

# EVA Checklist

## STS-125 Flight Supplement

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**Mission Operations Directorate  
EVA, Robotics, and Crew Systems  
Operations Division**

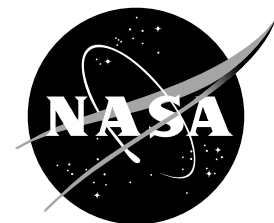
**Final, Rev A  
April 24, 2009**

### **NOTE**

This supplement is to be integrated into the generic edition to provide a complete document for the specific flight. Some pages in the generic edition may be replaced with supplemental pages identified as 'TEMP'. These generic pages, if any, must be retained for use on future flights.

National Aeronautics and  
Space Administration

**Lyndon B. Johnson Space Center**  
Houston, Texas



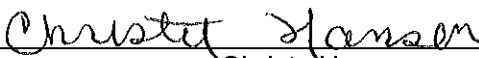


MISSION OPERATIONS DIRECTORATE

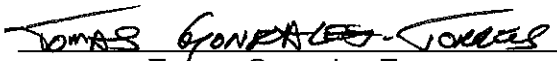
**EVA CHECKLIST  
STS-125 FLIGHT SUPPLEMENT**

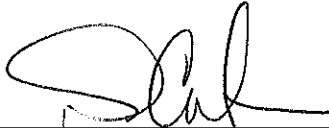
FINAL, REVISION A  
April 24, 2009


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Incorporates the following:		
482#:	EVA FS-00240	EVA FS-00248
	EVA FS-00241	EVA FS-00249
	EVA FS-00242	EVA FS-00250
	EVA FS-00243	EVA FS-00251
	EVA FS-00244	EVA FS-00252
	EVA FS-00245	EVA FS-00253
	EVA FS-00246	EVA FS-00254
	EVA FS-00247	EVA FS-00255

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager

DX35/C. Hansen

281-483-7522

EVA CHECKLIST  
STS-125 FLIGHT SUPPLEMENT

**LIST OF EFFECTIVE PAGES**

FINAL 09/17/08  
REV A 04/24/09

Sign Off .....	*	125/FIN A	TEMP FS 3-7 .....	125/FIN A
FS ii .....	*	125/FIN A	TEMP FS 3-8 .....	125/FIN A
iii .....	*	generic	TEMP FS 4-1 .....	125/FIN A
iv .....	*	generic	TEMP FS 4-2 .....	125/FIN A
FS v .....	*	125/FIN A	TEMP FS 4-3 .....	125/FIN A
FS vi .....	*	125/FIN A	TEMP FS 4-4 .....	ALL/FIN A
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FS viii .....	*	125/FIN A	TEMP FS 4-6 .....	125/FIN A
FS ix .....	*	125/FIN A	TEMP FS 4-7 .....	125/FIN A
FS x .....	*	125/FIN A	TEMP FS 4-8 .....	125/FIN A
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FS xii .....	*	125/FIN A	TEMP FS CC 4-10 .....	125/FIN A
FS xiii .....	*	125/FIN A	4-11 .....	generic
FS xiv .....	*	125/FIN A	4-12 .....	generic
FS xv .....		125/FIN A	5-1 .....	generic
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FS xvii .....		125/FIN A	5-3 .....	generic
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FS xix .....		125/FIN A	A6-1 .....	generic
FS xx .....		125/FIN A	CC A6-2 .....	generic
FS xxi .....		125/FIN A	6-3 .....	generic
FS xxii .....		125/FIN A	CC 6-4 .....	generic
FS xxiii .....		125/FIN A	FS 7-1 .....	125/FIN A
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FS xxv .....		125/FIN A	FS 7-3 .....	⊗ 125/FIN A
FS xxvi .....		125/FIN A	FS 7-4 .....	125/FIN A
1-1 .....		generic	FS 7-5 .....	Δ 125/FIN A
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1-3 .....		generic	FS 7-7 .....	Δ 125/FIN A
1-4 .....		generic	FS 7-8 .....	Δ 125/FIN A
1-5 .....		generic	FS 7-9 .....	Δ 125/FIN A
1-6 .....		generic	FS 7-10 .....	Δ 125/FIN A
1-7 .....		generic	FS 7-11 .....	Δ 125/FIN A
1-8 .....		generic	FS 7-12 .....	Δ 125/FIN A
1-9 .....		generic	FS 7-13 .....	Δ 125/FIN A
1-10 .....		generic	FS 7-14 .....	Δ 125/FIN A
TEMP FS 2-1 .....		125/FIN A	FS 7-15 .....	125/FIN A
TEMP FS 2-2 .....		125/FIN A	FS 7-16 .....	125/FIN A
TEMP FS 2-3 .....		125/FIN A	FS 7-17 .....	125/FIN A
TEMP FS 2-4 .....		125/FIN A	FS 7-18 .....	125/FIN A
TEMP FS 2-5 .....		125/FIN A	FS 7-19 .....	125/FIN A
TEMP FS 2-6 .....		125/FIN A	FS 7-20 .....	125/FIN A
TEMP FS 3-1 .....		125/FIN A	FS 7-21 .....	125/FIN A
TEMP FS 3-2 .....		125/FIN A	FS 7-22 .....	125/FIN A
TEMP FS 3-3 .....		125/FIN A	FS 7-23 .....	125/FIN A
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TEMP FS 3-5 .....		125/FIN A	FS 7-25 .....	125/FIN A
TEMP FS 3-6 .....		125/FIN A	FS 7-26 .....	⊗ 125/FIN A

\* – Omit from flight book

⊗ – Flight copies of this page contain color

Δ – Tear-out page

FS 7-27	.....	125/FIN A	FS 7-83	.....	△	125/FIN A	
FS 7-28	.....	125/FIN A	FS 7-84	.....	△	125/FIN A	
FS 7-29	.....	125/FIN A	FS 7-85	.....		125/FIN A	
FS 7-30	.....	125/FIN A	FS 7-86	.....		125/FIN A	
FS 7-31	.....	125/FIN A	FS 7-87	.....		125/FIN A	
FS 7-32	.....	125/FIN A	FS 7-88	.....		125/FIN A	
FS 7-33	.....	125/FIN A	FS 7-89	.....		125/FIN A	
FS 7-34	.....	⊗	125/FIN A	FS 7-90	.....	⊗	125/FIN A
FS 7-35	.....	125/FIN A	FS 7-91	.....		125/FIN A	
FS 7-36	.....	⊗	125/FIN A	FS 7-92	.....		125/FIN A
FS 7-37	.....	125/FIN A	FS 7-93	.....		125/FIN A	
FS 7-38	.....	125/FIN A	FS 7-94	.....		125/FIN A	
FS 7-39	.....	125/FIN A	FS 7-95	.....		125/FIN A	
FS 7-40	.....	⊗	125/FIN A	FS 7-96	.....		125/FIN A
FS 7-41	.....	125/FIN A	FS 7-97	.....		125/FIN A	
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FS 7-44	.....	125/FIN A	FS 7-100	.....	⊗	125/FIN A	
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FS 7-47	.....	⊗	125/FIN A	FS 7-103	.....		125/FIN A
FS 7-48	.....	⊗	125/FIN A	FS 7-104	.....		125/FIN A
FS 7-49	.....	125/FIN A	FS 7-105	.....		125/FIN A	
FS 7-50	.....	125/FIN A	FS 7-106	.....		125/FIN A	
FS 7-51	.....	125/FIN A	FS 7-107	.....	⊗	125/FIN A	
FS 7-52	.....	125/FIN A	FS 7-108	.....		125/FIN A	
FS 7-53	.....	125/FIN A	FS 7-109	.....		125/FIN A	
FS 7-54	.....	125/FIN A	FS 7-110	.....		125/FIN A	
FS 7-55	.....	125/FIN A	FS 7-111	.....		125/FIN A	
FS 7-56	.....	125/FIN A	FS 7-112	.....	⊗	125/FIN A	
FS 7-57	.....	125/FIN A	FS 7-113	.....		125/FIN A	
FS 7-58	.....	125/FIN A	FS 7-114	.....		125/FIN A	
FS 7-59	.....	125/FIN A	FS 7-115	.....		125/FIN A	
FS 7-60	.....	125/FIN A	FS 7-116	.....		125/FIN A	
FS 7-61	.....	125/FIN A	FS 7-117	.....		125/FIN A	
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FS 7-65	.....	125/FIN A	FS 7-121	.....		125/FIN A	
FS 7-66	.....	125/FIN A	FS 7-122	.....		125/FIN A	
FS 7-67	.....	125/FIN A	FS 7-123	.....		125/FIN A	
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FS 7-69	.....	⊗	125/FIN A	FS 7-125	.....		125/FIN A
FS 7-70	.....	125/FIN A	FS 7-126	.....		125/FIN A	
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FS 7-72	.....	125/FIN A	FS 7-128	.....		125/FIN A	
FS 7-73	.....	125/FIN A	FS 7-129	.....		125/FIN A	
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FS 7-77	.....	125/FIN A	FS 7-133	.....	⊗	125/FIN A	
FS 7-78	.....	125/FIN A	FS 7-134	.....		125/FIN A	
FS 7-79	.....	⊗	125/FIN A	FS 7-135	.....		125/FIN A
FS 7-80	.....	⊗	125/FIN A	FS 7-136	.....		125/FIN A
FS 7-81	.....	125/FIN A	FS 7-137	.....		125/FIN A	
FS 7-82	.....	125/FIN A	FS 7-138	.....		125/FIN A	

⊗ – Flight copies of this page contain color  
△ – Tear-out page

FS 7-139 .....	⊗	125/FIN A	TEMP FS 9-5.....	125/FIN A
FS 7-140 .....		125/FIN A	TEMP FS 9-6.....	⊗ 125/FIN A
FS 7-141 .....	⊗	125/FIN A	TEMP FS 10-1.....	125/FIN A
FS 7-142 .....	⊗	125/FIN A	TEMP FS 10-2.....	ALL/FIN A
FS 7-143 .....		125/FIN A	TEMP FS 10-3.....	ALL/FIN A
FS 7-144 .....		125/FIN A	TEMP FS 10-4.....	125/FIN A
FS 7-145 .....		125/FIN A	TEMP FS 10-4a.....	125/FIN A
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FS 7-147 .....		125/FIN A	10-5 .....	generic
FS 7-148 .....		125/FIN A	10-6 .....	generic
FS 7-149 .....		125/FIN A	TEMP FS 10-7.....	ALL/FIN A
FS 7-150 .....		125/FIN A	TEMP FS 10-8.....	125/FIN A
FS 7-151 .....		125/FIN A	TEMP FS 10-9.....	125/FIN A
FS 7-152 .....		125/FIN A	TEMP FS 10-10.....	125/FIN A
FS 7-153 .....	⊗	125/FIN A	TEMP FS 10-11.....	ALL/FIN A
FS 7-154 .....		125/FIN A	TEMP FS 10-12.....	125/FIN A
FS 7-155 .....		125/FIN A	TEMP FS 10-13.....	125/FIN A
FS 7-156 .....		125/FIN A	TEMP FS 10-14.....	ALL/FIN A
FS 7-157 .....		125/FIN A	FS CC 10-15 .....	125/FIN A
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FS 7-161 .....		125/FIN A	12-i .....	generic
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TEMP FS 8-2b .....		125/FIN A	12-4 .....	generic
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8-4 .....		generic	12-6 .....	generic
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FS 8-9 .....		125/FIN A	12-11 .....	generic
FS 8-10 .....		125/FIN A	12-12 .....	generic
FS 8-11 .....		125/FIN A	12-13 .....	generic
FS 8-12 .....		125/FIN A	12-14 .....	generic
FS 8-13 .....		125/FIN A	12-15 .....	generic
FS 8-14 .....		125/FIN A	12-16 .....	generic
FS 8-15 .....		125/FIN A	12-17 .....	generic
FS 8-16 .....		125/FIN A	12-18 .....	generic
FS 8-17 .....		125/FIN A	12-19 .....	generic
FS 8-18 .....		125/FIN A	12-20 .....	generic
FS 8-19 .....		125/FIN A	12-21 .....	generic
FS 8-20 .....		125/FIN A	12-22 .....	generic
FS 8-21 .....		125/FIN A	12-23 .....	generic
FS 8-22 .....		125/FIN A	12-24 .....	generic
FS 8-23 .....		125/FIN A	12-25 .....	generic
FS 8-24 .....		125/FIN A	12-26 .....	generic
FS 8-25 .....		125/FIN A	FS 12-27.....	125/FIN A
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TEMP FS 9-1 .....		125/FIN A	FS 12-29.....	⊗ 125/FIN A
TEMP FS 9-2 .....		125/FIN A	FS 12-30.....	⊗ 125/FIN A
TEMP FS 9-3 .....		125/FIN A	FS 12-31.....	⊗ 125/FIN A
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FS 12-33 .....	⊗	125/FIN A	FS 16-15.....	125/FIN A
FS 12-34 .....		125/FIN A	FS 16-16.....	125/FIN A
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FS 13-2 .....		125/FIN A	FS 16-18.....	125/FIN A
14-1 .....		generic	FS 16-19.....	125/FIN A
14-2 .....		generic	FS 16-20.....	125/FIN A
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14-4 .....		generic	FS 16-22.....	125/FIN A
14-5 .....		generic	FS 16-23.....	125/FIN A
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14-9 .....		generic	FS 16-27.....	125/FIN A
14-10 .....		generic	FS 16-28.....	125/FIN A
14-11 .....		generic	FS 16-29.....	125/FIN A
14-12 .....		generic	FS 16-30.....	125/FIN A
14-13 .....		generic	FS 16-31.....	125/FIN A
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TEMP FS 15-9 .....		125/FIN A	FS 16-49.....	125/FIN A
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TEMP FS 15-12 .....		125/FIN A	FS 16-52.....	125/FIN A
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16-ii .....		generic	FS 16-56.....	125/FIN A
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FS 16-9 .....		125/FIN A	FS 16-65.....	125/FIN A
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FS 16-14 .....		125/FIN A	FS 16-70.....	125/FIN A

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FS 16-72 .....	125/FIN A	FS 16-128.....	125/FIN A
FS 16-73 .....	125/FIN A	FS 16-129.....	125/FIN A
FS 16-74 .....	125/FIN A	FS 16-130.....	125/FIN A
FS 16-75 .....	125/FIN A	FS 16-131.....	125/FIN A
FS 16-76 .....	125/FIN A	FS 16-132.....	125/FIN A
FS 16-77 .....	125/FIN A	FS 16-133.....	125/FIN A
FS 16-78 .....	125/FIN A	FS 16-134.....	⊗ 125/FIN A
FS 16-79 .....	125/FIN A	FS 16-135.....	⊗ 125/FIN A
FS 16-80 .....	125/FIN A	FS 16-136.....	⊗ 125/FIN A
FS 16-81 .....	125/FIN A	TEMP FS 17-1.....	125/FIN A
FS 16-82 .....	125/FIN A	TEMP FS 17-2.....	ALL/FIN A
FS 16-83.....	⊗ 125/FIN A	FS 17-3.....	125/FIN A
FS 16-84 .....	125/FIN A	FS 17-4.....	125/FIN A
FS 16-85 .....	125/FIN A	FS 17-5.....	125/FIN A
FS 16-86 .....	125/FIN A	FS 17-6.....	125/FIN A
FS 16-87 .....	125/FIN A	FS 17-7.....	125/FIN A
FS 16-88 .....	125/FIN A	FS 17-8.....	125/FIN A
FS 16-89 .....	125/FIN A	FS 17-9.....	125/FIN A
FS 16-90 .....	125/FIN A	FS 17-10.....	125/FIN A
FS 16-91 .....	125/FIN A	FS 17-11.....	125/FIN A
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FS 16-93 .....	125/FIN A	FS 17-13.....	125/FIN A
FS 16-94 .....	125/FIN A	FS 17-14.....	125/FIN A
FS 16-95 .....	125/FIN A	FS 17-15.....	125/FIN A
FS 16-96 .....	125/FIN A	FS 17-16.....	125/FIN A
FS 16-97 .....	125/FIN A	FS 18-1.....	125/FIN A
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FS 16-101.....	125/FIN A	FS CC 18-5 .....	125/FIN A
FS 16-102.....	125/FIN A	FS CC 18-6 .....	⊗ 125/FIN A
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FS 16-104.....	125/FIN A	FS CC 18-8 .....	125/FIN A
FS 16-105.....	125/FIN A	FS 18-9.....	125/FIN A
FS 16-106.....	125/FIN A	FS 18-10.....	125/FIN A
FS 16-107.....	125/FIN A	FS 18-11.....	125/FIN A
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FS 16-109.....	125/FIN A	FS 18-13.....	125/FIN A
FS 16-110.....	125/FIN A	FS 18-14.....	125/FIN A
FS 16-111.....	125/FIN A	FS 18-15.....	125/FIN A
FS 16-112.....	125/FIN A	FS 18-16.....	125/FIN A
FS 16-113.....	125/FIN A	FS 18-17.....	125/FIN A
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FS 16-115.....	⊗ 125/FIN A	FS 18-19.....	⊗ 125/FIN A
FS 16-116.....	125/FIN A	FS 18-20.....	⊗ 125/FIN A
FS 16-117.....	125/FIN A	FS 18-21.....	125/FIN A
FS 16-118.....	125/FIN A	FS 18-22.....	125/FIN A
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FS 16-120.....	125/FIN A	FS 18-24.....	⊗ 125/FIN A
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FS 16-123.....	125/FIN A	FS 18-27.....	125/FIN A
FS 16-124.....	125/FIN A	FS 18-28.....	125/FIN A
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FS 16-126.....	125/FIN A	FS 18-30.....	⊗ 125/FIN A

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FS 18-31	⊗	125/FIN A	FS 18-87	⊗	125/FIN A
FS 18-32		125/FIN A	FS 18-88	⊗	125/FIN A
FS 18-33	⊗	125/FIN A	FS 18-89	⊗	125/FIN A
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(Back of DEPRESS/REPRESS) .....	CC 6-4	generic
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CREW AID IFs (Front) .....	FS CC 18-5	EVA-4a/125/O/A
SSM-ES AND AFT SHROUD CREW AID IFs		
(VIEWING FROM EXTERNAL) (Back) .....	FS CC 18-6	EVA-4b/125/O/A
HST LAYOUT (Front) .....	FS CC 18-7	EVA-6a/125/O/A
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RESCUE EVA 2 DEPRESS/REPRESS CUE CARD		
(Front) .....	FS CC 22-49	EVA-8a/125/O/A
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AIRLOCK  
CONFIG

## AIRLOCK PREP (50 min)

	Retrieve or unstow following equipment:	
MF14K	3/8-in breaker bar, 4-in ext w/3/8-in drive	
IFM Tool Kit	1/2-in socket w/3/8-in drive	
Vol H	EMU Equipment Bag – attach to middeck wall	
	Helmet Lights (2)	
	Adjustable Wrench and Airlock Ratchet w/7/16-in socket from EVA Bag	
	EMU Servicing Kit	
FDF Locker	Cuff Checklists (4) – stow in EMU Equipment Bag	
	<u>DEPRESS/REPRESS</u> Cue Card	
AW18A	1. √Inner hatch Equal vlv (two) – OFF	
	2. LTG FLOOD (four) – ON	
	3. Remove from airlock, as reqd:	
	Airlock Stowage Bag	
	Airlock Floor Pallet using 3/8-in breaker bar, 4-in ext w/3/8-in drive, and 1/2-in socket w/3/8-in drive	
	4. Stow Vol H Bags back in Vol H	
	5. Stow Adjustable Wrench and Airlock Ratchet w/7/16-in socket to HST Tool Bag	
	6. Transfer to airlock:	
	<u>DEPRESS/REPRESS</u> Cue Card	
	7. Install IVA foot restraint, as reqd	
	8. Unbuckle SCU straps, Velcro SCU to wall	
EMUs 3,4	9. Disconnect helmets from Airlock EMUs, install Helmet Lights and Helmet Light Batteries per <u>STS-125 EVA CONSUMABLES CUE CARD (EMU     MAINT/RECHARGE)</u> ; temp stow	
	10. Remove comm caps from LTA Restraint Bags and connect to electrical harnesses, stow B/U comm cap s/n 1189 in EMU Equipment Bag	
	11. Remove LTA Restraint Bags from EMUs	
	12. Disconnect waist rings; remove and stow any equipment stowed in HUT/LTA	
BOTH	13. Attach Cuff Checklists	
	14. Stow LTA Restraint Bags on Airlock AAPs	
	15. √Thermal cover clear of waist ring	
	16. Waist ring – engage posn	
	17. Connect LTA to HUT, lock	
EMUs 1,2	18. Remove 20-g Crash Bag from middeck EMUs	
	19. Retrieve Modified Depress valve cap from MF71H, secure in airlock	

AIRLOCK  
CONFIG

## EMU SWAP (30 min)

### NOTE

EMUs A,B are to be removed from the airlock  
EMUs C,D are to be installed in the airlock

- |          |   |   |
|----------|---|---|
| EMU A,B  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 1. Install gloves   |
| AW18H    | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 2. √PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF<br>√MODE (two) – OFF  |
| DCM      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 3. √SCUs disconnected, DCM covers installed   |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 4. √SCUs stowed on AAPs.  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 5. Release EMUs from AAPs, transfer EMUs to middeck   |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 6. Remove EMU Batteries (EMU BATTERY<br>REMOVAL/INSTALLATION, EMU MAINT/RECHARGE); temp<br>stow for charging in ~4 hr |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 7. Install helmets  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 8. Unstow REBA jumper cables  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 9. Remove EMUs C,D from middeck AAPs, install EMUs A,B  |
| EMUs C,D | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 10. Disconnect helmets with sunshades down and helmet covers<br>installed temp stow                                   |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 11. Transfer EMUs to airlock  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 12. Mount EMUs on airlock AAPs  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 13. √REBA sw – OFF (toward left arm of suit)  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 14. √Helmet lights, helmet light batteries, and EMU TVs installed on<br>helmets                                       |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 15. √EMU TV power cables demated, connected to ground plugs   |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 16. Remove Drink Bag Restraint Bags   |

### NOTE

Drink bag should be used within 24 hr  
if filled with non-iodinated water

- |  |   |   |
|--|---|---|
|  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 17. Fill drink bags from galley with cold water, remove gas and insert<br>drink bags in restraint bags                                  |
|  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 18. Install Drink Bag Restraint Bags in HUTs and dispose of fill tools<br>in wet trash  |
|  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 19. Unstow comm caps and inspect moisture barrier earphone<br>diaphragms (MBEDs) (2) for damage. Replace if reqd (EMU<br>Servicing Kit) |
|  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 20. As required, apply anti-fog (EMU Servicing Kit), wipe off:<br>Helmets (not Fresnel lens)<br>EV glasses, stow in EMU Equipment Bag   |
|  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 21. Stow EMU Servicing Kit as required  |
|  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 22. Install helmets, lock   |
|  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 23. √Cuff C/Ls installed  |
|  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 24. √Wrist mirrors installed  |
|  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 25. Stage crew preference items in EMU Equipment Bag as reqd  |

## LTA RESTRAINT BAG REMOVAL (15 min)

### NOTE

May be performed on EMUs 1,2,3, and 4 simultaneously

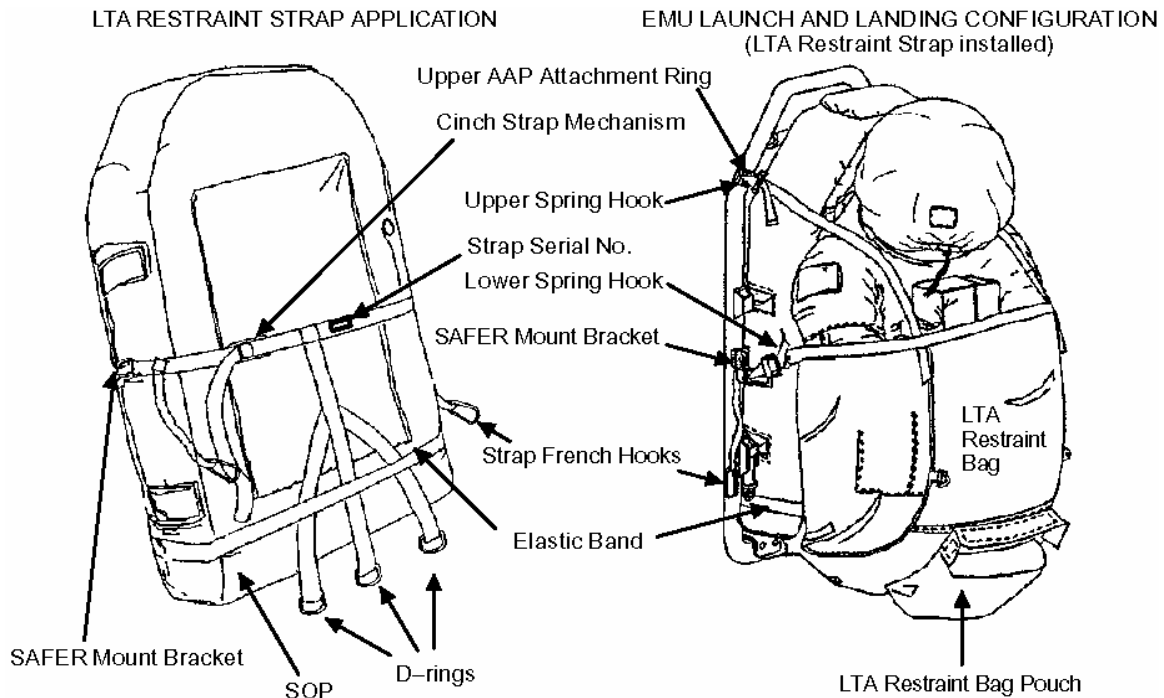
1. Disconnect upper spring hooks (two) from AAP attachment rings
2. Disconnect lower spring hooks (two) from AAP attachment rings
3. Pull Restraint Bag off of EMU, leave bottom connected to bottom of AAP
4. Roll LTA Restraint Bag up and use button snap to retain

## LTA RESTRAINT BAG INSTALLATION (15 min)

### NOTE

May be performed on EMUs 1,2,3, and 4 simultaneously.  
Perform steps as reqd for current EMU config. Procedure written to install in Launch/Landing config shown below

- |          |   |
|----------|---|
| AAPs     | 1. Unroll LTA Restraint Bag (4) from AAP bottom   |
| All EMUs | 2. Engage EMU in AAPs   |
|          | 3. Stow LTA, suit arms inside LTA Restraint Bag   |
|          | 4. Connect upper spring hooks (two) over suit shoulders to upper AAP attachment rings (two) |
|          | 5. Connect lower spring hooks (two) to AAP attachment rings (two)                           |
|          | 6. Tighten all LTA bag straps with bag as high as possible on EMU                           |



### NOTE

French hooks should be attached to SAFER mount brackets for launch and landing

## EVA BATTERIES AND CHARGER SETUP (30 min)

### NOTE

Refer to REF DATA to verify specific plug-in plan locations listed in this procedure

Retrieve or unstow the following equipment:

Mass ECOK Spare Helmet Bag – label “Charged”  
 Good’s ECOK Spare Mesh Bag – label “EVA Systems Bag”

Location	Item	Stow in	
		“Charged” bag	“EVA Systems Bag”
ML60B	2 EHIP battery chargers		<b>X</b>
MF43H	6 PGT Batteries	<b>X</b>	
MF43H	2 EHIP DC Y PWR Cable		<b>X</b>
MF57C	1 EHIP battery charger		<b>X</b>
MF57C	1 EMU middeck battery charger		<b>X</b>
MF57C	1 REBA charger		<b>X</b>
MF57H	4 EHIP batteries	<b>X</b>	
MA16F	3 EHIP-PGT adapter cables		<b>X</b>
MA16F	1 PGT battery	<b>X</b>	
MD Floor STBD 1	4 REBA batteries	<b>X</b>	
MD Floor STBD 1	1 EHIP battery w/Thermal pouch (for SCM)	<b>X</b>	

- Secure “Charged” and “EVA Systems Bag” near battery central, as desired

- MO63P J3
- √REBA EXT (25’) connected to J3 and REBA DC Y PWR cable (pre-routed)
  - √DC UTIL PWR – OFF
  - cb – closed (in)
  - Unstow REBA charger and plug it into REBA DC Y PWR cable (2 plugs)
  - Stow REBA charger in battery central or near middeck EMUs as desired

- ML85E J22
- √DC UTIL PWR – OFF
  - cb – closed (in)
  - Unstow EMU middeck battery charger and plug it into J22
  - Stow EMU middeck charger in battery central

- ML85E J23
- √DC UTIL PWR – OFF
  - cb – closed (in)
  - Unstow and plug into J23, 1 EHIP DC Y PWR Cable
  - Unstow 2 EHIP battery chargers and plug them into the EHIP DC Y PWR Cable
  - Stow EHIP chargers in battery central

- ML85E J13
- √DC UTIL PWR – OFF
  - cb – closed (in)
  - Unstow and plug into J13, 1 EHIP DC Y PWR Cable
  - Unstow 1 EHIP battery charger and plug it into one leg of the EHIP DC Y PWR Cable
  - √Unused leg of EHIP DC Y PWR Cable is capped
  - Stow EHIP charger in battery central

- Secure 3 EHIP-PGT adapter cables near EHIP chargers in battery central or leave in “EVA Systems Bag” for use later

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CHECKOUTS

EMU CHECKOUT .....	TEMP FS 3-2
EMU POWERUP AND COMM CHECK .....	TEMP FS 3-2
PRIMARY REGULATOR/FAN/PUMP CHECK.....	TEMP FS 3-4
SOP CHECK .....	TEMP FS 3-5
BATTERY CHARGE CHECK INIT .....	TEMP FS 3-6
BATTERY CHARGE CHECK TERM.....	TEMP FS 3-6
EMU SWAP DURING CHECKOUT.....	TEMP FS 3-7
POST EMU C/O RECONFIG .....	TEMP FS 3-7
REBA POWERED HARDWARE CHECKOUT.....	TEMP FS 3-8

# EMU CHECKOUT

## NOTE

Procedures are written for simultaneous C/O of EMU 3 (stbd) and 4 (port) in airlock. An additional C/O of EMUs 1 and 2 use same procedure after performing EMU SWAP during C/O

X: SM 60 SM TABLE MAINT

- 1. Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

Param Name	Param ID	Lower Limit	Upper Limit
EXT A/L H2O LINE T			
EXT A/L H2O SPLY ZN 1 T	0640181	43	100
EXT A/L LCG 2 SPLY ZN 1 T	0640182	36	85
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	100
EXT A/L LCG 2 SPLY ZN 2 T	0640185	36	82
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	80
EXT A/L BATT CHARGER			
VOLTS EMU 1	0640210	OSL	OSH
VOLTS EMU 2	0640213	OSL	OSH

## EMU POWERUP AND COMM CHECK (15 min)

### NOTE

PWR RESTART msg and BITE light should be illuminated whenever EMU power is cycled. Display and tone tests only occur during cold restarts

- AW82B     2.  $\sqrt$ EV-1, EV-2 O2 vlv (two) – CL
- BOTH DCM     3. Retrieve, position SCUs; remove DCM covers
- 4. Connect SCUs to DCM,  $\sqrt$ locked
- 5. PWR – BATT

### CAUTION

EMU must be on BATT pwr when airlock power supply is turned on

- AW18H     6. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR  
BUS SEL (two) – MNA(MNB)
- 7.  $\sqrt$ EMU INPUT 1,2 volts = 18.0-20.0
- EV AW18D     8.  $\sqrt$ AIRLK AUD PWR – OFF
- BOTH DCM     9. COMM mode – ALT
- 10.  $\sqrt$ Comm FREQ – LOW
- IV A1R     11.  $\sqrt$ AUD CTR UHF A/G 1,2 (two) – OFF  
A/A – T/R
- R14:C     12.  $\sqrt$ cb MNA UHF EVA – cl  
 $\sqrt$ MNC UHF EVA – cl

CHECKOUTS

- R10  13. BIOMED CH 1 – EVA 1  
CH 2 – EVA 2
- IVA ATU  14. √AUD PWR – AUD/TONE  
A/G 1,2 (two) – OFF  
A/A – T/R  
ICOM A,B (two) – OFF (as reqd)
- O6  15. UHF SPLX/EVA PWR AMP – OFF  
MODE – EVA
- BOTH  16. √Helmets disconnected  
 17. Don comm caps

**NOTE**

After the next step, be prepared to verify no missing segments on display and that all tones are audible

18. PWR – SCU
19. Verify no missing segments during display test  
Verify BITE light extinguishes  
Verify status (continuous) tone and warble tone are audible

Report any anomalies to MCC

20. Perform onboard A/A comm check per table

EMUs		IV O6:	
MODE	FREQ	EVA STRING	UHF SPLX/EVA XMIT FREQ
ALT	LOW	2	259.7/414.2
ALT	HIGH	2	296.8/417.1
PRI	HIGH	1	296.8/417.1
PRI	LOW	1	259.7/414.2

- IV IVA ATU  21. AUD A/G 1(2) – T/R
- A1R  22. AUD CTR UHF A/G 2(1) – T/R  
√A/G 1(2) – OFF  
A/A – OFF
- BOTH  23. Verify RF comm with MCC
- IV A1R  24. AUD CTR UHF A/G 2(1) – OFF
25. Doff comm caps
- DCM  26. DISP – STATUS, until  displayed  
– YES (hold for 2 sec)  
– STATUS, until  displayed  
– YES (hold for 2 sec)  
Verify  displayed

PRIMARY REGULATOR/FAN/PUMP CHECK (40 min)

MD(fir)  27. EMU O2 ISOL VLV – OP

DCM  28.  $\sqrt{\text{STATUS: O2 P}} = 850-950$

EMU	1	2	3	4
28. O2 P				

AW82B  29. EV-1, EV-2 O2 vlv (two) – OP

30. Install helmet, lock

31.  $\sqrt{\text{Suit arms aligned}}$

32.  $\sqrt{\text{Gloves locked}}$

33.  $\sqrt{\text{Helmet purge vlv – cl, locked}}$

DCM  34. PURGE vlv – cl (dn)

35. O2 ACT – IV

36.  $\sqrt{\text{STATUS: SUIT P}} = 0.4-1.4$  and stable (compare w/gauge)

EMU	1	2	3	4
36. SUIT P (IV)				

37. O2 ACT – PRESS

38.  $\sqrt{\text{STATUS: SUIT P}} = 4.2-4.4$  and stable (compare w/gauge)

$\sqrt{\text{H2O TEMP}} = \text{ambient}$

$\sqrt{\text{H2O GP}} = 14.0-16.0$

$\sqrt{\text{H2O WP}} = 14.0-16.0$

EMU	1	2	3	4
38. SUIT P (PRESS)				
H2O TEMP				
H2O GP				
H2O WP				

39. DISP – STATUS, until LEAK CHECK? displayed

DISP – YES (hold for 2 sec)

Follow displayed instructions

EMU	1	2	3	4
39. $\Delta P$				

\* If LEAKAGE HI/ SUIT P msg occurs ( $\Delta P > 0.3$  psi), \*

\* go to FAILED LEAK CHECK (14.7/10.2 PSI) Cue \*

\* Card, CC 6-4 \*

DCM  40. O2 ACT – OFF

41. PURGE vlv – op (up)

42.  $\sqrt{\text{STATUS: SUIT P}} < 0.4$  (compare w/gauge)

43. Disconnect glove

44. Reconnect glove

45. Disconnect helmet, temp stow

46. Disconnect waist ring – secure LTA to outer hatch handrail

47. Remove Multiple Water Connector cover, temp stow

48. Connect LCVG,  $\sqrt{\text{locked}}$

DCM  49.  $\sqrt{\text{Temp control vlv – Max C}}$

**CAUTION**  
Minimize fan operation with O2 ACT – OFF (~2 min)

- 50. FAN – ON (PWR RESTART may occur)  
Verify flow at neck ring vent port
- AW18H □□□□ 51. √EMU INPUT amps = 1.5-4.7 (1.5-5.0 at 14.7)

EMU	1	2	3	4
51. INPUT AMPS				

- 52. Install SCOF, lock
- DCM □□□□ 53. O2 ACT – IV, **NO VENT FLOW** msg, DISP – PRO  
√Cooling flow in LCVG
- 54. √STATUS: **H2O TEMP** decrease from step 38

EMU	1	2	3	4
54. H2O TEMP				

- \* If no temp decrease, depress and hold pump priming \*
- \* valve on back of EMU, while slowly cycling TCV \*
- \* between 7 and Max C (30 sec minimum) \*

- AW18H□□□□ 55. √EMU INPUT amps = 1.5-3.6 (1.5-4.0 at 14.7)  
√EMU INPUT amps decrease from step 51

EMU	1	2	3	4
55. INPUT AMPS				

- DCM □□□□ 56. PWR – BATT, **NO VENT FLOW** message, DISP – PRO
- 57. √STATUS: **BAT VDC** ≥ 16.5  
**BAT AMPS** = 2.3-3.7 (2.4-4.0 at 14.7)  
**RPM** = 18.0-20.0 K

EMU	1	2	3	4
57. BAT VDC				
BAT AMPS				
RPM				

- 58. √Fan noise steady
- 59. O2 ACT – OFF
- 60. FAN – OFF
- 61. PWR – SCU

**SOP CHECK** (5 min)

- DCM □□□□ 62. DISP – STATUS, until **DATA?COMBO** displayed  
– YES (hold for 2 sec)  
– STATUS, until **DATA EMU?** displayed  
– YES (hold for 2 sec)  
Verify **DATA?EMU** displayed

- DCM □□□□ 63. √STATUS: **SOP P** = 5410-6800

EMU	1	2	3	4
63. SOP P				

SOP  64.  $\sqrt$ SOP gauge 5400-6800, note SOP interstage gauge

EMU	1	2	3	4
64. SOP GAUGE				
INT GAUGE				

DCM  65. DISP – STATUS until  SUIT P displayed  
– YES (hold for 2 sec) to lock parameter

66. Depress SOP manual override (50 sec max):  
 $\sqrt$ SOP interstage gauge < 600  
DCM  $\sqrt$ STATUS:  SUIT P = 3.4-3.9

EMU	1	2	3	4
66. SUIT P				
INT GAUGE				

67.  $\sqrt$ STATUS:  SOP P = 5410-6800

EMU	1	2	3	4
67. SOP P				

- 68. Remove SCOF, stow
- 69. Disconnect LCVG, stow in respective ECOK
- 70. Install Multiple Water Connector cover
- 71. Install helmet, LTA
- DCM  72. COMM mode – OFF

BATTERY CHARGE CHECK INIT (15 min)

AW18H 73. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
MODE (two) – CHARGE  
BUS SEL (two) – MNA(MNB)

74. Continue charge 15 min, minimum

BATTERY CHARGE CHECK TERM

When PWR/BATT CHGR EMU INPUT AMPS < 1 and 15 min minimum charge complete:

75. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
MODE (two) – OFF

**EMU SWAP DURING CHECKOUT (30 min)**

**NOTE**

EMUs 3, 4 to be removed from airlock.  
EMUs 1,2 to be installed in airlock

- EMU 3,4   76. ✓Gloves installed
- DCM   77. Disconnect SCUs, install DCM covers
- 78. Stow SCUs on AAPs, Velcro to wall
- 79. Release EMUs from AAPs, transfer EMUs to middeck
- 80. Stow LTA Restraint bags on airlock AAPs.
- EMU 1,2   81. Disconnect helmets, temp stow
- 82. Install comm caps from LTA Restraint Bags to electrical harness
- 83. Remove LTA Restraint Bags from EMUs
- 84. Release EMUs from middeck AAPs
- 85. Stow LTA Restraint Bags on middeck AAPs
- All EMUs   86. Perform REBA BATTERY INSTALLATION (EMU MAINT/RECHARGE) refer to STS-125 EVA CONSUMABLES CUE CARD (EMU/MAINT/RECHARGE)
- EMUs 3,4   87. Install EMUs in middeck AAPs
- EMUs 1,2   88. Transfer EMUs to Airlock
- 89. Install EMUs on airlock AAPs (EV1 stbd, EV2 port)
- 90. Disconnect waist ring; remove and stow any equipment stowed in HUT/LTA
- 91. Waist ring – engage posn
- 92. Connect LTA to HUT, lock

**NOTE**

O2 vlvs for SCUs connecting to EMUs must be closed prior to EMU checkout

- AW82B   93. EV-1, EV-2 O2 vlv – CL
- 94. Go to EMU POWERUP AND COMM CHECK, TEMP FS 3-2

**POST EMU C/O RECONFIG (5 min)**

When EMU C/O for all EMUs complete:

- IV O6  95. UHF MODE – OFF
  - ✓SPLX/EVA XMIT FREQ – 259.7/414.2
  - ✓PWR AMP – OFF
  - ✓SPLX SQUELCH – ON
- R10  96. ✓BIOMED CH 1 – EVA 1
  - ✓CH 2 – EVA 2
- AW82B  97. EV-1, EV-2 O2 vlv (two) – CL
- BOTH DCM  98. Remove SCUs, install DCM covers
- 99. Stow SCU on AAP, Velcro to wall
- IV ML86B:C  100. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl (heaters will be deactivated on MCC call)

**X: SM 60 SM TABLE MAINT**

- 101. Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

Param Name	Param ID	Lower Limit	Upper Limit
EXT A/L H2O LINE T			
EXT A/L H2O SPLY ZN 1 T	0640181	43	145
EXT A/L LCG 2 SPLY ZN 1 T	0640182	49	145
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	145
EXT A/L LCG 2 SPLY ZN 2 T	0640185	45	145
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	OSH

## REBA POWERED HARDWARE CHECKOUT (15 min)

### NOTE

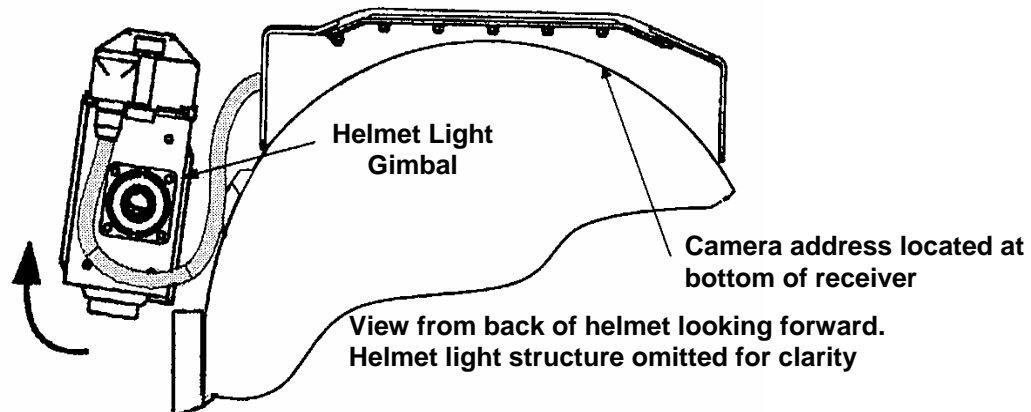
Procedure written for simultaneous C/O of 12 volt HDW on 2 EMUs.  
The checkout will first be completed for EMUs 3,4 and repeated for EMUs 1,2

- |           |   |   |
|-----------|---|---|
| Both EMUs | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 1. ✓REBA sw (1 per EMU) – OFF (toward left arm of suit)   |
|           | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 2. Install EMU TV on helmets 3,4; note camera addresses<br>EV3 (EV1): <u>  19  </u> , EV4 (EV2): <u>  20  </u> (see figure below) |
| PLSS      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 3. Unstow EMU TV power cable, disconnect from ground plug   |
|           | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 4. Mate EMU TV power cable to EMU TV  |
|           | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 5. ✓Upper arm connections mated   |
|           | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 6. ✓Glove heater sw (one per glove) – OFF   |
|           | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 7. Connect lower arm pwr harness to gloves  |

### NOTE

To avoid excessive battery consumption and heat buildup, deactivate heaters once heat detected at fingertips

- |          |   |  |
|----------|---|--|
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 8. REBA sw (1 per EMU) – ON, pull tab toward right arm of suit                                   |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 9. Glove heater sw (one per glove) – ON  |
|          |   | When heat detected on all outside fingertips:  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 10. Glove heater sw (one per glove) – OFF  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 11. EMU TV power pb – press, ✓Green LED illuminated  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 12. EMU TV power pb – press, ✓Green LED not illuminated  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 13. REBA sw (1 per EMU) – OFF, pull tab toward left arm of suit                                  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 14. Disconnect lower arm pwr harness from gloves   |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 15. Stow lower arm and glove pwr harness connectors under TMG                                    |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 16. Disconnect EMU TV power cable from EMU TV  |
| PLSS     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 17. Connect EMU TV power cable to ground plug  |
| EMUs 3,4 | <input type="checkbox"/> <input type="checkbox"/>   | 18. Disconnect Helmet Lights and EMU TVs from EMUs 3 & 4 and install on EMUs 1 & 2, respectively |
|          |   | 19. Repeat procedure for EMUs 1,2  |





EVA PREP

MIDDECK PREP .....	TEMP FS 4-2
EVA PREP .....	TEMP FS 4-3
PREP FOR DONNING .....	TEMP FS 4-3
EMU DONNING.....	TEMP FS 4-5
EMU CHECK.....	TEMP FS 4-7
EMU PURGE.....	TEMP FS 4-7
EMU PREBREATHE.....	TEMP FS 4-8
EVA COMM CONFIG.....	TEMP FS CC 4-9
EVA COMM DECONFIG.....	TEMP FS CC 4-9
APPROVED NON-EMU HARDWARE MATRIX.....	4-11

**WARNING**

Payload bay floods exceed EMU thermal limits during operation. If EVA crew will be operating in vicinity of PLB floods, floods must be turned off now. Cooldown time may be as long as 6 hr

**MIDDECK PREP (30 min)**

- |          |   |
|----------|---|
| AW18A    | 1. LTG FLOOD (four) – ON  |
|          | 2. ✓EVA Bag installed in airlock  |
| EMUs 1,2 | 3. ✓REBA sw – OFF (toward left arm of suit)                                 |
|          | 4. ✓Helmet lights, helmet light batteries, and EMU TVs installed on helmets |
| PLSS     | 5. ✓EMU TV power cable demated, connected to ground plug                    |
|          | 6. Disconnect helmets, temp stow  |
| HUT      | 7. Remove Drink Bag Restraint Bag   |

**NOTE**

Drink bag should be used within 24 hr if filled with non-iodinated water

8. Fill drink bag from galley with cold water, remove gas and insert drink bag in Restraint Bag
9. Install Drink Bag Restraint Bag in HUT and dispose of fill tool in wet trash
10. Unstow comm cap and inspect moisture barrier earphone diaphragms (MBEDs) (2) for damage. Replace if reqd (EMU Servicing Kit)
11. Apply anti-fog (EMU Servicing Kit), wipe off:
  - Helmets (not Fresnel lens)
  - EV glasses, attach to comm cap
12. Stow EMU Servicing Kit
13. Install helmets, lock
14. Attach Cuff C/L to EMUs
15. ✓Wrist mirrors installed
16. Stage crew preference items in EMU Equipment Bag as reqd

**CAUTION**

EV crewmembers should minimize application of hygiene and hydrocarbon-based products prior to EVA day to avoid introduction of irritants into EMU. Reference APPROVED NON-EMU HARDWARE MATRIX, 4-11, for acceptable items in EMU

# EVA PREP (90 min)

MET ____/____/____	MET ____/____/____	MET ____/____/____	MET ____/____/____	MET ____/____/____	MET ____/____/____
--------------------	--------------------	--------------------	--------------------	--------------------	--------------------

**X: SM 60 SM TABLE MAINT**

- Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

<u>Param Name</u>	<u>Param ID</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
EXT A/L H2O LINE T			
SPLY ZN 1 T	0640181	43	100
LCG 2 SPLY ZN 1 T	0640182	36	85
H2O LINE T 2			
SPLY ZN 2 T	0640184	48	100
LCG 2 SPLY ZN 2 T	0640185	36	82
O2 LN T			
SPLY ZN 2 T	0640186	OSL	80

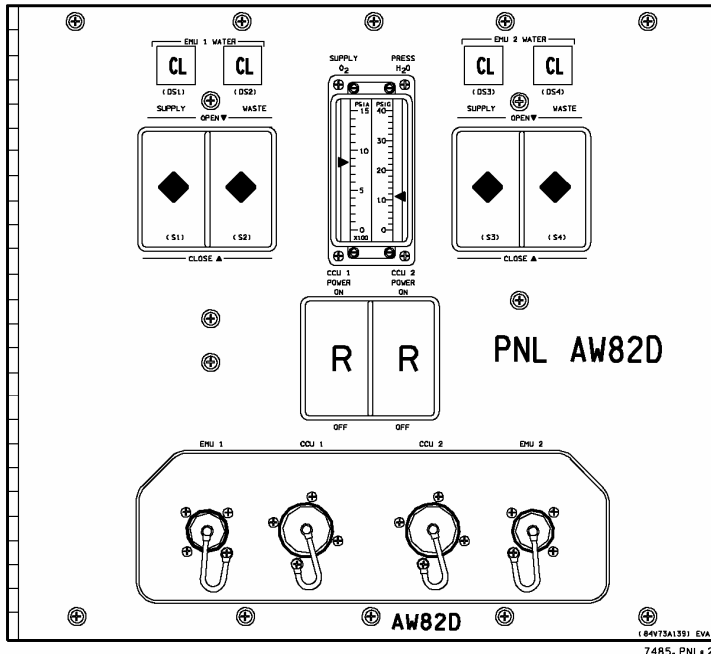
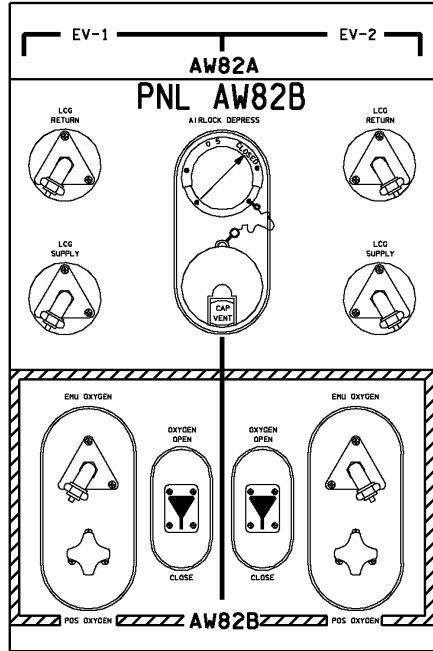
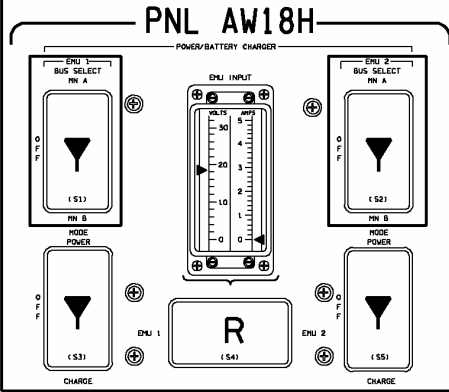
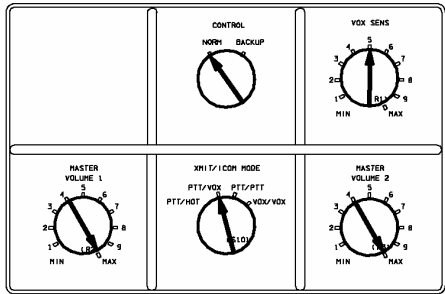
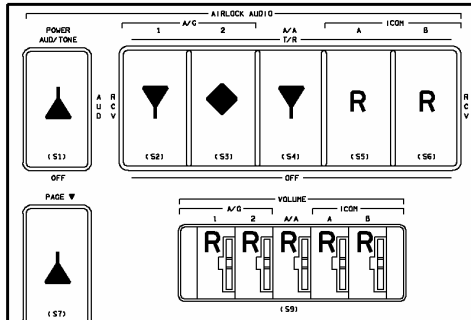
**PREP FOR DONNING (30 min)**

- |         |     |                          |  |
|---------|-----|--------------------------|--|
| BOTH    | DCM | <input type="checkbox"/> | 2. Retrieve, position SCU; remove DCM cover      |
|         |     | <input type="checkbox"/> | 3. Connect SCU to DCM, $\sqrt$ locked            |
| AW82B   |     | <input type="checkbox"/> | 4. EV-1, EV-2 O2 vlv (two) – op                  |
| MO13Q   |     | <input type="checkbox"/> | 5. $\sqrt$ ARLK H2O S/O VLV – OPEN (tb-OP)       |
| MD(flr) |     | <input type="checkbox"/> | 6. $\sqrt$ EMU O2 ISOL VLV – OP                  |
| ML86B:C |     | <input type="checkbox"/> | 7. $\sqrt$ cb MNC EXT ARLK HTR ZN 1,2 (two) – op |
| L2      |     | <input type="checkbox"/> | 8. $\sqrt$ O2 XOVR SYS 1,2 (two) – OP            |
| BOTH    | DCM | <input type="checkbox"/> | 9. PWR – BATT                                    |

**CAUTION**

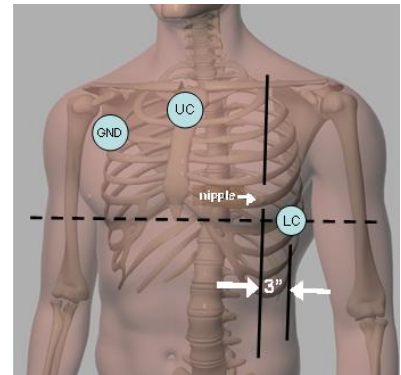
EMU must be on BATT pwr when airlock power supply turned on

- |       |                          |  |
|-------|--------------------------|--|
| AW18H | <input type="checkbox"/> | 10. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR<br>BUS SEL (two) – MNA(MNB) |
| DCM   | <input type="checkbox"/> | 11. PWR – SCU  |
|       | <input type="checkbox"/> | 12. $\sqrt$ STATUS: <input type="checkbox"/> BATT VDC $\geq$ 20.3      |
|       | <input type="checkbox"/> | 13. Verify panels as shown next page                                   |



16473A1331 EVA  
7485, PNL 2

- |          |   |  |
|----------|---|--|
| IV       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 14. Perform EVA COMM CONFIG, steps 1-4   |
| BOTH DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 15. Comm FREQ – LOW  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 16. COMM mode – PRI (EMU data only, no audio)  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 17. Disconnect, transfer, temp stow LTAs & helmets to middeck  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 18. Remove Dosimeter from inflight garments; insert in LCVG  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 19. Unstow biomed pigtail adapter (EVA OBS cable in EMU Servicing Kit), connect to elec harness  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 20. Don MAG, TCU, LCVG   |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 21. Don biomed per figure; shave 3-in patch using shave gel and razor (as reqd) (EMU Servicing Kit), clean skin using shave gel and damp towel, dry skin, install stoma seals and apply paste to electrodes, adhere to chest and secure with overtapes |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 22. Don comm caps  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 23. Connect biomed to elec harness   |
| IV       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 24. Perform EVA COMM CONFIG, step 6 (EMU hot mic)  |
|          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 25. Verify biomed signal, EMU data, and RF comm with MCC   |
| BOTH DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 26. COMM mode – HL   |



EVA BIOMED PLACEMENT

**NOTE**

Be prepared to verify a nominal powerup sequence after the next step and verify no missing segments on display and that all tones are audible

- |       |   |  |
|-------|---|--|
|       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 27. PWR – BATT<br>Verify no missing segments during display test<br>Verify status (continuous) tone and warble tone audible<br>Verify BITE light extinguishes. Report anomalies to MCC |
|       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 28. PWR – SCU  |
|       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 29. Doff comm caps   |
|       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 30. Disconnect biomed  |
| AW18D | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 31. AIRLK AUD PWR – AUD/TONE   |

**EMU DONNING (55 min)**

**NOTE**

May be performed by EV1 and EV2 simultaneously

- |      |   |   |
|------|---|---|
| BOTH | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 32. Take one aspirin tablet (325 mg)  |
|      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 33. √STATUS: <b>SOP P</b> = 5410-6800 (compare w/gauge)                           |
| EV1  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 34. √Waist ring – op  |
|      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 35. Don LTA, attach donning handles as reqd<br>If boot bladder manipulation reqd: |
|      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 36. Disconnect boot from leg (sizing ring)  |
|      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 37. Pull up excess boot bladder around full circumference of boot disconnect      |
|      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 38. Connect boot to leg (sizing ring)   |
|      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 39. Engage Lock 1   |
|      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 40. √All locks (three per boot) engaged   |

- |      |                          |                          |                          |                          |                          |   |
|------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---|
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 41. Ingress airlock   |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 42. ✓Suit arms aligned  |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 43. Disconnect gloves; ✓wrist disconnects – op                          |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 44. Stow IV glasses   |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 45. Don thumb loops   |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 46. ✓Drink valve posn before HUT donning                                |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 47. ✓Biomed elec harness outside of HUT                                 |
| PLSS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 48. ✓REBA sw – OFF  |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 49. Don HUT   |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 50. Release thumb loops   |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 51. ✓Suit arms aligned  |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 52. Don EV glasses as reqd  |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 53. Don comm cap  |
| DCM  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 54. ✓COMM mode – HL, vol as reqd  |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 55. ✓Comm with IV   |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 56. Connect biomed to elec harness                                      |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 57. Connect LCVG to multiple water connector, ✓locked                   |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 58. ✓Thermal cover clear of waist ring                                  |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 59. Waist ring – engage posn  |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 60. Connect waist ring to HUT, ✓locked                                  |
|      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 61. Remove donning handles, stow in EMU Equipment Bag; cover waist ring |

<b>CAUTION</b>
Pulling on drink bag blue bite vlv to adjust posn can cause vlv to release from stem

- |    |                          |                          |                          |                          |                          |   |
|----|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---|
|    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 62. ✓Drink vlv posn after HUT donning       |
|    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 63. ✓Mike boom posn                         |
|    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 64. Don comfort gloves, wristlets           |
|    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 65. Wrist rings – engage posn               |
|    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 66. Don EV gloves, ✓locked                  |
|    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 67. Tighten palm restraint straps           |
| IV | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 68. ✓Glove heater sw (two) – OFF            |
|    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 69. Connect lower arm pwr harness to gloves |
|    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 70. Stow slack under arm TMG                |
|    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 71. ✓Cuff C/L posn                          |

<b>CAUTION</b>
Minimize fan operation with O2 ACT – OFF (~2 min)

- |     |      |                          |                          |                          |                          |  |
|-----|------|--------------------------|--------------------------|--------------------------|--------------------------|--|
| EV1 | DCM  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 72. FAN – ON (PWR RESTART may occur)                       |
|     |      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 73. ✓Elec harness clear of neck ring                       |
|     |      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 74. Don helmet, ✓locked                                    |
|     | DCM  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 75. O2 ACT – IV  |
|     |      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 76. ✓Helmet purge vlv – cl, locked                         |
|     | DCM  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 77. PURGE vlv – cl (dn)                                    |
|     | PLSS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 78. Unstow EMU TV power cable; disconnect from ground plug |
|     |      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 79. Mate EMU TV power cable to EMU TV                      |
| EV2 |      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 80. Repeat steps 33-79 if done serially                    |

**EMU CHECK (5 min)**

BOTH  81.  Cooling

- \* If cooling insufficient slowly cycle temp control vlv \*
- \* between 7 and Max C while IV depresses and holds \*
- \* pump priming vlv on back of EMU (30 sec min) \*

DCM  82. Temp control vlv – as reqd  
 83.  Wrist rings – covered  
 84.  Waist rings – covered

DCM  85.  COMM mode – HL

86.  WATER – OFF

87.  PWR – SCU

88.  FAN – ON

89.  Comm FREQ – LOW

90.  Helmet Light ops

DCM  91.  Helmet purge vlv – cl, locked

92.  PURGE vlv – cl (dn)

93. DISP – STATUS: until **LEAK CHECK?** msg displayed  
 DISP –YES (hold for 2 sec), follow displayed instructions

- \* If **PRESS FAIL/SUIT P X.X** or **LEAKAGE HI SUIT P X.X**, \*
- \* go to **FAILED LEAK CHECK (14.7/10.2 PSI)**, CC 6-4 \*
- \* (Cue Card) \*

**EMU PURGE**

MET \_\_\_/\_\_\_:\_\_\_    MET \_\_\_/\_\_\_:\_\_\_    MET \_\_\_/\_\_\_:\_\_\_    MET \_\_\_/\_\_\_:\_\_\_    MET \_\_\_/\_\_\_:\_\_\_

**NOTE**

Flex arms and legs periodically and avoid overcooling during purge/prebreathe

CABIN P	PURGE DURATION (min)
10.2	8
14.7	12

BOTH DCM  1. O2 ACT – PRESS  
 2. Verify no EMU fit issues  
 3. PURGE vlv – op (up), begin purge clock

**NOTE**

The next sequence (step 4) may be performed in reverse order to avoid an additional pressure cycle to the ears

**WARNING**

With the PURGE vlv open, moving the O2 ACT – IV must be performed with minimal delay in the OFF position to keep the SUIT P > 0.25 psig. Nitrogen may be reintroduced if suit pressure goes lower

4. When N2 purge complete (per table):  
 PURGE vlv – cl (dn)  
 O2 ACT – IV

# EMU PREBREATHE

MET ____/____:____	MET ____/____:____	MET ____/____:____	MET ____/____:____	MET ____/____:____
--------------------	--------------------	--------------------	--------------------	--------------------

- 1. Begin prebreathe clock
- IV R1      2. O2 TK3 HTR A(B) – as reqd
- IV AW82B      3. AIRLK DEPRESS vlv cap – vent, remove, stow
- 4. √Modified Depress valve cap stowed and secure in airlock
- 5. Remove loose equipment
- 6. If reqd, stow REBA jumper cable

CABIN P		PREBREATHE DURATION
10.2	12 hr	01:15
	24 hr	00:40
14.7		04:00

- As reqd per MCC,  
set battery amp-hours:
- 7. DISP – STATUS until BATT? 32.0AH displayed
  - 8. DISP – YES (hold for 2 sec)
  - 9. Use DISP to status to desired value
  - 10. When desired value selected, DISP – YES (hold for 2 sec)

- IV      11. Install MWS and BRTs (as reqd)
- 12. √EVA tools installed in airlock
- A/L      13. Remove, stow appropriate vent ducts to allow hatch closure
- MD(flr)      14. Disconnect vent duct from airlock fitting; reposition duct in middeck
- 15. √Loose middeck-stowed items clear of inner hatch and middeck diffuser cap air flow
- DCM      16. Remove WATER switch guard (two), stow in EMU Equipment Bag
- 17. REBA sw – ON (toward right arm of suit)
- 18. EMU TV power pb – press, √Green LED illuminated
- 19. MPT PWR – ON, as reqd
- A/L(flr)      20. Deploy floor EVA hatch supports
- 21. Egress AAP, stow handles
- 22. Attach tethers, install MFR handle in tunnel
- 23. Egress airlock
- 24. Inner hatch – close, lock
- 25. √Inner hatch Equal vlv caps (two) – removed
- 26. Inner hatch Equal vlv (two) – OFF
- 27. When prebreathe time complete, √MCC for GO to DEPRESS/REPRESS (Cue Card)



HOOK  
VELCROHOOK  
VELCRO**EVA COMM CONFIG**

- R14:C 1. √cb MNA UHF EVA – cl  
√MNC UHF EVA – cl
- O6 2. √UHF SPLX/EVA XMIT FREQ – 259.7/414.2  
√PWR AMP – OFF  
√EVA STRING – 1  
UHF MODE – EVA
- IVA ATU 3. √AUD A/G 1(2) – T/R
- R10 4. BIOMED CH 1 – EVA 1  
2 – EVA 2

If docked with ISS and EVA comm on A/G 1:

**NOTE**

In step 5, A/G 1 docked hardline disabled.  
UHF will become A/G 1 Shuttle-to-ISS link

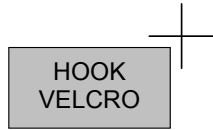
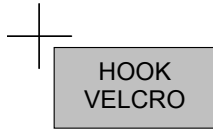
5. √MCC and ISS that UHF configured and in  
Public Call
- A1R AUD CTR SPACELAB A/G 1 – OFF
- A1R 6. AUD CTR UHF A/G 1(2) – T/R  
√2(1) – OFF  
√A/A – OFF

**EVA COMM DECONFIG**

- O6 1. UHF MODE – OFF  
√SPLX/EVA XMIT FREQ – 259.7/414.2  
√PWR AMP – OFF  
√SPLX SQUELCH – ON
- If docked with ISS and EVA comm on A/G 1:
- A1R 2. AUD CTR SPACELAB A/G 1 – ON
3. AUD CTR UHF A/G 1(2) – OFF  
√2(1) – OFF  
√A/A – OFF

EVA-12a/125/O/A | I

TOP  
BACK OF 'EVA COMM CONFIG/DECONFIG'



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EVA-12b/125/O/A | I

(reduced copy)

TEMP FS CC 4-10

## TIMELINES

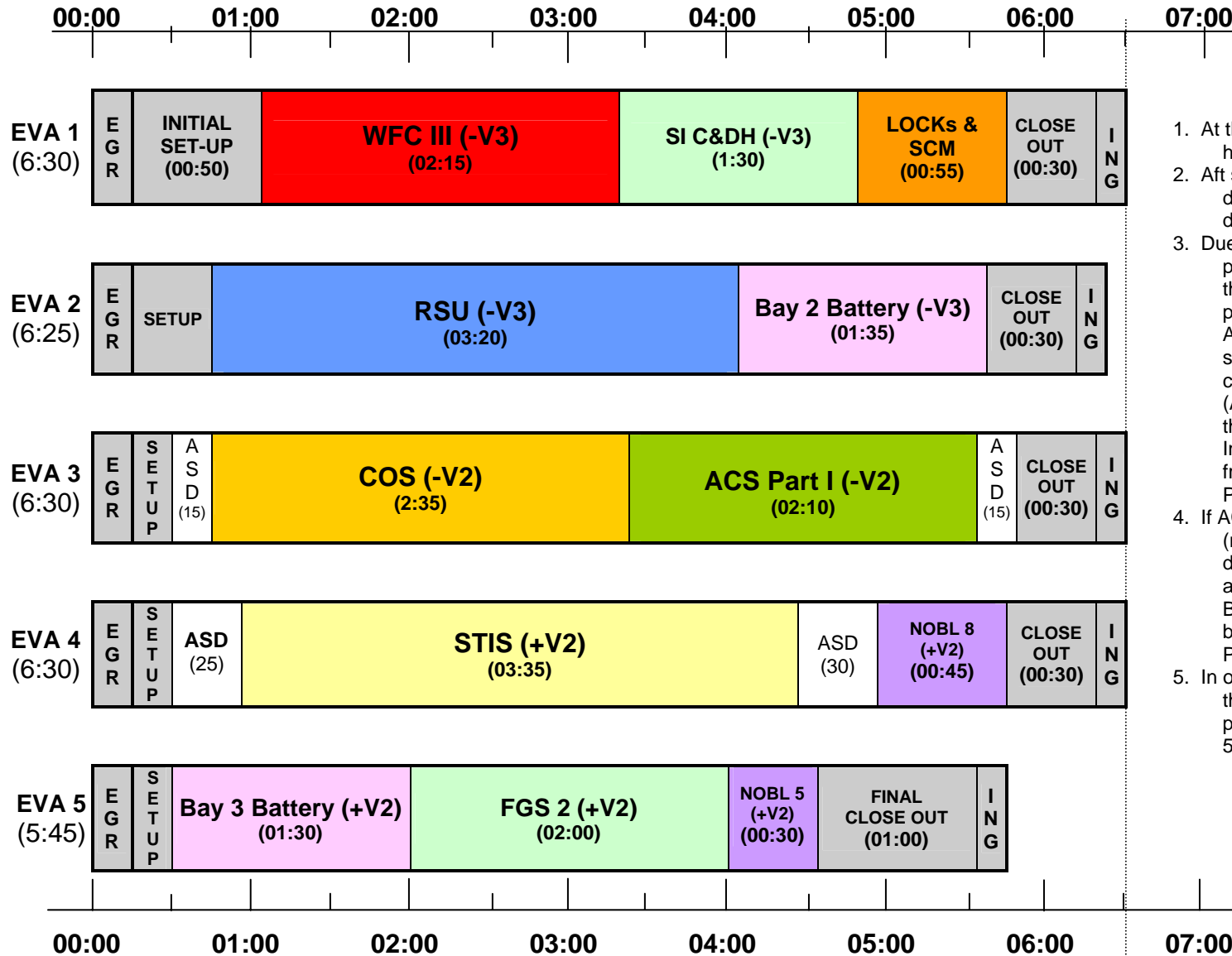
HST SM4 EVA TIMELINES .....	FS 7-3
EVA ORBITER INHIBIT PAD (EVAs 1-5) .....	FS 7-4
EVA 1 BRIEF CARD .....	FS 7-5
EVA 2 BRIEF CARD .....	FS 7-7
EVA 3 BRIEF CARD .....	FS 7-9
EVA 4 BRIEF CARD .....	FS 7-11
EVA 5 BRIEF CARD .....	FS 7-13
ORBITER CAUTIONS AND WARNINGS .....	FS 7-15
HST GENERIC NO TOUCH/NO DAMAGE/KEEP-OUT ZONES.....	FS 7-16
HST TASK SPECIFIC NO-TOUCH/NO-DAMAGE AREAS .....	FS 7-18
EVA 1	
EVA 1 SUMMARY TIMELINE .....	FS 7-23
EVA 1 TOOL CONFIG .....	FS 7-24
EVA 1 POST TOOL CONFIG.....	FS 7-25
EGRESS/INITIAL SETUP .....	FS 7-26
WFC III .....	FS 7-28
SI C&DH R&R .....	FS 7-35
SCM & LOCKS.....	FS 7-40
DAILY CLOSEOUT/INGRESS .....	FS 7-43
EVA 2	
EVA 2 SUMMARY TIMELINE .....	FS 7-44
EVA 2 TOOL CONFIG .....	FS 7-45
EVA 2 POST TOOL CONFIG.....	FS 7-46
EGRESS/DAILY SETUP .....	FS 7-47
RSU R&R .....	FS 7-48
BAY 2 BATTERY R&R.....	FS 7-58
DAILY CLOSEOUT/INGRESS .....	FS 7-64
EVA 3	
EVA 3 SUMMARY TIMELINE .....	FS 7-65
EVA 3 TOOL CONFIG .....	FS 7-66
EVA 3 POST TOOL CONFIG.....	FS 7-67
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ACS PART I .....	FS 7-77
DAILY CLOSEOUT/INGRESS .....	FS 7-86
EVA 4	
EVA 4 SUMMARY TIMELINE .....	FS 7-87
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EVA 4 POST TOOL CONFIG.....	FS 7-89
EGRESS/DAILY SETUP .....	FS 7-90
STIS REPAIR.....	FS 7-92
NOBL 8 .....	FS 7-104
DAILY CLOSEOUT/INGRESS .....	FS 7-108
EVA 5	
EVA 5 SUMMARY TIMELINE .....	FS 7-109
EVA 5 TOOL CONFIG .....	FS 7-110
EVA 5 POST TOOL CONFIG.....	FS 7-111
EGRESS/DAILY SETUP .....	FS 7-112
BAY 3 BATTERY R&R.....	FS 7-113
FGS-2 R&R .....	FS 7-119
NOBL 5 .....	FS 7-126
FINAL CLOSEOUT/INGRESS .....	FS 7-128
ALT EVA 5	
ALTERNATE EVA 5 SUMMARY TIMELINE .....	FS 7-130
EVA 5 TOOL CONFIG .....	FS 7-131
EVA 5 POST TOOL CONFIG.....	FS 7-132
EGRESS/DAILY SETUP .....	FS 7-133
BAY 3 BATTERY R&R.....	FS 7-134
ACS PART II .....	FS 7-140

NOBL 5 .....	FS 7-148
FINAL CLOSEOUT/INGRESS .....	FS 7-150
NOBL 7 .....	FS 7-152
ACS REPAIR – COMPLETION .....	FS 7-153
DAILY CLOSEOUT/INGRESS .....	FS 7-158
CONTINGENCY DAILY CLOSEOUT/INGRESS .....	FS 7-159
CONTINGENCY EGRESS/DAILY SETUP .....	FS 7-161

**TIMELINES**

## HST SM4 EVA TIMELINES (W/ ACS PART I ONLY)

I



**Notes:**

1. At the end of ACS Part I, two cards have been removed.
2. Aft shroud door open/close for -V2 doors is shorter than the other doors due to LOCKs being installed.
3. Due to time limitations and mission priorities, ACS Part II is not shown in the timeline since FGS 2 is higher priority than one of the SI repairs. ACS Part I task is scheduled in support of preparing the telescope for completion of the ACS repair task (ACS Part II) on EVA 5 in the event that the STIS repair is not successful. In that case, FGS would be deleted from EVA 5 and replaced with ACS Part II.
4. If ACS Part II is added into EVA 5 (replaces FGS), the total task duration for that block would be 2:15, and it would be performed after the Bay 3 Battery. The entire EVA would be executed with -V3 fwd w/ an EVA PET of 6:00.
5. In order to complete ACS during EVA 3, the EVA would have to be extended past 6:30. Possibly by as much as 55-60 min (w/ LOCKs installed).

## EVA ORBITER INHIBIT PAD (EVAs 1-5)

ALL EVAs	
KU-BAND ANTENNA	
MCC-H	1. √KU-BAND Mask – active 2. √KU-BAND EVA Protect Box – active
S-BAND ANTENNAS	
	<u>NOTE</u> Possible loss of comm when forced LL FWD antenna
IV	If EV crew < 1.6 ft from S-Band antenna
A1R	1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER 2. √MCC, lower antenna selected
	If no comm, or on MCC GO
C3	3. S-BAND PM ANT – LL FWD
	When EVA crewmember at least 1.6 ft away from all S-Band upper antennas
C3	4. S-BAND PM ANT – GPC

### Ground

All EVAs	
Ground Radar	
MCC-H	1. √FDO console, ground radar restrictions in place for EVA

## EVA 1 BRIEF CARD

LESSONS LEARNED from previous days

### CREW RESPONSIBILITIES

EVA/IVA  
RMS/Photo TV

**John & Drew/Mass & Bueno  
Megan/RayJ**

### EMU STATUS

Suit anomalies  
Positioning: drink bag, EEH  
Boot bladder reconfig  
Requests

John-hold DIDB during ingress  
**(none expected)**

### SUIT DONNING

EVA Prep Start Time (-01:30)  
Start Purge and Pre-breathe  
PET start

**02/14:45** \_\_\_/\_\_\_:\_\_\_  
**02/16:15** \_\_\_/\_\_\_:\_\_\_  
**02/17:15** \_\_\_/\_\_\_:\_\_\_

### EGRESS PLAN

**John 1<sup>st</sup>/Drew – solo MFR**

### PRECAUTIONS (see task data sheet)

Timeline notes & warnings  
No touch/No damage/Keep out  
RMS+ is close to structure/FF  
ORU close to structure

**WFC will move 1.2”  
FHST/louvers Bay 2,3**

### TASK SPECIFICS

Summary EVA Timeline  
Review task risks

**WFC radiator**

### CREW COORDINATION

Shuttle Voice Protocol  
Call clearances (RMS, helmet, PLSS)  
EMU Mals  
Call turns and torque, HST priority  
Contingency and Crib Sheet

### INGRESS PLAN

**Drew in 1<sup>st</sup>**

### POST EVA

Crew responsibilities

**Mass lead**

### EMERGENCIES

Comm Fail, Term EVA, Abort EVA  
Review lost tool/instrument/crewman  
Mal of the day

**EVA Cuff C/L**

### EVA TOP TEN

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## EVA 2 BRIEF CARD

LESSONS LEARNED from previous days

### CREW RESPONSIBILITIES

EVA/IVA

RMS/Photo TV

**Mass & Bueno/John & Drew  
Megan/RayJ**

### EMU STATUS

Suit anomalies

Positioning: drink bag, EEH

Boot bladder reconfig

Requests

**Mass**

### SUIT DONNING

EVA Prep Start Time (-01:30)

Start Purge and Pre-breathe

PET start

**03/14:45** \_\_\_/\_\_\_:\_\_\_

**03/16:15** \_\_\_/\_\_\_:\_\_\_

**03/17:15** \_\_\_/\_\_\_:\_\_\_

### EGRESS PLAN

#### PRECAUTIONS

Timeline notes & warnings

No touch/No damage/Keep out

RMS+ is close to structure/FF

ORU close to structure

**Mass 1<sup>st</sup>/MFR Handle/Bueno**

**Be a statue**

**FHST/louvers Bay 2,3**

### TASK SPECIFICS

Summary EVA Timeline

Review task risks

**Battery demates**

### CREW COORDINATION

Shuttle Voice Protocol

Call clearances (RMS, helmet, PLSS)

EMU Mals

Call turns and torque, HST priority

Contingency and Crib Sheet

### INGRESS PLAN

**Mass in 1<sup>st</sup>**

### POST EVA

Crew responsibilities

**John lead**

### EMERGENCIES

Comm Fail, Term EVA, Abort EVA

Review lost tool/instrument/crewman

Mal of the day

### EVA TOP TEN

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## EVA 3 BRIEF CARD

LESSONS LEARNED from previous days

### CREW RESPONSIBILITIES

EVA/IVA

RMS/Photo TV

**John & Drew/Mass & Bueno  
Megan/RayJ**

### EMU STATUS

Suit anomalies

Positioning: drink bag, EEH

Boot bladder reconfig

Requests

### SUIT DONNING

EVA Prep Start Time (-01:30)

**04/14:45** \_\_\_/\_\_\_:\_\_\_

Start Purge and Pre-breathe

**04/16:15** \_\_\_/\_\_\_:\_\_\_

PET start

**04/17:15** \_\_\_/\_\_\_:\_\_\_

### EGRESS PLAN

**John 1<sup>st</sup>/MFR Handle/Drew**

### PRECAUTIONS (see task data sheet)

Timeline notes & warnings

No touch/No damage/Keep out

RMS+ is close to structure / FF

ORU close to structure

**COS insertion**

### TASK SPECIFICS

Summary EVA Timeline

Review task risks

**COS & EV coords/clearance  
Grid Cutter, circuit cards sharp**

### CREW COORDINATION

Shuttle Voice Protocol

Call clearances (RMS, helmet, PLSS)

EMU Mals

Call turns and torque, HST priority

Contingency and Crib Sheet

### INGRESS PLAN

**John in 1<sup>st</sup>**

### POST EVA

Crew responsibilities

**Mass lead**

### EMERGENCIES

Comm Fail, Term EVA, Abort EVA

Review lost tool/instrument/crewman

Mal of the day

### EVA TOP TEN

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## EVA 4 BRIEF CARD

LESSONS LEARNED from previous days

### CREW RESPONSIBILITIES

EVA/IVA

RMS/Photo TV

**Mass & Bueno/John & Drew  
Scooter/RayJ**

### EMU STATUS

Suit anomalies

Positioning: drink bag, EEH

Boot bladder reconfig

Requests

**Mass**

### SUIT DONNING

EVA Prep Start Time (-01:30)

Start Purge and Pre-breathe

PET start

**05/14:45** \_\_\_/\_\_\_:\_\_\_

**05/16:15** \_\_\_/\_\_\_:\_\_\_

**05/17:15** \_\_\_/\_\_\_:\_\_\_

### EGRESS PLAN

**Bueno 1<sup>st</sup>/MFR Handle/Mass**

### PRECAUTIONS (see task data sheet)

Timeline notes & warnings

No touch/No damage/Keep out

RMS+ is close to structure/FF

ORU close to structure

**FCP, circuit cards, CEB  
MFR in aft shroud**

### TASK SPECIFICS

Summary EVA Timeline

Review task risks

**LVPS-R EOS & ESD**

### CREW COORDINATION

Shuttle Voice Protocol

Call clearances (RMS, helmet, PLSS)

EMU Mals

Call turns and torque, HST priority

Contingency and Crib Sheet

### INGRESS PLAN

**Bueno in 1<sup>st</sup>**

### POST EVA

Crew responsibilities

**John lead**

### EMERGENCIES

Comm Fail, Term EVA, Abort EVA

Review lost tool/instrument/crewman

Mal of the day

### EVA TOP TEN

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## EVA 5 BRIEF CARD

LESSONS LEARNED from previous days

### CREW RESPONSIBILITIES

EVA/IVA  
RMS/Photo TV

**John & Drew/Mass & Bueno  
Megan/RayJ**

### EMU STATUS

Suit anomalies  
Positioning: drink bag, EEH  
Boot bladder reconfig  
Requests

### SUIT DONNING

EVA Prep Start Time (-01:30)  
Start Purge and Pre-breathe  
PET start

**06/14:45** \_\_\_/\_\_\_:\_\_\_  
**06/16:15** \_\_\_/\_\_\_:\_\_\_  
**06/17:15** \_\_\_/\_\_\_:\_\_\_

### EGRESS PLAN

**Drew 1<sup>st</sup>/MFR Handle/John**

### PRECAUTIONS (see task data sheet)

Timeline notes & warnings  
No touch/No damage/Keep out  
RMS+ is close to structure/FF  
ORU close to structure

**Battery louvers**

### TASK SPECIFICS

Summary EVA Timeline  
Review task risks

**Battery demates**

### CREW COORDINATION

Shuttle Voice Protocol  
Call clearances (RMS, helmet, PLSS)  
EMU Mals  
Call turns and torque, HST priority  
Contingency and Crib Sheet

### INGRESS PLAN

**(Opt. Speech at WSIPE), John in 1<sup>st</sup>**

### POST EVA

Crew responsibilities

**Mass lead**

### EMERGENCIES

Comm Fail, Term EVA, Abort EVA  
Review lost tool/instrument/crewman  
Mal of the day

### EVA TOP TEN

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## ORBITER CAUTIONS AND WARNINGS

### CAUTION

#### Shuttle Constraints

- A. Avoid inadvertent contact with
  - 1. OBSS and SRMS Composite Sections, Joint Torque Arms, Grapple Fixture Shafts, and Cable Harnesses
  - 2. LCS (silver Teflon) and LDRI (silver Teflon) and ITVC (gold foil) [OBSS]
  - 3. WVS Antenna [ODS Truss & PLB Sill]
  - 4. Payload Bay and camera wire harnesses, cables, cable guides, and connectors
- B. No Touch
  - 1. LDRI diffuser [OBSS]
  - 2. OBSS saddle contacts (when OBSS unberthed) [OBSS]
  - 3. Monkey fur [PLB]
  - 4. Cameras: metallic surfaces [PLB]
  - 5. Ku-Band Antenna black dish and gold thermal blankets [PLB]
  - 6. Avoid contact with OBSS striker bars (Vitrolube coating)

### WARNING

#### Shuttle Constraints

- A. Arcing/Molten Debris
  - 1. Stay  $\geq 2$  ft from exposed EFGF connector when OBSS berthed, powered, and EFGF not grappled [PLB]
  - 2. Stay  $\geq 2$  ft from exposed Stbd Fwd MPM contacts [PLB]
  - 3. Stay above PLB sill when within 1 ft of powered ROEU connector [PLB]
- B. Pinch
  - 1. PRLA operation [PLB]
- C. RF Radiation Exposure
  - 1. Stay 3.28 ft from S-Band Antenna when powered
  - 2. Stay 1 ft from top and side of UHF/SSOR PLB Antenna radome surface when in high powered mode [ODS truss]
  - 3. Stay 0.33 ft from top and side of UHF/SSOR PLB Antenna radome surface when in low powered mode [ODS truss]
  - 4. Remain below the level of the PLB door mold line for first 20 in Aft of Fwd bulkhead when S-Band Antenna powered [PLB]
  - 5. Remain on the inboard side of the Stbd slidewire (sill handrails if slidewire not installed) for first 20 ft Aft of Fwd bulkhead when Ku-Band Antenna powered [PLB]

### WARNING (Cont)

#### Shuttle Constraints (Cont)

- D. Sharp Edges
  - 1. PRLA grounding wipers [PLB]
  - 2. LDRI baffles (Also an entrapment hazard) [OBSS]
  - 3. Keep hands away from SRMS EE opening and snares
- E. Thermal
  - 1. Illuminated PLB lights; do not touch
  - 2. OBSS grapple fixture shafts/cams may be hot. Limit handling if required
  - 3. Stay 27 ft from PRCS when powered
  - 4. Stay 3 ft from VRCS when powered
  - 5. Stay 3 ft from APU when operating
- F. Contamination
  - 1. Stay out of the immediate vicinity of leaking jet or APU
- G. Lasers
  - 1. Do not look at LDRI diffuser or LCS laser aperture window

## HST GENERIC NO TOUCH/NO DAMAGE/KEEP-OUT ZONES

KEEP-OUT	REASON
1. High Gain Antenna dish (when operating)	<ul style="list-style-type: none"> <li>• EMI fields</li> </ul>
2. High Gain Antenna latches and hinge	<ul style="list-style-type: none"> <li>• Pinch point</li> <li>• Hardware damage</li> </ul>
3. FSS BAPS and HST, during rotation and pivot	<ul style="list-style-type: none"> <li>• Pinch points, collision</li> </ul>
4. Aperture door and sun shade hinges	<ul style="list-style-type: none"> <li>• Pinch points</li> </ul>
5. LGA = 3.8 in (when operating without LGAP-C installed)	<ul style="list-style-type: none"> <li>• EMI fields</li> </ul>
6. SLIC magnetic isolators = 2 in away from isolator rings (8)	<ul style="list-style-type: none"> <li>• EMI fields</li> </ul>
7. IMAX (when camera door is open); 24 in	<ul style="list-style-type: none"> <li>• Possible broken glass; glass lens does not meet kick loads</li> </ul>
8. RNS = 24 in	<ul style="list-style-type: none"> <li>• Possible damage</li> </ul>

NO TOUCH	REASON
1. Low Gain Antenna and waveguide	<ul style="list-style-type: none"> <li>• Reduction of loss of comm</li> </ul>
2. Edges and Inside face of Aperture Door	<ul style="list-style-type: none"> <li>• Sharp edges</li> <li>• Potential source of contamination</li> </ul>
3. HST interior MLI surfaces	<ul style="list-style-type: none"> <li>• Contamination</li> </ul>
4. Magnetometer and Covers	<ul style="list-style-type: none"> <li>• Potential source of contamination</li> </ul>
5. -V3 FHST Shades, internal & external	<ul style="list-style-type: none"> <li>• Sharp edges</li> <li>• Potential source of contamination</li> </ul>
6. -V3 Door Retract/Extend Seals	<ul style="list-style-type: none"> <li>• Potential light leak</li> <li>• Potential source of contamination</li> </ul>
7. P105 and P106 connector pins	<ul style="list-style-type: none"> <li>• Exposed voltage</li> <li>• Reduction or loss of connector function</li> <li>• Electrical short circuits</li> </ul>
8. High Gain Antenna dish/mast	<ul style="list-style-type: none"> <li>• Sharp edges, pinch points</li> <li>• Reduction or loss of comm</li> <li>• Potential source of contamination</li> </ul>
9. Bay 2 and Bay 3 doors battery thermal louvers	<ul style="list-style-type: none"> <li>• Sharp edges</li> <li>• Reduction or loss of radiative capability</li> <li>• Potential source of contamination</li> </ul>
10. WF/PC 2 & WFC III Radiator	<ul style="list-style-type: none"> <li>• Reduction or loss of radiative capability</li> <li>• Potential source of contamination</li> </ul>
11. Aft Bulkhead Docking Target Pin	<ul style="list-style-type: none"> <li>• Note: This pin is fragile because it is bonded to the surface</li> <li>• Potential for breakage &amp; loss of angular cue function</li> </ul>
12. NCS Conduit (aft bulkhead)	<ul style="list-style-type: none"> <li>• Damage to vent port opening (loads)</li> </ul>
13. Aft shroud door latch bolts (all)	<ul style="list-style-type: none"> <li>• Sharp edge</li> <li>• Contamination (braycote)</li> </ul>
14. NCS Radiator	<ul style="list-style-type: none"> <li>• Reduction/loss of thermal properties</li> <li>• Contamination</li> </ul>
15. Guide stud threads	<ul style="list-style-type: none"> <li>• Sharp edge</li> </ul>

## HST GENERIC NO TOUCH/NO DAMAGE/KEEP-OUT ZONES (Cont)

NO DAMAGE	REASON
1. Docking Target Pins	<ul style="list-style-type: none"> <li>• Potential for breakage &amp; loss of angular cue function</li> </ul>
2. Magnetic Torquer Bar cable harness	<ul style="list-style-type: none"> <li>• Reduction or loss of pointing capability</li> </ul>
3. Wave Guide	<ul style="list-style-type: none"> <li>• Reduction or loss of comm</li> </ul>
4. Coarse Sun Sensors	<ul style="list-style-type: none"> <li>• Reduction or loss of pointing capability</li> <li>• Potential source of contamination</li> </ul>
5. HST MLI on SSM Bays, OTA Bays, and FS/LS	<ul style="list-style-type: none"> <li>• Potential source of debris</li> </ul>
6. ESM	<ul style="list-style-type: none"> <li>• Reduction or loss of operating capability</li> </ul>
7. Reflectors	<ul style="list-style-type: none"> <li>• Sharp-edge hazard if broken</li> </ul>
8. NOBLs (1,6,9,10)	<ul style="list-style-type: none"> <li>• Reduction/loss of thermal protection</li> </ul>

# HST TASK SPECIFIC NO-TOUCH/NO-DAMAGE AREAS

## EVA 1

NO TOUCH	WFPC 2/WFC III	REASON
1. FHST light shades (3) (baffles and seals)	<ul style="list-style-type: none"> <li>• Sharp edge</li> <li>• Potential light leak</li> <li>• Potential source of contamination</li> </ul>	
2. WFPC 2/WFC III radiators	<ul style="list-style-type: none"> <li>• Thermal degradation</li> <li>• Contamination</li> </ul>	
3. WFC III/WFPC 2 A latch threaded rod and sperical bearing	<ul style="list-style-type: none"> <li>• Sharp edge</li> <li>• Contamination</li> </ul>	
4. WFPC 2/WFC III/HST A, B, and C latches/plungers	<ul style="list-style-type: none"> <li>• Coated with braycote; could be deposited on critical surfaces</li> </ul>	
5. WFPC and WFC rub strip rollers	<ul style="list-style-type: none"> <li>• Coated with braycote; could be deposited on critical surfaces</li> </ul>	
6. Bay 2 and 3 battery door thermal louvers	<ul style="list-style-type: none"> <li>• Sharp edge</li> <li>• Reduction or loss of radiative capability</li> <li>• Potential source of contamination</li> </ul>	
7. HST/WSIPE guide rails	<ul style="list-style-type: none"> <li>• Coated with braycote; could be deposited on critical surfaces</li> </ul>	
8. WFPC 2/WFC III pick-off mirror	<ul style="list-style-type: none"> <li>• Sharp edge</li> <li>• Reduction/loss in operating capability</li> </ul>	
9. WFPC 2/WFC III black MLI surfaces and radiators	<ul style="list-style-type: none"> <li>• Contamination</li> <li>• Thermal degradation</li> </ul>	
10. WFC III angled interior radiator struts (without Kapton tape)	<ul style="list-style-type: none"> <li>• Delicate harnesses and sensitive hardware</li> </ul>	
11. WFC III/WFPC 2 blind mate connector	<ul style="list-style-type: none"> <li>• Sharp edge on drive rod</li> </ul>	
12. Bay 2 and bay 3 MLI blankets	<ul style="list-style-type: none"> <li>• Contamination</li> </ul>	

NO DAMAGE	REASON
1. WFC III heat pipes	<ul style="list-style-type: none"> <li>• Ammonia contamination (doesn't meet kick loads)</li> </ul>
2. WSIPE inner lid heater harness	<ul style="list-style-type: none"> <li>• Damage could expose voltage</li> </ul>
3. WFPC 2/WFC III/HST labyrinth seal	<ul style="list-style-type: none"> <li>• Contamination</li> </ul>

SI C&DH	
NO TOUCH	REASON
1. Bay 10 door connector bracket shim	<ul style="list-style-type: none"> <li>• Possible sharp edge on connector bracket shim; possible pinch point on springs</li> </ul>
2. SI C&DH square connector pins and screw	<ul style="list-style-type: none"> <li>• Sharp edge, possible loss of connector function</li> </ul>

SI C&DH	
NO DAMAGE	REASON
1. SI C&DH cables and harnesses	<ul style="list-style-type: none"> <li>• Reduction or loss of operating capability</li> </ul>
2. SI C&DH drive stud receptacle	<ul style="list-style-type: none"> <li>• Failure to mate connectors</li> </ul>
3. Bay 10 door thermistor wire	<ul style="list-style-type: none"> <li>• Potential hardware damage; loss of operating capability</li> </ul>

## HST TASK SPECIFIC NO-TOUCH/NO-DAMAGE AREAS (Cont)

### SCM

KEEP-OUT	REASON
1. SCM attachment and release jaws	<ul style="list-style-type: none"> <li>Pinch point</li> </ul>

NO TOUCH	REASON
2. SCM contingency bolts	<ul style="list-style-type: none"> <li>Contamination; braycote on bolt threads</li> </ul>

### EVA 2

#### RSU

NO TOUCH	REASON
1. Avoid contact with FHST light shade	<ul style="list-style-type: none"> <li>Sharp edge</li> <li>Possible damage leading to light leaks into aft shroud</li> </ul>
2. Black MLI inside aft shroud (black Kapton)	<ul style="list-style-type: none"> <li>Contamination</li> </ul>
3. Connector pins	<ul style="list-style-type: none"> <li>Damage, leading to inability to mate</li> </ul>
4. RSU black paint and MLI	<ul style="list-style-type: none"> <li>Contamination</li> <li>Reduction in operating capability</li> </ul>

NO DAMAGE	REASON
1. Mykroy pads	<ul style="list-style-type: none"> <li>Sharp edge</li> <li>Failure to seat properly/alignment issues</li> </ul>
2. CASH	<ul style="list-style-type: none"> <li>Reduction in operating capability</li> </ul>
3. RSU Kapton cover	<ul style="list-style-type: none"> <li>Reduction in operating capability</li> </ul>

#### BATTERY

NO TOUCH	REASON
1. Battery J1 & J2 connectors	<ul style="list-style-type: none"> <li>Connectors are energized</li> </ul>
2. Bay 2 and bay 3 thermal louvers	<ul style="list-style-type: none"> <li>Sharp edges</li> <li>Reduction or loss of radiative capability</li> <li>Potential source of contamination</li> </ul>
3. Bay 2 and bay 3 MLI blankets	<ul style="list-style-type: none"> <li>Contamination</li> </ul>
4. Battery-R connectors	<ul style="list-style-type: none"> <li>Connector damage</li> <li>1 inhibit isolates power</li> </ul>

## HST TASK SPECIFIC NO-TOUCH/NO-DAMAGE AREAS (Cont)

### EVA 3

#### COS

NO TOUCH	REASON
1. A, B, or C Latches	<ul style="list-style-type: none"> <li>Coated with braycote; could be deposited on critical surfaces</li> </ul>
2. Aperture area	<ul style="list-style-type: none"> <li>Sharp edge</li> </ul>
3. Black painted/anodized aluminum surfaces inside aft shroud	<ul style="list-style-type: none"> <li>Contamination</li> <li>Sharp edge (if damaged)</li> </ul>
4. ASIPE lid latch male interfaces	<ul style="list-style-type: none"> <li>Coated with braycote and beryllium copper; could be deposited on critical surfaces</li> </ul>

NO DAMAGE	REASON
1. ASIPE lid heaters and wires (interior lid surface)	<ul style="list-style-type: none"> <li>Heater damage</li> </ul>
2. COS radiator	<ul style="list-style-type: none"> <li>Degradation of thermal performance</li> </ul>
3. COS guide blocks	<ul style="list-style-type: none"> <li>Possible misalignment during install</li> <li>Contamination</li> </ul>
4. CASH	<ul style="list-style-type: none"> <li>Reduction in operating capability</li> </ul>
5. COSTAR Y-harness	<ul style="list-style-type: none"> <li>Reduction in operating capability</li> </ul>
6. B-latch alignment aid	<ul style="list-style-type: none"> <li>Reduction in alignment feature</li> </ul>
7. Silver thermal tape on COS inbd panels	<ul style="list-style-type: none"> <li>Reduction in operating capability</li> <li>Contamination</li> </ul>

#### ACS

NO TOUCH	REASON
1. Grid cutter blades	<ul style="list-style-type: none"> <li>Sharp edge</li> </ul>
2. ACS cut grid	<ul style="list-style-type: none"> <li>Sharp edge</li> </ul>
3. ACS cards	<ul style="list-style-type: none"> <li>Sharp edge</li> </ul>
4. Black painted/anodized aluminum surfaces inside aft shroud	<ul style="list-style-type: none"> <li>Contamination</li> <li>Sharp edge (if damaged)</li> </ul>
5. Failed fastener	<ul style="list-style-type: none"> <li>Sharp edge</li> </ul>

## HST TASK SPECIFIC NO-TOUCH/NO-DAMAGE AREAS (Cont)

### EVA 4

NO TOUCH	STIS	REASON
1. STIS HR standoffs (once tube removed)		<ul style="list-style-type: none"> <li>• Sharp edge</li> </ul>
2. Backside of MEB cover (spiral metal and finger style EMI gaskets)		<ul style="list-style-type: none"> <li>• Sharp edge</li> <li>• Contamination</li> </ul>
3. STIS interior		<ul style="list-style-type: none"> <li>• Sharp edge</li> <li>• ESD sensitive</li> </ul>
4. LVPS-2 and LVPS-2R cards		<ul style="list-style-type: none"> <li>• Sharp edge</li> </ul>
5. Black painted/anodized aluminum surfaces inside aft shroud		<ul style="list-style-type: none"> <li>• Contamination</li> <li>• Sharp edge (if damaged)</li> </ul>
6. Failed fastener		<ul style="list-style-type: none"> <li>• Sharp edge</li> </ul>
7. FCP label cutter (when deployed)		<ul style="list-style-type: none"> <li>• Sharp edge</li> </ul>
8. STIS cutter blade		<ul style="list-style-type: none"> <li>• Sharp edge</li> </ul>
9. STIS EMI gasket		<ul style="list-style-type: none"> <li>• Contamination</li> </ul>
10. STIS radiator		<ul style="list-style-type: none"> <li>• Thermal degradation</li> </ul>

NO TOUCH	NOBL 8/NOBL 5/NOBL 7	REASON
1. STIS/NOBL cutter blade		<ul style="list-style-type: none"> <li>• Sharp edge</li> </ul>
2. NOBL enhanced radiator (ER)		<ul style="list-style-type: none"> <li>• Contamination (from EMU gloves)</li> <li>• Hardware damage</li> </ul>
3. Bay 7 wires		<ul style="list-style-type: none"> <li>• Damaged/frayed wires are possible sharp edges</li> </ul>
4. Vent plugs		<ul style="list-style-type: none"> <li>• Contact may cause inadvertent release</li> </ul>

NO DAMAGE	REASON
1. NOBL	<ul style="list-style-type: none"> <li>• Kick load less than 125 lb</li> </ul>
2. HST exterior MLI	<ul style="list-style-type: none"> <li>• Contamination</li> </ul>

## HST TASK SPECIFIC NO-TOUCH/NO-DAMAGE AREAS (Cont)

### EVA 5

#### FGS

NO TOUCH	REASON
1. Black painted/anodized aluminum surfaces inside aft shroud	<ul style="list-style-type: none"> <li>• Contamination</li> <li>• Sharp edge (if damaged)</li> </ul>
2. FGS-2/FGS-2R/HST A, B, C, and D latches/plungers	<ul style="list-style-type: none"> <li>• Coated with braycote; could be deposited on critical surfaces</li> </ul>
3. FGS-2/FGS-2R rub strip rollers	<ul style="list-style-type: none"> <li>• Coated with braycote; could be deposited on critical surfaces</li> </ul>
4. HST/FSIPE guide rails	<ul style="list-style-type: none"> <li>• Coated with braycote; could be deposited on critical surfaces</li> </ul>
5. FGS-2/FGS-2R pick-off mirror	<ul style="list-style-type: none"> <li>• Sharp edge</li> <li>• Contamination (EMU gloves)</li> </ul>
6. FGS-2/FGS-2R black MLI surfaces, gold taped surfaces, and radiators	<ul style="list-style-type: none"> <li>• Contamination</li> <li>• Thermal degradation</li> </ul>
7. FGS-2/FGS-2R dog house/adsorber module	<ul style="list-style-type: none"> <li>• Contamination</li> <li>• Honeycomb material; sharp edge if damaged</li> </ul>
8. FGS connectors	<ul style="list-style-type: none"> <li>• Sharp edges on connector key pins and bayonets</li> </ul>

#### NO DAMAGE

#### REASON

1. FSIPE inner lid heater harness	<ul style="list-style-type: none"> <li>• Damage could expose voltage</li> </ul>
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#### BATTERY

NO TOUCH	REASON
1. Battery J1 & J2 connectors	<ul style="list-style-type: none"> <li>• Connectors are energized</li> </ul>
2. Bay 2 and bay 3 thermal louvers	<ul style="list-style-type: none"> <li>• Sharp edges</li> <li>• Reduction or loss of radiative capability</li> <li>• Potential source of contamination</li> </ul>
3. Bay 2 and bay 3 MLI blankets	<ul style="list-style-type: none"> <li>• Contamination</li> </ul>
4. Battery-R connectors	<ul style="list-style-type: none"> <li>• Connector damage</li> <li>• 1 inhibit isolates power</li> </ul>



# EVA 1 SUMMARY TIMELINE

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TASK TIME (PET TIME) HR : MIN	IV/FSS	EV	RMS	
00:00 ---	√ FSS 180°, -V3, Pivot 85°, SA to 0°  PIVOT HST (to 90°) (PL OPS, <u>IN BAY OPS</u> )	<u>POST DEPRESS</u> (00:05)	Bay 10 APC posn	
01:00 ---		<u>EGRESS/INITIAL SETUP</u> (01:00) <ul style="list-style-type: none"> <li>• MFR Setup</li> <li>• Translation Adaptation (RMS EV)</li> <li>• BAPS Post Installation</li> <li>• TA Setup</li> <li>• LGAP Cover Installation</li> </ul>	MFR Setup posn  Airlock MFR Ingress/Egress posn	
		02:00 ---	<u>WFC III</u> (02:15) <ul style="list-style-type: none"> <li>• Handhold Retrieval                             <ul style="list-style-type: none"> <li>• Aft Fixture Setup</li> </ul> </li> <li>• WFPC 2 Removal</li> <li>• WFC III Retrieval</li> <li>• WFC III Installation</li> <li>• WFPC 2 Stow in WSIPE</li> <li>• WFPC 2 Cleanup</li> </ul>	Fwd Fixture posn WFPC Handhold Install posn Aft Fixture posn Fwd Fixture posn WFC III Retrieval posn WFC III Pre-Install posn WFC III Install posn  WFC Handhold Handoff posn
03:00 ---			<u>SI C&amp;DH</u> (01:30) <ul style="list-style-type: none"> <li>• SI C&amp;DH Removal                             <ul style="list-style-type: none"> <li>• SI C&amp;DH-R Retrieval</li> </ul> </li> <li>• SI C&amp;DH Swap</li> <li>• SI C&amp;DH -R Install</li> </ul>	Aft Fixture posn WFPC 2 Stow posn Fwd Fixture posn
			04:00 ---	<u>SCM &amp; LOCKS</u> (00:55)
05:00 ---		<u>DAILY CLOSEOUT/INGRESS</u> (00:40)		LOCK Retrieval posn LOCK Install posn
		06:00 ---	<u>PRE REPRESS</u> (00:05)	Airlock MFR Ingress/Egress posn  RMS Extended Park posn
EVA = 6:30				

# EVA 1

## EVA 1 TOOL CONFIG

### AIRLOCK

- HST Tool Bag:**
- Helmet light battery (spare)
- General Purpose Caddy
  - IFM 5/32-in allen w/ tether (FSS cont)
  - IFM 1/8-in allen wrench w/ tether (ECU drive stud cont)
- MWS key strap
- Inspection mirror w/ O-tether
- Palm Wheel
- Wire tie caddy
- Connector Cleaner Tool Kit
- Cheater bar
- Airlock wrench (3/8" ratchet with 7/16" socket)
- Adjustable wrench
- DCM Plug
- 2 - 34-in adj tethers (cont) (HST bag pouch)
- 1 - 80-in adj tether (cont) (HST bag pouch)
- Overgloves (4 pair)
- Ballstack (no-RMS cont)
- SSAT tool (SIC&DH align guide & bracket removal cont)
- Fish stringer #1:**
- Socket caddy #1:
  - Short adj extension (spare)
- Lube Applicators (2)
- PGT (spare): s/n: \_\_\_\_\_
- PGT Battery: s/n: \_\_\_\_\_
- EVA Ratchet (spare)
  - MTL
  - 6-in rigid socket (spare)
- High torque connector tool
  
- Digital Camera with Bracket (spare)
  - Lg-sm RET
  
- Spare tethers (as desired, on HST tool bag)
  
- Prior to EVA, inspect the following:
  - RET cords for damage
  - Safety and waist tether load alleviating straps (no red band or damage)

### MFR HANDLE - EGRESS

- FRONT** (MFR handle install posts facing you) (MFR=180 deg)
- Tool board C (left side of MFR handle):
  - Small trash bag (lower bayonet), int RET, √zipped
  - Adj tether
  - O-tether, int RET (bungee)
- Tool board T (right side of MFR handle):
  - Manual door stay (upper outbd small diameter hole)
  - Int RET
  
- BACK** (MFR=0 deg)
- Tool board C
  - Lube applicator, upper bayonet, int RET
  - Adj tether
- Tool board T
  - EVA ratchet with MTL (38) and hybrid ext, upper bayonet
  - Sm-sm paddle RET
  - EHIP Battery Bag (SCM), adj tether
  - EHIP Battery (tether point toward lid)
  - Adj tether (spare) - on bag for temp stow
  - 6-in wobble (SI C&DH drive stud) (post)
  - Long adj extension (post)
  - Palm wheel, int RET
  
- Bayonet fittings: (facing front side)
  - Lower left: Digital camera, int camera RET
  - Upper right: PGT w/ hybrid ext, socket faces back, lg-sm RET
  - PGT s/n: \_\_\_\_\_ PGT Battery s/n: \_\_\_\_\_
  - Upper left: PGT w/ 6-in wobble, sm-sm eq RET
  - PGT s/n: \_\_\_\_\_ PGT Battery s/n: \_\_\_\_\_
  
- Top tether points:
  - 1 – RET (lg-sm paddle) (spare)
  
- Side tether points:
  - 1 – RET (lg-sm) (to tether MFR Handle in A/L) (stays in A/L)
  - 1 – Waist tether (to tether MFR Handle in A/L) (stays in A/L)
  - 1 – Sm-sm equip RET (side of board) (spare)
  - 1 – Fish stringer #2 (LOCKS) (across back of boards)

### MWS-EGRESS

- A/L D-RING: D-ring extender
  
- FF EV (Grunsfeld)
  - MWS w/ right swing arm
    - Sm trash bag, √zipped (inner bayonet)
    - Sm-sm pb RET
  - 1 - Waist tether - Hooks locked (coated - left)
  - 1 - RET w/ PIP pin (sm-sm paddle) – left
  - 1 - RET (lg-sm paddle) – right
  - 1 - Adj tether – right D-ring to trash bag
  - Bay 10 thermal cover, integ hook, behind T-bar
  - Safety tether (right) (hook locked)
  
- RMS EV (8 Ball)
  - MWS w/ right swing arm
    - Sm-sm eq RET with PIP pin
  - 1 - Waist tether - Hooks locked (coated - right)
  - 1 - RET (lg-sm paddle) – left
  - 1 - RET (lg-sm paddle) – right
  - 1 - Adj tether – (D-ring to D-ring)
  - Safety tether (left) (hook locked)
  
- TOTAL TETHER COUNT
  - 2 – sm-sm equip RET (8)
  - 7 – lg-sm paddle RET (9)
  - 1 – sm-sm pb RET (3)
  - 6 – adj tether (10)
  - 1 – sm-sm paddle RET (2)
  - 1 – sm-sm paddle RET w/PIP pin (2)
  - 1 – sm-sm eq RET with PIP pin (2)

# EVA 1 POST TOOL CONFIG

## MFR HANDLE - INGRESS

- Small trash bag
- Manual door stay
- Lube applicator
- EVA ratchet with MTL (38) and 6-in wobble
- Palm wheel
- EHIP battery bag
- EHIP battery
- O-tether
- Hybrid ext
- Hybrid ext
- Digital camera
- PGT with long adj ext
- Fish stringer #2
- SICDH connector cap stringer
- Bay 10 thermal cover

## TETHERS

- 2 – sm-sm equip RET
- 5 – lg-sm paddle RET
- 1 – sm-sm pb RET
- 6 – adj tether
- 1 – sm-sm paddle RET
- 1 – sm-sm paddle RET w/PIP pin
- 1 – sm-sm eq RET with PIP pin

## MIDDECK TOOLS

- STIS/ACS Ground Strap Harness Bag (with ACS HR clamp, 2 FETs, cutters, CMT)
- HRTs (2)
- CRT
- RSU Bag
- STIS/MPT Bit Caddy (7 bits)
- RIB Caddy (4 RIBs, 1 FEB, 1 WET, 1 CB)
- GP Caddy (spare)
- Middeck Cont Kit and Blanket
- MUT EE
- Red bit spares (2)
- Black bit
- Battery Cap Caddy (2)

## MWS-INGRESS

### FF EV (Grunsfeld)

- MWS w/ right swing arm
- 1 - Waist tether
- 1 - Sm trash bag
- Safety tether
- PGT with 6-in wobble socket
- Vent plugs (2) - if removed from Bay 5 as a get-ahead

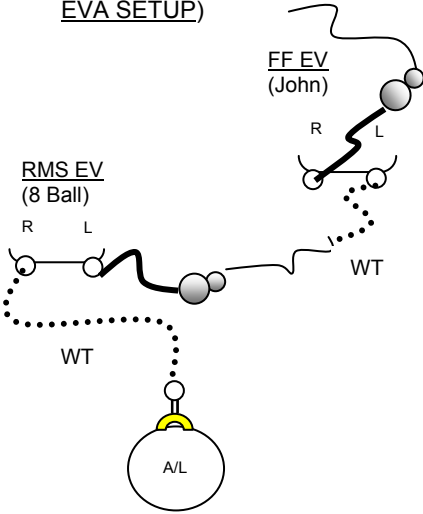
### RMS EV (8 Ball)

- MWS w/ right swing arm
- 1 - Waist tether
- Safety tether

## MIDDECK TOOLS

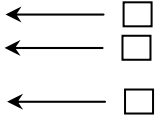
- Drop-proof tether adapter (2)
- 1 - 34-in adj tether
- 1 - 80-in adj tether
- PGT Batteries (4)
- MPT (2) with 1 holster
- Left swingarm (2)
- Y-harness restraint tool
- ACS Guide Stud Caddy
- FRB
- Trash bag (old style)

# EGRESS/INITIAL SETUP (01:00)

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>1. √ Pivot FSS to 85°</p> <p>2. RMS: To MFR Pre-grapple Posn (PDRS, EVA SETUP)</p>  <p>INITIAL SAFETY TETHER CONFIG</p> <p>3. RMS: To Airlock Setup Posn</p>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Own safety tether load alleviating strap attached to right EMU D-ring, hook slide lock - L, reel unlocked</li> <li>√ Waist tether to left EMU D-ring, hook slide lock - L</li> <li>√ RMS EV safety tether long end attached to left waist tether, hook slide locks (2) - L</li> </ul> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. Thermal cover - open</li> <li>2. Egress airlock</li> <li>3. Translate to port sill slidewire cushion</li> <li>4. Open aft 1/4 turn fastener</li> <li>5. Gently relocate slider aft of RMS shoulder</li> <li>6. Translate aft of RMS shoulder</li> <li>7. Attach safety tether to aft-most slider:             <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>8. Remove RMS EV's safety tether from self; attach to A/L truss center/stbd handrail standoff             <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> </ol> <p><u>MFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to Orbiter port bay 10             <ul style="list-style-type: none"> <li>- Release Velcro at fwd fixture (get-ahead)</li> </ul> </li> <li>2. Tether MFR to APC and unlatch MFR (lg/sm RET)</li> <li>3. GCA SRMS for MFR grapple</li> <li>4. When SRMS in position, install MFR into EE</li> <li>5. Give SRMS operator GO to capture and rigidize</li> <li>6. Retrieve lg/sm RET from APC</li> <li>7. Give RMS operator GO to mnvr RMS to A/L</li> <li>8. Temp stow Bay 10 thermal cover on APC</li> </ol> <p><u>BAPS POST INSTALLATION</u> (00:20)</p> <ol style="list-style-type: none"> <li>1. Translate to FSS</li> <li>2. Remove BAPS post umbilical Velcro straps (3)</li> <li>3. Remove port BAPS hitch pin and PIP pin</li> </ol>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Right waist tether to A/L D-ring extender, hook slide lock - L</li> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> </ul> <p><u>EGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Release waist tether from airlock D-ring extender</li> <li>2. Egress airlock</li> </ol> <p><u>TRANSLATION ADAPTATION</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Perform translation adaptation</li> <li>2. Translate to WSIPE, release stbd and center WSIPE latches</li> </ol> <p><u>MFR SETUP</u> (00:35)</p> <ol style="list-style-type: none"> <li>1. Translate to A/L</li> <li>2. Install MFR/RMS tether; tighten</li> <li>3. Install waist tether onto truss HR             <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>4. Perform safety tether swap from A/L truss HR to RMS HR standoff (black end)             <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> </ol>

**EGRESS/INITIAL SETUP (01:00) (Cont)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>4. PIVOT HST (to 90°) (PL OPS, <u>IN BAY OPS</u>)</p>	<ol style="list-style-type: none"> <li>4. Remove stbd BAPS hitch pin and PIP pin</li> <li>5. Tether BAPS post stbd end to MWS (lg. hook–fwd)</li> <li>6. Remove BAPS post</li> <li>7. Install BAPS stbd clevice into FSS fwd/upper bracket, install PIP pin; secure Velcro</li> <li>8. Release post mechanism and extend</li> <li>9. Install BAPS post port clevice into aft/lower bracket, install PIP pin; secure Velcro</li> <li>10. Translate clear of pivot envelope ← □</li> <li>11. Translate to aft fixture</li> <li>12. Remove hitch pins and PIP pins (2); stow</li> <li>13. Secure hitch pins via Velcro tabs</li> <li>14. Deploy aft fixture</li> <li>15. Engage captive lock pins (2)</li> <li>16. ✓ Top fork PIP pin in proper orientation</li> </ol> <p>After pivot to 90°</p> <ol style="list-style-type: none"> <li>17. Install center pip pins (2)</li> </ol> <p><u>TRANSLATION AID SETUP (00:05)</u></p> <ol style="list-style-type: none"> <li>1. Configure center TA (straight up): S↓, A=6, B=6, <b>C=6</b>, extended (1)</li> <li>2. Perform glove inspection</li> </ol> <p><u>LGAP COVER INSTALLATION (00:10)</u></p> <ol style="list-style-type: none"> <li>1. Inspect P105 and P106 covers</li> <li>2. Translate to aft/port MULE</li> <li>3. Remove LGAP cover (2 captive lock pins)</li> <li>4. Translate to LGA (on aft/stbd corner of HST), install cover</li> </ol>	<ol style="list-style-type: none"> <li>5. Give RMS operator GO to roll EE</li> <li>6. Deploy MFR stanchion</li> <li>7. Retrieve MFR handle from airlock/temp stow</li> <li>8. Install MFR handle onto MFR</li> <li>9. Close A/L thermal cover</li> <li>10. Attach boot plate lanyard to MWS lower D-ring</li> <li>11. Ingress MFR</li> <li>12. Retrieve Ratchet and PGT with hybrid ext from MFR handle, stow on MWS</li> <li>13. Perform glove inspection</li> </ol>

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>5. √ FSS 180°, -V3, Pivot 90°, +/-SA to 0°                      6. √ In sun protect att before removing WFPC 2                      7. √ MCC GO for WFPC 2 removal (blind mate)                      * If NO COMM perform: *                      * DEADFACE WFPC 2 (PL OPS, <u>ORU/ORI</u>) *                      8. RMS: To Fwd Fixture posn</p> <p>9. RMS: To WFPC 2 Removal posn</p>	<p><u>WFPC 2 REMOVAL</u></p> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: 80%; text-align: center;"> <p><u>CAUTION</u>                      Avoid contact with FHSTs (3), Bay 2 &amp; 3 MLI, Labyrinth seal, &amp; WFPC2 radiator</p> </div> <div style="border: 3px double black; padding: 5px; margin: 5px auto; width: 80%; text-align: center;"> <p><u>WARNING</u>                      Avoid contact with bay 2 and 3 battery door thermal louvers, &amp; WFC pick-off mirror</p> </div> <ol style="list-style-type: none"> <li>1. Retrieve Bay 10 thermal cover from APC</li> <li>2. Translate to Bay 10 (via -V2 doors, PLB stbd)                             <ul style="list-style-type: none"> <li>- Install fairlead on SOPE top knob, fwd of aft fixture</li> </ul> </li> <li>3. Install SIC&amp;DH thermal cover, attach clips (4)</li> <li>4. Stow ground strap on HST integral bolt</li> </ol>	<div style="text-align: center;">  </div> <p><u>HANDHOLD RETRIEVAL</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Mnvr to fwd fixture</li> <li>2. Rotate stanchion to 135L; MFR handle 180°, boot plate to 0°</li> <li>3. Pitch MFR stanchion fully out</li> <li>4. Retrieve FGS handhold (outboard)                             <ul style="list-style-type: none"> <li>- Release 1/4 turn fasteners (2)</li> </ul> </li> </ol> <p><u>WFPC 2 REMOVAL</u> (00:30)</p> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: 80%; text-align: center;"> <p><u>CAUTION</u>                      Avoid contact with FHSTs (3), Bay 2 &amp; 3 MLI, Labyrinth seal, &amp; WFPC2 radiator</p> </div> <div style="border: 3px double black; padding: 5px; margin: 5px auto; width: 80%; text-align: center;"> <p><u>WARNING</u>                      Avoid contact with bay 2 and 3 battery door thermal louvers, &amp; WFC pick-off mirror</p> </div> <ol style="list-style-type: none"> <li>1. Mnvr to WFPC 2</li> <li>2. Rotate handhold w/ "A" latch cut-out PLB nadir</li> <li>3. Install FGS handhold; install zip nuts (4) first, then hand tighten</li> <li>4. <b>PGT [A3, CCW 2, 10.5] hybrid ext, fully ext</b></li> <li>5. Disengage blind mate interface, ~5.5 turns (hard stop)</li> <li>6. Disengage ground strap bolt, 4-6 turns</li> <li>7. <b>EVA Ratchet [CCW, MTL 38] hybrid ext, fully ext</b></li> <li>8. Disengage "A" latch, 1/2 turn</li> <li>9. Stow EVA ratchet on MWS</li> </ol>

**WFC III (02:15) (Cont)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>10. "A" total turns _____</p> <p>11. RMS: To WFPC 2 Temp Stow posn</p> <p>12. RMS: To WFC Handhold Retrieve at Fwd Fixture posn</p> <p>13. RMS: To WFC III Retrieval posn</p>	<p align="center"><u>NOTE</u> Expect to see WFPC 2 move ~ 1.1 inches out of telescope during "A" latch bolt release</p> <p>5. Monitor WFPC 2 clearances with HST</p> <p>6. Inspect HST bay:</p> <ul style="list-style-type: none"> <li>- MLI or guide rail damage</li> <li>- Verify blind-mate floating plate in proper orientation and fully engaged (all probes and ball detents in place)</li> <li>- No hardware interference for WFC III installation</li> </ul> <p><u>WFC III RETRIEVAL</u></p> <p>1. Translate to fwd fixture</p> <p>2. Release WFC handhold ground strap, stow on Velcro patch</p> <p>3. Release WFC handhold captive lock pins (3)</p> <p>4. Assist RMS EV w/ handhold retrieval</p> <p>5. Translate to WSIPE</p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p align="center"><u>CAUTION</u> Avoid contact with WFC III Radiator</p> </div> <div style="border: 3px double black; padding: 5px; margin: 10px auto; width: fit-content;"> <p align="center"><u>WARNING</u> Avoid contact with WFC III pick-off mirror</p> </div> <p>6. Release lid latch, open After aft two zip nuts engaged:</p> <p>7. Translate onto handhold; hand tighten fwd zip nuts (2)</p>	<p>10. Attach RET to WFPC 2</p> <p align="center"><u>NOTE</u> Expect to see WFPC 2 move ~ 1.1 inches out of telescope during "A" latch bolt release</p> <p>11. <b>PGT [A3, CCW 2, 10.5]</b></p> <p>12. Drive "A" latch 22 turns, (free spin) ← □</p> <p>13. Remove WFPC 2; posn self high</p> <p>14. Mnv'r to aft fixture</p> <p>15. Stow WFPC on aft fixture; install upper fork PIP pin</p> <p>16. Release RET prior to mnvr</p> <p><u>WFC III RETRIEVAL (00:25)</u></p> <p>1. Mnv'r to fwd fixture</p> <p>2. Retrieve WFC handhold (inboard)</p> <p>3. Mnv'r to WSIPE</p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p align="center"><u>CAUTION</u> Avoid contact with WFC III Radiator</p> </div> <div style="border: 3px double black; padding: 5px; margin: 10px auto; width: fit-content;"> <p align="center"><u>WARNING</u> Avoid contact with WFC III pick-off mirror</p> </div> <p>4. Install WFC handhold (orient "A" latch cutout aft)</p> <p>5. Hand tighten aft zip nuts (2)</p> <p>6. <b>PGT [A2, CCW 2, 5.5]</b></p> <p>7. Disengage vent valves (2), ~5 turns (hard stop)</p>

**WFC III (02:15) (Cont)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>14. Light ON "A" turns _____</p> <p>15. "A" total turns _____</p> <p>16. (P/TV09, <u>ICBC3D</u>): ICBC #2: WFC III Transition from WSIPE to HST Install</p> <p>17. ICBC #3: WFC III Installation</p> <p>18. RMS: To WFC III Pre-install posn</p>        <p>19. RMS: To WFC III Install posn</p>	<p>8. Stow ground strap onto WSIPE bolt</p> <p>9. Temp hold RMS EV's PGT</p> <p style="text-align: center;"><u>NOTE</u> Expect to see WFC III move ~ 1.1 inches out of WSIPE during A-latch bolt release</p> <p>10. Transfer PGT to RMS EV</p> <p>11. Monitor WFC III clearances with WSIPE</p> <p>12. GCA RMS EV into position for blind mate inspection</p> <p>13. Verify blind mate connector tangs (4) retracted, clear of FOD; inspect pins</p> <p>14. Inspect WSIPE for guide rail damage (hardware interference for WFPC 2 installation)</p> <p>15. Verify ground strap clear for lid closure</p> <p>16. Close WSIPE lid, one latch (port)</p> <p><u>WFC III INSTALLATION</u></p> <p style="text-align: center;"><u>NOTE</u> Expect to see WFC III move ~ 1.1 inches into telescope during A-latch bolt driving</p> <p>1. Translate to WFC III bay (via -V2 doors) - Re-do fairlead at SOPE</p>	<p>8. <b>PGT [A3, CCW 2, 10.5]</b></p> <p>9. Disengage ground strap bolt, 4-6 turns</p> <p>10. Transfer PGT to FF EV for temp hold</p> <p>11. <b>EVA Ratchet [CCW, MTL 38] hybrid ext (fully ext)</b></p> <p>12. Disengage "A" latch, 1/2 turn</p> <p style="text-align: center;"><u>NOTE</u> Expect to see WFC III move ~ 1.1 inches out of WSIPE during A-latch bolt release</p> <p>13. Attach RET to WFC III</p> <p>14. Receive PGT from FF EV</p> <p>15. <b>PGT [A3, CCW 2, 10.5] (turns)</b></p> <p>16. Release "A" latch, 22 turns (free spin)</p> <p>17. √"A" LATCHED light on (2.5 turns) ← <input type="checkbox"/></p> <p>18. Partially remove WFC III - Hold for blind mate inspection</p> <p>19. Complete WFC III removal from WSIPE ← <input type="checkbox"/> ← <input type="checkbox"/></p> <p><u>WFC III INSTALLATION (00:30)</u></p> <p>1. Mnvr for WFC III installation, posn self high</p> <p style="text-align: center;"><u>NOTE</u> Expect to see WFC III move ~ 1.1 inches into telescope during A-latch bolt driving</p> <p>2. Center WFC III in bay opening</p>



**WFC III (02:15) (Cont)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>20. "A" total turns _____</p> <p>21. Notify MCC blind mate connected (GO for A/T)</p> <p>22. RMS: To WFC Handhold Handoff posn</p> <p>23. ICBC #4: EV closeup during WFPC 2 stow</p> <p>24. RMS: To WFPC 2 Temp Stow Retrieve posn</p> <p>25. RMS: To WFPC 2 Stow posn</p>	<p>2. Assist RMS EV with left rub strip alignment into guide rail</p> <p>3. Temp hold RMS EV's PGT</p> <p>4. Transfer PGT to RMS EV</p> <p>5. Install HST ground strap onto WFC III</p> <p>6. Perform glove inspection</p> <p><u>WFPC 2 STOW IN WSIPE</u></p> <p>1. Translate to fwd fixture</p> <p>2. Receive WFC III handhold from RMS EV</p> <p>3. Stow handhold (inboard)</p> <p>4. Engage handhold captive lock pins (3)</p> <p>5. Engage conductive velcro ground strap</p> <p>6. Translate to WSIPE</p> <p>7. Open WSIPE lid (port latch)</p> <p>8. Clear ground strap for WFPC 2 insertion</p> <p>9. Monitor WFPC 2 clearances with WSIPE</p> <p>10. Install WSIPE ground strap</p>	<p>3. Insert WFC III (to hard stop against "A" latch)</p> <p>4. <b>PGT [A3, CW 2, 10.5]</b></p> <p>5. Engage "A" latch, 22 turns (to torque)</p> <p>6. Transfer PGT to FF EV for temp hold</p> <p>7. <b>EVA Ratchet [CW, MTL 38]</b></p> <p>8. Perform final torquing (~1/2 turn) until MTL slip ← □</p> <p>9. Receive PGT from FF EV</p> <p>10. <b>PGT [A3, CW 2, 10.5]</b></p> <p>11. Engage ground strap bolt, 4-6 turns (torque)</p> <p>12. Engage blind mate interface, ~5.5 turns (hard stop) ← □</p> <p>13. Relocate WFC handhold RET to left vertical beam on handhold</p> <p>14. Disengage handhold zip nuts, stow, hand tighten</p> <p>15. Remove WFC III handhold</p> <p><u>WFPC 2 STOW IN WSIPE (00:25)</u></p> <p>1. Mnvr to fwd fixture</p> <p>2. Transfer WFC III handhold to FF EV - "A-latch" interface point fwd in PLB - Cut-out faces aft</p> <p>3. Perform glove inspection ← □</p> <p>4. Mnvr to aft fixture</p> <p>5. Release upper fork PIP pin; stow</p> <p>6. Retrieve WFPC 2</p> <p>7. Mnvr to WSIPE</p> <p>8. Insert WFPC 2 into WSIPE (to hard stop)</p> <p><b>NOTE</b> Expect to see WFPC 2 move ~ 1.1 inches into WSIPE during A-latch bolt driving</p> <p>9. <b>PGT [A3, CW 2, 10.5]</b></p> <p>10. Engage "A" latch, 22 turns (to torque)</p> <p>11. √ "A" LATCHED lights off (2) (hinge-stbd side)</p> <p>12. <b>PGT [A3, CW 2, 10.5]</b></p>

**WFC III (02:15) (Cont)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>26. "A" total turns _____</p> <p>27. RMS: To FGS Handhold Stow posn</p>	<p><u>WFPC 2 CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Disengage fwd handhold zip nuts, stow; hand tighten</li> <li>2. Translate to aft fixture</li> <li>3. Stow aft fixture; install PIP pins (2)</li> <li>4. Translate to fwd fixture</li> </ol> <p>5. Assist RMS EV w/ conductive Velcro as necessary</p> <ol style="list-style-type: none"> <li>6. Receive EHIP battery bag with adj tether, PGT, and lube applicator with adj tether</li> <li>7. Translate to WSIPE</li> <li>8. Inspect WSIPE; close lid</li> <li>9. Engage lid latches (3)</li> </ol>	<ol style="list-style-type: none"> <li>13. Engage ground strap bolt, 4-6 turns (torque)</li> <li>14. Stow PGT on swing arm</li> <li>15. <b>EVA Ratchet [CW, MTL 38]</b></li> <li>16. Perform "A-latch" final torquing (~1/2 turn) until MTL slip ← <input type="checkbox"/></li> </ol> <p><u>WFPC 2 CLEANUP (00:15)</u></p> <p>After fwd zip nuts released:</p> <ol style="list-style-type: none"> <li>1. Disengage aft handhold zip nuts, stow; hand tighten</li> <li>2. Remove FGS handhold</li> <li>3. Mnv to fwd fixture</li> <li>4. Stow handhold (outboard); engage 1/4 turn latches (2)</li> <li>5. Engage conductive Velcro ground strap</li> <li>6. Retrieve EHIP battery bag with adj tether, PGT, lube applicator with adj tether, and camera (if desired) from MFR handle; transfer to FF EV</li> <li>7. Configure: <ul style="list-style-type: none"> <li><input type="checkbox"/> EVA ratchet w/ palm wheel and 6-in wobble</li> <li><input type="checkbox"/> PGT with long adj extension</li> </ul> </li> <li>8. Stow ratchet on MFR handle, upper right bayonet</li> </ol>

## WFPC 2/WFC III – TASK DATA SHEET

Estimated Task Duration: 02:15

	FF	W/ RMS
Two EV Crew	NA	02:15

### Tools:

FF EV	RMS EV (MFR handle)
<ul style="list-style-type: none"> <li>Bay 10 thermal cover (SIC&amp;DH)</li> </ul>	<ul style="list-style-type: none"> <li>EVA Ratchet w/hybrid ext</li> <li>PGT w/hybrid ext</li> </ul>

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
WFPC 2 blind mate	7/16"	1	NA	A3		Release: 5.5
WFPC 2 ground strap	7/16"	1	A3	A3		Release: 4-6 Install: 4-6
WFPC 2 A Latch	7/16"	1	A3	A3		Release: 1/2, then 22 Install: 22, then 1/2
WFC III vent valves	7/16"	2		A2		Release: 5
WFC III A Latch	7/16"	1	A3	A3		Release: 1/2, then 22 Install: 22, then 1/2
WFC III ground strap	7/16"	1	A3	A3		Release: 4-6 Install: 4-6
WFC III blind mate	7/16"	1	A3	NA		Install: 5.5

### Foot Restraints:

Task	S#	PFR Setting
WFPC 2/WFC III R&R	MFR	NA

### Timeline Considerations:

- WFC III is the second highest priority task for SM4

### Notes:

- The fully-extended hybrid socket setting is 25 (9 settings, 17-25) (long wobble)
- The fully extended long adj socket setting is 24 (9 settings); the long adj socket is slightly shorter than the hybrid adj when fully extended (short wobble)
- The fully-extended short adj socket has 5 settings (long wobble)
- Both the hybrid ext and the short adj sockets have long wobbles
- WFPC 2 = 620 lbs, WFC III = 900 lbs
- WFC III has an anti-rotation feature on its ground strap interface on the WFC III side; this is not present on WFPC 2
- It is acceptable to contact the instrument rub strip as required
- It is acceptable to contact some of the WFC III struts (with Kapton tape)
- The upper/right WFC III guide stud is longer than the other 3
- WFC III/WFPC 2 will move in/out of HST/WSIPE ~ 1.1 inches as A-latch is driven
- The WSIPE port "C" rail is longer than the "B" rail

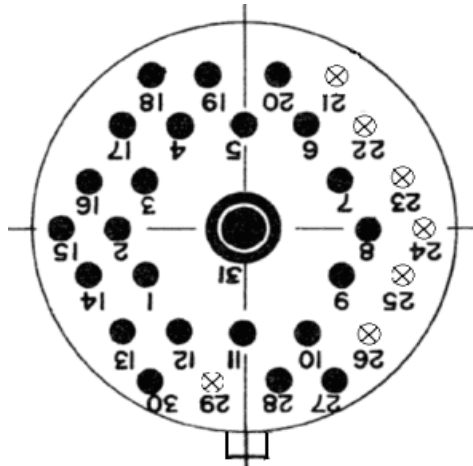
### Cautions:

- Avoid contact with A, B, and C latches/plungers; they are coated with braycote and could be deposited on critical surfaces
- Avoid contact with MLI on bottom of Bays 2 and 3
- Avoid contact with Labyrinth seal (not a sharp edge); Labyrinth seal is no damage with a max 50 lb force
- Avoid contact with WFPC and WFC rub strip rollers
- WFPC2 side handrails shall not exceed a 50 lb force
- Avoid contact with all black MLI surfaces and radiators (2)
- Max allowable exposure time for WFC III is 3:30

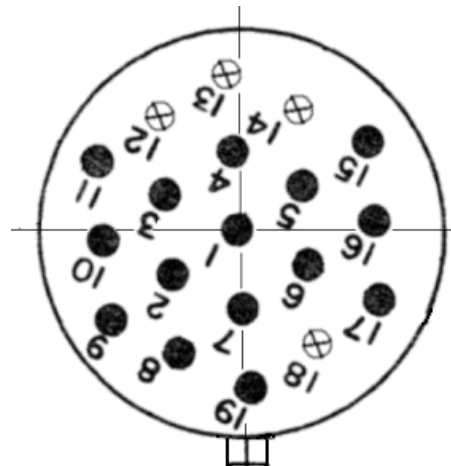
### Warnings:

- Pick-off mirror is sharp-edge hazard
- Bay 2 and 3 thermal louvers are sharp-edge hazards

WFPC 2/WFC III – TASK DATA SHEET (Cont)

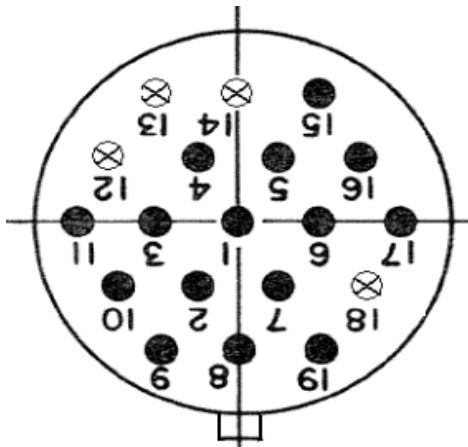


**J3** (PINS 20 - AWG)

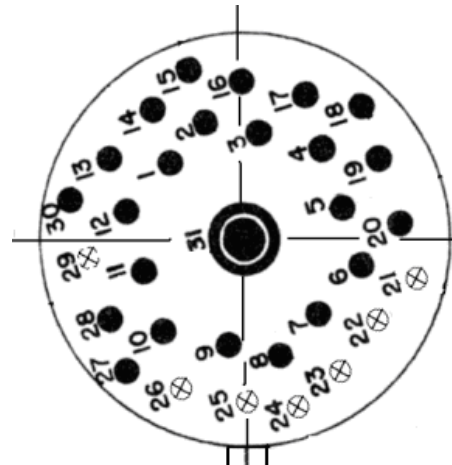


**J2** (PINS 16 - AWG)

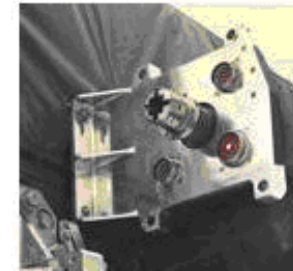
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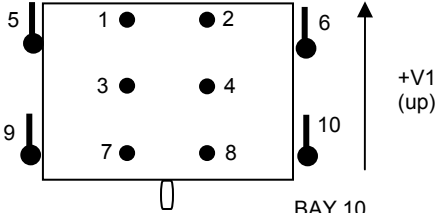
**J1** (PINS 16 - AWG)



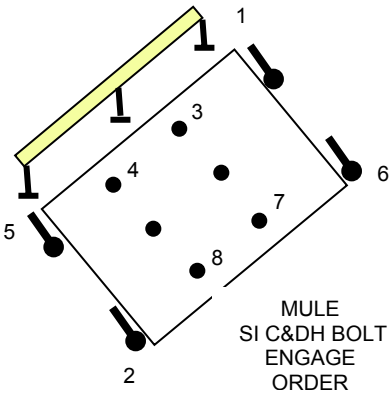
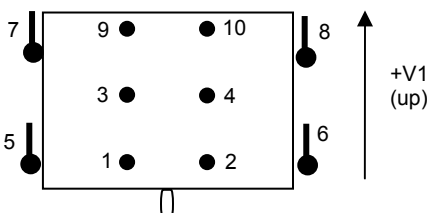
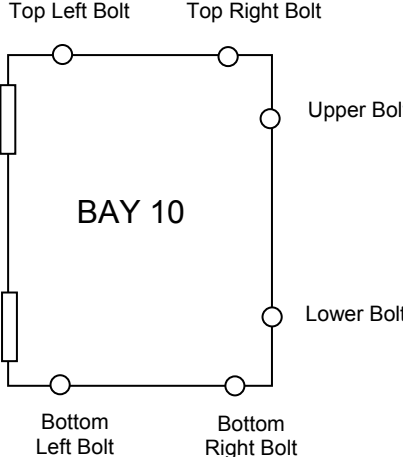
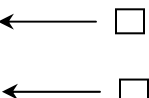
**J4** (PINS 20 - AWG)



Note: Black dots represent populated pins,  
X's represent missing pins

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>1. RMS: To Bay 10 Door posn</p>  <p>BAY 10 SI C&amp;DH BOLT DISENGAGE ORDER</p> <p>2. ✓ MCC GO for SI C&amp;DH changeout * If NO COMM: Hold on SI C&amp;DH task, * * Do <u>NOT</u> open Bay 10 door *</p> <p>3. RMS: To SIC&amp;DH Handoff at MULE posn</p>	<p><u>SI C&amp;DH-R RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to stbd/aft MULE</li> <li>2. Temp stow EHIP battery bag and lube applicator on COPE lid w/ adj tethers (2)</li> <li>3. Open MLI thermal cover; restrain open</li> </ol> <p style="text-align: center;"><u>NOTE</u> Upper and middle SIC&amp;DH-R spring-loaded bolts are engaged for launch on MULE</p> <ol style="list-style-type: none"> <li>4. <b>PGT [A3, CCW 2, 10.5], 6-in wobble</b></li> <li>5. Disengage spring-loaded bolts (4), 8 turns</li> <li>6. Disengage 3 of 4 keyway bolts, 6 turns</li> </ol> <p><u>SI C&amp;DH SWAP</u></p> <p style="text-align: center;"><u>NOTE</u> Avoid contact with Egraf coating on bottom surface of SIC&amp;DH-R</p> <ol style="list-style-type: none"> <li>1. Tether to SI C&amp;DH-R D-ring</li> <li>2. <b>PGT [A3, CCW 2, 10.5]</b></li> <li>3. Release final keyway bolt, 6 turns</li> <li>4. Remove SI C&amp;DH-R from MULE</li> <li>5. Translate to swap location (top of MULE stbd tower)</li> <li>6. Transfer SI C&amp;DH-R to RMS EV</li> </ol>	<p><u>SI C&amp;DH REMOVAL</u> (00:35)</p> <ol style="list-style-type: none"> <li>1. Mnvr to bay 10; MFR handle 180, stanchion to 135L; boot plate 90R</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Monitor solar array clearances during SI C&amp;DH operations</p> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Avoid contact with thermistor wire</p> </div> <ol style="list-style-type: none"> <li>2. <b>PGT [A3, CCW 2, 10.5], long adj</b></li> <li>3. Disengage J-bolts (6), 6 turns</li> </ol> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>4. Open Bay 10 door fully</li> <li>5. Configure boot plate 0°</li> <li>6. <b>PGT [A3, CCW 2, 10.5]</b></li> <li>7. Disengage SIC&amp;DH bolts in following order:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Upper spring-loaded bolts (2), 12 turns</li> <li><input type="checkbox"/> Center spring-loaded bolts (2), 12 turns</li> <li><input type="checkbox"/> Upper keyway bolts (2), 4 turns</li> <li><input type="checkbox"/> Lower spring-loaded bolts (2), 12 turns</li> <li><input type="checkbox"/> Lower keyway bolts (2), 4 turns</li> </ul> </li> <li>8. Attach tether to HR</li> <li>9. <b>EVA Ratchet [CCW, MTL 10] 6-in wobble</b></li> <li>10. Disengage connector drive stud, 6 turns</li> <li>11. Pre-configure EVA ratchet to CW, MTL 5</li> <li>12. Temp stow EVA ratchet onto MFR handle</li> <li>13. Remove SI C&amp;DH</li> <li>14. Inspect door side connector receptacles for damage or FOD, and door inserts (6) for possible broken fasteners</li> </ol> <p><u>SI C&amp;DH SWAP</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Mnvr to SI C&amp;DH swap posn</li> <li>2. Receive SI C&amp;DH-R from FF EV</li> <li>3. Transfer SI C&amp;DH to FF EV</li> </ol>

SI C&DH R&R (01:30) (Cont)

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>4. IV: Notify MCC SI C&amp;DH-R installation complete (GO for A/T)</p> <p>5. WVS: RMS EV Center Cam; overview of SI C&amp;DH installed, bolts (10), &amp; connectors engaged</p>  <p>MULE SI C&amp;DH BOLT ENGAGE ORDER</p>  <p>BAY 10 SI C&amp;DH-R BOLT ENGAGE ORDER</p>	<p>7. Receive SI C&amp;DH from RMS EV</p> <p><u>SI C&amp;DH STOW</u></p> <ol style="list-style-type: none"> <li>1. Install old SI C&amp;DH onto MULE (connectors outbd)</li> <li>2. <b>PGT [A3, CW 2, 10.5]</b></li> <li>3. Engage keyway bolts #1 and #2 (2), 5-7 turns</li> <li>4. Engage remaining bolts in following order: <ul style="list-style-type: none"> <li>- #3 and #4 (HR side, spring bolts), 6-9 turns</li> <li>- #5 and #6 (keyway bolts), 5-7 turns</li> <li>- #7 and #8 (outbd side, spring bolts), 6-9 turns</li> <li>- Re-torque keyway bolt #2</li> </ul> </li> <li>5. Close thermal cover</li> <li>6. Perform glove inspection</li> <li>7. Translate to Bay 10</li> <li>8. Assist RMS EV as reqd</li> </ol>  <p>Top Left Bolt    Top Right Bolt</p> <p>Upper Bolt</p> <p>BAY 10</p> <p>Lower Bolt</p> <p>Bottom Left Bolt    Bottom Right Bolt</p>	<p><u>SI C&amp;DH-R INSTALL (00:45)</u></p> <ol style="list-style-type: none"> <li>1. Mnvr to Bay 10</li> <li>2. Remove SI C&amp;DH connector cap stringer; temp stow</li> <li>3. Inspect SI C&amp;DH-R connectors</li> <li>4. Install SI C&amp;DH-R onto Bay 10 door</li> <li>5. <b>EVA Ratchet [CW, MTL 5]</b></li> <li>6. Engage connector drive stud, 4-5 turns, MTL slip <ul style="list-style-type: none"> <li>- Verify box moves down evenly</li> <li>- Check for even 1/2-in gap</li> </ul> </li> <li>7. <b>PGT [A3, CW 2, 10.5], long adj</b></li> <li>8. Engage SIC&amp;DH bolts in following order: <ul style="list-style-type: none"> <li><input type="checkbox"/> Lower spring-loaded bolts (2), 4-7 turns</li> <li><input type="checkbox"/> Center spring-loaded bolts (2), 4-7 turns</li> <li><input type="checkbox"/> Lower keyway bolts (2), 3-5 turns</li> <li><input type="checkbox"/> Upper keyway bolts (2), 3-5 turns</li> <li><input type="checkbox"/> Upper spring-loaded bolts (2), 4-7 turns</li> <li><input type="checkbox"/> Re-torque keyway bolts (4)</li> </ul> </li> </ol>  <ol style="list-style-type: none"> <li>9. Close bay 10 door</li> <li>10. <b>PGT [A3, CW 2, 10.5]</b></li> <li>11. Engage J-bolts (6), 4-6 turns</li> <li>12. Remove Bay 10 thermal blanket, stow on MFR handle</li> <li>13. Perform glove inspection</li> </ol>

# SI C&DH R&R – TASK DATA SHEET

## Estimated Task Duration: (01:30)

	FF	W/ RMS
Two EV Crew	N/A	01:30

## Tools:

FF EV	RMS EV
<ul style="list-style-type: none"> <li>PGT w/ 6-in wobble</li> </ul>	<ul style="list-style-type: none"> <li>PGT with long adj ext</li> <li>Ratchet with 6-in wobble and MTL</li> </ul>

## EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
Bay 10 Door J-bolts	7/16	6	A3	A3		Release: 6 Install: 4-6
SI C&DH spring-loaded bolts	7/16	6	A3	A3	16.0 (vespel path on threads) 22.5 (rod)	Release (from bay 10 door) 12 Install (on MULE) 6-9
HST keyway bolts	7/16	4	A3	A3	16.0	Release 4 Install 3-5
HST drive stud bolt	7/16	1	Ratchet MTL/CW=5	Ratchet MTL/CCW = 10	11.9	Release 6 Install 4-5
SI C&DH-R spring-loaded bolts	7/16	6	A3	A3		Release (from MULE) 8 Install (bay 10 door) 4-7
MULE keyway bolts	7/16	4	A3	A3		Release 6 Install 5-7

## Foot Restraints:

Task	S#/FR#	PFR Setting
Bay 10 SI C&DH R&R	MFR	NA
No-RMS SI C&DH	FR 7	ASIPE PFR ext: 60R↓; HST PFR: 15R↓, PP/A/BB/6

## Notes:

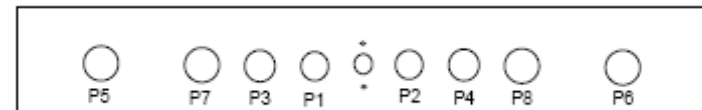
- SI C&DH mass: 136 lbs
- SI C&DH bolts on Bay 10 door have required sequence for both engagement and disengagement
- SI C&DH bolts on MULE have required sequence for engagement only
- MULE keyway bolt interrupted threads start at 8 turns
- Pins are on SIC&DH box itself; sockets are on door side connector bracket
- Avoid contact with Egraf coating on bottom surface of SIC&DH-R

## Cautions:

- Avoid contact with SI C&DH cables and connectors
- Avoid contact with thermistor wire on bay 10 door
- Monitor solar array clearances during SI C&DH operations

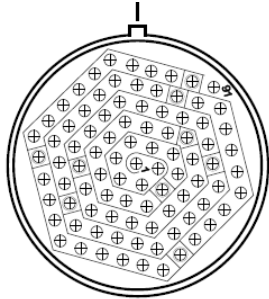
## Connectors:

Connector	From	To	Function	Pin Gauge
HST P1	HST P1	SI C&DH J1	power	20
HST P2	HST P2	SI C&DH J2	power	20
HST P3	HST P3	SI C&DH J3	CMD/TLM (DMU/DIU 5 - SI C&DH)	22
HST P4	HST P4	SI C&DH J4	CMD/TLM (DMU/DIU 5 - SI C&DH)	22
HST P5	HST P5	SI C&DH J5	CMD/TLM (SIs - SI C&DH)	22
HST P6	HST P6	SI C&DH J6	CMD/TLM (SIs - SI C&DH)	22
HST P7	HST P7	SI C&DH J7	heater power	22
HST P8	HST P8	SI C&DH J8	heater power	22

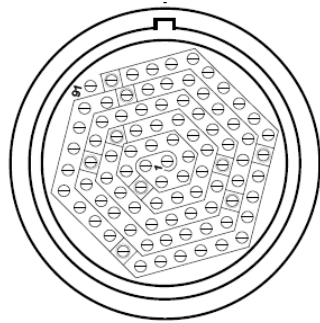


SI C&DH CONNECTOR BRACKET

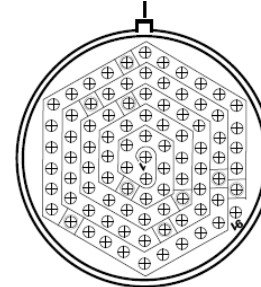
SI C&DH R&R – TASK DATA SHEET (Cont)



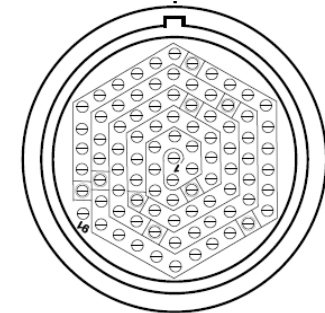
J8



P8

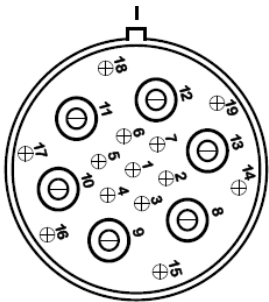


J7

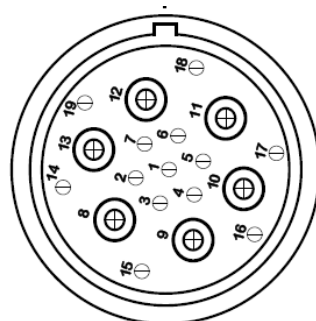


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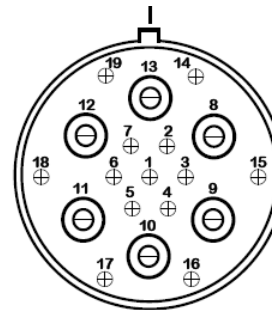
**PIN MAPS**



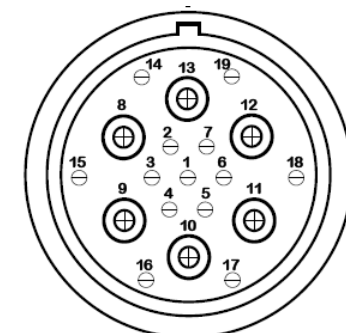
J6



P6



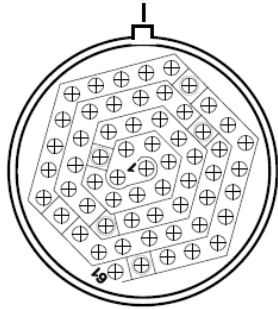
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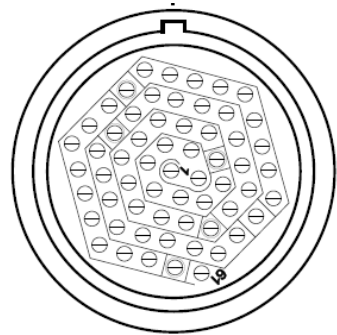
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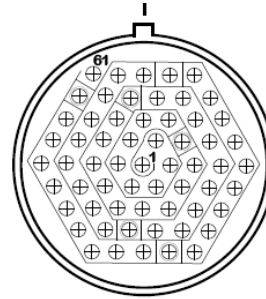
SI C&DH R&R – TASK DATA SHEET (Cont)



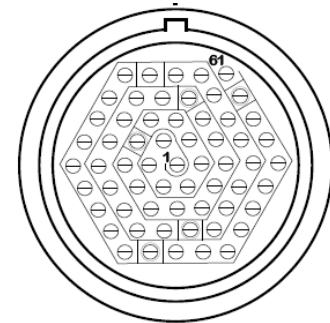
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P4

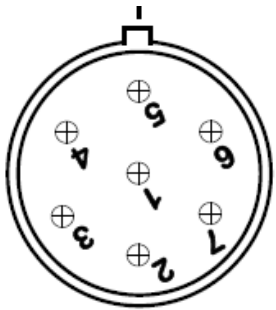


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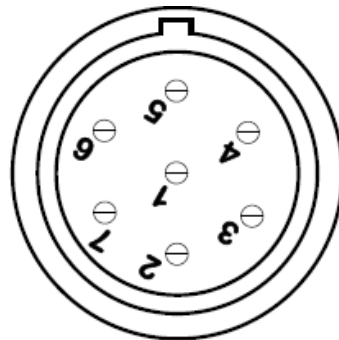


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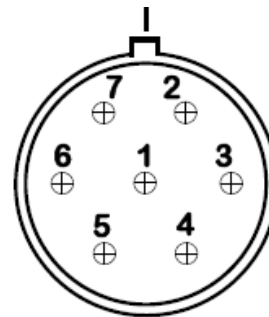
PIN MAPS



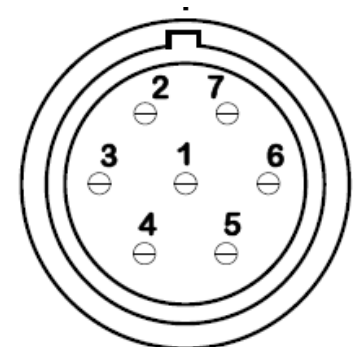
J2



P2

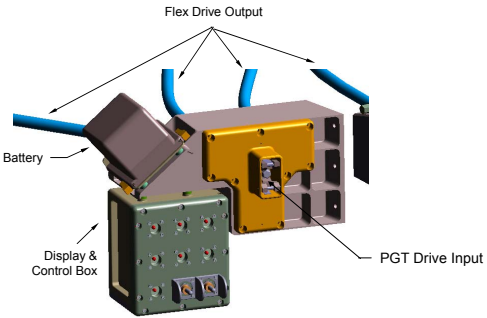


J1

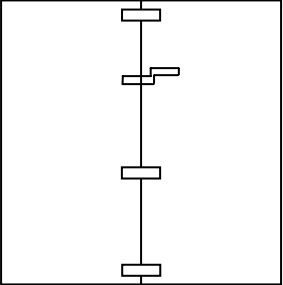


P1

## SCM & LOCKS (00:55)

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>1. RMS: To Bay 2 posn</p>  <p style="text-align: center;">SCM</p> <p>2. RMS: To LOCK Retrieval posn</p> <p>3. RMS: To LOCK Install posn</p>	<p><u>GET AHEAD: SCM (00:10)</u></p> <ol style="list-style-type: none"> <li>1. Retrieve EHIP battery bag and lube applicator from COPE</li> <li>2. Translate to SCM EVA interface (-V2 side of FSS)</li> <li>3. Install EHIP battery into SCM battery housing</li> <li>4. Take battery MASTER switch on (up)</li> <li>5. Verify PWR LED is illuminated red</li> <li>6. Take battery TEST switch on (up)</li> <li>7. Verify HST LEDs (3) and FSS LEDs (3) are illuminated</li> <li>8. Take battery TEST switch to OFF</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p>During SCM bolt driving, inform IV of the following:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> FSS LED (3) illumination at 16-19 turns</li> <li><input type="checkbox"/> HST LED (3) illumination at 30-35 turns</li> </ul> <ol style="list-style-type: none"> <li>9. <b>PGT [A3, CW 3, 10.5]-6-Ext-7/16:</b> Drive SCM hex interface, 35 turns (stop on turns, bolt free spins)</li> <li>10. Verify FSS and HST LEDs all illuminated</li> <li>11. Take battery MASTER switch to OFF, verify PWR LED off</li> <li>12. Remove EHIP battery from SCM housing, stow in bag</li> <li>13. Replace SCM cover</li> </ol> <p><u>-V2 DOOR LOCK INSTALL (00:45)</u></p> <ol style="list-style-type: none"> <li>1. Translate to aft/port MULE</li> <li>2. Transfer EHIP battery to RMS EV</li> <li>3. Retrieve LOCKs (3); transfer to RMS EV <ul style="list-style-type: none"> <li>- Fully release main handle and LOCK arm</li> <li>- Rotate lever 1 lock pin to red setting</li> <li>- Rotate lever 1 down to hard-stop</li> </ul> </li> <li>4. Translate to -V2 doors</li> </ol>	<p><u>GET AHEAD: BAY 2 DOOR BOLT RELEASE (00:10)</u></p> <ol style="list-style-type: none"> <li>1. Configure stanchion, boot plate, and MFR handle as desired for clearance</li> <li>2. Mnv to Bay 2</li> <li>3. <b>PGT [A3, CCW 3, 10.5], hybrid ext</b></li> <li>4. Disengage top and bottom J-bolts (4), 6 turns <ul style="list-style-type: none"> <li>- Verify J-hooks swung out of way</li> <li>- Leave upper and lower bolts engaged</li> </ul> </li> <li>5. Perform glove inspection</li> </ol> <p><u>-V2 DOOR LOCK INSTALL</u></p> <ol style="list-style-type: none"> <li>1. Mnv to aft/port MULE for LOCK retrieval</li> <li>2. Configure stanchion 180°; boot plate 90L</li> <li>3. Receive EHIP battery from FF EV; temp stow on MFR handle</li> <li>4. Receive LOCKs (3) from FF EV; temp stow on fish stringer</li> <li>5. Mnv to -V2 aft shroud doors</li> <li>6. Configure boot plate 90R</li> </ol>

## SCM & LOCKS (00:55) (Cont)

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<div style="text-align: center;">  </div> <p style="text-align: center;">-V2 DOORS</p> <p>4. WVS: RMS EV Center Cam (Overview of each LOCK)</p>	<p style="text-align: center;"><b>NOTE</b> Preferred order for LOCK install is top to bottom</p> <p>5. Assist RMS EV as possible</p> <p><u>GET AHEAD: DOOR LUBE</u></p> <p>1. Perform lube application to the following door bolts as time available:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> -V3 aft shroud doors</li> <li><input type="checkbox"/> +V2 aft shroud doors</li> <li><input type="checkbox"/> FGS-2 (+V3) bay doors</li> </ul> <p><u>GET AHEAD: NOBL VENT PLUGS</u></p> <p>1. Translate to Bay 5</p> <p>2. Remove NOBL vent plugs installed in Bay 5 (qty 2); stow in trash bag</p>	<p style="text-align: center;"><b>NOTE</b> Preferred order for LOCK install is top to bottom</p> <p>7. Perform steps 8 thru 20 for -V2 door bolts:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Top bolt</li> <li><input type="checkbox"/> Lower middle bolt</li> <li><input type="checkbox"/> Bottom bolt</li> </ul> <p>8. Position LOCK over door bolt</p> <p>9. Rotate lever 1 down to hard-stop</p> <p>10. Engage lever 1 lock pin to yellow setting</p> <p>11. Rotate lever 1 up to hard-stop</p> <p>12. <b>PGT [A4, CCW2, 23.5], hybrid ext</b></p> <p>13. Disengage door bolt, 7 turns</p> <p>14. Rotate door bolt out of bathtub</p> <p>15. Rotate lever 1 down to hard-stop</p> <p>16. Engage lever 1 lock pin to green setting</p> <p>17. Rotate LOCK arm into bathtub</p> <p>18. Rotate lever 2 to 90 deg</p> <p>19. Press down and verify LOCK fully seated into door latch fitting</p> <p>20. Rotate main handle to final posn</p> <ul style="list-style-type: none"> <li>- Verify main handle lock pin in green setting</li> <li>- Verify no gaps</li> </ul> <p style="text-align: center;">← <input type="checkbox"/></p>

# SCM & LOCKS – TASK DATA SHEET

## Estimated Task Duration: (00:55)

	FF	W/ RMS
Two EV Crew	N/A	00:55

## Tools:

FF EV	RMS EV
<ul style="list-style-type: none"> <li>PGT</li> <li>Socket caddy with 6-in wobble and short adj ext</li> <li>EHIP battery and bag</li> </ul>	<ul style="list-style-type: none"> <li>PGT with hybrid ext</li> <li>LOCKS</li> </ul>

## EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
SCM bolt	7/16	1	A3			35
Bay 2 Door J-bolts	7/16	4 of 6	A3	A3		Release: 6 Install: 4-6

## Foot Restraints:

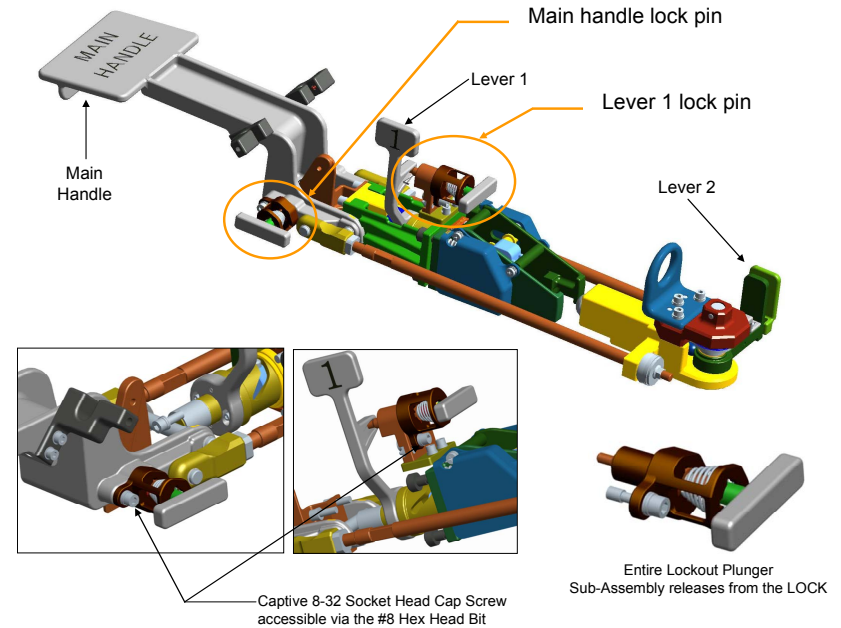
Task	S#	PFR Setting
Bay 2 Door Bolt get-ahead LOCKs	MFR	NA

## Timeline Considerations:

1. Installing LOCKs on EVA 1 increases the chance of completing ACS in a single EVA day
2. Releasing the Bay 2 battery door J-bolts saves time on EVA 2

## Notes:

1. During SCM bolt driving, inform IV of the following:
  - FSS LED (3) illumination at 16-19 turns
  - HST LED (3) illumination at 30-35 turns
2. Preferred order for LOCK install is top to bottom



LOCK OVERVIEW

## DAILY CLOSEOUT/INGRESS (00:40)

RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>1. RMS: To Airlock MFR Ingress/Egress posn (PDRS, <u>EVA CLOSEOUT</u>)</p> <p>2. RMS: To RMS Extended Park posn (PDRS, <u>EXTENDED PARK</u>)</p>	<p><u>PLB CLEANUP</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Translate to FSS</li> <li>3. Inspect main umbilical mechanism</li> <li>4. Configure center TA (due aft): A=6, B=6, <b>C=0</b>, retracted to 1</li> <li>5. Remove BAPS post center PIP pins (2); stow</li> <li>6. Perform tool inventory</li> <li>7. Translate to airlock; open thermal cover</li> <li>8. Receive MFR handle from RMS EV</li> </ol> <p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Transfer MFR handle to RMS EV</li> <li>2. Release MFR/RMS tether</li> <li>3. Remove RMS safety tether from RMS; attach to right EMU D-ring or waist tether - Engage crew hook slide lock - L</li> <li>4. Translate to Orbiter port sill (aft of RMS shoulder)</li> <li>5. Remove safety tether from slider</li> <li>6. Gently relocate slider fwd of RMS shoulder</li> <li>7. Translate fwd of RMS shoulder</li> <li>8. Stow slider, close cushion; engage quarter turn fastener</li> <li>9. Ingress airlock</li> <li>10. Open DCM cover; Velcro to self</li> <li>11. Connect SCU to DCM; √ SCU locked</li> <li>12. WATER - OFF (expect "H2O IS OFF" msg)</li> <li>13. Thermal cover - close</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>14. Verify hardware clear of hatch</li> <li>15. Close, lock outer hatch</li> <li>16. Go to PRE REPRESS (<u>DEPRESS/REPRESS CC</u>)</li> </ol>	<p><u>PLB CLEANUP</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Mnvr to airlock</li> <li>3. Relocate PGT to MFR handle</li> <li>4. Perform tool inventory</li> <li>5. MFR stanchion 0°; boot plate 0°</li> <li>6. MFR handle 0°</li> <li>7. Remove MFR handle; transfer to FF EV</li> <li>8. Egress MFR</li> <li>9. Release boot plate tether; temp stow onto MFR</li> </ol> <p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Ingress airlock</li> <li>2. Receive MFR handle from FF EV; stow in tunnel</li> <li>3. Attach waist tether to airlock D-ring extender - Engage crew hook slide lock - L</li> <li>4. Verify FF EV's tether config</li> <li>5. Open DCM cover; Velcro to self</li> <li>6. Connect SCU to DCM; √ SCU locked</li> <li>7. WATER - OFF (expect "H2O IS OFF" msg)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div>

## EVA 2

### EVA 2 SUMMARY TIMELINE

TASK TIME (PET TIME) HR : MIN	IV/FSS	EV	RMS	
00:00 ---	√ FSS 180°, -V3, Pivot 90°, SA 0°	POST DEPRESS (00:05)		
		EGRESS/DAILY SETUP (00:40) <ul style="list-style-type: none"> <li>• MFR Setup</li> <li>• Translation Adaptation (RMS EV)</li> <li>• BAPs Post Setup/TA Setup</li> </ul>	Airlock MFR Ingress/Egress posn	
01:00 ---		RSU R&R (03:20) <ul style="list-style-type: none"> <li>• RSU-2 Retrieval from SOPE</li> <li>• Open -V3 Doors</li> </ul>	SOPE Access posn -V3 Aft Shroud posn CASH Relocate posn	
02:00 ---		<ul style="list-style-type: none"> <li>• RSU-2 R&amp;R</li> </ul>	RSU-2 R&R posn SOPE Access posn	
03:00 ---		<ul style="list-style-type: none"> <li>• RSU-3 R&amp;R</li> </ul>	RSU-3 R&R posn	
04:00 ---		<ul style="list-style-type: none"> <li>• RSU-1 R&amp;R</li> <li>• Close -V3 Doors</li> </ul>	SOPE Access posn RSU-1 R&R posn CASH Relocate posn -V3 Aft Shroud posn	
05:00 ---		BAY 2 BATTERY R&R (01:35) <ul style="list-style-type: none"> <li>• Bay 2 Battery Retrieval               <ul style="list-style-type: none"> <li>• Bay 2 SLIC Battery-R Prep</li> </ul> </li> <li>• Bay 2 Battery Swap</li> <li>• Bay 2 Battery-R Install</li> </ul>	Bay 2 posn  Bay 2 Battery Swap posn Bay 2 posn	
06:00 ---		DAILY CLOSEOUT/INGRESS (00:40)	Airlock MFR Ingress/Egress posn  RMS Extended Park posn	
		EVA = 6:25	PRE REPRESS (00:05)	

# EVA 2 TOOL CONFIG

## AIRLOCK

### HST Tool Bag:

- Helmet light battery (spare)
- General Purpose Caddy
  - IFM 5/32-in allen w/ tether (FSS cont) (umbil, bert latch)
  - IFM 1/8-in allen wrench w/ tether (ECU drive stud cont)
- MWS key strap
- Inspection mirror w/ O-tether
- Palm Wheel
- Wire tie caddy
- Connector Cleaner Tool Kit
- Cheater bar
- Airlock wrench (3/8" ratchet with 7/16" socket)
- Adjustable wrench
- DCM Plug
- 2 - 34-in adj tethers (cont) (HST bag pouch)
- 1 - 80-in adj tether (cont) (HST bag pouch)
- Overgloves (4 pair) -----
- Ballstack (no-RMS cont)
- O-Tether
- Fish stringer #1:**
  - Socket caddy #1
    - 6-in wobble socket (SCM, if reqd)
    - Drop proof tether adapter with IFM 1/2-in rigid socket
  - Lube Applicators (2)
  - PGT (spare): s/n: \_\_\_\_\_
  - PGT Battery: s/n: \_\_\_\_\_
  - EVA Ratchet with Palm Wheel (cont)
  - MTL with 6-in rigid socket
  - EHIP Battery Bag (if reqd)
  - EHIP Battery (tether point toward top of bag)
- Socket caddy #2, (Mass)
  - Short adjustable socket
  - Lg-sm paddle RET (stays in A/L)
  - Adj tether
- Digital Camera with bracket (Mass)
  - Lg-sm paddle RET (stays in A/L)
- PGT: s/n: \_\_\_\_\_
- Lg-sm paddle RET + sm-sm pb RET (just takes pb)
- PGT Battery: s/n: \_\_\_\_\_
- Spare tethers (as desired, on HST tool bag)

- Prior to EVA, inspect the following:
  - RET cords for damage
  - Safety and waist tether load alleviating straps (no red band or damage)
  - Trash bag bristles for deformation/damage

## MFR HANDLE - EGRESS

- FRONT** (MFR handle install posts facing you) (MFR=180 deg)
  - Tool board C (left side of MFR handle):
    - Battery cap caddy (3 cap sets) (lower bayonet), int RET
    - Small trash bag (upper bayonet), int RET, stuffed w/80-in zippered
  - Tool board T (right side of MFR handle):
    - Manual door stay (upper outbd smaller diameter hole), int RET
    - Hybrid ext (post) (spare)
    - High torque connector tool (bungee), int RET
- BACK** (MFR=0 deg)
  - Tool board C
    - PGT with hybrid ext (upper bayon)
    - Handle inbd, socket down
    - Sm-sm paddle RET
    - PGT s/n: \_\_\_\_\_ PGT Battery s/n: \_\_\_\_\_
    - Digital camera (lower bayonet), int camera mount RET
  - Tool board T
    - 6-in wobble (right socket post) (RSU-1)
- Bayonet fittings:** (facing front side)
  - Upper left: RSU Bag, sm-sm equip RET
- Top tether points:**
  - 1 - RET (lg-sm paddle) (spare), upper right tether point
  - 1 - 80" tether, webbing in trash bag, large hook to D-ring
  - Pre-set length
- Side tether points:**
  - 1 - RET (lg-sm paddle) (MFR Handle in A/L) (stays in A/L)
  - 1 - Waist tether (tether MFR Handle in A/L) (stays in A/L)
  - 1 - Adj tether (spare) (Top of MFR handle - to trash bag)
  - 2 - RETs (eq-eq) (spare)

## MWS-EGRESS

- A/L D-RING:** D-ring extender
- FF EV** (Mass)
  - MWS w/ right swing arm (no RET, moved to PGT in A/L)
  - Left swingarm
  - 1 - Waist tether (coated) – right
  - 1 - RET w/ PIP pin (sm-sm paddle) – left
  - 1 - RET (lg-sm paddle) – right
  - Safety tether (left) (hook locked)
- RMS EV** (Bueno)
  - MWS w/ right swing arm
  - Sm-sm equip RET
  - 2 - wire ties around T-bar (bunny ears)
  - 1 - Waist tether - Hooks locked (coated - left)
  - 1 - RET (lg-sm paddle) – right
  - 1 - RET w/ PIP pin (sm-sm eq) – (Rt Dring-ear)
  - 1 - RET (lg-sm paddle) – left
  - 1 - Adj tether – (Lower D-ring to left ear)
  - Safety tether (right) (hook locked)
  - MWS EE to MWS stem
- TOTAL TETHER COUNT**
  - 4 – sm-sm equip RET (8)
  - 1 – sm-sm eq RET with PIP pin (2)
  - 8 – lg-sm paddle RET (9)
  - 1 – sm-sm pb RET (3)
  - 3 – adj tether (10)
  - 1 – sm-sm paddle RET (2)
  - 1 – sm-sm paddle RET w/PIP pin (2)
  - 3 – waist tethers (4)

## EVA 2 POST TOOL CONFIG

### MFR HANDLE - INGRESS

- Battery cap caddy (empty)
- Small trash bag
- Manual door stay
- PGT with hybrid ext
- 6-in wobble
- Hybrid ext (post)
- Digital camera
- RSU bag
- 80" tether
- High-torque connector tool

### TETHERS

- 4 – sm-sm equip RET
- 1 – sm-sm eq RET with PIP pin
- 4 – lg-sm paddle RET
- 1 – sm-sm pb RET
- 3 – adj tether
- 1 – sm-sm paddle RET
- 1 – sm-sm paddle RET w/PIP pin

### MIDDECK TOOLS

- STIS/ACS Ground Strap Harness Bag (with ACS HR clamp, 2 FETs, cutters, CMT)
- HRTs (2)
- CRT
- STIS/MPT Bit Caddy (7 bits)
- RIB Caddy (4 RIBs, 1 FEB, 1 WET)
- SSAT Tool
- Y-harness restraint tool
- MUT EE
- EVA Ratchet with MTL and Palm Wheel (spare)
- MPT (2) with 1 holster
- 2 spare red bits
- 1 black bit
- Trash bags (2)

### MWS-INGRESS

- #### FF EV (Mass)
- MWS w/ right and left swing arm
  - Waist tether
  - Socket caddy with short adj
  - PGT
  - Safety tether
  - Digital camera

#### RMS EV (Bueno)

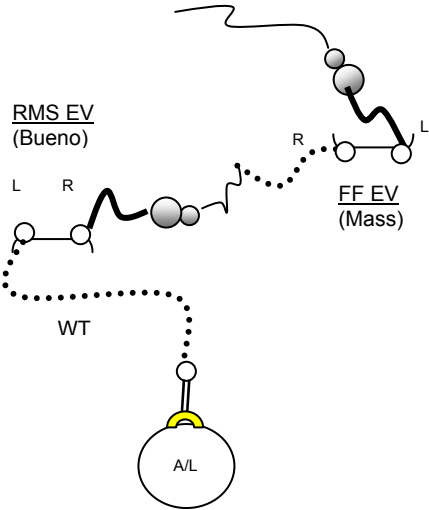
- MWS w/ right swing arm
- 2 wire ties around T-bar (bunny ears)
- Waist tether
- Safety tether

### MIDDECK TOOLS

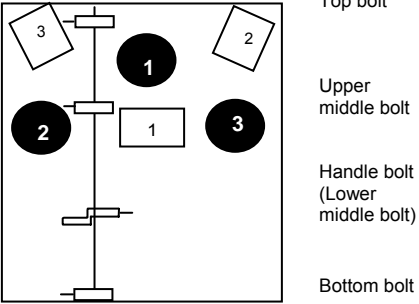
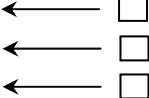
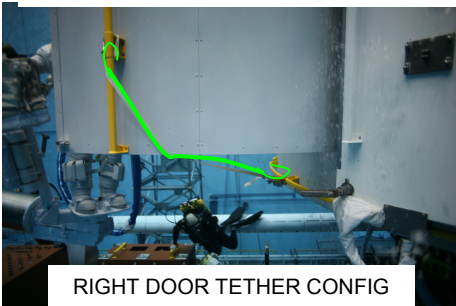
- GP Caddy (spare)
- 1 - 34-in adj tether
- 1 - 80-in adj tether
- Fish stringer
- Long adj socket
- PGT Batteries (4)
- Left Swingarm
- ACS Guide Stud Caddy
- FRB
- Middeck Cont Kit and Blanket
- Short adj socket
- Drop-proof tether adapter
- Lube applicator



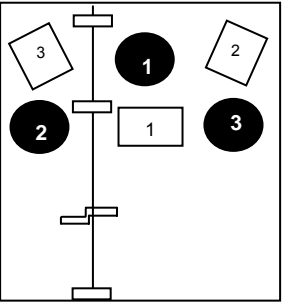
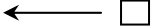
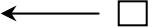
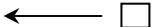
## EGRESS/DAILY SETUP (00:40)

IV/RMS	FF EV (MASS)	RMS EV (BUENO)
 <p>INITIAL SAFETY TETHER CONFIG</p>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Right waist tether attached to RMS EV safety tether long end, hook slide locks (2) - L</li> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> </ul> <p><u>EGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Thermal cover - open</li> <li>2. Egress airlock</li> <li>3. Translate to Orbiter port sill</li> <li>4. Release aft fastener on slidewire cushion; open</li> <li>5. Gently relocate slider aft of RMS shoulder</li> <li>6. Translate aft of RMS shoulder</li> <li>7. Attach safety tether to aft slider <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>8. Remove RMS EV's safety tether from self; attach to RMS handrail standoff (black end) <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>9. Install MFR/RMS tether, tighten</li> </ol> <p><u>MFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Receive MFR handle from RMS EV</li> <li>2. Transfer MFR handle to RMS EV</li> <li>3. Close thermal cover</li> </ol> <p><u>BAPS POST SETUP</u></p> <ol style="list-style-type: none"> <li>1. Install BAPS post center pip pins (2)</li> </ol> <p><u>TRANSLATION AID SETUP</u></p> <ol style="list-style-type: none"> <li>1. Config center TA (straight up): A=6, B=6, <b>C=6</b>, ext (1)</li> </ol>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Left waist tether to A/L D-ring extender, hook slide lock - L</li> <li>√ Own safety tether load alleviating strap attached to right EMU D-ring, hook slide lock - L, reel unlocked</li> </ul> <p><u>EGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Release waist tether from airlock D-ring extender</li> </ol> <p><u>MFR SETUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Transfer MFR handle to FF EV</li> <li>2. Egress airlock</li> <li>3. Ingress MFR (do not attach lanyard)</li> <li>4. Receive MFR handle from FF EV</li> <li>5. Install MFR handle</li> <li>6. Egress MFR</li> </ol> <p><u>TRANSLATION ADAPTATION</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Perform translation adaptation</li> <li>2. Attach boot plate lanyard to MWS lower D-ring</li> <li>3. Ingress MFR</li> </ol>

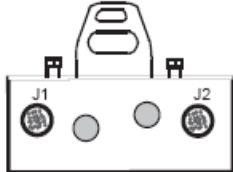
# RSU R&R (03:20)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)												
<ol style="list-style-type: none"> <li>√ FSS 180°, -V3, Pivot 90°, +/-SA to 0°</li> <li>√ In sun protect att before opening doors and SOPE</li> <li>L12U √ RSU SURV HTR PWR - OFF (tb-bp)</li> <li>RMS: RSU-2R Pickup at SOPE posn</li> </ol>  <p style="text-align: center;">-V3 DOORS</p>	<p><u>RSU-2R RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>Translate to SOPE lid</li> <li>Open PIK STIK MLI cover, tether to PIK STIK jaws</li> <li>Retrieve PIK STIK (2 captive lock pins)</li> <li>Unlock and open PIK STIK jaws; temp stow</li> <li>Close PIK STIK thermal cover</li> <li>Open SOPE lid</li> </ol> <ol style="list-style-type: none"> <li>Transfer PIK STIK to RMS EV</li> <li>Close RSU transport module lid, 1 latch</li> <li>Close SOPE lid, 1 latch</li> </ol>	 <p><u>RSU-2R RETRIEVAL</u> (00:10)</p> <ol style="list-style-type: none"> <li>RMS mnvr to SOPE; retrieve PGT from MFR handle</li> <li>Configure MFR handle to 180° (front), retrieve 80-in tether and stow on MWS</li> <li>Configure stanchion 135L, config MFR handle to shark fin</li> <li>Pitch MFR stanchion fully out</li> <li>Retrieve RSU-2R from SOPE (PLB aft location; S/N 1004)</li> <li>Receive PIK STIK from FF EV</li> <li>Attach PIK STIK to RSU-2R, lock PIK STIK jaws</li> <li>Stow PIK STIK and RSU-2R on right side of MFR handle (upper bayonet)</li> </ol>												
<table border="1"> <thead> <tr> <th></th> <th>Top Bolt</th> <th>Bottom Left Bolt</th> <th>Bottom Right Bolt</th> </tr> </thead> <tbody> <tr> <td>FHST 2 (left)</td> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>FHST 3 (right)</td> <td>.....</td> <td>.....</td> <td>.....</td> </tr> </tbody> </table>		Top Bolt	Bottom Left Bolt	Bottom Right Bolt	FHST 2 (left)	.....	.....	.....	FHST 3 (right)	.....	.....	.....	<p><u>OPEN -V3 DOORS</u></p> <ol style="list-style-type: none"> <li>Translate to aft ASIPE</li> <li>Verify STS PFR configured: AS: P=2.5: Y=12, R=A, P=4.5 (for RSU-2)</li> <li>Translate to -V3 aft shroud doors</li> </ol>	<p><u>OPEN -V3 DOORS</u> (00:35)</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Avoid contact with FHST light seals</p> </div>
	Top Bolt	Bottom Left Bolt	Bottom Right Bolt											
FHST 2 (left)	.....	.....	.....											
FHST 3 (right)	.....	.....	.....											
<p style="text-align: center;">FHST LIGHT SEAL TURN COUNT</p>  <p style="text-align: center;">RIGHT DOOR TETHER CONFIG</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Verify no paint flakes on handrails for possible contamination of the aft shroud</p> </div> <ol style="list-style-type: none"> <li>Relocate 80" large hook to horz HR under aft shroud opening</li> </ol>	<ol style="list-style-type: none"> <li>Mnvr to -V3 aft shroud doors</li> <li>Mnvr to left FHST</li> <li>Configure boot plate 30R</li> <li><b>PGT [A2, CW2, 5.5], hybrid ext (fully extended)</b></li> <li>Retract left FHST seals, drive fasteners (3), 3 turns then 2.5 [5.5 total] (verify bolt gaps even)</li> <li>Mnvr to right FHST</li> <li>Configure boot plate 30L</li> <li><b>PGT [A2, CW2, 5.5], hybrid ext (fully extended)</b></li> <li>Retract right FHST seals, drive fasteners (3), 3 turns then 2.5 [5.5 total] (verify bolt gaps even)</li> <li>Temp stow 80-in adj tether on right -V3 door: - Small hook looped around second to bottom</li> </ol>												


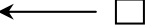
RSU R&R (03:20) (Cont)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>5. <u>ICBC #5</u> (P/TV09, <u>ICBC3D</u>), Open -V3 Doors</p>  <p style="text-align: center;">-V3 DOORS</p> <p>RMS: To CASH Relocate posn</p> <p>6. √ MCC GO for RSU-2 connector demates          * If NO COMM, repeat <u>DEADFACE</u> *          * <u>RSU/ECU</u> (PL OPS, <u>ORU/ORI OPS</u>) *</p> <p>7. ICBC #6: FF EV PFR Ingress</p>	<p>5. Assist EV4 with latch bolt clearance calls</p> <p>6. Manage left door</p> <p>7. Secure right aft shroud door clear of radiator w/ 80-in tether (2nd standoff from the left edge of horz HR)</p> <p>8. Perform glove inspection</p> <p><u>RSU-2 R&amp;R</u></p> <p>1. Assist w/ CASH relocation (left side) (spring-loaded)</p>  <p>2. Remove AS and PFR from aft ASIPE PFR extender; transfer to RMS EV</p> <p>3. Rotate MWS T-bar fully down for connector clearance</p> <p>4. With RMS EV assist, ingress PFR</p>	<p>vertical HR standoff          - Lg hook around bottom most vertical HR</p>  <p style="text-align: center;"><u>NOTE</u>          No soft stop on the upper middle door latch bolt</p> <p>11. Configure boot plate 0°</p> <p>12. <b>PGT [A4, CCW 3, 23.5] (turns)</b></p> <p>13. Disengage latch bolts (3), 7 turns</p> <p>14. Disengage handle bolt, 7 turns</p> <p>15. Maintain pressure on doors          - Remove PIP pin          - Release handle latch          - Reinstall PIP pin</p> <p>16. MnvR RMS to open doors</p> <p>17. Hold right door open (max 90°) for FF EV          - Verify no door contact w/ radiator</p> <p>18. Perform glove inspection</p> <p><u>RSU-2 R&amp;R</u> (00:40)</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b>              Avoid contact with FHST light shade</p> </div> <p>1. Configure stanchion to 180° for CASH clearances; remove shark fin</p> <p>2. Relocate CASH to lower angled handrail position</p> <p>3. Configure stanchion 135L, shark fin MFR handle</p>  <p>4. Receive AS and PFR from FF EV, install in FR29; Y=30R.]</p> <p>5. Insert FF EV into PFR</p>

RSU R&R (03:20) (Cont)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>8. RMS: To RSU-2 R&amp;R posn</p> <p>9. ICBC #7: FF EV Transfers RSU-2 to RMS EV</p>  <p>RSU-2 CONNECTORS</p> <p>10. RSU-2R S/N <u>1004</u></p>	<p>5. Memorize RSU connector harness routing; RSU gap with mounting plate</p> <p>6. Demate RSU-2 connectors (2):  <input type="checkbox"/> P1  <input type="checkbox"/> P2</p> <p>7. Receive RET from RMS EV, attach RET to RSU-2  ← <input type="checkbox"/></p> <p>8. Assist RMS EV with socket engagement on bolt head</p> <p>9. Hold bottom of RSU-2</p> <p>10. Transfer RSU-2 to RMS EV</p> <p>11. Provide visual assistance for RSU-2R seating</p>	<p>6. Mnvr to RSU-2 R&amp;R posn</p> <p>7. Transfer RET to FF EV, lock RET</p> <p>8. <b>PGT [A3, CCW2, 10.5], fully ext</b></p> <p>9. Disengage RSU bolts (3), 11 turns (spring-loaded)  <input type="checkbox"/> 1st - top bolt  <input type="checkbox"/> 2nd - bottom right bolt  <input type="checkbox"/> 3rd - bottom left bolt</p> <p>10. Temp stow PGT</p> <p>11. Receive RSU-2 from FF EV (unlock RET)</p> <p>12. Temp stow RSU-2 on top of MFR handle (1adj+1RET)</p> <p>13. Pre-configure <b>PGT [A2, CW2, 5.5]; fully ext</b></p> <p>14. Remove PIK STIK/RSU-2R from MFR handle</p> <p>15. Remove RSU caps</p> <p>16. Inspect connectors and Mykroy pads</p> <p>17. Verify RSU-2R S/N 1004 to be installed  ← <input type="checkbox"/></p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b>  Avoid pushing on bolt head during socket engagement and RSU install</p> </div> <p>18. Thread PIK STIK/RSU-2R into aft shroud (connectors nadir)</p> <p>19. Seat RSU-2R</p> <p>20. <b>PGT [A2, CW2, 5.5]; fully ext</b></p> <p>21. Engage bolts (2), 5 turns  <input type="checkbox"/> 1st - bottom right bolt  <input type="checkbox"/> 2nd - top bolt</p> <p>22. Release PIK STIK jaws</p> <p>23. Remove PIK STIK from aft shroud</p> <p>24. Stow PIK STIK on MWS T-bar left side</p> <p>25. Engage bottom left bolt, 9 turns</p> <p>26. Engage bolts (2), 4 turns [9 total]  <input type="checkbox"/> 1st - bottom right bolt  <input type="checkbox"/> 2nd - top bolt</p>

# RSU R&R (03:20) (Cont)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>11. Notify MCC RSU-2R connectors mated (RSU-2R A/T)</p> <p>12. RMS: To SOPE Access posn</p> <p>13. RMS: To RSU-3 R&amp;R posn</p> <p>14. √ MCC GO for RSU-3 connector demates            * If NO COMM, repeat <u>DEADFACE</u> *            * <u>RSU/ECU</u> (PL OPS, <u>ORU/ORI OPS</u>) *</p> <div style="text-align: center;"> </div> <p style="text-align: center;">RSU-3 CONNECTORS</p>	<p>12. Mate RSU-2R connectors (2):  <input type="checkbox"/> P1 then,  <input type="checkbox"/> P2  </p> <p>13. Egress PFR            14. Rotate MWS T-bar up (RMS EV assist)</p> <p><u>RSU-3 R&amp;R</u></p> <ol style="list-style-type: none"> <li>1. Reconfigure AS: Y=150R↓</li> <li>2. Translate to SOPE</li> <li>3. Open lid</li> <li>4. Receive RSU-2 from RMS EV, stow in SOPE</li> <li>5. Close RSU-2R transport module lid, 1 latch</li> <li>6. Close RSU-3R transport module lid, 1 latch</li> <li>7. Close SOPE lid, 1 latch</li> <li>8. Rotate MWS T-bar fully down for connector clearance</li> <li>9. Translate to PFR in FR29  </li> <li>10. With RMS EV assist, ingress PFR</li> <li>11. Demate RSU-3 connectors (2):  <input type="checkbox"/> P1  <input type="checkbox"/> P2</li> <li>12. Receive RET from RMS EV, attach to RSU-3</li> <li>13. Assist RMS EV with socket engagement on bolt head</li> <li>14. Hold RSU-3</li> </ol> <p>15. Transfer RSU-3 to RMS EV</p>	<p>27. Remove PGT from aft shroud, temp stow            28. Temp stow PIK STIK on MFR handle</p> <p>29. Assist FF EV with PFR egress</p> <p><u>RSU-3 R&amp;R (00:40)</u></p> <ol style="list-style-type: none"> <li>1. MnvR RMS to RSU-3R posn at SOPE;              - Stow RSU caps in trash bag              - Relocate PIK STIK to MWS</li> <li>2. Transfer RSU-2 to FF EV</li> <li>3. Access RSU-3R in PLB fwd location (S/N 1007)</li> <li>4. Remove RSU-3R from SOPE</li> <li>5. Attach PIK STIK to RSU-3R, lock PIK STIK jaws</li> <li>6. Stow PIK STIK and RSU-3R on right side of MFR handle (upper bayonet)</li> <li>7. MnvR to FF EV PFR ingress posn</li> <li>8. Insert FF EV into PFR</li> <li>9. MnvR to RSU-3 R&amp;R posn</li> <li>10. Transfer RET to FF EV, lock RET</li> <li>11. <b>PGT [A3, CCW 2, 10.5], fully ext</b></li> <li>12. Disengage RSU bolts (3), 11 turns (spring-loaded)  <input type="checkbox"/> 1st - top bolt  <input type="checkbox"/> 2nd - bottom left bolt  <input type="checkbox"/> 3rd - bottom right bolt</li> <li>13. Temp stow PGT</li> <li>14. Receive RSU-3 from FF EV (unlock RET)</li> <li>15. Temp stow RSU-3 on MFR handle (1adj+1RET)</li> <li>16. Pre-configure <b>PGT [A2, CW 2, 5.5]; fully ext</b></li> <li>17. Temp stow PGT</li> <li>18. Remove PIK STIK/RSU-3R from MFR handle</li> <li>19. Remove RSU caps</li> <li>20. Inspect connectors and Mykroy pads</li> <li>21. Verify RSU-3R S/N 1007 to be installed</li> </ol>

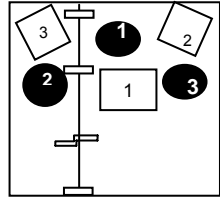
RSU R&R (03:20) (Cont)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>15. RSU-3R S/N <u>1007</u></p> <div> <p>Top bolt</p> <p>Upper middle bolt</p> <p>Handle bolt (Lower middle bolt)</p> <p>Bottom bolt</p> <p>-V3 DOORS</p> </div> <p>16. Notify MCC RSU-3R connectors mated (RSU-3R A/T)</p> <p>17. RMS: To SOPE Access posn</p>	<p>16. Provide visual assistance for RSU-3R seating</p> <p>17. Mate RSU-3R connectors (2):</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> P2 then,</li> <li><input type="checkbox"/> P1</li> </ul> <p>18. Egress PFR</p> <p>19. Rotate MWS T-bar up (RMS EV assist)</p> <p>20. Perform glove inspection</p> <p><u>RSU-1 R&amp;R</u></p> <ol style="list-style-type: none"> <li>1. Relocate AS and PFR from FR29 to FR5</li> <li>2. Configure AS and PFR while in FR5, AS: Y=60L↓, P=2.5: PFR: <b>Y=9, R=B.5, P=10.5</b></li> <li>3. Translate to SOPE</li> <li>4. Open SOPE lid</li> </ol> <p>5. Receive PIK STIK from RMS EV, temp stow</p> <p>6. Receive RSU-3 from RMS EV, install in SOPE</p>	<p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>22. Thread PIK STIK/RSU-3R into aft shroud (connectors nadir)</li> <li>23. Seat RSU-3R</li> <li>24. <b>PGT [A2, CW 2, 5.5]; fully ext</b></li> <li>25. Engage bolts (2), 5 turns             <ul style="list-style-type: none"> <li><input type="checkbox"/> 1st - bottom right bolt</li> <li><input type="checkbox"/> 2nd - top bolt</li> </ul> </li> <li>26. Release PIK STIK jaws</li> <li>27. Remove PIK STIK from aft shroud</li> <li>28. Stow PIK STIK on MWS T-bar left side</li> <li>29. Engage bottom left bolt, 9 turns</li> <li>30. Engage bolts (2), 4 turns [9 total]             <ul style="list-style-type: none"> <li><input type="checkbox"/> 1st - bottom right bolt</li> <li><input type="checkbox"/> 2nd - top bolt</li> </ul> </li> <li>31. Remove PGT from aft shroud; temp stow</li> <li>32. Temp stow PIK STIK on MFR handle</li> </ol> <p>33. Assist FF EV with PFR egress</p> <p>34. Perform glove inspection</p> <p><u>RSU-1 R&amp;R (00:40)</u></p> <ol style="list-style-type: none"> <li>1. Mnvr to RSU-1R posn at SOPE; relocate RSU caps to trash bag</li> <li>2. Configure PGT with 6-in socket from MFR handle</li> <li>3. Pre-configure PGT to: <b>[A3, CCW2, 10.5]</b></li> <li>4. Temp stow PGT on swing arm</li> <li>5. Retrieve PIK STIK then RSU-3 from MFR handle</li> <li>6. Transfer PIK STIK to FF EV</li> <li>7. Transfer RSU-3 to FF EV</li> <li>8. Retrieve RSU-1R from SOPE (PLB center location,</li> </ol>

**RSU R&R (03:20) (Cont)**

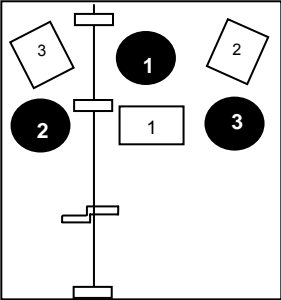
IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>18. ✓ MCC GO for RSU-1 connector demates * If NO COMM, repeat <u>DEADFACE</u> * * <u>RSU/ECU</u> (PL OPS, <u>ORU/ORI OPS</u>) *</p> <p>19. RMS: To RSU-1 R&amp;R posn</p> <div> </div> <p style="text-align: center;">RSU-1 CONNECTORS</p> <p>20. ✓ MCC, GO to retrieve PIE harness (SOPE) 21. RSU-1R S/N <u>1006</u> 22. RMS: To RSU-1 R&amp;R posn</p>	<p>7. Close RSU-3 transport module lid, 1 latch 8. Close RSU-1 transport module lid, 1 latch 9. Close SOPE lid, 1 latch 10. Stow PIK STIK on lid (2 captive lock pins)     - Handle aft and pointed inboard 11. Close PIK STIK MLI 12. Translate to aft shroud, assist RMS EV as req'd</p> <p>13. Receive RSU-1 from RMS EV 14. Translate to SOPE 15. Open SOPE lid 16. Install RSU-1 in SOPE 17. Close RSU transport module lid, 1 latch ← <input type="checkbox"/></p> <p>18. Close SOPE lid, 3 latches 19. Translate to aft shroud</p>	<p>S/N 1006), stow in RSU bag ← <input type="checkbox"/></p> <p>9. Mnvr to RSU-1 changeout posn 10. Configure boot plate 180°, stanchion 135L (to avoid contact w/ right door) 11. Memorize RSU-1 connector harness routing 12. Demate RSU-1 connectors (2)     <input type="checkbox"/> P1     <input type="checkbox"/> P2 13. <b>PGT [A3, CCW 2, 10.5], 6-Ext 7/16</b> 14. Disengage bolts (3), 11 turns (spring-loaded)     <input type="checkbox"/> 1st - single top bolt     <input type="checkbox"/> 2nd - bottom left bolt     <input type="checkbox"/> Tether to RSU     <input type="checkbox"/> 3rd - bottom right bolt 15. Remove RSU-1 16. Mnvr out of aft shroud (~ 2-3 feet; head at lip of telescope) 17. Transfer RSU-1 to FF EV 18. Pre-configure <b>PGT: [A2, CW 2, 5.5]</b>, stow on T-bar 19. Remove caps from RSU-1R (leave tethered to bag) 20. Remove RSU-1R from bag 21. Inspect RSU-1R connectors and Mykroy pads</p> <p>22. Verify RSU-1R S/N 1006 to be installed ← <input type="checkbox"/></p> <p>23. Mnvr back into aft shroud for RSU-1R install 24. Install RSU-1R 25. <b>PGT [A2, CW 2, 5.5]</b> 26. Engage bolts (3), 5 turns then 4 turns [9 total]     <input type="checkbox"/> Bottom right bolt     <input type="checkbox"/> Bottom left bolt     <input type="checkbox"/> Single top bolt 27. Stow PGT w/ 6-in wobble on MWS T-bar</p>

RSU R&R (03:20) (Cont)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>23. Notify MCC RSU-1R connectors mated (RSU-1R A/T - after PIE mated)</p> <p>24. √ MCC GO for ACS connector demate (only if doing PIE install)                      * If NO COMM perform:                      * DEADFACE ACS (PL OPS, <u>ORU/ORI</u>)</p> <p>25. Notify MCC PIE harness mated</p> <p>26. RMS: To CASH Relocate posn</p> <p>27. WVS: RMS EV Center Cam (1. RSUs, 2. CASH, 3. Overview prior to door closing)</p> <p>28. RMS: To -V3 Aft Shroud posn</p>	<p><u>GET AHEAD: PIE HARNESS INSTALL</u> (00:15)</p> <p>← <input type="checkbox"/></p> <p>* 1. Reposition CASH as low as possible                      * 2. Translate to ACS connector panel                      3. Perform the following connections:                          <input type="checkbox"/> Demate HST P1 from ACS J1                          <input type="checkbox"/> Mate PIE J1A to HST P1                          <input type="checkbox"/> Mate PIE P1A to ACS J1                      4. Temp stow free end (P6) of PIE harness at ACS connector panel</p> <p>← <input type="checkbox"/></p> <p><u>CLOSE -V3 DOORS</u></p> <p>1. Reposition CASH</p> <p>2. Translate to right aft shroud door                      3. Transfer right door to RMS EV                      4. Ingress PFR in FR5                      5. Assist RMS EV with door closure</p> <p>6. Rotate bottom bolt into bathtub</p>	<p>28. Mate RSU-1R connectors:                          <input type="checkbox"/> P1                          <input type="checkbox"/> P2                      ← <input type="checkbox"/></p> <p><u>GET AHEAD: PIE HARNESS INSTALL</u> (00:15)</p> <p>1. Reposition CASH as low as possible, stanchion 180°, remove shark fin                      2. If req'd, mnvr to assist FF EV for PIE ops</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Top bolt</p> <p>Upper middle bolt Handle bolt</p> <p>(Lower middle bolt)</p> <p>Bottom bolt</p> </div> </div> <p><u>CLOSE -V3 DOORS</u> (00:35)</p> <p>1. Mnvr to CASH posn, boot plate 0°, stanchion 180°, remove shark fin</p> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>CAUTION</b> Avoid contact with FHST light shades</p> </div> <p>2. Reposition CASH                      ← <input type="checkbox"/></p> <p>3. Mnvr for door closure                      4. Configure PGT with hybrid extension</p> <p>5. Receive right door from FF EV</p> <p>6. Close left then right door                      7. Engage handle and install PIP pin                      8. √ Door seals                      9. Rotate remaining bolts into bathtubs</p>



RSU R&R (03:20) (Cont)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)												
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">  <p style="text-align: center;">-V3 DOORS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Top Bolt</th> <th>Bottom Left Bolt</th> <th>Bottom Right Bolt</th> </tr> </thead> <tbody> <tr> <td>FHST 2 (left)</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>FHST 3 (right)</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> </tbody> </table> <p style="text-align: center;">FHST LIGHT SEAL TURN COUNT</p> </div> <div style="width: 50%;"> <p>Top bolt</p> <p>Upper middle bolt</p> <p>Handle bolt (Lower middle bolt)</p> <p>Bottom bolt</p> </div> </div>		Top Bolt	Bottom Left Bolt	Bottom Right Bolt	FHST 2 (left)				FHST 3 (right)				<p>7. Relocate 80-in tether to door handrail</p> <p><u>PFR STOW</u></p> <ol style="list-style-type: none"> <li>Egress PFR</li> <li>Remove STS PFR and AS from FR5</li> <li>Stow in aft ASIPE PFR extender at Y=90R</li> <li>Configure PFR for COS, AS: <b>P=1, PFR: Y=12, R=A, P=9.5</b>, install AS hitch pin or Velcro flag</li> </ol> <p><u>GET AHEAD: PORT TA SETUP</u></p> <ol style="list-style-type: none"> <li>Translate to port TA</li> <li>Configure port TA in following order: <b>A=6, B=4, C=8</b>, extension = 1 (for COS day)</li> <li>Perform glove inspection</li> </ol>	<ol style="list-style-type: none"> <li><b>PGT [B4, CW 3, 23.5], hybrid ext</b></li> <li>Engage handle bolt, 7 turns</li> <li>Engage latch bolts (3), 7 turns (start with top bolt)</li> <li>Re-torque first three bolts</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px 0; text-align: center;"> <p><b>CAUTION</b> Extending FHST seals &gt; 5.5 turns may damage soft stop</p> </div> <ol style="list-style-type: none"> <li>Mnvr to right FHST</li> <li>Configure boot plate 30L</li> <li><b>PGT [A2, CCW 2, 5.5], fully ext (turns)</b></li> <li>Extend right FHST seals drive fasteners (3), 3 turns then 2.5 [5.5 total]</li> <li>Verify fastener gaps are even</li> <li>Mnvr to left FHST</li> <li>Configure boot plate 30R</li> <li><b>PGT [A2, CCW 2, 5.5], fully ext (turns)</b></li> <li>Extend left FHST seals drive fasteners (3), 3 turns then 2.5 [5.5 total]</li> <li>Verify fastener gaps are even</li> <li>Retrieve 80-in tether</li> <li>Perform glove inspection</li> </ol>
	Top Bolt	Bottom Left Bolt	Bottom Right Bolt											
FHST 2 (left)														
FHST 3 (right)														

## RSU R&R – TASK DATA SHEET

Estimated Task Duration: (3:20)

	FF	W/ RMS
Two EV Crew	N/A	3:20

Tools:

FF EV	RMS EV
<ul style="list-style-type: none"> <li>PGT with 6-in</li> <li>PIE (time permitting)</li> </ul>	<ul style="list-style-type: none"> <li>PGT with hybrid ext &amp; 6-in</li> <li>PIK STIK</li> </ul>

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
FHST seals	7/16	6	A2	A2		Retract: 5.5 Extend: 5.5
-V3 aft shroud door bolts	7/16	4	B4	A4		Release: 7 Install: 7
RSU bolts	7/16	9	A2	A3		Release: 11 Install: 9

Foot Restraints:

Task	S#	PFR Setting
RSU R&R	MFR	NA
RSU-2 Connectors	FR29	AS: Y=30R↓, P=2.5, PFR: Y=12, R=A, P=4.5
RSU-3 Connectors	FR29	AS: Y=150R↓, P=2.5, PFR: Y=12, R=A, P=4.5

Connectors:

Connector	From	To	Clamps	Size	Function
HST P1	RSU-2 J1	RSU-2R J1	N/A		Power and data to gyro 1 of RSU-2R (AKA HST Gyro 3)
HST P2	RSU-2 J2	RSU-2R J2	N/A		Power and data to gyro 2 of RSU-2R (AKA HST Gyro 4)
HST P1	RSU-3 J1	RSU-3R J1	N/A		Power and data to gyro 1 of RSU-3R (AKA HST Gyro 5)
HST P2	RSU-3 J2	RSU-3R J2	N/A		Power and data to gyro 2 of RSU-3R (AKA HST Gyro 6)
HST P1	RSU-1 J1	RSU-1R J1	N/A		Power and data to gyro 1 of RSU-1R (AKA HST Gyro 1)
HST P2	RSU-1 J2	RSU-1R J2	N/A		Power and data to gyro 2 of RSU-1R (AKA HST Gyro 2)

Timeline Considerations:

- Based on gyro usage requirements addressed in a PCS analysis, the desired RSU R&R order is RSU-2, RSU-3, and then RSU-1

Notes:

- RSU mass = 27 lbs
- The fully-extended hybrid socket setting is 25
- The fully extended long adj socket setting is 24; the long adj socket is slightly shorter than the hybrid adj when fully extended
- Alignment cube on RSU top is made of solid beryllium copper with an aluminum coating. Edges of the cube are protected with a rubber grommet, and breakage of the cube is not credible
- No more than one set of RSU electrical connectors should be demated at one time in order to reduce risk to HST in an emergency situation
- The aluminum teflon on the RSU edges is ok for moderate handling during RSU install
- RSU 1: Gyros 1 & 2
- RSU 2: Gyros 3 & 4
- RSU 3: Gyros 5 & 6

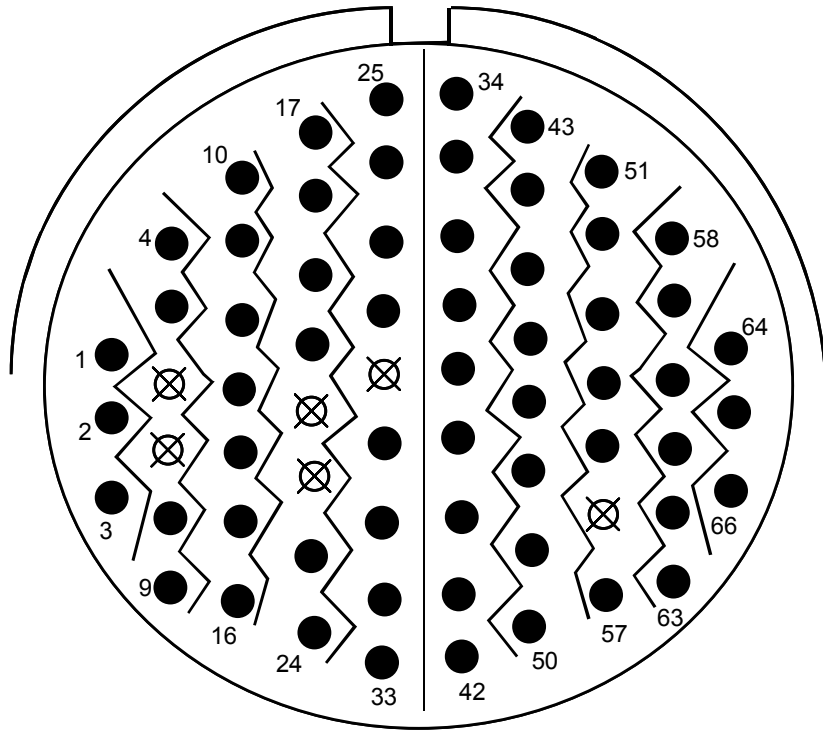
Cautions:

- The FHST seals do not have hard stops. Therefore, during extension and retraction the crew must stop on turns
- Two RSU bolts are required to be engaged 5 turns prior to releasing PIK STIK
- Avoid contact with RSU black paint and black MLI surfaces
- Avoid pushing on RSU bolt head during socket engagement and RSU install with PIK STIK
- Verify no paint flakes on handrails for possible aft shroud contamination
- Extending FHST seals > 5.5 turns may damage soft stop
- Avoid contact with black MLI inside -V3 aft shroud doors, light shades, and struts

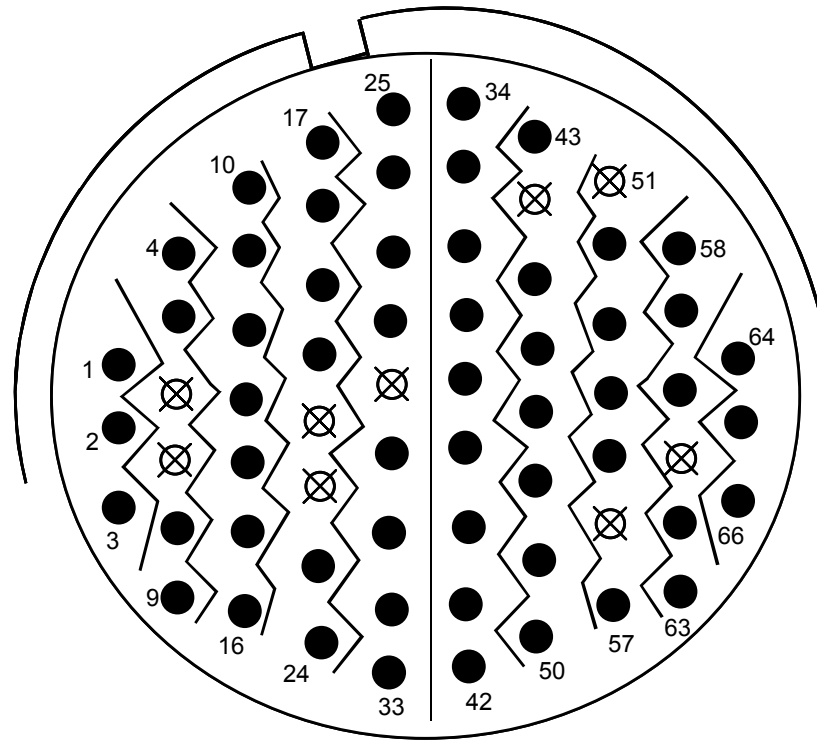
Warnings:

- Avoid contact with FHST light seals

RSU R&R – TASK DATA SHEET (Cont)



P1

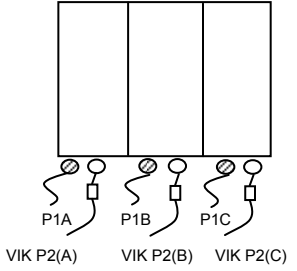


P2

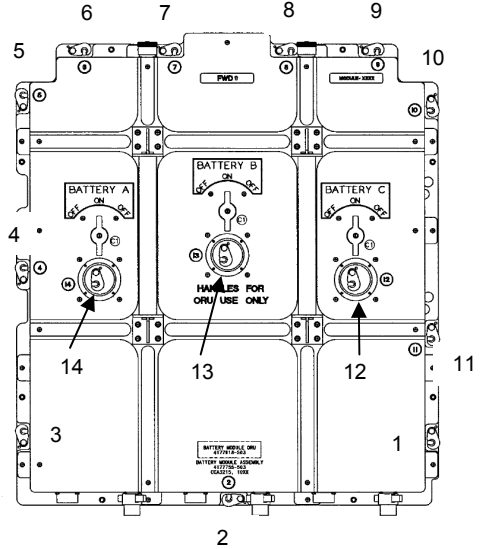
**NOTE:** Black dots represent populated pins; X's represent missing pins

RSU PIN MAPS

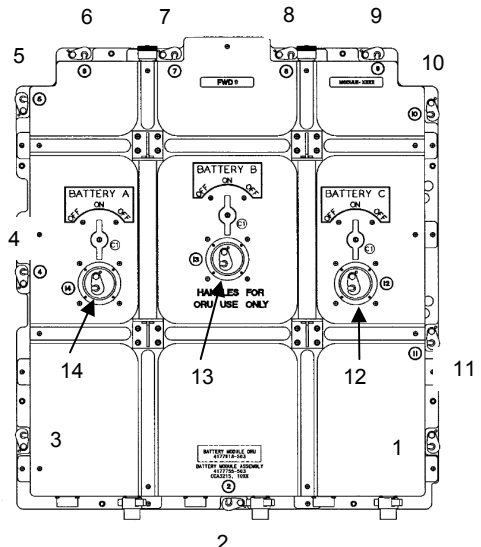
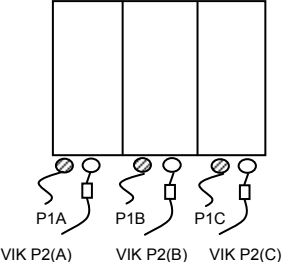
## BAY 2 BATTERY R&R (01:35)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>1. L12U FSS PCU PWR CONTR A - ON CONTR B - ON ESS/MN SW ENA - OFF (tb-bp) Notify MCC CONTR A and B - ON ESS/MN SW ENA - OFF</p> <p>2. RMS: To Bay 2 posn</p> <p>3. √ MCC GO for Bay 2 battery demate * If NO COMM perform: * * <u>BAY 2 BATT PREP FOR REMOVAL</u> * (PL OPS, ORU/ORI)</p> 	<p><u>BAY 2 SLIC BATTERY-R TOOL RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>Translate to airlock</li> <li>Retrieve: <ul style="list-style-type: none"> <li>Socket caddy with short adj and adj tether</li> <li>Digital camera (if desired) - swing arm</li> <li>PGT w/ RET</li> </ul> </li> <li>Close airlock thermal cover</li> </ol> <p><u>BAY 2 SLIC BATTERY-R PREP</u></p> <ol style="list-style-type: none"> <li>Translate to SLIC aft, fairlead on safety bar</li> <li>Verify FSIPE STS PFR (AS: Y=12, P=3; PFR: Y=9, R=K, P=1.5)</li> <li>Open stbd battery thermal cover</li> <li>Secure cover open w/ Velcro</li> <li>√ Battery-R isolator switches (3) - OFF</li> <li>Visually verify J3 connector caps in place (3)</li> <li>Visually verify J2 gender changers in place (3)</li> <li>Inspect battery connector receptacles (6)</li> <li>Configure PGT w/ short adj ext</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <ol style="list-style-type: none"> <li>Battery bolts 12 &amp; 13 are not present on BPA</li> <li>SLIC battery bolts may be released in any order</li> <li>Leave Bolts 8 and 11 to be released while in PFR</li> </ol> <ol style="list-style-type: none"> <li><b>PGT [A3, CCW 3, 10.5], short adj ext</b></li> <li>Disengage the following J-bolts, 4 turns <ul style="list-style-type: none"> <li>Bolt 1</li> <li>Bolt 2</li> <li>Bolt 3</li> <li>Bolt 4</li> <li>Bolt 5</li> <li>Bolt 6</li> </ul> </li> </ol>	<p><u>BAY 2 BATTERY RETRIEVAL (00:45)</u></p> <p>← <input type="checkbox"/></p> <div style="border: 3px double black; padding: 5px; text-align: center;"> <p><u>WARNING</u></p> <ol style="list-style-type: none"> <li>Do not touch battery bay door thermal louvers</li> <li>Battery J1 &amp; J2 connectors are energized</li> </ol> </div> <ol style="list-style-type: none"> <li>Mnvr to bay 2; stanchion to 90L</li> <li>Rotate MFR handle to 180°; boot plate 0°</li> <li>Stow 80-in tether as required</li> <li>Retrieve manual door stay and battery cap caddy from MFR handle</li> <li><b>PGT [A3, CCW 3, 10.5], hybrid ext</b></li> <li>Disengage J-bolts (2 - upper and lower), 6 turns</li> <li>Open Bay 2 door fully</li> <li>Install manual door stay; extend to G - Door stay turns _____</li> <li>Release tether from manual door stay</li> <li>Rotate boot plate 90R</li> </ol> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Perform one at a time: <ul style="list-style-type: none"> <li>Demate P1A; install cap on J1A</li> <li>Demate VIK P2(A) from GCP2; install cap on GCP2</li> <li>Demate P1B; install cap on J1B</li> <li>Demate VIK P2(B) from GCP2; install cap on GCP2</li> <li>Demate P1C; install cap on J1C</li> <li>Demate VIK P2(C) from GCP2; install cap on GCP2</li> </ul> </li> <li>Tether or tuck connectors clear of battery</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u></p> <p>Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be released last</p> </div>

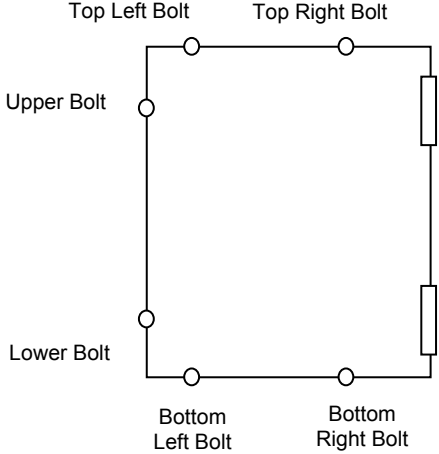
## BAY 2 BATTERY R&R (01:35) (Cont)

IV/RMS	FF EV (Mass)	RMS EV (Buono)
 <p>4. RMS: To Battery Handoff posn</p> <p>5. ICBC #8: RMS EV Battery-R Install 6. RMS: To Battery-R Install posn</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 7</li> <li><input type="checkbox"/> Bolt 9</li> <li><input type="checkbox"/> Bolt 10</li> <li><input type="checkbox"/> Bolt 14</li> </ul> <p><b>BAY 2 BATTERY SWAP</b></p> <ol style="list-style-type: none"> <li>1. Ingress PFR</li> <li>2. Tether to battery (aft battery handrail)</li> <li>3. <b>PGT [A3, CCW 3, 10.5]</b></li> <li>4. Disengage remaining Battery-R J-bolt, 4 turns <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 11</li> <li><input type="checkbox"/> Bolt 8</li> </ul> </li> <li>5. Remove stbd Battery-R</li> <li>6. Transfer Battery-R to RMS EV</li> <li>7. Receive Battery from RMS EV</li> </ol> <p><b>BAY 3 BATTERY STOW</b></p> <ol style="list-style-type: none"> <li>1. Install Battery on SLIC (connectors outboard)</li> <li>2. Verify Battery flush with BPA</li> <li>3. Engage as many J-hooks as possible from PFR</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <ol style="list-style-type: none"> <li>1. Battery bolt numbers 12 &amp; 13 are not engaged for landing</li> <li>2. After bolt 11 engaged, SLIC battery bolts may be engaged in any order</li> </ol>	<ol style="list-style-type: none"> <li>13. <b>PGT [A3, CCW 3, 10.5], hybrid ext</b></li> <li>14. Disengage battery J-bolts (14), 4 turns <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 1</li> <li><input type="checkbox"/> Bolt 2</li> <li><input type="checkbox"/> Bolt 3</li> <li><input type="checkbox"/> Bolt 5</li> <li><input type="checkbox"/> Bolt 6</li> <li><input type="checkbox"/> Bolt 7</li> <li><input type="checkbox"/> Bolt 8</li> <li><input type="checkbox"/> Bolt 9</li> <li><input type="checkbox"/> Bolt 10</li> <li><input type="checkbox"/> <b>Bolt 11</b></li> <li><input type="checkbox"/> <b>Bolt 4</b></li> <li><input type="checkbox"/> <b>Bolt 14</b></li> <li><input type="checkbox"/> <b>Bolt 13</b></li> <li><input type="checkbox"/> Tether to battery &amp; lock RET (Left sm/lg RET to right HR)</li> <li><input type="checkbox"/> Prep swingarm for PGT</li> <li><input type="checkbox"/> <b>Bolt 12</b></li> </ul> </li> <li>15. Remove battery</li> </ol> <p><b>BAY 2 BATTERY SWAP (00:10)</b></p> <ol style="list-style-type: none"> <li>1. Mnvr for Bay 2 battery swap</li> <li>2. Receive Battery-R from FF EV</li> <li>3. Transfer Battery to FF EV</li> </ol> <p><b>BAY 2 BATTERY-R INSTALL (00:40)</b></p> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>1. Mnvr to Bay 2</li> <li>2. Install Battery-R</li> <li>3. Verify battery flush</li> <li>4. Engage as many J-hooks as possible from single RMS posn</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be engaged first</p> </div>

## BAY 2 BATTERY R&R (01:35) (Cont)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>7. IV: Record SLIC battery turn counts 8. IV: Record HST battery turn counts</p>  <p>9. IV: Notify MCC Bay 2 Battery-R connectors mated; (GO for A/T)</p> <p>10. ✓ MCC GO to rotate Battery-R isolator switches * If NO COMM: * * Notify EV GO to rotate Battery-R * * isolator switches *</p> <p>11. IV: Notify MCC Battery isolator switches (3) - ON (GO for resume Battery A/T)</p>	<p>4. PGT [A3, CW 3, 10.5] ← <input type="checkbox"/></p> <p>5. Engage J-bolt #11 first, 3-5 turns 6. Engage remaining J-bolts (11 total), 3-5 turns - Egress PFR as necessary</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 11 _____ turns</li> <li><input type="checkbox"/> Bolt 1 _____ turns</li> <li><input type="checkbox"/> Bolt 2 _____ turns</li> <li><input type="checkbox"/> Bolt 3 _____ turns</li> <li><input type="checkbox"/> Bolt 4 _____ turns</li> <li><input type="checkbox"/> Bolt 5 _____ turns</li> <li><input type="checkbox"/> Bolt 6 _____ turns</li> <li><input type="checkbox"/> Bolt 7 _____ turns</li> <li><input type="checkbox"/> Bolt 8 _____ turns</li> <li><input type="checkbox"/> Bolt 9 _____ turns</li> <li><input type="checkbox"/> Bolt 10 _____ turns</li> <li><input type="checkbox"/> Bolt 14 _____ turns</li> </ul> <p>7. Close SLIC battery thermal cover 8. Remove short adj ext from PGT; stow on socket caddy 9. Stow PGT onto swing arm 10. Reconfigure FSIFE aft PFR for port battery (AS: Y=12, P=11, PFR: Y=9, R=B.5, P=1.5)</p> 	<p>5. PGT [A3, CW 3, 10.5] ← <input type="checkbox"/></p> <p>6. Engage Battery-R J-bolts (14), 3-5 turns</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 4 _____ turns</li> <li><input type="checkbox"/> Bolt 11 _____ turns</li> <li><input type="checkbox"/> Bolt 12 _____ turns</li> <li><input type="checkbox"/> Bolt 13 _____ turns</li> <li><input type="checkbox"/> Bolt 14 _____ turns</li> <li><input type="checkbox"/> Bolt 1 _____ turns</li> <li><input type="checkbox"/> Bolt 2 _____ turns</li> <li><input type="checkbox"/> Bolt 3 _____ turns</li> <li><input type="checkbox"/> Bolt 5 _____ turns</li> <li><input type="checkbox"/> Bolt 6 _____ turns</li> <li><input type="checkbox"/> Bolt 7 _____ turns</li> <li><input type="checkbox"/> Bolt 8 _____ turns</li> <li><input type="checkbox"/> Bolt 9 _____ turns</li> <li><input type="checkbox"/> Bolt 10 _____ turns</li> </ul> <p>7. Verify tether released from battery 8. Retrieve, inspect; mate one at a time:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Mate P1A to J1A</li> <li><input type="checkbox"/> Mate VIK P2(A) to GCP2</li> <li><input type="checkbox"/> Mate P1B to J1B</li> <li><input type="checkbox"/> Mate VIK P2(B) to GCP2</li> <li><input type="checkbox"/> Mate P1C to J1C</li> <li><input type="checkbox"/> Mate VIK P2(C) to GCP2</li> </ul> <p>← <input type="checkbox"/></p> <p>9. Release manual door stay - Use turn count from installation 10. Stow manual door stay and battery cap caddy on MFR handle ← <input type="checkbox"/></p> <p>On IV GO: 11. Rotate Battery-R isolator switches (3) - ON ← <input type="checkbox"/></p>

**BAY 2 BATTERY R&R (01:35) (Cont)**

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>12. WVS: RMS EV Center Cam (1. Connectors and 2. Battery Overview)</p> <p>13. On MCC GO: L12U FSS PCU PWR CONTR A - OFF CONTR B - OFF Notify MCC CONTR A and B - OFF</p>	 <p style="text-align: center;">BAY 2 DOOR BOLTS</p>	<p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>12. Verify harnesses clear of door; close bay door</p> <p>13. <b>PGT [A3, CW 3, 10.5]</b></p> <p>14. Engage J-bolts (6), 4-6 turns</p>

## BAY 2 BATTERY R&R – TASK DATA SHEET

### Estimated Task Duration: (01:35)

	FF	W/ RMS
Two EV Crew	N/A	1:35

### Tools:

FF EV	RMS EV
<ul style="list-style-type: none"> <li>Socket caddy with short adj</li> <li>Digital camera</li> <li>PFR</li> </ul>	<ul style="list-style-type: none"> <li>PGT with hybrid ext</li> <li>Battery cap caddy</li> <li>Manual door stay</li> </ul>

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
Bay 2 Battery-R J-bolts (on SLIC)	7/16	12		A3		Release: 4
Bay 2 Battery-R J-bolts (on HST)	7/16	14	A3			Install: 3-5
Bay 2 Door J-bolts	7/16	6	A3	A3		Release: 6 Install: 4-6
Bay 2 Battery (old) J-bolts (HST)	7/16	14		A3		Release: 4
Bay 2 Battery (old) J-bolts (SLIC)	7/16	12	A3			Install: 3-5

### Foot Restraints:

Task	S#	PFR Setting
Bay 2 SLIC Battery-R Prep	FSIPE aft socket S28	AS: 12, P=3; PFR: Y=9, R=K, P=1.5
Bay 2 Battery R&R	MFR	NA

### Timeline Considerations:

- Bay 3 battery R&R is higher priority than Bay 2

### Notes:

- Battery-R = 465 lbs; Old battery = 463 lbs
- Bay 3 lower bolt is released from 1st set of threads due to problems during re-installation on SM-3B
- J1 = Sockets (Power); J2 = Pins (Telemetry), with VIKs (Sockets)
- In order to ensure the old battery is fully seated on the BPA shear pins, it is highly desired that one of the three following fasteners be fully torqued prior to torquing any other bolts: #11, 14, or 4
- Less than 2.5 turns will prevent the SLIC and HST battery J-hooks from swinging open and more than 4 turns will increase the risk of getting a bolt into its interrupted threads

### Cautions:

- Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be released last (on old battery)
- Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be engaged first (on new battery)

### Warnings:

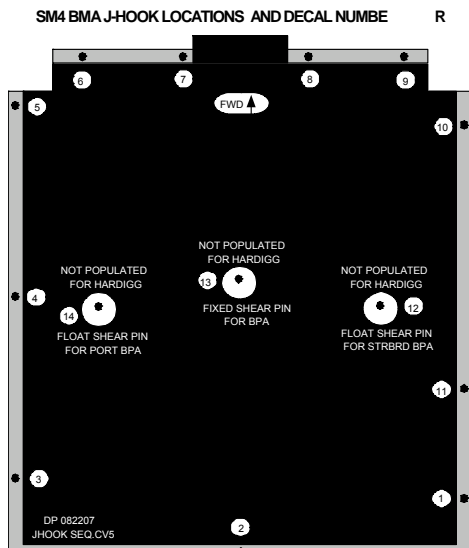
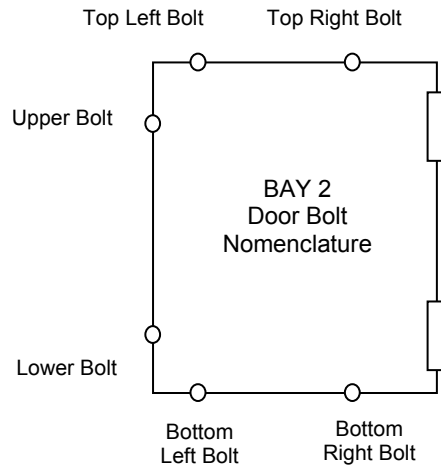
- Do not touch battery bay door thermal louvers
- Battery J1 & J2 connectors are energized

### Connectors:

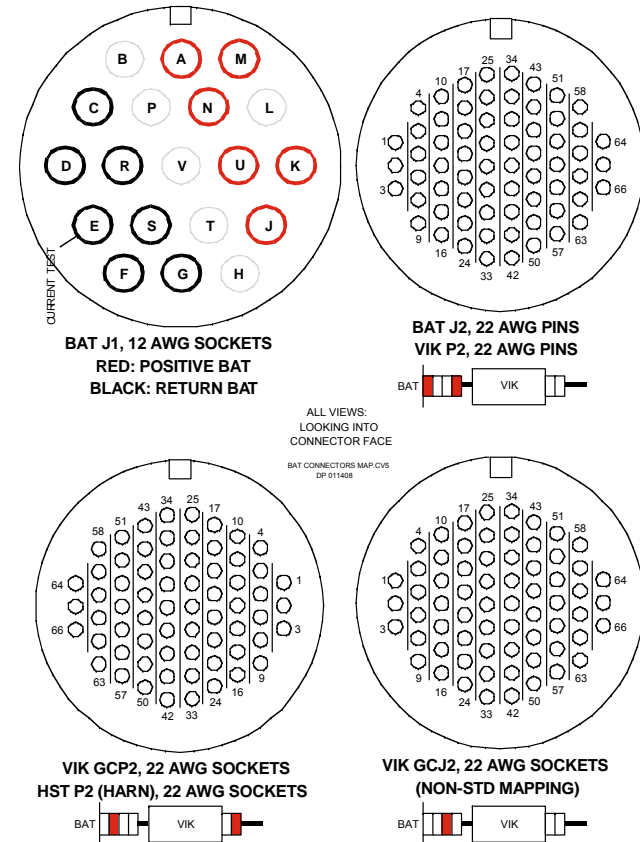
Connector	From	To	Function
HST P1A	Battery: J1A	Battery-R: J1A	power
VIK P2(A)	Battery: GCP2	Battery-R: GCP2	heater/telemetry
HST P1B	Battery: J1B	Battery-R: J1B	power
VIK P2(B)	Battery: GCP2	Battery-R: GCP2	heater/telemetry
HST P1C	Battery: J1C	Battery-R: J1C	power
VIK P2(C)	Battery: GCP2	Battery: GCP2	heater/telemetry



# BAY 2 BATTERY R&R – TASK DATA SHEET (Cont)



SLIC BPA SHEAR PIN LOCATIONS



BATTERY AND VIK PIN MAPS



# EVA 3 SUMMARY TIMELINE

TASK TIME (PET TIME) HR : MIN	IV/FSS	EV	RMS
00:00 ---	√ FSS 90°, -V2, Pivot 90°, -SA to 0°	<u>POST DEPRESS</u> (00:05)	
		<u>EGRESS/DAILY SETUP</u> (00:25) <ul style="list-style-type: none"> <li>• MFR Setup</li> <li>• BAPS Post Setup</li> </ul>	Airlock MFR Ingress/Egress
01:00 ---		<u>COS</u> (02:50) <ul style="list-style-type: none"> <li>• Open -V2 Doors <ul style="list-style-type: none"> <li>• Aft Fixture Setup</li> </ul> </li> <li>• COSTAR Removal</li> </ul>	-V2 Aft Shroud posn  FF EV "A" Latch posn COSTAR Removal posn COSTAR Stow posn COS Retrieval posn
02:00 ---		<ul style="list-style-type: none"> <li>• COS Retrieval</li> </ul>	
		<ul style="list-style-type: none"> <li>• COS Installation</li> </ul>	COS Install posn  COS Connectors posn
03:00 ---		<ul style="list-style-type: none"> <li>• COSTAR Installation</li> </ul>	COSTAR Retrieval - Aft Fixture posn COSTAR Install posn
			FSIPE Lid for MFR Egress posn
04:00 ---		<u>ACS PART I</u> (02:25) <ul style="list-style-type: none"> <li>• ACS Prep</li> <li>• Guide Stud Installation</li> </ul>	
	<ul style="list-style-type: none"> <li>• ACS Grid Cover Removal</li> <li>• FCP Installation</li> <li>• ACS CEB Cover Removal</li> </ul>		
05:00 ---	<ul style="list-style-type: none"> <li>• Card Removal</li> </ul>		
	<ul style="list-style-type: none"> <li>• Cleanup</li> <li>• Close -V2 Doors</li> </ul>	-V2 Aft Shroud posn	
06:00 ---		<u>DAILY CLOSEOUT/INGRESS</u> (00:40)	Airlock MFR Ingress/Egress posn
			RMS Extended Park posn
	EVA = 6:30	<u>PRE REPRESS</u> (00:05)	

EVA 3 TOOL CONFIG

AIRLOCK

- HST Tool Bag:**
- Helmet light battery (spare)
- General Purpose Caddy
  - IFM 5/32-in allen w/ tether (FSS cont) (umbil, bert latch)
  - IFM 1/8-in allen wrench w/ tether (ECU drive stud cont)
- MWS key strap
- Inspection mirror w/ O-tether
- Palm Wheel
- Wire tie caddy
- Connector Cleaner Tool Kit
- Cheater bar
- Airlock wrench (3/8" ratchet with 7/16" socket)
- Adjustable wrench
- DCM Plug
- 2 - 34-in adj tethers (cont) (HST bag pouch)
- 1 - 80-in adj tether (cont) (HST bag pouch)
- Overgloves (4 pair) -----
- Ballstack (no-RMS)
- Fish stringer #1:**
- Socket caddy #1
  - Hybrid ext (spare)
  - 6-in wobble (spare)
  - DPTA with IFM 3/16" ball-end (ACS drill jig cont)
- Lube Applicator
- MPT (spare) (s/n 05)
- PGT battery, s/n: \_\_\_\_\_
- PGT (spare): s/n: \_\_\_\_\_
- PGT Battery: s/n: \_\_\_\_\_
- EVA Ratchet with Palm Wheel (spare)
- MTL
- Small trash bag (spare), √zipped
- Digital Camera with Bracket
- Spare tethers (as desired, on HST tool bag)
- Prior to EVA, inspect the following:
  - RET cords for damage
  - Safety and waist tether load alleviating straps (no red band or damage)
  - Trash bag bristles for deformation/damage

MFR HANDLE - EGRESS

- FRONT** (MFR handle install posts facing you) (MFR=180 deg)
- Tool board C (left side of MFR handle):
  - Y-harness restraint tool (lower bayonet), int RET
  - Cut slit in bag to expose bayonet probe
  - High torque connector tool (bungee), int RET
- Tool board T (right side of MFR handle):
  - Short adj ext on O-tether (under bungee), int RET
  - Digital Camera with Bracket (lower bayonet), int cam RET
- BACK**
- Tool board C
  - MPT holster (upper bayonet), int RET
  - MPT with red bit (#4 TS) (use s/n 03)
  - Socket caddy #2 (lower bayonet), sm-sm eq RET
  - Black bit (3/16" socket head) (part 2, CEB module)
  - Red bit (spare)
- Tool board T
  - EVA ratchet with MTL (38) and 6-in rigid (upper bayonet) (no palm wheel), sm-sm eq RET
  - Small trash bag (lower bayonet), adj tether, √zipped
- Bayonet fittings:**
- Upper right: MPT battery, int RET
- Lower right: PGT with short adj socket, faces back, int RET
- Upper left: ACS guide stud caddy (with 4 studs), eq-eq RET
- Lower left: Ground strap harness bag, lg-sm RET
  - Front Pouch
    - Integral ground harnesses (2)
  - Middle Pouch
    - SSAT tool (int RET)
    - FRB (int RET)
  - Back Pouch (remove FET tip covers)
    - Cutters (zipped tie down - low profile)
    - 14-in extension (FET), (int RET)
    - 9-in extension (mini-FET), (int RET)
    - CMT
  - Ground strap pouch (remove bag from P11)
    - Verify ESM plug installed on GAM
  - ACS HR clamp
    - 1 adj tether from clamp to bag D-ring
- Top tether points:**
- 1 - RET (lg-sm paddle) (spare)
- 1 - 80-in adj tether (-V2 Doors) (folded)
- Side tether points:**
- 1 - RET (lg-sm) (to tether MFR Handle in A/L) (stays in A/L)
- 1 - Waist tether (to tether MFR Handle in A/L) (stays in A/L)
- 1 - Adj tether (spare)
- 1 - RET (sm-sm equip) (spare)

MWS-EGRESS

- A/L D-RING:** D-ring extender
- FF EV** (Grunsfeld)
- MWS
  - Left swingarm
    - PGT with 6-in wobble, s/n: \_\_\_\_\_
    - Sm-sm pb RET
  - 1 - Waist tether - Hooks locked (coated - right)
  - 1 - RET w/ PIP pin (eq-eq) – left
  - 1 - RET (lg-sm paddle) – left
  - 1 - RET (eq-eq) – right
  - 1 - Adj tether – (right)
  - Safety tether (left) (hook locked)
- RMS EV** (8 Ball)
- MWS w/ right swing arm
  - Sm-sm equip RET with PIP pin
  - 1 - Waist tether - Hooks locked (coated - right)
  - 1 - RET (lg-sm paddle) – left
  - 1 - RET (lg-sm paddle) – right
  - 1 - Adj tether – D-ring to D-ring
  - Safety tether (left) (hook locked)
- TOTAL TETHER COUNT**
- 5 – sm-sm equip RET (8)
- 2 – sm-sm equip RET w/PIP pin (2)
- 6 – lg-sm paddle RET (9)
- 1 – sm-sm pb RET (3)
- 5 – adj tether (10)
- 0 – sm-sm paddle RET (2)
- 0 – sm-sm paddle RET w/PIP pin (2)
- 3 – waist tethers (4)

# EVA 3 POST TOOL CONFIG

## MFR HANDLE - INGRESS

- 6-in rigid socket
- ACS guide stud caddy (empty)
- Socket caddy
  - red bits (2)
- EVA ratchet with MTL (38)
- Small trash bag
- MPT battery
- PGT with short adj socket
- MPT holster
  - MPT with black bit
- Ground strap harness bag
  - Cutter
  - CMT
  - 14-in extension (FET)
  - SSAT tool
  - FRB (with 4 fasteners)
  - 9-in extension (mini FET)
  - ACS HR clamp
- 80-in adj tether
- Short adj ext (backup)
- Card stowage enclosure (4 CTE)
- Wishbone
- Card extraction tool (ICET)
- Digital Camera
- High torque connector tool
- O-tether
- 3 caps (if did ACS completion)

## TETHERS

- 5 – sm-sm equip RET
- 2 – sm-sm equip RET w/PIP pin
- 5 – lg-sm paddle RET
- 1 – sm-sm pb RET
- 5 – adj tether

## MWS - INGRESS

- ### FF EV (Grunsfeld)
- MWS
  - Left swingarm
    - PGT with 6-in wobble
  - 1 - Waist tether
  - Safety tether

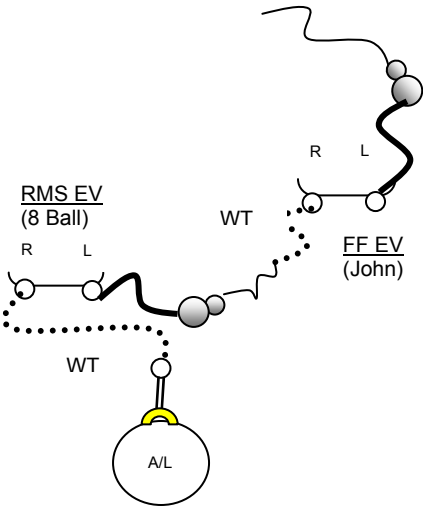
### RMS EV (8 Ball)

- MWS w/ right swing arm
- 1 - Waist tether
- Safety tether

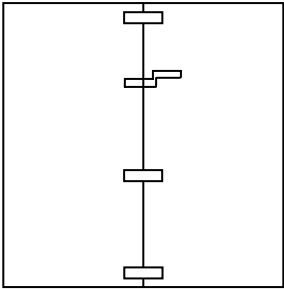
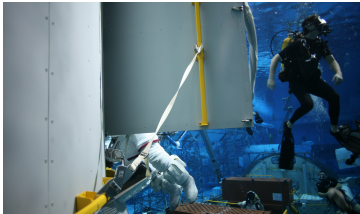
## MIDDECK TOOLS

- Fish stringer #2
- HRTs (2)
- CRT
- RSU Bag
- STIS/MPT Bit Caddy (7 bits)
- RIB Caddy (4 RIBs, 1 FEB, 1 WET)
- Battery Cap Caddy (2)
- Manual Door Stay
- Lube Applicator (2)
- EHIP battery bag (EHIP battery may be stowed elsewhere)
- GP Caddy (spare)
- 1 - 34-in adj tether
- Long adj socket
- PGT Batteries (2)
- Middeck Cont Kit and Blanket
- MUT EE
- Left swingarm
- Hybrid ext
- Drop-proof tether adapter (2)
- Trash bag
- Right swingarm

## EGRESS/DAILY SETUP (00:25)

IV/RMS	FF EV (GRUNSFELD)	RMS EV (8 BALL)
 <p>INITIAL SAFETY TETHER CONFIG</p> <ol style="list-style-type: none"> <li>1. RMS: To Airlock MFR Ingress/Egress posn (PDRS, <u>DAILY SETUP</u>)</li> </ol>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Right waist tether attached to RMS EV safety tether long end, hook slide locks (2) - L</li> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> </ul> <p><u>EGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Thermal cover - open</li> <li>2. Egress airlock</li> <li>3. Translate to Orbiter port sill</li> <li>4. Release aft fastener on slidewire cushion; open</li> <li>5. Gently relocate slider aft of RMS shoulder</li> <li>6. Translate aft of RMS shoulder</li> <li>7. Attach safety tether to aft slider <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>8. Remove RMS EV's safety tether from self; attach to RMS handrail standoff (black end) <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>9. Install MFR/RMS tether, tighten</li> </ol> <p><u>MFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Receive MFR handle from RMS EV</li> <li>2. Transfer MFR handle to RMS EV</li> <li>3. Close thermal cover</li> </ol> <p><u>BAPS POST SETUP</u> (00:05)</p> <ol style="list-style-type: none"> <li>1. Install BAPS post center pip pins (2)</li> </ol>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Right waist tether to A/L D-ring extender, hook slide lock - L</li> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> <li>√ MPT PWR - ON</li> </ul> <p><u>EGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Release waist tether from airlock D-ring extender</li> </ol> <p><u>MFR SETUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Transfer MFR handle to FF EV; egress airlock</li> <li>2. Attach boot plate lanyard to MWS lower D-ring</li> <li>3. Ingress MFR</li> <li>4. Receive MFR handle from FF EV</li> <li>5. Install MFR handle</li> </ol>

**COS (02:50)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>1. √ FSS 90°, -V2, Pivot 90°, -SA to 0°                  2. √ In sun protect att before opening doors</p> <p>3. RMS: To -V2 Aft Shroud Door posn (PDRS, <u>COS</u>)</p> <div style="border: 1px solid black; padding: 5px;">  <p style="text-align: center;">-V2 DOORS</p> </div> <p>4. <u>ICBC #7 alt</u> (P/TV09, <u>ICBC3D</u>) RMS EV Opens Doors</p> <div style="border: 1px solid black; padding: 5px;">  <p style="text-align: center;">LEFT DOOR TETHER CONFIG</p> </div> <p>5. L12U SSM WK LTS - ON (For A &amp; B Lights)</p>	<p><u>AFT FIXTURE SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to aft fixture                         <ul style="list-style-type: none"> <li>- Verify safety tether routed fwd of aft fixture</li> </ul> </li> <li>2. Remove PIP pins (2); stow</li> <li>3. Deploy aft fixture</li> <li>4. Engage captive lock pins (2)</li> <li>5. √ Top fork PIP pin in proper orientation</li> <li>6. Configure port TA: A=6, B=4, C=8, <b>extend to 7</b>  <i>(launched at: A=17, B=6, C=6 ext=1)</i></li> </ol> <p>As req'd:</p> <ol style="list-style-type: none"> <li>7. Verify aft ASIPE PFR (into PFR extender) for COS: (AS: Y=90R, P=1, PFR: Y=12, R=A, P=9.5)</li> <li>8. Time permitting, release ASIPE lid latches (4 of 5)</li> <li>9. Receive 80-in adj tether from RMS EV</li> <li>10. If in sun protect att, disengage lower two LOCKs (2)                         <ul style="list-style-type: none"> <li>- Release locking pin; rotate main handle</li> <li>- Rotate LOCK arm out of bath tub</li> </ul> </li> <li>11. Temp stow 80-in adj tether on left -V2 door handrail                         <ul style="list-style-type: none"> <li>- Sm hook to lower vertical door HR standoff (second from bottom)</li> <li>- Lg hook temp stowed on self</li> </ul> </li> <li>12. Tether left aft shroud door open (keep door from closing)                         <ul style="list-style-type: none"> <li>- Lg hook to horizontal HR standoff outboard of LGAP cover</li> </ul> </li> </ol>	<p><u>OPEN -V2 DOORS</u> (00:15)</p> <div style="display: flex; align-items: center;"> <span style="font-size: 2em;">←</span> <div style="margin-left: 10px;"> <input type="checkbox"/>  <input type="checkbox"/> </div> </div> <ol style="list-style-type: none"> <li>1. Mnvr to -V2 aft shroud doors</li> <li>2. Retrieve 80-in tether and PGT w/ short adj from MFR handle</li> <li>3. Rotate MFR handle 180° (front), boot plate 0°, stanchion 180°</li> <li>4. Transfer 80-in adj tether to FF EV</li> </ol> <p style="text-align: center;"><u>NOTE</u> No soft stop on the upper middle (handle) door latch bolt</p> <ol style="list-style-type: none"> <li>5. Disengage top LOCK (1)                         <ul style="list-style-type: none"> <li>- Release locking pin; rotate main handle; re-engage locking pin</li> <li>- Rotate LOCK arm out of bath tub</li> </ul> </li> </ol> <div style="display: flex; align-items: center;"> <span style="font-size: 2em;">←</span> <div style="margin-left: 10px;"> <input type="checkbox"/> </div> </div> <ol style="list-style-type: none"> <li>6. <b>PGT [A4, CCW2, 23.5] short adj</b> (turns)</li> <li>7. Disengage handle bolt, 7 turns</li> <li>8. Stow PGT on swing arm</li> <li>9. Maintain pressure on doors                         <ul style="list-style-type: none"> <li>- Remove PIP pin</li> <li>- Release handle latch</li> <li>- Reinstall PIP pin</li> </ul> </li> <li>10. Open doors</li> </ol> <div style="display: flex; align-items: center;"> <span style="font-size: 2em;">←</span> <div style="margin-left: 10px;"> <input type="checkbox"/> </div> </div>

**COS (02:50) (Cont)**

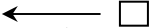
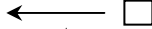
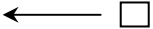
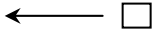
IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>6. √ MCC GO for COSTAR connector demate            * If NO COMM perform:            * DEADFACE COSTAR (PL OPS, <u>ORU/ORI</u>)</p> <p>7. Ground strap turns _____</p> <p>8. RMS: Stabilize FF EV posn</p> <p>9. "A" total turns _____</p> <p>10. RMS: To COSTAR Removal posn</p>	<p><u>COSTAR REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Release COSTAR Y-harness Velcro; reattach to itself</li> <li>2. Receive Y-harness restraint tool from RMS EV</li> <li>3. Install Y-harness restraint tool onto center guide rail outboard strut, open end up</li> <li>4. Reposition Y-harness into restraint tool ← <input type="checkbox"/></li> <li>5. Demate COSTAR connectors (4):  <input type="checkbox"/> P1  <input type="checkbox"/> P2  <input type="checkbox"/> P3  <input type="checkbox"/> P4</li> </ol> <p style="text-align: center;"><u>NOTE</u> Ground strap clip MLI flap is only taped to HST</p> <ol style="list-style-type: none"> <li>6. <b>PGT [A3, CCW3, 10.5], 6-Ext 7/16</b></li> <li>7. Disconnect ground strap, 6 (4-6) turns; temp stow ← <input type="checkbox"/></li> <li>8. Pre-configure PGT for A-latch: (B2, CCW 3, 5.5)</li> <li>9. Open "B" latch cover</li> <li>10. √ indicator lights off (4)</li> <li>11. Translate to "A" latch</li> <li>12. √ "A" LATCHED lights off (2)</li> <li>13. Receive EVA ratchet from RMS EV</li> <li>14. <b>EVA Ratchet [CCW, MTL 38], 6" rigid-Ext 7/16</b></li> <li>15. Break torque on "A" latch, 1/2 turn</li> <li>16. Transfer ratchet to RMS EV</li> <li>17. Note alignment and posn of SI</li> <li>18. <b>PGT [B2, CCW 3, 5.5]</b></li> <li>19. √ "A" LATCHED light on (2), (1-2 turns)</li> <li>20. Disengage "A" latch 11.5-15.5 turns to hardstop ← <input type="checkbox"/></li> <li>21. Translate to "B" latch</li> </ol>	<p><u>COSTAR REMOVAL</u> (00:35)</p> <ol style="list-style-type: none"> <li>1. Retrieve Y-harness restraint tool from MFR handle; transfer to FF EV</li> <li>2. Mnvr to stabilize FF EV (hold feet for connectors and ground strap)</li> <li>3. Rotate MFR handle to 0° (back)</li> <li>4. Retrieve EVA ratchet from MFR handle; stow on self</li> <li>5. Rotate MFR handle 180° (front)</li> <li>6. Verify EVA ratchet set to CCW, 38</li> <li>7. Mnvr to assist FF EV with "A" latch ops</li> <li>8. Transfer EVA ratchet to FF EV</li> <li>9. Hold FF EV as req'd for "A" latch torque break</li> <li>10. Receive ratchet from FF EV, stow on MWS</li> <li>11. Mnvr for COSTAR removal</li> <li>12. Note alignment and posn of SI</li> <li>13. Maintain downward force</li> </ol>



**COS (02:50) (Cont)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>11. ICBC #9: RMS EV Removes COSTAR</p> <p>12. "B" total turns _____</p> <p>13. RMS: To COSTAR Temp Stow posn</p> <p>14. ICBC #10: EV Closeup Opportunity (end of COSTAR temp stow)</p> <p>15. RMS: To COS Retrieval posn – ASIPE</p> <p>16. Ground strap turns _____</p> <p>17. "A" total turns _____</p>	<p>← <input type="checkbox"/></p> <p>On RMS EV GO:</p> <p>22. <b>PGT [B7, CCW 2, 15.5]</b></p> <p>23. Disengage "B" latch, 1/2 turn</p> <p>24. <b>PGT [B5, CCW 2, 5.5]</b>, expect MTL slip</p> <p>25. Disengage "B" latch, 9.5-13.5 additional turns to hardstop</p> <p>← <input type="checkbox"/></p> <p>26. √ "A" SEATED lights on (2)</p> <p>27. Provide RMS clearance calls</p> <p>28. Assist RMS EV</p> <p>29. Inform RMS EV when "B" READY lights on</p> <p>30. Inspect bay (latches and all MLI)</p> <p><u>COS RETRIEVAL (00:35)</u></p> <p>1. Once RMS clear, translate to ASIPE; open lid (1 of 5 latches remain)</p> <p>2. Perform glove inspection</p> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">Minimize contact between COS surface and PGT socket during ground strap bolt access</p> <p>3. <b>PGT [A2, CCW2, 2.5]</b></p> <p>4. Disconnect ground strap bolt, 13 turns</p> <p>← <input type="checkbox"/></p> <p>5. Stow ASIPE ground strap</p> <p>6. Disengage alignment aid stowage lock, 6-8 turns (spring loaded)</p> <p>7. Disengage alignment aid deployment lock 1/2 turn</p> <p>8. Deploy alignment aid 90°</p> <p>9. Re-engage deployment lock, 1/2 turn</p> <p>10. Provide RMS clearance calls</p>	<p>14. Give FF EV GO for "B" latch disengage</p> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">7 to 9 lbs force to demate "C" latch</p> <p>15. Remove COSTAR</p> <p>16. Mnvr to aft fixture (COSTAR connectors PLB fwd)</p> <div style="border: 2px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> <p><u>WARNING</u></p> <p>Possible finger pinch hazard when stowing COSTAR on aft fixture</p> </div> <p>← <input type="checkbox"/></p> <p>17. Stow COSTAR on aft fixture</p> <p>18. Install PIP pin</p> <p><u>COS RETRIEVAL</u></p> <p>1. Mnvr to ASIPE</p> <p>2. Perform glove inspection</p> <p>3. √ "A" LATCHED lights off</p> <p>4. <b>EVA Ratchet [CCW, MTL 38], 6 rigid-Ext 7/16</b></p> <p>5. Break torque on "A" latch, 1/2 turn</p> <p>6. <b>PGT [B2, CCW2, 5.5], short adj</b></p> <p>7. √ "A" LATCHED lights on (1-2 turns)</p> <p>8. Disengage "A" latch, 11.5-15.5 turns to hardstop</p> <p>← <input type="checkbox"/></p> <p>9. Configure <b>PGT [A3, CW2, 10.5]</b></p> <p>10. Stow PGT on swingarm</p> <p>11. GCA PLB aft; grab COS handrail</p> <p>12. Maintain aftward force</p>

**COS (02:50) (Cont)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>18. "B" total turns _____</p> <p>19. ICBC #11: RMS EV translation to COS Install</p> <p>20. ICBC #12: Closeup of COS Install</p> <p>21. RMS: To COS Install posn</p> <p>22. "B" total turns _____</p>	<p>11. Open "B" latch access door, 2 latches</p> <p>On RMS EV GO:</p> <p>12. <b>PGT [A3, CCW2, 10.5]</b></p> <p>13. Disengage "B" latch, 1/2 turn</p> <p>14. <b>PGT [B5, CCW2, 5.5]</b></p> <p>15. Disengage "B" latch, 9.5 - 13.5 additional turns to hardstop  </p> <p>16. ✓ "A" SEATED lights on</p> <p>17. Assist RMS EV</p> <p>18. ✓ "B" READY lights come on (2)</p> <p>19. Inspect ASIPE interior; inspect "A", "B", and "C" latches</p> <p>20. Close ASIPE lid (1 latch)</p> <p><u>COS INSTALLATION (00:45)</u></p> <p>1. Pre-configure <b>PGT [A3, CW 1, 10.5]</b></p> <p>2. Translate to -V2 aft shroud</p> <p>3. Assist RMS EV</p> <p>4. Disengage alignment aid deployment lock, 1/2 turn</p> <p>5. Deploy the alignment aid arm</p> <p>6. Re-engage deployment lock, 1/2 turn</p> <p>7. Inform RMS EV when "B" READY lights off</p> <p>8. <b>PGT [A3, CW1, 10.5]</b></p> <p>9. Engage "B" latch, 2 turns</p> <p>10. Verify no COS vertical movement</p> <p>11. Engage "B" latch, 8-12 additional turns          - Verify latch over-center  </p> <p>12. ✓ "A" SEATED lights off</p>	<p><u>NOTE</u> 7 to 9 lbs force to demate "C" latch</p> <p>13. Give FF EV GO for "B" latch release</p> <p><u>NOTE</u> Once COS has cleared ASIPE, move COS PLB aft to clear FSIPE</p> <p>14. Remove COS</p> <p><u>COS INSTALLATION</u></p> <p>  </p> <p>1. Mnvr to -V2 aft shroud</p> <p>2. Insert COS until front face clears center outboard guide rail</p> <p>3. Insert COS until "B" READY lights off</p> <p>4. Maintain slight downward force</p> <p>5. Verify no COS vertical movement          * If vertical movement, reseat COS *          * on "B" latch plunger *</p> <p>6. <b>PGT [A3, CW2, 10.5]</b></p>

**COS (02:50) (Cont)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>23. "A" total turns _____</p> <p>24. RMS: To FF COS Latch Assist posn</p> <p>25. Ground strap turns _____</p> <p>26. Notify MCC COS connectors mated (COS Aliveness Test)</p> <p>27. WVS: FF EV Center Cam, P/TV6 HST EVA, OPS (PHOTO/TV FS, <u>SCENES</u>) (1. COS conn panel, 2. ground strap, 3. Y-harness)</p> <p>28. L12U SSM WK LTS - OFF (For A &amp; B Lights)</p>	<p>13. Stow alignment aid            - Release deployment lock, 1/2 turn            - Slide alignment aid up            - Rotate alignment aid 90°            - Engage stowage lock zip nut hand tight            - Engage deployment lock (1/2 turn)</p> <p>14. Replace "B" latch cover</p> <p>15. <b>PGT [B6, CW2, 10.5]</b></p> <p>16. Reinstall HST ground strap, 4-6 turns            ← <input type="checkbox"/></p> <p>17. Inspect and mate COS connectors (4) (pins on COS):  <input type="checkbox"/> P1  <input type="checkbox"/> P2  <input type="checkbox"/> P3  <input type="checkbox"/> P4</p> <p>18. Receive ground strap bag</p> <p>19. Attach ACS HR clamp to ground strap bag</p> <p>20. Install ground strap harness bag onto aft shroud inner handrail            ← <input type="checkbox"/></p> <p>21. Inspect and adjust COSTAR Y-harness as req'd            ← <input type="checkbox"/></p>	<p>7. Engage "A" latch, 11.5-15.5 turns</p> <p>8. √ "A" LATCHED lights off</p> <p>9. <b>EVA Ratchet [CW, MTL 38]</b></p> <p>10. Continue driving "A" latch 1/2 turn until MTL slips            ← <input type="checkbox"/></p> <p>11. Mnvr to stabilize FF EV (connectors)</p> <p>12. Retrieve ground strap bag from MFR handle; transfer to FF EV</p> <p>13. Perform glove inspection</p>

**COS (02:50) (Cont)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>29. RMS: To COSTAR Retrieval - Aft Fixture posn            30. RMS: To COSTAR Stow posn</p> <p>31. "B" turns _____</p> <p>32. "A" turns _____</p> <p>33. RMS: To MFR Egress posn            34. Ground strap turns _____</p> <p>35. RMS: To Aft Shroud posn</p>	<p><u>COSTAR INSTALLATION</u></p> <ol style="list-style-type: none"> <li>1. Translate to ASIPE; open lid</li> <li>2. Perform glove inspection</li> <li>3. Translate to aft fixture</li> <li>4. Provide RMS clearance calls</li> <li>5. Once clearance calls complete, stow aft fixture, engage PIP pins (2)</li> <li>6. As req'd: ingress aft ASIPE PFR</li> <li>7. Assist RMS EV</li> <li>8. Inform RMS EV when "B" READY lights off</li> <li>9. <b>PGT [B6, CW1, 10.5]</b></li> <li>10. Engage "B" latch, 2 turns &amp; check for movement</li> <li>11. Continue engaging "B" latch 8-12 additional turns, verify latch over-center            ← <input type="checkbox"/></li> <li>12. ✓ "A" SEATED lights off</li> <li>13. Close "B" latch access cover (2 latches)</li> <li>14. Ingress aft ASIPE PFR</li> <li>15. <b>PGT [A2, CW2, 2.5]</b></li> <li>16. Install ground strap on COSTAR; engage bolt, 15.5 turns            ← <input type="checkbox"/></li> <li>17. Close ASIPE lid (1 latch, aft/center)</li> </ol> <p><u>PFR SETUP FOR ACS</u></p> <ol style="list-style-type: none"> <li>1. Perform safety tether fairlead at port TA</li> <li>2. Deploy center TA: A=6, B=6, <b>C=6</b>, extended (1)</li> <li>3. Configure AS: <b>P=2.5</b>, PFR: <b>Y=2, R=B, P=1.5</b></li> <li>4. Retrieve STS PFR and art socket from aft ASIPE socket</li> <li>5. Install into aft shroud FR 4 at 90L↓</li> </ol>	<p><u>COSTAR INSTALLATION (00:40)</u></p> <ol style="list-style-type: none"> <li>1. Mnv to aft fixture</li> <li>2. Retrieve COSTAR</li> <li>3. Mnv to ASIPE</li> <li>4. Insert COSTAR until "B" READY lights off</li> <li>5. Maintain slight aft force (Orbiter -X)</li> <li>6. Verify no COSTAR Orbiter +X movement</li> <li>7. <b>PGT [A3, CW2, 10.5]</b></li> <li>8. Engage "A" latch, 13-13.5 turns</li> <li>9. <b>EVA Ratchet [CW, MTL 38]</b></li> <li>10. Continue "A" latch 1/2 turn until MTL slips            ← <input type="checkbox"/></li> <li>11. ✓ "A" LATCHED lights off</li> <li>12. Mnv to FSIPE lid for egress</li> <li>13. Stow PGT and ratchet onto MFR handle            - PGT on top stanchion bayonet receptacle</li> <li>14. Configure MFR boot plate 0°, stanchion 0°            - Do not pitch stanchion out fully</li> <li>15. Egress MFR on FSIPE lid; give RMS operator GO to mnvr to aft shroud</li> <li>16. Engage ASIPE lid latches (5)            - Fwd and aft latches first (2), then center latches (3)</li> </ol>

# COS/COSTAR – TASK DATA SHEET

Estimated Task Duration: (02:50)

	FF	W/ RMS
Two EV Crew	NA	02:50

**Tools:**

FF EV	RMS EV
<ul style="list-style-type: none"> <li>PGT with 6-in wobble socket</li> <li>Y-harness restraint tool</li> </ul>	<ul style="list-style-type: none"> <li>PGT with short adj</li> <li>EVA ratchet with 6-in rigid socket</li> </ul>

**EVA Fasteners:**

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
-V2 aft shroud door bolts	7/16	4	B4	A4		Release: 7 Install: 7
COSTAR ground strap	7/16"	1	A2	A3		Release: 4-6 Install: 15.5
COSTAR A Latch	7/16"	1	A3	B2		Release: 1/2, then 11.5-15.5 Install: 13-13.5, then 1/2
COSTAR B Latch	7/16"	1	B6	B7, B5		Release: 1/2, then 9.5-13.5 Install: 10-14
COS A Latch	7/16"	1	A3	B2		Release: 1/2, then 11.5-15.5 Install: 11.5-15.5, then 1/2
COS ground strap	7/16"	1	B6	A2		Release: 13 Install: 4-6
COS B Latch	7/16"	1	A3	A3, B5		Release: 1/2, then 9.5-13.5 Install: 2, then 8-12

**Foot Restraints:**

Task	S#	PFR Setting
COS and COSTAR ops at ASIPE	Aft ASIPE socket (with extender)	AS: Y=90R, P=1, PFR: Y=12, R=A, P=9.5)
COS/COSTAR	MFR	NA

**Connectors:**

Connector	From	To	Clamps	Function
HST P1	PDU4-J5/J8	COS J1	N/A	Power A
HST P2	PDU3-J5/J8	COS J2	N/A	Power B
HST P3	CU/SDF-J7	COS J3	N/A	Signal A
HST P4	CU/SDF-J8	COS J4	N/A	Signal B

**Notes:**

- Pins are on SI side
- COS mass: ~888.0 lbs; COSTAR mass: ~ 671.0 lbs
- The fully-extended hybrid socket setting is 25
- The fully extended long adj socket setting is 24; the long adj socket is slightly shorter than the hybrid adj when fully extended
- Both the hybrid ext and the short adj sockets have long wobbles
- HST ground strap clip MLI flap is only taped to HST
- B-latch cover is taped and Velcroed to HST; it is not hard-mounted. Velcro holds the cover in both the open and close position
- 7 to 9 lbs force to demate "C" latch
- Once COS has cleared ASIPE, move COS PLB aft to clear FSIPE
- COSTAR must be stowed on the aft fixture with connectors fwd due to physical interference with the L-handle if installed the other way
- There is no soft stop on -V2 upper middle (handle) bolt

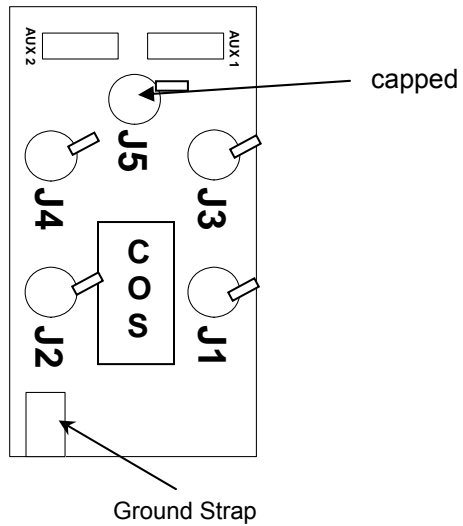
**Cautions:**

- Avoid contact between COS surface and PGT socket during ground strap bolt access
- Contact with A, B, or C-Latches is not allowed
- Avoid contact with black aluminum surfaces inside aft shroud doors

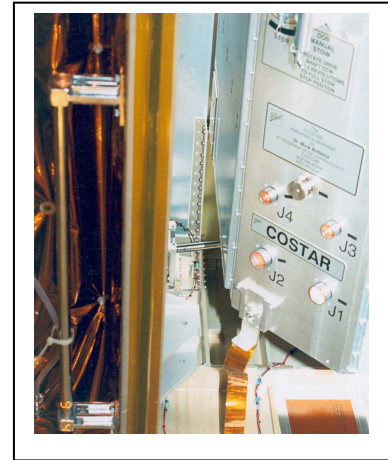
**Warnings:**

- Possible finger pinch hazard when stowing COSTAR on aft fixture
- Avoid contact with aperture area due to possible sharp edge hazard

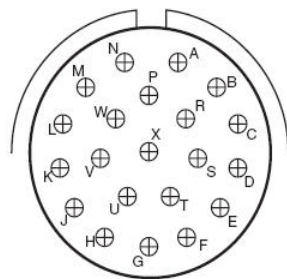
**COS/COSTAR – TASK DATA SHEET (Cont)**



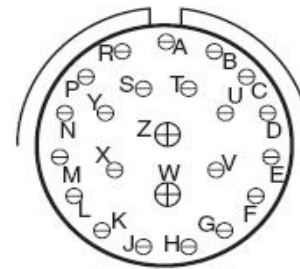
COS CONNECTOR LAYOUT



COSTAR CONNECTOR LAYOUT



J1 and J2 PIN MAP



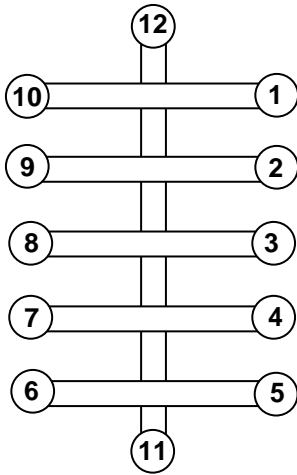
J3 and J4 PIN MAP

### ACS PART I (02:25)

I

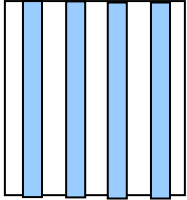
IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>1. ✓ MCC GO for ESM P11 turn-around plug demate (<u>Note</u>: GO will be given during COSTAR pwr dwn)</p> <p>2. Notify MCC P11R ground strap harness installed (GO for ACS pwr dwn)</p> <p>3. ICBC #13: Grid cutter/FCP tool transfers</p>	<p><u>ACS PREP (00:05)</u></p> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Demate ESM P11 turn-around plug from J11</li> <li>Mate ground strap harness P11-R onto ESM J11</li> </ol> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Restrain P11 turn-around plug via Velcro strap</li> <li>Ingress PFR</li> </ol> <p><u>GUIDE STUD INSTALLATION (00:15)</u></p> <ol style="list-style-type: none"> <li>Retrieve SSAT tool and FRB from ground strap bag</li> <li>Using SSAT tool, perform the following steps to release #10 fasteners (4), and stow in FRB:             <ul style="list-style-type: none"> <li>- Partially release #10 fasteners, 2.5 turns</li> <li>- Install SSAT tool to capture washers, continue driving fasteners until fully released (up to 8.5 turns)                 <ul style="list-style-type: none"> <li><input type="checkbox"/> Left - 3rd from bottom</li> <li><input type="checkbox"/> Left - 2nd from bottom</li> <li><input type="checkbox"/> Right - 3rd from bottom</li> <li><input type="checkbox"/> Right - 2nd from bottom</li> </ul> </li> </ul> </li> <li>Stow fasteners (4) in FRB</li> <li>Stow SSAT tool and FRB in ground strap bag</li> <li>Receive guide stud caddy from RMS EV</li> <li>Install four guide studs to hand tight, 4.5-10 turns:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Left - 3rd from bottom</li> <li><input type="checkbox"/> Left - 2nd from bottom</li> <li><input type="checkbox"/> Right - 3rd from bottom</li> <li><input type="checkbox"/> Right - 2nd from bottom</li> </ul> </li> <li>Transfer guide stud caddy to RMS EV</li> </ol> <p><u>ACS GRID COVER REMOVAL (00:15)</u></p> <ol style="list-style-type: none"> <li>Retrieve grid cutter from bag</li> <li>Install grid cutter onto upper grid and slide down, ✓ left grid legs centered within position indicators (4)</li> <li>Rotate upper and lower grid cutter arms (2)</li> </ol>	<p><u>ACS PREP</u></p> <ol style="list-style-type: none"> <li>Translate to LOPE (fwd/stbd ORU-C); open lid</li> <li>Retrieve FCP transfer bag; stow on swingarm</li> <li>Close LOPE (1 latch)</li> <li>Translate to NOPE (aft/stbd ORU-C); open lid</li> <li>Retrieve grid cutter transfer bag; stow on T-bar</li> <li>Close NOPE lid (1 latch)</li> <li>Translate to MFR handle; stow on handle:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Grid cutter transfer bag (lower right bayonet fitting)</li> <li><input type="checkbox"/> Keep FCP transfer bag on swingarm</li> </ul> </li> </ol> <p><u>GUIDE STUD INSTALLATION</u></p> <ol style="list-style-type: none"> <li>Ingress MFR; GCA for FF EV handoffs             <ul style="list-style-type: none"> <li>- No boot plate lanyard tether</li> </ul> </li> <li>Transfer guide stud caddy to FF EV</li> <li>Receive guide stud caddy; stow onto MFR handle (upper left bayonet fitting)</li> </ol> <p><u>ACS GRID COVER REMOVAL</u></p> <ol style="list-style-type: none"> <li>Present grid cutter transfer bag to FF EV</li> <li>Stow FCP transfer bag onto MFR handle (lower right bayonet fitting)</li> </ol> <p>← <input type="checkbox"/></p>

ACS PART I (02:25) (Cont)

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
 <p style="text-align: center;">GRID CUTTER</p> <p>4. RMS: To aft shroud posn</p>	<div style="border: 2px solid black; padding: 5px; text-align: center; margin-bottom: 10px;"> <p><b>WARNING</b></p> <p>Sharp edges will be present after grid cutter has been removed</p> </div> <p>4. <b>PGT [A2, CW2, 5.5], 6-in ext</b></p> <p>5. Engage grid cutter bolts (12 bolts):</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Left side, #11, &amp; #12: 4 turns (hard stop)</li> <li><input type="checkbox"/> Right side: 8 turns (hard stop)</li> </ul> <p>6. As necessary, engage drive-off feature (knob)</p> <p>7. Remove grid cutter</p> <p>8. Stow grid cutter/EMI grid into bag</p> <p>9. Perform glove inspection</p> <p><u>FCP INSTALLATION (00:20)</u></p> <ol style="list-style-type: none"> <li>1. Retrieve 9" extension (mini FET) and 14" extension (FET) from ground strap harness bag</li> <li>2. Break torque on all CEB cover fasteners (32)             <ul style="list-style-type: none"> <li>- Re-tighten fastener #1, 28, &amp; 29</li> </ul> </li> <li>3. Receive FCP from RMS EV; stabilize for film removal</li> <li>4. Install FCP onto CEB chassis; install ground strap</li> <li>5. Engage latches (3); perform pull test</li> <li>6. Engage "sticky" pads (2)</li> <li>7. GCA RMS/MFR into aft shroud (port side)</li> </ol> <p><u>ACS CEB COVER REMOVAL (00:30)</u></p> <ol style="list-style-type: none"> <li>1. Using 14" extension (FET), release the following fasteners:             <ul style="list-style-type: none"> <li><input type="checkbox"/> 1</li> <li><input type="checkbox"/> 2</li> <li><input type="checkbox"/> 3</li> <li><input type="checkbox"/> 5</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>3. Present cutter transfer bag to FF EV</li> <li>4. Stow bag on swing arm</li> <li>5. Perform glove inspection</li> </ol> <p><u>FCP INSTALLATION</u></p> <ol style="list-style-type: none"> <li>1. Retrieve FCP from MFR handle, verify:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Sticky pads (2) retracted</li> <li><input type="checkbox"/> Hard dock latches retracted (3)</li> <li><input type="checkbox"/> Cover retainer latches outboard (4)</li> </ul> </li> <li>2. Transfer FCP to FF EV</li> <li>3. Remove sticky pad protective film</li> </ol> <ol style="list-style-type: none"> <li>4. Adjust MFR handle for MPT access</li> <li>5. Provide RMS clearance calls as necessary</li> </ol> <p><u>ACS CEB COVER REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to NOPE (aft/stbd ORU-C); open lid</li> <li>2. Stow grid cutter transfer bag, engage straps (2)</li> <li>3. Retrieve the following tools:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Wishbone</li> </ul> </li> </ol>



ACS PART I (02:25) (Cont)

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>5. √MCC ACS pwr dwn complete (GO to retract sticky pad plungers)</p> <div style="text-align: center;">  <p>#1 #2 #3 #4 ACS CEB Cards</p> </div>	<ul style="list-style-type: none"> <li>□ 11</li> <li>□ 32</li> <li>2. Stow 14" and 9" extension into ground strap harness bag</li> <li>3. Configure MPT to CCW</li> <li>4. Retrieve MPT from holster</li> <li>5. <b>MPT [CCW, 15, MTR], #4 torque tip bit</b> (red)</li> <li>6. Release remaining fasteners, (27)</li> <li>7. Verify all fasteners released</li> <li>8. Transfer/stow MPT to RMS EV</li> <li>← □</li> <li>9. Perform simo retract of "sticky" pads (2)</li> <li>10. Engage cover retainer latches (4)</li> <li>11. Release FCP latches (3)</li> <li>12. Remove FCP/CEB cover</li> <li>13. Transfer FCP w/ CEB cover to RMS EV</li> </ul> <p><u>CARD REMOVAL</u> (00:30)</p> <ul style="list-style-type: none"> <li>1. Retrieve CMT from ground strap harness bag</li> <li>2. Release Card-Loks on all 4 cards (2 each), 6 turns</li> <li>3. Stow CMT into ground strap harness bag</li> <li>4. Retrieve wishbone from MFR handle</li> <li>5. Install ground strap harness onto wishbone</li> <li>6. Install wishbone via upper 2 holes</li> </ul> <div style="border: 2px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>WARNING</b> Sharp edges on CEB cards</p> </div> <ul style="list-style-type: none"> <li>7. Receive/retrieve card stowage enclosure from RMS EV, stow on ACS HR (using integral clamps)</li> <li>8. Open and prep card stowage enclosure for first card</li> </ul> <p>Card #1:</p> <ul style="list-style-type: none"> <li>9. Receive card extraction tool from RMS EV</li> <li>10. Verify index set to card 1</li> </ul>	<ul style="list-style-type: none"> <li>□ Card stowage enclosure (swing arm)</li> <li>□ Card extraction tool</li> <li>4. Close NOPE (3 latches)</li> <li>5. Translate to MFR handle</li> <li>6. Stow wishbone, extraction tool, card stowage enclosure on MFR handle <ul style="list-style-type: none"> <li>- Swap card stowage enclosure and FCP bag locations</li> </ul> </li> <li>7. Receive/retrieve MPT from FF EV</li> <li>8. Configure MPT w/ black bit</li> <li>9. Stow MPT</li> <li>10. Receive FCP w/ CEB cover from FF EV, stow in transfer bag</li> </ul> <p><u>CARD REMOVAL</u></p> <ul style="list-style-type: none"> <li>1. Translate to LOPE (fwd/stbd ORU-C); open lid</li> <li>2. Stow FCP/CEB cover transfer bag</li> <li>3. Close LOPE lid (1 latch)</li> <li>4. On MCC GO, Go to section 7: ACS REPAIR COMPLETION</li> <li>5. Translate to NOPE (aft/stbd ORU-C); open lid</li> <li>6. Retrieve CEB-R temp cover</li> <li>7. Close NOPE lid (3 latches)</li> <li>8. Translate to MFR; ingress</li> <li>9. Stow CEB-R temp cover; retrieve card extraction tool</li> </ul> <div style="border: 2px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>WARNING</b> Sharp edges on CEB cards</p> </div> <ul style="list-style-type: none"> <li>10. Transfer card stowage enclosure and card extraction tool to FF EV</li> </ul>

ACS PART I (02:25) (Cont)

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<div> </div> <div> <p>#1 #2 #3 #4 ACS CEB Cards</p> </div> <div> <p>6. IV: Check MCC to request removal of Cards #3 and #4</p> </div>	<ol style="list-style-type: none"> <li>11. Verify elevator drive blocks fully retracted</li> <li>12. Verify clamp lever open</li> <li>13. Verify elevator drive block lever - DOCK</li> <li>14. Install ground strap onto extraction tool</li> <li>15. Install extraction tool onto wishbone &amp; first card</li> <li>16. Push &amp; rotate clamp lever CW to closed (360°)</li> <li>17. <b>PGT [B2, CW 2, 5.5], 6-Ext 7/16</b></li> <li>18. Drive CET elevator drive CW2, 18 turns</li> <li>19. Drive CET elevator drive CCW2, 6 turns</li> <li>20. Drive CET elevator drive CW2, 8 turns</li> <li>21. Place card tool elevator drive block lever - UNDOCK</li> <li>22. Verify card can be removed</li> <li>23. Re-set elevator drive; PGT: CCW3 to hard stop (~20 turns)</li> <li>24. Stow PGT</li> <li>25. Remove card #1 from CEB</li> <li>26. Install card into card stowage enclosure; engage slide lock</li> <li>27. Release clamp lever (push &amp; rotate CCW 360°)</li> </ol> <p>Card #2:</p> <ol style="list-style-type: none"> <li>28. Set index to card 2 on card extraction tool</li> <li>29. Verify clamp lever open</li> <li>30. Place elevator drive block lever - DOCK</li> <li>31. Install extraction tool onto wishbone &amp; second card</li> <li>32. Push and rotate clamp lever CW to closed (360°)</li> <li>33. <b>PGT [B2, CW 2, 5.5], 6-Ext 7/16</b></li> <li>34. Drive CET elevator drive CW2, 18 turns</li> <li>35. Drive CET elevator drive CCW2, 6 turns</li> <li>36. Drive CET elevator drive CW2, 8 turns</li> <li>37. Place card tool elevator drive block lever - UNDOCK</li> <li>38. Verify card can be removed</li> <li>39. Re-set elevator drive; PGT: CCW3 to hard stop (~20 turns)</li> <li>40. Stow PGT</li> <li>41. Remove card #2 from CEB</li> <li>42. Install card into card stowage enclosure; engage slide lock</li> <li>43. Release clamp lever (push &amp; rotate CCW 360°)</li> </ol> <div> </div> <p>If GO to remove Cards #3 and #4:</p> <ol style="list-style-type: none"> <li>44. Go to Section 7: (ACS REPAIR COMPLETION)</li> </ol>	

ACS PART I (02:25) (Cont)

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<div style="display: inline-block; vertical-align: top;"> </div> <div style="display: inline-block; vertical-align: top; margin-left: 10px;"> <p>Top bolt</p> <p>Handle bolt (upper middle bolt)</p> <p>Lower middle bolt</p> <p>Bottom bolt</p> </div> <p>7. RMS: To Close -V2 Doors posn</p> <p>8. WVS: RMS EV Center Cam (Aft shroud overview prior to door close)</p>	<p>45. Transfer card stowage enclosure to RMS EV</p> <p>46. Stow extraction tool into ground strap harness bag</p> <p>47. Remove wishbone; stow into ground strap harness bag</p> <p><u>CLEANUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>Retrieve/receive CEB-R temp cover from MFR handle</li> <li>Install ground strap harness onto temp cover</li> <li>Install temp cover</li> <li>Engage hard dock latches (3)</li> <li>Stow harnesses into ground strap harness bag</li> </ol> <p style="text-align: center;"><u>Note</u></p> <p style="text-align: center;">If ACS can be completed in one day, replace original ESM/P11 cap</p> <ol style="list-style-type: none"> <li>Release ground strap bag GAM from ESM P11</li> <li>Transfer ground strap harness bag to RMS EV</li> <li>Egress PFR</li> <li>Retrieve PFR and AS from aft shroud</li> <li>Translate to aft ASIPE socket</li> <li>Stow PFR and AS into aft ASIPE PFR socket: configure to: AS: <b>Y=90R, P=3.5</b>, PFR: <b>Y=6, R=C, P=3.5</b> (STIS); install AS Velcro flag</li> </ol> <p><u>CLOSE -V2 DOORS</u></p> <ol style="list-style-type: none"> <li>Close right aft shroud door</li> <li>Retrieve 80-in tether (left door); stow</li> <li>Close left aft shroud door</li> <li>Assist RMS EV in door closure</li> </ol>	<p>11. Receive card stowage enclosure from FF EV, stow on MFR handle</p> <p><u>CLEANUP</u></p> <ol style="list-style-type: none"> <li>Transfer CEB-R temp cover to FF EV</li> <li>Receive ground strap harness bag from FF EV</li> <li>Stow bag onto MFR handle</li> <li>As possible, assist FF EV w/ PFR removal</li> </ol> <p><u>CLOSE -V2 DOORS</u> (00:15)</p> <ol style="list-style-type: none"> <li>Mnvr to aft shroud ← □</li> <li>Retrieve PGT from MFR</li> <li>Configure stanchion 135L, boot plate 0°</li> <li>Close doors; right then left</li> <li>Engage handle bolt and PIP pin</li> <li><b>PGT [B4, CW 2, 23.5], short adj</b></li> <li>Engage handle bolt, 7 turns</li> <li>√ Door seals</li> <li>Engage LOCKs (3): <ul style="list-style-type: none"> <li>- Rotate LOCK arm into bathtub</li> <li>- Pull pin; engage main handle down</li> <li>- Verify green visible on main handle lock pin</li> </ul> </li> </ol>

# ACS PART I – TASK DATA SHEET

Estimated Task Duration: (02:25)

	<b>FF</b>	<b>W/ RMS</b>
Two EV Crew		02:25

**Tools:**

FF EV	RMS EV
<ul style="list-style-type: none"> <li>SSAT tool/FRB</li> <li>Guide studs (4)</li> <li>PGT with 6-in socket</li> <li>14" and 9" extension (FETs)</li> <li>MPT with #4 torque tip (red)</li> </ul>	NA

**EVA Fasteners:**

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
Grid cutter bolts	7/16"	12		A2		Left (4) Right (8)
CEB cover fasteners	#4 TS/torque tip (red)	32	9 in-lbs	15, MTR (in-lbs)		~ 4.5
Card Loks	#4 hex	4 cards X 2 screws = 8	6 in-lbs			6
CET elevator drive	7/16"	1		B2		18 CW 6 CCW 8 CW
CEB-R anchor drive studs	3/16" socket head (black)	4 (2 req'd)		20, MTR (in-lbs)		To torque
CEB-R card drive screws	3/16" socket head (black)	4		20, MTR (in-lbs)		8-9 turns (to torque)
-V2 aft shroud door bolts	7/16	4	B4	A4		Release: 7 Install: 7

**Foot Restraints:**

Task	S#/FR#	PFR Setting
ACS - RMS	MFR	NA
ACS - FF	FR 4 at 90L↓	AS: P=2.5 PFR: Y=2, R=B, P=1.5
ACS - X-Training (Mass)	FR 4	90 deg convert: 30R↑ AS: Y=120R, P=4 PFR: Y=9, R=A, P=11.5

**Notes:**

- For ACS guide stud installation, hand tight can range from 4.5 to 10 turns
- A torque of approximately 35 in-lbs is sufficient to install an ACS guide stud and is acceptable up to a torque of 50 in-lbs with minimal deformation to the EMI Shielding Plate
- If ACS can be completed in one EVA day, replace original ESM P11 cap; if not, leave ground strap bag P11-R attached
- The maximum ACS card LOK turn count is 6; it is possible for front wedge to release beginning at 7 turns
- Full card LOK disassembly can occur as early as 11.5 turns, causing several loose pieces of hardware to be released inside the aft shroud
- The LVPS-R and CEB-R modules have connector savers
- CEB cover fastener turn count (HFMS, 10/07):
  - 20 #4 perimeter fasteners release at ~ 2.5-3 turns
  - 12 #4 cover-card fasteners release at ~ 5 turns
- For CET Elevator Drive:
  - 16-18 turns CW (OUT) extracts card a distance of 1.000" - 1.125"
  - 6-8 turns CCW (IN) drives card in .375" - .500"
  - 6-8 turns CW (OUT) extracts card .375" - .500"

**Cautions:**

- NA

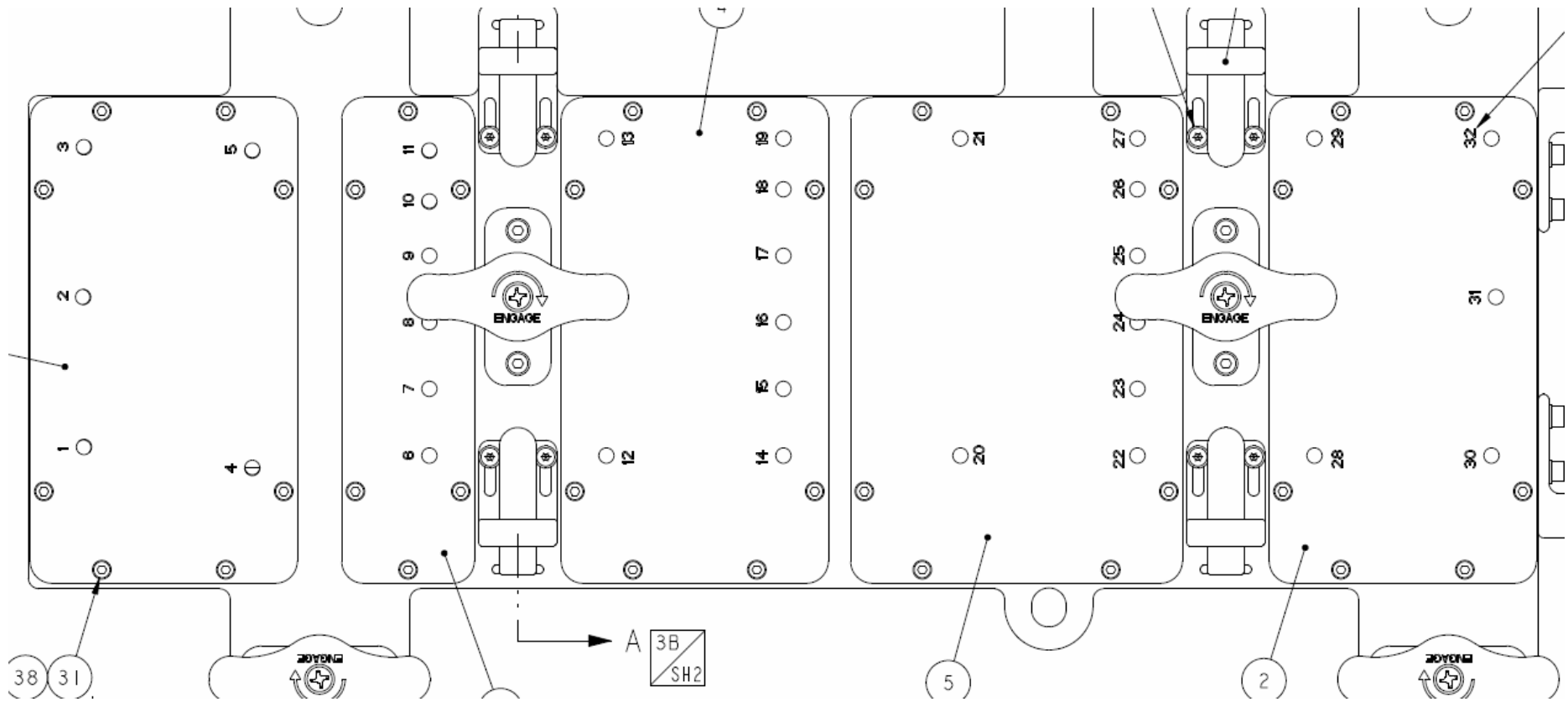
**Warnings:**

- Sharp edges will be present after grid cutter has been removed
- Sharp edges on CEB cards
- Sharp edge on bottom of grid cutter (however, blades are retracted)

**Acronyms:**

FRB=Fastener Retention Block  
 CEB=CCD Electronics Board (access cover)  
 SSAT= S-band Single Access Transmitter  
 CET=Card Extraction Tool  
 NOPE=New ORU Protective Enclosure  
 LOPE=Large ORU Protective Enclosure (heated)  
 FCP=Fastener Capture Plate  
 FET=Fastener Extraction Tool

ACS PART I – TASK DATA SHEET (Cont)

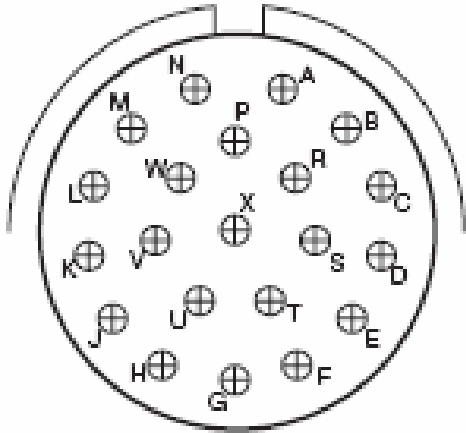


ACS FCP NUMBERING SCHEME

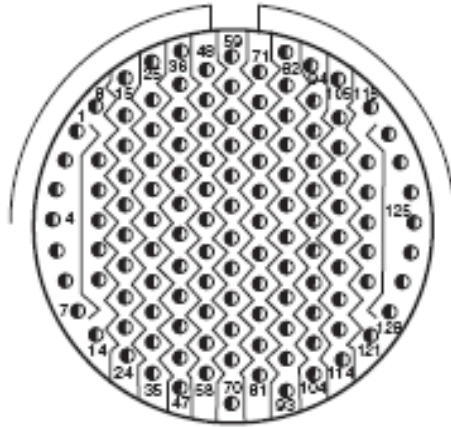
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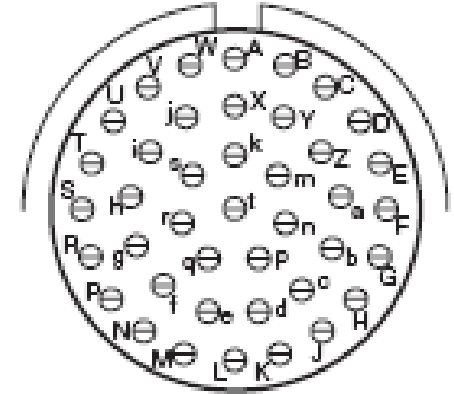
ACS PART I – TASK DATA SHEET (Cont)



PIE J1A PIN MAP  
(P1A is mirror image)



POE P7 and CEB J8 PIN MAP  
(LVPS J7 and POE P8 are mirror images)



LVPS J6 PIN MAP  
(PIE P6 is mirror image)

**DAILY CLOSEOUT/INGRESS (00:40)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>1. RMS: To Airlock MFR Ingress/Egress posn (PDRS, <u>EVA CLOSEOUT</u>)</p> <p>2. RMS: To RMS Extended Park posn (PDRS, <u>EXTENDED PARK</u>)</p>	<p><u>PLB CLEANUP</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Translate to FSS</li> <li>3. Inspect main umbilical mechanism</li> <li>4. Remove BAPS post center PIP pins (2); stow</li> <li>5. Reconfigure center TA (due aft): A=6, B=6, <b>C=0</b>, extension to 1</li> <li>6. Reconfigure port TA: extension to 1, attach Velcro flag</li> <li>7. Perform tool inventory</li> <li>8. Translate to airlock; open thermal cover</li> <li>9. Receive MFR handle from RMS EV</li> </ol> <p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Transfer MFR handle to RMS EV</li> <li>2. Release MFR/RMS tether</li> <li>3. Remove RMS safety tether from RMS; attach to right EMU D-ring or waist tether - Engage crew hook slide lock - L</li> <li>4. Translate to Orbiter port sill (aft of RMS shoulder)</li> <li>5. Remove safety tether from slider</li> <li>6. Gently relocate slider fwd of RMS shoulder</li> <li>7. Translate fwd of RMS shoulder</li> <li>8. Stow slider, close cushion; engage quarter turn fastener</li> <li>9. Ingress airlock</li> <li>10. Open DCM cover; Velcro to self</li> <li>11. Connect SCU to DCM; √ SCU locked</li> <li>12. WATER - OFF (expect "H2O IS OFF" msg)</li> <li>13. Thermal cover - close</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>14. Verify hardware clear of hatch</li> <li>15. Close, lock outer hatch</li> <li>16. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>	<p><u>PLB CLEANUP</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Mnvr to airlock</li> <li>3. Perform tool inventory</li> <li>4. MFR stanchion 0°; boot plate 0°</li> <li>5. MFR handle 0°</li> <li>6. Remove MFR handle; transfer to FF EV</li> <li>7. Egress MFR</li> </ol> <p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Ingress airlock</li> <li>2. Attach waist tether to airlock D-ring extender - Engage crew hook slide lock - L</li> <li>3. Receive MFR handle from FF EV; stow</li> <li>4. Verify FF EV's tether config</li> <li>5. Open DCM cover; Velcro to self</li> <li>6. Connect SCU to DCM; √ SCU locked</li> <li>7. WATER - OFF (expect "H2O IS OFF" msg)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div>



# EVA 4 SUMMARY TIMELINE

TASK TIME (PET TIME) HR : MIN	IV/FSS	EV	RMS
00:00 ---	√ FSS 270°, +V2, Pivot 90°, -SA to 0°	<u>POST DEPRESS</u> (00:05)	
		<u>EGRESS/DAILY SETUP</u> (00:25)	Airlock MFR Ingress/Egress posn FCP Retrieval posn
01:00 ---		<u>STIS REPAIR</u> (04:30) • Open +V2 Doors  • MEB Cover Removal Prep	+V2 Aft Shroud posn
02:00 ---		• MEB Cover Removal	
03:00 ---		• Card R&R	FCP Enclosure posn STIS Aft Shroud posn
04:00 ---		• STIS Closeout  • Close +V2 Doors	MEB-R Retrieval posn  +V2 Aft Shroud posn
05:00 ---		<u>NOBL 8</u> (00:45) • NOBL Tool Gather • Bay 8 MLI Patch Kit Removal • Bay 8 NOBL Installation	MINC NOBL Retrieval posn HST Bay 8 posn
06:00 ---	<u>DAILY CLOSEOUT/INGRESS</u> (00:40)	Airlock MFR Ingress/Egress posn  RMS Extended Park posn	
	EVA = 6:30	<u>PRE REPRESS</u> (00:05)	

EVA 4 TOOL CONFIG

**AIRLOCK**

**HST Tool Bag:**

- Helmet light battery (spare)
- General Purpose Caddy
  - IFM 5/32-in allen w/ tether (FSS cont) (umbil, bert latch)
  - IFM 1/8-in allen wrench w/ tether (ECU drive stud cont)
- MWS key strap
- Inspection mirror w/ O-tether
- Palm Wheel
- Wire tie caddy
- Connector Cleaner Tool Kit
- Cheater bar
- Airlock wrench (3/8" ratchet with 7/16" socket)
- Adjustable wrench
- DCM Plug
- 2 - 34-in adj tethers (cont) (HST bag pouch)
- 1 - 80-in adj tether (cont) (HST bag pouch)
- Overgloves (4 pair) -----
- O-Tether
- Fish stringer #1:**
  - Socket caddy #1
    - 6-in wobble socket (spare)
    - 6-in rigid (door cont)
  - MPT (spare) (s/n 05)
    - PGT battery, s/n: \_\_\_\_\_
  - PGT (spare): s/n: \_\_\_\_\_
  - PGT Battery: s/n: \_\_\_\_\_
  - EVA Ratchet with Palm Wheel (spare)
  - MTL
  - Lube Applicator (if req'd)
  - Socket caddy #2 (no-RMS)
  - High torque connector tool
- Spare tethers (as desired, on HST tool bag)
- ACS 14-in extension (FET)
  - Lg-sm RET
- Digital Camera with Bracket (spare)
  - Lg-sm RET
- Prior to EVA, inspect the following:
  - RET cords for damage
  - Safety and waist tether load alleviating straps (no red band or damage)
  - Trash bag bristles for deformation/damage

**MFR HANDLE - EGRESS**

**FRONT** (MFR handle install posts facing you) (MFR=180 deg)

- Tool board C** (left side of MFR handle):
  - Trash bag, upper bayonet, int RET, √zipped
- Tool board T** (right side of MFR handle):
  - Clamp Removal Tool (CRT), bungee, int RET
  - Hybrid ext (spare)
- BACK** (MFR=0 deg)
  - Tool board C**
    - MPT holster (upper bayonet), int RET
      - MPT (no bit, b/c RIB needed first) (use s/n 03)
    - STIS socket caddy (lower bayonet), sm eq RET (PIP pin)
      - #8 hex bit (clear)
      - #4 hex bit (blue)
      - #4 torque tip bit (red) (use new bit)
      - #8 torque tip bit (green)
      - #4 torque tip bit (red) (spare) (use new bit)
      - #4 hex bit (blue) (spare)
      - Yellow slot empty
  - Tool board T**
    - MPT battery housing (upper bayonet), sm-sm eq RET
    - 6-in socket (post)

**Bayonet fittings:** (facing front side)

- Upper right: RIB Caddy, sm-sm eq RET
  - RIBs (5)
  - FEB (1) (orange)
  - WET (1)
- Lower left: PGT w/ hybrid ext (socket faces back), int RET
  - PGT s/n: \_\_\_\_\_ PGT Battery s/n: \_\_\_\_\_
- Upper left: Digital Camera, int RET, adj tether a la mode
- Lower right: STIS ground strap bag, int RET
  - Front Pouch
    - Integral ground harness
    - HRT (int RET)
  - Middle Pouch
    - Integral ground harness
    - HRT (int RET)
  - Back Pouch
    - Cutters
    - Mini FET (9") (french hook, int RET)
    - CMT

**Side tether points:**

- 1 - RET (lg-sm) (to tether MFR Handle in A/L) (stays in A/L)
- 1 - Waist tether (to tether MFR Handle in A/L) (stays in A/L)
- 1 - Adj tether (spare)
- 2 - RETs (sm-sm equip) (spare), 1 on C upper

**MWS-EGRESS**

- A/L D-RING:** D-ring extender
- FF EV** (Mass)
  - MWS w/ right swing arm
    - PGT with HRT hex bit (yellow)
    - Sm-sm pb RET
  - Left swingarm
    - Sm-sm pb RET
  - 1 - Small trash bag, inner left, √zipped
  - 1 - Adj tether - left D-ring to trash bag
  - 1 - Waist tether (coated) - right
  - 1 - RET w/PIP pin (sm-sm paddle) - left
  - 1 - RET (lg-sm paddle) - right
  - Safety tether (left) (hook locked)
- RMS EV** (Bueno)
  - MWS w/ right swing arm
    - Sm-sm equip RET
  - 2 - Wire ties around T-bar (bunny ears)
  - 1 - Waist tether (coated) - left
  - 1 - Adj tether - lower MWS D-ring to bunny ear
  - 1 - RET w/ PIP pin (sm-sm paddle) - left
  - 1 - RET (lg-sm paddle) - right
  - 1 - RET (sm-sm equip) (rt D-ring to rt bunny ear)
  - Safety tether (right) (hook locked)
- MFR Top tether points:**
  - 1 - RET (lg-sm paddle), top left tether point
  - 1 - Ballstack with MUT EE (top right ECOM)
    - Int RET to ball-stack tether point
    - Lg-sm paddle from MFR top right tether point to ballstack, large hook on ballstack
- TOTAL TETHER COUNT**
  - 6 - sm-sm equip RET (8)
  - 1 - sm-sm equip RET w/PIP pin (2)
  - 7 - lg-sm paddle RET (9)
  - 2 - sm-sm pb RET (3)
  - 4 - adj tether (10)
  - 0 - sm-sm paddle RET (2)
  - 2 - sm-sm paddle RET w/PIP pin (2)
  - 3 - waist tethers (4)

# EVA 4 POST TOOL CONFIG

## MFR HANDLE - INGRESS

- MPT holster
  - MPT with #8 torque tip bit (green)
- STIS socket caddy
  - #8 hex bit (white)
  - #4 hex bit (blue)
  - #4 torque tip bit (red)
  - HRT hex bit (yellow)
  - #4 torque tip bit (red) (spare)
  - #4 hex bit (blue) (spare)
- MPT battery housing (upper bayonet)
- Hybrid ext (spare)
- PGT w/ hybrid ext
- STIS grounding bag
  - Cutters
  - CMT
  - 9-in ACS extension (mini FET)
- Bay 8 MLI recovery bag (patches, MLI, adhesive film)
- Ballstack with MUT EE
- Trash bag
- RIB Caddy (5 RIBS, 1 FEB, 1 WET)
- Digital Camera

## TETHERS

- 6 – sm-sm equip RET
- 1 – sm-sm equip RET w/PIP pin
- 4 – lg-sm paddle RET
- 2 – sm-sm pb RET
- 4 – adj tether
- 2 – sm-sm paddle RET w/PIP pin

## MWS - INGRESS

### FF EV (Mass)

- MWS w/ right swing arm
- PGT with 6-in socket
- Left swingarm
- Waist tether
- Sm trash bag
- Safety tether

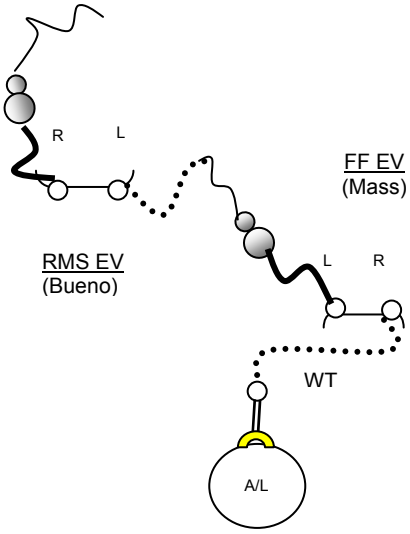
### RMS EV (Bueno)

- MWS w/ right swing arm
- Wire ties around T-bar (2)
- Waist tether
- Safety tether

## MIDDECK TOOLS

- Short adj socket (2)
- Long adj socket
- PGT Batteries (2)
- SSAT tool
- EVA Ratchet with MTL/Palm Wheel
- FRB
- ACS Guide Stud Caddy
- 1- 34"
- RSU bag
- Drop-proof tether adapter (2)
- GP Caddy (spare)
- Battery Cap Caddy (2)
- Manual Door Stay
- Lube Applicators (2)
- Left swingarm
- Fish Stringer
- 2 spare red bits
- 1 black bit
- EHIP battery bag
- 1-80" adj tether
- Middeck Cont Kit and Blanket

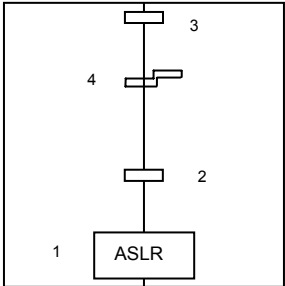
## EGRESS/DAILY SETUP (00:25)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>1. RMS: To Airlock MFR Ingress/Egress posn (PDRS, <u>EVA SETUP</u>)</p>  <p style="text-align: center;">INITIAL SAFETY TETHER CONFIG</p> <p>2. RMS: To FCP Receive posn (PDRS, <u>STIS</u>)</p>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Right waist tether to A/L D-ring extender, hook slide lock - L</li> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> <li>√ MPT PWR - ON</li> </ul> <p><u>EGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Release waist tether from airlock D-ring extender</li> </ol> <p><u>MFR/STIS SETUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Transfer MFR handle to RMS EV</li> <li>2. Egress A/L</li> <li>3. Receive MFR handle; temp hold</li> <li>4. Transfer MFR handle to RMS EV</li> <li>5. Close thermal cover</li> <li>6. Receive digital camera with adj tether from RMS EV, stow on swing arm</li> <li>7. Translate to FCP enclosure (aft/stbd ORUC shelf)</li> <li>8. Open enclosure lid latches (2)</li> <li>9. Release 1/4 turn latches (2)</li> <li>10. Remove FCP (sits on stud)</li> <li>11. Verify CG label cutter retracted and in locked posn</li> </ol>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Own safety tether load alleviating strap attached to right EMU D-ring, hook slide lock - L, reel unlocked</li> <li>√ Left waist tether attached to FF safety tether long strap, hook slide locks (2) - L</li> </ul> <p><u>EGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Thermal cover - open</li> <li>2. Egress airlock</li> <li>3. Attach own safety tether to RMS handrail standoff (black end) <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>4. Attach MFR/RMS tether, tighten</li> <li>5. Translate to Orbiter port slidewire</li> <li>6. Release aft fastener on slidewire cushion; open</li> <li>7. Gently relocate slider aft of RMS shoulder</li> <li>8. Translate aft of RMS shoulder</li> <li>9. Attach FF EV's safety tether onto aft slider <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> </ol> <p><u>MFR/STIS SETUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Translate to A/L</li> <li>2. Receive MFR handle; temp hold</li> <li>3. Transfer MFR handle to FF EV</li> <li>4. Attach boot plate lanyard to MWS lower D-ring</li> <li>5. Ingress MFR</li> <li>6. Receive MFR handle from FF EV; install</li> <li>7. Transfer digital camera with adj tether to FF EV</li> <li>8. Rotate MFR handle to 180°</li> <li>9. Retrieve PGT w/ hybrid ext from handle; stow on MWS swing arm</li> <li>10. Mnvr to FCP receive position</li> <li>11. Configure boot plate 0°, stanchion 135R; pitch fully out</li> </ol>

**EGRESS/DAILY SETUP (00:25) (Cont)**

<b>IV/RMS</b>	<b>FF EV (Mass)</b>	<b>RMS EV (Bueno)</b>
	<p>12. Transfer FCP to RMS EV            13. Close FCP lid (1 latch)            14. Temp stow digital camera on aft FSIPE lid (with adj tether)</p> <p><u>BAPS POST SETUP</u></p> <p>1. Translate to FSS            2. Install BAPS post center PIP pins (2)            3. Translate to fwd/port FSS</p> <p>4. Retrieve 90 deg socket converter, stow on MWS            - Verify PIP pins are installed opposite lanyard anchor point</p>	<p>12. Receive FCP from FF EV            13. Stow FCP onto MUT EE/ballstack</p>

# STIS REPAIR (04:30)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>1. √ FSS 270°, +V2, Pivot 90°, +/-SA to 0°</p> <p>2. RMS: To +V2 Aft Shroud Doors posn</p> <p>3. √ In sun protect att before opening doors and SOPE</p> <p>4. <u>P/TV09</u>: ICBC #3D: ICBC #5, alt oppt 1: Open Doors</p> <div style="border: 1px solid black; padding: 5px;">  <p style="text-align: center;">+V2 DOORS</p> </div> <p>5. ICBC #14: STIS crew choice (#1/5 oppts): MEB cover removal prep</p>	<p><u>STIS PREP</u></p> <ol style="list-style-type: none"> <li>1. Configure center TA: A=6, B=6, <b>C=6</b>, extend (1)</li> <li>2. Translate to ATM-2 (aft/port ORUC)</li> <li>3. Open ATM-2</li> <li>4. Retrieve guide stud caddy; temp stow on swingarm</li> <li>5. Retrieve disposal bag; temp stow on T-bar</li> <li>6. Close ATM-2, 1 latch</li> <li>7. Translate to RMS</li> </ol> <p>8. Assist RMS EV as req'd (right door)</p> <p>9. Transfer guide stud caddy and disposal bag to RMS EV</p> <p>10. Perform glove inspection</p> <p><u>MEB COVER REMOVAL PREP</u> (01:15)</p> <ol style="list-style-type: none"> <li>1. Remove ASIPE STS PFR, transfer to RMS EV</li> </ol> <div style="border: 1px solid black; width: 60px; height: 15px; margin-left: 10px;"></div> <ol style="list-style-type: none"> <li>2. Translate to FR22, install 90 deg socket converter at 30R↑ (keep tether on converter)</li> <li>3. Receive PFR from RMS EV, install into 90 deg socket converter at Y=12 (temp stow converter tether to PFR)</li> <li>4. Ingress PFR as req'd</li> </ol>	<p><u>OPEN +V2 DOORS</u> (00:25)</p> <ol style="list-style-type: none"> <li>1. Mnvr to +V2 aft shroud doors</li> </ol> <div style="margin-left: 10px;"> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> </div> <ol style="list-style-type: none"> <li>2. <b>PGT [A4, CCW 3, 23.5] hybrid ext (turns)</b></li> <li>3. Disengage ASLR on bottom latch, 9 turns <ul style="list-style-type: none"> <li>- Remove PIP pin, rotate ASLR; reinstall PIP pin</li> </ul> </li> <li>4. Disengage latch bolts (2), 7 turns</li> <li>5. Disengage handle bolt, 7 turns</li> <li>6. Maintain pressure on doors <ul style="list-style-type: none"> <li>- Remove PIP pin</li> <li>- Release handle latch</li> <li>- Reinstall PIP pin</li> </ul> </li> <li>7. Open doors (left door - opens first)</li> </ol> <ol style="list-style-type: none"> <li>8. Receive guide stud caddy and disposal bag from FF EV; stow on MFR handle: <ul style="list-style-type: none"> <li>- Guide stud caddy - lower left bayonet receptacle</li> <li>- Disposal bag- upper left bayonet receptacle (opening toward Mass)</li> </ul> </li> <li>9. Perform glove inspection</li> </ol> <p><u>MEB COVER REMOVAL PREP</u></p> <ol style="list-style-type: none"> <li>1. Receive PFR from FF EV; verify settings: R=C, P=3.5</li> <li>2. Transfer PFR to FF EV</li> <li>3. Retrieve ground strap harness bag from handle</li> <li>4. Transfer ground strap bag to FF EV</li> </ol>

STIS REPAIR (04:30) (Cont)

IV/RMS	FF EV (Mass)	RMS EV (Buena)
	<ol style="list-style-type: none"> <li>5. Receive ground strap harness bag</li> <li>6. Install ground strap harness bag               <ul style="list-style-type: none"> <li>- Tether hook end to handrail lower standoff</li> <li>- Install clamp end onto STIS ground strap tab</li> </ul> </li> <li>7. Receive CRT from RMS EV</li> <li>8. Install CRT onto MEB clamp w/ RMS EV assist               <ul style="list-style-type: none"> <li>- Align CRT so that only yellow band visible</li> <li>- Engage lever 1, then 2</li> </ul> </li> <li>9. Retrieve HRTs (2) from ground strap bag; install               <ul style="list-style-type: none"> <li>- Rotate handle; engage slide lock</li> </ul> </li> <li>10. Receive RIB caddy from RMS EV</li> <li>11. Install RIB caddy on STIS HR (left-to-right); lock</li> <li>12. Receive MPT battery from RMS EV; stow on left swing arm</li> <li>13. Configure MPT with RIB for washer retainer installation</li> <li>14. <b>MPT [CCW, 15, MTR], RIB bit</b></li> <li>15. Install washer retention clips onto #8 C-fasteners (4); stow RIBs in RIB caddy:               <ul style="list-style-type: none"> <li><input type="checkbox"/> 2nd down - right</li> <li><input type="checkbox"/> 2nd up (8th down) - right</li> <li><input type="checkbox"/> 2nd down - left</li> <li><input type="checkbox"/> 2nd up (6th down) - left</li> </ul> </li> <li>16. Egress PFR to verify retention clips fully seated</li> <li>17. Configure MPT with FEB</li> <li>18. <b>MPT [CCW, 15, MTR], FEB</b></li> <li>19. Release #8 C-fasteners (4); place into stowage bracket on top HRT:               <ul style="list-style-type: none"> <li><input type="checkbox"/> 2nd down - right</li> <li><input type="checkbox"/> 2nd up (8th down) - right</li> <li><input type="checkbox"/> 2nd down - left</li> <li><input type="checkbox"/> 2nd up (6th down) - left</li> </ul> </li> <li>20. Temp stow MPT in ground strap bag</li> <li>21. Tether to and retrieve WET from RIB caddy</li> <li>22. Remove RIB caddy from STIS HR, transfer to RMS EV</li> <li>23. Remove washers/retention clips (4)               <ul style="list-style-type: none"> <li><input type="checkbox"/> 2nd down - right</li> <li><input type="checkbox"/> 2nd up (8th down) - right</li> <li><input type="checkbox"/> 2nd down - left</li> <li><input type="checkbox"/> 2nd up (6th down) - left</li> </ul> </li> <li>24. Insert WET into RIB caddy</li> </ol>	<ol style="list-style-type: none"> <li>5. Retrieve CRT from MFR handle</li> <li>6. Stabilize FF EV as necessary for ground strap install</li> <li>7. Transfer CRT to FF EV</li> <li>8. Stabilize FF EV for CRT install</li> <li>9. Stow PGT on MFR handle:               <ul style="list-style-type: none"> <li>- MFR top bayonet receptacle</li> </ul> </li> <li>10. Transfer RIB caddy to FF EV</li> <li>11. Transfer MPT &amp; battery to FF EV</li> <li>12. Stabilize FF EV for RIB, FEB, and WET</li> <li>13. Receive RIB caddy from FF EV</li> <li>14. Stow RIB caddy on MFR handle (upper right)</li> </ol>

**STIS REPAIR (04:30) (Cont)**

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>6. ICBC #14, oppt 6: LVPS-2R Retrieval (crew choice)</p>	<p>25. Attach integral tether from disposal bag to STIS handhold</p> <p>26. Retrieve PGT from swing arm</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> Possible sharp edge on handrail standoffs once handrail removed</p> </div> <p>27. <b>PGT [A4, CCW 3, 23.5], HRT hex bit</b> (yellow)</p> <p>28. Disengage handhold fasteners (4), 9 turns</p> <p>29. Remove handhold, transfer to RMS EV</p> <p>30. Access guide stud caddy on MFR handle/RMS EV</p> <p>31. Receive and install FCP anchors (4) until anchors flush w/ MEB cover (raise elbow to turn):</p> <p>Zip Nuts:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 2nd down - right</li> <li><input type="checkbox"/> 2nd up (8th down) – right</li> </ul> <p>Wing nuts:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 2nd down - left</li> <li><input type="checkbox"/> 2nd up (6th down) - left</li> </ul> <p>32. Verify left wing nuts fully backed out for FCP install</p> <p>33. Receive FCP from RMS EV; install ground strap harness and tether</p> <p>34. Install FCP onto MEB cover</p> <p>35. Engage Zip nuts (2) and wing nuts (2), hand tight</p> <p>36. Verify FCP fully seated via visual indicators - Black bands visible on depth indicators (4)</p> <p>37. GCA MFR handle for STIS support</p> <p>38. Perform glove inspection</p> <p><u>MEB COVER REMOVAL</u> (01:10)</p> <ol style="list-style-type: none"> <li>1. Cut CG label: <ul style="list-style-type: none"> <li>- Pull lever; rotate to deploy posn</li> <li>- Push lever; rotate CW to remove CG label</li> </ul> </li> <li>2. Configure MPT w/ #4 torque tip bit (red)</li> <li>3. <b>MPT [CCW, 10, MTR], #4 torque tip bit</b> (red)</li> <li>4. Release MEB A-fasteners, (39)</li> </ol>	<p>15. Retrieve disposal bag from MFR handle; present tether to FF EV</p> <p>16. Receive handhold; stow in disposal bag</p> <p>17. Stow disposal bag on swingarm</p> <p>18. Retrieve guide stud caddy from MFR, present to FF EV, stow on T-bar as reqd</p> <p style="text-align: center;">← <input type="checkbox"/></p> <p>19. Retrieve FCP; transfer FCP to FF EV</p> <p>20. Configure stanchion 45R; rotate MFR handle for FF EV access (shark fin), pitch up</p> <p>21. Egress MFR</p> <p><u>LVPS-2R RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to ATM-2 (aft/port ORUC); open</li> <li>2. Stow disposal bag and guide stud caddy, engage ball and cleat straps (2)</li> <li>3. Retrieve card tool; stow on T-bar</li> <li>4. Retrieve soft transport enclosure, stow on swing arm</li> <li>5. Close ATM-2, 1 latch</li> <li>6. Translate to MFR</li> <li>7. Stow soft transport enclosure on MFR handle - Top left bayonet receptacle</li> </ol>



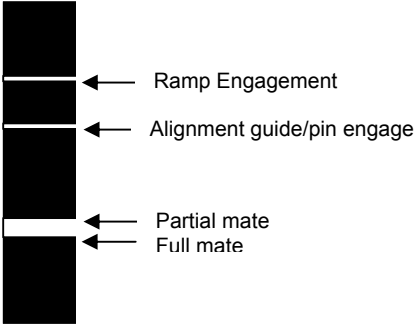
# STIS REPAIR (04:30) (Cont)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>7. IV: Notify MCC - MEB A-fasteners complete (GO for STIS pwr dwn) * If NO COMM perform: * * DEADFACE STIS (PL OPS, <u>ORU/ORI</u>) *</p> <p>8. IV: Verify w/ MCC - GO for release of B1, B10, B19, and B33 fasteners * If NO COMM: * * Continue with release of B-fasteners *</p> <p>9. RMS: To Clear Aft Shroud posn</p> <p>10. ICBC #14, oppt 10: MEB Cover Removal (crew choice)</p>	<p>- see diagram on STIS - TASK DATA SHEET ← <input type="checkbox"/></p> <p>5. <b>MPT [CCW, 15, MTR], #8 hex bit</b> (white) 6. Release C-fasteners, (12) 7. <b>MPT [CCW, 10, MTR], #4 hex bit</b> (blue)</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not release fasteners B1, B10, B19, and B33 until final GO is given (jitter reqts)</p> </div> <p>8. Release MEB B-fasteners, (52 of 56) 9. Visually verify all fasteners released except B1, B10, B19, and B33 ← <input type="checkbox"/></p> <p>10. Release remaining MEB B-fasteners:  <input type="checkbox"/> B1  <input type="checkbox"/> B10  <input type="checkbox"/> B19  <input type="checkbox"/> B33</p> <p>11. Visually verify all fasteners released 12. <b>MPT [CCW, 35, MTR], #8 torque tip bit</b> (green) 13. Release MEB clamp fasteners (2), 14 turns 14. Stow MPT and battery on MFR handle 15. Stow yellow bit on bit caddy; configure PGT with 6-in socket from tool board 16. Retrieve thermistor wire cutters from ground strap harness bag 17. Transfer cutters to RMS EV 18. <b>PGT [B3, CW 2, 2.5], 6-Ext 7/16</b> 19. Engage FCP drive off features; 2 right (first), &amp; 1 left - 7 turns each ← <input type="checkbox"/></p> <div style="border: 3px double black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Backside of MEB cover and STIS interior contain sharp edges</p> </div>	<p>8. Stow card tool on MFR handle (behind bungee)</p> <p>9. Translate to SOPE; open 10. Retrieve hard transport enclosure w/ LVPS-2R card, stow on swing arm 11. Close transport module (1/4 turn) 12. Close SOPE, 1 latch 13. Translate to aft shroud 14. Ingress MFR as req'd 15. Temp stow hard transport enclosure onto MFR - Bottom right bayonet receptacle</p> <p>16. Perform glove inspection</p> <p><u>MEB COVER REMOVAL</u></p> <ol style="list-style-type: none"> <li>GCA RMS away from aft shroud, stanchion 135R, pitch out</li> <li>Translate inside aft shroud</li> <li>Receive thermistor wire cutters from FF EV</li> </ol> <div style="border: 3px double black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Backside of MEB cover and STIS interior contain sharp edges</p> </div>

**STIS REPAIR (04:30) (Cont)**

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>11. RMS: To FCP/MEB Cover Handoff posn</p> <p>12. RMS: To Aft Shroud posn</p> <p>13. WVS: As needed: FF EV Center Cam (STIS Interior Overview)</p> <p>14. ICBC #14, oppt 10: Card Removal (crew choice)</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> STIS interior ESD sensitive</p> </div> <p>20. Remove the FCP/MEB cover</p> <p>21. Position cover for thermistor wire cutting</p> <p>22. Transfer FCP/MEB cover to RMS EV</p> <p>23. Remove ground strap from FCP; temp stow</p> <p>24. Translate to FCP enclosure; open lid</p> <p>25. Receive FCP/MEB cover from RMS EV</p> <p>26. Stow FCP/MEB cover in enclosure: - Radiator inbd, CRT down</p> <p>27. Engage inner 1/4 turn latches (2)</p> <p>28. Close lid, 2 latches</p> <p>29. Translate to aft shroud; ingress PFR</p> <p>30. Verify remaining thermistor wire and EMI gasket will not interfere with the MEB-R cover installation ← <input type="checkbox"/></p> <p>31. Perform glove inspection</p> <p><u>CARD R&amp;R (00:30)</u> ← <input type="checkbox"/></p> <p>1. Retrieve CMT from ground strap harness bag</p> <p>2. Release Card-Loks on top most LVPS-2 card (2), 6 turns</p> <p>3. Stow CMT in ground strap harness bag</p> <p>4. Receive card tool from RMS EV</p> <p>5. Attach ground strap harness to card tool</p> <p>6. Verify the following on the extraction tool: - Elevator drive blocks fully retracted (flush)</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> STIS interior ESD sensitive</p> </div> <p>4. Cut thermistor wires (2 bundles of 2), as close to STIS as possible</p> <p>5. Stow thermistor wire cutters into ground strap harness bag</p> <p>6. Attach boot plate lanyard</p> <p>7. Ingress MFR</p> <p>8. Verify/configure stanchion 135R, pitch stanchion fully out, boot plate 0</p> <p>9. Receive FCP/MEB cover from FF EV</p> <p>10. Mnvr to FCP enclosure handoff</p> <p>11. Transfer FCP/MEB cover to FF EV</p> <p>12. Mnvr to aft shroud</p> <p>13. Perform glove inspection</p> <p><u>CARD R&amp;R</u></p> <p>1. Retrieve card tool from MFR handle</p> <p>2. Transfer card tool to FF EV</p>

**STIS REPAIR (04:30) (Cont)**

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
 <p>← Ramp Engagement</p> <p>← Alignment guide/pin engage</p> <p>← Partial mate</p> <p>← Full mate</p> <p>LVPS-2R INSERTION LABELS</p>	<ul style="list-style-type: none"> <li>- Elevator drive block latch switches (2) - DOCK</li> <li>- Clamp lever fully open</li> <li>7. Install card tool onto LVPS-2 card</li> <li>8. Rotate clamp lever CW to closed (360°)</li> <li>9. <b>PGT [B2, CW 2, 5.5], 6-Ext 7/16</b></li> <li>10. Drive card tool elevator drive CW2, 18 turns</li> <li>11. Drive card tool elevator drive CCW2, 6 turns</li> <li>12. Drive card tool elevator drive CW2, 8 turns</li> <li>13. Place card tool elevator drive block latches – UNDOCK</li> <li>14. Verify card can be removed</li> <li>15. Re-set elevator drive; PGT: CCW3 to hard stop (~20 turns)</li> <li>16. Stow PGT on swing arm</li> </ul> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Sharp edges on LVPS-2 and LVPS-2R cards</p> </div> <ul style="list-style-type: none"> <li>17. Remove LVPS-2 card</li> <li>18. Present card to RMS EV</li> <li>19. Install LVPS-2 card into soft transport enclosure</li> <li>20. Engage slide lock</li> <li>21. Release card tool from LVPS-2 card</li> <li>22. Inspect MEB slot</li> <li>23. Attach ground strap to hard transport enclosure, open lid</li> <li>24. Install card tool onto LVPS-2R, rotate clamp to closed posn</li> <li>25. Pull open enclosure front cover, remove card</li> <li>26. Present LVPS-2R card for inspection to RMS EV</li> <li>27. Using visual indicators (3) as a guide, install LVPS-2R card into MEB slot; apply firm pressure along centerline (~20 lbs force):             <ul style="list-style-type: none"> <li>- 1st white line = ramp engagement</li> <li>- 2nd white line = alignment guide/pin contact,</li> </ul> </li> </ul>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Sharp edges on LVPS-2 and LVPS-2R cards</p> </div> <ul style="list-style-type: none"> <li>3. Retrieve soft transport enclosure from MFR handle</li> <li>4. Inspect card for damaged or bent pins</li> <li>5. Open soft transport enclosure</li> <li>6. Present soft transport enclosure to FF EV</li> <li>7. Temp stow soft transport enclosure on MFR handle (top left)</li> <li>8. Retrieve hard transport enclosure from MFR handle, present grounding point to FF EV</li> </ul> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Do not touch LVPS-2R card (sharp edge)</p> </div> <ul style="list-style-type: none"> <li>9. Inspect card for damaged pins or debris</li> <li>10. Release ground strap from hard transport enclosure</li> <li>11. Stow hard transport enclosure on swing arm</li> </ul>

**STIS REPAIR (04:30) (Cont)**

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>15. WVS: FF EV Center Cam (STIS MEB Overview)</p> <p>16. ICBC #14, STIS Closeout (crew choice)</p> <p>17. RMS: To MEB-R Cover Retrieval posn (ASIPE lid)</p> <p>18. RMS: To Aft Shroud posn</p> <p>19. Notify MCC MEB-R cover installed (GO for A/T)</p> <p>20. WVS: FF EV Center Cam (STIS MEB-R Cover Overview)</p>	<p>connector pins just short of cups</p> <ul style="list-style-type: none"> <li>- Beginning of 3rd white band = partial pin mate</li> <li>- 3rd white band not visible = full pin mate</li> </ul> <p>28. Verify outer surface of LVPS-2R card is flush with the other LVPS cards present (no gap at black stops)</p> <p>29. Open clamp lever, release card tool from LVPS-2R</p> <p>30. Remove ground strap harness from card tool</p> <p>31. Receive ground strap harness from RMS EV; temp stow</p> <p>32. Transfer card tool to RMS EV ← <input type="checkbox"/></p> <p><u>STIS CLOSEOUT</u> ← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>1. Egress STS PFR</li> <li>2. Translate to MEB-R cover enclosure (ASIPE lid)</li> <li>3. Open MEB-R thermal cover; secure</li> <li>4. Tether to MEB-R cover</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Backside of MEB-R cover contains sharp edges</p> </div> <ol style="list-style-type: none"> <li>5. Open MEB-R cover enclosure lid (1 latch and PIP pin)</li> <li>6. Release MEB-R from soft dock, transfer to RMS EV</li> <li>7. Close enclosure lid, 1 latch and PIP pin</li> <li>8. Close thermal cover; secure Velcro</li> <li>9. Translate to aft shroud; ingress PFR</li> </ol> <p>10. Receive MEB-R cover from RMS EV</p> <p>11. Attach ground strap harness onto MEB-R cover</p> <p>12. Install MEB-R Cover – left side first:</p> <ul style="list-style-type: none"> <li>- Disengage locking pins (4)</li> <li>- Rotate left and right handles inboard (simo)</li> <li>- Engage locking pins (1 per handle), ✓white bands visible</li> </ul> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>13. Egress STS PFR</p>	<p>12. Transfer ground strap harness to FF EV</p> <p>13. Receive card tool; stow on MFR handle (bungee)</p> <p><u>STIS CLOSEOUT (00:40)</u></p> <ol style="list-style-type: none"> <li>1. MnvR RMS to MEB-R cover hand-off posn</li> <li>2. Verify stanchion 135R, boot plate 0</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Backside of MEB-R cover contains sharp edges</p> </div> <ol style="list-style-type: none"> <li>3. Receive MEB-R cover from FF EV; inspect backside for damage</li> <li>4. Verify MEB-R cover handles are open</li> <li>5. MnvR RMS to aft shroud</li> <li>6. Transfer MEB-R cover to FF EV</li> </ol>

# STIS REPAIR (04:30) (Cont)

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>21. RMS: To Clear Aft Shroud posn</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> </div> <p style="text-align: center;">+V2 DOORS</p> <p>22. RMS: To +V2 Aft Shroud Doors posn</p> <p>23. WVS: RMS EV Center Cam (Aft shroud overview prior to door closing)</p>	<ol style="list-style-type: none"> <li>14. Remove ground strap harness/es; transfer ground strap bag to RMS EV</li> <li>15. Receive card tool and soft transport enclosure from RMS EV; stow on MWS</li> <li>16. Translate to ATM-2, open</li> <li>17. Stow card tool, install straps (2) (bayonet probe toward wall and up)</li> <li>18. Stow soft transport enclosure, engage straps (2)</li> <li>19. Close ATM-2 lid; 4 latches</li> <li>20. Translate to PFR in FR22</li> </ol> <ol style="list-style-type: none"> <li>21. Remove PFR from FR22 (from 90 deg converter), transfer to RMS EV</li> <li>22. Remove 90 deg socket converter from FR22, stow on MWS</li> <li>23. Translate to aft ASIPE socket</li> <li>24. Receive PFR from RMS EV</li> <li>25. Install PFR into ASIPE AS: PFR: Y=6 (stays in STIS settings for landing; not needed anymore)</li> <li>26. Perform glove inspection</li> </ol> <p><u>CLOSE +V2 DOORS</u></p> <ol style="list-style-type: none"> <li>1. Assist RMS EV as necessary</li> <li>2. Translate to FSS, stow 90 deg socket converter, engage Velcro strap</li> </ol>	<ol style="list-style-type: none"> <li>7. Receive ground strap bag from FF EV; stow on MFR handle, lower right</li> <li>8. Transfer card tool &amp; soft transport enclosure to FF EV</li> <li>9. MnvR RMS clear of aft shroud</li> <li>10. Egress MFR</li> <li>11. Translate to SOPE, open lid</li> <li>12. Stow hard transport enclosure in SOPE</li> <li>13. Engage TM 1/4-turn latch</li> <li>14. Close SOPE lid, 3 latches</li> <li>15. Retrieve digital camera w/ adj tether from FSIFE, stow on MFR handle (T front)</li> </ol> <ol style="list-style-type: none"> <li>16. Attach boot plate lanyard to MFR, ingress</li> <li>17. Receive PFR from FF EV</li> </ol> <ol style="list-style-type: none"> <li>18. Transfer PFR to FF EV</li> <li>19. Perform glove inspection</li> </ol> <p><u>CLOSE +V2 DOORS (00:30)</u></p> <ol style="list-style-type: none"> <li>1. Retrieve PGT from MFR</li> <li>2. MnvR for door closure, boot plate 0°</li> <li>3. Verify aft shroud clear of all tools &amp; tethers</li> </ol> <div style="margin-left: 20px;"> </div> <ol style="list-style-type: none"> <li>4. Close right then left door</li> <li>5. Engage handle and install PIP pin</li> <li>6. <b>PGT [B4, CW 2, 23.5], hybrid ext</b></li> <li>7. Engage handle bolt, 7 turns</li> <li>8. ✓ Door seals</li> <li>9. Engage (top &amp; lower middle) latch bolts (2), 7 turns</li> <li>10. Engage ASLR and install PIP pin (from +V1 dirctn)</li> <li>11. Engage ASLR bolt, 8-10 turns</li> <li>12. Re-torque bolts (3)</li> </ol>

# STIS REPAIR – TASK DATA SHEET

Estimated Task Duration: (04:30)

	FF	W/ RMS
Two EV Crew	04:30	

## Tools:

FF EV	RMS EV
<ul style="list-style-type: none"> <li>MPT with green, yellow, red, blue, and white sockets</li> <li>HRTs/CRT</li> <li>RIBs/WET</li> <li>PGT with 6-in socket</li> <li>PFR</li> </ul>	<ul style="list-style-type: none"> <li>PGT with hybrid ext</li> </ul> <p><u>CROSS TRAINING PFR SETTINGS</u> John: AS: Y=120R↑, P=4 PFR: Y=6, R=6, P=3.5</p>

## EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
+V2 Door Bolts	7/16"	4	B4	A4		7
MEB clamp fasteners	#8 TS torque tip bit (green)	2		2.4 ft-lb (MPT=35 in-lb, MTR)	3.7 ft-lb (MPT=50 in-lb)	14
C-fasteners (for guide studs)	#8 TS hex bit (RIB)	4		0.8 ft-lb (MPT=15 in-lb, MTR)	3.7 ft-lb (MPT=50 in-lb)	~ 5
Handhold fasteners	HRT bit (1/4-28) (yellow)	4		14.1 ft-lb (to break epoxy) A4	8.3 ft-lb	9
A-fasteners	#4 TS torque tip bit (red)	39		0.75 ft-lb (MPT=10 in-lb, MTR)	1.0 ft-lb (MPT=15 in-lb, MTR)	10
B-fasteners	#4 SH hex bit (blue)	56		0.75 ft-lb (MPT=10 in-lb, MTR)	1.0 ft-lb (MPT=15 in-lb)	10
C-fasteners	#8 SH hex bit (clear)	12		0.8 ft-lb (MPT=15 in-lb, MTR)	3.7 ft-lb (MPT=50 in-lb)	5
FCP drive-off fasteners	7/16"	3		3.0 ft-lb B3		7
CET elevator drive bolt	7/16"	1		3.0 ft-lb B2		
Card Loks	3/32" ball end	2		0.75 ft-lb	1.0 ft-lb	6

## Notes:

- Thermistor wire consists of two bundles of two loosely twisted wires. The wires are 24 gauge with approximately 12-15 inches of slack
- STIS card has 320 pins
- The maximum STIS allowable card LOK turn count is 6; it is possible for front wedge to release beginning at 7 turns
- Full card LOK disassembly can occur as early as 11.5 turns, causing several loose pieces of hardware to be released inside the aft shroud
- Pin #7 is broken on spare LVPS-2R card (known pre-flight condition)

## Cautions:

- Do not contact the back side of the FCP; compliant material located on backside of FCP.
- If using the CMT to "wiggle" the MEB card, avoid contact with the capacitor on the right side of the card
- STIS interior is ESD sensitive (all conductive CATs & ORUs w/in 24" must be grounded)
- LVPS-2R card is ESD sensitive; maintain 3" spacing from EMU
- Failure of Card-Lok screw will release debris into the aft shroud
- Bending moment > 1.7 ft-lb will damage LVPS-2R card
- Do not release fasteners B1, B10, B19, & B33 until final GO is given (minimum jitter reqts)

## Warnings:

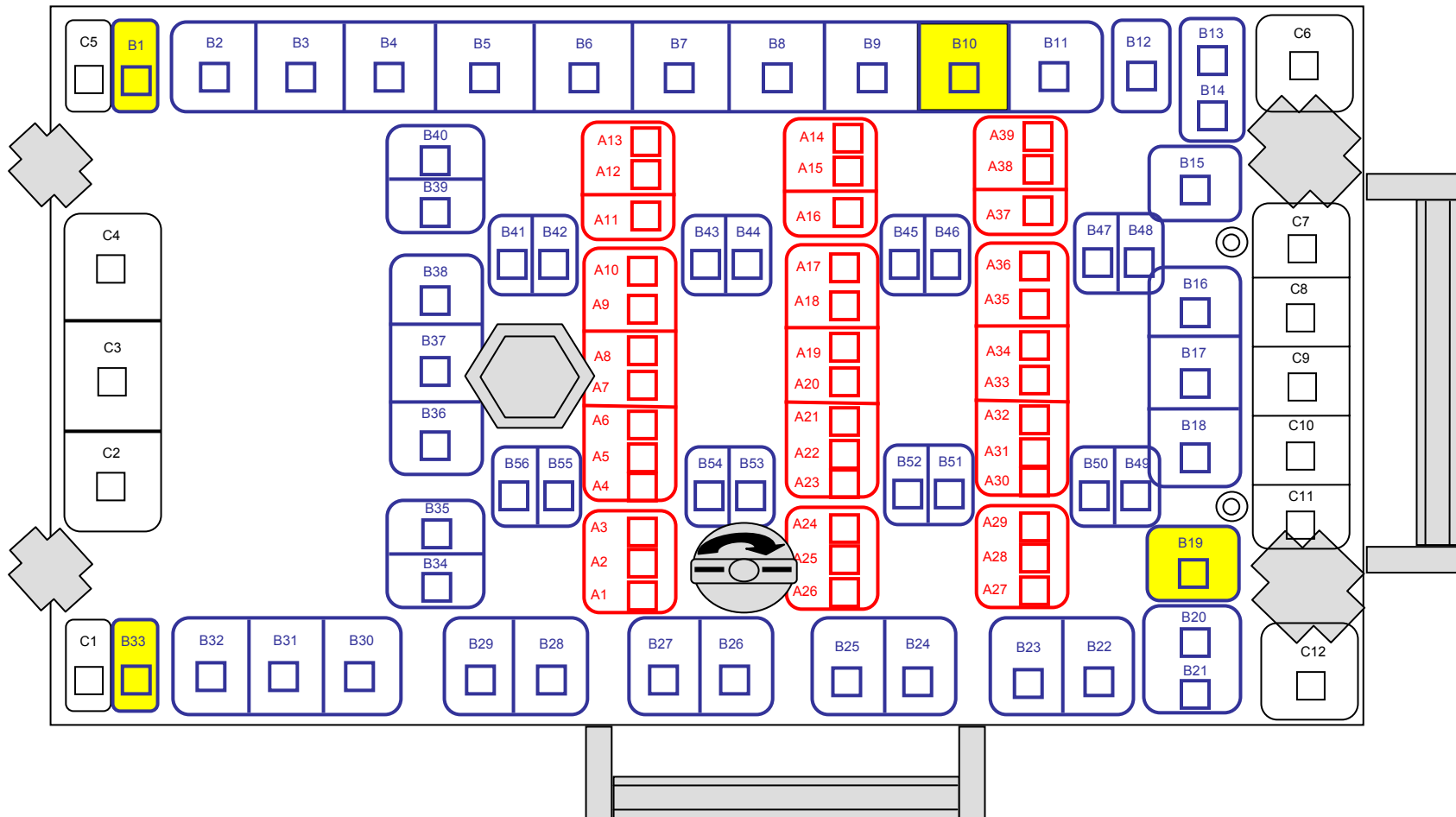
- CG label cutter on backside of FCP is a sharp edge hazard
- The back side of the MEB cover contains sharp edges
- The interior of the STIS enclosure contains sharp edges
- Possible sharp edge on STIS HR standoffs once removed
- Do not touch LVPS-2 and LVPS-2R cards (sharp edge)

## Acronym List:

ATM: Auxiliary Transport Module  
 MEB: Main Electronic's Board  
 CRT: Clamp Removal Tool  
 HRT: HR Removal Tool  
 MPT: Mini-Power Tool  
 WET: Washer Extraction Tool  
 FCP: Fastener Capture Plate  
 FEB/CB: Fastener extraction bit  
 CET: Card Extraction Tool (card tool)  
 CMT: Card-Lok Manipulation Tool  
 CTE: Card Transport Enclosure (hard and soft transport enclosures)  
 LVPS: Low Voltage Power Supply  
 SHCS: Socket head capture screw  
 RIB: Retainer Installation Bit  
 FET: Fastener Extraction Tool

Bit	Operation	Color Code
HRT (1/4-28 SH)	Handrail Removal	Yellow / Gold
#8 TS	Clamp Removal	Green
#4 TS	MEB Removal	Red
#4 SH	MEB Removal	Blue
#8 SH	MEB Removal	White / Clear
#4 TS - spare	MEB Removal	Red
#4 SH - spare	MEB Removal	Blue

STIS REPAIR – TASK DATA SHEET (Cont)



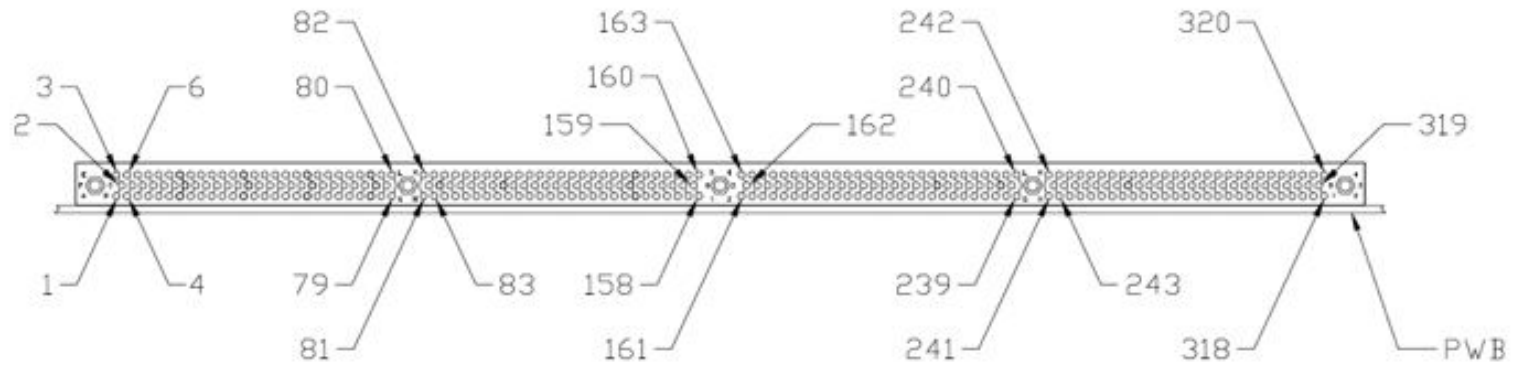
STIS MEB COVER BOLT PATTERN

TEAR-OUT PAGE

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STIS REPAIR – TASK DATA SHEET (Cont)



LVPS-2R PIN MAP

NOTE: Pin 7 is broken on spare board

**NOBL 8 (00:45)**

<b>IV/RMS</b>	<b>FF EV (Mass)</b>	<b>RMS EV (Bueno)</b>
<p>1. √ FSS 270°, +V2, Pivot 90°, +/-SA to 0°</p> <p>2. RMS: To MINC NOBL Retrieve posn</p> <p>3. RMS: To HST Bay 8 posn, NOBL 8 Repair</p>	<p><u>BAY 8 NOBL RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to MLI recovery bag stowage area (below aft fixture)</li> <li>2. Retrieve Bay 8 MLI recovery bag</li> <li>3. Translate to MINC at MULE</li> <li>4. Retrieve roller and cutters from I-Beam; stow on MWS</li> <li>5. Transfer recovery bag and cutters to RMS EV</li> <li>6. Disengage MINC latches (3); open</li> <li>7. Release NOBL 8 conductive velcro strap (center slot)</li> <li>8. Retrieve Bay 8 NOBL (center); transfer to RMS EV</li> <li>9. Verify conductive straps engaged on any remaining NOBLs</li> <li>10. Close MINC lid, 3 latches; verify shear pins pop up (3)</li> </ol> <p><u>BAY 8 MLI AND PATCH REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to Bay 9</li> <li>2. Receive NOBL 8 from RMS EV</li> </ol>	<p><u>BAY 8 NOBL RETRIEVAL</u> (00:10)</p> <p style="text-align: center;"><u>NOTE</u> Be aware of keel pin during RMS mnvr</p> <ol style="list-style-type: none"> <li>1. Mnvr to MINC</li> <li>2. Boot plate to 90L</li> <li>3. Receive Bay 8 MLI recovery bag and cutters from FF EV; stow on MWS</li> <li>4. Receive NOBL 8 from FF EV</li> </ol> <p><u>BAY 8 MLI AND PATCH REMOVAL</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Mnvr to Bay 8</li> <li>2. Transfer NOBL 8 to FF EV</li> <li>3. Remove upper and lower Bay 8 MLI patch kit attachment clips (2), from around Bay 7 door knob</li> <li>4. <b>PGT [A3, CCW 2, 10.5] 7/16-in ext</b></li> <li>5. Disengage Bay 8 bottom left J-bolt, 4-6 turns</li> <li>6. Remove wire loop from bottom left J-bolt</li> <li>7. <b>PGT [A3, CW 2, 10.5]</b></li> <li>8. Engage Bay 8 bottom left J-bolt, 4-6 turns</li> <li>9. Release clip from around handrail below Bay 9</li> <li>10. Release clips (2), from Bay 9 NOBL wire loop (one for upper and one for lower patch kits)</li> <li>11. Remove lower MLI patch kit, stow in MLI recovery bag</li> <li>12. GCA to upper MLI patch kit</li> <li>13. Release clip from handrail above Bay 7</li> <li>14. Release clip from handrail above Bay 9</li> <li>15. Remove patch kit; stow in MLI recovery bag</li> <li>16. Cut Bay 8 door MLI ground wires (2)</li> </ol>

**NOBL 8 (00:45) (Cont)**

IV/RMS	FF EV (Mass)	RMS EV (Bueno)
<p>4. WVS: RMS EV Center Cam (NOBL 8 radiator closeup)</p>	<p><u>BAY 8 NOBL INSTALLATION</u></p> <ol style="list-style-type: none"> <li>1. Transfer NOBL to RMS EV</li>   <li>2. Transfer roller to RMS EV</li>   <li>3. Receive roller and cutters from RMS EV</li> <li>4. Translate to MINC/I-Beam</li> <li>5. Stow cutters and roller:               <ul style="list-style-type: none"> <li>- For cutter, engage Velcro flap and external strap</li> <li>- For roller, engage internal straps (2) and external strap</li> </ul> </li> </ol>	<p>- Top and bottom on knob side</p> <ol style="list-style-type: none"> <li>17. Fold and remove Bay 8 MLI</li> <li>18. Stow MLI in recovery bag</li> </ol> <p><u>BAY 8 NOBL INSTALLATION (00:20)</u></p> <ol style="list-style-type: none"> <li>1. Receive NOBL from FF EV; mnvr for installation</li> <li>2. Install Bay 8 NOBL and integral vent plugs (4)</li> <li>3. Connect NOBL ground cap on J-hook bolt</li> <li>4. Release radiator cover latches (3)</li> <li>5. Open radiator cover, re-engage latches (3)</li> <li>6. Remove radiator protective film; stow in MLI recovery bag</li> <li>7. Release radiator latches (3)</li> <li>8. Close NOBL radiator, engage latches (3)</li> <li>9. Receive NOBL roller from FF EV</li> <li>10. Roll surface of radiator slowly and deliberately:       <ul style="list-style-type: none"> <li>- Starting from center of radiator, move roller outbd in all directions, covering entire surface of radiator</li> <li>- Gently push on NOBL-ER frame to assess adhesion</li> </ul> </li> </ol> <p>← □</p> <ol style="list-style-type: none"> <li>11. Transfer roller and cutters to FF EV</li> <li>12. Stow MLI recovery bag onto MFR handle (upper left)</li> </ol>

## NOBL – TASK DATA SHEET

### Estimated Task Duration: (00:45)

	FF	W/ RMS
Two EV Crew	N/A	00:45

### Tools:

FF EV	RMS EV
<ul style="list-style-type: none"><li>• Cutters</li><li>• Roller</li><li>• NOBL 8</li></ul>	<ul style="list-style-type: none"><li>• Bay 8 MLI Recovery Bag</li></ul>

### Foot Restraints: NA

Task	PFR Socket	PFR Setting
NOBL 8	MFR	NA

### Notes:

1. Bay 5 NOBL = 28 lbs
2. Bay 8 NOBLs = 23 lbs
3. Bay 7 NOBL = 12 lbs
4. Be aware of keel pin during RMS mnvr

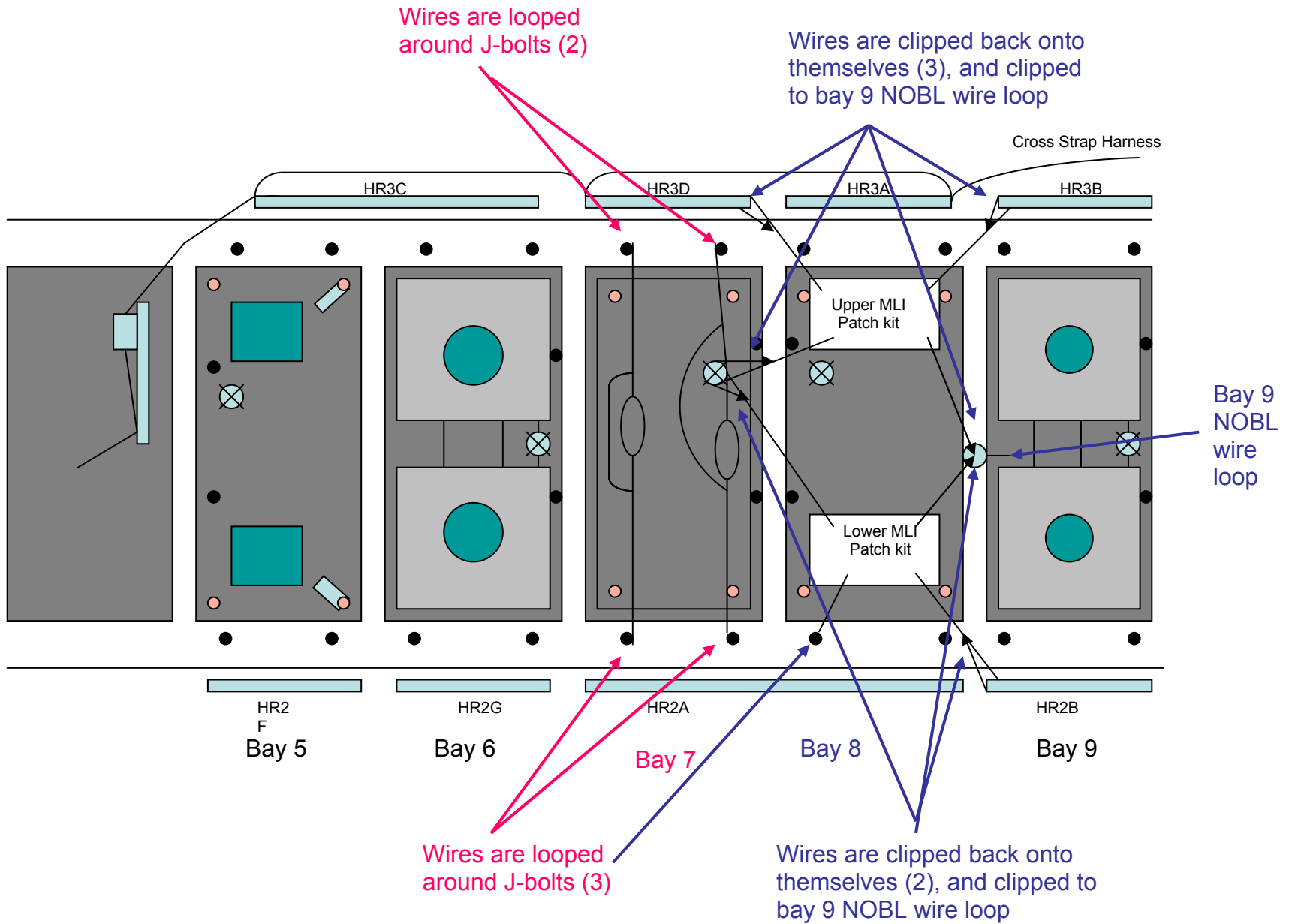
### Cautions:

1. Avoid contact with NOBL radiators
2. NOBLs do not meet 125 lb kick loads
3. MINC exposed face does not meet 125 lb kick loads
4. Avoid contact with NOBL radiator adhesive
5. Avoid contact with HST exterior MLI

### Warnings:

1. NOBL cutters have sharp edge

NOBL – TASK DATA SHEET (Cont)



## DAILY CLOSEOUT/INGRESS (00:40)

IV/SRMS	FF EV (Mass)	RMS EV (Bueno)
<p>1. RMS: To Airlock MFR Ingress/Egress posn (PDRS, <u>EVA CLOSEOUT</u>)</p> <p>2. RMS: To RMS Extended Park posn (PDRS, <u>EXTENDED PARK</u>)</p>	<p><u>PLB CLEANUP</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Translate to FSS</li> <li>3. Inspect main umbilical mechanism</li> <li>4. Remove BAPS post center PIP pins (2); stow</li> <li>5. Configure center TA to: A=6, B=6, <b>C=0</b>, ext (1)</li> <li>6. Perform tool inventory</li> <li>7. Translate to airlock; open thermal cover</li> <li>8. Receive MFR handle from RMS EV</li> <li>9. Transfer MFR handle to RMS EV</li> </ol> <p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Ingress airlock</li> <li>2. Receive MFR handle from RMS EV and transfer to tunnel (to give RMS EV space to ingress)</li> <li>3. Attach waist tether to airlock D-ring extender <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>4. Verify RMS EV's safety tether config, give to release RMS safety tether from RMS</li> <li>5. Open DCM cover; Velcro to self</li> <li>6. Connect SCU to DCM; ✓ SCU locked</li> <li>7. WATER - OFF (expect "H2O IS OFF" msg)</li> </ol> <div style="border: 1px solid black; text-align: center; padding: 5px;"> <p><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div>	<p><u>PLB CLEANUP</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Mvnr to airlock, relocate PGT to MFR handle (lower left)</li> <li>3. Perform tool inventory</li> <li>4. MFR stanchion 0°; boot plate 0°</li> <li>5. MFR handle to 0°</li> <li>6. Remove MFR handle; transfer to FF EV</li> <li>7. Egress MFR</li> <li>8. Receive MFR handle from FF EV, temp hold</li> </ol> <p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Transfer MFR handle to FF EV</li> <li>2. Translate to port slidewire</li> <li>3. Remove FF EV's safety tether from slider; attach to waist tether <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>4. Gently relocate slider fwd of RMS shoulder</li> <li>5. Stow slider, close cushion; engage quarter turn fastener</li> <li>6. Remove RMS safety tether from RMS</li> <li>7. Release MFR/RMS tether, stow on stanchion</li> <li>8. Ingress airlock</li> <li>9. Open DCM cover; Velcro to self</li> <li>10. Connect SCU to DCM; ✓ SCU locked</li> <li>11. WATER - OFF (expect "H2O IS OFF" msg)</li> <li>12. Thermal cover - close</li> </ol> <div style="border: 1px solid black; text-align: center; padding: 5px;"> <p><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>13. Verify hardware clear of hatch</li> <li>14. Close, lock outer hatch</li> <li>15. Go to PRE REPRESS (<u>DEPRESS/REPRESS CC</u>)</li> </ol>

# EVA 5 SUMMARY TIMELINE

TASK TIME (PET TIME) HR : MIN	IV/FSS	EV	RMS
00:00 ---	√ FSS 270°, +V2, Pivot 90°, -SA to 0°	<u>POST DEPRESS</u> (00:05)	
		<u>EGRESS/DAILY SETUP</u> (00:25)	Airlock MFR Ingress/Egress
01:00 ---		<u>BAY 3 BATTERY R&amp;R</u> (01:30) <ul style="list-style-type: none"> <li>● Bay 3 Battery Retrieval                             <ul style="list-style-type: none"> <li>● Bay 3 SLIC Battery-R Prep</li> </ul> </li> </ul>	Bay 3 posn
		<ul style="list-style-type: none"> <li>● Bay 3 Battery Swap</li> <li>● Bay 3 Battery-R Install</li> </ul>	Bay 3 Battery Swap posn Bay 3 posn
02:00 ---		<u>FGS-2 R&amp;R</u> (02:00) <ul style="list-style-type: none"> <li>● Handhold Retrieval</li> <li>● Open FGS-2 Bay Doors</li> </ul>	Handhold posn FGS-2 Bay posn
		<ul style="list-style-type: none"> <li>● FGS-2 Connector Demate</li> <li>● FGS-2 Removal</li> </ul>	Aft Fixture posn
03:00 ---		<ul style="list-style-type: none"> <li>● FGS-2R Retrieval</li> <li>● FGS-2R Installation</li> </ul>	FGS-2R Retrieval posn FGS-2R Pre-install posn
		<ul style="list-style-type: none"> <li>● Close FGS-2 Bay Doors</li> <li>● FGS-2 Stow</li> </ul>	Aft Fixture posn FGS-2 Stow posn
04:00 ---	<u>NOBL 5</u> (00:30) <ul style="list-style-type: none"> <li>● Bay 5 NOBL Retrieval</li> <li>● Bay 5 MLI Removal &amp; NOBL Installation</li> </ul>	MINC NOBL Retrieve posn Bay 5 NOBL Install	
	<u>FINAL CLOSEOUT/INGRESS</u> (01:10) <ul style="list-style-type: none"> <li>● Final PLB Cleanup</li> </ul>	Airlock MFR Ingress/Egress posn	
05:00 ---	<ul style="list-style-type: none"> <li>● MFR Stow</li> <li>● Final Tool Inventory</li> </ul>	Airlock Ingress posn	
	EVA = 5:45	<u>PRE REPRESS</u> (00:05)	

EVA 5 TOOL CONFIG

**AIRLOCK**

- HST Tool Bag:**
- Helmet light battery (spare)
- General Purpose Caddy
  - IFM 5/32-in allen w/ tether (FSS cont) (umbil, bert latch)
  - IFM 1/8-in allen wrench w/ tether (ECU drive stud cont)
- MWS key strap
- Inspection mirror w/ O-tether
- Palm Wheel
- Wire tie caddy
- Connector Cleaner Tool Kit
- Cheater bar
- Airlock wrench (3/8" ratchet with 7/16" socket)
- Adjustable wrench
- DCM Plug
- 2 - 34-in adj tethers (cont) (HST bag pouch)
- 1 - 80-in adj tether (cont) (HST bag pouch)
- Overgloves (2 pair)
- Ballstack (no-RMS) -----
- Fish stringer #1:**
- Socket caddy #1
  - 6-in rigid (door cont)
  - 6-in wobble (spare)
  - Drop proof tether adapter with IFM 1/2-in rigid socket
- Lube Applicator (if req'd)
- MPT (spare)
  - PGT battery, s/n: \_\_\_\_\_
- PGT (spare): s/n: \_\_\_\_\_
- PGT Battery: s/n: \_\_\_\_\_
- EVA Ratchet with Palm Wheel (spare)
  - MTL (spare)
- Digital Camera with Bracket (spare)
- Socket caddy #2 (no-RMS)
  - Hybrid ext (spare)
- Spare tethers (all remaining)
- Prior to EVA, inspect the following:
  - RET cords for damage
  - Safety and waist tether load alleviating straps (no red band or damage)
  - Trash bag bristles for deformation/damage

**MFR HANDLE - EGRESS**

- FRONT** (MFR handle install posts facing you) (MFR=180 deg)
- Tool board C (left side of MFR handle):
  - Sm trash bag (lower bayonet), integral RET, √zipped
  - Battery cap caddy (3 cap sets) (upper bayonet), int RET
- Tool board T (right side of MFR handle):
  - Manual door stay (upper outbd small diameter hole)
  - Integral RET
  - 6-in wobble (spare)
- BACK** (MFR=0 deg)
- Tool board C
  - Back - EVA ratchet with MTL (38)
  - (upper bayonet) (palm wheel removed), integral RET
- Tool board T
  - Back - Hi-torque connector tool (bungee), integral RET
- Bayonet fittings:** (facing front side)
  - Upper left: PGT with short adj (socket faces front), eq RET
  - Lower left: Empty
  - Upper right: Digital camera, integral camera RET
  - Lower right: Empty
- Top tether points:**
  - 1 - RET (lg-sm) (spare)
  - 1 - adj tether
- Side tether points:**
  - 1 - RET (lg-sm) (to tether MFR Handle in A/L) (stays in A/L)
  - 1 - Waist tether (to tether MFR Handle in A/L) (stays in A/L)
  - 2 - Adj tethers (spare), Board C
  - 1 - Eq-eq RET

**MWS-EGRESS**

- A/L D-RING:** D-ring extender
- FF EV** (8 Ball)
- MWS w/ right swing arm
  - PGT, s/n: \_\_\_\_\_
  - Sm-sm equip RET w/ PIP pin
- 1 - Small trash bag, inner right T-bar, √zipped
- O-Tether
  - Short adj extension
  - Eq-eq RET
- 1 - RET (lg-sm paddle) – left
- 1 - eq-eq RET (FGS connectors)
- 1 - Adj tether – (D-ring to trash bag)
- 1 - Waist tether - Hooks locked (coated) - left
- Safety tether (right) (hook locked)
- RMS EV** (Grunsfeld)
- MWS w/ right swing arm
  - Sm-sm pb RET
- 1 - RET (lg-sm paddle) – left
- 1 - RET w/ PIP pin (sm-sm eq) – left
- 1 - eq-eq RET (FGS connectors)
- 1 - RET (lg-sm paddle) – right
- 1 - Waist tether - Hooks locked (coated) - right
- Safety tether (left) (hook locked)
- TOTAL TETHER COUNT**
- 5 – sm-sm equip RET (8)
- 2 – sm-sm equip RET w/PIP pin (2)
- 5 – lg-sm paddle RET (9)
- 1 – sm-sm pb RET (3)
- 4 – adj tether (10)
- 0 – sm-sm paddle RET (2)
- 0 – sm-sm paddle RET w/PIP pin (2)
- 3 – waist tethers (4)



# EVA 5 POST TOOL CONFIG

## MFR HANDLE-INGRESS

- Sm trash bag
- 6-in wobble (spare)
- Battery cap caddy
- PGT
  - Short adj extension
- Digital camera
- MLI Recovery Bag
- High torque connector tool
- Manual door stay
- EVA ratchet with MTL (38)
  - Short adj extension
- PGT (Drew's)
- O-tether
- Vent plugs (2) (if not removed on a prior EVA)

## TETHERS

- 5 – sm-sm equip RET
- 2 – sm-sm equip RET w/PIP pin
- 4 – lg-sm paddle RET
- 1 – sm-sm pb RET
- 4 – adj tether

## MIDDECK TOOLS

- Battery Cap Caddy
- SSAT tool
- GP Caddy (spare)
- 1 - 34-in adj tether
- 1 - 80-in adj tether
- Fish stringer
- Long adj socket
- ACS Guide Stud Caddy
- 14" ACS socket extension (FET)
- Drop-proof tether adapter

## MWS-INGRESS

- FF EV** (8 Ball)
- MWS w/ right swing arm
- Sm trash bag
- Waist tether
- Safety tether

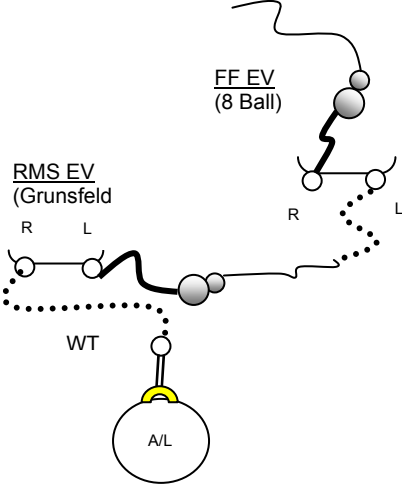
## RMS EV (Grunsfeld)

- MWS w/ right swing arm
- Waist tether
- Safety tether

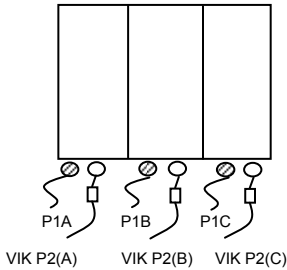
## MIDDECK TOOLS

- Left swingarm (2)
- RSU Bag
- STIS/MPT Bit Caddy
- RIB Caddy (4 RIBs, 1 FEB, 1 WET)
- FRB
- Lube Applicators (2)
- MUT EE
- PGT Batteries (2)
- 9" ACS socket extension (mini FET)
- EHIP Battery Bag
- Hybrid ext

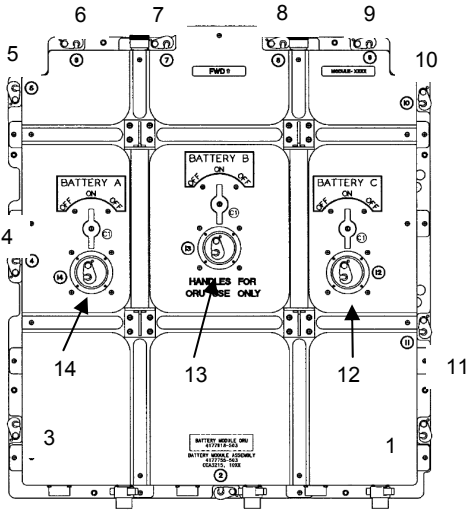
## EGRESS/DAILY SETUP (00:25)

IV/RMS	FF EV (8 BALL)	RMS EV (GRUNSFELD)
 <p>INITIAL SAFETY TETHER CONFIG</p>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Own safety tether load alleviating strap attached to right EMU D-ring, hook slide lock - L, reel unlocked</li> <li>√ RMS safety tether long end attached to left waist tether, hook slide locks (2) - L</li> </ul> <p><u>EGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Thermal cover - open</li> <li>2. Egress airlock</li> <li>3. Translate to Orbiter port sill</li> <li>4. Release aft fastener on slidewire cushion; open</li> <li>5. Gently relocate slider aft of RMS shoulder</li> <li>6. Translate aft of RMS shoulder</li> <li>7. Attach safety tether to aft slider:             <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>8. Remove RMS EV's safety tether from self; attach to RMS handrail standoff (black end):             <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>9. Install MFR/RMS tether, tighten</li> </ol> <p><u>MFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Receive MFR handle from RMS EV</li> <li>2. Transfer MFR handle to RMS EV</li> <li>3. Close thermal cover</li> </ol> <p><u>BAPS POST SETUP</u></p> <ol style="list-style-type: none"> <li>1. Install BAPS post center pip pins (2)</li> </ol> <p><u>TRANSLATION AID SETUP</u></p> <ol style="list-style-type: none"> <li>1. Configure center TA: A=6, B=6, <b>C=6</b>, extend (1)</li> </ol>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Right waist tether to A/L D-ring extender, hook slide lock - L</li> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> </ul> <p><u>EGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Release waist tether from airlock D-ring extender</li> </ol> <p><u>MFR SETUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Handout MFR handle to FF EV; egress airlock</li> <li>2. Attach boot plate lanyard to MWS lower D-ring</li> <li>3. Ingress MFR</li> <li>4. Receive MFR handle from FF EV, install onto MFR</li> </ol>

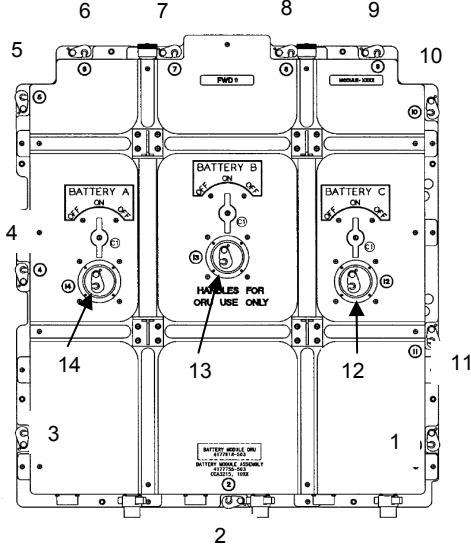
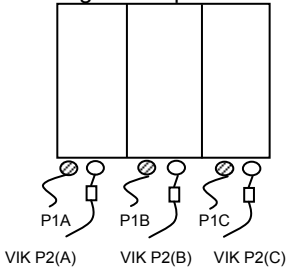
# BAY 3 BATTERY R&R (01:30)

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>1. L12U FSS PCU PWR CONTR A - ON CONTR B - ON ESS/MN SW ENA - OFF (tb-bp) Notify MCC CONTR A and B - ON ESS/MN SW ENA - OFF</p> <p>2. RMS: To Bay 3 posn</p> <p>3. √ MCC GO for Bay 3 battery demate * If NO COMM perform: * * <u>BAY 3 BATT PREP FOR REMOVAL</u> * (PL OPS, ORU/ORI)</p> 	<p><u>BAY 3 SLIC BATTERY-R PREP</u></p> <ol style="list-style-type: none"> <li>1. Translate to FSIPE fwd PFR</li> <li>2. Verify FSIPE STS PFR (AS:Y=12, P=11; PFR: Y=9, R=B.5, P=1.5)</li> <li>3. Open port battery thermal cover</li> <li>4. Secure cover open w/ Velcro</li> <li>5. √ Battery-R isolator switches (3) - OFF</li> <li>6. Visually verify J2 gender changers in place (3)</li> <li>7. Visually verify J3 connector caps in place (3)</li> <li>8. Inspect battery connector receptacles (6)</li> <li>9. Configure PGT w/ short adj ext</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <ol style="list-style-type: none"> <li>1. Battery bolts 13 &amp; 14 are not present on BPA</li> <li>2. SLIC battery bolts may be released in any order</li> <li>3. Leave Bolt 7 to be released while in PFR</li> </ol> <p>10. <b>PGT [A3, CCW 3, 10.5], short adj ext</b></p> <p>11. Disengage the following J-bolts, 4 turns</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 1</li> <li><input type="checkbox"/> Bolt 2</li> <li><input type="checkbox"/> Bolt 3</li> <li><input type="checkbox"/> Bolt 4</li> <li><input type="checkbox"/> Bolt 5</li> <li><input type="checkbox"/> Bolt 6</li> <li><input type="checkbox"/> Bolt 8</li> <li><input type="checkbox"/> Bolt 9</li> <li><input type="checkbox"/> Bolt 10</li> <li><input type="checkbox"/> Bolt 11</li> <li><input type="checkbox"/> Bolt 12</li> </ul>	<p><u>BAY 3 BATTERY RETRIEVAL</u> (00:40)</p> <p>← <input type="checkbox"/></p> <div style="border: 2px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>WARNING</u></p> <ol style="list-style-type: none"> <li>1. Do not touch battery bay door thermal louvers</li> <li>2. Battery J1 &amp; J2 connectors are energized</li> </ol> </div> <p style="text-align: center;"><u>NOTE</u> Bay 3 lower bolt is already released</p> <ol style="list-style-type: none"> <li>1. Mnvr to bay 3:             <ul style="list-style-type: none"> <li>- Retrieve PGT from MFR handle</li> <li>- Rotate MFR handle 180°</li> <li>- Stanchion to 180°; boot plate 90R</li> </ul> </li> <li>2. Retrieve manual door stay and battery cap caddy from MFR handle</li> <li>3. <b>PGT [A3, CCW 3, 10.5], short adj ext</b></li> <li>4. If not already completed, release lower J-hook</li> <li>5. Disengage J-bolts (5), 6 turns</li> <li>6. Open Bay 3 door fully</li> <li>7. Install manual door stay; extend to H</li> <li>8. Configure boot plate 0°</li> </ol> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>9. Perform one at a time:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Demate P1A; install cap on J1A</li> <li><input type="checkbox"/> Demate VIK P2(A) from GCP2; install cap on gender changer P2</li> <li><input type="checkbox"/> Demate P1B; install cap on J1B</li> <li><input type="checkbox"/> Demate VIK P2(B) from GCP2; install cap on GCP2</li> <li><input type="checkbox"/> Demate P1C; install cap on J1C</li> <li><input type="checkbox"/> Demate VIK P2(C) from GCP2; install cap on GCP2</li> </ul> </li> <li>10. Tether or tuck connectors clear of battery</li> <li>11. Stow battery cap caddy on MFR handle</li> </ol>

## BAY 3 BATTERY R&R (01:30) (Cont)

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
 <p style="text-align: center;"><b>2</b> <u>BAY 3 BATTERY-R</u></p> <ol style="list-style-type: none"> <li>4. RMS: To Battery Swap at SLIC posn</li> <li>5. ICBC #15: RMS mnvr to Battery-R install (if Bay 2 opt not shot)</li> <li>6. RMS: To Battery-R Install posn</li> </ol>	<p style="text-align: center;"><u>BAY 3 BATTERY SWAP</u></p> <ol style="list-style-type: none"> <li>1. Ingress FSIPE PFR</li> <li>2. Tether to battery</li> <li>3. <b>PGT [A3, CCW 3, 10.5]</b></li> <li>4. Disengage remaining Battery-R J-bolt, 4 turns <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 7</li> </ul> </li> <li>5. Remove port Battery-R</li> <li>6. Transfer Battery-R to RMS EV</li> <li>7. Receive Battery from RMS EV</li> </ol> <p style="text-align: center;"><u>BAY 3 BATTERY STOW</u></p> <ol style="list-style-type: none"> <li>1. Install Battery on SLIC (connectors outboard)</li> <li>2. Verify Battery flush with BPA</li> <li>3. Engage as many J-hooks as possible from PFR</li> </ol>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be released last</p> </div> <ol style="list-style-type: none"> <li>12. <b>PGT [A3, CCW 3, 10.5]</b>, (extend as req'd)</li> <li>13. Disengage battery J-bolts (14), 4 turns <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 1</li> <li><input type="checkbox"/> Bolt 2</li> <li><input type="checkbox"/> Bolt 3</li> <li><input type="checkbox"/> Bolt 5</li> <li><input type="checkbox"/> Bolt 6</li> <li><input type="checkbox"/> Bolt 7</li> <li><input type="checkbox"/> Bolt 8</li> <li><input type="checkbox"/> Bolt 9</li> <li><input type="checkbox"/> Bolt 10</li> <li><input type="checkbox"/> <b>Bolt 11</b></li> <li><input type="checkbox"/> <b>Bolt 13</b></li> <li><input type="checkbox"/> <b>Bolt 14</b></li> <li><input type="checkbox"/> <b>Bolt 4</b></li> <li><input type="checkbox"/> Tether to battery (right lg-sm RET to left battery HR)</li> <li><input type="checkbox"/> Prep swingarm for PGT</li> <li><input type="checkbox"/> <b>Bolt 12</b></li> </ul> </li> <li>14. Remove battery</li> </ol> <p style="text-align: center;"><u>BAY 3 BATTERY SWAP (00:10)</u></p> <ol style="list-style-type: none"> <li>1. Mnvr for battery swap at SLIC</li> <li>2. Receive Battery-R from FF EV</li> <li>3. Transfer Battery to FF EV</li> </ol> <p style="text-align: center;"><u>BAY 3 BATTERY-R INSTALL (00:40)</u></p> <p style="text-align: center;">← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>1. Mnvr to Bay 3; inspect Battery-R connectors (6)</li> <li>2. Install Battery-R</li> <li>3. Verify battery flush</li> <li>4. Engage as many J-hooks as possible from single</li> </ol>

# BAY 3 BATTERY R&R (01:30) (Cont)

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>7. IV: Record HST battery turn counts 8. IV: Record SLIC battery turn counts</p>  <p>9. IV: Notify MCC Bay 3 Battery-R connectors mated</p>	<p><b>NOTE</b></p> <ol style="list-style-type: none"> <li>Battery bolt numbers 13 &amp; 14 are not engaged for landing</li> <li>After bolts 11 and 12 engaged, SLIC battery bolts may be engaged in any order</li> </ol> <p>4. PGT [A3, CW 3, 10.5]</p> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Engage J-bolts #11 and #12, 3-5 turns (torque)</li> <li>Engage remaining J-bolts (10 total), 3-5 turns <ul style="list-style-type: none"> <li>- Egress PFR as necessary</li> <li><input type="checkbox"/> Bolt 11 _____ turns</li> <li><input type="checkbox"/> Bolt 12 _____ turns</li> <li><input type="checkbox"/> Bolt 1 _____ turns</li> <li><input type="checkbox"/> Bolt 2 _____ turns</li> <li><input type="checkbox"/> Bolt 3 _____ turns</li> <li><input type="checkbox"/> Bolt 4 _____ turns</li> <li><input type="checkbox"/> Bolt 5 _____ turns</li> <li><input type="checkbox"/> Bolt 6 _____ turns</li> <li><input type="checkbox"/> Bolt 7 _____ turns</li> <li><input type="checkbox"/> Bolt 8 _____ turns</li> <li><input type="checkbox"/> Bolt 9 _____ turns</li> <li><input type="checkbox"/> Bolt 10 _____ turns</li> </ul> </li> <li>Stow short adj ext on O-tether</li> <li>Close SLIC battery thermal cover</li> <li>Perform glove inspection</li> </ol> 	<p>RMS posn</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be engaged first</p> </div> <p>5. PGT [A3, CW 3, 10.5]</p> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Engage Battery-R J-bolts (14), 3-5 turns (torque) <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 4 _____ turns</li> <li><input type="checkbox"/> Bolt 11 _____ turns</li> <li><input type="checkbox"/> Bolt 12 _____ turns</li> <li><input type="checkbox"/> Bolt 13 _____ turns</li> <li><input type="checkbox"/> Bolt 14 _____ turns</li> <li><input type="checkbox"/> Bolt 5 _____ turns</li> <li><input type="checkbox"/> Bolt 6 _____ turns</li> <li><input type="checkbox"/> Bolt 7 _____ turns</li> <li><input type="checkbox"/> Bolt 8 _____ turns</li> <li><input type="checkbox"/> Bolt 9 _____ turns</li> <li><input type="checkbox"/> Bolt 10 _____ turns</li> <li><input type="checkbox"/> Bolt 1 _____ turns</li> <li><input type="checkbox"/> Bolt 2 _____ turns</li> <li><input type="checkbox"/> Bolt 3 _____ turns</li> </ul> </li> <li>Verify tether released from battery</li> <li>Retrieve, inspect; mate one at a time: <ul style="list-style-type: none"> <li><input type="checkbox"/> Mate P1A to J1A</li> <li><input type="checkbox"/> Mate VIK P2(A) to GCP2</li> <li><input type="checkbox"/> Mate P1B to J1B</li> <li><input type="checkbox"/> Mate VIK P2(B) to GCP2</li> <li><input type="checkbox"/> Mate P1C to J1C</li> <li><input type="checkbox"/> Mate VIK P2(C) to GCP2</li> </ul> </li> </ol> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Release manual door stay</li> <li>Stow manual door stay on MFR handle</li> </ol>

**BAY 3 BATTERY R&R (01:30) (Cont)**

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>10. ✓ MCC GO to rotate Battery-R isolator switches</p> <p>* If NO COMM: *</p> <p>* Notify EV GO to rotate Battery-R isolator switches *</p> <p>11. IV: Notify MCC Battery-R isolator switches (3) - ON (GO for resume Battery A/T)</p> <p>12. WVS: RMS EV Center Cam (1. Connectors and 2. Battery Overview)</p> <p>13. On MCC GO: L12U FSS PCU PWR CONTR A - OFF CONTR B - OFF Notify MCC CONTR A and B - OFF</p>		<p style="text-align: center;"><u>NOTE</u> Bay 3 lower bolt may cause problems during engagement. Manually start bolt threads</p> <p>11. Attempt to manually start/re-engage lower door bolt prior to bay door closing</p> <p>12. Verify harnesses clear of door in prep for door closure</p> <p style="text-align: center;">← <input type="checkbox"/></p> <p>On IV GO:</p> <p>13. Rotate Battery-R isolator switches (3) - ON</p> <p style="text-align: center;">← <input type="checkbox"/></p> <p style="text-align: center;">← <input type="checkbox"/></p> <p style="text-align: center;">← <input type="checkbox"/></p> <p>14. Close bay door</p> <p>15. <b>PGT [A3, CW 3, 10.5]</b></p> <p>16. Engage J-bolts (6), 4-6 turns</p>

## BAY 3 BATTERY R&R – TASK DATA SHEET

Estimated Task Duration: (01:30)

	FF	W/ RMS
Two EV Crew	N/A	01:30

### Tools:

FF EV	RMS EV
<ul style="list-style-type: none"> <li>PGT</li> <li>O-tether with short adj</li> <li>PFR</li> </ul>	<ul style="list-style-type: none"> <li>PGT with short adj ext</li> <li>Battery cap caddy</li> <li>Manual door stay</li> </ul>

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
Bay 3 Battery-R J-bolts (on SLIC)	7/16	12		A3		Release: 4
Bay 3 Battery-R J-bolts (on HST)	7/16	14	A3			Install: 3-5
Bay 3 Door J-bolts	7/16	5 (one already dis-engaged)	A3	A3		Release: 6 Install: 4-6
Bay 3 Battery (old) J-bolts (HST)	7/16	14		A3		Release: 4
Bay 3 Battery (old) J-bolts (SLIC)	7/16	12	A3			Install: 3-5

### Foot Restraints:

Task	S#	PFR Setting
Bay 3 SLIC Battery-R Prep	FSIPE fwd/center socket	AS: Y=12, P=11; PFR: Y=9, R=B.5, P=1.5
Bay 3 Battery R&R	MFR	NA

### Notes:

- Battery-R = 466 lbs; Old battery = 463 lbs
- In order to ensure the old battery is fully seated on the BSA shear pins, it is highly desired that one of the three following fasteners be fully torqued prior to torquing any other bolts: #11, 12, or 4
- J1 = Sockets (Power); J2 = Pins (Telemetry), with VIKs (Sockets)
- Less than 2.5 turns will prevent the SLIC and HST battery J-hooks from swinging open and more than 4 turns will increase the risk of getting a bolt into its interrupted threads
- Bay 3 lower bolt may cause problems during engagement. Manually start bolt threads
- BET may be required to pry off old battery from door; tight thermal limits begin when 1st battery J-bolt is released

### Cautions:

- Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be released last (on old battery)
- Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be engaged first (on new battery)

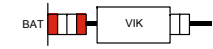
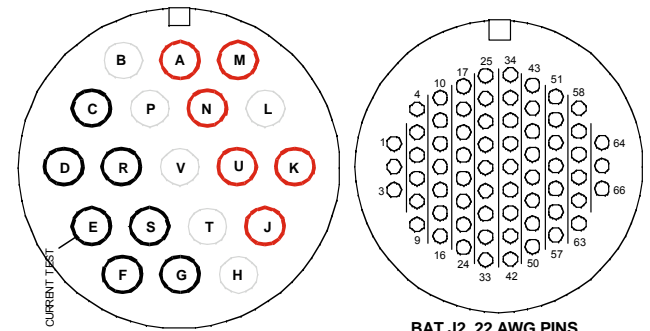
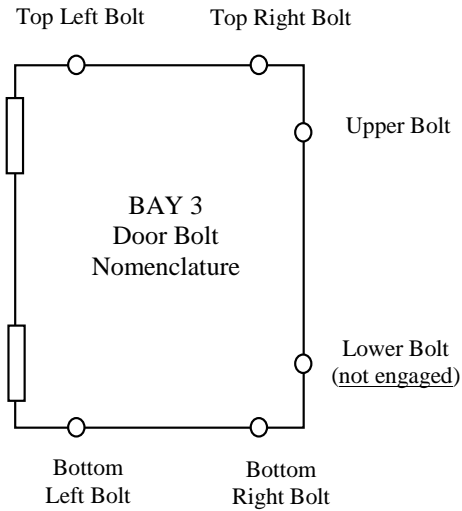
### Warnings:

- Do not touch battery bay door thermal louvers
- Battery J1 & J2 connectors are energized

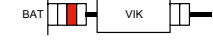
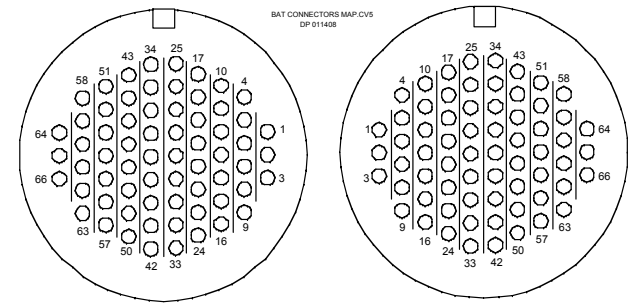
### Connectors:

Connector	From	To	Function
HST P1A	Battery: J1A	Battery-R: J1A	power
VIK P2(A)	Battery: GCP2	Battery-R: GCP2	heater/telemetry
HST P1B	Battery: J1B	Battery-R: J1B	power
VIK P2(B)	Battery: GCP2	Battery-R: GCP2	heater/telemetry
HST P1C	Battery: J1C	Battery-R: J1C	power
VIK P2(C)	Battery: GCP2	Battery: GCP2	heater/telemetry

# BAY 3 BATTERY R&R – TASK DATA SHEET (Cont)

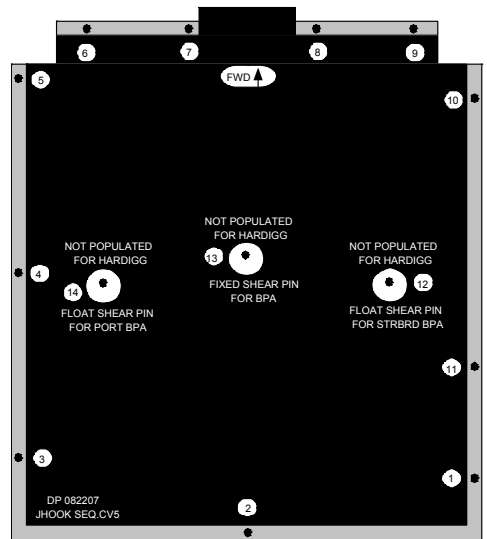


ALL VIEWS:  
LOOKING INTO  
CONNECTOR FACE  
BAT CONNECTORS MAP.CVS  
DP 011408



BATTERY AND VIK PIN MAPS

SM4 BMA J-HOOK LOCATIONS AND DECAL NUMBE R



SLIC BPA SHEAR PIN LOCATIONS



IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>1. √ FSS 270°, +V2, Pivot 90°, +SA to 0°</p> <p>2. RMS: To Fwd Fixture Posn (PDRS, <u>EVA 5</u>)</p> <p>3. P/TV09: <u>ICBC3D</u>: ICBC #5 alt oppt: Open Doors</p> <p>4. L12U SSM WK LTS - ON</p> <p>5. √ In sun protect before opening doors</p> <p>6. RMS: To FGS-2 Bay posn</p>  <p>7. √ MCC GO for FGS-2 connector demates</p> <p>* If NO COMM perform:</p> <p>* DEADFACE FGS-2 (PL OPS, <u>ORU/ORI</u>)</p>	<p><u>AFT FIXTURE SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to aft fixture - Fairlead at FSIPE knob and port TA as reqd</li> <li>2. Remove PIP pins (2); stow</li> <li>3. Deploy aft fixture</li> <li>4. Engage captive lock pins (2)</li> <li>5. √ Top fork PIP pin in proper orientation</li> <li>6. Release FGS handhold velcro strap as reqd</li> <li>7. Transfer O-tether with short adj extension and PGT to RMS EV</li> </ol> <p><u>OPEN FGS-2 BAY DOORS</u></p> <ol style="list-style-type: none"> <li>1. Translate to left side of +V3 FGS doors</li> <li>2. Assist RMS EV as req'd</li> <li>3. √"A" LATCHED light off (left side)</li> </ol> <p><u>FGS-2 CONNECTOR DEMATE</u></p> <p>← <input type="checkbox"/></p> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> <p><b>CAUTION</b> Ground strap connector P10 must be disconnected last</p> </div> <ol style="list-style-type: none"> <li>1. Tether and restrain connectors to OTA D-ring</li> </ol>	<p><u>HANDHOLD RETRIEVAL</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Mnvr to fwd fixture; rotate handle to back</li> <li>2. Retrieve EVA ratchet from MFR handle; stow on MWS</li> <li>3. Rotate MFR handle 180°, stanchion 135R</li> <li>4. GCA to FGS handhold retrieval posn</li> </ol> <ol style="list-style-type: none"> <li>5. Receive O-tether with short adj and PGT from FF EV: stow on MFR handle: <ul style="list-style-type: none"> <li><input type="checkbox"/> PGT - lower right</li> <li><input type="checkbox"/> Short adj ext - EVA Ratchet</li> <li><input type="checkbox"/> O-tether - MFR handle</li> </ul> </li> <li>6. Release FGS handhold latches (2)</li> <li>7. Remove FGS handhold (outboard) from fwd fixture</li> <li>8. Temp stow handhold on MFR handle</li> </ol> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p><u>OPEN FGS-2 BAY DOORS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Mnvr for door opening, boot plate 90L</li> <li>2. <b>PGT [A4, CCW 2, 23.5], short adj ext (fully extend)</b></li> <li>3. Disengage latch bolts (2), 7 turns</li> <li>4. Disengage handle bolt, 7 turns</li> <li>5. Remove PIP pin, release handle; open doors</li> </ol> <p><u>FGS-2 CONNECTOR DEMATE</u> (00:10)</p> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>1. Tether and restrain connectors to OTA D-ring</li> </ol>

**FGS-2 R&R (02:00) (Cont)**

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>8. ICBC #16: FGS-2 Removal</p> <p>9. ICBC #4 oppty: Closeup FGS-2 Stow</p> <p>10. Light ON "A" turns _____</p> <p>11. Total "A" turns _____</p> <p>12. RMS: To FGS-2 Temp Stow Posn</p>	<p>2. Demate left connectors:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> P2</li> <li><input type="checkbox"/> P3</li> <li><input type="checkbox"/> P6</li> <li><input type="checkbox"/> P8</li> </ul> <p>3. On RMS EV GO: Demate ground strap connector</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> P10</li> </ul> <p>4. Verify connector bundle clear of worksite</p> <p>5. Position self for "A" latch LED visibility (left side)</p> <p>6. Perform glove inspection</p> <p><u>FGS-2 REMOVAL</u></p> <p>1. Assist RMS EV as necessary</p> <p style="text-align: center;"><u>NOTE</u> Expect to see FGS-2 move ~ 1.125 inches out of telescope during A-latch bolt release</p> <p>2. Report "A" LATCHED light on</p> <p>← <input type="checkbox"/></p> <p>3. Assist RMS EV</p> <p>4. Inspect bay (guide rails, latches, and MLI)</p>	<p>2. Demate right connectors:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> P1</li> <li><input type="checkbox"/> P4</li> <li><input type="checkbox"/> P5</li> <li><input type="checkbox"/> P9</li> </ul> <p>3. Give FF EV GO to demate ground strap connector</p> <p>4. Verify connector bundle clear of worksite</p> <p>5. Perform glove inspection</p> <p><u>FGS-2 REMOVAL</u> (00:15)</p> <p>1. <b>EVA Ratchet [CCW, MTL 38] short adj ext</b></p> <p>2. Break torque on "A" latch, 1/2 turn</p> <p>3. Stow EVA ratchet</p> <p>4. Retrieve handhold from MFR handle</p> <p>5. Install handhold on FGS-2</p> <p>6. Install and torque zip nuts (4) to hand tight</p> <p style="text-align: center;"><u>NOTE</u> Expect to see FGS-2 move ~ 1.125 inches out of telescope during A-latch bolt release</p> <p>← <input type="checkbox"/></p> <p>7. <b>PGT [A3, CCW 3, 10.5]</b></p> <p>8. Disengage "A" latch 22 turns (free spin)</p> <p>9. √"A" LATCHED light on (2.5 turns)</p> <p>← <input type="checkbox"/></p> <p>10. Remove FGS-2, avoid pitch down - A over D at ~ 2nd roller exiting guide rail</p> <p>11. Mnv r to aft fixture, boot plate to 0</p> <p>12. Stow FGS-2 on aft fixture, install PIP pin</p>

**FGS-2 R&R (02:00) (Cont)**

<b>IV/RMS</b>	<b>FF EV (8 Ball)</b>	<b>RMS EV (Grunsfeld)</b>
<p>13. RMS: To FGS-2R Retrieval posn (FSIPE)</p>          <p>14. Light ON "A" turns _____</p> <p>15. Total "A" turns _____</p>   <p>16. ICBC #16 alt: FGS-2R Install</p>          <p>17. RMS: To FGS-2R Pre-install posn</p>          <p>18. Light OFF "A" turns _____</p> <p>19. Total "A" turns _____</p>	<p><u>FGS-2R RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to FSIPE</li> <li>2. Open FSIPE lid (3 latches)</li> <li>3. Disconnect ground strap (P10); mate to dummy receptacle</li> </ol>          <p style="text-align: center;"><u>NOTE</u> Expect to see FGS-2R move ~ 1.1 inches out of FSIPE during A-latch bolt release</p>          <ol style="list-style-type: none"> <li>4. Assist RMS EV w/ FGS-2R removal</li> <li>5. Inspect FSIPE for guide rail damage; hardware interference for FGS-2 installation</li> <li>6. Verify ground strap clear</li> <li>7. Close FSIPE lid, one latch</li> </ol>	<p><u>FGS-2R RETRIEVAL</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Mnv to FSIPE</li> <li>2. Retrieve EVA ratchet</li> <li>3. <b>EVA Ratchet [CCW, MTL 38] short adj ext</b></li> <li>4. Break torque on "A" latch, 1/2 turn</li> <li>5. Stow EVA ratchet; retrieve PGT</li> <li>6. √"A" LATCHED light off (FSIPE hinge)</li> </ol>          <p style="text-align: center;"><u>NOTE</u> Expect to see FGS-2R move ~ 1.1 inches out of FSIPE during A-latch bolt release</p>          <ol style="list-style-type: none"> <li>7. <b>PGT [A3, CCW 3, 10.5]</b></li> <li>8. Disengage "A" latch 22 turns (free spin)</li> <li>9. √"A" LATCHED light on (2.5 turns)</li> </ol> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>10. Remove FGS-2R - Pitch A over D as required</p> <p>← <input type="checkbox"/></p>
	<p><u>FGS-2R INSTALLATION</u></p> <ol style="list-style-type: none"> <li>1. Translate to left side of FGS Bay 2 - Fairlead at FSIPE knob and port TA as reqd</li> <li>2. Verify cables clear</li> <li>3. Assist RMS EV</li> <li>4. √"A" LATCHED light off (19-20 turns); report turn count</li> </ol> <p>← <input type="checkbox"/></p>	<p><u>FGS-2R INSTALLATION</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Mnv to +V3 FGS Bay 2, boot plate 90L</li> <li>2. Insert FGS-2R, left justify and avoid pitch down - A over D at ~ 1st roller entering guide rail</li> <li>3. <b>PGT [A3, CW 3, 10.5]</b></li> <li>4. Engage "A" latch, 22 turns (hard stop)</li> <li>5. <b>EVA Ratchet [CW, MTL 38]</b></li> <li>6. Torque "A" latch ~1/2 turn until MTL slips</li> </ol> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>7. Stow Ratchet on MFR handle, upper left</li> </ol>



**FGS-2 R&R (02:00) (Cont)**

<b>IV/RMS</b>	<b>FF EV (8 Ball)</b>	<b>RMS EV (Grunsfeld)</b>
<p>23. RMS: To FGS-2 at Aft Fixture Retrieval Posn</p> <p>24. RMS: To FGS-2 Stow posn</p>   <p>25. Light OFF "A" turns _____</p> <p>26. Total "A" turns _____</p>	<p>4. Stow aft fixture; engage PIP pins (2)</p> <p>5. Assist RMS EV</p>   <p>6. Re-install ground strap connector (P10)</p> <p>7. Re-torque handhold zipnuts (4) - Hand tight, 20 in-lbs minimum</p> <p>8. Inspect FSIPE, verify ground strap clear</p> <p>9. Close FSIPE lid; engage latches (3)</p>	<p><u>FGS-2 STOW</u> (00:20)</p> <ol style="list-style-type: none"> <li>1. Mnvr to aft fixture, boot plate to 0</li> <li>2. Tether to FGS-2</li> <li>3. Remove top fork PIP pin; stow</li> <li>4. Retrieve FGS-2</li> <li>5. Mnvr to FSIPE</li> <li>6. Insert FGS-2 to hard stop - Pitch A over D as required</li> <li>7. <b>PGT [A3, CW 3, 10.5]</b></li> <li>8. Engage "A" latch, 22 turns (hard stop)</li> <li>9. √"A" LATCHED light off (19-20 turns)</li> <li>10. <b>EVA Ratchet [CW, MTL 38]</b></li> <li>11. Torque "A" latch ~1/2 turn until MTL slips</li> </ol> <p>← □</p> <p>← □</p>

## FGS-2 R&R – TASK DATA SHEET

Estimated Task Duration: (02:00)

	FF	W/ RMS
Two EV Crew	N/A	02:00

Tools:

FF EV	RMS EV
	<ul style="list-style-type: none"> <li>PGT with short adj ext</li> <li>EVA ratchet with short adj ext</li> <li>FGS handhold</li> </ul>

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
FGS Door Bolts	7/16"	3	B4	A4		Release: 7 Install: 7
FGS-2 (old) A Latch	7/16"	1	A3	A3		Release: 1/2, then 22 Install: 22, then 1/2
FGS-2R A Latch	7/16"	1	A3	A3		Release: 1/2, then 22 Install: 22, then 1/2

Foot Restraints:

Task	S#	PFR Setting
FGS-2 R&R	MFR	NA

Connectors:

Connector	From	To	Clamps	Size (Shell/ # of pins)	Function
HST P1	FGE	FGS-2R J1	NA	19/66	Servo A interface
HST P2	FGE	FGS-2R J2	NA	21/41	Servo A & B Interface
HST P3	FGE	FGS-2R J3	NA	19/66	Servo B Interface
HST P4	EP/TCE	FGS-2R J4	NA	17/26	TCE Interface
HST P5	FGE	FGS-2R J5	NA	11/13	Interferometer Interface
HST P6	OCE	FGS-2R J6	NA	21/79	SEA Interface
HST P8	OCE	FGS-2R J8	NA	13/10	SEA Interface

Connector	From	To	Clamps	Size (Shell/ # of pins)	Function
HST P9	EP/TCE	FGS-2R J9	NA	19/32	TCE Interface
HST P10	Aft Shroud	FGS-2R J10	NA	15/37	Ground

Notes:

- The fully-extended hybrid socket setting is 25
- The fully extended long adj socket setting is 24; the long adj socket is slightly shorter than the hybrid adj when fully extended
- Both the hybrid ext and the short adj sockets have long wobbles
- A 3-5 lb force will be required to insert the socket and engage the A-latch in order to overcome the anti-rotation feature
- FGS-2 = 463.8 lbs
- The FGS rub strip, dome (front face), and GSE brackets are acceptable crew contact points
- Apply pressure to doors while engaging latch bolts
- Expect to see FGS-2 and FGS-2R move ~1.1 inches in and out of FSIPE and HST during installation and removal respectively

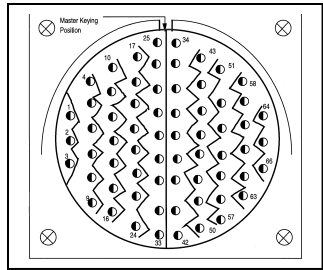
Cautions:

- Avoid contact with A, B, C, and D latches; they are coated with braycote and could be deposited on critical surfaces
- Avoid contact with instrument rollers
- Avoid contact with dog house and absorber module (back of FGS)
- Avoid contact with all black MLI surfaces
- Ground strap connector P10 must be mated first and disconnected last

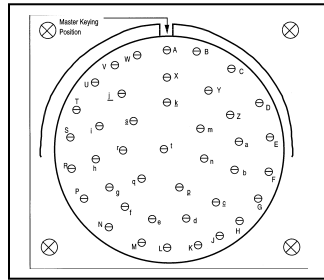
Warnings:

- Pick-off mirror is a sharp-edge hazard

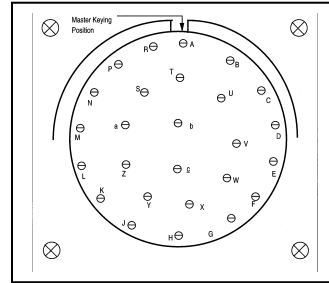
**FGS-2 R&R – TASK DATA SHEET (Cont)**



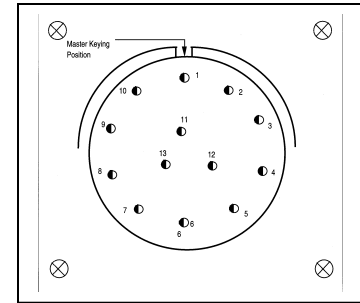
**J1 and J3  
PIN MAP**



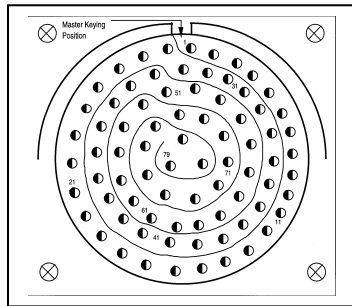
**J2 PIN MAP**



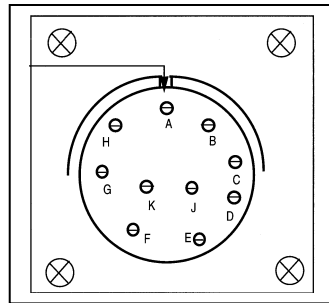
**J4 PIN MAP**



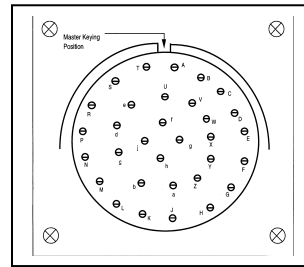
**J5 PIN MAP**



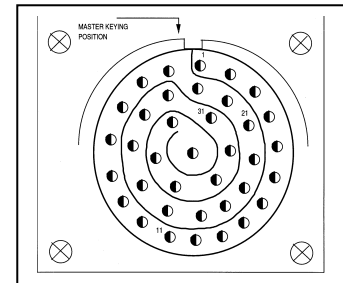
**J6 PIN MAP**



**J8 PIN MAP**



**J9 PIN MAP**



**J10 PIN MAP**

IV/RMS	FF EV	RMS EV
<p>1. RMS: To MINC NOBL Retrieve posn</p> <p>2. RMS: To HST Bay 5 posn, NOBL 5 Repair</p> <p>3. ICBC #17: FF Receive Bay 5 NOBL from RMS EV; OR ICBC #17 alt: FF EV transfer NOBL to RMS EV</p>	<p><u>BAY 5 NOBL RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to MLI recovery bag stowage area (below aft fixture)</li> <li>2. Retrieve MLI recovery bag; stow on self</li> <li>3. Translate to MINC at MULE</li> <li>4. Retrieve roller and cutters from I-Beam; stow on MWS</li> <li>5. Transfer recovery bag and cutters to RMS EV</li> <li>6. Disengage MINC latches (3); open</li> <li>7. Release NOBL 5 conductive velcro strap (aft slot)</li> <li>8. Retrieve Bay 5 NOBL (aft); transfer to RMS EV</li> <li>9. Verify conductive straps engaged on any remaining NOBLs</li> <li>10. Close MINC lid, 3 latches; verify shear pins pop up (3)</li> </ol> <p><u>BAY 5 MLI REMOVAL &amp; NOBL INSTALLATION</u></p> <ol style="list-style-type: none"> <li>1. Translate to left side of Bay 5 via +V2 doors - Fairlead at center TA ← □</li> <li>2. Receive NOBL 5 from RMS EV</li> <li>3. Transfer NOBL to RMS EV</li> <li>4. Transfer roller to RMS EV</li> </ol>	<p><u>BAY 5 NOBL RETRIEVAL (00:10)</u></p> <ol style="list-style-type: none"> <li>1. Mnvr to MINC; MFR stanchion to 135R, boot plate to 90L</li> <li>2. Stow ratchet and PGT on back of MFR handle</li> <li>3. Receive MLI recovery bag and cutters from FF EV; stow on MWS</li> <li>4. Receive NOBL 5 from FF EV</li> </ol> <p><u>BAY 5 MLI REMOVAL &amp; NOBL INSTALLATION (00:20)</u></p> <ol style="list-style-type: none"> <li>1. Mnvr to Bay 5</li> <li>2. Transfer NOBL 5 to FF EV</li> <li>3. As reqd, remove vent plugs (2) from port vent holes; temp stow</li> <li>4. Cut Bay 5 door MLI ground wires (2) - Top and bottom on knob side</li> <li>5. Fold and remove Bay 5 MLI</li> <li>6. Stow MLI in recovery bag</li> <li>7. Receive NOBL from FF EV; mnvr for installation</li> <li>8. Install Bay 5 NOBL and integral vent plugs (4)</li> <li>9. Connect NOBL ground cap on J-hook bolt</li> <li>10. Release radiator cover latches (3)</li> <li>11. Open radiator cover, re-engage latches (3)</li> <li>12. Remove radiator protective film (2 pieces); stow in MLI recovery bag</li> <li>13. Release radiator latches (3)</li> <li>14. Close NOBL radiator, engage latches (3)</li> <li>15. Receive roller from FF EV</li> <li>16. Roll surface of radiator slowly and deliberately: - Starting from center of radiator, move roller outbd in all directions, covering entire</li> </ol>



**NOBL 5 (00:30) (Cont)**

<b>IV/RMS</b>	<b>FF EV</b>	<b>RMS EV</b>
		surface of radiator - Gently push on NOBL-ER frame to assess adhesion 17. Stow MLI recovery bag onto MFR handle

**FINAL CLOSEOUT/INGRESS (01:10)**

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>1. RMS: To Airlock MFR Ingress/Egress posn (PDRS, <u>EVA CLOSEOUT</u>)</p> <p>2. RMS: Perform <u>MFR RELEASE</u></p> <p>3. On EV GO: Release MFR</p> <p>4. RMS: To Airlock Ingress posn</p> <p>5. Notify MCC EV crew clear of HST</p>	<p><u>FINAL PLB CLEANUP</u> (00:45)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Translate to airlock</li> <li>3. Receive MFR handle from RMS EV; stow in airlock</li> <li>4. Close thermal cover</li> <li>5. Translate to Orbiter port bay 10</li> <li>6. Assist RMS EV with MFR stow as req'd; posn body fwd of RMS EV</li> <li>7. Tether MFR to APC</li> <li>8. Squeeze APC handle latch and rotate handle</li> <li>9. Remove tether from MFR and APC</li> <li>10. Configure center TA for landing: A=6, B=6, C=0, ext (1)</li> <li>11. Inspect P105 and P106 cover (+V2 side, fwd)</li> <li>12. Inspect main umbilical mechanism (in between +V2 and -V3; fwd/stbd/inbd)</li> <li>13. Remove BAPS post center PIP pins (2); stow</li> <li>14. √ Velcro engaged on BAPS attach fitting clevis PIP pins</li> </ol> <p><u>FINAL TOOL INVENTORY</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Translate to airlock ← <input type="checkbox"/></li> <li>2. Perform tool inventory</li> </ol>	<p><u>FINAL PLB CLEANUP</u> (00:20)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Mnvr to airlock</li> <li>3. Perform tool inventory</li> <li>4. MFR boot plate D-ring 0°</li> <li>5. MFR stanchion 0°, boot plate 0°, MFR handle 0°</li> <li>6. Attach boot plate tether to stanchion</li> <li>7. Remove MFR handle; transfer to FF EV</li> <li>8. Egress MFR</li> </ol> <p><u>MFR STOW</u> (00:25)</p> <ol style="list-style-type: none"> <li>1. Ride RMS to Orbiter port bay 10</li> <li>2. Stow MFR stanchion, √ latched</li> <li>3. Release MFR/RMS tether and stow</li> <li>4. Hold MFR while RMS preps for ungrapple</li> <li>5. Give RMS operator GO to release MFR</li> <li>6. Install MFR hooks onto upper APC fitting and pivot MFR down</li> <li>7. Fully install bottom of MFR into APC latch, install PIP pin</li> <li>8. Translate to LGA (port/aft); remove LGAP cover</li> <li>9. Translate to MULE aft/port; stow LGAP cover (2 captive lock pins); stow PIP pin in pouch</li> <li>10. Translate to I-Beam</li> <li>11. Stow cutters and roller: <ul style="list-style-type: none"> <li>- For cutter, engage Velcro flap and external strap</li> <li>- For roller, engage internal straps (2) and external strap</li> </ul> </li> </ol> <p><u>FINAL TOOL INVENTORY</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Translate to airlock (ride RMS back)</li> </ol>

**FINAL CLOSEOUT/INGRESS (01:10) (Cont)**

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
	<p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Remove RMS safety tether from RMS; attach to left waist tether - Engage both paddle hook slide locks - L</li> <li>2. Translate to Orbiter port sill (aft of RMS shoulder)</li> <li>3. Remove safety tether from slider</li> <li>4. Gently relocate slider fwd of RMS shoulder</li> <li>5. Translate fwd of RMS shoulder</li> <li>6. Stow slider, close cushion; engage quarter turn fastener</li> <li>7. Ingress airlock</li> <li>8. Open DCM cover; Velcro to self</li> <li>9. Connect SCU to DCM; √ SCU locked</li> <li>10. WATER - OFF (expect "H2O IS OFF" msg)</li> <li>11. Thermal cover - close</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>12. Verify hardware clear of hatch</li> <li>13. Close, lock outer hatch</li> <li>14. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>	<p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Ingress airlock</li> <li>2. Attach waist tether to airlock D-ring extender - Engage crew hook lock slide lock - L</li> <li>3. Verify FF EV's tether config</li> </ol> <ol style="list-style-type: none"> <li>4. Open DCM cover; Velcro to self</li> <li>5. Connect SCU to DCM; √ SCU locked</li> <li>6. WATER - OFF (expect "H2O IS OFF" msg)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>7. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>

**ALT  
EVA 5**

**ALTERNATE EVA 5 SUMMARY TIMELINE (BAY 3 BATTERY, ACS PART II, NOBL 5)**

TASK TIME (PET TIME) HR : MIN	IV/FSS	EV	RMS
00:00 ---	√ FSS 180°, -V3, Pivot 90°, -SA to 0°	<u>POST DEPRESS</u> (00:05)	
		<u>EGRESS/DAILY SETUP</u> (00:25)	Airlock MFR Ingress/Egress
01:00 ---		<u>BAY 3 BATTERY R&amp;R</u> (01:30) <ul style="list-style-type: none"> <li>• Bay 3 Battery Retrieval <ul style="list-style-type: none"> <li>• Bay 3 SLIC Battery-R Prep</li> </ul> </li> </ul>	Bay 3 posn
		<ul style="list-style-type: none"> <li>• Bay 3 Battery Swap</li> <li>• Bay 3 Battery-R Install</li> </ul>	Bay 3 Battery Swap posn Bay 3 posn
02:00 ---		<u>ACS PART II</u> (02:15) <ul style="list-style-type: none"> <li>• ACS Prep</li> <li>• Open -V2 Doors</li> <li>• ACS Setup</li> <li>• Card Removal</li> </ul>	PFR Handoff posn -V2 Doors posn
03:00 ---		<ul style="list-style-type: none"> <li>• CEB-R Module Install</li> <li>• LVPS-R Install</li> </ul>	ACS Support posn  LOPE posn
04:00 ---		<ul style="list-style-type: none"> <li>• Cleanup</li> <li>• Close -V2 Doors</li> </ul>	Aft Shroud posn -V2 Aft Shroud posn
	<u>NOBL 5</u> (00:30) <ul style="list-style-type: none"> <li>• Bay 5 NOBL Retrieval</li> </ul>	MINC NOBL Retrieve posn	
	<ul style="list-style-type: none"> <li>• Bay 5 MLI Removal &amp; NOBL Installation</li> </ul>	Bay 5 NOBL Install	
05:00 ---	<u>FINAL CLOSEOUT/INGRESS</u> (01:10) <ul style="list-style-type: none"> <li>• Final PLB Cleanup</li> </ul>	Airlock MFR Ingress/Egress posn	
	<ul style="list-style-type: none"> <li>• MFR Stow</li> <li>• Final Tool Inventory</li> </ul>	Airlock Ingress posn	
06:00 ---	EVA = 6:00	<u>PRE REPRESS</u> (00:05)	

# EVA 5 TOOL CONFIG

## AIRLOCK

- HST Tool Bag:**
- Helmet light battery (spare)
- General Purpose Caddy
  - IFM 5/32-in allen w/ tether (FSS cont) (umbil, bert latch)
  - IFM 1/8-in allen wrench w/ tether (ECU drive stud cont)
- MWS key strap
- Inspection mirror w/ O-tether
- Palm Wheel
- Wire tie caddy
- Connector Cleaner Tool Kit
- Cheater bar
- Airlock wrench (3/8" ratchet with 7/16" socket)
- Adjustable wrench
- DCM Plug
- 2 - 34-in adj tethers (cont) (HST bag pouch)
- 1 - 80-in adj tether (cont) (HST bag pouch)
- Overgloves (4 pair)
- Ballstack (no-RMS) -----
- Fish stringer #1:**
- Socket caddy #1
  - 6-in rigid (door cont)
  - 6-in wobble (spare)
  - Drop proof tether adapter with IFM 1/2-in rigid socket
- Lube Applicator (if req'd)
- MPT (spare) (s/n 05)
  - PGT battery, s/n: \_\_\_\_\_
- PGT (spare): s/n: \_\_\_\_\_
- PGT Battery: s/n: \_\_\_\_\_
- EVA Ratchet with Palm Wheel (spare)
- MTL
- Digital Camera with Bracket (spare)
- Socket caddy #2 (no-RMS)
  - Hybrid ext (spare)
- Spare tethers (all remaining)
- Prior to EVA, inspect the following:
  - RET cords for damage
  - Safety and waist tether load alleviating straps (no red band or damage)
  - Trash bag bristles for deformation/damage

## MFR HANDLE - EGRESS

- FRONT** (MFR handle install posts facing you) (MFR=180 deg)
- Tool board C (left side of MFR handle):
  - Sm trash bag (lower bayonet), int RET, √zipped
  - Battery cap caddy (3 cap sets) (upper bayonet), int RET
- Tool board T (right side of MFR handle):
  - Manual door stay (upper outbd small diameter hole), int RET
  - 6-in wobble (spare)
- BACK** (MFR=0 deg)
- Tool board C
  - Back - MPT Holster (lower bayonet), int RET
  - MPT with black bit (use s/n 03)
- Tool board T
  - Back - MPT battery (lower bayonet), eq-eq RET
  - Yellow bit (post) (spare to black, but with ball-end)
  - Hi-torque connector tool (bungee), int RET
- Bayonet fittings:** (facing front side)
  - Upper left: PGT with short adj (socket faces front), eq RET
  - Lower left: Card stowage enclosure, eq-eq RET (no cards)
  - Upper right: Digital camera, int camera RET
  - Lower right: Ground strap bag, int RET
    - Cutters
    - CMT
    - Wishbone (hooked to ground), int RET
    - Card extraction tool (CET)
      - Sticking out side of bag
      - Hooked to ground
      - Eq-eq RET from CET to bag
    - ACS HR clamp
    - 2 adj tethers from clamp to bag D-ring
- Top tether points:**
  - 1 - RET (lg-sm) (spare)
  - 1 - adj tether
- Side tether points:**
  - 1 - RET (lg-sm) (to tether MFR Handle in A/L) (stays in A/L)
  - 1 - Waist tether (to tether MFR Handle in A/L) (stays in A/L)
  - 1 - Adj tether (spare), Board C
  - 1 - Eq-eq RET

## MWS-EGRESS

- A/L D-RING:** D-ring extender
- FF EV** (8 Ball)
  - MWS w/ right swing arm
    - Trash bag, √zipped
  - Left swingarm
    - PGT, s/n: \_\_\_\_\_
    - Sm-sm equip RET w/ PIP pin
  - O-Tether, MWS D-ring
    - Short adj extension
    - Eq-eq RET
  - 1 - RET (lg-sm paddle) – right
  - 1 - Adj tether – (D-ring to trash bag)
  - 1 - Waist tether - Hooks locked (coated) - left
  - Safety tether (right) (hook locked)
- RMS EV** (Grunsfeld)
  - MWS w/ right swing arm
    - Sm-sm pb RET
  - 1 - RET (lg-sm paddle) – left
  - 1 - RET (lg-sm paddle) – right
  - 1 - Adj tether – left
  - 1 - Waist tether - Hooks locked (coated) - right
  - Safety tether (left) (hook locked)
- TOTAL TETHER COUNT**
  - 6 – sm-sm equip RET (8)
  - 1 – sm-sm equip RET w/PIP pin (2)
  - 5 – lg-sm paddle RET (9)
  - 1 – sm-sm pb RET (3)
  - 6 – adj tether (10)
  - 0 – sm-sm paddle RET (2)
  - 0 – sm-sm paddle RET w/PIP pin (2)
  - 3 – waist tethers (4)

# EVA 5 POST TOOL CONFIG

## MFR HANDLE-INGRESS

- Sm trash bag
- 6-in wobble (spare)
- Temp cover
- Battery cap caddy
- MPT Holster
  - MPT with black bit
- MPT battery
- Yellow bit
- PGT with short adj ext
- Digital camera
- Ground strap bag
  - Cutters
  - CMT
  - Card extraction tool
  - Wishbone
- Card Stowage Enclosure
- MLI Recovery Bag
- High torque connector tool
- Manual door stay
- PGT
- O-tether with short adj extension

## TETHERS

- 6 – sm-sm equip RET
- 1 – sm-sm equip RET w/PIP pin
- 4 – lg-sm paddle RET
- 1 – sm-sm pb RET
- 6 – adj tether

## MIDDECK TOOLS

- Battery Cap Caddy
- SSAT tool
- GP Caddy (spare)
- 1 - 34-in adj tether
- 1 - 80-in adj tether
- Fish stringer
- Long adj socket
- ACS Guide Stud Caddy
- 14" ACS socket extension (FET)
- Drop-proof tether adapter

## MWS-INGRESS

- FF EV** (8 Ball)
- MWS w/ right swing arm
  - Left swingarm
  - Sm trash bag
  - Waist tether
  - Safety tether

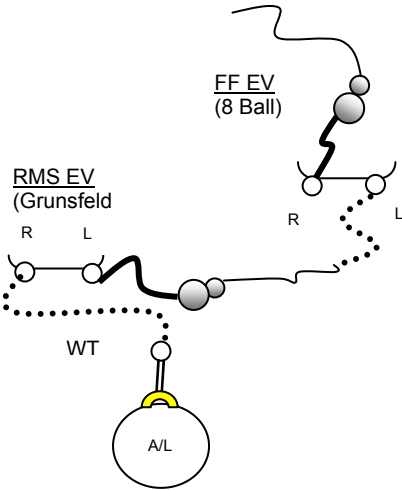
## **RMS EV** (Grunsfeld)

- MWS w/ right swing arm
- Waist tether
- Safety tether

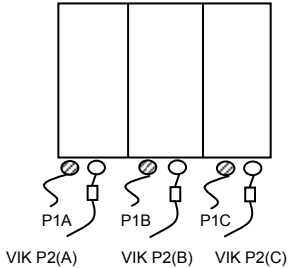
## MIDDECK TOOLS

- Left swingarm
- RSU Bag
- STIS/MPT Bit Caddy
- RIB Caddy (4 RIBs, 1 FEB, 1 WET)
- FRB
- Lube Applicators (2)
- MUT EE
- PGT Batteries (2)
- Left Swingarm
- 9" ACS socket extension (mini FET)
- EHIP Battery Bag
- Hybrid ext

EGRESS/DAILY SETUP (00:25)

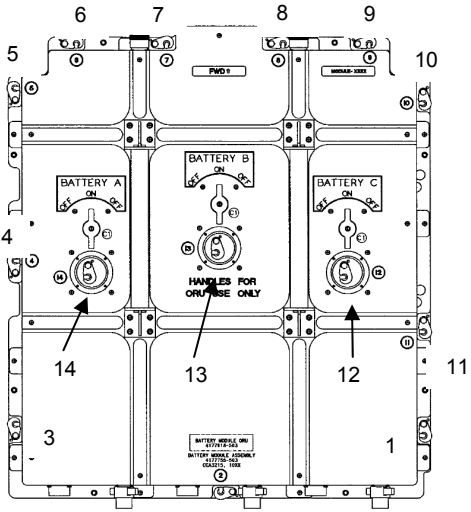
IV/RMS	FF EV (8 BALL)	RMS EV (GRUNSFELD)
 <p>INITIAL SAFETY TETHER CONFIG</p>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Own safety tether load alleviating strap attached to right EMU D-ring, hook slide lock - L, reel unlocked</li> <li>√ RMS safety tether long end attached to left waist tether, hook slide locks (2) - L</li> </ul> <p><u>EGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Thermal cover - open</li> <li>2. Egress airlock</li> <li>3. Translate to Orbiter port sill</li> <li>4. Release aft fastener on slidewire cushion; open</li> <li>5. Gently relocate slider aft of RMS shoulder</li> <li>6. Translate aft of RMS shoulder</li> <li>7. Attach safety tether to aft slider:             <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>8. Remove RMS EV's safety tether from self; attach to RMS handrail standoff (black end):             <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>9. Install MFR/RMS tether, tighten</li> </ol> <p><u>MFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Receive MFR handle from RMS EV</li> <li>2. Transfer MFR handle to RMS EV</li> <li>3. Close thermal cover</li> </ol> <p><u>BAPS POST SETUP</u></p> <ol style="list-style-type: none"> <li>1. Install BAPS post center pip pins (2)</li> </ol> <p><u>TRANSLATION AID SETUP</u></p> <ol style="list-style-type: none"> <li>1. Configure center TA: A=6, B=6, <b>C=6</b>, extend (1)</li> </ol>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Right waist tether to A/L D-ring extender, hook slide lock - L</li> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> <li>√ MPT PWR - ON</li> </ul> <p><u>EGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Release waist tether from airlock D-ring extender</li> </ol> <p><u>MFR SETUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Handout MFR handle to FF EV; egress airlock</li> <li>2. Attach boot plate lanyard to MWS lower D-ring</li> <li>3. Ingress MFR</li> <li>4. Receive MFR handle from FF EV</li> </ol>

# BAY 3 BATTERY R&R (01:30)

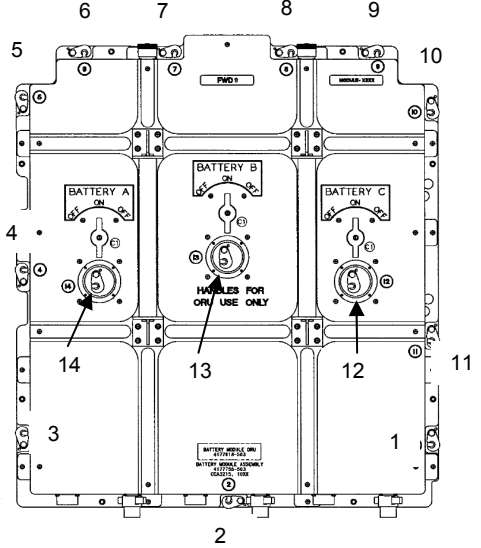
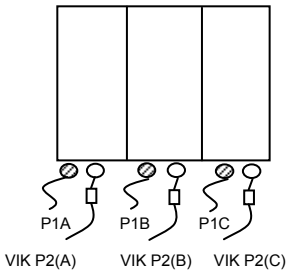
IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>1. L12U FSS PCU PWR CONTR A - ON CONTR B - ON ESS/MN SW ENA - OFF (tb-bp) Notify MCC CONTR A and B - ON ESS/MN SW ENA - OFF</p> <p>2. RMS: To Bay 3 posn</p> <p>3. √ MCC GO for Bay 3 battery demate * If NO COMM perform: * * <u>BAY 3 BATT PREP FOR REMOVAL</u> * (PL OPS, ORU/ORI) *</p> 	<p><u>BAY 3 SLIC BATTERY-R PREP</u></p> <ol style="list-style-type: none"> <li>1. Translate to FSIPE fwd PFR</li> <li>2. Verify FSIPE STS PFR (AS:Y=12, P=11; PFR: Y=9, R=B.5, P=1.5)</li> <li>3. Open port battery thermal cover</li> <li>4. Secure cover open w/ Velcro</li> <li>5. √ Battery-R isolator switches (3) - OFF</li> <li>6. Visually verify J2 gender changers in place (3)</li> <li>7. Visually verify J3 connector caps in place (3)</li> <li>8. Inspect battery connector receptacles (6)</li> <li>9. Configure PGT w/ short adj ext</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <ol style="list-style-type: none"> <li>1. Battery bolts 13 &amp; 14 are not present on BPA</li> <li>2. SLIC battery bolts may be released in any order</li> <li>3. Leave Bolt 7 to be released while in PFR</li> </ol> <p>10. <b>PGT [A3, CCW 3, 10.5], short adj ext</b></p> <ol style="list-style-type: none"> <li>11. Disengage the following J-bolts, 4 turns <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 1</li> <li><input type="checkbox"/> Bolt 2</li> <li><input type="checkbox"/> Bolt 3</li> <li><input type="checkbox"/> Bolt 4</li> <li><input type="checkbox"/> Bolt 5</li> <li><input type="checkbox"/> Bolt 6</li> <li><input type="checkbox"/> Bolt 8</li> <li><input type="checkbox"/> Bolt 9</li> <li><input type="checkbox"/> Bolt 10</li> <li><input type="checkbox"/> Bolt 11</li> <li><input type="checkbox"/> Bolt 12</li> </ul> </li> </ol>	<p><u>BAY 3 BATTERY RETRIEVAL</u> (00:40)</p> <p>← <input type="checkbox"/></p> <div style="border: 2px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>WARNING</u></p> <ol style="list-style-type: none"> <li>1. Do not touch battery bay door thermal louvers</li> <li>2. Battery J1 &amp; J2 connectors are energized</li> </ol> </div> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">Bay 3 lower bolt is already released</p> <ol style="list-style-type: none"> <li>1. Mnvr to bay 3: <ul style="list-style-type: none"> <li>- Retrieve PGT from MFR handle</li> <li>- Rotate MFR handle 180°</li> <li>- Stanchion to 180°; boot plate 90R</li> </ul> </li> <li>2. Retrieve manual door stay and battery cap caddy from MFR handle</li> <li>3. <b>PGT [A3, CCW 3, 10.5], short adj ext</b></li> <li>4. If not already completed, release lower J-hook</li> <li>5. Disengage J-bolts (5), 6 turns</li> <li>6. Open Bay 3 door fully</li> <li>7. Install manual door stay; extend to H</li> <li>8. Configure boot plate 0°</li> </ol> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>9. Perform one at a time: <ul style="list-style-type: none"> <li><input type="checkbox"/> Demate P1A; install cap on J1A</li> <li><input type="checkbox"/> Demate VIK P2(A) from GCP2; install cap on gender changer P2</li> <li><input type="checkbox"/> Demate P1B; install cap on J1B</li> <li><input type="checkbox"/> Demate VIK P2(B) from GCP2; install cap on GCP2</li> <li><input type="checkbox"/> Demate P1C; install cap on J1C</li> <li><input type="checkbox"/> Demate VIK P2(C) from GCP2; install cap on GCP2</li> </ul> </li> <li>10. Tether or tuck connectors clear of battery</li> <li>11. Stow battery cap caddy on MFR handle</li> </ol>



## BAY 3 BATTERY R&R (01:30) (Cont)

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
 <p style="text-align: center;"><b>2</b> <u>BAY 3 BATTERY-R</u></p> <ol style="list-style-type: none"> <li>4. RMS: To Battery Swap at SLIC posn</li> <li>5. ICBC #6: RMS mnvr to Battery-R install</li> <li>6. RMS: To Battery-R Install posn</li> </ol>	<p style="text-align: center;"><u>BAY 3 BATTERY SWAP</u></p> <ol style="list-style-type: none"> <li>1. Ingress FSIPE PFR</li> <li>2. Tether to battery</li> <li>3. <b>PGT [A3, CCW 3, 10.5]</b></li> <li>4. Disengage remaining Battery-R J-bolt, 4 turns <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 7</li> </ul> </li> <li>5. Remove port Battery-R</li> <li>6. Transfer Battery-R to RMS EV</li> <li>7. Receive Battery from RMS EV</li> </ol> <p style="text-align: center;"><u>BAY 3 BATTERY STOW</u></p> <ol style="list-style-type: none"> <li>1. Install Battery on SLIC (connectors outboard)</li> <li>2. Verify Battery flush with BPA</li> <li>3. Engage as many J-hooks as possible from PFR</li> </ol>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be released last</p> </div> <ol style="list-style-type: none"> <li>12. <b>PGT [A3, CCW 3, 10.5]</b>, (extend as req'd)</li> <li>13. Disengage battery J-bolts (14), 4 turns <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 1</li> <li><input type="checkbox"/> Bolt 2</li> <li><input type="checkbox"/> Bolt 3</li> <li><input type="checkbox"/> Bolt 5</li> <li><input type="checkbox"/> Bolt 6</li> <li><input type="checkbox"/> Bolt 7</li> <li><input type="checkbox"/> Bolt 8</li> <li><input type="checkbox"/> Bolt 9</li> <li><input type="checkbox"/> Bolt 10</li> <li><input type="checkbox"/> <b>Bolt 11</b></li> <li><input type="checkbox"/> <b>Bolt 13</b></li> <li><input type="checkbox"/> <b>Bolt 14</b></li> <li><input type="checkbox"/> <b>Bolt 4</b></li> <li><input type="checkbox"/> Tether to battery (right lg-sm RET to left battery HR)</li> <li><input type="checkbox"/> Prep swingarm for PGT</li> <li><input type="checkbox"/> <b>Bolt 12</b></li> </ul> </li> <li>14. Remove battery</li> </ol> <p style="text-align: center;"><u>BAY 3 BATTERY SWAP (00:10)</u></p> <ol style="list-style-type: none"> <li>1. Mnvr for battery swap at SLIC</li> <li>2. Receive Battery-R from FF EV</li> <li>3. Transfer Battery to FF EV</li> </ol> <p style="text-align: center;"><u>BAY 3 BATTERY-R INSTALL (00:40)</u></p> <p style="text-align: center;">← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>1. Mnvr to Bay 3; inspect Battery-R connectors (6)</li> <li>2. Install Battery-R</li> <li>3. Verify battery flush</li> <li>4. Engage as many J-hooks as possible from single</li> </ol>

# BAY 3 BATTERY R&R (01:30) (Cont)

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>7. IV: Record HST battery turn counts 8. IV: Record SLIC battery turn counts</p>  <p>9. IV: Notify MCC Bay 3 Battery-R connectors mated</p>	<p><b>NOTE</b></p> <ol style="list-style-type: none"> <li>Battery bolt numbers 13 &amp; 14 are not engaged for landing</li> <li>After bolts 11 and 12 engaged, SLIC battery bolts may be engaged in any order</li> </ol> <p>4. PGT [A3, CW 3, 10.5]</p> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Engage J-bolts #11 and #12, 3-5 turns (torque)</li> <li>Engage remaining J-bolts (10 total), 3-5 turns <ul style="list-style-type: none"> <li>- Egress PFR as necessary</li> <li><input type="checkbox"/> Bolt 11 _____ turns</li> <li><input type="checkbox"/> Bolt 12 _____ turns</li> <li><input type="checkbox"/> Bolt 1 _____ turns</li> <li><input type="checkbox"/> Bolt 2 _____ turns</li> <li><input type="checkbox"/> Bolt 3 _____ turns</li> <li><input type="checkbox"/> Bolt 4 _____ turns</li> <li><input type="checkbox"/> Bolt 5 _____ turns</li> <li><input type="checkbox"/> Bolt 6 _____ turns</li> <li><input type="checkbox"/> Bolt 7 _____ turns</li> <li><input type="checkbox"/> Bolt 8 _____ turns</li> <li><input type="checkbox"/> Bolt 9 _____ turns</li> <li><input type="checkbox"/> Bolt 10 _____ turns</li> </ul> </li> <li>Stow short adj ext on O-tether</li> <li>Close SLIC battery thermal cover</li> <li>Perform glove inspection</li> </ol> 	<p>RMS posn</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p><b>CAUTION</b> Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be engaged first</p> </div> <p>5. PGT [A3, CW 3, 10.5]</p> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Engage Battery-R J-bolts (14), 3-5 turns (torque) <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 4 _____ turns</li> <li><input type="checkbox"/> Bolt 11 _____ turns</li> <li><input type="checkbox"/> Bolt 12 _____ turns</li> <li><input type="checkbox"/> Bolt 13 _____ turns</li> <li><input type="checkbox"/> Bolt 14 _____ turns</li> <li><input type="checkbox"/> Bolt 5 _____ turns</li> <li><input type="checkbox"/> Bolt 6 _____ turns</li> <li><input type="checkbox"/> Bolt 7 _____ turns</li> <li><input type="checkbox"/> Bolt 8 _____ turns</li> <li><input type="checkbox"/> Bolt 9 _____ turns</li> <li><input type="checkbox"/> Bolt 10 _____ turns</li> <li><input type="checkbox"/> Bolt 1 _____ turns</li> <li><input type="checkbox"/> Bolt 2 _____ turns</li> <li><input type="checkbox"/> Bolt 3 _____ turns</li> </ul> </li> <li>Verify tether released from battery</li> <li>Retrieve, inspect; mate one at a time: <ul style="list-style-type: none"> <li><input type="checkbox"/> Mate P1A to J1A</li> <li><input type="checkbox"/> Mate VIK P2(A) to GCP2</li> <li><input type="checkbox"/> Mate P1B to J1B</li> <li><input type="checkbox"/> Mate VIK P2(B) to GCP2</li> <li><input type="checkbox"/> Mate P1C to J1C</li> <li><input type="checkbox"/> Mate VIK P2(C) to GCP2</li> </ul> </li> </ol> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Release manual door stay</li> <li>Stow manual door stay on MFR handle</li> </ol>

**BAY 3 BATTERY R&R (01:30) (Cont)**

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>10. √ MCC GO to rotate Battery-R isolator switches</p> <p>* If NO COMM: *</p> <p>* Notify EV GO to rotate Battery-R isolator switches *</p> <p>11. IV: Notify MCC Battery-R isolator switches (3) - ON (GO for resume Battery A/T)</p> <p>12. WVS: RMS EV Center Cam (1. Connectors and 2. Battery Overview)</p> <p>13. On MCC GO: L12U FSS PCU PWR CONTR A - OFF CONTR B - OFF Notify MCC CONTR A and B - OFF</p>		<p style="text-align: center;"><u>NOTE</u> Bay 3 lower bolt may cause problems during engagement. Manually start bolt threads</p> <p>11. Attempt to manually start/re-engage lower door bolt prior to bay door closing</p> <p>12. Verify harnesses clear of door in prep for door closure</p> <p>← <input type="checkbox"/></p> <p>On IV GO:</p> <p>13. Rotate Battery-R isolator switches (3) - ON</p> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>14. Close bay door</p> <p>15. <b>PGT [A3, CW 3, 10.5]</b></p> <p>16. Engage J-bolts (6), 4-6 turns</p>

## BAY 3 BATTERY R&R – TASK DATA SHEET

Estimated Task Duration: (01:30)

	FF	W/ RMS
Two EV Crew	N/A	01:30

### Tools:

FF EV	RMS EV
<ul style="list-style-type: none"> <li>PGT</li> <li>Socket caddy with short adj</li> <li>PFR</li> </ul>	<ul style="list-style-type: none"> <li>PGT with short adj ext</li> <li>Battery cap caddy</li> <li>Manual door stay</li> </ul>

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
Bay 3 Battery-R J-bolts (on SLIC)	7/16	12		A3		Release: 4
Bay 3 Battery-R J-bolts (on HST)	7/16	14	A3			Install: 3-5
Bay 3 Door J-bolts	7/16	5 (one already dis-engaged)	A3	A3		Release: 6 Install: 4-6
Bay 3 Battery (old) J-bolts (HST)	7/16	14		A3		Release: 4
Bay 3 Battery (old) J-bolts (SLIC)	7/16	12	A3			Install: 3-5

### Foot Restraints:

Task	S#	PFR Setting
Bay 3 SLIC Battery-R Prep	FSIPE fwd/center socket	AS: Y=12, P=11; PFR: Y=9, R=B.5, P=1.5
Bay 3 Battery R&R	MFR	NA

### Notes:

- Battery-R = 466 lbs; Old battery = 463 lbs
- In order to ensure the old battery is fully seated on the BSA shear pins, it is highly desired that one of the three following fasteners be fully torqued prior to torquing any other bolts: #11, 12, or 4
- J1 = Sockets (Power); J2 = Pins (Telemetry), with VIKs (Sockets)
- Less than 2.5 turns will prevent the SLIC and HST battery J-hooks from swinging open and more than 4 turns will increase the risk of getting a bolt into its interrupted threads
- Bay 3 lower bolt may cause problems during engagement. Manually start bolt threads
- BET may be required to pry off old battery from door; tight thermal limits begin when 1st battery J-bolt is released

### Cautions:

- Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be released last (on old battery)
- Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be engaged first (on new battery)

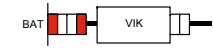
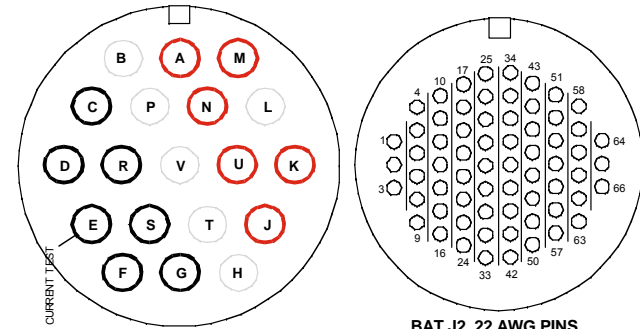
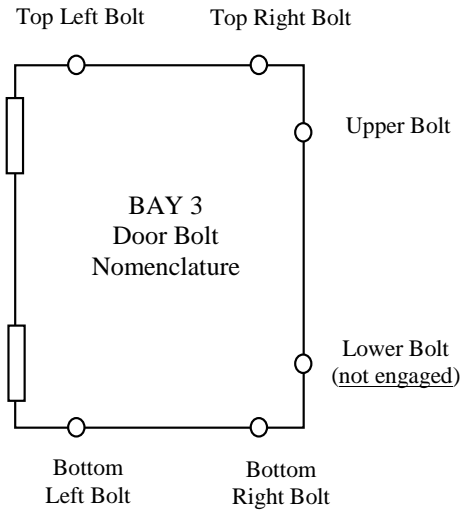
### Warnings:

- Do not touch battery bay door thermal louvers
- Battery J1 & J2 connectors are energized

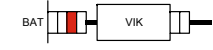
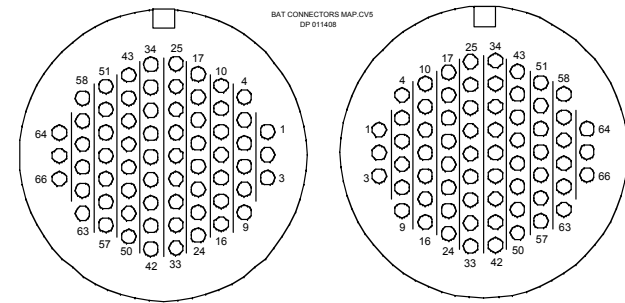
### Connectors:

Connector	From	To	Function
HST P1A	Battery: J1A	Battery-R: J1A	power
VIK P2(A)	Battery: GCP2	Battery-R: GCP2	heater/telemetry
HST P1B	Battery: J1B	Battery-R: J1B	power
VIK P2(B)	Battery: GCP2	Battery-R: GCP2	heater/telemetry
HST P1C	Battery: J1C	Battery-R: J1C	power
VIK P2(C)	Battery: GCP2	Battery: GCP2	heater/telemetry

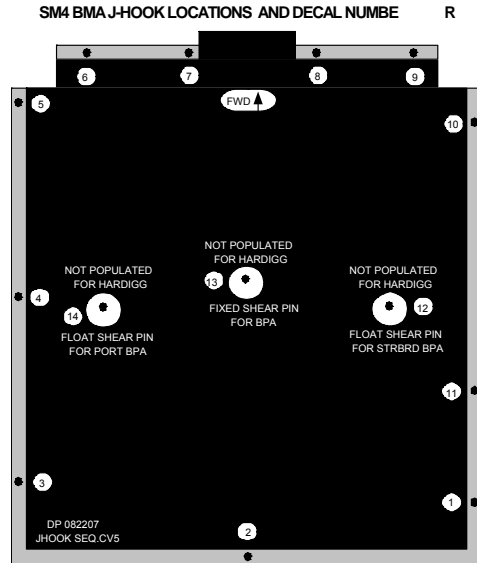
# BAY 3 BATTERY R&R – TASK DATA SHEET (Cont)



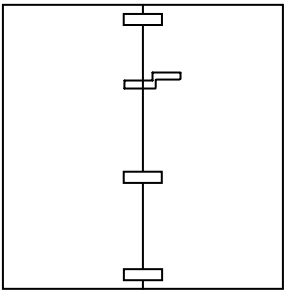
ALL VIEWS:  
LOOKING INTO  
CONNECTOR FACE  
BAT CONNECTORS MAP.CVS  
DP 011408



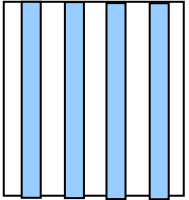
BATTERY AND VIK PIN MAPS



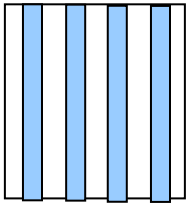
SLIC BPA SHEAR PIN LOCATIONS

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>1. Notify MCC for mnvr to sun protect att 2. RMS: To PFR Handoff posn - new 3. ICBC #15, oppty 4: ACS Prep</p> <p>4. √ In sun protect att before opening doors</p> <p>5. RMS: To -V2 Aft Shroud Doors posn</p> <div style="border: 1px solid black; padding: 5px;">  <p style="text-align: center;">-V2 DOOR BOLTS</p> </div> <p>6. Check MCC GO for PIE harness mate * If NO COMM perform: * DEADFACE ACS (PL OPS, <u>ORU/ORI</u>) 7. ICBC #15, oppty 4: ACS Setup</p>	<p><u>ACS PREP</u> ← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Translate to aft ASIPE PFR</li> <li>Transfer O-tether with short adj extension and PGT to RMS EV</li> <li>Retrieve PFR and AS from aft ASIPE socket, transfer to RMS EV</li> </ol> <p>4. Disengage lower two LOCKs (2) - Release locking pin; rotate main handle; re-engage locking pin - Rotate LOCK arm out of bath tub</p> <p>5. Assist RMS EV as possible</p> <p>6. Open right door</p> <p><u>ACS SETUP (00:20)</u> ← <input type="checkbox"/></p> <p>* If PIE not already installed: * 1. Translate to ACS connector panel</p>	<p><u>ACS PREP (00:10)</u> ← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Mnvr to PFR transfer posn</li> <li>Verify stanchion 135L and boot plate 90R</li> <li>Receive O-tether with short adj and PGT from FF EV: stow on MFR handle (where space allows)</li> <li>Receive PFR and AS from FF EV, stow on MFR handle</li> </ol> <p><u>OPEN -V2 DOORS (00:15)</u> ← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Mnvr to -V2 aft shroud doors</li> </ol> <p style="text-align: center;"><u>NOTE</u> No soft stop on the upper middle (handle) door latch bolt</p> <ol style="list-style-type: none"> <li>Release top LOCK - Release locking pin; rotate main handle; re-engage locking pin - Rotate LOCK arm out of bath tub</li> <li><b>PGT [A4, CCW 3, 23.5] short adj ext (turns)</b></li> <li>Disengage handle bolt, 7 turns</li> <li>Stow PGT on self</li> <li>Maintain pressure on doors - Remove PIP pin - Release handle latch - Reinstall PIP pin</li> <li>Open doors</li> </ol> <p><u>ACS SETUP</u> ← <input type="checkbox"/></p>

ACS PART II (02:15) (Cont)

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>8. RMS: To ACS Support posn</p> <p>9. Check MCC GO for temp cover removal/PIE harness P6 mate (needed here if PIE already installed and GO call in step 6 was skipped)</p> <p>* If NO COMM perform: * DEADFACE ACS (PL OPS, <u>ORU/ORI</u>)</p> <div style="text-align: center;">  <p>#1 #2 #3 #4 ACS CEB Cards</p> </div> <p>10. ICBC: #5B: Card Removal</p> <p>11. RMS: To LOPE Access posn (LVPS and CEB-R Retrieval)</p>	<p>2. Perform the following connections:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tether to and demate HST P1 from ACS J1</li> <li><input type="checkbox"/> Mate PIE J1A to HST P1</li> <li><input type="checkbox"/> Mate PIE P1A to ACS J1</li> </ul> <p>3. Temp stow free end of PIE harness on MWS</p> <p>4. Receive PFR from RMS EV</p> <p>5. Install into FR 4 at 90L↓</p> <p>6. Verify PFR settings: (AS: P=2.5, PFR: Y=2, R=B, P=1.5)</p> <p>7. Receive ground strap harness bag from RMS EV</p> <p>8. Install ground strap harness bag onto aft shroud inner handrail</p> <ul style="list-style-type: none"> <li>- Attach ground strap bag clamp to HR</li> <li>- Mate ground strap clamp to ESM P11-R plug</li> </ul> <p>9. Ingress PFR ← <input type="checkbox"/></p> <p>10. Install ground strap harness onto CEB-R temp cover; remove cover</p> <p>11. Transfer temp cover to RMS EV</p> <p>12. Verify ground strap harness installed on wishbone</p> <p>13. Install wishbone via upper 2 holes</p> <p>14. Receive card stowage enclosure from RMS EV</p> <p>15. Stow card stowage enclosure on ACS HR; open lid</p> <p>16. Perform glove inspection</p> <p><u>CARD REMOVAL</u> (00:30)</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Sharp edges on CEB cards</p> </div> <p>Card #3:</p> <ol style="list-style-type: none"> <li>1. Receive PGT from RMS EV</li> <li>2. Remove card extraction tool from ground strap bag</li> <li>3. Set index to card 3</li> <li>4. Verify elevator drive blocks fully retracted</li> <li>5. Verify clamp lever open</li> <li>6. Verify elevator drive block lever - DOCK</li> </ol>	<p>1. As necessary, assist FF EV with stabilization</p> <p>2. Transfer PFR to FF EV</p> <p>3. Retrieve ground strap harness bag from MFR handle</p> <p>4. Transfer ground strap harness bag to FF EV - Attach ACS HR clamp to ground strap bag</p> <p>5. Receive temp cover from FF EV, remove ground strap</p> <p>6. Stow temp cover on MFR handle</p> <p>7. Transfer card stowage enclosure to FF EV</p> <p>8. Perform glove inspection</p> <p><u>CARD REMOVAL</u></p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Sharp edges on CEB cards</p> </div> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>1. Transfer PGT to FF EV (with short adj)</li> <li>2. RMS mnvr to LOPE (fwd/stbd ORU-C shelf); open lid</li> <li>3. Verify stanchion 135L, boot plate as reqd; MFR handle as reqd</li> </ol>

ACS PART II (02:15) (Cont)

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>12. RMS: To Aft Shroud Doors Closing posn</p> <div style="text-align: center;">  <p>#1 #2 #3 #4 ACS CEB Cards</p> </div>	<ol style="list-style-type: none"> <li>7. Install ground strap onto extraction tool</li> <li>8. Install extraction tool onto wishbone &amp; third card</li> <li>9. Push &amp; rotate clamp lever CW to closed (360°)</li> <li>10. <b>PGT [B2, CW 2, 5.5], short adj</b></li> <li>11. Drive CET elevator drive CW2, 18 turns</li> <li>12. Drive CET elevator drive CCW2, 6 turns</li> <li>13. Drive CET elevator drive CW2, 8 turns</li> <li>14. Place card tool elevator drive block lever - UNDOCK</li> <li>15. Verify card can be removed</li> <li>16. Re-set elevator drive; PGT: CCW3 to hard stop (~20 turns)</li> <li>17. Stow PGT on self</li> <li>18. Remove card #3 from CEB</li> <li>19. Install card into card stowage enclosure; engage slide lock</li> <li>20. Release clamp lever (push &amp; rotate CCW 360°)</li> </ol> <p>Card #4:</p> <ol style="list-style-type: none"> <li>21. Set index to card 4</li> <li>22. Verify elevator drive blocks fully retracted</li> <li>23. Verify clamp lever open</li> <li>24. Verify elevator drive block lever - DOCK</li> <li>25. Install extraction tool onto wishbone &amp; fourth card</li> <li>26. Push &amp; rotate clamp lever CW to closed (360°)</li> <li>27. <b>PGT [B2, CW 2, 5.5], short adj</b></li> <li>28. Drive CET elevator drive CW2, 18 turns</li> <li>29. Drive CET elevator drive CCW2, 6 turns</li> <li>30. Drive CET elevator drive CW2, 8 turns</li> <li>31. Place card tool elevator drive block lever - UNDOCK</li> <li>32. Verify card can be removed</li> <li>33. Re-set elevator drive; PGT: CCW3 to hard stop (~20 turns)</li> <li>34. Stow PGT on self or MFR handle</li> <li>35. Use CMT at top of card #4 to bias card away from structure during card extraction</li> <li>36. Remove card #4 from CEB</li> <li>37. Install card into card stowage enclosure; engage slide lock</li> <li>38. Release clamp lever (push &amp; rotate CCW 360°)</li> <li>39. Temp stow card extraction tool onto ground strap harness bag</li> </ol>	<p style="text-align: center;"><u>NOTE</u></p> <p>Avoid contact with LVPS-R latches due to braycote</p> <ol style="list-style-type: none"> <li>4. Retrieve the following items: <ul style="list-style-type: none"> <li><input type="checkbox"/> LVPS-R (and temp stow on swingarm) <ul style="list-style-type: none"> <li>- Release TM latches (2)</li> </ul> </li> <li><input type="checkbox"/> CEB-R <ul style="list-style-type: none"> <li>- Release TM latches (2); open lid</li> <li>- Release cam latches (2)</li> <li>- Rotate swing arms outboard into detents</li> </ul> </li> </ul> </li> <li>5. Close LOPE (1 latch)</li> <li>6. RMS mnvr to aft shroud</li> </ol>



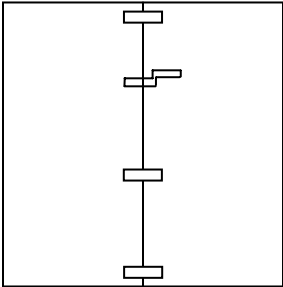
ACS PART II (02:15) (Cont)

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
	<p>40. Stow CMT into ground strap harness bag            41. Transfer PGT to RMS EV prior to bay inspection            42. Inspect empty CEB bay</p> <p><u>CEB-R MODULE INSTALL (00:15)</u></p> <ol style="list-style-type: none"> <li>1. Remove wishbone; temp stow in ground strap harness bag</li> <li>2. Receive CEB-R module from RMS EV</li> <li>3. Mate ground strap harness to CEB-R module</li> <li>4. Install module into ACS to hard stop               <ul style="list-style-type: none"> <li>- Install lower part of module first; roll in</li> </ul> </li> <li>5. Verify CEB-R fully seated, ✓green pop-up indicators (2) visible</li> <li>6. Retrieve MPT from MFR handle</li> </ol> <p style="text-align: center;"><u>NOTE</u> Drive MPT at slow speed while engaging cards</p> <ol style="list-style-type: none"> <li>7. <b>MPT [CW, 20, MTR], 3/16" socket head</b> (black bit)</li> <li>8. Engage anchor drive studs (2), until MTL slips (one top &amp; one bottom) (4.5-11 turns)</li> <li>9. <b>MPT [CW, 20, MTR], 3/16" socket head</b> (black bit)</li> <li>10. Engage card drive screws (4), until MTL slips (7-9 turns);                ✓ white bands visible               <ul style="list-style-type: none"> <li><input type="checkbox"/> Card 1</li> <li><input type="checkbox"/> Card 2</li> <li><input type="checkbox"/> Card 3</li> <li><input type="checkbox"/> Card 4</li> </ul> </li> <li>11. Stow MPT on MFR handle</li> <li>12. Stow ground strap harnesses into bag</li> <li>13. Remove GAM from P11-R turn-around plug on ESM, stow in ground strap bag</li> <li>14. Transfer the following to RMS EV:               <ul style="list-style-type: none"> <li><input type="checkbox"/> Card stowage enclosure</li> <li><input type="checkbox"/> Ground strap harness bag w/ card extraction tool</li> </ul> </li> <li>15. Relocate PIE harness to MWS</li> </ol>	<p>7. Receive PGT; temp stow</p> <p><u>CEB-R MODULE INSTALL</u></p> <ol style="list-style-type: none"> <li>1. Transfer CEB-R module to FF EV</li> </ol> <p>2. Receive tools/hardware from FF EV, &amp; stow on MFR handle:  <input type="checkbox"/> Card stowage enclosure  <input type="checkbox"/> Ground strap harness bag w/ card extraction tool</p>

ACS PART II (02:15) (Cont)

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<div style="display: inline-block; vertical-align: top;"> </div> <p>Top bolt</p> <p>Handle bolt (upper middle bolt)</p> <p>Lower middle bolt</p> <p>Bottom bolt</p> <p>13. Notify MCC all connectors mated (GO for A/T)</p> <p>14. WVS: FF EV Center Cam, P/TV15 HST EVA, OPS (PHOTO/TV FS, <u>SCENES</u>) (1. ACS CEB-R, 2. LVPS-R, and 3. Cable routing)</p> <p>15. ICBC: #15, oppty 5: Cleanup</p> <p>16. ICBC: #15, oppty 6: Close Doors</p> <p>16. RMS: To -V2 Aft Shroud posn</p>	<p><u>LVPS-R INSTALL</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Receive LVPS-R from RMS EV</li> <li>2. Install LVPS-R onto ACS handhold (right to left) <ul style="list-style-type: none"> <li>- Engage two handhold clamps</li> </ul> </li> <li>3. Relocate trash bag to T-bar</li> <li>4. Mate PIE cable: <ul style="list-style-type: none"> <li><input type="checkbox"/> Demate cap from LVPS-R J6, temp stow</li> <li><input type="checkbox"/> Demate cap from PIE P6, temp stow</li> <li><input type="checkbox"/> Mate PIE P6 to LVPS-R J6</li> </ul> </li> <li>5. After PIE mated: Route power output element (POE) cable LVPS-R to CEB-R module: <ul style="list-style-type: none"> <li><input type="checkbox"/> Demate cap from CEB-R J8</li> <li><input type="checkbox"/> Demate POE P8 from dummy connector</li> <li><input type="checkbox"/> Mate POE P8 to CEB-R J8</li> </ul> </li> </ol> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p><u>CLEANUP</u></p> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>1. Egress PFR</li> <li>2. Stow caps into trash bag</li> <li>3. Retrieve PFR and AS from aft shroud</li> <li>4. Translate to aft ASIPE socket</li> <li>5. Stow PFR and AS into aft ASIPE PFR extender: AS: Y=90R, P=2.5, PFR: Y=2, R=B, P=1.5; install Velcro flag or hitch pin</li> </ol> <p><u>CLOSE -V2 DOORS</u></p> <ol style="list-style-type: none"> <li>1. Assist RMS EV with door closure</li> </ol>	<p><u>LVPS-R INSTALL</u></p> <ol style="list-style-type: none"> <li>1. As req'd, transfer LVPS-R to FF EV</li> <li>2. Assist FF EV with caps as reqd</li> </ol> <p><u>CLEANUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Assist FF EV as necessary</li> </ol> <p>← <input type="checkbox"/></p> <p><u>CLOSE -V2 DOORS</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Mnvr to aft shroud</li> <li>2. Retrieve PGT from MFR</li> <li>3. Configure boot plate 90R, stanchion 135L</li> <li>4. Close doors; right then left</li> <li>5. Engage handle bolt and PIP pin</li> <li>6. <b>PGT [B4, CW 2, 23.5], short adj ext</b></li> <li>7. Engage handle bolt, 7 turns</li> </ol>

ACS PART II (02:15) (Cont)

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Top bolt</p> <p>Handle bolt (upper middle bolt)</p> <p>Lower middle bolt</p> <p>Bottom bolt</p> </div> </div> <p style="text-align: center; margin-top: 10px;">+V2 DOORS</p>		<ol style="list-style-type: none"> <li>8. Stow PGT on MFR handle</li> <li>9. Engage top LOCK:               <ul style="list-style-type: none"> <li>- Rotate LOCK arm into bathtub</li> <li>- Pull pin; engage main handle down</li> <li>- Verify green visible on main handle lock pin</li> </ul> </li> <li>10. ✓ Door seals</li> </ol>

## ACS PART II – TASK DATA SHEET

Estimated Task Duration: (2:15)

	FF	W/ RMS
Two EV Crew		2:15

### Tools:

FF EV	RMS EV
<ul style="list-style-type: none"> <li>• Ground strap bag</li> <li>• CMT</li> <li>• Card tool</li> <li>• Card stowage enclosure (4CTE)</li> <li>• Wishbone</li> <li>• PGT w/ short adj</li> <li>• MPT w/ black bit</li> </ul>	NA

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
Card Loks		4 cards X 2 screws = 8				6
CET elevator drive	7/16"	1		B2		18 CW 6 CCW 8 CW
CEB-R anchor drive studs	3/16" socket head (black)	4 (2 req'd)		20, MTR (in-lbs)		To torque (4.5-11)
CEB-R card drive screws	3/16" socket head (black)	4		20, MTR (in-lbs)		7-9 turns (to torque)
-V2 aft shroud door bolts	7/16	4	B4	A4		Release: 7 Install: 7

### Foot Restraints:

Task	S#/FR#	PFR Setting
ACS - RMS	MFR	NA
ACS - FF	FR 4 at 90L↓	AS: P=2.5 PFR: Y=2, R=B, P=1.5
ACS - X-Training (Mass)	FR 4	90 deg convert: 30R↑ AS: Y=120R, P=4 PFR: Y=9, R=A, P=11.5

### Notes:

1. Leave GAM P11-R turn-around plug installed on ESM J11
2. Drive MPT at slow speeds while engaging CEB-R cards
3. There is no soft stop on the upper middle (handle) door latch bolt
4. Avoid contact with LVPS-R latches due to braycoat
5. For CET Elevator Drive:
  - 16-18 turns CW (OUT) extracts card a distance of 1.000" - 1.125"
  - 6-8 turns CCW (IN) drives card in .375" - .500"
  - 6-8 turns CW (OUT) extracts card .375" - .500"

### Cautions:

1. Avoid contact with black MLI surfaces inside aft shroud

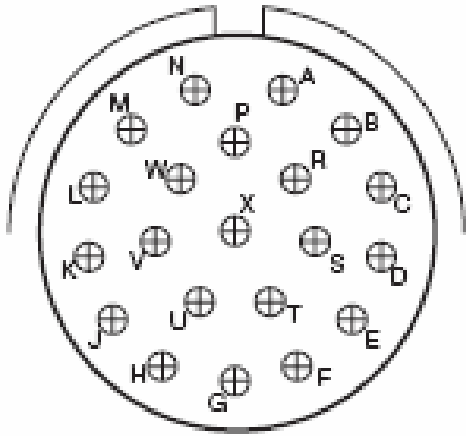
### Warnings:

1. Sharp edges on CEB cards

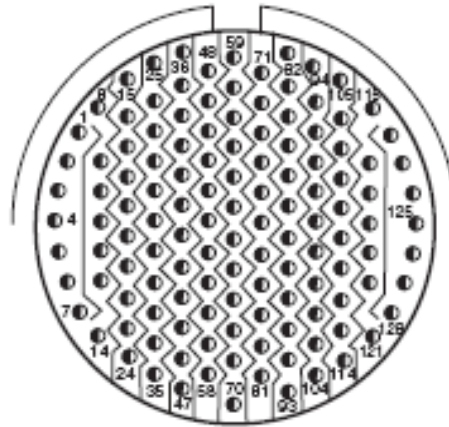
### Acronyms:

CEB=CCD Electronics Board (access cover)  
 CET=Card Extraction Tool  
 NOPE=New ORU Protective Enclosure  
 LOPE=Large ORU Protective Enclosure (heated)

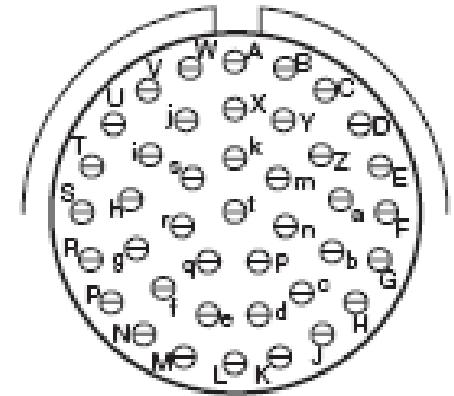
ACS PART II – TASK DATA SHEET (Cont)



PIE J1A PIN MAP  
(P1A is mirror image)



POE P7 and CEB J8 PIN MAP  
(LVPS J7 and POE P8 are mirror images)



LVPS J6 PIN MAP  
(PIE P6 is mirror image)

IV/RMS	FF EV	RMS EV
<p>1. RMS: To MINC NOBL Retrieve posn</p> <p>2. RMS: To HST Bay 5 posn, NOBL 5 Repair</p>	<p><u>BAY 5 NOBL RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to MLI recovery bag stowage area (below aft fixture)</li> <li>2. Retrieve MLI recovery bag; stow on self</li> <li>3. Translate to MINC at MULE</li> <li>4. Retrieve roller and cutters from I-Beam; stow on MWS</li> <li>5. Transfer recovery bag and cutters to RMS EV</li> <li>6. Disengage MINC latches (3); open</li> <li>7. Release NOBL 5 conductive velcro strap (aft slot)</li> <li>8. Retrieve Bay 5 NOBL (aft); transfer to RMS EV</li> <li>9. Verify conductive straps engaged on any remaining NOBLs</li> <li>10. Close MINC lid, 3 latches; verify shear pins pop up (3)</li> </ol> <p><u>BAY 5 MLI REMOVAL &amp; NOBL INSTALLATION</u></p> <ol style="list-style-type: none"> <li>1. Translate to left side of Bay 5 via +V2 doors <ul style="list-style-type: none"> <li>- Fairlead as reqd</li> </ul> </li> <li>2. Receive NOBL 5 from RMS EV</li> <li>3. Transfer NOBL to RMS EV</li> <li>4. Transfer roller to RMS EV</li> </ol>	<p><u>BAY 5 NOBL RETRIEVAL (00:10)</u></p> <ol style="list-style-type: none"> <li>1. Mnvr to MINC; MFR stanchion to 135R, boot plate to 90L</li> <li>2. Receive MLI recovery bag and cutters from FF EV; stow on MWS</li> <li>3. Receive NOBL 5 from FF EV</li> </ol> <p><u>BAY 5 MLI REMOVAL &amp; NOBL INSTALLATION (00:20)</u></p> <ol style="list-style-type: none"> <li>1. Mnvr to Bay 5</li> <li>2. Transfer NOBL 5 to FF EV</li> <li>3. As reqd, remove vent plugs (2) from port vent holes; temp stow</li> <li>4. Cut Bay 5 door MLI ground wires (2) <ul style="list-style-type: none"> <li>- Top and bottom on knob side</li> </ul> </li> <li>5. Fold and remove Bay 5 MLI</li> <li>6. Stow MLI in recovery bag</li> <li>7. Receive NOBL from FF EV; mnvr for installation</li> <li>8. Install Bay 5 NOBL and integral vent plugs (4)</li> <li>9. Connect NOBL ground cap on J-hook bolt</li> <li>10. Release radiator cover latches (3)</li> <li>11. Open radiator cover, re-engage latches (3)</li> <li>12. Remove radiator protective film (2 pieces); stow in MLI recovery bag</li> <li>13. Release radiator latches (3)</li> <li>14. Close NOBL radiator, engage latches (3)</li> <li>15. Receive roller from FF EV</li> <li>16. Roll surface of radiator slowly and deliberately: <ul style="list-style-type: none"> <li>- Starting from center of radiator, move roller outbd in all directions, covering entire surface of radiator</li> </ul> </li> </ol>

**NOBL 5 (00:30) (Cont)**

<b>IV/RMS</b>	<b>FF EV</b>	<b>RMS EV</b>
		- Gently push on NOBL-ER frame to assess adhesion 17. Stow MLI recovery bag onto MFR handle

**FINAL CLOSEOUT/INGRESS (01:10)**

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
<p>1. RMS: To Airlock MFR Ingress/Egress posn (PDRS, <u>EVA CLOSEOUT</u>)</p> <p>2. RMS: Perform <u>MFR RELEASE</u></p> <p>3. On EV GO: Release MFR</p> <p>4. RMS: To Airlock Ingress posn</p> <p>5. Notify MCC EV crew clear of HST</p>	<p><u>FINAL PLB CLEANUP</u> (00:45)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Translate to airlock; close LOPE lid latches (2)</li> <li>3. Receive MFR handle from RMS EV; stow in airlock</li> <li>4. Close thermal cover</li> <li>5. Translate to Orbiter port bay 10</li> <li>6. Assist RMS EV with MFR stow as req'd; posn body fwd of RMS EV</li> <li>7. Tether MFR to APC</li> <li>8. Squeeze APC handle latch and rotate handle</li> <li>9. Remove tether from MFR and APC</li> <li>10. Configure center TA for landing: A=6, B=6, C=0, ext (1)</li> <li>11. Inspect P105 and P106 cover (+V2 side, stbd/aft)</li> <li>12. Inspect main umbilical mechanism (in-between +V2 and -V3; aft/stbd/inbd)</li> <li>13. Remove BAPS post center PIP pins (2); stow</li> <li>14. √ Velcro engaged on BAPS attach fitting clevis PIP pins</li> </ol> <p><u>FINAL TOOL INVENTORY</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Translate to airlock</li> <li>2. Perform tool inventory</li> </ol>	<p><u>FINAL PLB CLEANUP</u> (00:20)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Mnvr to airlock</li> <li>3. Perform tool inventory</li> <li>4. MFR boot plate D-ring 0°</li> <li>5. MFR stanchion 0°, boot plate 0°, MFR handle 0°</li> <li>6. Attach boot plate tether to stanchion</li> <li>7. Remove MFR handle; transfer to FF EV</li> <li>8. Egress MFR</li> </ol> <p><u>MFR STOW</u> (00:25)</p> <ol style="list-style-type: none"> <li>1. Ride RMS to Orbiter port bay 10</li> <li>2. Stow MFR stanchion, √ latched</li> <li>3. Release MFR/RMS tether and stow</li> <li>4. Hold MFR while RMS preps for ungrapple</li> <li>5. Give RMS operator GO to release MFR</li> <li>6. Install MFR hooks onto upper APC fitting and pivot MFR down</li> <li>7. Fully install bottom of MFR into APC latch, install PIP pin</li> <li>8. Translate to LGA (port/fwd); remove LGAP cover</li> <li>9. Translate to MULE aft/port; stow LGAP cover (2 captive lock pins); stow PIP pin in pouch</li> <li>10. Translate to I-Beam</li> <li>11. Stow cutters and roller: <ul style="list-style-type: none"> <li>- For cutter, engage Velcro flap; external strap</li> <li>- For roller, engage internal straps (2); external strap</li> </ul> </li> </ol> <p><u>FINAL TOOL INVENTORY</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Translate to airlock (ride RMS back)</li> </ol>



**FINAL CLOSEOUT/INGRESS (01:10) (Cont)**

IV/RMS	FF EV (8 Ball)	RMS EV (Grunsfeld)
	<p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Remove RMS safety tether from RMS; attach to left waist tether - Engage both paddle hook slide locks - L</li> <li>2. Translate to Orbiter port sill (aft of RMS shoulder)</li> <li>3. Remove safety tether from slider</li> <li>4. Gently relocate slider fwd of RMS shoulder</li> <li>5. Translate fwd of RMS shoulder</li> <li>6. Stow slider, close cushion; engage quarter turn fastener</li> <li>7. Ingress airlock</li> <li>8. Open DCM cover; Velcro to self</li> <li>9. Connect SCU to DCM; ✓ SCU locked</li> <li>10. WATER - OFF (expect "H2O IS OFF" msg)</li> <li>11. Thermal cover - close</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>12. Verify hardware clear of hatch</li> <li>13. Close, lock outer hatch</li> <li>14. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>	<p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Ingress airlock</li> <li>2. Attach waist tether to airlock D-ring extender - Engage crew hook lock slide lock - L</li> <li>3. Verify FF EV's tether config</li> </ol> <ol style="list-style-type: none"> <li>4. Open DCM cover; Velcro to self</li> <li>5. Connect SCU to DCM; ✓ SCU locked</li> <li>6. WATER - OFF (expect "H2O IS OFF" msg)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>7. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>

**NOBL 7 (00:20)**

I

IV/RMS	FF EV	RMS EV
<p>1. RMS: To MINC NOBL Retrieve posn</p> <p>2. RMS: To HST Bay 7 posn, NOBL 7 Repair</p>	<p><u>BAY 7 NOBL RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to MINC at MULE</li> <li>2. Disengage MINC latches (3); open</li> <li>3. Release NOBL 7 conductive Velcro strap (fwd slot)</li> <li>4. Retrieve Bay 7 NOBL (fwd); transfer to RMS EV</li> <li>5. Verify conductive straps engaged on any remaining NOBLs</li> <li>6. Close MINC lid, 3 latches; verify shear pins pop up (3)</li> </ol> <p><u>BAY 7 NOBL INSTALLATION</u></p> <ol style="list-style-type: none"> <li>1. Translate to Bay 7</li> <li>2. Assist RMS EV as req'd</li> </ol>	<p><u>BAY 7 NOBL RETRIEVAL &amp; INSTALLATION (00:20)</u></p> <ol style="list-style-type: none"> <li>1. Mnv'r to MINC</li> <li>2. Boot plate and MFR stanchion as req'd</li> <li>3. Receive NOBL 7 from FF EV</li> <li>4. Mnv'r to Bay 7</li> <li>5. Install Bay 7 NOBL and integral vent plugs (4)</li> <li>6. Connect NOBL ground cap on J-hook bolt</li> </ol>



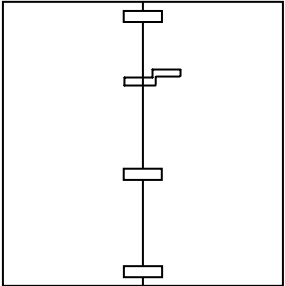
ACS REPAIR – COMPLETION (01:40) (Cont)

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
	<p>32. Use CMT at top of card #4 to bias card away from structure during card extraction</p> <p>33. Remove card #4 from CEB</p> <p>34. Install card into card stowage enclosure; engage slide lock</p> <p>35. Release clamp lever (push &amp; rotate CCW 360°)</p> <p>36. Temp stow card extraction tool onto ground strap harness bag</p> <p>37. Stow CMT into ground strap harness bag</p> <p>38. Inspect empty CEB bay</p> <p><u>CEB-R MODULE INSTALL (00:25)</u></p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Remove wishbone; temp stow in ground strap harness bag</li> <li>3. Receive CEB-R module from RMS EV</li> <li>4. Mate ground strap harness to CEB-R module</li> <li>5. Install module into ACS to hard stop               <ul style="list-style-type: none"> <li>- Install lower part of module first; roll in</li> </ul> </li> <li>6. Verify CEB-R fully seated, ✓ green pop-up indicators (2) visible</li> <li>7. Retrieve MPT from MFR handle</li> </ol> <p style="text-align: center;"><u>NOTE</u> Drive MPT at slow speed while engaging cards</p> <ol style="list-style-type: none"> <li>8. <b>MPT [CW, 20, MTR], 3/16" socket head</b> (black bit)</li> <li>9. Engage anchor drive studs (2), until MTL slips (one top &amp; one bottom) (4.5-11 turns)</li> <li>10. <b>MPT [CW, 20, MTR], 3/16" socket head</b> (black bit)</li> <li>11. Engage card drive screws (4), until MTL slips (7-9 turns); ✓ white bands visible               <ul style="list-style-type: none"> <li><input type="checkbox"/> Card 1</li> <li><input type="checkbox"/> Card 2</li> <li><input type="checkbox"/> Card 3</li> <li><input type="checkbox"/> Card 4</li> </ul> </li> <li>12. Stow MPT on MFR handle</li> <li>13. Stow ground strap harnesses into bag</li> <li>14. Demate GAM/P11-R from ESM and stow in ground</li> </ol>	<p><u>CEB-R MODULE INSTALL</u></p> <ol style="list-style-type: none"> <li>1. Transfer CEB-R module to FF EV</li> <li>2. Perform glove inspection</li> <li>3. Ensure LVPS is accessible to FF EV</li> </ol>

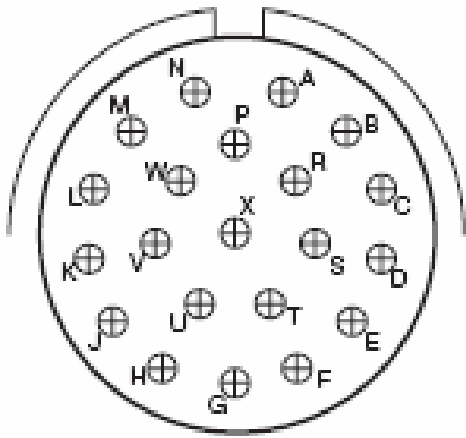
**ACS REPAIR – COMPLETION (01:40) (Cont)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>3. Notify MCC all connectors mated (GO for A/T)</p> <p>4. WVS: FF EV Center Cam, P/TV15 HST EVA, OPS (PHOTO/TV FS, <u>SCENES</u>) (1. ACS CEB-R, 2. LVPS-R, and 3. cable routing)</p>	<p>strap bag; re-install original ESM/P11 cap back onto ESM</p> <p>15. Transfer the following to RMS EV:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Card stowage enclosure</li> <li><input type="checkbox"/> Ground strap harness bag w/ card extraction tool</li> </ul> <p>16. Receive PIE harness from RMS EV</p> <p>17. Install PIE harness:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tether to and demate HST P1 from ACS J1</li> <li><input type="checkbox"/> Mate PIE J1A to HST P1</li> <li><input type="checkbox"/> Mate PIE P1A to ACS J1</li> </ul> <p>18. Temp stow free end of PIE harness on MWS</p> <p><u>LVPS-R INSTALL</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Retrieve/receive LVPS-R from RMS EV</li> <li>2. Install LVPS-R onto ACS handhold (right to left) <ul style="list-style-type: none"> <li>- Engage two handhold clamps</li> </ul> </li> <li>3. Retrieve PIE cable from temp stow location</li> <li>4. Mate PIE cable: <ul style="list-style-type: none"> <li><input type="checkbox"/> Demate cap from LVPS-R J6, temp stow</li> <li><input type="checkbox"/> Demate cap from PIE P6, temp stow</li> <li><input type="checkbox"/> Mate PIE P6 to LVPS-R J6</li> </ul> </li> <li>5. After PIE mated: Route power output element (POE) cable LVPS-R to CEB-R module: <ul style="list-style-type: none"> <li><input type="checkbox"/> Remove cap from CEB-R J8</li> <li><input type="checkbox"/> Demate POE P8 from dummy connector</li> <li><input type="checkbox"/> Mate POE P8 to CEB-R J8</li> </ul> </li> </ol> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p><u>CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Egress PFR</li> <li>2. Stow caps into trash bag</li> <li>3. Retrieve PFR and AS from aft shroud</li> </ol>	<p>4. Receive tools/hardware from FF EV, &amp; stow on MFR handle:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Card stowage enclosure</li> <li><input type="checkbox"/> Ground strap harness bag w/ card extraction tool</li> </ul> <p>5. Transfer PIE harness to FF EV</p> <p>6. Provide FF EV stabilization as req'd</p> <p><u>LVPS-R INSTALL</u></p> <ol style="list-style-type: none"> <li>1. As req'd, transfer LVPS-R to FF EV</li> <li>2. Assist FF EV as req'd</li> </ol> <p><u>CLEANUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Assist FF EV as necessary</li> </ol>

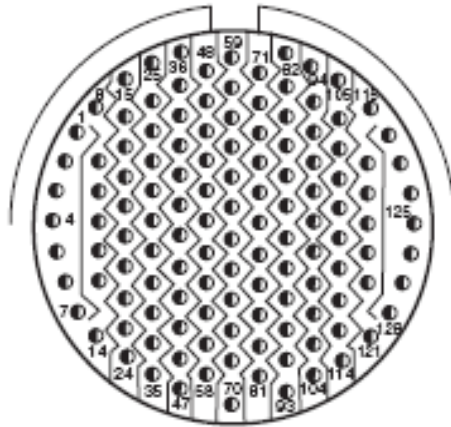
ACS REPAIR – COMPLETION (01:40) (Cont)

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>5. RMS: To -V2 Aft Shroud posn</p> <p>6. WVS: RMS EV Center Cam (Aft shroud overview prior to door close)</p>  <p>Top bolt</p> <p>Handle bolt (upper middle bolt)</p> <p>Lower middle bolt</p> <p>Bottom bolt</p>	<p>4. Translate to aft ASIPE socket</p> <p>5. Stow PFR and AS into aft ASIPE PFR socket: AS: <b>Y=90R, P=3.5</b>, PFR: <b>Y=6, R=C, P=3.5</b> (STIS); install AS Velcro flag</p> <p><u>CLOSE -V2 DOORS</u></p> <ol style="list-style-type: none"> <li>1. Close right aft shroud door</li> <li>2. Retrieve 80-in tether (left door); stow</li> <li>3. Close left aft shroud door</li> <li>4. Assist RMS EV in door closure</li> </ol>	<p><u>CLOSE -V2 DOORS</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Mnvr to aft shroud ← □</li> <li>2. Retrieve PGT from MFR</li> <li>3. Configure boot plate 0°, stanchion 135L</li> <li>4. Close doors; right then left</li> <li>5. Engage handle bolt and PIP pin</li> <li>6. <b>PGT [B4, CW 2, 23.5], short adj</b></li> <li>7. Engage handle bolt, 7 turns</li> <li>8. Engage LOCKs (3): <ul style="list-style-type: none"> <li>- Rotate LOCK arm into bathtub</li> <li>- Pull pin; engage main handle down</li> <li>- Verify green visible on main handle lock pin</li> </ul> </li> <li>9. ✓ Door seals</li> </ol>

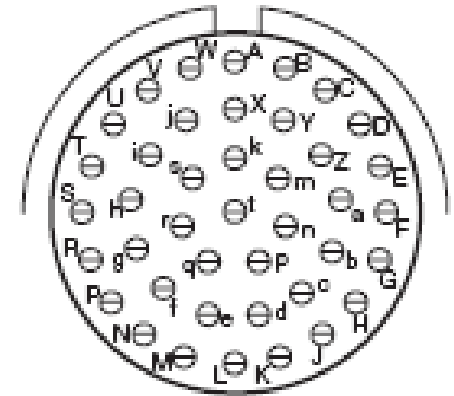
ACS REPAIR – COMPLETION – TASK DATA SHEET



PIE J1A PIN MAP  
(P1A is mirror image)



POE P7 and CEB J8 PIN MAP  
(LVPS J7 and POE P8 are mirror images)



LVPS J6 PIN MAP  
(PIE P6 is mirror image)

**DAILY CLOSEOUT/INGRESS (00:40)**

IV/RMS	FF EV (Grunsfeld)	RMS EV (8 Ball)
<p>1. RMS: To Airlock MFR Ingress/Egress posn (PDRS, <u>EVA CLOSEOUT</u>)</p> <p>2. RMS: To RMS Extended Park posn (PDRS, <u>EXTENDED PARK</u>)</p>	<p><u>PLB CLEANUP</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Translate to FSS</li> <li>3. Inspect main umbilical mechanism</li> <li>4. Remove BAPS post center PIP pins (2); stow</li> <li>5. Reconfigure center TA (due aft): A=6, B=6, <b>C=0</b>, extension to 1</li> <li>6. Reconfigure port TA: extension to 1, attach Velcro flag</li> <li>7. Perform tool inventory</li> <li>8. Translate to airlock; close LOPE lid latches (2)</li> <li>9. Open thermal cover</li> <li>10. Receive MFR handle from RMS EV</li> </ol> <p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Transfer MFR handle to RMS EV</li> <li>2. Release MFR/RMS tether</li> <li>3. Remove RMS safety tether from RMS; attach to right EMU D-ring or waist tether - Engage crew hook slide lock - L</li> <li>4. Translate to Orbiter port sill (aft of RMS shoulder)</li> <li>5. Remove safety tether from slider</li> <li>6. Gently relocate slider fwd of RMS shoulder</li> <li>7. Translate fwd of RMS shoulder</li> <li>8. Stow slider, close cushion; engage quarter turn fastener</li> <li>9. Ingress airlock</li> <li>10. Open DCM cover; Velcro to self</li> <li>11. Connect SCU to DCM; √ SCU locked</li> <li>12. WATER - OFF (expect "H2O IS OFF" msg)</li> <li>13. Thermal cover - close</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>14. Verify hardware clear of hatch</li> <li>15. Close, lock outer hatch</li> <li>16. Go to PRE REPRESS (DEPRESS/REPRESS CC)</li> </ol>	<p><u>PLB CLEANUP</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Mnvr to airlock</li> <li>3. Perform tool inventory</li> <li>4. MFR stanchion 0°; boot plate 0°</li> <li>5. MFR handle 0°</li> <li>6. Remove MFR handle; transfer to FF EV</li> <li>7. Egress MFR, stow boot plate tether</li> </ol> <p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Ingress airlock</li> <li>2. Attach waist tether to airlock D-ring extender - Engage crew hook slide lock - L</li> <li>3. Receive MFR handle from FF EV; stow</li> <li>4. Verify FF EV's tether config</li> <li>5. Open DCM cover; Velcro to self</li> <li>6. Connect SCU to DCM; √ SCU locked</li> <li>7. WATER - OFF (expect "H2O IS OFF" msg)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div>



**CONTINGENCY DAILY CLOSEOUT/INGRESS (00:55)**

IV/RMS	FF EV	RMS EV
<p>1. RMS: To Airlock MFR Ingress/Egress posn (PDRS, <u>EVA CLOSEOUT</u>)</p> <p>2. RMS: Perform <u>MFR RELEASE</u></p> <p>3. On EV GO: Release MFR</p> <p>4. RMS: To Airlock Ingress posn</p>	<p><u>PLB CLEANUP</u> (00:45)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Translate to airlock</li> <li>3. Perform tool inventory</li> <li>4. Receive MFR handle from RMS EV; stow in airlock</li> <li>5. Close thermal cover</li> <li>6. Translate to Orbiter port bay 10</li> <li>7. Assist RMS EV with MFR stow as req'd; posn body fwd of RMS EV</li> <li>8. Tether MFR to APC</li> <li>9. Squeeze APC handle latch and rotate handle</li> <li>10. Remove tether from MFR and APC</li> <li>11. Configure center TA (due aft): A=6, B=6, <b>C=0</b>, ext (1)</li> <li>12. Inspect main umbilical</li> <li>13. Remove BAPS post center PIP pins (2); stow</li> <li>14. Translate to airlock; open thermal cover</li> </ol> <p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Remove RMS safety tether from RMS; attach to left waist tether               <ul style="list-style-type: none"> <li>- Engage both paddle hook slide locks - L</li> </ul> </li> <li>2. Translate to Orbiter port sill (aft of RMS shoulder)</li> <li>3. Remove safety tether from slider</li> <li>4. Gently relocate slider fwd of RMS shoulder</li> </ol>	<p><u>PLB CLEANUP</u> (00:20)</p> <ol style="list-style-type: none"> <li>1. Perform glove inspection</li> <li>2. Mnvr to airlock</li> <li>3. Perform tool inventory</li> <li>4. MFR stanchion 0°, boot plate 0°, MFR handle 0°</li> <li>5. Attach boot plate tether to stanchion</li> <li>6. Remove MFR handle; transfer to FF EV</li> <li>7. Egress MFR</li> </ol> <p><u>MFR STOW</u> (00:25)</p> <ol style="list-style-type: none"> <li>1. Ride RMS to Orbiter port bay 10</li> <li>2. Stow MFR stanchion, √ latched</li> <li>3. Release MFR/RMS tether and stow</li> <li>4. Hold MFR while RMS preps for ungrapple</li> <li>5. Give RMS operator GO to release MFR</li> <li>6. Install MFR hooks onto upper APC fitting and pivot MFR down</li> <li>7. Fully install bottom of MFR into APC latch, install PIP pin</li> <li>8. Translate to airlock (ride RMS back)</li> </ol> <p><u>AIRLOCK INGRESS</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Ingress airlock</li> <li>2. Attach waist tether to airlock D-ring extender               <ul style="list-style-type: none"> <li>- Engage crew hook lock slide lock - L</li> </ul> </li> <li>3. Verify FF EV's tether config</li> </ol>

**CONTINGENCY DAILY CLOSEOUT/INGRESS (00:55) (Cont)**

IV/RMS	FF EV	RMS EV
	<p>5. Translate fwd of RMS shoulder                      6. Stow slider, close cushion; engage quarter turn fastener                      7. Ingress airlock                      8. Open O2 actuator cover; Velcro to self                      9. Connect SCU to DCM; √ SCU locked                      10. WATER - OFF (expect "H2O IS OFF" msg)                      11. Thermal cover - close</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u>                      Do not close hatch until EMU                      water – OFF for 2 min</p> </div> <p>12. Verify hardware clear of hatch                      13. Close, lock outer hatch                      14. Go to PRE REPRESS (<u>DEPRESS/REPRESS CC</u>)</p>	<p>4. Open O2 actuator cover; Velcro to self                      5. Connect SCU to DCM; √ SCU locked                      6. WATER - OFF (expect "H2O IS OFF" msg)</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u>                      Do not close hatch until EMU                      water – OFF for 2 min</p> </div> <p>7. Go to PRE REPRESS (<u>DEPRESS/REPRESS CC</u>)</p>

# CONTINGENCY EGRESS/DAILY SETUP (01:00)

I

IV/RMS	FF EV	RMS EV
1. RMS: To MFR Pre-Grapple posn          2. RMS: Perform <u>MFR SETUP</u>	<p><u>INITIAL CONFIG</u> √ Per nominal procedures</p> <p><u>EGRESS (00:10)</u></p> <ol style="list-style-type: none"><li>1. Thermal cover - open</li><li>2. Egress airlock</li><li>3. Translate to port sill slidewire cushion</li><li>4. Open aft 1/4 turn fastener</li><li>5. Gently relocate slider aft of RMS shoulder</li><li>6. Translate aft of RMS shoulder</li><li>7. Attach safety tether to aft-most slider: - Engage crew hook slide lock - L</li><li>8. Remove RMS EV's safety tether from self; attach to A/L truss center/stbd handrail standoff - Engage crew hook slide lock - L</li></ol> <p><u>MFR SETUP (00:15)</u></p> <ol style="list-style-type: none"><li>1. Translate to Orbiter port bay 10</li><li>2. Tether MFR to APC and unlatch MFR (Lg/sm RET)</li><li>3. GCA SRMS for MFR grapple</li><li>4. When SRMS in position, install MFR into EE</li><li>5. Give SRMS operator GO to capture and rigidize</li><li>6. Retrieve lg/sm RET from APC</li><li>7. Give RMS operator GO to mnvr RMS to A/L</li></ol> <p><u>BAPS POST SETUP (00:05)</u></p> <ol style="list-style-type: none"><li>1. Translate to FSS</li><li>2. Install BAPS post center pip pins (2)</li></ol> <p><u>IF EVA2: TRANSLATION AID SETUP (00:05)</u></p> <ol style="list-style-type: none"><li>1. Configure center TA (straight up): S↓, A=6, B=6, <b>C=6</b>, extended (1)</li></ol>	<p><u>INITIAL CONFIG</u> √ Per nominal procedures</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"><li>1. Release waist tether from airlock D-ring extender</li><li>2. Egress airlock</li></ol> <p><u>IF EVA2: TRANSLATION ADAPTATION</u></p> <ol style="list-style-type: none"><li>1. Perform translation adaptation</li></ol> <p><u>MFR SETUP (00:35)</u></p> <ol style="list-style-type: none"><li>1. Translate to A/L</li><li>2. Install MFR/RMS tether; tighten</li><li>3. Install waist tether onto truss HR - Engage crew hook slide lock - L</li><li>4. Perform safety tether swap from A/L truss HR to RMS HR standoff (black end) - Engage crew hook slide lock - L</li><li>5. Give RMS operator GO to roll EE</li><li>6. Deploy MFR stanchion</li><li>7. Retrieve MFR handle from airlock/temp stow</li><li>8. Install MFR handle onto MFR</li><li>9. Close A/L thermal cover</li><li>10. Attach boot plate lanyard to MWS lower D-ring</li><li>11. Ingress MFR</li><li>12. Rotate stanchion to 135L; boot plate to 0°</li><li>13. Pitch MFR handle fully out</li></ol>

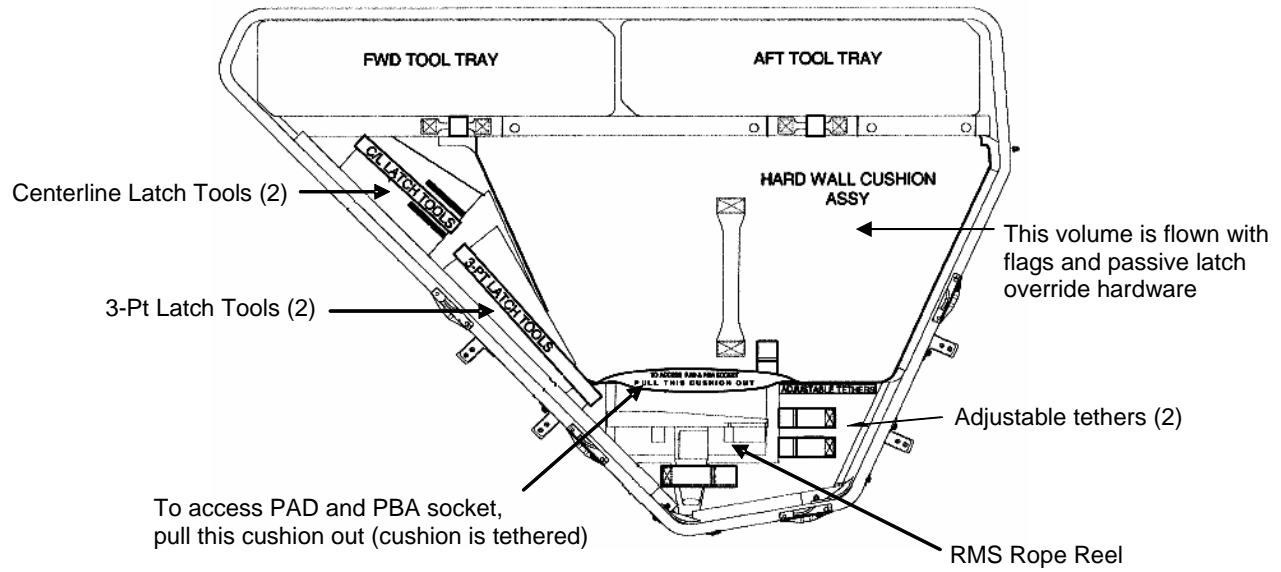
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## TOOLS AND STOWAGE

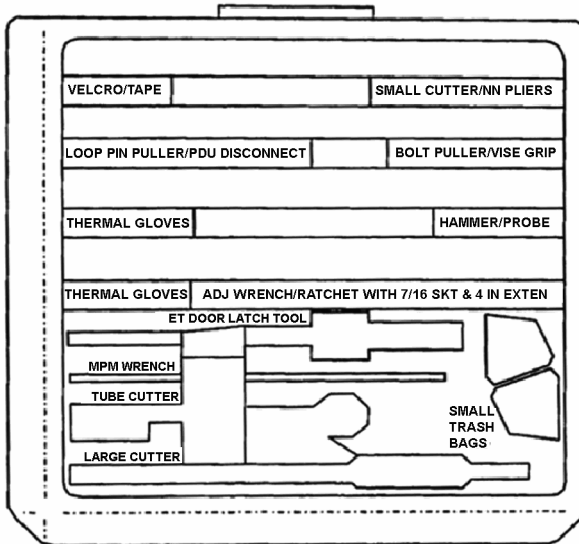
PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA) .....	TEMP FS 8-2
STBD LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA).....	TEMP FS 8-2b
PGT CHECKOUT .....	8-3
PGSC-PGT CONNECTION (A31P AND 760XD) .....	8-4
PROGRAM PGT SETTINGS .....	TEMP FS 8-5
DOWNLOAD/ERASE EVENT LOG .....	TEMP FS 8-5
TOOL SETTING MATRIX .....	TEMP FS 8-6
STS-125 PGT SETTINGS TABLE .....	TEMP FS 8-7
PISTOL GRIP TOOL CONTINGENCIES.....	TEMP FS 8-8
PISTOL GRIP TOOL.....	FS 8-9
MULTI-SETTING TORQUE LIMITER.....	FS 8-10
EVA EQUIPMENT STOWAGE LIST (BY ITEM).....	FS 8-11
EVA EQUIPMENT STOWAGE LIST (BY LOCATION).....	FS 8-15
PFR POSITIONS AND TA SETTINGS .....	FS 8-19
EMU EQUIPMENT STOWAGE LIST (BY ITEM).....	FS 8-23
EMU EQUIPMENT STOWAGE LIST (BY LOCATION).....	FS 8-25

**TOOLS AND  
STOWAGE**

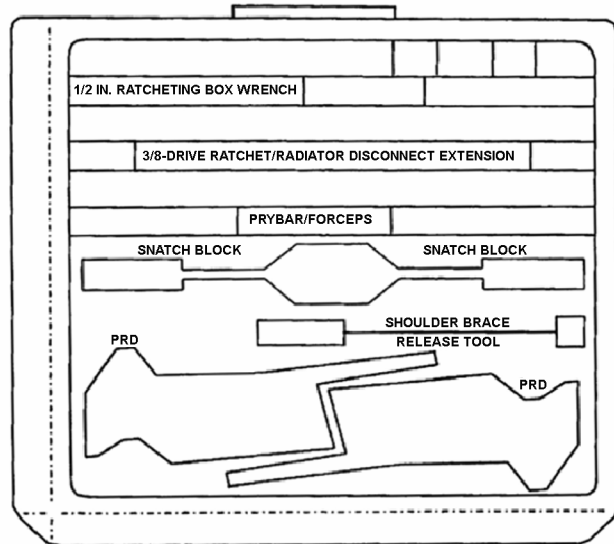
# PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA)



TOOLS AND STOWAGE

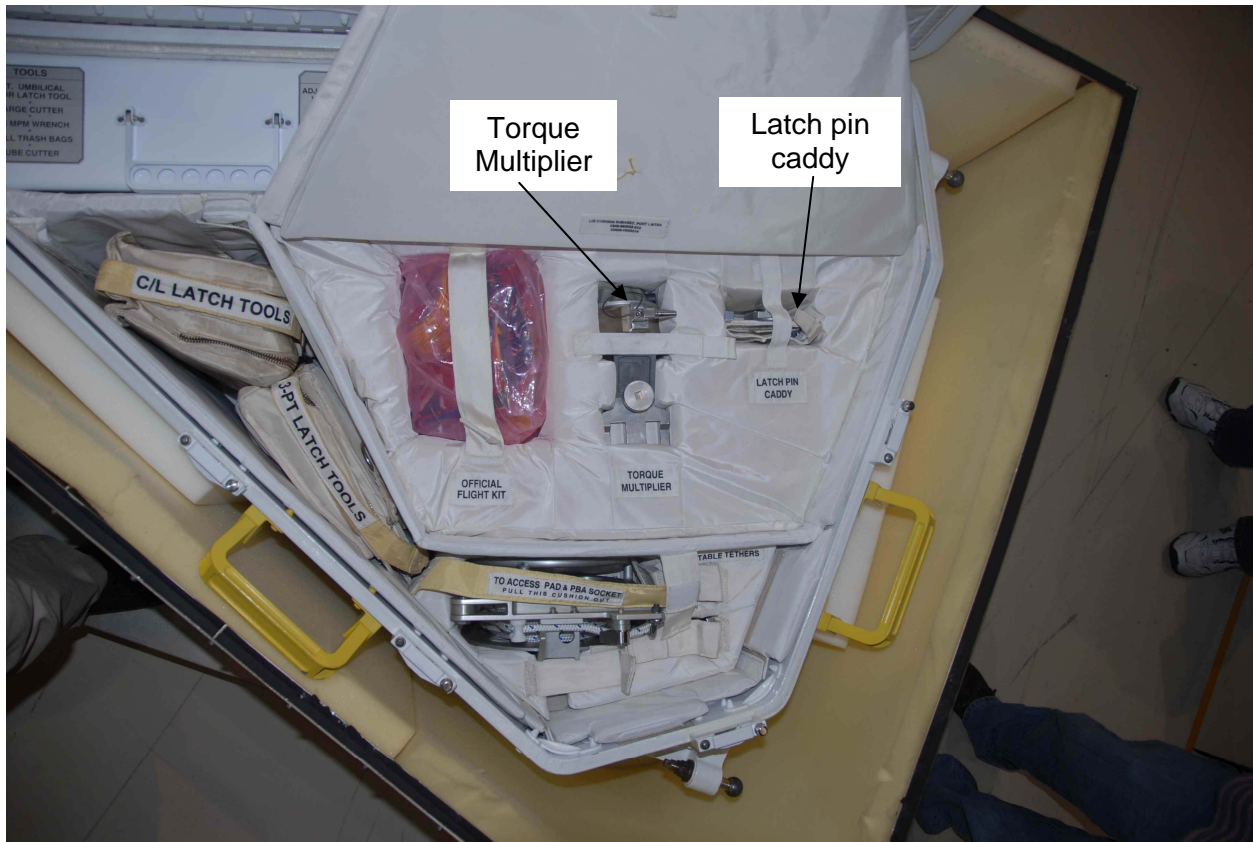


Forward Tray Layout and Labels

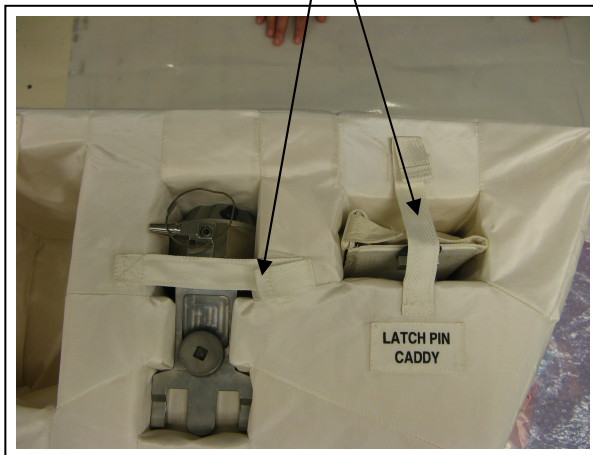


Aft Tray Layout and Labels

# PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA) (Cont)



Velcro straps

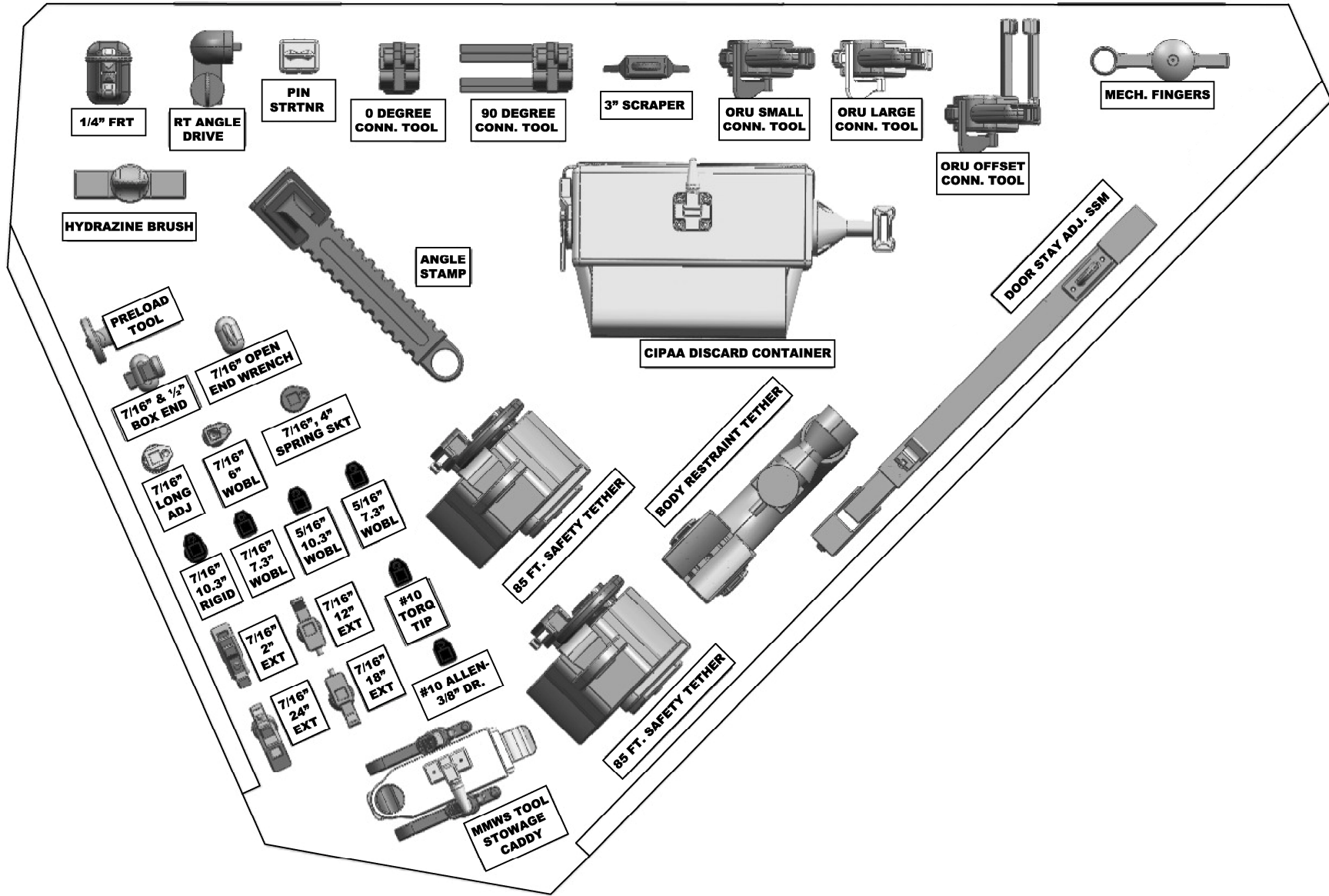


TORQUE MULTIPLIER AND LATCH PIN CADDY



TORQUE MULTIPLIER PULL TEST

# STBD LIGHTWEIGHT TOOL STORAGE ASSEMBLY (TSA)





## PROGRAM PGT SETTINGS

1. Perform PGSC-PGT CONNECTION (A31P AND 760XD)  
If loading settings from a set file in C:\SPOCAPPS\PGT32\SETTINGS:
  2. Select FILE, OPEN ...
  3. Select desired settings file, OPEN
4. Select TORQUE/REVOLUTIONS SETTINGS tab in Pistol Grip Tool Remote Software window
5. Enter changes to table as necessary
6. Select SPEED & POWER MANAGEMENT SETTINGS tab
7. Enter changes to table as necessary
8. ✓Ratchet collar – not MTR
9. Select TOOL, SEND DATA TO TOOL
10. Select desired tables for upload
11. ✓All sent settings – black on gray (programmed successfully)  
If saving new settings to a file:
  12. Select FILE, SAVE AS ...
  13. Type in new file name, SAVE
14. Verify programmed settings on PGT by cycling MODE/torque collar/speed collar; compare displayed values to expected values

## DOWNLOAD/ERASE EVENT LOG

1. Perform PGSC-PGT CONNECTION (A31P AND 760XD)
2. ✓Ratchet collar – not MTR
3. Select EVENT LOG tab
4. Select TOOL, GET DATA FROM TOOL...
5. Select TOOL EVENT LOG DATA (READ-ONLY)
6. ✓DOWNLOAD PGT EVENT LOG dialog box appears
7. Select YES to download data
8. ✓SAVE EVENT LOG DATA TO FILE dialog box appears
9. Enter name for file
10. Select SAVE
11. ✓Event Log data displayed in viewer
12. If erasing Event Log data from PGT, select OK in ERASE EVENT LOG dialog box

## TOOL SETTING MATRIX

### PGT PROGRAMMED PARAMETERS

PROFILE	NOMINAL TORQUE ft-lb	RANGE (Low-High) ft-lb	MAX TURNS	SPEED	RPM	PGT MTL SETTINGS ft-lb
A1	0.7	0-1.7,3.7	∞	CW 1	10	2.5 (2.0-3.0)
A2	5.0	4.0-6.0	∞	CW 2	20	5.5 (4.4-6.6)
A3	10.0	9.0-11.0	∞	CW 3	60	10.5 (8.4-12.4)
A4	23.0	20.7-25.3	∞	CCW 1	10	15.5 (12.4-18.6)
A5	15.0	13.5-16.5	∞	CCW 2	20	23.5 (18.8-28.2)
A6	25.5	22.9-28.1	∞	CCW 3	60	30.5 (24.4-36.6)
A7	5.0	4.0-6.0	110			
B1	20.0	18.0-22.0	∞			
B2	4.0	3.0-5.0,7.0	∞			
B3	2.0	1.0-3.0,5.0	7.75			
B4	17.0	15.3-18.7	∞			
B5	7.5	6.5-8.5	∞			
B6	8.5	7.5-9.5	∞			
B7	13.0	11.7-14.3	∞			

### MTL SETTINGS (ft-lb)

Standard	Cont
2 (1.6-2.4)	3
5 (4.0-6.0)	8
10 (8.0-12.0)	15
23 (18.4-27.6)	30
38 (30.4-45.6)	45

## STS-125 PGT SETTINGS TABLE

SETTING	TORQUE SETPOINT (FT-LB)	TORQUE WINDOW (FT-LB)	TORQUE THRESHOLD (FT-LB)	TURNS	ANGLE WINDOW
A1	0.7	+1/-1	0.5	Infinite	N/A
A2	5.0	±1.0	3.0	Infinite	N/A
A3	10.0	±1.0	3.0	Infinite	N/A
A4	23.0	±2.0	3.0	Infinite	N/A
A5	15.0	±1.5	3.0	Infinite	N/A
A6	25.5	±2.0	3.0	Infinite	N/A
A7	5.0	±1.0	3.0	110	N/A
B1	20.0	±2.0	3.0	Infinite	N/A
B2	4.0	±1.0	3.0	Infinite	N/A
B3	2.0	±1.0	1.0	7.75	N/A
B4	17.0	±1.7	3.0	Infinite	N/A
B5	7.5	±1.0	3.0	Infinite	N/A
B6	8.5	±1.0	3.0	Infinite	N/A
B7	13.0	±1.3	3.0	Infinite	N/A

SETTING	CCW1	CCW2	CCW3	CW3	CW2	CW1
SPEED (RPM)	10	20	60	60	20	10

SLEEP TIME (MIN)	15
AUTO-OFF TIME (MIN)	30

MULTI-SETTING TORQUE LIMITER (MTL) SETTINGS
2.5
5.5
10.5
15.5
23.5
30.5

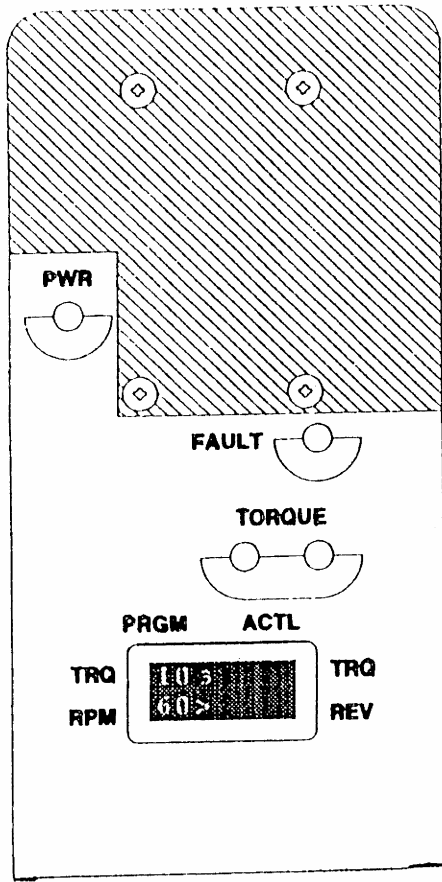
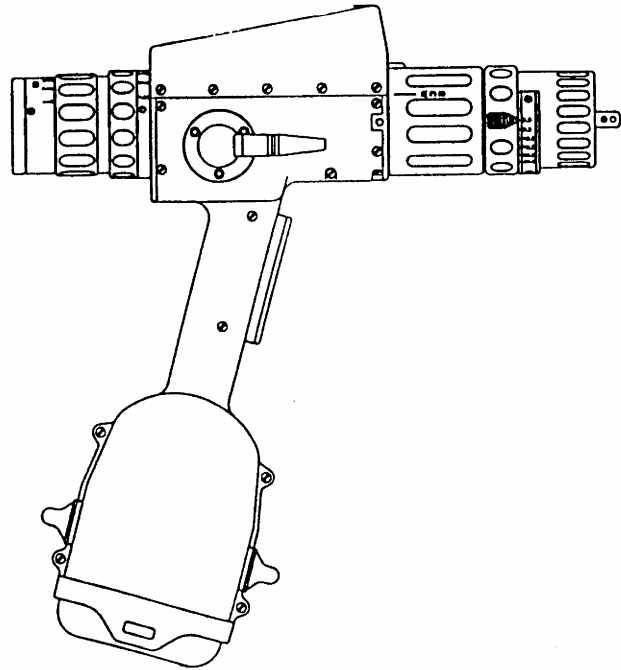
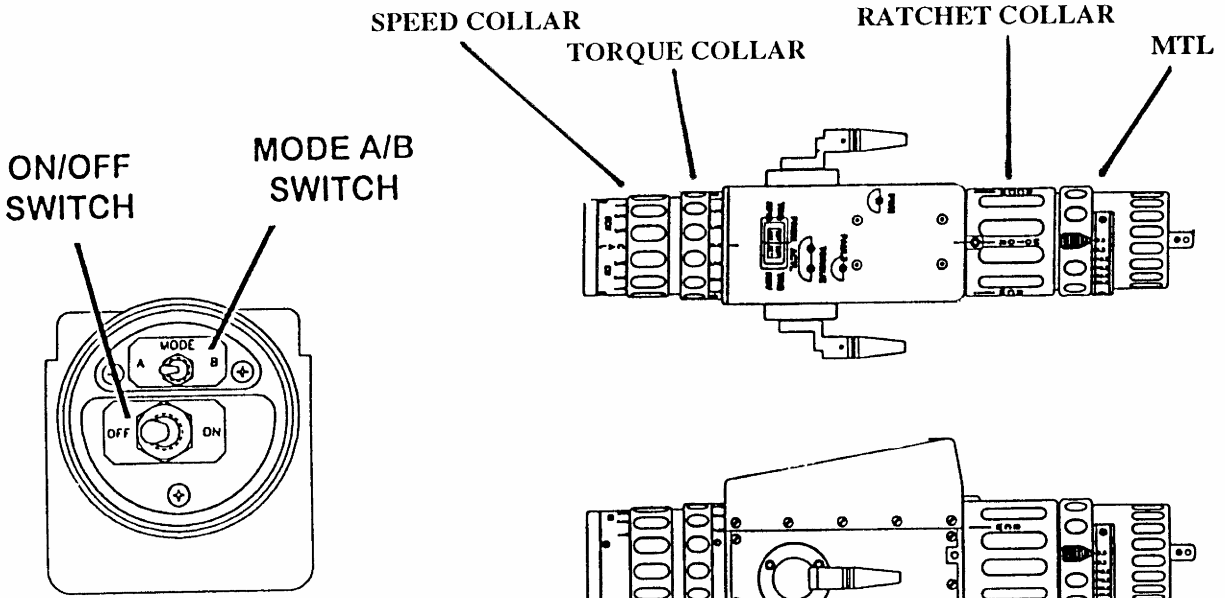
### MPT DATA

	TORQUE	SPEED	TORQUE LIMITER
MOTOR MODE	0-95 in-lb (7.9 ft-lb)	0-305 RPM	10-50 in-lb (5 in-lb increments) (12.5, 17.5, 22.5...)
MANUAL MODE	0-265 in-lb (22 ft-lb)	N/A	Disengaged
DRILL MODE	95 in-lb (7.9 ft-lb)	0-305 RPM	Disengaged

## PISTOL GRIP TOOL CONTINGENCIES

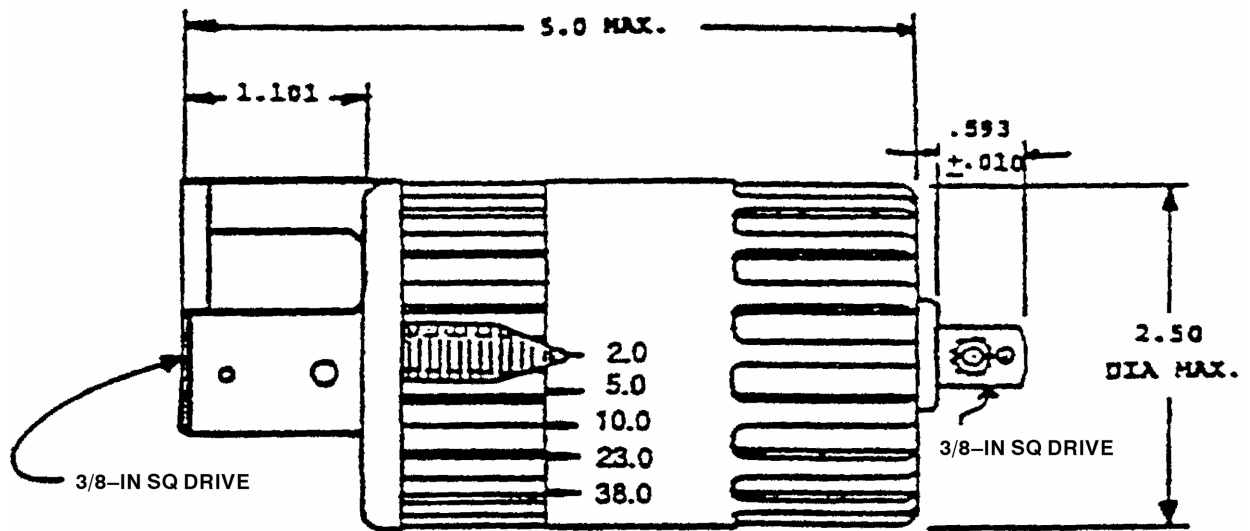
MESSAGE	CORRECTIVE ACTION
BATTERY HITEMP	Switch to manual mode or use alternate tool.
BATTERY LOTEMP (blinking)	Drive tool with no load to increase battery temperature, or use manual mode or alternate tool.
BATTERY LOVOLT (blinking)	Continue using tool until unable to provide sufficient torque or use manual mode. If no joy, replace battery.
CAL FAILED	Repeat calibration by squeezing trigger. If no joy, cycle power.
COLLAR ERROR	Cycle torque and speed/direction collars to clear error. If no joy, recalibrate.
COMPAR ERROR	Cycle torque collar and A/B switch setting. If no joy, cycle power.
EEPROM WR ERR (blinking)	Cycle power.
HI TORQ	If fault occurs during engagement and MTL did not slip, ignore message. Otherwise, cycle tool power and recalibrate.
HICURR	Reattempt operation. If no joy, cycle tool power and recalibrate.
HYBIRD HITEMP	Cycle power. If no joy, use alternate tool.
LO TORQ	Reattempt operation. If no joy, cycle tool power and recalibrate.
LOCURR	Reattempt operation. If no joy, cycle tool power and recalibrate.
LOG IS FULL (blinking)	Continue tool operation.
MOTOR HITEMP	Switch to manual mode or use alternate tool.
OVER CURR	Cycle power and recalibrate.
SLFTST FAIL X	Cycle power and recalibrate.

# PISTOL GRIP TOOL



LEDs AND DISPLAY

# MULTI-SETTING TORQUE LIMITER



## EVA EQUIPMENT STOWAGE LIST (BY ITEM)

ITEM	QTY	LOCATION
90 Degree Socket Converter	1	FSS, fwd/port
Alcohol Wipes	100	MD FI Bag-port 1
Allen Driver, 5/32-in	1	MD FI Bag-port 2
Angle Stamp	1	Stbd TSA
Articulating Socket (AS)	1	ASIPE, aft
Articulating Socket (AS)	1	FSIPE, fwd
Articulating Socket (AS) (no PIP pin)	1	Port TSA
ASIPE	1	ORUC
ASLR (5 – standard, 2 – axial handle, 1 – FGS handle)	8	ORUC, fwd/stbd
ATM-1	1	ORUC, fwd/port
ATM-2	1	ORUC, aft/port
Attachment Bracket Assy	2	MD FI Bag-stbd 2
Bag, Bay 8 MLI Recovery (under aft fixture)	2	ORUC, port
Bag, Crack Repair	1	MD FI Bag-port 2
Bag, Disposal	1	ATM-2
Bag, EMU Equipment	2	Vol H, INB
Bag, EVA	1	Vol H, OBD
Bag, Fastener Capture Plate (ACS)	1	LOPE
Bag, Ground Strap Harness	1	MD FI Bag-port 1
Bag, Ground Strap Harness (spare)	1	ATM-1
Bag, HST Tool	1	MF57H
Bag, ISS ORU Transfer, Large	1	Ext A/L Floor Bag
Bag, ISS ORU Transfer, Medium	1	Ext A/L Floor Bag
Bag, RSU	1	MD FI Bag-stbd 1
Bag, Small Trash	2	MD FI Bag-stbd 1
Bag, Small Trash	2	Port TSA
Bag, Small Trash (old-style)	1	MA16F
Ballstack	1	MF71H
Battery Cap Stringer – spare	1 set	COPE
Battery Cap Stringers (in caddies)	2 sets	MD FI Bag-stbd 1
Battery Extraction Tool	1	SLIC, fwd
Battery, EHIP (in EHIP bag)	1	MD FI Bag-stbd 1
Battery, EHIP	4	MF57H
Battery, EHIP	2	Vol H, INB
Battery, EHIP	2	Vol H, OBD
Battery, PGT	6	MF43H
Battery, PGT	1	MA16F
Battery-R	2	SLIC, aft
Berthing Latch Tool (BAR)	1	FSS, aft/stbd
Bit, #4 Torque Tip (red) (Bit caddy)	2	MD FI Bag-port 1
Bit, #4 Torque Tip (red) (Socket caddy #1)	1	ATM-1
Bit, #4 Torque Tip (red) (Socket caddy #2)	1	ATM-1
Bit, #4 Torque Tip (red) (spares) (not in caddy)	2	MD FI Bag-port 1
Bit, Blue (Socket Caddy #1)	1	ATM-1
Bit, Blue (Socket Caddy #2)	1	ATM-1
Bit, Blue (Bit Caddy)	2	MD FI Bag-port 1
Bit, CEB-R (black)	1	MD FI Bag-port 1
Bit, CEB-R (black) (Socket caddy #3)	1	ATM-1

ITEM	QTY	LOCATION
Bit, Clear (Bit caddy)	1	MD FI Bag-port 1
Bit, Clear (Socket caddy #1)	1	ATM-1
Bit, Clear (Socket caddy #5)	1	ATM-1
Bit, Fastener Extraction (capture BIT) (in RIB caddy)	1	MD FI Bag-port 1
Bit, Green (Bit caddy)	1	MD FI Bag-port 1
Bit, Green (Socket caddy #3)	1	ATM-1
Bit, STIS Contingency Drill (purple) (socket caddy #4)	3	ATM-1
Bit, STIS Contingency Drill (purple) (socket caddy #5)	1	ATM-1
Bit, Yellow (Bit caddy)	1	MD FI Bag-port 1
Bit, Yellow (Socket caddy #3)	1	ATM-1
B-Latch Alignment Tool	1	ASIPE, COS
Bolt Puller	1	Port TSA
Bolts, 7/16", SICDH keyway	4	MULE (caddy)
Bolts, #10 (5/16")	4	MULE (caddy)
Bridge Rail Clamp, High Strength	1	Bay 11 Port
Bridge Rail Clamp, High Strength	1	Bay 11 Stbd
BRT	1	Stbd TSA
Cable, EHIP/PGT	3	MA16F
Cable, RS422, PGT Program	1	ML60E
Caddy, ACS Guide Stud (with 4 guide studs)	1	MD FI Bag-port 1
Caddy, Battery Cap (with 3 cap assemblies)	2	MD FI Bag-stbd 1
Caddy, Bit (STIS) (2 reds, 2 blues, 1 clear, 1 yellow, 1 green)	1	MD FI Bag-port 1
Caddy, Broom Clip	1	Stbd TSA
Caddy, EHIP Battery (SCM)	1	MD FI Bag-stbd 1
Caddy, General Purpose	1	MF57H
Caddy, General Purpose	1	Vol H, OBD
Caddy, GSE latch pin (trunnion passive latch)	1	Port TSA
Caddy, RIB (4 RIBs, 1 WET, 1 FEB)	1	MD FI Bag-port 1
Caddy, Socket	1	MD FI Bag-stbd 1
Caddy, Socket	1	MF57H
Caddy, Socket 1 (clear, blue, red)	1	ATM-1
Caddy, Socket 2 (WET, blue, red)	1	ATM-1
Caddy, Socket 3 (black, green, yellow)	1	ATM-1
Caddy, Socket 4 (purple, purple, purple)	1	ATM-1
Caddy, Socket 5 (1 purple, clear, STIS clamp drill)	1	ATM-1
Caddy, STIS Guide Stud (2 wingnuts & 2 zipnuts)	1	ATM-2
Caddy, Velcro/Tape	1	Port TSA
Caddy, Wire Tie (w/9 wire ties)	1	MF71H
Camera Bracket	2	MF57H
Camera Thermal Blanket	2	MF57H
Card Extraction Tool, ACS (ICET)	2	NOPE
Card Stowage Enclosure (4CTE) (ACS)	1	NOPE
Card Tool (STIS)	1	ATM-2
Card Tool (STIS) – spare	1	COPE
Card Transport Enclosure, Hard (CTE) (STIS) – spare	1	COPE
Card Transport Enclosure, Hard (CTE-R) (STIS)	1	SOPE
Card Transport Enclosure, Soft (CTE) (STIS)	1	ATM-2
Card-Lok Manipulation Tool (CMT) – spare	1	ATM-1 (ground bag)

## EVA EQUIPMENT STOWAGE LIST (BY ITEM)

ITEM	QTY	LOCATION
Card-Lok Manipulation Tool (CMT) (inside ground bag)	1	MD FI Bag-port 1
CDU Cable Extension	1	FSS
CEB-R Module (ACS)	1	LOPE
Centerline Latch Tool	2	Port TSA
Cheater Bar	1	MD FI Bag-port 1
CIPAA Containment Bag Assy	1	MA9D/F
CIPAA discard container	1	Stbd TSA
Clamp Removal Tool	1	MD FI Bag-port 1
Clamp Removal Tool – spare	1	ATM-1
Clamps, SICDH cont	2	MULE – aft
Connector Cleaner Tool Kit	1	MF71H
Connector Tool, 0 degree	1	Stbd TSA
Connector Tool, 90 degree	1	Stbd TSA
Connector Tool, high-torque (PCU)	1	MD FI Bag-stbd 1
Connector Tool, Large	1	Stbd TSA
Connector Tool, Offset	1	Stbd TSA
Connector Tool, Small	1	Stbd TSA
COPE	1	MULE, aft
COS	1	ASIPE, ORUC
COSTAR Y-Harness (spare)	1	SLIC, aft vert pallet
Crack Repair Gun, Manual Cartridge Kit (in Icepac)	2	MA9J
Crack Repair Gun, Manual Cartridge Kit w/Thermal Cov	2	MD FI Bag-port 2
Crack Repair Palette Assembly	2	Vol D
Cutter, Tube	1	Port TSA
Cutters, Compound	1	Port TSA
Cutters, General Purpose	1	Port TSA
Cutters, NOBL	1	MULE I-Beam
Cutters, STIS – spare (in spare ground bag)	1	ATM-1
Cutters, STIS (inside ground bag)	1	MD FI Bag-port 1
Door Stay, Adjustable SSM	1	Stbd TSA
Door Stay, Manual	1	MD FI Bag-stbd 1
Drill Jig, ACS	1	NOPE lid
D-Ring Extender	1	MA16J
D-Ring Extender	1	MD FI Bag-port 2
Drive Unit Pre-load Tool	1	Stbd TSA
Drop Proof Tether Adapter	2	MF57H
ECU	1	COPE
Enclosure, FCP (STIS)	1	ORUC, aft/stbd
Enclosure, MEB (STIS)	1	ASIPE lid
ET Door Tool	1	Port TSA
EVA Punch Tool	1	MD FI Bag-stbd 2
EVA Thermal Sensor (w/goose neck probe)	1	MD FI Bag-port 2
EVA Transfer Bag Insert Assy	1	MD FI Bag-port-1
EVA Wipe	5	MD FI Bag-port 2
EWA Kit	2	MD FI Bag-port 2
Extension Blocks STIS (L & R) (in spare ground strap bag)	2	ATM-1
Fastener Capture Plate, ACS	1	LOPE
Fastener Capture Plate, STIS	1	ORUC, FCP Enclos

ITEM	QTY	LOCATION
Fastener Retention Tool, 1/4" (DIU)	1	Stbd TSA
FET, (14" ACS extension) (in ground strap bag)	1	MD FI Bag-port 1
FET, mini (9" ACS extension) (inside ground strap bag)	1	MD FI Bag-port 1
FET, spare (14" ACS extension) (in spare ground strap bag)	1	ATM-1
FGS Handhold	1	Fwd Fixture
FGS Handhold – spare	1	SLIC, port
FGS-2R	1	FSIPE
Fish Stringer	2	MA16J
Flow Shut-off Valve Assembly	2	MD FI Bag-port 2
Forceps	1	Port TSA
FRB (fastener retention block)	1	MD FI Bag-port 1
FSIPE	1	ORUC
Fuse Plugs (P15,P16,P17:2 each), (P25,P26,P27,P28:1 each)	10	SLIC, aft vert pallet
Gauge, Gap (10/20)	1	MD FI Bag-stbd 2
Gauge, Gap (30/35)	1	MD FI Bag-stbd 2
Gauge, Panel Step	1	MD FI Bag-stbd 2
Gauge, Protruberance	1	MD FI Bag-port 2
Gauge, Tile Step (Washer)	1	MD FI Bag-stbd 2
Gel Brush Kit, Full Gel Brush Compliment	1	MA9L
Gel Brush Kit, Half Gel/Half Foam Brush Compliment	1	MA9L
Grid Cutter	1	NOPE
Guide stud, ACS (spare) (with knob and tether)	1	ATM-1
Hammer	1	Port TSA
Handrail Clamp Tool, ACS (inside ground strap bag)	1	MD FI Bag-port 1
Handrail Cover Caddy (Misc.)	1	SLIC, under pallet
Handrail Cover Caddy (RSU)	1	SLIC, under pallet
Handrail Cover Caddy (V2)	2	SLIC, under pallet
Handrail Removal Tool	2	MD FI Bag-port 1
Handrail Removal Tool – spare	1	ATM-1
Holster	1	MD FI Bag-stbd 2
Hydrazine Brush	1	Stbd TSA
Inspection Mirror (on O-tether)	1	MF57H
Insulation Tile (IVA Overlay Practice Kit)	1	MD FI Bag-stbd 2
IVA Overlay Practice Kit	1	MD FI Bag-stbd 2
IVA Practice Plate Assy (IVA Overlay Practice Kit)	3	MD FI Bag-stbd 2
Jettison Handle (I-beam)	1	MULE
Latch Breaker (RAGB, 4" spring socket, SRTM, adapter hex DPTA)	1	COPE
LGA Protective Cover	1	MULE, aft/port
LOCKS	3	MULE, aft/port
Loop Pin Puller	1	Port TSA
LOPE	1	ORUC, stbd
Low Torque Stepper Clutch	1	MD FI Bag-stbd 2
Lube Applicator	1	MD FI Bag-stbd 1
Lube Applicator	2	MF71H
LVPS-2R Card (STIS)	1	SOPE, CTE-R
LVPS-2R Card (STIS) (spare)	1	COPE, CTE-R
LVPS-R Module (ACS)	1	LOPE
MEB Cover (STIS)	1	ASIPE lid/MEB enc



## EVA EQUIPMENT STOWAGE LIST (BY ITEM)

ITEM	QTY	LOCATION
Mechanical Fingers	1	Stbd TSA
MFR	1	Bay 10 Port APC
MFR Handhold	1	MD FI Bag-stbd 1
Middeck Contingency Kit (tie wraps, crimps, wires)	1	MD FI Bag-stbd 2
Middeck Contingency Kit Blanket	1	MD FI Bag-stbd 2
MINC	1	MULE, aft/port
MLI Blanket (Contingency – Large) (3' x 5')	2	ORUC, fwd/stbd
MLI Blanket (Contingency – Small) (3' x 1.5')	4	ORUC, fwd
MLI Repair Kit	1	COPE
MLI Repair Tool (tongue depressor)	1	ORUC, fwd/stbd
Mounting Strip Assy w/o PLA	4	MD FI Bag-stbd 2
MPT	1	MD FI Bag-port 1
MPT	1	MA16F
MPT Holster	1	MD FI Bag-port 1
MTL	1	MF71H
MTL	1	MD FI Bag-stbd 1
MTL (contingency)	1	SOPE
MUT EE	1	MD FI Bag-port 1
MWS Baseplate	2	MA16N
MWS Gimbal Assy	2	MA16N
MWS Key Strap	1	MF57H
MWS Left Swing Arm	2	MA16N
MWS Right Swing Arm	2	MA16N
Needle Nose Pliers	1	Port TSA
NOBL Roller	1	MINC I-Beam
NOBL Vent Plugs (4 spare, in caddy)	4	MINC I-Beam
NOBLs (Bay 5, 7 & 8)	1 each	MINC
NOPE	1	ORUC, stbd
Nozzle Assy, Long	1	MD FI Bag-stbd 2
Nozzle Assy, Short	1	MA9D/F
OFK	1	Port TSA
O-Tether (one on inspection mirror)	2	MF57H
Overlay Launch Assy	1	MD FI Bag-stbd 2
Overlay Template Assy (15" x 25")	1	MD FI Bag-stbd 2
PAD	1	Port TSA
PDU Disconnect Tool	1	Port TSA
Peel Layer Assy	4	MD FI Bag-stbd 2
PFR Extender (15 degrees off) (with hitch pin, no velcro)	1	Bay 10 Stbd APC
PFR Extender (has hitch pin and velcro)	1	ASIPE, aft
PFR, HST	1	Bay 10 Stbd APC
PFR, HST	1	FSS, fwd/port
PFR, STS	1	ASIPE, aft
PFR, STS	1	Bulkhead, fwd
PFR, STS	1	FSIPE, fwd
PGT	2	MF43H
PGT	1	MF71H
PIE	1	SOPE
PIK STIK	1	SOPE lid

ITEM	QTY	LOCATION
Pin Straightener (HST)	1	Stbd TSA
PIP Pin (Spare #1-12)	1 each	ORUC, fwd/stbd
PIP Pin Bracket	1	ORUC, fwd/stbd
PIVT	1	MD FI Bag-stbd 2
Plug Installation Tool	1	MD FI Bag-stbd 2
PRD	2	Port TSA
Probe	1	Port TSA
Pry Bar	1	Port TSA
Radiator Extension, 1/4-in	1	Port TSA
RAGB (Part of Latch Breaker Kit)	1	COPE
RCC Drill Assy, Large	1	MD FI Bag-stbd 2
RCC Drill Assy, Small	1	MD FI Bag-stbd 2
RCC Marker	2	MD FI Bag-stbd 2
RCC Plugs	19	MA9G
Rendezvous Reflector (with passive ECOM)	1	COPE
RIB (in caddy)	5	MD FI Bag-port 1
Right Angle Drive	1	Stbd TSA
RMS Rope Reel	1	Port TSA
RMS Shoulder Brace Release Tool	1	Port TSA
RSU – spare	1	COPE
RSU 1, 2, and 3	1	SOPE
Safety Bar, ASIPE	1	ORUC, fwd
Saffil Caddy Kit (6x6 sheets)	1	MD FI Bag-stbd 2
Saffil Caddy Kit (6x6x1)	1	MD FI Bag-stbd 2
Saffil Caddy Kit (small pieces)	2	MD FI Bag-stbd 2
Saffil Dispenser (3x1x1/4)	2	MD FI Bag-stbd 2
Saffil Dispenser (3x1x1/4L)	1	MD FI Bag-stbd 2
Saffil Dispenser (3x3x1)	2	MD FI Bag-stbd 2
Saffil Dispenser (6x1x1)	2	MD FI Bag-stbd 2
Saffil Dispenser (6x1x1/4)	4	MD FI Bag-stbd 2
Saffil Dispenser (6x6x1)	3	MD FI Bag-stbd 2
Saffil Dispenser (6x6x1/4R)	1	MD FI Bag-stbd 2
Scraper, 2-in	4	MA9L
Scraper, 5-in	2	MA9L
Scraper, TPS (3-in)	1	Stbd TSA
Snatch Block	2	Port TSA
Socket, #8 allen head capture tool – 12.5" with O-tether	1	MULE (caddy)
Socket, 2-in rigid (HST)	1	Stbd TSA
Socket, 4" spring (Part of Latch Breaker Kit)	1	COPE
Socket, 4-in spring	1	Stbd TSA
Socket, 5/16-in 10.3 ext (wobble-capture)	1	Stbd TSA
Socket, 5/16-in 7.3 ext (wobble-non-capture)	1	Stbd TSA
Socket, 5/16" x 10.3" capture – wobble with O-tether	1	MULE (caddy)
Socket, 5/16" coax hex tool	1	MULE (caddy)
Socket, 7/16-in 10.3 ext (rigid-capture)	1	Stbd TSA
Socket, 7/16-in 7.3 ext (wobble-non-capture)	1	Stbd TSA
Socket, 7/16" x 10.3" capture – wobble with O-tether	1	MULE (caddy)
Socket, 7/16-in x 12-in ext (HST)	1	Stbd TSA

## EVA EQUIPMENT STOWAGE LIST (BY ITEM)

ITEM	QTY	LOCATION
Socket, 7/16-in x 18-in ext (HST)	1	Stbd TSA
Socket, 7/16-in x 24-in ext (HST)	1	Stbd TSA
Socket, 7/16-in x 6-in Rigid (aka: solid)	1	MD FI Bag-port 1
Socket, 7/16-in x 6-in wobble (P/N: 4177656-007)	1	MD FI Bag-stbd 1
Socket, 7/16-in x 6-in wobble (P/N: 4177656-007)	1	MF57H
Socket, 7/16-in x 6-in wobble (SEG #)	1	Stbd TSA
Socket, Hybrid (A-latch)	2	MD FI Bag-stbd 1
Socket, Long Adjustable	1	MD FI Bag-port 1
Socket, Long Adjustable	1	Stbd TSA
Socket, Short Adjustable	2	MD FI Bag-port 1
SOPE	1	ORUC, stbd
SRTM (Part of Latch Breaker Kit)	1	COPE
SSAT Tool	1	MD FI Bag-port 1
TA, Center	1	ASIPE, aft
TA, Port	1	ORUC, aft/port
Temp Cover, ACS	1	NOPE
Template Mount Assy w/o Insulator	2	MD FI Bag-stbd 2
Template Mount Insulator Assy	2	MD FI Bag-stbd 2
Tether, 34-in Adjustable	1	MA16J
Tether, 34-in Adjustable	2	MF57H
Tether, 80-in Adjustable	1	MA16J
Tether, 80-in Adjustable	1	MF57H
Tether, Adjustable (sm/sm pb shuttle hook)	2	Port TSA
Tether, Adjustable Equipment (sm/sm equip hook)	10	MA16J
Tether, Retractable (lg/sm paddle hook) – reversed reel	1	MA16J
Tether, Retractable (lg/sm paddle hook) – reel on small hook	8	MA16J
Tether, Retractable (sm/sm equip hook w/PIP pin)	2	MA16J
Tether, Retractable (sm/sm equip hook)	8	MA16J
Tether, Retractable (sm/sm paddle hook w/PIP pin)	2	MA16J
Tether, Retractable (sm/sm paddle hook)	2	MA16J
Tether, Retractable (sm/sm pb/shuttle hook)	3	MA16J
Tether, Safety (55')	2	MA16J
Tether, Safety (55') (routed to port slidewire)	1	Port sill
Tether, Safety (85')	2	Stbd TSA
Tether, Waist (coated, locking)	2	1 each on EMU 1&2
Tether, Waist (coated, locking)	2	MA16J
Tether, Waist (STS-400 only)	2	MD FI Bag-stbd 2
Thermal Cover, Bay 10	1	Vol H, OBD
Thermal Mittens (inside GPC caddies)	2 pr	Port TSA
Three-pt Latch Tool	2	Port TSA
Tool Boards (C & T)	2	MD FI Bag-stbd 1
Torque Indicator Driver Assy	1	MD FI Bag-stbd 2
Torque Multiplier (for trunnion passive latch)	1	Port TSA
Torque Tip Tool (#10) (cont release of ACS #10 pan heads)	1	Stbd TSA
TRAD	1	MA9D/F
TRAD Sack	2	MA9D/F
Trash Bag, Large	1	MD FI Bag-port 2
VIK – contingency (with gender changer)	1	COPE

ITEM	QTY	LOCATION
Vise Grip	1	Port TSA
WET (in RIB caddy)	1	MD FI Bag-port 1
WET (spare) (socket caddy #2)	1	ATM-1
WFC Handhold	1	Fwd Fixture
WFC Handhold – spare	1	SLIC, fwd vert pallet
WFC III	1	WSIPE, SLIC
Wingnut with handle – spare (STIS FCP)	1	ATM-1
Wishbone	1	NOPE lid
Wrench, #10 allen (5/32") for 3/8" drive	1	Stbd TSA
Wrench, 1/2-in Box End	1	Port TSA
Wrench, 3/8-in Ratchet Drive	1	Port TSA
Wrench, 3/8-in Ratchet w/4-in ext	1	Port TSA
Wrench, 7/16-in Open End	1	Stbd TSA
Wrench, 7/16-in x 1/2-in Box End	1	Stbd TSA
Wrench, Airlock Ratchet (EVA Bag) – with 7/16 socket	1	Vol H, OBD
Wrench, Allen 1/8-in	1	MF57H
Wrench, Allen 5/32-in	1	MF57H
Wrench, EVA Adjustable	1	Port TSA
Wrench, EVA Adjustable (EVA Bag)	1	Vol H, OBD
Wrench, EVA Ratchet (with palm wheel)	1	MD FI Bag-stbd 1
Wrench, EVA Ratchet (with palm wheel)	1	MF71H
Wrench, MPM	1	Port TSA
WSIPE	1	SLIC
Y-Harness Restraint Tool (COSTAR)	1	MD FI Bag-port 1
Zipnut with handle – spare (STIS FCP)	1	ATM-1

## EVA EQUIPMENT STOWAGE LIST (BY LOCATION)

LOCATION	ITEM	QTY	
1 each on EMU 1&2	Tether, Waist (coated, locking)	2	
ASIPE lid	Enclosure, MEB (STIS)	1	
ASIPE lid/MEB enc	MEB Cover (STIS)	1	
ASIPE, aft	Articulating Socket (AS)	1	
	PFR Extender (has hitch pin and velcro)	1	
	PFR, STS	1	
	TA, Center	1	
ASIPE, COS	B-Latch Alignment Tool	1	
ASIPE, ORUC	COS	1	
ATM-1	Bag, Ground Strap Harness (spare)	1	
	Bit, #4 Torque Tip (red) (Socket caddy #1)	1	
	Bit, #4 Torque Tip (red) (Socket caddy #2)	1	
	Bit, Blue (Socket Caddy #1)	1	
	Bit, Blue (Socket Caddy #2)	1	
	Bit, CEB-R (black) (Socket caddy #3)	1	
	Bit, Clear (Socket caddy #1)	1	
	Bit, Clear (Socket caddy #5)	1	
	Bit, Green (Socket caddy #3)	1	
	Bit, STIS Contingency Drill (purple) (socket caddy #4)	3	
	Bit, STIS Contingency Drill (purple) (socket caddy #5)	1	
	Bit, Yellow (Socket caddy #3)	1	
	Caddy, Socket 1 (clear, blue, red)	1	
	Caddy, Socket 2 (WET, blue, red)	1	
	Caddy, Socket 3 (black, green, yellow)	1	
	Caddy, Socket 4 (purple, purple, purple)	1	
	Caddy, Socket 5 (1 purple, clear, STIS clamp drill)	1	
	Clamp Removal Tool – spare	1	
	Cutters, STIS – spare (in spare ground bag)	1	
	Extension Blocks STIS (L & R) (in spare ground strap bag)	2	
	FET, spare (14" ACS extension) (in spare ground strap bag)	1	
	Guide stud, ACS (spare) (with knob and tether)	1	
	Handrail Removal Tool – spare	1	
	Wingnut with handle – spare (STIS FCP)	1	
	Zipnut with handle – spare (STIS FCP)	1	
	ATM-1 (ground bag)	Card-Lok Manipulation Tool (CMT) – spare	1
	ATM-2	Bag, Disposal	1
		Caddy, STIS Guide Stud (2 wingnuts & 2 zipnuts)	1
		Card Tool (STIS)	1
		Card Transport Enclosure, Soft (CTE) (STIS)	1
	Bay 10 Port APC	MFR	1
Bay 10 Stbd APC	PFR Extender (15 degrees off) (with hitch pin, no velcro)	1	
	PFR, HST	1	
Bay 11 Port	Bridge Rail Clamp, High Strength	1	
Bay 11 Stbd	Bridge Rail Clamp, High Strength	1	
Bulkhead, fwd	PFR, STS	1	
COPE	Battery Cap Stringer – spare	1 set	
	Card Tool (STIS) – spare	1	
	Card Transport Enclosure, Hard (CTE) (STIS) – spare	1	
	ECU	1	

LOCATION	ITEM	QTY	
COPE (Cont)	Latch Breaker (RAGB, 4" spring socket, SRTM, adapter hex DPTA)	1	
	MLI Repair Kit	1	
	RAGB (Part of Latch Breaker Kit)	1	
	Rendezvous Reflector (with passive ECOM)	1	
	RSU – spare	1	
	Socket, 4" spring (Part of Latch Breaker Kit)	1	
	SRTM (Part of Latch Breaker Kit)	1	
	VIK – contingency (with gender changer)	1	
COPE, CTE-R	LVPS-2R Card (STIS) (spare)	1	
Ext A/L Floor Bag	Bag, ISS ORU Transfer, Large	1	
	Bag, ISS ORU Transfer, Medium	1	
FSIPE	FGS-2R	1	
FSIPE, fwd	Articulating Socket (AS)	1	
	PFR, STS	1	
FSS	CDU Cable Extension	1	
FSS, aft/stbd	Berthing Latch Tool (BAR)	1	
FSS, fwd/port	90 Degree Socket Converter	1	
	PFR, HST	1	
Fwd Fixture	FGS Handhold	1	
	WFC Handhold	1	
LOPE	Bag, Fastener Capture Plate (ACS)	1	
	CEB-R Module (ACS)	1	
	Fastener Capture Plate, ACS	1	
	LVPS-R Module (ACS)	1	
MA16J	D-Ring Extender	1	
	Fish Stringer	2	
	Tether, 34-in Adjustable	1	
	Tether, 80-in Adjustable	1	
	Tether, Adjustable Equipment (sm/sm equip hook)	10	
	Tether, Retractable (lg/sm paddle hook) – reversed reel	1	
	Tether, Retractable (lg/sm paddle hook) – reel on small hook	8	
	Tether, Retractable (sm/sm equip hook w/PIP pin)	2	
	Tether, Retractable (sm/sm equip hook)	8	
	Tether, Retractable (sm/sm paddle hook w/PIP pin)	2	
	Tether, Retractable (sm/sm paddle hook)	2	
	Tether, Retractable (sm/sm pb/shuttle hook)	3	
	Tether, Safety (55')	2	
	Tether, Waist (coated, locking)	2	
	MA16N	MWS Baseplate	2
		MWS Gimbal Assy	2
MWS Left Swing Arm		2	
MWS Right Swing Arm		2	
MA9D/F	CIPAA Containment Bag Assy	1	
	Nozzle Assy, Short	1	
	TRAD	1	
	TRAD Sack	2	
MA9J	Crack Repair Gun, Manual Cartridge Kit (in Icepac)	2	
MA9L	Gel Brush Kit, Full Gel Brush Compliment	1	
	Gel Brush Kit, Half Gel/Half Foam Brush Compliment	1	

## EVA EQUIPMENT STOWAGE LIST (BY LOCATION)

LOCATION	ITEM	QTY	
MA9L (Cont)	Scraper, 2-in	4	
	Scraper, 5-in	2	
MA16F	Bag, Small Trash (old-style)	1	
	Battery, PGT	1	
	Cable, EHIP/PGT	3	
	MPT	1	
MD FI Bag-port 1	EVA Transfer Bag Insert Assy	1	
	Alcohol Wipes	100	
	Bag, Ground Strap Harness	1	
	Bit, #4 Torque Tip (red) (Bit caddy)	2	
	Bit, #4 Torque Tip (red) (spares) (not in caddy)	2	
	Bit, Blue (Bit Caddy)	2	
	Bit, CEB-R (black)	1	
	Bit, Clear (Bit caddy)	1	
	Bit, Fastener Extraction (capture BIT) (in RIB caddy)	1	
	Bit, Green (Bit caddy)	1	
	Bit, Yellow (Bit caddy)	1	
	Caddy, ACS Guide Stud (with 4 guide studs)	1	
	Caddy, Bit (STIS) (2 reds, 2 blues, 1 clear, 1 yellow, 1 green)	1	
	Caddy, RIB (4 RIBs, 1 WET, 1 FEB)	1	
	Card-Lok Manipulation Tool (CMT) (inside ground bag)	1	
	Cheater Bar	1	
	Clamp Removal Tool	1	
	Cutters, STIS (inside ground bag)	1	
	FET, (14" ACS extension) (in ground strap bag)	1	
	FET, mini (9" ACS extension) (inside ground strap bag)	1	
	FRB (fastener retention block)	1	
	Handrail Clamp Tool, ACS (inside ground strap bag)	1	
	Handrail Removal Tool	2	
	MPT	1	
	MPT Holster	1	
	MUT EE	1	
	RIB (in caddy)	5	
	Socket, 7/16-in x 6-in Rigid (aka: solid)	1	
	Socket, Long Adjustable	1	
	Socket, Short Adjustable	2	
	SSAT Tool	1	
	WET (in RIB caddy)	1	
	Y-Harness Restraint Tool (COSTAR)	1	
	MD FI Bag-port 2	Allen Driver, 5/32-in	1
		Bag, Crack Repair	1
		Crack Repair Gun, Manual Cartridge Kit w/Thermal Cov	2
		D-Ring Extender	1
		EVA Thermal Sensor (w/goose neck probe)	1
		EVA Wipe	5
		EVA Kit	2
		Flow Shut-off Valve Assembly	2
Gauge, Protruberance		1	
Trash Bag, Large		1	

LOCATION	ITEM	QTY	
MD FI Bag-stbd 1	Bag, RSU	1	
	Bag, Small Trash	2	
	Battery Cap Stringers (in caddies)	2 sets	
	Battery, EHIP (in EHIP Bag)	1	
	Caddy, Battery Cap (with 3 cap assemblies)	2	
	Caddy, EHIP Battery (SCM)	1	
	Caddy, Socket	1	
	Connector Tool, high-torque (PCU)	1	
	Door Stay, Manual	1	
	Lube Applicator	1	
	MFR Handhold	1	
	MTL	1	
	Socket, 7/16-in x 6-in wobble (P/N: 4177656-007)	1	
	Socket, Hybrid (A-latch)	2	
	Tool Boards (C & T)	2	
	Wrench, EVA Ratchet (with palm wheel)	1	
	MD FI Bag-stbd 2	Attachment Bracket Assy	2
		EVA Punch Tool	1
		Gauge, Gap (10/20)	1
Gauge, Gap (30/35)		1	
Gauge, Panel Step		1	
Gauge, Tile Step (Washer)		1	
Holster		1	
Insulation Tile (IVA Overlay Practice Kit)		1	
IVA Overlay Practice Kit		1	
IVA Practice Plate Assy (IVA Overlay Practice Kit)		3	
Low Torque Stepper Clutch		1	
Middeck Contingency Kit (tie wraps, crimps, wires)		1	
Middeck Contingency Kit Blanket		1	
Mounting Strip Assy w/o PLA		4	
Nozzle Assy, Long		1	
Overlay Launch Assy		1	
Overlay Template Assy, (15"x25")		1	
Peel Layer Assy		4	
PIVT		1	
Plug Installation Tool		1	
RCC Drill Assy, Large		1	
RCC Drill Assy, Small		1	
RCC Marker		2	
Saffil Caddy Kit (6x6 sheets)		1	
Saffil Caddy Kit (6x6x1)		1	
Saffil Caddy Kit (small pieces)		2	
Saffil Dispenser (3x1x1/4)		2	
Saffil Dispenser (3x1x1/4L)		1	
Saffil Dispenser (3x3x1)		2	
Saffil Dispenser (6x1x1)		2	
Saffil Dispenser (6x1x1/4)		4	
Saffil Dispenser (6x6x1)		3	
Saffil Dispenser (6x6x1/4R)		1	

## EVA EQUIPMENT STOWAGE LIST (BY LOCATION)

LOCATION	ITEM	QTY	
MD FI Bag-stbd 2 (Cont)	Template Mount Assy w/o Insulator	2	
	Template Mount Insulator Assy	2	
	Tether, Waist (STS-400 only)	2	
	Torque Indicator Driver Assy	1	
MF43H	Battery, PGT	6	
	PGT	2	
MF57H	Bag, HST Tool	1	
	Battery, EHIP	4	
	Caddy, General Purpose	1	
	Caddy, Socket	1	
	Camera Bracket	2	
	Camera Thermal Blanket	2	
	Drop Proof Tether Adapter	2	
	Inspection Mirror (on O-tether)	1	
	MWS Key Strap	1	
	O-Tether (one on inspection mirror)	2	
	Socket, 7/16-in x 6-in wobble (P/N: 4177656-007)	1	
	Tether, 34-in Adjustable	2	
	Tether, 80-in Adjustable	1	
	Wrench, Allen 1/8-in	1	
	Wrench, Allen 5/32-in	1	
	MF71H	Ballstack	1
		Caddy, Wire Tie (w/9 wire ties)	1
Connector Cleaner Tool Kit		1	
Lube Applicator		2	
MTL		1	
PGT		1	
Wrench, EVA Ratchet (with palm wheel)		1	
MINC	NOBLs (Bay 5, 7 & 8)	1 each	
MINC I-Beam	NOBL Roller	1	
	NOBL Vent Plugs (4 spare, in caddy)	4	
ML60E	Cable, RS422, PGT Program	1	
MULE	Jettison Handle (I-beam)	1	
MULE (caddy)	Bolts, 7/16", SICDH keyway	4	
	Bolts, #10 (5/16")	4	
	Socket, #8 allen head capture tool – 12.5 with O-tether	1	
	Socket, 5/16" x 10.3" capture – wobble with O-tether	1	
	Socket, 7/16" x 10.3" capture – wobble with O-tether	1	
	Socket, 5/16" coax hex tool	1	
MULE I-Beam	Cutters, NOBL	1	
MULE, aft	Clamps, SICDH cont	2	
	COPE	1	
MULE, aft/port	LGA Protective Cover	1	
	LOCKs	3	
	MINC	1	
NOPE	Card Extraction Tool, ACS (ICET)	2	
	Card Storage Enclosure (4CTE) (ACS)	1	
	Grid Cutter	1	
	Temp Cover, ACS	1	

LOCATION	ITEM	QTY
NOPE lid	Drill Jig, ACS	1
	Wishbone	1
ORUC	ASIPE	1
	FSIPE	1
ORUC, aft/port	ATM-2	1
	TA, Port	1
ORUC, aft/stbd	Enclosure, FCP (STIS)	1
ORUC, FCP Enclos	Fastener Capture Plate, STIS	1
ORUC, fwd	MLI Blanket (Contingency – Small) (3' x 1.5')	4
	Safety Bar, ASIPE	1
ORUC, fwd/port	ATM-1	1
ORUC, fwd/stbd	ASLR (5 – standard, 2 – axial handle, 1 – FGS handle)	8
	MLI Blanket (Contingency – Large) (3' x 5')	2
	MLI Repair Tool (tongue depressor)	1
	PIP Pin (Spare #1-12)	1 each
	PIP Pin Bracket	1
ORUC, port	Bag, Bay 8 MLI Recovery (under aft fixture)	2
ORUC, stbd	LOPE	1
	NOPE	1
	SOPE	1
Port sill	Tether, Safety (55') (routed to port slidewire)	1
Port TSA	Articulating Socket (AS) (no PIP pin)	1
	Bag, Small Trash	2
	Bolt Puller	1
	Caddy, GSE latch pin (trunnion passive latch)	1
	Caddy, Velcro/Tape	1
	Centerline Latch Tool	2
	Cutter, Tube	1
	Cutters, Compound	1
	Cutters, General Purpose	1
	ET Door Tool	1
	Forceps	1
	Hammer	1
	Loop Pin Puller	1
	Needle Nose Pliers	1
	OFK	1
	PAD	1
	PDU Disconnect Tool	1
	PRD	2
	Probe	1
	Pry Bar	1
	Radiator Extension, 1/4-in	1
	RMS Rope Reel	1
	RMS Shoulder Brace Release Tool	1
	Snatch Block	2
	Tether, Adjustable (sm/sm pb shuttle hook)	2
	Thermal Mittens (inside GPC caddies)	2 pr
	Three-pt Latch Tool	2
Torque Multiplier (for trunnion passive latch)	1	

## EVA EQUIPMENT STOWAGE LIST (BY LOCATION)

LOCATION	ITEM	QTY
Port TSA (Cont)	Vise Grip	1
	Wrench, 1/2-in Box End	1
	Wrench, 3/8-in Ratchet Drive	1
	Wrench, 3/8-in Ratchet w/4-in ext	1
	Wrench, EVA Adjustable	1
	Wrench, MPM	1
SLIC	WSIPE	1
SLIC, aft	Battery-R	2
SLIC, aft vert pallet	COSTAR Y-Harness (spare)	1
	Fuse Plugs (P15,P16,P17:2 each), (P25,P26,P27,P28:1 each)	10
SLIC, fwd	Battery Extraction Tool	1
SLIC, fwd vert pallet	WFC Handhold – spare	1
SLIC, port	FGS Handhold – spare	1
SLIC, under pallet	Handrail Cover Caddy (Misc.)	1
	Handrail Cover Caddy (RSU)	1
	Handrail Cover Caddy (V2)	2
SOPE	Card Transport Enclosure, Hard (CTE-R) (STIS)	1
	MTL (contingency)	1
	PIE	1
	RSU 1, 2, and 3	1
SOPE lid	PIK STIK	1
SOPE, CTE-R	LVPS-2R Card (STIS)	1
Stbd TSA	Angle Stamp	1
	BRT	1
	Caddy, Broom Clip	1
	CIPAA discard container	1
	Connector Tool, 0 degree	1
	Connector Tool, 90 degree	1
	Connector Tool, Large	1
	Connector Tool, Offset	1
	Connector Tool, Small	1
	Door Stay, Adjustable SSM	1
	Drive Unit Pre-load Tool	1
	Fastener Retention Tool, 1/4" (DIU)	1
	Hydrazine Brush	1
	Mechanical Fingers	1
	Pin Straightener (HST)	1
	Right Angle Drive	1
	Scraper, TPS (3-in)	1
	Socket, 2-in rigid (HST)	1
	Socket, 4-in spring	1
	Socket, 5/16-in 10.3 ext (wobble-capture)	1
	Socket, 5/16-in 7.3 ext (wobble-non-capture)	1
	Socket, 7/16-in 10.3 ext (rigid-capture)	1
	Socket, 7/16-in 7.3 ext (wobble-non-capture)	1
	Socket, 7/16-in x 12-in ext (HST)	1
	Socket, 7/16-in x 18-in ext (HST)	1
	Socket, 7/16-in x 24-in ext (HST)	1
	Socket, 7/16-in x 6-in wobble (SEG #)	1

LOCATION	ITEM	QTY
Stbd TSA (Cont)	Socket, Long Adjustable	1
	Tether, Safety (85')	2
	Torque Tip Tool (#10) (cont release of ACS #10 pan heads)	1
	Wrench, #10 allen (5/32") for 3/8" drive	1
	Wrench, 7/16-in Open End	1
	Wrench, 7/16-in x 1/2-in Box End	1
Vol D	Crack Repair Palette Assembly	2
Vol H, INB	Bag, EMU Equipment	2
	Battery, EHIP	2
Vol H, OBD	Bag, EVA	1
	Battery, EHIP	2
	Caddy, General Purpose	1
	Thermal Cover, Bay 10	1
	Wrench, Airlock Ratchet (EVA Bag) – with 7/16 socket	1
	Wrench, EVA Adjustable (EVA Bag)	1
WSIPE, SLIC	WFC III	1

# PFR POSITIONS AND TA SETTINGS

## NOMINAL EVA STS PFR SETTINGS

TASK	EV	LOC	PFR SETTINGS
<b><u>WFC III/SI C&amp;DH</u></b> Aft ASIPE PFR	Not used	ASIPE S30	PFR Extender: Y=6:00, AS: Y=90R, P=2.5, PFR: Y=12, R=A, P=4.5 (for RSU-2, the 1st time we need it) (launch config)
Fwd FSIPE PFR	Not used	FSIPE S28	AS: Y=12, P=3; PFR: Y=9, R=K, P=1.5 (launch config)
<b><u>RSU/BAY 2 BATTERY R&amp;R</u></b> Aft ASIPE PFR		ASIPE S30	PFR Extender: Y=6:00, AS: Y=90R, P=2.5, PFR: Y=12, R=A, P=4.5 (moved to FR29 for RSU-2)
RSU-2 Connectors	Mass	FR29	AS: Y=30R↓, P=2.5, PFR: Y=12, R=A, P=4.5 (reconfigured for RSU-3 connectors)
RSU-3 Connectors	Mass	FR29	AS: Y=150R↓, P=2.5, PFR: Y=12, R=A, P=4.5 (moved to FR5 for door closure)
-V3 Door Closure	Mass	FR5	AS: Y=60L↓ (30 did not work in NBL), P=2.5, PFR: Y=9, R=B.5, P=10.5
Aft ASIPE PFR		ASIPE S30	PFR Extender: Y=6:00, AS Y=90R, P=1, PFR: Y=12, R=A, P=9.5 (ASIPE settings for COS)
Bay 2 SLIC Battery Ops	Mass	FSIPE S28	AS: Y=12, P=3, PFR: Y=9, R=K, P=1.5 (reconfig for bay 3 batt when done with bay 2)
<b><u>COS/ACS PART I</u></b> COS Retrieval, COSTAR Installation	John/Drew	ASIPE S30	PFR Extender: Y=6:00, AS Y=90R, P=1, PFR: Y=12, R=A, P=9.5 (moved to FR4 for ACS)
ACS Ops Part I	John/Drew	FR4	90L↓ AS: P=2.5, PFR: Y=2, R=B, P=1.5
Aft ASIPE PFR		ASIPE S30	PFR Extender: Y=6:00, AS: 90R, P=3.5, PFR: Y=6, R=C, P=3.5 (STIS settings)
Fwd FSIPE PFR	Not used	FSIPE S28	AS: Y=12, P=11, PFR: Y=9, R=B.5, P=1.5 (not used on EVA 3)
<b><u>STIS/NOBL 8</u></b> Aft ASIPE PFR		ASIPE S30	PFR Extender: Y=6:00, AS: 90R, P=3.5, PFR: Y=6, R=C, P=3.5 (STIS settings) (moved to FR22)
STIS Ops	Mass	FR22	90 deg socket converter into FR22 at 30R↑: PFR: Y=12, R=C, P=3.5
Aft ASIPE PFR		ASIPE S30	PFR Extender: Y=6:00, AS: 90R, P=3.5, PFR: Y=6, R=C, P=3.5 (lands with STIS settings)
Fwd FSIPE PFR	Not used	FSIPE S28	AS: Y=12, P=11, PFR: Y=9, R=B.5, P=1.5 (not used on EVA 4)
<b><u>BAY 3 BATTERY/FGS-2/NOBL5</u></b> Aft ASIPE PFR		ASIPE S30	PFR Extender: Y=6:00, AS: Y=90R, P=2.5, PFR: Y=2, R=B, P=1.5 (moved to FR4 for ACS)
ACS Ops Part II	Drew/John	FR4	90L↓ AS: P=2.5, PFR: Y=2, R=B, P=1.5
Aft ASIPE PFR	Not used	ASIPE S30	PFR Extender: Y=6:00, AS: 90R, P=3.5, PFR: Y=6, R=C, P=3.5 (landing config - STIS settings)
Bay 3 SLIC Battery Ops	Drew	FSIPE S28	AS: Y=12, P=11, PFR: Y=9, R=B.5, P=1.5 (landing config)
Fwd Bulkhead PFR		Fwd Bulkhead	R=A, P=10 (launch and landing)

## PFR POSITIONS AND TA SETTINGS (Cont)

### NOMINAL EVA HST PFR SETTINGS

TASK	EV	LOC	PFR SETTINGS
Fwd/Port FSS HST PFR	No planned use	Fwd/Port FSS HST PFR	JJ,A,BB,4 (launch and landing)
Stbd Bay 10 APC	No planned use	Stbd Bay 10 APC	PP,A,BB,4 (launch and landing)

### NO-RMS STS AND HST PFR SETTINGS

<b>NO-RMS WFC III</b> WFPC2 Ingress Posn WFPC2 Removal/WFCIII Install WFPC2/WFCIII handoff posn on carrier, aft fixture ops WFCIII Removal from WSIPE/WFPC2 Install into WSIPE WFCIII Removal from WSIPE/WFPC2 Install into WSIPE WFPC2/WFCIII intermediate handoff posn on carrier Port TA Usage (used for PFR ingress) Handhold for EV1 during WFPC2 removal and WFCIII install: Jettison handle and 90 deg converter	Drew Drew Drew John Drew John John	FR27 FR27 ORUC S26 WSIPE S12 WSIPE S10 FSIPE S28 ORUC S25 FR26	Stbd APC PFR extender: 15R↑, HST PFR: Y=45L↑, PP/N/BB/6 Stbd APC PFR extender: 15L↑, HST PFR: Y=45L↑, PP/Q/BB/9 ASIPE PFR extender: Y=30L↓, HST PFR: Y=75R↓, JJ/K/DD/1 AS: Y=90R↓, P=10.5, STS PFR: Y=12, R=A, P=10.5 AS: Y=90R↓, P=10.5, STS PFR: Y=12, R=A, P=10.5 AS: Y=90R, P=2.5, PFR: Y=12, R=A, P=11 Y=90L, A=7, B=6, C=6, ext=7 90 deg converter: Y= 30L↓ with jettison handle
<b>NO-RMS BAY 2 BATTERY</b> Bay 2 SLIC prep Bay 2 HST Battery Ops	Mass Bueno	FSIPE S28 FR27	AS: Y=12, P=3, PFR: Y=9, R=K, P=1.5 Stbd APC PFR extender: 15R↓, HST PFR: Y= 15L↓, JJ/O/ZZ/12
<b>NO-RMS BAY 3 BATTERY</b> Bay 3 SLIC prep Bay 3 HST Battery Ops	John Drew	FSIPE S28 FR26	AS: Y=12, P=11, PFR: Y=9, R=B.5, P=1.5 Stbd APC PFR extender: 15L↓, HST PFR: Y=15R↓, JJ/E/ZZ/1
<b>NO-RMS COS</b> ASIPE ops COSTAR Removal from HST/COS Install into HST Aft Fixture and Handoff Posn Center TA Usage (used for PFR ingress)	Drew Drew John	ASIPE S30 FR4 ORUC S26 ORUC S25	AS: Y=90R, P=1.5, PFR: Y=12, R=A, P=9.5 (no PFR extender) 90 deg converter: 90R↓, APC PFR ext: 75 R↑, HST PFR: Y=75R↓, LL/M/ZZ/4 Note: Drew reconfigs this PFR as reqd throughout the changeout ASIPE PFR extender: Y=30L↓, HST PFR: Y= 120R↓, JJ/K/DD/1 Y=90L, A=6, B=6, C=5, ext=7
<b>NO-RMS RSU</b> Left FHST Ops Right FHST Ops	Mass Bueno	FR5 FR24	AS: Y=90L↓, P=2.5, PFR: Y=8, R=A, P=10.5 Stbd APC PFR Extender: Y=15L↓, AS: Y=90L↓, P=2.5, PFR: Y=4, R=J.5, P=11



## PFR POSITIONS AND TA SETTINGS (Cont)

### NO-RMS STS AND HST PFR SETTINGS (Cont)

TASK	EV	LOC	PFR SETTINGS
RSU-2 Connector Ops RSU-2 Ops	Mass Bueno	FR29 FR29	AS: Y=30R↓, P=2.5, PFR: Y=12, R=A, P=4.5 90 deg conv: 180 <sup>0</sup> ↓, ASIPE PFR extender into 90 deg converter: 0 <sup>0</sup> ↑, AS: Y=120L↓, P=1.5, PFR: Y=12, R=A, P=11 or 10
RSU-3 Connector Ops RSU-3 Ops	Mass Bueno	FR29 FR29	AS: Y=150R↓, P=2.5, PFR: Y=12, R=A, P=4.5 90 deg conv: 180 <sup>0</sup> ↓, ASIPE PFR extender into 90 deg converter: 0 <sup>0</sup> ↑, AS: Y=60L↓, P=1.5, PFR: Y=12, R=A, P=11 or 10
RSU-1 Ops	Bueno	FR29	90 deg conv: 90R↓, ASIPE PFR extender into 90 deg converter: Y=90R↑, AS: Y=120R↑, P=4, STS PFR: Y=9, R=A, P=4
Door Closing Door Closing	Bueno Mass	FR24 FR27	Stbd APC PFR extender: Y=15L↓, AS: Y=90L↓, P=2.5, PFR: Y=4, R=J.5, P=11 ASIPE PFR extender: Y=30R↑; HST PFR: Y= 30L↓, JJ/H/11/ZZ
Port TSA Usage		Nominal TA location	A=6, B=6, C=9, ext=7
<b>NO-RMS FGS-2</b> FGS-2 Ingress Posn and FGS-2 Removal/Install at HST FGS-2R Retrieval FGS-2/FGS-2R carrier/aft fixture ops Port TA Usage (used for PFR ingress)	John  John Drew/John	FR11  FSIPE S28 ORUC S26 ORUC S25	Stbd APC PFR extender: 15R↑, HST PFR: Y=45L↑, PP/B/ZZ/6 (for ingress), then PP/B/BB/6 (for access) AS: Y= 12 o'clock, P=2.5, STS PFR: Y=12, R=A, P=11 ASIPE PFR extender: Y=30L↓: HST PFR: Y=120R↓, JJ/K/DD/1 Y = 90L, A = 7, B = 6, C = 6, Ext = 7

### GENERIC HST CONTINGENCY PFR SETTINGS

<b>NO MFR</b> PAD/HST PFR			15R↓, PP/S/CC/1
<b>HST MANUAL CAPTURE</b> PFR PFR  PFR	  <i>Shorter crewmember</i>  <i>Taller crewmember</i>	Port – sill Stbd – sill  Stbd – sill	Clamp at 4 <sup>th</sup> half hole fwd of FSS PRLA, AS: Y=3, P=1, PFR: Y=12, R=A, P=1 Clamp at 4 <sup>th</sup> half hole fwd of FSS PRLA, AS: Y=3, P=1, 2 <sup>nd</sup> AS: Y=3, P=1, PFR: Y=6, R=A, P=1 Clamp at 4 <sup>th</sup> half hole fwd of FSS PRLA, AS: Y=3, P=1, PFR: Y=12, R=A, P=1

PFR POSITIONS AND TA SETTINGS (Cont)

NOMINALCENTER AND PORT TA SETTINGS BY TASK

EVA/TASK	CENTER TA	PORT TA
<b>LAUNCH</b>	Launch Config: S31: <u>Y=0↓, A=6, B=6, C=0</u> (due aft), <u>ext=1</u> (A/B knob aft, C knob stbd)	Launch Config: S24: <u>Y=0↓, A=17, B=6, C=6, ext=1</u>
<b>EVA 1</b> WFC III, Bay 3 Battery	Initial Setup: S31: <u>Y=0↓, A=6, B=6, C=6</u> (straight up), <u>ext=1</u> <ul style="list-style-type: none"> <li>• <i>C=0 during payload bay cleanup</i></li> </ul>	Not used: S24: <u>Y=0↓, A=17, B=6, C=6, ext=1</u>
<b>EVA 2</b> RSU, Bay 2 Battery	Daily Setup: S31: <u>Y=0↓, A=6, B=6, C=6</u> (straight up), <u>ext=1</u> <ul style="list-style-type: none"> <li>• <i>C=0 during payload bay cleanup</i></li> </ul>	Not used: S24: <u>Y=0↓, A=17, B=6, C=6, ext=1</u>
<b>EVA 3</b> COS, ACS Part I	Post ASIPE Lid Closure: <u>Y=0↓, A=6, B=6, C=6</u> (straight up), <u>ext=1</u> <ul style="list-style-type: none"> <li>• <i>Not used until after COS due to ASIPE lid interference</i></li> <li>• <i>C=0 during payload bay cleanup</i></li> </ul>	Post RSU on EVA 2: S24: <u>Y=0↓, A=6, B=4, C=8, ext=7</u> <ul style="list-style-type: none"> <li>• Needed for COS b/c center TA cannot be used</li> <li>• Must be configured in order listed above due to hardware interferences</li> <li>• A,B, and C settings are set up on EVA 2, but it's not extended to "7" until EVA 3</li> <li>• Ext is set back to "1" during payload bay cleanup</li> </ul>
<b>EVA 4</b> STIS, NOBL 8/NOBL 5	Daily Setup: S31: <u>Y=0↓, A=6, B=6, C=6</u> (straight up), <u>ext=1</u> <ul style="list-style-type: none"> <li>• <i>C=0 during payload bay cleanup</i></li> </ul>	S24: <u>Y=0↓, B=4, A=6, C=8, ext=1</u>
<b>EVA 5</b> FGS-2, ACS Part II	Daily Setup: S31: <u>Y=0↓, A=6, B=6, C=6</u> (straight up), <u>ext=1</u> <ul style="list-style-type: none"> <li>• <i>C=0 during final closeout</i></li> </ul>	S24: <u>Y=0↓, B=4, A=6, C=8, ext=1</u>
<b>LANDING</b>	S31: <u>Y=0↓, A=6, B=6, C=0</u> (due aft), <u>ext=1</u>	S24: <u>Y=0↓, B=4, A=6, C=8, ext=1</u>

## EMU EQUIPMENT STORAGE LIST (BY ITEM)

ITEM	QTY	LOCATION
Arms (Mass b/u s/n 215, 216)	1 pr	ML60B
Bag, EMU Equipment	2	Vol H, INB, OBD
Bag, EVA	1	Vol H, OBD
Battery, EHIP s/n 1014, 1037	2	Vol H, OBD
Battery, EHIP s/n 1016, 1018	2	Vol H, INB
Battery, EHIP s/n 1003, 1009, 1012, 1013	4	MF57H
Battery, EHIP (SCM) s/n 1038	1	MD FI Bag – Stbd 1
Battery, EMU s/n 2075	1	MA16G
Battery, EMU s/n 2070	1	EMU 3017
Battery, EMU s/n 2082	1	EMU 3004
Battery, EMU s/n 2080	1	EMU 3015
Battery, EMU s/n 2081	1	EMU 3008
Battery, PGT s/n 1016, 1018, 1019, 1020, 5007, 5008	6	MF43H
Battery, PGT s/n 5006	1	MA16F
Battery, REBA s/n 1007, 1012, 1013, 1014	4	MD FI Bag – Stbd 1
BTA	1	MF57O
Bulb, EHIP Floodlight	2	Vol H, OBD
Bulb, EHIP Spot	1	Vol H, OBD
Cable, REBA 25' extension, B/U	1	MD FI Bag – Stbd 1
Cable, REBA 25' extension	1	Pre-Routed
Cable, EHIP-PGT Adapter	3	MA16F
Cable, EHIP DC Y PWR Cable	2	MF43H
Cable, REBA DC Y PWR Cable	1	Pre-Routed
Caddy, EHIP Battery (SCM)	1	MD FI Bag – Stbd 1
CCA (B/U Comm cap for EV crew)(s/n 1189)	1	EMU Equip Bag
CCA (Comm Cap for Megan & RayJ)(s/n 1175)	1	MD FI Bag – Stbd 1
CCA (FT comm cap s/n 1209)	1	EMU 3004
CCA (G comm cap s/n 1185)	1	EMU 3017
CCA (GF comm cap s/n 1183)	1	EMU 3008
CCA (MS comm cap s/n 1190)	1	EMU 3015
Charger, EHIP	2	ML60B
Charger, EHIP	1	MF57C
Charger, EMU Battery	2	MF57C
Charger, REBA	2	MF57C
Croakie (RayJ, ECOK Contingency Bag GF)	1	MD FI Bag – Stbd 2
Croakie, Modified – L (GF, EVA #1 bag)	1	ECOK, GF
Croakie, Modified – L (Mass, in EVA #2 bag)	1	ECOK, Mass
Croakie, Modified – M (Good, EVA #2 bag)	1	ECOK, Good
Cuff Checklist	3	MF43C
Cuff Checklist	1	MF43E
DCM Plug/SAFER Hard Mount	1	MD FI Bag – Stbd 1
Depress Valve Cap – Modified	2	MF71H
DIDB (drink bags)	5	MD FI Bag – Port 1
DIDB (drink bags)	8	MD FI Bag – Stbd 2
DIDB (drink bags)	5	MD FI Bag – Stbd 1
ECOK Contingency Bag (GF & MS)	1	MD FI Bag – Stbd 2
ECOK, FT	1	EMU 3004
ECOK, GF	1	EMU 3008

ITEM	QTY	LOCATION
ECOK, Good	1	EMU 3017
ECOK, Mass	1	EMU 3015
EMU EV Identifier (Scooter, EVA #1 bag)	1	ECOK, GF
EMU Servicing Kit	1	Vol H, INB
EMU TV (ERCA)	1	ML60B
EMU TV (ERCA)	1	ML60M
Gloves, APMA (Overgloves)	4	MA16G
Gloves, EMU (FT Cont s/n 6268)	1 pr	Vol G
Gloves, EMU (FT B/U s/n 6248)	1 pr	MF28O
Gloves, EMU (G B/U s/n 6286)	1 pr	MF28O
Gloves, EMU (GF Cont s/n 6108)	1 pr	Vol G
Gloves, EMU (GF B/U s/n 6129)	1 pr	MF28O
Gloves, EMU (MS B/U s/n 6210)	1 pr	MF28O
Gloves, Thermal Mittens	2 pr	Port TSA
LCVG (FT, s/n 3165)	1	EMU 3004
LCVG (GF, FT B/U s/n 3163)	1	Vol F
LCVG (GF, s/n 3164)	1	EMU 3008
LCVG (Good, s/n 3154)	1	EMU 3017
LCVG (Mass, s/n 3212)	1	EMU 3015
LCVG (MS, G B/U s/n 3205)	1	Vol F
Leg (FT B/U s/n 191)	1	MD FI Bag – Stbd 1
Leg (GF B/U s/n 229)	1	MD FI Bag – Stbd 1
Leg (MS & G B/U s/n 211)	1	MD FI Bag – Stbd 1
Leg Sizing Ring, 1.5" (Mass B/U)	1	ML60M
LiOH – EMU	1	Ext. A/L Floor Bag
LiOH – EMU	1	EMU 3006
LiOH – EMU	1	EMU 3008
LiOH – EMU	1	EMU 3015
LiOH – EMU	1	EMU 3017
LiOH – EMU	8	MD FI Bag – Port 1
LiOH – EMU	2	MD FI Bag – Port 2
LiOH – EMU	1	ML60M
MAG – 709 (FT, all 3 bags)	3	ECOK, FT
MAG – 709 (Good, all 3 bags)	3	ECOK, Good
MAG – 711 (GF, all 3 bags)	3	ECOK, GF
MAG – 711 (GF, ECOK Contingency Bag GF)	3	MD FI Bag – Stbd 2
MAG – 711 (Mass, ECOK Contingency Bag MS)	3	MD FI Bag – Stbd 2
MAG – 711 (Mass, in all 3 bags)	3	ECOK, Mass
Mesh Bag	1	ECOK, FT
Mesh Bag	1	ECOK, Good
Mesh bag	1	ECOK, Mass
Mesh Bag	1	Saddle Bag, GF
Moleskin/Mosite (FT, crew preference)	A/R	ECOK, FT
Moleskin/Mosite (GF, crew preference)	A/R	ECOK, GF
Moleskin/Mosite (Good, crew preference)	A/R	ECOK, Good
Moleskin/Mosite (Mass, crew preference)	A/R	ECOK, Mass
Moleskin Sheet 12x12 (FT, Crew Spares bag)	1	ECOK, FT
Mosite Sheet 12x12 (FT, Crew Spares bag)	1	ECOK, FT

**EMU EQUIPMENT STOWAGE LIST  
(BY ITEM) (Cont)**

ITEM	QTY	LOCATION
O2 Actuator Covers	2	MD FI Bag – Stbd 2
ORU EMU Mission Patch (FT, EVA #5 bag)	1	ECOK, FT
ORU EMU Mission Patch (GF, EVA #5 bag)	1	ECOK, GF
ORU EMU Mission Patch (Good, Unscheduled bag)	1	ECOK, Good
ORU EMU Mission Patch (Mass, Unscheduled bag)	1	ECOK, Mass
ORU EMU Mission Patch (Scooter, EVA #1 bag)	1	ECOK, GF
ORU EMU National Flag Patch (Scooter, EVA #1 bag)	1	ECOK, GF
PGT Battery Jumper	2	MF43H
Signal Conditioner – Backup	1	MA16L
Sock, Polypropylene Liner – L (Good, all 3 bags)	3 pr	ECOK, Good
Sock, Polypropylene liner – L (Mass, all 3 bags)	3 pr	ECOK, Mass
Sock, Thermax Liner – L (GF, EVA #1 bag)	1 pr	ECOK, GF
Sock, Woodsman – L (GF, all 3 bags)	3 pr	ECOK, GF
Spectra Comfort Glove – G (mosite sewn in) (Good, all 3 bags)	3 pr	ECOK, Good
Spectra Comfort Glove – L Thin (FT, all 3 bags)	3 pr	ECOK, FT
Spectra Comfort Glove – L Thin (GF, all 3 bags)	3 pr	ECOK, GF
Spectra Comfort Glove – L Thin (Mass, EVA #4 bag)	1 pr	ECOK, Mass
Spectra Comfort Glove – LI (Mass, all 3 bags)	3 pr	ECOK, Mass
Spectra Comfort Glove – MS (Mass, EVA #4 bag)	1 pr	ECOK, Mass
TCU Bottom – L (GF, all 3 bags)	3	ECOK, GF
TCU Bottom – L (Mass, in all 3 bags)	3	ECOK, Mass
TCU Bottom – M (Good, all 3 bags)	3	ECOK, Good
TCU Bottom – S (FT, all 3 bags)	3	ECOK, FT
TCU Top – L (GF, all 3 bags)	3	ECOK, GF
TCU Top – L (Good, all 3 bags)	3	ECOK, Good
TCU Top – L (Mass, in all 3 bags)	3	ECOK, Mass
TCU Top – M (FT, all 3 bags)	3	ECOK, FT
Tube Socks (FT, in all 3 bags)	3 pr	ECOK, FT
Wristlet (FT, in all 3 bags)	3 pr	ECOK, FT
Zip-Lip Bag 10x10 (GF, all 3 bags)	3	ECOK, GF
Zip-Lip Bag 10x10 (GF & MS, ECOK Contingency bag)	6	MD FI Bag – Stbd 2
Zip-Lip Bag 10x10 (Good, all 3 bags)	3	ECOK, Good
Zip Lip bag 10x10 (in all 3 bags)	3	ECOK, FT
Zip Lip Bag 10x10 (Mass, in all 3 bags)	3	ECOK, Mass

## EMU EQUIPMENT STORAGE LIST (BY LOCATION)

LOCATION	ITEM	QTY	
ECOK, FT	MAG – 709 (FT, all 3 bags)	3	
	TCU Top – M (FT, all 3 bags)	3	
	TCU Bottom – S (FT, all 3 bags)	3	
	Spectra Comfort Glove – L Thin (FT, all 3 bags)	3 pr	
	Wristlet (FT, in all 3 bags)	3 pr	
	Tube Socks (FT, in all 3 bags)	3 pr	
	Moleskin/Mosite (FT, crew preference)	A/R	
	Moleskin Sheet 12x12 (FT, Crew Spares bag)	1	
	Mosite Sheet 12x12 (FT, Crew Spares bag)	1	
	ORU EMU Mission Patch (FT, EVA #5 bag)	1	
	Zip Lip bag 10x10 (in all 3 bags)	3	
	Mesh Bag	1	
	ECOK, GF	MAG – 711 (GF, all 3 bags)	3
		TCU Top – L (GF, all 3 bags)	3
TCU Bottom – L (GF, all 3 bags)		3	
Spectra Comfort Glove – L Thin (GF, all 3 bags)		3 pr	
Sock, Woodsman – L (GF, all 3 bags)		3 pr	
Sock, Thermax Liner – L (GF, EVA #1 bag)		1 pr	
Croakie, Modified – L (GF, EVA #1 bag)		1	
Moleskin/Mosite (GF, crew preference)		A/R	
ORU EMU Mission Patch (GF, EVA #5 bag)		1	
Zip-Lip Bag 10x10 (GF, all 3 bags)		3	
EMU EV Identifier (Scooter, EVA #1 bag)		1	
ORU EMU Mission Patch (Scooter, EVA #1 bag)		1	
ORU EMU National Flag Patch (Scooter, EVA #1 bag)		1	
ECOK, Good		MAG – 709 (Good, all 3 bags)	3
	TCU Top – L (Good, all 3 bags)	3	
	TCU Bottom – M (Good, all 3 bags)	3	
	Spectra Comfort Glove – G (mosite sewn in) (Good, all 3 bags)	3 pr	
	Sock, Polypropylene Liner – L (Good, all 3 bags)	3 pr	
	Croakie, Modified – M (Good, EVA #2 bag)	1	
	Moleskin/Mosite (Good, crew preference)	A/R	
	ORU EMU Mission Patch (Good, Unscheduled bag)	1	
	Mesh Bag	1	
	Zip-Lip Bag 10x10 (Good, all 3 bags)	3	
	ECOK, Mass	MAG – 711 (Mass, in all 3 bags)	3
		TCU Top – L (Mass, in all 3 bags)	3
		TCU Bottom – L (Mass, in all 3 bags)	3
		Spectra Comfort Glove – MS (Mass, EVA #4 bag)	1 pr
Spectra Comfort Glove – LI (Mass, all 3 bags)		3 pr	
Spectra Comfort Glove – L Thin (Mass, EVA #4 bag)		1 pr	
Sock, Polypropylene liner – L (Mass, all 3 bags)		3 pr	
Croakie, Modified – L (Mass, in EVA #2 bag)		1	
Moleskin/Mosite (Mass, crew preference)		A/R	
ORU EMU Mission Patch (Mass, Unscheduled bag)		1	

LOCATION	ITEM	QTY
ECOK, Mass (Cont)	Zip Lip Bag 10x10 (Mass, in all 3 bags)	3
	Mesh bag	1
EMU 3004	Battery, EMU s/n 2082	1
	LCVG (FT, s/n 3165)	1
	ECOK, FT	1
	CCA (FT comm cap s/n 1209)	1
EMU 3006	LiOH – EMU	1
EMU 3008	Battery, EMU s/n 2081	1
	LiOH – EMU	1
	LCVG (GF, s/n 3164)	1
	LCVG (GF, s/n 3164)	1
	ECOK, GF	1
	CCA (GF comm cap s/n 1183)	1
EMU 3015	Battery, EMU s/n 2080	1
	LiOH – EMU	1
	LCVG (Mass, s/n 3212)	1
	ECOK, Mass	1
EMU 3017	CCA (MS comm cap s/n 1190)	1
	Battery, EMU s/n 2070	1
	LiOH – EMU	1
	LCVG (Good, s/n 3154)	1
EMU Equip Bag	ECOK, Good	1
	CCA (G comm cap s/n 1185)	1
	CCA (B/U Comm cap for EV crew)(s/n 1189)	1
Ext. A/L Floor Bag	LiOH – EMU	1
MA16F	Battery, PGT s/n 5006	1
	Cable, EHIP-PGT Adapter	3
MA16G	Battery, EMU s/n 2075	1
	Gloves, APMA (Overgloves)	4
MA16L	Signal Conditioner – Backup	1
MD FI Bag – Port 1	DIDB (drink bags)	5
	LiOH – EMU	8
MD FI Bag – Port 2	LiOH – EMU	2
MD FI Bag – Stbd 1	Battery, EHIP (SCM) s/n 1038	1
	Battery, REBA s/n 1007, 1012, 1013, 1014	4
	Cable, REBA 25' extension, B/U	1
	Caddy, EHIP Battery (SCM)	1
	CCA (Comm Cap for Megan & RayJ)(s/n 1175)	1
	DIDB (drink bags)	5
	Leg (FT B/U s/n 191)	1
	Leg (GF B/U s/n 229)	1
Leg (MS & G B/U s/n 211)	1	
MD FI Bag – Stbd 2	DCM Plug/SAFER Hard Mount	1
	DIDB (drink bags)	8
	ECOK Contingency Bag (GF & MS)	1

**EMU EQUIPMENT STOWAGE LIST  
(BY LOCATION) (Cont)**

LOCATION	ITEM	QTY
MD FI Bag – Stbd 2 (Cont)	O2 Actuator Covers	2
	MAG – 711 (GF, ECOK Contingency Bag GF)	3
	MAG – 711 (Mass, ECOK Contingency Bag MS)	3
	Croakie (RayJ, ECOK Contingency Bag GF)	1
	Zip-Lip Bag 10x10 (GF & MS, ECOK Contingency bag)	6
MF28O	Gloves, EMU (FT B/U s/n 6248)	1 pr
	Gloves, EMU (G B/U s/n 6286)	1 pr
	Gloves, EMU (GF B/U s/n 6129)	1 pr
	Gloves, EMU (MS B/U s/n 6210)	1 pr
MF43C	Cuff Checklist	3
MF43E	Cuff Checklist	1
MF43H	Battery, PGT s/n 1016, 1018, 1019, 1020, 5007, 5008	6
	Cable, EHIP DC Y PWR Cable	2
	PGT Battery Jumper	2
MF57C	Charger, EHIP	1
	Charger, EMU Battery	2
	Charger, REBA	2
MF57H	Battery, EHIP s/n 1003, 1009, 1012, 1013	4
MF57O	BTA	1
MF71H	Depress Valve Cap – Modified	2
ML60B	Arms (Mass b/u s/n 215, 216)	1 pr
	Charger, EHIP	2
	EMU TV (ERCA)	1
ML60M	EMU TV (ERCA)	1
	Leg Sizing Ring, 1.5" (Mass B/U)	1
	LiOH – EMU	1
Port TSA	Gloves, Thermal Mittens	2 pr
Pre-Routed	Cable, REBA 25' extension	1
	Cable, REBA DC Y PWR Cable	1
Saddle Bag, GF	Mesh Bag	1
Vol F	LCVG (GF, FT B/U s/n 3163)	1
	LCVG (MS, G B/U s/n 3205)	1
Vol G	Gloves, EMU (FT Cont s/n 6268)	1 pr
	Gloves, EMU (GF Cont s/n 6108)	1 pr
Vol H, INB	Battery, EHIP s/n 1016, 1018	2
	EMU Servicing Kit	1
Vol H, INB, OBD	Bag, EMU Equipment	2
Vol H, OBD	Bag, EVA	1
	Battery, EHIP s/n 1014, 1037	2
	Bulb, EHIP Floodlight	2
	Bulb, EHIP Spot	1

POST EVA

POST EVA .....	TEMP FS 9-2
SUIT DOFFING .....	TEMP FS 9-2
EMU WATER RECHARGE .....	TEMP FS 9-3
SUIT DRYING/SEAL WIPE .....	TEMP FS 9-3
OXYGEN RECHARGE VERIFICATION.....	TEMP FS 9-4
WATER FILL VERIFICATION .....	TEMP FS 9-4
EMU POWERDOWN/OVERNIGHT STOW .....	TEMP FS 9-4
POST EVA GLOVE PHOTOS .....	TEMP FS 9-6

POST EVA

**POST EVA** (00:45 if NOT performing 'If reqd' proc blocks)  
 (01:25 if performing all 'If reqd' proc blocks)

SUIT DOFFING

**WARNING**  
 Do not doff EMU if DCS symptoms resolved during REPRESS. √MCC via PMC

- |  |         |   |   |
|--|---------|---|---|
| IV   |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 1. When $\Delta P < 0.5$ , open hatch   |
|  | A/L     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 2. Configure appropriate vent ducts for airflow into airlock  |
| EV   |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 3. √Gloves clean  |
| * If reqd, IV use damp towel to clean gloves * |         |   |   |
| IV   |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 4. Take glove photos, reference POST EVA GLOVE PHOTOS ( <u>POST EVA</u> ). Report any damage to MCC   |
| BOTH   | DCM     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 5. O2 ACT – OFF   |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 6. PURGE vlv – op (up)  |
| IV   | DCM     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 7. Install WATER sw guards (two)  |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 8. EMU TV power pb – press; √Green LED not illuminated  |
|  | PLSS    | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 9. √Glove heaters sw (one per glove) – OFF  |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 10. REBA sw – OFF (toward left arm of suit)   |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 11. Disconnect lower arm pwr harness from gloves  |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 12. Stow lower arm and glove pwr harness connectors under TMG   |
|  | PLSS    | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 13. Demate EMU TV power cable, mate to ground plug  |
|  | DCM     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 14. √STATUS: <span style="border: 1px solid black; padding: 2px;">SUIT P</span> < 0.4 (compare w/gauge); disconnect gloves, stow in EMU Equipment Bag |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 15. Disconnect helmet, transfer to middeck  |
|  | AW82B   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 16. AIRLK DEPRESS vlv – install cap   |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 17. AAP release handles to 90°  |
| BOTH   |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 18. Engage HUT in AAP (IV assist as reqd)   |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 19. AAP release handles to lock   |
|  | DCM     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 20. FAN – OFF (fwd)   |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 21. COMM mode – OFF   |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 22. Doff comm cap   |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 23. Disconnect waist ring, LCVG, biomed   |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 24. √Wrist disconnects – op   |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 25. Doff EV glasses   |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 26. Doff HUT  |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 27. Doff LTA, secure to handrail  |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 28. Remove dosimeter from LCVG; insert in inflight garment  |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 29. Doff: Biomed (disc pigtail adapter, stow in EMU Servicing Kit)<br>LCVG (secure to HUT)<br>TCU (allow to dry, as reqd)<br>MAG, stow in wet trash   |
| IV   | HUT     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 30. Install Multiple Water Connector cover  |
|  |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 31. Perform EVA COMM DECONFIG ( <u>EVA PREP</u> )   |
|  | R1      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 32. O2 TK3 HTR A(B) – as reqd   |
|  | ML86B:C | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 33. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl  |

POST EVA

Cont next page

TEMP FS 9-2

**125**

EVA/125/FIN A



EMU WATER RECHARGE (5 min) (If reqd)

R11L  34. SPLY H2O TKA OUTLET – CL (tb-CL)

**SM 60 TABLE MAINT**

CRT  35. Use TKB quantity:

PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC

36. Log value before recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

AW82D  37. √EMU 1,2 H2O WASTE tb (two) – CL  
EMU 1,2 SPLY (two) – OP (tb-OP)

CRT  38. √H2O TKB quantity decreasing

SUIT DRYING/SEAL WIPE

39. Wipe with drying towel:  
LTA, legs, boots  
HUT, suit arms  
Gloves

**WARNING**

Avoid stericide contact with eyes. Wash hands thoroughly after application

40. Wipe LTA crotch and HUT armpit areas with stericide (in EMU Servicing Kit)

41. Lightly wipe seals on LTA waist ring, arm wrist rings, HUT neck ring with lint-free wipe (in EMU Servicing Kit)

42. Clean, refurbish biomed

43. Remove drink bag from HUT and dispose in wet trash

44. √Drink Bag Restraint Bag installed in HUT

### OXYGEN RECHARGE VERIFICATION

DCM  45.  $\sqrt$ STATUS: O2 P  ~850 (recharge complete)

### WATER FILL VERIFICATION (10 min) (If reqd)

DCM  46.  $\sqrt$ STATUS: H2O WP  8-15 psi and stable for ~30 sec  
(indicates charging complete)

#### SM 60 TABLE MAINT

CRT  47. Use TKB quantity:  
PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC

R11L  48. Log value after recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

#### NOTE

Full charge = ~6%/EMU

R11L  49. SPLY H2O TKA OUTLET – OP (tb-OP)

WCS  50.  $\sqrt$ FAN SEP same as HOSE BLOCK

51. MODE – COMMODE/MANUAL/EMU, posn guard over sw  
( $\sqrt$ airflow, WCS ON It on)

AW82D  52. EMU 1,2 H2O SPLY (two) – CL (tb-CL)

53. Install SCOFs, lock

DCM  54. O2 ACT – IV

AW82H  55. EMU 1,2 H2O WASTE reg (two) – MAN OP

#### NOTE

Step 56 will be performed serially for EMU 1 and EMU 2

AW82D  56. EMU 1(2) H2O WASTE (one) – OP (tb-OP) (1 min), then  
– CL (tb-CL)  
– Repeat for other EMU

AW82H  57. EMU 1,2 H2O WASTE reg (two) – REGULATING

DCM  58. O2 ACT – OFF

59. Remove SCOFs, stow

WCS  60. MODE – AUTO ( $\sqrt$ WCS ON It off)

### EMU POWERDOWN/OVERNIGHT STOW

61. Stow comm cap in arm of EMU

62. Remove used Helmet Light Batteries in preparation for Battery Charging

63. Install new Helmet Light Batteries per STS-125 EVA CONSUMABLES CUE CARD (EMU MAINT/RECHARGE) in preparation for the next EVA

$\sqrt$ Helmet Light Ops

64. Remove Helmet Lights and EMU TV, install on Middeck EMUs in preparation for the next EVA

AW18D  65. AIRLK AUD PWR – OFF

AW18H  66. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
PWR/BATT CHGR EMU 1,2 MODE (two) – OFF

AW82D  67.  $\sqrt$ EMU 1,2 H2O WASTE, SPLY tb (four) – CL

AW82B  68. EV-1, EV-2 O2 vlv (two) – CL

BOTH  69. Remove SCU; install DCM cover

70. Stow SCU on AAP, Velcro to wall

71. Tether LTA for drying

72. Hang LCVGs, TCUs, and other EMU accessories for drying

If last EVA completed:

X: SM 60 SM TABLE MAINT

73. Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

<u>Param Name</u>	<u>Param ID</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
EXT A/L H2O LINE T 1			
EXT A/L H2O SPLY ZN 1 T	0640181	43	145
EXT A/L LCG 2 SPLY ZN 1 T	0640182	49	145
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	145
EXT A/L LCG 2 SPLY ZN 2 T	0640185	45	145
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	OSH

## POST EVA GLOVE PHOTOS

### CAMERA SETTINGS:

D2Xs  1. A (Aperture Priority), 28-70 mm @ 70mm, f16, ISO 100, Exposure Comp = 0.0, flash mode TTL BL, Diffuser Dome installed, tilt = 45 deg

### EMU GLOVE and OVERGLOVE PHOTO SEQUENCE:

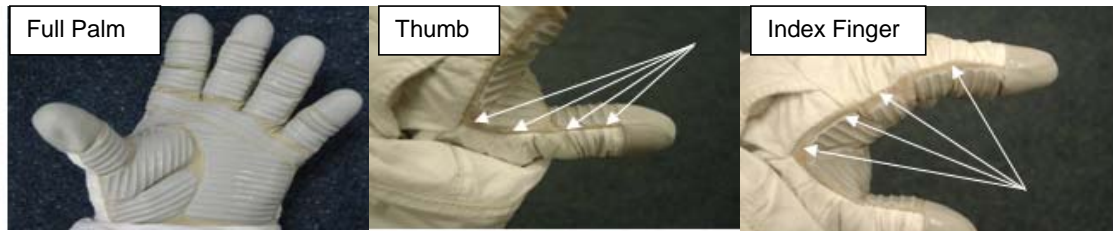


FIGURE 1.- GLOVE PHOTOS

### NOTE

- Steps 2 through 9 should be performed serially
- Steps 3 through 8 are required for both the EMU Gloves and the Overgloves if used
- Squeeze finger caps and photograph any slices
- Manipulate Vectran along seam from index finger to thumb to open potential holes
- Manipulate TMG to show best possible views of the damage
- If not obvious, point to area of interest or concern

- |            |   |  |
|------------|---|--|
| EV1,2,3,4  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 2. Place CM identification (suit stripes, Velcro IDs) in photos                |
| Left       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 3. Full palm   |
| Glove      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 4. Thumb (seam facing index finger)  |
|            | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 5. Index finger (seam facing thumb)  |
|            |   | Take additional photos as necessary of any damaged Vectran, missing or cut RTV |
| Right      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 6. Full palm   |
| Glove      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 7. Thumb (seam facing index finger)  |
|            | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 8. Index finger (seam facing thumb)  |
|            |   | Take additional photos as necessary of any damaged Vectran, missing or cut RTV |
| Overgloves | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 9. Repeat steps 2 through 8 for EMU Overgloves if used                         |

### DOWNLINK PHOTOS:

- |   |  |
|---|--|
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 10. Insert Flash Card w/PCMCIA Adapter into KFX PGSC |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 11. Inform MCC "files containing glove photos ready" |

EMU MAINT/RECHARGE

WATER RECHARGE .....	TEMP FS 10-2
EMU POWERUP .....	TEMP FS 10-2
WATER FILL .....	TEMP FS 10-2
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STS-125 EVA CONSUMABLES CUE CARD .....	FS CC 10-15

## WATER RECHARGE

### IF EMU NOT ALREADY POWERED UP:

#### EMU POWERUP

- BOTH DCM 1. Retrieve, position SCUs; remove DCM covers  
 2. Connect SCUs to DCM, √locked  
 3. PWR – BATT

#### CAUTION

EMU must be on BATT pwr when  
 airlock pwr supply is turned on

- AW18H 4. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR  
 BUS SEL (two) – MNA(MNB)  
 MD(flr) 5. √EMU O2 ISOL VLV – OP  
 AW82B 6. EV1,2 O2 vlv (two) – OP  
 DCM 7. PWR – SCU

#### WATER FILL

- MO13Q 8. √ARLK H2O S/O VLV – OPEN (tb-OP)  
 R11L 9. √SPLY H2O TKA OUTLET – CL (tb-CL)

#### SM 60 TABLE MAINT

- CRT 10. Use TKB quantity:  
 PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC  
 11. Log value before recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

- AW82D 12. √EMU 1,2 H2O WASTE tb (two) – CL  
 SPLY (two) – OP (tb-OP)  
 13. √H2O TKB quantity decreasing

#### NOTE

Full charge requires ~15 min

#### WATER FILL VERIFICATION

- DCM 14. √STATUS: H2O WP 8-15 psi and stable for ~30 sec (indicates charging complete)

#### SM 60 TABLE MAINT

- CRT 15. Use TKB quantity:  
 PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC  
 16. Log value after recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

EMU MAINT/  
 RECHARGE

Cont next page

TEMP FS 10-2

125

EVA/ALL/FIN A

NOTE

Full charge = ~6%/EMU

- R11L 17. SPLY H2O TKA OUTLET – OP (tb-OP)
- WCS 18. √FAN SEP same as HOSE BLOCK
- 19. MODE – COMMODOE/MANUAL/EMU, posn guard over sw  
(√airflow, WCS ON It on)
- AW82D 20. EMU 1,2 H2O SPLY (two) – CL (tb-CL)
- 21. Install SCOFs, lock
- DCM 22. O2 ACT – IV
- AW82H 23. EMU 1,2 H2O WASTE reg (two) – MAN OP

NOTE

Step 24 will be performed serially for EMU 1 and EMU 2

- AW82D 24. EMU 1(2) H2O WASTE (one) – OP (tb-OP) (1 min), then  
– CL (tb-CL)  
– Repeat for other EMU
- AW82H 25. EMU 1,2 H2O WASTE reg (two) – REGULATING
- DCM 26. O2 ACT – OFF
- 27. Remove SCOFs, stow
- WCS 28. MODE – AUTO (√WCS ON It off)
- 29. If EMU powerup performed, go to EMU POWERDOWN

## EMU BATTERY INSTALLATION AND LiOH CHANGEOUT (20 min)

- 1. Unstow LiOH (2) and EMU Batteries (2) per STS-125 EVA CONSUMABLES CUE CARD (EMU/MAINT/RECHARGE) for upcoming EVA

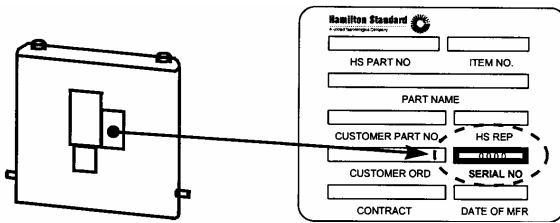
Middeck

EMUs

□□□□□□

□□□□□□

2. Unzip thermal cover, Velcro to top of EMU  
3. Record used LiOH serial numbers



EVA #	EV1	EV2
1		
2		
3		
4		
5		
6		

- 4. Remove used LiOH cartridge, temp stow, will mark with tape if SCU connected to DCM:  
AW18H □□□□□□ 5. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF

DCM

□□□□□□

6. √PWR – SCU

**CAUTION**

Do not allow battery to impact airlock wall and use care when handling/stowing battery to avoid damaging aluminum cover

□□□□□□

7. Install new battery (√connector alignment), latch

**CAUTION**

If 10.2 cabin used, possible  $\Delta P$  across LiOH cartridge caps. Direct ports away from face  
Limit exposure time of uncapped canister ports and avoid contact with seals

□□□□□□

8. Holding new LiOH cartridge with aluminum plate serial number facing self, remove caps, √O-ring seals for damage, install LiOH (attach Velcro retainer strap)

□□□□□□

9. Close thermal cover zipper

□□□□□□

10. Place caps and cap tape (mark with "X") on used LiOH cartridge

□□□□□□

11. Stow used LiOH in middeck lockers



## MIDDECK EMU BATTERY RECHARGE (STAND-ALONE)

### NOTE

Do not begin charging until 4 hr after EMU Battery use

Refer to REF DATA for specific plug-in plan location

### INITIATE (20 min)

- |              |   |
|--------------|---|
| Middeck EMUs | 1. Unstow middeck battery charger   |
|              | 2. Remove EMU Batteries for charging per <u>STS-125 EVA CONSUMABLES CUE CARD (EMU/MAINT/RECHARGE)</u> refer to (EMU BATTERY REMOVAL/INSTALLATION, <u>EMU MAINT/RECHARGE</u> ) |
| ML85E J22    | 3. √DC UTIL PWR – OFF   |
|              | If charging just 1 EMU Battery  |
|              | 4. Place Kapton Tape over the charger cable connection that will not be connected to a battery  |
|              | 5. Affix battery(s) to charger using Velcro straps on charger   |
|              | 6. Connect charger cables to battery(s)   |
|              | 7. Stow battery(s)/charger for charge   |
|              | 8. √Charger power cable connected to J22 MUP utility outlet   |
|              | 9. √CB closed for J22   |
| Charger      | 10. DC UTIL PWR – ON  |
|              | 11. √ON LEDs (red) – ON   |
|              | √READY LEDs (green) – ON (for 10 sec at startup)  |
|              | √READY LEDs (green) – blinking  |

### NOTE

EMU batteries may experience a false charge completion due to passivation within the battery. The passivation is removed with repeated attempts (two to three times) at charging the battery

After 15 min charging, verify charging is continuing:

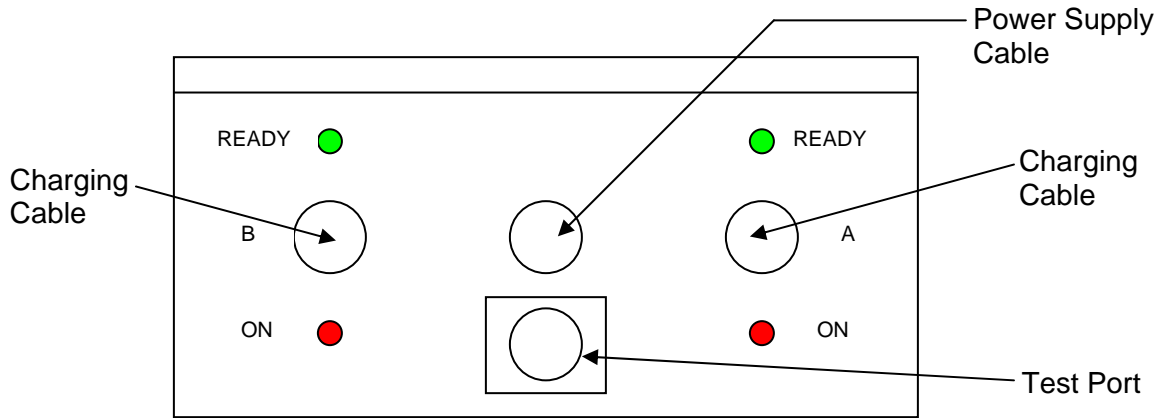
- |         |  |
|---------|--|
| Charger | 12. √ON LEDs (red) – ON                                |
|         | √READY LEDs (green) – blinking                         |
|         | * If ON LED (red) is OFF and READY LED (green) is ON * |
|         | * (non-blinking): *                                    |
|         | * 1. DC UTIL PWR – OFF (3 sec) *                       |
|         | * 2. DC UTIL PWR – ON *                                |
|         | * 3. √ON LEDs (red) – ON *                             |
| Charger | * 4. √READY LEDs (green) – ON 10 sec at startup *      |
|         | * 5. √READY LEDs (green) – blinking *                  |
|         | * 6. Report anomaly to MCC *                           |

### NOTE

The absence of any active LEDs represents an over-current or overvoltage condition that has caused the charger to shut down, or the charger has not been properly powered from the DC Utility Outlet. All protective conditions are resettable by taking the DC UTILITY POWER to OFF.

During the charge, the red ON LED will be illuminated and the green READY LED will continue to blink, giving positive indication that the charger is still charging

## MIDDECK EMU BATTERY RECHARGE (STAND-ALONE) (Cont)



TERMINATE (10 min)

### NOTE

When a nominal charge is complete, the red ON LED will extinguish and the green READY LED will illuminate without blinking. The red ON LED will be illuminated only when the positive current flow into the battery is greater than 0.6A

- Charger  
ML85E J22
13. When charge complete:
    - √ON LEDs (red) – OFF
    - √READY LEDs (green) – ON
    - DC UTIL PWR – OFF
    - Disconnect cables from battery(s)
  14. Stow batteries in “Charged” mesh bag or install in EMUs for next EVA
  15. Stow charger after last EMU’s batteries are charged from Post EVA 5

## IN-SUIT EMU BATTERY RECHARGE/CHARGE VERIFICATION

### INITIATE

1. Retrieve, position SCUs; remove DCM covers
2. Connect SCUs to DCM, √locked
- AW18H 3. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
MODE (two) – CHARGE  
BUS SEL (two) – MNA(MNB)
4. Continue charge as reqd:  
Verification: 15 min, minimum  
Full Charge: Up to 20 hr

### TERMINATE

- AW18H 5. √PWR/BATT CHGR EMU INPUT AMPS < 1 for both EMUs
6. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
MODE (two) – OFF
7. Remove SCU, install DCM cover
8. Stow SCU on AAP, Velcro to wall

## EMU POWERDOWN

- AW18H 1. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
MODE (two) – OFF
- AW82D 2. √EMU 1,2 H2O WASTE,SPLY tb (four) – CL
3. Remove SCU, install DCM cover
4. Stow SCU on AAP, Velcro to wall

# HELMET LIGHT/PGT BATTERY RECHARGE

INITIATE (10 min)

## NOTE

Refer to REF DATA for specific plug-in location  
 Refer to STS-125 EVA CONSUMABLES CUE CARD (EMU/MAINT/RECHARGE) for which batteries to be charged. J23 for 4 EHIPs, 2 PGTs & J13 for 1 PGT

1. Unstow, as reqd: EHIP Battery Charger (2-3)  
 EHIP DC Y PWR Cable (2)  
 EHIP-PGT Adapter cable (charger to battery) (2-3)  
 PGT Batteries (2-3)  
 Helmet Light Batteries (4)
- ML85E J23,J13 2. √DC UTIL PWR – OFF, √cb closed (in)
3. √Charger connector caps are installed where batteries will not be installed
4. √One leg of EHIP DC Y PWR Cable is capped if it is not going to be connected to a charger
- ML85E J23,J13 5. √EHIP DC Y PWR Cable plugged into charger and orbiter pwr supply
6. DC UTIL PWR – ON  
 √Blue LEDs illuminated
- \* If blue LEDs not illuminated: \*
- \* √DC UTIL PWR – ON \*
- \* If blue LEDs still not illuminated: \*
- \* DC UTIL PWR – OFF \*
- \* Unplug EHIP DC Y PWR Cable from charger \*
- \* Change fuse (7.5A) \*
- IFM Pin Kit \* Plug EHIP DC Y PWR Cable into charger \*
- \* DC UTIL PWR – ON \*

If charging helmet light batteries:

7. Install batteries (four) into charger

If charging PGT batteries, for EACH battery:

8. Release captive screw on PGT battery door using screwdriver
9. Pry open PGT battery door, rotate away from cavity
10. Remove cap from EHIP PGT Adapter cable into charger
11. Remove battery jumper, temp stow on EHIP-PGT Adapter cable cap  
 Plug EHIP-PGT Adapter cable into battery
12. Install EHIP-PGT Adapter cable into charger
13. √Yellow LED illuminated; start timer (MET \_\_\_\_/\_\_\_\_:\_\_\_\_:\_\_\_\_);  
 temp stow charger

\* If yellow LED not illuminated, see chart below \*

Indicator	Problem	Solution
Green and red LED illuminated	Cold batt (≤ 50 degF)	Leave batt installed in charger (batt will warm up and automatically change LED to yellow)
Red LED illuminated	Hot batt (≥ 113 degF)	DC UTIL PWR – OFF Remove batt or EHIP-PGT adapter if PGT batt DC UTIL PWR – ON

14. Wait 15 min and check LEDs to verify good charging

If yellow LEDs illuminated:

15. Continue charging

If green LED(s) illuminated:

16. DC UTIL PWR – OFF
17. Remove battery or EHIP-PGT Adapter cable from affected station(s)

18. DC UTIL PWR – ON
19. Wait for blue LED(s) to illuminate
20. Re-install battery or EHIP-PGT Adapter cable
21. ✓Yellow LED(s) illuminated
22. Continue charging

TERMINATE (10 min)

NOTE

Refer to REF DATA for specific plug-in location

1. ✓Green LED illuminated

WARNING  
Ensure charger is unpowered before disconnecting batteries

CAUTION  
Do not leave batteries installed after unpowering charger to prevent possible charger damage and battery discharge

- ML85E J23,J13    2. DC UTIL PWR – OFF

If helmet light batteries charged:

3. Remove batteries from charger, temp stow for install Post EVA

CAUTION  
Do not stow EMU lights in locker with batteries installed

If PGT batteries charged, for each battery:

4. Remove EHIP-PGT Adapter cable from charger
5. Unplug battery from EHIP-PGT Adapter cable; reinstall cap on cable

NOTE

PGT battery will not function if jumper is not installed

6. Re-install battery jumper
7. Rotate battery door into place, tighten screw using screwdriver
8. Stow charged batteries in “Charged” mesh bag
9. Stow after last batteries are charged Post EVA 5:  
EHIP Light Battery Chargers (3)  
EHIP DC Y PWR Cable (2)  
EHIP-PGT Adapter cables (3)

**REBA BATTERY INSTALLATION**

- 1. Unstow REBA(s) from locker per STS-125 EVA CONSUMABLES CUE CARD (EMU MAINT/RECHARGE)
- 2. Remove EMU from AAP as required, unzip TMG to access REBA pouch and EMU power harness
- 3. ✓Glove heater sw (two) – OFF
- 4. Remove REBA J1 fabric cover
- 5. Install REBA on EMU
- 6. Route REBA sw pull tabs thru TMG loops
- 7. ✓REBA sw (one per EMU) – OFF (toward left arm of suit)
- 8. Connect EMU power harness (P1) to REBA (J1); verify locked by gently pulling on EMU power harness cable
- 9. Zip TMG closed, install EMU on AAP

## EMU BATTERY REMOVAL/INSTALL (5 min)

### CAUTION

Do not allow battery to impact airlock wall and use care when handling/stowing battery to avoid damaging aluminum cover

### WARNING

EMU pwr switch must be in SCU position with airlock pwr OFF during battery changeout

DCM       1. √PWR – SCU

If SCU connected to DCM:

AW18H       2. √PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF

PLSS       3. Release EMU from AAP as reqd

4. Unzip thermal cover, Velcro to top of EMU

5. Open LiOH(Metox) latches (2)

6. Rotate LiOH(Metox) canister outward until softstop or remove canister

7. Open battery latch (1)

8. Remove/install EMU battery as reqd (√connector alignment)

9. Close battery latch (1)

10. Reinstall LiOH(Metox) latches (2)

11. Close thermal cover

12. Reinstall EMU in AAP as reqd

13. Stow or charge batteries as reqd

## HELMET LIGHT BULB CHANGEOUT (15 min)

### NOTE

Light assembly has several loose pieces which may be spring loaded. Be prepared to capture them during changeout

### CAUTION

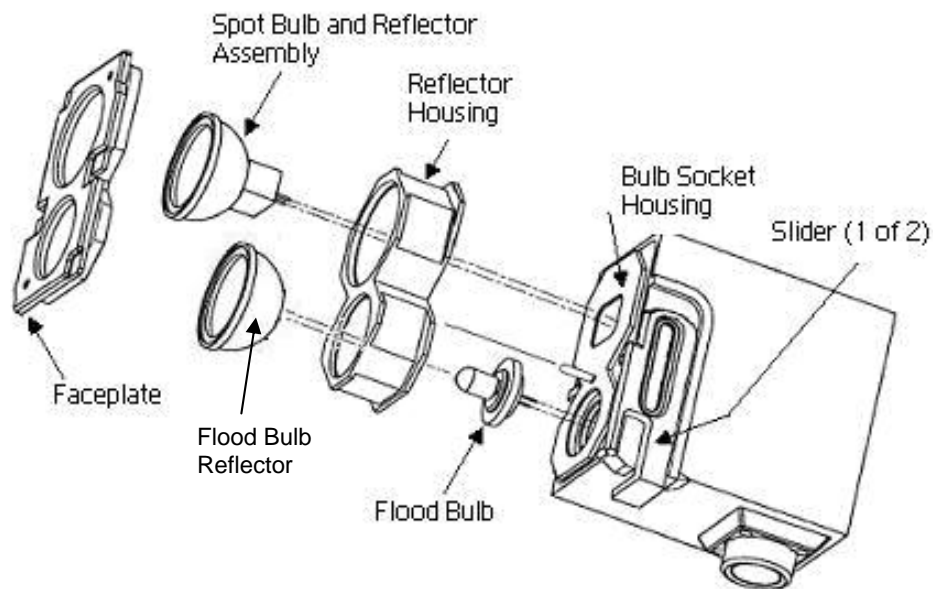
Handle bulbs with care. Do not touch bulbs with bare hands (could degrade bulb life span)

1. Remove battery from affected side of lights
2. If EMU TV installed, remove camera from affected side of lights
3. Obtain, don comfort glove
4. Depress faceplate; open faceplate sliders (two) on affected side of lights
5. Remove faceplate
6. Remove reflector housing by pulling straight out
7. Remove affected bulbs as reqd, replace
8. Mark, stow used bulbs

### NOTE

Contacts on spot bulb may be difficult to reseal fully into socket

9. Install reflector housing and flood bulb reflector, seat spot bulb
10. Install faceplate, lock sliders (two)
11. Install battery; ✓EMU light ops
12. If EMU TV installed, attach camera back to affected side of lights
13. Remove, stow comfort glove



## REBA BATTERY RECHARGE

INITIATE (10 min)

### NOTE

Refer to REF DATA for specific plug-in plan location

- |                 |  |
|-----------------|--|
| MO63P <u>J3</u> | 1. Unstow: REBA Charger  |
|                 | 2. √DC UTIL PWR – OFF, √cb closed (in)   |
|                 | 3. √REBA DC Y PWR Cable plugged into charger and the 25' REBA Ext Pwr cable, √25' REBA Ext Pwr cable plugged into orbiter power supply |
| MO63P <u>J3</u> | 4. DC UTIL PWR – ON  |
|                 | √Blue LEDs (two) illuminated   |
|                 | * If blue LED not illuminated: *   |
|                 | *     √DC UTIL PWR – ON *  |
|                 | *     √cb – cl *   |
|                 | *     √Cable connections mated *   |
|                 | * If blue LED still not illuminated: *   |
|                 | *     DC UTIL PWR – OFF *  |
| REBA<br>Charger | *     Unplug EHIP DC PWR/REBA DC EXT Y-Cable from charger *  |
|                 | *     Change fuse (4.0 Amps) *   |
|                 | *     Plug EHIP DC PWR/REBA DC EXT Y-Cable into charger *  |
|                 | *     DC UTIL PWR – ON *   |
| REBA            | 5. √REBA sw (two) – OFF  |
|                 | 6. Demate REBA jumper cables (two)   |
|                 | 7. Mate charger cables (two) to REBA jumper cables   |
| REBA<br>Charger | 8. √Yellow LEDs (two) illuminated; temp stow charger on wall   |

\* If yellow LED not illuminated, see chart below \*

Indicator	Problem	Solution
Green and red LED illuminated	Cold batt (≤ 50 degF)	Leave REBA connected to charger (REBA will warm up and automatically change LED to yellow)
Red LED illuminated	Hot batt (≥ 113 degF)	DC UTIL PWR – OFF Disconnect REBA from charger. Allow REBA to cool DC UTIL PWR – ON Mate charger cable to REBA jumper cable

Wait 15 min and check LEDs to verify good charging:

9. √READY LEDs (green) – Off

- |   |   |
|---|---|
| * If READY LED (green) – On:                  | * |
| *     DC UTIL PWR – OFF                       | * |
| *     Disconnect REBA from charger            | * |
| *     DC UTIL PWR – ON                        | * |
| *     When NO BATTERY LED (blue) – On:        | * |
| *     Mate charger cable to REBA jumper cable | * |
| *     √CHARGING LED (yellow) – On             | * |



TERMINATE (10 min)

NOTE

Refer to REF DATA for specific plug-in plan location

1. ✓Green LED illuminated

WARNING

Ensure charger is unpowered before disconnecting batteries

CAUTION

Do not leave batteries installed after unpowering charger to prevent possible charger damage and battery discharge

MO63P J3

2. DC UTIL PWR – OFF
3. Disconnect REBA from charger
4. Mate REBA jumper cables
5. Snap, Velcro, and zip EMU TMG close
6. Stow REBA Charger after last batteries are charged Post EVA 5

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TOP

**HOOK  
VELCRO**

**STS-125 EVA CONSUMABLES CUE CARD**

EV1: GF    EV3: MS  
EV2: FT    EV4: G

		EMU	LiOH (s/n)	EMU Battery (s/n)	HL Battery (s/n)	REBA (s/n)	PGT Battery (s/n)	MPT Battery (s/n)	Spare PGT/MPT Batt (s/n)	SCM (HL) Batt (s/n)
<b>FD 2: EMU C/O</b>	<b>GF</b>	3008	2004	2081		1013				
	<b>FT</b>	3004	2005	2082		1014				
	<b>MS</b>	3015	2006	2080	1014, 1037	1007				
	<b>G</b>	3017	2012	2070	1016, 1018	1012				
<b>FD 4: EVA 1</b>	<b>GF</b>	3008	~ launched in suit	2081 ~ launched in suit	1014, 1037	1013	1016		5008	1038
	<b>FT</b>	3004	2005 ~ launched in suit	2082 ~ launched in suit	1016, 1018	1014	1018			
<b>Post EVA 1</b>				Recharge 2081, 2082 after 4 hr in MUP J22	Recharge 1014, 1037, 1016, 1018 in EHIP charger in MUP J23	Recharge 1013, 1014 in suits in MO63PJ3	Recharge 1016, 1018 in PGT charger in MUP J23			
<b>FD 5: EVA 2</b>	<b>MS</b>	3015	2006 ~ launched in suit	2080 ~ launched in suit	1003, 1009	1007	1019		5008	
	<b>G</b>	3017	2012 ~ launched in suit	2070 ~ launched in suit	1012, 1013	1012	1020			
<b>Post EVA 2</b>				Recharge 2080, 2070 after 4 hr in MUP J22	Recharge 1003, 1009, 1012, 1013 in EHIP charger in MUP J23	Recharge 1007, 1012 in suits in MO63PJ3	Recharge 1019, 1020 in PGT charger in MUP J23			
<b>FD 6: EVA 3</b>	<b>GF</b>	3008	2020	2081	1014, 1037	1013	1016	5006	5008/5007	
	<b>FT</b>	3004	2003	2082	1016, 1018	1014	1018			
<b>Post EVA 3</b>				Recharge 2081, 2082 after 4 hr in MUP J22	Recharge 1014, 1037, 1016, 1018 in EHIP charger in MUP J23	Recharge 1013, 1014 in suits in MO63PJ3	Recharge 1016, 1018 in PGT charger in MUP J23	Recharge 5006 in PGT charger in MUP J13		

(reduced copy)

EVA-5a/125/O/B

TOP  
BACK OF 'STS-125 EVA CONSUMABLES CUE CARD'

**HOOK  
VELCRO**

EV1: GF	EV3: MS
EV2: FT	EV4: G

		EMU	LiOH (s/n)	EMU Battery (s/n)	HL Battery (s/n)	REBA (s/n)	PGT Battery (s/n)	MPT Battery (s/n)	Spare PGT/MPT Batt (s/n)	SCM (HL) Batt (s/n)
<b>FD 7: EVA 4</b>	<b>MS</b>	3015	2030	2080	1003, 1009	1007	1019	5007	5008/5006	
	<b>G</b>	3017	2025	2070	1012, 1013	1012	1020			
<b>Post EVA 4</b>				Recharge 2080, 2070 after 4 hr in MUP J22	Recharge 1003, 1009, 1012, 1013 in EHIP charger in MUP J23	Recharge 1007, 1012 in suits in MO63PJ3	Recharge 1019, 1020 in PGT charger in MUP J23	Recharge 5007 in PGT charger in MUP J13		
<b>FD 8: EVA 5</b>	<b>GF</b>	3008	2002	2081	1014, 1037	1013	1016		5008	
	<b>FT</b>	3004	2016	2082	1016, 1018	1014	1018			
<b>Post EVA 5</b>				Recharge 2081, 2082 after 4 hr in MUP J22	Recharge 1014, 1037, 1016, 1018 in EHIP charger in MUP J23	Recharge 1013, 1014 in suits in MO63PJ3	Recharge 1016, 1018 in PGT charger in MUP J23			
<b>FD 9: HST Deploy</b>	<b>MS</b>	3015	2021	2080 <sup>†</sup>	1003, 1009	1007	1019		5008	
	<b>G</b>	3017	2026	2070	1012, 1013	1012	1020			
<b>Post EVA 6</b>										
<b>PEEP</b>	<b>GF</b>	3008	2002	2081						
	<b>FT</b>	3004	2016	2082						
	<b>MS</b>	3015	2021	2080 <sup>†</sup>						
	<b>G</b>	3017	2026	2070						
<b>Cont EVA</b>	<b>GF</b>	3008	2031*	2070	1003, 1009	1013	1019		5008	
	<b>MS</b>	3015	2023*	2075	1012, 1013	1007	1020			
<b>Post EVA</b>										

<sup>†</sup> Will unstow EMU Battery 2075 from MA16G and install in EMU 3015 during EMU Prebreathe if EVA 6 is to be performed

\* Will use 2021 and 2026 if HST deploys without performing EVA 6

(reduced copy)

EVA-5b/125/O/B

POST EVA ENTRY PREP

## POST EVA ENTRY PREP (45 min)

POST EVA  
ENTRY PREP

- AW18D 1. AIRLK AUD PWR – OFF  
AW18H 2. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
MODE (two) – OFF
- MD(flr) 3. EMU O2 ISOL VLV – CL  
AW82B 4. EV-1, EV-2 O2 vlv (two) – CL  
AW82D 5. √EMU 1,2 H2O WASTE, SPLY tb (four) – CL  
6. Stow in FDF locker: DEPRESS/REPRESS (Cue Card)  
Cuff C/L (four)
- All EMUs 7. Disconnect helmets, comm caps (four) from elec harness, temp stow  
8. Remove LTA, √Multiple Water Connector cover installed  
9. Stow items from “Charged” and “EVA Systems Bag” mesh bags  
10. Stow mesh bags: “Charged” in EV3 ECOK, “EVA Systems Bag” in EV4 ECOK  
11. Stow LCVGs and EV Crew Options Kit (ECOK) in HUTs  
12. Connect LTA to HUT  
13. Install gloves
- EMUs 3,4 14. √One Waist Tether installed on each EMU in the airlock  
15. Remove REBA batteries from all EMUs (√REBA sw OFF, pull towards left arm of suit), stow
- All EMUs 16. Install/verify EMU batteries per STS-125 EVA CONSUMABLES CUE CARD; restow 5th EMU battery in MA16G, as required

### CAUTION

EMU TV and helmet lights must be removed prior to landing

- EMUs 3,4 17. Remove EMU TVs from helmet lights, stow  
18. Remove helmet lights from helmets, transfer to middeck  
19. Remove SCU, install DCM cover
- DCMs 20. Stow SCU on AAP, rebuckle straps
- All EMUs 21. Install helmets and covers, lock
- DCMs 22. √PURGE vlv – op (up)  
23. Perform LTA RESTRAINT BAG INSTALLATION (AIRLOCK CONFIG)  
24. Stow prime (4) comm caps in LTA Restraint Bag pouches  
25. Remove B/U comm cap from EMU Equipment Bag, stow in EMU 4 LTA Restraint Bag pouch  
26. Install and loosely secure airlock floor pallet using 1/4-in drive ratchet, 4-in ext w/1/4-in drive, and 1/2-in socket w/1/4-in drive. Torque to 200 in-lb using torque wrench
27. Install External Airlock Floor bag in airlock; √bag strap installed
- EMUs 1,2 28. Install 20-g Crash Bag on middeck EMUs  
29. Stow Modified Depress valve cap as required

### CAUTION

To prevent possible equipment damage, do not stow EMU lights with batts installed

- Vol H 30. Stow EMU lights (batts), EMU Equipment Bag, A/L Hatch Tools and EMU Servicing Kit  
31. Stow EMU Middeck charger (1), EHIP battery chargers (3), REBA charger (1)
- Inner Hatch 32. Equal vlv (two) – NORM, install caps
- \* If outer hatch leaking or integrity suspect: \*  
\* Equal vlv (two) – OFF, install caps \*
33. Inform MCC, Post EVA Entry Prep complete

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EMU CONT  
PROCS

### DISPLAY LOSS DURING POWER TRANSFER (WARM RESTART)

- DCM If PWR – BATT and SCU connected:
- AW18H 1. √PWR/BATT CHGR EMU 1(2) BUS SEL – OFF
- DCM If PWR – SCU:
- 2. PWR – BATT
- AW18H 3. PWR/BATT CHGR EMU 1(2) BUS SEL – OFF

**WARNING**  
Fan will be off from steps 4 to 9 during which time CO2 buildup is a concern

**NOTE**

Affected EMU will be without comm after step 6. Steps 6 and 7 should be read together before step 6 is performed

- DCM 4. FAN – OFF (expect **FAN SW OFF** msg, DISP – PRO)
- IV 5. Inform affected EV crewmember of impending comm loss
- DCM 6. PWR – SCU (7 sec)
- 7. PWR – BATT
- When power restart complete:
- 8. √Display – **O2 POS XX**, expect **FAN SW OFF** msg, DISP – PRO
- 9. As reqd, FAN – ON
- If display blank or locked up:
- 10. Contact MCC
- If SCU power desired:
- 11. √SCU connected to DCM
- AW18H 12. PWR/BATT CHGR EMU 1(2) MODE – PWR  
BUS SEL – MNA(MNB)
- 13. √EMU INPUT 1(2) Volts = 18.0 – 20.0
- DCM 14. PWR – SCU
- DCM 15. √Display – **O2 POS XX**

### VACUUM H2O RECHARGE (MANNED)

**WARNING**  
Procedure should be used only if performing a contingency EVA

- EV 1. Perform AIRLOCK INGRESS, Cuff C/L, 30 (Close hatch, partially engage latches)
- DCM 2. √Helmet purge vlv – cl, locked
- 3. √PURGE vlv – cl (dn)
- 4. √WATER – OFF
- IV MO13Q 5. √ARLK H2O S/O VLV – OPEN (tb-OP)
- MD(flr) 6. √EMU O2 ISOL VLV – OP
- ML86B:C 7. √cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op
- AW82B 8. √EV-1(EV-2) O2 vlv – OP
- EV AW18H 9. PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB)
- DCM 10. PWR – SCU (fwd), WARN TONE
- IV R11L If SPLY H2O XOVR VLV closed (tb-CL or bp) (water transfer config):  
11. SPLY H2O TKA OUTLET – CL (tb-CL)
- If SPLY H2O XOVR VLV open (tb-OP) (nominal config):
- L1 12. √RAD CNTLR OUT TEMP – NORM
- 13. √FLASH EVAP CNTLR PRI A,B (two) – OFF
- ML31C 14. SPLY H2O TKD OUTLET – CL (tb-CL)
- R11L 15. SPLY H2O TKB OUTLET – CL (tb-CL)  
√TKA OUTLET – CL (tb-CL)  
TKC INLET – CL (tb-CL)  
TKC OUTLET – OP (tb-OP)



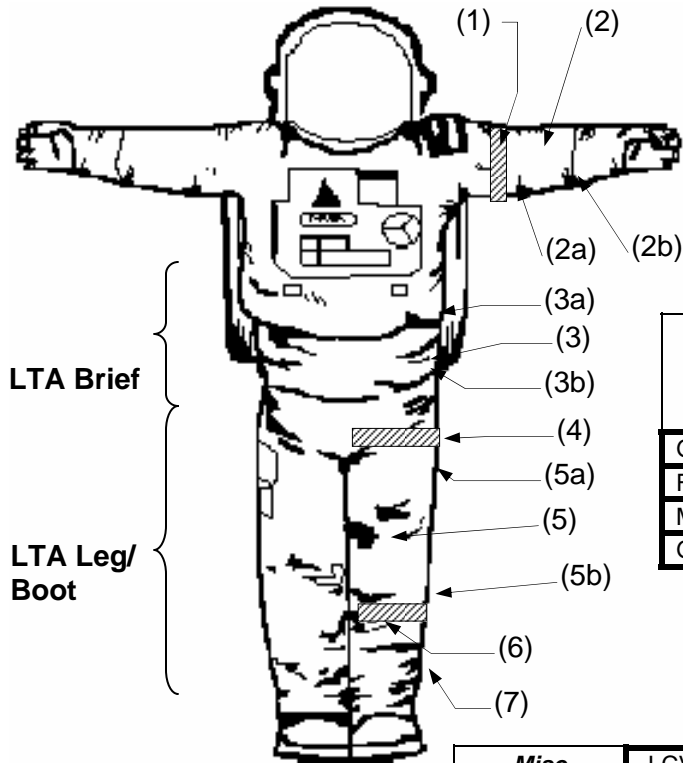
## EMU CONTINGENCY RESIZE MATRIX (STS-125/HST)

FOR LOSS OF:	EV1 – Grunsfeld	EV2 – Feustel	EV3 – Massimino	EV4 – Good
<b>HUT/PLSS</b>	Use M HUT s/n 3017 from Good 1. Install GF gloves 2. √Arm red disconnect on right, blue on left. √locks, √cams S/L 3. Use GF LTA 4. Swap EMU PLSS identifier stripes, mission patch, and national flag 5. Use GF helmet s/n 1072	Use L HUT s/n 3015 from Mass 1. Remove arm sizing rings 2. Install FT lower arms/gloves 3. √Arm red disconnect on right, blue on left, √locks, √cams S/S 4. Use FT LTA 5. Swap EMU PLSS identifier stripes, mission patch, and national flag 6. Use FT helmet s/n 1068	Use L HUT s/n 3004 from Feustel 1. Install MS 0.5" rings/ lower arms/gloves 2. √Arm red disconnect on right, blue on left, √locks, √cams L/L 3. Use MS LTA 4. Swap EMU PLSS identifier stripes, mission patch, and national flag 5. Use MS helmet s/n 1079	Use M HUT s/n 3008 from Grunsfeld 1. Install G gloves 2. √Arm red disconnect on right, blue on left, √locks, √cams S/L 3. Use G LTA 4. Swap EMU PLSS identifier stripes, mission patch, and national flag 5. Use G helmet s/n 1070
<b>CCA</b>	Use G b/u CCA s/n 1189	Use G b/u CCA s/n 1189	Use G b/u CCA s/n 1189	Use G b/u CCA s/n 1189
<b>Lower Arm Segment</b>	Use size 04 lower arm s/n 336 (R) or s/n 335 (L) from Good (red = right, blue = left). Cams S/L 1. √Locks, √cams	Use size 04 lower arm s/n 336 (R) or s/n 335 (L) from Good (red = right, blue = left). Cams S/S 1. √Locks, √cams	Use size 05 lower arm s/n 216(R) or s/n 215(L) (red = right, blue = left) from ML60B. Cams L/L 1. √Locks, √cams	Use size 04 lower arm s/n 344(R) or s/n 343(L) from Feustel (red = right, blue = left). Cams S/L 1. √Locks, √cams
<b>Gloves</b>	1 <sup>st</sup> Back-up: Use 6GF gloves s/n 6129 from MF280  2 <sup>nd</sup> Back-up: Use 6FO gloves s/n 6108 from Volume G 1. Remove arm sizing ring 2. Cams L/L	1 <sup>st</sup> Back-up: Use 6PZ gloves s/n 6248 from MF280  2 <sup>nd</sup> Back-up: Use 6PZ gloves s/n 6268 from Volume G	Use 6BB gloves s/n 6210 from MF280	Use 6G9 gloves s/n 6286 from MF280
<b>Waist Brief</b>	Use size 01 waist brief s/n 039 from Good. Cams L/S 1. Use GF legs/boots 2. √Locks, √cams 3. Swap EMU brief identifier stripes	Use size 01 waist brief s/n 039 from Good. Cams S/S 1. Use FT legs/leg rings/boots 2. √Locks, √cams 3. Swap EMU brief identifier stripes	Use size 01 waist brief s/n 020 from Feustel. Cams L/L 1. Use MS legs, Cams L/L 2. Remove 1.0" leg rings s/n 130 & 131 3. Install 1.5" leg rings s/n 123 & 124 from ML60M 4. Install MS boots 5. √Locks, √cams 6. Swap EMU brief identifier stripes	Use size 01 waist brief s/n 020 from Feustel. Cams L/S 1. Use G legs/leg rings/boots 2. √Locks, √cams 3. Swap EMU brief identifier stripes

**EMU CONTINGENCY RESIZE MATRIX (STS-125/HST) (Cont)**

<b>FOR LOSS OF:</b>	<b>EV1 – Grunsfeld</b>	<b>EV2 – Feustel</b>	<b>EV3 – Massimino</b>	<b>EV4 – Good</b>
<b>Leg Segment</b>	Use size 02 leg s/n 229 from MD Floor STBD 1. Cams S/S 1. Use GF waist brief/boots 2. √Locks, √cams	Use size 03 leg s/n 191 from MD Floor STBD 1. Cams S/L 1. Use FT waist brief/leg rings/boots 2. √Locks, √cams	Use size 04 leg s/n 211 from MD Floor STBD 1. Cams S/L 1. Use MS waist brief/leg rings/boots 2. √Locks, √cams	Use size 04 leg s/n 211 from MD Floor STBD 1. Cams S/L 1. Use G waist brief/leg rings/boots 2. √Locks, √cams
<b>Boot</b>	Use size 02 boots s/n 216 from Mass 1. Use GF waist brief/legs 2. √Locks	Use size 02 boots s/n 216 from Mass 1. Use FT waist brief/legs/leg rings 2. √Locks	Use size 02 boots s/n 210 from Fuestel 1. Use MS waist brief/legs/leg rings 2. √Locks	Use size 02 boots s/n 210 from Fuestel 1. Use G waist brief/legs/leg rings/BSI Toe Caps 2. √Locks
<b>Sizing Rings</b>	<ul style="list-style-type: none"> <li>• <u>0.5 arm</u>: Use s/n 140 or 141 from Good</li> </ul>	<ul style="list-style-type: none"> <li>• <u>0.5 Leg</u>: Use s/n 117 or 118 from Good</li> </ul>	<ul style="list-style-type: none"> <li>• <u>0.5 arm</u>: Use s/n 143 or 144 from Grunsfeld</li> <li>• <u>1.0 Leg</u>: See Loss of Waist Brief</li> </ul>	<ul style="list-style-type: none"> <li>• <u>0.5 arm</u>: Use s/n 143 or 144 from Grunsfeld</li> <li>• <u>0.5 Leg</u>: Use s/n 120 or 121 from Feustel</li> </ul>
<b>LCVG</b>	Use backup LCVG s/n 3163 from Volume F 1. Transfer biomed, dosimeter	Use backup LCVG s/n 3163 from Volume F 1. Transfer biomed, dosimeter	Use backup LCVG s/n 3205 from Volume F 1. Transfer biomed, dosimeter	Use backup LCVG s/n 3205 from Volume F 1. Transfer biomed, dosimeter 2. Remove Thermal Slippers from LCVG

# EMU NOMINAL SIZING (STS-125/HST)



LTA Brief

LTA Leg/  
Boot

<b>SEMU</b>	(1) Arm Sizing Ring	(2a) Arm Cam	(2) Lower Arm	(2b) Wrist Cam	HUT
Grunsfeld (3008)	0.5	Short	04	Long	M (02)
Feustel (3004)	--	Short	04	Short	L (03)
Massimino (3015)	0.5	Long	05	Long	L (03)
Good (3017)	0.5	Short	04	Long	M(02)

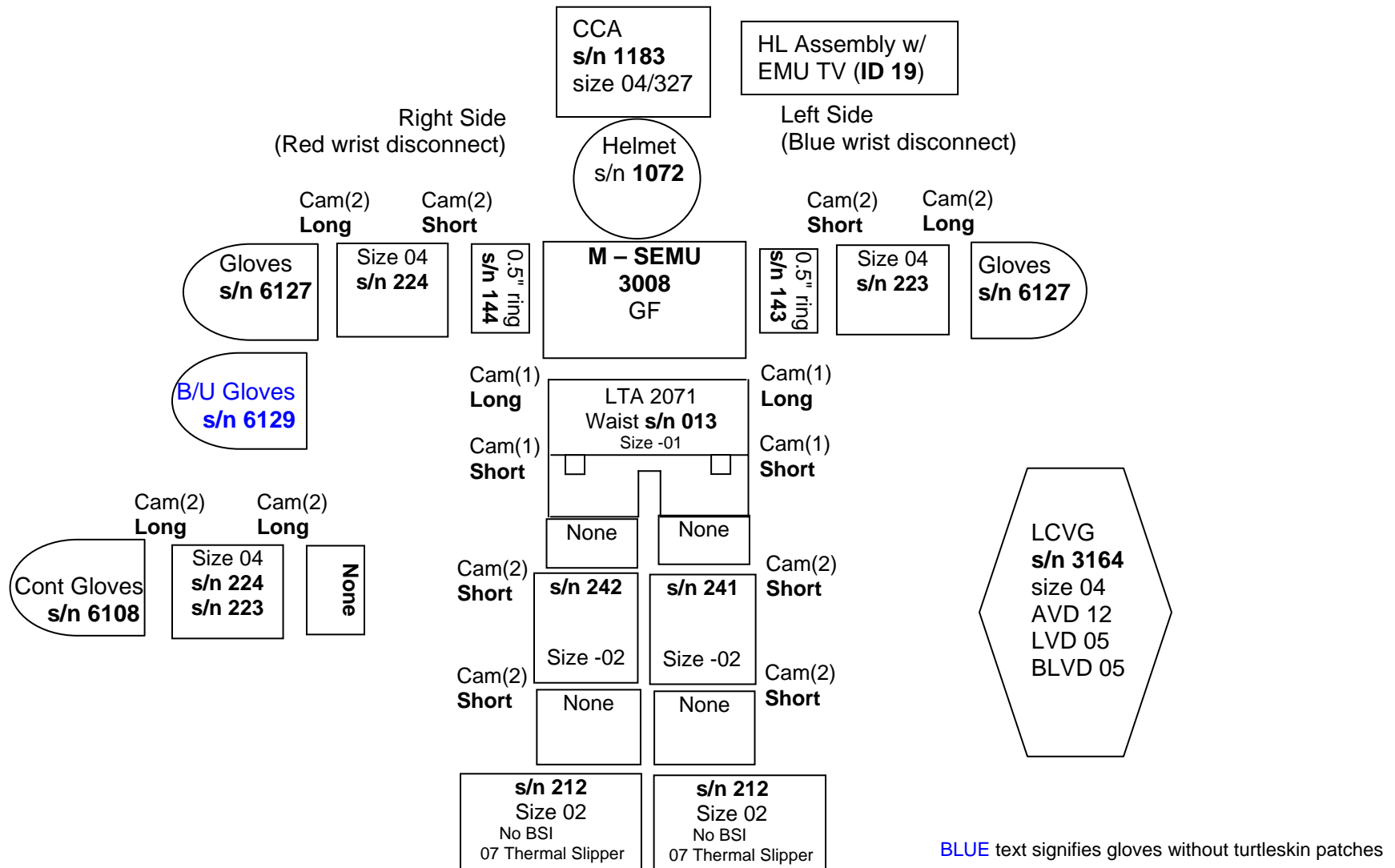
<b>LTA</b>	(3a) Brief Upper Cam	(3) Adjust. Waist Brief	(3b) Brief Lower Cam	(4) Thigh Sizing Ring	(5a) Thigh Cam	(5) Leg Segment	(5b) Leg Cam	(6) Leg Sizing Ring	(7) Boot/ Insert-Type
Grunsfeld	Long	01	Short	--	Short	02	Short	--	02 / 07 TS
Feustel	Short	01	Short	--	Short	03	Long	0.5	02 / 07 TS
Massimino	Long	02	Short	--	Short	04	Long	1.0	02 / 07 TS
Good	Long	01	Short	--	Short	04	Long	0.5	02 / 03 BSI

<b>Misc</b>	LCVG/ BLVD	TCU top/ Bottom/MAG	Prime Gloves s/n	b/u Gloves s/n	Cont Gloves s/n	CCA/ CCEM	Valsalva	Fresnel Lens (diopters)
Grunsfeld	04 / 05	L / L / 711	6GF / 6127	6GF / 6129	6FO / 6108*	04 / 327	Original	--
Feustel	04 / 05	M / S / 709	6PZ / 6245	6PZ / 6248	6PZ / 6268	04 / 323	Modified	--
Massimino	06 / 05	L / L / 711	6BB / 6102	6BB / 6210	--	06 / 327	Modified	--
Good	03 / 05	L / M / 709	6G9 / 6285	6G9 / 6286	--	05 / 327	Original	--

\* Signifies changes to arm sizing if using these gloves

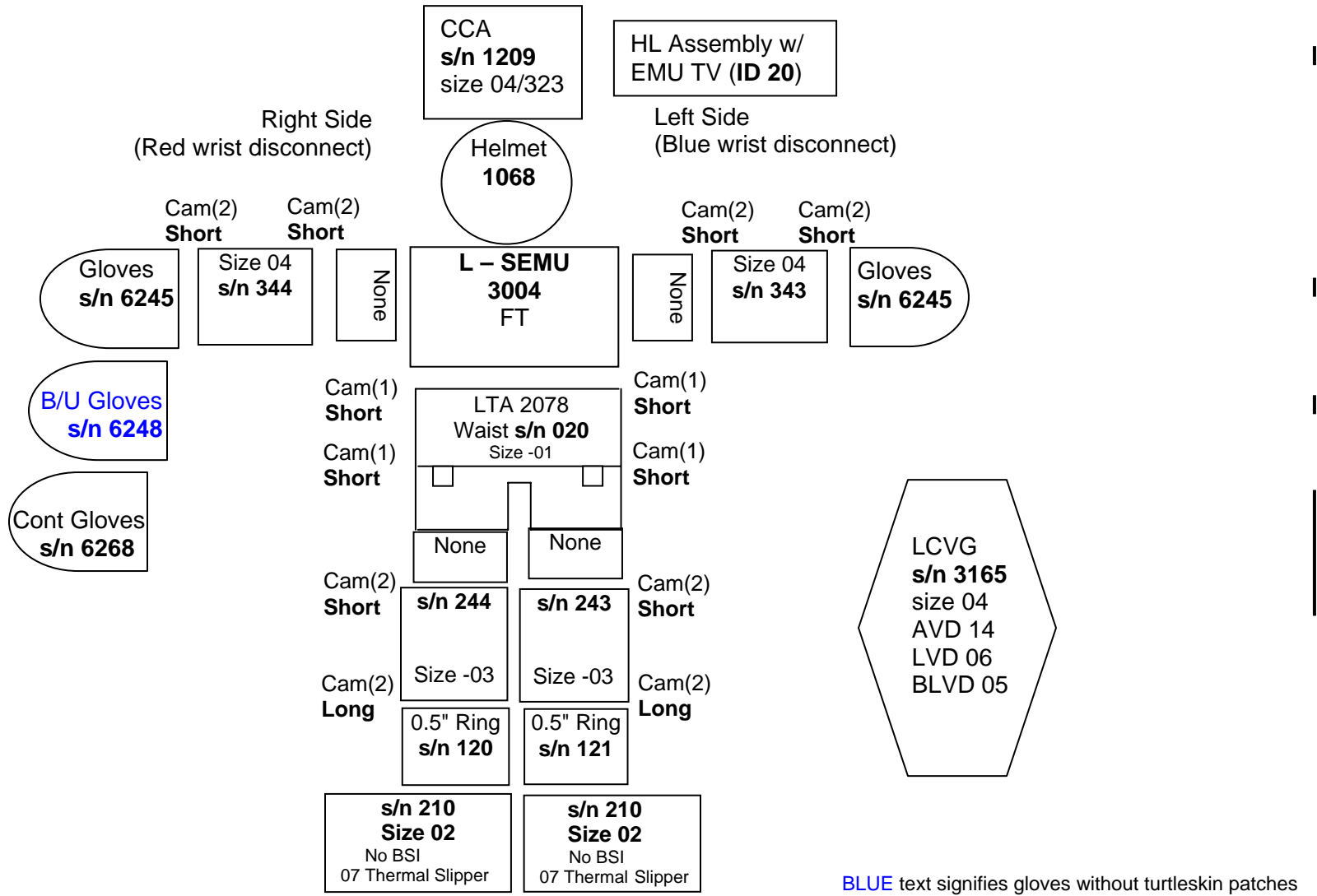
BLUE text signifies gloves without turtleskin patches

**EMU NOMINAL SIZING (STS-125/HST) (Cont)**



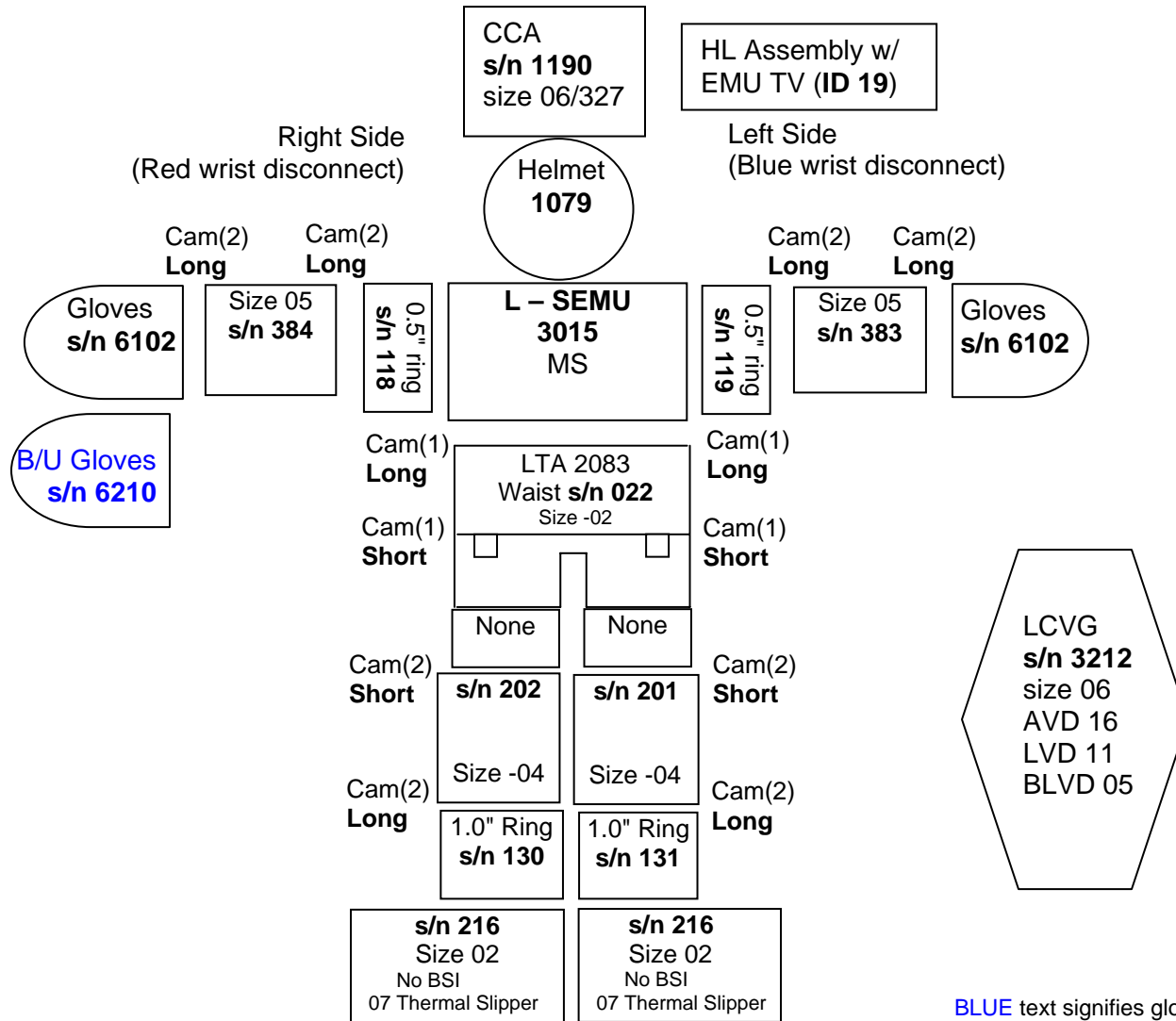
**Figure 1.- EMU 3008 (GF) Nominal Sizing**

**EMU NOMINAL SIZING (STS-125/HST) (Cont)**



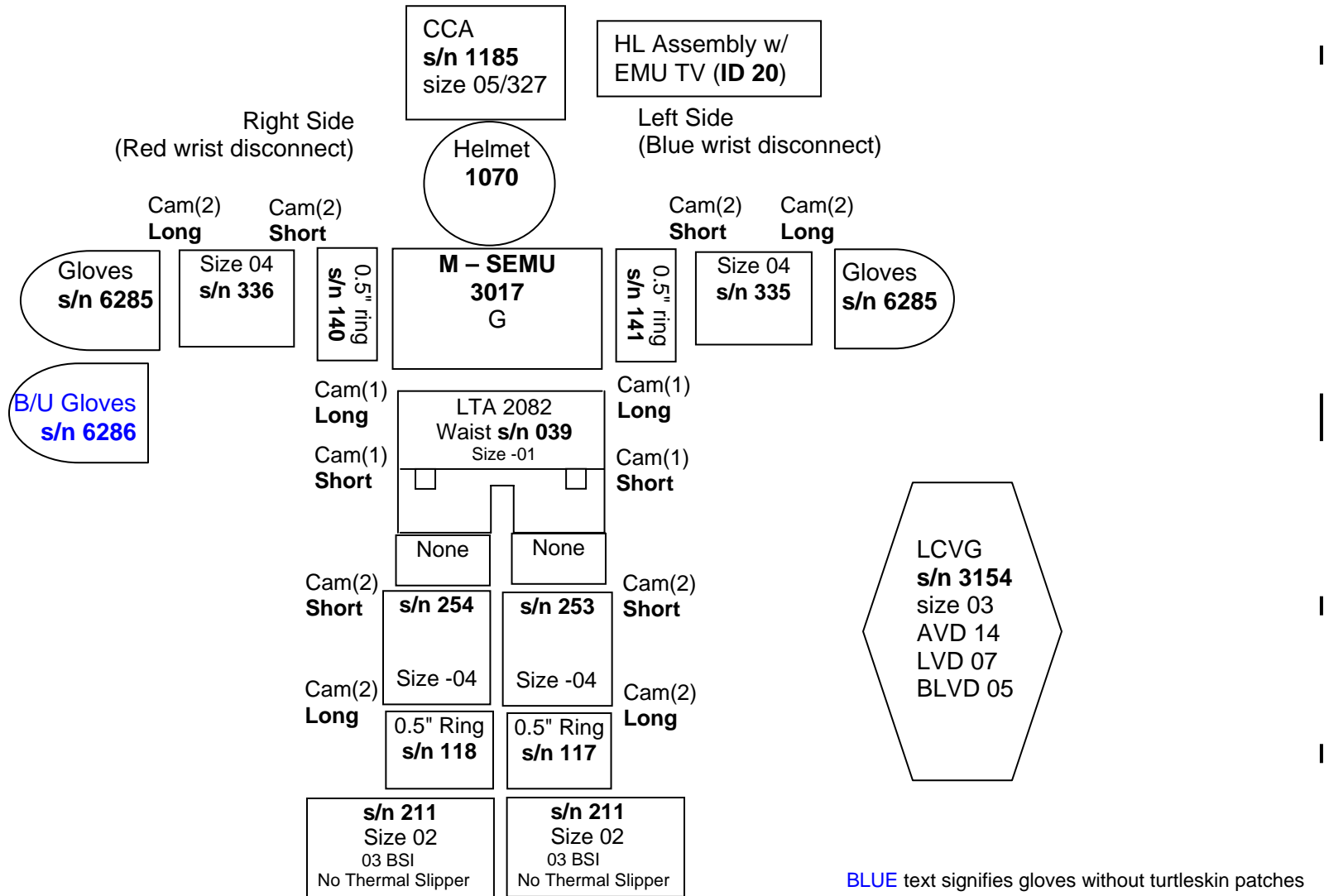
**Figure 2.- EMU 3004 (FT) Nominal Sizing**

**EMU NOMINAL SIZING (STS-125/HST) (Cont)**



**Figure 3.- EMU 3015 (MS) Nominal Sizing**

**EMU NOMINAL SIZING (STS-125/HST) (Cont)**



**Figure 4.- EMU 3017 (G) Nominal Sizing**

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## TPS REPAIR

The TPS Repair procedures listed below are not published in the hardcopy EVA Flight Supplement. These procedures will be uplinked realtime if they are required.

A PDF and a WORD version of the procedures can be found at:  
<http://mod.jsc.nasa.gov/do3/FDF/FDFBooks/Status%20Sheets/index.html>.

Select the "As Flown" Status sheet for STS-125 and the link to the procedures can be found with the link to the EVA FS. The procedures can also be found on the FDF Books CD provided to the FAO console

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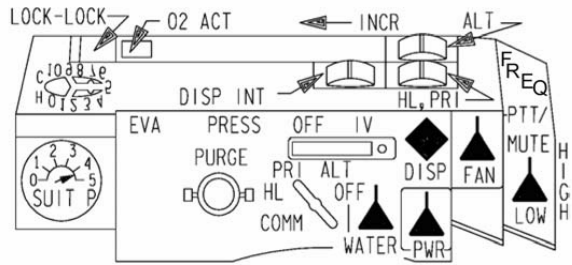
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EVA CUFF C/L

# EVA CUFF C/L

	<p style="text-align: center;"><b>NORMAL EVA STATUS</b></p> <table border="1"> <tr><td>O2 POS</td><td>EVA</td></tr> <tr><td>SUBLM P</td><td>2.0-4.2 psia</td></tr> <tr><td>TIME EV</td><td>HR:MIN since PWR-BATT</td></tr> <tr><td>TIME LF/limit consum</td><td>HR:MIN remaining at present use rate</td></tr> <tr><td>% O2 (PWR) LF</td><td>Non-limiting consumable will be displayed</td></tr> <tr><td>SUIT P</td><td>4.2-4.4 (4.7 during/after depress) psid</td></tr> <tr><td>O2 P</td><td>150-900 psia</td></tr> <tr><td>O2 RATE</td><td>0-4.0 psi/minute</td></tr> <tr><td>SOP P</td><td>5410-6800 psia</td></tr> <tr><td>BAT VDC</td><td>≥ 16.7</td></tr> <tr><td>BAT AMP</td><td>3.0-4.0</td></tr> <tr><td>RPM</td><td>18.0-20.0 K</td></tr> <tr><td>CO2</td><td>0.2-4.0 mm</td></tr> <tr><td>H2O TEMP</td><td>32-75 degF</td></tr> <tr><td>H2O GP</td><td>14.0-16.0 psid</td></tr> <tr><td>H2O WP</td><td>14.0-16.0 psid</td></tr> <tr><td>DATA?</td><td>COMBO</td></tr> <tr><td>BATT</td><td>32.0 AH (as directed by MCC-H)</td></tr> <tr><td>GAUGE</td><td>4.2-4.4 psid (4.7 during/after depress) psid</td></tr> </table> <p style="text-align: right;">1 <span style="float: right;">01/26/09</span></p>	O2 POS	EVA	SUBLM P	2.0-4.2 psia	TIME EV	HR:MIN since PWR-BATT	TIME LF/limit consum	HR:MIN remaining at present use rate	% O2 (PWR) LF	Non-limiting consumable will be displayed	SUIT P	4.2-4.4 (4.7 during/after depress) psid	O2 P	150-900 psia	O2 RATE	0-4.0 psi/minute	SOP P	5410-6800 psia	BAT VDC	≥ 16.7	BAT AMP	3.0-4.0	RPM	18.0-20.0 K	CO2	0.2-4.0 mm	H2O TEMP	32-75 degF	H2O GP	14.0-16.0 psid	H2O WP	14.0-16.0 psid	DATA?	COMBO	BATT	32.0 AH (as directed by MCC-H)	GAUGE	4.2-4.4 psid (4.7 during/after depress) psid	<p><b>DCM CONFG INDEX</b></p>																																																						
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<p style="text-align: center;"><b>DCM CONFIGURATION</b></p> <p><b>DCM CONFG INDEX</b></p>  <p style="text-align: center;">EVA COMM FREQUENCIES LOW=414.2 MHz      HIGH=417.1 MHz</p> <p style="text-align: right;">2 <span style="float: right;">08/01/05</span></p>	<p style="text-align: center;"><b>EMU MALFUNCTION INDEX</b></p> <table border="0"> <tr><td>14V SUP FAIL</td><td>27</td><td>O2 ACT FAULT</td><td>28</td></tr> <tr><td>5V REF FAIL</td><td>27</td><td>O2 IS OFF</td><td>28</td></tr> <tr><td>ABORT EVA</td><td>6</td><td>O2 LF (%)</td><td>28</td></tr> <tr><td>AIR FLOW CONT</td><td>24</td><td><b>O2 USE HIGH</b></td><td>15</td></tr> <tr><td>BATT AMPS HIGH</td><td>10</td><td>PWR LF (%)</td><td>28</td></tr> <tr><td>BATT V DECAY OR</td><td></td><td><b>RESRV H2O ON</b></td><td>18</td></tr> <tr><td>  BATT VDC LOW</td><td>11</td><td><b>RLF V FAIL</b></td><td>26</td></tr> <tr><td>BITE light</td><td>27</td><td>SCU PWR AVAL</td><td>28</td></tr> <tr><td>BUS CK FAIL</td><td>27</td><td>SET H2O OFF</td><td>28</td></tr> <tr><td>COMM FAIL</td><td>23</td><td>SET O2 EVA</td><td>28</td></tr> <tr><td>CO2 HIGH</td><td>21</td><td>SET O2 PRESS</td><td>28</td></tr> <tr><td>CO2 SNSR BAD</td><td>22</td><td><b>SOP O2 ON</b></td><td>9</td></tr> <tr><td>DCS</td><td>4</td><td><b>SOP P LOW</b></td><td>14</td></tr> <tr><td>DRAM FAIL</td><td>27</td><td><b>SUBLM P</b></td><td>16</td></tr> <tr><td>EE CSUM FAIL</td><td>27</td><td><b>SUIT P EMERG</b></td><td>8</td></tr> <tr><td>FAN SW OFF</td><td>28</td><td><b>SUIT P HIGH</b></td><td>13</td></tr> <tr><td>FW ANOMALY</td><td>27</td><td><b>SUIT P LOW</b></td><td>12</td></tr> <tr><td>H2O GP LOW</td><td>17</td><td>SW/FAN FAIL</td><td>27</td></tr> <tr><td>H2O IS OFF</td><td>28</td><td><b>TERMINATE EVA</b></td><td>7</td></tr> <tr><td>H2O WP HIGH</td><td>19</td><td>TIME LF: XX</td><td>28</td></tr> <tr><td>LOSS OF COOLING</td><td>25</td><td>VENT SW FAIL</td><td>27</td></tr> <tr><td>MONITOR CO2</td><td>21</td><td><b>WAT DOG FAIL</b></td><td>27</td></tr> <tr><td>NO VENT FLOW</td><td>20</td><td></td><td></td></tr> </table> <p style="text-align: right;">NOTE: <b>BOLDFACE</b> ind detailed proc</p> <p style="text-align: right;">3 <span style="float: right;">01/26/09</span></p>	14V SUP FAIL	27	O2 ACT FAULT	28	5V REF FAIL	27	O2 IS OFF	28	ABORT EVA	6	O2 LF (%)	28	AIR FLOW CONT	24	<b>O2 USE HIGH</b>	15	BATT AMPS HIGH	10	PWR LF (%)	28	BATT V DECAY OR		<b>RESRV H2O ON</b>	18	BATT VDC LOW	11	<b>RLF V FAIL</b>	26	BITE light	27	SCU PWR AVAL	28	BUS CK FAIL	27	SET H2O OFF	28	COMM FAIL	23	SET O2 EVA	28	CO2 HIGH	21	SET O2 PRESS	28	CO2 SNSR BAD	22	<b>SOP O2 ON</b>	9	DCS	4	<b>SOP P LOW</b>	14	DRAM FAIL	27	<b>SUBLM P</b>	16	EE CSUM FAIL	27	<b>SUIT P EMERG</b>	8	FAN SW OFF	28	<b>SUIT P HIGH</b>	13	FW ANOMALY	27	<b>SUIT P LOW</b>	12	H2O GP LOW	17	SW/FAN FAIL	27	H2O IS OFF	28	<b>TERMINATE EVA</b>	7	H2O WP HIGH	19	TIME LF: XX	28	LOSS OF COOLING	25	VENT SW FAIL	27	MONITOR CO2	21	<b>WAT DOG FAIL</b>	27	NO VENT FLOW	20			<p><b>DCS</b></p>
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<p style="text-align: center;"><b>SUIT P EMERG</b></p> <p style="text-align: center;"><b>SUIT P EMERG</b>   <b>CLOSE PURG V</b>   <b>SUIT P X.X</b></p> <p>If Suit P gauge <math>\leq</math> 4.0</p> <ol style="list-style-type: none"> <li>√DCM PURGE vlv – closed</li> <li>√Helmet purge vlv – closed and locked</li> <li>√O2 ACT – EVA</li> <li>Go to ABORT EVA, 6 &gt;&gt;</li> </ol> <p>If Suit P gauge &gt; 4.0 (sensor failed)</p> <ol style="list-style-type: none"> <li>Continue EVA, monitor Suit P gauge</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">Message triggered when SUIT P &lt; 3.1</p> <p><b>SUIT P EMERG</b></p> <p><b>SOP ON</b></p> <p style="text-align: center;">8 <span style="float: right;">01/26/09</span></p>	<p style="text-align: center;"><b>SOP O2 ON</b></p> <p style="text-align: center;"><b>SOP O2 ON</b>   <b>TIME LF XX:XX</b></p> <ol style="list-style-type: none"> <li>Go to ABORT EVA, 6</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">Msg triggered when: SUIT P &lt; 4.05 and SOP RATE &gt; 36.0 psi/min</p> <p style="text-align: center;">9 <span style="float: right;">01/26/09</span></p>	<p><b>BATT AMPS</b></p> <p><b>BATT VOLTS</b></p>
<p style="text-align: center;"><b>BATT AMPS HIGH</b></p> <p style="text-align: center;"><b>BATT AMPS HI</b>   <b>BATT AMPS X.X</b></p> <ol style="list-style-type: none"> <li>Helmet purge vlv – op</li> <li>FAN – OFF</li> </ol> <p>If BAT AMP w/o fan &gt; 1.3 (system short):</p> <ol style="list-style-type: none"> <li>WATER – OFF</li> <li>Notify IV/EV of impending comm loss</li> <li>PWR – SCU, do <u>not</u> activate airlock power</li> <li>Go to TERM EVA, 7 &gt;&gt;</li> </ol> <p>If BAT AMP w/o fan 0.7-1.3 (fan short):</p> <ol style="list-style-type: none"> <li>Go to TERM EVA, 7</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">Msg triggered when BATT AMPS &gt; 5.0 Normal BAT AMP = 3.0-4.0 Normal BAT AMP w/o fan = 0.7-1.3</p> <p><b>BATT AMPS</b></p> <p><b>BATT VOLTS</b></p> <p style="text-align: center;">10 <span style="float: right;">01/26/09</span></p>	<p style="text-align: center;"><b>BATT V DECAY OR BATT VDC LOW</b></p> <p style="text-align: center;"><b>BAT VDC DECAY</b>   <b>BAT VDC XX.X</b></p> <p>Or</p> <p style="text-align: center;"><b>BAT VDC LOW</b>   <b>BAT VDC XX.X</b></p> <p>If BAT VDC &lt; 13.0 and fan and communications still working:</p> <ol style="list-style-type: none"> <li>Continue EVA (sensor failure) &gt;&gt;</li> </ol> <p>Otherwise (battery failure)</p> <p style="text-align: center;"><b>WARNING</b> Impending fan and comm loss</p> <ol style="list-style-type: none"> <li>Begin translating to Airlock for Terminate EVA</li> <li>When vent flow lost, helmet purge vlv → op</li> <li>Go to TERM EVA, 7</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">BATT V DECAY message triggered when BATT VDC &lt; 17.5 BATT VDC LOW message triggered when BATT VDC &lt; 16.5 Normal Lithium Ion BATT VDC <math>\geq</math> 18.0 Normal ICB BATT VDC <math>\geq</math> 16.7 Normal Fan RPM: 19.0 to 20.0K</p> <p style="text-align: center;">11 <span style="float: right;">01/26/09</span></p>	<p><b>SUIT P LOW</b></p> <p><b>SUIT P HIGH</b></p>

<p style="text-align: center;"><b>SUIT P LOW</b></p> <p><b>SUIT P LOW   SUIT P X.X</b></p> <p>If O2 USE HIGH msg present:    1. Go to ABORT EVA, 6 &gt;&gt;  If O2 USE HIGH msg not present:  2. Continue EVA, monitor SUIT P, SOP P, and gauge  If gauge &lt; 4.0 and SOP P decreasing:  3. Go to TERM EVA, 7</p> <p><b>SUIT P LOW</b> <b>SUIT P HIGH</b></p> <p style="text-align: center;"><u>NOTE</u>  Msg triggered when SUIT P &lt; 4.05</p> <p style="text-align: right;">12                      01/26/09</p>	<p style="text-align: center;"><b>SUIT P HIGH</b></p> <p><b>SUIT P HIGH   O2 RATE XX.X   SOP RATE XXX</b></p> <p>If O2 RATE &gt; 7.0 or SOP RATE &gt; 8:    1. Go to TERM EVA, 7 &gt;&gt;  If O2 RATE &lt; 7.0 and SOP RATE ≤ 8:  2. Monitor SUIT P, SOP P, and gauge  3. Continue EVA</p> <p style="text-align: center;"><u>NOTE</u>  Msg triggered when SUIT P &gt; 4.55  Normal O2 RATE ≈1.7 psi/min</p> <p style="text-align: right;"><b>SOP LOW</b> <b>O2 USE</b></p> <p style="text-align: right;">13                      01/26/09</p>
<p style="text-align: center;"><b>SOP P LOW</b></p> <p><b>SOP P LOW   SOP P XXX0   SOP RATE XXX</b></p> <p>1. Go to TERM EVA, 7</p> <p style="text-align: center;"><u>NOTE</u>  Msg triggered when SOP P &lt; 4500, or SOP P &lt; init SOP P – 600 (SOP P initialized at EMU powerup)</p> <p><b>SOP LOW</b> <b>O2 USE</b></p> <p style="text-align: right;">14                      01/26/09</p>	<p style="text-align: center;"><b>O2 USE HIGH</b></p> <p><b>O2 USE HIGH   O2 RATE XX.X</b></p> <p>If SUIT P LOW msg present:    1. Go to ABORT EVA, 6 &gt;&gt;  If O2 P erratic or ~0:    2. Continue EVA    3. Recharge O2 periodically &gt;&gt;  If O2 RATE &gt; 7.0:    4. Go to TERM EVA, 7 &gt;&gt;  Otherwise:  5. Recharge O2 as reqd  6. Continue EVA</p> <p style="text-align: center;"><u>NOTE</u>  Msg triggered when:  O2 RATE &gt; 10.2 psi/min or  O2 P &lt; 150 and TIME EV &lt; 5 hr  Normal O2 RATE ≈1.7 psi/min</p> <p style="text-align: right;"><b>SUBLM PRESS</b> <b>H2O GP</b></p> <p style="text-align: right;">15                      01/26/09</p>

<p style="text-align: center;"><b>SUBLM PRESS</b></p> <p><b>SUBLM P XX.X   SET H2O OFF</b></p> <p>1. √WATER – OFF (fwd)  If SUBLM P &lt; 1.0 and stable:  When cooling desired, then:  2. Temp control vlv – Max H  3. WATER – ON (aft)  4. Temp control vlv – as reqd  If cooling insufficient:  5. Go to LOSS OF COOLING, 25, step 2 &gt;&gt;  If cooling sufficient:  6. Continue EVA, monitor SUBLM P and cooling &gt;&gt;  If SUBLM P ≥ 1.0 and stable (sensor fail):  7. Perform steps 2-4, continue EVA, monitor cooling</p> <p style="text-align: center;"><u>NOTE</u>  Msg triggered when SUBLM P &lt; 1.5 or &gt; 5.3  Normal SUBLM P = 2.0-4.2</p> <p><b>SUBLM PRESS</b>  <b>H2O GP</b></p> <p style="text-align: right;">16 01/26/09</p>	<p style="text-align: center;"><b>H2O GP LOW</b></p> <p><b>H2O GP LOW</b></p> <p>If H2O WP &lt; 13.5:  If cooling insufficient (H2O reg fail):  1. Go to LOSS OF COOLING, 25, step 2  If cooling sufficient (H2O reg shifted):  2. Monitor cooling  3. Continue EVA &gt;&gt;  If H2O WP ≥ 13.5 (sensor fail):  4. Monitor H2O WP (<b>RESRV H2O ON</b>) msg may be inhibited  If H2O WP drops to &lt; 12.0:  5. Go to TERM EVA, 7</p> <p style="text-align: center;"><u>NOTE</u>  Msg triggered when H2O GP &lt; 13.5  Normal H2O TEMP = 32-75 degF  WP = 14.0-16.0</p> <p style="text-align: right;">17 01/26/09</p>												
<p><b>RSRV H2O H2O WP</b></p> <p style="text-align: center;"><b>RESRV H2O ON</b></p> <p><b>RESRV H2O ON   TIME LF :XX</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>H2O GP</th> <th>H2O WP</th> <th>ACTION</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">~15</td> <td style="text-align: center;">~0</td> <td>1. Monitor SUBLM P and H2O TEMP (WP xdcr fail)</td> </tr> <tr> <td style="text-align: center;">&gt; 17.0</td> <td style="text-align: center;">~15</td> <td>2. Monitor H2O WP and H2O TEMP (GP xdcr fail)  If H2O WP drops to &lt; 12.0:  3. Go to TERM EVA, 7</td> </tr> <tr> <td style="text-align: center;">~15</td> <td style="text-align: center;">&lt; 12.0</td> <td>4. Go to TERM EVA, 7 (reserve H2O on)</td> </tr> </tbody> </table> <p style="text-align: center;"><u>NOTE</u>  Msg triggered when GP minus WP &gt; 2.1 psi  Normal SUBLM P = 2.0-4.2 psia  H2O TEMP = 32-75 degF  GP/WP = 14.0-16.0</p> <p style="text-align: right;">18 01/26/09</p>	H2O GP	H2O WP	ACTION	~15	~0	1. Monitor SUBLM P and H2O TEMP (WP xdcr fail)	> 17.0	~15	2. Monitor H2O WP and H2O TEMP (GP xdcr fail) If H2O WP drops to < 12.0: 3. Go to TERM EVA, 7	~15	< 12.0	4. Go to TERM EVA, 7 (reserve H2O on)	<p style="text-align: center;"><b>H2O WP HIGH</b></p> <p><b>H2O WP HIGH   H2O WP XX.X</b></p> <p>If H2O GP &lt; 16.0 (H2O WP sensor failed):  1. Monitor cooling (<b>RESRV H2O ON</b>) msg inhibited  2. Continue EVA &gt;&gt;  If O2 RATE &gt; 7.0 (H2O reg failed open):  3. Go to TERM EVA, 7 &gt;&gt;  If O2 RATE ≤ 7.0 (H2O reg shifted):  4. Monitor Suit P gauge and cooling  5. Continue EVA</p> <p style="text-align: center;"><u>NOTE</u>  Message triggered when H2O WP &gt; 17.0  Normal H2O WP and H2O GP: 14.0-16.0  Normal H2O TEMP: 32 to 75 degF  Normal O2 RATE ~ 1.7 psi/min  Normal Suit P: 4.2-4.4 psi</p> <p style="text-align: right;"><b>NO VENT CO2</b>  19 01/26/09</p>
H2O GP	H2O WP	ACTION											
~15	~0	1. Monitor SUBLM P and H2O TEMP (WP xdcr fail)											
> 17.0	~15	2. Monitor H2O WP and H2O TEMP (GP xdcr fail) If H2O WP drops to < 12.0: 3. Go to TERM EVA, 7											
~15	< 12.0	4. Go to TERM EVA, 7 (reserve H2O on)											







**MISC MSGS (CONT) / TIME LF**

**MISC 2  
A/L  
DISC**

FAN SW OFF
H2O IS OFF
O2 ACT FAULT
O2 IS OFF
SET H2O OFF
SET O2 EVA
SET O2 PRESS
SCU PWR AVAL

Verify proper config

Consumables

XX% O2 LF	TIME LF 'MM
XX% PWR LF	TIME LF 'MM

Triggered with 30 min of calculated time remaining for limiting consumable

- Contact MCC to confirm calculation

- \* If no comm with MCC: \*
- \* Go to TERM EVA, 7 \*

28

01/26/09

**AIRLOCK LATCH DISCONNECT**

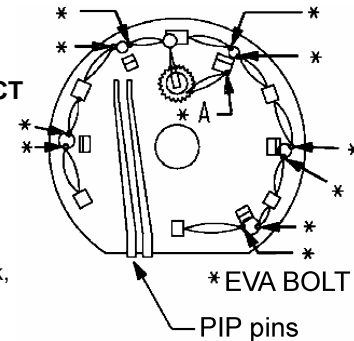
TOOL BOX/A/L – ADJ WRENCH, RATCHET WITH 7/16 SOCKET  
TOOL BOX – EVA TRASH BAG, ADJ TETHERS

- Remove bolt A, stow in trash bag
  - Rotate actuator handle
- If no rotation – jammed actuator:
- Force latches open
  - Seal hatch w/repress and secure for Idg (IV)
- If free rotation – jammed latch:
- Locate and remove jam
  - Reconnect actuator

**HINGE DISCONNECT**

TOOL BOX – ADJ TETHERS, VELCRO/TAPE

- Remove hinge PIP pins, as reqd
- Restrain hinge arm(s) and PIP pins clear of opening, ingress airlock, posn hatch for closing
- Close, lock hatch



**A/L  
INGR**

29

05/11/06

**AIRLOCK INGRESS**

- ✓TOOL BOX – closed, latched
- EV2**
- Ingress airlock
- EV1**
- Attach waist tether to A/L internal D-ring; lock hook
  - Attach EV2's safety tether, retracting end to waist tether; lock hooks
  - Disconnect EV1 safety tether, retracting end – attach to self
- BOTH**
- Ingress airlock
  - Unstow SCU, remove DCM cover, connect SCU to DCM (not reqd for tunnel adapter)
  - DCM WATER – OFF (fwd)
  - Thermal cover – close

**CAUTION**  
Do not close hatch until EMU WATER is OFF for 2 min

- EVA hatch handle – pre close posn
- ✓EVA hatch seal clear, outer (EVA) hatch – close, lock
- Go to PRE REPRESS (DEPRESS/REPRESS Cue Card)

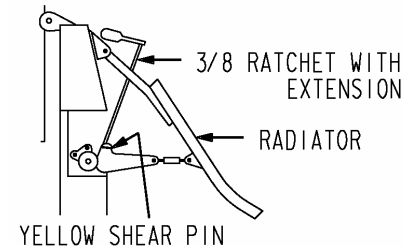
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**RADIATOR ACTUATOR DISCONNECT**

IFM – 1/4-in ALLEN HEAD DRIVER  
TOOL BOX – RADIATOR DISCONNECT/ 3/8 DRIVE RATCHET

- IV** ✓Pwr off
- Actuator disc sequence – aft to fwd
- Yellow shear pins (4) – retract to stop (6 revs ccw)
- When all actuators are disengaged:
- Manually close radiator panels and hold
- IV** ✓Pwr on
- IV** Latches – close



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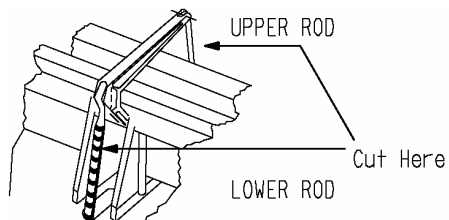
### PLBD DRIVE CUT

TOOL BOX – TUBE CUTTER, VELCRO/TAPE

IV √Pwr off

Cut #1, stow antenna if stbd side, perform WINCH OPS, 35, steps 1,2, then cut #6 thru #2 and perform WINCH OPS, 36, steps 3-7

BANDS VISIBLE	CORRECTIVE ACTION
1-6	Cut upper rod in middle and restrain (27)
7-10	Cut lower rod between 2nd and 3rd bands from top and restrain (27)

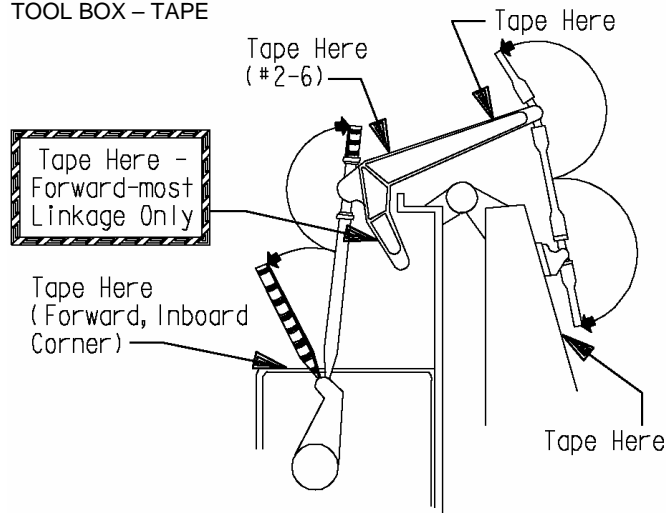


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### DOOR DRIVE RESTRAINT

TOOL BOX – TAPE



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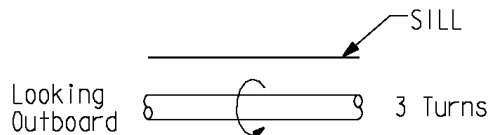
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### DOOR DRIVE DISCONNECT

TOOL BOX – PDU DISC TOOL, TRASH BAG

IV √Pwr off

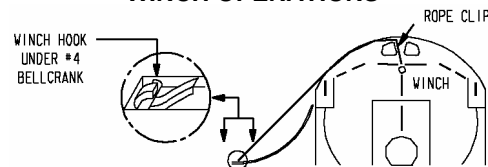
1. Perform WINCH OPS, 35, steps 1,2
2. Remove fabric cover(s)
3. Insert Disc Tool in Door Drive PDU  
Xo – 798, port OR stbd
4. Rotate tool cw to stop (60 deg) and leave tool in PDU
5. Rotate torque shaft at least 3 turns (see below)
6. Perform WINCH OPS, 36, steps 3-7
7. If reqd for other door, rotate tool ccw 60 deg and remove from PDU



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### WINCH OPERATIONS



IV

Radiators – stow and latch

1. Winch

CONTROL – REEL OUT

Handle ratchet – blue (center)

Attach rope to wrist tether

Rope: Fwd – in clip and over rollers

Aft – rope guide, under handrail, and over rollers

Winch hook – under #4 latch bellcrank

CONTROL – IN

Handle ratchet – green (cw)

2. Ratchet in rope slack only

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### WINCH OPERATIONS (CONT)

- IV** √Pwr off  
 3. PLBD(s) – close with winch  
 If aft not READY TO LATCH, repeat steps 1 and 3 at aft winch
- IV** √Pwr on
- IV** Latches – close
4. Winch hook – remove from PLBD
  5. Rope – reel in excess
  6. Handle – stow
  7. Repeat steps 5-7 for aft winch, if reqd

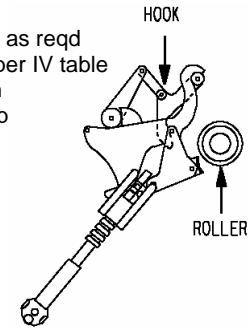
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### 3-PT TOOL INSTALLATION

TOOL BOX – 3-PT TOOLS, ADJUSTABLE TETHERS

- IV** √Pwr off
1. Position installation handles as reqd
  2. Tools – install in sequence per IV table
  3. Ratchet select lever – green
  4. Handle – ratchet to hard stop – stow handle or restrain with Adj tether



#### TOOL RESET

1. Ratchet – red
2. Handle – ratchet to stop
3. Tool – compress to latch handles

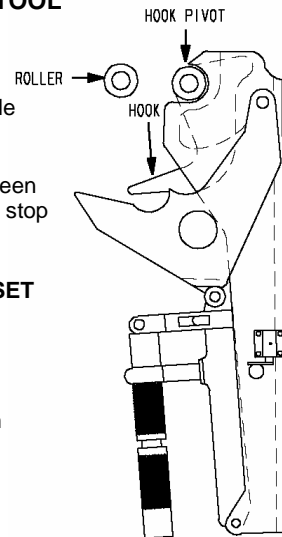
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### CL LATCH TOOL

TOOL BOX – CL LATCH TOOLS

- IV** √Pwr off
1. Tools – install per IV table
  2. Trigger – safety off – depress
  3. Ratchet select lever – green
  4. Handle – ratchet to hard stop – stow



#### TOOL RESET

1. Ratchet – red
2. Handle – ratchet to stop – stow
3. Tool – compress to latch

STBD →  
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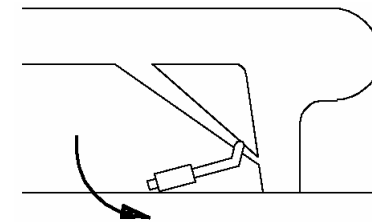
### RMS JOINT ALIGN

TOOL BOX – ADJ TETHERS, SNATCH BLOCKS (2), RMS ROPE REEL

1. Attach RMS rope around end effector under handrail. Translate to avoid wrapping rope around RMS
  2. Attach snatch block(s) to handrail(s) and route rope as reqd
- IV**
3. Reposition RMS as required for cradling
  4. Pull RMS down into MPMs
  5. Perform final positioning by hand to allow MRLs to latch

#### RMS SHOULDER BRACE RELEASE

TOOL BOX – RMS SHOULDER BRACE RELEASE TOOL



1. Fold aside rub strip and thermal blankets
2. Insert tool and move handle down
3. Remove tool and reconfigure blankets

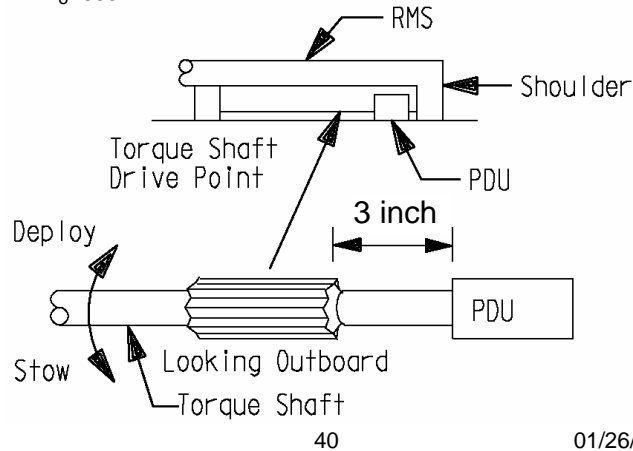
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### MPM STOW/DEPLOY

TOOL BOX – MPM WRENCH

1. Rotate torque shaft (8 revs) until MPMs are stowed/deployed, X<sub>0</sub>=693



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### RMS TIEDOWN

TOOL BOX – PRDs (2), EVA TRASH BAG

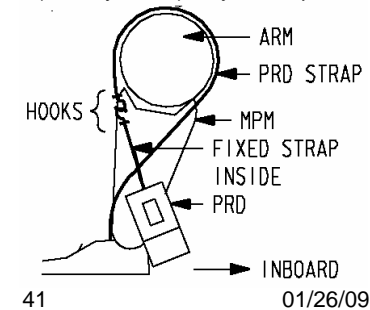
IFM – 9/64-in ALLEN WRENCH (AW)

**ELBOW** – PRD aft of MPM, peel blanket (fwd of MPM) toward EE; feed hook under cable harness (if reqd, remove cable harness clamp bolt with AW, bend clamp out of way), adjust strap as far fwd as possible

**WRIST** – PRD aft of MPM, strap rests just fwd of pitch joint opening

**END EFFECTOR** – PRD fwd of MPM, peel blankets aft and fwd, strap rests aft-most on yaw joint (at roll/yaw I/F), adjust strap under bolt studs

1. Figure eight the strap
2. Pull minimum 6-in slack in strap
3. Ratchet PRD snug, (14 full strokes reqd)
4. ✓Strap in correct arm location, ratchet tight
5. Reattach blankets



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### RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE

AIRLOCK – JETTISON STOWAGE BAG

TOOL BOX – 1/2-in BOX RATCHET, VELCRO/TAPE

- EV**
1. Rotate 10 o'clock posn release rod ccw to hard stop (~36 strokes of 90 deg)
  2. Rotate 4 o'clock posn release rod cw to hard stop (~36 strokes of 90 deg – shaft will release from grapple fixture)
  3. Clear worksite for RMS powerdown
  4. Tape end of shaft to restrain slug within shaft
  5. Cover end effector with jettison stowage bag to restrain grapple shaft

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### PRLA OPEN/CLOSE

AIRLOCK – RATCHET WITH 7/16 SOCKET

**IV** ✓PRLA PWR OFF

- EV**
1. Rotate ratchet in release direction (as marked above EVA drive) to shear pin
  2. View yellow indicator as applicable
  3. Continue to rotate drive 4-1/2 revs to disc gear train from drive shaft

To open latch:

4. Continue rotation in release direction (as marked above EVA drive) until latch open against stop

To close latch:

5. Rotate EVA drive in opposite direction of release (as marked above EVA drive) until latch closed against hardstop and over center

**IV** ✓PRLA to LAT

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**PRLA OPEN/CLOSE (CONT)**

- EV**
6. Apply PRLA locking feature if applicable  
To lock:
    7. Rotate each bolt (two) cw 1/2 turn
- For subsequent PRLA ops, release locking feature before operating EVA drive (two bolts ccw 1/2 turn); relock after operation

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**KU ANTENNA STOW**

1. Secure tether reel clear of antenna dish with wrist tether

**CAUTION**

Antenna dish is very fragile. Avoid contact with gold thermal blankets and black painted surfaces

2. Align  $\alpha$  (dish roll) and  $\beta$  (dish pitch) gimbals for pin engagement
3. Give IV GO to drive pins in short pulses

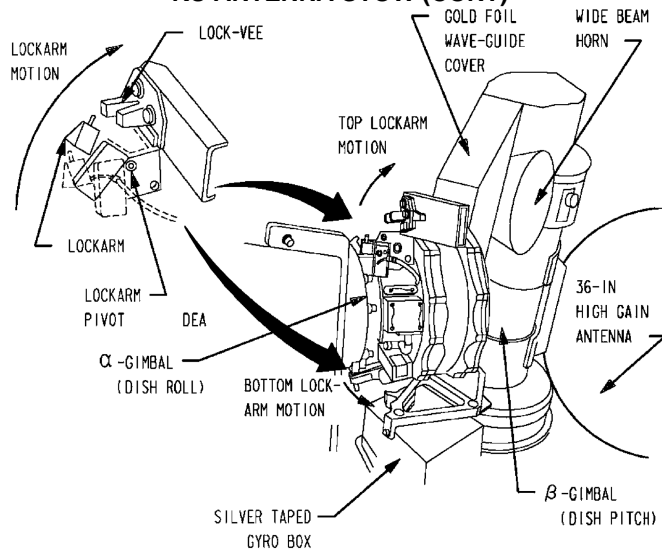
**NOTE**

Top lockarm (by wide beam horn and gold foil) drives fully before bottom lockarm (by silver gyro box)

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**KU ANTENNA STOW (CONT)**



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**AIRLOCK EGRESS**

**DAISY CHAIN:** EV2 waist tether to A/L internal D-ring  
EV2 safety tether (retracting end) to EV1 waist tether

- EV1**
1. Thermal cover – open
  2. Egress airlock
  3. Attach safety tether, retracting end to ODS dogbone handrail (or orbiter handrail tether point); lock hook,  $\checkmark$  reel unlocked
  4. Attach EV2's safety tether, retracting end to separate ODS dogbone handrail; lock hook,  $\checkmark$  reel unlocked
- BOTH**
5. Waist tethers – attach to self, stow extra waist tether (if reqd) in A/L clear of hatch
- EV2**
6. Egress airlock
  7. Thermal cover – close

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# WORKAROUNDS CRIBSHEET

HST CONTINGENCIES

**NOTE**

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<b>TSA</b>		
1. Latch fails to open	<b>PGT: (A2, CCW 2, 5.5):</b> Release 7/16" EVA bolt on latch bracket, 4 turns; rotate bracket clear of latch tongue. During TSA lid closing, rotate bracket back to launch config; <b>PGT: (A2, CW 2, 5.5),</b> 4 turns  <b>NOTE:</b> MER Info: TSA latch bolts are torqued to 4 ft-lb	
2. Latch fails to close	Close remaining latches (3 of 4 required for landing)	3 of 4

**SAFETY TETHER**

1. 55' safety tether fails to retract/tend	<ol style="list-style-type: none"> <li>Verify reel is unlocked</li> <li>Verify tether reel opening is clear of FOD</li> <li>Pull out small amount of cable, allow reel to retract while holding cable slightly tensioned</li> <li>Tap side of reel housing during retraction</li> </ol>	
2. Safety tether red stripe showing (any length)	Safety tether cannot be used. Replace with spare safety tether from port sill	

**PAD**

1. For PAD install, release knob fails to rotate to close	Verify knob unlocked and in release position	
2. For PAD remove, release knob fails to rotate to open	<ol style="list-style-type: none"> <li>Verify knob unlocked and in release position</li> <li>Attempt to rotate release knob using 7/16" Ratchet on knob's 7/16" hex stud</li> <li>To remove PAD from SRMS, <b>PGT[A6, CCW2, 30.5]-6-in ext:</b> Release contingency release bar by rotating 7/16" captive release bolts (2) CCW, 5 turns</li> </ol>	

**STS PFR**

1. Joint fails to actuate	<ol style="list-style-type: none"> <li>Verify both paddles depressed fully</li> <li>Verify no load is applied to joint</li> <li>Increase force applied in order to free joint</li> <li>If no joy, retrieve spare PFR from fwd bulkhead</li> </ol>	
---------------------------	---	--

**MFR**

1. RMS EE will not release from MFR grapple fixture	<ol style="list-style-type: none"> <li>Tether to MFR (close to APC in order to stow MFR once it is released from grapple fixture separation plane)</li> <li>Retrieve 1/2" box-end ratcheting wrench from port TSA</li> <li>Release 1/2" captive bolts (2), ~ 9-10 turns (bolts are not spring-loaded)</li> <li>Install MFR onto APC</li> <li>RMS EE will still have grapple shaft and round silver abutment plate attached; install jettison stowage bag</li> </ol> <p style="text-align: center;"><u>Bolt Torque Note</u></p> <p>Final installation torque of bolts is 60-90 in-lb. Torque break/removal seen at MFR fit check was low (~35 in-lb)</p>	
2. Boot plate fails to lock in place (free spins)	<ol style="list-style-type: none"> <li>Retrieve 34-in adj tethers (2) from A/L</li> <li>Route 34" adj tether(s) as reqd from boot plate toe loop around MFR/APC attach hooks and back onto other boot plate toe loops. Tighten adj tether(s) as reqd</li> </ol> <p><b>NOTE:</b> It is also possible to route 34-in tether(s) through RMS EE HR</p>	

## WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<b>HST PFR</b>		
1. HST PFR joint fails to lock (any joint)	<ol style="list-style-type: none"> <li>Wiggle joint while attempting to engage lock</li> <li>If no joy, retrieve spare from stbd APC or FSS</li> </ol>	
2. HST PFR PIP Pin is stuck in PFR socket (fails to remove from PFR socket)	<ol style="list-style-type: none"> <li>If PIP pin won't actuate, attempt to free it using hammer. If possible, secure PIP pin in PFR stowage hole. Otherwise, cut lanyard and stow PIP pin in small trash bag. Retrieve spare pip pin from ORUC PIP pin bracket (#3) for subsequent PFR operations</li> <li>If no joy, remove hex probe using procedure in block 3 below</li> </ol>	
3. HST PFR hex probe is stuck in PFR socket	<ol style="list-style-type: none"> <li>Loosen non-captive 7/16" hex bolt at end of hex probe until released (10 turns) using <b>PGT = A3/CCW2/10.5</b></li> <li>Capture loose bolt and retainer cap and stow in small trash bag</li> <li>Slide PFR off hex probe (using hammer if necessary). Capture Woodruff key and stow in small trash bag</li> </ol>	

### WING TAB CONNECTORS

1. Connector FOD	<p>On MCC GO, obtain connector cleaner tool from A/L; use entire cartridge prior to re-entry to the airlock</p> <p style="text-align: center;"><u>NOTE</u></p> <p>One N2 cartridge is already captured onto the CCT (the other is lanyarded inside caddy). In order to puncture cartridge, it must be threaded into CCT until indicator line passes out of sight under the collar of the CCT</p>	
2. Twist cap will not release	<ol style="list-style-type: none"> <li>On MCC GO, increase force</li> <li>On MCC GO, attach equipment hook to cap tether point and use strap of adj tether to assist with cap release</li> </ol>	
3. Connector EMI band bent (causing interference)	On MCC GO, obtain needle nose pliers or forceps to remove band (port TSA)	
4. Connector pin bent (20 or 22 gauge)	<ol style="list-style-type: none"> <li>Describe pin condition. If possible, obtain WVS view or interface</li> <li>On MCC GO, retrieve pin straightener or needle nose pliers; pin straightener or NN pliers must be electrically grounded to exterior of connector outer shell prior to usage; attempt pin repair</li> </ol>	
5. Pushed in Pin	Report pushed in pin # to MCC, press	
6. Connector O-ring or main joint gasket seal loose (used as a moisture seal in 1G only, not needed on orbit)	<ol style="list-style-type: none"> <li>If possible, remove seal with tether hook</li> <li>If no joy, on MCC GO, obtain needle nose pliers to remove seal</li> </ol>	

### MTL

1. MTL collar is stuck in between settings	<ol style="list-style-type: none"> <li>Translate to contingency bolt on aft/port corner of ORUC (under aft fixture)</li> <li>Turn PGT OFF</li> <li><b>PGT: RCW:</b> Engage ORUC bolt, force MTL to slip</li> <li>Re-attempt MTL collar re-set</li> </ol>	
--	--	--

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly

Action

Min Rqmt

**WFPC2 on HST**

1. FGS handhold will not release from fwd fixture		
-- Locking knob fails to pull up or pivot arm fails to swing	<ol style="list-style-type: none"> <li>1. Retrieve spare FGS handhold from SLIC port</li> <li>2. If no joy, translate back to fwd fixture. Loosen pivot bolt 4 turns CCW: <b>PGT=A3/10.5</b> with 5/32" (#10) allen extension (stbd TSA)</li> <li>3. Pull up on pivot arm and locking spool assembly and rotate 90 degrees to free FGS HH</li> <li>4. During cleanup: Re-install handhold and re-engage pivot bolt, 4 turns CW</li> </ol> <p><u>NOTE:</u> Failure Threshold: 13.2 ft-lb; Breakaway torque: 6.3 ft-lb</p>	2 of 2 latches reqd for landing
2. FGS handhold fails to install on WFPC-2		
-- FGS handhold does not fit over guide studs	<ol style="list-style-type: none"> <li>1. Remove handhold, rotate handhold 180 degrees and re-attempt installation</li> <li>2. If no joy, remove interfering guide stud, re-attempt installation</li> <li>3. If no joy, retrieve contingency FGS handhold from SLIC/port, re-attempt installation</li> </ol> <p><u>NOTE:</u> Guide studs are torqued to 50 in-lb</p>	3 of 4 zip nuts engaged on guide studs required for EVA on-orbit handling
-- Zip Nuts fail to mount to guide studs	<ol style="list-style-type: none"> <li>1. Engage zip nuts on other studs; verify 3 zip nuts engaged</li> <li>2. If no joy, contact MCC to either rotate FGS handle 180 degrees and re-attempt installation, or get spare FGS handhold (port SLIC)</li> </ol> <p><u>NOTE:</u> Guide studs are torqued to 50 in-lb</p>	3 of 4 zip nuts engaged on guide studs required for EVA on-orbit handling
3. WFPC-2 blind mate connector fails to release		
-- No Breakaway (< 1/2 turn)	<ol style="list-style-type: none"> <li>1. Re-try with <b>PGT B7/10.5</b> (MTL will slip)</li> <li>2. If no joy, re-try with <b>PGT: B7/15.5</b></li> </ol> <p><u>NOTE:</u> Failure torque: 13.4 ft-lb</p>	
-- Binds at 0.5 – 5.5 turns	<ol style="list-style-type: none"> <li>1. Re-try with <b>PGT B7/10.5</b> (MTL will slip)</li> <li>2. If no joy, re-try with <b>PGT: B7/15.5</b></li> </ol> <p><u>NOTE:</u> Failure torque: 13.4 ft-lb</p>	4.5 turns min (for tangs to release enough to allow separation of connector plate)
4. HST ground strap does not release from WFPC2	<ol style="list-style-type: none"> <li>1. Re-try with <b>PGT B7/15.5</b></li> <li>2. If no joy, re-try <b>PGT A5/15.5</b> or with <b>Ratchet/CMTL=15</b> (SOPE)</li> <li>3. If no joy, re-try with <b>PGT RCCW/23.5</b>, or <b>EVA Ratchet/38</b> to fail ground strap bolt</li> </ol> <p><u>NOTE:</u> Failure torque: 15.6 ft-lb</p>	
5. A-Latch fails to disengage: -- No break-away (< 1/2 turn)	<ol style="list-style-type: none"> <li>1. Re-attempt with <b>EVA Ratchet/CMTL=45</b> (SOPE)</li> <li>2. If no joy, remove CMTL from EVA ratchet and re-try</li> <li>3. If no joy, re-connect ground strap and blind mate connector; contact MCC for grounding workarounds</li> </ol> <p><u>NOTE:</u> Failure torque: 57.1 ft-lb (spinning drive rod)</p>	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
-- WFPC-2 binds (.5-22.5 turns)	<ol style="list-style-type: none"> <li>Reverse direction .5-3 turns (CW) at nominal torque and re-attempt to disengage A-Latch</li> <li>If no joy, increase PGT to A6/30.5 OR attempt with EVA Ratchet; MTL = 38</li> <li>If no joy, re-try with <b>EVA Ratchet</b> and CMTL (SOPE); <b>CMTL = 45</b></li> <li>If no joy, re-engage A-latch; reconnect ground strap and engage blind mate connector</li> </ol> <p><u>NOTE:</u> Failure torque: 57.1 ft-lb (spinning drive rod)  <u>NOTE:</u> If the A-Latch is disengaged &lt; 4 turns, it is possible to re-engage the blind mate connector</p>	
-- No WFPC-2 motion (free spinning)	<ol style="list-style-type: none"> <li>Verify socket is inserted properly into the A-latch housing and attempt to disengage</li> <li>If no joy, retrieve 7/16" short adj and re-try (original HST fit checks)</li> <li>If no joy, attempt to reverse direction and fully re-engage A-latch. Re-try disengagement</li> <li>If no joy, note profile of WFPC-2 radiator relative to surrounding structure and contact MCC</li> </ol>	
6. HST blind mate connector floating plate not in proper orientation; not engaged at all 4 corners (to ball detents on posts)	Use PGT with hybrid ext (fully extended) to gently push on floating plate post to re-engage plate onto ball detents on posts (4)	

**WFCIII in WSIPE**

1. WSIPE lid fails to open		
-- Lid latch fails to release	<ol style="list-style-type: none"> <li>Open latches in different sequence</li> <li>Set <b>PGT to A3/10.5</b> or <b>EVA Ratchet/MTL to 10</b>. Back off 7/16" contingency flexure bolt (7 turns CCW); Re-attempt opening latch</li> <li>If no joy, fully release 7/16" contingency flexure bolt, 12-15 total turns CCW</li> </ol> <p><u>NOTE:</u> Bolt and flexure will come free, no tether points  <u>NOTE:</u> Failure threshold: 12.7 ft-lb</p>	2 of 3 latches
2. WFC handhold will not release from fwd fixture		
-- Captive lock pin fails to release	<ol style="list-style-type: none"> <li>Retrieve spare WFC handhold from SLIC fwd/lower  - OR -</li> <li><b>PGT: B3, CCW 2, 5.5</b>; release failed 7/16-in captive lock pin bolts (2), 8 turns. Bolts are captive to lock pin T-handle assembly</li> <li>For landing, retrieve spare PIP pin #3 from ORUC bracket and install through handhold onto SLIC bracket</li> </ol> <p><u>NOTE:</u> Failure threshold is 3.7 ft-lb. Initial break torque is 1.7 ft-lb</p>	3 of 3 captive lock pins reqd for landing

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
3. WFC handhold fails to install on WFC III		
-- WFC Handhold does not fit over guide studs	<ol style="list-style-type: none"> <li>Using vise grips (port TSA), remove interfering guide stud, re-attempt installation</li> <li>If no joy, retrieve contingency WFC handhold from SLIC lower/fwd, re-attempt installation</li> </ol> <p><u>NOTE:</u> Guide studs are torqued to 50 in-lb</p>	3 of 4 zip nuts engaged on guide studs required for EVA on-orbit handling
-- Zip Nuts fail to mount to guide studs	<ol style="list-style-type: none"> <li>Engage zip nuts on other studs; verify 3 zip nuts engaged</li> <li>If no joy, contact MCC</li> </ol> <p><u>NOTE:</u> Guide studs are torqued to 50 in-lb</p>	3 of 4 zip nuts engaged on guide studs required for EVA on-orbit handling
4. WFC III vent valves fail to open	<ol style="list-style-type: none"> <li>Reverse direction (CW at nominal settings), fully to hard stop; verify motion. If successful, re-attempt valve opening at nominal setting</li> <li>If no joy, re-try valve opening with <b>PGT=B5/CCW2/10.5</b></li> </ol> <p><u>NOTE:</u> Failure threshold = 17.5 ft-lb</p>	1 vent valve opened a minimum of 3 turns
5. Fail to release WSIPE ground strap	<ol style="list-style-type: none"> <li>Re-try with: <b>PGT B7/15.5</b></li> <li>If no joy, re-try <b>PGT A5/15.5</b> or <b>Ratchet/CMTL=15</b> (SOPE)</li> <li>If no joy, contact MCC</li> </ol> <p><u>NOTE:</u> Failure threshold = 15.6 ft-lb (release)</p>	Ground strap is reqd
6. A-Latch fails to disengage:		
-- No Breakaway (< 1/2 turn)	<ol style="list-style-type: none"> <li><b>Ratchet/CMTL=45</b> (SOPE); re-attempt fastener breakaway</li> <li>If no joy, contact MCC</li> </ol> <p><u>NOTE:</u> Failure threshold = 57.1 ft-lb</p>	22 turns @ 17 ft-lb
-- WFCIII Binds (.5-22.5 turns)	<ol style="list-style-type: none"> <li>Reverse direction .5-3 turns at nominal torque and re-attempt to disengage A-Latch</li> <li>If no joy, change <b>PGT=A4/30.5</b>, re-attempt</li> <li>If no joy, contact MCC regarding increased torque values to release A-latch. <u>NOTE:</u> Possible thread inspection reqd prior to install into HST</li> <li>If A-latch is jammed (less than 22 turns of engagement), reference "A-Latch Override" procedure for WFC III Removal below:</li> </ol> <p><u>A-latch Override:</u></p> <ol style="list-style-type: none"> <li>Contact MCC for jettison options</li> <li>Rotate override release handles (2 handles; one on each side of WSIPE), 2-3 turns (~30 in-lb torque)</li> <li>Pull on release handles (2) with ~ 20 lb of force (~6-8 inches to hard stop)</li> <li>Remove WFC III from WSIPE (A-latch mounting bracket stays attached to WFC III); expect ~ 9 lb pull force resistance for both B and C latch</li> </ol>	22 turns @ 17 ft-lb

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
	<p>If no joy with removal, perform B-Latch and C-Latch Override procedure below:</p> <p><u>B and C Latch Disengagement</u> (same procedure for both)</p> <p><u>NOTE:</u> B latch override is located on stbd side of WSIPE and C latch override is on the port side</p> <ol style="list-style-type: none"> <li><b>EVA Ratchet with 6-in rigid</b> (no MTL): Release EVA hex head captive bolts (4 per latch) 24 total turns (Release torque is 35 ft-lb)</li> <li>Remove WFC III (latch and mounting plate depart with SI); WSIPE can no longer be used to hold WFC III for landing</li> </ol> <p><u>NOTE:</u> It is possible to close WSIPE lid without driving A-latch; guide stud contact with lid is possible</p> <p><u>NOTE:</u> Failure threshold = 57.1 ft-lb</p>	
<p>-- No WFC III Motion (Free Spinning):</p>	<ol style="list-style-type: none"> <li>Verify socket is inserted properly into the A latch housing and attempt to disengage</li> <li>If no joy, attempt to reverse direction at nominal torque and fully re-engage A-latch. Re-try disengagement</li> <li>If no joy, note profile of WFC III radiator relative to surrounding structure and contact MCC</li> <li>If no joy, note status of WSIPE latch lights (A-LATCHED light OFF) and reconnect ground strap</li> </ol>	<p>22 turns @ 17 ft-lb</p>
<p>7. A-Latch light fails to illuminate</p>	<ol style="list-style-type: none"> <li>IV: Verify switch S24 is on</li> <li>Continue observing WFC III motion</li> </ol>	
<p>8. WFC III blind mate tang not fully retracted</p>	<p>Use equipment hook to push tang back in; verify tang fully retracted</p>	
<p>9. WSIPE lid latch fails to close</p>	<p>Engage other latches and re-try</p>	<p>2 of 3 latches</p>

**WFCIII on HST**

<p>1. HST A-Latch fails to engage:</p> <p>-- No A-latch engagement (free-spinning)</p>	<ol style="list-style-type: none"> <li>Verify socket is inserted properly into the A latch housing and attempt to engage</li> <li>If no joy, pull WFC out 1-3 inches; re-insert and re-attempt A-latch engagement</li> <li>If no joy, remove WFC completely and inspect WFC and bay for obstruction/damage; re-attempt installation</li> </ol>	<p>18 turns with good motion seen &amp; 38 ft-lb torque</p>
<p>-- 0-3 turns</p>	<ol style="list-style-type: none"> <li>Reverse direction fully and disengage; remove WFC III 1-3 inches from telescope and re-insert; re-attempt latch engagement</li> <li>If no joy, remove WFC III completely, inspect bay and both A-latch halves; re-attempt installation</li> </ol> <p><u>NOTE:</u> Failure threshold is 57.1 ft-lb</p>	<p>18 turns with good motion seen &amp; 38 ft-lb torque</p>

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
-- 3-22 turns	<ol style="list-style-type: none"> <li>Reverse direction at nominal settings for 1-2 turns (to clear jam); re-attempt A-latch engagement</li> <li>If no joy, change <b>PGT=A6/30.5</b> and re-attempt A-latch engagement</li> <li>If no joy, take <b>PGT-OFF, RCW/30.5</b>: Re-attempt engagement manually</li> <li>If no joy, use <b>EVA Ratchet/MTL=38</b> and re-attempt</li> </ol> <p><u>NOTE</u>: Failure threshold is 57.1 ft-lb</p>	18 turns with good motion seen & 38 ft-lb torque
2. Ground strap bolt fails to engage	<ol style="list-style-type: none"> <li>Re-try using <b>PGT=B7/15.5</b></li> <li>If no joy, contact MCC</li> </ol> <p><u>NOTE</u>: Failure threshold: 15.6 ft-lb</p>	Ground strap is reqd
3. WFC III Blind mate connector fails to engage	<ol style="list-style-type: none"> <li>Reverse direction fully to hard stop; re-attempt blind mate connector engagement at nominal settings</li> <li>If no joy, re-try engagement with <b>PGT B7/CW/15.5</b></li> <li>If no joy, contact MCC for full WFC III removal plan</li> </ol> <p><u>NOTE</u>: Failure threshold is 13.4 ft-lb</p>	4 turns min
4. WFC handhold will not release from WFC III (zip nut fails to release)	<ol style="list-style-type: none"> <li>Attempt to release other zip nuts</li> <li>If no joy, use vise grips (port TSA) under zip nut handles to back out zip nut/guide stud</li> </ol> <p><u>NOTE</u>: If no joy, contact MCC (If guide stud remains attached to zip nut, stowage on forward fixture is not possible)</p> <p><u>NOTE</u>: Guide studs are torqued to 50 in-lb</p>	
5. WFC handhold will not stow on fwd fixture		
-- Captive lock pin will not engage	<ol style="list-style-type: none"> <li>If no joy, <b>PGT: B3, CCW 2, 5.5</b>; release failed 7/16-in captive lock pin bolts (2), 8 turns. Bolts are captive to lock pin T-handle assembly</li> <li>For landing, retrieve spare PIP pin #3 from ORUC fwd/stbd bracket and install</li> </ol> <p><u>NOTE</u>: Failure threshold is 3.7 ft-lb. Initial break torque is 1.7 ft-lb</p>	3 of 3 captive lock pins/PIP pin combo

## WFPC2 in WSIPE

1. WSIPE A-Latch fails to engage -- 0-3 turns	<ol style="list-style-type: none"> <li>Verify socket is inserted properly into the A-latch housing and re-attempt to engagement</li> <li>Reverse direction and disengage, remove WFPC2 1-3 inches and re-insert to re-attempt latch engagement</li> <li>If no joy, remove WFPC2 completely, inspect bay and both A-latch halves; re-attempt installation</li> <li>If no joy, contact MCC (possible latch contingency release)</li> </ol> <p><u>A-latch Override</u>:</p> <ol style="list-style-type: none"> <li>Contact MCC for jettison options</li> <li>Rotate override release handles (2 handles; one on each side of WSIPE), 2-3 turns (~30 in-lb)</li> <li>Pull on release handles (2) with ~ 20 lb of force (~6-8 inches to hard stop)</li> <li>Remove WFPC2 from WSIPE (A-latch mounting bracket stays attached to WFPC2); expect ~ 9 lb pull force resistance for both B and C latch</li> </ol> <p><u>NOTE</u>: Failure threshold: 57.1 ft-lb</p>	22 turns @ 17 ft-lb
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# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<p>-- 3-22 turns</p>	<ol style="list-style-type: none"> <li>Reverse direction at nominal torque for 1-2 turns (to clear jam); re-attempt A-latch engagement</li> <li>If no joy, re-try using: <b>PGT: A6, CW 2, 30.5</b></li> <li>If no joy, re-try with <b>Ratchet/MTL=38</b></li> <li>If no joy, and A-latch is jammed, disengage A-latch:</li> </ol> <p><u>A-latch Override:</u></p> <ol style="list-style-type: none"> <li>Contact MCC for jettison options</li> <li>Rotate override release handles (2 handles; one on each side of WSIPE), 2-3 turns (~30 in-lb)</li> <li>Pull on release handles (2) with ~ 20 lb of force (~6-8 inches to hard stop)</li> <li>Remove WFPC2 from WSIPE (A-latch mounting bracket stays attached to WFPC2); expect ~ 9 lb pull force resistance for both B and C latch</li> </ol> <p>If no joy with removal, perform B-Latch and C-Latch Override Procedure below:</p> <p><u>B and C Latch Disengagement</u> (same procedure for both)</p> <p><u>NOTE:</u> B latch override is located on stbd side of WSIPE and C latch override is on the port side</p> <ol style="list-style-type: none"> <li><b>EVA Ratchet with 6-in rigid (no MTL):</b> Release EVA hex head captive bolts (4 per latch) 24 total turns (Release torque is 35 ft-lb)</li> <li>Remove WFPC2 (latch and mounting plate depart with SI); WSIPE can no longer be used to hold WFPC2 for landing</li> </ol> <p><u>NOTE:</u> It is possible to close WSIPE lid without driving A-latch; guide stud contact with lid is possible</p>	<p>22 turns @ 17 ft-lb</p>
<p>-- No WFPC2 motion (free-spinning)</p>	<ol style="list-style-type: none"> <li>Verify socket properly engaged</li> <li>Pull WFPC2 out 1-3 inches and re-insert</li> <li>If no joy, remove WFPC2 completely and inspect bay for obstruction; re-attempt installation</li> </ol>	<p>22 turns @ 17 ft-lb</p>
<p>-- A-Latch light fails to extinguish</p>	<p>Contact MCC</p>	<p>22 turns @ 17 ft-lb</p>
<p>2. Fail to attach WSIPE ground strap to WFPC-2 (bolt fails to engage)</p>	<ol style="list-style-type: none"> <li>Re-try using <b>PGT=B7/15.5</b></li> <li>If no joy, retrieve wire tie from A/L; wrap one end of wire tie around ground strap bracket &amp; pull taut; wrap two loops around exposed threads of nearest guide stud</li> </ol> <p><u>NOTE:</u> Failure threshold: 15.6 ft-lb</p>	<p>Ground strap is reqd for landing</p>
<p>3. Fail to remove FGS handhold from WFPC2</p>	<p>Use vise grips (port TSA) under zip nut handles to back out zip nut/guide stud</p> <p><u>NOTE:</u> If no joy, contact MCC (If guide stud remains attached to zip nut, stowage on forward fixture is precluded)</p>	
<p>4. WSIPE lid latch fails to engage</p>	<p>Engage other latches and re-try</p>	<p>2 of 3 latches</p>
<p>5. FGS handhold fails to stow on forward fixture</p>		
<p>-- Locking knob fails to push down to locked position</p>	<ol style="list-style-type: none"> <li>Check for interferences, re-attempt ¼-turn latch</li> <li>If no joy, contact MCC: <ul style="list-style-type: none"> <li>➤ Bring handhold inside A/L</li> <li>OR</li> <li>➤ Tether handhold to fwd fixture for landing (open work)</li> </ul> </li> </ol>	<p>2 of 2 latches reqd for landing</p>

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly

Action

Min Rqmt

## SIC&DH REMOVAL FROM HST

Anomaly	Action	Min Rqmt
<p>1. SI C&amp;DH keyway bolt fails to disengage</p> <p>-- No breakaway</p>	<p>1. Increase PGT torque to <b>A5/15.5</b>; re-attempt bolt release</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> The following step may shear bolt; attempt to capture and stow bolt head</p> </div> <p>2. If no joy, re-try using <b>PGT/MTL=A4/23.5</b></p> <p><u>NOTE</u>: Failure Threshold: 16.0 ft-lb (at the Vespel pellet)  <u>NOTE</u>: Failure Threshold: 22.5 ft-lb (above the Vespel pellet)  <u>NOTE</u>: Interrupted threads begin at 7.16 turns</p>	<p>2 of 4 keyway bolts engaged; at least 1 on connector side</p>
<p>-- ≥ 1 turn</p>	<p>1. If jam occurs after 1 or 2 turns released, engage fastener 1 turn <b>CW</b> at <b>A5/15.5</b> to clear jam; continue with <b>CCW</b> bolt release at <b>A5/15.5</b> to fully disengage</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> The following step may shear bolt; attempt to capture and stow bolt head</p> </div> <p>2. If no joy, re-try bolt release using <b>PGT/MTL=A4/CCW/23.5</b></p> <p><u>NOTE</u>: Failure Threshold: 16.0 ft-lb (at the Vespel pellet)  <u>NOTE</u>: Failure Threshold: 22.5 ft-lb (above the Vespel pellet)  <u>NOTE</u>: Interrupted threads begin at 7.16 turns</p>	<p>2 of 4 keyway bolts engaged; at least 1 on connector side</p>
<p>2. SI C&amp;DH spring-loaded bolt fails to disengage</p> <p>-- No breakaway</p>	<p>1. Increase PGT torque to <b>A5/15.5</b>; re-attempt bolt release</p> <p>2. If no joy, attempt releasing remaining bolts at nominal PGT settings; Re-attempt stuck bolt release using <b>A5/15.5</b></p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> The following step may shear bolt; attempt to capture and stow bolt head</p> </div> <p>3. If no joy, contact MCC to break bolt: Re-try using <b>PGT/MTL=A4/23.5</b></p> <p>If spring bolt broken, contact MCC to determine forward plan for the following possible options:</p> <ol style="list-style-type: none"> <li>a. Bay 10 Door Connector Bracket Removal and SIC&amp;DH-R Spring-loaded Fastener Housing Removal (Procedures in Section 16)</li> <li>b. GO to attempt drive stud disengagement regardless of spring bolt failure (<u>NOTE</u>: If drive stud bolt shears, it shears at pin interface that allows removal of SIC&amp;DH receptacle from door drive stud housing)</li> <li>c. Decision to leave old SIC&amp;DH installed on door</li> </ol> <p><u>NOTE</u>: Failure torque: 22.3 ft-lb (disengagement)  <u>NOTE</u>: Failure torque: 15.4 ft-lb (engagement)</p>	<p>5 of 6 spring-loaded bolts engaged</p>

# WORKAROUNDS CRIBSHEET (Cont)

**NOTE**

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<p>-- ≥ 1 turn</p>	<ol style="list-style-type: none"> <li>1. If jam occurs after 1 or 2 turns released, engage fastener 1 turn <b>CW</b> at <b>B7/15.5</b> to clear jam; continue with <b>CCW</b> bolt release at <b>A5/15.5</b> to fully disengage</li> <li>2. If no joy, attempt releasing remaining bolts at nominal PGT settings; Re-attempt stuck bolt release using <b>A5/15.5</b></li> </ol> <div style="border: 2px solid black; padding: 5px; margin: 10px 0; text-align: center;"> <p><b>WARNING</b> The following step may shear bolt; attempt to capture and stow bolt head</p> </div> <ol style="list-style-type: none"> <li>3. If no joy, contact MCC to break bolt: Re-try bolt release using <b>PGT/MTL=A4/CCW/23.5</b></li> </ol> <p>If spring bolt broken, contact MCC to determine forward plan for the following possible options:</p> <ol style="list-style-type: none"> <li>a. Bay 10 Door Connector Bracket Removal and SIC&amp;DH-R Spring-loaded Fastener Housing Removal (Procedures in Section 16)</li> <li>b. GO to attempt drive stud disengagement regardless of spring bolt failure (<b>NOTE:</b> If drive stud bolt shears, it shears at pin interface that allows removal of SIC&amp;DH receptacle from door drive stud housing)</li> <li>c. Decision to leave old SIC&amp;DH installed on door</li> </ol> <p><b>NOTE:</b> Failure torque: 22.3 ft-lb (disengagement) <b>NOTE:</b> Failure torque: 15.4 ft-lb (engagement)</p>	<p>5 of 6 spring-loaded bolts engaged</p>
<p>3. SI C&amp;DH drive stud bolt fails to disengage</p>	<ol style="list-style-type: none"> <li>1. Verify the following:               <ul style="list-style-type: none"> <li>□ Spring-loaded bolts are fully disengaged and have popped up (6)</li> <li>□ Check for adequate gaps in between SIC&amp;DH tray and both corner and side brackets; If there are no gaps, and the SIC&amp;DH looks jammed up against the upper corner or side brackets, contact MCC to partially loosen the bracket(s):                   <ol style="list-style-type: none"> <li>a. Using SSAT tool (A/L) or 5/16" x 10.3" socket (MULE caddy or stbd TSA), loosen 5/16" bracket screws, 2 turns (<b>NOTE:</b> Screws come free at 5.5 turns; there will also be a washer) <b>NOTE:</b> Vice grips reqd for lower side bracket screws adjacent to connector bracket; re-attempt drive stud dis-engage</li> </ol> </li> <li>□ Check for possible interference between keyway bolts and keyway slots; if interference seen, perform the following steps as reqd based on jam severity:                   <ol style="list-style-type: none"> <li>a. Partially release keyway bolts at nominal torque setting an additional 2 turns; OR, fully release keyway bolts into interrupted threads to provide additional clearance; re-attempt drive stud disengagement</li> </ol> </li> </ul> </li> </ol> <p><b>NOTE:</b> Interrupted threads begin at 7.16 turns</p>	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
	<p>2. If no joy with above checks and workarounds, contact MCC for GO to shear drive stud; <u>NOTE</u>: Depending on failure, may need to use prybar (port TSA) to assist with connector demate and vise grips (port TSA) to remove broken bolt from SIC&amp;DH receptacle:</p> <p>a. Configure <b>Ratchet/CCW/38</b>; OR <b>PGT: A6, CCW1, 30.5</b>; attempt to disengage drive stud. If drive stud bolt breaks, attempt to contain sheared off bolt head, and perform the following to remove the SIC&amp;DH:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Slide SIC&amp;DH tray up toward top of door as far as possible (<u>NOTE</u>: May need to fully remove bottom 2 keyway bolts, 9 additional turns; MULE caddy: 7/16"x10.3" capture socket)</li> <li><input type="checkbox"/> Pivot top of box away from door to provide enough clearance to free drive stud receptacle interface from door housing</li> </ul> <p><u>NOTE</u>: Re-engage any loosened bracket fasteners, hand tight</p> <p><u>NOTE</u>: Failure Threshold: 22.9 ft-lb (pins inside hex head)</p>	

## SIC&DH-R REMOVAL FROM MULE

<p>1. SI C&amp;DH-R keyway bolt fails to disengage</p>		
<p>-- No breakaway</p>	<p>1. Increase PGT torque to <b>A5/15.5</b>; re-attempt bolt release</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> The following step may shear bolt; attempt to capture and stow bolt head</p> </div> <p>2. If no joy, re-try using <b>PGT/MTL=A4/23.5</b></p> <p><u>NOTE</u>: Failure Threshold: 18.5 ft-lb</p> <p><u>NOTE</u>: Interrupted threads begin at 8 turns</p>	<p>Any 8 of 10 combo of keyway and spring-loaded bolts</p>
<p>-- ≥ 1 turn</p>	<p>1. If jam occurs after 1 or 2 turns released, engage fastener 1 turn <b>CW</b> at <b>A5/15.5</b> to clear jam; continue with CCW bolt release at <b>A5/15.5</b> to fully disengage</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> The following step may shear bolt; attempt to capture and stow bolt head</p> </div> <p>2. If no joy, re-try bolt release using <b>PGT/MTL=A4/CCW/23.5</b></p> <p><u>NOTE</u>: Failure Threshold: 18.5 ft-lb</p> <p><u>NOTE</u>: Interrupted threads begin at 8 turns</p>	<p>Any 8 of 10 combo of keyway and spring-loaded bolts</p>

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<p>2. SI C&amp;DH-R spring-loaded bolt fails to disengage</p> <p>-- No breakaway</p>	<p>1. Increase PGT torque to <b>A5/15.5</b>; re-attempt bolt release</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u></p> <p>The following step may shear bolt; attempt to capture and stow bolt head</p> </div> <p>2. If no joy, increase torque; re-try using <b>PGT/MTL=A4/23.5</b>; attempt to slide SIC&amp;DH-R up and off of MULE; capture broken bolt debris as reqd; re-attempt SIC&amp;DH removal</p> <p>3. If no joy, provide MCC status for all bolts; verify remaining spring-loaded fasteners released; on MCC GO, perform the following steps to remove SIC&amp;DH-R:</p> <ol style="list-style-type: none"> <li>a. Using 7/16"x10.3" captive socket (from MULE caddy) and trash bag, fully remove keyway bolts (3 of 4), stow bolts in trash bag</li> <li>b. Re-engage 1 spring-loaded bolt 2-3 turns as reqd prior to releasing final keyway bolt (this will help restrain the box prior to removal of last keyway bolt); contact MCC for possible jettison of SIC&amp;DH</li> </ol> <p>If spring bolt broken, describe remaining fastener condition to MCC:</p> <ol style="list-style-type: none"> <li>a. If broken fastener shank protrudes above plane of MULE SPA plate; try to free it using vise grips (port TSA); If no joy, contact MCC for possible jettison of SIC&amp;DH</li> <li>b. If fastener fails below surface of MULE SPA plate; install SIC&amp;DH onto MULE SPA plate per nominal plan; re-engage other bolts as reqd to meet minimum landing requirements</li> </ol> <p><u>NOTE:</u> Failure torque: 22.3 ft-lb (disengage)  <u>NOTE:</u> Failure torque: 15.4 (engage)  <u>NOTE:</u> Use 7/16" x 10.3" capture wobble from cont caddy when shearing bolts</p>	<p>Any 8 of 10 combo of keyway and spring-loaded bolts</p>
<p>-- ≥ 1 turn</p>	<p>1. If jam occurs after 1 or 2 turns released, engage fastener 1 turn <b>CW</b> at <b>B7/15.5</b> to clear jam; continue with <b>CCW</b> bolt release at <b>A5/15.5</b> to fully disengage</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u></p> <p>The following step may shear bolt; attempt to capture and stow bolt head</p> </div> <p>2. If no joy, increase torque; re-try using <b>PGT/MTL=A4/23.5</b>; attempt to slide SIC&amp;DH-R up and off of MULE; capture broken bolt debris as reqd; re-attempt SIC&amp;DH removal</p> <p>3. If no joy, provide MCC status for all bolts; verify remaining spring-loaded fasteners released; on MCC GO, perform the following steps to remove SIC&amp;DH-R:</p> <ol style="list-style-type: none"> <li>a. Using 7/16"x10.3" captive socket (from MULE caddy) and trash bag, fully remove keyway bolts (3 of 4), stow bolts in trash bag</li> <li>b. Re-engage 1 spring-loaded bolt 2-3 turns as reqd prior to releasing final keyway bolt (this will help restrain the box prior to removal of last keyway bolt); contact MCC for possible jettison of SIC&amp;DH</li> </ol>	<p>Any 8 of 10 combo of keyway and spring-loaded bolts</p>

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
	<p>If spring bolt broken, describe remaining fastener condition to MCC:</p> <ul style="list-style-type: none"> <li>a. If broken fastener shank protrudes above plane of MULE SPA plate; try to free it using vise grips (port TSA); If no joy, contact MCC for possible jettison of SIC&amp;DH</li> <li>b. If fastener fails below surface of MULE SPA plate; install SIC&amp;DH onto MULE SPA plate per nominal plan; re-engage other bolts as reqd to meet minimum landing requirements</li> </ul> <p><u>NOTE</u>: Failure torque: 22.3 ft-lb (disengage)  <u>NOTE</u>: Failure torque: 15.4 (engage)  <u>NOTE</u>: Use 7/16" x 10.3" capture wobble from cont caddy when shearing bolts</p>	

## SIC&DH-R INSTALL ON HST

<p>1. SI C&amp;DH-R fails to install onto Bay 10 door</p>	<p>Check SIC&amp;DH-R clearances with door:</p> <p>If SIC&amp;DH-R is binding because one of the door corner or side brackets is contacting it:</p> <ul style="list-style-type: none"> <li>□ Check for adequate gaps in between SIC&amp;DH-R tray and both corner and side brackets on door; If there are no gaps, and the SIC&amp;DH-R looks jammed up against the upper corner or side brackets, contact MCC to partially loosen the bracket(s): <ul style="list-style-type: none"> <li>a. Using SSAT tool (A/L) or 5/16" x 10.3" socket (MULE caddy or stbd TSA), loosen 5/16" bracket screws, 2 turns (<u>NOTE</u>: Screws come free at 5.5 turns; there will also be a washer)  <u>NOTE</u>: Vice grips reqd for lower side bracket screws adjacent to connector bracket; re-attempt drive stud dis-engage</li> </ul> </li> </ul> <p>If SIC&amp;DH-R is binding because the tray does not line up with the door keyway bolts:</p> <ul style="list-style-type: none"> <li>□ Check for possible interference between keyway bolts and keyway slots; if interference seen, perform the following steps as reqd to fit SIC&amp;DH-R onto door: <ul style="list-style-type: none"> <li>a. Partially release keyway bolts at nominal torque setting an additional 2 turns; OR, fully release keyway bolts into interrupted threads to provide additional clearance</li> </ul> </li> </ul>	<p>2 of 4 keyway bolts engaged; at least 1 on connector side</p> <p>&amp;</p> <p>5 of 6 spring-loaded bolts engaged</p> <p>&amp;</p> <p>1/2-in gap visible between SIC&amp;DH-R tray and door connector bracket + 8 of 8 connectors mated</p>
<p>2. SI C&amp;DH-R drive stud fails to engage</p>	<p>If SIC&amp;DH-R tray fails to move down due to lack of thread engagement (drive stud bolt is free spinning), perform the following steps:</p> <ol style="list-style-type: none"> <li>1. Attempt to manually move box down while engaging bolt at nominal ratchet MTL settings</li> <li>2. If no joy (threads are in contact but fail to engage), retrieve contingency clamps (2) from aft MULE pouch (above COPE). Install clamps at outboard-most locations; alternate turns back and forth evenly between clamps while trying to engage drive stud</li> </ol>	<p>1/2-in gap visible between SIC&amp;DH-R tray and door connector bracket + 8 of 8 connectors mated</p>

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
	<p>If gross misalignment of drive stud with receptacle observed, perform the following steps:</p> <ol style="list-style-type: none"> <li>Using 5/16" coax tool and 5/16"x10.3" capture socket (MULE caddies), loosen bay 10 door connector bracket screws (14), ~ 2 turns; attempt to pull connector bracket away from door while simultaneously pulling down on SIC&amp;DH-R tray to align drive stud mechanisms; re-attempt drive stud engagement</li> <li>If no joy, contact MCC</li> </ol> <p><u>NOTE:</u> Failure Threshold: 22.9 ft-lb (pins inside hex head)</p>	
<p>3. SI C&amp;DH-R spring-loaded bolt fails to engage</p>	<p>If possible alignment issue, verify the following:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Check SIC&amp;DH-R tray keyway slot and door bolt alignment; make sure box has moved down all the way and is aligned properly</li> <li><input type="checkbox"/> Check gap spacing on sides of SIC&amp;DH-R tray to assure it is uniform and equal</li> <li><input type="checkbox"/> Check gap spacing between SIC&amp;DH-R tray connector bracket and door connector bracket is uniform</li> </ul> <p>-- If no alignment issues seen, go to next bolt and attempt bolt engage</p> <p>-- If no joy engaging next bolt, contact MCC for drive stud cycle and/or stand by for sunrise (to improve thermal deltas)</p> <p>If high torque seen during spring loaded fastener engagement:</p> <ol style="list-style-type: none"> <li>Using nominal PGT settings, back out bolt as reqd, 1-2 turns CCW to clear jam; re-engage at nominal PGT settings</li> <li>If no joy, re-try using <b>PGT/MTL=B7/CW/15.5</b></li> <li>If no joy, try next bolt</li> </ol> <p><u>NOTE:</u> Failure torque: 22.3 ft-lb (disengage)  <u>NOTE:</u> Failure torque: 15.4 (engage)</p>	<p>5 of 6 spring-loaded bolts engaged</p>
<p>4. SI C&amp;DH-R keyway bolt fails to engage</p>	<ol style="list-style-type: none"> <li>Re-try bolt engagement using <b>PGT/MTL=B7/15.5</b></li> <li>If no joy, re-try bolt engagement using <b>PGT/MTL=A5/15.5</b></li> <li>If no joy, press with engagement of remaining bolts; contact MCC for forward plan per minimum reqts</li> </ol> <p><u>NOTE:</u> Failure Threshold: 16.0 ft-lb (at the Vespel pellet)  <u>NOTE:</u> Failure Threshold: 22.5 ft-lb (above the Vespel pellet)  <u>NOTE:</u> Interrupted threads begin at 7.16 turns</p>	<p>2 of 4 keyway bolts engaged; at least 1 on connector side</p>

## SIC&DH INSTALL ON MULE

<p>1. SI C&amp;DH fails to seat onto MULE SPA plate</p>	<p>If problem with keyway fastener alignment with keyway slot, perform the following:</p> <ol style="list-style-type: none"> <li>Using nominal PGT settings, loosen interfering keyway bolt(s), 8 turns to interrupted threads, re-try SIC&amp;DH install</li> <li>If no joy, fully remove keyway bolt(s) an additional 3-4 turns as reqd to install SIC&amp;DH (<u>NOTE:</u> Use captive 7/16"x10.3" socket from MULE caddy and trash bag when fully removing bolts); re-attempt SIC&amp;DH install</li> <li>If no joy, contact MCC</li> </ol>	<p>Any 8 of 10 combo of keyway and spring-loaded bolts</p>
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## WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
2. SI C&DH keyway bolt fails to engage	Contact MCC for options to increase torque, perform bolt cycling, and/or to release engaged spring-loaded bolts as reqd  <u>NOTE:</u> Failure torque: 18.5 ft-lb	Any 8 of 10 combo of keyway and spring-loaded bolts
3. SI C&DH spring-loaded bolt fails to engage	1. Press to next bolt; go for minimum number of bolts reqd 2. If no joy, contact MCC for bolt cycling options and/or torque increase options  <u>NOTE:</u> Failure torque: 22.3 ft-lb (disengage) <u>NOTE:</u> Failure torque: 15.4 (engage)	Any 8 of 10 combo of keyway and spring-loaded bolts

### BATTERY/BATTERY-R on HST

1. HST or VIK Harness connectors fail to demate from Battery jacks (P1A, P1B, P1C, or P2)	1. Re-try connector demate using high torque connector tool (MFR handle) or large connector tool (stbd TSA) 2. If no joy, and VIK P2 fails to disconnect from GCP2, contact MCC to perform the following steps: a. Disconnect HST P2 (A, B, C) from VIK J2 b. Remove VIK/GC from Battery jack J2, temp stow c. Stow Battery on SLIC per nominal plan d. Retrieve spare VIK from COPE and perform VIK R&R; reference VIK Replacement procedure in section 16, steps 13-15 3. If no joy, and HST P2 (A, B, or C) fails to disconnect from VIK J2, contact MCC to perform the following steps: a. Disconnect GCP2 from Battery J2 (A, B, C), temp stow b. Remove GC from Battery-R, temp stow c. Mate VIK P2/GC to Battery-R J2	
2. Battery connector caps fail to separate from each other	1. Inspect caps and re-try 2. If no joy, retrieve spare caps from COPE	
3. Battery connector caps fail to install on Battery	1. Check connector caps for damage; if damaged, retrieve spare caps from COPE and re-attempt cap install 2. Check battery and GCP2 connectors for damage; if connectors damaged, contact MCC 3. If no joy with steps 1 or 2, contact MCC for permission to proceed with Battery changeout with Caution	
4. Battery mounting bolt fails to release at nominal torque	1. If no joy, increase PGT settings to: <b>A5/15.5</b> ; re-attempt bolt release 2. If no joy, contact MCC prior to failing bolt: If no other fasteners are failed, re-try using <b>PGT/MTL=A4/23.5</b> ; if bolt fails, capture and stow. After battery removal, inspect battery mounting plate. If remains of broken bolt shaft interfere with Battery-R installation, contact MCC  <u>NOTE:</u> Failure threshold = 15.6 ft-lb	10 of 14 bolts
5. Battery J-hook will not swing free of bolt at nominal turn count	Continue releasing bolt in ½ turn increments as reqd to swing J-hook free  <u>NOTE:</u> Interrupted thread min turn count: 4.87 turns	
6. Battery fails to separate from HST door (all J-hooks confirmed released)	Perform the following steps to use the BET to pry Battery off of door: 1. Retrieve battery extraction tool (BET) from SLIC fwd (2 captive lock pins, 2 velcro straps, 1 ground strap) 2. Deploy arms (2) 90 degrees, lock arms 3. Take slide lock to "Release" 4. Install BET onto battery handholds, engage slide lock to "Dock"	



# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
	<p>5. Rotate either of the two extension knobs CCW to extend elevators until battery is free of door. If no joy with current elevator, use secondary elevator or contingency bolt</p> <p>Perform the following steps to stow Battery back on SLIC BPA and BET on fwd SLIC brackets:</p> <ol style="list-style-type: none"> <li>1. Retract elevator legs prior to stowage on SLIC (RMS EV can do this)</li> <li>2. RMS EV transfer Battery with BET to FF EV (in PFR at SLIC)</li> </ol> <p><u>NOTE:</u> BPA thermal cover may interfere with BET deployment leg footprint during install onto BPA; increase force into Battery/BET as reqd to overcome thermal cover "spring" affect while engaging J-hooks</p> <ol style="list-style-type: none"> <li>3. FF EV install Battery onto BPA, engage as many J-hooks as possible with BET installed</li> <li>4. Remove BET and temp stow as reqd:               <ul style="list-style-type: none"> <li>• Take slide lock to "Release"</li> <li>• Remove BET from Battery</li> <li>• Take slide lock to "Dock"</li> <li>• Fold legs (2) down 90 degrees and lock</li> <li>• Temp stow BET</li> </ul> </li> <li>5. Complete full Battery installation onto BPA</li> <li>6. Stow BET on SLIC fwd brackets:               <ul style="list-style-type: none"> <li>➤ Orient legs (2), up and forward</li> <li>➤ Engage captive lock pins (2), velcro straps (2), and conductive ground strap</li> </ul> </li> </ol>	
7. Battery-R fails to seat on door	<ol style="list-style-type: none"> <li>1. Check J-hook position clear of Battery-R bolt opening</li> <li>2. If no joy, remove Battery-R as reqd and inspect for obstructions in footprint</li> <li>3. If no joy, contact MCC</li> </ol>	
8. Battery J-hooks fail to swing over bolts	<p>Release bolt in ½ turn increments as reqd to clear J-hook</p> <p><u>NOTE:</u> Interrupted thread min turn count: 4.87 turns</p>	10 of 14 bolts
9. Battery-R mounting bolt fails to achieve nominal turn count	<ol style="list-style-type: none"> <li>1. Release fastener at nominal torque and re-attempt engaging fastener at nominal PGT settings; report condition to MCC</li> <li>2. If no joy, increase <b>PGT</b> settings to: <b>A5/15.5</b>; re-try bolt engagement</li> </ol> <p><u>NOTE:</u> Failure threshold = 15.6 ft-lb</p>	10 of 14 bolts
10. Battery isolation switch (BIS) fails to rotate ON	<p>Contact MCC</p> <p><u>NOTE:</u> The BIS handle shaft has a Cap-head socket screw with 5/32 allen hex; and is coated with Arathane</p> <div style="border: 3px double black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;"><b>WARNING</b></p> <p>If T-handle fastener is broken, remove and capture T-handle and bolt. When T-handle comes off, BIS switch automatically goes to ON position and connectors are hot</p> </div>	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
11. Old Battery Must Be Re-installed on HST (for any reason)	<ol style="list-style-type: none"> <li>1. Configure <b>EVA Ratchet with palm wheel and IFM 1/2-in rigid socket with drop proof tether</b> adapter (all tools in A/L), (CCW)</li> <li>2. Retrieve FRT tool from stbd TSA (as reqd to capture shear pin)</li> <li>3. Partially release shear pin 5 turns; clamp FRT onto shear pin neck</li> <li>4. Fully release non-captive battery door shear pins (4), 6-8 total turns (shear pins come off as a single piece); stow in trash bag</li> <li>5. Install old battery (reference nominal install procedures for Battery-R onto HST)</li> </ol> <p><u>NOTE:</u> Release torque for shear pins is 8.3 ft-lb (100 in-lb)</p>	

## BATTERY/BATTERY-R on SLIC

1. Battery-R fails to remove from BPA -- Fastener fails to release at nominal torque	<ol style="list-style-type: none"> <li>1. Increase torque to <b>A5/15.5</b>; re-try bolt release</li> <li>2. If no joy, re-try using <b>PGT/MTL=A4/23.5</b></li> </ol> <p><u>NOTE:</u> If bolt fails: -- Verify bolt is captured. Continue with battery removal -- After battery removal, inspect battery mounting plate. If broken bolt shaft interferes with battery installation, contact MCC</p> <p><u>NOTE:</u> Failure threshold: 15.6 ft-lb</p>	11 of 12 bolts
2. Battery-R J-hook will not swing free of bolt at nominal turn count	Increase turn count in ½ turn increments as reqd to clear J-hook	Min 7 turns to interrupted threads
3. Battery fails to stow on BPA -- Battery fails to seat	<ol style="list-style-type: none"> <li>1. Check J-hook position clear of Battery bolt opening</li> <li>2. If no joy, remove and inspect for obstructions in footprint or floating shear pin (1) (floating shear pin is off-center on BPA, and fixed shear pin is in center)</li> <li>3. If no joy, contact MCC</li> </ol>	
-- Mounting bolt fails to achieve nominal turn count	<ol style="list-style-type: none"> <li>1. Release fastener and re-attempt at nominal torque settings; report condition to MCC</li> <li>2. If no joy, increase PGT settings to: <b>A5/15.5</b>; re-try bolt engagement</li> </ol>	11 of 12 bolts
4. Battery J-hooks fail to swing over BPA bolts	Increase turn count in ½ turn increments as reqd to clear J-hook	Min 7 turns to interrupted threads

## SCM

1. SCM mechanism fails to release from FSS	<div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u></p> <p>In the event of SCM failures, primary bolt shall be driven to 19 turns (from launch config) prior to troubleshooting and beginning any bolt override steps to ensure SCM is not attached to FSS and HST at the same time</p> </div> <ol style="list-style-type: none"> <li>1. Using nominal PGT torque setting (A3), reverse direction and drive back to initial condition; re-attempt SCM drive at nominal settings to release from FSS</li> <li>2. If no joy, increase PGT torque settings to <b>A5, CW 3, 23.5</b>; re-attempt SCM drive</li> </ol>	3 of 3 latches at 35 turns reqd for landing
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# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
	<p>3. If no joy, identify and translate to failed latch. <b>PGT [A2, CW 3, 5.5]-6-Ext-7/16</b>: Drive SCM 7/16" blue hex manual override bolt, 8-10 turns to release SCM from FSS. Then, access red override bolts: <b>PGT [A2, CW 3, 5.5]-6-Ext-7/16</b>: Drive SCM 7/16" red HST Attach override bolts (2), 27-31 turns to hard stop, to attach SCM to HST</p> <p>4. If no joy with blue override bolts at nominal setting, increase PGT/MTL settings on manual release bolt to <b>A3/15.5</b>, re-attempt blue override bolt</p> <p>5. If no joy with FSS release override, contact MCC</p> <p>6. Return to nominal SCM drive location and actuate using nominal PGT torque setting (A5) to finish driving good latches to HST attach position (HST LED illumination plus 2-3 turns)</p> <p><u>NOTE</u>: SCM must be fully attached to FSS for safe return (3 of 3 latches); Drive SCM from nominal gearbox drive CCW; <b>PGT: (A5, CCW 3, 23.5)</b> until the SCM torque limiters slip. Verify all (3) HST Attach and all (3) FSS Release LEDs are NOT lit</p> <p><u>NOTE</u>: Failure Threshold for FSS Release Override (blue): 12 ft-lb</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b></p> <p>All 3 SCM Mechanisms must be fully released from the FSS prior to making any attachment to HST, in order to meet the minimum safety requirement</p> </div>	
<p>2. SCM mechanism fails to attach to HST</p>	<p>1. Using nominal PGT torque setting (A3), reverse direction (CCW) and drive back 3 turns; re-attempt SCM drive at nominal settings for 8 turns. If no joy, repeat this step 2 more times, then contact MCC</p> <p>2. If no joy, increase PGT torque settings to <b>A5, CW 3, 23.5</b>; re-attempt SCM drive</p> <p>3. If no joy, translate to failed latch. <b>PGT [A2, CW 3, 5.5]-6-Ext-7/16</b>: Drive SCM 7/16" red HST Attach override bolts (2), 27-31 turns to hard stop, to attach SCM to HST; <u>NOTE</u>: If less than 27 turns achieved, provide visual verification of latch position and contact MCC; do NOT proceed to other side</p> <p>4. If no joy, increase PGT/MTL settings on red HST Attach override bolts to <b>A3/15.5</b>, re-attempt red override bolt</p> <p><u>NOTE</u>: Prior to nominal SCM bolt driving, red bolts (HST attach latches) must be fully released by driving fasteners CCW, the # of turns achieved in steps 1 and 2</p> <p>5. If no joy with HST Attach override, contact MCC:</p> <p><u>NOTE</u>: SCM must be fully attached (3 of 3 latches) to FSS for safe return; Drive SCM from nominal gearbox drive CCW; <b>PGT: (A5, CCW 3, 23.5)</b> until the SCM torque limiters slip. Verify all (3) HST Attach and all (3) FSS Release LEDs are not lit</p> <p><u>NOTE</u>: Failure Threshold for HST Attach Override (red): 12 ft-lb; but max final torque for deorbit is upper range of PGT A2 setting</p>	<p>3 of 3 latches at 35 turns reqd for landing</p>

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
	<p><u>NOTE:</u> The SCM Contingency Override to attach to HST has two override bolts at each mechanism location (total of 6 bolts) that must be engaged to successfully attach the SCM to HST for mission success</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u></p> <p>All 3 SCM Mechanisms must be fully released from the FSS prior to making any attachment to HST, in order to meet the minimum safety requirement</p> </div>	
<p>3. SCM mechanism fails to release from HST</p>	<p>1. Translate to failed latch. <b>PGT [B1, CCW 3, 23.5]-6-Ext-7/16:</b> Drive SCM 7/16" white HST Release override bolt, 24-26 turns to release SCM from HST; <u>NOTE:</u> If less than 24 turns achieved, provide visual verification of latch position Then, <b>PGT [B2, CW 2, 5.5]-6-Ext-7/16:</b> Engage yellow FSS Attach override bolt, 41-44 turns (to hard stop), to attach SCM to FSS</p> <p>2. If no joy with white override, increase PGT/MTL settings on white release override bolt to A6/30.5, re-attempt white override bolt</p> <p><u>NOTE:</u> Failure Threshold for HST Release Override (white): &gt; 45 ft-lb</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u></p> <p>All 3 SCM Mechanisms must be fully released from the HST prior to making any attachment to FSS, in order to meet the minimum safety requirement</p> </div>	<p>3 of 3 latches at 35 turns reqd for landing</p>
<p>4. SCM mechanism fails to re-attach to FSS</p>	<p>1. Translate to failed latch. <b>PGT [B2, CW 2, 5.5]-6-Ext-7/16:</b> Engage yellow FSS Attach override bolt, 41-44 turns (to hard stop), to attach SCM to FSS; <u>NOTE:</u> If less than 41 turns achieved, provide visual verification of latch</p> <p>2. If no joy, increase PGT/MTL settings on yellow FSS Attach override bolt to <b>A3/15.5</b>, re-attempt yellow override bolt</p> <p><u>NOTE:</u> Failure Threshold for FSS Attach Override (yellow): 12 ft-lb, but max final torque for landing is upper range of PGT A2 setting</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u></p> <p>All 3 SCM Mechanisms must be fully released from the HST prior to making any attachment to FSS, in order to meet the minimum safety requirement</p> </div>	<p>3 of 3 latches at 35 turns reqd for landing</p>

**LOCK**

<p>1. Lock pin fails to release</p>	<p><u>NOTE:</u> Once lock pin screws are released, lock pin assembly is free. Tether prior to releasing screws</p> <p><u>NOTE:</u> Main handle lock pin (lever 1) turn count is 12.75; cam handle lock pin (lever 2) is 5.25. Release torque is 35-37 in-lb (3.1 ft-lb)</p> <p><b>PGT: (B2, CCW 2, 5.5) - #8 hex head bit (gray bit; ATM-1; socket caddy #1):</b> Release failed lock pin 8/32-in captive socket head cap screws (2); (see turn count in above Note). Remove lock pin assembly. Remove LOCK and engage aft shroud door bolt nominally</p> <p><u>NOTE:</u> Failure torque = 5.3 ft-lb</p>	
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# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<b>RSU in HST</b>		
<p>1. PIK STIK fails to release from SOPE lid</p> <p>-- Captive lock pin(s) fails to release</p>	<p>1. <b>PGT: B3, CCW 2, 5.5</b>; release failed 7/16-in captive lock pin bolts (2), 8 turns. Bolts are captive to lock pin T-handle assembly</p> <p>2. For landing, retrieve spare PIP pin from ORUC bracket:</p> <ul style="list-style-type: none"> <li>• For aft captive lock pin, retrieve PIP pin #2 and install</li> <li>• For fwd captive lock pin, retrieve PIP pin #5 and install</li> </ul> <p><u>NOTE</u>: Failure threshold is 3.7 ft-lb. Initial break torque is 1.7 ft-lb</p>	<p>2 of 2 captive lock pins</p>
<p>2. FHST light shades fail to retract</p>	<p><u>NOTE</u>: If top fastener is retracted at least 3 turns (and other 2 fasteners are fully retracted), inform MCC of fastener configuration, then proceed to open doors. Once doors are open, inspect inner and outer portion of retraction mechanism</p> <p>If bolt seizes from 1/2 turn-3 turns:</p> <ol style="list-style-type: none"> <li>1. Using nominal settings, fully extend stuck fastener to starting config, re-try retracting stuck fastener</li> <li>2. If no joy, contact MCC</li> </ol> <p>If bolt seizes from 3 -5.5 turns:</p> <ol style="list-style-type: none"> <li>1. Extend previously retracted fastener(s) to stuck fastener position (using nominal settings); re-try retracting stuck fastener at nominal settings</li> <li>2. If no joy, contact MCC</li> </ol> <p><u>NOTE</u>: Failure threshold = 13.8 ft-lb (end stop bolt)</p>	
<p>3. FHST light shade fails to extend</p>	<p>If bolt seizes from 0-3 turns:</p> <ol style="list-style-type: none"> <li>1. Fully retract stuck fastener to starting config (attempting to clear FOD); re-try extending stuck fastener</li> <li>2. If no joy, retract other fastener(s) as reqd to the same point as stuck fastener and re-try extending stuck fastener at 1 turn increments until 5.5 turns (total)</li> <li>3. If no joy, contact MCC</li> </ol> <p>If bolt seizes at mid-point turn count starting config (from 3-5.5 turns) (and other fasteners are fully extended):</p> <ol style="list-style-type: none"> <li>1. Retract stuck fastener to mid-point starting posn (@ 3 turns extended) (attempting to clear FOD); re-try extending fastener</li> <li>2. If no joy, contact MCC for GO to press</li> </ol> <p><u>NOTE</u>: Failure threshold: &lt; 2 ft-lb (ring assy, at extended end-of-travel)</p>	
<p>4. RSU connectors fail to demate</p>	<p>Re-try demate with hi-torque (PCU) connector tool (MFR handle) or large connector tool (stbd TSA)</p>	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<p>5. RSU bolt fails to release from HST</p> <p>-- Fastener Fails to release at nominal torque</p>	<p><u>NOTE:</u> If bolt fails during workaround, verify bolt is captured to RSU-X (or attempt to capture bolt). Continue with RSU-X removal. After RSU removal, inspect RSU mounting plate. If broken bolt does not protrude, continue with change out, securing new RSU with only 2 bolts. If protruding, contact MCC</p> <div style="border: 2px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>WARNING</b> Broken bolt may expose sharp edges</p> </div> <ol style="list-style-type: none"> <li>1. <b>PGT: A5, CCW 2, 15.5:</b> Attempt to release fastener</li> <li>2. If no joy, attempt to engage stuck fastener at A5 setting in CW direction for 1-2 turns; then re-attempt fastener release at A5</li> <li>3. If no joy, contact MCC prior to breaking bolt; on MCC GO, re-try using <b>PGT: B4, CCW 2, 23.5</b></li> </ol> <p><u>NOTE:</u> Failure threshold = 15.6 ft-lb</p>	<p>1 of 3</p>
<p>6. RSU-R Mykroy pad is damaged</p>	<p>Contact MCC</p>	
<p>7. RSU-R fails to seat onto baseplate</p>	<p>Remove and inspect for obstructions in footprint, Mykroy pads, alignment pins, Velcro:</p> <ul style="list-style-type: none"> <li>-- If the Mykroy pad is damaged, contact MCC</li> <li>-- If alignment pins are damaged, contact MCC</li> </ul>	
<p>8. RSU-R bolt fails to engage in HST</p>	<ol style="list-style-type: none"> <li>1. If problem encountered with 1<sup>st</sup> or 2<sup>nd</sup> bolt (assumes an alignment problem): Fully release fasteners at nominal torque; re-align RSU, re-seat RSU, and re-attempt bolt engagement</li> <li>2. If problem encountered with 3<sup>rd</sup> bolt, (assume a fastener problem), Notify MCC and press (1 of 3 bolts reqd)</li> </ol>	<p>1 of 3</p> <p>Min turn count: 8 turns (at torque)</p>
<p>9. PIK STIK jaws fail to release from RSU handhold</p>	<p><u>NOTE:</u> Released jaw is lanyarded back to PIK STIK. Bolts are captive to tool side of jaw. Cut lanyard and remove loose jaw for landing</p> <p><u>NOTE:</u> Once jaw is released, PIK STIK handle must be rotated slightly with respect to tool and jaw will come free</p> <ol style="list-style-type: none"> <li>1. Tether to jaw; <b>PGT: A2, CCW 2, 5.5:</b> Release captive jaw override bolts (2), 10.5 turns</li> <li>2. Cut failed jaw lanyard and remove jaw for landing (bring jaw inside)</li> </ol> <p><u>NOTE:</u> Failure threshold = 12.67 ft-lb</p>	
<p>10. RSU connector fails to mate</p>	<p>Inspect for bent pins or debris. If reqd, fully remove RSU for connector inspection:</p> <ul style="list-style-type: none"> <li>-- If debris visible, use connector cleaner tool (see WINGTAB CONNECTOR cribsheet section)</li> <li>-- If bent pin, use pin straightener (see WINGTAB CONNECTOR cribsheet section)</li> </ul>	<p>J1 &amp; J2</p>

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly

Action

Min Rqmt

**DOORS**

1. Aft shroud door bolt fails to disengage (+/- V2, -V3, FGS)	<u>NOTE:</u> Monitor SAs for excessive motion	
-- < ½ turn (breakaway)	<ol style="list-style-type: none"> <li>1. Re-try using <b>PGT: A6, CCW 2, 30.5</b> or <b>RCCW, 30.5</b> (√PWR OFF). After breakaway, continue using <b>PGT: A4, 23.5</b> (nominal settings) for release</li> <li>2. If no joy, re-try using EVA ratchet with cheater bar (A/L), continue using <b>PGT: A4, 23.5</b> (nominal settings)</li> </ol> <p><u>NOTE:</u> Failure torque = 30.7 ft-lb</p>	
-- > ½ turn	<p><u>NOTE:</u> The following procedure may generate possible broken bolt; transfer trash bag to MWS. Ensure 1 additional latch engaged. If door bolt breaks, ASLR installation is required</p> <ol style="list-style-type: none"> <li>1. If bolt backed out at least 3 turns, attempt to pivot latch bolt while pressing on overlapping door</li> <li>2. Re-try failed latch using <b>PGT: A6, CCW2, 30.5</b> or <b>RCCW, 30.5</b> (√PWR OFF)</li> <li>3. If no joy, re-try using EVA ratchet w/cheater bar (A/L) &amp; 6-in rigid socket (A/L), or 4-in spring socket (stbd TSA)</li> </ol> <p style="text-align: center;">- OR -</p> <p><b>PGT: B2, CCW 3, 5.5 w/Latch Breaker Tool</b> (SRTM, RAGB &amp; 4-in spring socket – fully assembled inside COPE) until latch disengages or breaks bolt. Capture, stow bolt head and door stop</p> <p><u>NOTE:</u> Latch Breaker Tool cannot be used on top -V3 latches</p> <p><u>NOTE:</u> Failure torque = 30.7 ft-lb</p>	
2. Aft shroud doors fail to close (any doors):	<u>NOTE:</u> Monitor SAs for excessive motion	
- Door fails to seat prior to over-center handle capture range	<ol style="list-style-type: none"> <li>1. √For obstructions and shear plate alignment</li> <li>2. If no joy, use PRD (port TSA) to assist in door closure</li> </ol>	
- Door latch PIP pin fails to engage	<ol style="list-style-type: none"> <li>1. √Handle and latch plate holes align, cycle latch and re-try</li> <li>2. If no joy, retrieve spare PIP pin (ORUC fwd/stbd) bracket #3 and re-attempt install. Cut integral PIP pin lanyard (bring in middeck)</li> </ol>	
- Latch bolt fails to engage	Re-try using <b>PGT: A6, CW 2, 30.5</b> for a maximum of 6 turns; report running torque. For final torquing information, refer to “Aft Shroud Door Latch Torque Requirement” table, ASLR INFORMATION	4 of 4 AS latches or ASLRs
- Latch bolt not fully seated after final torquing (failure to achieve reqd turn count)	<ol style="list-style-type: none"> <li>1. Torque remaining latches and re-try non-seated latch</li> <li>2. If no joy, install ASLR</li> </ol>	4 of 4 AS latches or ASLRs
3. SSM bay 2 or 3 door bolt fails to disengage	<ol style="list-style-type: none"> <li>1. Attempt to release other J-hook bolts, re-try failed bolt</li> <li>2. If no joy, re-try using <b>PGT/MTL=A4/23.5</b>. If bolt shears, capture and stow bolt head</li> </ol> <p><u>NOTE:</u> For any additional stuck J-hook bolts, use <b>PGT: A5/15.5</b> to release</p> <p><u>NOTE:</u> Failure threshold = 15.6 ft-lb</p>	
4. SSM door bolt fails to engage	Engage other bolts and re-attempt	2 (1 from each pair of bolts at non-hinged corners)
5. Door seal is peeled away from door edge	Press door seal back in place. If door is not sealed properly, may need to open door, re-position seals and re-close door	
	<u>NOTE:</u> Seals are held to door with epoxy and rivets	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<b>COSTAR/COS</b>		
1. COSTAR connector fails to demate	Re-try using high torque (MFR handle) or large connector tool (stbd TSA)	
2. HST-COSTAR ground strap bolt fails to release from COSTAR	<ol style="list-style-type: none"> <li>1. Re-attempt using <b>PGT: A5, 15.5</b> (failure 15.6 ft-lb)</li> <li>2. If some turns achieved, but strap still not removable, <b>PGT: A5, CW2</b> to hard stop; re-attempt/cycle at <b>A5 CCW2, 23.5</b></li> <li>3. If no joy, shear the COSTAR ground strap bolt using <b>PGT: A4, CCW2, 23.5</b> (Retrieve small trash bag from MFR handle and attempt gathering debris)</li> </ol>	
3. COS ground strap bolt will not engage (running torque)	Re-try using <b>PGT: A3, CW 2, 10.5</b> (failure 13.8 ft-lb)	
4. Connector fails to mate	<ol style="list-style-type: none"> <li>1. Check connector for FOD or bent pins. If FOD, use connector cleaner tool (A/L) to clear. If bent pin, use pin straightener (stbd TSA). Re-attempt connector mate</li> <li>2. If no joy, mate remaining connectors</li> </ol>	J1 or J2 & J3 or J4

## HST A-LATCH

1. HST A-latch fails to disengage: - No Breakaway	<ol style="list-style-type: none"> <li>1. Check A-latch anti-rotation tangs fully disengaged (socket fully engaged on bolt head and pushed in as far as possible)</li> <li>2. If tangs are not the problem, and they are disengaged, <b>EVA Ratchet and CMTL (SOPE) 45</b>; attempt to break torque. After breakaway, continue using nominal PGT settings; retrieve cheater bar as reqd for additional leverage (A/L)</li> </ol> <p><u>NOTE:</u> Failure threshold: 50.6 ft-lb</p>	
- 1/2-7 turns	<ol style="list-style-type: none"> <li>1. Re-engage @ <b>PGT: B2, CW2, 5.5</b>; <math>\sqrt{A}</math> - LATCHED light is OFF. Re-try at nominal settings, <b>PGT: B2, CCW2, 5.5</b></li> <li>2. If no joy, re-try using <b>PGT: (A5, CCW 3, 15.5)</b> for 10 turns; return to nominal setting (B2, 5.5) for remaining A-latch turn count</li> <li>3. If no joy, engage A-latch 1 turn using <b>PGT: A6, CW 3, 30.5</b> or <b>RCW, 30.5</b> (<math>\sqrt{PWR}</math> OFF); re-try disengage at <b>PGT: A5, CCW 3, 15.5</b>; alternate as reqd to clear bind until past 7 turns</li> </ol> <p><u>NOTE:</u> Failure threshold for A-latch CCW running torque: 16.8 ft-lb</p> <p><u>NOTE:</u> Failure threshold for A-latch end of travel: 7.5 ft-lb</p> <p><u>NOTE:</u> Failure threshold for A-latch CW running torque: 50.6 ft-lb</p>	6-7 turns (A-latch ball should clear latch jaws)
- 7-12 turns	<ol style="list-style-type: none"> <li>1. Re-try using <b>PGT: A5, CCW 3, 15.5</b> for max of 10 turns total out from fully engaged; then use nominal (B2, 5.5) for remaining turns</li> <li>2. If no joy, disengage B-Latch and attempt SI removal (7 turns allows SI removal)</li> </ol>	
- > 16 turns (free spinning)	If A LATCHED light ON, disengage B and attempt SI removal	
2. HST A-latch fails to engage		
- No Breakaway	<ol style="list-style-type: none"> <li>1. Re-attempt using <b>EVA Ratchet, MTL 38</b>, 1/2 turn</li> <li>2. If no joy, leave latch open</li> </ol>	A-latch not reqd for science
- 1/2-12 turns	<ol style="list-style-type: none"> <li>1. Re-try using <b>PGT: A6, 30.5</b>, or <b>EVA ratchet; MTL 38</b></li> <li>2. Disengage fully and re-try</li> <li>3. Leave latch open</li> </ol> <p><u>NOTE:</u> Failure threshold for A-latch CW running torque: 50.6 ft-lb</p>	A-latch not reqd for science



# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly

Action

Min Rqmt

## HST B-LATCH

1. HST B-latch fails to disengage: - No Breakaway (< 1/2 turn)	Contact MCC; any additional torque increase may fail bolt  <u>NOTE:</u> B-latch breakaway failure is 15.8 ft-lb <u>NOTE:</u> B-latch running torque failure threshold is 8.9 ft-lb (collar pin)	
- No SI motion (free spinning) (possible broken shaft; no over-center)	√A - SEATED light – if ON, push SI against A and C latches; re-engage A latch	
- 1/2-2 turns	1. Reverse direction fully using <b>A3, CW 1, 10.5</b> ; then re-try using nominal settings 2. If no joy, re-try using <b>PGT: B5, CCW 2, 10.5</b> 3. If no joy, re-try alternating <b>PGT: A3, CW1, 10.5</b> and <b>PGT: B5, CCW2, 10.5</b> in one turn increments, cycling as needed to clear binding	
- 2-12 turns	1. Reverse direction for number of turns minus 2 (Do not drive over-center), using <b>A3, CW1, 10.5</b> ; then re-try using nominal settings 2. If no joy, re-try using <b>PGT: B5, CCW 2, 10.5</b> 3. If no joy, re-try alternating <b>PGT: A3, CW1, 10.5</b> and <b>PGT: B5, CCW2, 10.5</b> , in one turn increments, cycling as needed to clear binding  <u>NOTE:</u> B-latch running torque failure: 8.9 ft-lb	
- > 14 turns (free spinning)	1. If A SEATED light is ON and SI is moving, √clear of C and attempt to remove 2. If not clear of C, push SI against A. Re-engage A Latch; contact MCC for tether restraint plan	
2. HST B-latch fails to engage:		
- No Breakaway	Re-try using <b>PGT: A4, 23.5</b> for 1 turn only. If joy, continue with nominal setting engaging B-latch  <u>NOTE:</u> Failure threshold for B-latch CW breakaway: 25.3 ft-lb	
- 4-6 turns	<u>NOTE:</u> B-latch binding at 4-5 turns is indicative of SI misalignment. After second attempt, stow B-latch alignment aid  1. <b>PGT: B5, CCW 2, 10.5</b> ; Retract latch 2 turns, reposition SI, and re-attempt. <u>NOTE:</u> 2 turns is min # required to overcome deadband and to start plunger motion 2. If no joy, fully disengage B-latch, remove SI, cycle B-latch up to 6 turns and disengage; check for FOD in A and C-latch, fwd guide rail inbd and outbd slots, and fwd guide blocks. If nominal with latch cycle and no FOD visible, re-attempt nominal SI install 3. If no joy, and B-latch fails during cycling test (when no SI present); install SI and re-try using <b>PGT: A4, CW 1, 23.5</b> to overcome binding. Continue engagement with nominal settings  <u>NOTE:</u> Failure threshold for B-latch disengage: 8.9 ft-lb <u>NOTE:</u> Failure threshold for B-latch engagement running torque: 25.3 ft-lb (internal stop pin)	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
- 6-10 turns	<ol style="list-style-type: none"> <li>1. Re-try using <b>PGT: A4, CW 1, 23.5</b></li> <li>2. If no joy, push SI into A and C latches so "A-SEATED" light OFF; re-try B-latch engagement using <b>PGT: A4, CW 1, 23.5</b></li> <li>3. If min 10 turns and A-SEATED light OFF, press</li> <li>4. If min 10 turns and A-SEATED light ON, pull SI down. If no motion in -V1 direction, contact MCC for GO to close A-Latch</li> </ol> <p><u>NOTE:</u> Failure threshold for B-latch engagement running torque: 25.3 ft-lb (internal stop pin)</p>	10 turns
- > 14 turns (free spinning)	If SI moved during engagement, √A-SEATED lights, pull SI down (-V1); verify no motion. If no motion, continue with A-latch	10 turns

## AFT FIXTURE

1. Aft fixture fails to deploy:		
- Stowage PIP pin fails to release	<ol style="list-style-type: none"> <li>1. Release remaining PIP pin; attempt failed PIP pin removal by "jiggling" aft fixture</li> <li>2. If balls retract, pull on PIP pin T-handle while simultaneously driving out PIP pin with hammer (port TSA)</li> <li>3. If balls do not retract, insert probe (port TSA) into PIP pin opening and push</li> </ol>	
- Captive lock pin fails to engage	<ol style="list-style-type: none"> <li>1. No action for one pin failed</li> <li>2. If both failed, attempt deploy to 120 degree position (possible clearance issue between COSTAR and IMAX)</li> <li>3. Else, use tether to restrain fixture</li> </ol>	
- Fixture fails to rotate	<ol style="list-style-type: none"> <li>1. Inspect contingency/jettison PIP pins; verify PIP pins can be manually rotated; if joy with rotation, apply higher force to overcome friction (high friction is present between two parts of the aft fixture)</li> <li>2. If contingency/jettison PIP pin does not rotate: (<u>NOTE:</u> Copper beryllium washer about 2 inches in diameter will be non captive between the two parts and may come out):               <ol style="list-style-type: none"> <li>a. Remove hitch pin and PIP pin, replace with spare PIP pin #2 from PIP pin bracket on fwd/stbd ORUC, deploy at fixture per nominal plan</li> <li>b. If no joy, check to see if PIP pin balls retract;                   <ul style="list-style-type: none"> <li>➤ If yes, retrieve hammer from port TSA, tap on tip of PIP pin while simultaneously pulling on PIP pin handle to release pin, replace with spare PIP pin #2 from PIP pin bracket on fwd/stbd ORUC, deploy at fixture per nominal plan</li> <li>➤ If no joy, retrieve probe from port TSA, insert and push probe into tip of PIP pin while simultaneously pulling on PIP pin handle to release pin, replace with spare PIP pin #2 from PIP pin bracket on fwd/stbd ORUC, deploy at fixture per nominal plan</li> </ul> </li> </ol> </li> </ol>	
2. Aft fixture fails to stow:		
- Captive lock pin fails to release	Remove pivot assembly hitch pins and contingency/jettison PIP pins (2). Secure assembly for landing or bring inside. ( <u>NOTE:</u> Copper beryllium washer about 2 inches in diameter will be non captive between the two parts and may come out)	
- Stow PIP pin fails to engage	If neither PIP pin engaged, remove pivot assembly hitch pins and contingency/jettison pins. Secure assembly for landing or bring inside	1 of 2 for landing (w/hitch pin)

## WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
3. Upper fork PIP pin fails to engage	Use spare PIP pin #3 from ORUC fwd/stbd	
4. SI fails to remove from aft fixture (upper fork PIP pin will not release)	<ol style="list-style-type: none"> <li>1. Drive out upper fork PIP pin with hammer (port TSA)</li> <li>2. If no-joy, disengage 7/16 bolts (4) on back of top fork using <b>PGT: A3, 10.5</b>, 11 turns (failure 13.8 ft-lb). Cut pip pin lanyard to release it from the rest of the fixture; restrain aft fixture fork to SI with tether</li> </ol>	

### ASIPE

1. ASIPE fails to open:		
- Latch handle fails to rotate 90 degrees	<ol style="list-style-type: none"> <li>1. Engage other lid latches. Re-attempt failed latch</li> <li>2. If no joy, use <b>PGT: RCCW, 30.5</b> (√PWR OFF) or <b>EVA Ratchet w/MTL 38</b> on 7/16 EVA bolt</li> <li>3. If no joy, use <b>CMTL 45</b> (SOPE)</li> </ol> <p><u>NOTE:</u> Failure threshold: 57.5 ft-lb</p>	
- Plunger fails to pull up ~1/2-in	<p><u>NOTE:</u> Handle component on inside of lid (plunger) contains braycote and may be exposed</p> <ol style="list-style-type: none"> <li>1. If handle fully rotated 90 degrees, lid should open; check clearance for closing</li> <li>2. If no joy opening lid, rock handle to pop up plunger</li> </ol>	
2. ASIPE lid fails to secure for landing	<ol style="list-style-type: none"> <li>1. Disengage other latches, close in order of 1 to 5</li> <li>2. If 3 latches failed, use <b>PGT: RCW, 30.5</b> or <b>EVA Ratchet w/MTL 38 &amp; 7/16-ext</b> on hex override</li> <li>3. If no joy, install contingency bolt (failure 10 ft-lb) on side with failed latch, <b>PGT: A2, CW 2, 5.5:</b> <ul style="list-style-type: none"> <li>--- 11.5 turns CW to disengage bolt captive feature</li> <li>--- Push down on bolt to engage box threads</li> <li>--- 8-10 turns CW to bolt lid to box</li> </ul> </li> </ol>	4 of 7 latches/ cont bolts (1 device on FSIPE side)
3. ASIPE ground strap fastener fails to disengage from COS	<ol style="list-style-type: none"> <li>1. Re-try release using <b>PGT: B2, 5.5</b></li> <li>2. If no joy, release COS grounding bolt 1 turn using <b>EVA Ratchet with MTL/5</b> and 2-in rigid socket. Re-attempt wedge bolt release using nominal PGT settings</li> </ol> <p><u>NOTE:</u> FRT (stbd TSA) is required to capture bolt for step 3</p> <ol style="list-style-type: none"> <li>3. If no joy, fully release and remove COS grounding bolt, using <b>EVA ratchet w/ MTL/5 and 2-in, 7/16-ext;</b> remove ground strap and temp stow; re-install COS grounding bolt. <u>NOTE:</u> Manually start threads</li> </ol> <p><u>NOTE:</u> Failure torque for wedge bolt: 5 ft-lb <u>NOTE:</u> Failure torque for ground strap bolt: 15.6 ft-lb</p>	
4. ASIPE ground strap fails to engage to COSTAR	<ol style="list-style-type: none"> <li>1. If ground strap will not physically fit under COSTAR grounding bolt, release COSTAR grounding bolt 1 turn EVA ratchet w/MTL/5 and 2-in 7/16-ext</li> <li>2. If ASIPE grounding strap wedge will not fit under COSTAR grounding bolt or fails to engage, drive COSTAR grounding bolt using EVA ratchet w/MTL/5 and 2-in 7/16-ext to torque</li> </ol> <p><u>NOTE:</u> Failure torque for wedge bolt: 5 ft-lb <u>NOTE:</u> Failure torque for ground strap bolt: 15.6 ft-lb</p>	COSTAR ground is required for landing

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly

Action

Min Rqmt

**ASIPE A-LATCH**

1. ASIPE A-latch fails to disengage: - No Breakaway	<ol style="list-style-type: none"> <li><b>EVA Ratchet</b> and <b>CMTL (SOPE) 45</b>; attempt to break torque. After breakaway, continue using nominal PGT setting</li> <li>If no joy, re-attempt breakaway using <b>EVA Ratchet with Cheater Bar</b>, CMTL = <b>45</b></li> </ol> <p><u>NOTE</u>: A-latch breakaway failure threshold: 50.6 ft-lb</p>	
- 1/2-7 turns	<ol style="list-style-type: none"> <li>Re-engage using <b>PGT: B2, CW2, 5.5</b>; √A - LATCHED light is OFF. Re-try at nominal settings, <b>PGT: B2, CCW2, 5.5</b></li> <li>If no joy, re-try using <b>PGT: (A5, CCW 3, 15.5)</b> for 10 turns; return to nominal setting (B2, 5.5) for remaining A-latch turn count</li> <li>If no joy, engage A-latch 1 turn using <b>PGT: A6, CW 3, 30.5</b> or <b>RCW, 30.5</b> (√PWR OFF); re-try disengage at <b>PGT: A5, CCW 3, 15.5</b>; alternate as reqd to clear bind until past 7 turns</li> </ol> <p><u>NOTE</u>: A-latch CW breakaway failure threshold: 50.6 ft-lb  <u>NOTE</u>: A-latch CW running torque failure threshold: 50.6 ft-lb  <u>NOTE</u>: A-latch CCW running torque failure threshold: 16.8 ft-lb (shear pin on collar)  <u>NOTE</u>: A-latch CCW failure threshold – end of travel: 7.5 ft-lb</p>	Min clearance for A-latch ball release is 7 turns
- 7-12 turns	<ol style="list-style-type: none"> <li>Re-try using <b>PGT: A5, CCW 3, 15.5</b> for max of 10 turns; then use nominal (<b>B2, 5.5</b>) for remaining turns</li> <li>If no joy, disengage B-Latch and attempt SI removal (7 turns allows SI removal)</li> </ol>	
- > 14 turns (free spinning)	If A LATCHED light ON, disengage B and attempt SI removal	
2. ASIPE A-latch fails to engage: - No Breakaway	<ol style="list-style-type: none"> <li>Re-attempt breakaway using <b>PGT: A6, CW2, 30.5</b> (1 turn only). Continue using nominal settings: <b>PGT: A3, CW2, 10.5</b></li> <li>If no joy, disengage B, remove SI, inspect A and cycle A (using nominal setting) closed then open stopping 1 turn prior to hard stop. Re-insert SI</li> </ol> <p><u>NOTE</u>: A-latch CW breakaway failure threshold: 50.6 ft-lb (drive rod)</p>	
- 1/2-9	<ol style="list-style-type: none"> <li>Re-try using <b>PGT: A5, CW2, 15.5</b>, 2 turns to clear binding. Continue using nominal PGT settings</li> <li>If no joy, disengage A-latch using <b>PGT: A5, CCW 3, 15.5</b> for 1 turn. Re-engage using nominal settings</li> <li>If no joy, fully disengage A using <b>PGT: A5, CCW 3, 15.5</b> (CCW failure 16.8 ft-lb) then disengage B with nominal settings, remove SI, inspect A. Cycle A latch using nominal settings, re-attempt nominal installation</li> </ol> <p><u>NOTE</u>: A-latch CW breakaway failure threshold: 50.6 ft-lb (drive rod)</p>	A-latch required for landing

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
- 9-X	<ol style="list-style-type: none"> <li>1. Re-try using <b>PGT: A5, CW2, 15.5</b>, 2 turns to clear binding. Continue using nominal PGT settings</li> <li>2. If no joy, disengage A-latch using <b>PGT: A5, CCW 3, 15.5</b> for 1 turn. Re-engage using nominal settings</li> <li>3. If no joy, fully disengage A-latch using <b>PGT: A5, CCW 3, 15.5</b>; then disengage B-latch with nominal settings, remove SI, inspect A. Cycle A-latch using nominal settings, re-attempt nominal installation</li> <li>4. If no joy, and A-latch is jammed (SI trapped); <b>PGT: A6, CW 3, 30.5</b>; or <b>EVA Ratchet, CMTL (CW, 45)</b></li> </ol> <p><u>NOTE</u>: A-latch CW breakaway failure threshold: 50.6 ft-lb (drive rod)  <u>NOTE</u>: A-latch CCW running torque failure threshold: 16.8 ft-lb (shear pin on collar)</p>	A-latch required for landing
- X-14	<ol style="list-style-type: none"> <li>1. Re-try using <b>PGT: A5, CW2, 15.5</b>, 2 turns to clear binding. Continue using nominal PGT settings</li> <li>2. If no joy, disengage A-latch using <b>PGT: A5, CCW 3, 15.5</b> for 1 turn. Re-engage using nominal settings</li> <li>3. <b>EVA Ratchet, CMTL (CW 45)</b>, drive until MTL slip</li> </ol> <p><u>NOTE</u>: A-latch CW breakaway failure threshold: 50.6 ft-lb (drive rod)</p>	A-latch required for landing

## ASIPE B-LATCH

1. ASIPE B-latch fails to disengage: - No Breakaway	<p>Increase torque to: <b>PGT: A6, 30.5</b> for breakaway only. Continue using nominal setting</p> <p><u>NOTE</u>: Failure threshold for B-latch breakaway: 30.1 ft-lb  <u>NOTE</u>: Failure threshold for B-latch running torque: 8.9 ft-lb</p>	
- No SI motion (free spinning)	<p>√A-SEATED light – if ON push SI against A. Re-engage A at nominal setting, remove L-Handle and stow on FSS, install safety bar (Velcro flag reqd)</p> <p><u>Safety Bar Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Retrieve safety bar from ORUC fwd (PIP pin and Velcro ground)</li> <li>2. Orient safety bar such that blue knob and label that says “new SI” is facing up out of the ASIPE</li> <li>3. Install PIP pin and velcro flag</li> <li>4. Release blue knob from launch lock threads, 3-5 turns</li> <li>5. Push blue knob in and drive knob 13-15 turns, <b>PGT: A6/30.5</b></li> <li>6. Attach ground strap</li> </ol> <p><u>L-Handle Removal Steps</u></p> <ol style="list-style-type: none"> <li>1. Release wing tab bolts (3), 5-6 turns, <b>PGT: B5, CCW 2, 10.5</b></li> <li>2. Remove L-Handle</li> </ol> <p><u>NOTE</u>: L-handle feet are slotted in main tube; pull on feet to lengthen tube as reqd for stowage</p> <ol style="list-style-type: none"> <li>3. Stow L-handle on FSS outboard brackets; B-Latch Alignment Aid points down (toward keel); <b>PGT: A2, CW2, 5.5</b>; Engage wing tab on bottom/B-latch alignment aid side of L-handle, 5-7 turns</li> </ol> <p><u>NOTE</u>: Failure torque of wing tab bolt is 39.8 ft-lb</p>	2 of 2 FSS/ L-handle captive lock pins and 1 wing tab engaged reqd for landing

# WORKAROUNDS CRIBSHEET (Cont)

**NOTE**

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
- 1/2-2 turns	1. Reverse direction fully at <b>PGT: B5 CW 2, 5.5</b> , then re-try at nominal settings: <b>PGT: B5 CCW 2, 5.5</b> 2. If no joy, re-try using <b>PGT: B5, 10.5</b>  <u>NOTE:</u> Failure threshold for B-latch running torque: 8.9 ft-lb (shear pin in collar of drive rod)	
- 2-12 turns	1. Reverse direction using <b>PGT: B6, CW2, 10.5</b> for number of turns minus 2 ( <u>Do not drive over-center</u> ), then re-try using nominal settings 2. If no joy, re-try using more aftward force (to assist B-plunger retract) and <b>PGT: B5, 10.5</b>  <u>NOTE:</u> Failure threshold for B-latch CCW running torque: 8.9 ft-lb (shear pin in collar of drive rod) <u>NOTE:</u> Failure threshold for seating: 25.3 ft-lb	Over-center happens at 2 turns from fully engaged
- > 14 turns (free spinning)	1. If SI moved, √clear of C and remove 2. If not clear of C, push SI against A, re-engage A, remove L-handle and stow on FSS, install safety bar (Velcro flag reqd)  <u>Safety Bar Install Steps</u> 1. Retrieve safety bar from ORUC fwd (PIP pin and Velcro ground) 2. Orient safety bar such that blue knob and label that says "new SI" is facing up out of the ASIPE 3. Install PIP pin and velcro flag 4. Release blue knob from launch lock threads, 3-5 turns 5. Push blue knob in and drive knob 13-15 turns, <b>PGT: A6/30.5</b> 6. Attach ground strap  <u>L-Handle Removal Steps</u> 1. Release wing tab bolts (3), 5-6 turns, <b>PGT: B5, CCW 2, 10.5</b> 2. Remove L-Handle  <u>NOTE:</u> L-handle feet are slotted in main tube; pull on feet to lengthen tube as reqd for stowage  3. Stow L-handle on FSS outboard brackets; B-Latch Alignment Aid points down (toward keel); <b>PGT: A2, CW2, 5.5</b> , Engage wing tab on bottom/B-latch alignment aid side of L-handle, 5-7 turns  <u>NOTE:</u> Failure torque of wing tab bolt is 39.8 ft-lb	2 of 2 FSS/ L-handle captive lock pins and 1 wing tab engaged reqd for landing
2. ASIPE B-latch fails to engage:		
- No Breakaway	1. Re-try using <b>PGT: A4, CW 1, 23.5</b> , 1 turn. If breakaway achieved, continue using nominal settings 2. If no joy, remove SI and inspect B-latch and drive rod. If no visible problem, re-install SI, attempt to drive B-latch 1 turn using <b>PGT: RCW, 30.5</b> (√PWR OFF). If breakaway achieved, continue using nominal settings 3. If no joy, push SI forward to extinguish A-SEATED light, engage A-latch, remove L-handle and stow on FSS, install safety bar (Velcro flag reqd)  <u>NOTE:</u> Failure threshold: 25.3 ft-lb (B-latch breakaway)	A and B or A and safety bar

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
	<p><u>Safety Bar Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Retrieve safety bar from ORUC fwd (PIP pin and Velcro ground)</li> <li>2. Orient safety bar such that blue knob and label that says "new SI" is facing up out of the ASIPE</li> <li>3. Install PIP pin and velcro flag</li> <li>4. Release blue knob from launch lock threads, 3-5 turns</li> <li>5. Push blue knob in and drive knob 13-15 turns, <b>PGT: A6/30.5</b></li> <li>6. Attach ground strap</li> </ol> <p><u>L-Handle Removal Steps</u></p> <ol style="list-style-type: none"> <li>1. Release wing tab bolts (3), 5-6 turns, <b>PGT: B5, CCW 2, 10.5</b></li> <li>2. Remove L-Handle</li> <li>3. Stow L-handle on FSS inboard brackets; install top/slotted end first, engage captive lock pins (3) (folded end is down)</li> </ol>	<p>3 of 3 FSS/ L-handle captive lock pins reqd for landing</p>
<p>- No SI motion (free spinning)</p>	<p>Push SI forward to extinguish A-SEATED light, engage A, remove L-handle and stow on FSS, install safety bar (Velcro flag reqd)</p> <p><u>Safety Bar Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Retrieve safety bar from ORUC fwd (PIP pin and Velcro ground)</li> <li>2. Orient safety bar such that blue knob and label that says "new SI" is facing up out of the ASIPE</li> <li>3. Install PIP pin and velcro flag</li> <li>4. Release blue knob from launch lock threads, 3-5 turns</li> <li>5. Push blue knob in and drive knob 13-15 turns, <b>PGT: A6/30.5</b></li> <li>6. Attach ground strap</li> </ol> <p><u>L-Handle Removal Steps</u></p> <ol style="list-style-type: none"> <li>1. Release wing tab bolts (3), 5-6 turns, <b>PGT: B5, CCW 2, 10.5</b></li> <li>2. Remove L-Handle</li> <li>3. Stow L-handle on FSS inboard brackets; install top/slotted end first, engage captive lock pins (3) (folded end is down)</li> </ol>	<p>A and B or A and safety bar</p> <p>3 of 3 FSS/ L-handle captive lock pins reqd for landing</p>
<p>- 1/2-6 turns</p>	<p><u>NOTE:</u> B-latch binding at 4-5 turns is indicative of SI misalignment</p> <ol style="list-style-type: none"> <li>1. Reverse direction fully (nominal settings), reposition SI and re-attempt or reverse direction until 2 turns from fully disengaged and position SI over B-plunger, re-attempt</li> <li>2. If no joy, push SI fwd to extinguish A-SEATED light (react 15 lb at C-latch); posn SI as reqd to ensure B-latch alignment while driving B-latch (nominal settings)</li> <li>3. If no joy, re-try using <b>PGT: A4, CW 2, 23.5</b></li> <li>4. If no joy, push SI forward to extinguish A-SEATED light, engage A, remove L-handle and stow on FSS, install safety bar (Velcro flag reqd)</li> </ol> <p><u>NOTE:</u> Failure threshold: 25.3 ft-lb</p>	<p>A and B or A and safety bar</p> <p>(Takes 2 turns to get B-latch plunger into SI cone, motion should only be seen after 2 turns)</p>

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
	<p><u>Safety Bar Install Steps</u></p> <ol style="list-style-type: none"> <li>Retrieve safety bar from ORUC fwd (PIP pin and Velcro ground)</li> <li>Orient safety bar such that blue knob and label that says "new SI" is facing up out of the ASIPE</li> <li>Install PIP pin and velcro flag</li> <li>Release blue knob from launch lock threads, 3-5 turns</li> <li>Push blue knob in and drive knob 13-15 turns, <b>PGT: A6/30.5</b></li> <li>Attach ground strap</li> </ol> <p><u>L-Handle Removal Steps</u></p> <ol style="list-style-type: none"> <li>Release wing tab bolts (3), 5-6 turns, <b>PGT: B5, CCW 2, 10.5</b></li> <li>Remove L-Handle</li> <li>Stow L-handle on FSS inboard brackets; install top/slotted end first, engage captive lock pins (3) (folded end is down)</li> </ol>	<p>3 of 3 FSS/ L-handle captive lock pins reqd for landing</p>
<p>- 6-9 turns</p>	<ol style="list-style-type: none"> <li>Push SI toward A-latch to extinguish A-SEATED light and re-try using nominal settings</li> <li>If no joy, disengage latch 0-3 turns (total number of turns minus 6) and re-attempt at nominal settings</li> <li>If no joy, re-try using <b>PGT: A4, CW, 23.5</b></li> <li>If no joy, push SI forward to extinguish A-SEATED light, engage A, remove L-handle and stow on FSS, install safety bar (Velcro flag reqd)</li> </ol> <p><u>NOTE:</u> Failure threshold: 25.3 ft-lb</p> <p><u>Safety Bar Install Steps</u></p> <ol style="list-style-type: none"> <li>Retrieve safety bar from ORUC fwd (PIP pin and Velcro ground)</li> <li>Orient safety bar such that blue knob and label that says "new SI" is facing up out of the ASIPE</li> <li>Install PIP pin and velcro flag</li> <li>Release blue knob from launch lock threads, 3-5 turns</li> <li>Push blue knob in and drive knob 13-15 turns, <b>PGT: A6/30.5</b></li> <li>Attach ground strap</li> </ol> <p><u>L-Handle Removal Steps</u></p> <ol style="list-style-type: none"> <li>Release wing tab bolts (3), 5-6 turns, <b>PGT: B5 CCW 2, 10.5</b></li> <li>Remove L-Handle</li> <li>Stow L-handle on FSS inboard brackets; install top/slotted end first, engage captive lock pins (3) (folded end is down)</li> </ol>	<p>A and B or A and safety bar</p> <p>Over-center achieved at 9-10 turns</p> <p>Torque drops off after over- center</p> <p>3 of 3 FSS/ L-handle captive lock pins reqd for landing</p>
<p>- 9-14 turns</p>	<ol style="list-style-type: none"> <li>Re-try using <b>PGT: A4, CW, 23.5</b></li> <li>If no joy, notify MCC if B-latch over-center</li> </ol> <p><u>NOTE:</u> Failure threshold: 25.3 ft-lb</p>	<p>A and B or A and safety bar</p> <p>Over-center achieved at 9-10 turns</p> <p>Torque drops off after over- center</p>



# WORKAROUNDS CRIBSHEET (Cont)

**NOTE**

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
- > 14 turns (free spinning)	<ol style="list-style-type: none"> <li>1. Notify MCC if B-latch over-center</li> <li>2. If no joy, push SI forward to extinguish A-SEATED light, engage A, remove L-handle and stow on FSS, install safety bar (Velcro flag reqd)</li> </ol> <p><u>Safety Bar Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Retrieve safety bar from ORUC fwd (PIP pin and Velcro ground)</li> <li>2. Orient safety bar such that blue knob and label that says "new SI" is facing up out of the ASIPE</li> <li>3. Install PIP pin and velcro flag</li> <li>4. Release blue knob from launch lock threads, 3-5 turns</li> <li>5. Push blue knob in and drive knob 13-15 turns, <b>PGT: A6/30.5</b></li> <li>6. Attach ground strap</li> </ol> <p><u>L-Handle Removal Steps</u></p> <ol style="list-style-type: none"> <li>1. Release wing tab bolts (3), 5-6 turns, <b>PGT: B5 CCW 2, 10.5</b></li> <li>2. Remove L-Handle</li> <li>3. Stow L-handle on FSS inboard brackets; install top/slotted end first, engage captive lock pins (3) (folded end is down)</li> </ol>	<p>A and B or A and safety bar</p> <p>Over-center achieved at 9-10 turns</p> <p>Torque drops off after over-center</p> <p>3 of 3 FSS/ L-handle captive lock pins reqd for landing</p>

## B-LATCH ALIGNMENT AID

1. Stowage lock fails to release	<ol style="list-style-type: none"> <li>1. Re-try using <b>PGT: A2, CCW 2, 5.5</b></li> <li>2. If no joy, install without alignment aid (failure 6.7 ft-lb)</li> </ol>	
2. Deployment lock fails to release	<ol style="list-style-type: none"> <li>1. Apply initial inward pressure; re-try using <b>PGT: A3, CCW 2, 10.5</b> (failure 13.3 ft-lb). Attempt alignment aid deployment</li> <li>2. If no joy, install without alignment aid</li> </ol>	
3. Fails to deploy to 90 degrees	Stow; engage stowage and deployment locks. Install COS without alignment aid	1 of 2 locks
4. Fails to slide down to full deploy position	Stow; engage stowage and deployment locks. Install COS without alignment aid	1 of 2 locks
5. Fails to slide up	<ol style="list-style-type: none"> <li>1. Engage deployment lock; continue</li> <li>2. If no joy, remove alignment aid cont bolts (4 non-captive), using <b>EVA ratchet w/MTL 5</b>, 8-12 turns (failure 4.6 ft-lb). Capture bolts using FRT (stbd TSA)</li> </ol>	1 of 2 locks
6. Fails to stow to 0 degrees	<ol style="list-style-type: none"> <li>1. Engage deployment lock at the 90 degrees position</li> <li>2. If no joy, remove alignment aid cont bolts (4 non-captive), using <b>EVA ratchet w/MTL 5</b>, 8-12 turns (failure 4.6 ft-lb). Capture bolts using FRT (stbd TSA)</li> </ol>	1 of 2 locks
7. Stowage or deployment lock fails to engage for final stowage	If one lock engaged, continue	1 of 2 locks

## ACS

<ol style="list-style-type: none"> <li>1. Guide stud fails to install -- #10 TS fastener fails to release (for guide stud install)</li> </ol>	<p>If fail to break torque, attempt to release lower most fastener on corresponding corner (<b>NOTE:</b> Wishbone has third set of holes to accommodate lower-most fasteners)</p> <p>If fastener fails to fully remove (possible clearance issue with wishbone):</p> <ol style="list-style-type: none"> <li>1. Attempt to fully re-engage fastener</li> <li>2. If no joy, perform fitcheck with wishbone to assess clearance</li> <li>3. If no joy, contact MCC for steps to increase torque using power tool with SSAT tool, spare #10 torque set bit (stbd TSA) or #8 green bit (ATM-1/socket caddy #3)</li> </ol> <p><b>NOTE:</b> Failure torque = 6.7 ft-lb</p>	<p>FCP min reqts: Any 2 of 3 FCP alignment <u>holes</u></p> <p>Wishbone min reqts: 3 guide studs</p>
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# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
-- Guide stud fails to engage	<ol style="list-style-type: none"> <li>1. Check threads for debris, verify studs are not cross threaded and re-attempt installation</li> <li>2. If no joy, release lower most #10 fastener at corresponding corner, and re-attempt guide stud installation. (<u>NOTE</u>: Wishbone has third set of holes to accommodate lower-most fasteners)</li> <li>3. If no joy, retrieve spare guide stud from ATM-1; re-attempt</li> </ol> <p><u>NOTE</u>: For stuck or protruding guide stud, use 1/2-in box end wrench (port TSA) to apply additional torque to fully engage or release guide stud as reqd; guide stud may not be able to fully engage</p>	<p>FCP min reqts: Any 2 of 3 FCP alignment <u>holes</u></p> <p>Wishbone min reqts: 3 guide studs</p>
-- Guide stud knob fails to release	<p>Remove guide stud with knob attached, stow back into caddy. Notify MCC and press per minimal requirements. If minimal reqts not met, retrieve spare guide stud from ATM-1 and re-install into counterbore</p>	<p>FCP min reqts: Any 2 of 3 FCP alignment <u>holes</u></p> <p>Wishbone min reqts: 3 guide studs</p>
2. Grid cutter fails to install	<p>Verify/perform the following:</p> <ol style="list-style-type: none"> <li>1. Alignment snubbers on bottom of cutter are centered on center grid</li> <li>2. Drive-off knob fully retracted</li> <li>3. Cutter arms #11 and #12 are positioned in launch detent</li> <li>4. Cutter blades fully retracted</li> <li>5. Re-attempt installation</li> </ol> <p>If no joy, contact MCC</p>	
3. ACS Grid Cutter deployable arm fails to deploy	<p>Assess best option:</p> <ol style="list-style-type: none"> <li>1. Cut bolts 10 and 1 (top) OR 6 and 5 (bottom) to allow space to engage top/bottom grid arms as reqd</li> </ol> <p style="text-align: center;">- OR -</p> <ol style="list-style-type: none"> <li>2. Using #10 TS tool (SSAT, or #10 TS from stbd TSA), loosen either top/center or bottom/center screws in 1/2 turn increments as reqd to create space behind grid to engage upper/lower grid arm; after grid removed, re-engage released #10 fasteners, hand tight</li> <li>3. If no joy with step 1 or step 2, rotate deployable arm as far as possible; attempt partial cut of grid; manually rock tool back and forth as reqd to release partially cut grid</li> </ol>	<p>#11 (bottom) deployable arm reqd to trap cut grid</p>
4. Grid cutter fails to cut EMI grid		
-- PGT stalls before bolt shoulder hard stop is reached	<ol style="list-style-type: none"> <li>1. Check bolt shoulder has no gap; report condition to MCC; release remaining bolts; then re-attempt failed bolt</li> <li>2. If no joy, contact MCC to increase torque; configure <b>PGT: (B5, CW2, 10.5)</b>: Re-attempt grid cutter bolt engagement/grid cut</li> <li>3. If no joy with cut, attempt grid removal by rotating/twisting grid cutter as required</li> </ol> <p><u>NOTE</u>: Grid cutter bolt failure threshold: 100 in-lb (8.3 ft-lb)</p>	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<p>-- Grid cutter fails to release</p>	<ol style="list-style-type: none"> <li>1. Check bolt shoulder has no gap; report condition to MCC; release remaining bolts; then re-attempt failed bolt</li> <li>2. If no joy, contact MCC to increase torque; configure <b>PGT: (B5, CW2, 10.5)</b>: Re-attempt grid cutter bolt engagement/grid cut</li> <li>3. If no joy with cut, attempt grid removal by rotating/twisting grid cutter as required</li> </ol> <p><u>NOTE</u>: Use prybar (port TSA) for additional leverage as reqd</p> <p><u>NOTE</u>: Grid cutter bolt failure threshold: 100 in-lb (8.3 ft-lb)</p>	
<p>5. #4 TS fasteners fail to break torque with FET</p>		
<p>-- #4 TS fasteners fail to release with FET: (1, 2, 3, 5, 11 and/or 13)</p>	<p>Perform the following steps to drill out fastener heads:</p> <div style="border: 3px double black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>WARNING</b> ACS drill jig has sharp edges and braycoat</p> </div> <ol style="list-style-type: none"> <li>1. Retrieve ACS drill jig with cover from NOPE</li> <li>2. Translate to worksite</li> <li>3. Remove protective cover</li> <li>4. Install drill jig: Slide top jig tabs up under EMI grid frame, then to the right under EMI grid frame</li> <li>5. Configure <b>MPT: [CW,15, MTR] - black bit</b>: Engage locking drives (2), to hard stop</li> <li>6. <b>MPT: [CW,15, MTR] - IFM 3/16" ball end socket with drop proof tether adapter</b> (<u>NOTE</u>: IFM socket is just needed to reach screws 1 and 3): Drive drill bit over failed fastener until white band disappears (fastener head should be drilled out/removed)</li> <li>7. Remove drill jig; attempt to control/gather possible debris; continue with FCP installation</li> </ol>	
<p>-- #4 TS fasteners fail to release with FET (with exception of 1,2,3,5,11 and/or 13)</p>	<p>Press with FCP installation. Re-attempt failed fastener with MPT and red bit for additional torque; <b>MPT: [CCW,15, MTR]</b></p> <p>If no joy, contact MCC to proceed with one of two options:</p> <ol style="list-style-type: none"> <li>1. Retrieve purple drill bit from ATM-1. <b>MPT: [CW,15, MTR] - purple drill bit</b>: Drill out failed fastener(s) as reqd before proceeding with nominal release of other fasteners (this ensures access cover is secured in posn during drilling)</li> </ol> <p style="text-align: center;">- OR -</p> <ol style="list-style-type: none"> <li>2. Retrieve ACS drill jig with cover from NOPE</li> <li>3. Translate to worksite</li> <li>4. Remove protective cover</li> <li>5. Install drill jig upside down: Slide bottom drill jig tabs down beneath lower EMI grid frame, then to the left under EMI grid frame</li> <li>6. Configure <b>MPT: [CW,15, MTR] - black bit</b>: Engage locking drives (2), to hard stop</li> <li>7. <b>MPT: [CW,15, MTR] - black bit</b>: Drive drill bit over failed fastener until white band disappears (fastener head should be drilled out/removed)</li> <li>8. Remove drill jig; attempt to control/gather possible debris; continue with FCP installation</li> </ol>	

## WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
6. FCP fails to install	1. Inspect for the following: <ul style="list-style-type: none"> <li><input type="checkbox"/> Alignment issues</li> <li><input type="checkbox"/> Damage or debris</li> <li><input type="checkbox"/> Sticky pad plungers retracted (2)</li> <li><input type="checkbox"/> Hard dock latches released (3)</li> <li><input type="checkbox"/> Cut EMI grid tabs not protruding</li> <li><input type="checkbox"/> Guide studs fully seated</li> </ul> If all looks good, re-attempt installation	3 of 3 hard dock latches reqd for EVA ops and HST deploy
7. FCP hard dock latch fails to engage	2. If no joy, contact MCC 1. Inspect for alignment and debris; cycle hard dock latches as reqd; re-attempt installation. If clearance issue, loosen adjacent #10 screw(s) as reqd (can use SSAT tool or #10 TS from stbd TSA) to provide additional clearance behind grid for FCP latch to fit. <u>NOTE:</u> Must re-engage loosened fasteners when complete with task, hand tight 2. If no joy, contact MCC  <u>NOTE:</u> There are no overrides for mechanical jams/failures of hard dock latch	3 of 3 hard dock latches reqd for HST deploy
8. Sticky pad plunger fails to deploy	Check for interferences; re-try	
9. Sticky pad plunger fails to stick	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Failure to have 2 of 2 sticky pads engaged increases probability of lost screws</p> </div> 1. If only one plunger has not adhered to access cover, continue task 2. If both plungers have not adhered to access cover, contact MCC	1 of 2 pads reqd for temp soft dock of cover
10. FCP sticky pad/plunger fails to retract (cover fails to release from chassis)	Perform the following: <ol style="list-style-type: none"> <li>1. Inspect and verify all fasteners have been fully released</li> <li>2. Verify both sticky pads are fully engaged (1 of 2 reqd)</li> <li>3. Verify retainer latches retracted (4)</li> <li>4. Verify no fasteners stuck behind sticky pads</li> <li>5. If no joy, contact MCC to manually release sticky pad/plunger (<u>NOTE:</u> Be prepared to capture loose screws):               <ul style="list-style-type: none"> <li>• Using SSAT tool, manually release sticky pad/plunger #10 TS screws (2) on sides of plunger housing at base of FCP; stow screws in trash bag (housing remains captive to FCP)</li> <li>• Pull plunger/housing straight away from FCP face to manually lift sticky pad up into FCP housing</li> </ul> </li> </ol>	
11. Cover retainer latch fails to engage	Perform the following steps as reqd: <ol style="list-style-type: none"> <li>1. Verify both sticky pad plungers retracted (2)</li> <li>2. Verify that removed fastener is not obstructing latch</li> </ol> <u>NOTE:</u> If one sticky pad is slightly canted and not fully retracted, attempt to engage retainer latch closest to problem area	1 retainer latch on each side of FCP
12. FCP fails to release	1. Verify all 3 hard dock latches have been retracted and have not re-engaged; re-attempt removal 2. If no joy, contact MCC	3 of 3 hard dock latches reqd for HST deploy

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
13. Wishbone fails to install on guide studs	<ol style="list-style-type: none"> <li>1. Check for debris or damage on guide studs and wishbone mechanism; cycle wishbone mechanism as reqd to assess/clear possible jam</li> <li>2. If no joy, use card extraction tool without wishbone; <u>NOTE</u>: Can no longer use card extraction tool to push card in due to loss of mechanical advantage; press with driving card out up to 55 turns as reqd for card removal (card comes ~ 3.5" out)</li> </ol>	
14. Card extraction tool fails to install onto wishbone	<ol style="list-style-type: none"> <li>1. Check for debris or damage on card extraction tool and wishbone mechanism; verify card extraction tool elevator drive blocks fully retracted, clamp fully open, and elevator drive block lever is in DOCK  -- If problem with wishbone, perform step 2 -- If problem with card extraction tool, perform step 3</li> <li>2. If no joy, remove wishbone and use card extraction tool without wishbone. <u>NOTE</u>: Can no longer use card extraction tool to push card in due to loss of mechanical advantage; press with driving card out up to 55 turns as reqd for card removal (card comes ~ 3.5" out)</li> <li>3. If no joy, retrieve spare card extraction tool from NOPE; re-attempt</li> </ol>	
15. Card extraction tool fails to operate -- Jaws fail to engage card	<ol style="list-style-type: none"> <li>1. Verify jaws are fully opened; adjust jaw opening as reqd to avoid interference with adjacent cards or CEB structure; re-attempt clamp install onto card</li> <li>2. If no joy, contact MCC for spare card extraction tool retrieval (NOPE) or use of vice grips (port TSA) for card removal  <u>NOTE</u>: If a minimum of 270 degrees of rotation on clamp is achieved, it is possible that clamp may still engage card and be used for card removal</li> </ol>	
-- Indexing mechanism or elevator drive mechanism fail to work	Retrieve spare card extraction tool from NOPE (there are no overrides on ACS card extraction tool)	
16. Card fails to remove from CEB	<ol style="list-style-type: none"> <li>1. Using nominal PGT settings (<b>B2, CW2, 5.5</b>), fully drive card out, 55 turns (~3.5")</li> <li>2. If no joy, use vice grips (port TSA) to grip card at "L" bracket and pull outward using up and down motion to release jammed card loks</li> </ol>	
17. Card extraction tool clamp fails to open and release old card	<p>There are no clamp overrides; card extraction tool with stuck card must be stowed behind HST tool bag in A/L</p> <div style="border: 3px double black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Exposed card has sharp edges. Retrieve spare card extraction tool from NOPE as reqd to pull out remaining cards</p> </div>	
18. Wishbone fails to release from CEB	<p>Using 5/32 ball-end driver (stbd TSA) with EVA ratchet (or 5/32" allen wrench (A/L), manually release guide studs (4) via hex interface on head of guide stud; remove entire assy of wishbone with guide studs; stow entire assy in A/L (will not land back in NOPE in this config)</p> <p><u>NOTE</u>: Guide studs are torqued to ~ 30 in-lb</p>	
19. CEB temp cover fails to install	<ol style="list-style-type: none"> <li>1. Inspect for alignment and debris; cycle hard dock latches as reqd; re-attempt installation</li> <li>2. If no joy, contact MCC</li> </ol>	3 of 3 hard dock latches reqd for HST deploy

# WORKAROUNDS CRIBSHEET (Cont)

**NOTE**

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
20. CEB temp cover fails to release	<ol style="list-style-type: none"> <li>1. Verify all 3 latches have been retracted and have not re-engaged; re-attempt removal</li> <li>2. If no joy, contact MCC</li> </ol>	3 of 3 hard dock latches reqd for HST deploy
21. CEB-R fails to install -- Depth indicators fail to pop up (do not see green)	<ol style="list-style-type: none"> <li>1. Check for the following, then re-attempt install: <ul style="list-style-type: none"> <li>• Damage/debris (CEB-R and chassis)</li> <li>• Protruding EMI cut grid tabs</li> <li>• Guide stud obstruction</li> </ul> </li> <li>2. If no joy, contact MCC to increase MPT torque as reqd</li> </ol>	
-- CEB anchor drive stud fails to engage	<ol style="list-style-type: none"> <li>1. Verify CEB-R is fully inserted into the CEB chassis; check depth indicators (top and bottom) show green; re-attempt anchor drive stud at nominal MPT settings</li> <li>2. If no joy, attempt to engage adjacent anchor drive stud at nominal MPT settings</li> <li>3. If no joy, contact MCC for possible MPT torque increase</li> </ol> <p><u>NOTE:</u> Anchor guide stud failure torque: ~ 30 in-lb</p>	<p>1 top anchor stud and 1 bottom anchor stud;</p> <p>2 studs at top OR 2 studs at bottom may be acceptable (contact MCC)</p>
-- CEB card drive screw fails to engage	<p>If <u>no</u> turns yet achieved, perform the following:</p> <ol style="list-style-type: none"> <li>1. Increase MPT settings to: <b>[CW, 50, MTR] - black bit</b>; re-attempt card drive screw engagement</li> <li>2. If no joy, contact MCC</li> </ol> <p><u>NOTE:</u> Card drive screw failure torque (CW): 100 in-lb</p> <p>If <u>some</u> turns achieved, perform the following:</p> <ol style="list-style-type: none"> <li>1. Using EVA ratchet with black bit, manually (using low torque) back out failed card screw CCW to hard stop (back to launch position)</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u></p> <p style="text-align: center;">Exceeding back torque value will damage flight hardware; do NOT exceed 1.5 to 2.5 in-lb when hitting the hard stop</p> </div> <ol style="list-style-type: none"> <li>2. Increase MPT settings to: <b>[CW, 50, MTR] - black bit</b>; re-attempt card drive screw engagement</li> <li>3. If no joy, contact MCC</li> </ol>	4 card screws
22. LVPS-R fails to install	<ol style="list-style-type: none"> <li>1. Verify latch lever is fully opened and that LVPS-R is fully seated onto HR; look for debris/damage; re-attempt install</li> <li>2. If no joy, attempt to close other latch and re-try failed latch</li> <li>3. If no joy, engage contingency latch bolts (3); <b>MPT [CW, DRILL, MTR] - black bit</b>: Engage contingency latch bolts (3), to motor stall</li> </ol>	2 of 2 latches; if failed latch, 3 of 3 cont bolts reqd

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
23. CEB-R fails A/T	<ol style="list-style-type: none"> <li>1. √MCC which card must be cycled and re-seated</li> <li>2. Using EVA ratchet with black bit, manually (using low torque) back out failed card screw CCW to hard stop (back to launch position)</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Exceeding back torque value will damage flight hardware; do NOT exceed 1.5 to 2.5 in-lb when hitting the hard stop</p> </div> <ol style="list-style-type: none"> <li>3. <b>MPT [CW, 20, MTR]</b>; Engage card drive screw until MTL slips</li> <li>4. If no joy, Increase MPT settings to: <b>[CW, 50, MTR] - black bit</b>; re-attempt card drive screw engagement</li> <li>5. If no joy, contact MCC</li> </ol> <p><u>NOTE</u>: Card drive screw failure torque (CW): 100 in-lb</p>	

**STIS**

<ol style="list-style-type: none"> <li>1. CRT fails to install on MEB cover</li> </ol> <p>-- CRT fails to slide into position on cover clamp</p>	<ol style="list-style-type: none"> <li>1. Verify clamp levers 1 and 2 are in open position (up)</li> <li>2. If no joy, retrieve spare CRT from ATM-1, re-attempt install</li> <li>3. If no joy, temp stow CRT. √<b>PGT-OFF: (RCCW, 2.5): - #8 TS (green) bit</b>; attempt to break torque on clamp fastener. If joy, continue driving with <b>PGT: B3, CCW 1, 2.5</b>; disengage clamp fasteners (2), 7 turns (vs. 10 to release); brush any loose staking particles out of the aft shroud with a back-hand sweeping motion. Clamp will be loosened but not free. During MEB Cover removal, nominally drive right drive-off fasteners (2) first, followed by lower left drive-off fastener; and tilt right edge of MEB cover out to release the soft docks to the STIS handrail stanchions, pull the lower left corner out about 0.5", and rotate plate about 10 degrees CW to release radiator extension from cover clamp. <b>PGT: (A1, CW 1, 2.5) or MPT, CW, 10</b>: Re-engage clamp screws (2), 7 turns</li> <li>4. If no joy with breaking torque, attempt to remove cover without releasing clamp; During MEB Cover removal, nominally drive bottom right drive-off fastener first, followed by lower left drive-off fastener and then upper right; and tilt right edge of MEB cover out to release the soft docks to the STIS handrail stanchions, pull the lower left corner out about 0.5", and rotate plate about 10 degrees CW to release radiator extension from cover clamp</li> </ol> <p><u>NOTE</u>: Failure threshold =3.7 ft-lb</p>	
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# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<p>-- CRT fails to install onto clamp (lever 1 fails to engage)</p>	<ol style="list-style-type: none"> <li>1. Hold CRT over the clamp, adjusting position to line up the holes with the fasteners, and engage Lever 2</li> <li>2. If no joy, retrieve spare CRT from ATM-1, re-attempt install</li> <li>3. If no joy, temp stow CRT. <b>√PGT-OFF: (RCCW, 2.5):</b> - #8 TS (green) bit; attempt to break torque on clamp fastener. If joy, continue driving with <b>PGT: B3, CCW 1, 2.5</b>; disengage clamp fasteners (2), 7 turns (vs. 10 to release); brush any loose staking particles out of the aft shroud with a back-hand sweeping motion. Clamp will be loosened but not free. During MEB Cover removal, nominally drive bottom right drive-off fasteners (2) first, followed by lower left drive-off fastener and then upper right; and tilt right edge of MEB cover out to release the soft docks to the STIS handrail stanchions, pull the lower left corner out about 0.5", and rotate plate about 10 degrees CW to release radiator extension from cover clamp. <b>PGT: (A1, CW 1, 2.5) or MPT, CW, 10:</b> Re-engage clamp screws (2), 7 turns</li> <li>4. If no joy with breaking torque, attempt to remove cover without releasing clamp; During MEB Cover removal, nominally drive bottom right drive-off fastener first, followed by lower left drive-off fastener and then upper right; and tilt right edge of MEB cover out to release the soft docks to the STIS handrail stanchions, pull the lower left corner out about 0.5", and rotate plate about 10 degrees CW to release radiator extension from cover clamp</li> </ol> <p><b>NOTE:</b> Failure threshold =3.7 ft-lb</p>	
<p>-- CRT fails to install onto MEB cover (lever 2 fails to engage)</p>	<ol style="list-style-type: none"> <li>1. If no joy, retrieve spare CRT from ATM-1, re-attempt install</li> <li>2. If no joy, partially install CRT onto Clamp with Lever 1 and proceed with removal. Tether to CRT. After nominal MEB cover drive-off, (to clear clamp from counterbores), slide CRT to left to clear assembly from radiator and to separate the CRT with clamp from the cover, return in middeck</li> </ol>	
<p>2. MEB Cover Clamp fasteners fail to release (#8 torque-set)</p>	<ol style="list-style-type: none"> <li>1. Configure MPT to manual mode; Increase torque as needed to loosen fasteners, including failing the fasteners. <b>NOTE:</b> It's OK to fail both fasteners per flight rule</li> <li>2. If no joy with breaking torque, attempt to remove cover without releasing clamp; During MEB Cover removal, nominally drive bottom right drive-off fastener first, followed by lower left drive-off fastener and then upper right; and tilt right edge of MEB cover out to release the soft docks to the STIS handrail stanchions, pull the lower left corner out about 0.5", and rotate plate about 10 degrees CW to release radiator extension from cover clamp</li> </ol> <p><b>NOTE:</b> Failure threshold =3.7 ft-lb</p>	
<p>3. STIS Handrail Fails to Remove</p>		
<p>-- HRT does not install (bit does not align with the fastener head)</p>	<ol style="list-style-type: none"> <li>1. Retrieve spare HRT from ATM-1, install and re-attempt fastener removal</li> <li>2. If no joy, retrieve FRT from stbd TSA. Remove HRT as reqd and stow; Using FRT, release handrail fasteners (2 per stanchion), 9 total turns. Capture loose hardware by FRT (no washer) and stow in trash bag, brushing any loose staking particles out of the aft shroud with a slow, back-hand sweeping motion</li> </ol>	



# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
-- HRT soft dock feature does not engage	<ol style="list-style-type: none"> <li>1. Hold HRT in place, engage hard dock</li> <li>2. If no joy, remove HRT and install spare HRT from ATM-1</li> </ol>	
-- HRT hard dock feature does not engage	<ol style="list-style-type: none"> <li>1. Retrieve spare HRT from ATM-1, install</li> <li>2. If no joy, hold HRT in place (do not rely only on soft dock) while disengaging fasteners; use caution to ensure the HRT does not come off until the HRTs and EVA handrail are in the disposal bag</li> </ol>	
-- Handrail screws fail to break away from staking (socket head cap screws)	<p>Re-try with <b>PGT=RCCW/30.5</b>. Once the head is broken away from the staking, resume using nominal tool settings (expected breakaway torque is 14.1 ft-lb; running torque is 2.5 ft-lb; failure threshold is 8.3 ft-lb)</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Sheared screw shank remains behind in stanchion; poses sharp edge hazard</p> </div>	
4. Failure to Retrieve STIS Fastener Capture Plate		
-- Inner restraint 1/4-turn latch fails to release (locking knob fails to pull up)	<p><b>PGT=A3, CCW2, 10.5</b> or <b>Ratchet CCW/MTL= 10 with 5/32 (#10)</b> allen extension (stbd TSA):</p> <ol style="list-style-type: none"> <li>a. Loosen non-captive pivot bolt 4 turns CCW</li> <li>b. Pull up on pivot arm and locking spool assembly and rotate 90 degrees to free FCP</li> <li>c. Remove FCP, leave lever arm as is during EVA</li> <li>d. Stow FCP</li> <li>e. Rotate assembly 90 degrees to closed posn and re-engage pivot bolt 4 turns in (or engage contingency bolt)</li> </ol> <p><u>NOTE:</u> For 5/32-in bolt: Breakaway torque: 6.3 ft-lb, Failure threshold: 13.2 ft-lb</p>	<p>Any 2 of 4 mechanisms reqd</p> <p>(any combination of latches or bolts)</p>
5. Ground strap bag harness GAM will not install onto STIS ground strap tab	<p>If problem on HST side, install GAM onto NICMOS ground tab</p> <p>If problem on GAM side, retrieve spare ground strap bag, re-try</p>	
6. RIB caddy fails to install on STIS handrail	<ol style="list-style-type: none"> <li>1. If soft dock engaged, continue with nominal procedure; avoid bumping caddy from handrail</li> <li>2. If no joy, remove caddy from handrail, temp stow as reqd</li> </ol>	
7. RIB washer retainer will not fully seat into #8 C-fastener counterbore (b/c head of fastener off-set in counterbore)	<ol style="list-style-type: none"> <li>1. Verify RIB is level (adjust pitch as reqd); pull trigger lightly (CCW) to partially release fastener and to seat washer retainer over fastener head. Stow RIB in caddy and configure MPT with white bit (#8 hex). <b>MPT: (CW, 15, MTR)</b>: Re-tighten fastener. Stow white bit in caddy and configure MPT back to CCW. Continue with nominal procedure</li> <li>2. If no joy, Contact MCC: √GO to release fastener and washer without retainer installed</li> </ol> <p><u>NOTE:</u> If a washer and/or retainer come free, attempt to capture loose hardware or, using a back-hand motion, impart a small velocity out of the aft shroud</p>	
8. RIB fails to dispense washer retainer	<ol style="list-style-type: none"> <li>1. Re-attempt retainer installation with spare RIB (in RIB caddy)</li> <li>2. If no joy, Contact MCC: √GO to release fastener and washer without retainer installed</li> </ol> <p><u>NOTE:</u> If a washer and/or retainer come free, attempt to capture loose hardware or, using a back-hand motion, impart a small velocity out of the aft shroud</p>	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
9. Fastener extraction bit (FEB) or RIB fails to release #8 C-fastener	1. Release remaining C-fasteners per nominal plan (to preserve FEB before possible damage). Set MPT to 40; re-attempt release of final #8 C-fastener with FEB 2. If no joy, configure MPT to drill mode (no torque limiter); GO to shear head of final #8 C-fastener (head is captured in FEB)  <u>NOTE:</u> Shank may be stuck in counterbore with washer and retainer  <u>Failure torque:</u> 3.7 ft-lb (45 in-lb)  <u>NOTE:</u> Clear bit (ATM-1) can also be used to release #8 C fastener	
10. WET fails to remove washers and washer retainers	1. Re-try using spare WET (ATM-1) 2. If no joy, leave washer and retainer in place; proceed with nominal operations. FCP cannot land with only 3 of guide studs (may require jettison)  <u>NOTE:</u> Do not attempt to install guide studs on top of washer and washer retainer; will not get required force	3 of 4 guide studs reqd to remove cover  4 of 4 guide studs reqd for landing
11. RIB caddy fails to release from STIS Handrail	<b>PGT (A3, CCW 2, 10.5) 6-in wobble;</b> release RIB caddy from handrail by releasing 7/16" hex contingency override fasteners, (2) 10 turns  <u>NOTE:</u> Bolts are captive to the caddy <u>NOTE:</u> Bracket remains behind on handrail; no jitter concerns)	
12. Guide stud (anchor) fails to fully seat	1. Release, re-set guide stud to starting configuration (CCW to hard stop); re-attempt installation, confirm guide studs flush 2. If no joy, install spare guide stud (anchor) (spare guide stud flies with integral handhold and tether point) (ATM-1)	3 of 4 guide studs reqd to remove cover  4 of 4 guide studs reqd for landing
13. FCP fails to soft dock onto STIS handrail stanchions	If FCP soft docks interfere with one or both handrail stanchions, remove soft dock assemblies: <b>PGT: (B3, CCW 1, 2.5)-7/16" x 6" socket:</b> Release captive/slotted soft dock fasteners (2), 1.5 turns. Slide soft dock assembly off slotted bolts (does not come completely free)	3 of 4 guide studs reqd to remove cover  4 of 4 guide studs reqd for landing
14. FCP fails to install on guide studs (anchor)	1. If FCP only aligns to three of four guide studs (anchors), remove the guide stud (anchor) that is causing the interference, retrieve spare guide stud (anchor) with integral handhold and tether point from ATM-1, install spare guide stud, attempt re-installation of FCP 2. If no joy with 4/4, continue nominal operations. FCP cannot land in FCP enclosure (may require jettison)	3 of 4 guide studs reqd to remove cover  4 of 4 guide studs reqd for landing
15. Zip nuts or integral wing-tabs fail to secure FCP	1. If only three of four zip nuts/integral wing-tabs install properly, replace problematic guide stud (anchor) with spare guide stud (anchor) (with integral handhold and tether point) from ATM-1, re-attempt installation of FCP 2. If no joy with 4/4, continue nominal operations. FCP cannot land in FCP enclosure (may require jettison)	3 of 4 guide studs reqd to remove cover  4 of 4 guide studs reqd for landing

## WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
16. Disposal bag, Guide stud caddy, Soft CTE, or Card Tool Stowage straps in ATM-2 fail to seat (ball does not seat in cleat, OR, straps cannot be pulled taught)	Return items in middeck	1 of 2 balls seated in cleats with straps pulled taught  (1/4-turns are not reqd)
17. Fail to remove STIS CG label  -- Cutter fails to release from stowage posn or fails to rotate once released from stowage posn	1. Do not use cutter override; disengage fasteners directly through CG label ( <u>NOTE</u> : This affects screws A24 & A25): ❑ Using Torq-Set bit and power tool, press in with approx 20 lb force until label is punctured ❑ Continue with < 10 lb axial force for remaining turns to fully disengage fasteners 2. If no joy, use contingency bit (purple) (on socket caddy in ATM-1)	
18. MEB Cover fasteners fail to release  -- Red (#4 TS), -- Blue (#4 SHCS/hex), or -- White (#8 SHCS/hex) *Fasteners will not release at nominal MPT setting	1. Increase torque to failure: ➢ If #4 SHCS (blue); configure MPT to drill mode (no torque limiter), re-attempt release; GO to shear head of #4 SHCS fastener ➢ If #8 SHCS (white); configure MPT to drill mode (no torque limiter), GO to shear head of #8 SHCS fastener (failure torque =3.7 ft-lb) ➢ If #4 SHCS and #8 SHCS have stripped threads (and free spin) go to step 2 below for drilling workarounds 2. If #4 TS (red), use Contingency Drilling Bit (socket caddy in ATM-1): a. <b>MPT (MTR, CW, Drill), drill bit (purple)</b> (Drill bit Socket caddy from ATM-1) b. Insert MPT/drill bit through the access hole c. Engage drill bit housing with failed #4 TS fastener d. Grasp tab on drill bit to prevent rotation of tool housing (and fastener head) e. Fully depress MPT trigger (max RPMs) and slowly apply additional axial pressure to begin the drilling process f. Release trigger when drilling is completed, ~ 1-2 min; should feel break-away and should see washer on drill bit g. Remove bit from access hole – (washer from fastener head will be retained behind FCP access hole) (operate drill CCW if necessary) h. Stow drill bit (back in ATM-1 if time permits)  <u>NOTE</u> : The purple drill bit can be used on up to two failed fasteners before bit wears down and can no longer be used	
-- Free spinning #4 torque-set (red) (i.e., broken nut plate)	Refer to block 18, step 2, for Contingency Drilling steps	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
19. High torque during actuation of drive-off feature	<ol style="list-style-type: none"> <li>1. Inspect for unreleased fastener; if stuck fastener, use contingency fastener release methods listed in block 18 above</li> <li>2. If no joy, and stripped threads are prohibiting release of drive-off feature, a partially stripped fastener may come out with upward pressure applied via drive-off features. Alternate cycling drive-off feature and stripped fastener as reqd to release stripped fastener</li> <li>3. If no joy (and purely a drive-off fastener problem; no stuck fasteners), attempt other remaining drive-off fasteners, return to problematic fastener, re-attempt release. If no joy, increase torque setting for drive-off fastener: <b>PGT: A2, CW 1, 5.5</b></li> <li>4. If no joy with A2, use <b>PGT: A3, CW 1, 10.5</b></li> <li>5. If no joy, attempt to manually release FCP (from soft dock and EMI gasket)</li> </ol> <p><u>NOTE:</u> Failure torque of drive-off fastener: 13.5 ft-lb (sheared pin); Drive-off full turn count: 11.5 turns to hard stop</p>	
20. EMI gasket fails to fully release/separate (once drive off feature has been released)	<p>Use STIS cutters to cut exposed bridging sections of EMI gasket as close to the MEB surface as possible Alternate cutters: EVA scissors (left pocket), but grounding is reqd</p>	
21. Length of EMI gasket is dangling from STIS Enclosure front surface	<ol style="list-style-type: none"> <li>1. Use a grounded tool (CMT or STIS cutters) to press it back against the STIS Enclosure in a single layer</li> <li>2. If no joy, cut gasket using grounded STIS cutters</li> </ol>	
22. STIS cutters fail to cut thermistor wires	<ol style="list-style-type: none"> <li>1. Re-try with cutter from spare Ground Strap Harness Bag in ATM-1 (cutters are reqd to be grounded)</li> <li>2. If no joy, attempt to cut wires with EMU scissors (need to ground)</li> </ol>	
23. FCP Enclosure inner 1/4-turn latch fails to engage	<ol style="list-style-type: none"> <li>1. Check for interferences, re-attempt ¼-turn latch</li> <li>2. If no joy, engage contingency bolt: <b>PGT: A2, CW 2, 5.5, 14 turns (torque stall)</b></li> </ol> <p><u>NOTE:</u> Manual bolt engagement to start threads is recommended <u>NOTE:</u> Nominal engagement torque = 7.5 ft-lb <u>NOTE:</u> Failure torque = 9.2 ft-lb</p>	<p>Any 2 of 4 mechanisms reqd  (any combination of latches or bolts)</p>
24. Card Lok fasteners fail to release	<ol style="list-style-type: none"> <li>1. Install card tool, drive with <b>PGT: (A2, CW 2, 5.5)- 6-Ext 7/16</b> CW (out) to hard stop (56 turns), CCW (in) 6 turns, and CW (out) 6 turns; attempt to remove card</li> <li>2. If no joy, drive card lok with <b>PGT: (B6, CW 2, 10.5)- 6-Ext 7/16</b> CW (out) to hard stop (56 turns), CCW (in) 6 turns, and CW (out) 6 turns; attempt to remove card</li> <li>3. If no joy, remove card tool, and cycle elevator drive at nominal settings (to determine card tool failure vs card lok failure)</li> <li>4. If no joy, retrieve Contingency Extraction Blocks (CEB) from ATM-1: <ul style="list-style-type: none"> <li>➤ Verify card tool driven fully CW (out), 56 turns. With elevator blocks “OPEN”, drive the card tool elevator blocks with PGT CCW, 56 turns to the hard stop (fully retracted), set elevator block latches (2) to “DOCK”</li> <li>➤ Tether and ground CEBs. Separate the CEBs from each other, install CEBs between the card tool and the MEB enclosure using upward sliding motion. Release MEB docks on CEB. Remove CEBs from card tool before installation of LVPS-2 card into CTE</li> </ul> </li> </ol>	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
	<ul style="list-style-type: none"> <li>➤ Use PGT to drive card tool elevator blocks CW to end of travel (52-56 turns)</li> </ul> <p><u>NOTE:</u> Failure threshold of card loks is 10.5 ft-lb</p>	
<p>25. Card tool fails to install on LVPS-2 card L-bracket</p>	<ol style="list-style-type: none"> <li>1. Verify clamp is fully opened, card tool fully retracted, and card tool properly latched on MEB chassis</li> <li>2. If no joy, inspect MEB worksite for protrusions that may interfere with proper card tool placement (failed shank)</li> <li>3. If no joy, retrieve spare card tool from COPE, re-try</li> </ol> <p><u>NOTE:</u> Contact MCC for use of clamp override bolt to close clamp</p>	
<p>26. Card tool docks will not engage MEB chassis</p>	<ol style="list-style-type: none"> <li>1. Proceed with full extraction, 20 turns (nominal settings, CW/out); attempt to remove card; continue driving card out as reqd up to 56 turns</li> <li>2. If no joy, retrieve Contingency Extraction Blocks (CEB) from ATM-1:               <ul style="list-style-type: none"> <li>➤ Verify card tool driven fully CW (out). With elevator blocks "OPEN", drive the card tool elevator blocks with PGT CCW to the hard stop (fully retracted), set elevator block latches (2) to "DOCK"</li> <li>➤ Tether and ground CEBs. Separate the CEBs from each other, install CEBs between the card tool and the MEB- enclosure using upward sliding motion. Release MEB docks on CEB. Remove CEBs from card tool before installation of LVPS-2 card into CTE</li> <li>➤ Use PGT to drive card tool elevator blocks CW to end of travel (52-56 turns)</li> </ul> </li> </ol>	
<p>27. Elevator drive fails to actuate</p>	<ol style="list-style-type: none"> <li>1. Remove card tool, attempt driving elevators in/out with nominal tool settings. If card tool behaves normally, re-try</li> <li>2. If no joy, re-try with <b>PGT: B6, CW2, 10.5</b></li> <li>3. If no joy, retrieve spare card tool from SOPE, re-try</li> </ol> <p><u>NOTE:</u> Failure threshold of card tool elevator drive is 10.5 ft-lb</p>	
<p>28. LVPS-2 card fails to release from chassis after nominal OUT, IN, OUT cycle</p>	<ol style="list-style-type: none"> <li>1. Unlock latches as reqd, retract elevator drive 4 turns CCW (to create space between elevators and MEB); jiggle card in and out, attempt to manually remove the card</li> <li>2. If no joy, re-set elevator locks to 'DOCK' as reqd, resume outward motion (turn elevator knob CW) using <b>PGT [A2, CW 2, 5.5]</b>, 56 turns until end of travel (hard stop). Continue driving card CCW 6 turns, then CW 6 turns, re-attempt card release</li> </ol>	
<p>29. Card tool dock mechanism fails to release from MEB</p>	<ol style="list-style-type: none"> <li>1. Turn elevator drive CCW, 1 turn; ensure force between card tool and MEB is released (preload released), re-try moving latch levers to OPEN</li> <li>2. If no joy, actuate contingency tab (located under nominal dock levers), requires outboard motion of slide lock to release card tool from MEB</li> </ol>	
<p>30. Card tool clamp fails to release from card (old or new card)</p>	<ol style="list-style-type: none"> <li>1. <b>PGT: (B3, CW 2, 2.5):</b> Drive clamp handle override bolt (push in and drive) as reqd to open clamp</li> <li>2. If no joy, tether to loop, <b>PGT: B3, CCW 2 2.5:</b> Release captive bolt, 10 turns (removing rod from jaw mechanism; jaws will remain open</li> </ol>	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
31. Card tool will not clamp onto LVPS-2R card (new card)	1. Verify clamp is fully opened, card tool fully retracted and set to undock 2. If no joy, inspect hard CTE and card tool for protrusions that may interfere with proper card tool placement (failed shank) 3. If no joy, retrieve spare card tool from COPE, re-try 4. If no joy, retrieve spare LVPS-2R card in hard CTE in COPE, re-try  <u>NOTE:</u> Contact MCC for use of clamp override bolt to close clamp	
32. Hard CTE lid fails to open, cannot remove new card	<u>NOTE:</u> Since latches open in opposite directions, failure workaround direction will depend on which bolt has failed; use decals/arrows on CTE for reqd latch direction  1. Flip T-handle to opposite side and re-try using <b>PGT</b> in manual mode (turn PGT OFF), ( <b>RCCW, 30.5 or RCW, 30.5</b> ) or <b>EVA ratchet MTL = 38</b> , CCW on 7/16" hex interface, ¼ turn 2. If no joy, retrieve spare hard CTE (CTE-R) with spare LVPS-2R card from COPE, re-try  <u>NOTE:</u> Failure threshold is 110 ft-lb (torque matrix)	
33. LVPS-2R card will not reach third band during insertion (possible jam)	1. Remove LVPS-2R, re-inspect card for FOD or bent pins; re-inspect chassis for FOD. Re-try with 2nd EV assisting with alignment as reqd 2. If bent pin(s) found; retrieve spare hard CTE from COPE, put damaged LVPS-2R in soft CTE, transfer card tool to spare LVPS-2R, and re-try  <u>NOTE:</u> Pin diameter: .024 inches	
34. LVPS-2R card is within 3 <sup>rd</sup> band, but not fully seated (where 3 <sup>rd</sup> white band should not be visible)	If only partial engagement of the connector pins has been achieved, (within the third white band), remove card tool and leave full pin engagement to installation of the MEB replacement cover; continue with nominal operations	Within 3 <sup>rd</sup> white band
35. MEB Replacement Cover Stowage Enclosure PIP pin or handle will not release	1. <b>PGT: (A2, CCW 2, 5.5)-7/16"X6"</b> : Release EVA override captive/spring-loaded bolts (4), 9 turns; lift up on entire assembly to open (T-bar and base) 2. Close lid; ( <b>A2, CW 2, 5.5</b> ); Engage contingency bolts (4), 9 turns  <u>NOTE:</u> In the event the MEB cover must be re-stowed in the enclosure for landing: There may be a high spring force reqd for crew to re-engage the handle with MEB cover in place (due to Bellevue washers). First attempt to rotate handle and re-engage nominally; if no joy, <b>PGT: (A2, CW 2, 5.5)-7/16"-6"</b> : Engage handle spring-loaded override bolts (3), 9 turns (hard stop)	3 of 4 override bolts reqd  OR  latch with PIP pin
36. MEB Replacement Cover Stowage Enclosure handle will not engage OR PIP pin fails to install	<b>PGT: (A2, CW 2, 5.5)-7/16"- 6"</b> : Engage handle spring-loaded override bolts (3), 9 turns (hard stop)	2 of 3 override bolts reqd  OR  latch with PIP pin
37. MEB Replacement Cover handle lock pin fails to disengage	<b>PGT [A2, CCW 1, 5.5]</b> : Release contingency override for locking pin (removes ball plunger out of posn), 1 turn; pull lock pin out (no detent will hold it out)	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
38. MEB Replacement Cover handle lock pin fails to engage (once cover installed on chassis)	<ol style="list-style-type: none"> <li>Attempt to engage other lock pin on same handle</li> <li>If no joy with either lock pin, continue EVA, leaving handle unlocked (but over-center)</li> </ol>	0 of 2 lock pins reqd per handle/latch
39. MEB Replacement Cover left handle fails to actuate to latched posn	<ol style="list-style-type: none"> <li>Engage upper left contingency latch (CL1) using <b>PGT [A2, CW 1, 5.5]</b> 4 turns to torque, then <b>PGT [A2, CCW 1, 5.5]</b> 5 turns to torque. Verify visual indicator changed from red to green - and -</li> <li>Engage lower left contingency latch (CL2) using <b>PGT [A2, CCW 1, 5.5]</b> 4 turns to torque, then <b>PGT [A2, CW 1, 5.5]</b> 5 turns to torque. Verify visual indicator changed from red to green</li> </ol> <p><u>NOTE:</u> If during 2nd direction of contingency latch rotation, torque stops after 0.5 turns, it is a result of thread break-away. Continue at same stop torque value for 4.2 turns</p>	
40. MEB Replacement Cover right handle fails to actuate to latched posn	<ol style="list-style-type: none"> <li>Engage upper right contingency latch (CL3) using <b>PGT [A2, CCW 1, 5.5]</b> 4 turns to torque, then <b>PGT [A2, CW 1, 5.5]</b> 5 turns to torque. Verify visual indicator changed from red to green -and-</li> <li>Engage lower right contingency latch (CL4) using <b>PGT [A2, CW 1, 5.5]</b> 4 turns to torque, then <b>PGT [A2, CCW 1, 5.5]</b> 5 turns to torque. Verify visual indicator changed from red to green</li> </ol> <p><u>NOTE:</u> If during 2nd direction of contingency latch rotation, torque stops after 0.5 turns, it is a result of thread break-away. Continue at same stop torque value for 4.2 turns</p>	
41. Ground strap bag GAM fails to release from STIS grounding tab	<p><b>PGT: A3, CCW2, 10.5: - 7/16" socket:</b> Loosen GAM override fasteners (4), in star pattern (to prevent binding), 4 turns Release GAM (entire assembly, no loose parts)</p> <p><u>NOTE:</u> Failure torque is 15 ft-lb</p>	

## NOBL 8

1. MINC TM lid latch fails to release	<ol style="list-style-type: none"> <li>Release/re-engage other latches as reqd and re-try failed latch</li> <li>Flip T-handle to opposite side and re-try using <b>EVA ratchet MTL = 38</b>, CCW on 7/16" hex interface, ¼ turn</li> <li>If no joy, tether to T-handle, release (4) captive 7/16" hex lid latch fasteners, 6-8 turns CCW using <b>PGT = A2/2.5</b> or EVA Ratchet, MTL = 2.0 Slide latch toward hinge and lift to remove</li> </ol> <p><u>Failure Threshold:</u> Handle hex I/F = 56.5 ft-lb (pawl). TM 4 captive fasteners = 3 ft-lb</p>	(high strength latch)
2. MINC Lid shear pin fails to engage (only one)	Do nothing	3 latches and 2 shear pins
3. MINC Lid shear pin fails to engage (two)	<p>Install a contingency bolt at both locations corresponding to the failed shear pins</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>Open MLI flap to expose cont bolt</li> <li><b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	3 latches, 1 shear pin, and 2 contingency bolts

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<p>4. MINC TM lid latch fails to engage (only one)</p>	<ol style="list-style-type: none"> <li>1. Release/re-engage other latches as reqd and re-try failed latch</li> <li>2. If no joy, flip T-handle down and re-try using <b>EVA ratchet, MTL = 38</b> on 7/16" hex interface, stow T-handle into goal post</li> <li>3. Install contingency bolt a failed latch</li> </ol> <p><u>Failure Threshold:</u> Handle hex I/F = 56.5 ft-lb (pawl)</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Open MLI flap to expose cont bolt</li> <li>2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	<p>2 latches, 3 shear pins, and 1 contingency bolt</p>
<p>5. MINC TM lid latch fails to engage, and contingency bolt at that latch fails to engage</p>	<p>Install a contingency bolt at the locations corresponding to the other two engaged latches</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Open MLI flap to expose cont bolt</li> <li>2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	<p>2 latches, 3 shear pins, and 2 contingency bolts</p>
<p>6. MINC TM lid latches fails to engage (two)</p>	<p>Install a contingency bolt at both failed latch locations</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Open MLI flap to expose cont bolt</li> <li>2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	<p>1 latch, 3 shear pins, and 2 contingency bolts</p>
<p>7. Any single latch fails to engage and any single shear pin fails</p>	<p>Install a contingency bolt at failed latch location</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Open MLI flap to expose cont bolt</li> <li>2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	<p>2 latches, 2 shear pins, and 1 contingency bolt</p>
<p>8. MINC TM lid latches fails to engage (2) AND shear pins (2) fail to engage</p>	<p>Install a contingency bolt at all 3 locations</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Open MLI flap to expose cont bolt</li> <li>2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	<p>3 cont bolts</p>
<p>9. MINC TM lid latch fails to engage (only one) AND shear pins (3) fail to engage</p>	<p>Install a contingency bolt at all 3 locations</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Open MLI flap to expose cont bolt</li> <li>2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	<p>3 cont bolts</p>



# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
10. NOBL 8 fails to remove from MINC		
-- Conductive Velcro strap will not release from NOBL	<ol style="list-style-type: none"> <li>1. Pull harder</li> <li>2. If no joy, cut strap as close to NOBL as possible using EMU scissors</li> </ol>	
-- NOBL will not come free of guides	<ol style="list-style-type: none"> <li>1. Perform visual inspection, look for possible debris causing interference</li> <li>2. Pull harder; jiggle to loosen</li> <li>3. If no joy, pull up on NOBL to determine if one or both sides are stuck</li> <li>4. If both sides stuck, remove contingency rails (2): <ul style="list-style-type: none"> <li>• Tether to rails</li> <li>• <b>PGT: B2, CCW 2, 5.5:</b> Release contingency fasteners (3 per rail), 9 turns</li> <li>• Remove NOBL (rails will slide out with NOBL, and will be free to float away)</li> </ul> </li> <li>5. Temp stow rail (TBD if coming inside)</li> </ol> <p><u>NOTE:</u> Contingency rail fastener breakaway torque = 2.2 ft-lb</p> <p><u>NOTE:</u> Failure torque = 4.35 ft-lb</p>	
11. NOBL 8 fails to install		
-- NOBL fails to seat/install on door	<ol style="list-style-type: none"> <li>1. Possible bent frame; re-shape by hand until it seats on door</li> <li>2. If no joy, attempt vent plug install and re-try NOBL seating</li> <li>3. If no joy, re-install NOBL in MINC (engage conductive Velcro strap); re-install Bay 8 MLI, avoiding contact with radiators</li> </ol>	Bay 8 Door must either have MLI or NOBL for survival
-- Vent plug fails to install	<ol style="list-style-type: none"> <li>1. Remove plug; inspect plug and hole for debris. If debris visible, attempt to clear, and re-try vent plug install</li> <li>2. If no joy, retrieve spare vent plug from MINC I-Beam and re-try installation</li> </ol>	2 plugs in opposite corners, both handles deployed to 90 degrees
-- Ground cap fails to install on J-hook	<ol style="list-style-type: none"> <li>1. Tap onto interface</li> <li>2. If no joy, install on adjacent hex bolt. If no joy, do not ground and put cap in stowage pouch</li> </ol>	
12. Bay 8 attachments fail to remove		
-- Clip fails to release from knob	Pull on clip to generate slack in line and slip over Bay 7 door knob	
-- Patch attachments fail to remove due to J-hook release problem	Use NOBL cutters or EMU scissors to cut patch attachment wires	
13. NOBL 8 Radiator fails to deploy		
-- Radiator 1/4-turn fails to release from NOBL	<ol style="list-style-type: none"> <li>1. Increase force to release 1/4-turn fastener</li> <li>2. If no joy, retrieve pliers from port TSA and attempt to turn 1/4-turn fasteners</li> </ol>	
-- NOBL adhesive fails to stick	<ol style="list-style-type: none"> <li>1. Press roller for a few seconds on NOBL-ER, move slowly over surface giving time for adhesive to work</li> <li>2. Wait a couple of minutes and retry</li> <li>3. If no joy, press on</li> </ol>	
-- Radiator 1/4-turn fastener fails to re-install on NOBL	<ol style="list-style-type: none"> <li>1. Increase force to engage 1/4-turn fastener</li> <li>2. If no joy, contact MCC and press (1/4-turns are just backup to adhesive); retrieve pliers from port TSA on MCC GO and attempt to turn 1/4-turn fasteners</li> </ol>	1/4-turns are not reqd to be engaged on-orbit

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly

Action

Min Rqmt

**NOBL 5**

<p>1. MINC TM lid latch fails to release</p>	<p>1. Release/re-engage other latches as reqd and re-try failed latch                  2. Flip T-handle to opposite side and re-try using EVA ratchet MTL = 38, CCW on 7/16" hex interface, ¼ turn                  3. If no joy, tether to T-handle, release (4) captive 7/16" hex lid latch fasteners, 6-8 turns CCW using PGT = A2/2.5 or EVA Ratchet, MTL = 2.0 Slide latch toward hinge and lift to remove</p> <p><u>Failure Threshold:</u> Handle hex I/F = 56.5 ft-lb (pawl).                  TM 4 captive fasteners = 3 ft-lb</p>	<p>(high strength latch)</p>
<p>2. MINC Lid shear pin fails to engage (only one)</p>	<p>Do nothing</p>	<p>3 latches and 2 shear pins</p>
<p>3. MINC Lid shear pin fails to engage (two)</p>	<p>Install a contingency bolt at both locations corresponding to the failed shear pins:</p> <p><u>Contingency Bolt Install Steps</u>                  1. Open MLI flap to expose cont bolt                  2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</p> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb  <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	<p>3 latches, 1 shear pin, and 2 contingency bolts</p>
<p>4. MINC TM lid latch fails to engage (only one)</p>	<p>1. Release/re-engage other latches as reqd and re-try failed latch                  2. If no joy, flip T-handle down and re-try using EVA ratchet, MTL = 38 on 7/16" hex interface, stow T-handle into goal post                  3. Install contingency bolt a failed latch</p> <p><u>Failure Threshold:</u> Handle hex I/F = 56.5 ft-lb (pawl)</p> <p><u>Contingency Bolt Install Steps</u>                  1. Open MLI flap to expose cont bolt                  2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</p> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb  <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	<p>2 latches, 3 shear pins, and 1 contingency bolt</p>
<p>5. MINC TM lid latch fails to engage, and contingency bolt at that latch fails to engage</p>	<p>Install a contingency bolt at the locations corresponding to the other two engaged latches</p> <p><u>Contingency Bolt Install Steps</u>                  1. Open MLI flap to expose cont bolt                  2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</p> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb  <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	<p>2 latches, 3 shear pins, and 2 contingency bolts</p>
<p>6. MINC TM lid latches fails to engage (two)</p>	<p>Install a contingency bolt at both failed latch locations</p> <p><u>Contingency Bolt Install Steps</u>                  1. Open MLI flap to expose cont bolt                  2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</p> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb  <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	<p>1 latch, 3 shear pins, and 2 contingency bolts</p>

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
7. Any single latch fails to engage and any single shear pin fails	<p>Install a contingency bolt at failed latch location</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Open MLI flap to expose cont bolt</li> <li>2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb  <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	2 latches, 2 shear pins, and 1 contingency bolt
8. MINC TM lid latches fails to engage (2) AND shear pins (2) fail to engage	<p>Install a contingency bolt at all 3 locations</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Open MLI flap to expose cont bolt</li> <li>2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb  <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	3 cont bolts
9. MINC TM lid latch fails to engage (only one) AND shear pins (3) fail to engage	<p>Install a contingency bolt at all 3 locations</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Open MLI flap to expose cont bolt</li> <li>2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb  <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	3 cont bolts
10. NOBL 5 fails to remove from MINC		
-- Conductive Velcro strap will not release from NOBL	<ol style="list-style-type: none"> <li>1. Pull harder</li> <li>2. If no joy, cut strap as close to NOBL as possible using EMU scissors</li> </ol>	
-- NOBL 5 will not come free of guides	<ol style="list-style-type: none"> <li>1. Perform visual inspection, look for possible debris causing interference</li> <li>2. Pull harder; jiggle to loosen</li> <li>3. If no joy, pull up on NOBL to determine if one or both sides are stuck</li> <li>4. If both sides stuck, remove contingency rails (2): <ul style="list-style-type: none"> <li>• Tether to rails</li> <li>• <b>PGT: B2, CCW 2, 5.5:</b> Release contingency fasteners (3 per rail), 9 turns</li> <li>• Remove NOBL (rails will slide out with NOBL, and will be free to float away)</li> </ul> </li> <li>5. Temp stow rail (TBD if coming inside)</li> </ol> <p><u>NOTE:</u> Contingency rail fastener breakaway torque = 2.2 ft-lb  <u>NOTE:</u> Failure torque = 4.35 ft-lb</p>	
11. NOBL 5 fails to install		
-- NOBL fails to seat/install on door	<ol style="list-style-type: none"> <li>1. Possible bent frame; re-shape by hand until it seats on door</li> <li>2. If no joy, attempt vent plug install and re-try NOBL seating</li> <li>3. If no joy, re-install NOBL in MINC (engage conductive Velcro strap); re-install Bay 8 MLI, avoiding contact with radiators</li> </ol>	Bay 5 Door must either have MLI or NOBL for survival
-- Vent plug fails to install	<ol style="list-style-type: none"> <li>1. Remove plug; inspect plug and hole for debris. If debris visible, attempt to clear, and re-try vent plug install</li> <li>2. If no joy, retrieve spare vent plug from MINC I-Beam and re-try installation</li> </ol>	2 plugs in opposite corners, both handles deployed to 90 degrees
-- Ground cap fails to install on J-hook	<ol style="list-style-type: none"> <li>1. Tap onto interface</li> <li>2. If no joy, install on adjacent hex bolt. If no joy, do not ground and put cap in stowage pouch</li> </ol>	

## WORKAROUNDS CRIBSHEET (Cont)

### NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
12. NOBL Radiator fails to deploy		
-- Radiator 1/4-turn fails to release from NOBL	<ol style="list-style-type: none"> <li>Increase force to release 1/4-turn fastener</li> <li>If no joy, retrieve pliers from port TSA and attempt to turn 1/4-turn fasteners</li> </ol>	
-- NOBL adhesive fails to stick	<ol style="list-style-type: none"> <li>Press roller for a few seconds on NOBL-ER, move slowly over surface giving time for adhesive to work</li> <li>Wait a couple of minutes and retry</li> <li>If no joy, press on</li> </ol>	
-- Radiator 1/4 fastener fails to re-install on NOBL	<ol style="list-style-type: none"> <li>Increase force to engage 1/4-turn fastener</li> <li>If no joy, contact MCC and press (1/4-turns are just backup to adhesive); retrieve pliers from port TSA on MCC GO and attempt to turn 1/4-turn fasteners</li> </ol>	No 1/4-turns reqd engaged on-orbit

### NOBL 7

1. MINC TM lid latch fails to release	<ol style="list-style-type: none"> <li>Release/re-engage other latches as reqd and re-try failed latch</li> <li>Flip T-handle to opposite side and re-try using EVA ratchet MTL = 38, CCW on 7/16" hex interface, 1/4 turn</li> <li>If no joy, tether to T-handle, release (4) captive 7/16" hex lid latch fasteners, 6-8 turns CCW using <b>PGT = A2/2.5</b> or <b>EVA Ratchet, MTL = 2.0</b> Slide latch toward hinge and lift to remove</li> </ol> <p><u>Failure Threshold:</u> Handle hex I/F = 56.5 ft-lb (pawl). TM 4 captive fasteners = 3 ft-lb</p>	(high strength latch)
2. MINC Lid shear pin fails to engage (only one)	Do nothing	3 latches and 2 shear pins
3. MINC Lid shear pin fails to engage (two)	<p>Install a contingency bolt at both locations corresponding to the failed shear pins:</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>Open MLI flap to expose cont bolt</li> <li><b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	3 latches, 1 shear pin, and 2 contingency bolts
4. MINC TM lid latch fails to engage (only one)	<ol style="list-style-type: none"> <li>Release/re-engage other latches as reqd and re-try failed latch</li> <li>If no joy, flip T-handle down and re-try using EVA ratchet, MTL = 38 on 7/16" hex interface, stow T-handle into goal post</li> <li>Install contingency bolt a failed latch</li> </ol> <p><u>Failure Threshold:</u> Handle hex I/F = 56.5 ft-lb (pawl)</p> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>Open MLI flap to expose cont bolt</li> <li><b>PGT: (B2, CW 2, 5.5 )</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb</p>	2 latches, 3 shear pins, and 1 contingency bolt

## WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
5. MINC TM lid latch fails to engage, and contingency bolt at that latch fails to engage	Install a contingency bolt at the locations corresponding to the other two engaged latches  <u>Contingency Bolt Install Steps</u> 1. Open MLI flap to expose cont bolt 2. <b>PGT: (B2, CW 2, 5.5)</b> , install contingency bolt, 11 turns (torque stall)  <u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb	2 latches, 3 shear pins, and 2 contingency bolts
6. MINC TM lid latches fails to engage (two)	Install a contingency bolt at both failed latch locations  <u>Contingency Bolt Install Steps</u> 1. Open MLI flap to expose cont bolt 2. <b>PGT: (B2, CW 2, 5.5)</b> , install contingency bolt, 11 turns (torque stall)  <u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb	1 latch, 3 shear pins, and 2 contingency bolts
7. Any single latch fails to engage and any single shear pin fails	Install a contingency bolt at failed latch location  <u>Contingency Bolt Install Steps</u> 1. Open MLI flap to expose cont bolt 2. <b>PGT: (B2, CW 2, 5.5)</b> , install contingency bolt, 11 turns (torque stall)  <u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb)	2 latches, 2 shear pins, and 1 contingency bolt
8. MINC TM lid latches fails to engage (two) AND shear pins (2) fail to engage	Install a contingency bolt at all 3 locations  <u>Contingency Bolt Install Steps</u> 1. Open MLI flap to expose cont bolt 2. <b>PGT: (B2, CW 2, 5.5)</b> , install contingency bolt, 11 turns (torque stall)  <u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb	3 cont bolts
9. MINC TM lid latch fails to engage (only one) AND shear pins (3) fail to engage	Install a contingency bolt at all 3 locations  <u>Contingency Bolt Install Steps</u> 1. Open MLI flap to expose cont bolt 2. <b>PGT: (B2, CW 2, 5.5)</b> , install contingency bolt, 11 turns (torque stall)  <u>NOTE:</u> Failure torque (cont bolt steel collars): 5.7 ft-lb <u>NOTE:</u> Failure torque (cont bolt itself): 10.2 ft-lb	3 cont bolts
10. NOBL 7 fails to remove from MINC -- Conductive Velcro strap will not release from NOBL	1. Pull harder 2. If no joy, cut strap as close to NOBL as possible using EMU scissors	

## WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
-- NOBL 7 will not come free of guides	<ol style="list-style-type: none"> <li>1. Perform visual inspection, look for possible debris causing interference</li> <li>2. Pull harder; jiggle to loosen</li> <li>3. If no joy, pull up on NOBL to determine if one or both sides are stuck</li> <li>4. If both sides stuck, remove contingency rails (2): <ul style="list-style-type: none"> <li>• Tether to rails</li> <li>• <b>PGT: B2, CCW 2, 5.5:</b> Release contingency fasteners (3 per rail), 9 turns</li> <li>• Remove NOBL (rails will slide out with NOBL, and will be free to float away)</li> </ul> </li> <li>5. Temp stow rail (TBD if coming inside)</li> </ol> <p><u>NOTE:</u> Contingency rail fastener breakaway torque = 2.2 ft-lb  <u>NOTE:</u> Failure torque = 4.35 ft-lb</p>	
11. NOBL 7 fails to install		
-- NOBL fails to seat/install on door	<ol style="list-style-type: none"> <li>1. Possible bent frame; re-shape by hand until it seats on door</li> <li>2. If no joy, attempt vent plug install and re-try NOBL seating</li> <li>3. If no joy, re-install NOBL in MINC (engage conductive Velcro strap); re-install Bay 8 MLI, avoiding contact with radiators</li> </ol>	Bay 7 Door must either have MLI or NOBL for survival
-- Vent plug fails to install	<ol style="list-style-type: none"> <li>1. Remove plug; inspect plug and hole for debris. If debris visible, attempt to clear, and re-try vent plug install</li> <li>2. If no joy, retrieve spare vent plug from MINC I-Beam and re-try installation</li> </ol>	2 plugs in opposite corners, both handles deployed to 90 degrees
-- Ground cap fails to install on J-hook	<ol style="list-style-type: none"> <li>1. Tap onto interface</li> <li>2. If no joy, install on adjacent hex bolt. If no joy, do not ground and put cap in stowage pouch</li> </ol>	

### FGS-2 on HST

1. FGS handhold will not release from fwd fixture		
-- Locking knob fails to pull up or pivot arm fails to swing	<ol style="list-style-type: none"> <li>1. Retrieve spare FGS handhold from SLIC port</li> </ol> <p style="text-align: center;">-OR-</p> <ol style="list-style-type: none"> <li>2. Loosen pivot bolt 4 turns CCW: <b>PGT=A3/10.5</b> with 5/32" (#10) allen extension (stbd TSA)</li> <li>3. Pull up on pivot arm and locking spool assembly and rotate 90 degrees to free FGS HH</li> <li>4. Re-install handhold and re-engage pivot bolt, 4 turns</li> </ol> <p><u>NOTE:</u> Failure Threshold: 13.2 ft-lb; Breakaway torque: 6.3 ft-lb</p>	2 of 2 latches reqd for landing
2. FGS-2 connectors fail to demate	<p>Retrieve PCU connector tool from MFR handle; re-attempt demate of connectors</p> <p><u>NOTE:</u> Significant cable memory</p>	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
3. FGS handhold fails to install on FGS-2 -- FGS Handhold does not fit over guide studs	<ol style="list-style-type: none"> <li>1. Remove handhold, rotate handhold 180 and re-attempt installation</li> <li>2. If no joy, remove interfering guide stud, re-attempt installation</li> <li>3. If no joy, retrieve contingency FGS handhold from SLIC/port, re-attempt installation</li> </ol> <p><u>NOTE:</u> Guide studs are torqued to 50 in-lb</p>	<p>3 of 4 zip nuts engaged on guide studs required for EVA on-orbit handling</p> <p>4 of 4 zip nuts engaged on guide studs required for landing</p>
-- Zip Nuts fail to mount to guide studs	<ol style="list-style-type: none"> <li>1. Engage zip nuts on other studs</li> <li>2. If necessary, remove HH, remove interfering guide stud</li> <li>3. Verify 3 zip nuts engaged</li> </ol> <p><u>NOTE:</u> Guide studs are torqued to 50 in-lb</p>	<p>3 of 4 zip nuts engaged on guide studs required for EVA on-orbit handling</p> <p>4 of 4 zip nuts engaged on guide studs required for landing</p>
4. A-Latch fails to disengage:		
-- No break-away (< 1/2 turn)	<ol style="list-style-type: none"> <li>1. Re-attempt using CMTL (SOPE) set to 45 (failure 57.1 ft-lb)</li> <li>2. If no joy, reconnect ground strap and connectors</li> </ol>	
-- FGS binds (1/2-22 1/2 turns)	<ol style="list-style-type: none"> <li>1. Reverse direction 1/2-3 turns at nominal PGT settings: (A3, 10.5) and re-attempt</li> <li>2. If no joy, re-attempt using <b>PGT: A6, CCW2, 30.5</b> (failure 57.1 ft-lb)</li> <li>3. If no joy, retrieve CMTL from SOPE and install onto ratchet; set to 45; attempt to drive past bind</li> <li>4. If no joy, fully re-engage A-latch; reconnect ground strap and connectors</li> </ol>	
-- No FGS motion (free spinning)	<ol style="list-style-type: none"> <li>1. Verify socket is inserted properly into the A-Latch housing and attempt to disengage</li> <li>2. If no joy, perform pull test and verify no SI motion; report status of A-LATCH lights (should be OFF), reconnect ground strap and connectors</li> </ol>	
5. A-Latch lights fail to illuminate	<ol style="list-style-type: none"> <li>1. IV: Verify L12U SSM WK LTS-ON</li> <li>2. Continue observing FGS motion</li> </ol>	

## FGS-2R in FSIPE

1. FSIPE lid fails to open	<p><u>Lid latch will not release</u></p> <ol style="list-style-type: none"> <li>1. Open latches in different sequence</li> <li>2. Set PGT to <b>A3/10.5</b> or EVA Ratchet/MTL to 10. Back off 7/16" contingency flexure bolt (7 turns CCW); Re-attempt opening latch</li> <li>3. If no joy, fully release 7/16" contingency flexure bolt, 12-15 total turns CCW</li> </ol> <p><u>NOTE:</u> Bolt and flexure will come free, no tether points</p>	<p>2 of 3 latches engaged reqd for landing</p>
2. A-Latch fails to disengage:		
-- No breakaway (< 1/2 turn)	<ol style="list-style-type: none"> <li>1. Re-attempt using <b>CMTL</b> (SOPE) set to <b>45</b></li> <li>2. If no joy, reconnect ground strap, close lid; contact MCC for additional torque increase workarounds</li> </ol> <p><u>NOTE:</u> Failure torque = 57.1 ft-lb</p>	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<p>-- FGS binds (1/2-22 ½ turns)</p>	<ol style="list-style-type: none"> <li>Reverse direction ½-3 turns at nominal PGT settings: <b>(A3, 10.5)</b> and re-attempt</li> <li>If no joy, re-attempt using <b>PGT: A6, CCW2, 30.5</b> (failure 57.1 ft-lb)</li> <li>If no joy, retrieve <b>CMTL</b> from SOPE and install onto ratchet; set to <b>45</b>; attempt to drive past bind</li> <li>If no joy, fully re-engage A-latch (minimum of 22 turns engaged reqd); reconnect ground strap</li> <li>If no joy, and A-latch is jammed (less than 22 turns of engagement), reference "A-Latch Override" and "D-Latch Override" procedure for FGS Removal below:</li> </ol> <p style="text-align: center;"><u>NOTE</u> Since the D-latch and A-latch are linked together, both latches must be released to free the instrument</p> <p><u>D-latch Override:</u></p> <ol style="list-style-type: none"> <li>Contact MCC for jettison options</li> <li>Rotate override release handles (2 inbd handles), 2-3 turns (30 in-lb)</li> <li>Pull on release handles (2) with ~ 20 lb of force (~6-8 inches to hard stop)</li> </ol> <p><u>A-latch Override:</u></p> <ol style="list-style-type: none"> <li>Contact MCC for jettison options</li> <li>Rotate override release handles (2 outbd handles), 2-3 turns (30 in-lb)</li> <li>Pull on release handles (2) with ~ 20 lb of force (~6-8 inches to hard stop)</li> <li>Remove FGS-2R from FSIPE (A-latch, D-latch, and linkage stay attached to FGS-2R); expect ~ 9 lb pull force resistance for both B and C latch</li> </ol> <p>If no joy with removal, perform B-Latch and C-Latch Disengagement Procedure below:</p> <p><u>NOTE:</u> B latch override is located on stbd side of FSIPE and C latch override is on the port side</p> <p><u>B and C Latch Disengagement</u></p> <ol style="list-style-type: none"> <li><b>EVA Ratchet with 6-in rigid</b> (no MTL): Release EVA hex head captive bolts (4 per latch) 9-11 total turns (max breakaway torque is 60.8 ft-lb)</li> <li>Remove FGS-2R (latch and mounting plate depart with SI); FSIPE can no longer be used to hold FGS-2R for landing</li> </ol>	
<p>-- No FGS motion (free spinning)</p>	<ol style="list-style-type: none"> <li>Verify socket is inserted properly into the A-Latch housing and attempt to disengage</li> <li>If no joy, perform pull test and verify no SI motion; report status of A-LATCH lights (should be OFF), reconnect ground strap</li> </ol>	
<p>3. FSIPE lid latch fails to close</p>	<p>Engage other latches and re-try</p>	<p>2 of 3 latches engaged reqd for landing</p>
<p>4. FSIPE ground strap fails to demate</p>	<p>Use PCU Connector Tool (MFR handle or A/L); re-attempt demate</p>	
<p>5. FSIPE ground strap fails to engage</p>	<ol style="list-style-type: none"> <li>Use PCU connector tool to mate (MFR handle or A/L)</li> <li>If no joy, contact MCC</li> </ol>	<p>Grounding is reqd for landing</p>



# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<b>FGS-2R on HST</b>		
1. -- No A-latch engagement (free-spinning)	<ol style="list-style-type: none"> <li>1. Verify socket is inserted properly into the A latch housing and re-attempt A-latch engagement</li> <li>2. If no joy, pull FGS out 1-3 inches; re-insert and re-attempt A-latch engagement</li> <li>3. If no joy, remove FGS-2R completely and inspect FGS-2R and bay for obstruction/damage; re-attempt installation</li> </ol>	22 turns
2. HST A-Latch fails to engage:		
-- 0-3 turns	<ol style="list-style-type: none"> <li>1. Reverse direction and disengage A-latch at nominal PGT settings; remove FGS 1-3 inches from telescope and re-insert to re-attempt A-latch engagement</li> <li>2. If no joy, remove FGS completely, inspect bay and both A-latch halves; re-attempt installation</li> <li>3. If no joy, contact MCC</li> </ol>	22 turns
-- 3-22 turns	<ol style="list-style-type: none"> <li>1. Reverse direction at nominal settings for 1-2 turns (to clear jam); re-attempt A-latch engagement</li> <li>2. If no joy, change <b>PGT=A6/30.5</b> and re-attempt A-latch engagement</li> <li>3. If no joy, take <b>PGT-OFF, RCW/30.5</b>: Re-attempt engagement manually</li> <li>4. If no joy, use <b>EVA Ratchet/MTL=38</b> and re-attempt</li> </ol> <p><u>NOTE</u>: Failure torque: 57.1 ft-lb (hex ball shear)</p>	22 turns
-- A-Latch light fails to extinguish	Verify FGS motion during latch engagement; verify minimum torque and turn count on A-latch; if nominal, ignore lights and continue	22 turns
3. FGS-2R connector fails to mate	Reference connector section of cribsheet	All connectors and grnd strap

## FGS-2 in FSIPE

1. FSIPE A-Latch Fails to Engage -- 0-3 turns	<ol style="list-style-type: none"> <li>1. Verify socket is inserted properly into the A latch housing and attempt to disengage</li> <li>2. Reverse direction and disengage A-latch at nominal PGT settings; remove FGS 1-3 inches from FSIPE and re-insert to re-attempt A-latch engagement</li> <li>3. If no joy, remove FGS completely, inspect bay and both A-latch halves and D-latch; re-attempt installation</li> <li>4. If no joy, contact MCC (possible latch contingency release)</li> </ol> <p><u>NOTE</u>: Failure torque = 57.1 ft-lb</p> <p style="text-align: center;"><u>NOTE</u> Since the D-latch and A-latch are linked together, both latches must be released to free the instrument</p> <p><u>D-latch Override</u>:</p> <ol style="list-style-type: none"> <li>1. Contact MCC for jettison options</li> <li>2. Rotate override release handles (2 inbd handles), 2-3 turns (30 in-lb)</li> <li>3. Pull on release handles (2) with ~ 20 lb of force (~6-8 inches to hard stop)</li> </ol> <p><u>A-latch Override</u>:</p> <ol style="list-style-type: none"> <li>1. Contact MCC for jettison options</li> <li>2. Rotate override release handles (2 outbd handles), 2-3 turns (30 in-lb)</li> </ol>	16 turns
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# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
	<ol style="list-style-type: none"> <li>3. Pull on release handles (2) with ~ 20 lb of force (~6-8 inches to hard stop)</li> <li>4. Remove FGS-2 from FSIPE (A-latch, D-latch, and linkage stay attached to FGS-2); expect ~ 9 lb pull force resistance for both B and C latch</li> </ol>	
<p>-- 3-22 turns</p>	<ol style="list-style-type: none"> <li>1. Reverse direction at nominal torque for 1-2 turns (to clear jam); re-attempt A-latch engagement</li> <li>2. If no joy, re-try using: <b>PGT: A6, CW 2, 30.5</b></li> <li>3. If no joy, re-try with Ratchet/MTL=38</li> <li>4. If no joy, and A-latch is jammed, disengage A-latch and D-latch</li> </ol> <p style="text-align: center;"><u>NOTE</u> Since the D-latch and A-latch are linked together, both latches must be released to free the instrument</p> <p><u>D-latch Override:</u></p> <ol style="list-style-type: none"> <li>1. Contact MCC for jettison options</li> <li>2. Rotate override release handles (2 inbd handles), 2-3 turns (30 in-lb)</li> <li>3. Pull on release handles (2) with ~ 20 lb of force (~6-8 inches to hard stop)</li> </ol> <p><u>A-latch Override:</u></p> <ol style="list-style-type: none"> <li>1. Contact MCC for jettison options</li> <li>2. Rotate override release handles (2 outbd handles), 2-3 turns (30 in-lb)</li> <li>3. Pull on release handles (2) with ~ 20 lb of force (~6-8 inches to hard stop)</li> <li>4. Remove FGS-2 from FSIPE (A-latch, D-latch, and linkage stay attached to FGS-2); expect ~ 9 lb pull force resistance for both B and C latch</li> </ol> <p>If no joy with removal, perform B-Latch and C-Latch Disengagement Procedure below:</p> <p><u>NOTE:</u> B latch override is located on stbd side of FSIPE and C latch override is on the port side</p> <p><u>B and C Latch Disengagement</u></p> <ol style="list-style-type: none"> <li>1. <b>EVA Ratchet with 6-in rigid</b> (no MTL): Release EVA hex head captive bolts (4 per latch) 9-11 total turns (max breakaway torque is 60.8 ft-lb)</li> <li>2. Remove FGS-2 (latch and mounting plate depart with SI); FSIPE can no longer be used to hold FGS-2 for landing</li> </ol> <p><u>NOTE:</u> Failure torque = 57.1 ft-lb</p>	<p>16 turns</p>
<p>-- No FGS motion (A-latch not engaging, free-spinning)</p>	<ol style="list-style-type: none"> <li>1. Verify socket fully engaged on bolt head</li> <li>2. Pull FGS out 1-3 inches; re-insert and re-attempt A-latch engagement</li> <li>3. If no joy, remove FGS-2 completely and inspect FGS-2 and bay for obstruction/damage; re-attempt installation</li> </ol>	
<p>-- A-Latch light fails to extinguish</p>	<p>Verify FGS motion during latch engagement; verify minimum torque and turn count on A-latch; if nominal, ignore lights and continue</p>	
<ol style="list-style-type: none"> <li>2. FSIPE ground strap fails to attach to FGS</li> </ol>	<ol style="list-style-type: none"> <li>1. Use PCU connector tool to mate (MFR handle or A/L)</li> <li>2. If no joy, contact MCC</li> </ol>	<p>Grounding is reqd for landing</p>

## WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
3. FSIPE door latch fails to close	Engage latches in different sequence	2 of 3 latches engaged reqd for landing
4. FGS handhold fails to stow on fwd fixture		
-- Locking knob fails to push down to locked position	<ol style="list-style-type: none"> <li>1. Check for interferences, re-attempt ¼-turn latch</li> <li>2. If no joy, contact MCC: <ul style="list-style-type: none"> <li>➤ Bring handhold inside A/L</li> <li style="text-align: center;">OR</li> <li>➤ Tether handhold to fwd fixture for landing (open work)</li> </ul> </li> </ol>	2 of 2 latches reqd for landing

### SOPE/NOPE/COPE

1. SOPE/NOPE/COPE lid latch fails to open		
-- Lid latch will not release	<ol style="list-style-type: none"> <li>1. Release/re-engage other latches as reqd and re-try failed latch</li> <li>2. If no joy, and no other latches are failed, flip T-handle to opposite side and actuate 7/16" hex head (captive) 90 deg CCW using <b>EVA ratchet, MTL = 23</b></li> <li>3. If no joy, and no other latches are failed, tether to T-handle, release 4 captive 7/16" fasteners, 6-8 turns CCW using <b>PGT = A3/10.5</b> or <b>EVA Ratchet, MTL = 10</b>; slide latch assembly toward hinges and lift to remove</li> </ol> <p><u>Failure Threshold:</u> Handle hex I/F = 27.6 ft-lb (pawl)  <u>Failure Threshold:</u> Latch captive fasteners 15.5 ft-lb</p>	Any 3 of 5 combination of cont bolts or latches
2. SOPE/NOPE/COPE lid latch fails to close		
-- Lid latch fails to close	<ol style="list-style-type: none"> <li>1. Release/re-engage other latches as reqd and re-try failed latch</li> <li>2. If no joy, and no other latches are failed, flip T-handle down and re-try using <b>EVA ratchet, MTL = 23</b> on 7/16" hex interface, stow T-handle in goal post</li> <li>3. If no joy, engage other lid latches/cont bolts as reqd to meet minimum safe to land reqts</li> </ol> <p><u>Contingency Bolt Install Steps</u></p> <ol style="list-style-type: none"> <li>1. Open MLI flap to expose cont bolt</li> <li>2. <b>PGT: (B2, CW 2, 5.5)</b>, install contingency bolt, 11 turns (torque stall)</li> </ol> <p><u>Failure torque</u> (cont bolts): 5.7 ft-lb</p>	Any 3 of 5 combination of cont bolts or latches

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<b>LOPE</b>		
1. LOPE lid latch fails to open -- Lid latch fails to release	1. Release/re-engage other latches as reqd and re-try failed latch 2. If no joy, flip T-handle to opposite side and actuate 7/16" hex head (captive) 90 deg CCW using <b>EVA ratchet, MTL = 38</b> 3. If no joy, and no other latches are failed, tether to T-handle, release 4 captive 7/16" fasteners, 8-9 turns CCW using <b>PGT = B3/5.5</b> or <b>EVA Ratchet, MTL = 5</b> ; slide latch assembly toward hinges and lift to remove  <u>Failure Threshold:</u> Handle hex I/F = 56.5 ft-lb (pawl). <u>Failure Threshold:</u> Latch captive fasteners = 3 ft-lb  <u>NOTE:</u> If failed latch is long T-handle latch closest to FSIFE lid, the following additional step is reqd to remove the latch  1. <b>PGT = B3/CCW 2/5.5 (TBD)</b> or <b>EVA Ratchet CCW, MTL = 5</b> : Release EVA captive override pivot bolt on side of latch rod, 4 turns. Swing pivot assy (with bolt) clear of rod. Remove entire latch with rod and pawl, straight up and away from ATM; temp stow  <u>NOTE:</u> Pivot assy bolt failure torque is 3 ft-lb	Any 3 of 5 combination of cont bolts or latches
2. LOPE lid latch fails to close -- Lid latch fails to close	1. Release/re-engage other latches as reqd and re-try failed latch 2. If no joy, flip T-handle down and re-try using <b>EVA ratchet, MTL = 38</b> on 7/16" hex interface, stow T-handle into goal post 3. If no joy, engage other lid latches/cont bolts as reqd to meet minimum safe to land reqts  <u>Contingency Bolt Install Steps</u> 1. Open MLI flap to expose cont bolt 2. <b>PGT: (B2, CW 2, 5.5)</b> , install contingency bolt, 11 turns (torque stall)  Failure torque (cont bolts): 5.7 ft-lb	Any 3 of 5 combination of cont bolts or latches

## TRANSPORT MODULE (inside OPEs)

1. Transport Module lid latch fails to release (original design): <ul style="list-style-type: none"> <li>• RSU</li> <li>• ECU</li> </ul>	1. Flip T-handle to opposite side and re-try using <b>EVA ratchet MTL = 10</b> , CCW on 7/16" hex interface, ¼ turn 2. If no joy, tether to T-handle, release (4) captive 7/16" hex lid latch fasteners, 6-8 turns CCW using <b>PGT = A2/2.5</b> or <b>EVA Ratchet, MTL = 2.0</b> Slide latch toward hinge and lift to remove  <u>Failure Threshold:</u> Handle hex I/F = 22.0 ft-lb (pawl) <u>Failure Threshold:</u> TM 4 captive fasteners = 3 ft-lb	
2. Transport module lid latch fails to engage: <ul style="list-style-type: none"> <li>• RSU</li> <li>• ECU</li> </ul>	1. If no joy, flip T-handle down and re-try using <b>EVA ratchet, MTL = 10</b> on 7/16" hex interface, stow T-handle into goal post 2. If no joy, bring ORU inside middeck  <u>Failure Threshold:</u> Handle hex I/F = 22.0 ft-lb (pawl)	1 of 1

# WORKAROUNDS CRIBSHEET (Cont)

**NOTE**

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<p>3. Transport Module (s) lid latch fails to release (high-strength design):</p> <ul style="list-style-type: none"> <li>• STIS CTE-R (1) (SOPE)</li> <li>• LVPS-R (2) (LOPE)</li> <li>• CEB-R (2) (LOPE)</li> <li>• ACS 4 Card Transport Enclosure (2) (NOPE)</li> <li>• STIS FCP Enclosure (2)</li> </ul>	<ol style="list-style-type: none"> <li>1. Release/re-engage other latches as reqd and re-try failed latch</li> <li>2. Flip T-handle to opposite side and re-try using <b>EVA ratchet MTL = 38</b>, CCW on 7/16" hex interface, ¼ turn</li> <li>3. If no joy, tether to T-handle, release (4) captive 7/16" hex lid latch fasteners, 6-8 turns CCW using <b>PGT = A2/2.5 or EVA Ratchet, MTL = 2.0</b> Slide latch toward hinge and lift to remove</li> </ol> <p><u>Failure Threshold:</u> Handle hex I/F = 78.1 ft-lb (pawl). TM 4 captive fasteners = 3 ft-lb</p>	
<p>4. Transport module lid latch fails to engage (high-strength design):</p> <ul style="list-style-type: none"> <li>• STIS CTE-R (has 1 latch) (SOPE)</li> <li>• LVPS-R (has 2 latches) (LOPE)</li> <li>• CEB-R (has 2 latches) (LOPE)</li> <li>• ACS 4 Card Transport Enclosure (has 2 latches) (NOPE)</li> <li>• STIS FCP Enclosure (has 2 latches)</li> </ul>	<ol style="list-style-type: none"> <li>1. Release/re-engage other latches as reqd and re-try failed latch</li> <li>2. If no joy, flip T-handle down and re-try using <b>EVA ratchet, MTL = 38</b> on 7/16" hex interface, stow T-handle into goal post</li> <li>3. If no joy, bring ORU inside middeck</li> </ol> <p><u>Failure Threshold:</u> Handle hex I/F = 78.1 ft-lb (pawl)</p> <p><u>Contingency Bolt Install Steps (FCP Enclosure)</u></p> <ol style="list-style-type: none"> <li>1. Open MLI flap to expose cont bolt</li> <li>2. <b>NOTE:</b> Manually start bolt; <b>PGT: (A2, CW2, 5.5)</b>, install contingency bolt, 14 turns (torque stall)</li> </ol> <p><u>NOTE:</u> Nominal engagement torque: 7.5 ft-lb <u>NOTE:</u> Failure torque (cont bolts): 9.2 ft-lb</p>	<p>1 of 1 latch</p> <p>OR</p> <p>1 of 2 latches</p> <p>OR</p> <p>FCP Enclosure (2 of 4 cont bolts or latches)</p>

**ATM 1 and 2**

<p>1. ATM 2 lid latch fails to release</p>	<ol style="list-style-type: none"> <li>1. Release/re-engage other latches as reqd and re-try failed latch</li> <li>2. Flip T-handle to opposite side and re-try using <b>EVA ratchet MTL = 38</b>, CCW on 7/16" hex interface, ¼ turn</li> <li>3. If no joy, tether to T-handle, release (4) captive 7/16" hex lid latch fasteners, 6-8 turns CCW using <b>PGT = A2/2.5 or EVA Ratchet, MTL = 2.0</b> Slide latch toward hinge and lift to remove</li> </ol> <p><u>Failure Threshold:</u> Handle hex I/F = 78.1 ft-lb (pawl). TM 4 captive fasteners = 3 ft-lb</p>	
<p>2. ATM 2 lid latch fails to engage</p>	<ol style="list-style-type: none"> <li>1. Release/re-engage other latches as reqd and re-try failed latch</li> <li>2. If no joy, flip T-handle down and re-try using <b>EVA ratchet, MTL = 38</b> on 7/16" hex interface, stow T-handle into goal post</li> <li>3. If no joy, install contingency bolt as reqd: <b>PGT: B2, CW 1, 5.5:</b> Install contingency bolt, 9 turns</li> </ol> <p><u>Failure threshold of cont bolt:</u> 13.8 ft-lb</p>	<p><u>ATM-2:</u> Any 4 of 6 latches/cont bolts combo (use bolt closest to failed latch)</p>
<p>3. ATM 1 lid latch fails to release</p>	<ol style="list-style-type: none"> <li>1. Release/re-engage other latches as reqd and re-try failed latch</li> <li>2. Flip T-handle to opposite side and re-try using <b>EVA ratchet MTL = 38</b>, CCW on 7/16" hex interface, ¼ turn</li> <li>3. If no joy, tether to T-handle, release (4) captive 7/16" hex lid latch fasteners, 6-8 turns CCW using <b>PGT = A2/2.5 or EVA Ratchet, MTL = 2.0</b> Slide latch toward hinge and lift to remove</li> </ol> <p><u>Failure Threshold:</u> Handle hex I/F = 56.5 ft-lb (pawl) <u>Failure Threshold:</u> TM 4 captive fasteners = 3 ft-lb</p>	

## WORKAROUNDS CRIBSHEET (Cont)

### NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
4. ATM 1 lid latch fails to engage	<ol style="list-style-type: none"> <li>1. Release/re-engage other latches as reqd and re-try failed latch</li> <li>2. If no joy, flip T-handle down and re-try using <b>EVA ratchet, MTL = 38</b> on 7/16" hex interface, stow T-handle into goal post</li> <li>3. If no joy, install contingency bolt as reqd: <b>PGT: A2, CW 1, 5.5</b>: Install contingency bolt, 11 turns</li> </ol> <p><u>Failure threshold</u> of cont bolt: 13.8 ft-lb</p>	<b>ATM-1</b> : Any 2 of 4 latches/cont bolts combo (use bolt closest to failed latch)

### TA

1. TA fails to deploy		
-- Knob fails to loosen	<ol style="list-style-type: none"> <li>1. Ensure J-hook unlocked</li> <li>2. <b>PGT - OFF; (RCCW, MTL: 5.5)</b>: Drive 7/16" override bolt on knob head until joint is free to rotate</li> <li>3. If no joy, swap TAs</li> </ol> <p><u>NOTE</u>: Knob failure threshold: 10.1 ft-lb</p>	
-- Knob fails to tighten	<ol style="list-style-type: none"> <li>1. Ensure J-hook unlocked</li> <li>2. <b>PGT - OFF; (RCW, MTL: 5.5)</b>: Drive 7/16" override bolt on knob head until joint is free to rotate</li> <li>3. If no joy, remove TA from PFR socket and stow in middeck at earliest convenience. Use other TA if reqd</li> </ol> <p><u>NOTE</u>: Knob failure threshold: 10.1 ft-lb</p>	
2. TA fails to stow		
-- Knob fails to loosen	<ol style="list-style-type: none"> <li>1. Ensure J-hook unlocked</li> <li>2. <b>PGT - OFF; (RCCW, MTL: 5.5)</b>: Drive 7/16" override bolt on knob head until joint is free to rotate</li> <li>3. If no joy, either articulate other joints to clear payload bay envelope or remove TA from PFR socket and stow in middeck</li> </ol> <p><u>NOTE</u>: Knob failure threshold: 10.1 ft-lb</p>	
-- Knob fails to tighten	<ol style="list-style-type: none"> <li>1. Ensure J-hook unlocked</li> <li>2. <b>PGT - OFF; (RCW, MTL: 5.5)</b>: Drive 7/16" override bolt on knob head until joint is free to rotate</li> <li>3. If no joy, remove TA from PFR socket and stow in middeck</li> </ol> <p><u>NOTE</u>: Knob failure threshold: 10.1 ft-lb</p>	
3. PIP Pin is Stuck in TA Socket	<ol style="list-style-type: none"> <li>1. If PIP pin button will not depress, attempt to free it using Hammer (port TSA) and Probe (port TSA) combination. Stow PIP pin on TA if secure. Otherwise, cut lanyard and stow PIP pin in trash bag. Retrieve spare PIP pin from <b>ORUC (fwd/stbd) PIP pin bracket (#3 or 4)</b> for subsequent TA operations</li> <li>2. If no joy, disassemble TA using procedure below in block 4, step 2</li> </ol>	
4. Hex Probe is Stuck in TA Socket	<ol style="list-style-type: none"> <li>1. Articulate TA joints to clear HST/FSS pivot envelope and payload bay envelope; report settings to MCC</li> <li>2. If no joy, tether to TA handle. <b>PGT=A2/2.5</b>: Release EVA override non-captive bolts (2), 9 turns (located above B joint.) Stow bolts in trash bag. Separate TA and stow handle in middeck (there are no other loose parts)</li> </ol> <p><u>NOTE</u>: EVA override bolt failure threshold is 7.6 ft-lb</p>	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<b>LGAP-C</b>		
<p>1. LGAP-C Fails to Remove from MULE stowage bracket (captive lock pin fails to release)</p>	<p>1. Tether to captive lock pin; <b>PGT = B3, CCW 2, 5.5:</b> Release captive lock pin contingency 7/16" hex bolts (2), 8 turns. Bolts are captive to lock pin T-handle assembly. Stow captive lock pin in trash bag</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>The following torque may shear captive lock pin bolts; be careful of sharp edges and capture loose hardware to stow in trash bag</p> </div> <p>2. If no joy, increase PGT torque to: <b>A2 (5ft-lb), CCW 2, 5.5;</b> re-attempt release of captive lock pin bolts</p> <p><u>NOTE:</u> Failure threshold: 3.7 ft-lb. Initial break torque: 1.7 ft-lb</p> <p><u>NOTE:</u> A PIP pin replacement will be reqd for landing (#3 for inbd pin and #4 for outbd pin)</p>	
<p>2. LGAP-C Fails to Install onto HST (PIP pin fails to install)</p>	<p>Retrieve spare PIP pin #2 from ORUC PIP pin bracket; install. Stow failed PIP pin in LGAP-C MLI pouch</p>	
<p>3. LGA Cover Fails to Remove from HST (PIP pin fails to release)</p>	<p>1. Retrieve hammer and probe from port TSA. Attempt to drive out PIP pin using hammer. Use probe as reqd to push tip of PIP pin in to release pin</p> <p>2. If no joy, check MCC (Leave cover in deployed or stowed config?)</p> <p><u>NOTE:</u> LGAP-C PIP pin has drive-out tip on end of PIP pin</p> <p><u>NOTE:</u> If no joy with LGAP-C removal, leave installed on HST. It was designed to be RF transparent</p>	
<p>4. LGA Cover Fails to Stow on MULE stowage bracket (captive lock pin will not engage)</p>	<p>1. Identify which captive lock pin will not engage (inbd vs outbd). Retrieve spare PIP pin #3 for inbd lock pin, OR PIP pin #4 for outbd lock pin - from ORUC PIP pin bracket. Tether to captive lock pin; <b>PGT: B3, CCW 2, 5.5:</b> Release captive lock pin contingency 7/16" hex bolts (2), 8 turns. Bolts are captive to lock pin T-handle assembly. Stow captive lock pin in trash bag. Install spare PIP pin as reqd, install velcro flag</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>The following torque may shear captive lock pin bolts; be careful of sharp edges and capture loose hardware to stow in trash bag</p> </div> <p>2. If no joy, increase PGT torque to: <b>A2 (5 ft-lb), CCW 2, 5.5;</b> re-attempt release of captive lock pin bolts</p> <p><u>NOTE:</u> Failure threshold: 3.7 ft-lb. Initial break torque: 1.7 ft-lb</p> <p><u>NOTE:</u> A PIP pin replacement will be reqd for landing</p>	<p>2 of 2 captive lock pins or PIP pins</p>

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
<b>ORUC GENERIC</b>		
1. IMAX camera garage door fails to open (from fully closed)	<p><b>PGT with RAD</b> (port TSA) and <b>2-in rigid</b> (port TSA): <b>A1, CW 2, 2.5</b>; Drive IMAX override bolt, 32 turns (at bolt interface) to fully open garage door</p> <p><u>NOTE</u>: To get 32 turns at bolt interface using RAD, PGT must be driven 64 turns (due to RAD turn ratio)</p> <p><u>NOTE</u>: Peak torque recorded in 1G is 6-7 in-lb at beginning of travel to open door, decreasing to very little at end of travel. Expected on-orbit running torque is 1-2 in-lb</p> <p><u>NOTE</u>: 32 turns is minimum number required to open door enough for IMAX recording, hard stop is at 33.5 turns</p> <p><u>NOTE</u>: Contact MCC for failure torque; failure mode: Bolt head will shear off</p>	
2. IMAX camera garage door fails to close (from fully opened)	<p><b>PGT with RAD</b> (port TSA) and <b>2-in rigid</b> (port TSA): <b>A1, CCW 2, 2.5</b>; Drive IMAX override bolt, 32 turns (at bolt interface) to fully close garage door</p> <p><u>NOTE</u>: To get 32 turns at bolt interface using RAD, PGT must be driven 64 turns (due to RAD turn ratio)</p> <p><u>NOTE</u>: Peak torque of 6-7 in-lb at beginning of travel to close door, decreasing to very little at end of travel. Expected on-orbit running torque is 1-2 in-lb</p> <p><u>NOTE</u>: 32 turns is minimum number required to close door enough for IMAX operations, hard stop is at 33.5 turns</p> <p><u>NOTE</u>: Contact MCC for failure torque; failure mode: Bolt head will shear off</p>	

**SLIC**

1. WFC handhold (spare) fails to remove from SLIC		
-- Captive lock pin fails to release	<ol style="list-style-type: none"> <li>1. Re-try disengaging lock pin</li> <li>2. If no joy, <b>PGT: B3, CCW 2, 5.5</b>; release failed 7/16-in captive lock pin bolts (2), 8 turns. Bolts are captive to lock pin T-handle assembly</li> <li>3. For landing, retrieve spare PIP pin #5 from ORUC bracket and install through handhold onto SLIC bracket</li> </ol> <p><u>NOTE</u>: Failure threshold is 3.7 ft-lb. Initial break torque is 1.7 ft-lb</p>	2 of 2
2. WFC handhold (spare) fails to re-install onto SLIC		
-- Captive lock pin fails to engage	<ol style="list-style-type: none"> <li>1. Re-try engaging lock pin</li> <li>2. If no joy, <b>PGT: B3, CCW 2, 5.5</b>; release failed 7/16-in captive lock pin bolts (2), 8 turns. Bolts are captive to lock pin T-handle assembly</li> <li>3. For landing, retrieve spare PIP pin #5 from ORUC bracket and install through handhold onto SLIC bracket</li> </ol> <p><u>NOTE</u>: Failure threshold is 3.7 ft-lb. Initial break torque is 1.7 ft-lb</p>	2 of 2



# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly	Action	Min Rqmt
3. FGS handhold (spare) fails to remove from SLIC -- Locking knob fails to pull up or pivot arm fails to swing	1. Loosen pivot bolt 4 turns CCW: <b>PGT=A3/10.5</b> with 5/32" (#10) allen extension (stbd TSA) 2. Pull up on pivot arm and locking spool assembly and rotate 90 degrees to free FGS HH 3. Re-install handhold and re-engage pivot bolt, 4 turns	2 of 2 latches reqd for landing
4. FGS handhold (spare) fails to install on SLIC -- Locking knob fails to push down to locked position	1. Check for interferences, re-attempt ¼-turn latch 2. If no joy, bring handhold inside A/L	2 of 2 latches reqd for landing
5. Battery Extraction Tool fails to release from SLIC -- Captive lock pin fails to release	1. Re-try disengaging lock pin 2. If no joy, <b>PGT: B3, CCW 2, 5.5</b> ; release failed 7/16-in captive lock pin bolts (2), 8 turns. Bolts are captive to lock pin T-handle assembly  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;"><b>CAUTION</b></p> <p style="text-align: center;">The following torque may shear captive lock pin bolts; be careful of sharp edges and capture loose hardware to stow in trash bag</p> </div> 3. If no joy, increase PGT torque to: <b>A2 (5ft-lb), CCW 2, 5.5</b> ; re-attempt release of captive lock pin bolts 4. For landing, retrieve spare PIP pin #2 from ORUC bracket and install through handhold onto SLIC bracket  <u>NOTE:</u> Failure threshold is 3.7 ft-lb. Initial break torque is 1.7 ft-lb	2 of 2
6. Battery Extraction Tool fails to install on SLIC -- Captive lock pin fails to engage	1. Re-try engaging lock pin 2. If no joy, <b>PGT: B3, CCW 2, 5.5</b> ; release failed 7/16-in captive lock pin bolts (2), 8 turns. Bolts are captive to lock pin T-handle assembly  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;"><b>CAUTION</b></p> <p style="text-align: center;">The following torque may shear captive lock pin bolts; be careful of sharp edges and capture loose hardware to stow in trash bag</p> </div> 3. If no joy, increase PGT torque to: <b>A2 (5ft-lb), CCW 2, 5.5</b> ; re-attempt release of captive lock pin bolts 4. For landing, retrieve spare PIP pin #2 from ORUC bracket and install through handhold onto SLIC bracket  <u>NOTE:</u> Failure threshold is 3.7 ft-lb. Initial break torque is 1.7 ft-lb	2 of 2
7. Spare Fuse Plug fails to remove	1. Retrieve redundant spare 2. If no joy, contact MCC  <u>NOTE:</u> There are 2 fuse plugs each for P15, P16, & P17. There is only 1 each for P25, P26, P27, & P28	
8. COSTAR Y-Harness (spare) pouch fails to open	Cut the strap with EMU scissors	
9. Handrail Cover Caddies 1/4-turn latch fails to open	Cut the soft enclosure pouch lid that contains the latch. Release the Velcro cover restraint inside the pouch and remove caddy	

# WORKAROUNDS CRIBSHEET (Cont)

NOTE

Only one fastener per system may be failed without a GO from MCC

Anomaly

Action

Min Rqmt

**BAPS SUPPORT POST**

<p>1. BAPS post fails to unstow from launch cradle (PIP pin won't release from clevice)</p>	<p>1. Attempt to reduce system preload: Remove EVA override PIP pin, rotate handle, install PIP pin with EVA handle in UNLOCK posn (white-white)                  2. Attempt to remove clevice PIP pin. If no joy, attempt PIP pin removal using hammer and probe (port TSA)                  3. After BAPs post unstowed, remove EVA override PIP pin, rotate handle, re-install PIP pin with EVA handle in LOCK posn (black-black)</p>	
<p>2. BAPS post center PIP pin fails to remove</p>	<p>Drive Preload Release Bracket (PRB) CW in 1/4 turn increments with EVA Ratchet, MTL 23 (running torque 12.5 ft-lb), 7/16 ext while attempting to remove center PIP pin. If no joy, remove clevis PIP pin and then remove center pins</p>	
<p>3. BAPS post center PIP pin fails to install</p>	<p>If center holes aligned, attempt undersized PIP pin (ORUC bracket #8 &amp; #9)                  If clevis PIP pin will rotate (no preload),  <u>Post Too Short:</u>                  - <b>PGT: A6, CW2, 23.5</b>; Drive PRB CW while attempting center pins                  - If no joy, reset PRB to launch config (alignment mark - aft)                      IV: Pivot down 60 sec                      IV: Pivot up (30 sec past movement stops)                      EV: Attempt pin insertion                  - If no joy, perform servicing activities utilizing load mitigation techniques</p> <p>If clevis PIP pin will NOT rotate (preload),  <u>Post Too Long:</u>                  - <b>PGT: A6, CCW2, 23.5</b>; Drive PRB CCW while attempting center pins                  - If no joy:                      IV: Pivot down 60 sec                      EV: Remove post, attempt center pin insertion                  If no joy, use undersize pins or leave post unpinned; pivot up and install the post with the pivoter at 90 degrees by driving the PRB</p> <p><u>Rotary Misalignment:</u>                  - Use undersize pins</p>	

# ASLR KIT INSTALLATION

## ASLR-S INSTALLATION

1. Pivot latch bolt > 35 degrees

### NOTE

Reference ASLR TOOL ACCESS OPTIONS  
for tool and torque setting

2. Install ASLR-S; **PGT: (A4, CW2, 23.5)**: Engage mounting bolt 2.5+ turns
3. Remove PIP pin; deploy swing arm
4. Install PIP pin
5. **PGT: (B4, CW2, 23.5)**: Engage activation bolt 10-14 turns until latch body is preloaded against PIP pin

## ASLR-H (AXIAL) OR ASLR-H (FGS) INSTALLATION

1. Remove handle latch PIP pin; pivot latch bolt to 90 degrees
2. Install ASLR-H and PIP pin

### NOTE

Reference ASLR TOOL ACCESS OPTIONS  
for tool and torque setting

3. **PGT: (B4, CW2, 23.5)**: Engage activation bolt 13-16 turns until fork shoulder is preloaded against door latch fitting

## CRIBSHEET

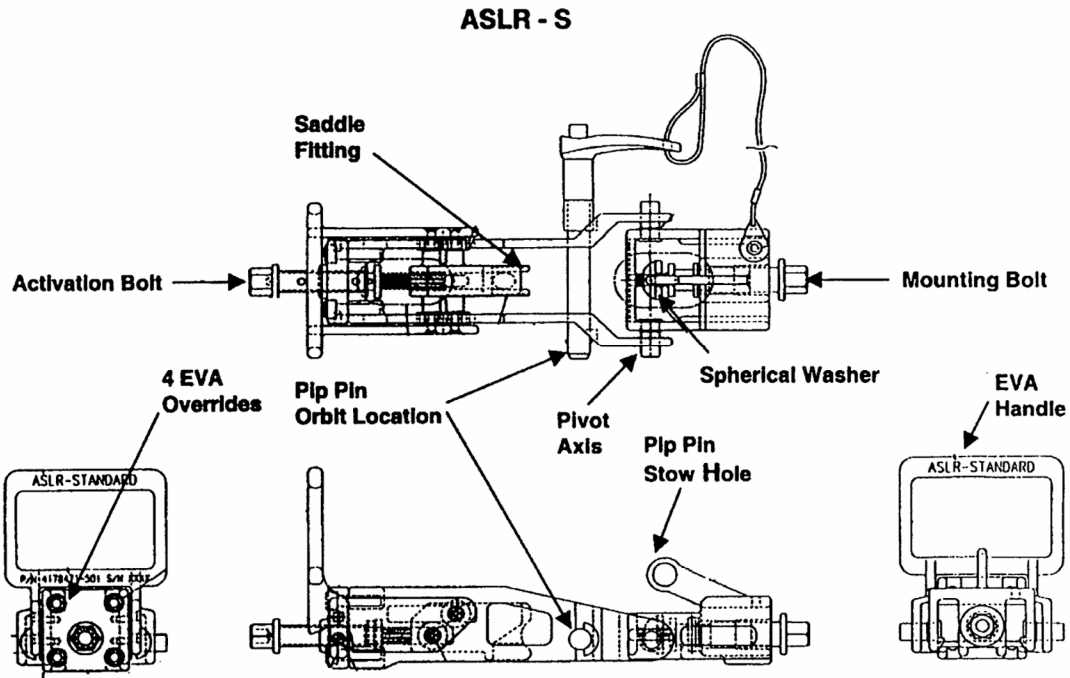
Anomaly	Action
1. ASLR fails to retrieve from ORUC aft	Tether to slide lock. Release captive override bolts (2) 12 turns, <b>PGT: A2, CCW 2, 5.5 w/ 7/16</b>
2. ASLR-S fails to install	
- Fails to seat into bathtub fitting	Verify mounting bolt is backed out. If back out req'd, use <b>PGT: A2, CCW 2, 5.5</b> . If no joy, use spare
- Mounting bolt fails to tighten	Use spare ASLR
- PIP pin fails to remove	Disengage mounting bolt 2.5 turns, <b>PGT: A2, CCW 2, 5.5</b> . Replace ASLR with spare
- Latch bolt fails to pivot up	If req'd, engage soft stop, <b>Ratchet w/ MTL 2 &amp; 5/16 ext</b> and <b>PGT: RCW (√PWR OFF)</b> (if req'd to react load)
- Swing arm fails to rotate to final position	If activation bolt not fully retracted, stow swing arm & engage pip pin, retract using MTL 2 to hardstop. If no joy, use MTL 5 but do not hit hardstop. If ASLR misaligned, loosen mounting bolt: <b>A2, CCW 2, 5.5</b> ; re-align and re-torque
- Activation bolt fails to seat against saddle	Back out activation bolt, inspect re-try
3. ASLR-H fails to install	
- Swing arm fails to rotate to final position	Verify bolt retracted 1 inch. If retraction req'd, use <b>PGT: A4, CCW 2, 23.5</b> . If no joy, retrieve spare ASLR-H
- Activation bolt fails to seat against handle	Back out activation bolt, inspect re-try

# ASLR INFORMATION

## AFT SHROUD DOOR LATCH TORQUE REQUIREMENT

	RUNNING TORQUE (FT-LB)				
	< 9	9-15.5	15.5-23	23-30.5	> 30.5 or Sheared
Seating torque (ft-lb)	17	23	30.5*	N/A	N/A
ASLR Desired	NO	NO	YES	YES	YES
ASLR Required	NO	NO	NO	YES	YES

\*Manual wrench w/MTL required



## ASLR TOOL ACCESS OPTIONS

Door	Latch	ASLR Interface	PGT=A5/15.5 + RAD + 2-in	PGT=A5/15.5 + RAD + 6-in	PGT=A5/15.5 + RAD + Short Adj	PGT=A5/15.5 + RAD + Long Adj	PGT=A4/23.5 + Long Adj	PGT=A4/23.5 + Short Adj	PGT=A4/23.5 + 6-in	PGT=A4/23.5 + 2-in
-V2 Aft Shroud	Top	Attachment (R)	OK	No Joy	Doable	Doable	Doable	Doable	No Joy	No Joy
		Activation (L)	OK	Doable	Doable	Doable	Doable	Doable	No Joy	No Joy
	Handle	Activation (R)	OK	Doable	OK	OK	OK	OK	No Joy	No Joy
		Bottom Center	Attachment (R)	OK	No Joy	OK	OK	Doable	Doable	No Joy
	Activation (L)		OK	Doable	OK	OK	OK	OK	No Joy	No Joy
	Bottom	Attachment (R)	OK	OK	OK	OK	OK	OK	Doable	No Joy
Activation (L)		OK	Doable	Doable	Doable	Doable	Doable	No Joy	No Joy	
+V2 Aft Shroud	Top	Attachment (R)	OK	No Joy	Doable	Doable	Doable	Doable	No Joy	No Joy
		Activation (L)	OK	Doable	Doable	Doable	Doable	Doable	No Joy	No Joy
	Handle	Activation (R)	OK	Doable	OK	OK	OK	OK	No Joy	No Joy
		Bottom Center	Attachment (R)	OK	No Joy	OK	OK	Doable	Doable	No Joy
	Activation (L)		OK	Doable	OK	OK	OK	OK	No Joy	No Joy
	Bottom	Attachment (R)	OK	OK	OK	OK	OK	OK	Doable	No Joy
Activation (L)		OK	Doable	Doable	Doable	Doable	Doable	No Joy	No Joy	
-V3 Aft Shroud	Top	Attachment (L)	OK	No Joy	OK	OK	OK	OK	No Joy	No Joy
		Activation (R)	OK	No Joy	No Joy	Doable	Doable	No Joy	No Joy	No Joy
	Top Center	Attachment (L)	OK	No Joy	No Joy	Doable	Doable	No Joy	No Joy	No Joy
		Activation (R)	OK	OK	No Joy	Doable	Doable	No Joy	No Joy	No Joy
	Handle	Activation (L)	OK	OK	OK	OK	OK	OK	No Joy	No Joy
		Bottom	Attachment (L)	OK	OK	OK	OK	OK	OK	No Joy
Activation (R)	OK		OK	OK	OK	OK	OK	No Joy	No Joy	
-V2 FGS	Top	Attachment (L)	OK	OK	Doable	Doable	Doable	Doable	No Joy	No Joy
		Activation (R)	OK	OK	OK	OK	OK	OK	Doable	No Joy
	Handle	Activation (L)	OK	OK	OK	OK	OK	OK	No Joy	No Joy
		Bottom	Attachment (L)	OK	OK	Doable	Doable	Doable	Doable	No Joy
	Activation (R)		OK	OK	OK	OK	OK	OK	Doable	No Joy
+V2 FGS	Top	Attachment (L)	OK	OK	Doable	Doable	Doable	Doable	No Joy	No Joy
		Activation (R)	OK	OK	OK	OK	OK	OK	No Joy	No Joy
	Handle	Activation (L)	OK	OK	OK	OK	OK	OK	No Joy	No Joy
		Bottom	Attachment (L)	OK	OK	Doable	Doable	Doable	Doable	No Joy
	Activation (R)		OK	OK	OK	OK	OK	OK	No Joy	No Joy
+V3 FGS	Top	Attachment (L)	OK	OK	OK	OK	OK	OK	No Joy	No Joy
		Activation (R)	OK	OK	OK	OK	OK	OK	No Joy	No Joy
	Handle	Activation (L)	OK	No Joy	Doable	Doable	Doable	Doable	No Joy	No Joy
		Bottom	Attachment (L)	OK	OK	OK	OK	OK	OK	No Joy
	Activation (R)		OK	OK	OK	OK	OK	OK	No Joy	No Joy

## AFT SHROUD DOOR LATCH CONFIGURATION

### NOTE

Latches not listed in the table have no known anomalies and were torqued to 23 ft-lb (-V3, +V2, -V2) & 16.7 ft-lb (+V3).  
If soft stop bolt backed out, ASLR installation may be difficult

Door	Latch	Current Status
-V3 AS	top	Soft stop bolt and washer loose
	upper middle	No soft stop bolt or washer Manually torqued to 23 ft-lb
	bottom	Soft stop bolt suspected loose; washer bent
+V2 AS	upper middle	Soft stop bolt and washer loose; washer bent
	lower middle	SM1 - No problem SM2 - Opened 7 turns to torque slip at 23 ft-lb Torqued w/ PRT: A4, 38 to get movement. Tightened to 23 ft-lb Soft stop bolt and washer loose; washer bent
	bottom	SM1 - No problem SM2 - Opened 3 turns to torque slip at 23 ft-lb. Bolt cleared bathtub fitting at 3 turns. Torqued manually w/ PRT: 38 to get movement. Tightened to 23 ft-lb No soft stop bolt or washer SM3B - ASLR installed
-V2 AS	top, upper & lower middle	Soft stop bolt and washer loose

## AFT SHROUD DOOR CLOSURE HISTORY

Door	Closure History
-V3 AS	SM1 - EVs at upper and lower ends. PRD assist for center section SM3A - FF EV at lower end and RMS EV at upper end. Closed doors on 2 <sup>nd</sup> attempt
+V2 AS	SM1 - Minor difficulty. Pushing on right door relieved problem SM2 - Torque problem for latch engagement. Pressure on both doors, right door pushed in +V1 direction SM3B - Running torque test failed and ASLR installed on bottom bolt
+V2 FGS	SM1 - No problem
-V2 AS	SM1 - Minor difficulty. Pressure on bottom of both doors, left door pushed in +V1 direction SM3B - No problem
-V2 FGS	SM2 - No problem

## SPARE PIP PIN MATRIX

### NOTE

1. One PIP pin in each slot
2. Numbers at end of each piece of hardware are back-up PIP pins to be used in priority order

ORUC BRACKET #	PIN DIAMETER	PIN GRIP LENGTH	USE
1	3/16"	4.60"	<ul style="list-style-type: none"> <li>• FSS BAPS post (EVA Lever)</li> <li>• APC Latches (FSS and stbd APC)</li> </ul>
2	3/8"	3.0"	<ul style="list-style-type: none"> <li>• Aft fixture (pivot center) (12,5,6)</li> <li>• BET captive lock pins (12,5,6)</li> <li>• PIK STIK aft captive lock pin (12,5,6)</li> <li>• MEB-R Cover (12,5,6)</li> <li>• LGAPC probe interface (12,5,6)</li> </ul>
3	3/8"	2.10"	<ul style="list-style-type: none"> <li>• 90 degrees PFR Socket Converter (10,4,11,2,12,5,6)</li> <li>• HST PFRs (10,4,11,2,12,5,6)</li> <li>• Aft Fixture (Upper Fork) (10,4,11,2,12,5,6)</li> <li>• TAs (Tube Lock &amp; Stow Lock) (10,4,11,2,12,5,6)</li> <li>• AS (10,4,11,2,12,5,6)</li> <li>• PFRs</li> <li>• PFR Extenders (10,4,11,2,12,5,6)</li> <li>• ASLRs – standard (10,4,11,2,12,5,6)</li> <li>• Jettison Handle (10,4,11,2,12,5,6)</li> <li>• FSS L-Handle Bracket CLPs</li> <li>• MULE LGAPC Inboard CLP (10,4,11,2,12,5,6)</li> <li>• Fwd Fixture CLPs (for WFC handhold) (10,4,11,2,12,5,6)</li> <li>• Aft Shroud Doors</li> <li>• PFR Sockets (all) (10,4,11,2,12,5,6)</li> </ul>
4	3/8"	2.50"	<ul style="list-style-type: none"> <li>• Aft Fixture (Stow Lock) (11,5,6)</li> <li>• MULE LGAPC Outboard CLP (11,2,12,5,6)</li> </ul>
5	3/8"	3.5"	<ul style="list-style-type: none"> <li>• WF Handhold CLPs (SLIC) (6)</li> <li>• Pik Stik Fwd CLP (6)</li> </ul>
6	3/8"	3.5"	<ul style="list-style-type: none"> <li>• Backup for Spare 5</li> </ul>
7	1/2"	3.0"	<ul style="list-style-type: none"> <li>• BAPS Post – Clevis Ends (8,9)</li> </ul>
8	.470"	4.50"	<ul style="list-style-type: none"> <li>• BAPS Post – Tube Center (Reduced Diameter) (9)</li> <li>• Backup for Spare 7</li> </ul>
9	.470"	4.50"	<ul style="list-style-type: none"> <li>• BAPS Post – Tube Center (Reduced Diameter)</li> <li>• Backup for Spare 8</li> </ul>
10	3/8"	2.1"	<ul style="list-style-type: none"> <li>• Backup for Spare 3</li> </ul>
11	3/8"	2.5"	<ul style="list-style-type: none"> <li>• Backup for Spare 4</li> </ul>
12	3/8"	3.0"	<ul style="list-style-type: none"> <li>• Backup for Spare 2</li> </ul>

## PIN STRAIGHTENING MATRIX

### NOTE

Connector pin straightener interfaces with 20 and 22 gauge pins

ORU	CONNECTOR	PIN AWG	ACTION
RSU	J1, J2 (BOX)	22	RETRIEVE SPARE FROM COPE
ECU	J1-J6 (BOX)	20	STRAIGHTEN & CONTINUE
BAY 2 & 3 BATTERIES	P1 (A,B,C) (HARNESS, PINS)	12	CHECK WITH MCC
	P2 (A,B,C) (SOCKET)	22	
	J1 (A,B,C) (SOCKET)	12	
	J2 (A,B,C) (PIN)	22	
VIK	VIK P2 (HARNESS) (PIN)	22	RETRIEVE CONTINGENCY VIK FROM COPE NOTE: BOTH ENDS OF GC ARE SOCKETS
	VIK J2 (PIN)	22	RETRIEVE CONTINGENCY VIK FROM COPE NOTE: BOTH ENDS OF GC ARE SOCKETS
COS	J1, J2	16	MCC CALL TO STRAIGHTEN USING PROBE
	J3, J4	20 (21 PINS) 16 (2 PINS)	20 AWG STRAIGHTEN & CONTINUE (FOR 16 AWG, MCC CALL TO STRAIGHTEN USING PROBE)
WFC III	J1, J2	16	MCC CALL TO STRAIGHTEN USING PROBE
	J3, J4	20 (21 PINS) 16 (2 PINS)	20 AWG STRAIGHTEN & CONTINUE (FOR 16 AWG, MCC CALL TO STRAIGHTEN USING PROBE)
			NOTE: J1-J4 ARE CONTAINED IN THE BLIND MATE CONNECTOR. THE ENTIRE INSTRUMENT WOULD NEED TO BE REMOVED AND STOWED OR STABILIZED TO HAVE ACCESS TO THE PINS
STIS	LVPS-2R	23	RETRIEVE SPARE FROM COPE
OTA FUSE PLUGS	P25, P26, P27, P28	16	RETRIEVE SPARE OTA FUSE PLUG FROM FUSE PLUG BRACKET
PDU FUSE PLUGS	P15	22	CHECK WITH MCC
	P16	20	
	P17	16	
	PINS ON PDU SIDE (HOT PINS)		
COSTAR/ Y-HARNESS	P1A, P2A (HST)	16	MCC CALL TO STRAIGHTEN USING PROBE
	P3A, P4A (HST)	20 (21 PINS) 16 (2 PINS)	20 AWG STRAIGHTEN & CONTINUE (FOR 16 AWG, MCC CALL TO STRAIGHTEN USING PROBE)
ACS	J1	16	MCC CALL TO STRAIGHTEN USING PROBE
	PIE (J1A)	16	REPORT, RETRIEVE SPARE
	LVPS-R (J6)	20	REMOVE CONNECTOR SAVER
	CEB-R (J8)	22	REMOVE CONNECTOR SAVER
FGS-2	J1, J3, J5, J6, J10 (PINS)	22	
	J2, J4, J8, J9 (PINS)	20	
ALL OTHERS	ANY		CHECK WITH MCC



## FSS CONTINGENCIES

KEEP OUT	Reason
1. FSS BAPS and HST during all operations of rotator and pivoter	Pinch points, collision
2. Umbilical Retract Mechanism during operation	Pinch points, spring loaded device
3. Inner edge of berthing latch jaw	Sharp edge
4. FSS pivoter downlock block corners opposite override bolts	Sharp edge

### FSS LAUNCH/LANDING LOCK RELEASE

Failure of primary and alternate CDUs to unlock:

1. **PGT: A3, CCW 2, 10.5, 6-in ext**
2. Tether downlock pin
3. Disengage bolts (4), 8 turns

**CAUTION**  
Verify EV clear of BAPS prior to pivot

4. On EV call, IV pivots BAPS
5. Remove downlock pin

### FSS BAPS PIVOT PRIOR TO HST BERTHING

Failure of primary and alternate CDUs to pivot – cannot berth HST:

Tools: **EVA Ratchet w/ CMTL and 7/16 6-in rigid Cheater Bar**

If BAPS pivoter > 43.8 degrees

1. Install BAPS post

If BAPS pivoter < 43.8 degrees

2. Install lower end of BAPS post
3. Pull MLI back from turnbuckle bolts (2)
4. EVA Ratchet, CMTL 45, 6-in rigid, cheater bar
5. Remove turnbuckle non-captive bolts (2), 18+ turns CCW
6. Stow bolts (2) in trash bag
7. Open MLI from pivoter housing
8. Pivot turnbuckles out
9. EVA Ratchet, **CMTL 8**

If top end of BAPS post not installed:

10. Turn passive pinion bolt, CW (4.9 deg/sec) until pivoter = 43.8 degrees
11. Install top end of BAPS without telescoping
12. Perform BAPS SUPPORT POST LATCH OVERRIDE procedure, For Latched Position
13. Turn passive pinion bolt, CW (4.9 deg/sec) until pivoter = 90 degrees
14. Install BAPS center PIP pins

## FSS CONTINGENCIES (Cont)

### FSS BAPS ROTATE

Failure of primary and alternate CDU to rotate:

- Tools: **PGT w/ 7/16 6-in wobble**  
**EVA Ratchet w/ MTL and 7/16 6-in wobble**
1. **PGT: A5, CCW 2, 15.5, 6-in wobble**
  2. Retract CDU wedge bolt (non-captive), 21 turns
  3. Pivot CDU housing away from BAPS
  4. Slide wedge under CDU bolt
  5. **PGT: A1, CW 1, 2.5**
  6. While applying pressure, tighten wedge bolt, 1-2 turns
  7. **EVA Ratchet, MTL 5, 6-in wobble**
  8. Turn Idler Gear Barrel Nut as required

#### NOTE

11 turns = 180 degrees  
10 deg/sec FSS rotator override I/F limit  
CW tool = CCW HST

9. **PGT: A2, CCW 2, 5.5**
10. When rotation complete, retract wedge bolt, 2 turns CCW
11. Slide wedge away
12. Pivot CDU housing to reengage Idler and Drive Gear
13. **PGT: A5, CW 2, 15.5**
14. While applying pressure, tighten wedge bolt, 21 turns CW

### HST P107/P108 MANUAL MATE TO UDM

Failure of primary and alternate CDUs to mate Main Umbilical:

1. **EVA Ratchet, 2-in ext**
2. ✓Main Umbilical retracted
3. Remove MLI from J107 and J108 jacks (FSS side)
4. Rotate Umbilical Retract Mechanisms (URMs) to RATCHET (locked)
5. Demate P107 and connect to FSS UDM J107
6. Demate P108 and connect to FSS UDM J108

#### NOTE

Wing tab should rotate 360 degrees once engaged

7. Rotate URMs to FREE (unlocked)

## FSS CONTINGENCIES (Cont)

### HST P107/P108 REMATE TO HST

Tools: **PGT w/ 7/16 6-in wobble**  
**EVA Ratchet w/ 2-in ext**

Primary EVA Method –

1. **EVA Ratchet, 2-in ext**
2. Rotate URMs to RATCHET (locked)
3. Manually demate P107 from UDM and connect to HST J107
4. Manually demate P108 from UDM and connect to HST J108
5. **EVA Ratchet, 2-in ext**

<b>CAUTION</b> Lanyard retracts when URM is FREE
---

6. Rotate URMs to FREE (unlocked)

Secondary Method –

1. **EVA Ratchet, 2-in ext**
2. Rotate URMs to RATCHET (locked)
3. Either remotely demate P107 and P108 or perform the following:
4. **PGT: A3, CW, 10.5 w/ 6-in wobble**
5. Disengage DRIVE DISENGAGE 13 turns CW, √indicator window
6. **PGT: A3, CCW, 10.5 or Essex, 2-in ext**
7. Rotate RELEASE UMBILICAL 1/2 turn CCW
8. √P107 and P108 demated from UDM
9. Manually connect P107 to HST J107
10. Manually connect P108 to HST J108

<b>CAUTION</b> Lanyard retracts when URM is FREE (unlocked)
--

11. Rotate URMs to FREE (unlocked)  
NOTE: Consider re-engaging UDM drive for landing

### FSS MAIN UMBILICAL DEMATE

Failure of primary and alternate CDUs to demate Main Umbilical

Tools: **PGT w/ 7/16 6-in wobble**

Primary Method –

1. **PGT: A5, CCW 2, 15.5, 6-in wobble**
2. Retract captive translator screw, 56 turns max (approx 2.5-in)
3. √Main Umbilical connector demated

Secondary Method –

1. Install RET PIP pin into retainer plate hole (this is your tether)
2. Disengage retainer plate screws (2), **5/32 Allen wrench**, or **5/32 ball-end driver** (stbd TSA), 10 turns CCW
3. Remove retainer plate, stow in trash bag
4. Pull back Main Umbilical
5. Tether Main Umbilical in retracted position

## FSS CONTINGENCIES (Cont)

### FSS BERTHING LATCH OPEN

Failure of primary and alternate CDUs to open latches

Tools: **PGT w/ 7/16 6-in wobble**

Primary Method –

1. PGT: A5, CCW 2, 15.5, 6-in wobble
2. Open MLI
3. Retract captive jaw pivot pin screws (2), 33 turns (possible high running torque)
4. Rotate jaws (2) outwards by hand
5. Close MLI

Secondary Method –

1. Loosen eccentric retainer lever screws (2), 5/32 Allen or 5/32 ball-end driver (stbd TSA), 3 turns CCW
2. Rotate levers downward by hand
3. Tighten retainer lever screws
4. Repeat Primary Method

If no joy with Primary Method:

5. Disengage jaw pivot pin housing retainer screws (2), **5/32 Allen or 5/32 ball-end driver** (stbd TSA), 8 turns CCW
6. Remove housing
7. Rotate latch jaw outward

### FSS BERTHING LATCH CLOSE

Failure of primary and alternate CDUs close latches:

Part 1 –

1. **PGT: A5, CCW 2, 15.5, 6-in wobble**
2. Open MLI
3. Retract captive jaw pivot pin screws (2), 33 turns (possible high running torque)

If no joy retracting jaw pivot pin screw:

4. Perform Part 2 then repeat Part 1
5. Rotate jaws (2) outward by hand
6. Perform Part 3

Part 2 –

1. Loosen eccentric retainer lever screws (2), **5/32 Allen or 5/32 ball-end driver** (stbd TSA), 3 turns CCW
7. Rotate levers downward by hand
8. Tighten retainer lever screws
9. Repeat Part 1

Part 3 –

1. Disengage jaw pivot pin housing retainer screws (2), **5/32 Allen or 5/32 ball-end driver** (stbd TSA), 12 turns CCW
2. Remove housing with attached pivot pin, stow
3. Repeat for second pivot pin
4. Remove PIP pins from BAR
5. Insert BAR over towel bar from right to left (BAR hex bolt to the right)
6. Install left PIP pin first, align and install right PIP pin
7. Remove tether from BAR
8. **PGT: A5, CW 2, 15.5, 6-in wobble**
9. Tighten BAR over towel bar 24 turns

#### NOTE

During BAR removal overnight, BAR PIP pin must be stowed back into berthing latch and NOT into BAR; if BAR is brought back into middeck, this does NOT apply

## BAPS SUPPORT POST LATCH OVERRIDE

Failure of primary and alternate CDUs to release the BAPS support post latch

### For Latch Assist position

If BSP deploy not req'd

1. Remove BSP and reinstall on FSS cradle
2. Reinstall bracket PIP pins (2)
3. Secure electrical harness Velcro strips

If BSP deploy req'd:

1. Release non-captive 7/16 EVA bolts (2), retrieve spacer plate from FSS latch beam
2. Disengage non-captive BAPS CDU bolts (4), **5/32 Allen**, 10 turns CCW
3. Pull CDU down ~ 1/4-in and install spacer plate
4. Engage BAPS CDU bolts (4), 2-3 turns
5. Remove EVA override PIP pin (black-black)
6. Rotate EVA lever 12 degrees CCW to disengage mechanism
7. Insert EVA override PIP pin (white-white)
8. Perform pivot ops
9. Reconfigure EVA lever and override PIP pin to original posn (black-black)

### For Latched position

1. Remove EVA override PIP pin (black-black)
2. Rotate EVA lever 12 degrees CCW to disengage breech lock mechanism
3. Insert EVA override PIP pin (white-white)
4. Perform pivot ops
5. Reconfigure EVA lever and override PIP pin to original posn (black-black)

## HIGH GAIN ANTENNA (HGA) CONTINGENCIES

KEEP OUT	Reason
• HGA dishes (inside)	EM fields
NO TOUCH	Reason
• Bay 2 & 3 door battery thermal louvers	Sharp edges Reduction or loss of radiative capability Potential source of contamination
• WF/PC II Radiators	Reduction or loss of radiative capability Potential source of contamination
• HGA dishes	Potential source of contamination
• LGA waveguide (+V3)	Reduction or loss of comm

### HGA MANUAL RETRACT

Tools: **Airlock Wrench** or **7/16-in & 1/2-in Box End Wrench** or  
**EVA Ratchet w/o palm wheel w/ 2-in ext**

- EV1 1. Translate to FSS, insert BAPS post center PIP pins
- EV2 2. Ingress MFR; mnvr to worksite
3. Rotate 7/16 HGA hinge manual override CW (< 2 deg/sec) to fully retracted hardstop position (initial torque 27 ft-lb)

#### NOTE

1:1 correlation between HGA hex manual override and HGA rotation  
Max rotation 92 degrees

4. If req'd, √HGA latch fittings within capture range of latch pawls.  
Manual dish alignment may be required
5. Inform IV HGA retracted

### HGA MANUAL DEPLOY

Tools: **Airlock Wrench** or **7/16-in & 1/2-in Box End Wrench** or  
**EVA Ratchet w/o palm wheel w/ 2-in ext**  
**Drive Unit Preload Tool**

- EV1 1. Translate to FSS, insert BAPS post center PIP pins
- EV2 2. Ingress MFR; mnvr to worksite
3. Rotate 7/16 HGA hinge manual override CCW (< 2 deg/sec) to fully deployed hardstop position (initial torque 27 ft-lb)

#### NOTE

1:1 correlation between HGA hex manual override and HGA rotation  
Max rotation 92 degrees

4. Preload HGA hinge drive motor using **Preload Tool**. Apply +V1 force (15 lb) 1 degree rotation

## APERTURE DOOR CONTINGENCIES

NO TOUCH	Reason
• Edges and inside face of AD and inside Light Barrel	Sharp edges, pinch points Potential source of contamination

### APERTURE DOOR CLOSE

Tools: **PGT w/ 7/16 6-in wobble**  
**EVA Ratchet w/ 2-in ext**

1. Translate to FSS; insert BAPS post center PIP pins if req'd
2. Ingress MFR; mnvr to AD hinge
3. **PGT: A3, CCW 2, 10.5**
4. Release Sun shade J-bolts (3) 3 turns; open sun shade
5. **EVA Ratchet w/ 2-in ext**
6. Rotate 7/16 AD hinge manual override CW (< 2 deg/sec) to fully closed posn (initial torque 27 ft-lb) – use handrails as req'd

#### NOTE

AD is fully closed when gap between door and light shield is even

7. **PGT: A3, CW 2, 10.5**
8. Close sun shade, engage J-bolts (3) 3 turns

### APERTURE DOOR OPEN

Tools: **PGT w/ 7/16 6-in wobble**  
**EVA Ratchet w/ 2-in ext**  
**Drive Unit Preload tool**

1. Translate to FSS; insert BAPS post center PIP pins if req'd
2. Ingress MFR; mnvr to AD hinge
3. **PGT: A3, CCW 2, 10.5, 6-in wobble**
4. Release Sun shade J-bolts (3) 3 turns; open sun shade
5. **EVA Ratchet, 2-in ext**
6. Rotate 7/16 AD hinge manual override CCW (< 2 deg/sec) to fully open position (initial torque 27 ft-lb) – use handrails as req'd
7. Preload AD open using **Preload tool**. Apply +V1 force (15 lb) 1 degree rotation
8. **PGT: A3, CW 2, 10.5**
9. Close sun shade, engage J-bolts (3) 3 turns

## APERTURE DOOR CONTINGENCIES (Cont)

### APERTURE DOOR JETTISON

**HST CONFIG: Rotation: +V3 Fwd, Pivot: 75 degrees**

Tools: **PGT w/ 7/16 6-in wobble  
Jettison handle**

- EV1 1. Translate to FSS, insert BAPS post center PIP pins if req'd
- EV2 2. Ingress MFR; mnvr to MULE aft
- 3. Retrieve Jettison handle
- 4. Translate to AD Jettison handle receptacle
- 5. Install Jettison handle and PIP pin
- 6. **PGT: A3, CCW 2, 10.5, 6-in wobble**
- 7. Release Sun shade J-bolts (3) 3 turns; open sun shade
- 8. Disconnect AD active hinge electrical connectors (4)
- 9. **PGT: A4, CCW 2, 23.5**
- 10. Rotate 7/16 jettison clamp bolt CCW 2 turns; rotate bolt free of clamp
- 11. Pivot jettison bracket open (use 7/16-in interface if req'd)

**CAUTION**

When passive hinge is disengaged, AD is free

- 12. Translate to passive hinge and repeat steps 10-11
- 13. Mnvr to Jettison handle
- 14. Mnvr AD clear of HST; mnvr to release position
- IV 15. Perform orbiter backaway procedures
- 16. **PGT: A4, CW 2, 23.5**
- EV1 17. Pivot jettison bracket closed; reengage clamp bolt CW (active and passive)



## SOLAR ARRAY MANUAL SLEW AND LOCK

Tools: **EVA Ratchet w/ 7/16 6-in rigid (no palm wheel)**

- EV1 1. Translate to FSS, insert BAPS post center PIP pins if req'd
- 2. Translate to +/- V2 SA3 mast as reqd
- EV2 3. Ingress MFR
- 4. MFR mnvr to +/- V2 SA3 mast as reqd
- 5. Manually slew solar array to reqd angle (TBD), confirm angle with IV, hold in posn
- EV1 6. **EVA Ratchet, 6-in rigid**
- 7. Engage SA3 brake interface "A" or "B" bolt, 12 turns max
- 8. Give EV1 GO to release SA3

# ECU

TIME (HR : MIN)	IV	FF EV	RMS EV
	<p>√FSS posn L12U √RSU SURV HTR PWR – OFF (tb-bp) RMS: To COPE handoff posn</p> <p>RMS: To Bay 10 posn</p> <p>√In att before opening Bay 10 door</p> <p>√MCC GO for ECU connector demate</p> <p><b>SM 210 HST SYS</b> ORU/ORI OPERATIONS √RSU STAT 1, (2, 3) OFF – OFF √MAMP 1, (2, 3) &lt; 20 (for 10 min) * If RSU STAT 1 (2, 3) ON or MAMP&gt;20 and NO COMM: * * <u>DEADFACE RSU/ECU</u> (PL OPS, <u>ORU/ORI OPS</u>) *</p> <p>On EV GO: Notify MCC Go for ECU Aliveness Test</p> <p>RMS: To MULE posn</p>	<ul style="list-style-type: none"> <li>• Translate to stbd TSA; retrieve right angle drive</li> <li>• Close stbd TSA</li> <li>• Translate to COPE; open</li> <li>• Retrieve ECU-R; stow in RSU bag</li> <li>• Transfer RSU bag w/ ECU-R to RMS EV</li> <li>• Close COPE, engage latches (2)</li> <li>• Translate to HST Bay 10</li> </ul> <p><u>ECU SWAP</u> • Assist RMS EV</p> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> <p><b>WARNING</b> P3 and P4 sockets are energized</p> </div> <p><u>STOW ECU</u> • Translate to COPE, open</p> <ul style="list-style-type: none"> <li>• Receive RSU bag w/ ECU from RMS EV</li> <li>• Remove ECU from RSU bag; stow in COPE</li> <li>• Close COPE, engage latches (3)</li> </ul>	<ul style="list-style-type: none"> <li>• MFR stanchion as req'd</li> <li>• Mnvr to COPE</li> </ul> <p>• Receive RSU bag w/ ECU-R from FF EV • Mnvr to HST Bay 10</p> <p><u>ECU SWAP</u> (00:40) • <b>PGT: A3, CCW 3, 10.5, short adj ext</b> • Disengage J-bolts (6) 5 (4-6) turns, open door</p> <p>◀ <input type="checkbox"/></p> <ul style="list-style-type: none"> <li>• <b>PGT: A2, CCW 2, 5.5</b></li> <li>• Disengage keyway bolts (4) 6 turns</li> <li>• <b>PGT: A3, CCW 2, 10.5, rt angle drive, 2-in ext</b></li> <li>• Disengage connector drive bolt 6 turns at interface</li> <li>• Remove and swap ECUs</li> <li>• Install ECU-R</li> <li>• <b>PGT: A2, CW 2, 5.5</b></li> <li>• Engage connector drive bolt 6 turns at interface</li> <li>• <b>PGT: A2, CW 2, 5.5, short adj ext</b></li> <li>• Engage keyway bolts (4) 6 turns</li> <li>• Inform IV ECU-R installed</li> <li>• Perform photo closeout</li> <li>• <b>PGT: A3, CW 2, 10.5</b></li> <li>• Close door, engage J-bolts (6) 5 turns</li> </ul> <p><u>STOW ECU</u> (00:15) • Mnvr to COPE • Transfer RSU bag w/ ECU to FF EV</p>

### Tools and Tethers:

- PGT w/ rt angle drive, 2-in ext (connector drive bolt)
- PGT, short adj ext (door j-bolts, ECU bolts)
- RET (ECU and ECU-R)
- RET (1/8-in Allen) and RSU bag

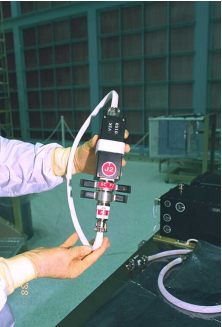
### Missing Pins:

- J1 & J2: 10, 20, 21, 42, 54
- J5: 15, 16, 34, 35
- J6: 15, 16, 22, 26, 34, 35, 41

### CRIBSHEET

Anomaly	Action
ECU keyway bolt fails to release	Attempt to release other bolts, increase torque to (10 ft-lb)
ECU connector drive stud fails to release	Verify no interference and re-try. (failure 22.0 ft-lb at bolt)
ECU connector drive stud fails to engage	Verify no interference with keyway bolts. If no-joy, disengage drive stud non captive fasteners using 1/8 Allen wrench, √MCC for turns. Push ECU until connectors seated, engage keyway bolts
ECU keyway bolt fails to seat	Engage remaining bolts

# VIK REPLACEMENT

TASK TIME (PET TIME) HR : MIN	IV	FF	RMS
	<p>√FSS 180 degrees, -V3, Pivot 90 degrees posn +SA 160 degrees, -SA +180 degrees √MCC GO for Bay 2 &amp; 3 VIK Replacement</p>  <p>SPARE VIK with GC</p> <p>RMS: To Bay 2 (or 3) Demate posn (PDRS, <u>TBD</u>)</p> <p>√MCC GO for isolation switch and connector demates</p> <ul style="list-style-type: none"> <li>* If NO COMM after MCC GO for jumper plug install: *</li> <li>* <b>SM 213 HST BATT</b> *</li> <li>* Prior to and during Bay 2 (or 3) jumper plug install *</li> <li>* √TLM COUNT – incr *</li> <li>* BATT CURRENTS √1 &lt; 0.5 (4 &lt; 0.5) *</li> <li>* √2 &lt; 0.5 (5 &lt; 0.5) *</li> <li>* √3 &lt; 0.5 (6 &lt; 0.5) *</li> <li>* Notify EV GO for Bay 2 (or 3) connector demates *</li> </ul>	<p><u>BAY 2 (or 3) VIK REPLACEMENT</u></p> <ol style="list-style-type: none"> <li>1. Translate to COPE</li> <li>2. Open COPE; retrieve spare VIK from lid</li> <li>3. Close COPE, 3 latches</li> <li>4. Translate to MFR stanchion, stow VIK</li> </ol> <ol style="list-style-type: none"> <li>5. Demate spare VIK P2 from VIK GCP2</li> <li>6. Insert PIP pin into VIK GC; demate GCP2 from VIK J2 and stow in trash bag</li> <li>7. Transfer spare VIK to RMS EV</li> </ol>	<p>← □</p> <p><u>BAY 2 (or 3) VIK REPLACEMENT</u></p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;">Do not touch battery thermal louvers</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;">Battery J1 connectors are energized</p> </div> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">Spare VIK has a gender changer pre-attached</p> <ol style="list-style-type: none"> <li>1. Mnvr to Bay 2 or 3; stanchion to 180 degrees, boot plate 0 degrees</li> <li>2. <b>PGT: A3, CCW 3, 10.5</b></li> <li>3. For bay 2: Disengage J-bolts (6) 6 (4-6) turns For Bay 3: Disengage J-bolts (5) 6 (4-6) turns</li> <li>4. Open door, set door stay (or use manual door stay)</li> <li>5. Boot plate 90R for Bay 2 (90L for Bay 3)</li> </ol> <p>← □</p> <p>Perform for P2A, P2B, or P2C:</p> <ol style="list-style-type: none"> <li>6. Turn isolator switch to – OFF</li> <li>7. Tether to VIK</li> <li>8. Demate VIK harness P2 from GCP2 on battery J2</li> <li>9. Demate vehicle harness P2 from VIK J2</li> <li>10. Mate VIK P2 to VIK J2</li> <li>11. Stow old VIK on MFR handle (or give to FF EV)</li> <li>12. Retrieve spare VIK from MFR handle or FF EV</li> <li>13. Mate spare VIK J2 to vehicle harness P2</li> <li>14. Mate spare VIK P2 to GCP2 on battery J2</li> <li>15. Secure VIK to harnesses using integral Velcro strap</li> <li>16. Turn isolator switch to – ON</li> <li>17. Release door stay; verify harnesses clear of door</li> <li>18. <b>PGT: A3, CW 3, 10.5</b></li> <li>19. Close door; J-bolt (6) 4-6 turns</li> </ol>

# FUSES

	IV	PDU FF EV	RMS EV
	<ul style="list-style-type: none"> <li>RMS: To HST Bay 4 posn</li> </ul> <p>√MCC GO for fuse changeout</p> <p>Notify MCC fuse replaced</p>	<ul style="list-style-type: none"> <li>Translate to SLIC aft vertical pallet</li> <li>Retrieve J15, J16 or J17 fuse plug</li> </ul> <ul style="list-style-type: none"> <li>Translate to HST Bay 4</li> <li>Transfer fuse plug to RMS EV</li> </ul>	<ul style="list-style-type: none"> <li>Mnvr to HST Bay 4</li> <li><b>PGT: A3, CCW 2, 10.5, short adj</b></li> <li>Disengage J-bolts (6) 6 (4-6) turns</li> <li>Open door; tether (90 degrees, 110 degrees max)</li> </ul> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> J15, J16, and J17 on PDU are energized</p> </div> <ul style="list-style-type: none"> <li>Receive fuse plug from FF EV</li> <li>On IV go:               <ul style="list-style-type: none"> <li>Replace failed fuse plug</li> <li>Perform cont photo closeout</li> <li>Close door</li> </ul> </li> <li><b>PGT: A3, CW 2, 10.5</b></li> <li>Engage J-bolts (6) 4-6 turns</li> </ul>

	IV	EP/TCE FF EV	RMS EV
	<ul style="list-style-type: none"> <li>RMS: To HST Bay H posn</li> </ul> <p>√MCC GO for fuse changeout</p>	<ul style="list-style-type: none"> <li>Translate to SLIC aft vertical pallet</li> <li>Retrieve PCU connector tool or 90 degree connector tool; J25, J26, J27A, or J28A fuse plug</li> </ul> <ul style="list-style-type: none"> <li>Translate to HST Bay H</li> <li>Transfer fuse plug to RMS EV</li> </ul>	<ul style="list-style-type: none"> <li>Mnvr to HST Bay H</li> <li><b>PGT: A3, CCW 2, 10.5, short adj</b></li> <li>Disengage J-bolts (3) 5 (4-6) turns</li> <li>Open door; tether (90 degrees, 137 degrees max)</li> </ul> <p style="text-align: center;"><u>NOTE</u> J25 and J26 changeout may require P27 and/or P28 demate If demated, notify MCC</p> <ul style="list-style-type: none"> <li>Remove fuse, stow in trash bag</li> <li>Receive fuse plug from FF EV</li> <li>Install spare fuse</li> <li>Perform cont photo closeout</li> <li>Close door</li> <li><b>PGT: A3, CW 2, 10.5</b></li> <li>Engage J-bolts (6) 4-6 turns</li> </ul>

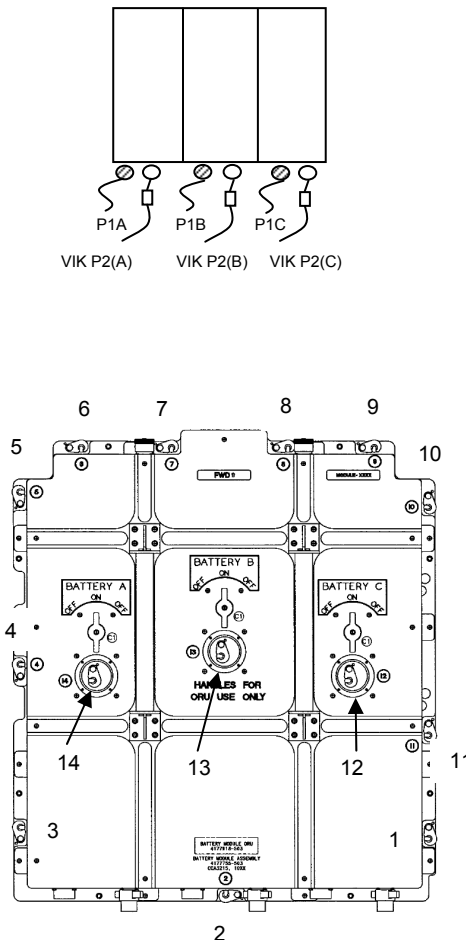
## NO-RMS BATTERY R&R – EGRESS

IV	EV1/3	EV2/4
<div style="border: 1px solid black; padding: 5px;"> <p><u>EV1 Tools</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> PGT</li> <li><input type="checkbox"/> Socket caddy</li> <li><input type="checkbox"/> Short adj ext</li> <li><input type="checkbox"/> 6-in ext</li> <li><input type="checkbox"/> Tethers</li> <li><input type="checkbox"/> 80-in tether</li> </ul> <p><u>EV2 Tools</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> PGT</li> <li><input type="checkbox"/> Socket caddy</li> <li><input type="checkbox"/> Hybrid ext</li> <li><input type="checkbox"/> 6-in ext</li> <li><input type="checkbox"/> Battery cap caddy</li> <li><input type="checkbox"/> Manual door stay</li> <li><input type="checkbox"/> Tethers</li> </ul> </div>	<p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. Thermal cover - open</li> <li>2. Egress airlock</li> <li>3. Attach own safety tether to stbd truss HR standoff:               <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>4. Attach other EV's safety tether to port truss HR standoff:               <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> </ol>	<p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. Release waist tether from airlock D-ring extender</li> <li>2. Egress airlock</li> <li>3. Close A/L thermal cover</li> </ol>

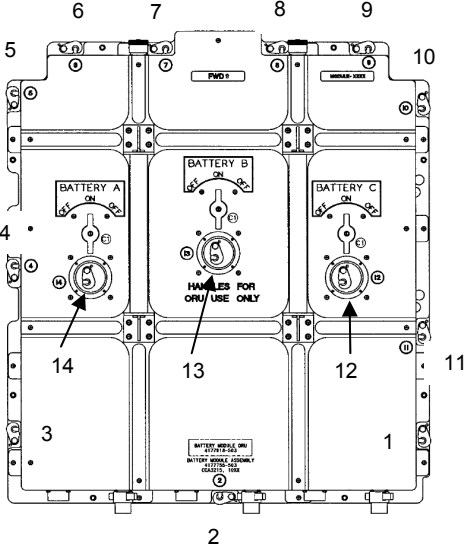
# NO-RMS BAY 2 BATTERY R&R

IV	EV1/3	EV2/4
<p>1. √ FSS 180°, -V3, Pivot 43.8°, -SA to TBD°                  2. L12U FSS PCU PWR CONTR A - ON                      CONTR B - ON                  ESS/MN SW ENA - OFF (tb-bp)                  Notify MCC CONTR A and B - ON                      ESS/MN SW ENA - OFF</p> <p style="text-align: center;">2</p> <p style="text-align: center;"><u>BAY 2 BATTERY-R</u></p> <p>3. √ MCC GO for Bay 2 battery demate                  * If NO COMM perform: *                  * <u>BAY 2 BATT PREP FOR REMOVAL</u> *                  * (PL OPS, ORU/ORI) *</p>	<p style="text-align: center;"><u>BAY 2 SLIC BATTERY-R PREP</u></p> <ol style="list-style-type: none"> <li>Translate to FSIPE</li> <li>If necessary, configure FSIPE STS PFR (AS: 12, <b>P=3</b>; PFR: Y=9, <b>R=K</b>, P=1.5)</li> <li>Open stbd battery thermal cover</li> <li>Secure cover open w/ Velcro</li> <li>√ Battery-R isolator switches (3) - OFF</li> <li>Visually verify J2 gender changers in place (3)</li> <li>Visually verify J3 connector caps in place (3)</li> <li>Inspect battery connector receptacles (6)</li> <li>Configure PGT w/ short adj ext</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <ol style="list-style-type: none"> <li>Battery bolts 12 &amp; 13 are not present on BPA</li> <li>SLIC battery bolts may be released in any order</li> <li>Leave Bolts 8 and 11 to be released while in PFR</li> </ol> <ol style="list-style-type: none"> <li><b>PGT [A3, CCW 3, 10.5], short adj ext</b></li> <li>Disengage the following J-bolts, 4 turns                         <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 1</li> <li><input type="checkbox"/> Bolt 2</li> <li><input type="checkbox"/> Bolt 3</li> <li><input type="checkbox"/> Bolt 4</li> <li><input type="checkbox"/> Bolt 5</li> <li><input type="checkbox"/> Bolt 6</li> <li><input type="checkbox"/> Bolt 7</li> <li><input type="checkbox"/> Bolt 9</li> <li><input type="checkbox"/> Bolt 10</li> <li><input type="checkbox"/> Bolt 14</li> </ul> </li> </ol>	<div style="text-align: center;"> </div> <p style="text-align: center;"><u>BAY 2 HST PFR SETUP</u></p> <ol style="list-style-type: none"> <li>Translate to stbd APC</li> <li>Retrieve PFR extender</li> <li>Configure HST PFR into PFR extender at 15L↓</li> <li>Retrieve HST PFR and PFR extender stack-up</li> <li>Translate to HST FR27 (left of Bay 2)</li> <li>Configure PFR extender into HST at 15R↓</li> <li>Configure HST PFR at JJ/O/ZZ/12 (for battery connector demates)</li> </ol> <p style="text-align: center;"><u>BAY 2 BATTERY RETRIEVAL</u></p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p style="text-align: center;"><u>WARNING</u></p> <ol style="list-style-type: none"> <li>Do not touch battery bay door thermal louvers</li> <li>Battery J1 &amp; J2 connectors are energized</li> </ol> </div> <ol style="list-style-type: none"> <li>Translate to Bay 2</li> <li><b>PGT [A3, CCW 3, 10.5], 6-in ext</b></li> <li>Disengage J-bolts (6), 6 turns                      - May just be 2 bolts (upper and lower)</li> <li>Open Bay 2 door fully</li> <li>Install manual door stay; extend to G                      - Door stay turns _____</li> <li>Release tether from manual door stay</li> <li>Ingress HST PFR in FR27</li> </ol> <div style="text-align: center;"> </div> <ol style="list-style-type: none"> <li>Perform one at a time:                         <ul style="list-style-type: none"> <li><input type="checkbox"/> Demate P1A; install cap on J1A</li> <li><input type="checkbox"/> Demate VIK P2(A) from GCP2; install cap on GCP2</li> <li><input type="checkbox"/> Demate P1B; install cap on J1B</li> </ul> </li> </ol>

# NO-RMS BAY 2 BATTERY R&R (Cont)

IV	EV1/3	EV2/4
 <p>The diagram shows three battery units (A, B, C) with terminals P1A, P1B, and P1C. Below them are VIK P2(A), VIK P2(B), and VIK P2(C) connectors. A larger diagram shows the battery bay layout with numbered callouts 1 through 14. Callouts 1-3 are at the bottom, 4-6 on the left, 7-9 at the top, and 10-11 on the right. A central label reads 'HANDLES FOR ORU USE ONLY'. A note at the bottom of the bay diagram says 'BATTERY SWAP ON 10/17/2010 BATTERY SWAP CHECKLIST 04/27/10-1111'.</p>	<p><b>BAY 2 BATTERY SWAP</b></p> <ol style="list-style-type: none"> <li>Temp stow PGT w/ short adj</li> <li>Translate to FSIFE lid handrail</li> <li>Receive Bay 2 Battery from EV4</li> </ol>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Demate VIK P2(B) from GCP2; install cap on GCP2</li> <li><input type="checkbox"/> Demate P1C; install cap on J1C</li> <li><input type="checkbox"/> Demate VIK P2(C) from GCP2; install cap on GCP2</li> </ul> <p>9. Tether or tuck connectors clear of battery</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><b>CAUTION</b></p> <p style="text-align: center;">Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be released last</p> </div> <ol style="list-style-type: none"> <li>Egress HST PFR</li> <li>Configure PGT w/ hybrid ext</li> <li><b>PGT [A3, CCW 3, 10.5], hybrid ext</b></li> <li>Disengage battery J-bolts (14), 4 turns <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 1</li> <li><input type="checkbox"/> Bolt 2</li> <li><input type="checkbox"/> Bolt 3</li> <li><input type="checkbox"/> Bolt 5</li> <li><input type="checkbox"/> Bolt 6</li> <li><input type="checkbox"/> Bolt 7</li> <li><input type="checkbox"/> Bolt 8</li> <li><input type="checkbox"/> Bolt 9</li> <li><input type="checkbox"/> Bolt 10</li> <li><input type="checkbox"/> <b>Bolt 11</b></li> <li><input type="checkbox"/> <b>Bolt 4</b></li> <li><input type="checkbox"/> <b>Bolt 14</b></li> <li><input type="checkbox"/> <b>Bolt 13</b></li> <li><input type="checkbox"/> Tether to battery &amp; lock RET</li> <li><input type="checkbox"/> Ingress PFR for Battery swap</li> <li><input type="checkbox"/> <b>Bolt 12</b></li> </ul> </li> </ol> <p>14. Remove battery</p> <p><b>BAY 2 BATTERY SWAP</b></p> <ol style="list-style-type: none"> <li>Transfer Battery to EV3</li> <li>Egress and assist EV3 w/ Battery temp stow</li> </ol>

## NO-RMS BAY 2 BATTERY R&R (Cont)

IV	EV1/3	EV2/4
 <p>4. IV: Record SLIC battery turn counts</p>	<ol style="list-style-type: none"> <li>4. Temp stow Battery on FSIPE top/fwd face using 80-in tether</li> <li>5. Ingress FSIPE STS PFR</li> <li>6. Tether to Battery-R</li> <li>7. <b>PGT [A3, CCW 3, 10.5]</b></li> <li>8. Disengage remaining Battery-R J-bolt, 4 turns             <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 11</li> <li><input type="checkbox"/> Bolt 8</li> </ul> </li> <li>9. Remove stbd Battery-R</li> <li>10. Transfer Battery-R to EV4</li> <li>11. Translate to FSIPE lid handrail</li> <li>12. Receive Battery-R from EV4</li> <li>13. Transfer Battery-R to EV4</li> </ol> <p><u>BAY 2 BATTERY STOW</u></p> <ol style="list-style-type: none"> <li>1. Ingress FSIPE STS PFR</li> </ol> <ol style="list-style-type: none"> <li>2. Receive Battery from EV4</li> <li>3. Install Battery on SLIC (connectors outboard)</li> <li>4. Verify Battery flush with BPA</li> <li>5. Engage as many J-hooks as possible from PFR</li> </ol>	<ol style="list-style-type: none"> <li>3. Translate to FSIPE</li> <li>4. Receive and temp hold Battery-R</li> <li>5. Transfer Battery-R to EV3</li> <li>6. Translate to HST PFR; ingress</li> <li>7. Pre-configure <b>PGT [A3, CW3, 10.5]</b>; stow</li> <li>8. Receive Battery-R from EV3</li> </ol> <p><u>BAY 2 BATTERY-R INSTALL</u></p> <ol style="list-style-type: none"> <li>1. Install Battery-R</li> <li>2. Verify battery flush</li> <li>3. Engage as many J-hooks as possible</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be engaged first</p> </div> <ol style="list-style-type: none"> <li>4. <b>PGT [A3, CW 3, 10.5]</b> ← <input type="checkbox"/></li> <li>5. Engage Battery-R J-bolts (2), 3-5 turns             <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Bolt 11</b> _____ turns</li> <li><input type="checkbox"/> <b>Bolt 12</b> _____ turns</li> </ul> </li> <li>6. Egress HST PFR</li> <li>7. Translate to Battery temp stow</li> <li>8. Retrieve Battery; transfer to EV3</li> <li>9. Translate to HST</li> <li>10. <b>PGT [A3, CW 3, 10.5]</b></li> <li>11. Engage Battery-R J-bolts (12), 3-5 turns             <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Bolt 4</b> _____ turns</li> <li><input type="checkbox"/> <b>Bolt 13</b> _____ turns</li> <li><input type="checkbox"/> <b>Bolt 14</b> _____ turns</li> </ul> </li> </ol>



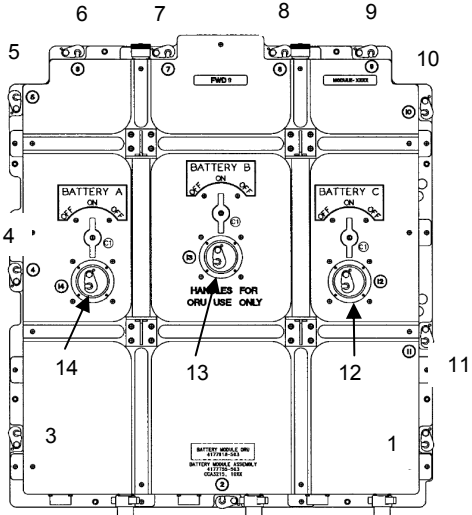
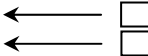
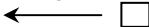
**NO-RMS BAY 2 BATTERY R&R (Cont)**

IV	EV1/3	EV2/4
<p>5. IV: Record HST battery turn counts</p> <p>6. IV: Notify MCC Bay 2 Battery-R connectors mated; (GO for A/T)</p> <p>7. √ MCC GO to rotate Battery-R isolator switches                      * If NO COMM: *                      * Notify EV GO to rotate Battery-R *                      * isolator switches *</p> <p>8. IV: Notify MCC Battery-R isolator switches (3) - ON (GO for resume Battery A/T)</p> <p>9. WVS: RMS EV Center Cam (1. Connectors and 2. Battery Overview)</p> <p>10. On MCC GO:                      L12U FSS PCU PWR CONTR A - OFF                      CONTR B - OFF                      Notify MCC CONTR A and B - OFF</p>	<p style="text-align: center;"><u>NOTE</u></p> <p>1. Battery bolt numbers 12 &amp; 13 are not engaged for landing</p> <p>2. After bolt 11 engaged, SLIC battery bolts may be engaged in any order</p> <p>6. <b>PGT [A3, CW 3, 10.5]</b>                      ← <input type="checkbox"/></p> <p>7. Engage J-bolt #11 first, 3-5 turns</p> <p>8. Engage remaining J-bolts (11 total), 3-5 turns                      - Egress PFR as necessary</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 11 _____ turns</li> <li><input type="checkbox"/> Bolt 1 _____ turns</li> <li><input type="checkbox"/> Bolt 2 _____ turns</li> <li><input type="checkbox"/> Bolt 3 _____ turns</li> <li><input type="checkbox"/> Bolt 4 _____ turns</li> <li><input type="checkbox"/> Bolt 5 _____ turns</li> <li><input type="checkbox"/> Bolt 6 _____ turns</li> <li><input type="checkbox"/> Bolt 7 _____ turns</li> <li><input type="checkbox"/> Bolt 8 _____ turns</li> <li><input type="checkbox"/> Bolt 9 _____ turns</li> <li><input type="checkbox"/> Bolt 10 _____ turns</li> <li><input type="checkbox"/> Bolt 14 _____ turns</li> </ul> <p>9. Close SLIC battery thermal cover</p> <p>10. Remove short adj ext from PGT; stow on socket caddy</p> <p>11. Stow PGT onto swing arm</p> <p><u>PFR CLEANUP: IF BATTERY OPS COMPLETE</u></p> <p>1. Verify hitch pin/Velcro installed on FSIPE PFR articulating socket PIP pin</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 1 _____ turns</li> <li><input type="checkbox"/> Bolt 2 _____ turns</li> <li><input type="checkbox"/> Bolt 3 _____ turns</li> <li><input type="checkbox"/> Bolt 5 _____ turns</li> <li><input type="checkbox"/> Bolt 6 _____ turns</li> <li><input type="checkbox"/> Bolt 7 _____ turns</li> <li><input type="checkbox"/> Bolt 8 _____ turns</li> <li><input type="checkbox"/> Bolt 9 _____ turns</li> <li><input type="checkbox"/> Bolt 10 _____ turns</li> </ul> <p>12. Retrieve, inspect; mate one at a time:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Mate P1A to J1A</li> <li><input type="checkbox"/> Mate VIK P2(A) to GCP2</li> <li><input type="checkbox"/> Mate P1B to J1B</li> <li><input type="checkbox"/> Mate VIK P2(B) to GCP2</li> <li><input type="checkbox"/> Mate P1C to J1C</li> <li><input type="checkbox"/> Mate VIK P2(C) to GCP2</li> </ul> <p>← <input type="checkbox"/></p> <p>13. Egress HST PFR as desired</p> <p>14. Release manual door stay; stow on self                      - Use turn count from installation                      ← <input type="checkbox"/></p> <p>On IV GO:</p> <p>15. Rotate Battery-R isolator switches (3) - ON</p> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>16. Verify harnesses clear of door; close bay door</p> <p>17. Configure PGT w/ 6-in ext</p> <p>18. <b>PGT [A3, CW 3, 10.5]</b></p> <p>19. Engage J-bolts (6), 4-6 turns</p>

**NO-RMS BAY 2 BATTERY R&R (Cont)**

IV	EV1/3	EV2/4
		<p><u>PFR CLEANUP: IF BATTERY OPS COMPLETE</u></p> <ol style="list-style-type: none"> <li>1. Translate to HST PFR in FR27</li> <li>2. Configure HST PFR to: <b>PP/A/BB/4</b> (launch/landing config)</li> <li>3. Remove HST PFR and PFR extender</li> <li>4. Translate to stbd APC, stow HST PFR and PFR extender               <ul style="list-style-type: none"> <li>- Install hitch pin/Velcro onto PFR extender PIP pin</li> </ul> </li> </ol>

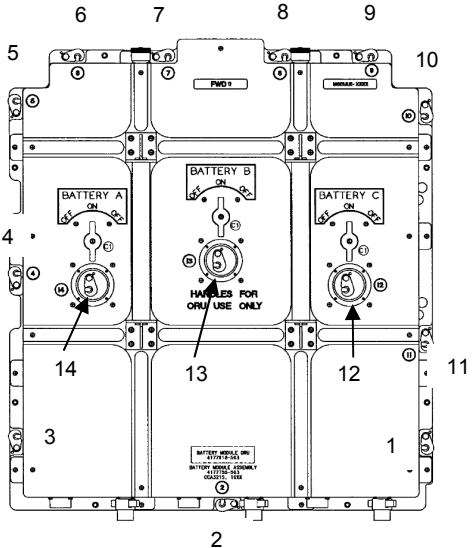
# NO-RMS BAY 3 BATTERY R&R

IV	EV1/3	EV2/4
<p>1. √ FSS 180°, -V3, Pivot 43.8°, -SA to TBD°                  2. L12U FSS PCU PWR CONTR A - ON                      CONTR B - ON                  ESS/MN SW ENA - OFF (tb-bp)                  Notify MCC CONTR A and B - ON                      ESS/MN SW ENA - OFF</p>  <p style="text-align: center;"><b>BAY 3 BATTERY-R</b></p> <p>3. MCC GO for Bay 3 battery demate                  * If NO COMM perform: *                  * <u>DEADFACE TBD</u> (PL OPS,ORU/ORI) *</p>	<p style="text-align: center;"><b>BAY 3 SLIC BATTERY-R PREP</b></p> <ol style="list-style-type: none"> <li>1. Translate to FSIPE</li> <li>2. As necessary, configure FSIPE STS PFR (AS: Y=12 (black line up), P=11; PFR: Y=9, R=B.5, P=1.5)</li> <li>3. Open port battery thermal cover</li> <li>4. Secure cover open w/ Velcro</li> <li>5. √ Battery-R isolator switches (3) - OFF</li> <li>6. Visually verify J2 gender changers in place (3)</li> <li>7. Visually verify J3 connector caps in place (3)</li> <li>8. Inspect battery connector receptacles (6)</li> <li>9. Configure PGT w/ short adj ext</li> </ol> <p style="text-align: center;"><b>NOTE</b></p> <ol style="list-style-type: none"> <li>1. Battery bolts 13 &amp; 14 are not present on BPA</li> <li>2. SLIC battery bolts may be released in any order</li> <li>3. Leave Bolt 7 to be released while in PFR</li> </ol> <p>10. <b>PGT [A3, CCW 3, 10.5], short adj ext</b>                  11. Disengage the following J-bolts, 4 turns</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 1</li> <li><input type="checkbox"/> Bolt 2</li> <li><input type="checkbox"/> Bolt 3</li> <li><input type="checkbox"/> Bolt 4</li> <li><input type="checkbox"/> Bolt 5</li> <li><input type="checkbox"/> Bolt 6</li> <li><input type="checkbox"/> Bolt 8</li> <li><input type="checkbox"/> Bolt 9</li> <li><input type="checkbox"/> Bolt 10</li> <li><input type="checkbox"/> Bolt 11</li> <li><input type="checkbox"/> Bolt 12</li> </ul>	<div style="text-align: center;">  </div> <p style="text-align: center;"><b>BAY 3 HST PFR SETUP</b></p> <ol style="list-style-type: none"> <li>1. Translate to stbd APC</li> <li>2. Retrieve PFR extender</li> <li>3. Configure HST PFR into PFR extender at 15R↓</li> <li>4. Retrieve HST PFR and PFR extender stack-up</li> <li>5. Translate to HST FR26 (right of Bay 3)</li> <li>6. Configure PFR extender into HST at 15L↓</li> <li>7. Configure HST PFR at JJ/E/ZZ/1 (for battery connector demates)</li> </ol> <p style="text-align: center;"><b>BAY 3 BATTERY RETRIEVAL</b></p> <div style="border: 2px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><b>WARNING</b></p> <ol style="list-style-type: none"> <li>1. Do not touch battery bay door thermal louvers</li> <li>2. Battery J1 &amp; J2 connectors are energized</li> </ol> </div> <p style="text-align: center;"><b>NOTE</b>                  Bay 3 lower bolt is already released</p> <ol style="list-style-type: none"> <li>1. Translate to Bay 3</li> <li>2. <b>PGT [A3, CCW 3, 10.5], 6-in ext</b></li> <li>3. Disengage J-bolts (5), 6 turns</li> <li>4. Open Bay 3 door fully</li> <li>5. Install manual door stay; extend to H                      - Door stay turns _____</li> <li>6. Release tether from manual door stay</li> <li>7. Ingress HST PFR in FR26</li> </ol> <div style="text-align: center;">  </div> <ol style="list-style-type: none"> <li>8. Perform one at a time:                     <ul style="list-style-type: none"> <li><input type="checkbox"/> Demate P1A; install cap on J1A</li> </ul> </li> </ol>

# NO-RMS BAY 3 BATTERY R&R (Cont)

IV	EV1/3	EV2/4
<div style="border: 1px solid black; padding: 5px;"> <p align="center"><u>EV2 PFR NOTE</u></p> <p>ORUC S26 also worked for access to Bay 3 Battery in HST. EV2 could reach connectors, bolt 4, and bolt 14 from S26:</p> <p><u>Settings:</u>            AS into S26: Y=90R↓, P=1            PFR extender into AS: 15L↓            HST PFR into extender: Y= 45L↓, JJ/M/EE/6</p> </div> <div> </div>	<div> </div>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Demate VIK P2(A) from GCP2; install cap on GCP2</li> <li><input type="checkbox"/> Demate P1B; install cap on J1B</li> <li><input type="checkbox"/> Demate VIK P2(B) from GCP2; install cap on GCP2</li> <li><input type="checkbox"/> Demate P1C; install cap on J1C</li> <li><input type="checkbox"/> Demate VIK P2(C) from GCP2; install cap on GCP2</li> </ul> <p>9. Tether or tuck connectors clear of battery</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p align="center"><b>CAUTION</b></p> <p align="center">Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be released last</p> </div> <ul style="list-style-type: none"> <li>10. Egress HST PFR</li> <li>11. Configure PGT w/ hybrid ext</li> <li>12. <b>PGT [A3, CCW 3, 10.5], hybrid</b> (extend as reqd)</li> <li>13. Disengage battery J-bolts (14), 4 turns</li> </ul> <p align="center"><u>NOTE</u></p> <p align="center">EV2 has shown access to Bolts 4, 14, and 2 from PFR</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 1</li> <li><input type="checkbox"/> Bolt 2</li> <li><input type="checkbox"/> Bolt 3</li> <li><input type="checkbox"/> Bolt 5</li> <li><input type="checkbox"/> Bolt 6</li> <li><input type="checkbox"/> Bolt 7</li> <li><input type="checkbox"/> Bolt 8</li> <li><input type="checkbox"/> Bolt 9</li> <li><input type="checkbox"/> Bolt 10</li> <li><input type="checkbox"/> <b>Bolt 11</b></li> <li><input type="checkbox"/> <b>Bolt 12</b></li> <li><input type="checkbox"/> <b>Bolt 13</b></li> <li><input type="checkbox"/> Tether to battery &amp; lock RET</li> <li><input type="checkbox"/> Ingress PFR for Battery swap</li> <li><input type="checkbox"/> <b>Bolt 14</b></li> <li><input type="checkbox"/> <b>Bolt 4</b></li> </ul> <p>14. Remove battery</p>

# NO-RMS BAY 3 BATTERY R&R (Cont)

IV	EV1/3	EV2/4
 <p>4. IV: Record HST battery turn counts</p>	<p><u>BAY 3 BATTERY SWAP</u></p> <ol style="list-style-type: none"> <li>Temp stow PGT w/ short adj</li> <li>Translate to FSIPE lid handrail</li> <li>Receive Bay 3 Battery from EV2</li> <li>Temp stow Battery on top/fwd face of FSIPE with 80-in tether</li> <li>Ingress STS PFR</li> <li>Tether to Battery-R</li> <li><b>PGT [A3, CCW 3, 10.5]</b></li> <li>Disengage remaining Battery-R J-bolt, 4 turns <input type="checkbox"/> Bolt 7</li> <li>Remove port Battery-R</li> <li>Transfer Battery-R to EV2</li> <li>Translate to FSIPE lid handrail</li> <li>Receive Battery-R from EV2</li> <li>Transfer Battery-R to EV2</li> </ol> <p><u>BAY 3 BATTERY STOW</u></p> <ol style="list-style-type: none"> <li>Ingress FSIPE STS PFR</li> </ol> <p>2. Receive Battery from EV2 3. Install Battery on SLIC (connectors outboard) 4. Verify Battery flush with BPA 5. Engage as many J-hooks as possible from PFR</p>	<p><u>BAY 3 BATTERY SWAP</u></p> <ol style="list-style-type: none"> <li>Transfer Battery to EV1</li> <li>Egress and assist EV1 w/ Battery temp stow</li> <li>Translate to FSIPE</li> <li>Receive and temp hold Battery-R</li> <li>Transfer Battery-R to EV1</li> <li>Translate to HST PFR; ingress</li> <li>Pre-configure <b>PGT [A3, CW3, 10.5]</b>; stow</li> <li>Receive Battery-R from EV1</li> </ol> <p><u>BAY 3 BATTERY-R INSTALL</u></p> <ol style="list-style-type: none"> <li>Install Battery-R</li> <li>Verify battery flush</li> <li>Engage as many J-hooks as possible</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Battery bolt numbers 11, 12, 13, 14, and 4 (middle row) must be engaged first</p> </div> <ol style="list-style-type: none"> <li><b>PGT [A3, CW 3, 10.5]</b> ← <input type="checkbox"/></li> <li>Engage Battery-R J-bolts (2), 3-5 turns (torque) <input type="checkbox"/> <b>Bolt 4</b> _____ turns <input type="checkbox"/> <b>Bolt 14</b> _____ turns</li> <li>Egress HST PFR</li> <li>Translate to Battery temp stow</li> <li>Retrieve Battery; transfer to EV1</li> <li>Translate to HST</li> <li><b>PGT [A3, CW 3, 10.5]</b></li> <li>Engage Battery-R J-bolts (12), 4-6 turns (torque) <input type="checkbox"/> <b>Bolt 11</b> _____ turns</li> </ol>

# NO-RMS BAY 3 BATTERY R&R (Cont)

IV	EV1/3	EV2/4
<p>5. IV: Record SLIC battery turn counts</p> <p>6. IV: Notify MCC Bay 3 Battery-R connectors mated</p> <p>7. √ MCC GO to rotate Battery-R isolator switches            * If NO COMM: *            * Notify EV Go to rotate Battery-R *            * isolator switches *</p> <p>8. IV: Notify MCC Battery-R isolator switches (3) - ON (GO for resume Battery A/T)</p> <p>9. WVS: RMS EV Center Cam (1. Connectors and 2. Battery Overview)</p> <p>10. On MCC GO:            L12U FSS PCU PWR CONTR A - OFF            CONTR B - OFF            Notify MCC CONTR A and B - OFF</p>	<p style="text-align: center;"><u>NOTE</u></p> <p>1. Battery bolt numbers 13 &amp; 14 are not engaged for landing</p> <p>2. After bolts 11 and 12 engaged, SLIC battery bolts may be engaged in any order</p> <p>6. <b>PGT [A3, CW 3, 10.5]</b>            ← <input type="checkbox"/></p> <p>7. Engage J-bolts #11 and #12, 3-5 turns (torque)</p> <p>8. Engage remaining J-bolts (10 total), 3-5 turns            - Egress PFR as necessary</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 11 _____ turns</li> <li><input type="checkbox"/> Bolt 12 _____ turns</li> <li><input type="checkbox"/> Bolt 1 _____ turns</li> <li><input type="checkbox"/> Bolt 2 _____ turns</li> <li><input type="checkbox"/> Bolt 3 _____ turns</li> <li><input type="checkbox"/> Bolt 4 _____ turns</li> <li><input type="checkbox"/> Bolt 5 _____ turns</li> <li><input type="checkbox"/> Bolt 6 _____ turns</li> <li><input type="checkbox"/> Bolt 7 _____ turns</li> <li><input type="checkbox"/> Bolt 8 _____ turns</li> <li><input type="checkbox"/> Bolt 9 _____ turns</li> <li><input type="checkbox"/> Bolt 10 _____ turns</li> </ul> <p>9. Close SLIC battery thermal cover</p> <p>10. Remove short adj ext from PGT; stow on socket caddy</p> <p>11. Stow PGT on swing arm</p> <p><u>PFR CLEANUP: IF BATTERY OPS COMPLETE</u></p> <p>1. Verify hitch pin/Velcro installed on FSIPE PFR articulating socket PIP pin</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Bolt 12 _____ turns</li> <li><input type="checkbox"/> Bolt 13 _____ turns</li> <li><input type="checkbox"/> Bolt 5 _____ turns</li> <li><input type="checkbox"/> Bolt 6 _____ turns</li> <li><input type="checkbox"/> Bolt 7 _____ turns</li> <li><input type="checkbox"/> Bolt 8 _____ turns</li> <li><input type="checkbox"/> Bolt 9 _____ turns</li> <li><input type="checkbox"/> Bolt 10 _____ turns</li> <li><input type="checkbox"/> Bolt 1 _____ turns</li> <li><input type="checkbox"/> Bolt 2 _____ turns</li> <li><input type="checkbox"/> Bolt 3 _____ turns</li> </ul> <p>12. Retrieve, inspect; mate one at a time:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Mate P1A to J1A</li> <li><input type="checkbox"/> Mate VIK P2(A) to GCP2</li> <li><input type="checkbox"/> Mate P1B to J1B</li> <li><input type="checkbox"/> Mate VIK P2(B) to GCP2</li> <li><input type="checkbox"/> Mate P1C to J1C</li> <li><input type="checkbox"/> Mate VIK P2(C) to GCP2</li> </ul> <p>← <input type="checkbox"/></p> <p>13. Egress HST PFR as desired</p> <p>14. Release manual door stay; stow on self            - Use turn count from installation</p> <p>15. Attempt to manually start/re-engage lower door bolt prior to bay door closing</p> <p>16. Verify harnesses clear of door in prep for door closure            ← <input type="checkbox"/></p> <p>On IV GO:</p> <p>17. Rotate Battery-R isolator switches (3) - ON</p> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p style="text-align: center;"><u>NOTE</u>            Bay 3 lower bolt may cause problems during engagement. Manually start bolt threads</p>

**NO-RMS BAY 3 BATTERY R&R (Cont)**

<b>IV</b>	<b>EV1/3</b>	<b>EV2/4</b>
		<p>18. Verify harnesses clear of door; close bay door            19. Configure PGT w/ 6-in ext            20. <b>PGT [A3, CW 3, 10.5]</b>            21. If possible, engage lower J-bolt, 4-6 turns            22. Engage J-bolts (5), 4-6 turns</p> <p><u>PFR CLEANUP: IF BATTERY OPS COMPLETE</u></p> <ol style="list-style-type: none"> <li>1. Translate to HST PFR in FR27</li> <li>2. Configure HST PFR to: <b>PP/A/BB/4</b> (launch/landing config)</li> <li>3. Remove HST PFR and PFR extender</li> <li>4. Translate to stbd APC, stow HST PFR and PFR extender               <ul style="list-style-type: none"> <li>- Install hitch pin/Velcro onto PFR extender PIP pin</li> </ul> </li> </ol>

**NO-RMS BATTERY R&R – INGRESS**

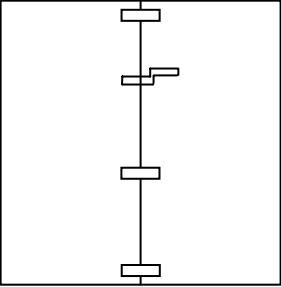
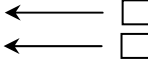
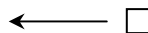
IV	EV1/3	EV2/4
	<p><u>PLB CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Perform glove inspections</li> <li>2. Translate to FSS</li> <li>3. Inspect main umbilical mechanism</li> <li>4. Perform tool inventory</li> <li>5. Translate to airlock</li> </ol> <p><u>AIRLOCK INGRESS</u></p> <ol style="list-style-type: none"> <li>1. On EV2 GO, release EV2 safety tether from stbd truss HR; attach to EMU D-ring - Engage crew hook slide lock - L</li> <li>2. Release own safety tether from port truss HR; stow on self</li> <li>3. Translate to airlock</li> <li>4. Ingress airlock</li> <li>5. Open DCM cover; Velcro to self</li> <li>6. Connect SCU to DCM; √ SCU locked</li> <li>7. WATER - OFF (expect "H2O IS OFF" msg)</li> <li>8. Thermal cover - close</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>9. Verify hardware clear of hatch</li> <li>10. Close, lock outer hatch</li> <li>11. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>	<p><u>PLB CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Perform glove inspections</li> <li>2. Translate to airlock</li> <li>3. Perform tool inventory</li> </ol> <p><u>AIRLOCK INGRESS</u></p> <ol style="list-style-type: none"> <li>1. Open thermal cover</li> <li>2. Ingress airlock</li> <li>3. Attach waist tether to airlock D-ring extender - Engage crew hook slide lock - L</li> </ol> <ol style="list-style-type: none"> <li>4. Open DCM cover; Velcro to self</li> <li>5. Connect SCU to DCM; √ SCU locked</li> <li>6. WATER - OFF (expect "H2O IS OFF" msg)</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div>



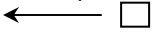
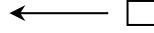
**NO-RMS COS**

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<div style="border: 1px solid black; padding: 5px;"> <p><u>EV1 Tools</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Trash bag</li> <li><input type="checkbox"/> Tethers</li> <li><input type="checkbox"/> RET with PIP pin</li> <li><input type="checkbox"/> Y-harness restraint tool</li> </ul> <p><u>EV2 Tools</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> EVA Ratchet with MTLwith 6-in rigid</li> <li><input type="checkbox"/> PGT (no socket) - swingarm</li> <li><input type="checkbox"/> Socket caddy                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Short adj</li> <li><input type="checkbox"/> 6-in wobble</li> </ul> </li> <li><input type="checkbox"/> Tethers</li> <li><input type="checkbox"/> 80-in tether</li> </ul> </div>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Right waist tether attached to RMS EV safety tether long end, hook slide locks (2) - L</li> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> </ul> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. Thermal cover - open</li> <li>2. Egress airlock</li> <li>3. Attach safety tether to port truss HR standoff:                             <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>4. Attach EV2's safety tether to stbd truss HR standoff:                             <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>5. Translate to ASIPE lid, temp stow ratchet</li> </ol> <p><u>BAPS POST INSTALLATION</u></p> <ol style="list-style-type: none"> <li>1. Install BAPS post center PIP pins (2)</li> </ol>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Right waist tether to A/L D-ring extender, hook slide lock - L</li> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> </ul> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. Release waist tether from airlock D-ring extender</li> <li>2. Egress airlock</li> <li>3. Close A/L thermal cover</li> </ol>

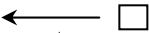
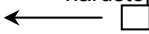
**NO-RMS COS (Cont)**

<p align="center"><b>IV</b></p>	<p align="center"><b>EV1 (Grunsfeld)</b></p>	<p align="center"><b>EV2 (8 Ball)</b></p>
<p>1. ✓ FSS 90°, -V2, Pivot 90°, -SA to 0° 2. ✓ In sun protect att before opening doors</p> <p><u>NOTE FOR DOOR BOLT ACCESS:</u></p> <ul style="list-style-type: none"> <li>• Top Bolt: 6-in rigid w/o MTL works (does not work with MTL)</li> <li>• Lower Middle: 6-in rigid w/o MTL works (does not work with MTL)</li> <li>• Bottom Bolt: 6-in rigid w/o MTL works (does not work with MTL)</li> </ul> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Top bolt (Loose soft stop bolt)</p> <p>Handle bolt (upper middle bolt) (Loose soft stop bolt)</p> <p>Lower middle bolt (Loose soft stop bolt)</p> <p>Bottom bolt</p> </div> </div> <p align="center">-V2 DOORS</p> <p>3. L12U SSM WK LTS - ON (For A &amp; B Lights)</p>	<p><u>AFT FIXTURE &amp; STS PFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to aft fixture - Verify safety tether routed fwd of aft fixture</li> <li>2. Remove PIP pins (2); stow</li> <li>3. Deploy aft fixture to no-RMS intermediate posn</li> <li>4. Engage captive lock pins (2)</li> <li>5. ✓ Top fork PIP pin in proper orientation</li> <li>6. Configure port TA in following order: A=6, B=4, C=8: <b>extend to 7 (launched at S↓17,6,6 ext=1)</b></li> <li>7. Translate to aft ASIPE</li> <li>8. Configure aft ASIPE PFR: (AS: P=1.5, PFR: Y=12, R=A, P=9.5)</li> <li>9. Remove PFR and AS from PFR extender, temp stow</li> <li>10. Remove ASIPE PFR extender from ASIPE, temp stow on MWS</li> <li>11. Re-install AS into ASIPE socket at 90R</li> <li>12. Translate to ORUC S26 (port side of ORUC-LIS)</li> <li>13. Install ASIPE PFR extender into S26 at 30L↓</li> <li>14. Translate to aft shroud doors</li> </ol> <ol style="list-style-type: none"> <li>15. Attach large hook of 80-in tether to self prior to door opening (or give to EV2 for door opening)</li> <li>16. Assist EV2 in door opening</li> </ol>	<p><u>OPEN -V2 DOORS</u></p> <div style="display: flex; align-items: center;">  </div> <ol style="list-style-type: none"> <li>1. Translate to -V2 aft shroud doors</li> <li>2. Temp stow 80-in adj tether on left -V2 door handrail - Sm hook to lower vertical door HR standoff (second from bottom) - Lg hook on lower horizontal HR</li> </ol> <p align="center"><u>NOTE</u></p> <ol style="list-style-type: none"> <li>1. No soft stop on the upper middle (handle) door latch bolt</li> <li>2. Leave bottom bolt in bathtub so doors stay closed during translation</li> </ol> <ol style="list-style-type: none"> <li>3. <b>EVA Ratchet with 6-in rigid (no MTL)</b></li> <li>4. Break torque on door bolts (4), 1/2 turn</li> <li>5. Configure PGT w/ short adj ext</li> <li>6. <b>PGT [A4, CCW 3, 23.5] short adj ext</b> (turns)</li> <li>7. Disengage latch bolts (3), 6.5 turns</li> <li>8. Disengage handle bolt, 6.5 turns</li> <li>9. Stow short adj ext on socket caddy</li> <li>10. Maintain pressure on doors - Remove PIP pin - Release handle latch - Reinstall PIP pin</li> <li>11. Open left door</li> <li>12. Tether left aft shroud door open (to keep from closing) - Lg hook to horizontal HR standoff outboard of LGAP cover</li> </ol> <div style="display: flex; align-items: center;">  </div>

**NO-RMS COS (Cont)**

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>4. ✓ MCC GO for COSTAR connector demate            * If NO COMM perform: *            * DEADFACE COSTAR (PL OPS, <u>ORU/ORI</u>) *</p> <p>5. Ground strap turns _____</p>	<p><u>ORUC HST PFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to center TA</li> <li>2. Relocate center TA to ORUC S25; configure to:  <b>Y=90°L↓ A=6, B=6, C=5, ext = 7</b> (for S26 PFR ingress)</li> <li>3. Translate to stbd APC</li> <li>4. Configure HST PFR JJ/K/DD/1 (had to remove PFR prior to configuring roll to K) (or: JJ/K/EE/11)</li> <li>5. Retrieve HST PFR from APC</li> <li>6. Translate to ORUC S26 (port side of ASIPE)</li> <li>7. Install HST PFR into ASIPE PFR extender at 120R↓ (body should face aft)</li> </ol> <p><u>COSTAR REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Retrieve Y-harness restraint tool from MWS</li> <li>2. Release COSTAR Y-harness Velcro; re-attach to itself</li> <li>3. Install Y-harness restraint tool onto center guide rail outboard strut, open end up</li> <li>4. Reposition Y-harness into restraint tool  </li> <li>5. Demate COSTAR connectors (4):               <ul style="list-style-type: none"> <li><input type="checkbox"/> P1</li> <li><input type="checkbox"/> P2</li> <li><input type="checkbox"/> P3</li> <li><input type="checkbox"/> P4</li> </ul> </li> </ol> <p style="text-align: center;"><u>NOTE</u> Ground strap clip MLI flap is only taped to HST</p> <ol style="list-style-type: none"> <li>6. <b>PGT [A3, CCW 3, 10.5], 6-Ext 7/16 wobble</b></li> <li>7. Disconnect ground strap, 6 (4-6) turns; temp stow  </li> <li>8. Pre-configure PGT for A-latch: (B2, CCW3, 5.5)</li> <li>9. Open "B" latch cover</li> <li>10. ✓ indicator lights off (4)</li> <li>11. Translate to "A" latch</li> <li>12. Receive EVA ratchet from EV2</li> </ol>	<p><u>AFT SHROUD HST PFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to fwd/port face of FSS</li> <li>2. Retrieve 90 deg converter and HST PFR</li> <li>3. Translate to FR4 (inside aft shroud right side)</li> <li>4. Temp stow HST PFR (avoid HST HR)</li> <li>5. Install 90 deg converter at 90R↓ into FR4</li> <li>6. Translate to stbd APC; retrieve PFR extender</li> <li>7. Translate to aft shroud</li> <li>8. Configure APC PFR ext into 90 deg converter at 75 R↑</li> <li>9. Configure HST PFR at LL/M/ZZ/4</li> <li>10. Install HST PFR into PFR ext at 75R↓</li> </ol> <p><u>COSTAR REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Stabilize EV1 as reqd (for connector ops and ground strap)</li> </ol> <ol style="list-style-type: none"> <li>2. Ingress HST PFR in aft shroud</li> <li>3. ✓ "A" LATCHED lights off (2)</li> <li>4. Transfer EVA ratchet to EV1</li> <li>5. Hold EV1 for "A" latch torque break</li> </ol>

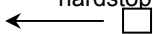
NO-RMS COS (Cont)

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p><u>NOTE</u> Possible for EV2 to also break torque on A-Latch from PFR</p> <p>6. "A" total turns _____</p> <p>7. "B" total turns _____</p>	<p>13. Configure ratchet with 6-in rigid            14. <b>EVA Ratchet [CCW, MTL 38], 6-Ext 7/16 rigid</b>            15. Break torque on "A" latch, 1/2 turn            16. Stow EVA ratchet on MWS            17. Translate to "B" latch            18. Note alignment and posn of SI</p> <p>On EV2 GO:            19. <b>PGT [B7, CCW 2, 15.5], 6-Ext 7/16 wobble</b>            20. Disengage "B" latch, 1/2 turn            21. <b>PGT [B5, CCW 2, 5.5]</b>, expect MTL slip            22. Disengage "B" latch, 9.5-13.5 additional turns to hardstop              23. ✓ "A" SEATED lights on (2)            24. ✓ "B" READY lights come on (2)            25. Pitch and yaw EV2's PFR bootplate as reqd for COSTAR removal            26. Assist EV2 w/ COSTAR removal            - Position self on stbd side of aft shroud doors            - Slide COSTAR out of bay, and yaw SI to keep handholds accessible            27. Translate to ORUC S26, ingress HST PFR            28. Receive COSTAR from EV2</p> <p><u>NOTE</u>            IMAX interferes with nominal installation of COSTAR onto aft fixture: posn COSTAR as aft as possible to clear interference and engage aft-most and upper forks</p>	<p>6. <b>PGT [B2, CCW 3, 5.5], 6-Ext 7/16 wobble</b>            7. ✓ "A" LATCHED light on (2), (1-2 turns)            8. Disengage "A" latch 11.5-15.5 additional turns to hardstop              9. Note alignment and posn of SI            10. Maintain downward force            11. Give EV1 GO for "B" latch disengage</p> <p><u>NOTE</u>            7 to 9 lbs force to demate "C" latch</p> <p>12. Remove COSTAR            - Slide COSTAR out of bay, and yaw SI to keep handholds accessible            13. Transfer COSTAR to EV1 (COSTAR connectors PLB fwd)            14. Translate to aft fixture</p>

**NO-RMS COS (Cont)**

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>8. "A" total turns _____</p> <p>9. Ground strap turns _____</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> Possible finger pinch hazard when stowing COSTAR on aft fixture</p> </div> <p>29. Stow COSTAR on aft fixture; install adj tethers as reqd to hold COSTAR inside forks</p> <p><u>COS RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Egress HST PFR</li> <li>2. Translate to telescope; inspect bay (latches and all MLI)</li> <li>3. Translate to ASIPE top/port face</li> <li>4. √ "A" LATCHED lights off</li> <li>5. <b>EVA Ratchet [CCW, MTL 38], 6-Ext 7/16 rigid</b></li> <li>6. Break torque on "A" latch, 1/2 turn</li> <li>7. Configure PGT w/ 6-in socket</li> <li>8. <b>PGT [B2, CCW 3, 5.5], 6-Ext 7/16 wobble</b></li> <li>9. √ "A" LATCHED lights on (1-2 turns)</li> <li>10. Disengage "A" latch, 11.5-15.5 additional turns to hardstop ← <input type="checkbox"/></li> <li>11. Translate to "B" latch cover w/ FF PGT</li> <li>12. Open "B" latch access cover (2 latches)</li> </ol>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> Possible finger pinch hazard when stowing COSTAR on aft fixture</p> </div> <p>15. Assist EV1 w/ COSTAR install into aft fixture; install adj tethers as reqd to hold COSTAR inside forks</p> <p>16. If possible, install PIP pin</p> <p><u>COS RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to ASIPE aft face</li> <li>2. Ingress PFR</li> <li>3. Open lid (5 latches)</li> <li>4. Hold EV1's feet as reqd for "A" latch</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Avoid contact between COS surface and PGT socket during ground strap bolt access</p> </div> <ol style="list-style-type: none"> <li>5. <b>PGT [A2, CCW 2, 2.5], 6-Ext 7/16</b></li> <li>6. Disconnect ground strap bolt, 13 turns ← <input type="checkbox"/></li> <li>7. Stow ASIPE ground strap</li> <li>8. Disengage alignment aid stowage lock, 6-8 turns (spring loaded)</li> <li>9. Disengage alignment aid deployment lock, 1/2 turn</li> <li>10. Deploy alignment aid 90°</li> <li>11. Re-engage deployment lock, 1/2 turn</li> <li>12. Apply aftward force while EV2 drives "B" latch</li> <li>13. Give EV1 GO for "B" latch release</li> </ol>

**NO-RMS COS (Cont)**

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>10. "B" total turns _____</p>	<p>On EV2 GO:</p> <ol style="list-style-type: none"> <li>13. Translate to "B" latch cover w/ FF PGT</li> <li>14. Open "B" latch access cover (2 latches)</li> <li>15. <b>PGT [A3, CCW 2, 10.5]</b></li> <li>16. Disengage "B" latch, 1/2 turn</li> <li>17. <b>PGT [B5, CCW 2, 5.5]</b></li> <li>18. Disengage "B" latch, 9.5 - 13.5 additional turns to hardstop  <div style="text-align: center;">  </div> </li> <li>19. √ "A" SEATED lights on</li> <li>20. √ "B" READY lights come on (2)</li> <li>21. Translate to COS</li> <li>22. Assist EV2 with COS removal</li>   <li>23. Translate to ORUC S26</li> <li>24. Ingress HST PFR</li> <li>25. Receive COS from EV2</li>   <li>26. Transfer COS to EV2 (HRs must be payload bay forward)</li> <li>27. Close ASIPE lid, 1 latch</li> <li>28. Egress PFR</li> <li>29. Translate to aft shroud for COS install (stbd side)</li>   <p><u>COS INSTALLATION</u></p> <ol style="list-style-type: none"> <li>1. Assist EV2 with insertion of COS</li> <li>2. Disengage alignment aid deployment lock, 1/2 turn</li> <li>3. Deploy the alignment aid arm</li> <li>4. Re-engage deployment lock, 1/2 turn</li> <li>5. Inform RMS EV when "B" READY lights off</li> <li>6. <b>PGT [A3, CW 1, 10.5], 6-Ext 7/16</b></li> <li>7. Engage "B" latch, 2 turns</li> <li>8. Verify no COS vertical movement</li> </ol> </ol>	<p style="text-align: center;"><u>NOTE</u> 7 to 9 lbs force to demate "C" latch</p> <ol style="list-style-type: none"> <li>14. Remove COS from ASIPE - Slide out of PLB until clear of guide rails, then pivot up until SI vertical</li> <li>15. Transfer COS to EV1</li> <li>16. Egress ASIPE PFR</li> <li>17. Translate to FR4, ingress PFR, reconfig PFR settings as reqd: KK/M/ZZ/2</li> <li>18. Receive COS from EV1</li> </ol> <p><u>COS INSTALLATION</u></p> <ol style="list-style-type: none"> <li>1. Insert COS until front face clears center outboard guide rail</li>   <li>2. Insert COS until "B" READY lights off</li> <li>3. Maintain slight downward force</li>   <li>4. Verify no COS vertical movement <ul style="list-style-type: none"> <li>* If vertical movement, reseal COS *</li> <li>* on "B" latch plunger *</li> </ul> </li> </ol>

**NO-RMS COS (Cont)**

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>11. "B" total turns _____</p> <p>12. "A" total turns _____</p> <p>13. Ground strap turns _____</p> <p>14. Notify MCC COS connectors mated (COS Aliveness Test)</p> <p>15. WVS: FF EV Center Cam, P/TV15 HST EVA, OPS (PHOTO/TV FS, <u>SCENES</u>) (COS conn panel, ground Strap, Y-harness)</p> <p>16. L12U SSM WK LTS - OFF (For A &amp; B Lights)</p>	<p>9. Engage "B" latch, 8-12 additional turns - Verify latch over-center ← <input type="checkbox"/></p> <p>10. √ "A" SEATED lights off</p> <p>11. Give EV2 GO for "A" latch engage</p> <p>12. Replace "B" latch cover</p> <p>13. Transfer EVA ratchet to EV2</p> <p>14. Stow alignment aid - Release deployment lock, 1/2 turn - Slide alignment aid up - Rotate alignment aid 90° - Engage stowage lock zip nut hand tight - Engage deployment lock (1/2 turn)</p> <p>15. <b>PGT [B6, CW 2, 10.5]</b></p> <p>16. Reinstall HST ground strap, 4-6 turns ← <input type="checkbox"/></p> <p>17. Inspect and mate COS connectors (4) (pins on COS): <input type="checkbox"/> P1 <input type="checkbox"/> P2 <input type="checkbox"/> P3 <input type="checkbox"/> P4</p> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>18. Inspect and adjust COSTAR Y-harness as reqd ← <input type="checkbox"/></p> <p><u>COSTAR INSTALLATION</u></p> <p>1. Translate to port ORUC S26 2. Ingress HST PFR</p> <p>3. Retrieve COSTAR from aft fixture</p> <p>4. Transfer COSTAR to EV2</p> <p>5. Egress HST PFR</p> <p>6. Assist EV2 w/ COSTAR insertion into ASIPE - Pitch COSTAR down until horizontal in PLB, then</p>	<p>5. <b>PGT [A3, CW 3, 10.5], short adj ext or 6-in?</b></p> <p>6. On EV1 GO, engage "A" latch, 11.5-15.5 turns</p> <p>7. √ "A" LATCHED lights off</p> <p>8. Receive ratchet from EV1</p> <p>9. Remove short adj ext from PGT; configure onto EVA ratchet</p> <p>10. <b>EVA Ratchet [CW, MTL 38]</b></p> <p>11. Continue driving "A" latch 1/2 turn until MTL slips ← <input type="checkbox"/></p> <p>12. Stabilize EV1 if possible</p> <p><u>COSTAR INSTALLATION</u></p> <p>1. Translate to ASIPE; open lid</p> <p>2. Inspect ASIPE interior; inspect "A", "B", and "C" latches</p> <p>3. Translate to aft fixture</p> <p>4. Assist EV2 w/ COSTAR retrieval</p> <p>5. Ingress aft ASIPE STS PFR</p> <p>6. Receive COSTAR from EV1</p> <p>7. Insert COSTAR into ASIPE - Pitch COSTAR down until horizontal in PLB,</p>

**NO-RMS COS (Cont)**

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>17. "B" turns _____</p> <p>18. Ground strap turns _____</p> <p>19. "A" turns _____</p>	<p>insert into ASIPE</p> <ol style="list-style-type: none"> <li>7. Translate to "B" latch access door</li> <li>8. Inform EV2 when "B" READY lights off</li> <li>9. <b>PGT [B6, CW 1, 10.5], 6-Ext 7/16</b></li> <li>10. Engage "B" latch, 2 turns &amp; check for movement</li> <li>11. Continue engaging "B" latch 8-12 additional turns, verify latch over-center ← <input type="checkbox"/></li> <li>12. √ "A" SEATED lights off</li> <li>13. Close "B" latch access cover (2 latches)</li> <li>14. Translate to "A" latch</li> </ol> <ol style="list-style-type: none"> <li>15. <b>PGT [A3, CW 3, 10.5]</b></li> <li>16. Engage "A" latch, 13-13.5 turns</li> <li>17. Receive ratchet from EV2</li> <li>18. <b>EVA Ratchet [CW, MTL 38], 6-Ext 7/16</b></li> <li>19. Continue "A" latch 1/2 turn until MTL slips ← <input type="checkbox"/></li> <li>20. √ "A" LATCHED lights off</li> <li>21. Close ASIPE lid; engage latches - Fwd and aft latches first (2), then center latches (3)</li> </ol> <p><u>HST PFR CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to ORUC S26 (port side of ASIPE)</li> <li>2. Retrieve HST PFR and ASIPE PFR extender</li> <li>3. Translate to stbd APC</li> <li>4. Stow HST PFR (PP/A/BB/4)</li> </ol> <ol style="list-style-type: none"> <li>5. Translate to aft ASIPE socket</li> <li>6. Remove PFR and AS, temp stow on ASIPE lid</li> <li>7. Install PFR extender into aft ASIPE at ~ 6 o'clock, install hitch pin or Velcro flag</li> <li>8. Install AS and PFR into PFR extender, AS: 90R, P=3.5, PFR: Y=6, R=C, P=3.5 (STIS settings); install AS hitch pin or Velcro flag</li> <li>9. Relocate center TA to ORUC S31; configure to: <b>Y=0</b>↓, <b>A=6, B=6, C=0</b>, extension =1; install Velcro flag and conductive Velcro ground strap</li> </ol>	<p>then insert into ASIPE</p> <ol style="list-style-type: none"> <li>8. Insert COSTAR until "B" READY lights off</li> <li>9. Maintain slight aft force (Orbiter -X)</li> <li>10. Verify no COSTAR Orbiter +X movement</li> </ol> <ol style="list-style-type: none"> <li>11. <b>PGT [A2, CW 2, 2.5], 6-Ext 7/16 or short adj</b></li> <li>12. Install ground strap on COSTAR; engage bolt, 15.5 turns ← <input type="checkbox"/></li> <li>13. Stabilize EV1 as possible</li> <li>14. Transfer ratchet to EV1</li> </ol> <ol style="list-style-type: none"> <li>15. Close ASIPE lid; engage latches - Fwd and aft latches first (2), then center latches (3)</li> <li>16. Egress PFR</li> <li>17. Translate to aft fixture</li> <li>18. Stow aft fixture; engage PIP pins (2)</li> </ol> <p><u>HST PFR CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate into aft shroud; retrieve HST PFR</li> <li>2. Translate to fwd/port face of FSS</li> <li>3. Stow HST PFR (JJ/A/BB/4)</li> </ol> <ol style="list-style-type: none"> <li>4. Translate to aft shroud; retrieve stbd APC PFR extender and 90 deg converter</li> <li>5. Translate to fwd/port face of FSS</li> <li>6. Stow 90 deg converter, install Velcro flag</li> </ol> <ol style="list-style-type: none"> <li>7. Translate stbd APC, stow PFR extender, install hitch pin or Velcro flag</li> </ol>



**N0-RMS COS (Cont)**

IV	EV1	EV2
	<p><u>PLB CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to FSS</li> <li>2. Inspect main umbilical mechanism</li> <li>3. Remove BAPS post center PIP pins (2); stow</li> <li>4. Perform tool inventory</li> <li>5. Translate to airlock</li> </ol> <p><u>AIRLOCK INGRESS</u></p> <ol style="list-style-type: none"> <li>1. On EV2 GO, release EV2 safety tether from stbd truss HR, attach to EMU D-ring - Engage crew hook slide lock - L</li> <li>2. Release own safety tether from port truss HR, stow on self</li> <li>3. Translate to airlock</li> <li>4. Ingress airlock</li> <li>5. Open DCM cover; Velcro to self</li> <li>6. Connect SCU to DCM; ✓ SCU locked</li> <li>7. WATER - OFF (expect "H2O IS OFF" msg)</li> <li>8. Thermal cover - close</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>9. Verify hardware clear of hatch</li> <li>10. Close, lock outer hatch</li> <li>11. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>	<p><u>PLB CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Mnvr to airlock</li> <li>2. Perform tool inventory</li> </ol> <p><u>AIRLOCK INGRESS</u></p> <ol style="list-style-type: none"> <li>1. Open thermal cover</li> <li>2. Ingress airlock</li> <li>3. Attach waist tether to airlock D-ring extender - Engage crew hook slide lock - L</li> </ol> <ol style="list-style-type: none"> <li>4. Open DCM cover; Velcro to self</li> <li>5. Connect SCU to DCM; ✓ SCU locked</li> <li>6. WATER - OFF (expect "H2O IS OFF" msg)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div>

**NO-RMS FGS-2**

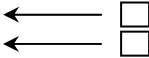
IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>1. √ FSS 0 (+V3 fwd), pivot 55°</p> <div style="border: 1px solid black; padding: 5px;"> <p><u>EV1 Tools</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tethers</li> <li><input type="checkbox"/> 34" tether</li> </ul> <p><u>EV2 Tools</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> EVA ratchet w/ MTL</li> <li><input type="checkbox"/> PGT - empty</li> <li><input type="checkbox"/> Socket caddy with short adj</li> <li><input type="checkbox"/> Tethers</li> </ul> </div>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> <li>√ Waist tether to left EMU D-ring, hook slide lock - L</li> <li>√ EV2 safety tether long end attached to right waist tether, hook slide locks (2) - L</li> </ul> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. Thermal cover - open</li> <li>2. Egress airlock</li> <li>3. Attach own safety tether to port truss HR standoff               <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>4. Attach EV2's safety tether to stbd truss HR standoff               <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> </ol> <p><u>AFT FIXTURE SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to aft fixture</li> <li>2. Remove PIP pins (2); stow</li> <li>3. Deploy aft fixture to intermediate posn (135 deg, if RMS in MPMs)</li> <li>4. Engage captive lock pins (2)</li> <li>5. √ Top fork PIP pin in proper orientation</li> </ol> <p><u>HST PFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to stbd APC</li> <li>2. Retrieve PFR extender</li> <li>3. Install HST PFR into PFR extender at 45L↑</li> <li>4. Retrieve HST PFR &amp; extender</li> <li>5. Translate to HST FR11 (stbd of FGS-2)</li> </ol>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Right waist tether to A/L D-ring extender, hook slide lock - L</li> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> </ul> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. Release waist tether from airlock D-ring extender</li> <li>2. Egress airlock</li> <li>3. Close A/L thermal cover</li> </ol> <p><u>STS PFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to ASIPE socket S30 (aft)</li> <li>2. Remove STS PFR and AS from PFR extender; temp sow</li> <li>3. Remove ASIPE PFR extender from ASIPE; temp stow on MWS</li> <li>4. Re-install AS into ASIPE socket at 90R</li> <li>5. Translate to ORUC S26 (port side of ORUC-LIS)</li> <li>6. Install ASIPE PFR ext into S26 at Y=30L↓</li> <li>7. Retrieve HST PFR from fwd/port FSS</li> <li>8. Translate to S26; configure HST PFR JJ/K/DD/1</li> <li>9. Install HST PFR into PFR ext at 120R↓</li> <li>10. Relocate port TA to ORUC S25, configure straight up: <b>Y=90L↓</b> (C-knob inboard), <b>A=7, B=6, C=6</b>, ext=7 (ingress aid for S26)</li> </ol>



NO-RMS FGS-2 (Cont)

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>5. LED ON "A" turns _____</p> <p>6. Total "A" turns _____</p>	<p><u>HANDHOLD RETRIEVAL AND INSTALL</u></p> <ol style="list-style-type: none"> <li>1. Translate to HST PFR in S26 (ORUC), ingress</li> <li>2. Receive FGS handhold from EV2</li> <li>3. Transfer FGS handhold to EV2</li> <li>4. Assist EV2 as req'd</li> </ol> <p><u>FGS-2 REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Assist EV2 as req'd</li> </ol> <p style="text-align: center;"><u>NOTE</u> Expect to see FGS-2 move ~ 1.1 inches out of telescope during "A" latch bolt release</p> <ol style="list-style-type: none"> <li>2. Report "A" LATCHED light on ← <input type="checkbox"/></li> <li>3. Assist EV2 with initial FGS-2 removal</li> </ol>	<p><input type="checkbox"/> P10</p> <ol style="list-style-type: none"> <li>4. Verify connector bundle clear of worksite</li> </ol> <p><u>HANDHOLD RETRIEVAL AND INSTALL</u></p> <ol style="list-style-type: none"> <li>1. Translate to fwd fixture</li> <li>2. Retrieve FGS handhold; transfer to EV1               <ul style="list-style-type: none"> <li>- Release Velcro grounding strap, temp stow</li> <li>- Release latches (2)</li> </ul> </li> <li>3. Translate to FGS 2</li> <li>4. As req'd ingress HST PFR; receive FGS handhold from EV1</li> <li>5. Install FGS handhold</li> <li>6. Install and torque zip nuts (4) to hand tight</li> </ol> <p><u>FGS-2 REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Ingress HST PFR in FR 11</li> <li>2. Adj HST PFR pitch from ZZ to BB (2 clicks)</li> <li>3. Retrieve EVA ratchet from MWS</li> <li>4. Configure EVA ratchet w/ short adj ext</li> <li>5. <b>EVA Ratchet [CCW, MTL 38] short adj</b></li> <li>6. Break torque on "A" latch, 1/2 turn</li> <li>7. Stow EVA ratchet; retrieve PGT</li> </ol> <p style="text-align: center;"><u>NOTE</u> Expect to see FGS-2 move ~ 1.1 inches out of telescope during "A" latch bolt release</p> <ol style="list-style-type: none"> <li>8. <b>PGT [A3, CCW 3, 10.5] short adj</b></li> <li>9. Disengage "A" latch 22 turns (free spin)</li> <li>10. ✓ "A" LATCHED light on (2.5 turns) ← <input type="checkbox"/></li> <li>11. Perform initial FGS-2 removal, avoid pitch down               <ul style="list-style-type: none"> <li>- A over D at ~ 2nd roller exiting guide rail</li> </ul> </li> </ol>

**NO-RMS FGS-2 (Cont)**

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>7. LED ON "A" turns _____</p> <p>8. Total "A" turns _____</p>	<p>4. Once FGS-2 w/ in reach, complete instrument removal from HST            - Layback may be required to clear HST</p> <p>5. Install FGS-2 onto aft fixture</p> <p><u>FGS-2R RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to FSIPE; open FSIPE lid (3 latches)</li> <li>2. Disconnect ground strap (P10); mate to dummy receptacle</li> <li>3. Ingress PFR in FSIPE socket S28 (fwd/center)</li> <li>4. Receive FGS handhold from EV2</li> <li>5. Install FGS handhold onto FGS-2R integral handhold, install; torque aft 2 zip nuts to hand tight</li> <li>6. <b>EVA Ratchet [CCW, MTL 38] short adj ext, fully ext</b></li> <li>7. Break torque on "A" latch, 1/2 turn</li> <li>8. Stow EVA ratchet; retrieve PGT</li> <li>9. √"A" LATCHED light off (FSIPE hinge)</li> <li>10. <b>PGT [A3, CCW 3, 10.5]</b></li> <li>11. Disengage "A" latch 22 turns (free spin)</li> <li>12. √"A" LATCHED light on (2.5 turns)</li> </ol>  <ol style="list-style-type: none"> <li>13. Stow PGT</li> <li>14. Remove FGS-2R            - Pitch A over D as req'd            - Motion will be straight out of WSIPE until guidrails clear, then yaw to Orbiter stbd to clear pick-off mirror</li> <li>15. Perform slight layback to clear FSIPE lid for closing</li> <li>16. Transfer FGS-2R to EV2</li> </ol>	<p>12. Transfer main instrument control to EV1</p> <ol style="list-style-type: none"> <li>13. Egress HST PFR</li> <li>14. Translate to aft fixture</li> <li>15. Ensure EV1 and EV2 safety tethers are fwd of aft fixture</li> <li>16. Assist EV1 w/ stowing FGS-2 on aft fixture; install upper fork PIP pin</li> <li>17. Translate to HST FGS bay; inspect bay (guide rails, latches, and MLI)</li> </ol> <p><u>FGS-2R RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to port SLIC, retrieve spare FGS handhold</li> <li>2. Transfer handhold to EV1</li> <li>3. Assist EV2 with handhold install</li> <li>4. Once aft handhold zip nuts complete, torque fwd 2 zip nuts to hand tight</li> <li>5. Translate to stbd side of FSIPE</li> <li>6. Assist EV1 w/ FGS-2R removal</li> <li>7. Close FSIPE lid (1 latch)</li> <li>8. Translate to FR11, ingress HST PFR            - As necessary adj HST PFR pitch to ZZ for ingress, then to BB for FGS install</li> <li>9. Receive FGS-2R from EV1</li> </ol>



**NO-RMS FGS-2 (Cont)**

<b>IV</b>	<b>EV1 (Grunsfeld)</b>	<b>EV2 (8 Ball)</b>
<p>13. L12U SSM WK LTS - OFF</p> <p>14. LED OFF "A" turns _____</p> <p>15. Total "A" turns _____</p>	<p><u>CLOSE FGS-2 BAY DOORS</u></p> <ol style="list-style-type: none"> <li>1. Remove 34" adj tether from right door, stow on MWS</li> <li>2. Close door (left then right)</li> <li>3. Assist EV2</li> </ol> <p><u>FGS-2 STOW</u></p> <ol style="list-style-type: none"> <li>1. If not already preformed, ingress HST PFR in S26 (ORUC)</li> <li>2. Remove FGS-2 from aft fixture</li> <li>3. Transfer FGS-2 to EV2</li> <li>4. Open FSIPE lid (1 latch)</li> <li>5. Inspect FSIPE</li> </ol>	<p><u>CLOSE FGS-2 BAY DOORS</u></p> <ol style="list-style-type: none"> <li>1. Close door (left then right)</li> <li>2. Ingress HST PFR in FR11</li> <li>3. Re-install handle PIP pin</li> <li>4. ✓ Door seals</li> </ol> <p style="text-align: center;"><u>NOTE</u> Apply pressure to doors while engaging latch bolts</p> <ol style="list-style-type: none"> <li>5. <b>PGT [B4, CW 2, 23.5]</b></li> <li>6. Engage handle bolt, 7 turns</li> <li>7. Engage latch bolts (2), 7 turns</li> <li>8. Re-torque bolts (2)</li> <li>9. ✓ Door seals</li> </ol> <div style="text-align: center;">← <input type="checkbox"/></div> <p><u>FGS-2 STOW</u></p> <ol style="list-style-type: none"> <li>1. Translate to aft fixture</li> <li>2. Remove top fork PIP pin; stow</li> <li>3. Assist EV1 w/ FGS-2 removal from aft fixture</li> <li>4. Ingress STS PFR in FSIPE socket S28 (fwd FSIPE)</li> <li>5. Receive FGS-2 from EV1</li> <li>6. Perform layback as necessary to clear FSIPE for lid opening</li> <li>7. Install FGS-2 into FSIPE (hard stop)</li> <li>8. <b>PGT [A3, CW 3, 10.5]</b></li> <li>9. Engage "A" latch, 22 turns (hard stop)</li> <li>10. ✓"A" LATCHED light off (19-20 turns)</li> <li>11. <b>EVA Ratchet [CW, MTL 38]</b></li> <li>12. Torque "A" latch ~1/2 turn until MTL slips</li> </ol> <div style="text-align: center;">← <input type="checkbox"/></div> <div style="text-align: center;">← <input type="checkbox"/></div> <ol style="list-style-type: none"> <li>13. Re-torque handhold zipnuts (4) - Hand tight, 20 in-lbs minimum</li> </ol>

**NO-RMS FGS-2 (Cont)**

<b>IV</b>	<b>EV1 (Grunsfeld)</b>	<b>EV2 (8 Ball)</b>
	<p>6. Close FSIPE lid; engage latches (3)</p> <p><u>PFR CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to HST PFR in FR11</li> <li>2. Configure HST PFR to: PP/A/BB/4 (launch/landing config)</li> <li>3. Remove HST PFR and PFR extender</li> <li>4. Translate to stbd APC, stow HST PFR and PFR extender               <ul style="list-style-type: none"> <li>- Install hitch pin or Velcro flag onto PFR extender PIP pin</li> </ul> </li> </ol>	<p><u>PFR CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to aft fixture</li> <li>2. Stow aft fixture, install PIP pins (2); Velcro tabs</li> <li>3. Translate to HST PFR in ORUC S26</li> <li>4. Configure HST PFR: JJ/A/BB/4</li> <li>5. Stow HST PFR into fwd/port FSS APC</li> <li>6. Relocate ASIPE PFR extender from S26; translate to aft ASIPE socket (S30)</li> <li>7. Remove STS PFR and AS from socket; temp stow</li> <li>8. Install PFR ext into S26: Y=6 o'clock (straight down)</li> <li>9. Install AS into PFR ext: AS: Y=90R               <ul style="list-style-type: none"> <li>- Install Velcro flag onto PFR extender PIP pin</li> <li>- Install hitch pin or Velcro flag onto articulating socket PIP pin</li> </ul> </li> <li>10. Relocate port TA from ORUC S25 back to ORUC S24, configure to: Y=0↓, 17,6,6, ext=1 (launch config)               <ul style="list-style-type: none"> <li>- Re-install Velcro flags on TA extension PIP pin and S24 socket PIP pin interfaces</li> <li>- Install conductive Velcro ground strap</li> </ul> </li> </ol>



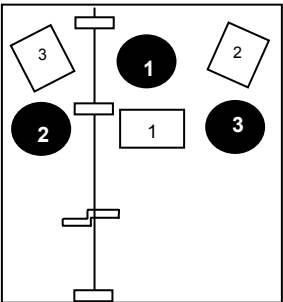
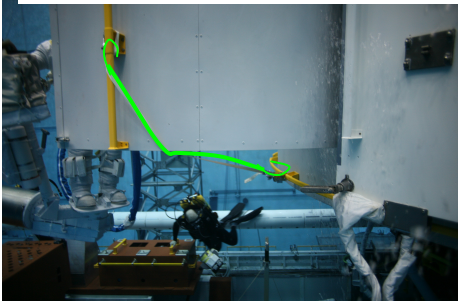
## DAILY CLOSEOUT/INGRESS

IV	EV1	EV2
	<p><u>PLB CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to FSS</li> <li>2. Inspect main umbilical mechanism</li> <li>3. Remove BAPS post center PIP pins (2); stow</li> <li>4. Perform tool inventory</li> <li>5. Translate to airlock</li> </ol> <p><u>AIRLOCK INGRESS</u></p> <ol style="list-style-type: none"> <li>1. On EV2 GO, release EV2 safety tether from stbd truss HR; attach to EMU D-ring - Engage crew hook slide lock - L</li> <li>2. Release own safety tether from port truss HR; stow on self</li> <li>3. Translate to airlock</li> <li>4. Ingress airlock</li> <li>5. Open DCM cover; Velcro to self</li> <li>6. Connect SCU to DCM; √ SCU locked</li> <li>7. WATER - OFF (expect "H2O IS OFF" msg)</li> <li>8. Thermal cover - close</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>9. Verify hardware clear of hatch</li> <li>10. Close, lock outer hatch</li> <li>11. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>	<p><u>PLB CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to airlock</li> <li>2. Perform tool inventory</li> </ol> <p><u>AIRLOCK INGRESS</u></p> <ol style="list-style-type: none"> <li>1. Open thermal cover</li> <li>2. Ingress airlock</li> <li>3. Attach waist tether to airlock D-ring extender - Engage crew hook slide lock - L</li> </ol> <ol style="list-style-type: none"> <li>4. Open DCM cover; Velcro to self</li> <li>5. Connect SCU to DCM; √ SCU locked</li> <li>6. WATER - OFF (expect "H2O IS OFF" msg)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>7. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>

# NO-RMS RSU

IV	EV3 (Mass)	EV4 (Bueno)
<p>1. √ FSS 180, -V3, pivot 90°, SA 0°</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><u>EV3 Tools</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> PGT</li> <li><input type="checkbox"/> Socket caddy with hybrid ext</li> <li><input type="checkbox"/> Tethers (several adjustables for temp stow)</li> <li><input type="checkbox"/> Left swingarm</li> <li><input type="checkbox"/> RSU bag on left swingarm</li> <li><input type="checkbox"/> 80-in tether</li> <li><input type="checkbox"/> Trash bag</li> <li><input type="checkbox"/> EVA Ratchet with short adj extension</li> <li><input type="checkbox"/> Fish stringer (to temp stow items at ASIPE lid for Mass)</li> </ul> <p><u>EV4 Tools</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> PGT</li> <li><input type="checkbox"/> Socket caddy with hybrid ext and 6-in socket</li> <li><input type="checkbox"/> Tethers</li> </ul> <p><u>SOPE</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> PIK STIK</li> </ul> </div>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Left waist tether attached to EV4 safety tether long end, hook slide locks (2) - L</li> <li>√ Own safety tether load alleviating strap attached to right EMU D-ring, hook slide lock - L, reel unlocked</li> </ul> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. Thermal cover - open</li> <li>2. Egress airlock</li> <li>3. Attach safety tether to stbd truss HR standoff: <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> <li>4. Attach EV4's safety tether to port truss HR standoff: <ul style="list-style-type: none"> <li>- Engage crew hook slide lock - L</li> </ul> </li> </ol> <p><u>BAPS POST INSTALLATION</u></p> <ol style="list-style-type: none"> <li>1. Install BAPS post center pip pins (2)</li> </ol> <p><u>TRANSLATION AID SETUP</u></p> <ol style="list-style-type: none"> <li>1. Configure center TA (straight up): A=6, B=6, <b>C=6</b>, extended (1)</li> <li>2. Configure port TA: <b>A=6</b>, B=6, <b>C=9</b>, extended (7)</li> </ol>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Left waist tether to A/L D-ring extender, hook slide lock - L</li> <li>√ Own safety tether load alleviating strap attached to right EMU D-ring, hook slide lock - L, reel unlocked</li> </ul> <ol style="list-style-type: none"> <li>1. Release waist tether from airlock D-ring extender</li> <li>2. Egress airlock</li> <li>3. Close A/L thermal cover</li> </ol> <p><u>TRANSLATION ADAPTATION</u></p> <ol style="list-style-type: none"> <li>1. Perform translation adaptation</li> </ol>

# NO-RMS RSU (Cont)

IV	EV3 (Mass)	EV4 (Buono)												
<p>1. √ FSS 180°, -V3, Pivot 90°, +/-SA to 0°                  2. √ In sun protect att before opening doors and SOPE                  3. L12U √ RSU SURV HTR PWR - OFF (tb-bp)</p>  <p style="text-align: center;">-V3 DOORS      FR24</p>	<p><b>STS PFR SETUP</b></p> <ol style="list-style-type: none"> <li>Translate -V3 right door, install fairlead at SOPE knob</li> <li>Temp stow 80-in tether on right door</li> <li>Translate to ASIPE lid:                         <ul style="list-style-type: none"> <li>☐ Transfer fish stringer to ASIPE lid</li> <li>☐ Temp stow RSU bag and trash bag on fish stringer</li> </ul> </li> <li>Configure aft ASIPE AS to P=2.5, and PFR to Y=8, R=A, P=10.5</li> <li>Relocate PFR and AS from ASIPE socket S30 to HST FR5 (stbd/nadir of -V3 doors): Y=90L↓</li> </ol>	<p>← ☐ ← ☐</p> <p><b>STS PFR SETUP</b></p> <ol style="list-style-type: none"> <li>Translate to FSIPE fwd socket S28, configure AS to P=2.5, and PFR to Y=4, R=J.5, P=11</li> <li>Remove AS and STS PFR from FSIPE S28, temp stow (used ORUC S25 last time)</li> <li>Translate to stbd APC, retrieve PFR extender</li> <li>Translate to FR24 (port/nadir of -V3 doors), install PFR extender at Y=15L↓</li> <li>Retrieve AS and PFR from temp stow location; Install AS into PFR extender at: Y=90L↓                         <ul style="list-style-type: none"> <li>- <u>Back-up Settings #1</u>: PFR ext: 15L↓, 90 deg conv: 0 deg↑, AS: Y= 90R↑, P=11.5; PFR: Y=4, R=K.5, P=10.5</li> <li>- <u>Back-up Settings #2</u>: PFR ext 0 deg down, HST PFR clocking 15L down, then NNE/BB/12</li> </ul> </li> </ol>												
<table border="1"> <thead> <tr> <th></th> <th>Top Bolt</th> <th>Bottom Left Bolt</th> <th>Bottom Right Bolt</th> </tr> </thead> <tbody> <tr> <td>FHST 2 (left)</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> </tr> <tr> <td>FHST 3 (right)</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> </tr> </tbody> </table>		Top Bolt	Bottom Left Bolt	Bottom Right Bolt	FHST 2 (left)	⋮	⋮	⋮	FHST 3 (right)	⋮	⋮	⋮	<p><b>OPEN -V3 DOORS</b></p> <ol style="list-style-type: none"> <li>Ingress FR5</li> </ol>	<p><b>OPEN -V3 DOORS</b></p>
	Top Bolt	Bottom Left Bolt	Bottom Right Bolt											
FHST 2 (left)	⋮	⋮	⋮											
FHST 3 (right)	⋮	⋮	⋮											
<p style="text-align: center;"><b>FHST LIGHT SEAL TURN COUNT</b></p>  <p style="text-align: center;">RIGHT DOOR TETHER CONFIG</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Verify no paint flakes on handrails for possible contamination of the aft shroud</p> </div> <ol style="list-style-type: none"> <li><b>PGT [A2, CW 2, 5.5], hybrid ext (fully extended)</b></li> <li>Retract left FHST seals, drive fasteners (3), 3 turns then 2.5 [5.5 total] (verify bolt gaps even)</li> <li>Stow hybrid ext on socket caddy</li> <li>Egress PFR</li> <li>Reconfigure PFR and AS for RSU-2 connector ops: AS: P=2.5: Y=12, R=A, P=4.5</li> <li>Translate to right door, temp stow 80-in adj tether on right -V3 door                         <ul style="list-style-type: none"> <li>- Small hook looped around second to bottom vertical HR standoff</li> </ul> </li> </ol>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Verify no paint flakes on handrails for possible contamination of the aft shroud</p> </div> <ol style="list-style-type: none"> <li>Translate to FR24, ingress PFR</li> <li><b>PGT [A2, CW 2, 5.5], hybrid ext (fully extended)</b></li> <li>Retract right FHST seals, drive fasteners (3), 3 turns then 2.5 [5.5 total] (verify bolt gaps even)</li> <li>Stow hybrid ext on socket caddy</li> <li>Egress PFR</li> <li>Reconfigure PFR for RSU-2 removal ops: AS: P=1.5: Y=12, R=A, P=11 or 10</li> <li>Translate to fwd/port FSS</li> <li>Retrieve 90 deg socket converter, stow on MWS</li> <li>Translate to aft ASIPE socket, retrieve ASIPE PFR</li> </ol>												

NO-RMS RSU (Cont)

IV	EV3 (Mass)	EV4 (Bueno)
<div> </div> <p>-V3 DOORS</p> <p>4. √ MCC GO for RSU-2 connector demates * If NO COMM, repeat <u>DEADFACE</u> * * <u>RSU/ECU</u> (PL OPS, <u>ORU/ORI OPS</u>) *</p> <div> </div> <p>RSU-2 CONNECTORS</p>	<p>- Lg hook around HST horz HR</p> <p><u>NOTE</u></p> <ol style="list-style-type: none"> <li>No soft stop on the upper middle door latch bolt</li> <li>Leave bottom bolt in bathtub so door doesn't swing open during translation</li> </ol> <ol style="list-style-type: none"> <li><b>EVA Ratchet with short adj (no MTL)</b></li> <li>Break torque on door bolts (4), 1/2 turn</li> <li><b>PGT [A4, CCW 2, 23.5], short adj or hybrid (turns)</b></li> <li>Disengage latch bolts (3), 6.5 turns</li> <li>Disengage handle bolt, 6.5 turns; If reqd, ingress PFR in FR 24 (or FR5) for final bolt release</li> <li>Maintain pressure on doors             <ul style="list-style-type: none"> <li>- Remove PIP pin</li> <li>- Release handle latch</li> <li>- Reinstall PIP pin</li> </ul> </li> <li>Open left door</li> <li>Hold right door open (max 90°) for EV4             <ul style="list-style-type: none"> <li>- Verify no door contact w/ radiator</li> </ul> </li> <li>Temp stow socket caddy and PGT on fish stringer</li> </ol> <p><u>RSU-2 R&amp;R</u></p> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>Assist w/ CASH relocation (left side) (spring-loaded)</li> <li>Transfer PFR and AS from FR5 to EV4</li> <li>Rotate MWS T-bar fully down for connector clearance</li> <li>Ingress PFR</li> <li>Memorize RSU connector harness routing</li> <li>Demate RSU-2 connectors (2):             <ul style="list-style-type: none"> <li><input type="checkbox"/> P1</li> <li><input type="checkbox"/> P2</li> </ul> </li> </ol>	<p>extender</p> <ol style="list-style-type: none"> <li>Install PFR extender into 90 deg coverter at 0°↑</li> <li>Temp stow 90 deg converter and PFR extender on ASIPE lid (decided to keep these on you last time)</li> </ol> <ol style="list-style-type: none"> <li>Manage right door</li> <li>Secure right aft shroud door clear of radiator w/ 80-in tether:             <ul style="list-style-type: none"> <li>- Lg hook on horz handrail under aft shroud opening</li> </ul> </li> </ol> <p><u>RSU-2 R&amp;R</u></p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u></p> <p>Avoid contact with FHST light shade</p> </div> <ol style="list-style-type: none"> <li>Relocate CASH to lower angled HR position</li> <li>Receive AS and PFR from EV3, install into FR29 at Y=30R↓</li> <li>Assist EV3 with PFR ingress</li> <li>Assist EV3 with PFR egress</li> </ol>

# NO-RMS RSU (Cont)

IV	EV3 (Mass)	EV4 (Bueno)
<div> </div> <p>-V3 DOORS</p> <p>5. RSU-2R S/N <u>    1004    </u></p>	<ol style="list-style-type: none"> <li>7. Egress PFR</li> <li>8. Rotate MWS up</li> <li>9. Translate to ASIPE lid</li> <li>10. Receive PFR and AS from EV4, stow on ASIPE lid (or ASIPE aft FR socket)</li> <li>11. Retrieve 90 degree converter with PFR extender from ASIPE lid, install into FR29 at 180°↓</li> <li>12. Receive AS and PFR from EV4, install into PFR extender at: <b>Y=120L</b>↓ P=1.5; PFR: Y=12, R=A, P=11 or 10</li> <li>13. Translate to SOPE lid; retrieve PIK STIK, temp stow as reqd</li> <li>14. Attach EV4's waist tether to PFR (may use adj tether in series)</li> <li>15. Assist EV4 with PFR ingress, pitch EV4's PFR boot plate fwd as reqd</li> <li>16. Transfer PIK STIK to EV4</li> <li>17. Retrieve RSU bag from aft ASIPE</li> <li>18. Translate to SOPE, open lid</li> <li>19. Access RSU-2R in PLB aft location (S/N 1004)</li> <li>20. Install RSU-2R in RSU bag</li> <li>21. Close SOPE lid, 1 latch</li> <li>22. Translate to ASIPE lid, temp stow RSU bag (or leave on MWS)</li> </ol> <ol style="list-style-type: none"> <li>23. Remove RSU-2 from PIK STIK</li> <li>24. Translate to ASIPE lid, temp stow RSU-2</li> <li>25. Remove RSU-2R from RSU bag, verify S/N 1004 to be installed</li> </ol> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>26. Transfer RSU-2R to EV4</li> <li>27. Retrieve RSU-2 and RSU bag from ASIPE</li> <li>28. Translate to SOPE, temp stow RSU-2 and RSU bag</li> <li>29. Open SOPE lid</li> <li>30. Stow RSU-2 in SOPE</li> </ol>	<ol style="list-style-type: none"> <li>5. Remove PFR and AS from FR29, transfer to EV3 on ASIPE lid</li> <li>6. Remove AS and PFR from FR24; transfer to EV3 (to avoid translating across radiator with it)</li> <li>7. Ingress PFR in FR29, use waist tether as reqd</li> <li>8. Receive PIK STIK from EV3, stow on MWS</li> <li>9. <b>PGT [A3, CCW 2, 10.5], fully ext</b></li> <li>10. Disengage first bolt, 11 turns (spring-loaded) <ul style="list-style-type: none"> <li>□ 1st - bottom left</li> </ul> </li> <li>11. Grapple RSU-2</li> <li>12. Lock PIK STIK jaws</li> <li>13. Disengage remaining bolts (2), 11 turns (spring-loaded) <ul style="list-style-type: none"> <li>□ 2nd</li> <li>□ 3rd</li> </ul> </li> <li>14. Temp stow PGT</li> <li>15. Slowly inch PIK STIK with RSU-2 out of aft shroud</li> <li>16. Rotate PIK STIK jaws for EV3 access</li> <li>17. Reconfig PGT: A2, CW 2, 5.5</li> <li>18. Receive RSU-2R from EV3, install onto PIK STIK</li> <li>19. Lock PIK STIK jaws</li> <li>20. Remove connector caps, temp stow</li> <li>21. Inspect connectors and Mykroy pads</li> </ol>

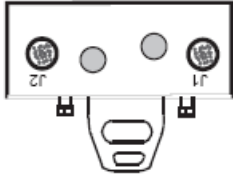
# NO-RMS RSU (Cont)

IV	EV3 (Mass)	EV4 (Bueno)
<div> </div> <p>RSU 3 CONNECTORS</p> <div> </div> <p>-V3 DOORS</p> <p>6. Notify MCC RSU-2R connectors mated (RSU-2R Aliveness Test)</p> <p>7. √ MCC GO for RSU-3 connector demates            * If NO COMM, repeat <u>DEADFACE</u> *            * <u>RSU/ECU</u> (PL OPS, <u>ORU/ORI OPS</u>)*</p>	<p>31. Close RSU transport enclosure lid, 1 latch            32. Access RSU-3R in PLB fwd location (S/N 1007)            33. Stow RSU-3R in RSU bag            34. Close SOPE lid, 1 latch            35. Translate to ASIPE lid, temp stow RSU-3R</p> <p>36. Assist EV4 with PFR egress            37. Translate to ASIPE lid</p> <p>38. Receive PFR stack from EV4, temp stow on ASIPE lid            39. Retrieve PFR and AS from ASIPE lid, transfer to EV4            40. Rotate MWS T-bar fully down for connector clearance</p> <p>41. Ingress PFR            42. Mate RSU-2R connectors (2):  <input type="checkbox"/> P1 then,  <input type="checkbox"/> P2</p> <p>← <input type="checkbox"/>            43. Egress PFR            44. Reconfigure AS: Y=150R↓</p> <p><u>RSU-3 R&amp;R</u></p> <p>← <input type="checkbox"/></p> <p>1. Ingress PFR            2. Memorize RSU connector harness routing            3. Demate RSU-3 connectors (2):  <input type="checkbox"/> P1</p>	<p>22. Rotate PIK STIK to RSU-2R install posn            23. Position PGT socket onto bottom bolt            24. Thread PIK STIK/RSU-2R into aft shroud (connectors nadir)</p> <p>25. Seat RSU-2R            26. <b>PGT [A2, CW 2, 5.5]; fully ext</b>            27. Engage bolts (2), 5 turns  <input type="checkbox"/> 1st - bottom right  <input type="checkbox"/> 2nd - top</p> <p>28. Release PIK STIK jaws            29. Remove PIK STIK from aft shroud, stow on MWS            30. Engage bottom left bolt, 9 turns            31. Engage bolts (2), 4 turns [9 total]  <input type="checkbox"/> 1st  <input type="checkbox"/> 2nd</p> <p>32. Stow PGT            33. Egress PFR            34. Remove full stack from FR29 (90 deg, PFR ext, AS, and PFR), transfer to EV3</p> <p>35. Receive PFR and AS from EV3            36. Install AS into FR29 at Y=30R↓            37. Assist EV3 with PFR ingress</p> <p>38. Assist EV3 with PFR egress</p> <p><u>RSU-3 R&amp;R</u></p> <p>1. Assist EV3 with PFR ingress</p>

NO-RMS RSU (Cont)

IV	EV3 (Mass)	EV4 (Bueno)
<div> </div> <p>-V3 DOORS</p> <p>8. RSU-3R S/N <u>1007</u></p>	<p>☐ P2</p> <ol style="list-style-type: none"> <li>4. Egress PFR</li> <li>5. Rotate MWS up</li> <li>6. Remove AS and PFR from FR29, temp stow on ASIPE lid</li> <li>7. Transfer full PFR stack from ASIPE lid to EV4</li> <li>8. Assist EV4 with PFR ingress (hook up waist tether as reqd)</li> </ol> <ol style="list-style-type: none"> <li>9. Remove RSU-3 from PIK STIK</li> <li>10. Translate to ASIPE lid, temp stow RSU-3</li> <li>11. Remove RSU-3R from RSU bag</li> <li>12. Verify RSU-3R S/N 1007 to be installed</li> </ol> <p>← ☐</p> <ol style="list-style-type: none"> <li>13. Transfer RSU-3R to EV4</li> <li>14. Retrieve RSU-3 and RSU Bag from ASIPE</li> <li>15. Translate to SOPE, open lid</li> <li>16. Stow RSU-3 in SOPE</li> <li>17. Close RSU transport enclosure lid, 1 latch</li> <li>18. Access RSU-1R in PLB center location (S/N 1006)</li> <li>19. Stow RSU-1R in RSU bag</li> <li>20. Close SOPE lid, 1 latch</li> <li>21. Translate to ASIPE lid, temp stow RSU-1R</li> </ol>	<ol style="list-style-type: none"> <li>2. Assist EV3 with PFR egress</li> <li>3. Receive PFR stack from EV3; install 90 degree converter into FR29 at 180°↓</li> <li>4. Reconfigure AS: <b>Y=60L</b>↓</li> <li>5. Ingress PFR, use waist tether as reqd</li> <li>6. <b>PGT [A3, CCW 2, 10.5], fully ext</b></li> <li>4. Disengage first bolt, 11 turns (spring-loaded) <ul style="list-style-type: none"> <li>☐ 1st - lower left</li> </ul> </li> <li>5. Grapple RSU-3</li> <li>6. Lock PIK STIK jaws</li> <li>7. Disengage remaining bolts (2), 11 turns (spring-loaded) <ul style="list-style-type: none"> <li>☐ 2nd - upper</li> <li>☐ 3rd - lower right</li> </ul> </li> <li>8. Slowly inch PIK STIK with RSU-3 out of aft shroud</li> <li>9. Rotate PIK STIK jaws for EV3 access</li> <li>10. Reconfigure PGT: Reconfig PGT: A2, CW 2, 5.5</li> </ol> <ol style="list-style-type: none"> <li>11. Receive RSU-3R from EV3, install on PIK STIK</li> <li>12. Lock PIK STIK jaws</li> <li>13. Remove connector caps, temp stow</li> <li>14. Inspect connectors and Mykroy pads</li> <li>15. Rotate PIK STIK to RSU-3R install posn</li> <li>16. Position PGT socket onto bottom right bolt</li> <li>17. Thread PIK STIK/RSU-3R into aft shroud (connectors nadir)</li> <li>18. Seat RSU-3R</li> <li>19. <b>PGT [A2, CW 2, 5.5]; fully ext</b></li> <li>20. Engage bolts (2), 5 turns <ul style="list-style-type: none"> <li>☐ 1st - bottom right</li> <li>☐ 2nd - top</li> </ul> </li> <li>21. Release PIK STIK jaws</li> </ol>

**NO-RMS RSU (Cont)**

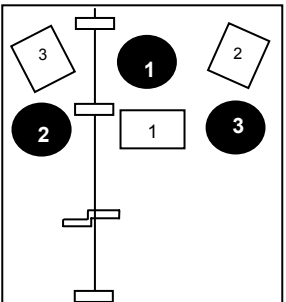
IV	EV3 (Mass)	EV4 (Bueno)
<p>9. Notify MCC RSU-3R connectors mated (RSU-3R Aliveness Test)</p> <p>10. √ MCC GO for RSU-1 connector demates            * If NO COMM, repeat <u>DEADFACE</u> *            * <u>RSU/ECU</u> (PL OPS, <u>ORU/ORI OPS</u>)*</p>  <p>RSU 1 CONNECTORS</p>	<p>22. Assist EV4 with PFR egress            23. Translate to ASIPE lid            24. Receive PFR stack from EV4; temp stow on ASIPE lid            25. Retrieve PFR and AS from ASIPE lid; transfer to EV4            26. Rotate MWS T-bar fully down for connector clearance</p> <p>27. Ingress PFR            28. Mate RSU-3R connectors (2):  <input type="checkbox"/> P1 then,  <input type="checkbox"/> P2</p> <p>← <input type="checkbox"/></p> <p>29. Egress PFR            30. Rotate MWS up            31. Remove PFR and AS from FR29; temp stow on ASIPE lid</p> <p><u>RSU-1 R&amp;R</u></p> <p>← <input type="checkbox"/></p> <p>1. Receive PIK STIK from EV4            2. Translate to SOPE            3. Stow PIK STIK on lid (2 captive lock pins)            - Handle aft and pointed inboard</p> <p>4. Assist EV3 with PFR ingress</p>	<p>22. Engage bottom left bolt, 9 turns            23. Engage bolts (2), 4 turns [9 total]  <input type="checkbox"/> 1st - bottom right  <input type="checkbox"/> 2nd - top            24. Reconfigure PGT with 6-in socket            25. Egress PFR            26. Remove PFR stack from FR29; transfer to EV3</p> <p>27. Receive PFR and AS from EV4; install AS into FR29 at: Y=150R↓            28. Assist EV3 with PFR ingress</p> <p>29. Assist EV3 with PFR egress</p> <p><u>RSU-1 R&amp;R</u></p> <p>1. Transfer PIK STIK to EV4            2. Translate to ASIPE lid            3. Reconfigure PFR stack:            - PFR extender into 90 degree converter:              Y=90R↑            - AS into PFR extender: Y=120R↑, P=4            - PFR into AS: Y=9, R=A, P=4            4. Remove PFR stack from ASIPE lid, install 90 degree converter into FR29 at Y=90R↓            - Alternate Settings: AS into FR29: Y= 90L or 120L:              PFR: Y=6, R=A, P=4            - Alternate Settings (103): AS into FR29: Y=60R↓, P=3:              PFR ext: Y=5.5, PFR: Y=180↓, R=A, P=4.5            5. Ingress PFR            6. Memorize RSU-1 connector harness routing            7. Demate RSU-1 connectors (2):  <input type="checkbox"/> P1</p>



**NO-RMS RSU (Cont)**

IV	EV3 (Mass)	EV4 (Bueno)
<p>11. RSU-1R S/N <u>1006</u></p> <p>12. Notify MCC RSU-1R connectors mated (RSU-1R Aliveness Test)</p> <p>13. WVS: RMS EV Center Cam (1. RSUs, 2. CASH)</p>	<p>5. Receive RSU-1 from EV4, temp stow on ASIPE lid</p> <p>6. Retrieve RSU-1R from RSU bag</p> <p>7. Remove connector caps, temp stow</p> <p>8. Inspect connectors and Mykroy pads</p> <p>9. Verify RSU-1R S/N 1006 to be installed</p> <p>← <input type="checkbox"/></p> <p>10. Transfer RSU-1R to EV4</p> <p>11. Translate to ASIPE lid, retrieve RSU-1</p> <p>12. Translate to SOPE, open lid</p> <p>13. Stow RSU-1 in SOPE</p> <p>14. Close RSU transport enclosure lid, 1 latch</p> <p>15. Close SOPE lid, engage latches (3)</p> <p>16. Translate to trash bag on ASIPE lid</p> <p>17. Transfer connector caps to trash bag (Bueno may still have 2 sets of caps on him)</p> <p>18. Translate to aft shroud, assist EV4 with PFR egress</p> <p><u>CLOSE -V3 DOORS</u></p> <p>1. Reconfigure AS and PFR on ASIPE lid; AS: P=2.5, PFR: Y=9, R=B.5, P=10.5</p> <p>2. Relocate PFR and AS to FR5; AS: Y=60L↓ (door closing; 30↓ did not work last run)</p> <p>3. Receive ASIPE PFR extender from EV4, stow on MWS</p> <p>4. Retrieve HST PFR from fwd FSS</p> <p>5. Translate to HST FR27 (top/left corner above left -V3 door); install PFR extender at Y= 30R↑; HST PFR: Y=30L↓, JJ/H/11/ZZ</p> <p>6. Translate to inside of aft shroud</p>	<p><input type="checkbox"/> P2</p> <p>8. <b>PGT [A3, CCW 2, 10.5], 6-in ext</b></p> <p>9. Disengage RSU bolts (3), 11 turns (spring-loaded)</p> <p>10. Remove RSU-1</p> <p>11. Transfer RSU-1 to EV3</p> <p>12. Preconfigure PGT: A2, CW 2, 5.5</p> <p>13. Receive RSU-1R from EV3</p> <p>14. Install RSU-1R</p> <p>15. <b>PGT [A2, CW 2, 5.5]</b></p> <p>16. Engage bolts (3), 5 turns then 4 turns [9 total]</p> <p><input type="checkbox"/> Single top bolt</p> <p><input type="checkbox"/> Bottom left bolt</p> <p><input type="checkbox"/> Bottom right bolt</p> <p>17. Stow PGT w/ 6-in wobble on MWS</p> <p>18. Mate RSU-1R connectors:</p> <p><input type="checkbox"/> P1</p> <p><input type="checkbox"/> P2</p> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p>19. Egress PFR</p> <p><u>CLOSE -V3 DOORS</u></p> <p>1. Remove AS and PFR from FR29</p> <p>2. Install AS and PFR into FR24 (stbd/nad of -V3 doors, for right FHST); configure AS: Y=90L↓, P=2.5; PFR: Y=4, R=J.5, P=11</p> <p>3. Remove 90 deg conv and ASIPE PFR extender from FR29</p> <p>4. Transfer ASIPE PFR extender to EV3</p> <p>5. Temp stow 90 deg converter</p>

NO-RMS RSU (Cont)

IV	EV3 (Mass)	EV4 (Bueno)												
<div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Top bolt</p> <p>Upper middle bolt</p> <p>Handle bolt (Lower middle bolt)</p> <p>Bottom bolt</p> </div> </div> <p style="text-align: center;">-V3 DOORS</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th></th> <th>Top Bolt</th> <th>Bottom Left Bolt</th> <th>Bottom Right Bolt</th> </tr> </thead> <tbody> <tr> <td>FHST 2 (left)</td> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>FHST 3 (right)</td> <td>.....</td> <td>.....</td> <td>.....</td> </tr> </tbody> </table> <p style="text-align: center;">FHST LIGHT SEAL TURN COUNT</p>		Top Bolt	Bottom Left Bolt	Bottom Right Bolt	FHST 2 (left)	.....	.....	.....	FHST 3 (right)	.....	.....	.....	<ol style="list-style-type: none"> <li>7. Reposition CASH</li> <li>8. Ingress HST PFR in FR27</li> <li>9. Assist EV4 with door closure</li> <li>10. If possible, engage handle and install PIP pin</li> <li>11. ✓ Door seals</li> <li>12. <b>PGT [B4, CW 3, 23.5]</b></li> <li>13. Engage handle bolt, 7 turns</li> <li>14. Engage latch bolts (3), 7 turns</li> <li>15. Retrieve 80-in tether when possible</li> <li>16. Re-torque first three bolts</li> <li>17. Ingress PFR in FR5 (stbd/nadir of -V3 doors)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>CAUTION</b> Extending FHST seals &gt; 5.5 turns may damage soft stop</p> </div> <ol style="list-style-type: none"> <li>18. <b>PGT [A2, CCW 2, 5.5], fully ext (turns)</b></li> <li>19. Extend left FHST seals drive fasteners (3), 3 turns then 2.5 [5.5 total]</li> <li>20. Verify fastener gaps are even</li> <li>21. Egress PFR</li> <li>22. Remove HST PFR and ASIPE PFR extender from FR27</li> <li>23. Stow HST PFR on FSS; configure to: JJ/A/BB/4</li> <li>24. Stow PFR extender in aft ASIPE socket at Y=6 (straight down); install Velcro flag</li> <li>25. Relocate PFR from FR5 to aft ASIPE PFR extender socket, configure to: AS: Y=90R, P=1, PFR: Y=12, R=A, P=9.5 (ASIPE settings for COS); install AS hitch pin or Velcro flag</li> </ol>	<ol style="list-style-type: none"> <li>6. Translate to inside of aft shroud</li> <li>7. Reposition CASH</li> <li>8. Ingress FR24</li> <li>9. Close left, then right door</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>CAUTION</b> Extending FHST seals &gt; 5.5 turns may damage soft stop</p> </div> <ol style="list-style-type: none"> <li>10. <b>PGT [A2, CCW 2, 5.5], fully ext (turns)</b></li> <li>11. Extend right FHST seals drive fasteners (3), 3 turns then 2.5 [5.5 total]</li> <li>12. Verify fastener gaps are even</li> <li>13. Egress PFR</li> <li>14. Remove stbd APC PFR extender, AS, and PFR from FR24</li> <li>15. Translate to FSIPE fwd socket S28: Install AS and PFR into S28: AS: Y=12, P=3; PFR: Y=9, R=K, P=1.5, install AS hitch pin or Velcro flag</li> <li>16. Translate to stbd APC, stow PFR extender, install hitch pin</li> <li>17. Retrieve 90 deg coverter from temp stow location</li> <li>18. Translate to FSS fwd/port, stow 90 deg converter, install velcro flag</li> </ol>
	Top Bolt	Bottom Left Bolt	Bottom Right Bolt											
FHST 2 (left)	.....	.....	.....											
FHST 3 (right)	.....	.....	.....											

## DAILY CLOSEOUT/INGRESS

IV	EV3	EV4
	<p><u>PLB CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to FSS</li> <li>2. Inspect main umbilical mechanism</li> <li>3. Remove BAPS post center PIP pins (2); stow</li> <li>4. Configure center TA (due aft): A=6, B=6, C=0, retracted to 1, install Velcro flag</li> <li>5. Configure port TA: A=6, B=4, C=8, extension = 1 (for COS day), install Velcro flag</li> <li>6. Perform tool inventory</li> <li>7. Translate to airlock</li> </ol> <p><u>AIRLOCK INGRESS</u></p> <ol style="list-style-type: none"> <li>1. On EV4 GO, release EV4 safety tether from port truss HR, attach to EMU D-ring - Engage crew hook slide lock - L</li> <li>2. Release own safety tether from stbd truss HR, stow on self</li> <li>3. Translate to airlock</li> <li>4. Ingress airlock</li> <li>5. Open O2 actuator cover; Velcro to self</li> <li>6. Connect SCU to DCM; ✓ SCU locked</li> <li>7. WATER - OFF (expect "H2O IS OFF" msg)</li> <li>8. Thermal cover - close</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>9. Verify hardware clear of hatch</li> <li>10. Close, lock outer hatch</li> <li>11. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>	<p><u>PLB CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to airlock</li> <li>2. Perform tool inventory</li> </ol> <p><u>AIRLOCK INGRESS</u></p> <ol style="list-style-type: none"> <li>1. Open thermal cover</li> <li>2. Ingress airlock</li> <li>3. Attach waist tether to airlock D-ring extender - Engage crew hook slide lock - L</li> </ol> <ol style="list-style-type: none"> <li>4. Open O2 actuator cover; Velcro to self</li> <li>5. Connect SCU to DCM; ✓ SCU locked</li> <li>6. WATER - OFF (expect "H2O IS OFF" msg)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>7. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>

**NO-RMS WFCIII**

<p align="center"><b>IV</b></p>	<p align="center"><b>EV1 (Grunsfeld)</b></p>	<p align="center"><b>EV2 (8 Ball)</b></p>
<p>1. √ FSS 180 (-V3 fwd), pivot 55°</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><u>EV1 Tools</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tethers (RETs and adj)</li> <li><input type="checkbox"/> Trash bag</li> </ul> <p><u>EV2 Tools</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> PGT - empty</li> <li><input type="checkbox"/> Socket caddy with hybrid ext</li> <li><input type="checkbox"/> Tethers (RETs and adj)</li> <li><input type="checkbox"/> EVA ratchet w/ MTL</li> </ul> </div>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> <li>√ Waist tether to left EMU D-ring, hook slide lock - L</li> <li>√ EV2 safety tether long end attached to right waist tether, hook slide locks (2) - L</li> </ul> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. Thermal cover - open</li> <li>2. Egress airlock</li> <li>3. Attach own safety tether to port truss HR standoff - Engage crew hook slide lock - L</li> <li>4. Attach EV2's safety tether to stbd truss HR standoff - Engage crew hook slide lock - L</li> </ol> <p><u>BAPS POST INSTALLATION</u></p> <p>As req'd:</p> <ol style="list-style-type: none"> <li>1. Translate to FSS</li> <li>2. Remove BAPS post umbilical Velcro straps (3)</li> <li>3. Remove port BAPS hitch pin and pip pin</li> <li>4. Remove stbd BAPS hitch pin and pip pin</li> <li>5. Tether BAPS post stbd end to MWS (lg. hook-fwd)</li> <li>6. Remove BAPS post</li> <li>7. Install BAPS stbd clevice into FSS fwd/upper bracket, install PIP pin; secure Velcro</li> <li>8. Release post mechanism and extend</li> <li>9. Install BAPS post port clevice into aft/lower bracket, install PIP pin; secure Velcro</li> </ol>	<p><u>INITIAL CONFIG</u></p> <ul style="list-style-type: none"> <li>√ Right waist tether to A/L D-ring extender, hook slide lock - L</li> <li>√ Own safety tether load alleviating strap attached to left EMU D-ring, hook slide lock - L, reel unlocked</li> </ul> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. Release waist tether from airlock D-ring extender</li> <li>2. Egress airlock</li> <li>3. Close A/L thermal cover</li> </ol> <p><u>TRANSLATION ADAPTATION</u></p> <ol style="list-style-type: none"> <li>1. Perform translation adaptation</li> <li>2. Translate to WSIPE, release stbd and center WSIPE latches</li> </ol> <p><u>STS PFR PREP</u></p> <ol style="list-style-type: none"> <li>1. Translate to port TSA; open</li> <li>2. Retrieve articulating socket</li> <li>3. Close TSA, 4 latches</li> <li>4. Translate to Orbiter fwd bulkhead</li> <li>5. Release STS PFR from bulkhead (PIP pin and hitch pin)</li> <li>6. Configure AS: P=10.5, STS PFR: Y=12, R=A, P=10.5</li> <li>7. Relocate STS PFR and AS from fwd bulkhead to WSIPE socket S12 (stbd); install at 90R↓</li> </ol>

NO-RMS WFCIII (Cont)

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
	<p><u>LGAP COVER INSTALLATION</u></p> <p>If LGAP cover req'd:</p> <ol style="list-style-type: none"> <li>1. Translate to aft/port MULE; fairlead as req'd</li> <li>2. Remove LGAP cover (2 captive lock pins)</li> <li>3. Translate to LGA (on aft/stbd corner of HST), install cover</li> </ol> <p><u>HST PFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to stbd APC</li> <li>2. Retrieve PFR extender</li> <li>3. Install HST PFR into PFR extender at 45L↑</li> <li>4. Retrieve HST PFR</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><b>CAUTION</b></p> <p style="text-align: center;">Avoid contact with FHSTs (3), Bay 2 &amp; 3 MLI, Labyrinth seal, &amp; WFPC2 radiator</p> </div> <div style="border: 3px double black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;">Avoid contact with bay 2 and 3 battery door thermal louvers, &amp; WFC pick-off mirror</p> </div> <ol style="list-style-type: none"> <li>5. Translate to HST FR27 (stbd of WFPC2) <ul style="list-style-type: none"> <li>- Install fairlead on SOPE top knob</li> </ul> </li> <li>6. Install PFR extender into FR27: 15R↑, HST PFR: Y=45L↑, PP/N/BB/6</li> <li>7. Translate to fwd/port FSS, retrieve 90 deg converter</li> <li>8. Translate to MULE I-Beam (port), retrieve jettison handle</li> <li>9. Configure jettison handle into 90 deg converter 0°↑</li> <li>10. Translate to HST FR26 w/ full jettison handle stack <ul style="list-style-type: none"> <li>- Port of WFPC2, above NICMOS radiator</li> </ul> </li> <li>11. Install 90 deg converter into FR26, Y= 30L↓ (handles horz as req'd)</li> </ol>	<p><u>AFT FIXTURE SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to aft fixture <ul style="list-style-type: none"> <li>- Verify safety tether routed fwd of aft fixture</li> </ul> </li> <li>2. Remove hitch pins and PIP pins (2); stow</li> <li>3. Secure hitch pins via Velcro tabs</li> <li>4. Deploy aft fixture to intermediate posn (135 deg if RMS stowed)</li> <li>5. Engage captive lock pins (2)</li> <li>6. √ Top fork PIP pin in proper orientation</li> </ol> <p><u>STS PFR SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to aft ASIPE</li> <li>2. Remove PFR and AS from PFR extender and temp stow</li> <li>3. Retrieve PFR extender</li> <li>4. Translate to ORUC socket S26; install PFR extender at 30L↓</li> <li>5. Translate to HST PFR on fwd FSS</li> <li>6. Retrieve HST PFR; translate to ORUC socket S26</li> <li>7. Configure HST PFR: JJ/K/DD/1; insert into PFR extender at 75R↓ (body should face aft)</li> <li>8. Relocate port TA to ORUC S25, configure straight up: <b>Y=90L↓</b> (C-knob inboard), <b>A=7, B=6, C=6</b>, ext=7 (ingress aid for S26) <ul style="list-style-type: none"> <li>- Final config slightly tilted inboard</li> </ul> </li> <li>9. Retrieve temp stowed STS PFR and AS</li> <li>10. Configure AS: P=10.5, STS PFR: Y=12, R=A, P=10.5</li> <li>11. Translate to WSIPE socket S10 (port); install at 90R↓</li> <li>12. Translate to FSIPE fwd socket S28</li> <li>13. Configure AS: 90R, P=2.5, STS PFR: Y=12, R=A, P=11</li> </ol>

**NO-RMS WFCIII (Cont)**

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>2. √ In sun protect att before removing WFPC 2</p> <p>3. √ MCC GO for WFPC 2 removal (blind mate)</p> <p>* If NO COMM perform: *</p> <p>* DEADFACE WFPC 2 (PL OPS, <u>ORU/ORI</u>)*</p>	<p><u>HANDHOLD RETRIEVAL AND INSTALL</u></p> <ol style="list-style-type: none"> <li>1. Translate to STS PFR in S26 (ORUC), ingress</li> <li>2. Receive handhold from EV2</li> <li>3. Rotate handhold w/ "A" latch cut-out PLB nadir</li> <li>4. Transfer WFC handhold to EV2</li> <li>5. Egress HST PFR</li> <li>6. Translate to jettison handle (FR26) - Port of WFPC 2</li> <li>7. Assist EV2</li> </ol> <p>← <input type="checkbox"/></p> <p>← <input type="checkbox"/></p> <p><u>WFPC 2 REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Assist EV2 as req'd</li> <li>2. Stow ground strap on HST integral bolt</li> </ol>	<p><u>HANDHOLD RETRIEVAL AND INSTALL</u></p> <ol style="list-style-type: none"> <li>1. Translate to fwd fixture</li> <li>2. Retrieve WFC handhold (outboard) <ul style="list-style-type: none"> <li>- Release Velcro grounding strap, temp stow</li> <li>- Release captive lock pins (3)</li> </ul> </li> <li>3. Transfer handhold to EV1</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p style="text-align: center;">Avoid contact with FHSTs (3), Bay 2 &amp; 3 MLI, Labyrinth seal, &amp; WFPC2 radiator</p> </div> <div style="border: 3px double black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>WARNING</u></p> <p style="text-align: center;">Avoid contact with bay 2 and 3 battery door thermal louvers, &amp; WFC pick-off mirror</p> </div> <ol style="list-style-type: none"> <li>4. Translate to HST FR27 (stbd), ingress HST PFR</li> <li>5. Receive WFC handhold from EV1</li> <li>6. Install WFC handhold; install zipnuts (4) first, then hand tighten (may have to pop 1 leg out of PFR for reach)</li> </ol> <p><u>WFPC 2 REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Configure PGT w/ hybrid ext</li> <li>2. <b>PGT [A3, CCW 2, 10.5] hybrid ext, fully ext</b></li> <li>3. Disengage blind mate interface, ~5.5 turns (hard stop)</li> <li>4. Disengage ground strap bolt, 4-6 turns</li> <li>5. Remove hybrid ext from PGT; configure onto EVA ratchet</li> <li>6. <b>EVA Ratchet [CCW, MTL 38] hybrid ext, fully ext</b></li> </ol>

NO-RMS WFCIII (Cont)

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>4. "A" total turns _____</p>	<p style="text-align: center;"><u>NOTE</u> Expect to see WFPC 2 move ~ 1.1 inches out of telescope during "A" latch bolt release</p> <p>3. Hold WFPC2 in place</p> <p>4. Assist EV2 with initial removal</p> <p>5. Translate to S28 (fwd FSIPE) STS PFR</p> <p>6. Receive WFPC 2 from EV2; complete WFPC 2 removal from HST</p> <p>7. Transfer WFPC2 to EV2</p> <p>8. Egress PFR</p> <p>9. Translate to aft fixture</p> <p>10. Assist EV2 with stowing WFPC2 on aft fixture, install upper fork PIP pin</p>	<p>7. Disengage "A" latch, 1/2 turn</p> <p>8. Configure PGT w/ hybrid ext; stow EVA ratchet on MWS</p> <p style="text-align: center;"><u>NOTE</u> Expect to see WFPC 2 move ~ 1.1 inches out of telescope during "A" latch bolt release</p> <p>9. <b>PGT [A3, CCW 2, 10.5]</b></p> <p>10. Drive "A" latch 22 turns, (free spin) ← <input type="checkbox"/></p> <p>11. Stow hybrid ext on caddy, stow PGT</p> <p>12. Reconfigure PFR ext from 15R↑ to 15L↑, to put body high and make room for WFPC2 removal</p> <p>13. Ingress HST PFR</p> <p>14. Remove WFPC 2 - Motion will be straight out of HST, then wait to hand off to EV1</p> <p>15. Transfer WFPC 2 to EV1</p> <p>16. Egress HST PFR</p> <p>17. Translate to ORUC socket S26 (port)</p> <p>18. Ensure EV1 and EV2 safety tethers are fwd of aft fixture</p> <p>19. Ingress PFR (use TA for ingress as req'd)</p> <p>20. Receive WFPC2 from EV1, install on aft fixture</p> <p>21. Translate to HST</p> <p>22. Inspect WFPC HST bay: - MLI or guide rail damage - Verify blind-mate floating plate in proper orientation and fully engaged (all probes and ball detents in place) - No hardware interference for WFC III installation</p>

NO-RMS WFCIII (Cont)

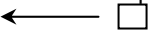
IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>5. Light ON "A" turns _____</p> <p>6. "A" total turns _____</p>	<p><u>WFC III RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to WSIPE</li> <li>2. Open lid (3 latches)</li> <li>3. Assist EV2 as req'd</li> <li>4. Receive WFC handhold from EV2</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Avoid contact with WFC III Radiator</p> </div> <div style="border: 3px double black; padding: 5px; text-align: center;"> <p><u>WARNING</u> Avoid contact with WFC III pick-off mirror</p> </div> <ol style="list-style-type: none"> <li>5. Install WFC handhold (orient "A" latch cutout aft)</li> <li>6. Hand tighten zip nuts (2)</li> <li>7. Ingress STS PFR in WSIPE S10 (port)</li> <li>8. Stow ground strap onto WSIPE bolt</li> <li>9. Remove WFC III               <ul style="list-style-type: none"> <li>- At half-way point, hold for blind-mate inspect</li> <li>- Motion will be straight out of WSIPE until guide rails and pick-off mirror clears, then pitch pick-off mirror up (toward Orbiter fwd), and yaw to have EV2 in control</li> </ul> </li> <li>10. Egress PFR</li> <li>11. Inspect WSIPE for guide rail damage (hardware interference for WFPC 2 installation)</li> </ol>	<p><u>WFC III RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Translate to SLIC fwd/lower</li> <li>2. Retrieve WFC handhold (release 2 captive lock pins, pivot port end out, and slide port)</li> <li>3. Transfer WFC handhold to EV1</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Avoid contact with WFC III Radiator</p> </div> <div style="border: 3px double black; padding: 5px; text-align: center;"> <p><u>WARNING</u> Avoid contact with WFC III pick-off mirror</p> </div> <ol style="list-style-type: none"> <li>4. Assist EV1</li> <li>5. Hand tighten zip nuts (2)</li> <li>6. Configure PGT w/ hybrid ext</li> <li>7. <b>PGT [A2, CCW 2, 5.5]</b></li> <li>8. Disengage vent valves (2), ~5 turns (hard stop)</li> <li>9. <b>PGT [A3, CCW 2, 10.5]</b></li> <li>10. Disengage ground strap bolt, 4-6 turns</li> <li>11. Reconfigure hybrid onto EVA ratchet</li> <li>12. <b>EVA Ratchet [CCW, MTL 38] hybrid ext (fully ext)</b></li> <li>13. Disengage "A" latch, 1/2 turn</li> <li>14. Reconfigure hybrid onto PGT</li> <li>15. <b>PGT [A3, CCW 2, 10.5] (turns)</b></li> <li>16. Release "A" latch, 22 turns (free spin) ← <input type="checkbox"/></li> <li>17. Remove hybrid from PGT; stow</li> <li>18. Ingress STS PFR in WSIPE stbd side (S12)</li> <li>19. Remove WFC III               <ul style="list-style-type: none"> <li>- At half-way point, hold for blind-mate inspect</li> <li>- Motion will be straight out of WSIPE until guide rails and pick-off mirror clears, then pitch pick-off mirror up (toward Orbiter fwd), and yaw to have EV2 in control</li> </ul> </li> <li>20. Verify blind mate connector tangs (4) retracted, clear of FOD &amp; inspect pins</li> </ol>



**NO-RMS WFCIII (Cont)**

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>7. "A" total turns _____</p> <p>8. Notify MCC blind mate connected (GO for A/T)</p>	<p>12. Translate to S28 (fwd FSIPE); ingress STS PFR 13. Receive WFC III from EV2</p> <p><u>WFC III INSTALLATION</u></p> <p>1. Transfer WFC III to EV2 2. Egress PFR 3. Translate to jettison handle in FR26 (port) 4. Assist EV2 with installation 5. If possible, assist EV2 by driving A-latch</p> <p>6. Install HST ground strap onto WFC III</p> <p>7. Translate to S28 (fwd FSIPE); ingress STS PFR</p> <p>8. Receive WFC handhold from EV2</p> <p>9. Transfer handhold to EV2 10. Assist EV2</p> <p><u>WFPC 2 STOW IN WSIPE</u></p> <p>1. Translate to aft fixture, assist EV2 with WFPC2 removal 2. Translate to FSIPE S28, ingress PFR</p> <p>3. Receive WFPC 2 from EV2</p>	<p>21. Transfer WFC III to EV1 22. Egress PFR 23. If req'd: Close WSIPE lid; engage 1 lid latch</p> <p><u>WFC III INSTALLATION</u></p> <p>1. Translate to HST PFR in FR27 (stbd of WFC III) 2. Configure HST PFR: <b>PP/Q/BB/9</b> 3. Ingress PFR 4. Receive WFC III from EV1 5. Once EV1 available to watch for clearances, rotate WFC III about self, for insertion 6. Insert WFC III (to hard stop against "A" latch) 7. <b>PGT [A3, CW 2, 10.5]</b> 8. Engage "A" latch, 22 turns (to torque) 9. Configure hybrid ext onto EVA ratchet 10. <b>EVA Ratchet [CW, MTL 38]</b> 11. Perform final torquing (~1/2 turn) until MTL slip ← <input type="checkbox"/></p> <p>12. <b>PGT [A3, CW 2, 10.5]</b> 13. Engage ground strap bolt, 4-6 turns (torque) 14. Engage blind mate interface, ~5.5 turns (hard stop) ← <input type="checkbox"/></p> <p>15. Disengage WFC handhold zip nuts, stow, hand tighten 16. Remove WFC handhold, transfer to EV1 17. Egress PFR 18. Translate to fwd fixture 19. Receive handhold from EV1 20. Stow handhold on fwd fixture</p> <p><u>WFPC 2 STOW IN WSIPE</u></p> <p>1. Ingress STS PFR in ORUC S26 2. Remove WFPC 2 from aft fixture</p> <p>3. Transfer WFPC 2 to EV1 4. Egress PFR</p>

**NO-RMS WFCIII (Cont)**

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
<p>9. "A" total turns _____</p>	<ol style="list-style-type: none"> <li>4. Transfer WFPC 2 to EV2</li> <li>5. Egress PFR</li> <li>6. Translate to WSIPE</li> <li>7. Clear ground strap for WFPC 2 insertion</li> <li>8. Ingress PFR in S10 (port WSIPE)</li> <li>9. Assist EV2 with insertion</li> </ol> <p>10. Install WSIPE ground strap</p> <p><u>WFC HANDHOLD AND PFR CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Disengage WFC handhold zip nuts (4), stow; hand tighten</li> <li>2. Remove WFC handhold</li> <li>3. Transfer handhold to EV2</li> <li>4. Egress PFR</li> <li>5. Close WSIPE lid, engage latches (3)</li> <li>6. Translate to HST PFR in FR27</li> <li>7. Configure HST PFR to: PP/A/BB/4 (launch/landing config)</li> <li>8. Remove HST PFR and PFR extender</li> <li>9. Translate to stbd APC, stow HST PFR and PFR extender               <ul style="list-style-type: none"> <li>- Install hitch pin onto PFR extender PIP pin</li> </ul> </li> <li>10. Translate to HST FR26</li> <li>11. Remove jettison handle and 90 deg converter</li> </ol>	<ol style="list-style-type: none"> <li>5. Translate to WSIPE</li> <li>6. As req'd: Open WSIPE lid (1 latch)</li> <li>7. Ingress PFR in WSIPE S12 (stbd)</li> <li>8. Receive WFPC 2 from EV1</li> </ol> <ol style="list-style-type: none"> <li>9. Insert WFPC 2 into WSIPE (to hard stop)</li> <li>10. Configure PGT w/ hybrid ext</li> <li>11. <b>PGT [A3, CW 2, 10.5]</b></li> <li>12. Engage "A" latch, 22 turns (to torque)</li> <li>13. ✓ "A" LATCHED lights off (2) (hinge-stbd side)</li> <li>14. <b>PGT [A3, CW 2, 10.5]</b></li> <li>15. Engage ground strap bolt, 4-6 turns (torque)</li> <li>16. Configure hybrid ext onto EVA ratchet</li> <li>17. <b>EVA Ratchet [CW, MTL 38]</b></li> <li>18. Perform "A-latch" final torquing (~1/2 turn) until            MTL slip  </li> </ol> <p><u>WFC HANDHOLD AND PFR CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Egress PFR</li> <li>2. Translate to SLIC fwd/lower</li> <li>3. Receive handhold from EV1</li> <li>4. Stow handhold (2 captive lock pins)</li> <li>5. Translate to ORUC S26; retrieve HST PFR</li> <li>6. Translate to fwd FSS APC; stow HST PFR (JJ/A/BB/4)</li> <li>7. Translate to ORUC S26; retrieve PFR extender</li> <li>8. Translate to aft ASIPE S30; install PFR extender at 6 o'clock (straight down)           <ul style="list-style-type: none"> <li>- Install Velcro flag onto PFR extender PIP pin</li> </ul> </li> <li>9. Translate to S10 (port WSIPE); retrieve PFR and AS</li> <li>10. Translate to aft ASIPE S30; configure AS: Y=90R into PFR extender, <b>P=1</b>, STS PFR: Y=12, R=A,</li> </ol>

NO-RMS WFCIII (Cont)

IV	EV1 (Grunsfeld)	EV2 (8 Ball)
	<p>12. Translate to FSS fwd/port, stow 90 deg converter</p> <p>13. Translate to MULE I-Beam (port), stow jettison handle</p> <p>14. Re-engage hitch pin into jettison handle PIP pin - If no joy, bring jettison handle inside</p> <p>15. Translate to S28 (fwd FSIPE) STS PFR</p> <p>16. Configure AS: P=11, PFR: Y=9, R=B.5, P=1.5 (for Bay 3 battery ops at SLIC)</p>	<p><b>P=9.5</b> (nom settings for start of EVA2) - Install hitch pin or Velcro flag onto articulating socket PIP pin</p> <p>11. Translate to aft fixture</p> <p>12. Stow aft fixture, install PIP pins (2)</p> <p>13. Relocate port TA from ORUC S25 back to ORUC S24, configure to: Y=0↓, 17,6,6, ext=1 (launch config), - Install Velcro flag at S24 socket - Install conductive Velcro ground strap - Install Velcro flag on TA extension PIP pin</p> <p>14. Translate to STS PFR in WSIPE S10 (port)</p> <p>15. Configure STS PFR: R=A, <b>P=1</b> (for stowage on fwd bulkhead)</p> <p>16. Remove art socket from STS PFR (bring inside)</p> <p>17. Translate to Orbiter fwd bulkhead; stow STS PFR</p> <p>18. Engage PIP pin &amp; hitch pin</p>

## DAILY CLOSEOUT/INGRESS

IV	EV1	EV2
	<p><u>PLB CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to FSS</li> <li>2. Inspect main umbilical mechanism</li> <li>3. Perform tool inventory</li> <li>4. Translate to airlock</li> </ol> <p><u>AIRLOCK INGRESS</u></p> <ol style="list-style-type: none"> <li>1. On EV2 GO, release EV2 safety tether from stbd truss HR; attach to EMU D-ring - Engage crew hook slide lock - L</li> <li>2. Release own safety tether from port truss HR; stow on self</li> <li>3. Translate to airlock</li> <li>4. Ingress airlock</li> <li>5. Open DCM cover; Velcro to self</li> <li>6. Connect SCU to DCM; ✓ SCU locked</li> <li>7. WATER - OFF (expect "H2O IS OFF" msg)</li> <li>8. Thermal cover - close</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>9. Verify hardware clear of hatch</li> <li>10. Close, lock outer hatch</li> <li>11. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>	<p><u>PLB CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to airlock</li> <li>2. Perform tool inventory</li> </ol> <p><u>AIRLOCK INGRESS</u></p> <ol style="list-style-type: none"> <li>1. Open thermal cover</li> <li>2. Ingress airlock</li> <li>3. Attach waist tether to airlock D-ring extender - Engage crew hook slide lock - L</li> </ol> <ol style="list-style-type: none"> <li>4. Open DCM cover; Velcro to self</li> <li>5. Connect SCU to DCM; ✓ SCU locked</li> <li>6. WATER - OFF (expect "H2O IS OFF" msg)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>7. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> CC)</li> </ol>

# CARRIER PASSIVE LATCH RELEASE

## TOOLS:

- Needle nose pliers (port TSA)
- Compound cutters (port TSA)
- Adj tethers or wire ties (to restrain open latch)
- Torque multiplier (port TSA)
- Latch pin caddy (port TSA)
- EVA ratchet
- Small trash bag
- PFR and bridge rail clamp (as reqd to break torque)

### NOTE

The passive latch release procedure is just one part of the more comprehensive Carrier Jettison procedure. The comprehensive jettison procedure will also include SIP panel cable cuts and Orbiter attitude mnvrs

### NOTE

There are 2 floating latches per Carrier; the floating latches are always payload bay forward (bay 5 and bay 7) and will require the installation of latch pins to preclude them from moving freely during landing

### NOTE

Passive latch initial break torque ranges between 37-41 ft-lb

1. Translate to carrier passive latch
2. **Needle nose pliers and/or compound cutters:** Break and remove safety wire on latch, stow wire in trash bag
3. Install torque multiplier (TM) onto passive latch bolt
4. Rotate knurled knob on side of TM CW to rigidly attach to latch
5. Take direction selector on TM knob to CCW
6. As reqd, install bridge rail clamp and PFR on sill to assist in breaking passive latch bolt torque
7. **If Floating Latch:** Note posn of latch with respect to bridge rail
8. **EVA Ratchet:** Install ratchet 3/8" drive into TM sculpted knob drive interface; release passive latch bolt ~ 1 3/4 turns
9. Remove TM (CCW on knurled knob), temp stow
10. Rotate bolt downward toward sill; rotate upper half of passive latch open
11. Restrain rotated latch clear of trunnion pin jettison path using adj tethers or wire ties

### NOTE

The above procedure would be repeated for the remaining 3 passive latches; MCC will recommend a release sequence

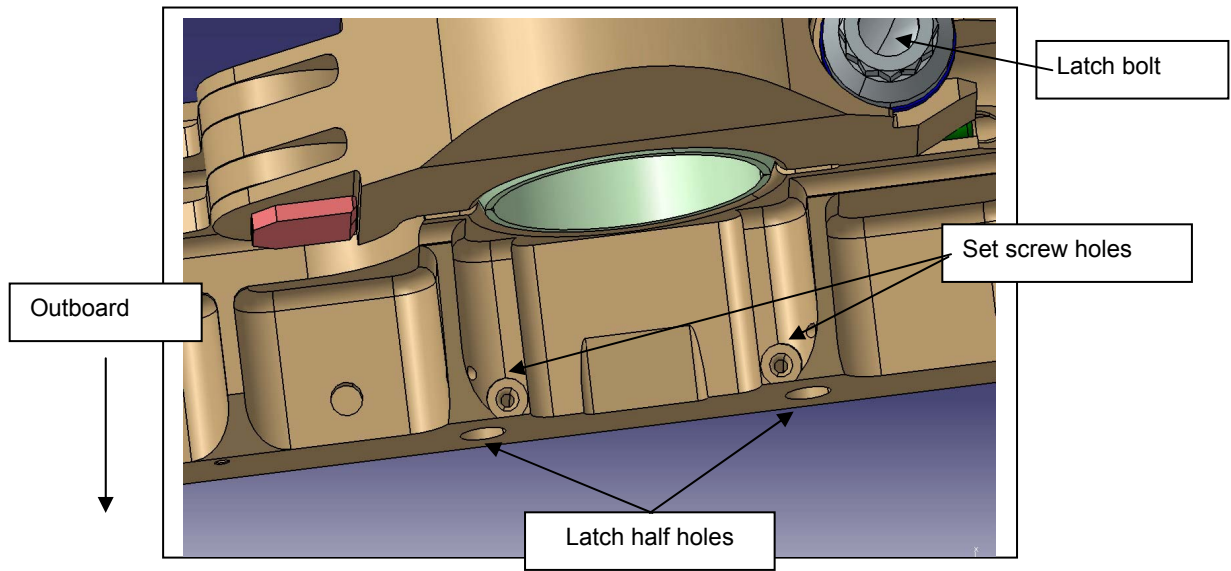
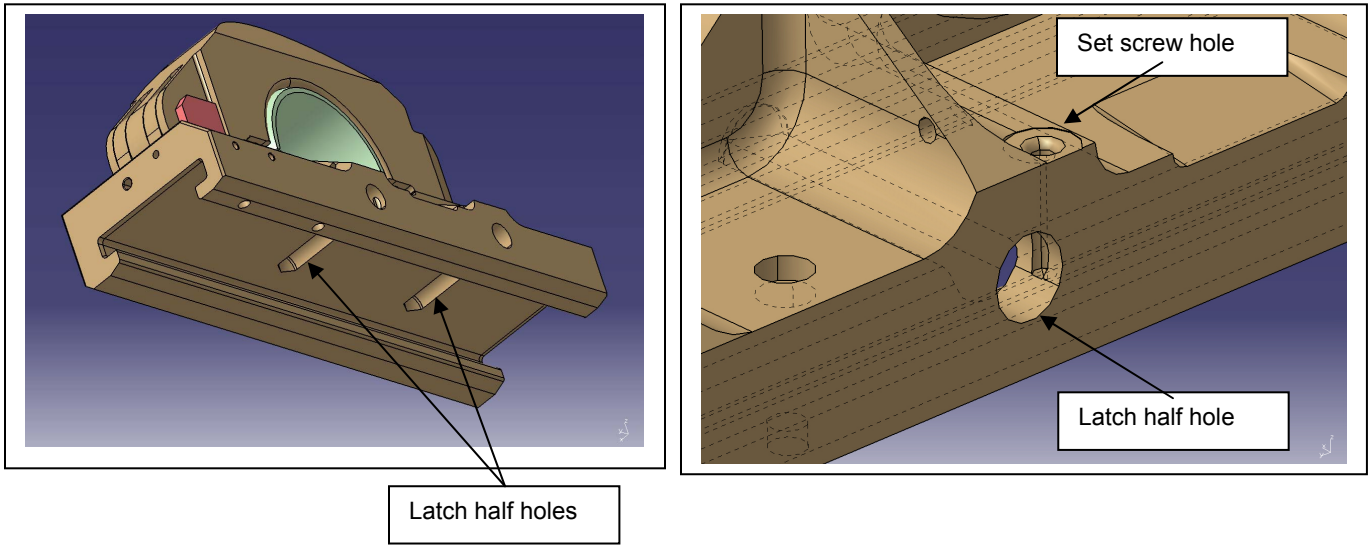
### **After Carrier Jettison:**

12. Release adj tethers and wire ties as reqd; close passive latch and re-install latch bolt
13. Install TM, tighten onto latch in CW direction
14. **EVA Ratchet:** Install ratchet onto TM 3/8" drive interface; tighten latch bolt CW until rigid, then add additional 2/3 turn
15. Remove TM (CCW on knurled knob)

### **If Floating Passive Latch:**

16. Slide passive latch along bridge rail as reqd to expose bridge rail half hole; verify latch is located at launch position
17. Install latch pin (from caddy) through passive latch and bridge rail half hole (outboard to inboard)
18. Install set screw through passive latch into latch pin (screw threads into top of latch pin, hand tight)
19. Clean up worksite

# CARRIER PASSIVE LATCH RELEASE (Cont)



## PASSIVE LATCH

## BAY 10 DOOR CONNECTOR BRACKET REMOVAL

Possible sheared spring-loaded fastener produced exposed shank that precludes SIC&DH from sliding on Bay 10 door during drive stud disengagement

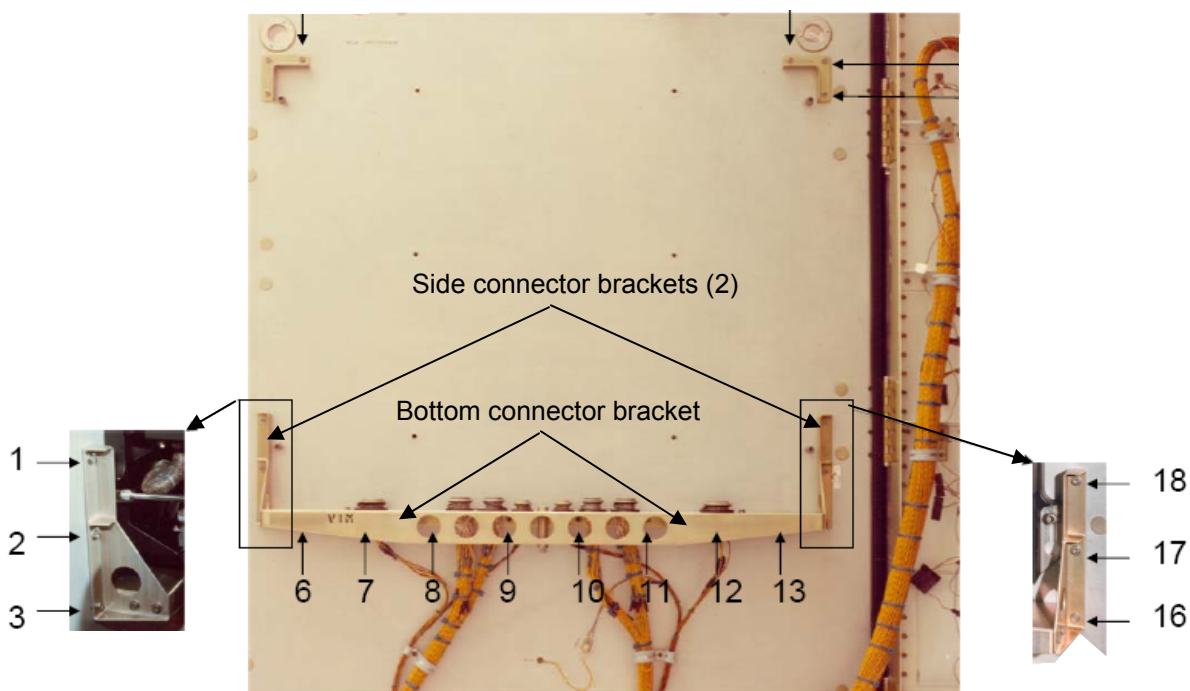
Tools: **PGT with long adj ext**  
**EVA Ratchet with MTL and 6-in wobble**  
**5/16" coax tool (MULE caddy)**  
**5/16"x10.3" capture wobble socket with O-tether (MULE caddy)**  
**SSAT tool (A/L) - as reqd**  
**7/16"x10.3" capture wobble socket with O-tether (MULE caddy)** (if removal of keyway reqd)  
**Small trash bag**  
**5/16" replacement screws (2) (MULE caddy)**  
**7/16" replacement screws (MULE caddy)** (if removal of keyway reqd)

**NOTE:** Prepare to capture loose screws and washers; stow in trash bag

**NOTE:** 5/16" screws are torqued to 40 in-lb

1. **5/16" Coax Tool**
2. Using coax tool, release 5/16" non-captive screws/washers (4), 5-6 turns at outboard-most locations on bottom connector bracket (screws # 6,7,12, & 13); stow in trash bag
3. **5/16"x10.3" Capture Wobble Socket with O-tether OR SSAT Tool**
4. Release remaining 5/16" non-captive screws/washers (10), 5-6 turns from both side and bottom connector brackets, stow in trash bag (screws # 1,2,3,8,9,10,11,16,17,&18)
5. Engage keyway bolt(s) as desired prior to drive stud disengagement (nominal settings)
6. **EVA Ratchet with MTL (10) and 6-in wobble**
7. Press with drive stud disengagement; **NOTE:** connector tray will move down toward bottom of door
8. Release any remaining bolt(s), remove SIC&DH

**NOTE:** After SIC&DH-R fully installed onto door, re-install 5/16" screws (2) onto side connector brackets; 1 per side, 5 turns, hand tight



BAY 10 DOOR CONNECTOR BRACKET

## SI C&DH-R SPRING LOADED FASTENER/HOUSING REMOVAL

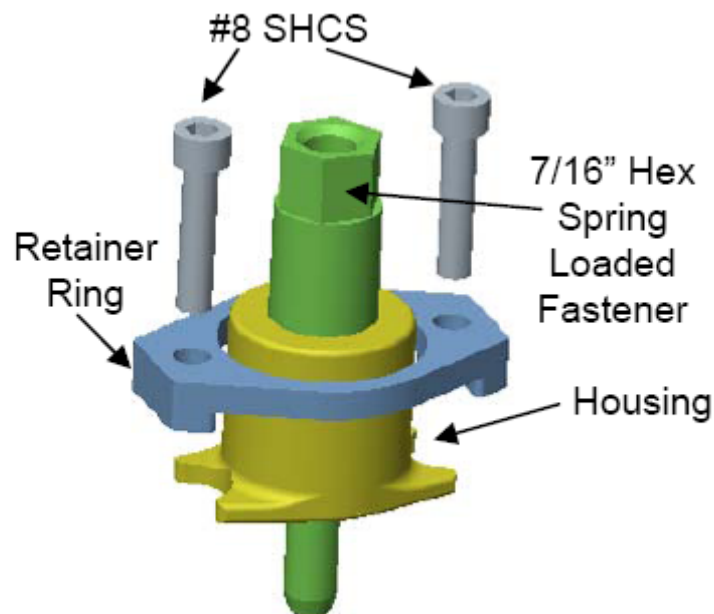
SIC&DH-R fastener/housing required to be removed due to sheared fastener interference during SI C&DH removal from Bay 10 door

Tools: **PGT (if fastener not yet nominally released)**  
**#8 Allen head capture tool with O-tether (MULE caddy)**  
**7/16"x10.3" capture wobble socket with O-tether (MULE caddy)**  
**Small trash bag**

### NOTE

There will be a total of 4 loose pieces that will need to be captured (housing, retainer ring, and two #8 fasteners)

1. Verify 7/16" spring loaded fastener fully released per nominal procedures
2. **#8 Allen head capture tool w/ O-tether**
3. Break torque on #8 fasteners (2), ~ 1 turn
4. Fully release one of two #8 fasteners (~11 turns) by hand (torque = 1.7 ft-lb); stow in trash bag
5. Install 7/16"x10.3" socket over spring loaded fastener (captures housing and retainer ring)
6. **#8 Allen head capture tool w/ O-tether**
7. Release remaining #8 fastener (~11 turns) by hand; stow in trash bag
8. **7/16"x10.3" capture socket**
9. Remove retainer ring and housing (at the same time) using 7/16" capture socket; stow in trash bag



SI C&DH-R SPRING LOADED FASTENER



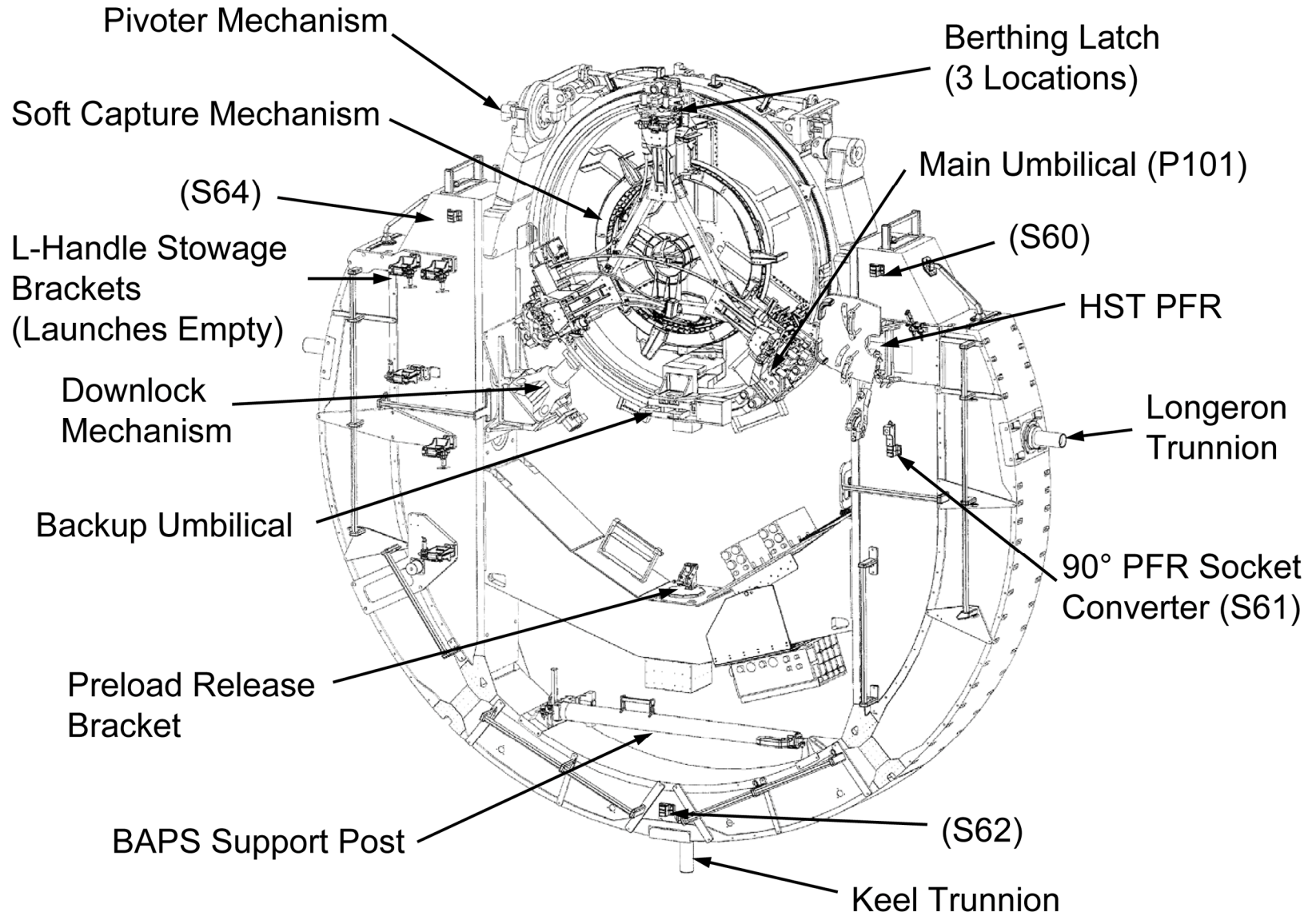
FSS REF DATA

FSS FORWARD VIEW .....	FS 17-3
FSS FORWARD VIEW (LANDING CONFIGURATION).....	FS 17-4
FSS AFT VIEW (LANDING CONFIGURATION) .....	FS 17-5
BAPS RING .....	FS 17-6
LAUNCH LOCK .....	FS 17-7
LAUNCH LOCK MECHANISM .....	FS 17-8
BAPS PIVOTER.....	FS 17-9
BAPS ROTATOR.....	FS 17-10
BERTHING LATCH.....	FS 17-11
BERTHING LATCH INTERNAL MECHANISM.....	FS 17-12
P107/P108 UMBILICAL MECHANISMS.....	FS 17-13
MAIN UMBILICAL.....	FS 17-14
UMBILICAL RETRACT/DISCONNECT MECHANISMS.....	FS 17-15
BAPS SUPPORT POST .....	FS 17-16

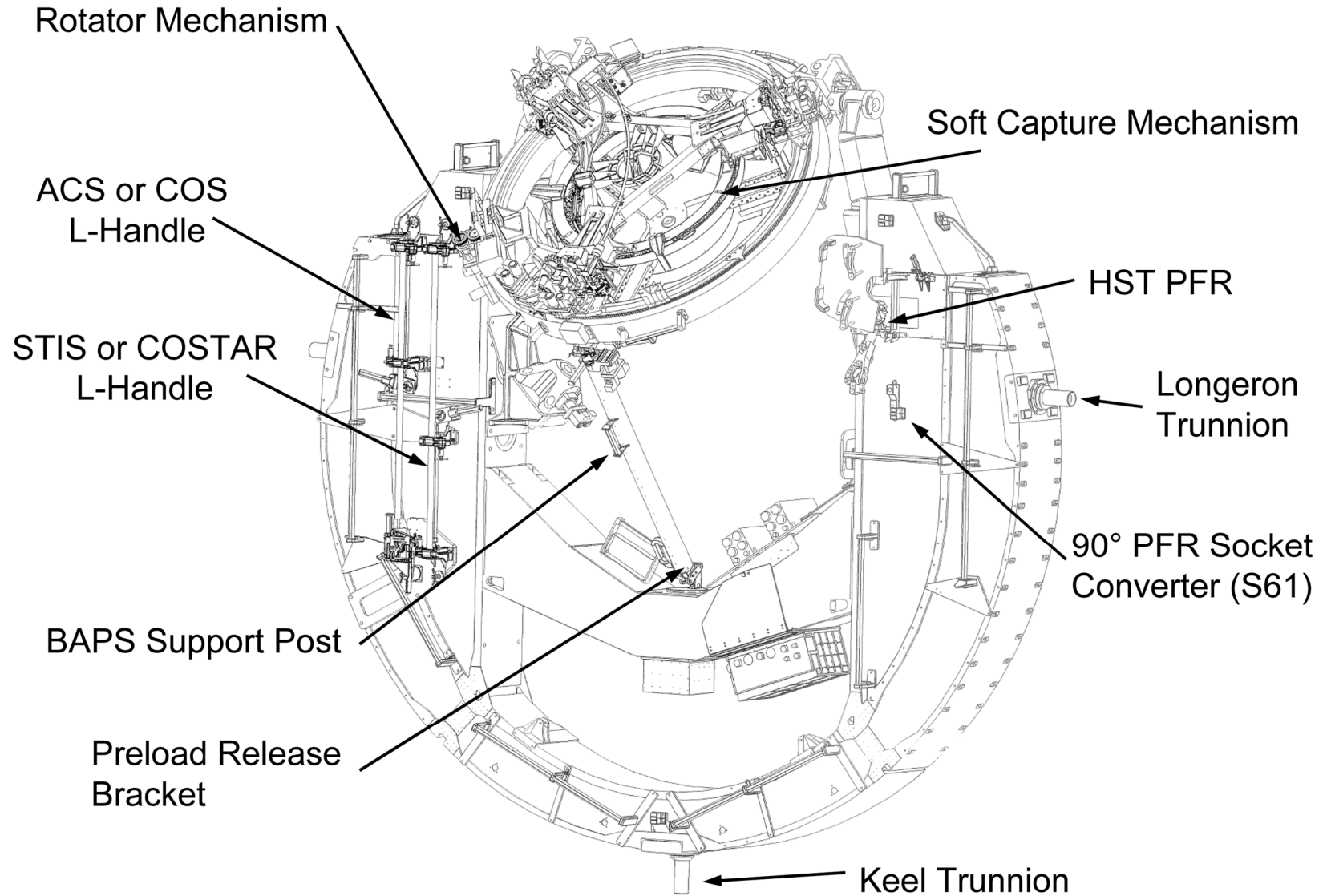
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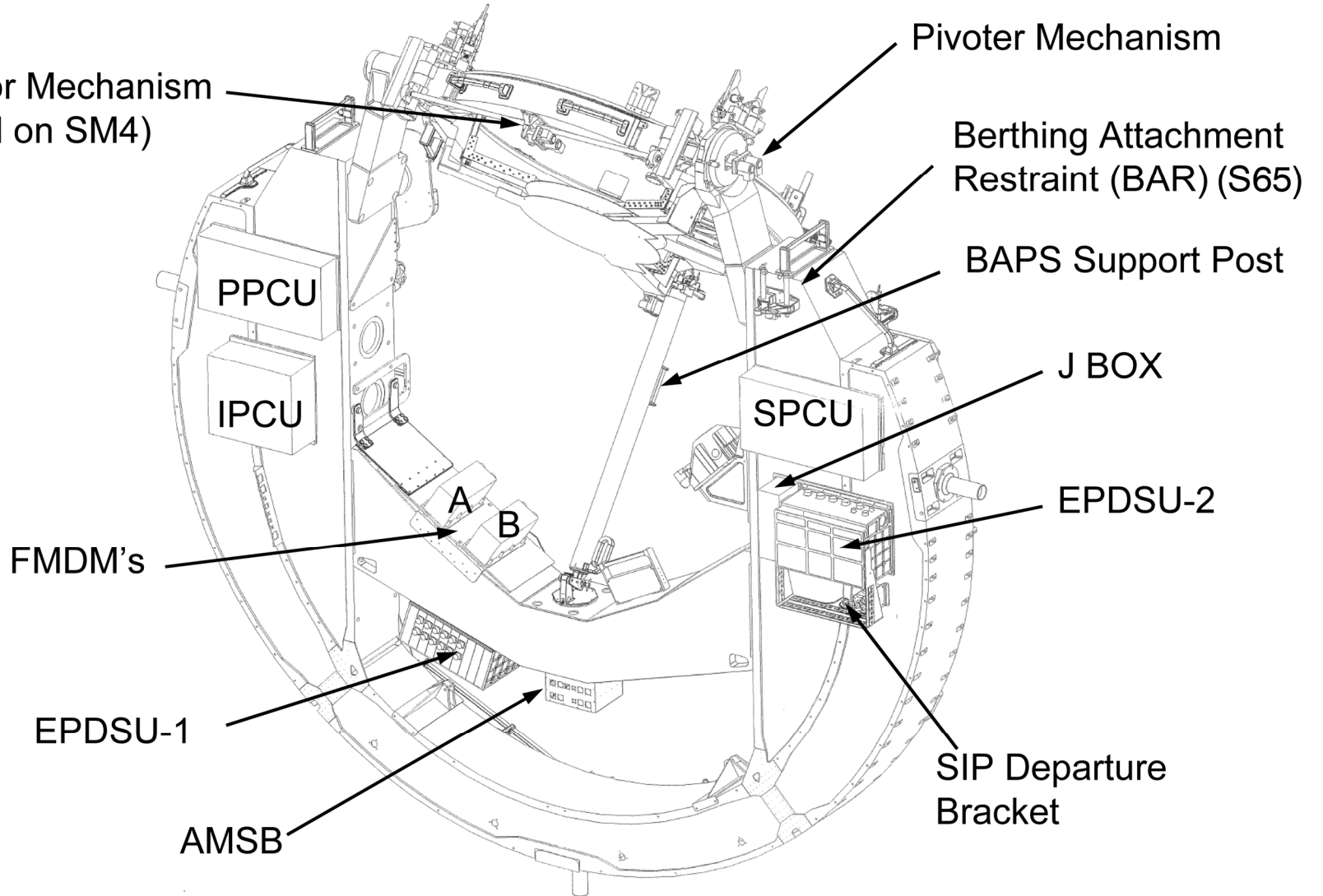
**FSS FORWARD VIEW**



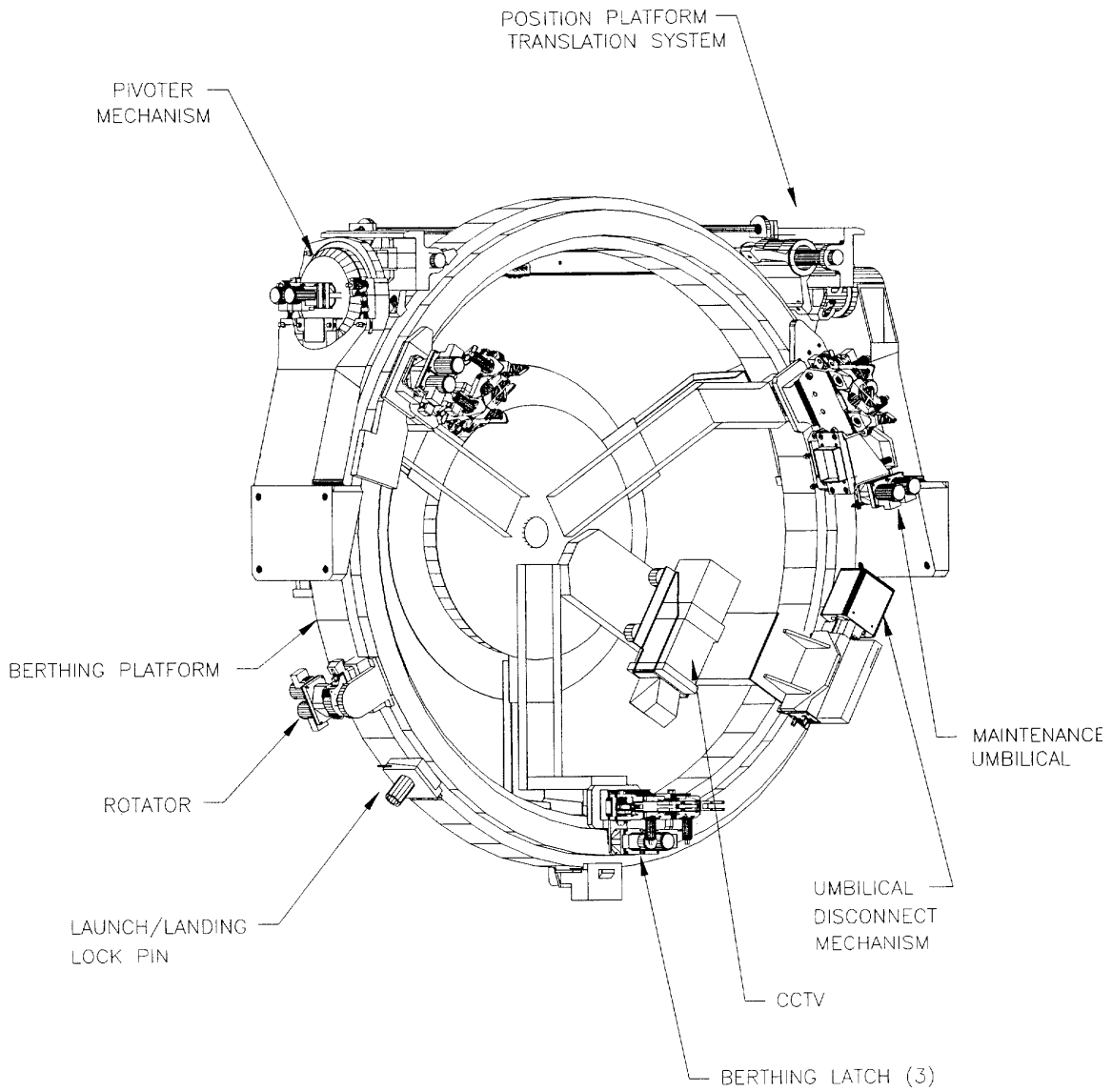
**FSS FORWARD VIEW  
(Landing Configuration)**



**FSS AFT VIEW**  
**(Landing Configuration)**

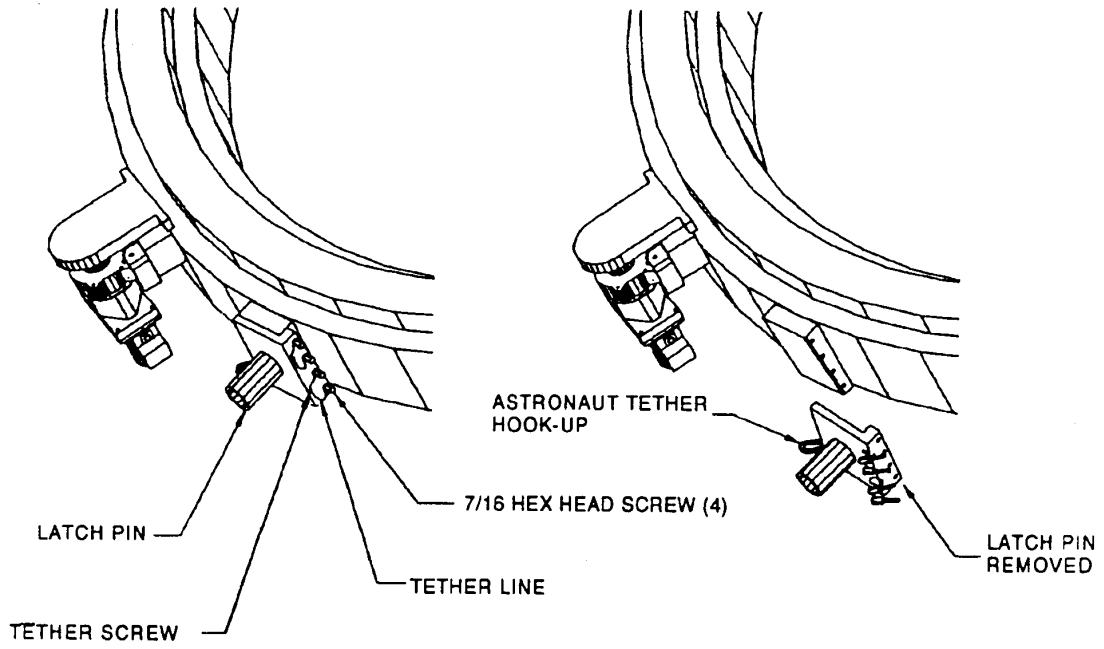


# BAPS RING

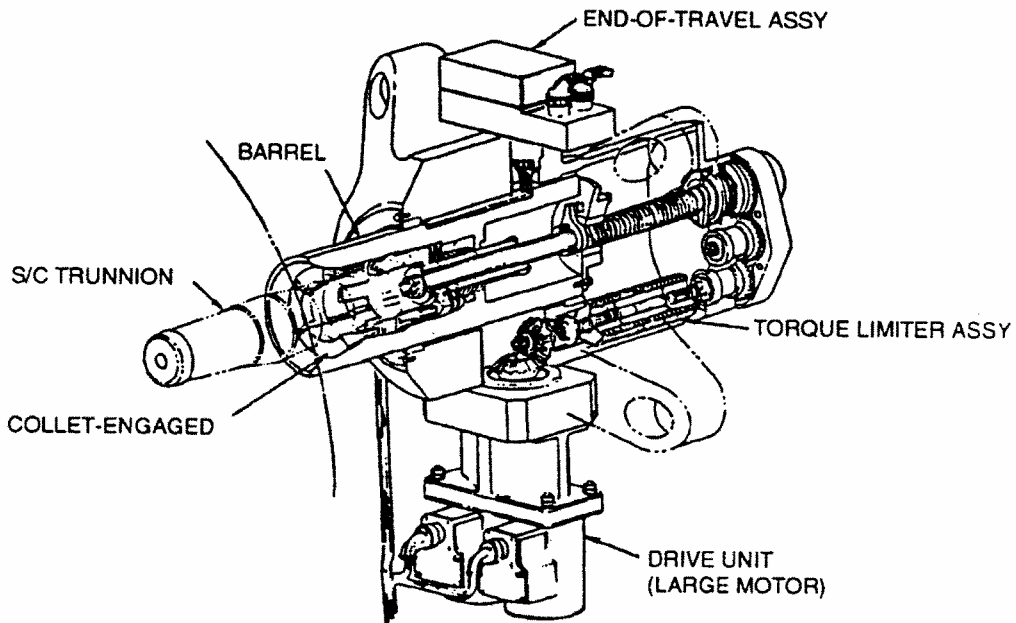
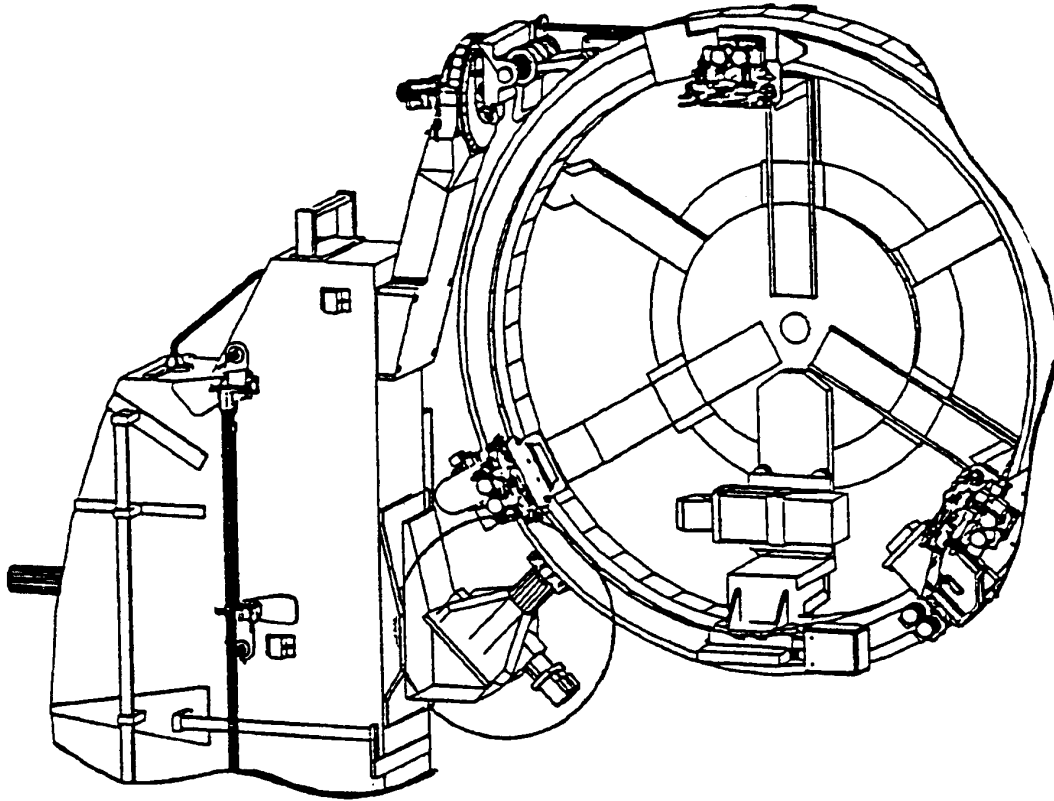


**NOTE:** SCM not shown

# LAUNCH LOCK



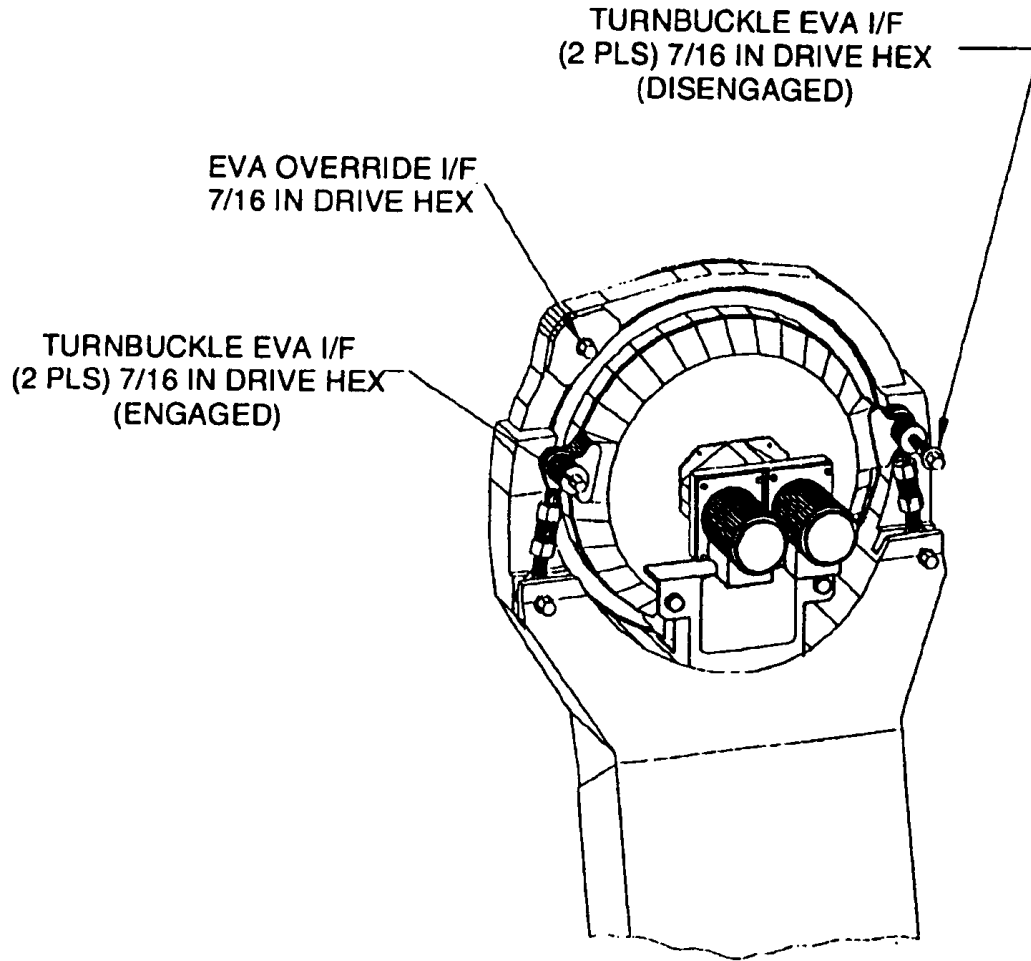
# LAUNCH LOCK MECHANISM



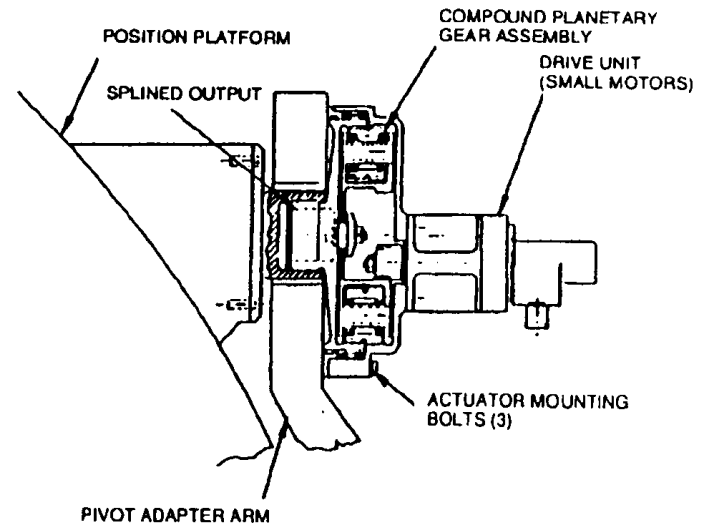
NOTE: SCM not shown



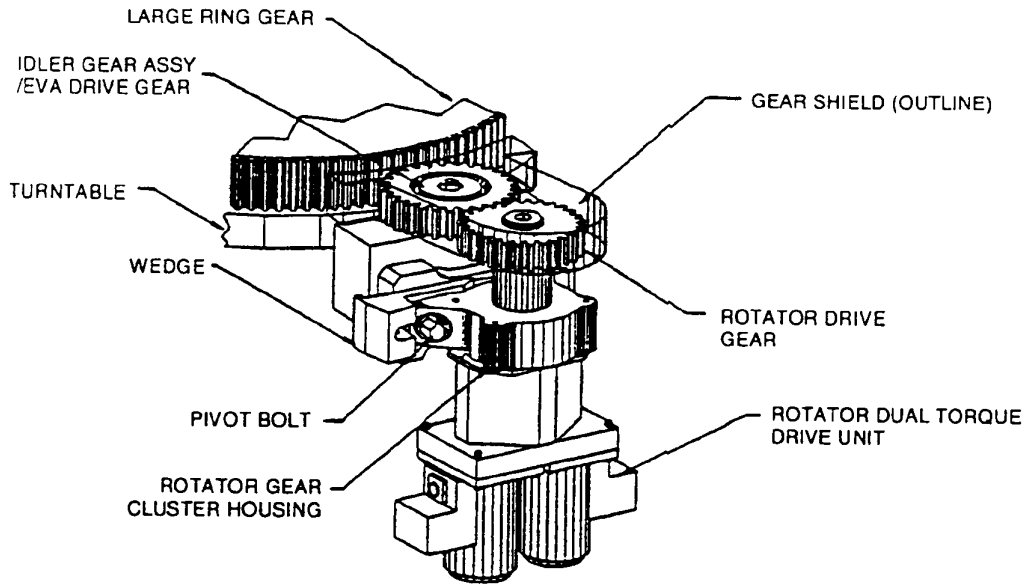
# BAPS PIVOTER



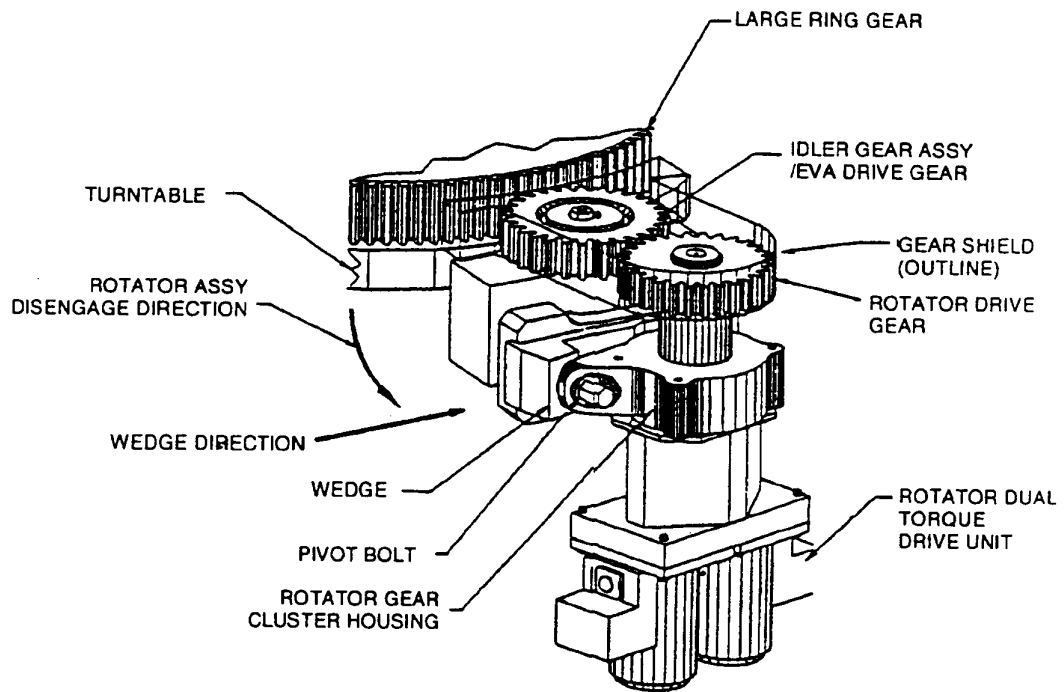
PIVOTER  
VIEW LOOKING INBOARD



# BAPS ROTATOR

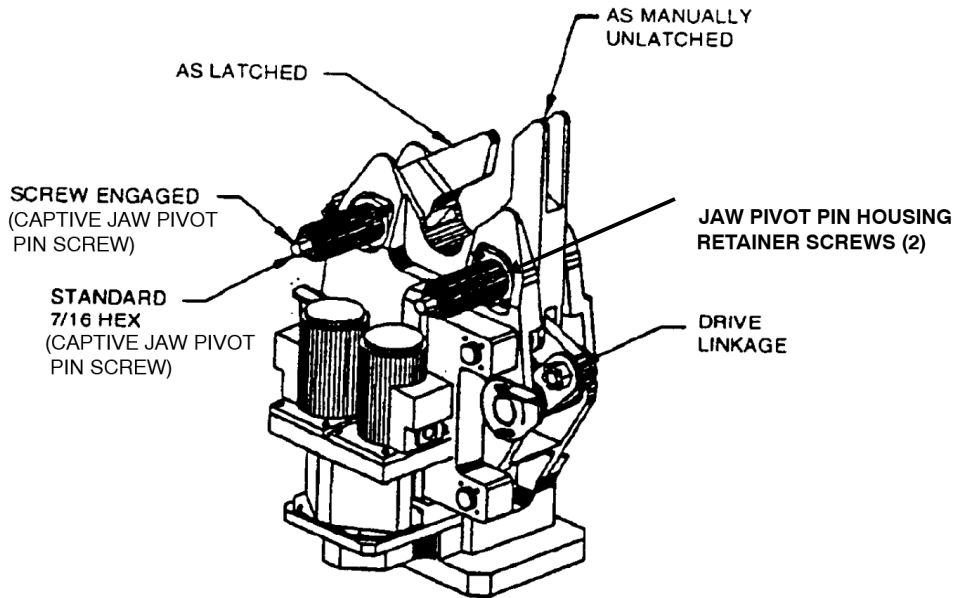


ROTATOR PRIMARY DRIVE CONFIGURATION

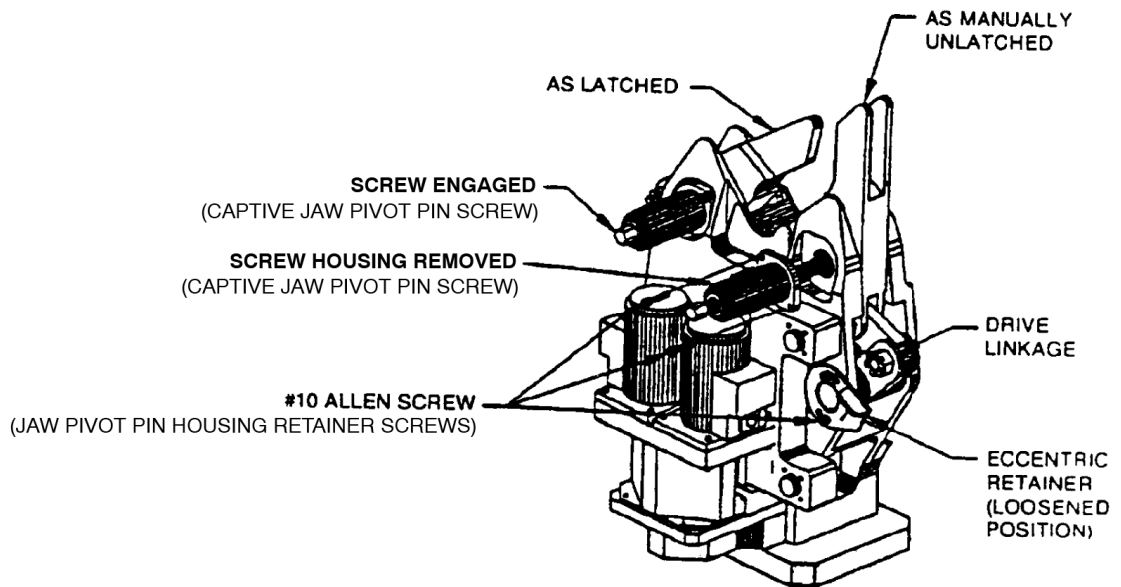


ROTATOR PRIMARY EVA OVERRIDE DISENGAGED

# BERTHING LATCH

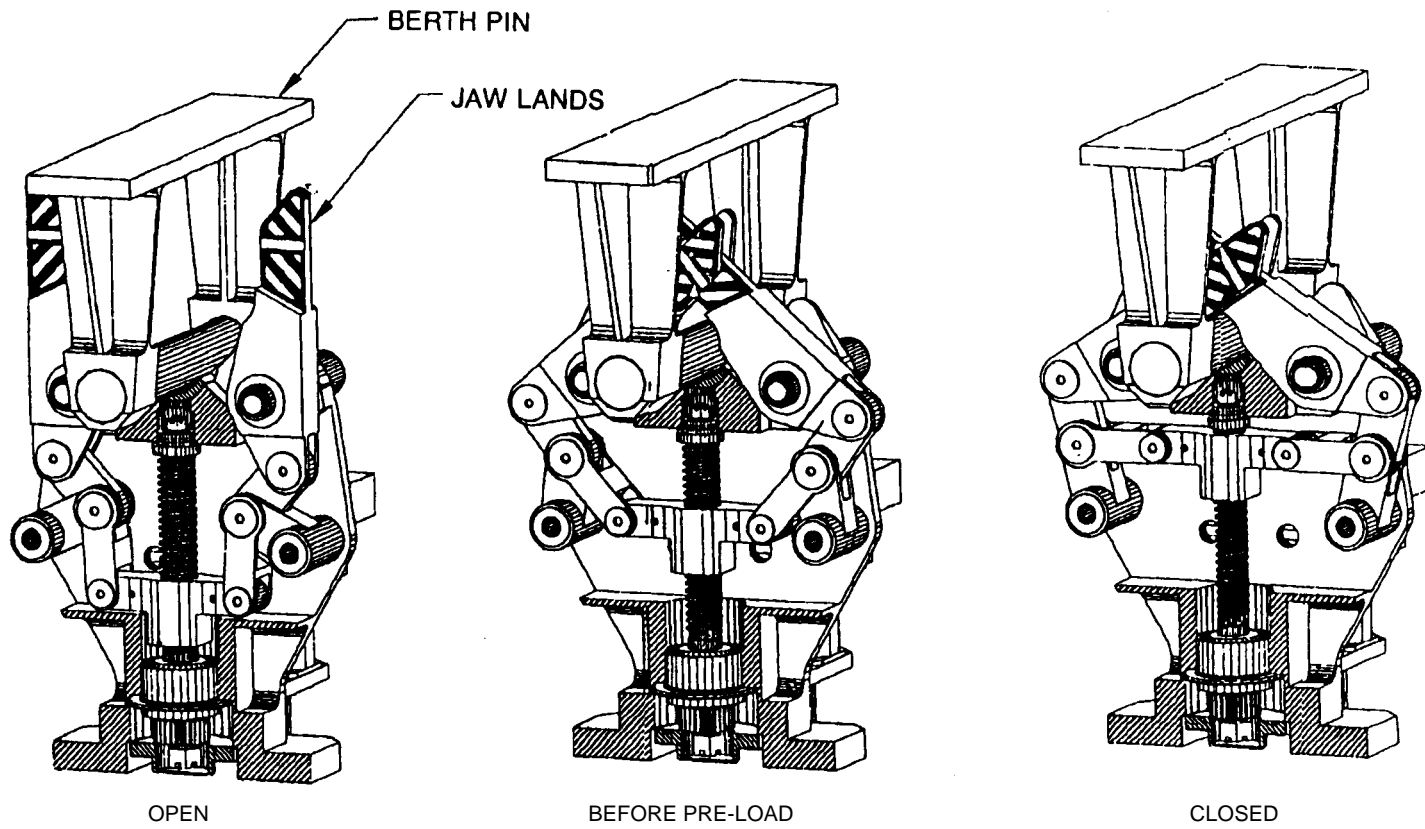


BERTHING LATCH PRIMARY OVERRIDE

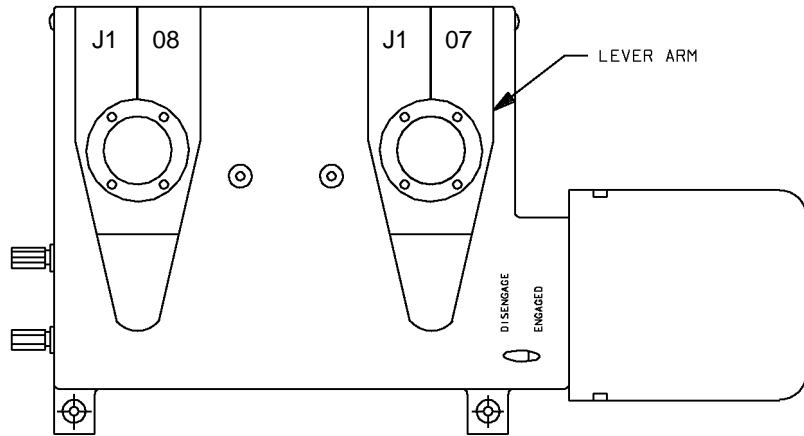
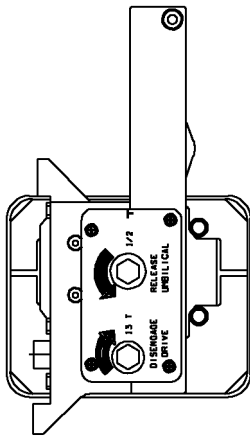
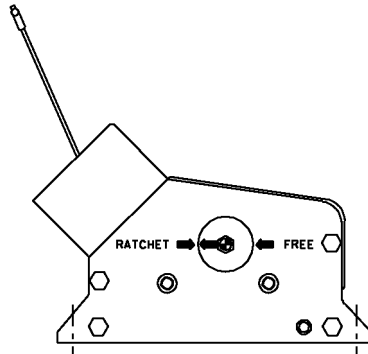


BERTHING LATCH SECONDARY EVA OVERRIDE

# BERTHING LATCH INTERNAL MECHANISM

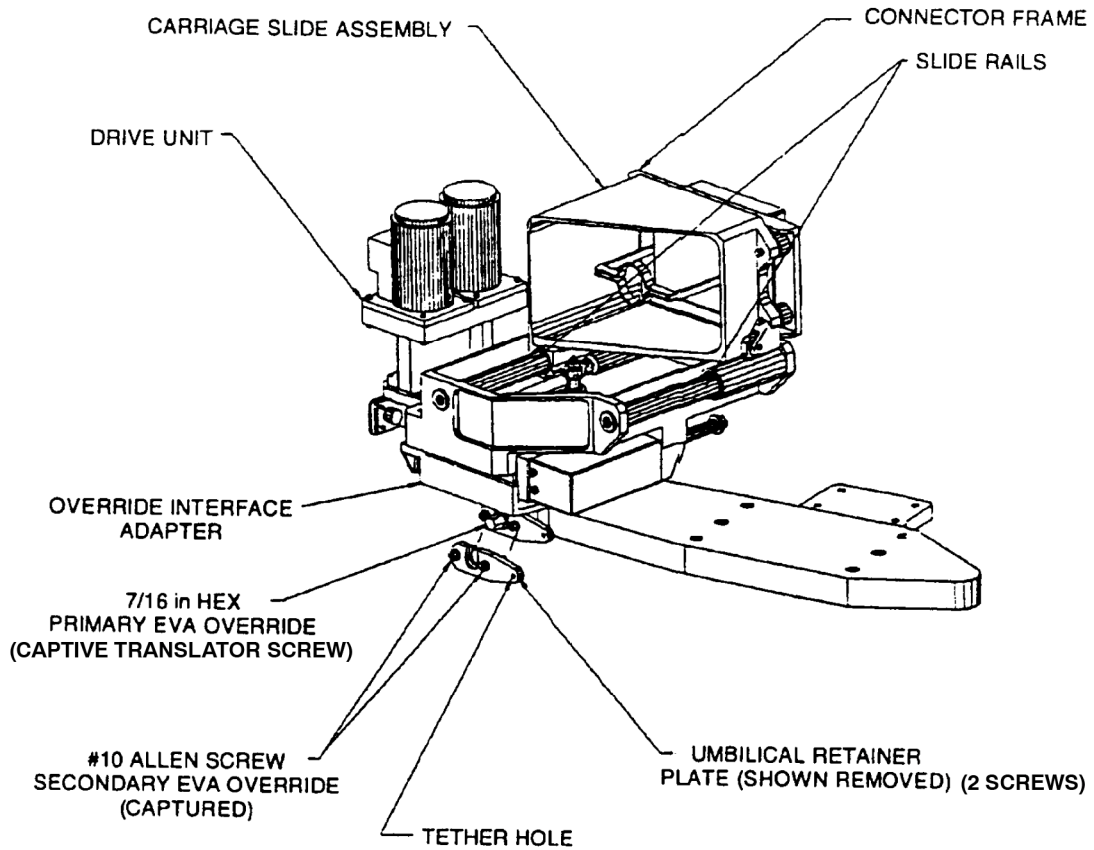


# P107/P108 UMBILICAL MECHANISMS



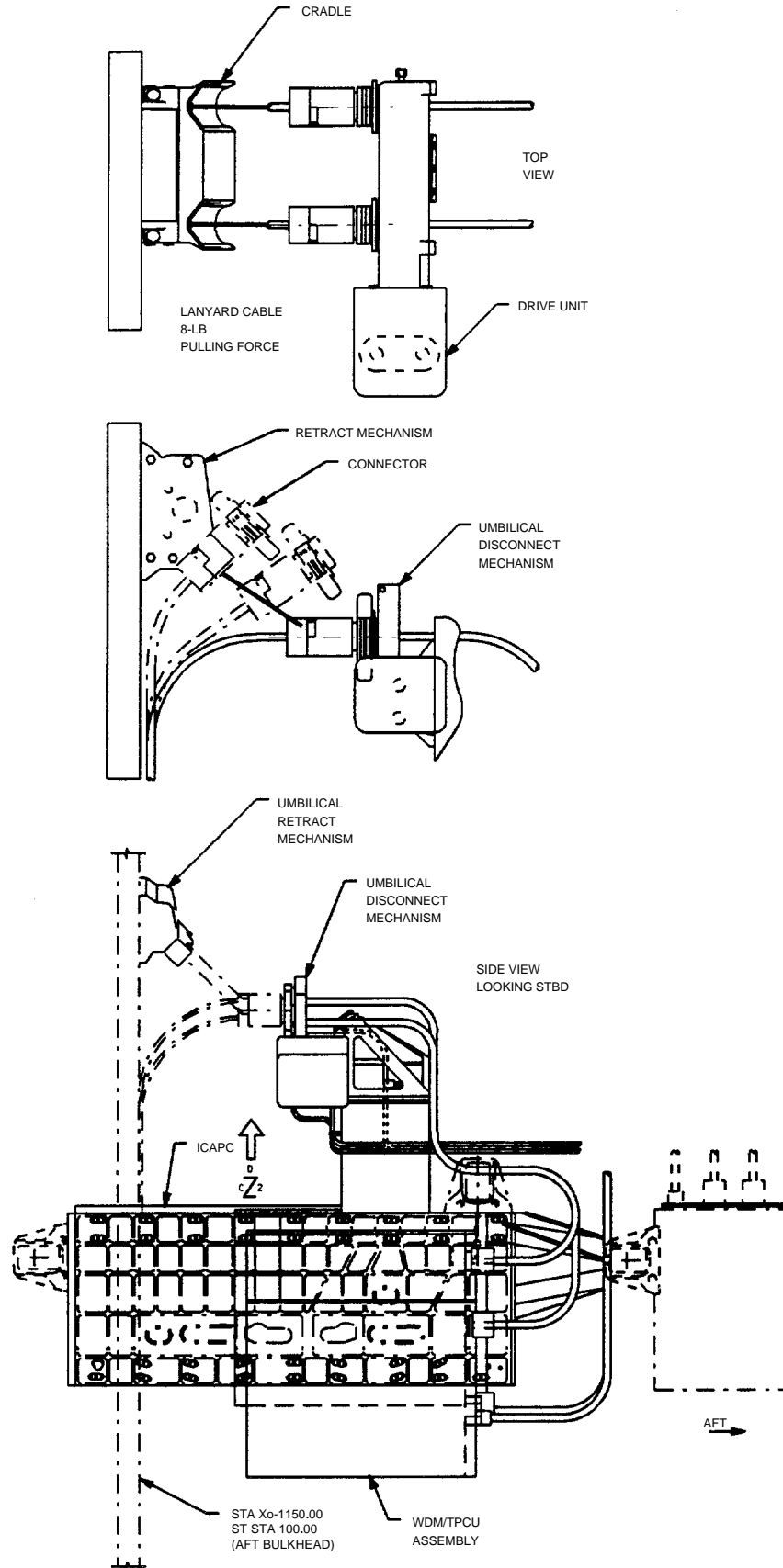
173253110. ART, 2

# MAIN UMBILICAL

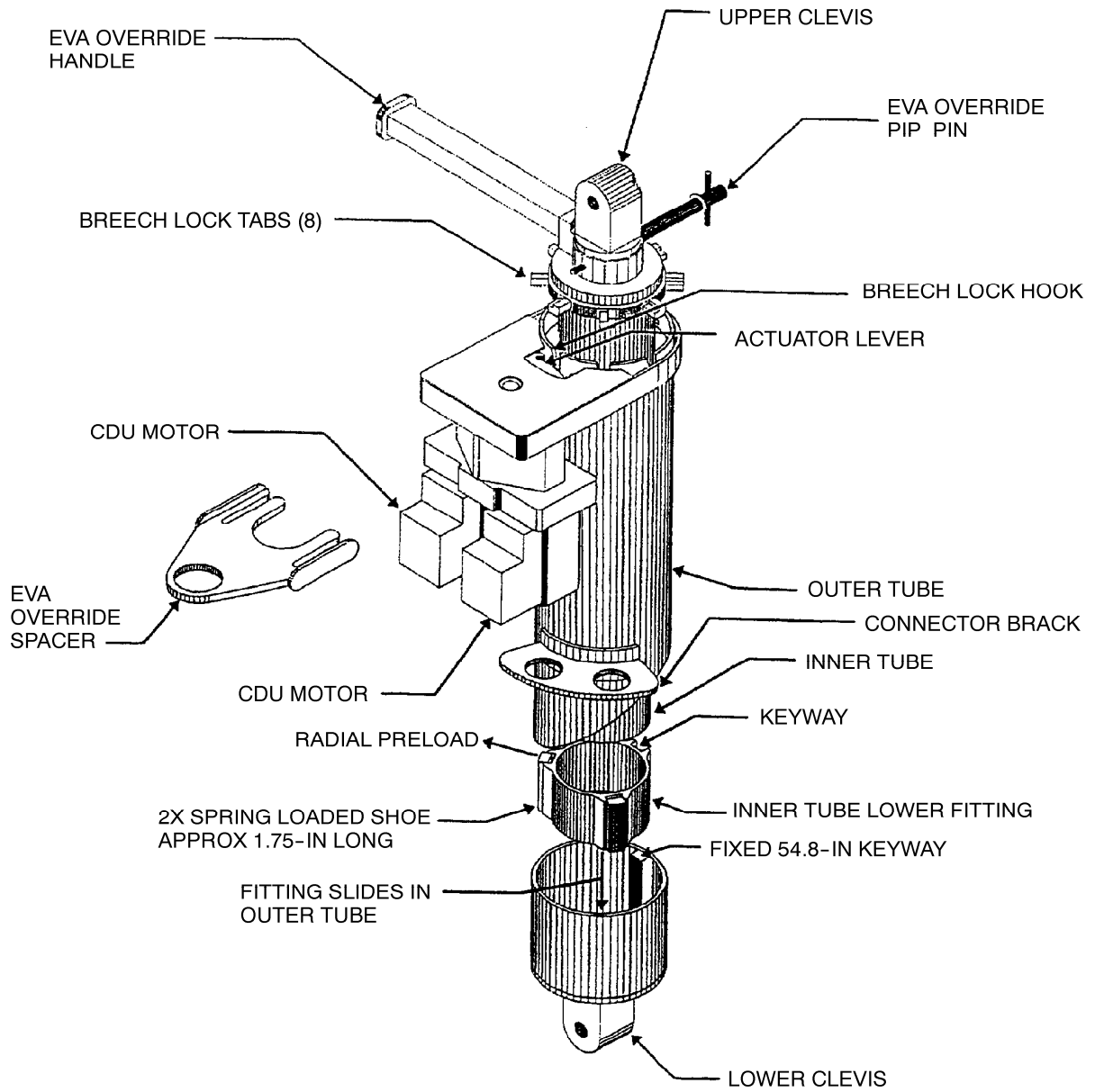


NOTE: Harness removed for clarity

# UMBILICAL RETRACT/DISCONNECT MECHANISMS



# BAPS SUPPORT POST





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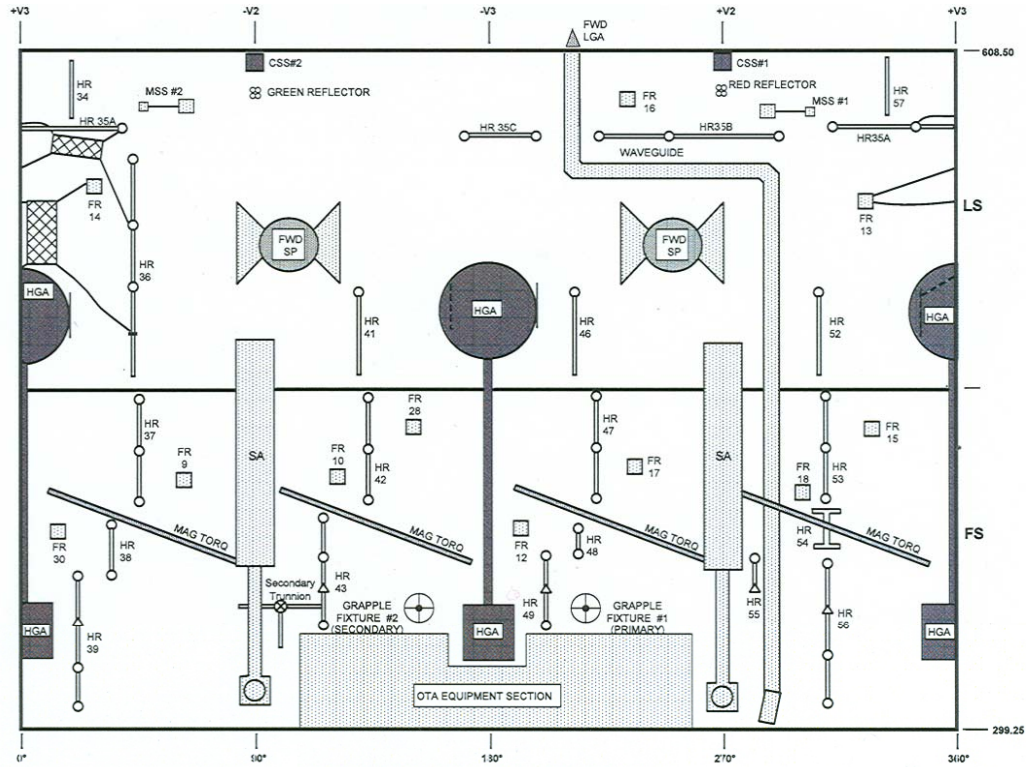
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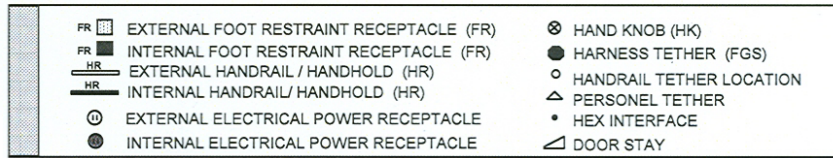
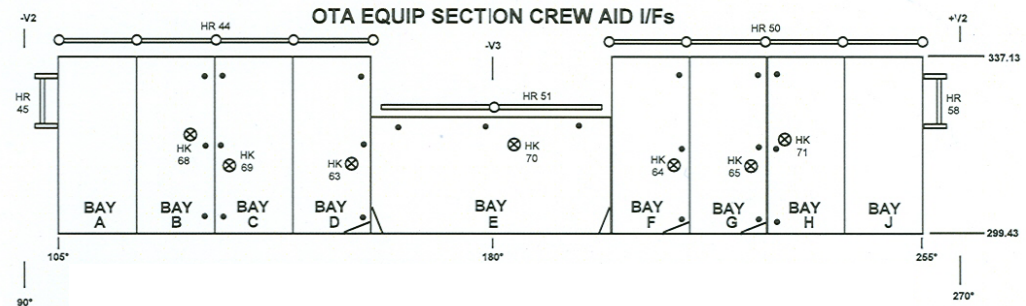
HOOK  
VELCRO

HOOK  
VELCRO

**LIGHT SHIELD AND FORWARD SHELL CREW AID I/Fs**



OTA BAY	EVA Max Opening
B	135°
C	118°
D	100°
E	100°
F	100°
G	100°
H	137°



HST  
REF DATA

EVA-4a/125/O/A

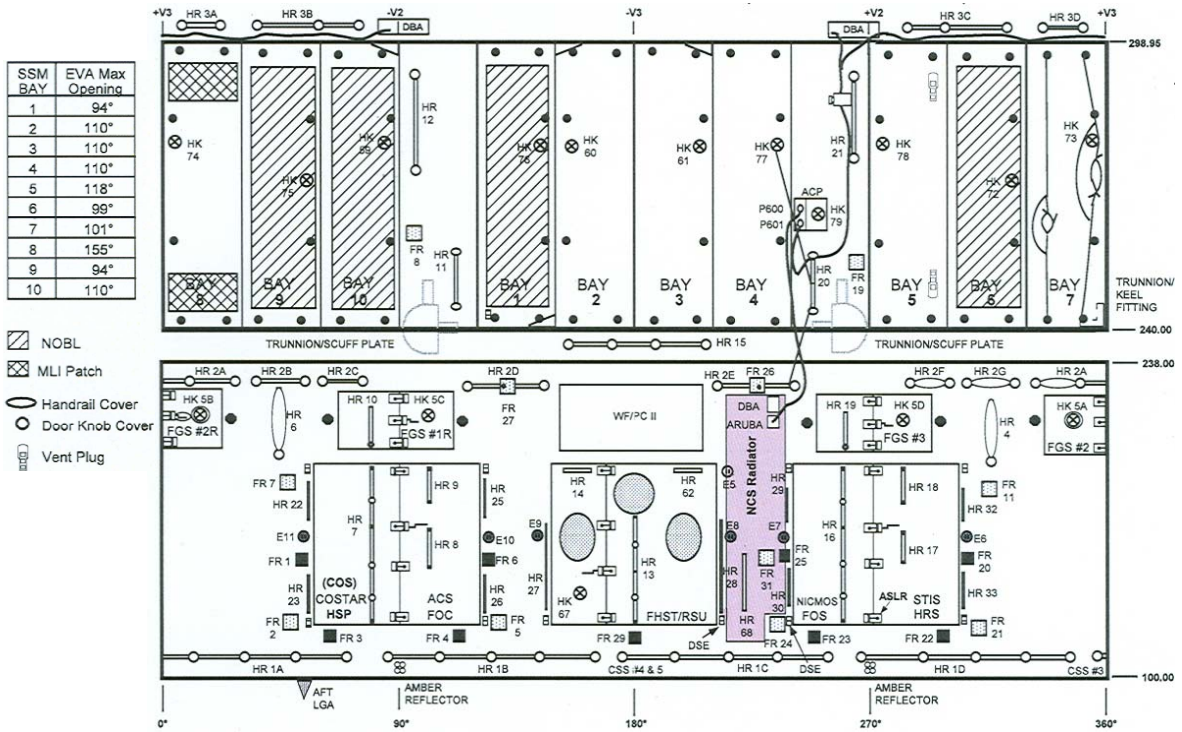
(reduced copy)

TOP  
 BACK OF 'LIGHT SHIELD AND FORWARD SHELL CREW AID I/Fs'

HOOK  
 VELCRO

HOOK  
 VELCRO

SSM-ES AND AFT SHROUD CREW AID I/Fs (VIEWING FROM EXTERNAL)



HST  
 REF DATA

EVA-4b/125/O/A

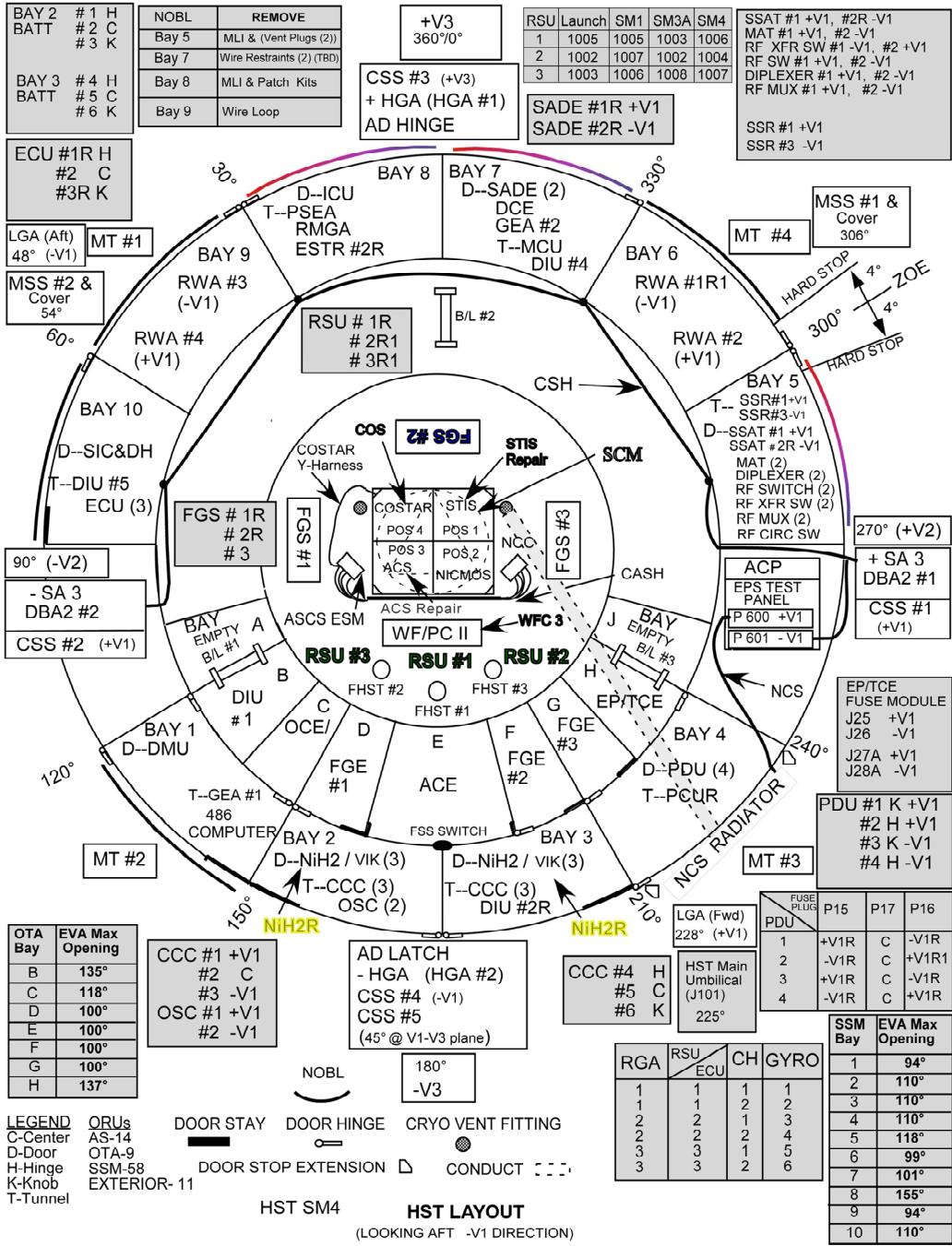
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TOP

HOOK  
VELCRO

HOOK  
VELCRO

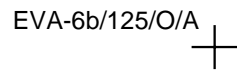
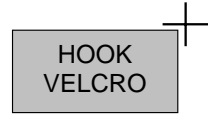
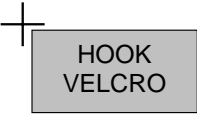
**HST LAYOUT**  
(LOOKING AFT -V1 DIRECTION)



EVA-6a/125/O/A

(reduced copy)

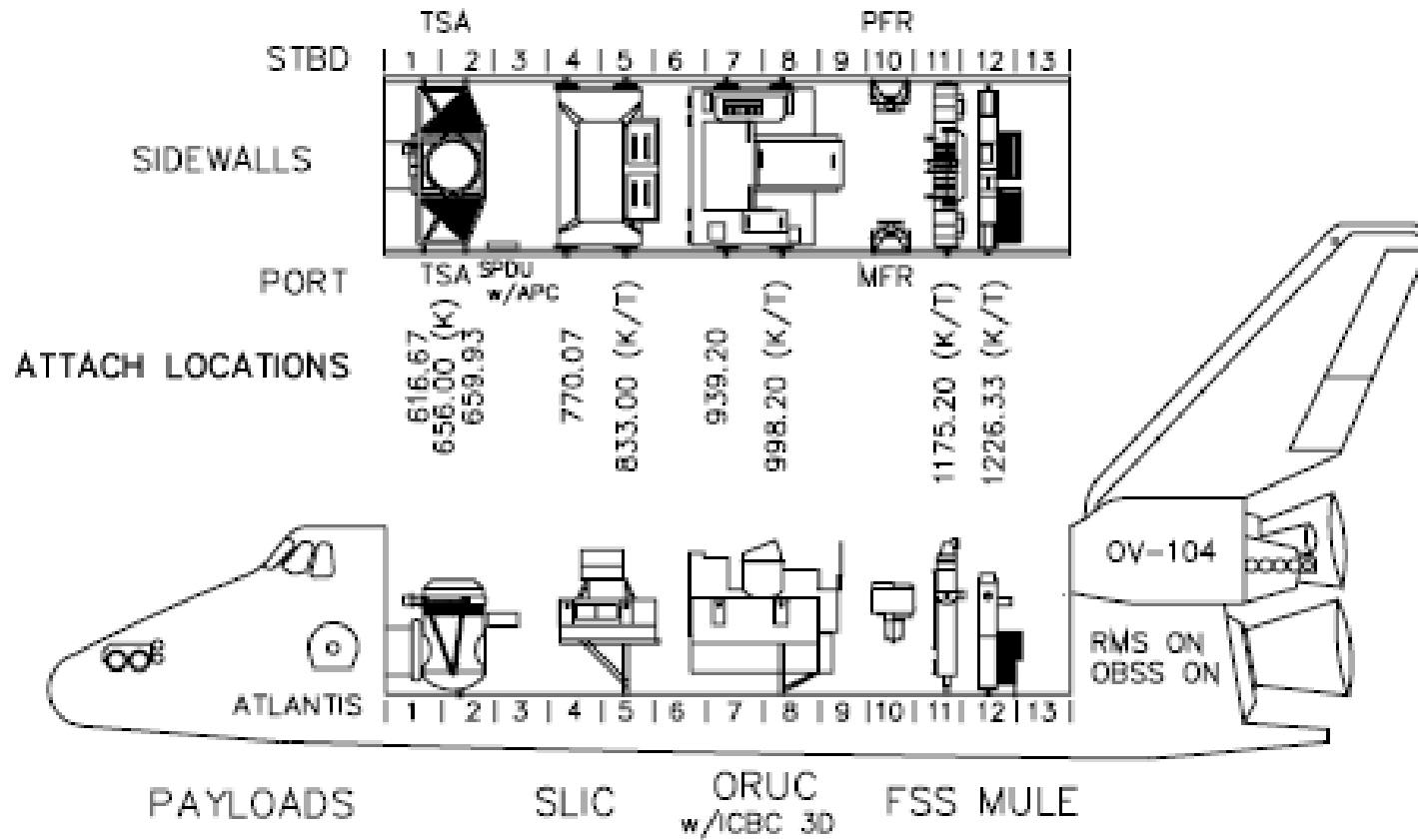
TOP  
BACK OF 'HST LAYOUT'



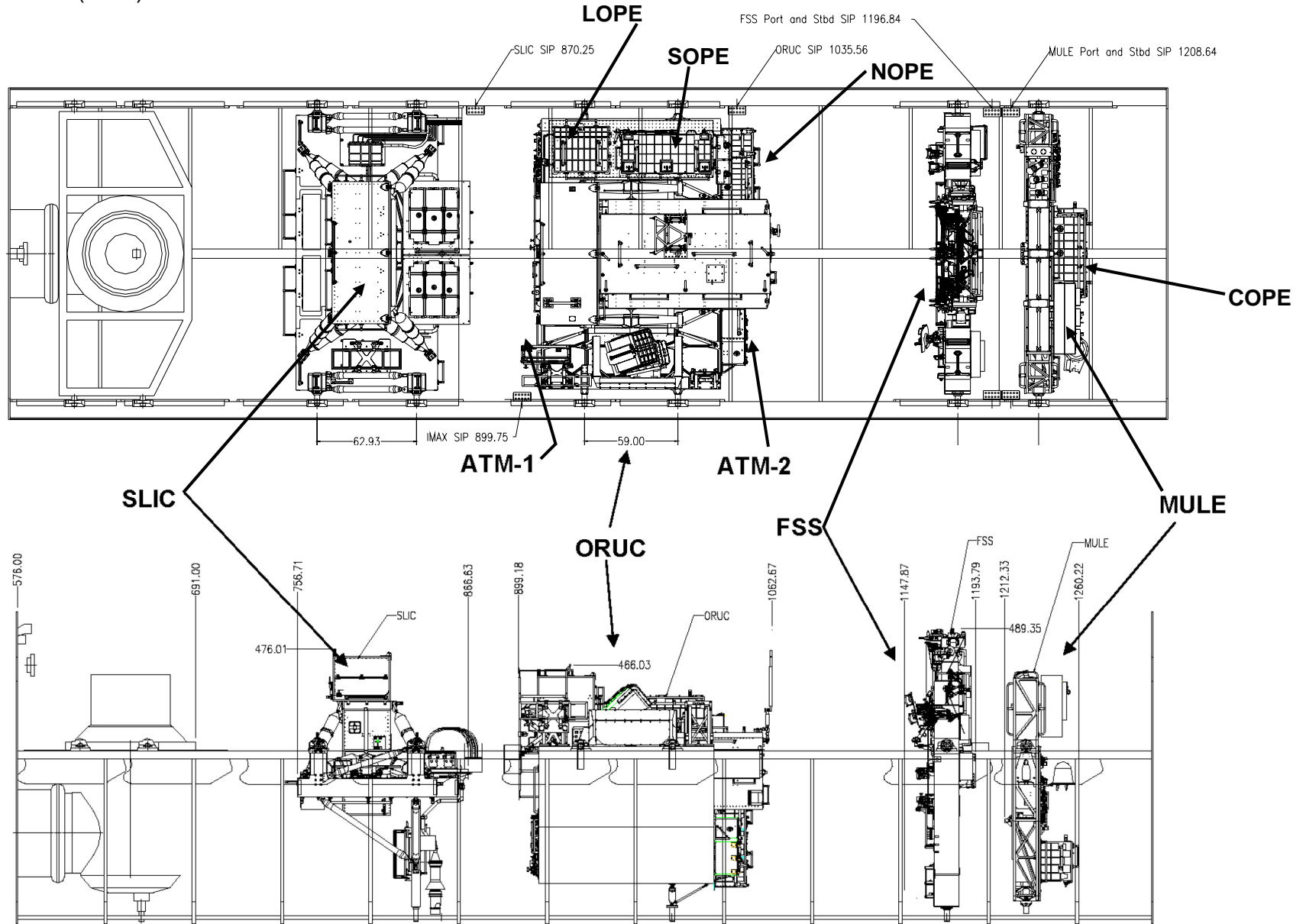
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# PLB OVERVIEW

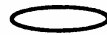


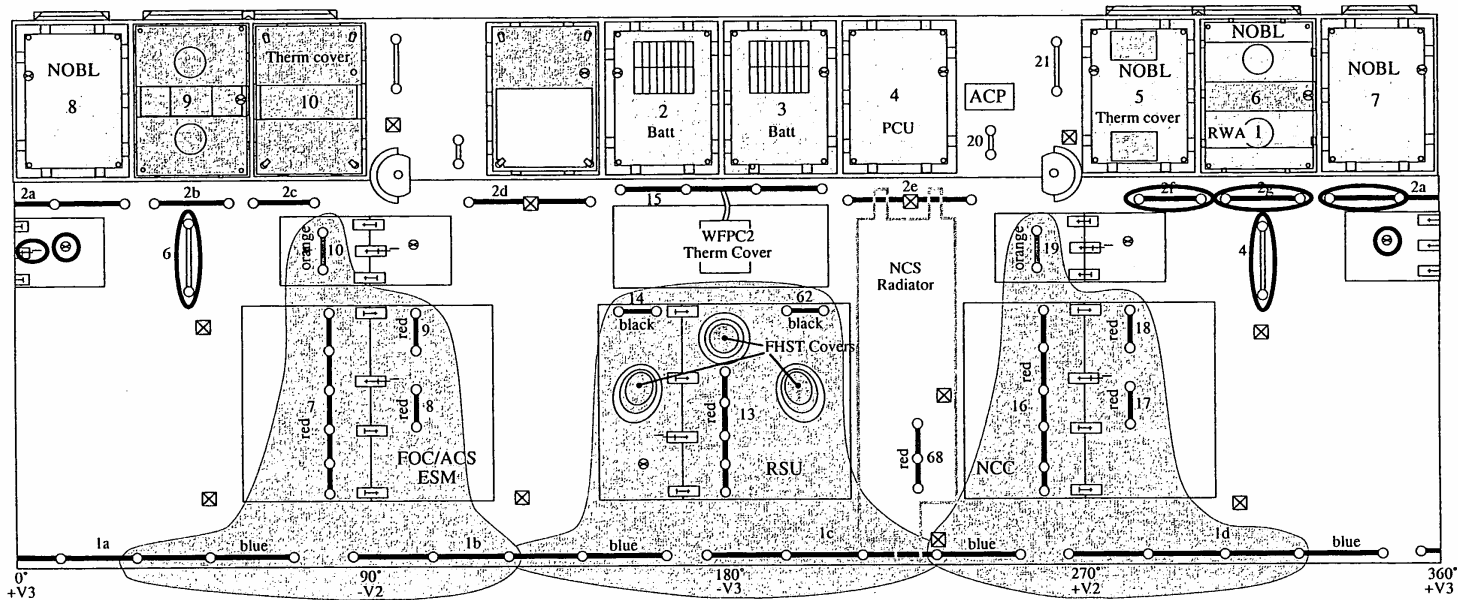
**PLB OVERVIEW (Cont)**



# HANDRAIL COVERS

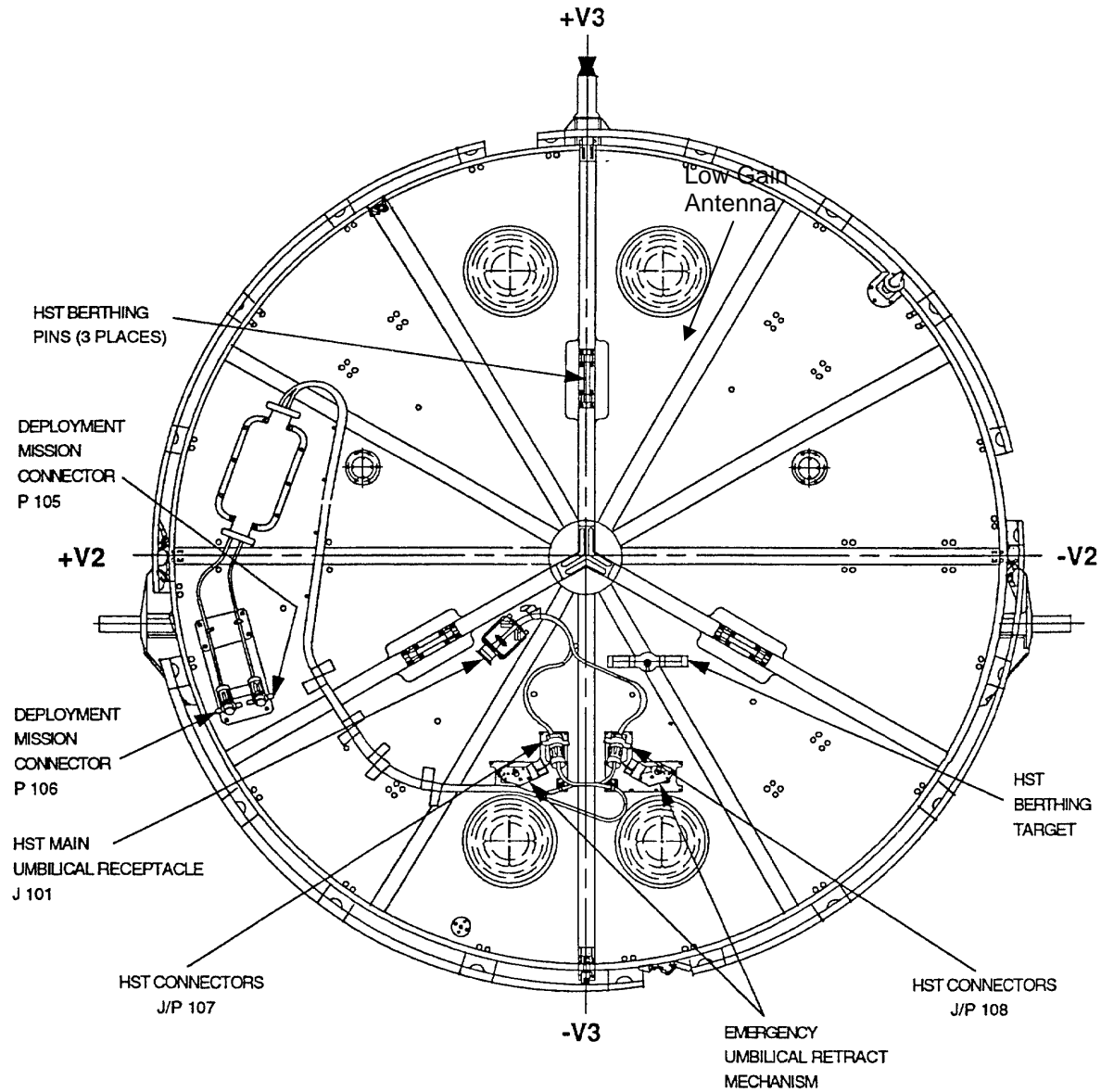
V2 Caddy			V2 Caddy			RSU/Shield Caddy			Total	
3	Blue	23.5"	3	Blue	23.5"	4	Blue	23.5"	13	Blue 23.5"
1	Gaiter	23.5"	1	Gaiter	23.5"	1	Gaiter	23.5"	3	Gaiter 23.5"
5	Red	12.75"	5	Red	12.75"	3	Red	12.75"	18	Red 12.75"
1	Gaiter	12.75"	1	Gaiter	12.75"	1	Gaiter	12.75"	3	Gaiter 12.75"
1	Orange	10"	1	Orange	10"	2	Black	7"	2	Orange 10"
1	Handle		1	Handle		1	Knob		2	Black 7"
						1	Handle		2	Knob
									3	Handle

 installed cover

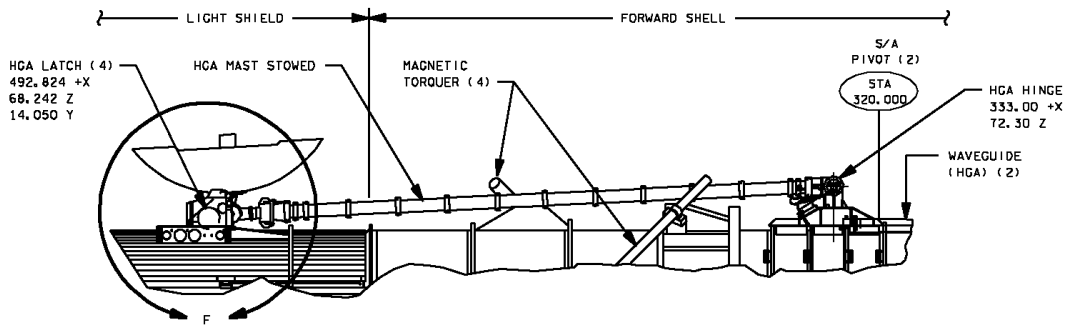
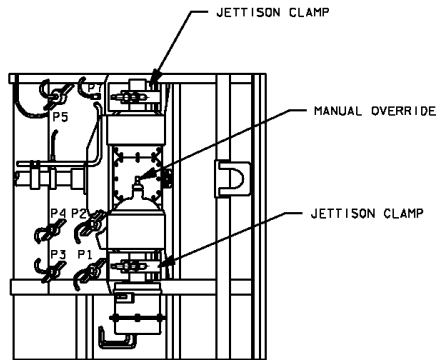
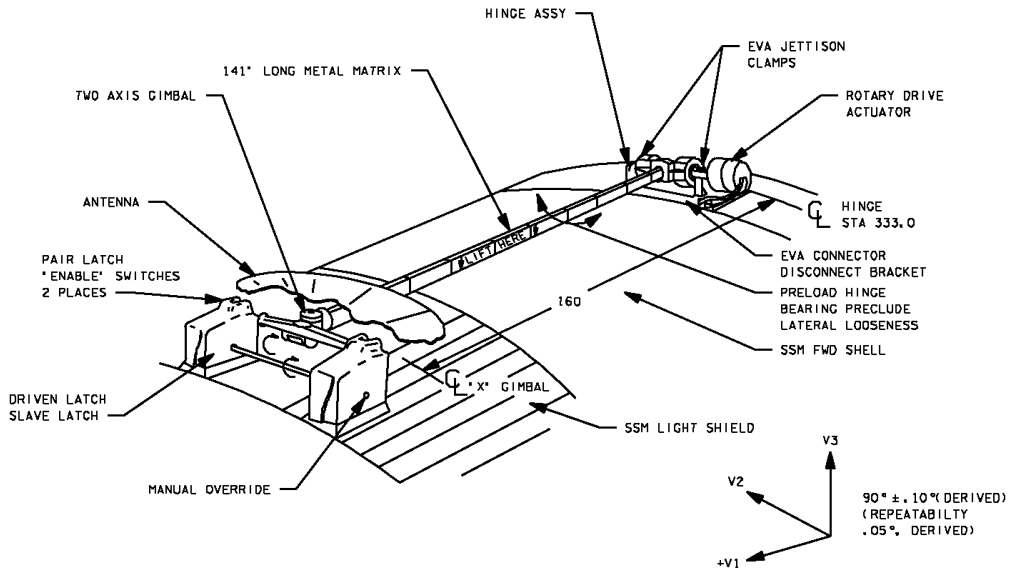


- Note: 1. Do not install cover on radiator attach handrails  
 2. Install covers on flaking handrails used on aft shroud days before door opening through door closure

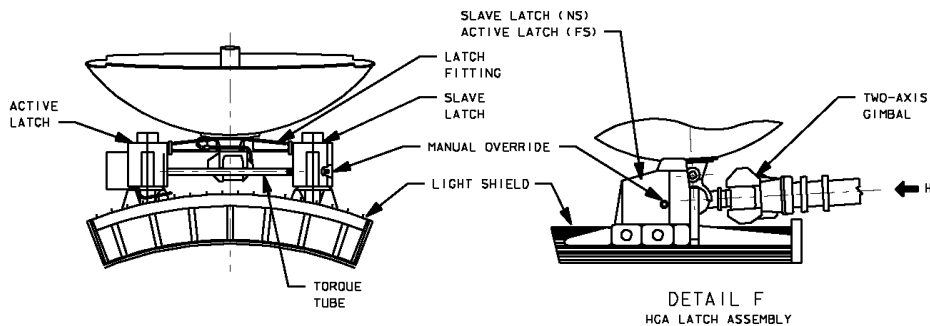
# HST AFT BULKHEAD



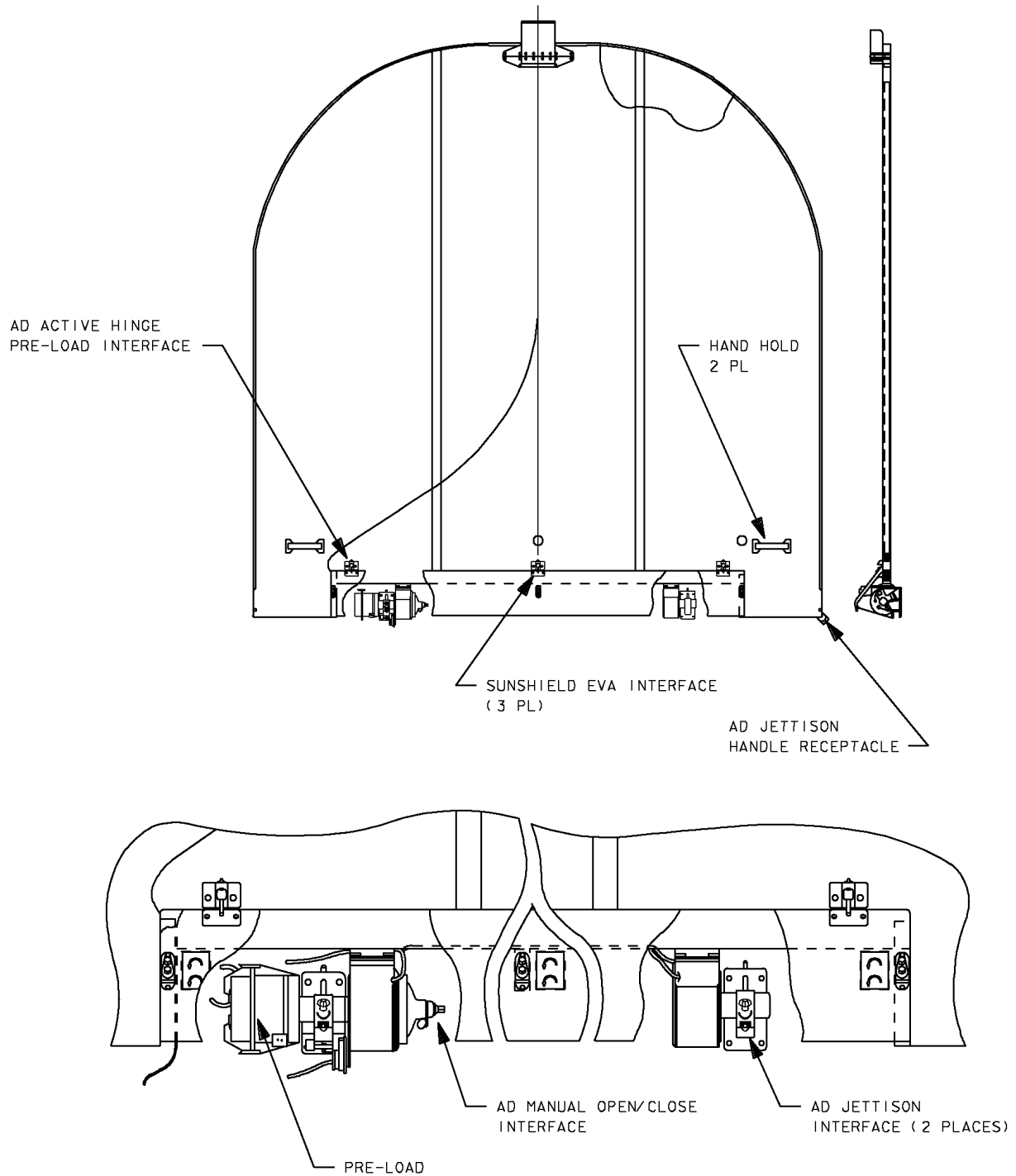
# HGA OVERRIDE AND LATCHES



HGA STOWED CONFIGURATION

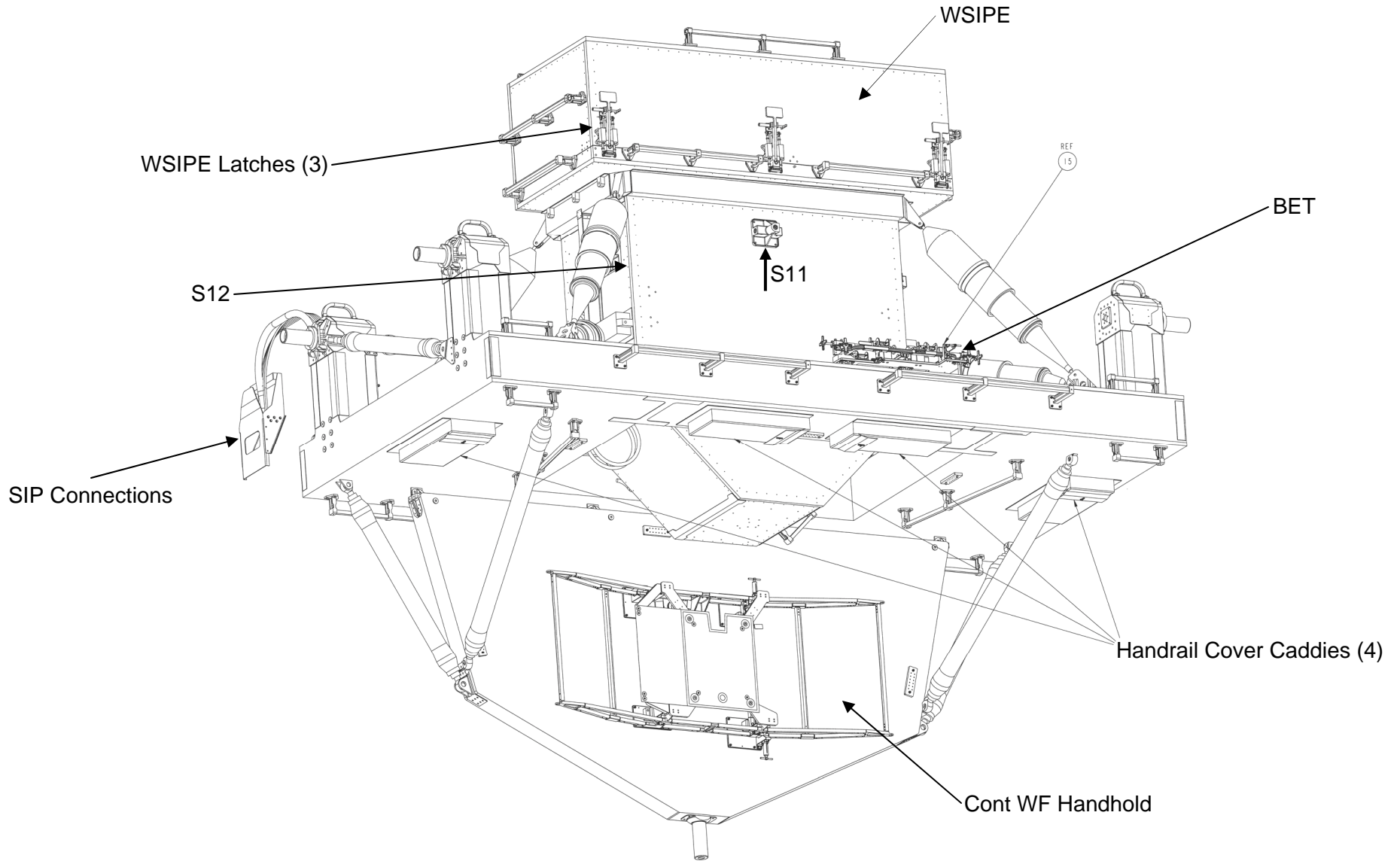


# APERTURE DOOR LATCH AND HINGES



173253188. ART; 3

**SLIC FWD VIEW**

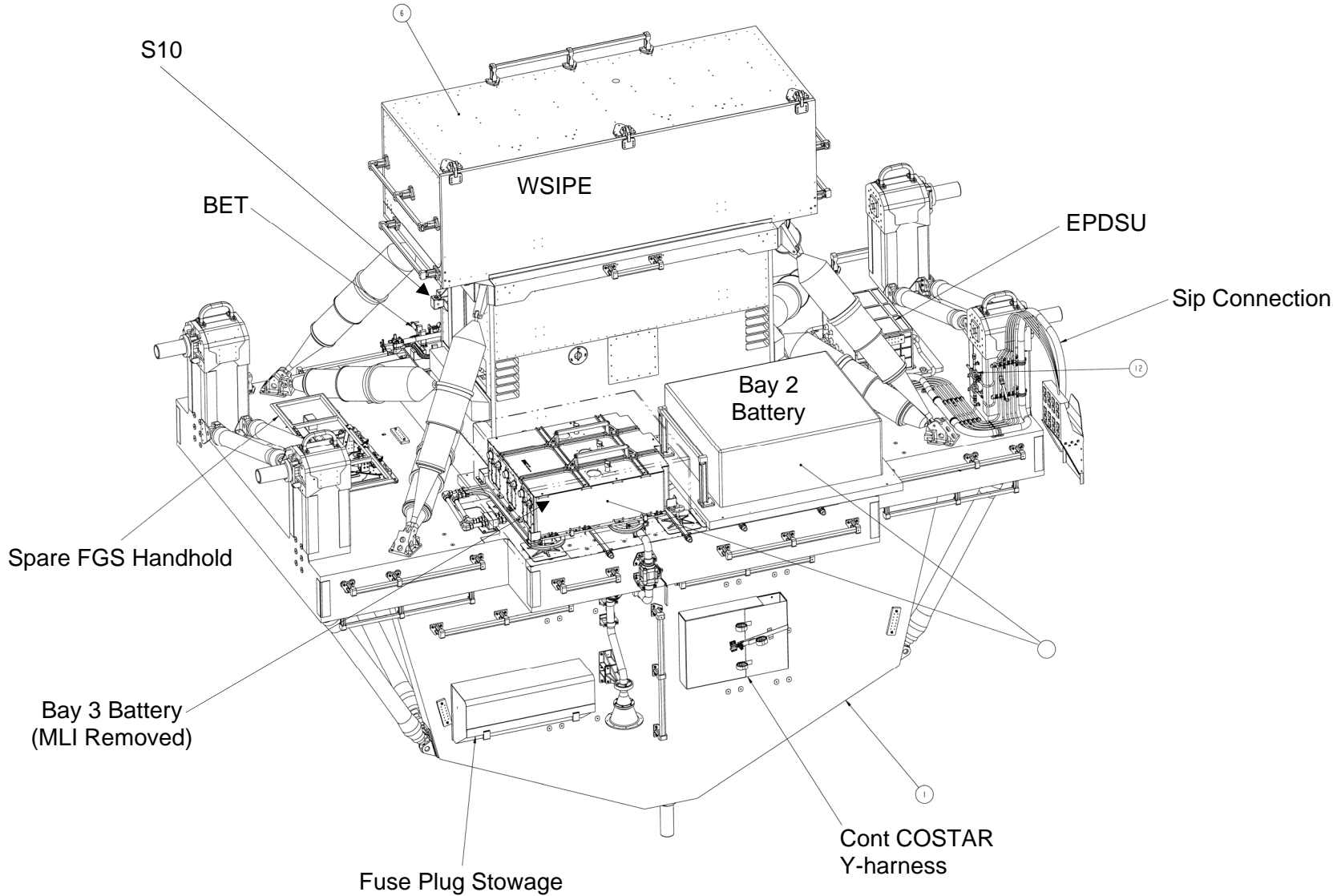


FS 18-15

EVA/125/FIN A

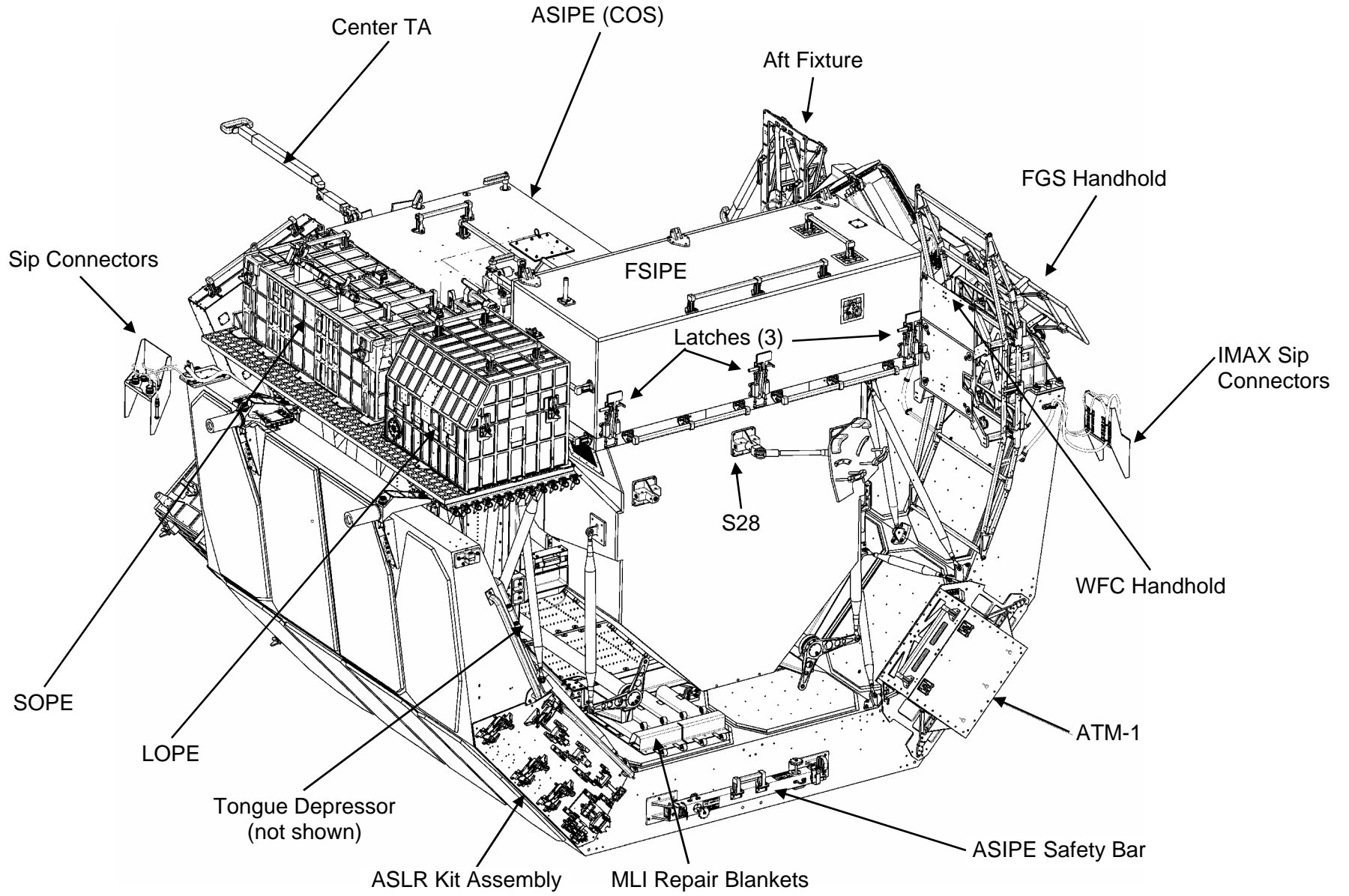
# CARRIERS AND STOWAGE

## SLIC AFT VIEW

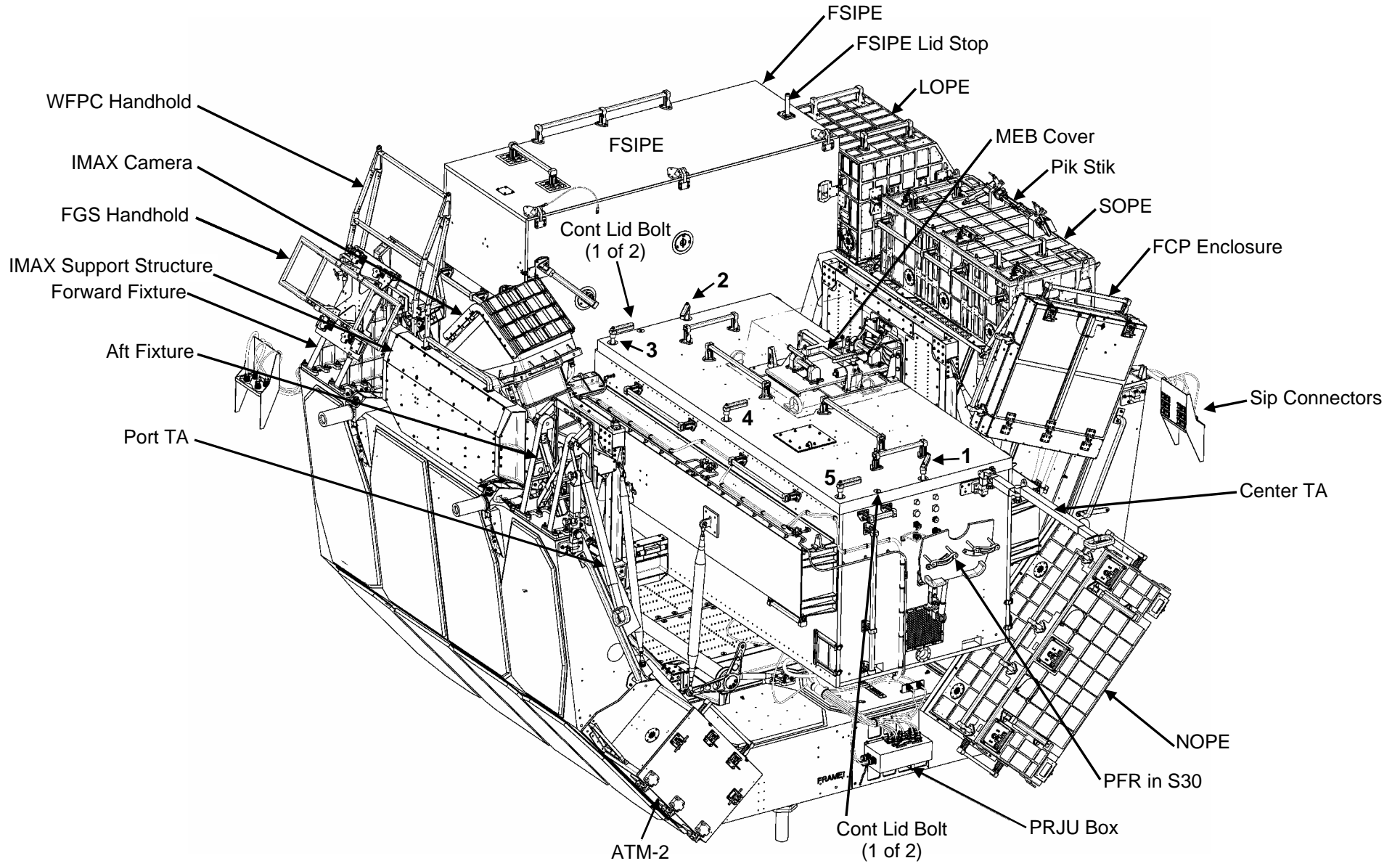




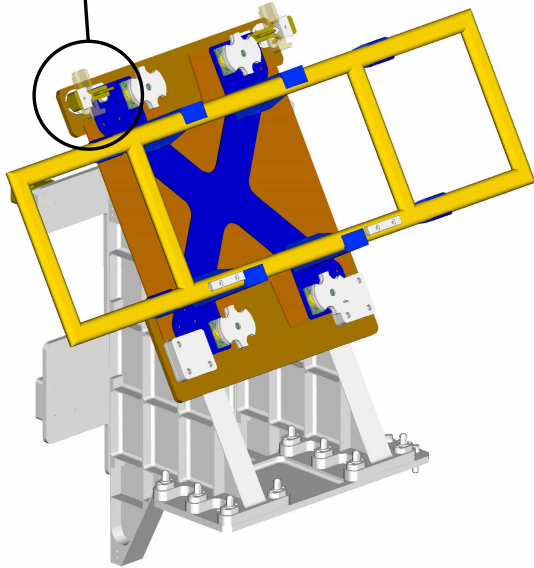
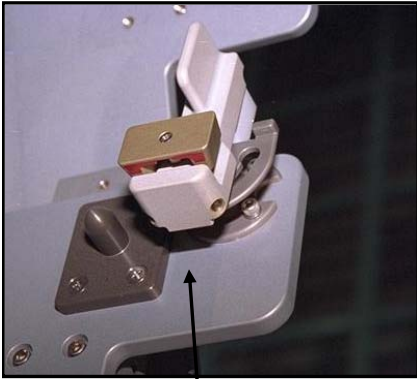
**ORUC FWD VIEW**



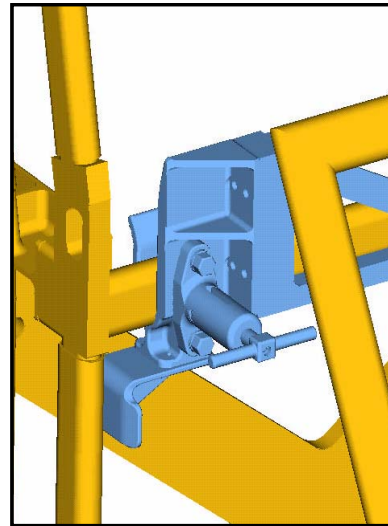
# ORUC AFT VIEW



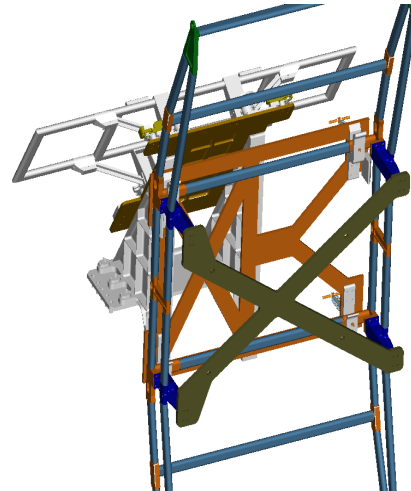
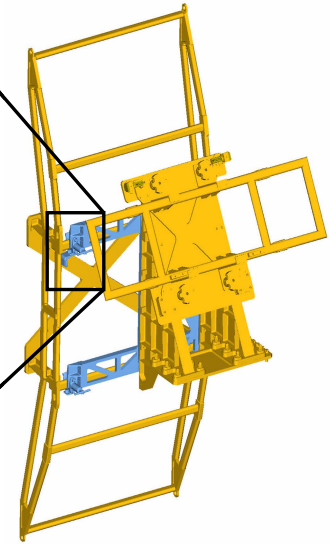
# FORWARD FIXTURE



FGS Handhold on Fwd Fixture

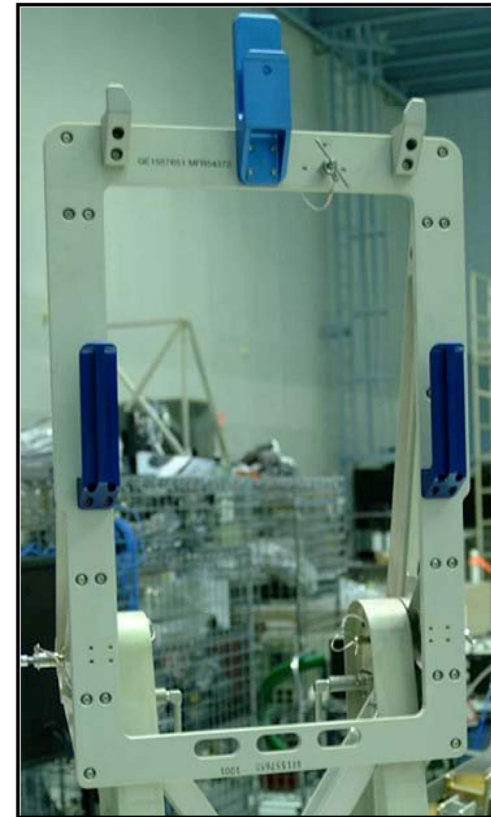
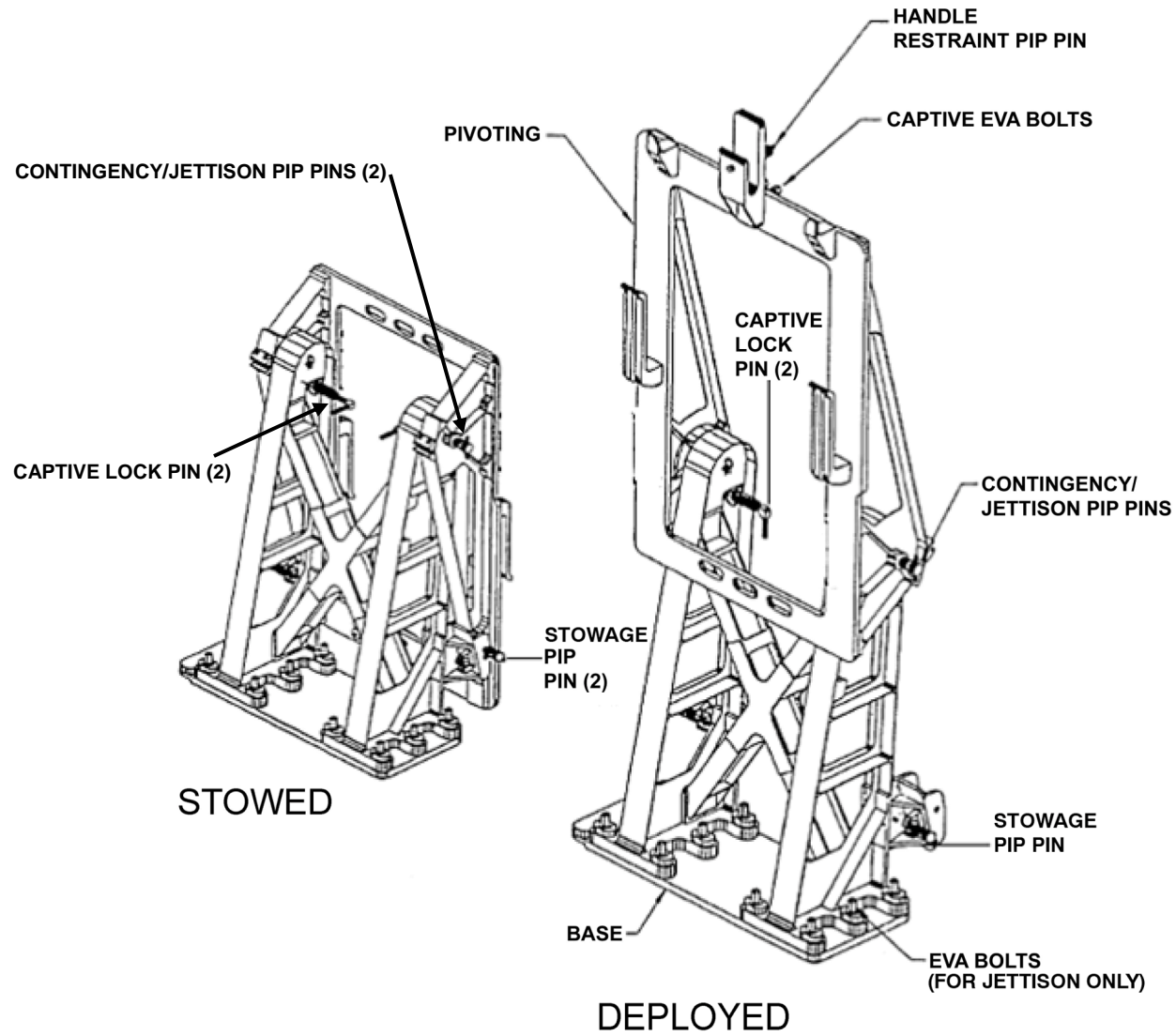


WFPC Handhold on Fwd Fixture

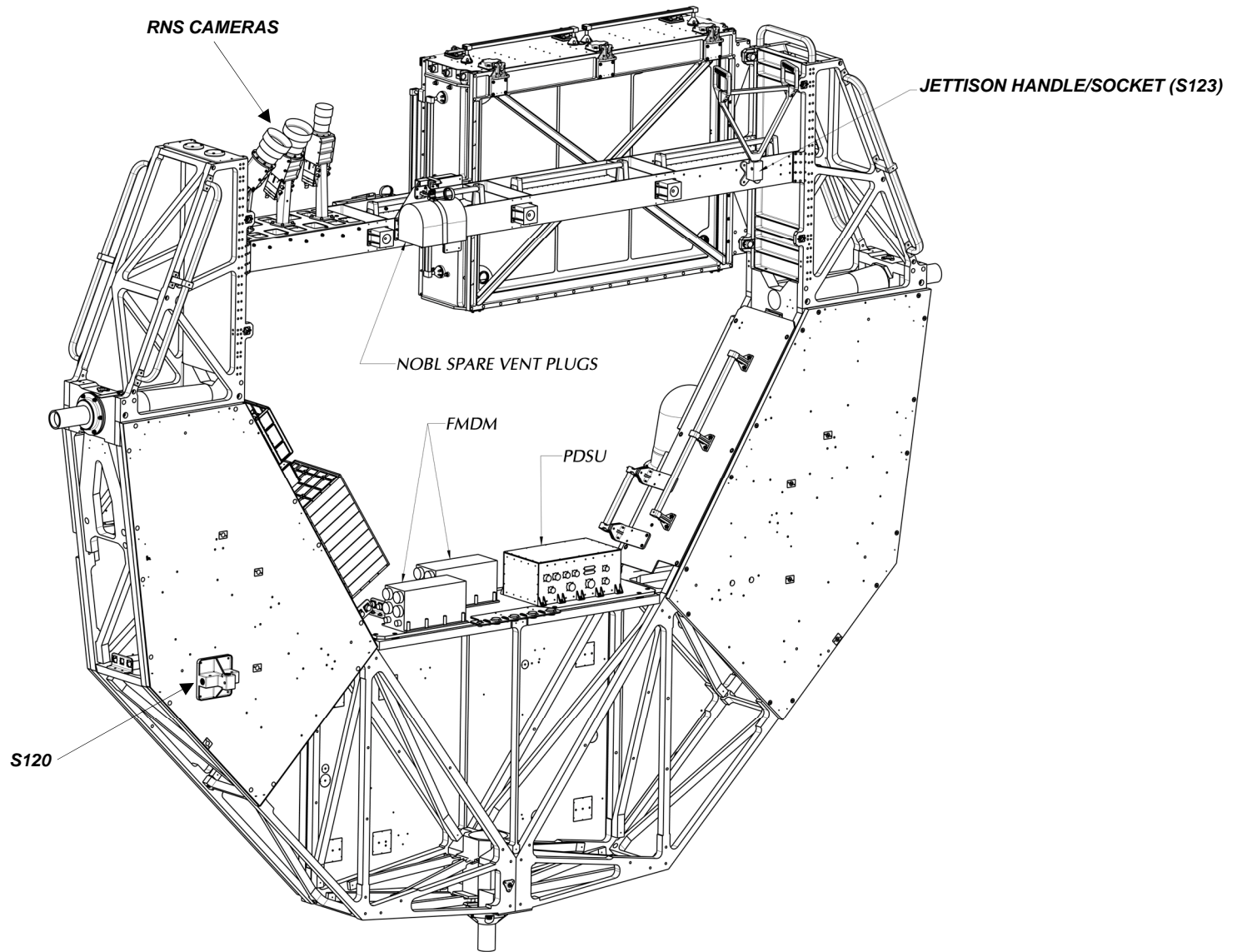


FGS and WFPC Handholds on Fwd Fixture

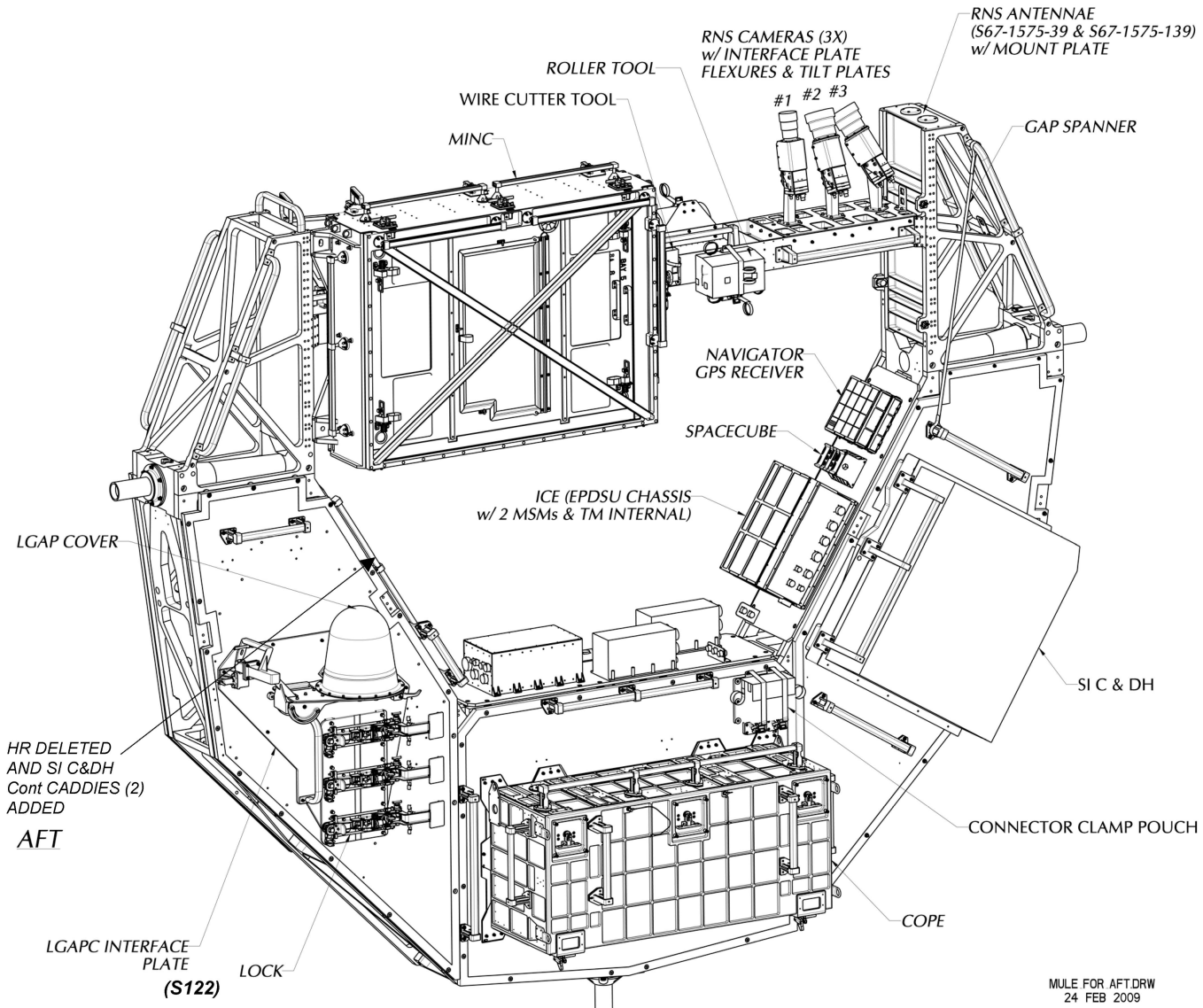
# AFT FIXTURE



# MULE FWD VIEW

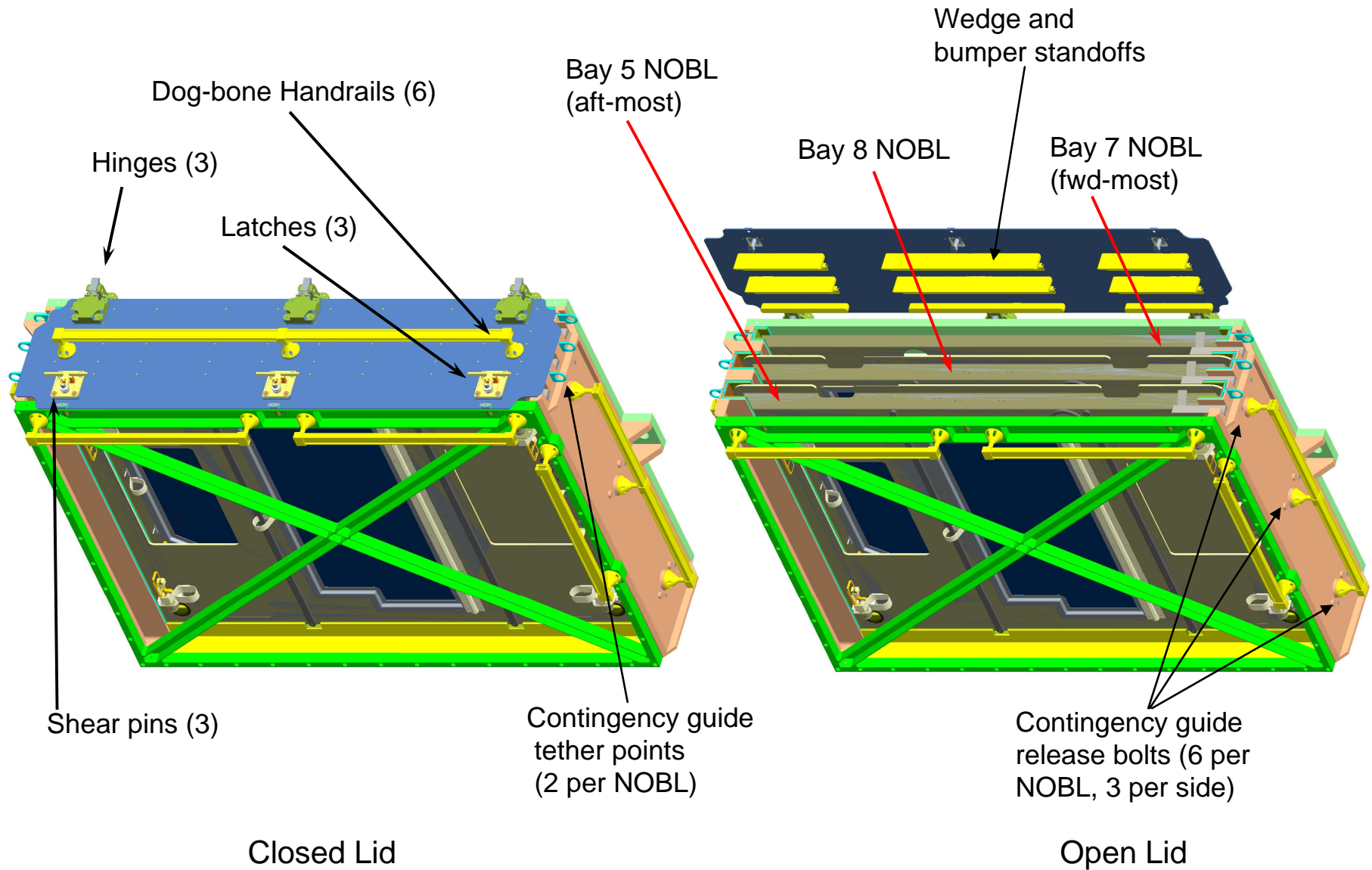


# MULE AFT VIEW

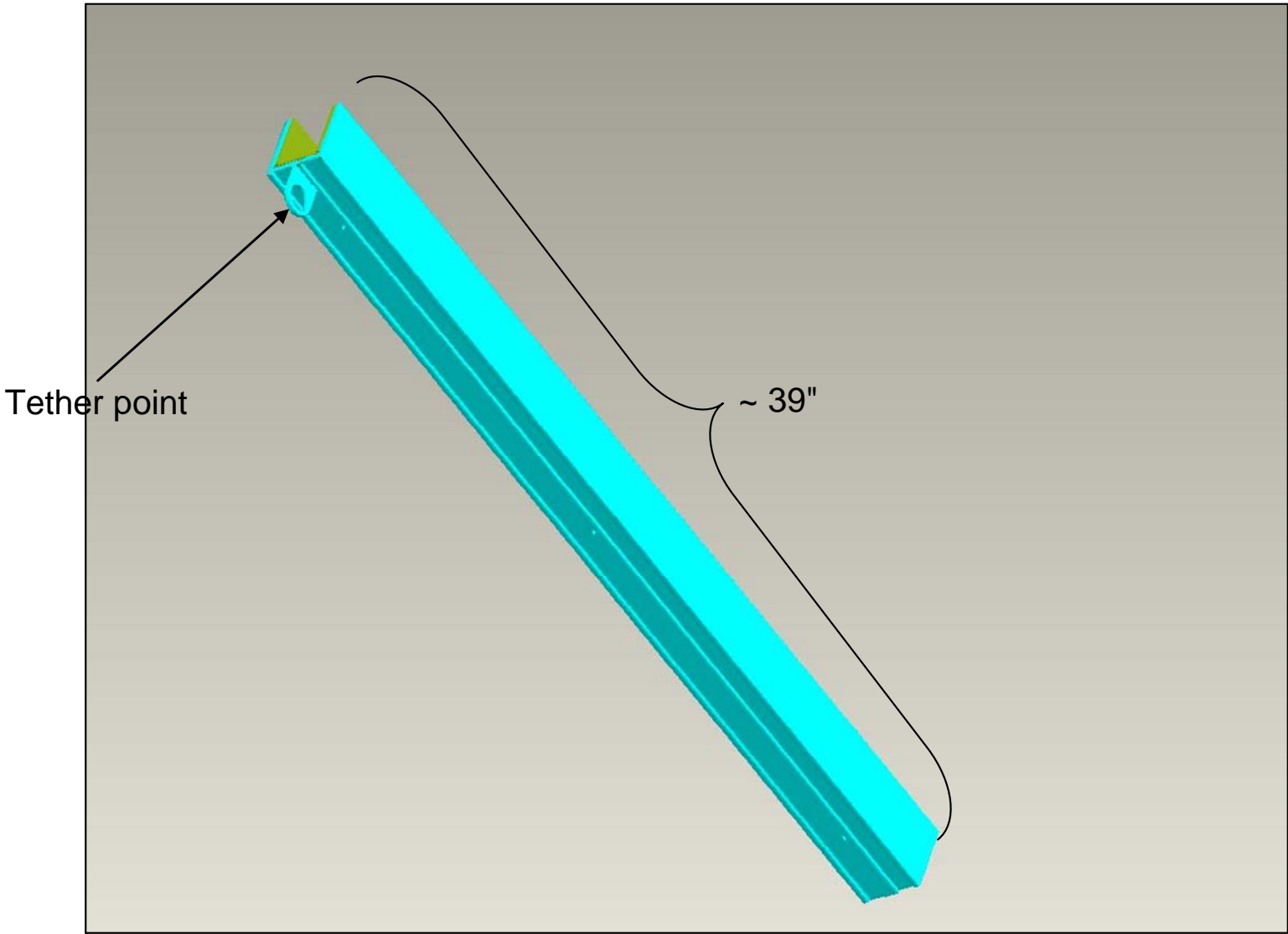


MULE FOR AFT.DRW  
24 FEB 2009

# MINC OVERVIEW

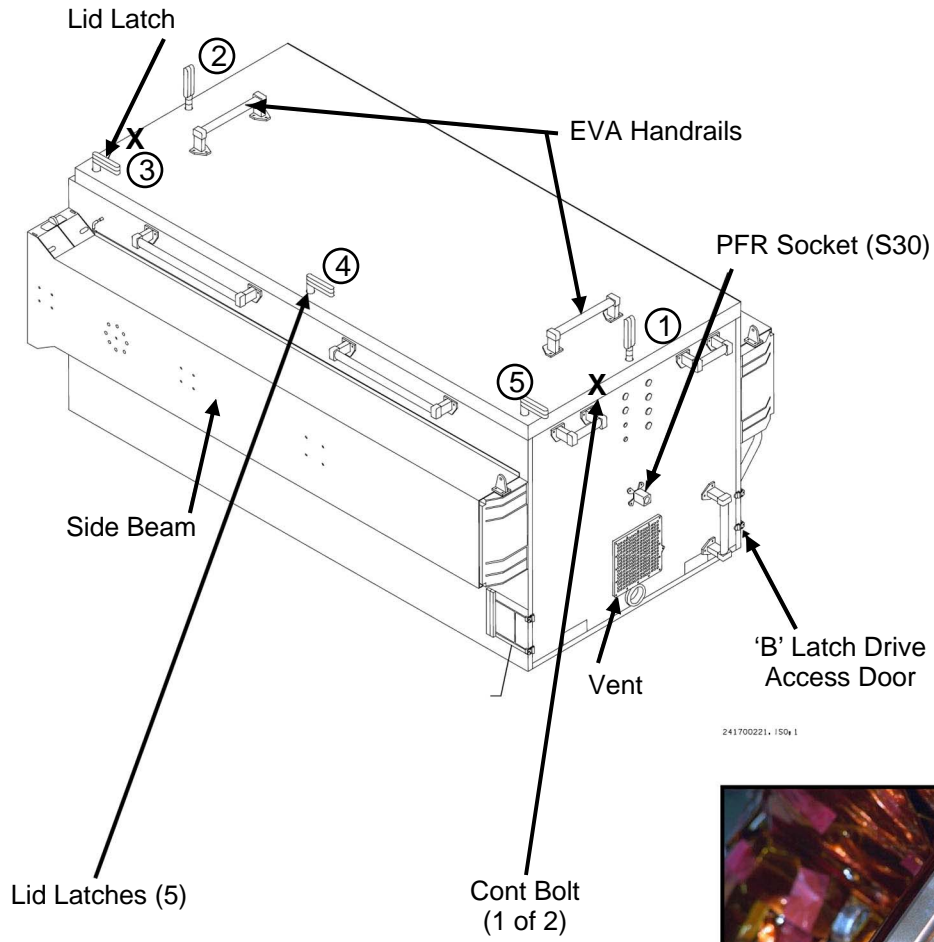


**MINC CONTINGENCY GUIDE**

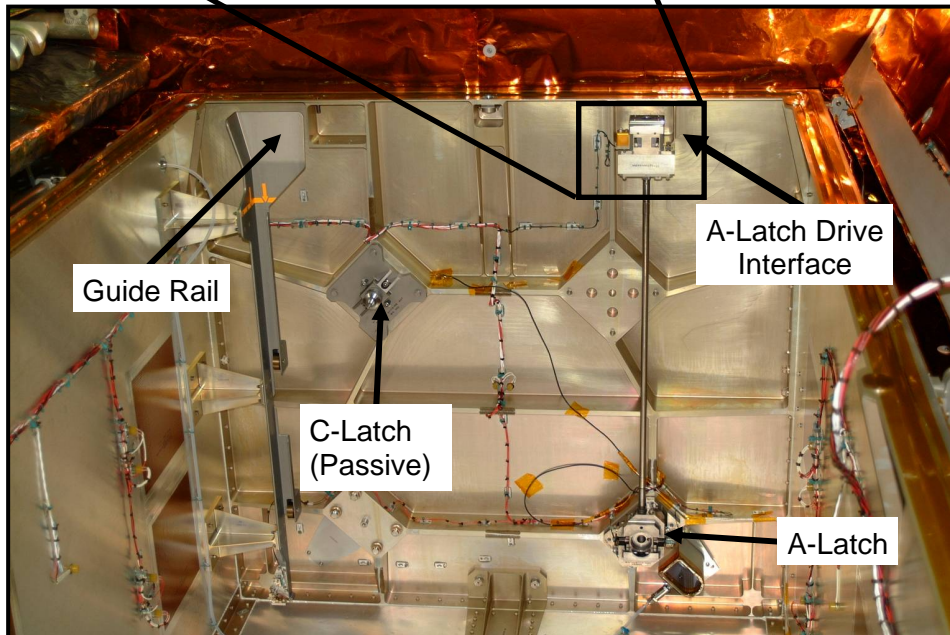
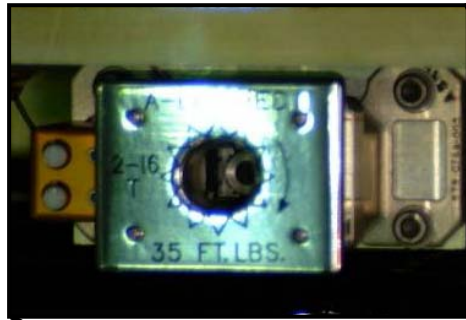




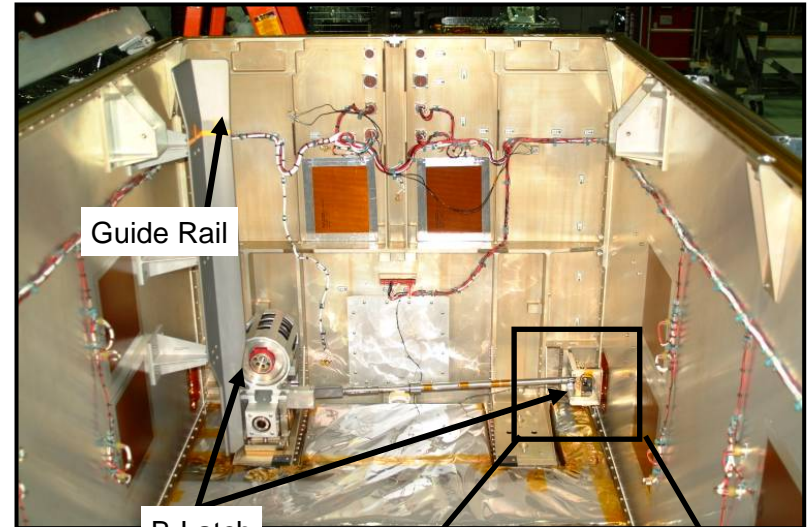
# ASIPE OVERVIEW



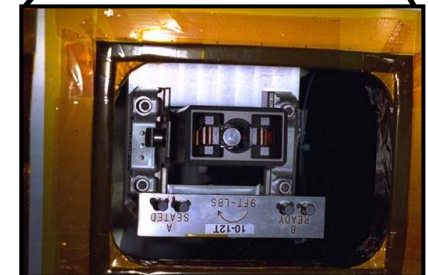
## ASIPE OVERVIEW (Cont)



ASIPE INTERNAL LATCHES – PLB FWD

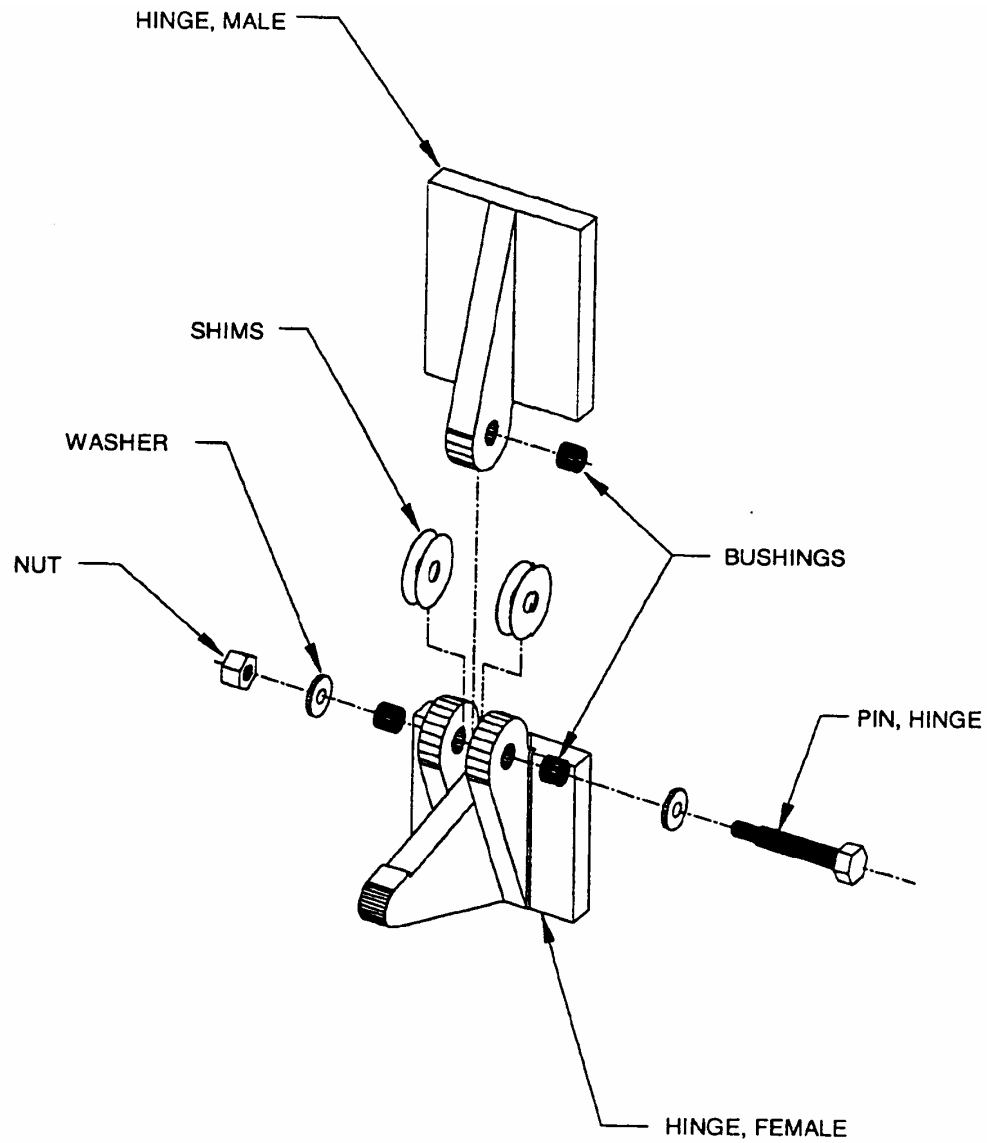


B-Latch



ASIPE INTERNAL LATCHES – PLB AFT

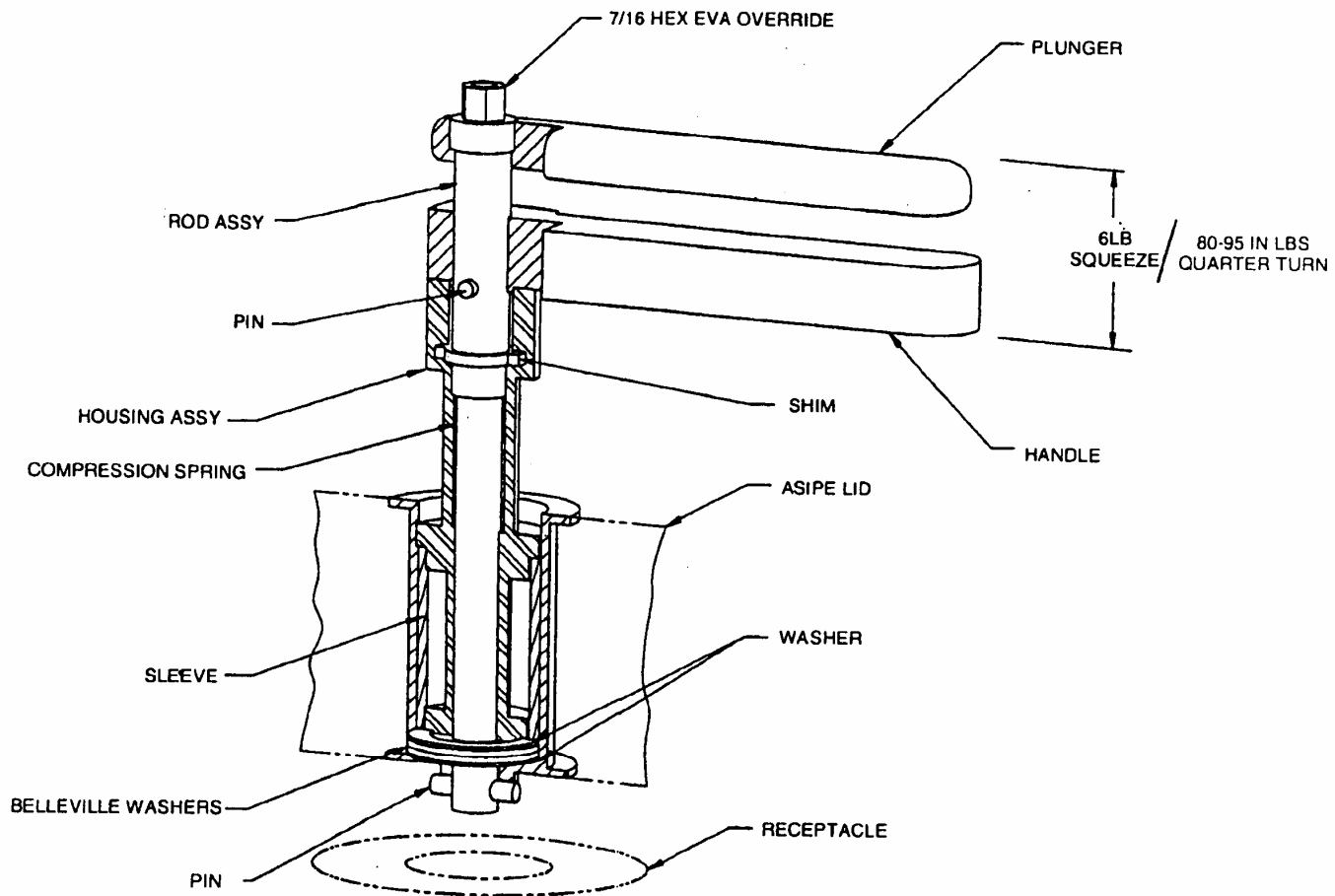
# ASIPE LID HINGE



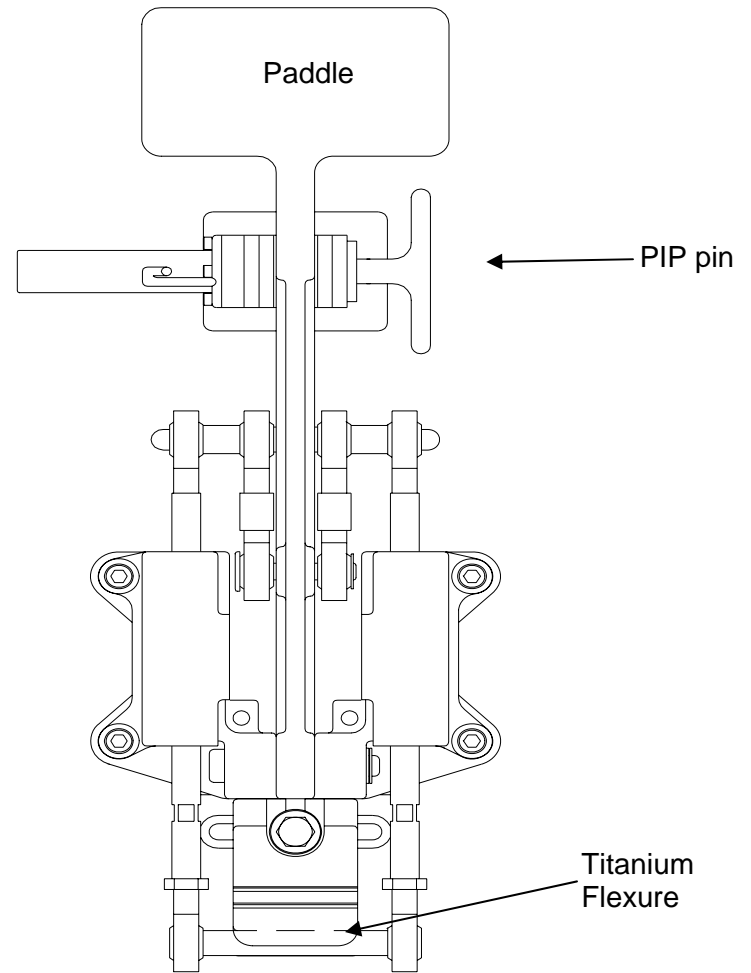
FS 18-27

EVA/125/FIN A

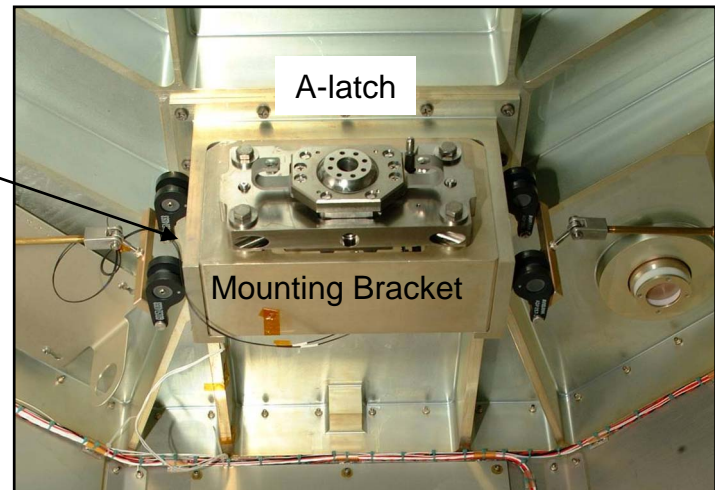
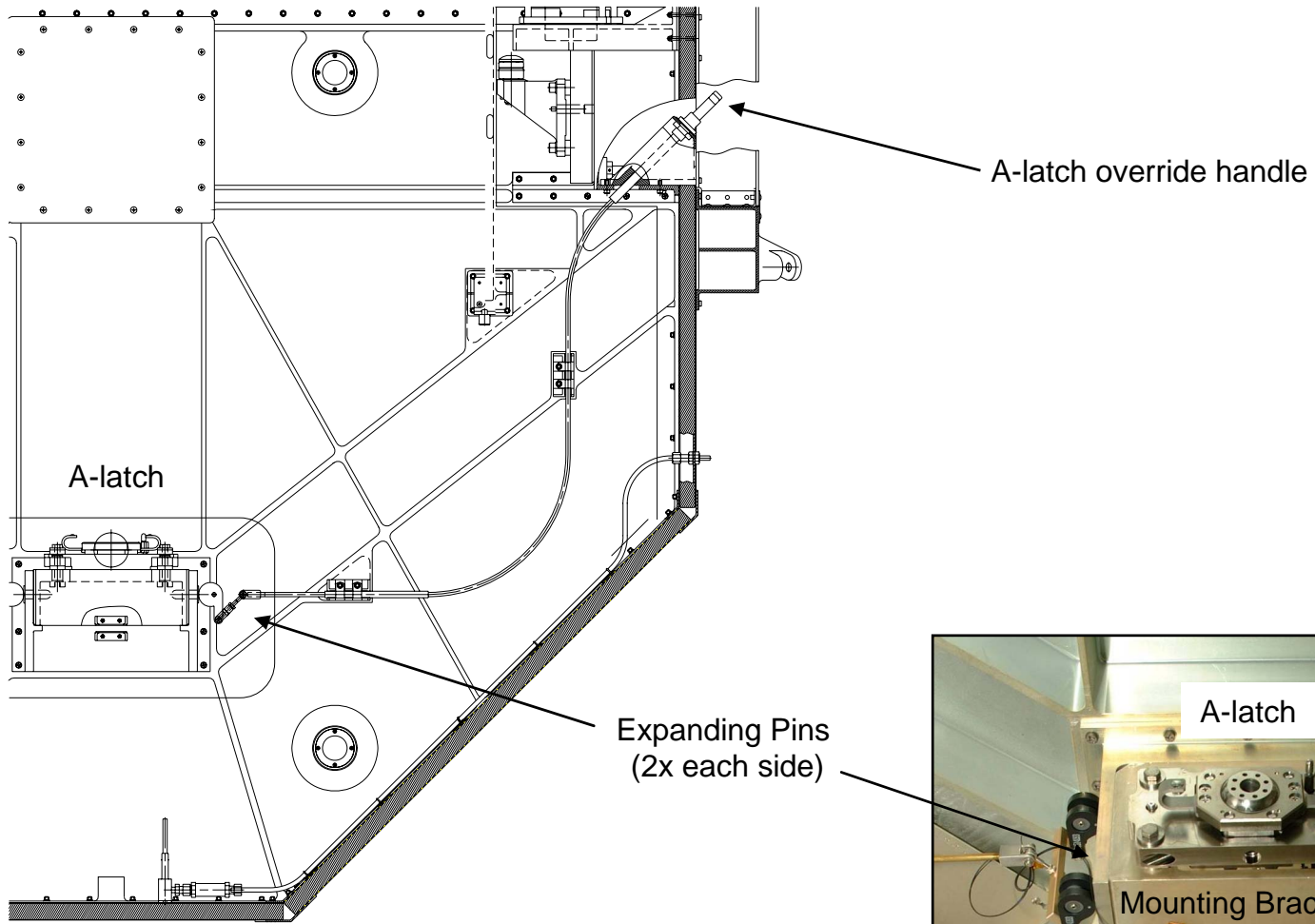
# ASIPE LID LATCH



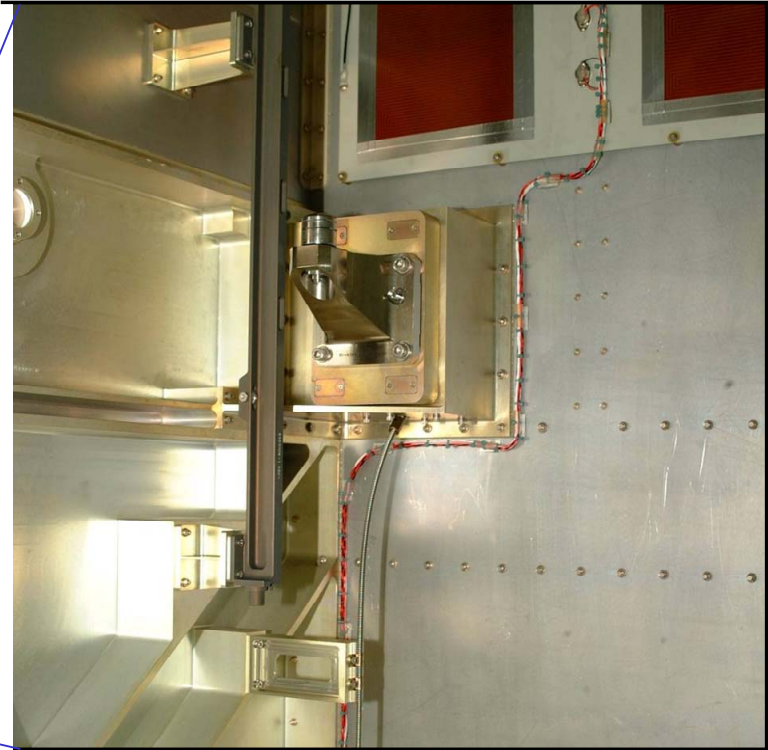
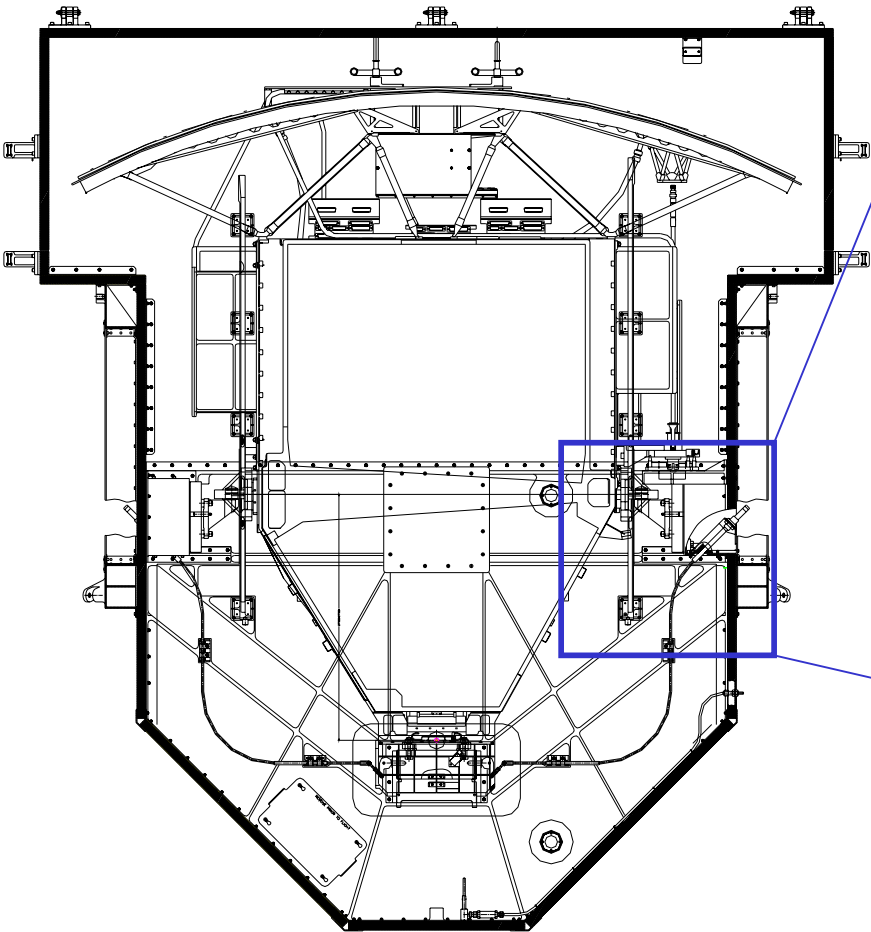
## WSIPE OVERVIEW AND DOOR LATCHES



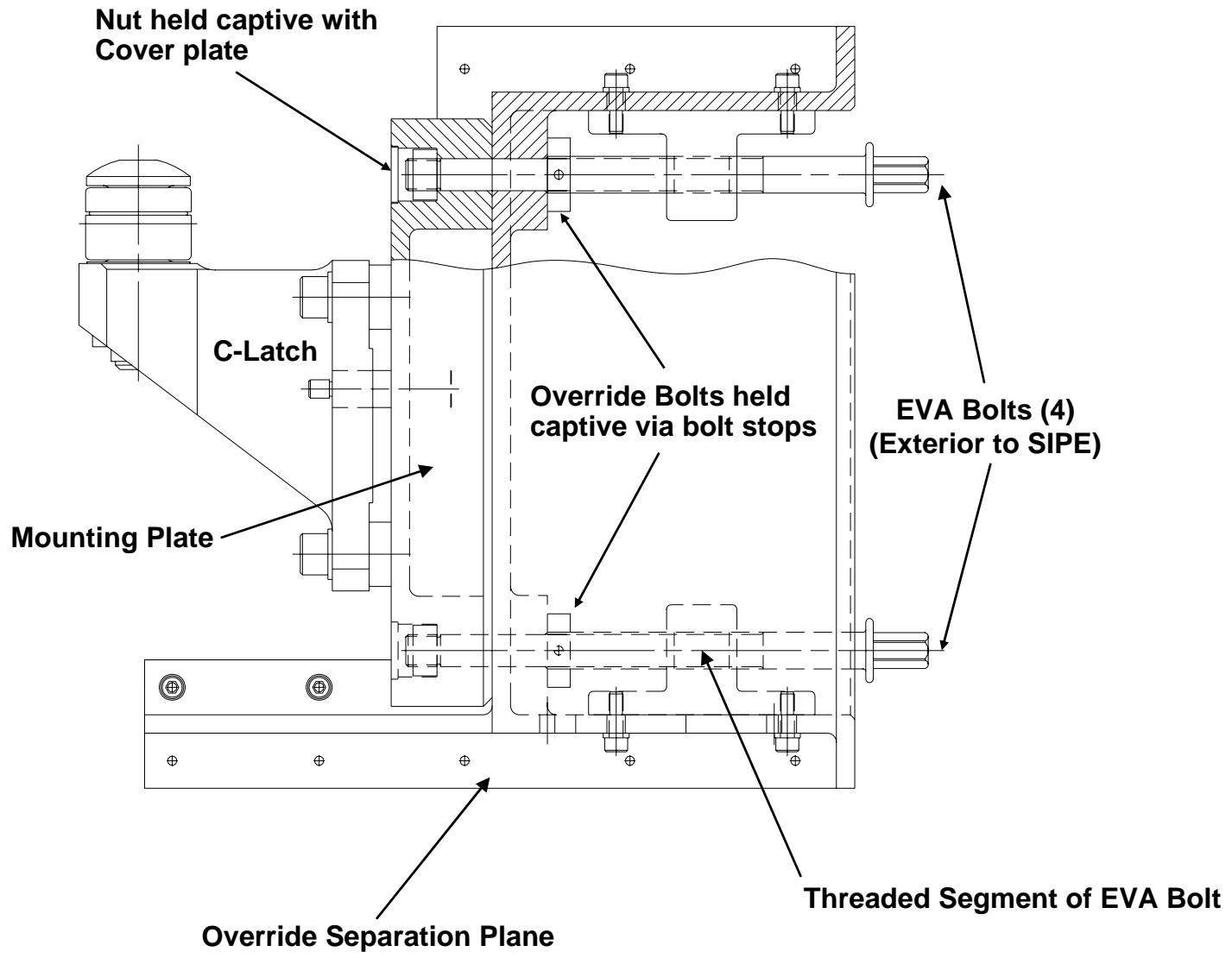
# WSIPE A-LATCH OVERRIDE



**WSIPE B- & C-LATCH OVERRIDES**

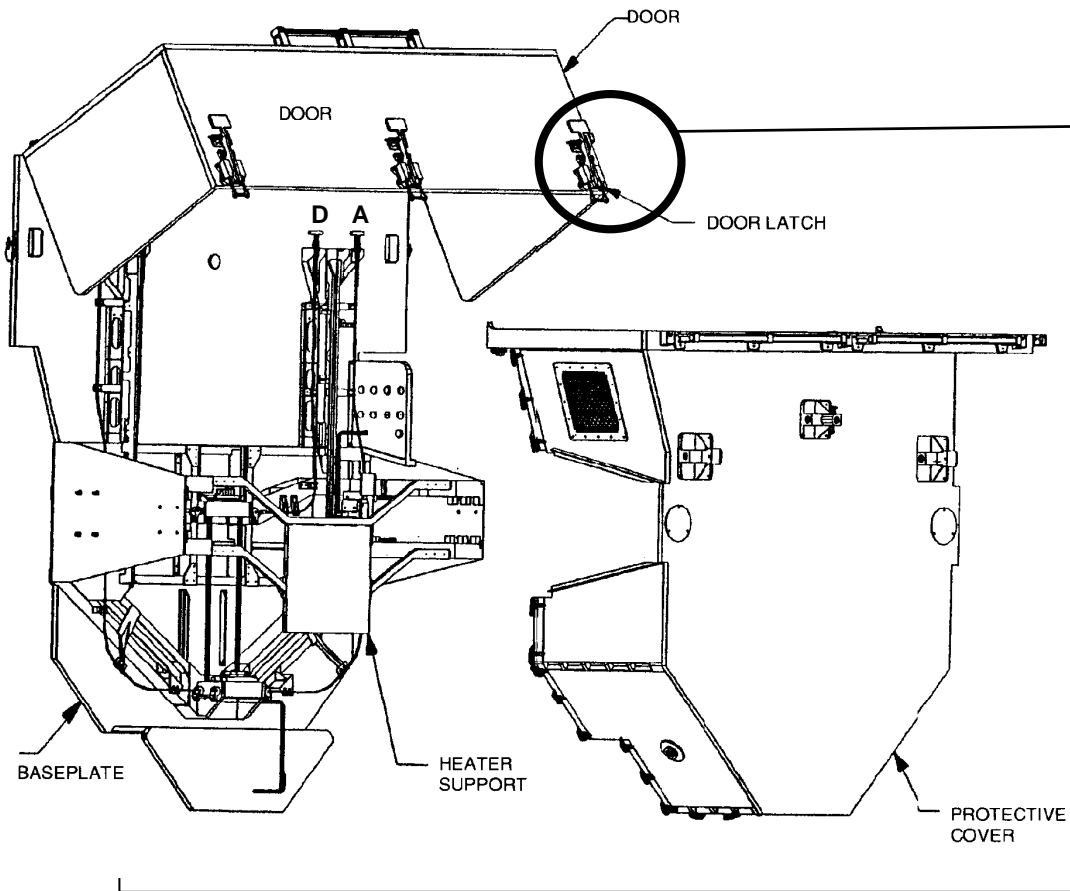


**WSIPE B- & C-LATCH OVERRIDES (Cont)**

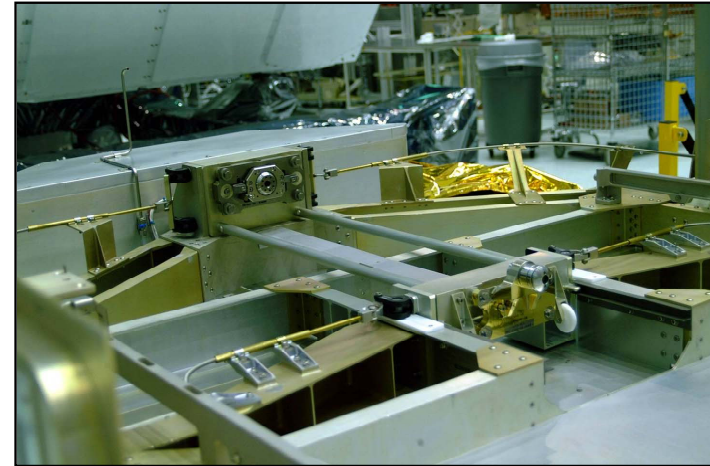
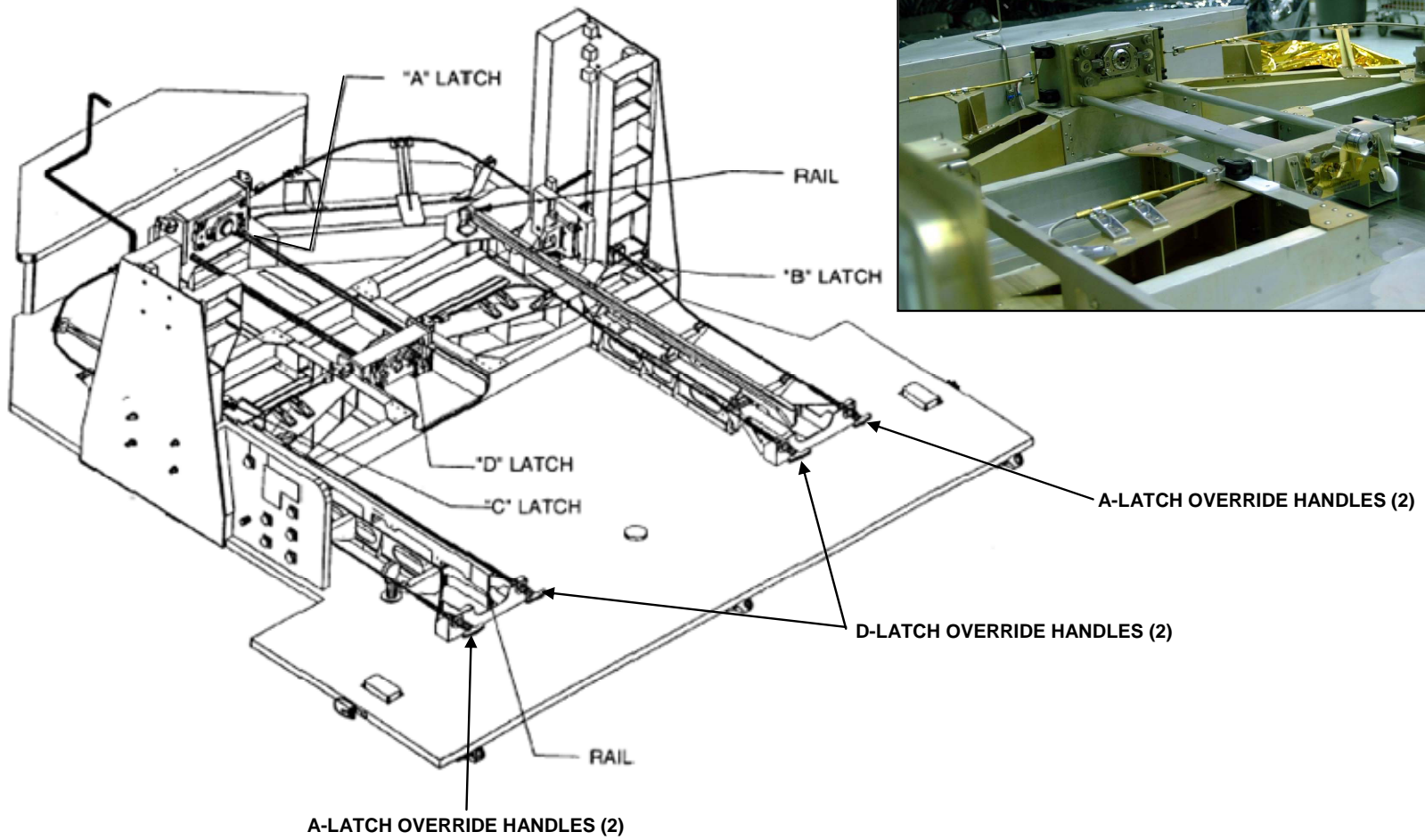




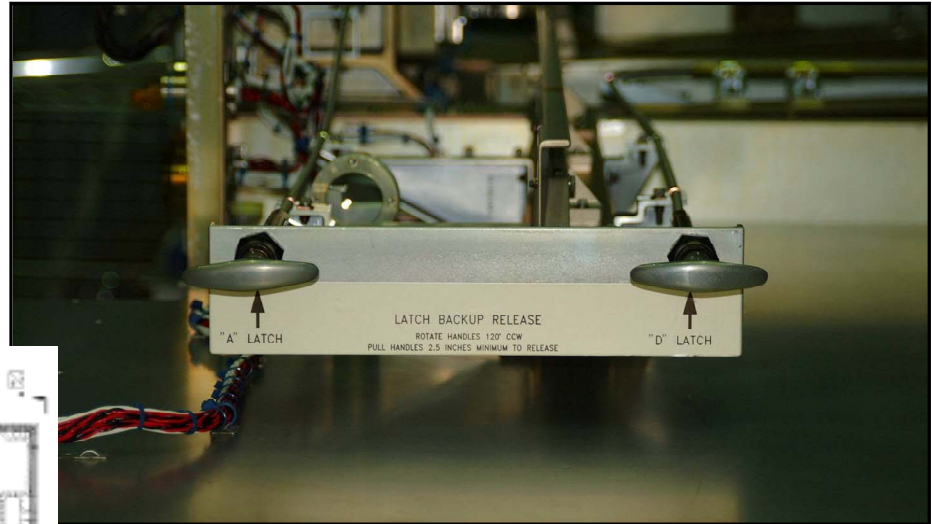
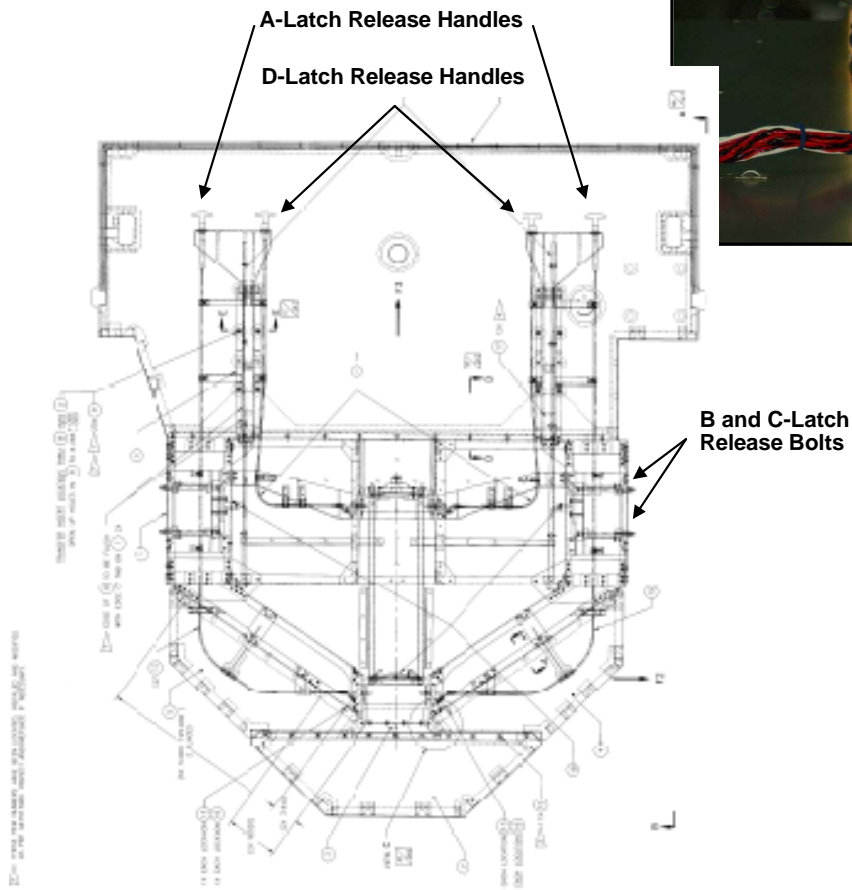
# FSIPE OVERVIEW AND DOOR LATCHES



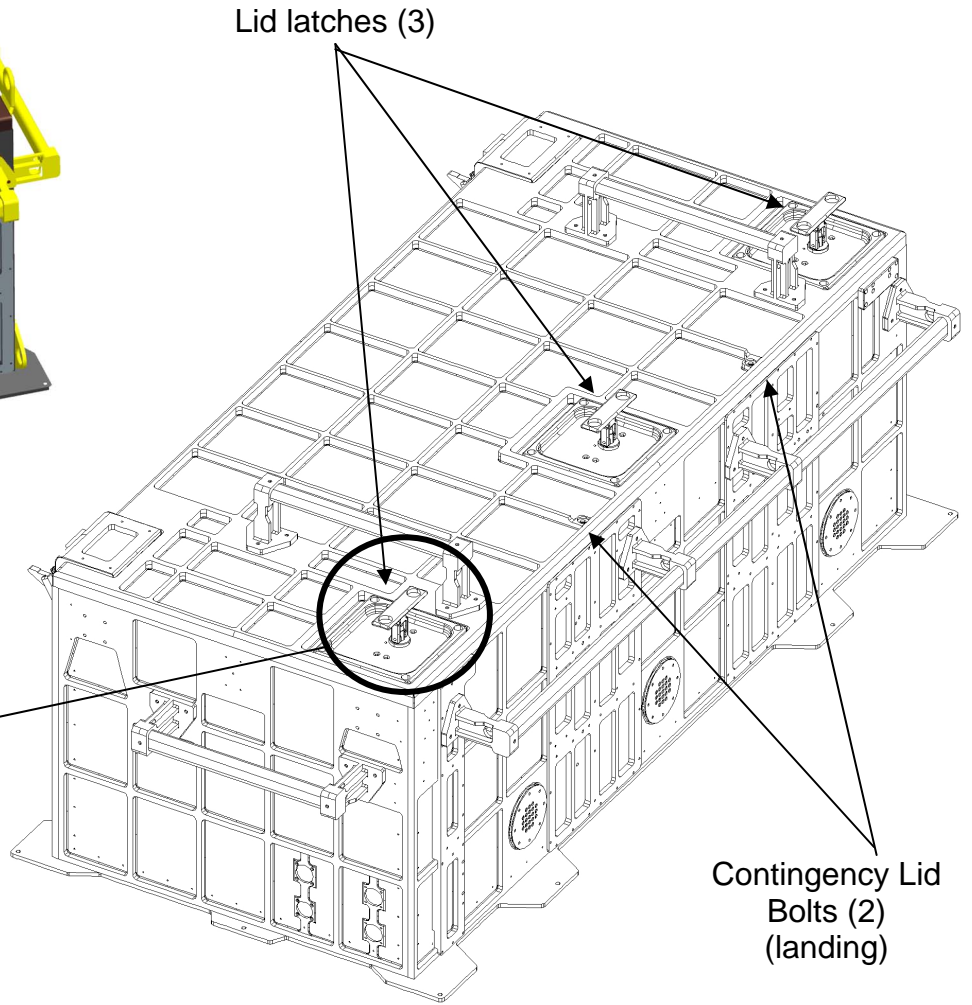
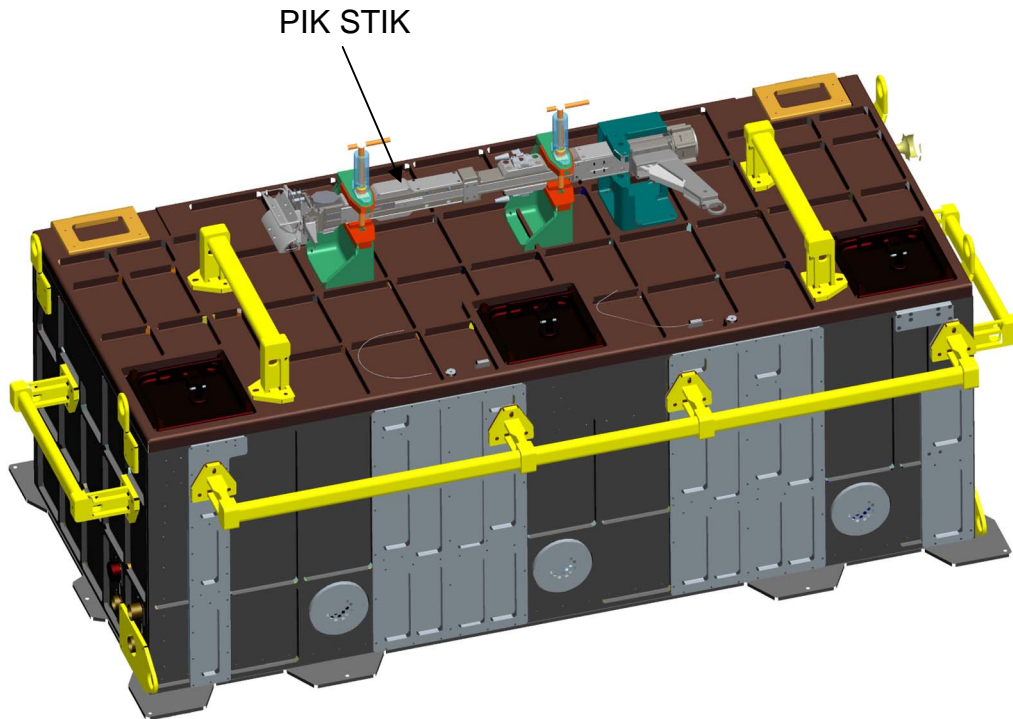
# FSIPE SI LATCHES – A,B,C AND D



# FSIPE SI LATCHES – A AND D

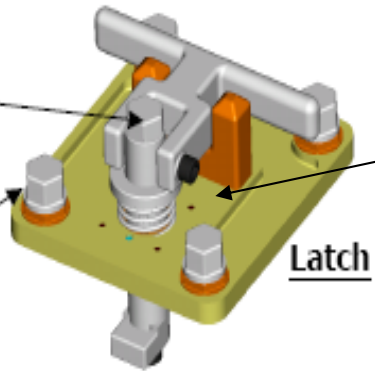


# SOPE – EXTERNAL VIEW

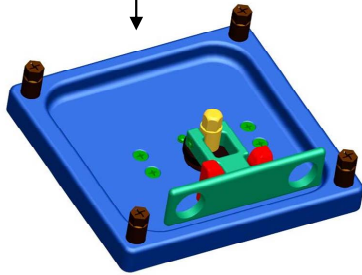
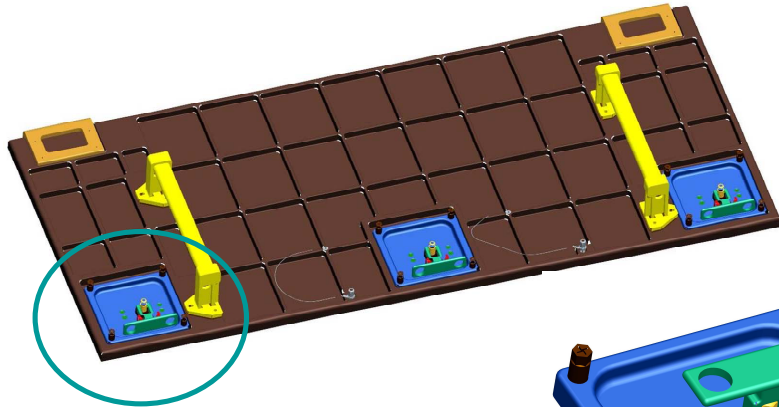


7/16" hex override if handle difficult to rotate

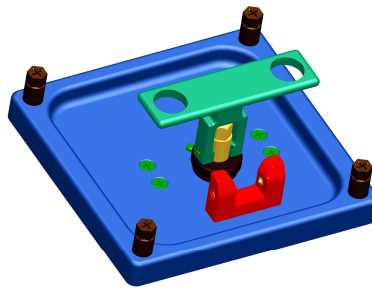
4 Captive Fasteners for EVA Override with Standard 7/16" Hex Interface



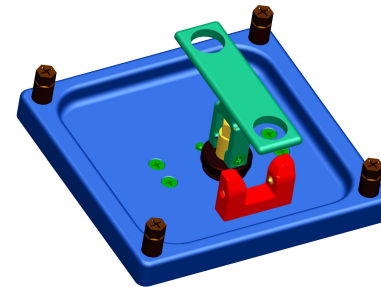
# SOPE LATCH DETAILS



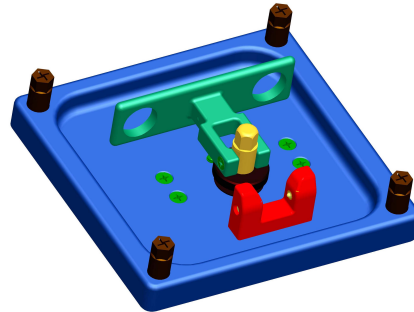
T-Handle  
Launch Position



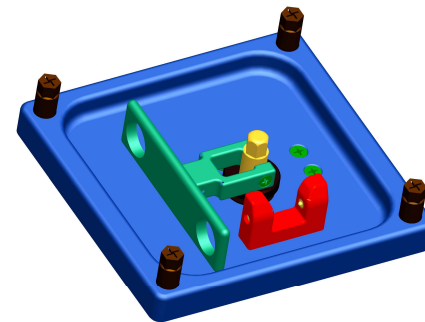
Nominal Opening: Flip T-Handle 90°



Nominal Opening: Rotate ccw 90°

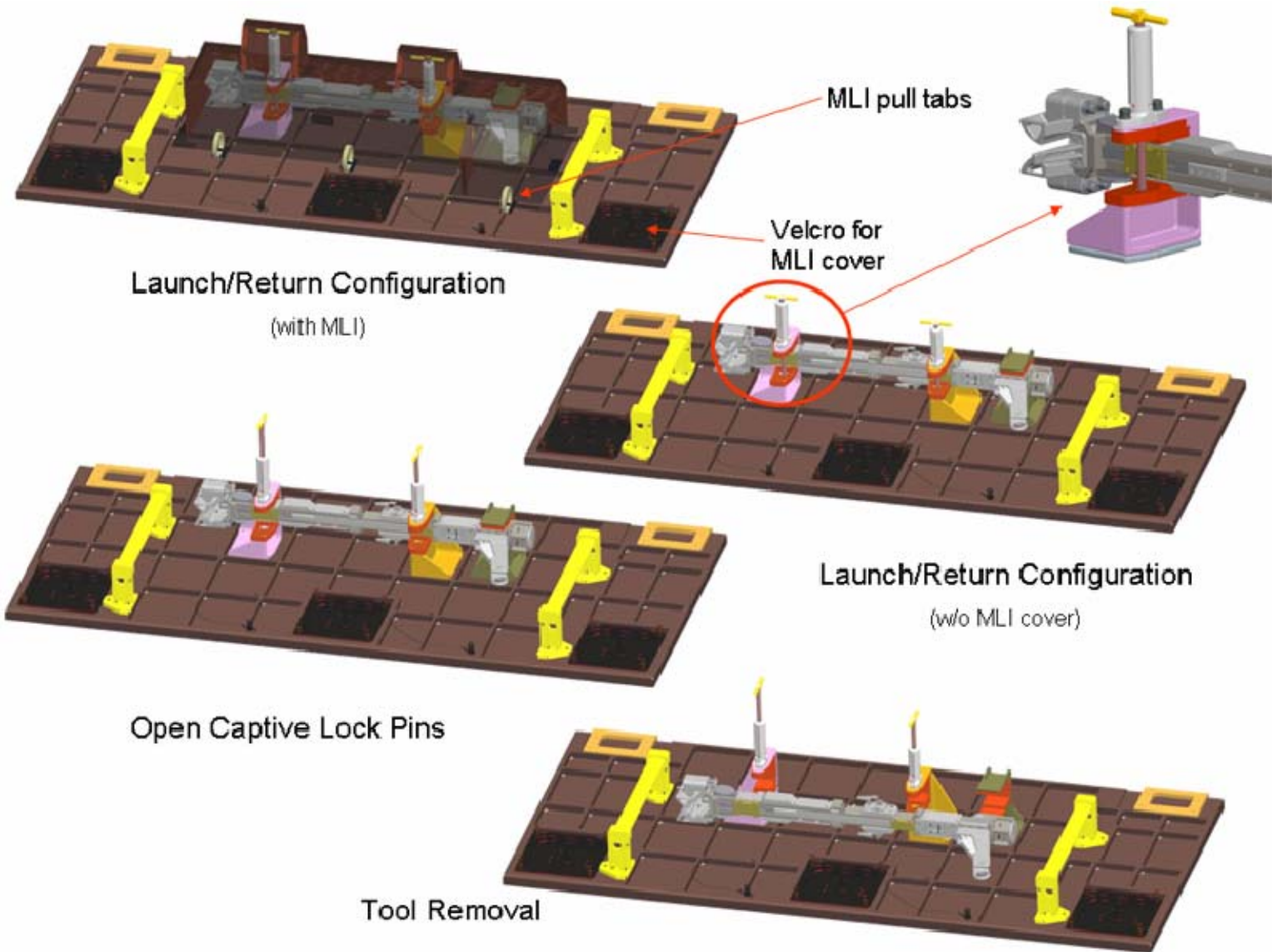


Contingency Override: Flip T-Handle 180°

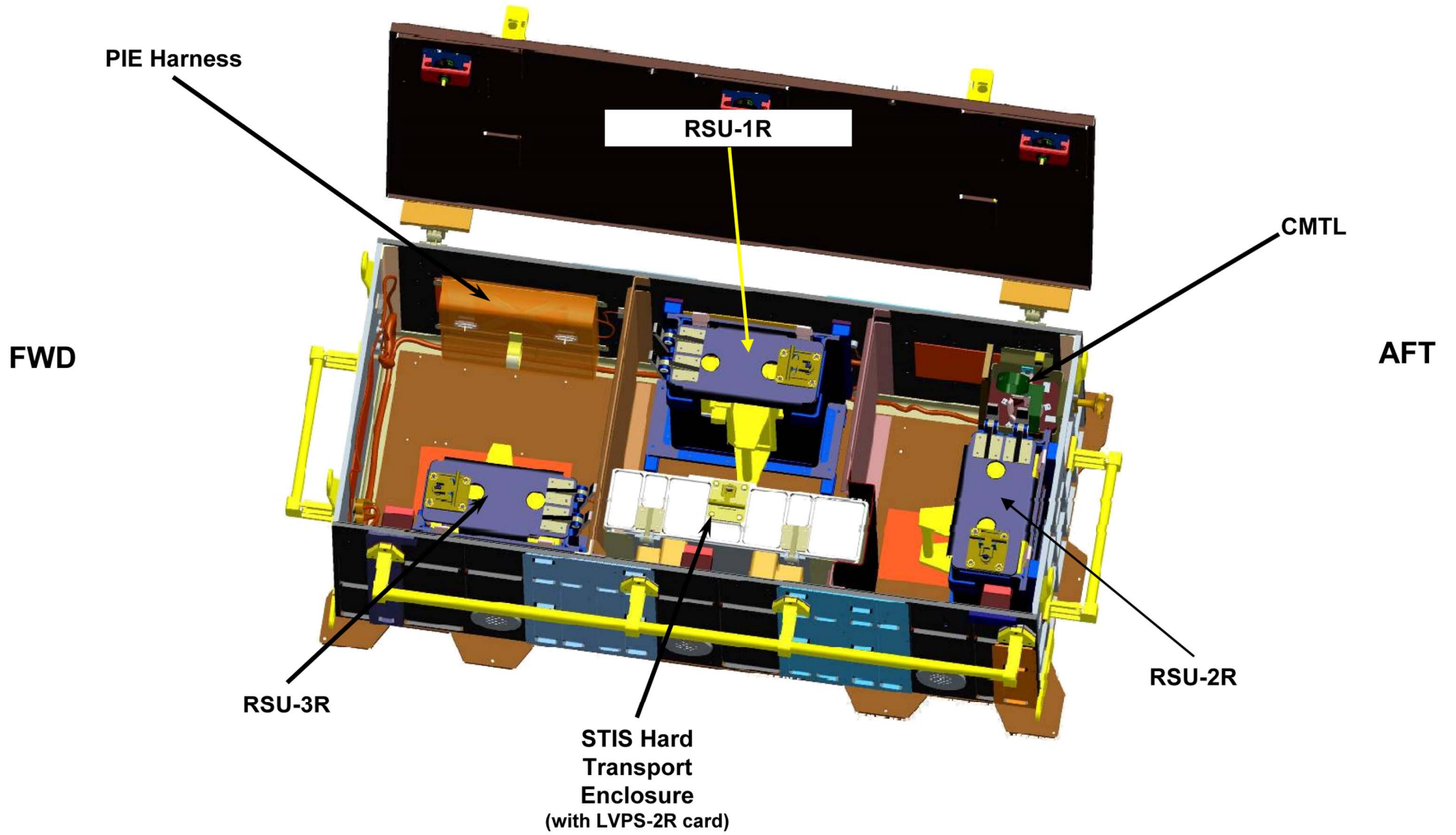


Contingency Override: Rotate ccw 90°

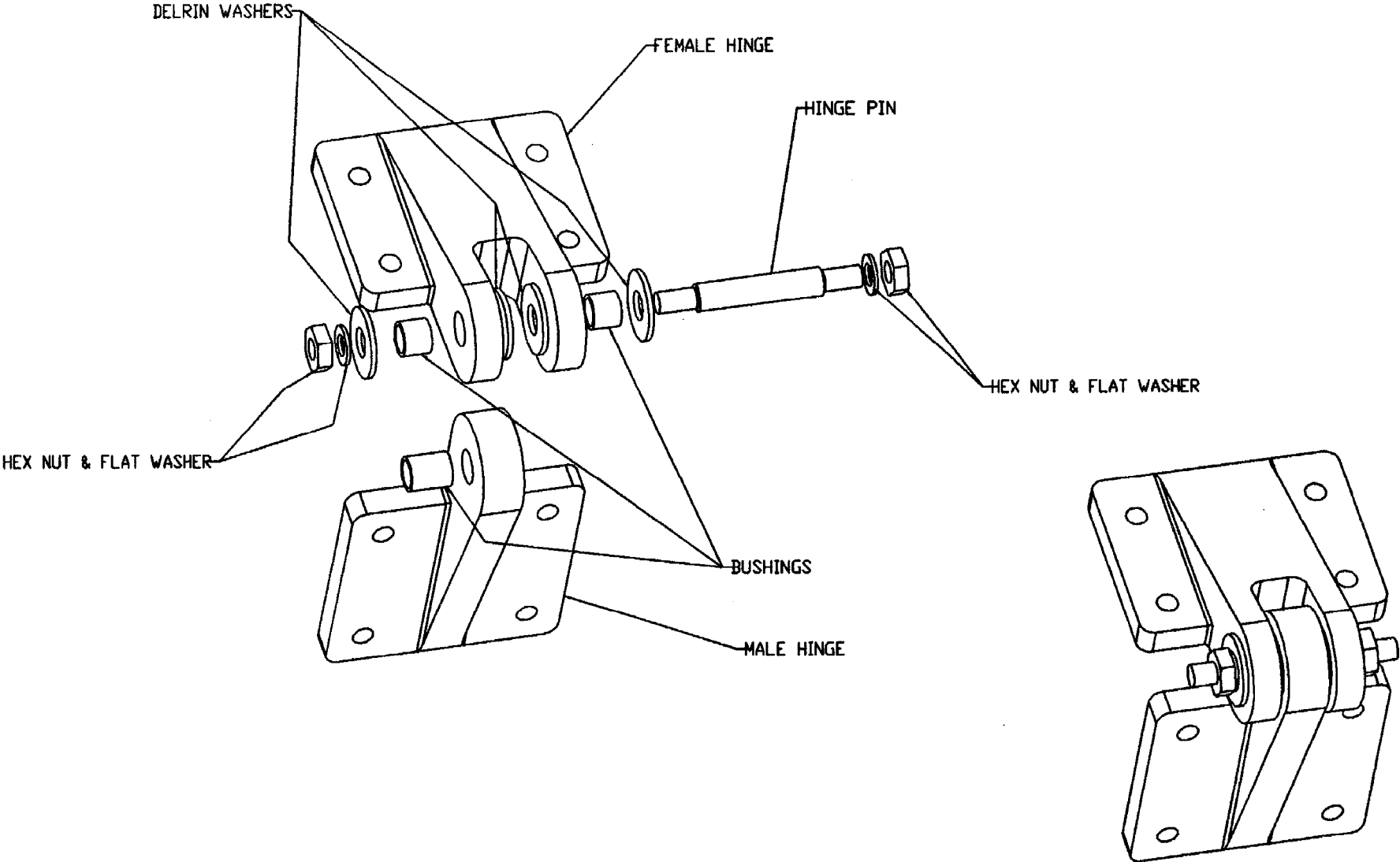
# PIK STIK STOWAGE



**SOPE – INTERNAL VIEW**

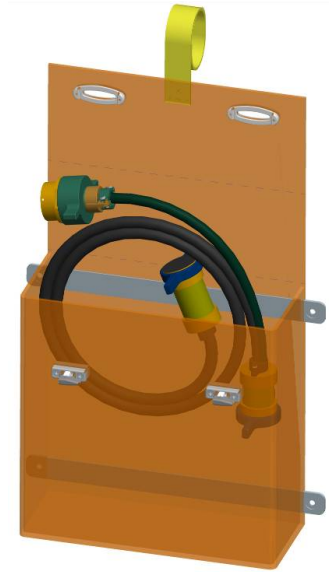
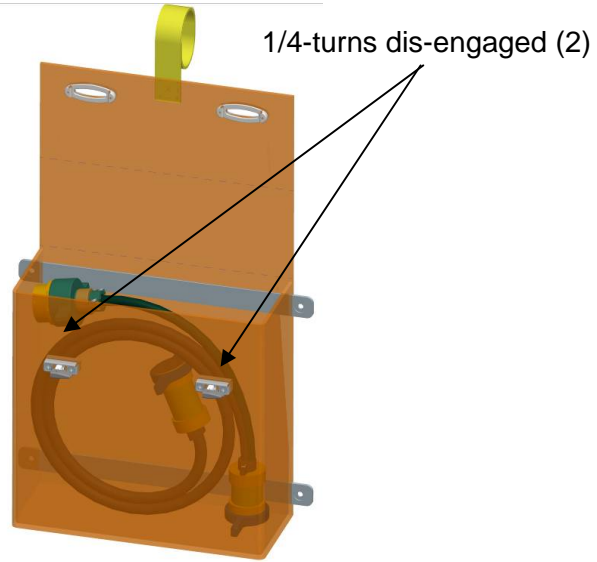
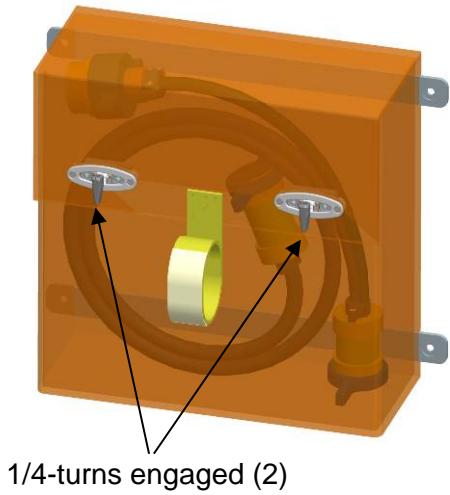


**TRANSPORT MODULE HINGE**

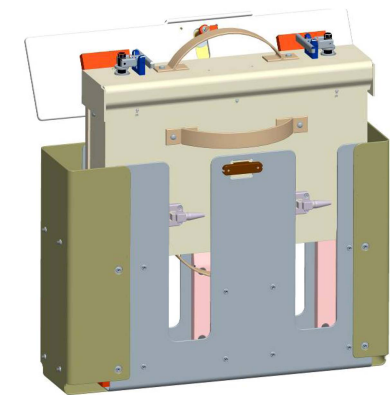
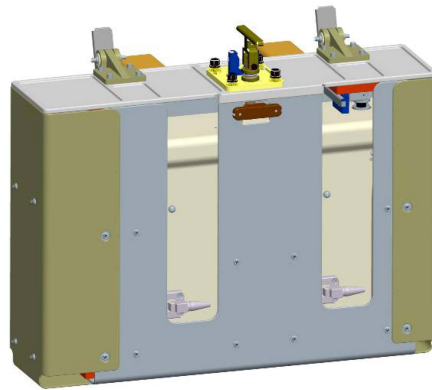
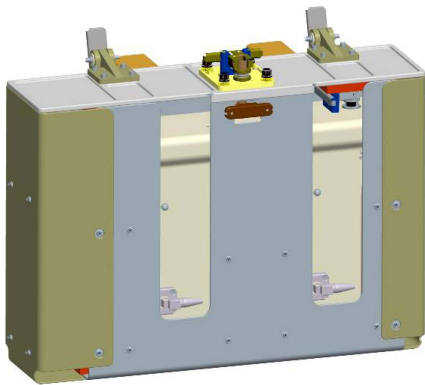




# SOPE – PIE HARNESS AND HARD TRANSPORT ENCLOSURE STORAGE

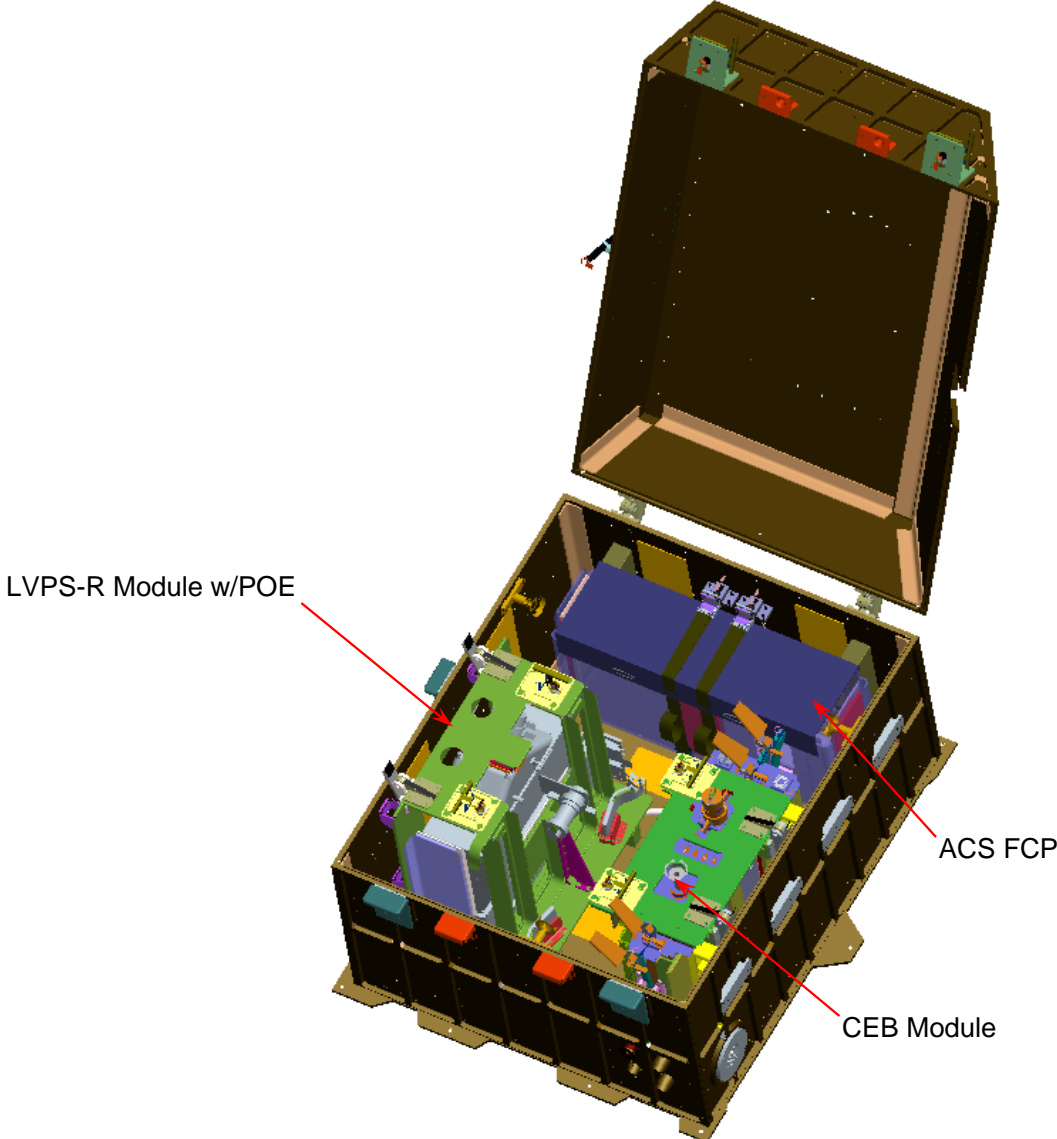


PIE STOWAGE

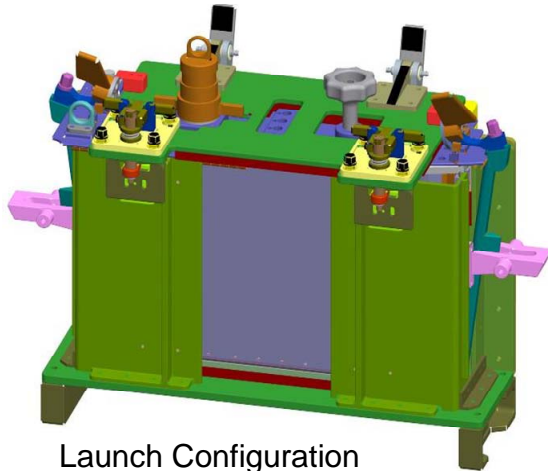


HARD CTE STOWAGE

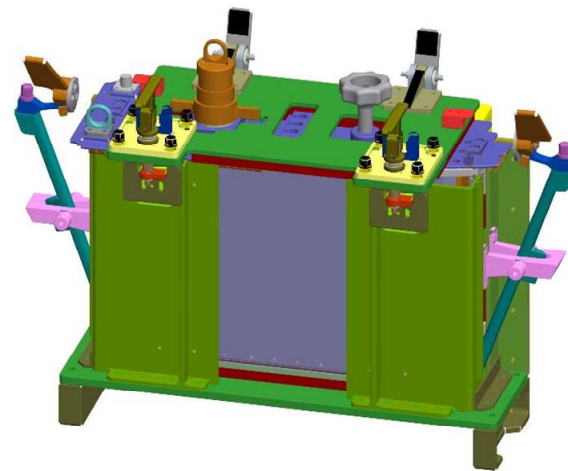
LOPE – INTERNAL VIEW



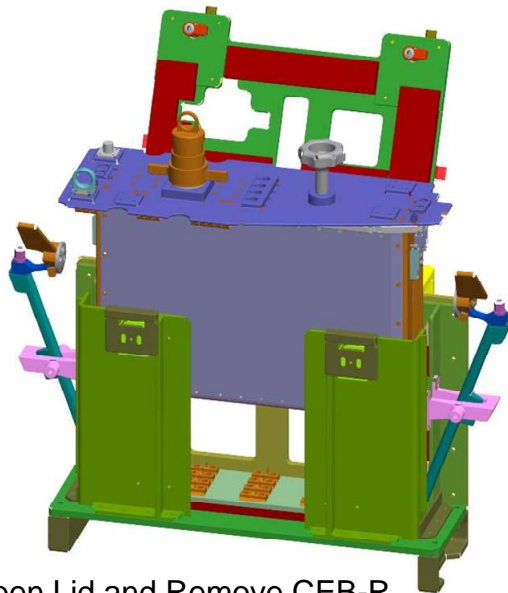
## ACS CEB-R STOWAGE



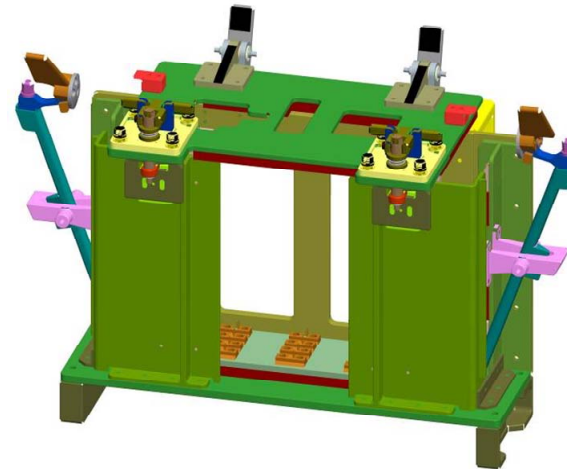
Launch Configuration



Release ¼-turn latches (2) and  
Lock Swing Arms

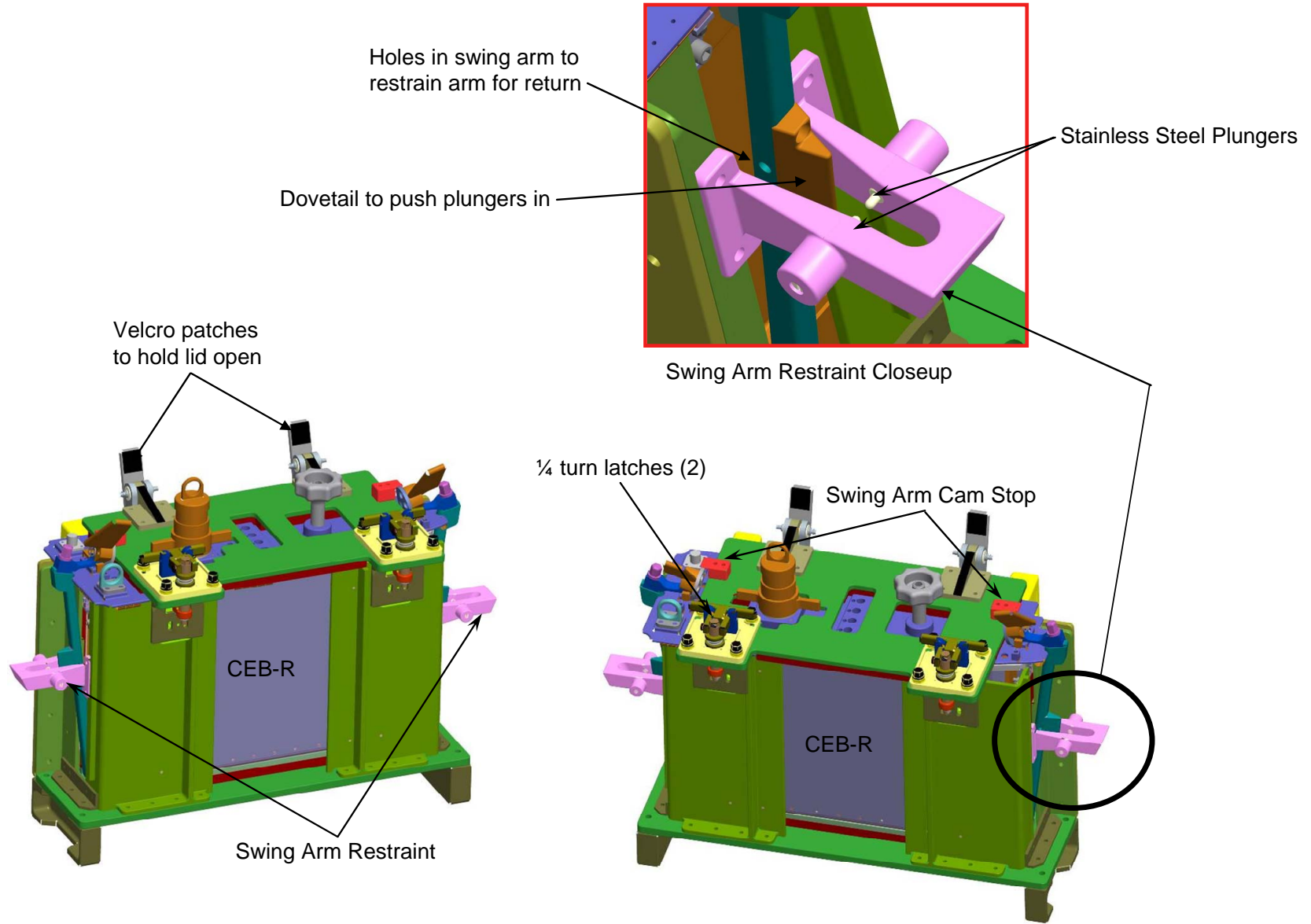


Open Lid and Remove CEB-R

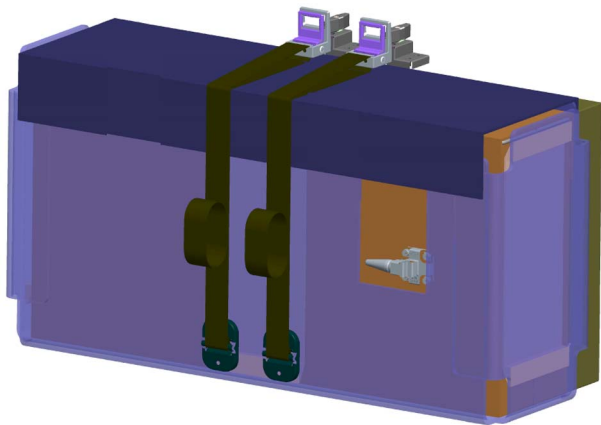


Return Configuration Close Lid  
and ¼-turn latches

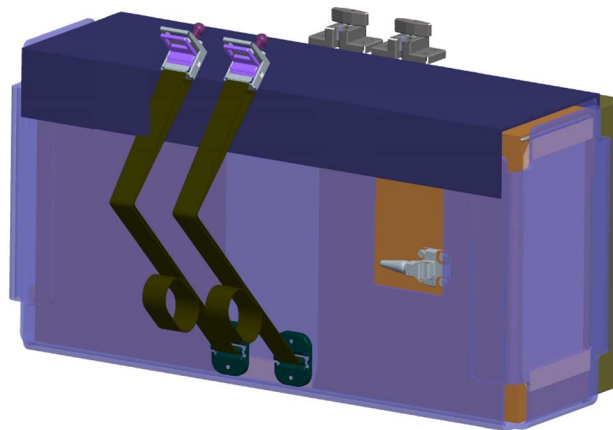
# ACS CEB-R TM OVERVIEW



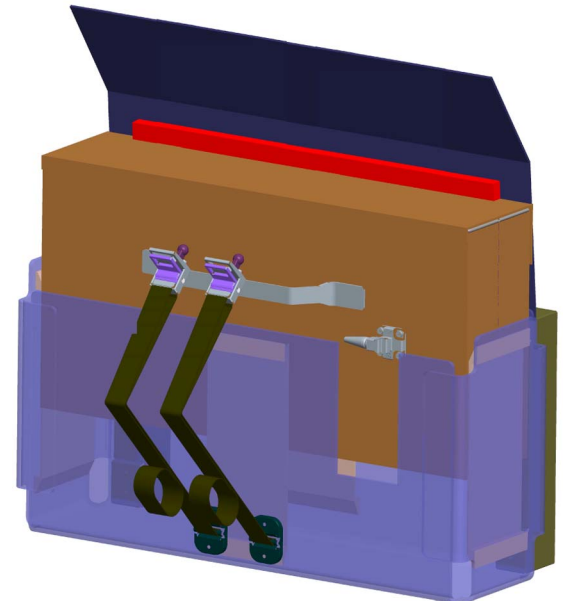
LOPE – ACS FCP



LAUNCH CONFIG

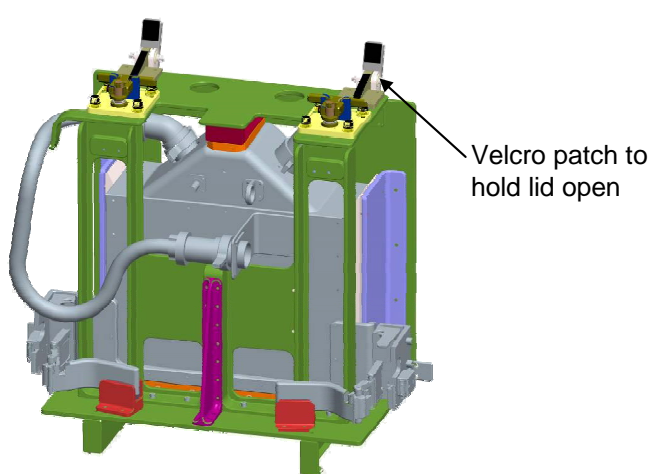


LID RELEASE

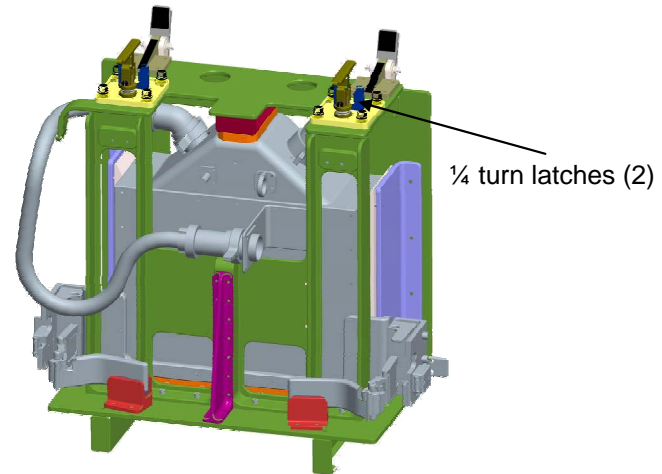


FCP RETRIEVAL

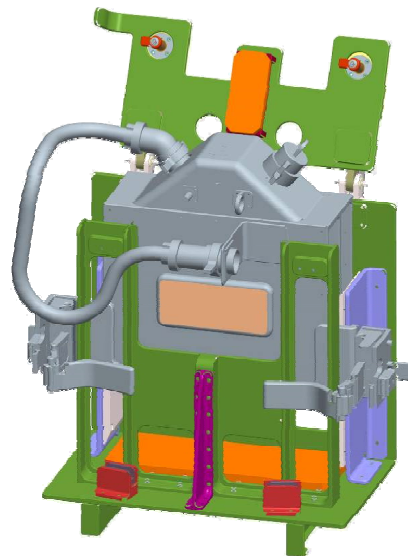
# LOPE – LVPS-R STOWAGE



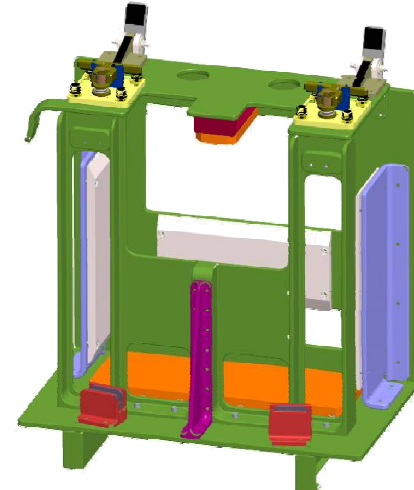
Launch Configuration



Open 1/4 turn latch

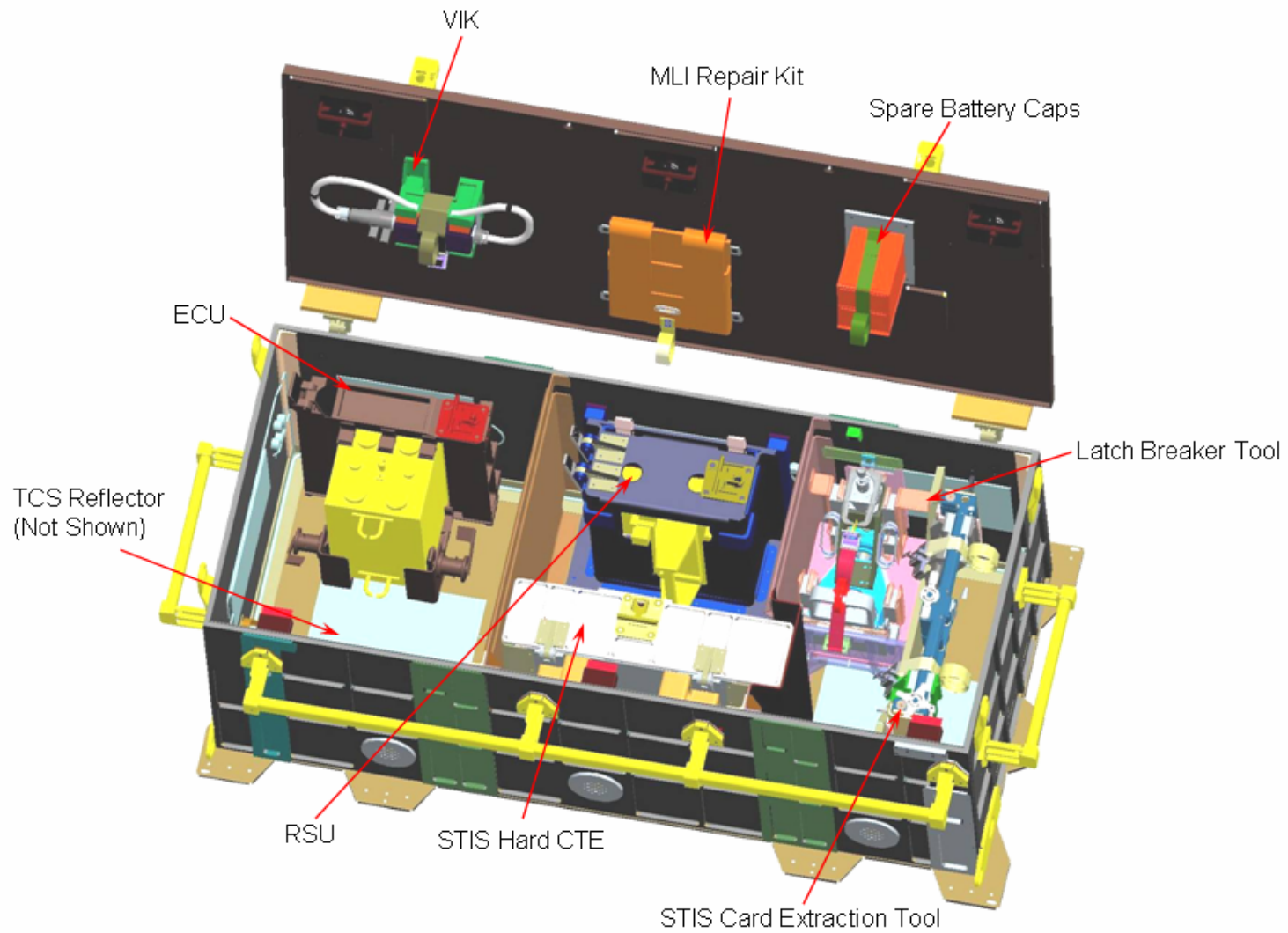


Open Lid and Remove LVPS-R



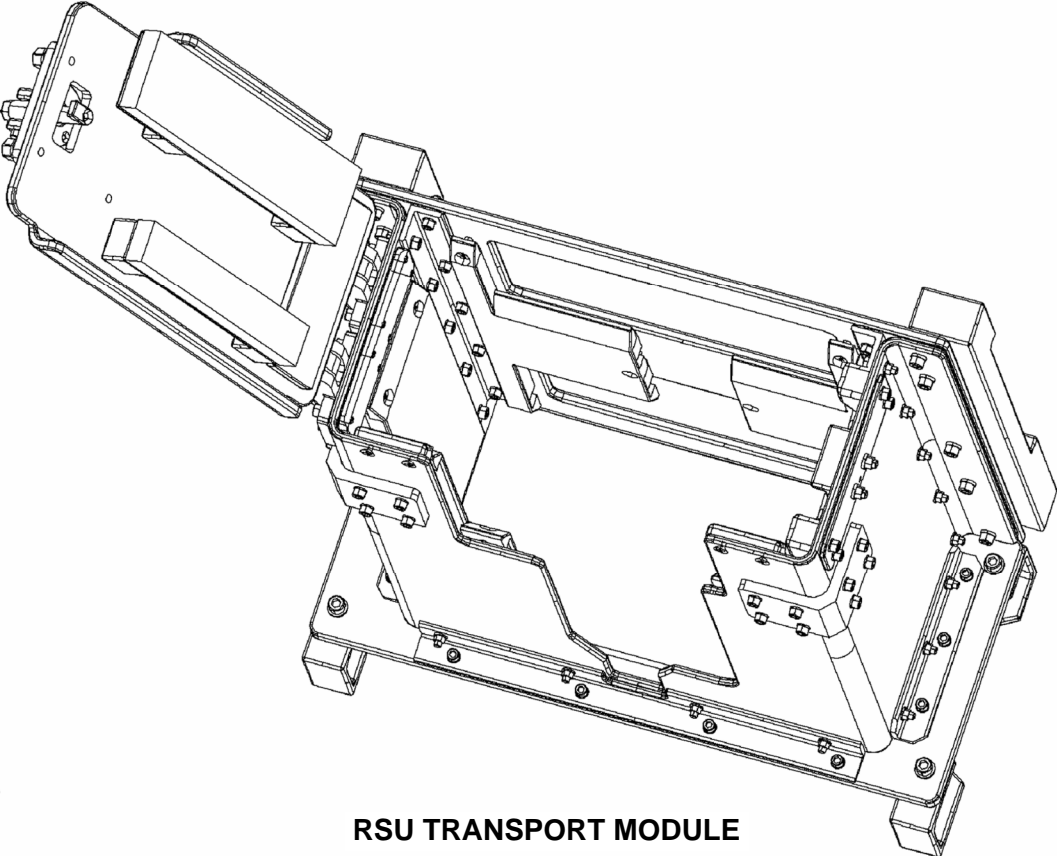
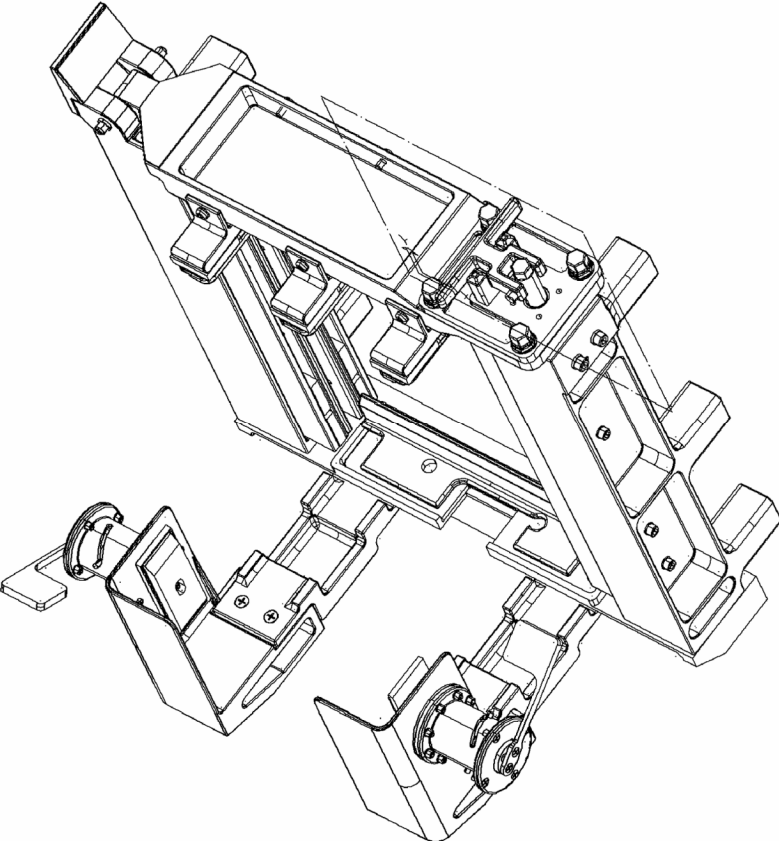
Return Configuration Close Lid and 1/4-turn latches

# COPE – INTERNAL VIEW



**ECU TRANSPORT MODULE**

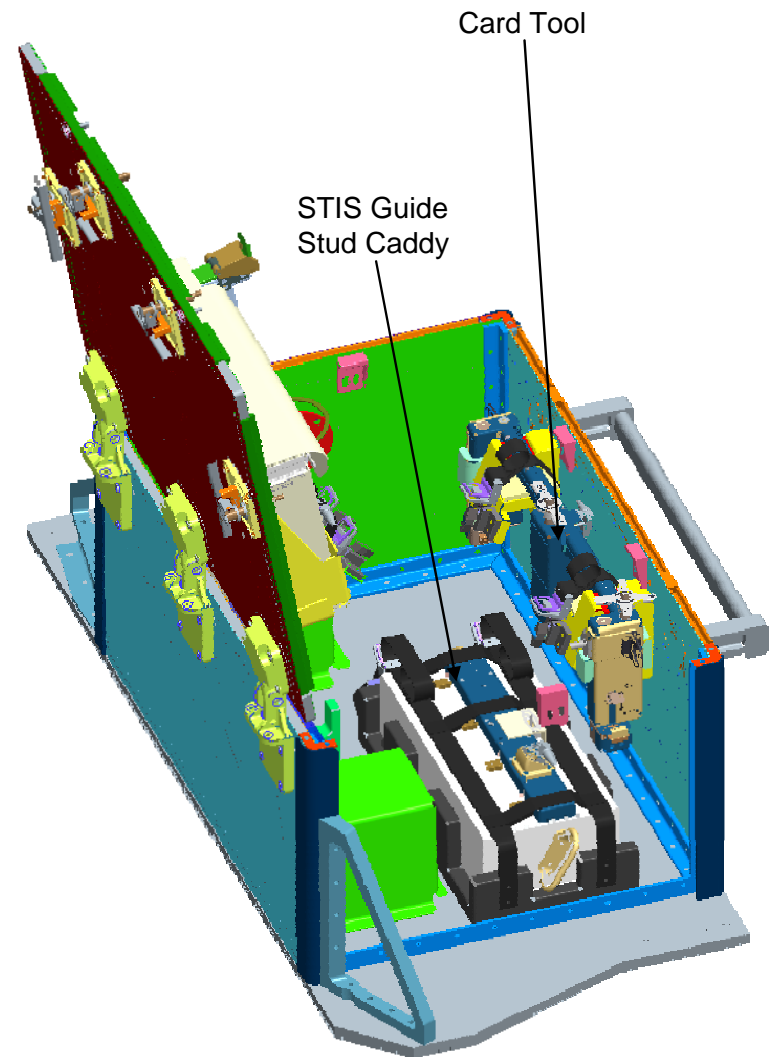
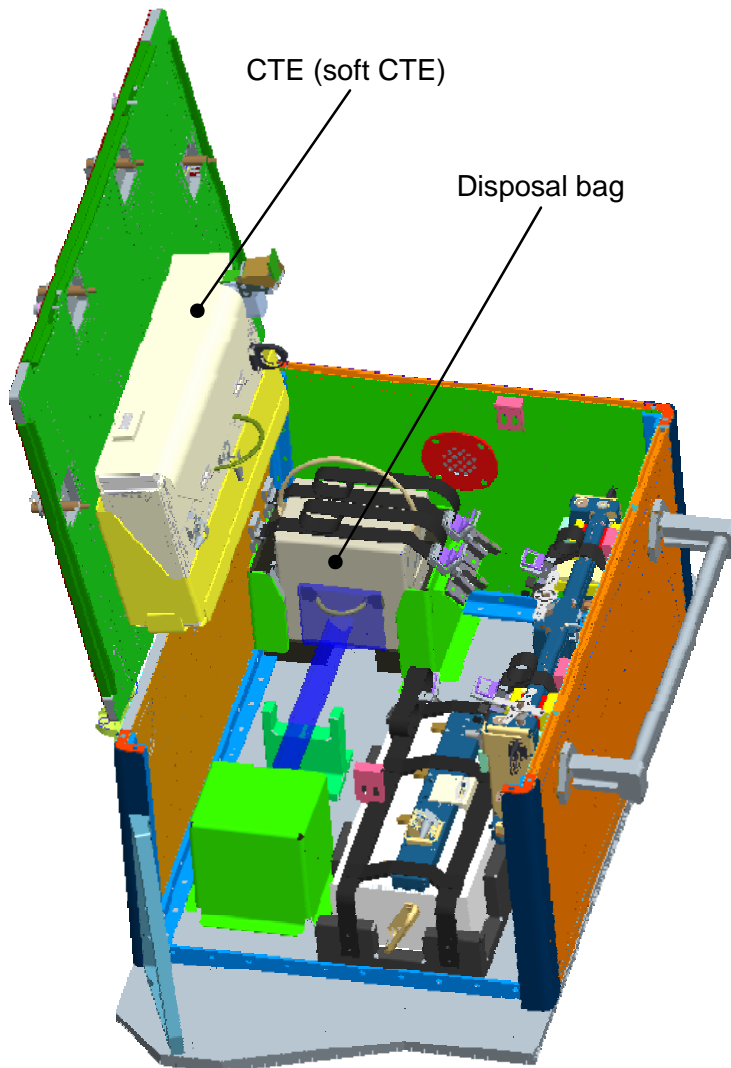
**ECU TRANSPORT MODULE**



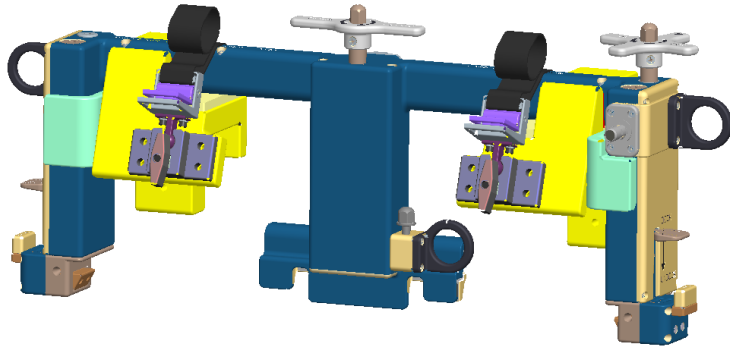
**RSU TRANSPORT MODULE**



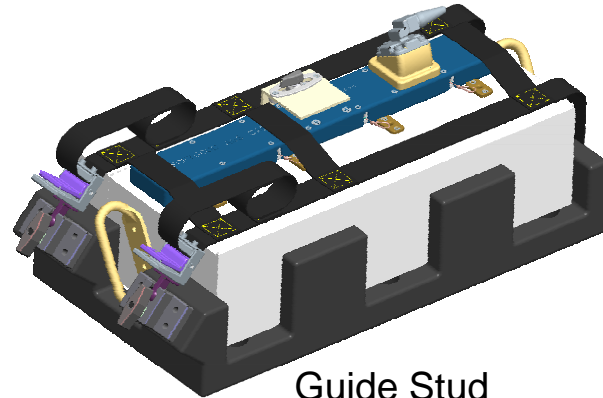
## ATM-2 INTERNAL VIEW



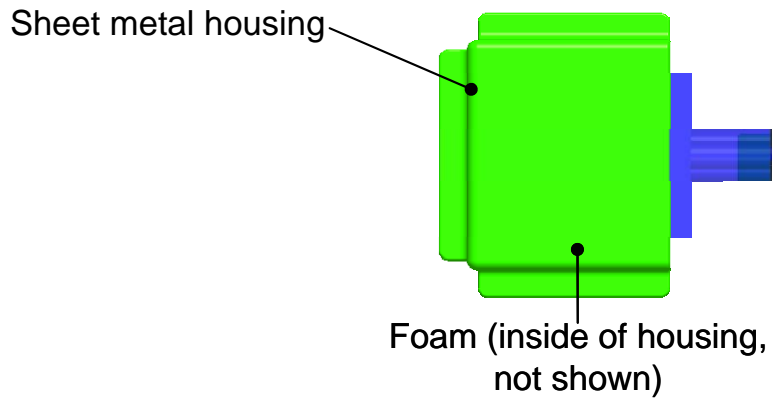
# STIS TOOL RETRIEVAL FROM ATM-2



Card Tool Stowage



Guide Stud  
Caddy Stowage



Tower w/foam

Disposal Bag  
Return Stowage

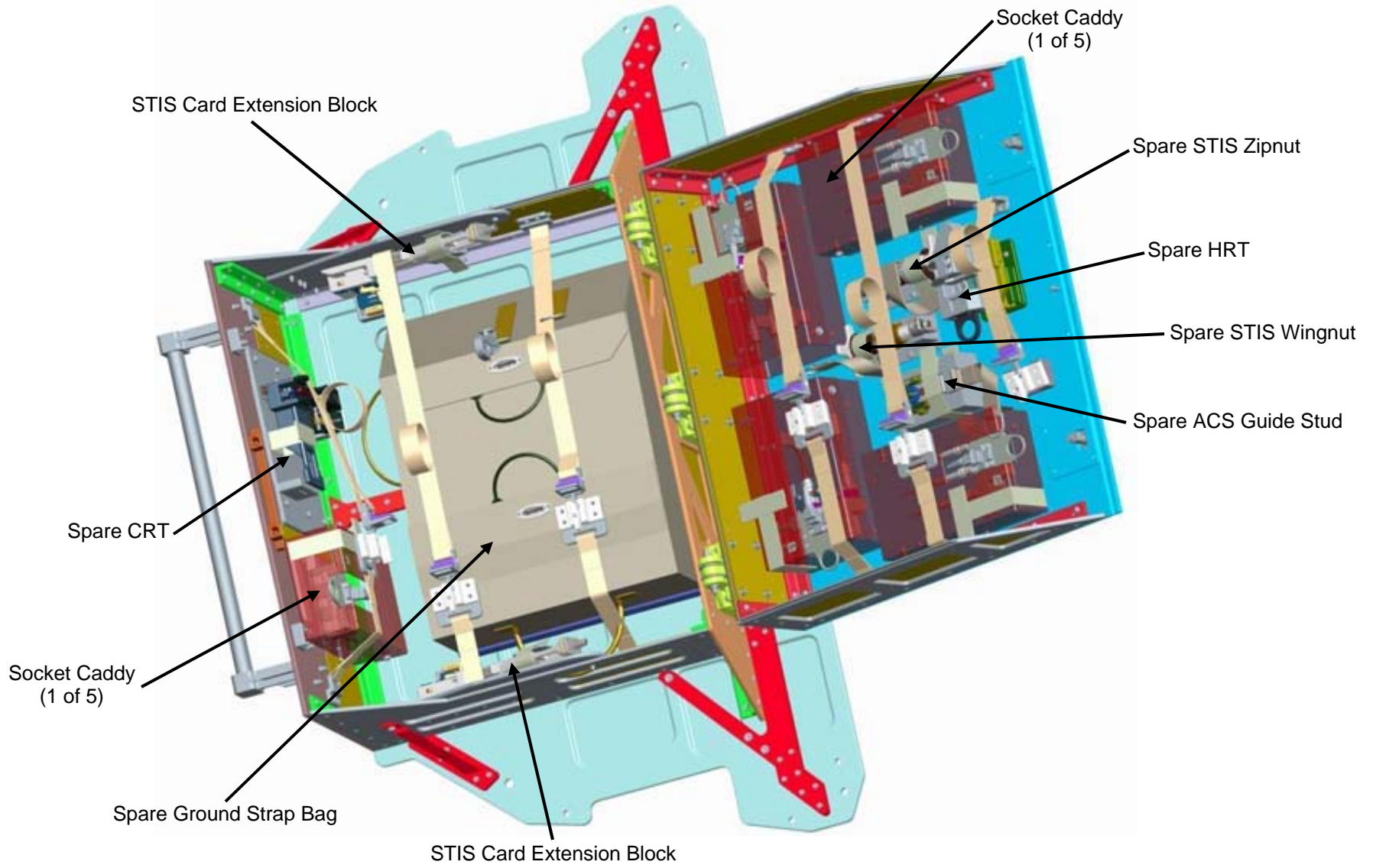
DB in launch  
configuration

Sheet metal housing

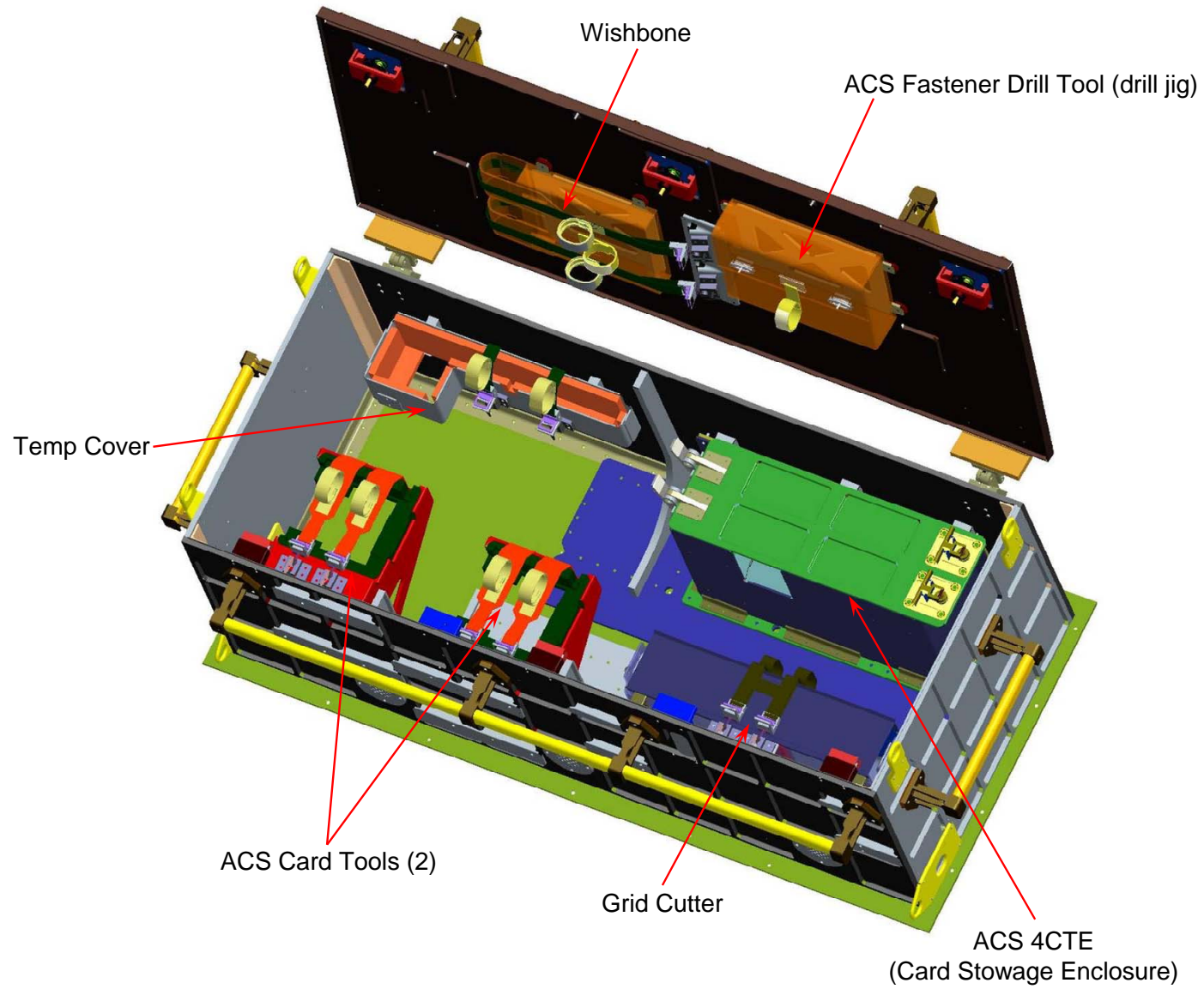
Launch straps

Foam

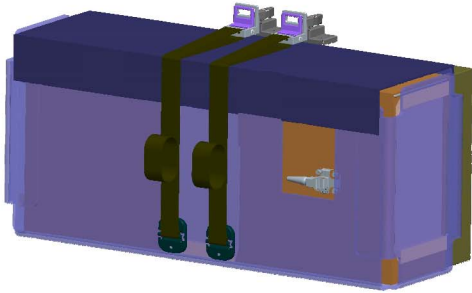
# ATM-1 INTERNAL VIEW



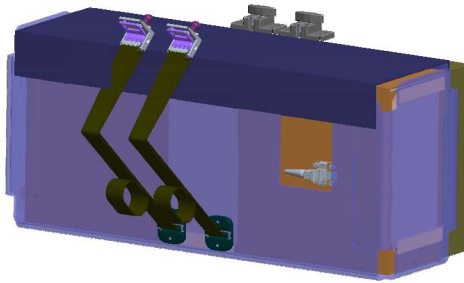
**NOPE – INTERNAL VIEW**



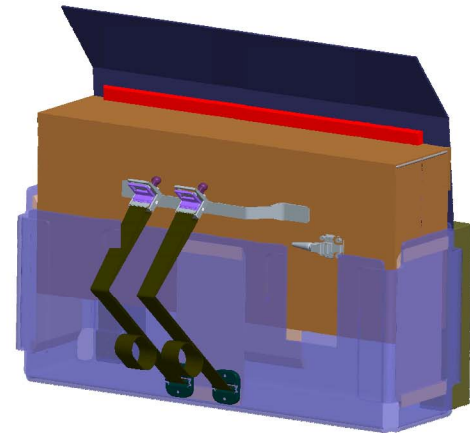
**NOPE – GRID CUTTER STOWAGE**



Launch Configuration

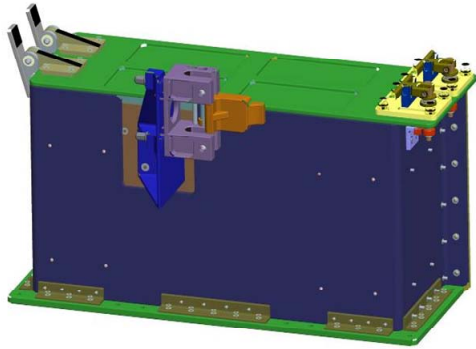


Open Quarter Turn Latches  
and Unhook Straps

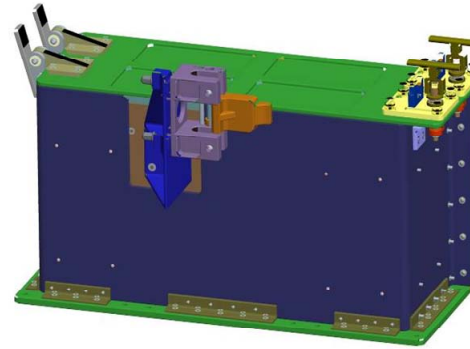


Remove ACS SGC

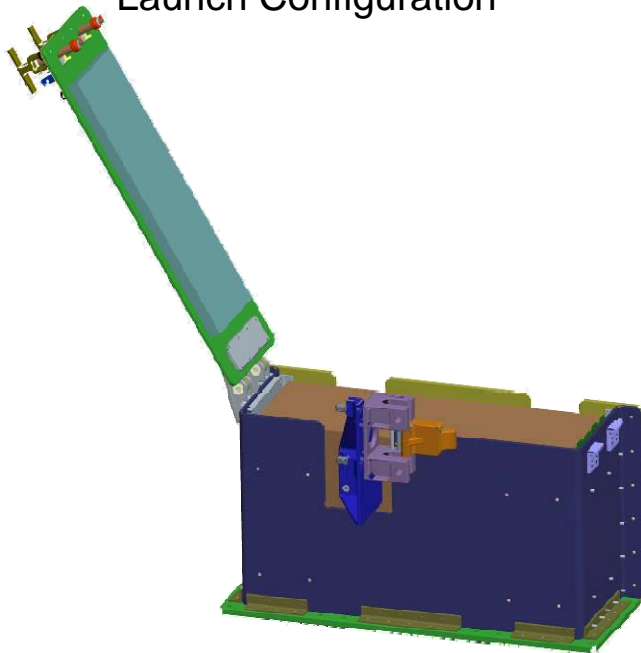
**NOPE – ACS CARD STOWAGE ENCLOSURE**



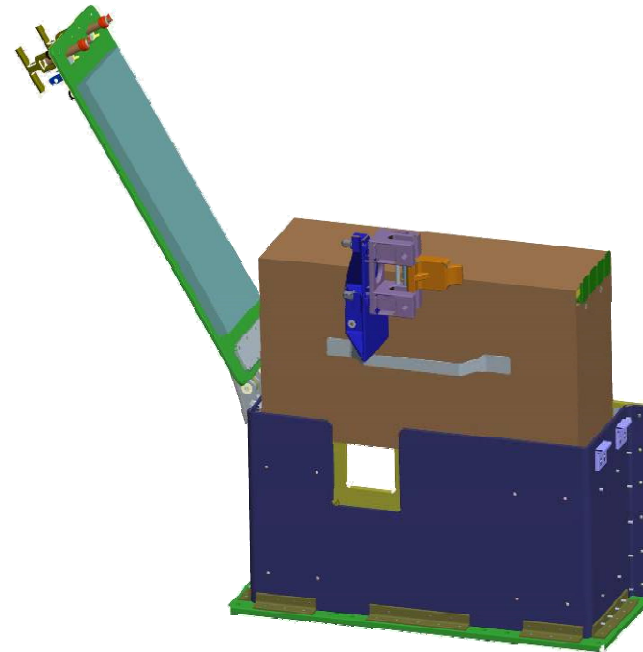
Launch Configuration



Open 1/4-turn latches (2)

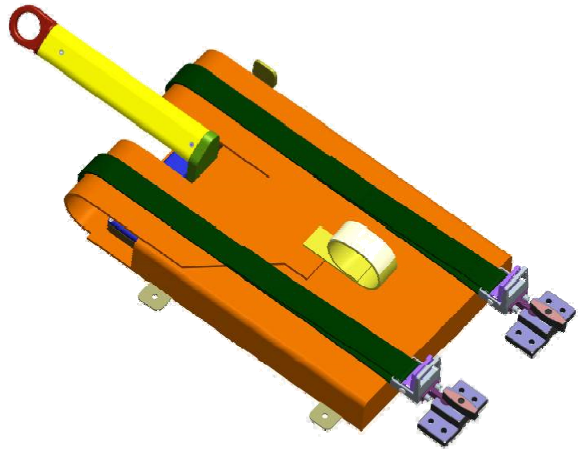


Open Lid

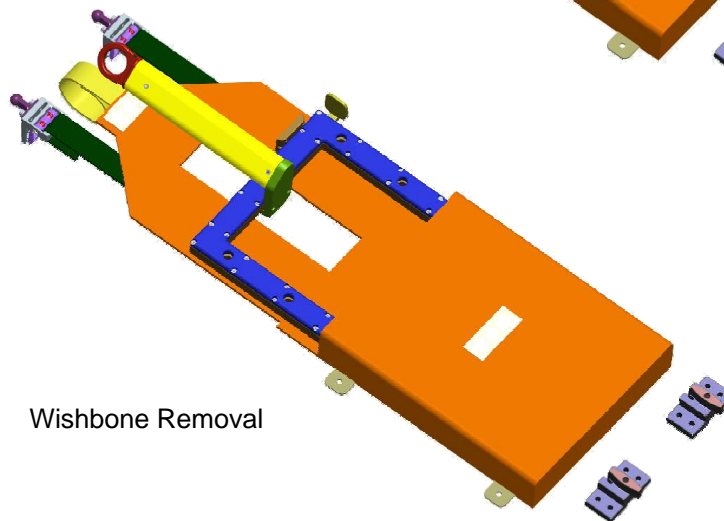
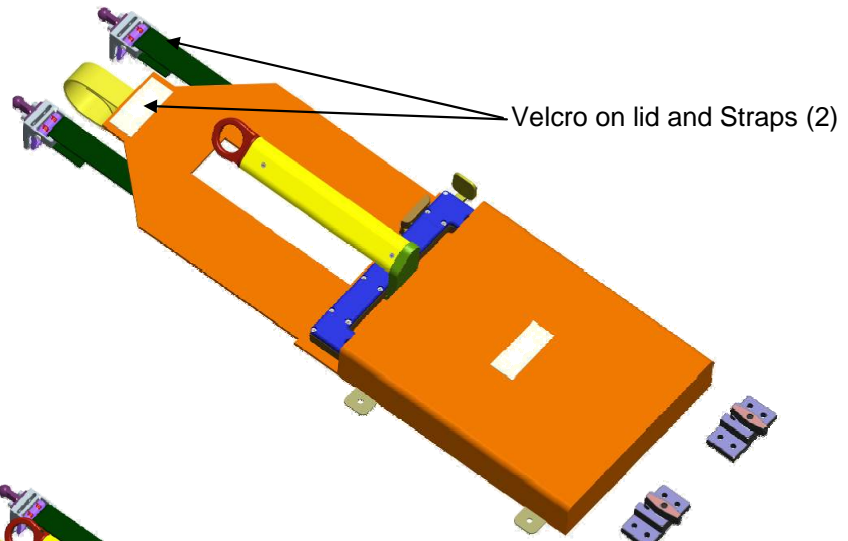


Remove ACS CTE

# NOPE – ACS WISHBONE STOWAGE

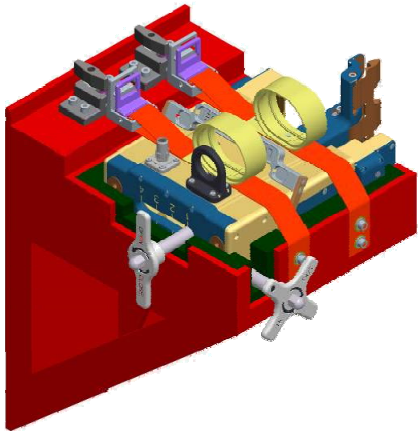


Launch Configuration

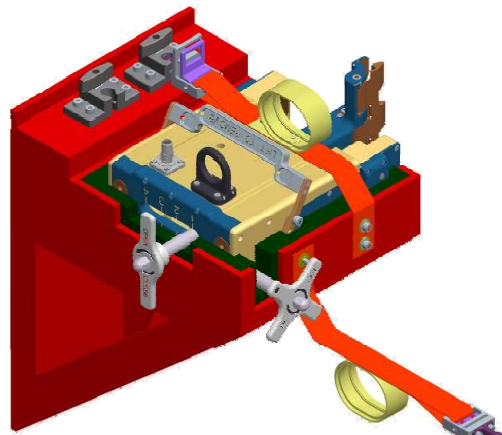


Wishbone Removal

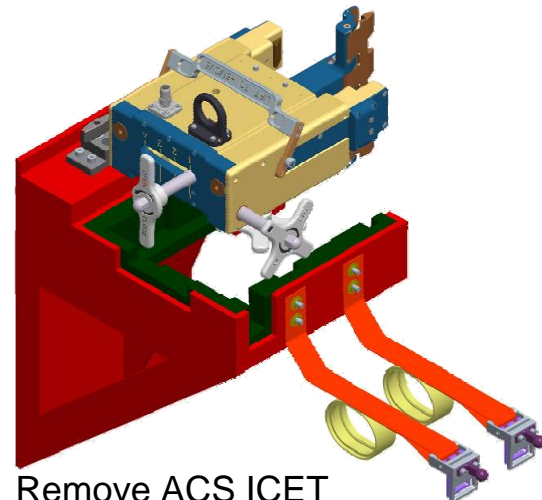
**NOPE – ACS CET STORAGE**



Launch Configuration



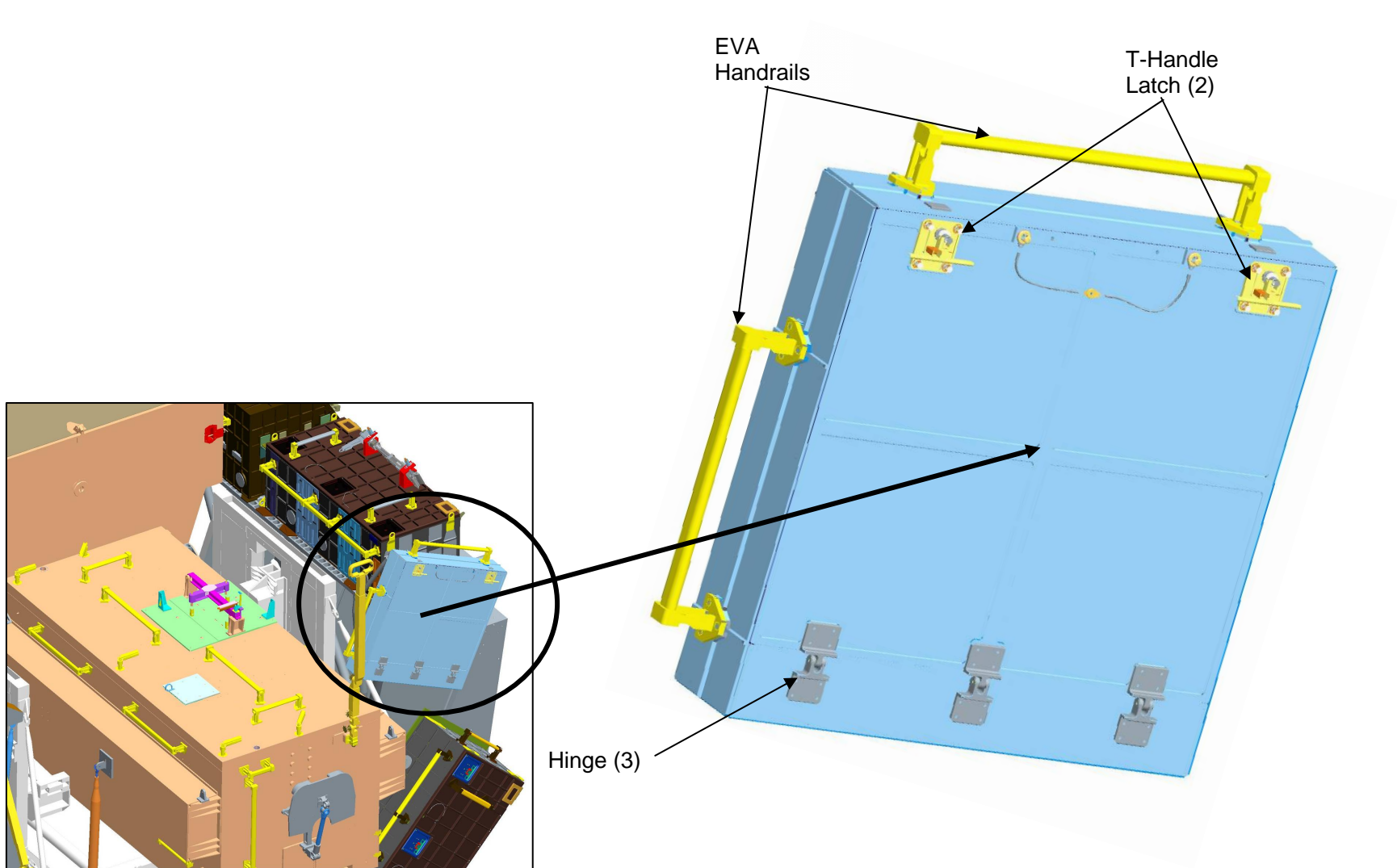
Open Quarter Turn Latches  
and Unhook Straps



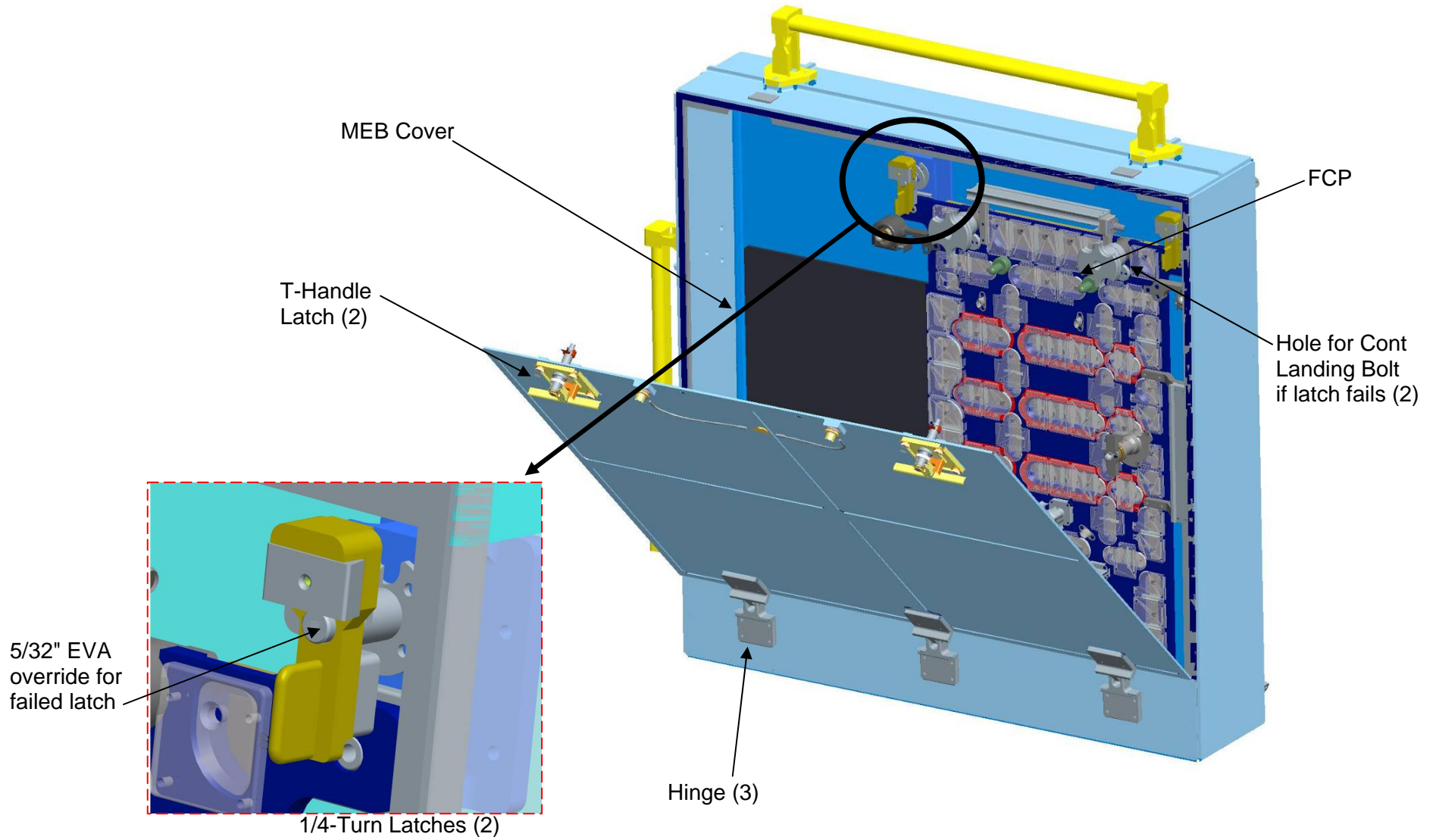
Remove ACS ICET



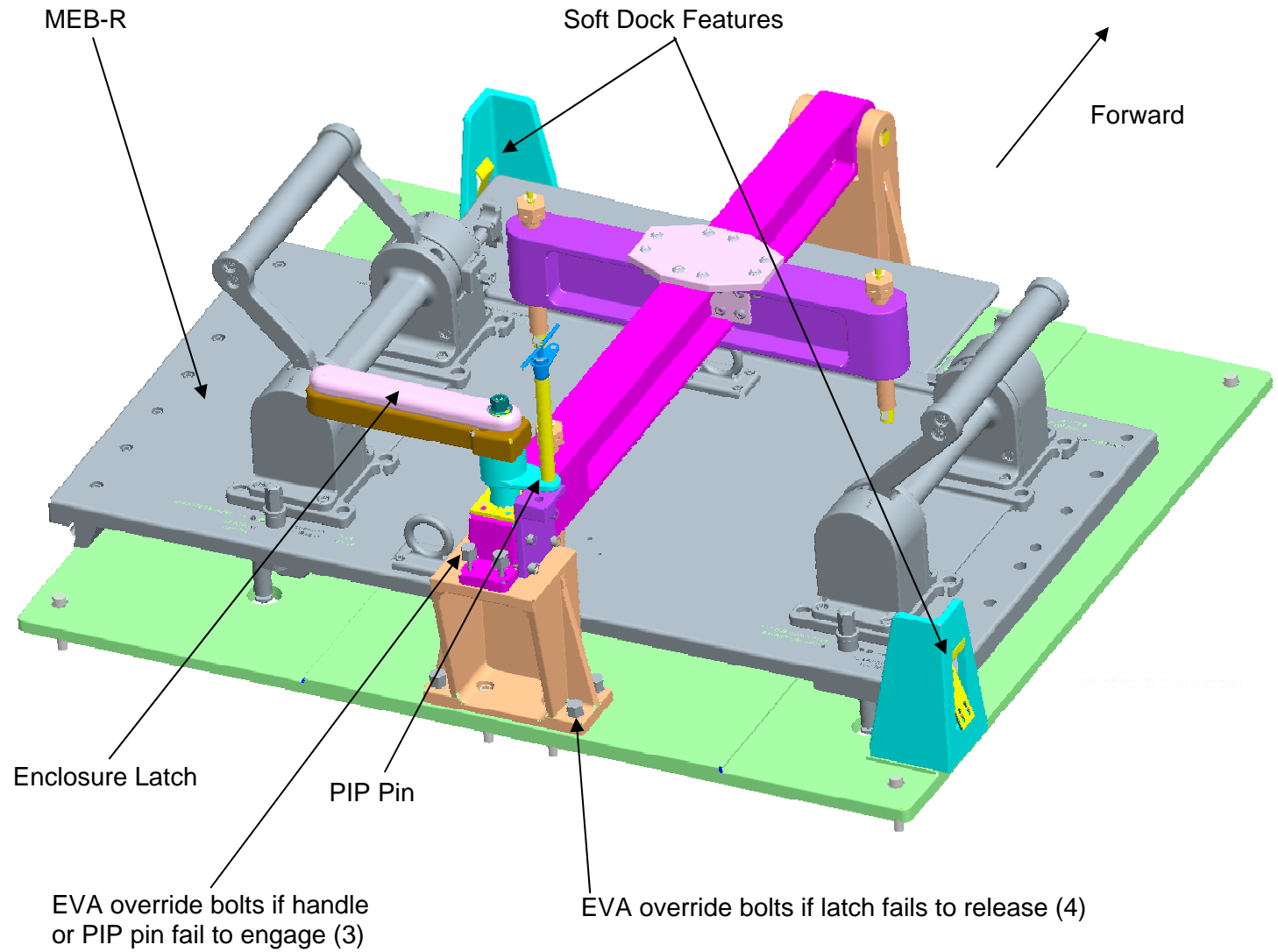
# STIS FCP ENCLOSURE – EXTERNAL VIEW



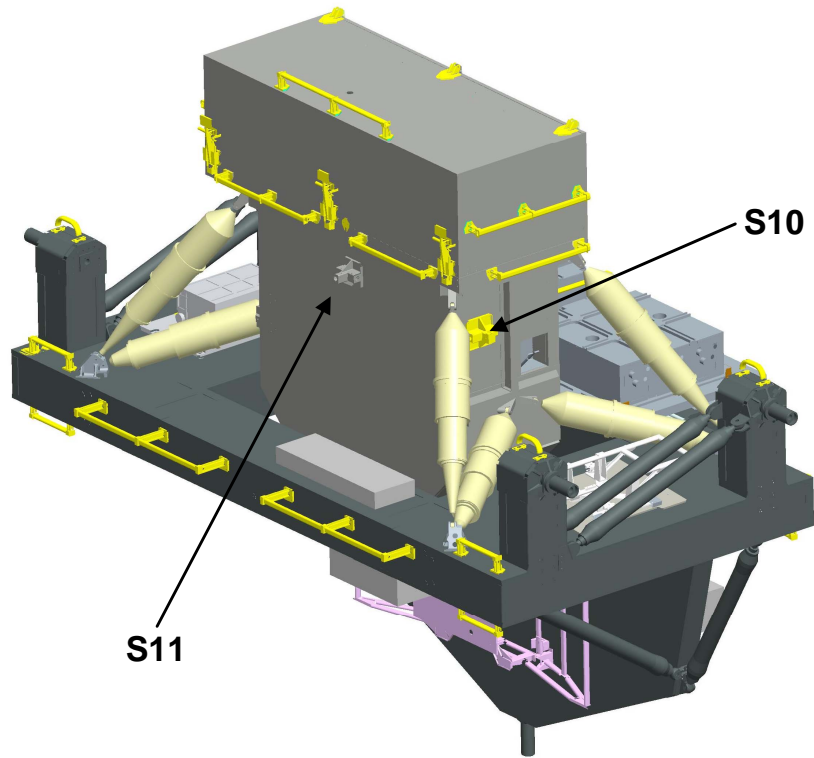
# STIS FCP ENCLOSURE – INTERNAL VIEW



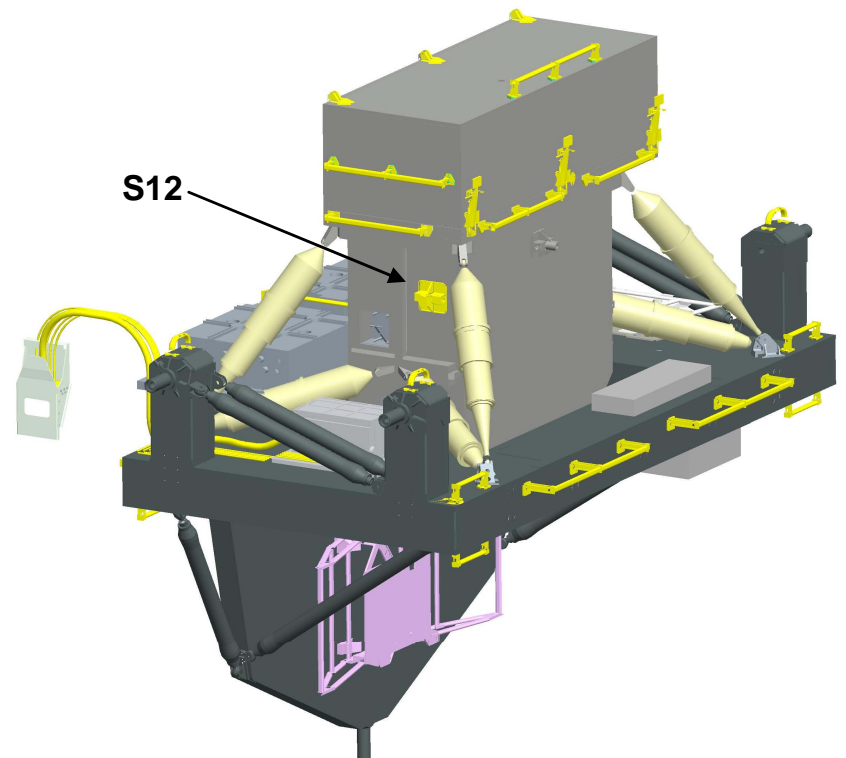
# MEB-R ENCLOSURE



# SLIC PFR SOCKET

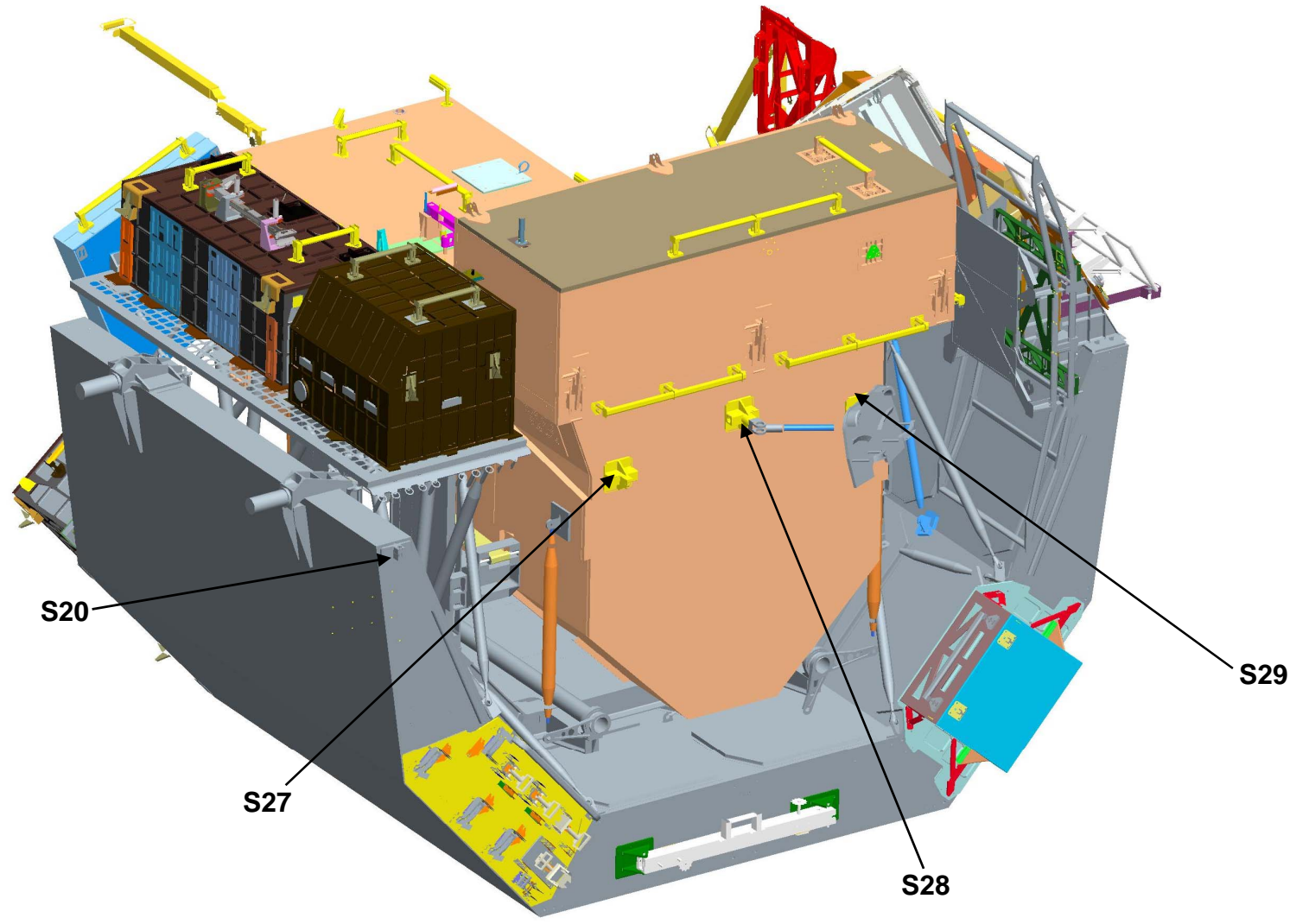


Port



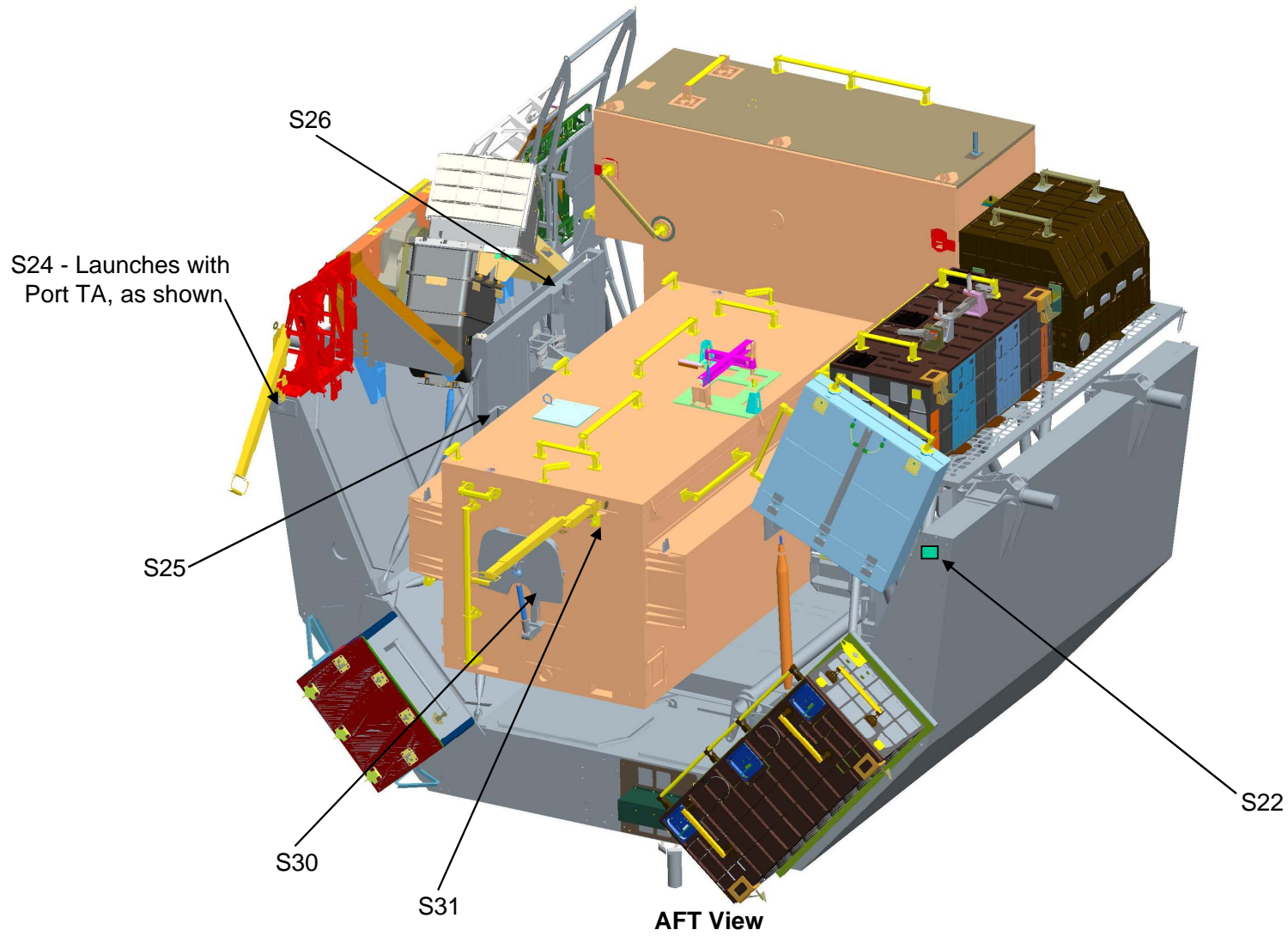
Starboard

# ORUC PFR SOCKETS

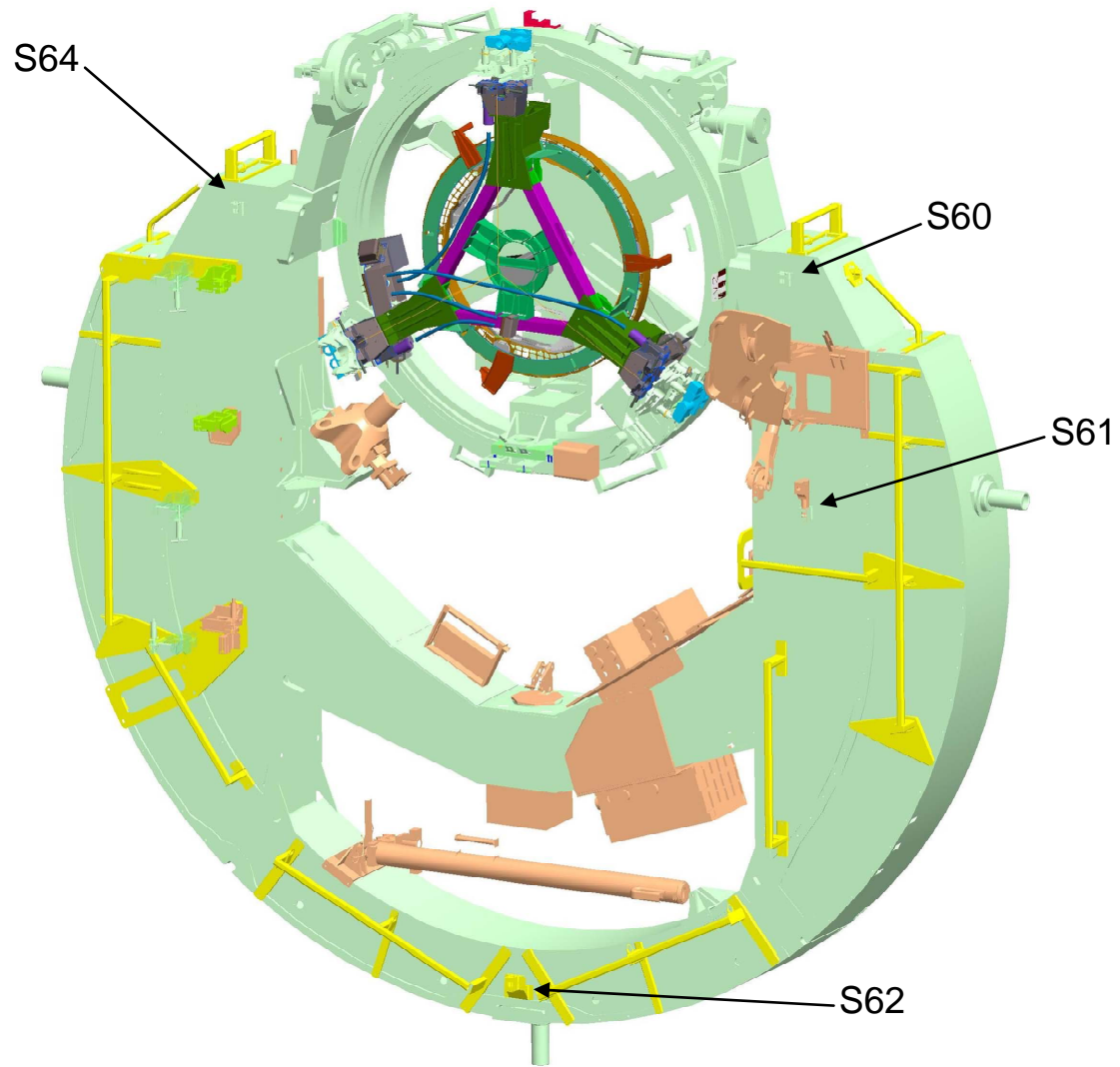


FWD View

# ORUC PFR SOCKETS (Cont)

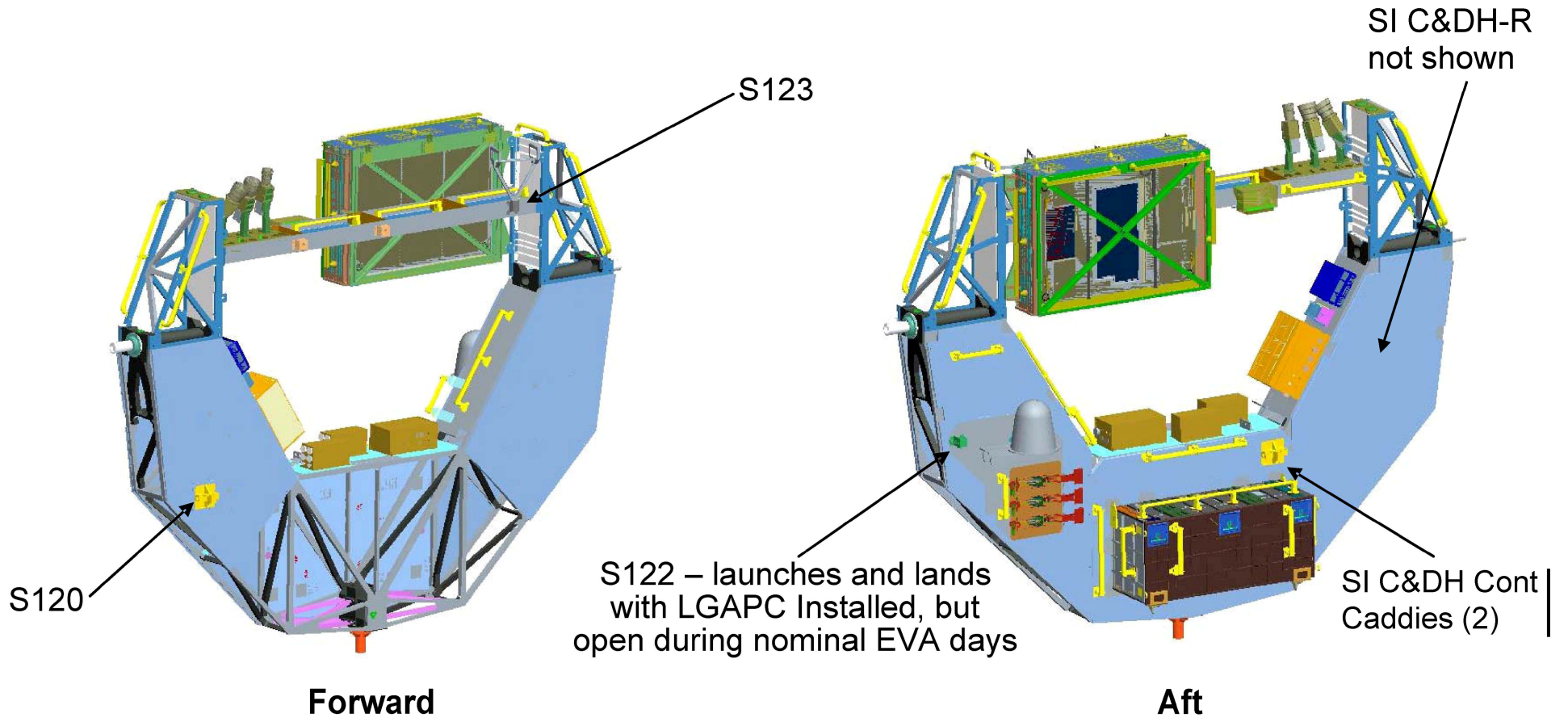


# FSS PFR SOCKETS



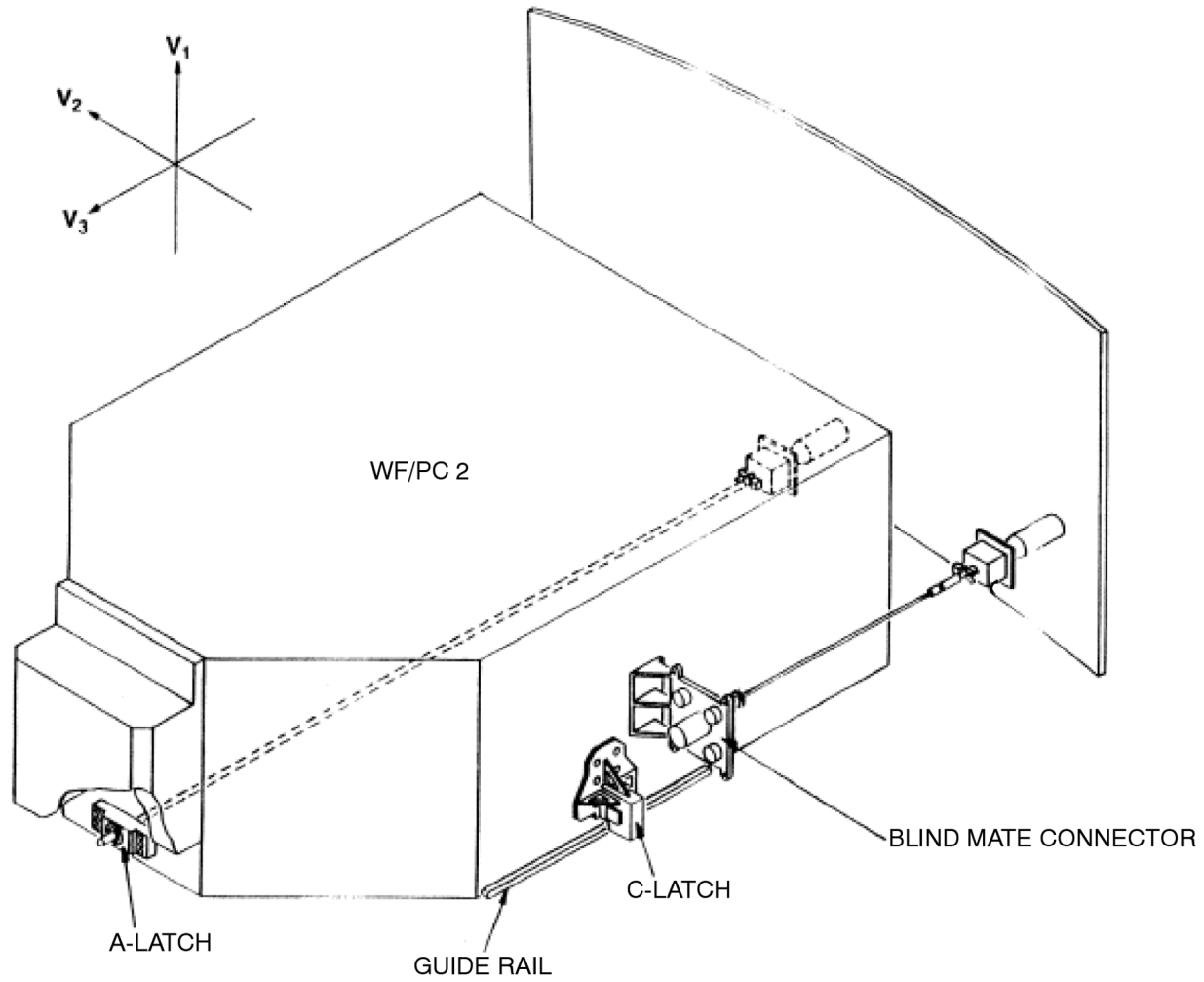
**FSS PFR Sockets – Front Side Only**

# MULE PFR SOCKETS





## WFPC 2 – OVERVIEW

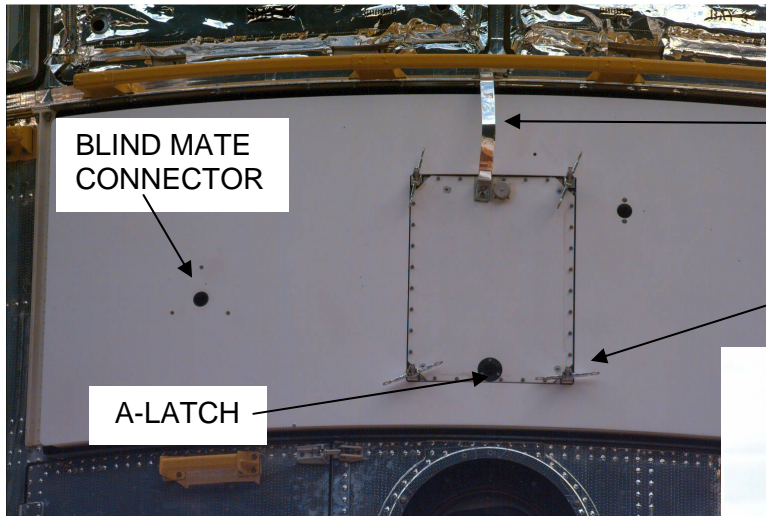


FS 18-65

EVA/125/FIN A

**WFPC 2/WFC III**

WFPC 2 – OVERVIEW (Cont)



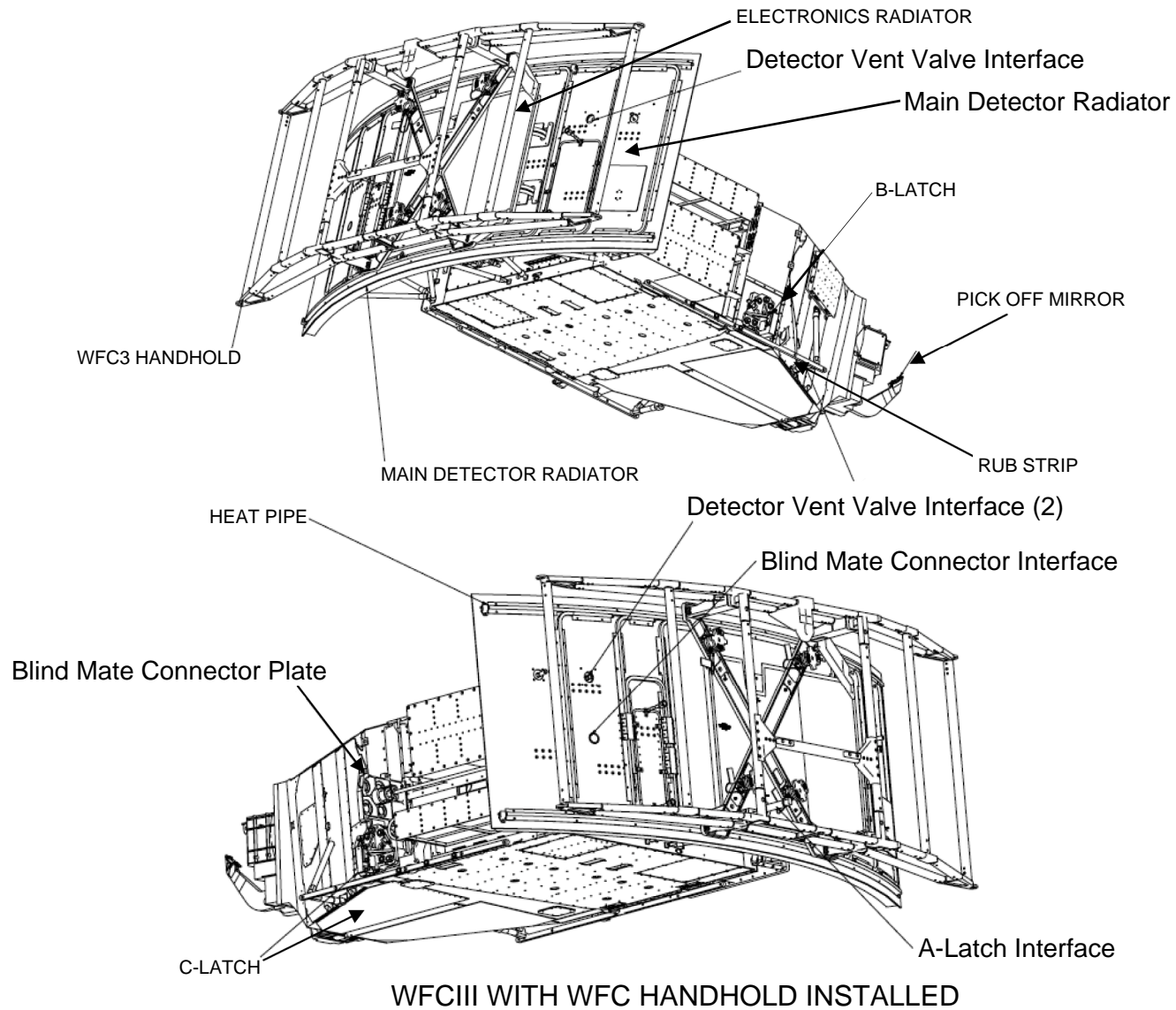
S103E5403 1999:12:25 10:41:38

WFPC 2 INSTALLED IN HST

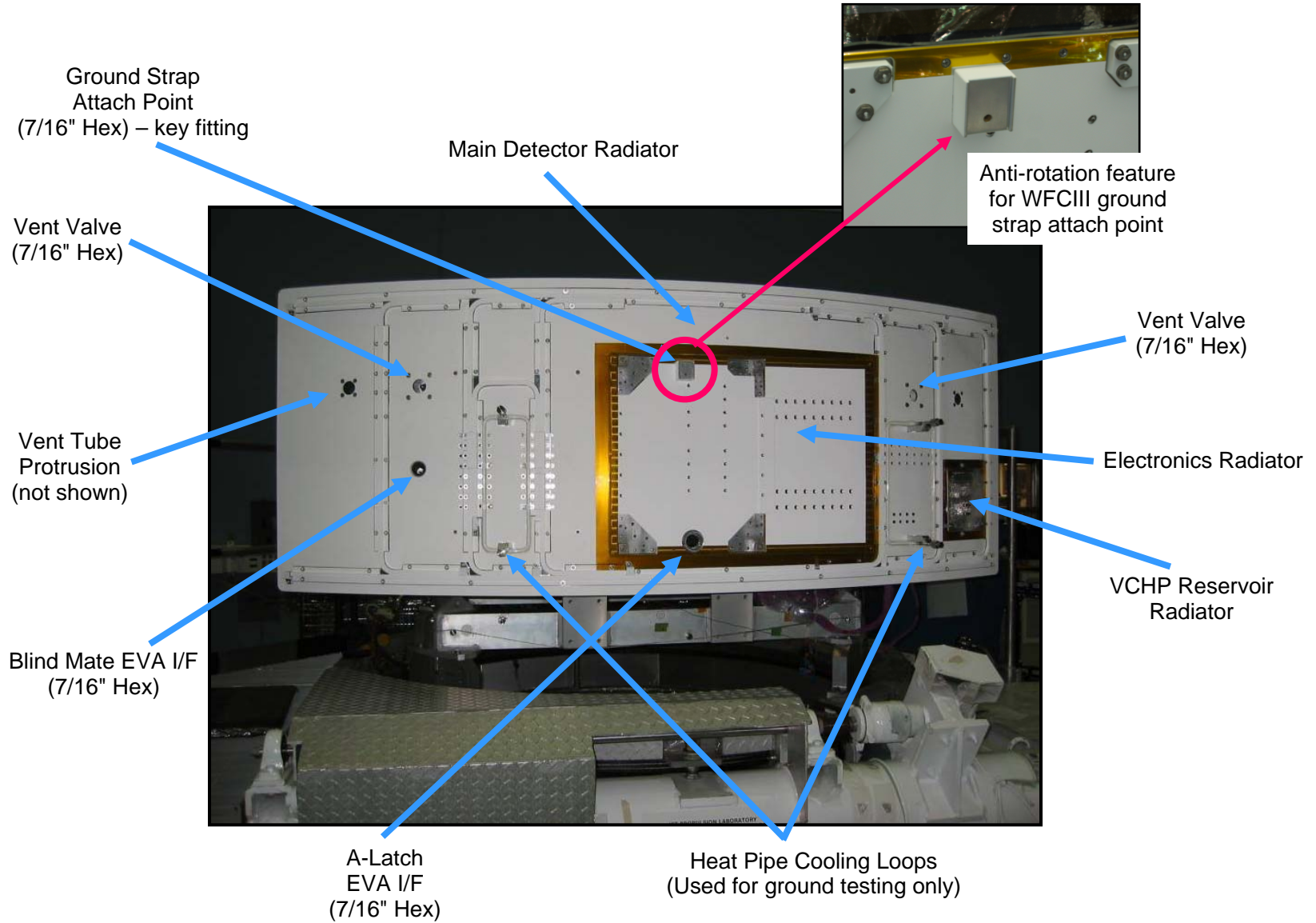


HST GROUND STRAP INTERFACE

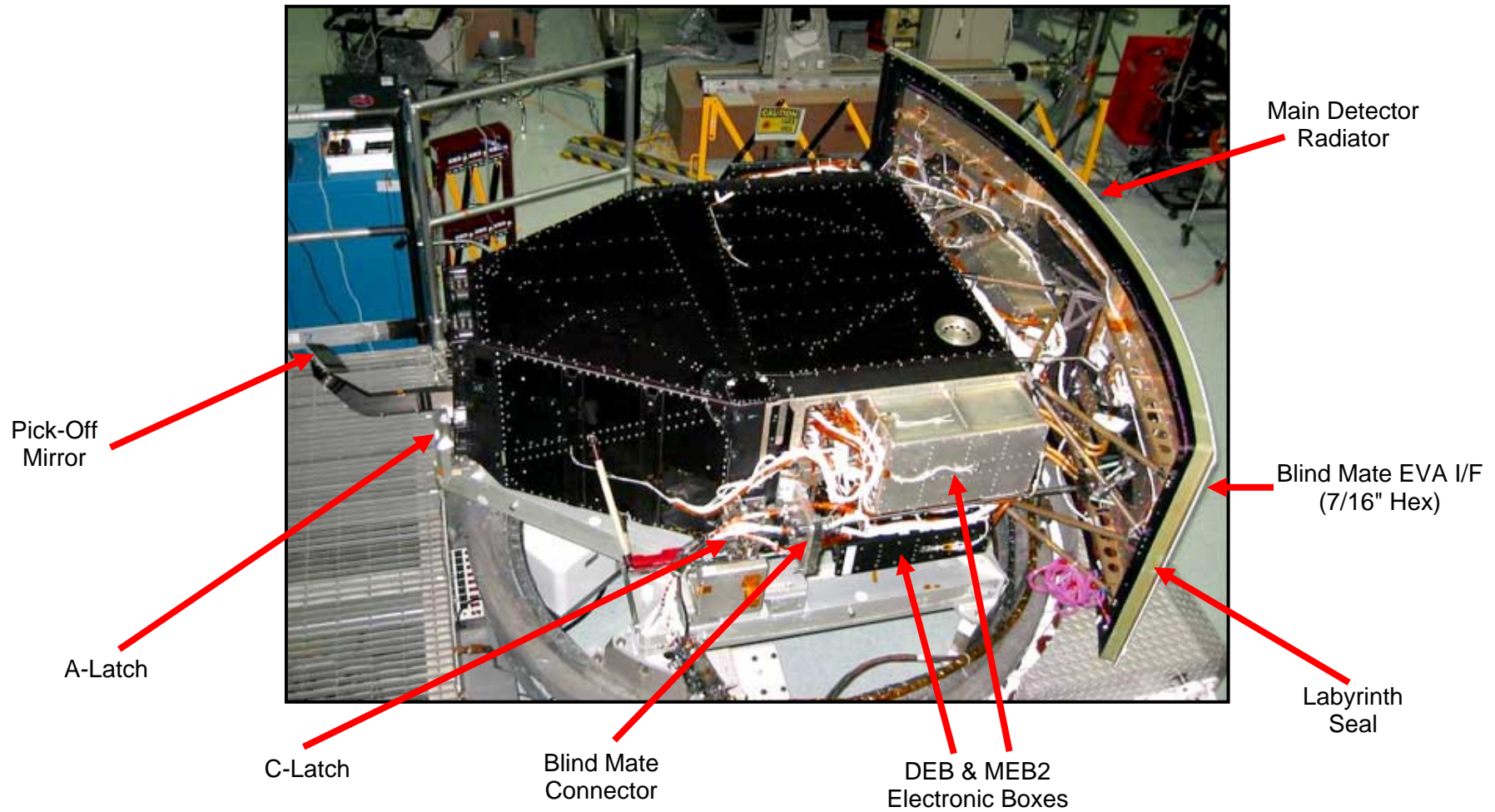
## WFC III – OVERVIEW



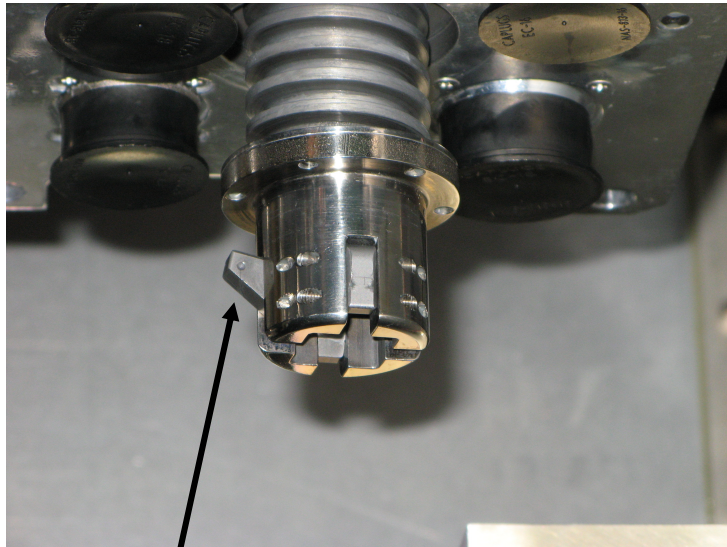
# WFC III – FRONT VIEW



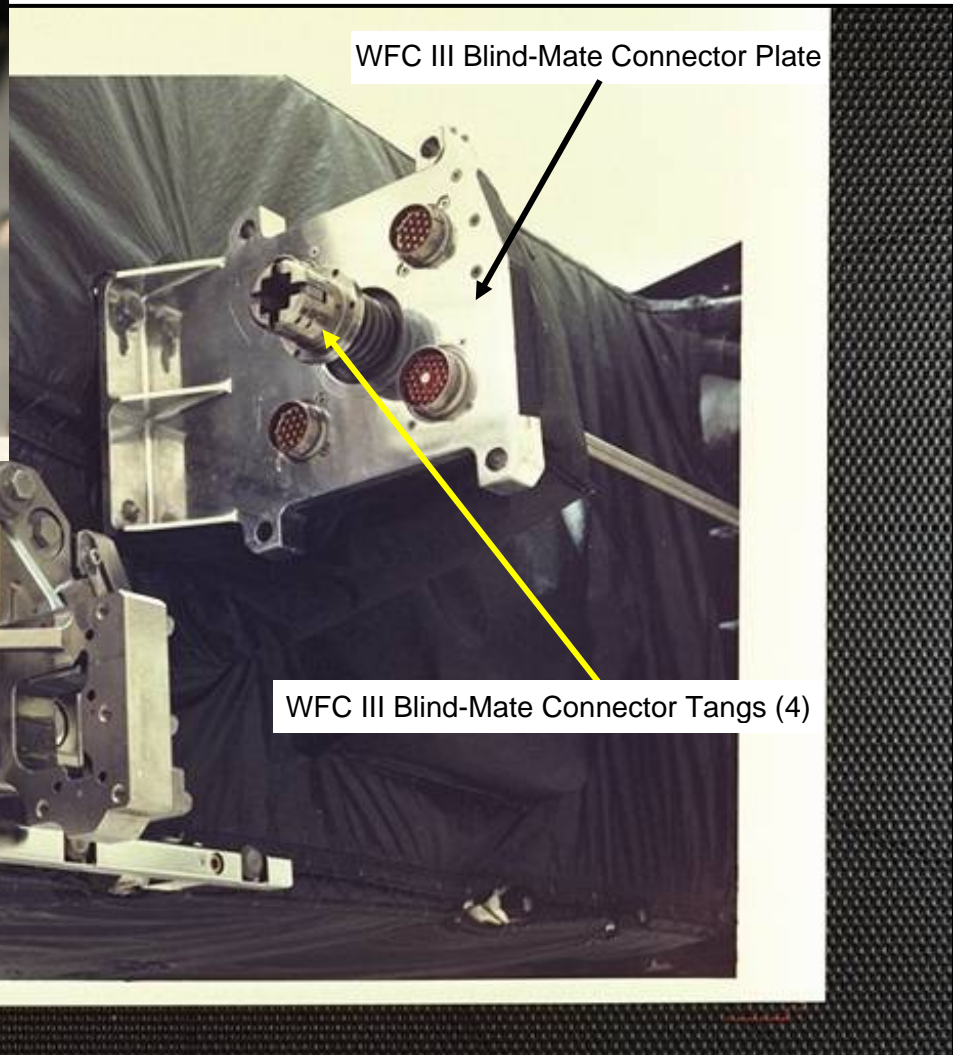
WFC III – SIDE VIEW



## WFC III – BLIND MATE CONNECTOR PLATE



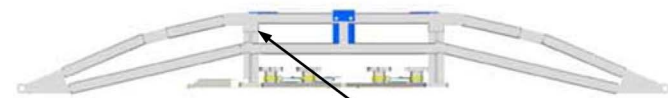
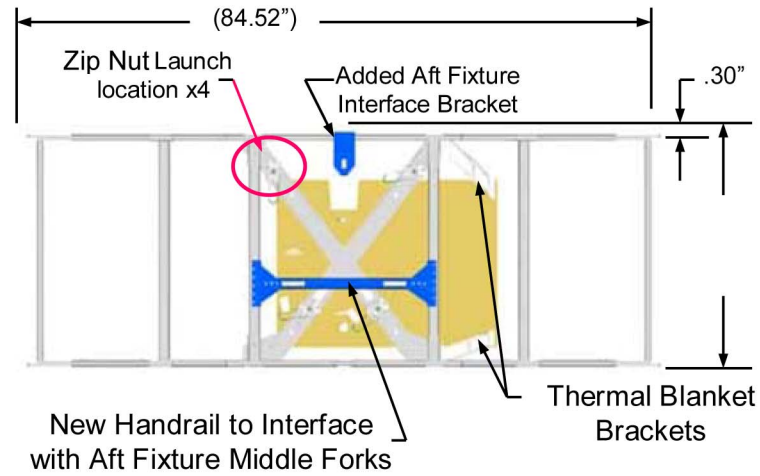
Out-of-Position Tang



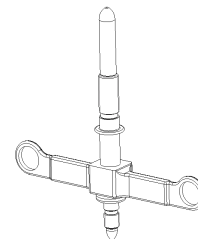
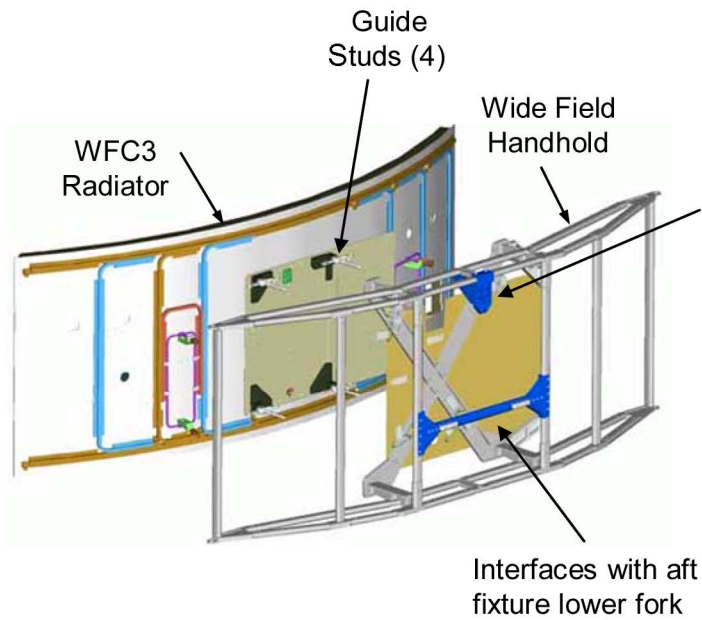
WFC III Blind-Mate Connector Plate

WFC III Blind-Mate Connector Tangs (4)

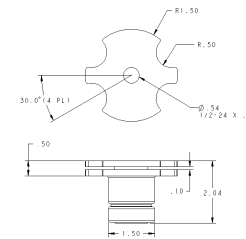
# WFC HANDHOLD



Conductive Velcro

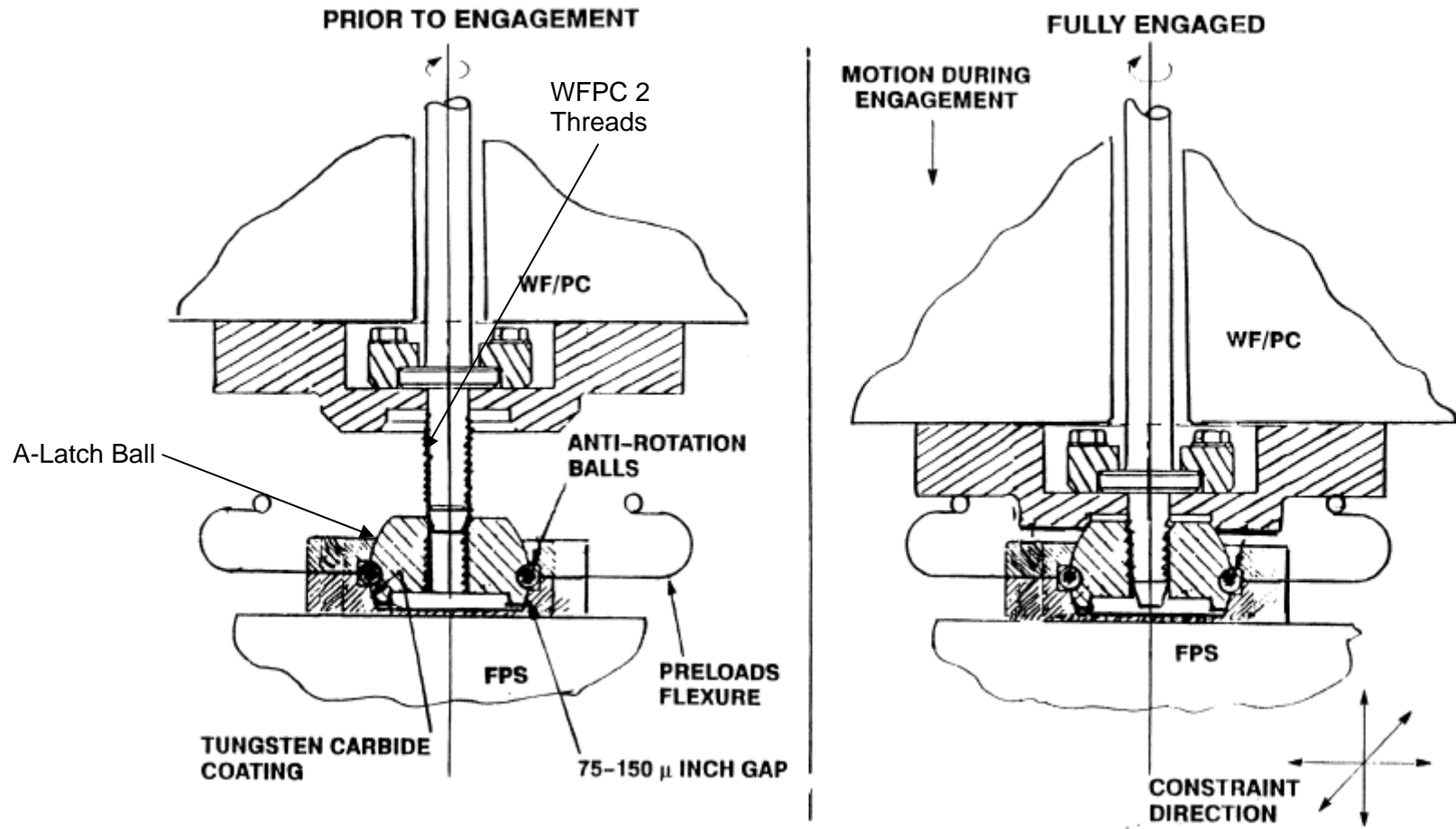


Guide Stud



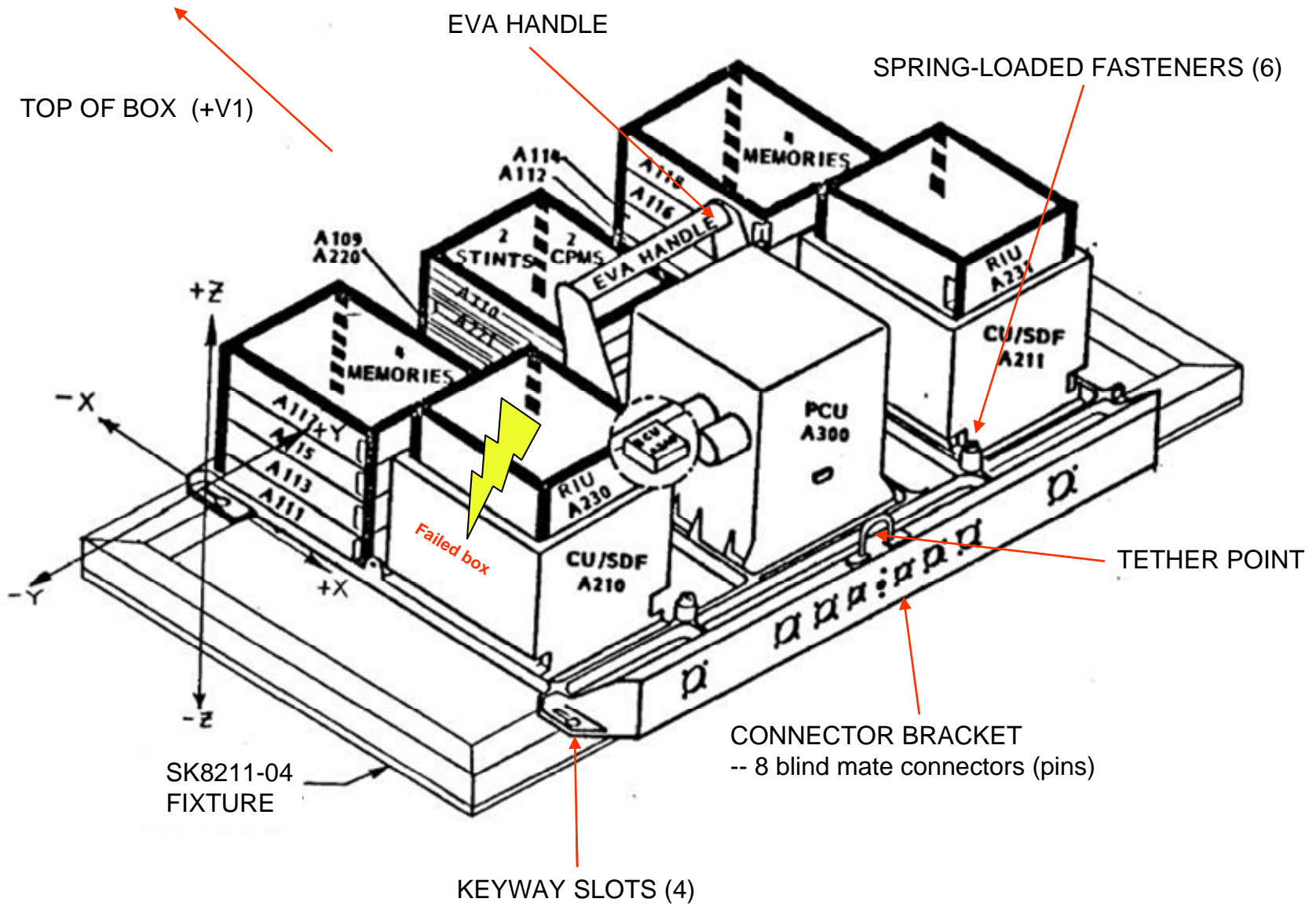
Zip Nut

# WFPC 2/WFC III – A-LATCH INTERFACE



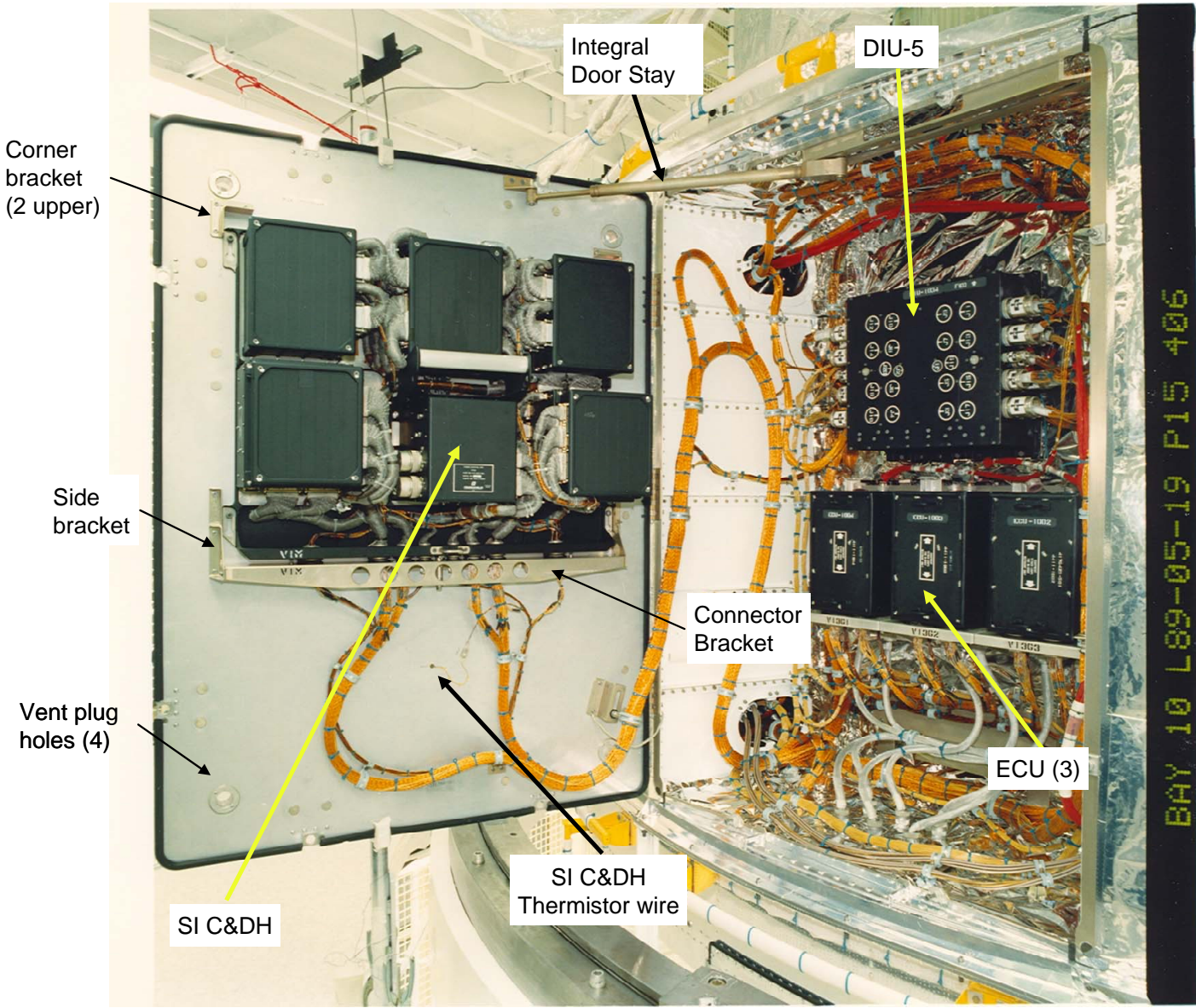


SI C&DH OVERVIEW

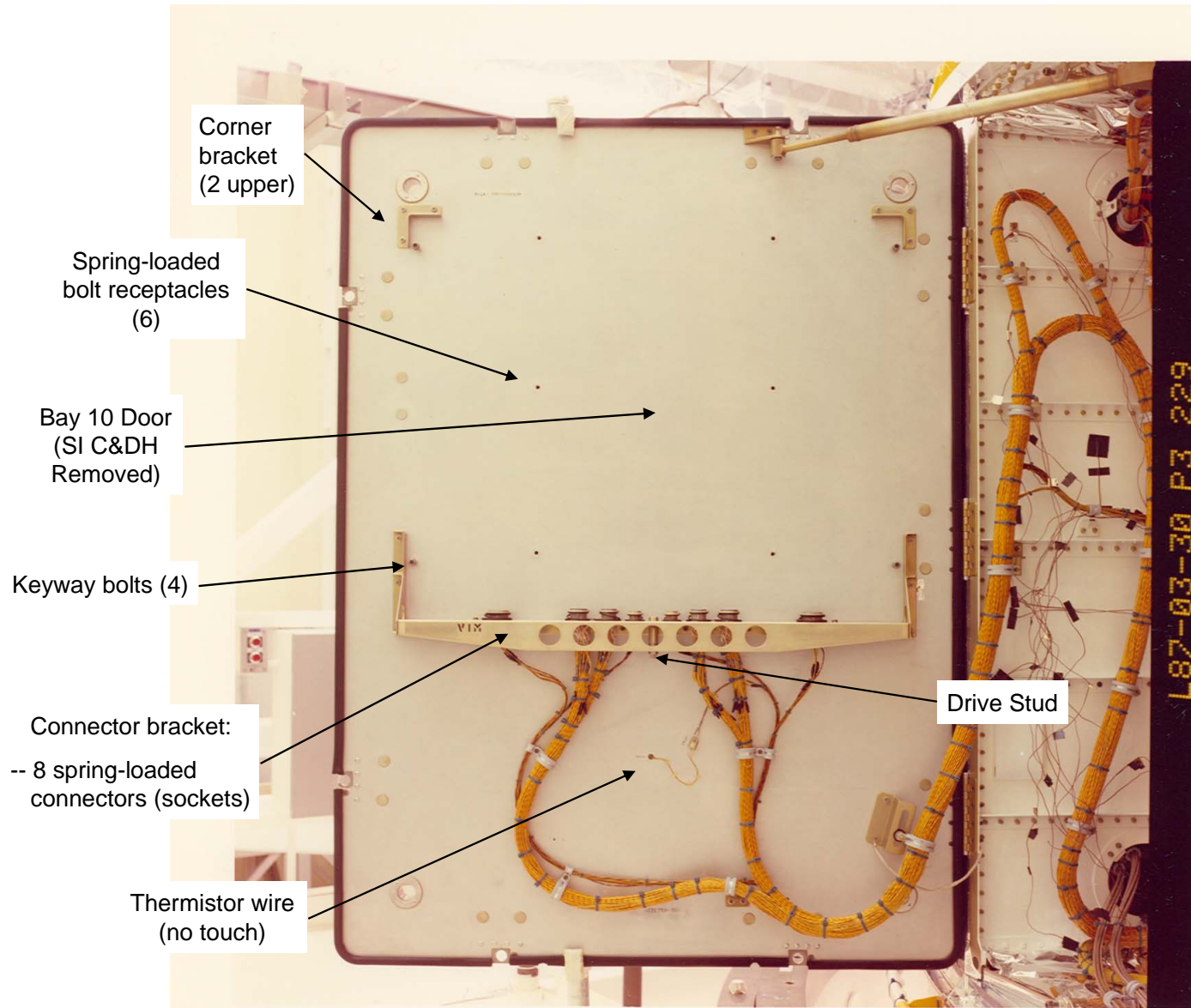


BAY 10 INTERNAL OVERVIEW WITH SI C&DH

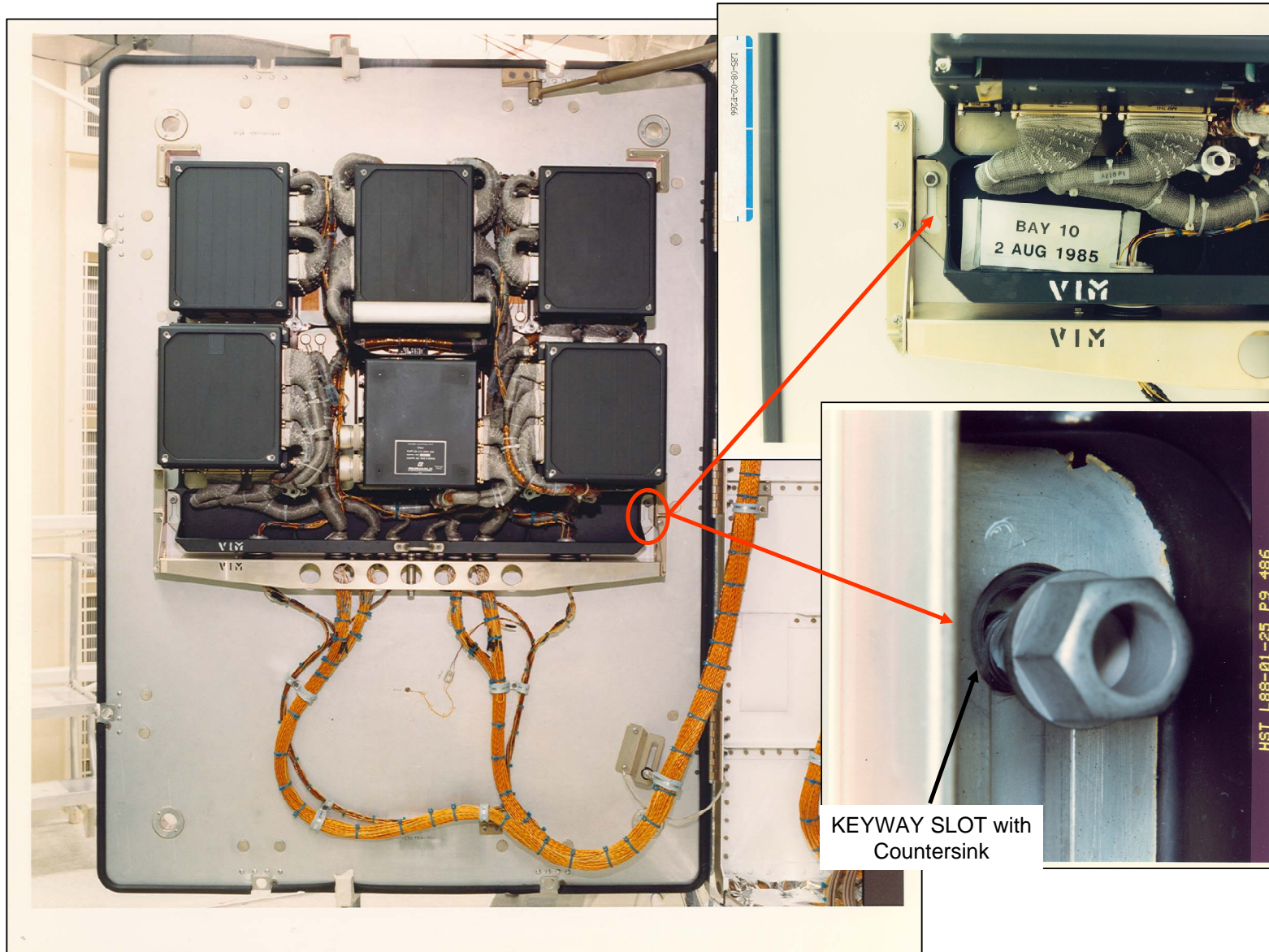
I



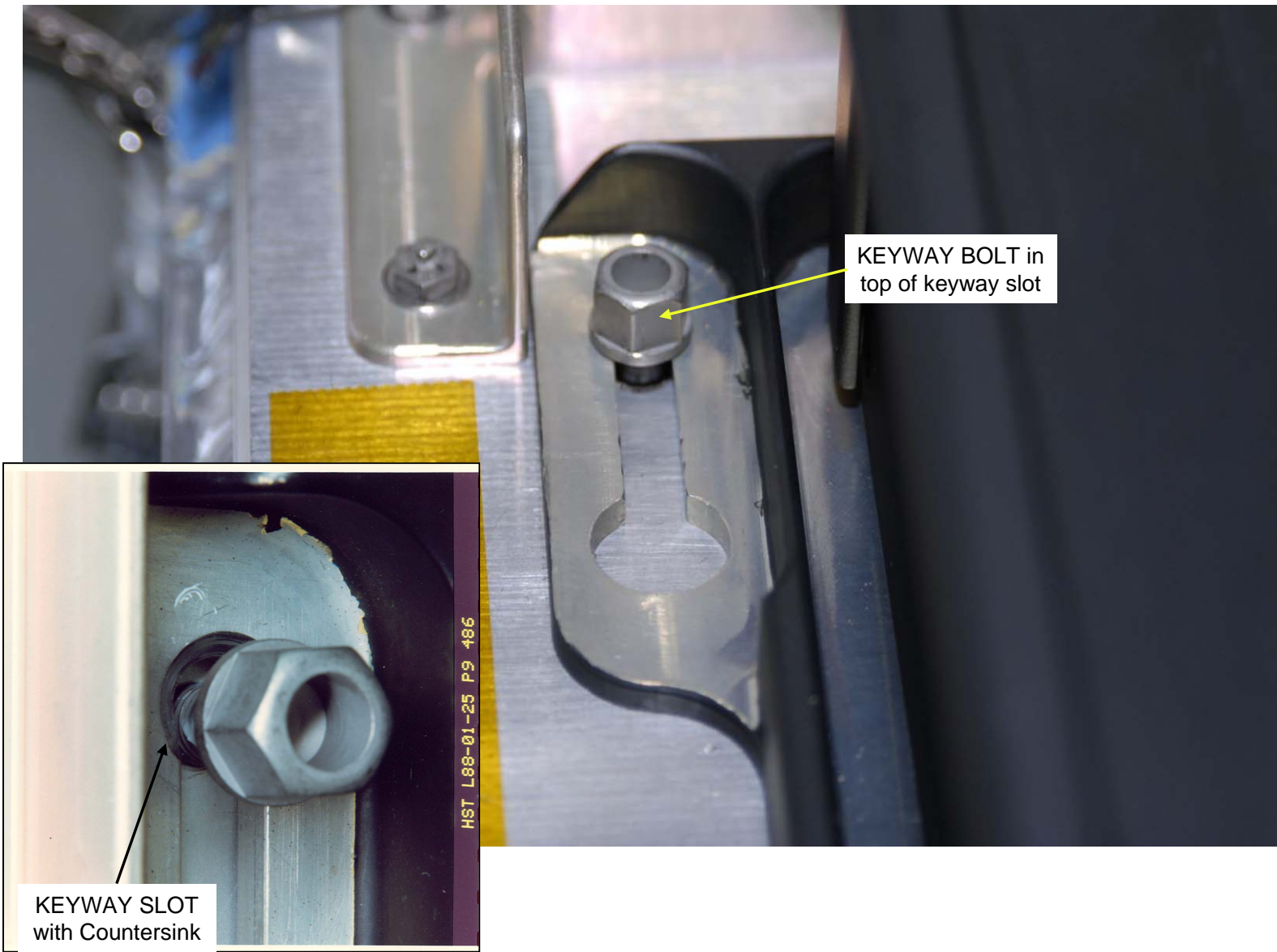
**BAY 10 INTERNAL OVERVIEW – SI C&DH REMOVED**



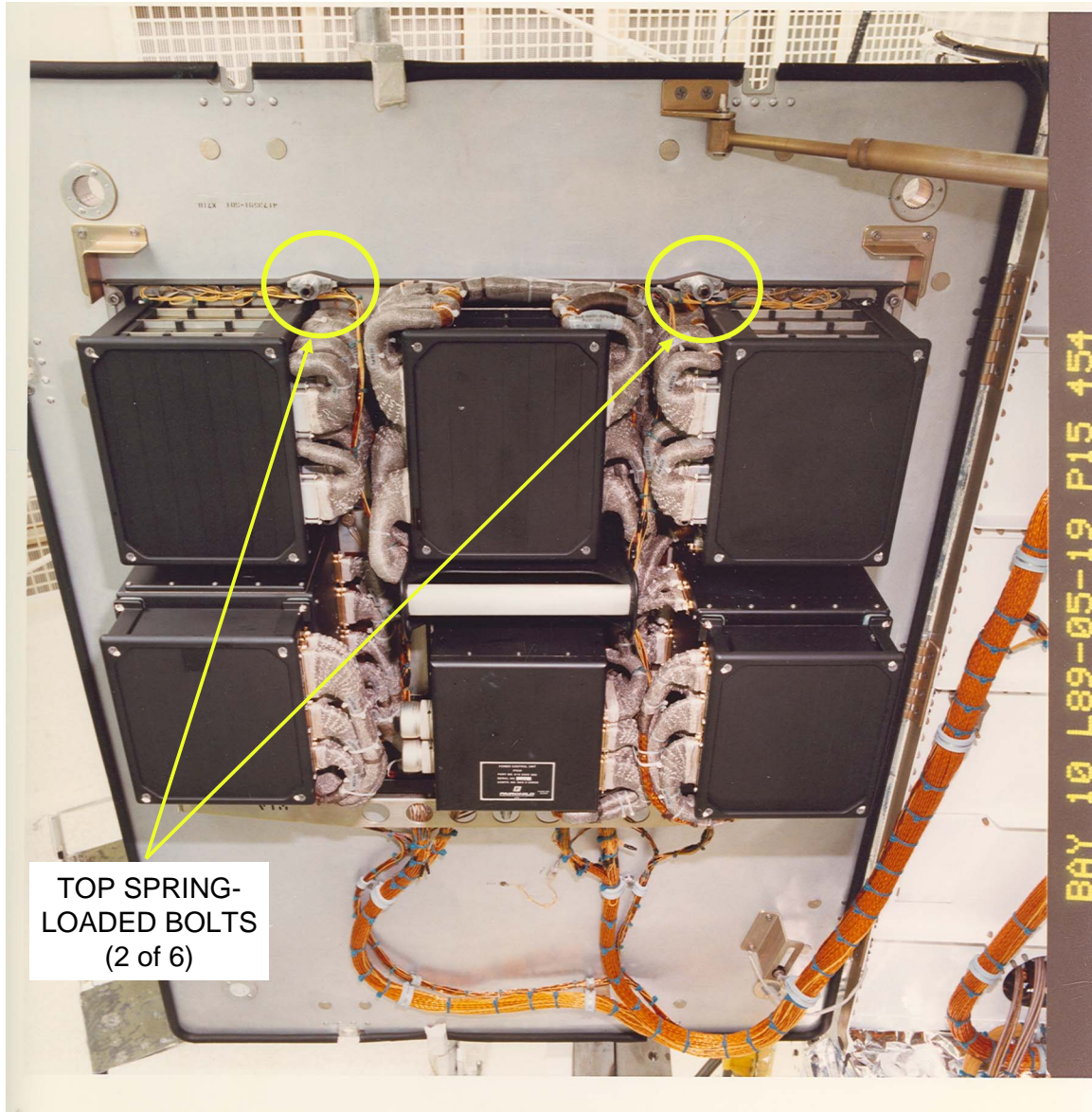
# SI C&DH OVERVIEW: KEYWAY BOLTS



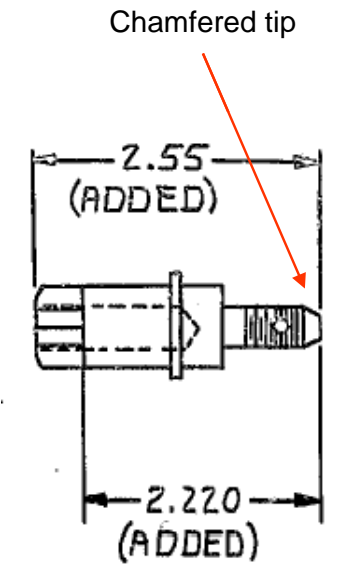
SI C&DH OVERVIEW: KEYWAY BOLTS (Cont)



# SI C&DH OVERVIEW: SPRING-LOADED BOLTS

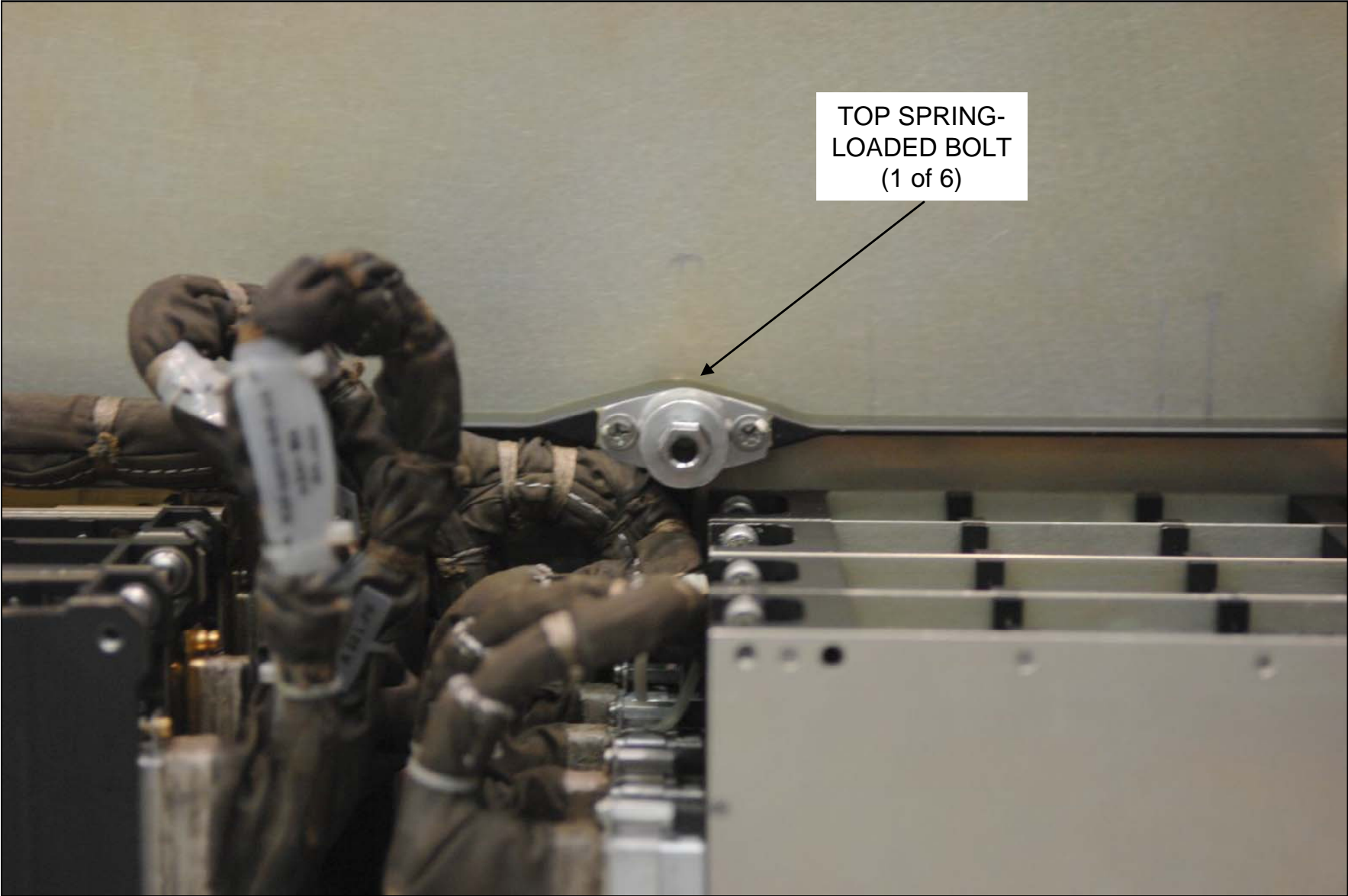


TOP SPRING-LOADED BOLTS  
(2 of 6)

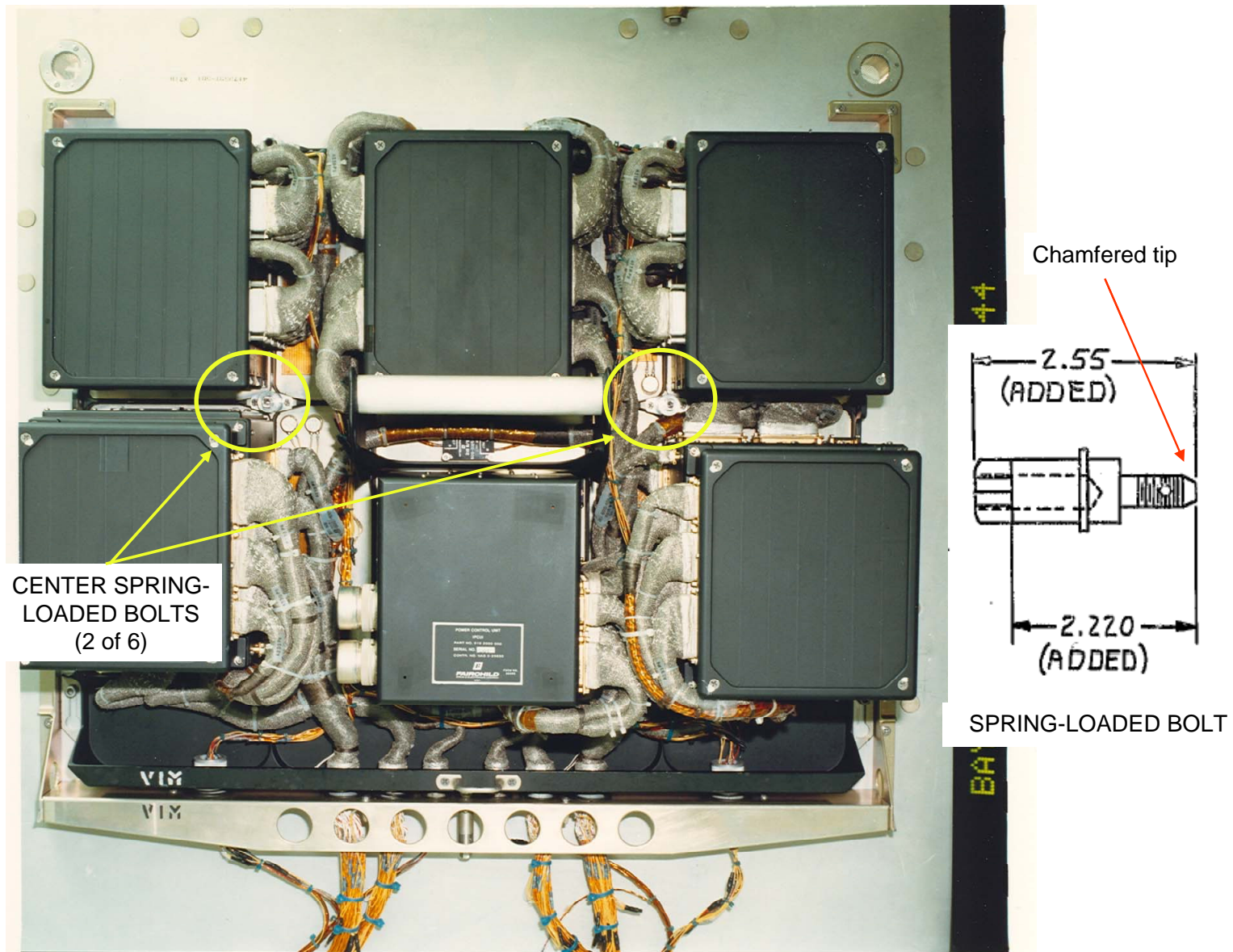


SPRING-LOADED BOLT

SI C&DH OVERVIEW: SPRING-LOADED BOLTS (Cont)

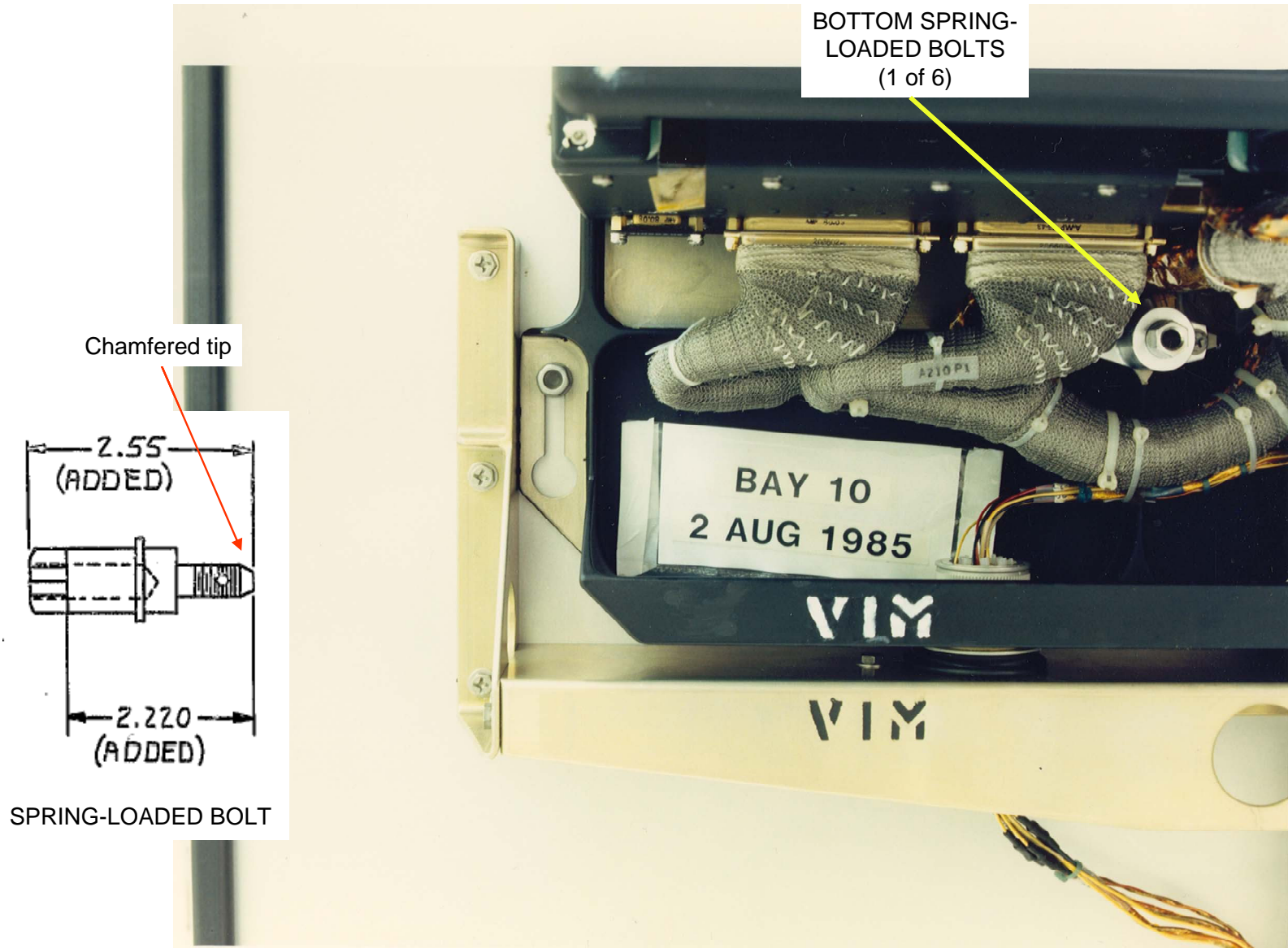


# SI C&DH OVERVIEW: SPRING-LOADED BOLTS (Cont)

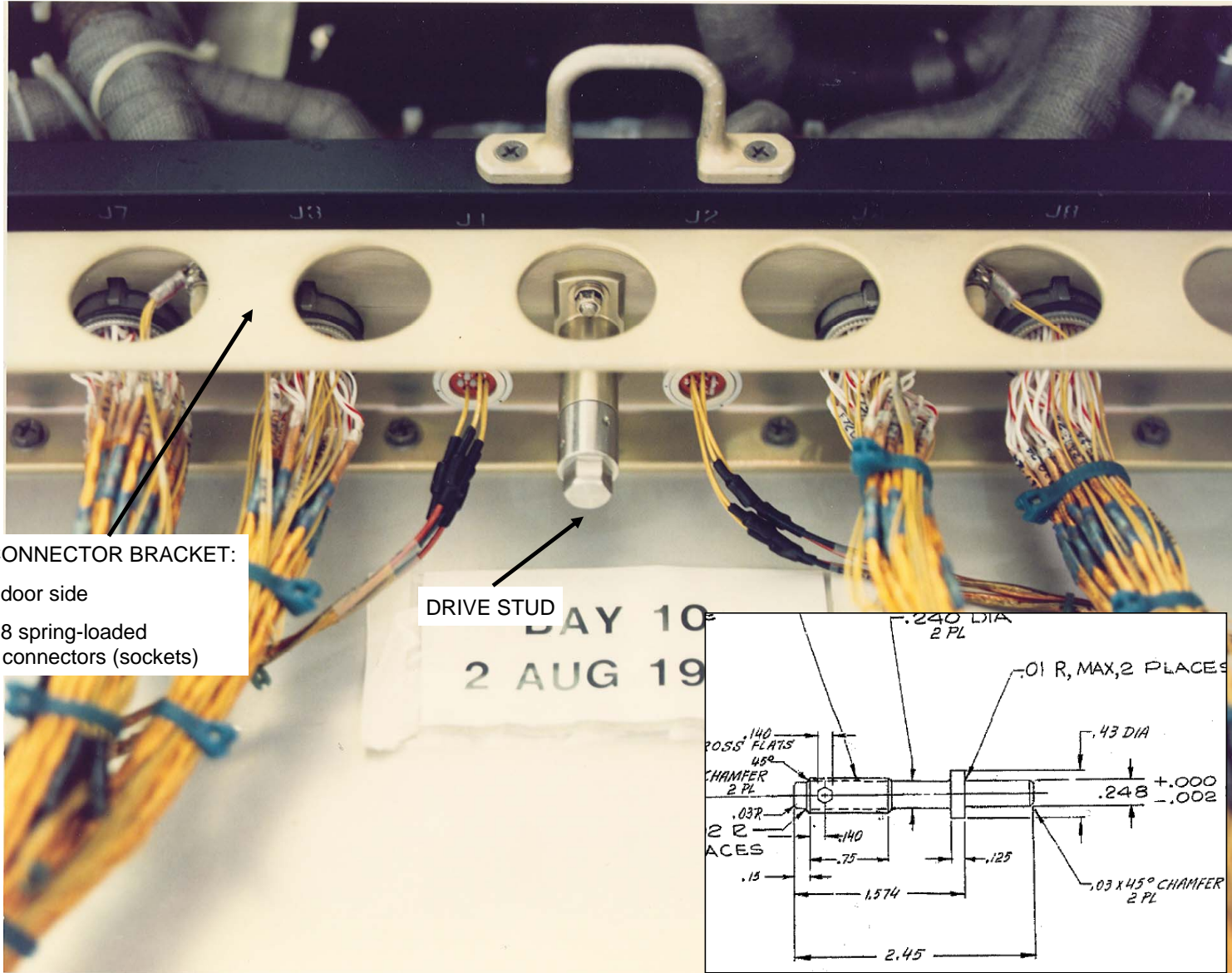




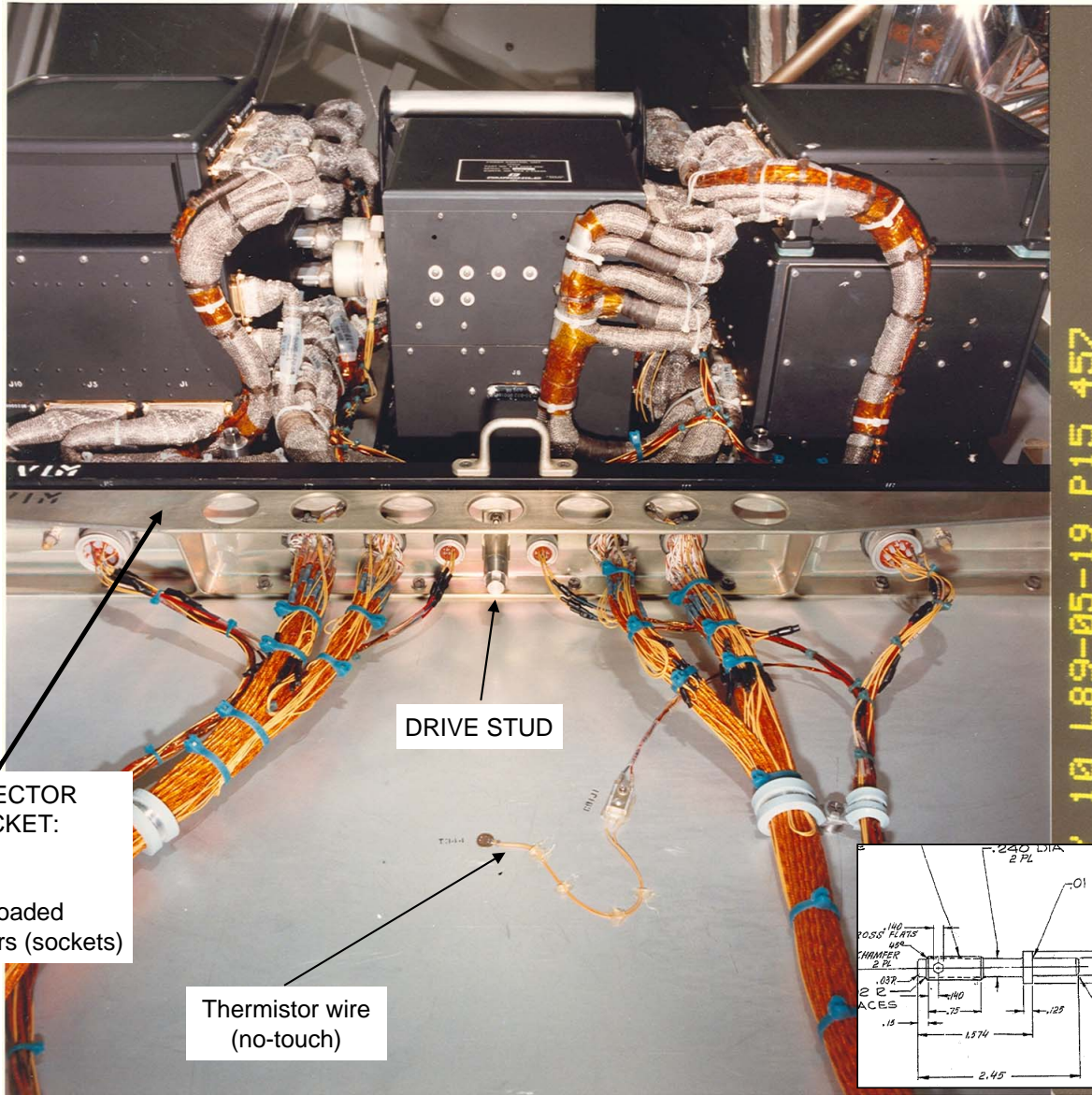
SI C&DH OVERVIEW: SPRING-LOADED BOLTS (Cont)



# SI C&DH OVERVIEW: CONNECTOR BRACKET & DRIVE STUD



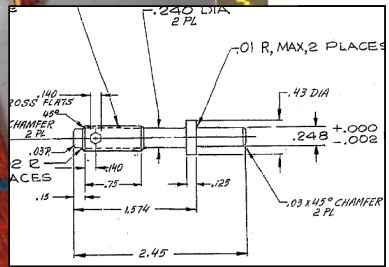
SI C&DH OVERVIEW: CONNECTOR BRACKET & DRIVE STUD (Cont)



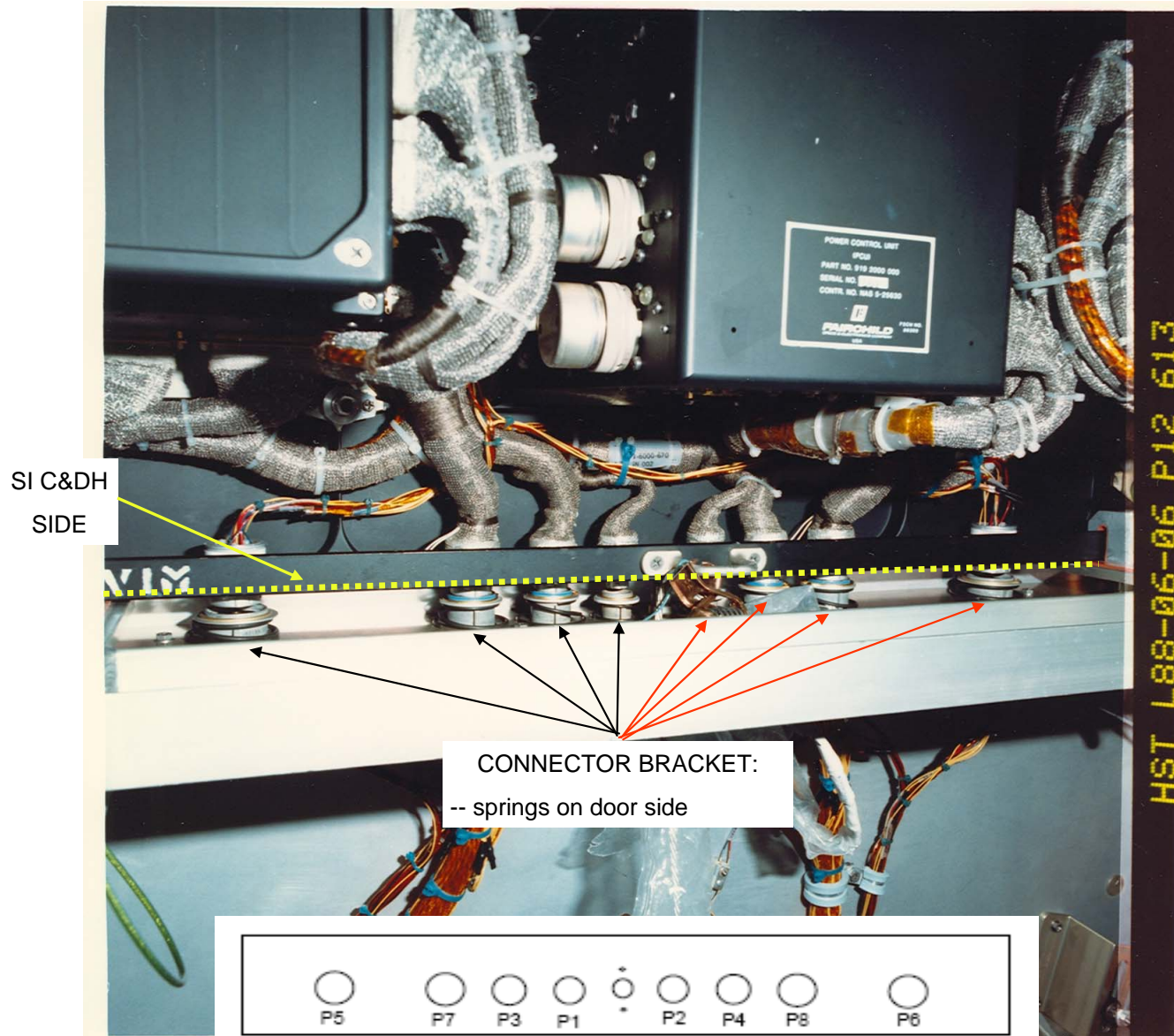
CONNECTOR BRACKET:  
 -- door side  
 -- 8 spring-loaded connectors (sockets)

DRIVE STUD

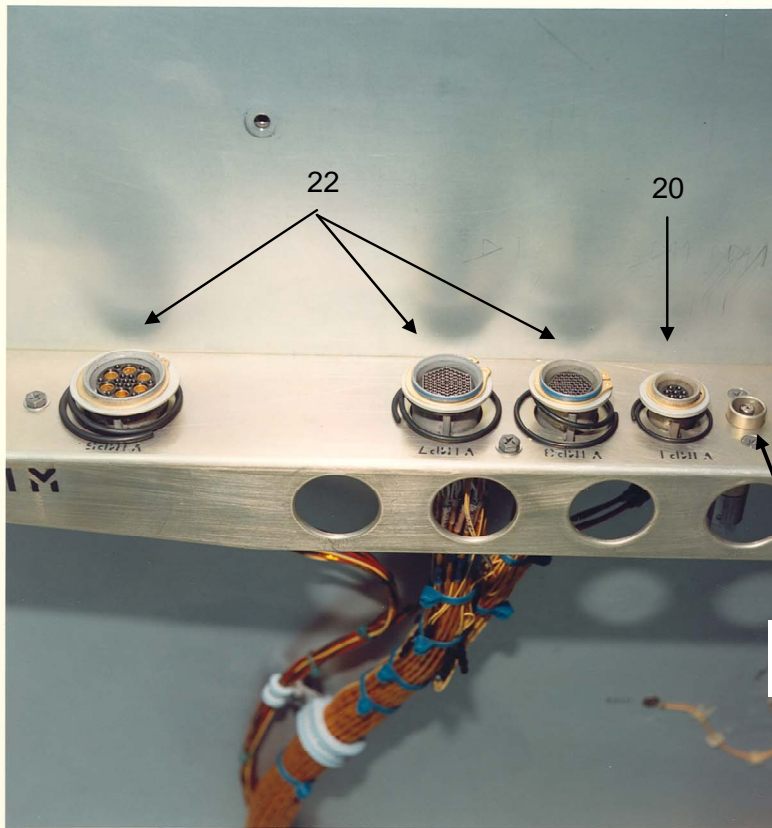
Thermistor wire (no-touch)



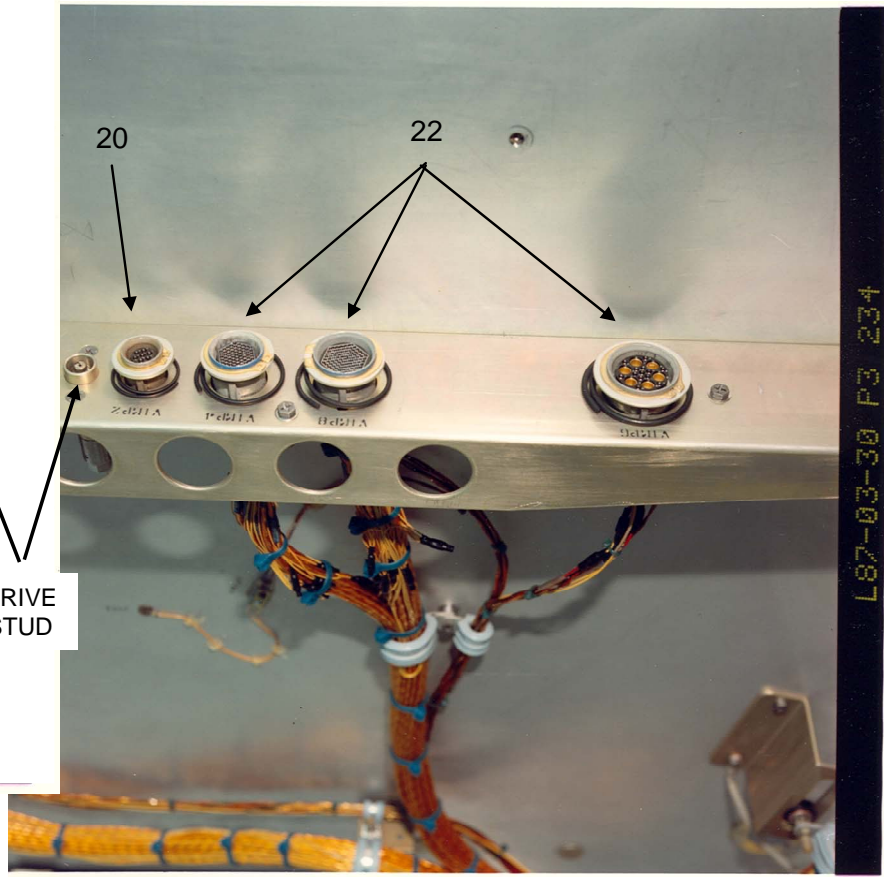
SI C&DH OVERVIEW: CONNECTOR BRACKET & DRIVE STUD (Cont)



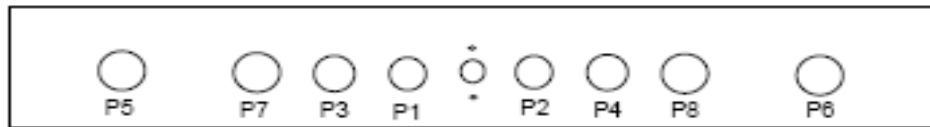
SI C&DH OVERVIEW: CONNECTOR BRACKET & DRIVE STUD (Cont)



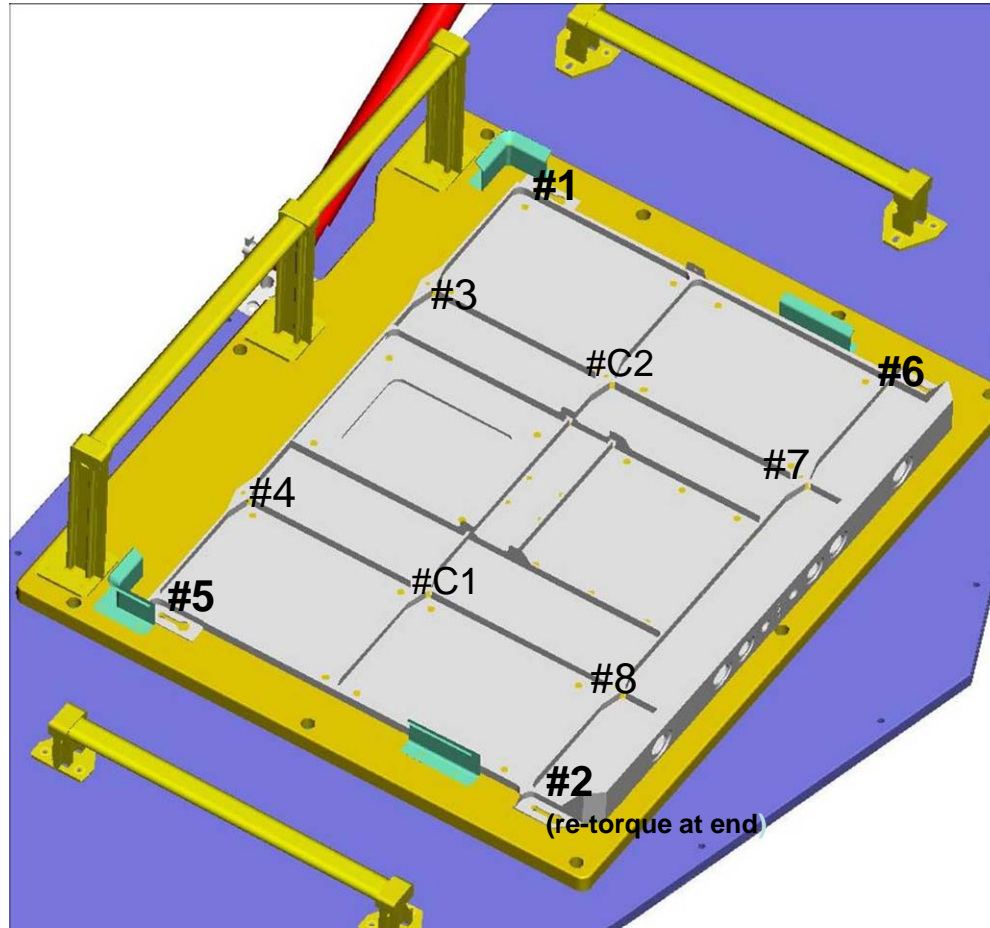
LEFT CONNECTORS



RIGHT CONNECTORS

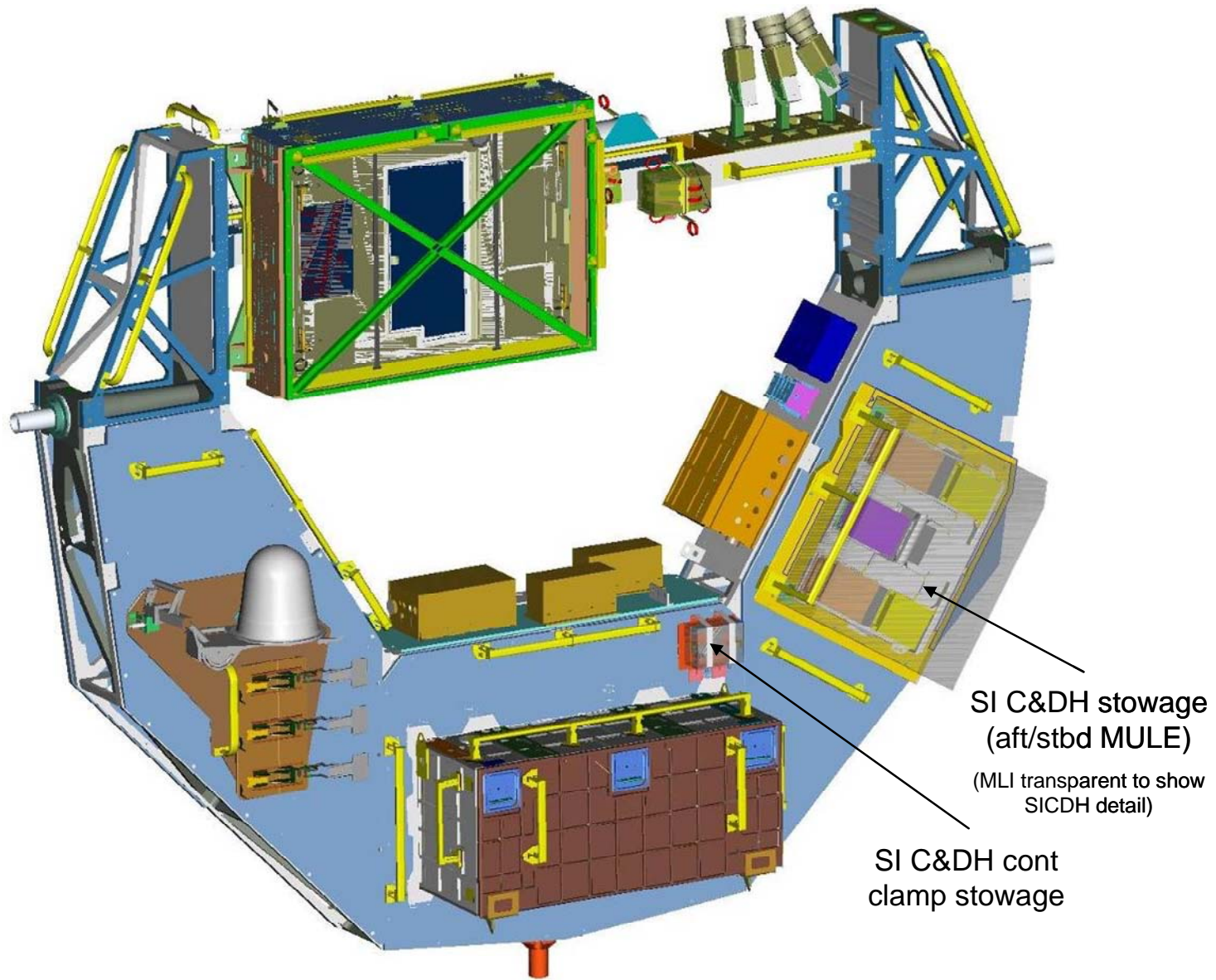


# MULE SPA SI C&DH BOLT INSTALL ORDER

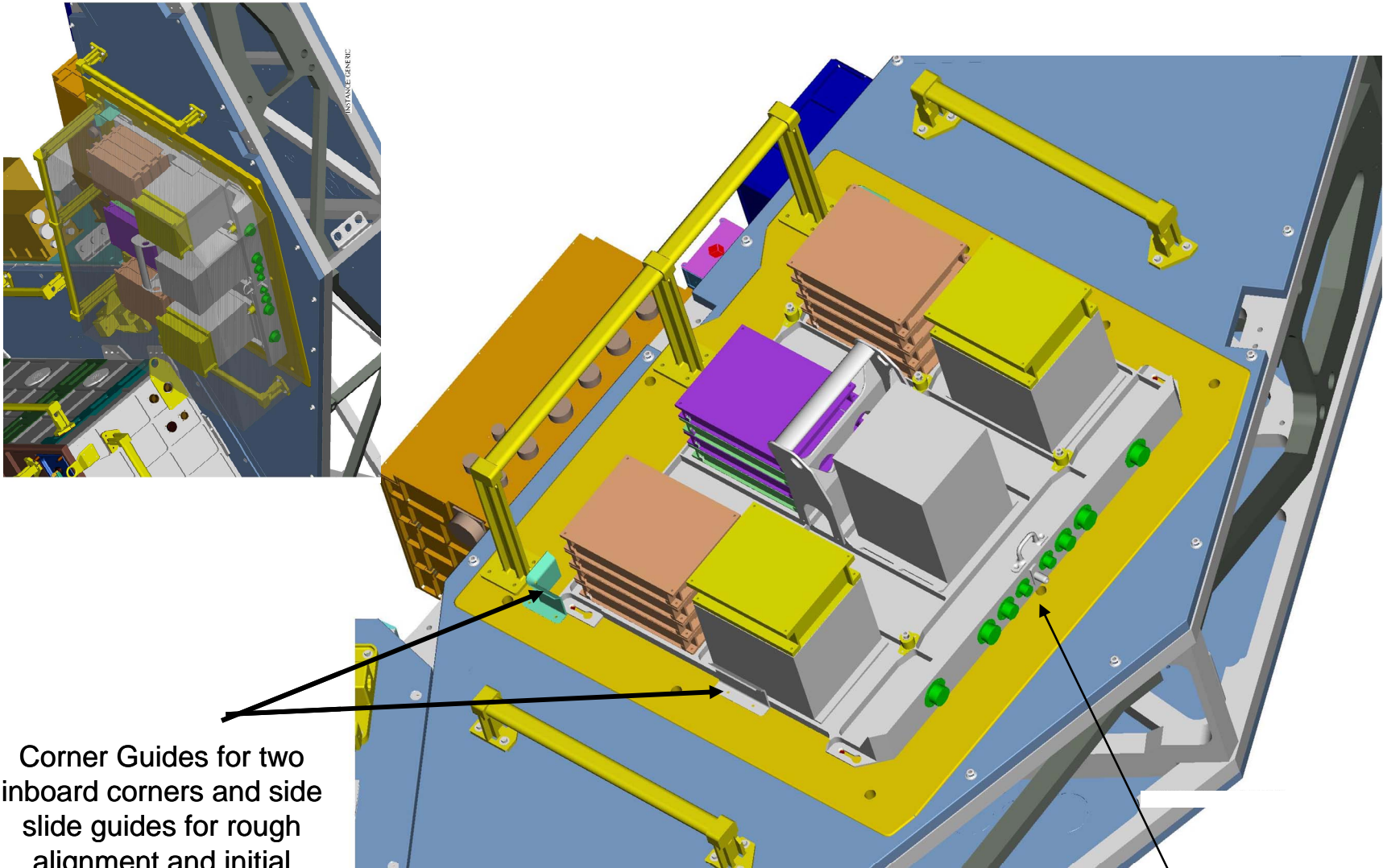


# MULE AFT VIEW

I



SI C&DH OVERVIEW: SPARE SI C&DH STORAGE ON MULE

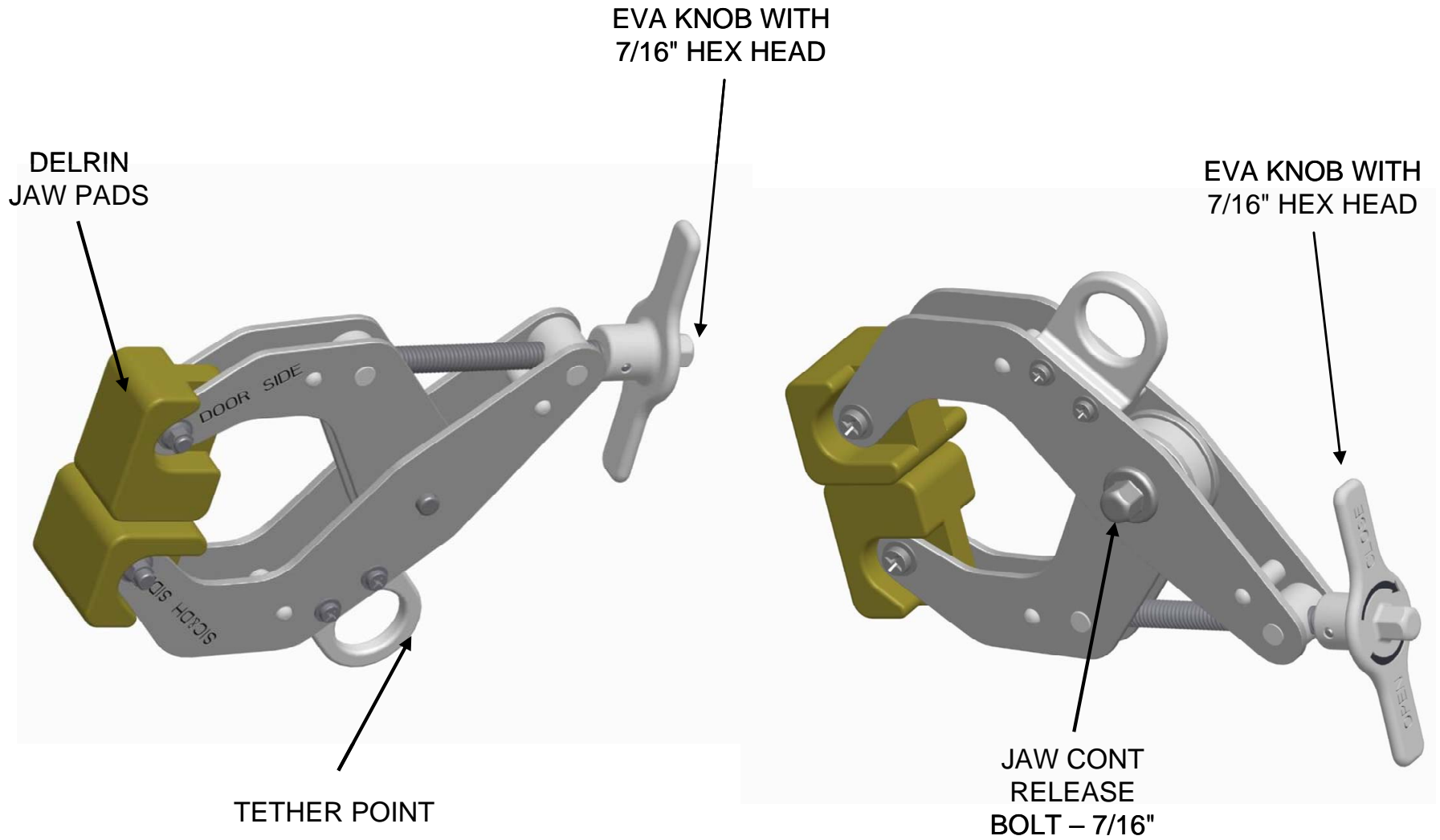


Corner Guides for two inboard corners and side slide guides for rough alignment and initial engagement

Connector bracket will have cover



SI C&DH CONTINGENCY CLAMP

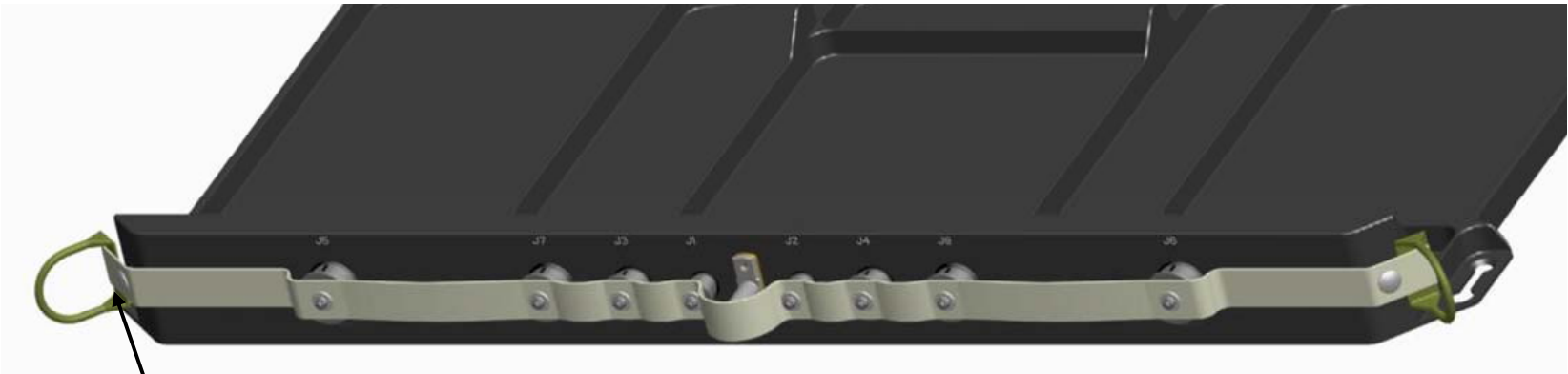


# SI C&DH CONNECTOR COVER

TETHER POINT  
(1 per side)



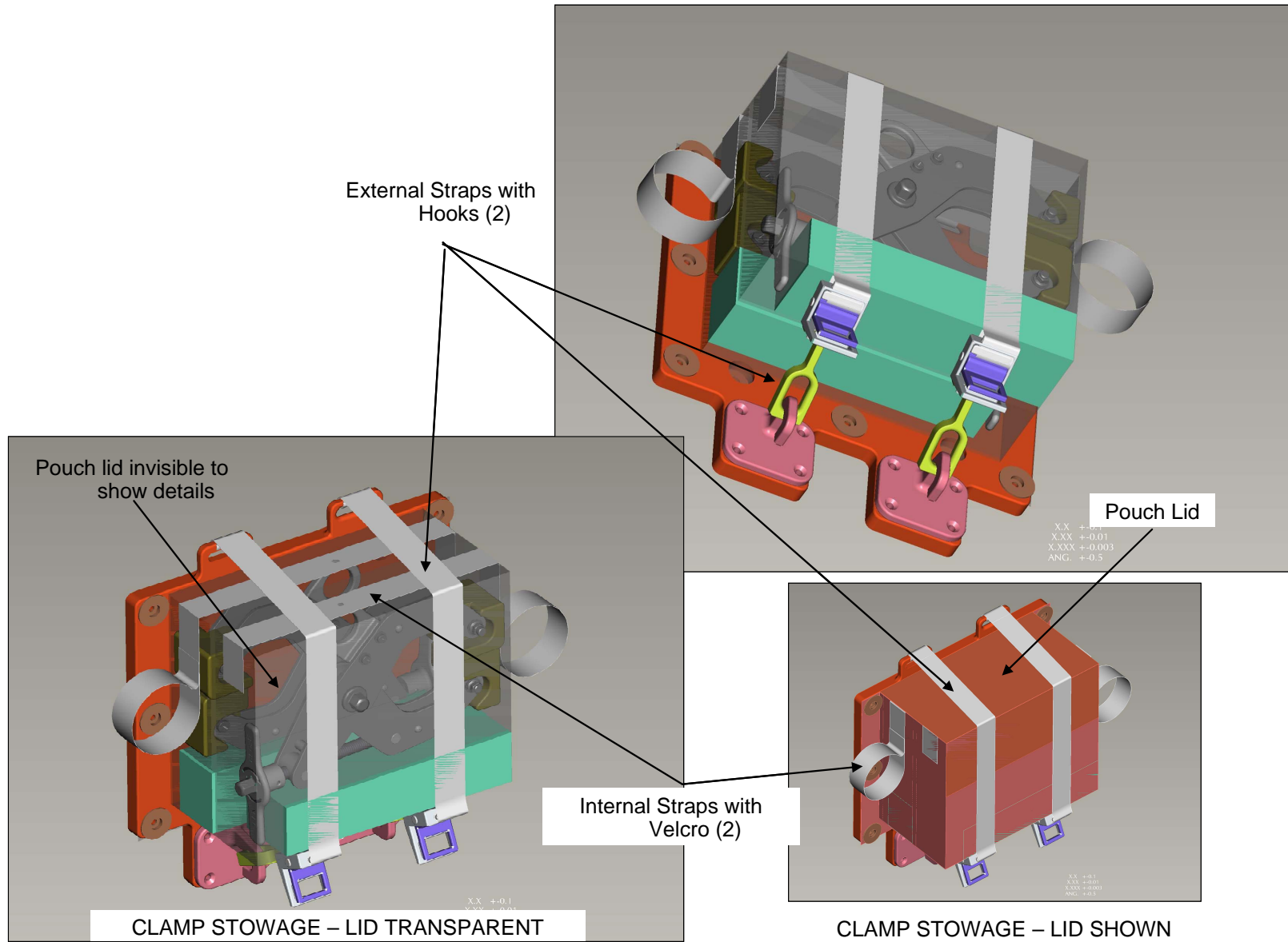
EVA SNAPS  
(1 per side)



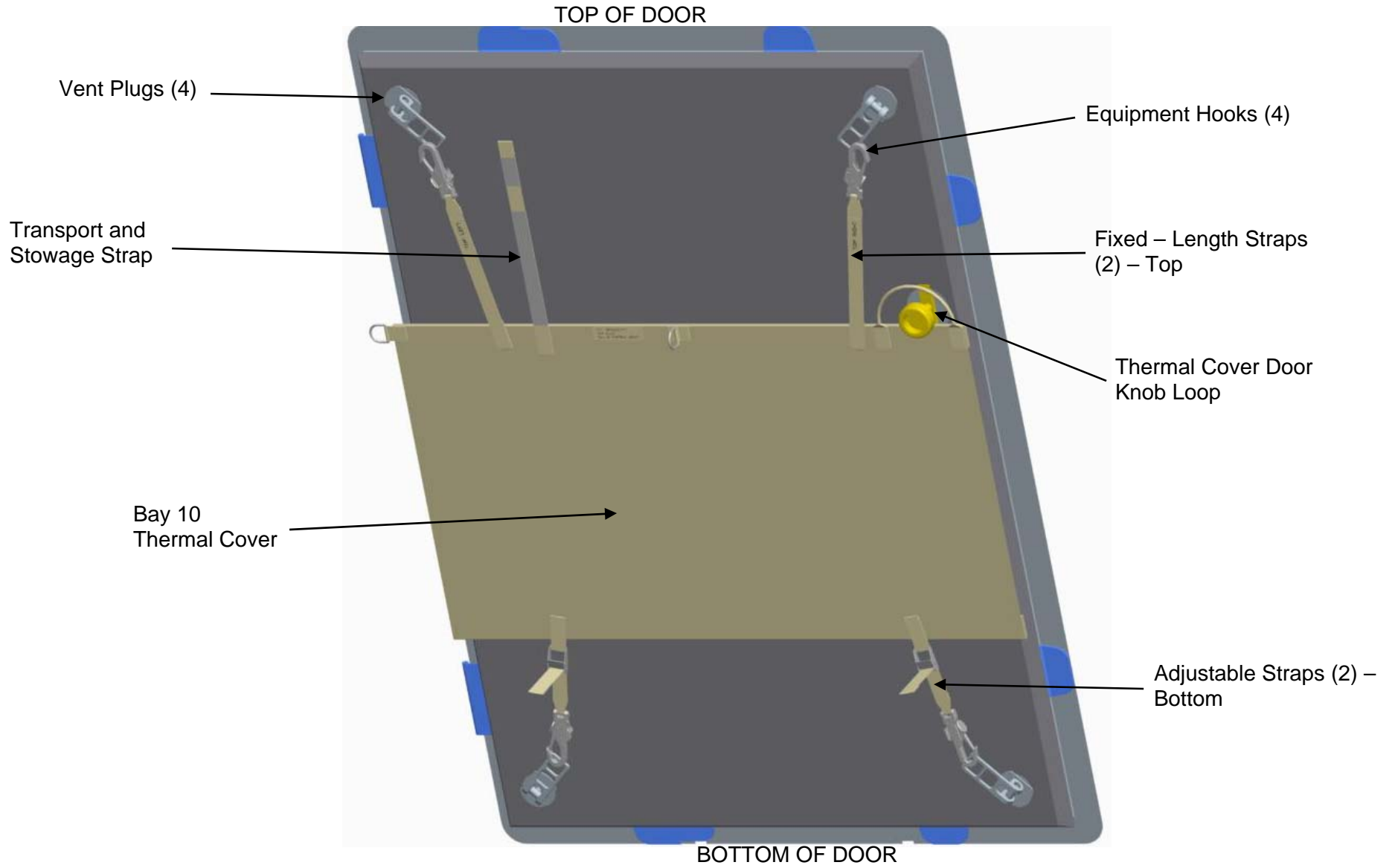
EVA SNAPS  
(1 per side)

CONNECTOR COVER INSTALLED

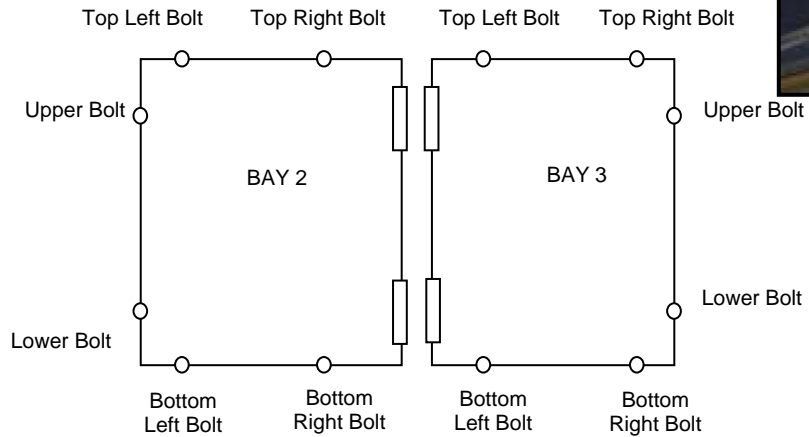
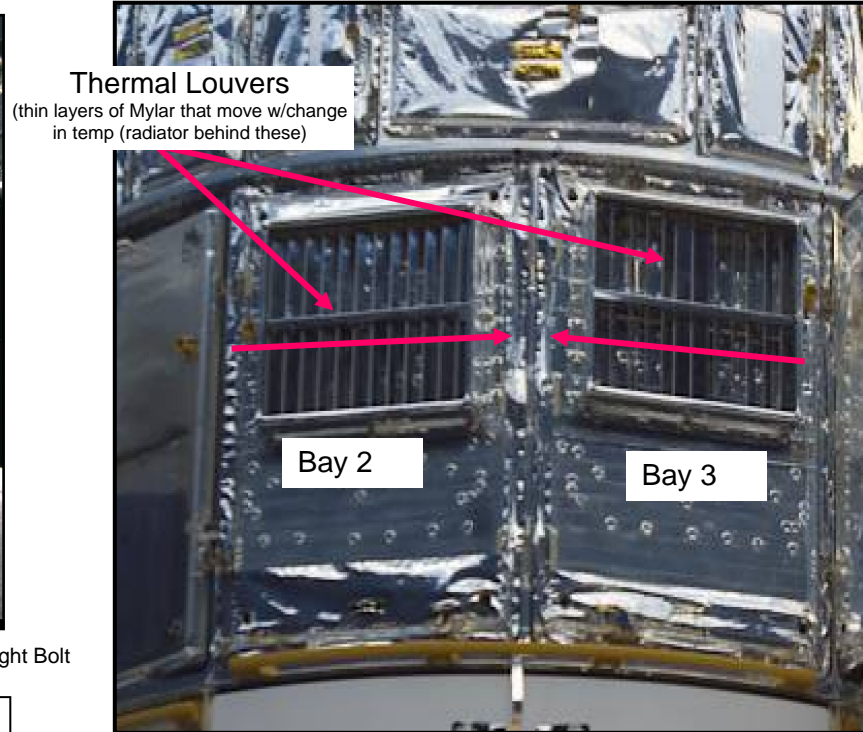
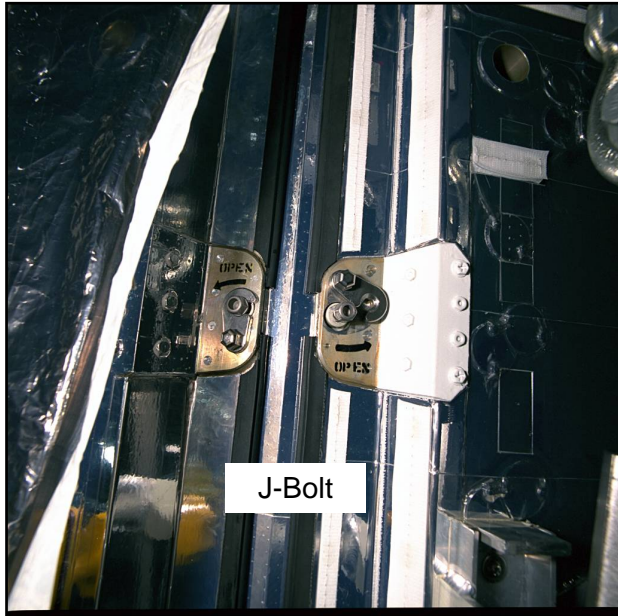
# SI C&DH CONTINGENCY CLAMP STORAGE



# BAY 10 THERMAL COVER



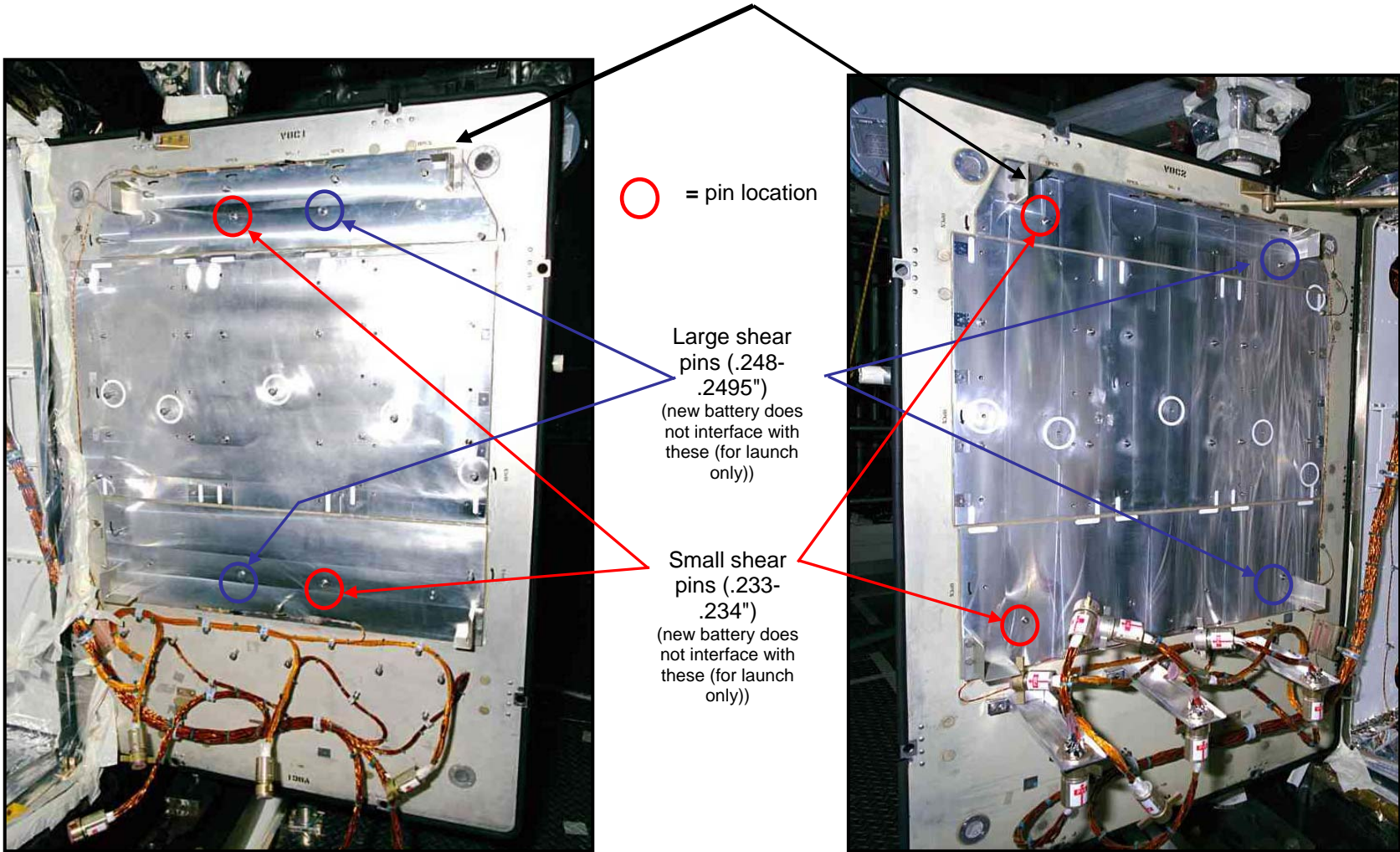
# BATTERY DOOR OVERVIEW



BAY 2 AND BAY 3 BOLT NOMENCLATURE

# BATTERY

## BATTERY DOOR OVERVIEW (Cont)



BAY 2 DOOR  
(SHEAR PINS)

BAY 3 DOOR  
(SHEAR PINS)

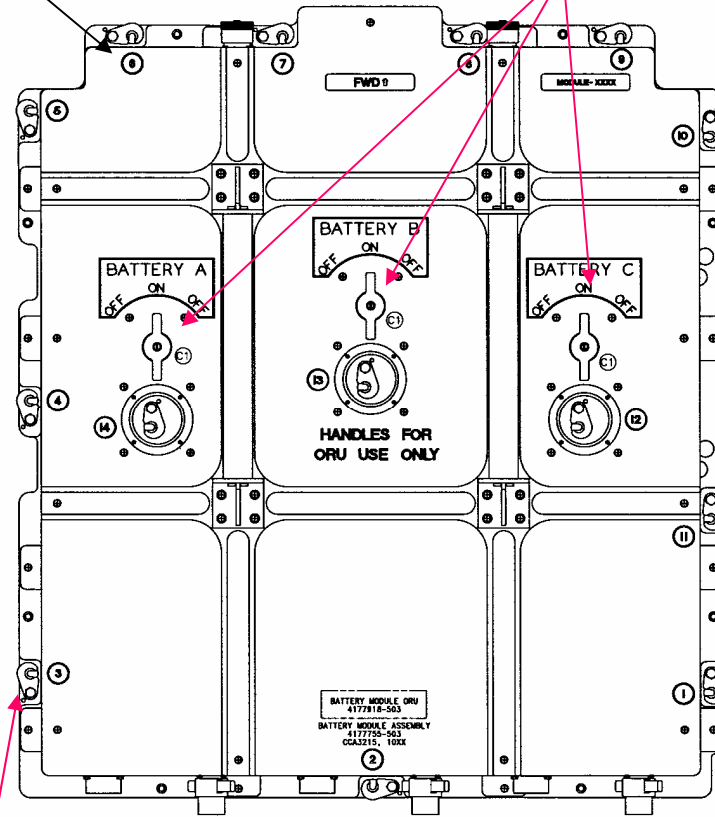
# BATTERY OVERVIEW



OLD BATTERY

Bolts Are Labeled on Battery-R

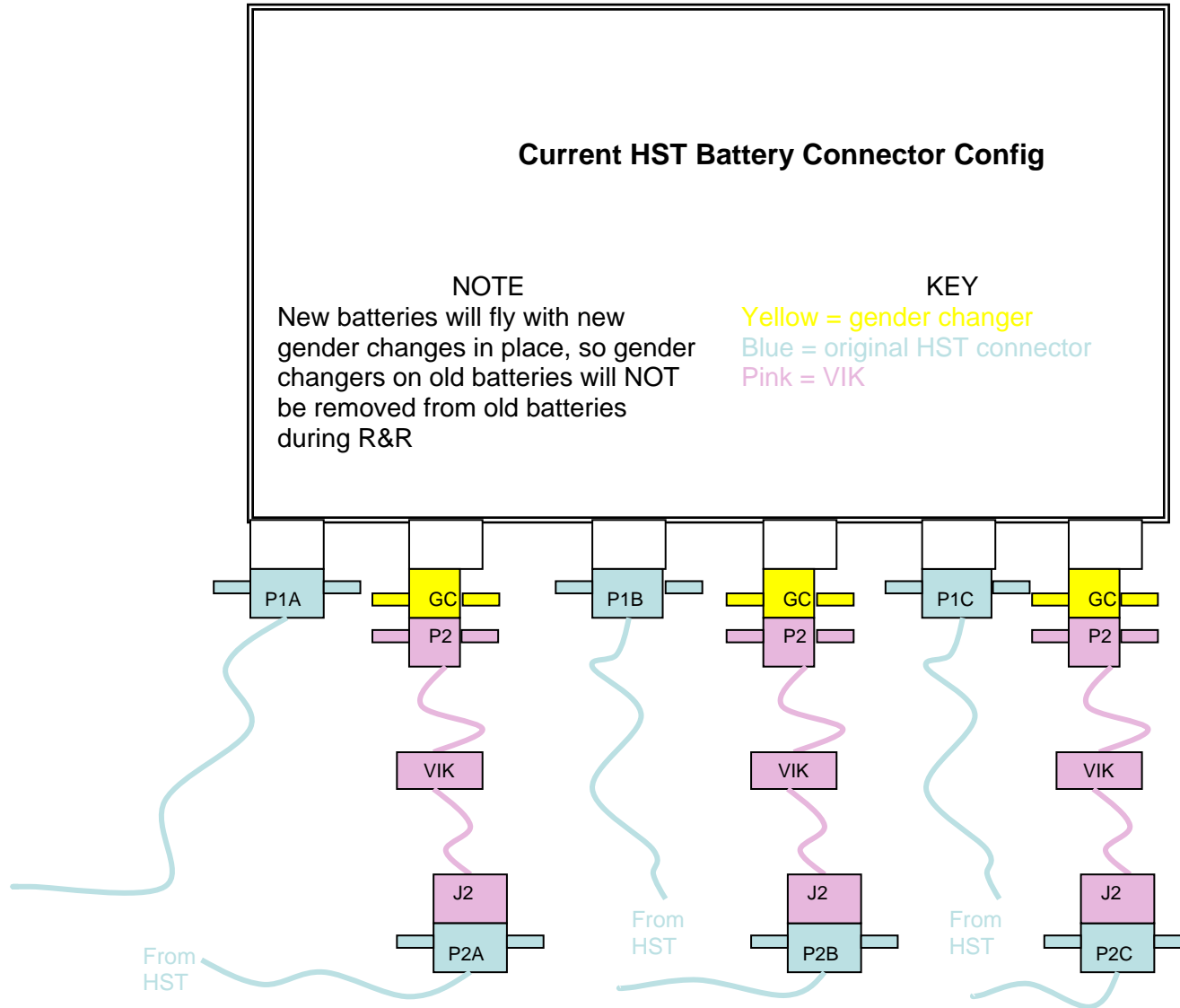
Isolators (only on new batteries)



J-hook on battery, bolt on HST side

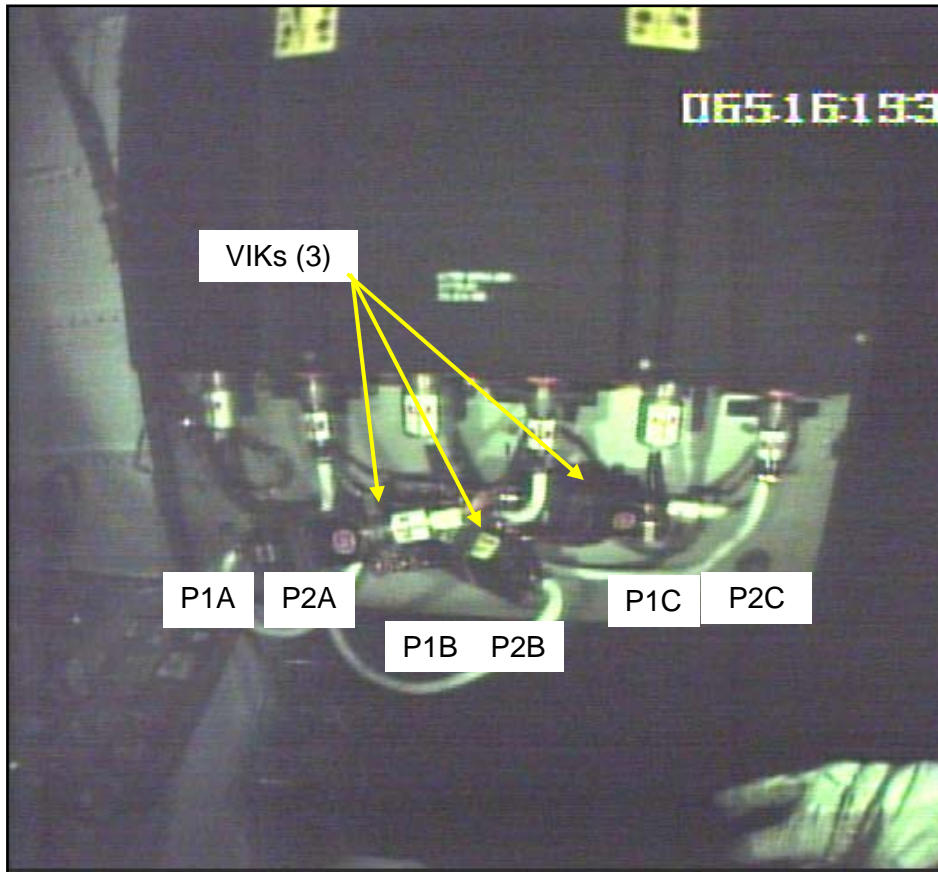
BATTERY-R

## BATTERY OVERVIEW (Cont)





**BATTERIES WITH VIKS INSTALLED**

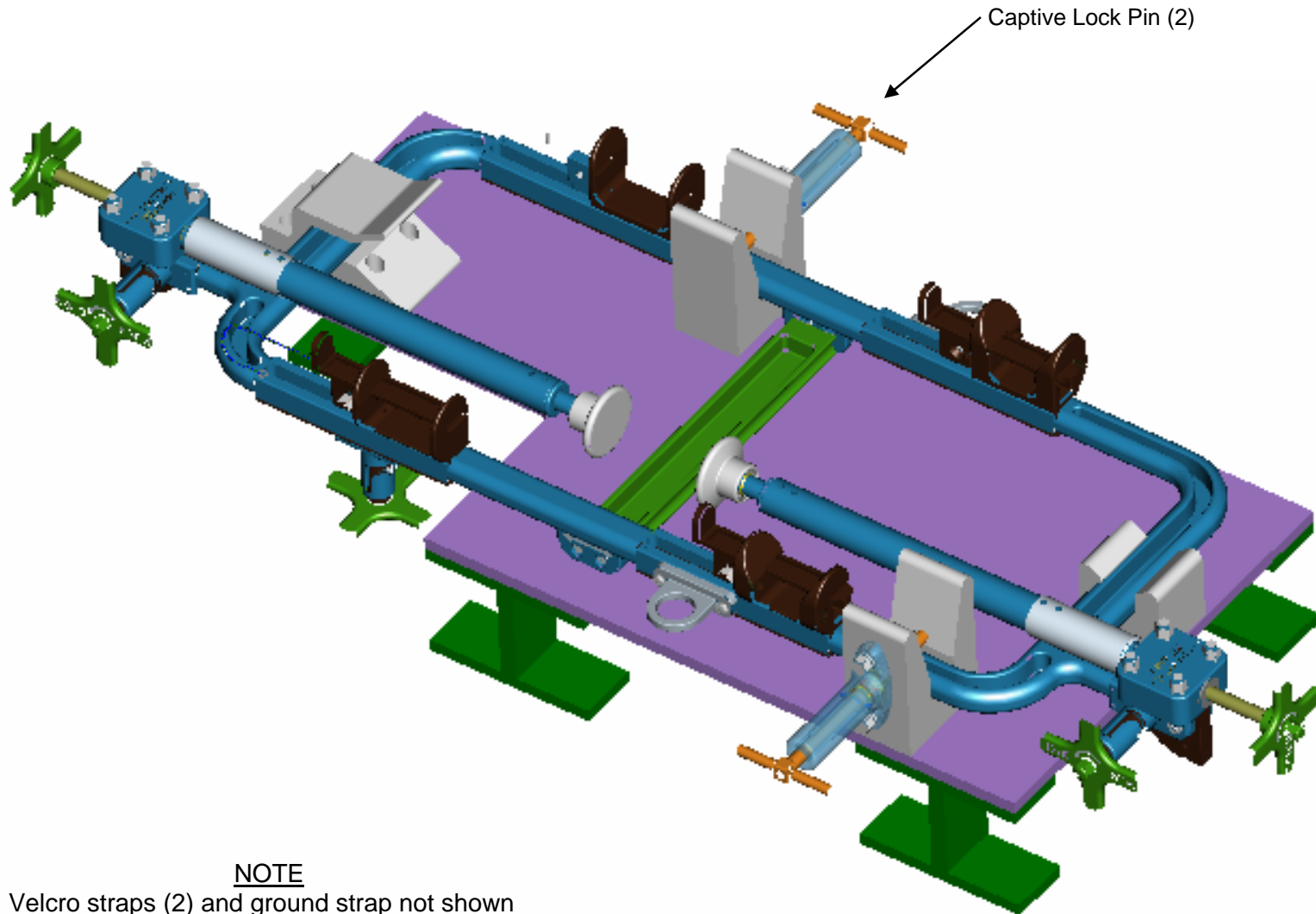


**BAY 2  
CONNECTORS**

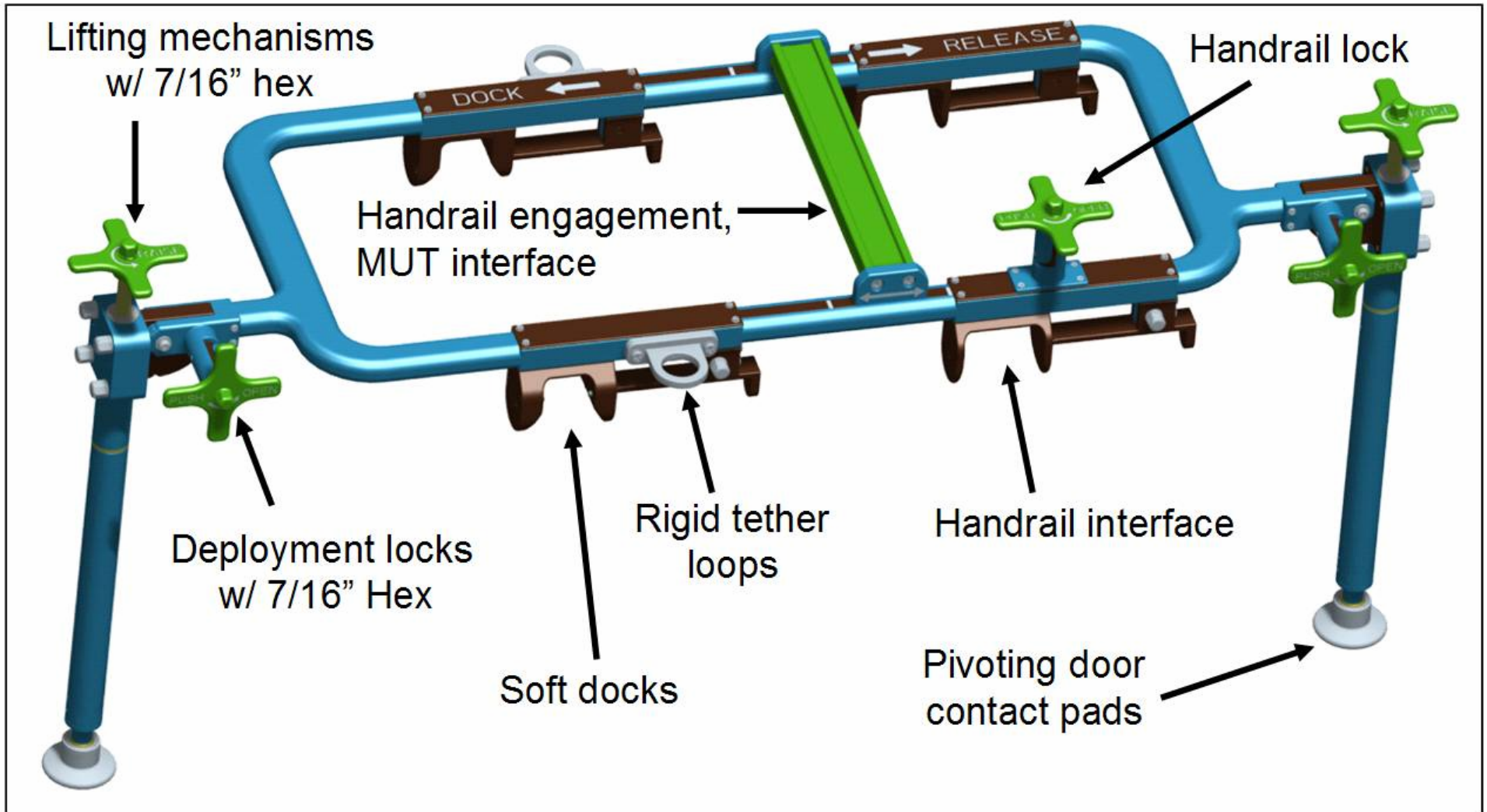


**BAY 3  
CONNECTORS**

## BATTERY EXTRACTION TOOL – STOWED ON SLIC

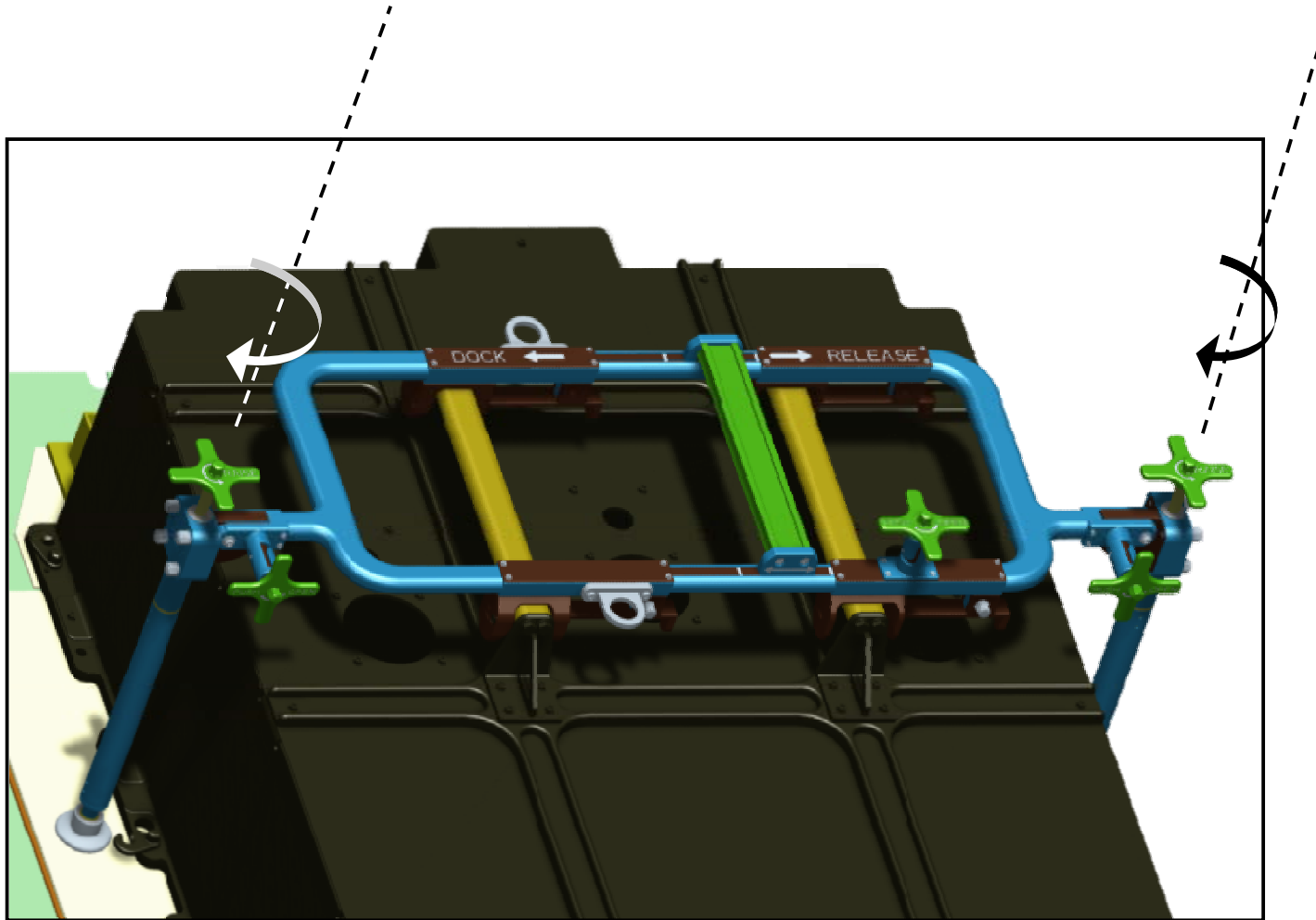


**BATTERY EXTRACTION TOOL – DEPLOYED CONFIG**



(Tool Shown Deployed)

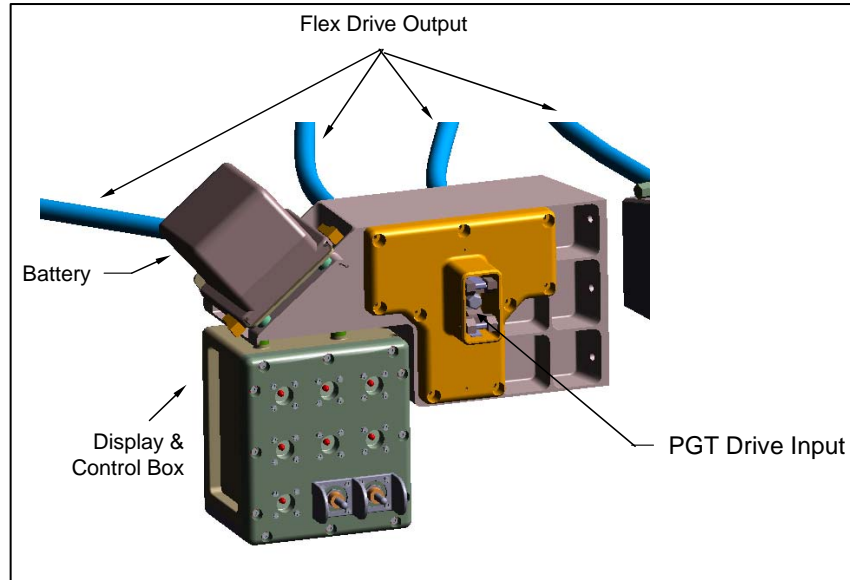
**BATTERY EXTRACTION TOOL – INSTALLED ON BATTERY**



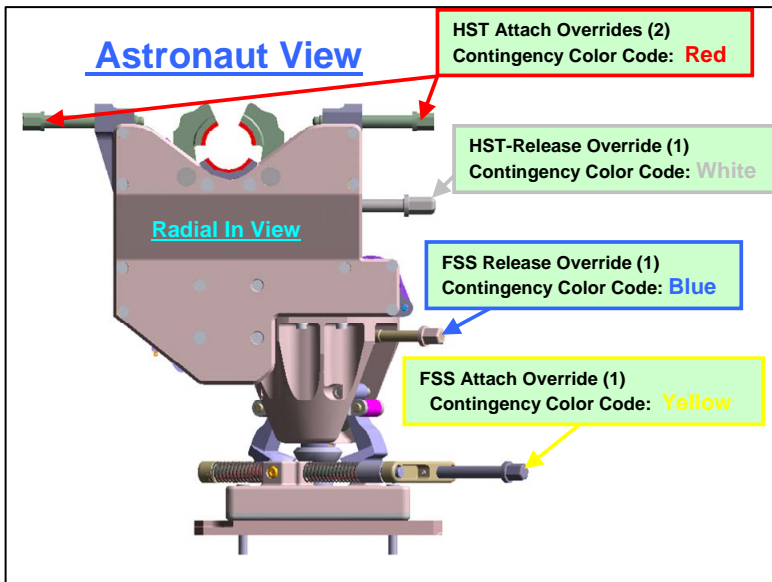
**BET INSTALLED ON BATTERY**

# SOFT CAPTURE MECHANISM (SCM)

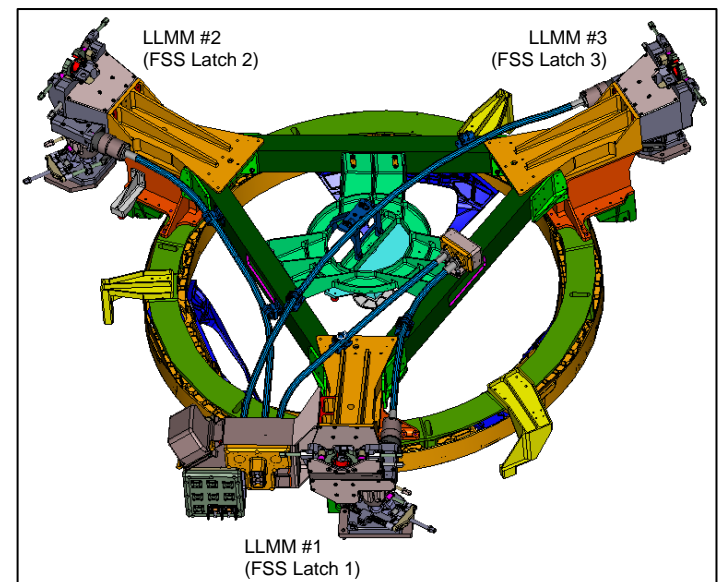
Nominal SCM Drive:



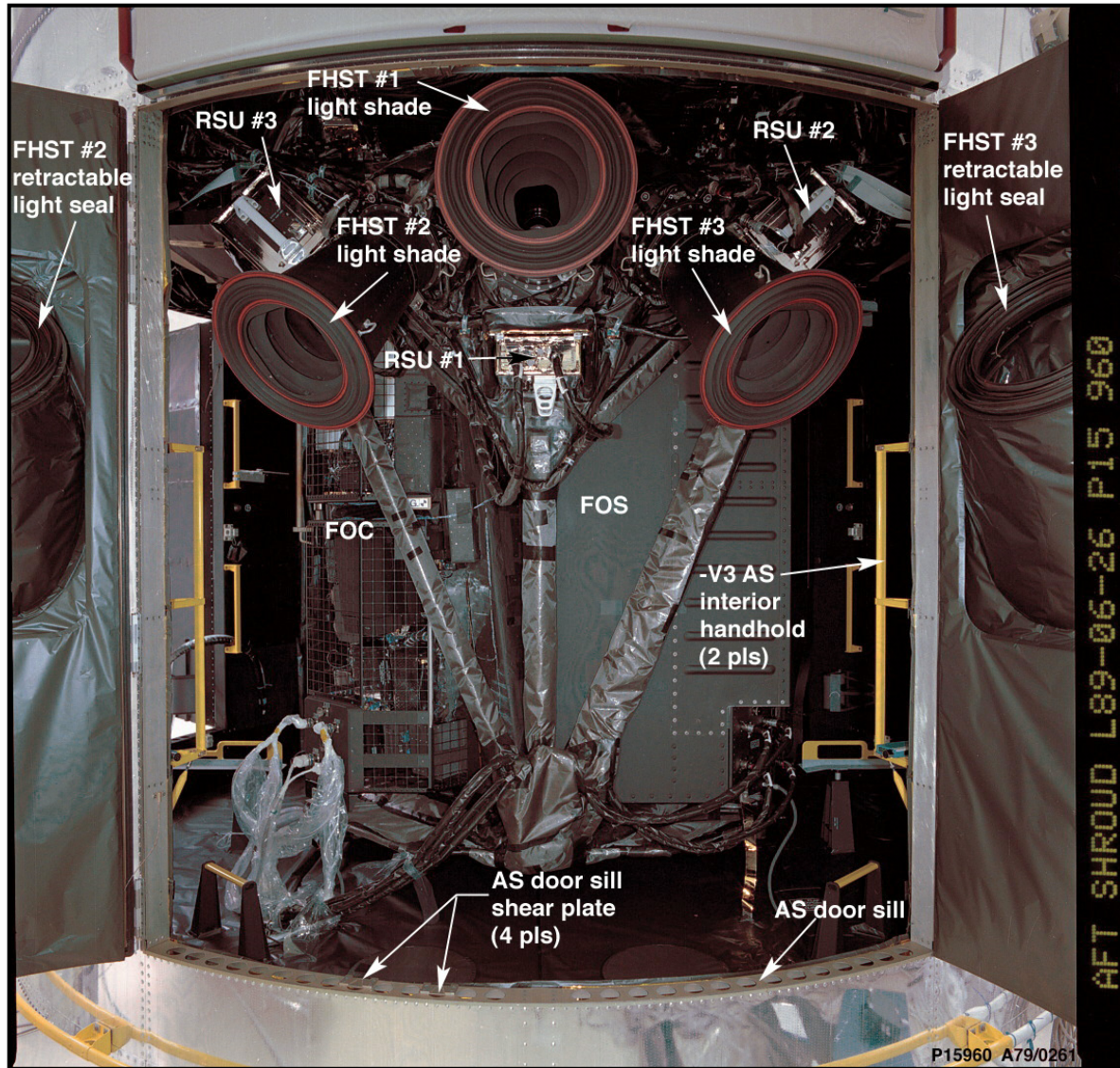
SCM Overrides:



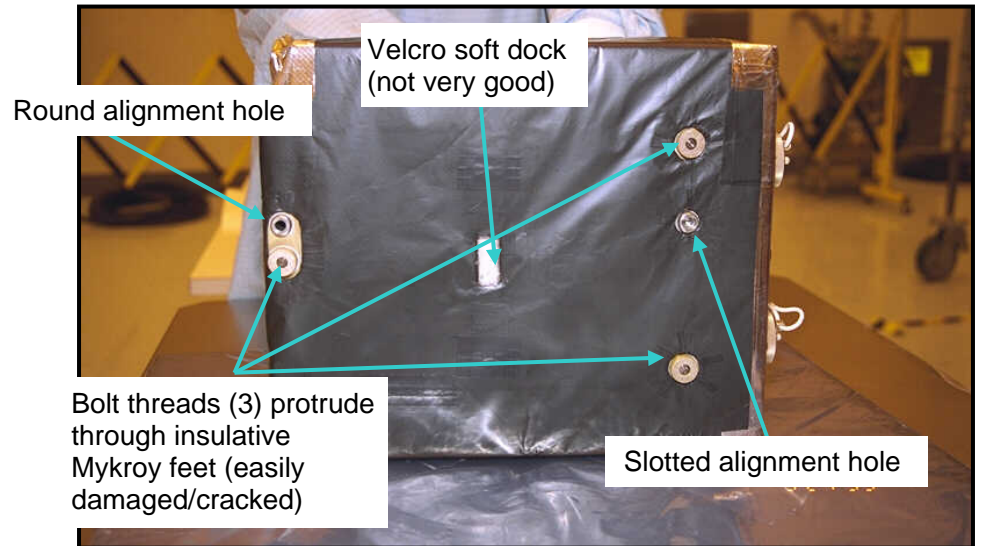
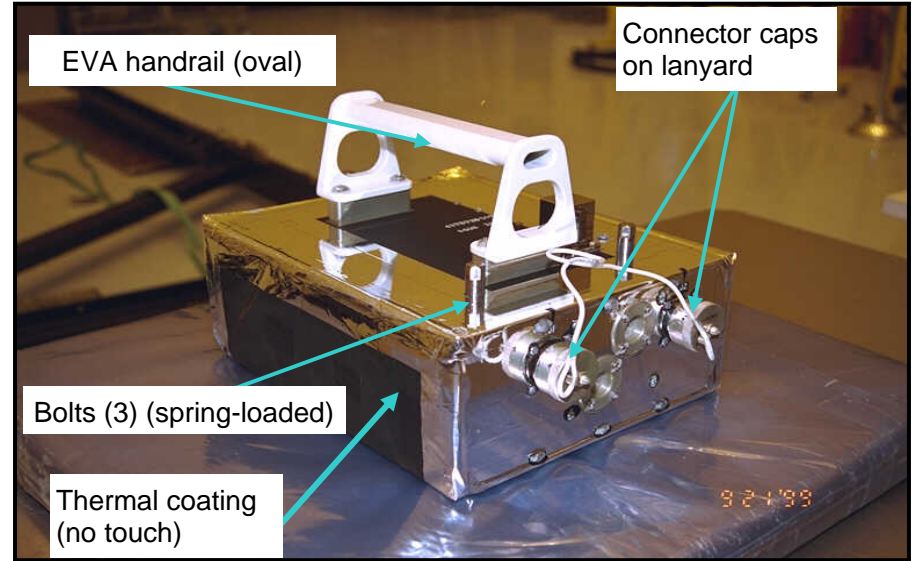
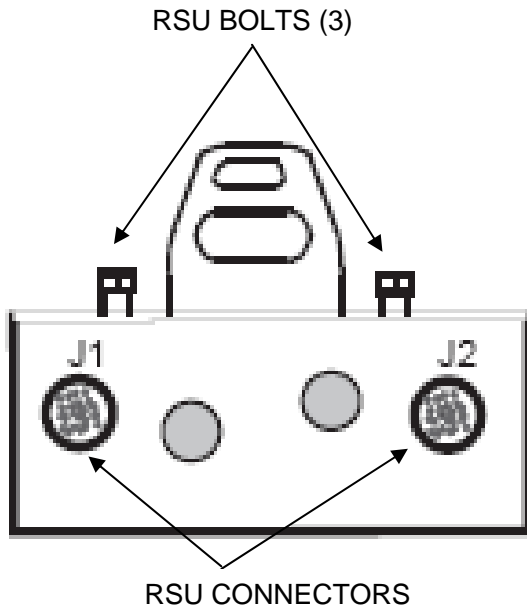
LLMM ID/Locations



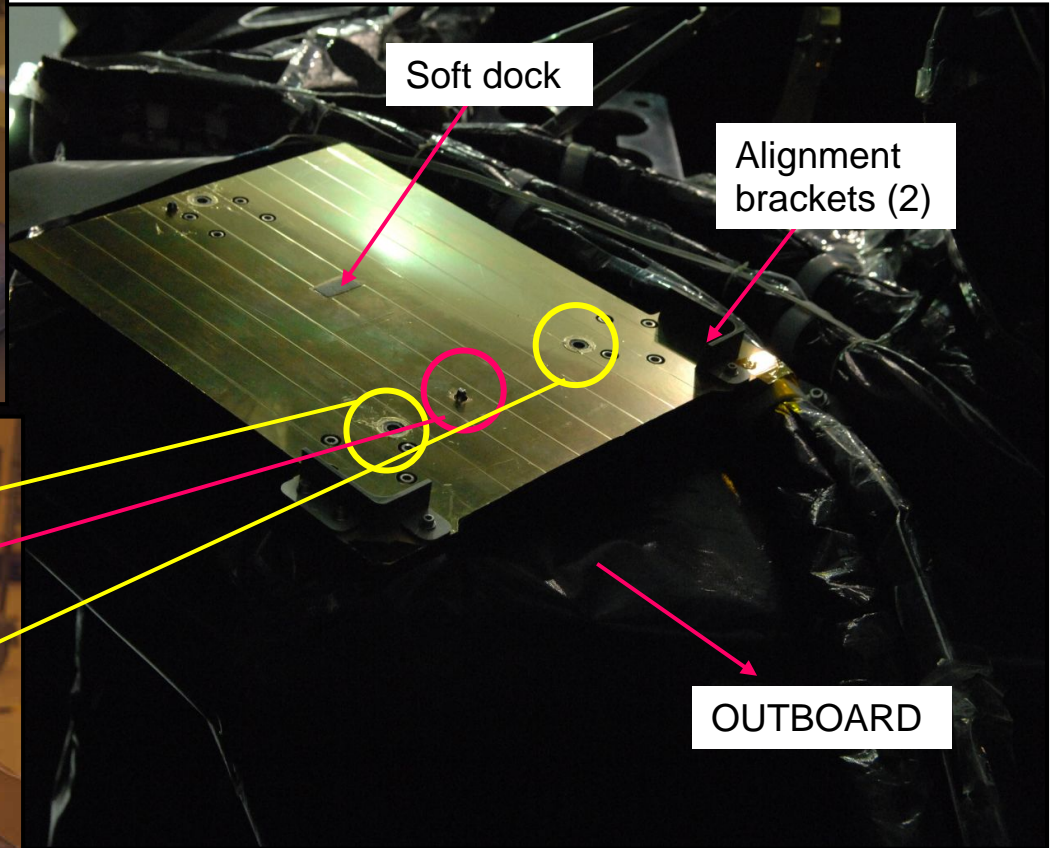
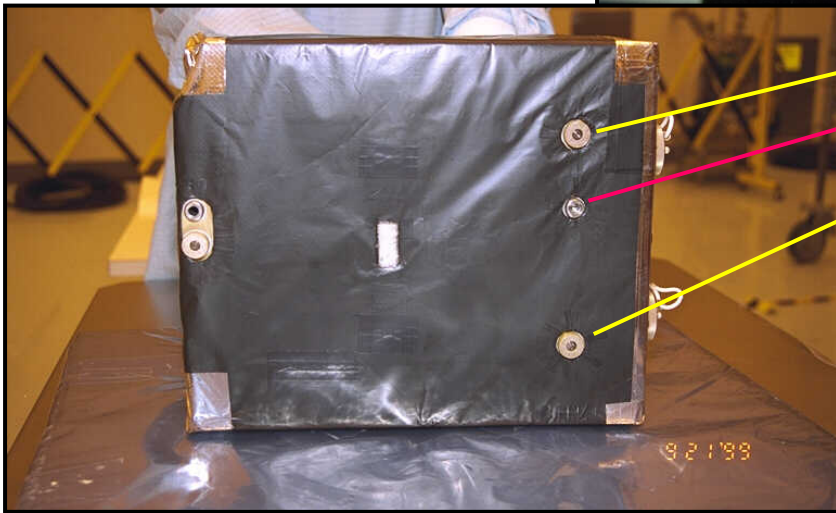
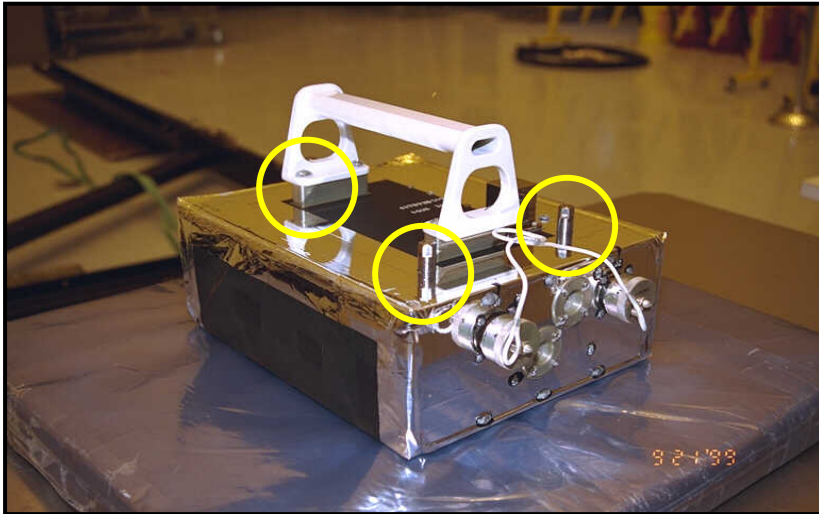
RSU WORKSITE OVERVIEW



# RSU OVERVIEW

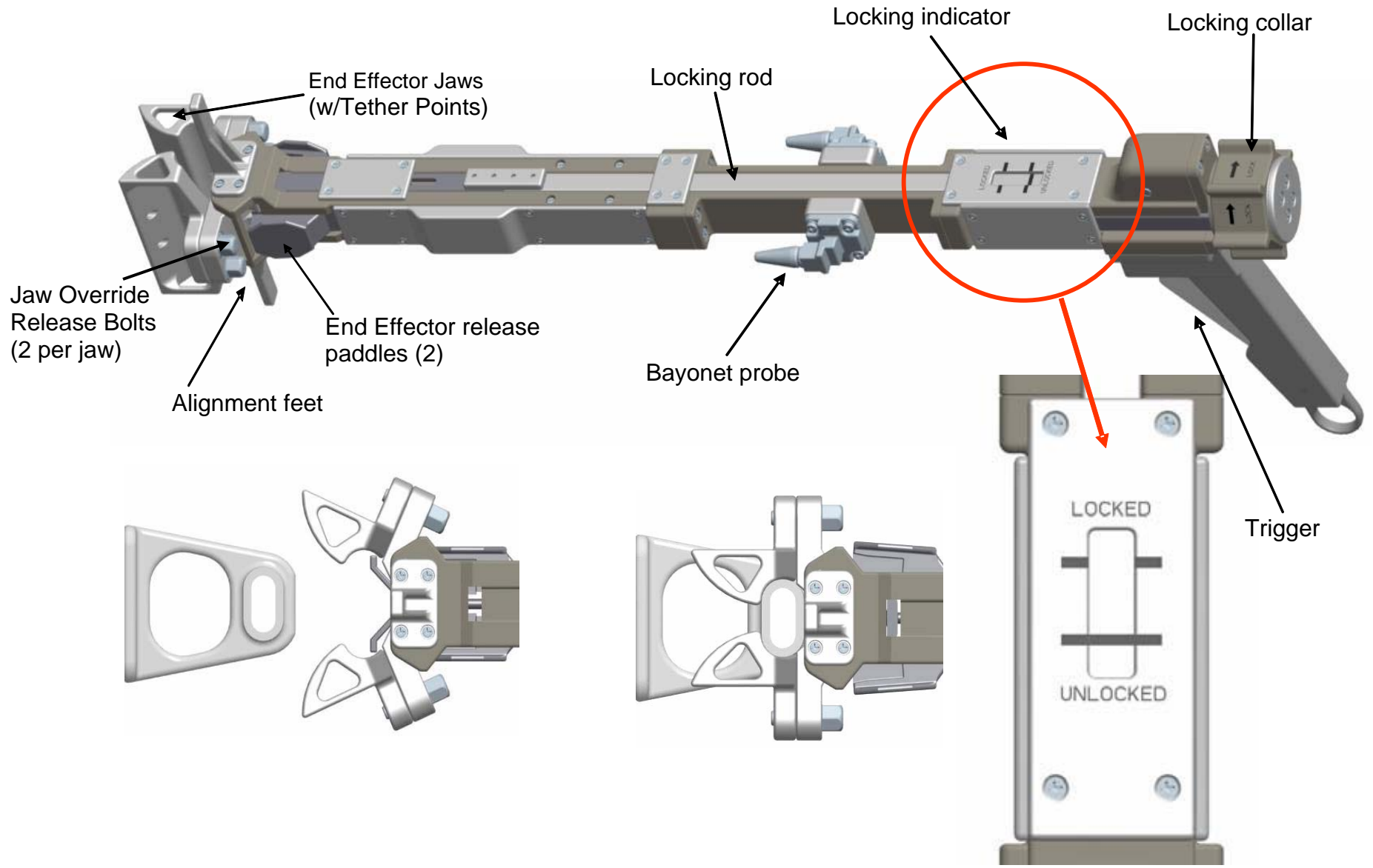


RSU OVERVIEW (Cont)





**PIK STIK**

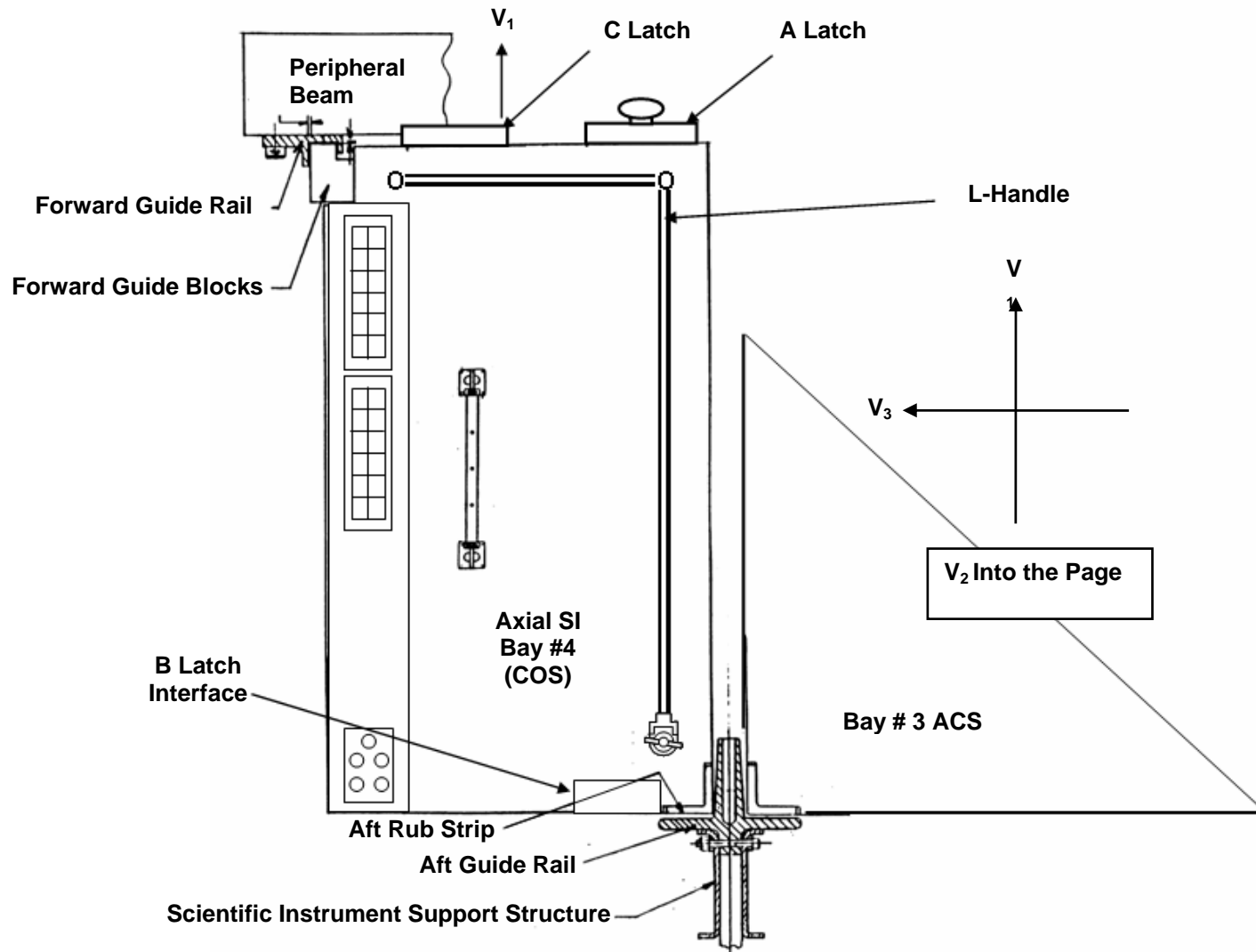


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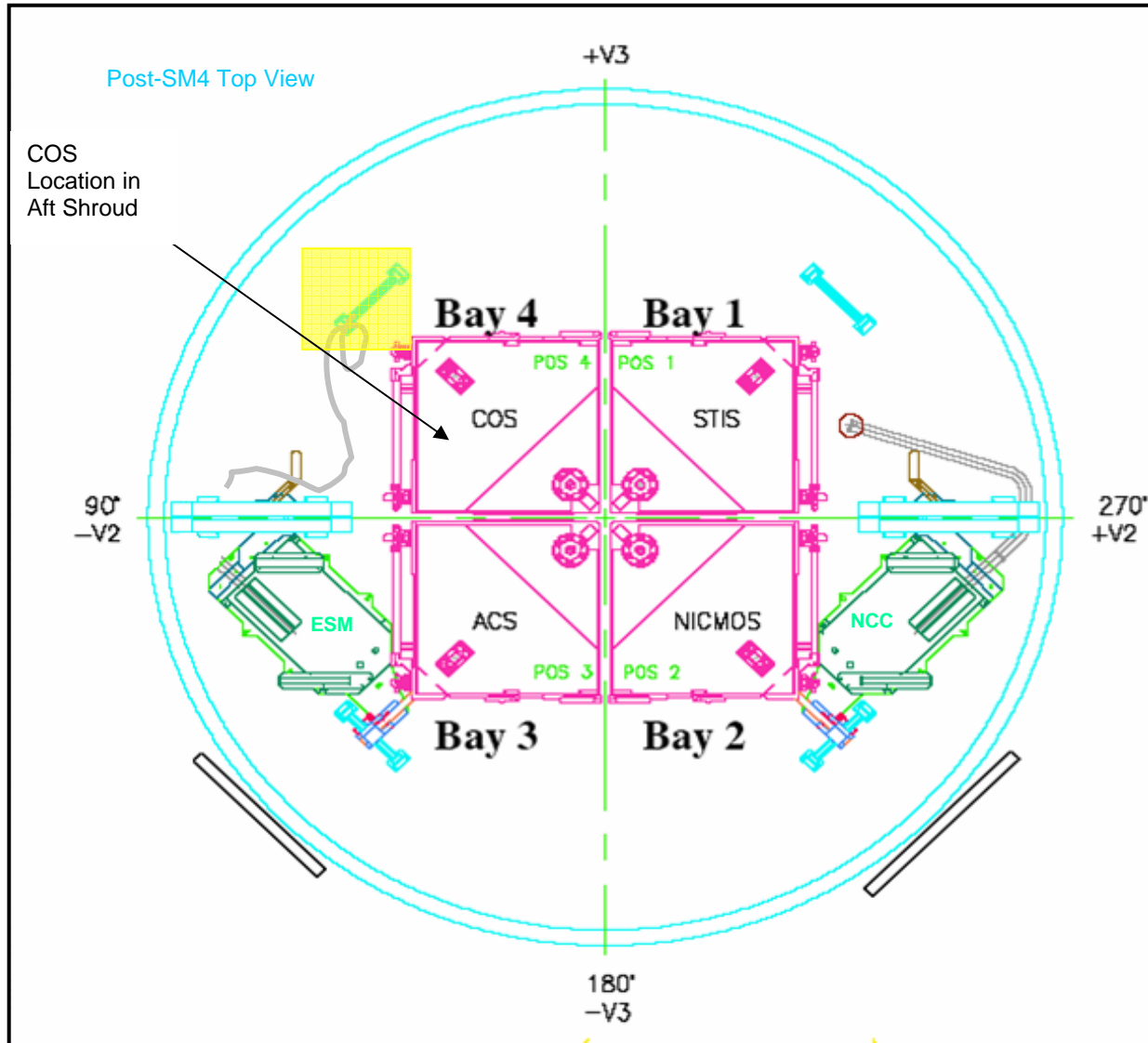
EVA/125/FIN A

# COS

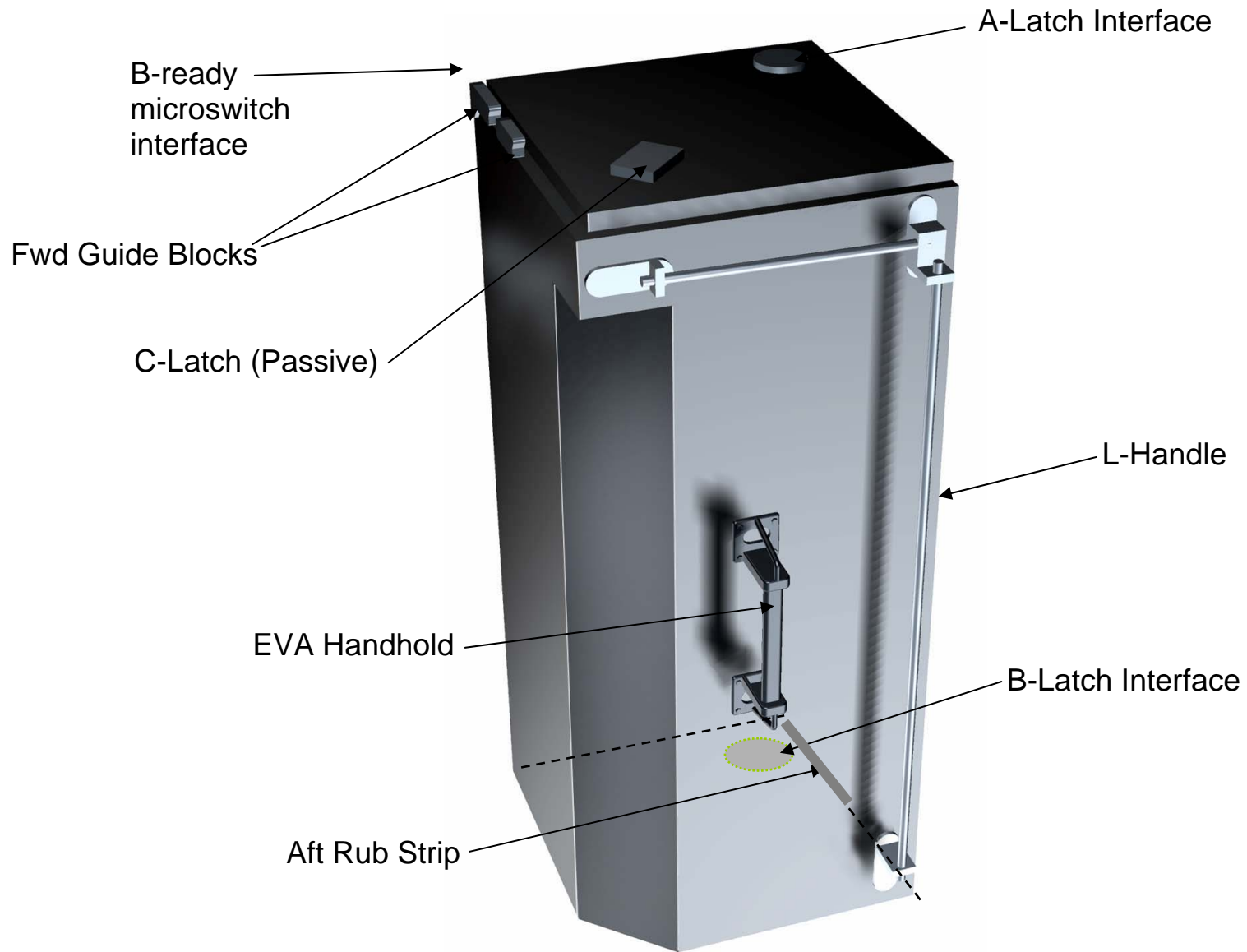
## COS OVERVIEW



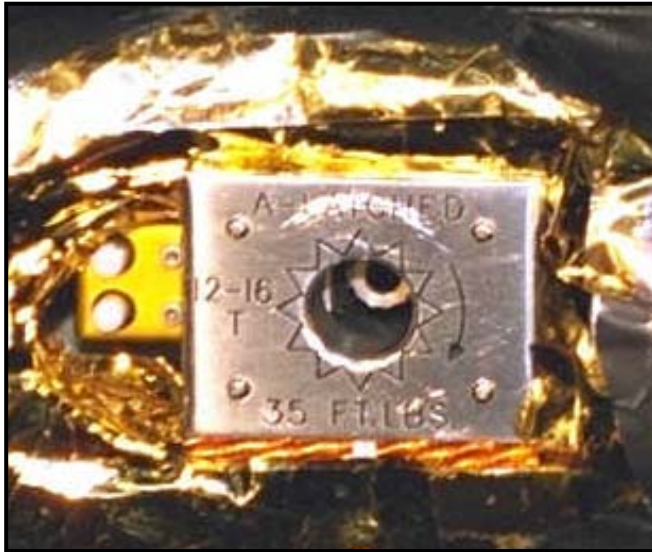
# COS OVERVIEW (Cont)



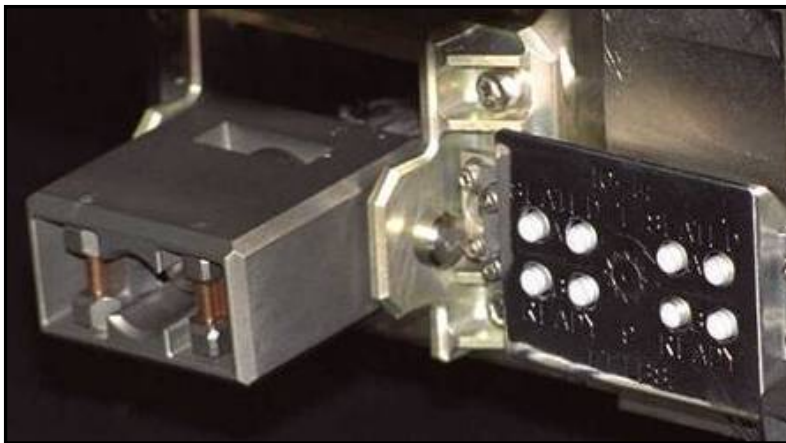
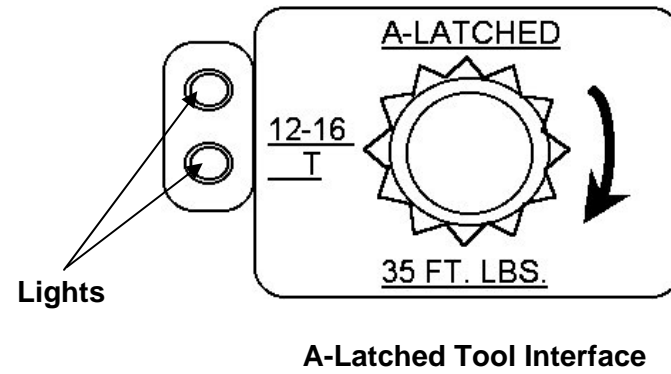
**COS OVERVIEW (Cont)**



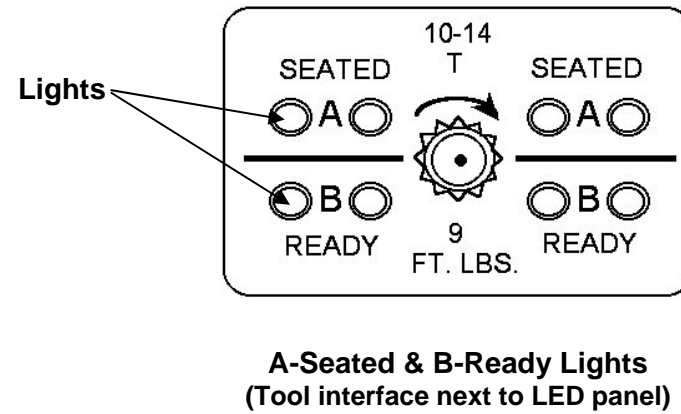
**COS PGT INTERFACES AND LIGHTS**



A-Latched Tool Interface



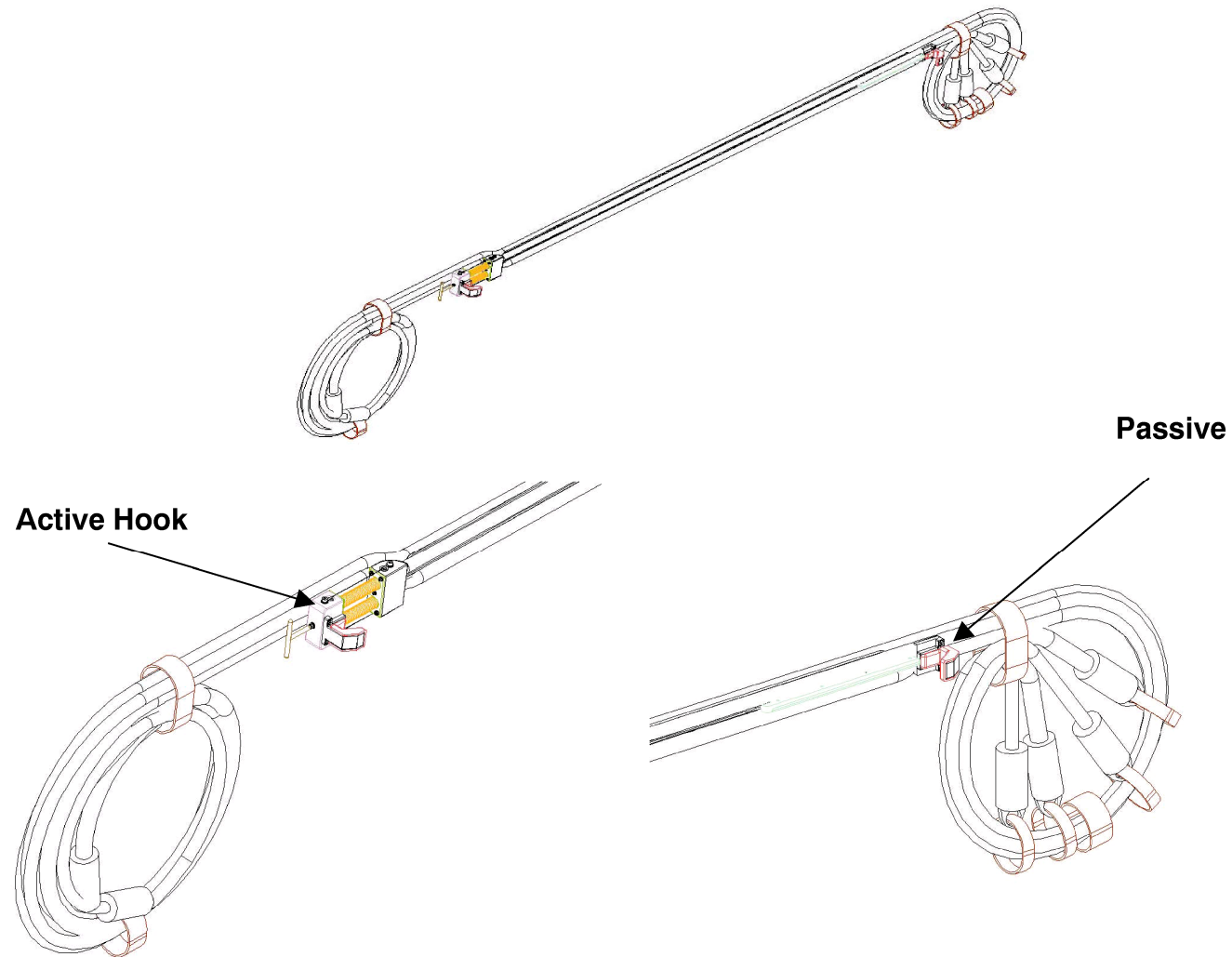
A-Seated & B-Ready LED Panel  
(Tool interface next to LED panel)



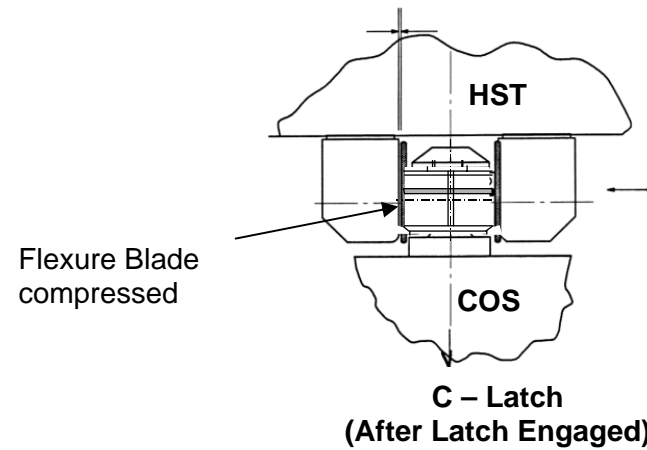
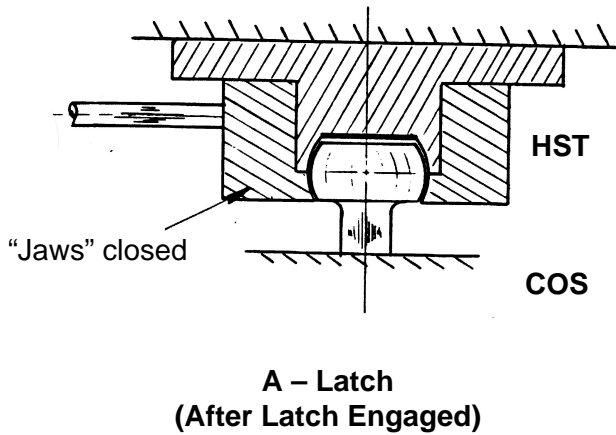
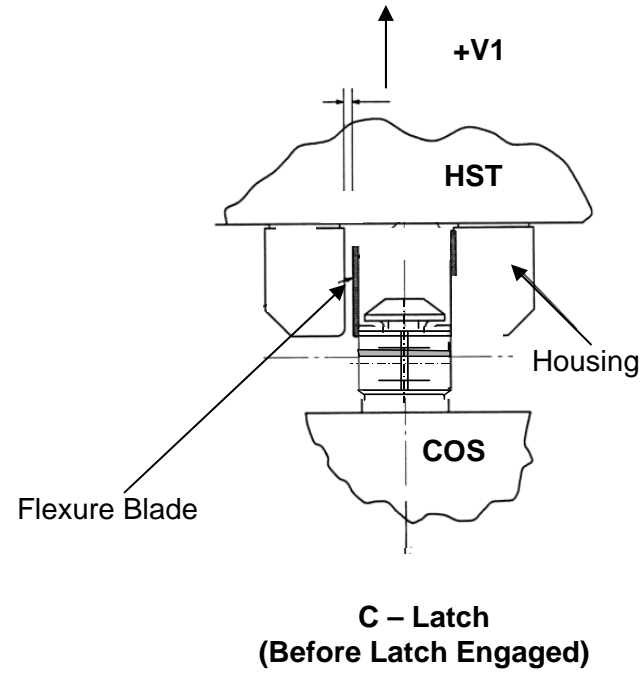
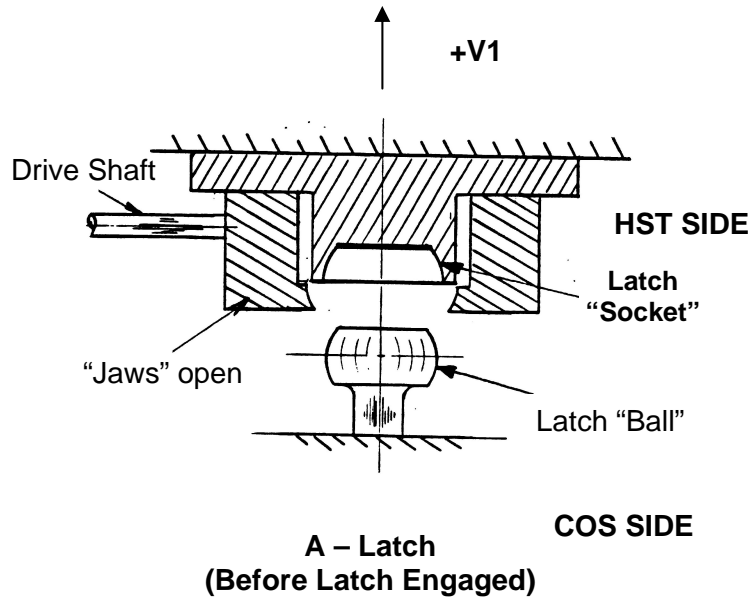
COS CONNECTOR PANEL



CASH

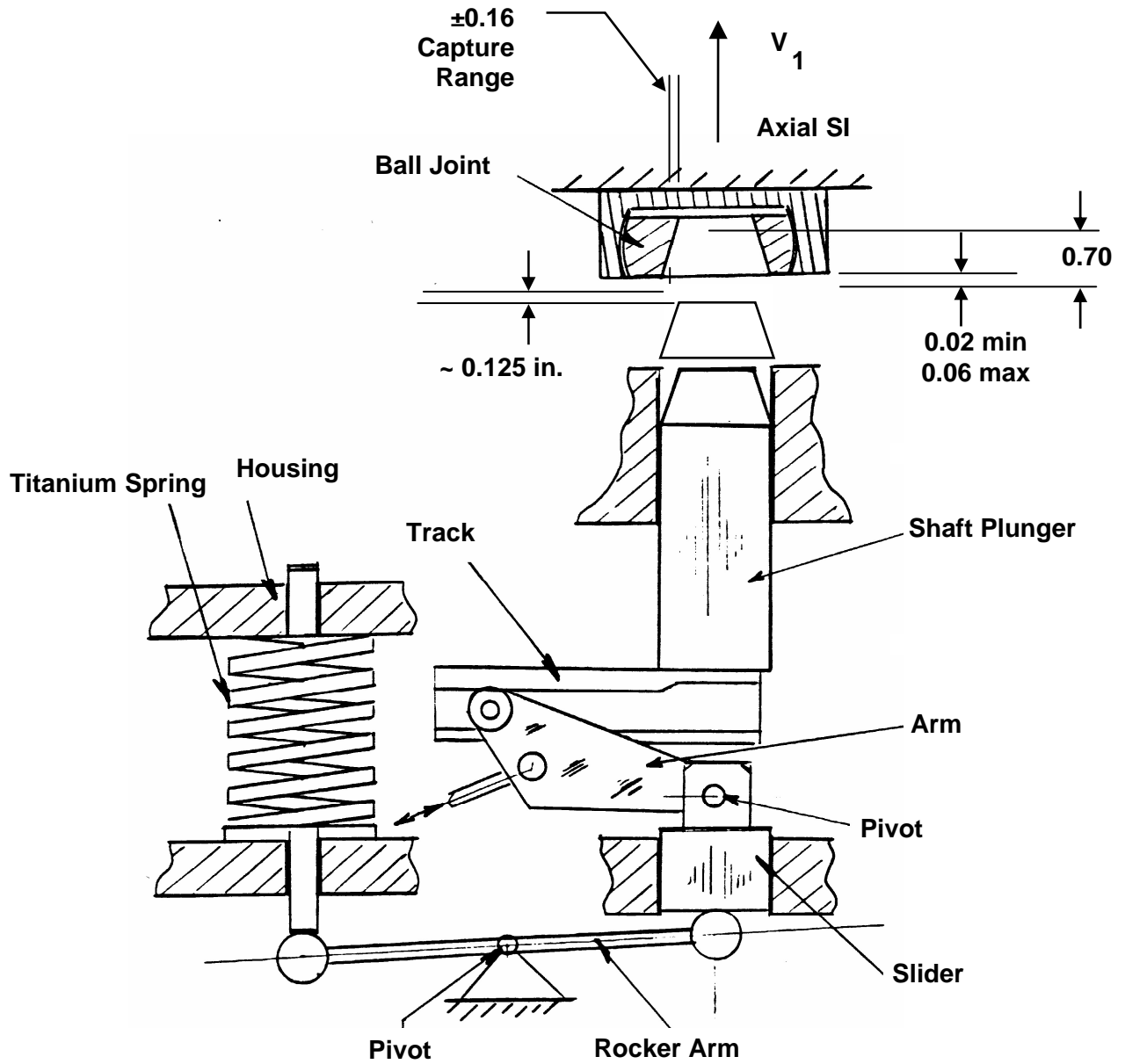


**A & C SI LATCHES**

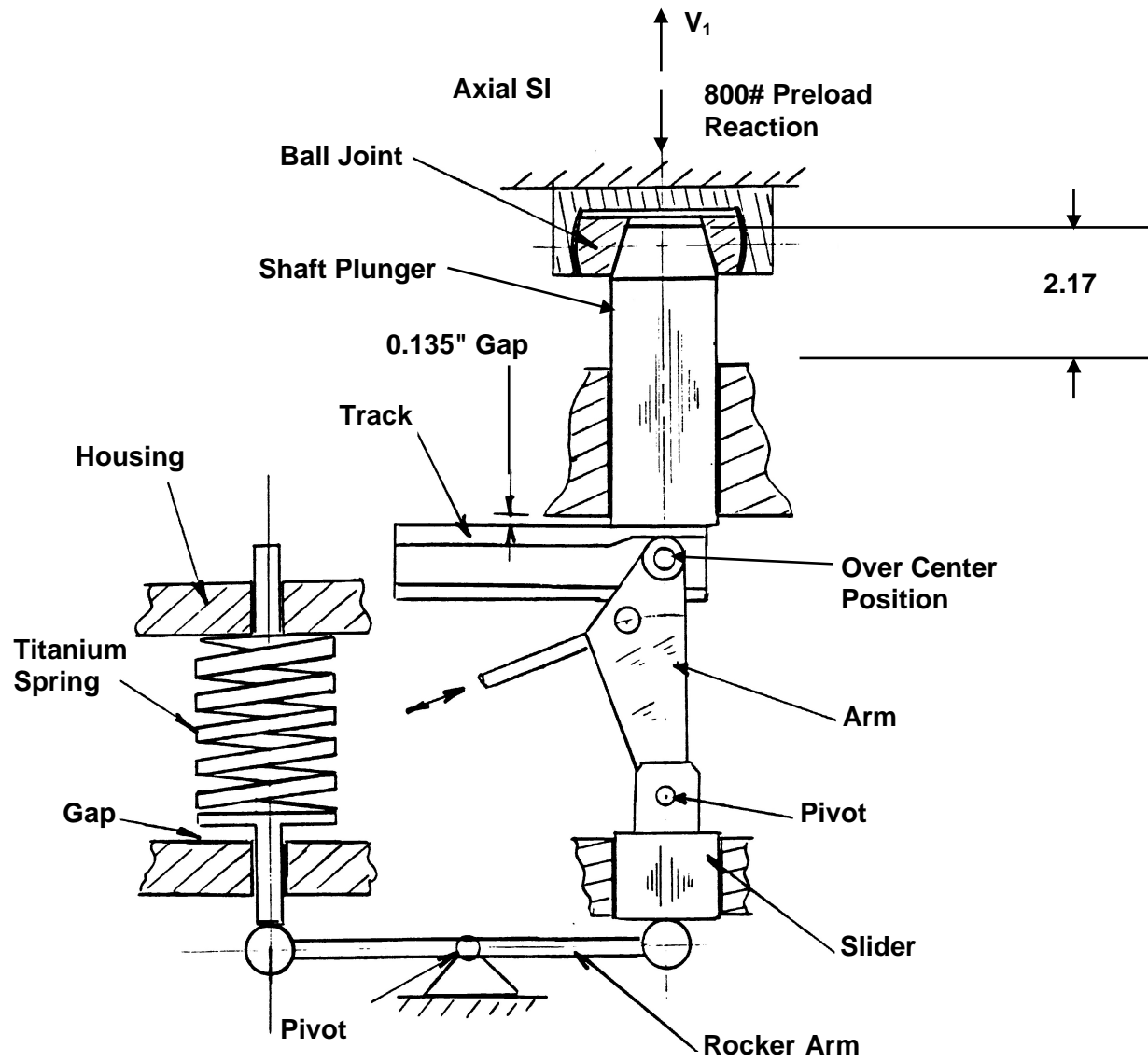




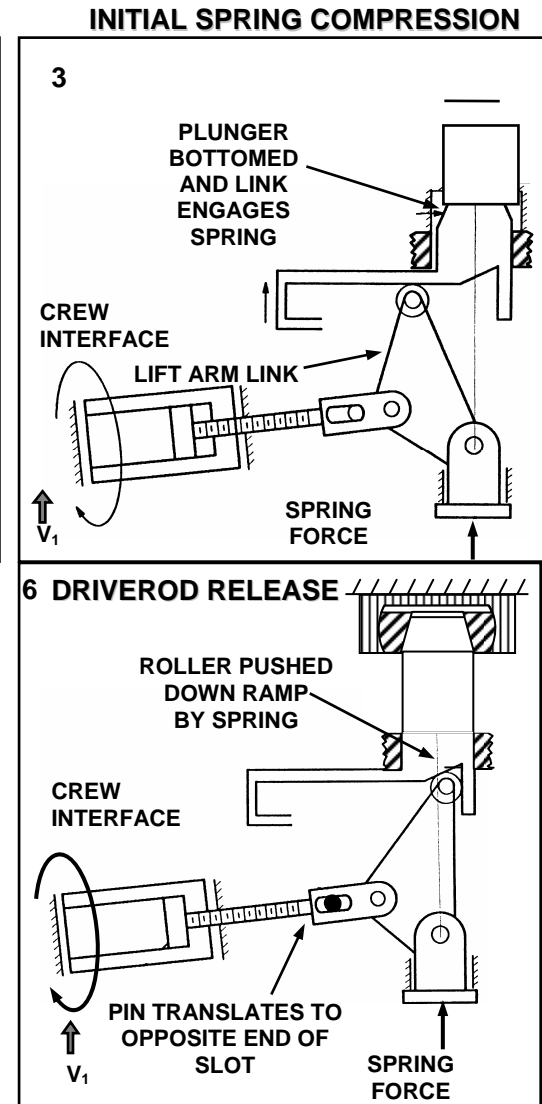
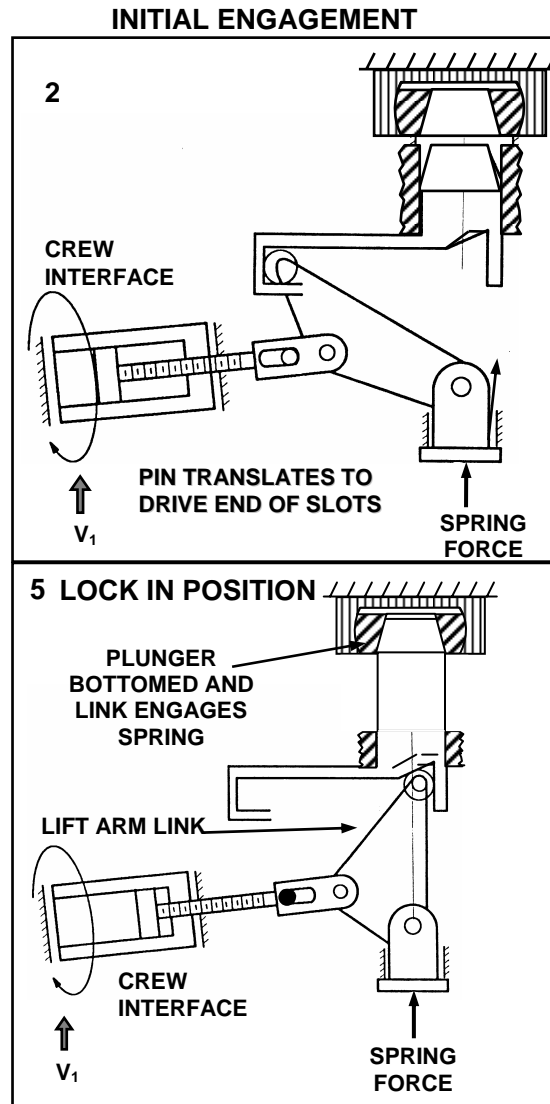
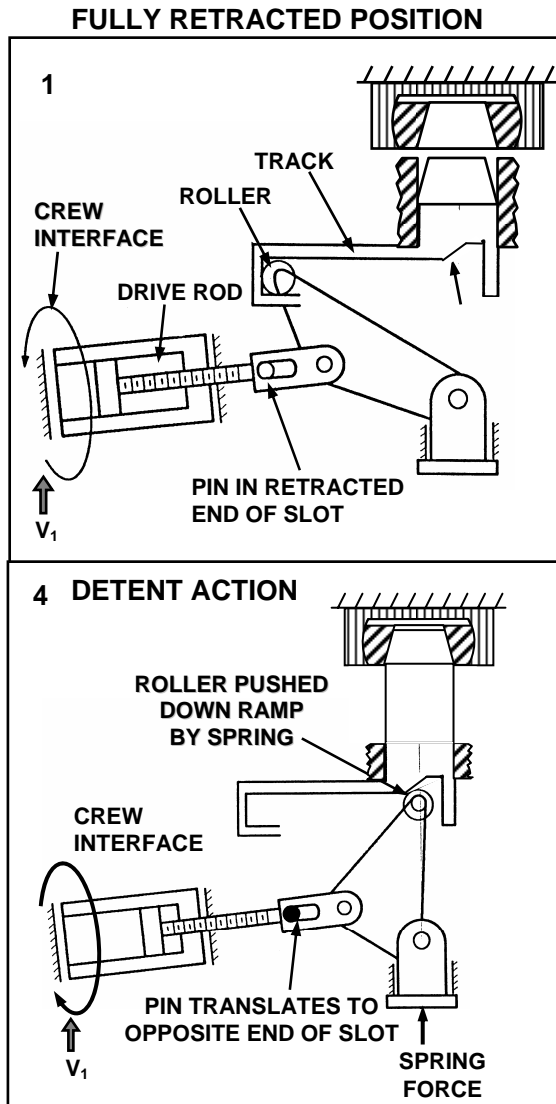
# B SI LATCH – UNLATCHED



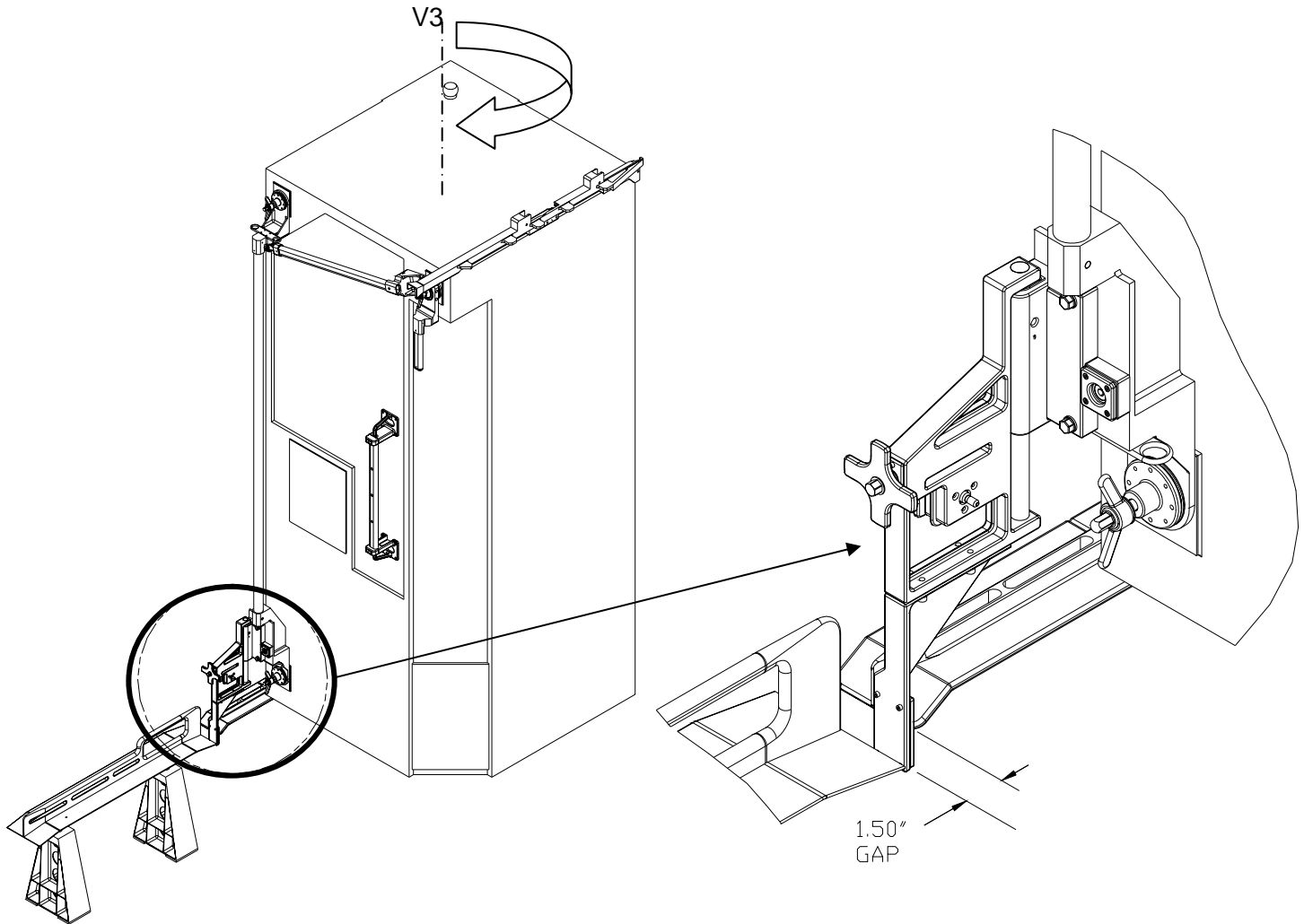
# B SI LATCH – LATCHED



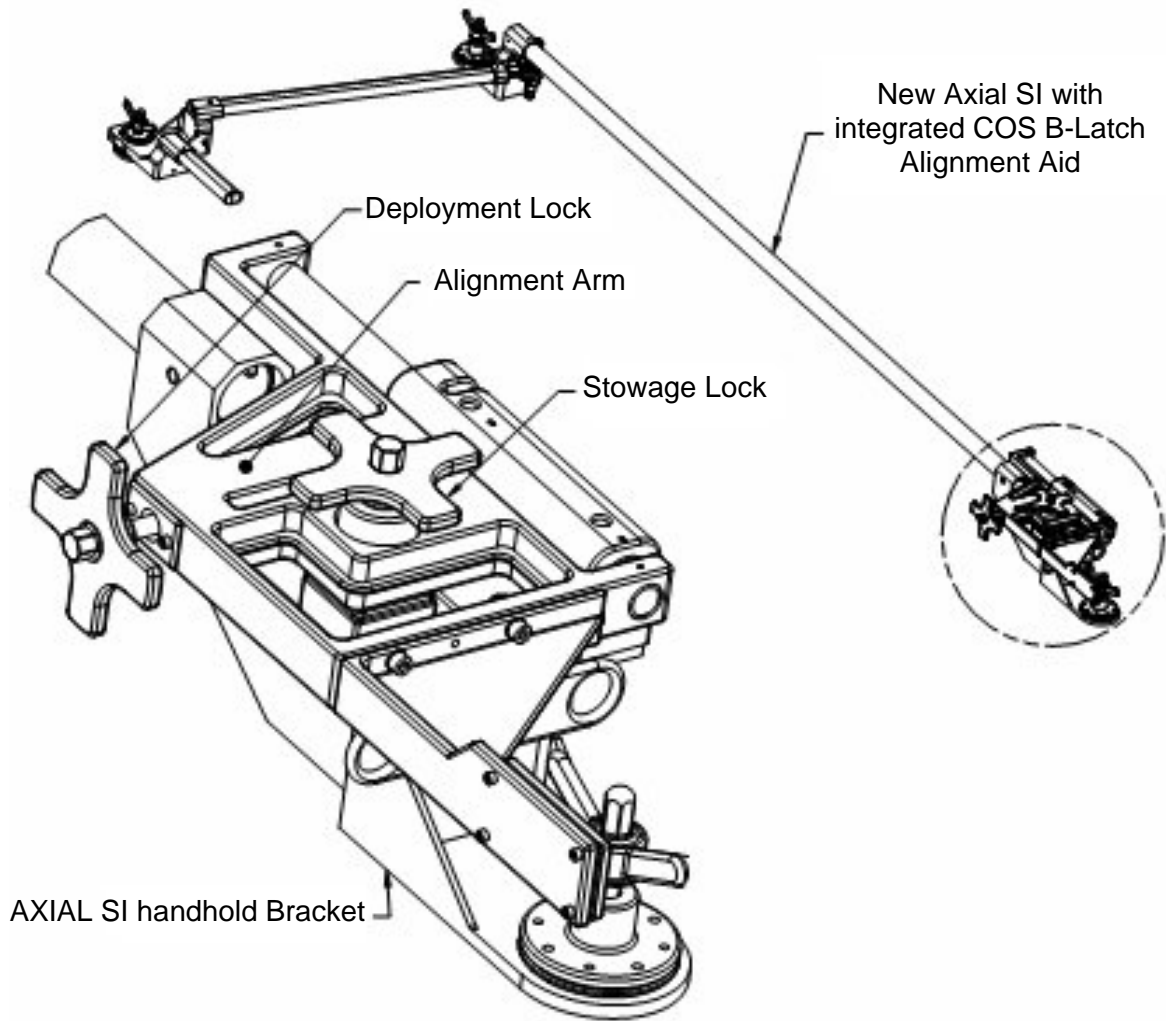
# B SI LATCH – COMPLETE OPERATION



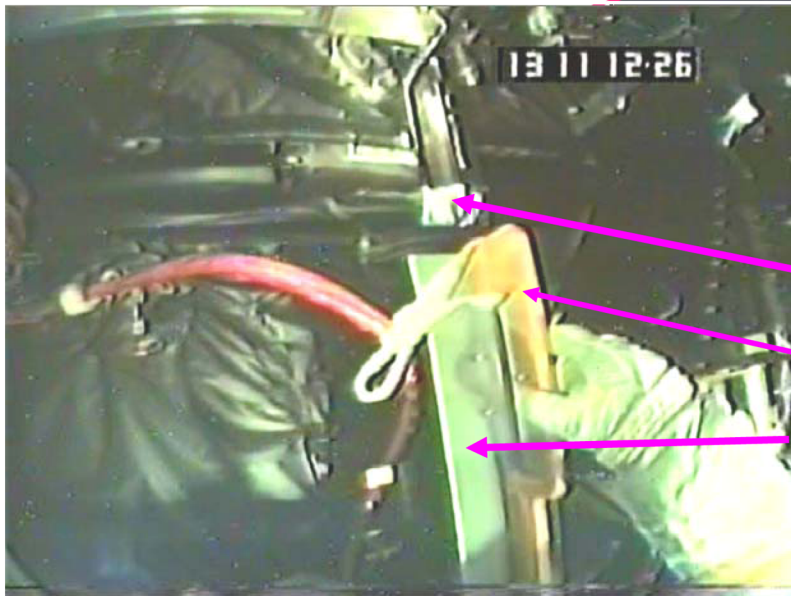
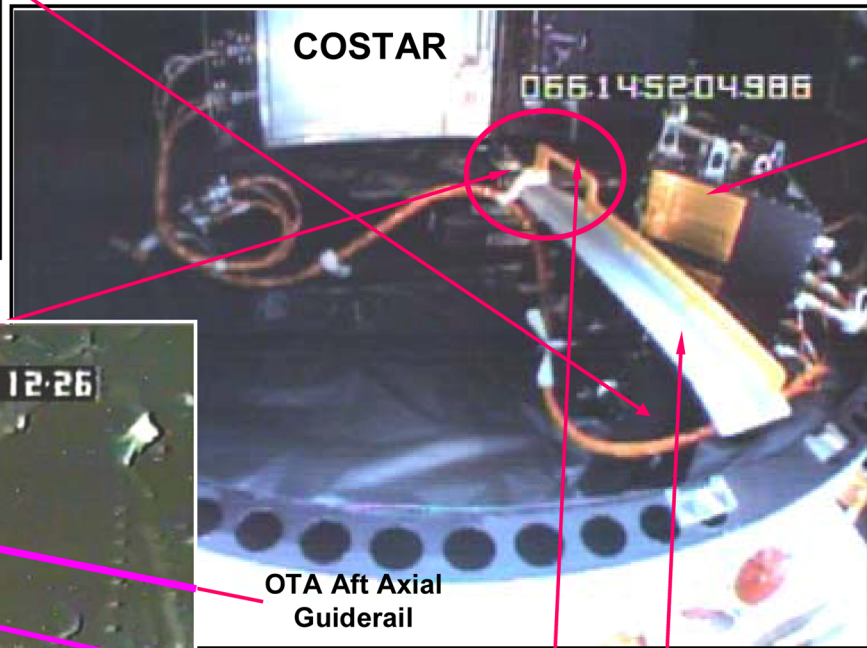
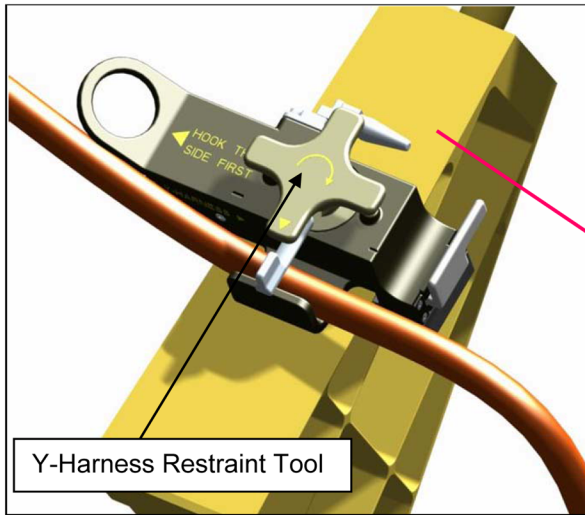
**B LATCH ALIGNMENT TOOL**



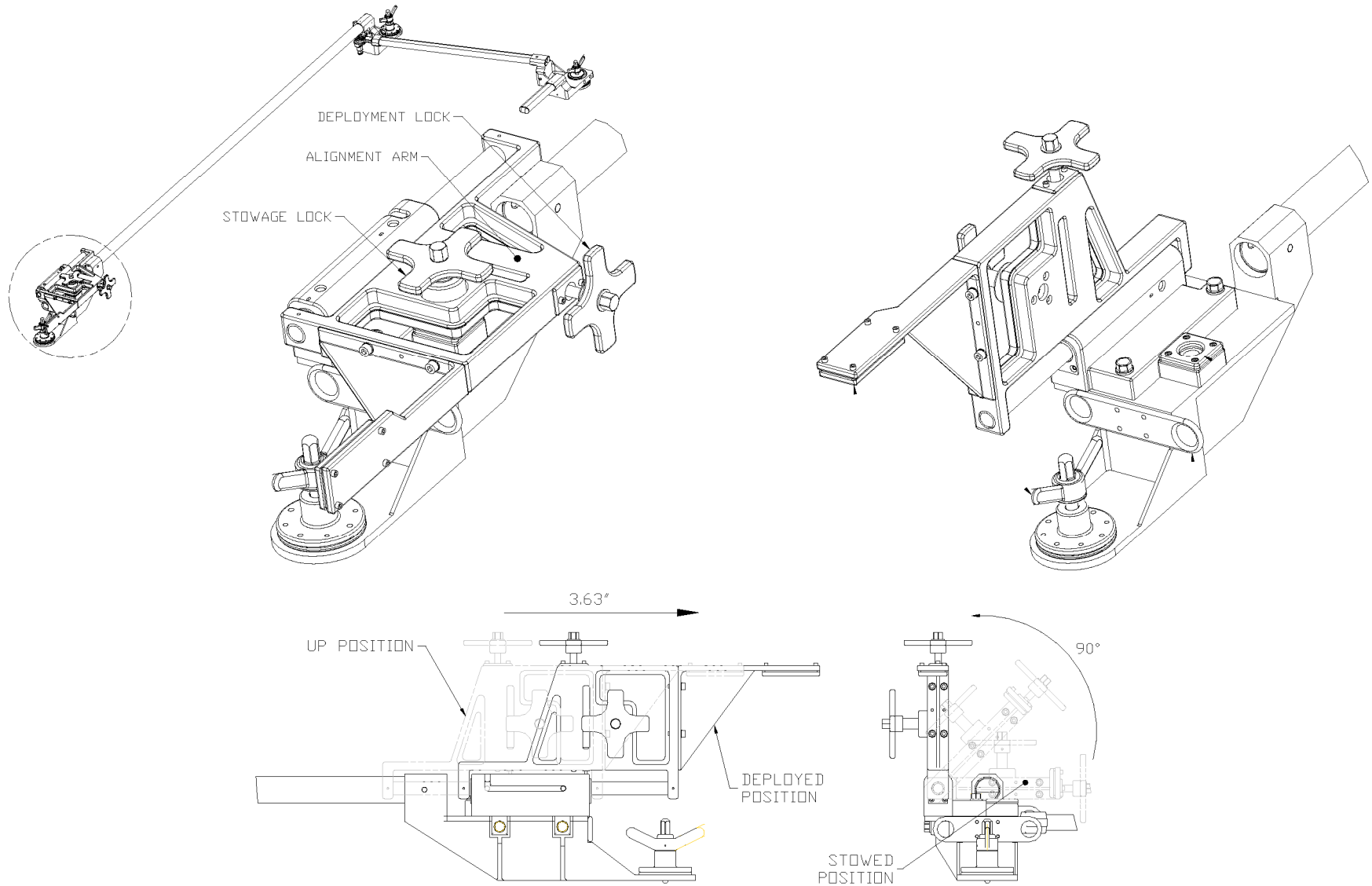
**B LATCH ALIGNMENT TOOL (Cont)**



# Y-HARNESS RESTRAINT TOOL



# SI ALIGNMENT AID

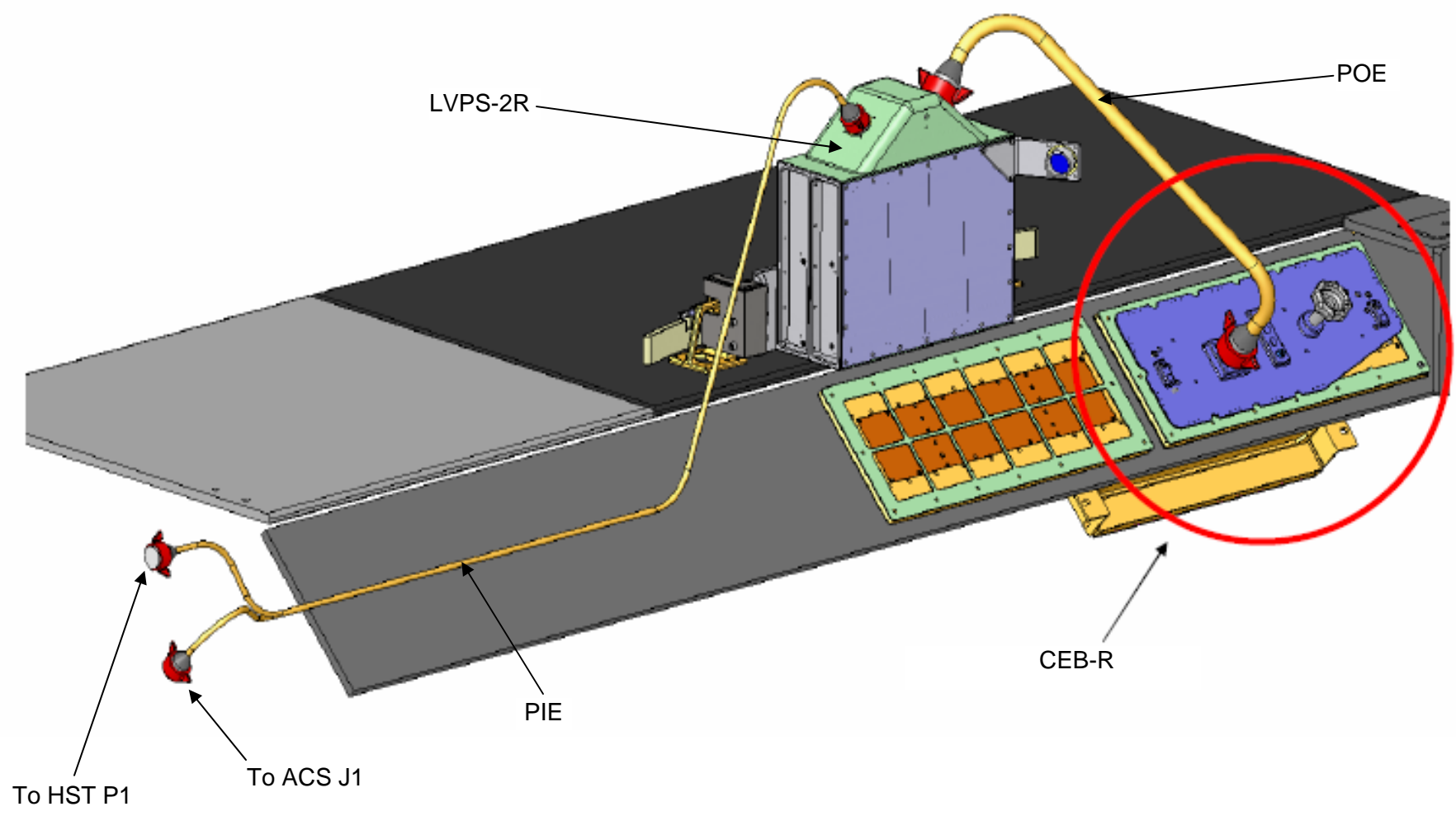


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EVA/125/FIN A

ACS

ACS – LVPS-2R AND CEB-R INSTALLED

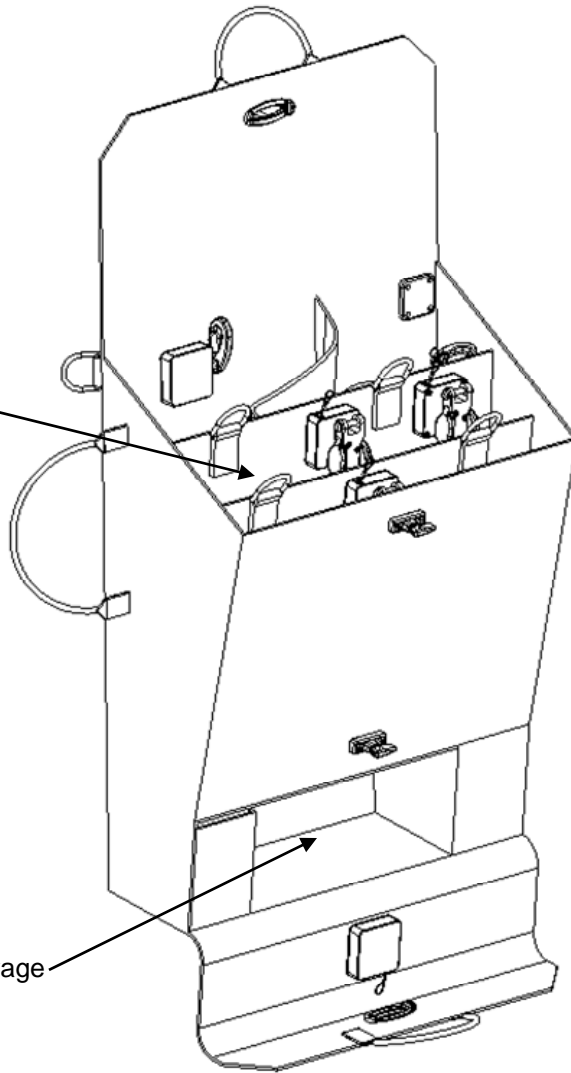




## GROUND STRAP HARNESS BAG

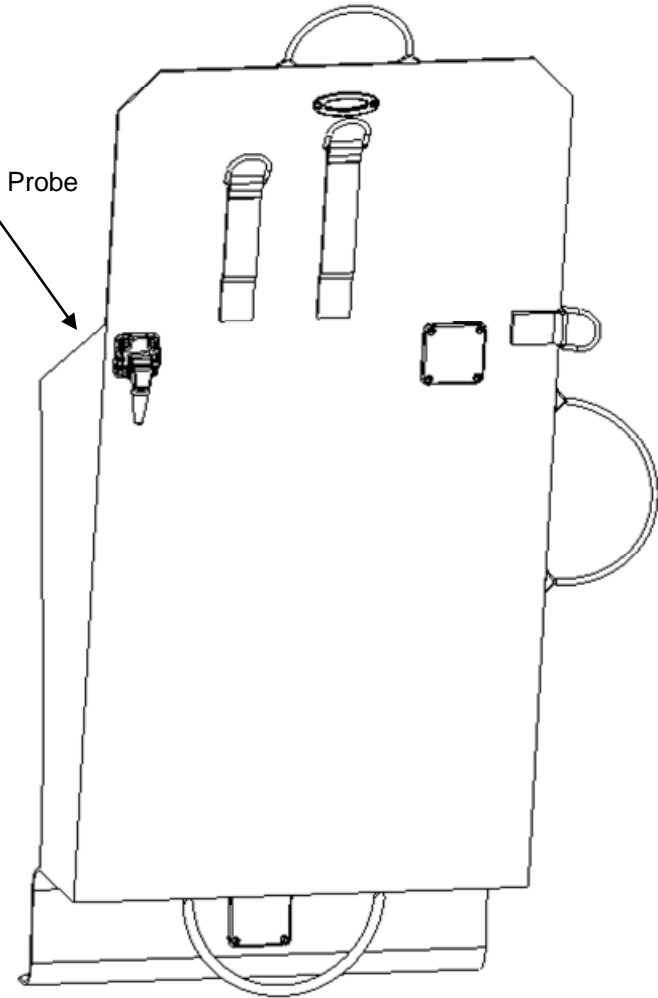
- 3 Equip RET Reels
- 2 French Hook Reels

GAM and ESM Plug Stowage



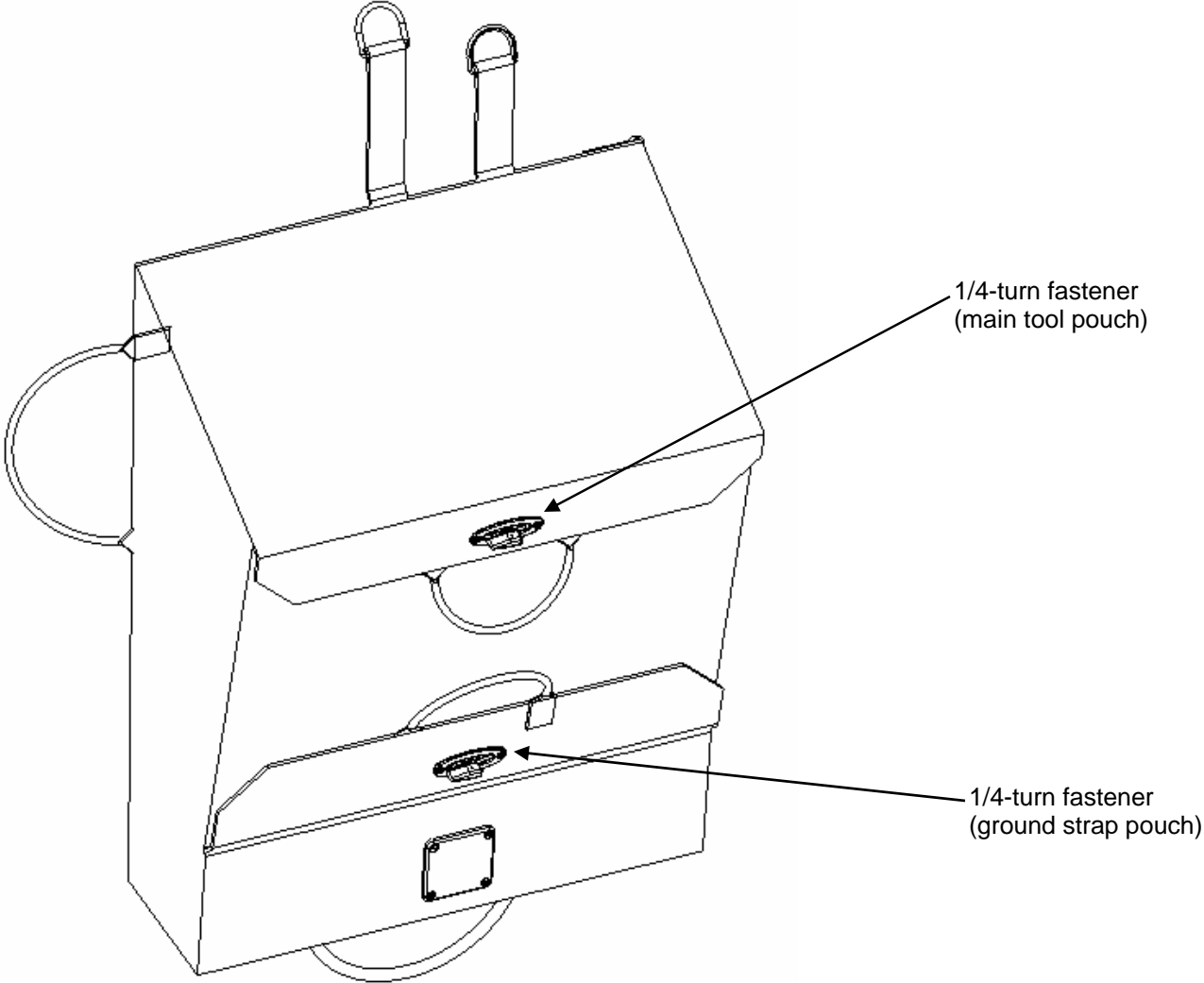
Front of Bag  
(lid opened)

Bayonet Probe



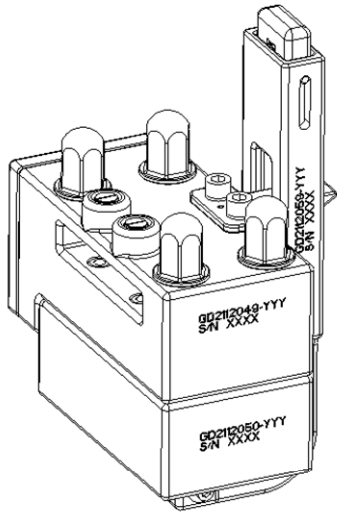
Back of Bag

**GROUND STRAP HARNESS BAG (Cont)**

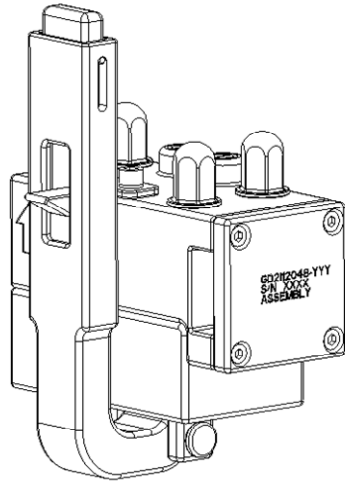


Front of Bag  
(lid closed)

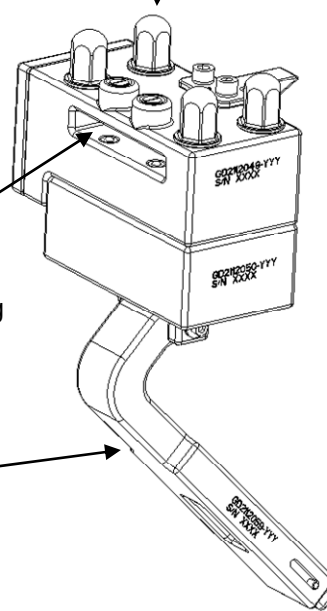
# GROUND ATTACHMENT MECHANISM



GAM Lever Engaged

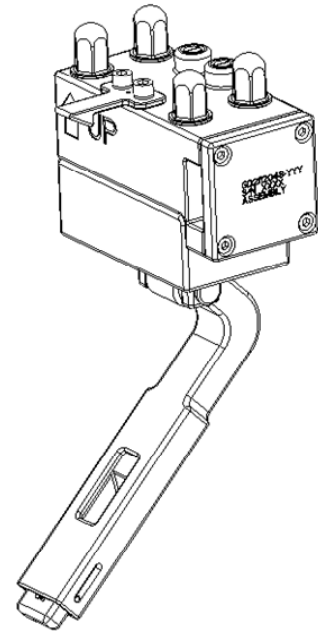


EVA Cont Release Bolts (4)



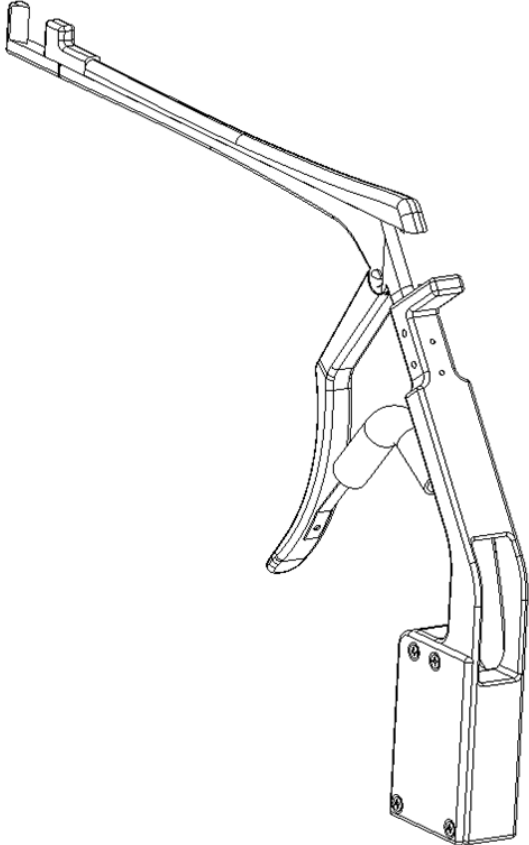
Ground Tab and ESM Plug Opening

GAM Lock Lever

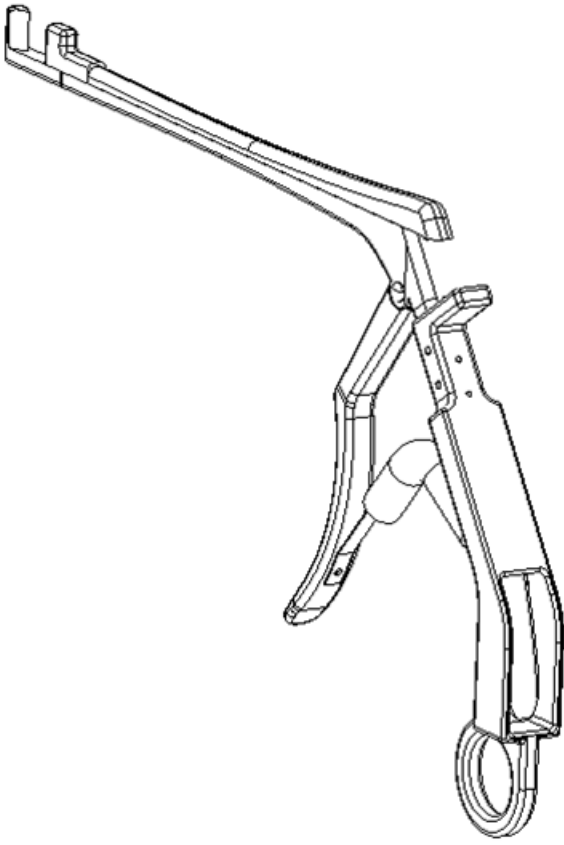


GAM Lever Unlocked

WIRE CUTTER TOOL

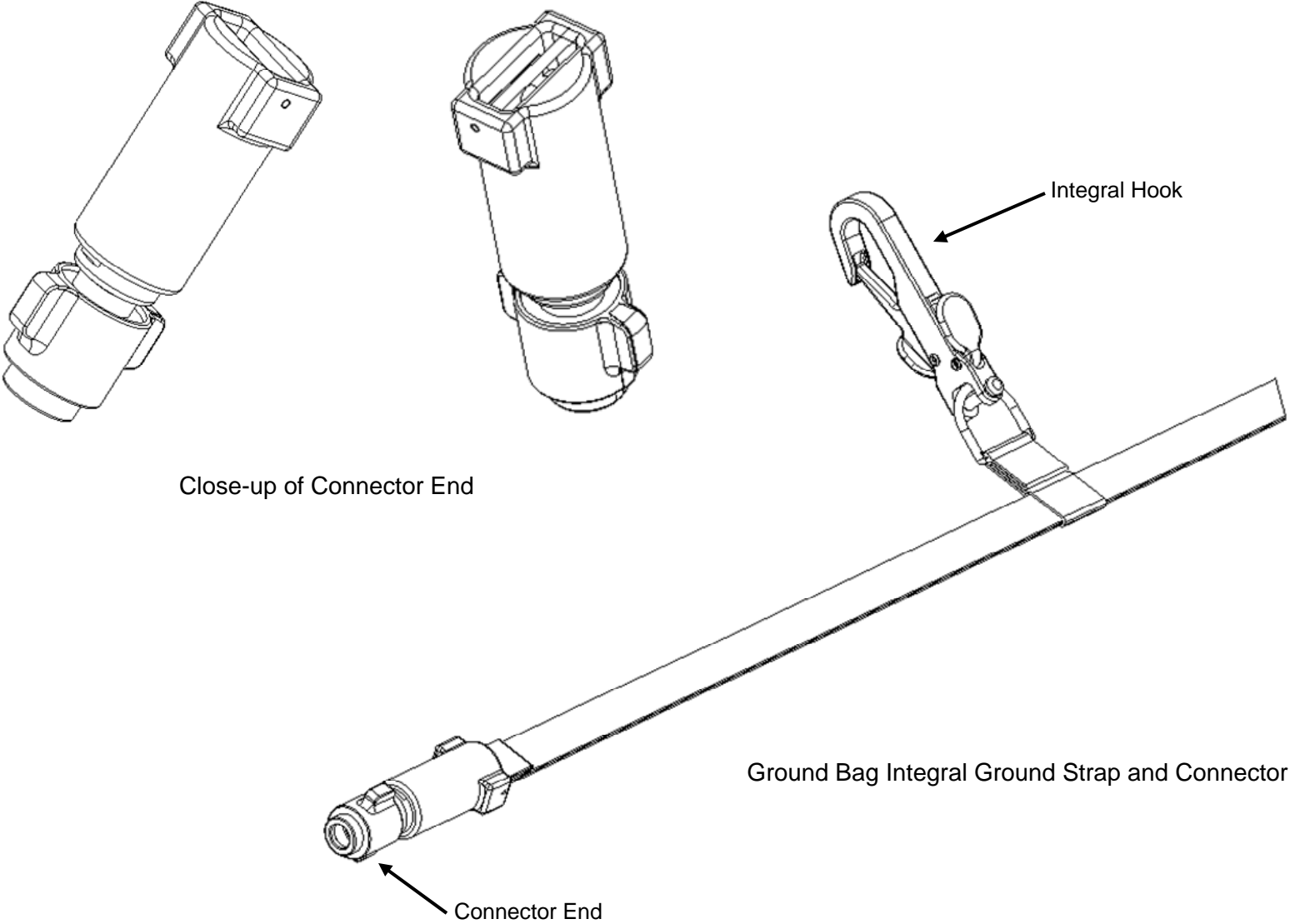


GSH BAG



NOBL

**GROUND STRAP BAG INTEGRAL GROUND HARNESS**



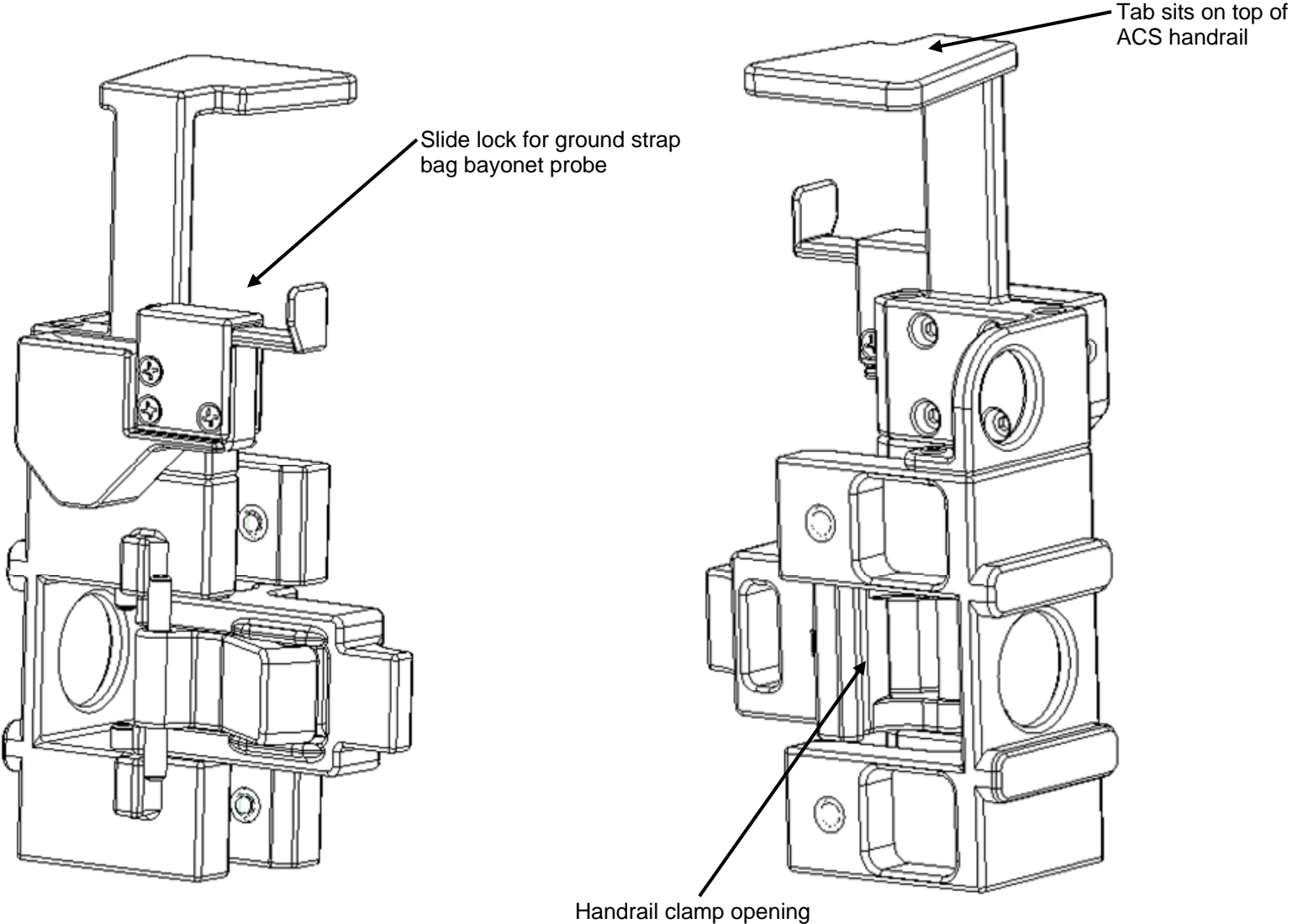
Close-up of Connector End

Integral Hook

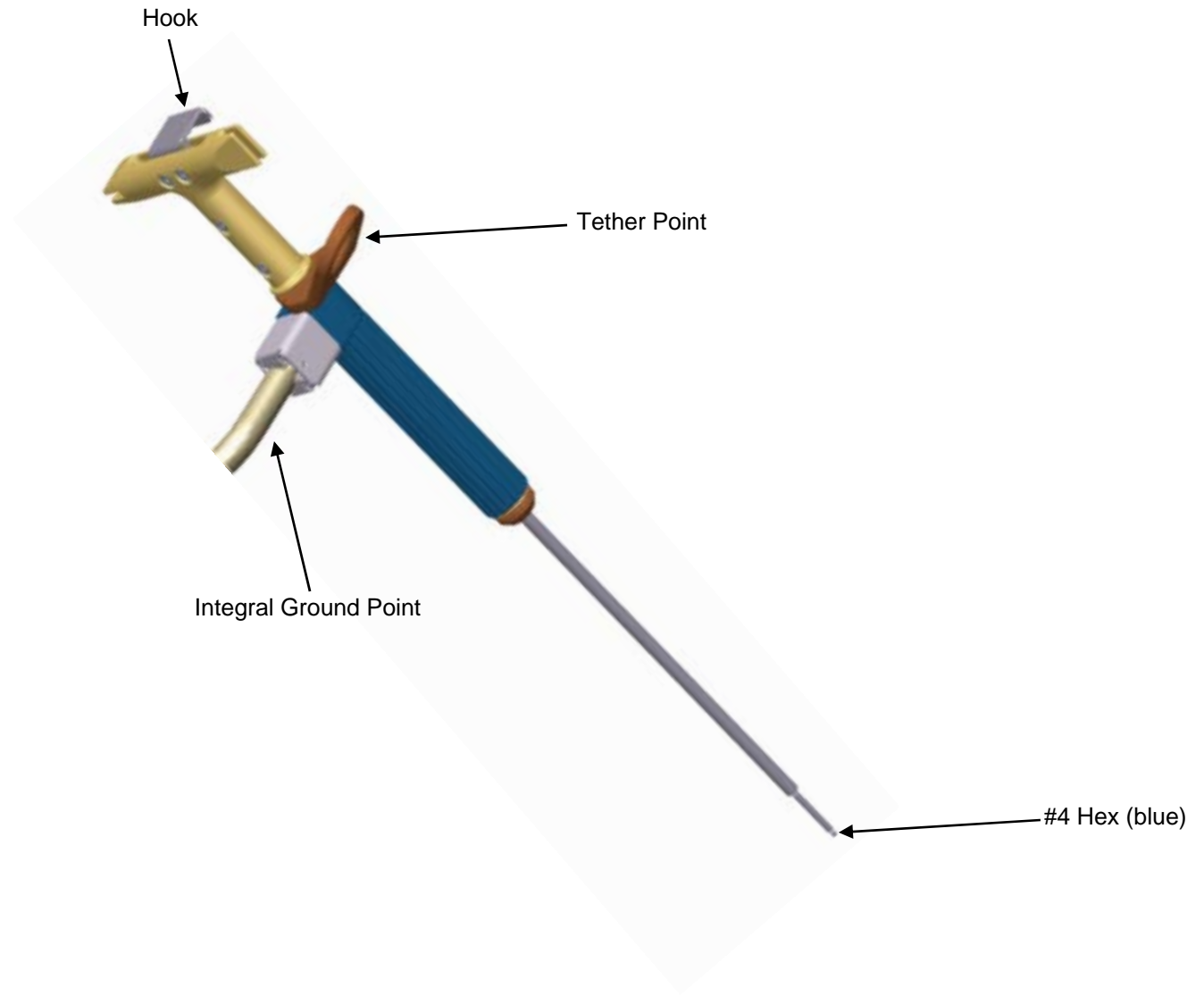
Ground Bag Integral Ground Strap and Connector

Connector End

**ACS HANDRAIL LATCH**



CMT

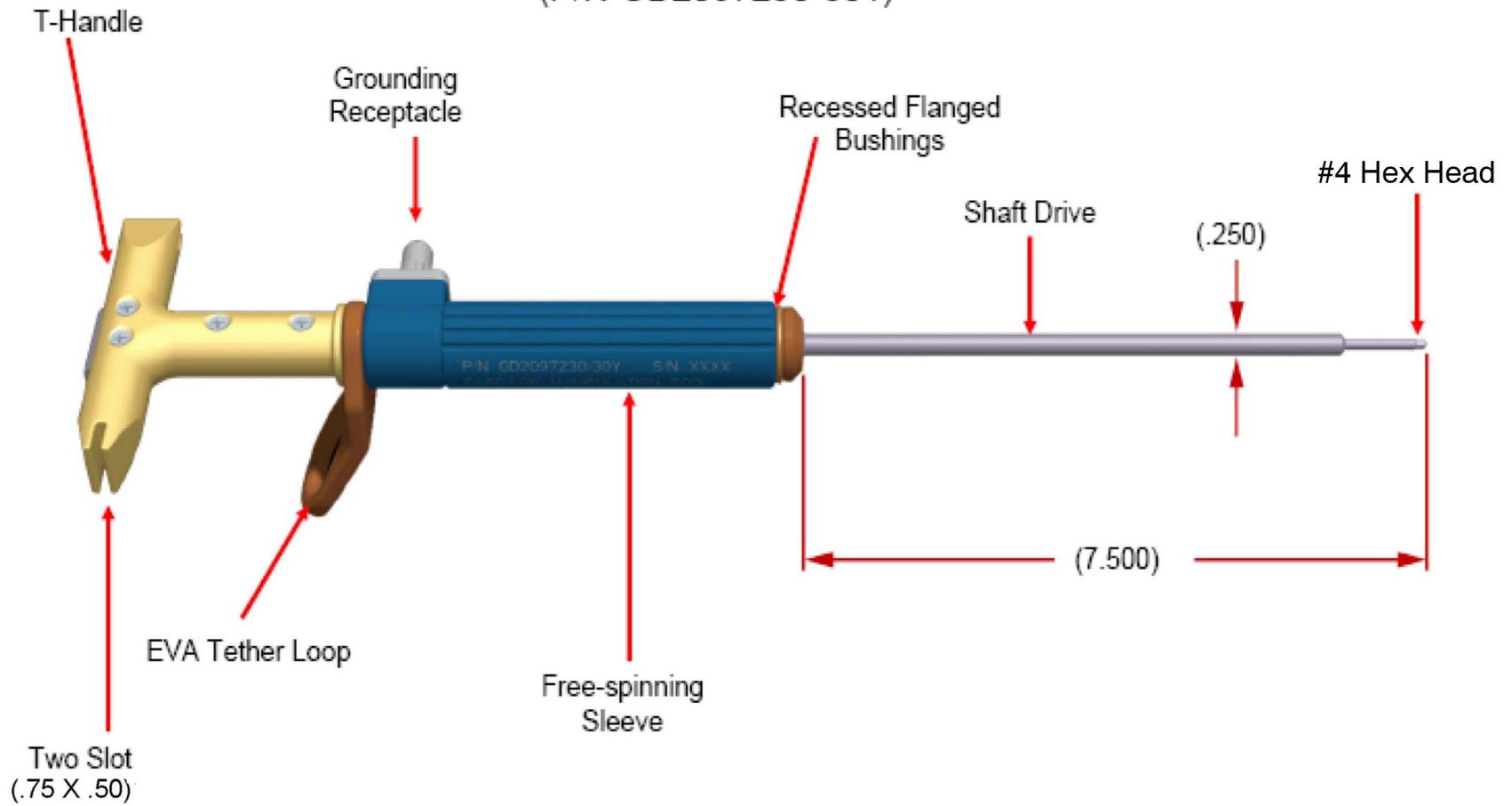


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EVA/125/FIN A

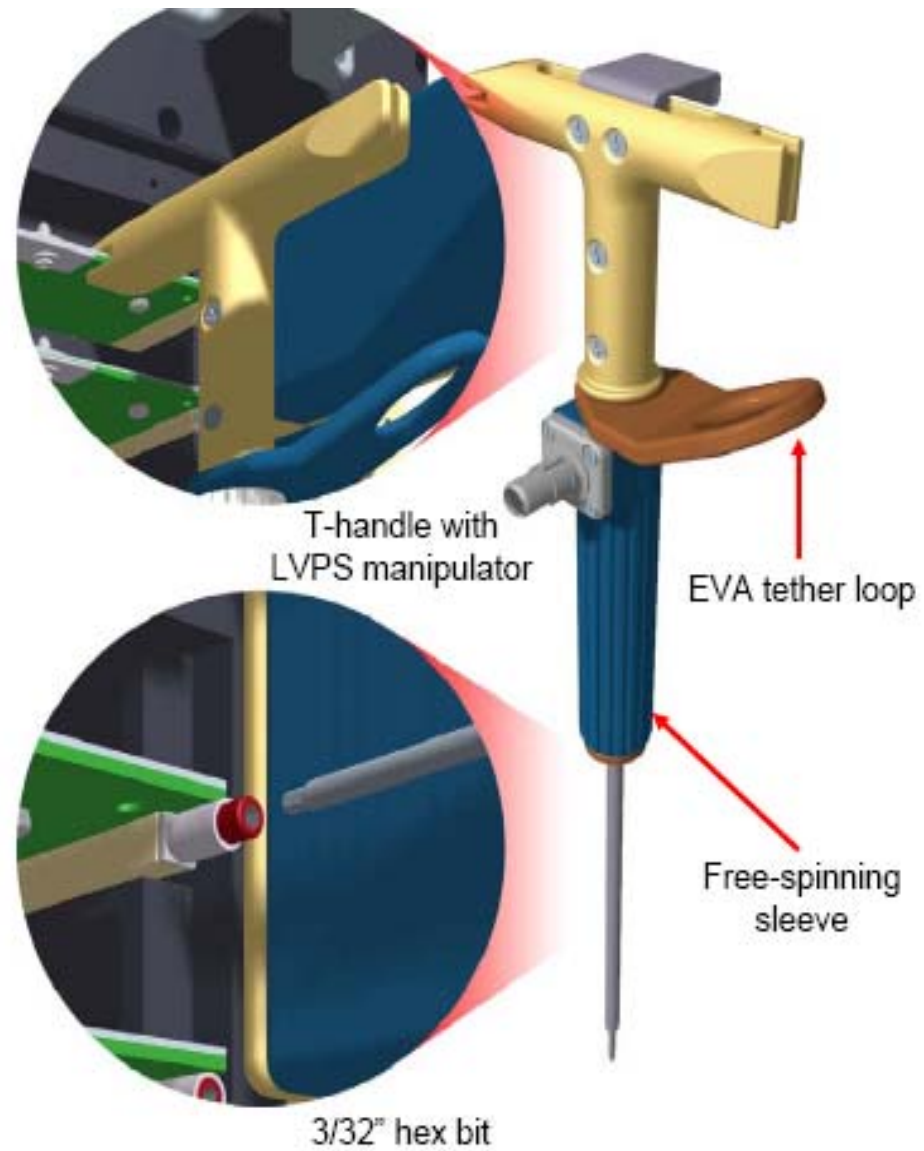
CMT (Cont)

(P/N GD2097250-301)

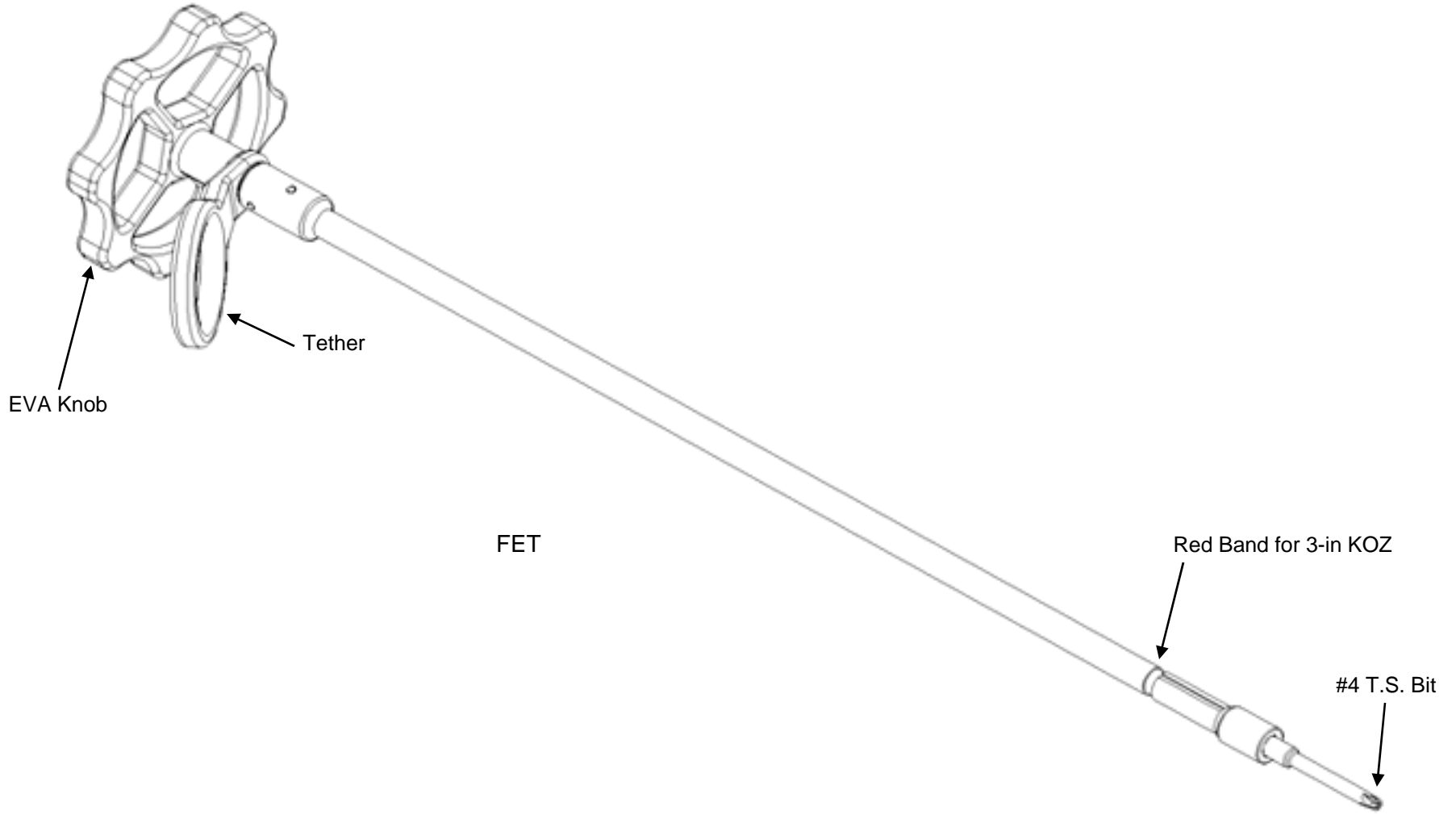




CMT (Cont)



FET

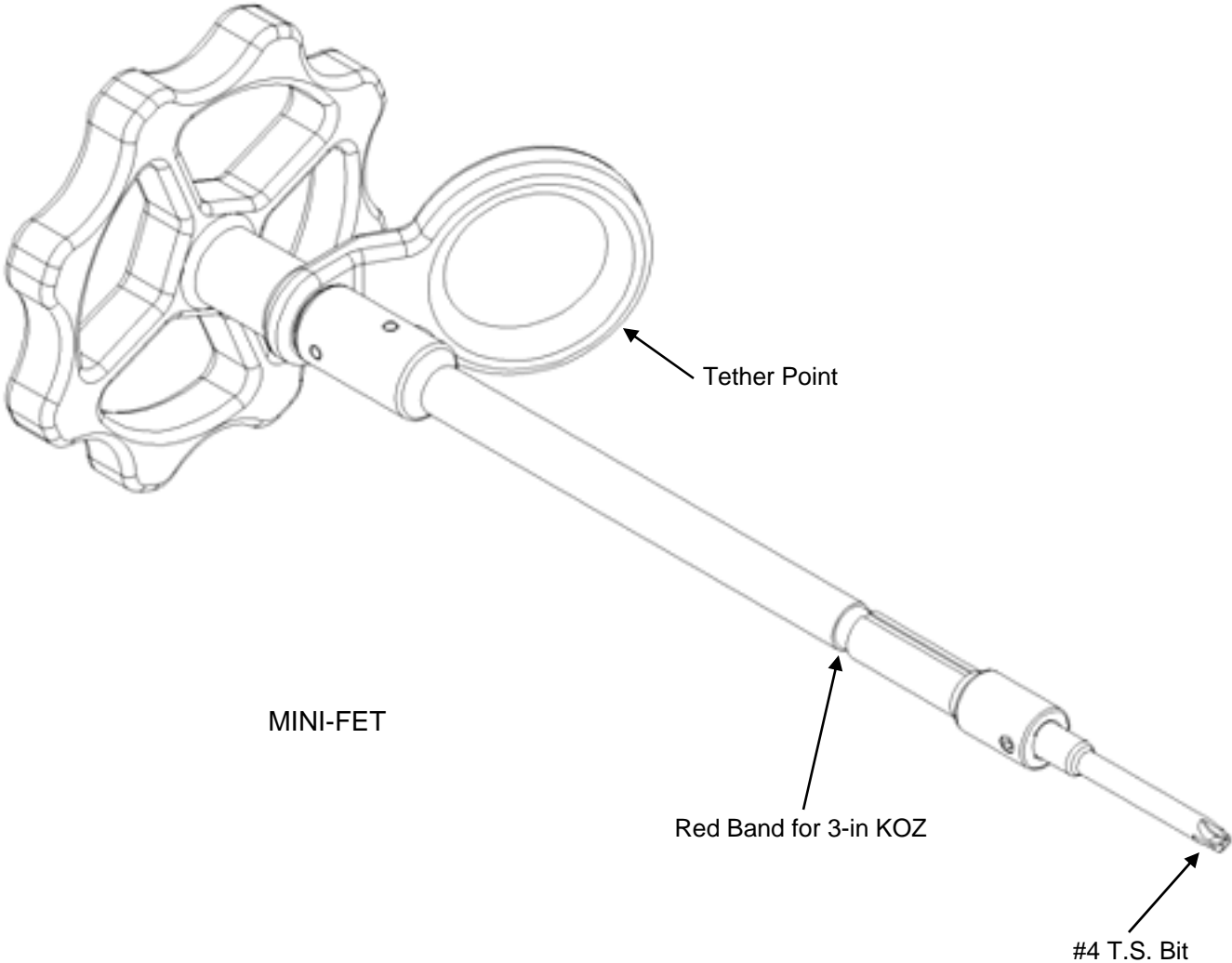


FET

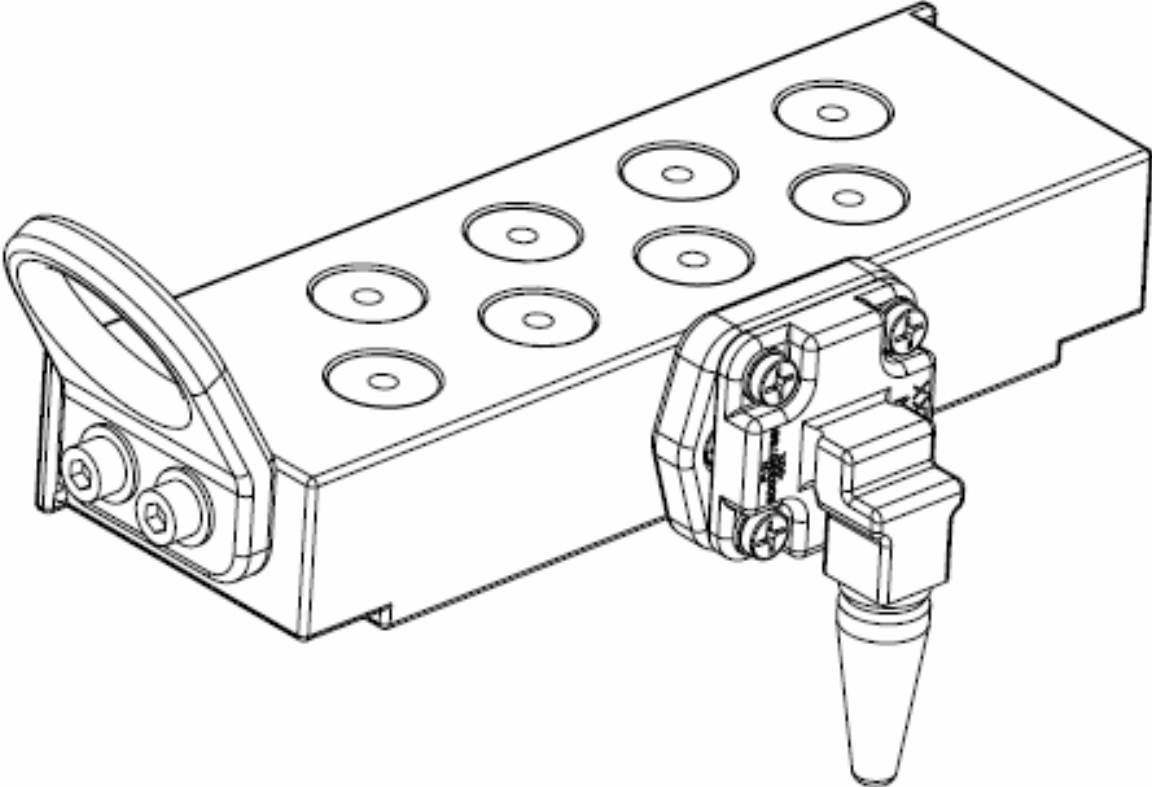
Red Band for 3-in KOZ

#4 T.S. Bit

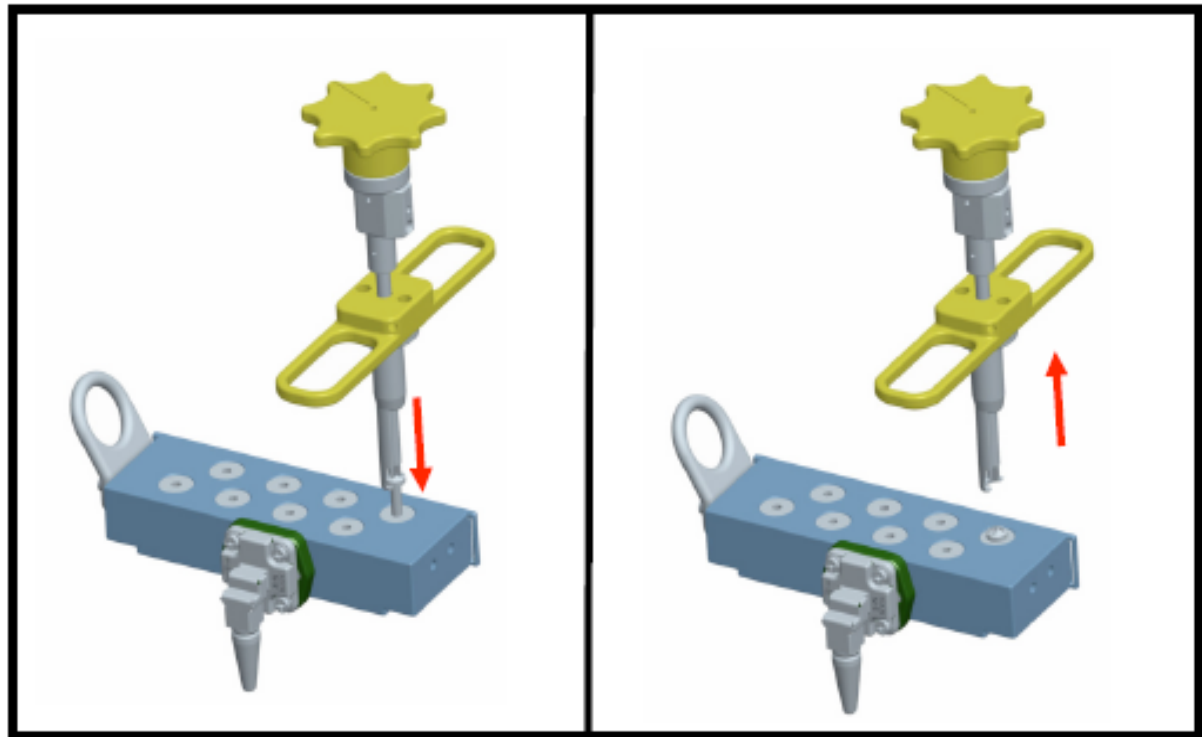
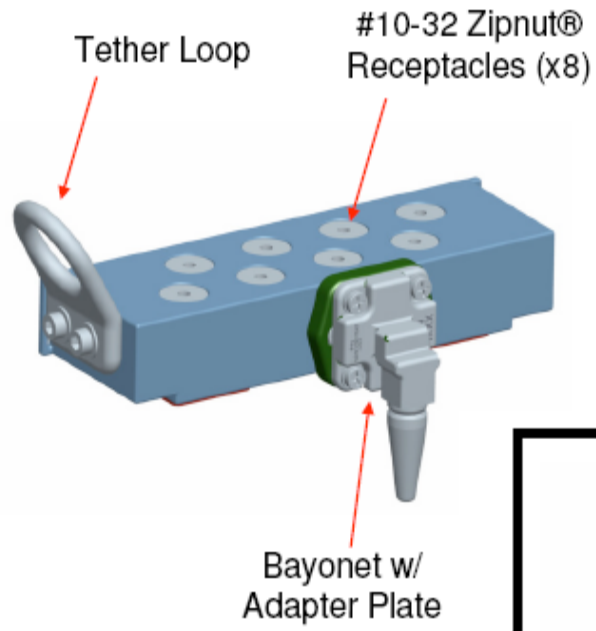
**MINI-FET**



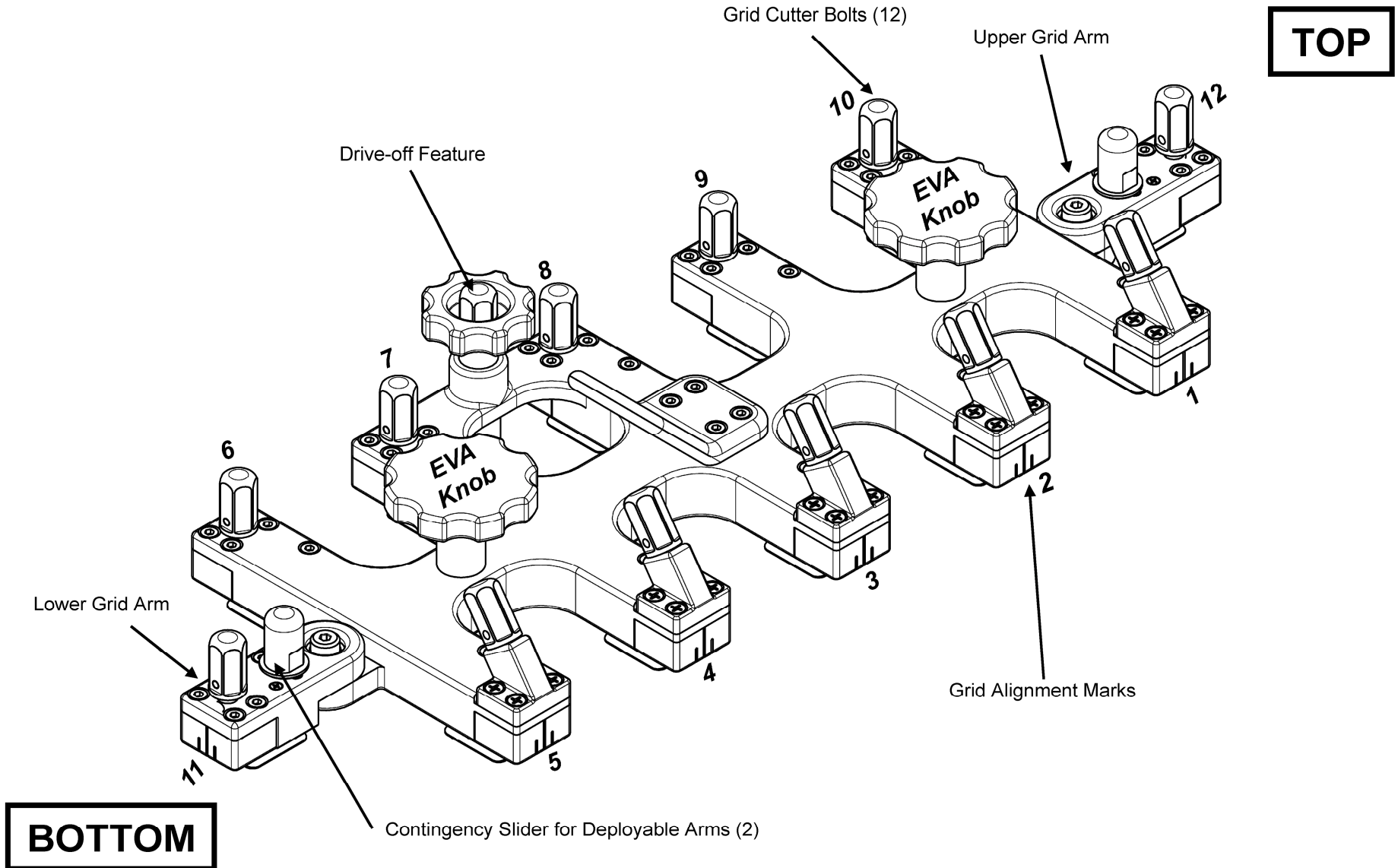
**FASTENER RETENTION BLOCK (FRB)**



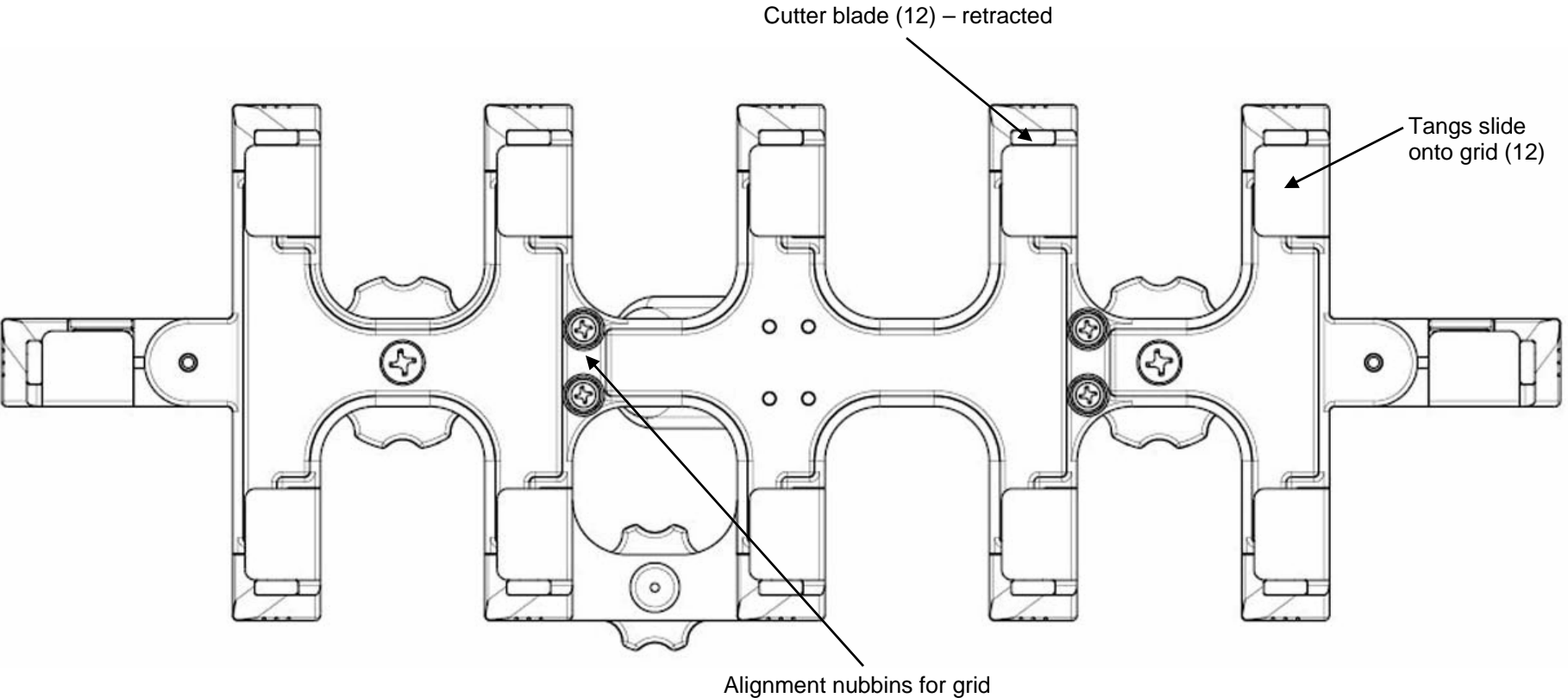
### FASTENER RETENTION BLOCK (FRB) (Cont)



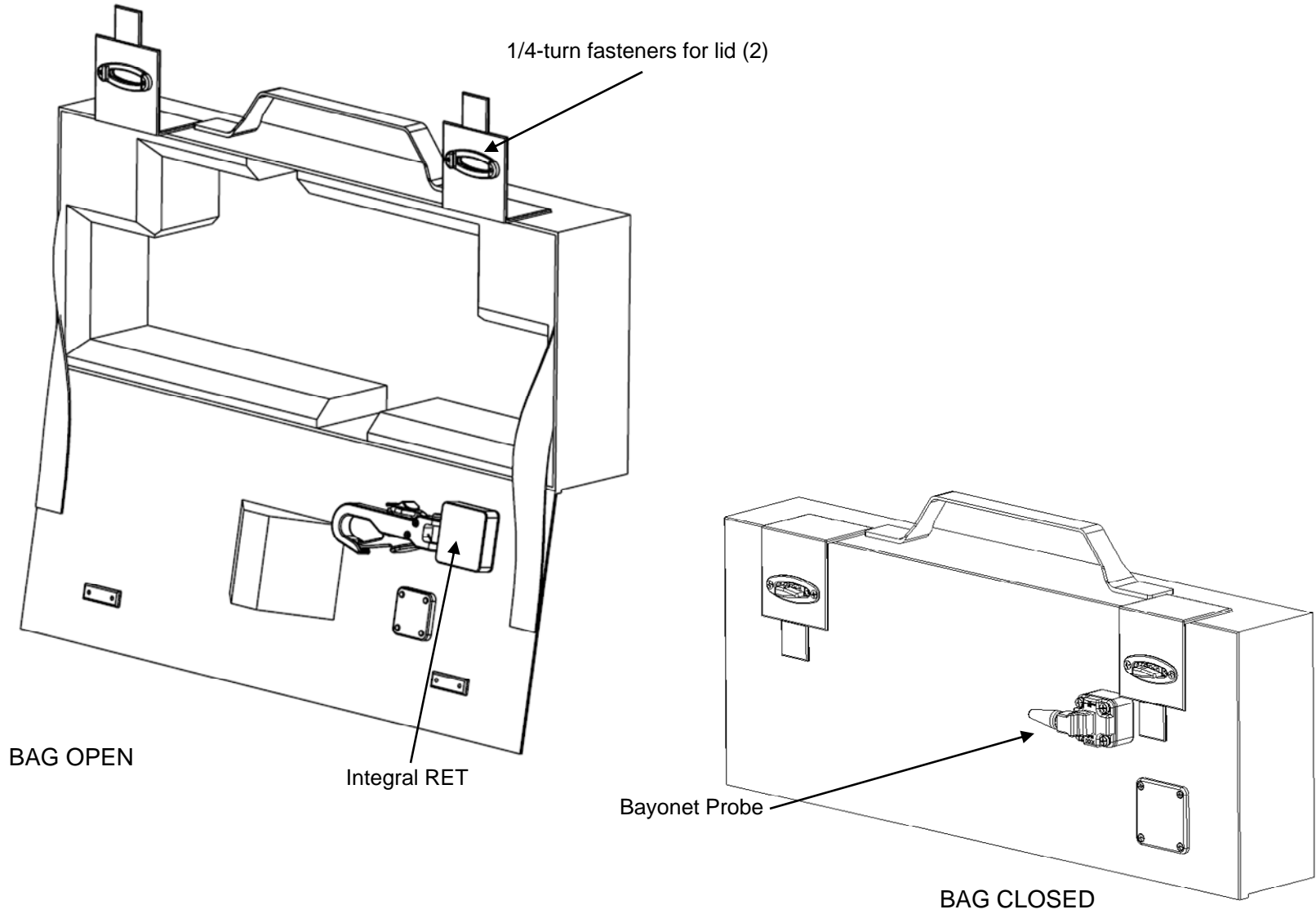
# GRID CUTTER – TOP VIEW



**GRID CUTTER – BOTTOM VIEW**

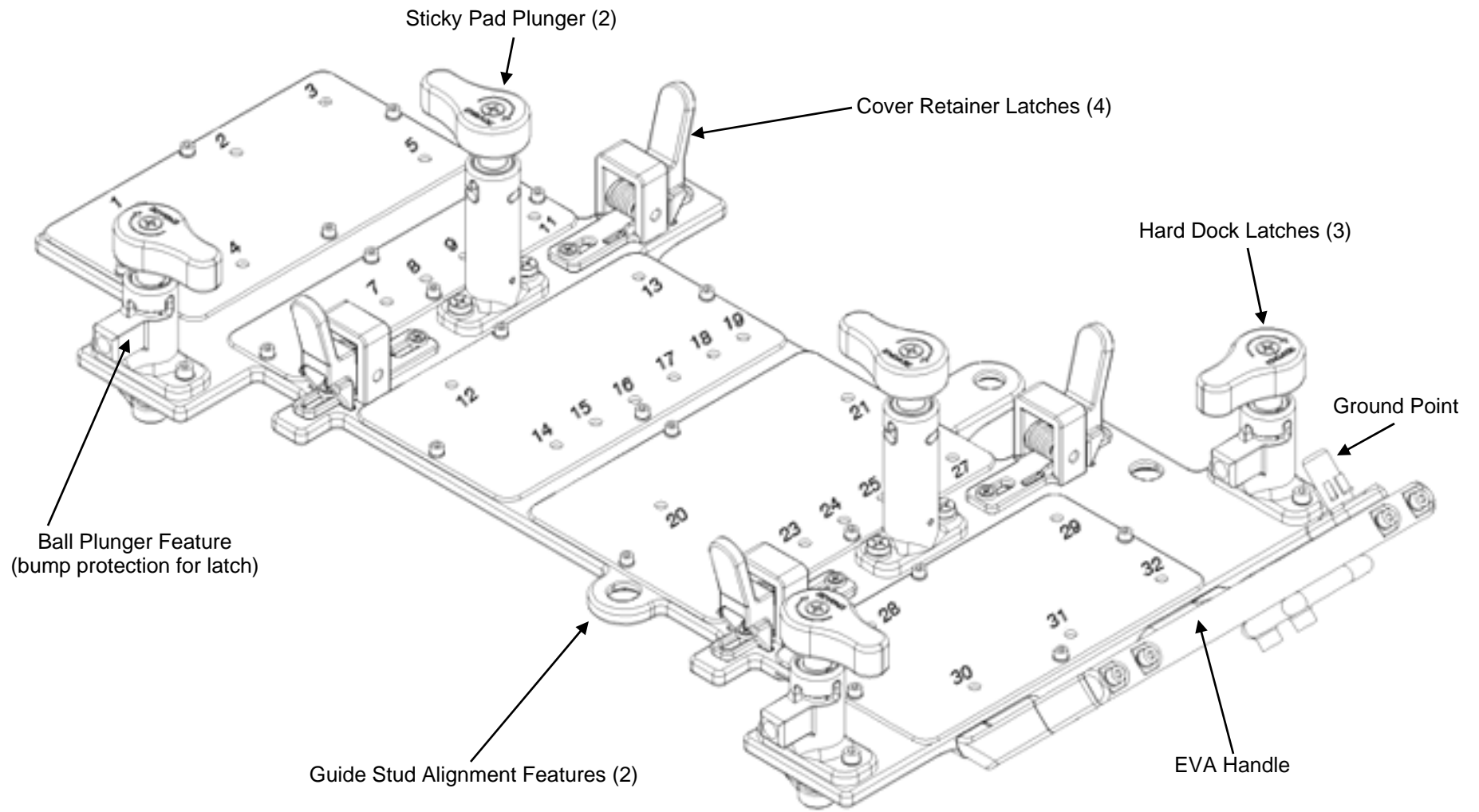


# GRID CUTTER TRANSFER BAG

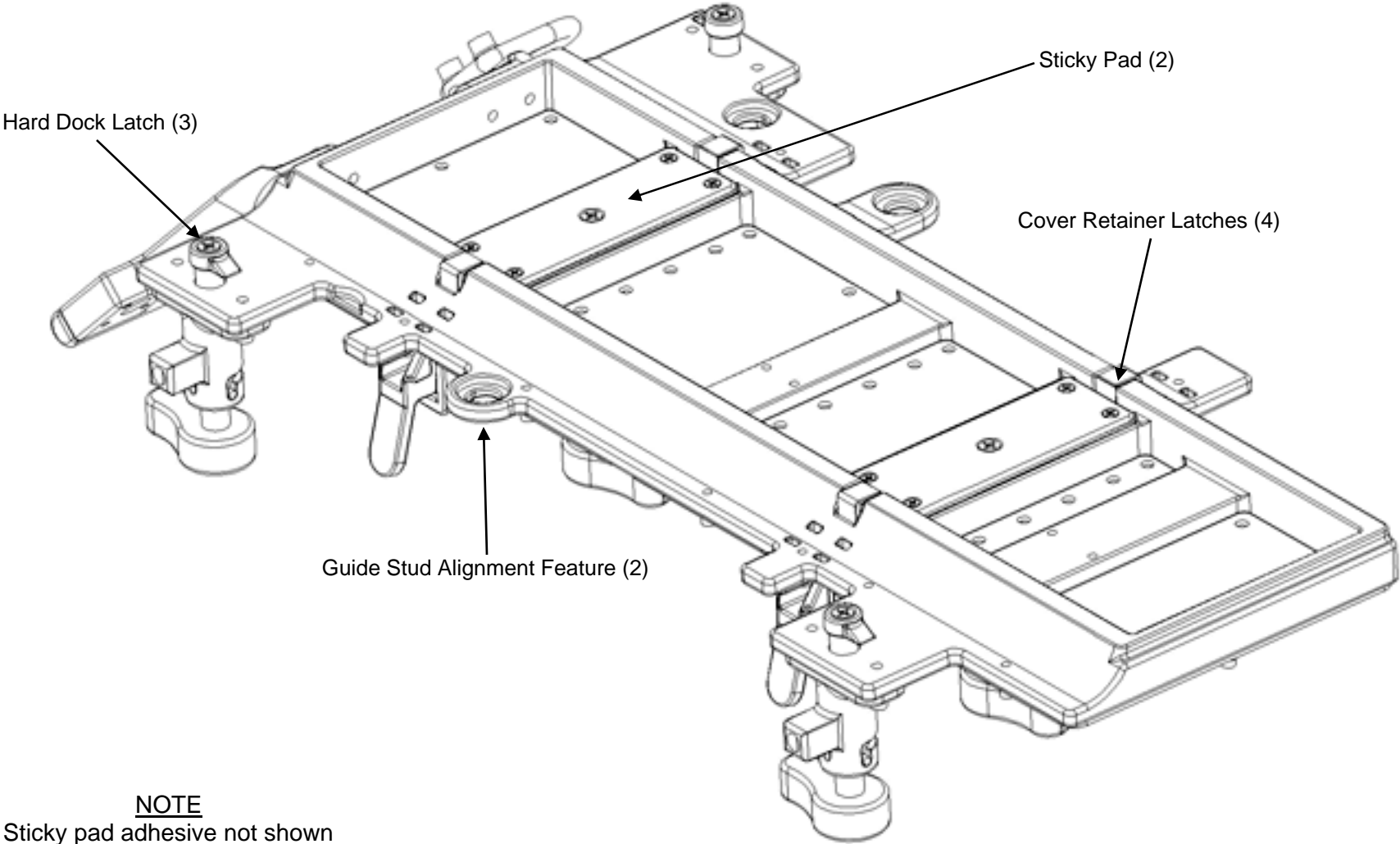




**FCP – TOP VIEW**

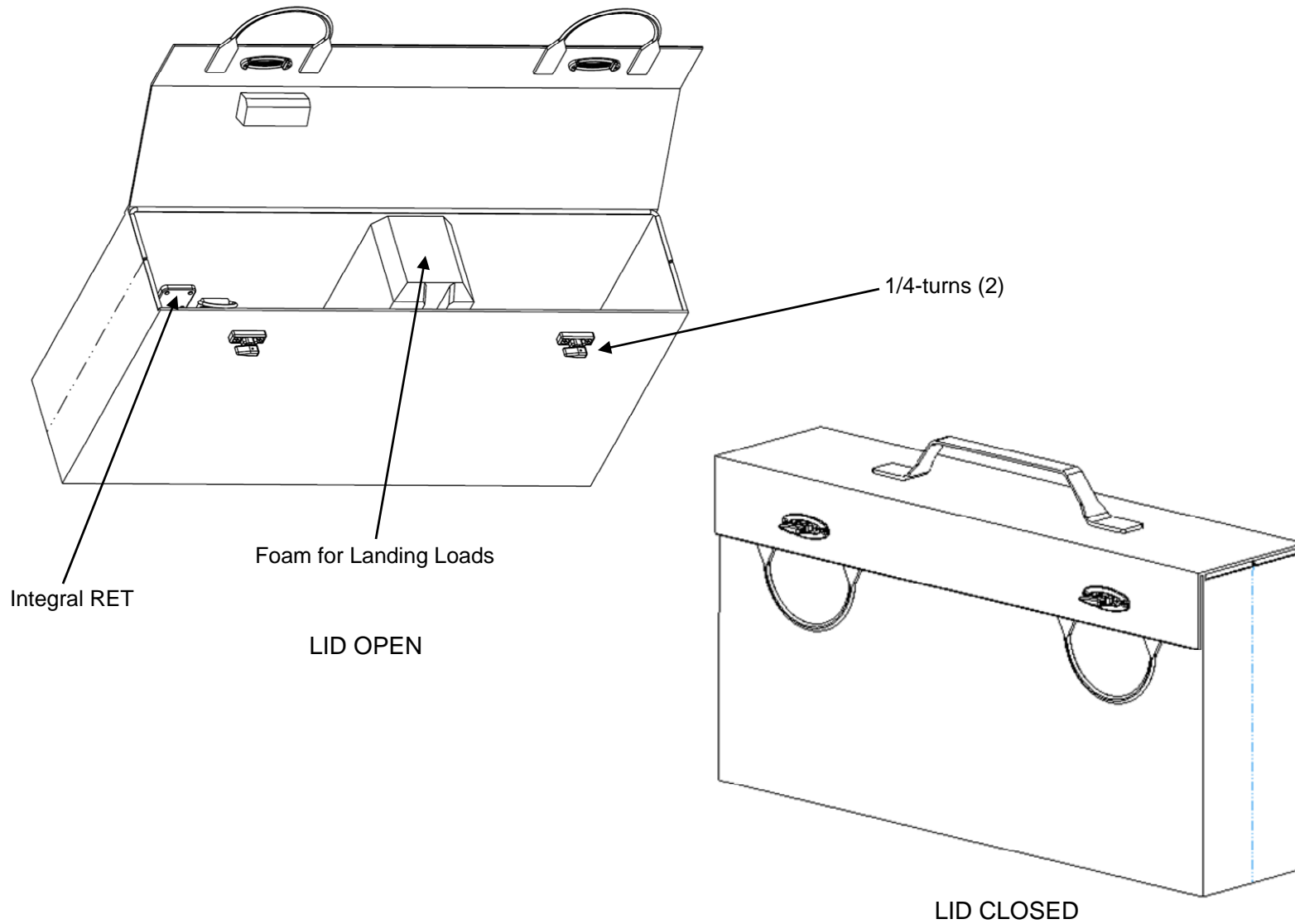


**FCP – BOTTOM VIEW**

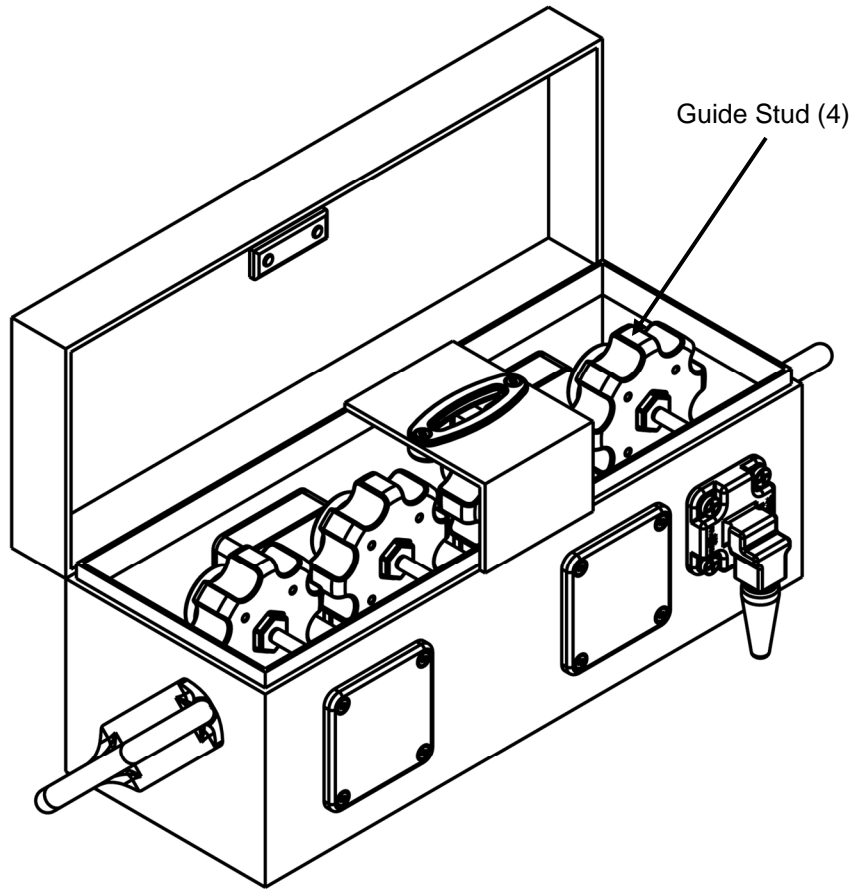


**NOTE**  
Sticky pad adhesive not shown

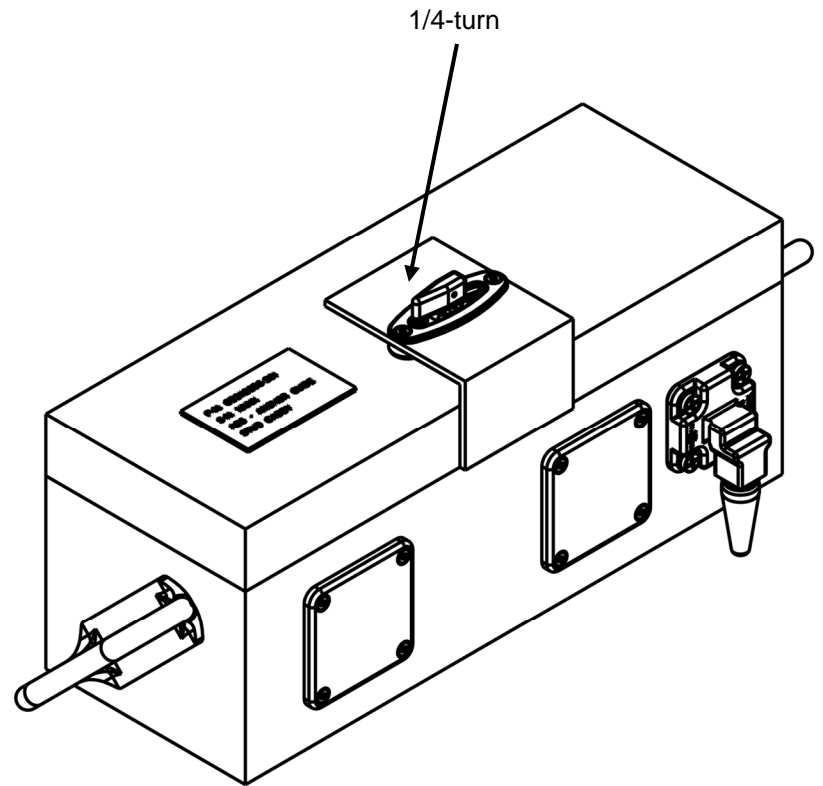
# FCP TRANSFER BAG



# ACS GUIDE STUD CADDY

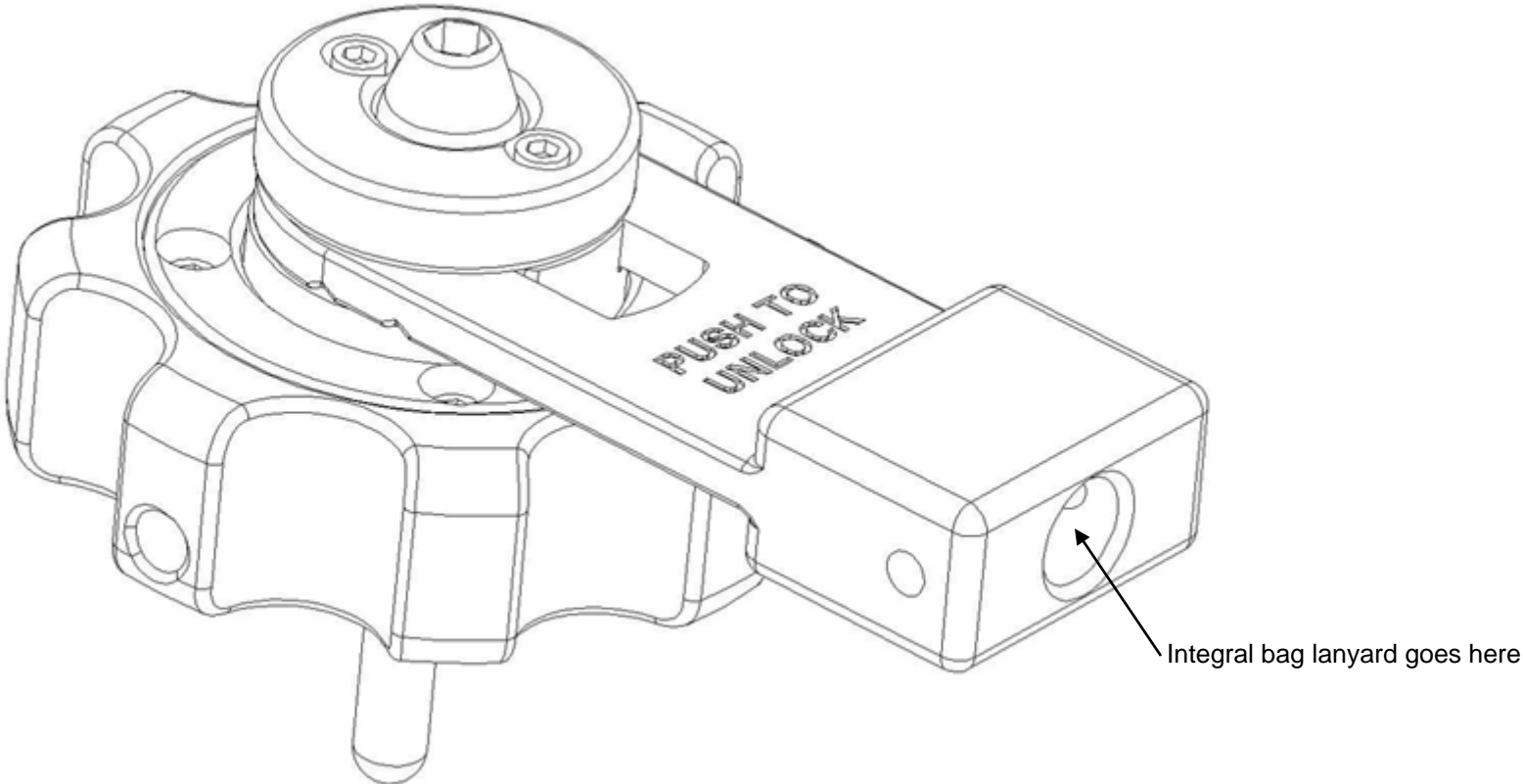


LID OPEN



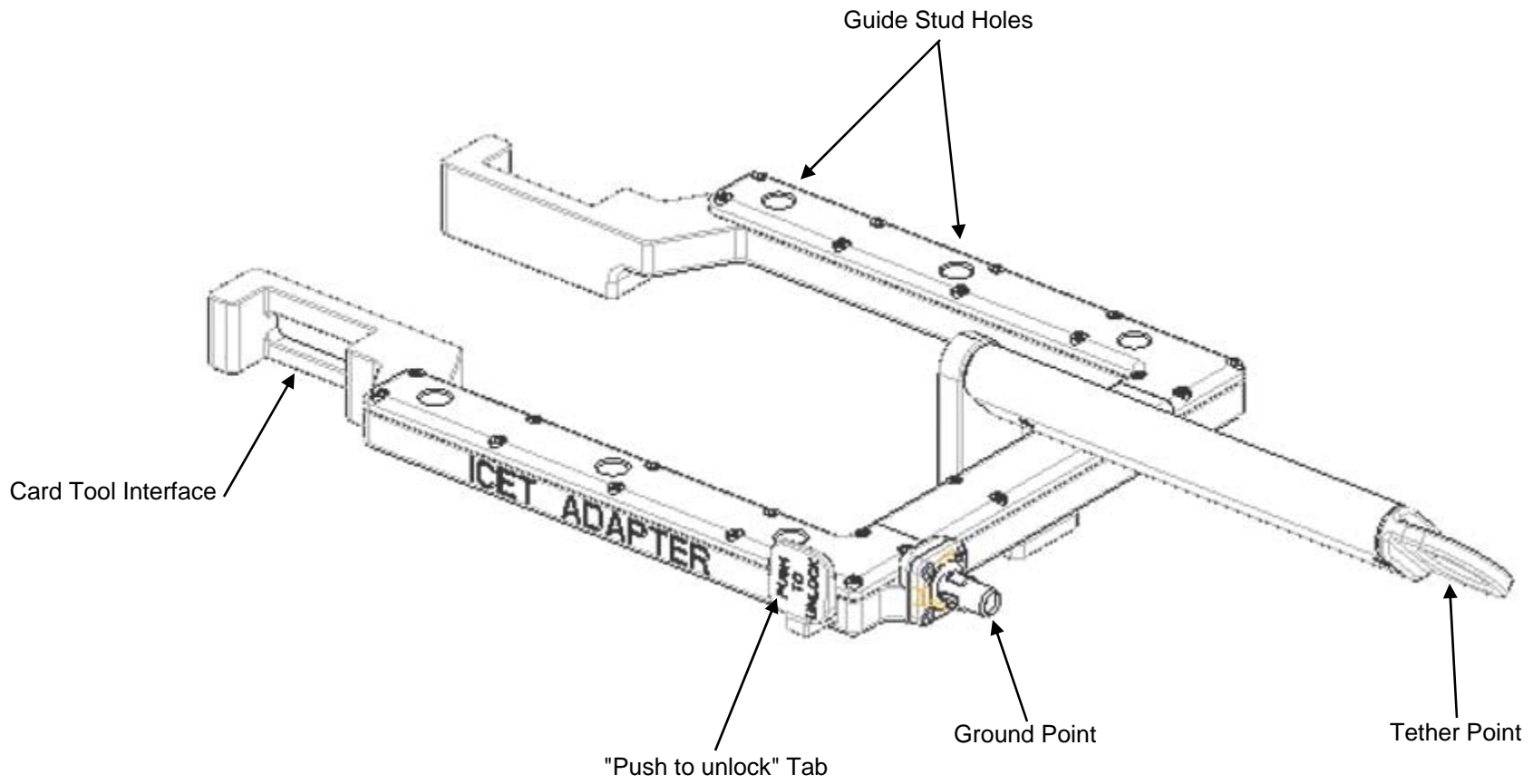
LID CLOSED

**ACS GUIDE STUD CADDY (Cont)**

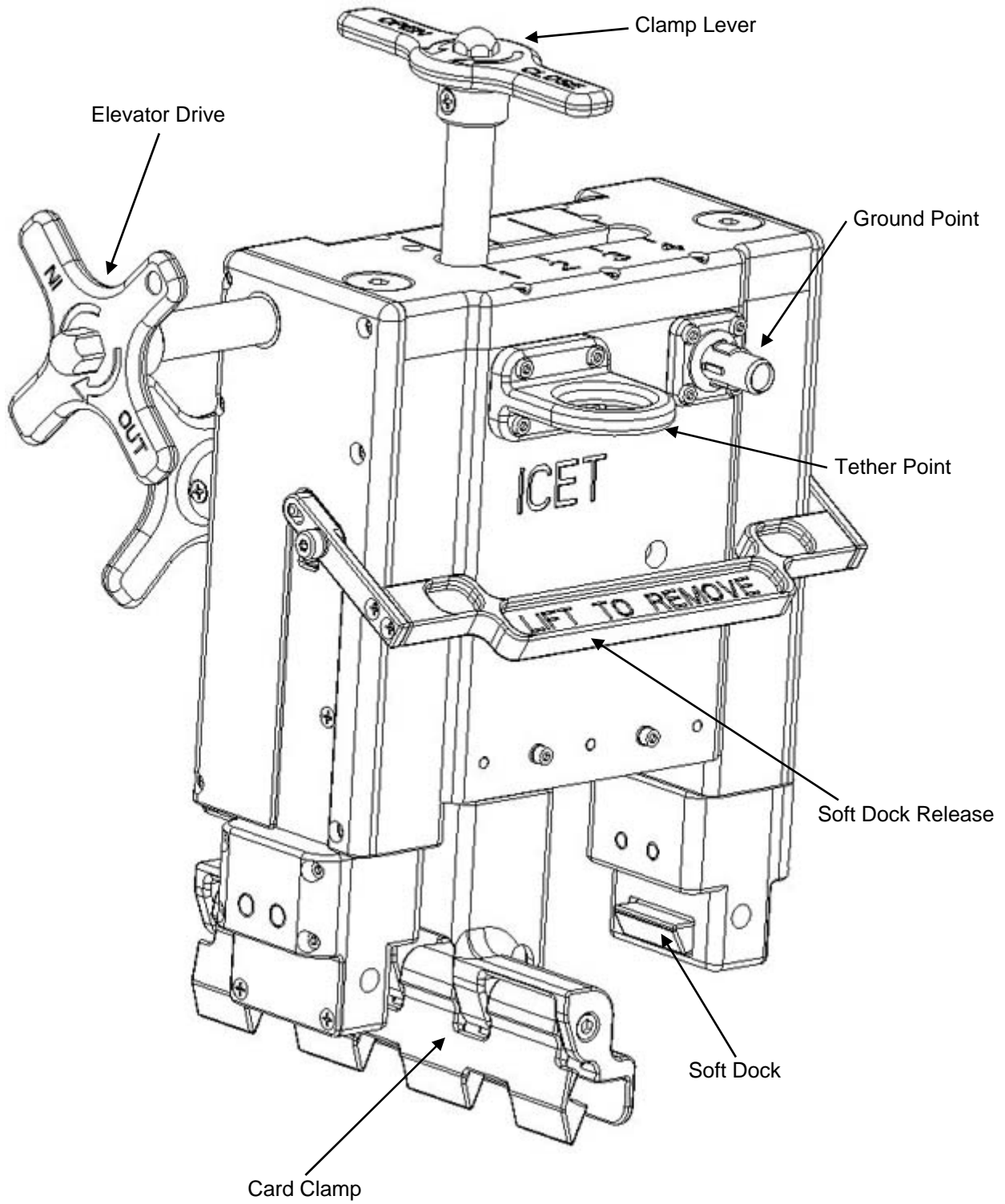


CLOSEUP OF ACS GUIDE STUD

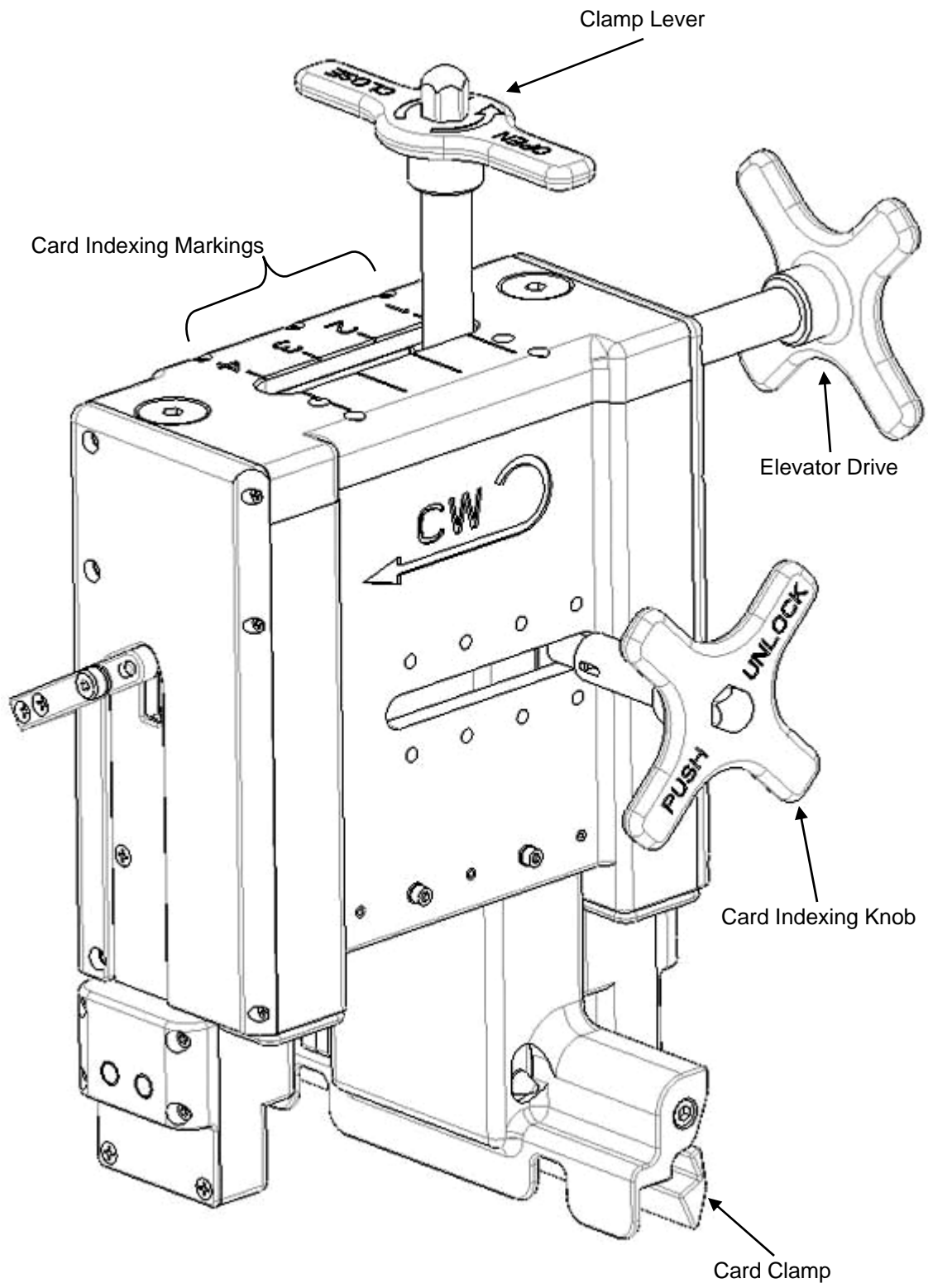
# WISHBONE



# CARD TOOL

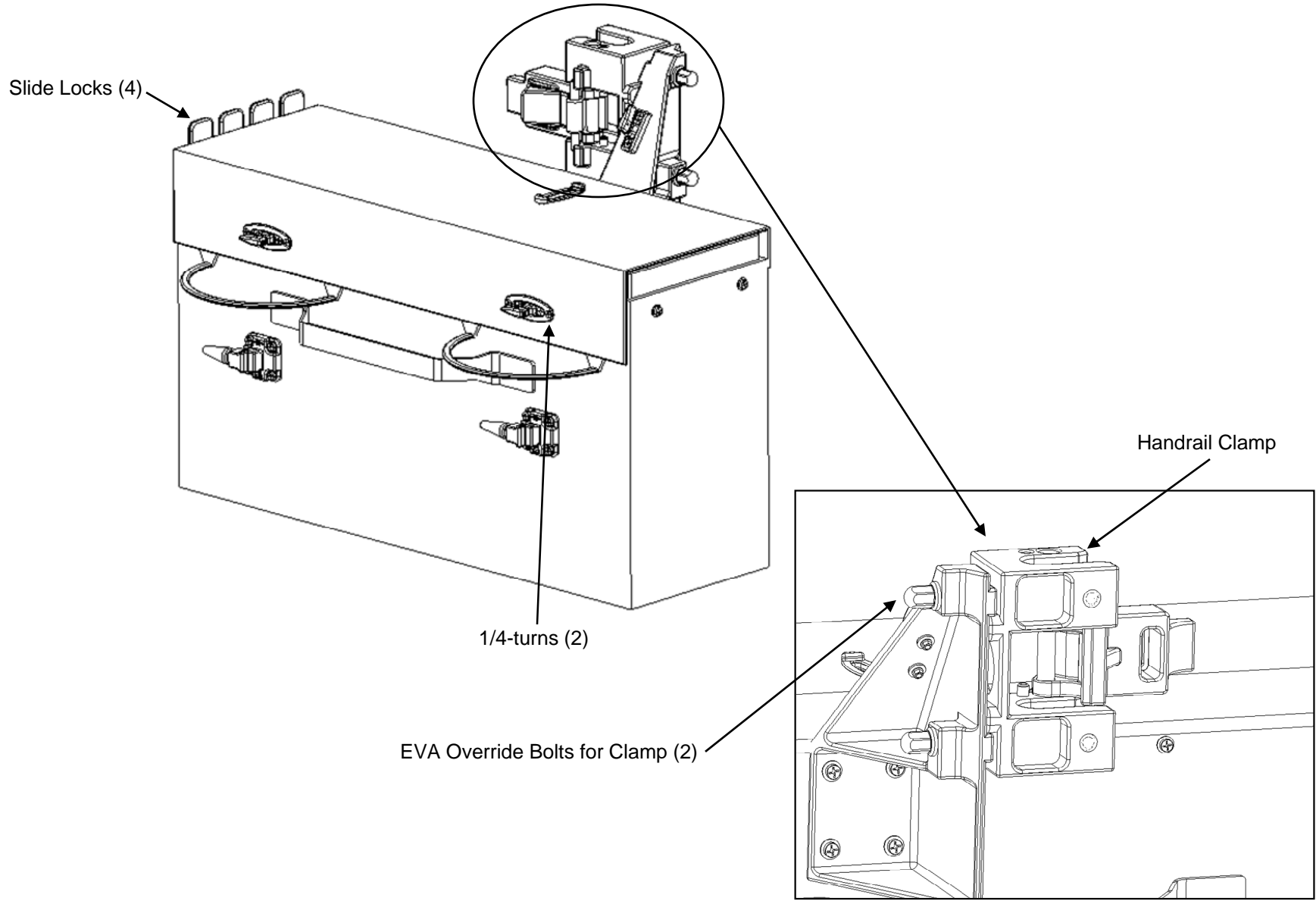


# CARD TOOL (Cont)

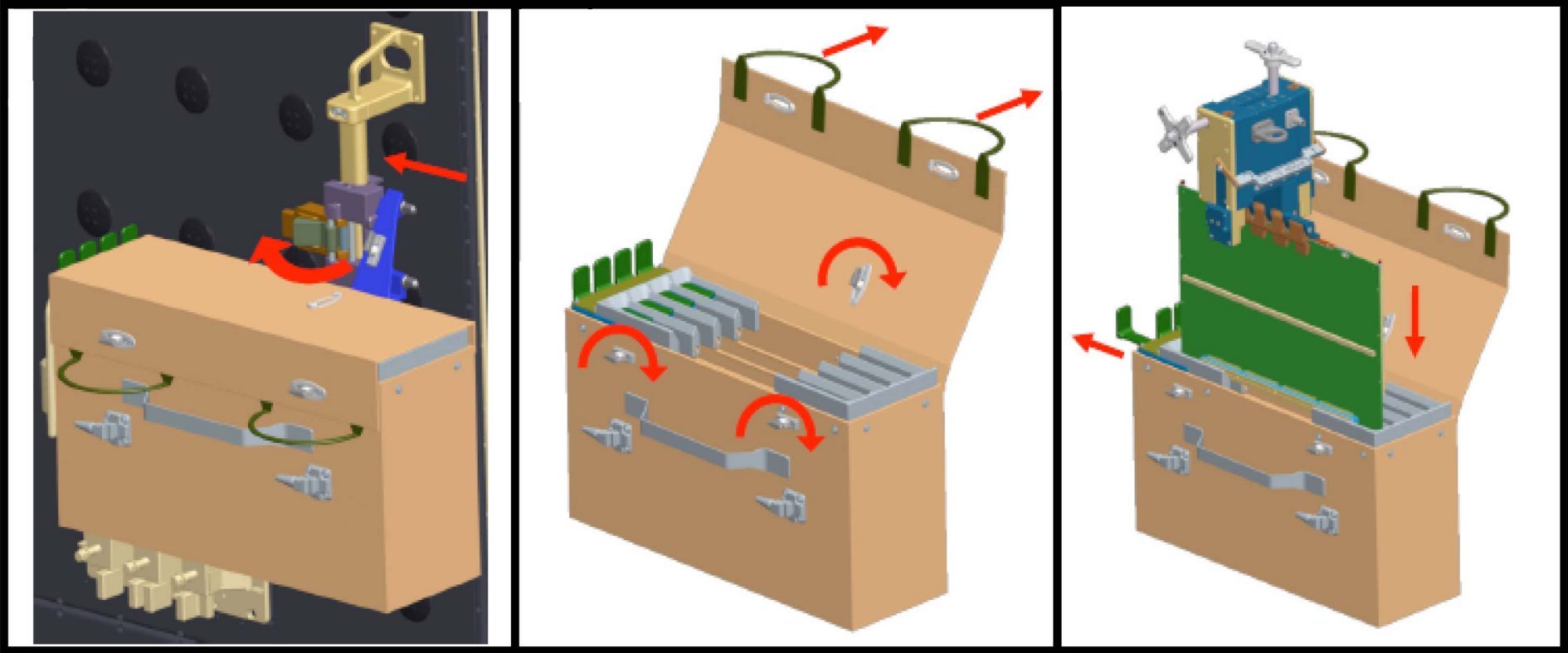




# CARD STORAGE ENCLOSURE



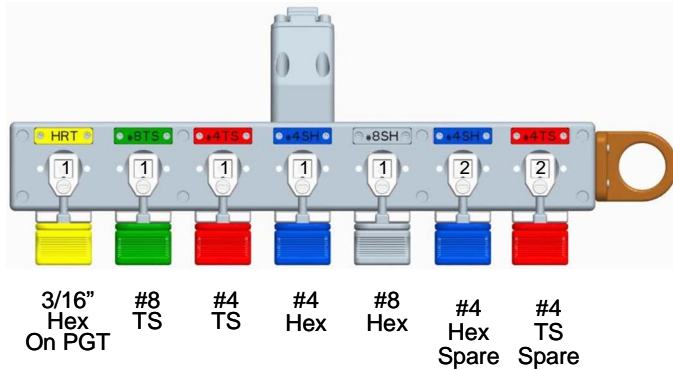
CARD TRANSPORT ENCLOSURE



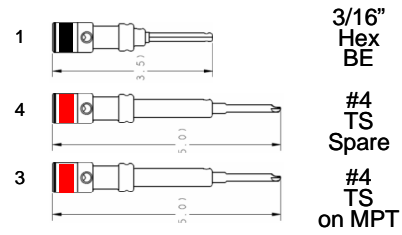
# BIT CADDY AND BIT OVERVIEW (ACS)

Egress with new (unused) Bits each SI Repair Day

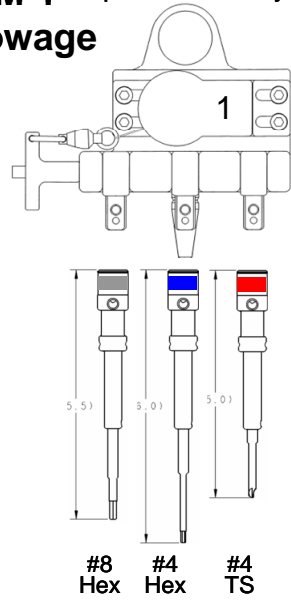
## STIS Bit Caddy (Middeck)



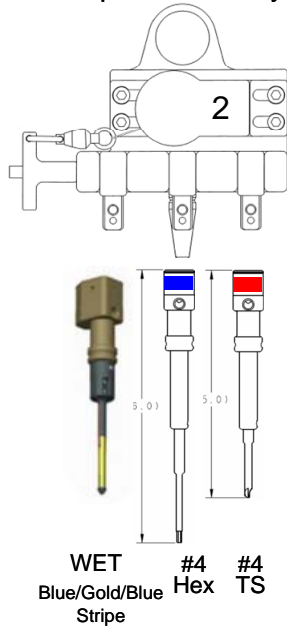
## ACS Bits (Middeck)



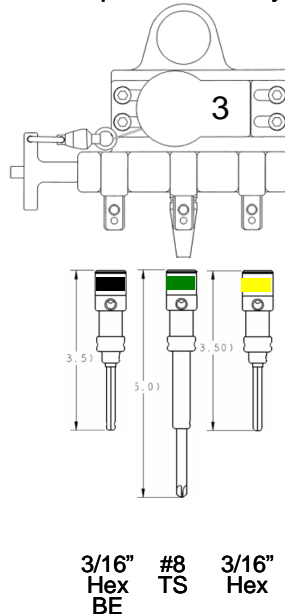
### ATM-1 Spare Bit Caddy Storage



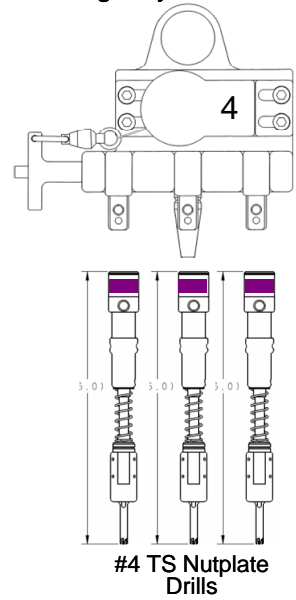
### Spare Bit Caddy



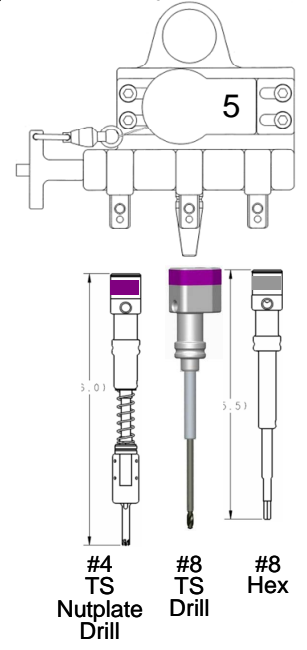
### Spare Bit Caddy



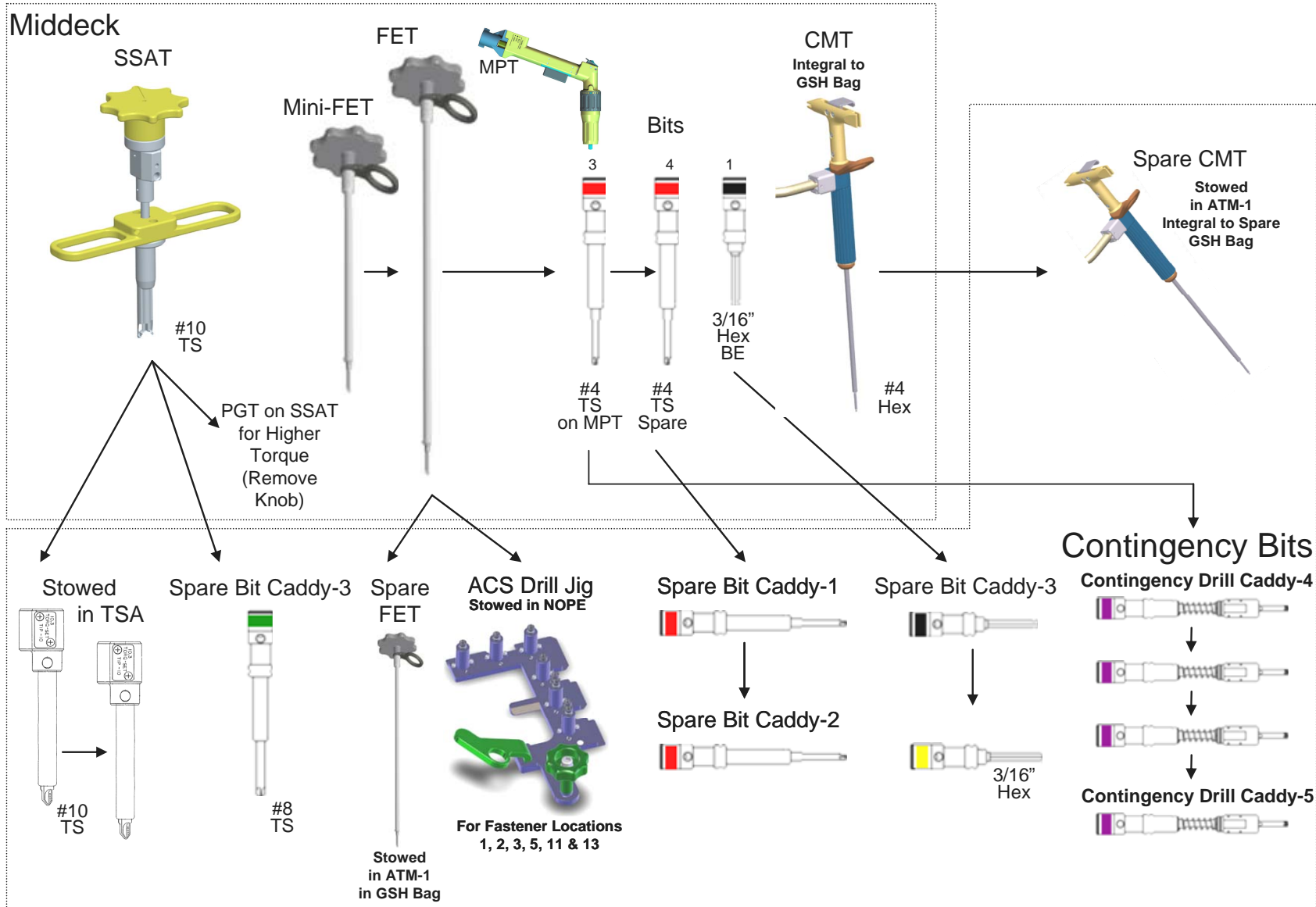
### Contingency Drill Caddy



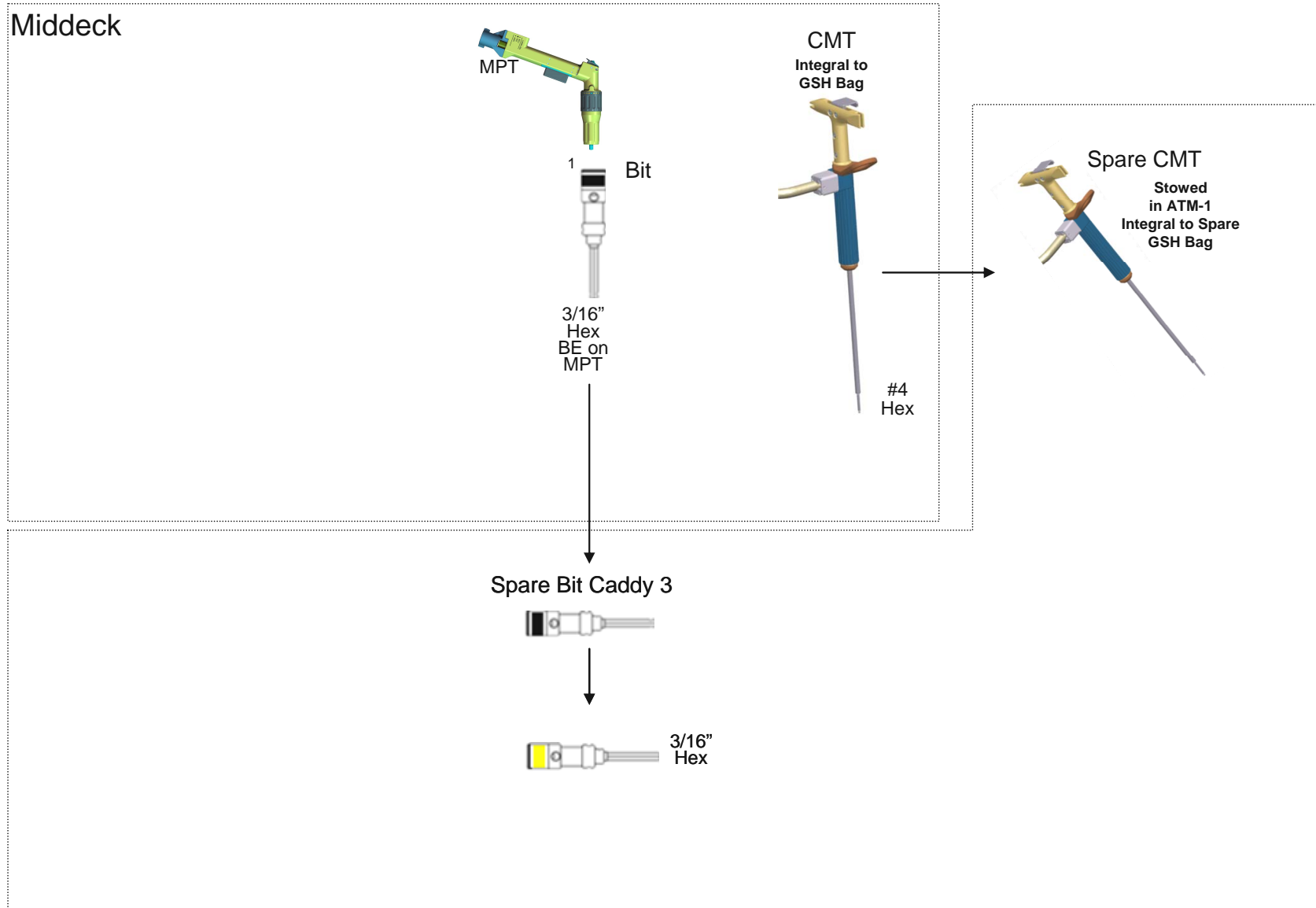
### Contingency Caddy



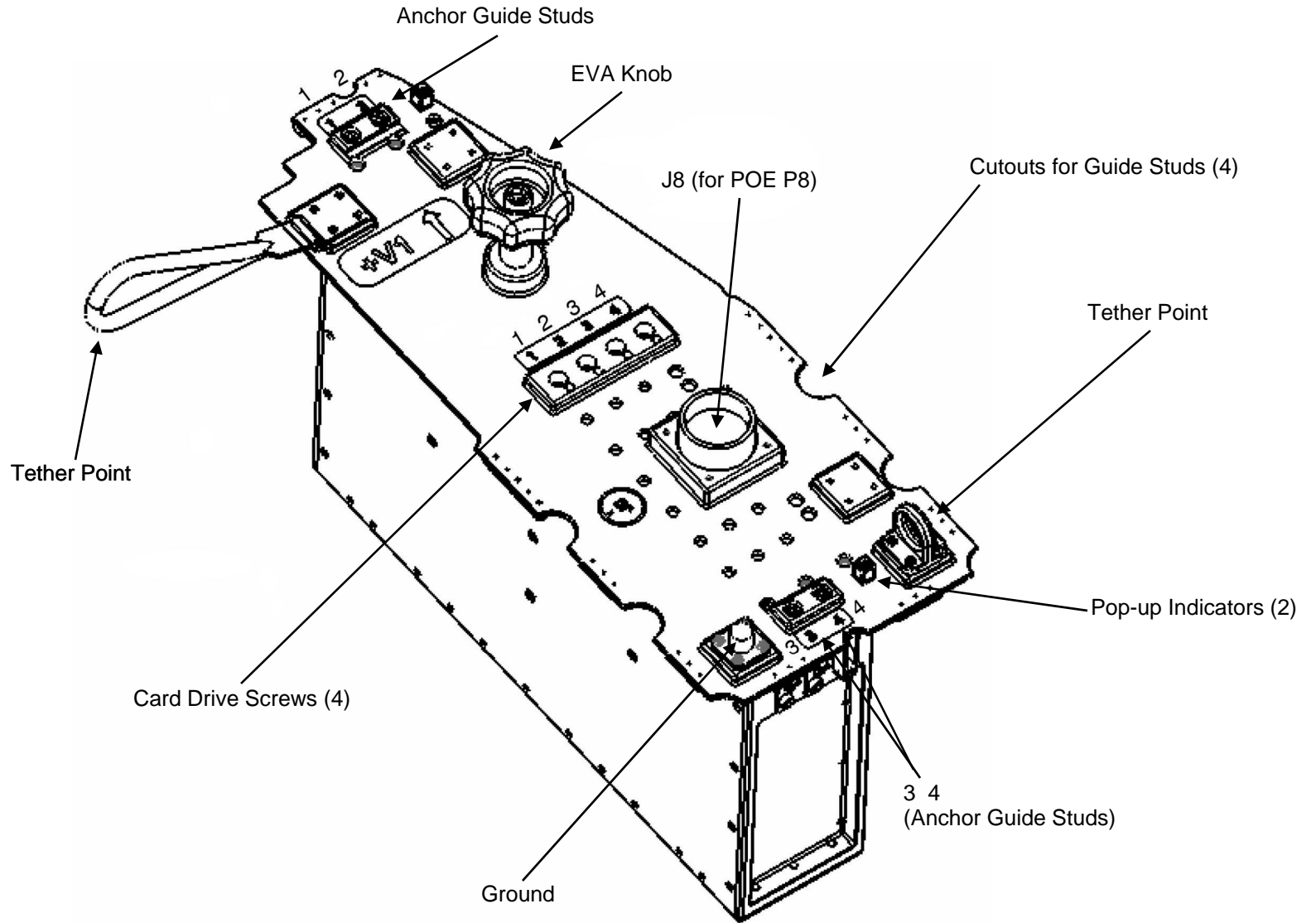
# ACS BITS – SPARE SELECTION FLOW



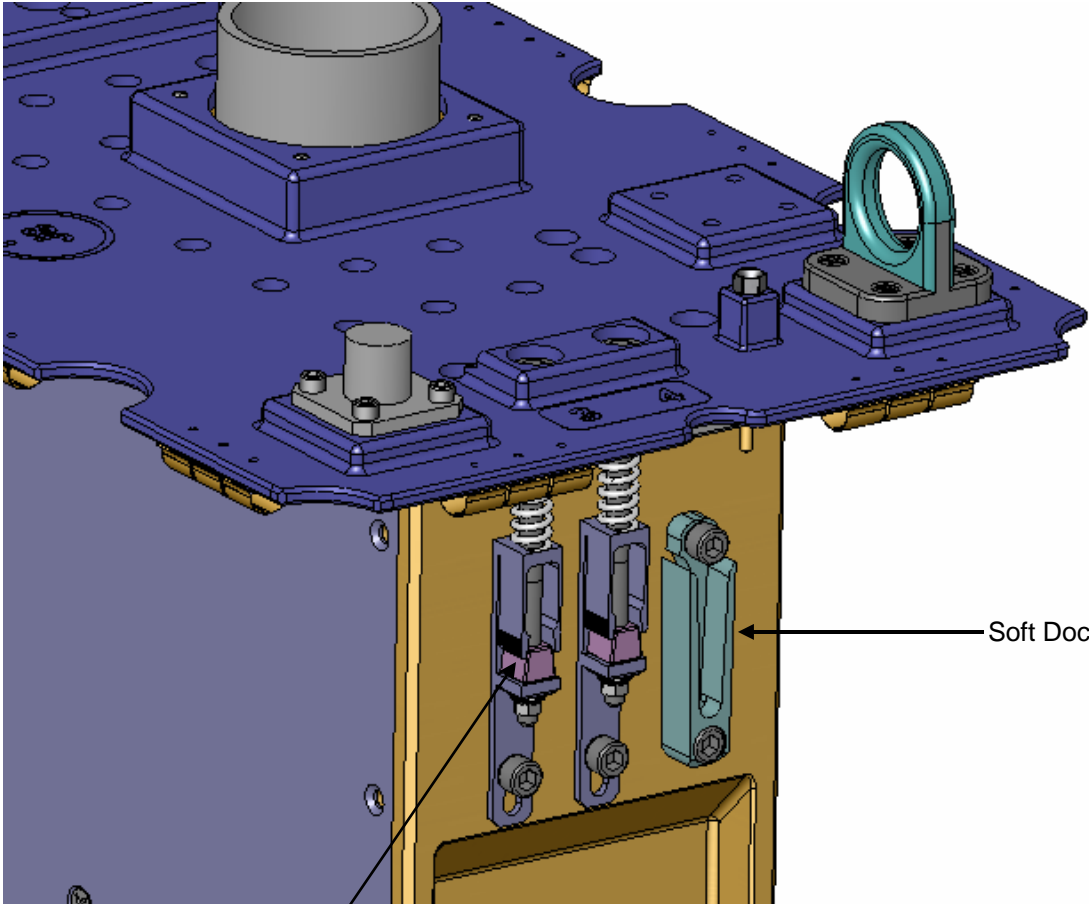
# ACS BITS – SPARE SELECTION FLOW (Cont)



CEB-R



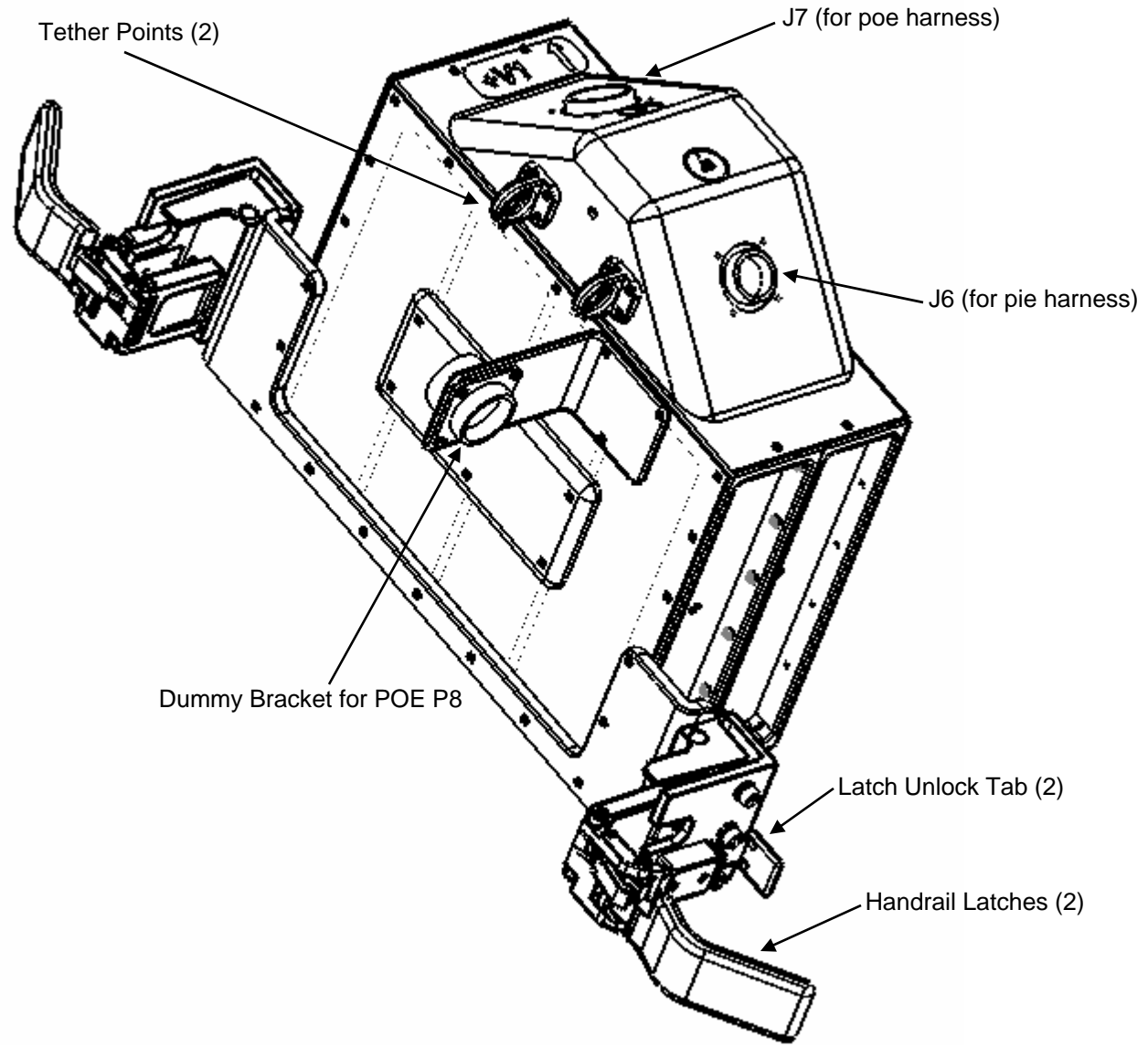
**CEB-R ANCHOR GUIDE STUD CLOSEUP**



Anchor Guide Studs

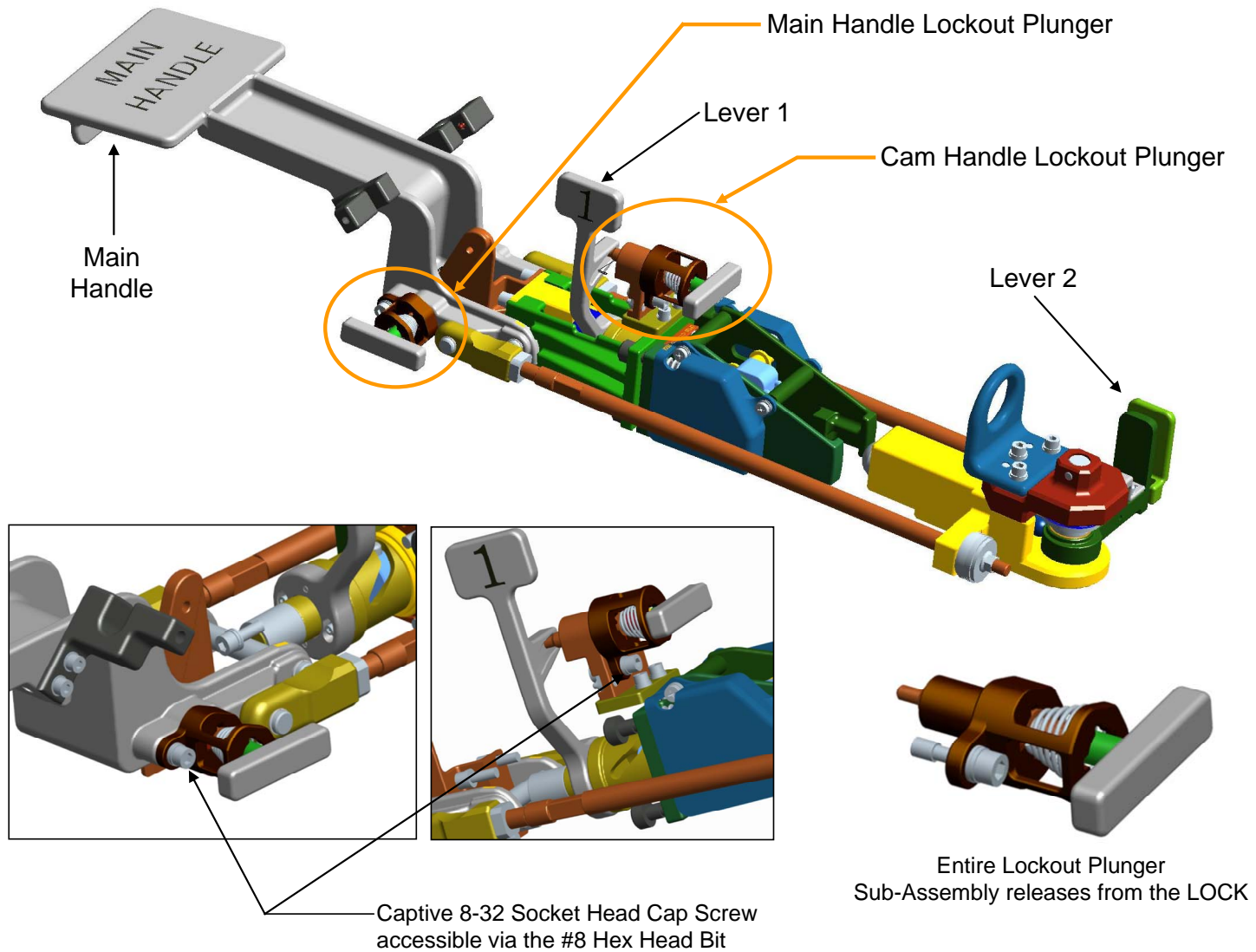
Soft Dock

LVPS-R

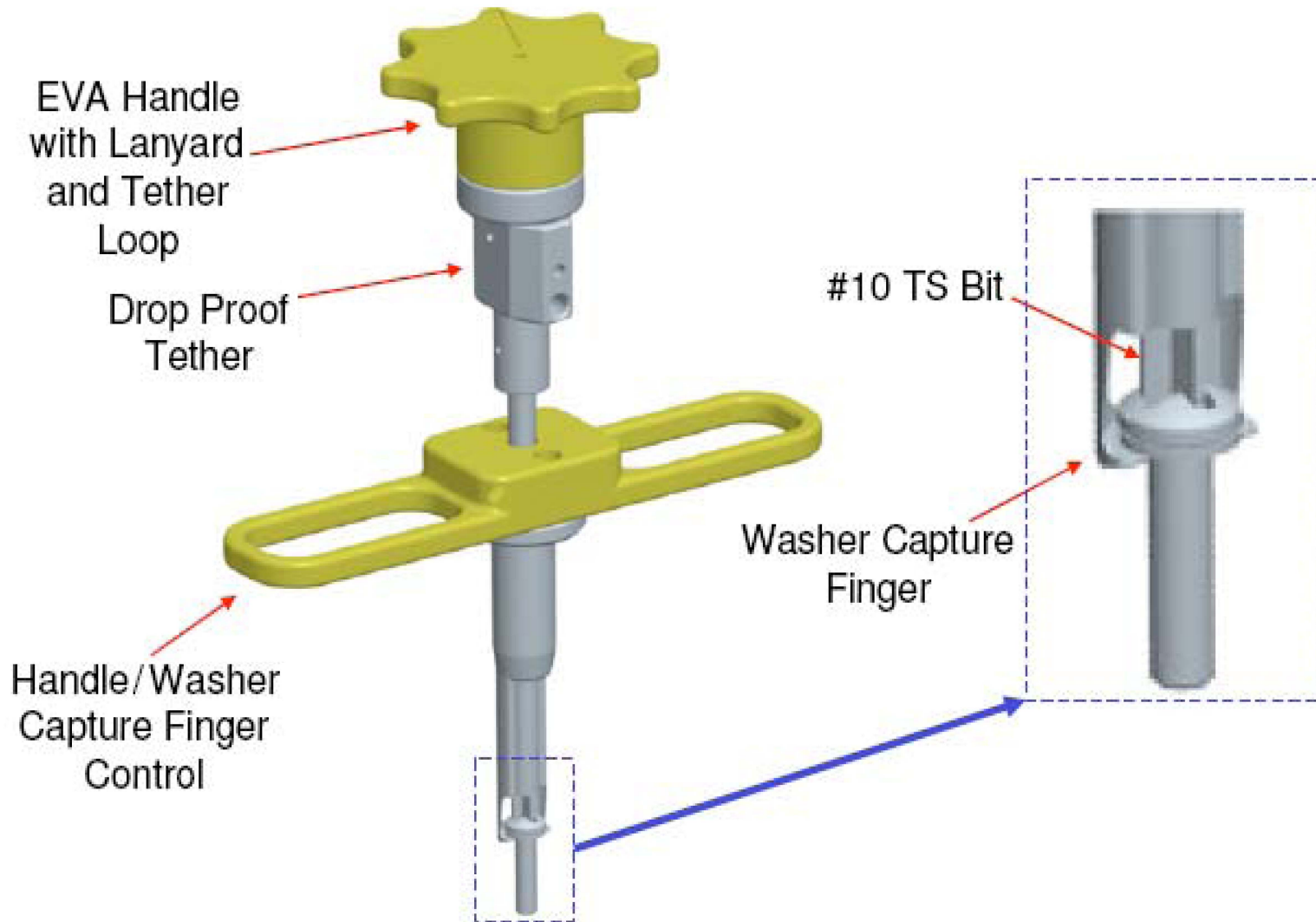




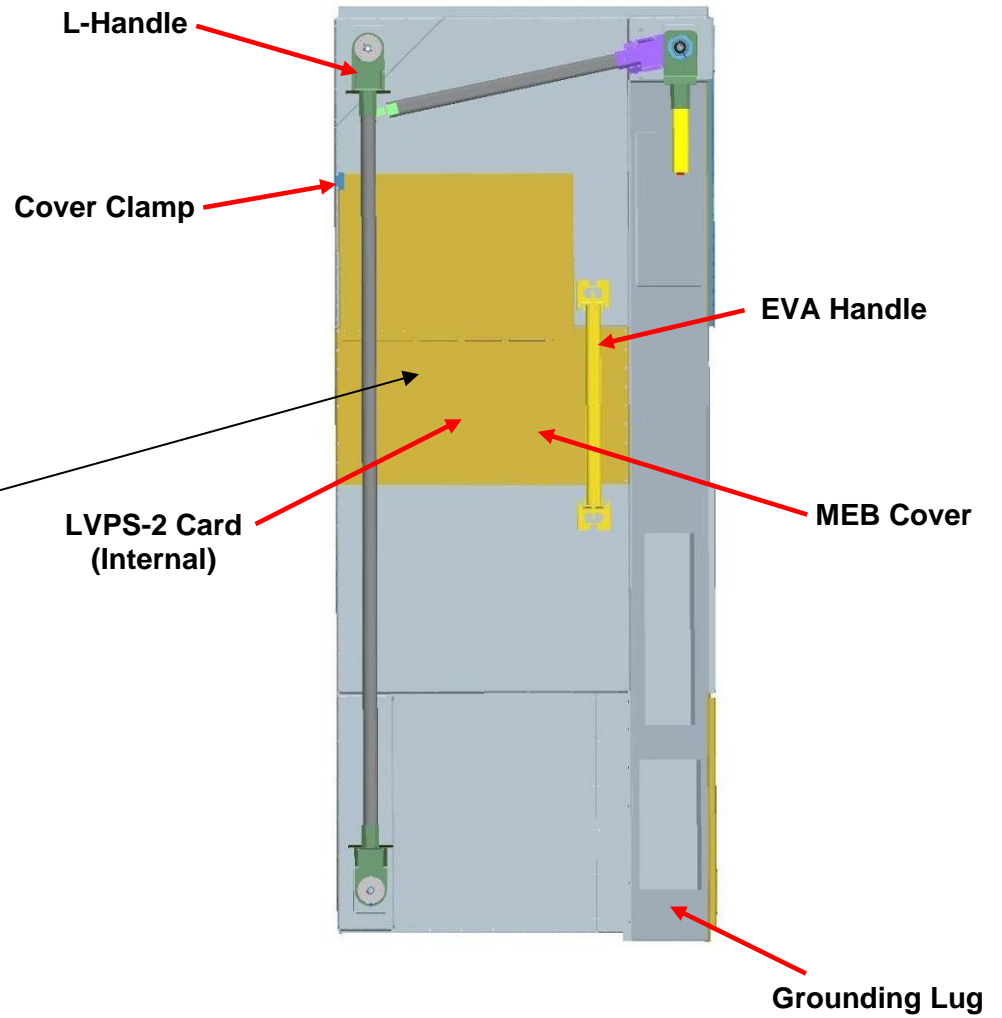
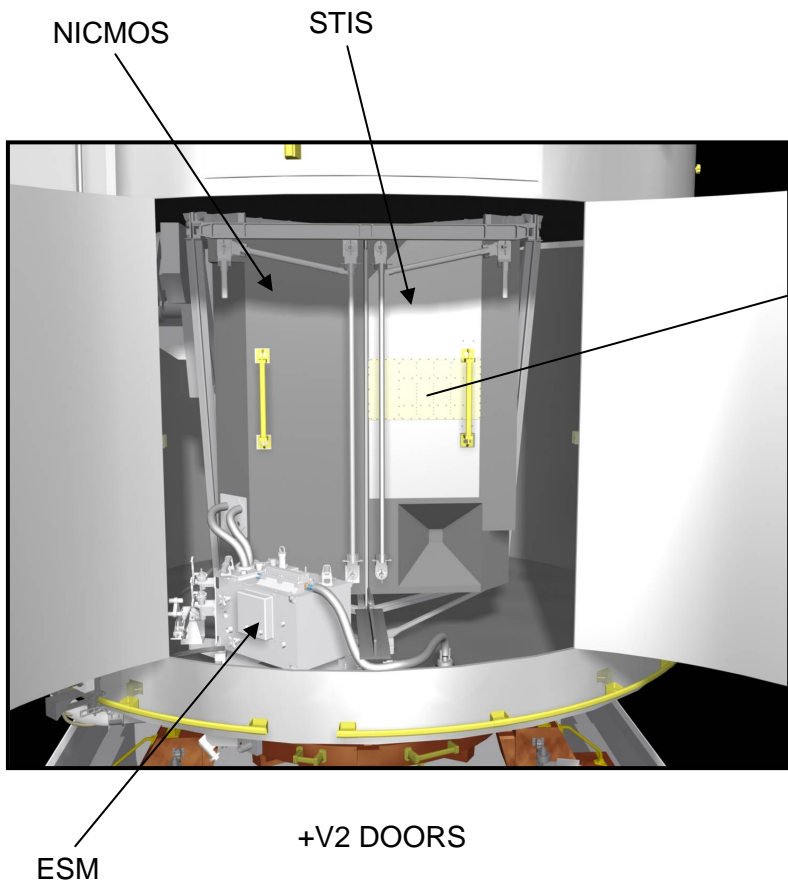
# LOCK (LATCH OVER-CENTER KIT)



SSAT TOOL



# STIS OVERVIEW

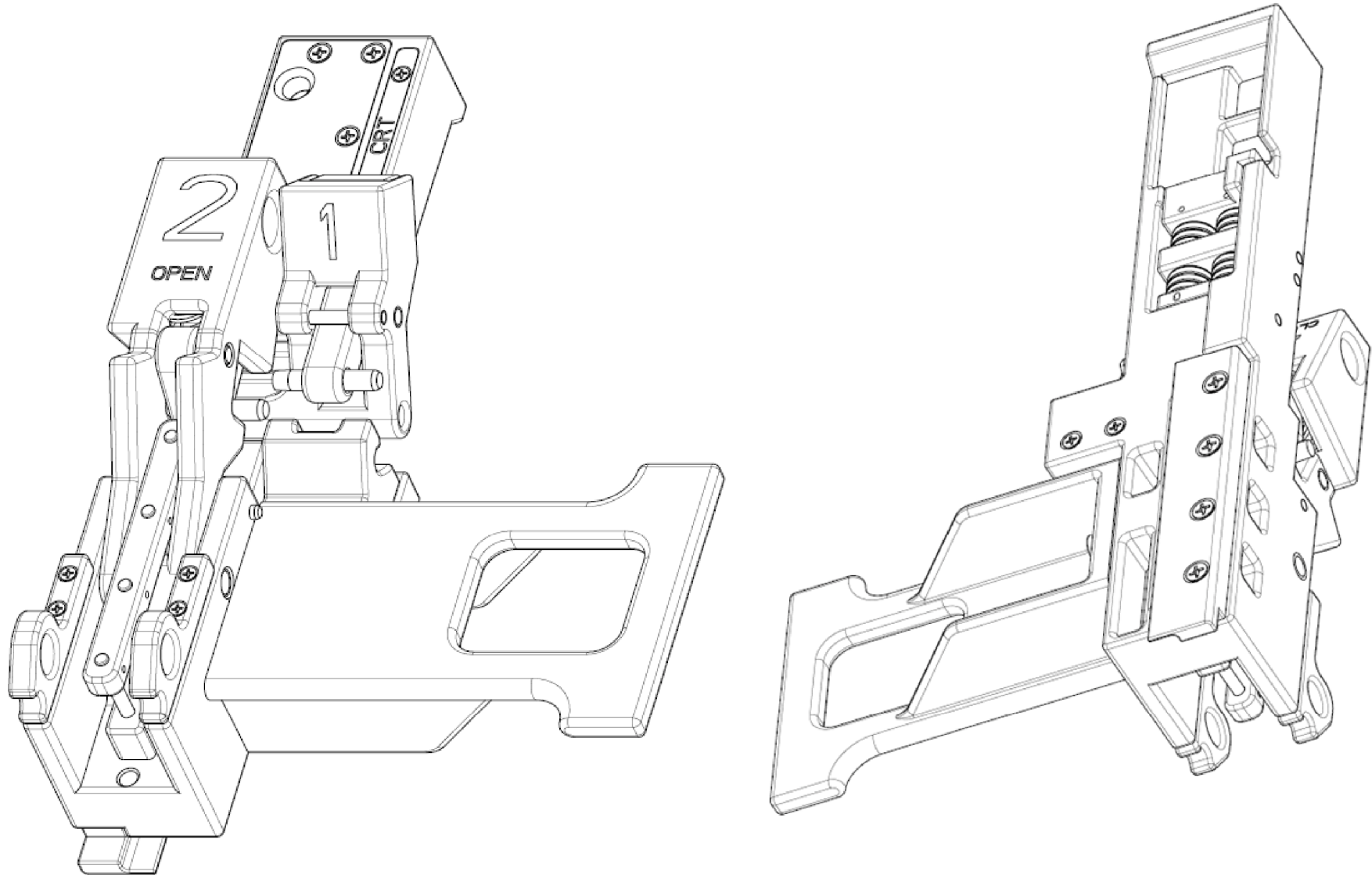


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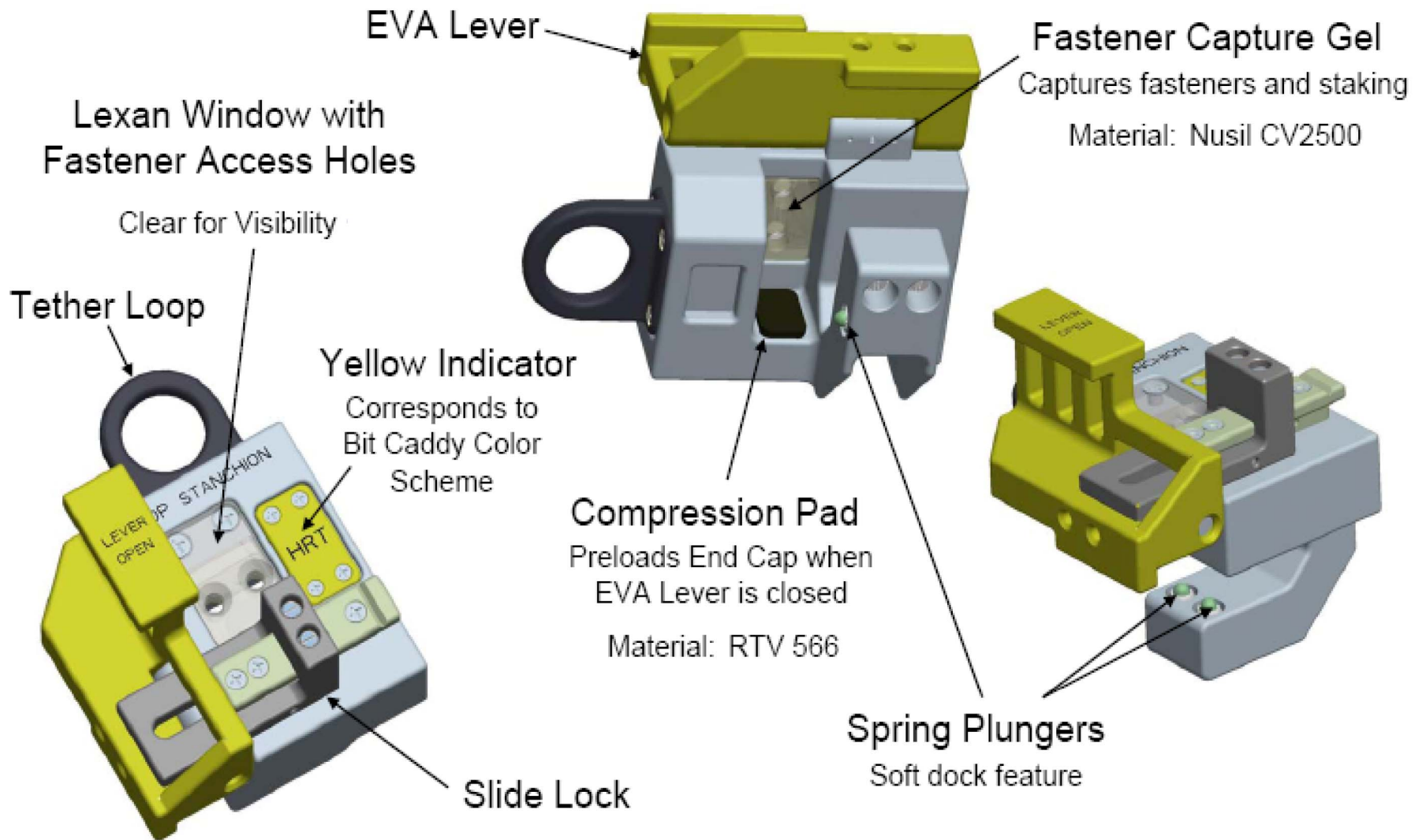
EVA/125/FIN A

STIS

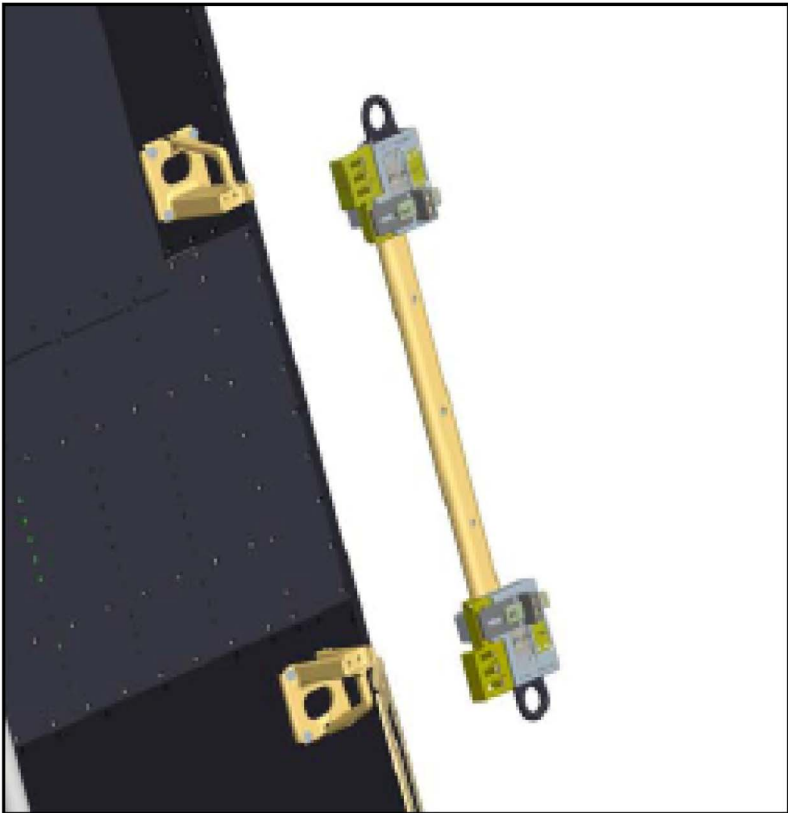
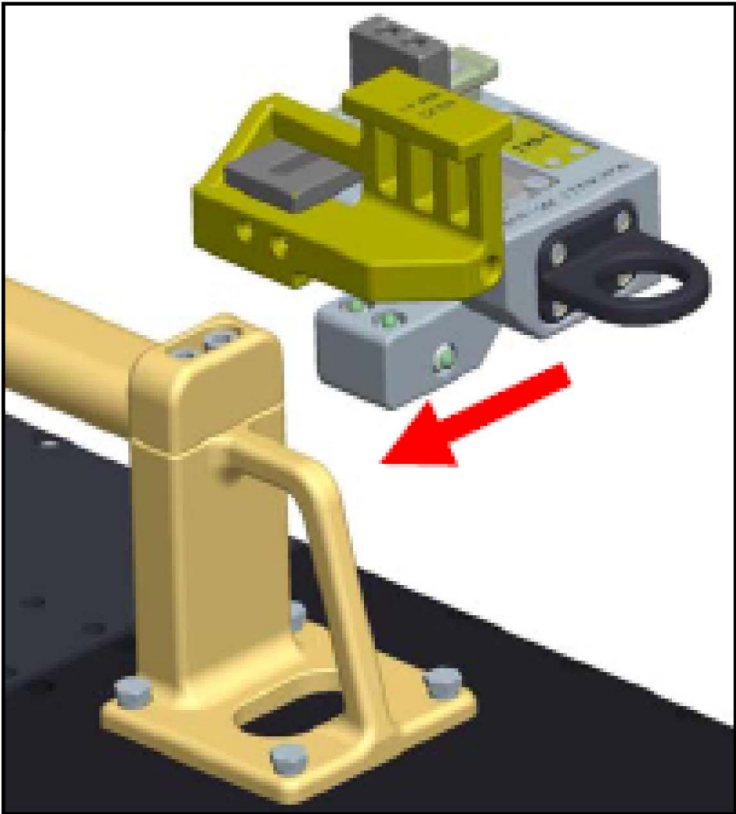
CLAMP REMOVAL TOOL



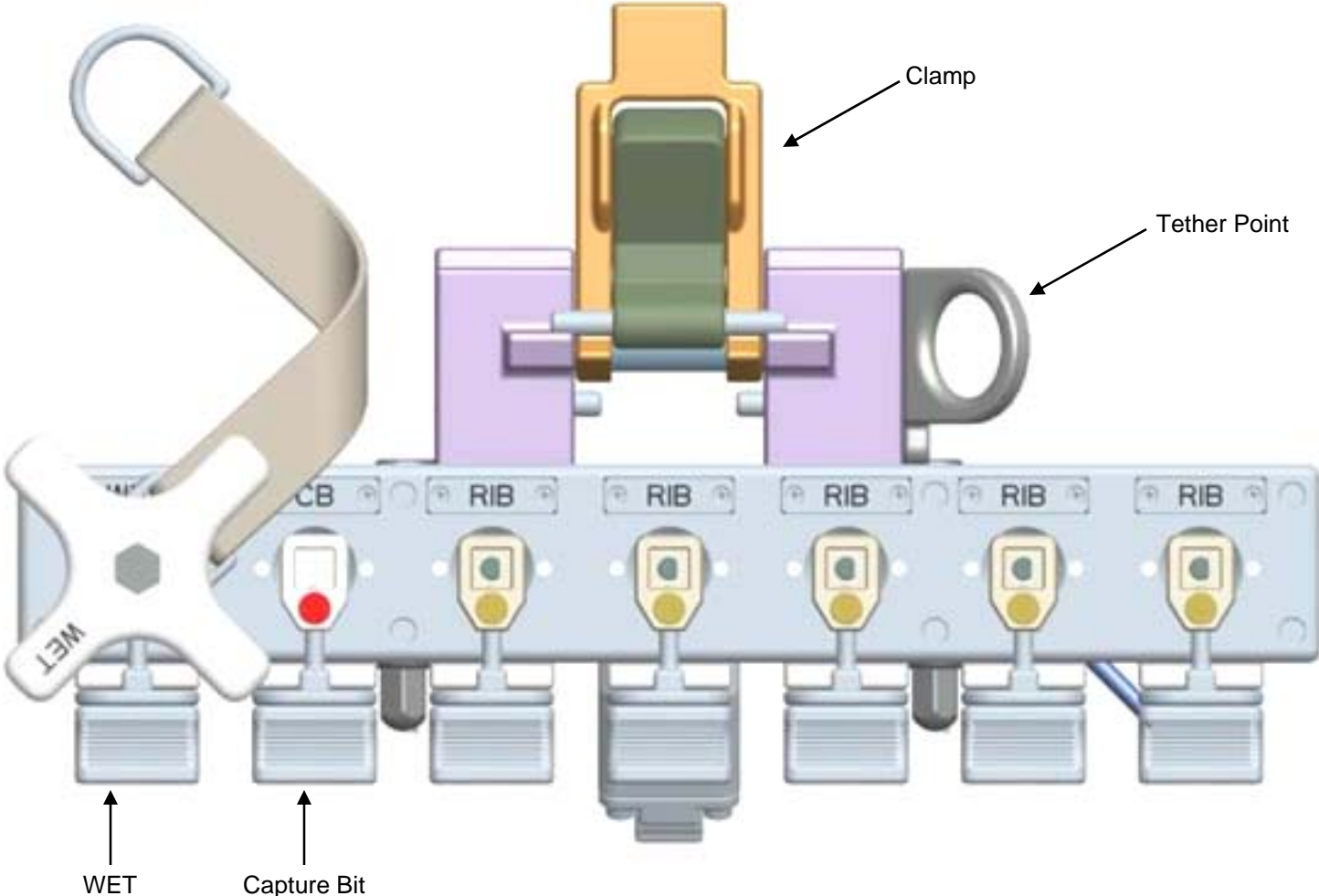
HRT



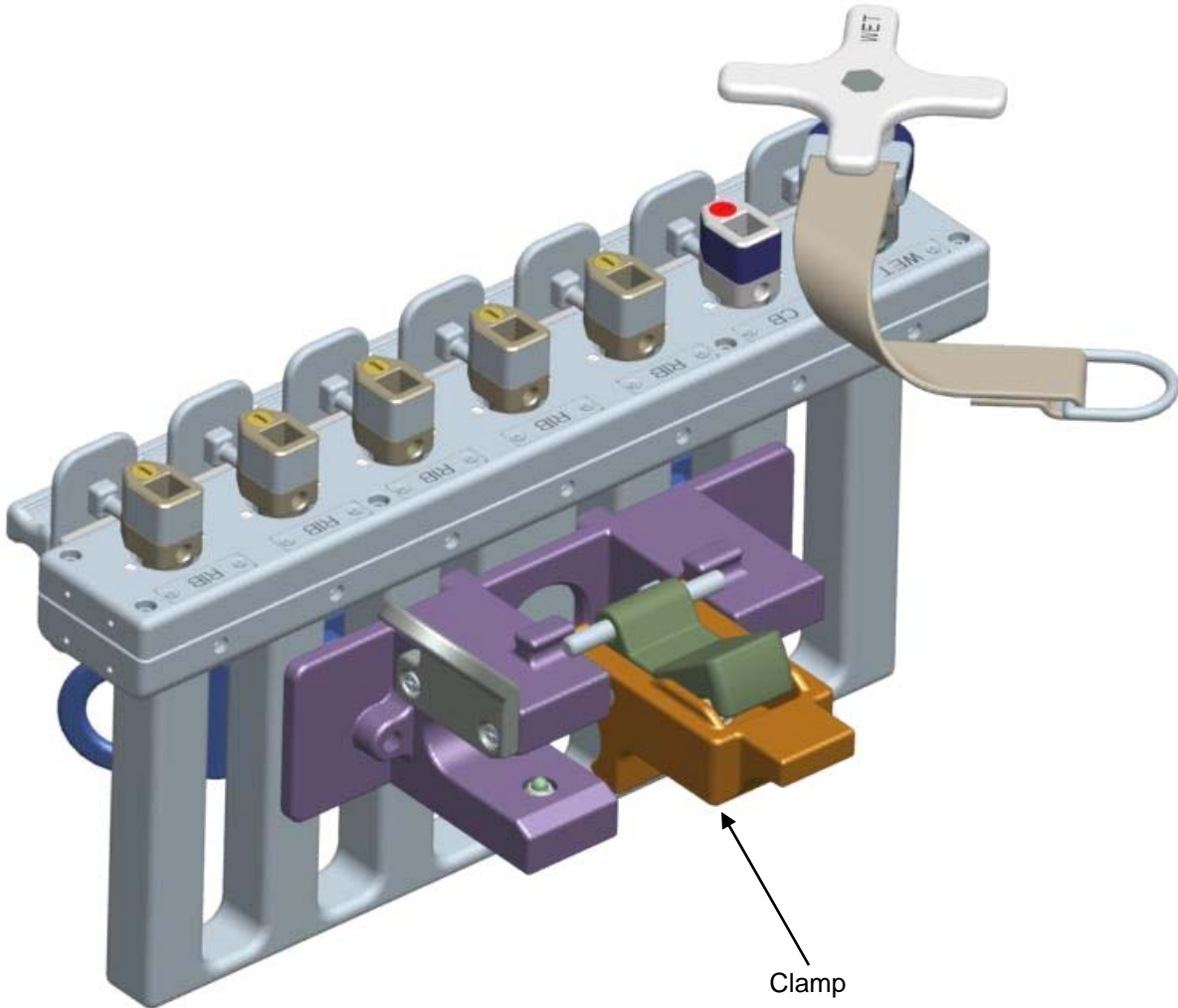
HRT (Cont)



RIB CADDY – TOP

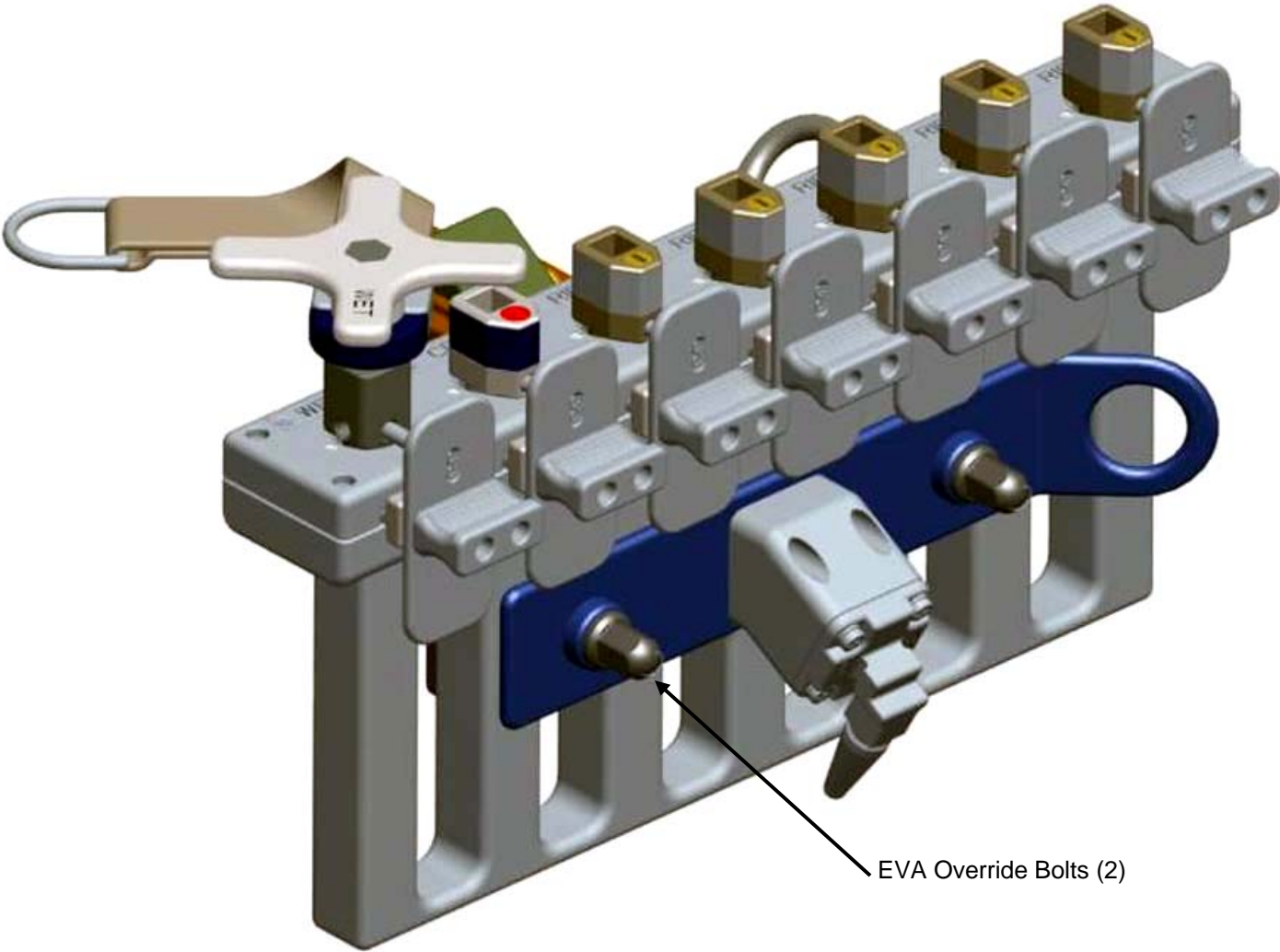


RIB CADDY – CLAMP VIEW



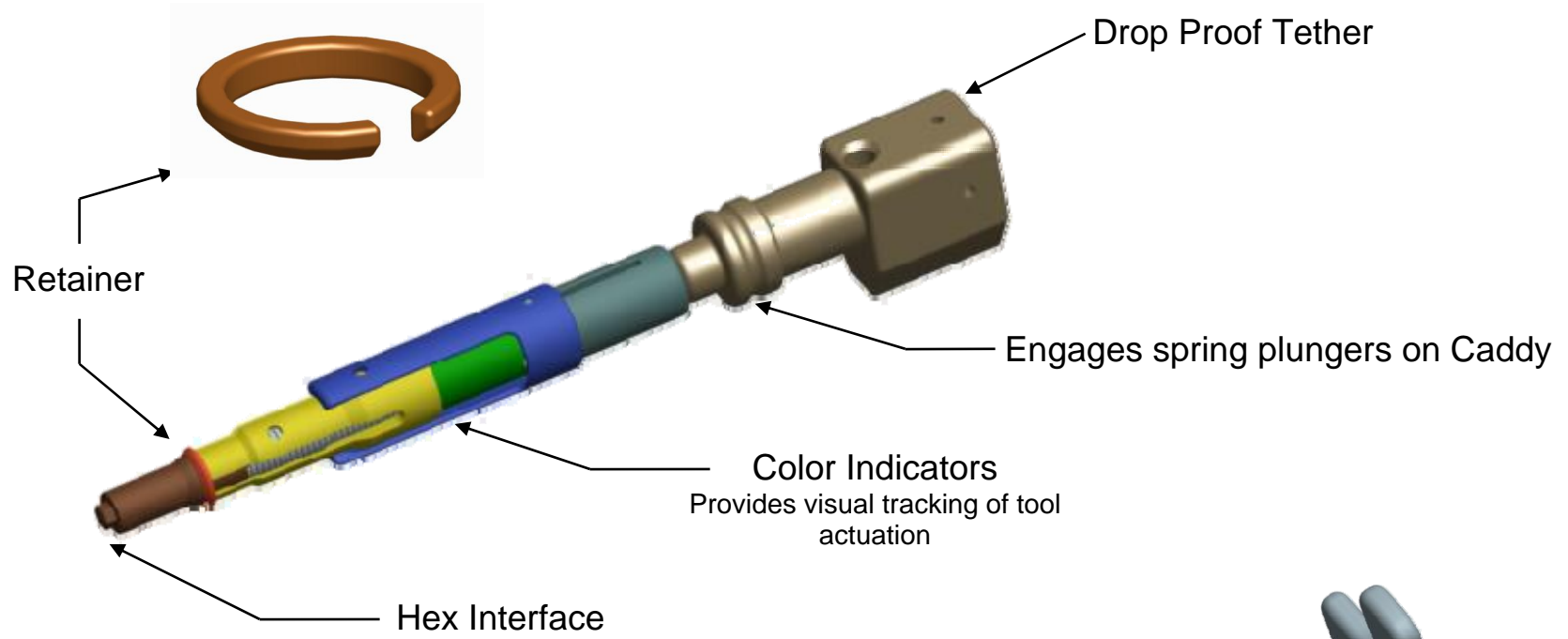


RIB CADDY – BAYONET VIEW

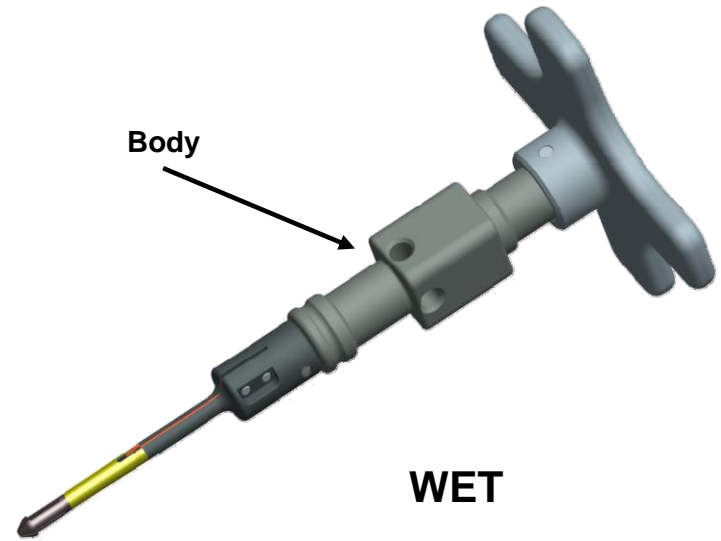


EVA Override Bolts (2)

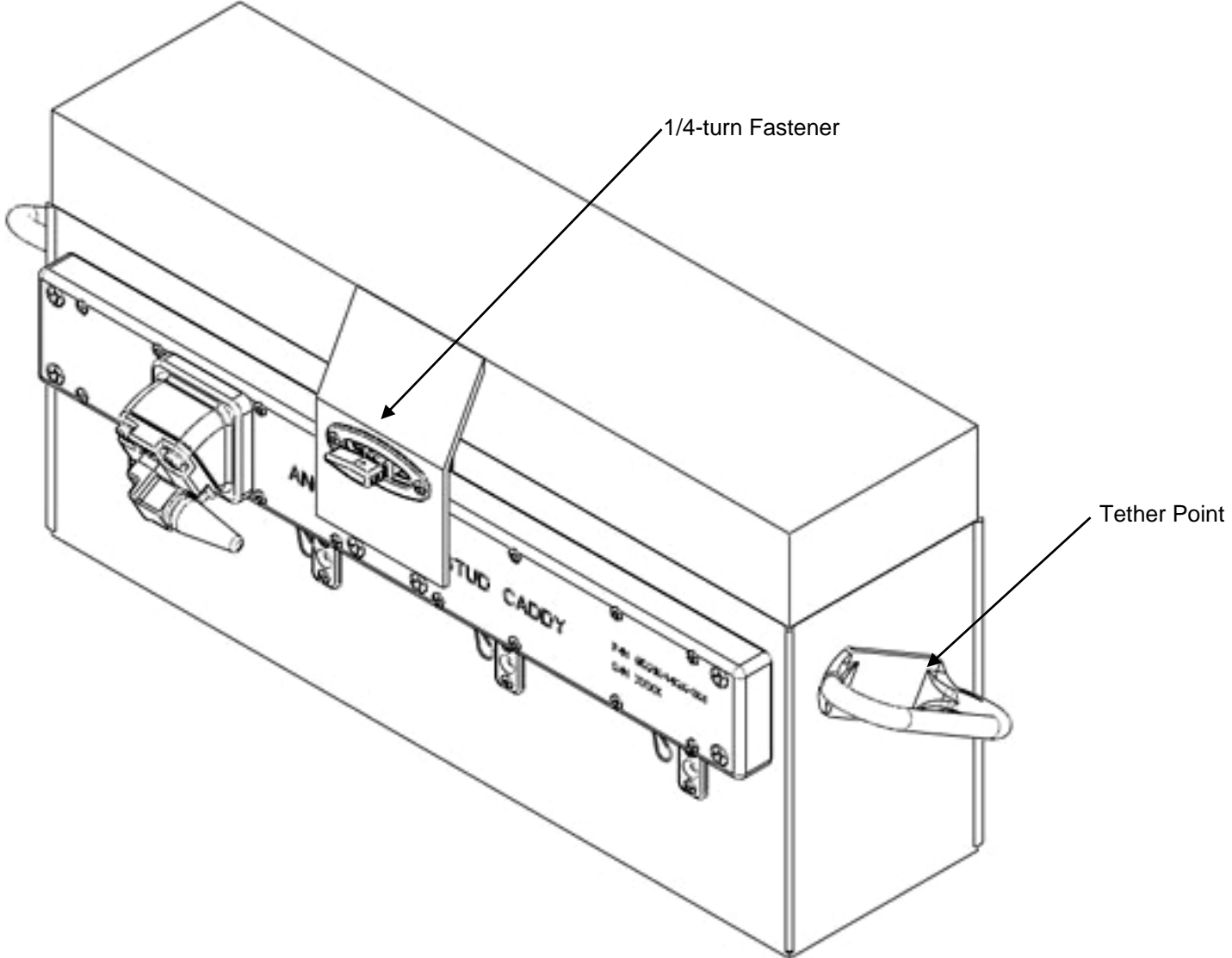
**RIB AND WET**



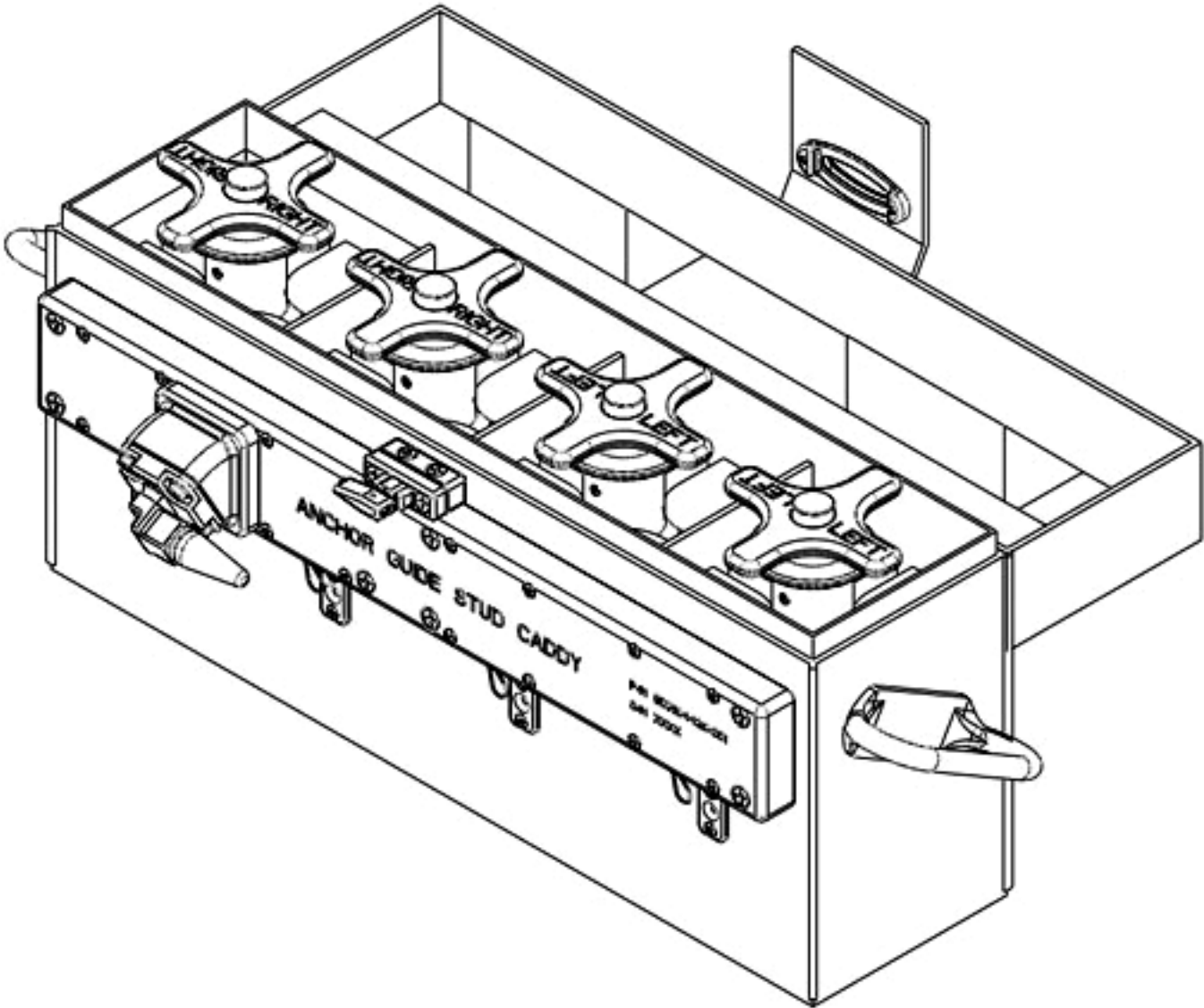
**RIB**



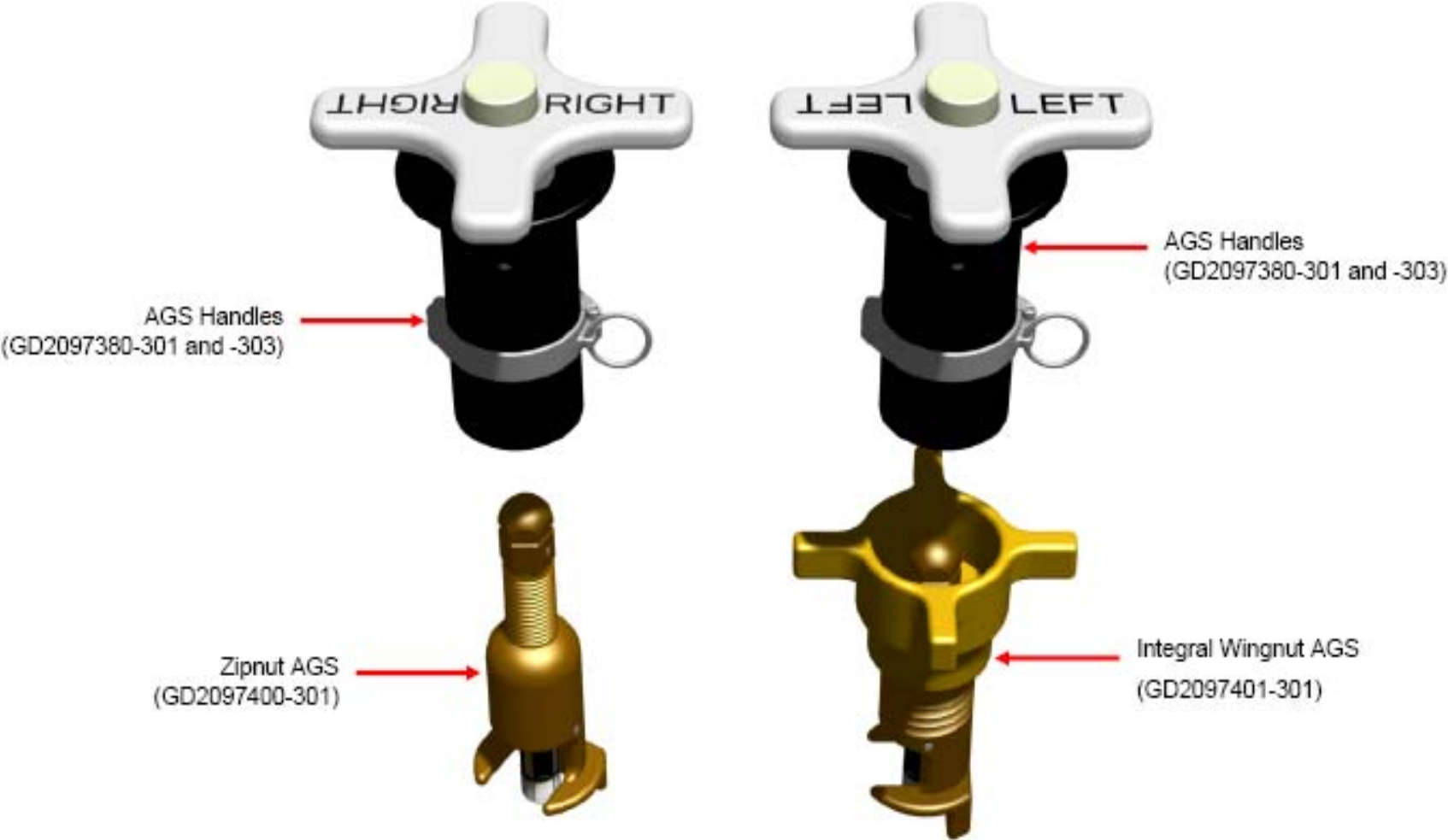
**STIS GUIDE STUD CADDY – LID CLOSED**



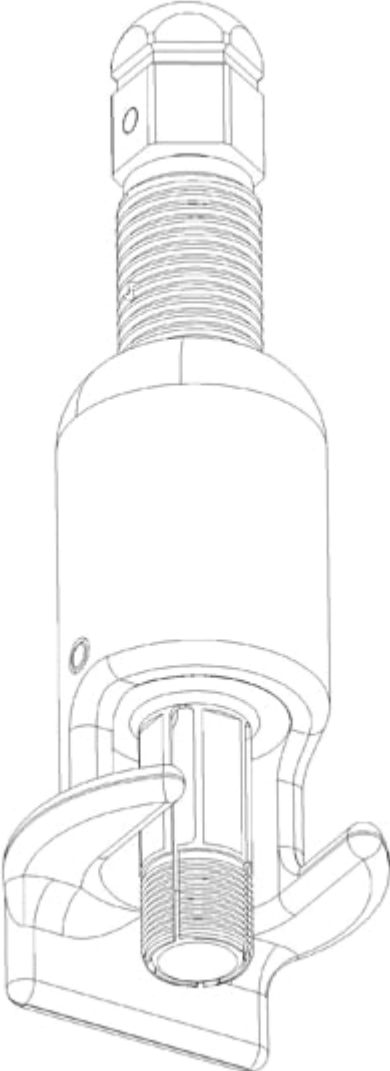
**STIS GUIDE STUD CADDY – LID OPEN**



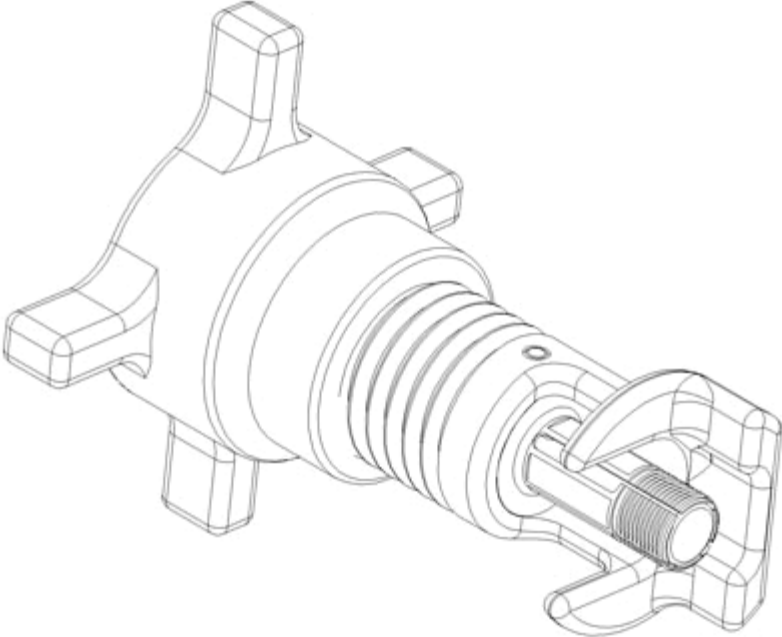
**ZIPNUT AND WINGNUT**



**ZIPNUT AND WINGNUT (Cont)**

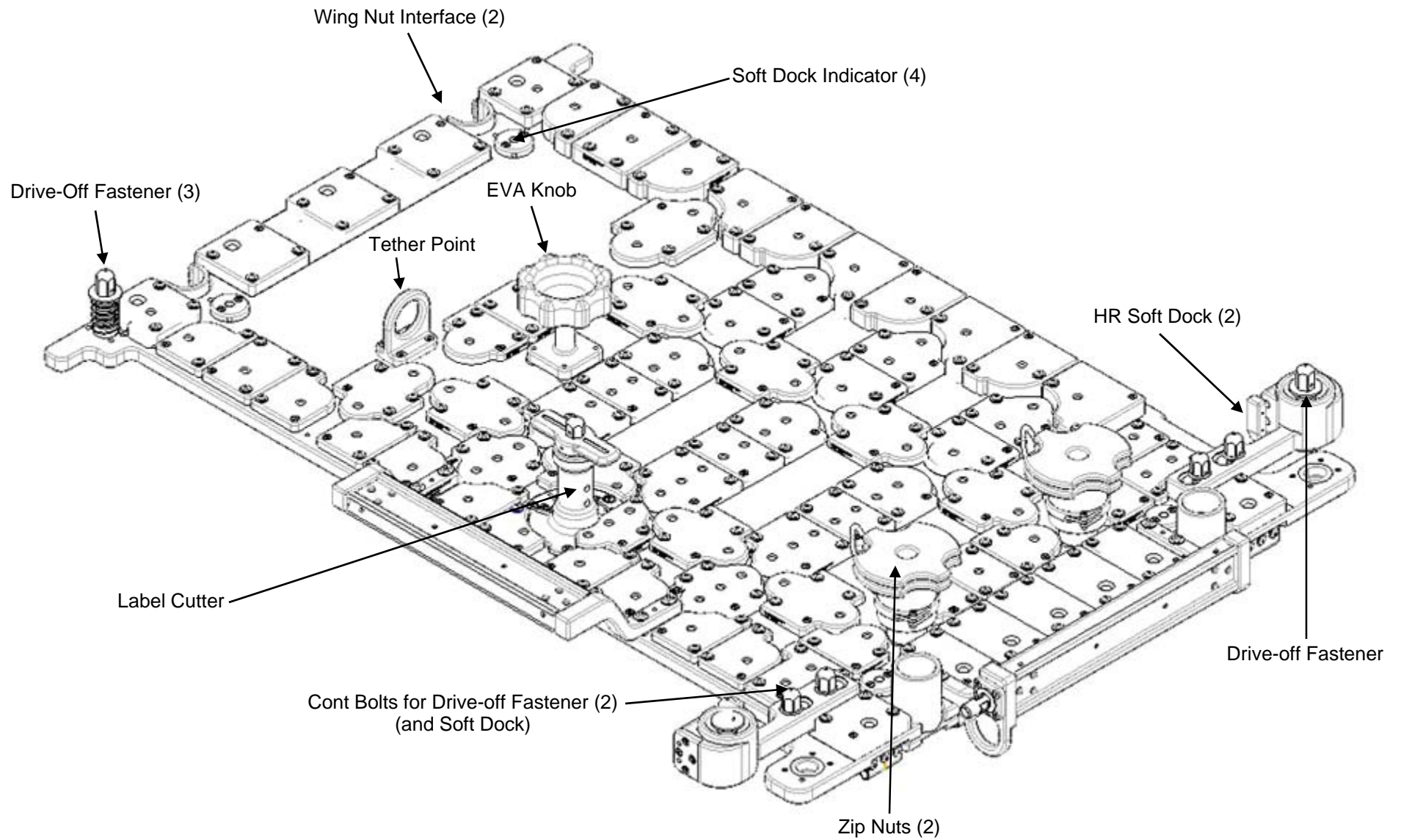


Zipnut



Wingnut

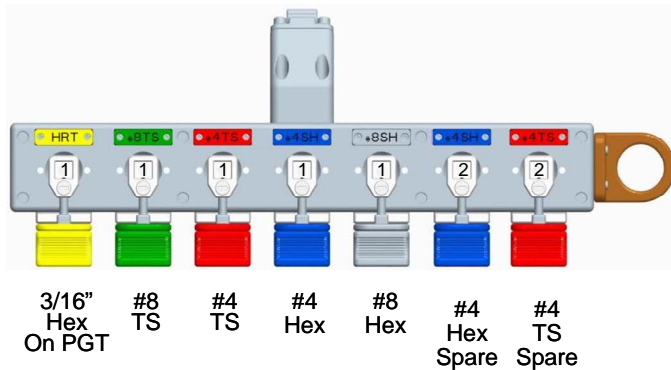
# FCP OVERVIEW



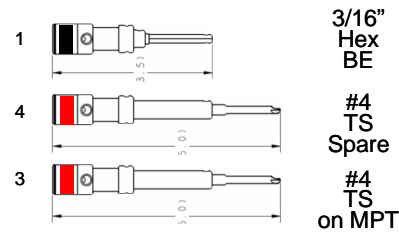
# BIT CADDY AND BIT OVERVIEW (STIS)

Egress with new (unused) Bits each SI Repair Day

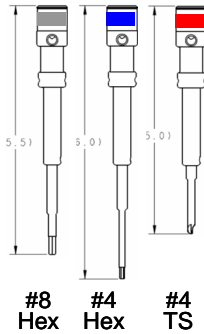
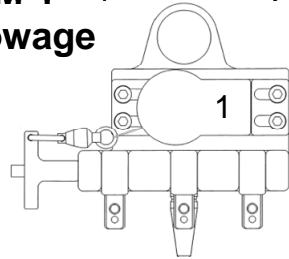
## STIS Bit Caddy (Middeck)



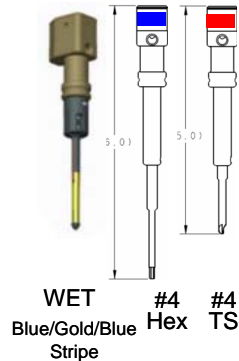
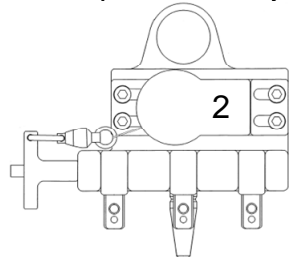
## ACS Bits (Middeck)



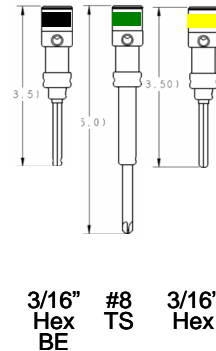
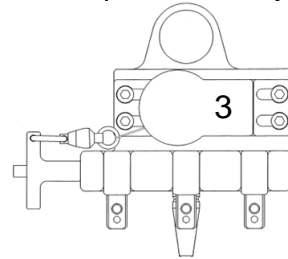
### ATM-1 Spare Bit Caddy Stowage



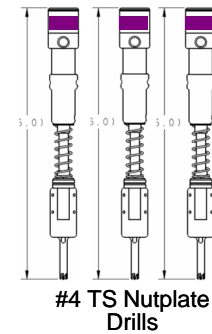
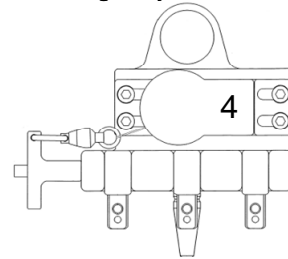
### Spare Bit Caddy



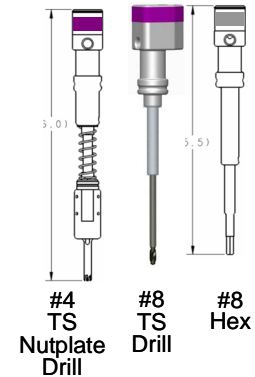
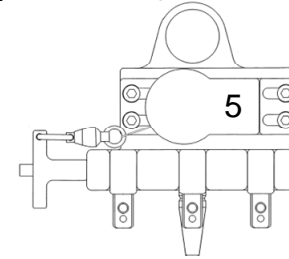
### Spare Bit Caddy



### Contingency Drill Caddy

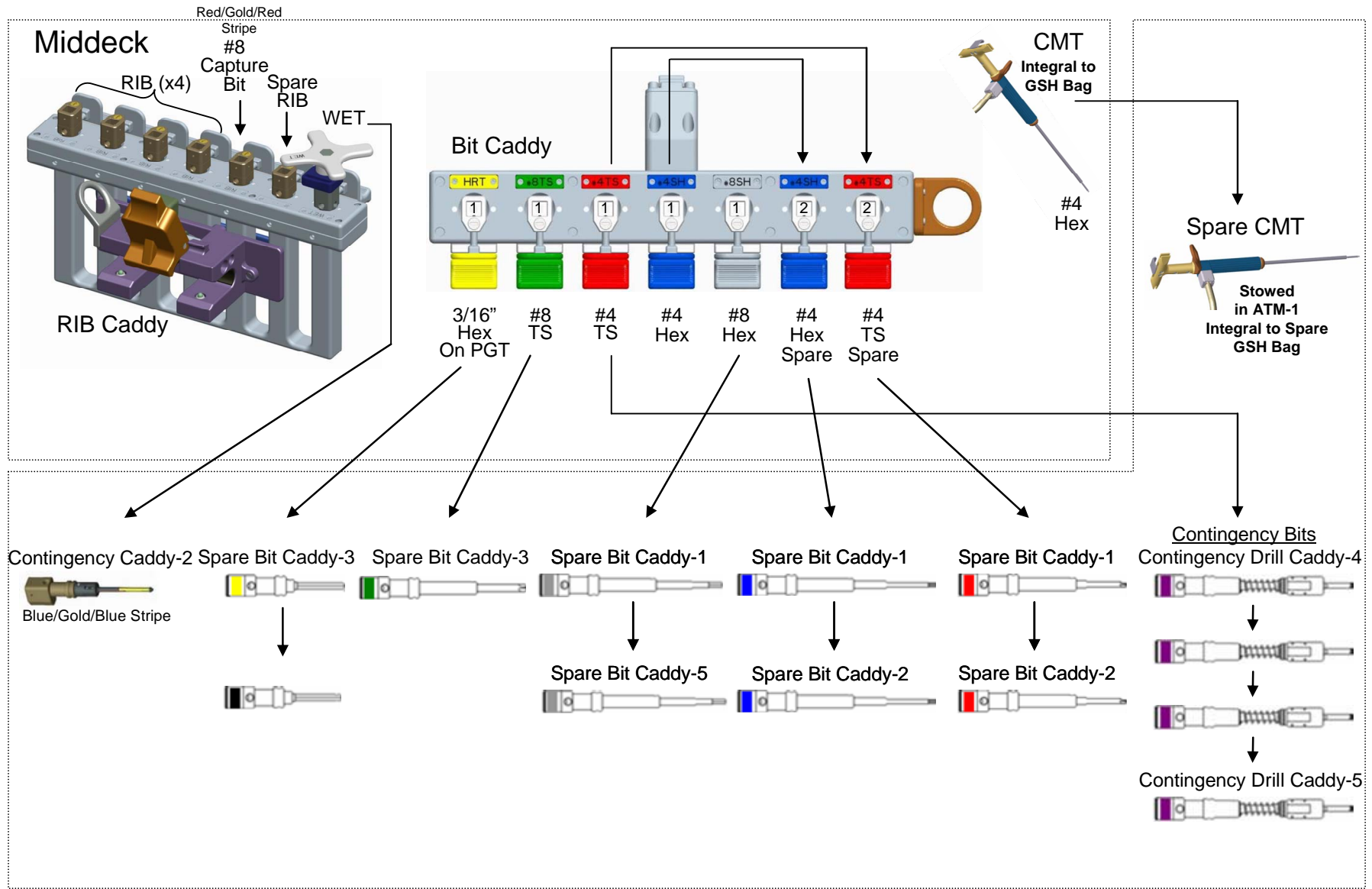


### Contingency Caddy

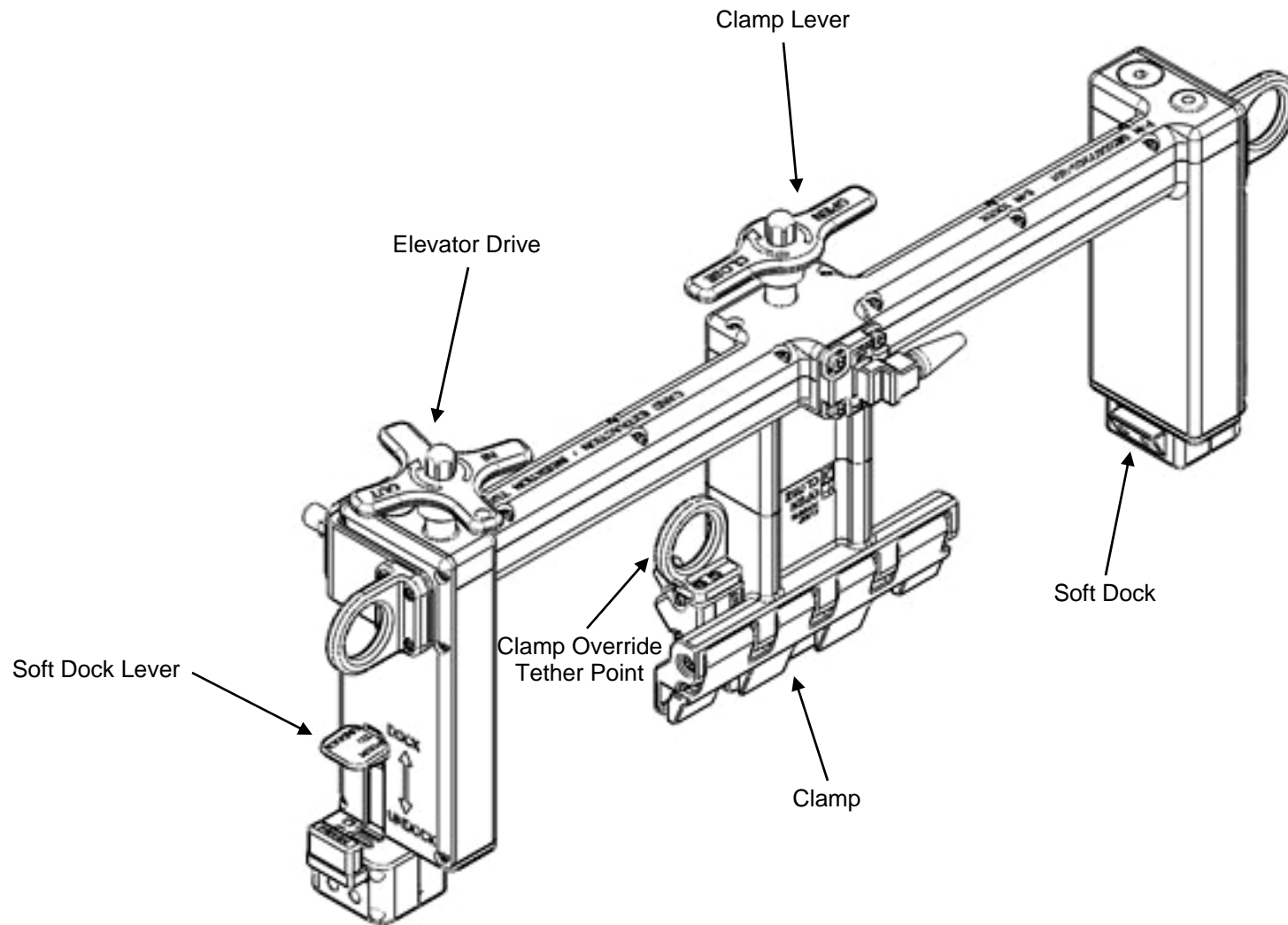




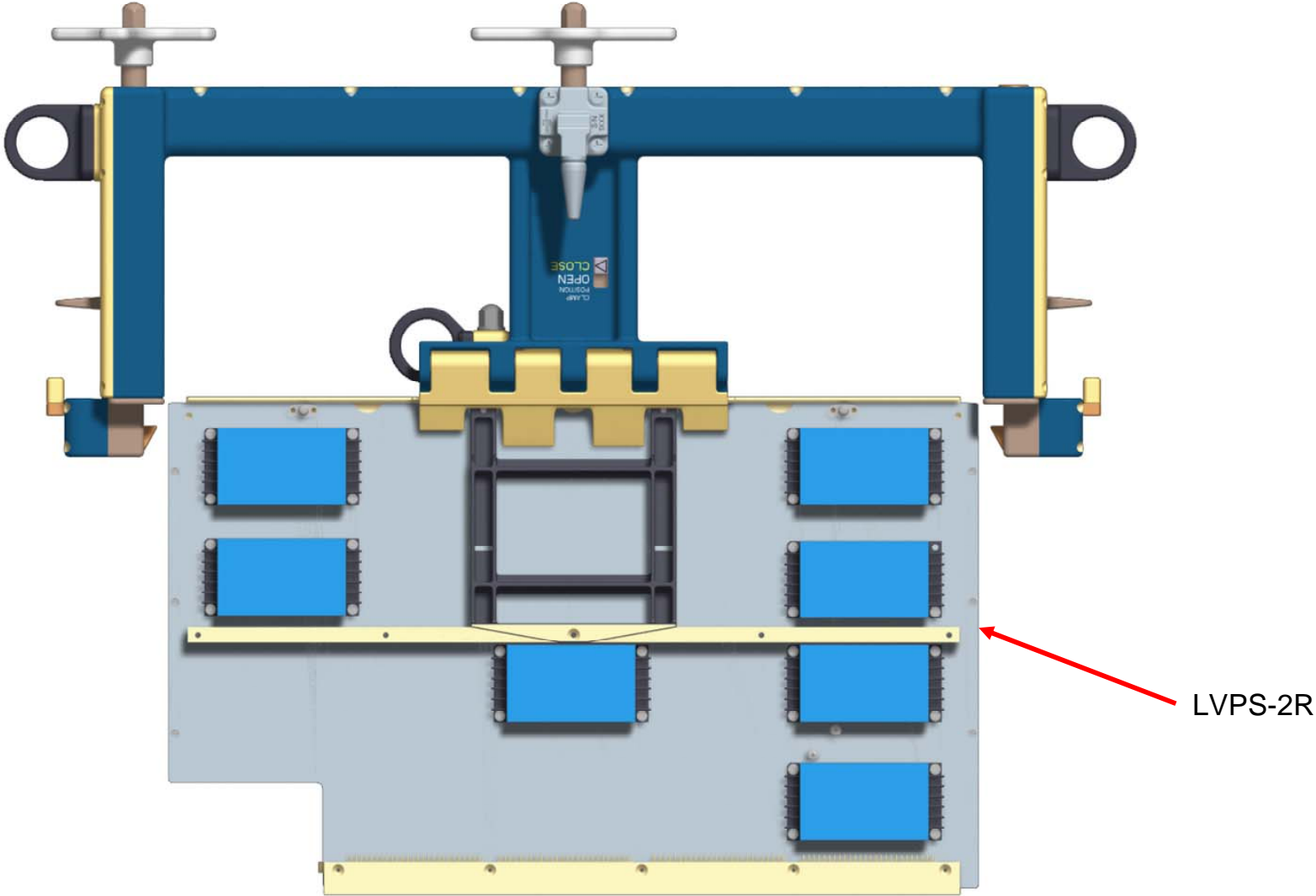
# STIS BITS – SPARE SELECTION FLOW



# STIS CARD TOOL

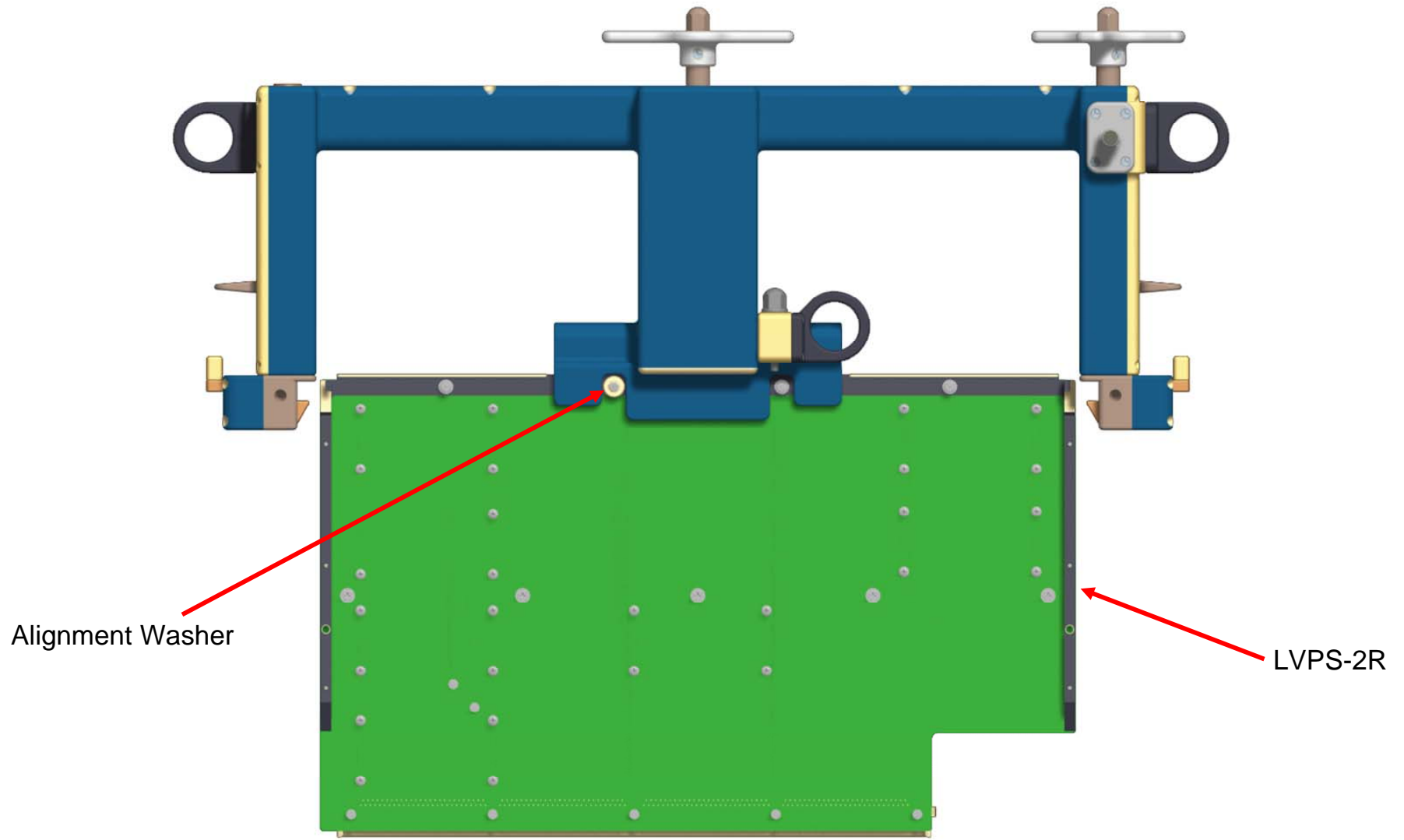


**STIS CARD TOOL CLAMPED ONTO LVPS-2R – FRONT**



Front View

STIS CARD TOOL CLAMPED ONTO LVPS-2R – BACK

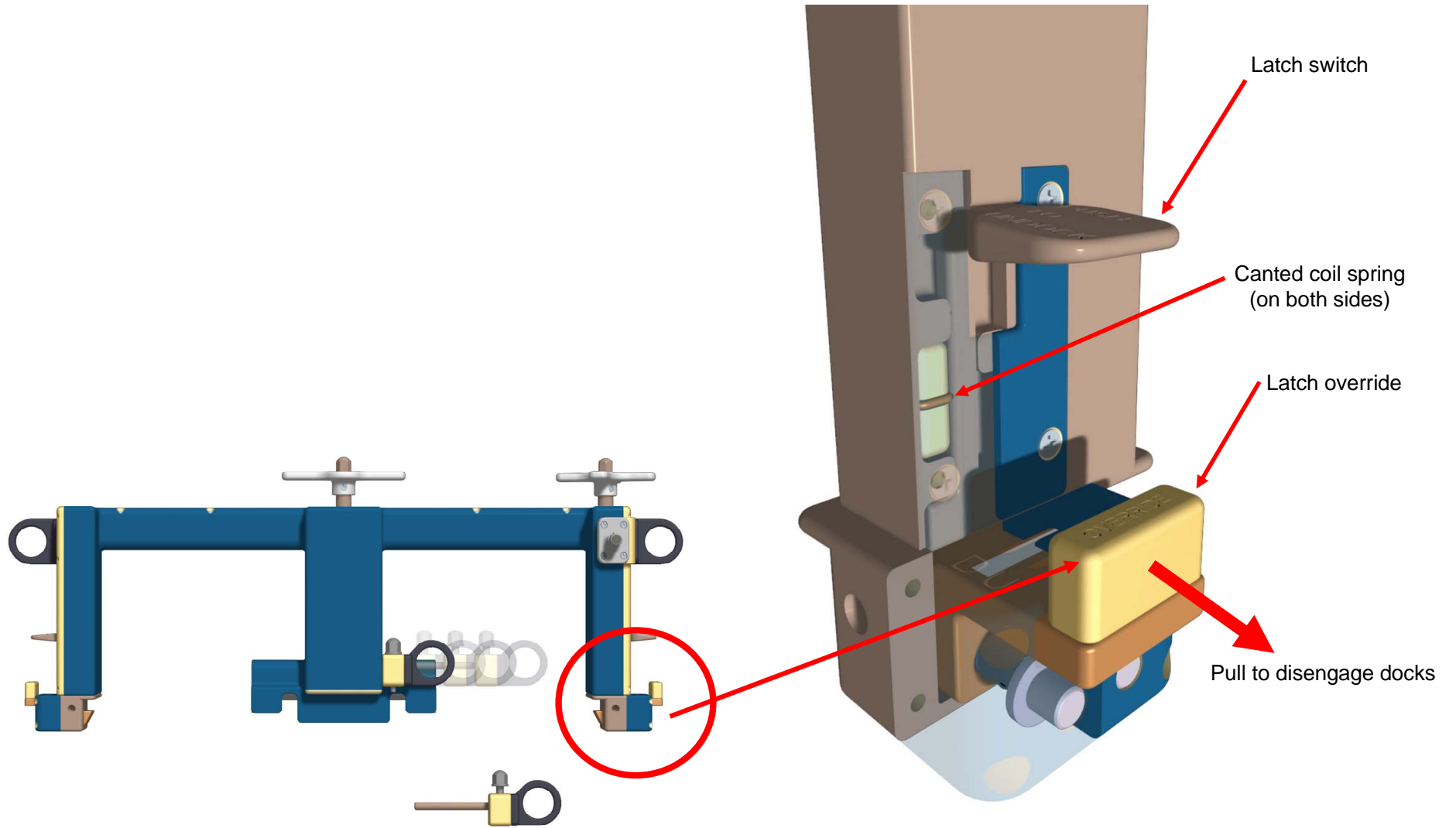


Alignment Washer

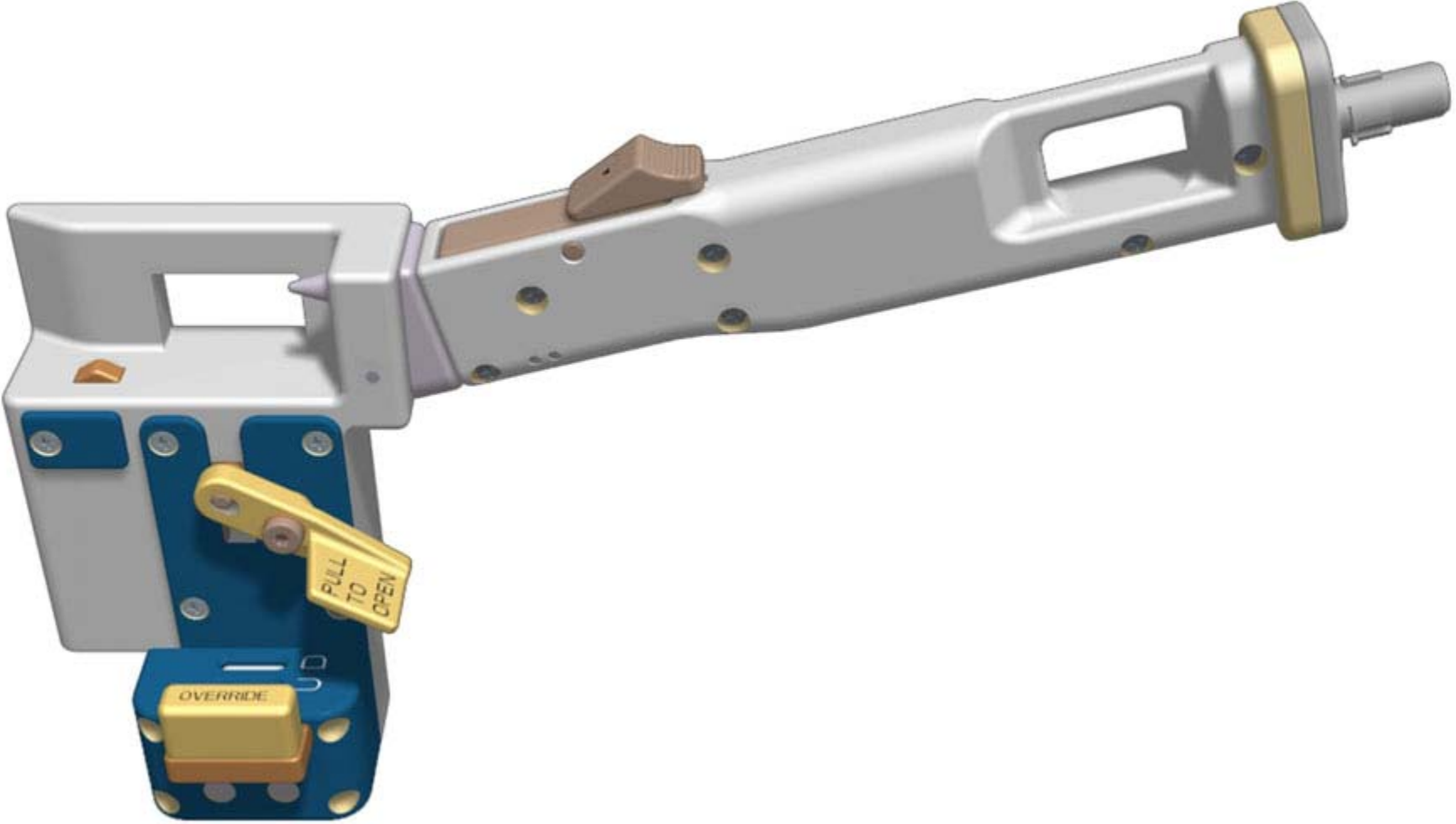
LVPS-2R

Back View

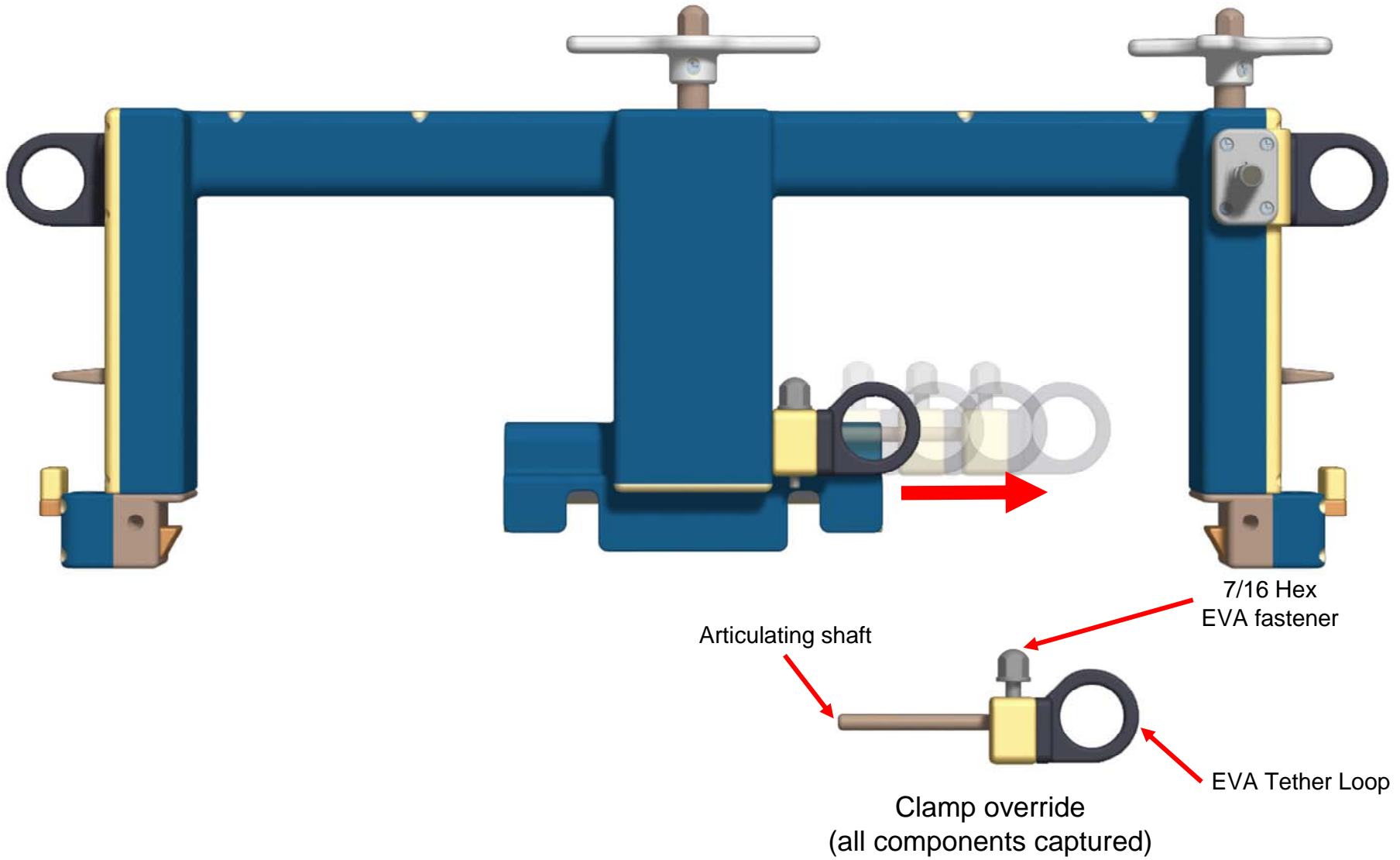
# STIS CARD TOOL DOCK LATCH OVERRIDE



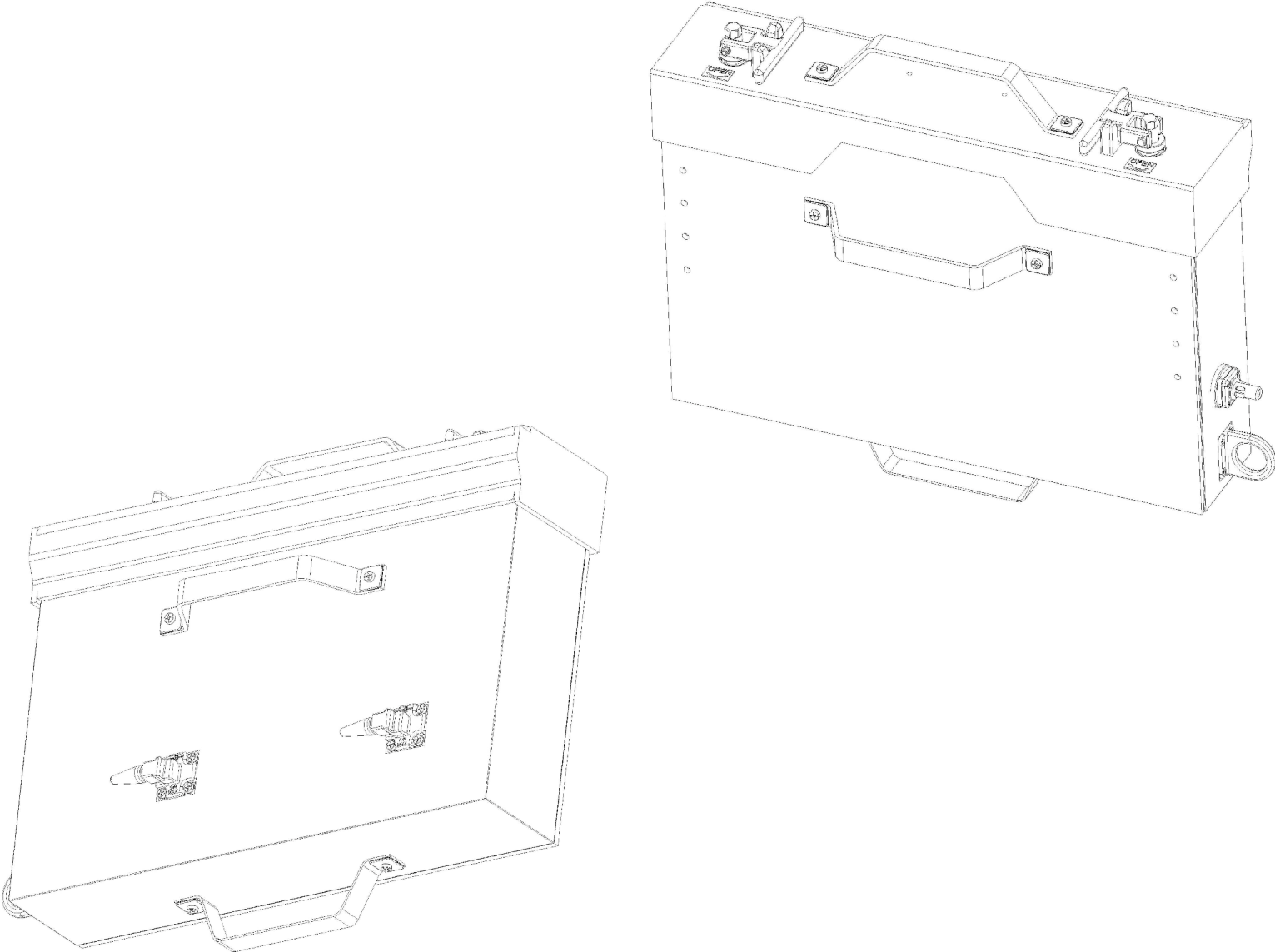
**STIS CARD TOOL EXTENSION BLOCK**



# STIS CARD TOOL CLAMP OVERRIDE

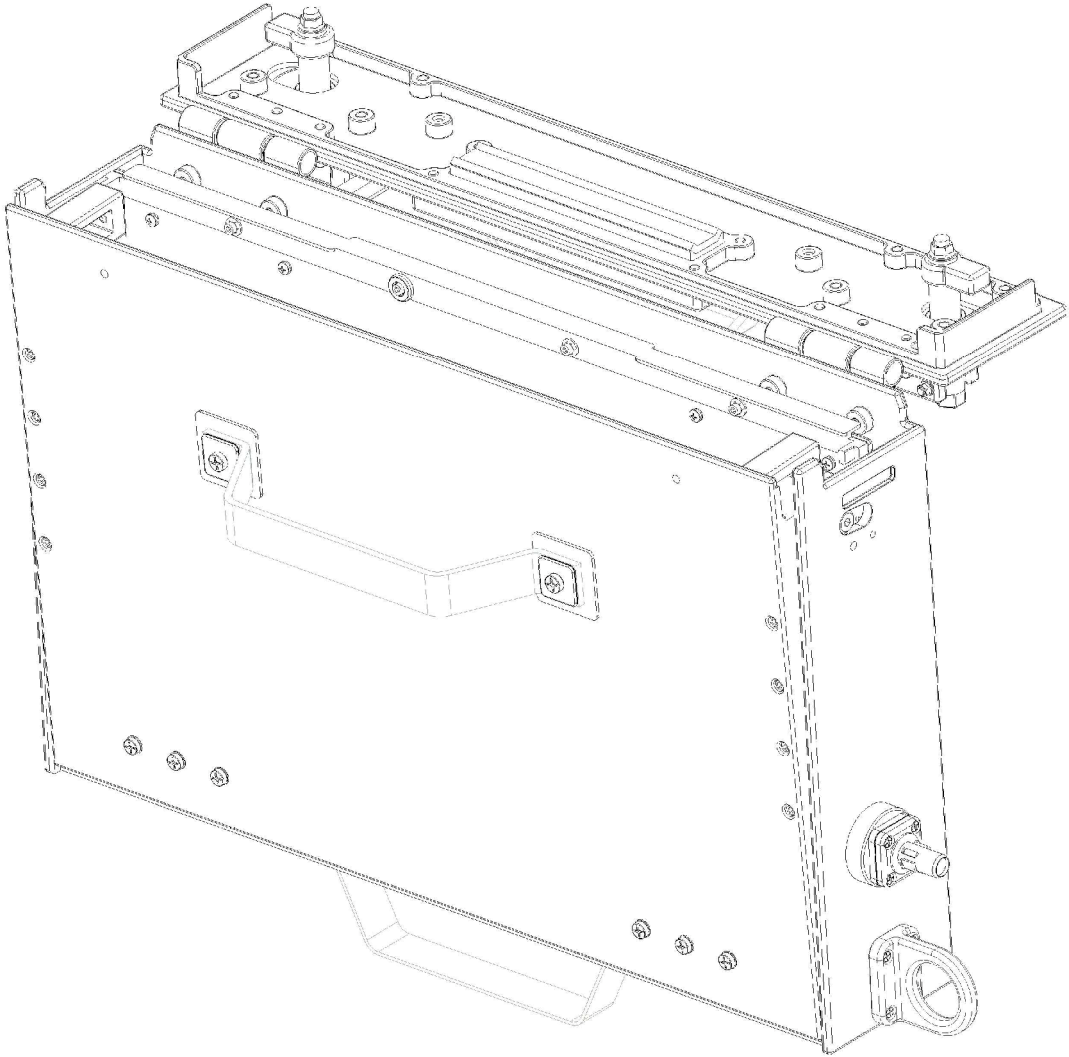


**HARD CTE (CTE-R)**

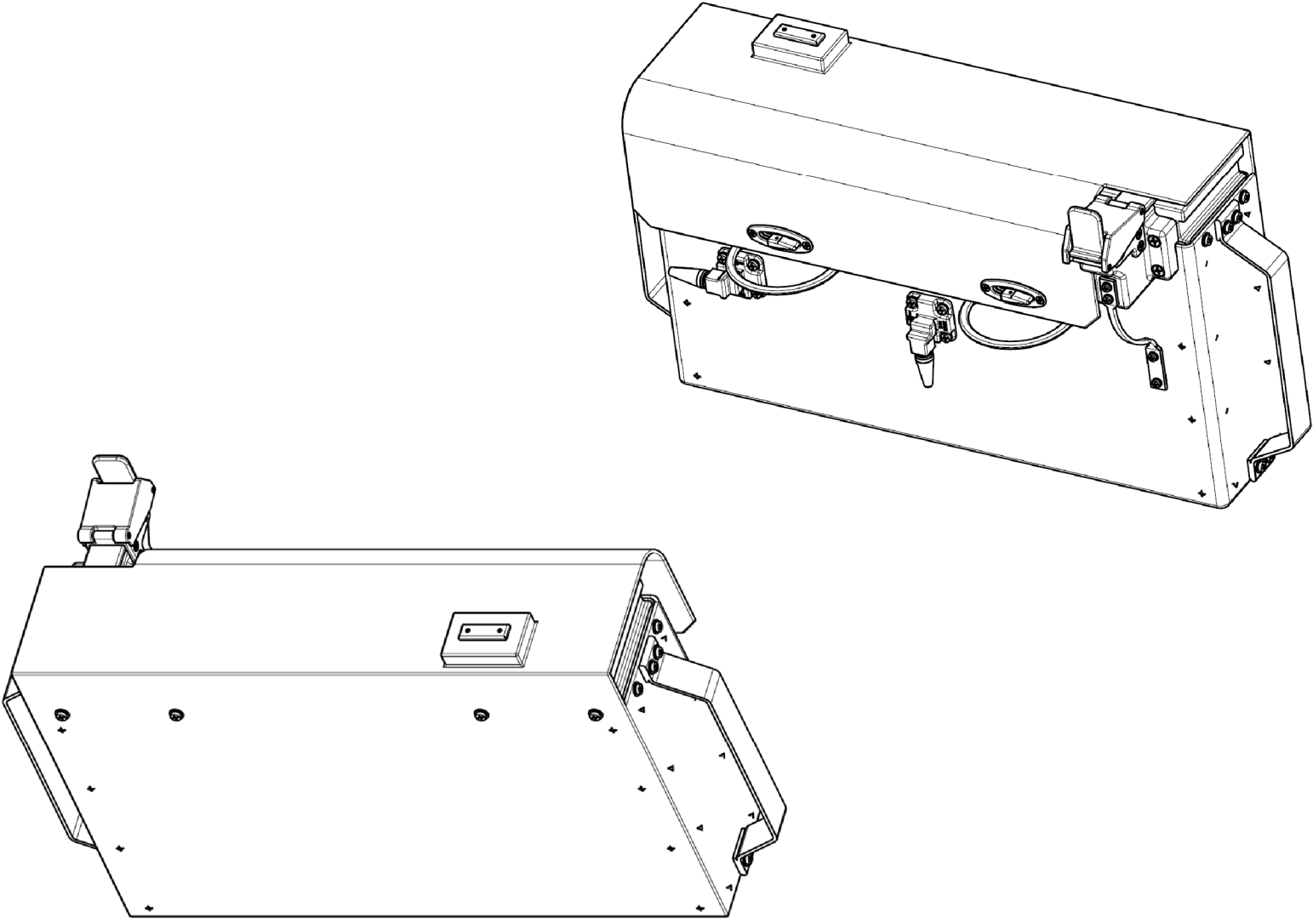




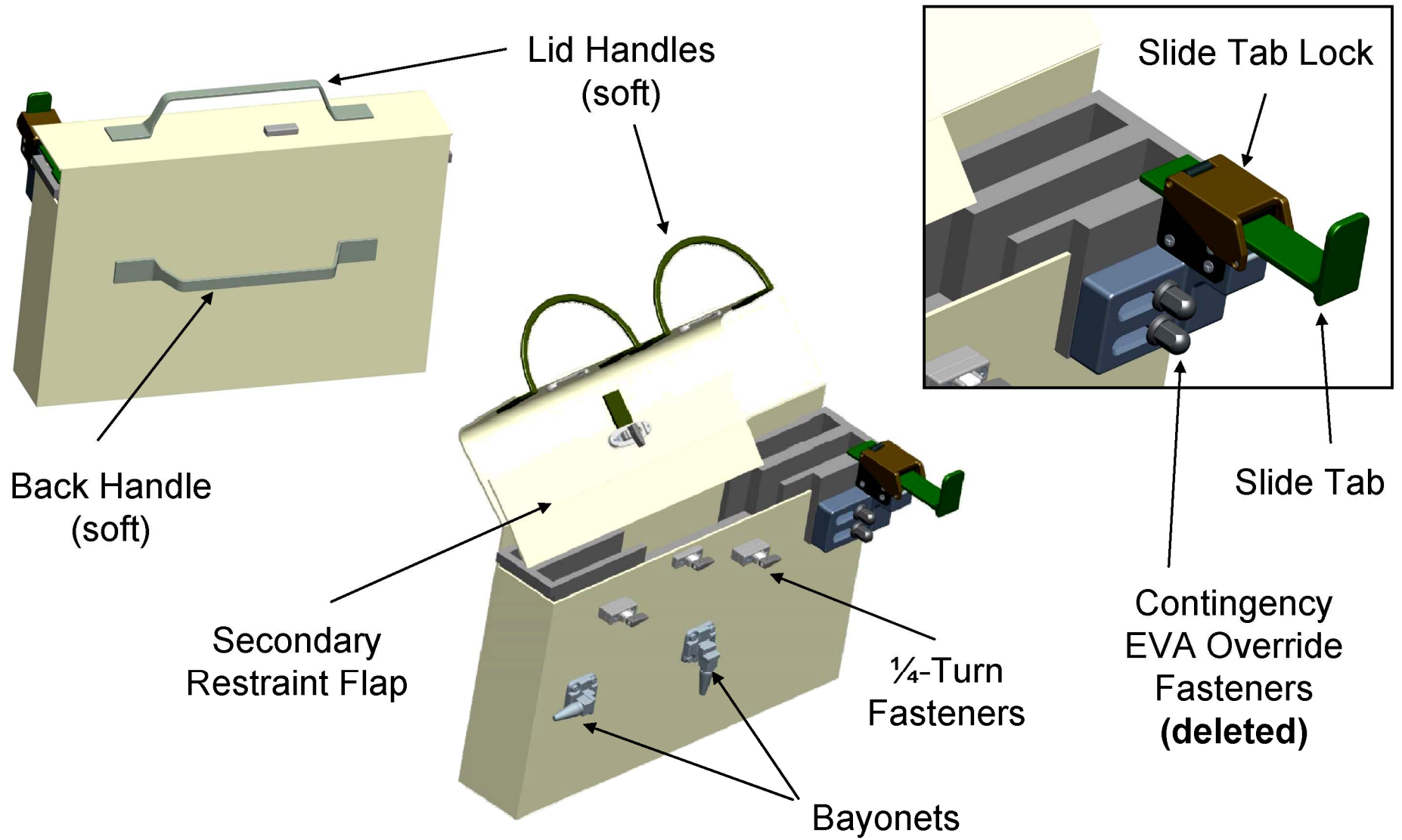
**HARD CTE (CTE-R) – LID OPEN**



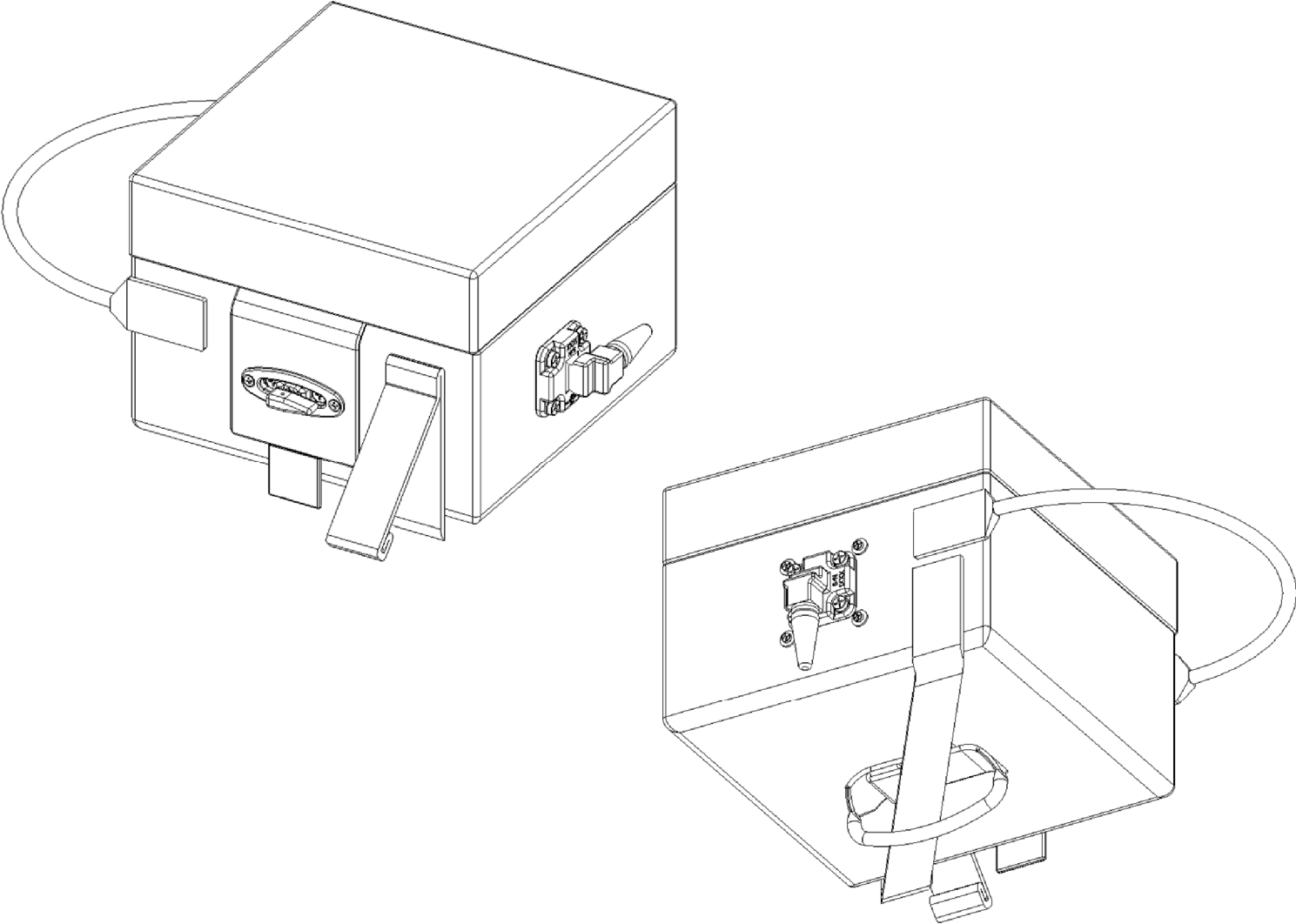
SOFT CTE



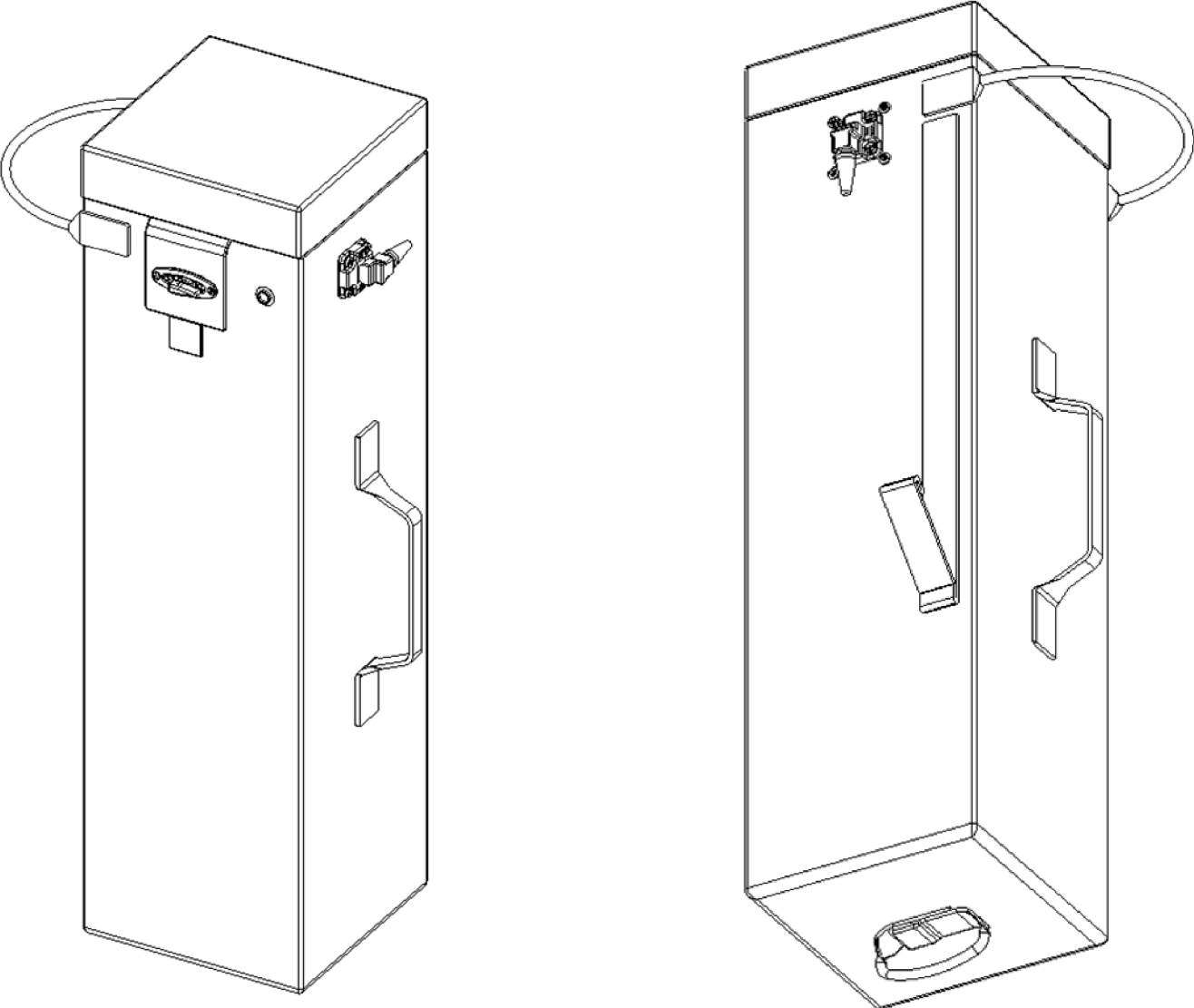
SOFT CTE (Cont)



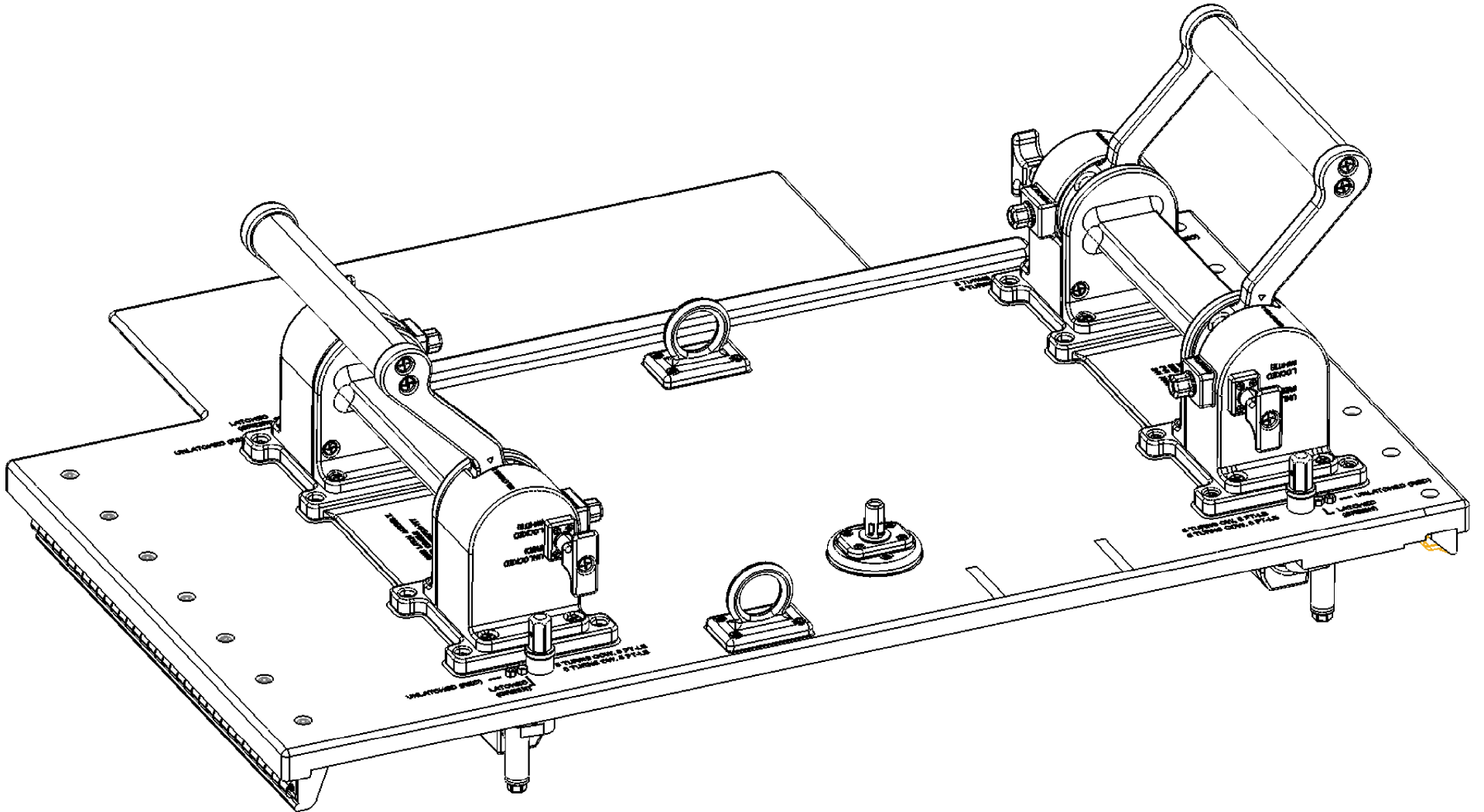
**DISPOSAL BAG – LAUNCH CONFIG**



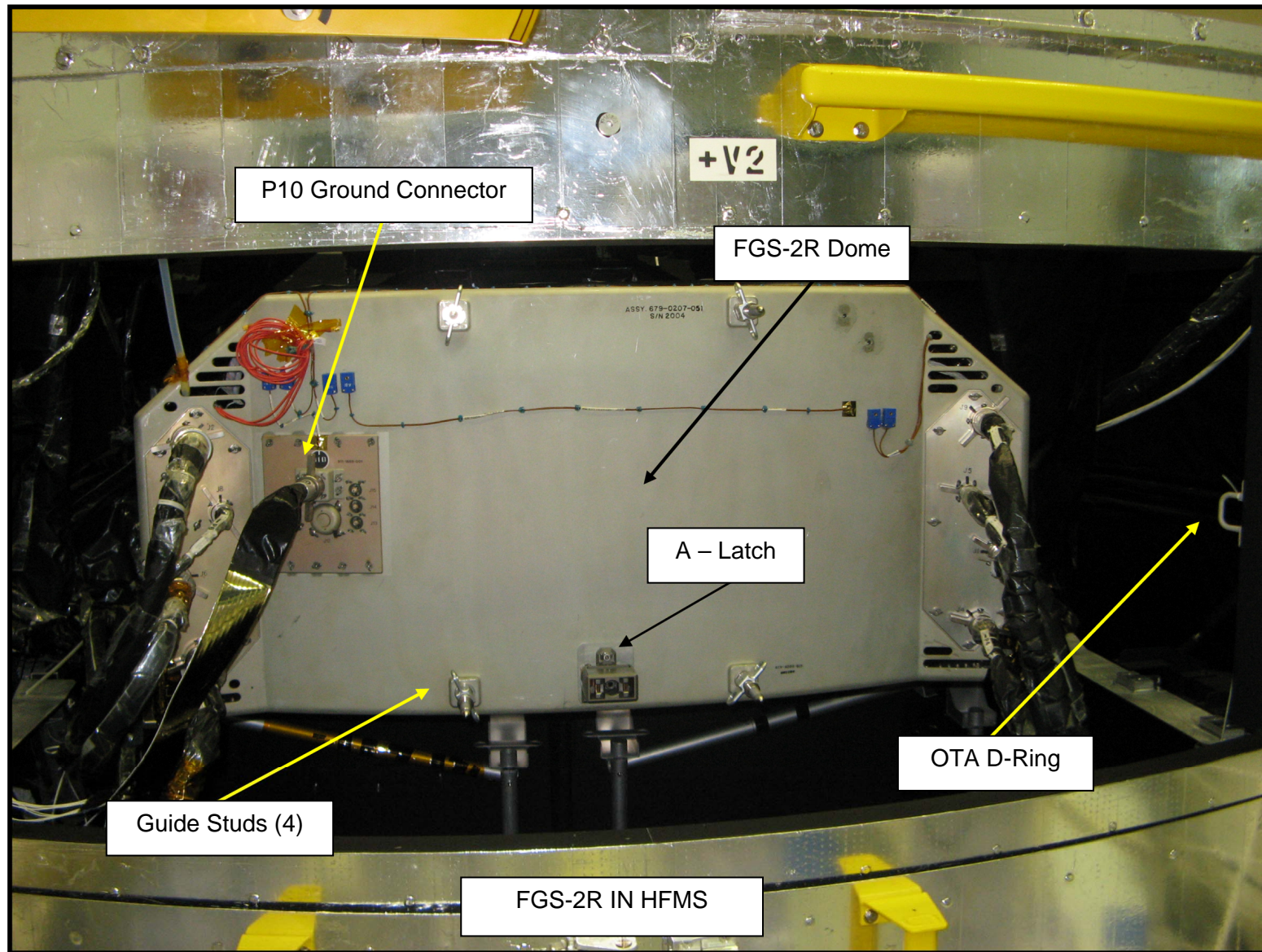
**DISPOSAL BAG – DEPLOYED CONFIG**



MEB-R COVER



## FGS-2R OVERVIEW – FRONT FACE

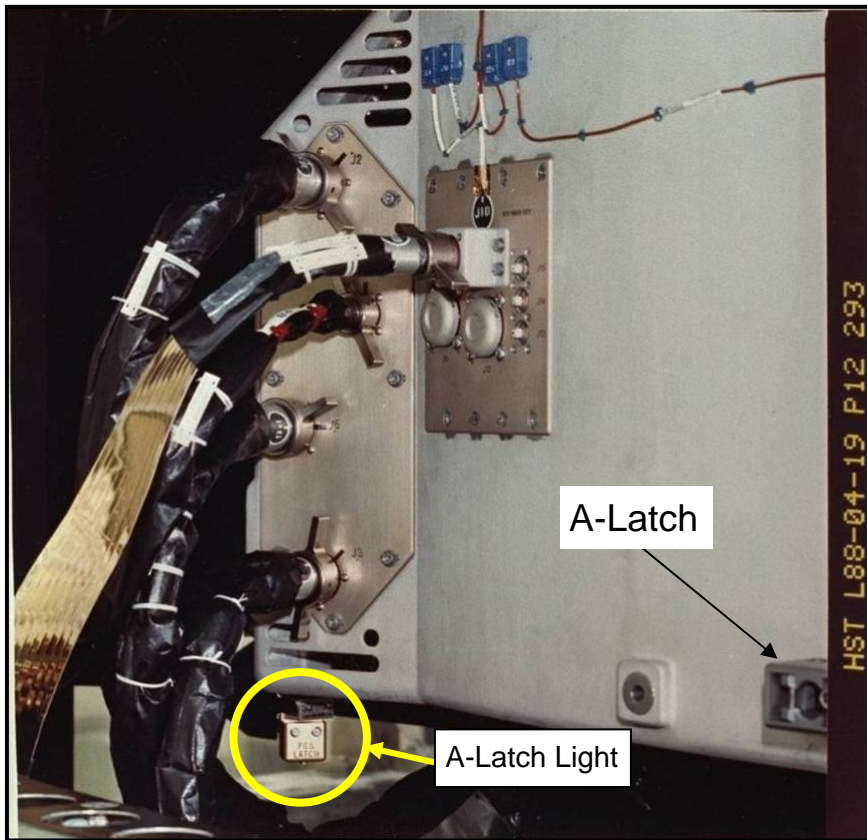


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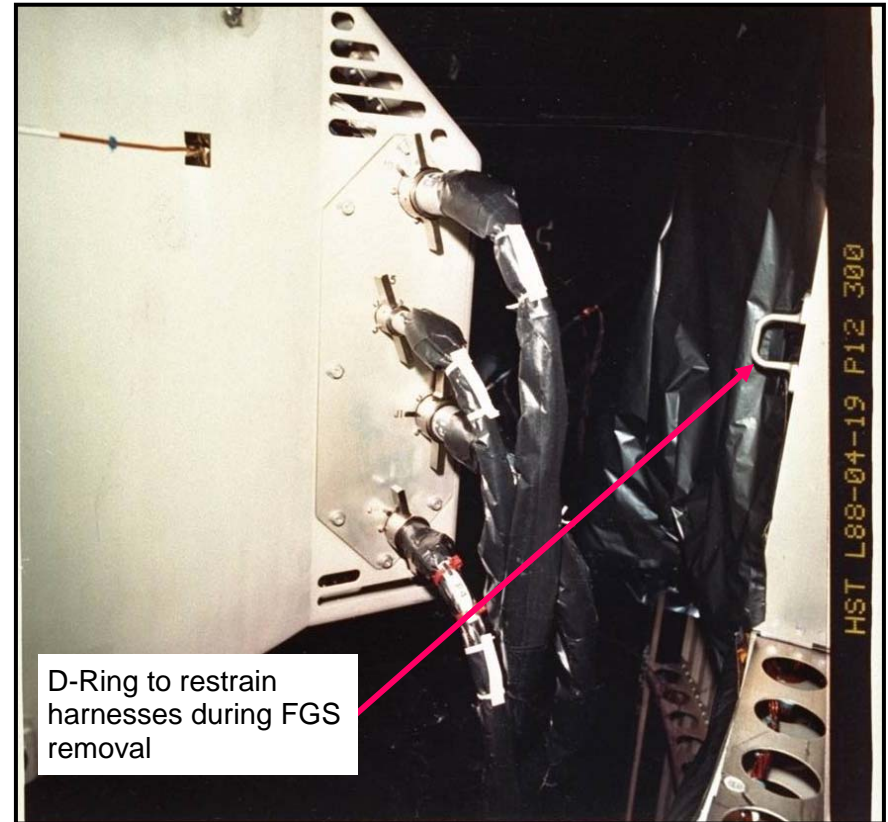
EVA/125/FIN A

**FGS-2**

FGS-2R OVERVIEW – CONNECTORS



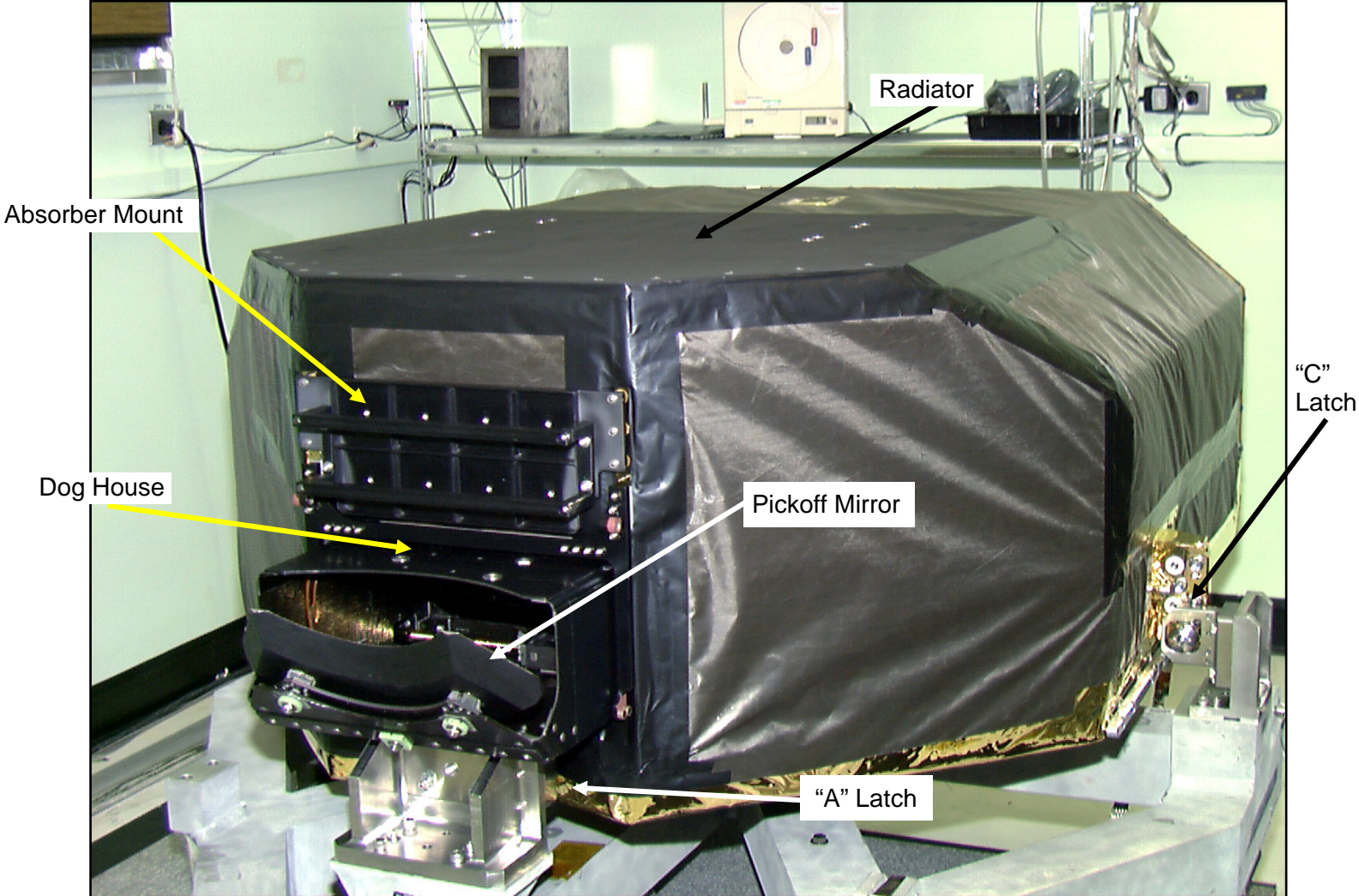
LEFT FGS CONNECTORS



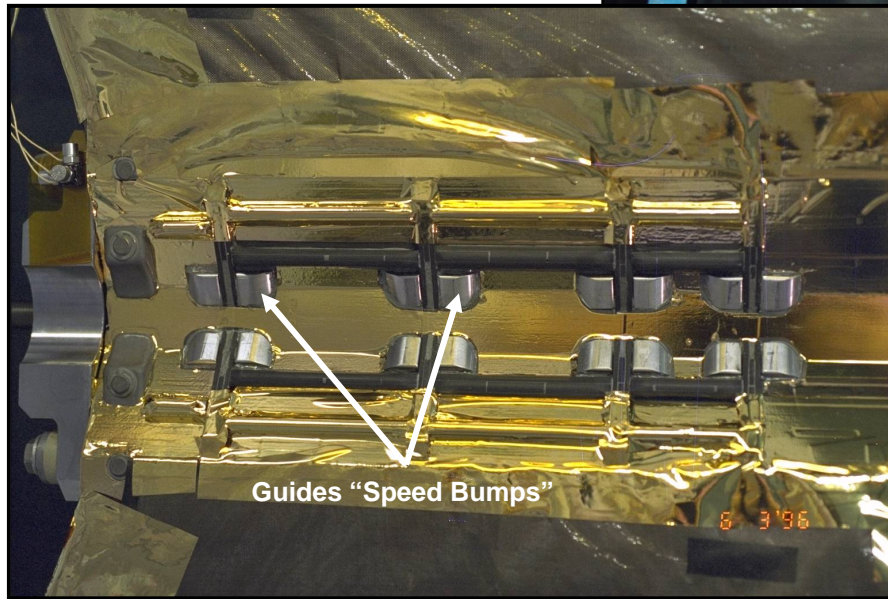
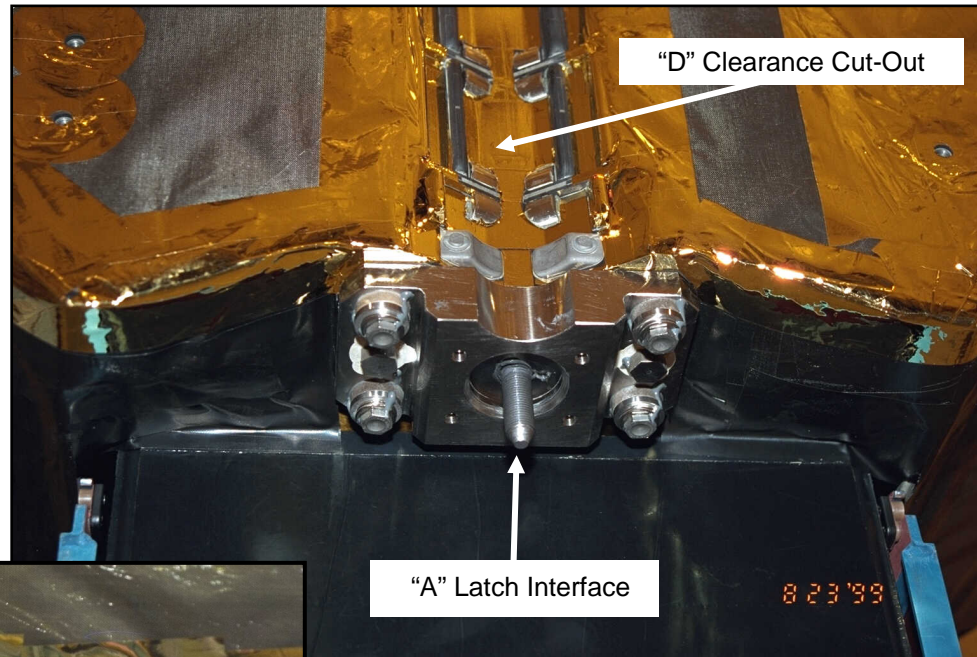
RIGHT FGS CONNECTORS



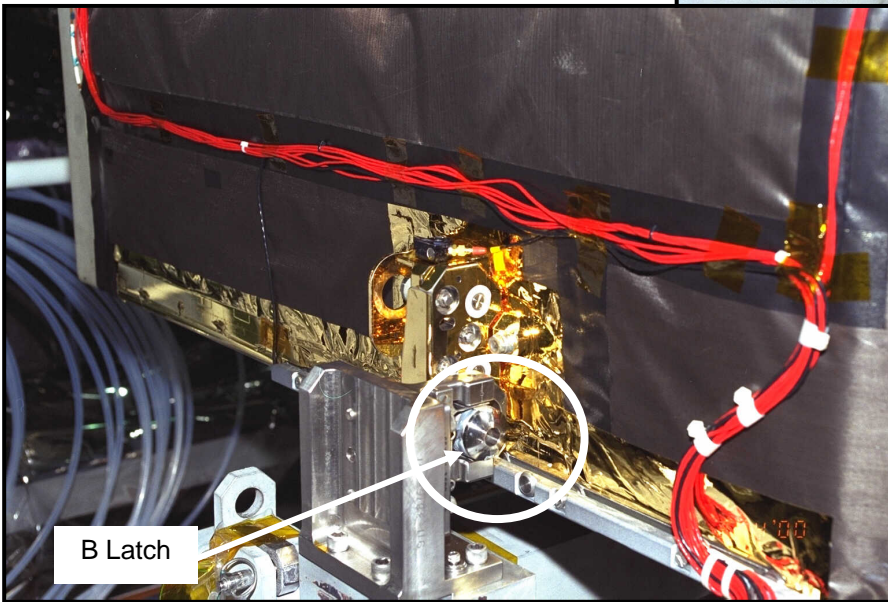
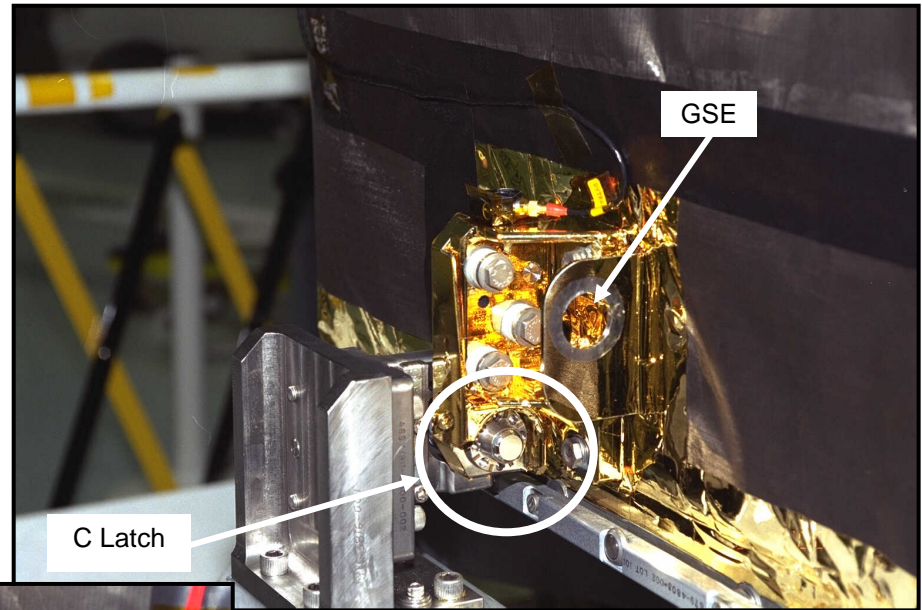
FGS-2R OVERVIEW – BACK SIDE



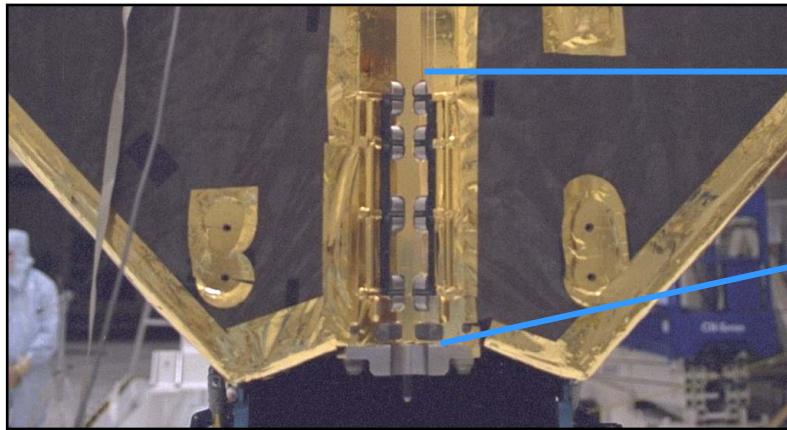
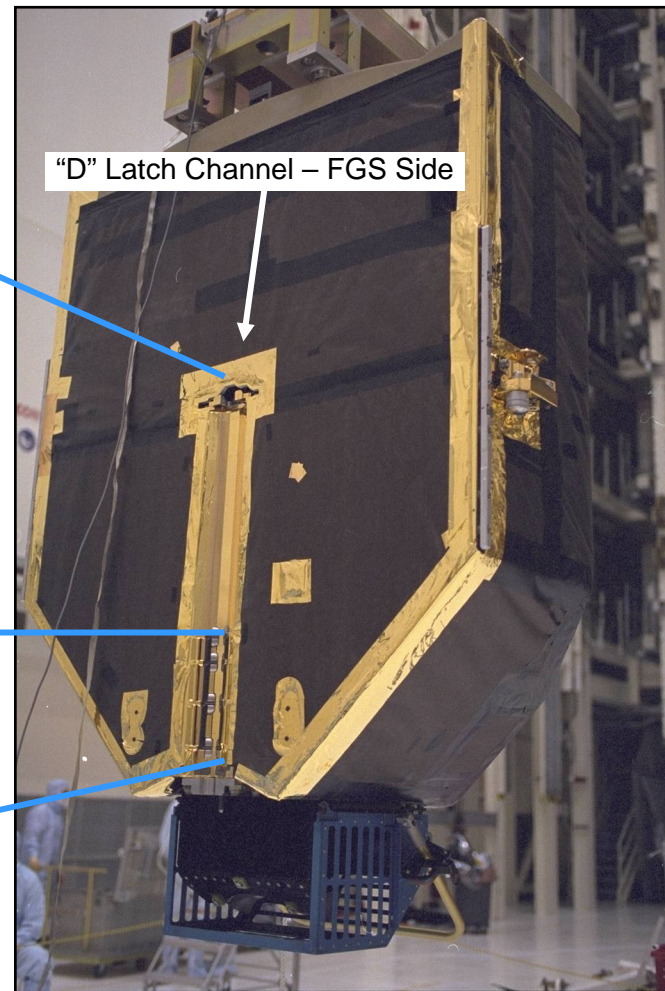
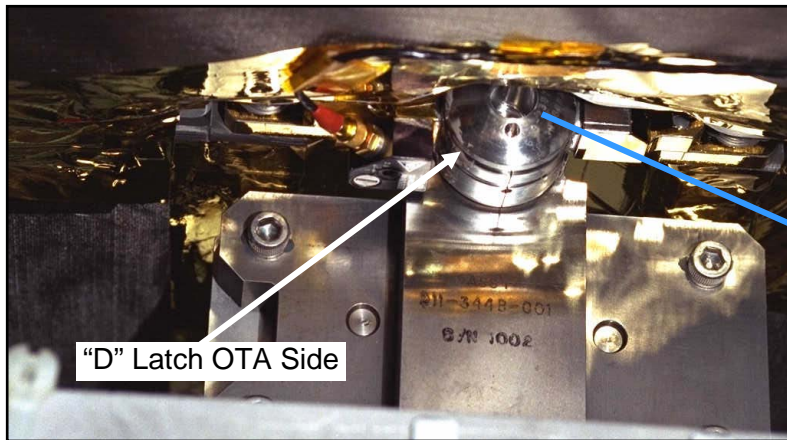
## A-LATCH AND D-LATCH



## B-LATCH AND C-LATCH

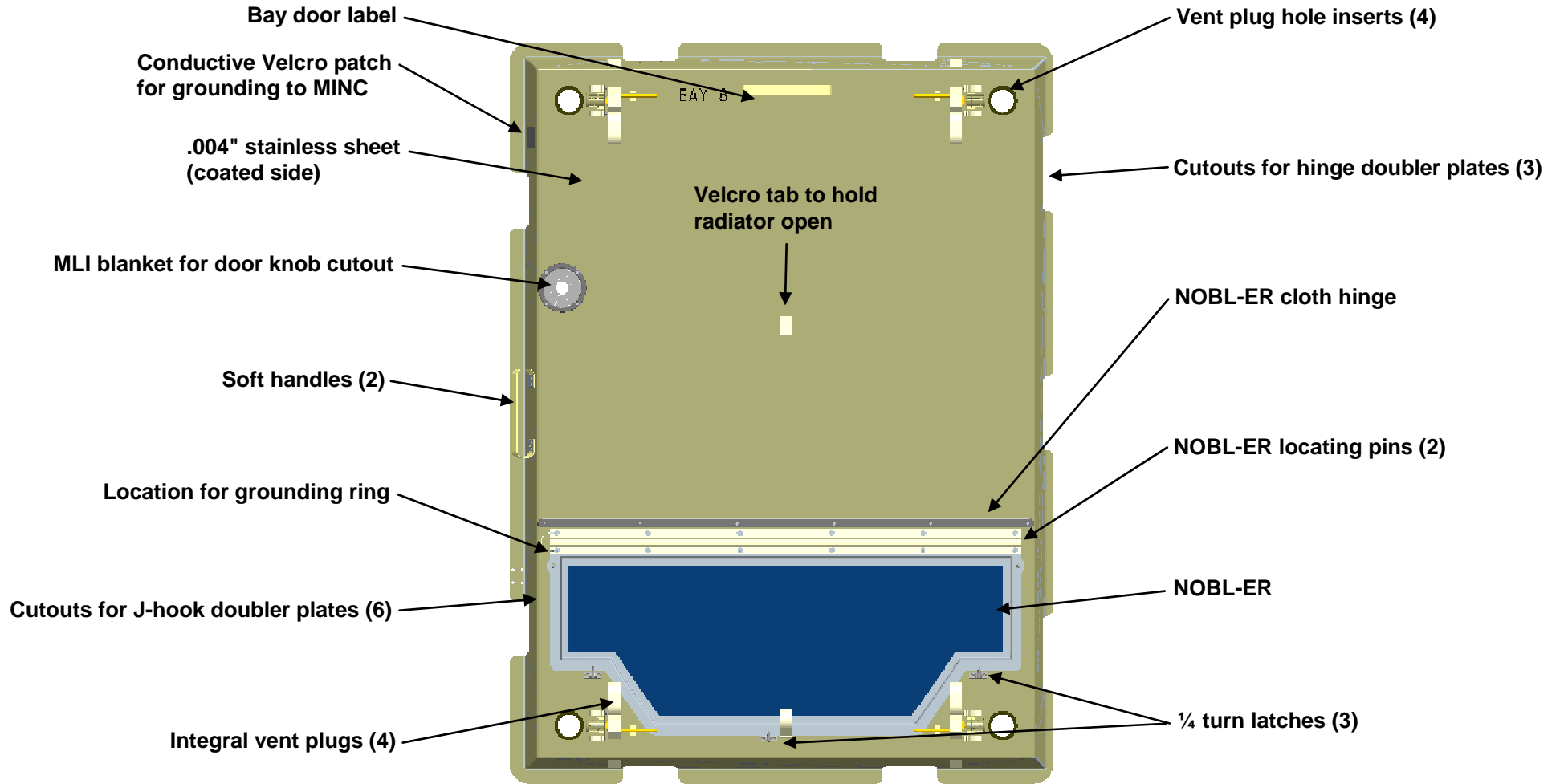


# D-LATCH



D-LATCH CHANNEL GUIDES

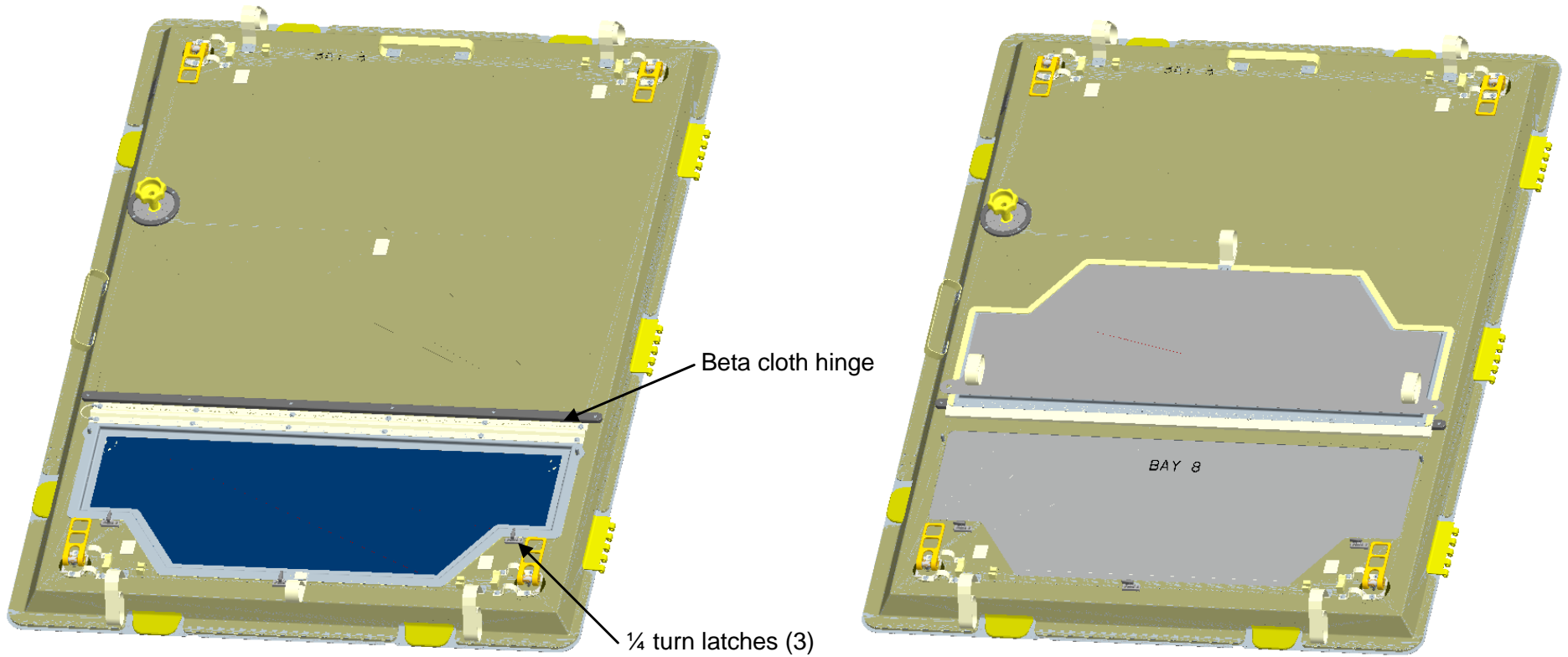
**SM4 BAY 8 NOBL**



**Bay 8 NOBL (Front View)**

# NOBL

## SM4 BAY 8 NOBL (Cont)

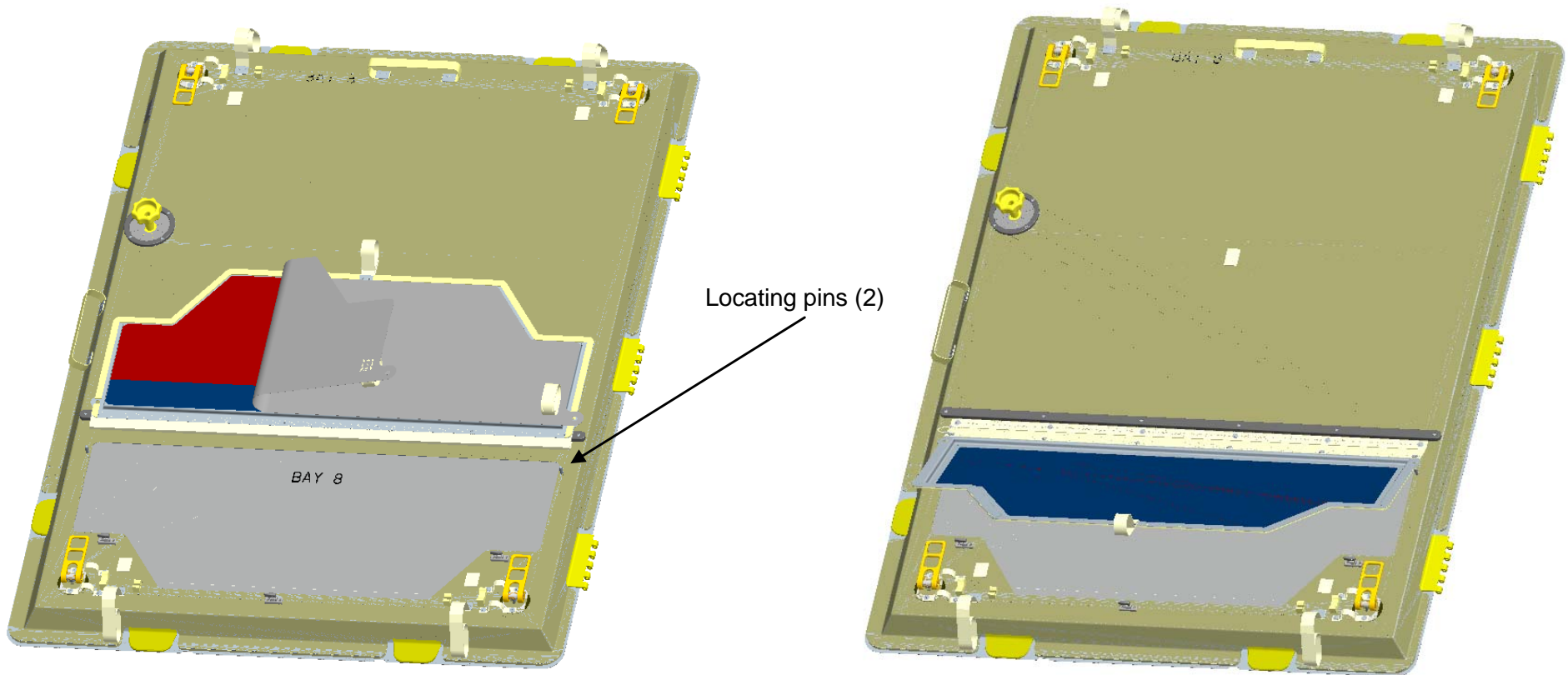


NOBL installed on bay door with NOBL-ER in the as stowed position

NOBL-ER in the open position. Beta cloth handle adheres to Velcro patch

### Deployment of Bay 8 NOBL-ER

**SM4 BAY 8 NOBL (Cont)**

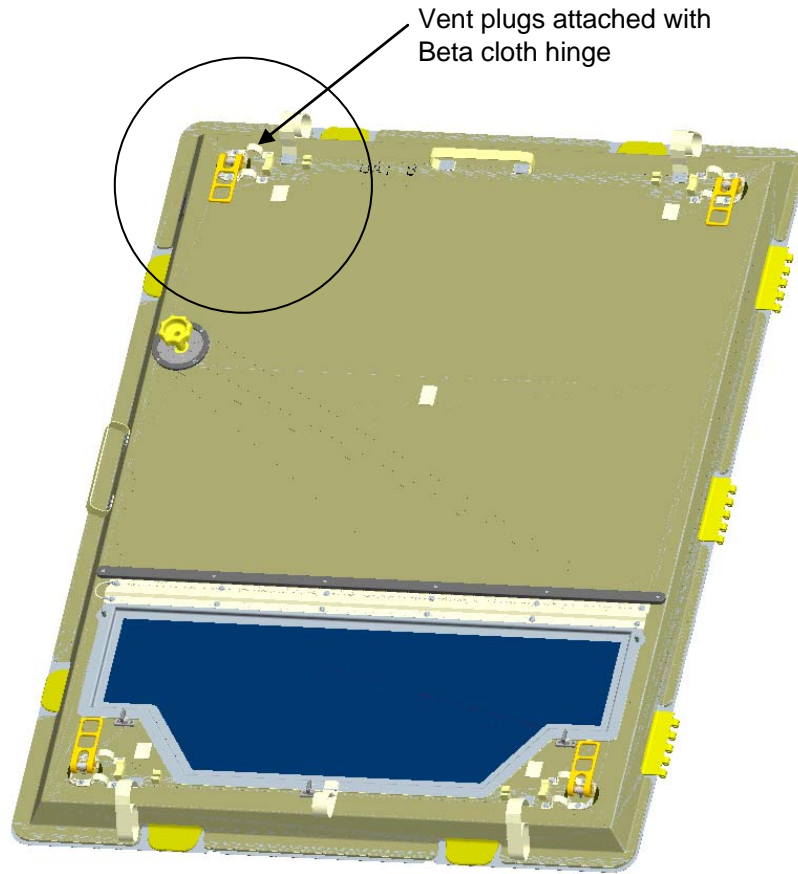


Locating pins (2)

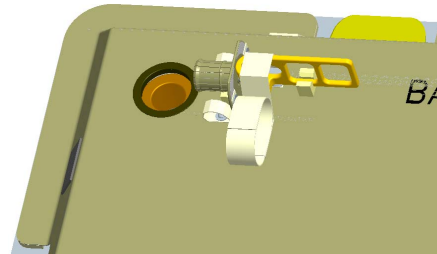
Release liner is removed to expose the adhesive

NOBL-ER being closed. Locating pins aid in maintaining correct orientation

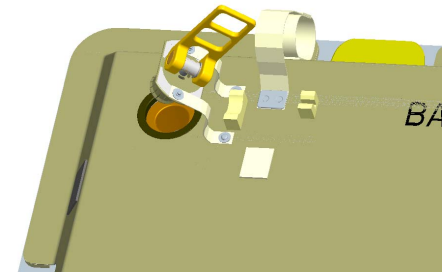
## SM4 BAY 8 NOBL VENT PLUGS



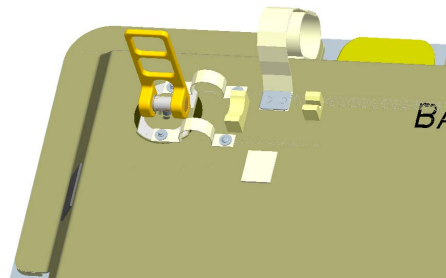
Bay 8 NOBL on bay door with vent plugs installed



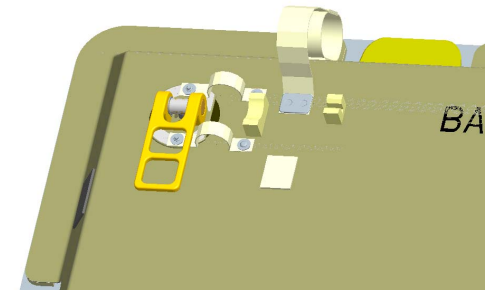
Vent plug in uninstalled position



Beta cloth restraining strap released. Vent plug undocked from foam supports. Beta cloth hinge maintains proper orientation



Vent plug being installed into vent hole

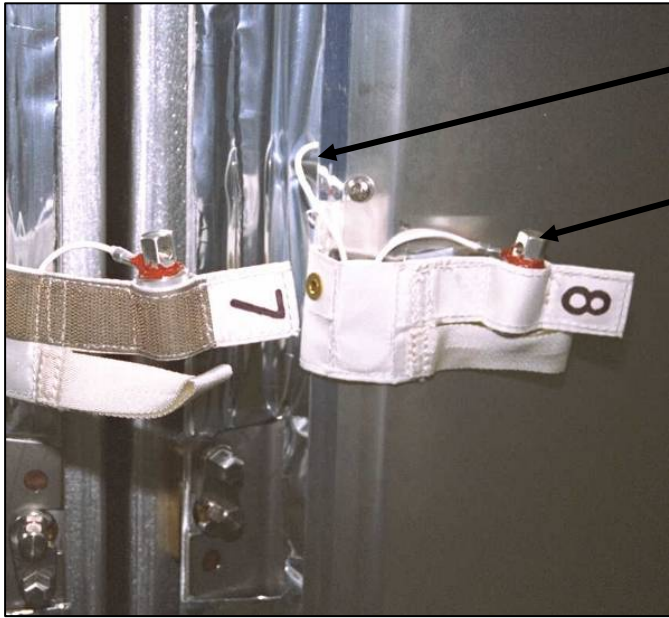


Vent plug installed into vent hole

### Installation Integral Vent Plugs (Bay 8 shown)



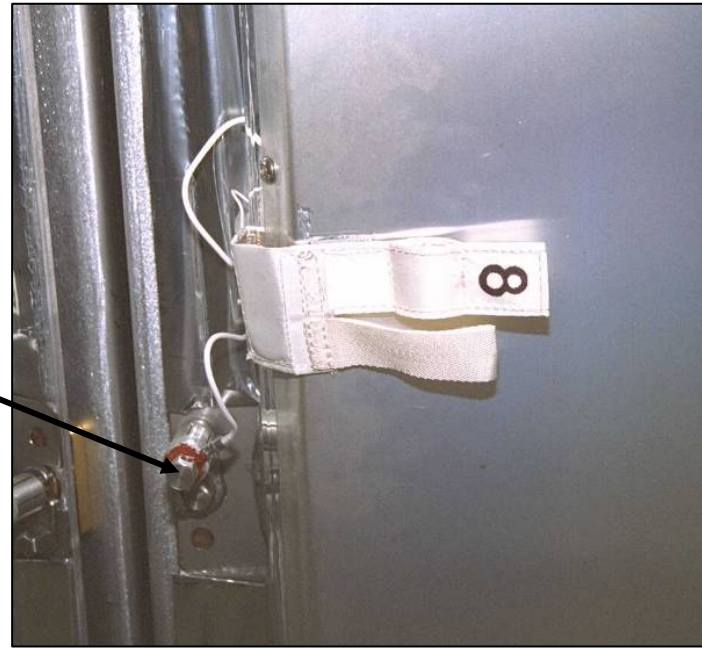
# BAY 8 NOBL GROUNDING



Ground wire attached to NOBL frame

Ground ring stowed in cloth strap

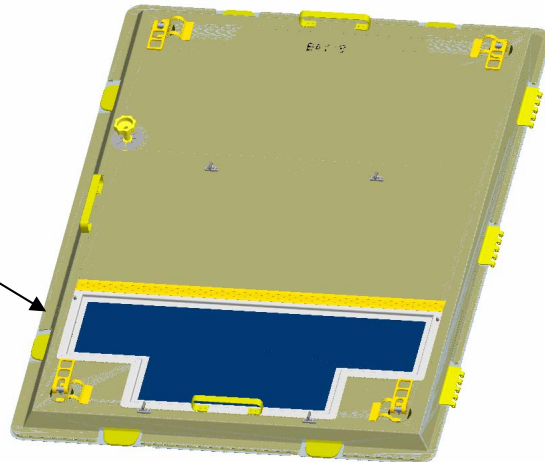
Ground ring installed on J-hook



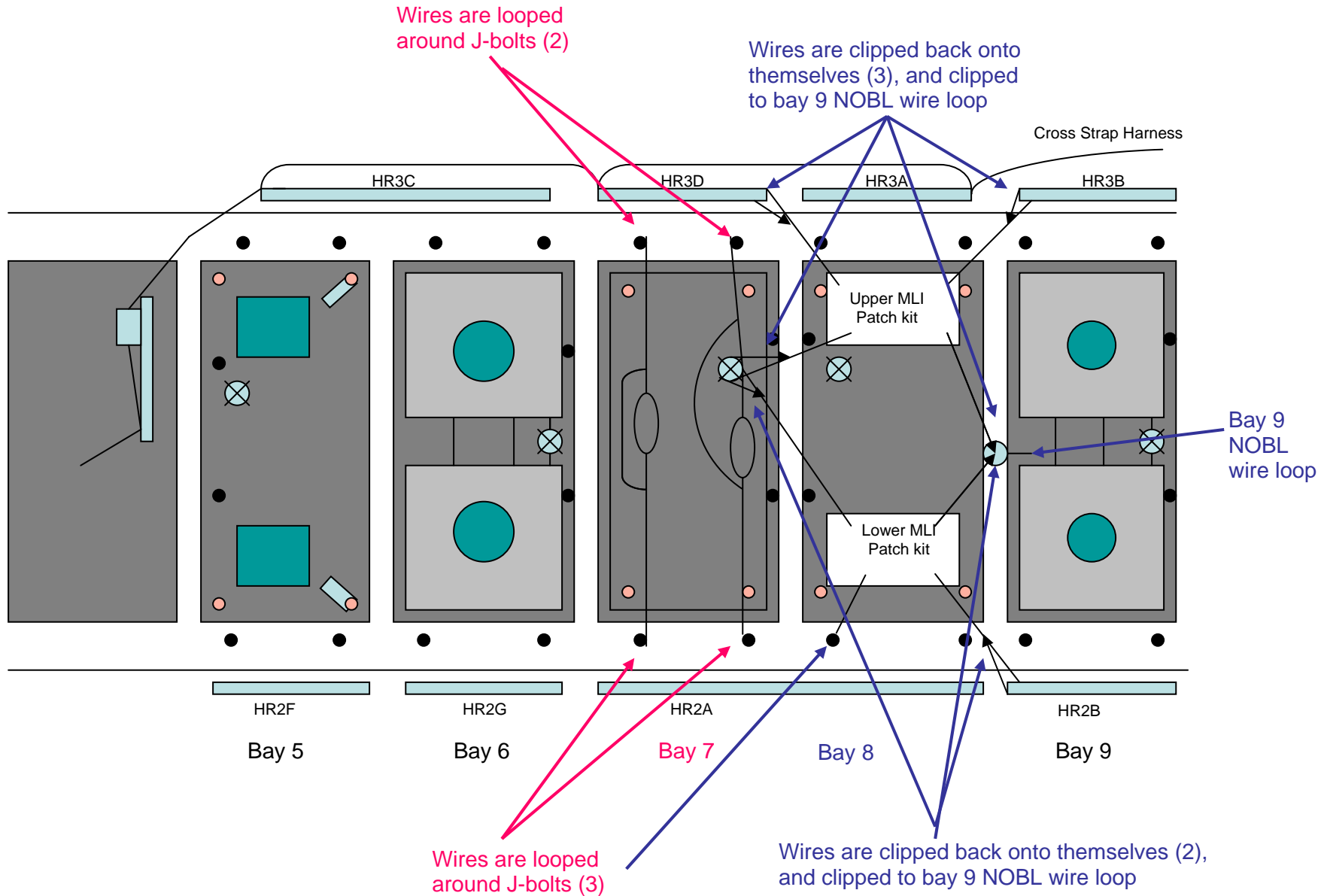
GROUND STRAP NOT INSTALLED

GROUND STRAP INSTALLED

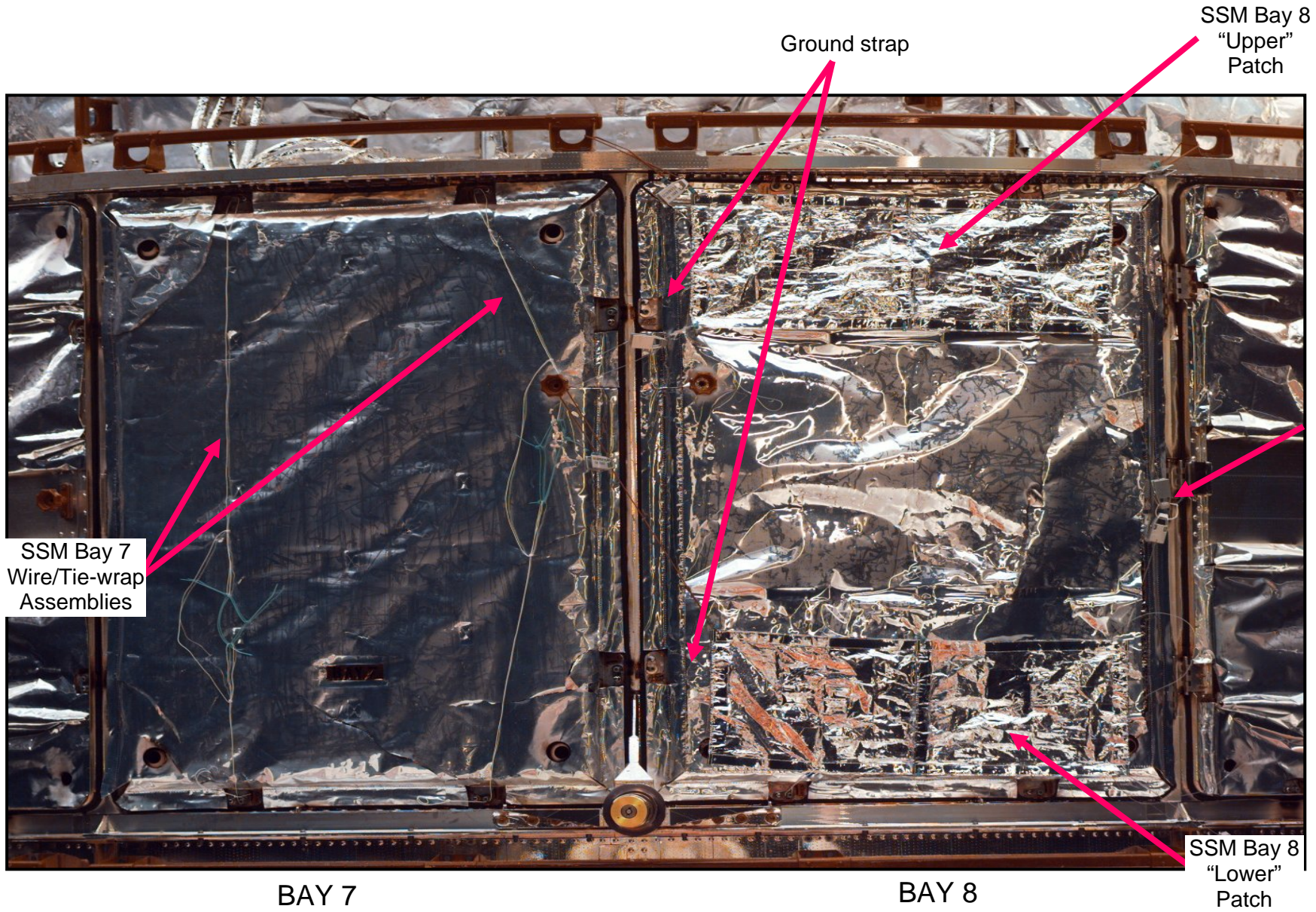
Location of ground wire attachment



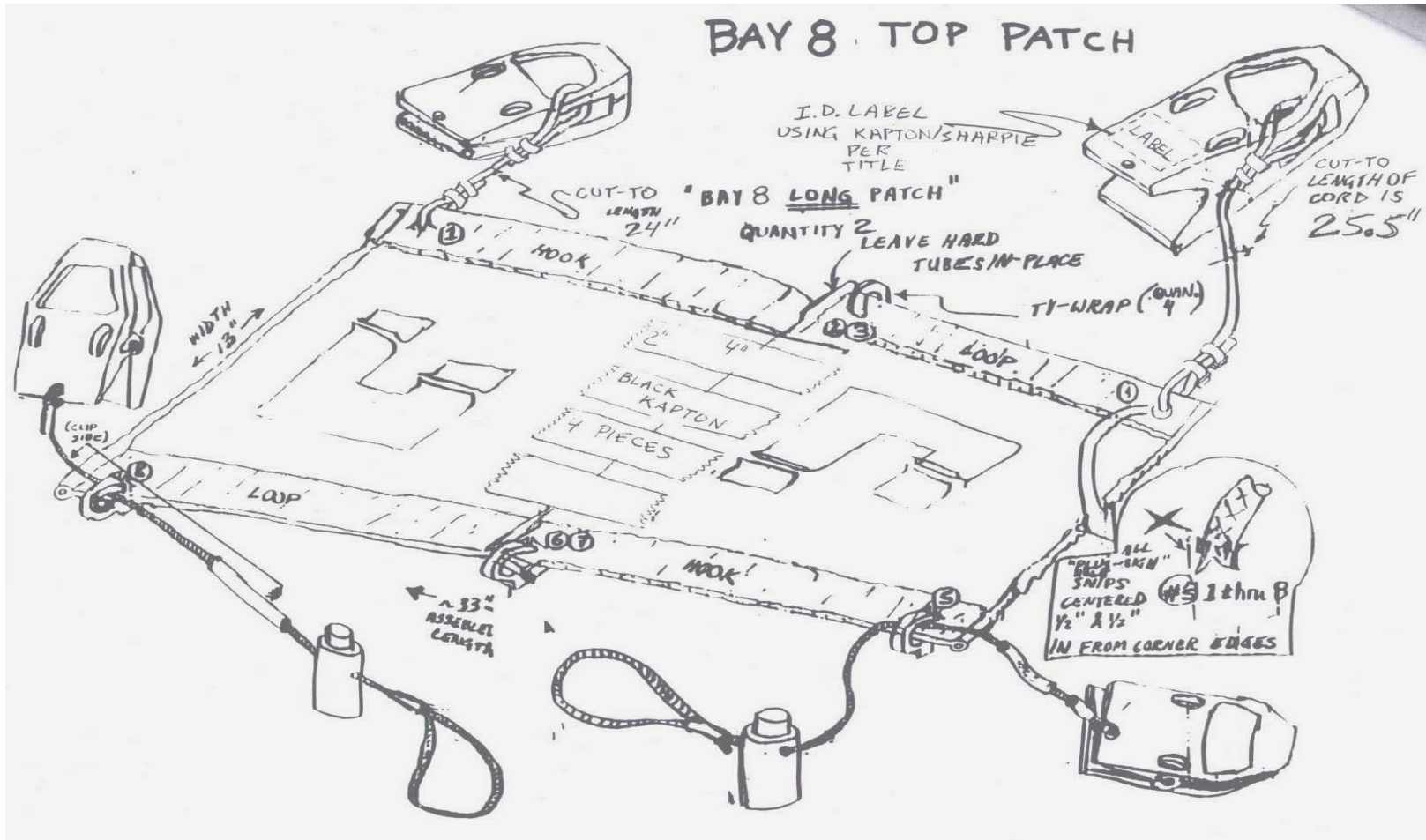
# SSM BAYS 4 THROUGH 9



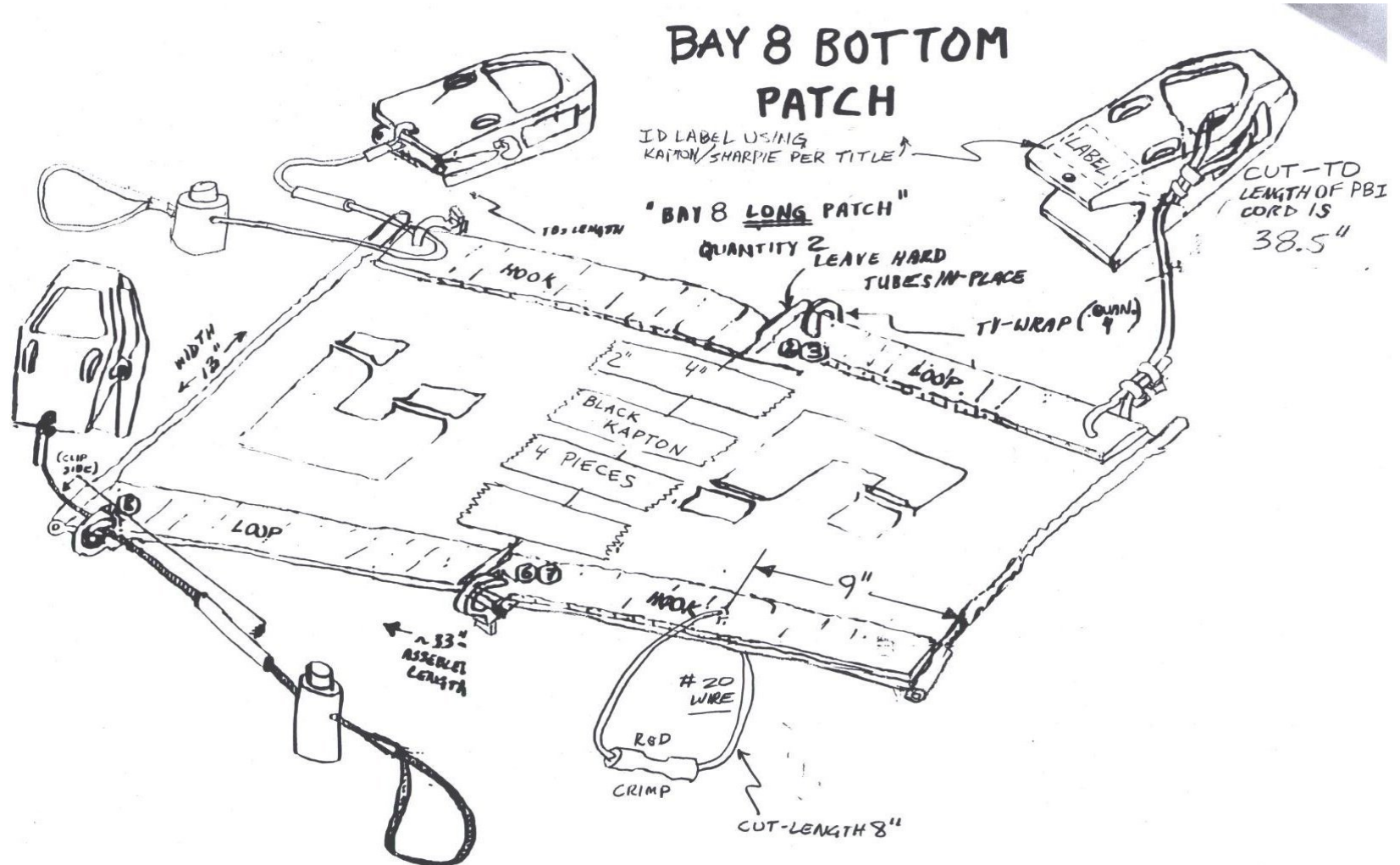
**BAY 7 AND 8 MLI CONFIG**



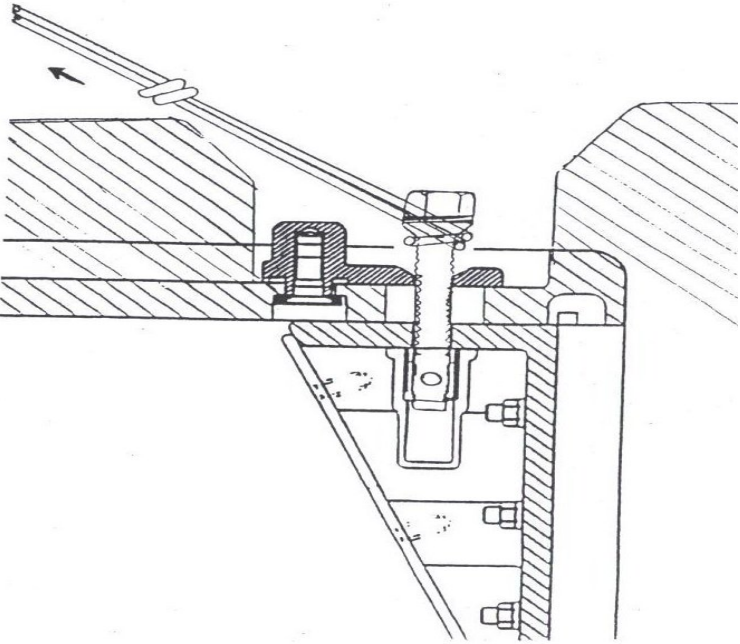
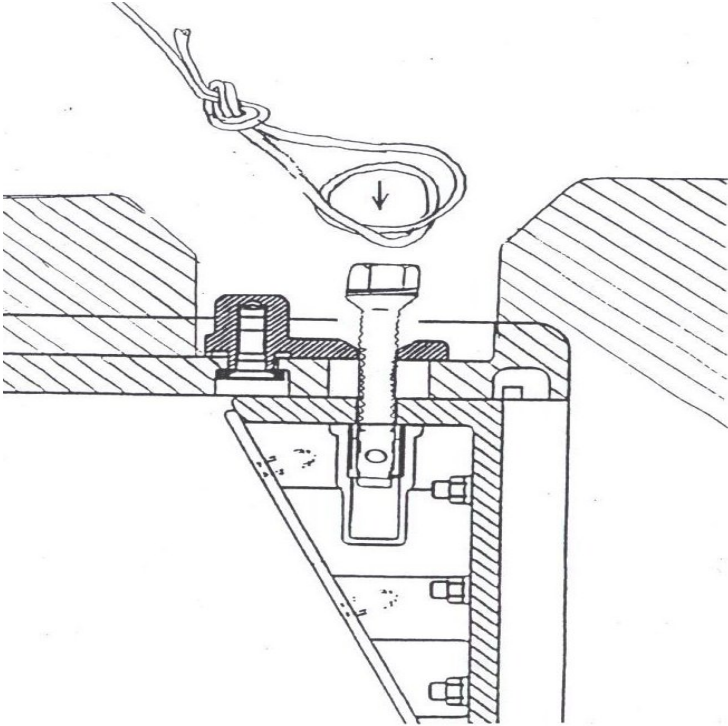
# BAY 8 TOP PATCH



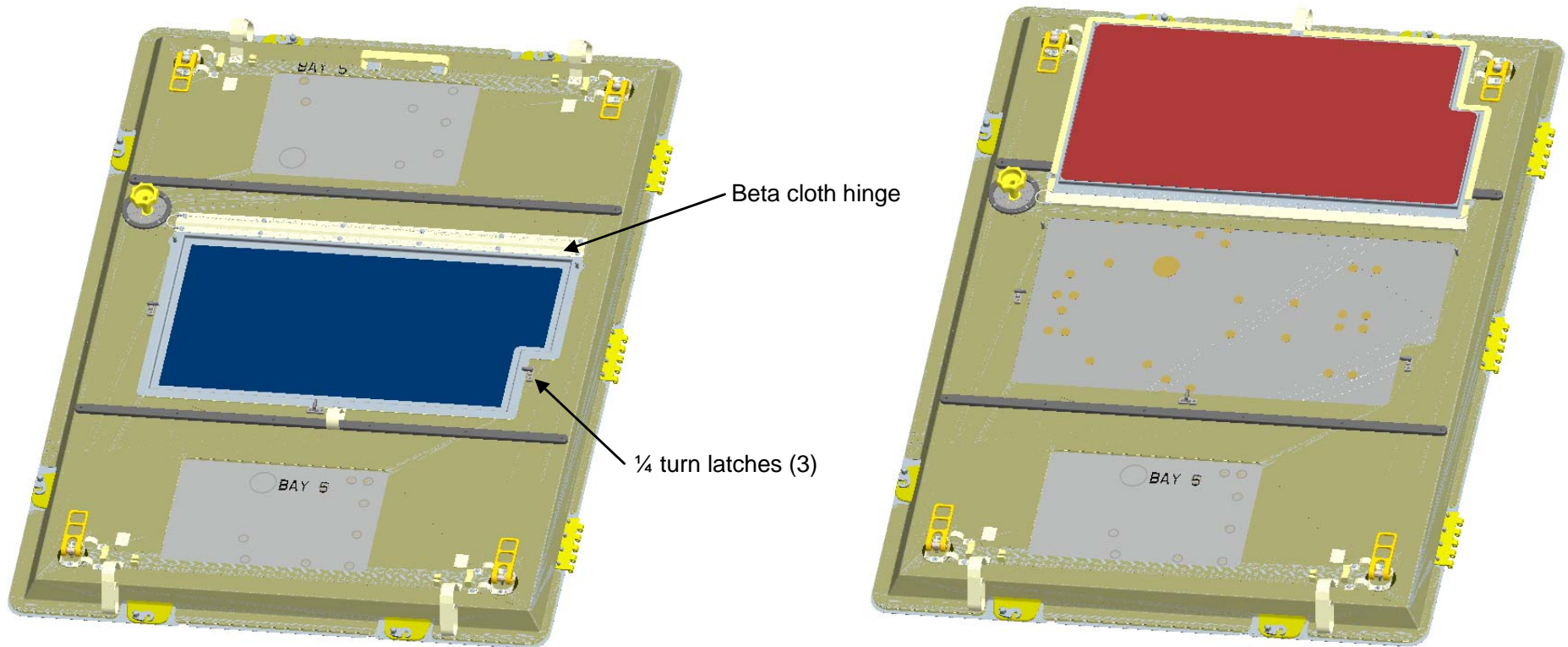
# BAY 8 BOTTOM PATCH



**MLI PATCH ATTACHMENT TO J-HOOK BOLTS**



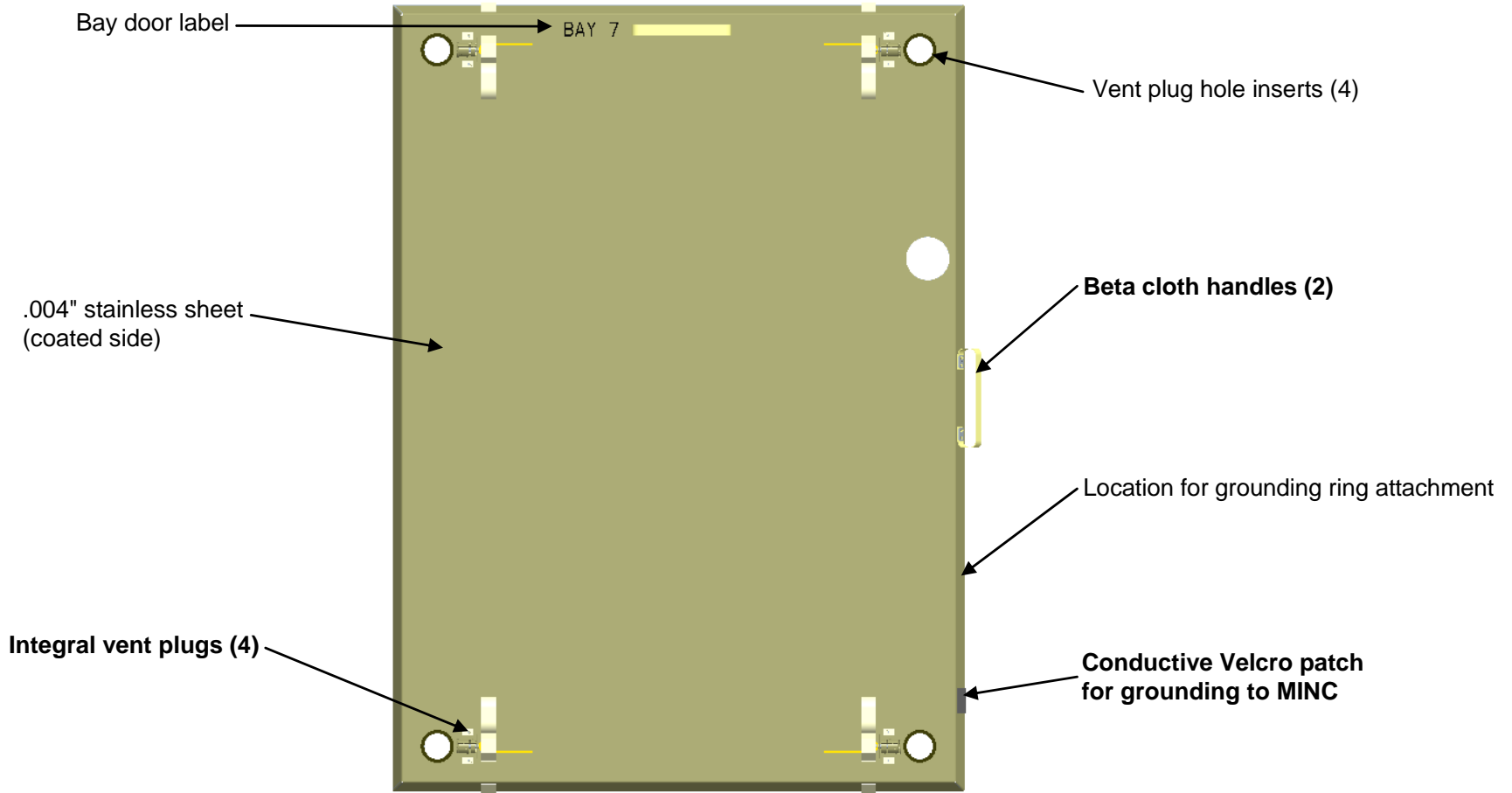
## SM4 BAY 5 NOBL OVERVIEW



NOBL installed on bay door with  
NOBL-ER in the as stowed position

NOBL-ER in the open position. Beta cloth  
handle adheres to Velcro patch. Release  
liner is removed to expose the adhesive

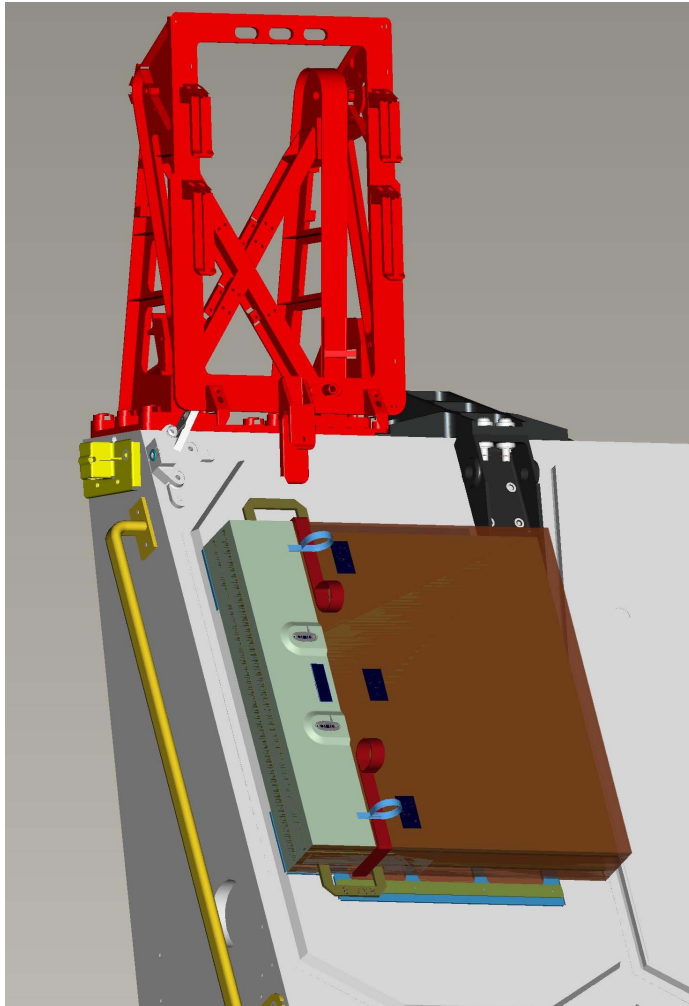
# SM4 BAY 7 NOBL OVERVIEW



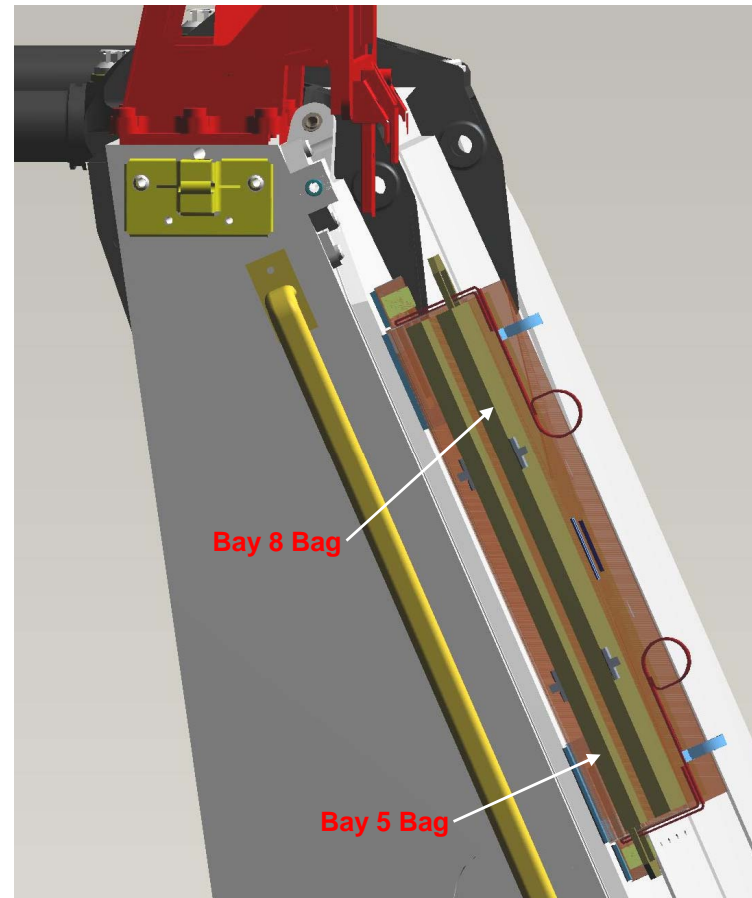
Bay 7 NOBL (Front View)



## MLI RECOVERY BAG STOWAGE

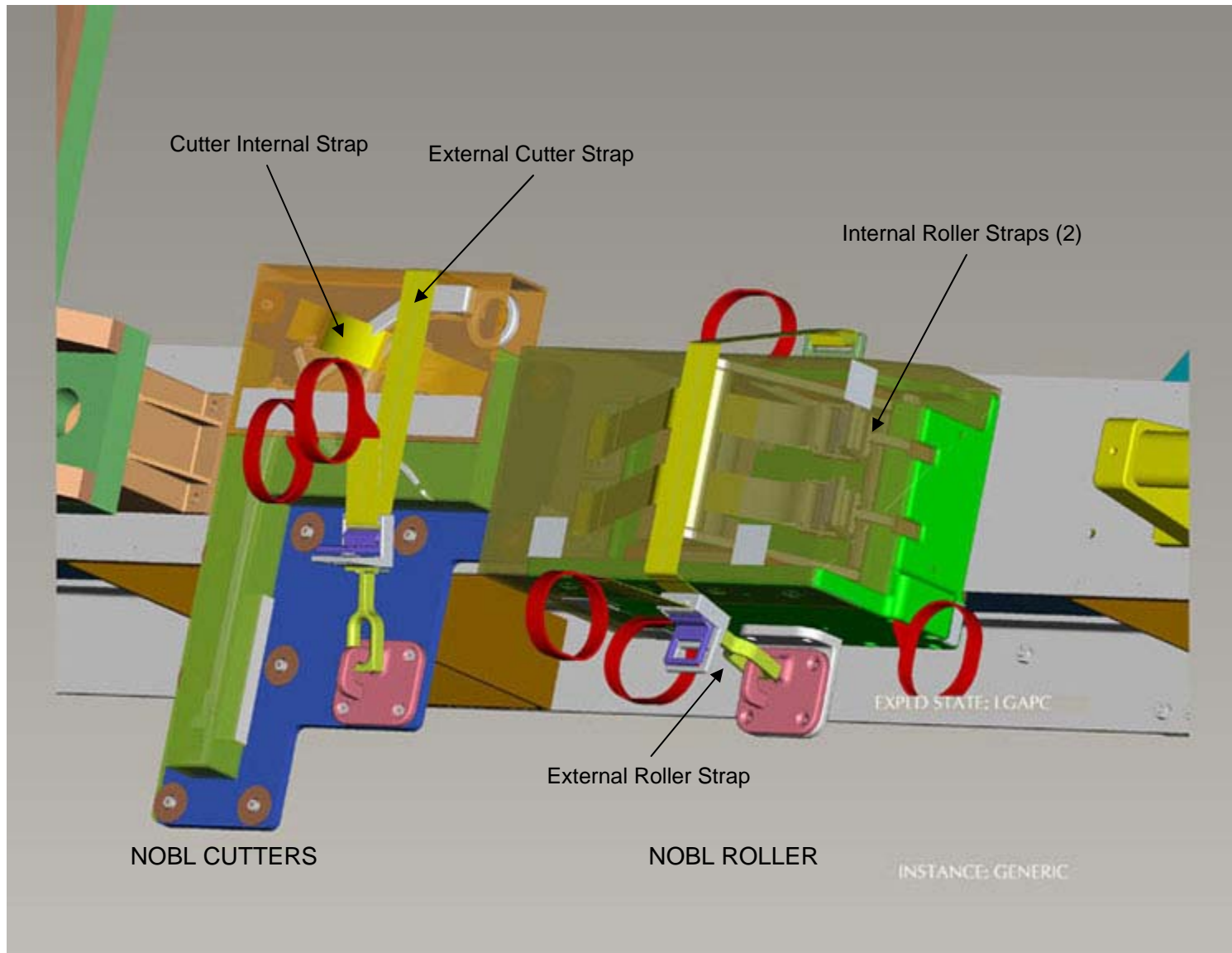


**Pouch Closed**

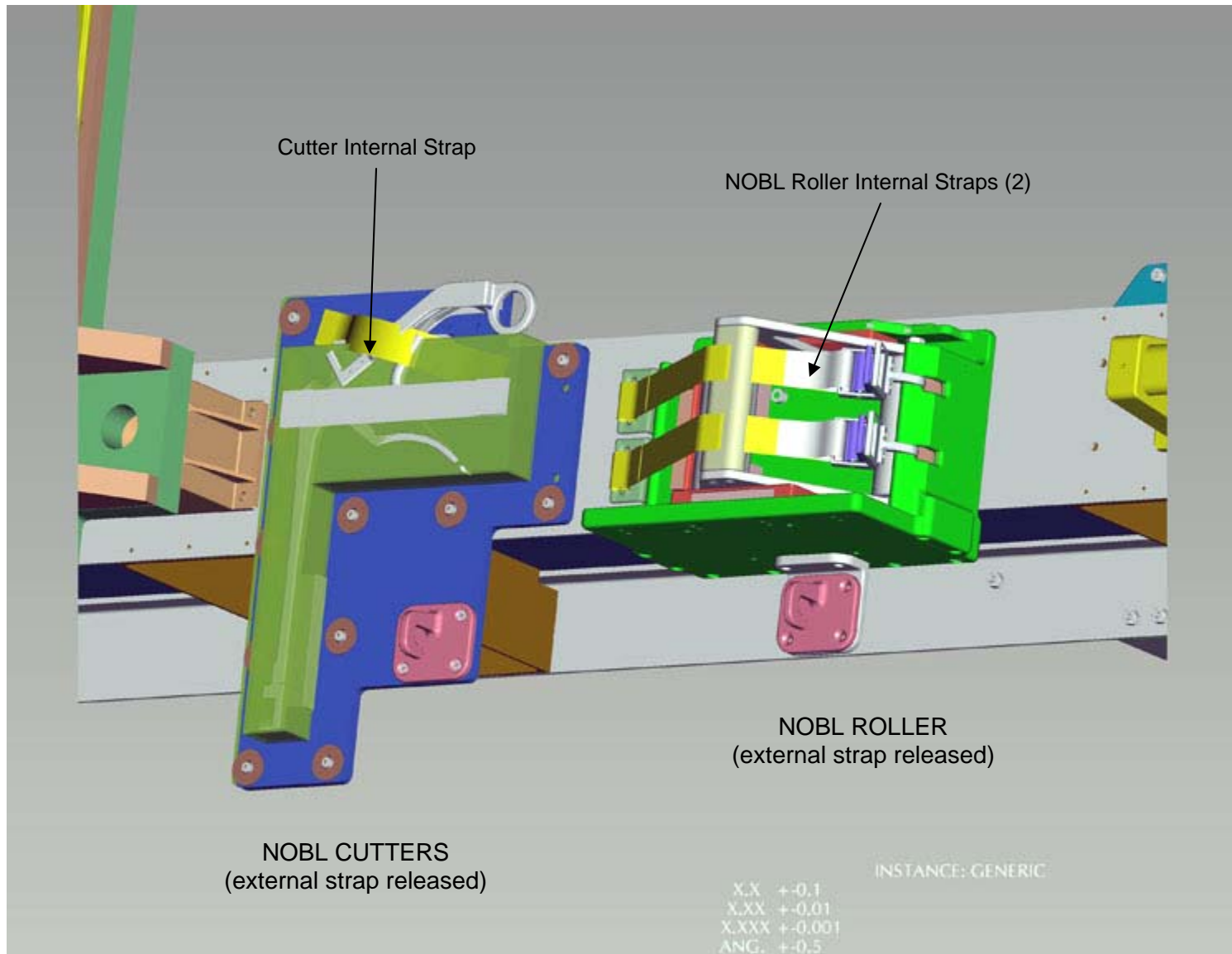


**Pouch Open  
(Lid Flap Not Shown)**

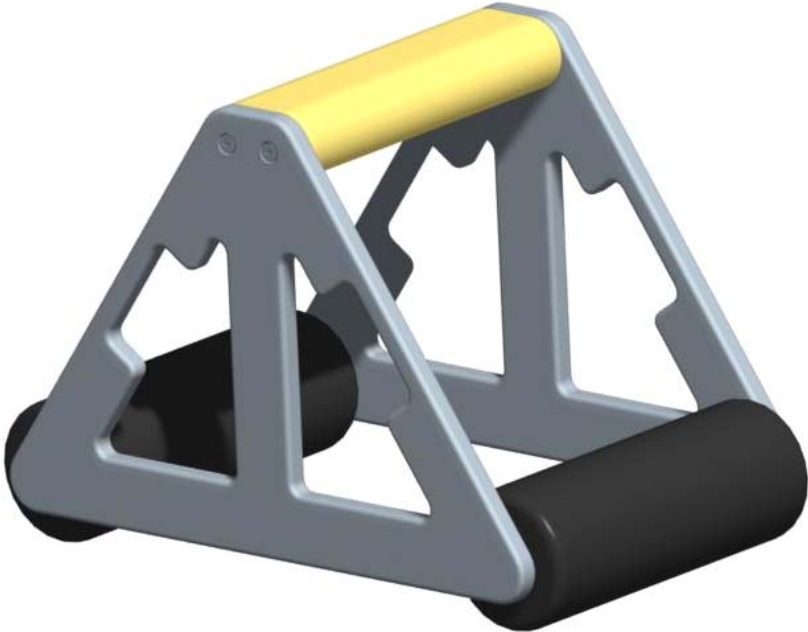
## NOBL CUTTERS AND ROLLER STOWAGE



## NOBL CUTTERS AND ROLLER STOWAGE (Cont)



**NOBL ROLLER TOOL AND CUTTERS**

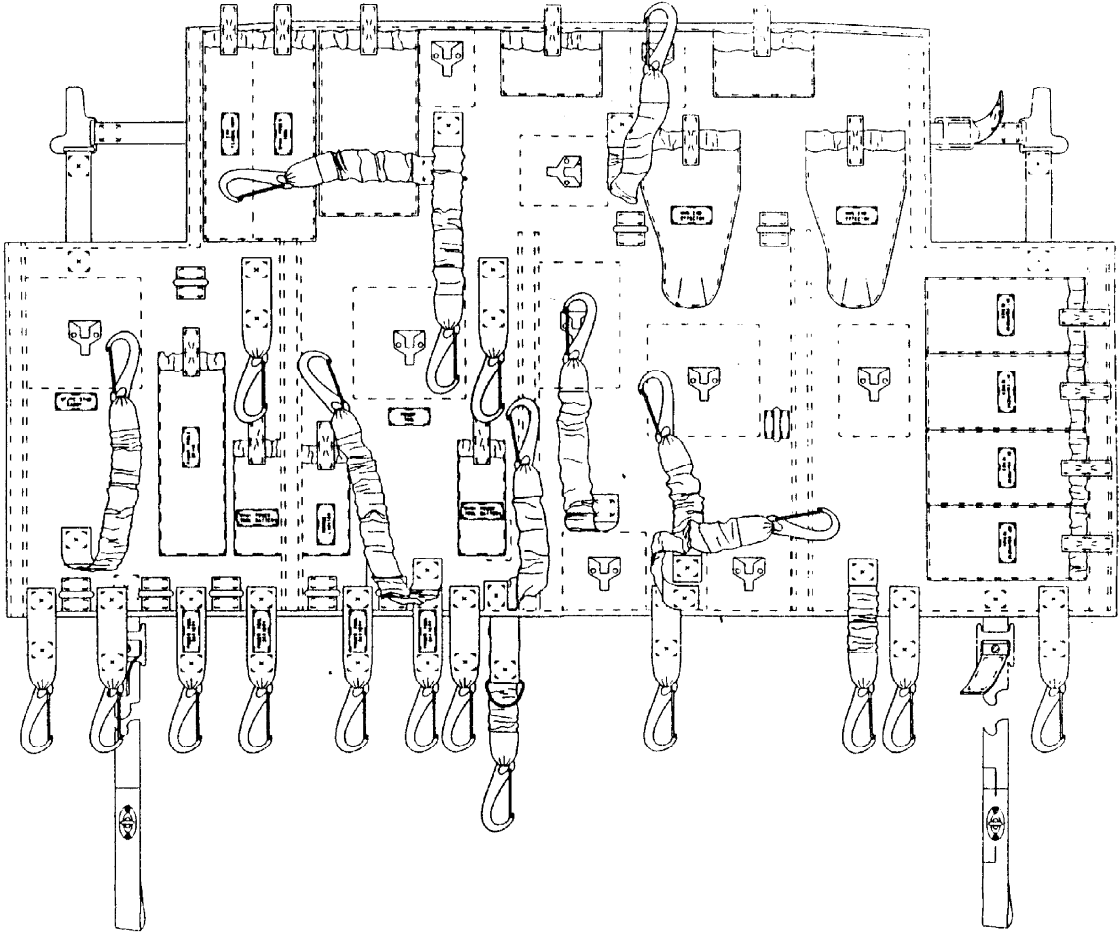


ROLLER TOOL



CUTTERS

HST TOOL BAG

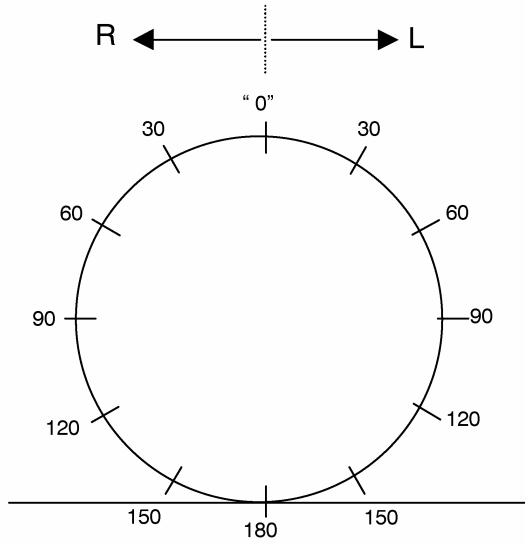


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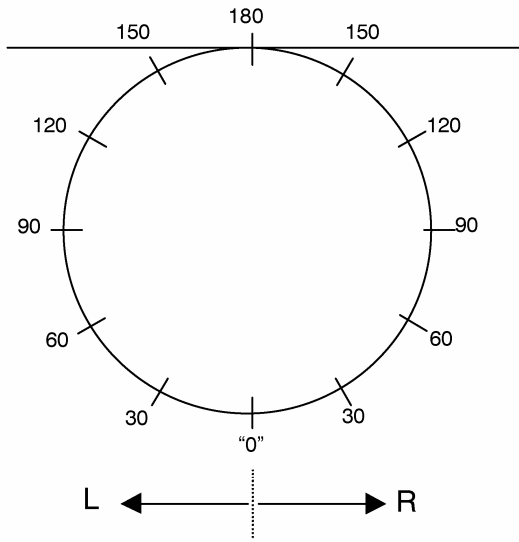
EVA/125/FIN A

**GENERIC  
CATS**

**PFR SOCKETS**

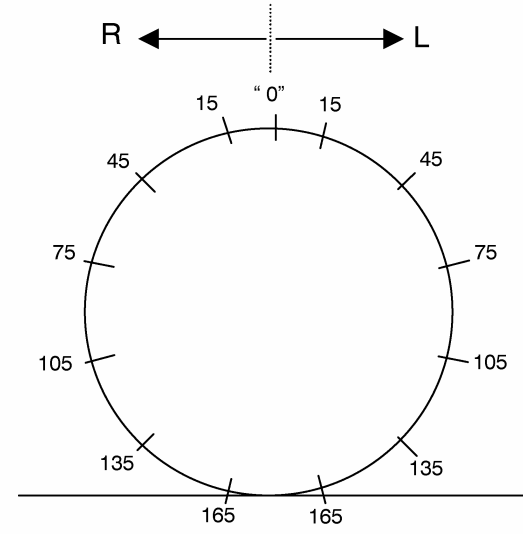


STS PFR Clocking

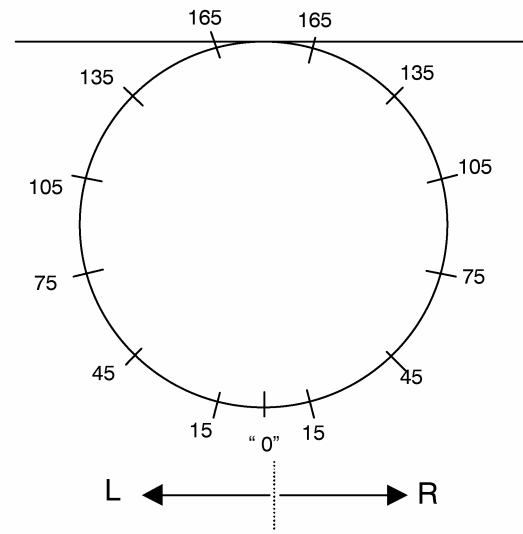


HST Bulkhead

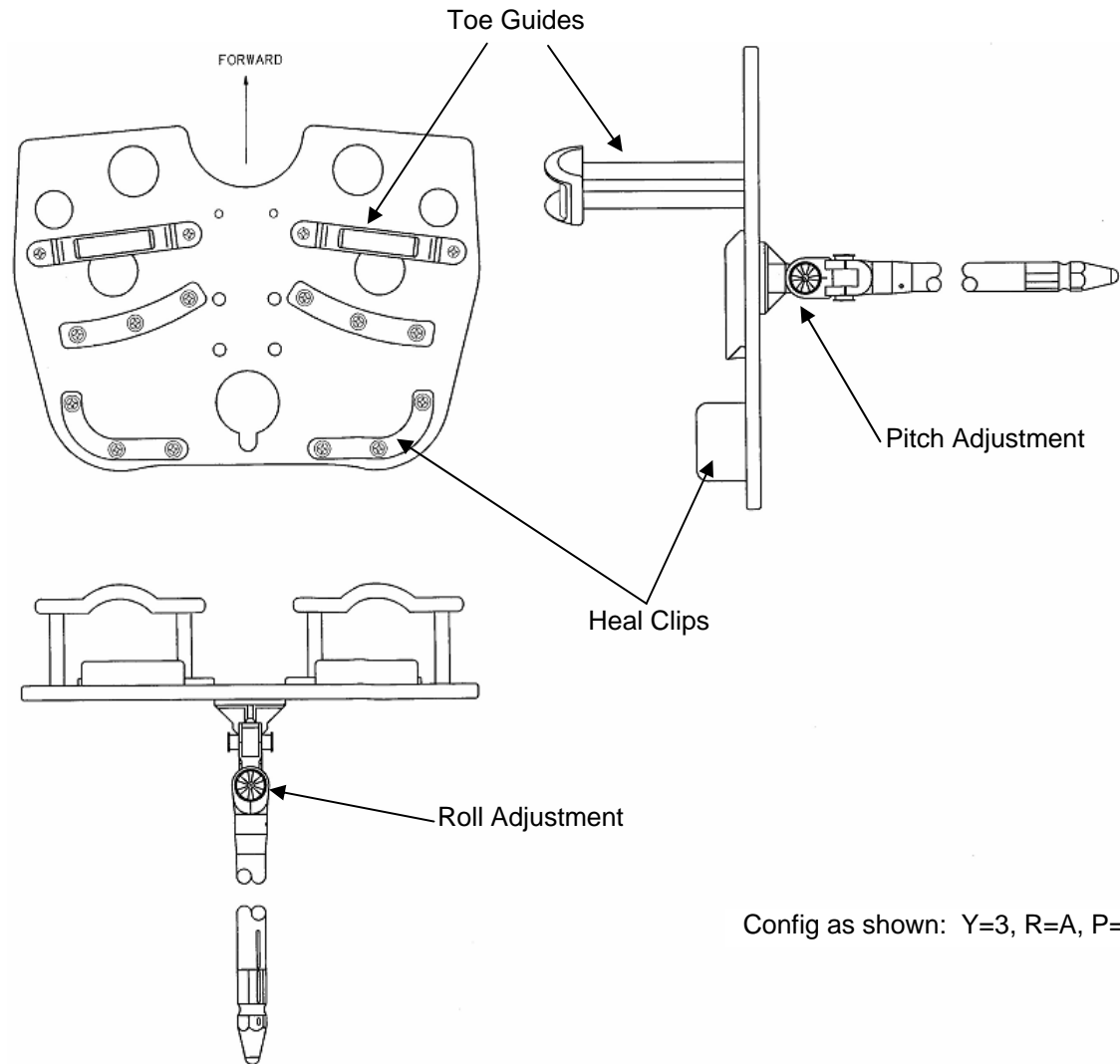
HST Bulkhead



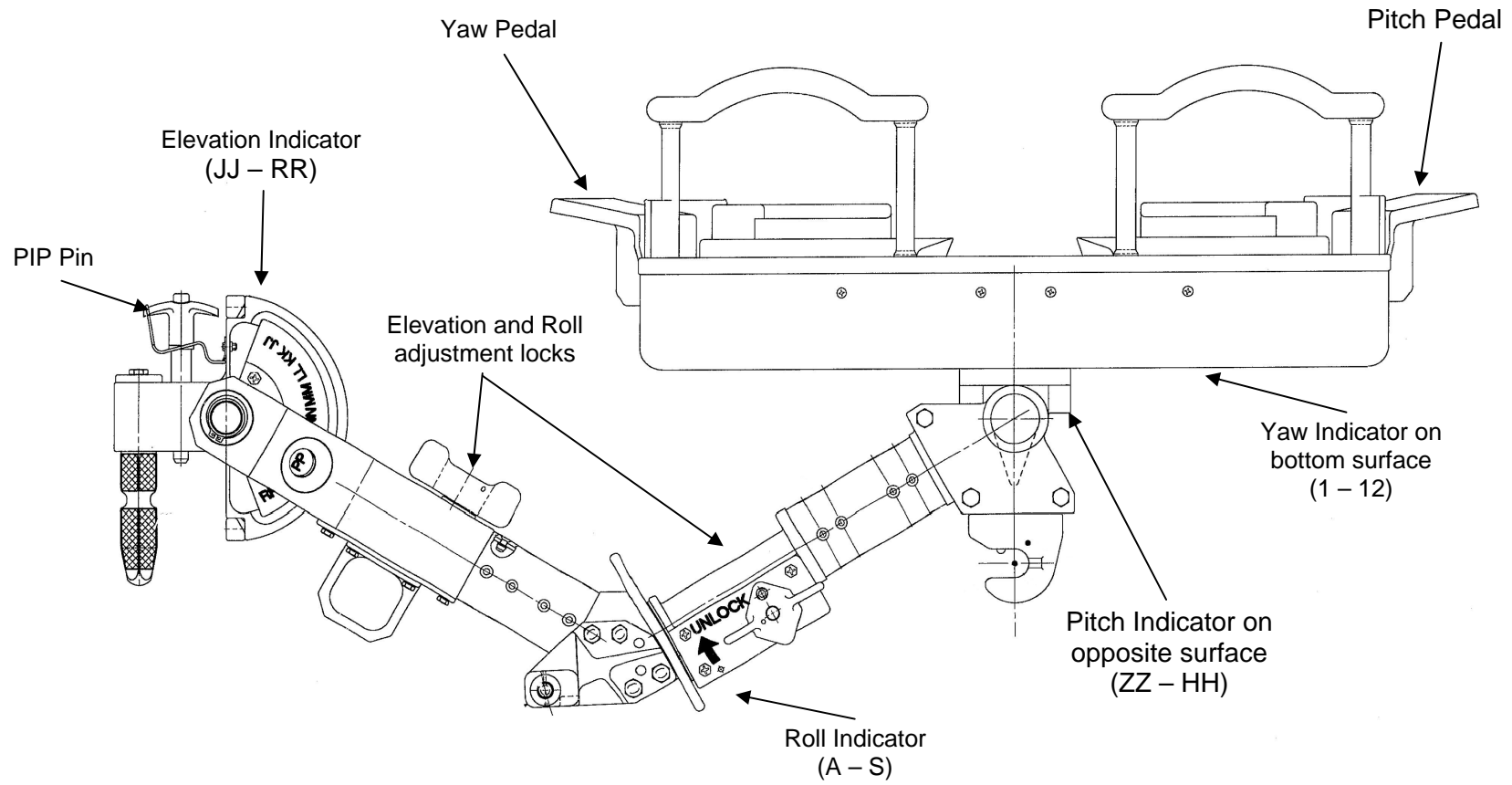
HST PFR Clocking



STS PFR

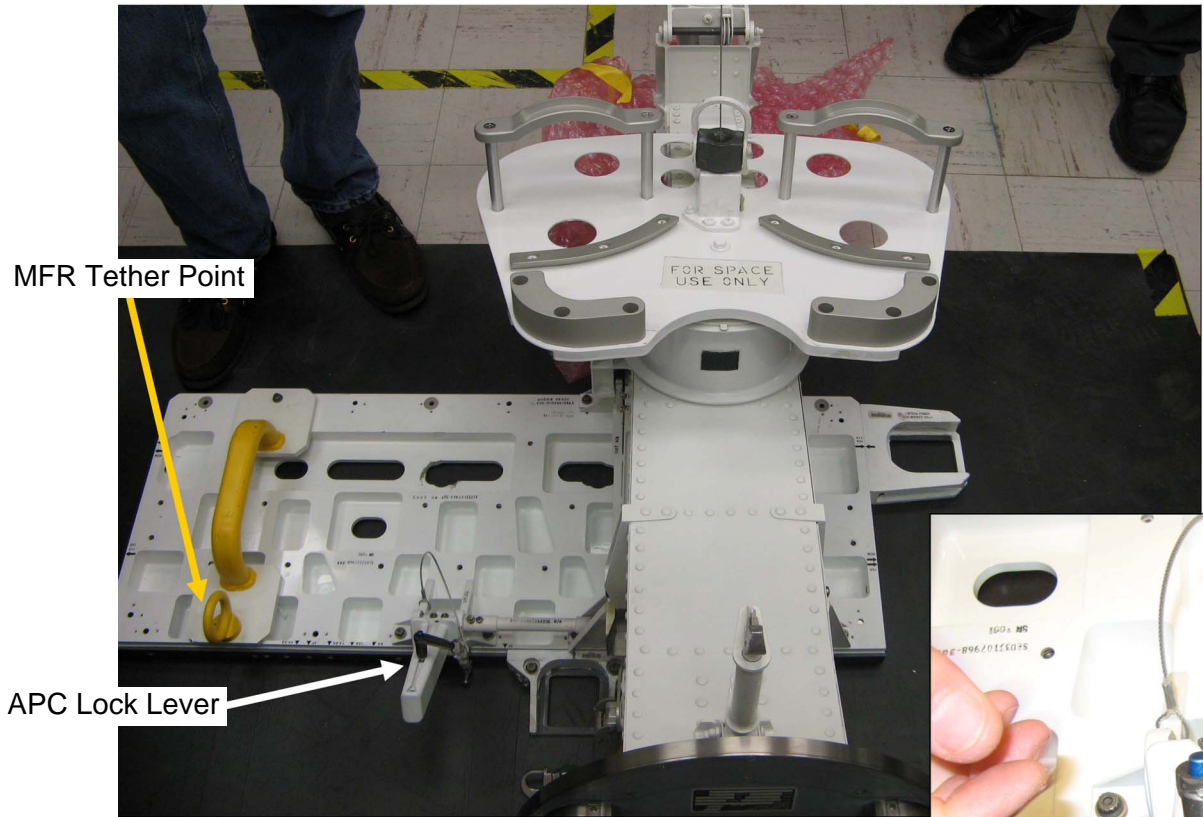


HST PFR





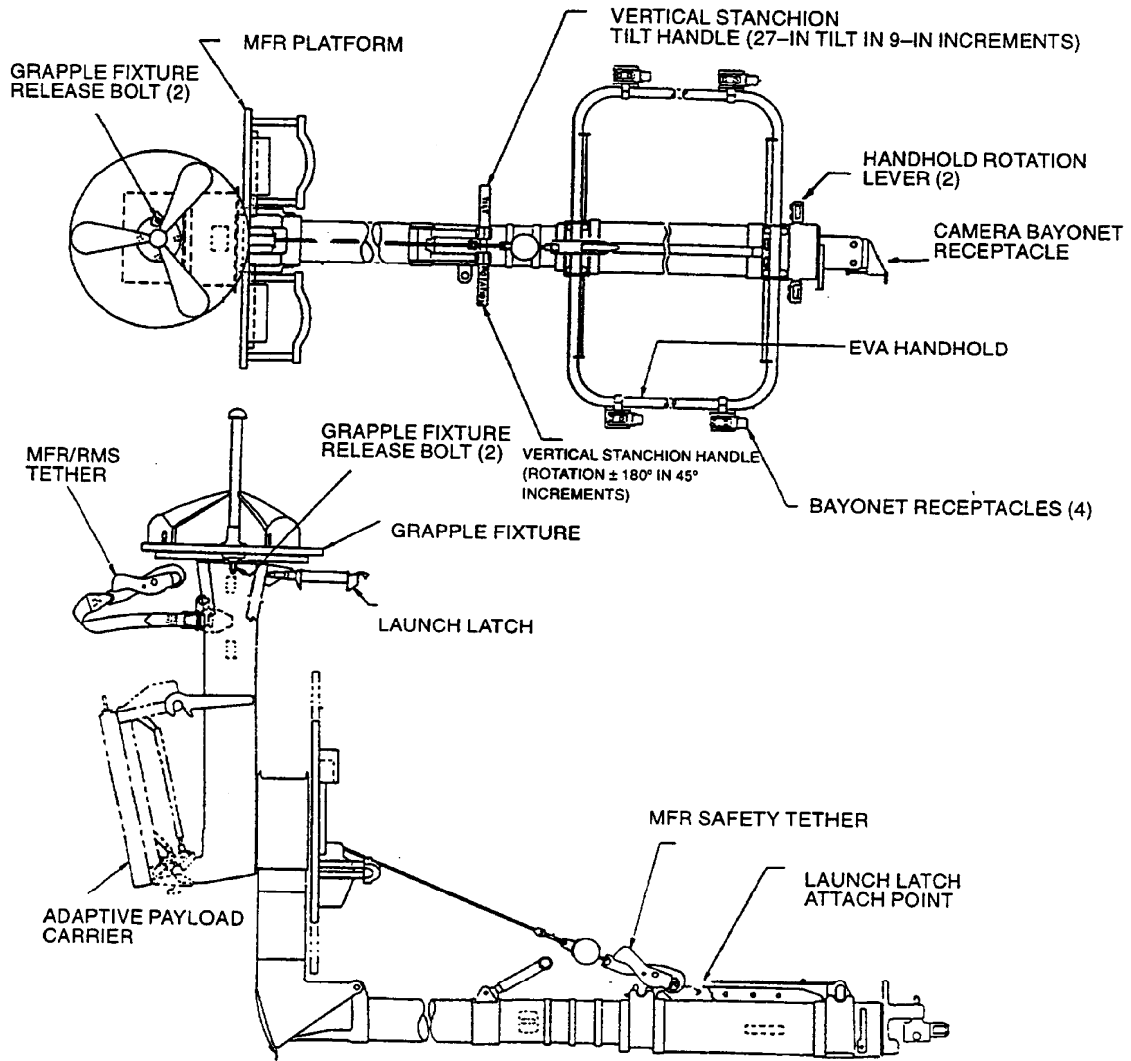
# STBD APC



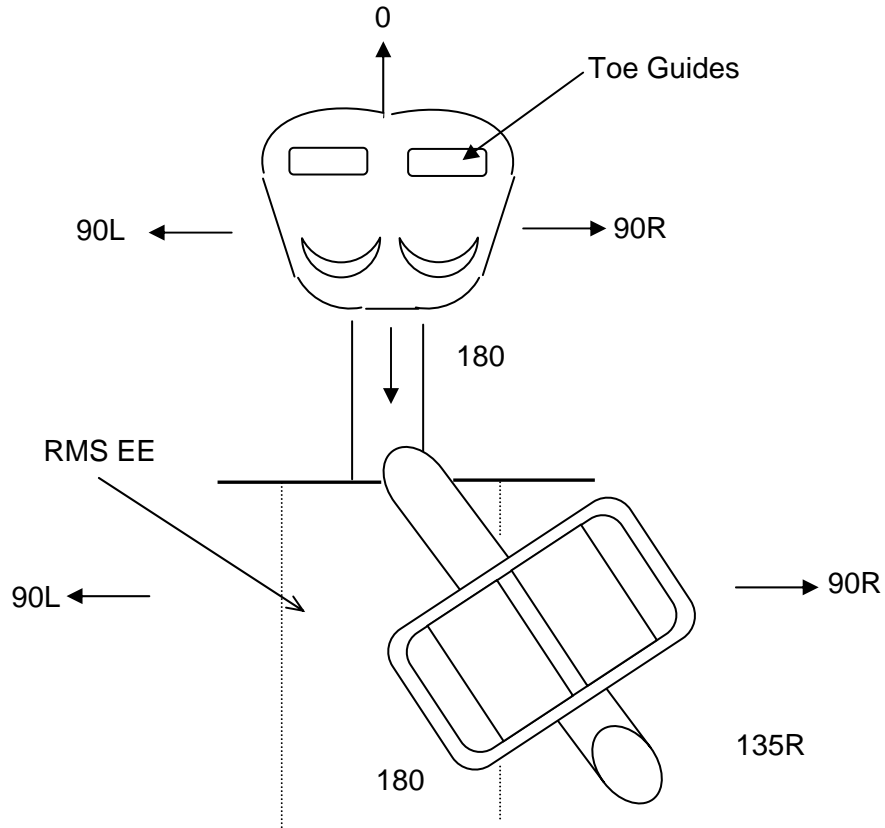
STBD APC WITH MFR INSTALLED



# MFR

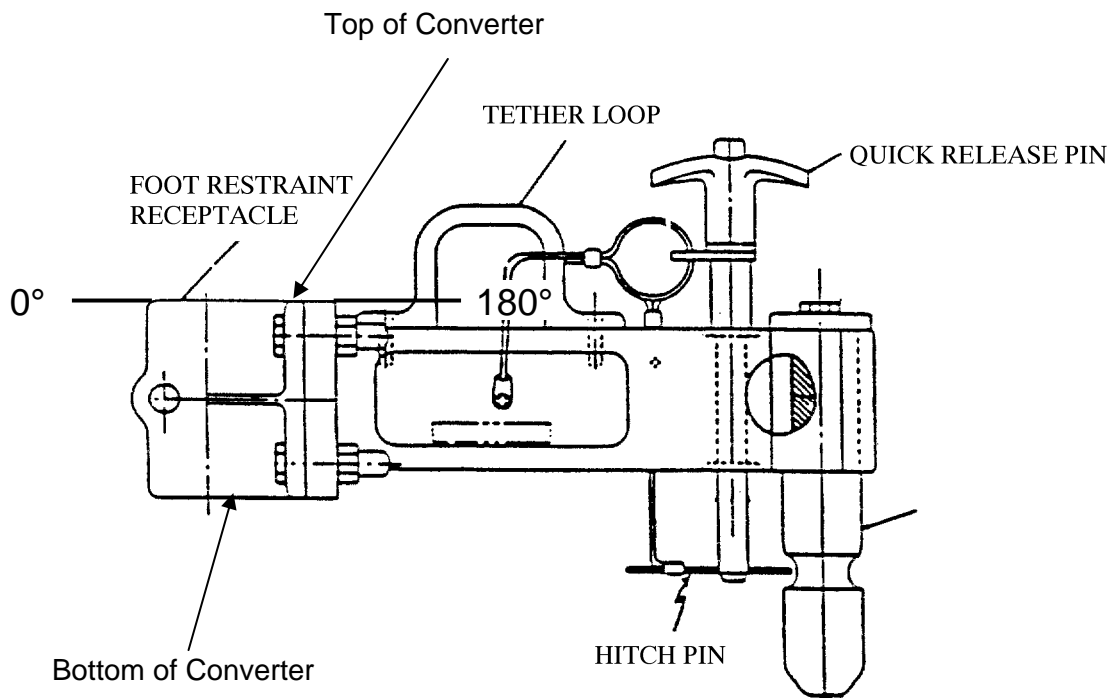
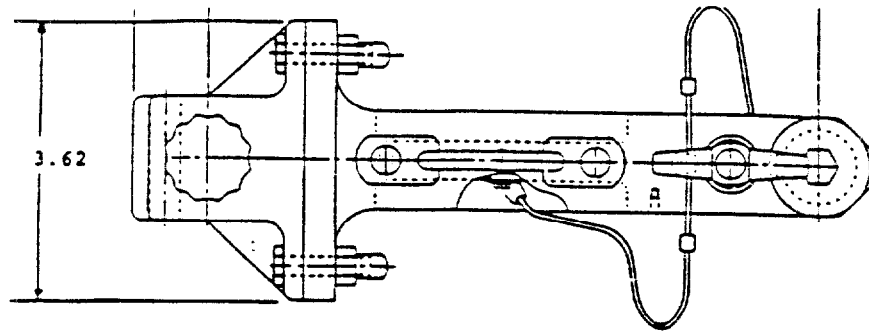


MFR (Cont)

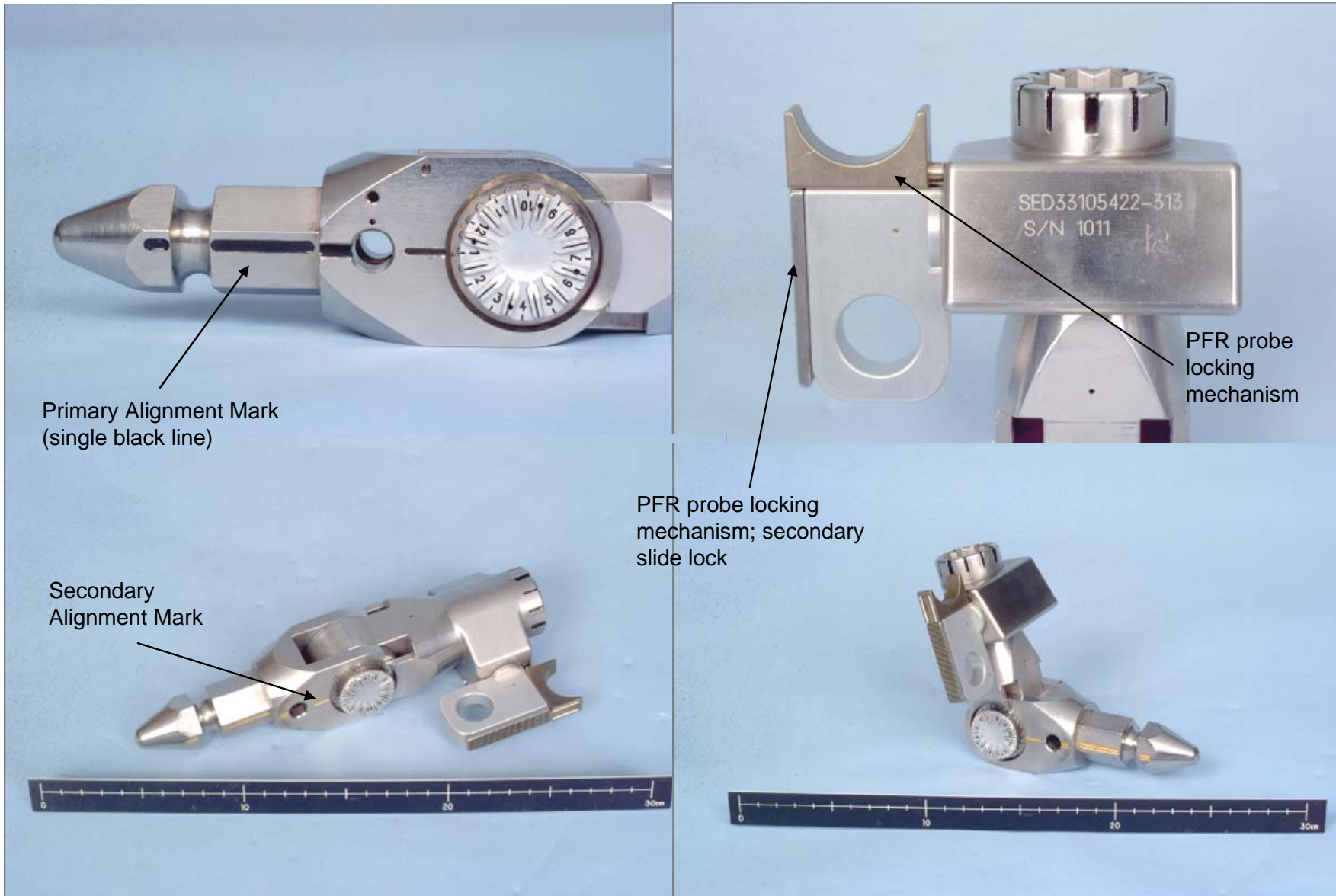


BOOT PLATE @ 0; STANCHION @ 135R

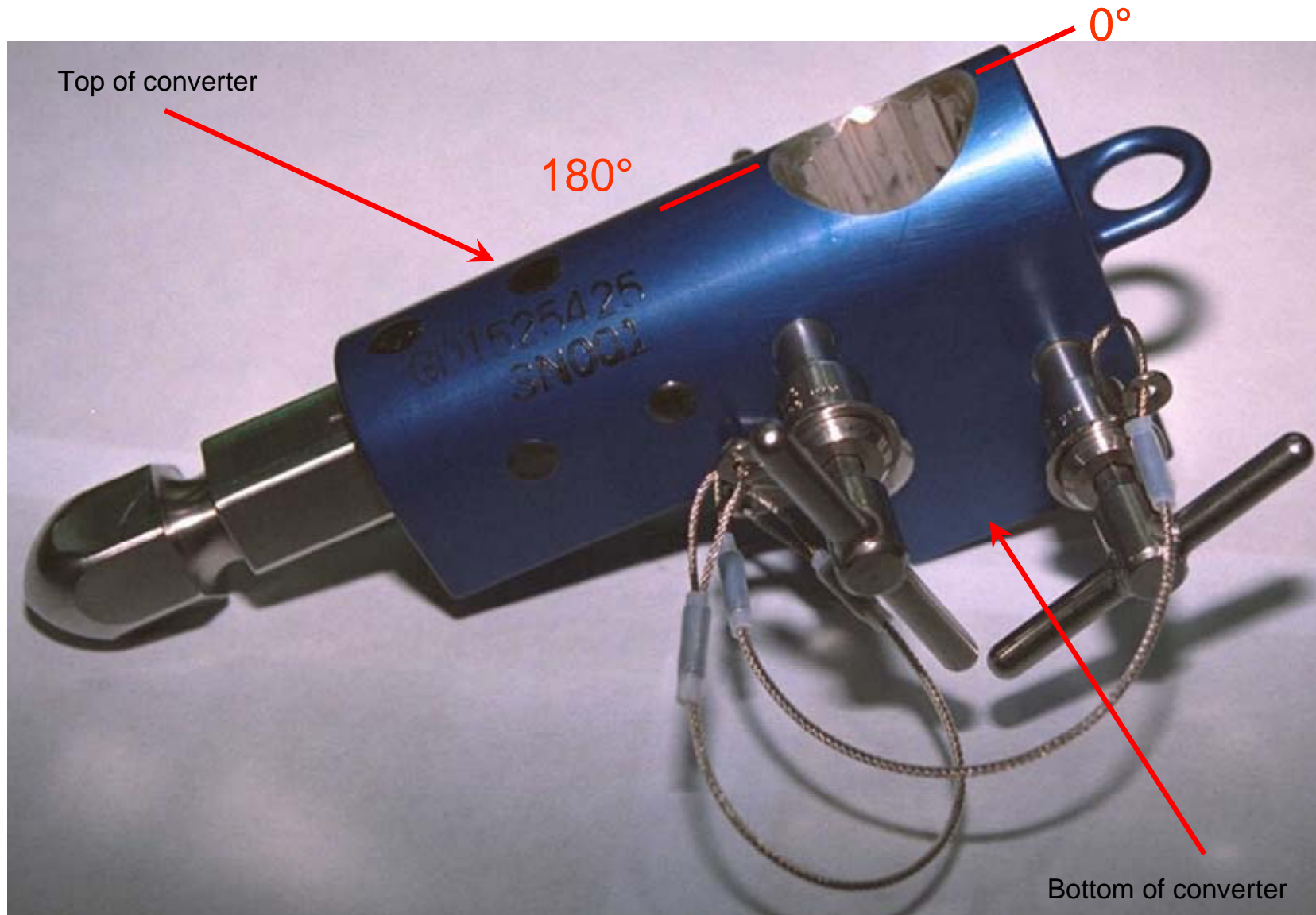
# PFR EXTENDER



# ARTICULATING SOCKET

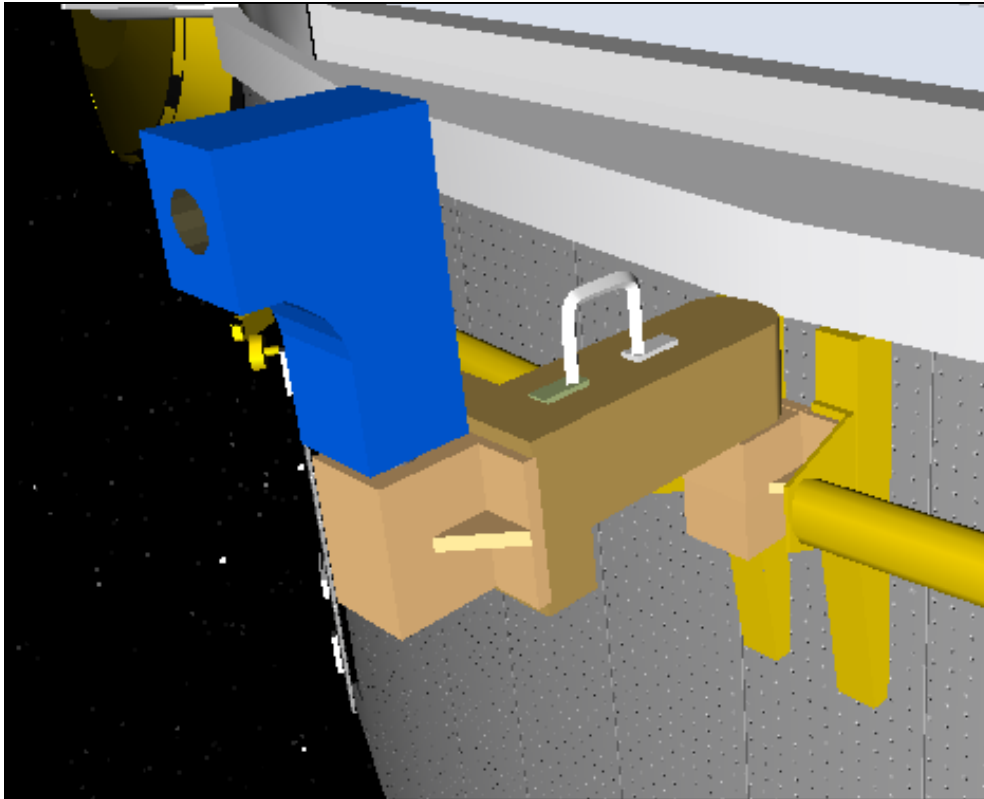


90 DEGREE CONVERTER



## 90 DEGREE CONVERTER WITH PFR EXTENDER CONFIGS

I

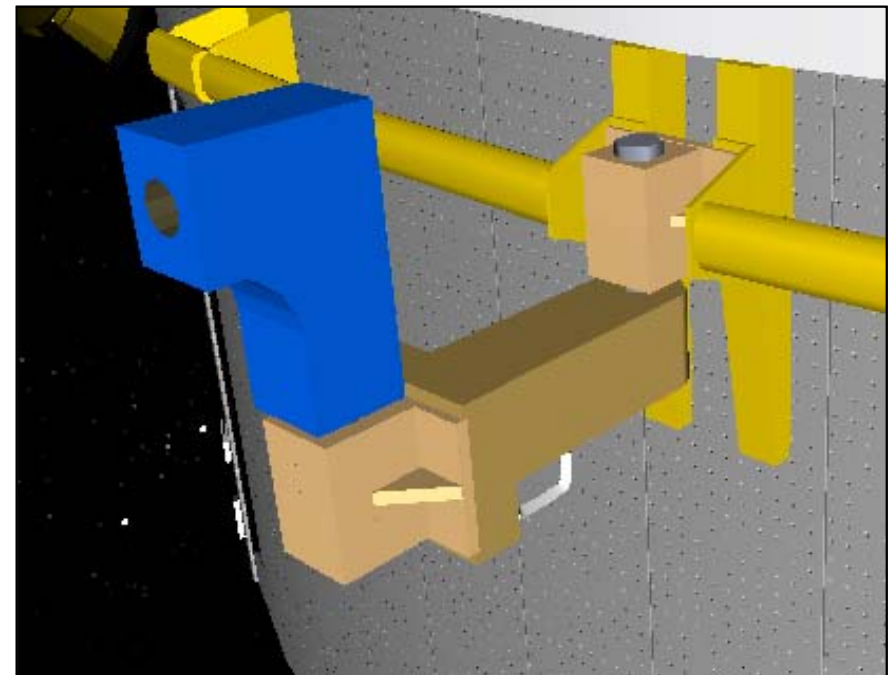


PFR Extender = 0↓

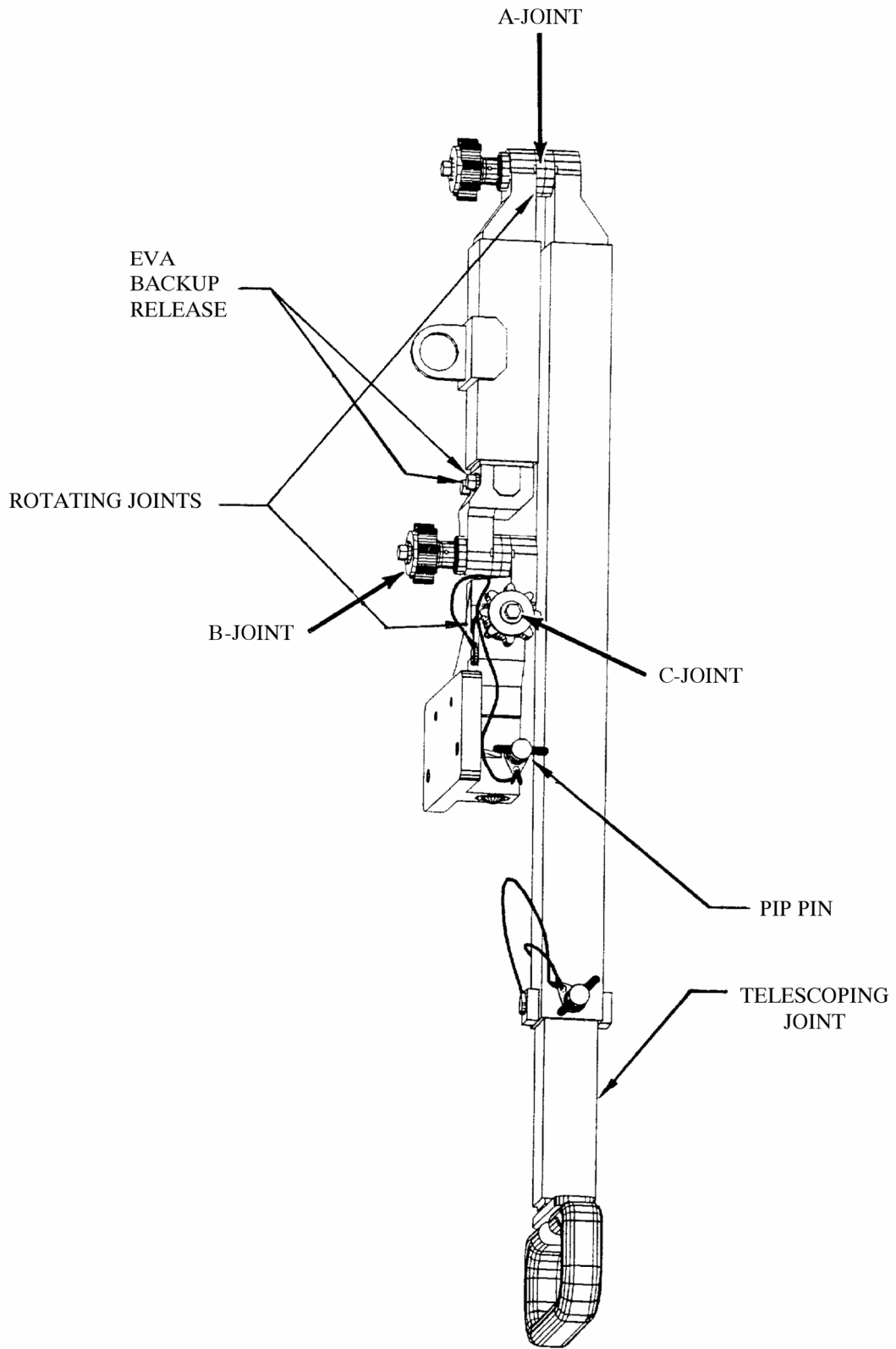
90 Deg Converter = 0↓

PFR Extender = 0↑

90 Deg Converter = 0↑

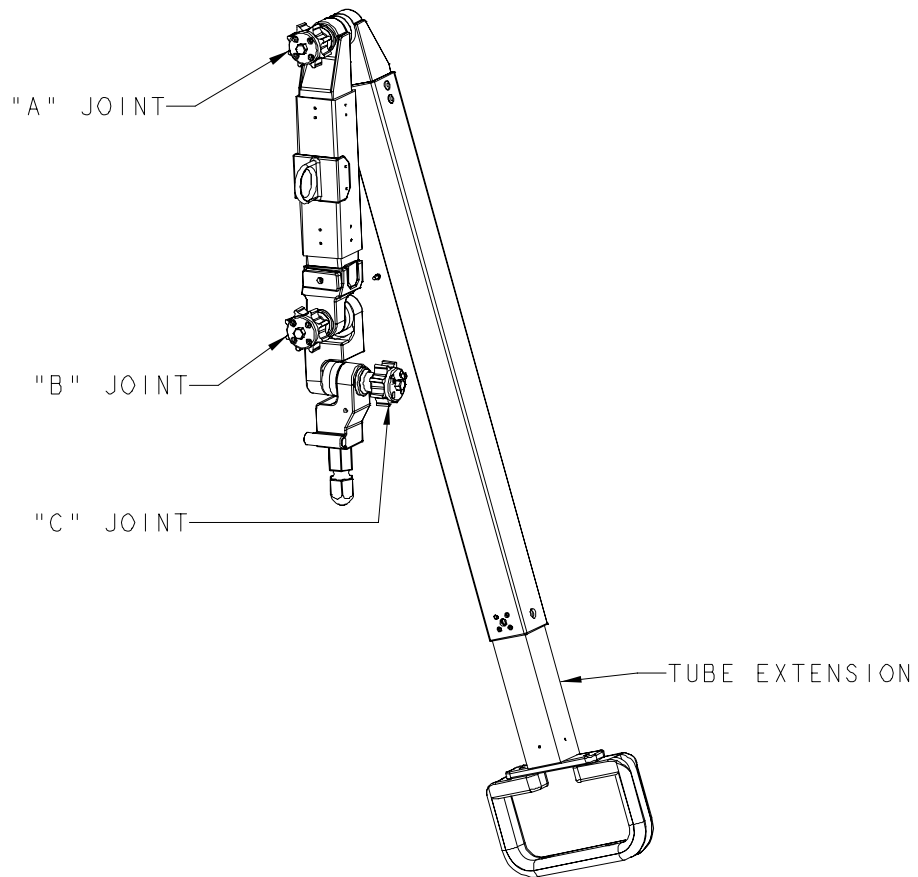
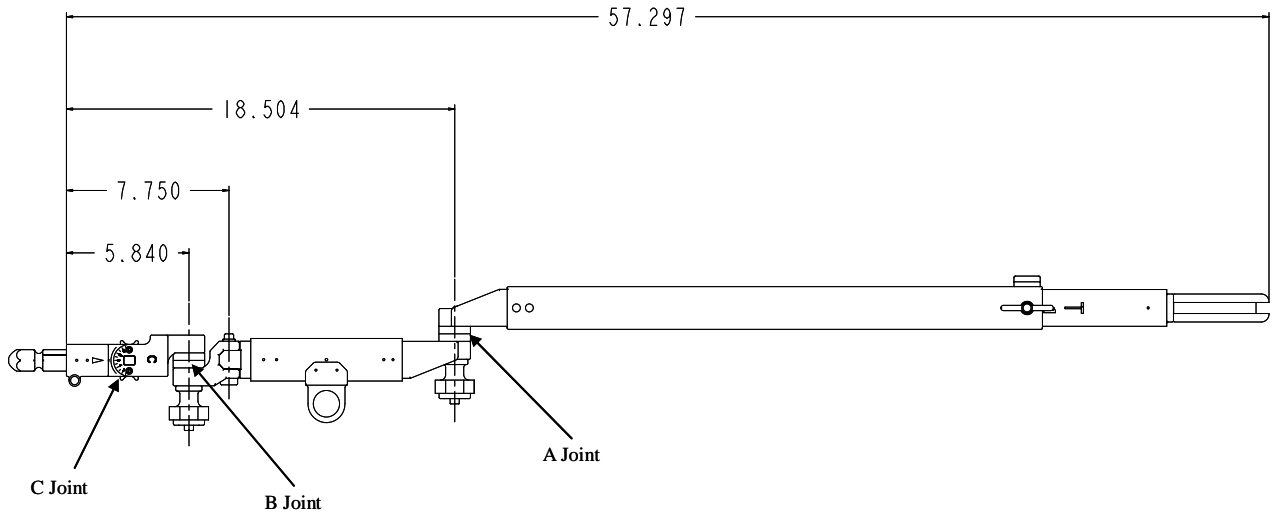


# TRANSLATION AID (TA)

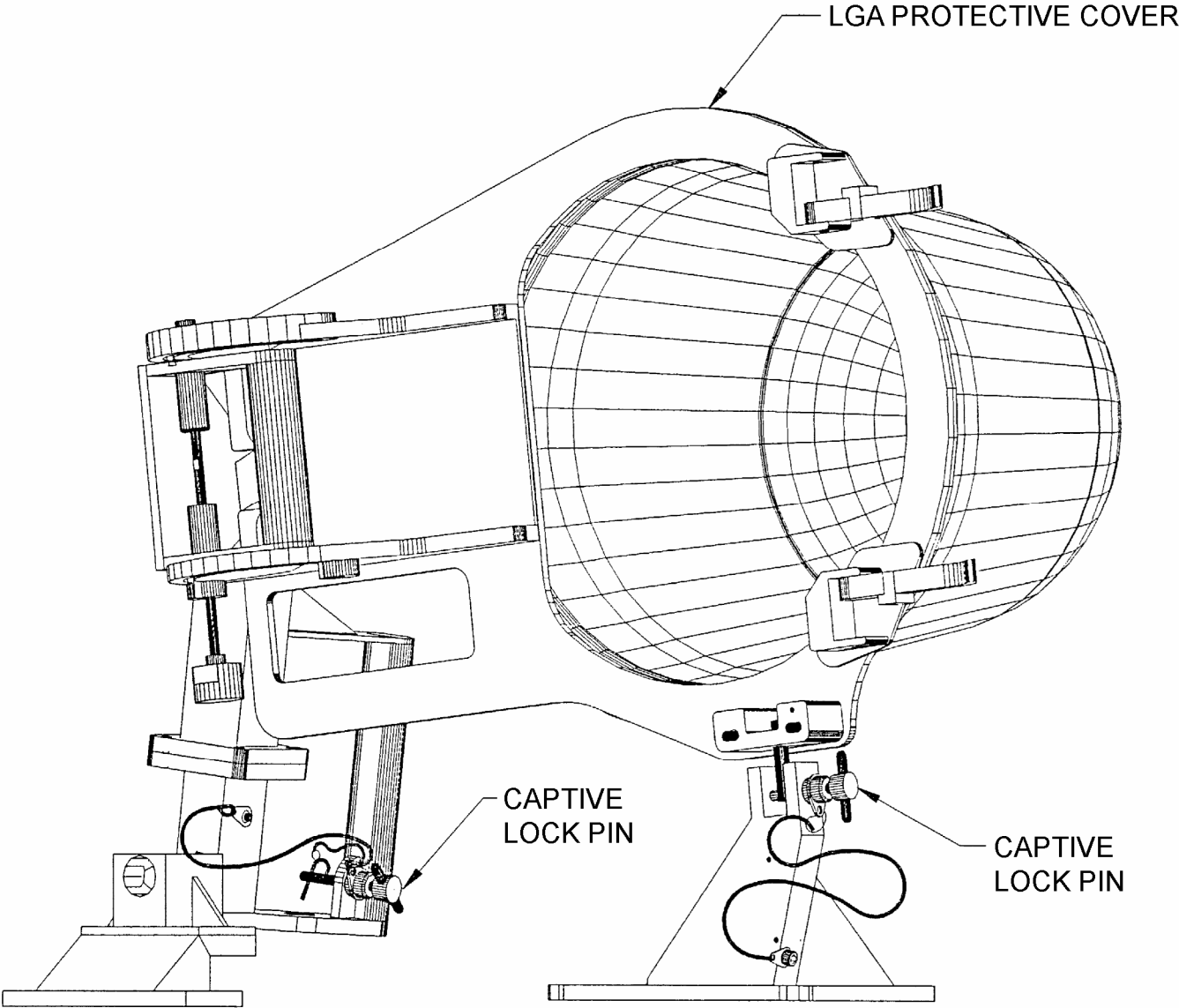




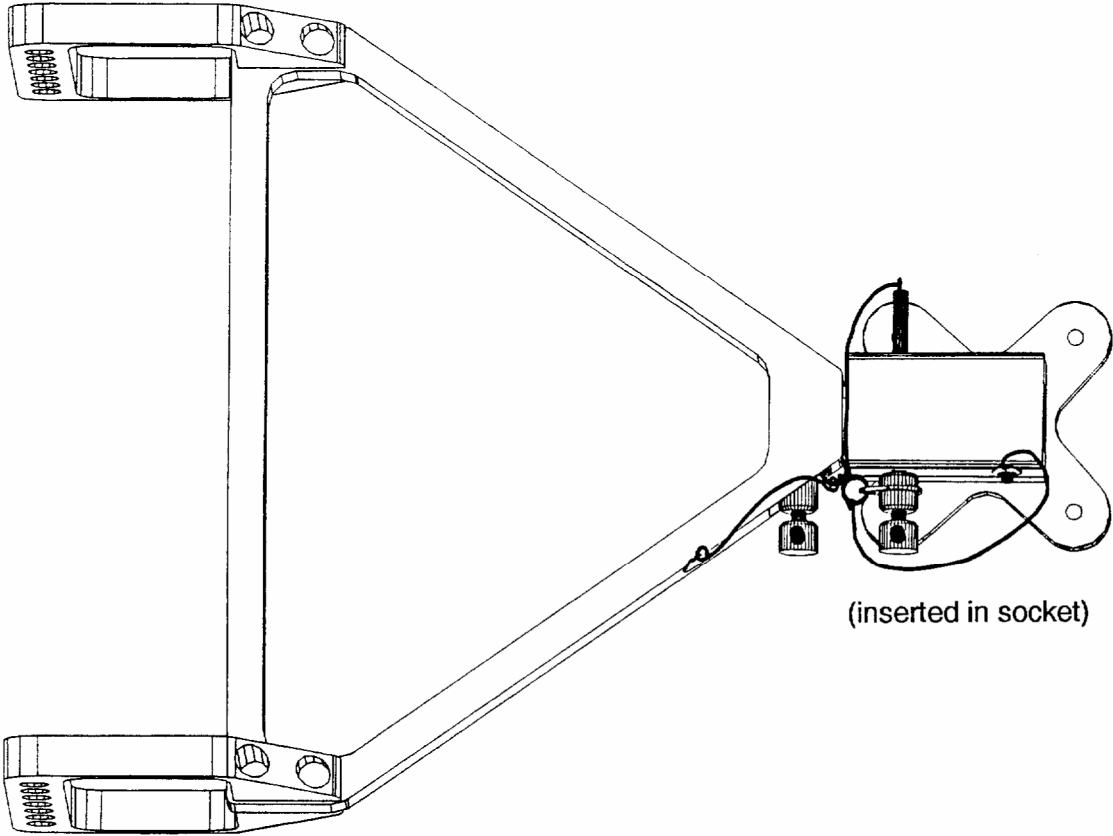
# TRANSLATION AID (TA) (Cont)



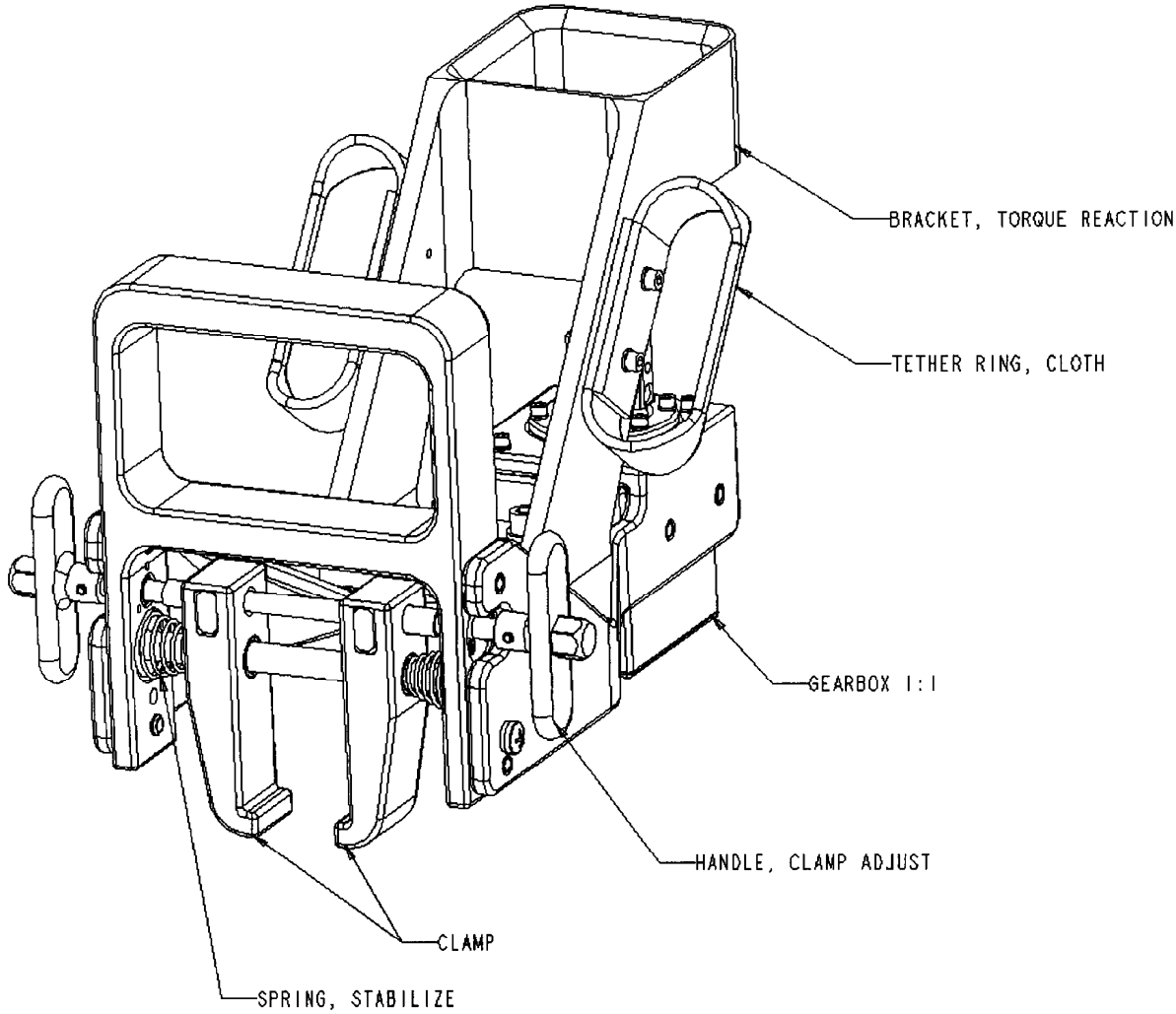
LGA PROTECTIVE COVER



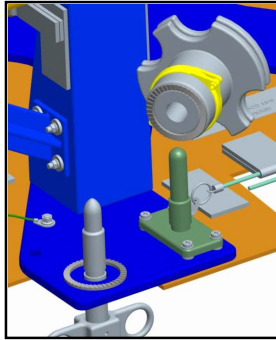
JETTISON HANDLE



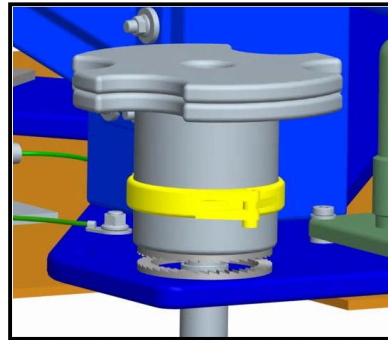
**RIGHT ANGLE GEAR BOX**



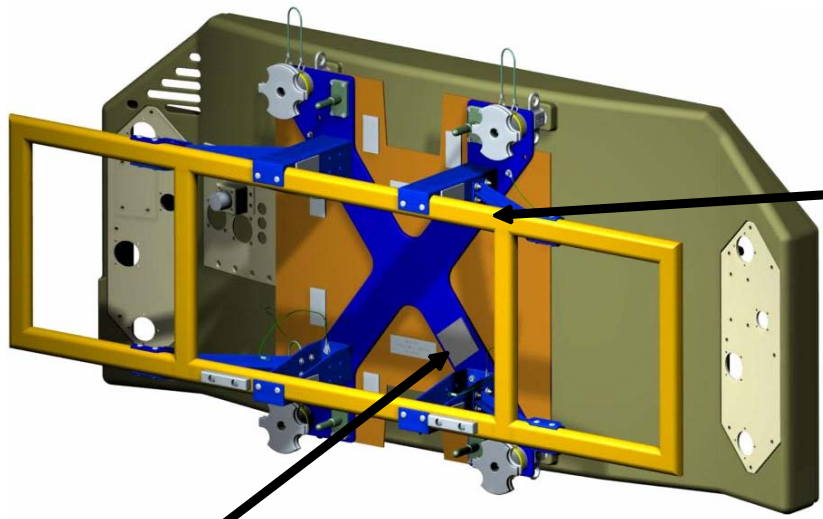
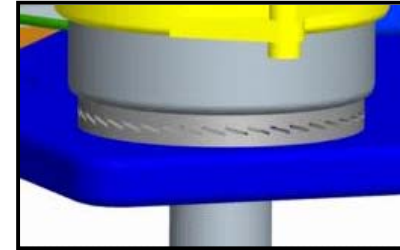
# FGS HANDHOLD



Zip Nut being installed; notice ratchet rings

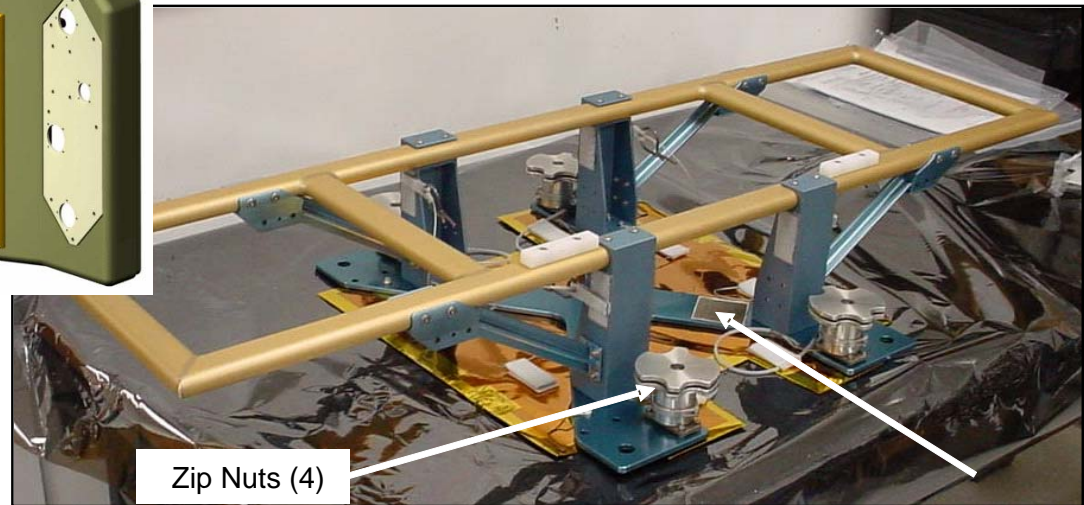


ZIP NUT DETAILS



FGS Handhold Mounted to FGS Dome

Conductive Velcro



Zip Nuts (4)

**MPT OVERVIEW**

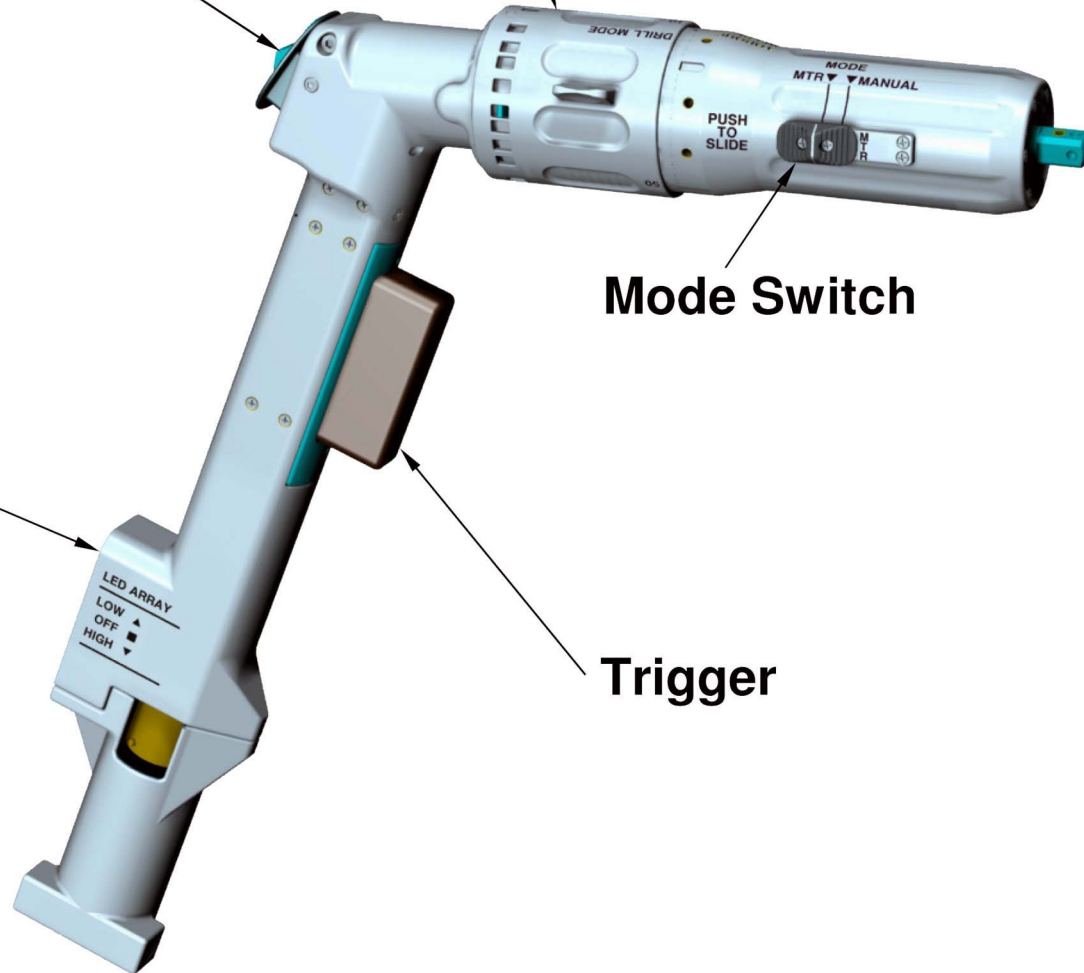
**Thumb Release**

**Torque Adjusting Collar**

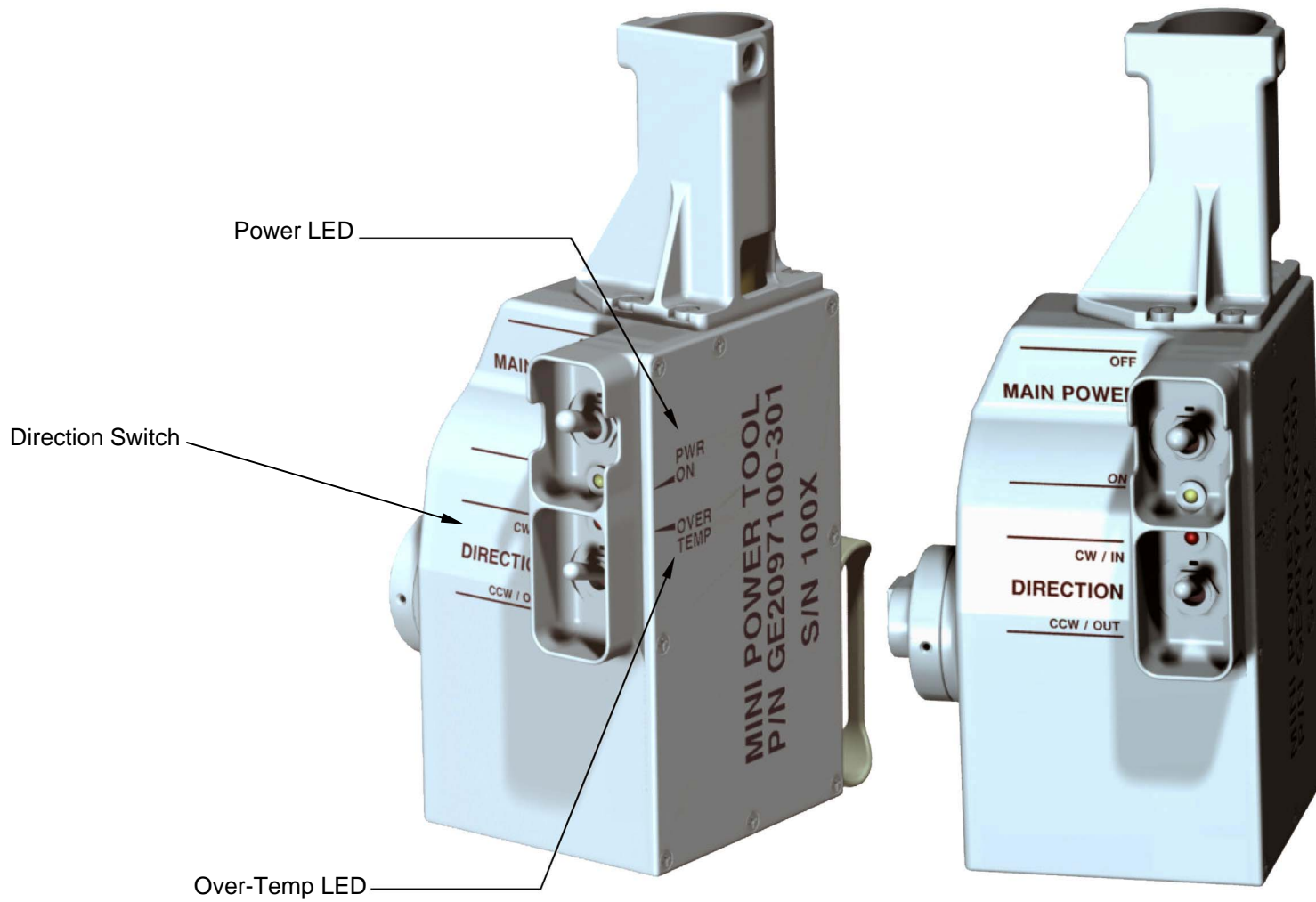
**Mode Switch**

**LED Array**

**Trigger**



# MPT – BATTERY HOUSING MODULE



MPT – LED ARRAY

**LED Array Labels**



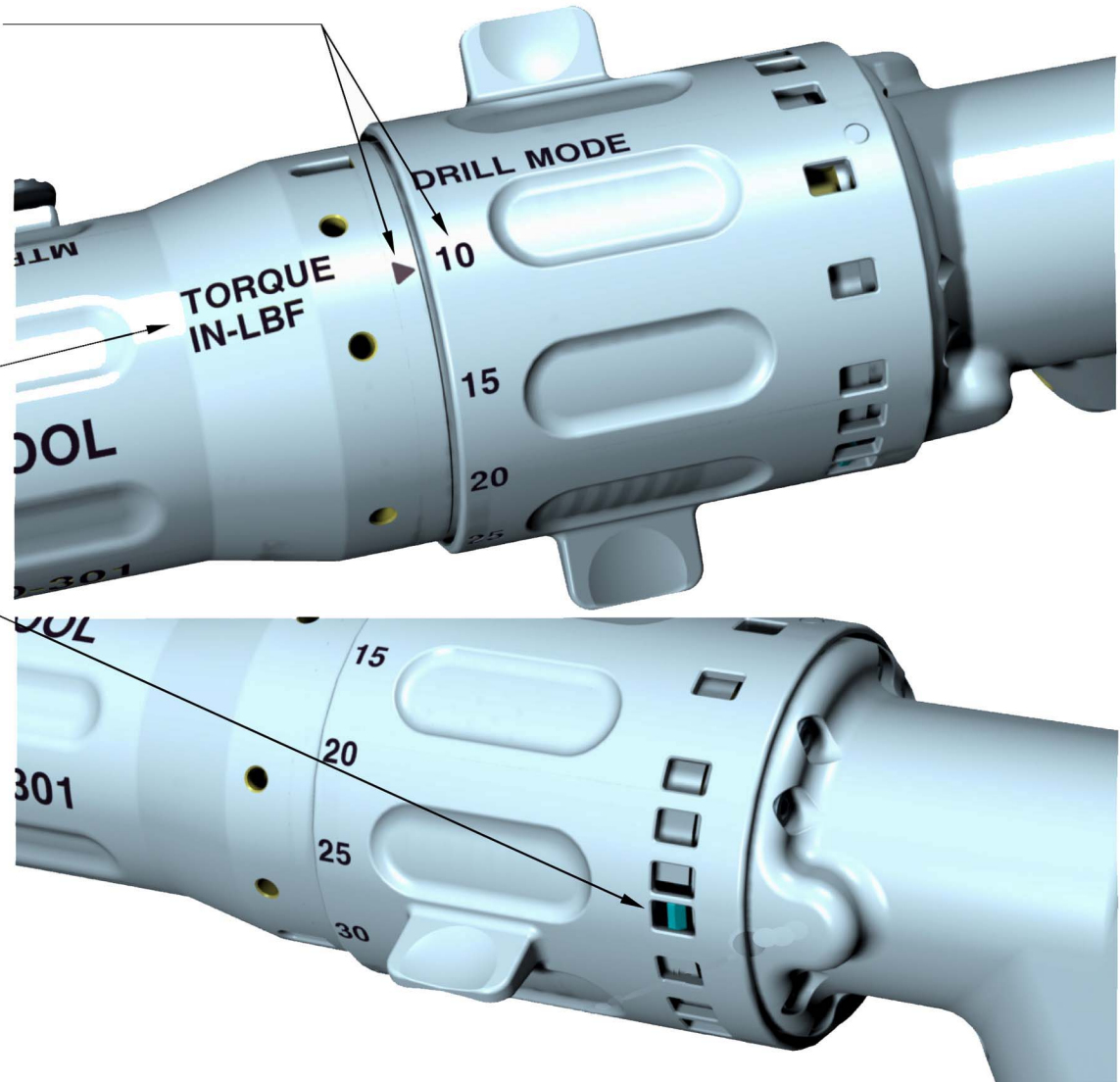


**MPT – TORQUE ADJUSTING COLLAR**

**Torque Alignment Marks**

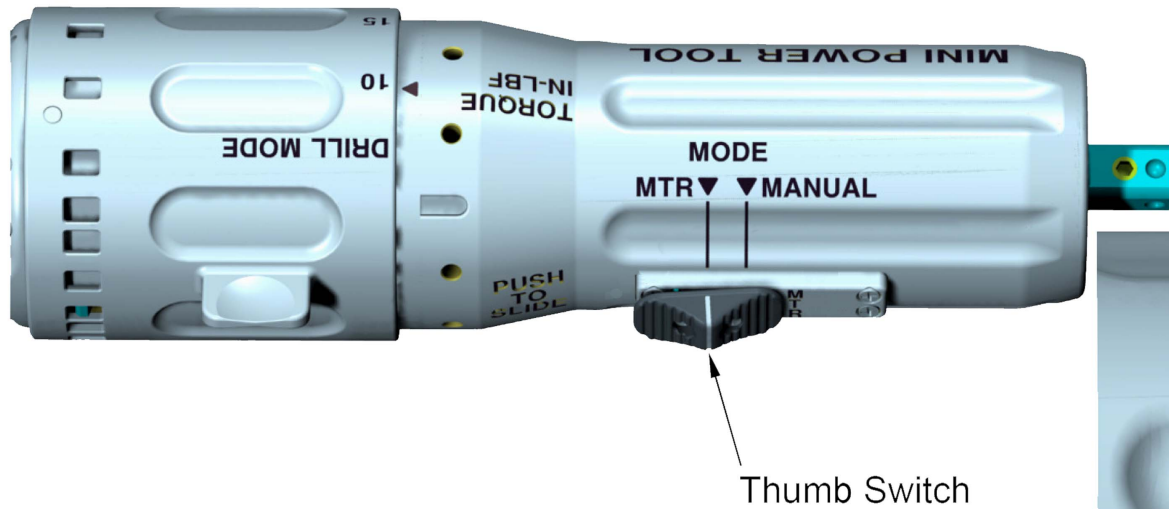
**Torque Label**

**Collar Lock Pawls**

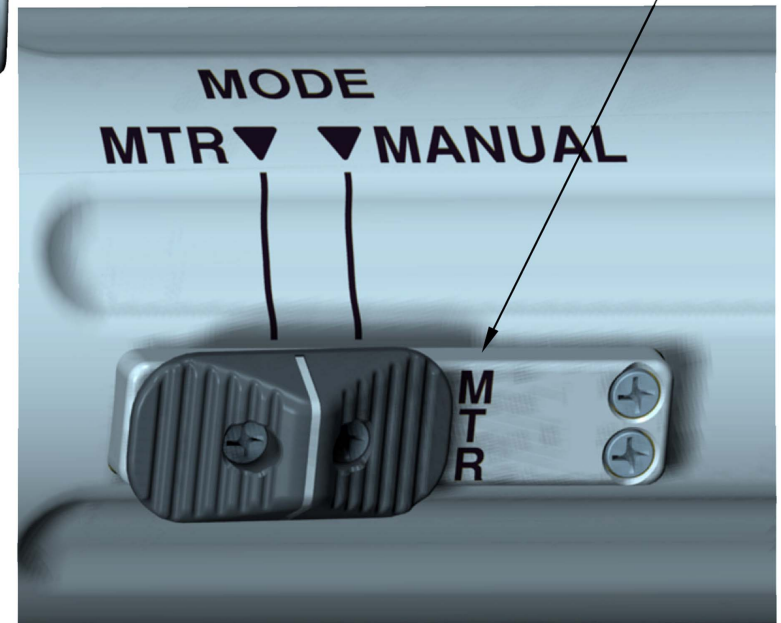


## MPT – MODE SWITCH

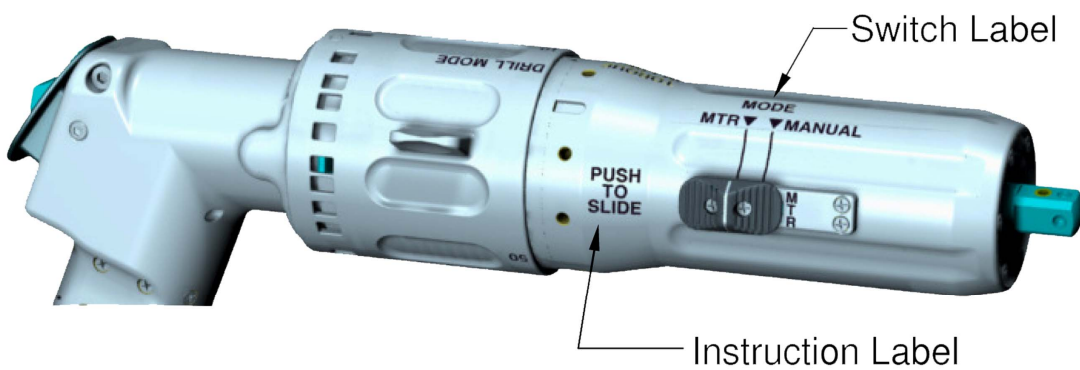
### Mode Switch Alignment Marks



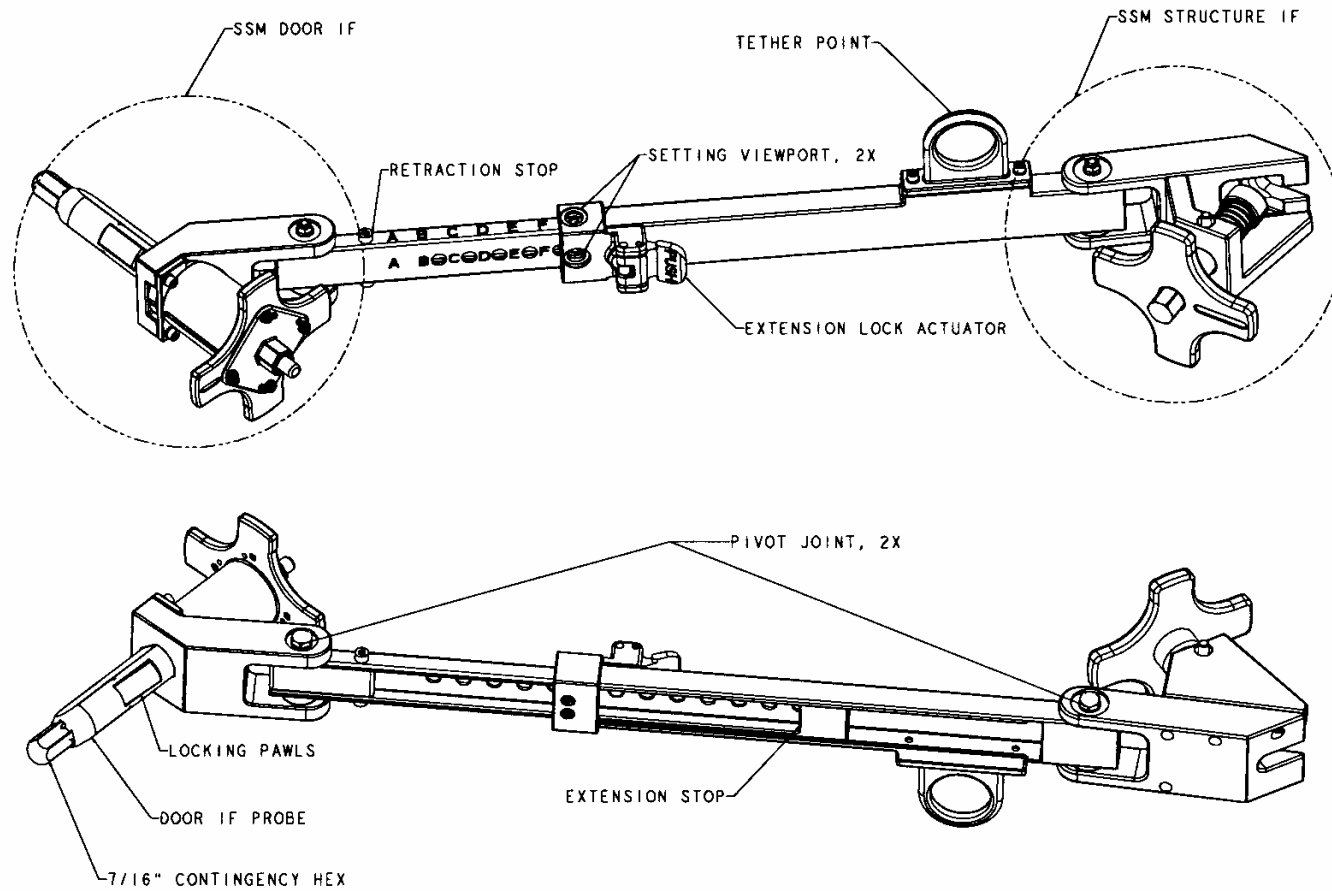
Additional label visible only in Motorized Mode confirms status



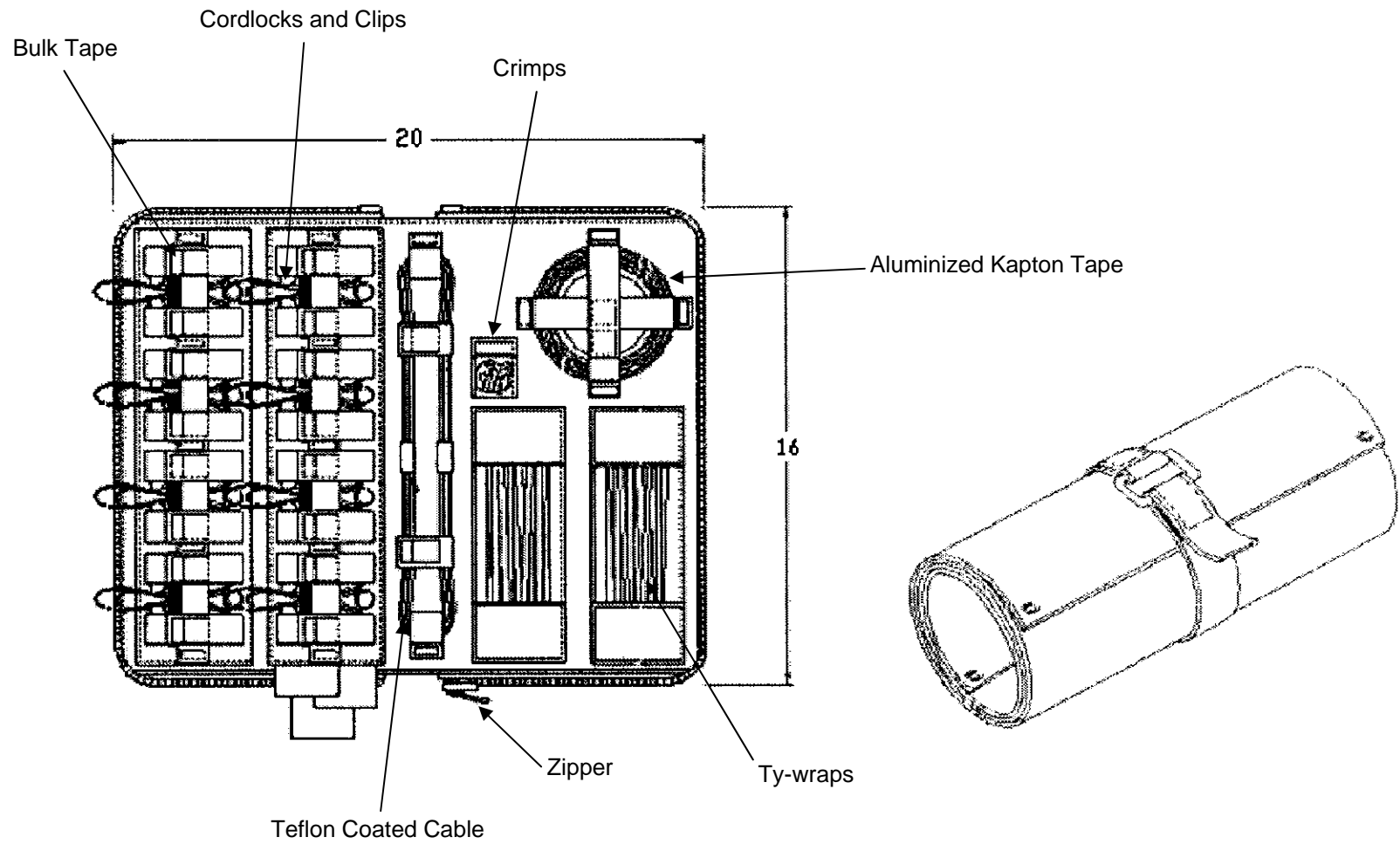
### Mode Switch Labels



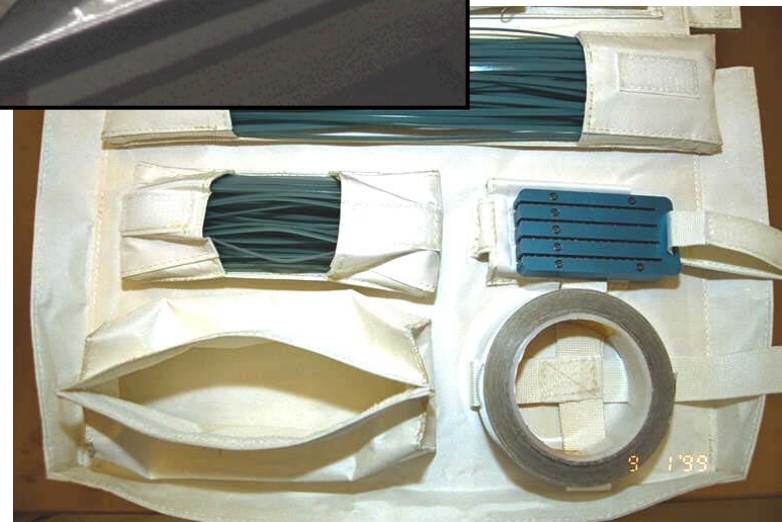
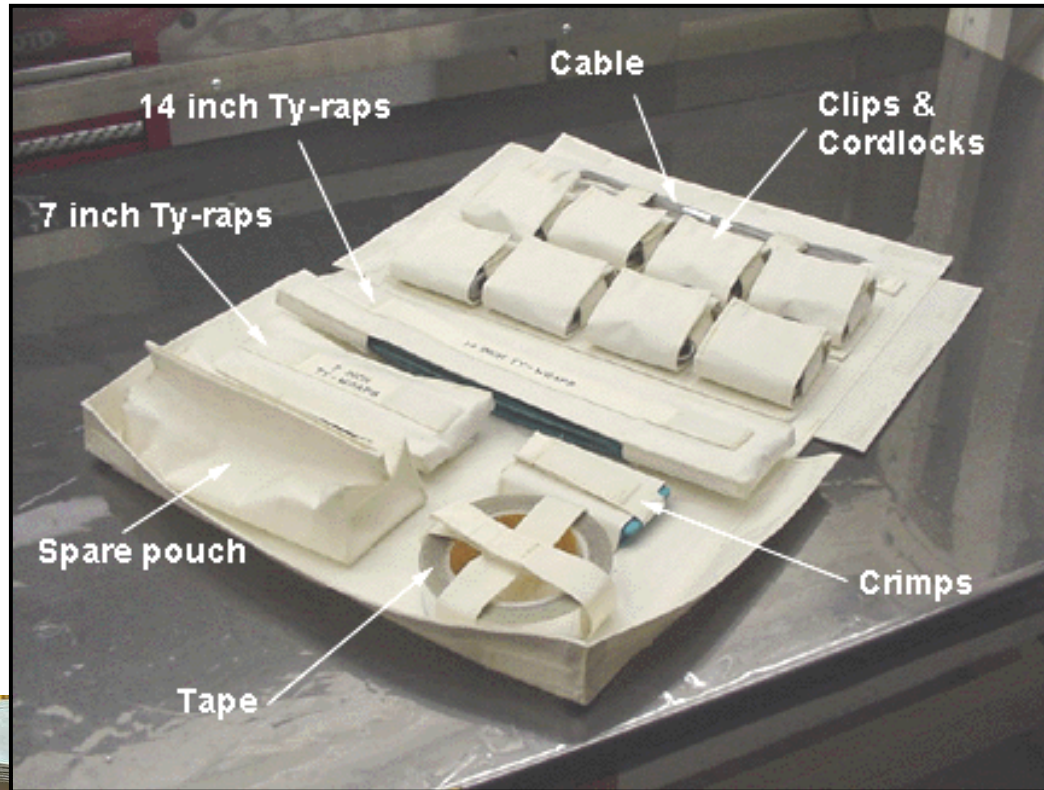
# MANUAL DOOR STAY



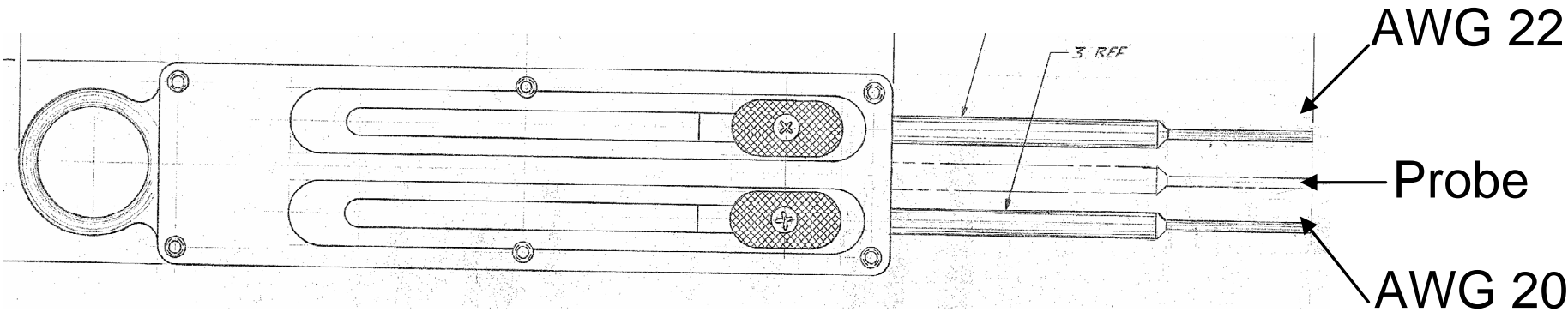
# MIDDECK CONTINGENCY KIT



MIDDECK CONTINGENCY KIT (Cont)

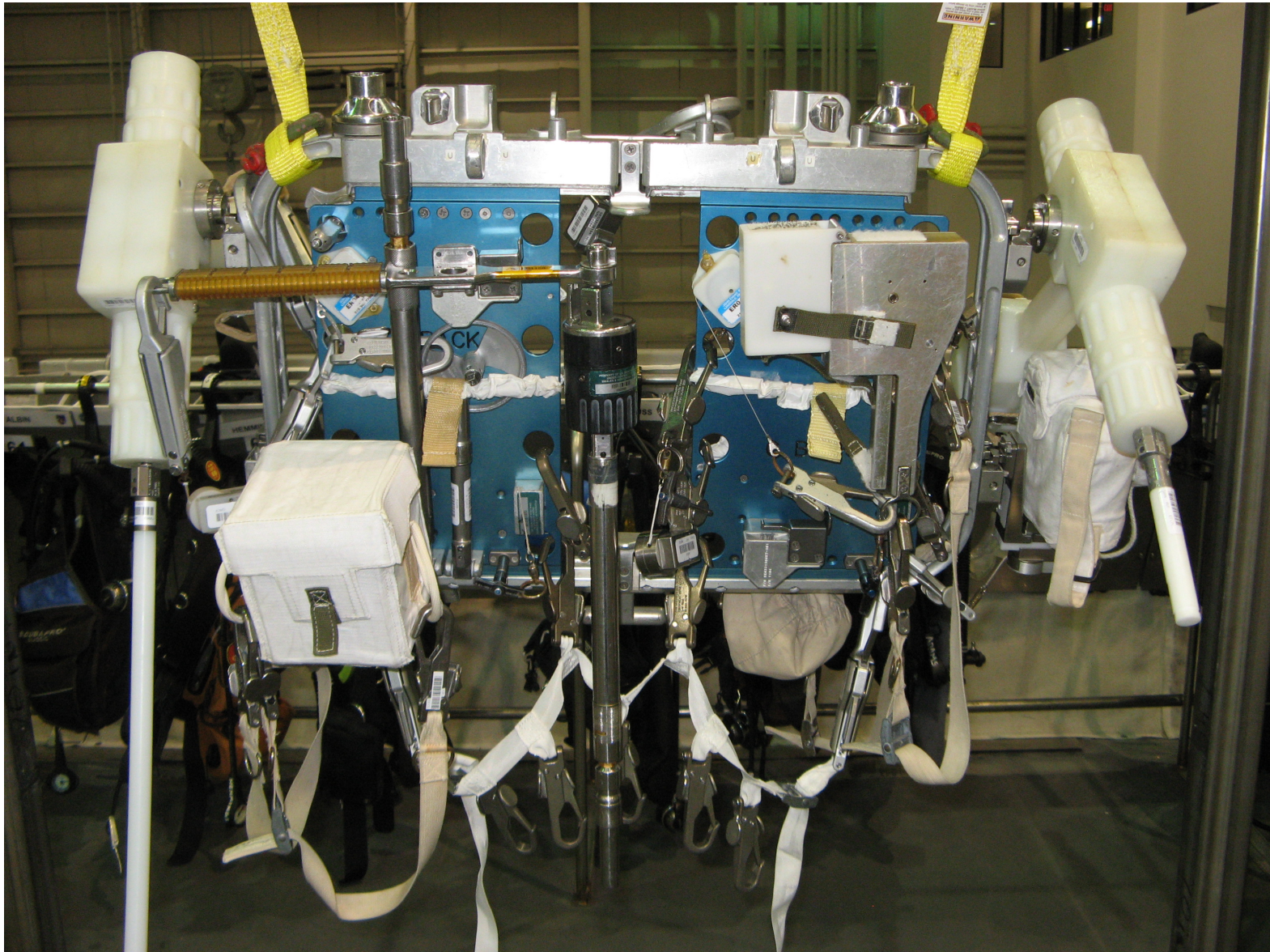


**PIN STRAIGHTENER**



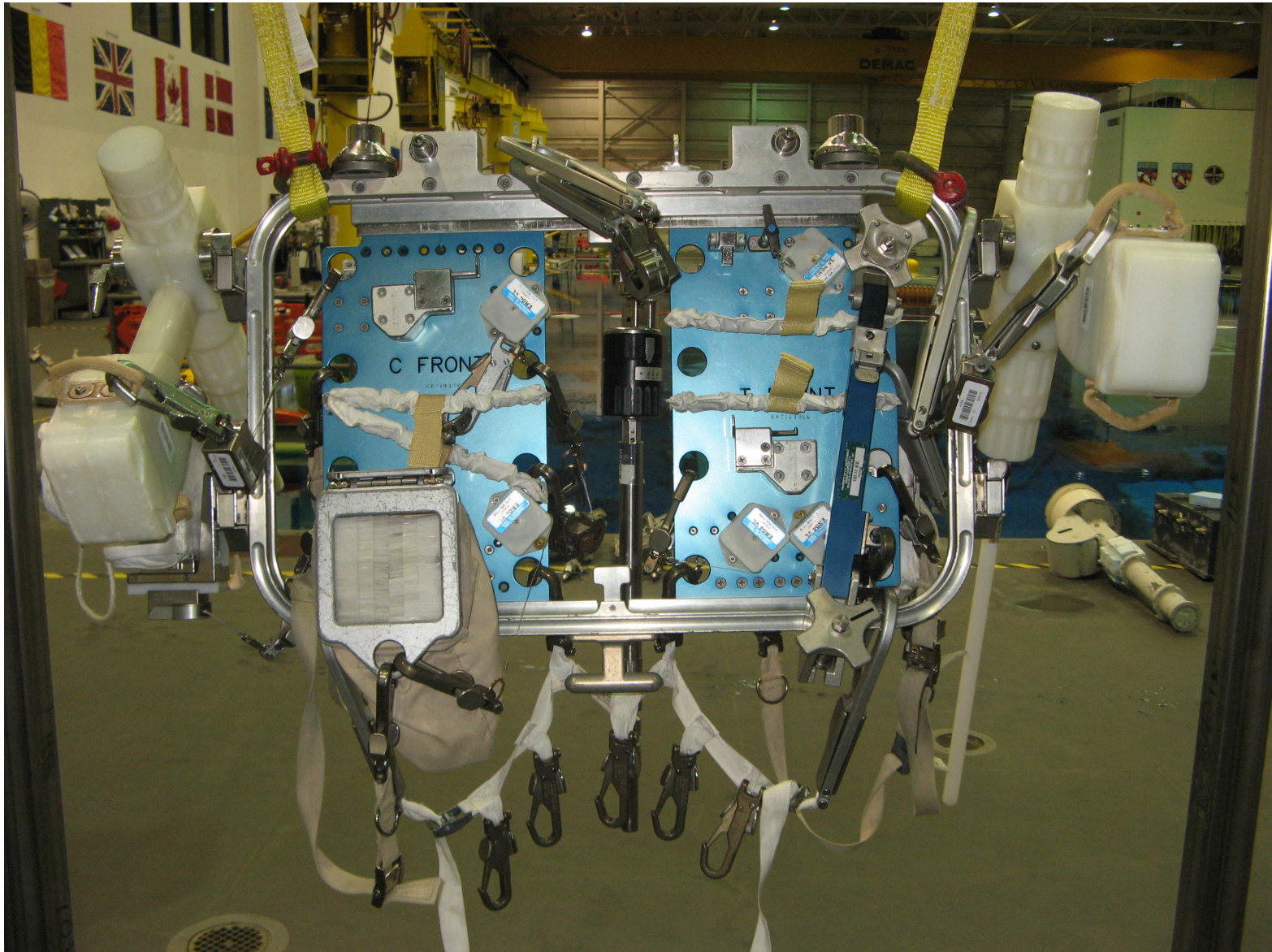
EVA 1 MFR HANDLE 'BACK'

I



EVA 1 MFR HANDLE 'FRONT'

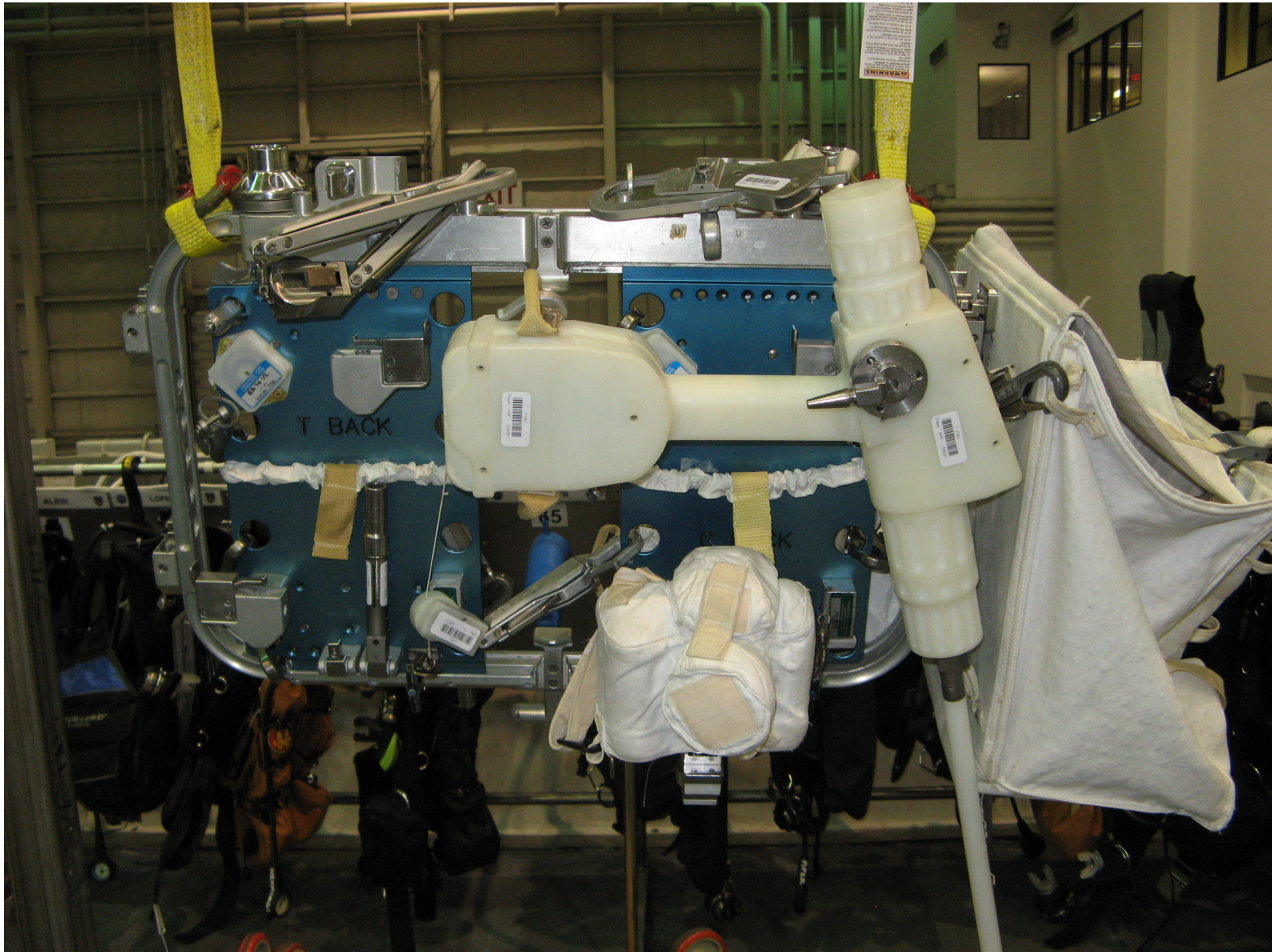
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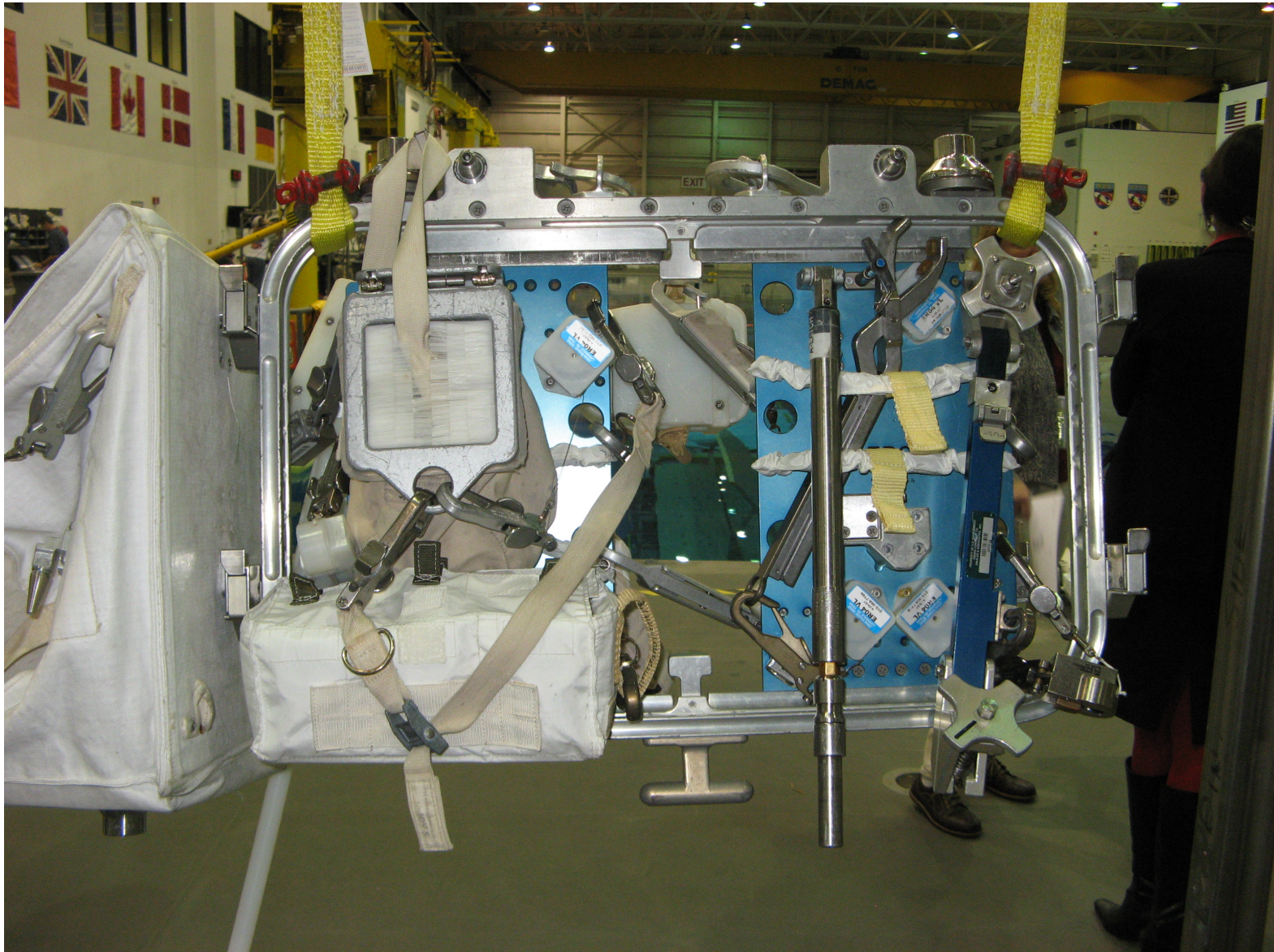
EVA 2 MFR HANDLE 'BACK'

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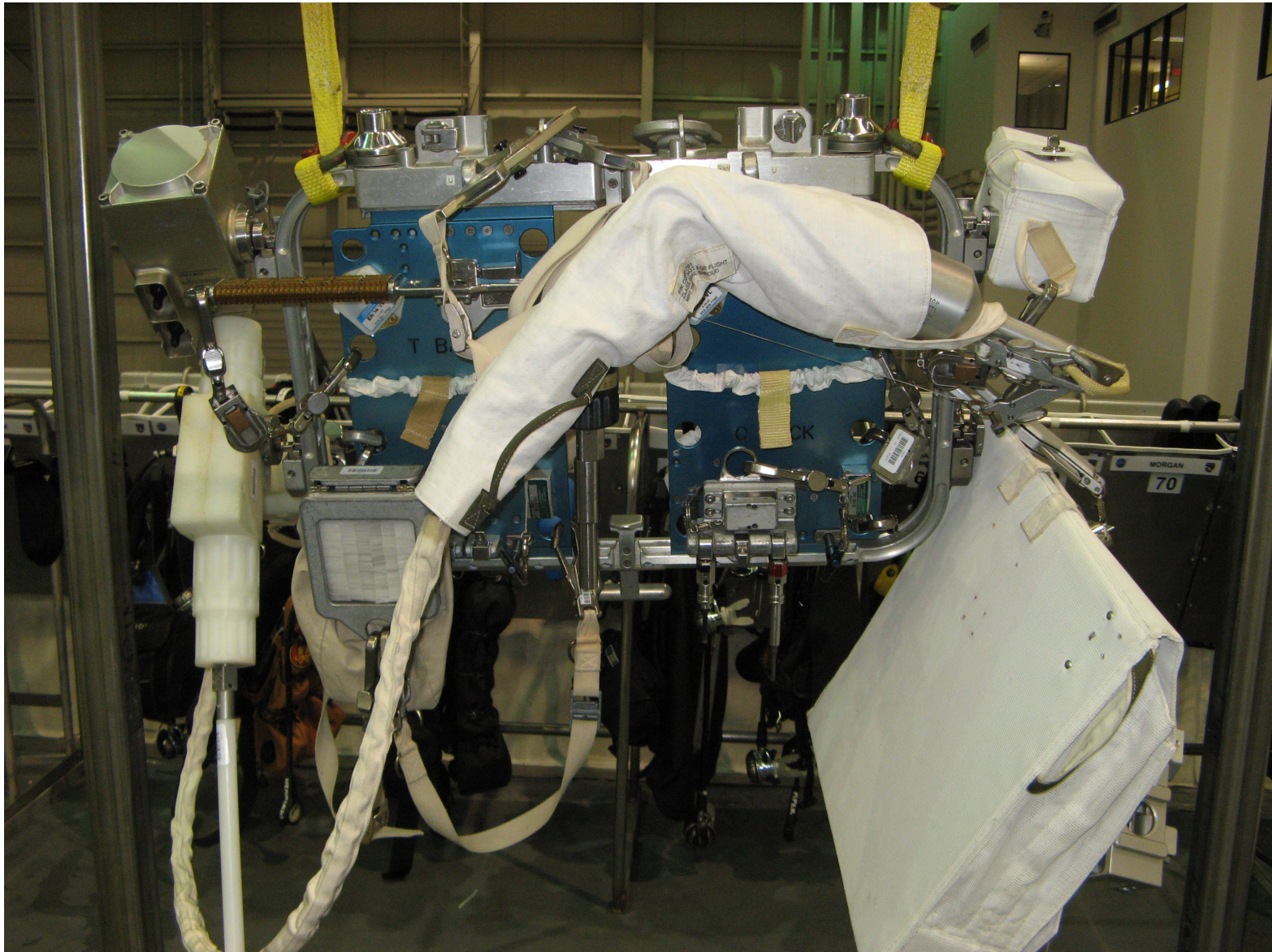
EVA 2 MFR HANDLE 'FRONT'

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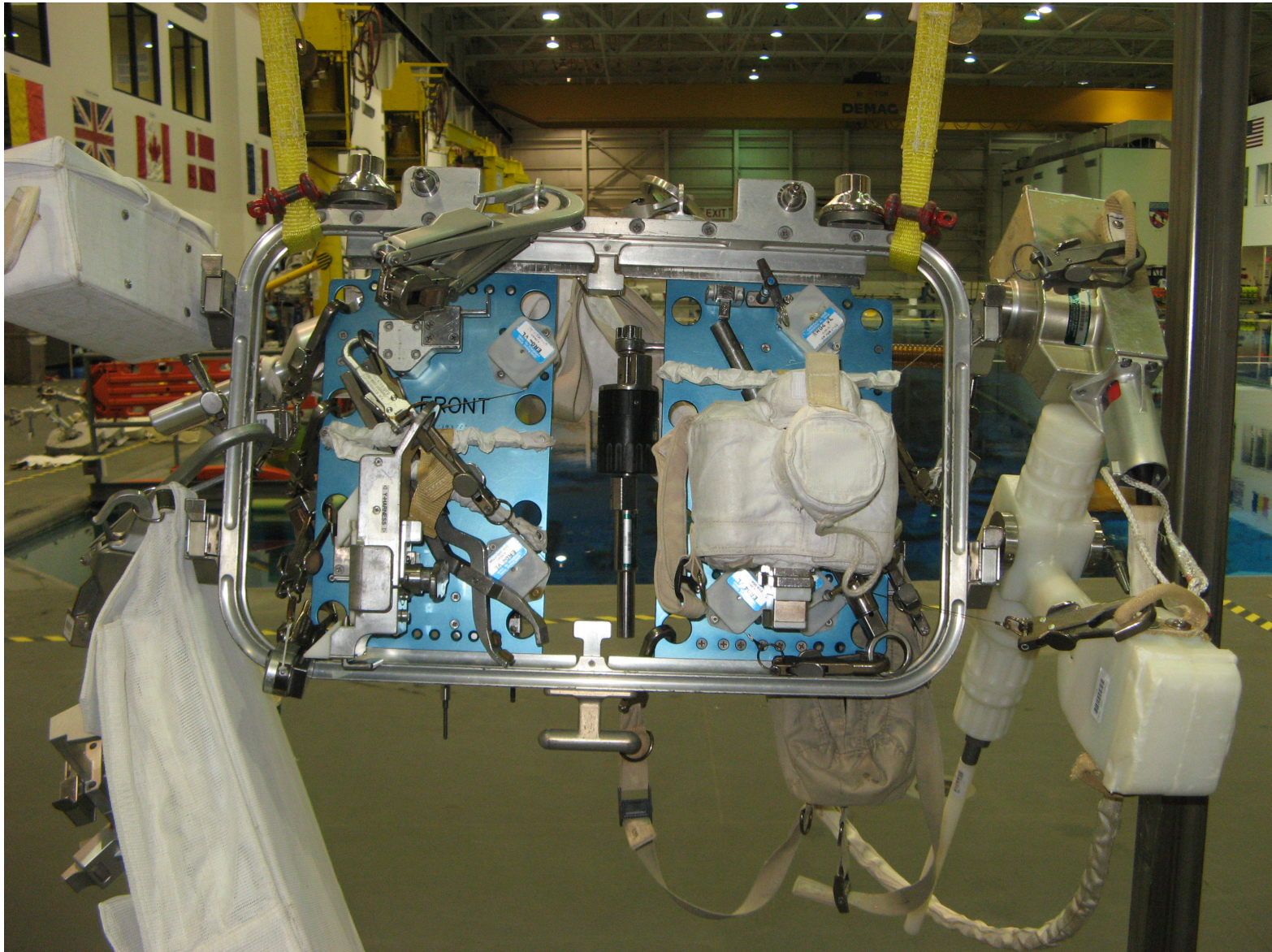


EVA 3 MFR HANDLE 'BACK'

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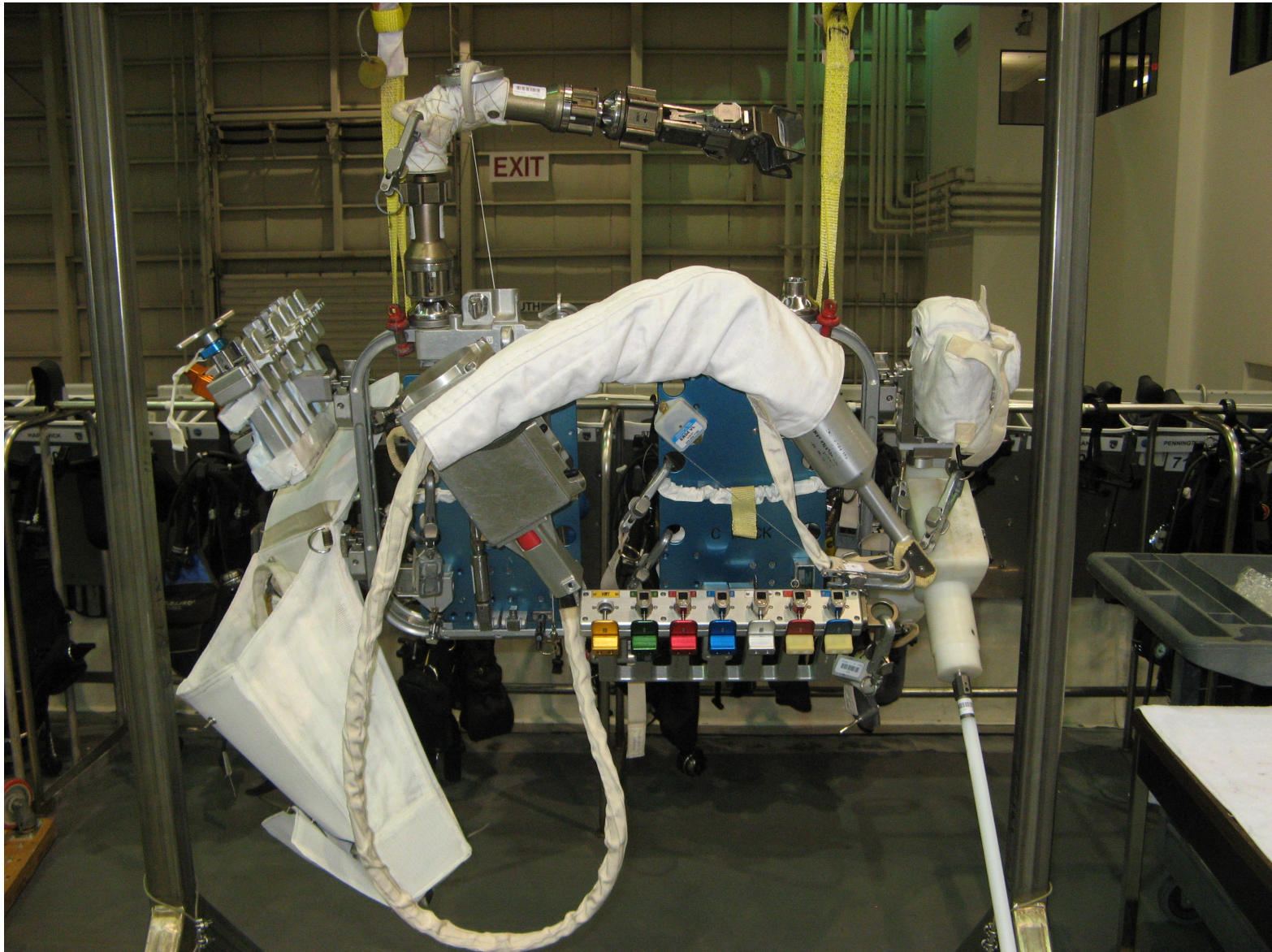


EVA 3 MFR HANDLE 'FRONT'



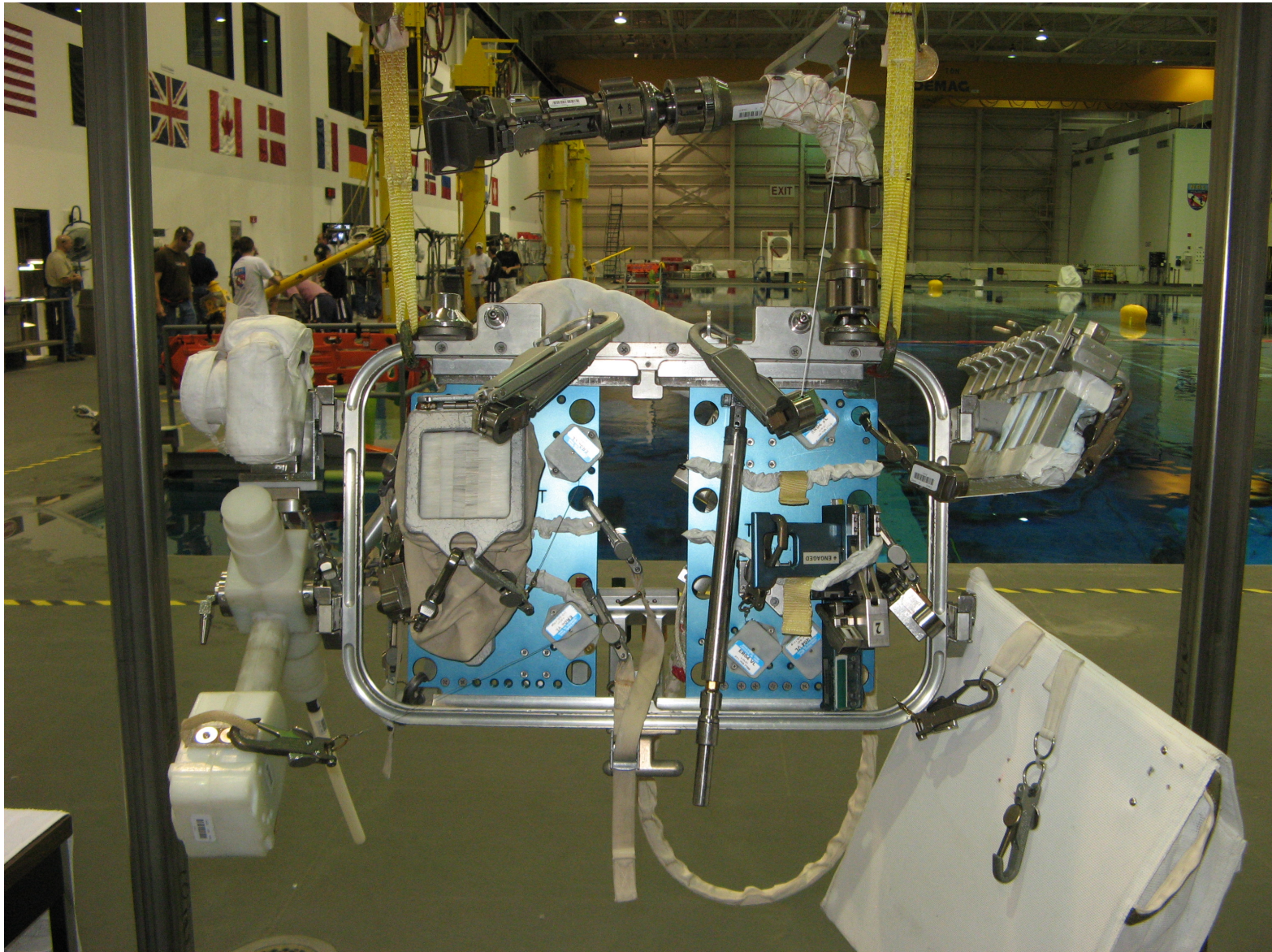
EVA 4 MFR HANDLE 'BACK'

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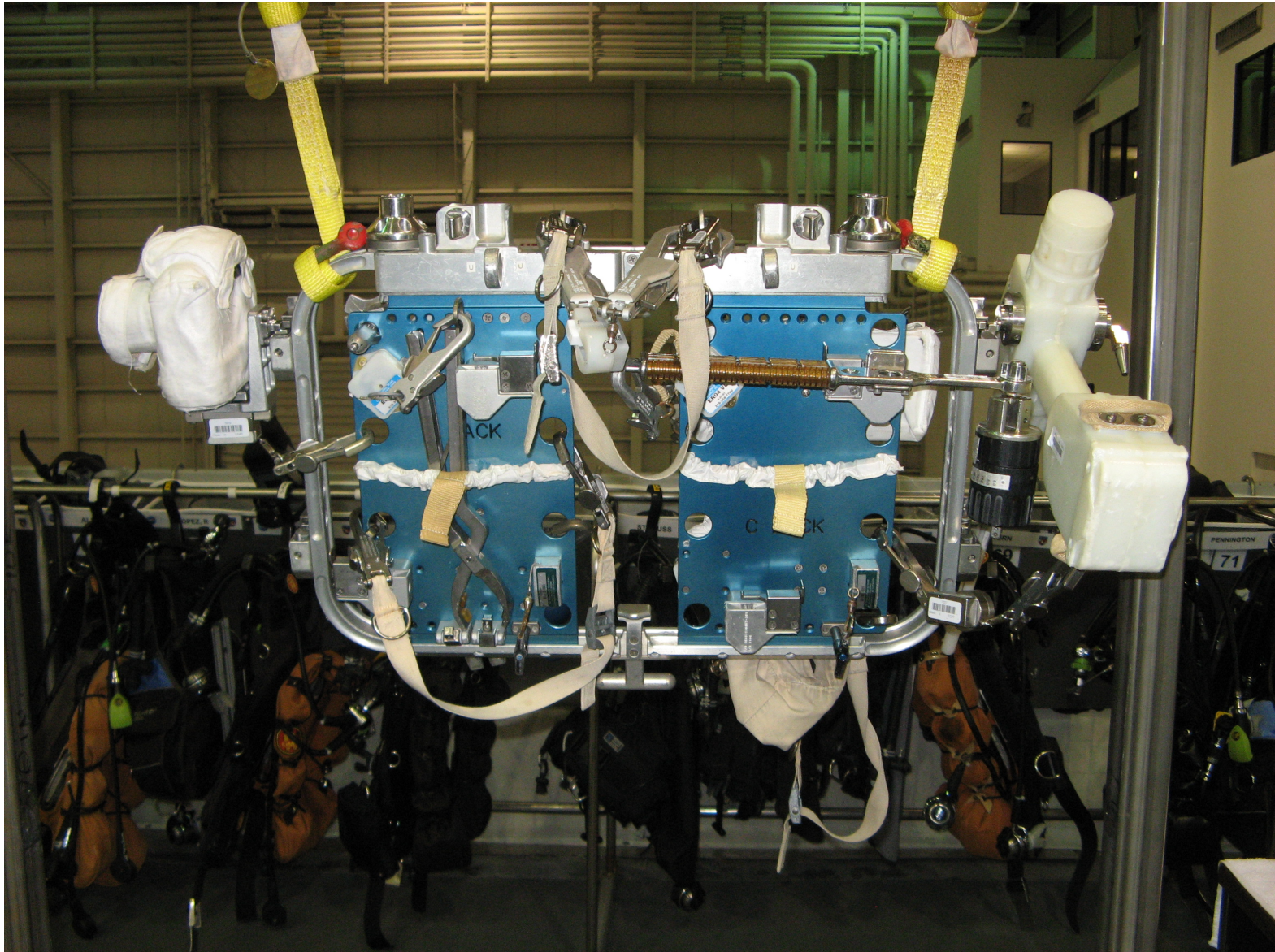
EVA 4 MFR HANDLE 'FRONT'

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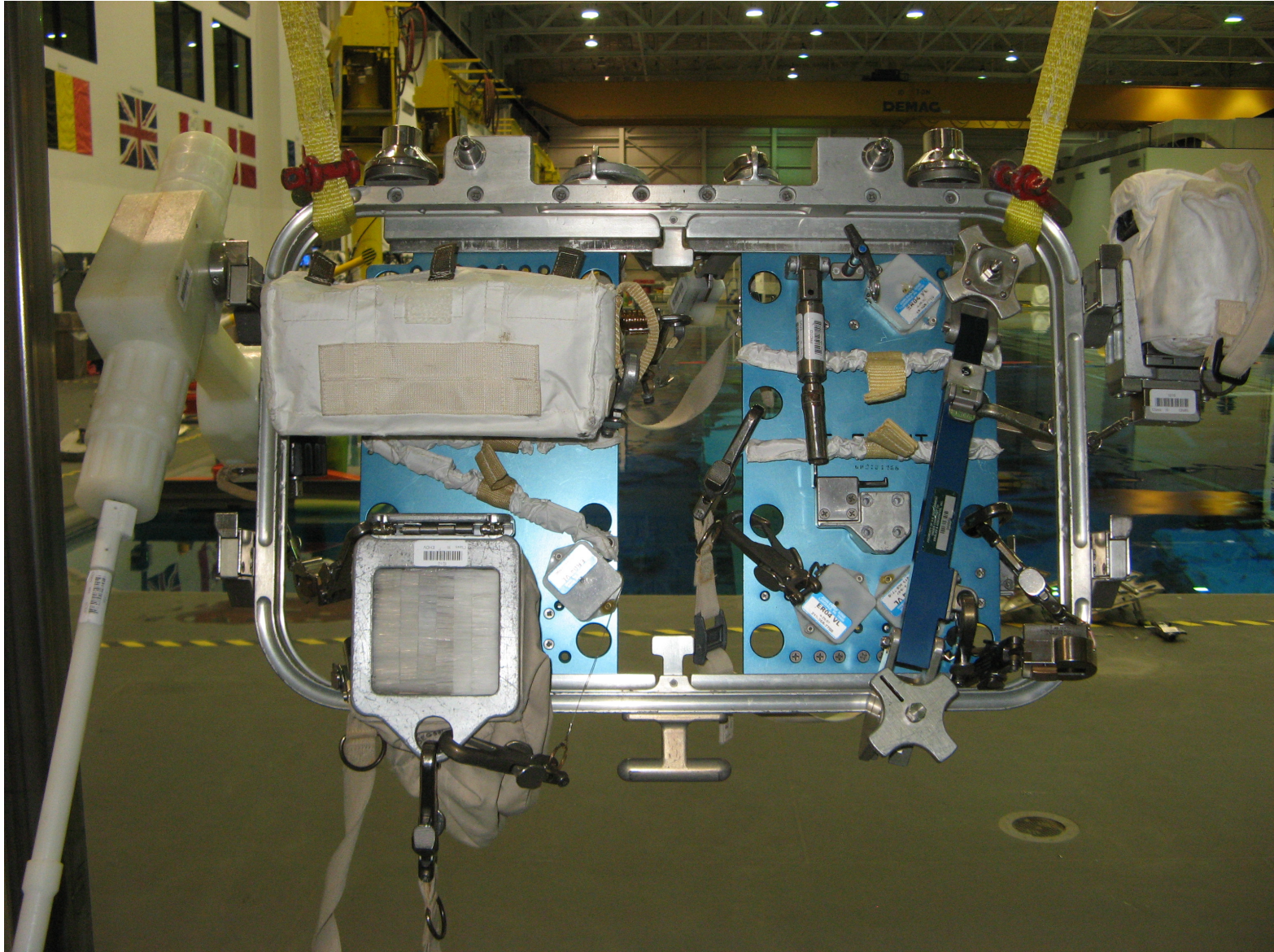
EVA 5 MFR HANDLE 'BACK'

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EVA 5 MFR HANDLE 'FRONT'

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LON AIRLOCK PREP ..... FS 22-5  
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LON RESCUE EVA 2 TOOL CONFIG ..... FS 22-85  
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TOP

**HOOK  
VELCRO**

**STS-400 EVA CONSUMABLES CUE CARD**

EV1: GF	EV3: MS	CDR: AT	RMS: MH	HST
EV2: FT	EV4: G	PLT: JC		LON

		EMU	LiOH (s/n)	EMU Battery (s/n)	HL Battery (s/n)	REBA (s/n)
EVA 1	GF	3008	2021	2070	1003, 1009	--
	FT	3004	2026	2082	1012, 1013	--
	MS	3015	2023	2080	--	--
	MH	3017	2031	2081	--	1012
	For AT	3003	2014	2078	1001, 1008	--
Post EVA 1 Part 1	For JC	3017	METOX 0004	2081	--	1012
EVA 2	MS	3015	2023	2080	1001, 1008	--
	JC	3017	METOX 0004	2081	--	1012
	AT	3003	2014	2078	--	--
	GF	3008	METOX 0018	2079	1003, 1009	--
	For G	3004	2026	2082	1012, 1013	--
EVA 3	MS	3015	2024	2080	1001, 1008	--
	G	3004	2028	2065	1012, 1013	--
	AT	3003	2014	2078	--	1007
	XX	3008	2021	2070	1020, 1027	--
	XX	3017	2031	2081	1003, 1009	1012

EVA-10a/125/O/B

(reduced copy)

TOP  
BACK OF 'STS-400 EVA CONSUMABLES CUE CARD'

**HOOK  
VELCRO**

EVA-10b/125/O/A

(reduced copy)

FS CC 22-4

EVA/125/FIN A

## LON AIRLOCK PREP (50 min)

- Retrieve or unstow following equipment:
- |                    |   |  |
|--------------------|---|--|
| MA16D              | 3/8-in breaker bar, 4-in ext w/3/8-in drive         |  |
| IFM Tool Kit       | 1/2-in socket w/3/8-in drive                        |  |
| Vol H              | EMU Equipment Bag – attach to middeck wall          |  |
|                    | Helmet Light (1) from Vol H OBD bag                 |  |
|                    | Helmet Light batteries (2) from Vol H INBD bag      |  |
|                    | EVA Bag   |  |
| FDF Locker         | Cuff Checklist (1) – stow in EMU Equipment Bag      |  |
|                    | <u>RESCUE EVA DEPRESS/REPRESS</u> Cue Cards (3)     |  |
|                    | <u>DEPRESS/REPRESS</u> Cue Card (1)                 |  |
| MD Ceil Bag Port 1 | WATER Switch Guards (2) – stow in EMU Equipment Bag |  |
- AW18A
1. ✓ Inner hatch Equal vlv (two) – OFF
  2. LTG FLOOD (four) – ON
  3. Remove from airlock, as reqd:
    - Airlock Stowage Bag
    - Airlock Floor Pallet using 3/8-in breaker bar, 4-in ext w/3/8-in drive, and 1/2-in socket w/3/8-in drive
  4. Stow Vol H Bags in Vol H
  5. Remove 20-g Crash Bag from middeck EMU, stow
  6. Remove comm cap from LTA Restraint Bag, temp stow in EMU Equipment Bag
  7. Remove LTA Restraint Bag
  8. Install LiOH per the STS-400 EVA Consumables Cue Card, stow vent port plugs
  9. ✓ EMU Battery installed
  10. Stow LTA Restraint Bag on AAP
  11. Transfer to airlock:
    - EMU 3003 – install on starboard AAP
    - EVA Bag – install on airlock wall
    - RESCUE EVA 1 DEPRESS/REPRESS CUE CARD
    - Helmet Light
  12. Install IVA foot restraint, as reqd
  13. Unbuckle SCU straps, Velcro SCU to wall
  14. Install EMU lights and batteries on helmet
  15. Disconnect helmet from Airlock EMU, temp stow
  16. Connect comm cap from EMU Equipment Bag to electrical harness
  17. Install helmet (not reqd if proceeding directly to EMU Checkout)
  18. Disconnect waist ring; remove and stow any equipment stowed in HUT/LTA
  19. ✓ Thermal cover clear of waist ring
  20. Waist ring – engage posn
  21. Connect LTA to HUT, lock

# LON EMU CHECKOUT

X: SM 60 SM TABLE MAINT

- 1. Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

<u>Param Name</u>	<u>Param ID</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
EXT A/L H2O LINE T			
EXT A/L H2O SPLY ZN 1 T	0640181	43	100
EXT A/L LCG 2 SPLY ZN 1 T	0640182	36	85
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	100
EXT A/L LCG 2 SPLY ZN 2 T	0640185	36	82
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	80
EXT A/L BATT CHARGER			
VOLTS EMU 1	0640210	OSL	OSH
VOLTS EMU 2	0640213	OSL	OSH

## EMU POWERUP AND COMM CHECK (15 min)

### NOTE

PWR RESTART

 msg and BITE light should be illuminated whenever EMU power is cycled. Display and tone tests only occur during cold restarts

- EMU 3003  2. Remove Arm Sizing Rings s/n 138 and 139, stow
- 3. Reinstall Arms s/n 385 and 386
- DCM  4. Retrieve, position SCU; remove DCM cover
- 5. Connect SCU to DCM,  $\checkmark$ locked
- 6. PWR – BATT

### CAUTION

EMU must be on BATT pwr when airlock power supply is turned on

- AW18H  7. PWR/BATT CHGR EMU 1 MODE (one) – PWR  
BUS SEL (one) – MNA(MNB)
- 8.  $\checkmark$ EMU INPUT 1 volts = 18.0-20.0
- EV AW18D  9.  $\checkmark$ AIRLK AUD PWR – OFF
- DCM  10. COMM mode – ALT
- 11.  $\checkmark$ Comm FREQ – LOW
- IV A1R  12.  $\checkmark$ AUD CTR UHF A/G 1,2 (two) – OFF  
A/A – T/R
- R14:C  13.  $\checkmark$ cb MNA UHF EVA – cl  
 $\checkmark$ MNC UHF EVA – cl



- R10  14. BIOMED CH 1 – EVA 1  
CH 2 – EVA 2
- IVA ATU  15. √AUD PWR – AUD/TONE  
A/G 1,2 (two) – OFF  
A/A – T/R  
ICOM A,B (two) – OFF (as reqd)
- O6  16. UHF SPLX/EVA PWR AMP – OFF  
MODE – EVA
- 17. √Helmet disconnected
- 18. Don comm caps

NOTE

After the next step, be prepared to verify no missing segments on display and that all tones are audible

- 19. PWR – SCU
- 20. Verify no missing segments during display test  
Verify BITE light extinguishes  
Verify status (continuous) tone and warble tone are audible

Report any anomalies to MCC

- 21. Perform onboard A/A comm check per table

EMU		IV O6:	
MODE	FREQ	EVA STRING	UHF SPLX/EVA XMIT FREQ
ALT	LOW	2	259.7/414.2
ALT	HIGH	2	296.8/417.1
PRI	HIGH	1	296.8/417.1
PRI	LOW	1	259.7/414.2

- IV IVA ATU  22. AUD A/G 1(2) – T/R
- IV A1R  23. AUD CTR UHF A/G 1(2) – T/R  
√A/G 2(1) – OFF  
A/A – OFF
- IV A1R  24. Verify RF comm with MCC
- IV A1R  25. AUD CTR UHF A/G 1(2) – OFF
- IV A1R  26. Doff comm cap
- DCM  27. DISP – STATUS, until DATA?COMBO displayed  
– YES (hold for 2 sec)  
– STATUS, until DATA EMU? displayed  
– YES (hold for 2 sec)  
Verify DATA?EMU displayed

PRIMARY REGULATOR/FAN/PUMP CHECK (40 min)

- MD(fir)  28. EMU O2 ISOL VLV – OP  
 DCM  29.  $\sqrt{\text{STATUS: O2 P}} = 850-950$

EMU	1	2	3	4
30. O2 P				

- AW82B  31. EV-1 O2 vlv (one) – OP  
 32. Install helmet, lock  
 33.  $\sqrt{\text{Suit arms aligned}}$   
 34.  $\sqrt{\text{Gloves locked}}$   
 DCM  35.  $\sqrt{\text{Helmet purge vlv – cl, locked}}$   
 36. PURGE vlv – cl (dn)  
 37. O2 ACT – IV  
 38.  $\sqrt{\text{STATUS: SUIT P}} = 0.4-1.4$  and stable (compare w/gauge)

EMU	1	2	3	4
39. SUIT P (IV)				

40. O2 ACT – PRESS  
 41.  $\sqrt{\text{STATUS: SUIT P}} = 4.2-4.4$  and stable (compare w/gauge)  
 $\text{H2O TEMP} = \text{ambient}$   
 $\text{H2O GP} = 14.0-16.0$   
 $\text{H2O WP} = 14.0-16.0$

EMU	1	2	3	4
42. SUIT P (PRESS)				
H2O TEMP				
H2O GP				
H2O WP				

43. DISP – STATUS, until LEAK CHECK? displayed  
 DISP – YES (hold for 2 sec)  
 Follow displayed instructions

EMU	1	2	3	4
44. $\Delta P$				

- \* If LEAKAGE HI/ SUIT P msg occurs ( $\Delta P > 0.3$  psi), \*  
 \* go to FAILED LEAK CHECK (14.7/10.2 PSI) \*  
 \* Cue Card, CC 6-4 \*

- DCM  45. O2 ACT – OFF  
 46. PURGE vlv – op (up)  
 47.  $\sqrt{\text{STATUS: SUIT P}} < 0.4$  (compare w/gauge)  
 48. Disconnect glove  
 49. Reconnect glove  
 50. Disconnect helmet, temp stow  
 51. Disconnect waist ring – secure LTA to outer hatch handrail  
 52. Remove Multiple Water Connector cover, temp stow  
 53. Connect LCVG,  $\sqrt{\text{locked}}$   
 DCM  54.  $\sqrt{\text{Temp control vlv – Max C}}$

**CAUTION**  
Minimize fan operation with O2 ACT – OFF (~2 min)

- 55. FAN – ON (PWR RESTART may occur)  
Verify flow at neck ring vent port
- AW18H  56. √EMU INPUT amps = 1.5-5.0 (1.5-4.7 at 10.2)

EMU	1	2	3	4
57. INPUT AMPS				

- DCM  58. Install SCOF, lock
- 59. O2 ACT – IV, **NO VENT FLOW** msg, DISP – PRO  
√Cooling flow in LCVG
- 60. √STATUS: **H2O TEMP** decrease from step 41

EMU	1	2	3	4
61. H2O TEMP				

\* If no temp decrease, depress and hold pump priming \*  
\* valve on back of EMU, while slowly cycling TCV \*  
\* between 7 and Max C (30 sec minimum) \*

- AW18H  62. √EMU INPUT amps = 1.5-4.0 (1.5-3.6 at 10.2)  
√EMU INPUT amps decrease from step 56

EMU	1	2	3	4
63. INPUT AMPS				

- DCM  64. PWR – BATT, **NO VENT FLOW** message, DISP – PRO
- 65. √STATUS: **BAT VDC** ≥ 16.5  
**BAT AMPS** = 2.4-4.0 (2.3-3.7 at 10.2)  
**RPM** = 18.0-20.0 K

EMU	1	2	3	4
66. BAT VDC				
BAT AMPS				
RPM				

- 67. √Fan noise steady
- 68. O2 ACT – OFF
- 69. FAN – OFF
- 70. PWR – SCU

SOP CHECK (5 min)

- DCM  71. DISP – STATUS, until **DATA?COMBO** displayed  
– YES (hold for 2 sec)  
– STATUS, until **DATA EMU?** displayed  
– YES (hold for 2 sec)  
Verify **DATA?EMU** displayed

- DCM  72. √STATUS: **SOP P** = 5410-6800

EMU	1	2	3	4
73. SOP P				

SOP  74. √SOP gauge 5400-6800, note SOP interstage gauge

EMU	1	2	3	4
75. SOP GAUGE				
INT GAUGE				

DCM  76. DISP – STATUS until **SUIT P** displayed  
DISP – YES (hold for 2 sec) to lock parameter

77. Depress SOP manual override (50 sec max):  
√SOP interstage gauge < 600  
√STATUS: **SUIT P** = 3.4-3.9

DCM

EMU	1	2	3	4
78. SUIT P				
INT GAUGE				

79. √STATUS: **SOP P** = 5410-6800

EMU	1	2	3	4
80. SOP P				

- 81. Remove SCOF, stow
- 82. As necessary remove gloves and boots; position LCVG arms and legs in HUT arms and LTA legs
- 83. Install pigtail adapter to signal conditioner and electrical harness
- 84. Install helmet, LTA
- 85. Reinstall gloves and boots as required
- 86. Configure all helmet visors and shades to be down
- 87. Install thermal mittens from shuttle stowage
- DCM  88. COMM mode – OFF

BATTERY CHARGE CHECK INIT (15 min)

AW18H  89. PWR/BATT CHGR EMU 1 BUS SEL (one) – OFF  
MODE (one) – CHARGE  
BUS SEL (one) – MNA(MNB)

90. Continue charge 15 min, minimum

BATTERY CHARGE CHECK TERM

When PWR/BATT CHGR EMU INPUT AMPS < 1 and 15 min minimum charge complete:

91. PWR/BATT CHGR EMU 1 BUS SEL (one) – OFF  
MODE (one) – OFF

Cont next page

POST EMU C/O RECONFIG (5 min)

When EMU C/O complete:

- IV O6  92. UHF MODE – OFF
  - √SPLX/EVA XMIT FREQ – 259.7/414.2
  - √PWR AMP – OFF
  - √SPLX SQUELCH – ON
- R10  93. √BIOMED CH 1 – EVA 1
  - √CH 2 – EVA 2
- AW82B  94. EV-1 O2 vlv (one) – CL
  - √EV-2 O2 vlv (one) – CL
- BOTH DCM  95. Remove SCUs, install DCM covers
- 96. Stow SCU on AAP, Velcro to wall
- IV ML86B:C  97. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl  
(heaters will be deactivated on MCC call)

**X: SM 60 SM TABLE MAINT**

- 98. Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

<u>Param Name</u>	<u>Param ID</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
EXT A/L H2O LINE T			
EXT A/L H2O SPLY ZN 1 T	0640181	43	145
EXT A/L LCG 2 SPLY ZN 1 T	0640182	49	145
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	145
EXT A/L LCG 2 SPLY ZN 2 T	0640185	45	145
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	OSH

## EMU RESIZE FOR BOWEN

This procedure will reconfigure **EMU 3003 for Bowen** for a contingency EVA. Refer to figure 1

### NOTE

Reference EMU RESIZE (EMU CONTINGENCY PROCS) for component changeout steps.

All hardware being stowed needs to be in a pouch OR have a cover installed

### CAUTION

Remove rings and other jewelry before exposing EMU bladder

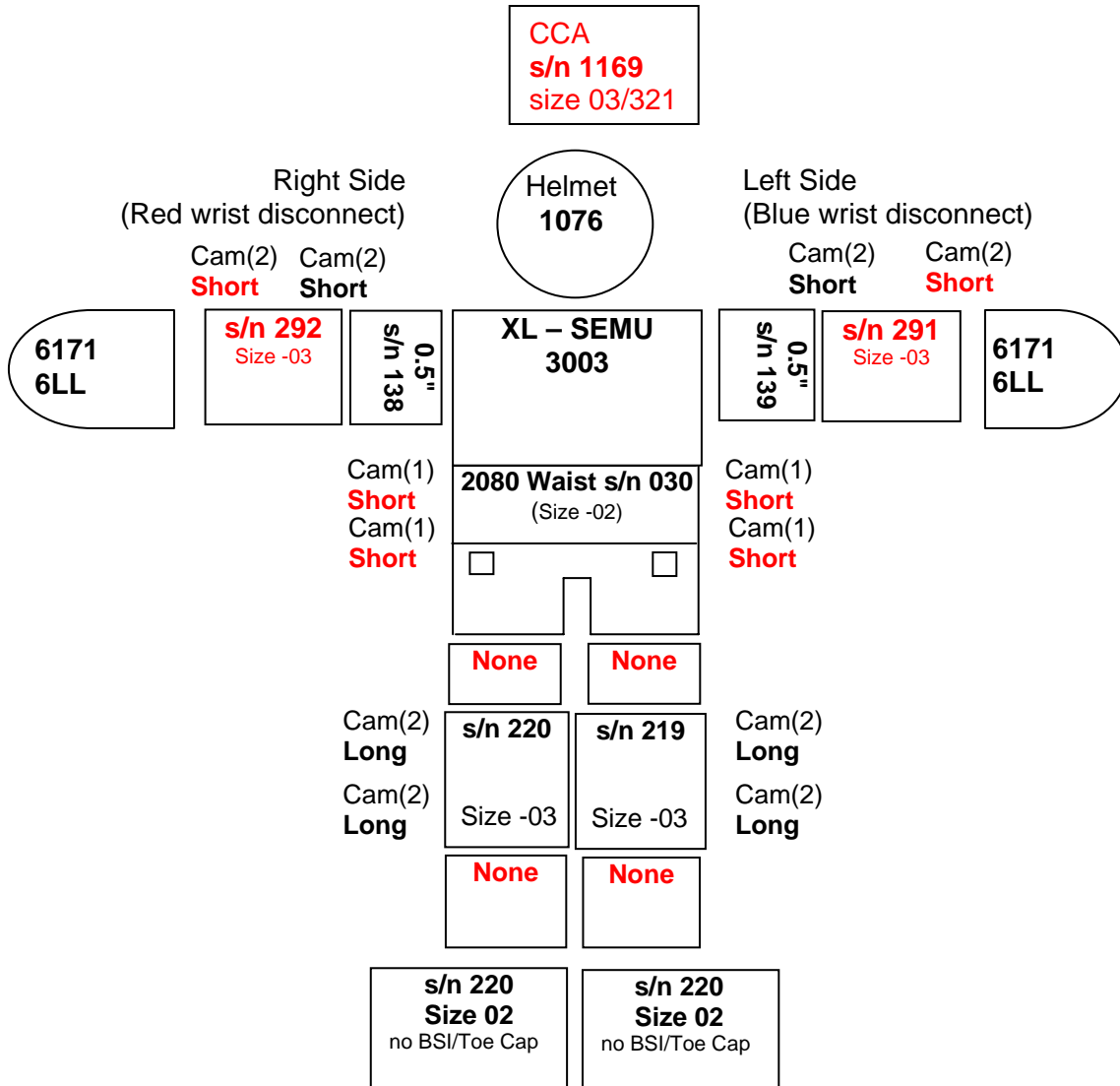
√All seals are clean and free of debris before making connections

### Reconfiguring EMU 3003 for Bowen

1. Remove Helmet, s/n 1076  
Remove Altman Valsalva and use Gray Tape to remove adhesive  
Install Bowen Valsalva in Bowen position  
Install Bowen Comm Cap, s/n 1169
2. Remove BW Gloves, s/n 6171
3. Remove Arms, s/n 385 and 386; temp stow  
Install Arms, s/n 291 and 292
4. Verify Upper and Lower Arm cams in Short position
5. Install Helmet, s/n 1076
6. Install BW Gloves, s/n 6171
7. Adjust Upper and Lower Waist Cams to Short position
8. Verify Upper and Lower Leg Cams to Long position
9. Remove 0.5" Thigh Sizing Rings s/n 133 and 134  
Remove 1.5" Leg Sizing Rings, s/n 121 and 122
10. Reinstall Legs s/n 219 and 220  
Reinstall Boots, s/n 220
11. On BW LCVG s/n 3182, unsnap and remove Leg Cuff Extensions
12. Stow removed components

NOTE

- All labels show serial numbers on top
- **BLACK** font indicates hardware already on **EMU 3003**
- **RED** font indicates hardware changes

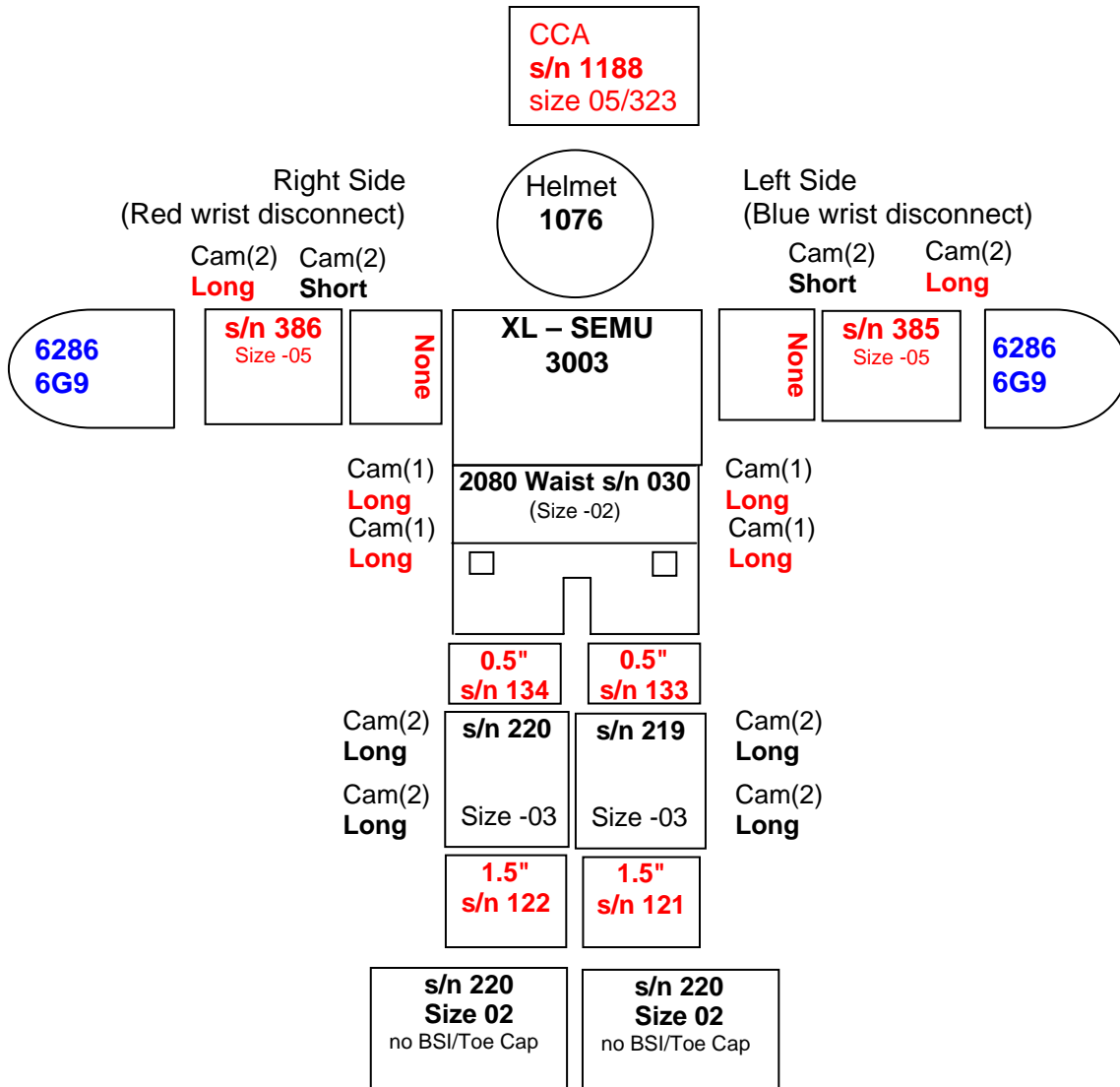


FINAL EMU 3003 CONFIG FOR BOWEN

# NOMINAL EMU SIZING FOR SCOOTER

## NOTE

- All labels show serial numbers on top
- **BLACK** font indicates hardware already on **EMU 3003**
- **RED** font indicates hardware different from Bowen's config
- **BLUE** font indicates hardware obtained from STS 125



FINAL EMU 3003 CONFIG FOR SCOOTER



## EMU RESIZE FOR McARTHUR

This procedure will reconfigure **EMU 3017 for McArthur** for transfer on EVA 1. This resize will occur on the HST vehicle. Refer to figure 1

### NOTE

Reference EMU RESIZE (EMU CONTINGENCY PROCS) for component changeout steps.

All hardware being stowed needs to be in a pouch OR have a cover installed

### CAUTION

Remove rings and other jewelry before exposing EMU bladder

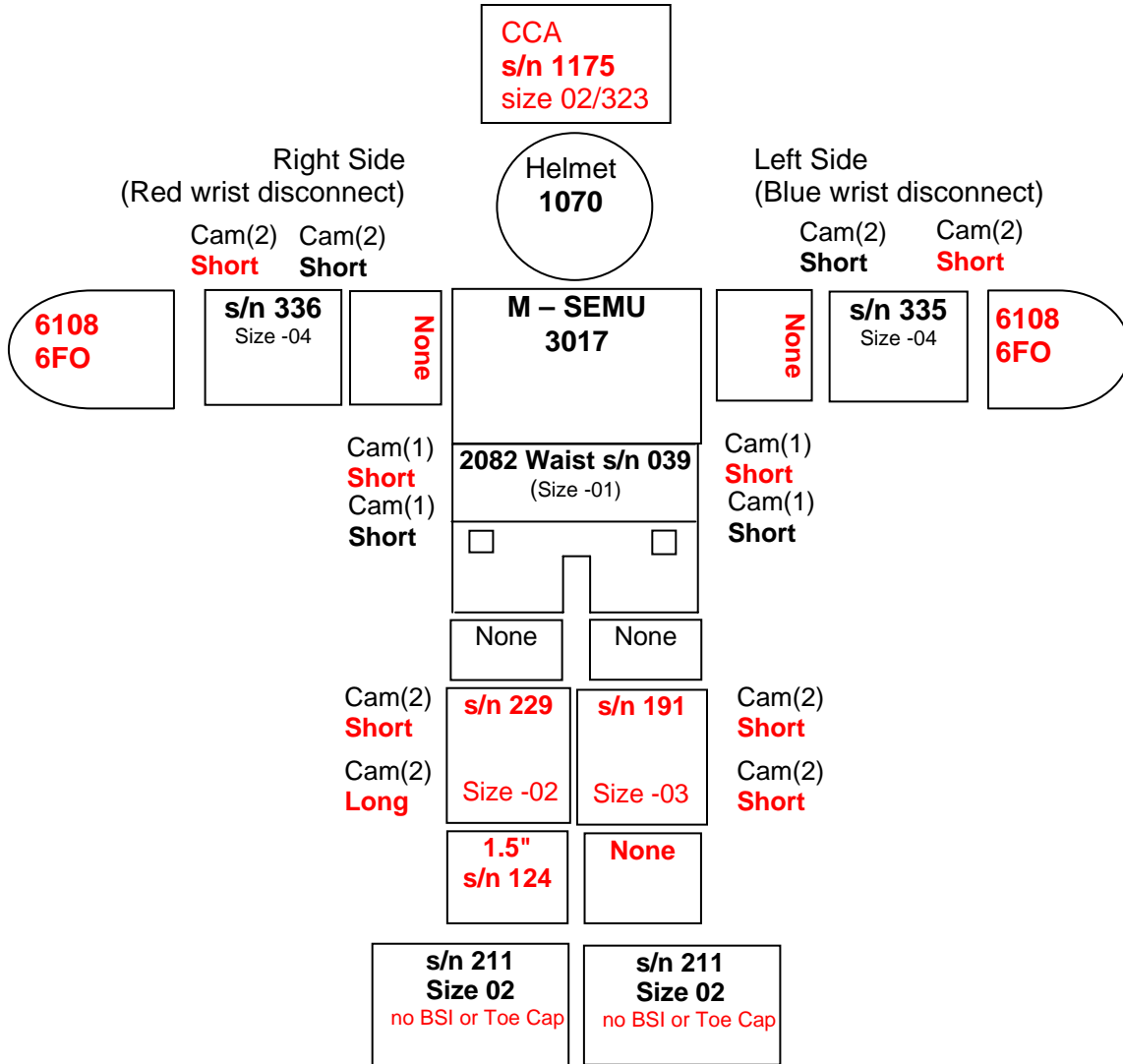
✓ All seals are clean and free of debris before making connections

### Reconfiguring EMU 3017 for McArthur

1. If present, remove Helmet Lights and EMU TV
2. Remove from EMU 3017 Helmet, s/n 1070  
Remove Valsalva  
Use Gray Tape to remove adhesive  
Install McArthur Valsalva and Johnson Valsalva (if it doesn't interfere with Megan)
3. Remove G comm cap s/n 1185, stow in G ECOK, install MH/JC comm cap s/n 1175
4. Remove and stow G gloves, s/n 6285
5. Remove and stow Arm Sizing Rings, s/n 140 and 141  
Reinstall Lower Arms, s/n 335 and 336 (red disconnect on right, blue on left)
6. Reinstall Helmet s/n 1070, install GF cont gloves, s/n 6108
7. Adjust/verify all Arm Cams to Short position
8. Adjust/verify upper waist cams and lower waist cams to Short position.
9. Remove Legs, s/n 253 and 254 and Boots, s/n 211. Install Leg size 02, s/n 229 and 1.5" Leg Sizing Ring, s/n 124 on right leg. Install Leg size 03, s/n 191 on left leg, no sizing ring
10. For right leg, adjust upper leg cams to Short position and lower leg cams to Long position. For left leg, adjust all cams to Short position
11. Remove BSIs, toe caps, stow in G ECOK
12. Reinstall Boots, s/n 211
13. Stow removed components

NOTE

- All labels show serial numbers on top
- **BLACK** font indicates hardware already on **EMU 3017**
- **RED** font indicates hardware changes



FINAL EMU 3017 CONFIG FOR McARTHUR

# HST EVA 1 PREP (90 min)

MET \_\_\_/\_\_\_:\_\_\_

MET \_\_\_/\_\_\_:\_\_\_

MET \_\_\_/\_\_\_:\_\_\_

**X: SM 60 SM TABLE MAINT**

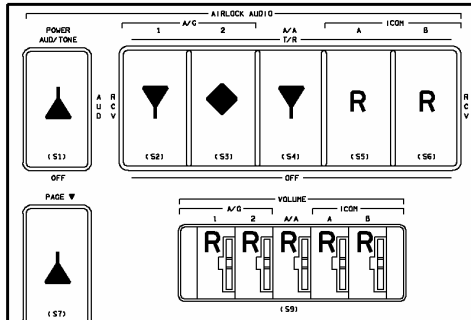
1. Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

<u>Param Name</u>	<u>Param ID</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
EXT A/L H2O LINE T			
EXT A/L H2O SPLY ZN 1 T	0640181	43	<input type="text" value="100"/>
EXT A/L LCG 2 SPLY ZN 1 T	0640182	<input type="text" value="36"/>	<input type="text" value="85"/>
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	<input type="text" value="100"/>
EXT A/L LCG 2 SPLY ZN 2 T	0640185	<input type="text" value="36"/>	<input type="text" value="82"/>
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	<input type="text" value="80"/>

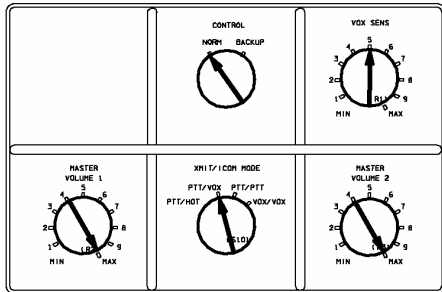
## PREP FOR DONNING (30 min)

Install Megan's EMU on STBD AAP and EV2 suit in PORT AAP. All will be in battery power to facilitate SCU swapping for cooling. EV1 will be Comm Mode – ALT and Low, EV2 and Megan will be Comm Mode in PRI and Low. EV1 suit may perform steps 10,12-26 in parallel

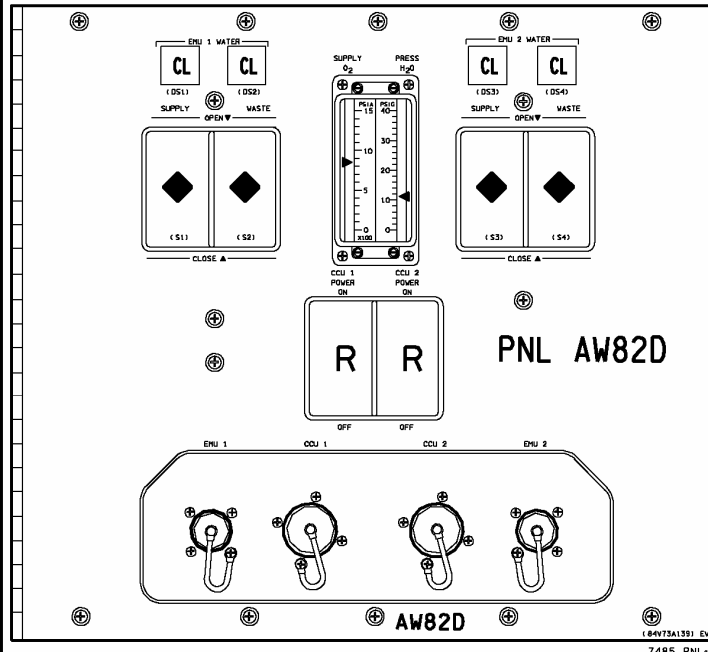
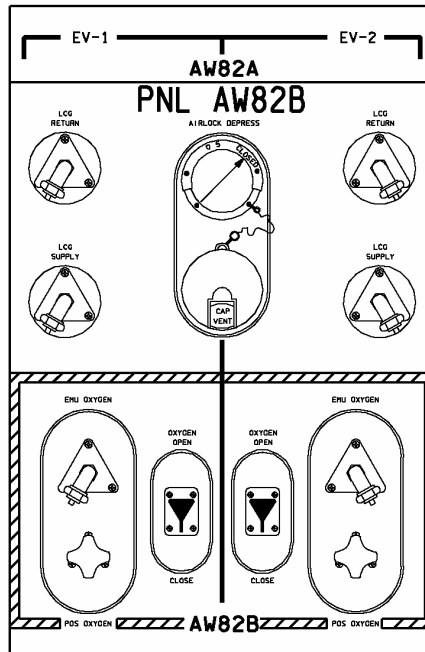
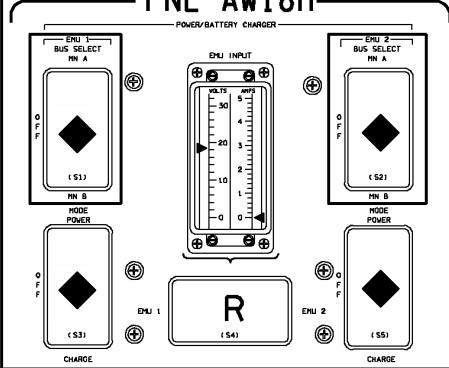
- |           |                          |                          |                          |   |
|-----------|--------------------------|--------------------------|--------------------------|---|
| EV2,Megan | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 2. Retrieve, position SCU; remove DCM cover   |
| DCM       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |   |
|           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 3. Connect SCU to DCM, $\checkmark$ locked  |
| AW18H     | <input type="checkbox"/> |                          |                          | 4. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR<br>$\checkmark$ PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF |
| AW82B     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 5. EV-1, EV-2 O2 vlv (two) – op   |
| MO13Q     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 6. $\checkmark$ ARLK H2O S/O VLV – OPEN (tb-OP)   |
| MD(flr)   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 7. $\checkmark$ EMU O2 ISOL VLV – OP  |
| ML86B:C   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 8. $\checkmark$ cb MNC EXT ARLK HTR ZN 1,2 (two) – op   |
| L2        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 9. $\checkmark$ O2 XOVR SYS 1,2 (two) – OP  |
| ALL 3     | DCM                      | <input type="checkbox"/> | <input type="checkbox"/> | 10. PWR – BATT  |
|           |                          | <input type="checkbox"/> | <input type="checkbox"/> | 11. Verify panels as shown next page  |



PNL AW18D

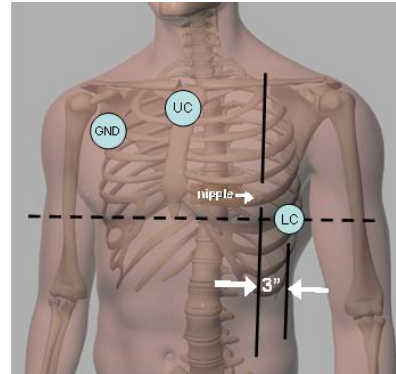


PNL AW18H



1 64973A1331 EVA  
7485, PNL 2

- |           |     |  |   |
|-----------|-----|--|---|
| ALL 3     | DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 12. Comm FREQ – LOW   |
| EV2,Megan |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 13. COMM mode – PRI (EMU Hot mic to ground)   |
| EV1       |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 14. COMM mode – ALT(EMU Hot mic to ground)  |
|           |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 15. Disconnect, transfer, temp stow LTAs, helmets, additional EMU(s) to middeck     |
| ALL       |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 16. Remove Dosimeter from inflight garments; insert in LCVG                         |
|           |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 17. Unstow biomed pigtail adapter (EMU Servicing Kit), connect to elec harness      |
|           |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 18. Don MAG, TCU, LCVG (sternal harness not required)                               |
| ALL 3     |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 19. Don comm caps   |
|           |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 20. Verify EMU data and RF comm with MCC  |
| DCM       |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 21. COMM mode – HL on MCC GO (will not all go to HL together, for suit data on EV1) |
|           |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 22. PWR – SCU (will power off suits)  |



NOTE

Be prepared to verify a nominal powerup sequence after the next step and verify no missing segments on display and that all tones are audible

- |       |  |  |  |
|-------|--|--|--|
|       |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 23. PWR – BATT<br>Verify no missing segments during display test<br>Verify status (continuous) tone and warble tone audible<br>Verify BITE light extinguishes. Report anomalies to MCC |
|       |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 24. Doff comm caps   |
| AW18D |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 25. AIRLK AUD PWR – AUD/TONE   |

EMU DONNING (55 min)

NOTE

May be performed simultaneously by 2-3 crew

- |       |  |  |  |
|-------|--|--|--|
| ALL 3 |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 26. Take one aspirin tablet (325 mg)   |
|       |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 27. √STATUS: <span style="border: 1px solid black; padding: 2px;">SOP P</span> = 5410-6800 (compare w/gauge) |
|       |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 28. √Waist ring – op   |
|       |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 29. Don LTA, attach donning handles as reqd<br>If boot bladder manipulation reqd:                            |
|       |  |  | 30. Disconnect boot from leg (sizing ring)   |
|       |  |  | 31. Pull up excess boot bladder around full circumference of boot disconnect                                 |
|       |  |  | 32. Connect boot to leg (sizing ring)  |
|       |  |  | 33. Engage Lock 1  |
|       |  |  | 34. √All locks (three per boot) engaged  |
|       |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 35. Ingress Airlock  |
|       |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 36. √Suit arms aligned   |
|       |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 37. Disconnect gloves; √wrist disconnects – op   |

- |                   |  |  |
|-------------------|--|--|
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 38. Stow IV glasses  |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 39. Don thumb loops  |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 40. ✓Drink valve posn before HUT donning                                   |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 41. ✓Biomed elec harness outside of HUT                                    |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 42. Don HUT  |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 43. Release thumb loops  |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 44. ✓Suit arms aligned   |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 45. Don EV glasses as reqd   |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 46. Don comm cap   |
| EV2, Megan<br>DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 47. COMM mode – PRI, Freq – Low, vol as reqd                               |
| EV1               | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 48. COMM mode – ALT, Freq – Low, vol as reqd for EV1 only                  |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 49. ✓Comm with IV  |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 50. Connect biomed to elec harness   |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 51. Connect LCVG to multiple water connector, ✓locked                      |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 52. ✓Thermal cover clear of waist ring                                     |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 53. Waist ring – engage posn   |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 54. Connect waist ring to HUT, ✓locked                                     |
|                   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 55. Remove donning handles, stow in EMU Equipment Bag;<br>cover waist ring |

<p><b>CAUTION</b> Pulling on drink bag blue bite vlv to adjust posn can cause vlv to release from stem</p>
--

- |            |  |  |
|------------|--|--|
|            | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 56. ✓Drink vlv posn after HUT donning                |
|            | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 57. ✓Mike boom posn                                  |
|            | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 58. Don comfort gloves, wristlets                    |
|            | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 59. Wrist rings – engage posn                        |
|            | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 60. Don EV gloves, ✓locked                           |
|            | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 61. Tighten palm restraint straps                    |
| Megan only | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 62. ✓REBA sw – OFF                                   |
|            | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 63. ✓Glove heater sw (two) – OFF                     |
|            | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 64. Connect lower arm pwr harness to gloves          |
| ALL        | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 65. Stow slack or dangling pwr harness under arm TMG |
|            | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 66. ✓Cuff C/L posn                                   |

<p><b>CAUTION</b> Minimize fan operation with O2 ACT – OFF (~2 min)</p>
---

- |     |  |  |
|-----|--|--|
| DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 67. FAN – ON (PWR RESTART may occur)   |
|     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 68. ✓Elec harness clear of neck ring   |
|     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 69. Don helmet, ✓locked  |
| DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 70. O2 ACT – IV<br>Expect <span style="border: 1px solid black; padding: 2px;">O2 USE HIGH</span> message, PRO   |
|     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 71. ✓Helmet purge vlv – cl, locked   |
| DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 72. PURGE vlv – cl (dn)  |
|     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 73. Repeat steps 27-73 if EMU donning done serially. Swap EV1<br>EMU into Port AAP for donning as required. Leave SCU<br>connected to donned EMUs for cooling. Swap back and forth<br>between EV1 and EV2 as required (do not disconnect SCUs<br>when purging). EV2 and Megan should continue with EMU<br>CHECK and EMU PURGE while EV1 is donning |

EMU CHECK (5 min)

ALL 3

74.  Cooling

- \* If cooling insufficient slowly cycle temp control vlv \*
- \* between 7 and Max C while IV depresses and holds \*
- \* pump priming vlv on back of EMU (30 sec min) \*

75. Temp control vlv – as reqd

76.  Wrist rings – covered

77.  Waist rings – covered

DCM  78.  COMM mode – PRI (ALT for EV1)

79.  WATER – OFF

80.  PWR – BATT

81.  FAN – ON

82.  Comm FREQ – LOW

EV1, EV2  83.  Helmet Light ops

84.  Helmet purge vlv – cl, locked

DCM  85.  PURGE vlv – cl (dn)

86. O2 ACT – PRESS

Expect  O2 USE HIGH message, PRO

87. DISP – STATUS: until  LEAK CHECK? msg displayed

88. DISP – YES (hold for 2 sec), follow displayed instructions

- \* If  PRESS FAIL/SUIT P X.X or  LEAKAGE HI  SUIT P X.X, \*
- \* go to FAILED LEAK CHECK (14.7/10.2 PSI), CC 6-4 \*
- \* (Cue Card) \*

EMU PURGE

MET \_\_\_/\_\_\_:\_\_\_

MET \_\_\_/\_\_\_:\_\_\_

MET \_\_\_/\_\_\_:\_\_\_

NOTE

Flex arms and legs periodically and avoid overcooling during purge/prebreathe

CABIN P	PURGE DURATION (min)
10.2	8
14.7	12

Megan and Feustel will purge for 8 min first. When Grunsfeld completes EMU donning, he will connect to the SCU he is sharing with Feustel and perform his 8-min purge

EV2, Megan

1.  SCU connected

2. O2 ACT – PRESS

3. Verify no EMU fit issues

4. PURGE vlv – op (up), begin purge clock

Expect  O2 USE HIGH message, PRO

5. When N2 purge complete (per table):

PURGE vlv – cl (dn)

O2 ACT – IV

EMU PREBREATHE

MET \_\_\_/\_\_\_:\_\_\_

MET \_\_\_/\_\_\_:\_\_\_

MET \_\_\_/\_\_\_:\_\_\_

During prebreathe, suited crewmembers will have Comm modes in PRI or ALT and Low Freq, and therefore hot mic to ground. All will be on BATT power so they can easily swap the SCUs for cooling

- |    |       |  |   |
|----|-------|--|---|
| IV | R1    | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 1. Begin prebreathe clock after Grunsfeld completes his purge |
|    |       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 2. O2 TK3 HTR A(B) – as reqd                                  |
|    |       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 3. Egress AAP, stow handles, as reqd                          |
|    |       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 4. EV2 should be Port, Megan Stbd, and EV1 on the floor       |
| IV | AW82B | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 5. AIRLK DEPRESS vlv cap – vent, remove, stow                 |
|    |       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 6. Remove loose equipment                                     |
- 
- | CABIN P |       | PREBREATHE DURATION |
|---------|-------|---------------------|
| 10.2    | 12 hr | 01:15               |
|         | 24 hr | 00:40               |
| 14.7    |       | 04:00               |
- 
- As reqd per MCC,  
set battery amp-hours:
- |                 |     |  |  |
|-----------------|-----|--|--|
| EV1, EV2, Megan | DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 7. DISP – STATUS until <u>BATT? 32.0AH</u> displayed         |
|                 |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 8. DISP – YES (hold for 2 sec)                               |
|                 |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 9. Use DISP to status to desired value                       |
|                 |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 10. When desired value selected, DISP – YES (hold for 2 sec) |
- 
- |       |          |  |  |
|-------|----------|--|--|
| IV    |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 11. Install MWS and BRTs (as reqd)   |
|       |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 12. ✓EVA tools installed in airlock  |
|       | A/L      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 13. Remove, stow appropriate vent ducts to allow hatch closure                                 |
|       | MD(flr)  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 14. As reqd, disconnect vent duct from middeck floor fitting; stow                             |
|       |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 15. As reqd, unstow, install diffuser cap on middeck floor fitting                             |
|       |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 16. ✓Loose middeck-stowed items clear of inner hatch and middeck diffuser cap air flow         |
|       | DCM      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 17. Remove WATER switch guards (3), stow in EMU Equipment Bag                                  |
| Megan |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 18. REBA sw – ON (toward right arm of suit)  |
|       | A/L(flr) | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 19. Deploy floor EVA hatch supports  |
|       | AW18D    | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 20. XMIT/ICOM Mode – VOX/VOX (for Megan when she is on HL after depress)                       |
|       |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 21. ✓ <u>RESCUE EVA 1 DEPRESS/REPRESS CUE CARD</u> in Airlock                                  |
|       |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 22. Outer hatch Equal vlv caps (two) – remove  |
|       |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 23. Egress Airlock   |
|       |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 24. Inner hatch – close, lock  |
|       |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 25. ✓Inner hatch Equal vlv caps (two) – removed  |
|       |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 26. Inner hatch Equal vlv (two) – OFF  |
|       |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 27. When prebreathe time complete, ✓MCC for GO to <u>RESCUE EVA 1 DEPRESS/REPRESS CUE CARD</u> |



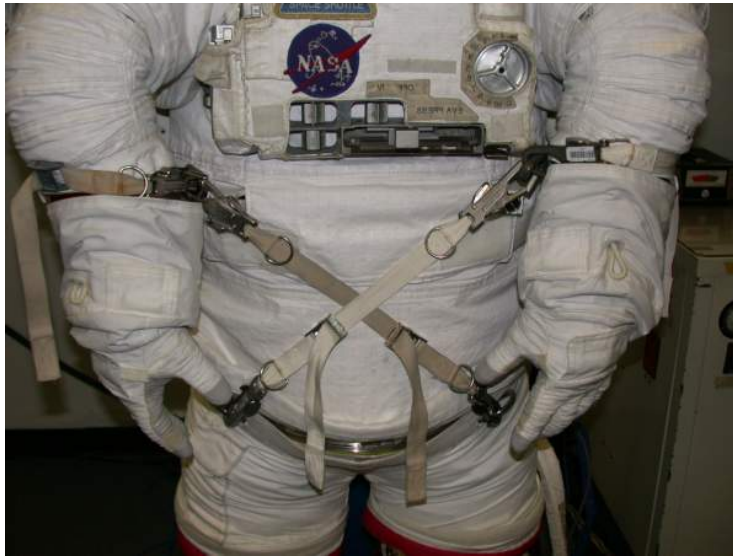
# LON EMU CONFIG FOR EVA 1 TRANSFER (00:40)

## Configure EMU 3003 for Transfer in Vacuum

- DCM  1. Retrieve, position SCU; remove DCM cover
- 2. Connect SCU to DCM,  $\sqrt{\text{locked}}$
- AW82B  3. EV-1, EV-2 O2 vlv (two) – op
- MD(flr)  4.  $\sqrt{\text{EMU O2 ISOL VLV – OP}}$
- ML86B:C  5.  $\sqrt{\text{cb MNC EXT ARLK HTR ZN 1,2 (two) – op}}$
- L2  6.  $\sqrt{\text{O2 XOVR SYS 1,2 (two) – OP}}$
- DCM  7.  $\sqrt{\text{COMM mode – OFF}}$
- 8. Verify panels as shown on FS 22-18
- 9. PWR – BATT

**CAUTION**  
EMU must be on BATT pwr when  
airlock power supply turned on

- AW18H  10. PWR/BATT CHGR EMU 1 MODE (one) – PWR  
BUS SEL (one) – MNA(MNB)
- DCM  11. PWR – SCU
- 12.  $\sqrt{\text{STATUS: BATT VDC}} \geq 20.3$
- 13.  $\sqrt{\text{Helmet purge vlv – cl, locked}}$
- DCM  14. PURGE vlv – cl (dn)
- 15. DISP – STATUS, until **LEAK CHECK?** displayed  
DISP – YES (hold for 2 sec)  
Follow displayed instructions  
When Leak Check complete, continue with next step
- 16. FAN – ON
- 17. Temp control vlv – 7
- 18. O2 ACT – IV
- 19.  $\sqrt{\text{Helmet Light ops}}$
- 20.  $\sqrt{\text{Wrist rings – covered}}$
- 21.  $\sqrt{\text{Waist rings – covered}}$
- DCM  22.  $\sqrt{\text{WATER – OFF}}$
- 23.  $\sqrt{\text{PWR – SCU}}$
- 24.  $\sqrt{\text{FAN – ON}}$
- 25.  $\sqrt{\text{Comm FREQ – LOW}}$
- 26.  $\sqrt{\text{EVA tools installed in airlock}}$
- 27. As reqd, perform **BOOSTER FAN DEACTIVATION/REMOVAL (AIRLOCK CONFIG)**
- A/L  28. Remove, stow appropriate vent ducts to allow hatch closure
- MD(flr)  29. As reqd, disconnect vent duct from middeck floor fitting; stow
- 30. As reqd, unstow, install diffuser cap on middeck floor fitting
- 31.  $\sqrt{\text{Loose middeck-stowed items clear of inner hatch and middeck diffuser cap air flow}}$
- A/L(flr)  32. Deploy floor EVA hatch supports
- Wait until HST gives a GO (Megan switches COMM Mode – HL)  
before continuing. Critical for all crewmembers to have comm
- DCM  33. On HST-EV GO, continue steps 34-48
- 34. O2 ACT – PRESS
- 35. Install adjustable tethers (4) to restrain arms as shown



- EMU
- 36. Install MMWS and right swing arm from shuttle stowage
  - 37. COMM Mode – PRI
  - 38. Outer Hatch Equal vlv caps (two) – removed, stow securely
  - 39. √RESCUE EVA 1 DEPRESS/REPRESS CUE CARD in Airlock

Following steps should be performed just before EV1 arrives at the LON airlock to depress it, in order to conserve battery power

- IV DCM
- 40. POWER – BATT
- AW18H
- 41. PWR/BATT CHGR EMU 1 BUS SEL (two) – OFF  
MODE (two) – PWR
- DCM
- 42. Remove SCU, stow
  - 43. DISP – STATUS, until DATA?COMBO displayed
    - YES (hold for 2 sec)
    - STATUS, until DATA EMU? displayed
    - YES (hold for 2 sec)
 Verify DATA?EMU displayed
- AW18D
- 44. Remove WATER sw guard (one), stow in EMU Equipment Bag
  - 45. XMIT/ICOM Mode – VOX/VOX
  - 46. Position/restrain suit clear opening of EV hatch
  - 47. Egress Airlock
  - 48. Inner hatch – close, lock
  - 49. √Inner hatch Equal vlv caps (two) – removed
  - 50. Inner hatch Equal vlv (two) – OFF

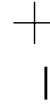
HOOK VELCRO		<b>RESCUE EVA 1 DEPRESS/REPRESS CUE CARD</b>	HOOK VELCRO
<p><b>DEPRESS (10 min)</b> When prebreathe complete</p> <p>ALL DCM 1. √Comm FREQ – LOW 2. √COMM mode – PRI (ALT for EV1) AW82B 3. AIRLK DEPRESS vlv – 5, EV ALERT TONE, monitor suit P gauge &lt; 5.5 * If gauge &gt; 5.5, stop depress, √MCC *</p> <p>4. Airlock at 6.0, EV ALERT TONE 5. When airlock at 5.0, AIRLK DEPRESS vlv – CL, EV ALERT TONE</p> <p>ALL DCM 6. DISP – STATUS: until <b>LEAK CHECK ?</b> displayed, DISP – YES (hold for 2 sec), follow displayed instructions * If <b>LEAKAGE HI   SUIT P X.X</b>, go to <b>FAILED</b> * * <b>LEAK CHECK (5 PSI)</b>, reverse side *</p> <p>DCM 7. √O2 ACT – EVA, may have to get Megan's after depress, if so, expect <b>SET O2 EVA</b> AW82B 8. AIRLK DEPRESS vlv – 0, EV ALERT TONE, monitor suit P gauge &lt; 5.5 * If gauge &gt; 5.5, stop depress, √MCC *</p> <p>9. Attach waist tether(s) to A/L D-ring for egress ALL 10. Airlock dP/dT ~0, EV ALERT TONE 11. When outer hatch ΔP &lt; 0.5, outer hatch – open, stow AW82B 12. AIRLK DEPRESS vlv – CL</p>		<p><b>PRE REPRESS (5 min)</b></p> <p>IV ML86B:C 1. √cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op MD(flr) 2. √EMU O2 ISOL vlv – OP DCM 3. √SCUs connected to DCM 4. √WATER – OFF for 2 min BOTH 5. √Outer hatch closed and locked 6. Disc waist tethers, attach to EMU AW82B 7. √EV-1, EV-2 O2 vlv (two) – OP AW18H 8. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – MNA(MNB) DCM 9. PWR – SCU, EV WARN TONE (IV record MET _ _ : _ _)</p>	
<p><b>POST DEPRESS (5 min)</b></p> <p>EV1,2 DCM 1. (IV record MET _ _ : _ _) <b>PET = 00:00</b> Megan DCM 2. Disc SCU; install DCM cover, stow SCU as reqd 3. Connect SCU as reqd, EV1,2 DCM 4. √Megan's O2 ACT – EVA 5. Temp control vlv – Max H 6. WATER – ON 7. √DCM blank, BITE off 8. Temp control vlv – 3 to MAX C 9. √STATUS, compare to Cuff C/L, 1 (IV record) 10. Visors as reqd 11. Perform AIRLOCK EGRESS, Cuff C/L, 47, or Flight Specific Timeline IV ML86B:C 12. On MCC GO: cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl</p>		<p><b>REPRESS (10 min)</b></p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> If on SOP, leave O2 ACT – EVA thru airlock repress</p> </div> <p>DCM 1. O2 ACT – PRESS 2. COMM mode – HL</p> <p style="text-align: center;"><b>NOTE</b> IV expect dP/dT alarm during repress</p> <p>AW82B 3. √AIRLK DEPRESS vlv – CL 4. Inner hatch Equal vlv (one) – throttle OFF to NORM (as reqd), EV ALERT TONE 5. Airlock at 4.0, EV ALERT TONE 6. When airlock at 5.0, Equal vlv – OFF, EV ALERT TONE DCM 7. √Airlock pressure integrity (2 min, ΔP ≤ 0.1 psi) 8. √Gloves clean</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> If Cuff 1 symp resolve upon repress, report as Cuff 2 If any DCS, leave O2 ACT – PRESS</p> </div> <p>DCM 9. O2 ACT – IV, if possible 10. Inner hatch Equal vlv (one) – NORM, EV ALERT TONE 11. Airlock dP/dT ~0, EV ALERT TONE 12. Go to HST POST EVA 1 or LON POST EVA 1 PART 1 for Megan, PART 2 for EV1, EV2</p> <p style="text-align: right;">EVA-7a/125/O/A</p>	

(reduced copy)

TOP  
BACK OF 'RESCUE EVA 1 DEPRESS/REPRESS CUE CARD'

HOOK  
VELCRO

HOOK  
VELCRO



HOOK  
VELCRO

(reduced copy)

HOOK  
VELCRO

EVA-7b/125/O/B



# LON POST EVA 1 PART 1 (00:40)

## SUIT DOFFING FOR MEGAN

**WARNING**  
Do not doff EMU if DCS symptoms resolved during REPRESS. √MCC via PMC

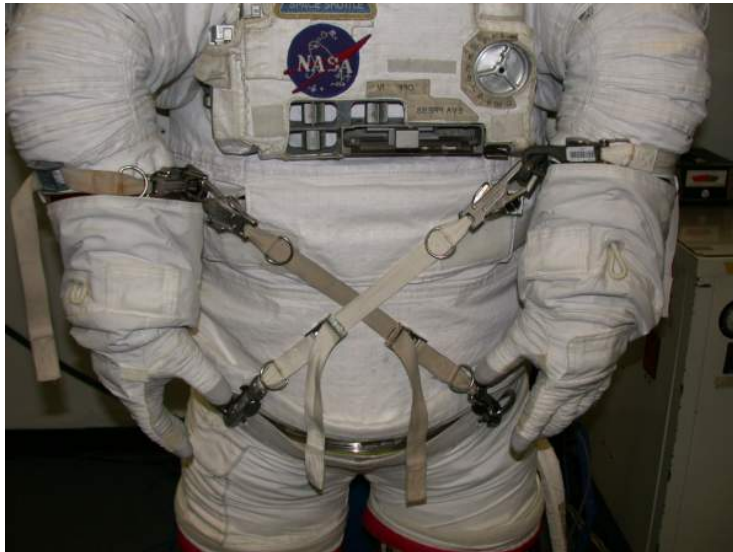
- IV  1. When  $\Delta P < 0.5$ , open hatch
- MD(flr)  2. As reqd, remove diffuser cap at middeck floor, stow
- A/L  3. As reqd, unstow airlock vent duct, connect end to middeck floor fitting
- 4. Configure appropriate vent ducts for airflow into airlock
- 5. As reqd, perform BOOSTER FAN INSTALLATION/ACTIVATION (AIRLOCK CONFIG)
- EMU  6. Install WATER sw guard (one)
- AW18H  7. √SCU1 connected
- 8. √PWR/BATT CHGR EMU 1 MODE (one) – PWR  
√PWR/BATT CHGR EMU 1 BUS SEL (one) – MNA(MNB)
- DCM  9. √POWER – SCU
- EV  10. √Gloves clean

\* If reqd, IV use damp towel to clean gloves \*

- DCM  11. O2 ACT – OFF
- 12. PURGE vlv – op (up)
- 13. √Glove heaters sw (one per glove) – OFF
- 14. REBA sw – OFF (toward left arm of suit)
- 15. Disconnect lower arm pwr harness from gloves
- 16. Stow lower arm and glove pwr harness connectors under TMG
- 17. √STATUS: SUIT P < 0.4 (compare w/gauge); disconnect gloves, stow in EMU Equipment Bag
- 18. Disconnect helmet, stow
- 19. AAP release handles to 90 degrees
- BOTH  20. Engage HUT in STBD AAP (IV assist as reqd)
- 21. AAP release handles to lock
- DCM  22. FAN – OFF (fwd)
- 23. COMM mode – OFF
- 24. Doff comm cap
- 25. Disconnect waist ring, LCVG, biomed
- 26. √Wrist disconnects – op
- 27. Doff EV glasses
- 28. Doff HUT
- 29. Doff LTA, secure to handrail
- 30. Remove dosimeter from LCVG; insert in inflight garment
- 31. Doff: LCVG (put inside HUT)  
TCU (allow to dry, as reqd)  
MAG, stow in wet trash
- 32. Inspect gloves for damage  
Report damage to MCC
- 33. Remove drink bag from HUT and dispose in wet trash
- 34. √Drink Bag Restraint Bag installed in HUT

CONFIGURE MEGAN'S EMPTY EMU FOR DEPRESS

- IV
  - 35. Connect LCVG (Megan just doffed), √locked
  - 36. As necessary remove gloves and boots; position LCVG arms and legs in HUT arms and LTA legs
  - 37. √Pigtail adapter connected to signal conditioner and electrical harness
  - 38. Attach waist ring to HUT
  - 39. Reinstall gloves and boots if required
  - 40. Install helmet
  - 41. Configure all helmet visors and shades down
  - 42. Install thermal mittens from shuttle stowage
  - 43. Install new METOX, reuse EMU battery (ref STS-400 EVA CONSUMABLES CUE CARD)
  - 44. Re-engage HUT in STBD AAP
- DCM
  - 45. √Helmet purge vlv – cl, locked
  - 46. PURGE vlv – cl (dn)
  - 47. DISP – STATUS, until LEAK CHECK? displayed  
DISP – YES (hold for 2 sec)  
Follow displayed instructions  
When leak check complete, continue with next step
  - 48. FAN – ON
  - 49. Temp control vlv – 7
  - 50. O2 ACT – IV
  - 51. COMM mode – PRI
  - 52. √Waist rings – covered
  - 53. √Wrist rings – covered
  - 54. √WATER – OFF
  - 55. √PWR – SCU
  - 56. √FAN – ON
  - 57. √Comm FREQ – LOW
  - 58. O2 ACT – PRESS
  - 59. Install adjustable tethers (4) to restrain arms as shown



- IV EMU
  - 60. Install MMWS and right swing arm from shuttle stowage
  - 61. As reqd, perform BOOSTER FAN DEACTIVATION/REMOVAL (AIRLOCK CONFIG)
- A/L MD(flr)
  - 62. Remove, stow appropriate vent ducts to allow hatch closure
  - 63. As reqd, disconnect vent duct from middeck floor fitting; stow

- 64. As reqd, unstow, install diffuser cap on middeck floor fitting
- 65. ✓ Loose middeck-stowed items clear of inner hatch and middeck diffuser cap air flow
- A/L(flr)  66. Deploy floor EVA hatch supports
- 67. ✓ Outer Hatch Equal vlv caps (two) – removed, stowed securely
- DCM  68. POWER – BATT
- AW18H  69. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
MODE (two) – PWR
- DCM  70. Remove SCU, stow
- 71. DISP – STATUS, until  displayed  
– YES (hold for 2 sec)  
– STATUS, until  displayed  
– YES (hold for 2 sec)  
Verify  displayed
- 72. Remove WATER sw guard (one), stow in EMU Equipment Bag
- 73. Position/restrain suit clear of opening EV hatch
- 74. Egress Airlock
- 75. Inner hatch – close, lock
- 76. ✓ Inner hatch Equal vlv caps (two) – removed
- 77. Inner hatch Equal vlv (two) – OFF
- 78. Give EV2 GO to depress LON airlock

## HST POST EVA 1 (00:15)

### RECONFIGURING EMPTY EMUs IN AIRLOCK

- |   |          |                          |  |  |
|---|----------|--------------------------|--|--|
| IV  |          | <input type="checkbox"/> | 1. When $\Delta P < 0.5$ , open hatch  |  |
|   | MD(flir) | <input type="checkbox"/> | 2. As reqd, remove diffuser cap at middeck floor, stow   |  |
|   |          | <input type="checkbox"/> | 3. As reqd, unstow airlock vent duct, connect end to middeck floor fitting   |  |
|   | A/L      | <input type="checkbox"/> | 4. Configure appropriate vent ducts for airflow into airlock   |  |
|   |          | <input type="checkbox"/> | 5. Install EMU 3017 in PORT AAP (RayJ's suit), EMU 3003 in STBD AAP (Scooter's suit)                                 |  |
|   | EMU 3003 | <input type="checkbox"/> | 6. Connect SCU1  |  |
|   | EMU 3017 | <input type="checkbox"/> | 7. Connect SCU2  |  |
|   | AW18H    | <input type="checkbox"/> | 8. $\sqrt{\text{PWR/BATT CHGR EMU 1,2 MODE (two) - PWR}}$<br>$\text{PWR/BATT CHGR EMU 1,2 BUS SEL (two) - MNA(MNB)}$ |  |
|   | DCM      | <input type="checkbox"/> | 9. POWER - SCU   |  |
| BOTH  | DCM      | <input type="checkbox"/> | 10. O2 ACT - OFF   |  |
|   |          | <input type="checkbox"/> | 11. Install WATER sw guards (two)  |  |
|   |          | <input type="checkbox"/> | 12. FAN - OFF (fwd)  |  |
|   |          | <input type="checkbox"/> | 13. PURGE vlv - op (up)  |  |
|   |          | <input type="checkbox"/> | 14. COMM mode - OFF  |  |
|   |          | <input type="checkbox"/> | 15. When $\boxed{\text{O2 P}} > 800$ , then continue with the next steps   |  |
|   | AW18H    | <input type="checkbox"/> | 16. $\text{PWR/BATT CHGR EMU 1,2 BUS SEL (two) - OFF}$<br>$\text{PWR/BATT CHGR EMU 1,2 MODE (two) - OFF}$            |  |
|   |          | <input type="checkbox"/> | 17. Remove Helmet Lights from EMU 3003 and install onto EV3's helmet   |  |
|   |          | <input type="checkbox"/> | 18. Remove MMWS and right swing arm from EMU 3003 for installing onto EV3 during HST EVA 2 PREP                      |  |
| If performing EVAs 2 & 3 on the same day, perform the following steps, else hold this config for EMU battery charging after 4-hr cool down period |          |                          |  |  |
|   | EMU 3003 | <input type="checkbox"/> | 19. Remove SCU; install DCM cover  |  |
|   |          | <input type="checkbox"/> | 20. Stow SCU on AAP, Velcro to wall  |  |
|   |          | <input type="checkbox"/> | 21. Remove EMU 3003 from Airlock, stow in middeck for EVA 3  |  |
|   |          | <input type="checkbox"/> | 22. Install EV3's EMU 3015 in STBD AAP (Mass's suit)   |  |



# LON POST EVA 1 PART 2 (00:60)

## SUIT DOFFING

<b>WARNING</b> Do not doff EMU if DCS symptoms resolved during REPRESS. √MCC via PMC
---

- |      |         |   |  |
|------|---------|---|--|
| IV   |         | <input type="checkbox"/> <input type="checkbox"/> | 1. When $\Delta P < 0.5$ , open hatch                                      |
|      | MD(flr) | <input type="checkbox"/> <input type="checkbox"/> | 2. As reqd, remove diffuser cap at middeck floor, stow                     |
|      |         | <input type="checkbox"/> <input type="checkbox"/> | 3. As reqd, unstow airlock vent duct, connect end to middeck floor fitting |
|      | A/L     | <input type="checkbox"/> <input type="checkbox"/> | 4. Configure appropriate vent ducts for airflow into airlock               |
|      |         | <input type="checkbox"/> <input type="checkbox"/> | 5. As reqd, perform BOOSTER FAN INSTALLATION/ACTIVATION (AIRLOCK CONFIG)   |
| BOTH | DCM     | <input type="checkbox"/> <input type="checkbox"/> | 6. Install WATER sw guards (two)   |
|      |         | <input type="checkbox"/> <input type="checkbox"/> | 7. √Gloves clean   |

\* If reqd, IV use damp towel to clean gloves \*

- |      |     |   |   |
|------|-----|---|---|
| BOTH | DCM | <input type="checkbox"/> <input type="checkbox"/> | 8. O2 ACT – OFF   |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 9. PURGE vlv – op (up)  |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 10. √STATUS: <span style="border: 1px solid black; padding: 2px;">SUIT P</span> < 0.4 (compare w/gauge); disconnect gloves, stow in EMU Equipment Bag |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 11. Disconnect helmet, stow   |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 12. Outer Hatch Equal vlv caps (two) – installed  |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 13. AAP release handles to 90 degrees   |
| BOTH |     | <input type="checkbox"/> <input type="checkbox"/> | 14. Engage HUT in AAP (IV assist as reqd)   |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 15. AAP release handles to lock   |
|      | DCM | <input type="checkbox"/> <input type="checkbox"/> | 16. FAN – OFF (fwd)   |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 17. COMM mode – OFF   |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 18. Doff comm cap   |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 19. Disconnect waist ring, LCVG, biomed   |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 20. √Wrist disconnects – op   |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 21. Doff EV glasses   |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 22. Doff HUT  |
|      |     | <input type="checkbox"/> <input type="checkbox"/> | 23. Doff LTA, secure to handrail  |

Continue Suit Doffing with EV2. EV1 should remain partially dressed for next EVA if performing on same day

- |      |          |   |   |
|------|----------|---|---|
| BOTH |          | <input type="checkbox"/> <input type="checkbox"/> | 24. Inspect gloves for damage<br>Report damage to MCC   |
|      |          | <input type="checkbox"/> <input type="checkbox"/> | 25. Remove dosimeter from LCVG; insert in inflight garment  |
|      |          | <input type="checkbox"/> <input type="checkbox"/> | 26. Doff: LCVG (put inside HUT)<br>TCU (allow to dry, as reqd)<br>MAG, stow in wet trash                |
| EV2  | EMU 3004 | <input type="checkbox"/> <input type="checkbox"/> | 27. Remove drink bag from HUT and dispose in wet trash  |
|      |          | <input type="checkbox"/> <input type="checkbox"/> | 28. √Drink Bag Restraint Bag installed in HUT   |
| EV1  | EMU 3008 | <input type="checkbox"/> <input type="checkbox"/> | 29. Check drink bag, refill as required   |
|      |          | <input type="checkbox"/> <input type="checkbox"/> | 30. Install new METOX and EMU battery (ref <u>STS-400 EVA CONSUMABLES CUE CARD</u> )                    |
| BOTH | DCM      | <input type="checkbox"/> <input type="checkbox"/> | 31. √STATUS: <span style="border: 1px solid black; padding: 2px;">O2 P</span> > 800 (recharge complete) |

If performing EVAs 2 and 3 on the next day, perform the following steps:  
If performing all EVAs on the same day, continue on to LON EMU CONFIG FOR EVA 2 TRANSFER

EMU WATER RECHARGE (5 min)

R11L   32. SPLY H2O TKA OUTLET – CL (tb-CL)

**SM 60 TABLE MAINT**

CRT   33. Use TKB quantity:  
PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC

34. Log value before recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

AW82D   35. √EMU 1,2 H2O WASTE tb (two) – CL  
EMU 1,2 SPLY (two) – OP (tb-OP)

CRT   36. √H2O TKB quantity decreasing

SUIT DRYING/SEAL WIPE

BOTH EMU   37. Wipe with drying towel:  
LTA, legs, boots  
HUT, suit arms  
Gloves

38. Inspect gloves for damage  
Report damage to MCC

**WARNING**  
Avoid stericide contact with eyes. Wash hands thoroughly after application

39. Wipe LTA crotch and HUT armpit areas with stericide (in EMU Servicing Kit)

40. Lightly wipe seals on LTA waist ring, arm wrist rings, HUT neck ring with lint-free wipe (in EMU Servicing Kit)

41. Clean, refurbish biomed

42. Remove drink bag from HUT and dispose in wet trash

43. √Drink Bag Restraint Bag installed in HUT

WATER FILL VERIFICATION (10 min)

DCM   44. √STATUS: **H2O WP** 8-15 psi and stable for ~30 sec  
(indicates charging complete)

**SM 60 TABLE MAINT**

CRT   45. Use TKB quantity:  
PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC

R11L   46. Log value after recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

NOTE

Full charge = ~6%/EMU

- R11L     47. SPLY H2O TKA OUTLET – OP (tb-OP)
- WCS     48. √FAN SEP same as HOSE BLOCK
- 49. MODE – COMMODE/MANUAL/EMU, posn guard over sw  
        (√airflow, WCS ON It on)
- AW82D   50. EMU 1,2 H2O SPLY (two) – CL (tb-CL)
- 51. Install SCOFs, lock
- DCM     52. O2 ACT – IV
- AW82H   53. EMU 1,2 H2O WASTE reg (two) – MAN OP

NOTE

Step 54 will be performed serially for EMU 1 and EMU 2

- AW82D   54. EMU 1(2) H2O WASTE (one) – OP (tb-OP) (1 min), then  
        – CL (tb-CL)  
        – Repeat for other EMU
- AW82H   55. EMU 1,2 H2O WASTE reg (two) – REGULATING
- DCM     56. O2 ACT – OFF
- 57. Remove SCOFs, stow
- WCS     58. MODE – AUTO (√WCS ON It off)

EMU POWERDOWN/OVERNIGHT STOW

- 59. Stow comm cap in arm of EMU
- 60. Install helmets and covers
- AW18D   61. AIRLK AUD PWR – OFF
- AW18H   62. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
        MODE (two)    – OFF
- AW82D   63. √EMU 1,2 H2O WASTE,SPLY tb (four) – CL
- AW82B   64. EV-1,EV-2 O2 vlv (two) – CL
- 65. Tether LTA to airlock handrail
- 66. Hang LCVGs, TCUs, and other EMU accessories for drying

X: SM 60 SM TABLE MAINT

- 67. Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

<u>Param Name</u>	<u>Param ID</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
EXT A/L H2O LINE T 1			
EXT A/L H2O SPLY ZN 1 T	0640181	43	<input type="checkbox"/> 145
EXT A/L LCG 2 SPLY ZN 1 T	0640182	<input type="checkbox"/> 49	<input type="checkbox"/> 145
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	<input type="checkbox"/> 145
EXT A/L LCG 2 SPLY ZN 2 T	0640185	<input type="checkbox"/> 45	<input type="checkbox"/> 145
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	<input type="checkbox"/> OSH

## EMU RESIZE FOR JOHNSON

This procedure will reconfigure **EMU 3017 for RayJ** for Transfer EVA 2. This resize will occur on the HST vehicle. Refer to figure 1

### NOTE

Reference EMU RESIZE (EMU CONTINGENCY PROCS) for component changeout steps.

All hardware being stowed needs to be in a pouch OR have a cover installed

### CAUTION

Remove rings and other jewelry before exposing EMU bladder

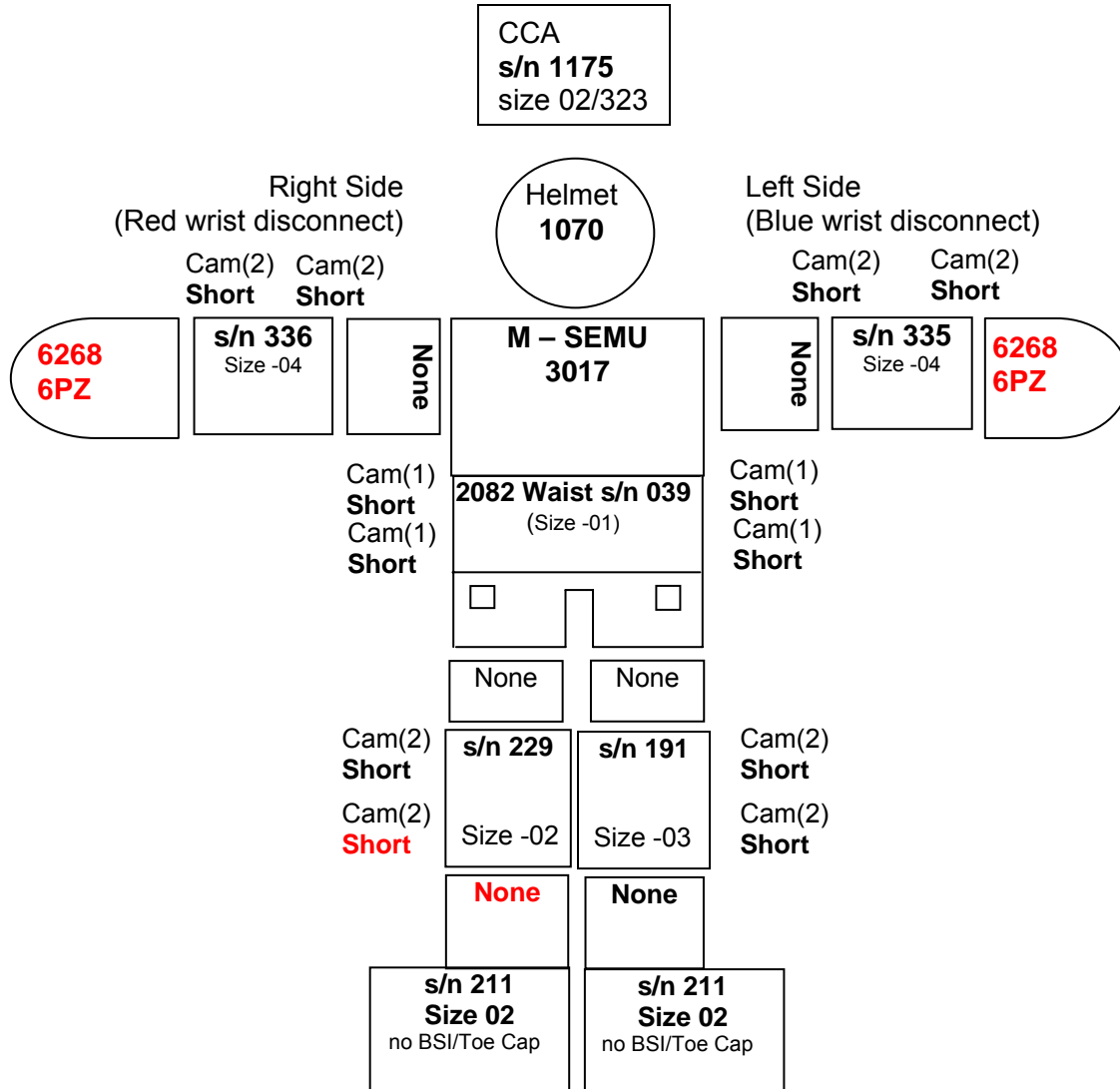
✓ All seals are clean and free of debris before making connections

### Reconfiguring EMU 3017 for Johnson

1. Remove GF cont gloves, s/n 6108
2. Retrieve and stow in EMU Equipment Bag, FT b/u gloves 6268 for RayJ to don
3. Remove right boot, s/n 211 and Leg Sizing Ring, s/n 124  
Reinstall right boot
4. Adjust Lower Cam on Right Leg to Short position. Verify all cams per the figure
5. Install Valsalva for RayJ as required
6. Stow removed components

NOTE

- All labels show serial numbers on top
- **BLACK** font indicates hardware already on **EMU 3017**
- **RED** font indicates hardware changes

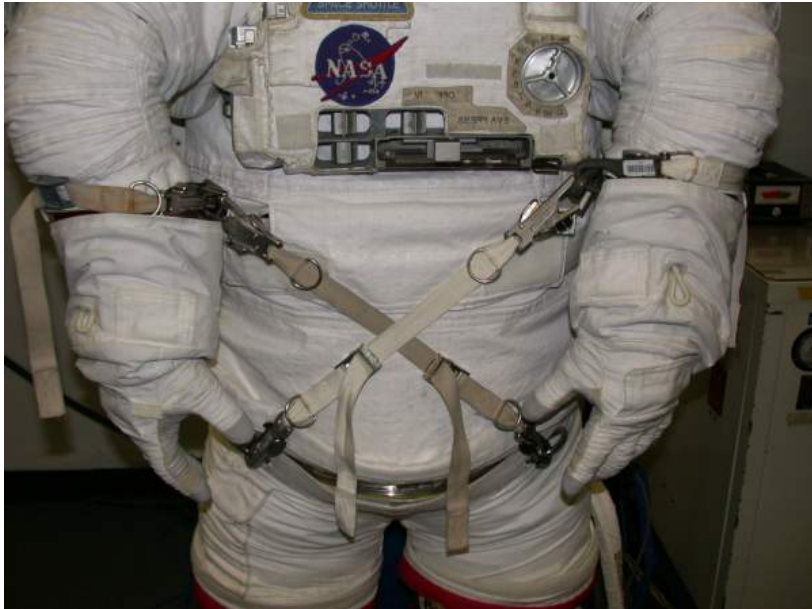


FINAL EMU 3017 CONFIG FOR JOHNSON

## LON EMU CONFIG FOR EVA 2 TRANSFER (00:20)

### Configure EMU 3004 for Transfer in Vacuum

- If performing EVAs over 2 days
- AW18H   1. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
MODE (two) – OFF
2. Connect LCVG(FT), √locked
3. As necessary remove helmet, gloves, and boots; position LCVG arms and legs in HUT arms and LTA legs
4. Install pigtail adapter to signal conditioner and electrical harness
5. Attach waist ring to HUT
6. Reinstall gloves and boots if required
7. Install helmet, as required
8. √Helmet purge vlv – cl, locked
- DCM  9. PURGE vlv – cl (dn)
10. Configure all helmet visors and shades to be down
11. Install thermal mittens from HST TSA (brought inside on EVA 1)
12. Engage HUT in PORT AAP
- DCM  13. PWR – BATT
- If performing EVAs over 2 days
- DCM  14. √SCU connected
- AW18H  15. PWR/BATT CHGR EMU 2 MODE (one) – PWR  
BUS SEL (one) – MNA(MNB)
16. PWR – SCU
- DCM  17. DISP – STATUS, until LEAK CHECK? displayed  
DISP – YES (hold for 2 sec)  
Follow displayed instructions  
When Leak Check complete, continue with next step
18. Temp control vlv – 7
19. √Wrist rings – covered
20. √Waist rings – covered
- DCM  21. √COMM mode – OFF
22. √WATER – OFF
23. √PWR – SCU
24. √Comm FREQ – LOW
25. √Helmet Light ops
26. O2 ACT – PRESS
27. Install adjustable tethers (4) to restrain arms as shown
28. Verify LON RESCUE EVA 2 Tool Config



Tether Configuration for restraining empty EMU arms

# HST EVA 2 PREP (90 min)

MET \_\_\_/\_\_\_:\_\_\_

MET \_\_\_/\_\_\_:\_\_\_

MET \_\_\_/\_\_\_:\_\_\_

**X: SM 60 SM TABLE MAINT**

1. Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

Param Name	Param ID	Lower Limit	Upper Limit
EXT A/L H2O LINE T			
EXT A/L H2O SPLY ZN 1 T	0640181	43	100
EXT A/L LCG 2 SPLY ZN 1 T	0640182	36	85
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	100
EXT A/L LCG 2 SPLY ZN 2 T	0640185	36	82
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	80

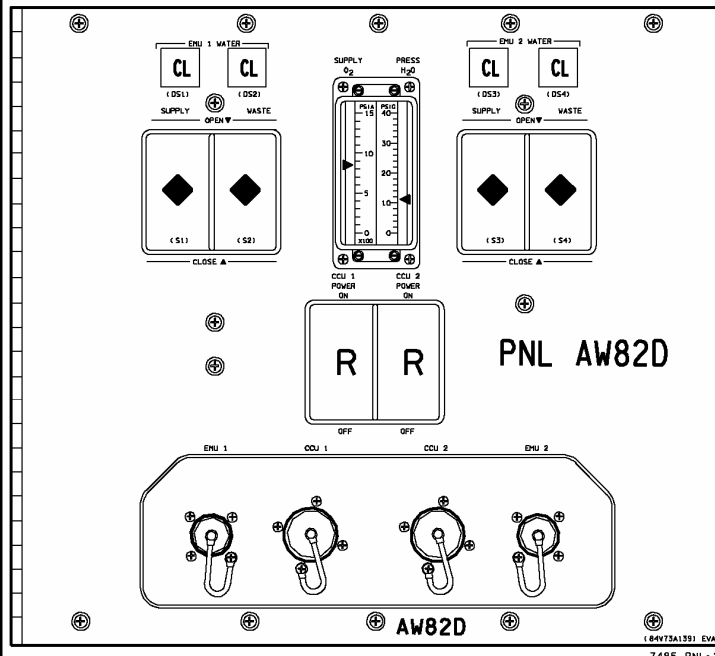
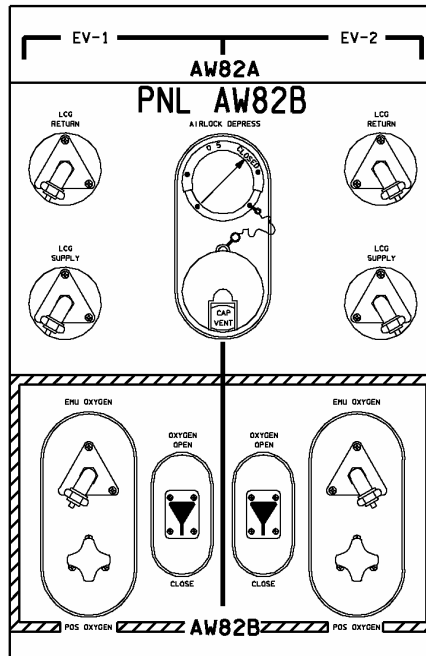
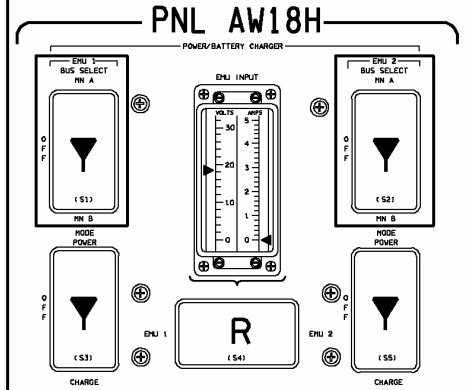
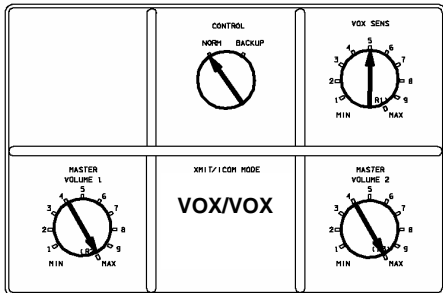
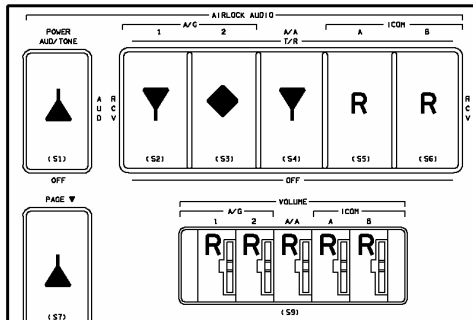
## PREP FOR DONNING (30 min)

- |          |                          |                          |  |
|----------|--------------------------|--------------------------|--|
| AW18H    | <input type="checkbox"/> | <input type="checkbox"/> | 2. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF<br>MODE (two) – OFF |
| EMU 3003 | <input type="checkbox"/> |                          | 3. Remove SCU; install DCM cover                                 |
|          |                          | <input type="checkbox"/> | 4. Remove EMU 3003 from Airlock, stow in middeck for EVA 3       |
| EMU 3015 | <input type="checkbox"/> |                          | 5. Install EV3's EMU 3015 in STBD AAP (Mass's suit)              |
| BOTH     | EMU                      | <input type="checkbox"/> | 6. Fill and install drink bags as required                       |
|          |                          | <input type="checkbox"/> | 7. Apply anti-fog to helmet as required                          |
| DCM      | <input type="checkbox"/> | <input type="checkbox"/> | 8. Retrieve, position SCU; connect SCU to DCM, √locked           |
| AW82B    | <input type="checkbox"/> | <input type="checkbox"/> | 9. √EV-1, EV-2 O2 vlv (two) – op                                 |
| MO13Q    | <input type="checkbox"/> | <input type="checkbox"/> | 10. √ARLK H2O S/O VLV – OPEN (tb-OP)                             |
| MD(flr)  | <input type="checkbox"/> | <input type="checkbox"/> | 11. √EMU O2 ISOL VLV – OP  |
| ML86B:C  | <input type="checkbox"/> | <input type="checkbox"/> | 12. √cb MNC EXT ARLK HTR ZN 1,2 (two) – op                       |
| L2       | <input type="checkbox"/> | <input type="checkbox"/> | 13. √O2 XOVR SYS 1,2 (two) – OP                                  |
| BOTH     | DCM                      | <input type="checkbox"/> | 14. PWR – BATT   |

<p><b>CAUTION</b>          EMU must be on BATT pwr when          airlock power supply turned on</p>
---

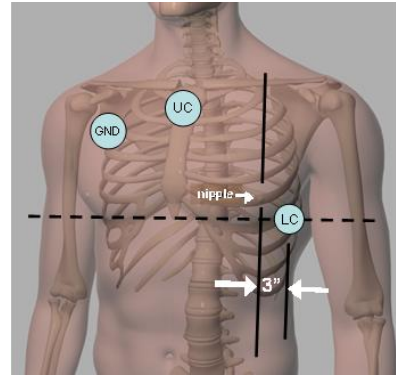
- |       |                          |                          |  |
|-------|--------------------------|--------------------------|--|
| AW18H | <input type="checkbox"/> | <input type="checkbox"/> | 15. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR<br>BUS SEL (two) – MNA(MNB) |
| DCM   | <input type="checkbox"/> | <input type="checkbox"/> | 16. PWR – SCU  |
|       | <input type="checkbox"/> | <input type="checkbox"/> | 17. √STATUS: <input type="checkbox"/> BATT VDC $\geq$ 20.3             |
|       | <input type="checkbox"/> | <input type="checkbox"/> | 18. Verify panels as shown next page                                   |





(84V73A139) EVA  
7485, PNL 2

- BOTH DCM
- 19. Comm FREQ – LOW
  - 20. COMM mode – PRI (EMU Hot mic to ground)
  - 21. Disconnect, transfer, temp stow LTAs, helmets, additional EMU(s) to middeck
  - 22. Remove Dosimeter from inflight garments; insert in LCVG
  - 23. Unstow biomed pigtail adapter (EMU Servicing Kit), connect to elec harness
  - 24. Don MAG, TCU, LCVG (sternal harness not required)



- DCM
- 25. Don comm caps
  - 26. Verify EMU data and RF comm with MCC
  - 27. COMM mode – HL

NOTE

Be prepared to verify a nominal powerup sequence after the next step and verify no missing segments on display and that all tones are audible

- 28. PWR – BATT  
Verify no missing segments during display test  
Verify status (continuous) tone and warble tone audible  
Verify BITE light extinguishes. Report anomalies to MCC
- 29. PWR – SCU
- 30. Doff comm caps
- AW18D   31. AIRLK AUD PWR – AUD/TONE

EMU DONNING (55 min)

NOTE

May be performed simultaneously by 2 crewmembers

- BOTH
- 32. Take one aspirin tablet (325 mg)
  - 33.  $\sqrt{\text{STATUS: SOP P}} = 5410-6800$  (compare w/gauge)
  - 34.  $\sqrt{\text{Waist ring – op}}$
  - 35. Don LTA, attach donning handles as reqd  
If boot bladder manipulation reqd:
    - 36. Disconnect boot from leg (sizing ring)
    - 37. Pull up excess boot bladder around full circumference of boot disconnect
    - 38. Connect boot to leg (sizing ring)
    - 39. Engage Lock 1
    - 40.  $\sqrt{\text{All locks (three per boot) engaged}}$

- |      |                          |                                     |   |
|------|--------------------------|-------------------------------------|---|
|      | <input type="checkbox"/> | <input type="checkbox"/>            | 41. Ingress Airlock   |
|      | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 42. Suit arms aligned   |
|      | <input type="checkbox"/> | <input type="checkbox"/>            | 43. Disconnect gloves; wrist disconnects – op                                       |
|      | <input type="checkbox"/> | <input type="checkbox"/>            | 44. Stow IV glasses   |
|      | <input type="checkbox"/> | <input type="checkbox"/>            | 45. Don thumb loops   |
|      | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 46. Drink valve posn before HUT donning   |
|      | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 47. Biomed elec harness outside of HUT  |
|      | <input type="checkbox"/> | <input type="checkbox"/>            | 48. Don HUT   |
|      | <input type="checkbox"/> | <input type="checkbox"/>            | 49. Release thumb loops   |
|      | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 50. Suit arms aligned   |
|      | <input type="checkbox"/> | <input type="checkbox"/>            | 51. Don EV glasses as reqd  |
|      | <input type="checkbox"/> | <input type="checkbox"/>            | 52. Don comm cap  |
| EV3  | DCM                      | <input type="checkbox"/>            | 53. COMM mode – HL, vol as reqd   |
| RayJ | DCM                      | <input type="checkbox"/>            | 54. COMM mode – PRI, vol as reqd (hot mic to ground, may not be able to adjust vol) |
|      |                          | <input type="checkbox"/>            | 55. Comm with IV  |
|      |                          | <input type="checkbox"/>            | 56. Connect biomed to elec harness  |
|      |                          | <input type="checkbox"/>            | 57. Connect LCVG to multiple water connector, locked                                |
|      |                          | <input type="checkbox"/>            | 58. Thermal cover clear of waist ring   |
|      |                          | <input type="checkbox"/>            | 59. Waist ring – engage posn  |
|      |                          | <input type="checkbox"/>            | 60. Connect waist ring to HUT, locked   |
|      |                          | <input type="checkbox"/>            | 61. Remove donning handles, stow in EMU Equipment Bag; cover waist ring             |

<p><b>CAUTION</b></p> <p>Pulling on drink bag blue bite vlv to adjust posn can cause vlv to release from stem</p>
---

- |           |                          |                                     |  |
|-----------|--------------------------|-------------------------------------|--|
|           | <input type="checkbox"/> | <input type="checkbox"/>            | 62. Drink vlv posn after HUT donning                 |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 63. Mike boom posn                                   |
|           | <input type="checkbox"/> | <input type="checkbox"/>            | 64. Don comfort gloves, wristlets                    |
|           | <input type="checkbox"/> | <input type="checkbox"/>            | 65. Wrist rings – engage posn                        |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 66. Don EV gloves, locked                            |
|           | <input type="checkbox"/> | <input type="checkbox"/>            | 67. Tighten palm restraint straps                    |
| RayJ only | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 68. REBA sw – OFF                                    |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 69. Glove heater sw (two) – OFF                      |
|           | <input type="checkbox"/> | <input type="checkbox"/>            | 70. Connect lower arm pwr harness to gloves          |
| ALL       | <input type="checkbox"/> | <input type="checkbox"/>            | 71. Stow slack or dangling pwr harness under arm TMG |
|           | <input type="checkbox"/> | <input type="checkbox"/>            | 72. Cuff C/L posn                                    |

<p><b>CAUTION</b></p> <p>Minimize fan operation with O2 ACT – OFF (~2 min)</p>
--

- |     |                          |                                     |   |
|-----|--------------------------|-------------------------------------|---|
| DCM | <input type="checkbox"/> | <input type="checkbox"/>            | 73. FAN – ON (PWR RESTART may occur)    |
|     | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 74. Elec harness clear of neck ring     |
|     | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 75. Don helmet, locked                  |
| DCM | <input type="checkbox"/> | <input type="checkbox"/>            | 76. O2 ACT – IV                         |
|     | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 77. Helmet purge vlv – cl, locked       |
| DCM | <input type="checkbox"/> | <input type="checkbox"/>            | 78. PURGE vlv – cl (dn)                 |
|     | <input type="checkbox"/> | <input type="checkbox"/>            | 79. Repeat steps 33-79 if done serially |

EMU CHECK (5 min)

BOTH

80. √Cooling

- \* If cooling insufficient slowly cycle temp control vlv \*
- \* between 7 and Max C while IV depresses and holds \*
- \* pump priming vlv on back of EMU (30 sec min) \*

DCM

- 81. Temp control vlv – as reqd
- 82. √Wrist rings – covered
- 83. √Waist rings – covered
- 84. √COMM mode – HL, PRI for RayJ
- 85. √WATER – OFF
- 86. √PWR – SCU
- 87. √FAN – ON
- 88. √Comm FREQ – LOW

EV3

DCM

- 89. √Helmet Light ops
- 90. √Helmet purge vlv – cl, locked
- 91. √PURGE vlv – cl (dn)
- 92. O2 ACT – PRESS
- 93. DISP – STATUS: until LEAK CHECK? msg displayed  
DISP – YES (hold for 2 sec), follow displayed instructions

- \* If PRESS FAIL/SUIT P X.X or LEAKAGE HI SUIT P X.X, \*
- \* go to FAILED LEAK CHECK (14.7/10.2 PSI), CC 6-4 \*
- \* (Cue Card) \*

EMU PURGE

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

NOTE

Flex arms and legs periodically and avoid overcooling during purge/prebreathe

CABIN P	PURGE DURATION (min)
10.2	8
14.7	12

DCM

- 1. √SCU connected
- 2. O2 ACT – PRESS
- 3. Verify no EMU fit issues
- 4. PURGE vlv – op (up), begin purge clock
- 5. When N2 purge complete (per table):  
PURGE vlv – cl (dn)  
O2 ACT – IV

## EMU PREBREATHE

MET ____/____:____
--------------------

MET ____/____:____
--------------------

MET ____/____:____
--------------------

EV1 from LON will depress first, then will wait for EV3 and PLT to finish depressing before coming out of the airlock

- |    |           |   |   |  |  |
|----|-----------|---|---|--|--|
| IV | R1        | <input type="checkbox"/> <input type="checkbox"/> | 1. Begin prebreathe clock after purge complete  |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 2. O2 TK3 HTR A(B) – as reqd  |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 3. Egress AAP, stow handles, as reqd  |  |  |
| IV | AW82B     | <input type="checkbox"/> <input type="checkbox"/> | 4. AIRLK DEPRESS vlv cap – vent, remove, stow   |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 5. Remove loose equipment   |  |  |
|    |           |   | As reqd per MCC,<br>set battery amp-hours:  |  |  |
|    | DCM       | <input type="checkbox"/> <input type="checkbox"/> | 6. DISP – STATUS until <span style="border: 1px solid black; padding: 2px;">BATT? 32.0AH</span> displayed                         |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 7. DISP – YES (hold for 2 sec)  |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 8. Use DISP to status to desired value  |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 9. When desired value selected, DISP – YES (hold for 2 sec)   |  |  |
| IV |           | <input type="checkbox"/> <input type="checkbox"/> | 10. Install MWS and BRTs (as reqd)  |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 11. <input checked="" type="checkbox"/> EVA tools installed in airlock  |  |  |
|    | A/L       | <input type="checkbox"/> <input type="checkbox"/> | 12. Remove, stow appropriate vent ducts to allow hatch closure  |  |  |
|    | MD(flir)  | <input type="checkbox"/> <input type="checkbox"/> | 13. As reqd, disconnect vent duct from middeck floor fitting; stow  |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 14. As reqd, unstow, install diffuser cap on middeck floor fitting  |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 15. <input checked="" type="checkbox"/> Loose middeck-stowed items clear of inner hatch and middeck diffuser cap air flow         |  |  |
|    | DCM       | <input type="checkbox"/> <input type="checkbox"/> | 16. Remove WATER sw guards (two), stow in EMU Equipment Bag   |  |  |
|    | A/L(flir) | <input type="checkbox"/> <input type="checkbox"/> | 17. Deploy floor EVA hatch supports   |  |  |
|    | AW18D     | <input type="checkbox"/> <input type="checkbox"/> | 18. <input checked="" type="checkbox"/> XMIT/ICOM Mode – VOX/VOX  |  |  |
| IV | RayJ      | <input type="checkbox"/> <input type="checkbox"/> | 19. REBA sw – ON (toward right arm of suit)   |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 20. <input checked="" type="checkbox"/> <u>RESCUE EVA 2 DEPRESS/REPRESS CUE CARD</u> in Airlock                                   |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 21. Egress Airlock  |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 22. Inner hatch – close, lock   |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 23. <input checked="" type="checkbox"/> Inner hatch Equal vlv caps (two) – removed  |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 24. Inner hatch Equal vlv (two) – OFF   |  |  |
|    |           | <input type="checkbox"/> <input type="checkbox"/> | 25. When prebreathe time complete, <input checked="" type="checkbox"/> MCC for GO to <u>RESCUE EVA 2 DEPRESS/REPRESS CUE CARD</u> |  |  |

CABIN P		PREBREATHE DURATION
10.2	12 hr	01:15
	24 hr	00:40
14.7		04:00

# LON EVA 2 PREP (90 min)

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

**X: SM 60 SM TABLE MAINT**

- Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

Param Name	Param ID	Lower Limit	Upper Limit
EXT A/L H2O LINE T			
EXT A/L H2O SPLY ZN 1 T	0640181	43	<input type="text" value="100"/>
EXT A/L LCG 2 SPLY ZN 1 T	0640182	<input type="text" value="36"/>	<input type="text" value="85"/>
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	<input type="text" value="100"/>
EXT A/L LCG 2 SPLY ZN 2 T	0640185	<input type="text" value="36"/>	<input type="text" value="82"/>
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	<input type="text" value="80"/>

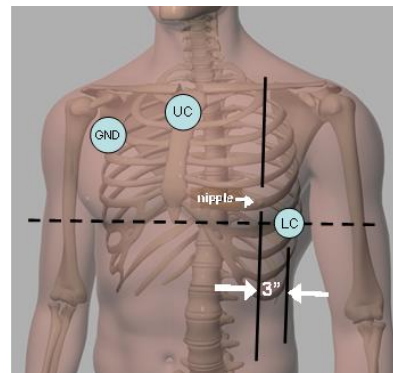
## PREP FOR DONNING (30 min)

Initial Condition: EV1 and EV2 EMUs are already connected and powered up on SCU if performing EVA on same day. EV1 will be re-donning his EMU, and EV2's EMU will be empty and pressurized. The empty EMU will pick up at Fan ON when EV1 turns his Fan ON

- ML86B:C  2.  $\sqrt{cb}$  MNC EXT ARLK HTR ZN 1,2 (two) – op  
L2  3.  $\sqrt{O2}$  XOVR SYS 1,2 (two) – OP

If performing EVAs over 2 days, perform steps 4-25, else pick up on step 26

- EV1  4. Apply anti-fog to helmet as required
- BOTH DCM  5.  $\sqrt{SCU}$  connected
- 6. PWR – BATT
- AW18H  7. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR  
BUS SEL (two) – MNA(MNB)
- 8. PWR – SCU
- EMU  9. Fill and install drink bags as required
- AW82B  10.  $\sqrt{EV-1, EV-2}$  O2 vlv (two) – op
- MO13Q  11.  $\sqrt{ARLK}$  H2O S/O VLV – OPEN (tb-OP)
- MD(flir)  12.  $\sqrt{EMU}$  O2 ISOL VLV – OP
- BOTH DCM  13. Comm FREQ – LOW
- 14. COMM mode – PRI (EMU Hot mic to ground)
- EV1  15. Disconnect, transfer, temp stow LTAs, helmets, additional EMU(s) to middeck
- 16. Remove Dosimeter from inflight garments; insert in LCVG
- 17. Unstow biomed pigtail adapter (EMU Servicing Kit), connect to elec harness
- 18. Don MAG, TCU, LCVG (sternal harness not required)



- 19. Don comm caps
- 20. Verify EMU data and RF comm with MCC
- 21. COMM mode – HL

NOTE

Be prepared to verify a nominal powerup sequence after the next step and verify no missing segments on display and that all tones are audible

- EV1  22. PWR – BATT  
Verify no missing segments during display test  
Verify status (continuous) tone and warble tone audible  
Verify BITE light extinguishes. Report anomalies to MCC
- 23. PWR – SCU
- 24. Doff comm caps
- AW18D  25. AIRLK AUD PWR – AUD/TONE

EMU DONNING (55 min)

- BOTH DCM  26.  $\sqrt{\text{STATUS: BATT VDC}} > 20.3$
- 27.  $\sqrt{\text{STATUS: SOP P}} = 5410-6800$  (compare w/gauge)
- EV1  28.  $\sqrt{\text{Waist ring – op}}$
- 29. Don LTA, attach donning handles as reqd  
If boot bladder manipulation reqd:
  - 30. Disconnect boot from leg (sizing ring)
  - 31. Pull up excess boot bladder around full circumference of boot disconnect
  - 32. Connect boot to leg (sizing ring)
  - 33. Engage Lock 1
  - 34.  $\sqrt{\text{All locks (three per boot) engaged}}$
- 35. Ingress Airlock
- 36.  $\sqrt{\text{Suit arms aligned}}$
- 37. Disconnect gloves;  $\sqrt{\text{wrist disconnects – op}}$
- 38. Stow IV glasses
- 39. Don thumb loops
- 40.  $\sqrt{\text{Drink valve posn before HUT donning}}$
- 41.  $\sqrt{\text{Biomed elec harness outside of HUT}}$
- 42. Don HUT
- 43. Release thumb loops
- 44.  $\sqrt{\text{Suit arms aligned}}$
- 45. Don EV glasses as reqd
- 46. Don comm cap
- DCM  47. COMM mode – HL, vol as reqd
- 48.  $\sqrt{\text{Comm with IV}}$
- 49. Connect biomed to elec harness
- 50. Connect LCVG to multiple water connector,  $\sqrt{\text{locked}}$
- 51.  $\sqrt{\text{Thermal cover clear of waist ring}}$
- 52. Waist ring – engage posn
- 53. Connect waist ring to HUT,  $\sqrt{\text{locked}}$
- 54. Remove donning handles, stow in EMU Equipment Bag; cover waist ring

CAUTION

Pulling on drink bag blue bite vlv to adjust posn can cause vlv to release from stem

- 55. √Drink vlv posn after HUT donning
- 56. √Mike boom posn
- 57. Don comfort gloves, wristlets
- 58. Wrist rings – engage posn
- 59. Don EV gloves, √locked
- 60. Tighten palm restraint straps
- 61. √Cuff C/L posn

**CAUTION**  
Minimize fan operation with O2 ACT – OFF (~2 min)

- BOTH DCM   62. FAN – ON for both EMUs (PWR RESTART may occur)
- EV1  63. √Elec harness clear of neck ring
- 64. Don helmet, √locked
- DCM  65. O2 ACT – IV
- 66. √Helmet purge vlv – cl, locked
- DCM  67. PURGE vlv – cl (dn)

**EMU CHECK** (5 min)

- EV1  68. √Cooling

\* If cooling insufficient slowly cycle temp control vlv \*  
 \* between 7 and Max C while IV depresses and holds \*  
 \* pump priming vlv on back of EMU (30 sec min) \*

- 69. Temp control vlv – as reqd
- 70. √Wrist rings – covered
- 71. √Waist rings – covered
- DCM  72. √COMM mode – HL
- 73. √WATER – OFF
- 74. √PWR – SCU
- 75. √FAN – ON
- 76. √Comm FREQ – LOW
- 77. √Helmet Light ops
- 78. √Helmet purge vlv – cl, locked
- DCM  79. √PURGE vlv – cl (dn)
- 80. O2 ACT – PRESS
- 81. DISP – STATUS: until LEAK CHECK? msg displayed  
 DISP – YES (hold for 2 sec), follow displayed instructions

\* If PRESS FAIL/SUIT P X.X or LEAKAGE HI SUIT P X.X, \*  
 \* go to FAILED LEAK CHECK (14.7/10.2 PSI), CC 6-4 \*  
 \* (Cue Card) \*



## EMU PURGE

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

### NOTE

Flex arms and legs periodically and avoid overcooling during purge/prebreathe

CABIN P	PURGE DURATION (min)
10.2	8
14.7	12

Only EV1 will purge. Should be ahead of the HST timeline. LON will depress first

- EV1 DCM  1.  $\sqrt$ SCU connected
- EV1  2. O2 ACT – PRESS (empty suit will stay in PRESS thru depress)
- EV1  3. Verify no EMU fit issues
- 4. PURGE vlv – op (up), begin purge clock (purge only GF)
- 5. When N2 purge complete (per table):  
PURGE vlv – cl (dn)  
O2 ACT – IV

## EMU PREBREATHE

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

EV1 should start prebreathe before HST crew does. LON will depress first

- IV R1  1. Begin prebreathe clock after Grunsfeld completes his purge
  - IV R1  2. O2 TK3 HTR A(B) – as reqd
  - IV AW82B  3. Egress AAP, stow handles
  - IV AW82B  4. AIRLK DEPRESS vlv cap – vent, remove, stow
  - 5. Remove loose equipment
- | CABIN P |       | PREBREATHE DURATION |
|---------|-------|---------------------|
| 10.2    | 12 hr | 01:15               |
|         | 24 hr | 00:40               |
| 14.7    |       | 04:00               |
- As reqd per MCC,  
set battery amp-hours:
- EV1 DCM  6. DISP – STATUS until BATT? 32.0AH displayed
  - 7. DISP – YES (hold for 2 sec)
  - 8. Use DISP to status to desired value
  - 9. When desired value selected, DISP – YES (hold for 2 sec)
  - IV  10. Install MWS and BRTs (as reqd)
  - 11.  $\sqrt$ EVA tools installed in Airlock
  - 12. As reqd, perform BOOSTER FAN DEACTIVATION/REMOVAL (AIRLOCK CONFIG)
  - A/L  13. Remove, stow appropriate vent ducts to allow hatch closure
  - MD(flr)  14. As reqd, disconnect vent duct from middeck floor fitting; stow
  - 15. As reqd, unstow, install diffuser cap on middeck floor fitting
  - 16.  $\sqrt$ Loose middeck-stowed items clear of inner hatch and middeck diffuser cap air flow
  - A/L(flr)  17. Deploy floor EVA hatch supports
  - Empty DCM  18.  $\sqrt$ RESCUE EVA 2 DEPRESS/REPRESS (Cue Card) in Airlock
  - AW18H  19. POWER – BATT
  - 20. PWR/BATT CHGR EMU 2 BUS SEL (one) – OFF  
PWR/BATT CHGR EMU 2 MODE (one) – PWR

Empty DCM

- 21. Remove SCU, stow
- 22. DISP – STATUS, until DATA?COMBO displayed
  - YES (hold for 2 sec)
  - STATUS, until DATA EMU? displayed
  - YES (hold for 2 sec)

Verify DATA?EMU displayed

- 23. COMM mode – PRI on Empty EMU
- 24. Remove WATER sw guards (two), stow in EMU Equipment Bag
- AW18D  25. XMIT/ICOM Mode – VOX/VOX (for RayJ when he is on HL for repress, will be hot mic to ground)
- 26. Position/restrain empty EMU clear of opening EV Hatch
- 27. Egress Airlock
- 28. Inner hatch – close, lock
- 29. ✓Inner hatch Equal vlv caps (two) – removed
- 30. Inner hatch Equal vlv (two) – OFF
- 31. When prebreathe time complete, ✓MCC for GO to EVA RESCUE EVA 2 DEPRESS/REPRESS (Cue Card)

HOOK  
VELCRO

HOOK  
VELCRO

**RESCUE EVA 2 DEPRESS/REPRESS CUE CARD**

<p><b>DEPRESS (10 min)</b> EV1 depresses first, and follows the EV3 callouts on this cue card for his suit only. When HST prebreathe complete and EV1 takes Comm Mode of the empty EMU on LON to HL, EV3 and RayJ can depress</p>		<p><b>PRE REPRESS (5 min)</b></p>	
EV3 RayJ	<p>DCM 1. √Comm FREQ – LOW 2. COMM mode – ALT 3. √COMM mode – PRI</p>	IV ML86B:C	<p>1. √cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op</p>
AW82B	<p>4. AIRLK DEPRESS vlv – 5, EV ALERT TONE, monitor suit P gauge &lt; 5.5 * If gauge &gt; 5.5, stop depress, √MCC * 5. Airlock at 6.0, EV ALERT TONE 6. When airlock at 5.0, AIRLK DEPRESS vlv – CL, EV ALERT TONE</p>	MD(flr) DCM	<p>2. √EMU O2 ISOL vlv – OP 3. √SCUs connected to DCM 4. √WATER – OFF for 2 min</p>
EV3	<p>DCM 7. DISP – STATUS: until [LEAK CHECK ?] displayed, DISP – YES (hold for 2 sec), follow displayed instructions * If [LEAKAGE HI   SUIT P X.X], go to FAILED * * LEAK CHECK (5 PSI), reverse side *</p>	BOTH	<p>5. √Outer hatch closed and locked 6. Disc waist tethers, attach to EMU</p>
RayJ	<p>DCM 8. √O2 ACT – EVA 9. On MCC GO, EV3 take RayJ O2 ACT – EVA</p>	AW82B AW18H	<p>7. √EV-1, EV-2 O2 vlv (two) – OP 8. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – MNA(MNB)</p>
AW82B	<p>10. AIRLK DEPRESS vlv – 0, EV ALERT TONE, monitor suit P gauge &lt; 5.5 * If gauge &gt; 5.5, stop depress, √MCC *</p>	DCM	<p>9. PWR – SCU, EV WARN TONE (IV record MET _ _ : _ _)</p>
BOTH	<p>11. Attach waist tether(s) to A/L D-ring for egress 12. Airlock dP/dT ~0, EV ALERT TONE 13. When outer hatch ΔP &lt; 0.5, outer hatch – open, stow</p>	<p><b>REPRESS (10 min)</b></p>	
AW82B	<p>14. AIRLK DEPRESS vlv – CL</p>	<p style="text-align: center;"><b>WARNING</b> If on SOP, leave O2 ACT – EVA thru airlock repress</p>	
<p><b>POST DEPRESS (5 min)</b> EV3 helps RayJ on these steps</p>		BOTH DCM	<p>1. O2 ACT – PRESS</p>
BOTH	<p>DCM 1. PWR – BATT, EV WARN TONE (IV record MET _ _ : _ _) [PET = 00:00]</p>	EV3	<p>2. √COMM mode – HL</p>
AW18H	<p>2. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF</p>	<p style="text-align: center;"><b>NOTE</b> IV expect dP/dT alarm during repress</p>	
DCM	<p>3. Disc SCU; install DCM cover 4. Stow SCU on AAP, Velcro to wall 5. Temp control vlv – Max H 6. WATER – ON 7. √DCM blank, BITE off 8. Temp control vlv – 3 to MAX C 9. √STATUS, compare to Cuff C/L, 1 (IV record) 10. Visors as reqd 11. Perform AIRLOCK EGRESS, Cuff C/L, 47, or Flight Specific Timeline</p>	AW82B	<p>3. √AIRLK DEPRESS vlv – CL 4. Inner hatch Equal vlv (one) – throttle OFF to NORM (as reqd), EV ALERT TONE 5. Airlock at 4.0, EV ALERT TONE 6. When airlock at 5.0, Equal vlv – OFF, EV ALERT TONE</p>
IV	<p>ML86B:C 12. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl</p>	DCM	<p>7. √Airlock pressure integrity (2 min, ΔP ≤ 0.1 psi) 8. √Gloves clean</p>
		<p style="text-align: center;"><b>WARNING</b> If Cuff 1 symp resolve upon repress, report as Cuff 2 If any DCS, leave O2 ACT – PRESS</p>	
		DCM	<p>9. O2 ACT – IV, if possible 10. Inner hatch Equal vlv (one) – NORM, EV ALERT TONE 11. Airlock dP/dT ~0, EV ALERT TONE 12. Go to HST or LON <u>POST EVA 2</u></p>

EVA-8a/125/O/A

HOOK  
VELCRO

HOOK  
VELCRO

(reduced copy)



TOP  
BACK OF 'RESCUE EVA 2 DEPRESS/REPRESS CUE CARD'

HOOK  
VELCRO

HOOK  
VELCRO



HOOK  
VELCRO

(reduced copy)

HOOK  
VELCRO

EVA-8b/125/O/B



## HST POST EVA 2 (00:30)

### SUIT DOFFING

**WARNING**  
Do not doff EMU if DCS symptoms resolved during REPRESS. √MCC via PMC

- IV  1. When  $\Delta P < 0.5$ , open hatch
- MD(flir)  2. As reqd, remove diffuser cap at middeck floor, stow
- A/L  3. As reqd, unstow airlock vent duct, connect end to middeck floor fitting
- EV3  4. Configure appropriate vent ducts for airflow into airlock
5. √Gloves clean

\* If reqd, IV use damp towel to clean gloves \*

- BOTH DCM   6. Install WATER sw guards (two)
7. O2 ACT – OFF
8. PURGE vlv – op (up)
- DCM   9. √STATUS: SUIT P < 0.4 (compare w/gauge); disconnect gloves, stow in EMU Equipment Bag
10. Disconnect helmet, stow
- BOTH   11. AAP release handles to 90°
12. Engage HUT in AAP (IV assist as reqd)
13. AAP release handles to lock
- DCM   14. FAN – OFF (fwd)
15. COMM mode – OFF
16. Doff comm cap
17. Disconnect waist ring, LCVG, biomed
18. √Wrist disconnects – op
19. Doff EV glasses
20. Doff HUT

### NOTE

EV3 should remain in his LCVG for next EVA

- EV3  21. Inspect gloves for damage  
Report damage to MCC
22. Check drink bag, refill as required

### OXYGEN RECHARGE VERIFICATION

- BOTH DCM   23. √STATUS: O2 P > 800 (recharge complete)

### EMU POWERDOWN

24. Stow comm cap in arm of EMU
- AW18H   25. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
√PWR/BATT CHGR EMU 1,2 MODE (two) – PWR

CONFIGURING FOR EVA 3

- EV3 DCM  26. Remove SCU; install DCM cover  
 27. Stow SCU on AAP, Velcro to wall  
 28. Remove EV3 EMU from STBD AAP, temp stow
- EMUs 3015, 3004  29. Install LiOH and EMU Batteries (ref STS-400 EVA CONSUMABLES CUE CARD)
- EMU 3003  30. Install REBA battery into CDR EMU (ref STS-400 EVA CONSUMABLES CUE CARD) (ref REBA BATTERY INSTALLATION (EMU MAINTENANCE/RECHARGE))  
 31. Perform REBA C/O on CDR EMU (ref REBA POWERED HARDWARE CHECKOUT (CHECKOUTS))
- IV EMU 3003  32. Install CDR EMU on STBD AAP
- R1  33. O2 TK3 HTR A(B) – as reqd
- AW82B  34. √AIRLK DEPRESS vlv cap removed  
 35. Install MWS and BRTs (as reqd) on EMUs 3004 and 3015  
 36. √Inner hatch Equal vlv caps (two) – removed  
 37. √RESCUE EVA 3 DEPRESS/REPRESS CUE CARD in Airlock

## LON POST EVA 2 (00:20)

### SUIT DOFFING

**WARNING**  
Do not doff EMU if DCS symptoms resolved during REPRESS. √MCC via PMC

- |    |          |   |  |
|----|----------|---|--|
| IV |          | <input type="checkbox"/> <input type="checkbox"/> | 1. When $\Delta P < 0.5$ , open hatch                                      |
|    | MD(flir) | <input type="checkbox"/> <input type="checkbox"/> | 2. As reqd, remove diffuser cap at middeck floor, stow                     |
|    |          | <input type="checkbox"/> <input type="checkbox"/> | 3. As reqd, unstow airlock vent duct, connect end to middeck floor fitting |
|    | A/L      | <input type="checkbox"/> <input type="checkbox"/> | 4. Configure appropriate vent ducts for airflow into airlock               |
|    |          | <input type="checkbox"/> <input type="checkbox"/> | 5. As reqd, perform BOOSTER FAN INSTALLATION/ACTIVATION (AIRLOCK CONFIG)   |
| EV |          | <input type="checkbox"/> <input type="checkbox"/> | 6. √Gloves clean   |

\* If reqd, IV use damp towel to clean gloves \*

- |      |       |   |   |
|------|-------|---|---|
| BOTH | DCM   | <input type="checkbox"/> <input type="checkbox"/> | 7. O2 ACT – OFF   |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 8. PURGE vlv – op (up)  |
| RayJ |       | <input type="checkbox"/>                          | 9. √Glove heaters sw (one per glove) – OFF  |
|      |       | <input type="checkbox"/>                          | 10. REBA sw – OFF (toward left arm of suit)   |
|      |       | <input type="checkbox"/>                          | 11. Disconnect lower arm pwr harness from gloves  |
|      |       | <input type="checkbox"/>                          | 12. Stow lower arm and glove pwr harness connectors under TMG   |
| BOTH | DCM   | <input type="checkbox"/> <input type="checkbox"/> | 13. √STATUS: <span style="border: 1px solid black; padding: 2px;">SUIT P</span> < 0.4 (compare w/gauge); disconnect gloves, stow in EMU Equipment Bag |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 14. Disconnect helmet, stow   |
|      | AW82B | <input type="checkbox"/> <input type="checkbox"/> | 15. AIRLK DEPRESS vlv – install cap   |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 16. AAP release handles to 90°  |
| BOTH |       | <input type="checkbox"/> <input type="checkbox"/> | 17. Engage HUT in AAP (IV assist as reqd)   |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 18. AAP release handles to lock   |
|      | DCM   | <input type="checkbox"/> <input type="checkbox"/> | 19. FAN – OFF (fwd)   |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 20. COMM mode – OFF   |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 21. Doff comm cap   |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 22. Disconnect waist ring, LCVG, biomed   |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 23. √Wrist disconnects – op   |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 24. Doff EV glasses   |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 25. Doff HUT  |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 26. Doff LTA, secure to handrail  |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 27. Remove dosimeter from LCVG; insert in inflight garment  |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 28. Doff: LCVG (temp stow for drying)<br>TCU (allow to dry, as reqd)<br>MAG, stow in wet trash  |
| BOTH |       | <input type="checkbox"/> <input type="checkbox"/> | 29. Inspect gloves for damage<br>Report damage to MCC   |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 30. Remove drink bag from HUT and dispose in wet trash  |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 31. √Drink Bag Restraint Bag installed in HUT   |

### EMU POWERDOWN

- |      |       |   |   |
|------|-------|---|---|
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 32. Install helmets   |
|      | AW18H | <input type="checkbox"/> <input type="checkbox"/> | 33. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF<br>MODE (two) – PWR |
| BOTH | DCM   | <input type="checkbox"/> <input type="checkbox"/> | 34. Remove SCU; install DCM cover                                 |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 35. Stow SCU on AAP, Velcro to wall                               |
|      |       | <input type="checkbox"/> <input type="checkbox"/> | 36. Temp stow LTAs  |

## EMU RESIZE FOR GOOD

This procedure will reconfigure **EMU 3004 for Good** for Transfer EVA 3. This reconfiguration will occur on the HST vehicle. Refer to figure 1

### NOTE

Reference EMU RESIZE (EMU CONTINGENCY PROCS) for component changeout steps.

All hardware being stowed needs to be in a pouch OR have a cover installed

### CAUTION

Remove rings and other jewelry before exposing EMU bladder

✓All seals are clean and free of debris before making connections

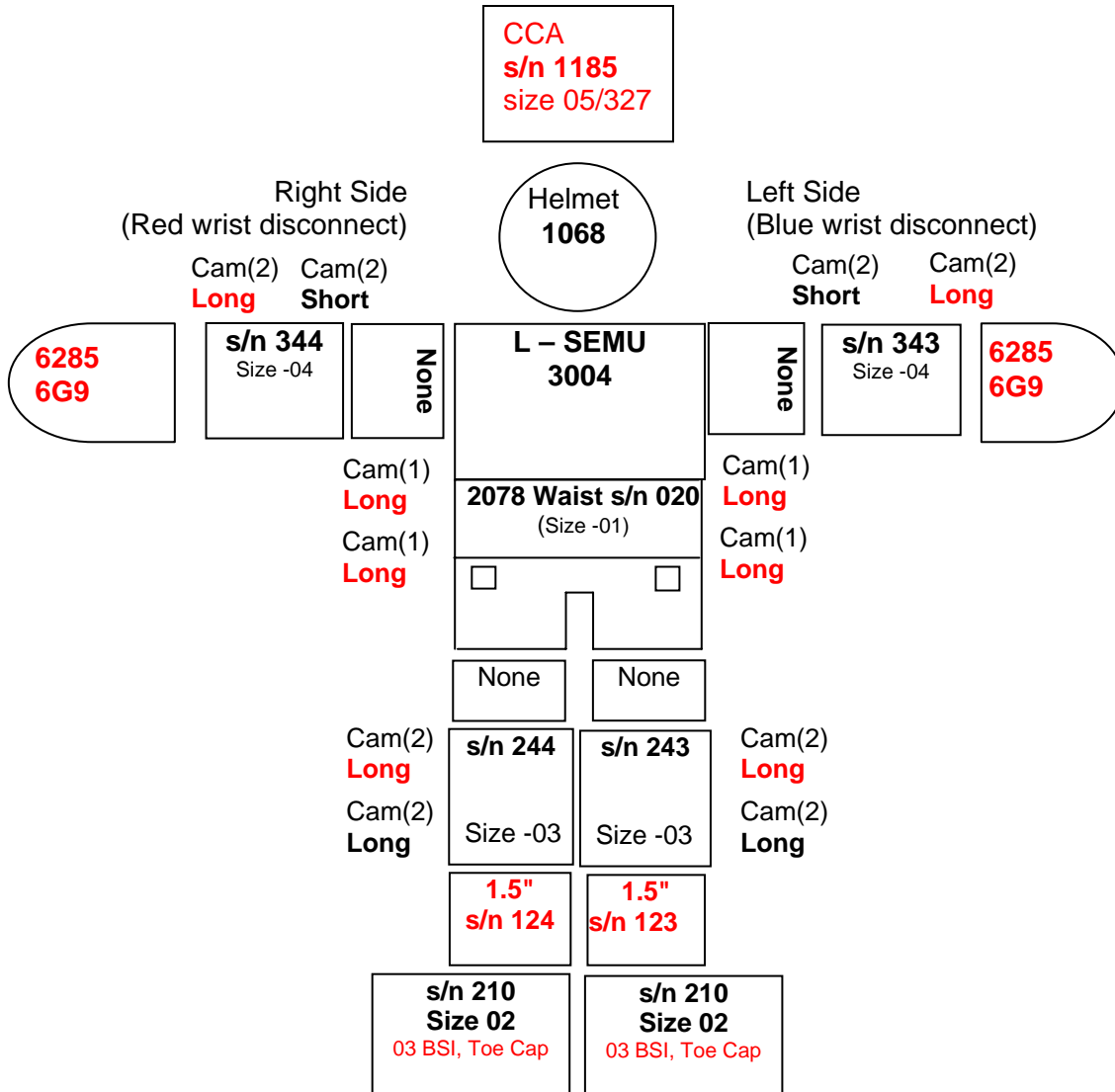
### Reconfiguring EMU 3004 for Good

1. Remove and stow FT gloves, s/n 6245
2. Retrieve and stow G gloves 6285 in A/L for donning
3. Remove Helmet s/n 1068 and remove Valsalva  
Use Gray Tape to remove adhesive  
Install G valsalva  
Temp stow Helmet in A/L for EMU donning
4. Remove CCA 1209, install CCA 1185 from G ECOK
5. Adjust/Verify Arm cams in Short/Long position (see figure)
6. Adjust/verify Upper and Lower Waist Cams to Long position
7. Adjust/Verify Upper Leg Cams to Long position and Lower Leg Cams in Long position
8. Remove Boots, s/n 210 and 0.5" Leg Sizing Rings, s/n 120 and 121  
Stow 0.5" Leg Sizing Rings  
Install 03 BSIs and Toe Caps in Boots s/n 210 if desired
9. Install 1.5" Leg Sizing Rings, s/n 123 and 124
10. Reinstall Boots, s/n 210
11. Stow all removed components



NOTE

- All labels show serial numbers on top
- **BLACK** font indicates hardware already on **EMU 3004**
- **RED** font indicates hardware changes



FINAL EMU 3004 CONFIG FOR GOOD

## LON EMU CONFIG FOR EVA 3 TRANSFER (00:20)

### Configure EMU 3017 and EMU 3008 for Transfer in Vacuum

- |            |                          |                          |  |   |
|------------|--------------------------|--------------------------|--|---|
| BOTH       | <input type="checkbox"/> | <input type="checkbox"/> | 1. <input checked="" type="checkbox"/> Helmet connected  |   |
| EMU        | <input type="checkbox"/> | <input type="checkbox"/> | 2. Remove METOX, install expended LiOH (ref <u>STS-400 EVA CONSUMABLES CUE CARD</u> )          |   |
| EMU 3008   | <input type="checkbox"/> | <input type="checkbox"/> | 3. Remove EMU Battery, install expended Battery (ref <u>STS-400 EVA CONSUMABLES CUE CARD</u> ) |   |
| BOTH       | <input type="checkbox"/> | <input type="checkbox"/> | 4. Install EMUs 3017 and 3008 in AAPs  |   |
| EMU 3017   | <input type="checkbox"/> | <input type="checkbox"/> | 5. Fill HUT and LTA cavity with RayJ LCVG and TCUs   |   |
|            | <input type="checkbox"/> | <input type="checkbox"/> | 6. Connect LTA   |   |
| Vol H INBD | <input type="checkbox"/> | <input type="checkbox"/> | 7. Retrieve helmet lights and batteries and install on helmet on EMU 3017                      |   |
| EMU 3008   | <input type="checkbox"/> | <input type="checkbox"/> | 8. Fill HUT and LTA cavity with GF LCVG and TCUs   |   |
|            | <input type="checkbox"/> | <input type="checkbox"/> | 9. Connect LTA   |   |
| BOTH       | DCM                      | <input type="checkbox"/> | <input type="checkbox"/>   | 10. <input checked="" type="checkbox"/> Helmet purge vlv – cl, locked   |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 11. PURGE vlv – cl (dn)   |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 12. As reqd, perform BOOSTER FAN DEACTIVATION/REMOVAL (AIRLOCK CONFIG)  |
| A/L        |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 13. Remove, stow appropriate vent ducts to allow hatch closure  |
| MD(flr)    |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 14. As reqd, disconnect vent duct from middeck floor fitting; stow  |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 15. As reqd, unstow, install diffuser cap on middeck floor fitting  |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 16. <input checked="" type="checkbox"/> Loose middeck-stowed items clear of inner hatch and middeck diffuser cap air flow |
| A/L(flr)   |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 17. Deploy floor EVA hatch supports   |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 18. Outer Hatch Equal vlv caps (two) – removed, stowed securely   |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 19. <input checked="" type="checkbox"/> Water switch guards (two) – removed   |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 20. <input checked="" type="checkbox"/> <u>RESCUE EVA 3 DEPRESS/REPRESS CUE CARD</u> in Airlock                           |
| BOTH       |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 21. Remove EMUs 3017 and 3008 from AAPs   |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 22. Tether EMUs to Airlock D-ring; position/restrain suits clear of opening EV hatch                                      |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 23. Egress Airlock  |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 24. Inner hatch – close, lock   |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 25. <input checked="" type="checkbox"/> Inner hatch Equal vlv caps (two) – removed  |
|            |                          | <input type="checkbox"/> | <input type="checkbox"/>   | 26. Inner hatch Equal vlv (two) – OFF   |

# HST EVA 3 PREP (90 min)

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

X: SM 60 SM TABLE MAINT

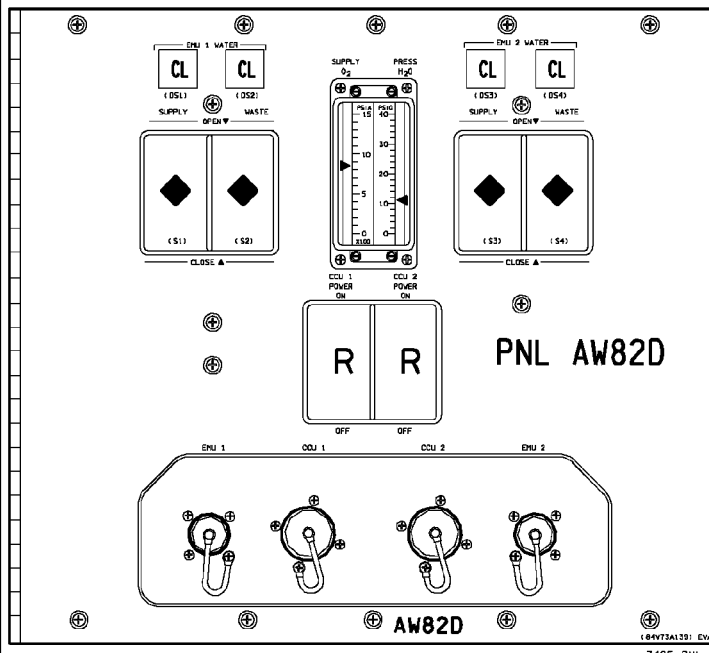
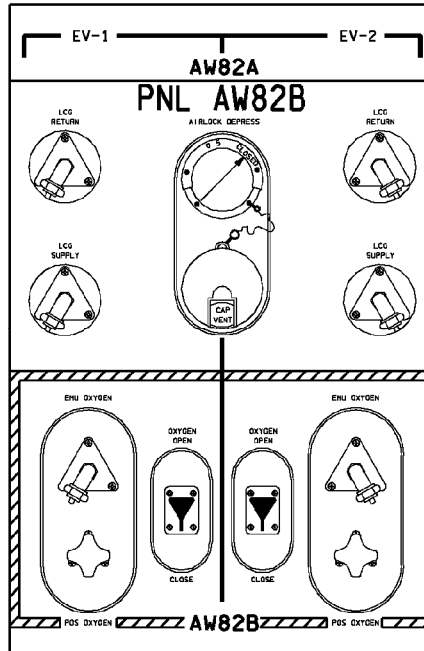
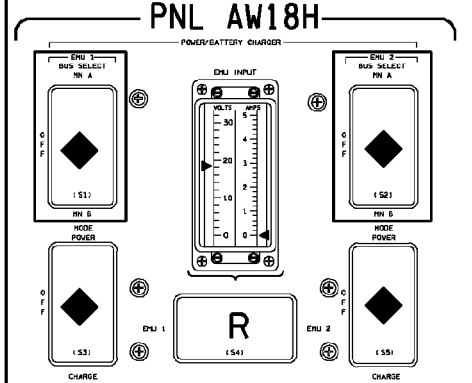
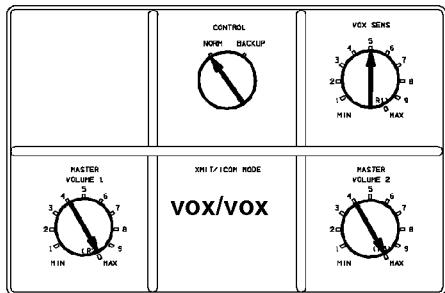
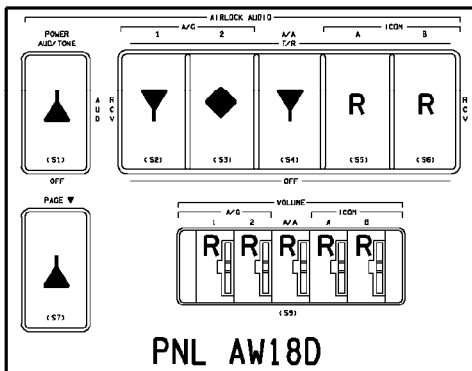
1. Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

Param Name	Param ID	Lower Limit	Upper Limit
EXT A/L H2O LINE T			
EXT A/L H2O SPLY ZN 1 T	0640181	43	<input type="text" value="100"/>
EXT A/L LCG 2 SPLY ZN 1 T	0640182	<input type="text" value="36"/>	<input type="text" value="85"/>
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	<input type="text" value="100"/>
EXT A/L LCG 2 SPLY ZN 2 T	0640185	<input type="text" value="36"/>	<input type="text" value="82"/>
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	<input type="text" value="80"/>

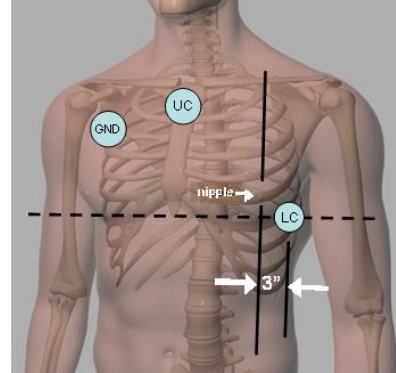
## PREP FOR DONNING (30 min)

Install Scooter's EMU on STBD AAP and EV4 suit in the PORT AAP. All will be in Battery power. EV4 and Scooter will have Comm Mode in PRI and Low. EV3 will have Comm Mode in ALT and Low. EV3 suit may perform in parallel, steps 3,12,14-27

- |             |                          |                          |                          |   |
|-------------|--------------------------|--------------------------|--------------------------|---|
| EMU         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 2. Install Scooter in STBD AAP, EV4 in PORT AAP   |
| BOTH EMU    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 3. Fill and install drink bags as required  |
|             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 4. Apply anti-fog to helmet as required   |
| Scooter EMU | <input type="checkbox"/> |                          |                          | 5. Install Valsalva for Scooter, remove any extras  |
| DCM         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 6. Retrieve, position SCU; connect SCU to DCM, <input checked="" type="checkbox"/> locked |
| AW82B       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 7. EV-1, EV-2 O2 vlv (two) – op   |
| MO13Q       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 8. <input checked="" type="checkbox"/> ARLK H2O S/O VLV – OPEN (tb-OP)                    |
| MD(flr)     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 9. <input checked="" type="checkbox"/> EMU O2 ISOL VLV – OP                               |
| ML86B:C     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 10. <input checked="" type="checkbox"/> cb MNC EXT ARLK HTR ZN 1,2 (two) – op             |
| L2          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 11. <input checked="" type="checkbox"/> O2 XOVR SYS 1,2 (two) – OP                        |
| ALL 3 DCM   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 12. PWR – BATT  |
|             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 13. Verify panels as shown next page  |



- |              |     |  |   |
|--------------|-----|--|---|
| ALL 3        | DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 14. Comm FREQ – LOW   |
| EV4, Scooter |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 15. COMM mode – PRI (EMU Hot mic to ground)                                     |
| EV3          |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 16. COMM mode – ALT (EMU Hot mic to ground)                                     |
|              |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 17. Disconnect, transfer, temp stow LTAs, helmets, additional EMU(s) to middeck |
| ALL          |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 18. Remove Dosimeter from inflight garments; insert in LCVG                     |
|              |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 19. Unstow biomed pigtail adapter (EMU Servicing Kit), connect to elec harness  |
|              |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 20. Don MAG, TCU, LCVG (sternal harness not required)                           |
| ALL 3        |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 21. Don comm caps   |
|              |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 22. Verify EMU data and RF comm with MCC  |
|              | DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 23. COMM mode – HL  |
|              |     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 24. PWR – SCU (will power off suits)  |



**NOTE**

Be prepared to verify a nominal powerup sequence after the next step and verify no missing segments on display and that all tones are audible

- |       |  |  |  |
|-------|--|--|--|
|       |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 25. PWR – BATT<br>Verify no missing segments during display test<br>Verify status (continuous) tone and warble tone audible<br>Verify BITE light extinguishes. Report anomalies to MCC |
|       |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 26. Doff comm caps   |
| AW18D |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 27. AIRLK AUD PWR – AUD/TONE   |

**EMU DORNING** (55 min)

Scooter and EV4 will don their HUTs first. EV3 will replace Scooter on AAP to don EV3's HUT. Scooter will complete to step 80 before coming out of the AAP

**NOTE**

May be performed simultaneously

- |              |  |  |   |
|--------------|--|--|---|
| Scooter, EV4 |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 28. Take one aspirin tablet (325 mg)  |
|              |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 29. $\sqrt{\text{STATUS: SOP P}} = 5410-6800$ (compare w/gauge)                   |
|              |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 30. $\sqrt{\text{Waist ring – op}}$   |
|              |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 31. Don LTA, attach donning handles as reqd<br>If boot bladder manipulation reqd: |
|              |  |  | 32. Disconnect boot from leg (sizing ring)  |
|              |  |  | 33. Pull up excess boot bladder around full circumference of boot disconnect      |
|              |  |  | 34. Connect boot to leg (sizing ring)   |
|              |  |  | 35. Engage Lock 1   |
|              |  |  | 36. $\sqrt{\text{All locks (three per boot) engaged}}$                            |

- Scooter, EV4
- 37. Ingress Airlock
  - 38. ✓ Suit arms aligned
  - 39. Disconnect gloves; ✓ wrist disconnects – op
  - 40. Stow IV glasses
  - 41. Don thumb loops
  - 42. ✓ Drink valve posn before HUT donning
  - 43. ✓ Biomed elec harness outside of HUT
  - 44. Don HUT
  - 45. Release thumb loops
  - 46. ✓ Suit arms aligned
  - 47. Don EV glasses as reqd
  - 48. Don comm cap
- EV4, Scooter  
EV3 DCM
- 49. COMM mode – PRI, Freq – Low, vol as reqd
  - 50. EV3 COMM mode – ALT
  - 51. ✓ Comm
  - 52. Connect biomed to elec harness
  - 53. Connect LCVG to multiple water connector, ✓ locked
  - 54. ✓ Thermal cover clear of waist ring
  - 55. Waist ring – engage posn
  - 56. Connect waist ring to HUT, ✓ locked
  - 57. Remove donning handles, install on next LTA;  
cover waist ring

CAUTION

Pulling on drink bag blue bite vlv to adjust posn  
can cause vlv to release from stem

- 58. ✓ Drink vlv posn after HUT donning
- 59. ✓ Mike boom posn
- 60. EV4 egresses AAP, will assist EV3 with suit donning
- 61. Scooter should complete to step 80 with EV3's help and hold for  
others to catch up

NOTE

Keep comfort gloves, wristlets, EV Gloves, and Helmets  
accessible to suited crewmembers in Airlock.

If cooling desired during donning by EV3 or EV4, they can  
turn their fans on with SCU connected. (LCVG needs to  
be connected too).

AAP handles should be in the 45° position for self egress

- 62. Repeat steps 29-59 for EV3 after EV4 completes them and  
Scooter is at step 80. Swap EV3 EMU into STBD AAP for  
donning after Scooter completes up to step 80. EV4 will help  
EV3 don his suit. Scooter can keep SCU until needed to swap  
for cooling

- EV3, EV4
- 63. EV3 and EV4 skip to step 81 to complete the two man donning  
steps

- Scooter only
- 64. Don comfort gloves, wristlets
  - 65. Wrist rings – engage posn
  - 66. Don EV gloves, ✓ locked
  - 67. Tighten palm restraint straps
  - 68. ✓ REBA sw – OFF
  - 69. ✓ Glove heater sw (two) – OFF

- 70. Connect lower arm pwr harness to gloves
- 71. REBA sw – ON (toward right arm of suit)
- 72. Stow slack or dangling pwr harness under arm TMG
- 73. ✓Cuff C/L posn

**CAUTION**  
Minimize fan operation with O2 ACT – OFF (~2 min)

- DCM
- 74. FAN – ON (PWR RESTART may occur)
  - 75. ✓Elec harness clear of neck ring
  - 76. Don helmet, ✓locked
  - 77. O2 ACT – IV  
Expect O2 USE HIGH message, PRO
  - 78. ✓Helmet purge vlv – cl, locked
  - 79. PURGE vlv – cl (dn)
  - 80. Remove WATER switch guard

**TWO MAN DONNING**

- EV3  
EV4 DCM
- 81. Egress AAP
  - 82. FAN – ON (PWR RESTART may occur)
  - 83. ✓Elec harness clear of neck ring
  - 84. Don helmet, ✓locked
  - 85. Temp control vlv – Max C, check cooling
  - 86. Temp control vlv – as reqd
  - 87. Don comfort gloves, wristlets
  - 88. Wrist rings – engage posn
  - 89. Don EV gloves, ✓locked
  - 90. Tighten palm restraint straps
  - 91. Stow slack or dangling pwr harness under arm TMG
  - 92. ✓Cuff C/L posn
- DCM
- 93. O2 ACT – IV  
Expect O2 USE HIGH message, PRO
  - 94. ✓Helmet purge vlv – cl, locked
  - 95. PURGE vlv – cl (dn)
  - 96. Remove WATER switch guard
  - 97. Repeat steps 81-97, two man donning for EV3, then go to EMU  
CHECK for all 3 crewmembers

**EMU CHECK (5 min)**

- ALL 3  98. ✓Cooling

\* If cooling insufficient slowly cycle temp control vlv \*  
\* between 7 and Max C while IV depresses and holds \*  
\* pump priming vlv on back of EMU (30 sec min) \*

- DCM
- 99. Temp control vlv – as reqd
  - 100. ✓Wrist rings – covered
  - 101. ✓Waist rings – covered
  - 102. ✓COMM mode – PRI (ALT for EV3)
  - 103. ✓WATER – OFF
  - 104. ✓PWR – BATT
  - 105. ✓FAN – ON
  - 106. ✓Comm FREQ – LOW
- EV3, EV4
- 107. ✓Helmet Light ops
  - 108. ✓Helmet purge vlv – cl, locked

- DCM  109. √PURGE vlv – cl (dn)  
 110. O2 ACT – PRESS  
 Expect  O2 USE HIGH message, PRO  
 111. DISP – STATUS: until  LEAK CHECK? msg displayed  
 DISP – YES (hold for 2 sec), follow displayed instructions
- \* If  PRESS FAIL/SUIT P X.X or  LEAKAGE HI  SUIT P X.X, \*  
 \* go to FAILED LEAK CHECK (14.7/10.2 PSI), CC 6-4 \*  
 \* (Cue Card) \*

EMU PURGE

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

NOTE

Flex arms and legs periodically and avoid overcooling during purge/prebreathe

CABIN P	PURGE DURATION (min)
10.2	8
14.7	12

Scooter and EV4 will purge for 8 min first. When they are done, EV3 will connect to the SCU used by EV4 and purge for another 8 min

- DCM  1. √SCU connected  
 2. O2 ACT – PRESS  
 3. Verify no EMU fit issues  
 4. PURGE vlv – op (up), begin purge clock  
 Expect  O2 USE HIGH message, PRO  
 5. When N2 purge complete (per table):  
 PURGE vlv – cl (dn)  
 O2 ACT – IV



## EMU PREBREATHE

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

MET \_\_\_\_/\_\_\_\_:\_\_\_\_

During prebreathe, all crewmembers will have Comm modes to PRI or ALT and Low Freq, and therefore hot mic to ground. All will be on BATT power so they can easily swap SCU for cooling

- |       |                          |                          |                          |   |  |
|-------|--------------------------|--------------------------|--------------------------|---|--|
|       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 1. Begin prebreathe clock after EV3 completes his purge |  |
|       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 2. Egress AAP, stow handles, as reqd                    |  |
| AW82B | <input type="checkbox"/> |                          |                          | 3. √AIRLK DEPRESS vlv cap – removed                     |  |

CABIN P		PREBREATHE DURATION
10.2	12 hr	01:15
	24 hr	00:40
14.7		04:00

As reqd per MCC,  
set battery amp-hours:

- |     |     |                          |                          |                          |   |  |
|-----|-----|--------------------------|--------------------------|--------------------------|---|--|
| ALL |     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 4. DISP – STATUS until <span style="border: 1px solid black; padding: 2px;">BATT? 32.0AH</span> displayed |  |
|     | DCM | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 5. DISP – YES (hold for 2 sec)  |  |
|     |     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 6. Use DISP to status to desired value  |  |
|     |     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 7. When desired value selected, DISP – YES (hold for 2 sec)   |  |
|     | A/L | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 8. Remove, stow appropriate vent ducts to allow hatch closure   |  |
|     |     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 9. Inner hatch – close, lock  |  |
|     |     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 10. Inner hatch Equal vlv (two) – OFF   |  |
|     |     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 11. When prebreathe time complete, √MCC for GO to <u>RESCUE</u><br><u>EVA 3 DEPRESS/REPRESS CUE CARD</u>  |  |

	HOOK VELCRO	<b>RESCUE EVA 3 DEPRESS/REPRESS CUE CARD</b>	HOOK VELCRO
<p><b>DEPRESS (10 min)</b></p> <p>When prebreathe complete</p> <p>DCM 1. √Comm FREQ – LOW</p> <p>AW82B 2. √COMM mode – PRI (ALT for EV3)</p> <p>3. AIRLK DEPRESS vlv – 5, EV ALERT TONE, monitor suit P gauge &lt; 5.5</p> <p style="padding-left: 40px;">* If gauge &gt; 5.5, <u>stop depress</u>, √MCC *</p> <p>4. Airlock at 6.0, EV ALERT TONE</p> <p>5. When airlock at 5.0, AIRLK DEPRESS vlv – CL, EV ALERT TONE</p> <p>DCM 6. DISP – STATUS: until <u>[LEAK CHECK ?]</u> displayed, DISP – YES (hold for 2 sec), follow displayed instructions</p> <p style="padding-left: 40px;">* If <u>[LEAKAGE HI   SUIT P X.X]</u>, go to <u>FAILED</u> *</p> <p style="padding-left: 40px;">* <u>LEAK CHECK (5 PSI)</u>, reverse side *</p> <p>7. √O2 ACT – EVA</p> <p>AW82B 8. AIRLK DEPRESS vlv – 0, EV ALERT TONE, monitor suit P gauge &lt; 5.5</p> <p style="padding-left: 40px;">* If gauge &gt; 5.5, <u>stop depress</u>, √MCC *</p> <p>9. Attach waist tether(s) to A/L D-ring for egress</p> <p>BOTH 10. Airlock dP/dT ~0, EV ALERT TONE</p> <p>11. When outer hatch ΔP &lt; 0.5, outer hatch – open, stow</p> <p>AW82B 12. AIRLK DEPRESS vlv – CL</p>	<p><b>PRE REPRESS (5 min)</b></p> <p>IV ML86B:C 1. √cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op</p> <p>MD(flir) 2. √EMU O2 ISOL vlv – OP</p> <p>DCM 3. √SCUs connected to DCM</p> <p>4. √WATER – OFF for 2 min</p> <p>BOTH 5. √Outer hatch closed and locked</p> <p>6. Disc waist tethers, attach to EMU</p> <p>AW82B 7. √EV-1, EV-2 O2 vlv (two) – OP</p>	<p><b>POST DEPRESS (5 min)</b></p> <p>All 1. (LON IV, record MET __:__:__) <u>[PET = 00:00]</u></p> <p>2. Disc SCU; install DCM cover</p> <p>3. Stow SCU on AAP, Velcro to wall</p> <p>DCM 4. Temp control vlv – Max H</p> <p>5. WATER – ON</p> <p>6. √DCM blank, BITE off</p> <p>7. Temp control vlv – 3 to MAX C</p> <p>8. √STATUS, compare to Cuff C/L, 1 (IV record)</p> <p>9. Visors as reqd</p> <p>10. Perform AIRLOCK EGRESS, Cuff C/L, 47, or Flight Specific Timeline</p>	<p><b>REPRESS (10 min)</b></p> <div style="border: 2px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>WARNING</b></p> <p>If on SOP, leave O2 ACT – EVA thru airlock repress</p> </div> <p>ALL 3 DCM 1. O2 ACT – PRESS</p> <p>2. √COMM mode – PRI (ALT for EV3)</p> <p style="text-align: center;"><b>NOTE</b></p> <p style="padding-left: 40px;">IV expect dP/dT alarm during repress</p> <p>AW82B 3. √AIRLK DEPRESS vlv – CL</p> <p>4. Inner hatch Equal vlv (one) – throttle OFF to NORM (as reqd), EV ALERT TONE</p> <p>5. Airlock at 4.0, EV ALERT TONE</p> <p>6. When airlock at 5.0, Equal vlv – OFF, EV ALERT TONE</p> <p>DCM 7. √Airlock pressure integrity (2 min, ΔP ≤ 0.1 psi)</p> <p>8. √Gloves clean</p> <div style="border: 2px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>WARNING</b></p> <p>If Cuff 1 symp resolve upon repress, report as Cuff 2</p> <p>If any DCS, leave O2 ACT – PRESS</p> </div> <p>DCM 9. O2 ACT – IV</p> <p>10. Inner hatch Equal vlv (one) – NORM, EV ALERT TONE</p> <p>11. Airlock dP/dT ~0, EV ALERT TONE</p> <p>12. Go to LON <u>POST EVA 3</u></p> <p style="text-align: right; font-size: small;">EVA-9a/125/O/A</p>
	HOOK VELCRO		HOOK VELCRO

(reduced copy)



TOP  
BACK OF 'RESCUE EVA 3 DEPRESS/REPRESS CUE CARD'

HOOK  
VELCRO

HOOK  
VELCRO



HOOK  
VELCRO

HOOK  
VELCRO

EVA-9b/125/O/B



(reduced copy)

FS CC 22-65

EVA/125/FIN A

**LON POST EVA 3 (01:00)**

SUIT DOFFING

**WARNING**  
Do not doff EMU if DCS symptoms resolved during REPRESS. √MCC via PMC

- |    |         |  |   |
|----|---------|--|---|
| IV |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 1. When $\Delta P < 0.5$ , open hatch   |
|    | MD(flr) | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 2. As reqd, remove diffuser cap at middeck floor, stow                            |
|    |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 3. As reqd, unstow airlock vent duct, connect end to middeck floor fitting        |
|    | A/L     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 4. Configure appropriate vent ducts for airflow into airlock                      |
|    |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 5. As reqd, perform BOOSTER FAN INSTALLATION/ACTIVATION ( <u>AIRLOCK CONFIG</u> ) |
| EV |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 6. √Gloves clean  |
- \* If reqd, IV use damp towel to clean gloves \*
- |              |         |  |   |
|--------------|---------|--|---|
| ALL 3        | DCM     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 7. O2 ACT – OFF   |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 8. PURGE vlv – op (up)  |
| IV           | DCM     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 9. Install WATER sw guards (three)  |
| Scooter      |         | <input type="checkbox"/>   | 10. √Glove heaters sw (one per glove) – OFF   |
|              |         | <input type="checkbox"/>   | 11. REBA sw – OFF (toward left arm of suit)   |
|              |         | <input type="checkbox"/>   | 12. Disconnect lower arm pwr harness from gloves  |
|              |         | <input type="checkbox"/>   | 13. Stow lower arm and glove pwr harness connectors under TMG   |
| ALL          | DCM     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 14. √STATUS: <u>SUIT P</u> < 0.4 (compare w/gauge); disconnect gloves, stow in EMU Equipment Bag  |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 15. Disconnect helmet, stow   |
|              |         | <input type="checkbox"/>   | 16. Outer Hatch Equal vlv caps (two) – installed  |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 17. AAP release handles to 90 degrees   |
| Scooter, EV3 |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 18. Engage HUT in AAP (IV assist as reqd)   |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 19. AAP release handles to lock   |
|              | DCM     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 20. FAN – OFF (fwd)   |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 21. COMM mode – OFF   |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 22. Doff comm cap   |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 23. Disconnect waist ring, LCVG, biomed   |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 24. √Wrist disconnects – op   |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 25. Doff EV glasses   |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 26. Doff HUT  |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 27. Repeat steps 18-26 as necessary to get everyone out of their HUTs   |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 28. Doff LTA, secure to handrail  |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 29. Remove dosimeter from LCVG; insert in inflight garment  |
|              |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 30. Doff: Biomed (disc OBS/EVA cable, stow in EMU Servicing Kit)<br>LCVG (secure to HUT)<br>TCU (allow to dry, as reqd)<br>MAG, stow in wet trash |
|              | HUT     | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 31. Install Multiple Water Connector cover, if any are left   |
| IV           |         | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 32. Perform EVA COMM DECONFIG ( <u>EVA PREP</u> )   |
|              | R1      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 33. O2 TK3 HTR A(B) – as reqd   |
|              | ML86B:C | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 34. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl  |

EMU WATER RECHARGE (5 min) – For EMUs 3015 and 3004 only

- 35. Install EMU 3015 in STBD AAP and 3004 in PORT AAP
- 36. Connect SCUs, as reqd
- R11L  37. SPLY H2O TKA OUTLET – CL (tb-CL)  
SM 60 TABLE MAINT
- CRT  38. Use TKB quantity:  
PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC
- 39. Log value before recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

- AW82D  40. ✓ EMU 1,2 H2O WASTE tb (two) – CL  
SPLY (two) – OP (tb-OP)
- CRT  41. ✓ H2O TKB quantity decreasing

SUIT DRYING/SEAL WIPE

- ALL 3 EMU  42. Wipe with drying towel:  
LTA, legs, boots  
HUT, suit arms  
Gloves
- 43. Inspect gloves for damage  
Report damage to MCC

**WARNING**  
Avoid stericide contact with eyes. Wash hands thoroughly after application

- 44. Wipe LTA crotch and HUT armpit areas with stericide (in EMU Servicing Kit)
- 45. Lightly wipe seals on LTA waist ring, arm wrist rings, HUT neck ring with lint-free wipe (in EMU Servicing Kit)
- 46. Clean, refurbish biomed
- 47. Remove drink bag from HUT and dispose in wet trash
- 48. ✓ Drink Bag Restraint Bag installed in HUT

OXYGEN RECHARGE VERIFICATION

- DCM  49. ✓ STATUS: O2 P ~850 (recharge complete)

WATER FILL VERIFICATION (10 min) – For EMUs 3015 and 3004 only

- DCM  50. ✓ STATUS: H2O WP 8-15 psi and stable for ~30 sec  
(indicates charging complete)  
SM 60 TABLE MAINT
- CRT  51. Use TKB quantity:  
PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC
- R11L  52. Log value after recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

NOTE

Full charge = ~6%/EMU

- R11L  53. SPLY H2O TKA OUTLET – OP (tb-OP)
- WCS  54. √FAN SEP same as HOSE BLOCK
- 55. MODE – COMMODE/MANUAL/EMU, posn guard over sw  
(√airflow, WCS ON It on)
- AW82D  56. EMU 1,2 H2O SPLY (two) – CL (tb-CL)
- 57. Install SCOFs, lock
- DCM  58. O2 ACT – IV
- AW82H  59. EMU 1,2 H2O WASTE reg (two) – MAN OP

NOTE

Step 60 will be performed serially for EMU 1 and EMU 2

- AW82D  60. EMU 1(2) H2O WASTE (one) – OP (tb-OP) (1 min), then  
– CL (tb-CL)  
– Repeat for other EMU
- AW82H  61. EMU 1,2 H2O WASTE reg (two) – REGULATING
- DCM  62. O2 ACT – OFF
- 63. Remove SCOFs, stow
- WCS  64. MODE – AUTO (√WCS ON It off)

EMU POWERDOWN/OVERNIGHT STOW

- 65. Stow comm cap in arm of EMU
- 66. Install helmets and covers
- AW18D  67. AIRLK AUD PWR – OFF
- AW18H  68. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
MODE (two) – OFF
- AW82D  69. √EMU 1,2 H2O WASTE,SPLY tb (four) – CL
- AW82B  70. EV-1,EV-2 O2 vlv (two) – CL
- 71. Tether LTA to airlock handrail
- 72. Hang LCVGs, TCUs, and other EMU accessories for drying

X: SM 60 SM TABLE MAINT

- 73. Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

<u>Param Name</u>	<u>Param ID</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
EXT A/L H2O LINE T 1			
EXT A/L H2O SPLY ZN 1 T	0640181	43	<input type="checkbox"/> 145
EXT A/L LCG 2 SPLY ZN 1 T	0640182	<input type="checkbox"/> 49	<input type="checkbox"/> 145
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	<input type="checkbox"/> 145
EXT A/L LCG 2 SPLY ZN 2 T	0640185	<input type="checkbox"/> 45	<input type="checkbox"/> 145
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	<input type="checkbox"/> OSH

# LON EVA OVERVIEW TIMELINE

**EVA 1 (04:50) FD 3 (RMS, EMU 3003/3017 Transfer) EV1: Grunsfeld EV2: Feustel RMS EV: McArthur**

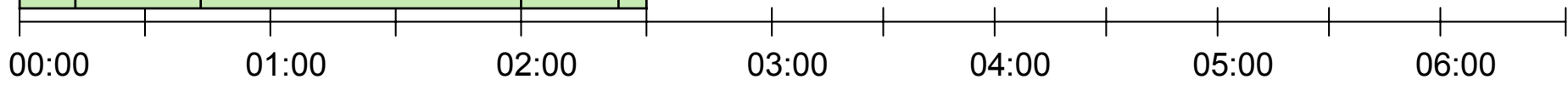
Post De- press 00:10	Egress/Setup (01:30) Retrieve TSA items Configure rope line EV1 translate to LON		EMU/RMS EV Transfer (02:30) Depress LON airlock EV2, RMS EV translate to LON (RMS EV Repress) EV1, EMU 3003 translate to HST Depress LON airlock EV2, EMU 3017 translate to HST Repress HST Airlock (with EMUs) Retrieve TSA TPS tools		Cleanup/ Ingress (00:35) EV1, EV2 Translate to LON	P R E P R E S S : 05

**EVA 2 (01:45) FD 4 (PLT, EMU 3004, TPS Tool Bag Transfer) EV1: Grunsfeld EV3: Massimino PLT EV: Johnson**

Post De- press 00:10	Egress/ Setup (00:30) Egress LON (HST Airlock Depress) EV1, EMU 3004 translate to HST	EMU/PLT EV Transfer (00:40) EV3, PLT EV Translate to LON EV1, TPS tool bag transfer to LON	Clean up/ Ingress (00:20) EV3 translate to HST	P R E P R E S S

**EVA 3 (02:30) FD 4 (CDR, EMU 3008/3017 Transfer) EV3: Massimino EV4: Good CDR EV: Altman**

Post De- press 00:10	Egress/ Setup (00:30) EV3, EV4 translate to LON	EMU/CDR EV Transfer (01:20) Depress LON Airlock EV3, EMU translate to HST EV4, EMU translate to HST EV4, CDR EV translate to LON EV3 translate to LON (deconfigure rope line)	Clean up/ Ingress (00:25)	P R E P R E S S



# LON EVA 1 SUMMARY TIMELINE

TASK TIME (PET TIME) HR : MIN	HST IV/AIRLOCK	EV1 (GRUNSFELD)	EV2 (FEUSTEL)	RMS EV (McARTHUR)	LON IV/AIRLOCK
00:00	A/L: 0.0 psi EV1, EV2, RMS EV	POST DEPRESS (00:10) EGRESS/SETUP (01:30) <input type="checkbox"/> Egress HST Airlock <input type="checkbox"/> Retrieve 85-ft tethers, thermal mittens and rope reel from TSAs <input checked="" type="checkbox"/> Route EV2 Safety Tether and rope to LON Payload bay (shimmy)	POST DEPRESS (00:10) EGRESS/SETUP (01:30) <input type="checkbox"/> Hold in Airlock	Remain on SCU cooling, RF comm EGRESS/SETUP (01:30) <input type="checkbox"/> Hold in Airlock	A/L: 10.2 psi, XL EMU 3003  <input type="checkbox"/> DAP – FREE during transfer <input type="checkbox"/> IV: Config EMU for RF Comm; close IV hatch
01:00		<input type="checkbox"/> Attach safety tethers (2) and rope reel to LON (EV2 GO for egress)	<input type="checkbox"/> Egress HST Airlock	<input type="checkbox"/> Go to HL comm for LON Depress	
02:00		EMU/RMS EV TRANSFER (02:30) <input type="checkbox"/> Depress LON Airlock <input type="checkbox"/> Retrieve XL EMU 3003; temp stow in PLB (Comm: HL) (RMS EV GO for egress)  <input checked="" type="checkbox"/> Retrieve XL EMU 3003; translate to HST A/L via rope	EMU/RMS EV TRANSFER (02:30) <input type="checkbox"/> Assist RMS EV <input checked="" type="checkbox"/> Translate to LON Airlock via Rope (with RMS EV)	EMU/RMS EV TRANSFER (02:30) <input type="checkbox"/> Egress HST A/L (Comm: PRI) <input type="checkbox"/> Tether to EV2 for transfer to LON Airlock <input type="checkbox"/> Ingress LON Airlock; PRE REPRESS, REPRESS LON A/L <input type="checkbox"/> Doff EMU; reconfig MED EMU 3017, A/L for depress	<input checked="" type="checkbox"/> DAP – AUTO, Airlock Depress <input type="checkbox"/> DAP – FREE (xfer) <input type="checkbox"/> DAP – FREE (xfer) <input checked="" type="checkbox"/> Airlock Repress with RMS EV
03:00		<input type="checkbox"/> Stow XL EMU 3003 in HST A/L <input type="checkbox"/> Retrieve TPS tools from TSA	<input type="checkbox"/> Hold in Payload bay for LON repress and subsequent depress <input type="checkbox"/> Depress LON Airlock <input type="checkbox"/> Retrieve MED EMU 3017; Transfer to HST Airlock via rope <input type="checkbox"/> Stow MED EMU 3017 in HST Airlock		<input type="checkbox"/> DAP – AUTO, Airlock Depress <input type="checkbox"/> DAP – FREE (xfer)
04:00	Airlock Repress with: MED EMU 3017, XL EMU 3003	<input type="checkbox"/> Close HST EV Hatch	CLEANUP/INGRESS (00:35) <input type="checkbox"/> Translate to LON Airlock via rope <input type="checkbox"/> Ingress LON Airlock		<input type="checkbox"/> DAP – FREE (xfer)
05:00	EVA PET 04:50	INGRESS/SETUP (00:35) <input type="checkbox"/> Ingress LON Airlock; stow EV1,2 safety tether load straps on ODS <input checked="" type="checkbox"/> Close LON EV Hatch PRE-REPRESS (00:05)	PRE-REPRESS (00:05)		Airlock Repress with: EV1, EV2



## LON EVA 2 SUMMARY TIMELINE

TASK TIME (PET TIME) HR : MIN	HST IV/AIRLOCK	EV1 (GRUNSFELD)	EV3 (MASSIMINO)	PLT EV (JOHNSON)	LON IV/AIRLOCK
00:00	A/L: 10.2 psi EV3, PLT EV, TPS tool bags	<u>POST DEPRESS (00:10)</u> <u>EGRESS/SETUP (00:30)</u> <input type="checkbox"/> Egress LON Airlock (Comm: HL) <input type="checkbox"/> Transfer Lg EMU 3004 to HST Airlock via Rope (deploy EV3 safety tether)	<u>EGRESS/SETUP (00:30)</u> <input type="checkbox"/> Depress HST Airlock  <input type="checkbox"/> Temp stow TPS tools; egress	Remain on SCU <u>EGRESS/SETUP (03:00)</u> <input type="checkbox"/> Egress Airlock, tether to EV3	A/L: 0.0 psi EV1, Lg EMU 3004 <input type="checkbox"/> DAP – AUTO for Depress <input type="checkbox"/> DAP – FREE during transfer
01:00		<u>EMU/PLT EV TRANSFER (00:40)</u> <input type="checkbox"/> Stow EMU in HST Airlock <input type="checkbox"/> Retrieve TPS tools, translate to LON Airlock via rope <input type="checkbox"/> Stow TPS tools in LON A/L	<u>EMU/PLT EV TRANSFER (00:40)</u> <input type="checkbox"/> Translate PLT EV to LON Airlock via rope	<u>EMU/PLT EV TRANSFER (00:40)</u> <input type="checkbox"/> Ingress LON Airlock, connect SCU	<input type="checkbox"/> DAP – FREE (xfer)
		<u>CLEANUP/INGRESS (00:20)</u> <input type="checkbox"/> Ingress LON A/L <input type="checkbox"/> Hold for EV3 HST Ingress  <input type="checkbox"/> Close LON EV Hatch	<u>CLEANUP/INGRESS (00:20)</u> <input type="checkbox"/> Retrieve EV1 safety tether load strap; translate to HST Airlock via rope <input type="checkbox"/> Stow Safety tethers on LON SRMS EE <input type="checkbox"/> Ingress HST A/L, close hatch	<u>CLEANUP/INGRESS (00:20)</u>	<input type="checkbox"/> DAP – FREE (xfer)
		<u>PRE REPRESS (00:05)</u>	<u>PRE REPRESS (00:05)</u>	<u>PRE REPRESS (00:05)</u>	
02:00	Airlock Repress with: EV3, Lg EMU 3004 EVA 2 PET 01:45				Airlock Repress with: EV3, PLT EV, TPS bag

# LON EVA 3 SUMMARY TIMELINE

TASK TIME (PET TIME) HR : MIN	HST IV/AIRLOCK	EV3 (MASSIMINO)	EV4 (GOOD)	CDR EV (ALTMAN)	LON IV/AIRLOCK
00:00	A/L: 0.0 psi EV3, EV4, CDR EV	<u>POST DEPRESS (00:10)</u> <u>EGRESS/SETUP (00:30)</u> <input type="checkbox"/> Egress HST Airlock <input type="checkbox"/> Retrieve 85-ft tethers <input type="checkbox"/> Translate to LON Airlock via rope	<u>POST DEPRESS (00:10)</u> <u>EGRESS/SETUP (00:30)</u> <input type="checkbox"/> Egress HST Airlock <input type="checkbox"/> Translate to LON Airlock via rope	Remain on SCU <u>EGRESS/SETUP (00:30)</u> <input type="checkbox"/> Hold in Airlock	A/L: 10.2 psi, Med EMU 3008, Med EMU 3017 <input type="checkbox"/> DAP – FREE during transfer <input type="checkbox"/> IV: Config EMU; close IV hatch
00:30					<input type="checkbox"/> DAP – AUTO, Airlock Depress <input type="checkbox"/> DAP – FREE (xfer)
01:00		<u>EMU/CDR EV TRANSFER (01:20)</u> <input type="checkbox"/> Depress LON Airlock <input type="checkbox"/> Retrieve EMU; pass to EV4 <input type="checkbox"/> Retrieve other EMU; translate to HST A/L via rope <input type="checkbox"/> Stow EMUs in HST A/L; close hatch <input type="checkbox"/> Release rope from LON SRMS EE <input type="checkbox"/> Translate to LON Payload bay (shimmy)	<u>EMU/CDR EV TRANSFER (01:20)</u> <input type="checkbox"/> Assist EV3 <input type="checkbox"/> Translate EMU to HST Airlock via rope <input type="checkbox"/> Temp stow EMU; in PLB <input type="checkbox"/> Translate to LON Airlock via rope (with CDR)	<u>EMU/CDR EV TRANSFER (01:20)</u> <input type="checkbox"/> Egress HST A/L <input type="checkbox"/> Tether to EV4 for transfer to LON Airlock <input type="checkbox"/> Ingress LON Airlock <input type="checkbox"/> Connect SCU	<input type="checkbox"/> DAP – FREE (xfer)
01:30		<u>CLEANUP/INGRESS (00:25)</u> <input type="checkbox"/> Retrieve safety tethers <input type="checkbox"/> Ingress LON Airlock <input type="checkbox"/> Close LON EV Hatch	<u>CLEANUP/INGRESS (00:25)</u> <input type="checkbox"/> Ingress LON Airlock, release Safety Tether		<input type="checkbox"/> DAP – FREE (xfer)
02:00					
02:30	Airlock remains At 0.0 w/Med EMU 3008, Med EMU 3017  EVA Time 02:30	<u>PRE-REPRESS (00:05)</u>	<u>PRE-REPRESS (00:05)</u>		<u>Airlock Repress with: EV3, EV4, CDR EV</u>

## LON EVA INHIBIT PAD

### STS-125

#### ALL EVAs

##### TCS

- L12 1. √TCS POWER – OFF

##### KU-BAND ANTENNA

- MCC-H 1. √PWR – OFF

##### RCS

If EV crew < 27 ft from FRCS

- IV 1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)  
O14,15,16 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF  
LOGIC (four) – OFF
- MCC-H 3. √Above RCS config
- IV 4. √RCS F – ITEM 1 EXEC (\*)  
√JET DES F1U – ITEM 17 (\*)  
F3U – ITEM 19 (\*)  
F2U – ITEM 21 (\*)

##### S-BAND ANTENNAS

#### NOTE

Possible loss of comm when forced LL FWD antenna

- IV If EV crew < 1.6 ft from S-Band antenna  
A1R 1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER  
2. √MCC, lower antenna selected
- If no comm, or on MCC GO
- C3 3. S-BAND PM ANT – LL FWD
- When EVA crewmember at least 1.6 ft away from all S-Band upper antennas
- C3 4. S-BAND PM ANT – GPC

### Ground

#### Ground Radar

- MCC-H 1. √FDO console, ground radar restrictions in place for EVA

### STS-400

#### ALL EVAs

##### TCS

- L12 1. √TCS POWER – OFF

##### KU-BAND ANTENNA

- MCC-H 1. √KU-BAND Mask – active  
2. √KU-BAND EVA Protect Box – active

##### RCS

If EV crew < 27 ft from FRCS

- IV 1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)  
O14,15,16 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF  
LOGIC (four) – OFF
- MCC-H 3. √Above RCS config
- IV 4. √RCS F – ITEM 1 EXEC (\*)  
√JET DES F1U – ITEM 17 (\*)  
F3U – ITEM 19 (\*)  
F2U – ITEM 21 (\*)

##### S-BAND ANTENNAS

#### NOTE

Possible loss of comm when forced LL FWD antenna

- IV If EV crew < 1.6 ft from S-Band antenna  
A1R 1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER  
2. √MCC, lower antenna selected
- If no comm, or on MCC GO
- C3 3. S-BAND PM ANT – LL FWD
- When EVA crewmember at least 1.6 ft away from all S-Band upper antennas
- C3 4. S-BAND PM ANT – GPC

##### SRMS

- A8L PORT RMS HTR B – OFF  
A7U PORT RMS CAMR – WRIST  
TV CAMR PWR RMS – OFF

## LON EVA NOTES/CAUTIONS/WARNINGS

### NOTES

Avoid contact with OBSS striker bars  
(Vitrolube coating)

### CAUTION

#### **Shuttle Constraints**

- A. Avoid inadvertent contact with
  - 1. OBSS and SRMS Composite Sections, Torque Arms, and Cable Harnesses
  - 2. LCS (silver Teflon) and LDRI (silver Teflon) and ITVC (gold foil) [OBSS]
  - 3. WVS Antenna [ODS Truss & PLB Sill]
  - 4. Payload Bay wire harnesses, cables, and connectors
- B. No touch
  - 1. LDRI diffuser [OBSS]
  - 2. OBSS saddle contacts (when OBSS unberthed) [OBSS]
  - 3. Monkey fur [PLB]
  - 4. Cameras: metallic surfaces [PLB]
  - 5. Ku-Band Antenna black dish and gold thermal blankets [PLB]

#### **SRMS Constraints**

- A. Only one crewmember will be local tethered to the translation rope at a time
- B. Do not impart kick loads onto the SRMS
- C. Do not exceed a translation velocity of 0.25 ft/sec while local tethered to the rope line
- D. Avoid imparting lateral loads into the transfer rope system (lateral loads quickly amplify line tension)
- E. Sudden starting and stopping loads should be imparted into the SRMS, not the rope line
- F. If excessive slack occurs in the transfer rope, re-tension to a light preload level as needed

### WARNING

#### **Shuttle Constraints**

- A. Arcing/Molten Debris
  - 1. Stay  $\geq 2$  ft from exposed EFGF connector when OBSS berthed, powered, and EFGF not grappled [PLB]
  - 2. Stay  $\geq 2$  ft from exposed Stbd Fwd MPM contacts [PLB]
  - 3. Stay above PLB sill when within 1 ft of powered ROEU connector [PLB]
- B. Pinch
  - 1. PRLA operation [PLB]
- C. RF radiation exposure
  - 1. Stay 3.28 ft from S-Band Antenna when powered
  - 2. Stay 1 ft from top and side of UHF PLB Antenna radome surface when in high powered mode [ODS truss]
  - 3. Stay 0.33 ft from top and side of UHF PLB Antenna radome surface when in low powered mode [ODS truss]
  - 4. Remain below the level of the PLB door mold line for first 20 in Aft of Fwd bulkhead when S-Band Antenna powered [PLB]
  - 5. STS-400 Only: Remain on the inboard side of the Stbd slidewire (sill handrails if slidewire not installed) for first 20 ft Aft of Fwd bulkhead when Ku-Band Antenna powered [PLB]
  - 6. STS-125: Ku-Band will be powered off

### WARNING

#### **Shuttle Constraints (Cont)**

- D. Sharp Edges
  - 1. PRLA grounding wipers [PLB]
  - 2. LDRI baffles (also an entrapment hazard) [OBSS]
  - 3. Keep hands away from SRMS EE opening and snares
  - 4. TCS connector backshells have exposed threads [ODS]
- E. Thermal
  - 1. Illuminated PLB lights; do not touch
  - 2. OBSS grapple fixture shafts/cams may be hot. Limit handling if required
  - 3. Stay 27 ft from PRCS when powered
  - 4. Stay 3 ft from VRCS when powered
  - 5. Stay 3 ft from APU when operating
- F. Contamination
  - 1. Stay out of the immediate vicinity of leaking jet or APU
- G. Lasers
  - 1. Do not look at LDRI diffuser or LCS laser aperture window

# LON RESCUE EVA 1 TOOL CONFIG

## AIRLOCK

Prior to EVA, inspect the following:

- Ret cords for damage
- Safety and waist tether load alleviating straps (no damage or red showing)

### HST Airlock:

- 2 – 55-ft Safety Tether on airlock D-ring
- 2 – IV Bungees
- D-ring extender (on A/L D-ring)
- 1 – 80-in HST adj eq tether (spare)
- EVA Bag
  - 3/8-in Ratchet w/7/16-in socket
  - EVA Adjustable Wrench
  - 1 – SAFER Hand Controller Module Hardmount

### LON Airlock:

- 2 – 85-ft Safety Tether on airlock D-ring
- 2 – RET (for TPS tools)
- 2 – IV Bungees
- D-ring extender (on A/L D-ring)
- EVA Bag
  - 3/8-in Ratchet w/7/16-in socket
  - EVA Adjustable Wrench
  - 1 – SAFER Hand Controller Module Hardmount

## EMUs

**EV1** (Med EMU 3008, Red Stripe) – (HST Airlock)

- 1 – MMWS w/right swing arm
- 2 – RET
- 1 – Waist tether
- 1 – 80-in HST adj eq tether
- 2 – Adj eq tethers (1 for rope reel fair lead, 1 for reel temp stow)
- 1 – 34-in HST adj eq tether (for rope reel tie down)
- 2 – Waist tethers (w/o inserts for rope reel tie down)

**EV2** (Lg EMU 3004, No Stripes) – (HST Airlock)

- 1 – MMWS w/right swing arm
- 2 – RET
- 2 – Adj eq tether
- 2 – Waist tether

**RMS EV** (Med EMU 3017, Barber Pole) – (HST Airlock)

- 1 – Waist tethers (L & R D-rings)
- 1 – RET to D-ring
- 4 – Adj eq tether (for Med EMU 3017 (barber pole) arms)

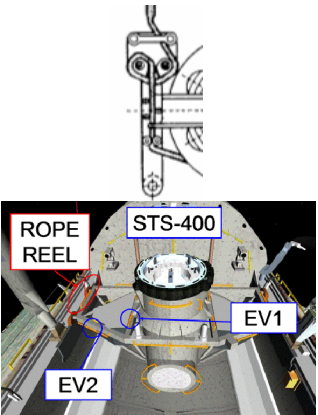
**CDR EMU** (XL EMU 3003 (Red Stripe) – (LON Airlock)

- 2 – Waist tethers (L & R D-rings)
- 1 – MMWS w/right swing arm
- 4 – Adj eq tether (for XL EMU 3003 (red stripe) arms)
- 1 – Pair thermal mittens

LON RESCUE EVA 1 (04:50)

STS-125 IV AIRLOCK	EV1 (GRUNSFELD)	EV2 (FEUSTEL)	RMS EV (McARTHUR)	STS-400 IV AIRLOCK
<p><u>INITIAL CONFIG</u> EV1, EV2, RMS EV</p>	<p><u>INITIAL CONFIG</u> √55-ft Airlock safety tether anchor hook attached to airlock D-ring, load strap attached to own right EMU D-ring, hook slide lock – L, reel unlocked</p> <p><u>EGRESS/SETUP (01:30)</u></p> <ol style="list-style-type: none"> <li>1. Thermal cover – open</li> <li>2. Egress airlock</li> <li>3. Translate to port TSA</li> <li>4. Retrieve rope reel and 1 thermal mitten caddy</li> <li>5. Close TSA, engage latches (4)</li> <li>6. Temp stow rope reel at airlock</li> <li>7. Transfer thermal mitten caddy to EV2</li> <li>8. Translate to stbd TSA</li> <li>9. Retrieve two 85-ft safety tethers</li> <li>10. Close TSA, engage latches (1)</li> <li>11. Attach load alleviating end of one safety tether to left D-ring               <ul style="list-style-type: none"> <li><input type="checkbox"/> hook slide lock – L</li> <li><input type="checkbox"/> reel – unlocked</li> <li><input type="checkbox"/> stow other end for translation</li> </ul> </li> <li>12. Attach anchor end of EV2's 85-ft safety tether to own waist tether               <ul style="list-style-type: none"> <li><input type="checkbox"/> hook slide lock – L</li> <li><input type="checkbox"/> reel – unlocked</li> </ul> </li> <li>13. Translate to HST airlock</li> <li>14. Transfer EV2's 85-ft tether load alleviating strap to EV2</li> <li>15. Release 55-ft safety tether, stow in airlock</li> <li>16. Close thermal cover</li> <li>17. Retrieve rope reel</li> <li>18. Translate to fwd OBSS grapple fixture</li> <li>19. Route hook end of rope through LON SRMS EE striker bar, attach hook to black tether point of LON SRMS EE handrail</li> </ol>	<p><u>INITIAL CONFIG</u> √Left waist tether attached to airlock D-ring extender, hook slide lock – L</p> <p><u>EGRESS/SETUP (01:30)</u></p> <ol style="list-style-type: none"> <li>1. Egress Airlock</li> <li>2. Receive thermal mitten caddy from EV1; stow on MWS</li> <li>3. Receive 85-ft safety tether load strap from EV1, attach to own EMU D-ring               <ul style="list-style-type: none"> <li><input type="checkbox"/> hook slide lock – L</li> <li><input type="checkbox"/> reel – unlocked</li> </ul> </li> <li>4. Check EV1 safety tether config</li> </ol>	<p><u>INITIAL CONFIG</u> √Right waist tether to airlock D-ring extender, hook slide lock – L √SCU mated and locked</p> <p><u>EGRESS/SETUP (01:30)</u></p> <ol style="list-style-type: none"> <li>1. Hold in airlock on RF comm until LON airlock depress and XL EMU 3003 (Red Stripe) retrieval</li> </ol>	<p><u>INITIAL CONFIG</u> A/L at 10.2 psi, XL EMU 3003 (Red Stripe) waist tether to airlock D-ring extender, legs behind bungee</p>

LON RESCUE EVA 1 (04:50) (Cont)

STS-125 IV AIRLOCK	EV1 (GRUNSFELD)	EV2 (FEUSTEL)	RMS EV (McARTHUR)	STS-400 IV AIRLOCK
<p>1. Notify LON IV, GO for DAP – FREE</p> <p>2. When RMS EV Comm mode HL: give LON IV GO for EMU config for depress steps</p>  <p>The diagram shows the STS-400 airlock hatch area. A rope reel is labeled 'ROPE REEL'. The airlock hatch is labeled 'STS-400'. Two external vehicles are labeled 'EV1' and 'EV2'. A small inset diagram shows a hand operating a control lever.</p>	<p>20. Configure 80-in tether around LON SRMS</p> <p>21. On IV GO, using 80-in tether, translate (shimmy) along LON SRMS to LON, releasing rope reel rope</p> <ul style="list-style-type: none"> <li>❑ Local tether to striker bar, release 80-in tether forward of camera, and reinstall aft of elbow camera</li> <li>❑ Fairlead Rope on SRMS mid striker bar with adj eq tether, (cinch)</li> <li>❑ Release local tether and continue to LON</li> </ul> <p>22. Attach rope reel to ODS handrail using 34-in HST adj eq tether and 2 waist tethers (w/o inserts)</p> <ul style="list-style-type: none"> <li>❑ 34-in adj eq tether fully extended</li> </ul> <p>23. Cinch 34-in adj eq tether to remove slack from system</p> <p>24. Stow 80-in adjustable tether</p> <p>25. Translate to LON airlock hatch</p> <p>26. Anchor own safety tether to LON ODS handrail near LON airlock</p> <ul style="list-style-type: none"> <li>❑ hook slide lock – L</li> </ul> <p>27. Anchor EV2's safety tether to other LON ODS handrail near LON airlock</p> <ul style="list-style-type: none"> <li>❑ hook slide lock – L</li> </ul> <p>28. Give EV2 GO for egress</p> <p>29. Glove inspection</p> <p><u>EMU/RMS EV TRANSFER (02:30)</u></p> <p>30. On LON IV GO, open LON EV hatch thermal cover</p> <p>31. Depress LON airlock:</p> <ul style="list-style-type: none"> <li>❑ EV Hatch Equal vlv (1) – NORM</li> </ul>	<p>5. On EV1 GO: Release waist tether from airlock D-ring</p> <p>6. Close thermal cover</p> <p><u>EMU/RMS EV TRANSFER (02:30)</u></p>	<p>2. Comm Mode – HL</p> <p><u>EMU/RMS EV TRANSFER (02:30)</u></p>	<p>1. On HST IV GO: DAP – FREE for EV transfer</p> <p>2. IV: Perform LON EMU CONFIG FOR EVA 1 TRANSFER, steps 39-50</p> <p>3. On MCC GO, DAP – AUTO for LON airlock depress</p>

LON RESCUE EVA 1 (04:50) (Cont)


STS-125 IV AIRLOCK	EV1 (GRUNSFELD)	EV2 (FEUSTEL)	RMS EV (McARTHUR)	STS-400 IV AIRLOCK
<p>3. MCC: Verify EMU Suit P &lt; 5.0 psid</p> <p>4. MCC: Verify RMS EV EMU telemetry. Give RMS EV GO for egress</p> <p>5. Notify LON IV, GO for DAP – FREE</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> When EV hatch ΔP gauge = 9 psid: Equal vlv – OFF, hold for MCC check of EMU data</li> <li><input type="checkbox"/> On MCC GO: Equal vlv – NORM</li> <li><input type="checkbox"/> When EV hatch ΔP gauge = 5 psi; Equal vlv – EMER</li> </ul> <p>32. When EV hatch ΔP gauge &lt; 0.5 psid, open EV hatch, stow</p> <p>33. EV Hatch Equal vlv – OFF</p> <p>34. Retrieve empty EMU 3003 (Red Stripe) from airlock</p> <p>35. On XL EMU 3003 (Red Stripe):</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Comm mode – HL</li> </ul> <p>36. Give RMS EV GO for DCM Comm mode – PRI</p> <p>37. Retrieve 1 waist tether from XL EMU 3003 (Red Stripe) and attach to own D-ring</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> hook slide lock – L</li> </ul> <p>38. Configure XL EMU 3003 (Red Stripe) for translation; hold for RMS EV transfer</p> <p>39. Translate to HST airlock (control XL EMU 3003 (Red Stripe) during translation)</p> <p>40. Transfer 80-in adjustable to XL EMU 3003 (Red Stripe)</p>	<p>7. Assist RMS EV as reqd</p> <p>8. Attach waist tether to RMS EV waist tether</p> <p>9. Close HST airlock thermal cover</p> <p>10. On IV GO, translate with RMS EV to LON airlock</p> <p>11. Assist RMS EV as reqd</p>	<p style="text-align: center;"><u>NOTE</u> It may take up to 20 sec for RMS EV to regain comm after Comm mode – PRI</p> <ol style="list-style-type: none"> <li>1. On EV1 GO, Comm mode – PRI</li> <li>2. Disc SCU; install DCM cover, stow SCU on AAP</li> <li>3. Temp control vlv – Max H</li> <li>4. WATER – ON</li> <li>5. √DCM blank, BITE – off</li> <li>6. Temp Control vlv – 3 to Max C</li> <li>7. Attach EV2's waist tether to own waist tether, √slide lock</li> <li>8. Release waist tether from airlock D-ring</li> <li>9. On MCC GO: Egress airlock</li> <li>10. Accompany EV2 to LON airlock</li> <li>11. Ingress LON airlock</li> <li>12. Attach waist tether to airlock D-ring</li> <ul style="list-style-type: none"> <li><input type="checkbox"/> hook slide lock – L</li> </ul> <li>13. Release waist tether from EV2</li> <li>14. Open DCM cover; Velcro to Self</li> <li>15. Connect SCU 1 to DCM; √SCU locked</li> <li>16. WATER – OFF (FWD), expect <span style="border: 1px solid black; padding: 2px;">H2O IS OFF</span> msg</li> </ol>	<p>4. On HST IV GO: DAP – FREE for EV transfer</p> <p>5. When EV crew off SRMS: DAP – AUTO</p>



LON RESCUE EVA 1 (04:50) (Cont)

STS-125 IV AIRLOCK	EV1 (GRUNSFELD)	EV2 (FEUSTEL)	RMS EV (McARTHUR)	STS-400 IV AIRLOCK
<p>6. MCC: Verify XL EMU 3003 (Red Stripe) data prior to repress</p> <p>7. MCC: Verify EMU Suit P &lt; 5.0 psid</p> <p>8. Notify LON IV, GO for DAP – FREE</p>	<p>41. When RMS EV comm on HL, XL EMU 3003 (Red Stripe):  <input type="checkbox"/> Comm mode – PRI (~2 min)  <input type="checkbox"/> WATER – OFF</p> <p>42. On MCC GO, XL EMU 3003 (Red Stripe): Comm Mode – HL</p> <p>43. Stow XL EMU 3003 (Red Stripe) in HST airlock, (waist tether to airlock D-ring, legs behind bungee)</p> <p>44. Close thermal cover</p> <p>45. Retrieve from stbd TSA:  <input type="checkbox"/> MMWS tool stowage caddy  <input type="checkbox"/> Angle stamp  <input type="checkbox"/> 3-in scraper  <input type="checkbox"/> CIPAA discard container (Stow 3-in scraper and angle stamp on MMWS tool stowage caddy equipment hooks, CIPAA discard container on swing arm)</p> <p>46. Close TSA, engage latches (4)</p> <p>47. Glove inspection</p>	<p>12. Verify hardware clear of hatch</p> <p>13. EV Hatch – verify handle position per hatch decal; close and lock</p> <p>14. Close hatch thermal cover</p> <p>15. Glove Inspection</p> <p>16. Hold in LON Payload Bay for repress and subsequent depress</p> <p>17. On LON IV GO, open LON EV hatch thermal cover</p> <p>18. Depress LON airlock:  <input type="checkbox"/> EV Hatch Equal vlv (1) – NORM  <input type="checkbox"/> When EV hatch ΔP gauge = 9 psid; Equal vlv – OFF, hold for MCC check of EMU data  <input type="checkbox"/> On MCC GO: Equal vlv – NORM  <input type="checkbox"/> When EV hatch ΔP gauge = 5 psi; Equal vlv – EMER</p> <p>19. When EV hatch ΔP gauge &lt; 0.5 psid, open EV hatch, stow</p> <p>20. EV Hatch Equal vlv – OFF</p> <p>21. Retrieve Med EMU 3017 (Barber Pole): configure for translation</p> <p>22. Close LON EV hatch thermal cover</p> <p>23. On IV GO: Translate to HST airlock</p>	<p>17. AW18H:  <input type="checkbox"/> PWR/BATT CHGR EMU1            BUS SEL – MNA</p> <p>18. DCM: PWR – SCU</p> <p>19. O2 ACT – PRESS</p> <p>20. Glove heaters – off</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div> <p>21. Go to PRE REPRESS (<u>RESCUE EVA 1 DEPRESS/REPRESS CUE CARD</u>)</p>	<p>6. Assist with Airlock repress</p> <p>7. Perform LON POST EVA 1 PART 1, all steps</p> <p>8. On HST IV GO: DAP – AUTO for LON airlock depress</p> <p>9. On HST IV GO: DAP – FREE for EV transfer</p>

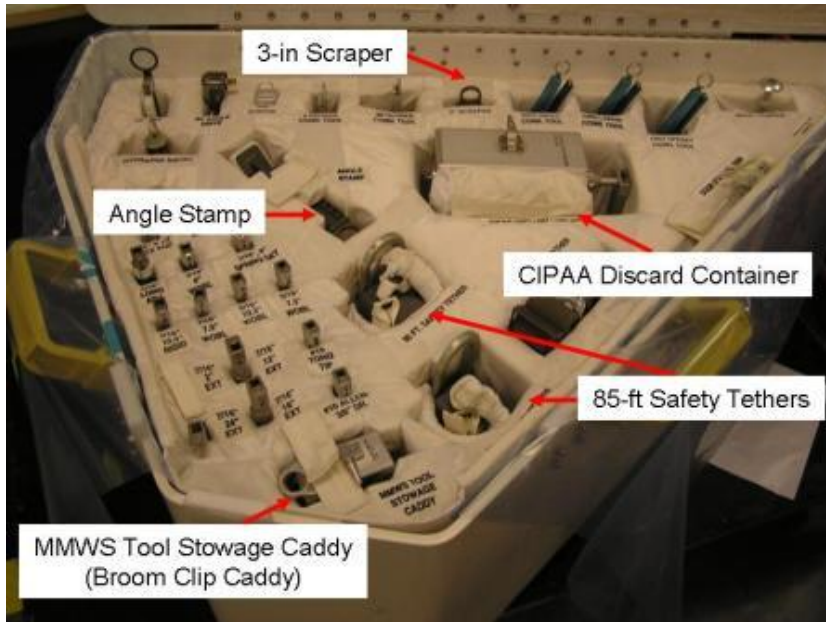
LON RESCUE EVA 1 (04:50) (Cont)

STS-125 IV AIRLOCK	EV1 (GRUNSFELD)	EV2 (FEUSTEL)	RMS EV (McARTHUR)	STS-400 IV AIRLOCK
<p style="text-align: center;"><u>NOTE</u></p> <p>Airlock will be repressed with Med EMU 3017 (Barber Pole) and XL EMU 3003 (Red Stripe) inside</p> <p>9. Perform REPRESS, steps 4,6,7,10,12 (<u>RESCUE EVA 1 DEPRESS/REPRESS CUE CARD</u>)</p> 	<p>48. Hold in HST payload bay for HST airlock repress</p> <p><u>CLEANUP/INGRESS (00:35)</u></p> <p>49. On IV GO: Translate to LON</p> <p>50. Detach 34-in tether from rope reel (stow adj/waist tethers on ODS HR)</p> <p>51. Open MLI on SRMS shoulder brace, attach reel to brace with adj tether, verify rope slack and locked</p> <p>52. Translate to airlock</p> <p>53. Attach waist tether to airlock D-ring extender  <input type="checkbox"/> hook slide lock – L</p> <p>54. Stow 85-ft tether to ODS handrail  <input type="checkbox"/> reel – unlocked</p> <p>55. Pass CIPAA discard container and broom clip caddy (with angle stamp and scraper) to EV2</p> <p>56. Ingress LON airlock</p>	<p>24. Med EMU 3017 (Barber Pole):  <input type="checkbox"/> WATER – OFF</p> <p>25. Stow Med EMU 3017 (Barber Pole) into HST airlock (waist tether to airlock D-ring, legs behind bungee)</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b></p> <p>Do not close hatch until EMU water – OFF for 2 min</p> </div> <p>26. Verify hardware clear of hatch</p> <p>27. EV Hatch – verify handle position per hatch decal; close and lock</p> <p>28. Thermal cover – close</p> <p>29. Give HST IV GO for airlock repress</p> <p>30. Glove inspection</p> <p>31. Hold in HST payload bay for HST airlock repress</p> <p><u>CLEANUP/INGRESS (00:35)</u></p> <p>32. On IV GO: Translate to LON airlock</p> <p>33. Attach waist tether to LON airlock D-ring extender  <input type="checkbox"/> hook slide lock – L</p> <p>34. Stow 85-ft tether on ODS handrail  <input type="checkbox"/> reel – unlocked</p> <p>35. Receive TPS tools from EV1 and stow in airlock</p> <p>36. Ingress LON airlock</p>		<p>10. When EV crew off SRMS: DAP – AUTO</p> <p>11. On HST IV GO: DAP – FREE for EV transfer</p> <p>12. When EV crew off SRMS: DAP – AUTO</p>

LON RESCUE EVA 1 (04:50) (Cont)

STS-125 IV AIRLOCK	EV1 (GRUNSFELD)	EV2 (FEUSTEL)	RMS EV (McARTHUR)	STS-400 IV AIRLOCK
	<p>57. Open DCM cover; Velcro to self</p> <p>58. Connect SCU to DCM; √SCU locked</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div> <p>59. WATER – OFF (FWD), expect <span style="border: 1px solid black; padding: 2px;">H2O IS OFF</span> msg</p> <p>60. Thermal cover – close</p> <p>61. Verify hardware clear of hatch</p> <p>62. EV Hatch – verify handle position per hatch decal; close and lock</p> <p>63. Go to PRE REPRESS (<u>RESCUE EVA 1 DEPRESS/REPRESS CUE CARD</u>)</p>	<p>37. Open DCM cover; Velcro to self</p> <p>38. Connect SCU to DCM; √SCU locked</p> <p>39. WATER – OFF (FWD), expect <span style="border: 1px solid black; padding: 2px;">H2O IS OFF</span> msg</p> <p>40. Go to PRE REPRESS (<u>RESCUE EVA 1 DEPRESS/REPRESS CUE CARD</u>)</p>		<p>13. Assist with airlock repress</p>

LON RESCUE EVA 1 (04:50) (Cont)

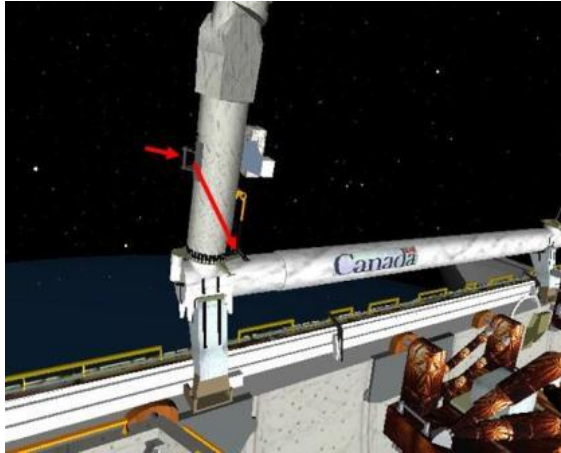


Stbd HST TSA

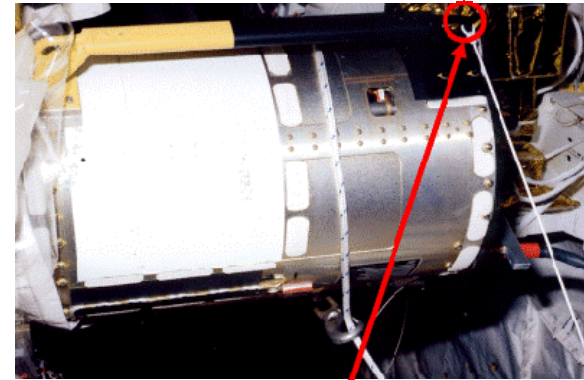


Port HST TSA

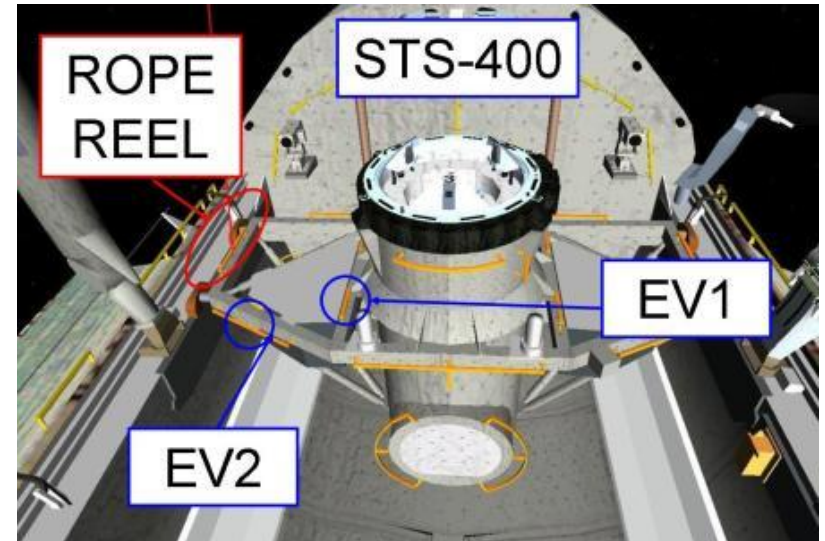
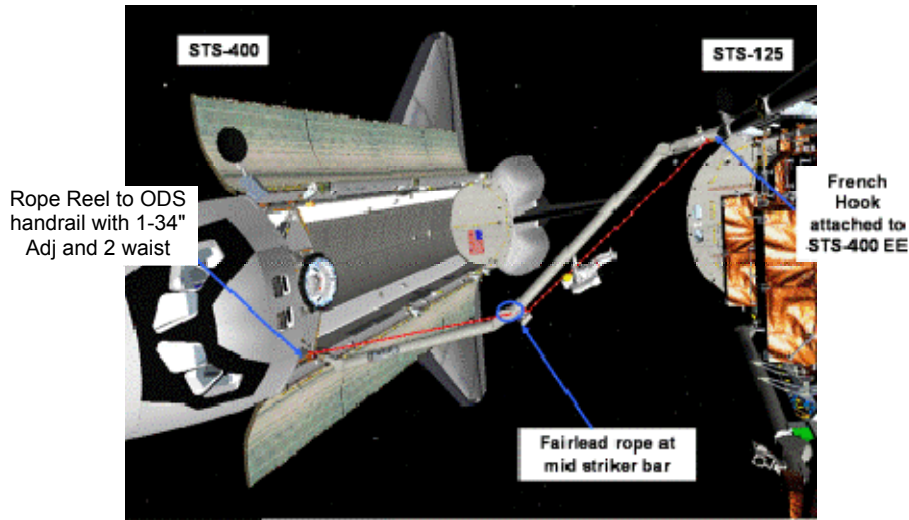
LON RESCUE EVA 1 (04:50) (Cont)



Route French hook through striker bar then attach to black tether point



Rope reel attach point

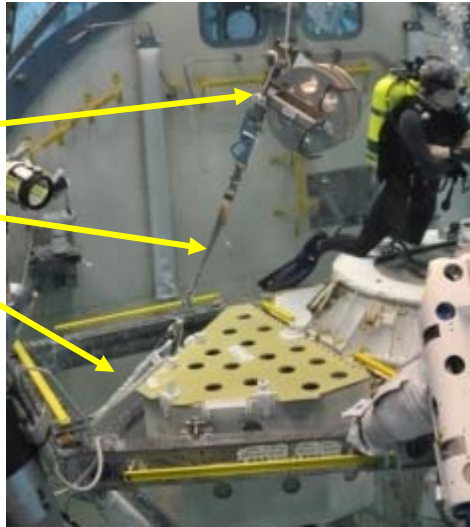


**LON RESCUE EVA 1 (04:50)**

Rope Reel

34-in HST AET

2 – Waist Tethers



Rope Reel temp stowed on SRMS shoulder brace with AET at end of EVA1



34-in HST tether to rope reel



2 small waist tether hooks to small HST hook



2 large waist tether hooks to port ODS handrail



LON RESCUE EVA 2 (01:45)

STS-125 IV AIRLOCK	EV1 (GRUNSFELD)	EV3 (MASSIMINO)	PLT EV (JOHNSON)	STS-400 IV AIRLOCK
<p><u>INITIAL CONFIG</u></p> <p>Airlock at 10.2 psi: EV3, PLT EV, TPS ORU Bags</p> <p><u>NOTE</u> HST airlock depress should not be performed until LON airlock depress complete and DAP – ALT, AUTO</p>	<p><u>INITIAL CONFIG</u></p> <p>√Waist tether attached to LON airlock D-ring extender, hook slide lock – L</p> <p><u>EGRESS/SETUP (00:30)</u></p> <ol style="list-style-type: none"> <li>On Lg EMU 3004 (No Stripes): <input type="checkbox"/> Comm mode – HL</li> <li>Give HST crew GO for airlock depress</li> <li>LON airlock thermal cover – open</li> <li>When HST airlock depressed and HST hatch open: Egress LON airlock</li> <li>Attach 85-ft safety tether to EMU D-ring <input type="checkbox"/> hook slide lock – L <input type="checkbox"/> reel – unlocked</li> <li>Release waist tether from airlock D-ring extender</li> <li>Reconfigure rope reel for transfer ops (release adj tether from shoulder brace, close MLI around brace, attach reel to 34-in HST adj tether secured to ODS HR). Verify config per FS 22-84)</li> <li>Retrieve Lg EMU 3004 (No Stripes), configure EMU for transfer</li> <li>Close thermal cover</li> <li>Retrieve other 85-ft safety tether <input type="checkbox"/> hook slide lock – L <input type="checkbox"/> reel – unlocked</li> </ol>	<p><u>INITIAL CONFIG</u></p> <p>√55-ft HST Airlock safety tether anchor hook attached to airlock D-ring, load strap attached to own right EMU D-ring, hook slide lock – L, reel unlocked</p> <p><u>EGRESS/SETUP (00:30)</u></p> <ol style="list-style-type: none"> <li>Hold in airlock for GO for depress</li> <li>On EV1 GO: Perform DEPRESS and POST DEPRESS (<u>RESCUE EVA 2 DEPRESS/REPRESS CUE CARD</u>)</li> <li>HST airlock thermal cover – open</li> <li>Egress HST airlock</li> <li>Temp stow Lg and Med ORU bags outside airlock (on port TSA)</li> <li>Assist PLT EV with egress</li> <li>Set local tether, attach waist tether to PLT EV waist tether <input type="checkbox"/> hook slide locks (2) – L</li> <li>Release 55-ft airlock safety tether from PLT</li> </ol>	<p><u>INITIAL CONFIG</u></p> <p>√55-ft HST Airlock safety tether anchor hook attached to airlock D-ring, load strap attached to own right EMU D-ring, hook slide lock – L, reel unlocked</p> <p><u>EGRESS/SETUP (00:30)</u></p> <ol style="list-style-type: none"> <li>On EV1 GO: Perform DEPRESS and POST DEPRESS (<u>RESCUE EVA 2 DEPRESS/REPRESS CUE CARD</u>)</li> <li>Egress HST airlock</li> </ol>	<p><u>INITIAL CONFIG</u></p> <p>Airlock at 0.0 psi: EV1, Lg EMU 3004 (No Stripes) waist tether to airlock D-ring extender</p> <ol style="list-style-type: none"> <li>On MCC GO, DAP – AUTO</li> </ol>



LON RESCUE EVA 2 (01:45) (Cont)

STS-125 IV AIRLOCK	EV1 (GRUNSFELD)	EV3 (MASSIMINO)	PLT EV (JOHNSON)	STS-400 IV AIRLOCK
<p>1. Notify LON IV, GO for DAP – FREE</p> <p>2. Notify LON IV, GO for DAP – FREE</p> <p>3. Notify LON IV, GO for DAP – FREE</p> <p>4. Notify LON IV, GO for DAP – FREE</p>	<p>11. On IV GO: Translate to HST airlock (watch for elbow camera)</p> <p><u>EMU/PLT/ORU BAG TRANSFER</u> (00:40)</p> <p>12. Transfer 85-ft tether to EV3 13. Glove inspection</p> <p>14. Stow EMU 3004 (No Stripes) in HST airlock (waist tether to airlock D-ring, legs behind bungee) 15. Close HST airlock thermal cover 16. Retrieve Lg and Med ORU bags from temp port TSA temp stow location</p> <p>17. On IV GO: Translate to LON airlock 18. Stow Lg and Med ORU bags in LON airlock</p> <p><u>CLEANUP/INGRESS</u> (00:20)</p> <p>19. Attach waist tether to LON airlock D-ring extender     <input type="checkbox"/> hook slide lock – L 20. Release safety tether, hand to EV3</p>	<p><u>EMU/PLT/ORU BAG TRANSFER</u> (00:40)</p> <p>9. Receive 85-ft safety tether from EV1, attach to EMU D-ring     <input type="checkbox"/> hook slide lock – L     <input type="checkbox"/> reel – unlocked 10. Disconnect from 55-ft airlock tether, stow in airlock 11. On IV GO: Translate with PLT EV to LON airlock 12. Open thermal cover 13. Assist PLT EV as reqd for ingress (partially ingress airlock to help with SCU) 14. Release waist tether from PLT EV 15. Glove inspection 16. Hold in LON payload bay for EV1</p> <p><u>CLEANUP/INGRESS</u> (00:20)</p> <p>17. Receive EV1's 85-ft safety tether and stow on self 18. Translate to HST 19. Temp stow EV1's 85-ft safety tether to LON SRMS EE handrail 20. Translate to HST airlock 21. Attach 55-ft safety tether to right waist tether</p>	<p><u>EMU/PLT/ORU BAG TRANSFER</u> (00:40)</p> <p>3. Accompany EV3 to LON airlock 4. Attach 55-ft airlock safety tether to EMU D-ring     <input type="checkbox"/> hook slide lock – L 5. Ingress Airlock 6. Open DCM cover; Velcro to self 7. Connect SCU to DCM; √SCU locked (remove MWS and stow in airlock if necessary) 8. WATER – OFF (FWD), expect <input type="checkbox"/> H2O IS OFF msg 9. Glove heaters – OFF</p> <p><u>CLEANUP/INGRESS</u> (00:20)</p>	<p>2. On HST IV GO: DAP – FREE for EV transfer 3. When EV crew off SRMS: DAP – AUTO</p> <p>4. On HST IV GO: DAP – FREE for EV transfer 5. When EV crew off SRMS: DAP – AUTO</p> <p>6. On HST IV GO: DAP – FREE for EV transfer 7. When EV crew off SRMS: DAP – AUTO</p> <p>8. On HST IV GO: DAP – FREE for EV transfer 9. When EV crew off SRMS: DAP – AUTO</p>

LON RESCUE EVA 2 (01:45) (Cont)

STS-125 IV AIRLOCK	EV1 (GRUNSFELD)	EV3 (MASSIMINO)	PLT EV (JOHNSON)	STS-400 IV AIRLOCK
<p>5. Assist with Airlock repress (EV3/Lg EMU 3004 (No Stripes))</p>	<p>21. Ingress LON airlock                  22. Open DCM cover; Velcro to self                  23. Connect SCU to DCM; √SCU locked</p> <p>24. WATER – OFF (FWD), expect <span style="border: 1px solid black; padding: 2px;">H2O IS OFF</span> msg</p> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> <p><b>CAUTION</b> Do not close hatch until EMU water – OFF for 2 min</p> </div> <p>25. Hold hatch closure for EV3 to ingress HST                  26. Thermal cover – close                  27. Verify hardware clear of hatch                  28. EV Hatch – verify handle position per hatch decal; close and lock                  29. Go to PRE REPRESS (<u>RESCUE EVA 2 DEPRESS/REPRESS CUE CARD</u>)</p>	<p><input type="checkbox"/> hook slide lock – L  <input type="checkbox"/> reel – unlocked</p> <p>22. Translate to LON SRMS EE                  23. Temp stow 85-ft safety tethers to LON SRMS EE handrail                  24. Translate to HST airlock</p> <p style="text-align: center;"><u>NOTE</u> EV1/EV3 ingress, hatch closures and represses should be completed relatively simultaneously on HST and LON vehicles</p> <p>25. Ingress HST airlock                  26. On Lg EMU 3004 (No Stripes):  <input type="checkbox"/> Comm mode – PRI  <input type="checkbox"/> √WATER – OFF                  27. Open DCM cover; Velcro to self                  28. Connect SCU to DCM; √SCU locked</p> <p>29. WATER – OFF (FWD), expect <span style="border: 1px solid black; padding: 2px;">H2O IS OFF</span> msg</p> <p>30. Thermal cover – close                  31. Verify hardware clear of hatch                  32. EV Hatch – verify handle position per hatch decal; close and lock                  33. Go to PRE REPRESS (<u>RESCUE EVA 2 DEPRESS/REPRESS CUE CARD</u>)</p>	<p>10. Comm mode – HL</p> <p>11. Go to PRE REPRESS (<u>RESCUE EVA 2 DEPRESS/REPRESS CUE CARD</u>)</p>	<p>10. Assist with airlock repress (EV1, PLT EV, lg and sm ORU bags)</p>

# LON RESCUE EVA 3 TOOL CONFIG

## AIRLOCK

Prior to EVA, inspect the following:

- Ret cords for damage
- Safety and waist tether load alleviating straps (no damage or red showing)

### HST Airlock:

- 2 – 55-ft Safety Tethers on airlock D-ring
- 2 – IV Bungees
- D-ring extender (on A/L D-ring)
- EVA Bag
  - 3/8-in Ratchet w/7/16-in socket
  - EVA Adjustable Wrench
  - 1 – SAFER Hand Controller Module Hardmount

### LON Airlock

- 2 – 85-ft Safety Tethers on airlock D-ring
- 2 – IV Bungees
- D-ring extender (on A/L D-ring)
- EVA Bag
  - 3/8-in Ratchet w/7/16-in socket
  - EVA Adjustable Wrench
  - 1 – SAFER Hand Controller Module Hardmount

## EMUs

**EV3** (Lg EMU 3015, Dash Stripe) – (HST Airlock)

- 2 – Waist tethers
- 1 – MMWS w/right swing arm
- 1 – Adj eq tether
- 1 – RET
- 1 – 80-in HST adj eq tether

**EV4** (Lg EMU 3004, No Stripes) – (HST Airlock)

- 2 – Waist tethers
- 1 – MMWS w/right swing arm
- 1 – RET
- 1 – Adj eq tether

**CDR EV** (XL EMU 3003, Red Stripe) – (HST Airlock)

**Med EMU 3008** (Red Stripe) – (LON Airlock)

- 2 – Waist tether
- 1 – MMWS w/right swing arm

**Med EMU 3017** (Barber Pole) – (LON Airlock)

- 2 – Waist tether
- 1 – MMWS w/right swing arm


**LON RESCUE EVA 3 (02:30)**

<b>STS-125 IV AIRLOCK</b>	<b>EV3 (MASSIMINO)</b>	<b>EV4 (GOOD)</b>	<b>CDR EV (ALTMAN)</b>	<b>STS-400 IV AIRLOCK</b>
<p><u>INITIAL CONFIG</u></p> <p>Airlock at 10.2 psi: EV3, EV4, CDR EV</p>	<p><u>INITIAL CONFIG</u></p> <p>√Own waist tether attached to airlock D-ring extender, hook slide lock – L</p> <p><u>EGRESS/SETUP (00:30)</u></p> <ol style="list-style-type: none"> <li>Egress airlock</li> </ol> <ol style="list-style-type: none"> <li>Attach 85-ft safety tether to EMU D-ring                     <ul style="list-style-type: none"> <li><input type="checkbox"/> hook slide lock – L</li> <li><input type="checkbox"/> reel – unlocked</li> </ul> </li> <li>Release waist tether from airlock D-ring</li> <li>Close thermal cover</li> <li>On IV GO: Translate to LON airlock</li> </ol> <p><u>EMU/CDR EV TRANSFER (01:20)</u></p> <ol style="list-style-type: none"> <li>On LON IV GO, open LON EV hatch thermal cover</li> <li>Depress LON airlock:                     <ul style="list-style-type: none"> <li><input type="checkbox"/> EV Hatch Equal vlv (1) – NORM</li> <li><input type="checkbox"/> When EV hatch ΔP gauge = 5 psi; Equal vlv – EMER</li> </ul> </li> </ol>	<p><u>INITIAL CONFIG</u></p> <p>√55-ft Airlock safety tether anchor hook attached to airlock D-ring, load strap attached to right EMU D-ring, hook slide lock – L, reel unlocked</p> <p><u>EGRESS/SETUP (00:30)</u></p> <ol style="list-style-type: none"> <li>Thermal cover open</li> <li>Egress HST airlock</li> <li>Retrieve pre-positioned 85-ft safety tethers from LON SRMS EE</li> <li>Attach 85-ft safety tether onto own EMU D-ring                     <ul style="list-style-type: none"> <li><input type="checkbox"/> hook slide lock – L</li> <li><input type="checkbox"/> reel – unlocked</li> </ul> </li> <li>Retrieve EV3's pre-positioned 85-ft safety tether</li> <li>Translate to HST airlock</li> <li>Transfer EV3's 85-ft safety tether to EV3</li> <li>Release 55-ft safety tether and stow in airlock</li> <li>Translate to LON airlock</li> </ol> <p><u>EMU/CDR EV TRANSFER (01:20)</u></p> <ol style="list-style-type: none"> <li>Assist EV3 as reqd</li> </ol>	<p><u>INITIAL CONFIG</u></p> <p>√55-ft Airlock safety tether anchor hook attached to airlock D-ring, load strap attached to right EMU D-ring, hook slide lock – L, reel unlocked</p> <p>√SCU mated and locked</p> <p><u>EGRESS/SETUP (00:30)</u></p> <ol style="list-style-type: none"> <li>Hold in HST airlock</li> </ol> <p><u>EMU/CDR EV TRANSFER (01:20)</u></p>	<p><u>INITIAL CONFIG</u></p> <p>Airlock at 10.2 psi: Med EMU 3008 (Red Stripe) waist tether to airlock D-ring extender, legs behind bungee, Med EMU 3017 (Barber Pole) waist tether to airlock D-ring extender, legs behind bungee</p> <ol style="list-style-type: none"> <li>DAP – FREE for EV transfer</li> </ol> <ol style="list-style-type: none"> <li>DAP – AUTO, give EV3 GO for LON airlock depress</li> </ol>

LON RESCUE EVA 3 (02:30) (Cont)

STS-125 IV AIRLOCK	EV3 (MASSIMINO)	EV4 (GOOD)	CDR EV (ALTMAN)	STS-400 IV AIRLOCK
	<p>8. When EV hatch ΔP gauge &lt; 0.5 psid, open EV hatch, stow</p> <p>9. EV Hatch Equal vlv – OFF</p> <p>10. Retrieve empty Med EMU 3008 (Red Stripe) and Med EMU 3017 (Barber Pole)</p> <p>11. Pass one empty EMU to EV4</p> <p>12. Assist EV4 as required</p> <p>13. Configure remaining empty EMU onto self for transfer back to HST airlock</p> <p>14. On IV GO: Translate along LON RMS to HST airlock</p> <p>15. Stow empty EMUs in HST airlock (waist tethers to airlock D-ring, legs behind bungees)</p> <p>16. EV Hatch – verify handle position per hatch decal; close and lock</p> <p>17. Glove inspection</p> <p>18. Translate to LON RMS EE</p> <p>19. Configure 80-in tether around LON SRMS for translation</p>	<p>11. Configure empty EMU onto self for transfer back to HST airlock</p> <p>12. Assist EV3 as reqd</p> <p>13. Translate along LON RMS to HST airlock</p> <p>14. Temp stow empty EMU on HST ODS handrail</p> <p>15. Assist CDR EV as reqd for egress</p> <p>16. Take one waist tether from empty EMU and put on CDR EMU D-ring  <input type="checkbox"/> hook slide lock – L</p> <p>17. Attach waist tether to CDR EV waist tether  <input type="checkbox"/> hook slide locks (2) – L</p> <p>18. Glove inspection</p> <p>19. On IV GO: Translate with CDR EV to LON airlock</p> <p>20. Assist CDR EV with ingress</p> <p>21. Release CDR EV waist tether from own waist tether</p> <p>22. Translate to rope reel</p>	<p>2. √SCU disconnected, egress HST airlock</p> <p>3. Release airlock 55-ft safety tether, stow on airlock D-ring</p> <p>4. Accompany EV4 to LON</p> <p>5. Ingress LON airlock</p> <p>6. Attach 55-ft airlock safety tether to EMU D-ring  <input type="checkbox"/> hook slide lock – L</p> <p>7. Open DCM cover; Velcro to self</p> <p>8. Connect SCU to DCM; √SCU locked (remove MWS as needed)</p> <p>9. WATER – OFF (FWD), expect <span style="border: 1px solid black; padding: 2px;">H2O IS OFF</span> msg</p> <p>10. Glove heaters – OFF</p>	<p>3. DAP – FREE for EV transfer</p> <p>4. When EV crew off SRMS: DAP – AUTO</p> <p>5. DAP – FREE for EV transfer</p> <p>6. When EV crew off SRMS: DAP – AUTO</p>

LON RESCUE EVA 3 (02:30) (Cont)

STS-125 IV AIRLOCK	EV3 (MASSIMINO)	EV4 (GOOD)	CDR EV (ALTMAN)	STS-400 IV AIRLOCK
	<p>20. Retrieve rope reel hook from EE tether point</p> <p>21. On IV and EV4 GO, using 80-in tether, translate (shimmy) along LON SRMS to LON payload bay, retrieve fairlead</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Local tether to striker bar, release 80-in tether forward of camera, and reinstall aft of elbow camera</li> </ul> <p>22. Transfer 80-in adjustable tether to EV4</p> <p><u>CLEANUP/INGRESS (00:25)</u></p> <p>23. Translate to EV4's 85-ft safety tether anchor point</p> <p>24. Assist EV4 as required</p> <p>25. On EV4 GO: Release EV4's safety tether anchor from structure and attach to own waist tether</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> hook slide lock – L</li> </ul> <p>26. Translate to own 85-ft safety tether anchor point, stow on MWS</p> <p>27. Perform final payload bay survey</p> <p>28. Ingress LON airlock</p> <p>29. Open DCM cover; Velcro to self</p> <p>30. Share SCU with other EV</p>	<p>23. Give EV3 GO to translate when ready to take up rope slack</p> <p>24. Take up rope as EV3 progresses toward LON</p> <p>25. Receive 80-in HST adj eq tether from EV3</p> <p><u>CLEANUP/INGRESS (00:25)</u></p> <p>26. Retrieve rope reel, 34-in HST adj eq tether, and 2 waist tethers</p> <p>27. Stow rope reel, 34-in HST adj eq tether, 80-in HST adj eq tether, and 2 waist tethers in port TSA</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Close TSA, engage latches (4)</li> </ul> <p>28. Ingress LON airlock; attach waist tether to airlock D-ring ext</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> hook slide lock – L</li> </ul> <p>29. Give GO for EV3 to release safety tether anchor hook</p> <p>30. Open DCM cover; Velcro to self</p> <p>31. Connect SCU to DCM; √SCU locked (share with other EV crewmember as needed)</p> <p>32. WATER – OFF (FWD), expect <span style="border: 1px solid black; padding: 2px;">H2O IS OFF</span> msg</p>	<p><u>CLEANUP/INGRESS (00:25)</u></p>	

LON RESCUE EVA 3 (02:30) (Cont)

STS-125 IV AIRLOCK	EV3 (MASSIMINO)	EV4 (GOOD)	CDR EV (ALTMAN)	STS-400 IV AIRLOCK
	<p>crewmember as needed; √SCU locked</p> <p>31. WATER – OFF (FWD), expect <u>H2O IS OFF</u> msg</p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u> Do not close hatch until EMU water – OFF for 2 min</p> </div> <p>32. Thermal cover – close 33. Verify hardware clear of hatch 34. EV Hatch – verify handle position per hatch decal; close and lock 35. Go to PRE REPRESS (<u>RESCUE EVA 3</u> <u>DEPRESS/REPRESS CUE</u> <u>CARD</u>)</p>	<p>33. Go to PRE REPRESS (<u>RESCUE EVA 3</u> <u>DEPRESS/REPRESS CUE</u> <u>CARD</u>)</p>	<p>11. Go to PRE REPRESS (<u>RESCUE EVA 3</u> <u>DEPRESS/REPRESS CUE</u> <u>CARD</u>)</p>	<p>7. Assist with airlock repress</p>

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# EVA CHECKLIST

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