Space Shuttle Program
FLIGHT DATA FILE

JSC-48024-134

EVA Checklist

STS-134 Flight Supplement

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

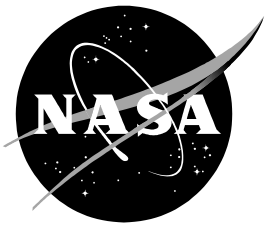
Final, Rev A
April 1, 2011

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-134 FLIGHT SUPPLEMENT

FINAL, REVISION A
April 1, 2011

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Incorporates the following:		
482#:	EVA FS-00395	EVA FS-00401
	EVA FS-00396	EVA FS-00402A
	EVA FS-00397	EVA FS-00403A
	EVA FS-00398	EVA FS-00404
	EVA FS-00399	EVA FS-00405B
	EVA FS-00400	

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DX32/V. Otto	281-483-2981

EVA CHECKLIST
STS-134 FLIGHT SUPPLEMENT

LIST OF EFFECTIVE PAGES

FINAL	04/21/10
REV A	04/01/11

Sign Off	*	134/FIN A	3-1		generic
FS ii	*	134/FIN A	3-2		generic
iii	*	generic	3-3		generic
iv	*	generic	3-4		generic
FS v	*	134/FIN A	3-5		generic
FS vi	*	134/FIN A	3-6		generic
FS vii	*	134/FIN A	3-7		generic
FS viii	*	134/FIN A	3-8		generic
FS ix	*	134/FIN A	3-8a		generic
FS x	*	134/FIN A	3-8b		generic
FS xi		134/FIN A	3-9		generic
FS xii		134/FIN A	CC 3-10		generic
FS xiii		134/FIN A	CC 3-11		generic
FS xiv		134/FIN A	3-12		generic
FS xv		134/FIN A	4-1		generic
FS xvi		134/FIN A	4-2		generic
FS xvii		134/FIN A	4-3		generic
FS xviii		134/FIN A	4-4		generic
1-1		generic	4-5		generic
1-2		generic	4-6		generic
1-3		generic	4-7		generic
1-4		generic	4-8		generic
1-5		generic	4-9		generic
1-6		generic	4-10		generic
1-7		generic	4-11		generic
1-8		generic	4-12		generic
1-9		generic	5-1		generic
1-10		generic	5-2		generic
TEMP FS 2-1		134/FIN A	5-3		generic
TEMP FS 2-2		ALL/FIN A	5-4		generic
TEMP FS 2-3		ALL/FIN A	A6-1		generic
TEMP FS 2-4		134/FIN A	CC A6-2		generic
TEMP FS 2-5		134/FIN A	6-3		generic
TEMP FS 2-6		ALL/FIN A	CC 6-4		generic
FS 2-7		134/FIN A	FS 7-1		134/FIN A
FS 2-8		134/FIN A	FS 7-2		134/FIN A
FS 2-9		134/FIN A	FS 7-3	⊗	134/FIN A
FS 2-10		134/FIN A	FS 7-4		134/FIN A
FS 2-11		134/FIN A	FS 7-5		134/FIN A
FS 2-12		134/FIN A	FS 7-6	⊗	134/FIN A
FS 2-13		134/FIN A	FS 7-7	⊗	134/FIN A
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FS 2-15		134/FIN A	FS 7-9	⊗	134/FIN A
FS 2-16		134/FIN A	FS 7-10		134/FIN A
FS 2-17		134/FIN A	FS 7-11		134/FIN A
FS 2-18		134/FIN A	FS 7-12		134/FIN A
FS 2-19		134/FIN A	FS 7-13	⊗	134/FIN A
FS 2-20		134/FIN A	FS 7-14	⊗	134/FIN A

* – Omit from flight book

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FS 7-15 ..... ⊗ 134/FIN A
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FS 7-126 ..... 134/FIN A

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FS 7-127 ..... 134/FIN A
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FS 7-214 ..... ⊗ 134/FIN A
FS 7-215 ..... ⊗ 134/FIN A
FS CC 7-216 ..... ⊗ 134/FIN A
FS CC 7-217 ..... ⊗ 134/FIN A
FS CC 7-218 ..... ⊗ 134/FIN A
FS CC 7-219 ..... ⊗ 134/FIN A
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FS 7-227 ..... ⊗ 134/FIN A
FS 7-228 ..... 134/FIN A
TEMP FS 8-1 ..... 134/FIN A
TEMP FS 8-2 ..... ⊗ 134/FIN A
8-3 ..... generic
8-4 ..... generic
8-5 ..... generic
8-6 ..... generic
8-7 ..... generic
8-8 ..... generic
FS 8-9 ..... 134/FIN A
FS 8-10 ..... ⊗ 134/FIN A

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FS 8-11 ..... ⊗ 134/FIN A
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FS 8-23 ..... ⊗ 134/FIN A
FS 8-24 ..... ⊗ 134/FIN A
FS 8-25 ..... ⊗ 134/FIN A
FS 8-26 ..... 134/FIN A
9-1 ..... generic
9-2 ..... generic
9-3 ..... generic
9-4 ..... generic
9-5 ..... generic
9-6 ..... generic
TEMP FS 10-1 ..... 134/FIN A
TEMP FS 10-2 ..... ALL/FIN A
10-3 ..... generic
10-4 ..... generic
10-4a ..... generic
10-4b ..... generic
10-5 ..... generic
10-6 ..... generic
10-7 ..... generic
10-8 ..... generic
10-9 ..... generic
10-10 ..... generic
10-11 ..... generic
10-12 ..... generic
10-13 ..... generic
10-14 ..... generic
FS CC 10-15 ..... 134/FIN A
FS CC 10-16 ..... ⊗ 134/FIN A
11-1 ..... generic
11-2 ..... generic
11-3 ..... generic
11-4 ..... generic
12-i ..... generic
12-ii ..... generic
TEMP FS 12-1 ..... 134/FIN A
TEMP FS 12-2 ..... ALL/FIN A
12-3 ..... generic
12-4 ..... generic
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12-6 ..... generic
12-7 ..... generic
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12-20 ..... generic
12-21 ..... generic
12-22 ..... generic
12-23 ..... generic
12-24 ..... generic
12-24a ..... generic
12-24b ..... generic
12-25 ..... generic
12-26 ..... generic
FS 12-27 ..... ⊗ 134/FIN A
FS 12-28 ..... ⊗ 134/FIN A
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FS 12-30 ..... 134/FIN A
FS CC 12-31 ..... ⊗ 134/FIN A
FS CC 12-32 ..... ⊗ 134/FIN A
FS 13-1 ..... 134/FIN A
FS 13-2 ..... 134/FIN A
14-1 ..... generic
14-2 ..... generic
14-3 ..... generic
14-4 ..... generic
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14-16 ..... generic
14-17 ..... generic
14-18 ..... generic
14-19 ..... generic
14-20 ..... generic
14-21 ..... generic
14-22 ..... generic
15-1 ..... generic
15-2 ..... generic
15-3 ..... generic
15-4 ..... generic
15-5 ..... generic
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15-8 ..... generic

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15-9		generic	FS 16-49		134/FIN A
15-10		generic	FS 16-50		134/FIN A
15-11		generic	FS 16-51	⊗	134/FIN A
15-12		generic	FS 16-52	⊗	134/FIN A
15-13		generic	FS 16-53	⊗	134/FIN A
15-14		generic	FS 16-54	⊗	134/FIN A
16-i		generic	FS 16-55	⊗	134/FIN A
16-ii		generic	FS 16-56	⊗	134/FIN A
TEMP FS 16-1		134/FIN A	FS 16-57		134/FIN A
TEMP FS 16-2		134/FIN A	FS 16-58		134/FIN A
FS 16-3		134/FIN A	FS 16-59		134/FIN A
FS 16-4		134/FIN A	FS 16-60	⊗	134/FIN A
FS 16-5	⊗	134/FIN A	FS 16-61		134/FIN A
FS 16-6	⊗	134/FIN A	FS 16-62		134/FIN A
FS 16-7	⊗	134/FIN A	FS 16-63		134/FIN A
FS 16-8		134/FIN A	FS 16-64		134/FIN A
FS 16-9		134/FIN A	FS 16-65		134/FIN A
FS 16-10		134/FIN A	FS 16-66		134/FIN A
FS 16-11		134/FIN A	FS 16-67		134/FIN A
FS 16-12		134/FIN A	FS 16-68		134/FIN A
FS 16-13		134/FIN A	FS 16-69		134/FIN A
FS 16-14	⊗	134/FIN A	FS 16-70		134/FIN A
FS 16-15		134/FIN A	FS 16-71		134/FIN A
FS 16-16		134/FIN A	FS 16-72		134/FIN A
FS 16-17	⊗	134/FIN A	FS 16-73		134/FIN A
FS 16-18	⊗	134/FIN A	FS 16-74		134/FIN A
FS 16-19	⊗	134/FIN A	FS 16-75	⊗	134/FIN A
FS 16-20		134/FIN A	FS 16-76		134/FIN A
FS 16-21		134/FIN A	FS 16-77		134/FIN A
FS 16-22		134/FIN A	FS 16-78	⊗	134/FIN A
FS 16-23		134/FIN A	FS 16-79		134/FIN A
FS 16-24		134/FIN A	FS 16-80	⊗	134/FIN A
FS 16-25		134/FIN A	FS 16-81		134/FIN A
FS 16-26		134/FIN A	FS 16-82		134/FIN A
FS 16-27		134/FIN A	FS 16-83		134/FIN A
FS 16-28		134/FIN A	FS 16-84	⊗	134/FIN A
FS 16-29	⊗	134/FIN A	FS 16-85	⊗	134/FIN A
FS 16-30		134/FIN A	FS 16-86		134/FIN A
FS 16-31		134/FIN A	FS 16-87		134/FIN A
FS 16-32	⊗	134/FIN A	FS 16-88	⊗	134/FIN A
FS 16-33		134/FIN A	FS 16-89	⊗	134/FIN A
FS 16-34	⊗	134/FIN A	FS 16-90	⊗	134/FIN A
FS 16-35		134/FIN A	FS 16-91	⊗	134/FIN A
FS 16-36		134/FIN A	FS 16-92	⊗	134/FIN A
FS 16-37		134/FIN A	FS 16-93	⊗	134/FIN A
FS 16-38	⊗	134/FIN A	FS 16-94	⊗	134/FIN A
FS 16-39	⊗	134/FIN A	FS 16-95	⊗	134/FIN A
FS 16-40	⊗	134/FIN A	FS 16-96	⊗	134/FIN A
FS 16-41		134/FIN A	FS 16-97	⊗	134/FIN A
FS 16-42	⊗	134/FIN A	FS 16-98	⊗	134/FIN A
FS 16-43	⊗	134/FIN A	FS 16-99	⊗	134/FIN A
FS 16-44		134/FIN A	FS 16-100	⊗	134/FIN A
FS 16-45		134/FIN A	FS 16-101	⊗	134/FIN A
FS 16-46		134/FIN A	FS 16-102	⊗	134/FIN A
FS 16-47		134/FIN A	17-1	*	generic
FS 16-48		134/FIN A	17-2	*	generic

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FS 18-1 ..... 134/FIN A
FS 18-2 ..... 134/FIN A
FS 18-3 ..... ⊗ 134/FIN A
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FS 18-5 ..... ⊗ 134/FIN A
FS 18-6 ..... ⊗ 134/FIN A
FS 18-7 ..... ⊗ 134/FIN A
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FS 18-41 ..... ⊗ 134/FIN A
FS 18-42 ..... ⊗ 134/FIN A
FS 18-43 ..... ⊗ 134/FIN A
FS 18-44 ..... ⊗ 134/FIN A
FS 18-45 ..... ⊗ 134/FIN A
FS 18-46 ..... ⊗ 134/FIN A
19-i ..... generic
19-ii ..... generic
TEMP FS 19-1 ..... 134/FIN A
TEMP FS 19-2 ..... ALL/FIN A
19-3 ..... generic
19-4 ..... generic
19-5 ..... generic
19-6 ..... generic
19-7 ..... generic
19-8 ..... generic
19-9 ..... generic
19-10 ..... generic
19-11 ..... generic
19-12 ..... generic
TEMP FS 19-13 ..... 134/FIN A
TEMP FS 19-14 ..... 134/FIN A
20-1 ..... * generic
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EVA CUE CARDS

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⊗ – Flight copies of this page contain color

* – Omit from flight book

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AIRLOCK PREP (50 min)

Retrieve or unstow following equipment:

MF28G	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
	EVA Bag
	Contamination Detection Kit (location flight specific)
FDF Locker	Cuff Checklists (2) – stow in EMU Equipment Bag
	DEPRESS/REPRESS Cue Card

AIRLOCK CONFIG

1. √Inner hatch Equal vlv (two) – OFF

AW18A

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. Transfer to airlock:
   - EVA Bag – install on airlock wall
   - DEPRESS/REPRESS Cue Card
   - Helmet Lights
   - Contamination Detection Kit – install on airlock wall
6. Install IVA foot restraint, as reqd
7. Unbuckle SCU straps, Velcro SCU to wall
8. Install EMU lights on helmets (EMU 1,EMU 2); perform pull test
9. Disconnect helmets from Airlock EMUs, temp stow
10. Remove comm caps from LTA Restraint Bags and connect to electrical harnesses
11. Install helmets (not reqd if proceeding directly to EMU Checkout)
12. Remove LTA Restraint Bags
13. Disconnect waist rings; remove and stow any equipment stowed in HUT/LTA
14. Stow LTA Restraint Bags on AAPs
15. √Thermal cover clear of waist ring
16. Waist ring – engage posn
17. Connect LTA to HUT, lock
18. Remove 20-g Crash Bag from middeck EMU, as reqd

EMU SWAP (30 min)

NOTE

EMU X is to be removed and EMU Y is to be installed

EMU X	1.	Install gloves
AW18H	2.	√PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF √MODE (two) – OFF
DCM	3.	Disconnect SCU, install DCM cover
	4.	Stow SCU on AAP, Velcro to wall
	5.	Connect LTA to HUT, lock (if reqd)
	6.	Disconnect helmet with sunshades down and helmet cover installed; stow
	7.	Release EMU from AAP, transfer EMU to middeck
	8.	Install helmet
	9.	Remove 20-g Crash Bag on middeck EMUs (if flown)
EMU Y	10.	Disconnect helmet, temp stow
	11.	Remove comm cap from LTA Restraint Bag and connect to electrical harness (if reqd)
	12.	Remove LTA Restraint Bag
	13.	Release EMU from middeck AAP, transfer to airlock
	14.	Mount EMU on AAP
	15.	Install helmets (not reqd if proceeding directly to EMU Checkout)
	16.	Disconnect waist ring; remove and stow any equipment stowed in HUT/LTA
	17.	Waist ring – engage posn
	18.	Connect LTA to HUT, lock

NOTE

O2 vlv for SCU connected to EMU Y must
be closed prior to checkout of EMU Y

AW82B	19.	If performing EMU CHECKOUT of EMU Y: EV-1(EV-2) O2 vlv – CL
EMU X	20.	Attach EMU to middeck AAP
	21.	Attach LTA Restraint Bag

BOOSTER FAN DEACTIVATION/REMOVAL (15 min)

MO13Q 1. ARLK FAN A,B (two) – OFF
MA73C:G 2. cb AC1,2 ARLK TNL FAN A,B (six) – op
EXT A/L 3. Disconnect flex duct from booster fan muffler inlet, direct airflow into airlock, temp secure
4. Disconnect vent duct from booster fan outlet and external airlock duct inlet; temp stow in middeck

If booster fan to be removed:

5. Disconnect flex duct from booster fan inlet; rotate and stow in launch bracket
6. Demate booster fan electrical connectors from J1,J2 (two) on tunnel extension wall; loosen cable harnesses (two) from Velcro strips (four)
7. Stow electrical connectors (two) on booster fan dummy fittings, secure cable harnesses with Velcro strips
8. Loosen booster fan fasteners (four)
9. Remove booster fan assy, temp stow in middeck

BOOSTER FAN INSTALLATION/ACTIVATION (15 min)

If booster fan to be installed:

MA73C:G 1. √cb AC1,2 ARLK TNL FAN A,B (six) – op
MO13Q 2. √ARLK FAN A,B (two) – OFF
EXT A/L 3. Install booster fan assy, secure fasteners (four)
4. Demate electrical connectors (two) from booster fan dummy fittings and Velcro strips
5. Mate booster fan electrical connectors J1,J2 (two) on tunnel extension wall; secure cable harnesses (two) with Velcro strips (four)
6. Unstow/connect flex duct from launch bracket to booster fan inlet
7. Unstow/connect vent duct to external airlock duct inlet and booster fan outlet
8. Unstow/connect flex duct from middeck to fan muffler inlet

MA73C:G 9. cb AC1,2 ARLK TNL FAN A,B (six) – cl
MO13Q 10. ARLK FAN A(B) – ON
11. Check for airflow at top of external airlock halo

EMU REMOVAL (15 min)

1. As reqd, install gloves
2. As reqd, perform LTA RESTRAINT STRAP INSTALLATION (AIRLOCK CONFIG)
3. As reqd, relocate LTA spring hooks (four) from AAP rings to SAFER mount brackets
4. Disconnect EMUs from AAPs, stow in middeck
5. Remove ICB EMU Batteries from EMUs, temp stow in Post Insertion locker MF43H

EMU INSTALLATION (15 min)

1. Transfer EMUs to A/L, connect to AAPs
2. As reqd for EVA, perform LTA RESTRAINT STRAP REMOVAL (AIRLOCK CONFIG)
3. As reqd, relocate LTA spring hooks (four) from SAFER mount brackets to AAP rings

EMU CHECKOUT PREP (30 min)

Airlock	1. LTG FLOOD (four) – ON
	2. Remove Ext A/L Floor Bag (Bag I) from Airlock, secure bag straps with gray tape or Velcro
	3. Unbuckle SCU straps as needed for EMU Checkout, Velcro SCU to wall
	4. Disconnect helmets from EMUs, temp stow
	5. √DIDB restraint bags installed
	6. Remove comm caps (4) from LTA Restraint Bag kangaroo pouches; temp stow FT2 and FN2 (for respective ECOKs, step 10)
	7. Connect comm caps FT1 and FN1 to electrical harnesses
IFM Tool Locker (tray 1)	Wrap 3-in length of Kapton tape, with 1/2-in courtesy tab, around joined LEMO connector between EMU electrical harness and comm caps
	8. Remove LTA Restraint Bags
	9. Disconnect waist rings; remove ECOKs/LCVGs – temp stow LCVGs for EMU Checkout
	10. Stow comm caps FT2 and FN2 in respective ECOKs
	11. Temp stow ECOKs for EVA Prep for ISS Transfer
	12. Stow LTA Restraint Bags on AAPs
	13. √Thermal cover clear of waist rings
	14. Waist rings – engage position
	15. Connect LTAs to HUTs, lock
Middeck Vol H INBD	16. Remove SCOFs (2) from EMU Equipment Bag for EMU Checkout
	17. Stow Vol H Bags in Vol H
	(SCOFs (2) will be stowed back in EMU Equipment Bag after EMU Checkout)

LTA RESTRAINT STRAP REMOVAL (15 min)

NOTE

May be performed on EMU 1 and 2 simultaneously.
Perform steps as reqd for current EMU config

1. As reqd, remove comm cap from LTA Restraint Bag; temp stow
2. Remove EMU from AAP
3. Disconnect all restraint attachments from SAFER mount brackets (two)
4. Loosen cinch strap mechanism, remove SAFER mount brackets
5. Remove strap from PLSS
6. Stow strap in LTA Restraint Bag Pouch with D-rings (three) connected
7. Engage EMU in AAP
8. Stow LTA Restraint Bag/strap

LTA RESTRAINT STRAP INSTALLATION (15 min)

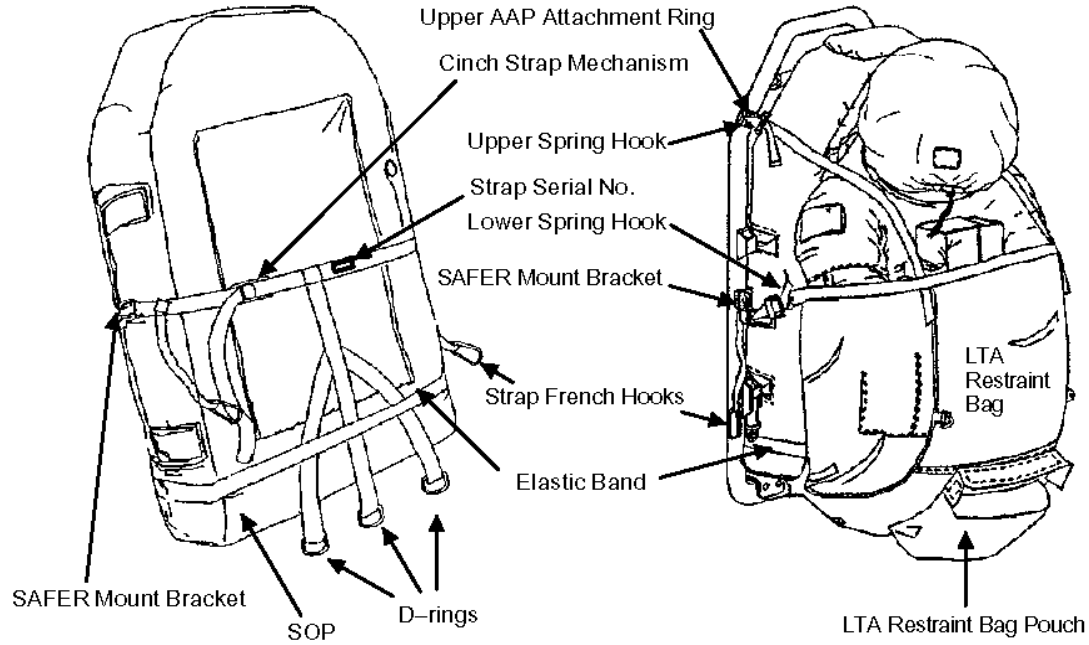
NOTE

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

1. Unstow LTA Restraint Bag/strap
2. Remove EMU from AAP
3. Install SAFER mount brackets (two)
4. Install elastic band of strap around SOP
5. Tighten cinch strap mechanism
6. Attach strap French hooks (two) to SAFER mount brackets
7. Engage EMU in AAP
8. Stow LTA, suit arms inside LTA Restraint Bag
9. Connect upper spring hooks (two) over suit shoulders to upper AAP attachment rings (two)
10. Connect lower spring hooks (two) around suit arms to SAFER mount brackets (two)
11. Tighten all LTA bag straps with bag as high as possible on EMU

LTA RESTRAINT STRAP APPLICATION

EMU LAUNCH AND LANDING CONFIGURATION
(LTA Restraint Strap installed)



NOTE

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

EVA PREP FOR ISS TRANSFER (90 min)

BOTH 1. √PWR – SCU
EMUs 2. √PURGE vlv – op (up)
3. √O2 ACT – OFF
4. √WATER – OFF, switch guard installed
5. √Helmet sunshades down, cover installed
6. Retrieve B/U gloves (FT2 and FN2) from Bag E and stow in respective ECOKs
7. Retrieve FT EVA 3 Ziplock bag and FN EVA 4 Ziplock bag from CF ECOK and stow in respective ECOKs
8. Configure/verify items stowed in tables below

EMU 3004 (L) (FT)	**EMU 3018 (L) (FN)**
☐ Helmet s/n 1084 ☐ Valsalva ☐ LTA FT (attached) ☐ EMU gloves FT1 s/n 6248 ☐☐ Wrist Mirrors (2)	☐ Helmet s/n 1072 ☐ Valsalva ☐ LTA FN (attached) ☐ EMU gloves FN1 s/n 6276 ☐☐ Wrist Mirrors (2)
EMU Crew Options Kit (ECOK) (FT) ☐ LCVG FT1 ☐ Comm cap FT2 ☐ EMU Gloves FT2 ☐ FT EVA 1, 2, & 3 Ziplock Bags ☐☐☐ 2 MAGs ☐☐☐ TCUs (top, bottom) ☐☐☐ Socks ☐☐☐ Wristlets ☐☐☐ Comfort Gloves ☐☐☐ Moleskin X☐☐ Patch, Stripes, American Flag	**EMU Crew Options Kit (ECOK) (FN)** ☐ LCVG FN1 ☐ Comm cap FN2 ☐ EMU Gloves FN2 ☐ FN EVA 2, 3 & 4 Ziplock Bags ☐☐☐ 2 MAGs ☐☐☐ TCUs (top, bottom) ☐☐☐ Socks ☐☐☐ Wristlets ☐☐☐ Comfort Gloves X☐☐ Patch, Stripes, American Flag

EVA PREP FOR ISS TRANSFER (90 min) (Cont)

From Bag E (Middeck Ceiling Port 1) **EMU Crew Options Kit (ECOK) (CF)** ☐ LCVG CF1 ☐☐ Comm cap CF1 & CF2 ☐ CF EVA 1 & 4 Ziplock Bags ☐☐ 2 MAGs ☐☐ TCUs (top, bottom) ☐☐ Socks ☐☐ Wristlets ☐☐ Comfort Gloves ☐☐ Patch, Stripes, American Flag ☐☐ Mole Skin ☐ X Valsalva/Lens Template ☐ X 2 Fresnel Lenses ☐☐ EMU gloves CF1 & CF2 ☐☐ 2 Mesh Bags SYSTEMS TRANSFER Bag TOOLS TRANSFER Bag	

SYSTEMS TRANSFER Bag (from CF ECOK)	
Current Location	Item
FDF Locker (MF71G)	☐ STS-134 CONSUMABLES TRACKING/BATTERY RECHARGE Cue Card ☐ EMERGENCY UNDOCKING/EVA TRANSFER Cue Card ☐ STS-134 EVA Checklist (SPARE)
SODF Locker (MF71G)	☐ STS-134 ISS EVA Systems Checklist (Brown stripe) ☐ 'EVA Transfer' Ziplock Bag ☐ JOINT EMERGENCY EGRESS Cue Card ☐☐ ISLE PREBREATHE Cue Cards (2) ☐☐☐ CREWLOCK DEPRESS/REPRESS Cue Cards (3) ☐☐☐ ISS EVA Cuff Checklist (3)
Bag E (Middeck Ceiling Port 1)	☐ 8 DIDBs ☐ 6 LiOH canisters

TOOLS TRANSFER Bag (from CF ECOK)	
Current Location	Item
Bag E (Middeck Ceiling Port 1)	☐☐ 85-ft Safety Tethers (#28 and #30) (2) (EVA 1) ☐ Vent Tool Extension Plug (EVA 1) ☐ 90 deg Connector Tool (EVA 1) ☐ HPGT MLI (EVA 3)
Bag D (Middeck Floor Starboard 2)	☐☐ "EVA Handrail Assy" – EWC Antennas/Handrails (2) (EVA 1) ☐ "Antenna Cable Assy" – EWC Cables (EVA 1)
Seat 7 Bag	☐☐ "FGB Cables" – FGB Y-Jumpers (2) (EVA 1)

POST-DOCKING EVA TRANSFER AND RECONFIG (60 min)

NOTE

This procedure assumes that transfer items were preconfigured per EVA PREP FOR ISS TRANSFER

1. Transfer items in table below to ISS; report status to **MCC-H** when complete:

Item	**Destination**
EMU 3004 (FT)	E-Lk, Aft EDDA
EMU 3018 (FN)	Node 1
ECOK (FT)	E-Lk
ECOK (FN)	Node 1
ECOK (CF)	E-Lk
SYSTEMS TRANSFER Bag	E-Lk
TOOLS TRANSFER Bag	E-Lk

SYSTEMS TRANSFER Bag

2. Unstow following items and position in E-Lk, unless otherwise specified:
   - ☐ STS-134 EVA CHECKLIST (SPARE)
   - ☐ STS-134 ISS EVA Systems Checklist (Brown stripe)
   - ☐ STS-134 CONSUMABLES TRACKING/BATTERY RECHARGE CUE CARD
   - ☐ EMERGENCY UNDOCKING/EVA TRANSFER CUE CARD
   - ☐ 'EVA Transfer' Ziplock Bag
     - ☐ JOINT EMERGENCY EGRESS Cue Card
     - ☐ ISLE PREBREATHE Cue Card in Node 1 in EVA #3 Systems Bag
     - ☐☐☐ ISS EVA Cuff Checklists (3) as follows:
       - ☐ Install EV1 on EMU 3004
       - ☐ Install EV2 on EMU 3018 in Node 1
       - ☐ Install EV3 on EMU 3005
     - ☐☐☐ CREWLOCK DEPRESS/REPRESS Cue Cards as follows:
       - ☐ Tether to Crewlock Wall
       - ☐ Stow on Equipment Lock Wall
       - ☐ Stow on Equipment Lock Wall per CDR

   Temp stow old CREWLOCK DEPRESS/REPRESS Cue Cards (2) for step 7

3. Unstow following items and position in EVA #1 Systems Bag:
   - ☐ LiOH canister
   - ☐☐ DIDBs (2)

4. Unstow following items and position in EVA #2 Systems Bag:
   - ☐ LiOH canister
   - ☐☐ DIDBs (2)

5. Unstow following items and position in EVA #3 Systems Bag:
   - ☐☐ LiOH canisters (2)
   - ☐☐ DIDBs (2)

6. Unstow following items and position in EVA #4 Systems Bag:
   - ☐☐ LiOH canisters (2)
   - ☐☐ DIDBs (2)

POST-DOCKING EVA TRANSFER AND RECONFIG (60 min) (Cont)

7. Stow following items in SYSTEMS TRANSFER Bag:
   - ☐☐ CREWLOCK DEPRESS/REPRESS Cue Cards (old) – temp stowed
   - ☐☐☐ ISS EVA Cuff Checklists (3) (old) from EMU Equipment Bag
   - ☐ STS-133 ISS EVA Systems Checklist (old)

TOOLS TRANSFER Bag

8. Unstow following items and position in EVA #1 Tools Bag:
   - ☐☐ 85-ft Safety Tethers (28 and 30) (2)
   - ☐ 90 deg Connector Tool
   - ☐ Vent Tool Extension Plug
   - ☐☐ "FGB Cables" – FGB Y-Jumpers (2)
   - ☐☐ "EVA Handrail Assy" – EWC Antennas/Handrails (2)
   - ☐ "Antenna Cable Assy" – EWC Cables
9. Unstow following items and position in EVA #3 Tools Bag:
   - ☐ HPGT MLI

CONFIGURE EMUs

EMU 3005 (CF)

10. √Installed on fwd EDDA
11. Install following items from EVA #1 Ziplock bag in CF ECOK:
    - ☐ STS-134 Mission Patch on DCM
    - ☐ Stripes as follows:
      - ☐☐ Upper PLSS (left, right) (2)
      - ☐☐ Leg lower Velcro (left, right) (2)
    - ☐ American Flag:
12. Remove protective arm covers and stow in EMU Equipment Bag
13. From CF ECOK, remove protective glove covers from Gloves CF1 and install gloves
14. Stow glove covers in CF ECOK
15. Disconnect/Reconnect Helmet to install:
    - ☐ Comm cap CF1 from CF ECOK

    Wrap 3-in length of Kapton tape, with 1/2-in courtesy tab, around joined LEMO connector between EMU electrical harness and comm cap (Kapton tape in EVA #1 Systems Bag)

EMU 3004

16. Install Helmet Light Assembly (HLA) without ERCA or EHIP batteries onto helmet
17. Perform finger pull test on all four white buttons to ensure buttons fully out
18. Perform pull test to verify all HLA latches fully seated in helmet brackets
19. Install ERCA per ERCA Address in STS-134 CONSUMABLES TRACKING CUE CARD (EMU MAINT/RECHARGE)

    Refer to Figure 1 ERCA Cable Routing:

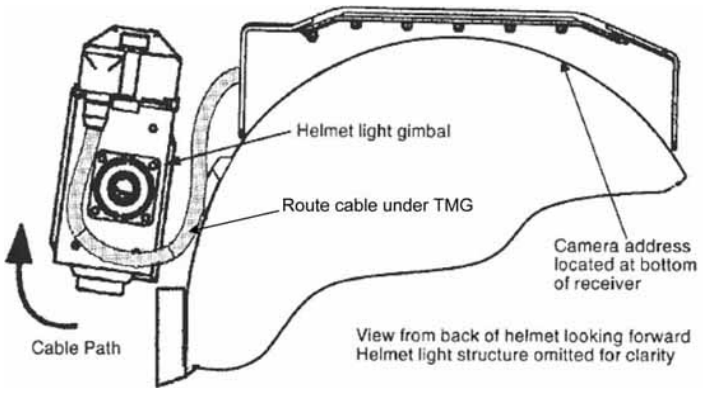


Figure 1.- ERCA Cable Routing.

20. Perform pull test of HLA/ERCA
21. Confirm sizing cam configuration per STS-134 NOMINAL EMU SIZING (EMU CONTINGENCY PROCS)

ECOKs (FT, CF)

22. Populate ISS EMU Equipment Bag crew specific compartments, as desired
    - ☐☐ Wristlets
    - ☐☐ Comfort Gloves
    - ☐☐ Moleskin/mosite
    - ☐☐ Nasal Spray

EMU SWAP FOR EVA 2 (CF → FN) (45 min)

NOTE

This procedure assumes the following procedures have been completed following EVA 1:
{1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST)
{1.605 BSA BATTERY RECHARGE - init} (SODF: ISS EVA SYS: BATTERY OPS)
{1.605 BSA BATTERY RECHARGE - term} (SODF: ISS EVA SYS: BATTERY OPS)

EMUs 3004,3005
1. Connect waist ring to HUT
2. Reconnect gloves and boots

EMU 3005 (CF)
3. Remove ERCA assembly from Helmet Light Assembly and temp stow
4. √Helmet installed, sun shades down, cover installed
5. Remove EMU from fwd EDDA, temp stow in Node 1
6. Remove CF items ISS EMU Equipment Bag crew specific compartments and stow in ECOK
   - ☐ Wristlets
   - ☐ Comfort Gloves
   - ☐ Moleskin/mosite
   - ☐ Nasal Spray
7. Remove CF ECOK from E-Lk, temp stow in Node 1

EMU 3018 (FN)
8. Transfer EMU and FN ECOK to E-Lk
9. Install EMU on fwd EDDA
10. Install Helmet Light Assembly (HLA) without ERCA or EHIP batteries onto helmet
11. Perform finger pull test on all four white buttons to ensure buttons fully out
12. Perform pull test to verify all HLA latches fully seated in helmet brackets
13. Install ERCA per ERCA Address in STS-134 CONSUMABLES TRACKING CUE CARD (EMU MAINT/RECHARGE)
    Refer to Figure 1 ERCA Cable Routing:

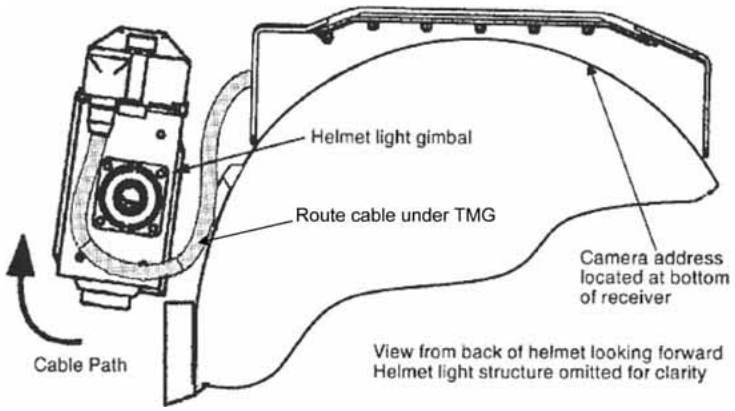


Figure 1.- ERCA Cable Routing.

14. Perform pull test of HLA/ERCA
15. Helmet sunshades down, install cover
16. Confirm sizing cam configuration per STS-134 NOMINAL EMU SIZING (EMU CONTINGENCY PROCS)

FT, FN ECOK
17. Populate ISS EMU Equipment Bag crew specific compartments, as desired
    - ☐☐ Wristlets
    - ☐☐ Comfort Gloves
    - ☐☐ Moleskin/mosite
    - ☐☐ Nasal Spray

EMU SWAP FOR EVA 4 (FT → CF) (CF AFT, FN FWD) (30 min)

NOTE

This procedure assumes the following procedures have been completed following EVA 3:
{1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST)
{1.605 BSA BATTERY RECHARGE - init} (SODF: ISS EVA SYS: BATTERY OPS)
{1.605 BSA BATTERY RECHARGE - term} (SODF: ISS EVA SYS: BATTERY OPS)
{1.506 EMU WATER RECHARGE} (SODF: ISS EVA SYS: EMU MAINTENANCE)

EMUs 3004,3018
1. Connect waist ring to HUT
2. Reconnect gloves and boots

EMU 3004 (FT)
3. Remove ERCA assembly and temp stow
4. √Helmet installed, sun shades down, cover installed
5. Remove EMU from fwd EDDA, temp stow on Node 1
6. Remove CF items ISS EMU Equipment Bag crew specific compartments and stow in ECOK
   - ☐ Wristlets
   - ☐ Comfort Gloves
   - ☐ Moleskin/mosite
   - ☐ Nasal Spray
7. Remove CF ECOK from E-Lk, temp stow in Node 1

EMU 3005 (CF)
8. Transfer EMU and FN ECOK to E-Lk
9. Install EMU on fwd EDDA
10. Install ERCA on Helmet Light Assembly per ERCA Address in STS-134 CONSUMABLES TRACKING CUE CARD (EMU MAINT/RECHARGE)
    Refer to Figure 1 ERCA Cable Routing:

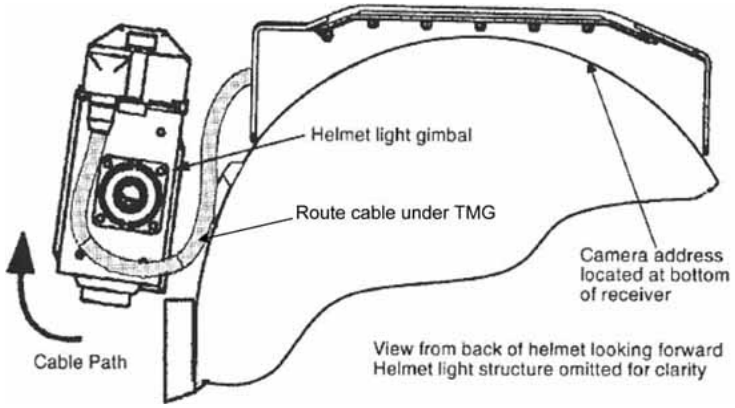


Figure 1.- ERCA Cable Routing.

11. Perform pull test of HLA/ERCA
12. √Helmet installed, sunshades down, install cover

FT, FN ECOK
13. Populate ISS EMU Equipment Bag crew specific compartments, as desired
    - ☐☐ Wristlets
    - ☐☐ Comfort Gloves
    - ☐☐ Moleskin/mosite
    - ☐☐ Nasal Spray

POST EVA EMU RECONFIGURATION (180 min)

NOTE

This procedure assumes the following procedures have been completed following EVA 4:
{1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST)

CONFIGURE EMU 3005 TO STAY ON ISS

EMU 3005

1. Remove following:
   - ☐ HL Batteries, stow in MO-2 Bag s/n 1038
   - ☐ REBAs, stow in MO-2 Bag s/n 1038
   - ☐ LiOH, install caps and stow in SYSTEMS TRANSFER Bag
   - ☐ Li-Ion EMU Battery, stow in MO-2 Bag s/n 1038
   - ☐ EV3 ISS Cuff C/L (cut out FS pages), stow in EMU Equipment Bag
   - ☐ Patches, Stripes, American Flag, stow in CF ECOK
   - ☐ Comm cap CF1, stow in CF ECOK
   - ☐☐ Fresnel Lenses (2), stow in CF ECOK
   - ☐ EMU Gloves CF1, install protective caps and stow in CF ECOK
2. Install protective arm covers from EMU Equipment Bag
3. Remove from Aft EDDA and temp stow

CONFIGURE EMUs 3004, 3018 FOR RETURN

EMU 3004

4. Install in Aft EDDA

EMUs 3004/3018

5. Remove following:
   - ☐☐ HL Batteries, stow in MO-2 Bag s/n 1038
   - ☐☐ REBAs, stow in MO-2 Bag s/n 1038
   - ☐☐ Li-Ion EMU Batteries, stow in MO-2 Bag s/n 1038
   - ☐☐ EV1, EV2 ISS Cuff C/Ls (cut out FS pages), stow in EMU Equipment Bag
   - ☐☐ Remove ISS tethers and tools, and temp stow
   - ☐☐ Patches, Stripes, American Flags, stow in respective ECOKs
   - ☐☐ Remove comm caps FT1, FN1, stow in respective ECOKs
   - ☐☐ Remove Helmet Lights Assemblies, ERCA assembly, stow in E-Lk

EMU 3010

6. Retrieve and stow in Airlock

7. As reqd, reference STS-134 NOMINAL EMU SIZING (EMU CONTINGENCY PROCS), fig 1, EMU 3010 – Initial Configuration and fig 2, EMU 3010 – Final Configuration

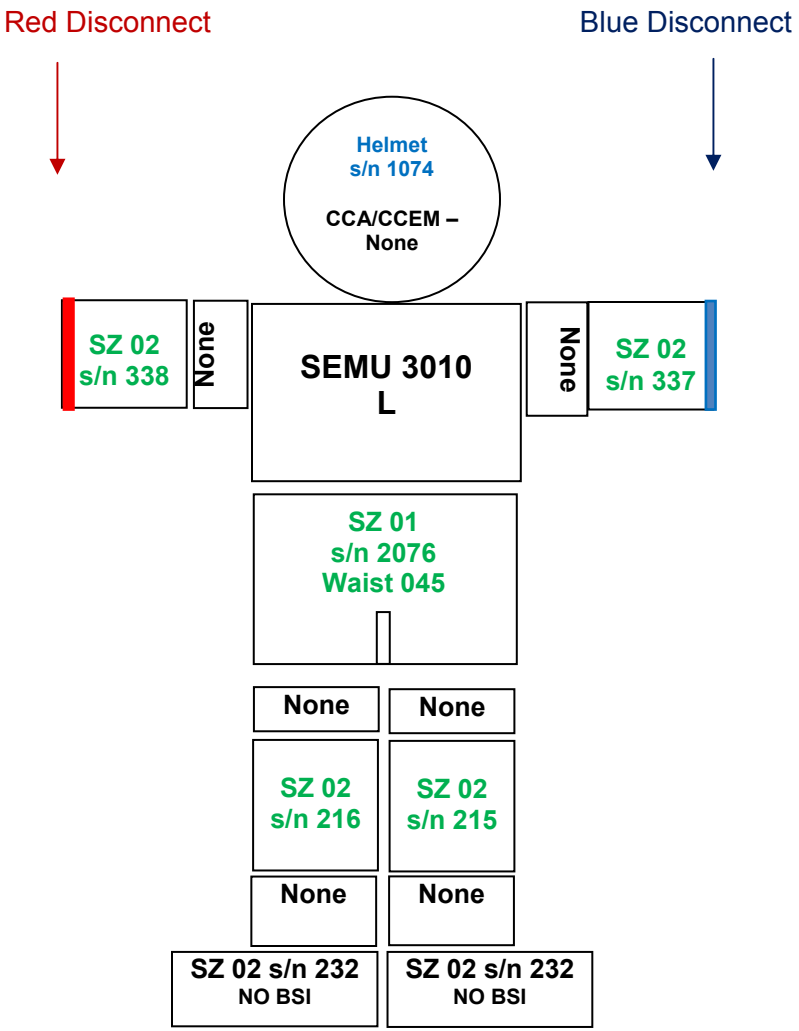


Figure 1 – EMU 3010 – Initial Configuration

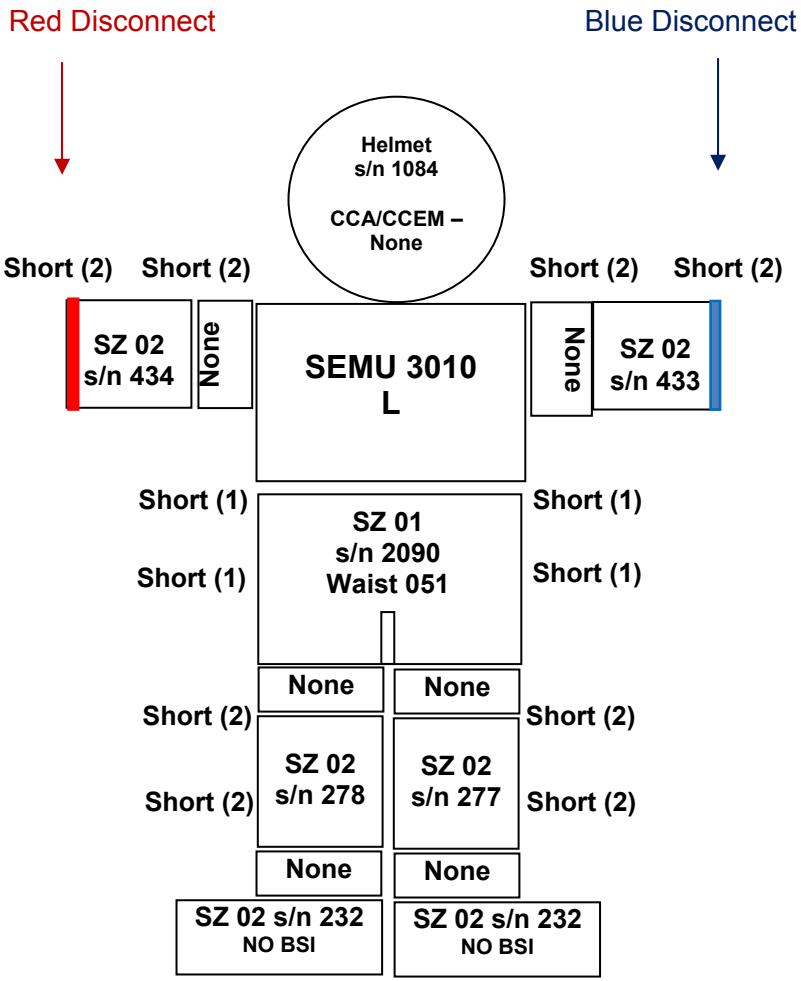


Figure 2 – EMU 3010 – Final Configuration

Blue Font – Indicates component to be swapped with EMU 3004
Green Font – Indicates components to be swapped with EMU 3018
Black Font – Indicates hardware remaining on EMU 3010

POST EVA EMU RECONFIGURATION (180 min) (Cont)

EMUs 3004/3010

8. Swap helmets
   - ☐☐ Remove valsalva, use gray tape to remove adhesive
   - ☐☐ As required, remove any Fresnel lenses from helmet 1074, stow in EMU Equipment Bag (Miscellaneous)
   - ☐☐ Verify sunshades down, cover installed

A/L1O1 MO-2 Bag s/n 1010

9. Retrieve Size 01 Waist Brief 029, s/n 2075
   Remove protective covers and temp stow

EMU 3004

10. Remove [Leg Assembly/Leg Sizing Ring/Boots] and temp stow
11. Remove Size 01 Waist Brief 052, s/n 2094 and install protective covers temp stowed in step 8
12. Install Size 01 Waist Brief 029, s/n 2075 and set waist sizing cams (4) to Short/Short
13. Re-install [Leg Assemblies/Leg Sizing Rings/Boots]
14. Remove from Aft EDDA and temp stow in Node 1 for transfer to Shuttle

EMU 3010

15. Install on Aft EDDA
16. Remove Boots s/n 232 and temp stow

EMU 3018

17. Remove [0.5" Leg Sizing Rings s/n 132,133/Boots s/n 240] and install on EMU 3010
18. Remove [Waist Brief s/n 051/Leg Assembly s/n 277,278] and temp stow

EMU 3010

19. Remove [Waist Brief s/n 045/Leg Assembly s/n 215,216/ 0.5" Leg Sizing Rings s/n 132,133/Boots s/n 240] and install on EMU 3018
20. Install [Waist Brief s/n 051/Leg Assembly s/n 277,278] from step 18
21. Re-install Boots s/n 232, temp stowed in step 16
22. Remove Lower Arm protective covers and temp stow
23. Remove Lower Arms s/n 337,338 and temp stow

EMU 3018

24. Remove EMU Gloves FN1 and temp stow
25. Install Lower Arm protective covers temp stowed in step 22
26. Remove Lower Arms s/n 433, 434 with protective covers and install on EMU 3010
27. Install Lower Arms s/n 337,338
    Set sizing cams (8) to Short/Long
28. Install EMU Gloves FN1
29. Verify waist cams (4) are Short/Short and leg sizing cams (8) are Short/Short

DCM

30. √O2 ACT – OFF
    √PWR – SCU
    √DCM Purge vlv – Op (up)
    √WATER – OFF, Switch Guard installed

POST EVA EMU RECONFIGURATION (180 min) (Cont)

31. Verify/reconfigure EMUs and ECOK per the following table:

EMU 3004 (FT↓)	**EMU 3018 (FN↓)**
☐ LiOH (any used) ☐ Helmet, sunshades down, cover installed ☐ FT ECOK ☐ LTA ☐ EMU Gloves FT1 ☐ Wrist Mirrors (2) [swap to worst]	☐ LiOH (any used) ☐ Helmet, sunshades down, cover installed ☐ FN ECOK ☐ LTA ☐ EMU Gloves FN1 ☐ Wrist Mirrors (2) [swap to worst]
EMU Crew Options Kit (ECOK) (FT) ☐ FT EVA 1, 2, & 3 Ziplock Bags ☐☐☐ TCUs (top, bottom) ☐☐☐ Socks ☐☐☐ Wristlets ☐☐☐ Comfort Gloves ☐☐☐ Moleskin X ☐☐ Patch, Stripes, American Flag ☐ LCVG FT1 (w/biomed sternal harness and signal conditioner) ☐ EMU Gloves FT2 ☐☐ Comm caps FT1 & FT2	**EMU Crew Options Kit (ECOK) (FN)** ☐ FN EVA 2, 3 & 4 Ziplock Bags ☐☐☐ TCUs (top, bottom) ☐☐☐ Socks ☐☐☐ Wristlets ☐☐☐ Comfort Gloves X ☐☐ Patch, Stripes, American Flag ☐ LCVG FN1 (w/biomed sternal harness and signal conditioner) ☐ EMU Gloves FN2 ☐☐ Comm caps FN1 & FN2
EMU Crew Options Kit (ECOK) (CF) ☐ CF EVA 1 & 3 Ziplock Bags ☐☐ TCUs (top, bottom) ☐☐ Socks ☐☐ Wristlets ☐☐ Comfort Gloves ☐☐ Patch, Stripes, American Flag ☐☐ Mole Skin ☐ X Valsalva/Lens Template ☐☐ Fresnel Lenses (2) ☐ LCVG CF1 (w/biomed sternal harness and signal conditioner) ☐☐ EMU Gloves CF1 & CF2 ☐☐Comm caps CF1 & CF2	

32. Retrieve new ISS EVA Systems Checklist (white) from STS; deploy in C-Lk

POST EVA EMU RECONFIGURATION (180 min) (Cont)

SYSTEMS TRANSFER Bag

33. Configure/verify contents of SYSTEMS TRANSFER Bag per following table:

SYSTEMS TRANSFER Bag
Verify already in Bag: ☐☐☐ ISS Cuff Checklists (3) (old) ☐☐ CREWLOCK DEPRESS/REPRESS Cue Card (2) old ☐ STS-133 ISS EVA Systems Checklist (old)
Configure: ☐ STS-134 CONSUMABLES TRACKING/BATTERY RECHARGE PLAN CUE CARD ☐ EMERGENCY UNDOCKING/EVA TRANSFER CUE CARD ☐ CREWLOCK DEPRESS/REPRESS CUE CARD – Mark's ☐ ISLE PREBREATHE Cue Card ☐ STS-134 ISS EVA Systems Checklist (Brown stripe) (Brown stripe copy bring back to STS; leave white copy) ☐☐ STS-134 EVA CHECKLIST (2) (SPARE and MASTER) ☐☐☐☐☐☐ EMU LiOH (6) (used)

EVA TRANSFER TO SHUTTLE (15 min) I

1. Configure/verify contents of TOOLS TRANSFER Bag per following table

TOOLS TRANSFER Bag
☐☐ 85-ft Safety tethers (#28 and #30) (2)
☐ 90 deg Connector Tool
☐ “Sample Wipes” Ziplock Bag

2. Transfer items in table below to Shuttle; report status to **MCC-H** when complete

Item	Destination
EMU 3004 (FT↓)	Temp stow Middeck
EMU 3018 (FN↓)	Temp stow Middeck
FT ECOK	Temp stow Middeck
FN ECOK	Temp stow Middeck
CF ECOK	Temp stow Middeck
SYSTEMS TRANSFER Bag	Temp stow Middeck
TOOLS TRANSFER Bag	Temp stow Middeck

EVA UNPACK AND STOW (90 min)

1. Retrieve 2 ICB EMU Batteries from Post Insertion locker (MF43H) and install in s/n 2089 in EMU 3004 and s/n 2090 in EMU 3018

2. Unpack and stow items per table below:

EMU SYSTEMS UNPACK AND STOW

Item	**Final Location**
EMU 3004 (FT)	Ext A/L (Stbd AAP)
EMU 3018 (FN)	Ext A/L (Port AAP)
FT ECOK ☐☐ Comm cap FT1 & FT2 ☐ EMU Gloves FT2 ☐ FT EVA #3 Bag	 Temp stow for LTA pouch Bag E CF ECOK
FN ECOK ☐☐ Comm cap FN1 & FN2 ☐ EMU Gloves FN2 ☐ FN EVA #4 Bag	 Temp stow for LTA pouch Bag E CF ECOK
CF ECOK; unpack to fit ☐ ECOK ☐ LCVG CF1 ☐☐ EMU Gloves CF1 & CF2 ☐☐ Comm caps CF1 & CF2	Bag E

SYSTEMS TRANSFER BAG UNPACK AND STOW

Item	**Final Location**
☐ STS-134 CONSUMABLES TRACKING CUE CARD ☐ EMERGENCY UNDOCKING EVA TRANSFER CUE CARD ☐☐ STS-134 EVA Checklist (SPARE and MASTER)	FDF Locker (MF71G)
☐ STS-134 ISS EVA Systems Checklists (Brown stripe) ☐ STS-133 ISS EVA Systems Checklist (old) ☐☐☐ ISS Cuff Checklist (3) (old) ☐☐ CREWLOCK DEPRESS/REPRESS (2) Cue Card (old) ☐ CREWLOCK DEPRESS/REPRESS Cue Card (Mark) ☐ ISLE PREBREATHE Cue Card	SODF Locker (MF71G)
☐☐☐☐☐☐ EMU LiOH (6) (used)	Bag E

TOOLS TRANSFER BAG UNPACK AND STOW

Item	**Final Location**
☐☐ 85-ft Safety tethers (28 and 30)	Bag E
☐ 90 deg Connector Tool	Bag E
☐ “Sample Wipes” Ziplock Bag	TBD

3. Stow empty SYSTEMS, TOOLS TRANSFER Bags (2) in Bag E

4. Report status to **MCC-H** when complete

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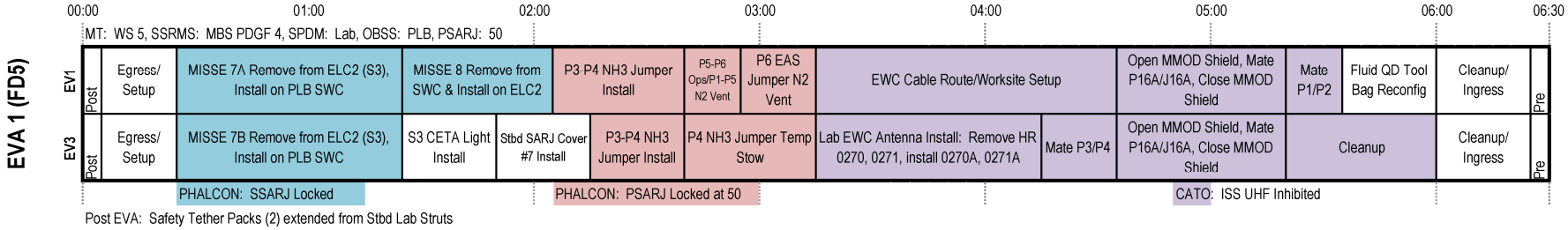
STS-134 (ULF6) EVA TIMELINE OVERVIEW

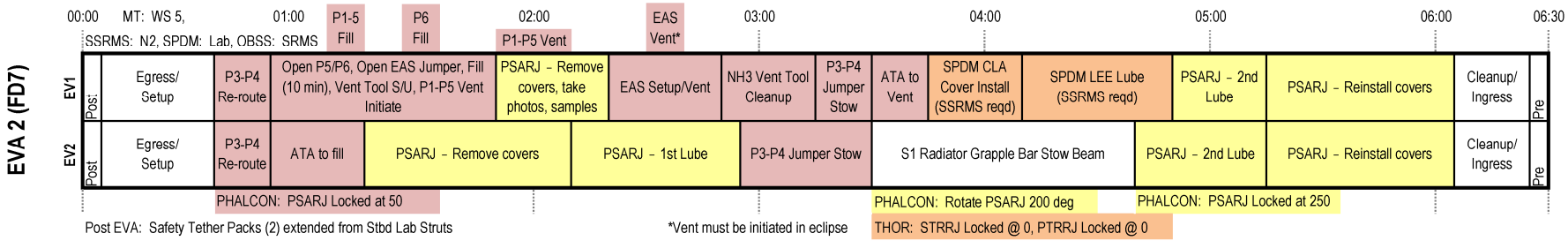
FD 3 ELC3 install, MT: WS 7, SSRMS: MBS PDGF 3, OBSS: PLB

FD 4 AMS install, MT: WS 2, SSRMS: MBS PDGF 3, OBSS: PLB



Post EVA: Safety Tether Packs (2) extended from Stbd Lab Struts

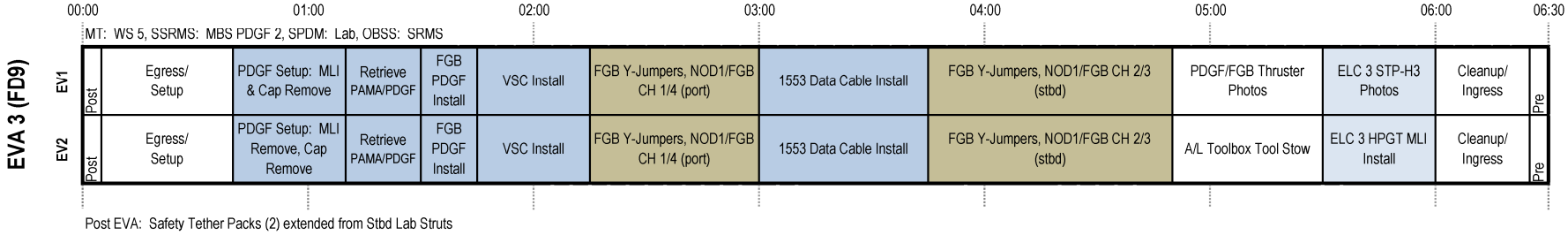
FD 6 OBSS H/O, MT: WS 5, SSRMS: Node 2, SPDM: Lab, OBSS: SSRMS @ beginning, SRMS @ end



Post EVA: Safety Tether Packs (2) extended from Stbd Lab Struts

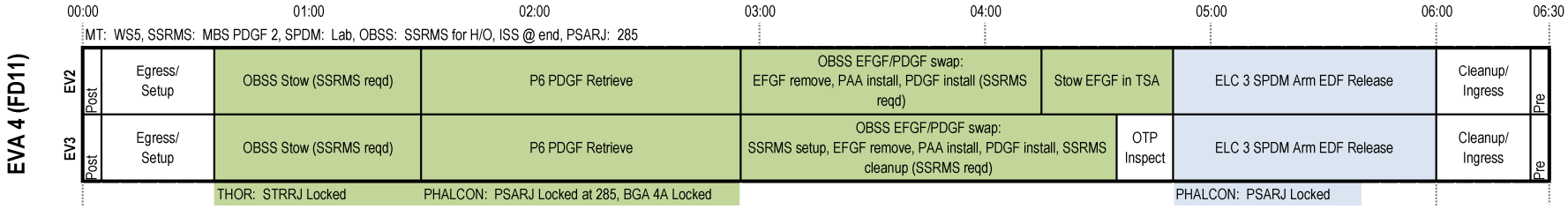
*Vent must be initiated in eclipse

FD 8



Post EVA: Safety Tether Packs (2) extended from Stbd Lab Struts

FD 10 Late Inspection, MT: WS 5, SSRMS: MBS PDGF 2, OBSS: SRMS



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EVA 1 SUMMARY TIMELINE

PET HR : MIN	IV/SSRMS	EV1 (Ft)	EV3 (Cf)	
00:00		EGRESS/SETUP (00:25) • Post Depress and Egress (00:15) • Setup (00:10)	EGRESS/SETUP (00:25) • Post Depress and Egress (00:15) • Setup (00:10)	00:00
		MISSE 7 RETRIEVE (01:00) • Retrieve PEC 7A (00:50) • Stow PEC 7A (00:10)	MISSE 7 RETRIEVE (01:00) • Retrieve PEC 7B (00:45) • Stow PEC 7B (00:15)	
01:00				01:00
		MISSE 8 INSTALL (00:40) • Retrieve MISSE 8 (00:15) • Install MISSE 8 (00:25)	S3 CETA LIGHT INSTALL (00:25)	
02:00		P3/P4 NH3 JUMPER INSTALL (00:35)	STBD SARJ COVER 7 INSTALL (00:25) P3/P4 NH3 JUMPER INSTALL (00:25)	02:00
		P5/P6 NH3 JUMPER INSTALL/N2 VENT (00:35) • Vent P1-P5 Jumpers (00:15) • Vent P6 EAS Jumper (00:20)	P3/P4 NH3 JUMPER TEMP STOW (00:35)	
03:00				03:00
		EWC ANTENNA INSTALL (02:20) • Setup/Worksite Prep (01:20)	EWC ANTENNA INSTALL (02:45) • Setup/EWC Antenna Install (01:00)	
04:00			• P3/P4 Mate (00:20)	04:00
		• Open MMOD Shield C2-01 (00:15) • Mate P16A/J16A (00:15) • Close MMOD Shield C2-01 (00:15) • Mate P1/P2 (00:15)	• Open MMOD Shield C2-01 (00:15) • Mate P16A/J16A (00:15) • Close MMOD Shield C2-01 (00:15) • Cleanup (00:40)	
05:00				05:00
		VTEB RECONFIG (00:25)		
06:00		CLEANUP/INGRESS (00:30) • Cleanup (00:10) • Ingress and Pre-Repress (00:20)	CLEANUP/INGRESS (00:30) • Cleanup (00:10) • Ingress and Pre-Repress (00:20)	06:00
06:30				06:30

EVA 1 TOOL CONFIG

ISS Configuration:

MT @ WS5: CETA Carts Port/Stbd
SSRMS on MBS PDGF
SPDM on Lab PDGF
PSARJ @ 50°
SSARJ @ 295°

Post EVA STP Config:
EV1 STP: S0 port, outbd Strut → A/L Curved HR, fwd Stanchion
EV3 STP: S0 port, inbd Strut → A/L aft D-ring

NOTE: Prior to use, inspect the following hardware:
- ❑ RET cords for fraying
- ❑ Inspect Load Alleviating Straps and D-ring Extenders; ref 2.230.100 CREW TETHER INSPECTIONS (SODF: ISS EVA TASKS):
  1. MMOD/general damage
  2. Discoloration
  3. Tack Stitching
  4. Red Band
- ❑ ISS Trash Bag: Bristle deformation/damage, after having stowed tools in trash bag
  √Empty √Zipper Closed
- ❑ BRT joint screws not loose
- ❑ Swing arm stiffness

Tether Counts: (Green RETs – Do NOT use ones in Ziplock bag labeled "ULF6 EVA 2 RETs")
RETs (sm-sm) = 11/11 RETs (PIP Pin) = 5/5
RETs (Lg-sm) = 7/8 Adj Equip Tethers = 9/10
Adj Equip Tethers (Lg-sm) = 1/2

EV1

- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (sm-sm)
    - ☐☐ Wire Tie (3 short)
  - ☐☐ T-Bar
    - ☐☐ RET (Lg-sm) (R)
    - ☐☐ RET (Lg-sm) (L)
    - ☐☐ Adj Equip Tether (R)
      - ☐☐ 1" QD Cap Removal Tool **2**
    - ☐☐ Adj Equip Tether (L to TB)
    - ☐☐ Small ISS Trash Bag (R, inbd)
  - ☐☐ Swing Arm (R)
    - ☐☐ RET w/PIP Pin
    - ☐☐ **EVA Camera w/bracket** (int RET – morning of)
- ☐☐ D-ring Extender (L D-ring)
  - ☐☐ ST Pack (85-ft + 85-ft to L D-ring Ext) (see fig 1)
- ☐☐ Waist Tether (1, R on D-ring)

EV3

- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (sm-sm)
    - ☐☐ Wire Tie (3 short)
  - ☐☐ T-Bar
    - ☐☐ RET (sm-sm) (L)
    - ☐☐ RET w/PIP Pin (R)
    - ☐☐ Adj Equip Tether (L to TB)
    - ☐☐ Wire Tie (2)
    - ☐☐ Small ISS Trash Bag (R, inbd)
  - ☐☐ Adj Equip Tether (R Wrist)
  - ☐☐ Swing Arm (R)
    - ☐☐ RET w/PIP Pin
      - ☐☐ PGT [A7, CAL, MTL 30.5] s/n _____
        - ☐☐ PGT Battery s/n _____
        - ☐☐ 7/16 (wobble) Socket-6 ext
- ☐☐ D-ring Extender (2, R & L D-ring)
  - ☐☐ Waist Tether (R on D-ring Ext)
  - ☐☐ Waist Tether (L on D-ring Ext)
  - ☐☐ ST Pack (85-ft + 85-ft to L D-ring Ext) (see fig 1)

A/L

- ☐☐ RET (Lg-Sm) (to HR Stanchion)
  - ☐☐ **EWC Med ORU Bag 2** (bottom to top)
    - ☐☐ Adj Equip Tether (ext – RF soft tether pt)
    - ☐☐ Adj Equip Tether (ext – LF soft tether pt)
    - ☐☐ Fish Stringer (RB, LB)
      - ☐☐ Hook 1: RET (sm-sm)
        - ☐☐ Long T-Handle Tool
          - ☐☐ Adj Equip Tether (Lg-sm) (sm hook to T-handle tool, Lg hook to D-ring)
      - ☐☐ Hook 2: RET (sm-sm)
        - ☐☐ Short T-Handle Tool
      - ☐☐ Hook 3: Loop Pin Puller
      - ☐☐ Hook 4: Wire Tie Caddy **3** (2 long, 7 short)
      - ☐☐ Hook 5: Wire Tie
        - ☐☐ P1 Cap
        - ☐☐ P2 Cap
        - ☐☐ J16A Cap
        - ☐☐ P16A Cap
    - ☐☐ Adj Equip Tether (RF) (replaces long wire tie)
      - ☐☐ EWC Cable (see fig 3)
      - ☐☐ EWIS Cable
    - ☐☐ Zenith Fish Stringer (fully extended; tape hook near hook #1; stow on left bag side tether; non-tape hook stow on LF soft tether pt)
      - ☐☐ Hook 1: RET (sm-sm) to Antenna side
        - ☐☐ EWC HR 0271A
        - ☐☐ EWC Antenna Cap
      - ☐☐ Hook 2: RET (sm-sm) to 0271A Antenna side
        - ☐☐ P4 Cap
      - ☐☐ Hook 3: RET (sm-sm)
        - ☐☐ HR 0271
      - ☐☐ Hook 4: 1" N2 Vent Tool **2**
      - ☐☐ Hook 5: RET (sm-sm)
        - ☐☐ HR 0270
      - ☐☐ Hook 6: RET (sm-sm) to 0270A Antenna side
        - ☐☐ P3 Cap
      - ☐☐ Hook 7: RET (sm-sm) to Antenna side
        - ☐☐ EWC HR 0270A
        - ☐☐ EWC Antenna Cap
- ☐☐ RET (Lg-Sm)
  - ☐☐ **FGB Y-Cable bag** (Node 3 Avionics bag) (back tether across to HR stanchion) (see fig 2)
    - ☐☐ Ch 2/3 (stbd) Cables (bottom/back) (see fig 4)
    - ☐☐ Ch 1/4 (port) Cables (top/front) (see fig 5)

EVA 1 TOOL CONFIG (Cont)

A/L (Cont)

☐☐ RET (Lg-sm) (to HR Stanchion)
- ☐☐ **CETA Med ORU Bag 2**
  - ☐☐ Adj Equip Tether (ext – LF soft tether pt)
  - ☐☐ Adj Equip Tether (ext – RB soft tether pt)
  - ☐☐ RET w/PIP Pin (RF)
    - ☐☐ 1" N2 Vent Tool
  - ☐☐ RET w/PIP Pin (RB)
    - ☐☐ SARJ Cover 7 (external MLI toward light)
  - ☐☐ RET (Lg-sm) (LF)
    - ☐☐ CETA Light

☐☐ RET (Lg-sm)
- ☐☐ VTE Plug

☐☐ **Staging Bag**
- ☐☐ Fish Stringer Tether
  - ☐☐ Wire Tie Caddy (hook 1) (5 short, 4 long)
  - ☐☐ Velcro/Tape Caddy (hook 2)
  - ☐☐ PGT (hook 3) s/n _____
    - ☐☐ PGT Battery s/n _____
    - ☐☐ 7/16 (wobble) Socket-6 ext
  - ☐☐ Vise Grips (hook 4)
  - ☐☐ Ratchet Wrench (hook 5)
    - ☐☐ 7/16 (rigid) Socket-2 ext
  - ☐☐ Long Duration Tie Down Tethers (2) (hook 6)
  - ☐☐ **Hubble Connector Tool (90 deg) 4** (hook 7)
  - ☐☐ Spare Safety Tether Pack (85-ft + 85-ft) (to strap)
- ☐☐ Fish Stringer Tether
  - ☐☐ Pin Straightener Assy (hook 1)
  - ☐☐ Connector Cleaner Tool Kit (hook 2)
  - ☐☐ Probe (hook 3)
  - ☐☐ Pry Bar (hook 4)
  - ☐☐ Needle Nose Pliers **2** (hook 6)
  - ☐☐ MWS Key Strap Assy (on wire tie, to strap)
  - ☐☐ **EVA Camera w/bracket 2** (hook 7 – morning of)

☐☐ **IV Bag**
- ☐☐ Towels (2)
- ☐☐ Contamination Detection Kit
- ☐☐ GP Caddy (2)
  - ☐☐ Adjustable Thermal Mittens (2)
- ☐☐ Socket Caddy (hatch cont) w/RET (sm-sm) (Black)
  - ☐☐ 1/2 Socket-8 ext
  - ☐☐ 7/16 (wobble) Socket-6 ext (spare)
- ☐☐ DCM Plug (SAFER Hardmount) (2)
- ☐☐ RET (sm-sm, Black) (2)

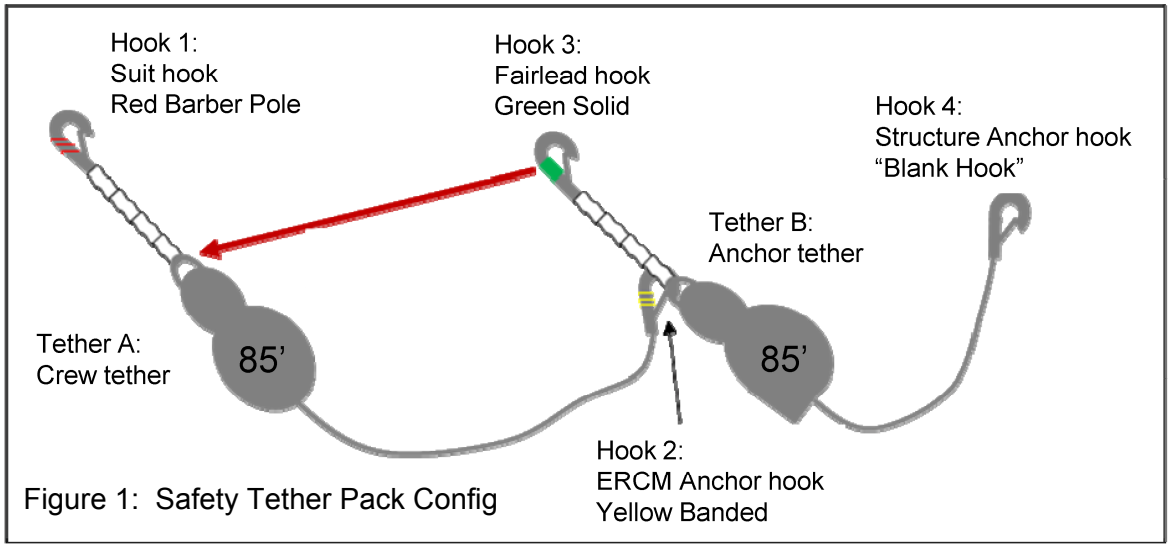
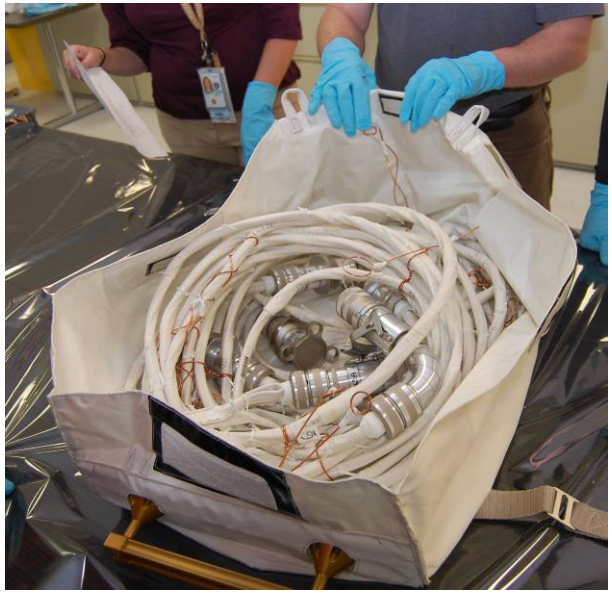


Figure 1: Safety Tether Pack Config



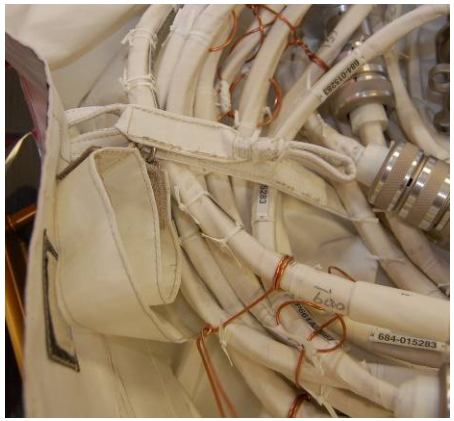
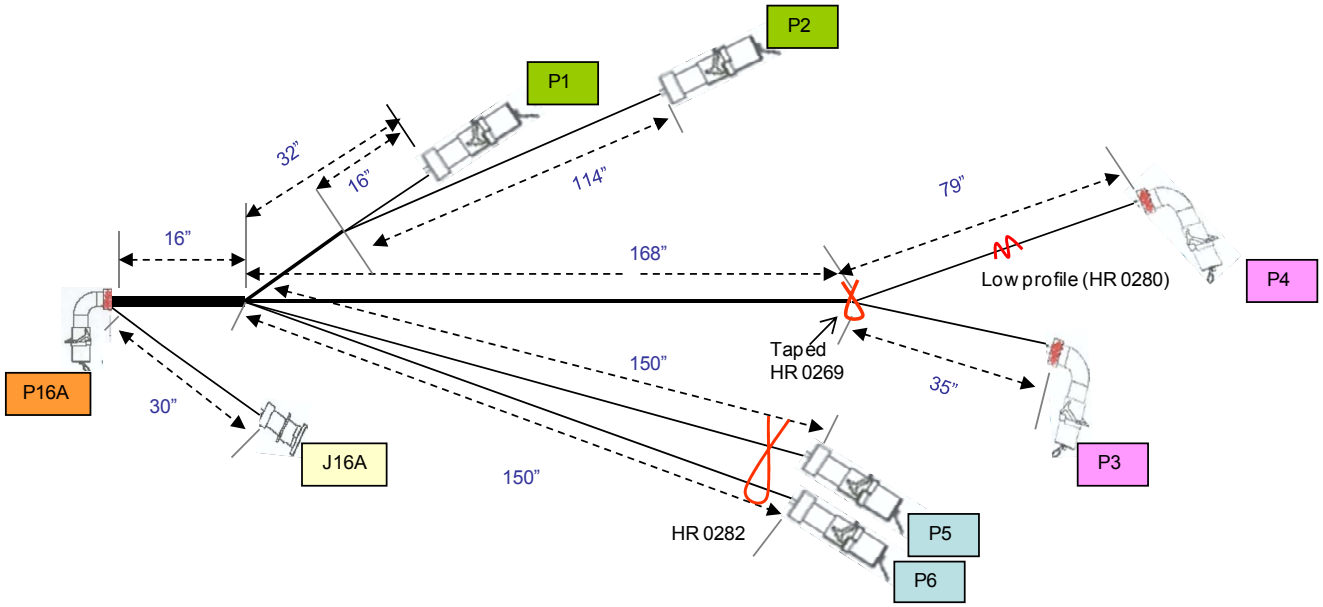
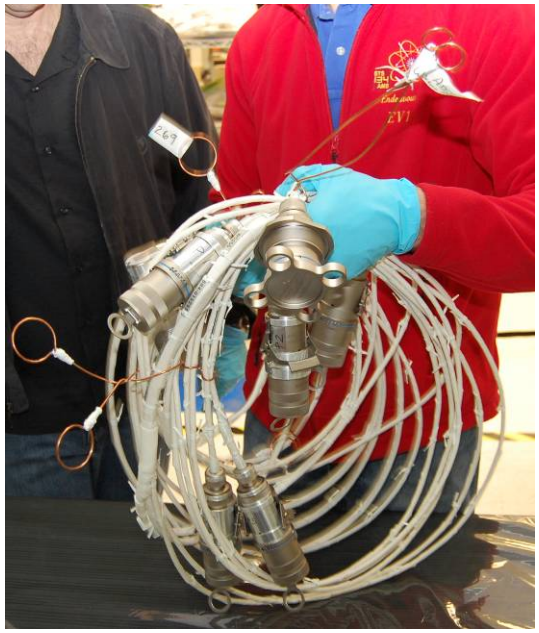


Figure 2: FGB Y-Cable Bag Config
❑ Tether through cable, through both D-rings, through bag tether, onto itself

EWC Cable





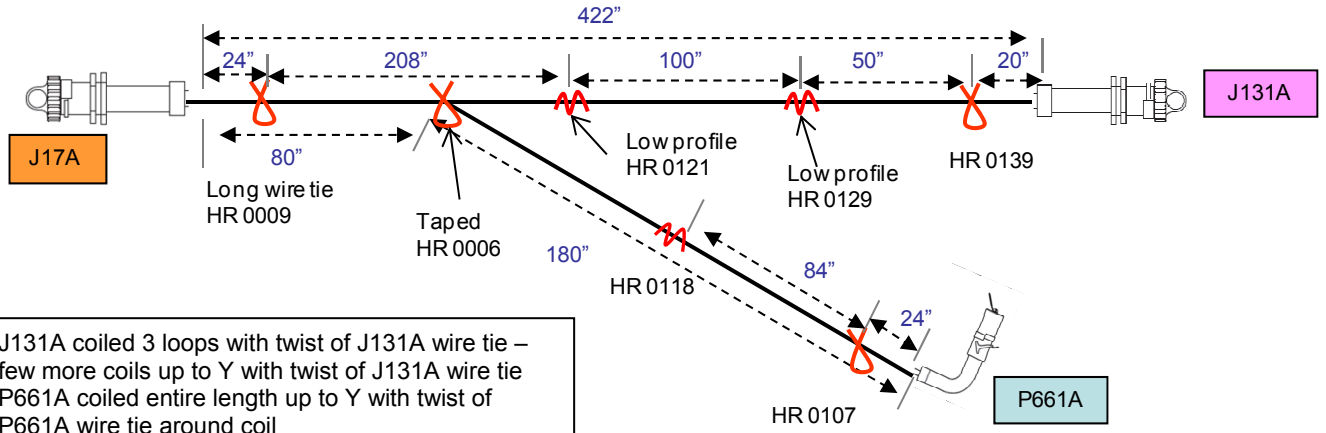
Actions:

- ❑ Replace long wire tie with Adj Equip Tether – goes around P1/P2/J16A/P16A only; hook back on D-ring
- ❑ Place smushed end of taped wire tie (from P3/P4) through unused D-ring of AET

Current Config:

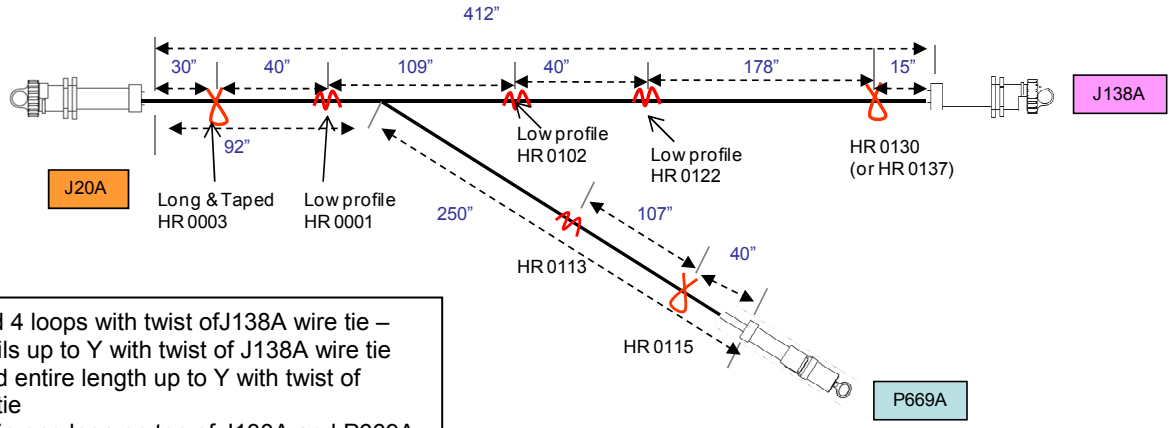
- ❑ All wire ties (3) are short
- ❑ P3/P4 coiled together up to taped wire tie. Coiled up to Big Y with twist of taped wire tie
- ❑ P1/P2/J16A/P16A coiled together with long wire tie around coils
- ❑ P3/P4 bundle on top of P1/P2/J16A/P16A bundle – smushed end of taped wire tie through "D-ring" of long wire tie
- ❑ P5/P6 coiled together 5 coils with a twist of P5/P6 wire tie – 1 more coil to Big Y with a twist of P5/P6 wire tie around additional coil and AET bundle

Figure 3: EWC Cable Coiled Configuration



- ❑ J131A coiled 3 loops with twist of J131A wire tie – few more coils up to Y with twist of J131A wire tie
- ❑ P661A coiled entire length up to Y with twist of P661A wire tie around coil
- ❑ Taped wire tie around both P661A and J131A coils
- ❑ J17A coiled in one loop on top of bundle with twist of J17A long wire tie around both coils and J17A loop

Figure 4: Ch 1/4 FGB Y-Cable (port)



- ❑ J138A coiled 4 loops with twist ofJ138A wire tie – few more coils up to Y with twist of J138A wire tie
- ❑ P669A coiled entire length up to Y with twist of P669A wire tie
- ❑ J20A coiled in one loop on top of J138A and P669A bundles with taped wire tie around both coils and J20A loop

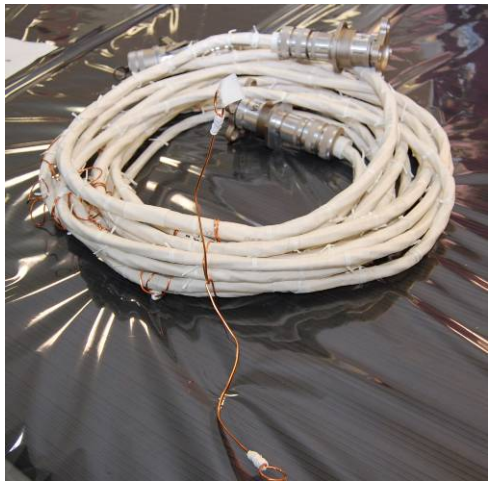


Figure 5: Ch 2/3 FGB Y-Cable (stbd)

EVA 1 BRIEFING CARD

EVA Prep
- Review Morning Timeline/Plan/Tethers
- Work With a Purpose
- Pure O2 Protocol
- Suit Donning Plan – special requests, boot bladder manipulation
- Safer, MWS, Tools, CL, Bag Stowage in A/L
- Airlock Depress Review

Procedure Review
- Egress Plan (tethers)
- Order of Tasks (summary timeline)
- Translation Paths, Fairleads
- Hazards (no touch, no damage, keep outs, notes, cautions, warnings)
  - Opened MISSE PECs – no touch; PEC hinges – pinch point
  - CETA Light – no touch
  - Backside of Dzus fastener – sharp edge
- Contingencies – section 16
- Task Constraints, Potential Get-aheads
- Ingress Plan

Post EVA
- Suit Doffing
- Tool Reconfig Plan

Emergencies
- Comm Fail (hand signals, Term EVA, Abort EVA)
  - EWC Task: Loss of comm plan/signals
- EMU Malfunctions
- Lost Tools/Crewmember (velocity and direction)
- DCS
- Safer Ops
- Crew Rescue

Reminders/Top Ten
- Gate Closed, Slider Locked, Tether Reel Unlocked
- Pins Straight, No FOD, Good EMI
- PGT Read-back, Turns and Torque with light
- Worksite Departure – tethers and tools clear
- Move Slow – no hopping (slower is faster)
- Body Position is Everything (use space)
- Tether Awareness – all of them
- Suit/Tool Awareness – BRT/PGT/ORU Stowage
- Suit MAL – read down DCM messages
- Discipline and Attention to detail until the end
- Day/Night Checks (Settings, tools, tethers)

Contingency
- MISSE 7B
- Loss of Comm during Lab EWC Antenna task

EVA 1 INHIBIT PAD

Orbiter

ALL EVAs

TCS *(Crew: Prior to Egress)*
IV L12 1. √TCS POWER – OFF
Install Switch Guard to remain in place through EVA 4

Ku-Band Antenna *(INCO: Prior to Egress)*
MCC-H 1. √KU-BAND Mask – active
2. √KU-BAND EVA Protect Box – active

RCS *(GNC/PROP: Prior to Egress)*
If EV crew < 27 ft from FRCS
IV 1. √DAP: VERN, FREE, LO Z
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 (*)

Ground

ALL EVAs

Ground Radar *(TOPO: Prior to Egress)*
MCC-H 1. √TOPO console, ground radar restrictions in place for EVA

USOS (1)

ALL EVAs

PCU *(PHALCON: Prior to Egress)*

NOTE

PCUs may require up to a 1-hr warmup period before they are operational

MCC-H 1. √PCUs (two) operational in discharge mode and one of the following:
a. CCS PCU EVA hazard control FDIR enabled
b. No more than two arrays unshunted and oriented < 105° from velocity vector
If one or both PCUs failed
2. No more than two arrays unshunted and oriented < 105° from velocity vector

CUCU (*Crew: Prior to Egress*)
IV – (LAB1O4)
1. √cb POWER A, B [two] – OPEN
2. √cb LINK 1,2 [two] – OPEN

And one of the following inhibit pairs:
POIC 3a. Express Rack 2 Locker 6 – Power Removed
3b. Express Rack 6 Locker 7 – Power Removed
OR
IV 4a. Express Rack 2 Locker 6 – OFF
4b. Express Rack 6 Locker 7 – OFF

LOCATION DEPENDENT INHIBITS

Lab Window *(Not expected)*
IV If EV crew less than 10 ft from window or in window FOV, close window shutter

Cupola Windows *(Not expected)*
IV If EV crew less than 10 ft from window, coordinate shutter opening/closing with EV crew and minimize time shutter is open

Mobile Transporter *(ROBO: Prior to Egress)*
MCC-H If EV crew < 1.5 meters from MT
1. √MT latched

SPDM *(ROBO: Prior to Egress)*
MCC-H If EV crew translating or working on SPDM
1. √SPDM in Keep Alive configuration or Safed

EVA 1 INHIBIT PAD (Cont)

TASK SPECIFIC INHIBITS

MISSE 7/8 on ELC2 *(POD: During Egress)*
POIC ELC-2 ECM EXPA-2 120V OPEN
ELC-2 ECM EXPA-2 28V OPEN
ELC-2 EXPA-2 OP PWR OPEN
RPCM S34B E RPC 1 – Open, Close Command Inhibited
RPCM S33A E RPC 1 – Open, Close Command Inhibited

S3 CETA Light *(PHALCON: Prior to Egress)*
MCC-H
1. RPC S31A A 03 – Open, Close Command Inhibited
2. RPC S32B A 02 – Open, Close Command Inhibited

Lab EWIS Antennas *(CATO: During Task – EWC Antenna Install)*
MCC-H Deactivate SSSR (UHF)

JEM (1)

ALL EVAs

ICS-EF Antenna *(Prior to Egress)*
SSIPC
1. ICS MOD – OFF
2. ICS UPC – OFF
3. ICS HPA – OFF
4. HPA ON and UPC ON commands are cleared (not present) in the ICS stored command queue

COL (1)

ALL EVAs

HAM Radio
IV
1. HAM Radio – Deactivate

RSOS (1)

ALL EVAs

SM Antennas *(RIO: Prior to Egress)*
IV
1. ARISS (Ham Radio) – Deactivate
MCC-M
2. GTS – Deactivate
3. Napor (РСПИ) – Deactivate

USOS (2)

LOCATION DEPENDENT INHIBITS

Stbd SARJ *(PHALCON: Prior to Egress – MISSE, SARJ Cover)*
MCC-H If EV crew working within 2 ft, outboard of SARJ or reqd per loads FR
1. √DLA (1) – LOCKED at +60 thru +180, +220 thru +350
2. All motor setpoints set to zero
3. All motors deselected

Port SARJ *(PHALCON: During Egress – PVTCS Fill Prep)*
MCC-H If EV crew working within 2 ft, outboard of SARJ or reqd per loads FR
1. √DLA (1) – LOCKED at 50°
2. All motor setpoints set to zero
3. All motors deselected

FPMU *(PHALCON: Prior to Egress – PVTCS Fill Prep)*
MCC-H If EV crew on Port truss (P1-P6) or working within 5 ft of Floating Potential Measurement Unit
1. RPCM P11A_B RPC 13 Open/Close Cmd Inhibit

SSPTS *(PHALCON: Prior to Egress – MISSEs, EWC Antennas Inhibit 1 egress until MISSE 8, inhibits 2 and 3 entire EVA)*
MCC-H If EV crew working within 2 ft of SSPTS cables
1. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit
2. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit
3. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

EVA 1 NOTES/CAUTIONS/WARNINGS

NOTES

1. Bolt install: Report torque and turns
2. Bolt release: Report torque and turns if different from published range
3. EVA connectors: After disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
4. Inspect QDs for damage prior to mating
5. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
6. 85-ft safety tether retract force may affect body positioning
7. CETA Cart brake handle wire ties must be replaced after crew loading

CAUTION

ISS Generic Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture shafts (dry lube)
   2. PIP pins
   3. Passive UMAs
   4. MBS/SSRMS/SPDM taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
   5. SPDM SJEU, EP, OTCM, LEU, and LEE VDU radiator surfaces
   6. OTSD

B. Electrical cables
   1. Avoid bend radii < 10 times cable diameter

C. Fiber optic cables
   1. Avoid bend radii < 10 times cable diameter
   2. Avoid pulling on cable during mate/demate

D. Fluid line flex hoses and QDs
   1. Avoid bend radii < 14 in for hoses with a diameter ≥ 1 in
   2. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
   3. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if required
   4. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements

CAUTION

ISS Generic Constraints (Cont)

E. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles

F. Other
   1. ITT Cannon connector: On demated connectors, do not rotate collar or manipulate cable/connector using collar or connector tool
   2. MLI handholds are not rated for crewmember translation loads

EVA 1 NOTES/CAUTIONS/WARNINGS (Cont)

CAUTION

ISS Truss Constraints

A. Avoid inadvertent contact with
   1. CETA lights (Z-93 paint) [LAB,S1,NODE 1,P3]
   2. Deployed TUS cable [Zenith and Nadir CETA rails]
   3. S0 aft face radiator
   4. GPS antennas (S13 paint) [S0,JLP]
   5. UHF antennas [LAB,P1]
   6. ETCS radiator flexhoses and panels [S1,P1]
   7. EETCS/PV radiator flexhoses, bellows and panels [P6,P4,S4,S6]
   8. SASA RF group [S1,P1]
   9. Heat pipe radiators [Z1]
   10. PCU cathode and HCA ports [Z1]
   11. Ku-Band antenna (SGANT) dish [Z1]
   12. CMG cover/shells [Z1]
   13. FPMU [P1]
   14. SASA high and low gain antennas and radiator surfaces [Z1]
   15. Deployed MISSEs
   16. OTP on HAB Tray [S0]

B. For structural reasons
   1. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

CAUTION

ISS Truss Constraints (Cont)

C. Other
   1. EWIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
   2. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS ground strap fasteners [P6,P4,S4,S6] can contaminate EMU
   3. Prevent inadvertent contact of the tether shuttle with ETRS when the P3 tether shuttle stop is raised away from the rail

CAUTION

ISS U.S. Pressurized Elements Constraints

A. Avoid inadvertent contact with
   1. EVA crane [PMA1]
   2. TCS reflectors [PMA2,PMA3]
   3. APAS hardware [PMA2,PMA3]
   4. CETA lights (Z-93 paint) [LAB,S1,NODE 1,P3]
   5. UHF antennas [LAB,P1]
   6. Open CBM petal covers, LAB and Cupola window shutters
   7. S0/NODE 2 fluid tray hardlines at NODE 2 end, which are limited to 25 lb

B. Other
   1. EWIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
   2. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged

CAUTION

ISS I.P. Elements Constraints

COL

A. Avoid inadvertent contact with
   1. COL ARISS and AIS antennas [COL-Nadir]

JEM

A. Avoid inadvertent contact with
   1. GPS antennas (S13 paint) [S0,JLP]
   2. Open JPM window shutter
   3. JTVE, WVE/EVE, JEF VE cameras
   4. JEMRMS taped radiative surfaces [JEU,EE,Cameras]
   5. JEM A/L target and pins
   6. JEF ORUs and EFUs (paint and lubricant)
   7. MAXI front and top panel (paint)
   8. SEDA-AP sensors (HIT, SDOM, and AOM)
   9. Trunnions and UCMs (paint and lubricant) [JEF Payloads]
   10. RAIDS covers on end of HREP
   11. ICS-EF Ka-Band antenna dish
   12. Small Fine Arm (SFA) (paint, coating and lubricant)

B. For structural reasons
   1. Avoid kicking MMOD shields between JLP and JPM
   2. Avoid tool impact on ICS-EF sensor

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 and PLB sill]
   4. Payload bay and camera wire harnesses, cables, cable guides, and connectors
   5. OBSS striker bars (drylube)

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]

WARNING

ISS Generic Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture targets and target pins

B. Pinch
   1. NZGL connector linkage. Use caution when mating/locking
   2. ITT Cannon connector rotating housing
   3. PDGF connector doors

C. QDs
   1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip
   2. Do not rotate if in mated/valve open configuration
   3. Bail may kick back suddenly when detent button is depressed if pressure has built up in spring cavity

D. Sharp Edges
   1. Inner edges of WIF sockets
   2. APFR active WIF probes
   3. Mating surfaces of EVA connectors Avoid side loads during connector mating
   4. Back side of MMOD shield fasteners
   5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAs, SARJ Covers); the end of the spring may protrude
   6. SPDM OTCM gripper jaws
   7. Keep hands away from SSRMS LEE/POA/SPDM LEE opening, snares, and PDGF curvic coupling (teeth)
   8. MMOD strikes on ISS exterior

WARNING

ISS Generic Constraints (Cont)

E. Thermal
   1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
   2. Turn off glove heaters when comfortable temperature reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
   3. Uncovered trunnion pins may be hot
   4. SSRMS/MBS/SPDM operating cameras and lights may radiate large amounts of heat
   5. Do not touch EMU protective visor if temperature has been < -134 degF for > 15 min
   6. No EMU boot contact with foot restraint when temperature < -120 degF or > 200 degF
   7. PDGF surfaces may not meet touch temperature requirements for unlimited contact when $\beta \leq -70$ or $\beta \geq 70$

WARNING

ISS Truss Constraints

A. Avoid inadvertent contact
   1. SSU, ECU, beta gimbal platform, mast canister, SAW blanket boxes unless the beta gimbal is locked and the motor is turned off
   2. Stay inboard of SARJ when active
   3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
   4. Stay 5 ft from moving MT on face 1
   5. Stay 3.3 ft from Ku-Band (SGANT antenna) when powered
   6. Stay 1 ft from top of STP-H3 (ELC3)
   7. Deployed MISSEs and ORMATE-III R/W

B. RF radiation exposure
   1. Stay 3.8 ft from S-Band (SASA) high gain antenna when powered [S1,P1]
   2. Stay 1.3 ft from S-Band (SASA) low gain antenna when powered [S1,P1]
   3. Stay 1 ft from UHF antenna when powered [LAB,P1]

C. Sharp Edges
   1. Solar array blanket box [P6,S6]
   2. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
   3. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner
   4. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 – SARJ at 0 deg]
   5. Nickel coated braided copper ground straps may contain frayed wires [P6,P4,S4,S6]
   6. MMOD strikes on Z1 toolboxes
   7. POA FSE (CSA logo below MBS mast camera)
   8. AMS Star Trackers Baffles (2)

WARNING

ISS Truss Constraints (Cont)

D. Electrical Shock
   1. Stay ≥ 2 ft from ungrounded floating connectors if powered
      S0 EVA power cables (inside S0 Bay 00 Face 4, Bay 01 Face 3)
      ESP-2 jumper (inside S0 Bay 03 Face 4)

E. Thermal
   1. ELC may exceed touch temperatures when β > 75 deg

WARNING

ISS U.S. Pressurized Elements Constraints

A. Handrails
   1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 and 566, A/L Tank 2 Nad/Fwd and Port/Fwd, P6 5389]

B. Pinch
   1. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
   2. LAB and Cupola window shutters and CBM petal cover linkages during operation

C. RF radiation exposure
   1. Stay 1 ft from UHF antenna when powered [LAB,P1]

D. Sharp Edges
   1. PMA umbilical launch restraints - exposed bolt threads
   2. Adjustable fuse tether (Fish Stringer) buckles stowed in Node bag
   3. Port/Aft portion of A/L circular HR [HR 0506]
   4. A/L HR 0537 (Eq Lock Zenith)
   5. ESP-2 HR 8012
   6. PMM ROEU and ROFU panels (zenith endcone)

WARNING

ISS U.S. Pressurized Elements Constraints (Cont)

E. Thermal
   1. PMA handrails may be hot. Handling may need to be limited
   2. Stay ≥ 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up; limit time to 15 min or less if > 300 degF
   3. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF
   4. No EMU TMG contact with PMAs and MMOD shields > 320 degF

F. Electrical Shock
   1. Stay ≥ 2 ft from ungrounded floating connectors if powered
      SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd

G. Fluid QDs
   1. Do not translate on gap spanners restraining NODE 3 – LAB NH3 jumpers

WARNING

ISS I.P. Elements Constraints

COL

A. Avoid inadvertent contact with
   1. SOLAR [COL EPF]

B. Thermal
   1. Columbus end cones may violate touch temperature constraints when $-75 \leq \beta \leq -60$ or $60 \leq \beta \leq 75$

JEM

A. Avoid inadvertent contact with
   1. ICS-EF sensors

B. Pinch
   1. JPM window shutter linkages during operation
   2. JEM cameras (JVTEs, EVE, WVE, and JEF VEs)
   3. JEM EFU latching arms
   4. JEF SSE latch
   5. ICS-EF antenna boom
   6. SEDA-AP mast
   7. SMILES antenna rotating area
   8. HREP hinge sides and RAIDS pinch areas
   9. JEMRMS EE
   10. JEMRMS Small Fine Arm (SFA) joints and booms

WARNING

ISS I.P. Elements Constraints (Cont)

JEM (Cont)

C. Sharp Edges
   1. Interior of JEMRMS HRMs
   2. JEMRMS EE opening and snares
   3. JEM A/L hatch corners
   4. ICS-EF AHM gears
   5. MAXI visual star camera
   6. SMILES baffles (two), baffle base bare bolts, and Cold Sky Terminator (CST)
   7. HREP baffles (four) [Star tracker aperture Zenith and three instrument baffles Aft]
   8. SFA Electro-Mechanical GF (EMGF)

D. RF radiation exposure
   1. Stay 0.3 ft from Fwd/Aft JPM PROX antenna

E. Thermal
   1. JPM Port End Cones and JLP Port Nadir may violate touch temperature constraints when $\beta > 60$ deg
   2. JEMRMS/JTVE/JEFVE operating cameras and lights may radiate large amounts of heat

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. 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]

EVA 1 NOTES/CAUTIONS/WARNINGS (Cont)

WARNING

Shuttle Constraints (Cont)

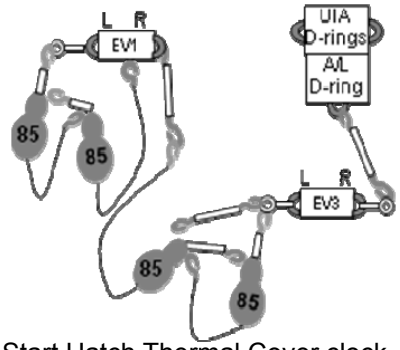
D. Sharp Edges
   1. PRLA grounding wipers [PLB]
   2. LDRI baffles (also an entrapment hazard) [OBSS]
   3. Keep hands away from SRMS EE opening and snares
   4. TCS connector backshells have exposed threads [ODS]

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

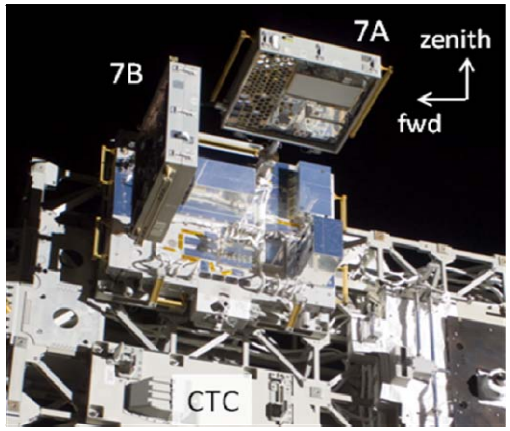
EVA 1 EGRESS/SETUP (00:25)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
1. Record PET Start Time __ : __ (Pwr to Batt) 2. Start WVS Recorders  3. Start Hatch Thermal Cover clock PET (30 min) __ : __	**Initial Configuration:** 1. √All gates closed & hooks locked ❑ R Waist Tether to EV3 Blank hook ❑ Red hook on L D-ring ext ❑ Yellow hook on Green ERCM ❑ Green hook on Red ERCM ❑ Blank hook on MWS <u>EGRESS/SETUP</u> (00:25) 2. Open hatch thermal cover 3. Egress A/L 4. Receive EWC ORU bag from EV3, stow on BRT w/RET 5. Perform buddy checks √MWS tabs up, BRT tabs up, tether configs 6. Verify SAFER config ❑ √L handle down (MAN ISOL Vlv – Open) ❑ √R handle down (HCM – Closed) 7. √WVS – green LED 8. Translate to S0 Port Struts 9. Attach EV1 **BLANK** hook to Port, outbd Strut ❑ √Gate closed, hook locked, reels unlocked, release RET 10. Attach EV3 **BLANK** hook to Port, inbd Strut ❑ √Gate closed, hook locked 11. Release EV1 R Waist Tether from EV3 **BLANK** hook 12. Give **EV3 GO** to release Waist Tether 13. Translate fwd along Lab	**Initial Configuration:** 1. √All gates closed & hooks locked ❑ R Waist Tether to A/L D-ring ext ❑ Red hook on L D-ring ext ❑ Yellow hook on Green ERCM ❑ Green hook on Red ERCM ❑ Blank hook to EV1 R Waist Tether <u>EGRESS/SETUP</u> (00:25) 2. Transfer EWC ORU bag to EV1 ❑ Position CETA ORU bag near hatch 3. Egress A/L 4. Perform buddy checks √MWS tabs up, BRT tabs up, tether configs 5. Verify SAFER config ❑ √L handle down (MAN ISOL Vlv – Open) ❑ √R handle down (HCM – Closed) 6. √WVS – green LED 7. Retrieve CETA ORU bag, stow on BRT w/RET 8. On **EV1 GO**, release R Waist Tether from A/L int D-ring 9. Close hatch thermal cover
4. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max 5. Stop Hatch Thermal Cover clock PET (30 min) __ : __		

EVA 1 EGRESS/SETUP (00:25) (Cont)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
	14. Stow EWC ORU bag on Lab HR 0260, 0259 with hinge ISS aft (Translate to S1 Face 1, zenith – MISSE 7 Retrieve)	10. Perform translation adaptation (Translate to S1 Face 1, nadir – MISSE 7 Retrieve)

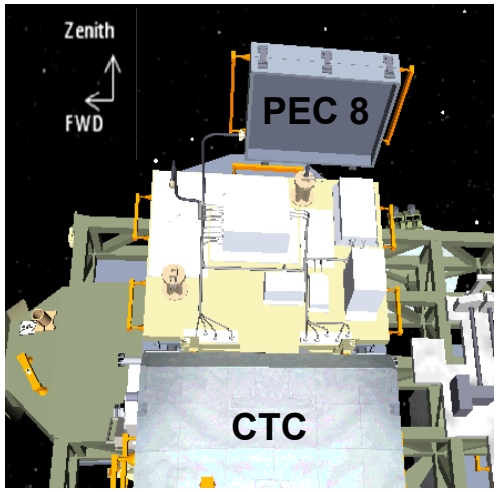
MISSE 7 RETRIEVE (01:00)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
Planned PET 00:25 1. Verify inhibits in place √Stbd SARJ Locked √MISSE/ELC-2 Inhibits  	WARNING Do not touch the hinged side while closing the MISSE PECs (Pinch Point) CAUTION Avoid inadvertent contact with deployed MISSE PECs, which have shatterable materials, and the silver avionics boxes atop the ExPA RETRIEVE PEC 7A (00:50) 1. Translate to S1 Face 2, zenith route ❑ Fairlead on S0 HR 3467 (bay 1) 2. Attach **GREEN** hook on S1 HR 3208 (bay 17) ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate zenith to ELC2 ❑ Fairlead on S3 HR 3052 (face 1) 4. 📷 Photograph deployed PECs PEC 7B (❑ Ram/Fwd side, ❑ Aft side) PEC 7A (❑ Zenith side, ❑ Nadir side) ❑❑ Overall View (2 angles) 5. Close PEC 7A ❑ √All 4 PIP pins are re-installed	RETRIEVE PEC 7B (00:45) 1. Translate to S1 Face 6, nadir route 2. Attach **GREEN** hook on S1 HR 3217 or Xo 5790 (bay 17) ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate outbd to bay 19 4. Stow CETA ORU bag on S3 HRs 3046, 3038 5. Translate zenith to ELC2 6. If EV1 complete with photos of PEC 7B, close PEC 7B ❑ √All 4 PIP pins are re-installed 7. Disconnect connector from PEC 7B ❑ RET, remove cap from dummy connector J7B ❑ Demate connector from PEC ❑ Mate connector to dummy connector J7B (√no FOD, pins) ❑ Install cap onto PEC 7B 8. Disconnect connector from PEC 7A ❑ RET, remove cap from dummy connector J7A ❑ Demate connector from PEC ❑ Mate connector to dummy connector J7A (√no FOD, pins) ❑ Install cap onto PEC 7A

MISSE 7 RETRIEVE (01:00) (Cont)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
		9. Release PEC 7B (2 PIP pins), stow on BRT w/RET (nadir HR) ❑ Reinstall Socket PIP pins (2)
	6. Release PEC 7A (release 2 PIP pins), stow on BRT w/RET (RAM HR) ❑ Reinstall Socket PIP pins (2)	
	CAUTION When translating around fwd edge of Node 2 and PMA2, avoid contact with Shuttle	
	7. Retrieve **GREEN** hook from S1 HR 3208 ❑ √Gate closed, hook locked, reels unlocked, release RET 8. Translate to Node 2, along port/zenith 9. Attach **GREEN** hook on Node 2 HR 0344 ❑ √Gate closed, hook locked, reels unlocked, release RET STOW MISSE 7A IN PLB (00:10) 10. Translate to Orbiter, port, bay 4 11. Remove SWC latch PIP pins (2) 12. Release latch (2) from stow position 13. Stow PEC 7A in carrier (HRs out, Probe up) 14. Lock fwd latch in landing config ❑ Install PIP pin 15. Retrieve RET 16. Lock aft latch in landing config ❑ Install PIP pin	10. Retrieve **GREEN** hook from S1 HR 3217 or Xo 5790 ❑ √Gate closed, hook locked, reels unlocked, release RET 11. Translate to Node 2, stbd/zenith route ❑ Fairlead on Lab HR 0247 with wrist Adj ❑ Fairlead on Node 2 HR 0314 ❑ Face toward Col and Node 2 WARNING Stay ≥ 2 ft from exposed EFGF connector when OBSS berthed, powered, and EFGF not grappled STOW MISSE 7B IN PLB (00:15) 12. Translate to Orbiter, stbd, bay 4 13. Remove SWC latch PIP pins (2) 14. Release latch (2) from stow position 15. Stow PEC 7B in carrier (HRs out, Probe up) 16. Lock aft latch in landing config ❑ Install PIP pin 17. Retrieve RET 18. Lock fwd latch in landing config ❑ Install PIP pin
	17. Glove and Gauntlet Check (Translate aft to Bay 9 – MISSE 8 Retrieve)	19. Glove and Gauntlet Check (Translate to S3 Face 1 – S3 CETA Light Install)

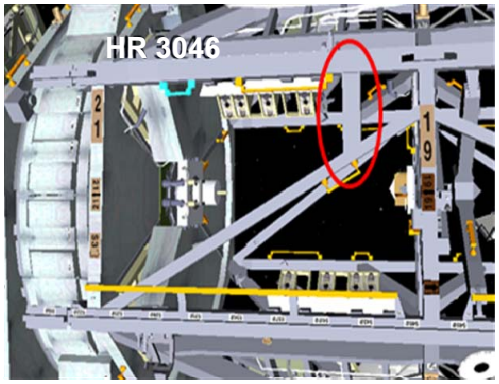
MISSE 8 INSTALL (00:40)

IV/SSRMS	EV1 (Drew)
Planned PET 01:25  1. When EV1 is clear of PMA2, **give MCC-H GO** to release SSPTS Inhibit 1	MISSE 8 RETRIEVE (00:15) 1. Translate aft to bay 9, MISSE 8 Side Wall Carrier 2. Release aft latch from launch config 3. RET to PEC 8 (fwd HR) 4. Release fwd latch to release PEC 8 from carrier 5. Stow PEC 8 on BRT w/RET (fwd HR) 6. Lock latches (2) into stow position ❑ Aft ❑ Fwd 7. Install PIP pins (2) 8. Retrieve **GREEN** hook from Node 2 HR 0344 ❑ √Gate closed, hook locked, reels unlocked, release RET 9. Translate to S1 Face 2, zenith route ❑ Fairlead on S0 HR 3467 (Bay 1) 10. Attach **GREEN** hook to S1 HR 3208 ❑ √Gate closed, hook locked, reels unlocked, release RET WARNING Do not touch the hinged side while opening the MISSE PEC CAUTION Avoid inadvertent contact with deployed MISSE PECs, which have shatterable materials, and the silver avionics boxes atop the ExPA MISSE 8 INSTALL (00:25) 11. Translate zenith to ELC2 at trunnion 12. Release PIP pins (2) on zenith ExPA socket 13. Install PEC 8 into socket (HRs inbd, connectors ISS fwd) ❑ √Alignment marks match up 14. Install PIP pins (2)

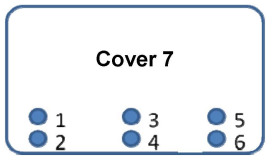
MISSE 8 INSTALL (00:40) (Cont)

IV/SSRMS	EV1 (Drew)
 MISSE 8 Side View	15. Mate MISSE 8 Connector 7A: ❑ Remove 7A cap (lower/red connector) ❑ Demate 7A connector from dummy panel J7A ❑ Mate J7A connector to J7A (lower connector) (√no FOD, pins) ❑ Install 7A cap onto dummy connector J7A 16. Mate MISSE 8 Connector 7B: ❑ Remove 7B cap (upper/green connector) ❑ Demate 7B connector from dummy panel J7B ❑ Mate J7B connector to J7B (upper connector) (√no FOD, pins) ❑ Install 7B cap onto dummy connector J7B 17. Open PEC 8 ❑ √All 4 PIP pins are re-installed 18. 📷 Photograph deployed PEC PEC 8 (❑ Nadir, ❑ Zenith) ❑❑ Overall View (2 angles)
2. When EV1 is clear of ELC2, give **MCC-H GO** to power up ELC2 (except for MISSE 8 WVS Inhibit) 3. Perform CETA ORU bag inventory: ☐ CETA Med ORU bag ☐ Adj Equip Tether (ext) ☐ Adj Equip Tether (ext) ☐ RET (sm-sm) ☐ RET (sm-sm) ☐ RET (sm-sm)	19. Translate to CETA ORU bag on S3 HR 3046 20. When clear of ELC2, give **IV GO** for ELC2 power up 21. Retrieve N2 vent tool from CETA ORU bag, leave RET in bag 22. If EV3 complete with CETA ORU bag, perform bag inventory 23. Stow CETA ORU bag on BRT w/RET 24. Retrieve **GREEN** hook S1 HR 3208 ❑ √Gate closed, hook locked, reels unlocked, release RET 25. Translate to CETA Spur ❑ Retrieve fairlead at Bay 1 ❑ Translate nadir at Bay 5 (watch for EV3's tether) 26. Stow CETA ORU bag on S0 HR 3413, 3412 (Face 6) 27. Glove and Gauntlet Check (Translate to P3 Face 1, nadir route – P3/P4 Jumper Install)

S3 CETA LIGHT INSTALL (00:25)

IV/SSRMS	EV3 (Taz)
Planned PET 01:25  1. Record CETA light bolt data: | Bolt | Turns | Torque (ft-lb) | |---|---|---| | CETA Light | (11-15) | (12.0) | 2. Give **MCC-H GO** for CETA light heater power	CAUTION CETA Lights are covered with Z-93 paint, avoid impact/inadvertent contact CETA Light grid could be a finger entrapment, do not stick finger in grid S3 CETA LIGHT INSTALL (00:25) 1. Translate to S1 Face 1 (stbd/zenith, then nadir route) ❑ Retrieve fairlead on Node 2 HR 0314 2. Attach **GREEN** hook on S1 HR 3217 or Xo 5790 (bay 17) ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate to S3 Face 1 (bay 19) 4. BRT to S3 HR 3037 5. Release TA clamp 6. Demate connector P170 from J1 on stanchion pnl A92 ❑ Close TA clamp, if able 7. RET, remove dust cap from J1 on CETA light 8. Retrieve CETA light from CETA ORU bag 9. Mate connector P170 to J1 on CETA light ❑ √Good pins & EMI band; no FOD 10. Retrieve RET 11. Soft dock light onto empty (inner) light bracket 12. Install dust cap on J1 on stanchion pnl A92 13. Configure PGT: **[B1 (12.0), CW2, 30.5]** 6-Ext 7/16 14. ←Drive bolt while pushing in, **11-15 turns** 15. Glove and Gauntlet Check 16. **Notify IV** when clear of worksite (Retrieve SARJ Cover – SARJ Cover Install)

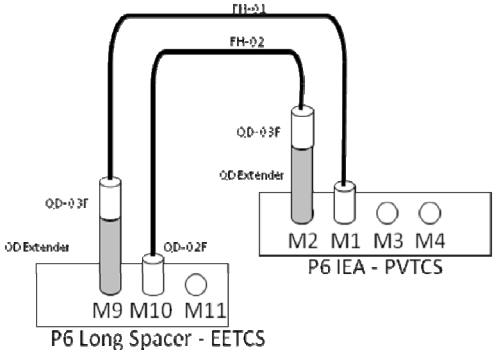
STBD SARJ COVER 7 INSTALL (00:25)

IV/SSRMS	EV3 (Taz)
Planned PET 01:50  1. Record SARJ Cover bolt: Cover 7: 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___	CAUTION Minimize side loading bolt head Maintain axial force on fastener to compress spring during rotation WARNING End of spring on EVA fasteners may protrude – sharp edge S3 SARJ COVER 7 INSTALL (00:25) 1. Retrieve SARJ Cover 7 from CETA ORU bag 2. Translate zenith at SARJ to Face 3 3. Report any off-nominal findings under Cover 7 4. Configure PGT: **[A1 (2.5), CW2, 30.5]** 6-Ext 7/16 5. ←Engage MLI cover fasteners, **9 turns** √Green light and bolt seated for all bolts 6. Retrieve **GREEN** hook from S1 HR 3217 or Xo 5790 ❑ √Gate closed, hook locked, reels unlocked, release RET (Translate to P3 Face 1, zenith – P3/P4 Jumper Install)

P3/P4 NH3 JUMPER INSTALL (00:35/00:25)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
Planned PET 02:05 (EV1) 02:15 (EV3) 1. Verify inhibits in place √Port SARJ locked at 50° (No inhibit required for P4 EWIS)	CAUTION QDs exposed to direct sun can overtemp in 20 min. Shading by EMU or thermal shrouds can lengthen acceptable time with bootie removed NOTE Mind your safety tethers. Do not route P3/P4 Jumper over your safety tether P3/P4 NH3 JUMPER INSTALL (00:35) 1. Translate to P3 Face 6, nadir route 2. Attach **GREEN** hook to P3 HR 3861 (bay 22) ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Attach RET to P3 HR 3860 _____ 4. RET, remove cap from QD M2 5. Translate nadir/aft to P4 bulkhead 6. Demate EWIS Connectors (2) ❑ J1 ❑ J2 7. Release jumper and mate EWIS Connectors √Good pins & EMI band; no FOD ❑ J1 ❑ J2 8. Release TA Clamps (10) 9. Retrieve QD F2 from EV3 w/tether 10. Translate to P3 M2 with QD F2 11. Route jumper as required 12. Mate and open QD F2 to M2 per **BLOCK B** and **BLOCK C** 13. Visually inspect jumper connections (Translate to P5/P6 Jumper)	P3/P4 NH3 JUMPER INSTALL (00:25) 1. Translate to P3 Face 2, zenith route ❑ Watch for EV1's ST ❑ Fairlead zenith after MT 2. Attach **GREEN** hook to P3 HR 3852 (bay 22) ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate zenith/aft to P4 inbd bulkhead 4. Open thermal bootie on QD F2 (1/4") ❑ √Detent button fully installed 5. Demate QD F2 per **BLOCK A** 6. Transfer QD F2 to EV1 7. Open thermal bootie on QD F15 (1") ❑ √Detent button fully installed 8. Demate QD F15 per **BLOCK A** 9. Translate to P4 M15 with QD F15 10. Remove cap from P4 M15 (lanyarded) 11. Mate and open QD F15 to M15 per **BLOCK B** and **BLOCK C** 12. Visually inspect jumper connections (Translate to P3 Face 6)

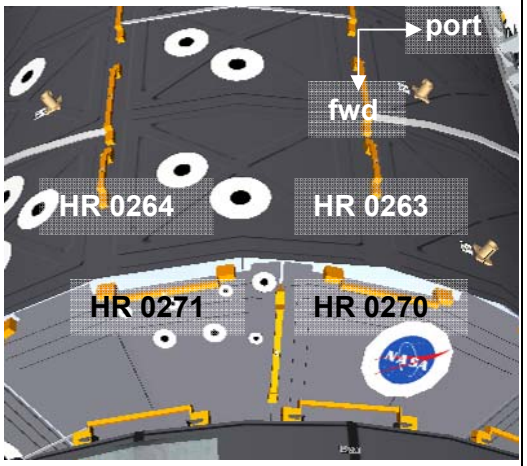
NH3 JUMPERS N2 VENT/P3/P4 JUMPER TEMP STOW (00:35)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
Planned PET 02:40	P1-P5 JUMPER VENT (00:15) 1. Translate to P5 dummy panel M14 2. Remove cap from N2 vent tool 3. Release TA Clamp (1) 4. Open thermal bootie on QD F14 ❑ √Detent button fully installed 5. Demate QD F14 per **BLOCK A**	P3/P4 NH3 JUMPER TEMP STOW (00:35) 1. Translate to P3 pnl A502 (face 6)
1. When EV1 complete with P1-P5 venting ops, give **EV3 GO** for P3/P4 Jumper temp stow	6. Mate QD F14 to N2 vent tool per **BLOCK B** (1") 7. Open QD F14 per **BLOCK C** to allow venting 8. After 45 sec, close QD F14 per **BLOCK D**; notify IV when complete (**EV3 GO** for P3/P4 temp stow) 9. Demate QD F14 from N2 vent tool per **BLOCK A** NOTE Do not touch P6 M14 Cap 10. Mate QD F14 to P5 dummy panel M14 (original location) per **BLOCK B**; do not open QD 11. Install cap on vent tool	2. On **IV GO**, close and demate QD F2 at M2 per **BLOCK D** and **BLOCK A** 3. Install cap on M2, leave EV1 RET there 4. Translate to P4 inbd bulkhead with QD F2 5. Mate QD F2 to dummy male M2 per **BLOCK B** ❑ Close nearest TA Clamp 6. Install wire tie around jumper on P4 HR 5123
	EAS JUMPER VENT (00:20) 12. Translate to EAS Jumpers, fairlead as reqd 13. Remove cap from vent tool 14. Open thermal bootie on QD-03F (jumper side of QD at M2) ❑ √Detent button fully installed 15. Open QD-03F to QD extender (jumper side QD) per **BLOCK C** 16. Open thermal bootie on QD Extender at M2 ❑ √Detent button fully installed 17. Demate QD Extender from M2 per **BLOCK A** 18. Mate and open QD Extender to N2 vent tool per **BLOCK B** and **BLOCK C** 19. After 5 sec, close and demate QD Extender from N2 vent tool per **BLOCK D** and **BLOCK A**	7. Glove and Gauntlet Check 8. Retrieve **GREEN** hook from P3 HR 3852 (bay 22) ❑ √Gate closed, hook locked, reels unlocked, release RET (Translate to Lab fwd – EWC Antenna Install)

NH3 JUMPERS N2 VENT/P3/P4 JUMPER TEMP STOW (00:35) (Cont)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
2. Consumable tag up with **MCC-H**	20. Mate QD Extender to M2 per **BLOCK B**; do not open QD 21. Install cap on N2 vent tool; stow behind MWS 22. Glove and Gauntlet Check 23. Translate to P3 HR 3860 (face 6) 24. Retrieve RET 25. Retrieve **GREEN** hook from P3 HR 3861 (bay 22) ❑ √Gate closed, hook locked, reels unlocked, release RET (Translate to Lab fwd – EWC Antenna Install)	

EWC ANTENNA INSTALL (02:20/02:45)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
Planned PET 03:15	CAUTION Avoid inadvertent contact with S0/Node 2 fluid tray hardlines at Node 2 end, which are limited to 25 lb NOTE MMOD Shield C2-03 (with NASA Meatball) is wire tied closed on port-most Dzus fastener	
	SETUP/WORKSITE PREP (01:20) 1. Translate to Lab fwd, zenith/port route 2. Open EWC ORU bag 3. Deploy zenith Fish Stringer on LAB HRs 0264 and 0263 on the fwd stanchions (taped hook on HR 0264/stbd) ❑ Tighten Fish Stringer as necessary 4. Stow N2 Vent tool on middle hook of zenith Fish Stringer w/o RET	SETUP/EWC ANTENNA INSTALL (01:00) 1. Translate to Lab fwd, zenith/stbd route 2. Assist with Fish Stringer deploy
	5. Close and stow EWC ORU bag on BRT w/RET 6. Translate port/nadir using gap spanner to Node 2 HR 0300	3. Relocate LTA Connector from Lab HR 0270 to HR 0269, old wire tie stays on HR 4. Retrieve RETs from zenith Fish Stringer, attach to ❑ HR 0270 ❑ HR 0271 5. Locate EWC Handrails 0270A and 0271A so reachable at BRT worksite 6. Attach R Waist Tether to HR 0369 7. BRT to Lab HR 0263 for HR 0270 8. Configure PGT: **[B1 (12.0), CCW2, 30.5]** 6-ext 7/16 9. Break torque on HR 0270 bolts, **1 turn only** ❑ Port bolt ❑ Stbd bolt 10. Configure PGT: **[A1 (2.5), CCW2, 30.5]** 6-ext 7/16 11. Release HR 0270, **7 turns** ❑ Port bolt ❑ Stbd bolt 12. Push OIH release buttons and remove HR

EWC ANTENNA INSTALL (02:20/02:45) (Cont)

IV/SSRMS

1. Record EWC HR 0270A bolt data:

Bolt	Turns	Torque (ft-lb)
Port	(8)	(3.8)
Stbd		

2. Record EWC HR 0271A bolt data:

Bolt	Turns	Torque (ft-lb)
Port	(8)	(3.8)
Stbd		

As time allows, Get-ahead items for EV1:
- ❑ P5/P6 Bundle Final Stow
- ❑ Ensure wire ties on EWIS Cable to HRs
- ❑ Route P2 cable stbd, wire tie to Lab HR 0297

EV1 (Drew)

7. Stow EWC ORU bag between Node 2 HRs 0300, 0301 and 0336 (lid hook to HR 0336)
8. Retrieve EWC cable bundle from ORU bag (RET to Adj D-ring)
9. Stow EWC cable on Lab HR 0226 using adj tether
10. Retrieve P3/P4 coil by pulling smushed end of taped wire tie out through adj tether D-ring
11. Translate zenith to Node 2 Fluid Umbilical Tray
    - ❑ Route cable under Node 2 Fluid Umbilical Tray
12. Transfer P3/P4 bundle to EV3 or temp stow on Lab 0269
13. Translate nadir to EWC cable bundle
14. Relocate EWC cable bundle to Lab HR 0298 nadir stanchion (tending cable as reqd)
15. Relocate the P5/P6 bundle (release P5/P6 wire tie) to Lab HR 0282
16. Remove caps (4) from J16A, P16A, P1 and P2 using BRT wire tie (stow first cap far down on wire tie)
    - ❑ J16A ❑ P16A ❑ P1 ❑ P2
17. Stow caps (4) on Fish Stringer in ORU bag
18. Retrieve following tools from ORU bag:
    - ❑ Long MMOD tool/RET/Lg-sm Adj
    - ❑ Short MMOD tool/RET

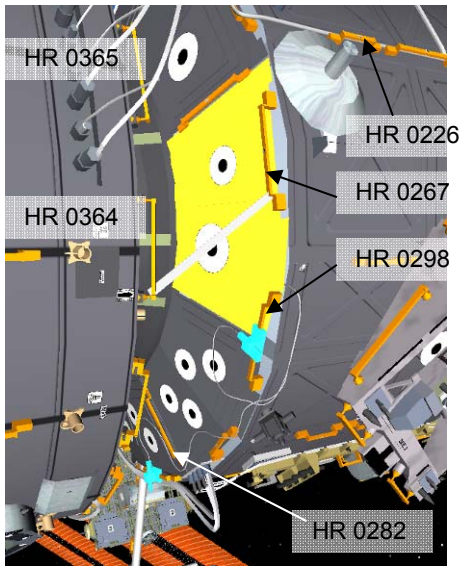
EV3 (Taz)

13. Retrieve EWC HR 0270A from zenith Fish Stringer
    √Handrail soft dock armed (push both buttons)
14. Install EWC HR 0270A into soft dock (Antenna pointing zenith)
    √Fully seated
15. Configure PGT:
    [A2 (3.8), CW2, 30.5] 6-ext 7/16
16. ←Tighten HR 0270A bolts, expect **8 turns**
17. Transfer RET from EWC HR 0270A to antenna cap
18. Remove cap, let it go back to zenith Fish Stringer
19. Relocate R Waist Tether to Lab HR 0370
20. BRT to Lab HR 0264 for HR 0271
21. Configure PGT:
    [B1 (12.0), CCW2, 30.5] 6-ext 7/16
22. Break torque on HR 0271 bolts, **1 turn only**
    ❑ Port bolt ❑ Stbd bolt
23. Configure PGT:
    [A1 (2.5), CCW2, 30.5] 6-ext 7/16
24. Release HR 0271, **7 turns**
    ❑ Port bolt ❑ Stbd bolt
25. Push OIH release buttons and remove HR
26. Retrieve EWC HR 0271A from zenith Fish Stringer
    √Handrail soft dock armed (push both buttons)
27. Install EWC HR0271A into soft dock (Antenna pointing zenith)
    √Fully seated
28. Configure PGT:
    [A2 (3.8), CW2, 30.5] 6-ext 7/16
29. ←Tighten HR 0271A bolts, expect **8 turns**
30. Transfer RET from EWC HR 0271A to antenna cap
31. Remove cap, let it go back to zenith Fish Stringer

<u>MATE EWC P3/P4 CONNECTORS</u> (00:20)

32. Attach **GREEN** hook to Lab HR 0272
    - ❑ √Gate closed, hook locked, reels unlocked, release RET

EWC ANTENNA INSTALL (02:20/02:45) (Cont)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
	19. Install long T-handle tool into MMOD shield C2-01 ❑ √Pull test 20. Attach Lg hook of adj equip tether from long T-handle to Node 2 HR 0364 21. Stow short T-handle tool on EOTP HR using attached RET 22. Remove gap spanner from Lab HR 0267; stow hook on Node 2 HR 0365 or HR 0364 23. Release trunnion MLI from MMOD Shield C2-01 24. As time allows, perform get-ahead tasks (on previous page) 25. Demate P1 from EWIS Antenna 11 (port) HR 0298 <u>OPEN MMOD SHIELD C2-01</u> (00:15) 26. Assess MMOD shield alignment and body positioning (Lab HR 0298 potential BRT) 27. Release Dzus fasteners, in any order ❑ Zenith ❑ Center ❑ Nadir 28. Give **EV3 GO**, open shield (clamshell) 29. Release nadir MLI Dzus fastener and peel back MLI to expose electrical connectors (attached w/Velcro)	33. Receive P3/P4 bundle from EV1 or Lab 0269 34. Wire tie cables to HR 0269 using integrated wire tie 35. Transfer RET from EWC HR 0270A to P3 connector cap, remove cap 36. Mate connector P3 to Ant 1 J3 on EWC HR 0270A (port) ❑ √Good pins & EMI band; no FOD 37. Transfer RET from EWC HR 0271A to P4 connector cap, remove cap 38. Mate connector P4 to Ant 2 J4 on EWC HR 0271A (stbd) ❑ √Good pins & EMI band; no FOD 39. Wire tie P4 cable to Lab HR 0280 (low profile wire tie) 40. Translate nadir/port to MMOD shield C2-01 using JEM HRs ❑ Fairlead on JEM or Node 2 <u>OPEN MMOD SHIELD C2-01</u> (00:15) 41. Assess MMOD shield alignment and body positioning (Lab HR 0267 potential BRT) ❑ Look at MMOD alignment landmarks 42. On **EV1 GO**, open shield (clamshell) while maintaining pressure into flanges to keep shield hinged

EWC ANTENNA INSTALL (02:20/02:45) (Cont)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
	NOTE Once inhibits are in place, Station UHF will no longer be in the Big Loop. Comm with EV crew will be via Shuttle A/G1. Loss of comm is possible. Will verify comm after SSSR deactivated. If no comm, EV1 re-establish comm by moving to line of sight with Orbiter Antenna (ISS nadir). Will give GO for steps 30 thru 35. Then EV1 will re-establish comm before continuing with MMOD shield closure	
3. Give **MCC-H GO** for SSSR (UHF) reconfiguration ***MCC-H:*** *Deactivate SSSR (UHF)* 4. On **MCC-H GO**, A1R AUD CTR SL A/G1 – ON 5. Perform Comm Check 6. Give **EV1 GO** for EWIS connector ops	<u>MATE P16A/J16A EWC CONNECTORS</u> (00:15) 30. On **IV GO**, demate EWIS P16A from J16 (nadir most on lab endcone) 31. Demate EWIS J16A from P16 (free-floating cable) 32. Remove old EWIS cable from under MMOD shield and HR 33. Retrieve new EWC P16A and J16A cable, route under HR 34. Mate connector P16A (90° backshell) to J16 (lab endcone) ❑ √Good pins & EMI band; no FOD 35. Mate connector J16A to P16 (free-floating cable) ❑ √Good pins & EMI band; no FOD	<u>MATE P16A/J16A EWC CONNECTORS</u> (00:15) 43. Assist EV1 as reqd with MMOD Shield
7. When J16A and P16A mated, give **MCC-H GO** to activate SSSR (UHF) ***MCC-H:*** *Activate SSSR (UHF)* 8. On **MCC-H GO,** A1R AUD CTR SL A/G1 – OFF <u>NOTE</u> Big loop comm is via UHF	36. Stow/position cable so does not interfere with MMOD shield/MLI 37. 📹 WVS survey of connections under MLI	

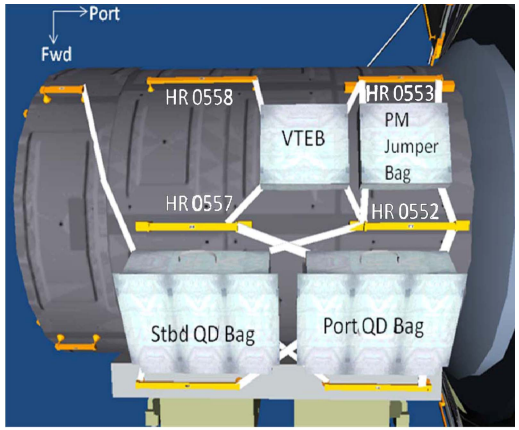
EWC ANTENNA INSTALL (02:20/02:45) (Cont)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
BINGO time for Drew to go to A/L: PET 05:35 (00:55 to SCU)  	<u>CLOSE MMOD SHIELD C2-01</u> (00:15) 38. Reinstall MLI Dzus fastener √Dzus alignment ❑ Rotate ccw until Dzus drops down onto spring ❑ Rotate Dzus to locked position cw, quarter turn ❑ Verify all MLI is beneath Dzus fastener plates 39. Install MMOD shield C2-01 40. Engage Center Dzus fastener √Dzus alignment ❑ Rotate ccw until Dzus drops down onto spring ❑ Rotate Dzus to locked position cw, quarter turn 41. Engage Dzus fasteners (❑ Zenith, ❑ Nadir) √Dzus alignment ❑ Rotate ccw until Dzus drops down onto spring ❑ Rotate Dzus to locked position cw, quarter turn <u>MATE EWC P1/P2 CONNECTORS</u> (00:15) 42. Mate new connector P1 to EWIS Ant 11 ❑ √Good pins & EMI band; no FOD 43. Route P2 cable stbd to EWIS Ant 12, wire tie on Lab HR 0297 (get-ahead task) 44. RET to old EWIS cable 45. Demate P2 from EWIS Ant 12 46. Mate EWC connector P2 to EWIS Ant 12 ❑ √Good pins & EMI band; no FOD 47. Wire tie new P2 cable and P5/P6 cable to Lab HR 0277 (BRT wire tie) 48. Release all wire ties from old EWIS cable	<u>CLOSE MMOD SHIELD C2-01</u> (00:15) 44. Assist EV1 as reqd <u>CLEANUP</u> (00:40) 45. Wire tie P3/P4 cable to Lab HR 0268 and/or HR 0267 (BRT wire tie) 46. Retrieve long T-handle tool/Lg-sm Adj/RET from shield 47. Retrieve short T-handle tool from EOTP 48. Stow T-handles (2) in EWC ORU bag on Fish Stringer ❑ Short ❑ Long 49. Re-install gap spanner from Node 2 HR 0365 to Lab HR 0267 (nadir stanchion) 50. Install trunnion MLI over MMOD shield 51. Config P5/P6 cable bundle for long-term stowage on Lab HR 0282 (get-ahead task)

EWC ANTENNA INSTALL (02:20/02:45) (Cont)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
EWC Med ORU Bag: ☐ Adj Equip Tether (ext) ☐ Adj Equip Tether (ext) ☐ Adj Equip Tether or Wire Tie ☐ EWIS Cable ☐ Fish Stringer #1 ☐ Hook 1: RET (sm-sm) ☐ Long T-Handle Tool ☐ Adj Equip Tether (Lg-sm) ☐ Hook 2: RET (sm-sm) ☐ Short T-Handle Tool ☐ Hook 3: Loop Pin Puller ☐ Hook 4: Wire Tie Caddy ☐ Hook 5: Wire tie ☐ P1 Cap ☐ P2 Cap ☐ J16A Cap ☐ P16A Cap	49. Assist EV3 with coiling old EWIS cable 50. WVS Survey 51. Translate fwd/zenith using port gap spanner 52. Translate to CETA Spur 53. Retrieve CETA ORU bag from S1 HR 3413, stow on BRT w/RET	52. Retrieve adj tether from Lab HR 0298 (from new EWC cable) 53. Retrieve EWIS cable 54. Coil cable and wrap long wire tie or adj tether around bundle, as reqd 55. Stow EWIS cable in EWC ORU bag 56. Perform EWC ORU bag inventory 57. Verify all cables are appropriately routed and wire tied to structure 58. WVS Survey 59. Stow EWC ORU Bag on BRT w/RET
☐ Zenith Fish Stringer ☐ Hook 1: RET (sm-sm) ☐ EWC Antenna Cap ☐ Hook 2: RET (sm-sm) ☐ P4 Cap ☐ Hook 3: RET (sm-sm) ☐ HR 0271 ☐ Hook 4: N2 Vent Tool ☐ Hook 5: RET (sm-sm) ☐ HR 0270 ☐ Hook 6: RET (sm-sm) ☐ P3 Cap ☐ Hook 7: RET (sm-sm) ☐ EWC Antenna Cap	54. Glove Check (Translate to A/L)	60. Translate zenith around JEM 61. If not completed, wire tie P4 cable to Lab HR 0280 (low profile wire tie) 62. Retrieve **GREEN** hook from Lab HR 0272 ❑ √Gate closed, hook locked, reels unlocked, release RET 63. Perform inventory of zenith Fish Stringer 64. Stow Fish Stringer into EWC ORU bag 65. Perform MWS tool inventory (Reference Final Tool Configs FS 7-) 66. Glove Check (Translate to A/L)

VTEB RECONFIG (00:25)

IV/SSRMS	EV1 (Drew)
Planned PET 05:35 *Fluid QD Bag info in section 8*  	VTEB RECONFIG (00:20) 1. Translate to A/L 2. Open hatch thermal cover 3. Stow CETA ORU bag in A/L 4. Retrieve VTE plug 5. Close hatch thermal cover 6. Translate zenith to VTEB 7. Open VTEB 8. Disconnect 1.5" Vent tool from vent tool extension ❑ Rotate indicator to Unlock ❑ Squeeze trigger and pull vent tool out 9. Install VTE plug into VTE connector: ❑ Rotate lock lever to unlock (hard stop detent – very loose) ❑ Depress lever to hard stop (2-10 lb) ❑ Insert VTE plug into connector tube ❑ Release lever and rotate to lock ❑ Perform pull test 10. Wrap long wire tie around VTE nozzle (disconnect from L-bracket if needed) 11. Coil VTE using wire tie and velcro strap and temp stow 12. Translate to Fluid QD Tool Bag #2 (port) with 1.5" Vent Tool 13. Open fwd/port corner of bag 14. Stow 1.5" Vent tool in Pocket F of Fluid QD Tool Bag #2 15. Retrieve vent tool adapter from QRT & FID Gauge pocket (leave Adj tether in QD bag) 16. Close QD bag, open fwd/stbd corner of QD bag 17. Retrieve 1.0" Vent tool from Pocket A 18. Close QD bag 19. Coil and stow following in VTEB (using internal tethers): ❑ MUT EE (already in VTEB) ❑ Vent Tool Adapter ❑ 1.0" Vent tool ❑ Vent Tool Extension w/plug 20. Relocate french hook of VTE plug to VTEB D-ring 21. Close VTE bag ❑ √All Velcro secure

VTEB RECONFIG (00:25) (Cont)

IV/SSRMS	EV1 (Drew)
	QD CONTINGENCY TOOL GATHER (00:05) 22. Open Fluid QD Bag #1 (stbd) 23. Retrieve the 1" Cap Tool (aft/stbd corner); stow on MWS adj equip tether 24. √1" QD Bail Drive Lever stowed in bag lid 25. Close Fluid QD Bag #1 26. Perform MWS tool inventory (Reference Final Tool Configs FS 7-)

EVA 1 CLEANUP/INGRESS (00:30)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
Planned PET 06:00	CLEANUP (00:10) 1. Translate nadir to A/L	CLEANUP (00:10) 1. Translate to A/L ❑ Retrieve fairlead and Adj Equip Tether from Lab HR 0247 ❑ Fairlead on Equip Lock HR 0500
1. Start Hatch Thermal Cover clock PET (30 min) __ : __	INGRESS/PRE-REPRESS (00:20)	INGRESS/PRE-REPRESS (00:20) 2. Open hatch thermal cover 3. Retrieve Node 3 Avionics bag from A/L (FGB Y-Cables)
	2. Receive Node 3 Avionics bag from EV3 3. Translate aft/zenith on C/L 4. Stow bag on C/L HRs 0513 and 0559 using integrated tethers 5. Translate nadir to A/L	4. Transfer Node 3 Avionics bag to EV1 5. Stow EWC ORU bag in A/L 6. Attach R Waist Tether to UIA D-ring ❑ √Gate closed, hook locked
2. Prior to hatch closure, perform WVS PWRDN (PHOTO/TV, WVS Cue Card)	6. On **EV3 GO**, RET to EV3 STP, release **RED** hook and attach to aft ext D-ring ❑ √Gate closed, hook locked, reels unlocked, release RET 7. Attach R Waist Tether to A/L int D-ring extender ❑ √Gate closed, hook locked 8. RET to STP, release **RED** hook and attach to curved HR, fwd/stbd stanchion ❑ √Gate closed, hook locked, reels unlocked, release RET 9. Ingress A/L	7. Give **EV1 GO** to release EV3 **RED** hook 8. Ingress A/L
3. Stop Hatch Thermal Cover clock PET (30 min) __ : __	10. Close hatch thermal cover; attach Velcro strap 11. Remove SCU from stowage pouch 12. Remove DCM cover; Velcro to DCM 13. Connect SCU to DCM √SCU locked NOTE A TCV setting 8 – Max C minimizes time for SCU cooling	9. Remove SCU from stowage pouch 10. Remove DCM cover; Velcro to DCM 11. Connect SCU to DCM √SCU locked NOTE A TCV setting 8 – Max C minimizes time for SCU cooling

EVA 1 CLEANUP/INGRESS (00:30) (Cont)

IV/SSRMS	EV1 (Drew)	EV3 (Taz)
	14. WATER – OFF (fwd), expect H2O IS OFF msg CAUTION Do not close hatch until EMU Water OFF for 2 min. Verify outer hatch clear of hardware 15. Verify outer hatch clear of hardware 16. Verify handle position per hatch decal 17. Close and lock hatch Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)	12. WATER – OFF (fwd), expect H2O IS OFF msg Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)

MISSE 7 RETRIEVE – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	02:00
Two EV Crew	N/A	01:00

Tools:

EV1
Camera

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
PEC Probe EVA Bolt	7/16	2/probe	N/A	123 in-lb	260 in-lb	11.5
SWC Latch Plate Pin	7/16	2/SWC	N/A	128 in-lb	260 in-lb	11.1

EVA Connectors:

Harness	From	To	Clamps (#)	Function
P7A	PEC J7A	J7A Dummy	1	Data
P7B	PEC J7B	J7B Dummy	1	Data + Heater

ORU Details:

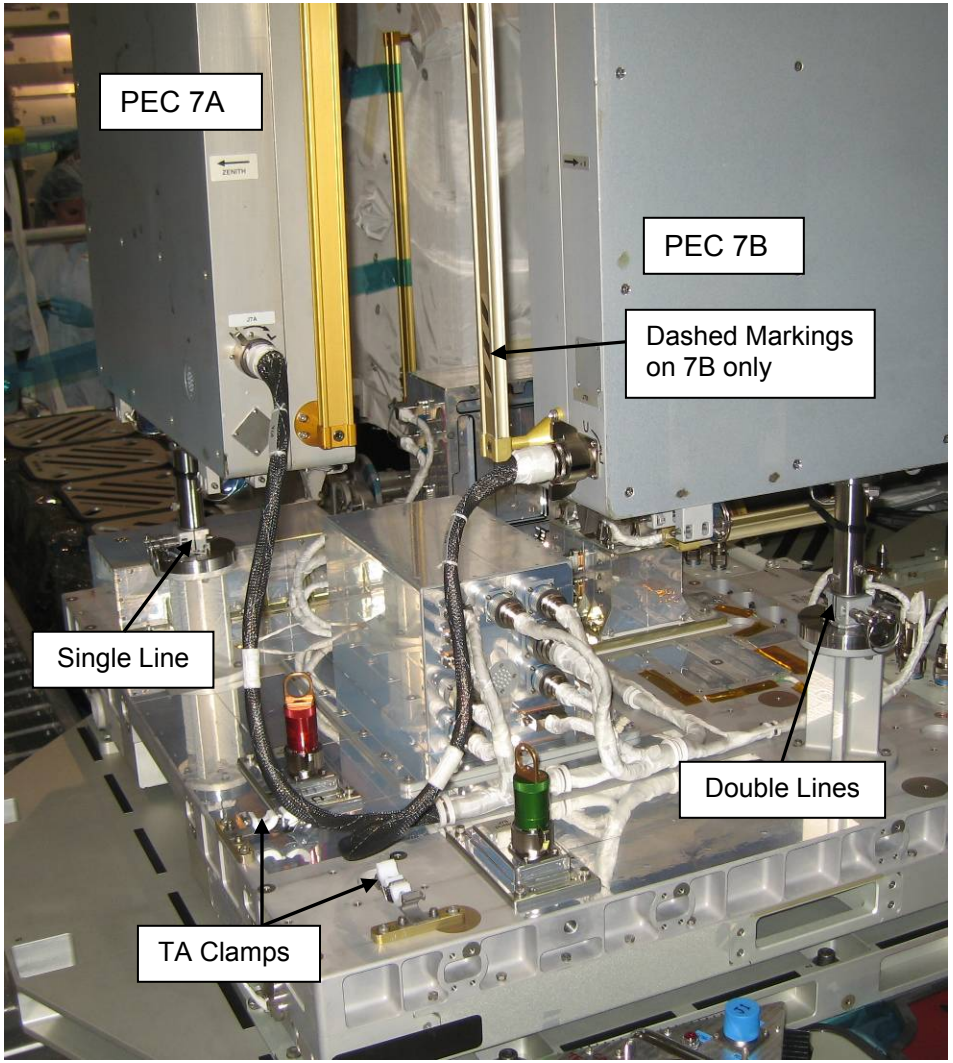
ORU	Part Number	Mass
MISSE 7A	FT-TA-5142	75.4 lb
MISSE 7B	PW-7B-0012	82.67 lb

Notes:

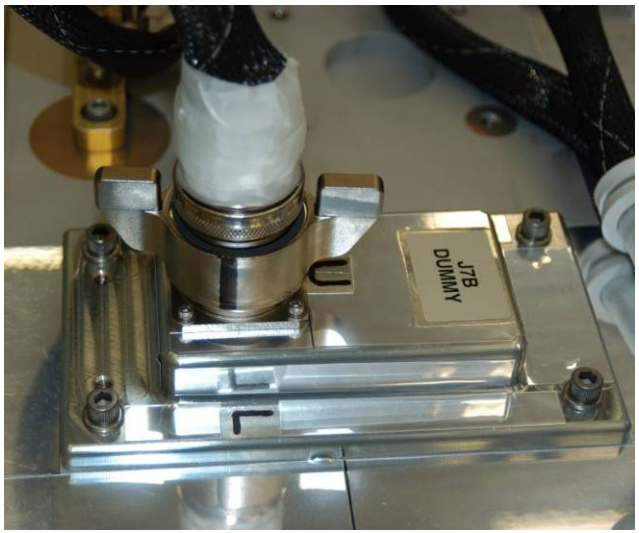
1. Red cap goes to PEC 7A; green cap goes to PEC 7B
2. Caps are not required to be installed on PECs for landing
3. Do not touch avionics boxes (shiny) on the ExPA
4. Alignment markings on the PECs connectors are no longer visible
5. Avoid inadvertent touch to ELC2 ExPCA when translating to MISSE ExPA

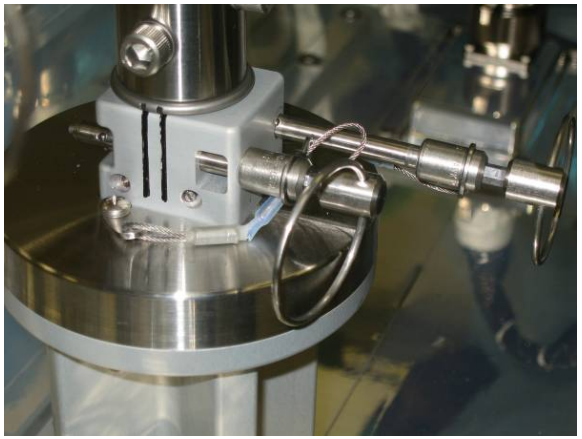
Timeline Considerations:

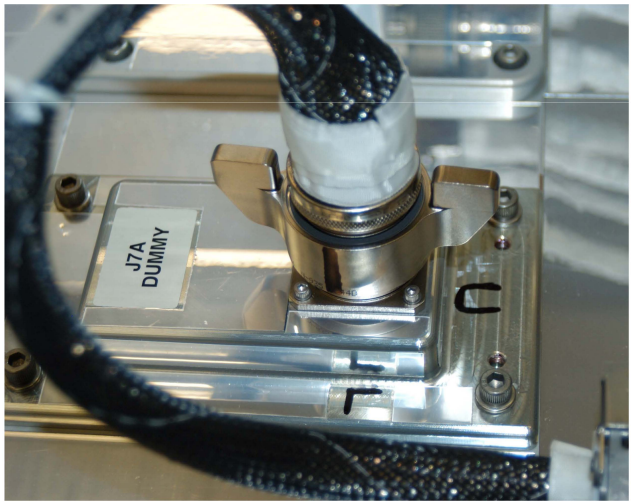
1. Thermal clock on MISSE 7 PECs is 120 min from ELC power off to PEC close
2. Thermal clock on ELC2 is 6 hr

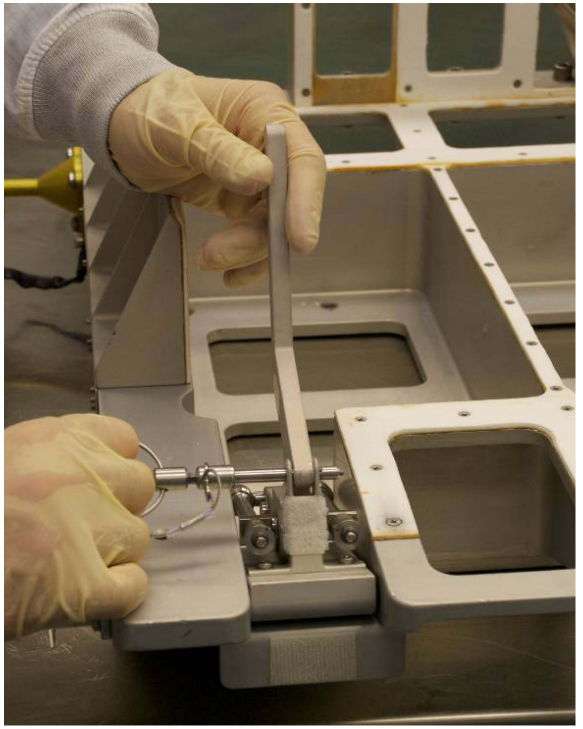


MISSE 7 RETRIEVE – TASK DATA (Cont)









MISSE 8 INSTALL – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:40
Two EV Crew	N/A	N/A

Tools:

EV1
MISSE 8 PEC

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
PEC Probe EVA Bolt	7/16	2	N/A	78 in-lb	260 in-lb	11.5
SWC Latch Plate Pin	7/16	2	N/A	128 in-lb	260 in-lb	11.1

EVA Connectors:

Harness	From	To	Clamps (#)	Function
P7A	J7A Dummy	PEC 8/J7A	1	Data
P7B	J7B Dummy	PEC 8/J7B	1	Data + Heater

ORU Details:

ORU	Part Number	Mass
MISSE 8 PEC	FT-TA-8010	80.2 lb

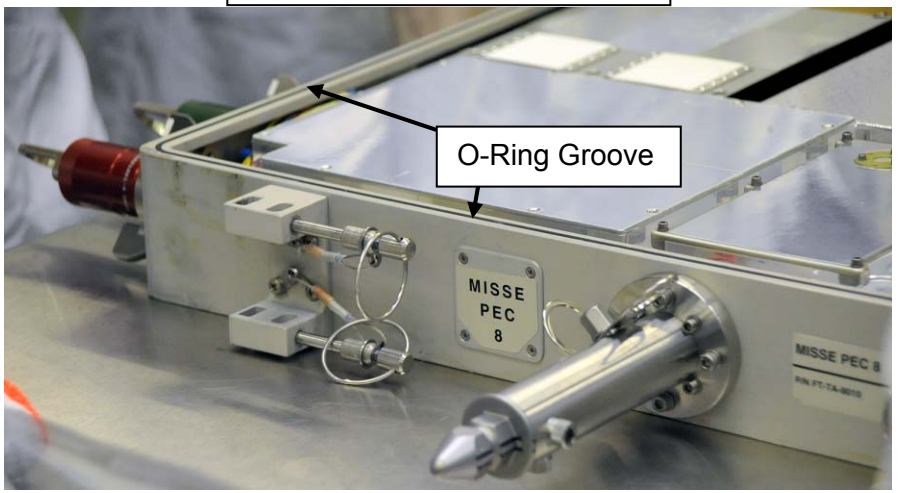
Notes:

1. 7A Connector provides data for 4 experiments, no heaters
2. 7B Connector provides data for 1 experiment, heaters
3. Connector Pins are on the PEC side
4. For connector install, line up one of the wing tabs to the black alignment mark, then rotate cw 90 deg
5. MISSE 8 install orientation is with HRs nadir (single alignment mark ISS fwd)

Timeline Considerations:

1. Thermal clock on MISSE 8 is 120 min from PEC open to ELC power on
2. ELC2 thermal clock is 6 hr

Connectors shown in Lock position



S3 CETA LIGHT INSTALL – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:30
Two EV Crew	N/A	N/A

Tools:

EV3
PGT w/7/16 – 6" ext
Medium ORU bag

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
CETA Light Bolt	7/16	1	12.0	24.0	73.4	11-15

EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
A92	S3 J170	CETA Light J1	1 TA	15	Power

ORU Details:

ORU	Part Number	Mass
CETA Light	1F03046-1	24.0 lb

Notes:

1. Heaters will be applied after install
2. Cap goes to connector dummy panel
3. Must push bracket past soft dock in order to engage bolt

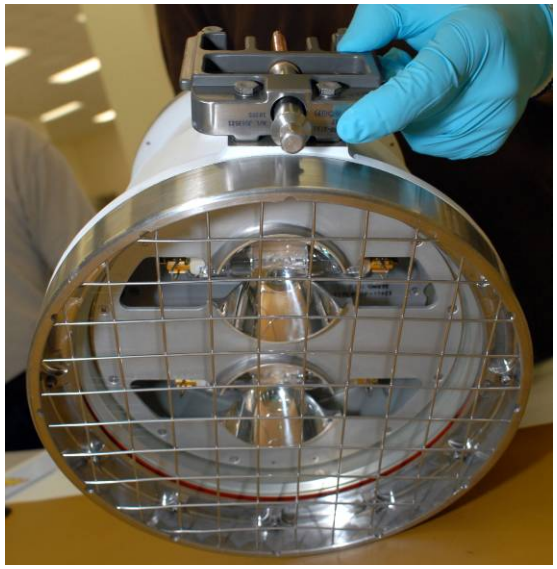
Caution:

1. CETA Lights are covered with Z-93 paint, avoid impact/inadvertent contact
2. If light turned on during EVA, do not touch (possible hot touch temp violation)

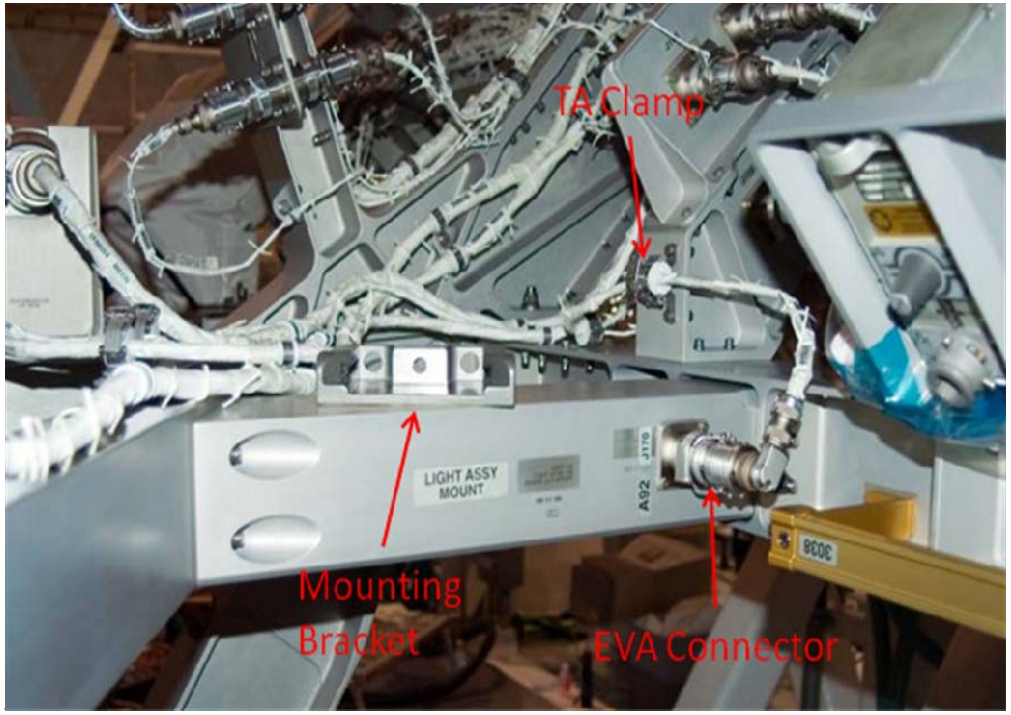
Timeline Considerations:

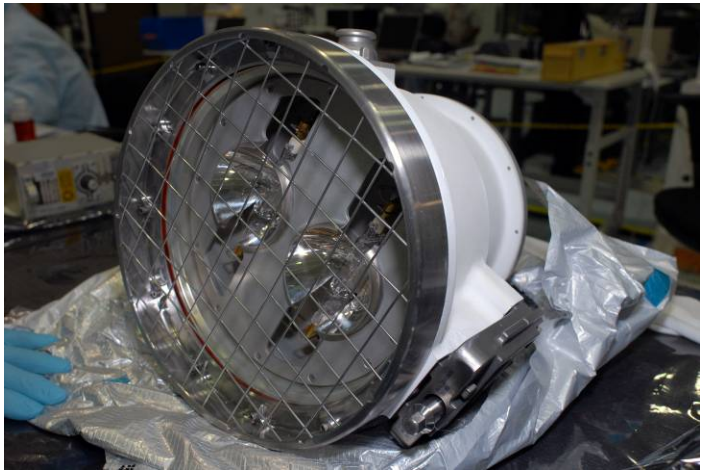
1. CETA light has a thermal clock of 3 hr. Refer to table below for more information

Translation time to wkst (in MLI)	Install time (outside MLI)
2 hr	1 hr
3 hr	0.6 hr
3.5 hr	0.5 hr
4 hr	0.3 hr



S3 CETA LIGHT INSTALL – TASK DATA (Cont)





STBD SARJ COVER 7 INSTALL – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:15
Two EV Crew	N/A	N/A

Tools:

EV3
PGT w/7/16 x 6" socket

EVA Fasteners:

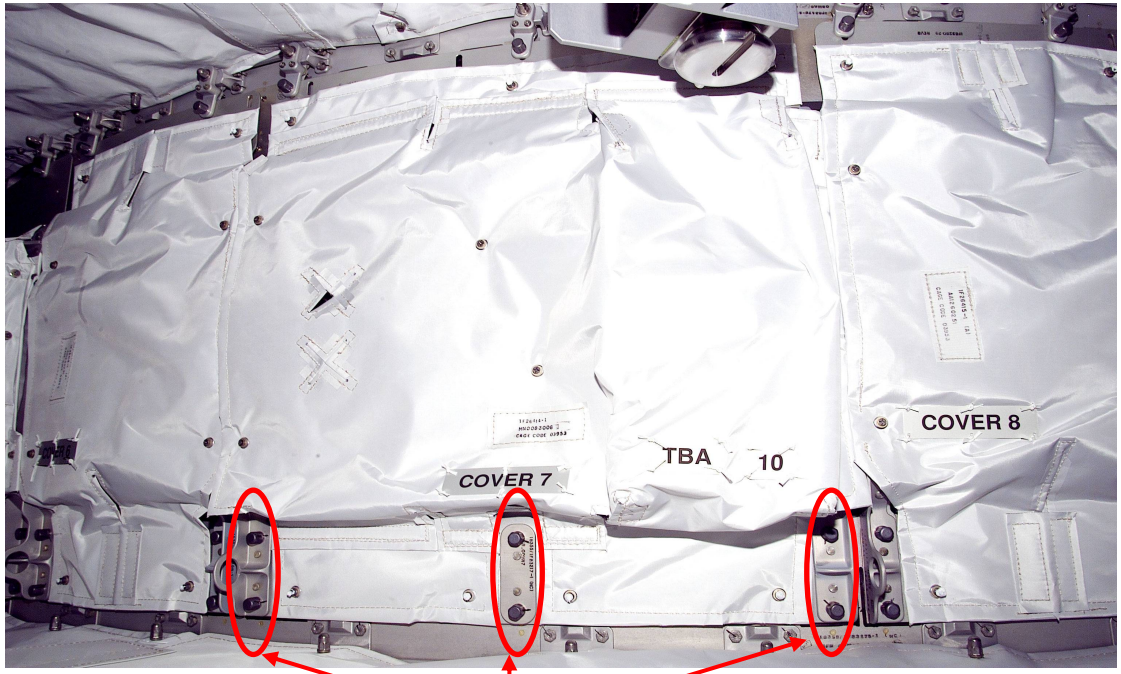
Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
SARJ Cover bolt	7/16	6	2.5	4.8	3.8	7-9

ORU Details:

ORU	Part Number	Mass
SARJ Cover 7 – Double	1F26519	5.63 lb

Notes:

1. EVA preferred stbd SARJ angles are 90°-165°, 220°-295°
2. Minimize side loading bolt head
3. Maintain axial force on fastener to compress spring during rotation
4. Limit turns if have to release



6 Bolts per Double Wide Cover

P6 PVTCS FILL SETUP – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	02:00
Two EV Crew	N/A	01:10

Tools:

EV1	EV3
1" N2 Vent Tool	Wire Tie

EVA Fluid QDs:

Jumper	QD#	Line #	QD Size	Pre EVA1	Post EVA1
ATA Vent Pnl	F184	N/A	1/4"	P1 Pnl A500 M2 – open	P1 Pnl A500 M2 – open
ATA Vent Pnl	F185	N/A	1/4"	P1 Pnl A500 M3 – open	P1 Pnl A500 M3 – open
P1/P3	F186	N/A	1/4"	P1 Pnl A503 M3 – open	P1 Pnl A503 M3 – open
P1/P3	F187	N/A	1/4"	P3 Pnl A503 M1 – open	P3 Pnl A503 M1 – open
P3/P4	F2	FH-03	1/4"	P4 Stowage QD – closed	P4 Stowage QD – closed
P3/P4	F15	FH-03	1"	P4 Stowage QD – closed	**P4 QD M15 – closed**
P4/P5	F16	FH-05	1"	P4 QD M16 – open	P4 QD M16 – open
P5/P6	F14	FH-06	1"	P5 Stowage QD – closed	P5 Stowage QD – closed
EAS Jumpers	02F	FH-02	1"	P6 QD M10 – closed	P6 QD M10 – closed
EAS Jumpers	03F	FH-02	1"	Extender – closed	**Extender – open**
EAS Jumpers	Ext	FH-02	1"	P6 QD M2 – closed	P6 QD M2 – closed

EVA Connectors:

Harness	Function
EWIS Connectors J1 and J2	Data

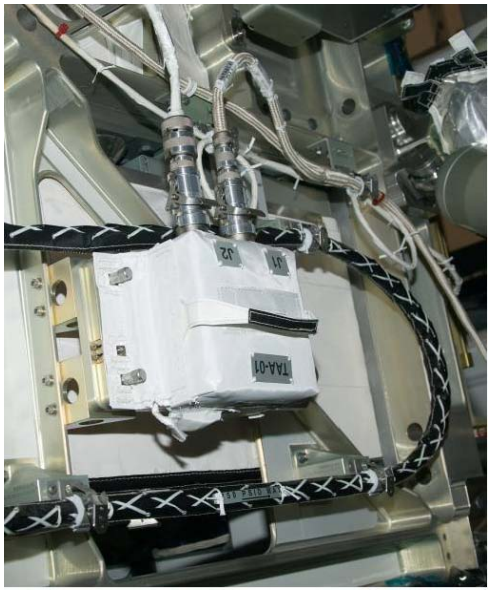
ORU Details:

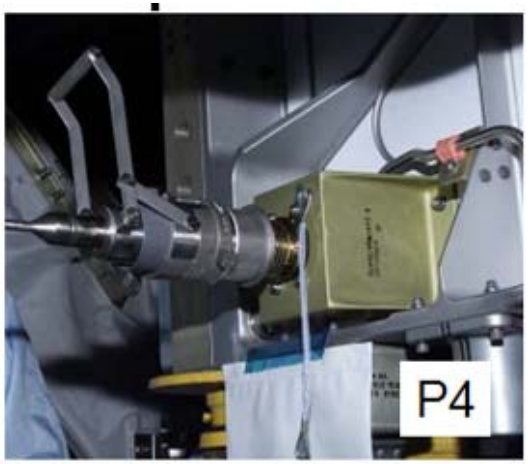
Name	Part Number	Mass
EAS Jumper	R081351	21.07 lb
EAS Jumper Assy	R081697	23.5 lb
EAS Extender	RH000054	5 lb
P3/P4 Jumper	RH000138-1	8.34 lb
1" N2 Vent Tool	1F98596-1	5.36 lb
P1 ATA Jumper “homeplate”	1F78113-5	3.3 lb

Notes:

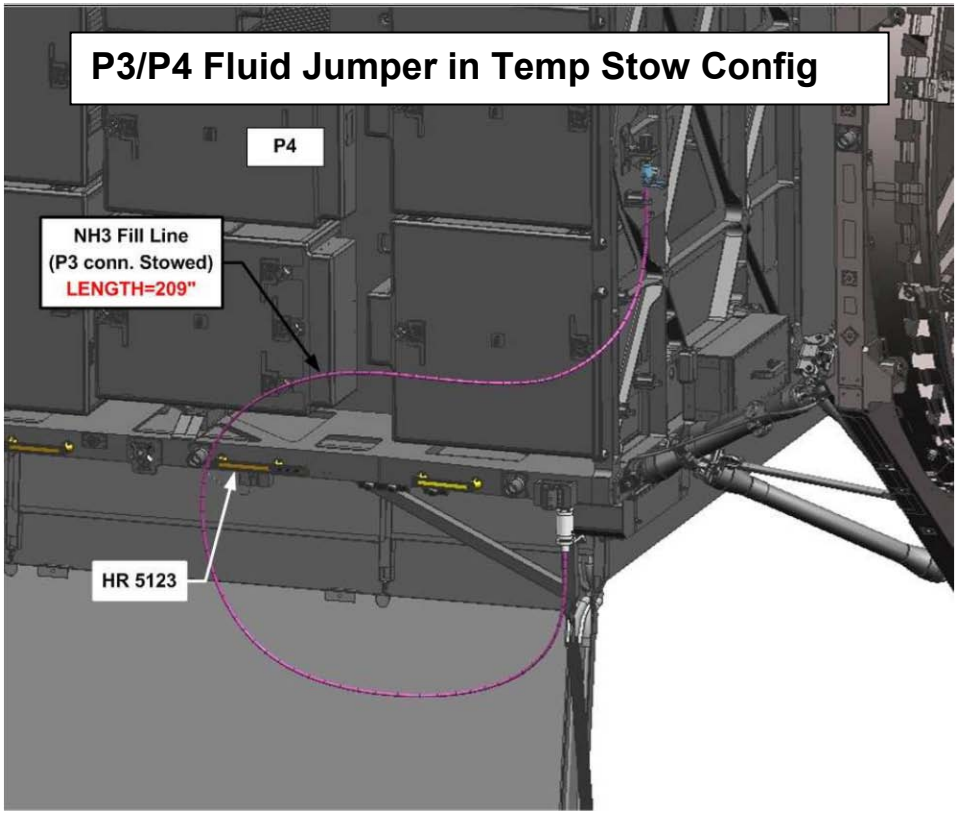
1. Port SARJ must be locked between -78° through +170° for P3/P4 Jumper to reach
2. S3/S4 jumper is 27 in longer than P3/P4 jumper
3. EAS Jumper is 102" long not including QD Extender
4. P3/P4 Jumper is 214.5" long, after thermal reduction factor it is 209.4". S3/S4 Jumper is 243.48" long, after thermal reduction factor it is 237.7" long (back-up jumper)
5. IFI 7792 contains information on a kink in the vent tool extension

P3/P4 Fluid Jumper

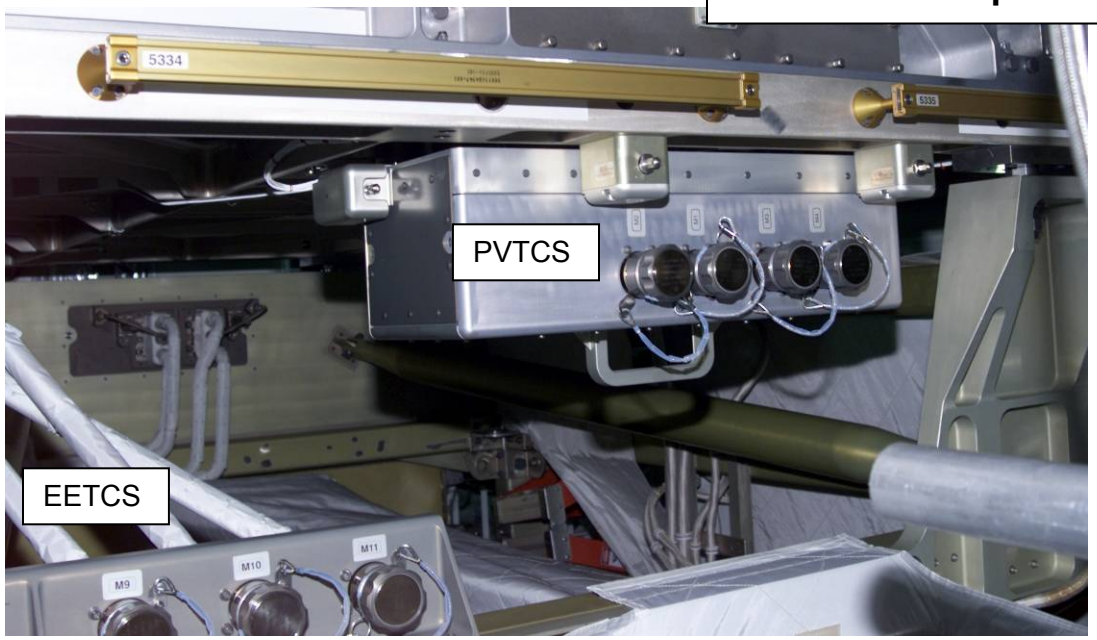




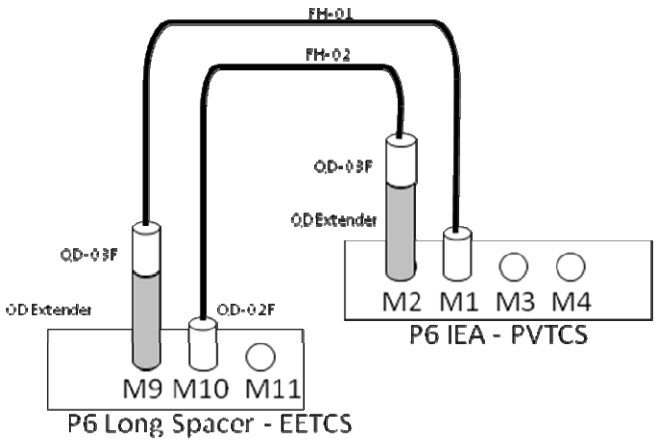
P5/P6 Fluid Jumper

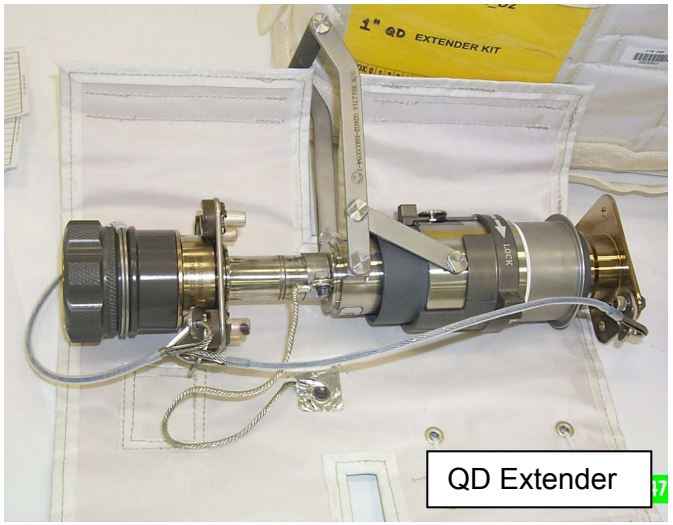


EAS Fluid Jumpers



EAS Jumper config





EWC ANTENNA INSTALL – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	02:30

Tools:

EV1	EV3
Short, Long MMOD T-handle Tools	PGT w/7/16 – 6" ext
Loop Pin Puller (Contingency)	
Wire ties for cable tie down	

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
Antenna Mount OIH EVA bolt	7/16	2/each	3.8	8.3	12.33	0.5-23.5
OIH bolt	7/16	2/each	3.8	8.3	25.5	9-9.5

EVA Connectors:

EWC Cable (W5255)	To	Label	Conn Size	Function
P1	EWIS Ant 11 (port)	J1	21	RF
P2	EWIS Ant 12 (stbd)	J1	21	RF
P3	EWC Ant 1 – 0270A (port)	J3	21	RF
P4	EWC Ant 2 – 0271A (stbd)	J4	21	RF
P5	Coil and stow	N/A	21	RF
P6	Coil and stow	N/A	21	RF
P16A	Lab	J16	25	ISS UHF
J16A	Lab free-float cable	P16	25	ISS UHF

EWIS Cable (W5448)	From	Label	Conn Size	Function
P1	EWIS Ant 11 (port)	J1	21	RF
P2	EWIS Ant 12 (stbd)	J1	21	RF
P16A	Lab	J16	25	ISS UHF
J16A	Lab free-float cable	P16	25	ISS UHF

ORU Details:

ORU	Part Number	Mass
HR 0270, 0271	SEG33106351-301	1.87 lb
EWC Ant HR 0270A	684-015274-0001	10.01 lb
EWC Ant HR 0271A	684-015274-0501	10.01 lb
EWC Cable	684-015255-0001	8.0 lb
EWIS Cable	1F15448-1	2.69 lb
EWIS Ant 11 HR	1F15742-1	9.69 lb
EWIS Ant 12 HR	1F15742-501	9.69 lb

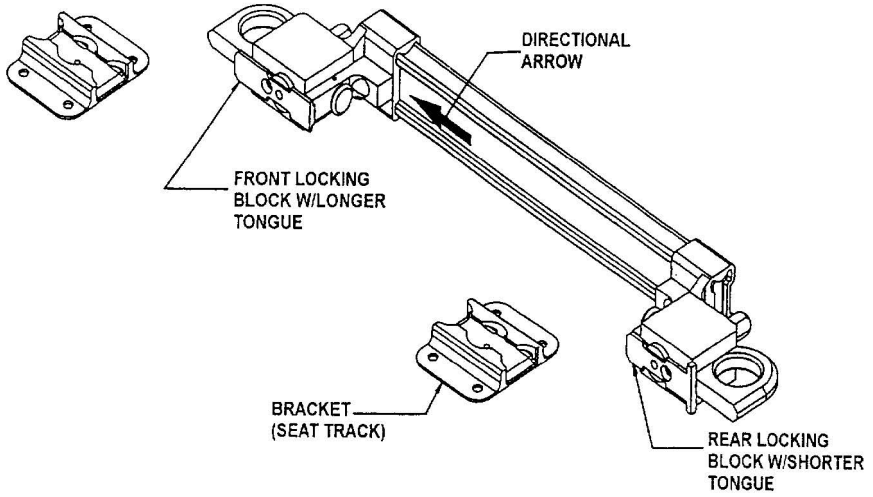
Notes:

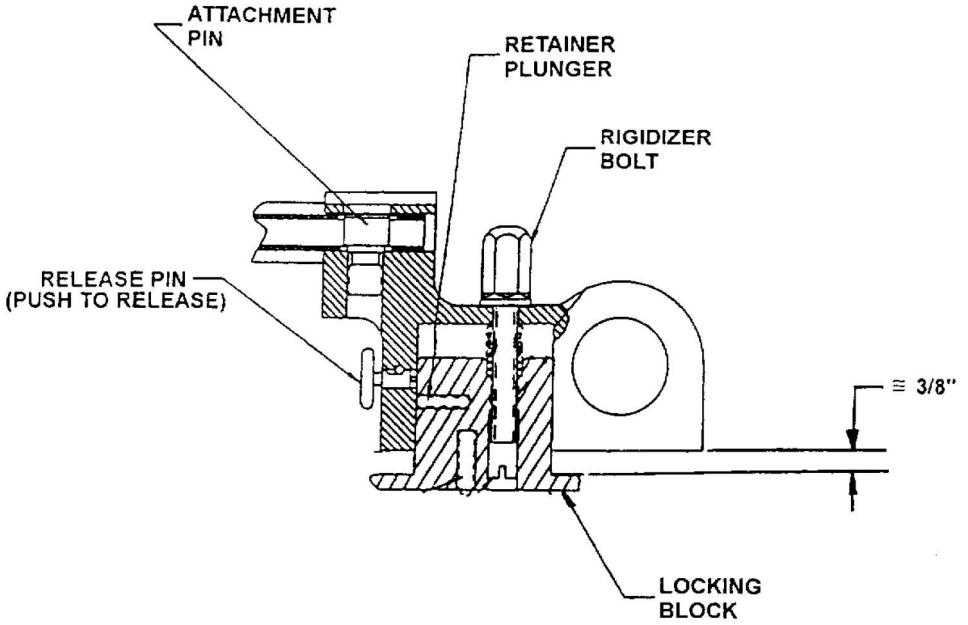
1. EWIS Connector P1 must be removed before C2-01 MMOD shield can be opened
2. EWIS Connector P1 is routed under HR 0298
3. EWC Antenna Handrails do have a direction arrow
4. EWC Ant 1 is on HR 0270A (J3), EWC Ant 2 is on HR 0271A (J4)
5. Caps have the “vent holes” or open keying grooves
6. Lab MMOD Shield C2-03 (NASA meatball) is secured with wire tie on port most Dzus fastener

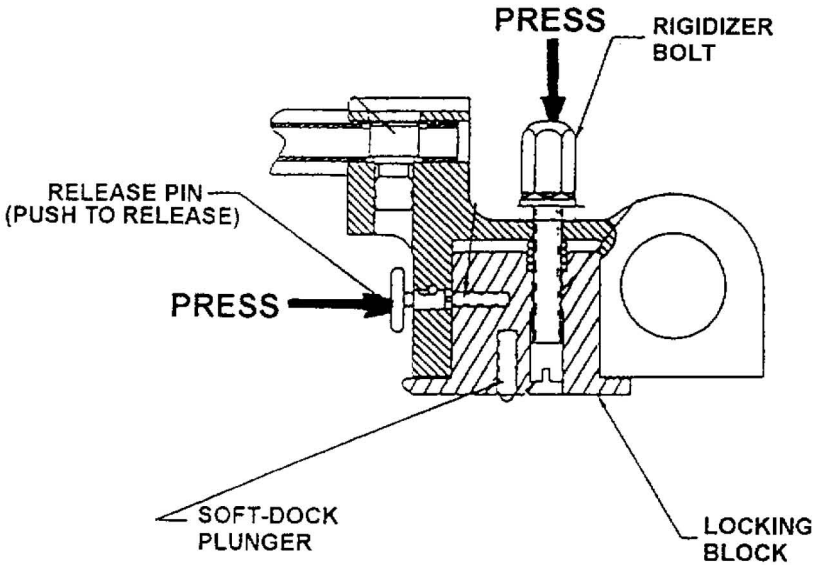
Timeline Considerations:

1. Loss of comm is possible during connector inhibits (inhibits ISS UHF). Want to get J16A and P16A connectors mated as soon as possible to limit UHF down time
2. Need 2 crew members to open MMOD shield

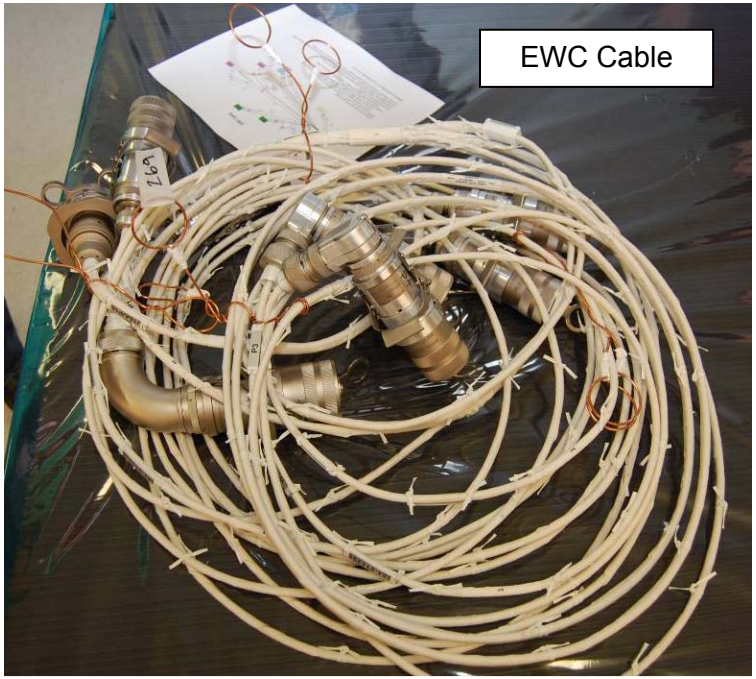
EWC ANTENNA INSTALL – TASK DATA (Cont)







EWC ANTENNA INSTALL – TASK DATA (Cont)



Dzus Fastener similar to MMOD Shield Fastener

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EVA 2 SUMMARY TIMELINE

PET HR : MIN	IV/SSRMS	EV1 (Ft)	EV2 (Fn)	
00:00		EGRESS/SETUP (00:35) • Post Depress and Egress (00:25) • Setup (00:10)	EGRESS/SETUP (00:35) • Post Depress and Egress (00:25) • Setup (00:10)	00:00
		P3/P4 NH3 JUMPER RE-ROUTE (00:15)	P3/P4 NH3 JUMPER RE-ROUTE (00:15)	
01:00	Leak Check in P1-P5 Jumpers Fill P6 PVTCS (10 min)	PVTCS NH3 FILL (01:00) • Leak Check; Open P5/P6 (00:15) • Open EAS Jumper/Fill PVTCS (00:15) • Vent tool Setup (00:20)	CONFIGURE ATA FOR NH3 FILL (00:25) PSARJ COVER REMOVAL (00:55) • Setup (00:20)	01:00
	Vent P1-P5 Jumper (17 min)	• Initiate P1-P5 vent (00:10)	• Remove Covers (00:35)	
02:00		PSARJ OPS (00:30) • Remove Covers (00:20) • Inspection (photos/samples) (00:10)	PSARJ FIRST LUBE (00:45)	02:00
	Vent EAS Jumpers (3.5 min)	EAS JUMPER SETUP/VENT (00:30) • Vent Tool Reconfig (00:10) • Vent EAS Jumpers (00:10) • EAS Jumper Reconfig (00:10)		
03:00		NH3 VENT TOOL CLEANUP (00:25)	P3/P4 JUMPER STOW (00:35)	03:00
		P3/P4 JUMPER STOW (00:15)		
	MCC-H: Rotate Port SARJ	CONFIGURE ATA FOR VENT (00:15)	S1 RAD GB STOW BEAM INSTALL (01:10)	
04:00	SSRMS: SPDM in APFR Ingress posn Mnvr to LEE Lube posn	SPDM CLA COVER INSTALL (00:25) • SPDM Setup (00:20) • CLA Cover Install (00:05)		04:00
		SPDM LEE LUBE (00:40) • SPDM LEE Lube (00:20)		
	SSRMS: Mnvr SPDM to APFR Egress posn	• Cleanup (00:20)	PSARJ SECOND LUBE (00:35)	
05:00		PSARJ SECOND LUBE (00:25)		05:00
		PSARJ REINSTALL COVERS (00:50) • Install SARJ Covers (00:35) • Cleanup (00:15)	PSARJ REINSTALL COVERS (00:50) • Install SARJ Covers (00:35) • Cleanup (00:15)	
06:00		CLEANUP/INGRESS (00:25) • Cleanup (00:10)	CLEANUP/INGRESS (00:25) • Cleanup (00:10)	06:00
06:30		• Ingress and Pre-Repress (00:15)	• Ingress and Pre-Repress (00:15)	06:30

EVA 2 TOOL CONFIG

ISS Configuration:

MT @ WS5; CETA Carts Port/Stbd
SSRMS on Node 2 PDGF
SPDM on SSRMS
PSARJ @ 50 deg

EV1 STP: S0 Port, inbd Strut → A/L aft D-ring
EV2 STP: S0 Port, outbd Strut → A/L Curved HR, fwd Stanchion

NOTE: Prior to use, inspect the following hardware:
- ❑ RET cords for fraying
- ❑ Inspect Load Alleviating Straps and D-ring Extenders; ref 2.230.100 CREW TETHER INSPECTIONS (SODF: ISS EVA TASKS):
  1. MMOD/general damage
  2. Discoloration
  3. Tack Stitching
  4. Red Band
- ❑ ISS Trash Bag: Bristle deformation/damage, after having stowed tools in trash bag
  √Empty √Zipper Closed
- ❑ BRT joint screws not loose
- ❑ Swing arm stiffness

Tether Counts: (Green RETs)
RETs (sm-sm) = 16/16 RETs (PIP Pin) = 5/5
RETs (Lg-sm) = 5/8 Adj Equip Tethers = 10/10
Adj Equip Tether (Lg-sm) = 2/2

EV1

- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (sm-sm)
    - ☐☐ Wire Tie (2 short)
  - ☐☐ T-Bar
    - ☐☐ RET (Lg-sm) (R)
    - ☐☐ RET (Lg-sm) (L)
    - ☐☐ Adj Equip Tether (R)
    - ☐☐ Adj Equip Tether (L to TB)
    - ☐☐ Small ISS Trash Bag (R, inbd)
  - ☐☐ Swing Arm (R)
    - ☐☐ **EVA Camera w/bracket** (int RET – morning of)
    - ☐☐ RET w/PIP Pin
- ☐☐ D-ring Extender (1, L D-ring)
- ☐☐ Waist Tether (1, R on D-ring)

EV2

- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (sm-sm)
    - ☐☐ Wire Tie (2 short)
  - ☐☐ T-Bar
    - ☐☐ RET (sm-sm) (L)
    - ☐☐ RET w/PIP Pin (R)
    - ☐☐ Adj Equip Tether (R)
    - ☐☐ Wire Tie (2 short)
    - ☐☐ Small ISS Trash Bag (R, inbd)
      - ■☐ Wire Tie (from P3/P4 Jumper)
  - ☐☐ Swing Arm (R)
    - ☐☐ RET (sm-sm)
      - ☐☐ PGT [A6, CAL, 30.5] s/n _____
        - ☐☐ PGT Battery s/n _____
        - ☐☐ 7/16 (wobble) Socket-6 ext
- ☐☐ D-ring Extender (2, R & L D-ring)
  - ☐☐ Waist Tether (1, R on D-ring Ext)
  - ☐☐ Waist Tether (1, L on D-ring Ext)

A/L

- ☐☐ RET (Lg-Sm) to HR stanchion
  - ☐☐ **SARJ Medium ORU Bag** (bottom to top)
    - ☐☐ Adj Equip Tether (ext – LF bottom)
    - ☐☐ Adj Equip Tether (ext – RF bottom)
    - ☐☐ Fish Stringer (Lg hook RF, all 7 sm hooks to free Lg hook)
    - ☐☐ RET (sm-sm) (RB)
      - ☐☐ Large Trash Bag
    - ☐☐ Fish Stringer (Tape near hook #1 – non-tape hook inside bag LB, taped hook on L bag side tether)
      - ☐☐ Hook #7: 1" QD Bail Drive Lever
      - ☐☐ Hook #6: 1" QD Cap Removal Tool **3**
      - ☐☐ Hook #5: **EVA Camera w/Flash** (int RET free – morning of)
      - ☐☐ Hook #4: RET (sm-sm) (to hinge side tether)
        - ☐☐ EVA Wipe Caddy
          - ☐☐ EVA Wipes (6) (dry – numbered 6-11) (wipe w/RED #6 inside-out)
      - ☐☐ Hook #3: RET (sm-sm) to shaft
        - ☐☐ J-Hook Nozzle Grease Gun w/zip tie tether pt
      - ☐☐ Hook #2: RET (sm-sm) to shaft
        - ☐☐ Straight-Nozzle Grease Gun w/zip tie tether pt
      - ☐☐ Hook #1: Adj Equip Tether (2) (covers)
      - ☐☐ Hook #1: Adj Equip Tether (Lg-sm) (2) (covers)
    - ■☐ RET w/PIP Pin
      - ■☐ PGT
        - ■☐ 7/16 (wobble) Socket-6 ext
    - ☐☐ RET (sm-sm) (ORU bag LF top to C/L bag R HR stanchion)
    - ☐☐ **EV1 Lube Crewlock Bag 3** (inside ORU bag) (integral tether to C/L bag lid handle)

      External:
      - ☐■ RET w/PIP Pin (C/L bag L D-ring) (PGT beneath C/L bag)
        - ☐■ PGT [A6, CAL, 30.5] s/n _____
          - ☐■ PGT Battery (Systems bag) s/n _____
          - ☐■ 7/16 (wobble) Socket-6 ext
      - ☐☐ Adj Equip Tether (L HR stanchion) (covers)
      - ☐☐ Adj Equip Tether (L HR stanchion) (covers)
      - ☐☐ Wire Ties (2 – long) (for grease gun) (see fig 1)
      - ☐☐ RET (sm-sm) (ext)
        - ☐☐ Straight-Nozzle Grease Gun (L)
      - ☐☐ RET (sm-sm) (external)
        - ☐☐ J-Hook Nozzle Grease Gun (R)

      Side 1 of divider:
      - ☐☐ EVA Gap Gauge "LEE" (int RET)
      - ☐☐ Taped Needle-Nose Pliers **3** (int RET)
      - ☐☐ RET (sm-sm)
        - ☐☐ CLA Cover MLI
          - ☐■ CLA Cover

EVA 2 TOOL CONFIG (Cont)

A/L (Cont)

Side 2 of divider:
- ☐☐ RET (sm-sm) (3) + (2 int RET)
  - ☐☐ EVA Wipes (5) (dry) (number 1-5)

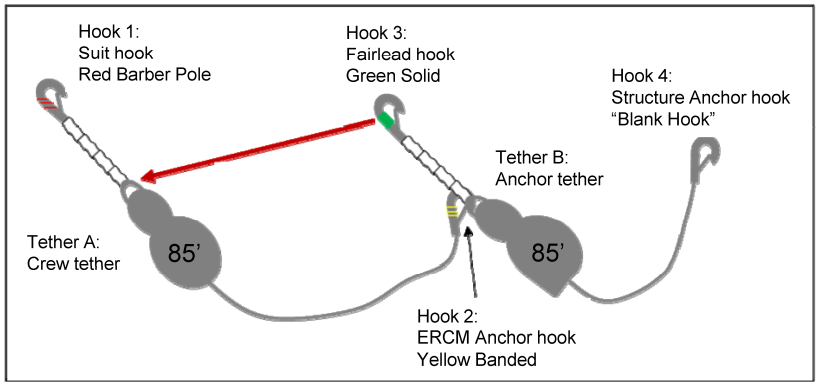
☐☐ RET (Lg-Sm)
(for SARJ C/L Bag return)

☐☐ RET (Lg-Sm)
- ☐☐ **Beam Med ORU Bag 3**
  - ☐☐ Adj Equip Tether (external) (L HR Stanchion)
  - ☐☐ RET w/PIP Pin (RF)
    - ☐■ Inbd Rad GB Stow Beam (front in bag)
  - ☐☐ RET w/PIP Pin (LB)
    - ☐■ Outbd Rad GB Stow Beam
  - ☐☐ RET (sm-sm) (LF)
    - ☐☐ Socket Caddy
      - ☐☐ 5/8 socket-7.8 ext

☐☐ **Staging Bag**
- ☐☐ Fish Stringer Tether
  - ☐☐ Wire Tie Caddy (hook 1) (5 short, 4 long)
  - ☐☐ Velcro/Tape Caddy (hook 2)
  - ☐☐ PGT (hook 3) s/n _____
    - ☐☐ PGT Battery s/n _____
    - ☐☐ 7/16 (wobble) Socket-6 ext
  - ☐☐ Vise Grips **3** (hook 4)
  - ☐☐ Ratchet Wrench (hook 5)
    - ☐☐ 7/16 (rigid) Socket-2 ext
  - ☐☐ Long Duration Tie-Down Tethers (2) (hook 6)
  - ☐☐ **Spare MUT EE D** (hook 7)
  - ☐☐ Spare Safety Tether Pack (85-ft + 85-ft) (to strap)
- ☐☐ Fish Stringer Tether
  - ☐☐ Pin Straightener Assy **3** (hook 1)
  - ☐☐ Connector Cleaner Tool Kit (hook 2)
  - ☐☐ Probe **3** (hook 3)
  - ☐☐ Pry Bar (hook 4)
  - ☐☐ **Socket Caddy D** (hook 5)
    - ☐☐ **5/8 socket-7.8 ext D**
  - ☐☐ **1" Button Depress Tool (BDT) D** (hook 6)
    - ☐☐ **1" Anti Kickback Tool (AKT) D**
  - ☐☐ MWS Key Strap Assy (on wire tie, to strap)
  - ☐☐ **1" N2 Vent Tool** (hook 7) **D**

☐☐ **IV Bag**
- ☐☐ Towels (2)
- ☐☐ Contamination Detection Kit
- ☐☐ GP Caddy (2)
  - ☐☐ Adjustable Thermal Mittens (2)
- ☐☐ Socket Caddy (hatch cont) w/RET (sm-sm) (Black)
  - ☐☐ 1/2 Socket-8 ext
  - ☐☐ 7/16 (wobble) Socket-6 ext (spare)
- ☐☐ DCM Plug (SAFER Hardmount) (2)
- ☐☐ RET (sm-sm, Black) (2)

Figure 1: EV1 Grease Gun Wire Tie Config



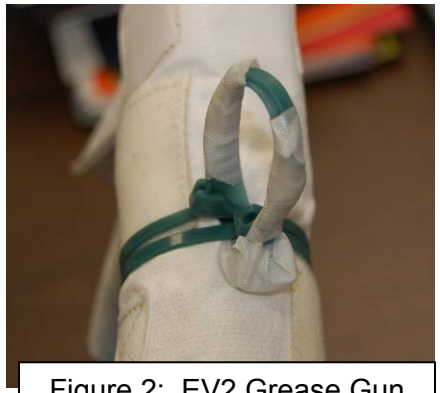


Figure 2: EV2 Grease Gun Wire Tie Config

Post EVA 2
1. Stow sample wipes in labeled Ziplock bag and place in "EVA Tools Transfer" bag
2. Stow all other used wipes in labeled Ziplock bag and place in "Done" mesh bag

EVA 2 BRIEFING CARD

EVA Prep
- ❑ Review Morning Timeline/Plan
- ❑ Work With a Purpose
- ❑ Pure O2 Protocol
- ❑ Suit Donning Plan – special requests, boot bladder manipulation
- ❑ Safer, MWS, Tools, CL, Bag Stowage in A/L
- ❑ Airlock Depress Review

Procedure Review
- ❑ Egress Plan (tethers) – Spanky then Drew, make good tether calls
- ❑ Order of Tasks (summary timeline)
- ❑ Translation Paths, Fairleads
- ❑ Hazards (no touch, no damage, keep outs, notes, cautions, warnings)
  - Stbd/Port TRRJs (Rad beam stow; LEE Lube)
  - SARJ ring/grease
  - Sharp edge: MT Lug near EAS Jumpers
  - Sharp edge: A/L Curved HR
- ❑ Contingencies – section 16 (NH3 QD ops, SARJ ops, Beam install)
- ❑ Task Constraints
  - NH3 Leak check choreography
  - EAS vent – night pass
  - P1-P5 vent – IV coordination (see P1-P5 Jumper Vent warning)
  - SARJ rotation – P3/P4 jumper
  - Drew's PGT – move before SARJ rotation
  - SARJ bolts turn count limited
  - Wipe numbering
  - Indexing for Grapple Bar Beam – Aft Bolt
  - LEE Lube – Drew inbd of APFR
- ❑ Ingress Plan

Robotics – SPDM LEE Lube
- ❑ Coordinate Frames
- ❑ GCA – clear and concise, direction and distance
- ❑ Clearance Concerns
- ❑ GCA Complete

Post EVA
- ❑ Suit Doffing
- ❑ Tool Reconfig Plan

Emergencies
- ❑ Comm Fail (hand signals), Term EVA, Abort EVA
- ❑ EMU Malfunctions
- ❑ Lost Tools/Crew Member (velocity and direction)
- ❑ DCS – Cuff Classes
- ❑ Safer Ops
- ❑ Crew Rescue

Reminders/Top Ten
- ❑ Gate Closed, Slider Locked, Tether Reel Unlocked
- ❑ QD Discipline – Read Blocks, verify actions (min Block interruptions)
- ❑ PGT Read-back, Turns and Torque with light
- ❑ Worksite Departure – tethers and tools clear
- ❑ Move Slow – no hopping (slower is faster)
- ❑ Body Position is Everything (use space)
- ❑ Tether Awareness – (special attn: egress, initial xlation, SARJ area, P3/P4 Jumper)
- ❑ Suit/Tool Awareness – BRT/PGT/ORU Stowage
- ❑ Suit MAL – read down DCM messages
- ❑ Discipline and Attention to detail until the end
- ❑ Day/Night Cycle Checks (settings, tools, tethers)

Contingency
- ❑ Retrieve and pre-stage appropriate books (FDF, SODF) for NH3 decontam and EMU suit contingencies
- ❑ Suspected NH3 Contamination
  - Describe leak
  - EMU Inspection
  - Priorities/Replan (consumables vs EVA objectives)
- ❑ Confirmed NH3 Contamination
  - EMU Inspection
  - Priorities/Replan (consumables vs EVA objectives)
- ❑ EVA NH3 Ingress

EVA 2 INHIBIT PAD

Orbiter

ALL EVAs

TCS *(Not required, switch guard installed on EVA 1)*
IV L12 1. √TCS POWER – OFF

Ku-Band Antenna *(INCO: Prior to Egress)*
MCC-H 1. √KU-BAND Mask – active
2. √KU-BAND EVA Protect Box – active

RCS *(Not expected since not translating to Payload Bay)*
If EV crew < 27 ft from FRCS
IV 1. √DAP: VERN, FREE, LO Z
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 (*)

Ground

ALL EVAs

Ground Radar *(TOPO: Prior to Egress)*
MCC-H 1. √TOPO console, ground radar restrictions in place for EVA

USOS (1)

ALL EVAs

PCU *(PHALCON: Prior to Egress)*

NOTE

PCUs may require up to a 1-hr warmup period before they are operational

MCC-H 1. √PCUs (two) operational in discharge mode and one of the following:
a. CCS PCU EVA hazard control FDIR enabled
b. No more than two arrays unshunted and oriented < 105° from velocity vector
If one or both PCUs failed
2. No more than two arrays unshunted and oriented < 105° from velocity vector

CUCU *(Crew: Prior to Egress)*
IV – (LAB1O4)
1. √cb POWER A, B [two] – OPEN
2. √cb LINK 1,2 [two] – OPEN

And one of the following inhibit pairs:
POIC 3a. Express Rack 2 Locker 6 – Power Removed
3b. Express Rack 6 Locker 7 – Power Removed
OR
IV 4a. Express Rack 2 Locker 6 – OFF
4b. Express Rack 6 Locker 7 – OFF

MISSE 8 *(POD: Prior to Egress)*
POIC Prior to EV Hatch Open
1. ELC-2 ExPA-2 Discrete Channel 6 – Disabled

EVA 2 INHIBIT PAD (Cont)

USOS (2)

LOCATION DEPENDENT INHIBITS

Lab Window *(Not expected)*
IV If EV crew less than 10 ft from window or in window FOV, close window shutter

Cupola Windows *(Not expected)*
IV If EV crew less than 10 ft from window, coordinate shutter opening/closing with EV crew and minimize time shutter is open

Mobile Transporter *(ROBO: Prior to Egress)*
MCC-H If EV crew < 1.5 meters from MT
1. √MT latched

TASK DEPENDENT INHIBITS

P6 PVTCS Fill *(THOR: Prior to Egress)*
MCC-H
1. Configure Loop for PVTCS Fill
2. √Final PVTCS Pressure
3. Provide ATA quantity to IV

JEM (1)

ALL EVAs

ICS-EF Antenna *(Prior to Egress)*
SSIPC
1. ICS MOD – OFF
2. ICS UPC – OFF
3. ICS HPA – OFF
4. HPA ON and UPC ON commands are cleared (not present) in the ICS stored command queue

COL (1)

ALL EVAs

HAM Radio
IV
1. HAM Radio – Deactivate

RSOS (1)

ALL EVAs

SM Antennas *(RIO: Prior to Egress)*
IV
MCC-M
1. ARISS (Ham Radio) – Deactivate
2. GTS – Deactivate
3. Napor (РСПИ) – Deactivate

USOS (3)

LOCATION DEPENDENT INHIBITS

Port SARJ *(PHALCON: Prior to Egress – will rotate to 250° after first lube)*
MCC-H If EV crew working within 2 ft, outboard of SARJ or reqd per loads FR
1. √DLA (1) – LOCKED at 50°
2. All motor setpoints set to zero
3. All motors deselected

Port TRRJ *(THOR: Prior to Egress – SPDM LEE Lube)*
MCC-H If EV crew working within 2 ft of P1 TRRJ rotation envelope (Includes Node 3 Port Endcone and PMA3)
1. √DLA 1(2) – LOCKED at 0°
2. √DLA 2(1) – ENGAGED

Stbd TRRJ *(THOR: Prior to Egress – Radiator Grapple Bar Stow Beams)*
MCC-H If EV crew working within 2 ft of S1 TRRJ rotation envelope
1. √DLA 1(2) – LOCKED at 0°
2. √DLA 2(1) – ENGAGED

FPMU *(PHALCON: Prior to Egress)*
MCC-H If EV crew on Port truss (P1-P6) or working within 5 ft of Floating Potential Measurement Unit
1. RPCM P11A_B RPC 13 Open/Close Cmd Inhibit

SSPTS *(Not expected)*
MCC-H If EV crew working within 2 ft of SSPTS cables
1. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit
2. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit
3. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

EVA 2 NOTES/CAUTIONS/WARNINGS

NOTES

1. Bolt install: Report torque and turns
2. Bolt release: Report torque and turns if different from published range
3. EVA connectors: After disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
4. Inspect QDs for damage prior to mating
5. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
6. 85-ft safety tether retract force may affect body positioning
7. CETA Cart brake handle wire ties must be replaced after crew loading

CAUTION

ISS Generic Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture shafts (dry lube)
   2. PIP pins
   3. Passive UMAs
   4. MBS/SSRMS/SPDM taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
   5. SPDM SJEU, EP, OTCM, LEU, and LEE VDU radiator surfaces
   6. OTSD

B. Electrical cables
   1. Avoid bend radii < 10 times cable diameter

C. Fiber optic cables
   1. Avoid bend radii < 10 times cable diameter
   2. Avoid pulling on cable during mate/demate

D. Fluid line flex hoses and QDs
   1. Avoid bend radii < 14 in for hoses with a diameter ≥ 1 in
   2. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
   3. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if required
   4. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements

CAUTION

ISS Generic Constraints (Cont)

E. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles

F. Other
   1. ITT Cannon connector: On demated connectors, do not rotate collar or manipulate cable/connector using collar or connector tool
   2. MLI handholds are not rated for crewmember translation loads

CAUTION

ISS Truss Constraints

A. Avoid inadvertent contact with
   1. CETA lights (Z-93 paint) [LAB,S1,NODE 1,P3,S3]
   2. Deployed TUS cable [Zenith and Nadir CETA rails]
   3. S0 aft face radiator
   4. GPS antennas (S13 paint) [S0,JLP]
   5. UHF antennas [LAB,P1]
   6. ETCS radiator flexhoses and panels [S1,P1]
   7. EETCS/PV radiator flexhoses, bellows and panels [P6,P4,S4,S6]
   8. SASA RF group [S1,P1]
   9. Heat pipe radiators [Z1]
   10. PCU cathode and HCA ports [Z1]
   11. Ku-Band antenna (SGANT) dish [Z1]
   12. CMG cover/shells [Z1]
   13. FPMU [P1]
   14. SASA high and low gain antennas and radiator surfaces [Z1]
   15. Deployed MISSEs
   16. OTP on HAB Tray [S0]

B. For structural reasons
   1. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

CAUTION

ISS Truss Constraints (Cont)

C. Other
   1. EWIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
   2. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS ground strap fasteners [P6,P4,S4,S6] can contaminate EMU
   3. Prevent inadvertent contact of the tether shuttle with ETRS when the P3 tether shuttle stop is raised away from the rail

CAUTION

ISS U.S. Pressurized Elements Constraints

A. Avoid inadvertent contact with
   1. EVA crane [PMA1]
   2. TCS reflectors [PMA2,PMA3]
   3. APAS hardware [PMA2,PMA3]
   4. CETA lights (Z-93 paint) [LAB,S1,NODE 1,P3,S3]
   5. UHF antennas [LAB,P1]
   6. Open CBM petal covers, LAB and Cupola window shutters
   7. S0/NODE 2 fluid tray hardlines at NODE 2 end, which are limited to 25 lb

B. Other
   1. EWIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
   2. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged

CAUTION

ISS I.P. Elements Constraints

COL

A. Avoid inadvertent contact with
   1. COL ARISS and AIS antennas [COL-Nadir]

JEM

A. Avoid inadvertent contact with
   1. GPS antennas (S13 paint) [S0,JLP]
   2. Open JPM window shutter
   3. JTVE, WVE/EVE, JEF VE cameras
   4. JEMRMS taped radiative surfaces [JEU,EE,Cameras]
   5. JEM A/L target and pins
   6. JEF ORUs and EFUs (paint and lubricant)
   7. MAXI front and top panel (paint)
   8. SEDA-AP sensors (HIT, SDOM, and AOM)
   9. Trunnions and UCMs (paint and lubricant) [JEF Payloads]
   10. RAIDS covers on end of HREP
   11. ICS-EF Ka-Band antenna dish
   12. Small Fine Arm (SFA) (paint, coating and lubricant)

B. For structural reasons
   1. Avoid kicking MMOD shields between JLP and JPM
   2. Avoid tool impact on ICS-EF sensor

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 and PLB sill]
   4. Payload bay and camera wire harnesses, cables, cable guides, and connectors
   5. OBSS striker bars (drylube)

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]

WARNING

ISS Generic Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture targets and target pins

B. Pinch
   1. NZGL connector linkage. Use caution when mating/locking
   2. ITT Cannon connector rotating housing
   3. PDGF connector doors

C. QDs
   1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip
   2. Do not rotate if in mated/valve open configuration
   3. Bail may kick back suddenly when detent button is depressed if pressure has built up in spring cavity

D. Sharp Edges
   1. Inner edges of WIF sockets
   2. APFR active WIF probes
   3. Mating surfaces of EVA connectors Avoid side loads during connector mating
   4. Back side of MMOD shield fasteners
   5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAs, SARJ Covers); the end of the spring may protrude
   6. SPDM OTCM gripper jaws
   7. Keep hands away from SSRMS LEE/POA/SPDM LEE opening, snares, and PDGF curvic coupling (teeth)
   8. MMOD strikes on ISS exterior

WARNING

ISS Generic Constraints (Cont)

E. Thermal
   1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
   2. Turn off glove heaters when comfortable temperature reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
   3. Uncovered trunnion pins may be hot
   4. SSRMS/MBS/SPDM operating cameras and lights may radiate large amounts of heat
   5. Do not touch EMU protective visor if temperature has been < -134 degF for > 15 min
   6. No EMU boot contact with foot restraint when temperature < -120 degF or > 200 degF
   7. PDGF surfaces may not meet touch temperature requirements for unlimited contact when $\beta \leq -70$ or $\beta \geq 70$

WARNING

ISS Truss Constraints

A. Avoid inadvertent contact
   1. SSU, ECU, beta gimbal platform, mast canister, SAW blanket boxes unless the beta gimbal is locked and the motor is turned off
   2. Stay inboard of SARJ when active
   3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
   4. Stay 5 ft from moving MT on face 1
   5. Stay 3.3 ft from Ku-Band (SGANT antenna) when powered
   6. Stay 1 ft from top of STP-H3 (ELC3)
   7. Deployed MISSEs and ORMATE-III R/W

B. RF radiation exposure
   1. Stay 3.8 ft from S-Band (SASA) high gain antenna when powered [S1,P1]
   2. Stay 1.3 ft from S-Band (SASA) low gain antenna when powered [S1,P1]
   3. Stay 1 ft from UHF antenna when powered [LAB,P1]

C. Sharp Edges
   1. Solar array blanket box [P6,S6]
   2. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
   3. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner
   4. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 – SARJ at 0 deg]
   5. Nickel coated braided copper ground straps may contain frayed wires [P6,P4,S4,S6]
   6. MMOD strikes on Z1 toolboxes
   7. POA FSE (CSA logo below MBS mast camera)
   8. AMS Star Trackers Baffles (2)

WARNING

ISS Truss Constraints (Cont)

D. Electrical Shock
   1. Stay ≥ 2 ft from ungrounded floating connectors if powered
      S0 EVA power cables (inside S0 Bay 00 Face 4, Bay 01 Face 3)
      ESP-2 jumper (inside S0 Bay 03 Face 4)

E. Thermal
   1. ELC may exceed touch temperatures when β > 75 deg

WARNING

ISS U.S. Pressurized Elements Constraints

A. Handrails
   1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 and 566, A/L Tank 2 Nad/Fwd and Port/Fwd, P6 5389]

B. Pinch
   1. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
   2. LAB and Cupola window shutters and CBM petal cover linkages during operation

C. RF radiation exposure
   1. Stay 1 ft from UHF antenna when powered [LAB,P1]

D. Sharp Edges
   1. PMA umbilical launch restraints - exposed bolt threads
   2. Adjustable fuse tether (Fish Stringer) buckles stowed in Node bag
   3. Port/Aft portion of A/L circular HR [HR 0506]
   4. A/L HR 0537 (Eq Lock Zenith)
   5. ESP-2 HR 8012
   6. PMM ROEU and ROFU panels (zenith endcone)

WARNING

ISS U.S. Pressurized Elements Constraints (Cont)

E. Thermal
   1. PMA handrails may be hot. Handling may need to be limited
   2. Stay ≥ 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up; limit time to 15 min or less if > 300 degF
   3. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF
   4. No EMU TMG contact with PMAs and MMOD shields > 320 degF

F. Electrical Shock
   1. Stay ≥ 2 ft from ungrounded floating connectors if powered
      SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd

G. Fluid QDs
   1. Do not translate on gap spanners restraining NODE 3 – LAB NH3 jumpers

WARNING

ISS I.P. Elements Constraints

COL

A. Avoid inadvertent contact with
   1. SOLAR [COL EPF]

B. Thermal
   1. Columbus end cones may violate touch temperature constraints when $-75 \leq \beta \leq -60$ or $60 \leq \beta \leq 75$

JEM

A. Avoid inadvertent contact with
   1. ICS-EF sensors

B. Pinch
   1. JPM window shutter linkages during operation
   2. JEM cameras (JVTEs, EVE, WVE, and JEF VEs)
   3. JEM EFU latching arms
   4. JEF SSE latch
   5. ICS-EF antenna boom
   6. SEDA-AP mast
   7. SMILES antenna rotating area
   8. HREP hinge sides and RAIDS pinch areas
   9. JEMRMS EE
   10. JEMRMS Small Fine Arm (SFA) joints and booms

WARNING

ISS I.P. Elements Constraints (Cont)

JEM (Cont)

C. Sharp Edges
   1. Interior of JEMRMS HRMs
   2. JEMRMS EE opening and snares
   3. JEM A/L hatch corners
   4. ICS-EF AHM gears
   5. MAXI visual star camera
   6. SMILES baffles (two), baffle base bare bolts, and Cold Sky Terminator (CST)
   7. HREP baffles (four) [Star tracker aperture Zenith and three instrument baffles Aft]
   8. SFA Electro-Mechanical GF (EMGF)

D. RF radiation exposure
   1. Stay 0.3 ft from Fwd/Aft JPM PROX antenna

E. Thermal
   1. JPM Port End Cones and JLP Port Nadir may violate touch temperature constraints when $\beta > 60$ deg
   2. JEMRMS/JTVE/JEFVE operating cameras and lights may radiate large amounts of heat

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. 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]

EVA 2 NOTES/CAUTIONS/WARNINGS (Cont)

WARNING

Shuttle Constraints (Cont)

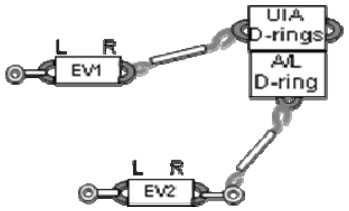
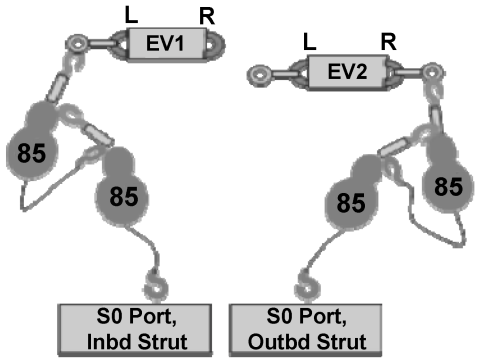
D. Sharp Edges
   1. PRLA grounding wipers [PLB]
   2. LDRI baffles (also an entrapment hazard) [OBSS]
   3. Keep hands away from SRMS EE opening and snares
   4. TCS connector backshells have exposed threads [ODS]

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

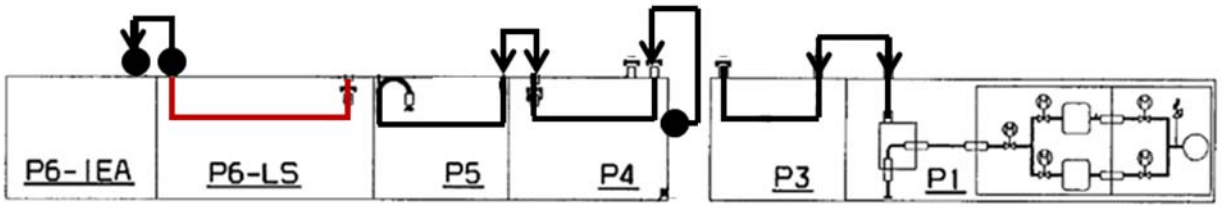
EVA 2 EGRESS/SETUP (00:35)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
1. Record PET Start time __ : __ (Pwr to Batt) 2. DAY/NIGHT Cycles _____  	**Initial Configuration:** 1. √All gates closed & sliders locked ❑ R Waist Tether to UIA D-ring	**Initial Configuration:** 1. √All gates closed & sliders locked ❑ R Waist Tether to A/L int D-Ring ext
	<u>EGRESS</u> (00:25)	<u>EGRESS</u> (00:25)
3. Start WVS Recorders 4. Start Hatch Thermal Cover clock PET (30 min) __ : __		2. Open hatch thermal cover 3. Egress A/L
5. Inspect Load Alleviating Straps for: 1. MMOD/general damage 2. Discoloration 3. Tack Stitching 4. Red Band	2. Partially egress A/L hatch to allow EV2 to attach the **RED** hook to L D-ring ext	4. Perform LAS inspection on EV1 ST Pack (aft D-ring) ❑ LAS; ❑ √Yellow hook on Green ERCM ❑ LAS; ❑ √Green hook on Red ERCM 5. RET to ST Pack on aft D-ring 6. Attach **RED** hook to EV1 L D-ring ext ❑ √Gate closed, slider locked, reels unlocked, release RET
 	3. On **EV2 GO**, release Waist Tether from UIA D-ring	7. Give **EV1 GO** to release Waist Tether 8. Perform LAS inspection on EV2 ST Pack ❑ LAS; ❑ √Yellow hook on Green ERCM ❑ LAS; ❑ √Green hook on Red ERCM 9. RET to ST Pack on fwd curved HR stanchion 10. Attach **RED** hook to R D-ring ext ❑ √Tether routing in front (right side) ❑ √Gate closed, slider locked, reels unlocked, release RET 11. Release Waist tether from A/L int D-ring ext
	4. Transfer Beam ORU bag to EV2 5. Transfer SARJ bag bundle to EV2 6. Pre-stage empty Lg-sm RETs on A/L int D-ring ext 7. Egress A/L	12. Receive and temp stow Beam ORU bag on HR____ 13. Receive SARJ bag bundle, stow on BRT w/RET

EVA 2 EGRESS/SETUP (00:35) (Cont)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
6. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max	8. Perform buddy checks √MWS tabs up, BRT tab up, tether configs 9. Verify SAFER config ❑ √L handle down (MAN ISOL Vlv – Open) ❑ √R handle down (HCM – Closed) 10. √WVS – green LED	14. Perform buddy checks √MWS tabs up, BRT tab up, tether configs 15. Verify SAFER config ❑ √L handle down (MAN ISOL Vlv – Open) ❑ √R handle down (HCM – Closed) 16. √WVS – green LED
7. Stop Hatch Thermal Cover clock PET (30 min) __ : __	11. Close hatch thermal cover <u>SETUP</u> (00:10) 12. Translate zenith on A/L to Vent Tool Extension Bag (VTEB) 13. Attach VTEB to BRT w/RET 14. Translate to P3 Face 6, nadir route 15. Attach **GREEN** hook to P3 HR 3861 (bay 22) ❑ √Gate closed, slider locked, reels unlocked, release RET (Translate to P3 QD M2 – P3/P4 Jumper)	<u>SETUP</u> (00:10) 17. Translate to P3 Face 2, zenith route ❑ √Lab strut ST anchor hooks ❑ Start zenith Bay 10 (fairlead tether) 18. Attach **GREEN** hook to P3 HR 3852 (bay 22) ❑ √Gate closed, slider locked, reels unlocked, release RET 19. Translate zenith/aft to Face 4 20. Stow SARJ bag bundle on P3 HR 3842 and HR 3849 (Diag Strut Face 4) (Translate to P4 HR 5123 – P3/P4 Jumper)

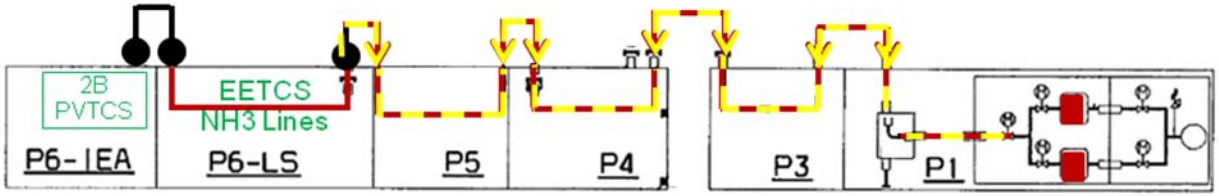
P3/P4 NH3 JUMPER RE-ROUTE (00:15)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 00:35	**Post EVA 1 Jumper Config:**  CAUTION • QDs exposed to direct sun can overtemp in 20 min. Shading by EMU or thermal shrouds can lengthen acceptable time with bootie removed • P3/P4 Jumper exposed to sun can become dangerously hot, use caution • P3/P4 Jumper QD stems can break with excessive force; use caution when handling NOTE Do not route safety tether underneath P3/P4 jumper connector	
	P3/P4 NH3 JUMPER RE-ROUTE (00:15) 1. Translate nadir to QD M2 on P3 outbd panel A502 (face 6) 2. Attach RET to P3 HR 3860 (notify IV _____) 3. RET, remove cap from QD M2 4. Translate nadir/aft to P4 inbd bulkhead M2 dummy male 5. RET, receive QD F2 from EV2 6. Translate to QD M2 on P3 panel A502 (face 6) 7. Mate and open QD F2 to M2 on panel A502 per **BLOCK B** and **BLOCK C** (HR 3860 if BRT reqd) (1/4") 8. Visually inspect jumper connections 9. Glove and Gauntlet Check (Translate to P6 Long Spacer – Stow VTEB)	P3/P4 NH3 JUMPER RE-ROUTE (00:15) 1. Translate to P4 HR 5123 (IEA Radiator sidewall) 2. Remove wire tie from P3/P4 jumper line, stow in trash bag 3. Translate to P4 inbd bulkhead M2 dummy male 4. Open TA clamp 5. Demate QD F2 per **BLOCK A** (HR 5110 if BRT reqd) (1/4") 6. Transfer QD F2 to EV1; watch jumper line as it is routed 7. Glove and Gauntlet Check (Translate to P3 face 2 – ATA Fill Config)

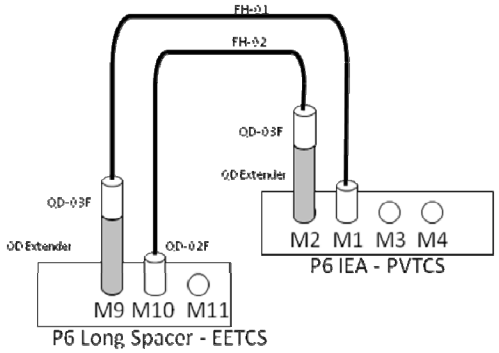
PVTCS NH3 FILL (01:00)/CONFIGURE ATA (00:25)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 00:50	OPEN P5/P6 JUMPER (00:15) 1. Translate to outbd end of P6 Long Spacer, fairlead as reqd 2. Stow VTEB on P6 HRs 5322 (2 hooks) and 5326 (1 hook) 3. Translate to P5 dummy panel M14 (Stand by for IV)	CONFIGURE ATA FOR NH3 FILL (00:25) 1. Translate to P3 face 2 HR 3852 2. Retrieve **GREEN** hook ❑ √Gate closed, slider locked, reel unlocked, release RET 3. Translate to P1 ATA panel A500 ❑ At bay 14, nadir to HR 3651 4. Remove cap from M1 5. Open thermal bootie on QD F185 (1/4") on M3 ❑ √Detent button fully installed 6. Close and demate QD F185 on M3 per **BLOCK D** and **BLOCK A** (HR 3612 if BRT reqd) 7. Mate and open QD F185 to M1 per **BLOCK B** and **BLOCK C**. (Do not reinstall bootie) 8. Install cap on M3 9. Perform following close valve steps on M1: (prep for quick valve closing if NH3 seen) a. √Detent button up and depressible b. √Side loads c. √Aft white band visible 10. **Notify IV** when valve is open and standing by on M1
	NOTE Big picture, Leak check coordination: Minimize comm; give **MCC-H GO** to start leak check, stand by for **MCC-H** words on leak check status and completion. If leak detected, EV2 close M1. EV1 must wait until leak check initiated before demating and mating P5/P6 jumper to P6. DO NOT open valve until leak check complete	
1. On **EV2 notification**, give **MCC-H GO** to open ATA vent valve		
MCC-H: *THOR Commands ATA vent valve open*	ATA fills jumper lines; perform leak check (~5 min)	
EV1/2: Cribsheet EVA 2: Blocks G, H, I		

PVTCS NH3 FILL (01:00)/CONFIGURE ATA (00:25) (Cont)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
	Current Jumper Config During Leak Check  	
	4. Remove cap from P6 M14 (HR 5309 if BRT reqd) 5. Demate QD F14 from dummy M14 per **BLOCK A** (1") 6. Mate QD F14 to P6 M14 per **BLOCK B** **(DO NOT OPEN)**	11. If observe any leaks or on **MCC-H GO**, perform the following close valve steps on QD F185/M1: a. Press detent button, move bail aft b. √Fwd white band visible; √detent button up c. Contact **MCC-H**
EV1: Cribsheet EVA 2: Blocks J, K ***MCC-H:*** *Report EV2 is GO to leave worksite (~2.5 min)*		
2. Give **EV2 GO** to leave from P1 ATA worksite		12. On **IV GO**, close bootie on QD F185 at M1
MCC-H: *Report leak check complete (~5 min)*		13. Translate to P3 Face 2, zenith route 14. Attach **GREEN** hook to P3 HR 3852 (bay 22) ❑ √Gate closed, slider locked, reels unlocked, release RET
3. Give **EV1 GO** to open P5/P6 Jumper	7. On **IV GO**, open QD F14 to P6 M14 per **BLOCK C** (Translate to P6 EAS Jumper FH-02)	(Translate to P3 SARJ, Face 4 – SARJ Cover Removal)

PVTCS NH3 FILL (01:00)/CONFIGURE ATA (00:25) (Cont)

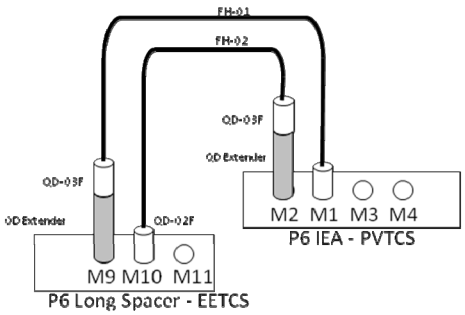
IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
EV1: Cribsheet EVA 2: Blocks L, M, & N **EAS Jumper Diagram**  	WARNING Sharp Edge on P6 MT Lug Near EAS Jumpers (near P6 HR 5333) OPEN EAS JUMPER/FILL PVTCS (00:15) 8. Translate to P6 EAS Jumper FH-02 9. Open thermal bootie on QD-02F at M10 ❑ √Detent button fully installed 10. Open QD-02F at M10 per **BLOCK C** (HR 5327 if BRT reqd) (1") 11. Open QD Extender at M2 per **BLOCK C** ATA fills P6 PVTCS (~10 min) NH3 VENT TOOL SETUP (00:20) 12. Translate to VTEB on P6 HR 5322 13. Retrieve and attach MUT EE to P6 HR 5321 (straight on HR) ❑ √Locked ❑ Clock L-bracket so it is parallel to HR 14. Attach vent tool extension (VTE) to L-bracket ❑ √French hook attached to bracket ❑ √VTE inbd of MUT EE ❑ Clock nozzle such that it points ISS Zenith/Fwd and away from all structure and solar arrays 15. Remove plug from VTE (stays in VTEB) ❑ Rotate lock lever to unlock (hard stop detent – very loose) ❑ Depress lever to hard stop (2-10 lb) 16. Prior to attaching 1.0" Vent Tool to VTE, perform visual check that vent tool nozzle will protrude past VTE internal seals: ❑ Hold vent tool nozzle against VTE external alignment groove (vent tool hook should contact VTE connector) ❑ √Nozzle tip is past thin black alignment line	

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
MCC-H: *Report when fill complete* EV1: Cribsheet EVA 2: Blocks O, P, Q, R 4. On **MCC-H GO**, give **EV1 GO** to close QD Extender at M2	17. Install vent tool nozzle into VTE connector: ❑ Rotate lock lever to unlock (hard stop detent – very loose) ❑ Depress lever to hard stop (2-10 lb) ❑ Insert vent tool nozzle into connector tube (vent tool hook will contact front of connector; go to hard stop) ❑ Release lever and rotate to lock 18. Retrieve vent tool adapter from VTEB 19. Remove 1 cap from vent tool adapter 20. Remove plug from vent tool QD (1", no collar) 21. Mate vent tool adapter to vent tool QD per **BLOCK B** 22. Open vent tool QD valve per **BLOCK C** 23. Temp stow vent tool adapter at VTEB worksite 24. Translate to P6 EAS Jumper at M2 25. On **IV GO**, close and demate QD Extender at M2 per **BLOCK D** and **BLOCK A** (1") 26. Perform visual inspection of QD; report if leaking 27. Install plug on QD Extender 28. Tether QD Extender bail to M1 bail w/Adj tether 29. Install cap on M2 ❑ √All booties installed before leaving workstation INITIATE P1-P5 JUMPER VENT (00:10) (HR 5309 if BRT reqd) NOTE Big picture: IV closing ATA valve for P1-P5 vent. Minimize comm during operations WARNING When P1-P5 line is isolated from accumulator during a day pass, NH3 in line can overtemp in 2.5 min. If there is difficulty opening QD valve, IV re-open ATA valve. (ref. 1.106 P1-P5 JUMPER VENT ECLIPSE CONSTRAINT WORKAROUND) (SODF: ASSY OPS)	

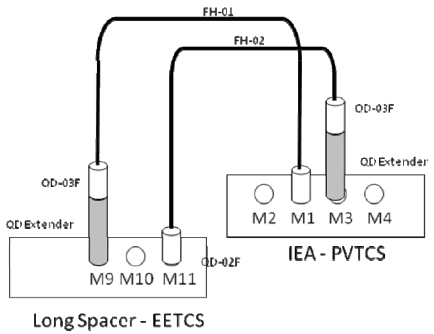
PVTCS NH3 FILL (01:00)/CONFIGURE ATA (00:25) (Cont)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
	30. Translate to VTEB, retrieve vent tool adapter w/Adj tether 31. Translate inbd to P6-LS QD F14 at M14, tending vent lines 32. Stow vent tool adapter with adj tether on HR 5309 33. Remove cap from vent tool adapter	
EV1: Cribsheet EVA 2: Block S, T, U	34. Close and demate P6 QD F14 per **BLOCK D** and **BLOCK A** (1")	
5. When QD F14 mated to vent tool adapter (not open), close ATA valve (ref. 1.106 P1-P5 JUMPER VENT ECLIPSE CONSTRAINT WORKAROUND) (SODF: ASSY OPS)	35. Mate QD F14 to vent tool adapter per **BLOCK B**, adjust adj equip tether as reqd **(DO NOT OPEN)**	
6. Give **EV1 GO** to open QD F14 valve	36. On **IV GO**, open valve on QD F14 per **BLOCK C** 37. Reinstall cap on P6 M14	
Jumper line vents (~17 min)	38. Attempt to shade QD F14/vent tool as much as possible during vent with bootie and structure 39. Translate inbd to assist EV2 with SARJ Lube as reqd (FS 7-__)	

EAS JUMPER SETUP/VENT (00:30)

IV/SSRMS	EV1 (Drew)
Planned PET 02:20 ***MCC-H:*** *Report when vent complete* 1. On **MCC-H GO**, give **EV GO** to close QD EV1: Cribsheet EVA 2: Block V 2. If eclipse, give **EV1 GO** to vent  EV1: Cribsheet EVA 2: Block Y	<u>VENT TOOL RECONFIG</u> (00:10) 1. Glove and Gauntlet check 2. Translate to P5 QD F14 near P6 Long Spacer 3. On **IV GO**, close QD F14 per **BLOCK D** 4. Demate QD F14 from vent tool adapter per **BLOCK A** 5. Mate QD F14 to P5 dummy panel M14 per **BLOCK B** **(DO NOT OPEN)** 6. Install cap on vent tool adapter <u>CAUTION</u> Initiate EAS Jumper vent only during eclipse to prevent trapping NH3 in jumper lines at high temperatures. Use caution when rotating EAS QD to vent position <u>NOTE</u> Check bail handle clocking for each QD on EAS jumper before manipulation <u>EAS JUMPER VENT</u> (00:10) (HR 5334 if BRT reqd) 7. Translate to P6 EAS Jumpers with vent tool adapter ❑ √Vent line as translating 8. Stow vent tool adapter to HR 5327 using adj tether; adjust as reqd 9. Remove cap from vent tool adapter 10. On **IV GO**, close QD-02F at M10 per **BLOCK D** 11. Remove plug from QD Extender on QD-03F by pulling back on release ring √Fwd white band not visible 12. Mate QD Extender to vent tool adapter per **BLOCK B**; adjust adj tether as reqd 13. Open valve on QD Extender per **BLOCK C** *Jumper line vents (~3.5 min)* 14. Remove cap from M3 15. Remove cap from M11

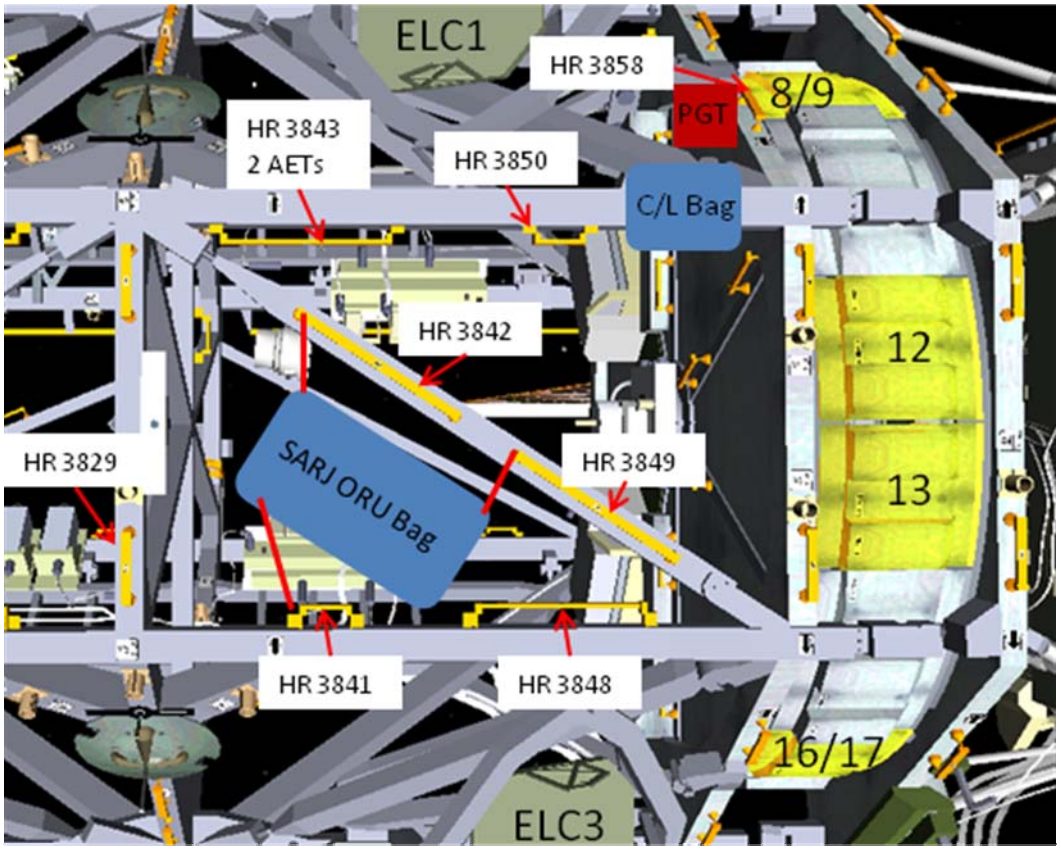
EAS JUMPER SETUP/VENT (00:30) (Cont)

IV/SSRMS	EV1 (Drew)
MCC-H: *Report when vent complete* 3. On **MCC-H GO**, give **EV1 GO** to close QD EV1: Cribsheet EVA 2: Blocks W, X **Final EAS Jumper Config**  	EAS JUMPER RECONFIG (00:10) 16. On **IV GO**, close QD Extender per **BLOCK D** 17. Demate QD Extender from vent tool adapter per **BLOCK A** 18. Mate QD Extender to M3 per **BLOCK B** **(DO NOT OPEN)** 19. Retrieve Adj tether from QD Extender 20. Demate QD-02F at M10 per **BLOCK A** 21. Mate QD-02F to M11 per **BLOCK B** **(DO NOT OPEN)** 22. Install cap on M10 23. Install cap on vent tool adapter 24. Visually inspect jumper connections (Translate to VTEB – Vent Tool Bag Cleanup)

NH3 VENT TOOL CLEANUP (00:25)

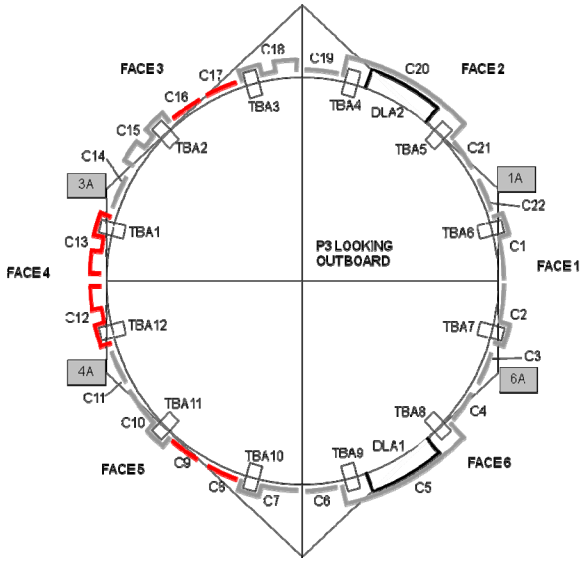
IV/SSRMS	EV1 (Drew)
Planned PET 02:50 1. Perform Bag Inventory: VTEB: ❑ MUT EE ❑ Vent Tool Adapter ❑ Vent Tool ❑ Vent Tool Extension	<u>VENT TOOL CLEANUP</u> (00:25) 1. Translate to VTEB with vent tool adapter; tend vent lines as reqd 2. Close vent tool QD valve per **BLOCK D** 3. Demate vent tool from vent tool adapter per **BLOCK A** 4. Reinstall cap on vent tool adapter; stow in VTEB 5. Reinstall QD plug on vent tool QD 6. Remove vent tool from vent tool extension (VTE) ❑ Rotate lock lever to unlock ❑ Depress lever to hardstop 7. Install VTE plug on vent tool extension ❑ Rotate lock lever to lock ❑ Pull test 8. Shake vent tools (to release NH3 crystals if present) before installing in bag 9. Coil vent tool; stow in VTEB 10. Using wire tie on nozzle, coil vent tool extension and temp stow coil 11. Retrieve MUT EE and L-bracket; stow in VTEB √MWS tethers not left in bag 12. Stow coiled VTE in VTEB 13. Perform bag inventory and close bag ❑ √Velcro secure 14. Stow VTEB on BRT w/RET <u>NOTE</u> Complete with Wet QD Ops. If contamination (suspected or confirmed), crew is GO for suit inspections at earliest convenience. If during day, shade inspections areas (Translate to P3 Jumper QD at M2 – P3/P4 Jumper Stow)

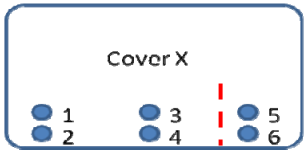
PSARJ COVER REMOVAL (00:55)

IV/SSRMS	EV2 (Spanky)
Planned PET 01:15	 SETUP (00:20) 1. Translate to SARJ bag on P3, face 4 2. Tether lid of SARJ ORU bag open to HR 3841 (using lid hook) 3. Remove Lube C/L bag from ORU bag and stow on P3 HR 3850 (use integral bag hook on HR, keep RET with ORU bag) 4. Remove external adj tethers from Lube C/L bag and attach to HR 3843 5. Stow EV1 PGT from Lube C/L bag on HR 3858 (using RET between PGT and C/L bag) 6. Attach taped fish stringer hook to P3 HR 3841

PSARJ COVER REMOVAL (00:55) (Cont)

IV/SSRMS





2. SARJ Cover removal & temp stow table

Cover	1	2	3	4	5	6
Cover 8		X				
Cover 9						
Cover 12						
Cover 13						
Cover 16						
Cover 17						

EV2 (Spanky)

CAUTION
To prevent loss of inboard MLI cover fasteners during removal:
- Limit turn count to minimum required for fastener release
- Minimize side loading bolt head
- Maintain axial force on fastener to compress spring during rotation

NOTE
EV1 will nominally remove covers 8 & 9 while waiting for P1-P5 to vent.
Bolt 2 is missing from cover 8; does not meet kick loads

EAS jumper must be vented during Eclipse:
- ❑ EV1 returns to FS 7-__ step 1 (EAS JUMPER SETUP/VENT)

PSARJ COVER REMOVAL (00:35)

7. Attach RET to cover
8. Configure PGT: (BRT as reqd)
   [A6 (8.3), CCW2, 30.5] 6-Ext 7/16
9. ←Release inboard MLI cover fasteners, **9 turns:**
   - ❑ Covers 8, 9, 16, 17 are singles
   - ❑ Covers 12, 13 are doubles

10. Stow covers on fish stringer hook #1 adj tethers near HR 3841
    - ❑ Cover 12
    - ❑ Cover 13
    - ❑ Cover 16
    - ❑ Cover 17
11. Stow covers on adj tethers on HR 3843
    - ❑ Cover 8
    - ❑ Cover 9

PSARJ FIRST LUBE (00:45)

IV/SSRMS

Planned PET 02:10

1. Table for photos, record Cover #

Cover	Datum A	Outer Canted
Cover ____		
Cover ____		
Cover ____		
Cover ____		

2. SARJ Table for samples, record cover # and sample wipe #

Cover	Datum A	Outer Canted	Inner Canted
Cover ____	#____	#____	#____
Cover ____	#____	#____	#____

3. SARJ Lube Table

Cover	Inner Canted	Datum A	Outer Canted
Cover 8			
Cover 9			
Cover 12			
Cover 13			
Cover 16			
Cover 17			

4. EVA wipe(s) used for cleaning:

Wipe #	#_____	#_____

EV2 (Spanky)

NOTE

Inspection:
- ❑ Inspection/Sample steps are only required for race ring under one cover or any areas of interest at worksite

Lube:
- ❑ When lubing Inner Canted surface: no pitch, no roll (if moving away – handle toward you; if moving toward you – handle away)
- ❑ Surfaces to be lubed: Outboard Ring – Inner Canted, Datum A, and Outer Canted surfaces

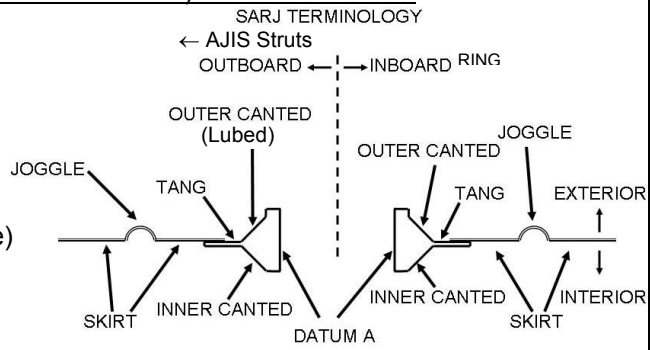
1. RET and stow EVA wipe on MWS as reqd (EV2 – red #6 is terrycloth inside)

INSPECTION AND SAMPLE (photos & inspection under same cover)

2. If reqd, retrieve camera/flash from SARJ ORU bag
3. 📷 Take photos of outboard Outer Canted surface and Datum A surface; **notify IV** under which covers
4. Retrieve 3 numbered EVA wipes
5. Using wiping motion, obtain sample from Datum A surface
6. Report wipe number and invert wipe, securing with Velcro
7. Repeat steps 5-6 for Outer Canted surface and Inner Canted surfaces
8. Stow sample wipes

LUBE INNER CANTED SURFACES (DATUM A/OUTER CANTED SURFACES) ON OUTBD RING

9. Retrieve J-hook nozzle gun (straight nozzle gun)
10. Prep J-hook nozzle gun (straight nozzle gun):
    a. Remove tip cover
    b. Push plunger in
    c. Black triangle up
    d. Rotate restraint ring to open
    e. Open shut off knob
11. Lube Inner Canted surface (Datum A/Outer Canted surface)
12. Safe J-hook nozzle gun (straight nozzle gun):
    a. Close shut off knob
    b. Rotate restraint ring to lock
    c. Black triangle down
    d. Wipe nozzle
    e. Install tip cover



13. Repeat for all covers
14. Repeat steps 9-13 with straight nozzle gun for Datum A and Outer Canted surfaces
15. Stow grease guns on fish stringer
16. Report any wipe numbers used for cleaning

(Translate to P3/P4 Jumper)

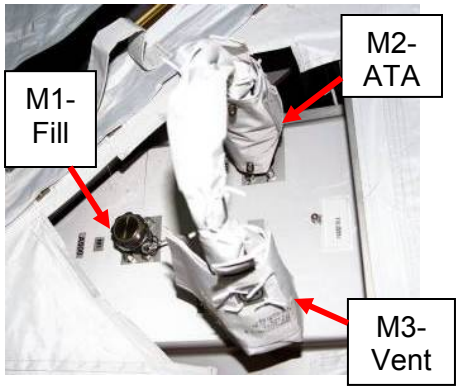
P3/P4 JUMPER STOW (00:15/00:35)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 03:15 (EV1), 02:55 (EV2) ***MCC-H:*** *Report if NH3 Inspection reqd*	CAUTION Use caution when translating near SARJ ring with open covers NOTE On **MCC-H GO:** Perform NH3 Inspection of EMU at earliest convenient opportunity, shade as reqd during day (For inspection description see 4.141 ISS EVA AMMONIA DECONTAMINATION, note 2 (SODF: ISS EVA SYS)	
1. EV1 Tool Inventory: ☐ MWS ☐ BRT (L) ☐ RET (sm-sm) ☐☐ Wire Tie (2 short) ☐ T-Bar ☐ RET (Lg-sm) (R) ☐ RET (Lg-sm) (L) ☐ Adj Equip Tether (R) ☐ Adj Equip Tether (L to TB) ☐ Small ISS Trash Bag (R, inbd) ☐ Swing Arm (R) ☐ EVA Camera w/bracket (int RET) ☐ RET w/PIP pin	P3/P4 JUMPER STOW (00:15) 1. Temp stow VTEB as reqd on HR_____ 2. Assist EV2 as reqd 3. Retrieve RET from P3 HR 3860	P3/P4 JUMPER STOW (00:30) 1. Translate to QD M2 on P3 outbd panel A502 (face 6) 2. Close and demate QD F2 at M2 per **BLOCK D** and **BLOCK A** 3. Install cap on M2 4. Close MLI on pnl A502 5. Translate to P4 inbd bulkhead with QD F2, tend line 6. Mate QD F2 to dummy male M2 per **BLOCK B** 7. Translate to P4 QD M15 8. Close and demate QD F15 per **BLOCK D** and **BLOCK A** 9. Install cap on M15
2. EV2 Tool Inventory: ☐ MWS ☐ BRT (L) ☐ RET (sm-sm) ☐☐ Wire Tie (2 short) ☐ T-Bar ☐ RET (sm-sm) (L) ☐ RET w/PIP pin (R) ☐☐ Wire Tie (2 short) ☐ Adj Equip Tether (R) ☐ Small ISS Trash Bag (R, inbd) ☐ Wire Tie (from P3/P4 temp stow) ☐ Swing Arm (R) ☐ RET (sm-sm) ☐ PGT w/7/16 socket 6" ext	CLEANUP (00:05) 4. Retrieve and stow Lube C/L bag on BRT w/RET 5. Verify Port SARJ interface is clear of all tethers and tools 6. Perform MWS tool inventory 7. Glove and Gauntlet Check	10. Translate to inbd bulkhead with QD F15 11. Mate QD F15 to dummy male M15 per **BLOCK B** 12. Stow jumper cable (close line in all outbd TA clamps and, as reqd, inbd TA clamps to ensure line is fully clear of SARJ) 13. WVS survey CLEANUP (00:05) 14. Retrieve and stow VTEB on BRT w/RET 15. Verify Port SARJ interface is clear of all tethers and tools 16. Perform MWS tool inventory 17. Glove and Gauntlet Check

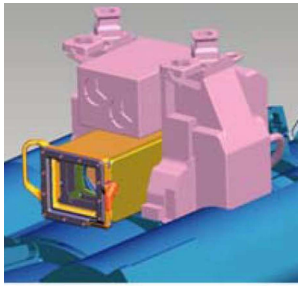
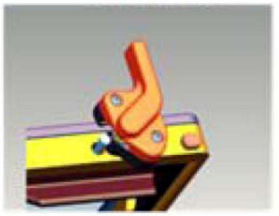
P3/P4 JUMPER STOW (00:15/00:35) (Cont)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
	8. Retrieve **GREEN** hook from P3 HR 3861 ❑ √Gate closed, slider locked, both reels unlocked, release RET	18. Retrieve **GREEN** hook from P3 HR 3852 ❑ √Gate closed, slider locked, both reels unlocked, release RET
3. On **EV1 and EV2 GO**, give **MCC-H GO** to rotate Port SARJ	9. When clear of worksite, **notify IV** for Port SARJ rotation	19. When clear of worksite, **notify IV** for Port SARJ rotation
4. Consumable tag up with **MCC-H**	(Translate to P1 ATA Config ATA to Vent)	(Translate to A/L – S1 Rad GB Beam Install)

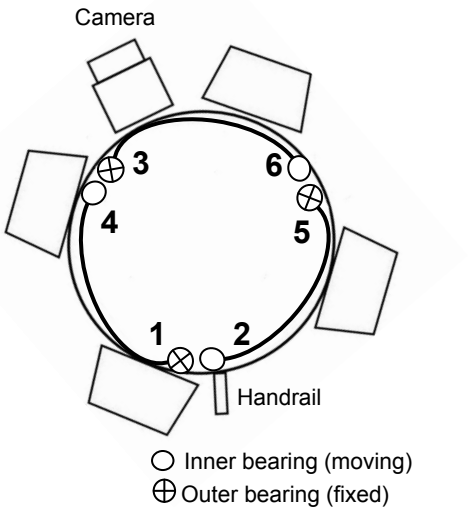
CONFIGURE ATA TO VENT (00:15)

IV/SSRMS	EV1 (Drew)
Planned PET 03:30  	CONFIGURE P1 ATA TO VENT (00:15) 1. Translate to P1 WIF 16 ❑ At bay 14, translate nadir to P1 HR 3651 2. Stow Lube C/L bag on HR 3649 3. Translate to P1 ATA panel A500 4. Remove cap from M3 5. Close and demate QD F185 on M1 per **BLOCK D** and **BLOCK A** 6. Mate and open QD F185 to M3 per **BLOCK B** and **BLOCK C** 7. Reinstall cap on M1 (Translate to Port CETA cart – SPDM LEE Lube)

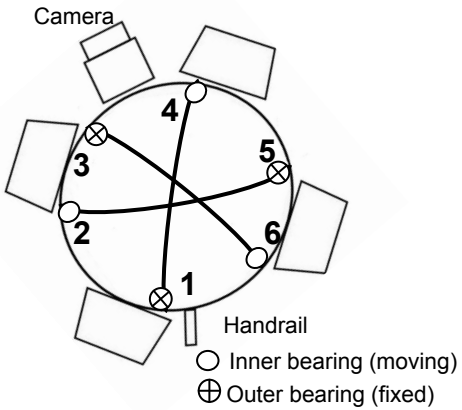
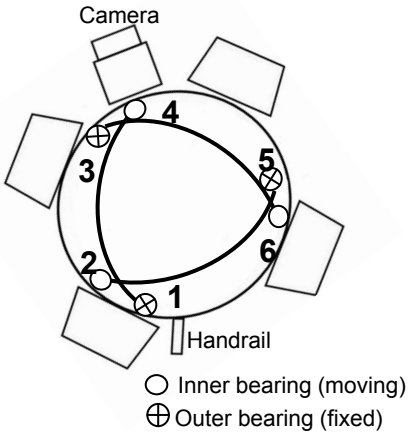
SPDM CLA COVER INSTALL (00:25)

IV/SSRMS	EV1 (Drew)
Planned PET 03:45 1. ICOM with Box ***SSRMS**: In EVA Setup posn; SPDM LEE snares fully opened* ***SSRMS**: Box Brief* ***SSRMS**: Mnvr to APFR Ingress posn* ❑ √Brakes on before ingress  	SPDM SETUP (00:20) 1. Translate to Port CETA cart 2. Remove APFR from WIF 2, stow on BRT w/RET 3. Translate to P1 nadir Bay 12 4. Install APFR in P1 WIF 16 **[9,** TT, F, 6**]** (3 o'clock = double black lines) ❑ √Black-on-black, pull/twist test 5. Retrieve SARJ C/L bag; stow on BRT w/RET WARNING Avoid touching curvic coupling, grounding springs, snares, internal mechanisms, cable-return springs, latch covers, shrouds, and camera with gloved hand NOTE Drew ingress position is Stbd/Inbd of APFR. Brakes ON reqd for APFR ingress/egress 6. Give **SSRMS GO** to mnvr to APFR Ingress position, GCA as reqd 7. If reqd for ingress, attach Waist tether to SPDM LEE HR 8. Ingress APFR 9. If reqd, remove Waist tether from SPDM LEE HR CLA COVER INSTALL ON SPDM LEE CAMERA (00:05) CAUTION Avoid contact with CLA cover lens 10. RET, retrieve CLA cover frame from C/L bag; MLI case remains in C/L bag 11. Rotate locking lever to the open/unlocked position (lever perpendicular to plane of lens) 12. GCA SSRMS to CLA cover install position 13. Install CLA cover frame on SPDM LEE CLA by inserting spring loaded flange to depress spring 14. Push cover to seat against camera bracket for full installation 15. Rotate locking lever to the closed/locked position (lever parallel to plane of lens) 16. Perform pull test 17. Retrieve RET 18. Perform WVS survey  Cover on CLA  Latch Pin

SPDM LEE LUBE (00:40)

IV/SSRMS	EV1 (Drew)
Planned PET 04:10 ***SSRMS**: GCA to LEE Lube position*  ***SSRMS**: On **EV1 GO**, rotate SPDM LEE as reqd* ***SSRMS**: On **EV1 GO**, fully close snares*	SPDM SNARE LUBE (00:20) 1. GCA SSRMS as required for SPDM lube 2. Verify camera & handrail orientation 3. Take photos of SPDM LEE ❑ Overall view of LEE ❑ Bearings 1 & 2 ❑ Bearings 3 & 4 ❑ Bearings 5 & 6 4. Stow camera 5. Retrieve unused wipe and stow on MWS 6. √Snares fully open 7. Prep straight nozzle gun: a. Remove tip cover b. Push plunger in c. Black triangle up d. Rotate restraint ring to open e. Open shut off knob NOTE Grease should not extend more than 1/4 inch from bearing 8. Apply grease to all bearings (6) in any order ❑ Use box pattern, apply to innermost side of bearing first ❑ Rotate SPDM LEE as reqd to reach all bearings ❑ 1 ❑ 3 ❑ 5 ❑ 2 ❑ 4 ❑ 6 9. √Worksite clear and give **SPDM GO** to fully close snares

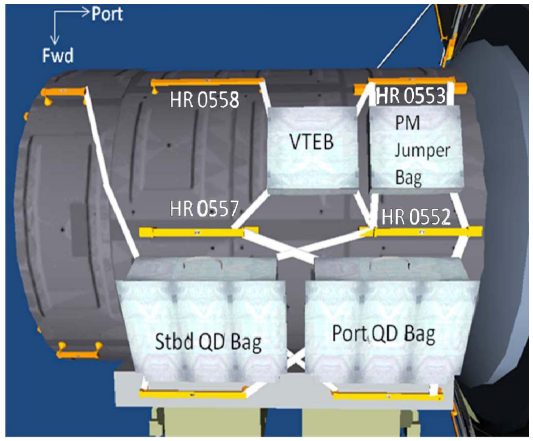
SPDM LEE LUBE (00:40) (Cont)

IV/SSRMS	EV1 (Drew)
***SSRMS**: On **EV1 GO**, rotate SPDM LEE as reqd* 	10. Apply grease to rod end & fork interface of all bearings (6) in any order ❑ Rotate SPDM LEE as reqd to reach all bearings ❑ 1 ❑ 3 ❑ 5 ❑ 2 ❑ 4 ❑ 6 11. Safe and stow straight nozzle gun: a. Close shut off knob b. Rotate restraint ring to lock c. Black triangle down d. Wipe nozzle e. Install tip cover 12. Retrieve needle nose pliers from C/L bag
***SSRMS**: On **EV1 GO**, partially open snares*	13. √Worksite clear and give **SPDM GO** to partially open snares (inner bearings within cam cutouts) CAUTION When exercising bearing, do not extend cable-return spring more than 90 deg (rod end perpendicular to housing) NOTE If bearings overshoot cam cutouts, use gap gauge to expose snares
***SSRMS**: On **EV1 GO**, rotate SPDM LEE as reqd* 	14. Exercise all bearings (6) in any order ❑ Bring rod end to 90 deg with needle nose pliers and exercise bearing in x axis (in/out of LEE) (1 min/40 cycles) ❑ Report bearing mobility to **MCC-H** ❑ Rotate SPDM LEE as reqd to reach all bearings ❑ 1 ❑ 3 ❑ 5 ❑ 2 ❑ 4 ❑ 6 15. If required, retrieve gap gauge from C/L bag and pack grease as required

SPDM LEE LUBE (00:40) (Cont)

IV/SSRMS	EV1 (Drew)
***SSRMS**: On **EV1 GO**, perform snare checkout* 1. EVA wipe(s) used for cleaning: **Wipe #** #_____ #_____ 2. Receive EV1 snare report ***SSRMS**: GCA for APFR Egress* ❑ √Brakes on before egress ***SSRMS**: Mnvr to SPDM stow posn*	SPDM LUBE CLEANUP (00:20) 16. √Worksite clear and give **SPDM GO** for snare checkout (open/close/open snares) 17. Clean tools as necessary with EVA wipe 18. Stow used wipe and report # 19. Report to **IV**/**MCC-H:** Snare condition (in or out of groove) 20. 📷 Take photos of SPDM ❑ Overall view of SPDM ❑ Bearings 1 & 2 ❑ Bearings 3 & 4 ❑ Bearings 5 & 6 21. Stow camera 22. √Tools and tethers clear from SPDM LEE 23. GCA SSRMS for APFR Egress 24. Egress APFR 25. Give **SSRMS GO** to stow SPDM 26. Stow Lube C/L bag on HR 3651 27. Remove APFR, stow on BRT w/RET 28. Translate to Port CETA cart 29. Install APFR into WIF 2 [6,GG] **[12,**TT,F,6**]** (boot plate toward nadir/port) (same position as removal) ❑ √Black-on-black, pull/twist test 30. Translate to HR 3651; retrieve and stow Lube C/L bag on BRT w/RET 31. Glove and Gauntlet check (Translate to Port SARJ – 2nd Lube)

S1 RAD GB STOW BEAM INSTALL (01:10)

IV/SSRMS	EV2 (Spanky)
Planned PET 03:30  1. Record Inbd Beam Bolt data (1st trq): Bolt / Turns / Torque (ft-lb) fwd / / (4.8) aft / /	S1 RAD GB STOW BEAM INSTALL (01:10) 1. Translate to A/L zenith ❑ √Clear of EV1 safety tether under MT 2. Stow VTEB onto A/L via crewlock handrails 0552, 0553, 0557, and 0558 (hinge toward aft side of A/L) 3. Translate nadir to A/L 4. Retrieve Beam ORU bag; stow on BRT w/RET 5. Translate to S1 ❑ Translate zenith at S1 FHRC to S1 HR 3250 (Bay 13) 6. Temp stow Beam ORU bag on S1 HR 3251 (zenith edge of S1) 7. Perform socket swap to 5/8 x 7.8-in socket ❑ Pull test 8. Retrieve inbd stowage beam from ORU bag 9. Translate to S1 HR 3252 inboard 10. BRT to S1 HR 3252, as reqd 11. Place inboard stowage beam on radiator beam per picture with tether point facing ISS fwd (away from radiator) NOTE Indexing the beam is defined as: ❑ Push AFT end of beam away from other beam while engaging ISS AFT bolt (This should center (aka “index”) AFT bolt to aid in alignment) 12. Fully depress ISS FWD bolt with the PGT or hand to engage zip nut to hard stop 13. While indexing beam, fully depress ISS AFT bolt with PGT or hand to engage zip nut to hard stop 14. √Beam fully seated on truss 15. Configure PGT: **[A3 (4.8), CW1, 30.5]** 5/8 x 7.8-in ext 16. ←Drive ISS FWD bolt to hard stop 17. ←While indexing beam, drive ISS AFT bolt to hard stop ❑ √No white lines visible on FWD and AFT bolts 18. Configure PGT: **[B3 (18.4), CW1, 30.5]** 5/8 x 7.8-in ext

S1 RAD GB STOW BEAM INSTALL (01:10) (Cont)

IV/SSRMS

2. Record Inbd Beam Bolt data (2nd trq):

Bolt	Turns	Torque (ft-lb)
fwd		(18.4)
aft		

3. Record Outbd Beam Bolt data (1st trq):

Bolt	Turns	Torque (ft-lb)
fwd		(4.8)
aft		

4. Record Outbd Beam Bolt data (2nd trq):

Bolt	Turns	Torque (ft-lb)
fwd		(18.4)
aft		

5. Perform Bag Inventory:
   Beam ORU Bag:
   - ❑ Adj Equip Tether (external)
   - ❑ RET w/PIP Pin
   - ❑ RET w/PIP Pin
   - ❑ RET (sm-sm)
     - ❑ Socket Caddy
       - ❑ 5/8 socket-7.8 ext

EV2 (Spanky)

19. ←Drive ISS FWD bolt to required torque
20. ←Drive ISS AFT bolt to required torque
21. Verify both bolts and beam secure (wiggle)

22. Retrieve outbd stowage beam from ORU bag
23. Translate outboard to S1 HR 3236
24. BRT to S1 HR 3236, as reqd
25. Place outboard stowage beam on radiator beam per picture with tether point facing ISS fwd

26. Fully depress ISS FWD bolt with the PGT or hand to engage zip nut to hard stop
27. While indexing beam, fully depress ISS AFT bolt with the PGT or hand to engage zip nut to hard stop
28. √Beam fully seated on truss

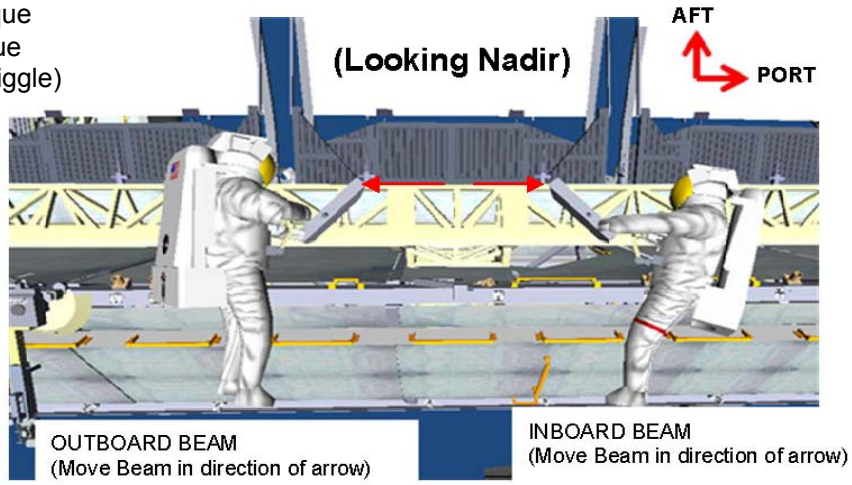
29. Configure PGT:
    [A3 (4.8), CW1, 30.5] 5/8 x 7.8-in ext
30. ←Drive ISS FWD bolt to hard stop
31. ←While indexing beam, drive ISS AFT bolt to hard stop
    ❑ √No white lines visible on FWD and AFT bolts

32. Configure PGT:
    [B3 (18.4), CW1, 30.5] 5/8 x 7.8-in ext
33. ←Drive ISS FWD bolt to required torque
34. ←Drive ISS AFT bolt to required torque
35. Verify both bolts and beam secure (wiggle)

36. Perform socket swap to 7/16 x 6-in
    ❑ Stow 5/8" on socket caddy
    ❑ Pull test
37. Stow socket caddy in ORU bag
38. Perform bag inventory
39. Stow ORU bag on BRT w/RET

40. Translate to A/L
41. Stow Beam ORU bag on curved HR

42. Glove and Gauntlet Check



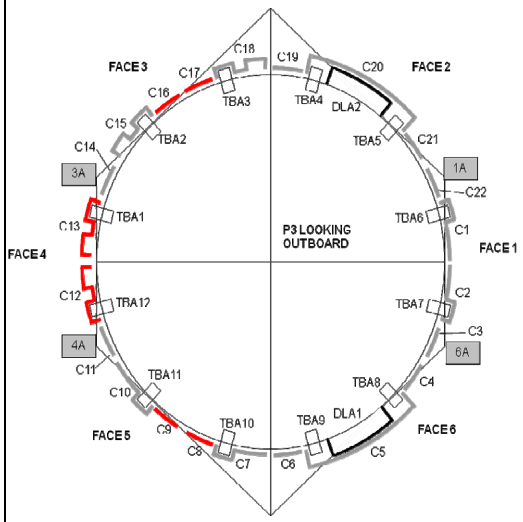
(Translate to Port SARJ – 2nd Lube)

PSARJ SECOND LUBE (00:25/00:35)

IV/SSRMS

Planned PET 04:50 (EV1) 04:40 (EV2)

1. Verify inhibits in place:
   √PSARJ locked at 250°



2. SARJ Lube Table

Cover	Inner Canted	Datum A	Outer Canted
Cover 8			
Cover 9			
Cover 12			
Cover 13			
Cover 16			
Cover 17			

3. EVA wipe(s) used for cleaning:

Wipe #	#_____	#_____

NOTE

- ❑ When lubing the Inner Canted surface: No pitch, no roll
  (if moving away – handle toward you; if moving toward you – handle away)
- ❑ Surfaces to be lubed: Outboard Ring – Inner Canted, Datum A, and Outer Canted surfaces

EV1 (Drew)

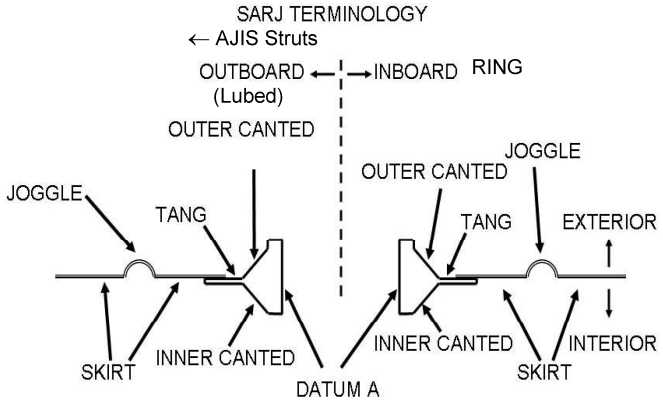
1. Translate to Port SARJ
2. Attach **GREEN** hook to P3 HR 3861
   - ❑ √Gate closed, slider locked, reels unlocked, release RET
3. Perform second SARJ Lube per procedures below:
   - ❑ Stow Lube C/L Bag on HR _____

EV2 (Spanky)

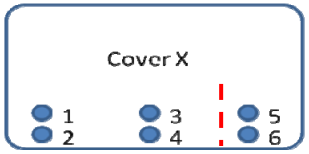
1. Translate to Port SARJ (√clear of EV1 safety tether)
2. Attach **GREEN** hook to P3 HR 3852
   - ❑ √Gate closed, slider locked, reels unlocked, release RET
3. Perform second SARJ Lube per procedures below:

LUBE INNER CANTED SURFACES (DATUM A/OUTER CANTED SURFACES) ON OUTBD RING

4. Retrieve unused wipe, report #
5. Retrieve J-hook nozzle gun (straight nozzle gun)
6. Prep J-hook nozzle gun (straight nozzle gun):
   a. Remove tip cover
   b. Push plunger in
   c. Black triangle up
   d. Rotate hinged restraint ring to open
   e. Open shut off knob
7. Grease Inner Canted surface (Datum A/Outer Canter surface)
8. Safe J-hook nozzle gun (straight nozzle gun):
   a. Close shut off knob
   b. Rotate hinged restraint ring to lock
   c. Black triangle down
   d. Wipe nozzle
   e. Install tip cover
9. Repeat for all covers
10. Repeat steps 5-9 with straight nozzle gun for Datum A and Outer Canted surfaces
11. Stow Straight Nozzle and J-Hook grease guns
    - ❑ EV2, fish stringer hooks #2 and 3
    - ❑ EV1, C/L bag
12. Report wipe #s if used for cleaning



PSARJ REINSTALL COVERS (00:50)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 05:15 1. SARJ Cover Bolts Table  2. Final tool and bag inventory (reference Tool Config FS 7-__)	CAUTION Minimize side loading bolt head. Maintain axial force on fastener to compress spring during rotation WARNING End of spring on EVA fasteners may protrude – sharp edge INSTALL SARJ COVERS (00:35) 1. Assist EV2 as reqd CLEANUP (00:15) 2. Stow adj tethers (2) from HR 3843; stow in C/L bag 3. Perform final MWS tool and bag inventory 4. Stow Lube C/L bag on BRT w/RET 5. Glove Check 6. WVS Survey of PSARJ	INSTALL SARJ COVERS (00:35) 1. Configure PGT: **[A1 (2.5), CW2, 30.5]** 6-Ext 7/16 2. ←Engage MLI cover fasteners, 9 turns: Covers ❑8, ❑9, ❑ 12, ❑ 13, ❑ 16, ❑ 17 √Green light and bolt seated for all bolts CLEANUP (00:15) 3. Stow fish stringer in SARJ ORU bag 4. Stow EV1 PGT in SARJ ORU bag 5. Stow all used wipes in large trash bag as reqd 6. Perform final MWS tool and bag inventory 7. Stow SARJ ORU bag on BRT w/RET 8. Glove Check 9. WVS Survey of PSARJ

Cover	1	2	3	4	5	6
Cover 8		X				
Cover 9						
Cover 12						
Cover 13						
Cover 16						
Cover 17						

EVA 2 CLEANUP/INGRESS (00:25)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 06:05	CLEANUP (00:10) 1. Retrieve **GREEN** hook from P3 HR 3861 ❑ √Gate closed, slider locked, reels unlocked, release RET 2. Translate to A/L ❑ Fairlead on Equip Lock HR 0500	CLEANUP (00:10) 1. Retrieve **GREEN** hook from P3 HR 3852 ❑ √Gate closed, slider locked, reels unlocked, release RET 2. Translate to A/L
1. Start Hatch Thermal Cover clock PET (30 min) __ : __	INGRESS/PRE-REPRESS (00:15) 3. Open hatch thermal cover 4. Stow bags in A/L ❑ Lube C/L bag ❑ Beam ORU bag ❑ SARJ ORU bag from EV2 5. Attach R Waist Tether to UIA D-ring ❑ √Gate closed, hook locked	INGRESS/PRE-REPRESS (00:15) 3. Transfer SARJ ORU bag to EV1
2. Prior to hatch closure, perform WVS PWRDN (PHOTO/TV, WVS Cue Card)	6. Give **EV2 GO** to release EV1 **RED** hook 7. Ingress A/L	4. On **EV1 GO**, RET to EV1 ST Pack and release EV1 **RED** hook 5. Attach EV1 **RED** hook to aft ext D-ring ❑ √Gate closed, slider locked, reels unlocked, release RET 6. Attach R Waist Tether to A/L int D-ring ext ❑ √Gate closed, hook locked 7. RET to ST Pack and release **RED** hook 8. Attach **RED** hook to curved HR, fwd/stbd stanchion ❑ √Gate closed, slider locked, reels unlocked, release RET 9. Ingress A/L
3. Stop Hatch Thermal Cover clock PET (30 min) __ : __	8. Remove SCU from stowage pouch 9. Remove DCM cover; Velcro to DCM 10. Connect SCU to DCM 11. √SCU locked	10. Close hatch thermal cover; attach Velcro strap 11. Remove SCU from stowage pouch 12. Remove DCM cover; Velcro to DCM 13. Connect SCU to DCM 14. √SCU locked

EVA 2 CLEANUP/INGRESS (00:25) (Cont)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
	NOTE A TCV setting 8 – Max C minimizes time for SCU cooling 12. WATER – OFF (fwd), expect H2O IS OFF msg Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)	NOTE A TCV setting 8 – Max C minimizes time for SCU cooling 15. WATER – OFF (fwd), expect H2O IS OFF msg CAUTION Do not close hatch until EMU Water OFF for 2 min. Verify outer hatch clear of hardware 16. Verify outer hatch clear of hardware 17. Verify handle position per hatch decal 18. Close and lock hatch Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)

P6 PVTCS FILL AND VENT – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	03:30
Two EV Crew	N/A	03:00

Tools:

EV1	Contingency Tools
1" NH3 Vent Tool	1" Bail Drive Lever
1" NH3 Vent Tool Adapter	1" Cap Removal Tool
1" NH3 Vent Tool Extension	
MUT EE	
Vent Tool Extender Plug	

EVA Fluid QDs:

Jumper	QD#	Line #	QD Size	Pre EVA2	Rad Fill Config	Post EVA2
ATA Vent Pnl	F184	N/A	1/4"	P1 Pnl A500 M2 – open	P1 Pnl A500 M2 – open	P1 Pnl A500 M2 – open
ATA Vent Pnl	F185	N/A	1/4"	P1 Pnl A500 M3 – open	**P1 Pnl A500 M1 – open**	**P1 Pnl A500 M3 – open**
P1/P3	F186	N/A	1/4"	P1 Pnl A503 M3 – open	P1 Pnl A503 M3 – open	P1 Pnl A503 M3 – open
P1/P3	F187	N/A	1/4"	P3 Pnl A503 M1 – open	P3 Pnl A503 M1 – open	P3 Pnl A503 M1 – open
P3/P4	F2	FH-03	1/4"	P4 Stowage QD – closed	**P3 Pnl A502 M2 – open**	**P4 Stowage QD – closed**
P3/P4	F15	FH-03	1"	P4 QD M15 – closed	P4 QD M15 – **open**	**P4 Stowage QD – closed**
P4/P5	F16	FH-05	1"	P4 QD M16 – open	P4 QD M16 – open	P4 QD M16 – open
P5/P6	F14	FH-06	1"	P5 Stowage QD – closed	**P6 QD M14 – open**	**P5 Stowage QD – closed**
EAS Jumper	02F	FH-02	1"	P6 QD M10 – closed	P6 QD M10 – **open**	**P6 QD M11 – closed**
EAS Jumper	03F	FH-02	1"	Extender – open	Extender – open	Extender – open
EAS Jumper	Ext	FH-02	1"	P6 QD M2 – closed	P6 QD M2 – **open**	**P6 QD M3 – closed**

ORU Details:

Name	Part Number	Mass
EAS Jumper	R081351	21.07 lb
EAS Jumper Assy	R081697	23.5 lb
EAS Extender	RH000054	5 lb
P3/P4 Jumper	RH000138-1	8.34 lb
S3/S4 Jumper	RH000138-21	9.09 lb
P1/P3 Jumper	1F78113-3	3.51 lb
P1 ATA Jumper “homeplate”	1F78113-5	3.3 lb
1" NH3 Vent Tool	1F98589-1	5.36 lb
1" Vent Tool Adapter	SEG33119079-301	10 lb
1" Vent Tool Extension	SEG33119090-301	15 lb
MUT EE	SEG33106890-303	3.5 lb
1" Vent Tool Extension Plug	SED33123116-301	.25 lb

P6 PVTCS FILL AND VENT – TASK DATA (Cont)

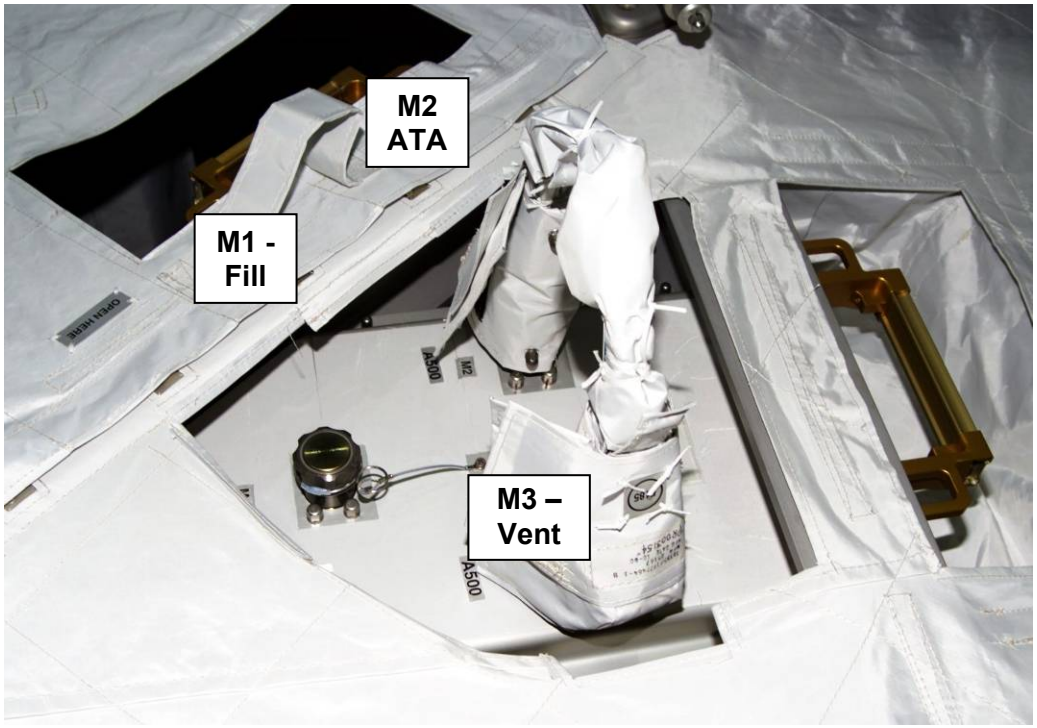
Notes:

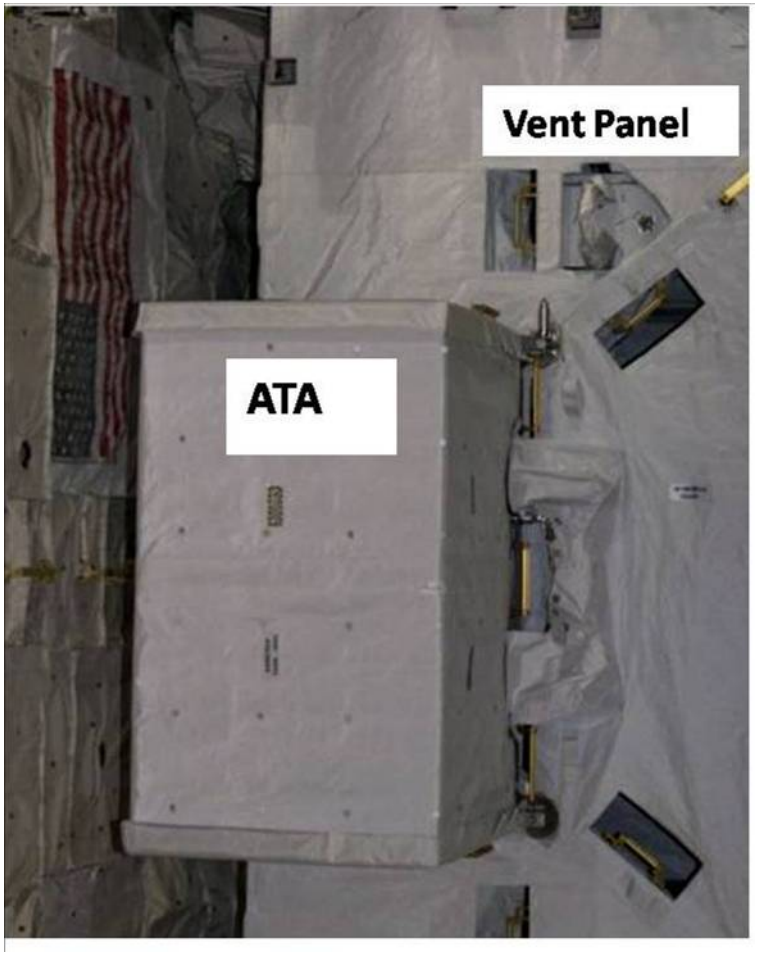
1. AR2180 documents difficulty that US EVA 6 crew had with removing cap from EETCS QD male M9. NH3 was noticed leaking from male. This QD is currently connected to PVTCS M1 through FH-01 line. It is not nominally planned for use during EVA 2; however, this line is a backup for the FH-02 line
2. EAS Jumpers have directional flow paths, must vent from the proper direction. Flow direction for both EAS jumper lines is toward QD Extenders
3. 6-8 lb of NH3 will be filled into 2B P6 PVTCS
4. Amount of NH3 venting from both Jumpers
   -P1-P5 Vent = 6 lb
   -EAS Jumper = 3 lb
5. QD Extenders have a lanyarded plug and cap attached
6. EAS Jumper is 102" long, not including QD Extender
7. P3/P4 Jumper is 214.5" long, after thermal reduction factor it is 209.4". S3/S4 Jumper is 243.48" long, after thermal reduction factor it is 237.7" long (back-up jumper)
8. IFI 7792 contains information on a kink in the vent tool extension

Timeline Considerations:

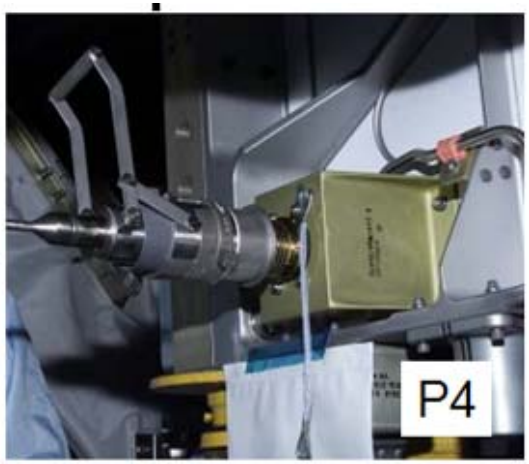
1. P1-P5 NH3 Vent must be coordinated with IV; IV will close ATA valve directly before vent
   a. IV to use Assy Ops Procedure 1.106 P1-P5 JUMPER VENT ECLIPSE CONSTRAINT WORKAROUND
2. EAS NH3 Vent must begin during a night pass
3. P6 M14 QD cap could be potential contamination point (QD cap on wet QD) similar situation on STS-130
4. Leak Check, checks the path from ATA to P5 QD F14. Can fail if NH3 is seen by crew or if THOR ATA quantity value drops below a predetermined level
5. PVTCS fill may require multiple iterations if the initial mark is not met; EV1 would assist with SARJ lube while waiting for fill completion

ATA "Homeplate" Jumper

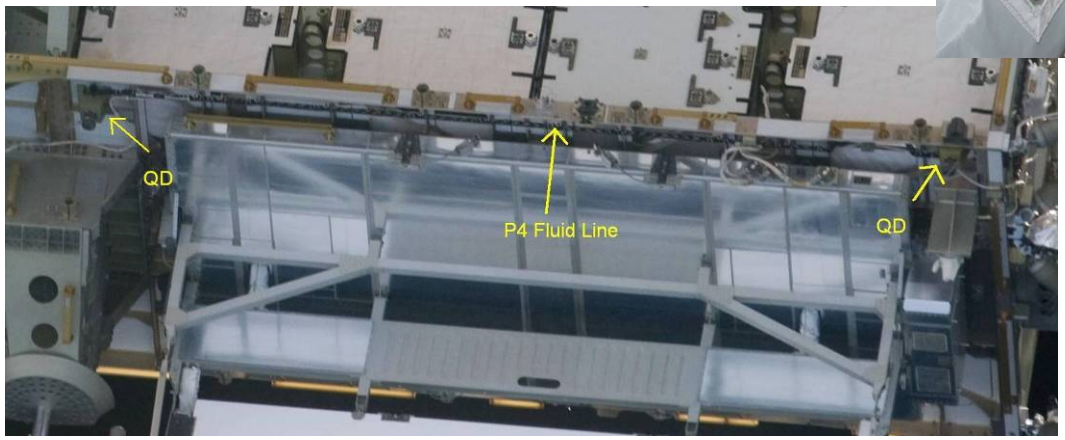




P3/P4 Fluid Jumper

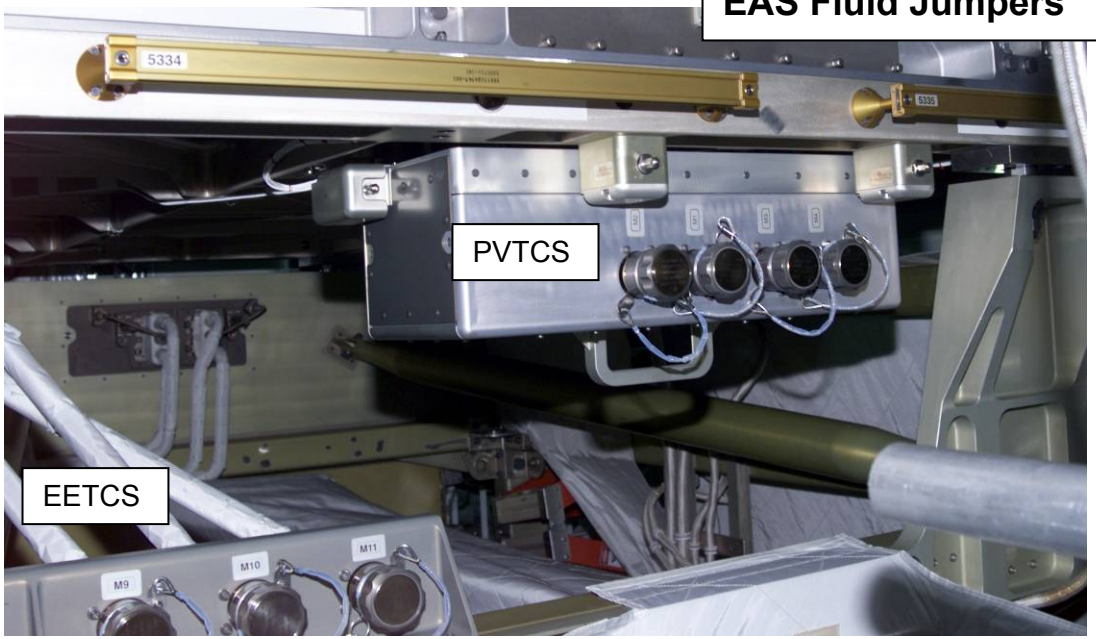


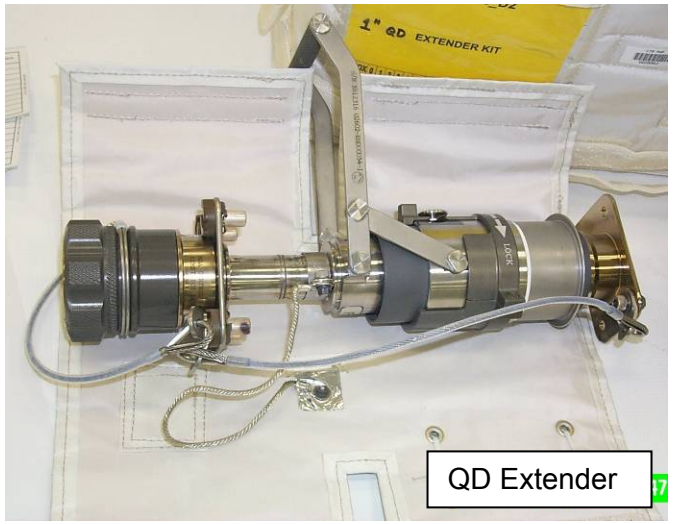
P4/P5 Fluid Jumper



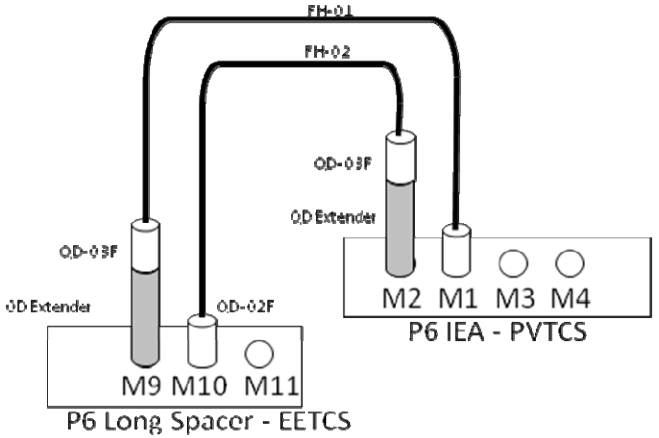
P5/P6 Fluid Jumper

EAS Fluid Jumpers

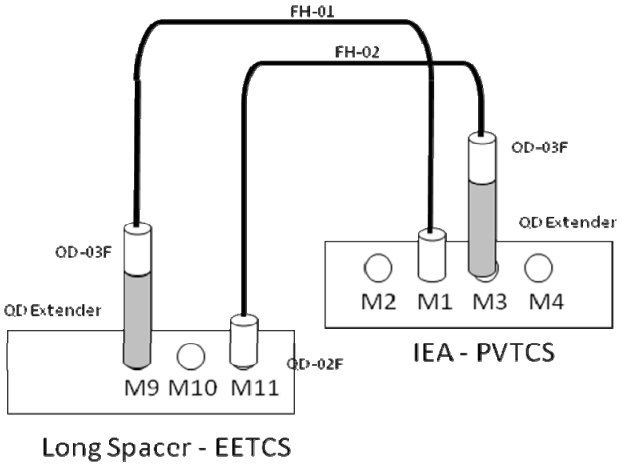




Pre-vent EAS Jumper config



Post-vent EAS Jumper config



PORT SARJ LUBE – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	04:00
Two EV Crew	N/A	02:30

Tools:

EV1	EV2
J-hook Nozzle Grease Gun	J-hook Nozzle Grease Gun
Straight Nozzle Grease Gun	Straight Nozzle Grease Gun
EVA wipes	Wipe Caddy with EVA wipes
Camera	Camera w/flash
	Large Trash bag
	PGT w/7/16 Socket 6"

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
SARJ Cover bolt	7/16	4 or 6	2.5	4.8	3.8 for install 13.7 for removal	7-9

ORU Details:

Name	Part Number	Mass
J-hook grease gun	SEG33120797-304	1.94 lb
Straight grease gun	SEG33120797-303	1.78 lb
EVA Wipes	SED33116397-701	0.3 lb
Single cover	1F26520-1	3.488 lb
Double cover	1F26517-1	5.568 lb

Notes:

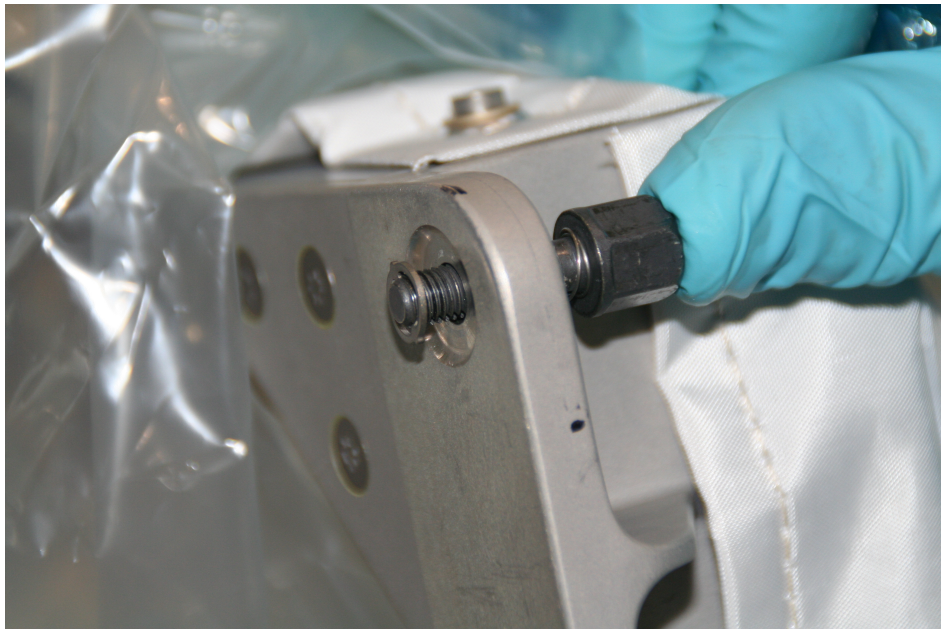
1. Do not reengage outboard MLI cover spring clamps during re-installation of cover. Spring clamp engagement will preclude future SARJ rotation
2. SARJ cover 8 missing bolt #2 (see bolt diagram below)
3. Samples and photos are reqd on one segment of ring before new grease is applied (can be under any cover)

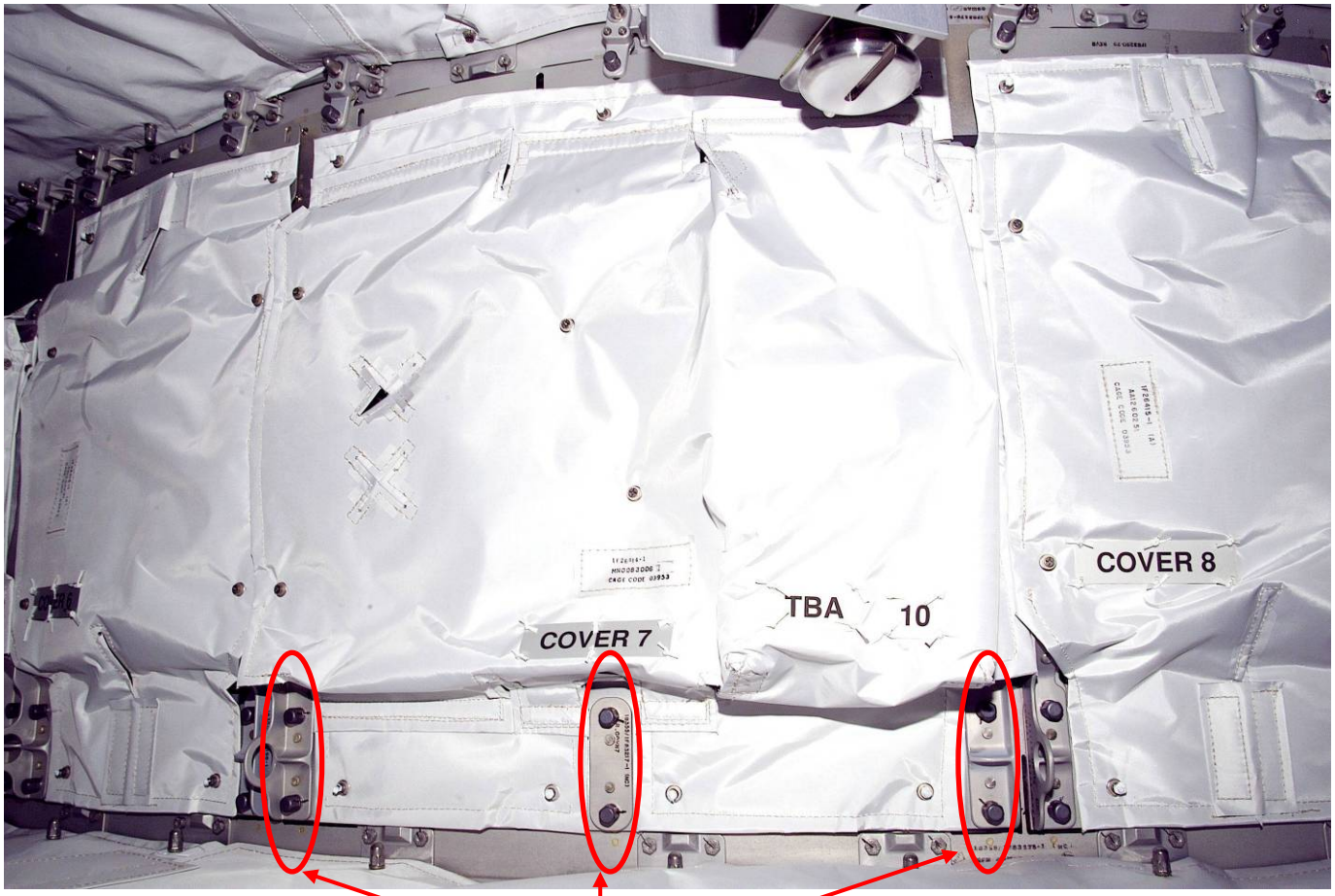
Caution:

1. SARJ Race Ring not tolerant to nicks and scratches. Exercise care within vicinity of Race Ring while handling components

Timeline Considerations:

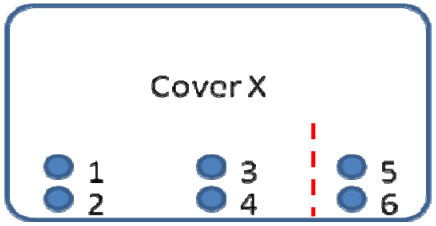
1. If photos are taken during night pass, camera w/flash is reqd
2. SARJ rotation between 1st and 2nd lube will be 200 deg, can take up to 1 hr. 250° is crew preference over 230° (180° rotation)





6 Bolts per Double Wide Cover

SARJ Cover Bolt nomenclature:
Single covers are bolts 1-4
Double covers are bolt 1-6



PORT SARJ LUBE – TASK DATA (Cont)

SPDM CLA COVER – TASK DATA

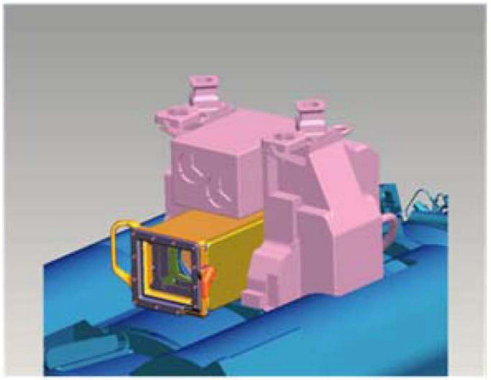
Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:10
Two EV Crew	N/A	N/A

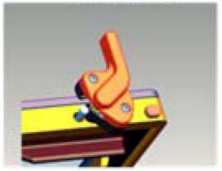
ORU Details:

ORU	Part Number	Mass (lb)	Dimensions (in)
Lens Cover	51612-4968-551	1.1	2.4 x 5.0 x 7.2
MLI Case	51612-5016-551	< 1.0	2.3 x 5.9 x 7.5

MSS Camera Cover
(Shown in Unlocked Position)



Cover on CLA



Latch Pin

SPDM LEE LUBE – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	00:40	N/A
Two EV Crew	N/A	N/A

Tools:

EV1
Straight Nozzle Grease Gun
EVA Wipes
Gap Gauge
Needle Nose Pliers
EVA Camera

Foot Restraints:

Task	WIF	APFR Setting
SPDM LEE Lube	P1 WIF 16	[9,TT,F,6]

Notes:

1. Crew member will use SSRMS handrail to ingress ISS-based APFR in P1 WIF 16
2. Grease should not extend more than 1/4 inch from bearing

Cautions:

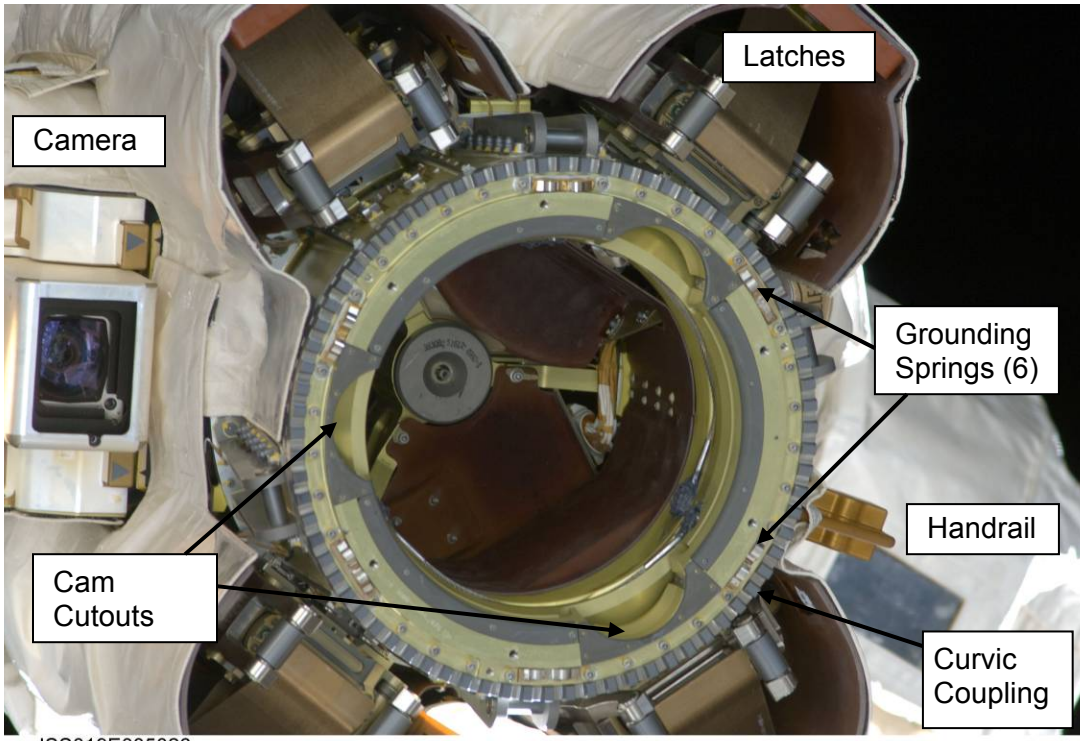
1. Avoid contact with grounding springs, cable-return springs, latch covers, shrouds, and camera
2. When exercising bearing, do not extend cable-return spring more than 90 deg (rod end perpendicular to housing)
3. Avoid contact with SPDM arms during APFR ingress/egress

Warnings:

1. Avoid touching curvic coupling, grounding springs, snares, and internal mechanisms with gloved hand

Timeline Considerations:

1. Photos shall be taken as best effort, noting that it is possible may be in eclipse
2. Inhibits for SSRMS brakes and trigger-safe are controlled in Robotics procedures. SSRMS will give EV1 GO when inhibits are in place and ready for EVA work



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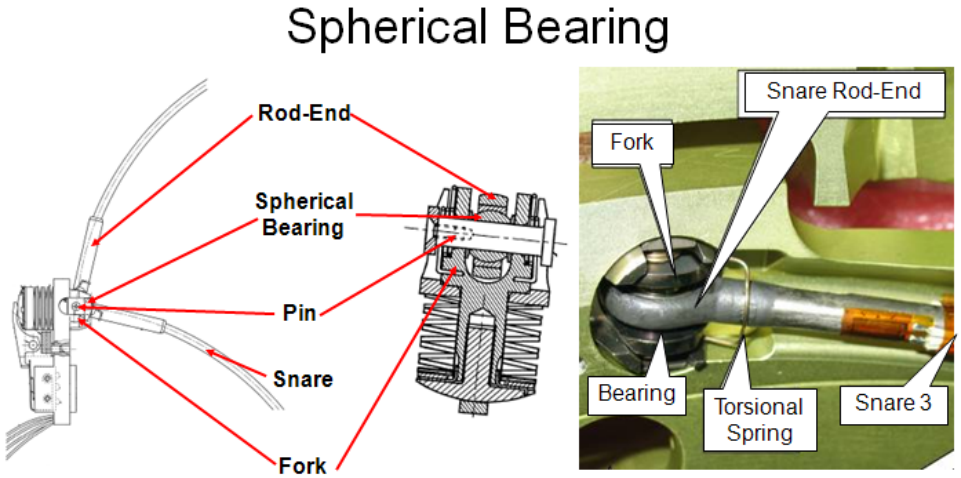
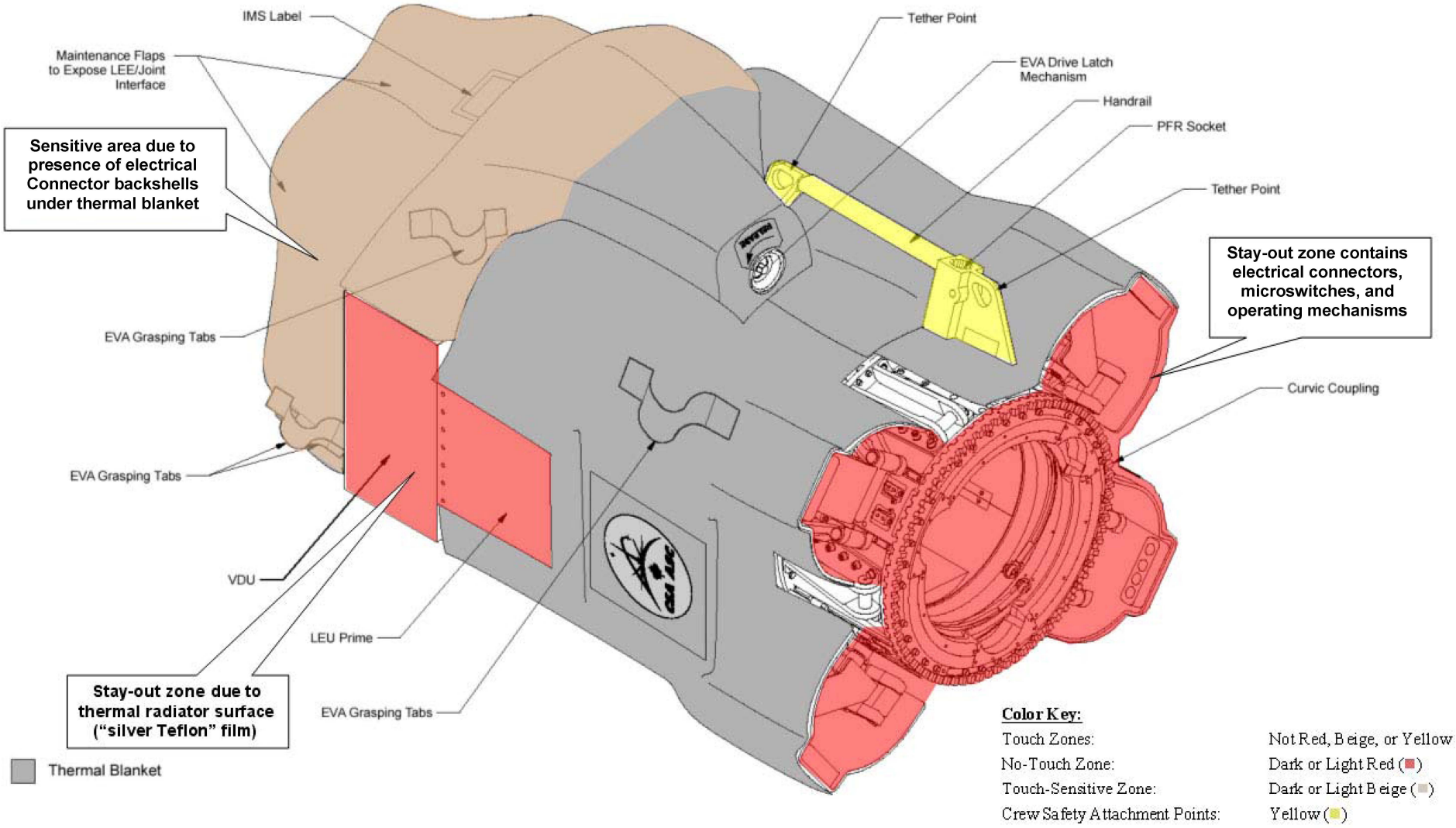


SPDM LEE LUBE – TASK DATA (Cont)



S1 RAD GB STOW BEAM INSTALL – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	01:00
Two EV Crew	N/A	00:30

Tools:

EV2
PGT
Socket Caddy
5/8 x 7.8-in Socket
Medium ORU Bag

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Rad GB Stow Beam Zip Nuts	5/8	2/each	18.4	25.5	77.0	21-23	30

Notes:

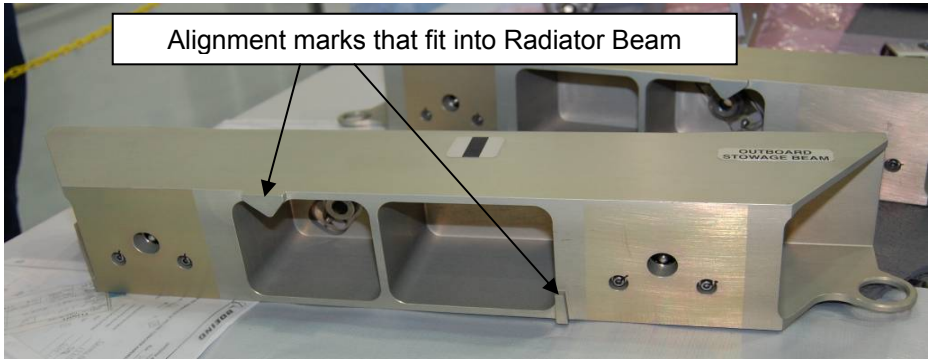
1. Rad GB Stow beams have zip nuts
2. Index (push beam away from center) when zipping or engaging aft bolt

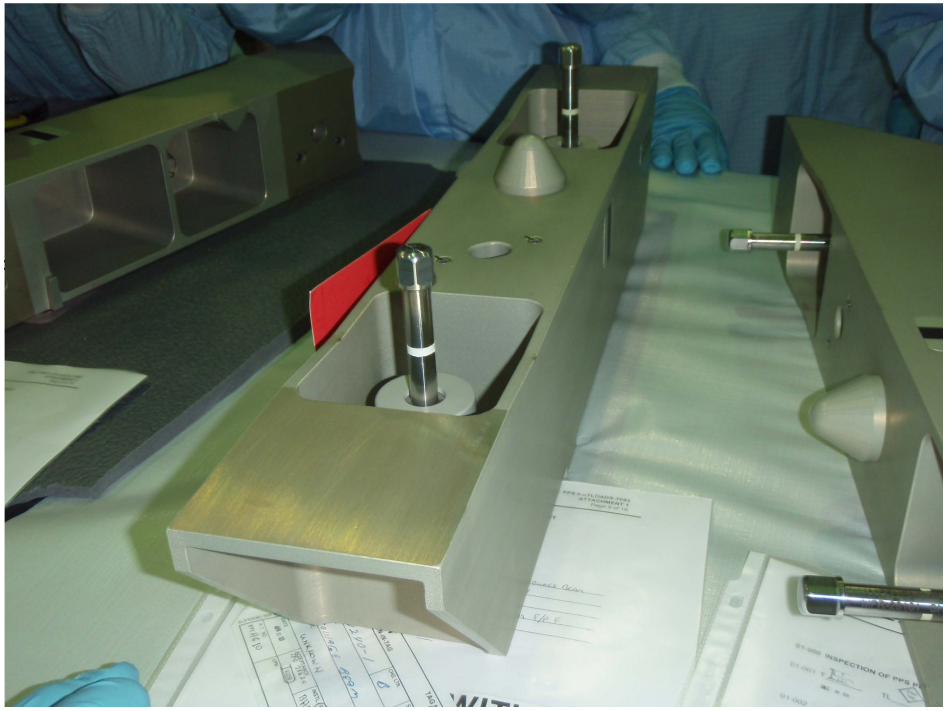
Cautions:

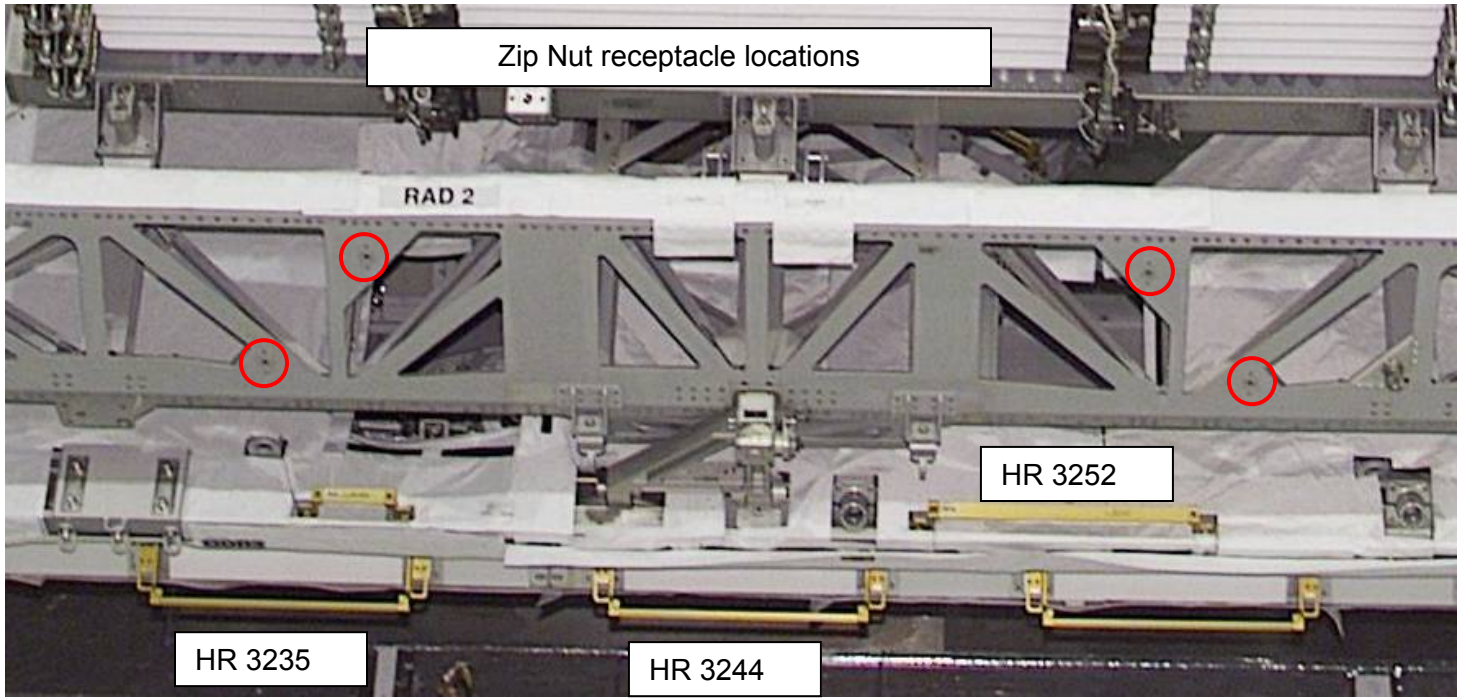
1. Avoid kicking S1 radiator beam. If this occurs, wait 2 to 5 min to allow structural response to dissipate

Timeline Considerations:

1. Task is being used to fill time while Port SARJ is rotating for SARJ Lube






Zip Nut receptacle locations
RAD 2
HR 3252
HR 3235
HR 3244

EVA 3 SUMMARY TIMELINE

PET HR : MIN	IV/SSRMS	EV1 (Ft)	EV2 (Fn)	
00:00		EGRESS/SETUP (00:40) • Post Depress and Egress (00:15) • Setup (00:25)	EGRESS/SETUP (00:40) • Post Depress and Egress (00:15) • Setup (00:25)	00:00
		PDGF SETUP (00:30)	PDGF SETUP (00:30)	
01:00		RETRIEVE PAMA/PDGF (00:20)	RETRIEVE PAMA/PDGF (00:20)	01:00
		PAMA/PDGF INSTALL (00:15)	PAMA/PDGF INSTALL (00:15)	
		VSC INSTALL (00:30)	VSC INSTALL (00:30)	
02:00		NOD1/FGB CH 1/4 CABLE INSTALL (00:45)	NOD1/FGB CH 1/4 CABLE INSTALL (00:45)	02:00
03:00		1553 DATA CABLE (00:45)	1553 DATA CABLE (00:45)	03:00
		NOD1/FGB CH 2/3 CABLE INSTALL (01:05)	NOD1/FGB CH 2/3 CABLE INSTALL (01:05)	
04:00				04:00
		PDGF AND FGB THRUSTER PHOTOS (00:40)	A/L TOOLBOX TOOL STOW (00:40)	
05:00				05:00
		STP-H3 PHOTOS (00:30)	HPGT FRGF MLI INSTALL (00:30)	
06:00		CLEANUP/INGRESS (00:30) • Cleanup (00:15) • Ingress and Pre-Repress (00:15)	CLEANUP/INGRESS (00:30) • Cleanup (00:15) • Ingress and Pre-Repress (00:15)	06:00
06:30				06:30

EVA 3 TOOL CONFIG

ISS Configuration:

MT @ WS5; CETA Carts Port/Stbd
SSRMS on MBS PDGF 2
SPDM on Lab
EV1 STP: S0 Port, outbd Strut → A/L Curved HR, fwd Stanchion
EV2 STP: S0 Port, inbd Strut → A/L aft D-ring

NOTE: Prior to use, inspect the following hardware:

- ❑ RET cords for fraying
- ❑ Inspect Load Alleviating Straps and D-ring Extenders; ref 2.230.100 CREW TETHER INSPECTIONS (SODF: ISS EVA TASKS):
  1. MMOD/general damage
  2. Discoloration
  3. Tack Stitching
  4. Red Band
- ❑ ISS Trash Bag: Bristle deformation/damage, after having stowed tools in trash bag
  √Empty √Zipper Closed
- ❑ BRT joint screws not loose
- ❑ Swing arm stiffness
- ❑ Remove PUMAA from PDGF
  PGT [B7 (25.5),CCW2,30.5] 11 turns
  Stow in EVA 4 Tools Mesh Bag
- ❑ Check alignment of Russian connector pins IVA (use cap tool) on both PDGF harness and 1553 cables

Tether Counts: (Green RETs)
RETs (sm-sm) = 16/16
RETs (PIP Pin) = 2/5
RETs (Lg-sm) = 6/8
Adj Equip Tethers = 7/10
Adj Equip Tethers (Lg-sm) = 1/2

EV1

- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (sm-sm)
    - ☐☐ Wire Tie (2 long, 2 short)
  - ☐☐ T-Bar
    - ☐☐ RET (Lg-sm) (L)
    - ☐☐ RET (Lg-sm) (R)
    - ☐☐ Adj Equip Tether (R)
    - ☐☐ Adj Equip Tether (L to TB)
    - ☐☐ Small ISS Trash Bag (R, inbd)
  - ☐☐ Swing Arm (R)
    - ☐☐ RET w/PIP Pin
    - ☐☐ **EVA Camera w/bracket** (int RET – morning of)
- ☐☐ D-ring Extender (1, L D-ring)
- ☐☐ Waist Tether (1, R on D-ring)

EV2

- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (sm-sm)
    - ☐☐ Wire Tie (4 short)
  - ☐☐ T-Bar
    - ☐☐ RET (sm-sm) (L)
    - ☐☐ RET w/PIP Pin (R)
    - ☐☐ Adj Equip Tether (R)
    - ☐☐ Adj Equip Tether (L)
    - ☐☐ Wire Tie (2, 1 around TB)
    - ☐☐ Small ISS Trash Bag (R, outbd)
      - ☐☐ PAMA 1 cap
      - ☐☐ PAMA 2 cap
      - ☐☐ PAMA 3 cap
  - ☐☐ Swing Arm (R)
    - ☐☐ **EVA Camera w/bracket** (int RET – morning of)
- ☐☐ D-ring Extender (2, R & L D-ring)
  - ☐☐ Waist Tether (R on D-ring Ext)
  - ☐☐ Waist Tether (L on D-ring Ext)

A/L

- ☐☐ RET (Lg-Sm)
  - ☐☐ **Med ORU Bag 4** (bottom to top)

External:

- ☐☐ Adj Equip Tether (RF soft tether pt to C/L bag door handle – taped hook)
- ☐☐ Adj Equip Tether (LB soft tether pt to C/L bag door handle – taped hook)
- ☐☐ 72" Gap Spanner fully extended (RB, RF soft tether pts with tether inside bag)

Internal:

- ☐☐ RET (sm-sm) (RB to Cable)
  - ☐☐ 1553 Cable (see fig 2)
    - ☐☐ 2 FPP Booties
- ☐☐ Fish Stringer (RB – other hook outside of bag)
  - ☐☐ Hook 1: FO video cable cap
  - ☐☐ Hook 2: Node 3 Terminator MLI
  - ☐☐ Hook 3: Node 3 Terminator MLI
  - ☐☐ Hook 4: Node 3 Terminator Cap
  - ☐☐ Hook 5: Node 3 Terminator Cap
  - ☐☐ Hook 6: 1553 P1 cap
  - ☐☐ Hook 7: 1553 P2 cap
- ☐☐ RET (Lg-sm) (LF)
  - ☐☐ VSC thermal cover (hard) (Velcro flaps folded up)
    - ☐☐ Russian Fixed tether (hooks thru tether, around VSC handle)
- ☐☐ RET (sm-sm) (LB)
  - ☐☐ VSC MLI (soft)
- ☐☐ RET (sm-sm) (LB)
  - ☐☐ VSC (inside VSC MLI)
- ☐☐ RET (sm-sm) (RF)
  - ☐☐ PGT [A7, CAL,30.5] s/n _____
    - ☐☐ PGT Battery s/n _____
    - ☐☐ 7/16 (wobble) Socket-6 ext
- ☐☐ RET (sm-sm) (from PDGF)
  - ☐☐ Grapple shaft cover
    - ☐☐ Wire Tie

- ☐☐ **Crewlock Bag 4** (divider snapped up – attached to underside of Med ORU bag)
  - ☐☐ Adj Equip Tether (Lg-sm) (ext – sm hook on R HR stanchion, Lg hook (taped) on Med bag)

Side 1 of divider:

- ☐☐ Wire Tie Caddy 4 (Int RET) (2 long, 7 short)
- ☐☐ RET (sm-sm)
  - ☐☐ PAMA Cheater Bar
- ☐☐ Russian Ratchet Wrench (Int RET)

EVA 3 TOOL CONFIG (Cont)

A/L (Cont)

Side 2 of divider:
- ☐☐ RET (sm-sm)
  - ☐☐ Long Wire Tie – preconfiged for MLI
- ☐☐ Dust cap P18 – size 25 (Int RET)
- ☐☐ Dust cap P19 – size 25 (Int RET)

☐☐ RET (Lg-sm) (near Staging Bag)
- ☐☐ **Tool Stow C/L bag** (divider snapped up)
  - ☐☐ Adj Equip Tether (external)

Side 1 of divider:
- ☐☐ Fish Stringer
  - ☐☐ Hook 1: RET (sm-sm)
    - ☐☐ Pin Straightener Assy
  - ☐☐ Hook 2: RET (sm-sm)
    - ☐☐ Short MMOD T-handle
  - ☐☐ Hook 3: RET (sm-sm)
    - ☐☐ Short MMOD T-handle
  - ☐☐ Hook 4: RET (sm-sm)
    - ☐☐ Probe
  - ☐☐ Hook 5: RET (sm-sm)
    - ☐☐ Vise Grips
  - ☐☐ Hook 6: RET (sm-sm)
    - ☐☐ 1" QD Cap Removal Tool

Side 2 of divider:
- ☐☐ HPGT FRGF MLI (Int RET – to MLI tether w/"T")
  - ☐☐ Long Wire Tie (around MLI – smushed loop around MLI tether)

☐☐ RET (Lg-sm) (foot 1 – Airlock D-ring ext)
- ☐☐ **PAMA/PDGF/Harness** (see fig 3)
  - ☐☐ RET (sm-sm)
    - ☐☐ Grapple shaft cover
      - ☐☐ Long Wire Tie
  - ☐☐ Dust Cover 1 (pre-installed on power cables)
  - ☐☐ Dust Cover 2 (pre-installed on power cables)
- ☐☐ Node 3 Cable Bag (FGB Y-Cables)

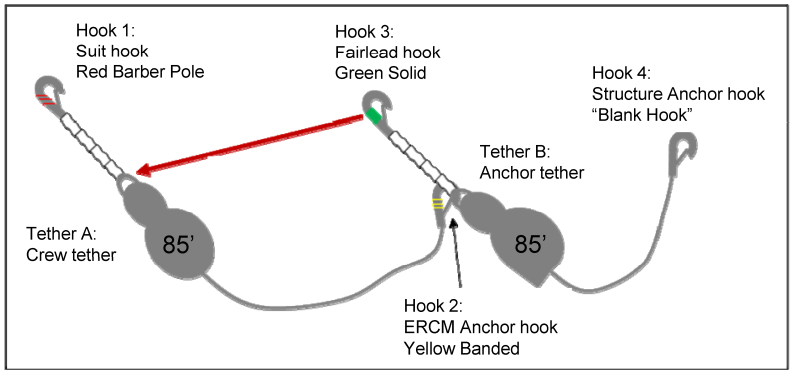


Figure 1: Safety Tether Pack Config

A/L (Cont)

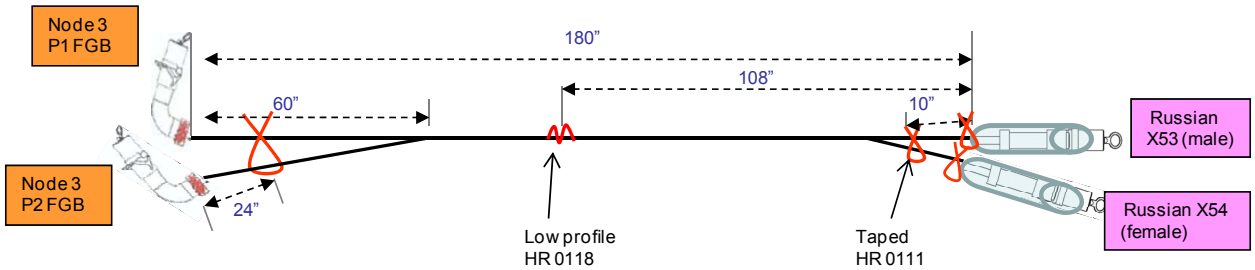
☐☐ **Staging Bag**
- ☐☐ Fish Stringer Tether
  - ☐☐ Wire Tie Caddy (hook 1) (5 short, 4 long)
  - ☐☐ Velcro/Tape Caddy (hook 2)
  - ☐☐ PGT (hook 3) s/n _____
    - ☐☐ PGT Battery s/n _____
    - ☐☐ 7/16 (wobble) Socket-6 ext
  - ☐☐ Ratchet Wrench (hook 5)
    - ☐☐ 7/16 (rigid) Socket-2 ext
  - ☐☐ Long Duration Tie-Down Tethers (2) (hook 6)
  - ☐☐ **Russian Ratchet Wrench D** (hook 7)
  - ☐☐ Spare Safety Tether Pack (85-ft + 85-ft) (to strap)
- ☐☐ Fish Stringer Tether
  - ☐☐ Connector Cleaner Tool Kit (hook 2)
  - ☐☐ Pry Bar (hook 4)
  - ☐☐ **Needle Nose Pliers** (hook 6)
  - ☐☐ **Russian Adjustable Tether** (2) (for tie down) **D**
  - ☐☐ **Russian Fixed Tether** (for tie down) **D**
  - ☐☐ MWS Key Strap Assy (on wire tie, to strap)

A/L (Cont)

☐☐ **IV Bag**
- ☐☐ Towels (2)
- ☐☐ Contamination Detection Kit
- ☐☐ GP Caddy (2)
  - ☐☐ Adjustable Thermal Mittens (2)
- ☐☐ Socket Caddy (hatch cont) w/RET (sm-sm) (Black)
  - ☐☐ 1/2 Socket-8 ext
  - ☐☐ 7/16 (wobble) Socket-6 ext (spare)
- ☐☐ DCM Plug (SAFER Hardmount) (2)
- ☐☐ RET (sm-sm, Black) (2)

ISS External:

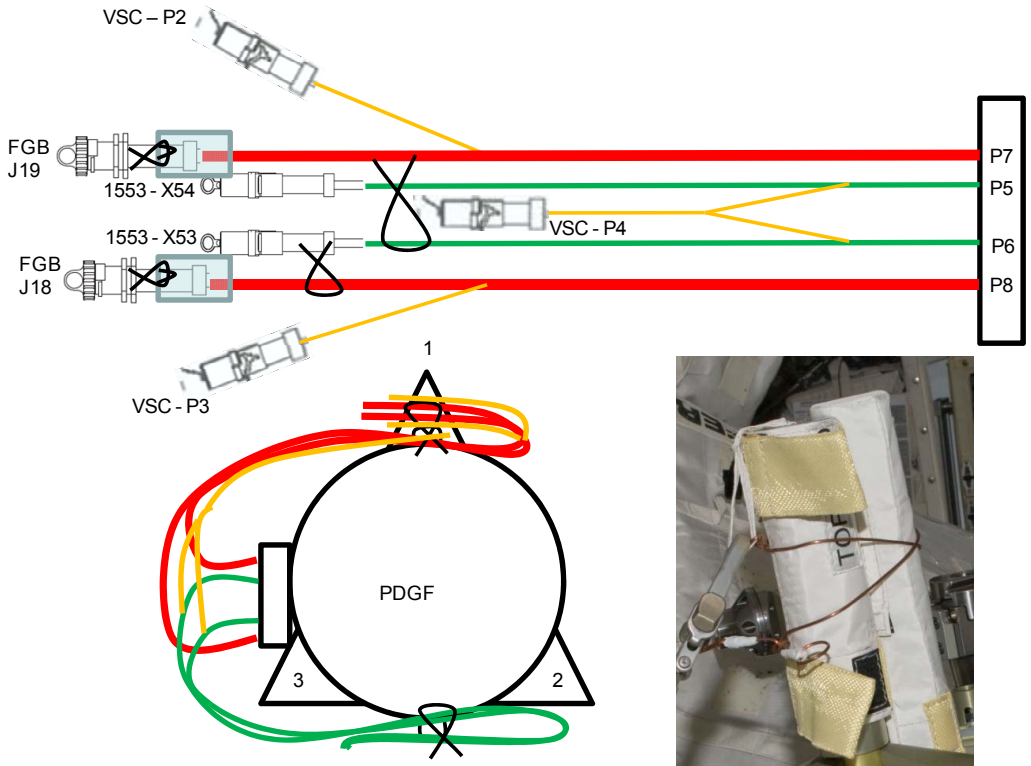
☐☐ **Node 3 Cable Bag (FGB Y-Cables)**
- ☐☐ NOD1/FGB Ch 1/4 Cables (see fig 4)
- ☐☐ NOD1/FGB Ch 2/3 Cables (see fig 5)

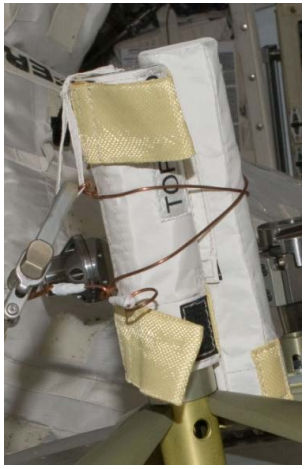


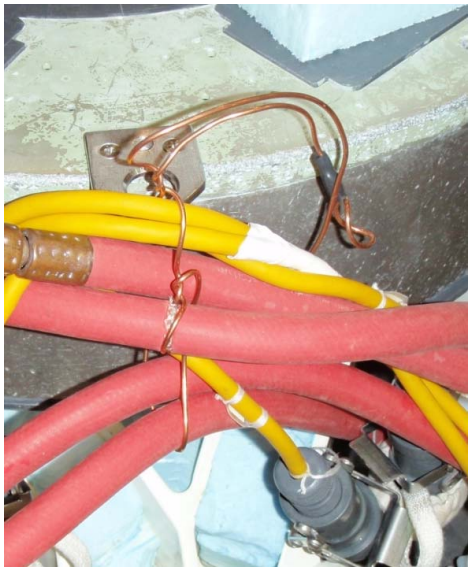
- ❑ Attach short wire tie at low profile location
  - ❑ Attach short wire tie on X53 cable/connector
    - ❑ Twist one remaining end of wire tie around cap tether point
    - ❑ Twist other end of wire tie around bootie tether point
  - ❑ Attach short wire tie on X54 cable/connector
    - ❑ Twist one remaining end of wire tie around cap tether point
    - ❑ Twist other end of wire tie around bootie tether point
- ❑ Attach taped short wire tie around both Russian cables
- ❑ Attach short wire tie around both Node 3 cables
- ❑ Coil Node 3 end toward Russian end 3 loops – twist Node 3 wire tie around coils
  - ❑ Continue coiling Node 3 end – twist taped wire tie (Russian) around whole bundle

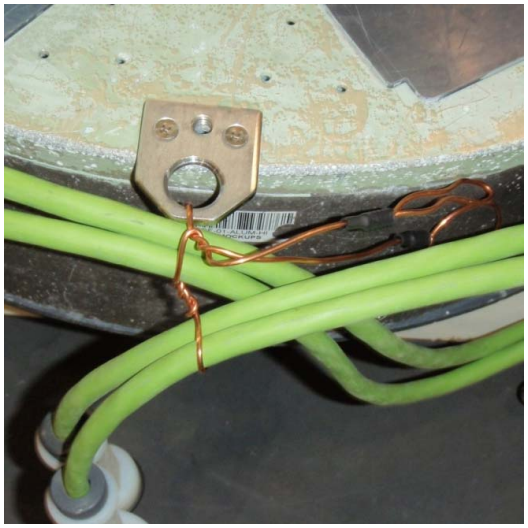
Figure 2: 1553 PDGF Cable

EVA 3 TOOL CONFIG (Cont)



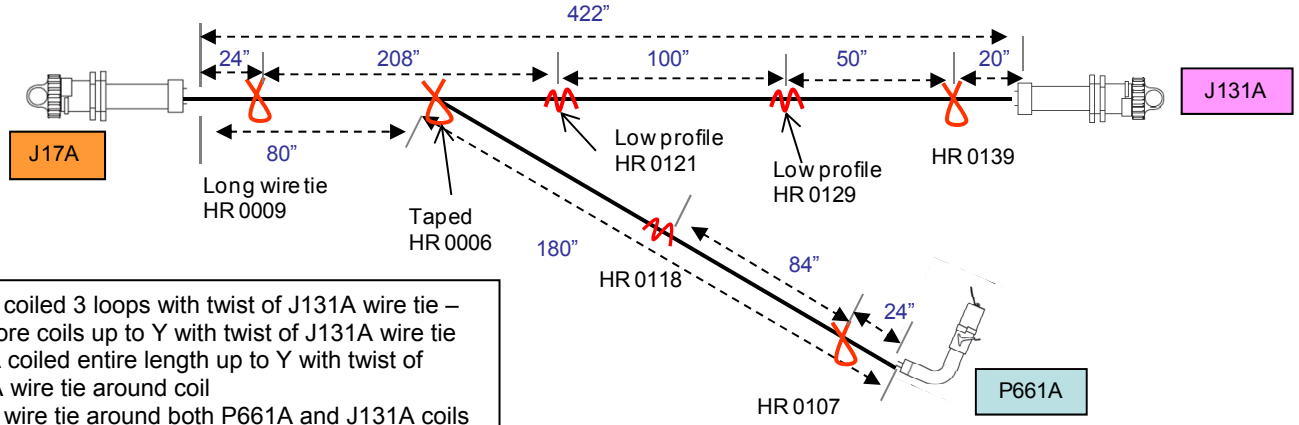






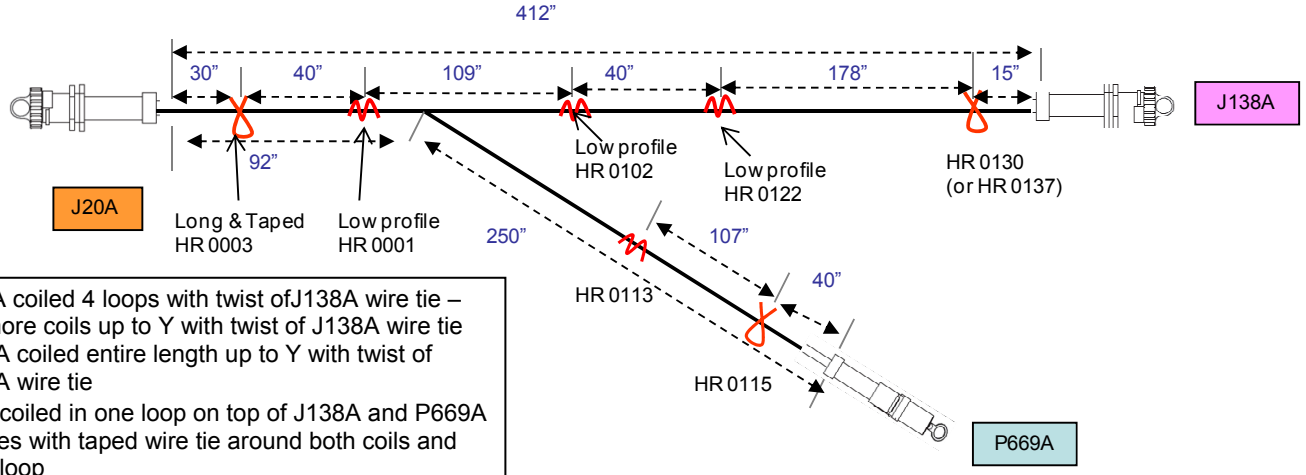
- ❑ Attach long wire tie (both ends smushed) on J18
- ❑ Attach long wire tie (both ends smushed) around both X53 and X54
- ❑ Attach short wire tie to dust cover tether pt, then wrap around J18 connector
- ❑ Attach short wire tie to dust cover tether pt, then wrap around J19 connector
- ❑ Coil cables as shown/described:
  - ❑ Wrap J18 wire tie around all VSC and Power cables – one end of wire tie through PDGF tether point, then twist with other end of wire tie
  - ❑ Wrap 1553 wire tie around both cables – one end of wire tie through PDGF tether point, then twist with other end of wire tie
    - ❑ Twist end not going through PDGF tether point through both cap tether points of Russian connectors
- ❑ Attach long wire tie to grapple shaft cover tether point, then around both covers (should already be configured)

Figure 3: FGB PDGF Harness



- ❑ J131A coiled 3 loops with twist of J131A wire tie – few more coils up to Y with twist of J131A wire tie
- ❑ P661A coiled entire length up to Y with twist of P661A wire tie around coil
- ❑ Taped wire tie around both P661A and J131A coils
- ❑ J17A coiled in one loop on top of bundle with twist of J17A long wire tie around both coils and J17A loop

Figure 4: Ch 1/4 FGB Y-Cable (port)



- ❑ J138A coiled 4 loops with twist ofJ138A wire tie – few more coils up to Y with twist of J138A wire tie
- ❑ P669A coiled entire length up to Y with twist of P669A wire tie
- ❑ J20A coiled in one loop on top of J138A and P669A bundles with taped wire tie around both coils and J20A loop

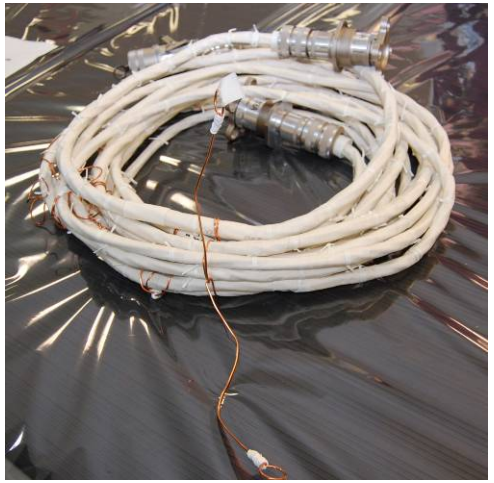


Figure 5: Ch 2/3 FGB Y-Cable (stbd)

EVA 3 BRIEFING CARD

EVA Prep

- ☐ Review Morning Timeline/Plan
- ☐ Work With a Purpose
- ☐ Pure O2 Protocol
- ☐ Suit Donning Plan – special requests, boot bladder manipulation
- ☐ Safer, MWS, Tools, CL, Bag Stowage in A/L
- ☐ Airlock Depress Review

Procedure Review

- ☐ Egress Plan (tethers)
- ☐ Order of Tasks (summary timeline)
- ☐ Translation Paths, Fairleads
  - Inch-worm comm with PAMA/PDGF
- ☐ Hazards (no touch, no damage, keep outs, notes, cautions, warnings)
  - Sun sensors, FGB thrusters, CETA light, WETA, SASA, EVA crane
- ☐ Contingencies – section 16
  - NZGLs, PAMA feet
- ☐ Task Constraints, Potential Get-aheads
  - FGB Y-cable order
- ☐ Ingress Plan

Post EVA

- ☐ Suit Doffing
- ☐ Tool Reconfig Plan

Emergencies

- ☐ Comm Fail (hand signals), Term EVA, Abort EVA
- ☐ EMU Malfunctions
- ☐ Lost Tools/Crewmember (velocity and direction)
- ☐ DCS
- ☐ Safer Ops
- ☐ Crew Rescue

Reminders/Top Ten

- ☐ Gate Closed, Slider Locked, Tether Reel Unlocked
- ☐ Pins Straight, No FOD, Good EMI
- ☐ PGT Read-back, Turns and Torque with light
- ☐ Worksite Departure – tethers and tools clear
- ☐ Move Slowly – no hopping (slower is faster)
- ☐ Body Position is Everything (use space)
- ☐ Tether Awareness – all of them
- ☐ Suit/Tool Awareness – BRT/PGT/ORU Stowage
- ☐ Suit MAL – read down DCM messages
- ☐ Discipline and Attention to detail until the end
- ☐ Day/Night Checks (tethers, tools, visors)

Contingency

- ☐ Coordinate with **MCC-H** on following connector demate ops
  - Rats Nest connectors
    - P132
    - P140
    - P141
  - PMA1 power connectors
    - FGB J16/P16
    - FGB J21/P21

EVA 3 INHIBIT PAD

Orbiter

ALL EVAs

TCS *(Not required, switch guard installed on EVA 1)*
IV L12 1. √TCS POWER – OFF

Ku-Band Antenna *(INCO: Prior to Egress)*
MCC-H 1. √KU-BAND Mask – active
2. √KU-BAND EVA Protect Box – active

RCS *(Not expected since not translating to Payload Bay)*
If EV crew < 27 ft from FRCS
IV 1. √DAP: VERN, FREE, LO Z
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 (*)

Ground

ALL EVAs

Ground Radar *(TOPO: Prior to Egress)*
MCC-H 1. √TOPO console, ground radar restrictions in place for EVA

USOS (1)

ALL EVAs

PCU *(PHALCON: Prior to Egress)*

NOTE

PCUs may require up to a 1-hr warmup period before they are operational

MCC-H 1. √PCUs (two) operational in discharge mode and one of the following:
a. CCS PCU EVA hazard control FDIR enabled
b. No more than two arrays unshunted and oriented < 105° from velocity vector
If one or both PCUs failed
2. No more than two arrays unshunted and oriented < 105° from velocity vector

CUCU *(Crew: Prior to Egress)*
IV – (LAB1O4)
1. √cb POWER A, B [two] – OPEN
2. √cb LINK 1,2 [two] – OPEN

And one of the following inhibit pairs:
POIC 3a. Express Rack 2 Locker 6 – Power Removed
3b. Express Rack 6 Locker 7 – Power Removed
OR
IV 4a. Express Rack 2 Locker 6 – OFF
4b. Express Rack 6 Locker 7 – OFF

MISSE 8 *(POD: Prior to Egress)*
POIC Prior to EV Hatch Open
1. ELC-2 ExPA-2 Discrete Channel 6 – Disabled

JEM (1)

ALL EVAs

ICS-EF Antenna *(Prior to Egress)*
SSIPC 1. ICS MOD – OFF
2. ICS UPC – OFF
3. ICS HPA – OFF
4. HPA ON and UPC ON commands are cleared (not present) in the ICS stored command queue

EVA 3 INHIBIT PAD (Cont)

LOCATION DEPENDENT INHIBITS

Lab Window *(Not expected)*
IV If EV crew less than 10 ft from window or in window FOV, close window shutter

Cupola Windows *(Not expected)*
IV If EV crew less than 10 ft from window, coordinate shutter opening/closing with EV crew and minimize time shutter is open

Mobile Transporter *(ROBO: Prior to Egress)*
MCC-H If EV crew < 1.5 meters from MT
1. √MT latched

Port SARJ *(PHALCON: Prior to Task – STP-H3 and HPGT MLI)*
MCC-H If EV crew working within 2 ft, outboard of SARJ or reqd per loads FR
1. √DLA (1) – LOCKED
2. All motor setpoints set to zero
3. All motors deselected

SSPTS *(PHALCON: Prior to Task – FGB stbd Y-jumper install*
Inhibit 1 not required, inhibits 2 and 3 from ~3:45 – ingress)
MCC-H If EV crew working within 2 ft of SSPTS cables
1. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit
2. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit
3. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

COL (1)

ALL EVAs

HAM Radio *(Crew: Prior to Egress)*
IV 1. HAM Radio – Deactivate

USOS (2)

TASK SPECIFIC

Ch 1/4 FGB Power Cable *(PHALCON: Prior to Egress for RACU)*
MCC-H
1. √RACU-6 – OFF
2. √RACU-5 – OFF

P17 (port Y-jumper, CH 1/4) – *prior to task*
1. ARCU 51 – ON
2. ARCU 52, 53 and 54 – OFF
3. CHT 21 and 22 – OFF
4. CHT 23 and 24 – ON
5. RPCM Z14B_A RPC1 – Open, Close Cmd Inhibit

P16 – *prior to task*
1. MBSU-2, RBI-5 – Open, Close Cmd Inhibit

Ch 2/3 FGB Power Cable *(PHALCON: Prior to Egress for RACU)*
MCC-H
1. √RACU-6 – OFF
2. √RACU-5 – OFF

P20 (stbd Y-jumper, CH 2/3) – *prior to task*
1. ARCU 53 – ON
2. ARCU 51, 52 and 54 – OFF
3. CHT 21 and 22 – ON
4. CHT 23 and 24 – OFF
5. RPCM Z13B_A RPC1 – Open, Close Cmd Inhibit

P21 – *prior to task*
1. MBSU-4, RBI-5 – Open, Close Cmd Inhibit

Node 3 J1 FGB and J2 FGB 1553 (*ROBO: Prior to Egress*)
MCC-H If any RWS active, cmd 'Active Assert Backup'

EVA 3 INHIBIT PAD (Cont)

RSOS (1)

ALL EVAs

SM Antennas *(RIO: Prior to Egress)*

IV
MCC-M

1. ARISS (Ham Radio) – Deactivate
2. GTS – Deactivate
3. Napor (РСПИ) – Deactivate

EVAs ON PMA1 OR RSOS (LOCATION DEPENDENT)

Soyuz TMA-20 (25S, No. 230) Thrusters

MCC-M

1. Inhibited

RSOS and RSOS Visiting Vehicle Antennas (Includes FGB, SM, DC-1, MRM-1, MRM-2, Soyuz TMA-20 (25S, No. 230) Progress)

MCC-M

1. √KURS P [КУРС Р] – Deactivated
2. √KURS A [КУРС А] – Deactivated

ADDITIONAL ANTENNA INHIBITS FOR EVAs ON RSOS (LOCATION DEPENDENT)

FGB Antennas

MCC-M

1. √TORU [ТОРУ] – Deactivated
2. √TV System [ТВС] – Deactivated
3. Radiotelemetry [БР-9ЦУ-8] – Deactivate
4. √TV System [КЛ-108А] – Deactivated
5. √CNPMS [СИТНП] – Deactivated
6. √KOMPARUS [КИС] – Deactivated

EVA 3 NOTES/CAUTIONS/WARNINGS

NOTES

1. Bolt install: Report torque and turns
2. Bolt release: Report torque and turns if different from published range
3. EVA connectors: After disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
4. Inspect QDs for damage prior to mating
5. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
6. 85-ft safety tether retract force may affect body positioning
7. CETA Cart brake handle wire ties must be replaced after crew loading

CAUTION

ISS Generic Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture shafts (dry lube)
   2. PIP pins
   3. Passive UMAs
   4. MBS/SSRMS/SPDM taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
   5. SPDM SJEU, EP, OTCM, LEU, and LEE VDU radiator surfaces
   6. OTSD

B. Electrical cables
   1. Avoid bend radii < 10 times cable diameter

C. Fiber optic cables
   1. Avoid bend radii < 10 times cable diameter
   2. Avoid pulling on cable during mate/demate

D. Fluid line flex hoses and QDs
   1. Avoid bend radii < 14 in for hoses with a diameter ≥ 1 in
   2. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
   3. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if required
   4. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements

CAUTION

ISS Generic Constraints (Cont)

E. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles

F. Other
   1. ITT Cannon connector: On demated connectors, do not rotate collar or manipulate cable/connector using collar or connector tool
   2. MLI handholds are not rated for crewmember translation loads

EVA 3 NOTES/CAUTIONS/WARNINGS (Cont)

CAUTION

ISS Truss Constraints

A. Avoid inadvertent contact with
   1. CETA lights (Z-93 paint) [LAB,S1,NODE 1,P3,S3]
   2. Deployed TUS cable [Zenith and Nadir CETA rails]
   3. S0 aft face radiator
   4. GPS antennas (S13 paint) [S0,JLP]
   5. UHF antennas [LAB,P1]
   6. ETCS radiator flexhoses and panels [S1,P1]
   7. EETCS/PV radiator flexhoses, bellows and panels [P6,P4,S4,S6]
   8. SASA RF group [S1,P1]
   9. Heat pipe radiators [Z1]
   10. PCU cathode and HCA ports [Z1]
   11. Ku-Band antenna (SGANT) dish [Z1]
   12. CMG cover/shells [Z1]
   13. FPMU [P1]
   14. SASA high and low gain antennas and radiator surfaces [Z1]
   15. Deployed MISSEs
   16. OTP on HAB Tray [S0]

B. For structural reasons
   1. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

CAUTION

ISS Truss Constraints (Cont)

C. Other
   1. EWIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
   2. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS ground strap fasteners [P6,P4,S4,S6] can contaminate EMU
   3. Prevent inadvertent contact of the tether shuttle with ETRS when the P3 tether shuttle stop is raised away from the rail

CAUTION

ISS U.S. Pressurized Elements Constraints

A. Avoid inadvertent contact with
   1. EVA crane [PMA1]
   2. TCS reflectors [PMA2,PMA3]
   3. APAS hardware [PMA2,PMA3]
   4. CETA lights (Z-93 paint) [LAB,S1,NODE 1,P3,S3]
   5. UHF antennas [LAB,P1]
   6. Open CBM petal covers, LAB and Cupola window shutters
   7. S0/NODE 2 fluid tray hardlines at NODE 2 end, which are limited to 25 lb

B. Other
   1. EWIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
   2. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged

EVA 3 NOTES/CAUTIONS/WARNINGS (Cont)

CAUTION

ISS I.P. Elements Constraints

COL

A. Avoid inadvertent contact with
   1. COL ARISS and AIS antennas [COL-Nadir]

JEM

A. Avoid inadvertent contact with
   1. GPS antennas (S13 paint) [S0,JLP]
   2. Open JPM window shutter
   3. JTVE, WVE/EVE, JEF VE cameras
   4. JEMRMS taped radiative surfaces [JEU,EE,Cameras]
   5. JEM A/L target and pins
   6. JEF ORUs and EFUs (paint and lubricant)
   7. MAXI front and top panel (paint)
   8. SEDA-AP sensors (HIT, SDOM, and AOM)
   9. Trunnions and UCMs (paint and lubricant) [JEF Payloads]
   10. RAIDS covers on end of HREP
   11. ICS-EF Ka-Band antenna dish
   12. Small Fine Arm (SFA) (paint, coating and lubricant)

B. For structural reasons
   1. Avoid kicking MMOD shields between JLP and JPM
   2. Avoid tool impact on ICS-EF sensor

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 and PLB sill]
   4. Payload bay and camera wire harnesses, cables, cable guides, and connectors
   5. OBSS striker bars (drylube)

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]

WARNING

ISS Generic Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture targets and target pins

B. Pinch
   1. NZGL connector linkage. Use caution when mating/locking
   2. ITT Cannon connector rotating housing
   3. PDGF connector doors

C. QDs
   1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip
   2. Do not rotate if in mated/valve open configuration
   3. Bail may kick back suddenly when detent button is depressed if pressure has built up in spring cavity

D. Sharp Edges
   1. Inner edges of WIF sockets
   2. APFR active WIF probes
   3. Mating surfaces of EVA connectors Avoid side loads during connector mating
   4. Back side of MMOD shield fasteners
   5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAs, SARJ Covers); the end of the spring may protrude
   6. SPDM OTCM gripper jaws
   7. Keep hands away from SSRMS LEE/POA/SPDM LEE opening, snares, and PDGF curvic coupling (teeth)
   8. MMOD strikes on ISS exterior

WARNING

ISS Generic Constraints (Cont)

E. Thermal
   1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
   2. Turn off glove heaters when comfortable temperature reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
   3. Uncovered trunnion pins may be hot
   4. SSRMS/MBS/SPDM operating cameras and lights may radiate large amounts of heat
   5. Do not touch EMU protective visor if temperature has been < -134 degF for > 15 min
   6. No EMU boot contact with foot restraint when temperature < -120 degF or > 200 degF
   7. PDGF surfaces may not meet touch temperature requirements for unlimited contact when $\beta \leq -70$ or $\beta \geq 70$

WARNING

ISS Truss Constraints

A. Avoid inadvertent contact
   1. SSU, ECU, beta gimbal platform, mast canister, SAW blanket boxes unless the beta gimbal is locked and the motor is turned off
   2. Stay inboard of SARJ when active
   3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
   4. Stay 5 ft from moving MT on face 1
   5. Stay 3.3 ft from Ku-Band (SGANT antenna) when powered
   6. Stay 1 ft from top of STP-H3 (ELC3)
   7. Deployed MISSEs and ORMATE-III R/W

B. RF radiation exposure
   1. Stay 3.6 ft from S-Band (SASA) high gain antenna when powered [S1,P1]
   2. Stay 1.3 ft from S-Band (SASA) low gain antenna when powered [S1,P1]
   3. Stay 1 ft from UHF antenna when powered [LAB,P1]

C. Sharp Edges
   1. Solar array blanket box [P6,S6]
   2. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
   3. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner
   4. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 – SARJ at 0 deg]
   5. Nickel coated braided copper ground straps may contain frayed wires [P6,P4,S4,S6]
   6. MMOD strikes on Z1 toolboxes
   7. POA FSE (CSA logo below MBS mast camera)
   8. AMS Star Trackers Baffles (2)

WARNING

ISS Truss Constraints (Cont)

D. Electrical Shock
   1. Stay ≥ 2 ft from ungrounded floating connectors if powered
      S0 EVA power cables (inside S0 Bay 00 Face 4, Bay 01 Face 3)
      ESP-2 jumper (inside S0 Bay 03 Face 4)

E. Thermal
   1. ELC may exceed touch temperatures when β > 75 deg

WARNING

ISS U.S. Pressurized Elements Constraints

A. Handrails
   1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 and 566, A/L Tank 2 Nad/Fwd and Port/Fwd, P6 5389]

B. Pinch
   1. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
   2. LAB and Cupola window shutters and CBM petal cover linkages during operation

C. RF radiation exposure
   1. Stay 1 ft from UHF antenna when powered [LAB,P1]

D. Sharp Edges
   1. PMA umbilical launch restraints - exposed bolt threads
   2. Adjustable fuse tether (Fish Stringer) buckles stowed in Node bag
   3. Port/Aft portion of A/L circular HR [HR 0506]
   4. A/L HR 0537 (Eq Lock Zenith)
   5. ESP-2 HR 8012
   6. PMM ROEU and ROFU panels (zenith endcone)

WARNING

ISS U.S. Pressurized Elements Constraints (Cont)

E. Thermal
   1. PMA handrails may be hot. Handling may need to be limited
   2. Stay ≥ 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up; limit time to 15 min or less if > 300 degF
   3. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF
   4. No EMU TMG contact with PMAs and MMOD shields > 320 degF

F. Electrical Shock
   1. Stay ≥ 2 ft from ungrounded floating connectors if powered
      SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd

G. Fluid QDs
   1. Do not translate on gap spanners restraining NODE 3 – LAB NH3 jumpers

WARNING

ISS I.P. Elements Constraints

COL

A. Avoid inadvertent contact with
   1. SOLAR [COL EPF]

B. Thermal
   1. Columbus end cones may violate touch temperature constraints when $-75 \leq \beta \leq -60$ or $60 \leq \beta \leq 75$

JEM

A. Avoid inadvertent contact with
   1. ICS-EF sensors

B. Pinch
   1. JPM window shutter linkages during operation
   2. JEM cameras (JVTEs, EVE, WVE, and JEF VEs)
   3. JEM EFU latching arms
   4. JEF SSE latch
   5. ICS-EF antenna boom
   6. SEDA-AP mast
   7. SMILES antenna rotating area
   8. HREP hinge sides and RAIDS pinch areas
   9. JEMRMS EE
   10. JEMRMS Small Fine Arm (SFA) joints and booms

WARNING

ISS I.P. Elements Constraints (Cont)

JEM (Cont)

C. Sharp Edges
   1. Interior of JEMRMS HRMs
   2. JEMRMS EE opening and snares
   3. JEM A/L hatch corners
   4. ICS-EF AHM gears
   5. MAXI visual star camera
   6. SMILES baffles (two), baffle base bare bolts, and Cold Sky Terminator (CST)
   7. HREP baffles (four) [Star tracker aperture Zenith and three instrument baffles Aft]
   8. SFA Electro-Mechanical GF (EMGF)

D. RF radiation exposure
   1. Stay 0.3 ft from Fwd/Aft JPM PROX antenna

E. Thermal
   1. JPM Port End Cones and JLP Port Nadir may violate touch temperature constraints when $\beta > 60$ deg
   2. JEMRMS/JTVE/JEFVE operating cameras and lights may radiate large amounts of heat

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. 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

Shuttle Constraints (Cont)

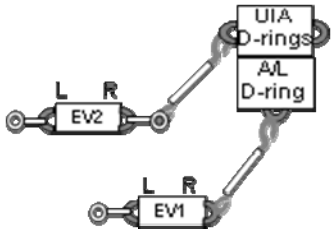
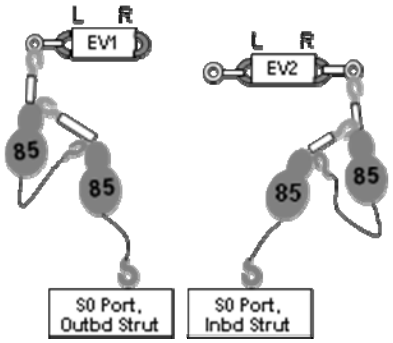
D. Sharp Edges
   1. PRLA grounding wipers [PLB]
   2. LDRI baffles (also an entrapment hazard) [OBSS]
   3. Keep hands away from SRMS EE opening and snares
   4. TCS connector backshells have exposed threads [ODS]

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

EVA 3 EGRESS/SETUP (00:40)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
1. Record PET Start time __:__	**Initial Configuration:**	**Initial Configuration:**
	1. √All gates closed & hooks locked	1. √All gates closed & hooks locked
	❑ R Waist Tether to A/L int D-ring ext	❑ R Waist Tether to UIA D-ring
2. Day/Night Cycles _____		
		
	WARNING Avoid inadvertent contact with grapple fixture target, target pin, connector doors, and PDGF curvic coupling (teeth)	
3. Start WVS Recorders	EGRESS (00:15)	EGRESS (00:15)
4. Start Hatch Thermal Cover clock PET (30 min) __ : __	2. Open hatch thermal cover	
	3. Egress A/L (toward fwd curved HR)	
5. Inspect Load Alleviating Straps for: 1. MMOD/general damage 2. Discoloration 3. Tack Stitching 4. Red Band	4. Perform LAS inspection on EV2 ST Pack (aft D-ring) ❑ LAS; ❑ √Yellow hook on Green ERCM ❑ LAS; ❑ √Green hook on Red ERCM	
	5. RET to ST Pack	
	6. Attach **RED** hook to EV2 R D-ring ext ❑ √Gate closed, hook locked, reels unlocked, release RET	2. Partially egress A/L hatch to allow EV1 to attach **RED** hook to R D-ring ext
	7. Give **EV2 GO** to release Waist Tether	3. On **EV1 GO**, release Waist Tether from UIA D-ring
	8. Perform LAS inspection on EV1 ST Pack ❑ LAS; ❑ √Yellow hook on Green ERCM ❑ LAS; ❑ √Green hook on Red ERCM	4. Relocate sm hook of Lg-sm RET to UIA D-rings
	9. RET to ST Pack on fwd/stbd curved HR stanchion	
	10. Attach **RED** hook to L D-ring ext ❑ √Gate closed, hook locked, reels unlocked, release RET	
	11. Release R Waist Tether from A/L int D-ring ext	5. Egress A/L with ORU+C/L bag bundle 6. Attach ORU+C/L bag bundle on BRT w/RET

EVA 3 EGRESS/SETUP (00:40) (Cont)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
6. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max	12. Perform buddy checks √MWS tabs up, BRT tab up, tether configs 13. Verify SAFER config ❑ √L handle down (MAN ISOL Vlv – Open) ❑ √R handle down (HCM – Closed) 14. √WVS – green LED	7. Perform buddy checks √MWS tabs up, BRT tab up, tether configs 8. Verify SAFER config ❑ √L handle down (MAN ISOL Vlv – Open) ❑ √R handle down (HCM – Closed) 9. √WVS – green LED
7. Stop Hatch Thermal Cover clock PET (30 min) __ : __	15. Close hatch thermal cover	
	CAUTION Avoid inadvertent contact with zenith PMA1 MDM and above 22" of EVA crane	
	WARNING Avoid contact with FGB sun sensors (possible sharp edges)	
	SETUP (00:25) 16. EV2 translate first, then translate aft/zenith on Crewlock to the Cable bag 17. Retrieve Cable bag, stow on BRT w/RET 18. Translate to FGB zenith/aft 19. Stow Cable bag across FGB HRs 1037 and 1032 (handle port) (Translate to PDGF worksite – PDGF Setup)	SETUP (00:25) 10. Translate to FGB/MRM1 interface ❑ Fairlead on E/L HR 0510 (zenith of trunnion pins) ❑ Fairlead on NOD1 HR 0119 (end cone radial HR) ❑ Translate nadir/port on PMA1 11. Attach **GREEN** hook to PMA1 HR 0013 ❑ √Gate closed, hook locked, reels unlocked, release RET 12. Release ORU bag taped hooks from C/L bag 13. Stow Medium ORU bag on PMA1 HRs 0011 and 0012 (hinge ISS fwd) 14. Install gap spanner on PMA1 HR 0010 and FGB vertical HR 1050 15. Remove C/L bag from ORU bag by releasing C/L bag taped hook from ORU bag 16. Stow C/L bag on MRM1 curved HR (Retrieve long wire tie – PDGF Setup)

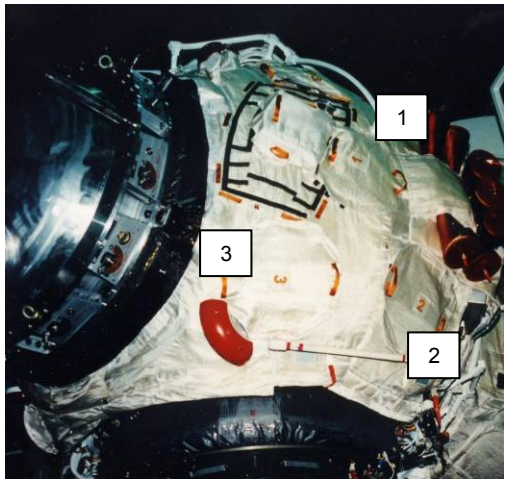
PDGF SETUP (00:30)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 00:40	PDGF SETUP (00:30) 1. Translate to PDGF worksite 2. Receive MLI and wire tie from EV2 3. Remove remaining PAMA and VSC MLI from FGB and stow on EV2 wire tie; twist wire tie to ensure each MLI is captured (3 twists after last MLI) ❑ PAMA 1 ❑ PAMA 2 ❑ PAMA 3 ❑ VSC (small) ❑ VSC (large – Ushape) 4. Translate zenith on FGB to FGB bracket 5. Bundle/stow MLI on FGB bracket ❑ 1 long wire tie to MLI tether point, around bundle and bracket (as tight as possible) ❑ 1 long wire tie to bracket, around bundle and through MLI tether loop (as tight as possible) ❑ Stow MLI under bracket 6. WVS of the temp stow config (Translate to A/L – Retrieve PAMA/PDGF)	PDGF SETUP (00:30) 1. Retrieve pre-configured long wire tie from C/L bag 2. Translate to PDGF worksite 3. Remove PAMA and VSC MLI from FGB and stow on wire tie; twist wire tie to ensure each MLI is captured ❑ PAMA 1 ❑ PAMA 2 ❑ PAMA 3 ❑ VSC (small) ❑ VSC (large) 4. Transfer MLI and wire tie to EV1 5. Retrieve Russian ratchet from C/L bag ❑ √Ratchet in Open 6. Remove PAMA caps (3 total): ❑ Pull and rotate T-handle (release secondary lock) ❑ Engage ratchet to cap; pull test ❑ Remove cap (ccw) and stow in trash bag (pull ratchet release tab) ❑ PAMA 1 ❑ PAMA 2 ❑ PAMA 3 7. Visually inspect PAMA mating surfaces (3) ❑ PAMA 1 ❑ PAMA 2 ❑ PAMA 3 8. Stow Russian ratchet in C/L bag (Translate to A/L – Retrieve PAMA/PDGF)

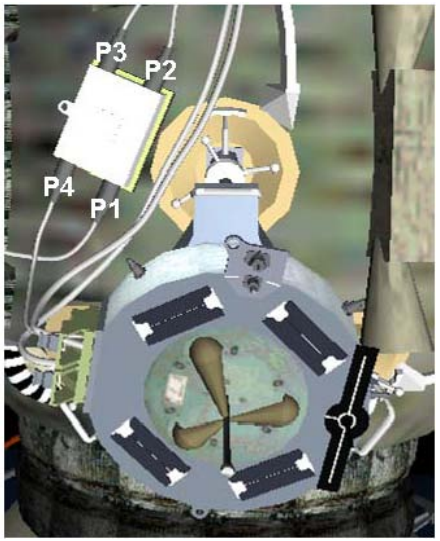
RETRIEVE PAMA/PDGF (00:20)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 01:10 1. Start Hatch Thermal Cover clock PET (30 min) __ : __ 2. Stop Hatch Thermal Cover clock PET (30 min) __ : __	RETRIEVE PAMA/PDGF (00:20) 1. Translate to A/L, go first 2. Glove Check 3. Open hatch thermal cover 4. Attach Lg-sm RET to PAMA handhold at foot 1 5. Retrieve the PAMA/PDGF 6. Close thermal cover	RETRIEVE PAMA/PDGF (00:20) 1. Translate zenith/stbd over PMA1 to A/L, EV1 goes first 2. Glove Check 3. Attach R Waist Tether to PAMA handhold at foot 3 4. Verify EV1 SAFER configuration ❑ √R Handle down (HCM door – Closed) ❑ √L Handle down (MAN ISO Valve – Open)
	WARNING During translation, PDGF surfaces may not meet touch temp requirements for incidental or unlimited contact Avoid inadvertent contact with grapple fixture target, target pin, connector doors, and PDGF curvic coupling (teeth)	
	7. Inch worm PAMA/PDGF toward Node 1 ❑ EV2 leads translation ❑ Fairlead EV2's tether on E/L HR 0510 8. Attach **GREEN** hook to Node 1 HR 0119, inbd stanchion ❑ √Gate closed, hook locked, reels unlocked, release RET 9. Inch worm PAMA/PDGF to PDGF Worksite ❑ Fairlead on PMA1 HR 0005 (EV1 is at zenith worksite)	5. Inch worm PAMA/PDGF toward Node 1 ❑ Verify grapple shaft away from structure ❑ Lead translation 6. Maintain control while EV1 drops his GREEN 7. Inch worm PAMA/PDGF to PDGF Worksite ❑ Translate zenith over FGB, then nadir/port to worksite (EV2 is at nadir worksite)

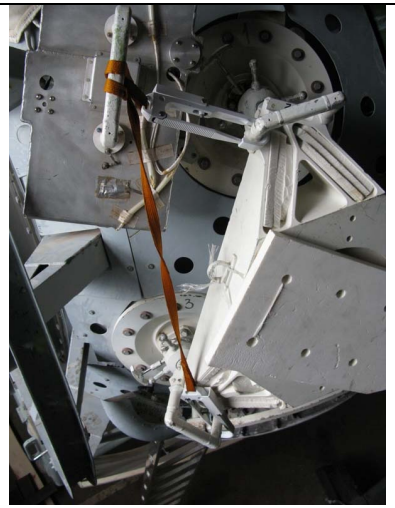
PAMA/PDGF INSTALL (00:15)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 01:30  PAMA/PDGF Alignment: Foot 1: Zenith Foot 2: Nadir/Aft Foot 3: Nadir/Fwd Target Pin: Aft Horseshoe/PDGF Harness: Fwd EV1: Zenith EV2: Nadir	PAMA/PDGF INSTALL (00:15) 1. Align PAMA/PDGF for install ❑ Foot 1 zenith ❑ Target pin aft ❑ Harness fwd 2. Verify ST clear of PAMA install 3. Install PAMA foot 1 to soft dock 4. Hand tighten PAMA foot 1, ~3-4 turns to hardstop, back off ½ turn ❑ PAMA Foot 1 ___ 5. Receive PAMA cheater bar from EV2 6. Place final torque on PAMA foot 1 ❑ √Black-on black 7. Engage secondary lock on PAMA foot 1 ❑ Pull and rotate T-handle 90° ❑ Confirm T-handle pin on knurled portion of foot 8. Transfer PAMA cheater bar to EV2 (Release VSC/Power Cables from PDGF – VSC Install)	PAMA/PDGF INSTALL (00:15) 1. Align PAMA/PDGF for install ❑ Foot 2 nadir/aft ❑ Target pin aft ❑ Harness fwd 2. Verify ST clear of PAMA install NOTE Soft dock in any order; hand tighten feet in desired 1-2-3 order 3. Install PAMA foot 3 to soft dock 4. Install PAMA foot 2 to soft dock 5. Hand tighten PAMA foot 2, ~3-4 turns to hardstop, back off ½ turn ❑ PAMA Foot 2 ___ 6. Hand tighten PAMA foot 3, ~3-4 turns to hardstop, back off ½ turn ❑ PAMA Foot 3 ___ 7. Retrieve PAMA cheater bar from C/L bag 8. Place final torque on PAMA feet 2 and 3, in any order ❑ Foot 2 √black-on black ❑ Foot 3 √black-on black 9. Engage secondary lock on PAMA feet 2 and 3 ❑❑ Pull and rotate T-handle 90° ❑❑ Confirm T-handle pin on knurled portion of foot 10. Transfer PAMA cheater bar to EV1 11. Receive PAMA cheater bar from EV1, stow in C/L bag (Retrieve VSC – VSC Install)

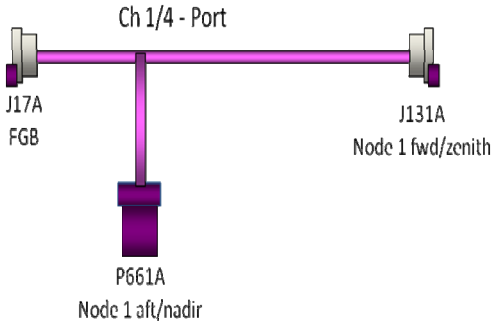
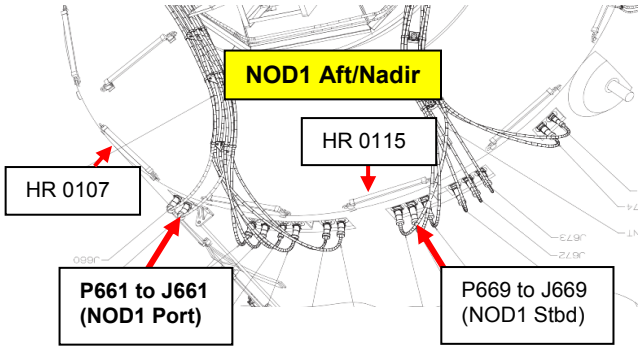
VSC INSTALL (00:30)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 01:45	VSC INSTALL (00:30) 1. Release wire tie from PDGF above foot 1 for VSC/J18/J19 cables 2. Route VSC/J18/J19 cables zenith; temp stow cables on FGB HR 1050 using J18 wire tie	VSC INSTALL (00:30) 1. Translate to Med ORU bag WARNING Avoid contact with exposed VSC surfaces: Grounding tabs, seals, bolt threads and connectors 2. Retrieve VSC and PGT from Med ORU bag 3. Remove MLI from VSC; let MLI RET retract back into ORU bag
	3. Assist EV2 with VSC install as reqd	4. Inspect following for FOD or damage: ❑ VSC mounting bracket ❑ VSC bottom and connectors 5. Install VSC into bracket with tether point ISS fwd (J2 & J3 connectors are zenith)
1. Record VSC bolt data: Bolt: VSC; Turns: (11); Torque (ft-lb): (12.0)		6. Configure PGT: **[B1 (12.0), CW2, 30.5]** 6-in ext 7/16 7. ←Engage VSC bolt to hard stop, **11 turns**
	4. Retrieve VSC connectors from FGB HR 1050 5. Remove MLI caps from PDGF harness connectors P2, P3, and P4 (lanyarded) 6. Mate PDGF harness connectors P2, P3, and P4 to VSC (√Good pins & EMI band; no FOD) ❑ PDGF harness P2 →|← VSC J2 ❑ PDGF harness P3 →|← VSC J3 ❑ PDGF harness P4 →|← VSC J4 7. Assist EV2 with VSC thermal cover install	8. Retrieve FO video cable from PMA1 HR 0006 (fwd/port) ❑ Route FO video cable nadir of crane 9. RET, remove FO video cable cap 10. Mate FO video cable connector P1 to VSC J1 ❑ √Safety Tether clear ❑ √Good pins & EMI band; no FOD 11. Stow FO cap on Fish Stringer and PGT in Med ORU bag 12. Retrieve VSC thermal cover (hard) from Med ORU bag 13. Unfold thermal cover MLI flaps NOTE Verify connector MLI caps do not interfere with VSC thermal cover install 14. Install VSC thermal cover on VSC (handle single stripe zenith, double stripe nadir)

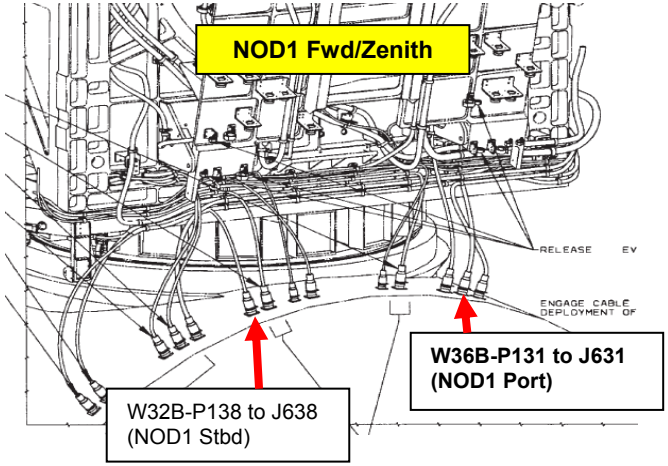
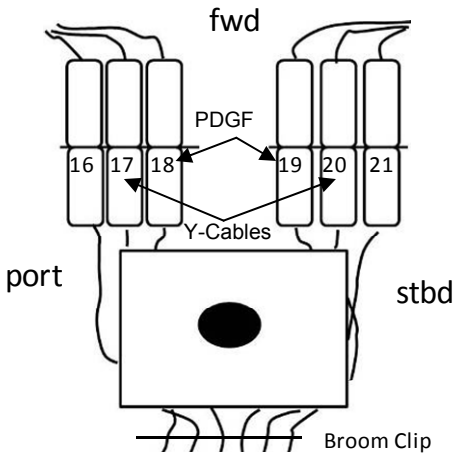
VSC INSTALL (00:30) (Cont)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
	8. Glove Check (Translate to FGB zenith – Port FGB Y-Cable Install)	15. Attach VSC thermal cover Velcro to FGB MLI 16. Attach Russian tether to PAMA foot 1 and foot 3 handholds 17. Wire tie slack in FO video cable to PMA1 HR 0006 ❑ Verify wire tie accommodates multiple cables 18. Glove Check (Translate to FGB zenith – Port FGB Y-Cable Install)

NOD1/FGB CH 1/4 CABLE INSTALL (PORT) (00:45)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 02:15 1. Verify inhibits in place: √P16/P17/P18 Inhibited  	CAUTION Avoid inadvertent contact with PMA1 MDM, FGB Sun sensors, and above 22" of EVA crane NOTE Ensure Safety Tethers are routed above all electrical connections CH 1/4 CABLE INSTALL (PORT) (00:45) 1. Translate to FGB zenith, Node 3 Cable bag 2. Retrieve Port FGB cable from bag (J17A), nearest to bag HR ❑ RET to cable before releasing Velcro strap 3. Wire tie J17A connector to PMA1 HR 0009 4. Transfer rest of cable to EV2 5. Assist EV2 with clearances 6. Untwist P661A wire tie to retrieve nadir cable coil (P661A) 7. Translate nadir to Node 1 aft endcone while routing cable 8. Wire tie cable to HR 0118 9. Demate P661 from Node 1 J661; do not mate P661A ❑ P661 ←|→ NOD1 J661 10. Wire tie P661 and P661A connectors to Node 1 HR 0107  	CH 1/4 CABLE INSTALL (PORT) (00:45) 1. Translate to FGB zenith 2. Retrieve cable from EV1 3. Attach taped wire tie to PMA1 HR 0006 4. Retrieve fwd cable coil (J131A) CAUTION Avoid inadvertent contact with Node 1 aft CETA Light 5. Translate to Node 1 fwd endcone under Rat's nest while routing cable ❑ Fwd/port to Node 1 ❑ Fwd along Node 3 stbd endcone ❑ Stbd onto Node 1 fwd endcone

NOD1/FGB CH 1/4 CABLE INSTALL (PORT) (00:45) (Cont)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
	11. Translate to PMA1/FGB zenith connector panel	6. Demate W36B cable connector P131 from Node 1 J631; do not mate P131A ❑ P131 ←|→ NOD1 J631
2. ❑ P661 demated ❑ P131 demated Give **EV1 GO** for demate of P17 and P18	12. On **IV GO**: Demate FGB P17 and P18 connectors from PMA1/FGB panel (zenith) ❑ FGB P17 ←|→ PMA1 J17 ❑ FGB P18 ←|→ PMA1 J18 13. Pull FGB P18 cable out from under SVS target ❑ Release cables (P16/P17) as reqd from broom clip to provide additional slack ❑ If need to demate P16, contact **MCC-H**	7. Remove cap from FGB cable connector J131A 8. Install cap on Node 1 J631 9. Stand by for **IV GO** on connector mating ops 
3. ❑ J17A mated Give **EV2 GO** to mate J131A 	14. Remove cap from FGB Y-cable connector J17A 15. Mate FGB Y-cable J17A connector to FGB P17 √Good pins & EMI band; no FOD ❑ FGB J17A →|← FGB P17	
	16. Install cap on FGB J17	10. On **IV GO**, mate FGB cable connector J131A to floating cable P131 ❑ √Good pins & EMI band; no FOD ❑ FGB J131A →|← P131
	17. Route P18 cable port under FGB HR toward PDGF (HR 1030) 18. Remove MLI cap from PDGF harness connector J18 (lanyarded) 19. Mate FGB P18 to PDGF harness J18 ❑ Verify all ST routed over the cables ❑ √Good pins & EMI band; no FOD ❑ PDGF J18 →|← FGB P18 20. Move dust cover in place around mated connector; adjust wire tie as reqd ❑ Verify no metal portion of connectors is exposed	11. Wire tie cable at following HRs as translate back to PMA1: ❑ Node 1 HR 0139 (fwd/port endcone – J131A wire tie) ❑ Node 1 HR 0129 (fwd/port near trunnion – low profile wire tie) ❑ Node 1 HR 0121 (aft/port base of CETA light – low profile wire tie) Position the cable so that it is as flush as possible to Node 1 port ❑ PMA1 HR 0006 – any excess slack

NOD1/FGB CH 1/4 CABLE INSTALL (PORT) (00:45) (Cont)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
	21. Translate nadir to Node 1 aft endcone 22. Remove cap from FGB cable connector P661A 23. Mate port FGB cable connector P661A to Node 1 J661 ❑ √Good pins & EMI band; no FOD ❑ FGB P661A →|← NOD1 J661 24. Install cap on floating cable connector P661	
4. On **EV1 GO**, give **MCC-H GO** to power up FGB Ch 1/4 and P18	25. **Notify IV** complete with Ch 1/4 connector ops 26. Wire tie cable at following HRs as translate back to PMA1: ❑ Node 1 HR 0107 (P661 wire tie) ❑ Node 1 HR 0118 (aft/port endcone – low profile wire tie) 27. Glove Check (Translate to PMA1 HR 0011 – 1553 Data Cable Install)	12. Glove Check (Retrieve 1553 cable – 1553 Data Cable Install)

1553 DATA CABLE INSTALL (00:45)

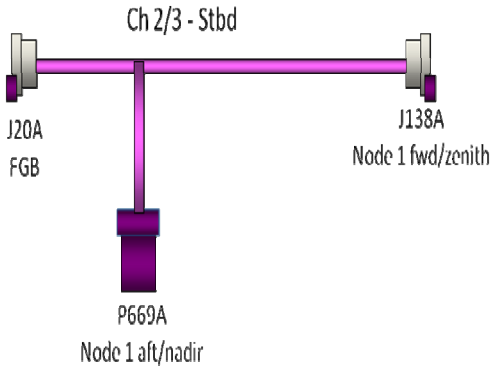
IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 03:00  1. Give **MCC-H GO** to check both data channels 2. Consumable tag up with **MCC-H**	1553 DATA CABLE INSTALL (00:45) 1. Translate to PAMA/PDGF between foot 2 and 3 2. Release wire tie from PDGF for the 1553 cables 3. Route PDGF harness cables toward PMA1 HR 0011 ❑ Verify ST routed over the cables 4. Remove caps (4); verify caps are securely wire tied to cables 5. Mate 1553 cable connectors to PDGF harness and lock connector: ❑ √Good pins; no FOD ❑ PDGF harness 1800-X54 →|← J54 (Bus A) ❑ PDGF harness 1800-X53 →|← J53 (Bus B) NOTE Russian connectors reminder: – Verify lock is in Open position – Align arrows on connector shells – Push connectors together – Rotate connectors ~1/4 turn – Verify arrow on plug points to white mark on socket – Slide lock closed 6. Secure FPP booties around 1553/PDGF harness connections; adjust wire ties as reqd 7. Wire tie any slack to PMA1 HR 0011 using integrated PDGF harness wire tie 8. Relocate C/L bag to FGB zenith HR 9. Glove Check (Translate to Node 3 Cable bag – Stbd FGB Cable Install)	1553 DATA CABLE INSTALL (00:45) 1. Retrieve 1553 cable and fish stringer from Med ORU bag ❑ RET to connector bail or cable 2. Untwist taped wire tie to release Node 3 end 3. Attach taped wire tie (FGB end) to PMA1 HR 0011 4. Translate nadir/port to Node 3 connector panel (along Node 1 HR 0118), reel out 1553 cable as reqd 5. Temp stow fish stringer 6. Remove Node 3 terminator MLI (2); stow on fish stringer ❑ J1 FGB ❑ J2 FGB 7. Remove Node 3 terminator caps (2) from aft avionics panel; stow on fish stringer ❑ Terminator cap ←|→ Node 3 J1 FGB ❑ Terminator cap ←|→ Node 3 J2 FGB 8. Remove cap from 1553 P1 cable; stow on fish stringer 9. Mate 1553 cable P1 to Node 3 J1 FGB ❑ √Good pins & EMI band; no FOD ❑ 1553 cable P1 →|← J1 FGB (Node 3) 10. Remove cap from 1553 P2 cable; stow on fish stringer 11. Mate 1553 cable P2 to Node 3 J2 FGB ❑ √Good pins & EMI band; no FOD ❑ 1553 cable P2 →|← J2 FGB (Node 3) 12. Retrieve fish stringer 13. Wire tie 1553 cable and any slack to Node 1 HR 0118 (low profile wire tie) and PMA1 HR 0006 14. Translate to Med ORU bag; stow fish stringer in Med ORU bag 15. Glove Check (Translate to FGB zenith – Stbd FGB Cable Install)

NOD1/FGB CH 2/3 CABLE INSTALL (STBD) (01:05)

IV/SSRMS

Planned PET 03:45

1. Verify inhibits in place:
   √SSPTS Inhibited
   √P19/P20/P21 Inhibited

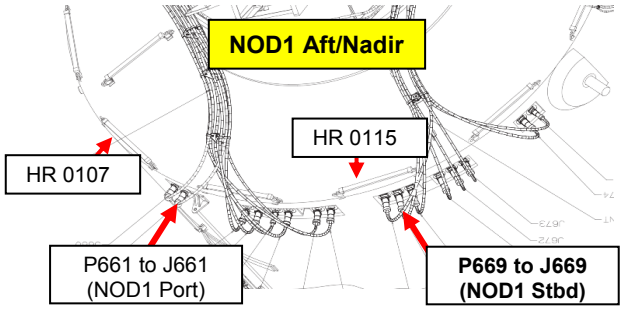


EV1 (Drew)

CAUTION
Avoid inadvertent contact with PMA1 MDM and FGB Sun sensors.
Ensure Safety Tethers are routed above all electrical connections

CH 2/3 CABLE INSTALL (STBD) (01:05)

1. Translate to Node 1 stbd
2. Retrieve **GREEN** hook from Node 1 HR 0119
   ❑ √Gate closed, hook locked, reels unlocked, release RET
3. Translate to FGB zenith, Node 3 Cable bag
4. Retrieve Stbd FGB Y-cable from bag (J20A)
   ❑ RET to cable before releasing Velcro strap
5. Untwist taped wire tie to release cable bundles
6. Transfer Node 1 fwd bundle (J138A) to EV2
7. Attach taped wire tie to PMA1 HR 0003
8. Retrieve nadir cable bundle (P669A)
9. Attach low profile wire tie to PMA1 HR 0001
10. Translate to Node 1 aft/nadir while routing cable
    ❑ Fwd to Node 1 aft endcone
    ❑ Nadir using aft endcone HRs
11. Wire tie cable to Node 1 HR 0113
12. Demate P669 from Node 1 J669; do not mate P669A
    ❑ P669 ←|→ NOD1 J669
13. Wire tie P669 and P669A connectors to Node 1 HR 0115



EV2 (Spanky)

CH 2/3 CABLE INSTALL (STBD) (01:05)

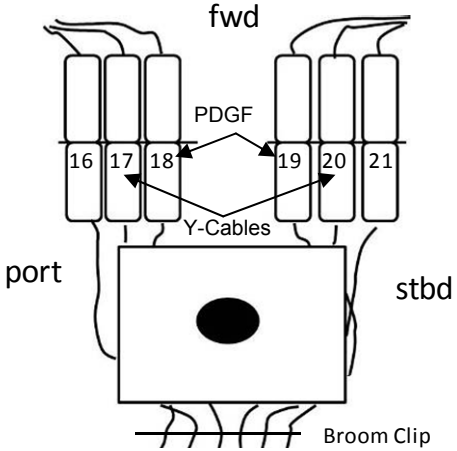
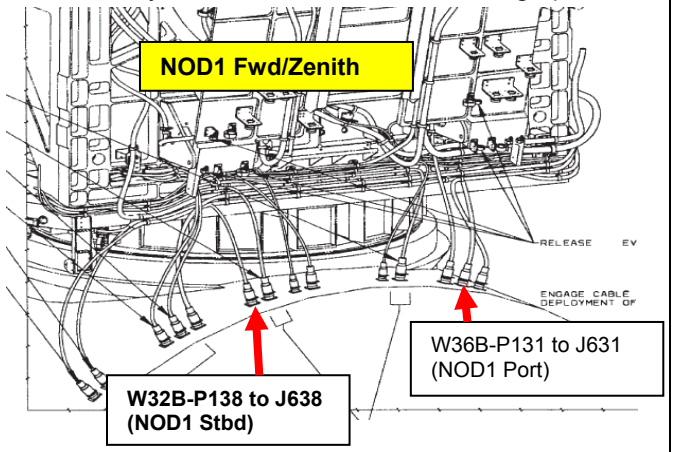
1. Translate to PMA1 nadir
2. Retrieve **GREEN** hook from PMA1 HR 0013
   ❑ √Gate closed, hook locked, reels unlocked, release RET
3. Translate to FGB zenith from stbd side
4. Retrieve Node 1 fwd bundle (J138A) from EV1

CAUTION
Avoid inadvertent contact with WETA antenna on NOD1 and spare SASA hi-gain and lo-gain antennas on Z1 stbd

WARNING
E/L HR 0537 has MMOD strike

5. Translate to Node 1 fwd endcone under Rat's nest while routing cable
   ❑ Fwd/stbd to Node 1
   ❑ Fwd along E/L, over HPGTs
   ❑ Port onto Node 1 fwd endcone

NOD1/FGB CH 2/3 CABLE INSTALL (STBD) (01:05) (Cont)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
	14. Translate to PMA1/FGB zenith connector panel	NOTE Best worksite position is inverted; Right hand on connector, Left hand on tray 6. Demate W32B cable connector P138 from Node 1 J638; do not mate P138A ❑ W32B P138 ←|→ NOD1 J638
2. ❑ P669 demated ❑ P138 demated Give **EV1 GO** for demate of P19 and 20  3. ❑ P20A mated Give **EV2 GO** to mate J138A	15. On **IV GO**: Demate FGB P19 and P20 connectors from PMA1/FGB panel (zenith) ❑ FGB P19 ←|→ PMA1 J19 ❑ FGB P20 ←|→ PMA1 J20 16. Pull FGB P19 cable out from under SVS target ❑ Release cable (P21/P20) as reqd from broom clip to provide additional slack ❑ If need to demate P21, contact **MCC-H** 17. Remove cap from FGB Y-cable connector J20A 18. Mate stbd FGB cable connector J20A to FGB P20 ❑ √Good pins & EMI band; no FOD ❑ FGB J20A →|← FGB P20 19. Install cap on FGB J20 20. Route P19 cable port under FGB HR toward PDGF (HR 1030) 21. Remove MLI cap from PDGF harness connector J19 (lanyarded) 22. Mate PDGF harness J19 to FGB P19 ❑ √Good pins & EMI band; no FOD ❑ PDGF J19 →|← FGB P19 23. Move dust cover in place around mated connector; adjust wire tie as reqd ❑ Verify no metal portion of connectors is exposed	7. Remove cap from FGB cable connector J138A 8. Install cap on Node 1 J638 9. Stand by for **IV GO** on connector mating ops  10. On **IV GO**: Mate FGB cable connector J138A to floating cable connector P138 ❑ √Good pins & EMI band; no FOD ❑ FGB J138A →|← P138 11. Wire tie cable at following HRs as translate back to PMA1: ❑ Node 1 HR 0130 (fwd/stbd – J138A wire tie) ❑ Node 1 HR 0122 (aft/stbd – low profile wire tie) (near Z1 pool handle) Position cable so that it is as flush as possible to Node 1 stbd ❑ Node 1 HR 0102 (low profile wire tie) ❑ PMA1 HR 0001 – any excess slack

NOD1/FGB CH 2/3 CABLE INSTALL (STBD) (01:05) (Cont)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
	24. Retrieve caps from C/L bag 25. Install caps on FGB J18 and J19 26. Translate nadir to Node 1 aft/nadir 27. Remove cap from FGB cable connector P669A 28. Install cap on floating cable connector P669 29. Mate FGB cable connector P669A to Node 1 J669 ❑ √Good pins & EMI band; no FOD ❑ FGB P669A →|← NOD1 J669	
4. On **EV1 GO**, give **MCC-H GO** to power up FGB Ch 2/3 and P19	30. **Notify IV**, complete with Ch 2/3 and FGB P19 connector ops 31. Wire tie cable at following HRs as translate back to PMA1: ❑ Node 1 HR 0113 (low profile wire tie) 32. Glove Check (Translate to PAMA/PDGF – Cleanup and Photos)	12. Glove Check (Translate to A/L – Tool Stow)

FGB AND PDGF PHOTOS/CLEANUP (00:40)

IV/SSRMS	EV1 (Drew)
Planned PET 04:50	CAUTION Avoid inadvertent contact with grapple fixture shaft PHOTOS/CLEANUP (00:10) 1. Take photos of the following FGB Thruster areas, as daylight and worksite access permit: ❑ Entire FGB port thruster cluster: Multiple angles ❑ Individual thrusters: Exterior cone ❑ Individual thrusters: Interior nozzle and throat 2. Inspect cabling around FGB PDGF; ensure cables clear of mating interfaces and plane; use wire ties as reqd to secure cables in place 3. Wire tie any excess slack in any cabling 4. Take photos of following PDGF areas, as daylight and worksite access permit: ❑ PDGF worksite closeout ❑ Cable routing ❑ PDGF mating surface clearance CLEANUP (00:30) 5. Retrieve grapple shaft cover/wire tie/RET from PDGF; stow in Med ORU bag 6. Retrieve gap spanner; stow in Med ORU bag 7. Perform bag inventory of Med ORU bag 8. Stow Med ORU bag on BRT w/RET
1. Perform bag inventories: (Ref FS 7-___ for Final Inventories)	9. Translate to A/L 10. Stow Med ORU bag near A/L 11. Translate to FGB zenith, C/L bag 12. Perform bag inventory of C/L bag 13. Stow C/L bag inside Node 3 Cable bag 14. Close Node 3 Cable bag, stow on BRT w/RET 15. Translate to A/L 16. Open hatch thermal cover 17. Stow bags in A/L: ❑ Med ORU bag ❑ Node 3 Cable bag w/C/L bag 18. Close hatch thermal cover (Translate to P3 Bay 20 - STP-H3 Photos)

A/L TOOLBOX TOOL STOW (00:40)

IV/SSRMS	EV2 (Spanky)
Planned PET 04:50	A/L TOOLBOX TOOL STOW (00:40) 1. Translate to A/L, watch for EV1 ST 2. Open hatch thermal cover 3. Retrieve Tool Stow C/L bag 4. Close hatch thermal cover 5. Translate to A/L Toolboxes NOTE Tether to toolboard prior to removal 6. Stow C/L bag on stbd/nadir door 7. Retrieve and temp stow fish stringer 8. Stow following tools in the Port A/L Toolbox (figs 1-2): ❑ Behind Zenith Door – Slot 1 (fig 3) ❑ Pin Straightener ❑ Behind Nadir Door – Slot 5 (figs 4-7) ❑ Short MMOD T-handle tool (tether point aligned with angled slot) ❑ Short MMOD T-handle tool (tether point aligned with angled slot) 9. Close both doors ❑ Verify at least one lever in lock position for each door NOTE Tether to toolboard prior to removal 10. Stow following tools in Starboard A/L Toolbox (fig 8): ❑ Inside Zenith Door – Panel 9 (fig 9) ❑ Probe ❑ Behind Zenith Door – Slot 5 (fig 10) ❑ Vise Grips 11. Close door ❑ Verify at least one lever in lock position 12. Stow fish stringer in C/L bag 13. Translate zenith to stbd FQD bag 14. Open stbd Fluid QD bag (stbd/aft corner) 15. Stow 1" QD cap tool in FQD bag 16. Close Fluid QD bag √Velcro secure 17. Stow Tool Stow C/L bag on BRT w/RET (Translate to ELC3 – HPGT MLI Install)

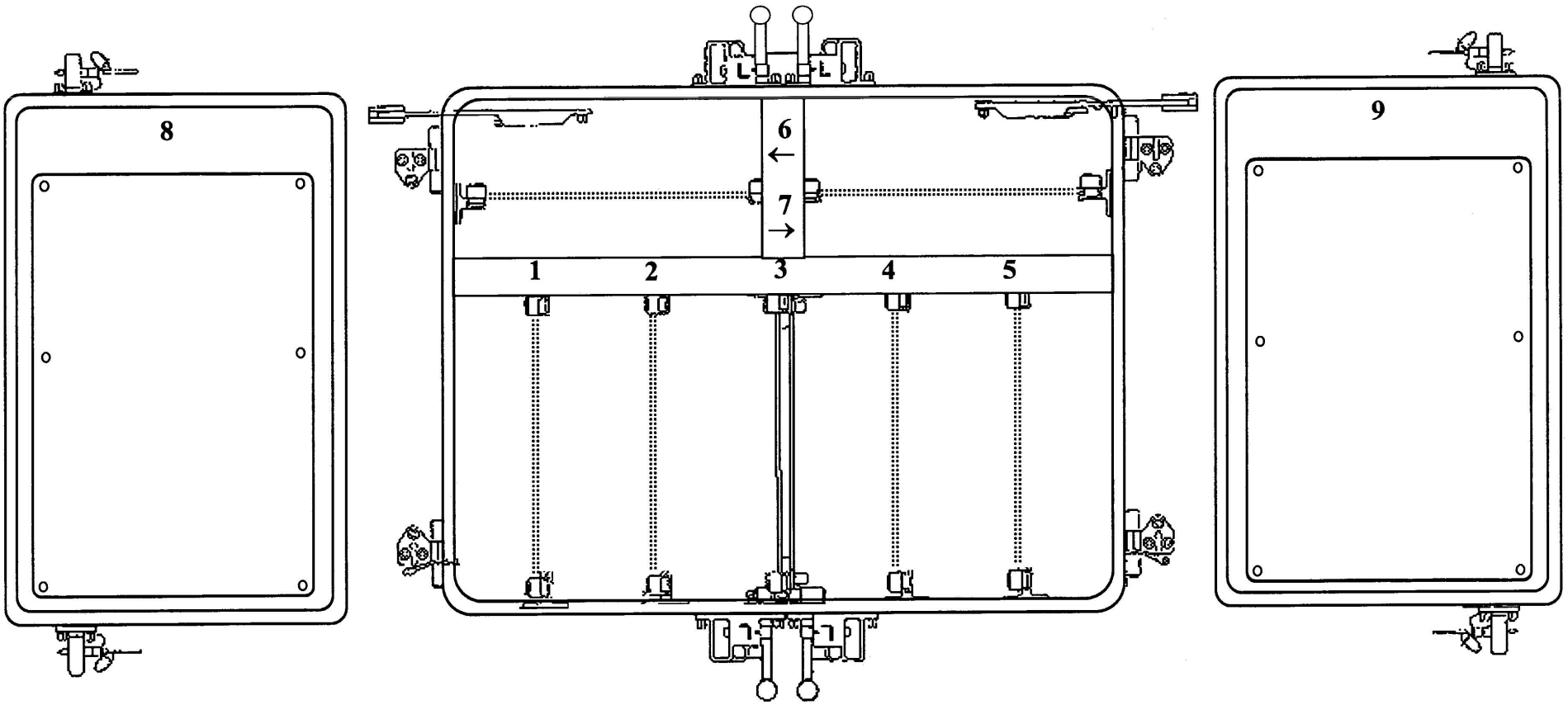


Figure 1.- A/L Toolbox Panel and Slot Labels.

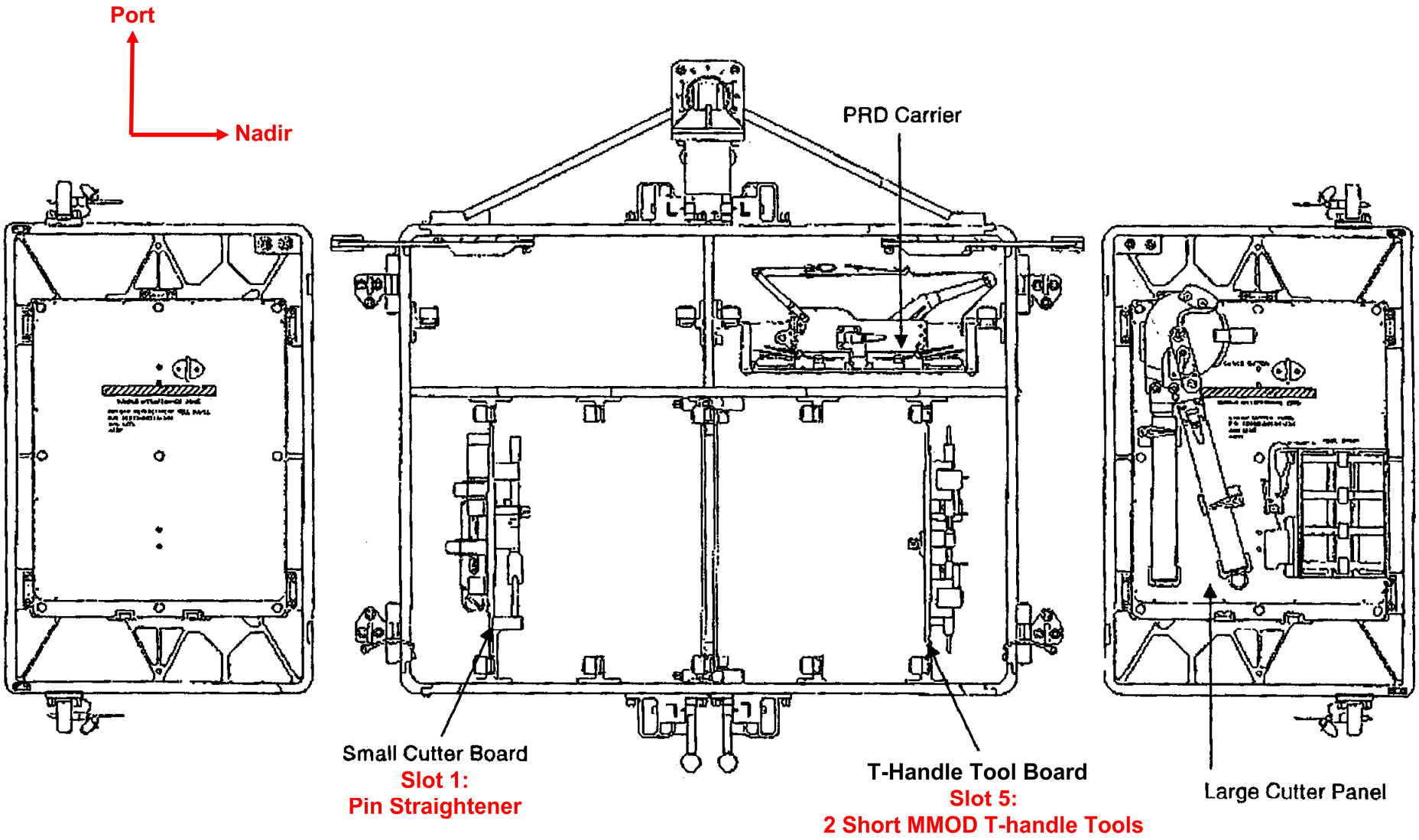


Figure 2.- A/L Toolbox 2 Port.

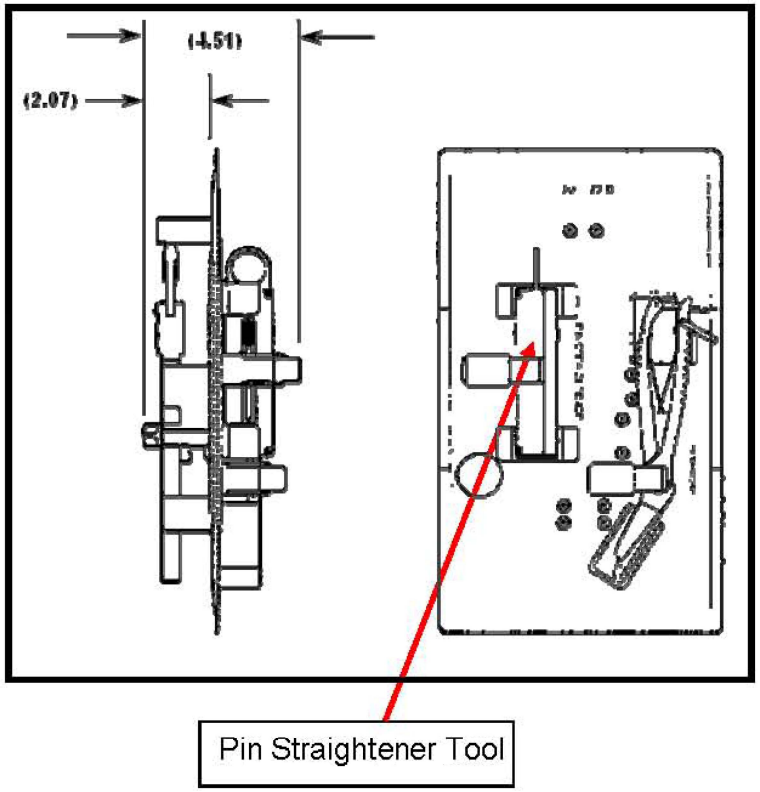


Figure 3.- Small Cutter Board.

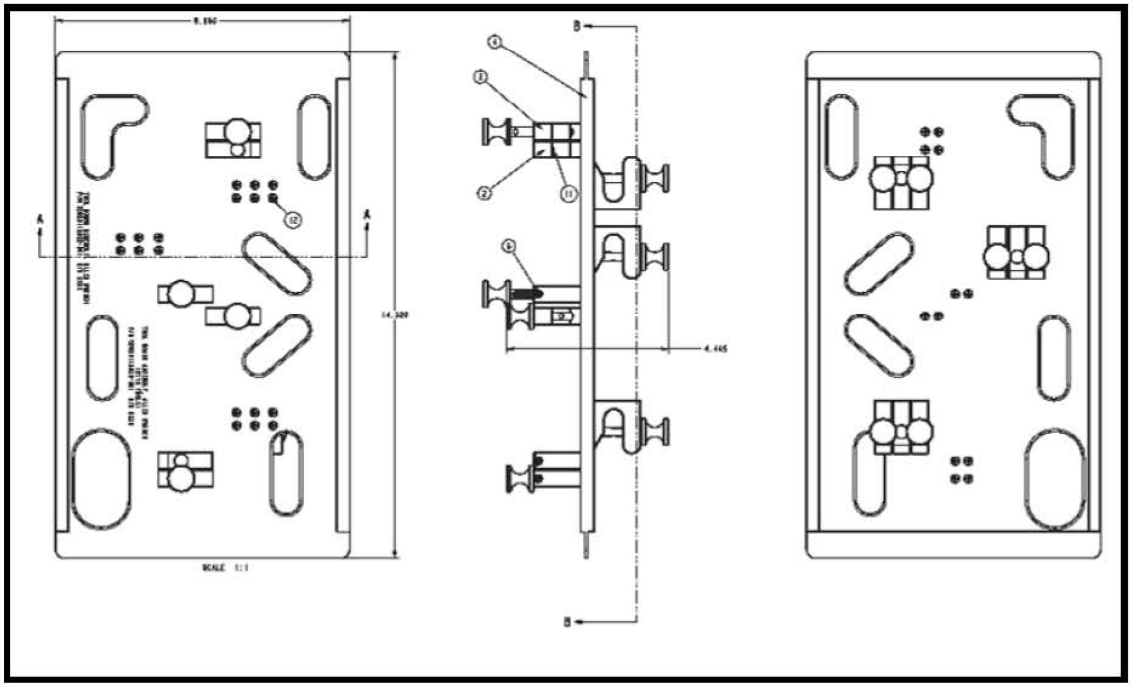
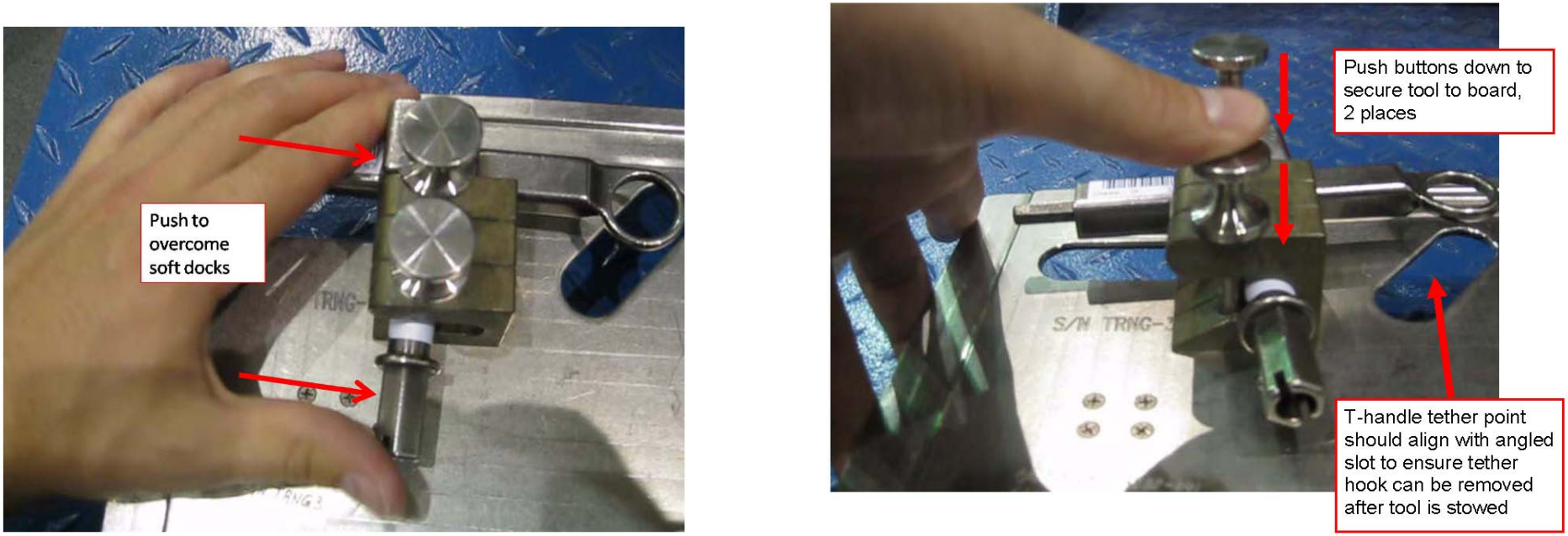


Figure 4.- T-Handle Tool Board.



Figures 5-6.- T-Handle Tool Board Operation.

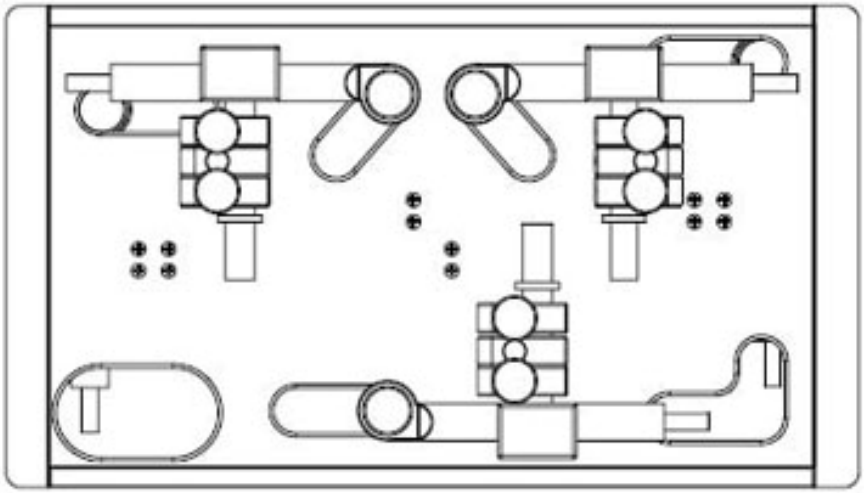


Figure 7.- T-Handle Tools Stowed on Tool Board.

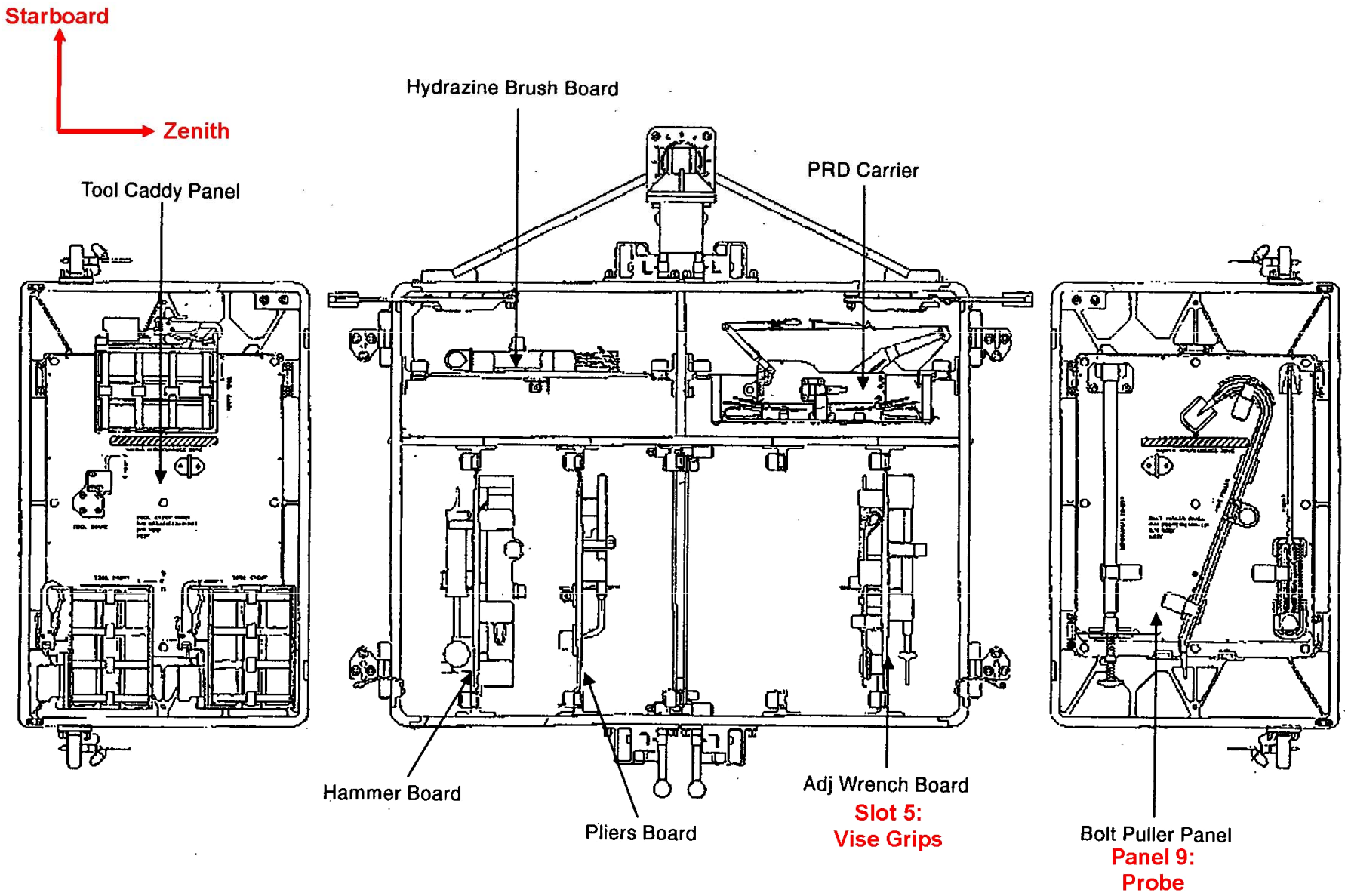


Figure 8.- A/L Toolbox 1 Stbd.

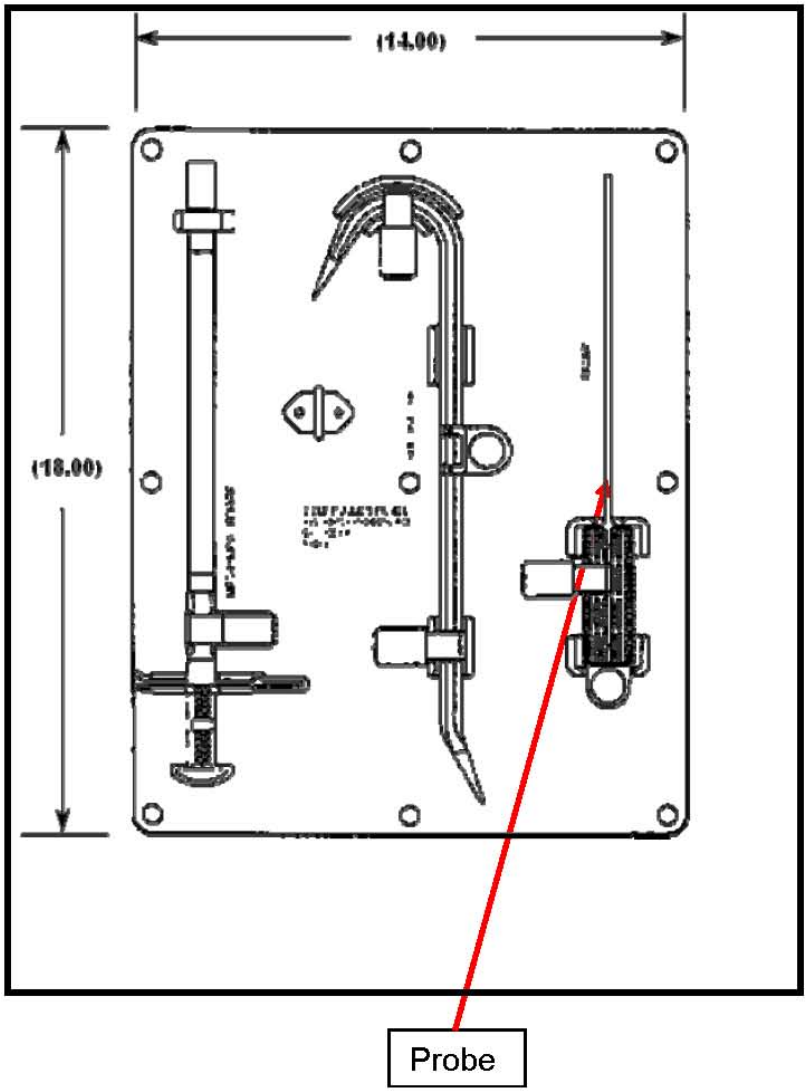


Figure 9.- Bolt Puller Panel.

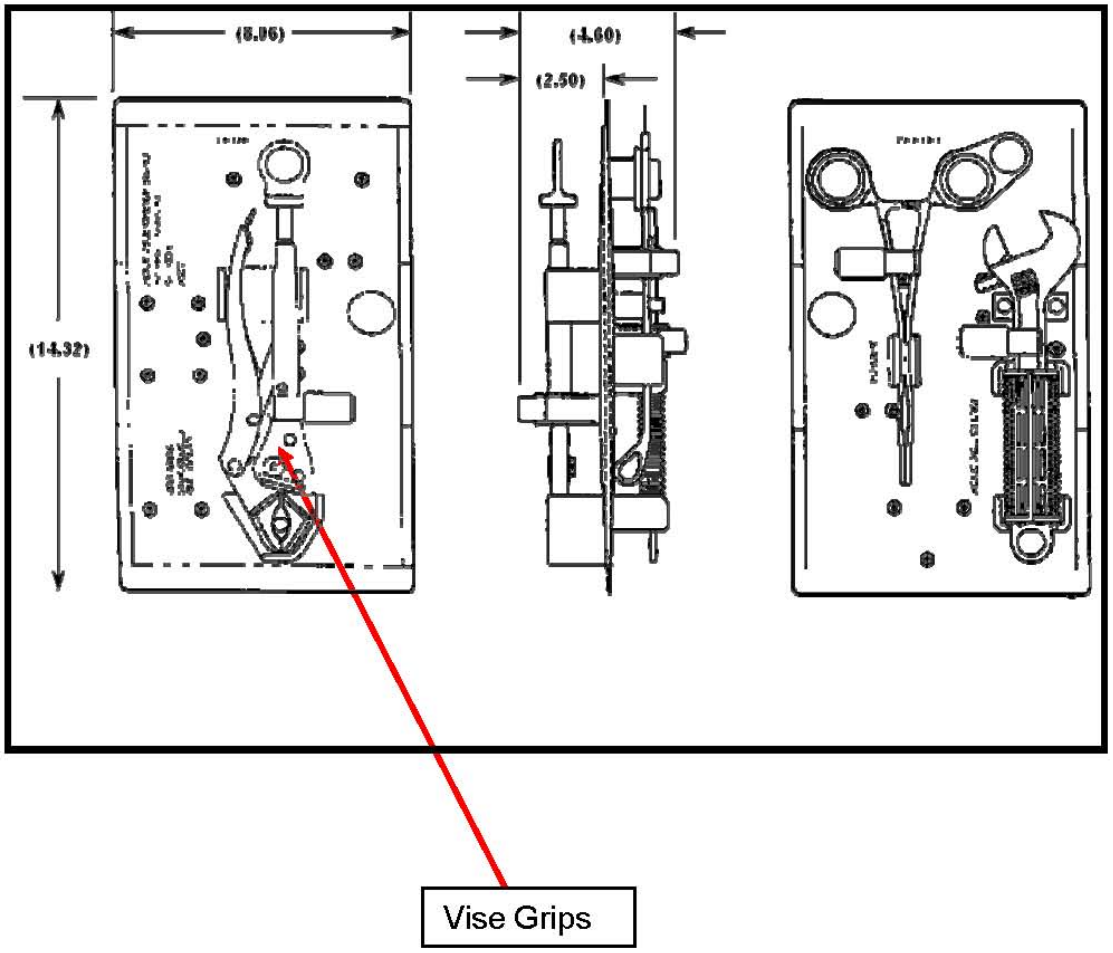
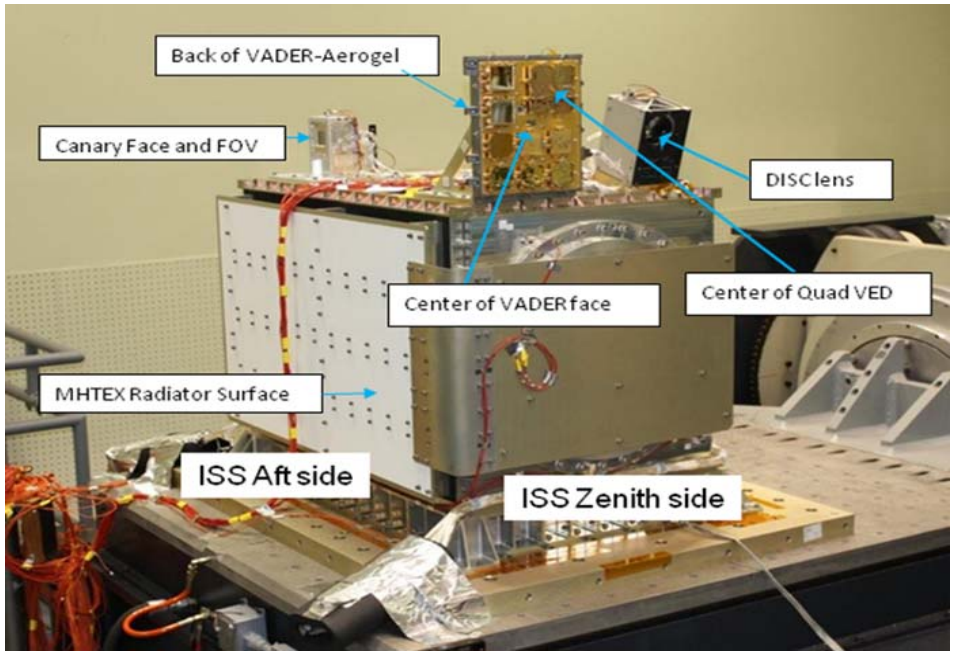


Figure 10.- Adjustable Wrench Board.

HPGT FRGF MLI INSTALL (00:30)

IV/SSRMS	EV2
Planned PET 05:30 1. Verify inhibits in place √PSARJ locked	CAUTION Avoid inadvertent contact with SASA's hi-gain and lo-gain Antennas HPGT FRGF MLI INSTALL (00:30) 1. Translate to P3, Bay 20 – nadir route 2. Attach **GREEN** hook to CETA rail Xo 10230 ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate to HPGT (outbd, fwd on ELC3) 4. Retrieve MLI from C/L bag 5. Install MLI on HPGT FRGF (T at 1 o'clock) 6. Stow wire tie in trash bag or C/L bag 7. Glove Check 8. Retrieve **GREEN** hook from Xo 10230 ❑ √Gate closed, hook locked, reels unlocked, release RET (Translate to A/L)

STP-H3 PHOTOS (00:30)

IV/SSRMS	EV1
Planned PET 05:30 1. Verify inhibits in place √PSARJ locked	CAUTION Top of STP-H3 is a KOZ Avoid inadvertent contact with MHTEX radiator – Z93 paint STP-H3 PHOTOS (00:30) 1. Translate to P1 Bay 18 – zenith route 2. Attach **GREEN** hook to P1 HR 3681 ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate to STP-H3 (outbd aft, zenith on ELC3) 4. 📷 Take photos of STP-H3 ❑ VADER back side (nadir) ❑ Canary Face (aft) ❑ MHTEX Radiator Surface (aft) 5. If additional time allows, also take photos of: ❑ Front of VADER ❑ DISC lens 6. Retrieve **GREEN** hook from P1 HR 3681 ❑ √Gate closed, hook locked, reels unlocked, release RET 7. Glove Check (Translate to A/L) 

EVA 3 CLEANUP/INGRESS (00:30)

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
Planned PET 06:00 1. Perform Tool and Bag Inventories: (Ref FS 7-__ for Final Inventories) 2. Start Hatch Thermal Cover clock PET (30 min) __ : __ 3. Prior to hatch closure, perform WVS PWRDN (PHOTO/TV, WVS Cue Card) 4. Stop Hatch Thermal Cover clock PET (30 min) __ : __	CLEANUP (00:15) 1. Translate to A/L 2. Perform MWS tool inventory INGRESS (00:15) 3. On **EV2 GO**, RET to EV2 STP, release **RED** hook and attach to aft ext D-ring ❑ √Gate closed, hook locked, reels unlocked, release RET 4. Attach R Waist Tether to A/L int D-ring ext ❑ √Gate closed, hook locked 5. RET to STP, release **RED** hook and attach to curved HR, fwd/stbd stanchion ❑ √Gate closed, hook locked, reels unlocked, release RET 6. Ingress A/L 7. Close thermal cover; attach Velcro strap 8. Remove SCU from stowage pouch 9. Remove DCM cover; Velcro to DCM 10. Connect SCU to DCM; √SCU locked NOTE A TCV setting 8 – Max C minimizes time for SCU cooling 11. WATER – OFF (fwd), expect H2O IS OFF msg CAUTION Do not close hatch until EMU Water OFF for 2 min. Verify outer hatch clear of hardware 12. Verify outer hatch clear of hardware 13. Verify handle position per hatch decal 14. Close and lock hatch Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)	CLEANUP (00:15) 1. Translate to A/L ❑ Fairlead on Equip Lock HR 0500 2. Perform MWS tool inventory INGRESS (00:15) 3. Open hatch thermal cover 4. Stow Tool Stow C/L bag in A/L 5. Attach R Waist Tether to UIA D-ring ❑ √Gate closed, hook locked 6. Ingress A/L 7. Give **EV1 GO** to release EV2 **RED** hook 8. Remove SCU from stowage pouch 9. Remove DCM cover; Velcro to DCM 10. Connect SCU to DCM; √SCU locked NOTE A TCV setting 8 – Max C minimizes time for SCU cooling 11. WATER – OFF (fwd), expect H2O IS OFF msg Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)

PDGF SETUP – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:45
Two EV Crew	N/A	00:25

Tools:

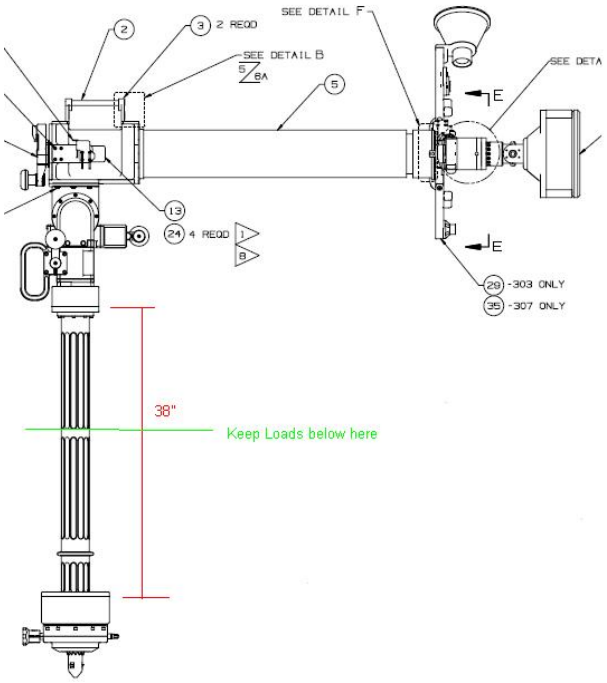
EV1	EV2
2 Long Wire Ties	Russian Ratchet Wrench
ISS Small Trash Bag	ISS Small Trash Bag
	Pre-configured Long Wire Tie
	72" Gap Spanner

Notes:

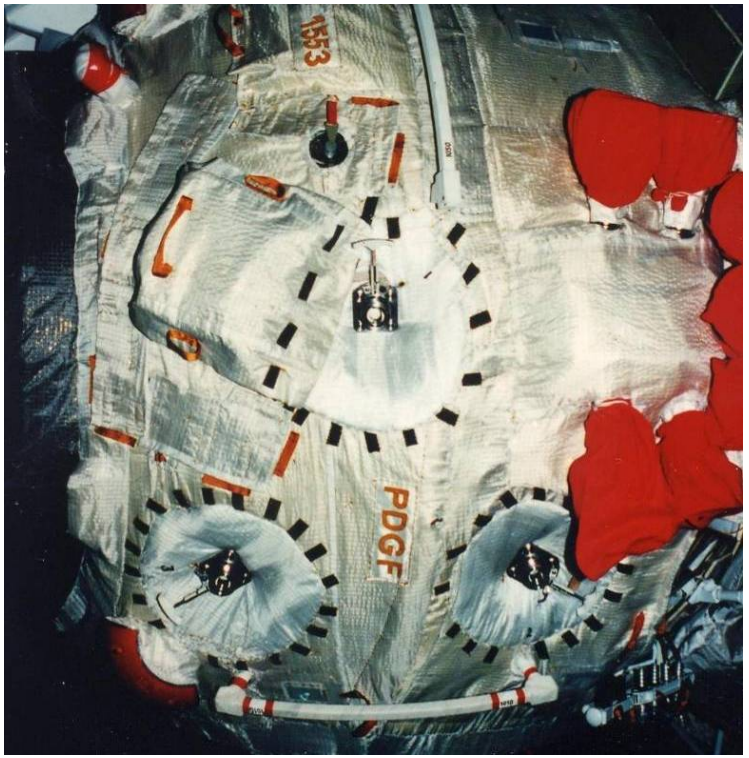
1. If PAMA does not get installed, will need to reinstall MLI
2. Gap Spanner will go around Russian HR and back onto its strap

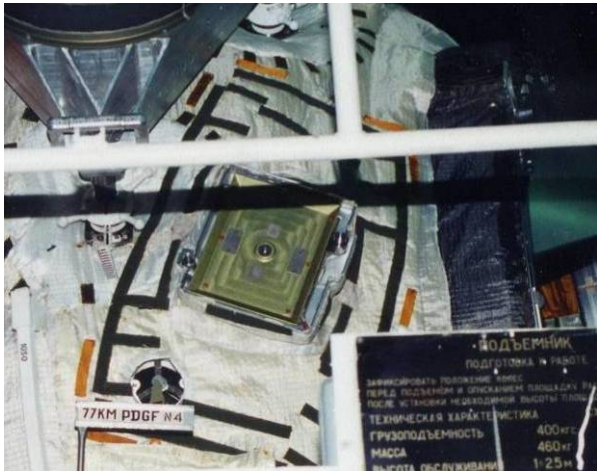
Caution:

1. OTD (Crane) can handle EVA translation loads up to 22" from WIF

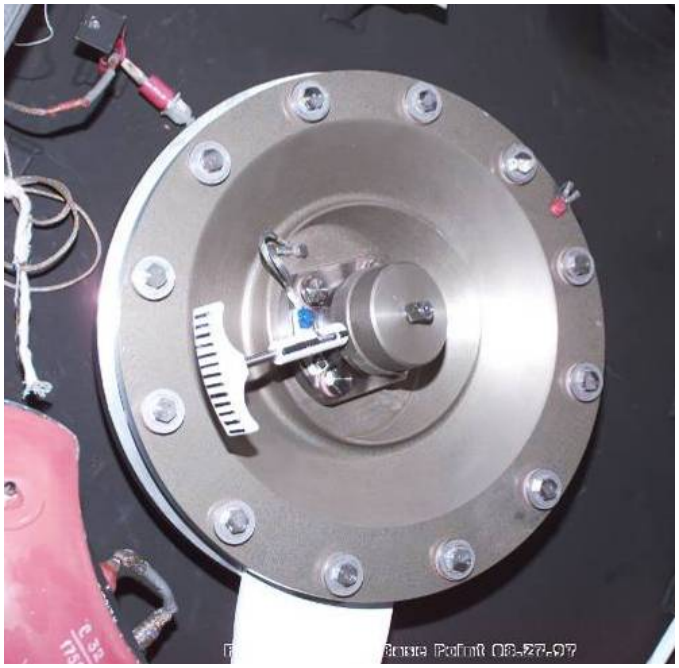


PDGF SETUP – TASK DATA (Cont)





PDGF SETUP – TASK DATA (Cont)



FGB PAMA/PDGF INSTALL – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	00:35

Tools:

EV2
Russian Cheater Bar

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
PAMA Foot	1/2/3	N/A	3	N/A	N/A	N/A	3-4	N/A

EVA Connectors:

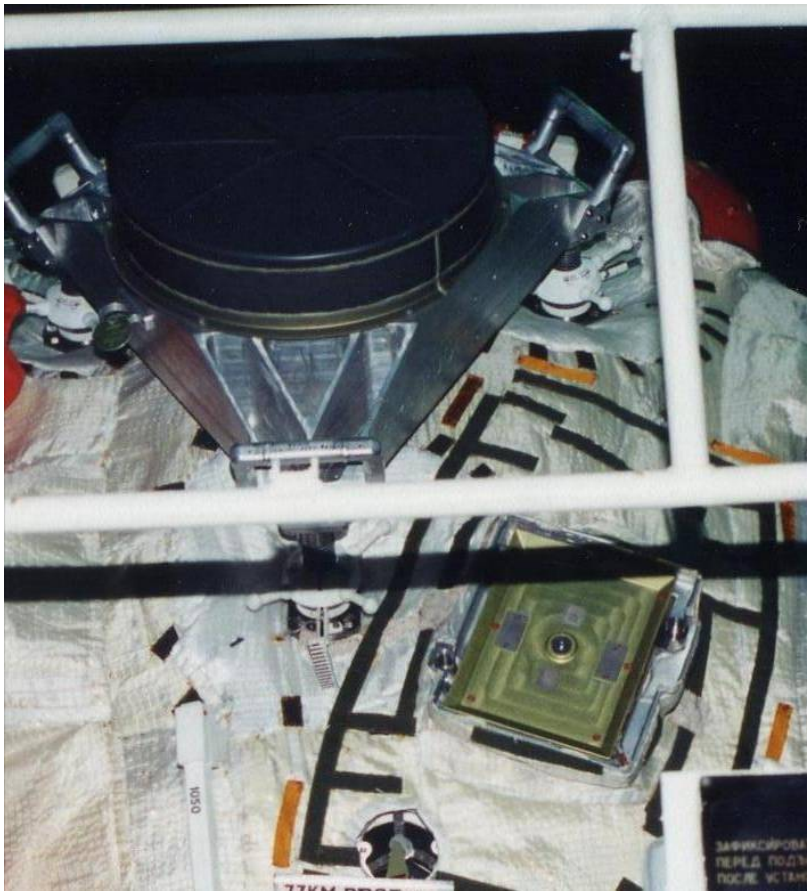
Connector	To	Size	Function
P2	VSC J2	15	VSC Pri Power
P3	VSC J3	15	VSC Alt Power
P4	VSC J4	15	VSC Coax
P5	PDGF		PDGF Pri Video/Data
P6	PDGF		PDGF Alt Video/Data
P7	PDGF		PDGF Pri Power
P8	PDGF		PDGF Alt Power
J18	FGB P18	25	FGB Alt Power
J19	FGB P19	25	FGB Pri Power
1800-X53	1553 J53		FGB Alt Data
1800-X54	1553 J54		FGB Prime Data

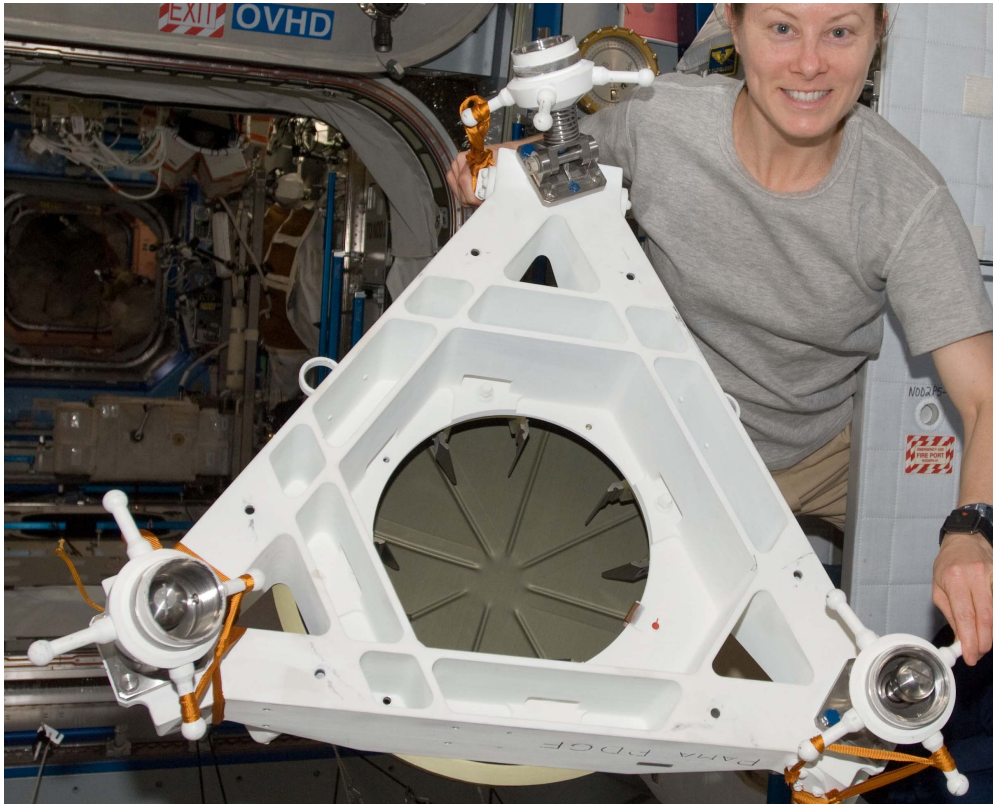
Notes:

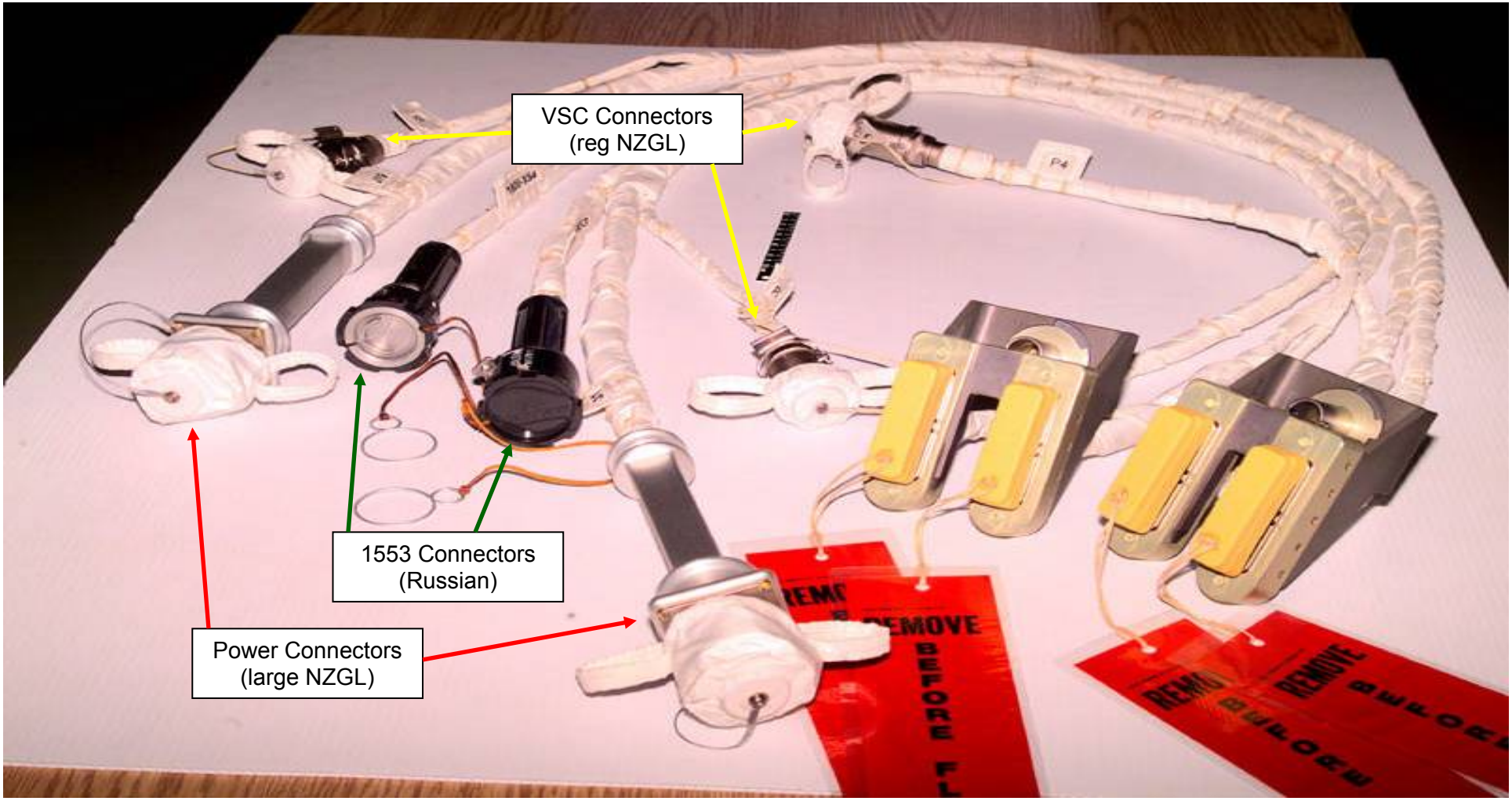
1. Crew will soft dock feet in 1-3-2 order. They will hand tighten feet in desired order of 1-2-3. If reqd, order of 1-3-2 is also acceptable
2. PAMA feet engage with double threads. 3-4 turns should bring the foot to a hardstop
3. Crane loads:
   – 125 lbf inadvertent kick load no higher than 33" up the OTD mast
   – 187 lbf translation load no higher than 22" up on the OTD mast
   – Stanchion portion is 38" so keep translation on the lower half of stanchion

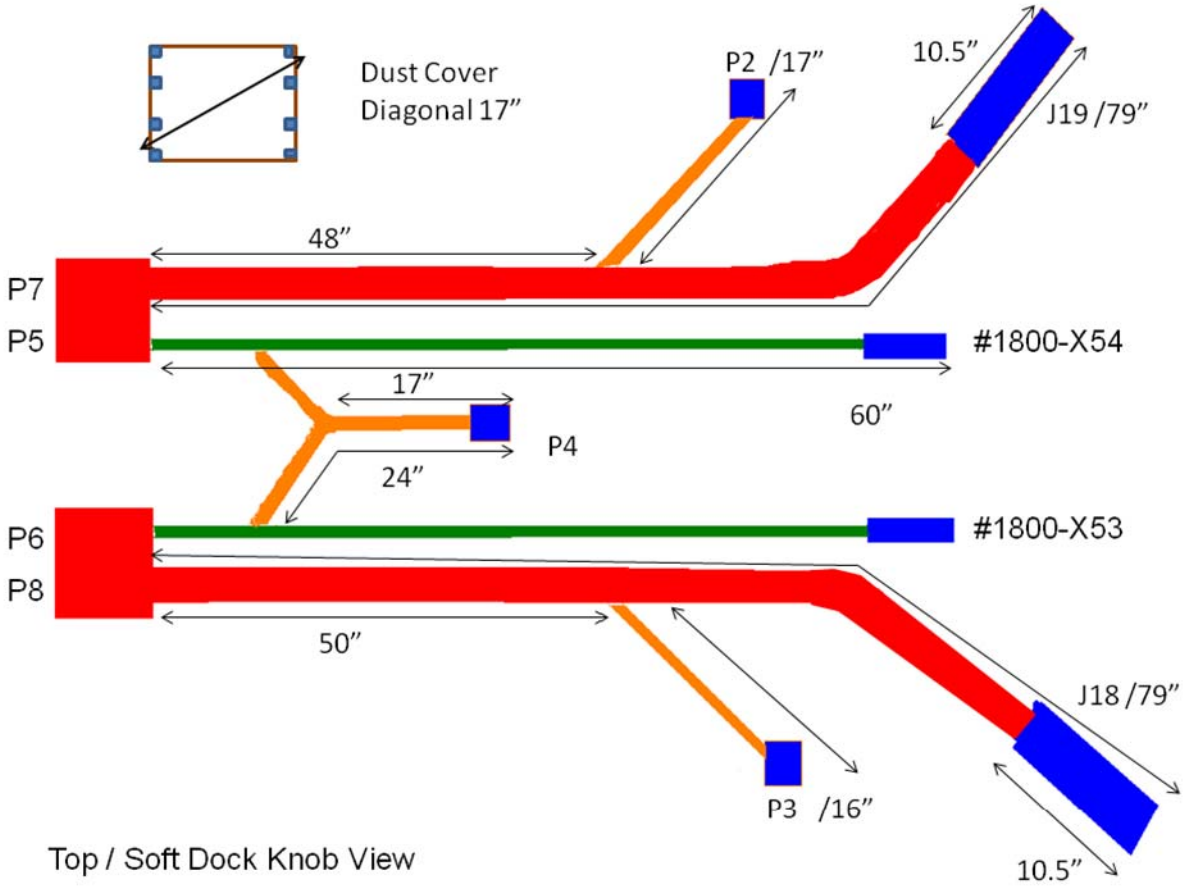
FGB PAMA/PDGF INSTALL – TASK DATA (Cont)

FGB PAMA/PDGF INSTALL – TASK DATA (Cont)






VSC Connectors
(reg NZGL)
1553 Connectors
(Russian)
Power Connectors
(large NZGL)


Dust Cover
Diagonal 17”
P2 /17”
10.5”
J19 /79”
48”
P7
P5
#1800-X54
17”
60”
P4
24”
P6
P8
#1800-X53
50”
J18 /79”
P3 /16”
10.5”
Top / Soft Dock Knob View

VSC INSTALL – TASK DATA

Estimated Task Duration:

	With SSRMS	Without SSRMS
One EV Crew	N/A	00:45
Two EV Crew	N/A	00:30

Tools:

EV1/2
PGT 6-ext 7/16
VSC Thermal Cover
Russian Tether

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
VSC Bolt	7/16	1	9.0	13.0	19.9	11

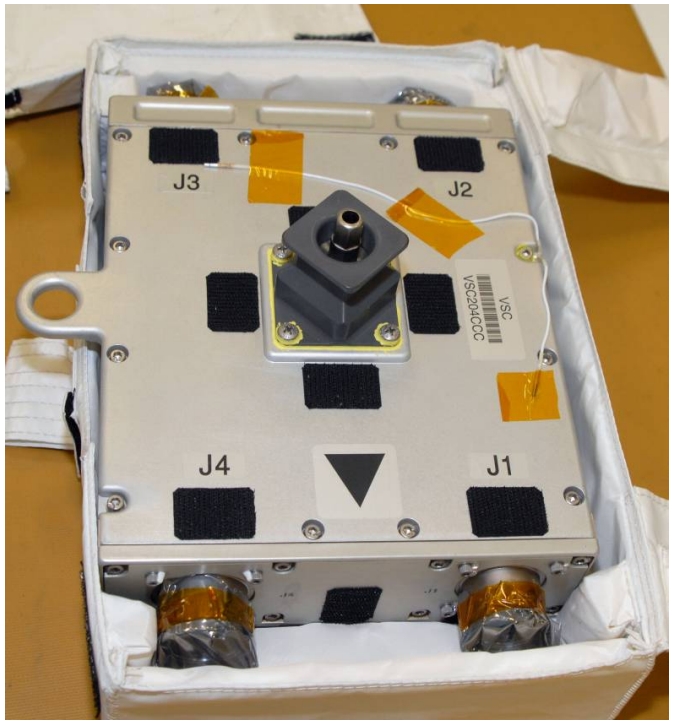
EVA Connectors:

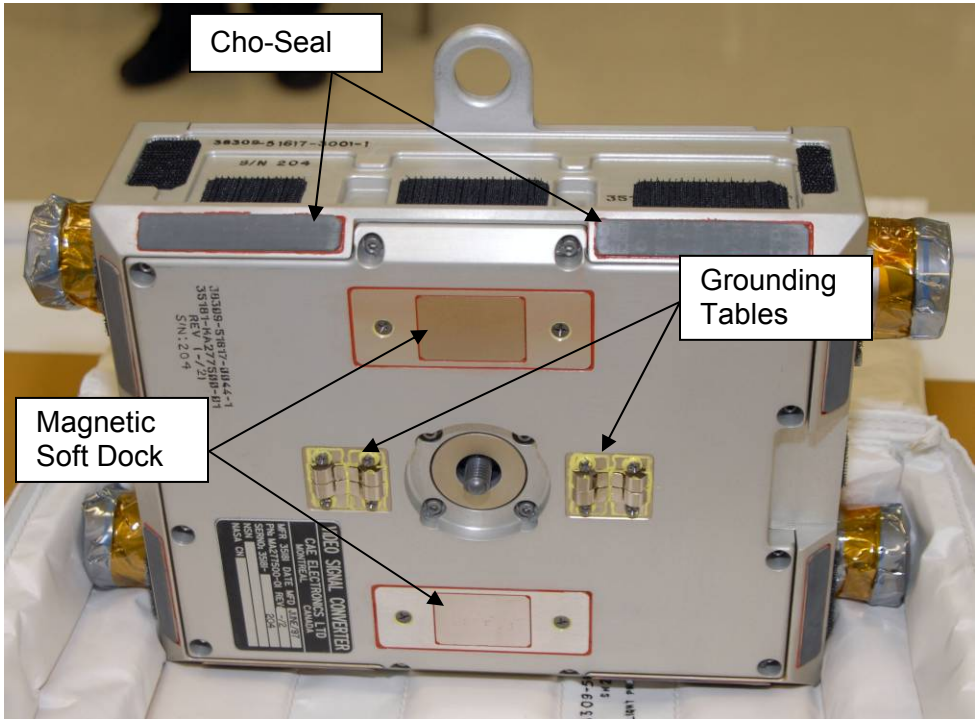
Connector	To	Size	Function
FO Cable P1	VSC J1	15	VSC Fiber Optic
PDGF P2	VSC J2	15	VSC Pri Power
PDGF P3	VSC J3	15	VSC Alt Power
PDGF P4	VSC J4	15	VSC Coax
P1	VSC J1	15	VSC Fiber Optic
P184	S0 J184	15	VSC Fiber Optic
P187	S0 J187	15	VSC Fiber Optic
P191	S0 J191	15	VSC Fiber Optic

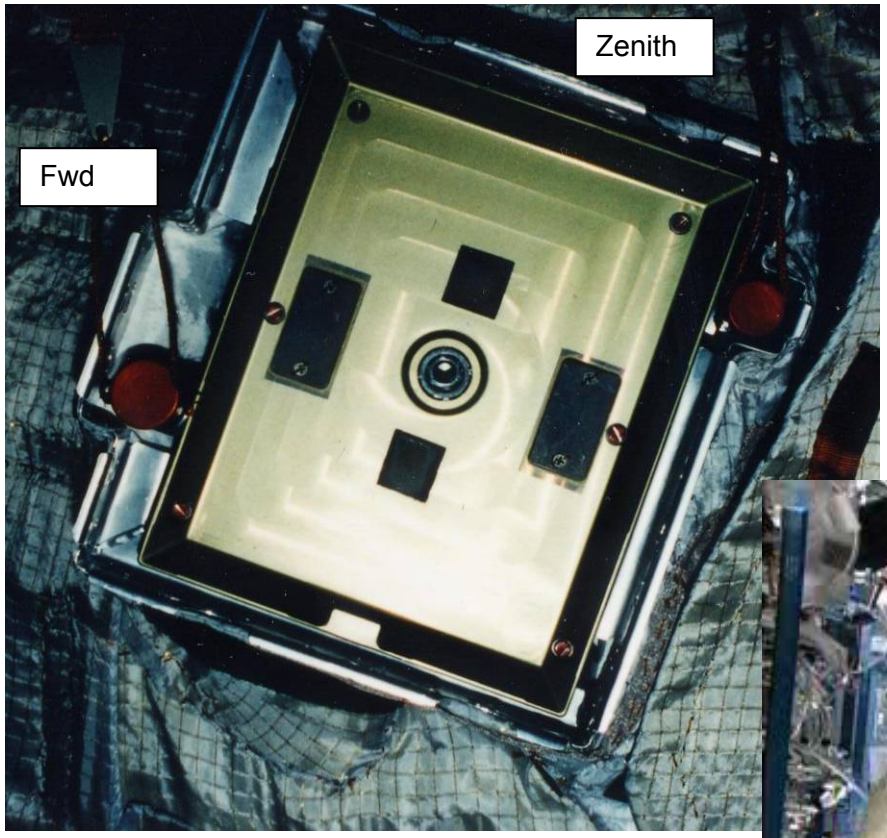
Notes:

1. VSC soft dock feature is magnetic
2. VSC installs with tether point ISS fwd
3. VSC thermal cover installs with double lines nadir, single line zenith

VSC INSTALL – TASK DATA (Cont)






Zenith
Fwd


Zenith

POWER CABLES – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:30
Two EV Crew	N/A	N/A

Tools:

EV2
Dust covers (2 – pre-installed on harness)
Dust caps (2) size 25

EVA Connectors:

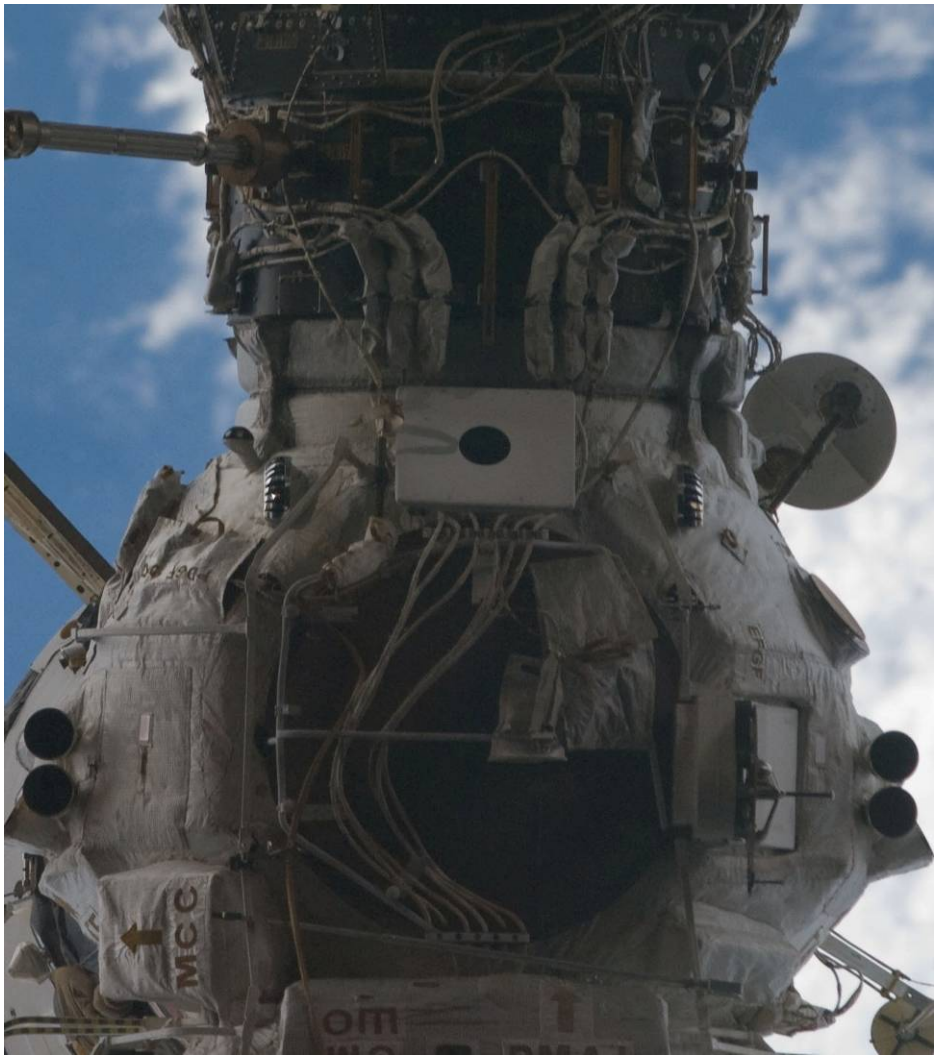
Connector	To	Size	Function
FGB P16	PMA1 J16	25	
FGB P18	PMA1 J18	25	
FGB P19	PMA1 J19	25	
FGB P21	PMA1 J21	25	
PDGF Harness			
J18	FGB P18	25	FGB Alt Power
J19	FGB P19	25	FGB Pri Power

Notes:

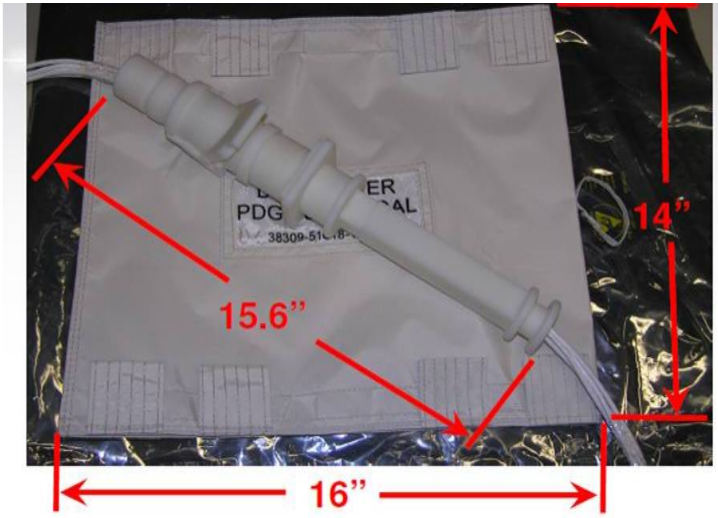
1. Dust covers pre-installed over harness power cables
2. If there is not enough slack to route P18 or P19 from under the SVS target, use P18 Routing Contingency or P19 Routing Contingency pages to temporarily demate additional cables for increased access to P18 or P19 cables
3. If dust covers do not fully cover all metal portions of connectors, dust covers should be placed in series per cribsheet steps and cables remated with both P18 and P19 connections stowed inside single longer dust cover

Timeline Considerations:

1. Wire tie power cables to FGB handrail after both VSC and power cable connections complete



POWER CABLES – TASK DATA (Cont)



1553 DATA CABLE – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	01:30
Two EV Crew	N/A	00:45

Tools:

EV1	EV2
FPP thermal booties (2)	Fish stringer
Wire ties	

EVA Connectors:

Connector	To	Size	Function
1553 Cables			
P1	J1 FGB	15	Bus A
P2	J2 FGB	15	Bus B
J53	1800-X53	male	Bus B
J54	1800-X54	female	Bus A
PDGF Harness			
1800-X53	1553 J53	female	FGB Alt Data
1800-X54	1553 J54	male	FGB Prime Data

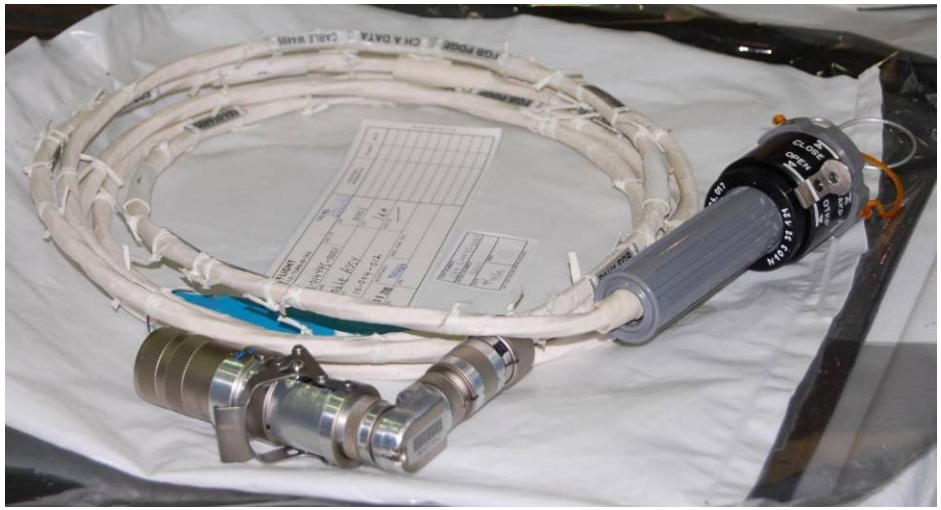
Notes:

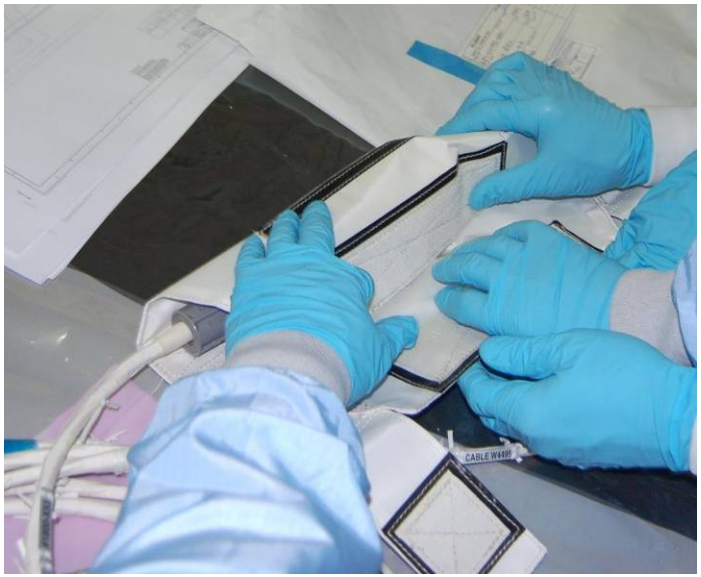
1. 1553 cables were taped together into a single bundle along middle of cable length First tape location on Russian connector side is located approximately 2 ft from connector; first tape location on NZGL connector side is located approximately 5 ft from connector

Timeline Considerations:

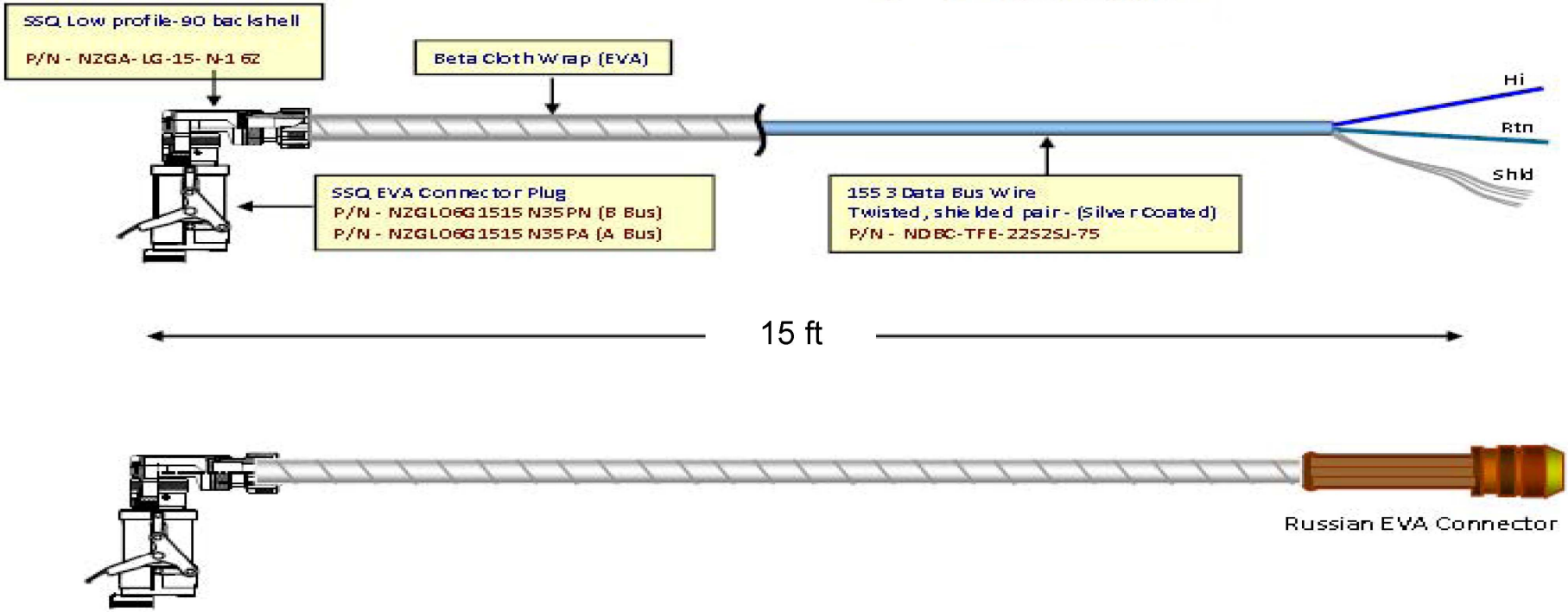
1. Although nominal timeline has extra 1553 cable slack stowed on PAMA HR 0006 and Node 1 HR 0118, Node 1 HR 0106 as well as Node 3 HR 0673 are acceptable tie-down points as well

1553 DATA CABLE – TASK DATA (Cont)





1553 DATA CABLE – TASK DATA (Cont)



NOD1/FGB CH 1/4 AND CH 2/3 CABLES INSTALL – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	04:00
Two EV Crew	N/A	02:00

EVA Connectors:

Harness	From	To	Conn Size	Function
Ch 1/4 Cable (port)				
J17A	Cap	FGB P17	25	
P661A	Cap	NOD1 J661	25	
J131A	Cap	W36B-P131	25	
Existing Cables				
FGB P17	PMA P17	Ch 1/4 J17A	25	
W36B-P131	NOD1 J631	Ch 1/4 J131A	25	
PMA1 W1101 P661	NOD1 J661	Cap	25	
Ch 2/3 Cable (stbd)				
J20A	Cap	FGB P20	25	
P669A	Cap	NOD1 J669	25	
J138A	Cap	W32B-P138	25	
Existing Cables				
FGB P20	PMA P20	Ch 2/3 J20A	25	
W32B-P138	NOD1 J638	Ch 2/3 J138A	25	
PMA1 W1102 P669	NOD1 J669	Cap	25	

ORU Details:

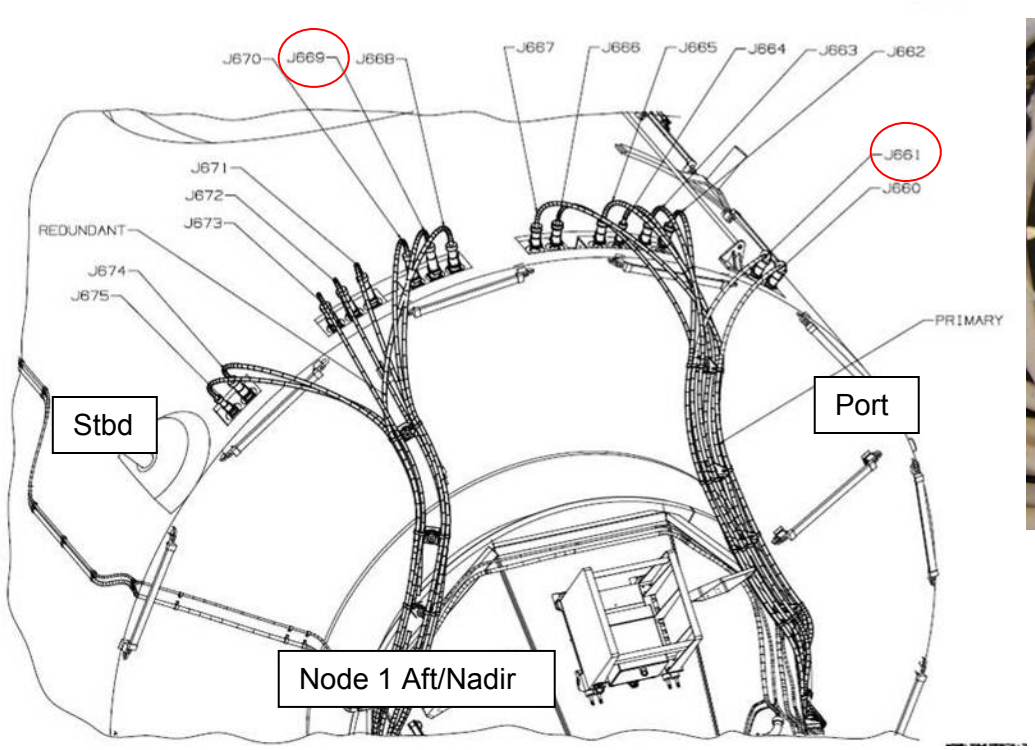
	Part Number	Mass
Ch 1/4 Cable	684-015283	25.13 lb
Ch 2/3 Cable	684-015284	25.13 lb

Notes:

1. Cables have minimum bend radius of 4.9" for J17A/J20A and 4.0" for others

Timeline Considerations:

1. Ch 1/4 Inhibits will be removed after Ch 1/4 cable (port) is installed to check connections
   The check will take approximately 45-60 min. During this time, power to both channels will be enabled
   Then Ch 2/3 inhibits will be put in place for Ch 2/3 cable (stbd)

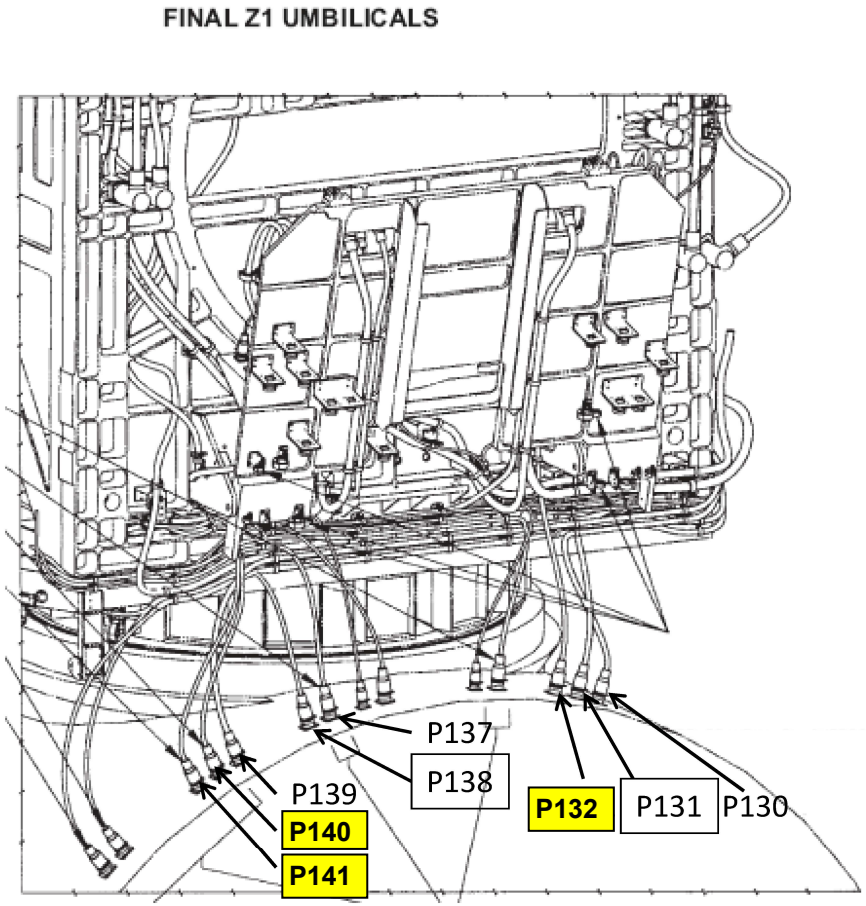

J670
J669
J668
J667
J666
J665
J664
J663
J662
J661
J660
J671
J672
J673
REDUNDANT
J674
J675
PRIMARY
Stbd
Port
Node 1 Aft/Nadir


P661A


P669A


J17A
J17A/P17


J20A



Connector	Shut Down reqd	Real time?
P130/J630	DDCU Z1-4B	No
P132/J632	RPCM N1 RS1-A 5 and 6	Yes
P137/J637	DDCU Z1-3B	No
P139/J639	DDCU Z1-3B	No
P140/J640	None	Yes
P141/J641	None	Yes

STP-H3 PHOTOS – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:20
Two EV Crew	N/A	00:20

Tools:

EV2
EVA Camera

Notes:

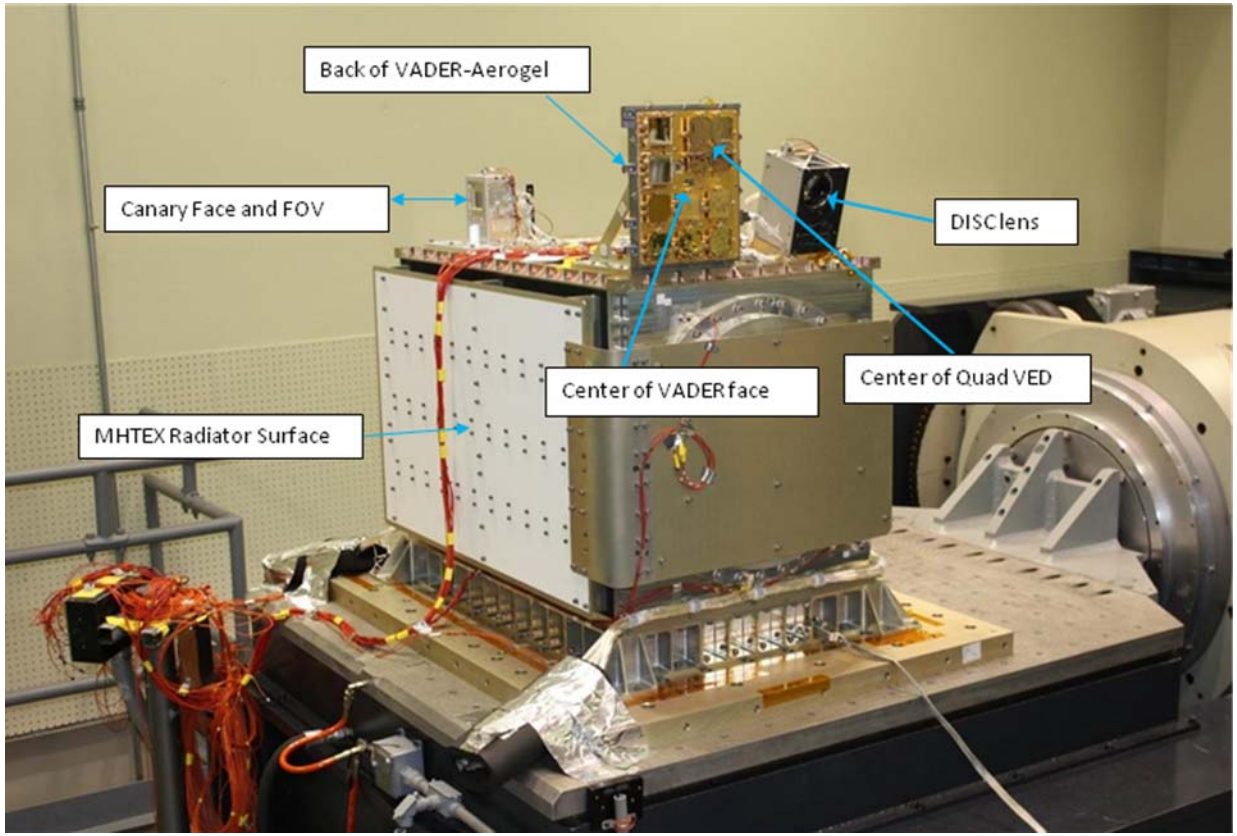
1. EVA Camera during EVA4 has a fish eye lens. This is acceptable for DoD

Cautions:

1. Top of STP-H3 is a KOZ
2. MHTEX Radiator has Z93 paint – avoid inadvertent contact

Timeline Considerations:

1. The following are required by EVA photos:
   - ❑ Canary Face and FOV
   - ❑ Back of VADER
   - ❑ MHTEX Radiator
2. If additional time allows, also take photos of:
   - ❑ Front of VADER
   - ❑ DISC lens



HPGT FRGF MLI INSTALL – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:15
Two EV Crew	N/A	N/A

Tools:

EV3
MLI

Notes:

1. Velcro is outlined with black sharpie
2. "T" located on MLI at the 1 o'clock position
3. MLI helps control ORU temperature

Cautions:

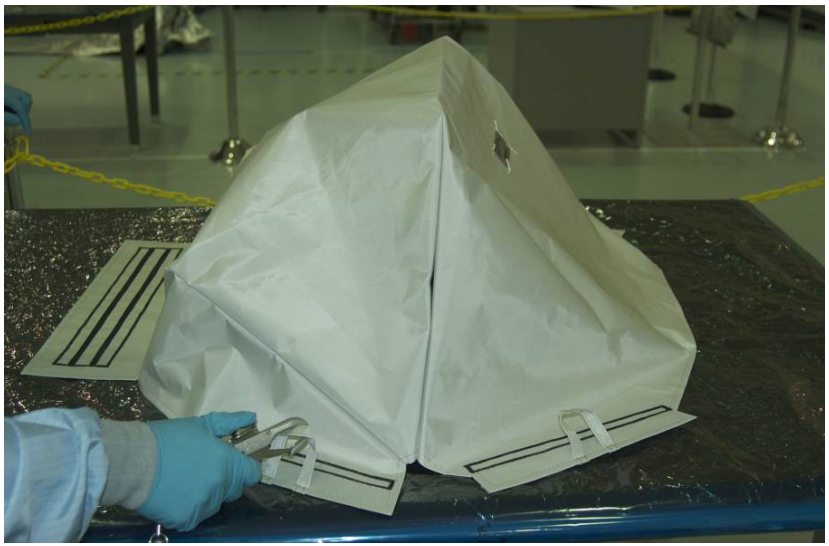
1. Avoid inadvertent contact with the SASA hi-gain and lo-gain antennas

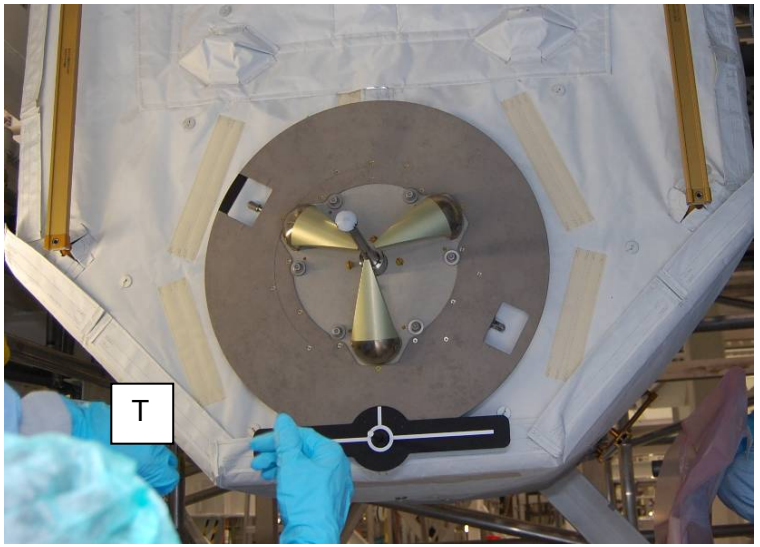
Timeline Considerations:

1. MLI must be installed prior to end of ULF6 mission

ORU Details:

ORU	Part Number	Mass (lb)
HPGT FRGF MLI	683-52338-8	1.59





EVA 4 SUMMARY TIMELINE

PET HR : MIN	IV/SSRMS	EV2 (Fn)	EV3 (Cf)	
00:00	SSRMS: Mnvr to OBSS Stow Setup posn	EGRESS/SETUP (00:35) • Post Depress and Egress (00:20) • Setup (00:15)	EGRESS/SETUP (00:35) • Post Depress and Egress (00:20) • Setup (00:15)	00:00
	SSRMS: Mnvr to Stow GCA Start posn	OBSS STOW (00:55) • OBSS Capture (00:35) • Grounding Connectors Install (00:20)	OBSS STOW (00:55) • OBSS Capture (00:35) • Cleanup (00:20)	
01:00				01:00
	SSRMS: Mnvr to Ingress posn	P6 PDGF RETRIEVE (01:25)	P6 PDGF RETRIEVE (01:25) • PDGF Retrieve (01:15) • APFR Relocate (00:10)	
02:00				02:00
03:00		OBSS EFGF/PDGF SWAP (01:20) • PDGF Handoff (00:20) • EFGF Removal/PDGF Adapter Assy Install (00:25) • PDGF Install (00:25) • Cleanup (00:10)	OBSS EFGF/PDGF SWAP (01:40) • APFR Ingress (00:20) • EFGF Removal/PDGF Adapter Assy Install (00:25) • PDGF Install (00:25) • SSRMS Cleanup (00:30)	03:00
	SSRMS: Mnvr to GF Setup posn			
04:00				04:00
	SSRMS: Mnvr to Egress posn SSRMS: Mnvr to APFR Removal Setup posn	STOW EFGF IN TSA (00:35)	OTP LDTD TETHER CINCH (00:15)	
05:00		SPDM EDF RELEASE (01:10)	SPDM EDF RELEASE (01:10)	05:00
06:00		CLEANUP/INGRESS (00:30) • Cleanup (00:15) • Ingress and Pre-Repress (00:15)	CLEANUP/INGRESS (00:30) • Cleanup (00:15) • Ingress and Pre-Repress (00:15)	06:00
06:30				06:30

EVA 4 TOOL CONFIG

ISS Configuration:

MT @ WS5 CETA Port/Stbd
SSRMS on MBS PDGF 2
SPDM on Lab
PSARJ @ 285°

EV2 STP: S0 port, inbd Strut → A/L aft D-ring
EV3 STP: S0 port, outbd Strut → A/L Curved HR, fwd Stanchion

NOTE: Prior to use, inspect the following hardware:
- ❑ RET cords for fraying
- ❑ Inspect Load Alleviating Straps and D-ring Extenders; ref 2.230.100 CREW TETHER INSPECTIONS (SODF: ISS EVA TASKS):
  1. MMOD/general damage
  2. Discoloration
  3. Tack Stitching
  4. Red Band
- ❑ ISS Trash Bag: Bristle deformation/damage, after having stowed tools in trash bag
  √Empty √Zipper Closed
- ❑ BRT joint screws not loose
- ❑ Swing arm stiffness

Tether Counts: (Green RETs)
RETs (sm-sm) = 9/16
RETs (Lg-sm) = 2/8
Adj Equip Tethers (Lg-sm) = 0/2
RETs (PIP Pin) = 2/5
Adj Equip Tethers = 9/10

EV2

- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (sm-sm)
    - ☐■ Wire Ties (2 short – smushed ends)
  - ☐☐ T-Bar
    - ☐☐ RET (sm-sm) (L)
    - ☐☐ RET w/PIP Pin (R)
    - ☐☐ Adj Equip Tether (R)
    - ☐☐ Adj Equip Tether (L)
    - ☐☐ Wire Tie (2)
    - ☐☐ Small ISS Trash Bag (L, inbd)
  - ☐☐ Swing Arm (R)
    - ☐☐ RET (sm-sm)
      - ☐☐ PGT s/n _____
        - ☐☐ PGT Battery s/n _____
        - ☐☐ 7/16 (wobble) Socket-6 ext
- ☐☐ D-ring Extender (2, R & L D-ring)
  - ☐☐ Waist Tether (R on D-ring Ext)
  - ☐☐ Waist Tether (L on D-ring Ext)
  - ■☐ ST Pack (85-ft+ 85-ft to R D-ring Ext) **SHUTTLE**

EV3

- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (sm-sm)
    - ☐■ Wire Tie (1 short, 1 long)
  - ☐☐ T-Bar
    - ☐☐ RET w/PIP Pin (R)
      - ☐■ WIF Adapter
    - ☐☐ RET (sm-sm) (L) (hold WIF Adapter to bunny ear)
    - ☐☐ Adj Equip Tether (L to TB)
    - ☐☐ Adj Equip Tether (L to TB)
    - ☐☐ Wire Tie (2)
    - ☐☐ Small ISS Trash Bag (R, inbd)
  - ☐☐ Swing Arm (R)
    - ☐☐ **EVA Camera w/bracket** (int RET – morning of)
- ☐☐ D-ring Extender (2, R & L D-ring)
  - ☐☐ Waist Tether (1, R on D-ring Ext)
  - ☐☐ Waist Tether (1, L on D-ring Ext)
  - ■☐ ST Pack (85-ft + 85-ft to L D-ring Ext) **SHUTTLE**

A/L

- ☐☐ RET (Lg-sm) (to bag aft soft tether pt)
  - ☐☐ **OBSS Medium ORU Bag** (aft/port corner of A/L)

External:
- ☐☐ Adj Equip Tether (aft tether pt)
- ☐☐ Adj Equip Tether (aft tether pt)
- ☐☐ Torque Wrench Bag (see fig 2)
  - ☐☐ Long Wire Tie (around bag tether pts and HR)
  - ☐☐ Short Wire Tie (around bag tether pts)
  - ☐☐ Adj Equip Tether (b/Pry Rod and HR stanchion)
    - ☐☐ Pry Rod

Internal:
- ☐☐ RET (sm-sm) (RF to T-handle b/Bolts 5 & 6)
  - ☐■ PAA
- ☐☐ RET (sm-sm) (LB)
  - ☐☐ Scissors (keep on top of bag)
- ☐☐ RET (sm-sm) (RB to L HR stanchion)
  - ☐☐ **OBSS Crewlock Bag** (divider snapped up)
    - ☐☐ Adj Equip Tether (ext – R D-ring)

Side 1 of divider:
- ☐☐ Wire tie caddy (5 short, 4 long) (int RET)
- ☐☐ Hubble Connector Tool (90 deg) **SHUTTLE** (int RET)
- ☐☐ Round Scoop (int RET)
  - ☐☐ PUMAA (Rd Scp straight out, opposite bolt)
    - ☐☐ RET (sm-sm) (both hooks on PUMAA)

Side 2 of divider:
- ☐■ J601/J602 Grounding Connectors (int RET) (on PIP pin tether loops) (see fig 1)
  - ☐☐ Adj Equip Tether (around Grounding Connectors and back onto own D-ring)
- ■☐ WIF Adapter (int RET)

☐☐ RET (Lg-sm) (for OBSS Crewlock Bag)

EVA 4 TOOL CONFIG (Cont)

A/L (Cont)

- ☐☐ **Staging Bag**
  - ☐☐ Fish Stringer Tether
    - ☐☐ Wire Tie Caddy (hook 1) (5 short, 4 long)
    - ☐☐ Velcro/Tape Caddy (hook 2)
    - ☐☐ PGT (hook 3) s/n _____
      - ☐☐ PGT Battery s/n _____
      - ☐☐ 7/16 (wobble) Socket-6 ext
    - ☐☐ Ratchet Wrench (hook 5)
      - ☐☐ 7/16 (rigid) Socket-2 ext
    - ☐☐ Long Duration Tie-Down Tethers (2) (hook 6)
    - ☐☐ **Spare WIF Adapter** (hook 7)
    - ☐☐ Spare Safety Tether Pack (85-ft + 85-ft) (to strap)
  - ☐☐ Fish Stringer Tether
    - ☐☐ Connector Cleaner Tool Kit (hook 2)
    - ☐☐ Pry Bar (hook 4)
    - ☐☐ Needle Nose Pliers (hook 6)
    - ☐☐ MWS Key Strap Assy (on wire tie, to strap)
    - ☐☐ **EVA Camera w/bracket** (hook 7– morning of)

- ☐☐ **IV Bag**
  - ☐☐ Towels (2)
  - ☐☐ Contamination Detection Kit
  - ☐☐ GP Caddy (2)
    - ☐☐ Adjustable Thermal Mittens (2)
  - ☐☐ Socket Caddy (hatch cont) w/RET (sm-sm) (Black)
    - ☐☐ 1/2 Socket-8 ext
    - ☐☐ 7/16 (wobble) Socket-6 ext (spare)
  - ☐☐ DCM Plug (SAFER Hardmount) (2)
  - ☐☐ RET (sm-sm, Black) (2)

Figure 1: OBSS Grounding Connectors

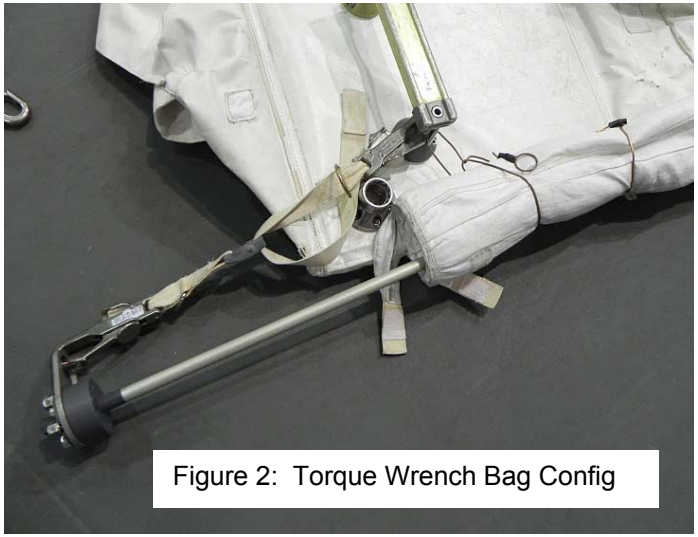
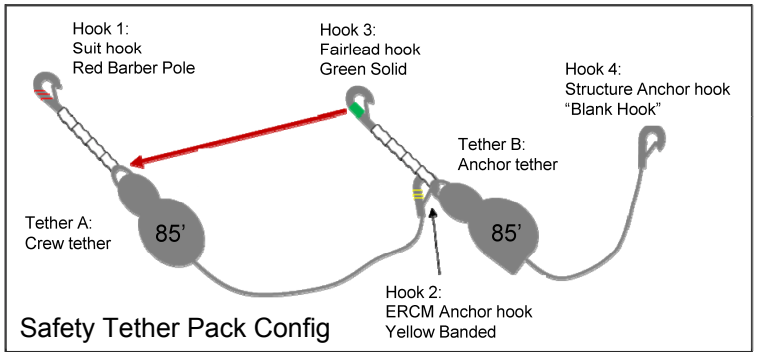


Figure 2: Torque Wrench Bag Config



Safety Tether Pack Config

EVA 4 BRIEFING CARD

EVA Prep
- ❑ Review Morning Timeline/Plan
  - From Wake to Egress
- ❑ Suit Donning Plan
  - Boot bladder manipulation – 2 people check, 3 locks in place
  - Verify comm-cap connection, bite valve
- ❑ Checks – SAFER, MWS Tools, CL Config, Bag Stowage
- ❑ Airlock Depress Review (Suit IV protocol)

Procedure Review
- ❑ EVA Summary/Sequence
- ❑ Egress Plan – Greg 1st, Mike 2nd
  - LAS and tether config inspections, RETs on STPs
  - Watch EV2 tether under A/L, EV3 tether near CETA spur
- ❑ Translation Paths/Fairleads
  - OBSS – EV2 fwd/zenith, EV3 aft/zenith
  - PDGF – EV2 low, EV3 high and 1st (frld on P4 not P6)
  - SPDM – EV2 high, EV3 low
- ❑ Hazards/Task Constraints (no touch, no damage, keep outs, notes, cautions, warnings)
  - WIF probes and sockets
  - OBSS striker bars, composite, MPM contacts, S1 Radiator Beam
  - PDGF doors, shaft, curvic coupling (especially during EV2 APFR ingress)
  - EFGF underside, open scissors
  - SPDM radiator areas, SASAs on ELC3
- ❑ Contingencies – section 16
- ❑ Potential Get-aheads
- ❑ Ingress Plan
  - EV2 secure – EV3 waist tether to EV2 anchor hook, take STPs inside
  - EV2 w/CL bag, EV3 w/OBSS ORU bag

Robotics (Box)
- ❑ Coordinate Frames
- ❑ GCA – clear and concise, direction and distance
- ❑ Clearance Concerns
- ❑ GCA Complete

Post EVA
- ❑ Suit Doffing
- ❑ Tool Reconfig Plan – section 2 procedures for xfer to Shuttle

Emergencies
- ❑ Comm Fail (hand signals), Term EVA, Abort EVA
- ❑ EMU Malfunctions – verbalize DCM messages
- ❑ Lost Tools/Crew Member (velocity and direction)
- ❑ DCS – note symptoms/changes during ingress
- ❑ Safer Ops – right handle controller – both down = ready
- ❑ Crew Rescue – approach from desired side, waist tether together + on STP

Reminders/Top Ten
- ❑ Slow is Fast – no hopping
- ❑ Discipline and Attention to Detail until the End (Flight not over until parked)
- ❑ BRT/ORU/Swing Arm/Tether Awareness
- ❑ Body Position is Everything (think 3D + zero-G, use BRT)
- ❑ Day/Night Checks – Visor (glove heaters, lights, tools, tethers)
- ❑ STs – Gate Closed, Slider Locked, 2 Reels Unlocked, remove RET
- ❑ Connectors – Check Pins Straight, No FOD, Red Band
- ❑ PGT – ON-Torque, Turns & Green Light, OFF (only if different than expected)
- ❑ Worksite Departure – check tools/tethers clear
- ❑ Glove & gauntlet check crossing SARJ
- ❑ Robotics – GCA complete and Brakes On
- ❑ Suit MAL – read down DCM messages
- ❑ Robotics – GCA complete and Bakes On (distance + observe in same call)

Contingency
- ❑ OBSS Stow – outbd reach
- ❑ SPDM EDF Release communication

EVA 4 INHIBIT PAD

Orbiter

ALL EVAs

TCS *(Not required, switch guard installed on EVA1)*
IV L12 1. √TCS POWER – OFF

KU-Band Antenna *(INCO: Prior to Egress)*
MCC-H 1. √KU-BAND Mask – active
2. √KU-BAND EVA Protect Box – active

RCS *(GNC/PROP: Prior to Egress)*
If EV crew < 27 ft from FRCS
IV 1. √DAP: VERN, FREE, LO Z
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 (*)

Ground

ALL EVAs

Ground Radar *(TOPO: Prior to Egress)*
MCC-H 1. √TOPO console, ground radar restrictions in place for EVA

USOS (1)

ALL EVAs

PCU *(PHALCON: Prior to Egress)*

NOTE
PCUs may require up to a 1-hr warmup period before they are operational

MCC-H 1. √PCUs (two) operational in discharge mode and one of the following:
a. CCS PCU EVA hazard control FDIR enabled
b. No more than two arrays unshunted and oriented < 105º from velocity vector
If one or both PCUs failed
2. No more than two arrays unshunted and oriented < 105º from velocity vector

CUCU *(Crew: Prior to Egress)*
IV – (LAB1O4)
1. √cb POWER A, B [two] – OPEN
2. √cb LINK 1,2 [two] – OPEN

And one of the following inhibit pairs:
POIC 3a. Express Rack 2 Locker 6 – Power Removed
3b. Express Rack 6 Locker 7 – Power Removed
OR
IV 4a. Express Rack 2 Locker 6 – OFF
4b. Express Rack 6 Locker 7 – OFF

MISSE 8 *(POD: Prior to Egress)*
POIC Prior to EV Hatch Open
1. ELC-2 ExPA-2 Discrete Channel 6 – Disabled

EVA 4 INHIBIT PAD (Cont)

LOCATION DEPENDENT INHIBITS

Lab Window *(Not expected)*
IV If EV crew less than 10 ft from window or in window FOV, close window shutter

Cupola Windows *(Not expected)*
IV If EV crew less than 10 ft from window, coordinate shutter opening/closing with EV crew and minimize time shutter is open

S-Band (SASA) Antennas *(CATO: Prior to Egress – OBSS Stow)*
MCC-H If EV crew < 3.8 ft from S1 SASA
1. P1 SASA – Active
2. S1 SASA – Powered down and unavailable to FDIR

Mobile Transporter *(ROBO: Prior to Egress)*
MCC-H If EV crew < 1.5 meters from MT
1. √MT latched

Port SARJ *(PHALCON: During Egress – PDGF Retrieve)*
MCC-H If EV crew working within 2 ft, outboard of SARJ or reqd per loads FR
1. √DLA (1) – LOCKED at 285°
2. All motor setpoints set to zero
3. All motors deselected

TRRJ *(THOR: Prior to Egress – OBSS Stow)*
MCC-H If EV crew working within 2 ft of S1 TRRJ rotation envelope
1. √DLA 1(2) – LOCKED within 65° to 90°
2. √DLA 2(1) – ENGAGED

FPMU *(PHALCON: Prior to Egress – PDGF Retrieve, SPDM EDF Release)*
MCC-H If EV crew on Port truss (P1-P6) or working within 5 ft of Floating Potential Measurement Unit
1. RPCM P11A_B RPC 13 Open/Close Cmd Inhibit

SSPTS (*PHALCON: Prior to Task – EFGF Stow in TSA Inhibits 1, 2 and 3 from ~4:00-5:15)*
MCC-H If EV crew working within 2 ft of SSPTS cables
1. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit
2. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit
3. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

TASK DEPENDENT INHIBITS

BGA 4A *(PHALCON: Prior to Egress – PDGF Retrieve)*
MCC-H If EV crew working within rotation plane of BGA
1. Lock BGA 4A between 50°-180° (160° preferred) with motor turned off

MISSE 8 *(POD: Prior to Egress – SPDM EDF Release)*
POIC If EV crew working zenith of plane of MISSE 8
1. MISSE-8 PASCAL solar cells – Zero voltage bias
2. ELC-2 ExPA-2 Discrete Channel 1 – Disabled
3. ELC-2 ExPA-2 28V Operational Power – Disabled

JEM (1)

ALL EVAs

ICS-EF Antenna
SSIPC
1. ICS MOD – OFF
2. ICS UPC – OFF
3. ICS HPA – OFF
4. HPA ON and UPC ON commands are cleared (not present) in the ICS stored command queue

COL (1)

ALL EVAs

HAM Radio *(Crew: Prior to Egress)*
IV 1. HAM Radio – Deactivate

RSOS (1)

ALL EVAs

SM Antennas *(RIO: Prior to Egress)*
IV 1. ARISS (Ham Radio) – Deactivate
MCC-M 2. GTS – Deactivate
3. Napor (РСПИ) – Deactivate

EVA 4 NOTES/CAUTIONS/WARNINGS

NOTES

1. Bolt install: Report torque and turns
2. Bolt release: Report torque and turns if different from published range
3. EVA connectors: After disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
4. Inspect QDs for damage prior to mating
5. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
6. 85-ft safety tether retract force may affect body positioning
7. CETA Cart brake handle wire ties must be replaced after crew loading

CAUTION

ISS Generic Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture shafts (dry lube)
   2. PIP pins
   3. Passive UMAs
   4. MBS/SSRMS/SPDM taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
   5. SPDM SJEU, EP, OTCM, LEU, and LEE VDU radiator surfaces
   6. OTSD

B. Electrical cables
   1. Avoid bend radii < 10 times cable diameter

C. Fiber optic cables
   1. Avoid bend radii < 10 times cable diameter
   2. Avoid pulling on cable during mate/demate

D. Fluid line flex hoses and QDs
   1. Avoid bend radii < 14 in for hoses with a diameter ≥ 1 in
   2. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
   3. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if required
   4. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements

CAUTION

ISS Generic Constraints (Cont)

E. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles

F. Other
   1. ITT Cannon connector: On demated connectors, do not rotate collar or manipulate cable/connector using collar or connector tool
   2. MLI handholds are not rated for crewmember translation loads

CAUTION

ISS Truss Constraints

A. Avoid inadvertent contact with
   1. CETA lights (Z-93 paint) [LAB,S1,NODE 1,P3,S3]
   2. Deployed TUS cable [Zenith and Nadir CETA rails]
   3. S0 aft face radiator
   4. GPS antennas (S13 paint) [S0,JLP]
   5. UHF antennas [LAB,P1]
   6. ETCS radiator flexhoses and panels [S1,P1]
   7. EETCS/PV radiator flexhoses, bellows and panels [P6,P4,S4,S6]
   8. SASA RF group [S1,P1]
   9. Heat pipe radiators [Z1]
   10. PCU cathode and HCA ports [Z1]
   11. Ku-Band antenna (SGANT) dish [Z1]
   12. CMG cover/shells [Z1]
   13. FPMU [P1]
   14. SASA high and low gain antennas and radiator surfaces [Z1]
   15. Deployed MISSEs
   16. OTP on HAB Tray [S0]
   17. OBSS composite sections, striker bars, grapple fixture shafts, and cable harnesses

B. For structural reasons
   1. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

CAUTION

ISS Truss Constraints (Cont)

C. Other
   1. EWIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
   2. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS ground strap fasteners [P6,P4,S4,S6] can contaminate EMU
   3. Prevent inadvertent contact of the tether shuttle with ETRS when the P3 tether shuttle stop is raised away from the rail

CAUTION

ISS U.S. Pressurized Elements Constraints

A. Avoid inadvertent contact with
   1. EVA crane [PMA1]
   2. TCS reflectors [PMA2,PMA3]
   3. APAS hardware [PMA2,PMA3]
   4. CETA lights (Z-93 paint) [LAB,S1,NODE 1,P3,S3]
   5. UHF antennas [LAB,P1]
   6. Open CBM petal covers, LAB and Cupola window shutters
   7. S0/NODE 2 fluid tray hardlines at NODE 2 end, which are limited to 25 lb

B. Other
   1. EWIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
   2. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged

CAUTION

ISS I.P. Elements Constraints

COL

A. Avoid inadvertent contact with
   1. COL ARISS and AIS antennas [COL-Nadir]

JEM

A. Avoid inadvertent contact with
   1. GPS antennas (S13 paint) [S0,JLP]
   2. Open JPM window shutter
   3. JTVE, WVE/EVE, JEF VE cameras
   4. JEMRMS taped radiative surfaces [JEU,EE,Cameras]
   5. JEM A/L target and pins
   6. JEF ORUs and EFUs (paint and lubricant)
   7. MAXI front and top panel (paint)
   8. SEDA-AP sensors (HIT, SDOM, and AOM)
   9. Trunnions and UCMs (paint and lubricant) [JEF Payloads]
   10. RAIDS covers on end of HREP
   11. ICS-EF Ka-Band antenna dish
   12. Small Fine Arm (SFA) (paint, coating and lubricant)

B. For structural reasons
   1. Avoid kicking MMOD shields between JLP and JPM
   2. Avoid tool impact on ICS-EF sensor

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 and PLB sill]
   4. Payload bay and camera wire harnesses, cables, cable guides, and connectors
   5. OBSS striker bars (drylube)

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]

WARNING

ISS Generic Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture targets and target pins

B. Pinch
   1. NZGL connector linkage. Use caution when mating/locking
   2. ITT Cannon connector rotating housing
   3. PDGF connector doors

C. QDs
   1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip
   2. Do not rotate if in mated/valve open configuration
   3. Bail may kick back suddenly when detent button is depressed if pressure has built up in spring cavity

D. Sharp Edges
   1. Inner edges of WIF sockets
   2. APFR active WIF probes
   3. Mating surfaces of EVA connectors Avoid side loads during connector mating
   4. Back side of MMOD shield fasteners
   5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAs, SARJ Covers); the end of the spring may protrude
   6. SPDM OTCM gripper jaws
   7. Keep hands away from SSRMS LEE/POA/SPDM LEE opening, snares, and PDGF curvic coupling (teeth)
   8. MMOD strikes on ISS exterior

WARNING

ISS Generic Constraints (Cont)

E. Thermal
   1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
   2. Turn off glove heaters when comfortable temperature reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
   3. Uncovered trunnion pins may be hot
   4. SSRMS/MBS/SPDM operating cameras and lights may radiate large amounts of heat
   5. Do not touch EMU protective visor if temperature has been < -134 degF for > 15 min
   6. No EMU boot contact with foot restraint when temperature < -120 degF or > 200 degF
   7. PDGF surfaces may not meet touch temperature requirements for unlimited contact when $\beta \leq -70$ or $\beta \geq 70$

WARNING

ISS Truss Constraints

A. Avoid inadvertent contact
   1. SSU, ECU, beta gimbal platform, mast canister, SAW blanket boxes unless the beta gimbal is locked and the motor is turned off
   2. Stay inboard of SARJ when active
   3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
   4. Stay 5 ft from moving MT on face 1
   5. Stay 3.3 ft from Ku-Band (SGANT antenna) when powered
   6. Stay 1 ft from top of STP-H3 (ELC3)
   7. Deployed MISSEs and ORMATE-III R/W

B. RF radiation exposure
   1. Stay 3.8 ft from S-Band (SASA) high gain antenna when powered [S1,P1]
   2. Stay 1.3 ft from S-Band (SASA) low gain antenna when powered [S1,P1]
   3. Stay 1 ft from UHF antenna when powered [LAB,P1]

C. Sharp Edges
   1. Solar array blanket box [P6,S6]
   2. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
   3. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner
   4. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 – SARJ at 0 deg]
   5. Nickel coated braided copper ground straps may contain frayed wires [P6,P4,S4,S6]
   6. MMOD strikes on Z1 toolboxes
   7. POA FSE (CSA logo below MBS mast camera)
   8. AMS Star Trackers Baffles (2)

WARNING

ISS Truss Constraints (Cont)

D. Electrical Shock
   1. Stay ≥ 2 ft from ungrounded floating connectors if powered
      S0 EVA power cables (inside S0 Bay 00 Face 4, Bay 01 Face 3)
      ESP-2 jumper (inside S0 Bay 03 Face 4)

E. Thermal
   1. ELC may exceed touch temperatures when β > 75 deg

WARNING

ISS U.S. Pressurized Elements Constraints

A. Handrails
   1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 and 566, A/L Tank 2 Nad/Fwd and Port/Fwd, P6 5389]

B. Pinch
   1. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
   2. LAB and Cupola window shutters and CBM petal cover linkages during operation

C. RF radiation exposure
   1. Stay 1 ft from UHF antenna when powered [LAB,P1]

D. Sharp Edges
   1. PMA umbilical launch restraints - exposed bolt threads
   2. Adjustable fuse tether (Fish Stringer) buckles stowed in Node bag
   3. Port/Aft portion of A/L circular HR [HR 0506]
   4. A/L HR 0537 (Eq Lock Zenith)

E. Thermal
   1. PMA handrails may be hot. Handling may need to be limited
   2. Stay ≥ 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up; limit time to 15 min or less if > 300 degF
   3. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF
   4. No EMU TMG contact with PMAs and MMOD shields > 320 degF

WARNING

ISS U.S. Pressurized Elements Constraints (Cont)

F. Electrical Shock
   1. Stay ≥ 2 ft from ungrounded floating connectors if powered
      SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd

G. Fluid QDs
   1. Do not translate on gap spanners restraining NODE 3 – LAB NH3 jumpers

WARNING

ISS I.P. Elements Constraints

COL
A. Avoid inadvertent contact with
   1. SOLAR [COL EPF]

B. Thermal
   1. Columbus end cones may violate touch temperature constraints when $-75 \leq \beta \leq -60$ or $60 \leq \beta \leq 75$

C. Sharp Edges
   1. LWAPA PIP pins [COL EPF]

JEM
A. Avoid inadvertent contact with
   1. ICS-EF sensors

B. Pinch
   1. JPM window shutter linkages during operation
   2. JEM cameras (JVTEs, EVE, WVE, and JEF VEs)
   3. JEM EFU latching arms
   4. JEF SSE latch
   5. ICS-EF antenna boom
   6. SEDA-AP mast
   7. SMILES antenna rotating area
   8. HREP hinge sides and RAIDS pinch areas
   9. JEMRMS EE
   10. JEMRMS Small Fine Arm (SFA) joints and booms

WARNING

ISS I.P. Elements Constraints (Cont)

JEM (Cont)
C. Sharp Edges
   1. Interior of JEMRMS HRMs
   2. JEMRMS EE opening and snares
   3. JEM A/L hatch corners
   4. ICS-EF AHM gears
   5. MAXI visual star camera
   6. SMILES baffles (two), baffle base bare bolts, and Cold Sky Terminator (CST)
   7. HREP baffles (four) [Star tracker aperture Zenith and three instrument baffles Aft]
   8. SFA Electro-Mechanical GF (EMGF)

D. RF radiation exposure
   1. Stay 0.3 ft from Fwd/Aft JPM PROX antenna

E. Thermal
   1. JPM Port End Cones and JLP Port Nadir may violate touch temperature constraints when $\beta > 60$ deg
   2. JEMRMS/JTVE/JEFVE operating cameras and lights may radiate large amounts of heat

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. 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]

EVA 4 NOTES/CAUTIONS/WARNINGS (Cont)

WARNING

Shuttle Constraints (Cont)

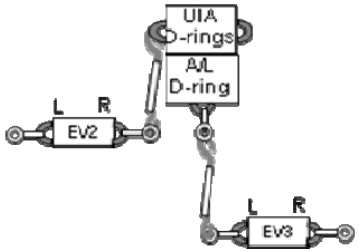
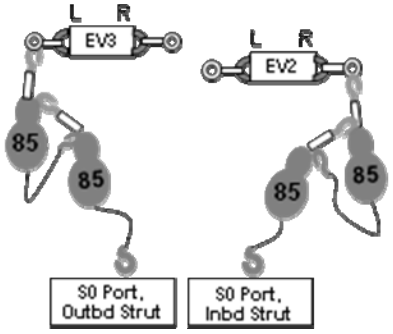
D. Sharp Edges
   1. PRLA grounding wipers [PLB]
   2. LDRI baffles (also an entrapment hazard) [OBSS]
   3. Keep hands away from SRMS EE opening and snares
   4. TCS connector backshells have exposed threads [ODS]

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

EVA 4 EGRESS/SETUP (00:35)

IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
1. Record PET Start time __:__ 2. Day/Night Cycles _____  	**Initial Configuration:** 1. √All gates closed & hooks locked ❑ R Waist Tether to UIA D-ring	**Initial Configuration:** 1. √All gates closed & hooks locked ❑ L Waist Tether to A/L int D-ring Ext
3. Start WVS Recorders 4. Start Hatch Thermal Cover clock PET (30 min) __ : __ 5. Inspect Load Alleviating Straps for: a. MMOD/general damage b. Discoloration c. Tack Stitching d. Red Band  	<u>EGRESS</u> (00:20) 2. Partially egress A/L hatch to allow EV3 to attach **RED** hook to R D-ring ext 3. On **EV3 GO**, release R Waist Tether from UIA D-ring 4. Relocate sm hooks on Lg-sm (2) to UIA D-rings 5. Egress A/L with OBSS ORU bag 6. Stow OBSS ORU bag on BRT w/RET	<u>EGRESS</u> (00:20) 2. Open hatch thermal cover 3. Egress A/L 4. Perform LAS inspection on EV2 ST Pack (aft D-ring) ❑ LAS, ❑ √Yellow hook on Green ERCM ❑ LAS, ❑ √Green hook on Red ERCM 5. RET to ST Pack on aft D-ring 6. Attach **RED** hook to EV2 R D-ring ext ❑ √Gate closed, hook locked, reels unlocked, release RET 7. Give **EV2 GO** to release Waist Tether 8. Perform LAS inspection on EV3 ST Pack ❑ LAS, ❑ √Yellow hook on Green ERCM ❑ LAS, ❑ √Green hook on Red ERCM 9. RET to ST Pack on fwd/stbd curved HR stanchion 10. Attach **RED** hook to L D-ring ext ❑ √Gate closed, hook locked, reels unlocked, release RET 11. Release L Waist Tether from A/L int D-ring Ext
6. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max	7. Perform buddy checks √MWS tabs up, BRT tabs up, tether configs 8. Verify SAFER config ❑ √L handle down (MAN ISOL Vlv – Open) ❑ √R handle down (HCM – Closed) 9. √WVS – green LED	12. Perform buddy checks √MWS tabs up, BRT tabs up, tether configs 13. Verify SAFER config ❑ √L handle down (MAN ISOL Vlv – Open) ❑ √R handle down (HCM – Closed) 14. √WVS – green LED

EVA 4 EGRESS/SETUP (00:35) (Cont)

IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
7. Stop Hatch Thermal Cover clock PET (30 min) __ : __	10. Close hatch thermal cover SETUP (00:15) 11. Translate to S0 Face 2 ❑ Watch for EV3 ST 12. Stow ORU bag on S0 HR 3458 13. Retrieve C/L bag from OBSS ORU bag, stow on BRT w/RET ❑ Remove RET from C/L bag and attach to HR 3458 to help secure ORU bag 14. Close OBSS ORU bag (Translate to S1 outbd OSE)	SETUP (00:15) 15. Translate to A/L stbd Toolbox ❑ Clear ST for EV2 16. Reconfig APFR to [x,**FF,J,1**] 17. Retrieve APFR; stow on BRT w/RET (Translate to S1 inbd OSE)

OBSS STOW (00:55)

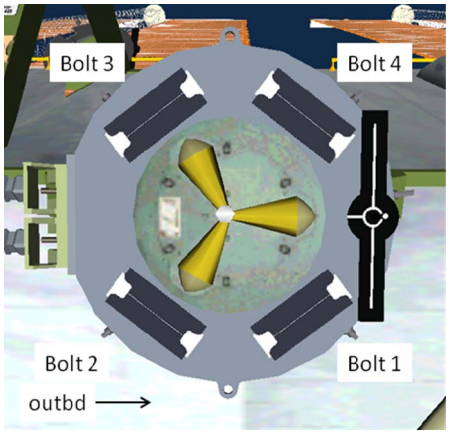
IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
Planned PET 00:35 ***SSRMS:*** *In OBSS Stow Setup posn*	OBSS CAPTURE (00:35) 1. Translate to S1 outbd OSE (Bay 17) ❑ Fairlead on S1 HR 3210 2. Configure PGT: **[B7 (25.5), CCW2, 30.5]** 6-Ext 7/16 3. Loosen clamp 'bolt 1' until preload is released, max 13 turns 4. Translate to SSBAD 5. Open SSBAD feet, if reqd ❑ √Status indicator in SD (indicator midway) WARNING OBSS camera unit rotates – avoid handling during OBSS soft capture (pinch point)	CAUTION Avoid inadvertent contact with SASA's high gain and low gain antennas OBSS CAPTURE (00:35) 1. Translate to S1 inbd OSE ❑ Aft translation 2. Install APFR in S1 WIF 5 **[10,TT**,J,1**]** ❑ √Locking collar black-on-black, pull/twist test 3. Open SSBAD feet, if reqd ❑ √Status indicator in SD (soft dock) 4. Ingress APFR
1. Give **SSRMS GO** for mnvr to Stow GCA Start posn (Box Brief – once crew stable) ***SSRMS:*** *Mnvr to Stow GCA Start posn*	6. **Notify IV** ready for mnvr to Stow GCA Start posn; assist with GCA as reqd	5. **Notify IV** ready for mnvr to Stow GCA Start posn; GCA as reqd
2. Give **SSRMS GO** for Release and OBSS Stow Backoff posn ***SSRMS:*** *Release and Mnvr to OBSS Stow Backoff posn*	7. Attach RET to OBSS HR (lockout RET, if reqd) 8. **Notify IV** ready for SSRMS release and backoff	6. Attach RET to OBSS HR (lock out RET, if reqd) 7. **Notify IV** ready for SSRMS release and backoff 8. Soft capture OBSS striker bar to inboard SSBAD √Between striker bar standoffs 9. Reposition slider knob to posn 4; re-install PIP pin in knob
	9. Check alignment of striker bar with SSBAD ❑ Rotate the OSE about the trunnion pin to help with alignment 10. Soft capture OBSS striker bar to outboard SSBAD √Between striker bar standoffs 11. Rotate SSBAD knob cw to CL (closed), lock knob ❑ √Indicator in CL (anywhere in black CL region) 12. Release RET from OBSS HR 13. Reposition slider knob to posn 4; re-install PIP pin in knob	10. Rotate SSBAD knob cw to CL (closed), lock knob ❑ √Indicator in CL (anywhere in black CL region) 11. Release RET from OBSS HR

OBSS STOW (00:55) (Cont)

IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
3. Record Bolt 1 data: Bolt | Turns | Torque (ft-lb) #1 | (11.5-13) | (18.4)	14. Translate aft to Bolt 1 of outboard OSE 15. Configure PGT: **[B3 (18.4), CW2, 30.5]** 6-Ext 7/16 16. ←Drive clamp 'bolt 1' to torque, max 13 turns 17. Verify OBSS stand fully clamped to trunnion (view clamping mechanism through OSE cover slot)	
	18. Release Y-slider PIP pin #1 and stow in any black ring stowage location	CLEANUP (00:20) 12. Egress APFR 13. Reconfigure APFR to **[**10**,FF,F,6]** 14. **Notify IV** ready for mnvr to APFR Install posn 15. GCA SSRMS as reqd for APFR install 16. Install WIF Adapter into SSRMS, tether point away from HR (PIP pin required; not hitch pin)
4. Give **SSRMS GO** for mnvr to APFR Install GCA Start posn ***SSRMS:*** *Mnvr to APFR Install posn*	GROUNDING CONNECTORS INSTALL (00:20) 19. Retrieve grounding connectors from OBSS C/L bag	17. Install APFR in WIF Adapter **[12,PP**,F,6**]** ❑ √Locking collar black-on-black, pull/twist test
5. Give **SSRMS GO** to mnvr to APFR Ingress Clearance posn ***SSRMS:*** *Mnvr to APFR Ingress Clearance posn*	20. Disconnect connectors ❑ P601 (outbd) ❑ P602 (inbd) 21. Mate grounding connectors to: (Align red wing with arrow, turn cw 1/4 turn) ❑ J601 ❑ J602 √Red band on connector is not visible 22. Wire tie OBSS connectors to OBSS tether points ❑ P601 (outbd) ❑ P602 (inbd) 23. Install PIP pins into OSE HR (pull test) ❑ ❑ √Orient so cable is inline with HR 24. Stow adj equip tether in C/L bag	18. **Notify IV** ready for mnvr APFR Ingress Clearance posn 19. Glove and Gauntlet Check
	25. Translate to stbd CETA cart 26. Stow C/L bag on upper/left grid (D) 27. Retrieve PUMAA/Rd Scoop/RET from C/L bag, stow on BRT w/RET ❑ Attach C/L bag RET to door handle	
	28. Glove and Gauntlet Check (Translate to P6, nadir route – PDGF Retrieve)	(Translate to P6, zenith route – PDGF Retrieve)

P6 PDGF RETRIEVE (01:25)

IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
Planned PET 01:30 1. Verify inhibits in place √Port SARJ locked at 285°	**WARNING** Avoid touching curvic coupling due to potential sharp edges **CAUTION** Avoid touching grapple pin, target and underside of PDGF	
	P6 PDGF RETRIEVE (01:25) 1. Translate to P3 Face 6, nadir route 2. Attach **GREEN** hook to P3 HR 3861 ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate to P6 PDGF ❑ EV3 leads, take same route	P6 PDGF RETRIEVE (01:15) 1. Translate to P3 Face 2, zenith route ❑ Go zenith after CETA Cart, fairlead ST 2. Attach **GREEN** hook to P3 HR 3852 ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate to P6 PDGF (Taz leads) ❑ Zenith corner of P4, fairlead after P4 radiator on trunnion pin ❑ Photo Ops ❑ Use gap spanner with no fairlead on P6
2. Record PUMAA bolt data: Bolt / Turns / Torque (ft-lb) PUMAA / (10) / (18.4)	4. Ingress APFR ❑ Only extend ingress aid if reqd 5. Configure PGT: **[B3 (18.4), CW2, 30.5]** 6-Ext 7/16 6. ←Install PUMAA onto PDGF between Bolts 1 and 2, expect 10 turns 7. Configure PGT: **[B7 (25.5), CCW2, 30.5]** 6-Ext 7/16 8. Swap PGT and EVA camera with EV3 9. After EV3, release EDF bolts (2), 5 turns ❑ Bolt 1 ❑ Bolt 4 10. √All EDFs fully extended Remove PDGF from mounting ring 11. Push in all EDFs into PDGF; stow PDGF on BRT w/RET ❑ Stow with grapple shaft toward PLSS/fwd	4. Verify APFR config in P6 WIF 12 [3,OO,F,12] ❑ Rotate ingress aid 5. Attach PUMAA RET to PDGF tether pt 6. √EV2 BRT RET attached to Rd Scoop or PUMAA 7. Swap PGT and EVA camera with EV2 8. Release EDF bolts (2), 5 turns ❑ Bolt 2 ❑ Bolt 3 9. Assist EV2 with release of PDGF and attach to EV2's BRT



P6 PDGF RETRIEVE (01:25) (Cont)

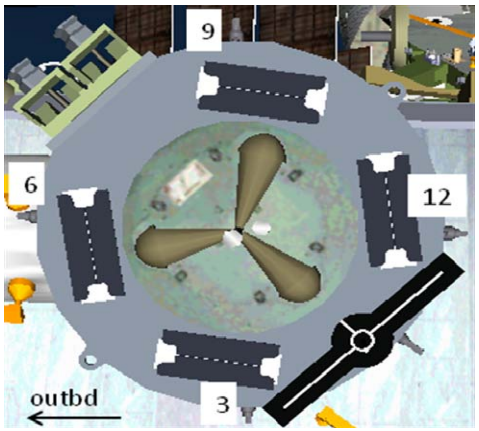
IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
	12. Egress APFR 13. Translate to P3 Face 6 (Spanky leads) ❑ Photo ops 14. Retrieve **GREEN** hook from P3 HR 3861 (face 6) ❑ √Gate closed, hook locked, reels unlocked, release RET 15. Glove Check (Translate to Face 2, Bay 03 – PDGF Handoff)	 10. Rotate ingress aid against boot plate 11. Retrieve APFR; stow on BRT w/RET 12. Translate to P3 Face 2 13. Retrieve **GREEN** hook from P3 HR 3852 (face 2) ❑ √Gate closed, hook locked, reels unlocked, release RET <u>APFR RELOCATE</u> (00:10) 14. Translate to port CETA cart 15. Install APFR in WIF 4 (zenith/port) [12,**DD**] **[12,**OO,F,12**]** ❑ √Locking collar black-on-black, pull/twist test 16. Glove Check (Translate to Face 2, Bay 00 – APFR Ingress)

OBSS EFGF/PDGF SWAP (01:20/01:40)

IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
Planned PET 02:55 ***SSRMS:*** *In APFR Ingress Clearance posn* 1. Give **SSRMS GO** for mnvr to PDGF Handoff Clearance posn and mnvr to GF Swap posn ***SSRMS:*** *Mnvr to PDGF Handoff Clearance posn and GF Swap posn*	<u>PDGF HANDOFF</u> (00:20) 1. Translate to Face 2, Bay 3 2. Open/prep OBSS ORU bag 3. Assist EV3 as required 4. Transfer PDGF to EV3, retrieve RET 5. Retrieve EVA scissors from OBSS ORU bag 6. Retrieve RET from HR 3458 for EFGF <u>EFGF REMOVAL/PAA INSTALL</u> (00:25) 7. Attach RET to EFGF 8. Transfer scissors to EV3 9. Tilt EFGF inbd and stabilize 10. Stow scissors and transfer EFGF near OBSS ORU bag	<u>APFR INGRESS</u> (00:20) 1. Translate to Face 2, Bay 0 2. GCA SSRMS as reqd for APFR Ingress 3. Ingress APFR 4. GCA SSRMS as reqd for PDGF Handoff 5. RET, retrieve PDGF from EV2; stow on BRT w/RET 6. **Notify IV** ready for mnvr to PDGF Handoff Clearance posn and GF Swap posn 7. GCA SSRMS as reqd for GF Swap <u>EFGF REMOVAL/PAA INSTALL</u> (00:25) 8. Configure PGT: **[B2 (16.0), CCW2, 30.5]** 6-Ext 7/16 9. Release EFGF bolts (6) in any order, expect 8 turns ❑ Bolt #1 ❑ Bolt #2 ❑ Bolt #3 ❑ Bolt #4 ❑ Bolt #5 ❑ Bolt #6 10. Retrieve scissors from EV2 11. Cut EFGF cable in blue area 12. Transfer scissors to EV2 13. Verify all (6) washers installed on OBSS mounting ring
	<u>WARNING</u> Avoid touching underside of EFGF, mounting location on OBSS, or cut EFGF cable due to potential sharp edges	

OBSS EFGF/PDGF SWAP (01:20/01:40) (Cont)

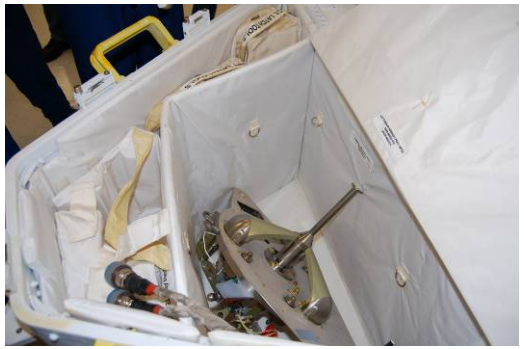
IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
	11. Retrieve PDGF Adapter Assy (PAA) from OBSS ORU bag; transfer to EV3	14. Retrieve PDGF Adapter Assy (PAA) from EV2 15. Align PAA on OBSS (Bolt 1 at 1 o'clock, black T handle to black line) √No interference with cut cable √No interference with OBSS MLI
	12. Take photos of PAA/PDGF as time allows	16. Configure PGT: **[A3 (4.8), CW2, 30.5]** 6-Ext 7/16 17. Drive PAA bolts in star pattern for only 3 turns ❑ Bolt #1 ❑ Bolt #4 ❑ Bolt #2 ❑ Bolt #5 ❑ Bolt #3 ❑ Bolt #6
2. Record PAA Bolt data: Bolt / Turns / Torque (ft-lb) #1 (5.5) (22.0) #4 #2 #5 #3 #6		18. Configure PGT: **[B5 (22.0), CW2, 30.5]** 6-Ext 7/16 19. ←Drive PAA bolts in star pattern to torque, expect 5.5 turns, 8.5 turns total, √bolts fully seated ❑ Bolt #1 ❑ Bolt #4 ❑ Bolt #2 ❑ Bolt #5 ❑ Bolt #3 ❑ Bolt #6 20. Perform pull test on PAA
	13. Release RET from PAA; stow in OBSS ORU bag	
	14. Stow EFGF in OBSS ORU bag	
	CAUTION Avoid applying off-axis loads to EDFs when the EDF is not engaged	
	PDGF INSTALL (00:25)	PDGF INSTALL (00:25) 21. Extend all EDFs √Verify all EDF lanyards clear of interface
	15. Assist EV3 with alignment and soft dock of PDGF	22. Align and soft dock PDGF onto PAA (target aligns with arrow on PAA; EDFs at 12, 3, 6, 9 o'clock posns)
	16. Engage zenith EDFs (2), may need to rotate EDF to catch hex key √Lanyard washer is flush to retaining ring	23. Engage nadir EDFs (2), may need to rotate EDF to catch hex key √Lanyard washer is flush to retaining ring

IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
3. Record Initial PDGF Bolt data: Bolt / Turns / Torque (ft-lb) 3 / (5) / (12.0) 6 / / 9 / / 12 / /	NOTE EDFs must be driven in a cross pattern (order not critical). Maintain axial force on EDF bolt to ensure hex key remains engaged	24. Configure PGT: **[B1 (12.0), CW2, 30.5]** 6-Ext 7/16
	17. Assist EV3 as reqd	25. ←Drive EDF bolt to torque, expect 5 turns Continue drive bolt until less than 1/4 turn of motion ❑ Bolt at 3 o'clock ❑ Bolt at 6 o'clock ❑ Bolt at 9 o'clock ❑ Bolt at 12 o'clock
	NOTE Tighten EDFs until repeatable torque reached and less than a 1/4 turn before reaching torque	
4. Record Final PDGF Bolt data: Bolt / Turns / Torque (ft-lb) 3 / (< 1) / (25.5) 6 / / 9 / / 12 / /		26. Configure PGT: **[B7 (25.5), CW2, 30.5]** 6-Ext 7/16
	18. Assist EV3 as reqd	27. ←Drive EDF bolt to torque, expect no more than 1 turn Continue drive bolt until less than 1/4 turn of motion ❑ Bolt at 3 o'clock ❑ Bolt at 6 o'clock ❑ Bolt at 9 o'clock ❑ Bolt at 12 o'clock 28. Perform pull test on all EDFs 29. Retrieve RET from PDGF, stow on PUMAA 30. Configure PGT: **[B7 (25.5), CCW2, 30.5]** 6-Ext 7/16 31. Release PUMAA bolt, expect 11 turns 32. Stow PUMAA/rd scoop on BRT w/RET
5. Give **SSRMS GO** to mnvr to APFR Egress posn ***SSRMS:*** *Mnvr to APFR Egress posn*	CLEANUP (00:10) 19. Stow EFGF and EVA scissors in OBSS ORU bag, if not completed 20. Stow OBSS ORU bag on BRT w/RET 21. Glove Check 22. Move nadir to clear EV3 tether	SSRMS CLEANUP (00:30) 33. **Notify IV** ready for SSRMS mnvr to APFR Egress posn, GCA as reqd 34. Egress APFR
6. Give **SSRMS GO** to mnvr to APFR Removal Setup posn ***SSRMS:*** *Mnvr to APFR Removal Setup posn*	(Translate to Node 2 – Stow EFGF in TSA)	35. **Notify IV** ready for SSRMS mnvr to APFR Removal Setup posn 36. Ride/GCA SSRMS to stbd CETA Cart for APFR Removal 37. RET, release APFR from SSRMS

OBSS EFGF/PDGF SWAP (01:20/01:40) (Cont)

IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
		38. Stow APFR in stbd CETA cart WIF 4 (zenith/port) [12,GG] [**9**,PP,F,6] ❑ √Locking collar black-on-black, pull/twist test 39. Retrieve WIF adapter
7. Give **SSRMS GO** for mnvr to Stage Park posn ***SSRMS:*** *Mnvr to Stage Park posn*		40. **Notify IV** ready for mnvr to Stage Park posn 41. Stow PUMAA/rd scoop/RET and WIF adapter in OBSS C/L bag
8. Perform C/L bag Inventory: OBSS Crewlock Bag: ☐ Adj Equip Tether (ext) ☐ Wire tie caddy (int RET) ☐ Hubble Connector Tool (90 deg) (int RET) ☐ Round Scoop (int RET) ☐ PUMAA ☐ RET (sm-sm) ☐ Adj Equip Tether ☐ WIF Adapter (int RET) 9. Consumables tag up with **MCC-H**		42. Perform OBSS C/L bag Inventory 43. Glove Check (Translate Zenith to OTP – OTP Inspection)

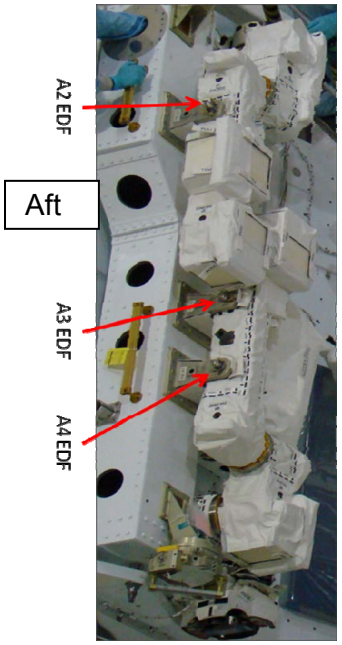
EFGF STOWAGE IN TSA (00:35)

IV/SSRMS	EV2 (Spanky)
Planned PET 04:15 1. Verify inhibits in place √SSPTS inhibited  2. Perform bag Inventory: OBSS Med ORU Bag: External: ☐☐ Adj Equip Tethers (2) (soft tether loops) ☐ Torque Wrench Bag ☐ Long Wire Tie ☐ Short Wire Tie ☐ Adj Equip Tether (between Pry Rod and HR) ☐ Pry Rod Internal: ☐ RET (sm-sm) (RF) ☐ RET (sm-sm) (LB) ☐ Scissors ☐ RET (sm-sm) (RB) 3. When EV2 is clear of PMA2 and Lab fwd, give **MCC-H GO** to release SSPTS Inhibits	CAUTION When translating around fwd edge of Node 2 and PMA2, avoid contact with Shuttle EFGF STOWAGE IN TSA (00:35) 1. Translate to Node 2, zenith/port route 2. Attach **GREEN** hook to Node 2 HR 0344 ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate to Orbiter, port TSA 4. Open port TSA ❑ √Adj equip tether config – pull out of pocket 5. Open flight specific compartment 6. Remove cushion 7. Open OBSS ORU bag 8. Retrieve EFGF from ORU bag 9. Remove adj equip tether hook from D-ring, attach to EFGF ❑ Release RET 10. Remove Tee Pull from EFGF 11. Stow EFGF in TSA; grapple shaft toward ODS, Tee bolt out 12. Install cushion and close flight specific compartment √Velcro strap closed 13. Close port TSA ❑ ❑ ❑ ❑ √Latches closed 14. Perform OBSS ORU bag Inventory 15. Close OBSS ORU bag; stow on BRT w/RET 16. Translate to Node 2 17. Retrieve **GREEN** hook from Node 2 HR 0344 ❑ √Gate closed, hook locked, reels unlocked, release RET (Translate to P3 (ELC3), zenith route – SPDM EDF Release)

OTP LDTD TETHER CINCH (00:15)

IV/SSRMS	EV3 (Taz)
Planned PET 04:35 	CAUTION Avoid inadvertent contact with the OTP and RPCM radiator panel on Face 3 OTP LDTD TETHER CINCH (00:15) 1. Translate zenith to OTP ❑ Use HR stanchion for local tether 2. Route wire tie under buckle 3. Cinch down LDTD Tether 4. Close MLI over buckle √No metal is showing 5. Install wire tie around MLI, closer to buckle end ❑ 3 twists 6. If possible, wrap wire tie under and around MLI a 2nd time ❑ 3 twists 7. Gather excess tether on top of MLI ❑ Close tabs (Translate to P3 (ELC3), nadir route – SPDM EDF Release)

SPDM EDF RELEASE (01:10)

IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
Planned PET 04:50 Zenith  1. Record EDF Bolt data: EDF / Turns / Torque (ft-lb) A3 / (5) / (12.0) A2 / /	CAUTION Avoid inadvertent contact with ELC3 PVGF, SASA Antennas and SPDM Radiators Limit pry rod impulses to 5, then wait 60 sec to let load dissipate SPDM EDFS RELEASE (01:10) 1. Translate to P1 Face 2, zenith route 2. Attach **GREEN** hook to P1 HR 3681 (bay 18) ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate to ELC3; cross at trunnion 4. Stow OBSS ORU bag on ELC3 HR 8704; retrieve pry rod 5. Translate to SPDM SAPH middle EDF (A3) 6. Retrieve PGT from EV3 7. Configure PGT: **[B5 (22.0), CCW2, 30.5]** 6-Ext 7/16 8. Release middle EDF bolt (A3), 5 turns 9. Remove EDF using lanyard; place in stowage location 10. Configure PGT: **[B1 (12.0), CW2, 30.5]** 6-Ext 7/16 11. ←Drive middle EDF bolt (A3), 5 turns 12. Transfer PGT to EV3 13. Place pry rod in EDF A3 bolt location up to black line 14. If A2 EDF does not release nominally, apply force on pry rod and give **EV3 GO** to release EDF 15. Swap PGT and EVA Camera with EV3	CAUTION Avoid inadvertent contact with STP-H3 top experiments, STP-H3 Radiator, and SPDM Radiators Limit pry rod impulses to 5, then wait 60 sec to let load dissipate SPDM EDFS RELEASE (01:10) 1. Translate to P3 Face 1, nadir route 2. Attach **GREEN** hook to P3 CETA rail at Xo 10230 ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate zenith ELC3 4. Translate around edge of ELC3 to SPDM SAPH shoulder EDF (A2) 5. Transfer PGT to EV2 6. Retrieve PGT from EV2 7. Configure PGT: **[B5 (22.0), CCW2, 30.5]** 6-Ext 7/16 8. Release shoulder EDF bolt (A2), 5 turns 9. Remove EDF using lanyard. Do not continue if observe resistance 10. On **EV2 GO**, remove EDF using lanyard 11. Place EDF in stowage location 12. Configure PGT: **[B1 (12.0), CW2, 30.5]** 6-Ext 7/16 13. ←Drive shoulder EDF bolt (A2), 5 turns 14. Swap PGT and EVA Camera with EV2

SPDM EDF RELEASE (01:10) (Cont)

<table>
<tr><th>IV/SSRMS</th><th>EV2 (Spanky)</th><th>EV3 (Taz)</th></tr>
<tr>
<td>2. Record EDF Bolt data:
<table>
<tr><th>EDF</th><th>Turns</th><th>Torque (ft-lb)</th></tr>
<tr><td>A4</td><td>(5)</td><td>(12.0)</td></tr>
</table>
3. Perform EV Final Tool Inventory (Refer to Tool Config FS 7-__)</td>
<td>16. Transfer pry rod to EV3
17. Configure PGT:
[B5 (22.0), CCW2, 30.5] 6-Ext 7/16
18. Release wrist EDF bolt (A4), 5 turns
19. Remove EDF using lanyard. Do not continue if observe resistance
20. On EV3 GO, remove EDF using lanyard
21. Place EDF in stowage location
22. Configure PGT:
[B1 (12.0), CW2, 30.5] 6-Ext 7/16
23. ←Drive wrist EDF bolt (A4), 5 turns
24. Retrieve pry rod from EV3
25. Stow pry rod on OBSS ORU bag
26. Perform MWS Tool Inventory
27. Stow OBSS ORU bag on BRT w/RET
28. Glove Check
29. Retrieve GREEN hook from P1 HR 3681
❑ √Gate closed, hook locked, reels unlocked, release RET
(Translate to A/L)</td>
<td>15. Retrieve pry rod from EV2
16. Place pry rod in EV3 bolt position up to black line
17. If EDF does not release nominally, apply force on pry rod and give EV2 GO to release EDF
18. Transfer pry rod to EV2
19. Perform MWS Tool Inventory
20. Glove Check
21. Retrieve GREEN hook from P3 CETA rail at Xo 10230
❑ √Gate closed, hook locked, reels unlocked, release RET
22. Translate to stbd CETA Cart
23. Retrieve C/L bag, stow on BRT w/RET
(Translate to S0 Port Struts)</td>
</tr>
</table>

CLEANUP/INGRESS (00:30)

IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
Planned PET 06:00	CLEANUP (00:15) 1. Translate to A/L	CLEANUP (00:15) 1. Translate to S0 Port Struts
	INGRESS (00:15)	INGRESS (00:15)
1. Start Hatch Thermal Cover clock PET (30 min) __ : __	2. Open hatch thermal cover	
	3. Attach R Waist Tether to A/L int D-ring ext ❑ √Gate closed, hook locked	
	4. Give **EV3 GO** to attach R WT and release EV2 **BLANK** hook	2. On **EV2 GO,** attach L Waist Tether to EV2 **BLANK** hook (inbd strut) ❑ √Gate closed, hook locked
	5. Stow OBSS ORU bag in A/L	3. Release EV2 **BLANK** hook from inbd strut ❑ √Gate closed, hook locked
2. Prior to hatch closure, perform WVS PWRDN (PHOTO/TV, WVS Cue Card)		4. Retrieve EV3 **BLANK** hook from outbd strut; attach to MWS
		5. Translate to A/L
	6. Retrieve OBSS C/L bag from EV3; stow in A/L	6. Transfer OBSS C/L bag to EV2
	7. Ingress A/L	
3. Stop Hatch Thermal Cover clock PET (30 min) __ : __		7. Ingress A/L 8. Close hatch thermal cover; attach Velcro strap
	8. Remove SCU from stowage pouch	9. Remove SCU from stowage pouch
	9. Remove DCM cover; Velcro to DCM	10. Remove DCM cover; Velcro to DCM
	10. Connect SCU to DCM √SCU locked	11. Connect SCU to DCM √SCU locked
	NOTE A TCV setting 8 – Max C minimizes time for SCU cooling	NOTE A TCV setting 8 – Max C minimizes time for SCU cooling
	11. WATER – OFF (fwd), expect H2O IS OFF msg	12. WATER – OFF (fwd), expect H2O IS OFF msg
		CAUTION Do not close hatch until EMU Water OFF for 2 min. Verify outer hatch clear of hardware
		13. Verify outer hatch clear of hardware

CLEANUP/INGRESS (00:30) (Cont)

IV/SSRMS	EV2 (Spanky)	EV3 (Taz)
		14. Verify handle position per hatch decal 15. Close and lock hatch
	Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)	Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)

OBSS STOW – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	00:55	N/A

Tools:

EV2	EV3
J601/J602 Grounding Connectors	APFR
90 deg Connector Tool (Contingency)	SSBAD/OSE
SSBAD/OSE	

EVA Fasteners (Contingency):

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
SSBAD Knob	7/16	1	3.8	12.0	12.3[1]	SD-CL 3.5-7.5 OP-CL 10.5-11.0
SSBAD Release Bolts	7/16	2	2.5	12.0	17.4	4-6
OSE Bolt 1	7/16	1	18.4	25.5	82.6	11.5-13

[1]Do not drive the SSBAD Knob bolt past the 'OP' indicator and to hard stop. Failure torque is 7.3 ft-lb if hard stop reached

EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
ISA1	P601	OSE HR (PIP pins)			Ground
ISA2	P602	OSE HR (PIP pins)			Ground
W1-3					

Foot Restraints:

Task	WIF	APFR Setting
OBSS Stow at Inbd OSE	S1 WIF 5	[10,TT,J,1]

ORU Details:

ORU	Part Number	Mass
IBA	Serial # 202	547.36 lb (IBA)
J601/J602 Connectors	260213-206938-553	1.72 lb

Notes:

1. If outbd striker bar lines up with outbd OSE, EV2 can soft dock simultaneously with EV3 (inbd OSE capture)
2. To disconnect P601/P602 connector, rotate wing-tabbed connector 1/4 turn ccw, then lift straight up
3. To install J601/J602 grounding connectors, align red stripped backshell wing with arrow on ISA plate, mate connector and rotate 1/4 turn cw
4. After grounding connectors are installed, verify red band on connector not visible
5. J601/J602 Grounding connectors are tied together to form one cable assembly. Connector end of cable has ~28 inches free and PIP pin end has ~35 inches free
6. Inbd OSE does not have 3rd joint release. Positions 3 and 4 are same
7. Once OBSS is fully secured to both OSEs, handrails on OBSS can be used for translation and BRT
8. OBSS is 597 inches long

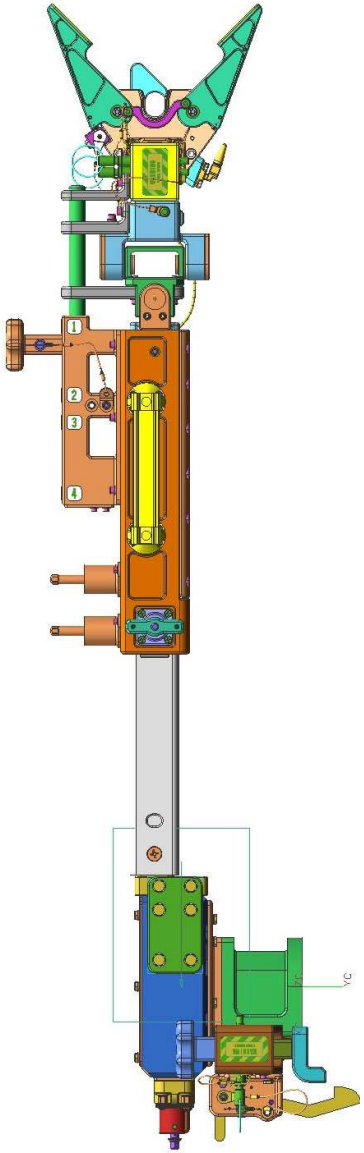
Caution:

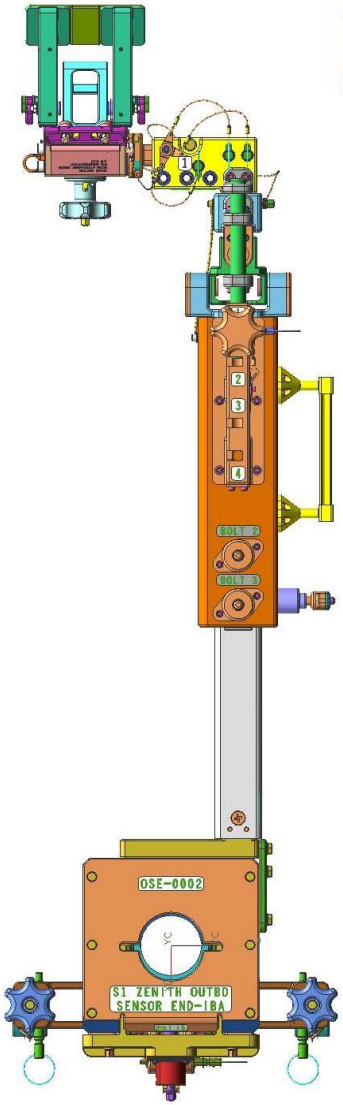
1. Must be cautious when moving SSRMS to clear FRGF grapple shaft of OBSS. Inadvertent oscillations can cause damage to LEE on SSRMS. If oscillations do occur, plan is to continue to move LEE away from OBSS at a constant rate while EV crewmembers try to maintain current positions. If significant oscillation occurs, SSMRS will stop motion and wait for oscillations to dampen before resuming motion

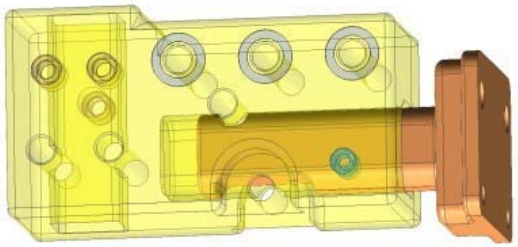
Timeline Considerations:

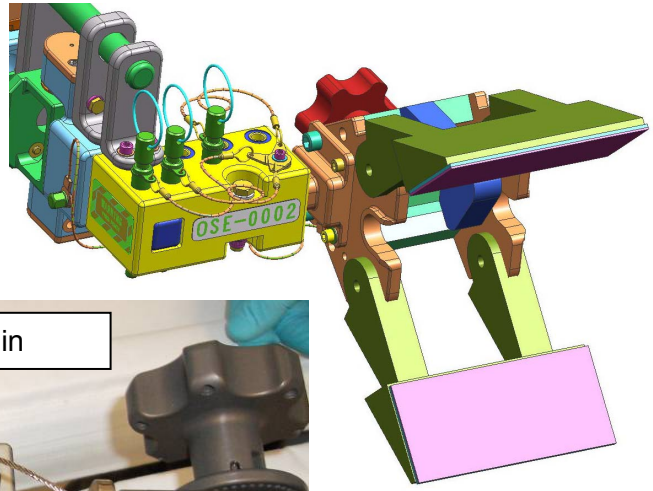
1. Sensors have a thermal clock of 90 min starting at SRMS/SSRMS handoff. Not applicable during OBSS stow since plan is to let sensors decay

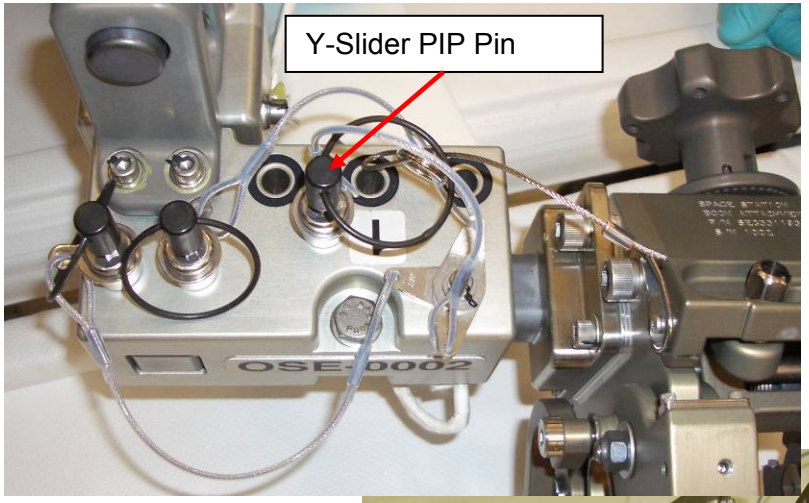
OBSS STOW – TASK DATA (Cont)



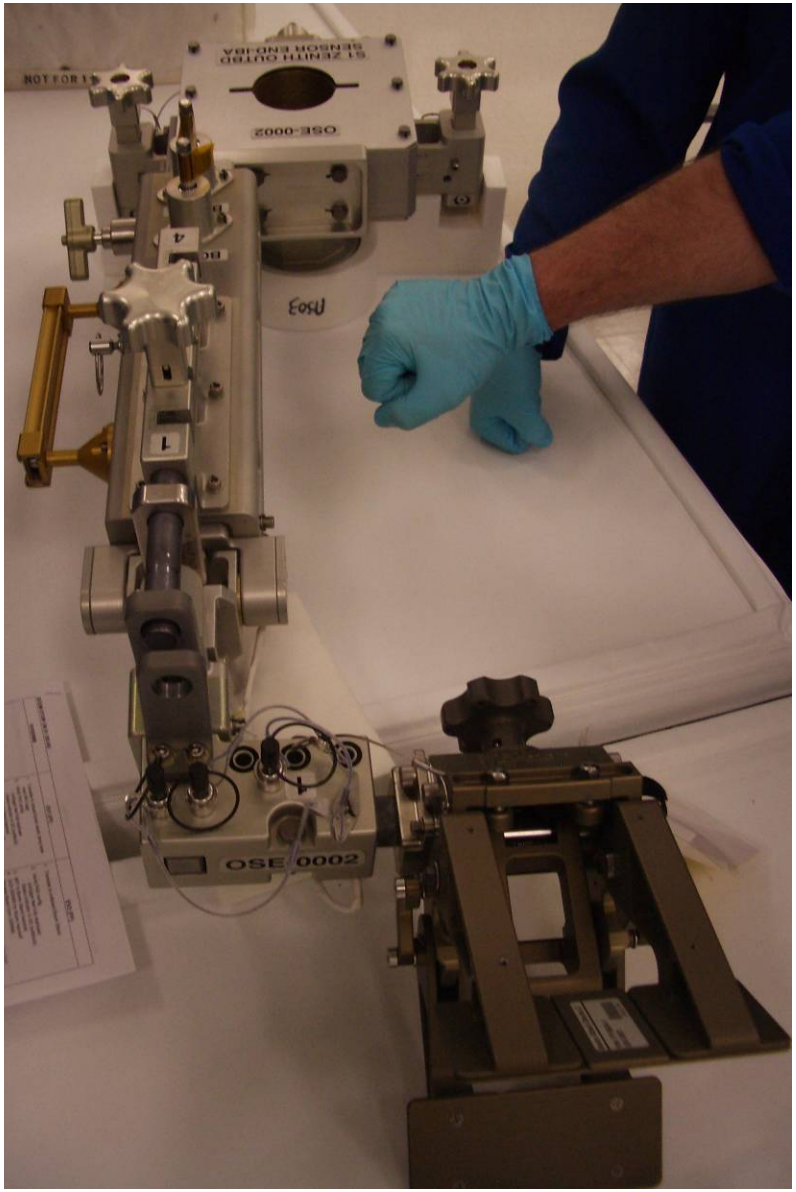


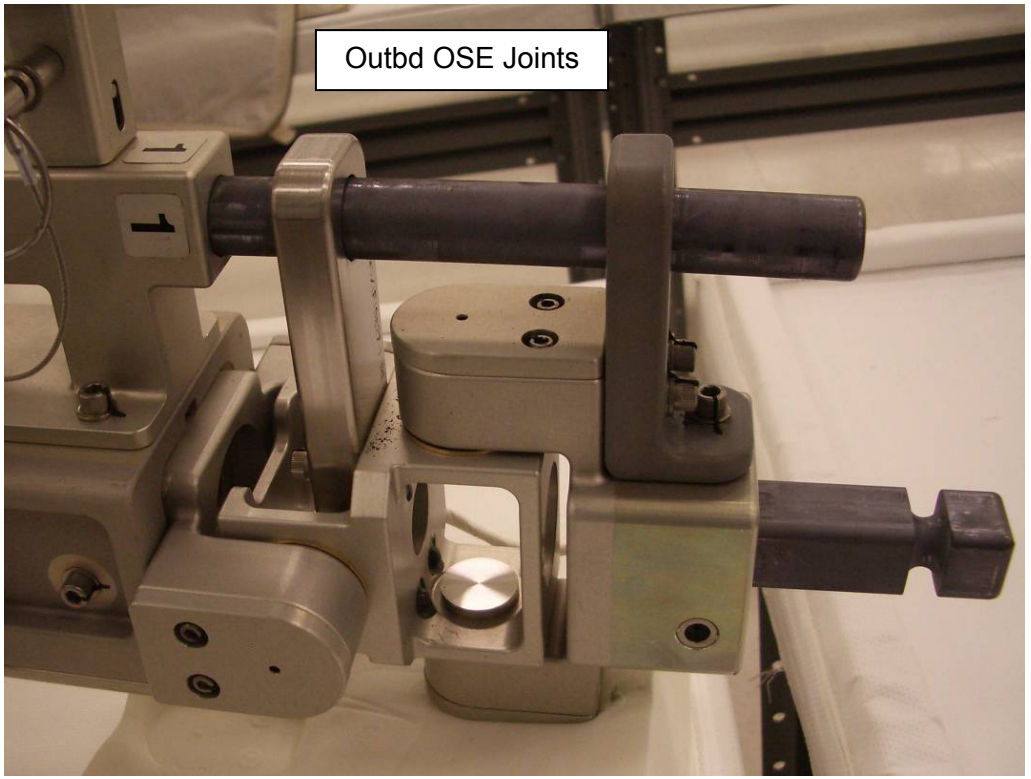


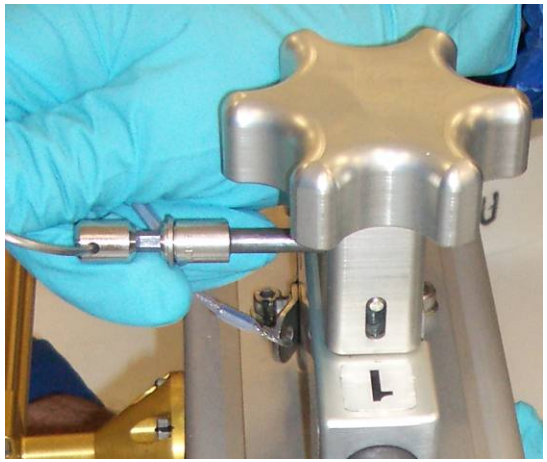




OBSS STOW – TASK DATA (Cont)







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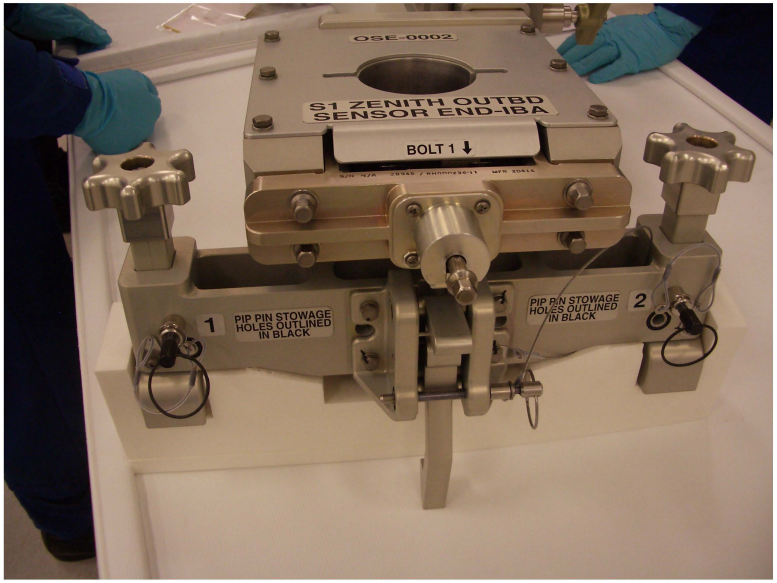

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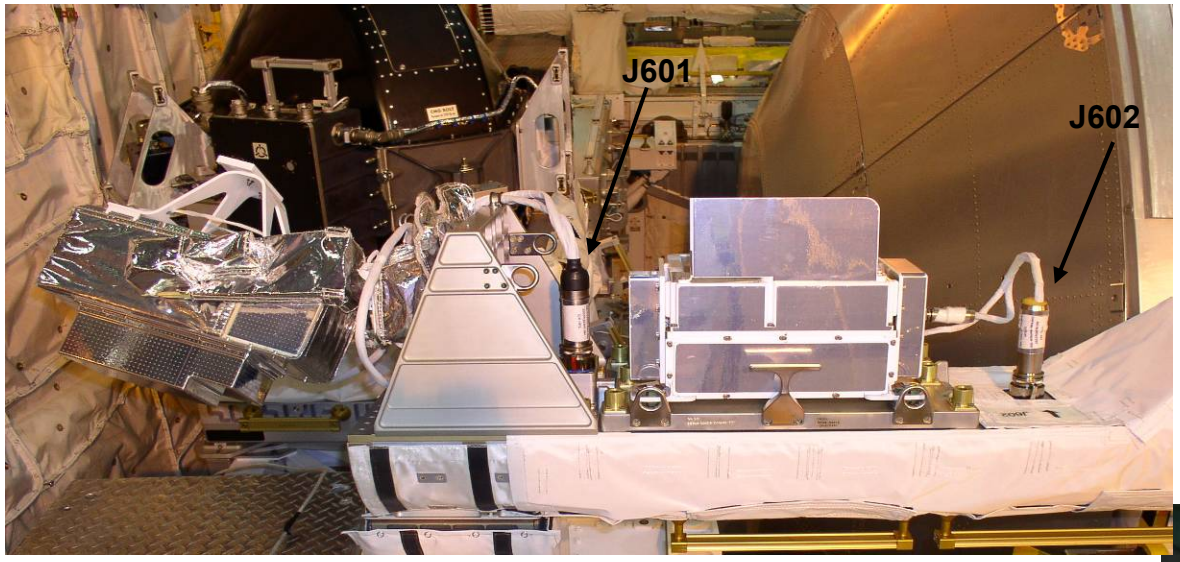
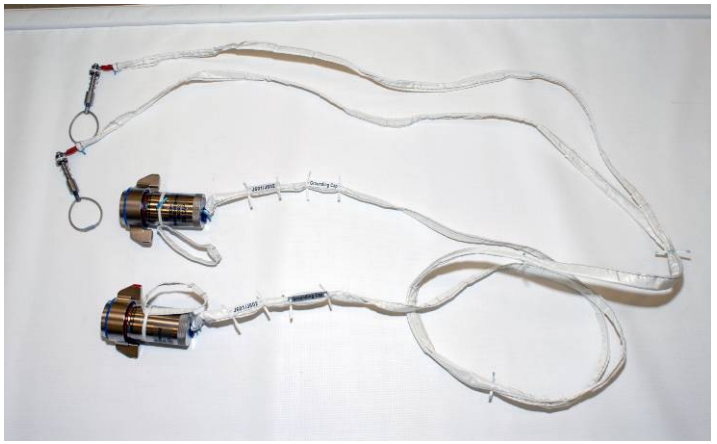
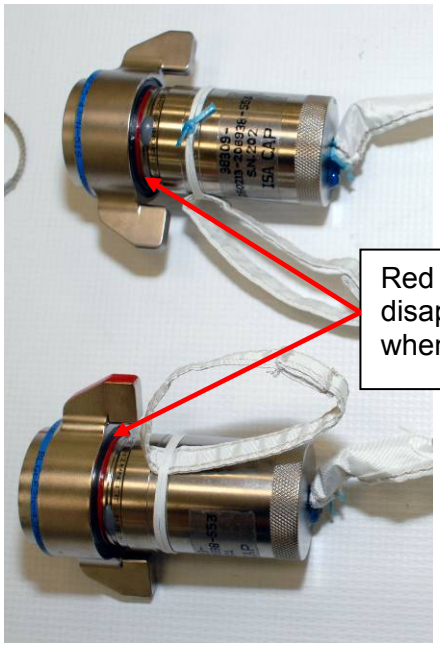






P6 PDGF RETRIEVE – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	01:25

Tools:

EV2	EV3
PUMAA	PGT w/7/16 Socket – 6 ext
Round Scoop	

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
PDGF EDFs	7/16	4	25.8	25.8	33.0	4-6
PUMAA Bolt	7/16	1	18.4	25.5[1] for 2 turns, 9.2 for 8 turns	27.3	10

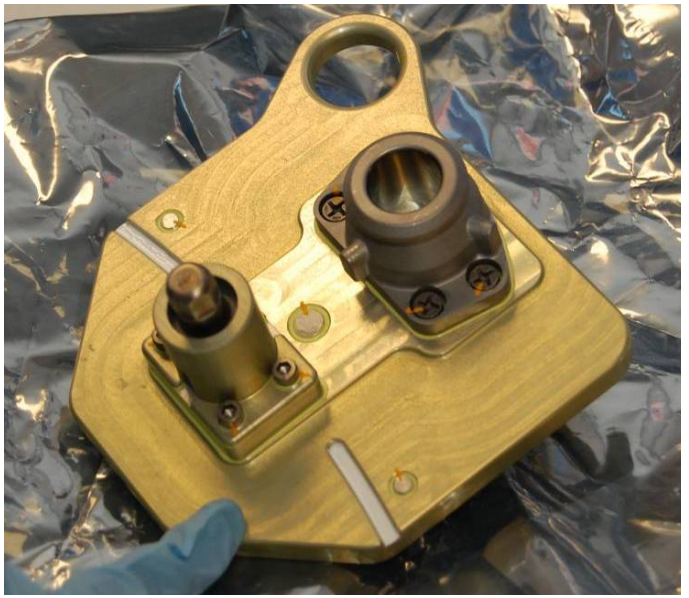
[1]Per MDA coordination, PUMAA bolt can be released at B7 for all turns

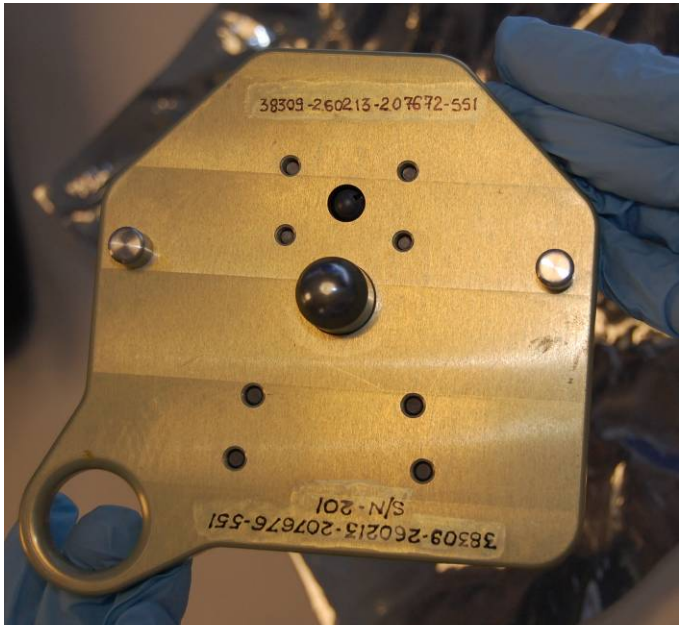
Foot Restraints:

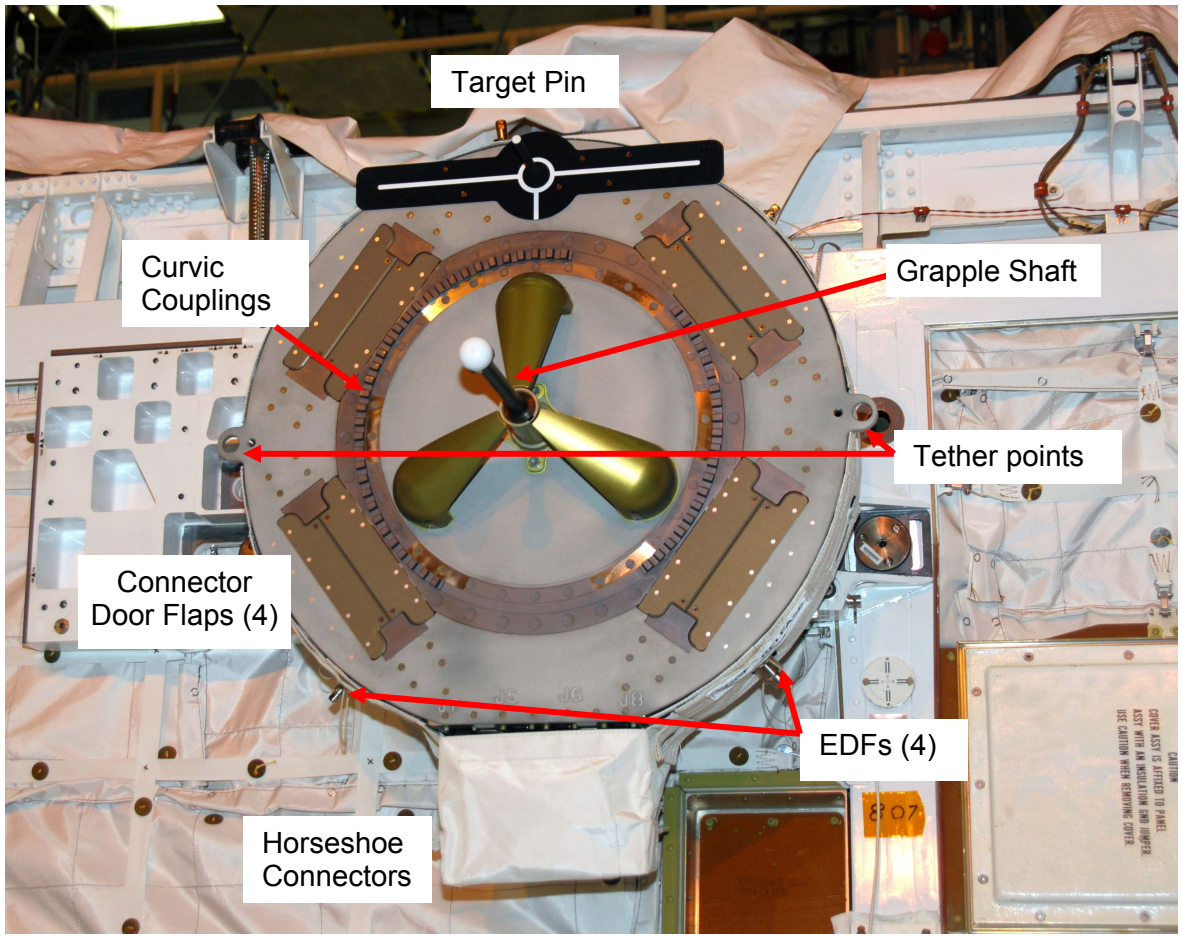
Task	WIF	APFR Setting
PDGF Retrieve	P6 WIF 12	[3,OO,F,12]

Notes:

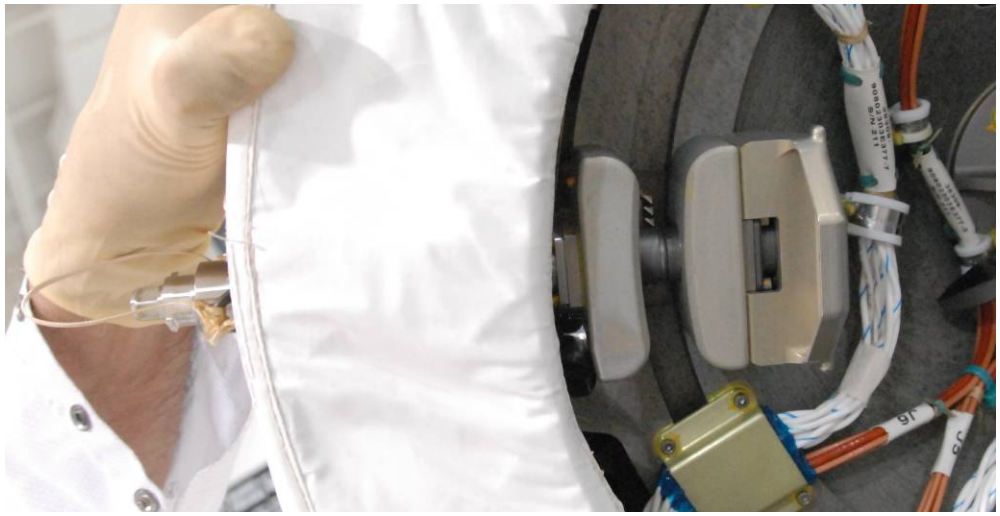
1. PUMAA could exceed touch temperatures in 4.5 min
2. RET must be directly applied to both PDGF and PUMAA (or round scoop if attached to PUMAA)
3. The number of cycles on PUMAA bolt needs to be tracked






Target Pin
Curvic Couplings
Grapple Shaft
Tether points
Connector Door Flaps (4)
EDFs (4)
Horseshoe Connectors


RELEASE



OBSS EFGF/PDGF SWAP – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	01:30	N/A

Tools:

EV2	EV3
EVA Scissors	PGT w/7/16 Socket – 6 ext
	WIF Adapter
	APFR

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
EFGF Bolts	7/16	6	16.0	25.5 2 turns, 9.2 remaining[1]	40.4	8
PAA Bolts	7/16	6	4.8 (3 turns), 22.0 (5.5 turns)	25.5 2 turns, 9.2 remaining	40.4	8.5
PDGF EDFs	7/16	4	12.0, then 25.5	25.5	33	4-6
PUMAA Bolt	7/16	1	18.4	25.5 2 turns, 9.2 remaining[2]	27.3	10

[1]Per MDA coordination, EFGF bolts can be released at B2 for all turns
[2]Per MDA coordination, PUMAA bolt can be released at B7 for all turns

ORU Details:

ORU	Part Number	Mass (lb)
EFGF	260213-204662-557	33.3
PAA	260213-207629-551	29.1
PDGF	51618-0002-1	70.7
PUMAA	260213-207676-551	1.7
EIBA	Serial # 202	621.32

Foot Restraints:

Task	WIF	APFR Setting
EFGF/PDGF Swap	SSRMS	[12,PP,F,6]

Notes:

EFGF

1. Bolts will disengage prior to visible white line
2. As the 6th EFGF bolt removed, EFGF can float concealing the white lines

PAA

3. 6 bolts on PAA and IBA standoff are numbered for alignment
4. No soft dock on PAA; must be held in place until at least 1 bolt
5. There are 4 T-handles, 1 black for alignment with IBA. Matches black line on IBA
6. Washers on IBA many become dislodged if struck. Refer to contingency procedures if this occurs

PDGF

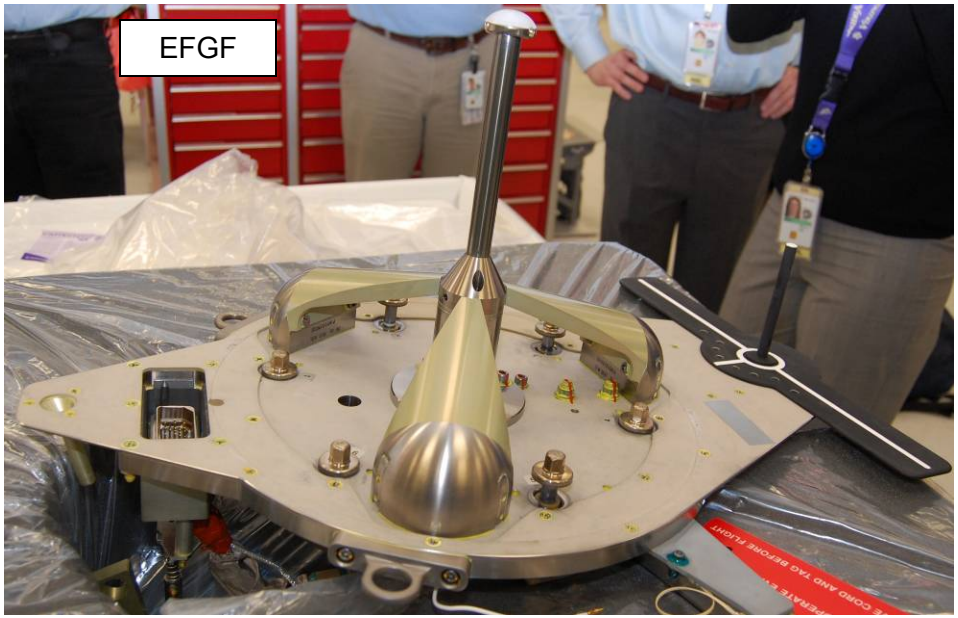
7. 1 o'clock orientation is only physically possible orientation for PDGF install on PAA
8. Target rod on PDGF will align with arrow on PAA
9. PDGF has soft dock
10. Crew should avoid off-axis loads on EDFs

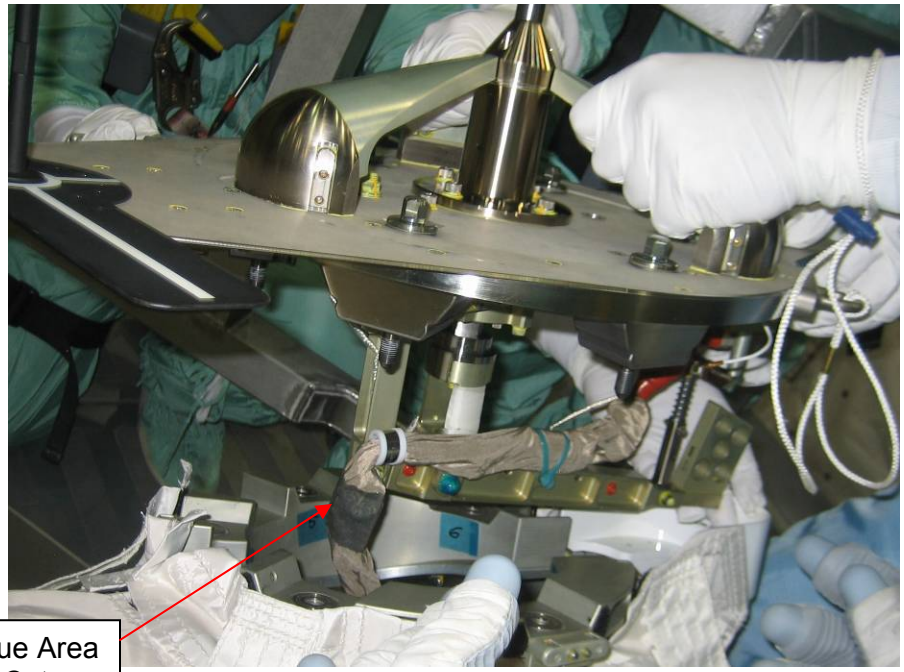
Warnings:

EFGF

1. Six captive EVA 7/16" bolts, non-spring retracted resulting in exposed threads (sharp edge concerns)
2. Bottom of 6 standoff blocks no-touch due to surface material (dry lube: Tungsten Disulphide)
3. Grapple shaft no-touch due to surface material (dry lube: Tungsten Disulphide)
4. Potential sharp edges after cutting EFGF harness cable

OBSS EFGF/PDGF SWAP – TASK DATA (Cont)

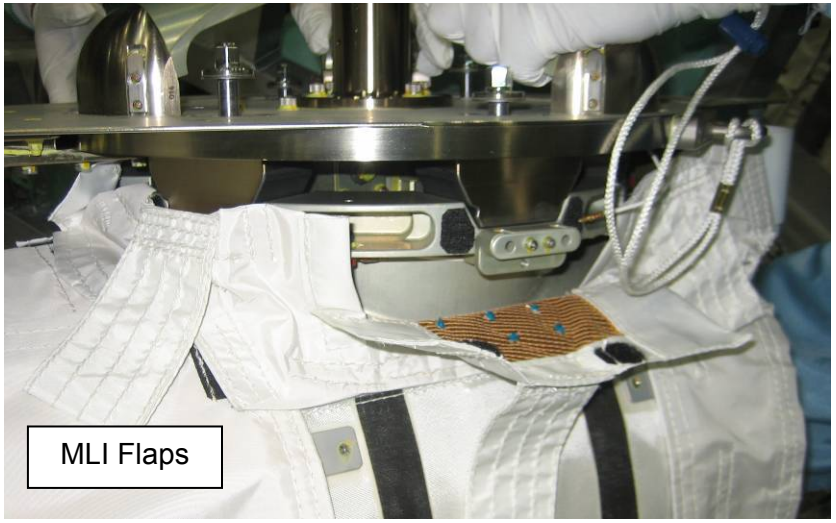


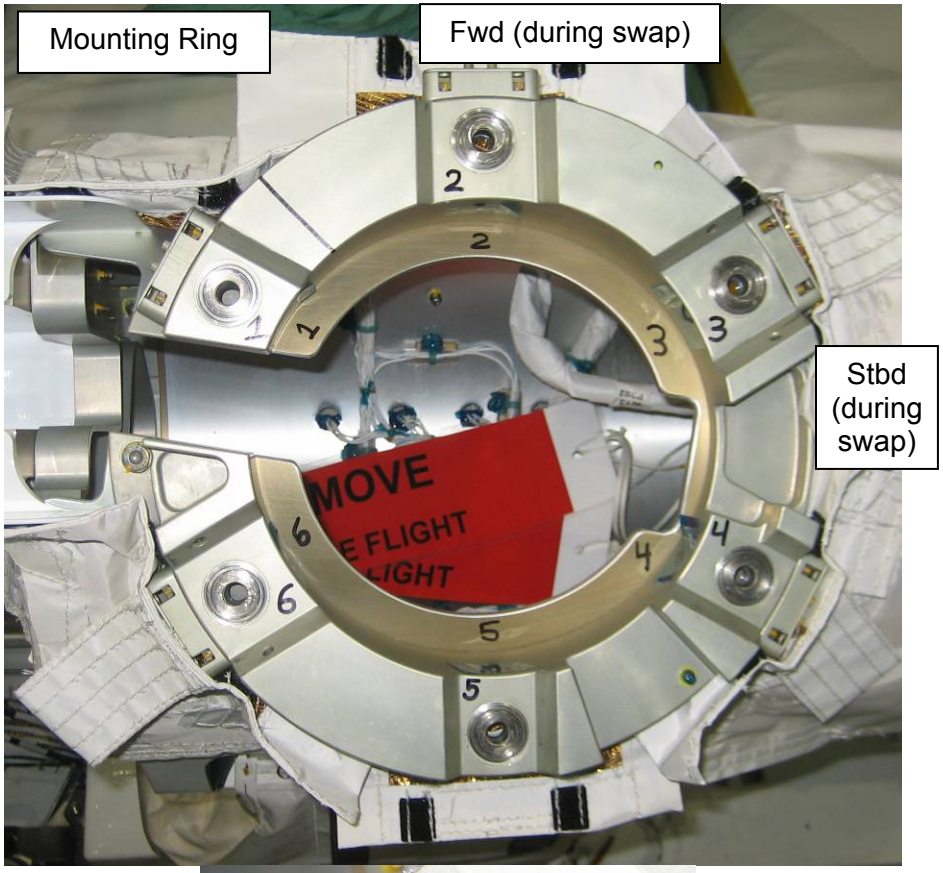


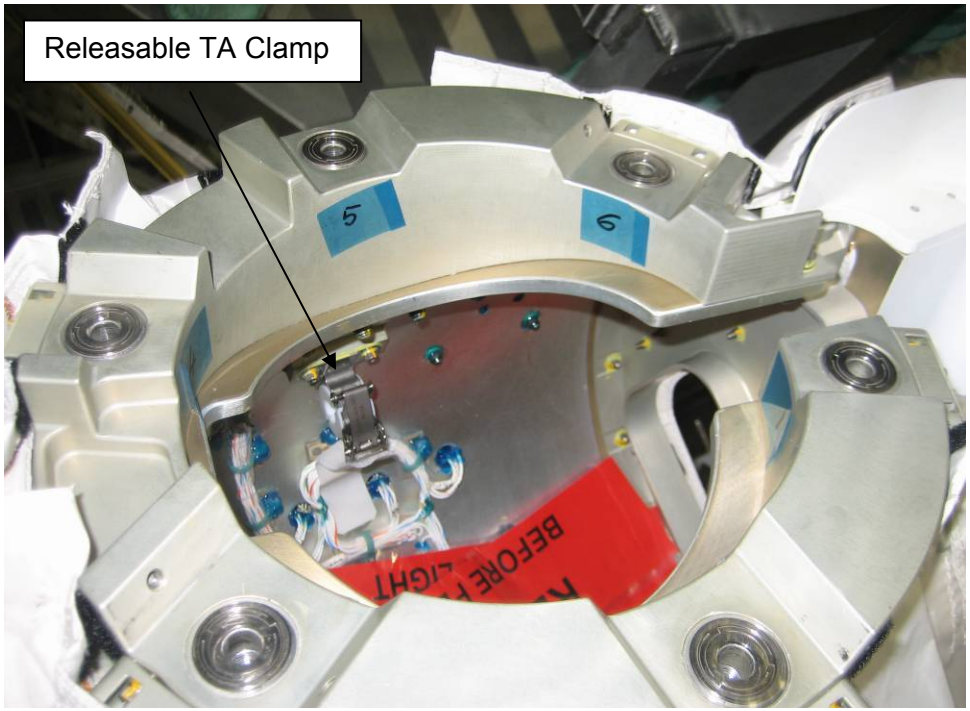
Blue Area to Cut

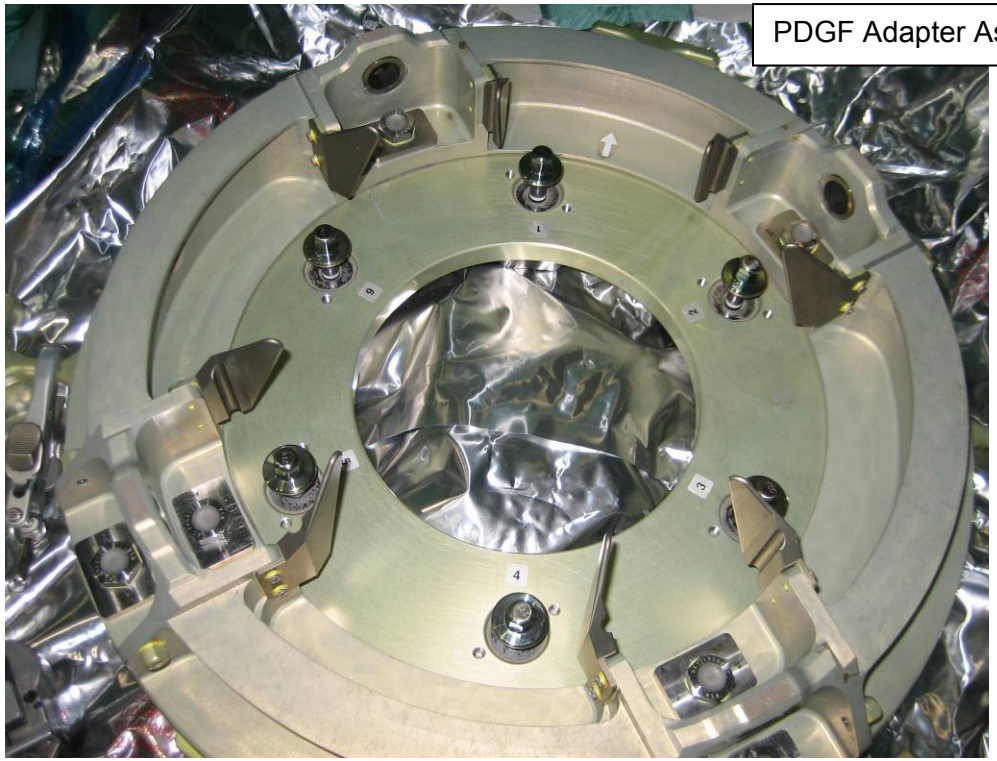
Releasable TA Clamp

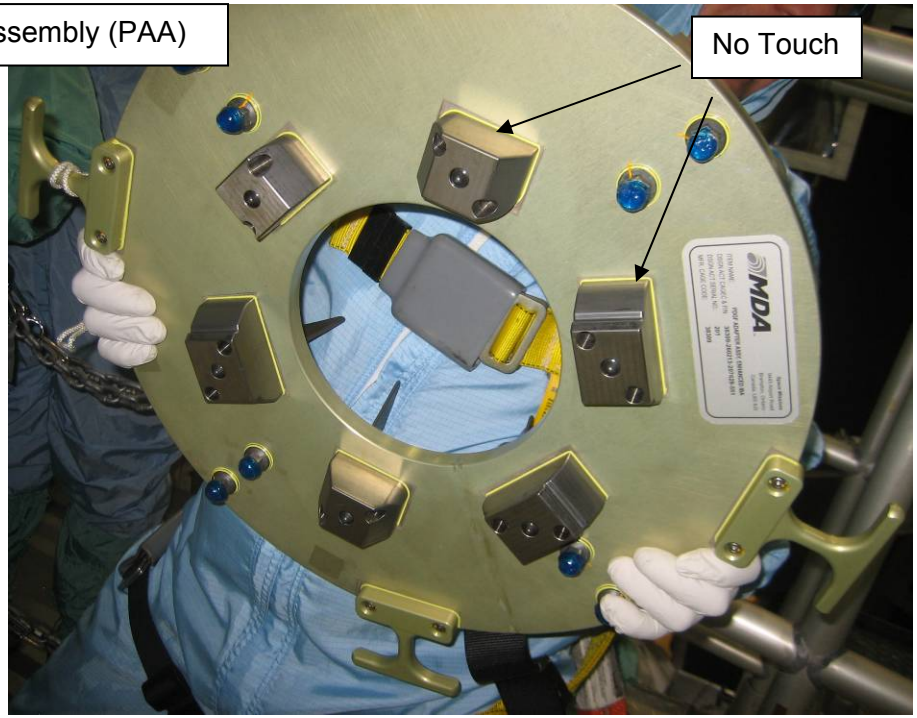
OBSS EFGF/PDGF SWAP – TASK DATA (Cont)








PDGF Adapter Assembly (PAA)


No Touch


Near Bolt 1

EFGF STOW IN TSA – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:35
Two EV Crew	N/A	N/A

Tools:

EV2
EFGF
1/2" Box End Ratchet (Contingency)

Notes:

1. EFGF is requested to be brought home mainly for the bolts
2. T-handle must be removed for EFGF to fit

OTP LDTD TETHER CINCH – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:15
Two EV Crew	N/A	N/A

Tools:

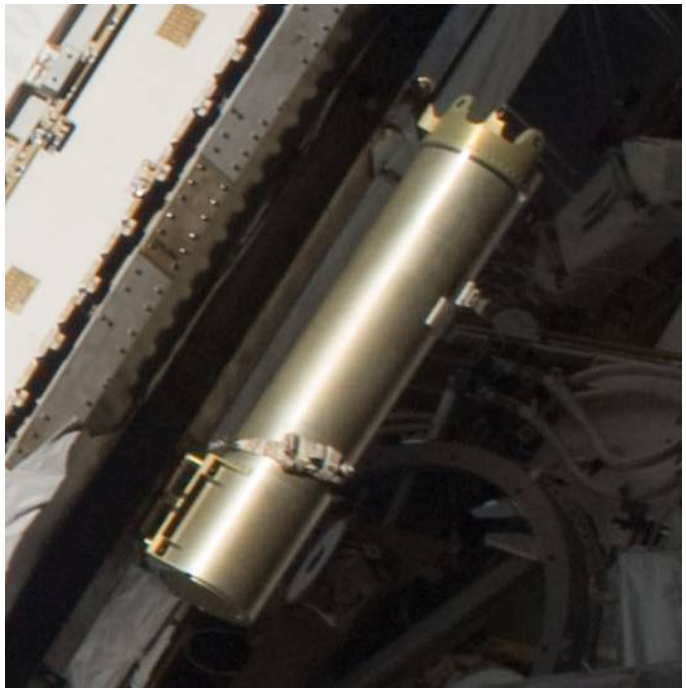
EV3
Long Wire Tie

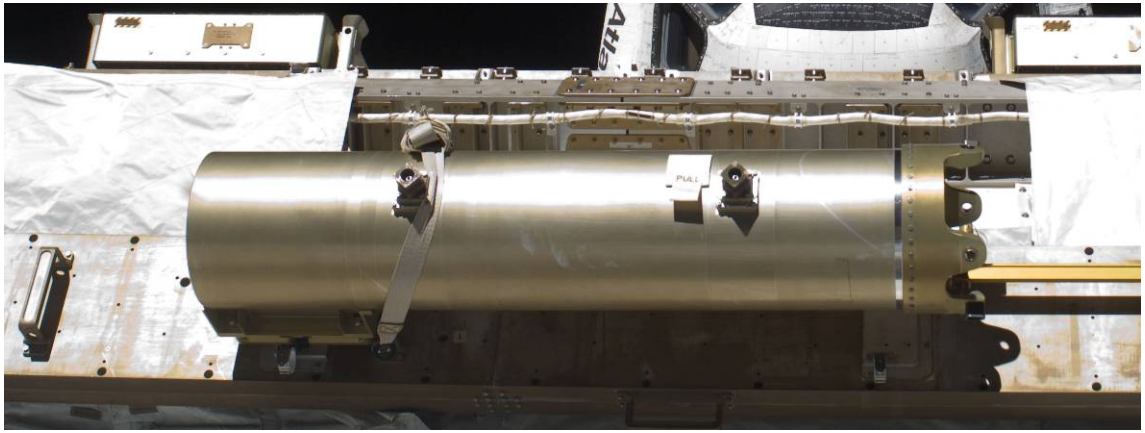
Notes:

1. 2 wraps of the wire tie around LDTDT is requested, but understand it is best effort

Caution:

1. Avoid inadvertent contact with RPCM Radiator Panel and OTP surfaces





SPDM EDF RELEASE – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	01:00

Tools:

EV2/EV3
PGT w/7/16 Socket – 6 ext
SPDM Pry Rod

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
SPDM EDFs	7/16	3	12.0	22.0	19.9	5	30

Foot Restraints:

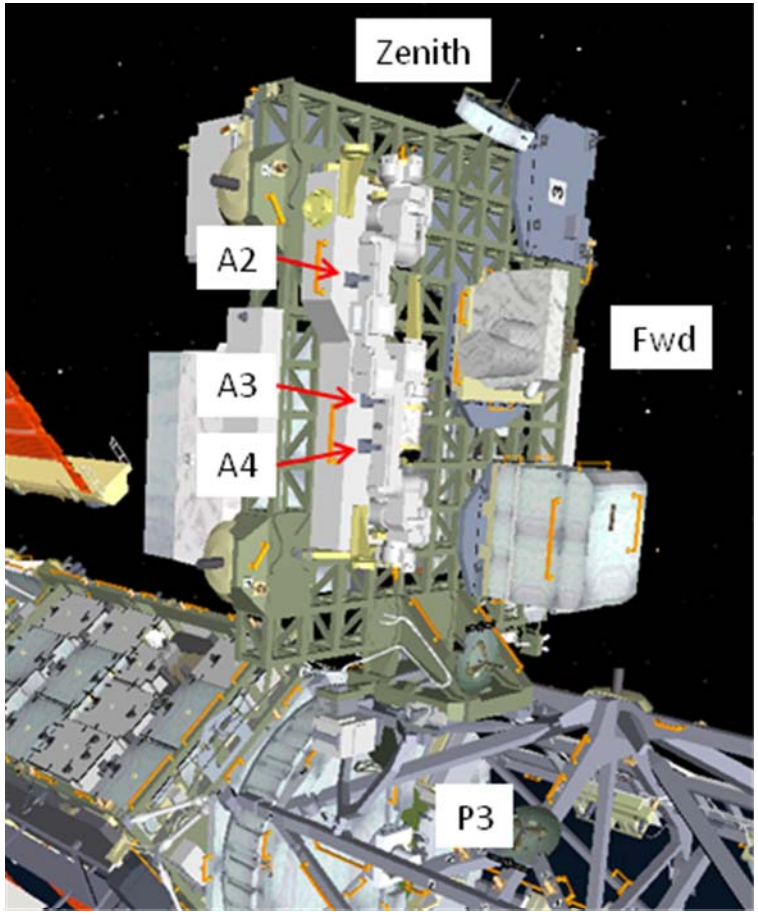
Task	WIF	APFR Setting
Release A4 EDF – Contingency	ELC3 WIF 3	[9,FF,A,12]
Release A2 EDF – Contingency	ELC3 WIF 4	[3,VV,A,1]

ORU Details:

ORU	Part Number	Mass (lb)
Pry Rod	51602-9315-551	3.53

Notes:

1. EDFs are only required for launch
2. Crew will attempt to release EDFs without use of pry rod
3. SPDM pry rod is 40" long
4. Estimated force on SPDM pry rod at end is 50 lb. Max is 67 lb
5. EV will insert SPDM pry rod into EDF hole up to black line
6. Limit pry rod impulses to 5, then wait 60 sec to let load dissipate



SPDM EDF RELEASE – TASK DATA (Cont)

TOP

HOOK VELCRO

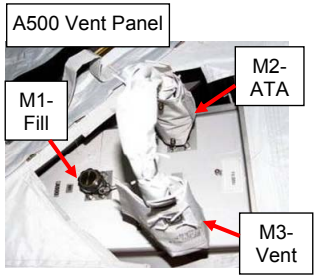
EVA FLUID QD/SARJ CUE CARD

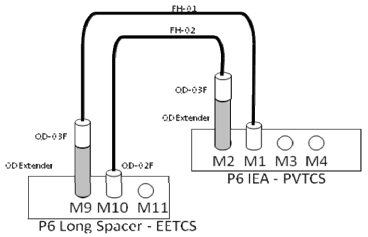
BLOCK A – DEMATE QD
1. √Side-loads
2. Pull back release ring – demate
3. √Fwd band not visible
4. √FOD – both sides

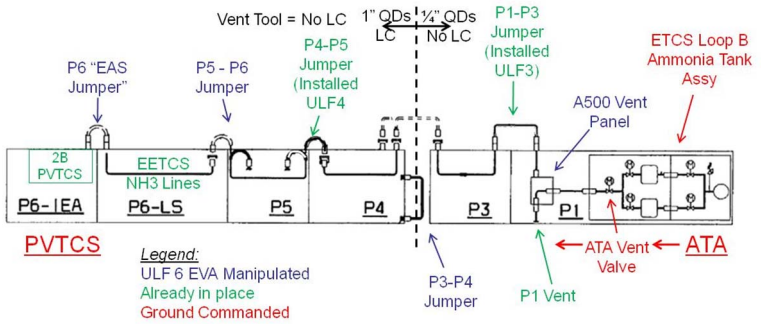
BLOCK B – MATE QD
1. √FOD – both sides
2. √Button up, collar locked (1" only)
3. √Fwd band not visible
4. √Side-loads
5. Mate QD
6. √Fwd band visible
7. Snapback, Pull, Gap checks
8. Close bootie (as reqd)

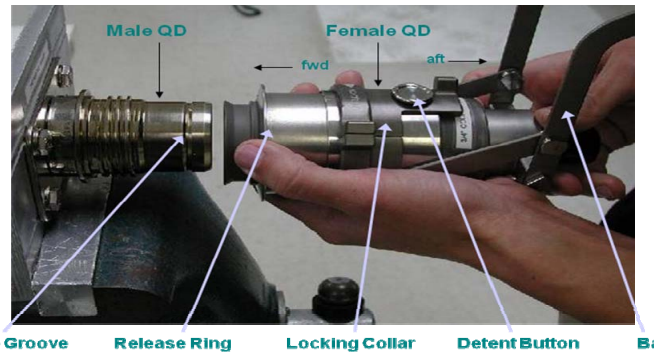
BLOCK C – OPEN VALVE
1. √Side-loads
2. Unlock collar (1" only)
3. Depress button, move bail fwd
4. √Aft band visible
   √Button up
5. Lock collar (1" only)
6. Close bootie (as reqd)

BLOCK D – CLOSE VALVE
1. √Aft band visible
2. Unlock collar (1" only)
3. √Detent button up & depressible
4. √Side-loads
5. Move bail fwd forcefully; while depressing button, move bail aft
6. √Fwd band visible
7. √Detent button up
8. Lock collar (1" only)
9. Close bootie (as reqd)







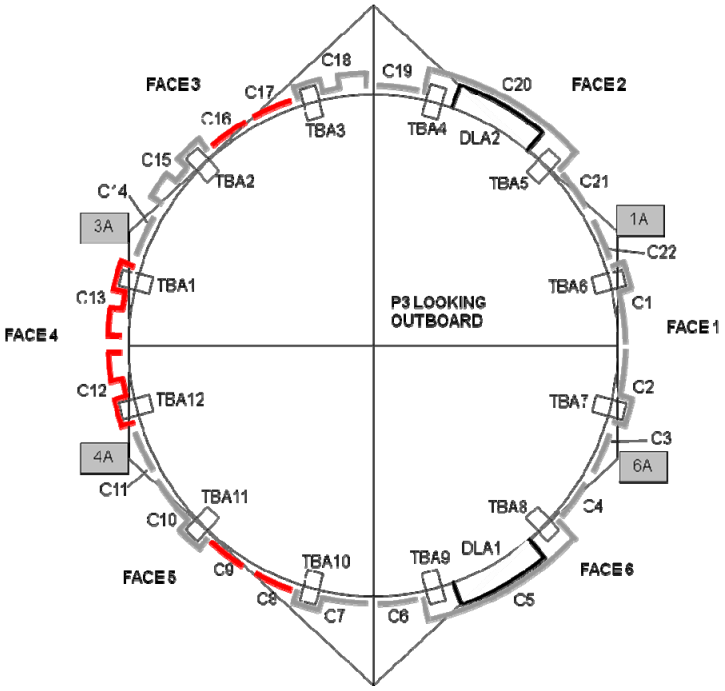


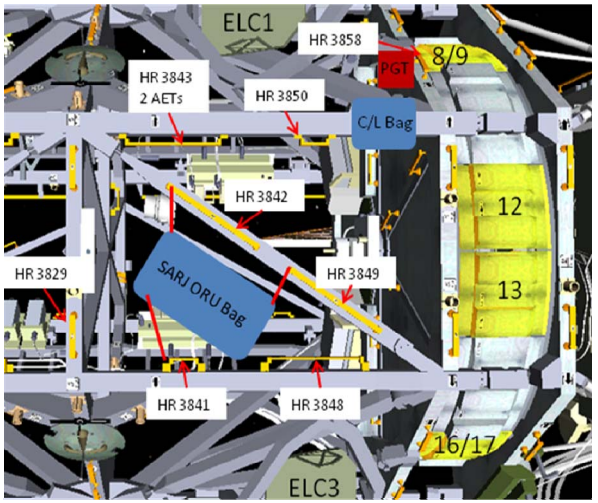
EVA-4a/134/O/B

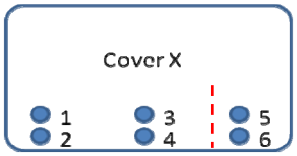
(reduced copy)

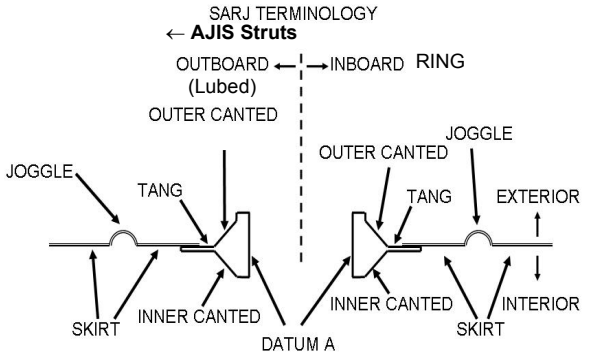
TOP
BACK OF 'EVA FLUID QD/SARJ CUE CARD'

HOOK VELCRO









EVA-4b/134/O/B

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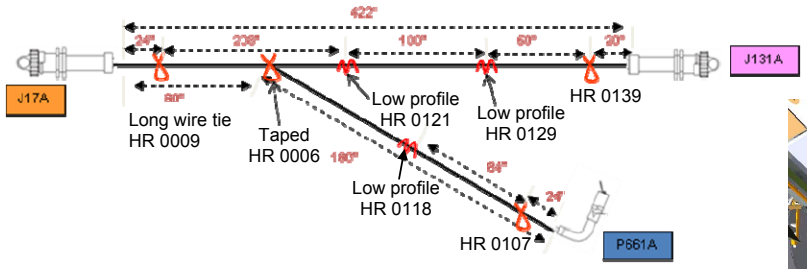
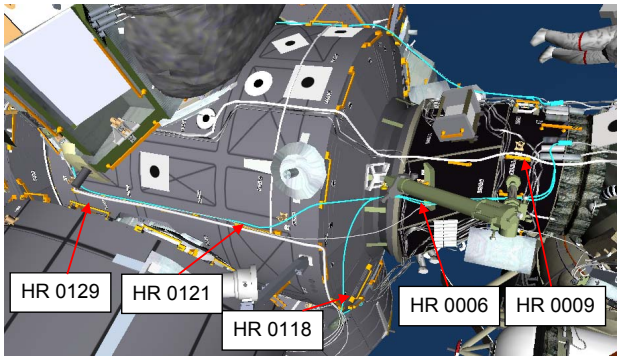
TOP

HOOK VELCRO

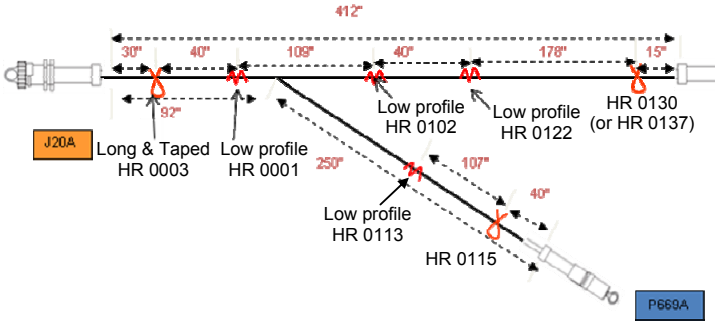
EVA 3 CABLE ROUTING CUE CARD

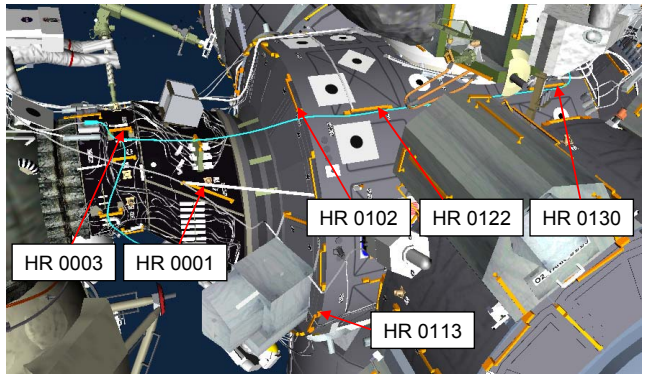
Ch 1/4 FGB Y-Cable (port)





Ch 2/3 FGB Y-Cable (stbd)



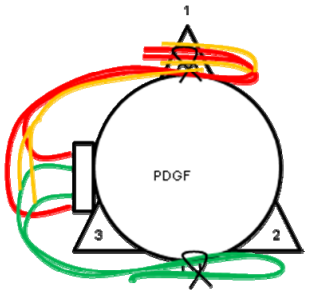


EVA-7a/134/O/A

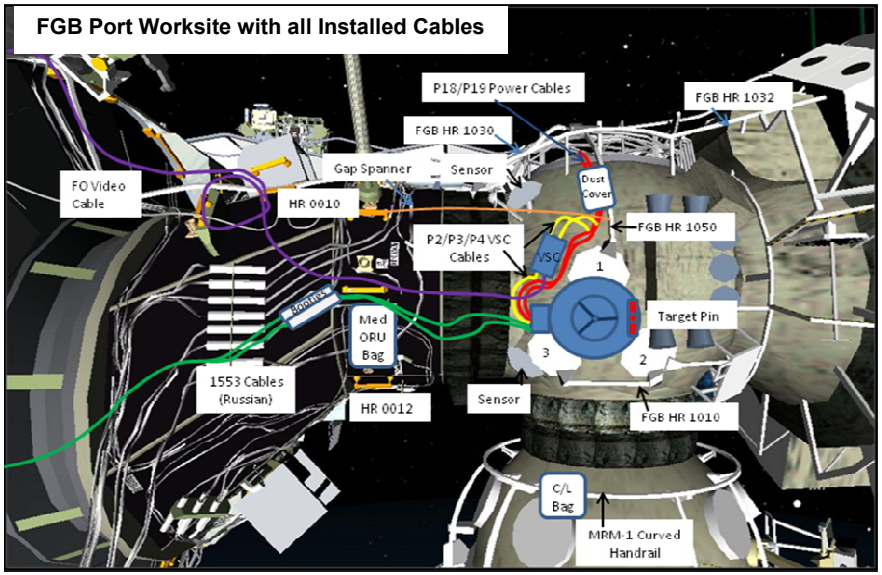
(reduced copy)

TOP
BACK OF 'EVA 3 CABLE ROUTING CUE CARD'

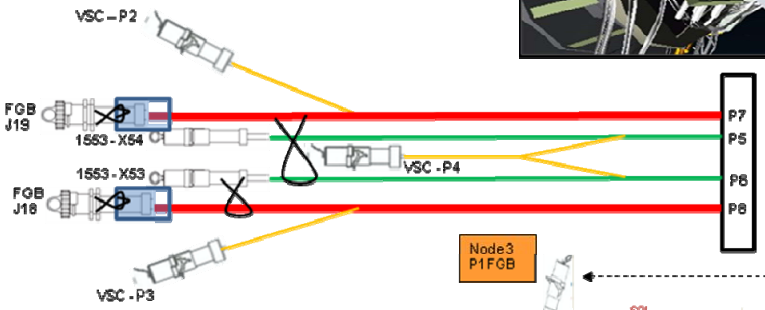
HOOK VELCRO



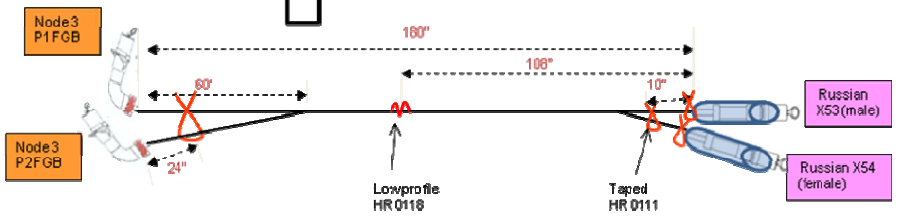
FGB Port Worksite with all Installed Cables



FGB PDGF Cables



1553 PDGF Cables



EVA-7b/134/O/A

(reduced copy)

GET-AHEADS

STS-134 GET-AHEADS

EVA Get-ahead Tasks (Order indicates priority)	Duration	EVA to Perform Task	Inhibits
OTP LDTD Tether Cinch	00:15	EVA 1, 2, 3	None
STP-H3 Photos	00:15	EVA 1, 2	PSARJ Locked
Port CETA Cart Reconfig	00:30	EVA 4	MT Latched
S1 FHRC P-Clamp Release	00:45	EVA 1, 2, 3, 4	Stbd TRRJ Locked at 0°

OTP LDTD TETHER CINCH (00:15)

IV/SSRMS	EV
Tools Required: ❑ 1 Long Wire Tie Inhibits Required: None 	CAUTION Avoid inadvertent contact with the OTP and RPCM radiator panel on Face 3 OTP LDTD TETHER CINCH (00:15) 1. Translate to OTP ❑ Use HR stanchion for local tether 2. Route wire tie under buckle 3. Cinch down the LDTD Tether 4. Close the MLI over the buckle √No metal showing 5. Install wire tie around MLI, closer to buckle end ❑ 3 twists 6. If possible, wrap wire tie under and around MLI a second time ❑ 3 twists 7. Gather excess tether on top of MLI ❑ Close tabs 8. Glove Check

OTP LDTD TETHER CINCH – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:15
Two EV Crew	N/A	N/A

Tools:

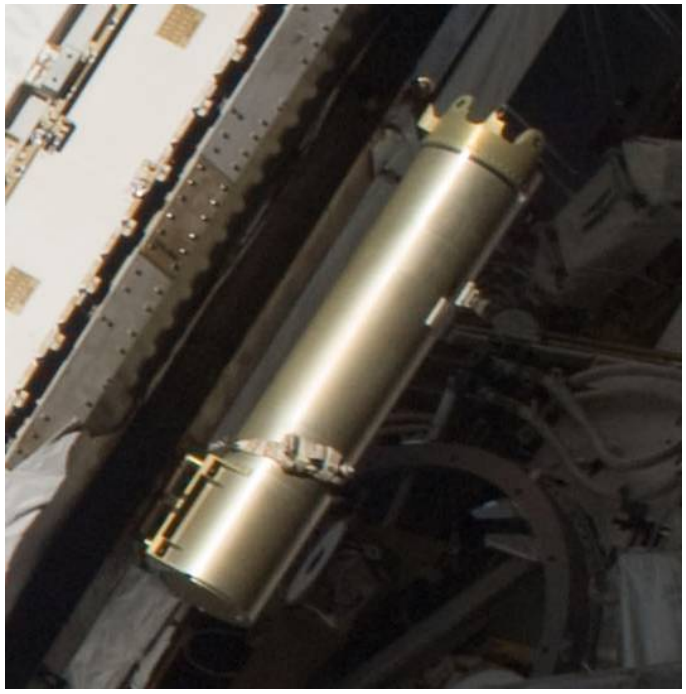
EV
Long Wire Tie

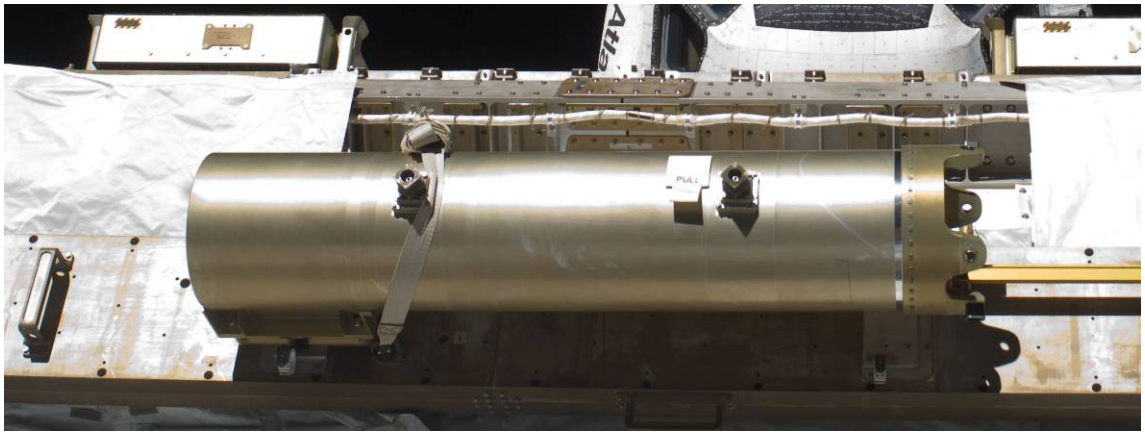
Notes:

1. Two wraps of the wire tie around the LDTDT is requested, but understand it is best effort

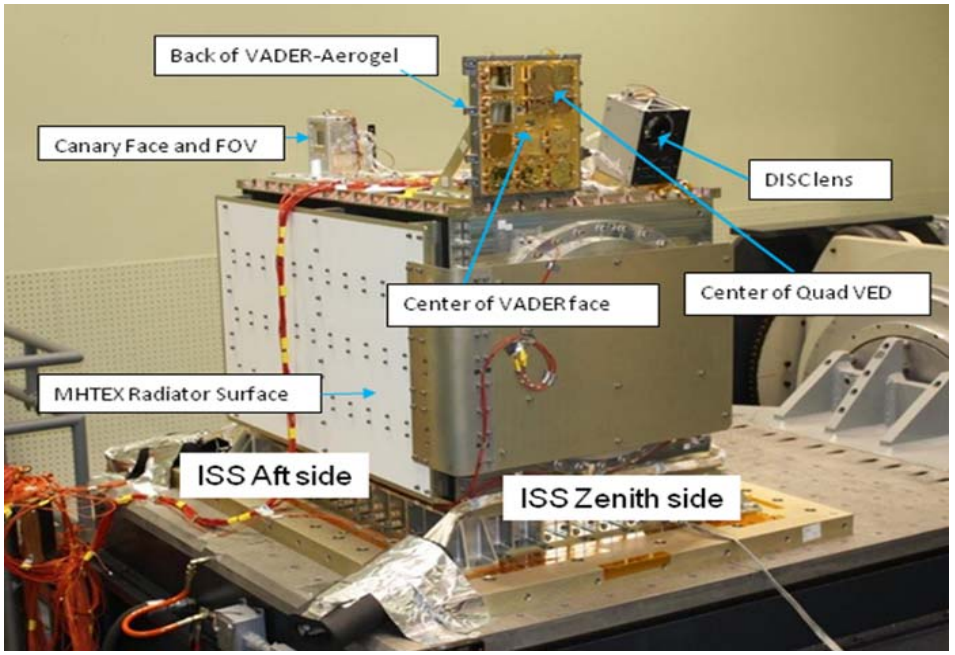
Caution:

1. Avoid inadvertent contact with RPCM Radiator Panel and OTP surfaces

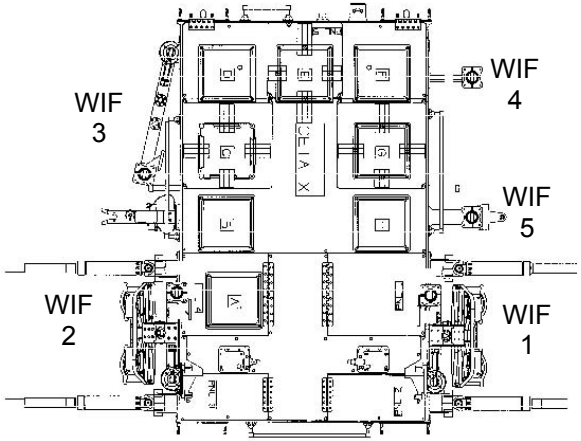
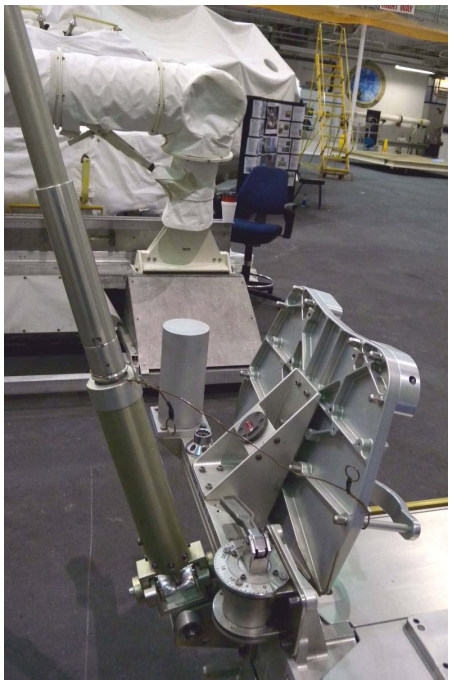




STP-H3 PHOTOS (00:15)

IV/SSRMS	EV
Tools Required: ❑ EVA Camera Inhibits Required: PSARJ locked	CAUTION Top of STP-H3 is a KOZ Avoid inadvertent contact with MHTEX radiator – Z93 paint STP-H3 PHOTOS (00:15) 1. Translate to P3 Bay 20 2. Attach **GREEN** hook to P3 HR 3852 ❑ √Gate closed, hook locked, reels unlocked, release RET 3. Translate to STP-H3 (outbd aft zenith on ELC3) 4. 📷 Take photos of STP-H3 ❑ VADER back side (nadir) ❑ Canary Face (aft) ❑ MHTEX Radiator Surface (aft) 5. If additional time allows, also take photos of: ❑ Front of VADER ❑ DISC lens 

PORT CETA CART RECONFIG (00:30)

IV/SSRMS	EV1
Tools Required: ❑ 2 long wire ties, 1 short (optional) Inhibits Required: Mobile Transporter **MCC-H** EV crew expected < 1.5 meters from MT (ROBO) 1. √MT latched  	PORT CETA CART RECONFIG (00:30) 1. Retrieve at least two long wire tires 2. Translate to Port CETA Cart 3. √TFR nadir 180 deg full nadir (position 30) 4. If not ❑ Release Port nadir TFR swing arm, move to position 30 ❑ Lock TFR swing arm 5. Attach Waist Tether to WIF 1 tether pt 6. Rotate Port brake handles forward and tie down (one long wire tie per handle) ❑ Nadir brake handle to zenith TFR Toe Clip ❑ Zenith brake handle to Sq Grid H (port/nadir corner) ❑ √Three twists at each end of wire ties ❑ √Brake handles bent at elbow and secured together with wire tie 7. Perform WVS survey of CETA Cart 8. Glove Check  

S1 FHRC P-CLAMP RELEASE (00:45)

IV/SSRMS

1. Record P-clamps:

Hose Box S1 Bay 13

	P-clamp	Tool	Socket
❑	**1 (N)**	PGT	6-in ext
❑	**2 (N)**	PGT	6-in ext
❑	**3 (N)**	Ratchet	2-in ext
❑	**1 (Z)**	PGT	6-in ext
√	**2 (Z)**	PGT	6-in ext
√	**3 (Z)**	Ratchet	2-in ext

2. Verify inhibits in place:
   √Stbd TRRJ locked at 0 deg

3. Record P-clamps:

Stinger S1 Bay 11

	P-clamp	Tool	Socket
❑	**1**	PGT	6- or 18-in ext
❑	**2**	PGT	18-in ext
❑	**3**	PGT	6-in ext
❑	**4**	PGT	6- or 18-in ext
❑	**5**	PGT	6- or 18-in ext
❑	**6**	PGT	6***** or 18-in ext

***** wobble reqd w/6-in

EV

S1 FHRC HOSE BOX P-CLAMP RELEASE – BAY 13 (00:20)

1. Translate to A/L
2. Open hatch thermal cover
3. Retrieve ratchet wrench with 2" ext from Staging Bag
4. Close hatch thermal cover

5. Translate to S1 FHRC Bay 13

> CAUTION
> Do not impart loads greater than 15 lb into FHRC Hose Box fluid lines

6. Configure PGT:
   [A7 (9.2), CCW2, 30.5]

7. Release Hose Box P-clamps (4) [P-clamp #3N requires ratchet] ~6-12.5 turns

8. Egress Bay 13
9. Verify SAFER handles:
   - ❑ √R Handle down (HCM door – Closed)
   - ❑ √L Handle down (MAN ISO Valve – Open)

S1 FHRC STINGER P-CLAMPS – BAY 11 (00:25)

10. Translate S1 FHRC Bay 11
11. Configure **PGT**
    [A7 (9.2), CCW2, 30.5] 7/16 socket 6 ext

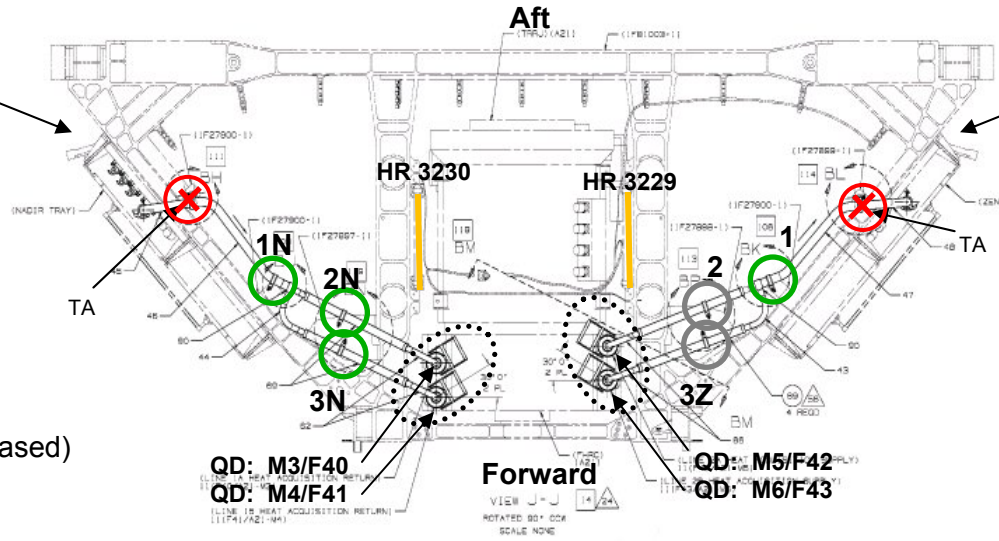
12. Release Stinger P-clamps (5) [P-clamp #2 requires 18 in ext] ~7-12.5 turns
    Do not release P-clamp on hardline
    P-clamps are not numbered
    Release 3 P-clamps closest to QD

13. Egress Bay 11
14. Verify SAFER handles:
    - ❑ √R Handle down (HCM door – Closed)
    - ❑ √L Handle down (MAN ISO Valve – Open)

15. Glove Check

S1 FHRC P-CLAMP RELEASE – TASK DATA

FHRC P-clamps – Hose Box (Outboard)



○ = P-clamp Location

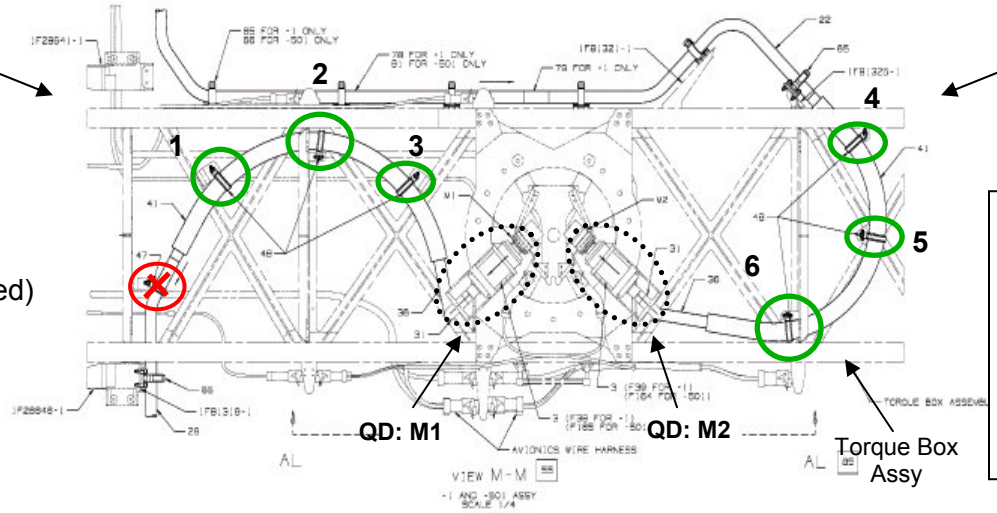
⊗ = TA-clamp (not released)

Hose Box clamps 2Z & 3Z were released on 15A/STS-119

Hose Box S1 Bay 13

	P-clamp	Tool	Socket
❑	1 (N)	PGT	6-in ext
❑	2 (N)	PGT	6-in ext
❑	3 (N)	Ratchet	2-in ext
❑	1 (Z)	PGT	6-in ext
√	2 (Z)	PGT	6-in ext
√	3 (Z)	Ratchet	2-in ext

FHRC P-clamps – Stinger (Inboard)



○ = P-clamp Location

⊗ = P-clamp (not released)

Stinger S1 Bay 11

	P-clamp	Tool	Socket
❑	1	PGT	6- or 18-in ext
❑	2	PGT	18-in ext
❑	3	PGT	6-in ext
❑	4	PGT	6- or 18-in ext
❑	5	PGT	6- or 18-in ext
❑	6	PGT	6* or 18-in ext

*** wobble reqd w/6-in**

S1 FHRC P-CLAMP RELEASE – TASK DATA (Cont)

Estimated Task Duration:

	With SSRMS	Without SSRMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	00:45

Tools:

EV1
PGT w/7/16 (wobble) Socket-6 ext
Ratchet wrench w/7/16-2 in ext

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Hosebox P-clamp bolts	1,2,3	7/16	6	N/A	6.0	12.6	6-12.5	30
Stinger P-clamp bolts	Arrow	7/16	6	N/A	6.0	12.6	7-12.5	30

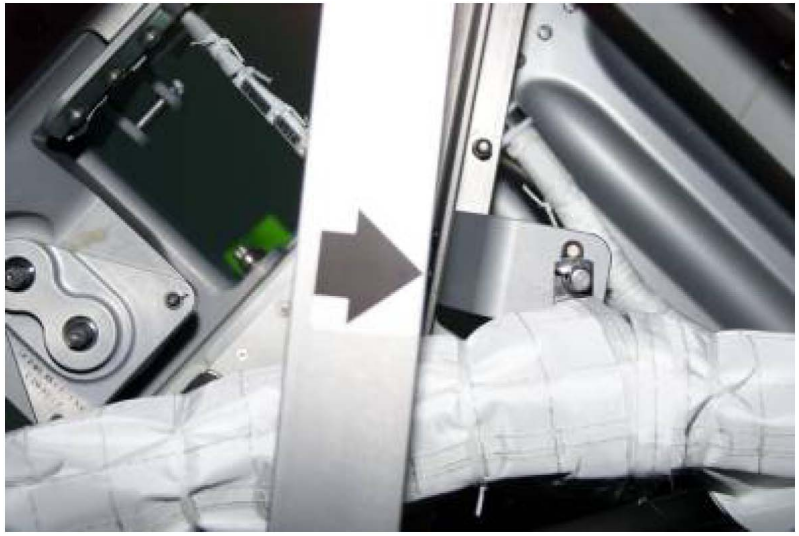
Inhibits:

ORU/Task	Location	Inhibit
S1 P-clamps	Prior to translation to S1	Stbd TRRJ √DLA (1) – LOCKED (0 deg)

Caution:

1. Do not impart more than 15 lbf load into the hose box fluid lines

Hose box P-clamps have labels with bolt numbers



Stinger P-clamps have arrow labels for bolts

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PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA) ..... TEMP FS 8-2
PGT CHECKOUT 8-3
PGSC-PGT CONNECTION (A31P AND 760XD) 8-4
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DOWNLOAD/ERASE EVENT LOG 8-5
PGT CONTINGENCIES 8-6
PGT STANDARD SETTINGS 8-7
APFR MANAGEMENT – STS-134 (ULF6) ..... FS 8-9
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SAFETY TETHERS STS-134/ULF6 ..... FS 8-11
TOOLBOX STOWAGE – STS-134 (ULF6) ..... FS 8-12
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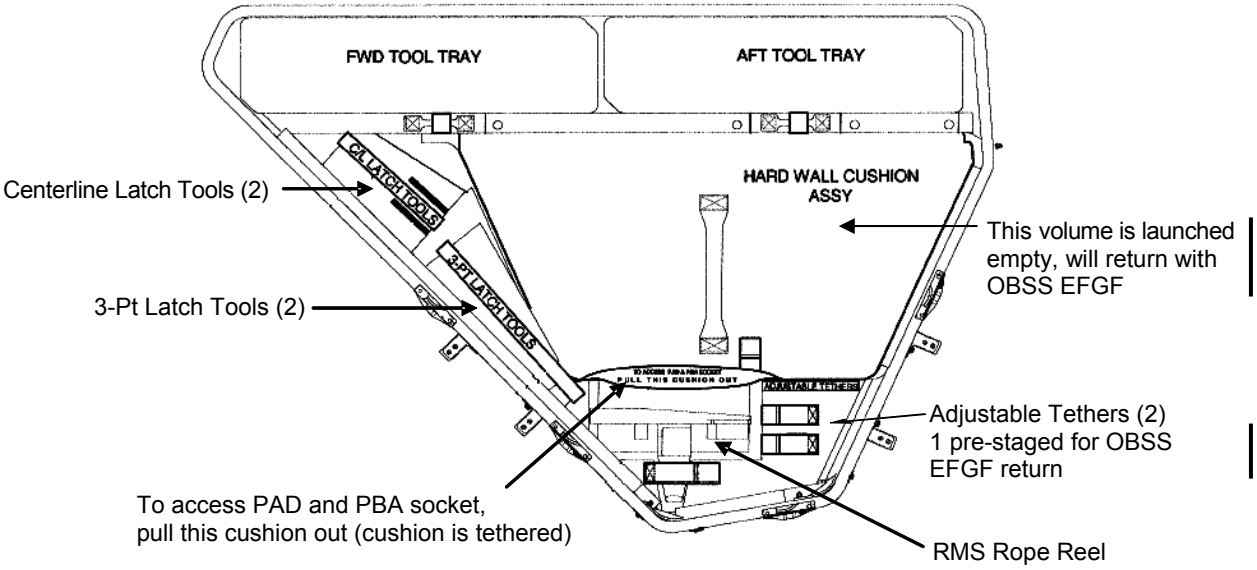
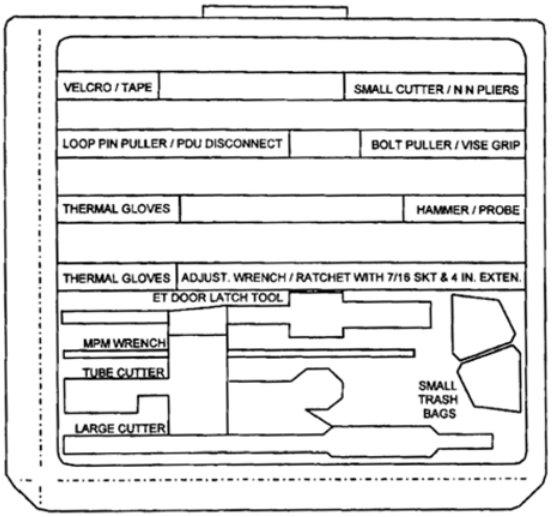
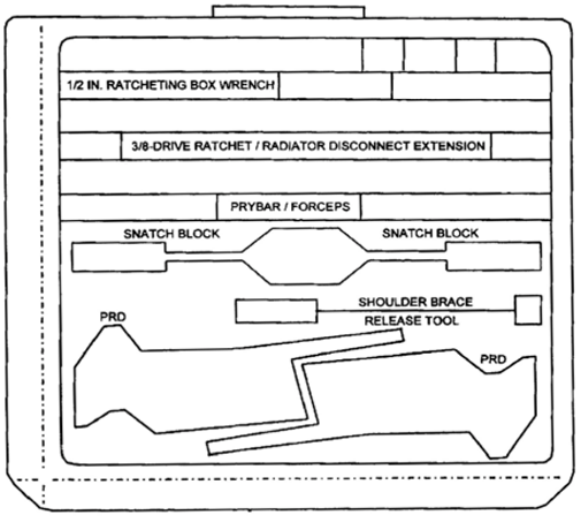
Z1 TOOLBOX INTERNAL LAYOUT ..... FS 8-14
AIRLOCK TOOLBOX INTERNAL LAYOUT ..... FS 8-15
FLUID QD BAG LAYOUT ..... FS 8-16
CETA CART CONFIG ..... FS 8-19
CREW TETHER INSPECTIONS ..... FS 8-20

PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA)

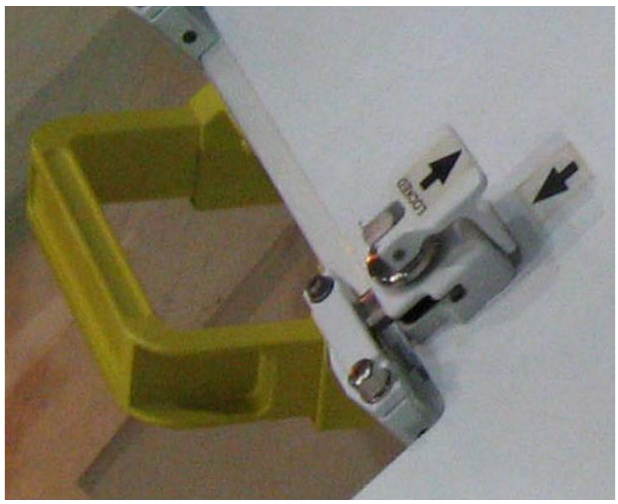




Forward Tray Layout and Labels



Aft Tray Layout and Labels



When closing TSA doors, ensure locking tabs on latches are closed “Arrow to Arrow”

TOOLS AND STOWAGE

APFR MANAGEMENT – STS-134 (ULF6)

APFR DESIGNATOR	APFR 1 s/n 1004 (8A, 13A.1 Pitch knob problem)	APFR 2 s/n 1006 (US EVA 9 Pitch knob problem, 10A sticky locking collar)	APFR 3 s/n 1005 (no pitch knob prob 9A-inc12 suspected sharp edge on locking collar and possible sticky locking collar)	APFR 4 s/n 1002 (Heat shield removed on ULF5)	APFR 5 s/n 1003 (Heat shield removed on ULF3)	APFR 6 s/n 1007 (Heat shield removed on 12A.1 stage)	APFR 7 s/n 1008	IAPFR 1	IAPFR 2	OTSD	WIF Extender
Post STS-133	Z1 WIF 13 [3,QQ,F,12] TS	P1 WIF 3 [6,PP,F,11] TS	ESP-2 WIF 06 [10,FF,A,3] Ingress Aid	A/L Toolbox1 [12,AA] [6,XX,F,12]	Port CETA Cart WIF 2 [6,GG] [12,TT,F,6]	COL WIF 3 [6,NN,F,6] Ingress Aid	P6 WIF 12 [3,OO,F,12] Ingress Aid	Z1 WIF 5 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	S0 WIF 7 CL=7	ESP-2 WIF 3 [3,A,1]
Post EVA 1	Z1 WIF 13 [3,QQ,F,12] TS	P1 WIF 3 [6,PP,F,11] TS	ESP-2 WIF 06 [10,FF,A,3] Ingress Aid	A/L Toolbox1 [12,AA] [6,XX,F,12]	Port CETA Cart WIF 2 [6,GG] [12,TT,F,6]	COL WIF 3 [6,NN,F,6] Ingress Aid	P6 WIF 12 [3,OO,F,12] Ingress Aid	Z1 WIF 5 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	S0 WIF 7 CL=7	ESP-2 WIF 3 [3,A,1]
Post EVA 2	Z1 WIF 13 [3,QQ,F,12] TS	P1 WIF 3 [6,PP,F,11] TS	ESP-2 WIF 06 [10,FF,A,3] Ingress Aid	A/L Toolbox1 [12,AA] [6,XX,F,12]	Port CETA Cart WIF 2 [6,GG] [12,TT,F,6]	COL WIF 3 [6,NN,F,6] Ingress Aid	P6 WIF 12 [3,OO,F,12] Ingress Aid	Z1 WIF 5 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	S0 WIF 7 CL=7	ESP-2 WIF 3 [3,A,1]
Post EVA 3	Z1 WIF 13 [3,QQ,F,12] TS	P1 WIF 3 [6,PP,F,11] TS	ESP-2 WIF 06 [10,FF,A,3] Ingress Aid	A/L Toolbox1 [12,AA] [6,XX,F,12]	Port CETA Cart WIF 2 [6,GG] [12,TT,F,6]	COL WIF 3 [6,NN,F,6] Ingress Aid	P6 WIF 12 [3,OO,F,12] Ingress Aid	Z1 WIF 5 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	S0 WIF 7 CL=7	ESP-2 WIF 3 [3,A,1]
Post EVA 4	Z1 WIF 13 [3,QQ,F,12] TS	P1 WIF 3 [6,PP,F,11] TS	ESP-2 WIF 06 [10,FF,A,3] Ingress Aid	**Stbd CETA Cart WIF 4 [12,GG] [4,PP,F,6]**	Port CETA Cart WIF 2 [6,GG] [12,TT,F,6]	COL WIF 3 [6,NN,F,6] Ingress Aid	**Port CETA Cart WIF 4 [12,DD] [7,OO,F,12] Ingress Aid**	Z1 WIF 5 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	S0 WIF 7 CL=7	ESP-2 WIF 3 [3,A,1]

Crane (old ORU tether)	ORU Stanchion/TERA Headless	APFR 2 Tool Stanchion	APFR 1 Tool Stanchion	Tool Stanchion
PMA1 WIF 5	S0 port wedge face	Hex pointed ISS zenith, tool head pointed ISS stbd, and oriented ISS Zenith/Nadir	Tool stanchion port, pointed zenith	S0 port wedge face

CETA CART WIF AND SWINGARM MANAGEMENT TABLE – STS-134/ULF6

WIF Designator	CETA 1 (port) WIF 1 Port-nadir	CETA 1 (port) WIF 2 Stbd-nadir	CETA 1 (port) WIF 3 Stbd-zenith	CETA 1 (port) WIF 4 Port-zenith	CETA 1 (port) WIF 5 Port-middle	CETA 2 (stbd) WIF 1 Port-nadir	CETA 2 (stbd) WIF 2 Stbd-nadir ULF4: Pitch setting stuck in FF	CETA 2 (stbd) WIF 3 Stbd-zenith	CETA 2 (stbd) WIF 4 Port-zenith	CETA 2 (stbd) WIF 5 Port-middle
Post STS 133	**[30,1,LL]**	**[0,6,GG]**	**[1,12,GG]**	**[12,DD]**	**[12,DD]**	**[0,12,GG]**	**[0,12,FF]**	**[1,12,GG]**	**[12,GG]**	**[12,GG]**
Post EVA 1	…	…	…	…	…	…	…	…	…	…
Post EVA 2	…	…	…	…	…	…	…	…	…	…
Post EVA 3	…	…	…	…	…	…	…	…	…	…
Post EVA 4	…	…	…	…	…	…	…	…	…	…

CETA 1 (port) Port Brake Handles	CETA 1 (port) Stbd Brake Handles	CETA 2 (Stbd) Port Brake Handles	CETA 2 (Stbd) Stbd Brake Handles
Folded over and wiretied to each other Handles FWD and NOT wiretied to cart	Straight and Locked No Wireties	Straight and Locked No Wireties	Straight and Locked No Wireties

NOTE

1. Settings highlighted red are unconfirmed. This table was created during STS-132/ULF4. All WIFs and swingarms not used on ULF4 are assumed unconfirmed
2. PORT CETA cart is NOT configured for translation to WS 8 unless the SARJ is parked for the duration
3. STBD CETA cart is NOT configured for translation to WS 1 unless the SARJ is parked for the duration

SAFETY TETHERS STS-134/ULF6

55-FT SAFETY TETHERS

	#67 s/n 1017 Lg-sm	#68 s/n 1018 Lg-sm (retracting issues – ULF4)	#69 s/n 1019 Lg-sm	#72 s/n 1022 Lg-sm
ULF5 Stage	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area
Post EVAs 1, 2, 3	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: C/L deployed in STP
Post EVA 4	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: C/L deployed in STP

85-FT SAFETY TETHERS

	#22 s/n 1002 Lg-sm (2 J/A – retracting issue)	#21 s/n 1001 Lg-sm (GMT201 Tether Inspect – only 1 through tack stitch)	#24 s/n 1004 Lg-sm	#29 s/n 1009 Lg-sm	#26 s/n 1006 Lg-sm	#23 s/n 1003 Lg-sm	#28 s/n 1008 Lg-sm	#30 s/n 1010 Lg-sm
ULF5 Stage	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	**STS-134/ULF6 Middeck**	**STS-134/ULF6 Middeck**
Post EVAs 1, 2, 3	INSIDE: C/L Deployed in STP	INSIDE: Tether staging area	INSIDE: C/L Deployed in STP	INSIDE: Tether staging area	**External: Deployed in STP**	**External: Deployed in STP**	**External: Deployed in STP**	**External: Deployed in STP**
Post EVA 4	INSIDE: C/L deployed in STP	INSIDE: Tether staging area	INSIDE: C/L deployed in STP	INSIDE: Tether staging area	**INSIDE: C/L deployed in STP**	**INSIDE: C/L deployed in STP**	**STS-134/ULF6 Middeck**	**STS-134/ULF6 Middeck**

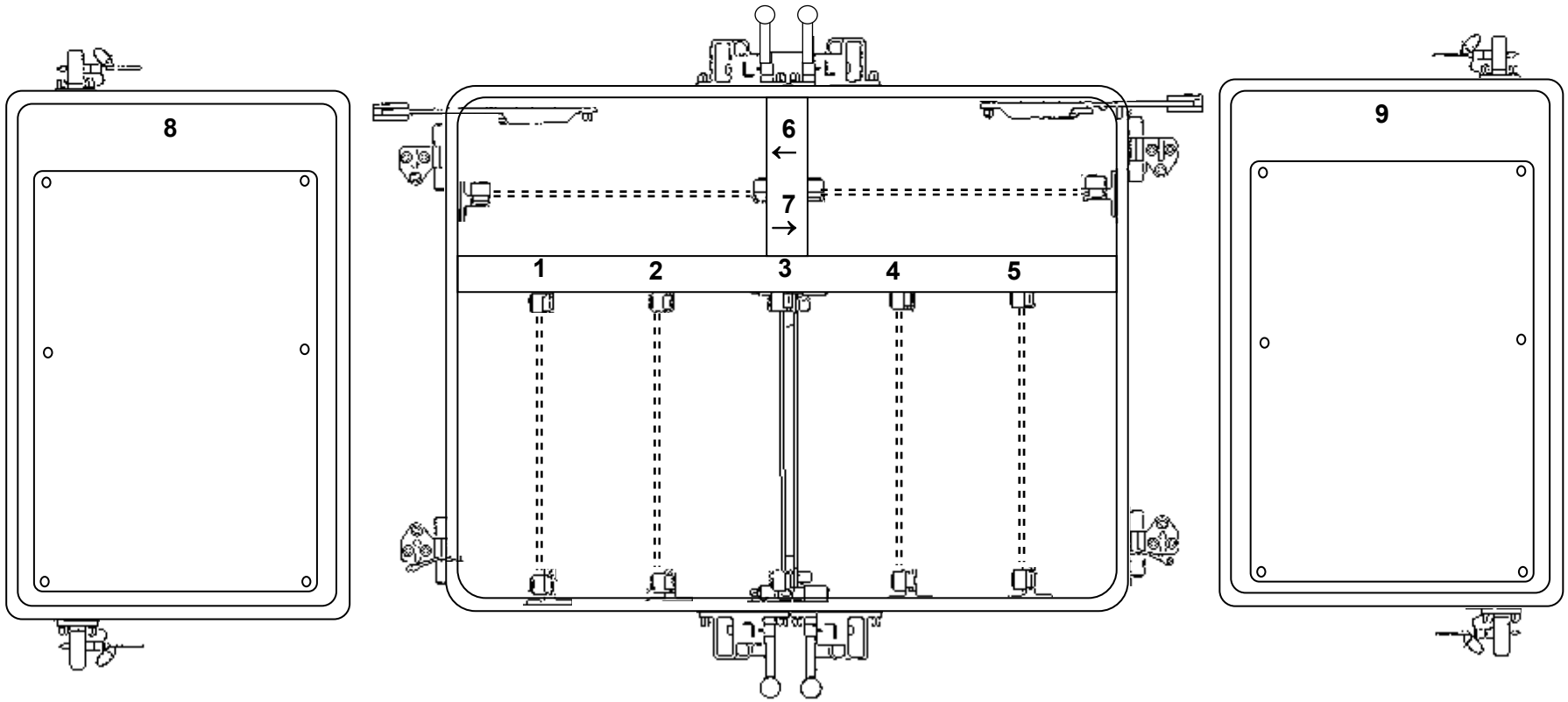
TOOLBOX STOWAGE – STS-134 (ULF6)

	Z1 PORT TOOLBOX (MMOD Damage – potential sharp edges) {all slots have sliders}	**Z1 STBD TOOLBOX (MMOD Damage – potential sharp edges)** {all slots have sliders}	**A/L TOOLBOX 1 (STBD)**	**A/L TOOLBOX 2 (PORT)**
SLOT # 1	SQUARE TM BOARD {stbd door} SQ TORQUE MULTIPLIER 7/16" FLUSH SQ SOCKET 7/16" PROUD SQ SOCKET 7/16" RECESSED SQ SOCKET		HAMMER BOARD {nadir door} HAMMER	CABLE CUTTER BOARD {zenith door} COMPOUND CUTTERS (SM) SCISSORS
SLOT # 2		QD BAIL TOOL BOARD {stbd door} BMRRM LATCH TOOL QD BAIL DRIVE TOOL (1")	PLIERS BOARD {nadir door} NEEDLE NOSE PLIERS	
SLOT # 3	RATCHET BOARD {middle} 7/16" X 12" WOBBLE SOCKET 7/16" X 2" RIGID SOCKET	RATCHET BOARD {middle} 7/16" X 6" WOBBLE SOCKET 7/16" X 12" WOBBLE SOCKET RATCHET WRENCH RIGHT ANGLE DRIVE	{only slot with slider}	{only slot with slider}
SLOT # 4				
SLOT # 5	ROUND TM BOARD {port door} RND TORQUE MULTIPLIER 5/8" PROUD RND SOCKET 7/16" FLUSH RND SOCKET 7/16" PROUD RND SOCKET		ADJ WRENCH BOARD {zenith door} FORCEPS WRENCH, ADJ	T-HANDLE TOOL BOARD {nadir door} 1-8" T-TOOLS
SLOT # 6	TRASH BAG BOARD {stbd door} SMALL TRASH BAG	TRASH BAG BOARD {stbd door}	HYDRAZINE BRUSH BOARD { nadir door} HYDRAZINE BRUSH	
SLOT # 7	SOCKET BOARD {port door} 5/32" BALL END ALLEN DR 1/2" X 8" WOBBLE SOCKET 5/16" X 7" RIGID SOCKET	SOCKET BOARD {port door} 5/32" BALL END ALLEN DR 1/2" X 8" WOBBLE SOCKET 5/16" X 7" RIGID SOCKET	PRD (Toolboard) {zenith door} PRD	PRD (Toolboard) {nadir door} PRD
PANEL # 8	CHEATER BAR PANEL {stbd door} CHEATER BAR GP CADDY CANNON CONNECTOR TOOLS (2)	CHEATER BAR PANEL {stbd door} CHEATER BAR ADJ EQUIP TETHER	TOOL CADDY PANEL {nadir door}	
PANEL # 9	18" SOCKET PANEL {port door} 7/16" X 18" WOBBLE SOCKET	18" SOCKET PANEL {port door} 7/16" X 18" WOBBLE SOCKET	BOLT PULLER PANEL {zenith door} BOLT PULLER MECHANICAL FINGER	LARGE CUTTER PANEL {nadir door} LARGE CUTTERS (-303)
EXTERNAL	1 ROUND SCOOP w/D-HANDLE (on zenith micro) (D-handle taped over repaired MMOD damage) D-HANDLE on port side of toolbox	NOTE D-Handle will not stow on the side of this toolbox due to an interference with the CMG MLI		

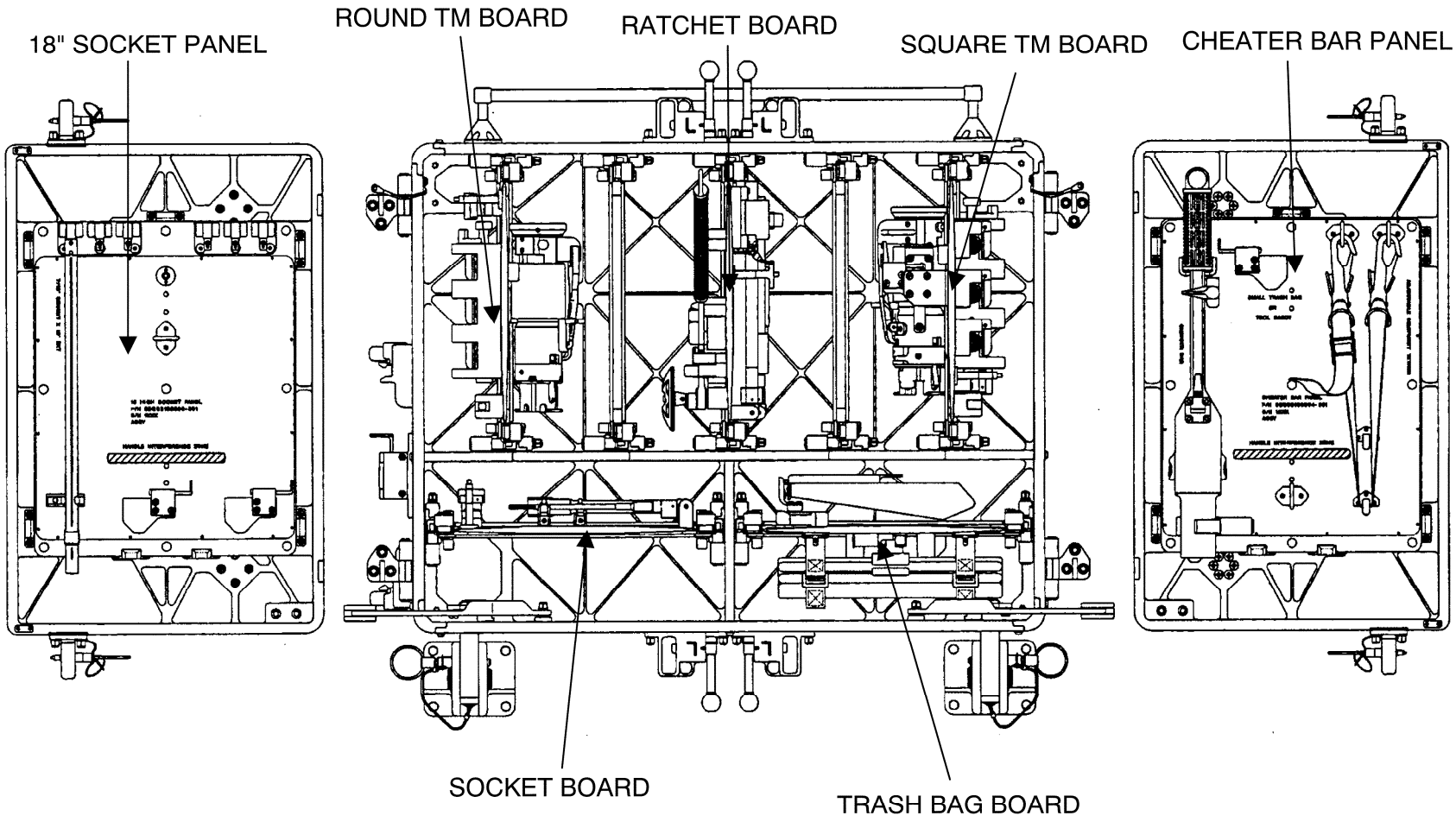
TOOLBOX PANEL AND SLOT LABELS

NOTE

- A/L Toolbox: Slider feature located in center slot only (#3)
- Z1/CETA Toolbox: Slider feature located in all slots

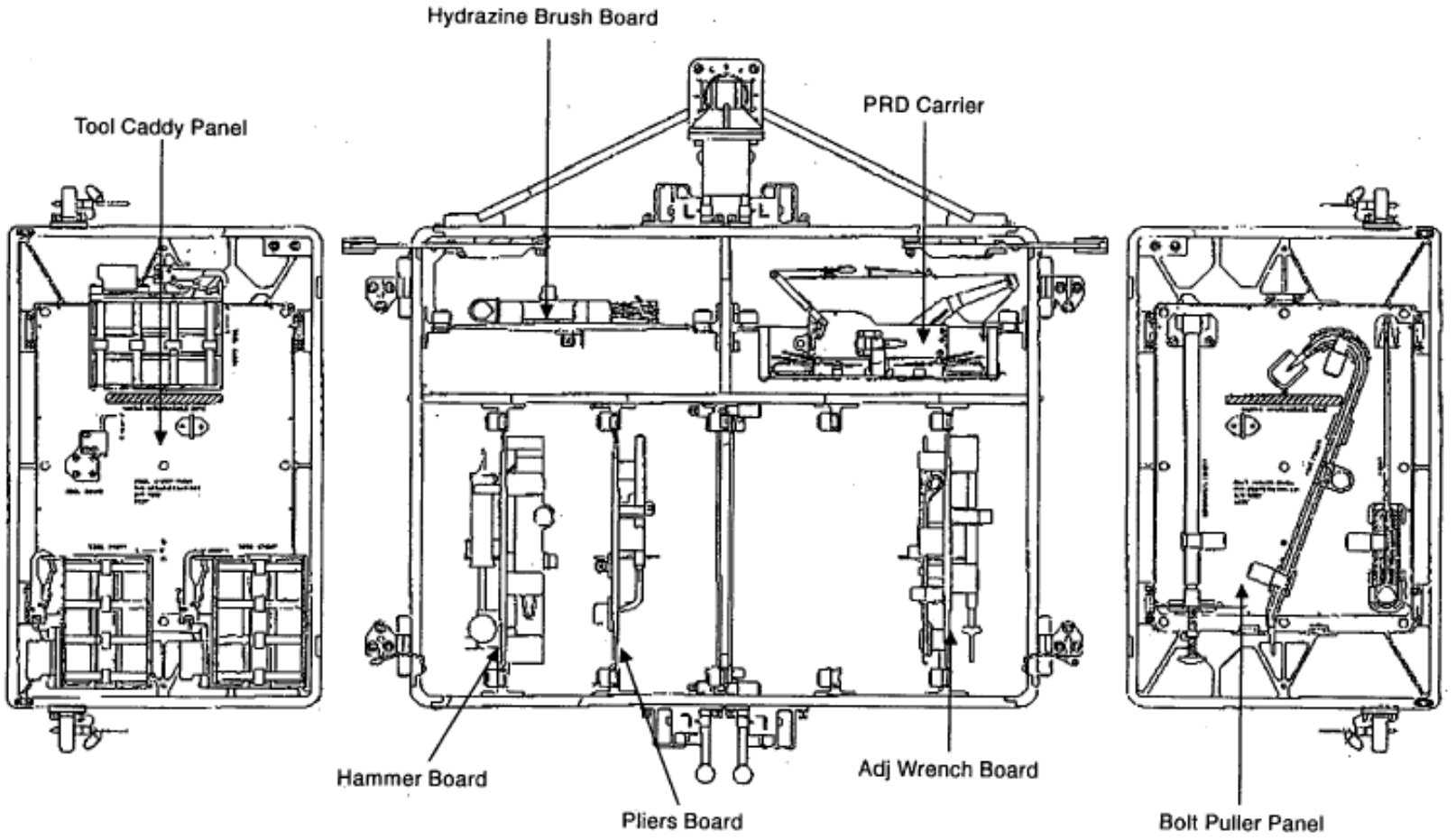


Z1 TOOLBOX INTERNAL LAYOUT



DOORS SHOWN REMOVED AND ROTATED 180° FROM CLOSED POSITION FOR CLARITY.

AIRLOCK TOOLBOX INTERNAL LAYOUT



FLUID QD BAG LAYOUT

QD TOOL BAG #1, STBD (SEG33114667-301/1001)							
	TOOL	**PART#**	**LOCATION POST ULF5**	**LOCATION POST EVA 1**	**LOCATION POST EVA 2**	**LOCATION POST EVA 3**	**LOCATION POST EVA 4**
1	1/4" Cap Tool	GD2043725	¼" Cap Tool Pkt				¼" Cap Tool Pkt
2	1/2" Cap Tool	GD2043730	½" Cap Tool Pkt				½" Cap Tool Pkt
3	1" Cap Tool	GD2043325	1" Cap Tool Pkt	**ISS A/L internal**	**ISS A/L internal (EV2 ORU bag during EVA)**	**1" Cap Tool Pkt**	1" Cap Tool Pkt
4	3/4" & 1' QD Bail Drive lever	SDG33113838-703	¾" & 1" QD Bail Drive Lever pouch on Lid				¾" & 1" QD Bail Drive Lever pouch on Lid
5	1.5" QD Bail Drive Lever	SDG33113837-701	1.5" QD Bail drive lever pouch on lid				1.5" QD Bail drive lever pouch on lid
6	1.5" NH3/N2 Vent Tool – F	1F9859-1/01	Pkt F: 1.5" NH3/N2				Pkt F: 1.5" NH3/N2
7	1" H20/N2 Vent Tool – F	1F98593-1/01	Pkt E: 1" H2O/N2				Pkt E: 1" H2O/N2
8	3/4" NH3/N2 Vent Tool – F	1F98597-1/01	Pkt D: ¾" NH3/N2				Pkt D: ¾" NH3/N2
9	1" NH3/N2 Vent Tool – F	1F98589-1/T	Pkt A: 1" NH3/N2				Pkt A: 1" NH3/N2
10	1" N2 Vent Tool – M	1F98596-1/01	Pkt B: 1" NH3/N2 (male tool)				Pkt B: 1" NH3/N2 (male tool)
11	1/4" NH3/N2 Vent Tool – F	1F98592-1/01	Pkt C: ¼" NH3/N2				Pkt C: ¼" NH3/N2
12	1.5" QRT & FID Gauge	SEG33114617-701	Pkt FID/Gauge				Pkt FID/Gauge
13	3/4" & 1" QRT & FID Gauge	SEG33114616-701	Pkt FID/Gauge				Pkt FID/Gauge

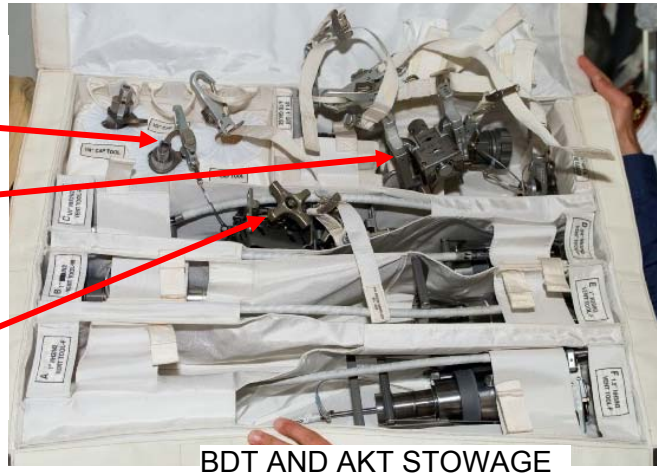
FLUID QD BAG LAYOUT (Cont)

QD TOOL BAG #2, PORT (SEG33114667-301/1002)							
	TOOL	**PART#**	**LOCATION POST ULF5**	**LOCATION POST EVA 1**	**LOCATION POST EVA 2**	**LOCATION POST EVA3**	**LOCATION POST EVA 4**
1	1/4" Cap Tool	GD2043725	¼" Cap Tool Pkt				¼" Cap Tool Pkt
2	1/2" Cap Tool	GD2043730	½" Cap Tool Pkt				½" Cap Tool Pkt
3	1" NH3/N2 Vent Tool – F	1F98589-1	Pkt A: 1" NH3/N2	**VTEB**	VTEB	VTEB	VTEB
4	1.5" NH3/N2 Vent Tool – F	1F9859-1/02	VTEB	**Pkt F: 1.5" NH3/N2**	Pkt F: 1.5" NH3/N2	Pkt F: 1.5" NH3/N2	Pkt F: 1.5" NH3/N2
5	1" H20/N2 Vent Tool – F	1F98593-1/02	Pkt E: H2O/N2				Pkt E: H2O/N2
6	3/4" NH3/N2 Vent Tool – F	1F98597-1/02	Pkt D: ¾" NH3/N2				Pkt D: ¾" NH3/N2
7	1/4" NH3/N2 Vent Tool – F	1F98592-1/02	Pkt C: ¼" NH3/N2				Pkt C: ¼" NH3/N2
8	1/4" BDT	SEG33114984-301/001	Pkt C: ¼" NH3/N2 w/adj tether				Pkt C: ¼" NH3/N2 w/adj tether
9	3/4" BDT	SEG33114986-301/001	Pkt C: ¼" NH3/N2 w/adj tether				Pkt C: ¼" NH3/N2 w/adj tether
10	3/4" AKT	SEG33114983-301/1001	Pkt FID/Gauge: Stowed w/Adj tether to int loop				Pkt FID/Gauge: Stowed w/Adj tether to int loop
11	Vent Tool Adapter	SEG33119079-301	Pkt FID/Gauge: Stowed w/Adj tether to int loop				Pkt FID/Gauge: Stowed w/Adj tether to int loop
12	Vent Tool Adapter	SEG33119079-301	Pkt FID/Gauge: Stowed w/Adj tether to int loop	**VTEB**	VTEB	VTEB	VTEB

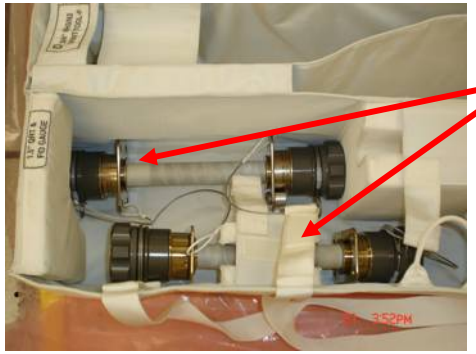
3/4" BDT is tethered to internal bag loop using integral tool tether

3/4" AKT stowed with VTAs in QRT/FID pouch

1/4" and 3/4" BDTs are stowed on top of 1/4" vent tool



BDT AND AKT STOWAGE



VENT TOOL ADAPTER STOWAGE

Vent Tool Adapters (2) are stowed in QRT/FID gauge pockets and need adj tethers

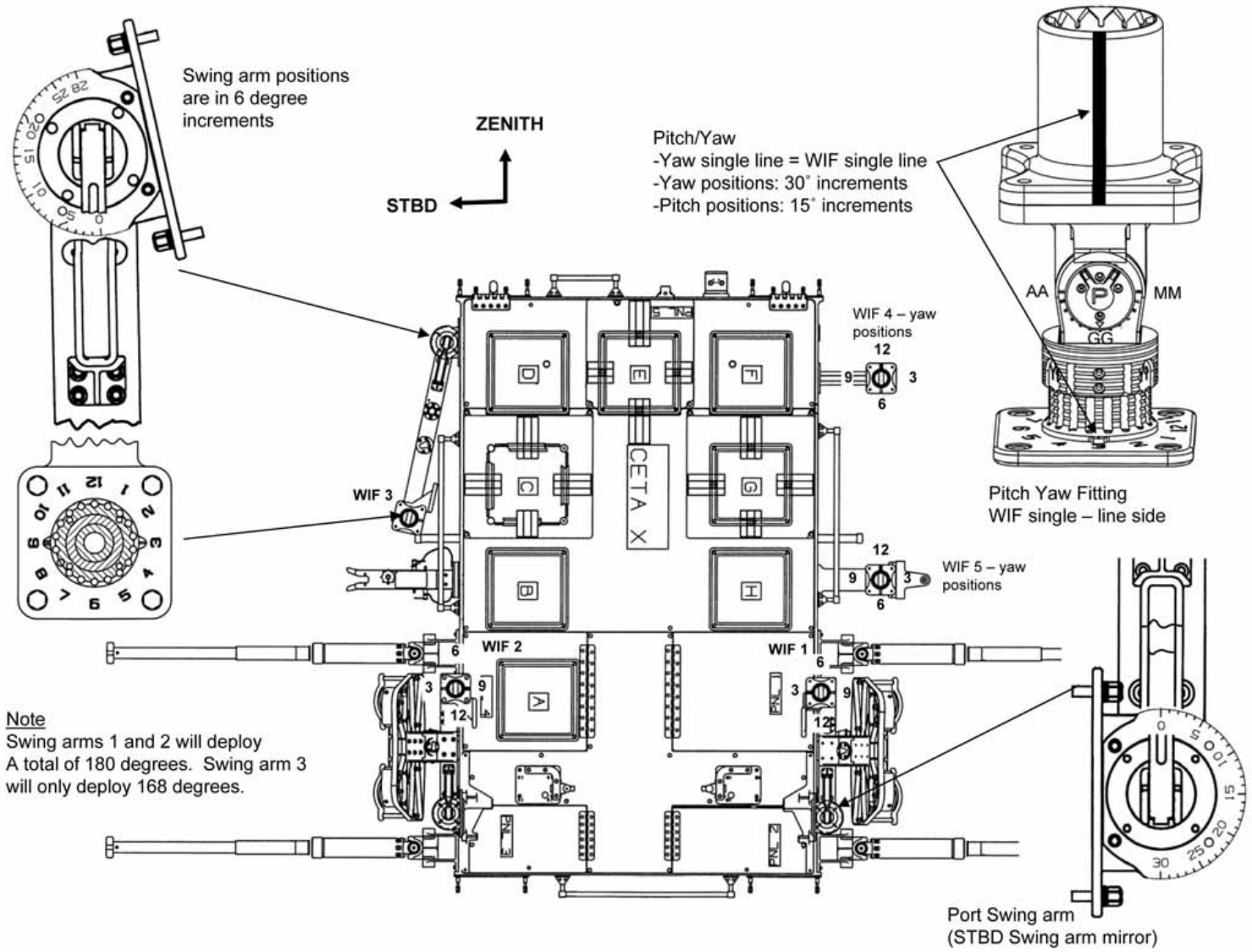
FLUID QD BAG LAYOUT (Cont)

VENT TOOL EXTENSION BAG (SEG33119100-301/1001)							
	TOOL	**PART#**	**LOCATION POST ULF5**	**LOCATION POST EVA 1**	**LOCATION POST EVA 2**	**LOCATION POST EVA 3**	**LOCATION POST EVA 4**
1	Vent Tool Extension	SEG33119090-301	Mated to 1.5" Vent tool	**VTEB with VTE plug**			VTEB with VTE plug
2	1.5" NH3/N2 Vent Tool – F	1F9859-1/02	Mated to VTE	**QD Bag 2, Pkt F**			QD Bag 2, Pkt F: 1.5" NH3/N2
3	MUT EE		Connected to VTE L-bracket				VTEB Connected to VTE L-bracket
4	Vent Tool Adapter	SEG33119079-301	QD Bag 2, Pkt FID/ Gauge	**VTEB**			VTEB
5	1" NH3/N2 Vent Tool – F	1F98589-1	Pkt A: 1" NH3/N2	**VTEB**			VTEB
6	Vent Tool Extension Plug		-	**VTEB mated to VTE**			VTEB Mated to VTE


S116E06137

PUMP MODULE JUMPER BAG (SEG33119100-301)			
#	**TOOL**	**PART #**	**LOCATION IN BAG**
1.	PUMP MODULE JUMPER ASSY	1F15818	❑ TETHERED BY 1 INTEGRAL TETHER TO HR ON JUMPER

CETA CART CONFIG



CREW TETHER INSPECTIONS

OBJECTIVE:

Inspect Load Alleviating Strap (LAS) on Safety Tethers, Waist Tethers and soft strap on D-Ring extenders. Prior to each set of EVAs (shuttle or ISS), all on-board tethers are to be inspected. Between each EVA, only those tethers used during the previous EVA require inspection.

DURATION:

1 hour 30 minutes (Parts 1 and 2 on six waist tethers, six D-Ring extenders, and eight safety tethers)

Additional 30 minutes required to perform Part 3 on two tethers.

NOTE
Standard tool config prep times only protect for performing Part 1 between EVAs on tethers used during the previous EVA.

ITEMS REQUIRED (PART 2 OR 3):

MATERIALS:

Sharpie

Ziplock Bag

TOOLS:

Camera

IS IVA Toolbox:

Drawer 5:

Tape Measure

Tape Pantry

EVA Tape (1" Permacel Glass Cloth Tape) P/N P-213

PART 1: PRIOR TO EACH EVA

1. Prior to EVA use, soft goods on each safety tether (LAS), waist tether (LAS) and D-Ring extender (strap) for that EVA must be inspected.

   1.1 MMOD Inspection

   Inspect the soft goods (LAS) of the Waist Tether and ERCM/Safety Tether and soft strap of the D-Ring extender for MMOD damage and discoloration, manipulating the sheath as needed to inspect between folds. The damage may appear as small or large holes in the LAS or as a tear/rip in the sheath. The MMOD damage may also appear in small concentrated areas of excessive fraying (as would be expected to be found in the vicinity of a hole). Soft goods should be white to yellow or tan in appearance. Soft goods showing a burnt brown or black discoloration should not be used.
   Refer to Figures 1, 2, 3.

1.2 D-Ring Extender

Inspect the soft strap of the D-Ring extender for MMOD damage, excessive wear and fraying.
Refer to Figures 1, 2, 3.

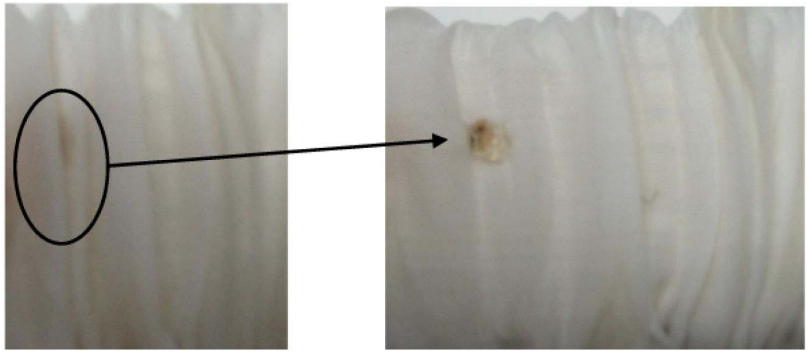


Figure 1. Damage Masked by Folds in LAS Sheath Exposed When Unbunched. (Note: Photo of ground-created damage.)

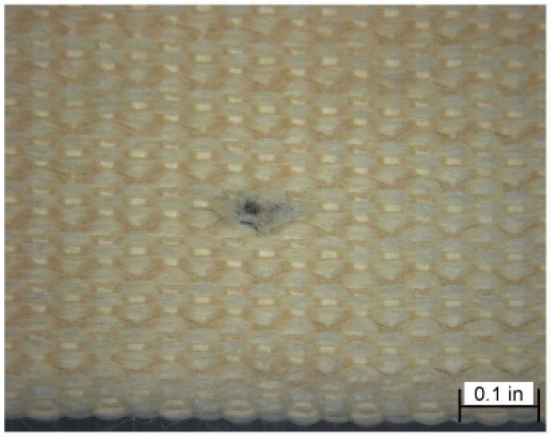


Figure 2. Picture Showing MMOD Damage Found in Flight AET.

Figure 3. Frayed D-Ring Extender; No-GO for Use.

1.3 LAS Base Inspection

Inspect base of LAS where strap attaches to ERCM D-Ring for any damage.
Refer to Figure 4.

1.3.1 Smudging is acceptable.

1.3.2 If safety tether anchor hook is taped, inspect tape for wear or damage.

Figure 4. LAS Attachment to ERCM D-Ring.

1.4 Tack Stitching Inspection

Verify two surface and two through tack stitches still present on each LAS (waist tether and safety tether).

1.4.1 Verify through stitches still intact by gently moving sheath away from hook to expose threads through Nomex.
Refer to Figures 5 and 6.
Once verified, gently replace sheath over red indicator.

1.4.2 Visually verify surface stitches on nonseam side of tether

1.5 Red Indicator Inspection

If red showing and all tack stitches present

1.5.1 Gently pull the sheath back to cover red indicator. Due to tolerances, some red may still show (tether is GO as long as tack stitching still present.)

1.5.2 Note width of any remaining red showing.

1.5.3 Report S/N of any tethers with red still showing to **MCC-H**.

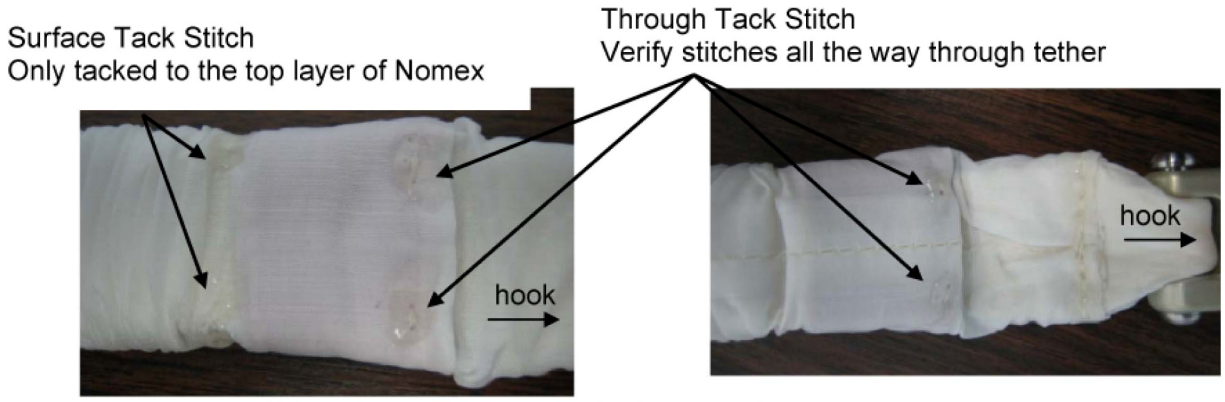


Figure 5. Top View (Non-Seam Side) and Bottom View (Seam Side).

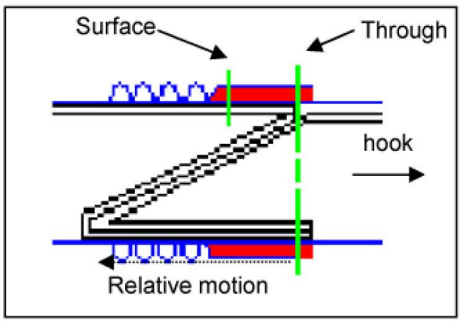


Figure 6. Cross-Section of Tack Stitching.

2. Report serial numbers to **MCC-H** with inspection results.

3. For any tethers with MMOD/other damage, fraying or missing tack stitching, proceed to Part 2.

4. Restow remaining tethers.

PART 2: MMOD DAMAGE/MISSING TACK STITCHING EVALUATION

5. Retrieve Camera and Ziplock Bag(s).

6. If MMOD damage is found on LAS

   6.1 Smooth out the sheath at the damage location and take detailed photos of damage (with serial number in photo if possible).
   Refer to Figures 7 and 8.
   Note if any damage to the underlying Nomex strap is visible.

   6.2 Remove tether from usable inventory.
   Place tether in Ziplock Bag labeled, "No-GO for use".
   Report location and S/N to **MCC-H**.

   6.3 Report results to **MCC-H**.

Figure 7. Photo of Partial Red Indicator Showing with Serial Number.

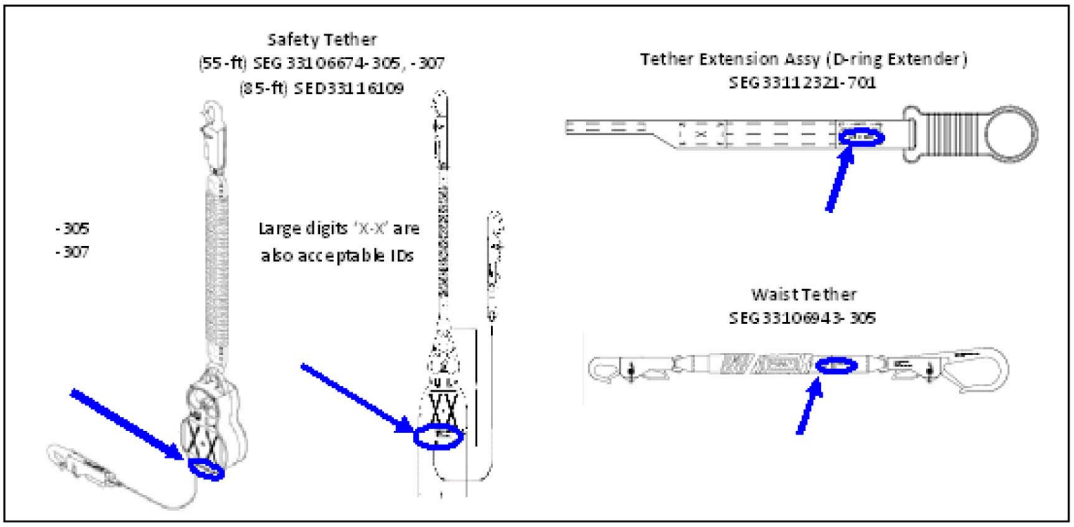


Figure 8. Serial Number References.

7. If tack stitches are broken

   7.1 Take detailed photos of tack stitches (with serial number in photo) for further engineering evaluation.
   Refer to Figure 7.

   7.2 Stow tethers per Table 1.

Table 1. Tether GO/No-GO Criteria

Broken Stitch	Action
One or both surface stitches broken	Gently smooth sheath away from hook so only a single layer covers the red indicator area. Return tether to usable inventory.
One through stitch broken, one through stitch intact and zero to two surface tack stitches intact	Return tether to usable inventory.
Two through stitches broken	Remove tether from usable inventory. Place tether in Ziplock Bag labeled "No-GO for use." Report location to **MCC-H**.

   7.3 Report results to **MCC-H**.

8. If fraying or MMOD damage is found on D-Ring extender

   8.1 Take detailed photos of damage showing S/N of extender (if possible).
   Refer to Figure 9.

   8.2 Remove tether from usable inventory.
   Place tether in Ziplock Bag labeled "No-GO for use."
   Report location and S/N to **MCC-H**.

~

8.3 Report results to **MCC-H**.

Figure 9. D-Ring Extender Showing Serial Number.

9. If damage found on LAS base

   9.1 Take detailed photos of damage with at least one photo showing tether number.

   9.2 Swap tether for spare.

   9.3 Remove tether from usable inventory.
   Place tether in Ziplock Bag labeled "No-GO for use."
   Report location and S/N to **MCC-H**.

   9.4 If tape damaged/worn on anchor hook, take detailed photos.
   Replace tape as necessary using EVA tape.

   9.5 Report results to **MCC-H**.

PART 3: MEASURE LAS LENGTH (ON MCC-H GO)

10. Retrieve quarantined tethers, tape measure, Sharpie, and Camera.

11. Mark the desired length on a stable surface.
    Refer to Figures 10 and 11 for required lengths.

12. Measure quarantined tether against markings.
    Photograph results.

13. Report findings to **MCC-H**.

14. Stow tethers per **MCC-H** direction.

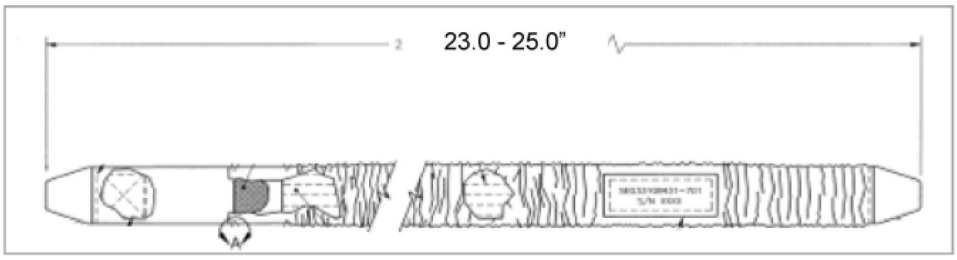


Figure 10. Waist Tether.

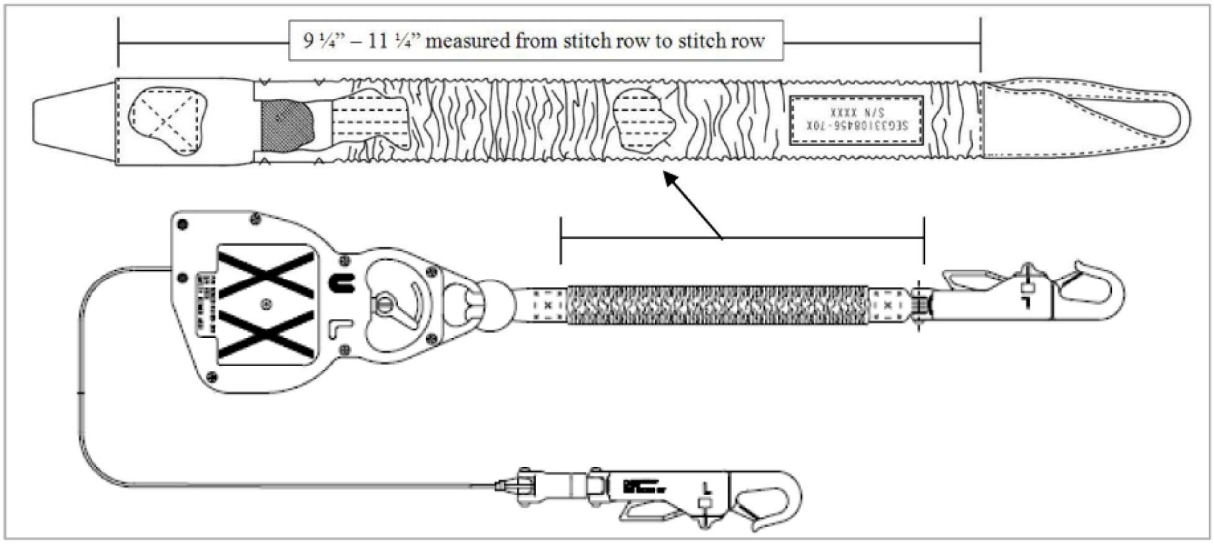


Figure 11. Safety Tether.

Table 2. Inspection Results

Tether Type	Tether S/N	Damage Description	Tether Location

WATER RECHARGE ..... TEMP FS 10-2
EMU POWERUP ..... TEMP FS 10-2
WATER FILL ..... TEMP FS 10-2
WATER FILL VERIFICATION ..... TEMP FS 10-2
EMU LiOH CHANGEOUT 10-4
MIDDECK EMU BATTERY RECHARGE (STAND-ALONE) 10-4a
MIDDECK EMU BATTERY RECHARGE/LiOH REPLACEMENT 10-5
INITIATE 10-5
TERMINATE 10-6
IN-SUIT EMU BATTERY RECHARGE/CHARGE VERIFICATION 10-7
INITIATE 10-7
TERMINATE 10-7
EMU POWERDOWN 10-7
HELMET LIGHT/PGT BATTERY RECHARGE 10-8
INITIATE 10-8
TERMINATE 10-9
REBA BATTERY INSTALLATION 10-9
EMU BATTERY REMOVAL/INSTALL 10-10
HELMET LIGHT BULB CHANGEOUT 10-11
REBA BATTERY RECHARGE 10-12
INITIATE 10-12
TERMINATE 10-13
STS-134 CONSUMABLES TRACKING CUE CARD ..... FS CC 10-15
STS-134 EVA BATTERY RECHARGE PLAN ..... FS CC 10-16

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	

Cont next page

TOP

HOOK VELCRO

STS-134 CONSUMABLES TRACKING CUE CARD

		EV1	EV2	EV3	EV3
Metox for Campout	**S/N**	5 & 22	7 & 11	15 & 16	13 & 21

PWR Usage: Use 1026, 1005, 1007 in that order until drained **Dump CWC:** 1059

	EV	EDDA SCU	EMU	LiOH (s/n)	EMU Batt (s/n)	REBA (s/n)	EHIP (HL) Batts (s/n)	ERCA (address)	SAFER (s/n)	PGT Batt (s/n)	PGT Batt Spare (s/n)
EVA 1	EV1 FT	AFT SCU1	3004	2012	3004	1007	1022 1025	18	1003		1005
	EV3 CF	FWD SCU2	3005	20__	3005	1012	1026 1028	20	1007	1011	
Batt Post EVA					X	X	X			X	X
EVA 2	EV1 FT	AFT SCU2	3004	2030	3006	1007	1029 1030	18	1003	1006	1009
	EV2 FN	FWD SCU1	3018	20__	3007	1009	1031 1035	20	1007	1008	
Batt Post EVA					X	X	X				
EVA 3	EV1 FT	AFT SCU1	3004	20__	3004	1007	1022 1025	18	1003		1011
	EV2 FN	FWD SCU2	3018	20__	3005	1009	1026 1028	20	1007	1009	
Batt Post EVA						X	X				
EVA 4	EV2 FN	FWD SCU2	3018	20__	3006	1009	1029 1030	20	1003		1011
	EV3 CF	AFT SCU1	3005	20__	3007	1012	1031 1035	18	1007	1005	
Return Config	EV1 FT	STBD SCU1	3004	20__	2089	N/A	N/A	N/A	N/A	N/A	N/A
	EV2 FN	PORT SCU2	3018	20__	2090	N/A	N/A	N/A	N/A	N/A	N/A

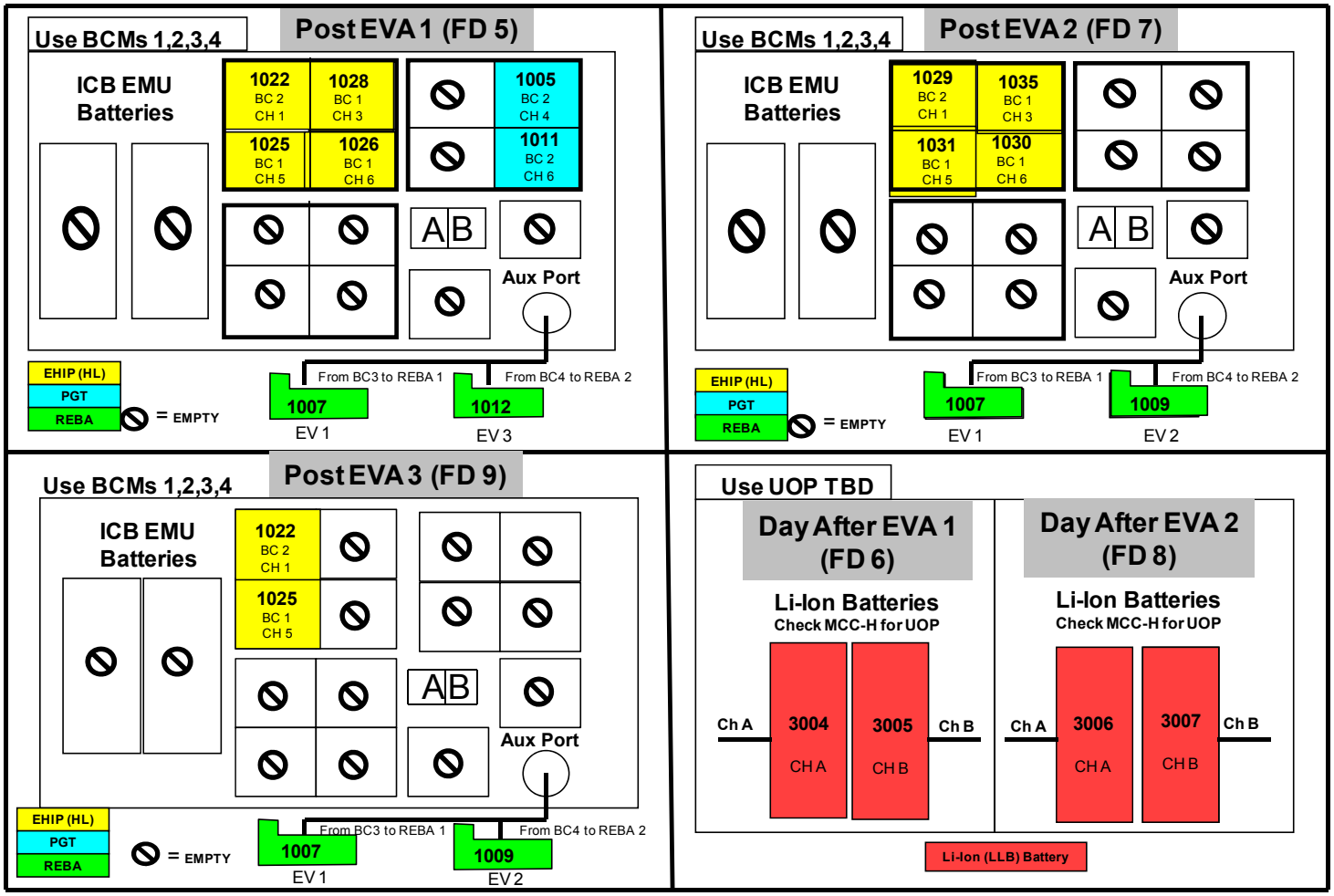
NOTE: SCU1 = double red, SCU2 = green; EMU Battery s/ns 20xx are ICB and 30XX are Li-Ion

(reduced copy)

TOP
BACK OF 'STS-134 CONSUMABLES TRACKING CUE CARD'

HOOK VELCRO

STS-134 EVA BATTERY RECHARGE PLAN



EVA-5b/134/O/B

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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

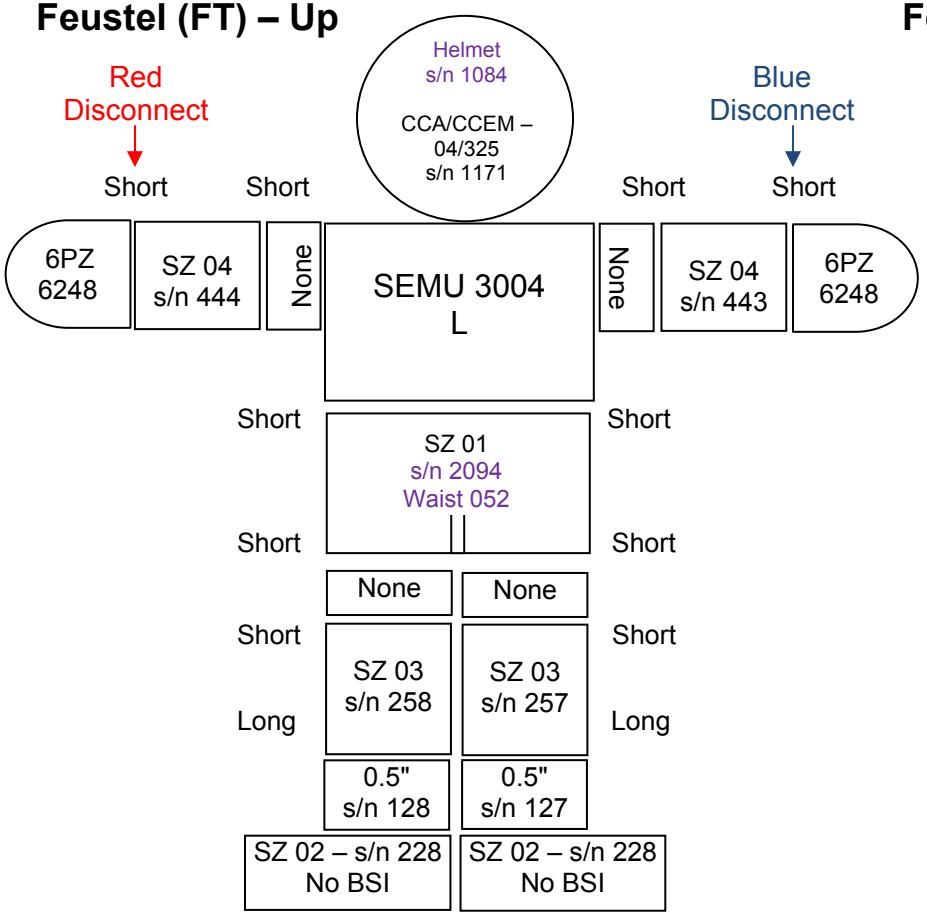
VACUUM H2O RECHARGE (MANNED)

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

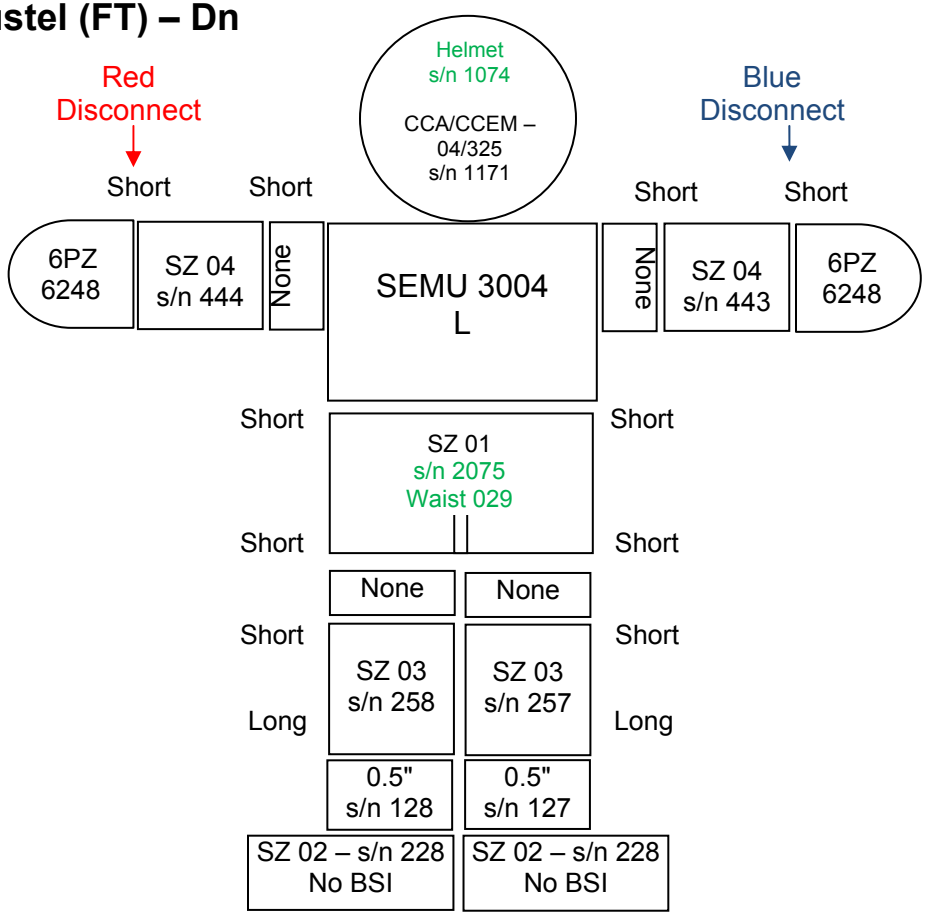
EV 1. Perform AIRLOCK INGRESS, Cuff C/L, 30 (Close hatch, partially engage latches)
2. √Helmet purge vlv – cl, locked
DCM 3. √PURGE vlv – cl (dn)
4. √WATER – OFF
IV MO13Q 5. √ARLK H2O S/O VLV – OPEN (tb-OP)
MD(flr) 6. √EMU O2 ISOL VLV – OP
ML86B:C 7. √cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op
AW82B 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)

STS-134 NOMINAL EMU SIZING

Feustel (FT) – Up



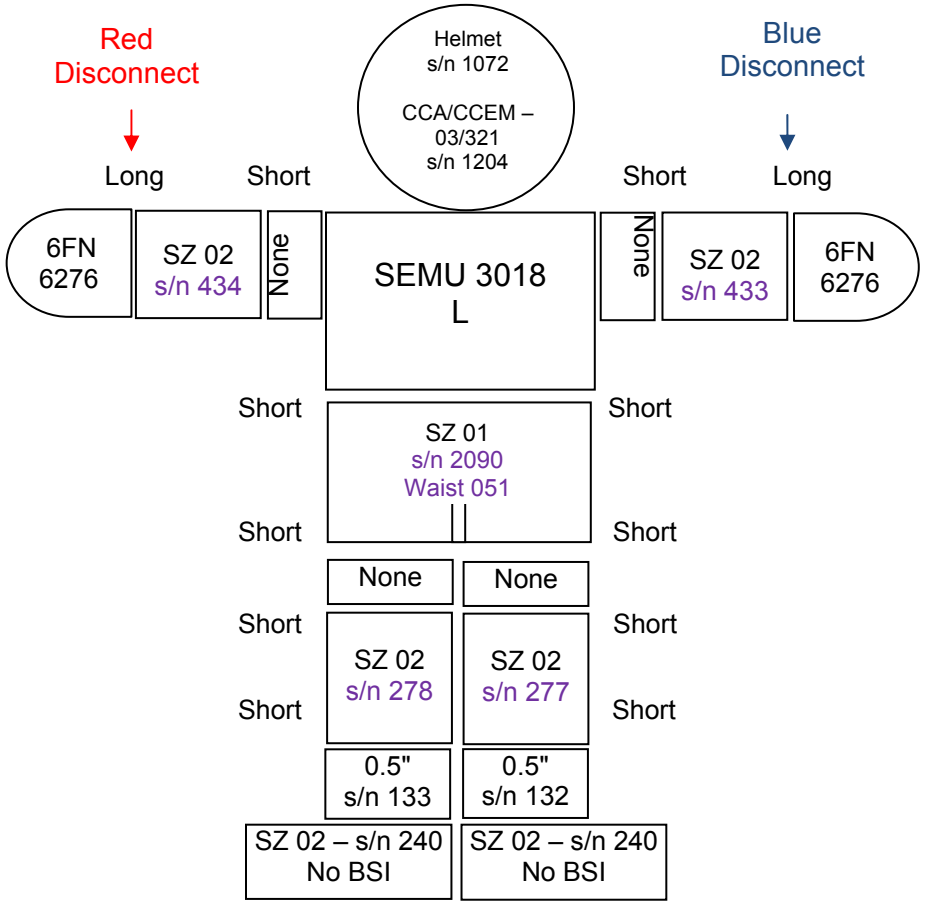
Feustel (FT) – Dn



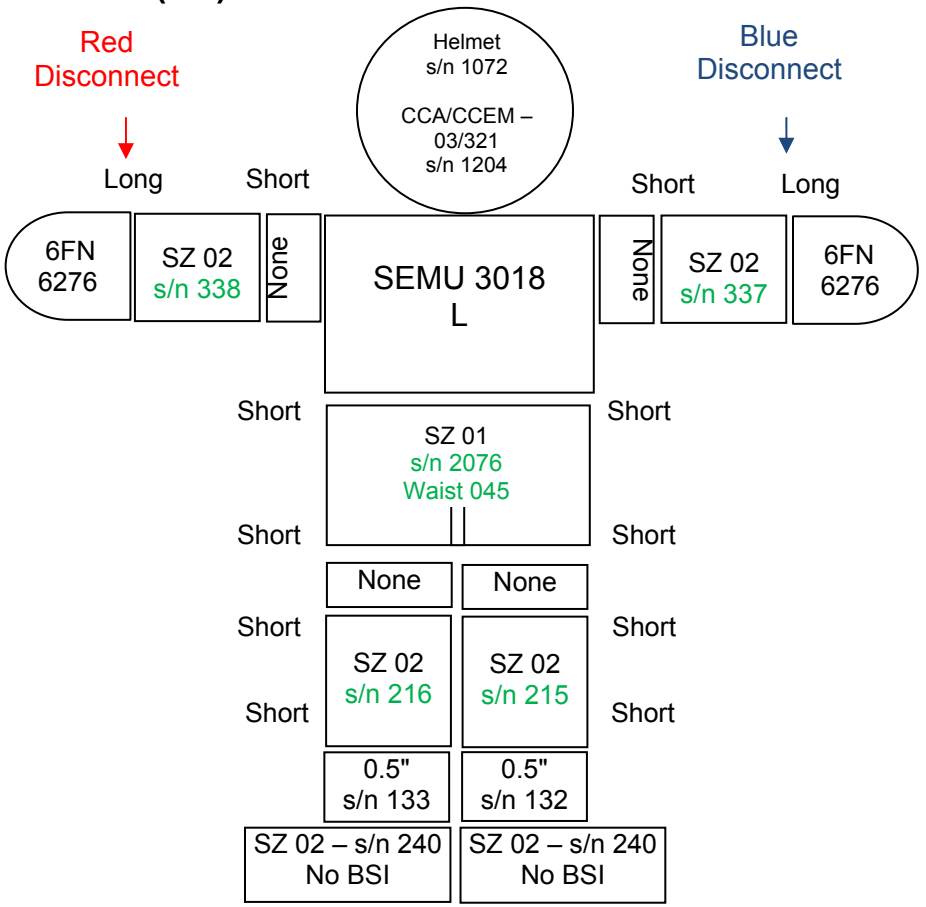
	Croakie	Fresnel	Valsalva	LCVG/BLVD	MAG	TCU Top	TCU Bottom	Comfort Gloves	Socks
FT	None	None	-308	04/05	709	M	S	Large, Thin	Tube

STS-134 NOMINAL EMU SIZING (Cont)

Fincke (FN) – Up



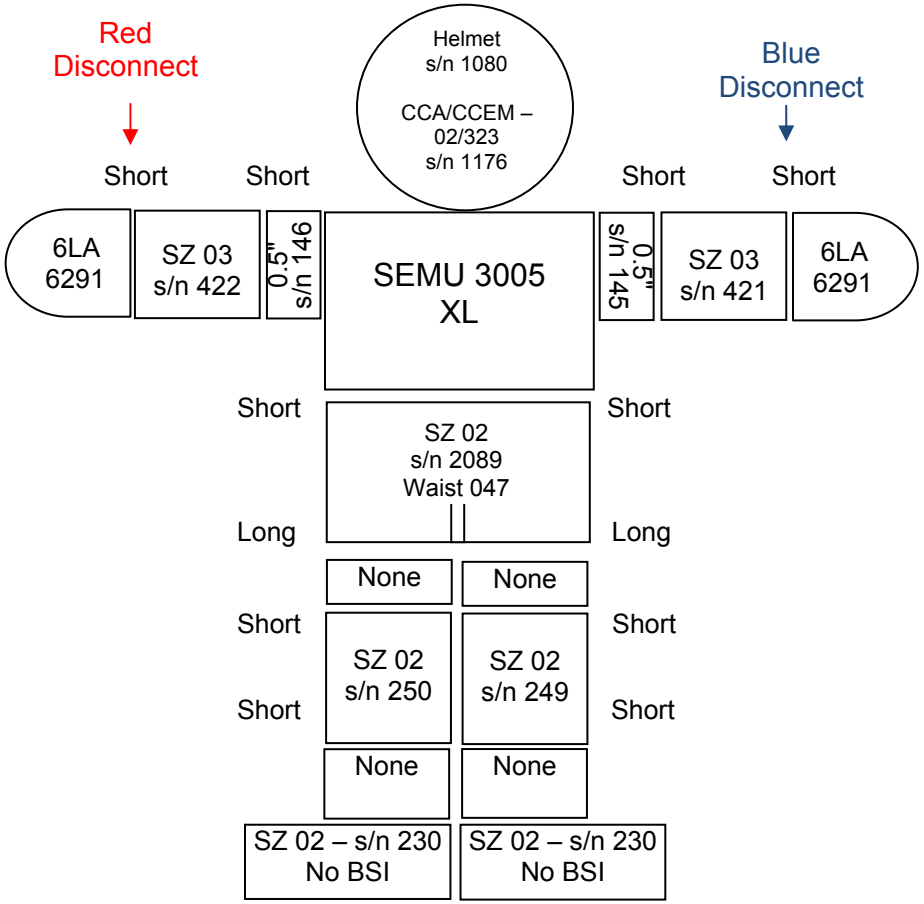
Fincke (FN) – Down



	Croakie	Fresnel	Valsalva	LCVG/BLVD	MAG	TCU Top	TCU Bottom	Comfort Gloves	Socks
FN	None	None	-309	03/04	709	M	S	Medium, Thick	Crew (10-13)

STS-134 NOMINAL EMU SIZING (Cont)

Chamitoff (CF



	Croakie	Fresnel	Valsalva	LCVG/BLVD	MAG	TCU Top	TCU Bottom	Comfort Gloves	Socks
CF	None	-019 -007	-308	05/05	711	XL	L	Custom Spectra [CF]	Poly Liner (L)

EMU CONTINGENCY RESIZE MATRIX (STS-134/ULF6)

FOR LOSS OF:	EV1 – Feustel	EV2 – Fincke	EV3 – Chamitoff
HUT/PLSS	Use EMU 3010, Large 1. Remove arm assys/gloves 2. Use primary arms, FT gloves 3. √Arm red connects to right, √locks, √cams 4. Use primary LTA 5. Swap EMU PLSS identifier stripes, American flag 6. Swap helmet, CCA, LiOH, Li-Ion EMU battery, REBA, DIDB	Use EMU 3010, Large 1. Remove arm assys/gloves 2. Use primary arms, FN gloves 3. √Arm red connects to right, √locks, √cams 4. Use primary LTA 5. Swap EMU PLSS identifier stripes, American flag 6. Swap helmet, CCA, LiOH, Li-Ion EMU battery, REBA, DIDB	INFO ONLY*: Use HUT ORU 2026, XL 1. Use primary rings, arms, CF gloves 2. √Arm red connects to right, √locks, √cams 3. Use primary LTA 4. Swap EMU PLSS identifier stripes, American flag 5. Swap helmet, CCA, LiOH, Li-Ion EMU battery, REBA, DIDB
CCA	Use size 04/325 s/n 1172 Location FT ECOK	Use size 03/321 CCA s/n 1207 Location FN ECOK	Use size 02/323 CCA s/n 1210 Location CF ECOK
Lower Arm Segment	Use size 04 arm s/n 379 or 380 from ISS. Cams S/S (red = right, blue = left) 1. √Locks, √cams	Use size 02 arm s/n 337 or 338 from ISS. Cams S/L (red = right, blue = left) 1. √Locks, √cams	Use size 03 arm s/n 377 or 378 from ISS. Cams S/S (red = right, blue = left) 1. √Locks, √cams
Gloves	Back-up (FT2) in FT ECOK: 1. Use 6PZ gloves s/n 6268 2. √Locks, √cams	Back-up (FN2) in FN ECOK: 1. Use 6FN gloves s/n 6241 2. Cams L/L 3. √Locks, √cams	Back-up (CF2) in CF ECOK: 1. Use 6LA gloves s/n 6194 2. √Locks, √cams
Waist Brief	Use size 01 waist brief s/n 2075 (029) from ISS. Cams S/S 1. Use FT prime 03 legs, 0.5" leg rings, and 02 boots 2. √Locks, √cams 3. Swap EMU brief identifier stripes	Use size 01 waist brief s/n 2076 (045) from ISS. Cams S/S 1. Use prime FN 02 legs and 02 boots/No BSI 2. √Locks, √cams 3. Swap EMU brief identifier stripes	Use size 02 waist brief s/n 2092 (053) from ISS. Cams S/L 1. Use prime CF 02 legs and 02 boots/No BSI 2. √Locks, √cams 3. Swap EMU brief identifier stripes
Leg Segment	Use size 03 leg s/n 251 or 252 from ISS. Cams S/L 1. Use FT prime 0.5" leg rings 2. √Locks, √cams	Use size 02 leg s/n 215 or 216 from ISS. Cams S/S 1. √Locks, √cams	Use size 02 leg s/n 215 or 216 from ISS. Cams S/S 1. √Locks, √cams
Boot	Use size 02 boots s/n 234 from ISS 1. No BSI 2. √Locks	Use size 02 boots s/n 234 from ISS 1. No BSI 2. √Locks	Use size 02 boots s/n 234 from ISS 1. No BSI 2. √Locks
Sizing Rings	• 0.5" Leg: Use s/n 115 or 116 from ISS	• 0.5" Leg: Use s/n 115 or 116 from ISS	• 0.5" Arm: Use s/n 171 or 172 from ISS
Signal Conditioner	Use s/n 117 from OBS IVA kit	Use s/n 117 from OBS IVA kit	Use s/n 123 from ISS
LCVG	Use s/n 3226 (FT 2) from Shuttle 1. Transfer biomed, dosimeter	Use s/n 3199 (FN 2) from Shuttle 1. Transfer biomed, dosimeter	Use s/n 3239 (CF 2) from Shuttle 1. Transfer biomed, dosimeter

*If EMU 3005 is no go, the pre-flight agreement is that Feustel and Fincke would become the EV crew, and Chamitoff would become Task IV

TOP

HOOK
VELCRO

EXPEDITED SUIT DOFFING CUE CARD

CAUTION
Verify EV crew is clear of hatch mechanism.

IV When equalization complete:
1. Open IV Hatch per decal

SUIT DOFFING
DCM
2. O2 ACT → OFF
3. PURGE vlv → op (up)
4. sw REBA → OFF (toward left arm of suit)
5. EMU TV Power Cable ←|→ EMU TV
6. √STATUS: SUIT P < 0.4 (compare with gauge)
7. Glove ←|→ EMU (leave donned, disconnected)
8. Helmet ←|→ EMU

DCM
9. sw FAN → OFF

SAFER DOFFING
SAFER
10. Latch → ENG
11. Latch ↶ until release (~90 deg)
12. PLSS ←|→ Thruster Towers

SAFER DOFFING cont.
PLSS
13. Engage EMU in EDDA.
14. Lower Arm Cables ←|→ Gloves
15. Gloves ←|→ EMU
16. Comm Mode → OFF
17. Doff EMU.

If taking EMUs to shuttle:
UIA
18. sw PWR EV-1,2 (two) → OFF
√PWR EV-1,2 LEDs (four) – Off

DCM
19. SCU ←|→ DCM
20. LTA →|← HUT
21. Gloves →|← EMU
22. Helmet →|← EMU
23. Go to **EMERGENCY UNDOCKING EVA TRANSFER** on reverse side

EVA-6a/134/O/A

TOP
BACK OF 'EXPEDITED SUIT DOFFING CUE CARD'

HOOK
VELCRO

EMERGENCY UNDOCKING
EVA TRANSFER

Critical

Take

- EMUs (FT & FN)
- Comm caps (FT & FN)
- Gloves (FT & FN)
- 85-ft Safety Tethers (2) (*prefer 28 and 30*)
- Shuttle EVA Checklist

Remove from EMUs, if time permitting

- *Helmet Lights/ERCA*
- *Li-Ion EMU Batteries*
- *REBAs*
- *ISS Tethers and Tools*
- *Biomed Pigtails*

Desired

- LCVGs (FT & FN)
- ECOKs (FT, FN, & CF)
- CF Comm cap, Gloves, LCVG

EVA-6b/134/O/B I

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-134 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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STS-134/ULF6 WORKAROUNDS CRIBSHEET

EVA 1 CONTINGENCIES

TASK	FAILURE	ACTION
I. MISSE 7 Retrieve and MISSE 8 Install	A. PEC door PIP pin will not release	Tap detent end of PIP pin (end opposite pull ring) with hammer or other tool; 6" max stroke; use metal side of hammer (Stbd A/L toolbox)
	B. PEC door PIP pin will not engage	1. Verify ball detents can be depressed 2. Check alignment and reattempt 3. If no joy, install other door PIP pin 4. If no joy, wire-tie door open/closed 5. For PEC 7s, if neither PIP pin installs and more than 1/4" gap exists, bring PEC inside A/L **One PIP pin is sufficient to restrain the PEC open/closed
	C. ExPA Socket PIP pin will not release	1. Push PIP pin button and increase force on pull ring; stop if deformation occurs 2. If no joy, offload any misalignments on the PEC while releasing PIP pin 3. If no joy, tap detent end of PIP pin with hook 4. If no joy, retrieve hammer (stbd A/L toolbox), pry bar (Staging Bag), and BMRRM tool (stbd Z1 toolbox, slot 2) 5. Tap detent end of PIP pin with hammer; 6" max stroke; use metal side of hammer; reattempt step 1 6. If no joy, place edge of pry bar along the detent end of PIP pins, tap with hammer; 6" max stroke; use metal side of hammer; reattempt step 1 7. If no joy, insert BMRRM tool axially into detent end of PIP pin, tap with hammer; 4" max stroke; use metal side of hammer; reattempt step 1 8. If no joy, release probe contingency bolts (2) to release PEC; RET to bolt tether pt **PGT [A7 (9.2), CCW2, 30.5], 11.5 turns**
	D. ExPA Socket PIP pin will not engage	1. Verify ball detents can be depressed 2. Check alignment of PEC 3. Wiggle PEC to offload any misalignments while installing PIP pin 4. Install other PIP pin, if not already, and reattempt **One PIP pin is sufficient to hold PEC in ExPA socket
	E. PEC 8 will not freely open	1. Verify both door PIP pins fully released 2. Increase force to pull open the door. Use other hand to stabilize on the PEC probe. It may require a constant force up to 25 lb, then a quick drop to no resistance 3. If O-ring comes out of groove on probe side of PEC, attach RET around O-ring. Remove and stow in trash bag or CETA ORU bag 4. If no joy, use pry bar (Staging Bag) between the doors, start from probe side and move up toward hinge
	F. Wing tab connector fails to release	1. Use tether hook for leverage 2. If no joy, use Hubble connector tool (90 deg) (Staging Bag)
	G. Wing tab connector fails to install	1. Check for FOD/damage 2. Verify connector is matched to correct jack and fully seated 3. Verify alignment/keying (line up wing with black line on PEC, rotate cw 90°) 4. Reattempt with lining up other wing with black line on PEC

EVA 1 CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
		5. If no joy, use tether hook or Hubble connector tool (90 deg) (Staging Bag) 6. If no joy on 7B connector, bring PEC inside A/L ******7B connector is required – provides heater power
	H. Side Wall Carrier Latch PIP pin will not release	1. Push PIP pin button and increase force on pull ring; stop if deformation occurs 2. If no joy, tap detent end of PIP pin with hook 3. If no joy, perform steps 2-3 in Block I
	I. Side Wall Carrier Latch will not release from launch config	1. Verify PIP pin fully released 2. Tether to both clamp and contingency bolt; release contingency bolt **PGT [A7 (9.2), CCW2, 30.5],** 11 turns 3. Stow bolt and latch assembly in trash bag
	J. Side Wall Carrier Latch does not latch into landing config	1. Check for interference (PIP pin, MISSE flush to SWC, etc) and reattempt 2. If no joy, wire tie latch to Side Wall Carrier 3. If no joy and on **MCC-H GO**, tether to both clamp and contingency bolt; release contingency bolt: **PGT [A7 (9.2), CCW2, 30.5]** (11 turns) 4. Stow bolt and latch assembly in trash bag ******One latch required for landing
	K. Side Wall Carrier Latch PIP pin will not install	Tap PIP pin with hook ******PIP pin not required for landing
II. SARJ Cover Install	A. SARJ MLI Cover bolt will not fully install	1. Check alignment of cover 2. Loosen installed bolts for only a few turns (do not release more turns than performed to engage) 3. Re-attempt starting with problem bolt. Verify all bolts are engaged before final torque 4. If no joy, install other bolts to achieve minimum reqd 5. If less than minimum bolts, bring cover inside A/L ******Minimum number of bolts is any 4 of 6 per cover. For 6 fasteners, 3 of 6 is min if one fastener in each pair CAUTION If cover has less than 4/4 or 6/6 bolts, it does not meet EVA kickloads. Avoid inadvertent contact with cover
III. CETA Light Install	A. CETA light fails to soft dock	1. Check for FOD/damage 2. Verify ball detents/plunger can be depressed, reattempt
	B. NZGL Connectors	See Generic Section of cribsheet
	C. Bolt fails to engage	1. Verify pushing in on bolt. Will need to push mounting bracket past soft dock to engage bolt; reattempt 2. If no joy, verify electrical cable clear or not interfering with install; reattempt 3. If no joy, remove CETA light and check for FOD/damage
	D. CETA light bolt fails to fully install	Increase torque **PGT [B7 (25.5), CW2, 30.5]** for 1 turn; then nominal settings for remainder turns
IV. EWC Install	A. HR bolt fails to break torque	1. Increase torque to **PGT [B7 (25.5), CW2, 30.5]** for 1 turn only 2. If no joy, use manual ratchet on PGT for 1 turn only
	B. HR bolt fails to release	1. Increase torque to **PGT [B5 (22.0), CCW2, 30.5]** 2. If no joy, re-install at **PGT [A2 (3.8), CW2, 30.5]** and reattempt bolt release

EVA 1 CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	C. HR will not install in seat track or fails to soft dock	1. Verify HR installed in correct direction per arrow on underside of HR 2. Verify HR shoes are completely released and soft dock armed 3. Verify pitch of feet is parallel to seat track 4. Check for FOD on HR and seat track; reattempt 5. If no joy, verify HR bolt completely released: **PGT [A1 (2.5), CCW2, 30.5]** 6. If HR in seat track but soft dock will not engage, attempt to drive HR bolts ******1 bolt is required CAUTION If less than 2 bolts fully installed, do not use for translation
	D. T-handle tool fails to engage shield	1. Remove adjacent fasteners and reattempt 2. If no joy, try other T-handle tool
	E. MMOD shield Dzus fastener fails to release WARNING Do not touch back side of MMOD shield or handle fastener fragments due to sharp edges Fastener and shield/tool interface must be covered to avoid potential projectiles	1. Release other Dzus fasteners and reattempt 2. On **MCC-H GO**, retrieve pry bar (Staging Bag) and CETA ORU bag 3. Assess clearance between MMOD shield and tools 4. If possible, rotate fastener to position tangs off of tools 5. Place ORU bag over failed fastener 6. Insert pry bar under MMOD shield by failed fastener and pry shield away from structure
	F. MLI grounding strap Dzus fails to release	On **MCC-H GO,** cut ground wire near Dzus fastener
	G. MLI grounding strap Dzus fails to engage	1. Verify alignment, push firmly and reattempt 2. If no joy, push MLI under bracket and install MMOD shield
	H. Access to P16 difficult	On **MCC-H GO**, disconnect P15 for more clearance. Mate P15 once P16 is mated
	I. MMOD shield Dzus fastener fails to engage	1. Verify center fastener is engaged first 2. Check Dzus fastener aligned with bracket (floating receptacles on endcones). Use loop pin puller to help with receptacle alignment if reqd 3. Verify fastener clocking correct per alignment mark 4. Push firmly to rotate; reattempt 5. If no joy, engage other fasteners ******2 out of 3 Dzus fasteners required 6. If 2 of 3 not achieved: –Wire Tie Shield (See figs 1-3): 1 properly secured wire tie = 1 Dzus fastener; using a long wire tie, squish the loop on one end, feed it through the bracket on structure (may need to push floating receptacle inboard to get it out of way), secure wire tie w/3 twists. Feed one end of wire tie around Dzus head (on outside of shield) and secure with 3 twists. If HR nearby can also secure wire tie to HR. (Goal is for the wire tie to push shield in toward body of structure and toward center if endcone shield)

EVA 1 CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
		– Option 2 (LDTDT): Use 1 adj (attach to tether point on T-tool and to structure HR) and 1 LDTDT across shield to hold shield in position

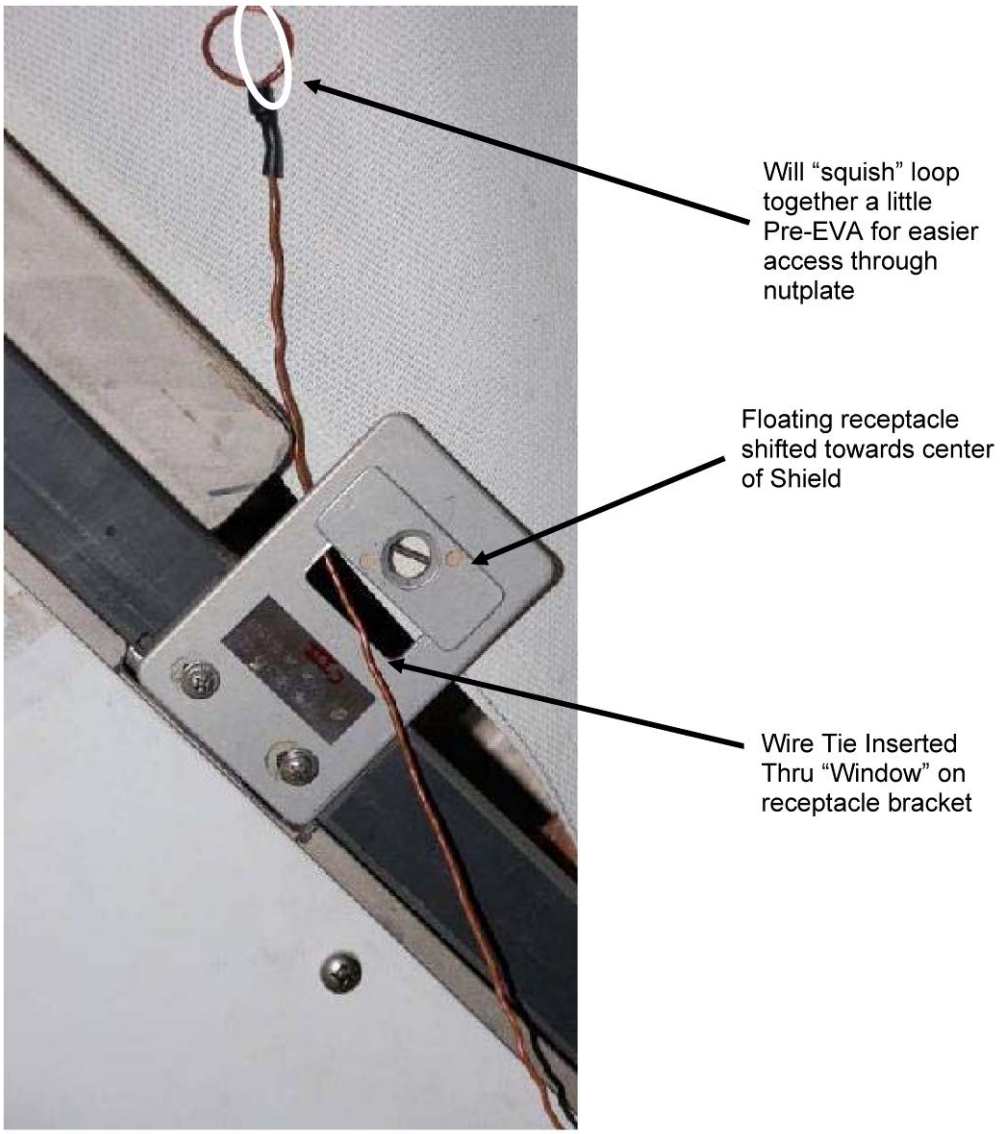


Figure 1.- MMOD Shield Wire Tie Option.

EVA 1 CONTINGENCIES (Cont)

TASK	FAILURE	ACTION

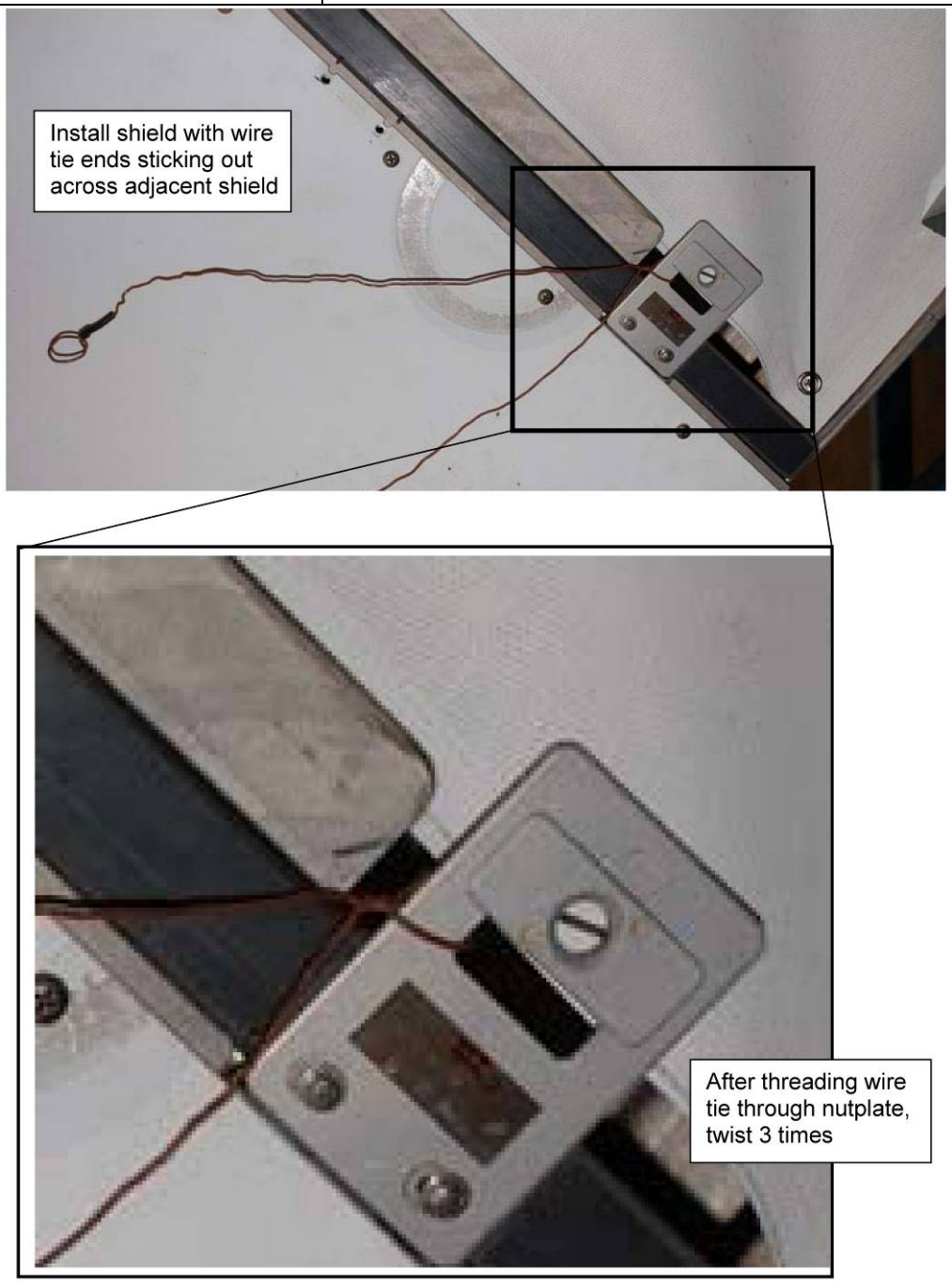


Figure 2.- MMOD Shield Wire Tie Option. (Cont)

EVA 1 CONTINGENCIES (Cont)

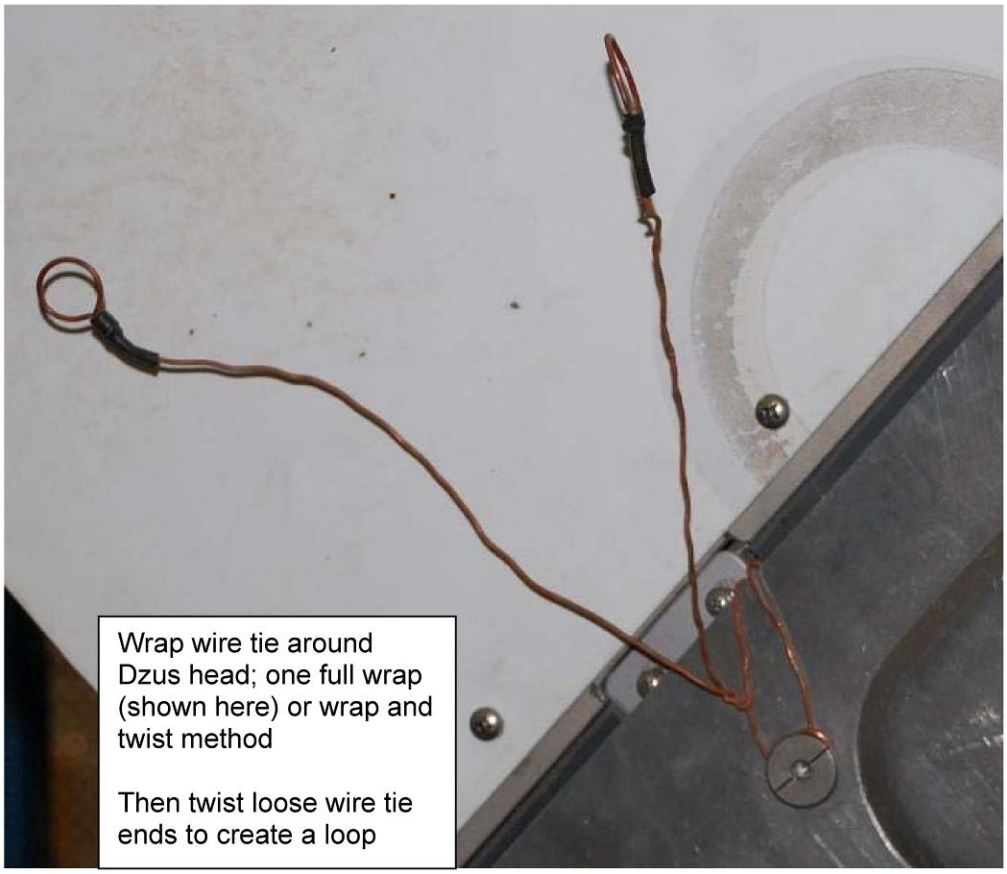
TASK	FAILURE	ACTION
		

Figure 3.- MMOD Shield Wire Tie Option. (Cont)

P6 PVTCS FILL CONTINGENCIES

TASK	FAILURE	ACTION
	Fluid QD Ops	
	NOTE Troubleshooting steps outlined in this section are for the Flight Specific task of refilling the P6 PVTCS. For any other QD items, use the QD steps in the generic section of the cribsheet. If troubleshooting requires the crew to leave the worksite, verify that female QDs are covered to prevent exposure to direct sunlight. For thermal clocks refer to flight rules	
	Mating Ops	
	A. QD fails to mate	1. Check alignment and verify side loads are counteracted 2. Verify fwd white band is not visible (release ring is retracted) 3. Inspect male and female QD for debris, damage, or NH3 • If NH3 present, leave female QD engaged with male (NH3 may sublimate between QDs) 4. Change body orientation for better access and reattempt
	B. Release ring snap back test fails	1. Push release ring forward. (Release ring will not slide fwd if QD is in FID) 2. If no joy, QD is in FID a. Pull back on release ring b. Demate QD c. Verify fwd white band not visible d. Remate QD
	C. Gap check fails (visual or FID gauge)	Demate and Remate QD a. Retract release ring b. Demate QD c. Verify fwd white band not visible d. Remate QD
	D. Pull test fails	1. Verify fwd white band is not visible. (If visible, retract release ring) 2. Assess and counteract sideloads and mate QD
	Valve Ops	
	A. Detent button is partially unthreaded	Rethread detent button a. Load bail handle towards the button (button will free spin if not loaded) • If valve is open, pull bail handle aft • If valve is closed, push bail handle fwd b. Rotate button cw (8 turns max)
	B. Detent button is missing NOTE Detent button is only required for BDT ops	1. Use equipment hook to depress detent button shaft 2. Or, use tether strap around gloved finger to depress detent button shaft 3. Or, retrieve and use BMRRM Tool (stbd Z1 Toolbox, slot 2) to depress detent button shaft
	C. Bail fails to travel to fwd (valve open) position (button does not pop up if attempting to go to full fwd)	1. Neutralize sideloads 2. If no joy, apply greater opening force to QD bail handle 3. If no joy, use QD bail drive lever (1-in only, SARJ Med ORU bag)

P6 PVTCS FILL CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	D. Detent button fails to depress in preparation for valve closing WARNING Bail may kick back and contact crew when a stuck button is depressed due to pressure build-up in spring cavity	1. Verify locking collar unlocked (for 1-in) 2. Push and hold bail handle fwd (to open) with significant force to relieve load on button while simultaneously depressing detent button • If button depresses, vent by pulling bail aft until aft white band no longer visible 3. If no joy: a. Rock bail handle from side-to-side while depressing button b. Rock QD at QD stub up-down and side to side while depressing button 4. If no joy, retrieve QD bail drive lever and repeat step 2 (1-in only, SARJ Med ORU bag) 5. If no joy, on **MCC-H GO,** retrieve and install QD button depress tool (BDT) (1/4-in – Fluid QD Bag #2, port; 1-in Staging Bag) 6. If no joy, on **MCC-H GO**, retrieve hammer (stbd A/L Toolbox, nadir door) and tap center of button. (Use fiberglass side of hammer.) (Inspect tool and QD)
	E. Bail fails to travel to full aft (valve closed) position (button does not pop up)	1. Neutralize possible side loading 2. Increase force on bail 3. If no joy, use QD bail drive lever (1-in only – SARJ Med ORU bag) 4. If no joy, inspect QD for retaining wire protrusion
	Demating Ops	
	A. Female QD fails to demate	1. Neutralize sideloads or manipulate flexhose to relieve mating forces on female QD 2. Verify release ring is fully retracted while attempting to demate 3. Verify TA clamps are released 4. Verify detent button is up. (Locking collar can be rotated under button) 5. If no joy, apply greater force to release ring and female QD 6. If no joy, retrieve and use QD release tool (QRT) to apply greater force (1-in only – Fluid QD Bag #1, stbd) 7. If no joy, shake QD vigorously while attempting to demate
	B. Thermal bootie fails to remain securely closed	Install wire tie around bootie to keep QD fully covered
	C. Cap will not demate	1. Verify pulling out on cap before rotating to ensure locking tab is disengaged 2. If no joy, wait for opposite thermal conditions if possible and reattempt cap removal 3. If no joy, retrieve QD cap tool (1/4-in – Fluid QD Bag #1 & 1-in located in SARJ Med ORU bag) a. Verify pull out on the cap before turning b. **PGT: [A4 (6.3), CCW1, 30.5]** with QD cap tool to turn stuck cap a maximum of 2 turns (cap vents at ~2 turns) c. Once venting is complete, finish removal of cap by hand (~1 additional turn) • If venting does not stop or cap cannot be removed by hand, notify **MCC-H**. (Male QD may be leaking)

P6 PVTCS FILL CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	D. Partial fwd white band visible after QD demate	1. Pull back on release ring to verify QD is not in FID 2. Verify detent button is up 3. If fwd white band is still partially visible this is likely a tolerance stackup and has been seen before; notify **MCC-H** and press with QD ops
	Vent Tool Reconfig Ops	
	A. Tip of vent tool does not pass black mark during alignment check	Slide the equipment hook further away from vent tool nozzle end
	B. Vent tool/VTE plug cannot be fully mated to Vent Tool Extender	Hold VTE adapter in sunlight to warm it up (known tolerance issue between cold VTE adapter & vent tool nozzle)
	Leaks	
	CAUTION Do not fully open a leaking QD. Fully opening a leaking 1-in QD could trap NH3 and prevent future valve closure	
I. General	A. Female QD leaks due to FID	1. Close valve (bail aft) 2. Perform release ring snap back test • If FID observed, demate and remate QD
	B. Frozen NH3 present on female or male QD	1. Leave QD exposed to vacuum; wait maximum of 5 min for sublimation (check periodically) 2. On **MCC-H GO**, continue QD ops (NH3 may sublimate during QD mating)
II. EVA 1	C. Problems with P3/P4 jumper (hole, QD won't demate/mate, etc)	1. Close and demate QDs at P3 M2 and P4 M15 2. Stow P3/P4 jumper back in launch config 3. Use S3/S4 jumper: a. Retrieve S3/S4 Jumper from S4 bulkhead b. Mate and open S3 QD F2 to P3 M2 c. Mate and open S4 QD F15 to P4 M15 NOTE: S3/S4 jumper is 28-in longer than P3/P4 jumper
	D. P3/P4 Jumper cannot reach P3 QD M2 (length too short)	1. Route jumper through AJIS struts 2. If no joy and on **MCC-H GO**, retrieve S3/S4 jumper (Reference Block C) or **MCC** will rotate SARJ
	E. Problems with FH-02 EAS Jumper	1. Close and demate QDs at M2 and M10 2. Use FH-01 Jumper: a. Demate QDs at M9 and M1 b. Mate QD-02F to M10 c. Open QD-03F at QD Extender d. Vent N2 from jumper at QD Extender QD e. Mate QD Extender to M2 3. Wire tie FH-02 to FH-01 per tiedown 4. If APFR is required for EAS Jumper QD ops in P6 WIF 11, inspect WIF adapter plate prior to using: • Verify 4 bolts present • Verify bolt/washers flush to plate • Verify lock collar black on black • Perform pull/twist test, verify no WIF motion
	F. Male QD M2 leaks when QD is demated (P6 PVTCS)	1. Install cap on M2 2. Wire tie QD Extender to FH-01 jumper (2 wire ties)
III. EVA 2	G. Loss of Comm during Leak Check	1. Monitor ATA Tank quantity Nav Display: P1: TCS: ATA: Loop B ATA Valves Loop B ATA Valves 'Telemetry' 2. If ATA Tank _____quantity < _____ (values to be provided by THOR on morning of EVA), IV send commands on display: Loop B ATA Valves 'Commands' **cmd** Tank (1 or 2, same as above) Isol Valve Close – Arm (√–√) **cmd** Tank (1 or 2, same as above) Isol Valve Close – Close (√ – Closed) 3. Contact **MCC-H** for further actions

P6 PVTCS FILL CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	Leaks	
	CAUTION Do not fully open a leaking QD. Fully opening a leaking 1-in QD could trap NH3 and prevent future valve closure	
	H. Leak Check fails	1. If Large Leak: a. EV2 close ATA QD M1 b. **MCC-H** (THOR) closes ATA valve c. On **MCC-H GO**, EV1/EV2 perform P6 PVTCS Leak Detection Procedure FS 16-____ d. Contact **MCC-H** for further actions 2. If Medium Leak: a. **MCC-H** (THOR) closes ATA valve b. On **MCC-H GO**, EV1/EV2 perform P6 PVTCS Leak Detection Procedure FS 16-____ (Including P1-P5 Vent) c. Contact **MCC-H** for further actions 3. If Small Leak, continue with nominal procedures (P6 QD F14 open)
	I. A500 pnl QD leaks during Leak Check	1. If F185 on M1, fully open valve (bail fwd) 2. If F184 on M2: a. Fully close valve (bail aft) b. Fully open valve (bail fwd) 3. If leak stopped, proceed with Leak Check 4. If leak persists, close QD, contact **MCC-H**
	J. Male QD M14 (P5/P6) leaks when cap removed	1. If leak is small and dissipating, continue with nominal procedures (Mate and open F14 to M14) 2. If large leak, install cap and contact **MCC-H**; quantify leak
	K. Female QD F14 (P5/P6) leaks before mate to P6 (valve in closed position)	1. Mate QD F14 to P6 male QD M14 2. Partially open valve (bail fwd ~halfway/50%) without popping up detent button 3. Return QD to closed position (bail aft) 4. If leak stopped, fully open QD F14, continue nominal plan 5. If leak persists, partially open valve (bail fwd ~halfway/50%) without popping up detent button
	L. Mated QD-02F leaks in valve open position at M10 (EAS Jumper)	1. Fully close valve (bail aft) 2. Partially open valve (bail fwd ~halfway/50%) without popping up detent button 3. If leak persists, use FH-01 jumper (see block E for steps). Contact **MCC-H** if need to vent FH-02 Jumper
	M. Leak in FH-02 Jumper	Use FH-01 Jumper (see block E for steps). Do not need to vent FH-02 Jumper
	N. Mated QD Extender leaks in valve open position at M2 (EAS Jumper)	1. Fully close valve (bail aft) 2. Partially open valve (bail fwd ~halfway/50%) without popping up detent button 3. If no joy, remove QD Extender from jumper: a. Fully close valve on QD Extender (bail aft) b. Fully close and demate QD-03F at QD Extender c. Demate QD Extender and temp stow d. Mate QD-03F to M2 and fully open valve. May need to demate QD at M1 if bail interference

P6 PVTCS FILL CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	Leaks	
	CAUTION Do not fully open a leaking QD. Fully opening a leaking 1-in QD could trap NH3 and prevent future valve closure	
	O. PVTCS overfilled (P1 NTA Isol Valve fail close)	1. On **MCC-H GO**, keep EAS QD Extender at M2 open, continue to P1-P5 vent 2. Or, vent additional NH3 from PVTCS using whole EAS Jumper a. Vent EAS jumper per nominal plan b. Mate and open QD Extender at M2 c. On **MCC-H GO**, close QD extender at M2 d. Vent FH-02 jumper e. On **MCC-H GO**, repeat steps b-d 3. Or, vent additional NH3 from PVTCS using EAS QD Extender a. Vent EAS jumper per nominal plan b. Mate QD Extender to M2 c. Fully close valve on QD-03F into QD Extender d. Open QD Extender at M2 e. On **MCC-H GO**, close QD extender at M2 f. Vent FH-02 jumper (Extender only) g. On **MCC-H GO**, repeat steps b-f
	P. QD Extender leaks after valve close operation at M2 (EAS Jumper)	1. Partially open valve (bail fwd ~halfway/50%) without popping up detent button 2. Wait while ice crystals on QD dissipate 3. Return QD to closed position (bail aft) 4. On **MCC-H GO**, demate QD and inspect 5. If leak persists: a. If male QD F14, reference Block Q b. If female QD F14, reference Block R
	Q. Male QD M2 leaks after demate (P6 PVTCS)	1. Contact **MCC-H**, quantify leak 2. If leak small and dissipating, continue with nominal procedures (install cap on M2) 3. Else, leave QD Extender attached to P6 PVTCS a. Mate QD Extender to M2 and fully open valve (bail fwd) b. Fully close and demate QD-03F at QD Extender c. Install cap on QD Extender
	R. Female QD Extender leaks after demate from M2 (EAS Jumper)	1. Contact **MCC-H**, quantify leak 2. If leak small and dissipating, continue with nominal procedures (install plug on QD Extender) 3. Else: a. On **MCC-H GO,** close and demate QD-02F at M10 b. Wire tie QD Ext to FH-01 jumper; allow to leak
	S. QD pair F14/M14 leaks during valve close operation (P5/P6)	1. Partially open valve (bail fwd ~halfway/50%) without popping up detent button 2. Contact **MCC-H**, quantify leak 3. On **MCC-H GO** and after NH3 crystals have dissipated, re-close QD 4. If still leaking, contact **MCC-H** to determine if male leaking. (THOR will monitor pressure drop) 5. On **MCC-H GO**, demate QD and inspect 6. If still leaking: a. If female QD F14, reference Block T b. If male QD M14, reference Block U

P6 PVTCS FILL CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	Leaks	
	CAUTION Do not fully open a leaking QD. Fully opening a leaking 1-in QD could trap NH3 and prevent future valve closure	
	T. Female QD F14 leaks after demate (P5/P6)	1. Contact **MCC-H**; quantify leak 2. Mate QD F14 to Vent tool adapter as quickly as possible
	U. Male QD M14 leaks after demate (male sleeve may be visibly stuck open) (P6 EETCS)	1. Contact **MCC-H**; quantify leak 2. Attempt to install cap on M14 3. If no joy, vent from P4: a. Mate QD F14 to M14 and fully open valve (bail fwd) b. Remove MUT EE/nozzle from P6 HR 5321 c. Translate to P4 HR 5131 with vent lines and MUT EE, attach MUT EE d. Translate to P4/P5 Jumper, tend vent lines e. Close and demate QD F16 f. Mate QD F16 to dummy male P5 M16 g. Remove vent tool adapter from Vent Tool h. Mate Vent Tool to P4 male QD M14 i. On **MCC-H GO**, open vent tool female QD to vent P1-P4 (eclipse constraint or IV close ATA)
	V. QD-02F leaks during valve close operation at M10 (EAS Jumper)	1. Small Leak: Demate QD and install cap on M10 2. Large Leak: a. Partially open valve (bail fwd ~halfway/50%) without popping up detent button b. Contact **MCC-H**; quantify leak c. On **MCC-H GO**, re-close QD d. If still leaking, contact **MCC-H** to determine if male leaking. (THOR will monitor pressure drop) e. On **MCC-H GO**, demate QD and inspect f. If still leaking: • If female QD, reference Block W • If male QD, reference Block X
	W. Female QD-02F leaks after demate from M10 (EAS Jumper)	1. Contact **MCC-H**; quantify leak 2. Wire tie FH-02 to FH-01 jumper per tiedown; allow to leak
	X. Male QD M10 leaks after demate	1. Contact **MCC-H**; quantify leak 2. Attempt to install cap on M10 3. If no joy, mate QD-02F to M10 and fully open valve (bail fwd). Do not vent Jumper
	Y. Male QD M3 (M11) leaks when cap removed	1. Reinstall cap on M3 (M11); notify **MCC-H** 2. Wire tie FH-02 to FH-01 jumper per tiedown
	Z. Leak occurs in vent tools during venting ops	1. Continue venting 2. Keep crew away from leak until vent is complete

EVA 2 CONTINGENCIES

TASK	FAILURE	ACTION
I. SARJ Covers	A. SARJ MLI Cover bolt will not release	1. Release other bolts, reattempt problem bolt 2. Increase torque to **PGT [B7 (25.5), CCW2**, **30.5]-6 ext 7/16** for 1 turn only 3. If free spinning nut plate suspected: a. Retrieve vise grips (Staging Bag) b. Attach vise grips to bolt head c. Turn bolt ccw while applying gentle pull force (do not fail bolt) 4. If no joy, re-install all released bolts and remove nearby cover
	B. SARJ MLI Cover bolt does not fully install	1. Check alignment of cover 2. Loosen installed bolts for only a few turns. (Do not release more turns than performed to engage) 3. Re-attempt starting with problem bolt. Verify all bolts are engaged before final torque 4. If no joy, install other bolts to achieve minimum reqd 5. If less than minimum bolts, bring cover inside A/L ******Minimum number of bolts that must be re-installed is any 2 of 4 or any 4 of 6 per cover panel. For 6 fasteners, 3 of 6 is min if one fastener in each pair CAUTION If cover has less than 4/4 or 6/6 bolts, it does not meet EVA kickloads. Avoid inadvertent contact with cover
II. Grease Guns	A. Hinged Restraint Ring gets stuck in closed posn	Use PIP pin to release ring, stow ring in trash bag NOTE Hinged Restraint Ring does not have a tether point
	B. Grease gun trigger jams 	1. Inspect trigger for FOD, look to see if zip tie is broken 2. If trigger is depressed, use tool or hook to pry trigger open. Re-examine for FOD 3. Use other grease gun OR manually use grease gun by depress plunger slowly and gently with hand (black triangle down)
	C. No resistance felt from grease gun trigger	Trigger spring probably broken. Use other grease gun or manually use grease gun by depressing plunger slowly and gently with hand (black triangle down)
III. S1 Radiator Grapple Bar Stowage Beams	A. Beam still loose after install procedures	1. Gently wiggle stowage beam and both bolts (may eliminate potential cross-thread). Report beam/fastener tightness and gaps to **MCC-H** 2. Release bolts 6 turns at **PGT [B3 (18.4), CCW2, 30.5] 7.8in ext 5/8** 3. Re-attempt install per nominal procedures 4. If no joy, perform tiedown

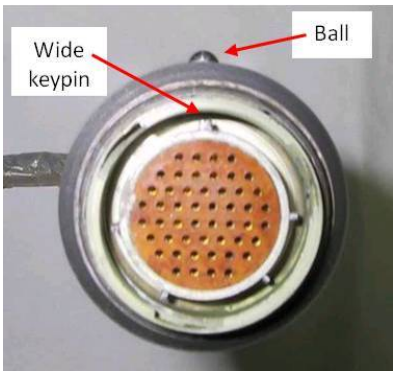
EVA 3 CONTINGENCIES

TASK	FAILURE	ACTION
I. FGB PDGF Setup	A. T-handle lock will not disengage from cap	1. Wiggle T-handle as attempt to pull and rotate into unlock position 2. If no joy, use equipment tether hook or adjustable tether strap to apply additional force to pull out T-handle
	B. Russian ratchet will not engage PAMA cap	1. Inspect ratchet and cap for FOD or damage 2. Cycle release tab, reattempt 3. If no joy, use other Russian ratchet (Staging Bag), reattempt
	C. PAMA cap will not release	1. Verify T-handle is in released position 2. Extend ratchet handle to apply more torque and reattempt
	D. Russian ratchet will not release from PAMA cap	1. Attempt to wiggle cap, inside trash bag, while pulling the release tab on the ratchet 2. If no joy, perform tug test on cap, leave cap attached to Russian ratchet and stow 3. Retrieve other Russian ratchet from Staging Bag if more caps need to be released
	E. MLI flaking or disintegrating	1. Attempt to put degraded MLI piece into middle of MLI bundle when stowing 2. If any fiberglass is present on EMU, use hydrazine brush (stbd A/L Toolbox – slot 6) to brush off flakes
II. PAMA/ PDGF Install	A. PAMA foot will not initially engage	1. Lift PAMA foot away from receptacle, verify no FOD or other interference in receptacle or on foot; verify soft dock mechanism clear; reattempt to hand-tighten foot 2. If PAMA foot does not engage soft dock, use equipment hook to verify soft dock plungers are functional 3. Back out or release previously installed PAMA feet, reattempt soft dock PAMA in 1-2-3 foot order 4. If no joy and at least one foot installed, implement PAMA tie-down plan 5. If no joy on any feet, return PAMA to A/L and reinstall PAMA MLI **3 of 3 feet with black-on-black required
	B. PAMA foot will not fully engage (after all feet are in soft dock)	1. Back out PAMA feet 2 turns and reattempt 2. If no joy, back out other PAMA feet 2 turns, reattempt to hand tighten PAMA foot, and retighten any PAMA feet loosened 3. If no joy, fully release PAMA feet and inspect for FOD or other interference in receptacle or on foot; verify soft dock mechanism clear, reattempt PAMA install in 1-2-3 foot order 4. If no joy, use PAMA cheater bar to tighten PAMA foot to 3-4 turns and black on black 5. If no joy and at least one foot installed, implement PAMA tie-down plan 6. If no joy on any feet, return PAMA to A/L and reinstall PAMA MLI **3 of 3 feet with black-on-black required

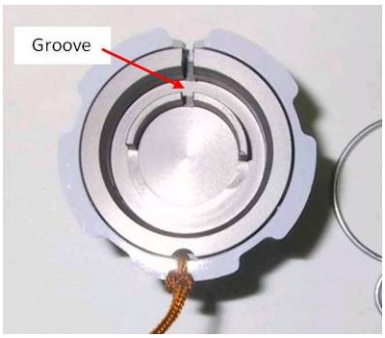
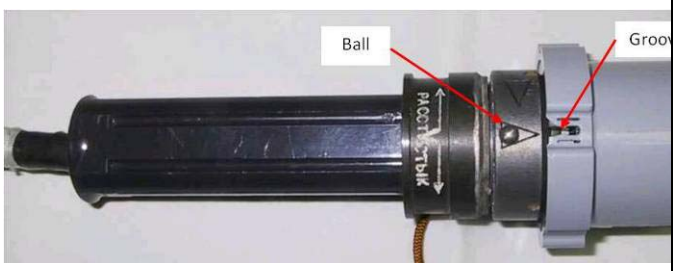
EVA 3 CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	C. Cheater bar will not engage	1. Cycle release button on cheater bar handle, reattempt 2. If no joy, attempt to engage cheater bar on different PAMA foot handle 3. If no joy, engage cheater bar on PAMA foot handle as far as possible, attempt to turn PAMA foot to black-on-black 4. If no joy, hand-tighten PAMA foot handle to black-on-black, use adj tether strap or tether hook as reqd
	D. PAMA foot will not engage to black-on-black	1. Loosen PAMA foot handle ½ turn, reattempt to engage with cheater bar to black-on-black 2. If no joy, implement PAMA tie-down plan ******3 of 3 feet with black-on-black required
	E. Cheater bar will not release	1. Cycle release button on cheater bar handle, reattempt 2. If release button will not depress, use equipment hook or hammer (stbd A/L toolbox) to lightly tap release button; reattempt 3. If no joy, wiggle cheater bar handle; reattempt 4. Retrieve tool to provide additional force to remove cheater bar: a. Vise grips (Staging Bag) to pull the cheater bar handle out b. Pry bar (Staging Bag) to pry the cheater bar free from PAMA handle 5. If no joy, tie down cheater bar
	F. T-handle lock will not engage	1. Wiggle T-handle while attempting to pull and rotate into lock position 2. If no joy, implement PAMA tie-down plan using the option that that foot is not engaged ******3 of 3 T-handles engaged required
III. FGB VSC Install	A. VSC fails to install in FGB bracket	1. Check VSC oriented correctly (tether point is station forward) 2. Check for FOD or MLI interference in FGB bracket
	B. VSC bolt fails to engage	1. Verify VSC is seated properly in bracket and reattempt 2. If no joy, increase torque to **PGT [B3 (18.4), CW2, 30.5]** 3. If no joy or bolt stuck, install hard thermal cover and Russian tether to PAMA foot 1
	C. NZGL Connectors	See Generic Section of Cribsheet
	D. Thermal cover will not engage detent	1. Attempt to reinstall thermal cover in opposite orientation 2. Verify ball detents on large probe are depressible 3. Verify no FOD or interference in the receptacles in the bracket; reattempt 4. If no joy, install thermal cover using Velcro and Russian tether attachments only

EVA 3 CONTINGENCIES (Cont)

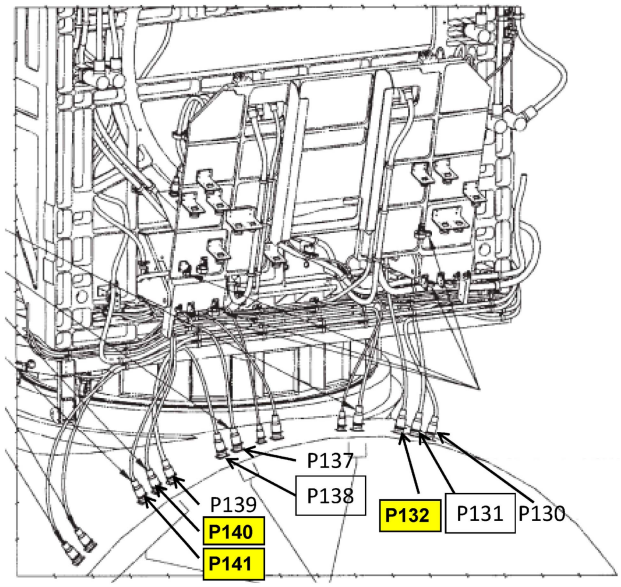
TASK	FAILURE	ACTION
IV. PDGF/FGB Power Connections	A. NZGL Connectors	See Generic Section of Cribsheet
	B. Dust cover does not fully cover all metal surfaces of power connectors	Redo power connections using dust covers in series: a. Tether to dust covers b. Demate connectors c. Using "H" hook labels, Velcro dust covers together  Figure 4.- PDGF Dust Covers. d. Place dust covers over both sets of connectors e. Mate connectors (follow checks, etc) f. Use dust covers to cover both sets of connectors g. If P18 or P19 booties are not fully under the dust covers, pull them back on the cables so none of the booties are touching the connectors h. Wire tie dust covers in place, then wire tie connectors to handrail
V. 1553 Cable Install	A. NZGL Connectors	See Generic Section of Cribsheet
	B. Russian connectors will not mate	1. Verify connector alignment: Wide keypin should align with ball on the exterior housing of the connector housing  Figure 5.- Russian connector socket.

EVA 3 CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
		2. If connector not aligned: a. Turn connector cap around to use keypin groove  Figure 6.- Russian connector cap. b. Place cap on connector so keypin enters groove on cap  Figure 7.- Russian socket and cap. c. Rotate cap until ball on connector housing aligns with groove on cap (may feel “detent” in rotation)  Figure 8.- Russian connector properly aligned. d. Remove cap and verify keypin aligns with ball on connector housing e. Reattempt connector mate

EVA 3 CONTINGENCIES (Cont)

<table>
<tr><th>TASK</th><th>FAILURE</th><th>ACTION</th></tr>
<tr><td rowspan="3">VI. FGB Y-Cables</td><td>A. NZGL Connectors</td><td>See Generic Section of Cribsheet</td></tr>
<tr><td>B. Access to Connector difficult</td><td>1. Notify MCC-H which connector needs to be removed
2. On MCC-H GO, demate connector. Need to mate connector once Y-cable mated

**The following table summarizes the inhibits per connector:
<table>
<tr><th>Connector</th><th>Shut Down reqd</th><th>Real time?</th></tr>
<tr><td>P130/J630</td><td>DDCU Z1-4B</td><td>No</td></tr>
<tr><td>P132/J632</td><td>RPCM N1 RS1-A 5 and 6</td><td>Yes</td></tr>
<tr><td>P137/J637</td><td>DDCU Z1-3B</td><td>No</td></tr>
<tr><td>P139/J639</td><td>DDCU Z1-3B</td><td>No</td></tr>
<tr><td>P140/J640</td><td>None</td><td>Yes</td></tr>
<tr><td>P141/J641</td><td>None</td><td>Yes</td></tr>
</table></td></tr>
<tr><td colspan="2">FINAL Z1 UMBILICALS
 
</td></tr>
<tr><td rowspan="5">VII. Tool Relocations</td><td>A. Toolbox door will not open</td><td>1. Verify both door locks are in open position (on either side of door panel)
• If necessary, remove launch restraint PIP pin, place in stowage bracket, and open lock
2. Ingress APFR/IAPFR for better worksite access</td></tr>
<tr><td>B. Toolbox door will not close</td><td>1. Verify no FOD or interference in door hinge
2. Verify door hinge in travel in groove</td></tr>
<tr><td>C. Toolbox door lock stuck</td><td>1. Verify no FOD or interference
2. Use crew hook to apply additional force in desired direction
3. If door lock is stuck open, leave in open position and close door lock on the other side of door panel</td></tr>
<tr><td>D. Toolboard tab will not open</td><td>1. Verify no FOD or interference in tab
2. Use equipment hook to tap toolboard tab into open position
3. If appropriate, utilize alternate tab (TB vs SL) to gain access to toolboard</td></tr>
<tr><td>E. Toolboard tab will not close</td><td>1. Verify toolboard is fully seated in guide rail, reattempt
2. Verify no FOD or interference in tab
3. Stow toolboard in alternate location (mission specific):
a. Alternate slot in same toolbox
b. Alternate slot in alternate toolbox
c. Return toolboard to Airlock for internal stowage</td></tr>
</table>

EVA 4 CONTINGENCIES

TASK	FAILURE	ACTION
I. OBSS Stow	A. OBSS fails to soft dock to SSBAD	1. Verify SSBAD in SD, knob J-lock not engaged 2. Verify SSBAD centered between striker bar stand-offs 3. Inspect for FOD and reattempt 4. If no joy, rotate SSBAD knob ccw to OP; insert OBSS striker bar, rotate SSBAD knob cw to CL 5. If no joy, SSRMS re-grapple OBSS
	B. SSBAD fails to go to "CL"	1. Verify knob in release position (J-hook not locked) 2. Verify SSBAD centered between striker bar standoffs 3. Pull OBSS into SSBAD and reattempt 4. If no joy, **PGT [A6, CW1, 30.5]** on knob's 7/16-in hex stud until in CL 5. If no joy and at least in soft dock, perform OBSS tiedown
	C. OBSS striker bar does not align with outbd SSBAD	1. Verify outbd OSE is fully rotated in the direction towards the striker bar 2. If EV2 not able to get full rotation, EV3 translate over to outbd OSE and help rotate about the trunnion pin 3. If no joy and if less than .5" required for alignment, EV2 release Y-slider and continue with nominal capture steps 4. Once U-joints released on outbd OSE, release clamp 'bolt 1' of inbd OSE **PGT [B7 (25.5), CCW2, 30.5]** 6 ext 7/16, max 13 turns 5. Rotate inbd OSE stbd to provide enough slack to be able to lock Y-slider on outbd OSE 6. Once in acceptable configuration, drive clamp 'bolt 1' of both OSEs **PGT [B3 (18.4), CW2, 30.5]** 6 ext 7/16; max 13 turns 7. Verify OBSS stand fully clamped to trunnion (view clamping mechanism through OSE cover slot)
	D. OSE slider knob stuck	1. Verify PIP pin fully released and pulling up on knob 2. Try to off-load SSBAD and reattempt
	E. Wing-tabbed Connectors fail to disconnect	Use Hubble Connector Tool (90 deg in C/L bag)
	F. Wing-tabbed Connectors fail to connect	1. Verify alignment/keying and reattempt (red wing line up with arrow, then rotate cw 90°) 2. Reattempt using the Hubble connector tool (90 deg in C/L bag) 3. If no joy, swap connectors and reattempt ******1 of 2 required
	G. Grounding PIP pins fail to install in OSE HR	1. Verify ball detents are depressible 2. Attempt in other OSE HR stanchion 3. Verify slack in line and reattempt on another HR stanchion (S1 HR 3223) 4. If no joy, lightly tap PIP pin with hook ******1 of 2 required

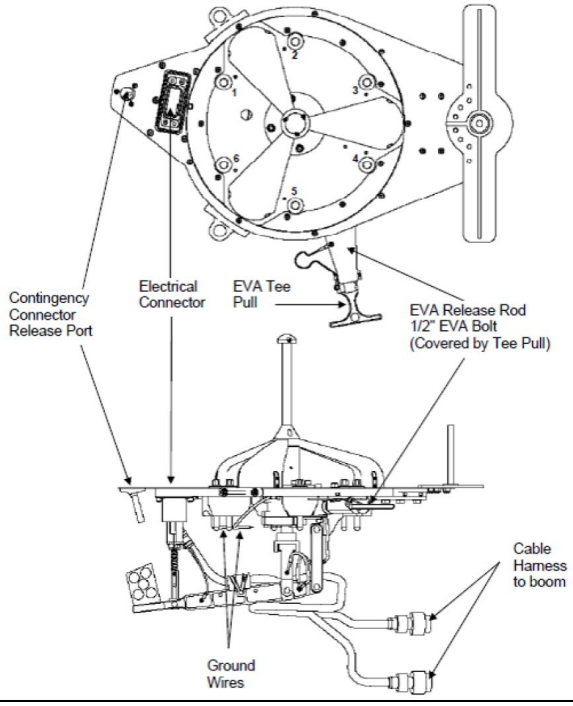
EVA 4 CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
II. PDGF Retrieve	A. PUMAA bolt does not fully install	1. Back out bolt at **PGT [B7 (25.5), CCW2, 30.5]** 2. Verify PUMAA flat against PDGF and no rocking motion. Check FOD at bolt and tether hole. Check for MLI interference 3. Reattempt with positive force on bolt at **PGT [A1 (2.5), CCW2, 30.5]** for **2 turns,** then **PGT [B3 (18.4), CCW2, 30.5]** for remainder turns (8) 4. If no joy, reattempt on other PDGF tether point 5. If no joy, use inchworm technique with PDGF
	B. Both EDF retaining lanyards missing/broken	1. Contact **MCC-H** if continue with release 2. On **MCC-H GO**, tether to pull lanyard of EDF and release EDF 3. Fully remove EDF and stow in trash bag (keep attached to RET) 4. Contact **MCC-H** if continue with PDGF install or bring inside A/L
	C. Torque cannot be broken on EDF	1. Re-torque EDF at **PGT [B7 (25.5), CW2,30.5]** 2. Reattempt release at **PGT [B7 (25.5), CCW2,30.5]** 3. If no joy, use manual ratchet on PGT for 1 turn only 4. If no joy, release other EDFs and reattempt 5. If no joy, retrieve ratchet wrench (Staging Bag) and reattempt 6. If no joy, retrieve pry bar (Staging Bag) and reattempt (only if head not free spinning)
	D. Once 5 turns achieved, EDF will not retract from PDGF	1. Twist outer washer (lanyard washer) back and forth while pulling outward and reattempt 2. If no joy, use hook to lightly tap bolt head and reattempt 3. If no joy, release EDF two more turns at **PGT [B5 (22.0), CCW2,30.5]** and reattempt 4. If no joy, release other EDFs and reattempt 5. If no joy, rock the PDGF while pulling outward on EDF 6. If no joy, use equipment hook to attempt to pry around bolt head/under retaining washer to release 7. If no joy and on **MCC-H GO**, use pry bar (Staging Bag) between the washers to pry EDF out. (EDF head must not be free spinning) 8. If no joy, on **MCC-H GO**, reinstall all 4 EDFs: • Torque in a star pattern • Initial torque **PGT [B1 (12.0), CW2, 30.5]** 5 turns • Final torque **PGT [B7 (25.5), CW2, 30.5]** ~1/4 turn repeatable ******2 of 4 EDFs fully installed required
	E. PDGF cannot be removed from mounting ring	1. Ensure all 4 EDFs are released and retracted, twist PDGF while pulling to work it off, avoiding curvic coupling and reattempt 2. If no joy and on **MCC-H GO**, retrieve pry bar (Staging Bag) and reattempt 3. If no joy and on **MCC-H GO**, reinstall all 4 EDFs: • Torque in a star pattern • Initial torque **PGT [B1 (12.0), CW2, 30.5]** 5 turns • Final torque **PGT [B7 (25.5), CW2, 30.5]** ~1/4 turn repeatable ******2 of 4 EDFs fully installed required

EVA 4 CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
III. EFGF Removal	A. EFGF bolt fails to break torque	1. Increase torque **PGT [B7 (25.5), CCW2, 30.5]** for 2 turns 2. If no joy, use manual ratchet mode on PGT 3. If no joy, release other bolts and reattempt 4. If no joy, reinstall all bolts at **PGT [B2 (16.0), CW2, 30.5],** 7 turns in star pattern ******4 of 6 bolts required
	B. EFGF bolt fails to release	1. Verify no preload/twist on EFGF 2. Release other bolts and reattempt 3. If no joy, increase torque to **PGT [B7 (25.5), CCW2, 30.5]** 4. If no joy, use manual ratchet mode on PGT 5. If no joy, reinstall all bolts at **PGT [B2 (16.0), CW2, 30.5],** 7 turns in star pattern ******4 of 6 bolts required
	C. EVA Scissors fail to cut through EFGF cable	1. Release TA Clamp to gain more leverage and reattempt 2. If no joy, use general purpose cutters (port A/L Toolbox) or EMU scissors 3. If no joy, reinstall EFGF in star pattern at **PGT [B2 (16.0), CW2, 30.5]**, 7 turns ******4 of 6 bolts required
	D. If pop off OBSS thermal washer	1. Try to capture washer, put in trash bag 2. Notify **MCC-H** bolt location 3. For PAA install, drive associated bolt as last installed bolt and at reduced torque **PGT [A1 (2.5), CW2, 30.5],** then ccw half a turn ******5 of 6 washers required
IV. PAA Install	A. PAA bolt fails to fully install	1. Verify PAA alignment (can only fit in 1 orientation) 2. Verify PAA fully seated (no soft dock) and no MLI or other interference; reattempt 3. If no joy, release other bolts at **PGT [B7 (25.5), CCW2, 30.5]** 2 turns 4. Reinstall all bolts at **PGT [B5 (22.0), CCW2, 30.5]** in star pattern starting with problem bolt ******5 of 6 required, bolts 2/5 must be seated within last two turns or will have interference issues with PDGF EDFs
	B. PAA Bolt 2 or 5 fails to fully install	1. If installed within 2 turns, install PAA and start with corresponding EDF 2. If not within 2 turns, PDGF will not seat properly on PAA. Bring PDGF inside A/L
V. PDGF Install	A. PDGF will not soft dock on to PAA	1. Verify all 4 EDFs are fully retracted 2. Verify PDGF orientation (can only fit in 1 o'clock posn) 3. Check for MLI and other interference 4. Verify PDGF is fully seated on PAA. If rocking motion observed, remove PDGF (PAA bolt not fully seated)

EVA 4 CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	B. EDF will not insert (greater than 1/4" gap between washers, but appears to be through all clevis/lug holes)	1. Ensure lanyards are not snagged between washers 2. Verify EDF fully seated on internal hex head and aligned by pushing in and rotating the EDF. May require up to 60 deg of rotation 3. Retract EDF, wiggle PDGF/EDF and reattempt 4. If no joy, release other EDFs at **PGT [B7 (25.5), CCW2, 30.5]**, reattempt 5. If no joy and for EDFs 3, 9 o'clock, remove PDGF, check PAA Bolt 2 or 5 if fully installed ******4 of 4 EDFs required for SSRMS grapple, 2 of 4 required for structural integrity
	C. After 5-7 cycles, unable to torque EDF to final torque	1. Verify EDF fully seated on internal hex head and aligned by pushing in and rotating the EDF. May require up to 60 deg of rotation 2. Verify maintaining axial force into EDF to keep engaged on hex head while driving EDF; reattempt 3. If no joy, release all EDFs at **PGT [B7 (25.5), CCW2, 30.5]**, reinstall per nominal procedures starting with problem EDF ******4 of 4 EDFs required for SSRMS grapple, 2 of 4 required for structural integrity
	D. PUMAA bolt fails to break torque	1. Use manual ratchet on PGT for 1 turn 2. If no joy, leave installed on PDGF
VI. EFGF Stow in TSA	A. TSA	See Generic Cribsheet Procedures
	B. EFGF does not fit in TSA	1. Verify Grapple Shaft towards ODS 2. Verify Tee Pull is released 3. Check for interference (Tee pull, cushion, Adj tether hook, etc) 4. If no joy and on **MCC-H GO**, release Grapple Shaft a. Retrieve 1/2" Box Ratchet from TSA (Aft tray) b. Add wire tie just under head for tether point c. Rotate release rod cw 19-23 turns to hard stop with 1/2" box ratchet (< 20 ft-lb) d. Stow shaft in ORU bag or in TSA 5. Or on **MCC-H GO**, bring EFGF into A/L 

EVA 4 CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
VII. OTP Cinch	A. Cannot get wire tie under buckle for 2nd loop	Verify 1st loop around end of buckle. Do not require 2nd loop – best effort
VIII. SPDM EDF Release	A. Both EDF retaining lanyards missing/broken	1. Contact **MCC-H** to continue with release 2. On **MCC-H GO**, tether to pull lanyard of EDF and release EDF 3. Fully remove EDF and stow in trash bag
	B. Torque cannot be broken on EDF	1. Use manual ratchet on PGT for 1 turn 2. If no joy and on **MCC-H GO**, retrieve ratchet wrench (Staging Bag) and reattempt
	C. Once 5 turns achieved, EDF will not release from lug/clevis (A3 EDF only)	1. Use hook to lightly tap bolt head and reattempt 2. If no joy, twist outer washer (lanyard washer) back and forth while pulling outward and reattempt 3. If no joy, release EDF two more turns at **PGT [B5 (22.0), CCW2,30.5]** and reattempt 4. If no joy, use equipment hook to attempt to pry around bolt head/under retaining washer to release 5. If no joy, release A2 or A4 EDF and use pryrod from that location, reattempt A3 EDF release 6. If no joy, use prybar (from Staging Bag) between the washers to pry EDF out
	D. EDF fail to release after pry rod (A2 and A4 EDFs)	1. Verify location of pry rod, no more than up to black line on pry rod showing 2. Reattempt with impulse loads 3. If no joy, retrieve APFR: • For A4 EDF, use ELC3 WIF 3 [9,FF,A,12] • For A2 EDF, use ELC3 WIF 4 [3,VV,A,1] NOTE While one EV crew is in the APFR, he must maintain a hand-hold on approved ELC3 structure while free float EV crew is translating. Limit pry rod impulses to 5, then wait 60 sec to let loads dissipate
	E. EDF fails to install in Stowage location	1. Ensure lanyards are not snagged between washers 2. Verify EDF fully seated on internal hex and aligned by pushing in and rotating the EDF. May require up to 60 deg of rotation 3. Verify maintaining axial force into EDF to keep engaged on hex head while driving EDF 4. If no joy, drive EDF 2 turns ccw, reattempt; verify head not free spinning 5. If no joy, wire tie EDF around FSE or cut lanyard with EVA scissors and stow in trash bag

GET-AHEAD CONTINGENCIES

TASK	FAILURE	ACTION
I. FHRC P-Clamp Release	A. Bolt fails to release	Increase torque **PGT: [B1 (12.0), CCW2, 30.5]** for 1 turn then return to nominal setting **PGT: [A7 (9.2), CCW2, 30.5]**

GENERIC CONTINGENCIES

TASK	FAILURE	ACTION
I. Generic	**AGB**	
	A. Bolt fails to release	1. Increase torque **PGT: [B1 (12.0), CCW2, 30.5], 7/16 - 6-ext (2-in required for ESP-2 FHRC)** 2. If no joy, increase torque **PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6-ext (2-in required for ESP-2 FHRC)**
	B. Bolt jams during AGB release due to PGT dimensions (on ESP-2 FHRC)	Use ratchet wrench a. Drive bolt back in **PGT: [A2 (3.8), CW2, 30.5], 7/16 - 2-ext** b. Retrieve ratchet wrench to perform release
	C. T-handle fails to unlock (release)	1. Check interface for FOD or damage 2. Increase force and reattempt 3. Use pry bar as lever to release T-handle
	D. AGB fails to release from soft dock	Use bolt puller or pry bar to pry the AGB from the PM near sticky plungers
	E. T-handle fails to engage into alignment hole	1. Slide AGB single pin side in and out a few inches while tapping T-handle into position 2. Install tether to hold 2 pin side to restraint engaged on ORU and push in single pin side. Then reattempt step 1
	F. AGB fails to soft dock	1. Check for FOD 2. Exercise plungers with bolt puller or prybar
	G. Slider mechanism overcomes soft dock	1. Verify T-handle fully out – 2 white lines 2. Install tether to hold 2 pin side to restraint engaged on ORU and push in single pin side. Then slide AGB single pin side in and out a few inches while tapping T-handle into position
	H. Bolt fails to engage fully	1. Check interface for FOD or damage 2. Back out bolt **PGT: [A2 (3.8), CCW2, 30.5], 7/16 - 6-ext (2-in required for ESP-2 FHRC)** and reattempt installation at nominal setting **[A2 (3.8), CW2, 30.5], 7/16 - 6-ext (2-in required for ESP-2 FHRC)** 3. If green light achieved, check with **MCC-H** if turn count is acceptable
	I. PGT interferes during AGB install (on ESP-2 FHRC)	Attempt turns by hand or with ratchet wrench palm wheel cw until bolt seated; do not put preload on bolt with ratchet
	APFR/IAPFR	
	A. APFR/IAPFR fails to install into WIF	1. Verify APFR collar in install position (black-on-black) 2. Check for FOD in WIF or structural interference 3. Attempt APFR install in alternate clocking 4. Attempt APFR install in alternate WIF 5. APFR failure • Use another APFR
	B. Joint fails to actuate	1. Verify no load is applied to joint and/or jiggle APFR joint while actuating • For pitch joint, push knob in during rotation. (Class I pitch joints known to be stiff) 2. Increase force applied in order to free joint
	C. Boot becomes stuck in APFR boot plate	1. Have other EV crewmember assist with getting boot out 2. Loosen 7/16-in EVA bolts (3) on heel clip using EVA ratchet or PGT: **PGT: [B1 (12.0), CCW2, 30.5], 7/16 - 6-ext** 3. Remove 7/16-in EVA bolts (3 – captive) on heel clip (non captive) using EVA ratchet or PGT: **PGT: [B1 (12.0), CCW2, 30.5], 7/16 - 6-ext** 5 turns total

GENERIC CONTINGENCIES (Cont)

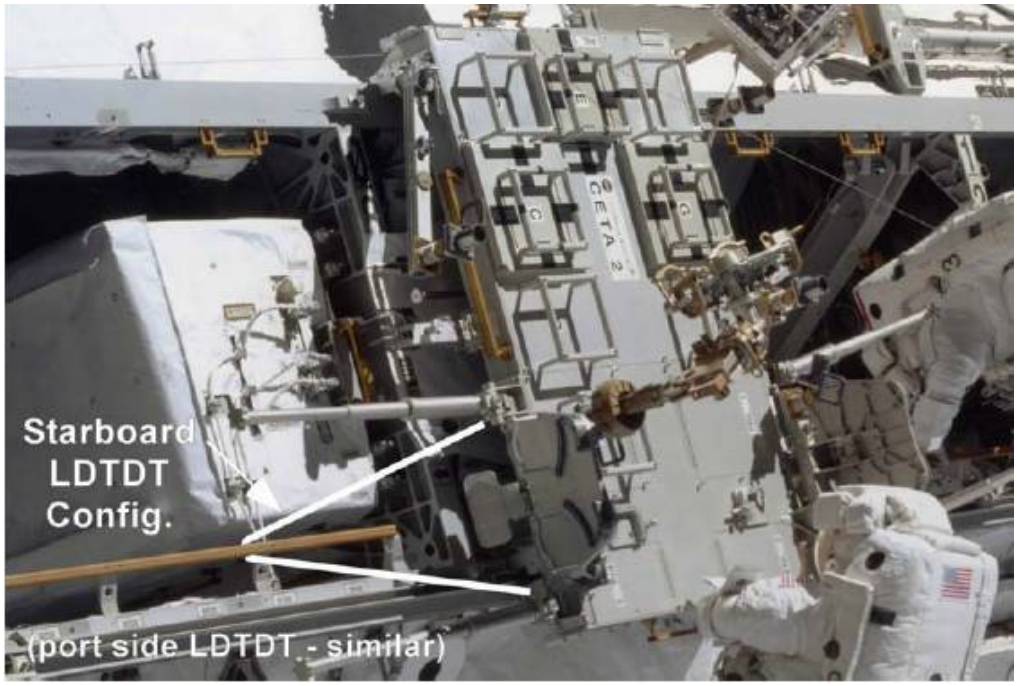
TASK	FAILURE	ACTION
	D. Boot becomes stuck in IAPFR boot plate	1. Have other EV crewmember assist with getting boot out 2. If wearing Small EMU boot, have other EV crewmember adjust boot sizing to Large 3. Loosen 7/16-in EVA bolts (2) on heel clip using EVA ratchet or PGT: **PGT: [B2 (16.0), CCW2, 30.5], 7/16 - 6-ext** 4. Remove 7/16-in EVA bolts (2) on heel clip using EVA ratchet or PGT: **PGT: [B2 (16.0), CCW2, 30.5], 7/16 - 6-ext** 4 turns total
	Ballstack	
	A. ECOM fails to release from ISS Structure	On **MCC-H GO**: Tether ballstack to handrail and leave outside
	B. ECOM fails to release from MUT EE	Leave together and return inside
	C. Ballstack fails to rigidize	On **MCC-H GO**: Use secondary tethers to assist in restraining payload
	BRT	
	A. BRT jaws fail to release	1. Loosen rigidizing collar to relieve sideloads 2. Shake BRT while depressing paddles to alleviate sideloads from handrail 3. Detach BRT from suit and tether to structure
	Cannon Connector	
	A. Connector fails to release	1. Check for FOD, damage or misalignment 2. Verify cable routing is not impeding connector rotation (Release TA-clamps as required) 3. Use cannon connector tool for more leverage
	B. Connector/Cap fails to soft dock	1. Verify collar unlocked (White on connector shell tip should align with white on receptacle backplate) 2. Check for FOD or damage
	C. Connector/Cap fails to lock	1. Remove connector/cap, check for FOD or damage 2. Check alignment, remate, rock connector back and forth as required. (Once locked, white on connector shell tip should align with black on receptacle backplate) 3. Use cannon connector tool for more leverage
	D. High cable stiffness prevents mating	1. Verify all TA-clamps are released 2. Use second crewmember 3. Use APFR
	E. Connector/Jack pin bent	1. Describe pin location and condition • Obtain WVS view of interface if possible 2. On **MCC-H GO**: For 16, 20, or 22 gauge pins only, retrieve pin straightener and attempt pin repair 3. On **MCC-H GO**: Retrieve needle nose pliers and attempt pin repair • **MCC-H** will verify pin size prior to retrieving tools
	F. Connector/Jack FOD	On **MCC-H GO**: Obtain connector cleaner tool to remove FOD
	G. Connector EMI band bent	On **MCC-H GO**: Obtain needle nose pliers or forceps to remove band

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	CETA Cart	
	A. Wheel bogie fails to release from truss	1. Verify brakes are fully released 2. Ensure trigger is being depressed while attempting to rotate handle 3. On **MCC-H GO**: Perform 6.100.125 CETA CART WHEEL BOGIE R&R • There is no spare wheel bogie on-orbit, so after CETA cart is relocated, the failed wheel bogie will be reinstalled
	B. Wheel bogie fails to install on truss	There is no spare wheel bogie on-orbit. 4 of 4 bogies are required. Real time call on whether MT couple or CETA cart tie down required. For tie down see block G
	C. Parking brake fails to engage	1. Use parking brake handle on other side of CETA cart 2. Couple CETA cart to MT and utilize other WIF if possible
	D. Parking brake fails to disengage	1. Hold pedal down for brake release 2. Use pedal on other side of CETA cart to release parking brake
	E. Dynamic brake fails to engage	Limit translation rates to allow manual stopping
	F. CETA active coupler fails to capture or lock	1. Cycle active coupler 2. On **MCC-H GO**: Swap active couplers by removing PIP pins (2 on each coupler). (Port CETA Cart has short coupler) (MT Coupler PIP pins restrained by lanyard which must be cut to remove PIP pins Stbd Cart Coupler PIP pins restrained by wire tie. Wire tie does not need to be reinstalled) 3. On **MCC-H GO**: Tie down CETA cart. See block G
	G. CETA cart tiedown	On **MCC-H GO**: Perform following tie-down procedure (see fig 1) a. Translate CETA cart to TBD location (not over truss segment joint) b. Engage parking brake c. Retrieve 2 Long Duration Tie-Down (LDTD) tethers d. Route 1 LDTD tether on stbd side of CETA cart as follows: 1. Attach 1 hook to zenith brake handle support tether point 2. Loop tether strap around CETA rail HR standoff 3. Attach second hook to nadir brake handle support tether point 4. Lightly cinch tether and close buckle 5. Close MLI flap over buckle and any excess strap e. Repeat on port side of CETA cart

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	H. Coupler knob fails to unlock	1. On **MCC-H GO**: Release active coupler by removing PIP pins (2) (MT Coupler PIP pins restrained by lanyard which must be cut to remove PIP pins Stbd Cart Coupler PIP pins restrained by wire tie. Wire tie does not need to be reinstalled) 2. On **MCC-H GO**: Release passive coupler via EVA bolt: **PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6-ext** 9 turns • Bolt is attached by lanyard
	I. Swing arm fails to deploy	Use alternate swing arm or WIF
	J. Swing arm fails to stow	On **MCC-H GO**: Remove swing arm via EVA bolts (4): **PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6-ext** TBD turns (Captive bolts?)
	K. Swing arm fails to lock	Restrain in stowed position with wire ties



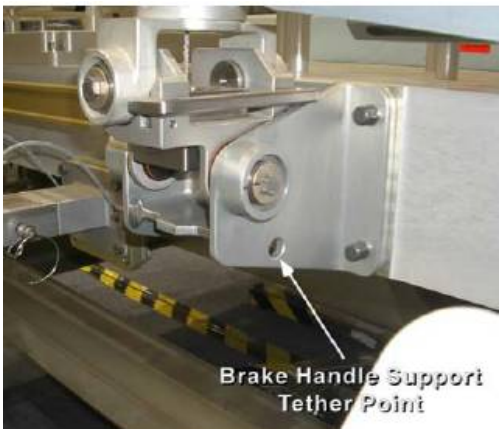


Figure 1.- CETA Cart Tiedown.

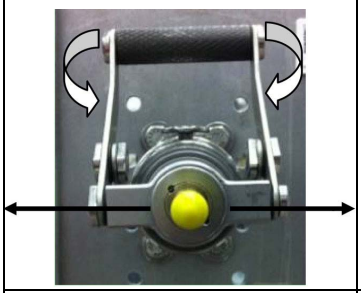
GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	EVA Wrench (Torque and Ratchet)	
	A. Ratchet teeth slip	Ratchet to new set of teeth and reapply torque
	B. Wrench does not ratchet	Hold the ratchet selector and socket in opposite hands and rotate in opposite directions
	Expandable Diameter Fasteners (EDFs)	
	A. EDF does not release with recommended torque	1. Increase torque to **PGT: [B7 (25.5), CCW2, 30.5]** for one turn only. Continue release at nominal setting 2. Increase torque to **PGT: [RCCW, 30.5]** for one turn only. Continue release at nominal setting 3. Use Ratchet Wrench (ccw) 4. Remove EDF with pry bar (only if head not free spinning)
	B. EDF cannot be removed from lug/clevis after untorqued	1. Twist outer washer (lanyard washer) back and forth while pulling outward 2. Verify lanyard not snagged 3. Drive EDF ccw 2 turns (start EDF by hand when re-installing) 4. Gently tap along EDF major axis with back of equipment hook or hammer (EDF head must not be free spinning), and pull outward with lanyards 5. Use equipment hook over EDF bolt head to remove (EDF head must not be free spinning) 6. Use EVA pry bar (EDF head must not be free spinning)
	C. Cannot insert EDF into lug/clevis interface	1. Verify lug/clevis fully seated 2. Twist EDF bolt head by hand to seat on tip hex head 3. Drive EDF 2 addl turns ccw, retry insertion, verify head not free spinning 4. Remove EDF and verify collets not expanded 5. Cut EDF lanyards and replace failed EDF with spare EDF
	D. EDF is not captive after all EDFs at final torque	1. Increase torque to **PGT: [B7 (25.5), CW2, 30.5],** ensure fully seated 2. Increase torque to **PGT: [RCW, 30.5],** ensure fully seated 3. Pull EDF and re-insert (loosen collets as reqd), ensure fully seated, retry 4. Increase torque on all EDFs to **PGT: [RCW, 30.5],** ensure fully seated 5. Cut EDF lanyards and replace failed EDF with spare EDF
	Fluid QD Ops	
	NOTE Troubleshooting steps outlined in this cribsheet are a generic starting point. Flight specific situations may require different actions. If troubleshooting requires the crew to leave the worksite, verify that female QDs are covered to prevent exposure to direct sunlight. For thermal clocks refer to flight rules	

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	Mating Ops	
	A. QD fails to mate	1. Check alignment and verify side loads are counteracted 2. Verify fwd white band is not visible. (Release ring is retracted) 3. Inspect male and female QD for debris, damage, or NH3 4. Leave female QD engaged with male. (NH3 may sublimate between QDs) 5. Change body orientation for better access
	B. Release ring snap back test fails	1. Push release ring forward. (Release ring will not slide fwd if QD is in FID) 2. QD is in FID a. Demate QD b. Pull back on release ring c. Verify fwd white band not visible. (Release ring is retracted) d. Assess and counteract sideloads and remate QD
	C. Gap check fails (visual or FID gauge)	QD is in FID a. Demate QD b. Pull back on release ring c. Verify fwd white band not visible. (Release ring is retracted) d. Assess and counteract sideloads and remate QD
	D. Pull test fails	1. Verify fwd white band is not visible. (Release ring is retracted) 2. Assess and counteract sideloads and mate QD
	Valve Ops	
	A. Detent button is partially unthreaded	Rethread detent button a. Load bail handle. (Button will free spin if not loaded) • If valve is open (bail fwd), pull bail handle aft • If valve is closed (bail aft), push bail handle fwd b. Rotate button cw to hardstop (8 turns max)
	B. Detent button is missing NOTE Detent button is only required for BDT ops and 1 in SPD ops	1. Use equipment hook to depress detent button shaft 2. Use tether strap around gloved finger to depress detent button shaft 3. Retrieve and use Beta Gimbal Antirotation Latch Tool to depress detent button shaft 4. On **MCC-H GO**: Install spare detent button. (Buttons are stowed IVA and must be configured prior to EVA use)
	C. Bail fails to travel to fwd (valve open) position (button does not pop up if attempting to go to full fwd)	1. Assess and counteract sideloads 2. Apply greater opening force to QD bail handle in fwd direction 3. Retrieve and use QD bail drive lever (3/4, 1, & 1.5 in only) 4. If applicable, retrieve and install SPD; notify **MCC-H**

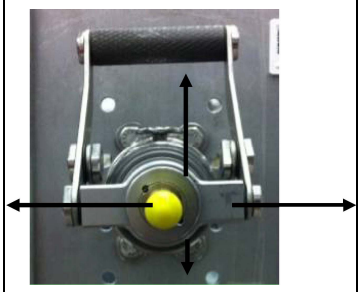
GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	D. Detent button fails to depress in preparation for valve closing WARNING Bail may kick back and contact crew when a stuck button is forcibly depressed due to pressure build-up in spring cavity 	1. Verify locking collar unlocked (1/2, 3/4, & 1 in only) 2. Push and hold bail handle fwd (to open) with significant force to relieve load on button while simultaneously depressing the detent button • If button depresses, vent by allowing bail aft until aft white band no longer visible 3. Twist bail handle/Rock QD from side-to-side and fwd/aft while depressing button to allow internal QD components to align 4. Retrieve QD bail drive lever and repeat step 2 (3/4, 1, & 1.5 in only) 5. Contact **MCC** to reduce NH3 pressure, if possible 6. On **MCC-H GO**: Retrieve and install QD button depress tool (BDT) (1/4, 3/4, & 1 in only) 7. On **MCC-H GO**: Retrieve hammer and tap center of button. (Use plastic side of hammer.) (Inspect tool and QD)
	E. Bail fails to travel to full aft (valve closed) position (button does not pop up)	1. Assess and counteract sideloads 2. Increase force on bail while depressing button 3. Retrieve and use QD bail drive lever (3/4, 1, & 1.5 in only) 4. Inspect QD for retaining wire protrusion
	Demating Ops	
	A. Female QD fails to demate	1. Assess and counteract sideloads or manipulate flexhose to relieve mating forces on female QD 2. Verify release ring is fully retracted while attempting to demate 3. Verify TA or P clamps are released 4. Verify detent button is up (locking collar can be rotated under button) 5. Verify trigger linkage is still attached to release ring (1.5 in only) 6. Apply greater force to release ring and female QD 7. Retrieve and use QD release tool (QRT) to apply greater force (3/4, 1, & 1.5 in only) 8. On **MCC-H GO**: Shake QD vigorously while attempting to demate
	B. Thermal bootie fails to remain securely closed	Install wire tie around bootie to keep QD fully covered
	C. Cap will not demate	1. Verify pulling out on cap before rotating to ensure locking tab is disengaged 2. Wait for opposite thermal conditions if possible and reattempt cap removal 3. Retrieve QD cap tool (1/4, 1/2, & 1 in only) a. **PGT: [A4 (6.3), CCW1, 30.5]** with QD cap tool to turn stuck cap a maximum of 2 turns (cap vents at ~2 turns) b. Once venting is complete, finish removal of cap by hand (~1 additional turn) • If venting does not stop or cap cannot be removed by hand, notify **MCC-H**. (Male QD may be leaking)

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	D. Partial fwd white band visible after QD demate	1. Pull back on release ring to verify QD is not in FID 2. Verify detent button is up 3. If fwd white band is still partially visible this is likely a tolerance stackup; notify **MCC-H** and press with QD ops
		CAUTION Do not fully open a leaking QD. Fully opening a leaking QD could trap NH3 and prevent depressing the button in the future. For 1.5 in QDs, insert fwd SPD spacer prior to opening valve
	Leaks	
	A. Mated QD leaks in valve open position (bail fwd)	1. Cycle valve a. Remove SPD if present (aft spacer only for 1.5 in) and fully close valve (bail aft); wait for ice crystals to dissipate b. Open valve halfway (bail fwd). (For 1.5 in, verify fwd SPD spacer installed prior to opening valve) c. Describe leak size and if leak rate is changing 2. If leak has stopped, on **MCC-H GO**: Complete valve open steps; else; repeat step 1 3. On **MCC-H GO**: Remove SPD if in place; push bail full fwd to engage secondary seal, verify detent button is up and aft white band is visible 4. Close valve; notify **MCC-H** 5. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white band is visible
	B. Female QD leaks due to FID	1. Return bail to aft position (valve closed) 2. Perform release ring snap back test • If FID is observed, demate and remate QD
	C. Male QD leaks after cap removal	1. If leak small, mate female QD; continue ops 2. Reinstall cap; notify **MCC-H**
	D. QD leaks after valve close operation WARNING Bail may kick back and contact crew when a stuck button is forcibly depressed due to pressure build-up in spring cavity	1. Cycle Valve a. Open valve halfway (bail fwd). (For 1.5-in, install fwd SPD spacer prior to opening valve) b. Contact **MCC-H**; describe leak size and if leak rate is changing; wait for ice crystals to dissipate c. On **MCC-H GO**, re-close QD; inform **MCC-H** if leak still present and quantify leak 2. If still leaking, contact **MCC-H** to determine if male leaking. (THOR will monitor pressure drop) 3. On **MCC-H GO**, demate QD and inspect 4. If still leaking, contact **MCC-H** for direction. Depending on the situation further direction could include: Living with leak, using a QD extender, additional cycles of QD, applying radial force to tube stub with valve open or other real-time decisions

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
		CAUTION Do not fully open a leaking QD. Fully opening a leaking QD could trap NH3 and prevent depressing the button in the future. For 1.5-in QDs, insert fwd SPD spacer prior to opening valve
	E. Female QD leaks after demate	1. Contact **MCC-H**: Describe leak size and if leak rate is changing 2. Depending on situation, **MCC-H** could recommend the following actions: Continuing ops, using a QD extender, or other real-time decisions
	F. Male QD leaks after demate. (Male sleeve may be visibly stuck open) 	1. Contact **MCC-H**: Describe leak size and if leak rate is changing 2. If leak is small and dissipating and does not interfere with EVA: Press with operations on **MCC-H GO** 3. If leak is large: Remate female QD and open valve (bail fwd) a. Depress button and use significant force to push bail forward; release button b. With QD in open position (bail fwd), apply significant force to aft end of female QD in side-to-side & up and down directions (radially from tube stub) c. Attempt to close valve (bail aft) d. Demate QD and inspect 4. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible 5. On **MCC-H GO**: Install cap
	G. Frozen NH3 present on female or male QD	1. Leave QD exposed to vacuum; wait maximum of 5 min for sublimation (check periodically) 2. On **MCC-H GO**: Continue QD ops. (NH3 may sublimate during QD mating)
	SPD	
	A. ½-in SPD cannot be installed	1. If aft portion of SPD not fully seated, move bail fwd slightly to allow SPD to fully seat 2. After bail secured in slot on slider, wire tie in place
	B. ½-in SPD cannot be removed	Increase force on SPD slider (1/2-in SPD sliders can be sticky)
	C. 1.5-in aft SPD spacer cannot be installed	1. Install fwd SPD spacer; ensure bail against fwd SPD 2. Wire tie bail to keep it against SPD; restrain aft SPD with wire tie, if reqd
	D. 1.5-in fwd SPD spacer cannot be installed	1. Install aft SPD spacer; ensure bail against aft SPD 2. Wire tie bail to keep it against SPD; restrain fwd SPD with wire tie, if reqd
	Vent Tool	
	A. Tip of vent tool does not pass black mark during alignment check	Slide the equipment hook further away from vent tool nozzle end
	B. Vent tool cannot be mated to Vent Tool Extender	Hold VTE adapter in sunlight to warm it up (known tolerance issue between cold VTE adapter & vent tool nozzle)

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION

Mate QD
1. Remove QD caps as required
2. Inspect male and female QD for debris or damage
3. Verify female QD ready to mate
   - √Detent button – up
   - √Locking collar – locked position
   - √Fwd white band – not visible
4. Assess and counteract side loads prior to mate
5. Mate QD
   - √Fwd white band – visible
6. Perform snapback test
   - √Fwd white band visible
7. Perform pull test. (Stay clear of button and release ring)
8. Perform visual gap test

Open Valve (1/4 inch)
1. Prior and during bail movement assess and counteract side loads
2. Depress detent button
3. Push bail to forward position
4. √Aft white band visible
5. √Detent button – up

Open Valve (1/2 inch)
1. Prior and during bail movement assess and counteract side loads
2. Rotate locking collar to unlocked position
3. Depress detent button
4. Push bail fwd, so aft white band just begins to show
5. Pull lock knob up on SPD
6. Slide SPD slider aft
7. Install SPD
8. Slide SPD slider fwd to engage bail handle
9. Push bail toward closed position up against slider
10. Push lock knob down on SPD; perform pull test on SPD

Open Valve (1 inch)
1. Prior and during bail movement assess and counteract side loads
2. Rotate locking collar to unlocked position
3. Depress detent button
4. Push bail to forward position
5. √Aft white band visible
6. √Detent button – up
7. Install 1-in SPD if present; verify locking tabs engage; perform pull test
8. Rotate locking collar to locked position, if present and no SPD

Demate QD
1. Assess and counteract side loads prior to demate
2. Pull back on release ring and demate QD
3. √Release ring – retracted (FWD white band not visible)
4. Inspect male and female QD for debris, damage, or anomalous conditions (ammonia crystals)
5. If complete with QD ops: Rotate locking collar to locked position (1/2, 3/4, & 1 in only)
6. Install QD caps as required; verify lock tab engaged

Close Valve

CAUTION
Do not fully open a leaking QD. Fully opening a leaking QD could trap NH3 and prevent depressing the button in the future. For 1.5-in QDs, insert fwd SPD spacer prior to opening valve

1. If present, remove SPD
2. Rotate locking collar to unlocked position (1/2, 3/4, & 1 in only)
3. √Aft white band visible
4. √Detent button fully installed
5. √Detent button up
6. √Detent button can be depressed
7. Prior and during bail movement assess and counteract side loads
8. Push bail toward open position with significant force while depressing detent button (unstick male sleeve seals)
9. Depress detent button, move bail aft (close valve)
10. √Fwd white band visible
11. √Detent button up
12. If complete with QD ops: Rotate locking collar to locked position (1/2, 3/4, & 1 in only)

Open Valve (3/4 inch)
1. Prior and during bail movement assess and counteract side loads
2. Rotate locking collar to unlocked position
3. Depress detent button
4. Push bail to forward position
5. √Aft white band visible
6. √Detent button – up
7. Rotate locking collar to locked position

Open Valve (1.5 inch)
1. Install forward SPD spacer aft of release ring
2. Prior and during bail movement assess and counteract side loads
3. Depress detent button
4. Push bail against fwd SPD spacer
5. Install aft SPD spacer

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	FRAM	
	A. Primary FRAM bolt fails to release	1. Confirm socket fully engaged to release anti-rotation mechanism 2. Increase PGT setting for 1 turn only (except CEPA): **PGT: [A7 (9.2), CCW2, 30.5], 7/16 - 6-ext** 3. Increase PGT setting for 1 turn only: **PGT: [B2 (16.0), CCW2, 30.5], 7/16 - 6-ext** 4. On **MCC-H GO**: Increase PGT setting for 1 turn only: **PGT: [B4 (19.4), CCW2, 30.5], 7/16 - 6-ext**
	B. Active FRAM fails to seat on passive FRAM	1. Check alignment. (Engage 2 forward shear pins first to ensure connector door is not jamming) 2. Check for FOD in mechanism
	C. Primary FRAM bolt fails to engage required number of turns NOTE 4 of 4 pins required in Shuttle PLB. 3 of 4 pins required for ISS Stowage	1. Verify active FRAM fully seated 2. Check for FOD 3. Cycle FRAM bolt a. Fully release primary FRAM bolt b. Reattempt engagement at nominal setting 4. Increase PGT setting (except CEPA): **PGT: [A7 (9.2), CW2, 30.5], 7/16 - 6-ext** 5. Increase PGT setting: **PGT: [B2 (12.0), CW2, 30.5], 7/16 - 6-ext** 6. On **MCC-H GO**: Increase PGT setting: **PGT: [B4 (16.0), CW2, 30.5], 7/16 - 6-ext** 7. Hold for thermal stabilization between active and passive FRAM 8. Engage contingency pins: • Front pins (all FRAMs) **PGT: [A4 (6.3), CW2, 30.5], 7/16 - 6-ext** 14.11 – (1.25 * Turns on Primary Bolt) turns NOTE Aft contingency pins can only be installed if the primary bolt turn count is 6.5 turns or less a. Aft pins for LWAPA, SAPA, CEPA, and ExPA 1. Remove bolt from STOW location and engage in INSTALL location 2. Manually turn bolt as far as possible 3. **PGT: [B1 (12.0), CW2, 30.5], 7/16 - 6-ext** ~3.5 turns b. Aft pins for MAPA and LAPA 1. **PGT: [A4 (6.3), CW2, 30.5], 7/16 - 6-ext** 16.858 – (1.25*Turns on Primary Bolt) turns c. Aft pins for LMC FRAM 1. Prep CPK by disengaging J-hook on locking mechanism; ensure J-hook fully seated in unlock position 2. Slide T-handle until contingency pin contacts primary FRAM pin (# on locking mechanism counter = # of turns on primary FRAM bolt) 3. Disengage J-hook from unlock position. J-hook is spring loaded and will “pop” into place if not precisely aligned with numbered slot. Fully seat J-hook in lock position

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	D. Latch dogs fail to retract during FRAM removal from Square Grid Interface	1. Lift FRAM so that latch dogs contact square grid 2. Cycle primary drive bolt
	E. Latch dogs not retracted prior to installation onto Square Grid Interface	Push latch dogs to retracted position with tool or tether hook
	MMOD Shield	
	A. MMOD shield Dzus fastener fails to release WARNING Do not touch back side of MMOD shield or handle fastener fragments due to sharp edges Fastener and shield/ tool interface must be covered to avoid potential projectiles	On **MCC-H GO**: Use pry bar to release a. Retrieve pry bar and emptied med ORU bag b. Release other Dzus fasteners c. Assess clearance between MMOD shield and tools d. If possible, rotate fastener to position tangs off of tools e. Place med ORU bag over failed fastener f. Insert pry bar under MMOD shield by failed fastener and pry shield away from structure
	B. MMOD shield Dzus fastener fails to engage	1. Verify center fastener is engaged first 2. Check Dzus fastener aligned with bracket (floating receptacles on endcones) 3. Verify fastener clocking correct per alignment mark 4. Push firmly and rotate 5. Engage other fasteners: 2 out of 3 required 6. If 2 of 3 not achieved: • Option 1 (Wire Tie) (See figs 2-4): 1 properly secured wire tie = 1 Dzus fastener; using a long wire tie, squish the loop on one end, feed it through the bracket on structure (may need to push floating receptacle inboard to get it out of way), secure wire tie w/3 twists. Feed one end of wire tie around Dzus head (on outside of shield) and secure with 3 twists. If HR nearby can also secure wire tie to HR. (Goal is for the wire tie to push shield in toward body of structure and toward center if endcone shield) • Option 2 (LDTDT): Use 1 adj (attach to tether point on T tool and to structure HR) and 1 LDTDT across shield to hold shield in position
	C. T-handle tool fails to engage shield	Remove adjacent fasteners and attempt reinstallation
	D. MLI grounding strap Dzus fails to release	On **MCC-H GO**: Cut ground wire near Dzus fastener

GENERIC CONTINGENCIES (Cont)

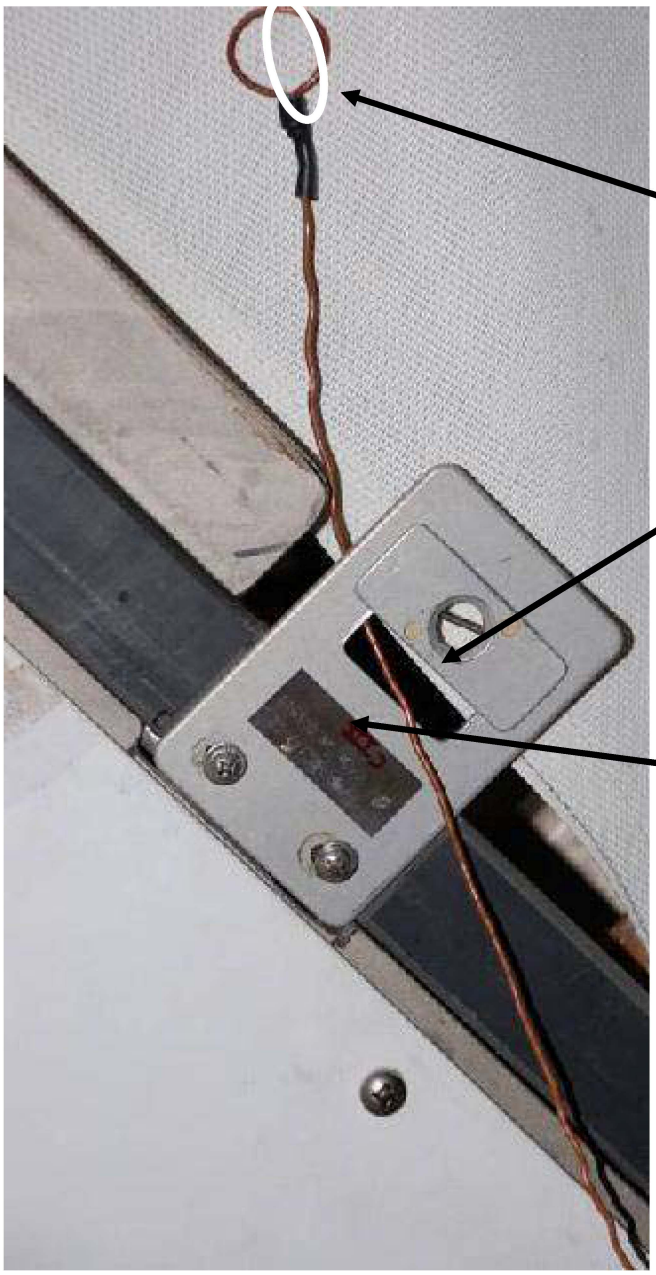
TASK	FAILURE	ACTION
		

Figure 2.- MMOD Shield Wire Tie Option.

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION

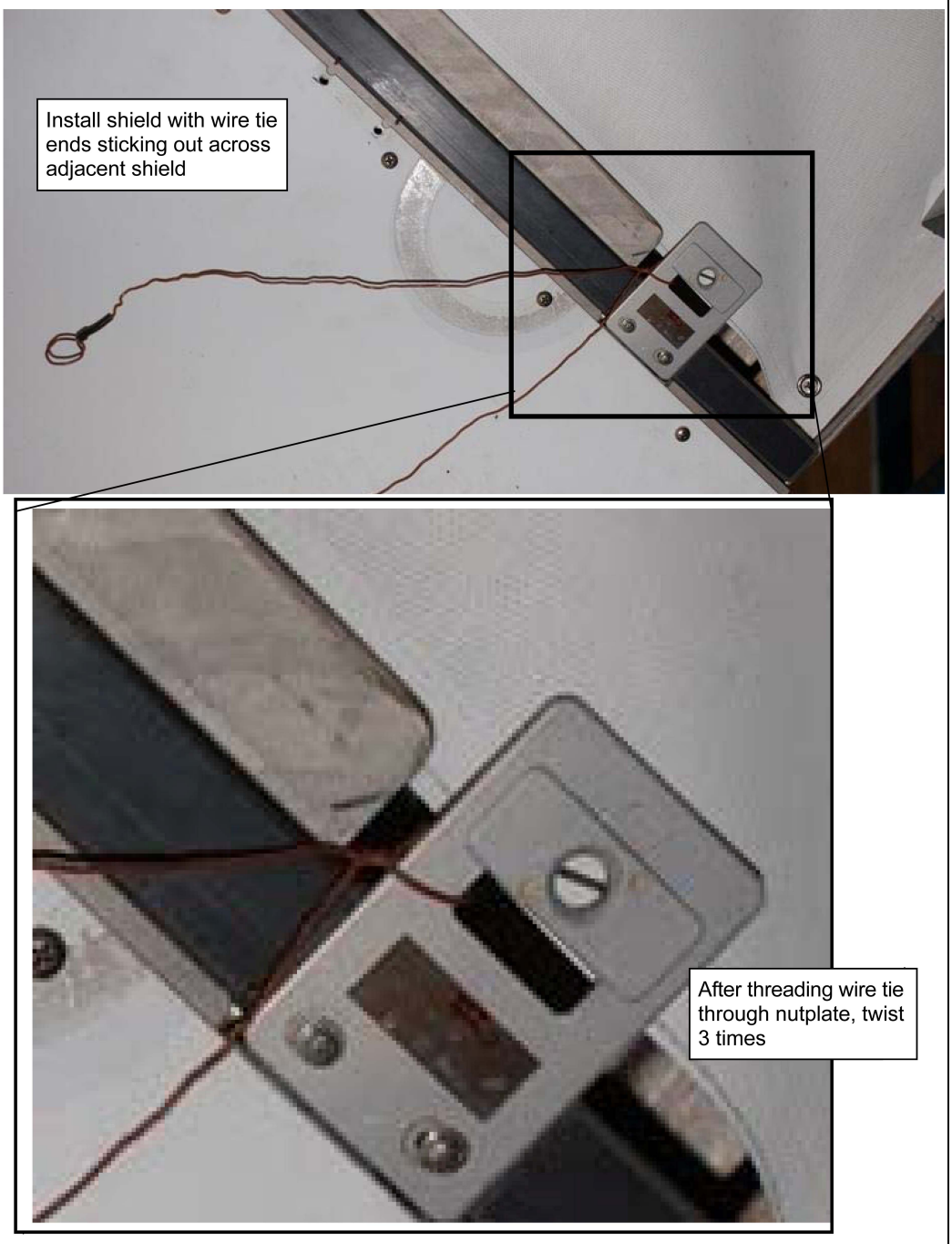
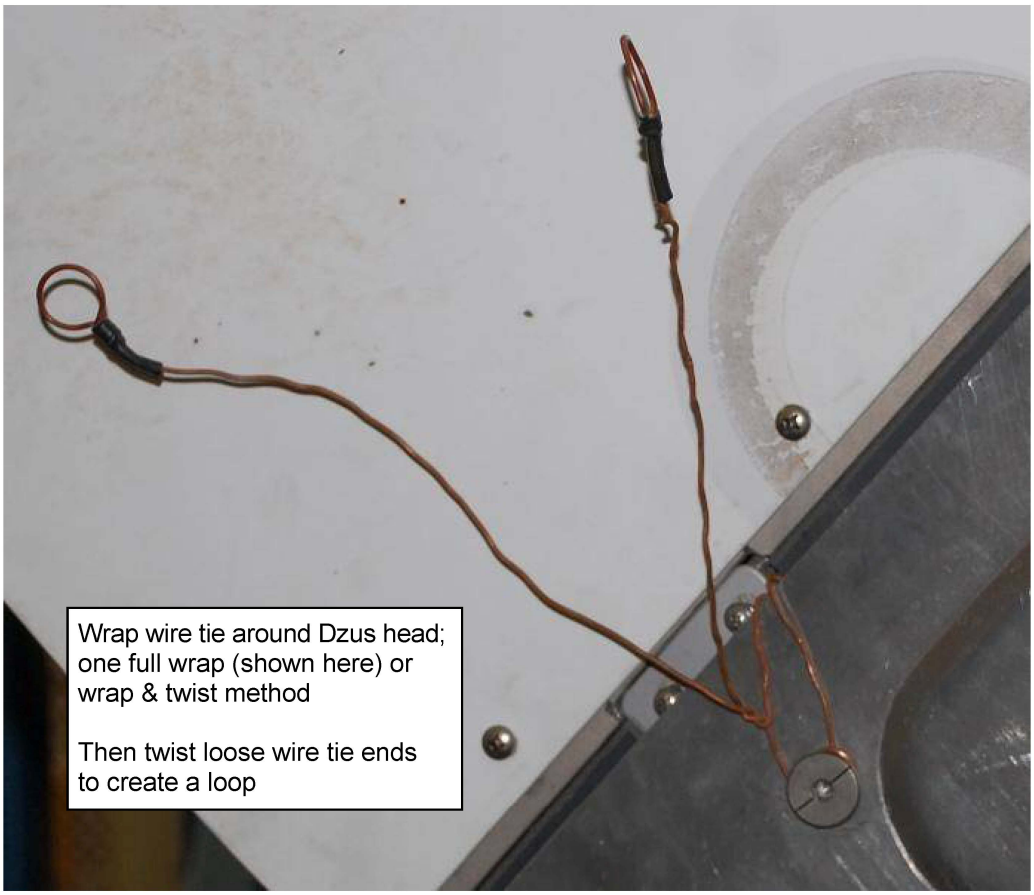


Figure 3.- MMOD Shield Wire Tie Option (Cont).

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	 Figure 4.- MMOD Shield Wire Tie Option (Cont).	
	MUT EE	
	A. MUT EE jaws fail to release	1. Verify locking collar fully released 2. Shake MUT EE while depressing paddles to alleviate sideloads from handrail 3. Release MUT EE ECOM socket and tether MUT EE to structure
	MWS	
	A. MWS EE is sticky	Known problem. Report degree of stickiness to **MCC-H** and any noted correlation with thermal environment. Post EVA, report s/n of affected unit (s/n located on "stem" of T-bar)
	B. MWS EE cord fails to retract	1. Verify MWS EE tether lock in unlock position 2. Cycle MWS EE tether lock 3. Check tether reel opening for FOD 4. Pull out small amount of tether and allow reel to retract while holding light tension on the tether
	C. MWS T-bar fails to pivot	1. Check sideloads on T-bar while depressing button 2. Slip T-bar clutch (40-60 lb force required)

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	NZGL Connectors	
	A. Bail bar fails to slide over-center	1. Inspect bail for FOD 2. Inspect bail linkage for damage and report to **MCC-H** 3. Check alignment and sideloads 4. Verify sufficient TA-clamps are open 5. Increase force on bail 6. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 7. On **MCC-H GO**: Retrieve vise grips to help increase force on bail
	B. Backshell fails to slide (after over-center mechanism has been overcome)	1. Verify sufficient TA-clamps are open 2. Check for cable harness and hardware interference 3. Check alignment and sideloads 4. Inspect bail and connector for FOD 5. Inspect bail linkage for damage and report to **MCC-H** 6. Wiggle/jiggle connector while pushing or pulling on backshell 7. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 8. On **MCC-H GO**: Retrieve vise grips to help increase force on bail
	C. Connector fails to release from soft dock	1. Verify bail fully thrown, undamaged, and backshell fully aft 2. If backshell springs forward, pull and hold in fully aft position (will have to overcome spring force, approx 5-10 lb) while attempting to demate connector 3. Verify sufficient TA-clamps are open 4. Check for cable harness and hardware interference 5. Check alignment and sideloads 6. Relieve compression on connector interface due to cable loads by pulling backshell away from jack 7. Push the plug towards the jack to compress the soft dock 8. Wiggle/jiggle connector. (Use slight rolling motion)
	D. Connector fails to soft dock	1. Verify correct plug and jack 2. Verify bail fully aft 3. Verify backshell fully aft and remains fully aft. If backshell not fully aft, pull and hold in fully aft position while attempting to soft dock connector 4. Inspect the following: • O-ring seal • FOD • Bend radius • Soft dock springs • Connector keying feature 5. Verify alignment (avoid excessive rolling or rocking the plug as this could unseat soft dock springs) • Connector should snap into soft dock with little force once half shells are aligned

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	E. Connector fails to mate	1. Verify half-shells are fully seated on both sides 2. Verify cable and backshell free to move (no clamps) 3. Push forward on connector backshell while actuating bail 4. Detach from soft dock and inspect: • Pins • FOD • EMI band • Bend radius • TA clamps • P clamps • Bail linkages and rivets • Soft dock springs • O-ring seal and main joint gasket • Connector keying feature 5. Cycle bail while disconnected. (Push forward on connector backshell for additional leverage)
	F. Connector pin bent	1. Rotate connector to bail up position and describe pin location and condition • Obtain WVS view of interface if possible 2. On **MCC-H GO**: For 16, 20, or 22 gauge pins only, retrieve pin straightener and attempt pin repair • **MCC-H** will verify pin size prior to retrieving tools 3. On **MCC-H GO**: Retrieve needle nose pliers and attempt pin repair 4. Inspect plug and jack prior to re-mating
	G. Connector FOD	On **MCC-H GO**: Remove FOD with connector cleaner tool a. Retrieve connector cleaner tool NOTE One N2 cartridge is already captured in the tool (the other is lanyarded inside the caddy). In order to puncture the cartridge, it must be threaded into the tool until the indicator line passes out of sight under the collar of the tool. Puncture connector cleaner cartridge only when ready to perform actual cleaning. Use entire N2 cartridge prior to reentering airlock b. Attempt cleaning
	H. Connector EMI band bent 	On **MCC-H GO**: Retrieve needle nose pliers or forceps to remove band • Bail may need to be pushed forward while demated to expose EMI band for removal

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	I. Connector bail linkage failure	1. On **MCC-H GO**: Re-attempt connector mate/demate with broken bail • Impart load through undamaged side of bail linkage • Assist bail motion with hand on backshell once bail linkage has passed over-center • May take multiple pushes on the bail to mate/demate connector 2. Tether hook or vise grips may be used for additional leverage
	J. Connector soft dock spring bent 	On **MCC-H GO**: Retrieve needle nose pliers and remove bent spring
	K. Connector O-ring or main joint gasket seal loose (seal and O-ring required in 1-G only)	1. Remove seal with tether hook 2. On **MCC-H GO**: Retrieve additional tools to remove seal (Ex: wire tie, needle nose pliers, probe, loop pin puller)
	L. Connector cap (Twist) will not release	1. Increase force 2. Use tether hook for additional leverage 3. On **MCC-H GO**: Attach equip hook to cap tether point and use strap of adj tether to release cap
	On-Orbit Installed HR	
	A. HR will not install in seat track or fails to soft dock	1. Verify HR installed in correct direction per arrow on underside of HR 2. Verify HR shoes are completely released and soft dock armed 3. Check for FOD on HR and seat track 4. Verify HR bolt completely released: **PGT [A1 (2.5), CCW2, 30.5], 7/16 - 6-ext** 5. If HR in seat track but soft dock will not engage, attempt to drive HR bolts 6. On **MCC-H GO**: Depending on HR priority, attempt to install 180 out or a different HR at this location
	B. HR bolt fails to fully engage	1. If torqued, remove HR: **PGT [A2 (3.8), CCW2, 30.5], 7/16 - 6-ext** • To break torque **PGT [A1 (2.5), CCW2, 30.5], 7/16 - 6-ext** • For removal Check for FOD on HR and seat track and reinstall using original torque 2. Increase PGT setting: **PGT [A3 (4.8), CW2, 30.5], 7/16 - 6-ext** 3. On **MCC-H GO**: Depending on HR priority, attempt to install 180 out or a different HR at this location

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	On-Orbit Installed WIF	
	A. WIF fails to soft dock	1. Check for FOD and structural interference, cycle soft dock pins; reattempt installation 2. Verify WIF is co-planar to structure 3. Install a different WIF at this location 4. On **MCC-H GO**: Attempt installation of WIF in a different location 5. Return WIF inside
	PAD	
	A. Release knob fails to rotate open	1. Verify knob in release position (J-hook not locked) 2. Attempt to rotate knob using ratchet on knob's 7/16 in hex stud 3. Release contingency release bar captive bolts (2) **PGT [A6 (8.3), CCW2, 30.5], 7/16 - 6 ext** 5 turns (Verify hook released from striker bar)
	PGT	
	A. No LEDs	1. Perform LED test 2. Use display torque
	B. LEDs and torque messages do not agree	Use torque message and notify **MCC-H**
	C. Mode switch breaks	Retrieve spare PGT
	D. NEED TO CAL displayed during PGT operation after calibration complete	1. Power cycle and calibrate 2. Retrieve spare PGT 3. Power off and switch to ratchet mode
	E. TRIG TO CAL displayed with Mode collar set to MTR. (Display should nominally read NEED TO CAL)	1. a. Set Mode collar to RCW or RCCW b. Depress Trigger; verify CAL PASSED c. Set Mode collar to MTR d. Verify good LED Test 2. a. Power Off b. Set Mode collar to RCW or RCCW c. Verify Speed collar in CAL d. Power On e. Verify TRIG TO CAL on display f. Complete calibration; continue ops 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	F. PGT fails to drive with Mode collar set to MTR	1. Power cycle and calibrate 2. a. Set Mode collar to RCW or RCCW b. Depress Trigger; verify CAL PASSED c. Set Mode collar to MTR d. Verify good LED Test 3. a. Power Off b. Set Mode collar to RCW or RCCW c. Verify Speed collar in CAL d. Power On e. Verify TRIG TO CAL on display f. Complete calibration; continue ops 4. Retrieve spare PGT 5. Power off and switch to ratchet mode

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	LCD Messages	
	A. BATTRY HITEMP	1. Power off PGT 2. If alternate battery available; change battery 3. Retrieve spare PGT 4. Switch to ratchet mode
	B. BATTRY LOTEMP (blinking)	1. Drive tool with no load to increase battery temperature 2. If alternate battery available; power off and change battery 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	C. BATTRY LOVOLT (blinking)	1. Continue using tool until unable to deliver sufficient torque 2. Retrieve spare PGT 3. Power off and switch to ratchet mode
	D. CAL FAILED	1. Press, release trigger to repeat calibration 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	E. COLLAR ERROR	1. Cycle torque and speed collars to clear error 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	F. COMPAR ERROR	1. Cycle torque collar and A/B mode switch 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	G. EEPROM WR ERR (blinking) HYBRID HITEMP OVER CURR SLFTST FAIL X	1. Power cycle and calibrate 2. Retrieve spare PGT 3. Power off and switch to ratchet mode
	H. HI TORQ	1. Contact **MCC-H** and report torque. (Real time engineering assessment required) 2. On **MCC-H GO**: Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	I. HICURR	1. Reattempt operation • Can be caused by excessive rotation of the PGT body while torquing 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	J. LO TORQ (Expected during bolt release)	1. Reattempt operation until desired torque is reached 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	K. LOCURR	1. Reattempt operation 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	L. LOG IS FULL (blinking)	1. Cycle torque and speed collars to clear message 2. Continue operation
	M. MOTOR HITEMP	1. Power off PGT 2. Retrieve spare PGT 3. Switch to ratchet mode

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	Safety Tether	
	A. Safety tether fails to retract/tend	1. Verify reel is unlocked and cycle the lock 2. Verify tether reel and/or cable guide (for 85-ft tethers) is clear of FOD 3. Pull out small amount of cable and allow reel to retract while holding light tension on the cable 4. Tap side of reel housing during retraction 5. Report ID # of faulty tether to **MCC-H** and use alternate safety tether 6. Coil safety tether to bring inside 7. For 85-ft tether, on **MCC-H GO**: If coiling tether is not practical, release level wind mechanism bypass on back of safety tether. (Red indicator will show around edge of bypass once released) NOTE Once level wind has been released cable guide will likely be frozen in place. This will limit the amount of tether that can be successfully retracted into the tether housing and may require coiling of excess tether. Level wind release will require safety tether be returned for ground servicing. If tether fails to retract due to thermal issue, normal tether function may return after tether brought IVA
	B. Safety tether red stripe showing (any length)	1. Use alternate safety tether 2. Connect waist tether to ERCM body as alternative load alleviation (Double Tether) 3. Inspect “Through” tack stitches. Tether NO-GO until tack stitching inspected. (Reference Crew tether inspection procedure) a. 1 of 2 stitches is required for tether to be GO for use b. If both “Through” stitches are broken, safety tether NO-GO for use • Report ID # of faulty tether to **MCC-H** • Use alternate safety tether
	C. Crew hook fails	1. On load alleviating end: Use waist tether to replace alleviating strap • Report ID # of faulty tether to **MCC-H** • Retrieve replacement safety tether 2. On anchor end: Report ID # of faulty tether to **MCC-H** and use an alternate safety tether
	Scoops	
	A. Scoop will not release from fitting	1. If actuator will not pull back while in locked position, tap actuator with tool to release 2. On **MCC-H GO**: Leave scoop in place 3. On **MCC-H GO**: Remove non-captive contingency screws; 5 turns. Stow in trash bag **PGT [A1 (2.5), CCW2, 30.5], 5/32 allen drive** • Square Scoop: 4 screws (fig 5) • Round Scoop: 7 screws (fig 6)

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION

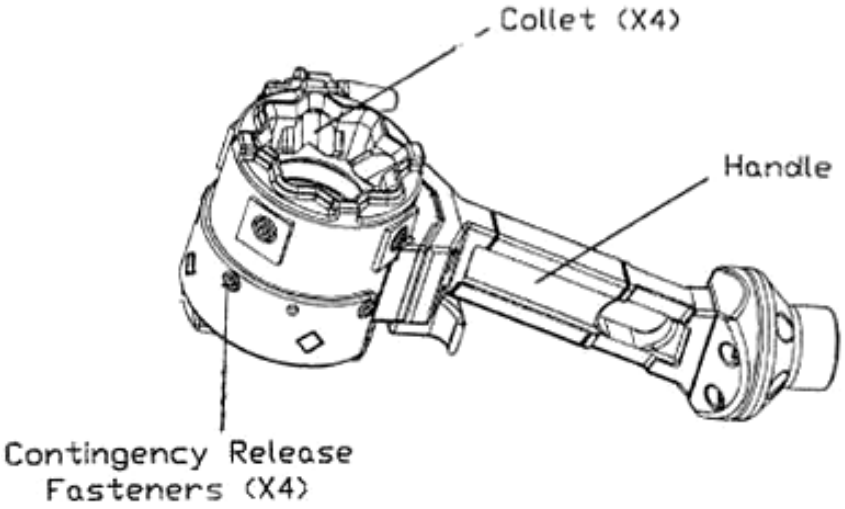


Figure 5.- Square Scoop.

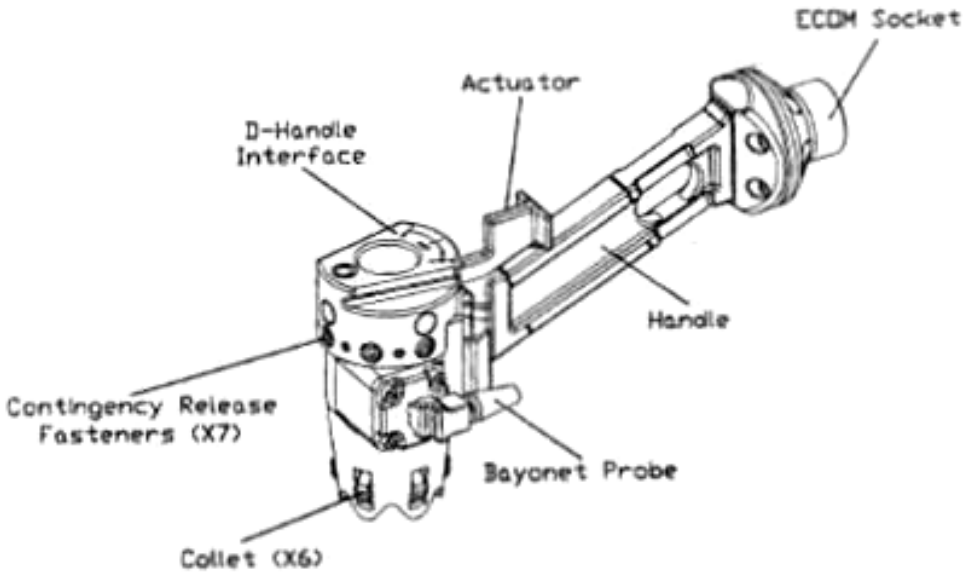
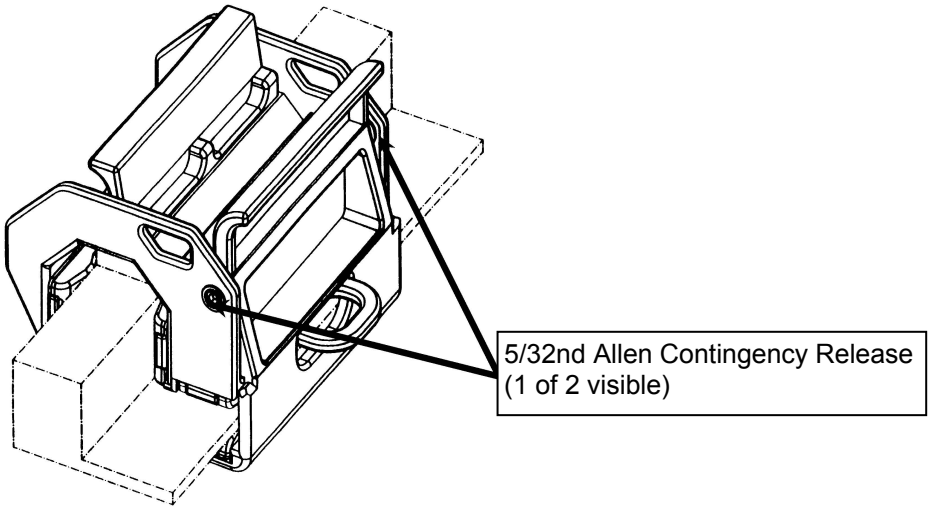
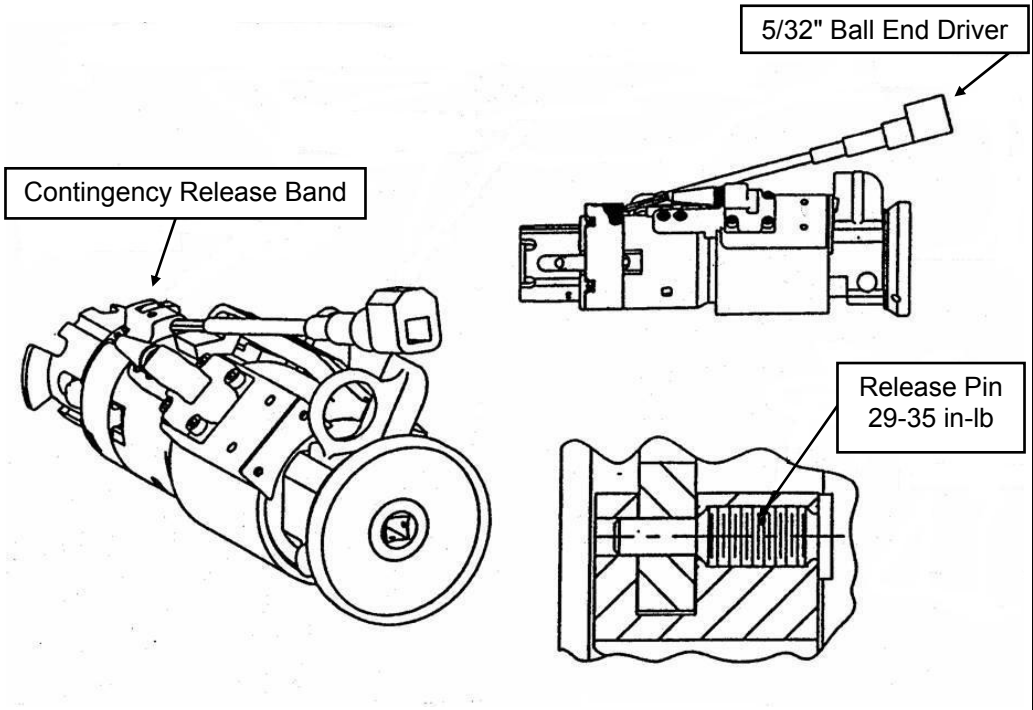


Figure 6.- Round Scoop.

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	Socket Caddy	
	A. Socket fails to release from socket caddy	1. Verify PIP pin fully inserted into drop proof tether interface on socket 2. Reattempt using a different PIP pin
	TA Clamp	
	A. TA clamp fails to release	1. With handle up, press down on top of rounded clamp 2. With handle up, use tether hook to pry drawhook from capture pin
	Tether Shuttle	
	A. Tether shuttle will not release from CETA/MT rail	1. Verify slider in unlock and no obstructions to paddle actuation 2. Verify safety tethered to structure and safety tether removed from tether shuttle anchor point 3. On **MCC-H GO**: Remove non-captive screws (2) at hingeline to release nadir section with slide lock (not captive) (fig 7). TBD turns. Stow screws in trash bag **PGT [A1 (2.5), CCW1, 30.5], 5/32 allen drive**
	 Figure 7.- Tether Shuttle.	
	Torque Multiplier	
	A. TM will not release from fitting	1. Place TM anti-backlash in neutral, if unable: **PGT [RCW, 30.5]** • Apply cw torque while pushing anti-backlash button to neutral. Reattempt removal 2. If able to lift TM off of bolt, attempt to rock off of fitting (Square TM only) 3. On **MCC-H GO**: Release TM contingency release band pin 20 turns (do not exceed 28 turns) (fig 8): **PGT [A1 (2.5), CCW2, 30.5], 5/32 ball end driver** • When band springs open remove TM

GENERIC CONTINGENCIES (Cont)

TASK	FAILURE	ACTION
	 Figure 8.- Torque Multiplier.	
	TSA	
	A. Latch fails to open	Release 7/16 EVA bolt on latch bracket; rotate bracket clear of latch **PGT [A2 (3.8), CCW2, 30.5], 7/16 - 6 ext** 1-2 turns
	B. Latch fails to close	Close remaining latches arrow to arrow (3 of 4 required for landing)

P6 PVTCS LEAK DETECTION

OBJECTIVE
To find a leak in the P1-P5 NH3 lines after PVTCS fill leak check has failed and the location of the leak is unknown.

Big Picture: Crew will translate toward P3/P4 interface looking for any NH3 leaks. The crew will close the jumper QDs. **MCC-H** will restart the fill and the EV crew will open the QDs one at a time. IV and **MCC-H** will coordinate whether to close the QD (if leak found) or to continue to next QD. Keep comm to minimum

IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
***MCC-H**: Report if Large or Medium leak* **NOTE** If Medium leak, have EV2 perform all Inspection steps and EV1 do Venting steps	P1-P5 JUMPER INSPECTION 1. Translate to P5 M14 dummy panel ❑ √QD F14 is mated, valve closed 2. Open bootie and inspect P5 QD F14 for any signs of leak 3. Peel back P5 Truss MLI as much as possible to view inside truss element 4. Translate to P4 QD M16 (P4/P5 Jumper) ❑ Look inside truss along NH3 lines for any signs of a leak 5. Open bootie and inspect P5 QD F16 and P4/P5 jumper for any signs of leak 6. Translate to P4 QD F15 (P3/P4 Jumper) ❑ Trace external NH3 line along P4 radiator for any signs of a leak 7. Open bootie and inspect P4 QD F15 for any signs of leak 8. Check P3/P4 Jumper for leaks	P1-P5 JUMPER INSPECTION 1. Open bootie and inspect ATA QD F184 at M2 and ATA jumper for any signs of leak 2. For Medium Leak, verify ATA QD F185 at M1 is open 3. Translate to P1 face 1 ❑ Look inside truss along NH3 lines and on MLI for any signs of a leak 4. Translate to P1/P3 Jumper, face 6 5. Open shroud on P1 nadir umbilical tray 6. Look for any signs of leak ❑ Pnl A503 (P1), open bootie and inspect QD F186 at M3 ❑ Pnl A501 (P3), open bootie and inspect QD F187 at M1 7. Close shroud on umbilical tray before leaving wkst 8. Translate to P3 face 6 9. Open bootie and inspect P3 QD F2 for any signs of leak 10. Check P3/P4 Jumper for leaks
1. For Medium Leak, give **EV1 GO** for P1-P5 Jumper Venting ops	P1-P5 JUMPER VENT (for Medium Leak) 9. On **IV/MCC-H GO**, perform Vent Tool Setup 10. Perform P1-P5 Jumper Vent (~17 min)	P1-P5 JUMPER VENT (for Medium Leak)

P6 PVTCS LEAK DETECTION (Cont)

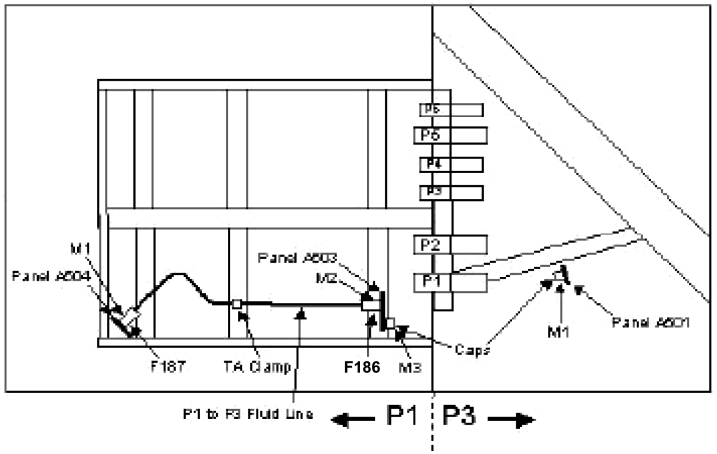
IV/SSRMS	EV1 (Drew)	EV2 (Spanky)
2. Verify following QDs are closed: ❑ P3/P4 Jumper at M2 pnl A502 ❑ P3/P4 Jumper at P4 M15 ❑ P1/P3 Jumper at M1 pnl A503 ❑ P1/P3 Jumper at M3 pnl A503 ❑ ATA Jumper at M1 pnl A500	NH3 LEAK ISOLATION 11. Close QD F15 at P4 M15, per **BLOCK D** 12. Translate to P3 side of P3/P4 Jumper pnl A502 *Stand by for IV*	NH3 LEAK ISOLATION 11. Close P3 QD F2 per **BLOCK D** 12. Translate to P1 face 6, P1/P3 Jumper 13. Open shroud on P1 nadir umbilical tray 14. Close QD F187 on pnl A501 (P3) M1 per **BLOCK D** 15. Close QD F186 on pnl A503 (P1) M3 per **BLOCK D** 16. Translate to P1 ATA pnl A500 17. Close QD F185 on M1 per **BLOCK D**, if not already
3. On **MCC-H GO**, give EV2 GO to open ATA QD F185 on M1 ***MCC-H:*** *Report leak or continue*		18. On **IV GO**, open QD F185 on M1 per **BLOCK C** 19. If no leak, translate to P1/P3 Jumper Face 6, pnl A503
4. On **MCC-H GO**, give EV2 GO to open P1 QD F186 on M3 ***MCC-H:*** *Report leak or continue*		20. On **IV GO,** open P1 QD F186 on M3 per **BLOCK C**
5. On **MCC-H GO**, give EV2 GO to open P3 QD F187 on M1 ***MCC-H:*** *Report leak or continue*		21. On **IV GO,** open P3 QD F187 on M1 per **BLOCK C** 22. Close shroud on P1 nadir umbilical tray
6. On **MCC-H GO**, give EV1 GO to open P3 QD F2 on M2 ***MCC-H:*** *Report leak or continue*	13. On **IV GO**, open P3 QD F2 at M2 per **BLOCK C** 14. If no leak, translate to P4 QD F15 of P3/P4 Jumper	
7. On **MCC-H GO**, give EV1 GO to open P4 QD F15 on M15 ***MCC-H:*** *Report leak or continue*	15. On IV GO, open P4 QD F15 at M15 per **BLOCK C**	
8. Contact **MCC-H** for further actions		

P6 PVTCS LEAK DETECTION (Cont)

P1 to P3 Fluid Line – Stowed Config

FACE 1

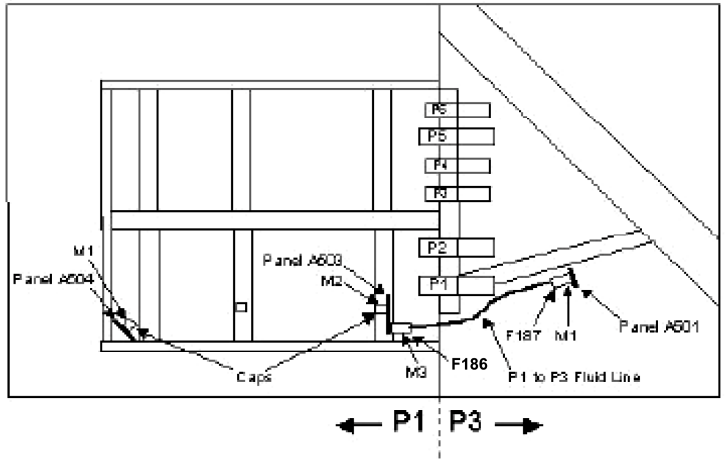
FACE 6



P1 to P3 Fluid Line – Deployed Config

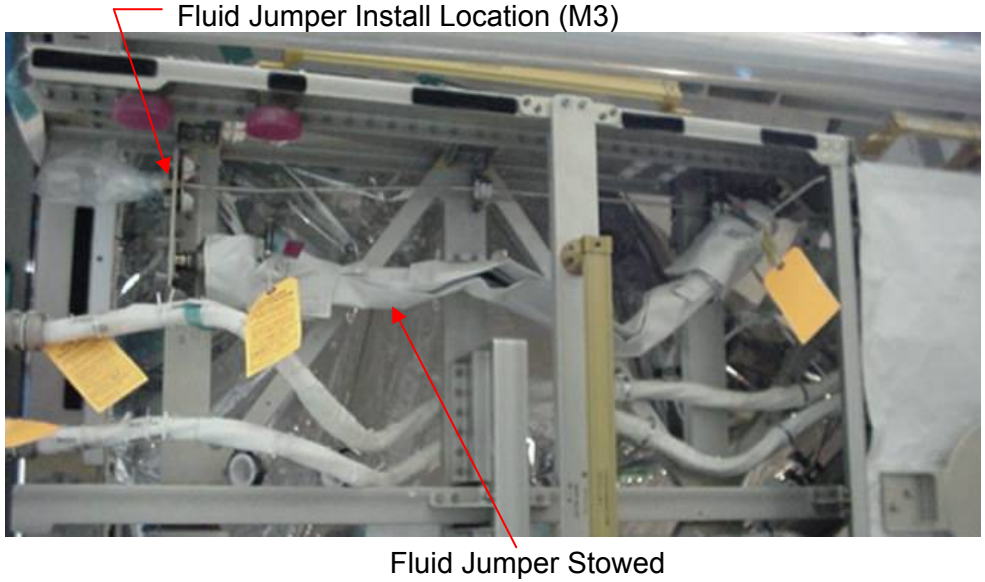
FACE 1

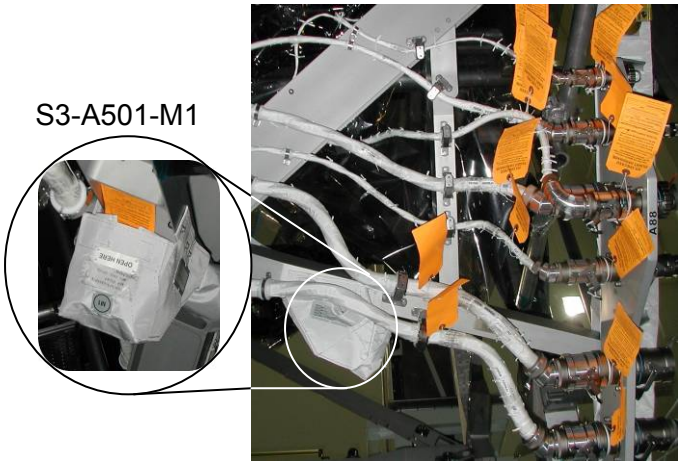
FACE 6



Notes:

1. Jumper QDs are 1/4-in
2.

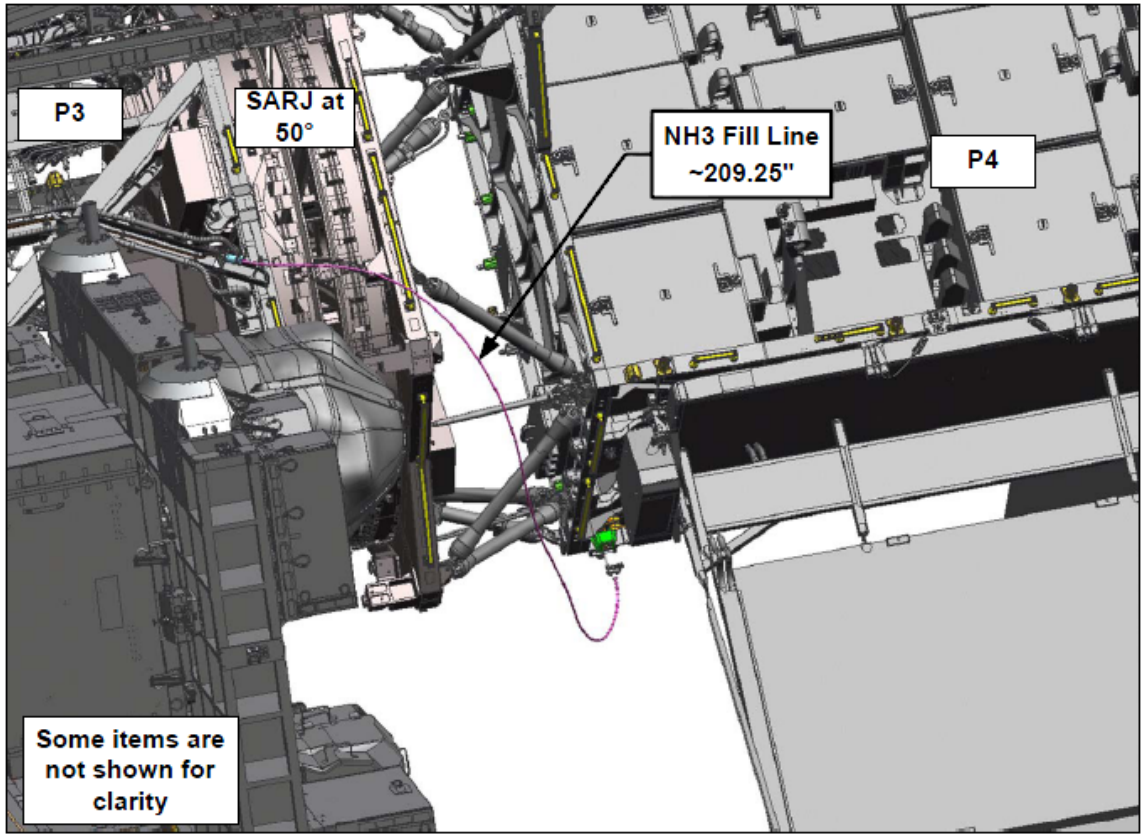




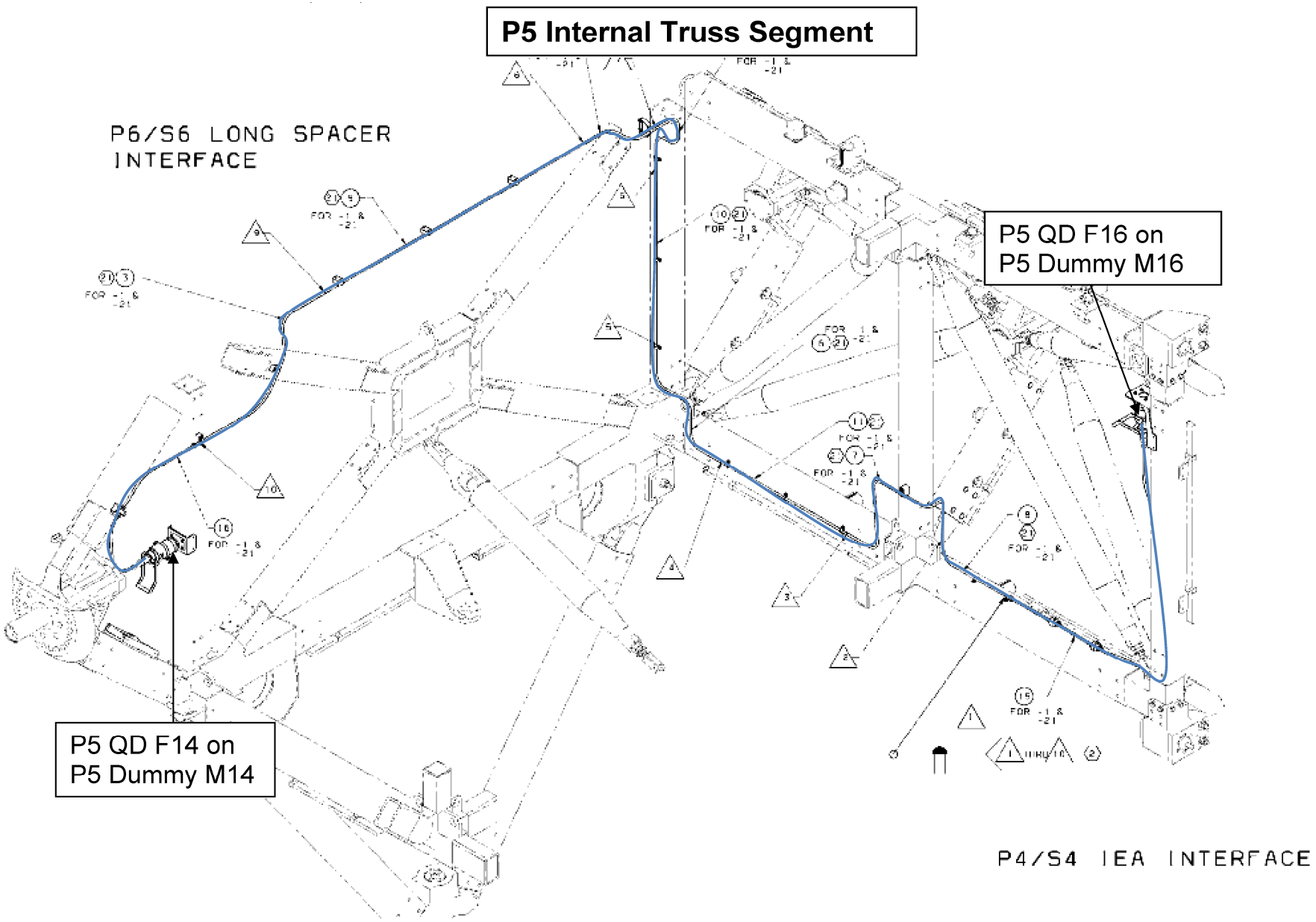
Ammonia Jumper Connection (S3-A501-M1)

P1/P3 Worksite Photos

Line connected with SARJ at 50°



P6 PVTCS LEAK DETECTION (Cont)



P6 PVTCS FILL FAILURE MATRIX

	Procedure Task	First Failure	Response/Control	Second Failure	Response/Control	Notes
1a	Remove P3/P4 jumper from P3 dummy, install on P3, open valve	Jumper fails to remove/install/open	Either utilize the S3/S4 Jumper or do not proceed with the fill and return the system to its nominal configuration (including venting if needed)	S3/S4 fails to remove/install/open	Do not proceed with the fill and return the system to its nominal configuration	Cap failures could also prevent proper installation of the jumper, preventing the fill
1b				Won't reattach to dummy	Tie down out of SARJ rotation plane or remove completely	The SARJ rotation plane must be clear of obstructions before the SARJ can be allowed to rotate
1c				Won't remove from P4	Remove at P3 and tie down	
2	Close and demate A500 panel jumper QD from vent position (M3)	Fails to close/remove	Remove jumper from ATA side and use S1 A500 jumper or No fill, return to nominal configuration	QD valve won't reopen	Can't vent ATA using A500 panel	Cap failures could also prevent proper installation of the jumper, preventing the fill or a return to a nominal configuration
3	Install and open A500 jumper to P1/P3 jumper position (M1)	Fails to install/open	No fill, return to nominal configuration or remove jumper from ATA side and use S1 A500 jumper	Won't remove or install at M3/S1 jumper fails to install/open	Install at M1; can't vent ATA using A500 panel without S1 A500 jumper	
4a1	Open ATA Vent Valve (this step pressurizes the segment from the ATA to P5/P6 jumper)	Large leak between P5 and A500 (greater than 6% ATA drop over 90 sec)	Close M1 jumper QD at A500 (this isolates the A500 to P5 line)	M1 fails to close	No overpress hazard immediately as there is no isolated segment; however, closing an alternate QD valve will ultimately result in an isolated segment – see NCR-ISS-259 for acceptance of this risk	For steps 4a1-4a3: With this very large leak rate, the segment that is isolated is losing 1.5 times its fluid mass per minute, while (for the entire volume) it takes at least 2.5 min of insolation to overpress. Ultimately, if the leak can't be isolated and/or repaired, the segment will be vented

P6 PVTCS FILL FAILURE MATRIX (Cont)

	Procedure Task	First Failure	Response/Control	Second Failure	Response/Control	Notes
4a2			Perform leak identification steps (closing nearest QD valve inboard of leak, reopen M1 once the leak has been isolated to a smaller segment) – see NCR-ISS-259 for acceptance of this risk	M1 fails to reopen	NCR-259, reopen valve that isolated the smaller segment, replace P1 A500 jumper with S1	For steps 4a1-4a3: With this very large leak rate, the segment that is isolated is losing 1.5 times its fluid mass per minute, while (for the entire volume) it takes at least 2.5 min of insolation to overpress. Ultimately, if the leak can't be isolated and/or repaired, the segment will be vented
4a3			Perform leak identification and isolation steps (closing and incrementally reopening QD valves, reopen M1 once the leak has been isolated to a smaller segment) – see NCR-ISS-259 for acceptance of this risk	Other valves fail to close/open; jumper replacement fails (QDs fail to release/attach/ open/close)	Close ATA VV; NCR-259	For steps 4a1-4a3: With this very large leak rate, the segment that is isolated is losing 1.5 times its fluid mass per minute, while (for the entire volume) it takes at least 2.5 min of insolation to overpress. Ultimately, if the leak can't be isolated and/or repaired, the segment will be vented
4b1		Large leak (greater than 6% ATA drop over 90 sec) that is actually between A500 and ATA VV	Close M1 jumper QD at A500 (this isolates the A500 to P5 line); upon determining that the leak has not stopped, reopen M1 – see NCR-ISS-259 for acceptance of this risk	M1 fails to open	Close ATA Isolation Valve or ATA VV, NCR-259; vent the P5-A500 segment or integrate with the EEATCS	The P5-A500 line segment is isolated with no pressure relief and is *not* leaking, the A500-ATA line is isolated with pressure relief, and leaking 1.5 times its fluid mass per minute, while (for the entire volume) it takes at least 2.5 min of insolation to overpress
4c		Medium leak (ATA-P5 pressure decay > (1551-PVPFINAL/20) kPa per minute) between P5 and VV	Close ATA Isolation Valve, attempt to locate and isolate leak, vent lines if not located; NCR-259	Isolation Valve fails to close	Close Vent Valve, vent lines; NCR-259	The P5-VV line segment is isolated with no pressure relief, but leaking – this configuration has *not* been shown good for over pressure protection
4d				Isolation Valve fails to relieve overpressure	NCR-259	The ATA Isolation Valve can be reopened if an overpressure condition is detected

P6 PVTCS FILL FAILURE MATRIX (Cont)

	Procedure Task	First Failure	Response/Control	Second Failure	Response/Control	Notes
5a	Remove P5/P6 jumper from P5 dummy, install on P6, open valve	Fails to remove/install/open	No fill, return to nominal configuration	Won't attach to dummy	Tie down or return to P6	Same for cap failures
5b				Won't remove from P6	Leave in place	
6	Open EAS jumper QD valve (M10)	Fails to open or leaks excessively	Use second EAS jumper	Second EAS jumper fails	Do not proceed with PVTCS fill, vent all lines that have been filled	
7a	Open EAS jumper QD extender valve (M2) (PVTCS fill begins)	Fails to open	Use second EAS jumper	Second EAS jumper fails	No fill, vent lines	EAS jumper partially filled – vent or stow away from EVA
7b				EAS jumper can't be removed	No fill, vent lines	
8a	Correct PVTCS overfill using GPRV	GPRV fails to correct PVTCS overfill	Close/demate EAS QD extender at M2 (begin manual EAS jumper vent to correct overfill)	Fails to close/can't remove	Close/demate EAS jumper QD (next to QD extender)	Manual EAS jumper isolation and venting (steps 8a-8e) must be in eclipse; the EAS jumper (or just the extender) will be repeatedly filled and vented to correct the overfill; a smaller volume of ammonia can be vented with each iteration if the extender must be left in place at M2 due to failures
8b			Close M10 QD valve	Fails to close	Use second EAS jumper to attach to M2 and vent PVTCS overfill	
8c			Mate Extender to vent tool	Fails to mate to vent tool	Use second EAS jumper or second vent tool	
8d			Open EAS jumper to vent tool	Fails to open	Use second EAS jumper	
8e			Repeat 8a through 8d until PVTCS overfill is corrected	Same as above. If either valve fails to open or close, or the jumper or vent tool extender QDs fail to mate or demate, use the second EAS jumper and/or vent tool		

P6 PVTCS FILL FAILURE MATRIX (Cont)

	Procedure Task	First Failure	Response/Control	Second Failure	Response/Control	Notes
9	Close and remove EAS jumper QD extender (M2) (PVTCS fill complete)	Fails to close/remove	Close and remove QD-03F/leave extender open with PVTCS	Fails to close/can't remove	Close M10/leave EAS open with PVTCS	
10a	Close and demate P5/P6 jumper QD from P6 (M14)	Fails to close/remove	Use P4/P5 jumper (reopen P5/P6 jumper and P5 becomes part of EETCS)	Fails to close/can't remove	Use P3/P4 jumper and P4 becomes part of EETCS	NOTE (steps 10a-10c4): Once the P5/P6 jumper is isolated, vent must be started in eclipse or within 2.5 min of isolation during day pass; however, the time to overpress was based on the total volume and NH3 qty in the entire P1/P5 line, since the time to overpress is unknown if venting from P4/P5 or P3/P4, these contingencies should be conducted in eclipse
10b1	Mate P5/P6 jumper (F14) to vent tool adapter	Fails to mate	Use second vent tool or P4/P5 jumper (reattach and open P5/P6 to EETCS)	Second vent tool or P4/P5 jumper fails to mate/open	Reattach and open P4/P5 jumper to EETCS, use P3/P4 jumper	The outboard line segments would be provided over pressure protection by the EETCS. Those segments could be subsequently reisolated and vented during eclipse.
10b2				P5/P6 jumper fails to reattach/open	Isolate and vent P5 segment separately from P4/P5	No analysis for separately isolated P5 segment exists – eclipse only constraint required
10c1	Open P5/P6 jumper to vent tool adapter (Vent P6-ATA VV line segment)	Fails to open	Use P4/P5 jumper (reattach and open P5/P6 jumper to the EETCS)	P4/P5 jumper fails to connect/open	Reattach and open P4/P5 jumper to EETCS, use P3/P4 jumper	The outboard line segments would be provided over pressure protection by the EETCS. Those segments could be subsequently reisolated and vented during eclipse
10c2				P5/P6 jumper fails to reattach/open	Isolate and vent P5 segment separately from P4/P5	No analysis for separately isolated P5 segment exists – eclipse only constraint required

P6 PVTCS FILL FAILURE MATRIX (Cont)

	Procedure Task	First Failure	Response/Control	Second Failure	Response/Control	Notes
10c3	Close and demate P5/P6 jumper (F14) (End P6-ATA VV vent)	Fails to close/demate	Leave in place, use alternate vent tool adapter for EAS venting	2nd vent tool adapter fails to mate/EAS jumper fails to open	Remove unvented EAS jumper, stow away from EVA or open QD Extender to M2 (integrate into PVTCS), attempt vent from QD-03F or open QD at M10 and integrate into EETCS	
11a	Close EAS QD (02F) at M10 (Isolates EAS jumper)	Fails to close	Leave in place, EAS jumper becomes part of EETCS			NOTE (steps 11a to 11c2): EAS jumper isolation and venting must be in eclipse
11b	Remove plug/Mate QD extender to vent tool	Fails to remove/mate	Leave in place (open QD at M10), EAS jumper becomes part of EETCS or use alternate vent tool	QD fails to reopen to integrate with EETCS or alternate vent tool fails to mate	Remove unvented EAS jumper, stow away from EVA or attempt to vent from QD 02F or reintegrate into PVTCS	
11c1	Open QD extender valve (EAS vent)	Fails to open	Leave in place, reopen M10, EAS jumper becomes part of EETCS	M10 fails to open	Remove unvented EAS jumper, stow away from EVA or attempt to vent from QD 02F or reintegrate into PVTCS	
12a	Close QD extender valve (EAS vent complete)	Fails to close	Stow EAS jumper and vent tool adapter together			
12b	Demate EAS jumper from vent tool	Fails to demate	Stow EAS jumper and vent tool adapter together			
13	Mate EAS jumper QD extender to M3	Fails to mate	Tie down			
14	Demate/Mate EAS jumper from M10/to M11	Fails to demate/mate	Leave in place or Tie down			
15	Similar controls for vent tool disassembly and stowage					

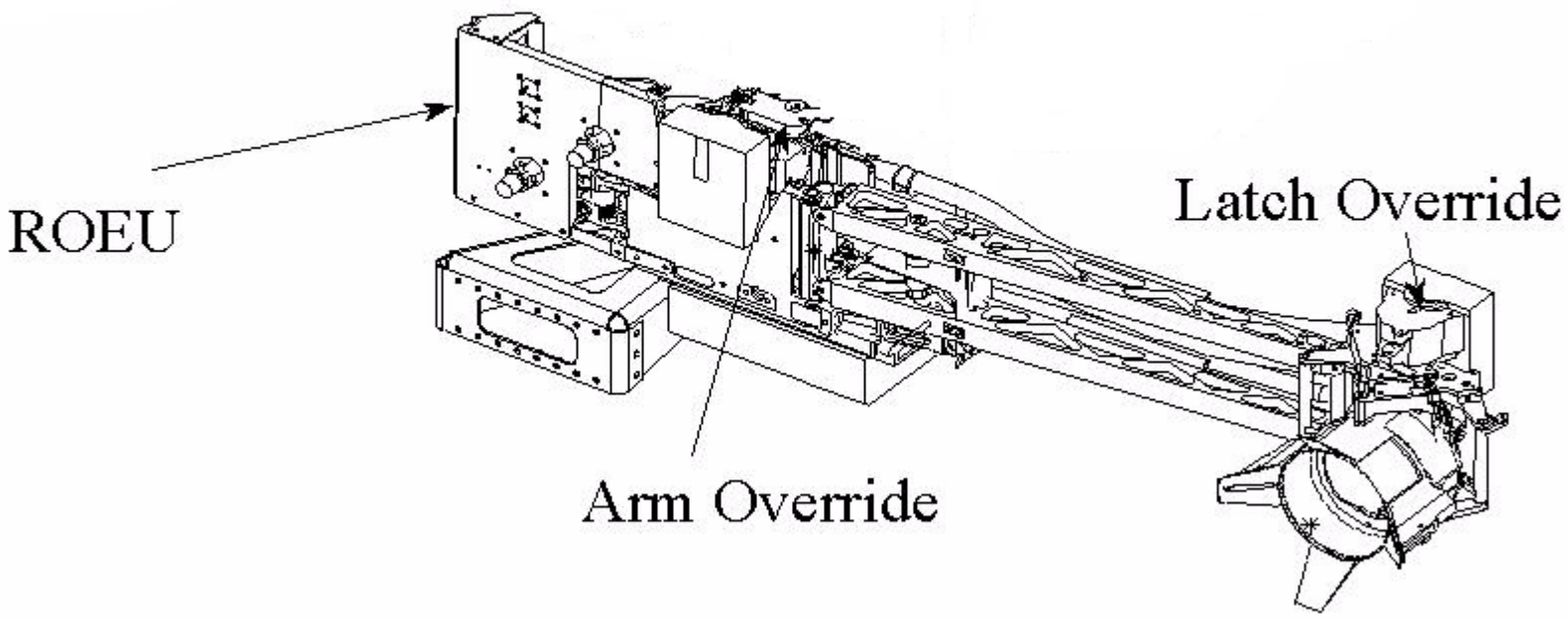
P6 PVTCS FILL FAILURE MATRIX (Cont)

	Procedure Task	First Failure	Response/Control	Second Failure	Response/Control	Notes
16a	Close and demate P3/P4 jumper (M2) from P3	Fails to close/ demate	Close & demate from P4	Fails to close/can't remove	Leave in place; Port SARJ cannot be rotated	
16b	Mate P3/P4 jumper to dummy	Fails to mate	Tie down out of SARJ rotation plane or remove jumper			
17a	Close/demate A500 QD valve (M1)	Fails to close/demate	Leave as is; can't use A500 to vent ATA without S1 A500 jumper			
17b	Mate/open A500 jumper to M3	Fails to mate/open	Return to M1, tie down, or leave as is		Can't use A500 to vent ATA without S1 A500 jumper	

NOTE: The hazard being protected for with these operational controls is EVA exposure to an isolated, liquid-locked line segment overpressurizing due to a temperature increase. Except where specifically noted, the isolation and venting of portions of the TCS system must occur in eclipse. In addition, utilizing alternate jumpers or means of venting, providing overpressurization protection, or limiting EVA exposure are all acceptable controls, so long as they provide similar fault-tolerance to the nominal or contingency operations provided below. While all possible failures have not been explicitly detailed, this matrix can be used as a guide to bring the system to a safe state following similar response controls for similar failures

Indicates Accepted Risk

Indicates not a listed hazard control



ROEU OVERVIEW

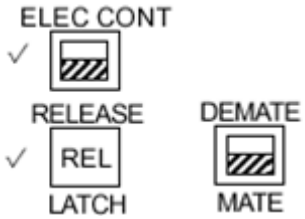
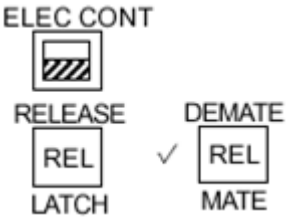
ROEU CONTINGENCIES (Cont)

RELEASE ELC(AMS) ROEU LATCHES

IV	EV
1. DEADFACE ROEU If ELC: L12L ELC3 PWR – OFF SSP2 √BUS 2/3 tb – bp √BUS 1 tb – bp cb SW PWR 4 – op R1 PL PRI MNC – OFF (tb-OFF) √MNB,FC3 (two) – ctr (tb-OFF) If AMS: L12L √cb SW PWR 4 – op SSP2 A15 √APCU 1,2 CONV (two) – OFF 1 OUTPUT – OFF 2. ROEU SAFING R13L √PL BAY MECH PWR SYS 1,2 (two) – OFF A6U √RETEN LOGIC PWR SYS 1,SYS 2 (two) – OFF PL SEL – MON Give EV GO to release ROEU	Tools reqd: Ratchet with 7/16-in Socket WARNING For release, do not close access cover until ROEU stowed. Latches may not snap back to closed posn 1. On IV GO, open latch drive access cover: Break safety cord, release access cover (3/4 turn ccw) Open access cover (~120°) Manual drive to RELEASE: Rotate control lever to RELEASE Rotate latch drive cw (~9 ft-lb) to hard stop (~3/4 turn) Remove drive ratchet, clear worksite

ROEU CONTINGENCIES (Cont)

RELEASE ELC(AMS) ROEU LATCHES (Cont)

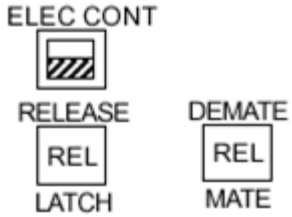
IV	EV
3. VERIFY TALKBACKS A6U Install ROEU A6U PANEL OVERLAY PL RETEN PL SEL – 2  4. DEMATE ROEU NOTE When LOGIC switches taken OFF, KU will mode to standby. MPM and MRL tbs – bp MA73C:A MCA LOGIC MNC MID 2 – OFF :B MNB MID 4 – OFF R13L PL BAY MECH PWR SYS 1,2 (two) – ON A6U RETEN LOGIC PWR SYS 1,SYS 2 (two) – ON Note single motor time (> 18 sec) ELC (AMS) DEMATE/MATE – DEMATE (tb-REL), 36 sec max – OFF  	WARNING For release, remain clear of latches during access cover closing. Latches may snap back to closed posn

ROEU CONTINGENCIES (Cont)

RELEASE ELC(AMS) ROEU LATCHES (Cont)

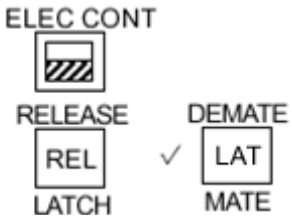
IV	EV
PL RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF PL SEL – MON R13L PL BAY MECH PWR SYS 1,2 (two) – OFF 5. <u>ENABLE POWER</u> MA73C:A MCA LOGIC MNC MID 2 – ON :B MNB MID 4 – ON	2. Reengage latch actuator: Rotate control lever to neutral posn Close, secure access cover (3/4 turn cw) Clear worksite

LATCH ELC(AMS) ROEU LATCHES

IV	EV
1. CONFIGURE FOR ROEU MATE A6U Install ROEU A6U PANEL OVERLAY √PL RETEN LOGIC PWR SYS 1,2 (two) – OFF PL SEL – 2 R13L √PL BAY MECH PWR SYS 1,2 (two) – OFF SM 97 PL RETENTION CRT √PL SEL 2 LAT 1,2 (3,4) (four): 0 * If LATCH 1,2 (3,4) LAT msw shows 1, * * drive latch for single motor time * A6U  If ELC: L12L √ELC3 PWR – OFF SSP2 √BUS 2/3 tb – bp √BUS 1 tb – bp √cb SW PWR 4 – op R1 √PL PRI MNB,FC3,MNC (three) – ctr (tb-OFF)	Tools reqd: Ratchet with 7/16-in Socket

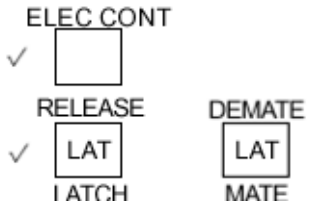
ROEU CONTINGENCIES (Cont)

LATCH ELC(AMS) ROEU LATCHES (Cont)

IV	EV
If AMS: L12L √cb SW PWR 4 – op SSP2 A15 √APCU 1,2 CONV (two) – OFF √1 OUTPUT – OFF 2. MATE ROEU NOTE When LOGIC switches taken OFF, KU will mode to standby. MPM and MRL tbs – bp MA73C:A MCA LOGIC MNC MID 2 – OFF :B MNB MID 4 – OFF R13L PL BAY MECH PWR SYS 1,2 (two) – ON A6U RETEN LOGIC PWR SYS 1,2 (two) – ON Note single motor time (> 30 sec) ELC (AMS) DEMATE/MATE – MATE (tb-LAT), 60 sec max – OFF  	

ROEU CONTINGENCIES (Cont)

LATCH ELC(AMS) ROEU LATCHES (Cont)

IV	EV
3. ROEU SAFING R13L PL BAY MECH PWR SYS 1,2 (two) – OFF A6U RETEN LOGIC PWR SYS 1,2 (two) – OFF PL SEL – MON Give EV GO to latch ROEU 4. VERIFY TALKBACKS A6U PL RETEN PL SEL – 2  5. RELAX ROEU If ELC: A6U PL RETEN PL SEL – 1 R13L PL BAY MECH PWR SYS 1,2 (two) – ON A6U RETEN LOGIC PWR SYS 1,SYS 2 (two) – ON NOTE Monitor PL SEL 1(2) LATCH 5 msw status on SPEC 97 Note single motor time (> 12 sec) RELAX – RELAX (tb-REL), 24 sec max When PL SEL 1(2) LATCH 5 REL A(B) msw changes to 1: RELAX – OFF  	1. On IV GO, open latch drive access cover: Break safety cord, release access cover (3/4 turn ccw) Open access cover (~120°) Manual drive to LATCH: Rotate control lever to LATCH Rotate latch drive ccw (~9 ft-lb) to hard stop (~3/4 turn) Remove drive ratchet, clear worksite

ROEU CONTINGENCIES (Cont)

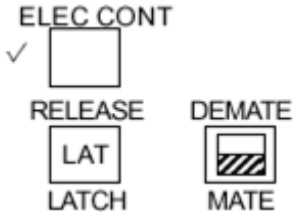
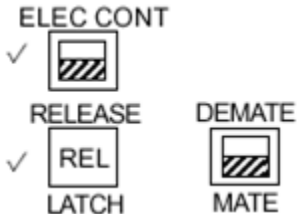
LATCH ELC(AMS) ROEU LATCHES (Cont)

IV	EV
PL RETEN LOGIC PWR SYS 1,2 (two) – OFF PL SEL – MON R13L BAY MECH PWR SYS 1,2 (two) – OFF 6. ENABLE POWER If ELC: R1 PL PRI MNC – ON (tb-ON) L12L cb SW PWR 4 – cl SSP2 ELC3 PWR – ON √BUS 2/3 tb – UP √BUS 1 tb – UP If AMS: On MCC GO: A15 APCU 1 OUTPUT – ON NOTE The APCU CONV switches need to be thrown simo due to AMS startup loads APCU 1,2 CONV (two simo) – ON MA73C:A MCA LOGIC MNC MID 2 – ON :B MNB MID 4 – ON	2. Reengage latch actuator: Rotate control lever to neutral posn Close, secure access cover (3/4 turn cw) Clear worksite

STOW ELC(AMS) ROEU ARM

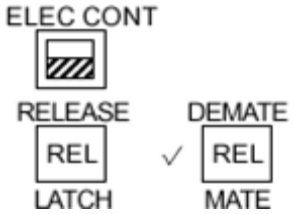
IV	EV
1. VERIFY ROEU DEADFACED If ELC: L12L √ELC3 PWR – OFF SSP2 √BUS 2/3 tb – bp √BUS 1 tb – bp √cb SW PWR 4 – op R1 √PL PRI MNB,FC3,MNC (three) – ctr (tb-OFF) If AMS: L12L √cb SW PWR 4 – op SSP2 A15 √APCU 1,2 CONV (two) – OFF √1 OUTPUT – OFF 2. CONFIGURE FOR ROEU LATCH A6U Install ROEU A6U PANEL OVERLAY NOTE When LOGIC switches taken OFF, KU will mode to standby. MPM and MRL tbs – bp MA73C:A MCA LOGIC MNC MID 2 – OFF :B MNB MID 4 – OFF √PL RETEN LAT (five) – OFF LAT PL SEL – 2 SM 97 PL RETENTION √PL SEL 2 REL 1,2 (3,4) (four) – 0	Tools reqd: Ratchet with 7/16-in Socket

STOW ELC(AMS) ROEU ARM (Cont)

IV	EV
* If LATCH 1,2 (3,4) REL msw shows 1, * * drive latch for single motor time *  2. RELEASE LATCHES R13L PL BAY MECH PWR SYS 1,2 (two) – ON A6U RETEN LOGIC PWR SYS 1,2 (two) – ON Note single motor time (> 20 sec) ELC (AMS) RELEASE/LATCH – REL (tb-REL), 40 sec max – OFF  	

ROEU CONTINGENCIES (Cont)

STOW ELC(AMS) ROEU ARM (Cont)

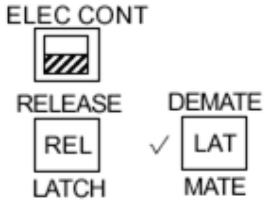
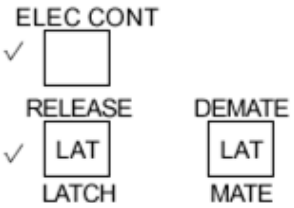
IV	EV
3. <u>ROEU SAFING</u> R13L PL BAY MECH PWR SYS 1,2 (two) – OFF A6U RETEN LOGIC PWR SYS 1,2 (two) – OFF PL SEL – MON Give EV GO to stow ROEU	1. On IV GO, open arm drive access cover: Break safety cord, release access cover (3/4 turn ccw) Open access cover (~120°) Manual drive to STOW: Rotate control lever to STOW Rotate arm drive ccw (~23 ft-lb) to hard stop (~3/4 turn) and pull arm inboard to verify Remove drive ratchet, clear worksite
4. <u>VERIFY TALKBACKS</u> A6U PL RETEN PL SEL – 2  	2. Reengage arm actuator: Rotate control lever to neutral posn Close, secure access cover (3/4 turn cw) Clear worksite
5. <u>ENABLE POWER</u> MA73C:A MCA LOGIC MNC MID 2 – ON :B MNB MID 4 – ON	

ROEU CONTINGENCIES (Cont)

MATE ELC(AMS) ROEU ARM

IV	EV
1. CONFIGURE ROEU	Tools reqd:
A6U Install ROEU A6U PANEL OVERLAY	Ratchet with 7/16-in Socket
2. ROEU SAFING	
R13L √PL BAY MECH PWR SYS 1,2 (two) – OFF	
A6U √RETEN LOGIC PWR SYS 1,SYS 2 (two) – OFF	
PL SEL – MON	
If ELC:	
L12L √ELC3 PWR – OFF	
SSP2 √BUS 2/3 tb – bp	
√BUS 1 tb – bp	
√cb SW PWR 4 – op	
R1 √PL PRI MNB,FC3,MNC (three) – ctr (tb-OFF)	
If AMS:	
L12L √cb SW PWR 4 – op	
SSP2	
A15 √APCU 1,2 CONV (two) – OFF	
√1 OUTPUT – OFF	
Give EV GO to mate ROEU	1. On IV GO, open arm drive access cover:
	Break safety cord, release access cover (3/4 turn ccw)
	Open access cover (~120°)
	Manual drive to MATE:
	Rotate control lever to MATE
	Ratchet arm drive cw (~25 ft-lb) until “READY TO LATCH” posn indicated on interface guide
	Remove drive ratchet
	Clear worksite (for latching)

MATE ELC(AMS) ROEU ARM (Cont)

IV	EV
3. VERIFY TALKBACKS A6U PL RETEN PL SEL – 2  4. LATCH LATCHES NOTE When LOGIC switches taken OFF, KU will mode to standby. MPM and MRL tbs – bp MA73C:A MCA LOGIC MNC MID 2 – OFF :B MNB MID 4 – OFF R13L PL BAY MECH PWR SYS 1,2 (two) – ON A6U RETEN LOGIC PWR SYS 1,SYS 2 (two) – ON Note single motor time (> 20 sec) ELC (AMS) RELEASE/LATCH – LATCH (tb-LAT), 40 sec max – OFF  PL RETEN LOGIC PWR SYS 1,SYS 2 (two) – OFF R13L BAY MECH PWR SYS 1,2 (two) – OFF	

ROEU CONTINGENCIES (Cont)

MATE ELC(AMS) ROEU ARM (Cont)

IV	EV
5. RELAX ROEU (EVA) If ELC: A6U PL RETEN PL SEL – 1 A6U Monitor RELAX tb Give EV GO to STOW arm, halt once RELAX tb – REL  6. ENABLE POWER MA73C:A :B MCA LOGIC MNC MID 2 – ON MNB MID 4 – ON If ELC: R1 PL PRI MNC – ON (tb-ON) L12L cb SW PWR 4 – cl SSP2 ELC3 PWR – ON √BUS 2/3 tb – UP √BUS 1 tb – UP If AMS: On MCC GO: A15 APCU 1 OUTPUT – ON NOTE The APCU CONV switches need to be thrown simo due to AMS startup loads APCU 1,2 CONV (two simo) – ON	2. RELAX ROEU (EVA) On IV GO, rotate control lever to STOW: Ratchet arm drive ccw until IV receives RELAX tb – REL. Remove drive ratchet 3. Reengage arm actuator: Rotate control lever to neutral posn Close, secure access cover (3/4 turn cw) Clear worksite

UCCAS/PAS UMBILICAL MATING ASSEMBLY (UMA) MANUAL DRIVE (00:20)

ESTIMATED TASK DURATION: 00:20

CAUTION

1. EVA override uses the same mechanism as the nominal drive - it does not bypass a jam and should not be used in a jammed case.

NOTE

If UMA drives part-way before failure, turn count must be obtained from OSO console. 6.053 IMCA turns = 1 EVA bolt turn. Full travel is 516 IMCA turns = ~ 85 EVA bolt turns.

IV/RMS	EV1/EV2
IV 1. Verify Inhibits.	NOTE Zenith UCCAS UMA is labeled: UMA ACTIVE-101. Nadir UCCAS UMA is labeled: UMA ACTIVE-102. Zenith Outboard PAS UMA is labeled: UMA ACTIVE-101. Zenith Inboard PAS UMA is labeled: UMA ACTIVE-102. Nadir Outboard PAS UMA is labeled: UMA ACTIVE-103. Nadir Inboard PAS UMA is labeled: UMA ACTIVE-104.
IV: 2. Check **MCC-H** for required turn count.	MANUALLY RETRACT UMA CONNECTOR 1. **PGT [A1, CCW2, MTL 30.5]-6 ext-7/16** 2. Engage EVA Override bolt on failed UMA _____ turns to turn count. 3. **PGT [A1, CCW1, MTL 30.5]-6 ext-7/16** 4. Engage EVA Override bolt on failed UMA four to five turns to torque stall. MANUALLY MATE UMA CONNECTOR 1. **PGT[A1, CW2, MTL 30.5]-6 ext-7/16** 2. Engage EVA Override bolt on failed UMA _____ turns to torque stall. 3. **PGT[A1, CW1, MTL 30.5]-6 ext-7/16** 4. Engage EVA Override bolt on failed UMA four to five turns to torque stall.

UCCAS/PAS UMBILICAL MATING ASSEMBLY (UMA) MANUAL DRIVE (00:20) (Cont)

TASK DATA

Table 1: Estimated Task Duration

	Without SSRMS
One EV Crew	0:20
Two EV Crew	N/A

Table 2: Tools

EV1 (RMS)
PGT
7/16 (wobble) Socket-6 ext

Table 3: EVA Fasteners

Fastener Name	Label	Head Size (in)	Qty	Drive Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
UMA EVA Override	EVA Override	7/16	1 ea	2.5	3.83	85 Refer to Note 1	30 10 for last four to five turns

Table 4: EVA ORU Lables

EVA Label	Location	Functional Designation
UMA ACTIVE – 0101	P3 Zenith UCCAS	UCCAS-1 UMA
UMA ACTIVE – 0102	P3 Nadir UCCAS	UCCAS-2 UMA
UMA ACTIVE – 0101	S3 Zenith Outboard PAS	PAS-1 UMA
UMA ACTIVE – 0102	S3 Zenith Inboard PAS	PAS-2 UMA
UMA ACTIVE – 0103	S3 Nadir Outboard PAS	PAS-3 UMA
UMA ACTIVE – 0104	S3 Nadir Inboard PAS	PAS-4 UMA

UCCAS/PAS UMBILICAL MATING ASSEMBLY (UMA) MANUAL DRIVE (00:20) (Cont)

Table 5: EVA ORU Inhibits

Location	UMA	RPCM
P3 Zenith	UCCAS-1 UMA (P3 Zenith)	P34B E RPC 01 – Open; Close command Inhibit
		P33A E RPC 01 – Open; Close command Inhibit
P3 Nadir	UCCAS-2 UMA (P3 Nadir)	P34B E RPC 02 – Open; Close command Inhibit
		P33A E RPC 02 – Open, Close command Inhibit
S3 Zenith Outboard	PAS-1 UMA (S3 Zenith Outboard)	S34BE RPC 01 – Open; Close command Inhibit
		S33A E RPC 01 – Open; Close command Inhibit
S3 Zenith Inboard	PAS-2 UMA (S3 Zenith Inboard)	S34B E RPC 02 – Open; Close command Inhibit
		S33A E RPC 02 – Open; Close command Inhibit
S3 Nadir Outboard	PAS-3 UMA (S3 Nadir Outboard)	S34BE RPC 03 – Open; Close command Inhibit
		S33A E RPC 03 – Open; Close command Inhibit
S3 Nadir Inboard	PAS-4 UMA (S3 Nadir Inboard)	S34BE RPC 04 – Open; Close command Inhibit
		S33A E RPC 04 – Open; Close command Inhibit

UCCAS/PAS UMBILICAL MATING ASSEMBLY (UMA) MANUAL DRIVE (00:20) (Cont)

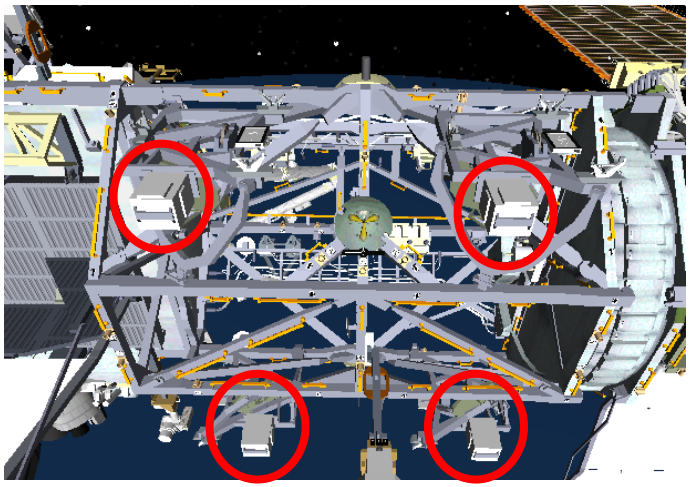


Figure 1.- S3 UMA Locations

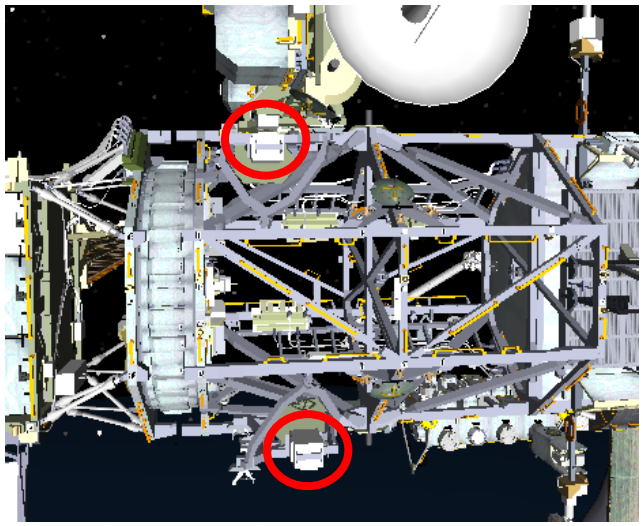


Figure 2.- P3 UMA Locations

Figure 3.- EVA Override Bolt

EXPCA R&R PROCEDURES (03:40)

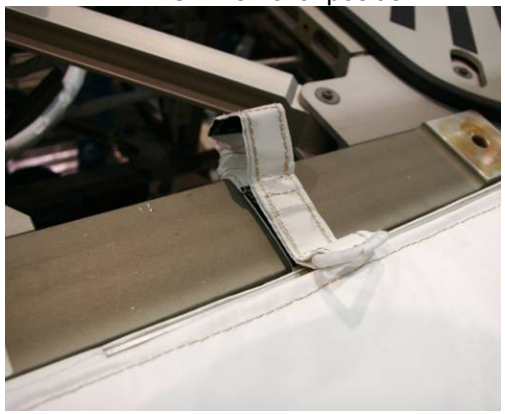
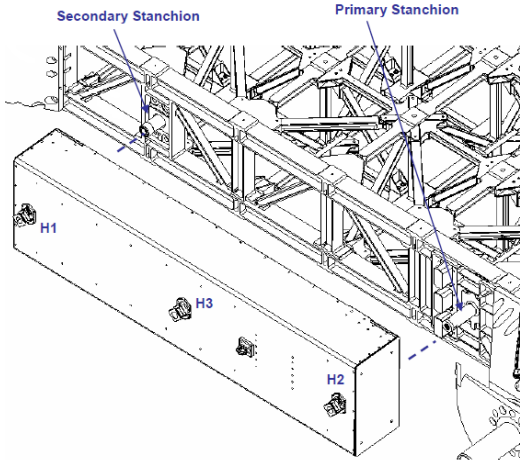
ESTIMATED TASK DURATION: 03:40

CAUTION
Avoid inadvertent contact with ExPCA – Z93 paint

NOTE

- ELCs have thermal clocks, need to do worksite specific analysis to determine
- ELC4 and ELC3 aft ExPCA locations have Velcro tabs on the ELCs for the ExPCA MLI. ELC4s ExPCA MLI was removed during STS-133
- H3 is an empty microconical – no bolt inside
- H2 is primary jacking bolt, H1 is secondary bolt
- H2 is nearest to the blind mate connectors
- Active UMA must be demated from ELC in addition to the inhibit
- ExPCA MLI may be required on failed ExPCA after the R&R

EXPCA R&R PROCEDURES (03:40) (Cont)

IV/SSRMS	EV1	EV2
1. Verify inhibits in place √Port SARJ locked (ELC3) √UMA demated	SSRMS SETUP (00:20) 1. Retrieve APFR 2. GCA SSRMS for APFR Install/Ingress 3. Install WIF adapter (tether point forward) 4. Install APFR [**TBD**] in WIF adapter 5. Perform Safety Tether swap to SSRMS 6. Ingress APFR	SPARE EXPCA SETUP (00:20) 1. Translate to aft side of ELC3 (spare ExPCA) 2. Tether to ExPCA MLI 3. Remove ELC2 ExPCA MLI (4 straps, 1 grounding strap) 4. Fold the structure Velcro straps (2 Stbd, 2 Port, 1 grounding strap) back to itself 5. Stow MLI in bag; use long wire tie, as required
SSRMS: On **EV1 GO**, mnvr to Failed ExPCA Removal position 	7. Give **SSRMS GO** to mnvr to Failed ExPCA Removal posn	6. Install scoop on H3 7. Install TM on H1 8. Configure PGT: **[A7 (9.2), CCW1, 30.5]** 9. Release H1 bolt 1 turn, 5 turns on PGT 10. Relocate TM from H1 to H2 11. Configure PGT: **[A7 (9.2), CCW1, 30.5]** 12. Release H2 bolt 1 turn, 5 turns on PGT 13. Remove TM and stow 14. Install scoop on H2
	EXPCA REMOVAL (00:45) 8. Install scoop on H3 and tether to ExPCA 9. Install TM on H1 10. Configure PGT: **[A7 (9.2), CCW1, 30.5]** 11. Release H1 bolt 1 turn, 5 turns on PGT 12. Relocate TM from H1 to H2, GCA SSRMS as reqd 13. Configure PGT: **[A7 (9.2), CCW1, 30.5]** 14. Release H2 bolt 1 turn, 5 turns on PGT 15. Remove TM and stow or transfer to EV2 16. Install scoop on H2	EXPCA REMOVAL (00:45) 15. Translate to failed ExPCA 16. Assist EV1 as required

IV/SSRMS	EV1	EV2
	17. Configure PGT: **[A7 (9.2), CCW2, 30.5]** 6-in ext 7/16 18. Release H1 bolt ~ 4 turns 19. Release H2 bolt ~15 turns 20. Remove failed ExPCA from stanchions and temp stow with EV2 assistance	
SSRMS: On **EV1 GO**, mnvr to Spare ExPCA Retrieve position	<u>SPARE EXPCA REMOVAL</u> (00:45) 21. Give **SSRMS GO** to mnvr to Spare ExPCA Retrieve posn 22. Tether to ExPCA 23. Configure PGT: **[A7 (9.2), CCW2, 30.5]** 6-in ext 7/16 24. Release H1 bolt ~ 4 turns 25. Release H2 bolt ~15 turns 26. Remove spare ExPCA from stanchions	<u>EXPCA REMOVAL</u> (00:45) 17. Assist EV1 as required
SSRMS: On **EV1 GO**, mnvr to Spare ExPCA Install position	27. Give **SSRMS GO** to mnvr to Spare ExPCA Install posn	
2. Record bolt data: **Bolt** / **Torque** / **Turns** H2 H1	<u>SPARE EXPCA INSTALL</u> (00:45) 28. Install spare ExPCA; align on stanchions, GCA as reqd (ball plunger on H2 ~5 lb soft dock) 29. Configure PGT: **[B7 (25.5), CW2, 30.5]** 6-in ext 7/16 30. Drive H2 bolt 14-16 turns 31. Drive H1 bolt 4-5 turns 32. Release scoops from H3 and H2 and stow 33. Release RET	<u>SPARE EXPCA INSTALL</u> (00:45) 18. For ELC4 site, verify MLI velcro tabs clear of interface 19. Assist EV1 as required
SSRMS: On **EV1 GO**, mnvr to Failed ExPCA Install position	<u>FAILED EXPCA INSTALL</u> (00:45) 34. Retrieve failed ExPCA from temp stow location, GCA SSRMS as reqd 35. Give **SSRMS GO** to mnvr to Failed ExPCA Install posn (ELC3 aft side)	<u>FAILED EXPCA INSTALL</u> (00:45) 20. At ELC3 aft site, verify MLI Velcro tabs clear of interface 21. Assist EV1 as required

EXPCA R&R PROCEDURES (03:40) (Cont)

<table>
<tr><th>IV/SSRMS</th><th>EV1</th><th>EV2</th></tr>
<tr>
<td>3. Record bolt data:
<table><tr><th>Bolt</th><th>Torque</th><th>Turns</th></tr><tr><td>H2</td><td></td><td></td></tr><tr><td>H1</td><td></td><td></td></tr></table>
SSRMS: On EV1 GO, mnvr to APFR Egress position</td>
<td>36. Install failed ExPCA; align on stanchions (ball plunger on H2 ~5 lb soft dock)
37. Configure PGT:
[B7 (25.5), CW2, 30.5] 6-in ext 7/16
38. Drive H2 bolt 14-16 turns
39. Drive H1 bolt 4-5 turns

40. Release scoops from H3 and H2 and stow
41. Release RET

<u>SSRMS CLEANUP</u> (00:20)
42. Give SSRMS GO to mnvr to APFR egress position
43. Egress APFR
44. Retrieve and stow APFR
45. Retrieve WIF adapter
46. Perform tether swap back to A/L tether

47. Glove Check</td>
<td></td>
</tr>
</table>

EXPCA R&R PROCEDURES (03:40) (Cont)

TASK DATA

Table 1: Estimated Task Duration

	Without SSRMS	With SSRMS
One EV Crew	N/A	04:00
Two EV Crew	N/A	03:40

Table 2: Tools

EV1 (RMS)	EV2 (FF)
PGT	PGT
7/16 (wobble) Socket-6 ext	7/16 (wobble) Socket-6 ext
2 Square Scoops	2 Square Scoops
Square TM w/Recessed 7/16 bolt	Square TM w/Recessed 7/16 bolt

Table 3: EVA Fasteners

Fastener Name	Label	Head Size (in)	Qty	Install Torque (ft-lb)	Removal Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Primary bolt	H2	7/16	1	9.2	9.2	104.4	14-16	10 w/TM; 30 w/out
Secondary bolt	H1	7/16	1	9.2	9.2	104.4	4-6	10 w/TM; 30 w/out

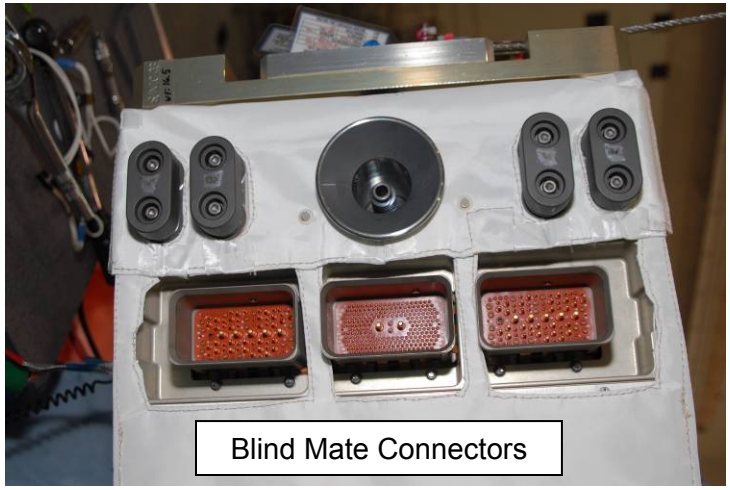
Table 4: ORU Details

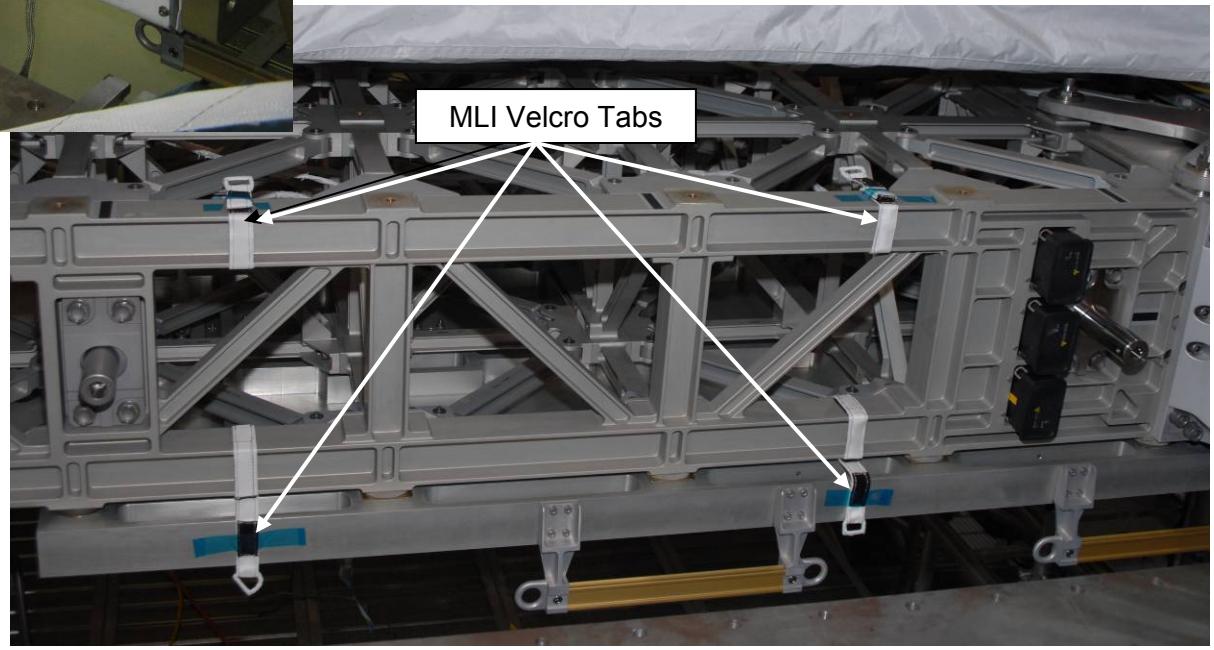
ORU	Part Number	Mass (lb)
ExPCA	2091750	197 lb

Table 5: EVA ORU Inhibits – Active UMA must also be demated from the ELCs in addition to the inhibits below:

Failed ExPCA Location	Inhibit
ELC1	TBD
ELC2	TBD
ELC3	TBD
ELC4	TBD
Spare ExPCA – ELC3	TBD

EXPCA R&R PROCEDURES (03:40) (Cont)





AMS CAPTURE BAR MANUAL RELEASE/INSTALL (01:00)

ESTIMATED TASK DURATION: 01:00

CAUTION
Do not exceed 60 RPM and 5 ft-lb when driving interface knob.
Avoid AMS Star Trackers Baffles - possible sharp edge.

NOTE

1. The ELC Capture Bar Manual Release procedure is performed only if release is not achieved by CLA Manual Drive procedure.

2. The anti-rotation mechanisms on the Load Release bolts may be stiff and require additional force on socket to disengage.

AMS CAPTURE BAR MANUAL RELEASE/INSTALL (01:00) (Cont)

IV	EV1 (FF)	EV2 (FF)
1. Verify CLA power off, UMA disconnected, and SSRMS grappled to AMS in Limp mode.	AMS CAPTURE BAR MANUAL RELEASE (00:30) 1. **PGT [A5 (7.0 ft-lb), CW2 (30 RPM), 30.5]-6" Ext-7/16:** Drive Load Release Bolt #1, 20 turns. 2. **PGT [A5 (7.0 ft-lb), CW2 (30 RPM), 30.5]-6" Ext-7/16:** Drive Load Release Bolt #2, 40 turns. **3. PGT [A5 (7.0 ft-lb), CW2 (30 RPM), 30.5]-6" Ext-7/16:** Drive Load Release Bolt #1, 40 turns. 4. **PGT [A5 (7.0 ft-lb), CW2 (30 RPM), 30.5]-6" Ext-7/16:** Drive Load Release Bolt #2, 40 turns. 5. **PGT [A5 (7.0 ft-lb), CW2 (30 RPM), 30.5]-6" Ext-7/16:** Drive Load Release Bolt #1, 20 turns. 6. Verify capture bar clear of CLA. 7. On **EV2 GO**, give **IV GO** for AMS removal.	AMS CAPTURE BAR MANUAL RELEASE (00:30) 1. Assist EV1 as reqd. 2. Translate to aft side of PCAS. 3. Pull Capture Bar out and rotate up/out through the Keel 4. Give **EV1 GO** for AMS removal when clear.
2. Give **SSRMS GO** for AMS removal. Prior to remating AMS to a CAS, perform capture bar restow.	AMS CAPTURE BAR RESTOW (00:30) NOTE The following steps are required to restow AMS on a CAS site. 8. **PGT [A3 (4.8 ft-lb), CCW2 (30 RPM), 30.5]-6" Ext-7/16:** Drive Load Release Bolt #1, 20 turns. 8. **PGT [A3 (4.8 ft-lb), CCW2 (30 RPM), 30.5]-6" Ext-7/16:** Drive Load Release Bolt #2, 40 turns. 9. **PGT [A3 (4.8 ft-lb), CCW2 (30 RPM), 30.5]-6" Ext-7/16:** Drive Load Release Bolt #1, 40 turns. 10. **PGT [A3 (4.8 ft-lb), CCW2 (30 RPM), 30.5]-6" Ext-7/16:** Drive Load Release Bolt #2 to torque stall, expect 40 turns. 11. **PGT [A3 (4.8 ft-lb), CCW2 (30 RPM), 30.5]-6" Ext-7/16:** Drive Load Release Bolt #1 to torque stall, expect 20 turns. 12. Inspect EMU gloves.	AMS CAPTURE BAR RESTOW (00:30) NOTE The following steps are required to restow AMS on a CAS site. 5. Push capture bar in/down into the locking slot, then into the installed position 6. Visually inspect capture bar to ensure it is fully seated in the installed position. 7. Inspect EMU gloves

AMS CAPTURE BAR MANUAL RELEASE/INSTALL (01:00) (Cont)

TASK DATA

Table 1: Estimated Task Duration

	Without SSRMS	With SSRMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	01:00

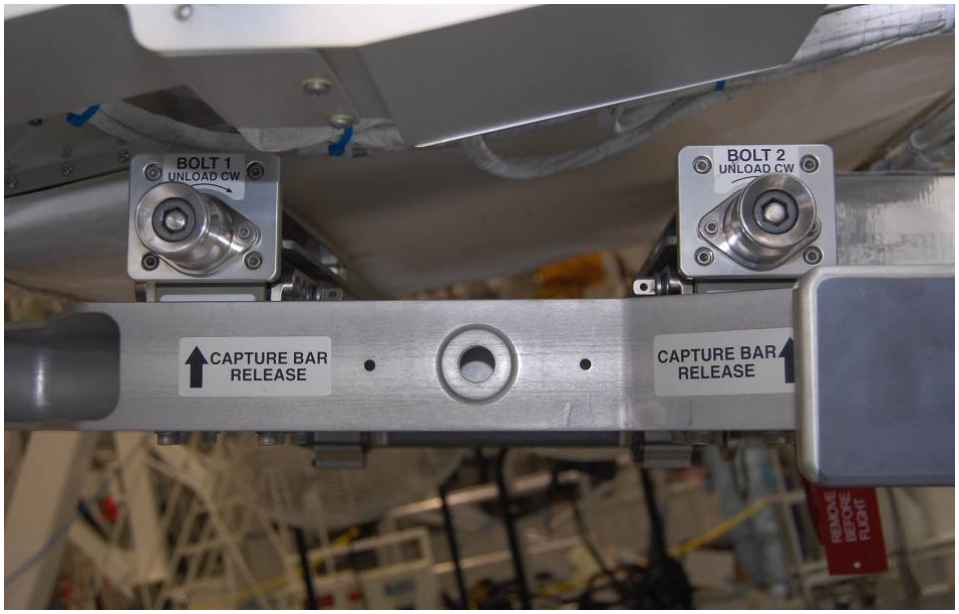
Table 2: Tools

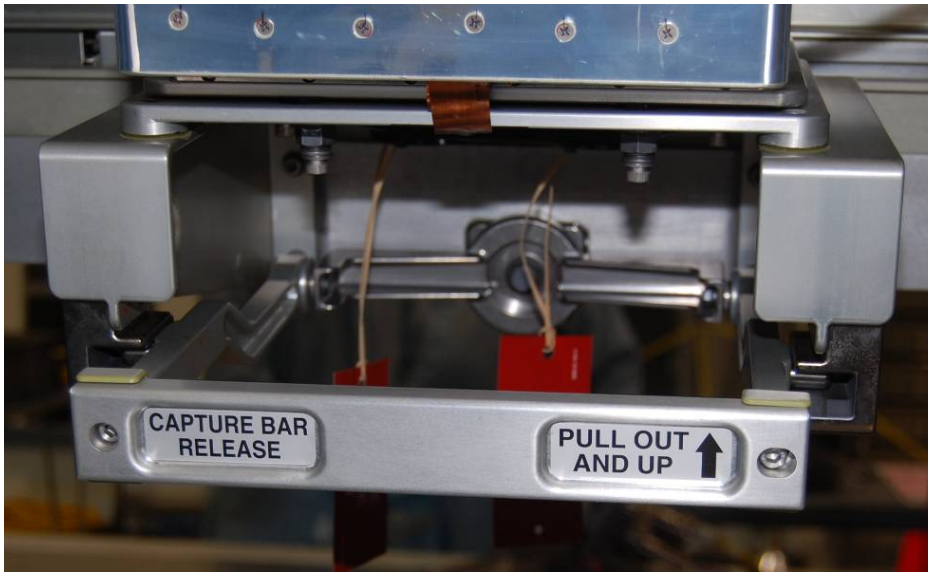
EV1
PGT
7/16 (wobble) Socket-6 ext

Table 3: EVA Fasteners

Fastener Name	Label	Head Size (in)	Qty	Install Torque (ft-lb)	Removal Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Capture Bar Release Bolt	Bolt 1	7/16	1	4.8	7.0	19.4	81	30
Capture Bar Release Bolt	Bolt 2	7/16	1	4.8	7.0	19.4	81	30

AMS CAPTURE BAR MANUAL RELEASE/INSTALL (01:00) (Cont)

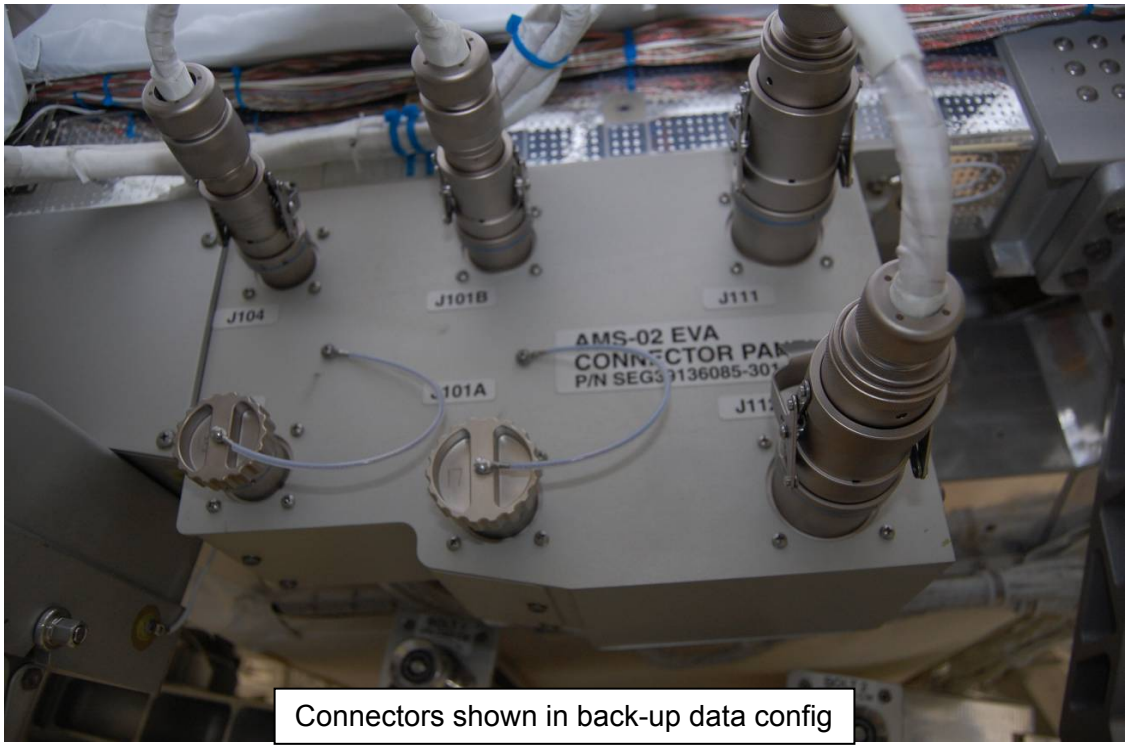




MANUALLY SWITCH AMS DATA CHANNELS

ESTIMATED TASK DURATION: 00:30

IV	EV1/EV2
1. Verify Inhibits. RPCMs Demate UMA	MANUALLY SWITCH AMS DATA CHANNELS 1. Translate to EVA Interface Panel 2. Remove cap from J104 3. Disconnect connector P103 4. Mate connector to J104 5. Install cap on J103 6. Remove cap from J101B 7. Disconnect connector P101A 8. Mate connector to J101B 9. Install cap on J101A



Connectors shown in back-up data config

MANUALLY SWITCH AMS DATA CHANNELS (Cont)

TASK DATA

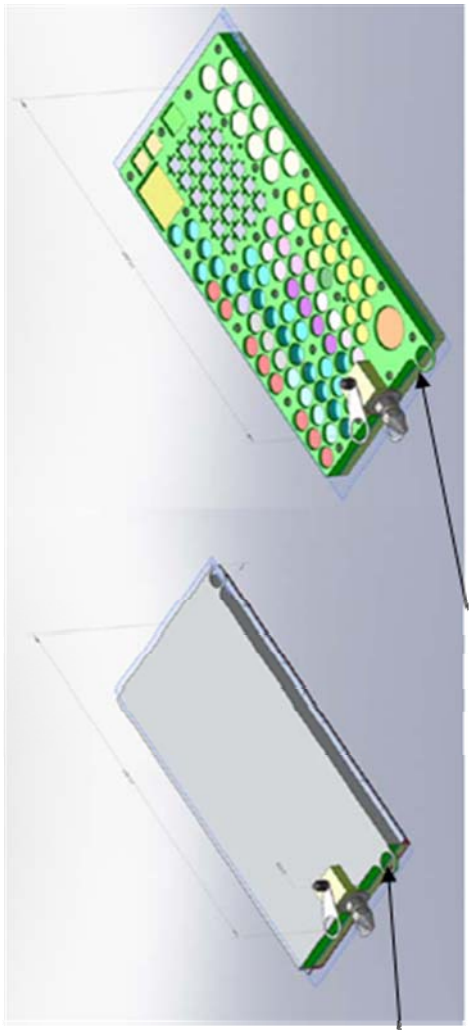
Table 1: Estimated Task Duration

	Without SSRMS	With SSRMS
One EV Crew	00:30	N/A
Two EV Crew	N/A	N/A

Table 2: EVA Connectors

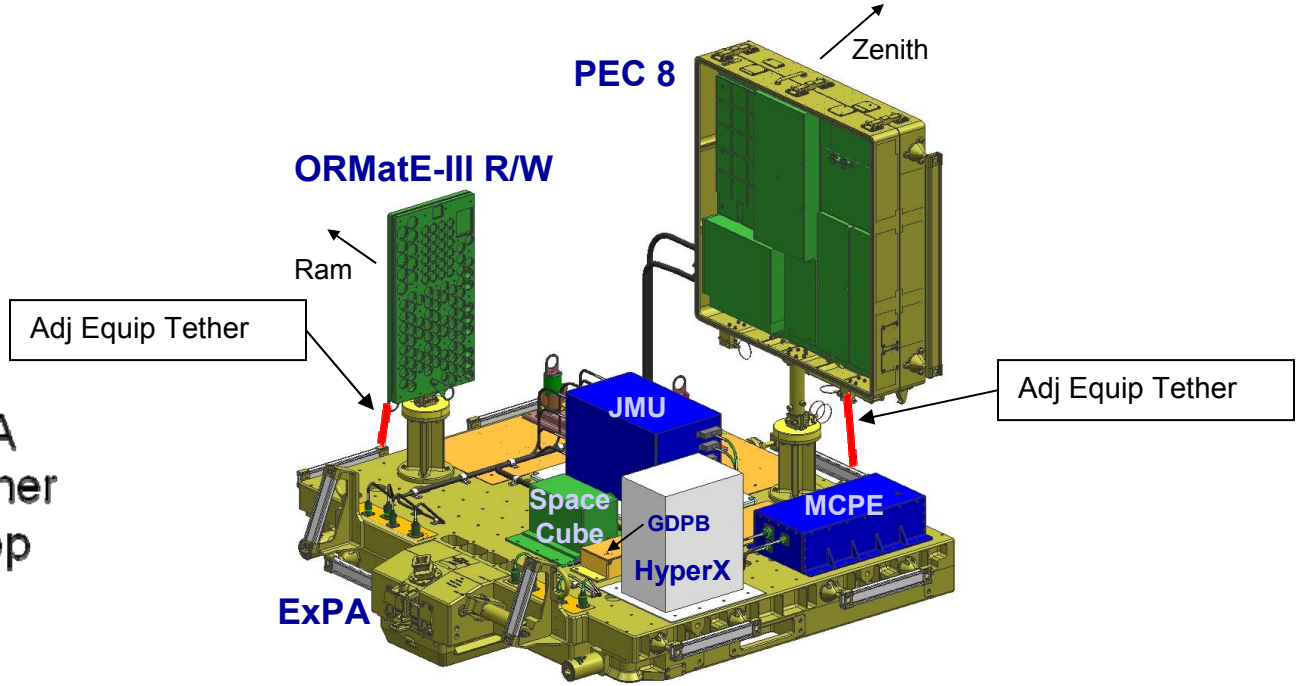
Connector	From	To	Conn Size	Function
P103	J103	J104	15	Data
P101	J101A	J101	15	Data
P111	J111	-	25	Power
P112	J112	-	25	Power

MISSE 8 AND ORMATE-III TIEDOWNS

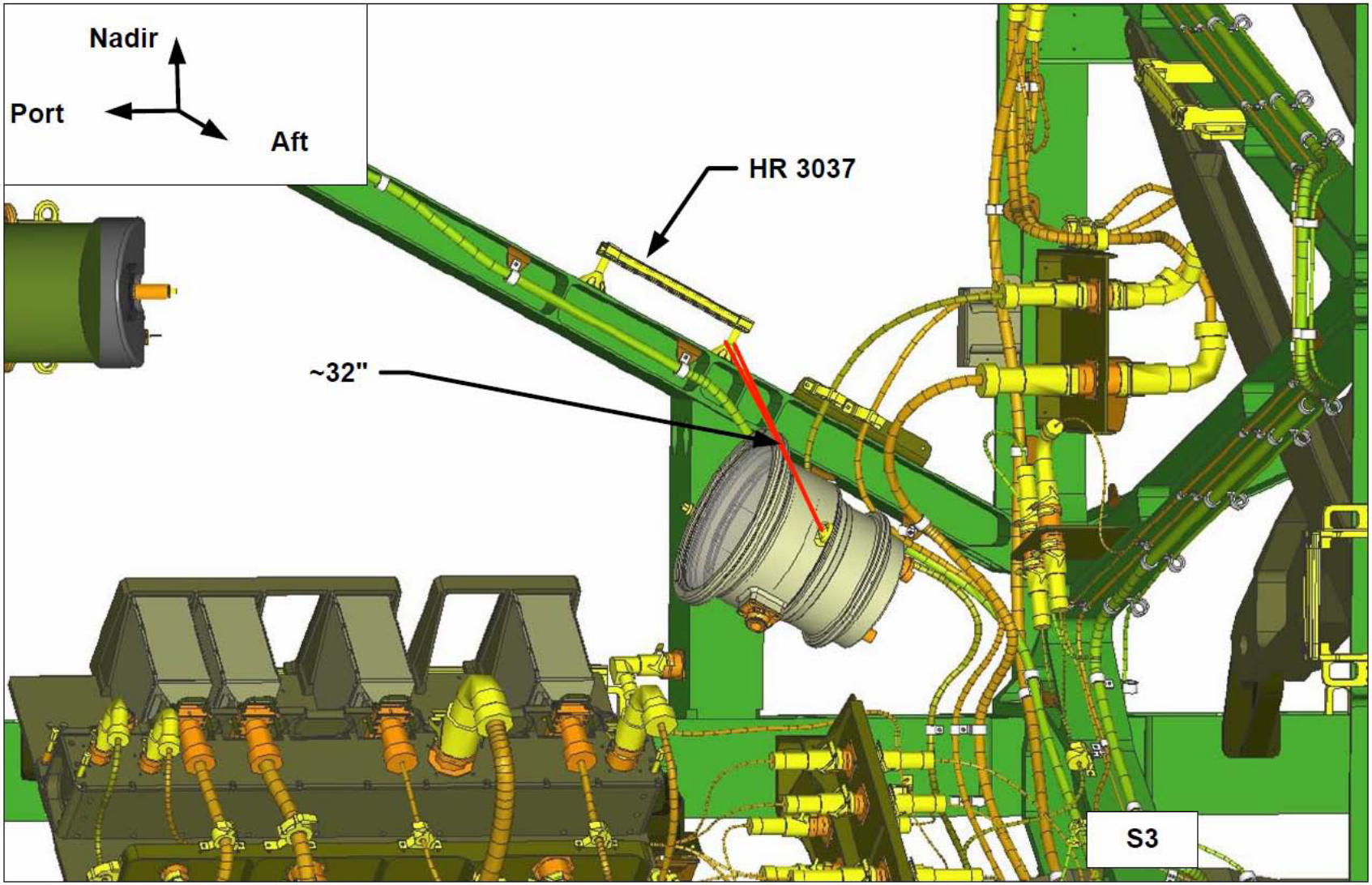


EVA Tether Loop

EVA Tether Loop

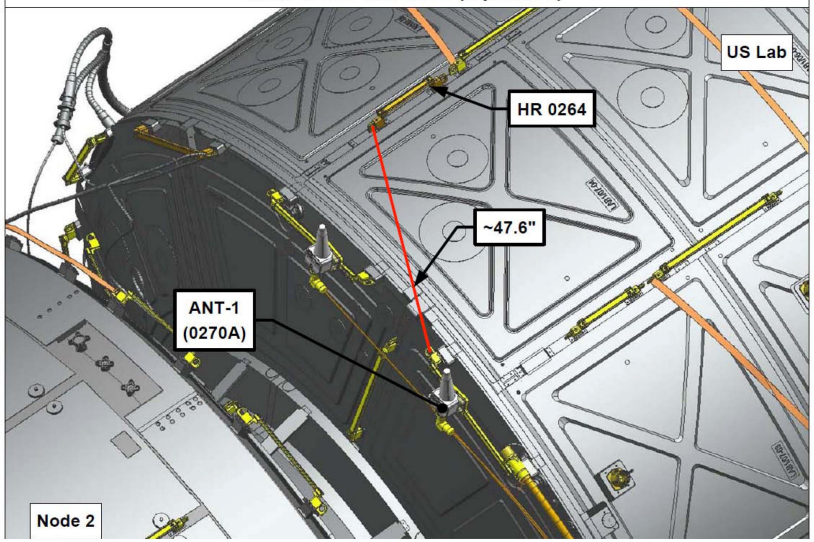


S3 CETA LIGHT TIEDOWN



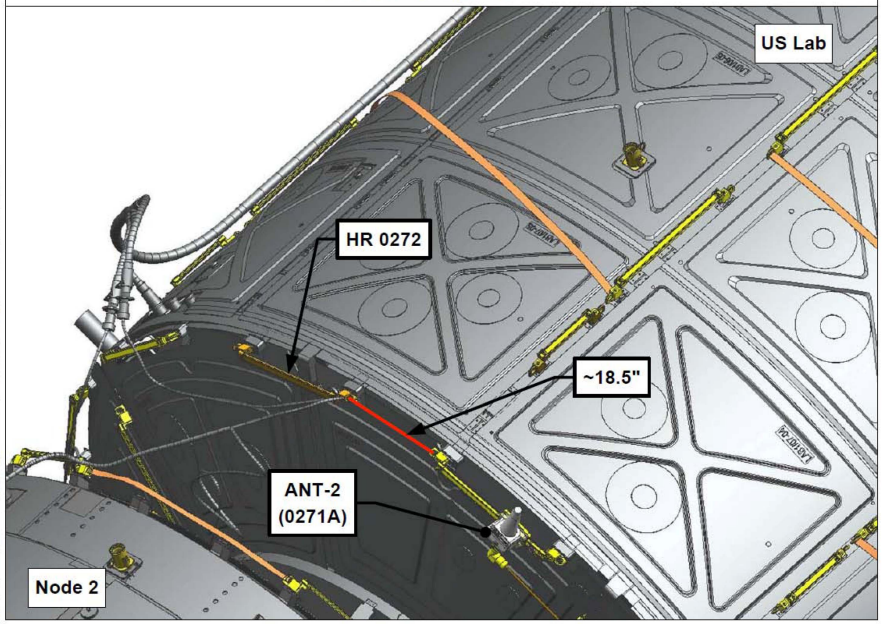
EWC ANTENNA HANDRAILS TIEDOWN

ANT-1 TO HR 0264 (Option 1)

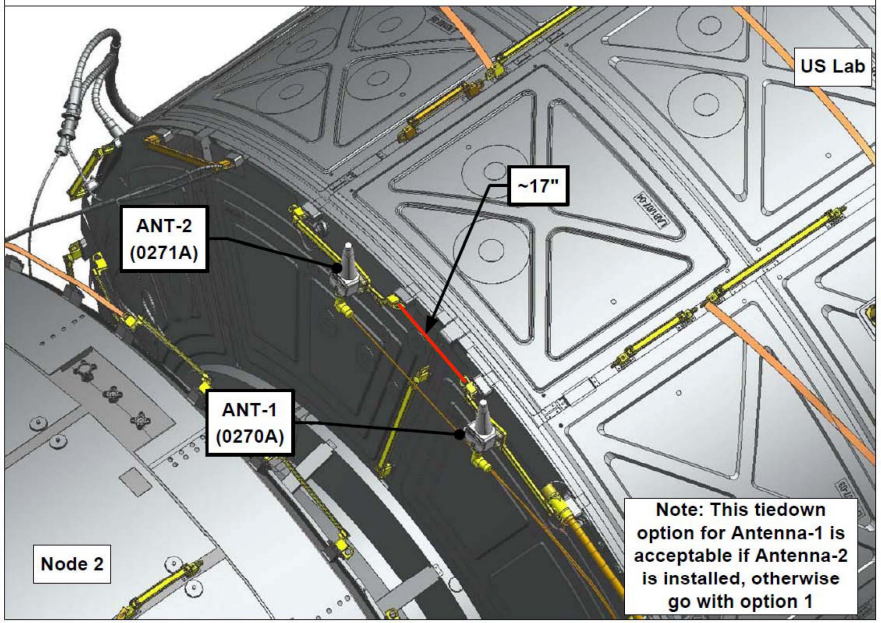


Option 1 is only if there is no Handrail fully installed in HR 0271 position
2 AETs will be used in series for the 47" span

ANT-2 TO HR 0272



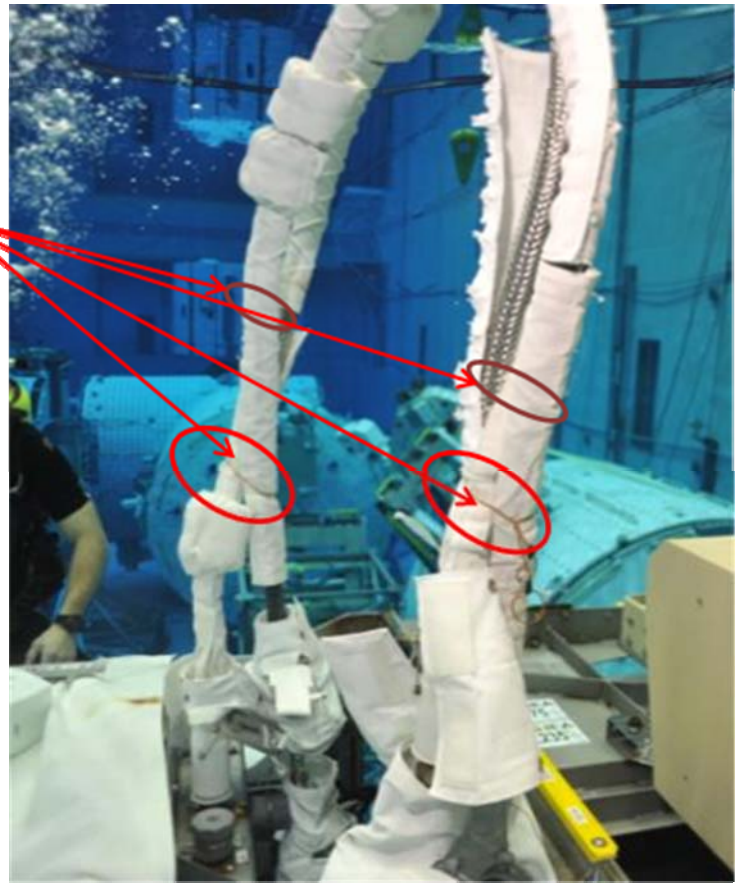
ANT-1 TO ANT-2 (Option 2)



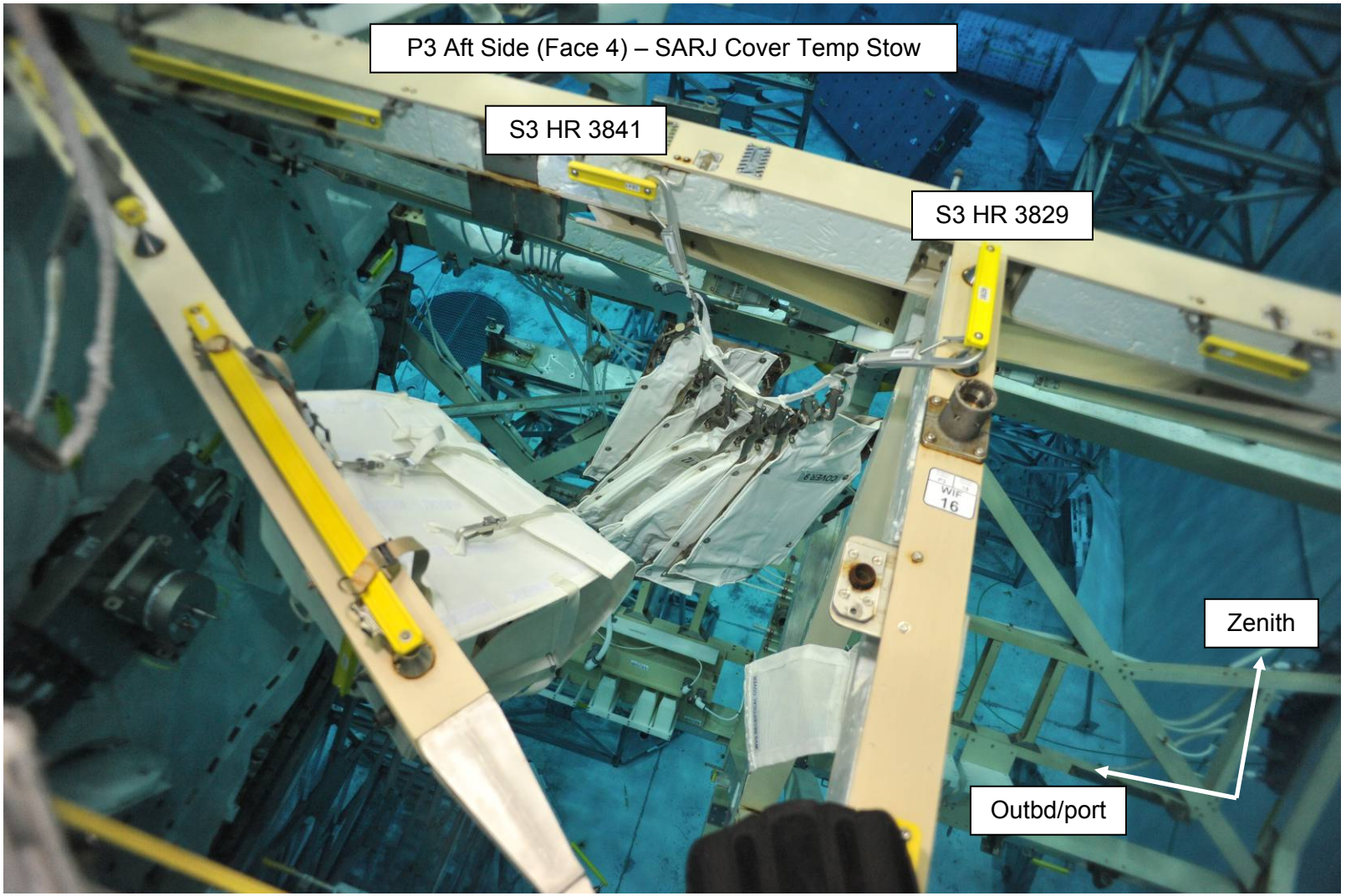
EAS JUMPER TIEDOWN

Approximate Wire Tie Locations (Qty 4)

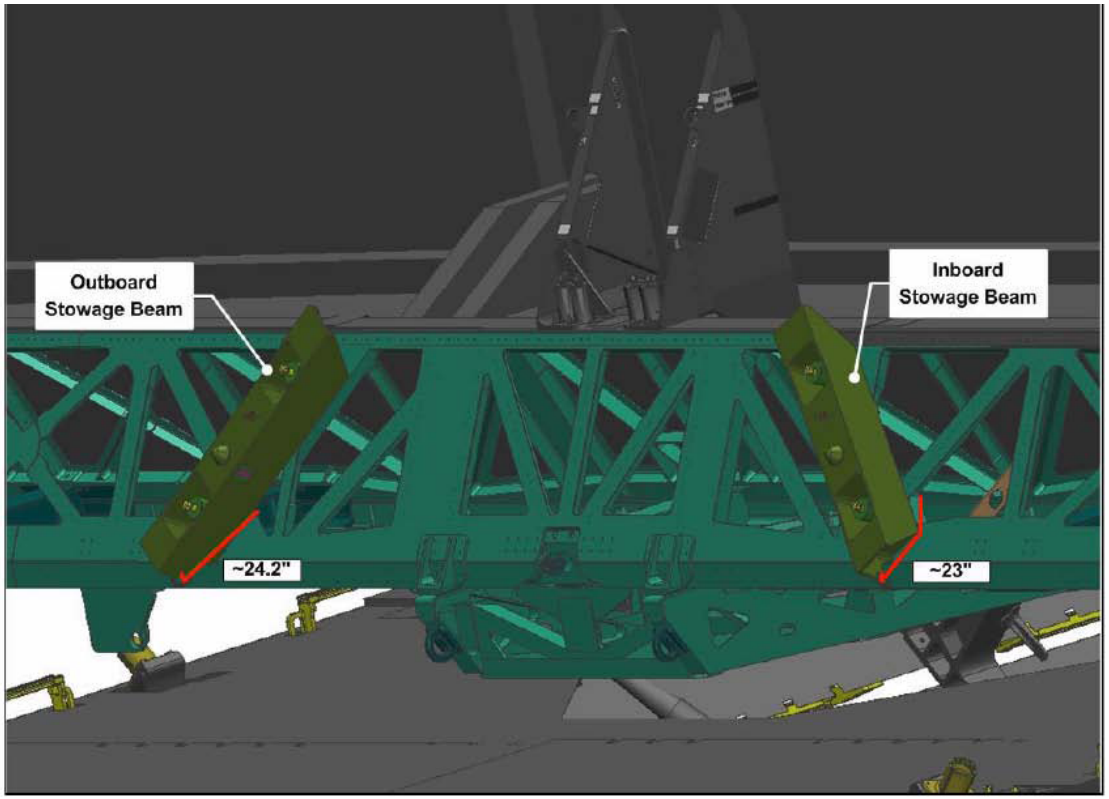
- Lower Wire Ties should be located ~1 ft from connectors
- Upper Wire Ties should be located ~1.5 ft from lower ties (as shown)

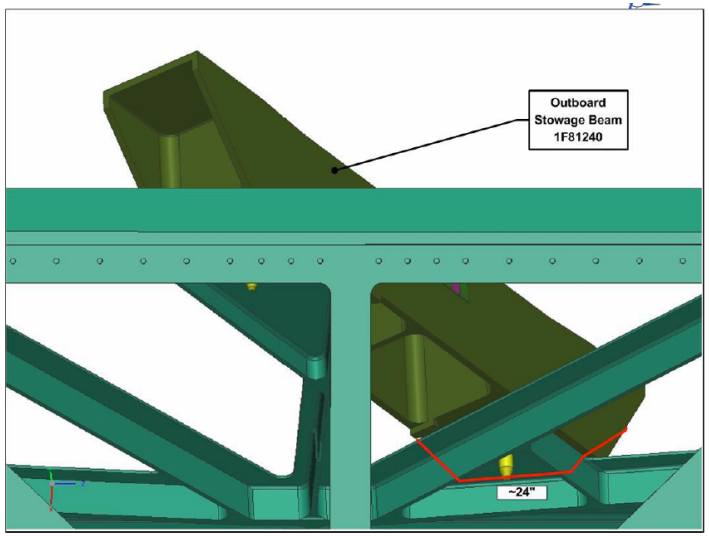


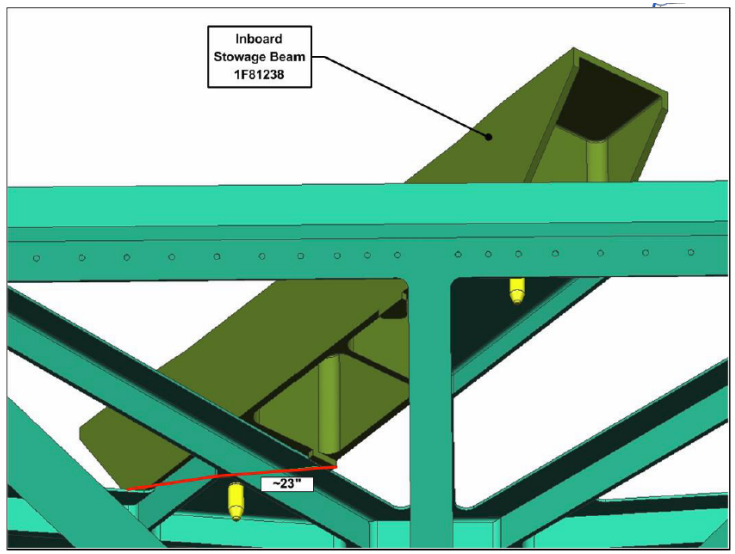
SARJ COVERS TIEDOWN



S1 RADIATOR GB STOW BEAMS TIEDOWN







PAMA/PDGF TIEDOWN

IV	EV1/EV2
Lock 1 installed	1. Retrieve Russian tethers (2 Adj, 1 Fixed) from Staging Bag 2. If only one PAMA foot fully engaged, T-handle locked: Use 2 Russian adjustable tethers in criss cross pattern from PAMA handholds 2 and 3 to FGB HR 1010 

PAMA/PDGF TIEDOWN (Cont)

IV	EV1/EV2
Locks 1 and 2 installed	3. If two PAMA feet fully engaged, T-handles locked: Use 1 Russian adjustable tether from PAMA handhold 3 diagonally to FBG HR 1010 

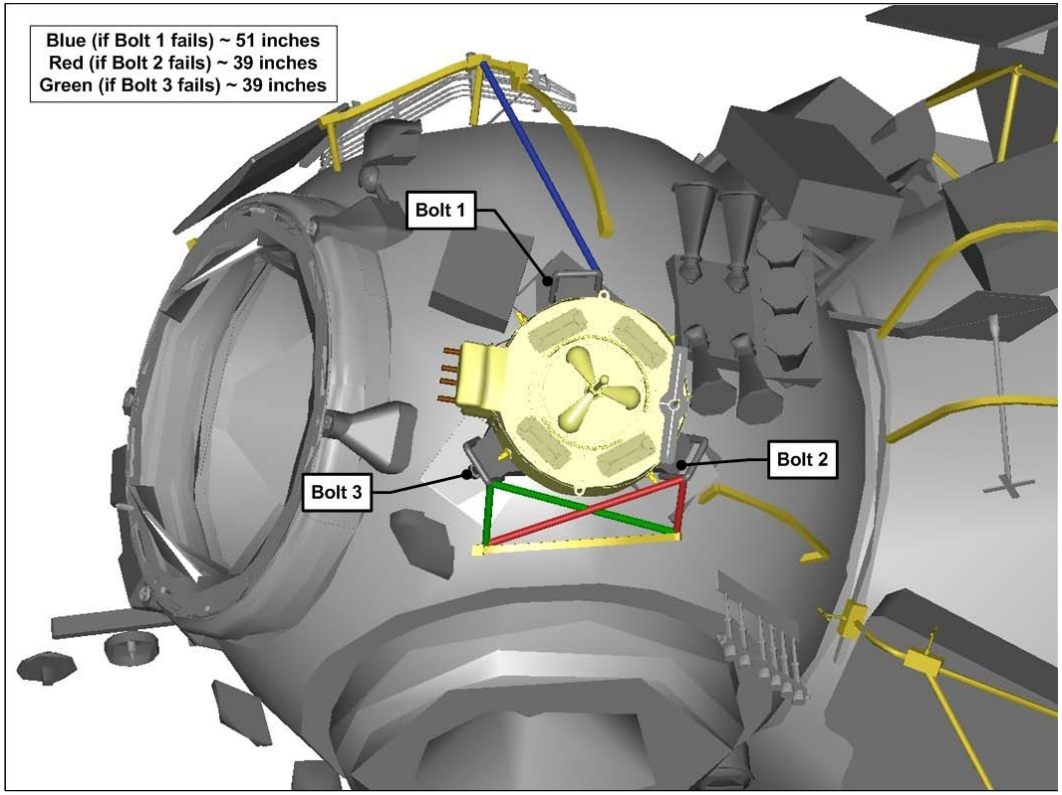
PAMA/PDGF TIEDOWN (Cont)

IV	EV1/EV2
Locks 1 and 3 installed	Use 1 Russian adjustable tether from PAMA handhold 2 diagonally to FGB HR 1010 

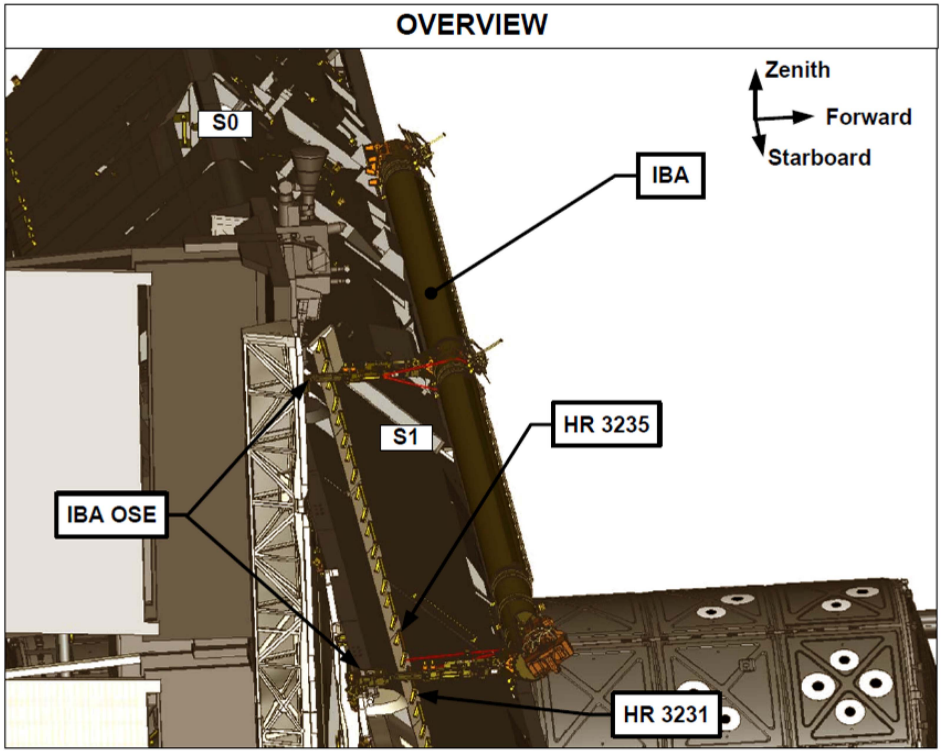
PAMA/PDGF TIEDOWN (Cont)

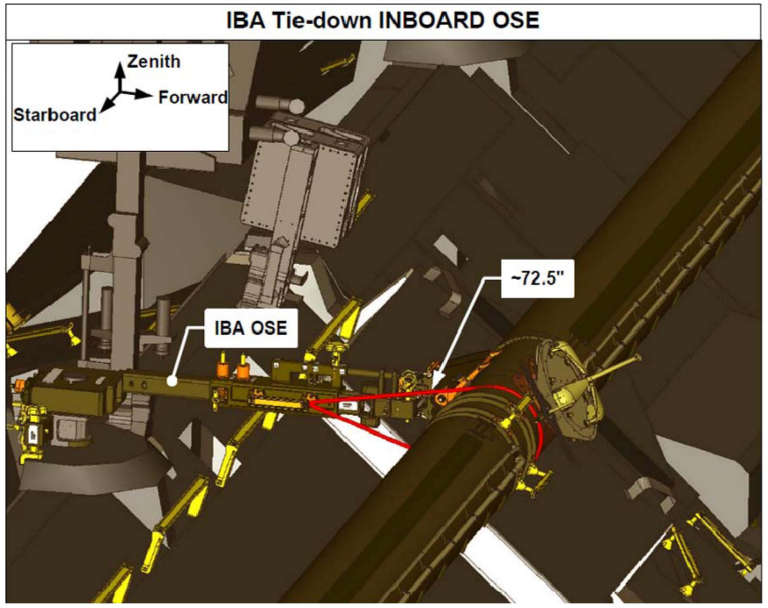
IV	EV1/EV2
Locks 2 and 3 installed	Use 1 Russian adjustable tether and 1 Russian fixed length tether in series from PAMA handhold 1 to FGB HR 1030 a. Fixed tether – both hooks to PAMA handhold 1 b. Adjustable tether – one hook to fixed tether strap, one hook to FGB HR 1010  

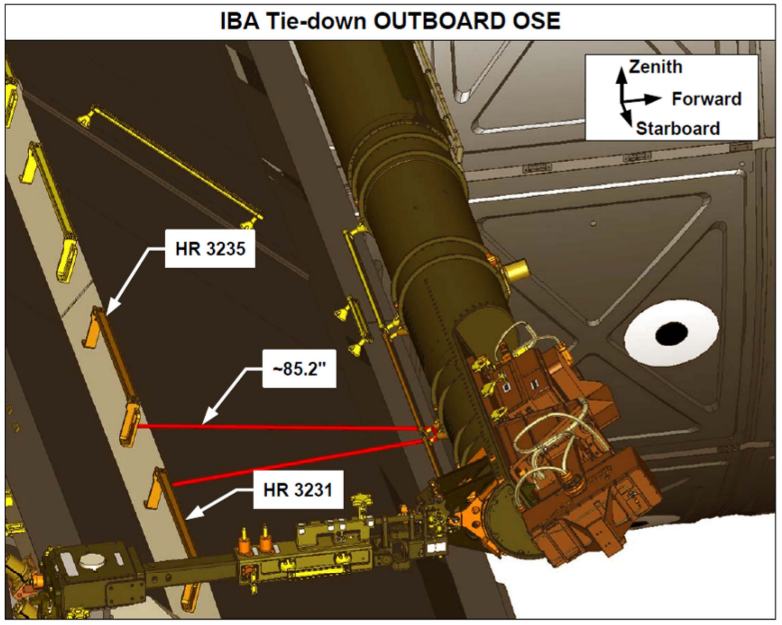
PAMA/PDGF TIEDOWN (Cont)



OBSS (IBA) TIEDOWN IN OSE



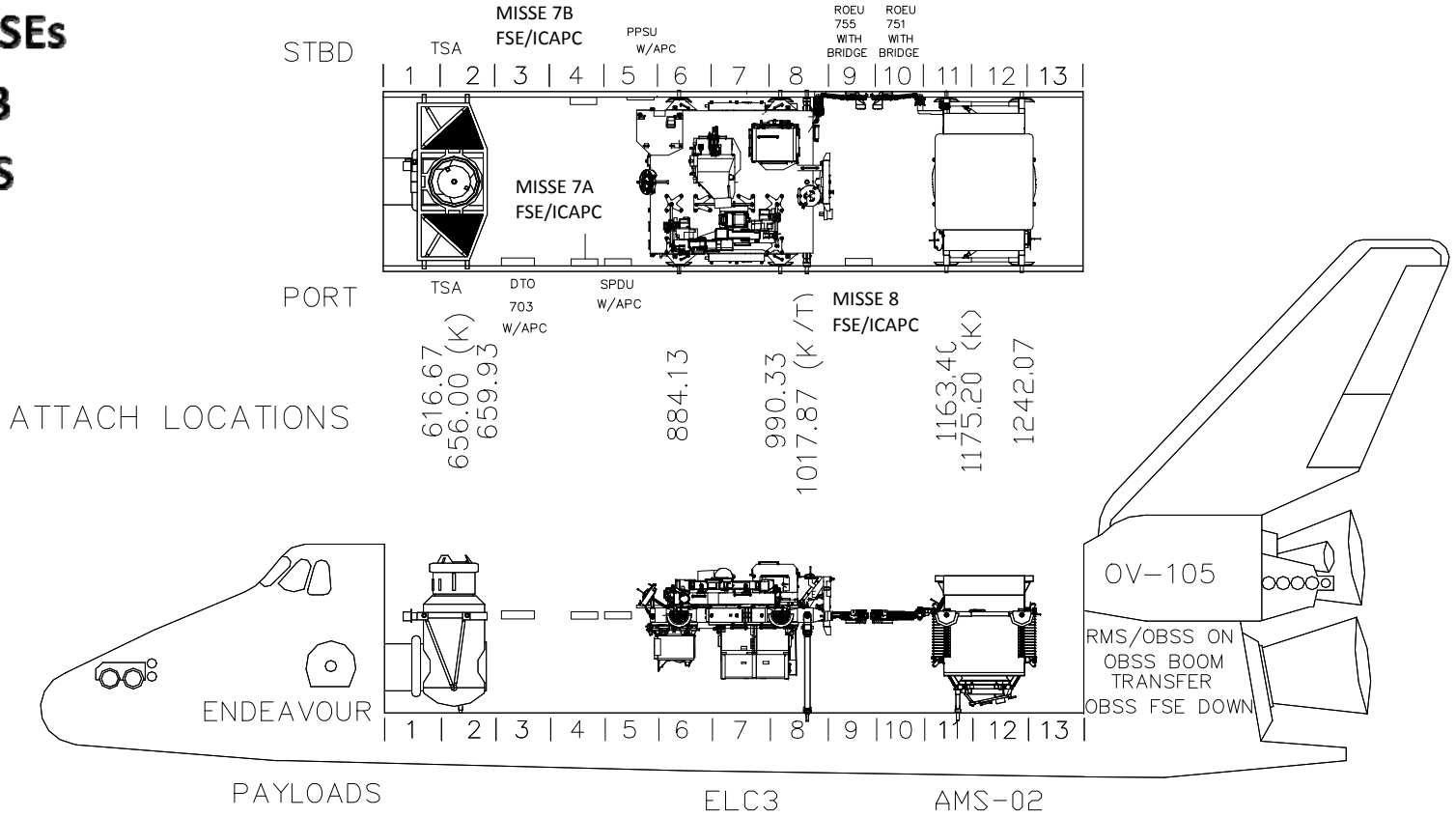




PAYLOAD BAY LAYOUT ..... FS 18-2
ELC3 ..... FS 18-4
AMS ..... FS 18-7
ROEU ..... FS 18-13
PRLA ..... FS 18-15
EVA 1
ELC2 ExPA ..... FS 18-16
MISSE 7 ..... FS 18-17
MISSE 8 ..... FS 18-19
LAB EWC ANTENNAS ..... FS 18-21
MMOD SHIELD DZUS FASTENERS ..... FS 18-25
P6 PVTCS FILL ..... FS 18-27
EVA 2
PORT SARJ LUBE ..... FS 18-28
SPDM LEE LUBE ..... FS 18-29
S1 RADIATOR GRAPPLE BAR STOWAGE BEAMS ..... FS 18-30
EVA 3
FGB PAMA/PDGF ..... FS 18-32
VSC ..... FS 18-34
NOD1/FGB CH1/4 AND CH2/3 CABLES ..... FS 18-35
EVA 4
OBSS ..... FS 18-38
PDGF ..... FS 18-41
EFGF/PAA ..... FS 18-43
PORT TSA ..... FS 18-44
SPARE SPDM ..... FS 18-45

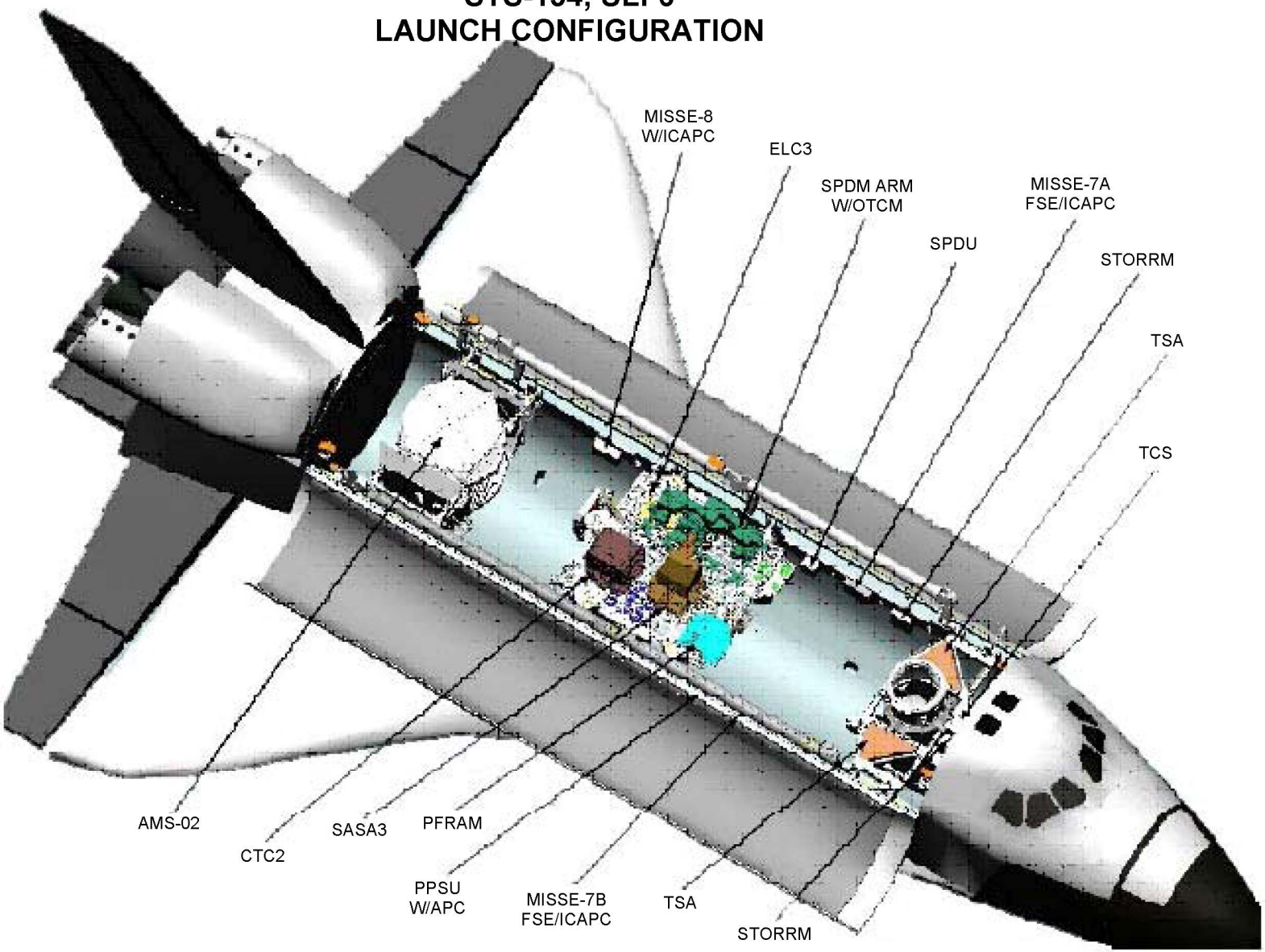
PAYLOAD BAY LAYOUT

- ODS
- STORRM
- MISSEs
- ELC3
- AMS

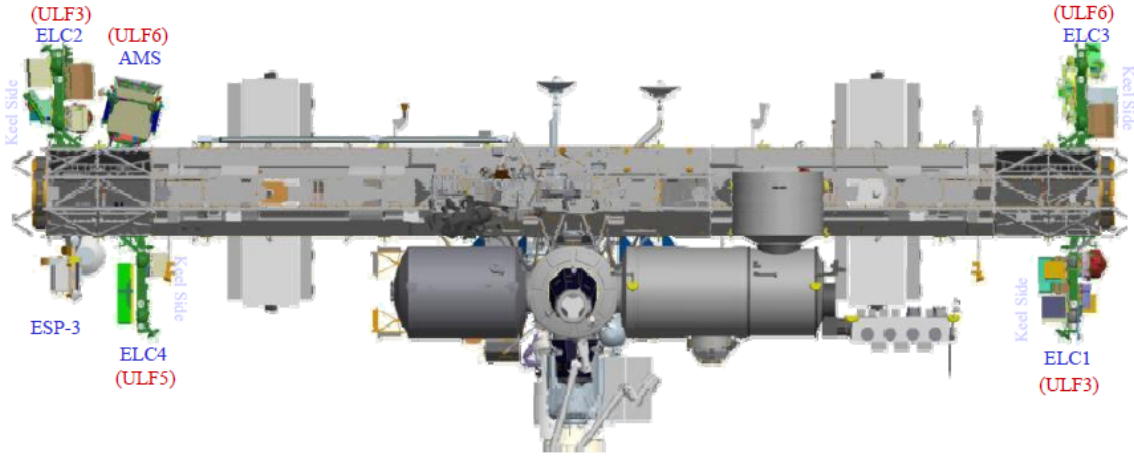


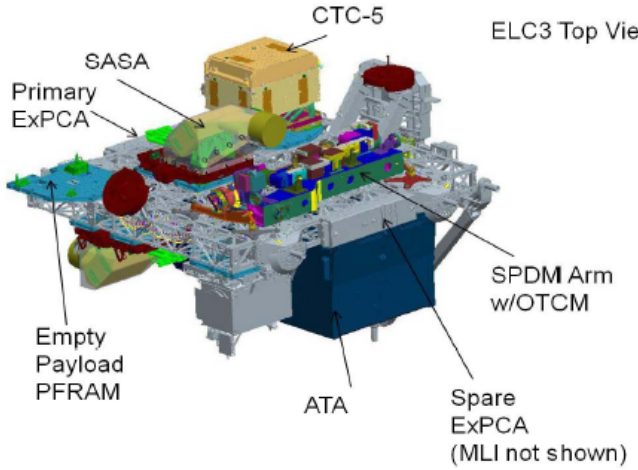
PAYLOAD BAY LAYOUT (Cont)

STS-134, ULF6
LAUNCH CONFIGURATION



ELC3

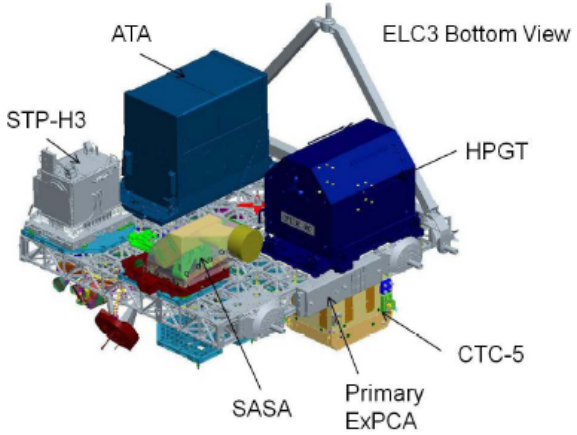




ELC3 Top View

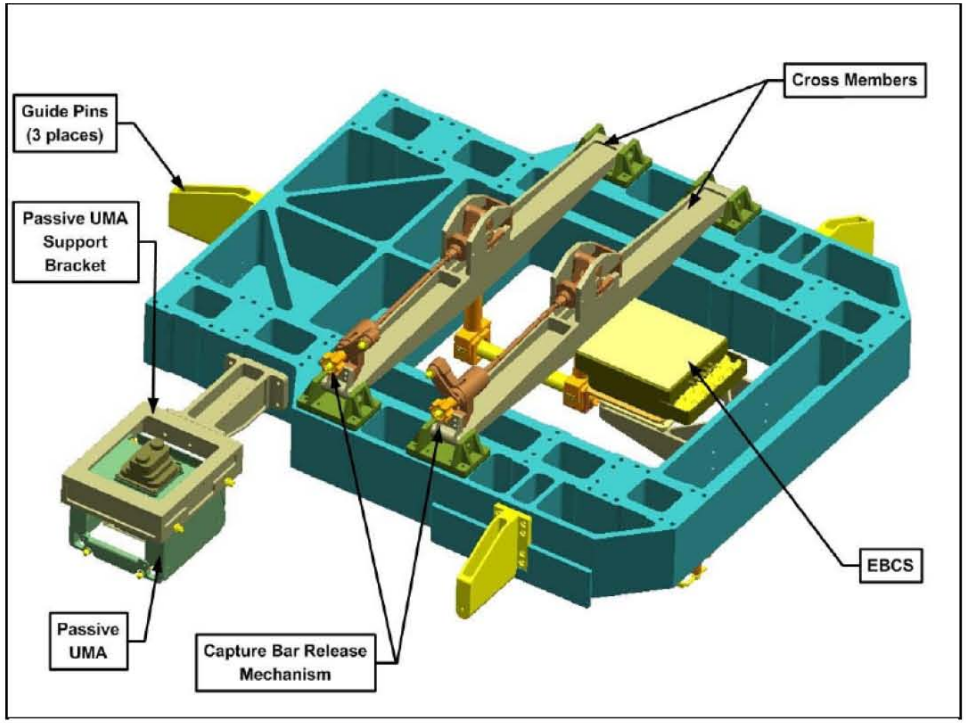
Pre-Positioned Spares:
SPDM ARM with Direct Mount FSE
HPGT with Direct Mount FSE
ATA with Direct Mount FSE
2 SASAs with SAPA FSE
CTC with 10 RPCMs, ACU

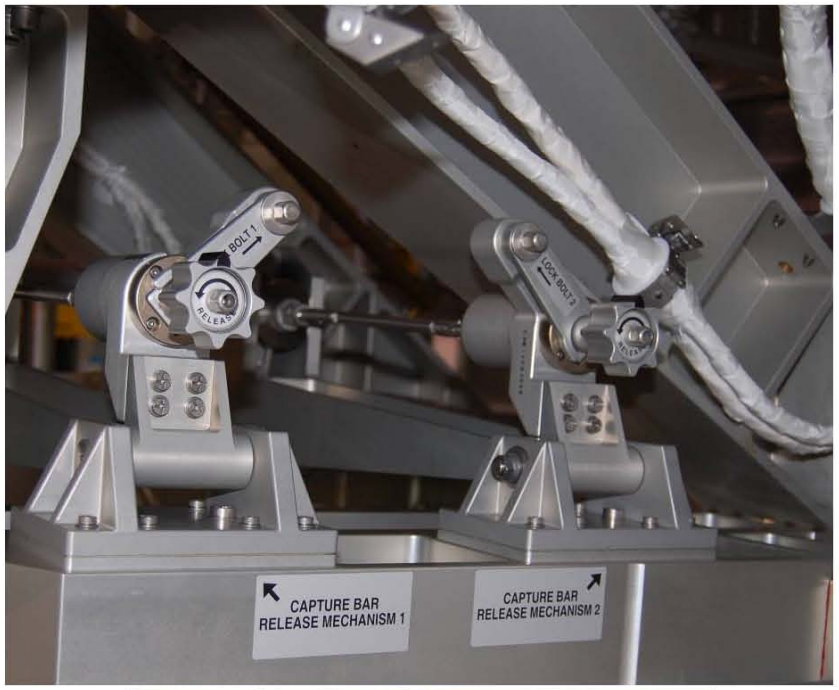
Utilization:
STP-H3 with EXPA FSE (returning on SpaceX)
Empty Payload PFAP site for future SCAN payload (HTV3)



ELC3 Bottom View

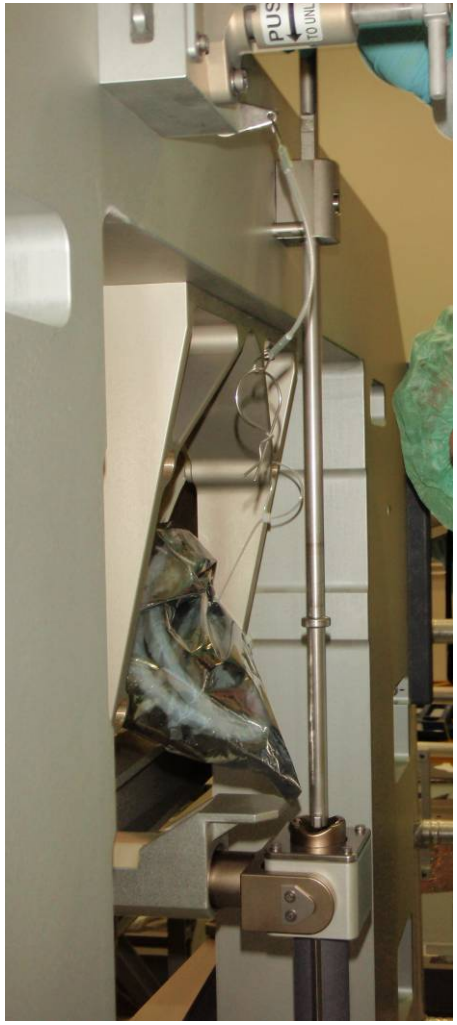
ELC3 (Cont)


Guide Pins
(3 places)
Passive UMA
Support
Bracket
Passive
UMA
Capture Bar Release
Mechanism
Cross Members
EBCS

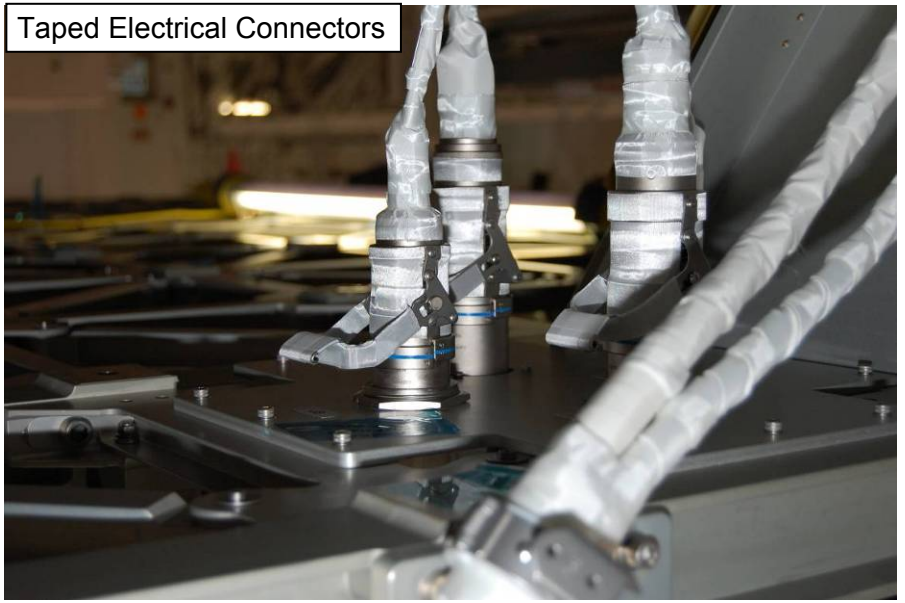

BOLT 1
RELEASE
LOCK BOLT 2
CAPTURE BAR
RELEASE MECHANISM 1
CAPTURE BAR
RELEASE MECHANISM 2

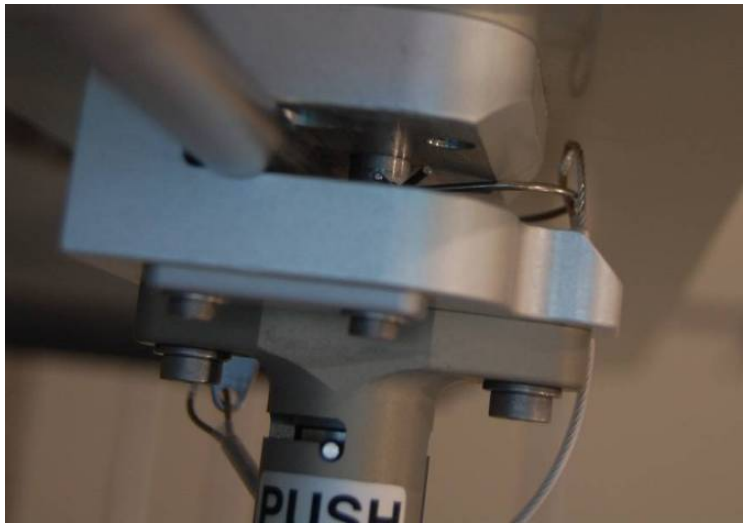

LOCK BOLT 1

ELC3 (Cont)

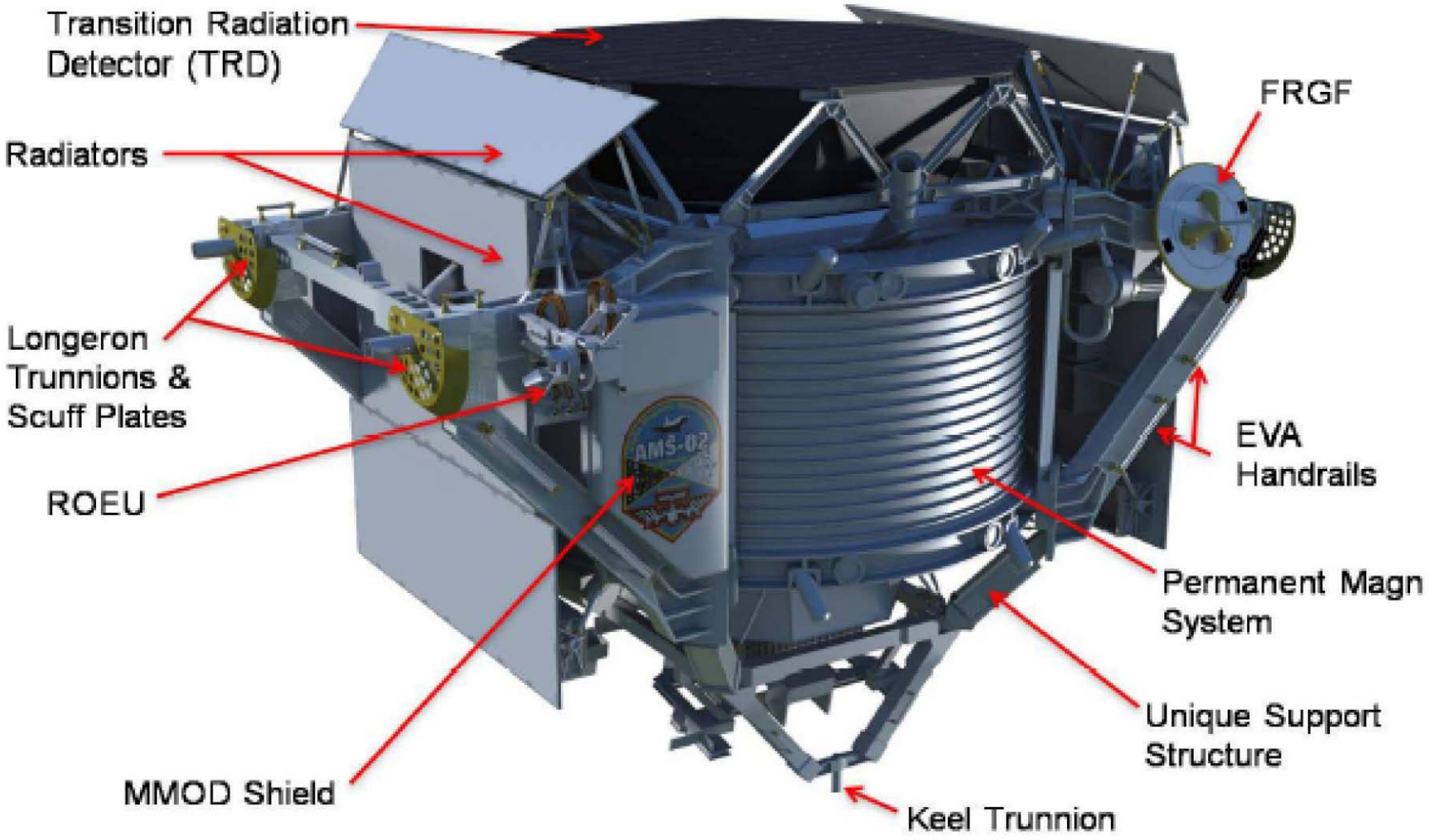


Taped Electrical Connectors





AMS

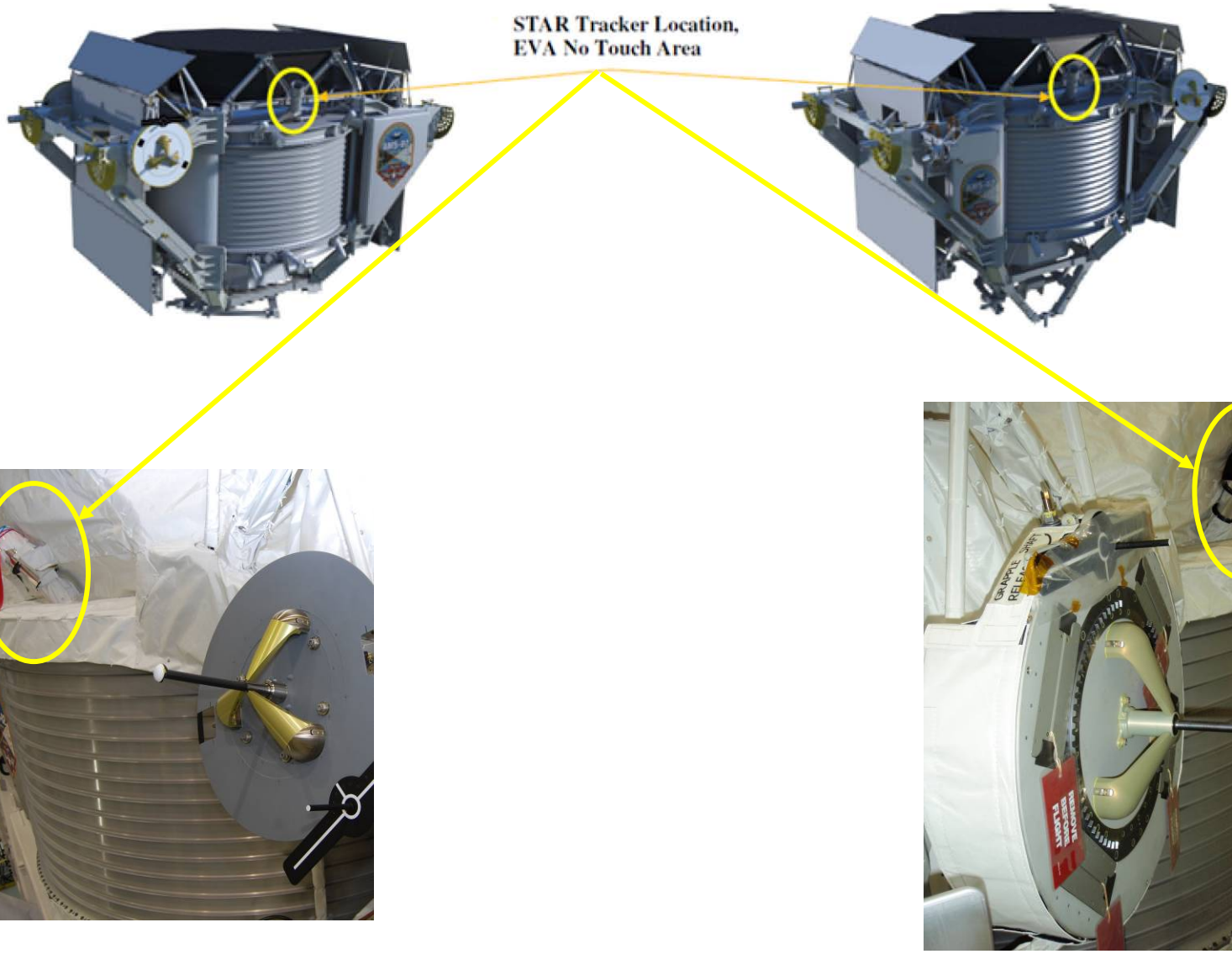

Transition Radiation Detector (TRD)
Radiators
Longeron Trunnions & Scuff Plates
ROEU
MMOD Shield
FRGF
EVA Handrails
Permanent Magn System
Unique Support Structure
Keel Trunnion
AMS-02

AMS (Cont)

AMS-02
Alpha Magnetic Spectrometer
AMS-02
Europe • Asia
North America

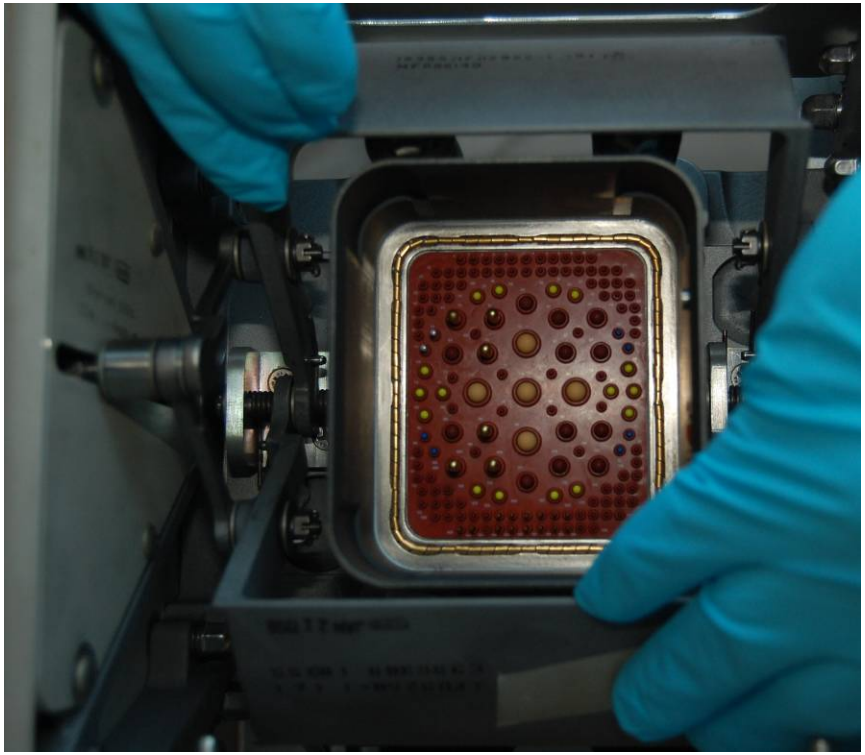
AMS (Cont)

STAR TRACKER BAFFLE – EVA No Touch Area



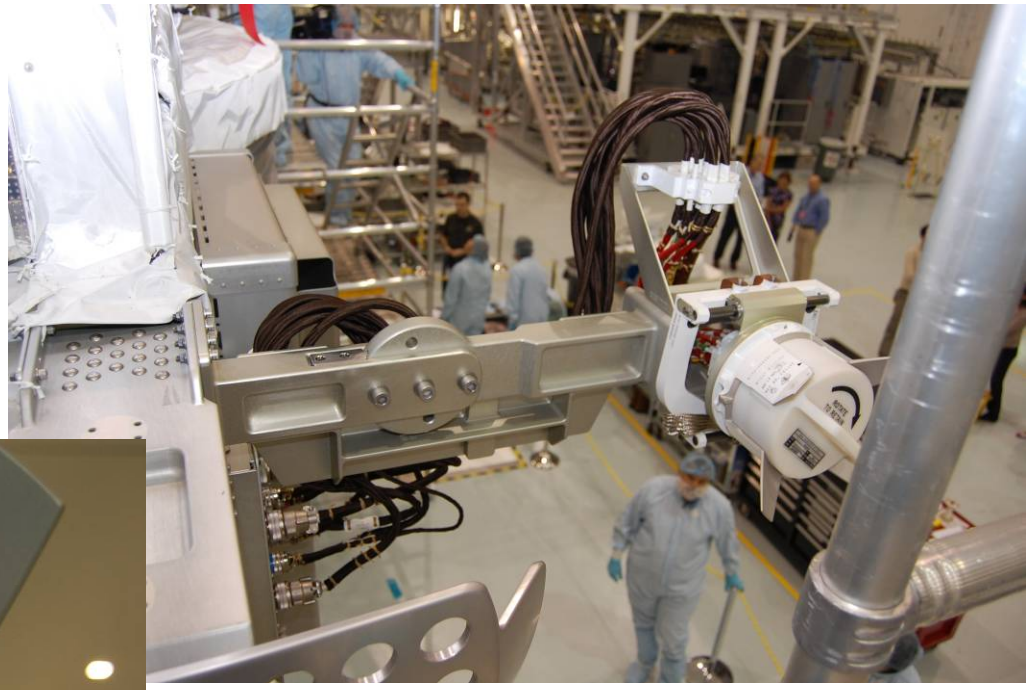
AMS (Cont)

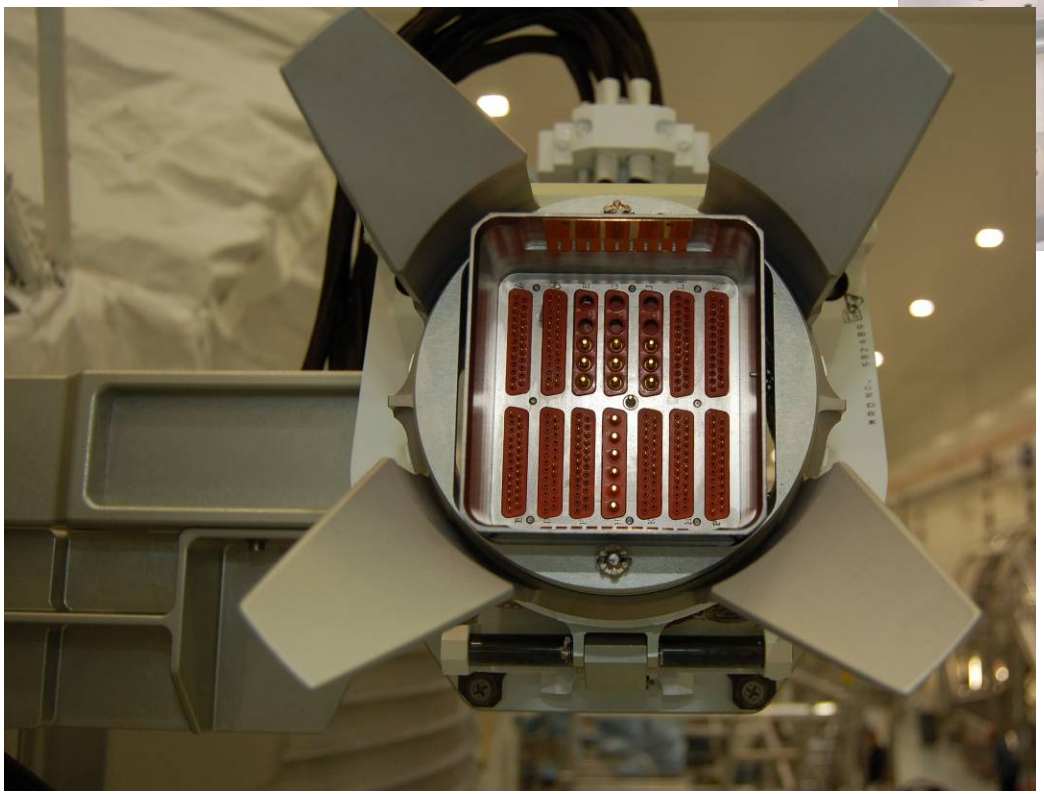
UMA Passive Connector and Electrical Pins



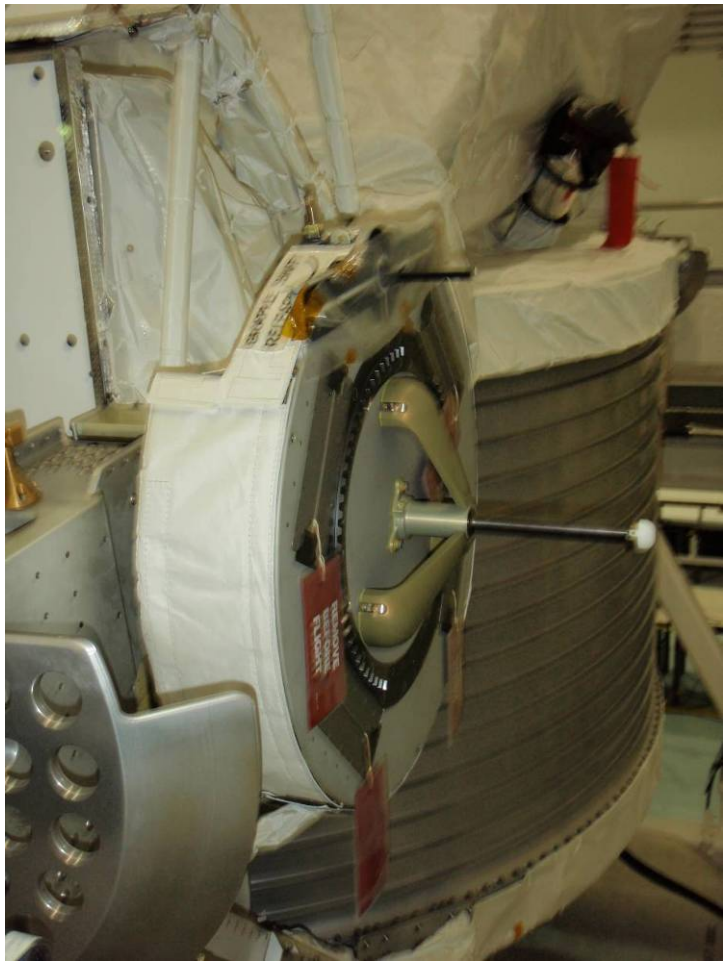
AMS (Cont)

ROEU and Electrical Pins



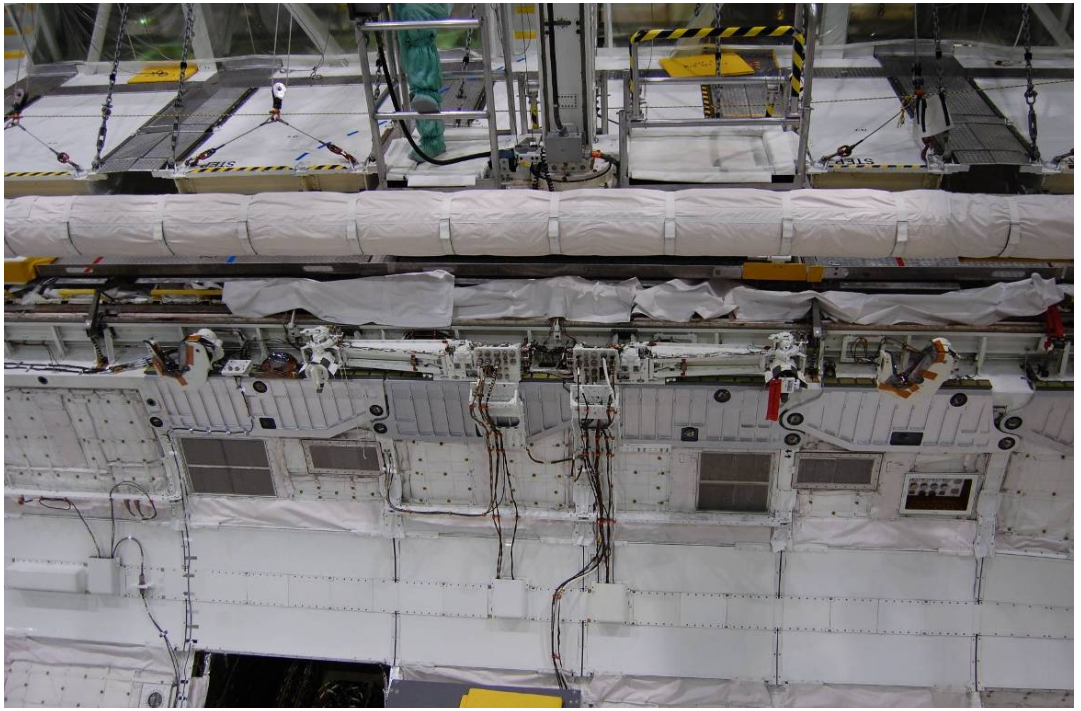


AMS (Cont)

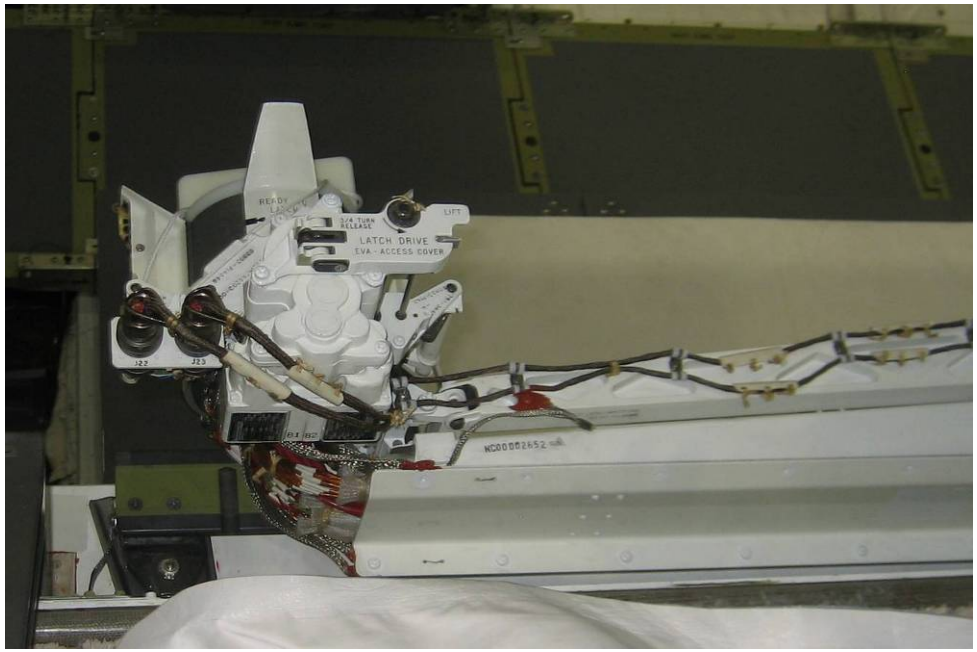


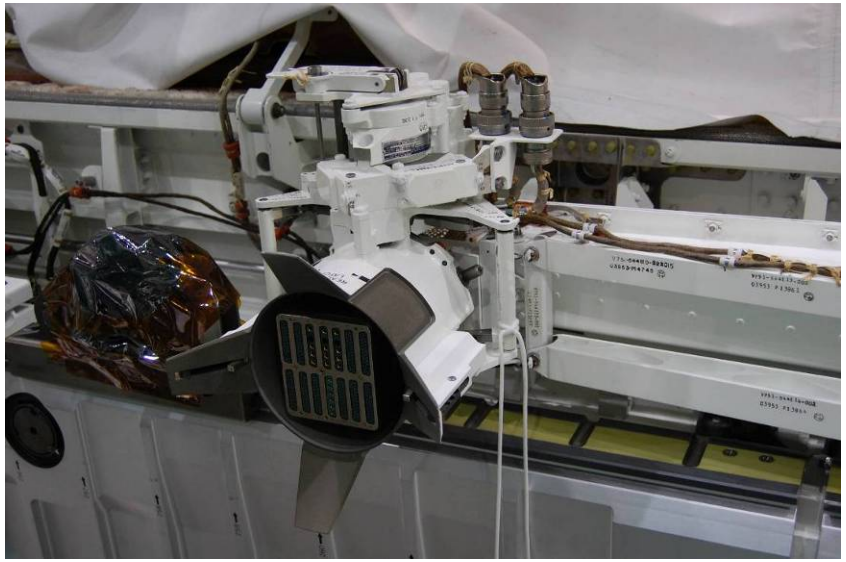
ROEU

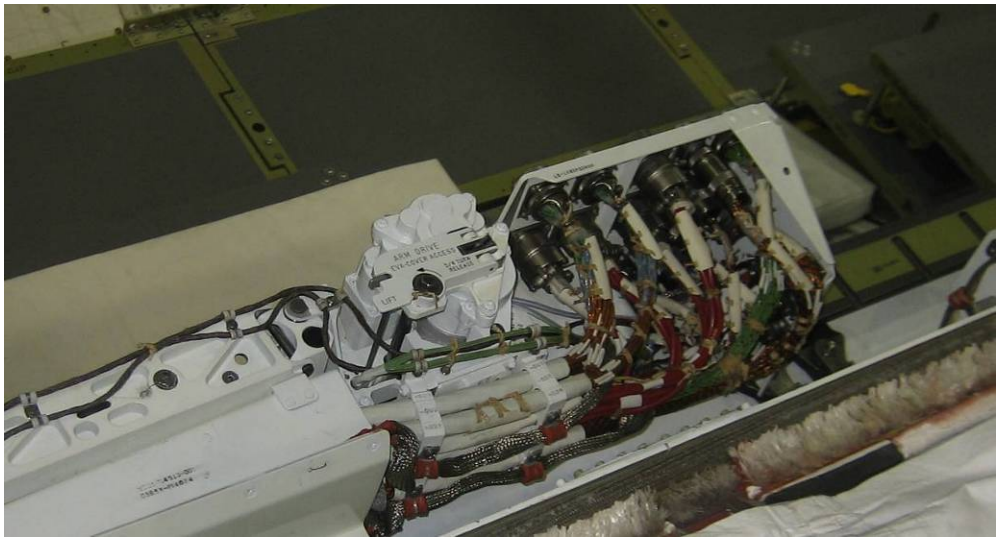
ROEUs on stbd PLB sill



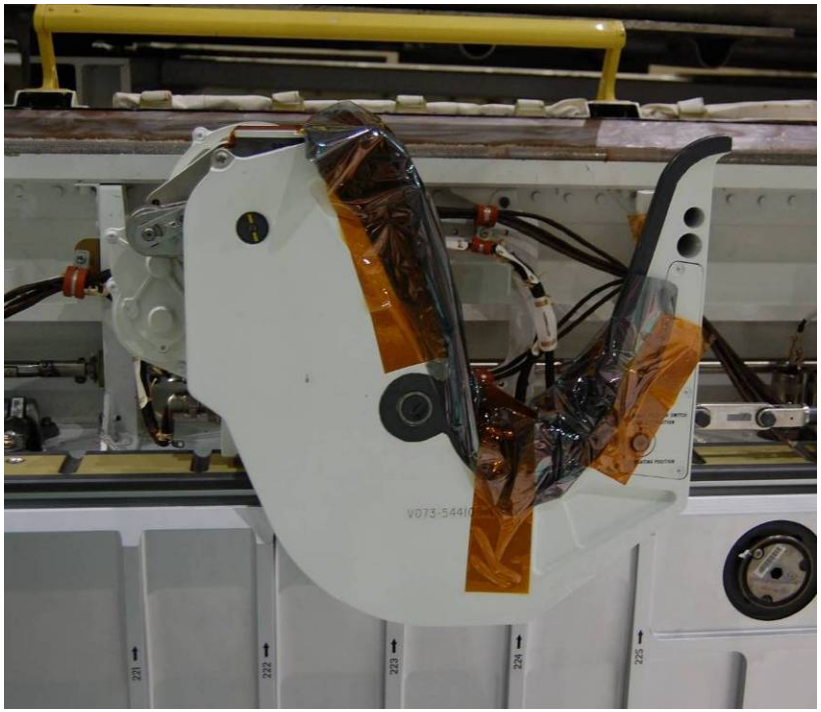
ROEU (Cont)



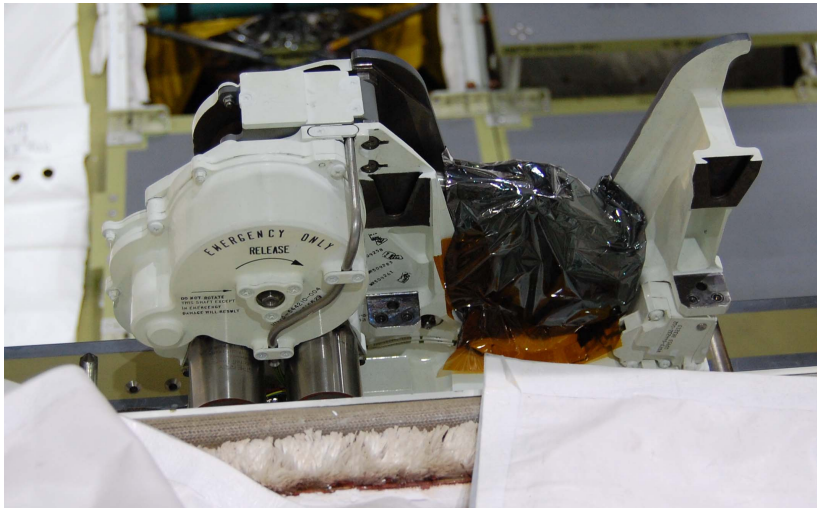


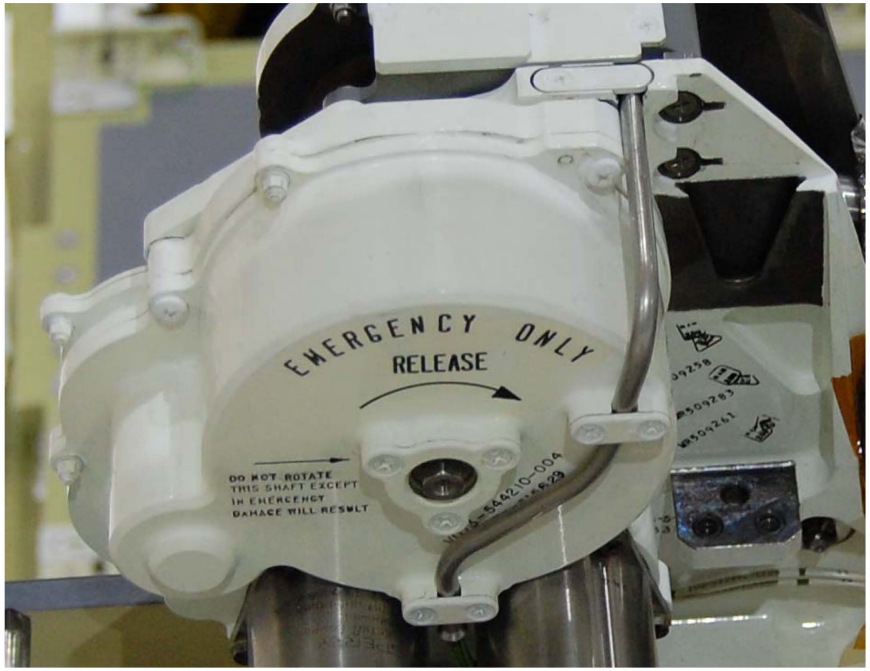


PRLA

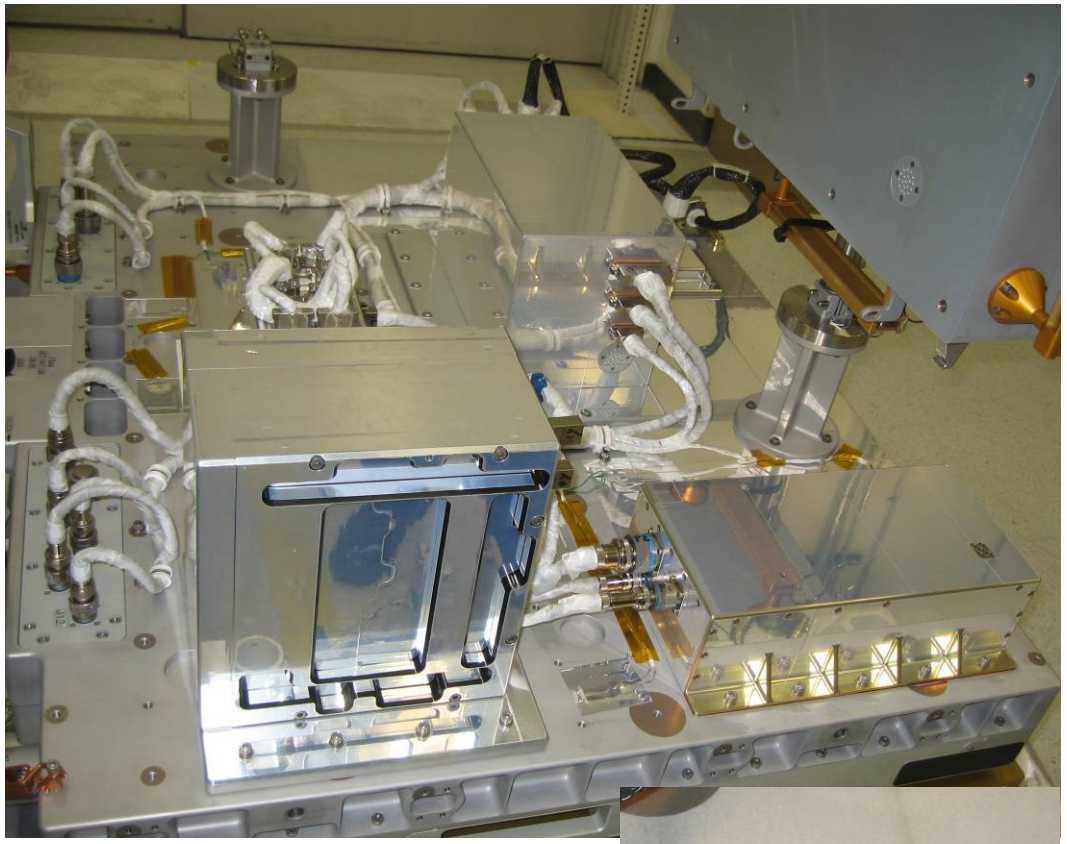


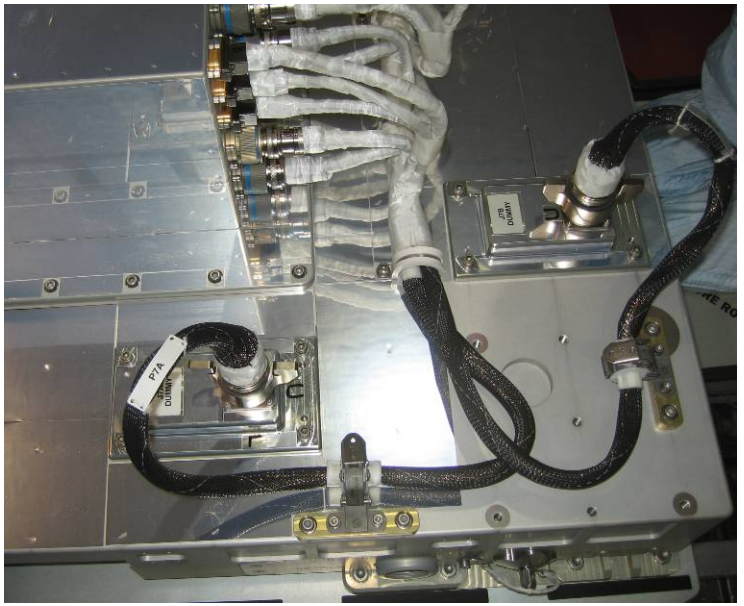

OPERATING POSITION
V073-544100 LWLL

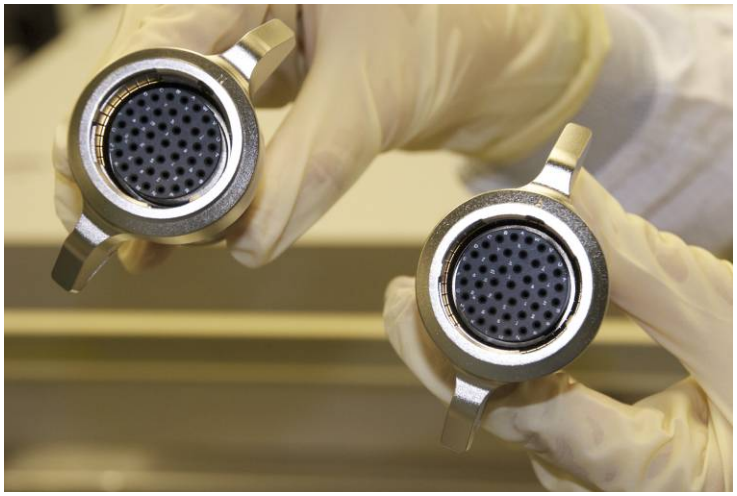

EMERGENCY ONLY
RELEASE


EMERGENCY ONLY
RELEASE
DO NOT ROTATE
THIS SHAFT EXCEPT
IN EMERGENCY
DAMAGE WILL RESULT

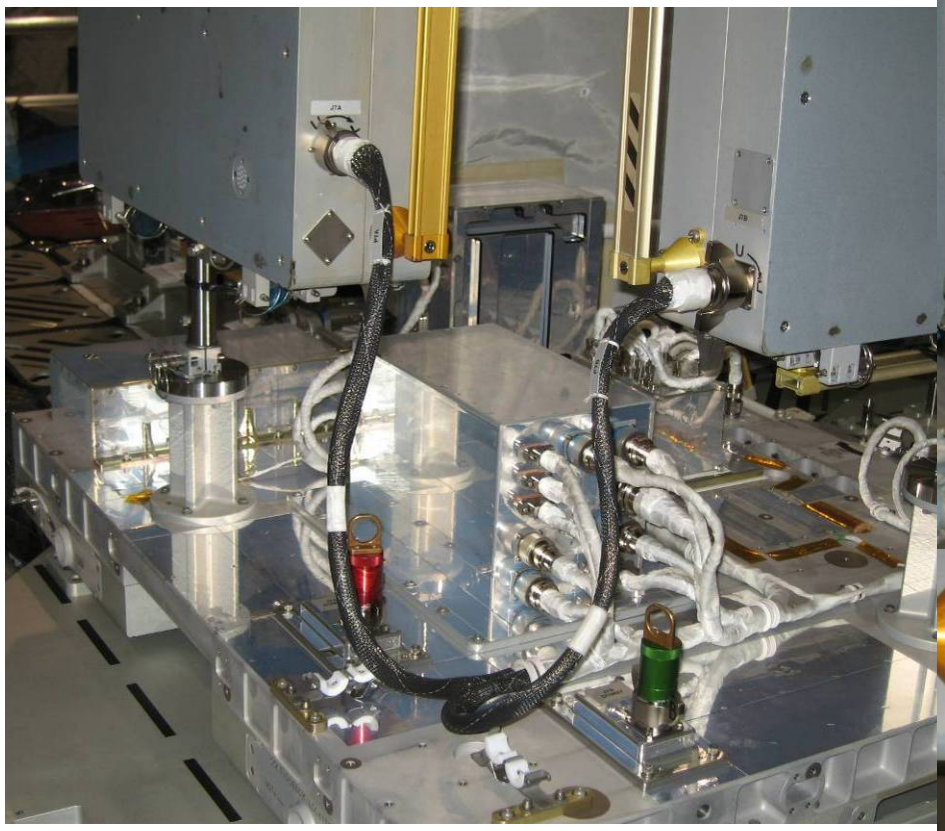
ELC2 ExPA

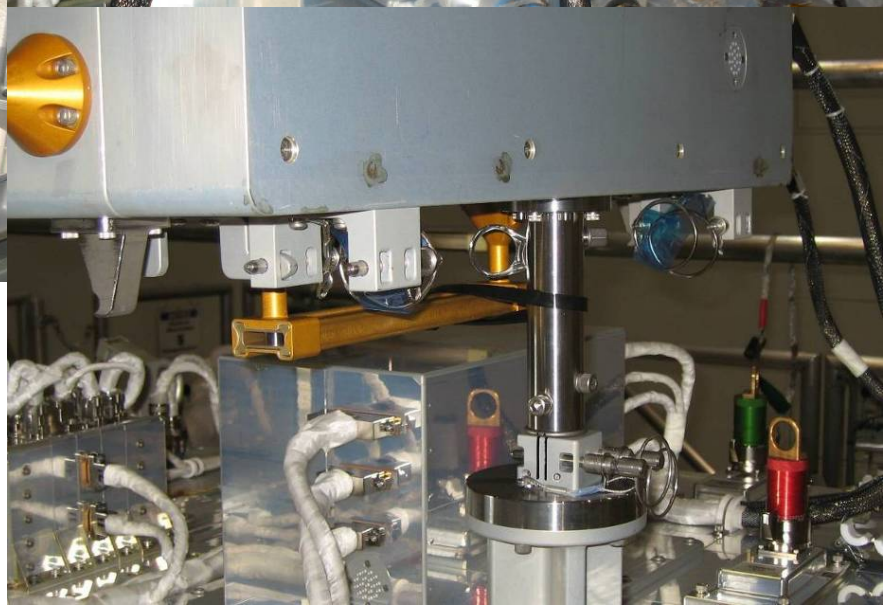






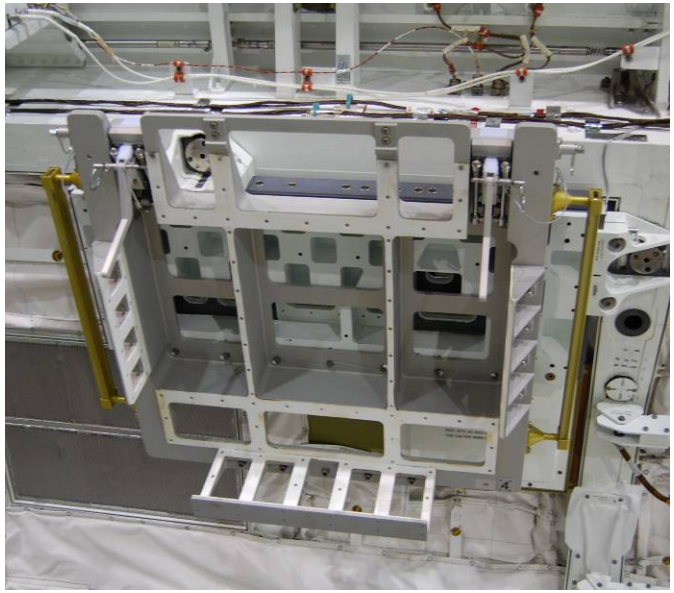
MISSE 7





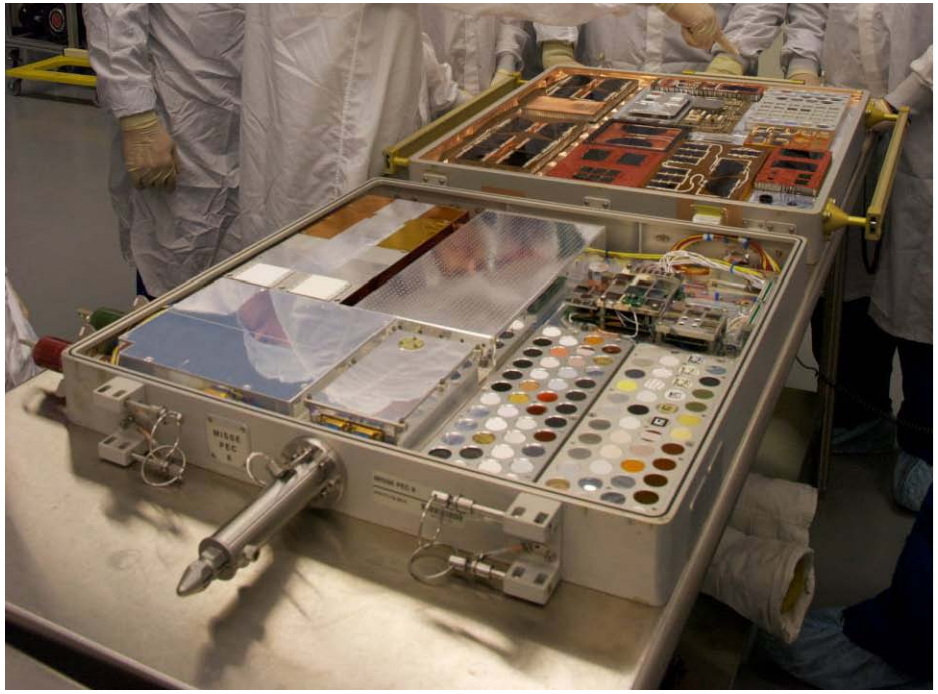
MISSE 7 (Cont)

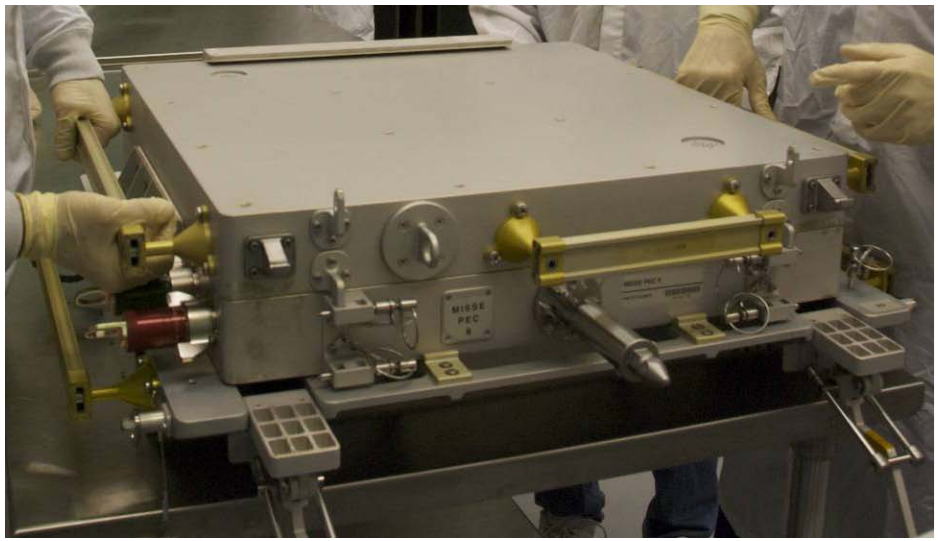
Translation path to stbd MISSE 7B SWC



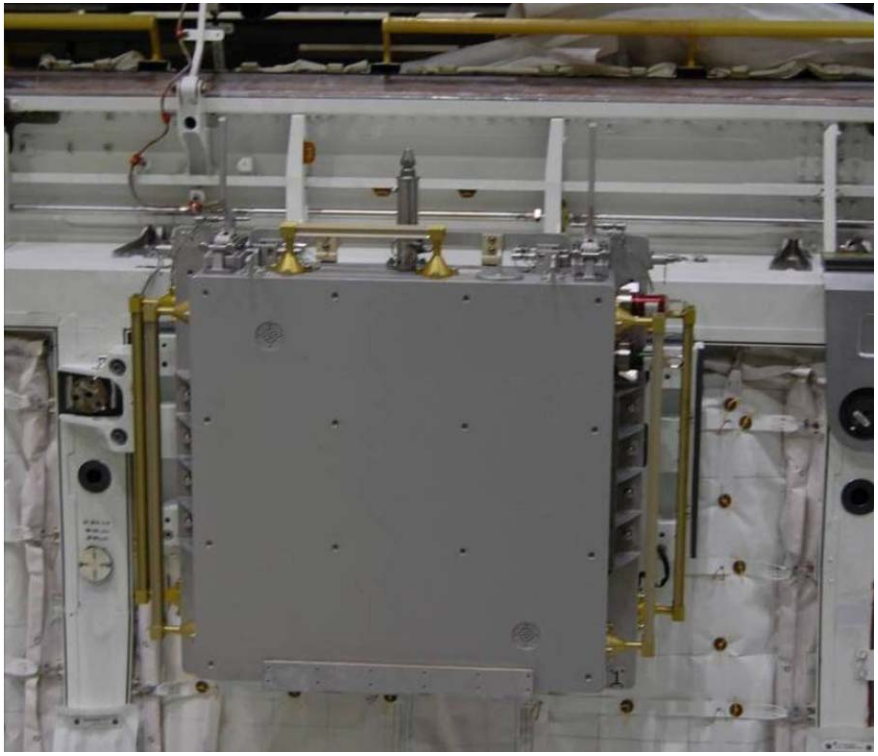
Translation path to port MISSE 7A SWC

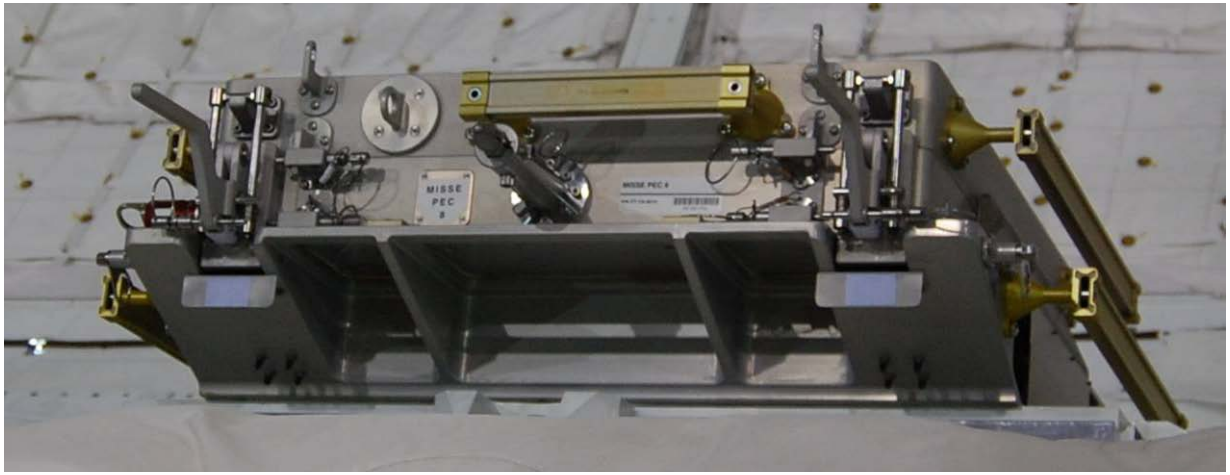
MISSE 8



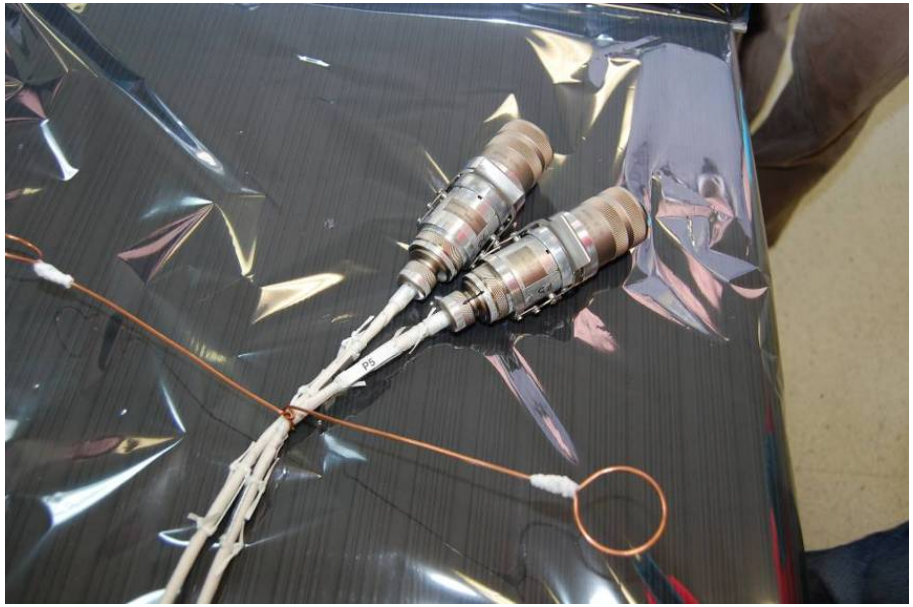


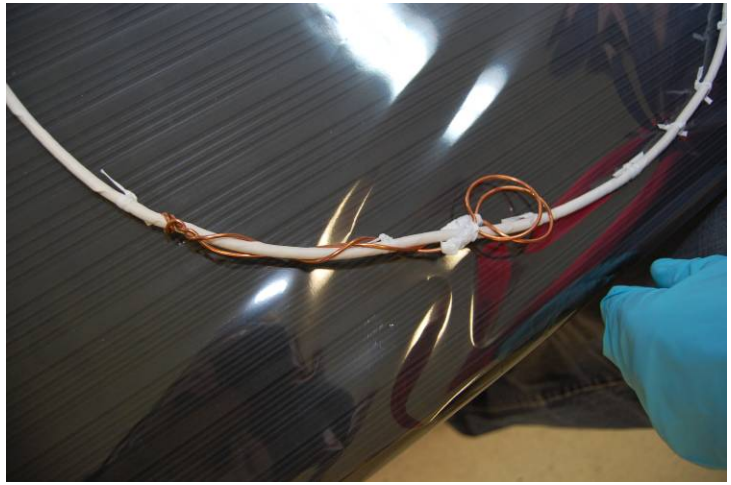
MISSE 8 (Cont)



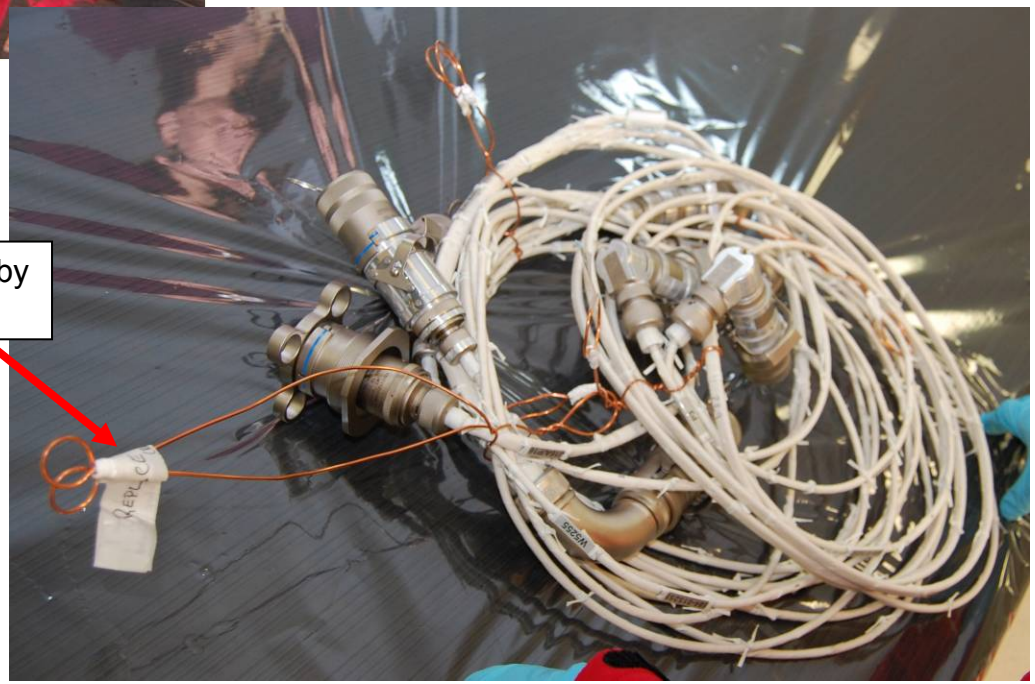


LAB EWC ANTENNAS



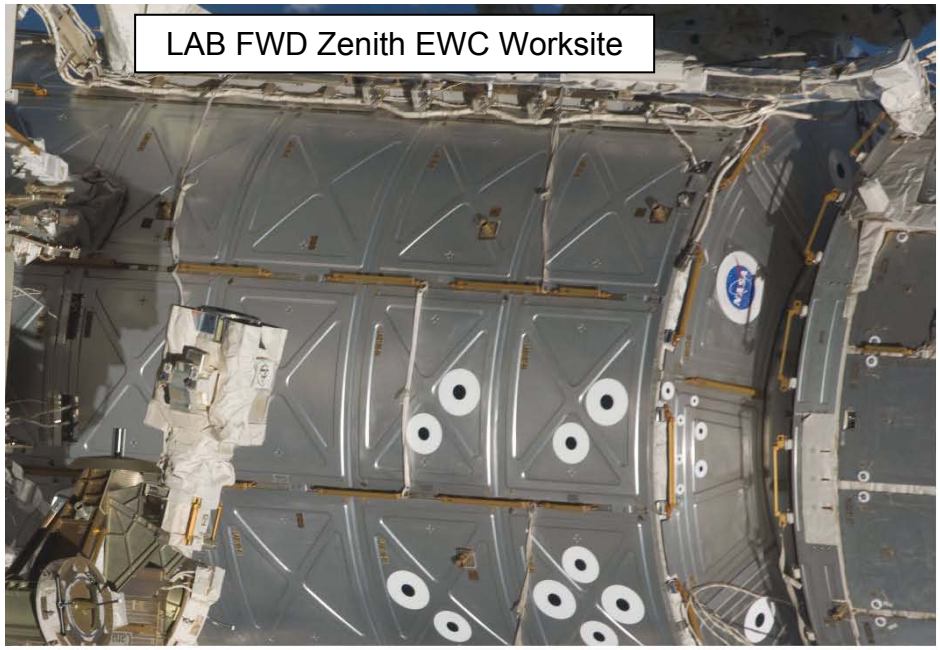


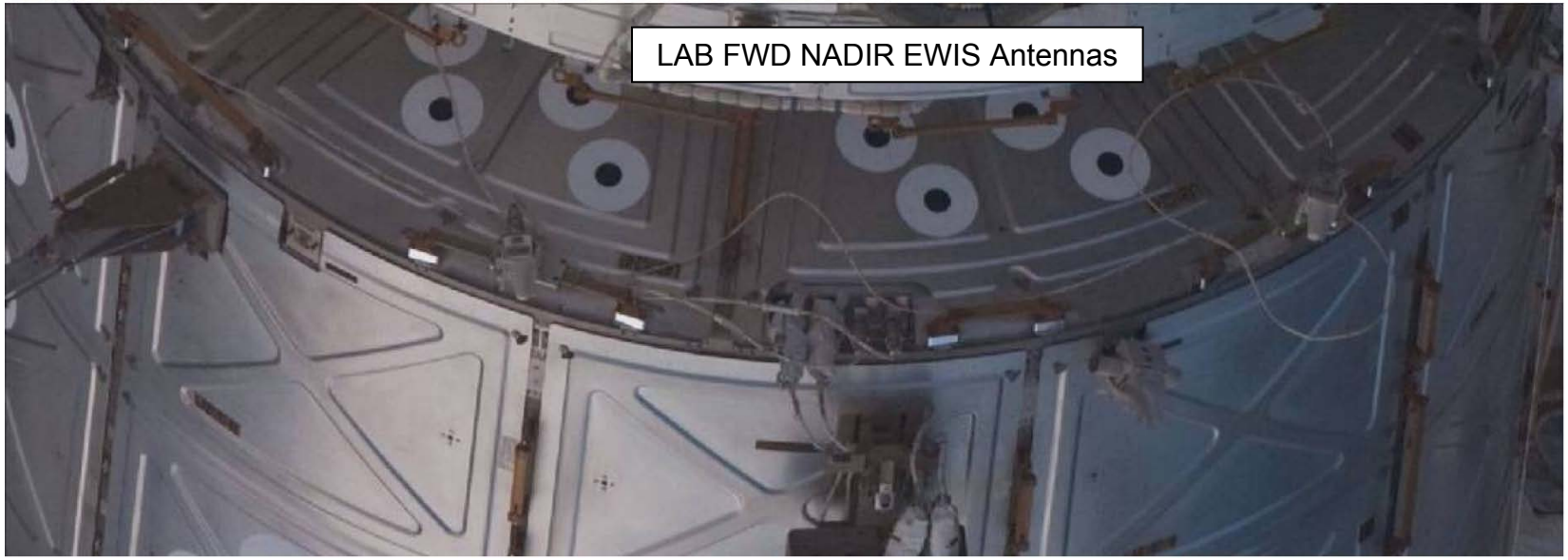
LAB EWC ANTENNAS (Cont)



Wire tie to be replaced by Adj Equip Tether

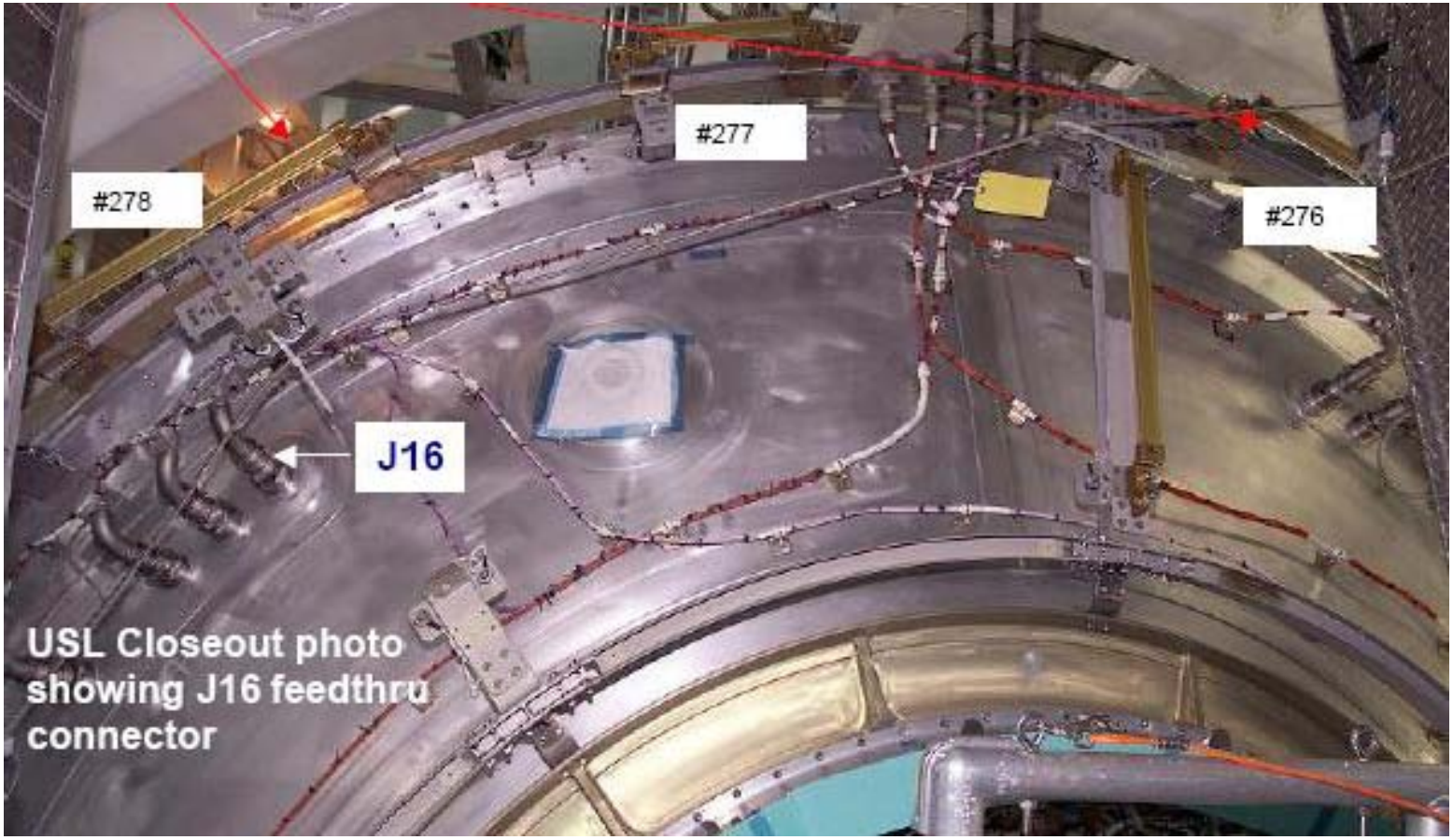
LAB EWC ANTENNAS (Cont)





LAB EWC ANTENNAS (Cont)

J16 Electrical Connector for EWC install
Located underneath MMOD Shield C2-01



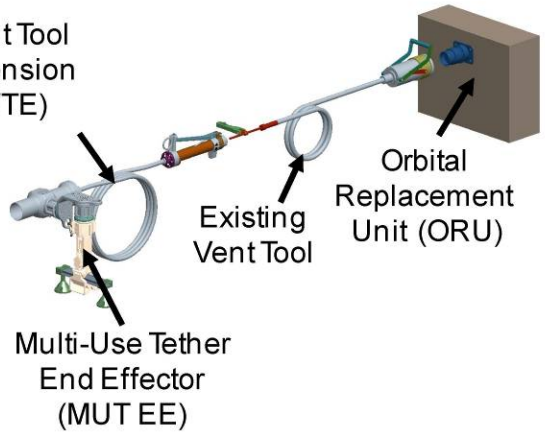
MMOD SHIELD DZUS FASTENERS

MMOD Shield Fastener Receptacles

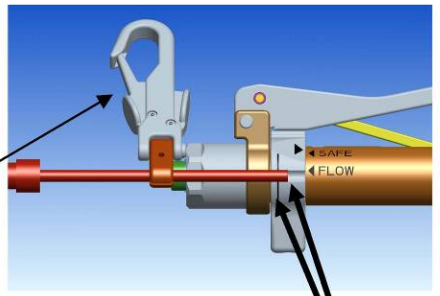
MMOD SHIELD DZUS FASTENERS (Cont)

MMOD Shield DZUS Fasteners

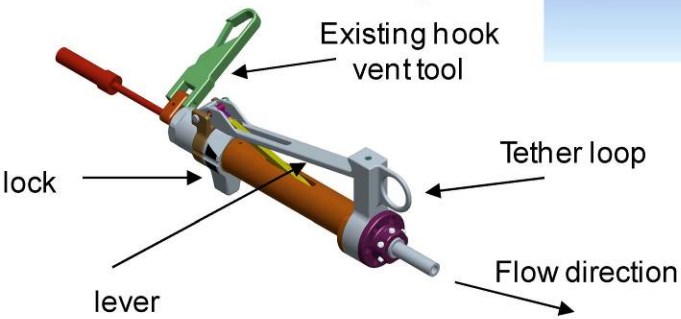
VENT TOOL & VTE



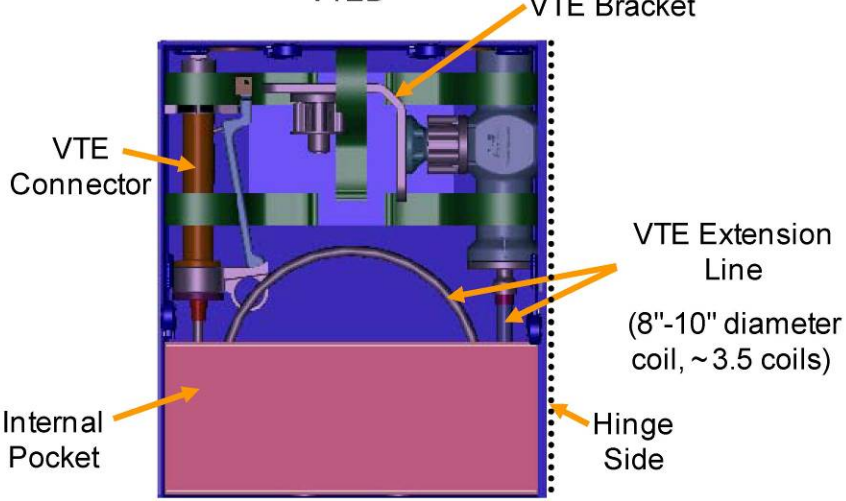
VENT TOOL & VTE VISUAL SEAL



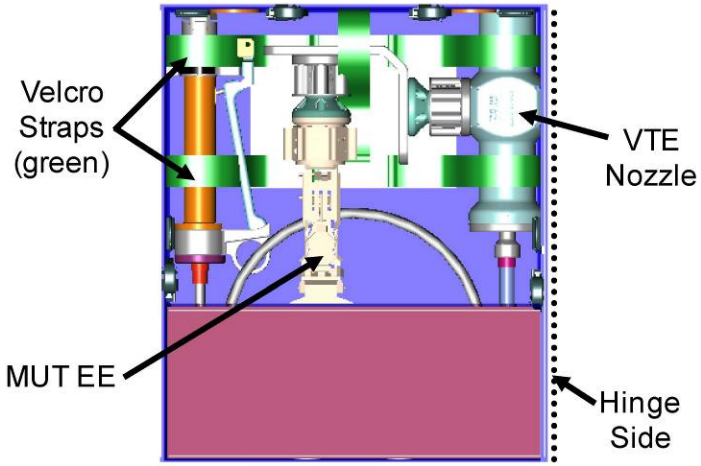
VTE CONNECTOR



VTE STOWED IN VTEB

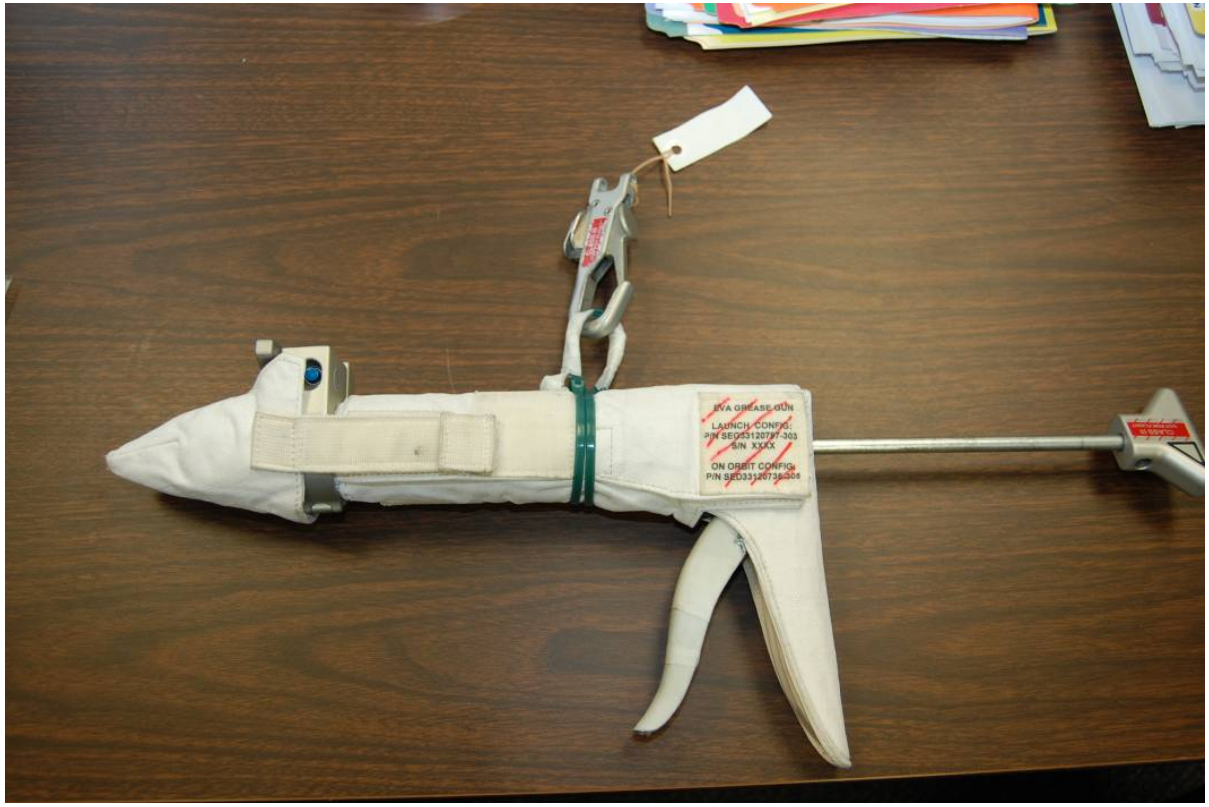


VTE & MUT EE STOWED IN VTEB

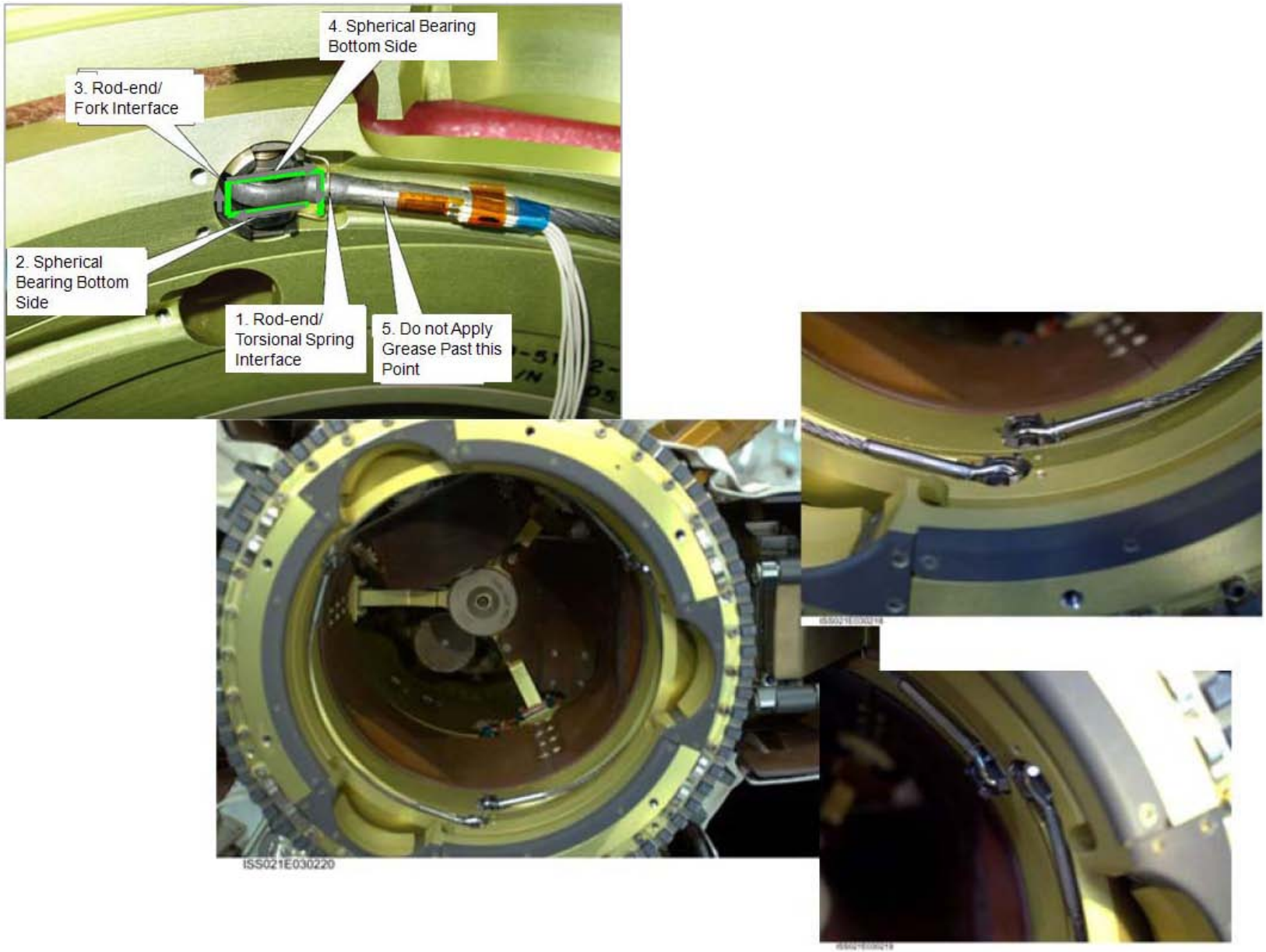


PORT SARJ LUBE

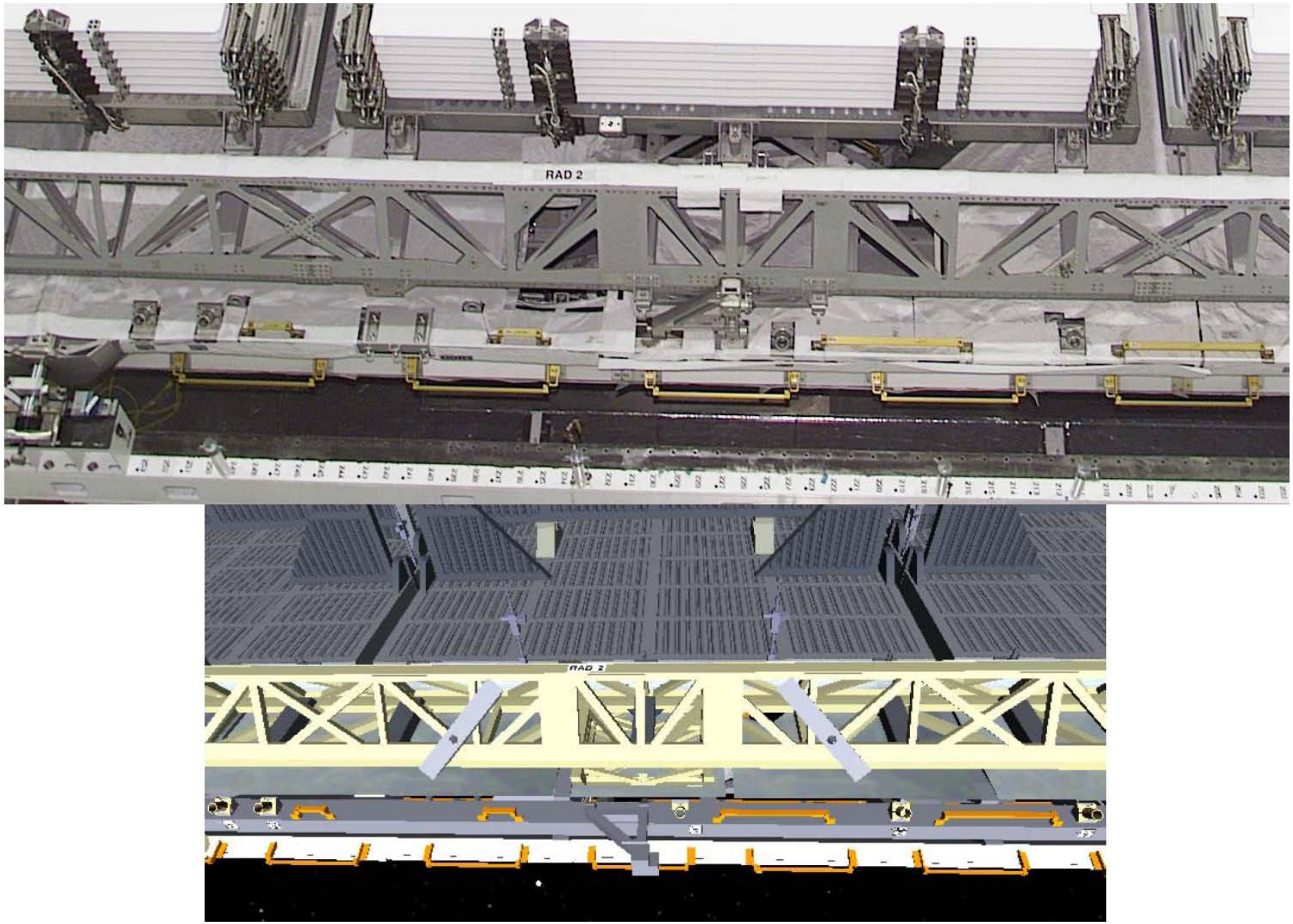
Zip Tie Tether point for Grease Gun



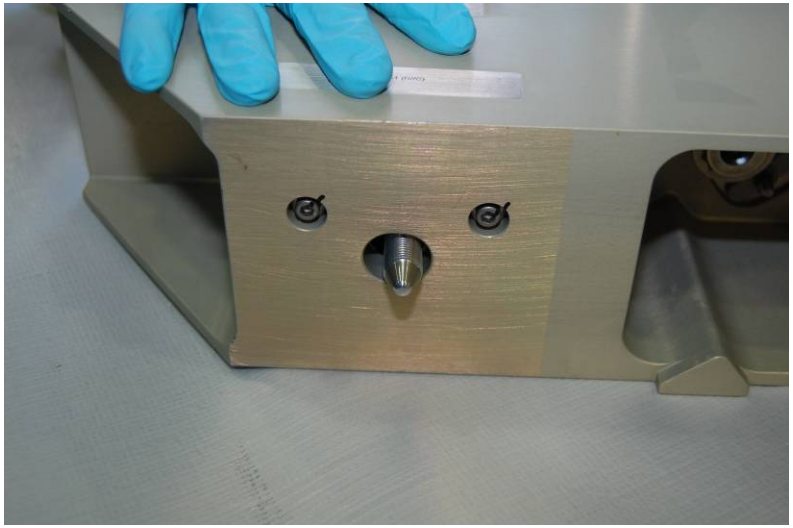
SPDM LEE LUBE

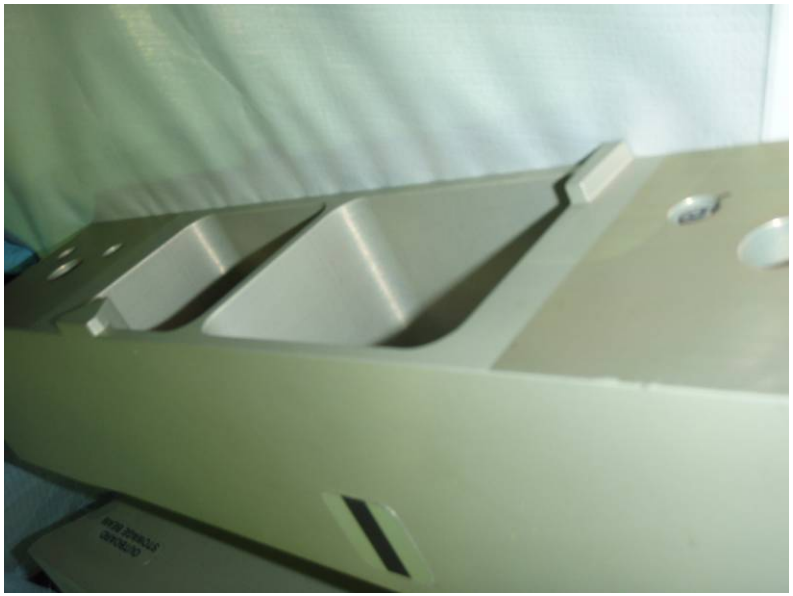


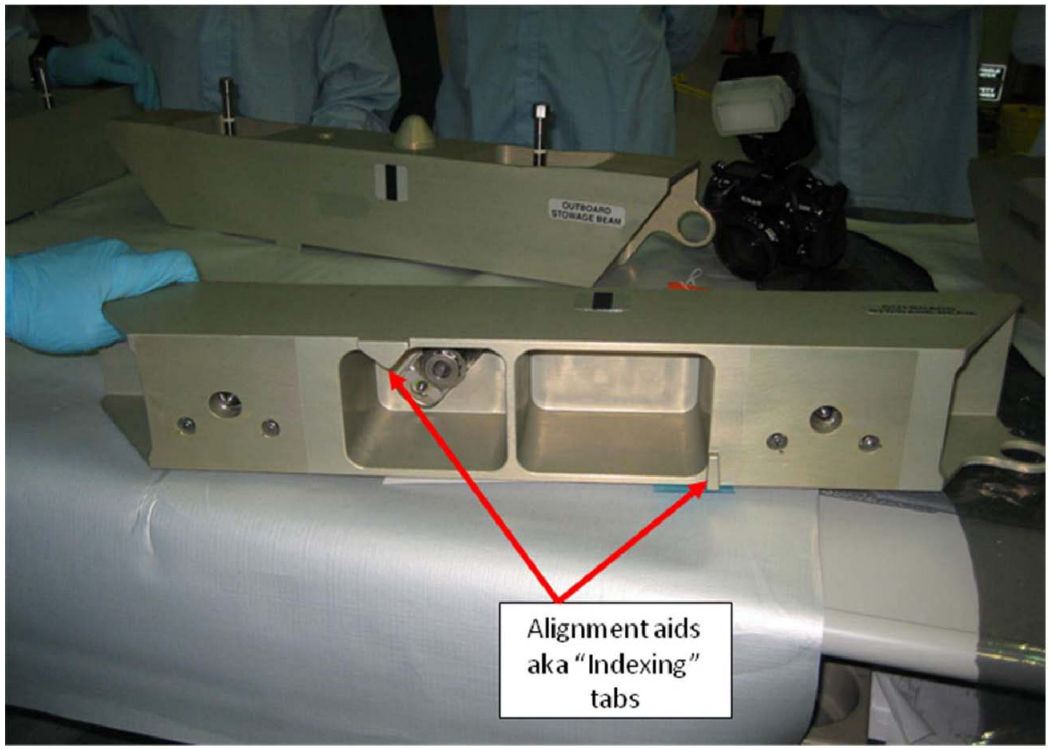
S1 RADIATOR GRAPPLE BAR STOWAGE BEAMS



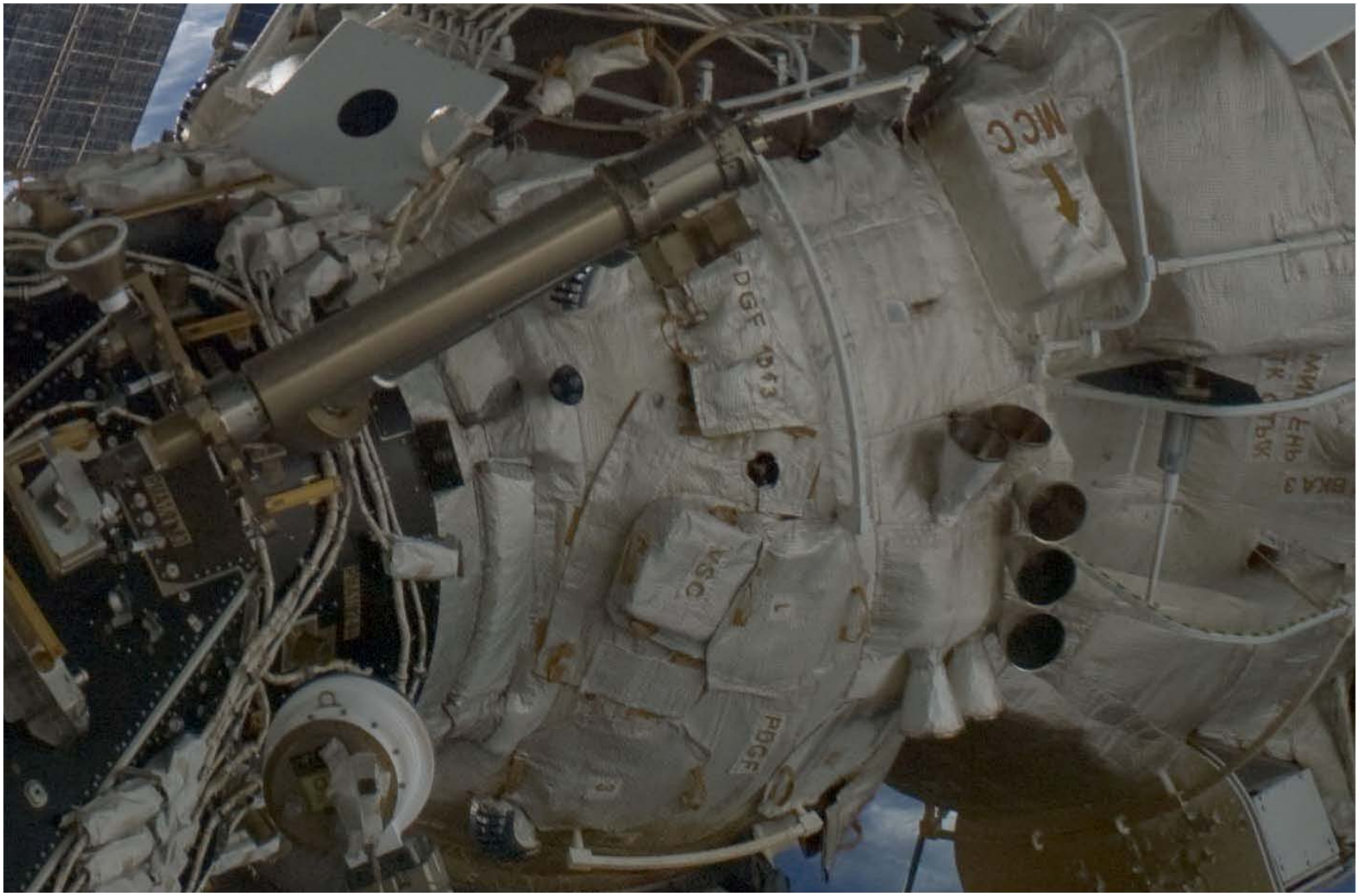
S1 RADIATOR GRAPPLE BAR STOWAGE BEAMS (Cont)



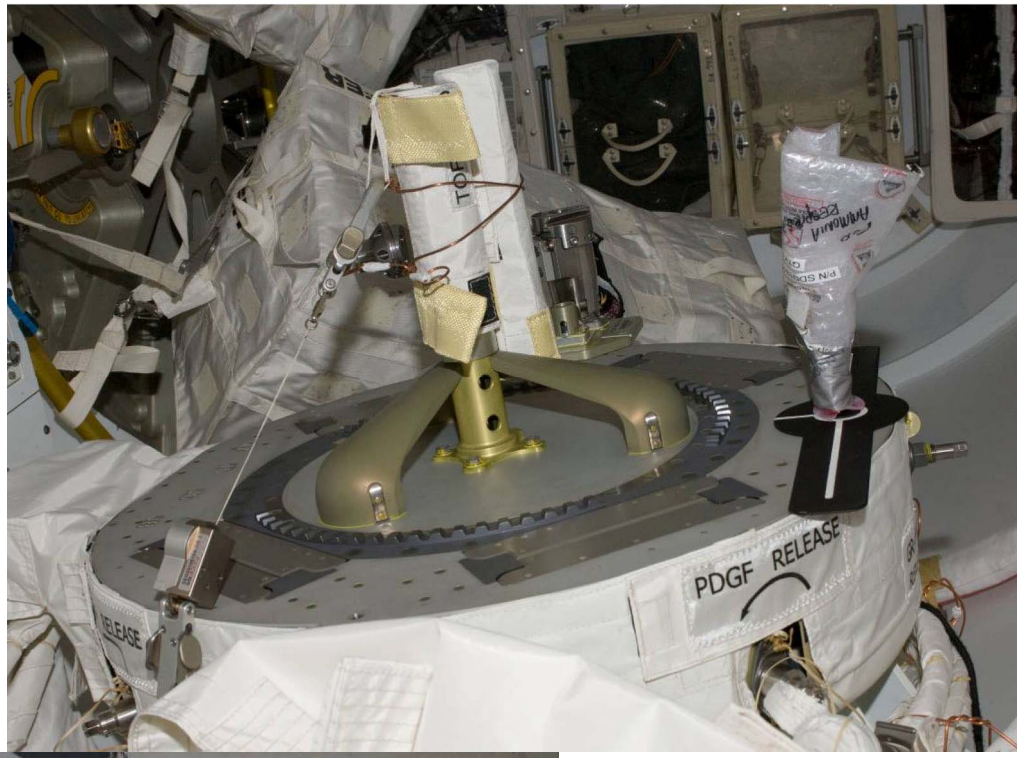




FGB PAMA/PDGF

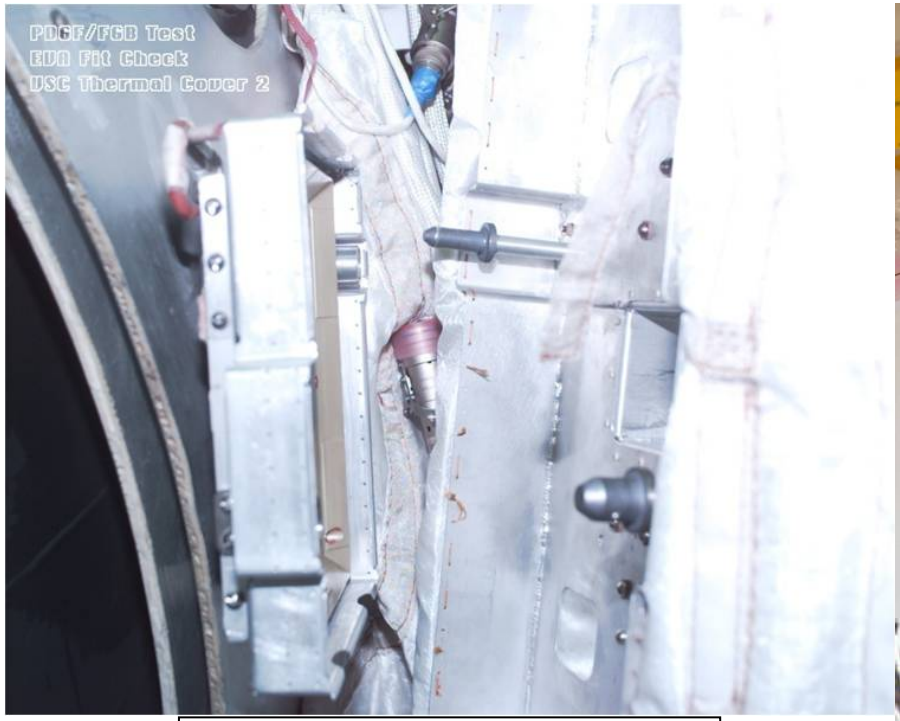


FGB PAMA/PDGF (Cont)



Russian Ratchet Wrench with PAMA Cap

VSC



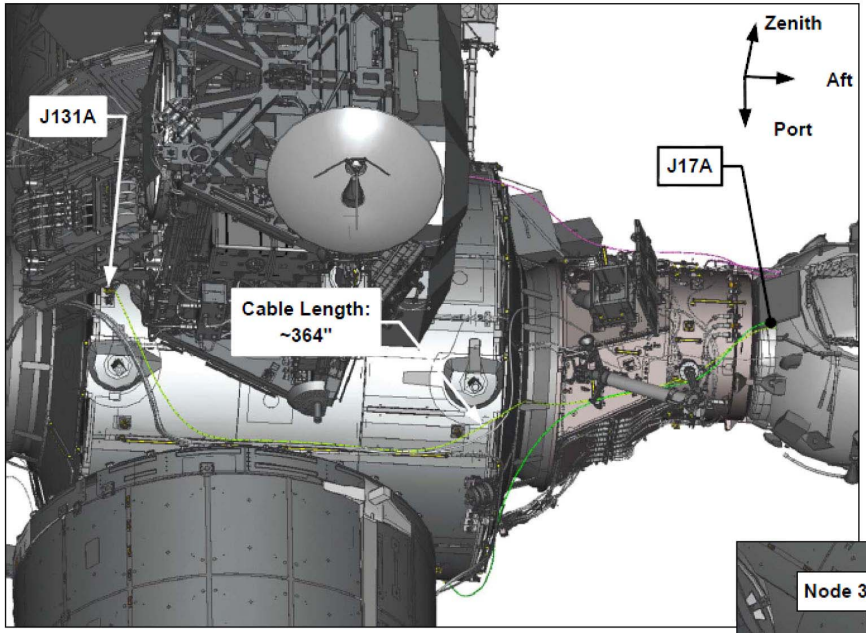
VSC Thermal Cover mating to FGB

VSC with MLI Protective Cover

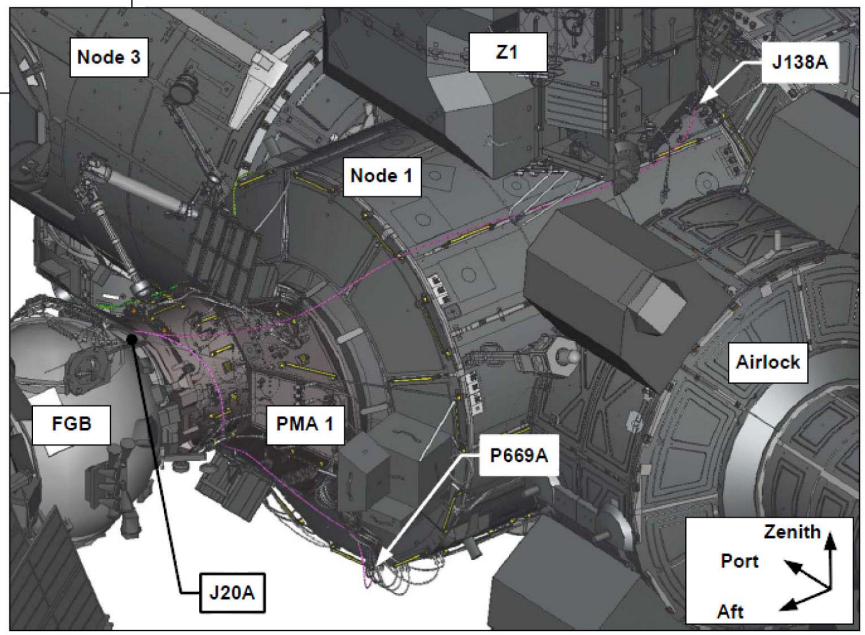
VSC Thermal Cover

NOD1/FGB CH1/4 AND CH2/3 CABLES

EVA Cables Ch 1/4 – J17A to J131A

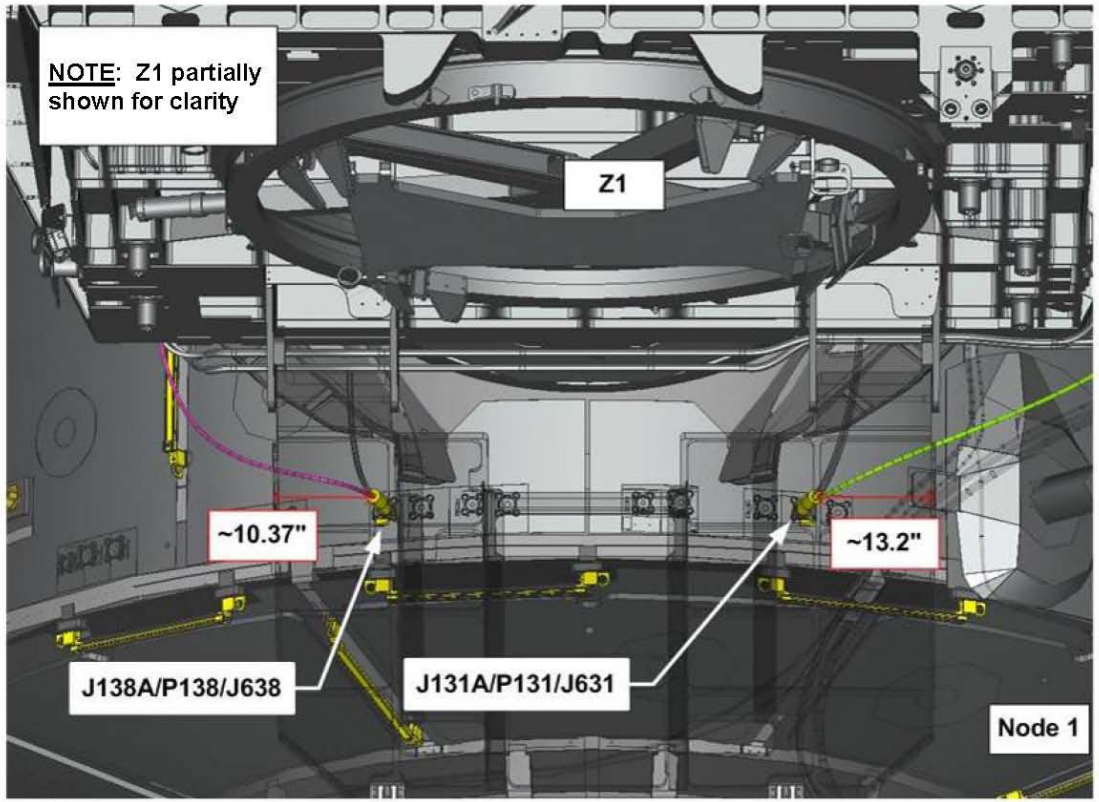


EVA Cables Ch 2/3 – Overview



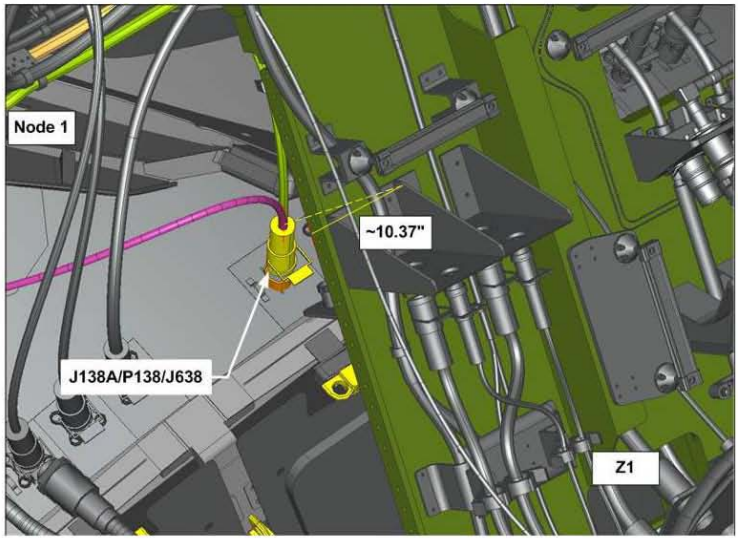
NOD1/FGB CH1/4 AND CH2/3 CABLES (Cont)

Node 1 Zenith Forward Endcone

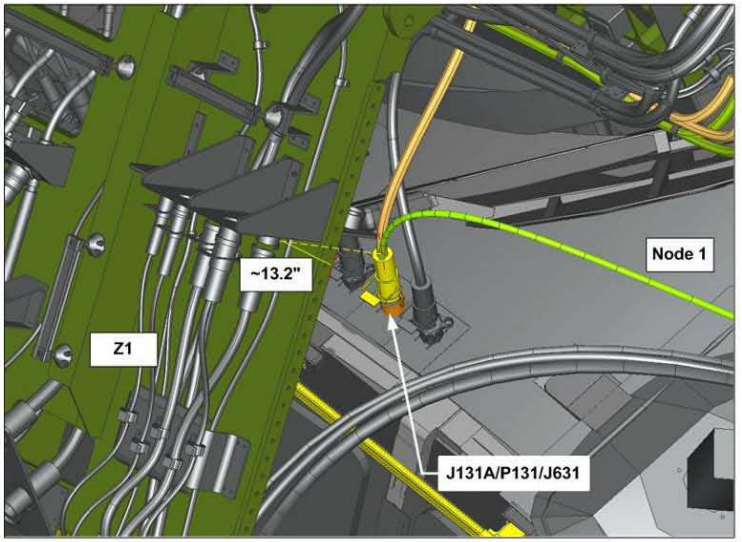


NOTE: NOD1/FGB Cable connectors are Jacks that mate to the cables shown mated to Node 1. They do not connect into Node 1 jacks

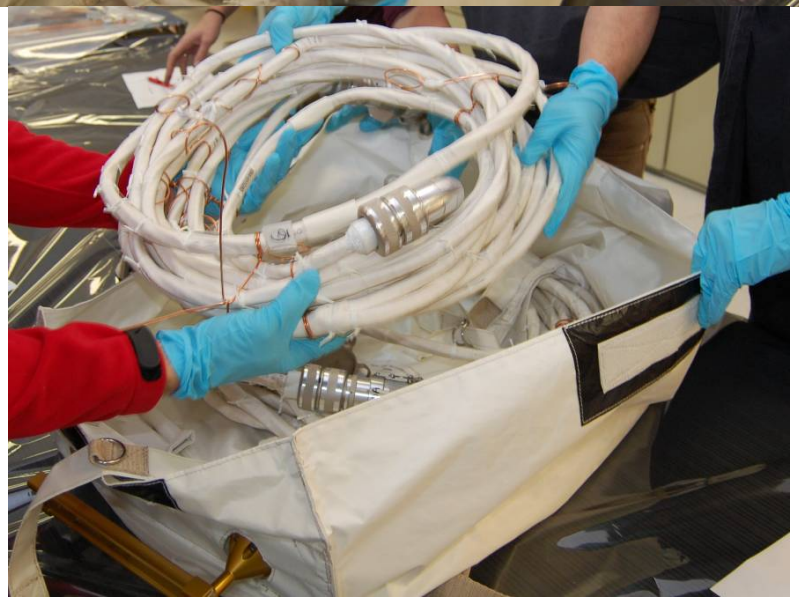
Measurement from Z1 tray to J138A



Measurement from Z1 tray to J131A



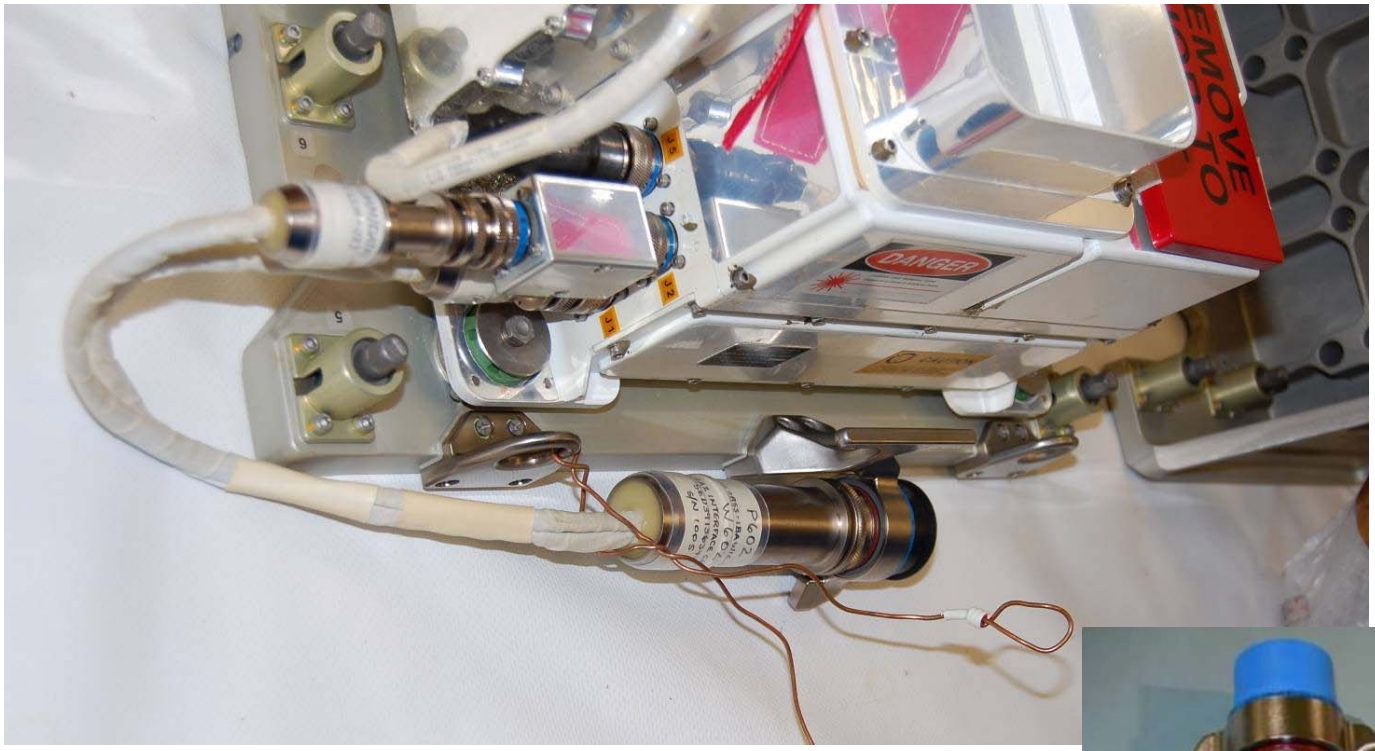
NOD1/FGB CH1/4 AND CH2/3 CABLES (Cont)



OBSS

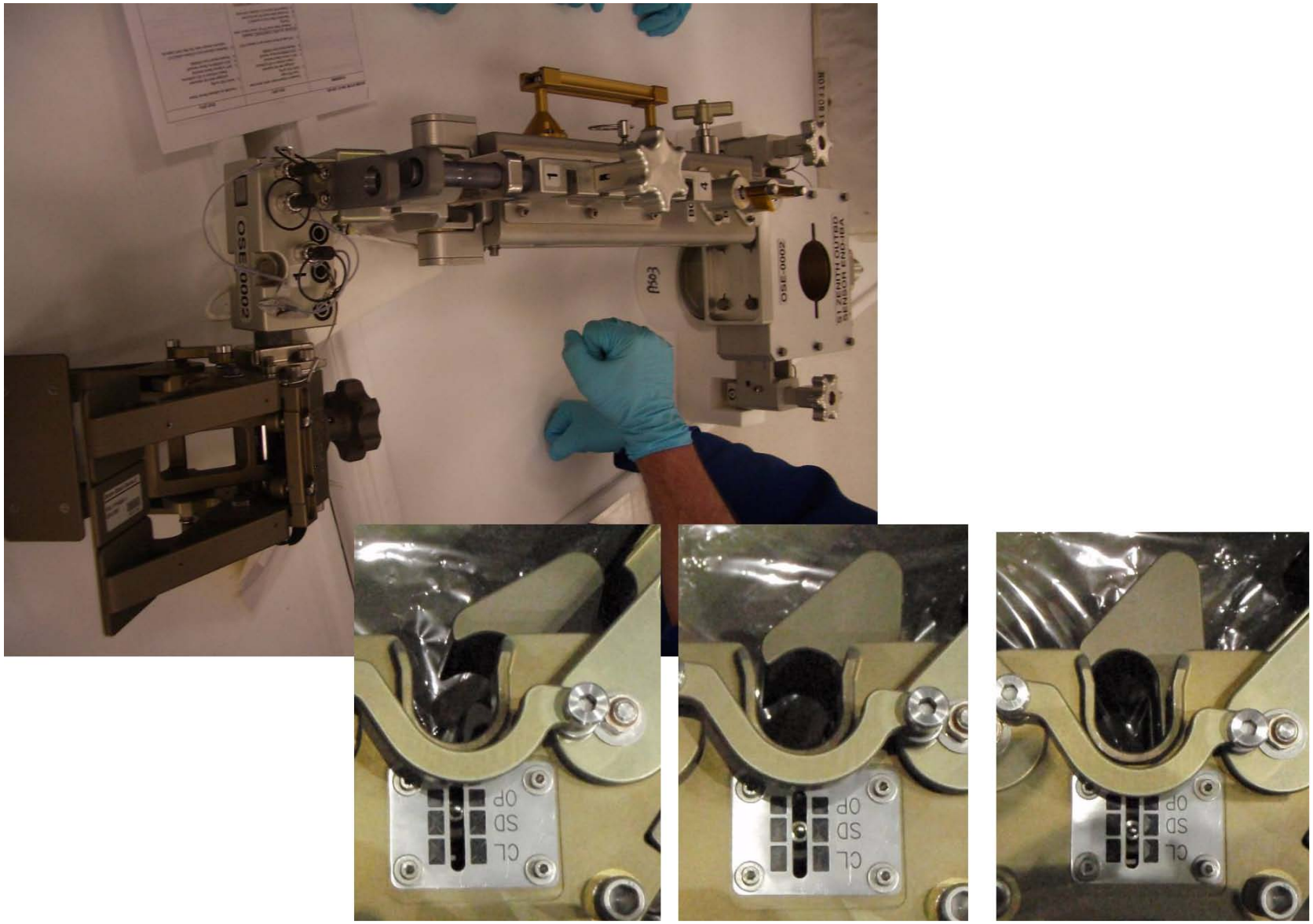
S1 OSEs

OBSS (Cont)

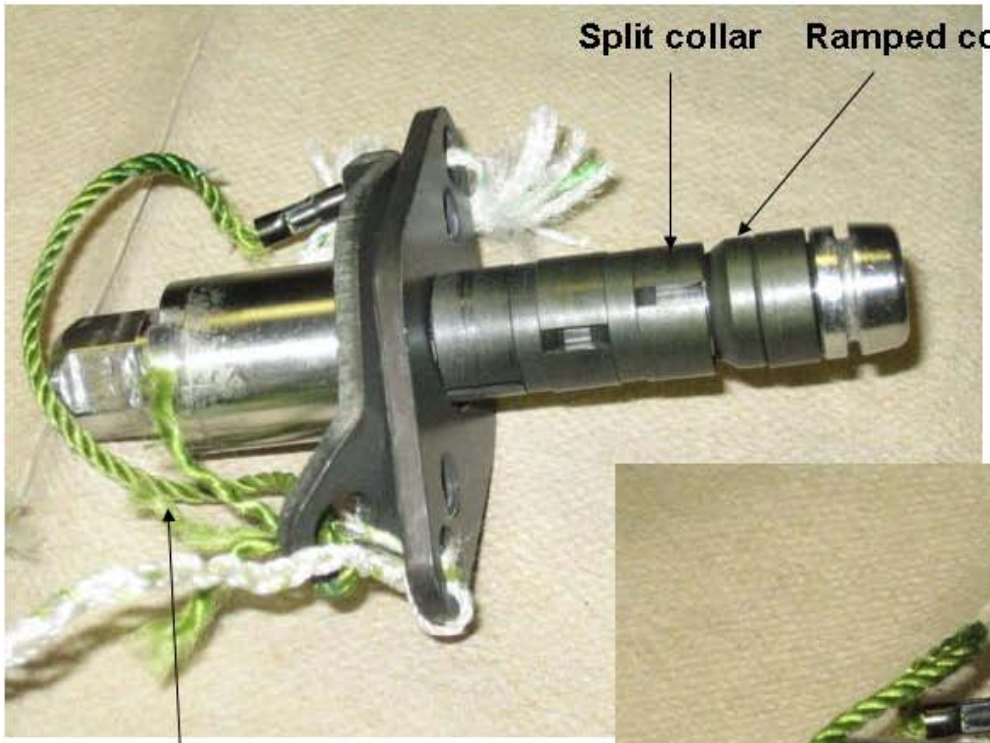


J601/602 Connector Cap Assembly

OBSS (Cont)

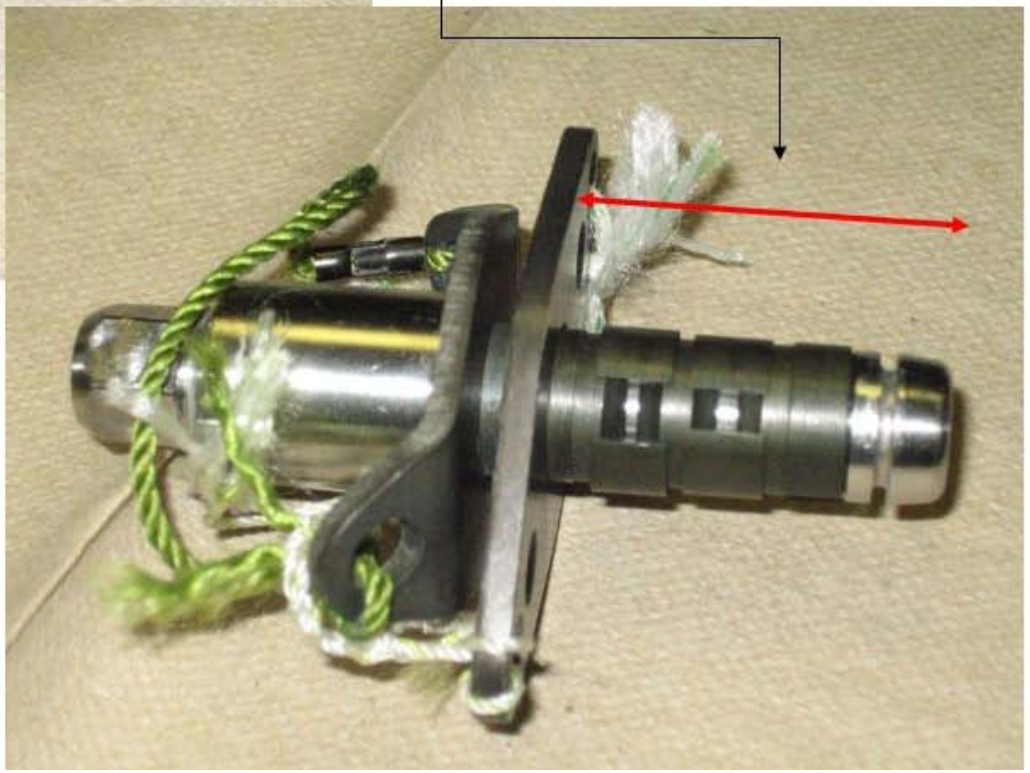


SSBAD – Space Station Boom Attachment Device



EDF Bolt

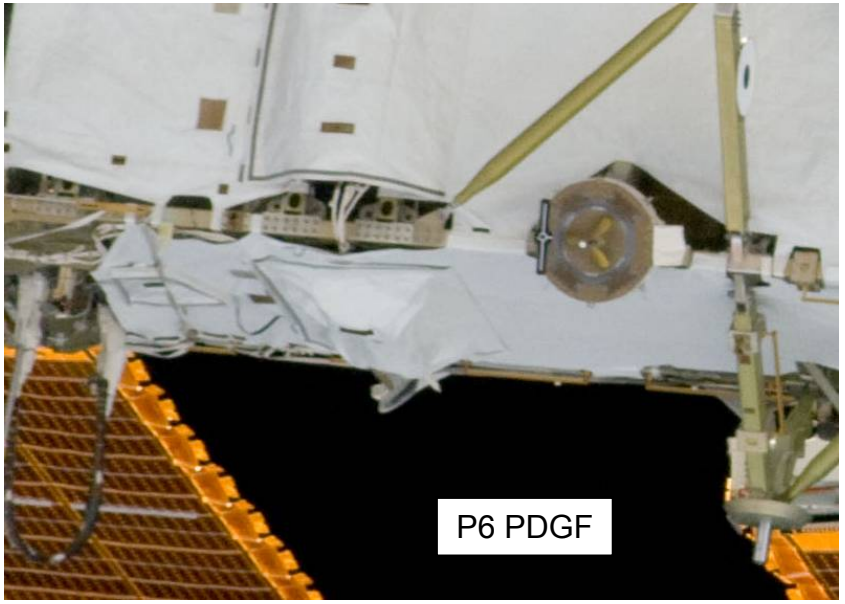
When bolt is driven, this distance is shortened. The ramped collars are driven under the split collars, forcing them to expand. The bolt can no longer be pulled free

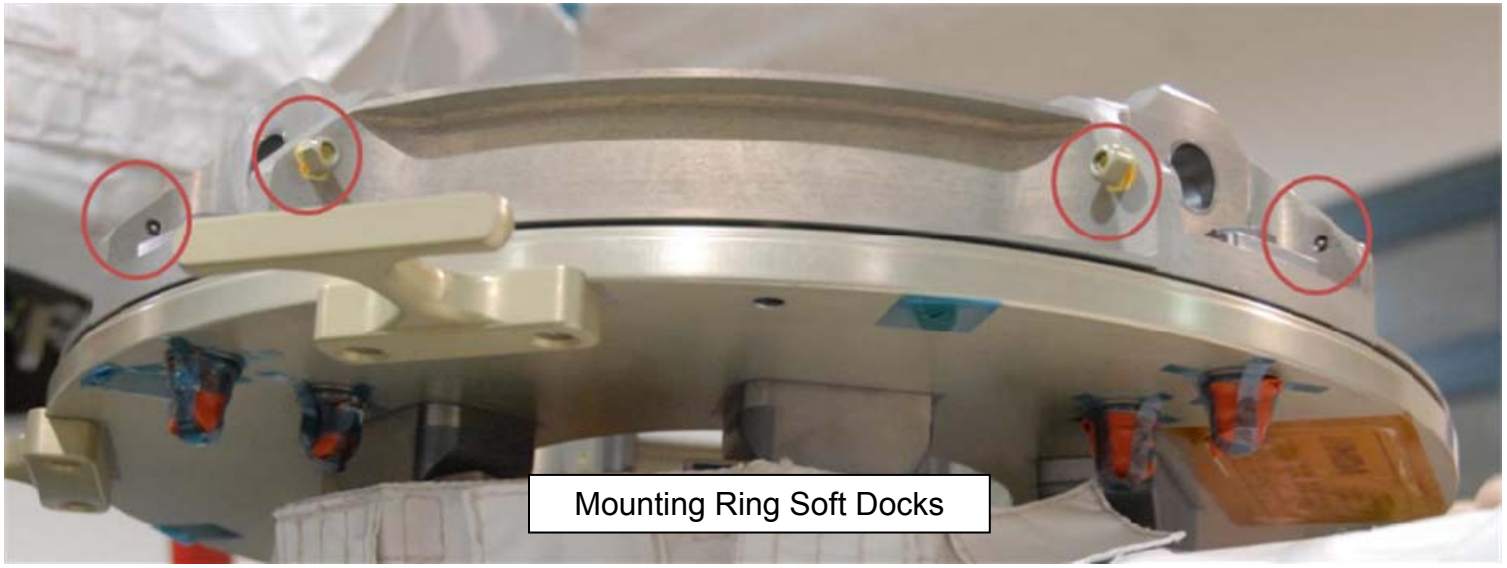


The lanyards restrain the bolt from coming free when the bolt is driven out and the collars will slip through the bolt hole

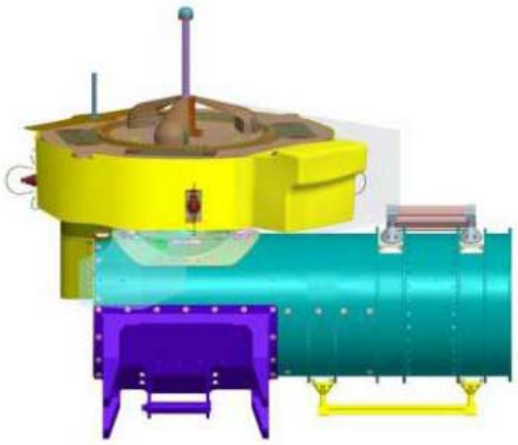
PDGF (Cont)

PUMAA – PDGF
Universal Microconical
Adapter Assembly

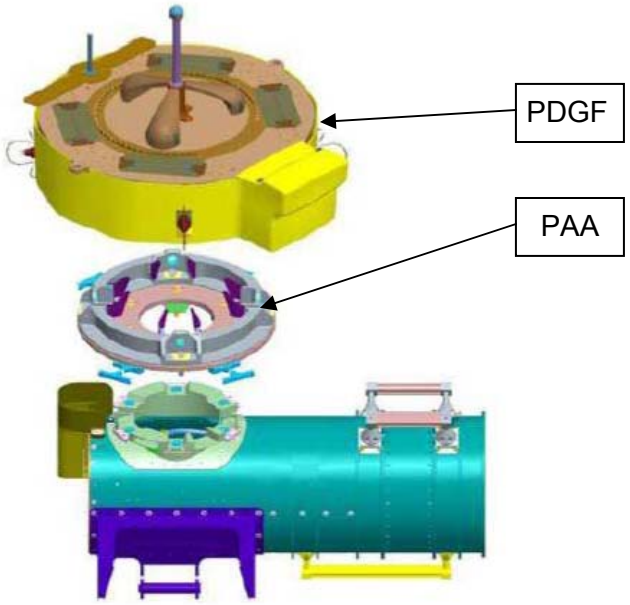




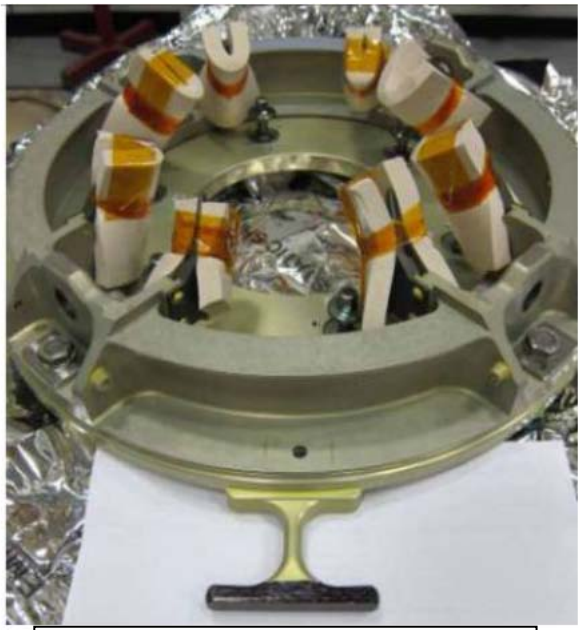
EFGF/PAA



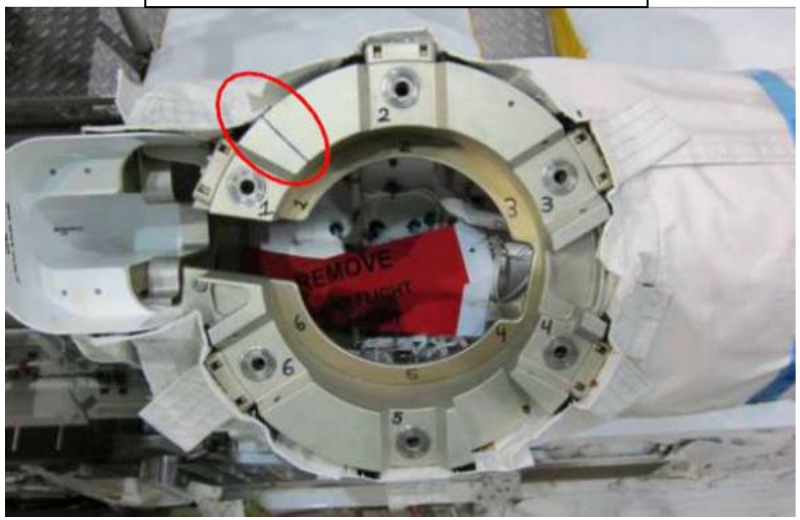
EIBA Complete Assembly (Fwd Transition)



Exploded view of EIBA (Fwd Transition)

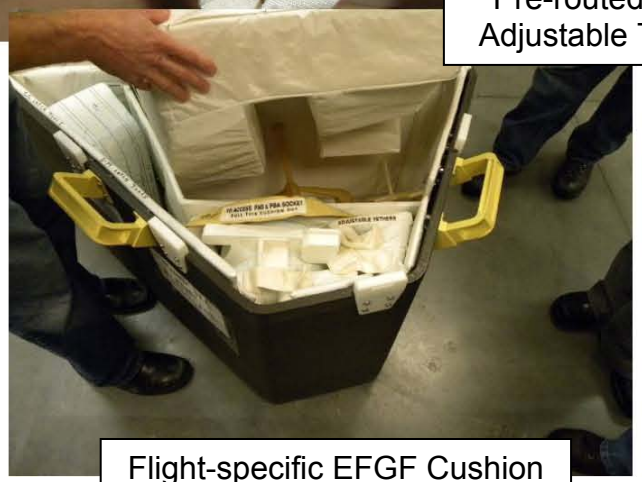


PAA – PDGF Adapter Assembly
Black mark at 1 o'clock



PORT TSA

Pre-routed TSA Adjustable Tether



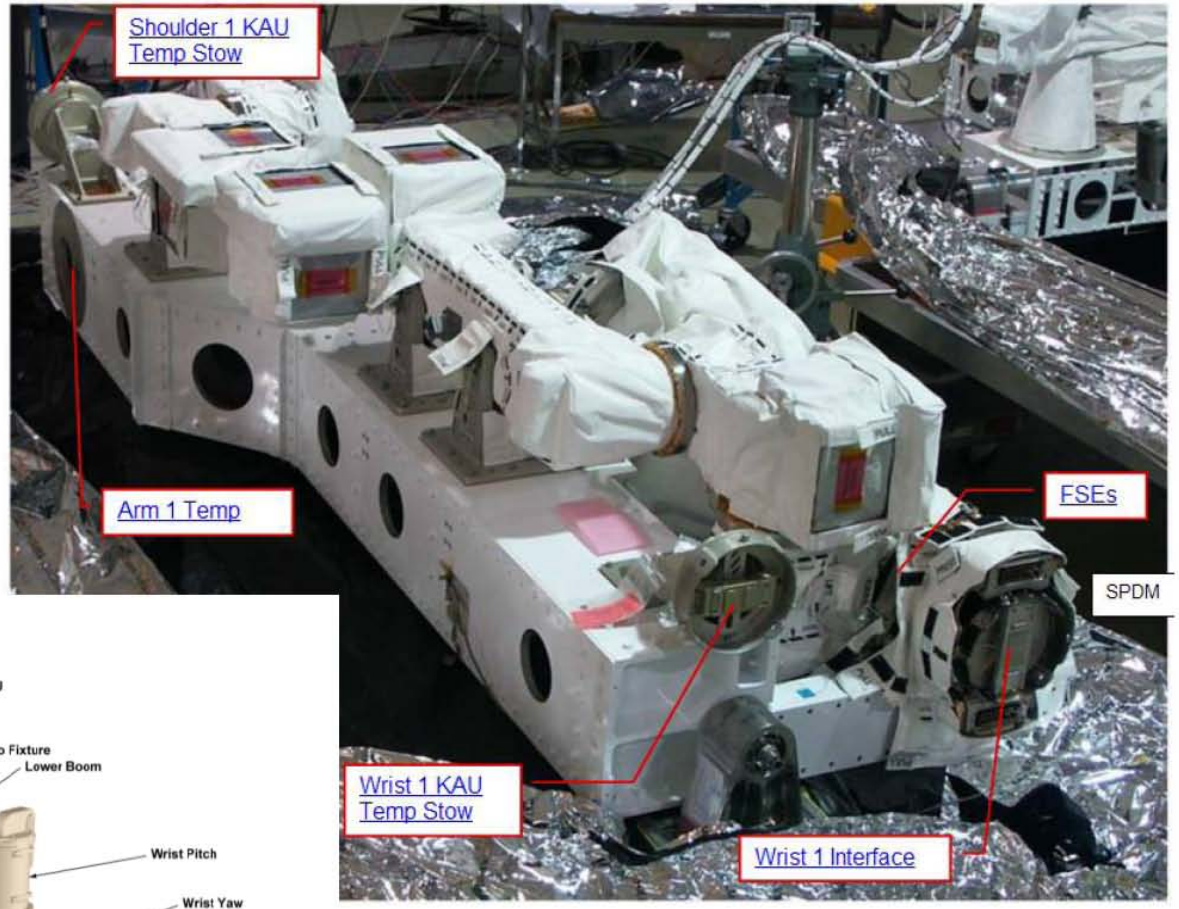
Flight-specific EFGF Cushion

SPARE SPDM

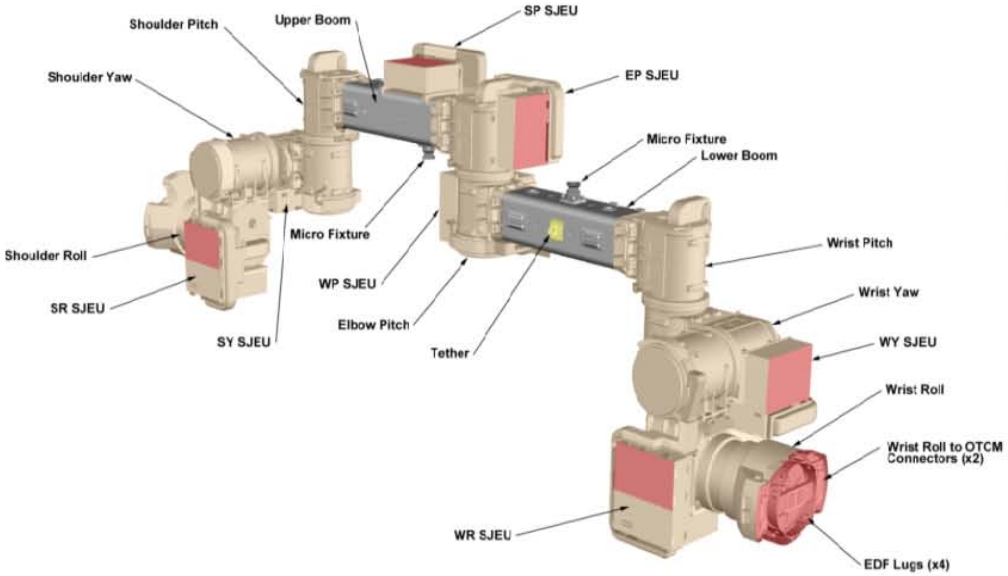
EDF Installed, Stowage Hole Below

Pry Rod in EDF Receptacle

SPARE SPDM (Cont)



No-Touch ( )



EMERGENCY AIRLOCK REPRESS 19-3
EMERGENCY AIRLOCK REPRESS 19-4
POST EMERGENCY AIRLOCK REPRESS 19-4
SAFER RESCUE 19-5
SAFER RESCUE 19-6
DAP/EVA RESCUE/RETRIEVE 19-7
EVA ORBITER CONFIG 19-7
RESCUE/RETRIEVE 19-9
19.1 DCS TREATMENT 19-10
CONTINGENCY SHUTTLE AIRLOCK INGRESS FROM ISS ..... TEMP FS 19-13

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CREWLOCK EGRESS

If ISS crewlock EV hatch closed and ΔP < 0.5 psi:

EV 1. √Tethers connected to crewlock D-ring, open EV hatch, stow
2. Perform POST DEPRESS steps as reqd on CREWLOCK DEPRESS/REPRESS CUE CARD (SODF: ISS EVA SYS: EVA PREP/POST)

EV1 3. Open thermal cover, egress crewlock
4. Configure safety tethers for EV1 and EV2, √locked

EV2 5. Egress crewlock, close thermal cover

SHUTTLE AIRLOCK PREP

NOTE

EV1 will translate to prep and open shuttle airlock hatch while EV2 remains to close ISS crewlock hatch after shuttle hatch is open

EV1 6. Translate to shuttle airlock

IV Aft Hatch MDK 7. Ext A/L Aft Hatch Equal vlv caps (two) – vent, remove caps, stow

8. Close Inner Hatch:
   Position handle to preclosing position per decal
   Hatch – rotate about hinge and push
   Handle – ccw to LATCH
   Lock lever to LOCKED

9. √Inner Hatch Equal vlvs (two) – OFF, caps removed

EV1 10. Open Ext A/L Aft Hatch thermal cover

IV 11. √MCC for attitude control in preparation for Shuttle airlock depress

EV1 12. On IV GO: Ext A/L Aft Hatch Equal vlvs (two) – EMER

IF CABIN DP/DT OR O2(N2) FLOW HI ALARM DURING AIRLOCK DEPRESS
EV crew: Ext A/L Aft Hatch Equal vlvs (two) – OFF
IV crew: Verify Inner Hatch closed and Inner Hatch Equal vlvs (two) – OFF

EV1 13. Monitor Ext A/L Aft Hatch ΔP gauge
When ΔP < 0.5 psi (~2 min), open hatch and ingress A/L, connect waist tether to A/L D-ring, √locked

EV1 14. Give EV2 GO for closing ISS crewlock EV Hatch

SHUTTLE AIRLOCK INGRESS

EV2 15. Open ISS crewlock thermal cover

16. As required,

UIA OXYGEN EMU 1,2 vlvs (two) – CLOSED

17. On EV1 GO, close ISS crewlock EV Hatch:
   Verify hatch clear of FOD and obstructions
   EV hatch handle – preclose
   Hatch – rotate around hinge and pull
   Handle – cw to LATCH
   Lock lever to LOCKED
   Close thermal cover

CONT
A/L INGRESS

18. Translate to Port Lab Struts
19. Attach waist tether to EV1 safety tether anchor hook, √locked
20. Release EV1 & EV2 safety tether anchor hooks from Port Lab Struts, attach EV2 safety tether anchor hook to mini-workstation
21. Translate to shuttle airlock, ingress
22. Close thermal cover

BOTH
23. Retrieve, position SCU; remove DCM cover
24. Connect SCU to DCM, √locked

AW82B
25. EV-1,EV-2 O2 vlv (two) – OP

AW18H
26. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR

BOTH
27. WATER – OFF (fwd)

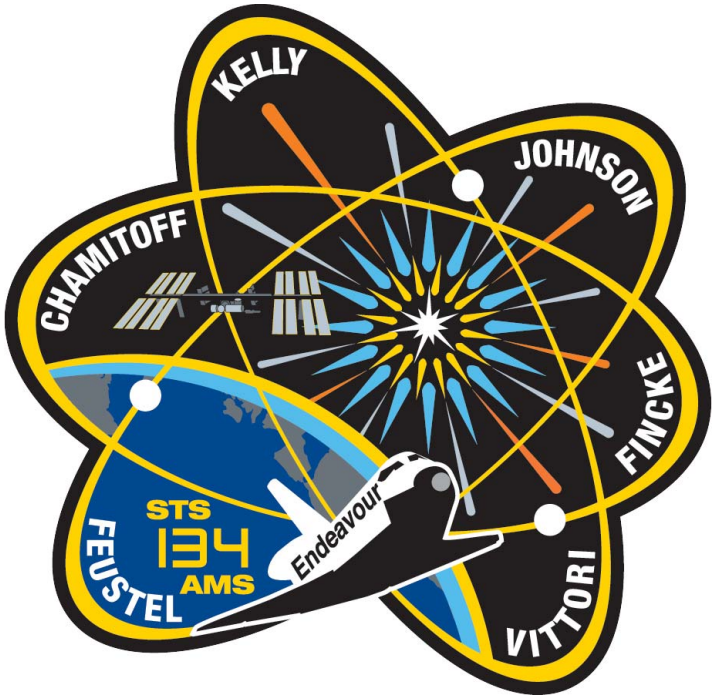
CAUTION
Do not close hatch until EMU WATER – OFF for 2 min

28. √Ext A/L Aft Hatch clear of FOD and obstructions, close hatch:
    Position handle to preclosing position per decal
    Hatch – rotate about hinge and push
    Handle – ccw to LATCH
    Lock lever to LOCKED
29. Ext A/L Aft Hatch Equal vlvs (two) – OFF, install caps

IV
30. Go to PRE-REPRESS/REPRESS (DEPRESS/REPRESS Cue Card) with the following delta:
    In REPRESS, skip step 2

Space Shuttle Program
FLIGHT DATA FILE

JSC-48024-134
FINAL, REV A



EVA CHECKLIST

STS
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Flight Cover (trim bottom to expose tabs)