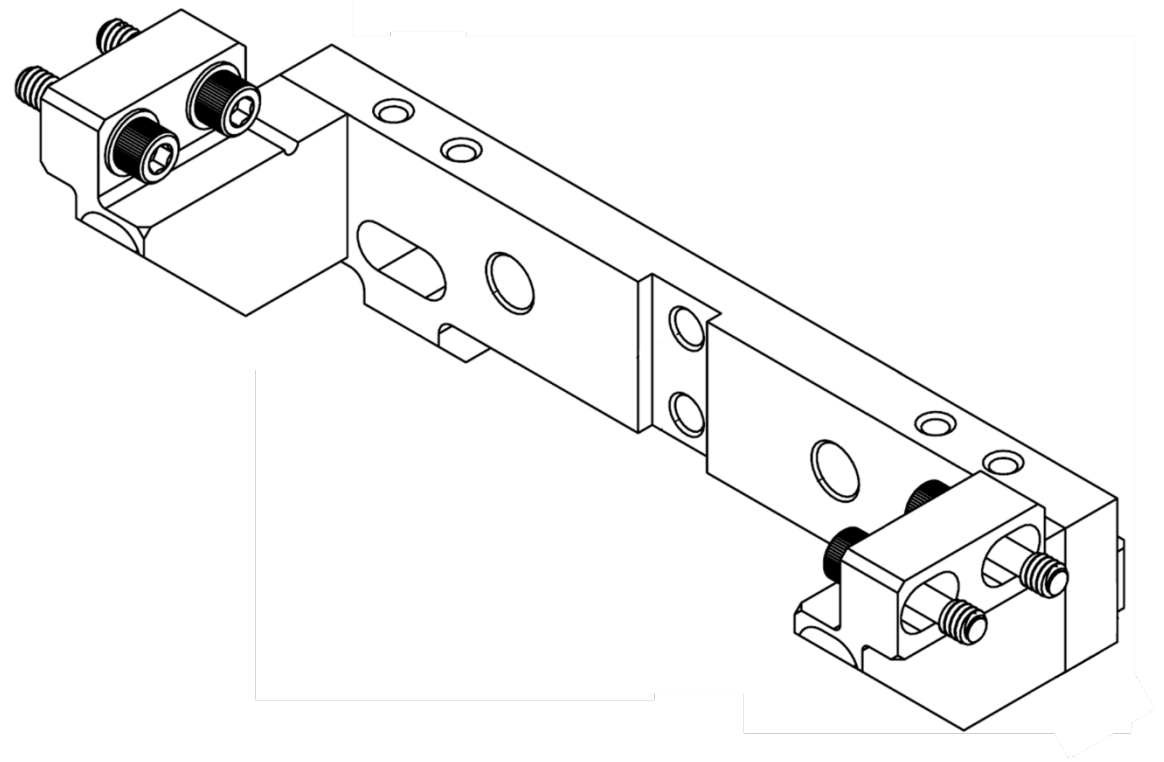
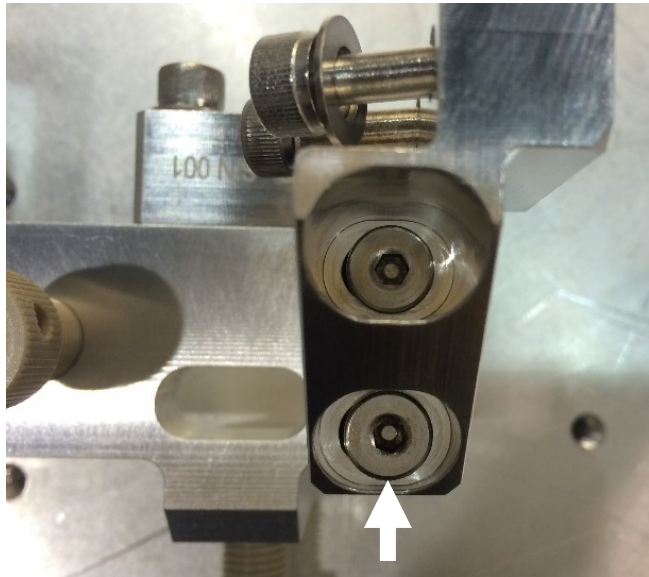
ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY
1	D1201471	Main Bar	6061-T6 Al	1
2	D1201472	Left Support (Bracket)	6061-T6 Al	1
3	D1201473	Right Support (Bracket)	6061-T6 Al	1
7	D1201478-101	Horizontal Adjust (LH)	6061-T6 Al	1
8	D1201478-102	Horizontal Adjust (RH)	6061-T6 Al	1
9	Thread Insert	Helicoil 1/4"-20 x 1Dia	Nitronic 60	14
12	WFV-25	Vented Washer, .255 ID X .468 OD X .032 THK #1/4	18-8 SSSL	4
13	95966A529	Screw, SHC, 1/4-20 X 1.0 LG. (Captive)	18-8 SSSL	4
14	93615A422	Screw, LSHC, 1/4"-20 x 1.25" LG.	18-8 SSSL	4



PREP – EQ STOP ASSY

Partially Assembled

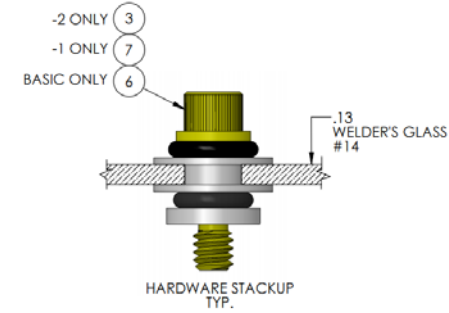
- EQ Stops will be taken from old EQ Assy (later step)
- Position:
 - Horizontal Adjust LH (7) & RH (8) – retracted (as far inward as possible)



PREP – BOLT ASSY Overview

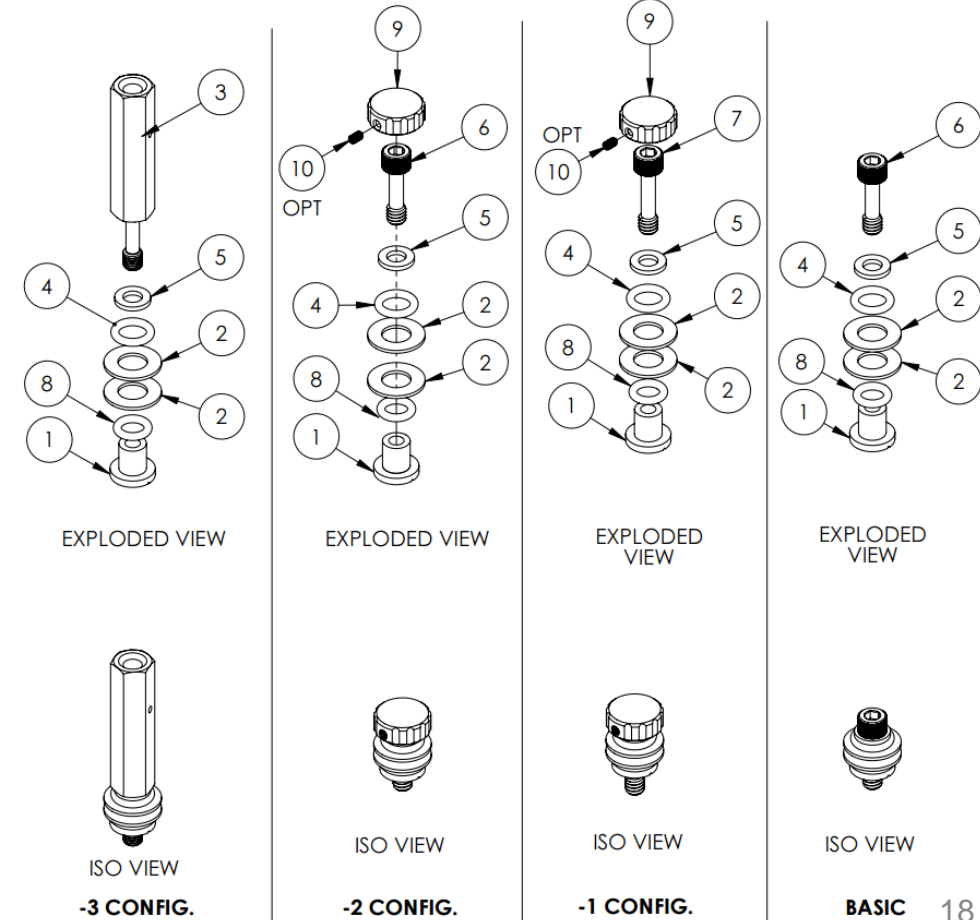
D1500105

- Multiple configurations
- Drawing (v3) doesn't show the -4 config.
- Item no. in table below are for bolt assy, not top level OMC.



ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY (EA)				
				Basic (36)	-1 (37)	-2 (38)	-3 (39)	-4 (No #)
1	D1500059	C'Bore Shoulder Washer	PEEK	1	1	1	1	1
2	D1500104	1/4 Washer	PEEK	2	2	2	2	-
3	D1500118	Male/Female Standoff, 1/4-20 (Captive)	6061-T6 Al	-	-	-	1	-
4	2-110 Parker	O-Ring, 3/32 X 3/8 ID X 9/16 OD	Viton	1	1	1	1	1
5	NAS620-C416	Washer, Flat, 1/4	300 SSSL	1	1	1	1	1
6	95966A523	Screw, SHC, 1/4-20 X .88 LG. (Captive)	18-8 SSSL	1	-	1	-	1
7	95966A529	Screw, SHC, 1/4-20 X 1.0 LG. (Captive)	18-8 SSSL	-	1	-	-	-
8	2-109 Parker	O-Ring, 3/32W X 5/16 ID X 1/2 OD	Viton	1	1	1	1	1
9	D1500146	Screw Cap	PEEK	-	1	1	-	-
10	94355A135	Set Screw, 4-40 X 3/16 LG.	18-8 SSSL	-	1	1	-	-
11	D1500104-1	Larger 1/4 Washer	PEEK	-	-	-	-	2

	Basic (36)	-1 (37)	-2 (38)	-3 (39)	-4 (No #)
TOTAL	44	6	16	4	6



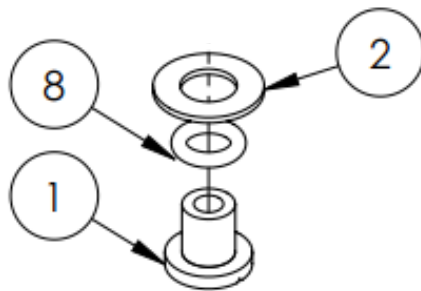
PREP – BOLT ASSY

Optional

- Save time – put together ALL the top & bottom halves of the bolt assy

Bottom Half

- Same parts used for all configurations except -4 (which has a larger PEEK washer).



ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY (EA)	
				All Except -4 (36-39)	-4 (No #)
1	D1500059	C'Bore Shoulder Washer	PEEK	1	1
2	D1500104	1/4 Washer	PEEK	2	-
8	2-109 Parker	O-Ring, 3/32W X 5/16 ID X 1/2 OD	Viton	1	1
11	D1500104-1	Larger 1/4 Washer	PEEK	-	2

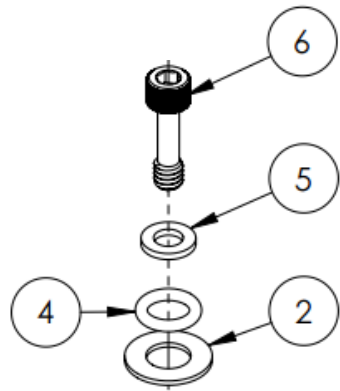
	All Except -4 (36-39)	-4 (No #)
TOTAL	70	6

PREP – BOLT ASSY

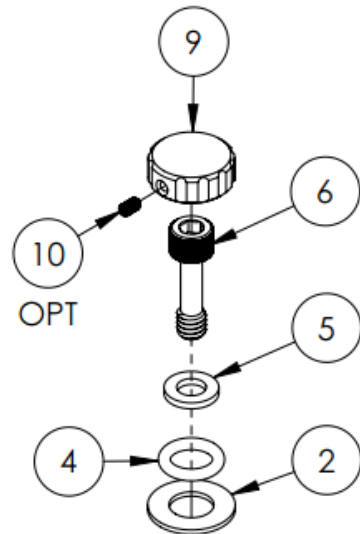
Optional

Top Half

- Most commonly used configurations:
 - Basic
 - -2
- -2 is the Basic config. plus a screw cap



BASIC



-2 CONFIG.

ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY (EA)	
				Basic (36)	-2 (38)
2	D1500104	1/4 Washer	PEEK	1	1
4	2-110 Parker	O-Ring, 3/32 X 3/8 ID X 9/16 OD	Viton	1	1
5	NAS620-C416	Washer, Flat, 1/4	300 SSSL	1	1
6	95966A523	Screw, SHC, 1/4-20 X .88 LG. (Captive)	18-8 SSSL	1	1
9	D1500146	Screw Cap	PEEK	-	1
10	94355A135	Set Screw, 4-40 X 3/16 LG.	18-8 SSSL	-	1

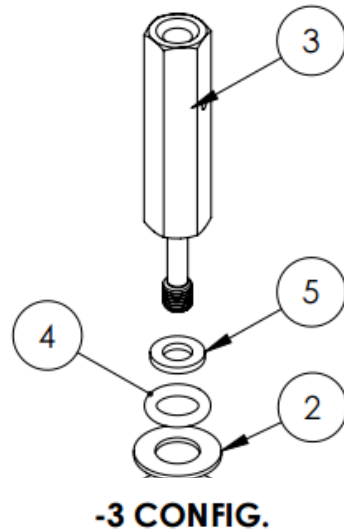
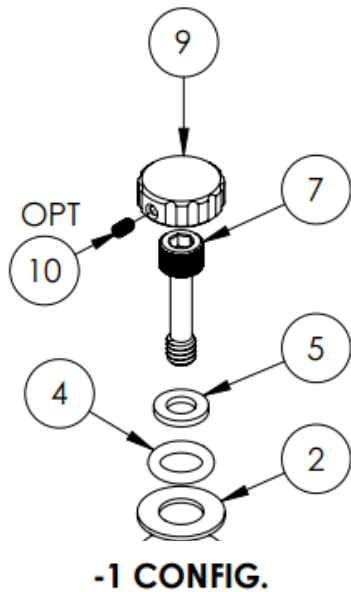
	Basic (36)	-2 (38)
TOTAL	44	16

PREP – BOLT ASSY

Optional

Top Half

- Less commonly used configurations:
 - -1
 - -3
 - -4

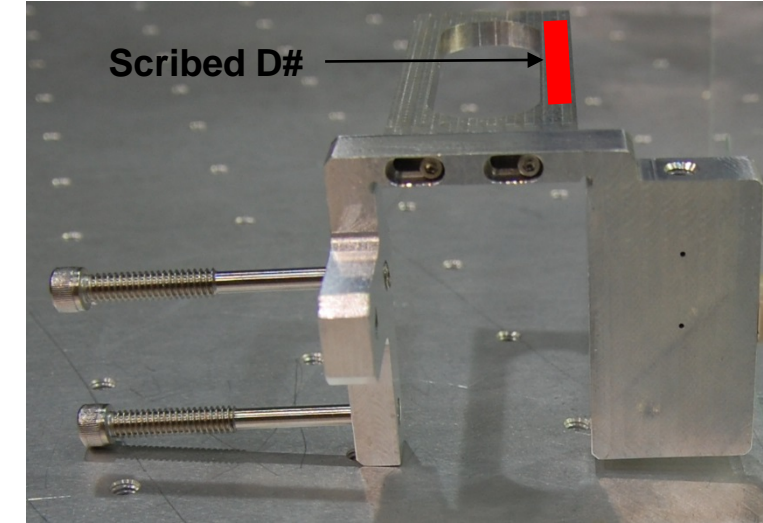


ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY EA		
				-1 (37)	-3 (39)	-4 (No #)
2	D1500104	1/4 Washer	PEEK	1	1	-
3	D1500118	Male/Female Standoff, 1/4-20 (Captive)	6061-T6 Al	-	1	-
4	2-110 Parker	O-Ring, 3/32 X 3/8 ID X 9/16 OD	Viton	1	1	1
5	NAS620-C416	Washer, Flat, 1/4	300 SSTL	1	1	1
6	95966A523	Screw, SHC, 1/4-20 X .88 LG. (Captive)	18-8 SSTL	-	-	1
7	95966A529	Screw, SHC, 1/4-20 X 1.0 LG. (Captive)	18-8 SSTL	1	-	-
9	D1500146	Screw Cap	PEEK	1	-	-
10	94355A135	Set Screw, 4-40 X 3/16 LG.	18-8 SSTL	1	-	-
11	D1500104-1	Larger 1/4 Washer	PEEK	-	-	1

	-1 (37)	-3 (39)	-4 (No #)
TOTAL	6	4	6

PREP – BRACKETS Overview

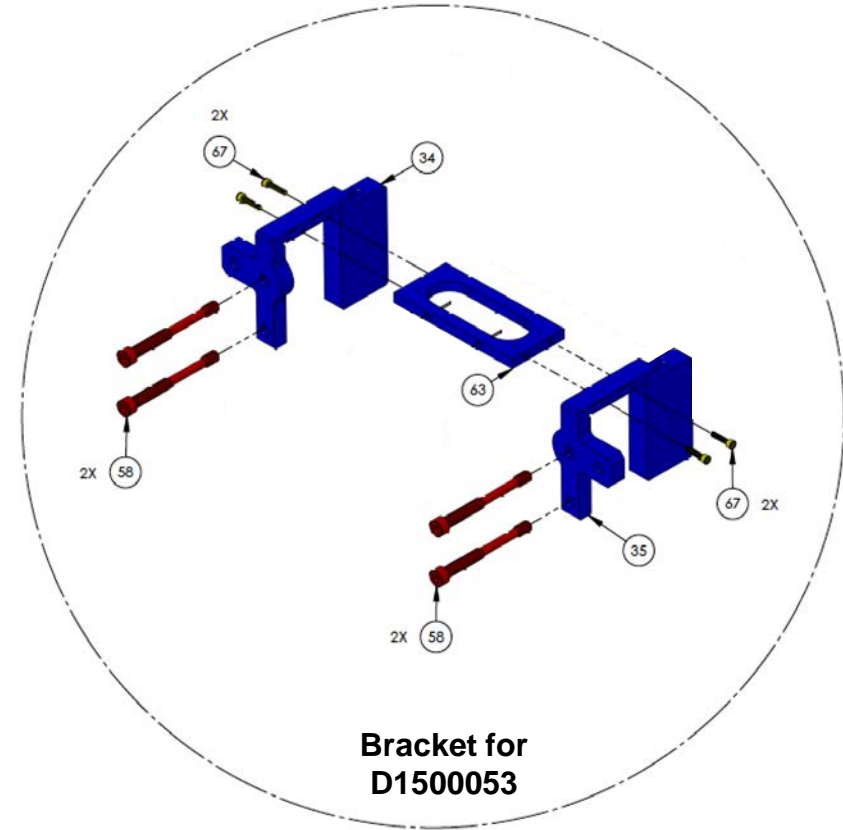
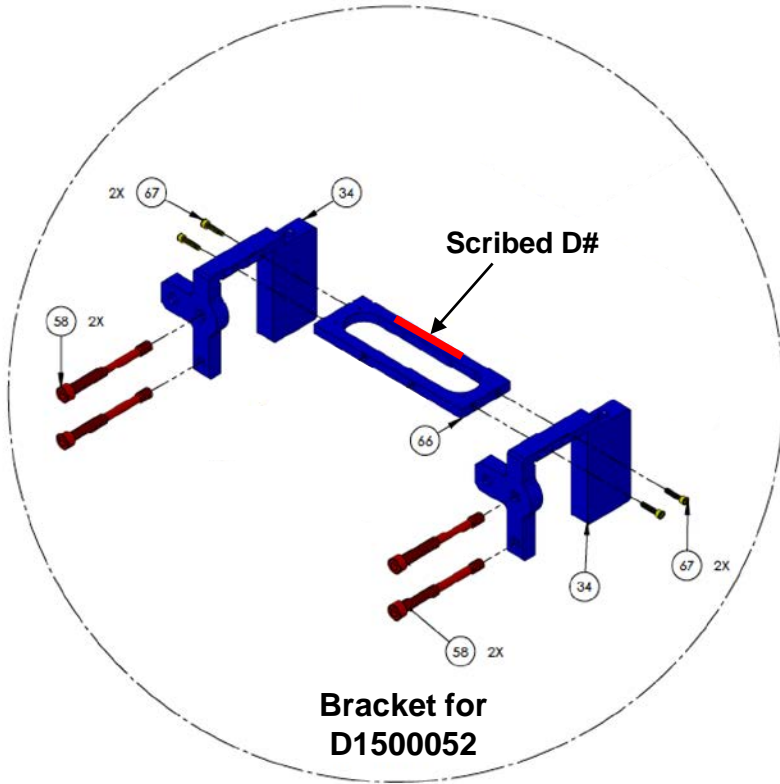
- Either fully assembled (2 total) or partially assembled (4 total).
 - “Fully” = prepped with both C-Clamps & Stiffener
 - “Partially” = prepped with 1 C-Clamp & Stiffener
 - C-Clamp Jaw & 2 SHCS always added after glass is positioned in chamber.
- Position (for all):
 - C-Clamp Screws (58) – retracted
 - Stiffener (63-64)
 - Forward (i.e. toward glass, away from C-Clamp screws)
 - Holes are offset on some of the parts, so note the orientation. D# should be on side near the glass panel (i.e. away from the C-Clamp screws).
- Align Stiffener & C-Clamps (or the bracket & glass won’t sit flat when installed).



	ITEM NO.	PART NUMBER	DESCRIPTION	QTY	C-CLAMPS		STIFFENERS				C-CLAMP SCREW (D1500144) (58)	SCREW, SHC 4-40 X 0.5 (67)
					-101 (LH) (34)	-102 (RH) (35)	-3495 (63)	-3620 (64)	-5370 (65)	-4620 (66)		
FULLY ASSEMBLED	26	D1500052	Vert Panel (TRANS AIR)	1	2	-	-	-	-	1	4	4
	27	D1500053	Vert Panel (-Y Side)	1	1	1	1	-	-	-	4	4
PARTIALLY ASSEMBLED	28	D1500054-101	Vert Panel (REFL AIR)	1	1	-	-	-	1	-	2	2
	29	D1500054-102	Vert Panel (REFL AIR)	1	-	1	-	1	-	-	2	2
	30	D1500055-101	Vert Panel (-X Side)	1	-	1	-	-	1	-	2	2
	31	D1500055-102	Vert Panel (-X Side)	1	1	-	-	1	-	-	2	2
					5	3	1	2	2	1	16	16

PREP – BRACKETS

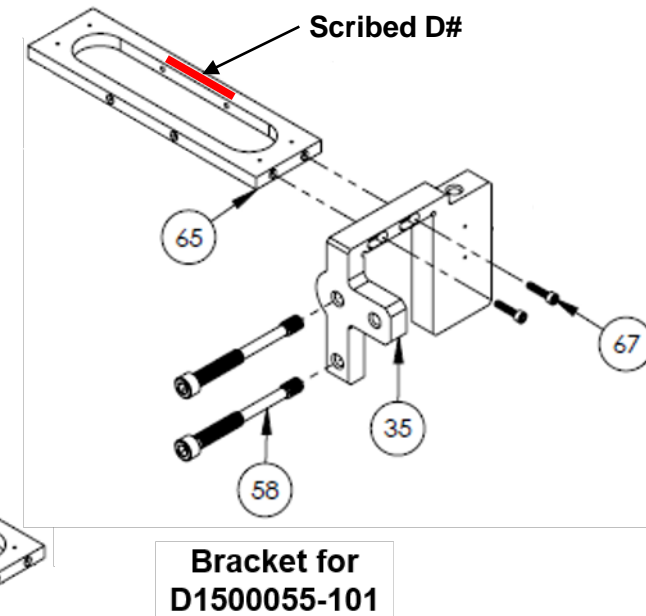
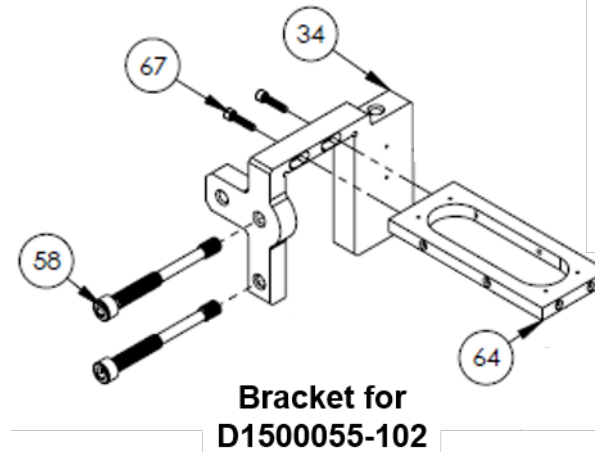
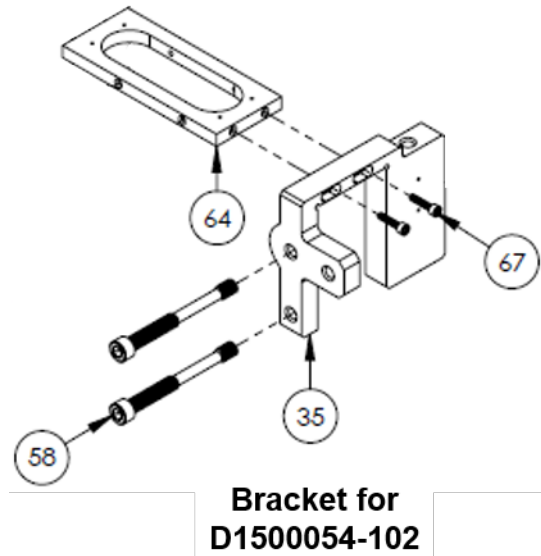
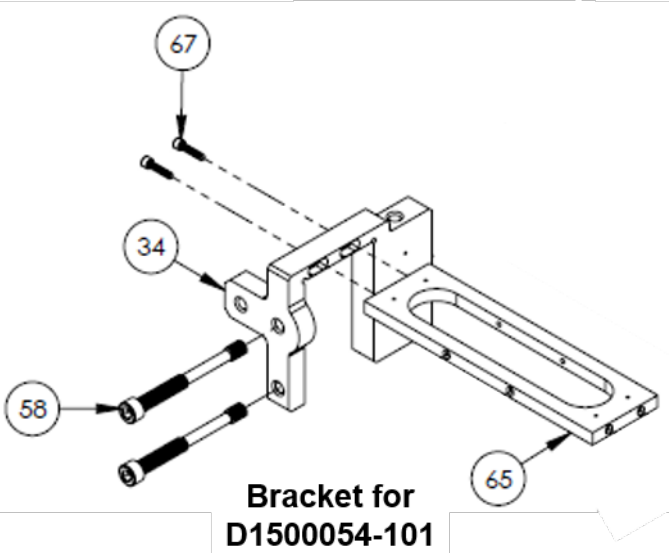
Fully Assembled



ITEM NO.	PART NUMBER	DESCRIPTION	QTY	C-CLAMPS		STIFFENERS		C-CLAMP SCREW (D1500144) (58)	SCREW, SHC 4-40 X 0.5 (67)
				-101 (LH) (34)	-102 (RH) (35)	-3495 (63)	-4620 (66)		
26	D1500052	Vert Panel (TRANS AIR)	1	2	-	-	1	4	4
27	D1500053	Vert Panel (-Y Side)	1	1	1	1	-	4	4

PREP – BRACKETS

Partially Assembled

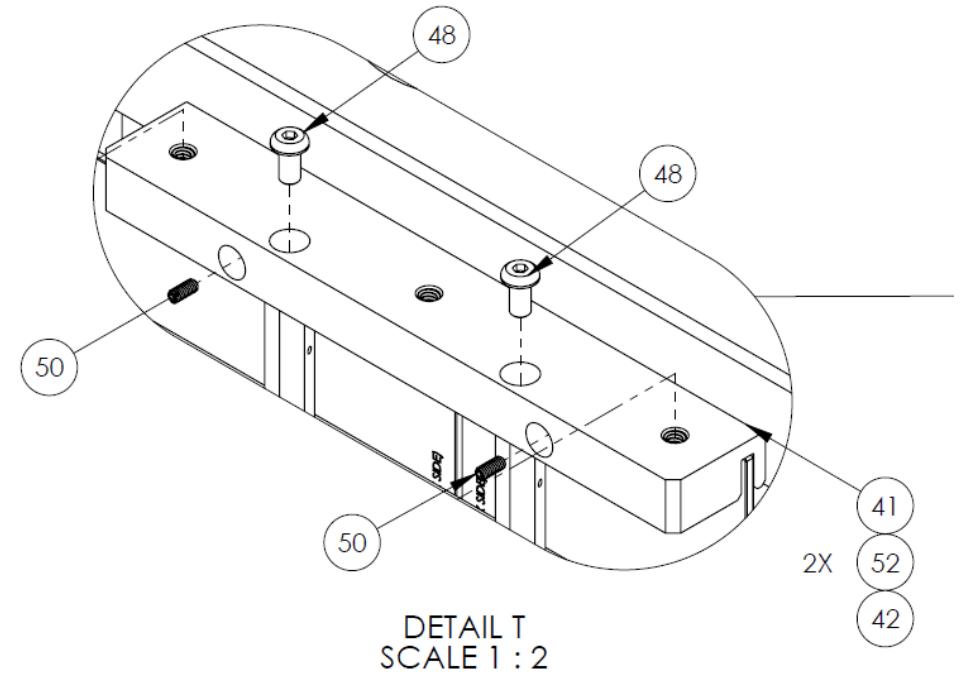


ITEM NO.	PART NUMBER	DESCRIPTION	QTY	C-CLAMPS		STIFFENER		C-CLAMP SCREW (D1500144) (58)	SCREW, SHC 4-40 X 0.5 (67)
				-101 (LH) (34)	-102 (RH) (35)	-3620 (64)	-5370 (65)		
28	D1500054-101	Vert Panel (REFL AIR)	1	1	-	-	1	2	2
29	D1500054-102	Vert Panel (REFL AIR)	1	-	1	1	-	2	2
30	D1500055-101	Vert Panel (-X Side)	1	-	1	-	1	2	2
31	D1500055-102	Vert Panel (-X Side)	1	1	-	1	-	2	2

PREP – PEEK PARTS

- Only need set screws & helicoils
- Retract set screws

ITEM NO.	PART NUMBER	DESCRIPTION	QTY	HARDWARE (TOTAL)	
				Set Screw, 8-32 x .38 (50)	Helicoil, 1/4-20 x .25 (52)
33	D1500057	Midspan Support	2	4	6
41	D1500117	Midspan Support (Inner)	2	8	16
				12	22



PREP – GLASS

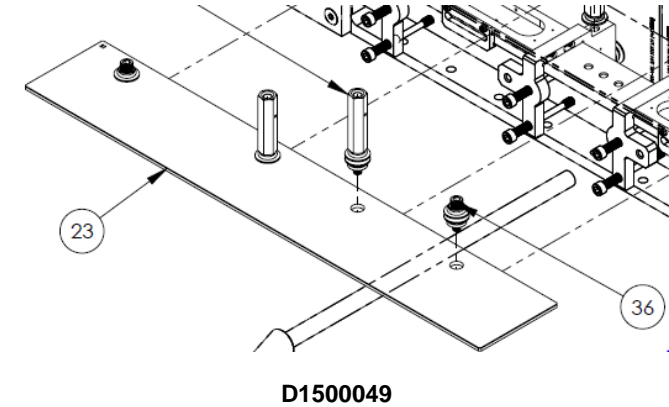
Pre-Assembly

Note – BOM quantities in this section are for prep work only, and may not reflect the top level total.

PREP – GLASS

Bolt Assy Only

	PART NUMBER	QTY	S1	QTY - BA	TOTAL
BASIC CONFIG.	D1500042-101	1	Shoulder	3	40
	D1500042-102	1	Shoulder	3	
	D1500043-101	1	Shoulder	3	
	D1500043-102	1	Shoulder	3	
	D1500044	1	Shoulder	4	
	D1500045	1	Shoulder	4	
	D1500046-101	1	Shoulder	4	
	D1500046-102	1	Shoulder	4	
	D1500046-103	1	Shoulder	4	
	D1500046-104	1	Shoulder	4	
	D1500048*	1	Head	2	
D1500049*	1	Head	2		
-1 CONFIG.	D1500047-101	1	Head	3	6
	D1500047-102	1	Head	3	
-2 CONFIG.	D1500050	1	Head	2	4
	D1500051	1	Head	2	
-3 CONFIG.	D1500048*	1	Head	2	4
	D1500049*	1	Head	2	
-4 CONFIG.	D1500116	2	Head	6	6



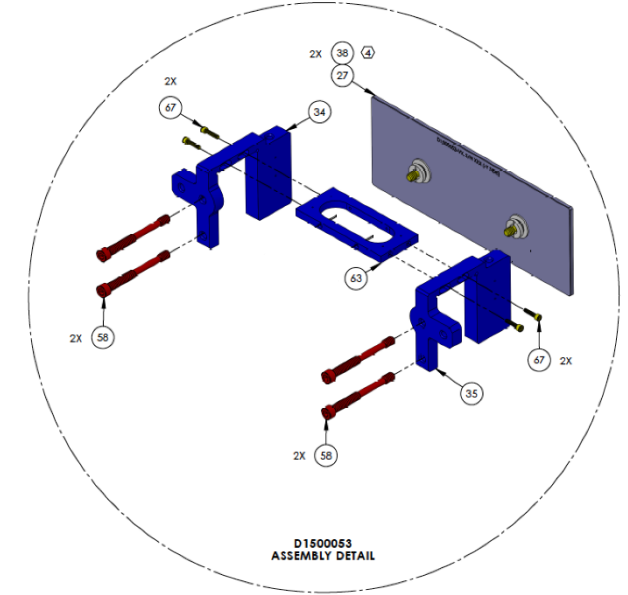
* D1500048 & 49: outer holes = -2/basic config., inner = -3 config.

PREP – GLASS

Assemblies with Brackets

OVERVIEW

- All use Bolt Assy -2 config.



				QTY - BA	QTY - C-CLAMPS		QTY - STIFFENERS			
				-2 Config.	-101 (LH) (34)	-102 (RH) (35)	-3495 (63)	-3620 (64)	-5370 (65)	-4620 (66)
	PART NUMBER	QTY	S1							
FULLY ASSEMBLED*	D1500052	1	Head	2	2					1
	D1500053	1	Head	2	1	1	1			
PARTIALLY ASSEMBLED	D1500054-101	1	Head	1	1				1	
	D1500054-102	1	Head	1		1		1		
	D1500055-101	1	Head	1		1			1	
	D1500055-102	1	Head	1	1			1		
				8	5	3	1	2	2	1

PREP – IN CHAMBER

PREP – IN CHAMBER

- Count the number of EQ Stops currently installed (on old EQ Stop Assy).
 - Total = 14: Go to next step.
 - Total <14: For every missing EQ stop on the OMC, remove 1 EQ stop from the Temp Stabilizer Assy. Replace with PEEK stops.
- Lock all EQ Stops.
- Pinch/lock upper and lower blade stops.
- Move/remove items per [HAM6 Table Balance.pdf](#) (D0900295 Other Files).

ASSEMBLY PROCEDURE

Notes:

- *2 person job.*
- *Item numbers are given per the top level OMC drawing for reference.*

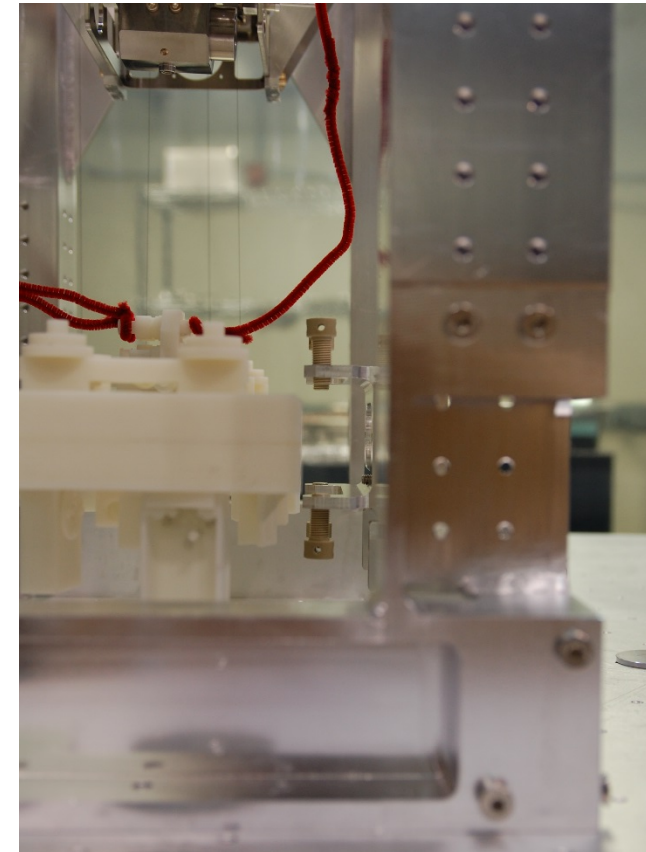
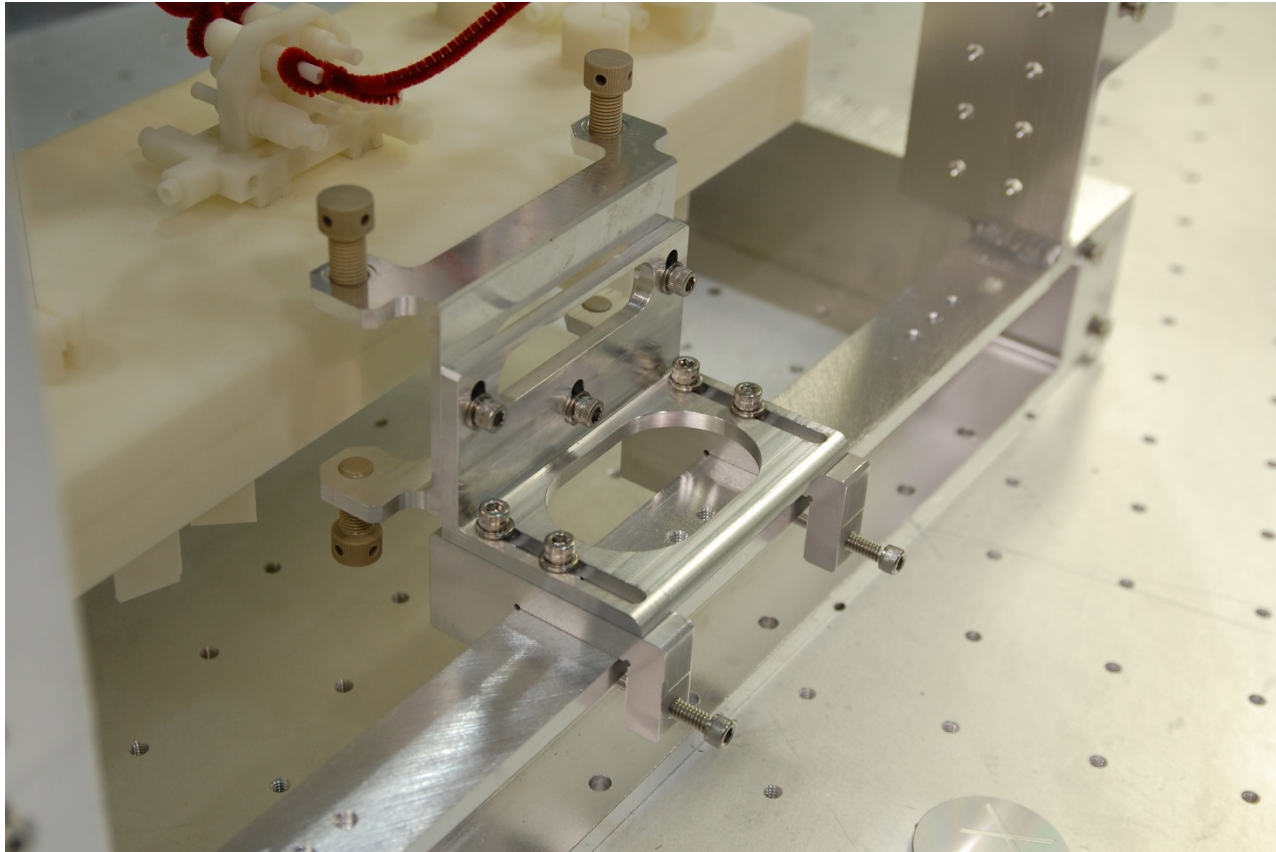
+X Side

1. Install EQ Stop Temp Stabilizer Assy ([69](#)) in its retracted position.

- Tighten C-Clamp Screws (69.2)



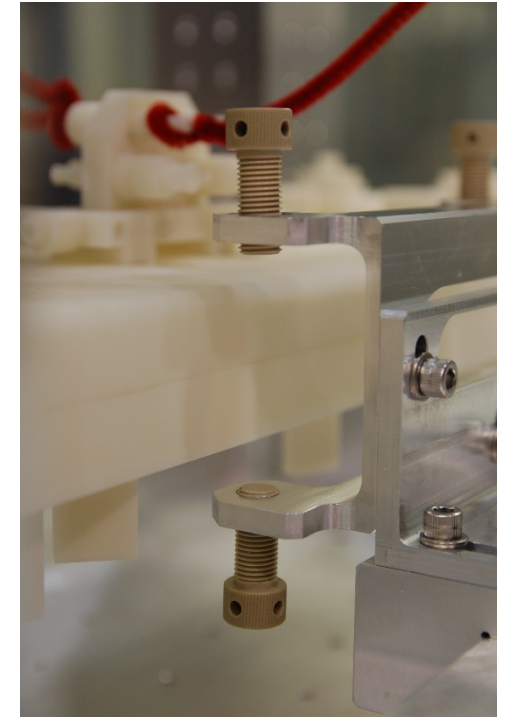
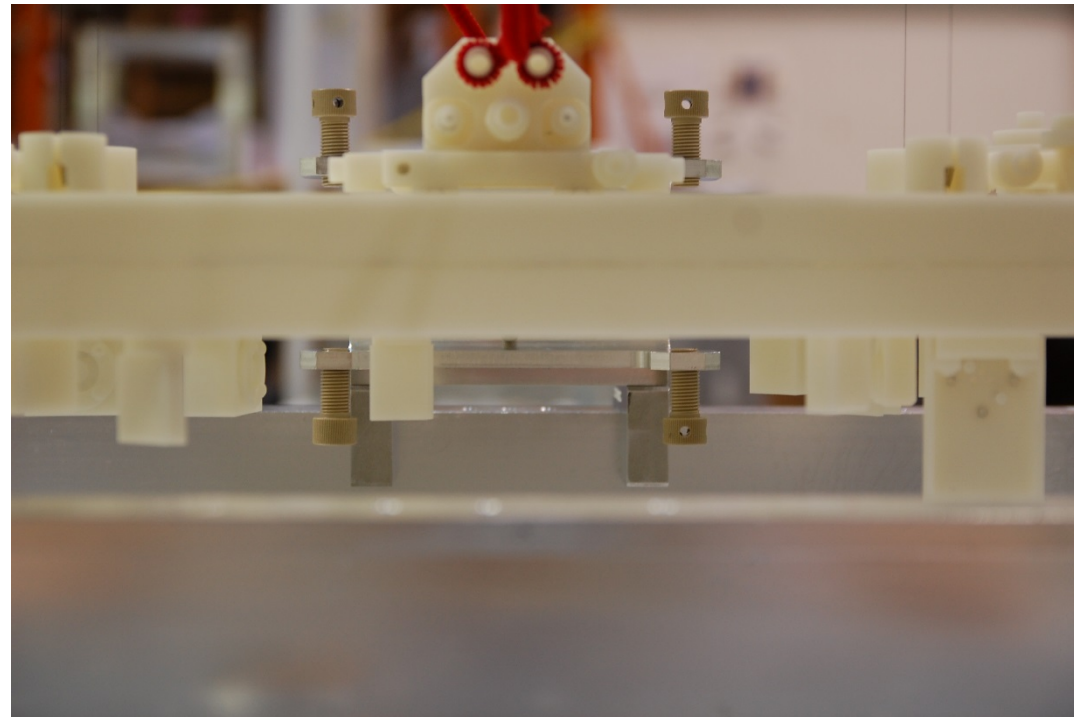
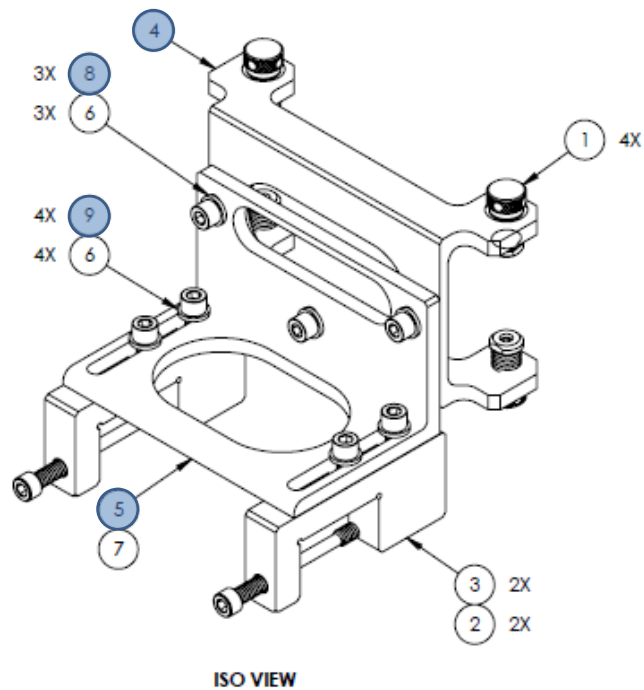
- *Mind the parts on the bottom of the bench.*
- *The assy pitches forward when the C-Clamps Screws are retracted. Once tightened, the assy is stable.*



+X Side

2. Adjust EQ Stop Temp Stabilizer Assy position.

- Loosen screws (69.8 & 69.9).
- Center U-Channel (69.4) wrt bench, and lock in place.
- Extend the L-Bracket (69.5) toward the bench as far as safely possible, and lock in place.

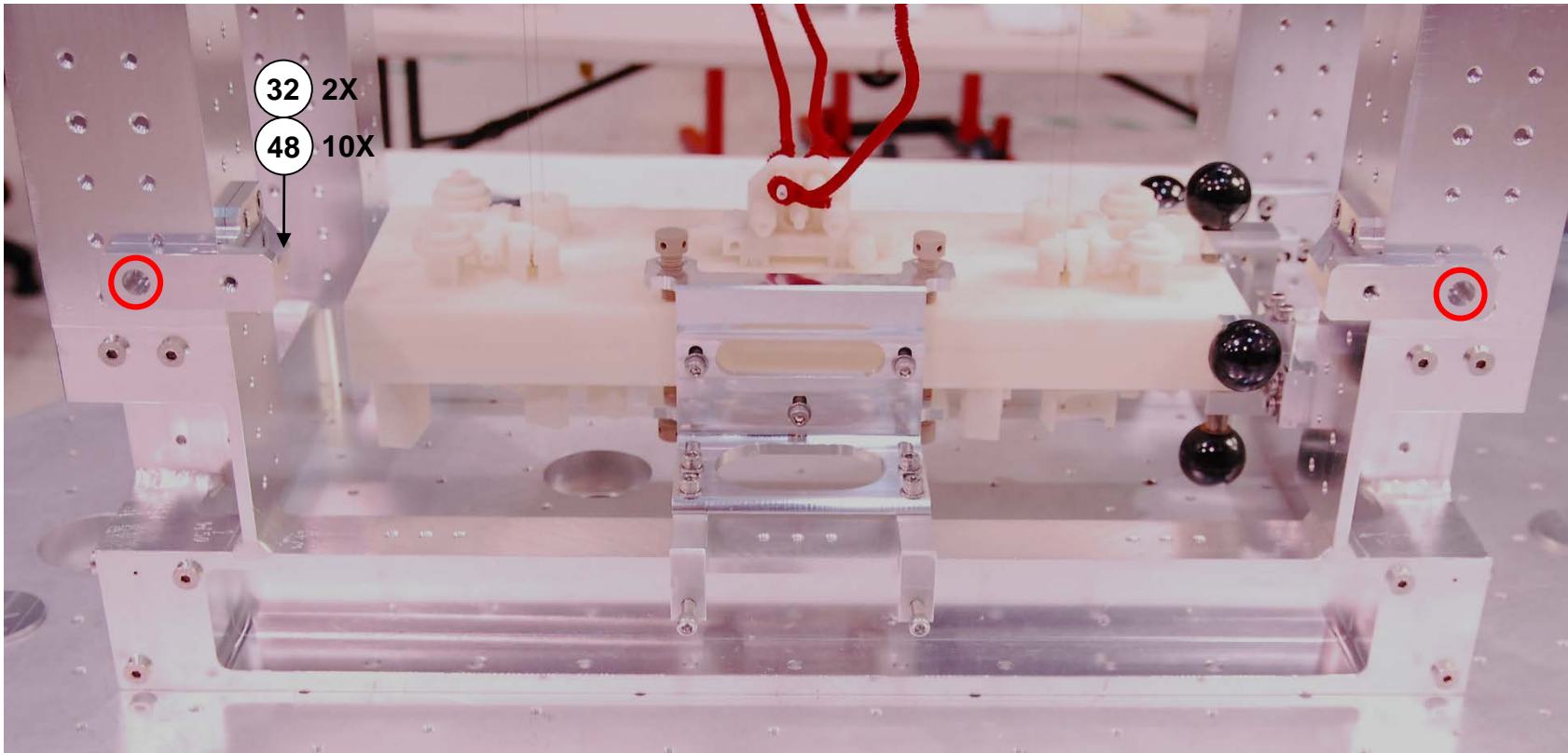


+X Side

3. Lock 4X PEEK EQ Stops (69.1).

4. Install 2X Panel Mounting Brackets (32).

- Required hardware: 10X Screws, BHSC 1/4-20 x 0.5 (48)
- Leave screws loose enough to adjust the position of the brackets.
- *Note – at LHO, 1X screw had to be removed from each bracket (position circled in red) to keep it flush with the structure.*

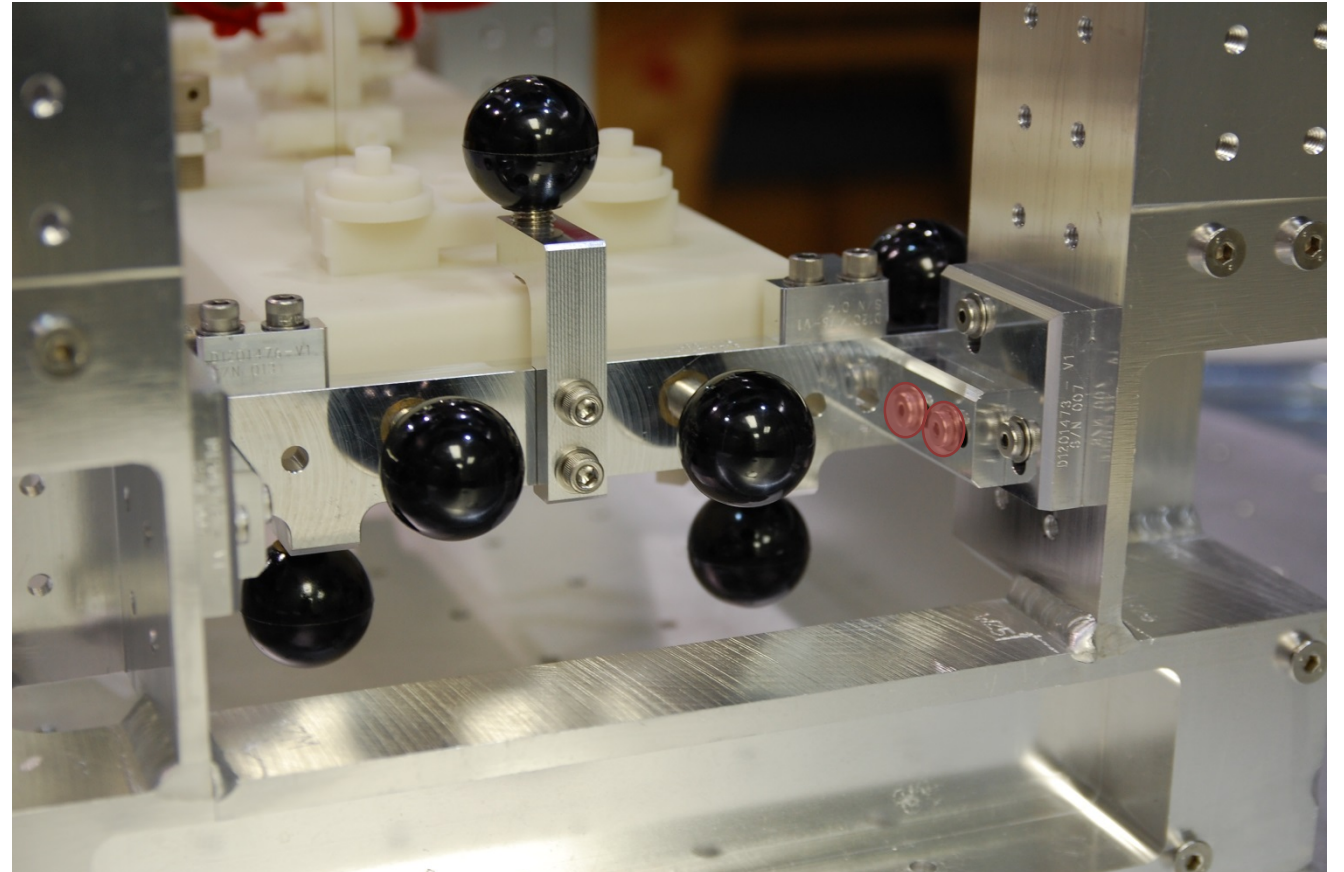
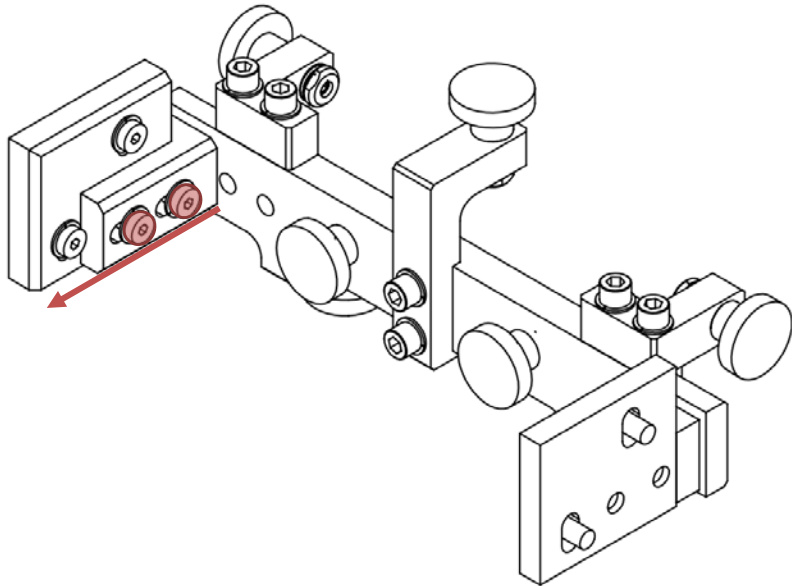


+Y Side

5. Fully retract 7X old EQ Stop Knobs.
6. Move old [EQ Stop Assy](#) as far back from the bench as possible.
 - Loosen 2X screws (circled) on 2X Horizontal Adjust parts.
 - Retract both Horiz. Adjust & tighten screws.



Hardware is not captive.



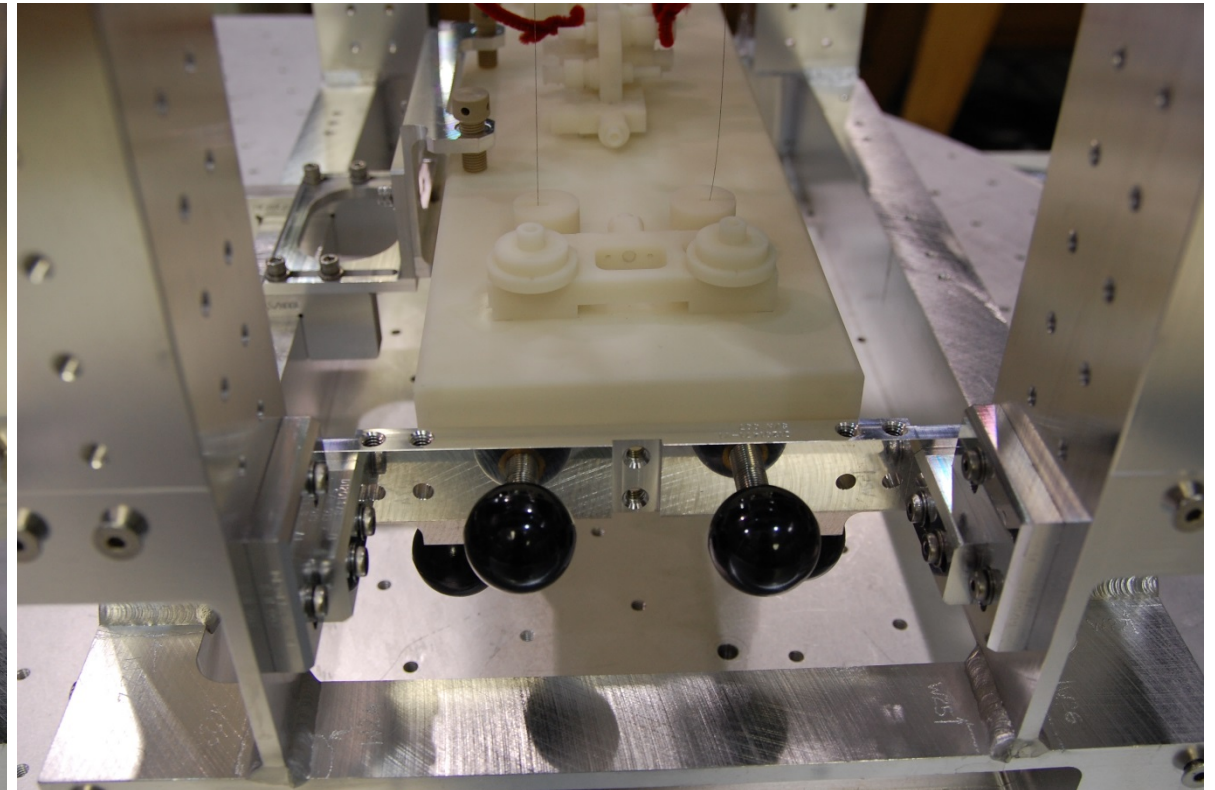
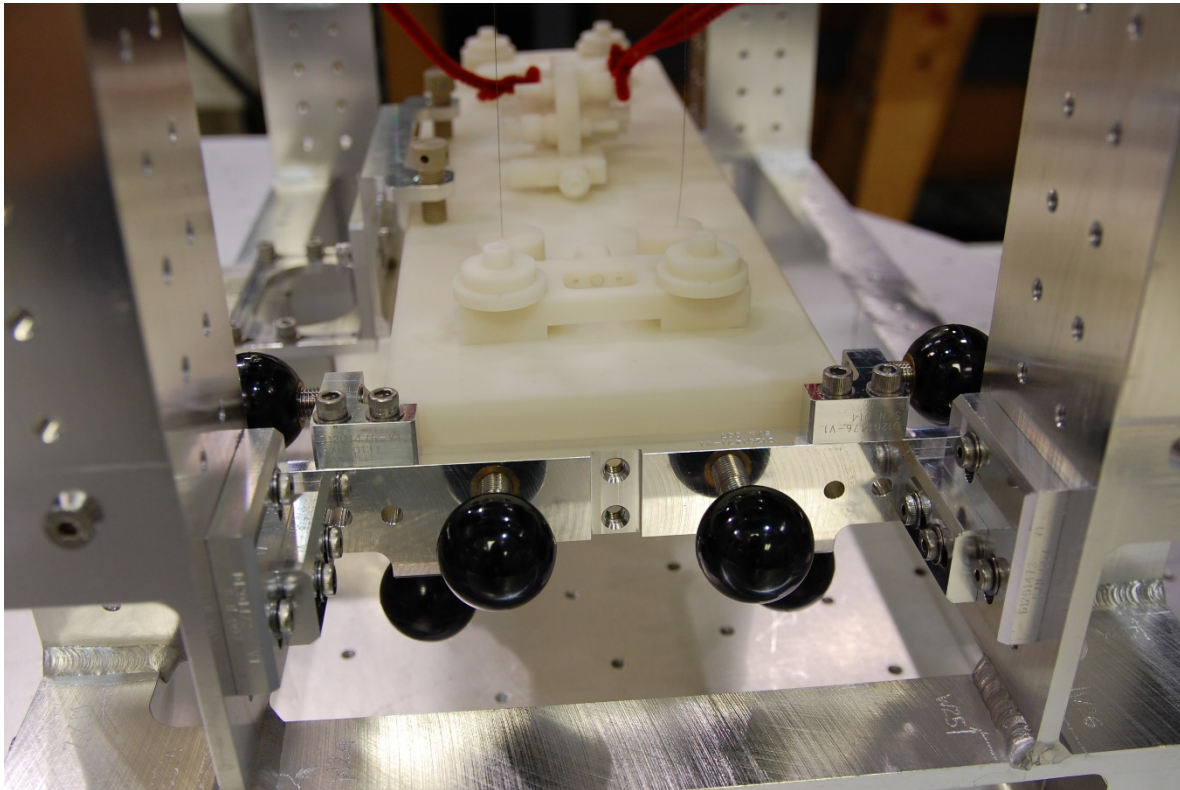
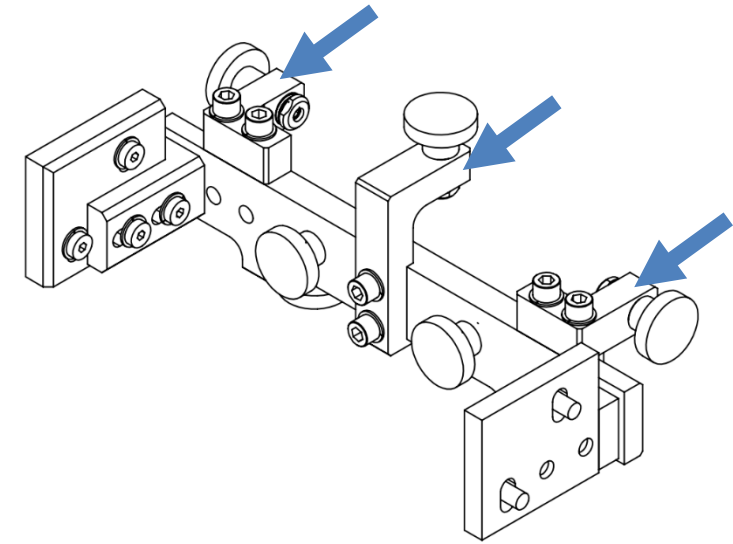
+Y Side

7. Remove [Top Bracket](#).

- Hardware: 2X SHCS (1/4-20), 2X washers

8. Remove 2X [Side Brackets](#).

- Hardware: 4X SHCS (1/4-20), 4X washers



+Y Side

9. Remove 4X LSHC screws & 4X washers from Main Bar.
 - Hold to prevent from dropping.
10. Carefully lower Main Bar toward the table, and remove through the -X Side.



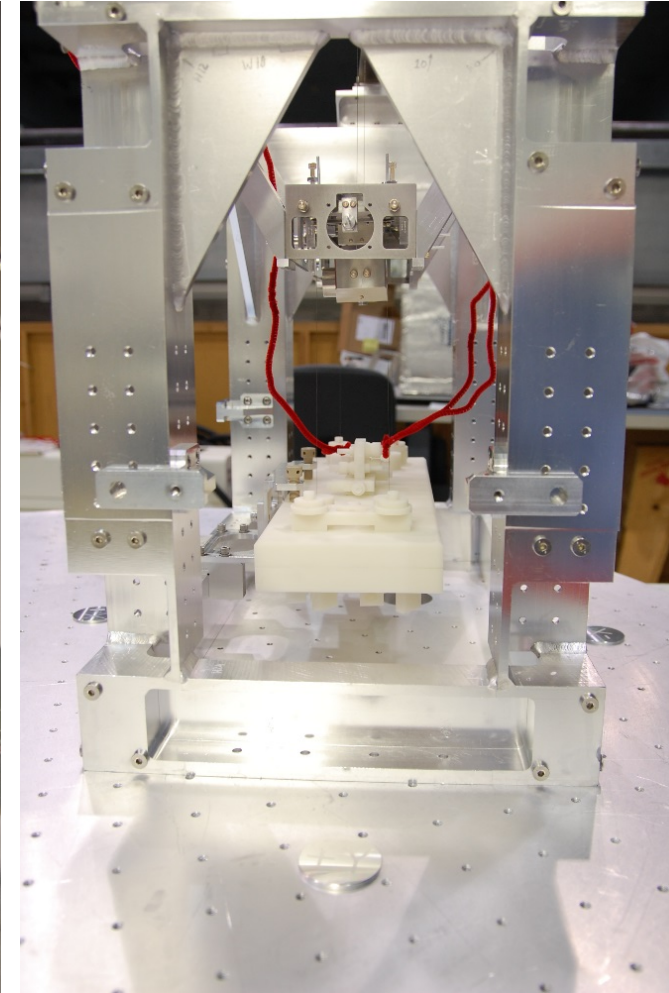
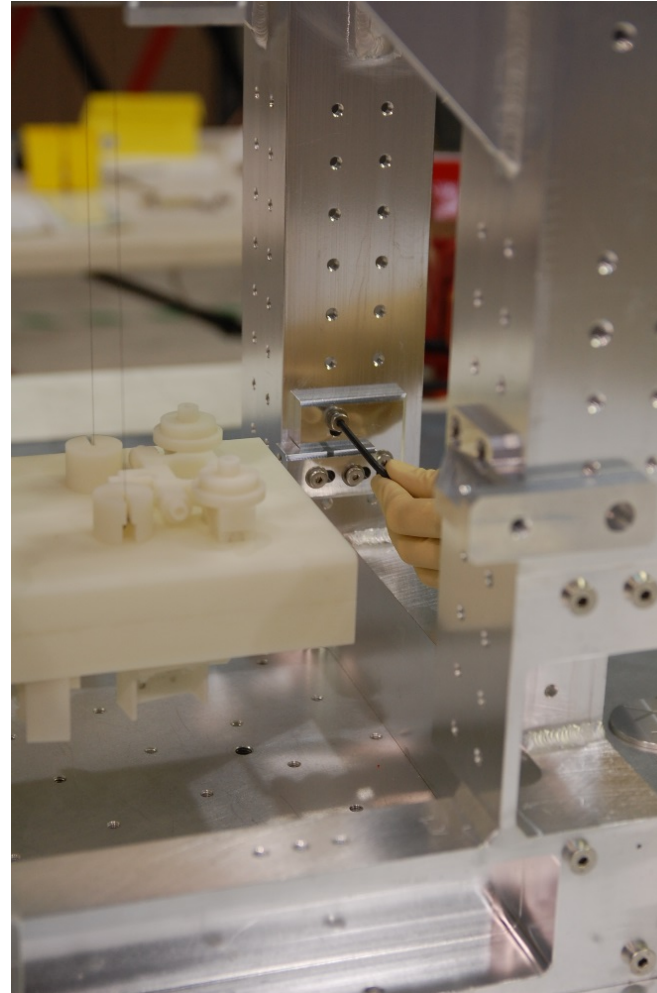
+Y Side

11. Remove [Left & Right Supports](#).

- Hardware: 4X LSHC screws, 4X washers

12. Install 2x Panel Mounting Brackets ([32](#)).

- Req. hardware: 10X BHSC, 1/4-20 x 0.5 (48)
- Leave screws loose



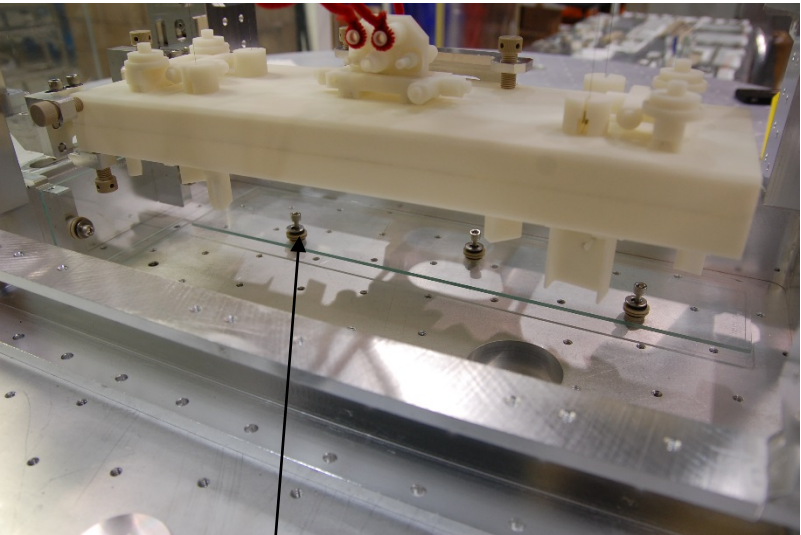
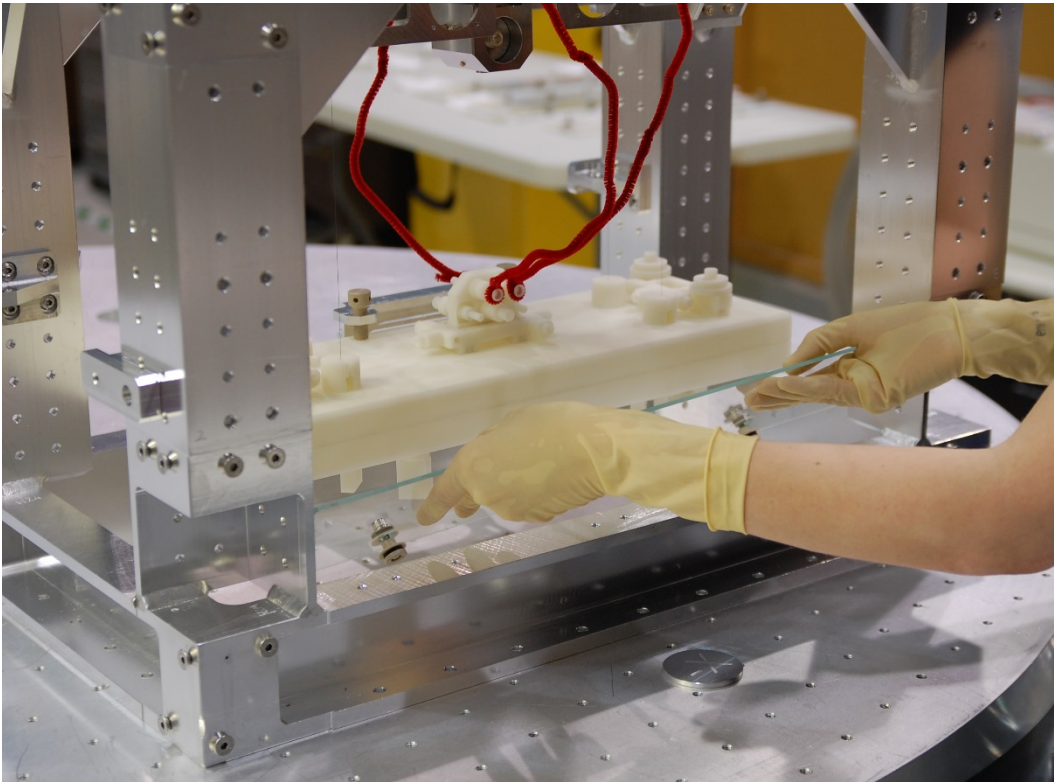
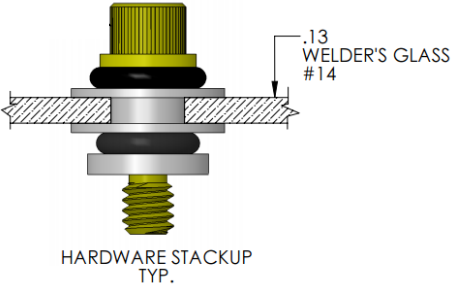
-X Side

13. Carefully position bottom panel D1500047-101 ([20](#)) under the bench, and slide toward +X side.

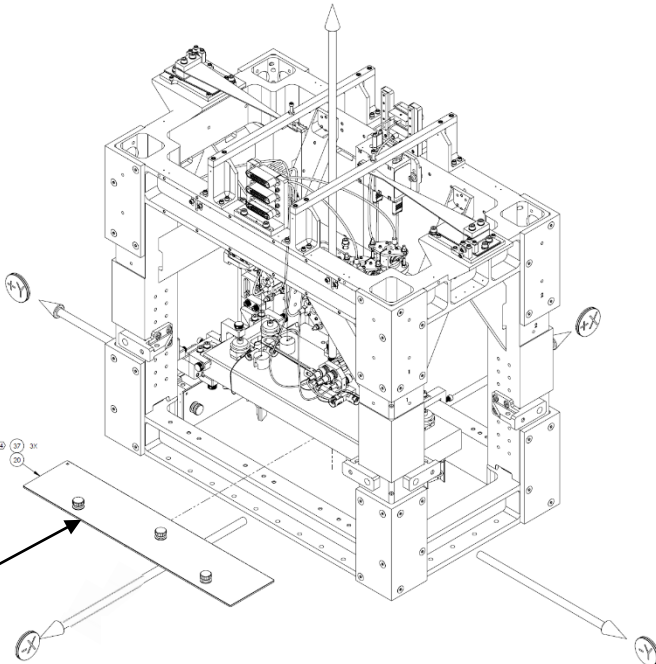
- Assistance from a 2nd person on the -Y side may be required.



- *If all the pieces of the bolt assemblies are in place (see diagram), the glass will rest stably on the shoulder washers. If not, the glass may drop/pitch suddenly when handled as the hardware moves around.*
- *Check the bolt assemblies, and help settle the hardware in place if needed.*



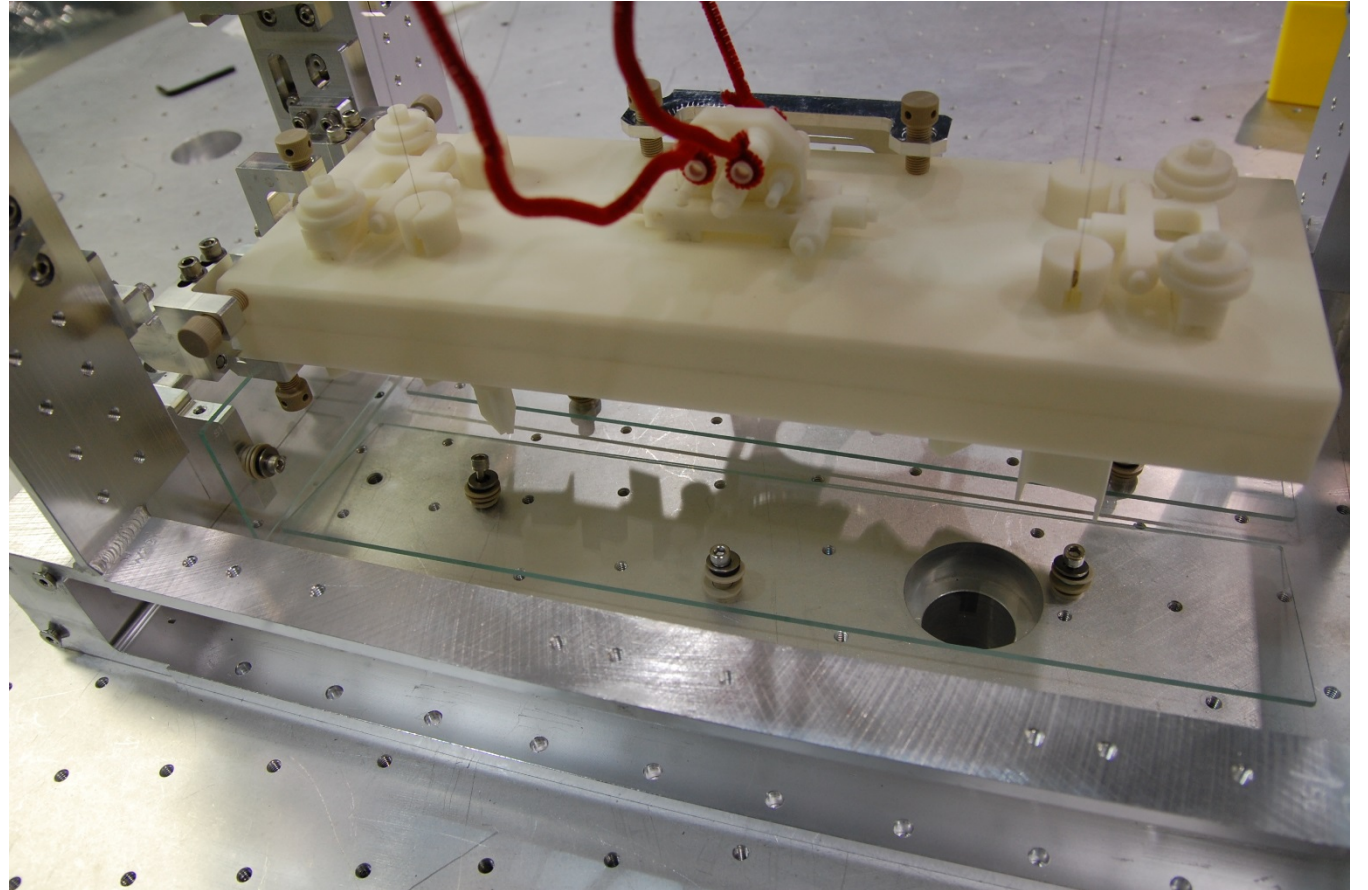
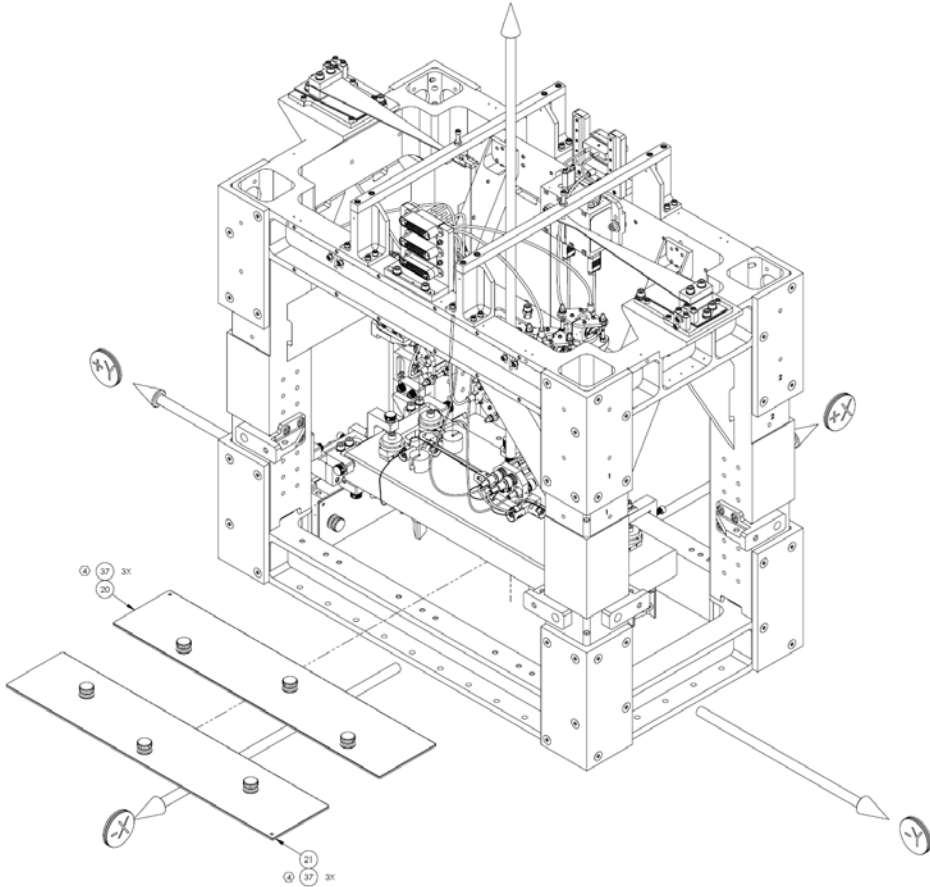
Should be -1 config.



Note orientation

-X Side

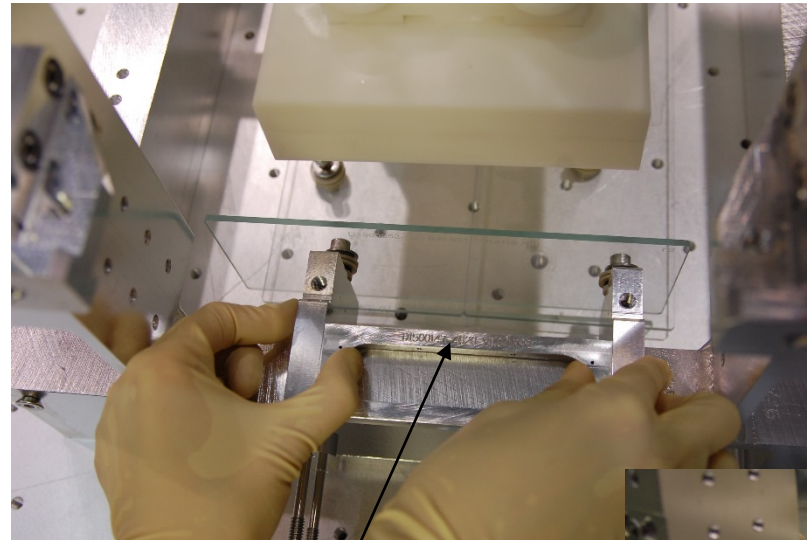
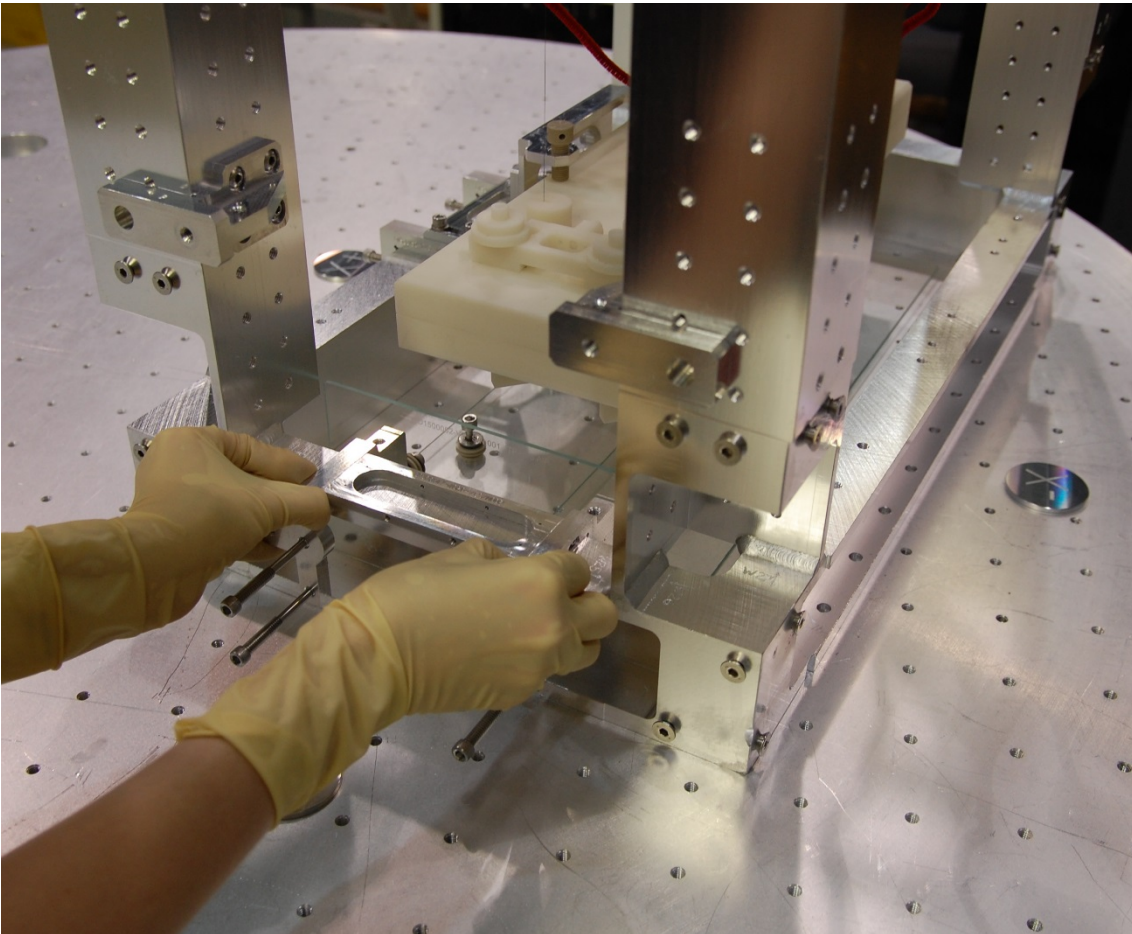
14. Place bottom panel D1500047-102 (21) under the bench next to -101 (20).
 - Panels should be roughly centered below the bench.
15. Loosely bolt both panels to the table.



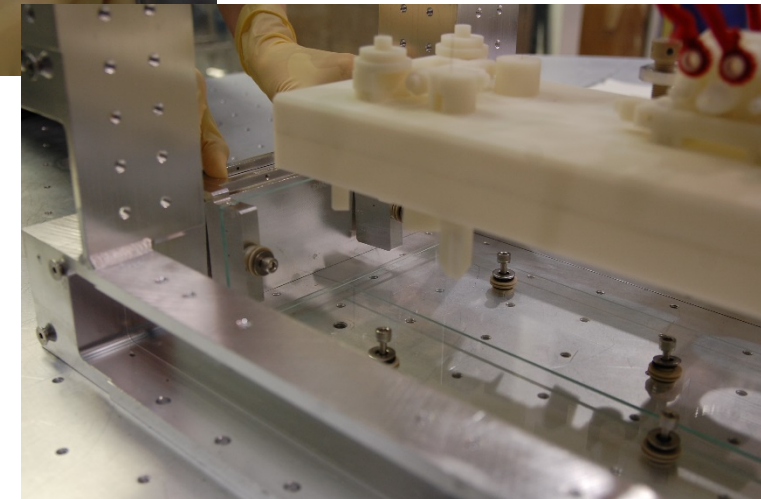
INTERFERENCE TEST

+Y Side

16. With a 2nd person monitoring the bottom panels, very carefully place vertical panel D1500052 (26).
- If D1500052 touches the bottom panels (interference), remove it immediately.
 - Continue to the next step regardless of whether or not there is interference.



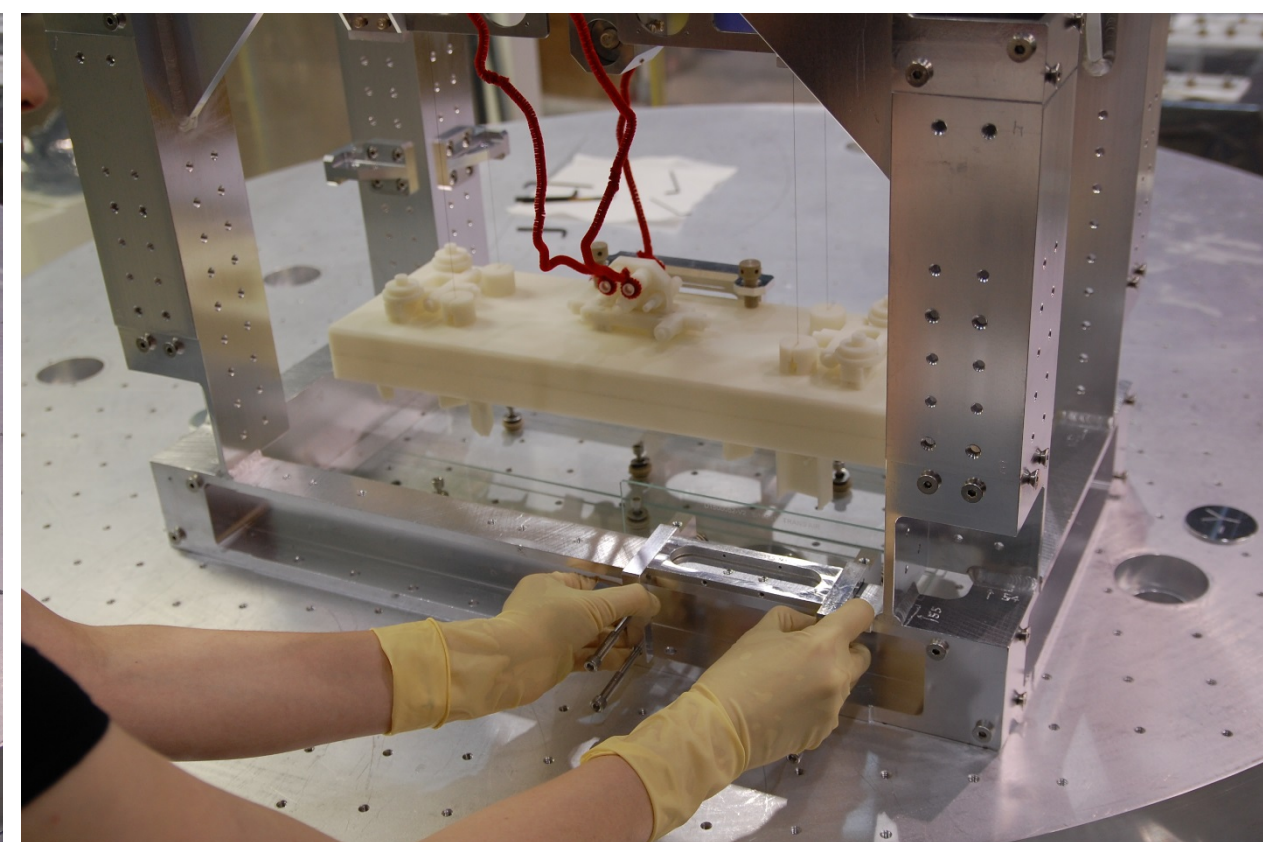
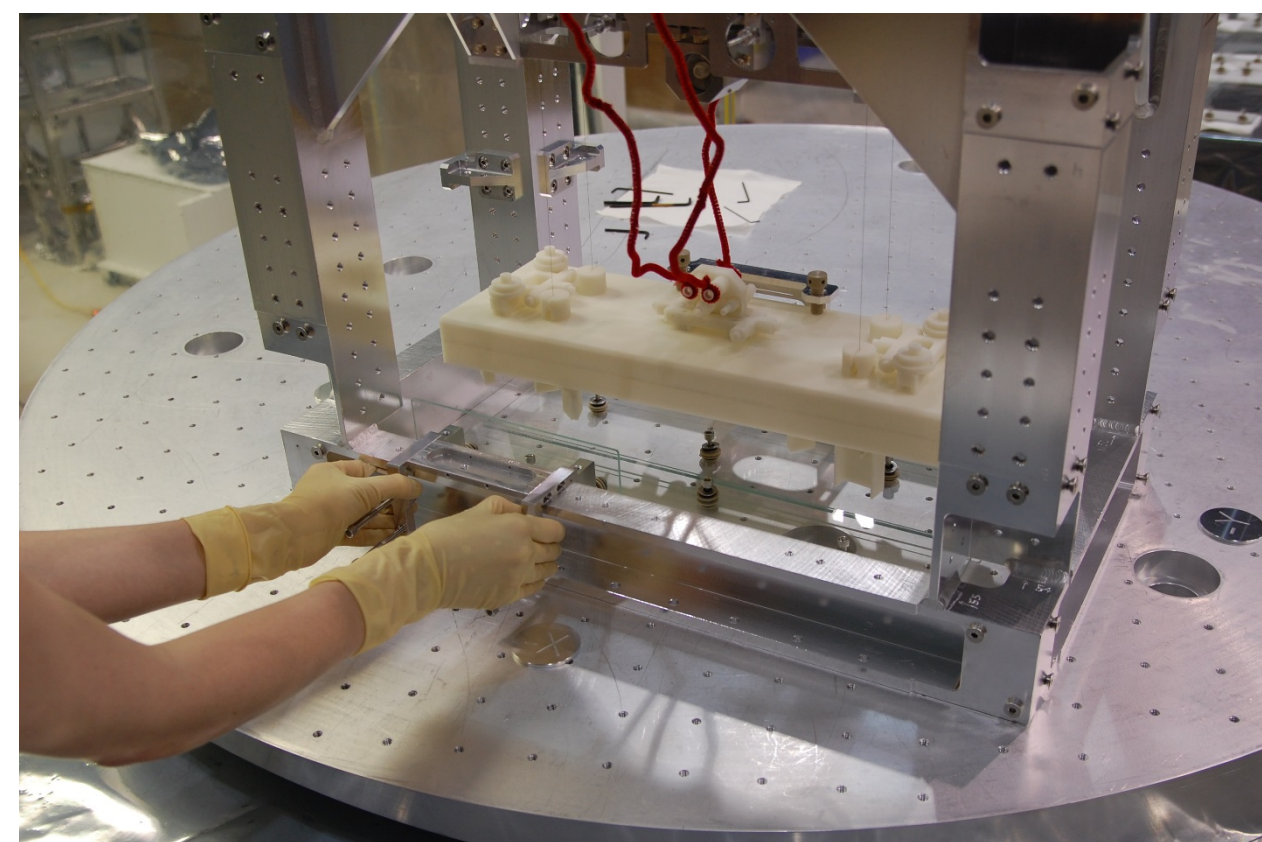
Note orientation (D#)



INTERFERENCE TEST

-X Side

17. Using the same glass panel (D1500052), check the entire -X side for interference.

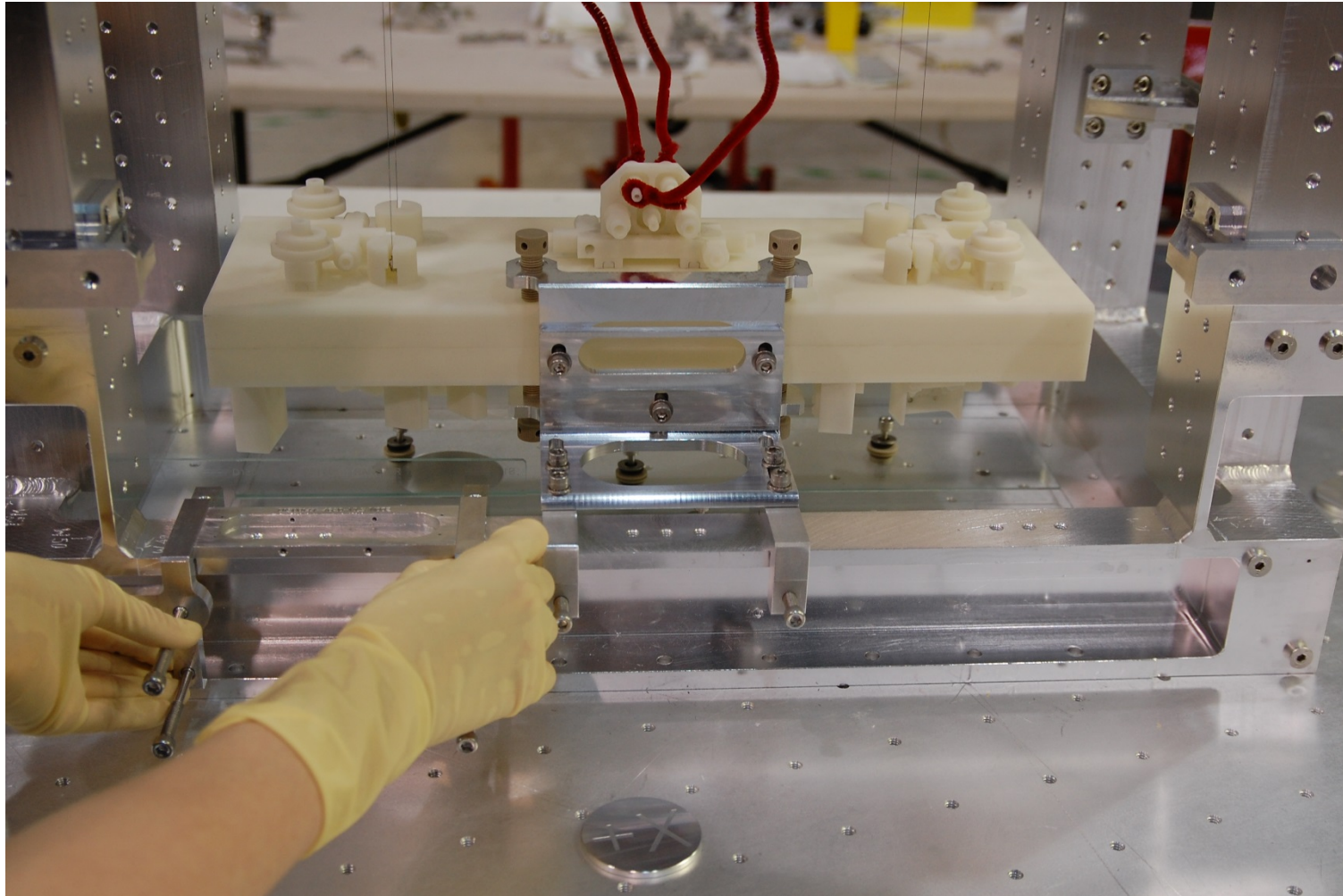


INTERFERENCE TEST

+X Side

18. Repeat for +X Side.

- This was possible at Caltech, but not at LHO.



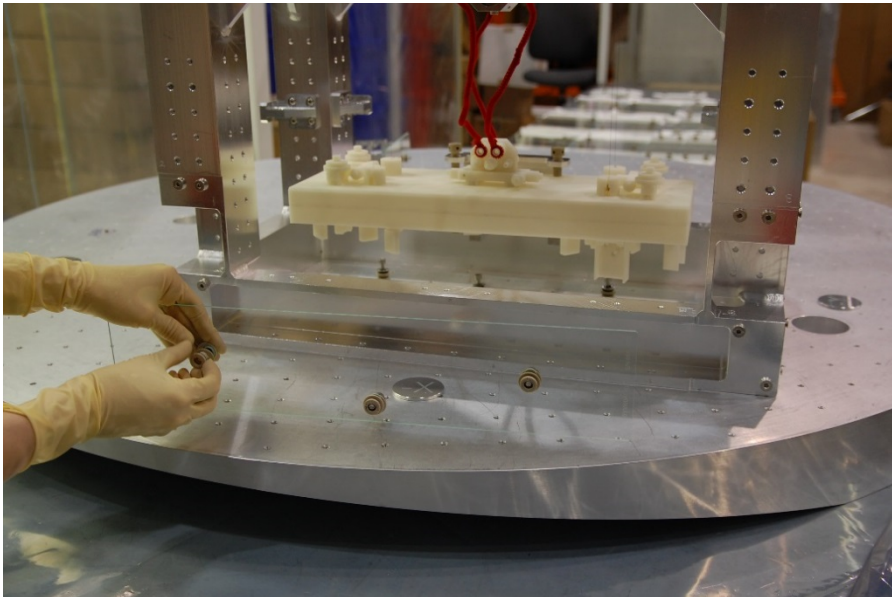
INTERFERENCE TEST

NO INTERFERENCE:

Continue to [Step 19](#).

INTERFERENCE:

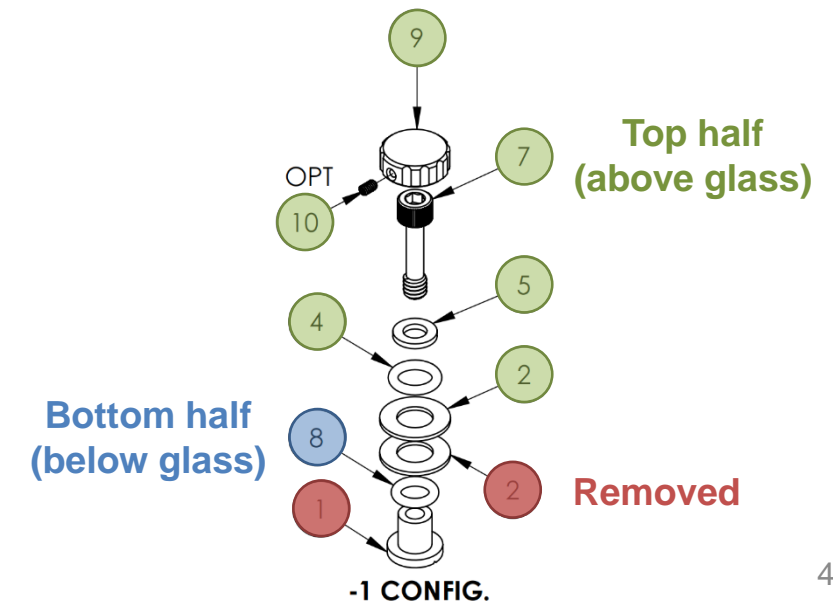
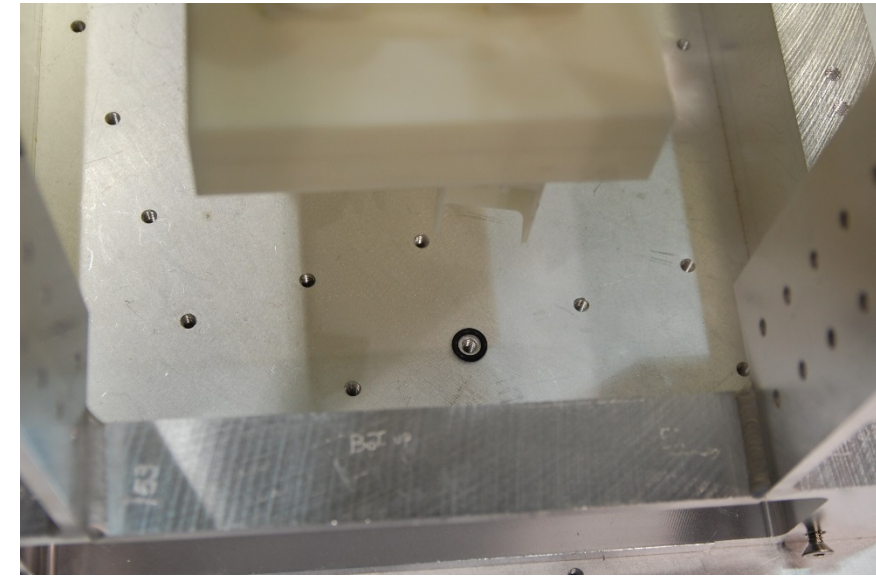
- i. Note the location of the 6X holes used to bolt the bottom panels to the table.
- ii. Remove both bottom panels.
- iii. Remove the bolt assemblies from the panels.



INTERFERENCE TEST

INTERFERENCE (continued):

- iv. Place an O-ring (37.8) on the table over each hole used to secure panel D1500047-101 (20).
- v. Move panel -101 back into position under the bench.
- vi. Loosely secure the panel using the upper half of the bolt assy.
 - Req. hardware circled in **green**.
 - Gain more play/sop and reduce the height of the panel by removing the shoulder washer and a PEEK washer (circled in **red**).
- vii. Place an O-ring over holes on the table for D1500047-102 (21).
- viii. Position -102 as before.
- ix. Loosely secure -102 in place with upper half of bolt assy.
- x. For each side that can be accessed ($\pm X$ & $\pm Y$):
 - Check for interference between vertical and bottom glass panels.
 - Try to re-position bottom panels to prevent interference.



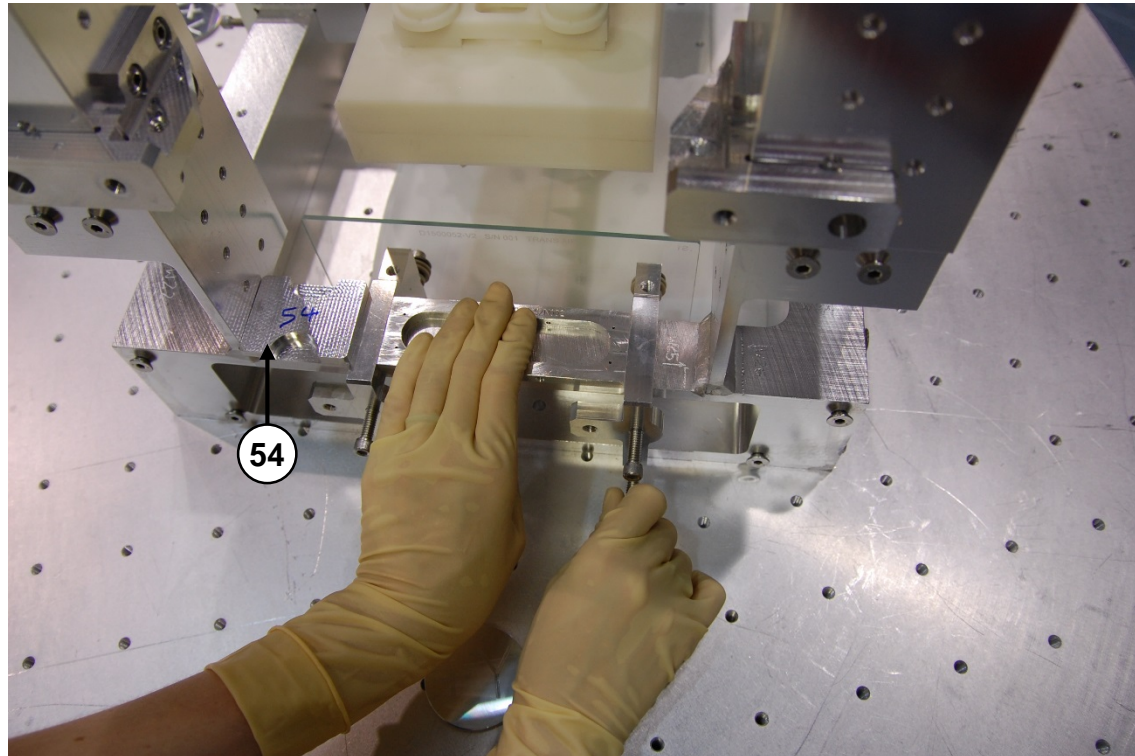
INTERFERENCE TEST

IF THERE'S STILL INTERFERENCE:

- xi. When positioning inner vertical panels (described in upcoming steps), use a washer(s) to raise the height of the brackets for the side that has interference. Do the same for the opposite side (i.e. do same for +Y & -Y or for +X & -X).
- xii. Contact Systems (Calum Torrie).

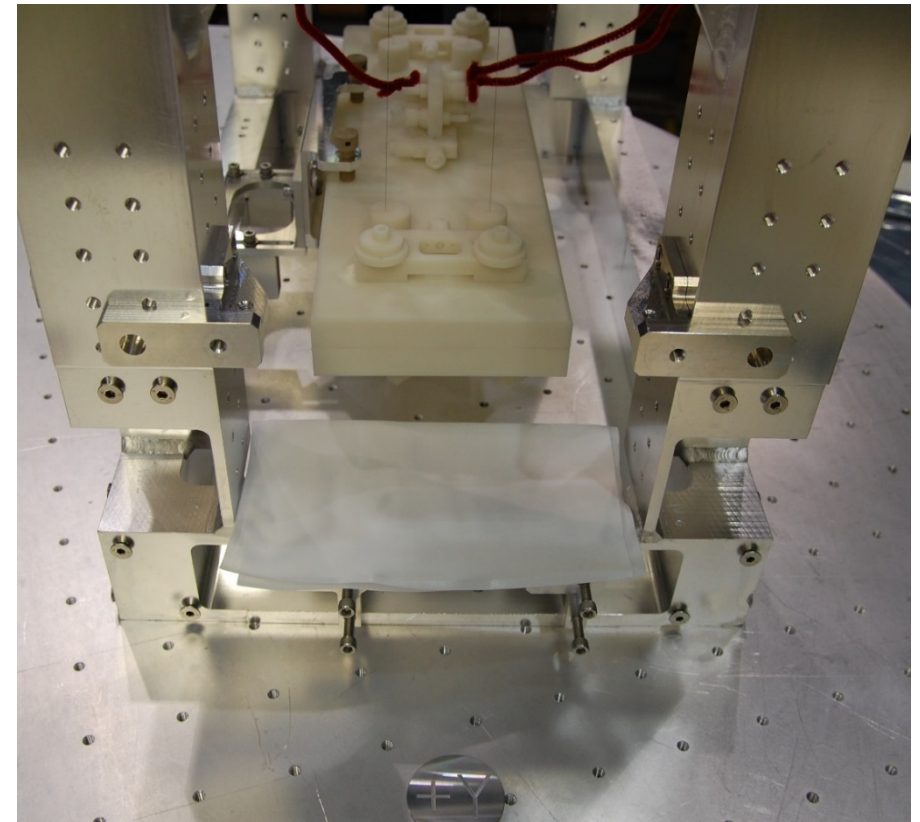
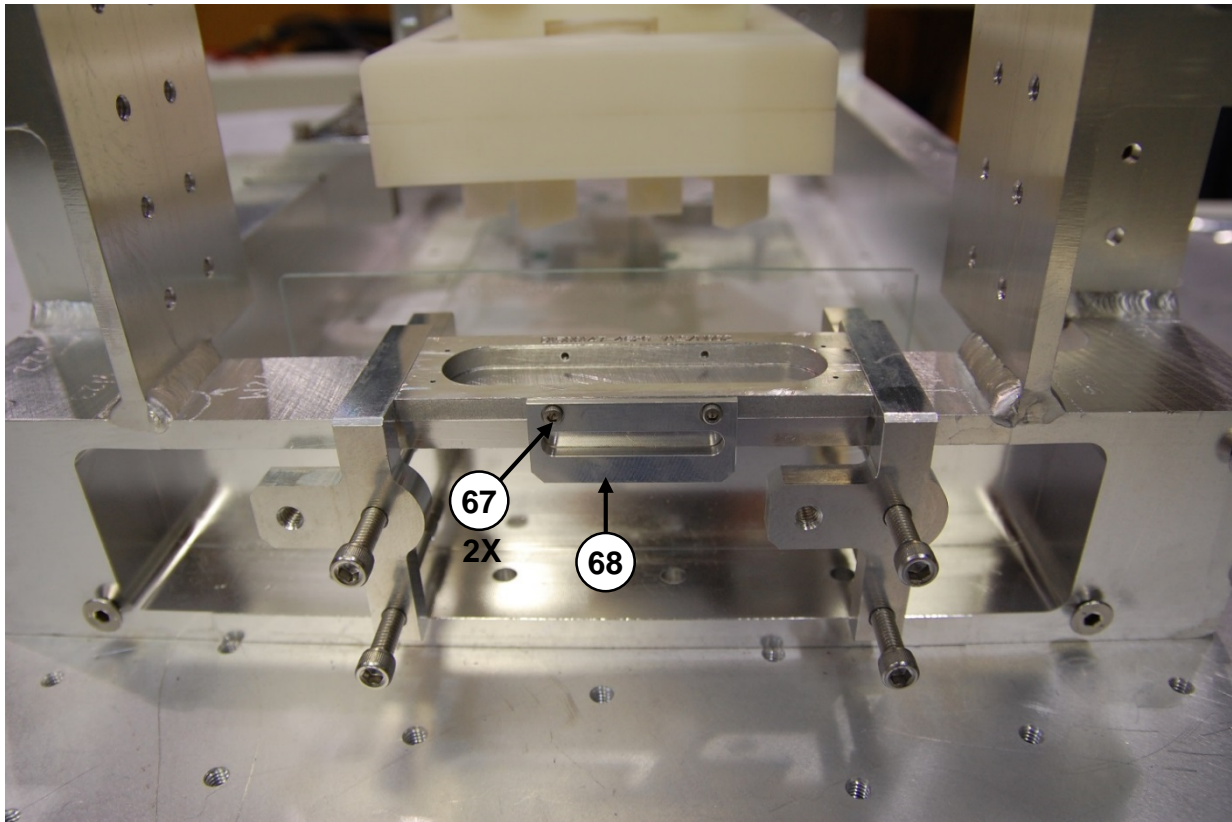
+Y Side

19. Protect bottom panels with wipes.
20. Position panel D1500052 (26) using gauge block D1500120-2140 (54) in +Y, +X corner.
 - Did not fit on OMC at LHO, so block was set on its side.
21. Tighten D1500052's C-Clamp screws.
 - Watch for lifting of the C-Clamps & Stiffener (from over-tightening).



+Y Side

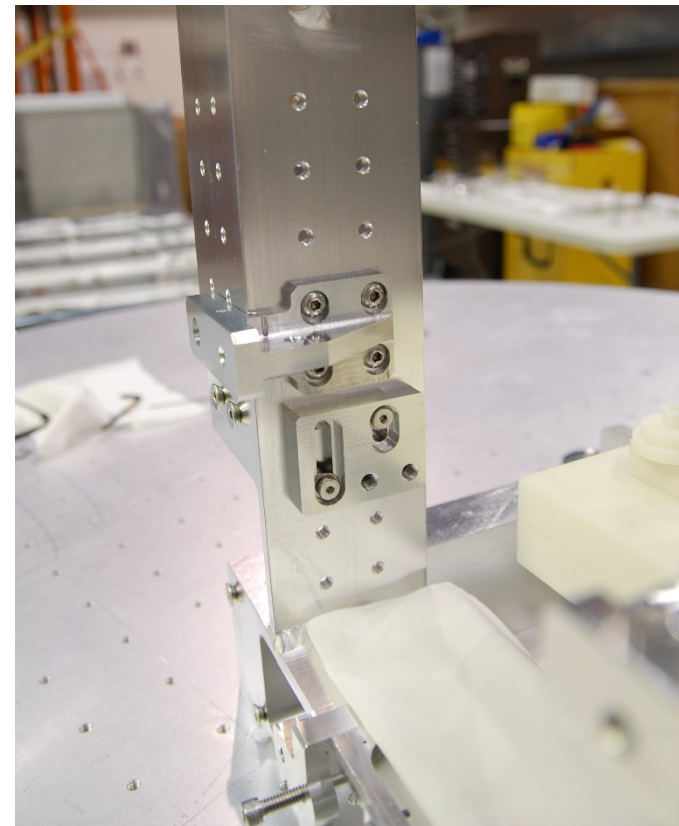
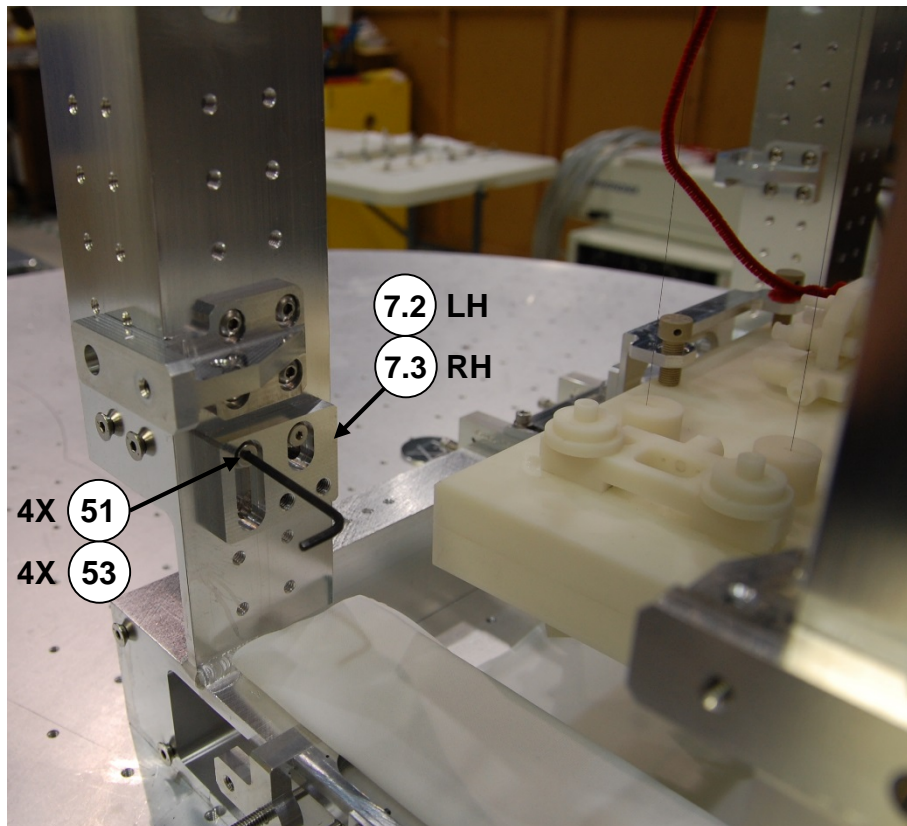
22. Add C-Clamp Jaw (68) once panel D1500052 is in its final position.
 - Req. hardware: 2X SHCS 4-40 x 0.5 (67)
23. Remove gauge block.
24. Place wipes over vertical glass panel.



+Y Side

25. Install new Left & Right Supports ([7.2](#) & [7.3](#)) for the new EQ Stop Assy.

- Req. hardware (relevant item numbers on D0900295 pg 7 are incorrect):
 - 4X LSHC, 1/4-20 x 5/8 (51)
 - 4X Vented Washer, .255 ID X .468 OD X .032 THK #1/4 (53)
- Position by installing screws in upper holes. Must be level.
- Then move outer screw to lower hole.

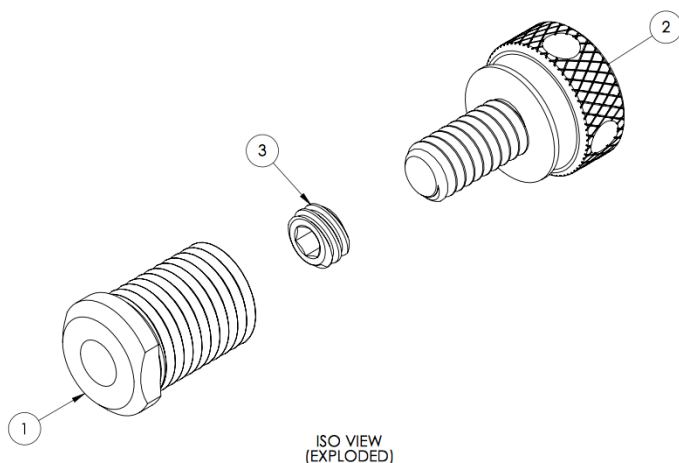


+Y Side

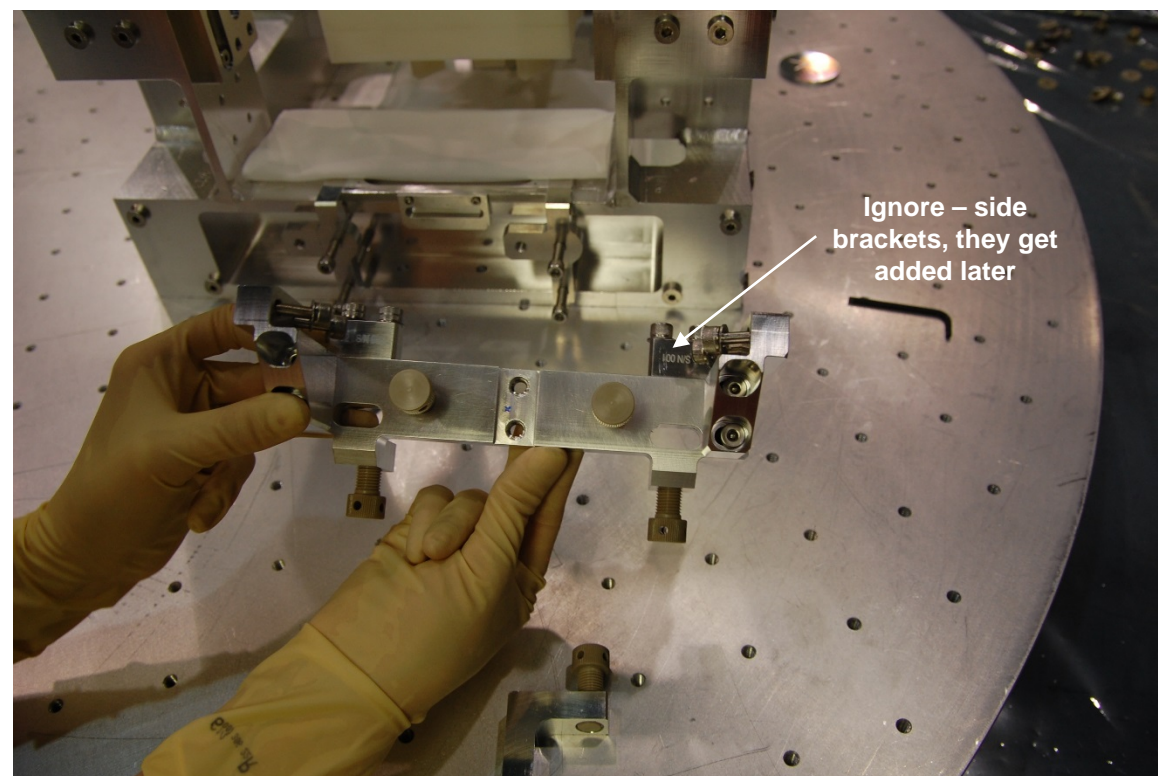
26. Remove 7X EQ Stop Knobs from the old EQ Stop Assy.

27. Add 4X new EQ Stop Knobs ([7.4](#)) to the new EQ Stop Assy Main Bar ([7.1](#)).

- See BOM & diagram.
- Threaded bumper & set screw are taken from old Stops.



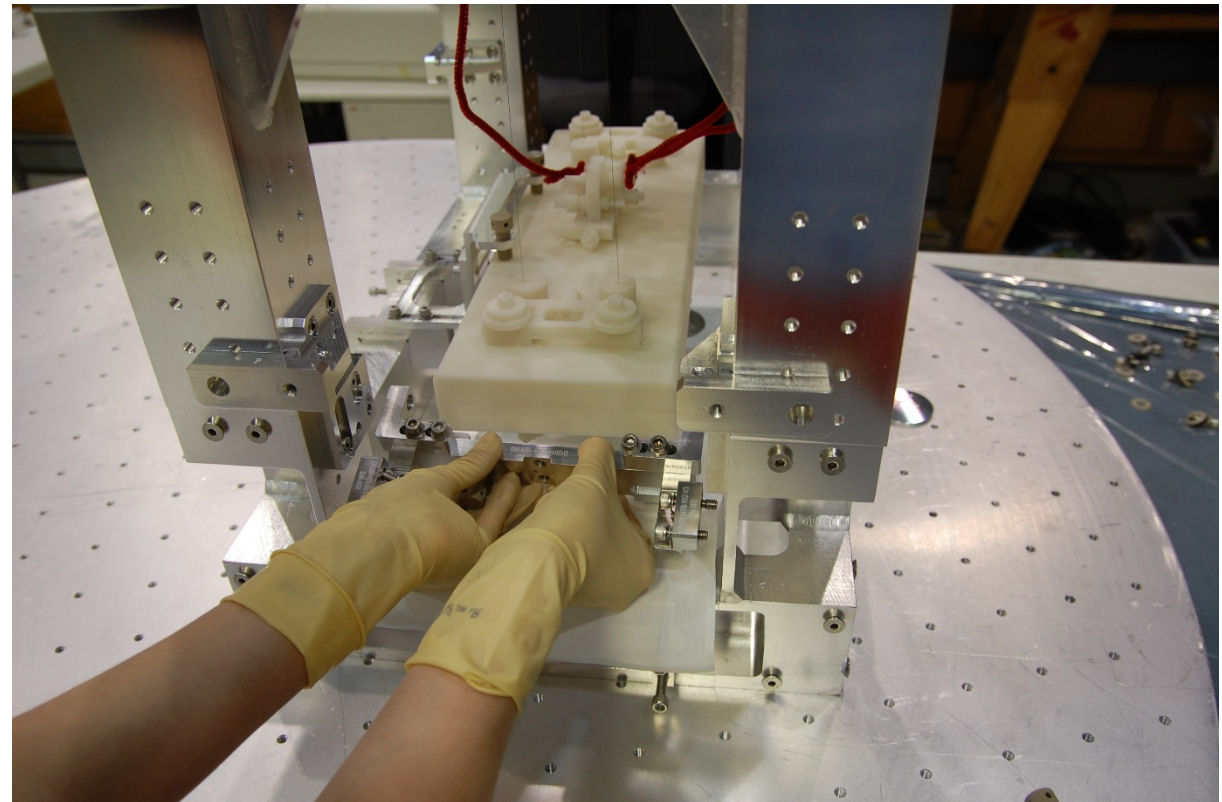
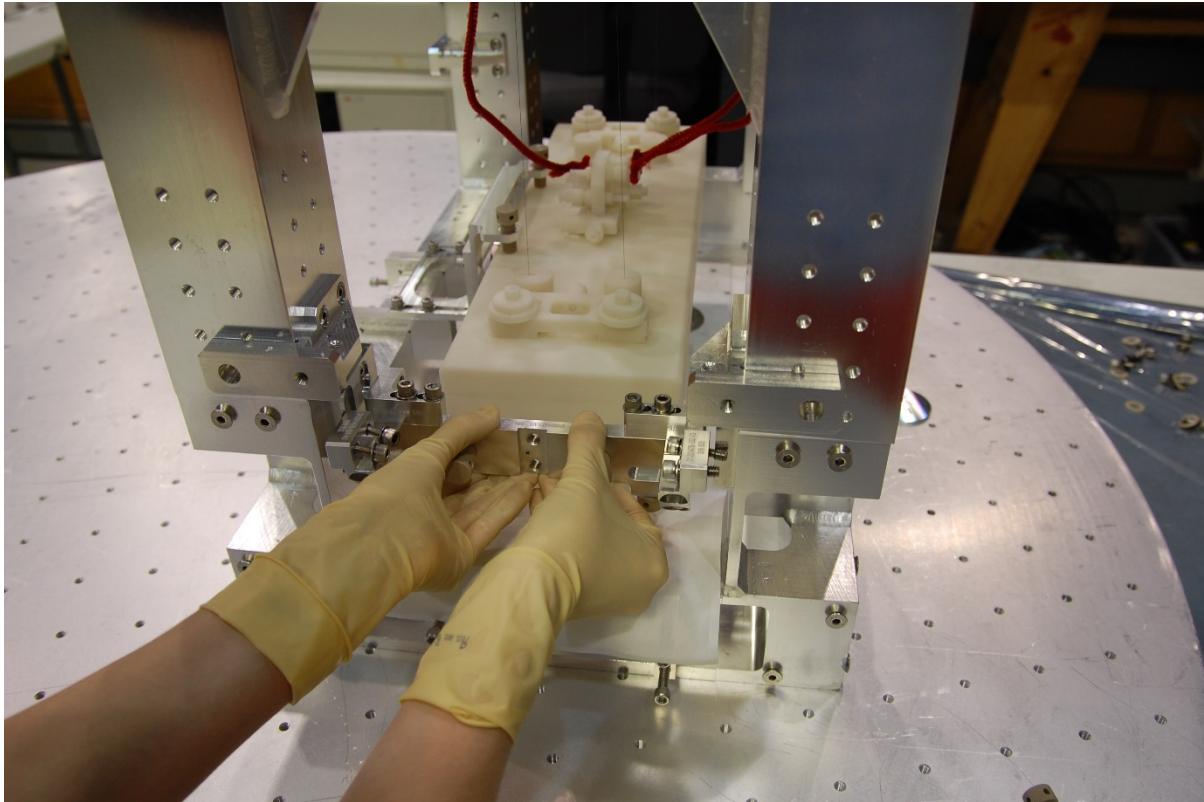
ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY
7.4	D1201441	EQ Stop Assy	-	7
7.4.1	D1201440	Threaded Bumper, EQ Stop	Semitron ESD 480	7
7.4.2	D1500149	Thumb Screw, EQ Stop	18-8 SSSL	7
7.4.3	91318A410	Hollow-Lock Set Screw, 1/4"-20 X 1/8" LG	18-8 SSSL	7



+Y Side

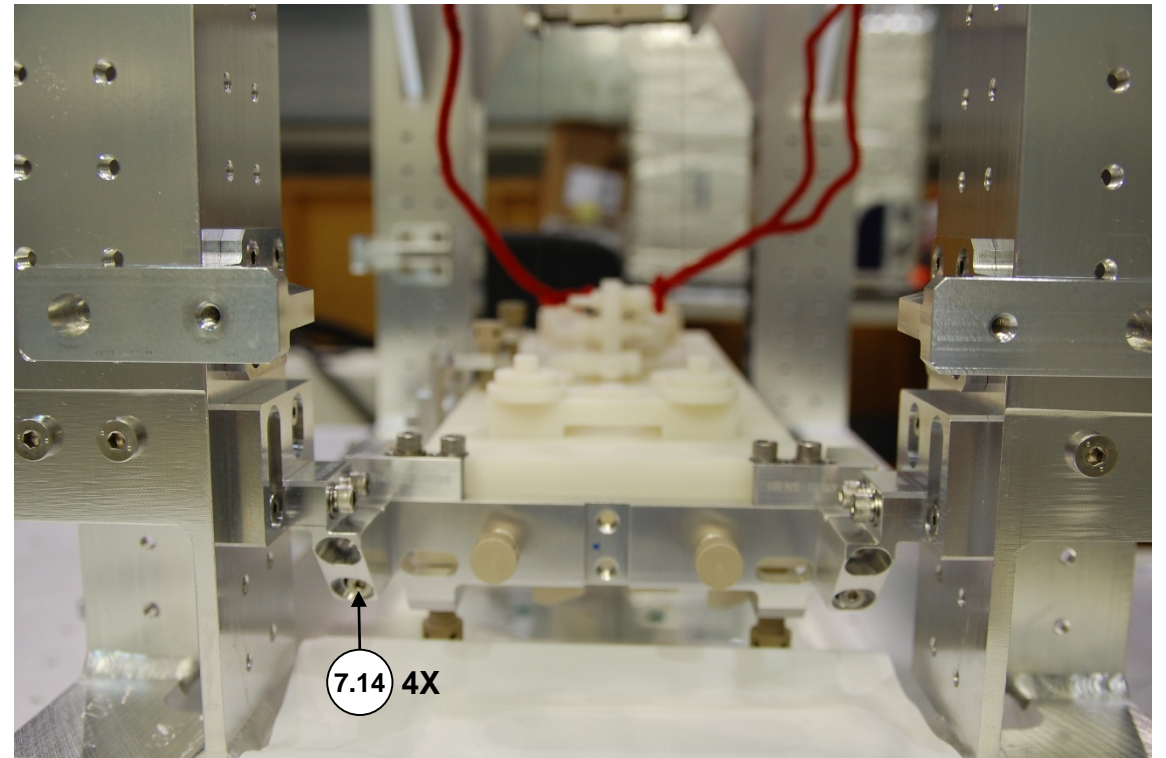
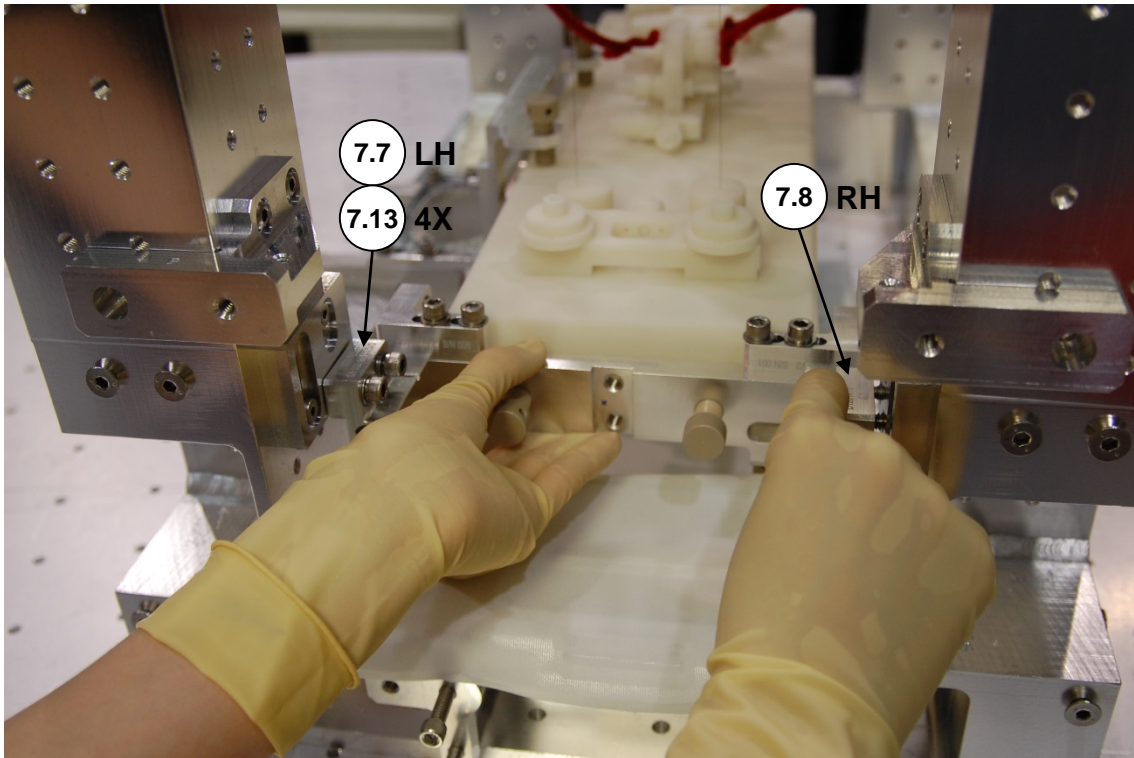
28. Slide new EQ Stop Assy (7) under bench.

- In retracted position.
- Will have to angle to avoid hitting glass or bench.



+Y Side

29. Stabilize by starting 4X captive screws (7.13) on the Horizontal Adjust parts (7.7 & 7.8).
 - Hold Main Bar to keep it from hitting bench.
30. Loosen 4X hidden screws (7.14) to move the Horiz. Adjusts closer to L & R Supports (7.2 & 7.3).
31. Finish locking in position with 4X captive screws (7.13).
 - Horiz. Adjusts must be level with L & R Supports, and Main Bar should be roughly centered wrt the bench.



+Y Side

32. Add a new EQ Stop Knob to the new Top Bracket (7.5) and both Side Brackets (7.6).

33. Install 2X Side Brackets (7.6).

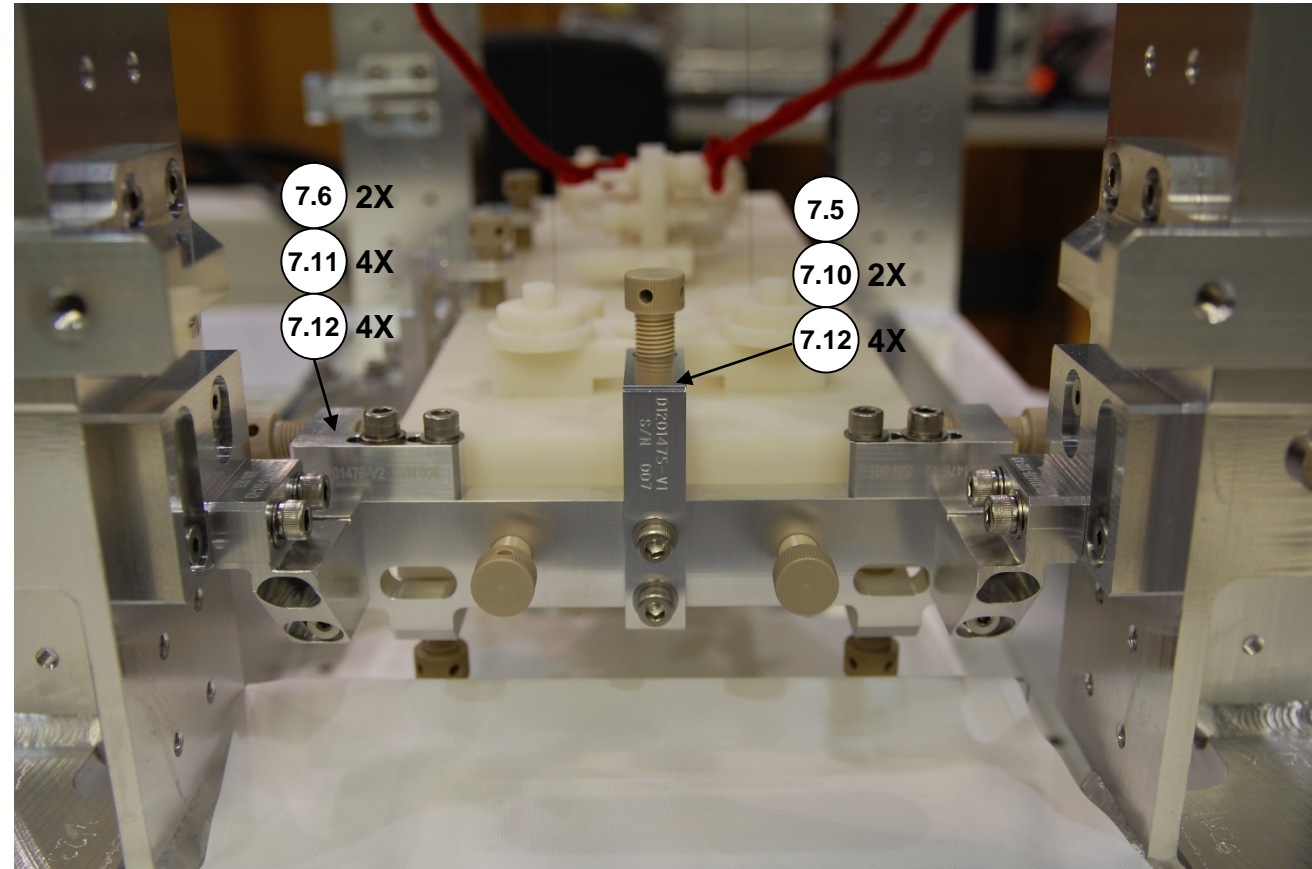
- Req. hardware:
 - 4X SHCS 1/4-20 x 1.0 (7.11)
 - 4X vented washer #1/4 (7.12)
- Keep stops and the brackets themselves retracted (away from bench). Will adjust position later.



Hardware is not captive.

34. Install Top Bracket (7.5).

- Req. hardware:
 - 2X SHCS, 1/4-20 x .875 (7.10)
 - 2X vented washer #1/4 (7.12)



+Y Side

35. Lock 7X EQ Stops.
36. Remove wipes from vertical glass panel.

INTERFERENCE TEST

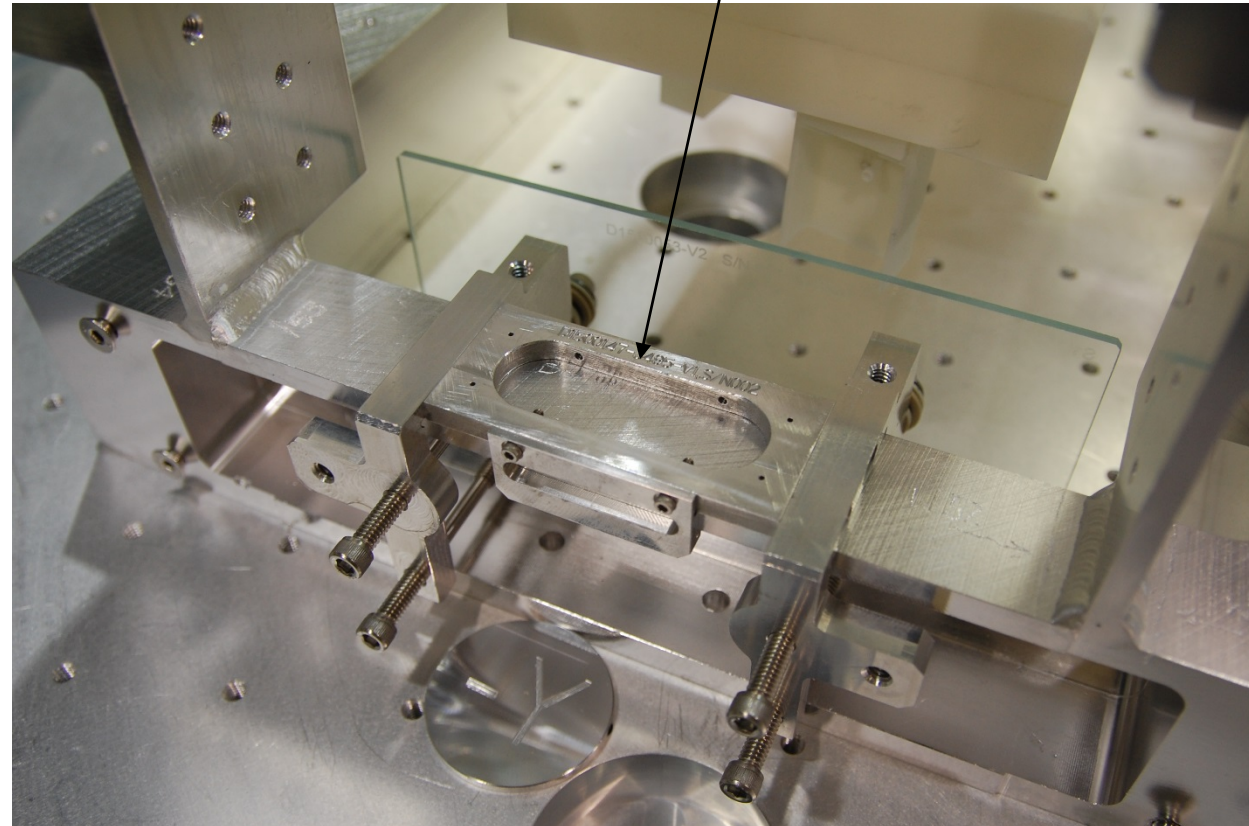
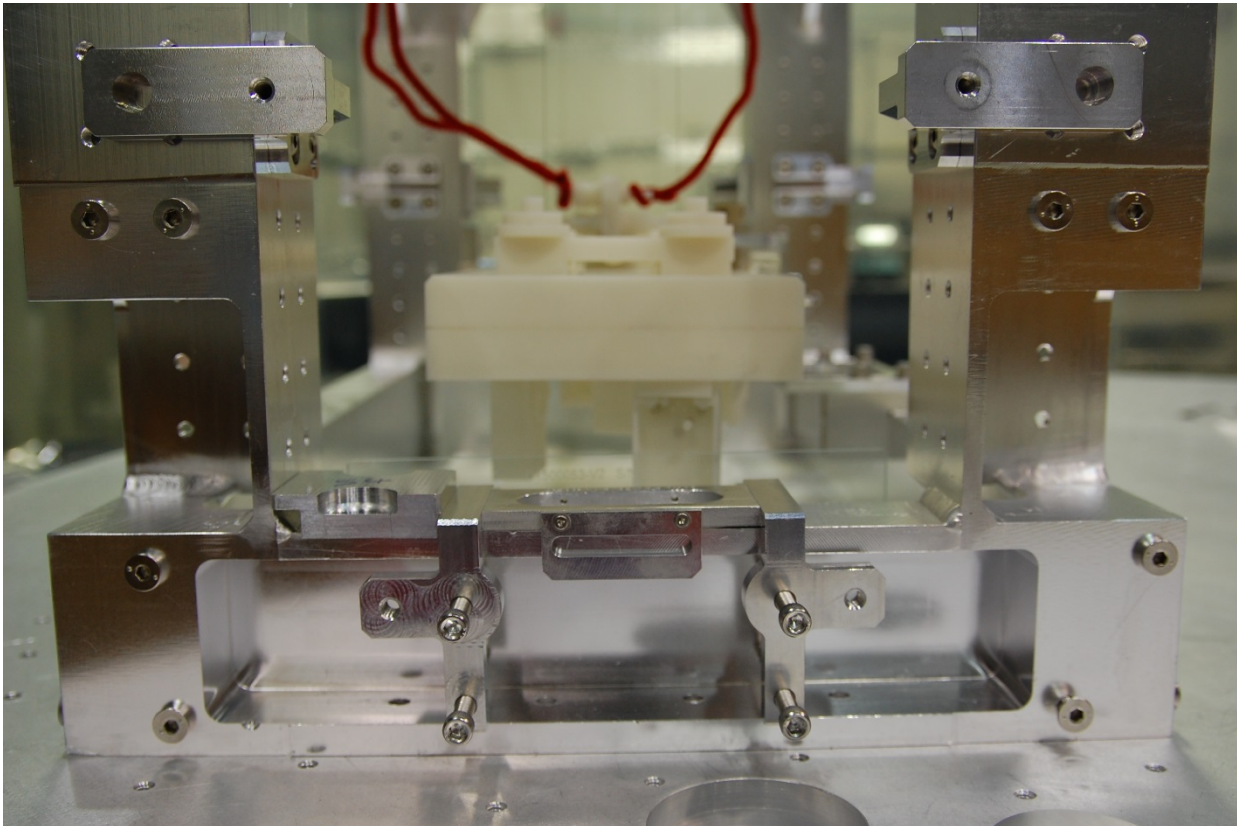
-Y Side

37. Place wipes on bottom panels for protection.
38. Remove old EQ Stop Assy using the same procedure as before (refer to [Steps 5 – 11](#)).
39. Install 2X Panel Mounting Brackets (32).
 - Req. hardware: 10X BHSC 1/4 X 0.5 (48), leave screws loose
40. With a 2nd person monitoring the bottom panels, very carefully place vertical panel D1500053 (27).
 - **If there's interference, immediately remove the vertical panel and follow instructions on [page 44](#).**
 - Continue to the next step if there's no interference.

-Y Side

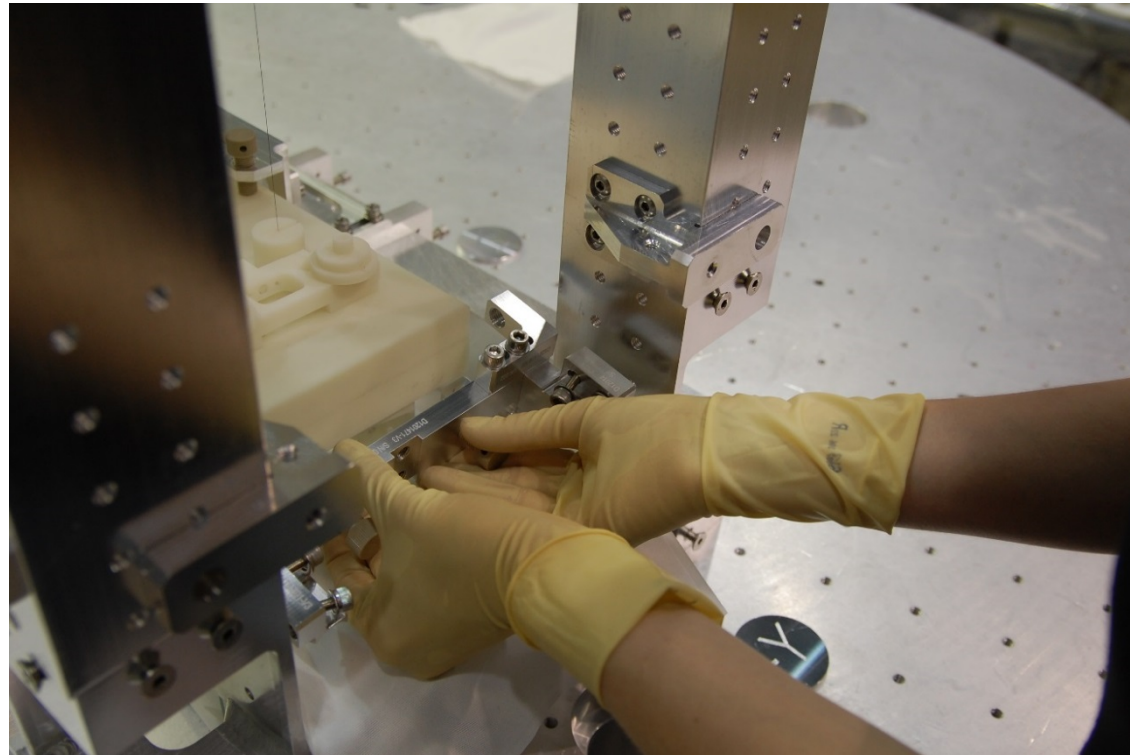
41. Position vertical panel D1500053 (27) using gauge block D1500120-2140 ([54](#)) in the -Y, -X corner.
42. Add C-Clamp Jaw (68) and tighten C-Clamp Screws.
 - Req. hardware: 2X SHCS, 4-40 x 0.5 (67)

Note orientation (D#)



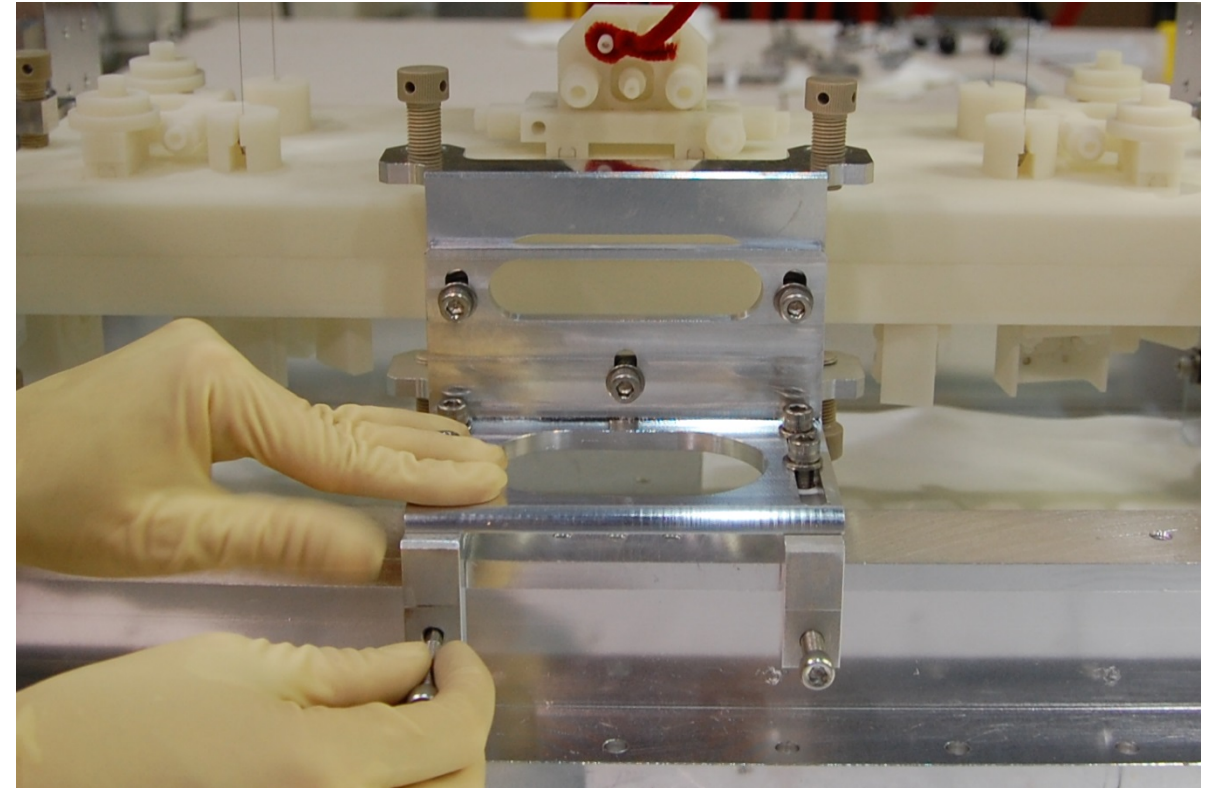
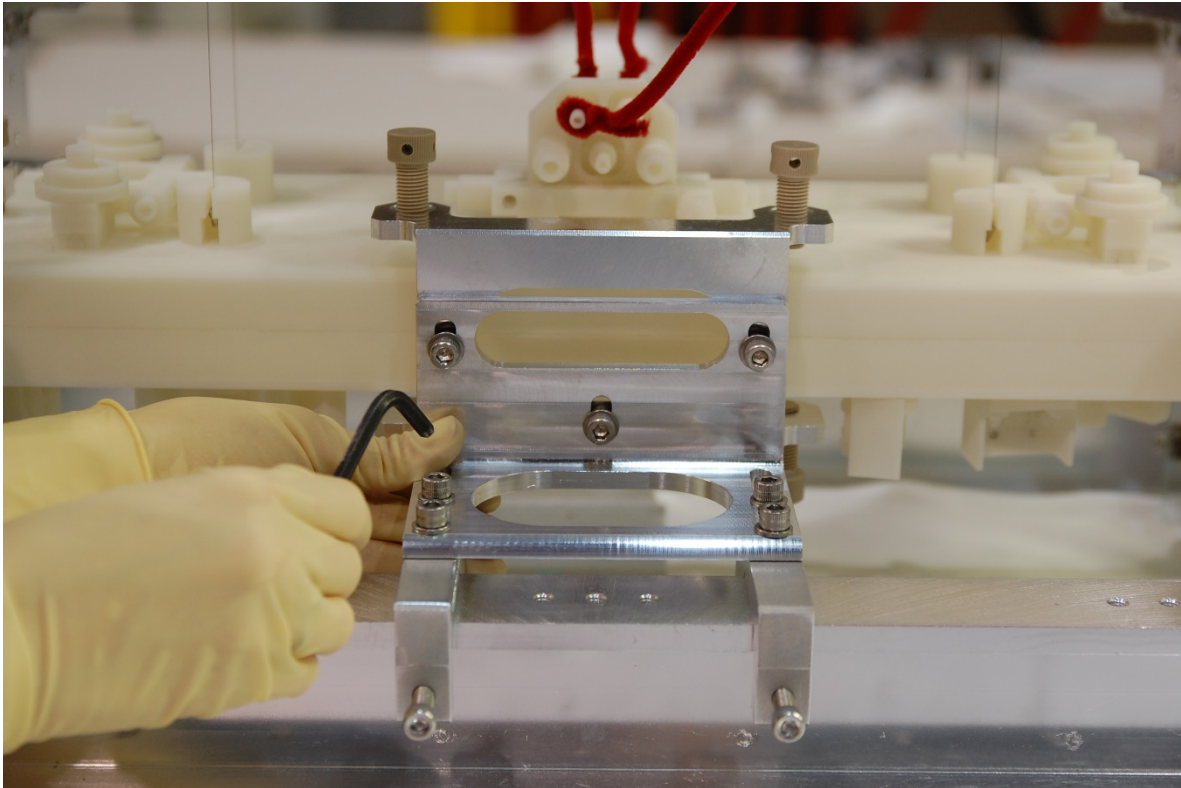
-Y Side

43. Place wipes over vertical glass.
44. Install new EQ Stop Assy using the same procedure as before (refer to [Steps 25 – 34](#)).
45. Lock 7X EQ Stops.
46. Remove wipes from vertical glass.



+X Side

47. Unlock all 4X EQ Stop Knobs in the Temp Stabilizer Assy.
48. Move the Temp Stabilizer Assy into its retracted position.
49. Remove the Temp Stabilizer Assy.



+Y Side

-Y Side

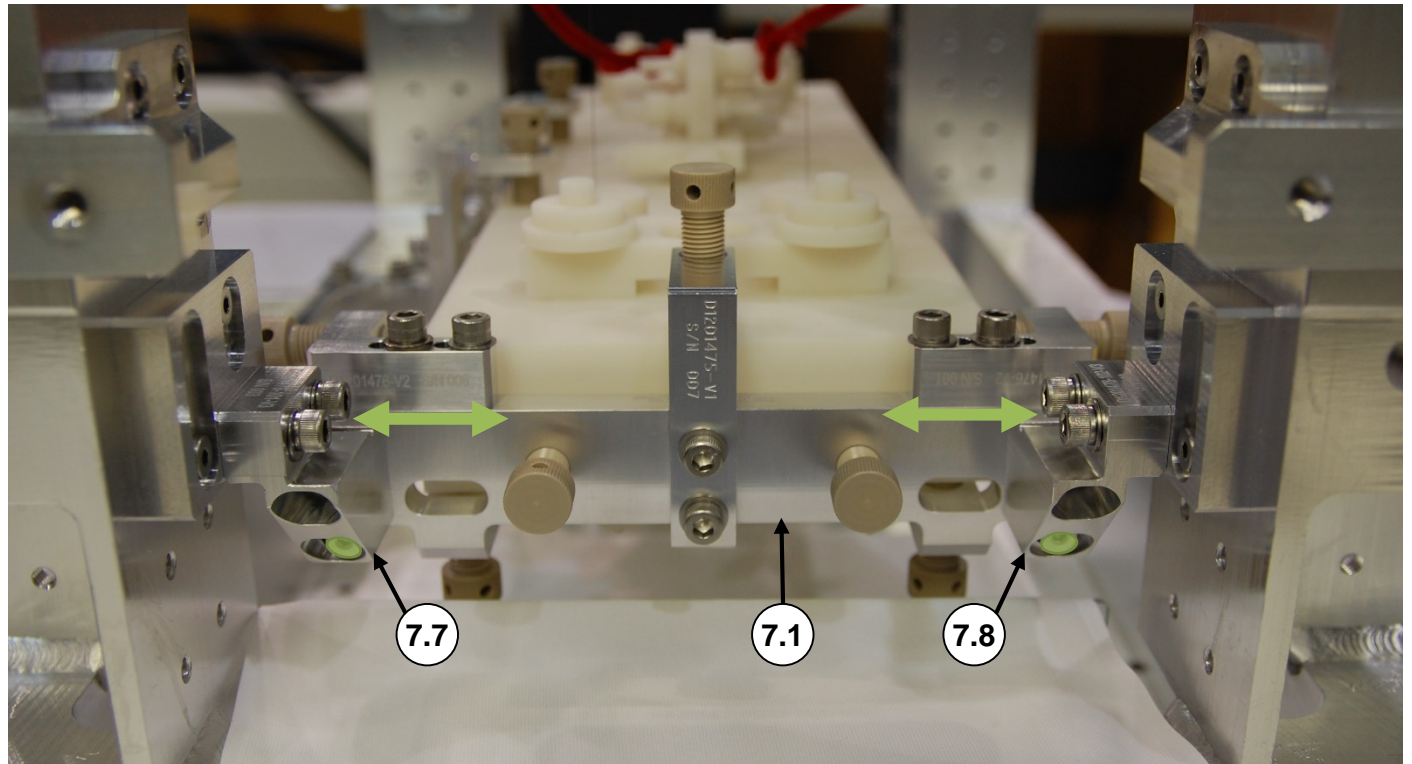
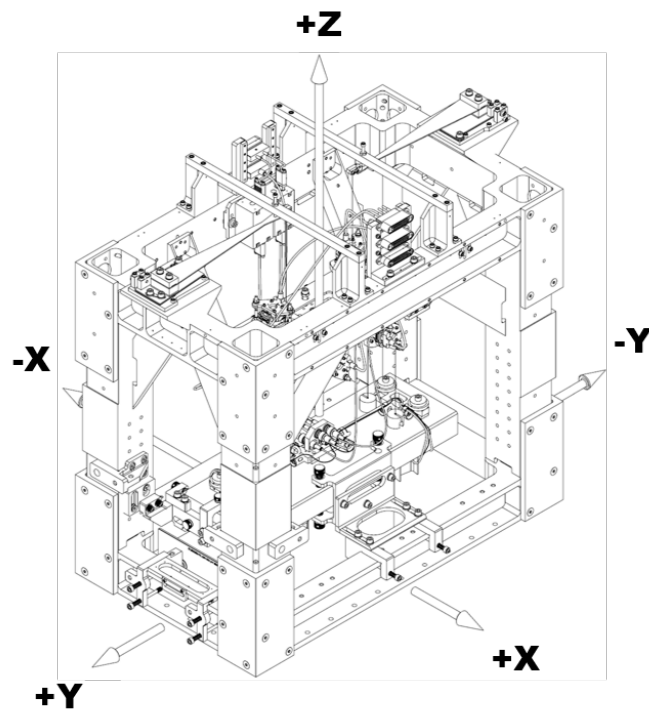
Steps 50 & 51 can be done 1 side at a time by 1 person, or simultaneously by 2 people (recommended):

50. Fully retract all 14X EQ Stop Knobs.

51. Make final adjustments to the position of the [EQ Stop Assy](#) (i.e. set Stop Knobs).

a) X-axis: Center the Main Bar (7.1) wrt the bench

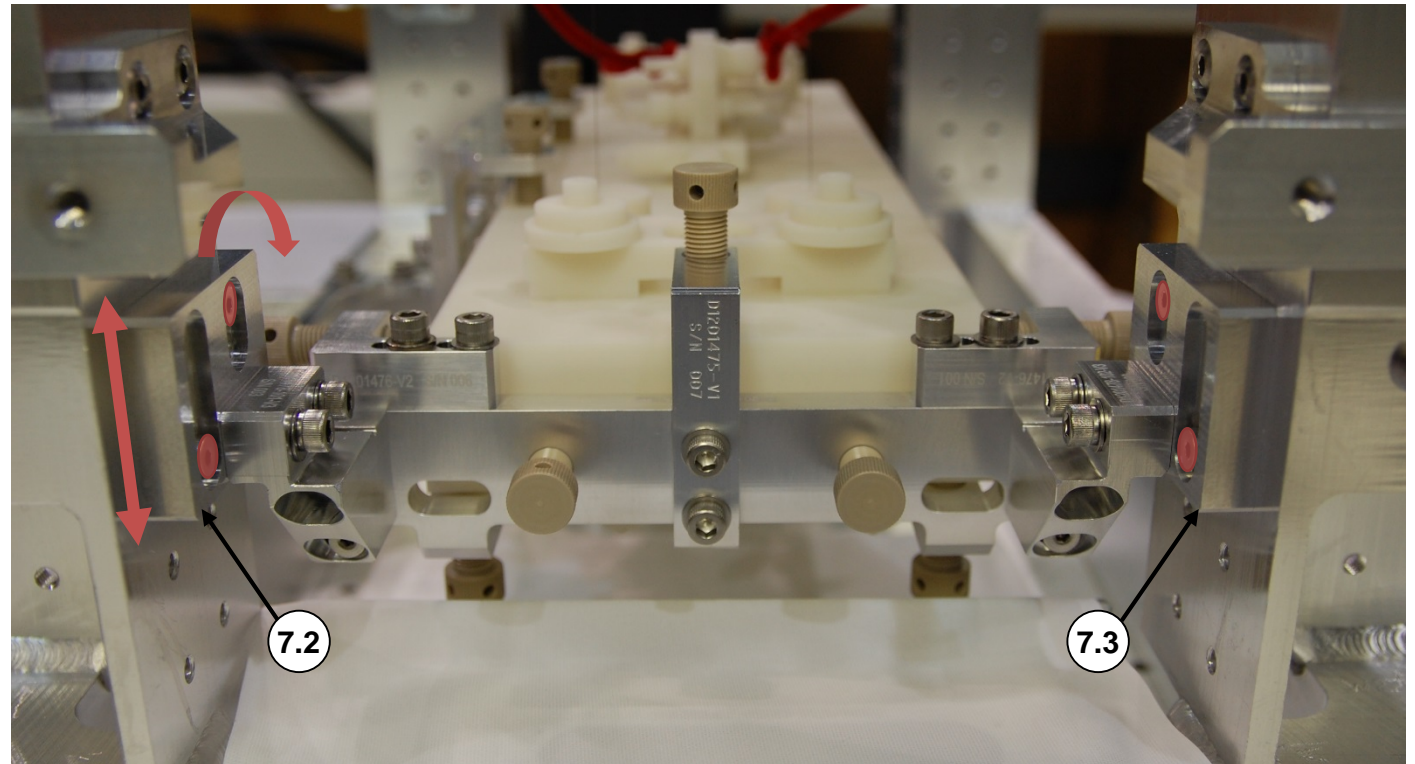
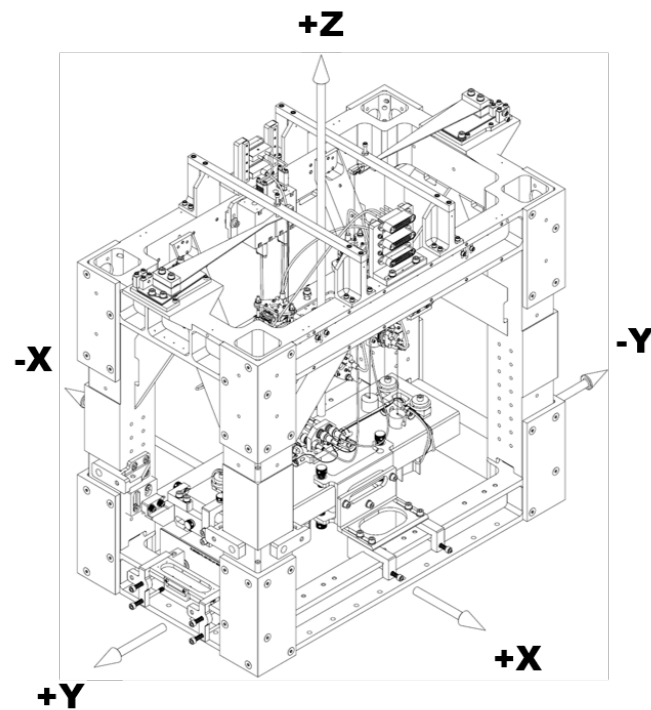
- Loosen 4X hidden screws (7.14) in the Horiz. Adjust (7.7 & 7.8) to free the Main Bar only along the X-axis..



+Y Side

-Y Side

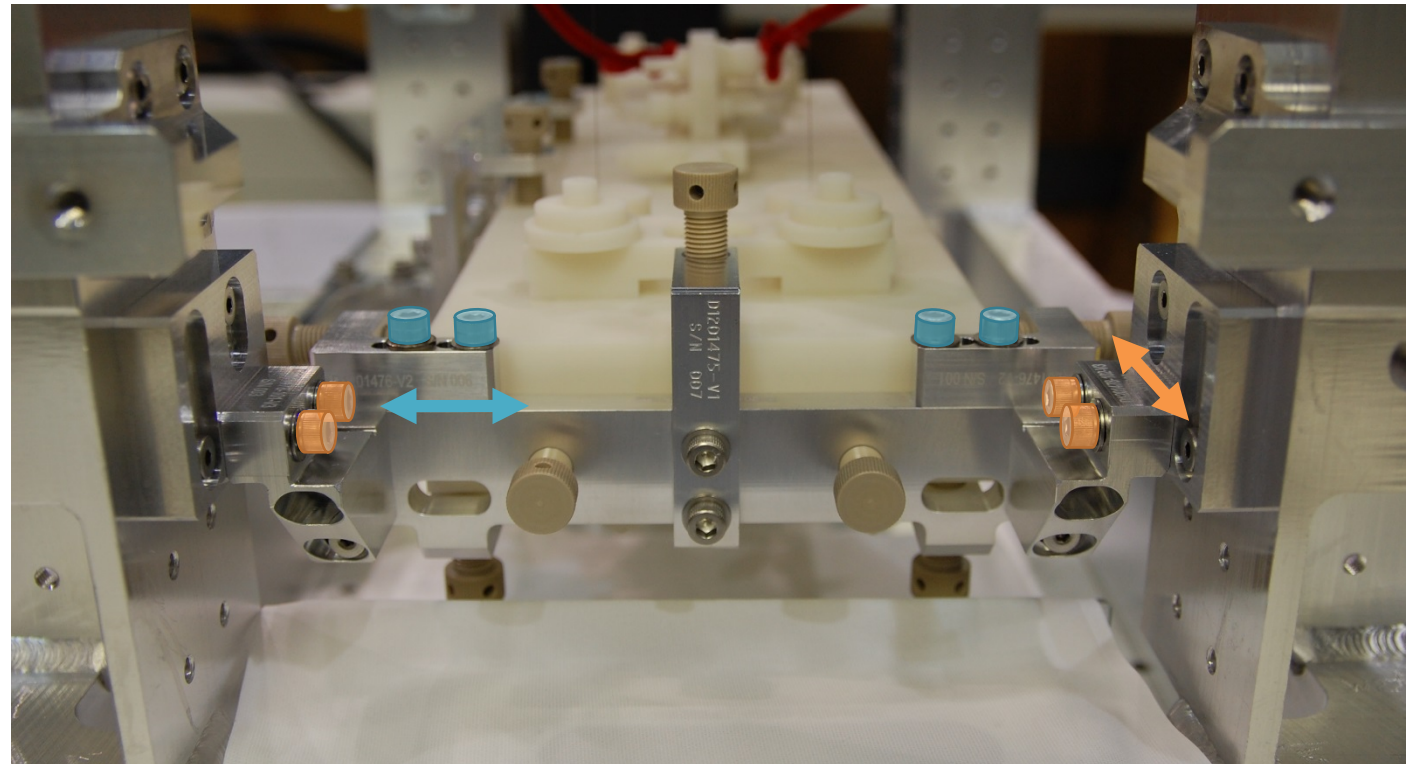
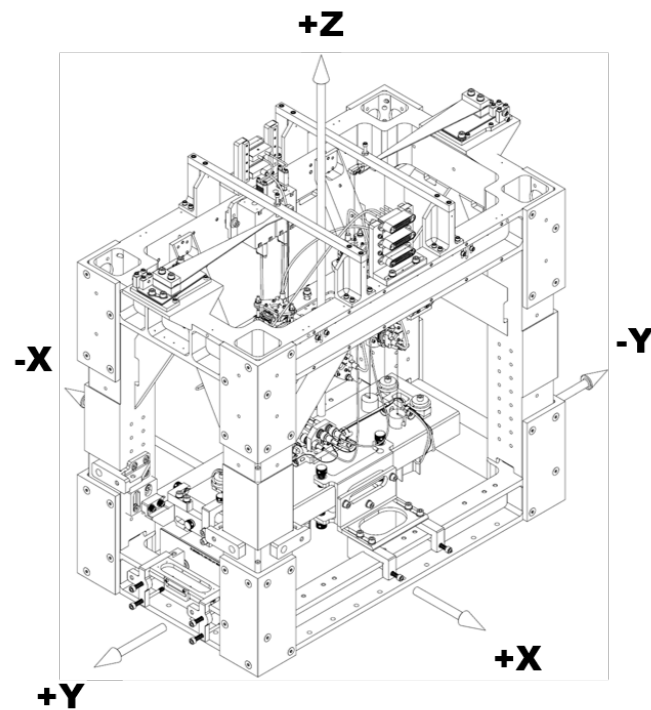
- b) Z-axis: Center assy wrt the bench, so the distance to the Top & 2X Bottom EQ Stop Knobs is roughly the same.
- Loosen 4X LSHC screws (51) in the Left & Right Supports (7.2 & 7.3) to slide assy up/down.
 - Confirm the Top & 2X Bottom Stops can be locked, then retract again.
 - At LHO, had to rotate the L & R Supports on the +Y Side EQ Stop Assy to get the Stops close enough to the bench.



+Y Side

-Y Side

- c) Y-axis: Move the assy close enough to the bench to lock the 2X Middle Stops in the Main Body.
- Loosen 4X captive screws (7.13) in the Horiz. Adjusts (7.7 & 7.8).
 - Mind the parts on the bottom side of the bench.
 - Confirm the 2X Middle Stops can be locked, then retract again.
- d) X-axis: Move the 2X Side Brackets (7.6) close enough to the bench to lock the 2X Side Stops.
- 4X SHCS (7.11) in the Side Brackets.
 - Confirm the 2X Side Stops can be locked then retract again.



+Y Side

-Y Side

- e) For each assy, confirm final position by locking all 7X EQ Stop Knobs.
- May need to repeat some of the previous steps.

52. Once all the positions are set, re-lock all but the bottom 4X EQ Stop Knobs.

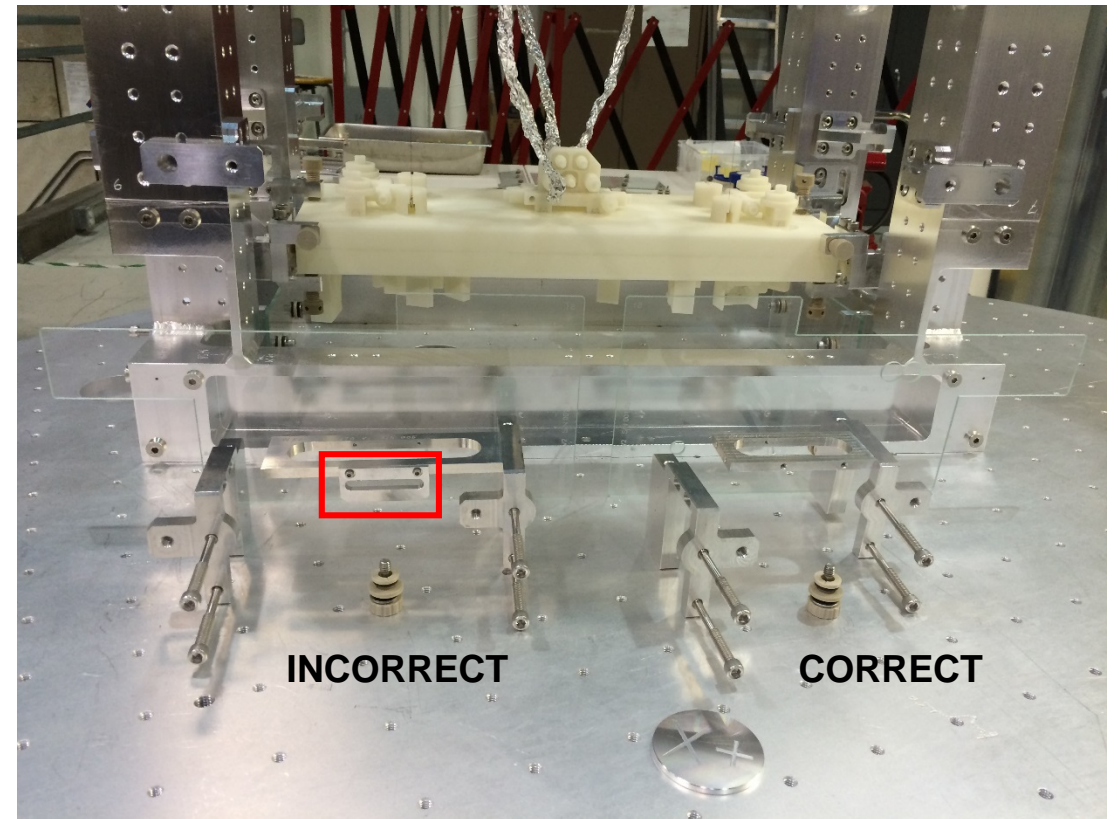
53. Set the bottom 4X Stops 1 – 2 mm from the bench.

+X Side

54. Double check and prep the vertical panels D1500054-101 & -102 (28 & 29) that are about to be installed. Confirm:

- Correct type of Stiffeners & C-Clamps (refer to [pg 24](#))
- Stiffener orientation
- Partially assembled bracket is on the side with the arm, and the other hole is empty.
- Position:
 - C-Clamp screws – retracted
 - Stiffener – forward (toward glass)
- Remaining parts are nearby (refer to [pg 5](#))
- Installed bolt assy is tight

HANDLING – Do not pick up panels using only the partial bracket. If holding partial bracket, other hand must be supporting the glass itself (main body, not the arm).



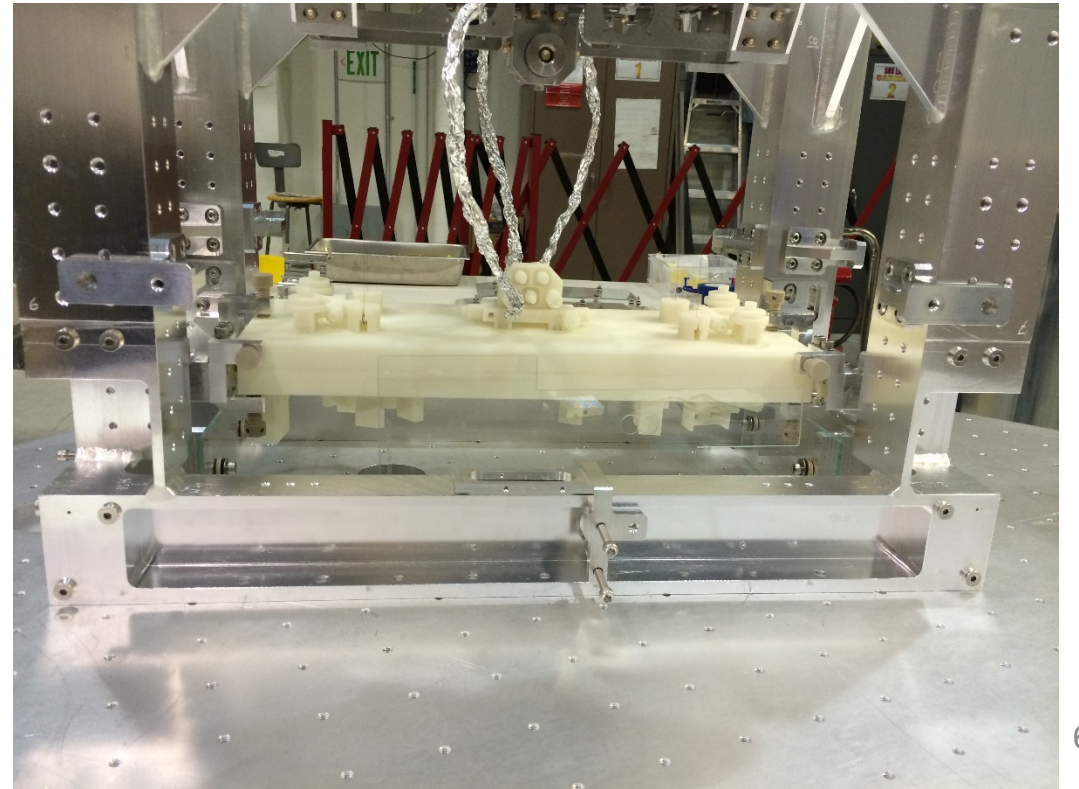
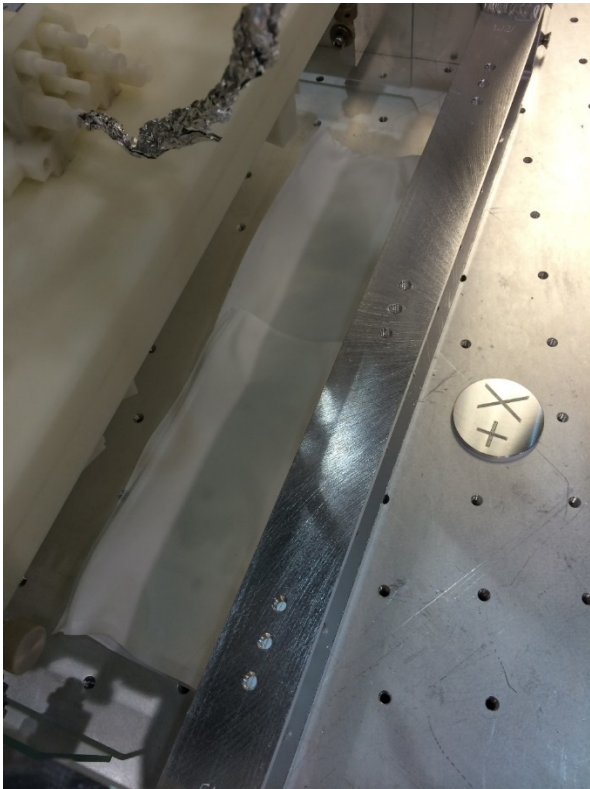
+X Side

Preferable to have a 2nd person in chamber on the +Y side to assist with +X Side install.

55. Lay down wipes to protect the bottom panels and to cushion the incoming vertical panels.

56. Carefully place D1500054-102 (29) as shown below.

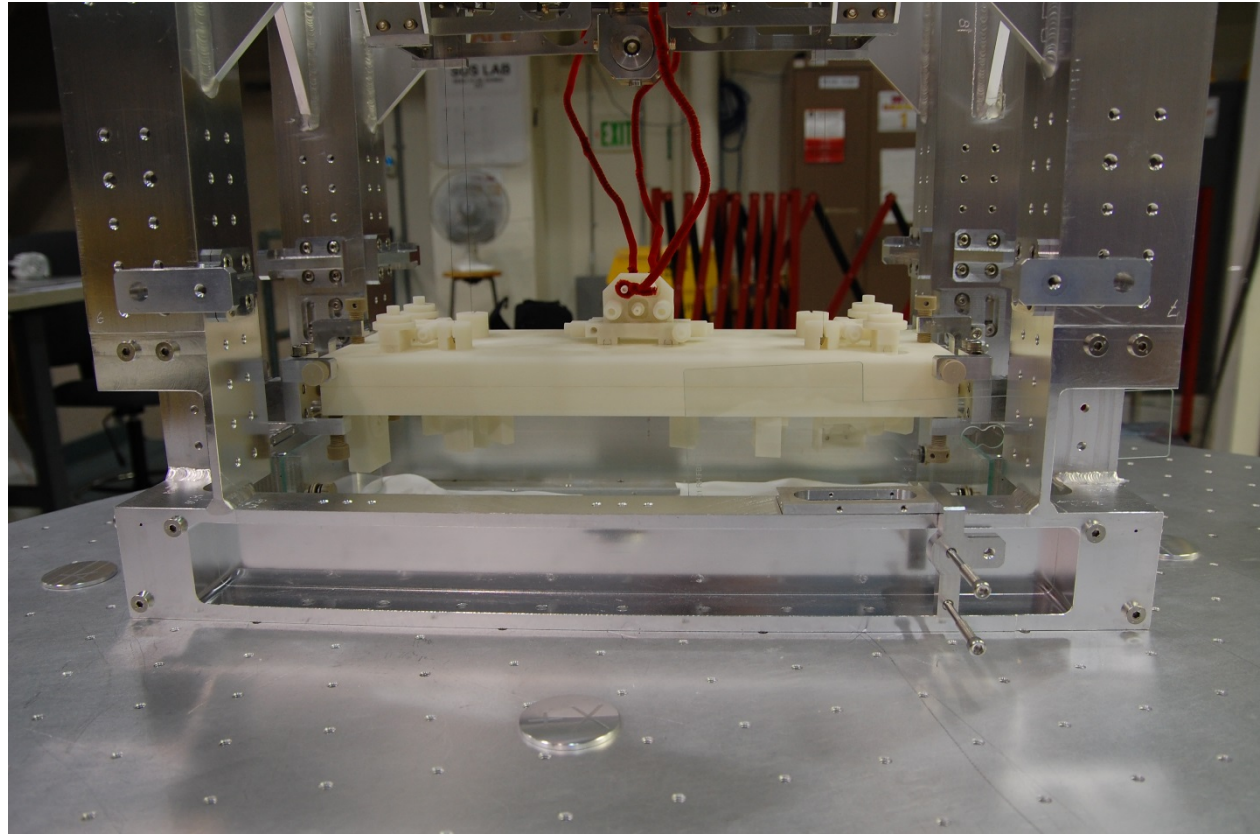
- Check for interference with bottom panels.
- Tightening the C-Clamp Screws a bit (not all the way) helps balance the partial assy.



+X Side

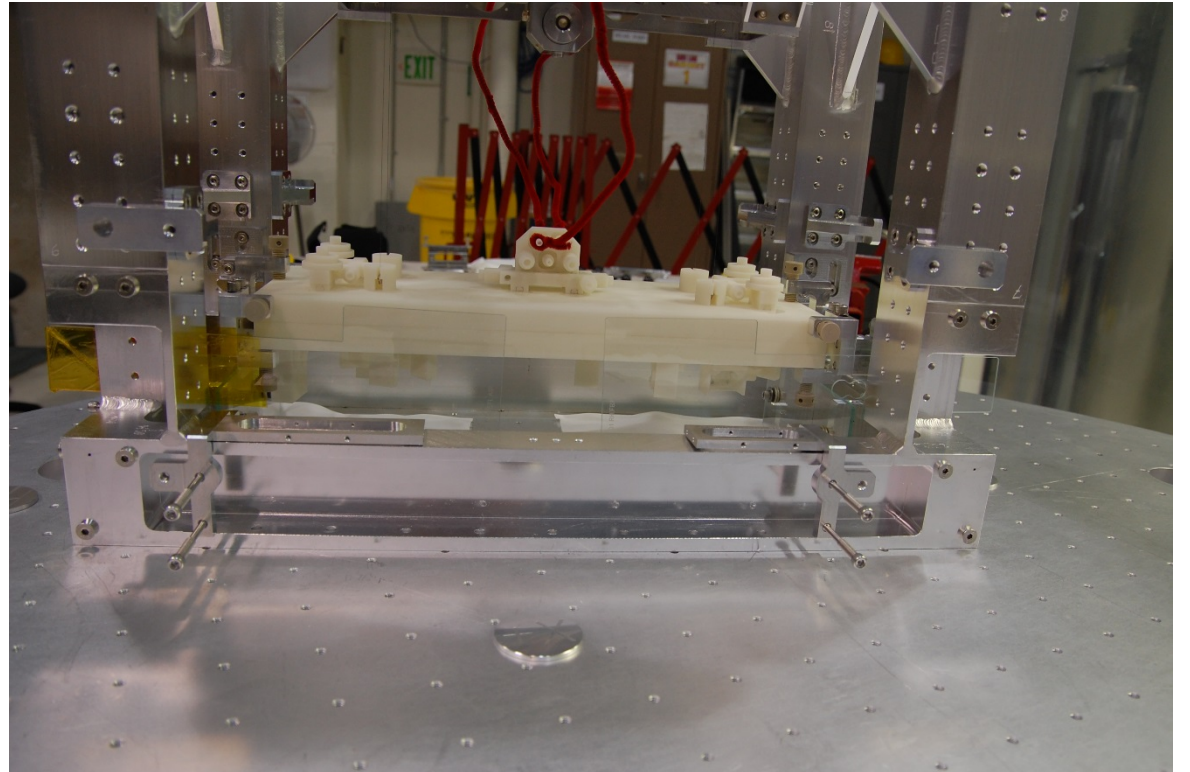
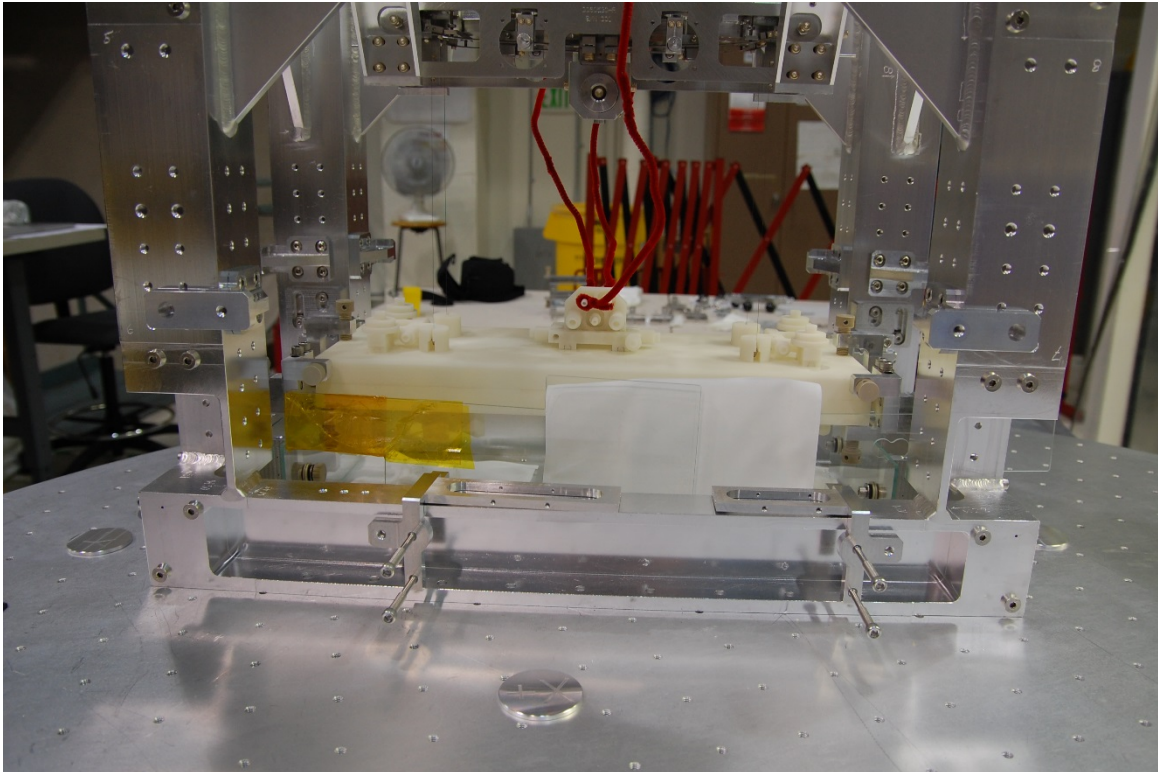
57. Slowly & gently move the -102 panel as far as it can safely go in the +Y direction.

- Arm should stick out past the structure.
- Possible obstructions/interference:
 - Installed +Y vertical panel D1500052 (26) – If this occurs mark/scribe the position, loosen C-Clamp screws, and slide it out of the way temporarily. Will not be able to use the gauge block once the +X vertical panel is installed.
 - Dog Clamps – Mark, note, photograph, move.



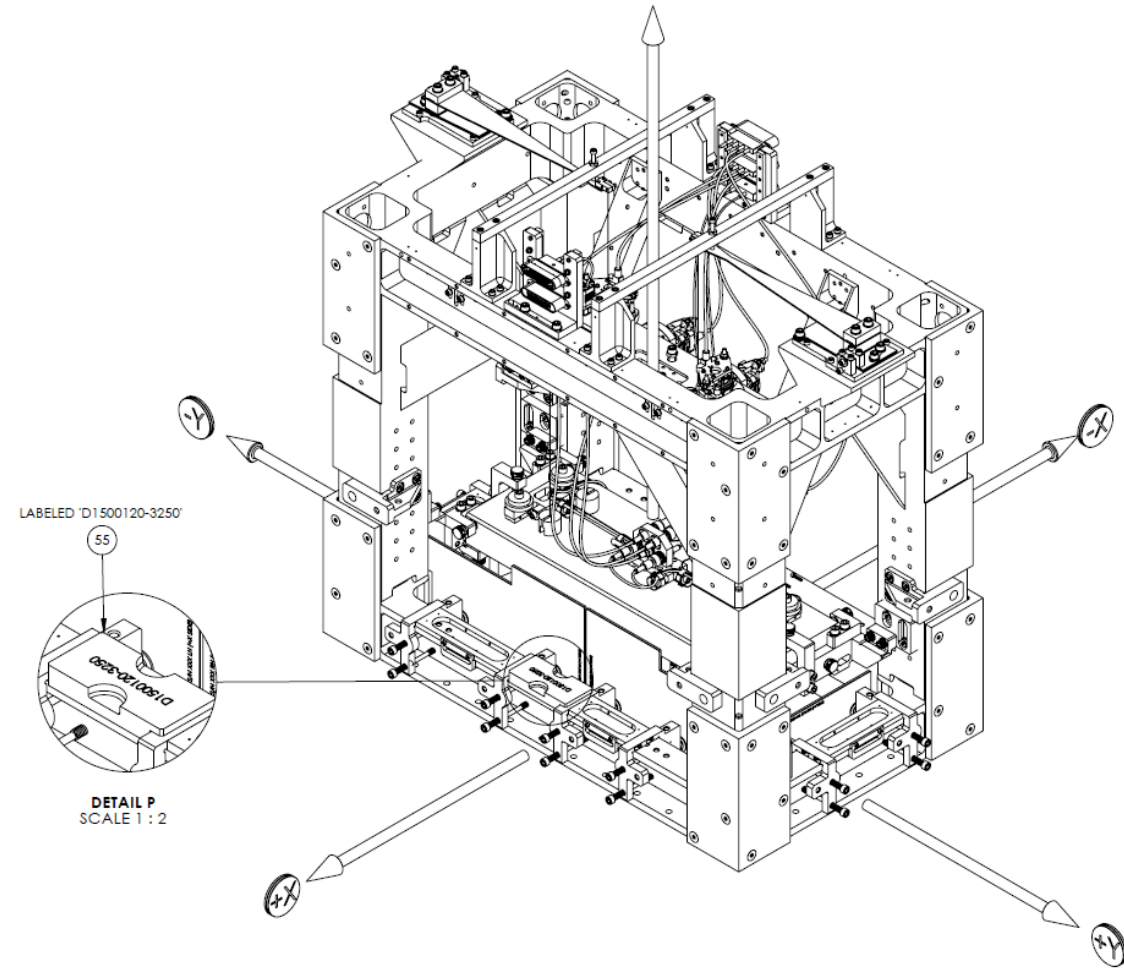
+X Side

58. Lay a single wipe over -102 as shown to protect it from scratches.
59. Position vertical panel D1500054-101 (28) per photo (overlaps -102).
60. Gently slide -101 as far as safely possible in the $-Y$ direction.
 - This leaves a little gap between the 2 vertical panels.
 - Potential interference with $-Y$ panel D1500053 (27) and dog clamps – mark/scribe position, note, move.



+X Side

61. Remove wipes.
62. Install 2X bolt assy (-2 config) in the empty holes.
63. Add missing C-Clamp to each partial assy.
 - Req. hardware: 4X SHCS, 4-40 x .5
64. Position vertical panels using gauge blocks D1500120-3250 (56) in +X, +Y corner and -3545 (55) between the panels.
65. Tighten C-Clamp Screws and add C-Clamp Jaw (68).
 - Req. hardware: 4X SHCS, 4-40 x .5
 - Use provided metal shim to help space glass. Want ~1/16" gap between the panels.
66. If dog clamps were moved, put them back.



+X Side

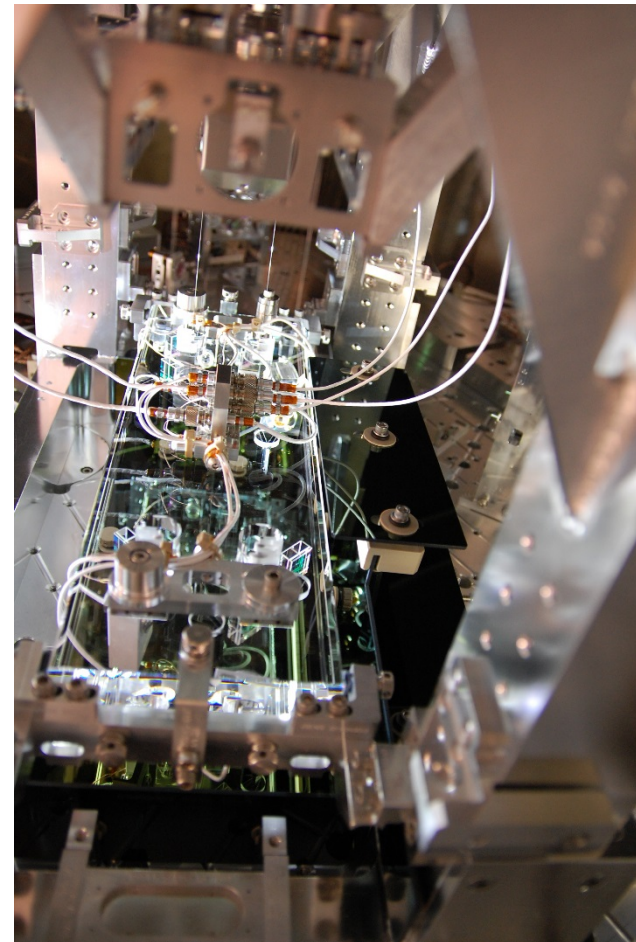
67. Install horizontal panel D1500049 (23).
68. Place PEEK Midspan Support (Inner) (41) on vertical glass and secure on standoffs.
 - Req. hardware: 2X BHSC 1/40-20 x.5 (48)
69. Slip PEEK Shim (42) behind the standoffs, and slide upward to position it between the set screws and glass.



+X Side

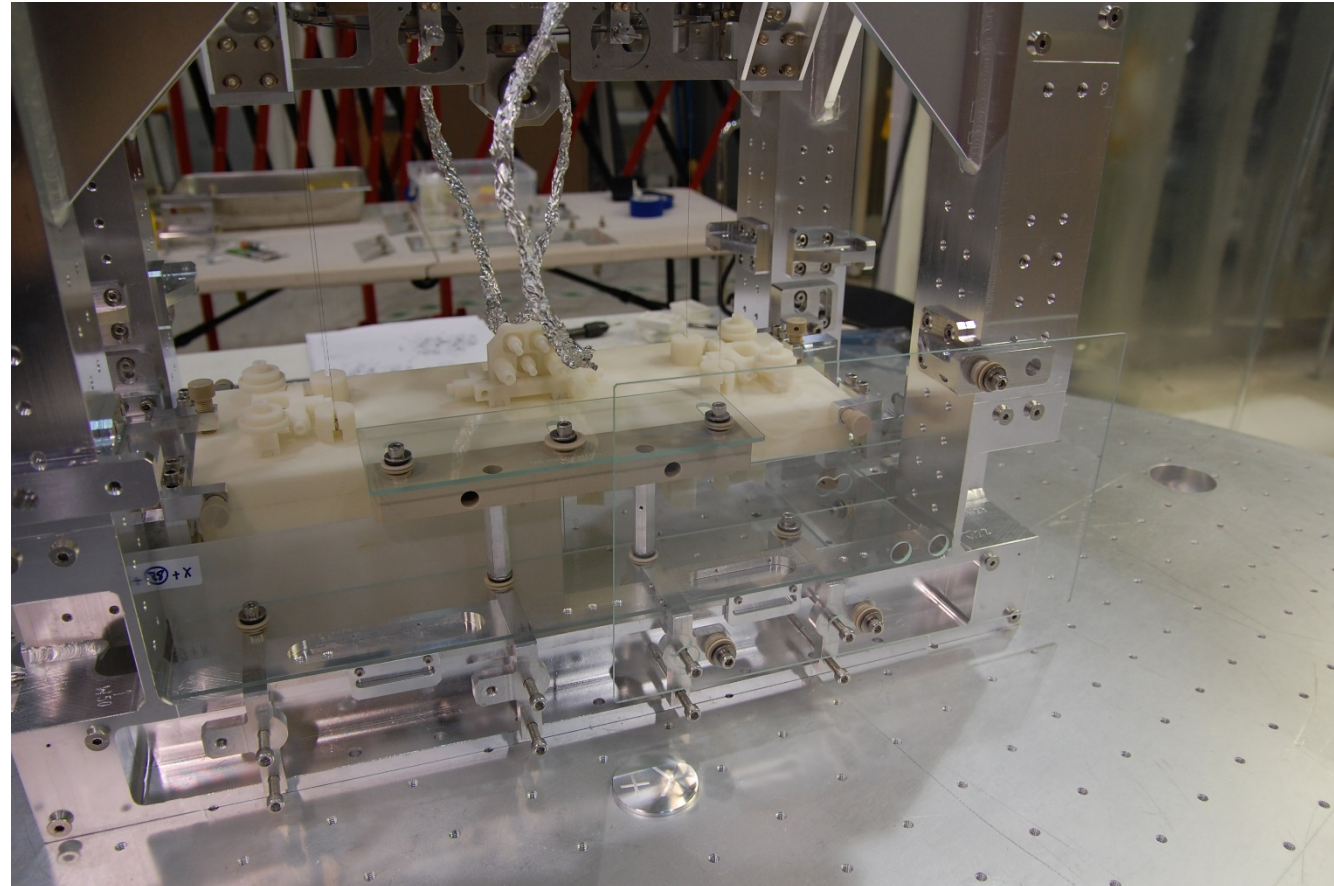
69. Tighten set screws.

70. Install D1500116 (40) in retracted position, then slide toward bench if possible.



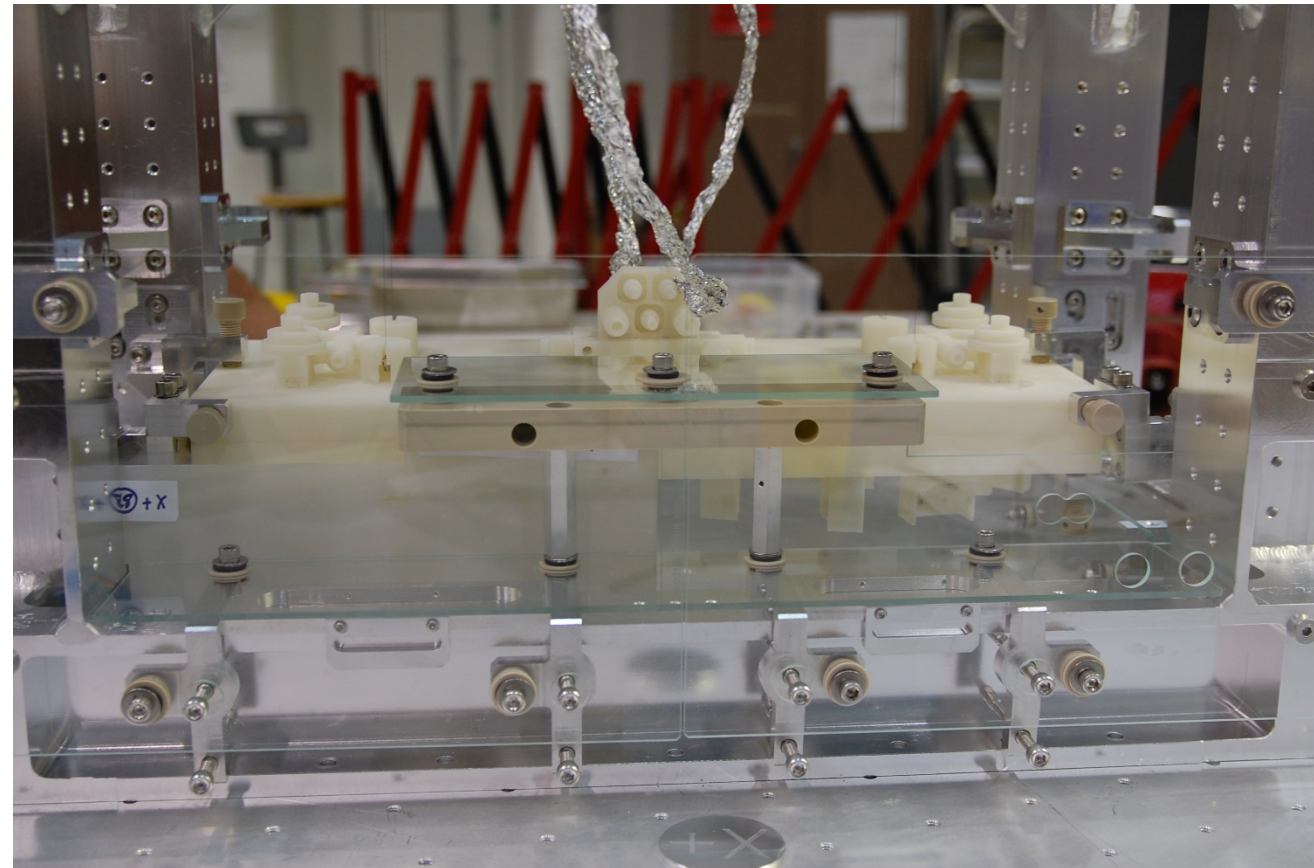
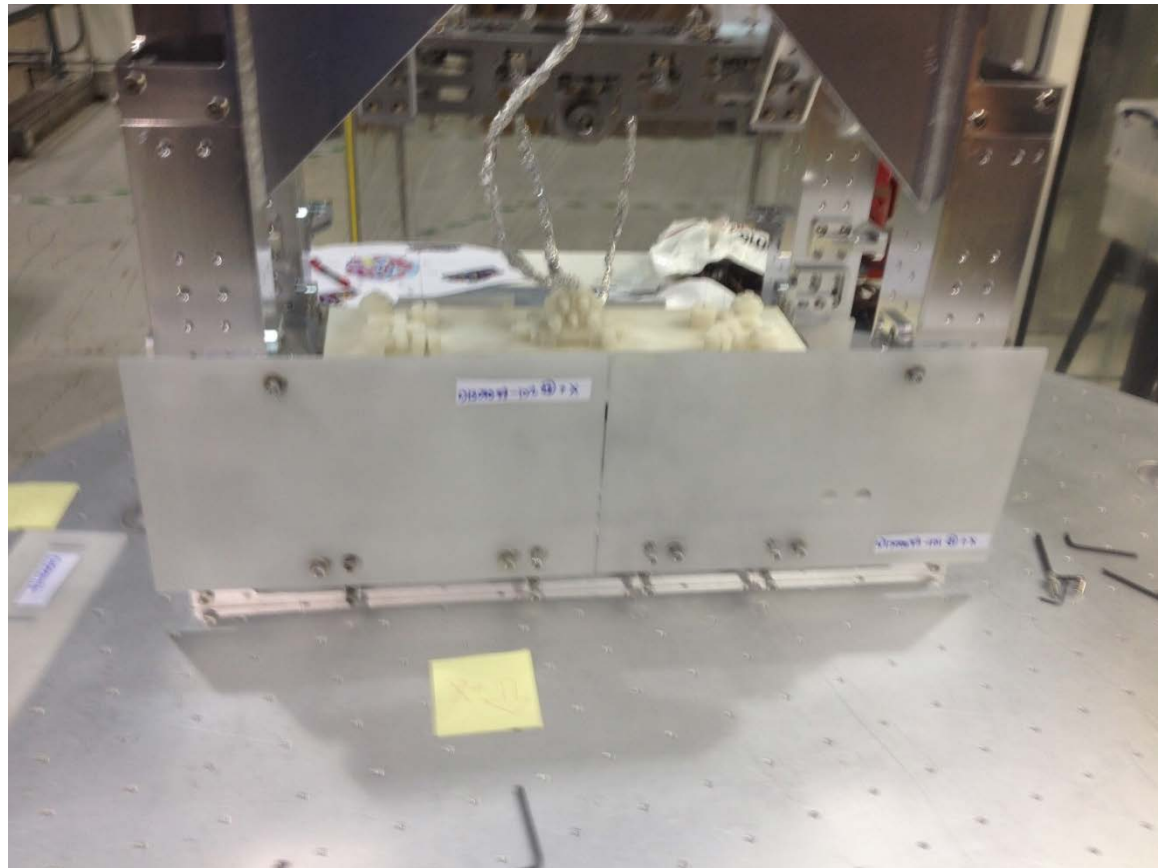
+X Side

71. Position vertical outer panel D1500043-101 (2) as shown.
 - The installed inner vertical panel's upper 2X C-Clamp screws fit through the holes in -101.
72. Screw the upper bolt assy into the Panel Mt Bracket (32) first, but leave loose.
73. Screw the lower 2X bolt assy into the installed C-Clamps, but leave loose.
 - May have to slide Panel Mt Bracket up/down to reach holes in C-Clamps.



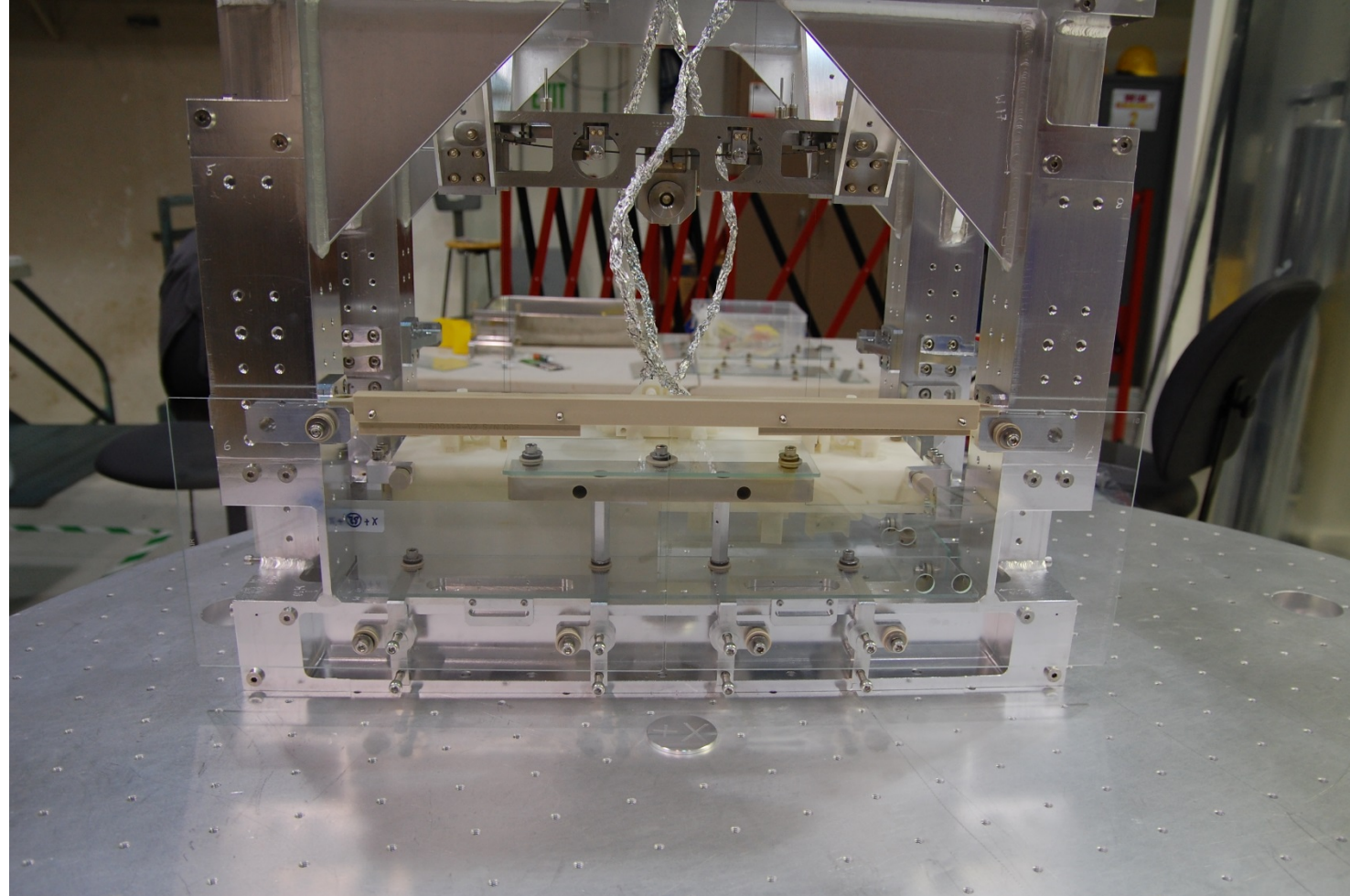
+X Side

74. Repeat Steps 71 – 73 for the other vertical outer panel, D1500043-102 (13).



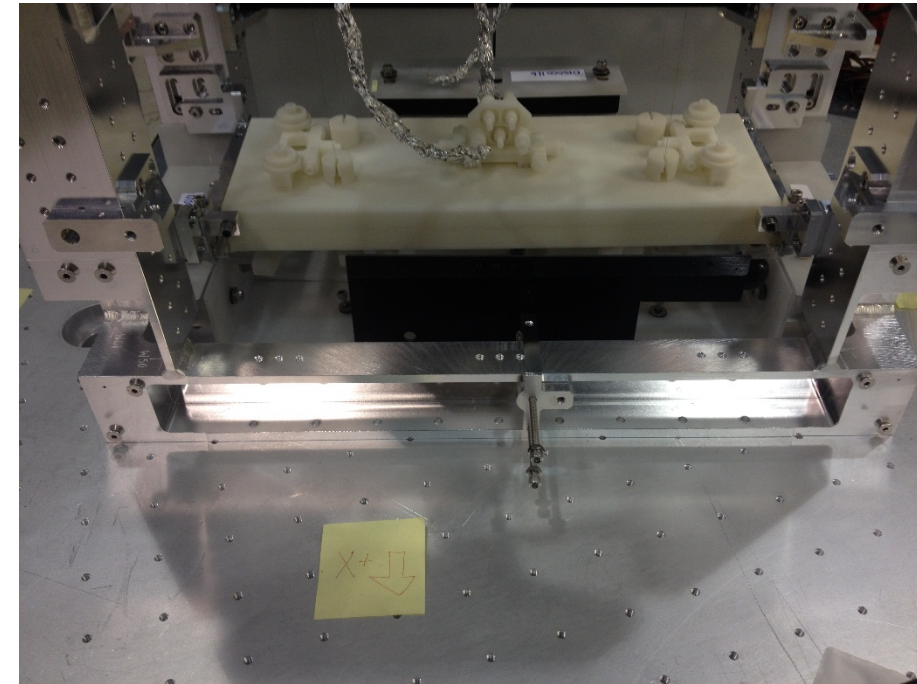
+X Side

75. Place PEEK Midspan Support (33) on outer panels and loosely secure to 2X Panel Mt Brackets.
- Req. hardware: 2X BHSC 1/40-20 x.5 (48)
 - Hardware on Panel Mt Brackets and outer vertical panels was left loose to make this step easier. Will probably have the position of the Panel Mt Brackets to screw the Midspan Support in.
76. Align outer vertical panels using the provided metal shim, then lock everything in place.
- 1/16" gap between glass.
 - Tighten 6X glass bolt assy, 10X BHSC (8X on Panel Mt Brackets and 2X on Midspan Support).
77. Slide 2X support shims (42) between set screws and glass, then tighten set screws.



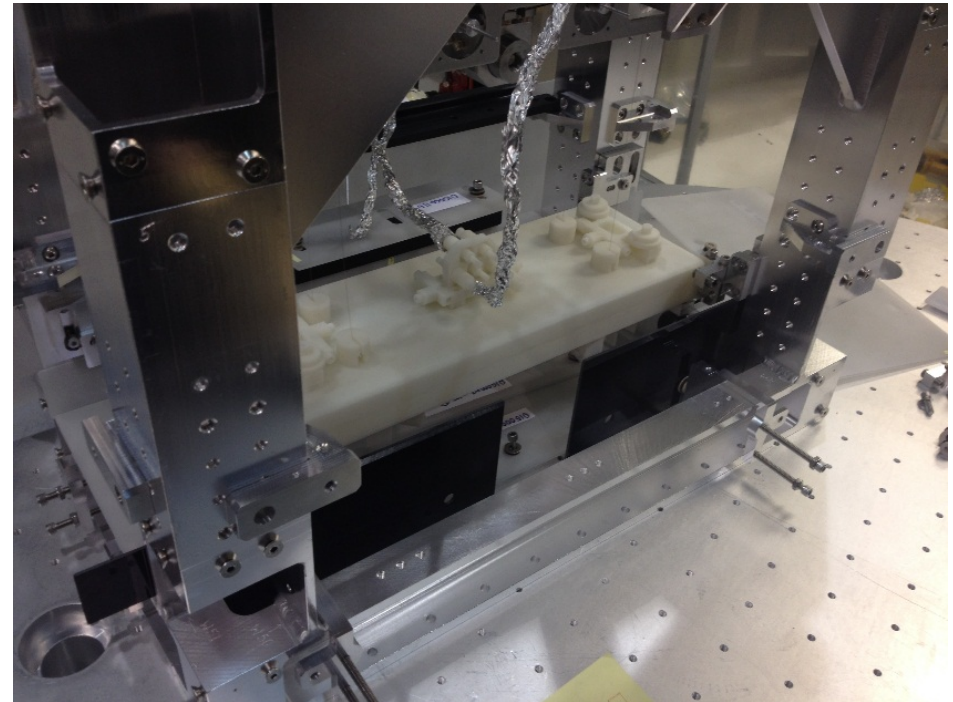
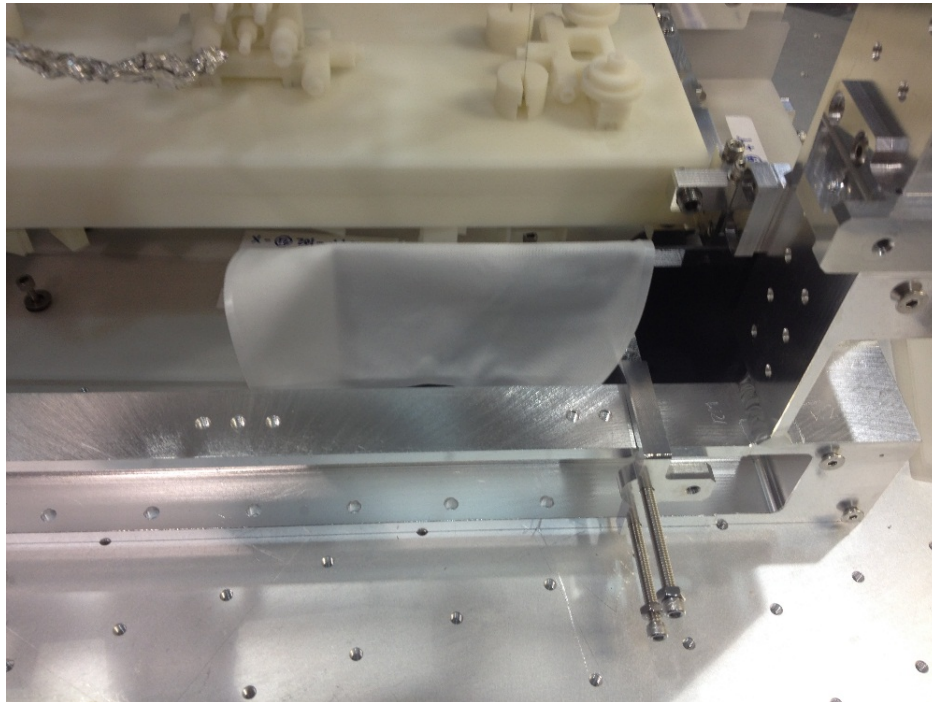
-X Side

78. Double check and prep the vertical panels D1500055-101 & -102 (30 & 31) that are about to be installed. Confirm:
- Correct type of Stiffeners & C-Clamps (refer to [pg 24](#))
 - Stiffener orientation
 - Partially assembled bracket is on the side with the arm, and the other hole is empty.
 - Position: C-Clamp screws – retracted & Stiffener – forward (toward glass)
 - Remaining parts are nearby (refer to [pg 5](#))
 - Installed bolt assy is tight
79. Lay down wipes to protect the bottom panels and to cushion the incoming vertical panels.
80. Install 2X Panel Mt Brackets (32).
- Required hardware: 10X Screws, BHSC 1/4-20 x 0.5 (48), leave loose.
81. Carefully place D1500055-101 (30).
- Check for interference with bottom panels.
82. Tighten 6X bolt assy on bottom panels (below bench).



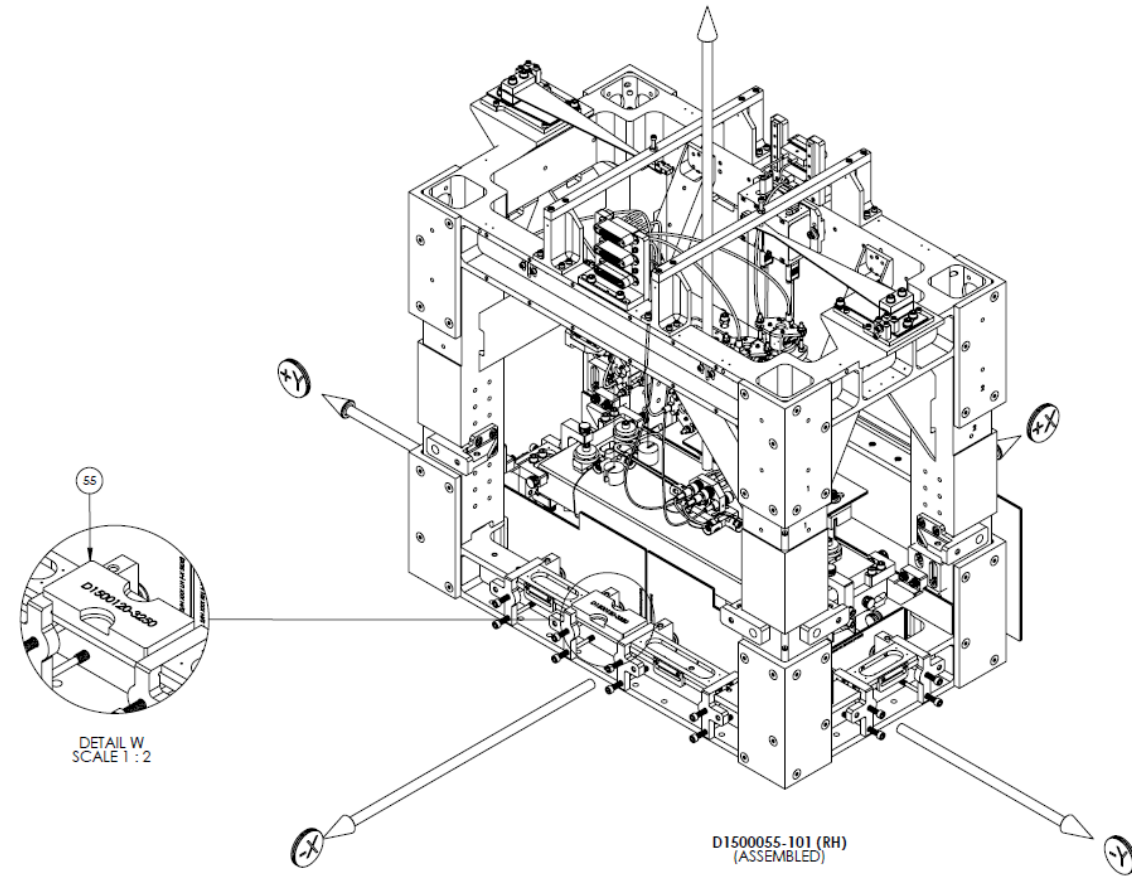
-X Side

83. Slowly & gently move the -101 panel as far as it can safely go in the -Y direction.
 - Potential interference with -Y panel D1500053 (27) and dog clamps – mark/scribe position, note, move.
84. Place a single wipe over -101 to protect it from scratches.
85. Position vertical panel D1500055-102 (32), and slide over as far as safely possible in +Y direction.
 - This leaves a little gap between the 2 vertical panels.
 - Potential interference with +Y panel D1500052 (26) and dog clamps – mark/scribe position, note, move.



-X Side

86. Remove wipes.
87. Install 2X bolt assy (-2 config) in the empty holes.
88. Add missing C-Clamp to each partial assy.
 - Req. hardware: 4X SHCS, 4-40 x .5
89. Position vertical panels using gauge blocks D1500120-3250 (56) in -X, +Y corner and -3545 (55) between the panels.
90. Tighten C-Clamp Screws and add C-Clamp Jaw.
 - Req. hardware: 4X SHCS, 4-40 x .5
 - Use metal shim to space panels ~1/16" apart.
91. If dog clamps were moved, put them back.



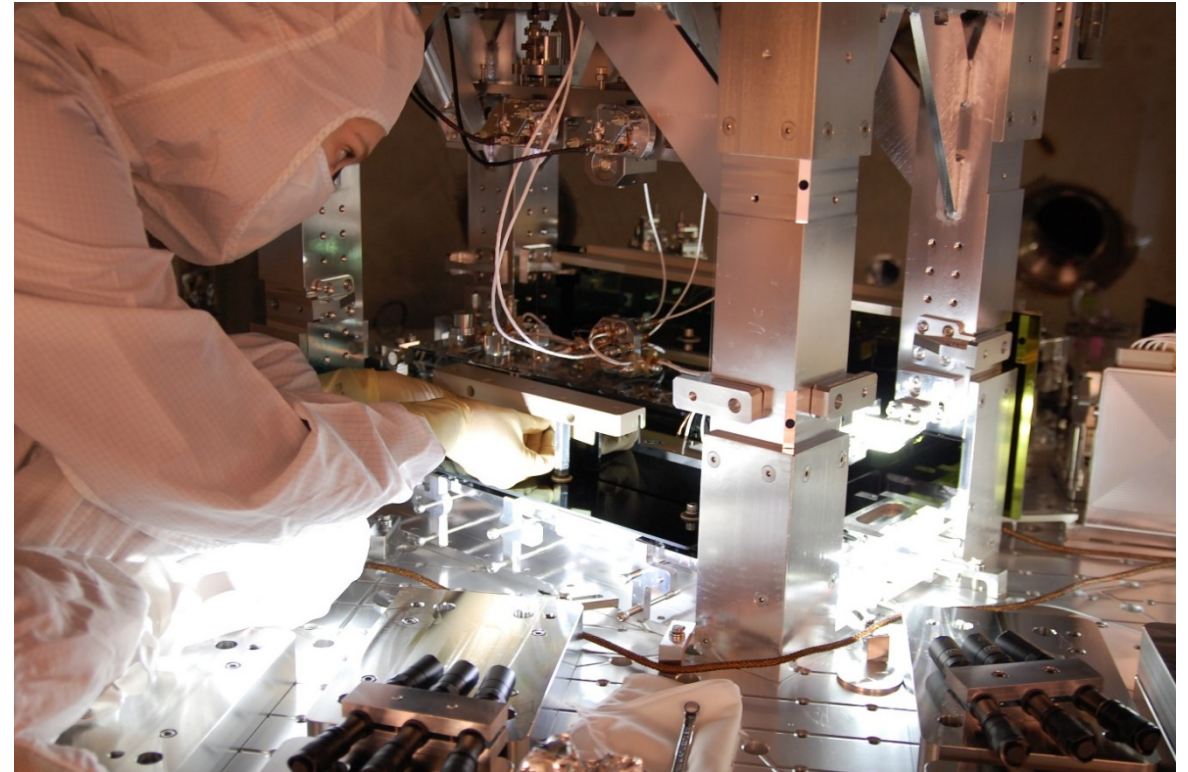
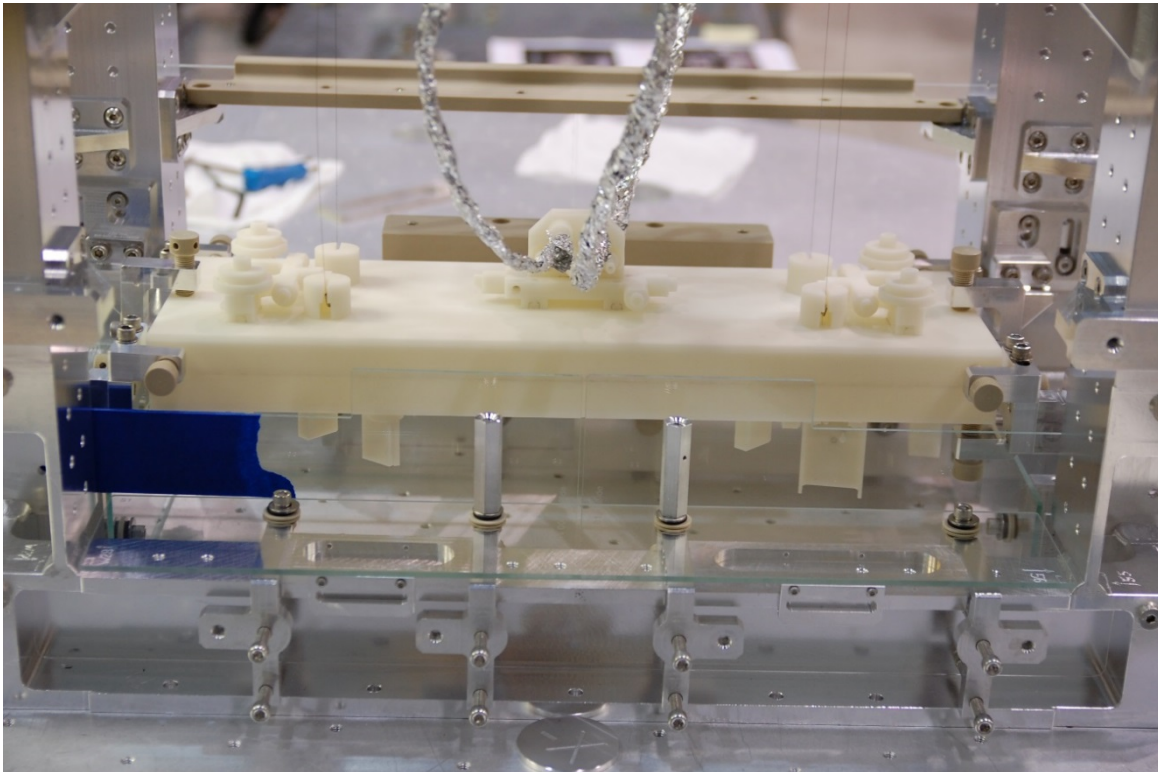
-X Side

92. Install horizontal panel D1500048 (22).

93. Place PEEK Midspan Support (Inner) (41) on vertical glass and secure on standoffs.

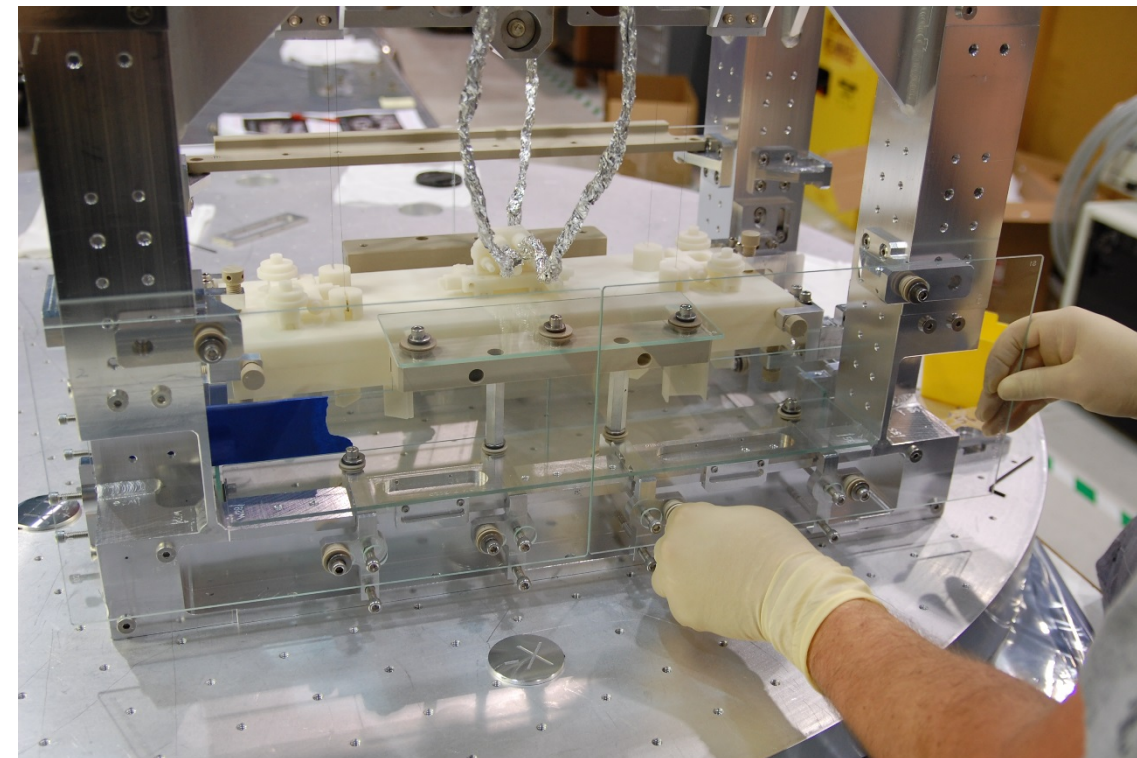
- Req. hardware: 2X BHSC 1/40-20 x.5 (48)

94. Slip PEEK Shim (42) behind the standoffs, and slide upward to position it between the set screws and glass. Tighten set screws.



-X Side

95. Install D1500116 (40) in retracted position, then slide toward bench if possible.
96. Position vertical outer panel D1500042-101 (10) & -102 (11) as shown.
97. Screw the upper bolt assy into the Panel Mt Brackets (32) first, and then the lower bolt assy into the installed C-Clamps. Leave loose.
 - May have to slide Panel Mt Bracket up/down to reach holes in C-Clamps



-X Side

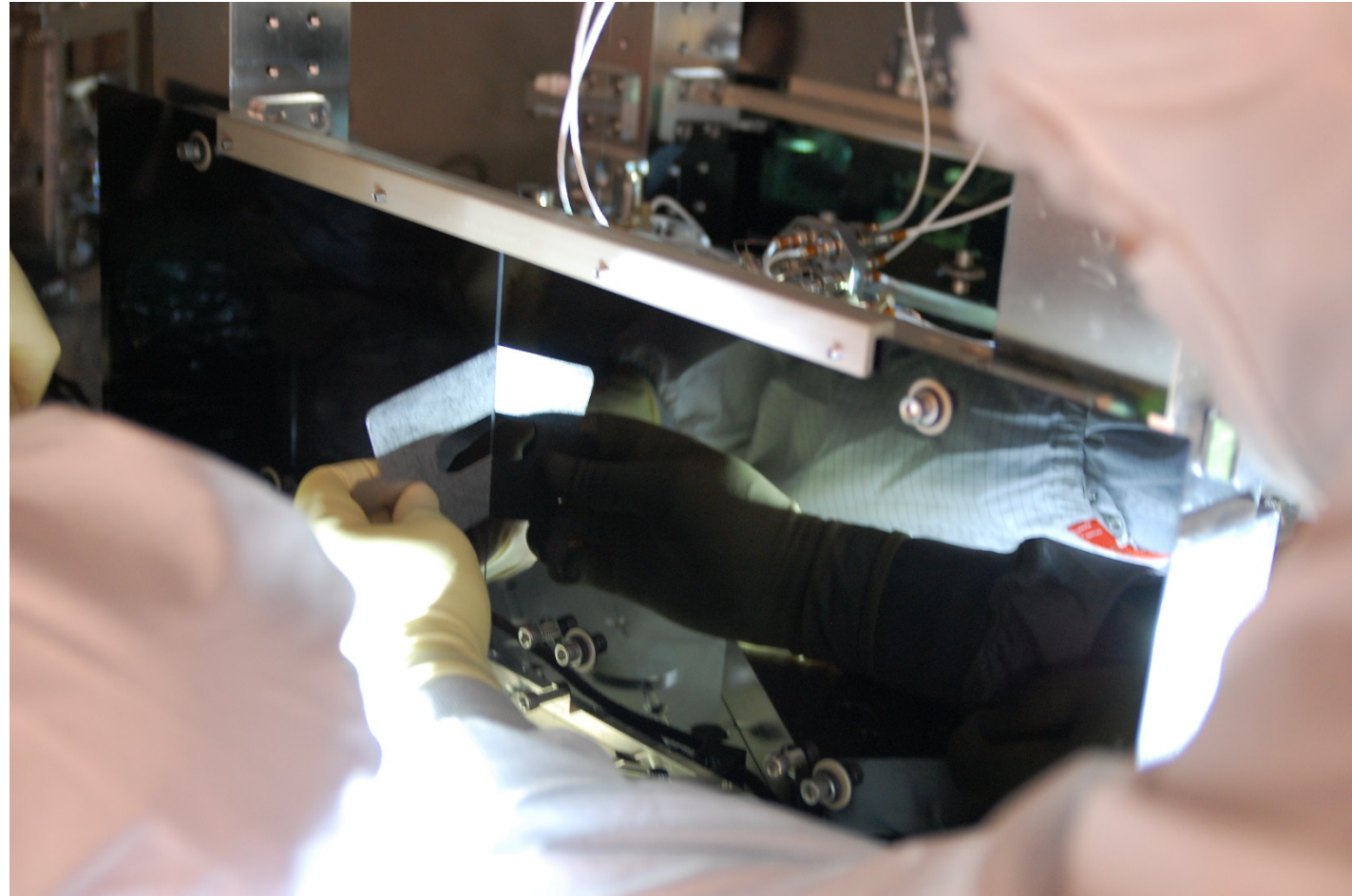
98. Place PEEK Midspan Support (33) on outer panels and loosely secure to 2X Panel Mt Brackets.

- Req. hardware: 2X BHSC 1/40-20 x.5 (48)
- Hardware on Panel Mt Brackets and outer vertical panels was left loose to make this step easier. Will probably have the position of the Panel Mt Brackets to screw the Midspan Support in.

99. Align outer vertical panels using the provided metal shim, then lock everything in place.

- 1/16" gap between glass.
- Tighten 6X glass bolt assy, 10X BHSC (8X on Panel Mt Brackets and 2X on Midspan Support).

100. Slide 2X support shims (42) between set screws and glass, then tighten set screws.



-X Side

+/-Y Side

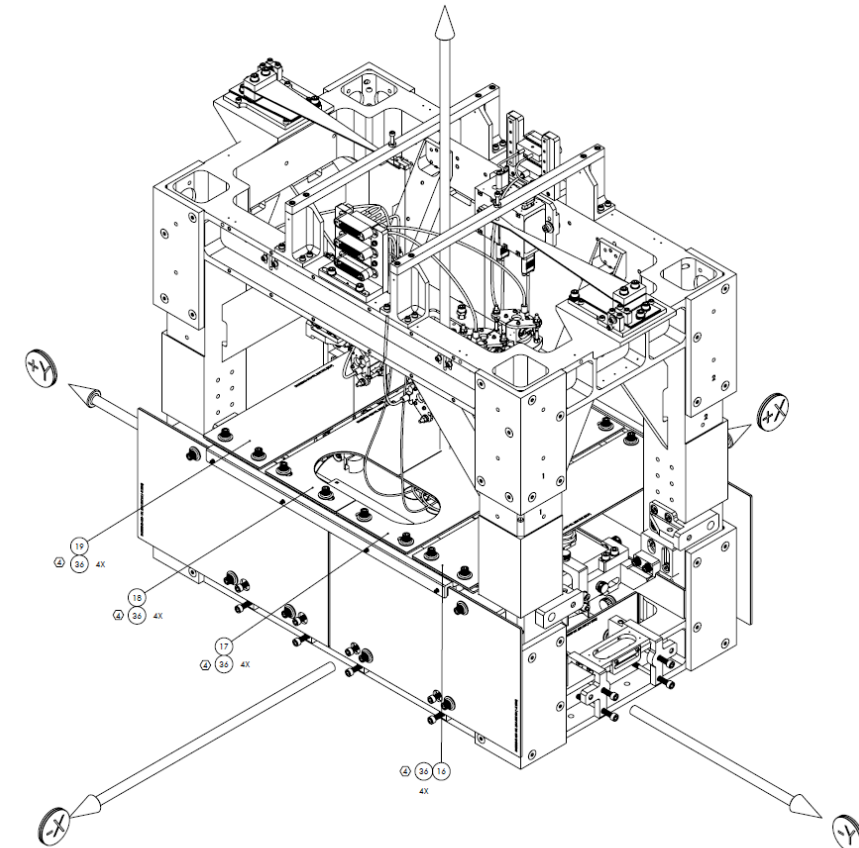
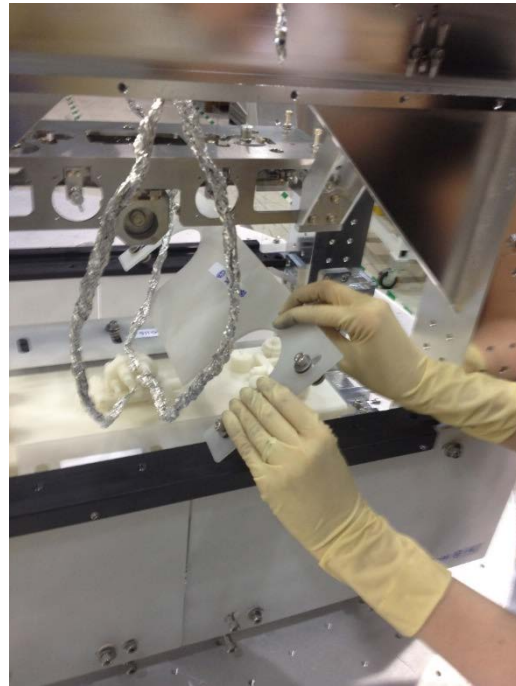
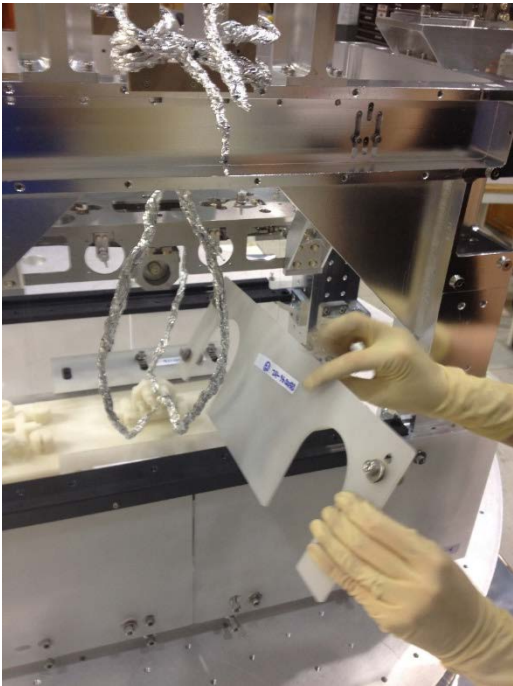
Next steps require 2 people in chamber – 1 on the -X Side and the other on +/-Y Side .

101. Install top outer panel D1500046-102 (17) as shown.

- Position as far inward (away from wires) as possible.
- Tighten down bolt assy to avoid pushing the panel into wires while installing the other top panels.

102. Install top panel -103 (18).

- Position -102 & -103 as close to each other and as far away from the wires as possible.



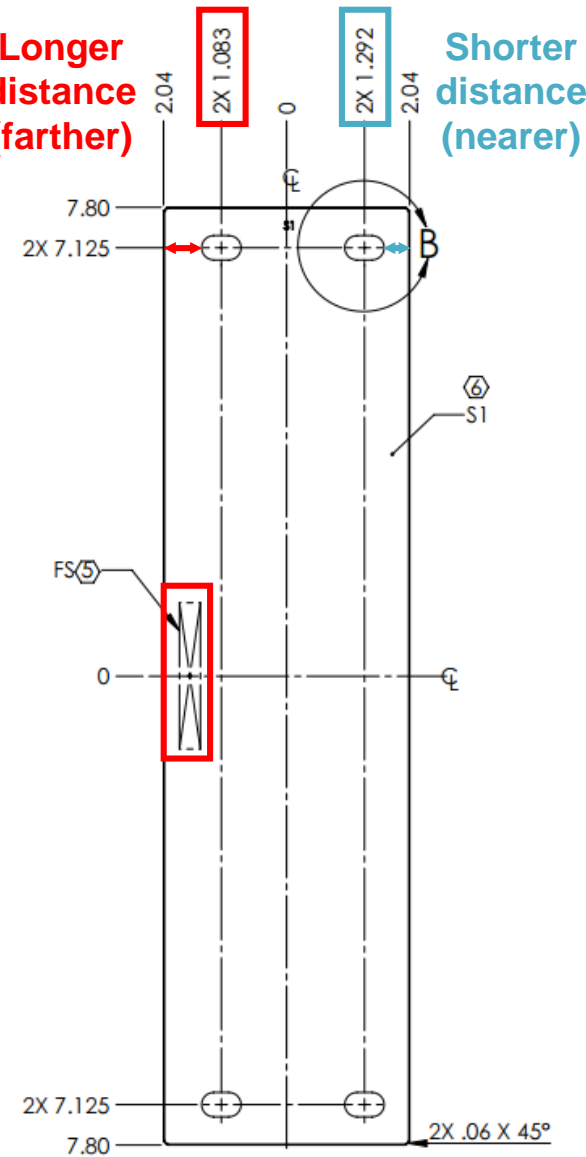
-X Side

+/-Y Side

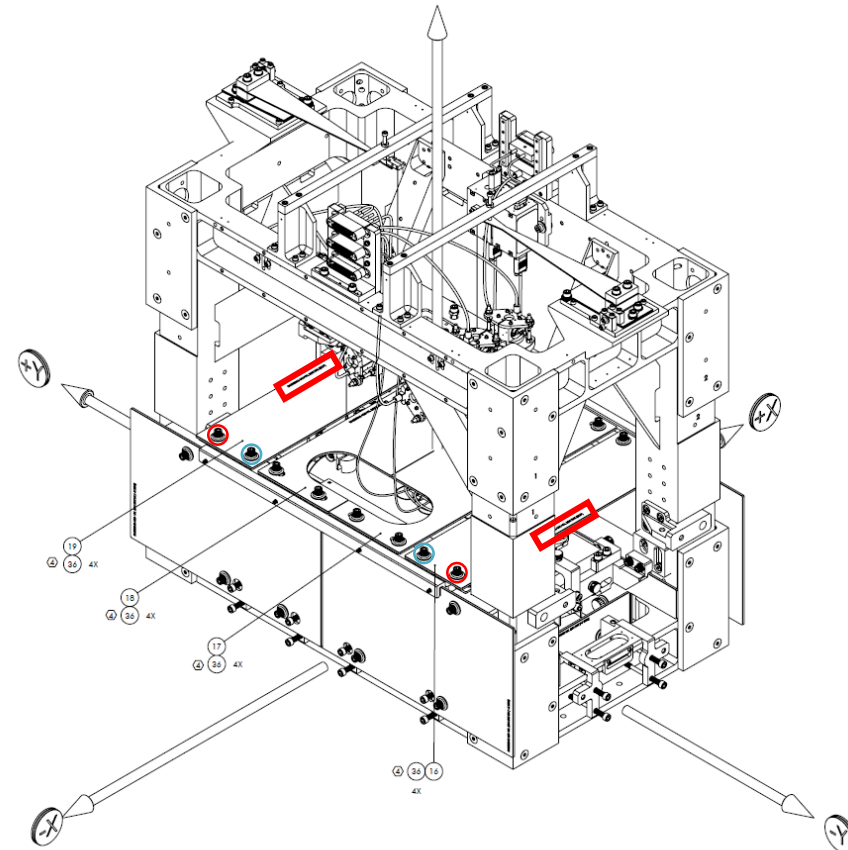
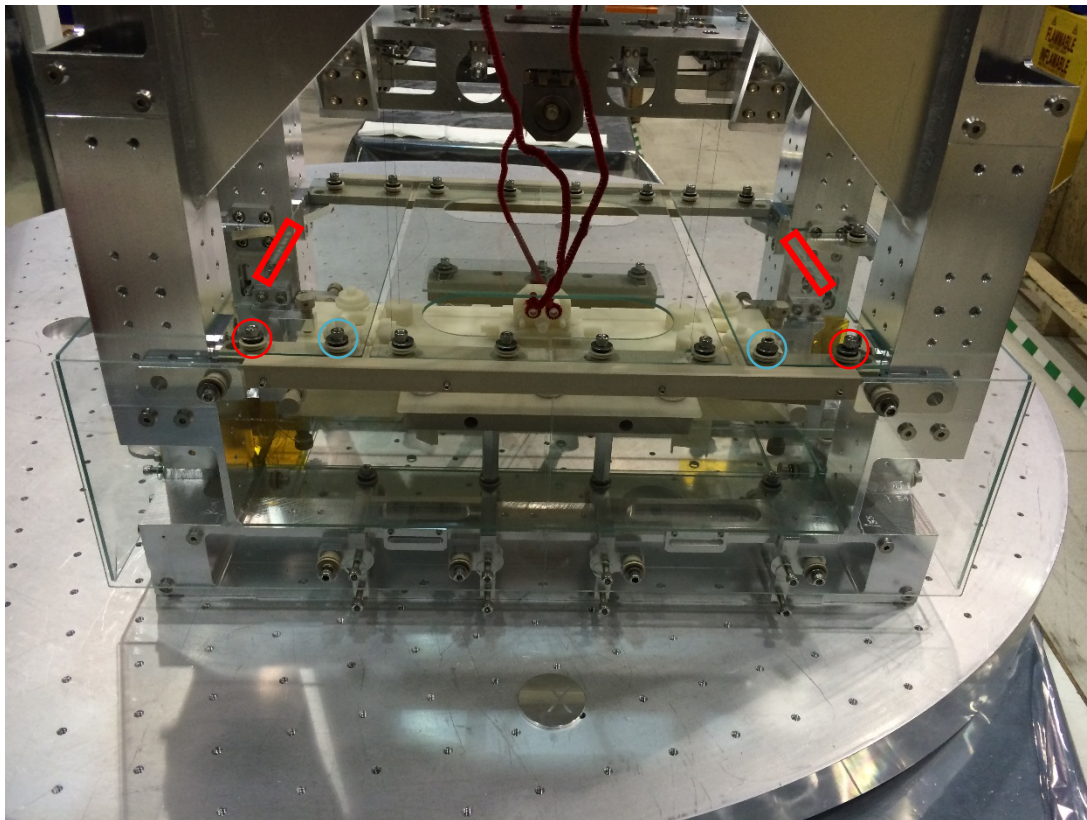
103. Install the top outer panels D1500046-101 & -104 ([16](#) & [19](#)).

- Note the asymmetry between the slots and edges of the glass.
 - The **nearer slot (shorter distance)** is adjacent to the other glass panels.
 - The **farther slot (longer distance)** & the **D#** are adjacent to the OMC's legs.
- Position panels as close to the structure (far away from wires) as possible.

Longer distance (farther) 2X 1.083
Shorter distance (nearer) 2X 1.292



-101 DETAIL



+Y Side

-Y Side

Steps 104 – 107 can be done 1 side at a time by 1 person, or simultaneously by 2 people (recommended):

104. Set (release) all 14 EQ Stop Knobs.

105. Adjust the position of the top outer panels if needed (to avoid touching wires).

106. If the inner vertical panels D1500052 & 53 (26 & 27) were moved due to interference, return them to their correct positions.

107. If dog clamps were moved, put them back.

-Y Side

108. Install inner horizontal panel D1500050 (24).

109. Position outer vertical panel D1500045 (15) as shown.

110. Screw the 2X upper bolt assy into the Panel Mt Brackets (32) first, and then the lower 2X bolt assy into the installed C-Clamps. Leave loose.

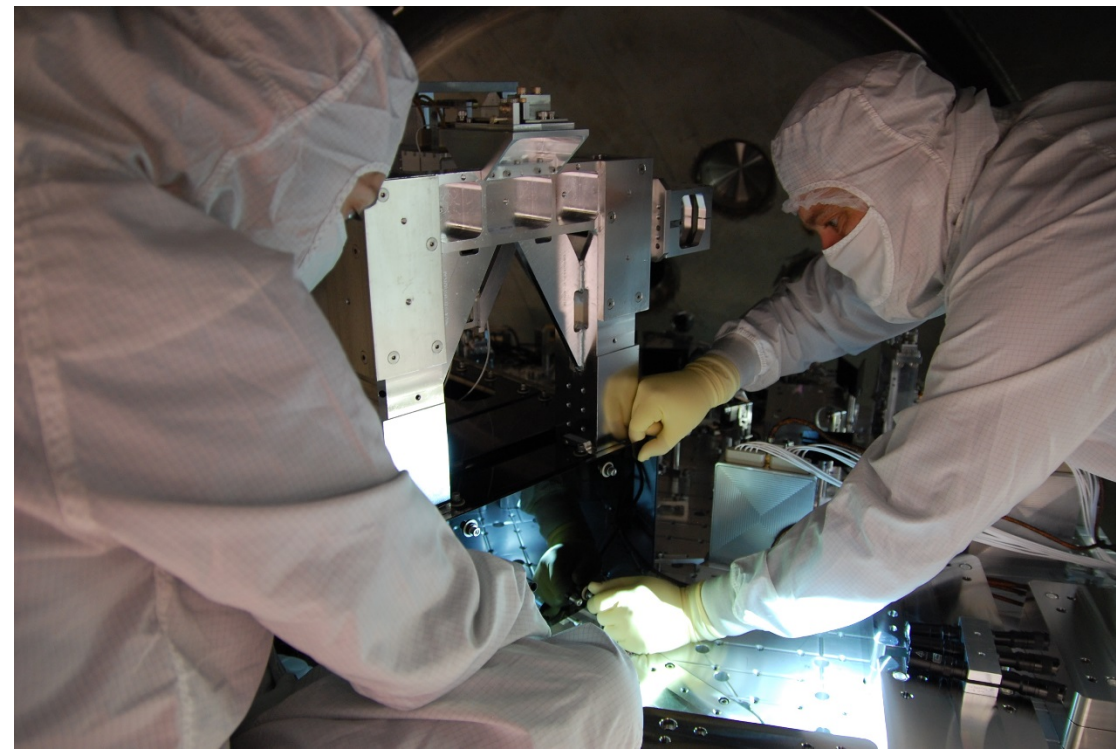
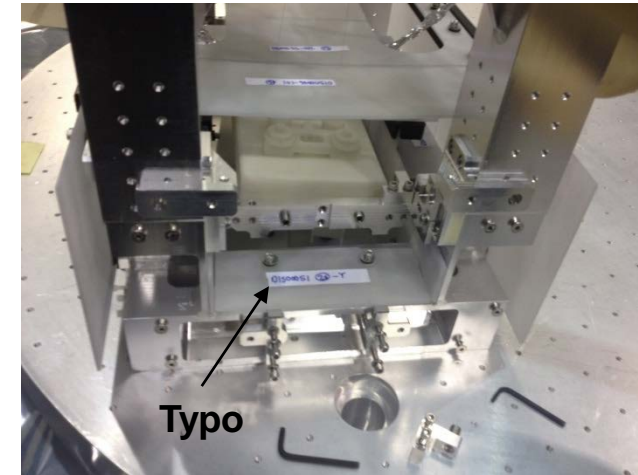
- May have to slide Panel Mt Brackets up/down to reach holes in C-Clamps.

111. Roughly align D1500045 to the other outer vertical panels on the +/-X sides, then lock everything in place.

- Tighten 4X bolt assy, 8X BHSC on Panel Mt Brackets.

112. Remove panel D1500045.

- Needed the panel in place to determine the position the Mt Brackets, but need it out of the way for the next step.

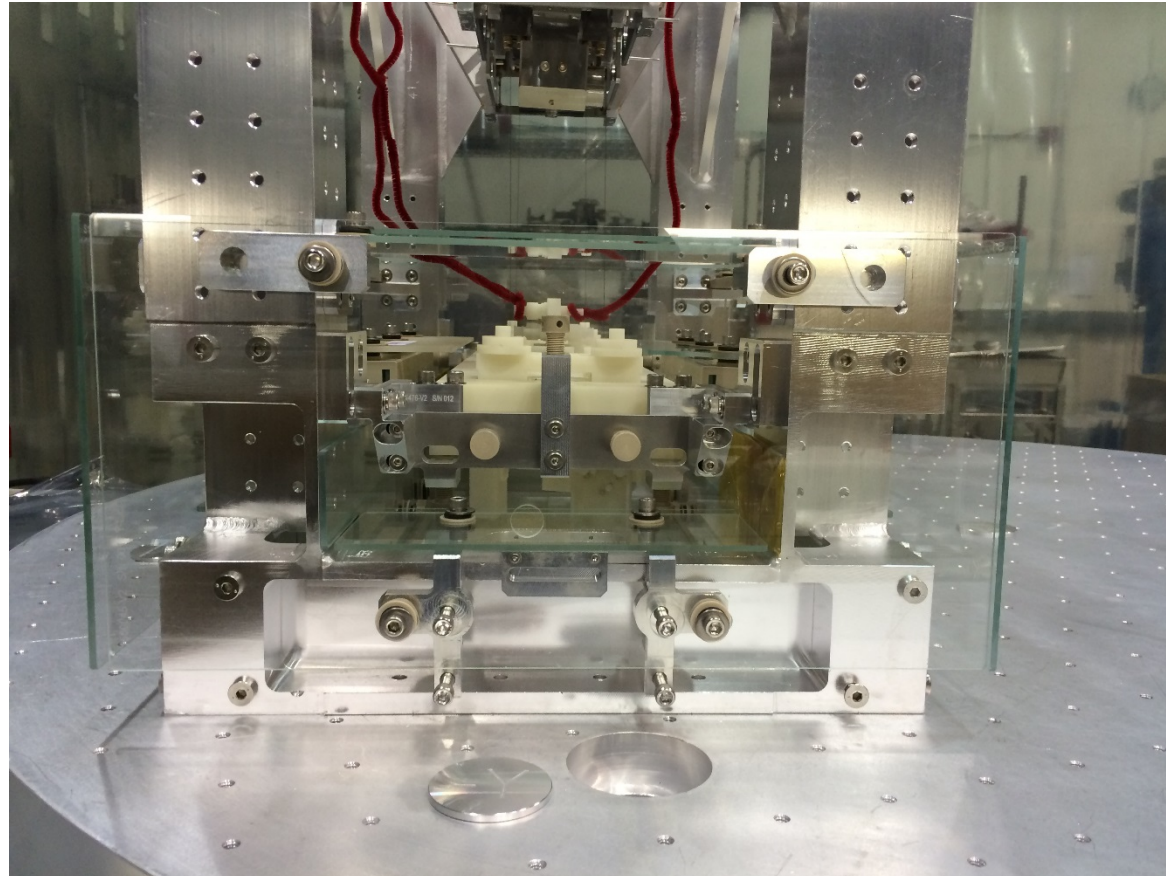


-Y Side

113. Install the top panel extension D1500143 (57).

- Req. hardware: 2X bolt assy (Basic config.) – **not captive**
- 2nd person should hold the panel until the bolt assy are tightened down.

114. Install D1500045.



+Y Side

115. Install inner horizontal panel D1500051 (25).

116. Position outer vertical panel D1500044 (14).

117. Screw the 2X upper bolt assy into the Panel Mt Brackets (32) first, and then the lower 2X bolt assy into the installed C-Clamps. Leave loose.

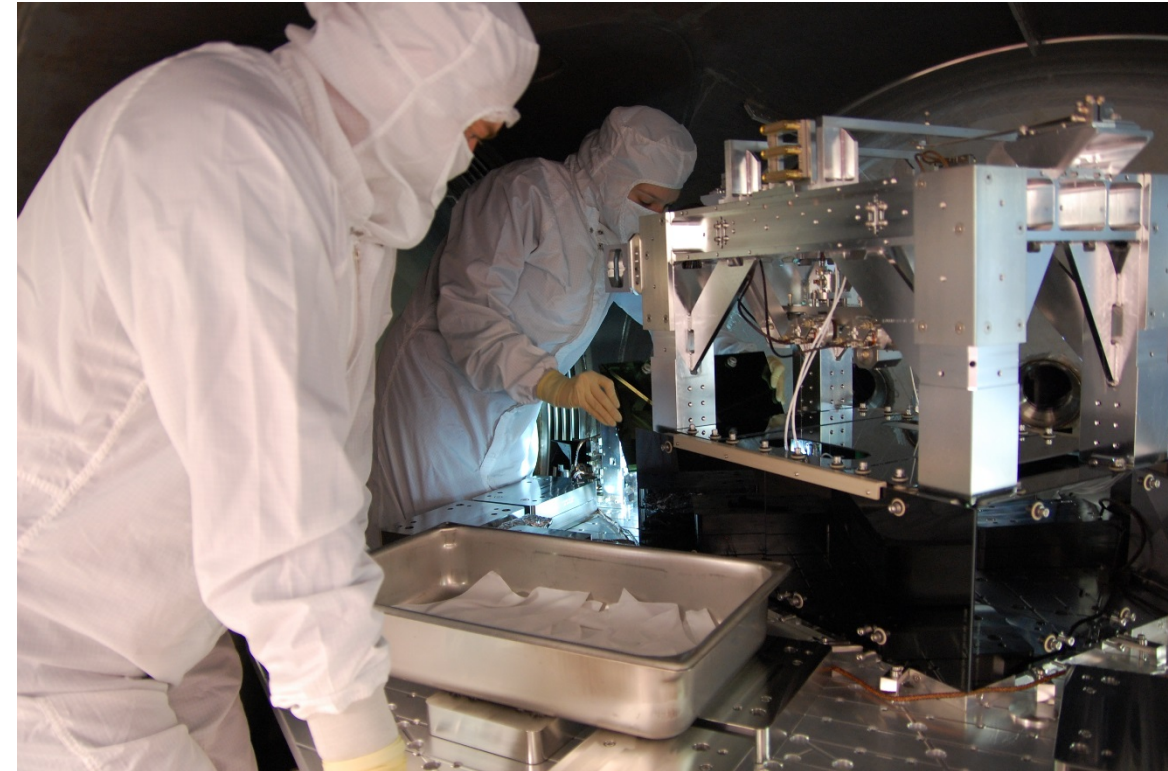
- May have to slide Panel Mt Brackets up/down to reach holes in C-Clamps.

118. Roughly align D1500044 to the other outer vertical panels on the +/-X sides, then lock everything in place.

- Tighten 4X bolt assy, 8X BHSC on Panel Mt Brackets.

119. Remove panel D1500044.

- Needed the panel in place to determine the position the Mt Brackets, but need it out of the way for the next step.

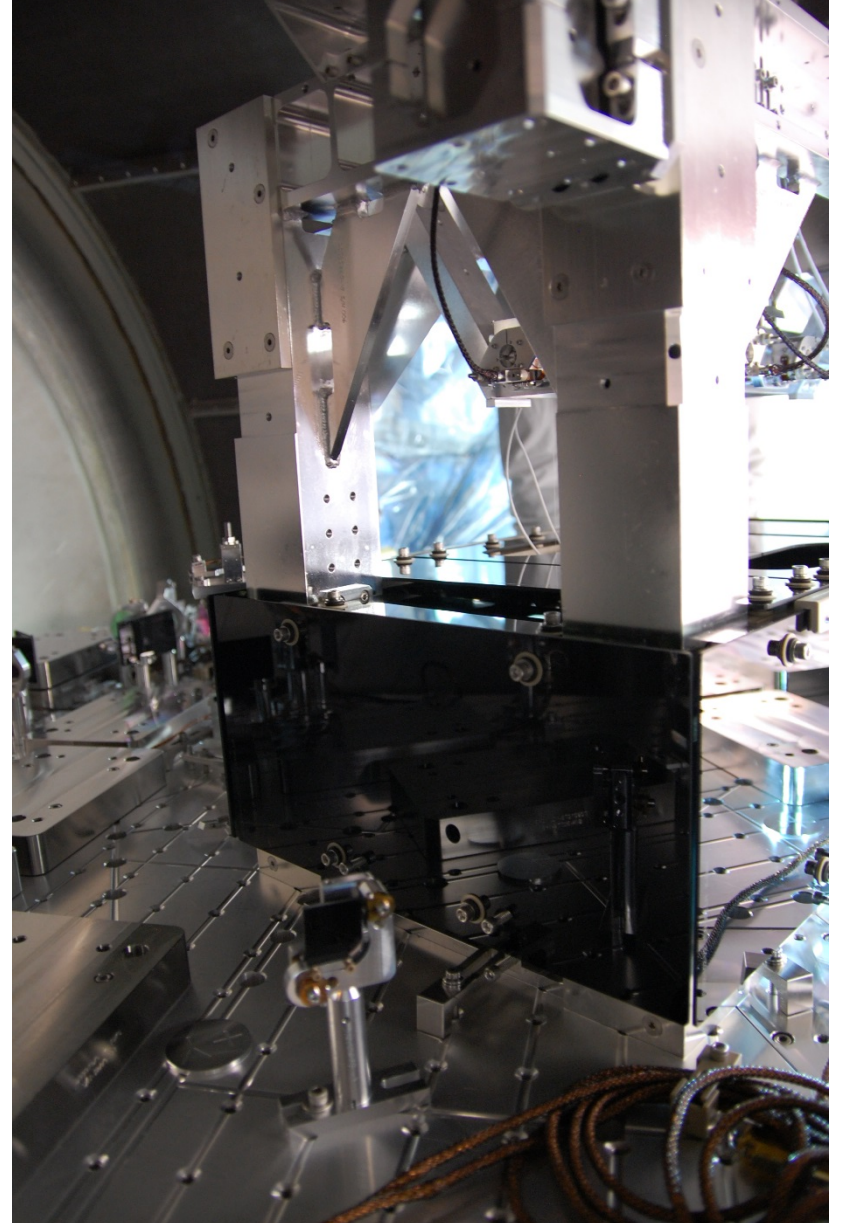


+Y Side

120. Install the top panel extension D1500143 (57).

- Req. hardware: 2X bolt assy (Basic config.) – **not captive**
- 2nd person should hold the panel until the bolt assy are tightened down.

121. Install D1500044.



-X Side

122. Check the top panels one last time to make sure they aren't touching cables or wires.

123.CELEBRATE!

