



International Space Station Robotics Group Robotics Book - Flight Specific ISS-ULF5

Mission Operations Directorate
Operations Division

15 OCT 10

This publication replaces
all previous publications.
These procedures are available
electronically on the SODF Homepage
at <http://mod.jsc.nasa.gov/do3>

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



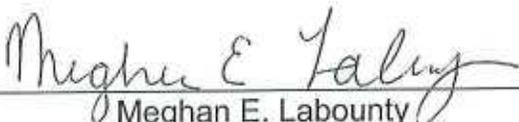
United Space Alliance

PST CODE: ROBO FSP ULF5 FIN 2

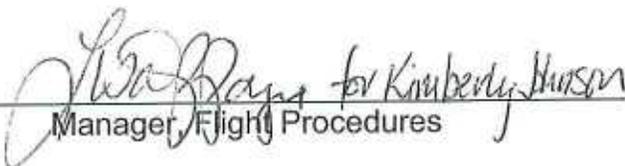
**INTERNATIONAL SPACE STATION
ROBOTICS GROUP
ROBOTICS BOOK - FLIGHT SPECIFIC
ISS-ULF5**

15 OCT 10

APPROVED BY:



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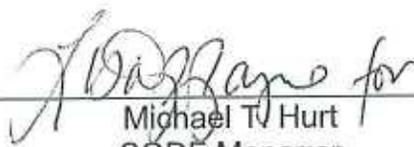


Manager, Flight Procedures

 10/15/10

SODF Coordinator

ACCEPTED BY:



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Incorporates the following:		
CR: Robotics_FS-00988 (PS)	Robotics_FS-00995	Robotics_FS-01002
Robotics_FS-00989	Robotics_FS-00996	Robotics_FS-01003
Robotics_FS-00990	Robotics_FS-00997A	Robotics_FS-01004
Robotics_FS-00991	Robotics_FS-00998	Robotics_FS-01005
Robotics_FS-00992	Robotics_FS-00999	Robotics_FS-01006
Robotics_FS-00993A	Robotics_FS-01000 (PS)	Robotics_FS-01007
Robotics_FS-00994	Robotics_FS-01001	

Uplinked Messages (or Approved Flight Notes) replaced by this revision,
remove from Book:

None

**INTERNATIONAL SPACE STATION
ROBOTICS GROUP
ROBOTICS BOOK - FLIGHT SPECIFIC
ISS-ULF5**

LIST OF EFFECTIVE PAGES

15 OCT 10

Sign Off	* 15 OCT 10	32.....	13 OCT 10
ii.....	* 15 OCT 10	33.....	13 OCT 10
iii.....	* 15 OCT 10	34.....	13 OCT 10
iv.....	* 15 OCT 10	35.....	13 OCT 10
v.....	* 15 OCT 10	36.....	13 OCT 10
vi.....	* 15 OCT 10	37.....	13 OCT 10
vii.....	* 15 OCT 10	38.....	13 OCT 10
viii.....	* 15 OCT 10	39.....	13 OCT 10
ix.....	15 OCT 10	40.....	13 OCT 10
x.....	15 OCT 10	41.....	13 OCT 10
1.....	15 OCT 10	42.....	13 OCT 10
2.....	15 OCT 10	43.....	13 OCT 10
3.....	13 OCT 10	44.....	13 OCT 10
4.....	13 OCT 10	45.....	13 OCT 10
5.....	13 OCT 10	46.....	13 OCT 10
6.....	13 OCT 10	47.....	13 OCT 10
7.....	13 OCT 10	48.....	13 OCT 10
8.....	13 OCT 10	49.....	13 OCT 10
9.....	13 OCT 10	50.....	13 OCT 10
10.....	13 OCT 10	51.....	13 OCT 10
11.....	13 OCT 10	52.....	13 OCT 10
12.....	13 OCT 10	53.....	13 OCT 10
13.....	13 OCT 10	54.....	13 OCT 10
14.....	13 OCT 10	55.....	13 OCT 10
15.....	13 OCT 10	56.....	13 OCT 10
16.....	13 OCT 10	57.....	13 OCT 10
17.....	13 OCT 10	58.....	13 OCT 10
18.....	13 OCT 10	59.....	13 OCT 10
19.....	13 OCT 10	60.....	13 OCT 10
20.....	13 OCT 10	61.....	13 OCT 10
21.....	13 OCT 10	62.....	13 OCT 10
22.....	13 OCT 10	63.....	13 OCT 10
23.....	13 OCT 10	64.....	13 OCT 10
24.....	13 OCT 10	65.....	13 OCT 10
25.....	13 OCT 10	66.....	13 OCT 10
26.....	13 OCT 10	67.....	13 OCT 10
27.....	13 OCT 10	68.....	13 OCT 10
28.....	13 OCT 10	69.....	13 OCT 10
29.....	13 OCT 10	70.....	13 OCT 10
30.....	13 OCT 10	71.....	13 OCT 10
31.....	13 OCT 10	72.....	13 OCT 10

* - Omit from flight book

73.....	13 OCT 10	123.....	14 OCT 10
74.....	13 OCT 10	124.....	14 OCT 10
75.....	13 OCT 10	125.....	14 OCT 10
76.....	13 OCT 10	126.....	14 OCT 10
77.....	13 OCT 10	127.....	14 OCT 10
78.....	TPIB	128.....	14 OCT 10
79.....	13 OCT 10	129.....	14 OCT 10
80.....	13 OCT 10	130.....	TPIB
81.....	13 OCT 10	131.....	14 OCT 10
82.....	13 OCT 10	132.....	14 OCT 10
83.....	13 OCT 10	133.....	14 OCT 10
84.....	13 OCT 10	134.....	14 OCT 10
85.....	13 OCT 10	135.....	14 OCT 10
86.....	13 OCT 10	136.....	14 OCT 10
87.....	13 OCT 10	137.....	14 OCT 10
88.....	13 OCT 10	138.....	14 OCT 10
89.....	13 OCT 10	139.....	14 OCT 10
90.....	13 OCT 10	140.....	14 OCT 10
91.....	13 OCT 10	141.....	14 OCT 10
92.....	13 OCT 10	142.....	14 OCT 10
93.....	13 OCT 10	143.....	14 OCT 10
94.....	13 OCT 10	144.....	14 OCT 10
95.....	13 OCT 10	145.....	14 OCT 10
96.....	13 OCT 10	146.....	14 OCT 10
97.....	13 OCT 10	147.....	14 OCT 10
98.....	13 OCT 10	148.....	14 OCT 10
99.....	13 OCT 10	149.....	14 OCT 10
100.....	13 OCT 10	150.....	14 OCT 10
101.....	13 OCT 10	151.....	14 OCT 10
102.....	13 OCT 10	152.....	14 OCT 10
103.....	14 OCT 10	153.....	14 OCT 10
104.....	14 OCT 10	154.....	14 OCT 10
105.....	14 OCT 10	155.....	14 OCT 10
106.....	14 OCT 10	156.....	14 OCT 10
107.....	14 OCT 10	157.....	14 OCT 10
108.....	14 OCT 10	158.....	14 OCT 10
109.....	14 OCT 10	159.....	14 OCT 10
110.....	14 OCT 10	160.....	14 OCT 10
111.....	14 OCT 10	161.....	14 OCT 10
112.....	14 OCT 10	162.....	14 OCT 10
113.....	14 OCT 10	163.....	14 OCT 10
114.....	14 OCT 10	164.....	14 OCT 10
115.....	14 OCT 10	165.....	14 OCT 10
116.....	14 OCT 10	166.....	14 OCT 10
117.....	14 OCT 10	167.....	14 OCT 10
118.....	14 OCT 10	168.....	14 OCT 10
119.....	14 OCT 10	169.....	14 OCT 10
120.....	14 OCT 10	170.....	14 OCT 10
121.....	14 OCT 10	171.....	14 OCT 10
122.....	14 OCT 10	172.....	14 OCT 10

* - Omit from flight book

173.....	15 OCT 10	223.....	15 OCT 10
174.....	15 OCT 10	224.....	15 OCT 10
175.....	15 OCT 10	225.....	13 OCT 10
176.....	15 OCT 10	226.....	TPIB
177.....	15 OCT 10	227.....	13 OCT 10
178.....	15 OCT 10	228.....	TPIB
179.....	15 OCT 10	229.....	15 OCT 10
180.....	15 OCT 10	230.....	15 OCT 10
181.....	13 OCT 10	231.....	13 OCT 10
182.....	13 OCT 10	232.....	TPIB
183.....	13 OCT 10	233.....	13 OCT 10
184.....	13 OCT 10	234.....	13 OCT 10
185.....	13 OCT 10	235.....	13 OCT 10
186.....	13 OCT 10	236.....	TPIB
187.....	13 OCT 10	237.....	13 OCT 10
188.....	TPIB	238.....	TPIB
189.....	15 OCT 10	239.....	13 OCT 10
190.....	15 OCT 10	240.....	TPIB
191.....	13 OCT 10	241.....	13 OCT 10
192.....	13 OCT 10	242.....	TPIB
193.....	13 OCT 10	243.....	13 OCT 10
194.....	13 OCT 10	244.....	TPIB
195.....	13 OCT 10	245.....	13 OCT 10
196.....	13 OCT 10	246.....	13 OCT 10
197.....	13 OCT 10	247.....	14 OCT 10
198.....	13 OCT 10	248.....	14 OCT 10
199.....	13 OCT 10	249.....	14 OCT 10
200.....	13 OCT 10	250.....	14 OCT 10
201.....	13 OCT 10	251.....	14 OCT 10
202.....	13 OCT 10	252.....	14 OCT 10
203.....	13 OCT 10	253.....	14 OCT 10
204.....	13 OCT 10	254.....	TPIB
205.....	13 OCT 10	255.....	13 OCT 10
206.....	13 OCT 10	256.....	13 OCT 10
207.....	13 OCT 10	257.....	13 OCT 10
208.....	13 OCT 10	258.....	13 OCT 10
209.....	13 OCT 10	259.....	13 OCT 10
210.....	13 OCT 10	260.....	13 OCT 10
211.....	13 OCT 10	261.....	13 OCT 10
212.....	13 OCT 10	262.....	13 OCT 10
213.....	13 OCT 10	263.....	13 OCT 10
214.....	13 OCT 10	264.....	13 OCT 10
215.....	13 OCT 10	265.....	13 OCT 10
216.....	13 OCT 10	266.....	13 OCT 10
217.....	13 OCT 10	267.....	13 OCT 10
218.....	13 OCT 10	268.....	13 OCT 10
219.....	13 OCT 10	269.....	13 OCT 10
220.....	TPIB	270.....	13 OCT 10
221.....	13 OCT 10	271.....	* 15 OCT 10
222.....	TPIB	272.....	* 15 OCT 10

* - Omit from flight book

273.....	* 13 OCT 10	326.....	* 13 OCT 10
274.....	* 13 OCT 10	327.....	* 13 OCT 10
275.....	* 13 OCT 10	328.....	* 13 OCT 10
276.....	* 13 OCT 10	329.....	* 13 OCT 10
277.....	* 13 OCT 10	330.....	* TPIB
278.....	* 13 OCT 10	331.....	* 13 OCT 10
279.....	* 13 OCT 10	332.....	* 13 OCT 10
280.....	* 13 OCT 10	333.....	* 13 OCT 10
281.....	* 13 OCT 10	334.....	* 13 OCT 10
282.....	* 13 OCT 10	335.....	* 13 OCT 10
283.....	* 13 OCT 10	336.....	* 13 OCT 10
284.....	* 13 OCT 10	337.....	* 13 OCT 10
285.....	* 13 OCT 10	338.....	* 13 OCT 10
286.....	* 13 OCT 10	339.....	* 13 OCT 10
287.....	* 13 OCT 10	340.....	* 13 OCT 10
288.....	* 13 OCT 10	341.....	* 13 OCT 10
289.....	* 13 OCT 10	342.....	* TPIB
290.....	* 13 OCT 10	343.....	* 13 OCT 10
291.....	* 13 OCT 10	344.....	* 13 OCT 10
292.....	* 13 OCT 10	345.....	* 13 OCT 10
293.....	* 13 OCT 10	346.....	* 13 OCT 10
294.....	* 13 OCT 10	347.....	* 13 OCT 10
295.....	* 13 OCT 10	348.....	* 13 OCT 10
296.....	* 13 OCT 10	349.....	* 13 OCT 10
297.....	* 13 OCT 10	350.....	* 13 OCT 10
298.....	* 13 OCT 10	351.....	* 13 OCT 10
299.....	* 13 OCT 10	352.....	* 13 OCT 10
300.....	* 13 OCT 10	353.....	* 13 OCT 10
301.....	* 13 OCT 10	354.....	* 13 OCT 10
302.....	* 13 OCT 10	355.....	* 13 OCT 10
303.....	* 13 OCT 10	356.....	* 13 OCT 10
304.....	* 13 OCT 10	357.....	* 13 OCT 10
305.....	* 13 OCT 10	358.....	* 13 OCT 10
306.....	* 13 OCT 10	359.....	* 13 OCT 10
307.....	* 13 OCT 10	360.....	* 13 OCT 10
308.....	* 13 OCT 10	361.....	* 13 OCT 10
309.....	* 13 OCT 10	362.....	* 13 OCT 10
310.....	* 13 OCT 10	363.....	* 13 OCT 10
311.....	* 13 OCT 10	364.....	* 13 OCT 10
312.....	* 13 OCT 10	365.....	* 13 OCT 10
313.....	* 13 OCT 10	366.....	* 13 OCT 10
314.....	* TPIB	367.....	* 13 OCT 10
315.....	* 13 OCT 10	368.....	* 13 OCT 10
316.....	* 13 OCT 10	369.....	* 13 OCT 10
317.....	* 13 OCT 10	370.....	* 13 OCT 10
318.....	* TPIB	371.....	* 13 OCT 10
319.....	* 13 OCT 10	372.....	* 13 OCT 10
320.....	* 13 OCT 10	373.....	* 13 OCT 10
321.....	* 13 OCT 10	374.....	* 13 OCT 10
322.....	* 13 OCT 10	375.....	* 13 OCT 10
323.....	* 13 OCT 10	376.....	* 13 OCT 10
324.....	* 13 OCT 10	377.....	* 13 OCT 10
325.....	* 13 OCT 10	378.....	* 13 OCT 10

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379 * 13 OCT 10
380 * 13 OCT 10
381 * 13 OCT 10
382 * 13 OCT 10
383 * 13 OCT 10
384 * 13 OCT 10
385 * 13 OCT 10
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401 * 13 OCT 10
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403 * 13 OCT 10
404 * 13 OCT 10
405 * 13 OCT 10
406 * TPIB

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CONTENTS

	<u>GND</u>	<u>ISS</u>
<u>NOMINAL</u>	1	1
<u>ELC4</u>		
1.110 BERTHED ELC4 GRAPPLE SETUP	3	3
1.120 ELC4 UNBERTH AND INSTALL	7	7
<u>OBSS</u>		
1.210 SSRMS OBSS UNBERTH AND HANDOFF	47	47
1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG	61	61
<u>PMM</u>		
1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR	79	79
<u>EVA</u>		
1.405 SSRMS EVA 1 SUPPORT	103	103
1.410 SSRMS EVA 2 SUPPORT	131	131
<u>FOCUSED INSPECTION SUPPORT</u>		
1.510 MNVR TO FI VIEWING	173	173
1.520 MNVR TO EVA 2 START	181	181
<u>CONTINGENCY</u>	189	189
2.120 SSRMS ELC4 INSTALL TO MCAS.....	191	191
2.310 SSRMS PMM INSTALL TO NODE 2 NADIR	209	209
2.666 CBM LATCH STALL RECOVERY	221	221
<u>REFERENCE</u>	223	223
3.110 ELC4 UNBERTH - FOR AND DISPLAY	225	225
3.120 ELC4 INSTALL - FOR AND DISPLAY	227	227
3.130 ELC4 PAS RTL REFERENCE SHEET	229	229
3.140 ELC4 PRLA CONFIGURATION.....	231	231
3.150 ELC4 EBCS REFERENCE SHEET	233	233
3.210 OBSS MID MPM - FOR AND DISPLAY	235	235
3.310 PMM UNBERTH - FOR AND DISPLAY	237	237
3.320 PMM INSTALL - FOR AND DISPLAY	239	239
3.330 PMM CBM RTL REFERENCE SHEET	241	241
3.340 PMM PRLA CONFIGURATION	243	243
3.350 PMM CBCS REFERENCE SHEET	245	245
3.405 EVA 1 SUPPORT - FOR AND DISPLAY	247	247
3.410 EVA 2 SUPPORT - FOR AND DISPLAY	249	249
3.600 PUBLISHED POSITIONS	255	255
<u>GROUND CONTROL</u>	271	IPV
4.110 SSRMS WALKOFF TO NODE 2.....	273	IPV
4.115 SURVEY - SSRMS WALKOFF TO NODE 2.....	315	IPV
4.120 SPDM SETUP FOR EVA 2	319	IPV
4.130 SPDM MANEUVER TO PARK.....	331	IPV
4.140 SSRMS WALKOFF TO NODE 2 FOR PMM.....	343	IPV
4.145 SURVEY - SSRMS WALKOFF TO NODE 2 FOR PMM	391	IPV
4.150 SURVEY - MT TRANSLATION WS3 TO WS2.....	395	IPV
4.160 SURVEY - MT TRANSLATION WS2 TO WS3.....	399	IPV
4.170 CLPA 1 UNCAGE AND CHECKOUT	403	IPV

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NOMINAL

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1.110 BERTHED ELC4 GRAPPLE SETUP

(RBT FS/ULF5/FIN 1/SPN) Page 1 of 4 pages

Verify SRMS is at Docking position

SY	SP	EP	WP	WY	WR
0.0	+25.0	-25.0	+5.0	0.0	0.0

1. HAND CONTROLLER CALIBRATION

THC/RHC Deflect each axis to positive and negative hard stops.

2. SETUP

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3
09: P1 Lower Outboard (+120, +20)	22: Base Elbow (-65, -5)	03: S1 Lower Outboard (+65, +20)

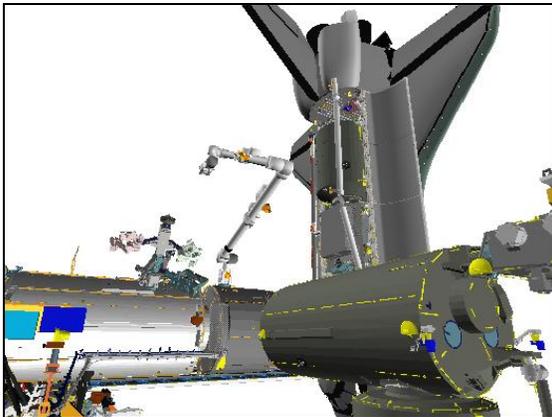


Figure 1.- Docking Park Position
(09: P1 Lower Outboard: +120, +20).

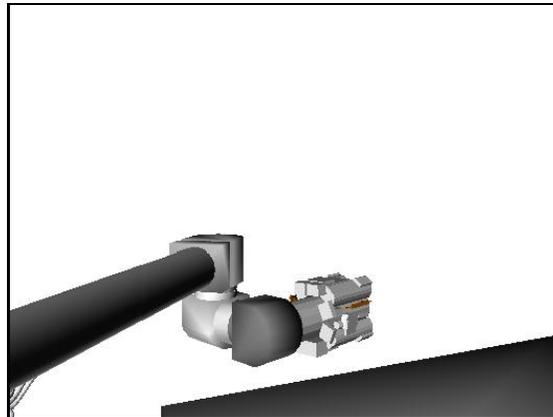


Figure 2.- Docking Park Position
(22:Base Elbow: -65, -5).

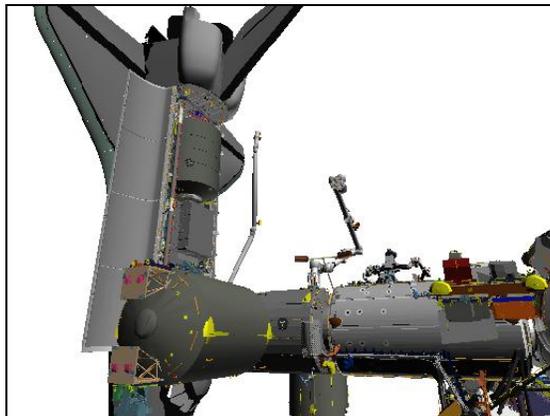


Figure 3.- Docking Park Position
(03: S1 Lower Outboard: +65, +20).

PCS

MSS: SSRMS:

Change Loaded Parameters ► ELC ► ELC4 Unberth SYH
Verify 'Loaded Parameters' (three) – ELC4 Unberth, SSRMS, SY Held

1.110 BERTHED ELC4 GRAPPLE SETUP

(RBT FS/ULF5/FIN 1/SPN) Page 2 of 4 pages

Change Unloaded Parameters ► Unloaded ► LEE Tip SYH
 Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

Change Display ► Orbiter ► ELC4 FRGF (Verify Orbiter>ELC4 FRGF)

Change Command ► SSRMS ► Internal (Verify SSRMS>Internal)

Verify SSRMS at Docking Park position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+180.0	-180.0	-120.0	-130.0	-209.0	-180.0	+177.2
X	Y	Z	Pitch	Yaw	Roll	
-976	-3	-439	+56.5*	-89.8	-154.6*	
FOR	Unloaded – LEE Tip, SY Held					
Disp	Orbiter>ELC4 FRGF					

*Display Singularity

3. JOCAS TO ELC4 PRE-GRAPPLE (2 MINUTES)

PCS MSS: SSRMS: MSS Safing:

cmd SSRMS: Remove (Verify Not Safed)

DCP BRAKES SSRMS → OFF (Verify OFF)

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► ELC4 ► Berthed Pre-grapple

Verify 'Joint Angles' 'Destination' for ELC4 Pre-Grapple position.

SR	SY	SP	EP	WP	WY	WR
+74.5	-173.6	-189.1	-131.7	-128.6	-164.6	+177.2

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+180.0	-180.0	-120.0	-130.0	-209.0	-180.0	+177.2
TGT	+74.5	-173.6	-189.1	-131.7	-128.6	-164.6	+177.2
ERR	+105.5	-6.4	+69.1	+1.7	-80.4	-15.4	0.0

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

1.110 BERTHED ELC4 GRAPPLE SETUP

(RBT FS/ULF5/FIN 1/SPN) Page 3 of 4 pages

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify SSRMS at ELC4 pre-grapple position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+74.5	-173.6	-189.1	-131.7	-128.6	-164.6	+177.2
X	Y	Z	Pitch	Yaw	Roll	
-150	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Held					
Disp	Orbiter>ELC4 FRGF					

NOTE

Expect the following message when safing is commanded:

'R3Z - MSS OCS SSRMS Prime(Redun) ACU SRT Cat-1 Brk Stat Fail' (SCR 17495)

This message should return to Norm.

DCP SAFING → SAFE (Verify ON)

4. [SETUP FOR GRAPPLE](#)

NOTE

The camera table below will setup views for the following SRMS and SSRMS maneuvers:

1. SRMS Maneuver to ELC4 unberth viewing position.
(PDRS Operations Checklist: ELC4 Nominal: ELC4 Unberth Viewing: Page FS 1-3, Step 1)
2. SSRMS ELC4 Grapple.
(SODF: RBT FS: 1.120 ELC4 Unberth and Install: Step 1)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3
09: P1 Lower Outboard (+120, +20)	25: Tip LEE (Full Zoom Out)	72 (DNLK)

1.110 BERTHED ELC4 GRAPPLE SETUP
(RBT FS/ULF5/FIN 1/SPN) Page 4 of 4 pages

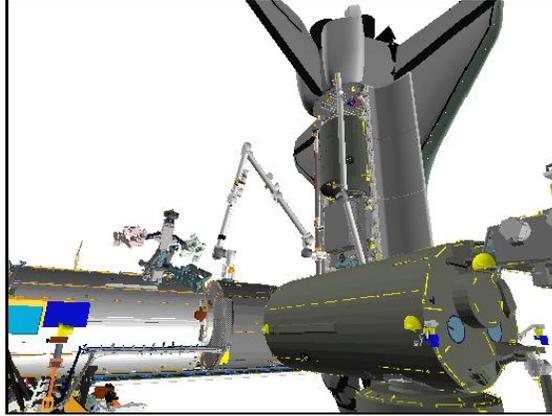


Figure 4.- Berthed ELC4 Pre-Grapple
(09: P1 Lower Outboard: +120, +20).

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 1 of 40 pages

NOTE
Items in Grey are for Shuttle crew or MCC-H (when noted.)

1. ELC4 FRGF GRAPPLE

Review SSRMS LEE CUE CARD (SSRMS IS LOADED AND LEE CAUTION IS ANNUNCIATED), all (SODF: RBT GEN: REFERENCE: CUE CARD).

1.1 Setup

Verify SRMS is at ELC4 Unberth Viewing position

SY	SP	EP	WP	WY	WR
+15.2	+71.3	-103.8	-77.1	-50.9	-184.9

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
09: P1 Lower Outboard (+120, +20)	25: Tip LEE (Full Zoom Out)	72 (DNLK): Camera A (-15, +10) Zoom = 25	Camera D (+25, +10)	SRMS Elbow (-65, -15)

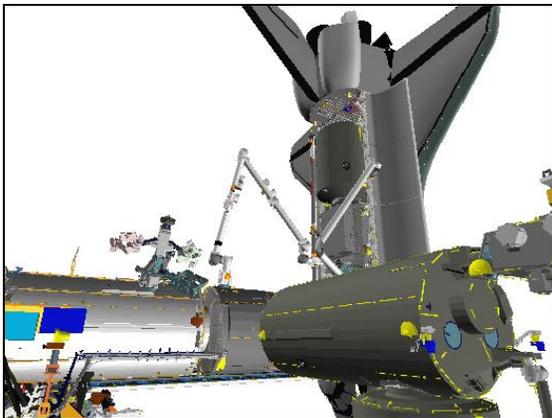


Figure 1.- Berthed ELC4 Pre-Grapple (09: P1 Lower Outboard: +120, +20).

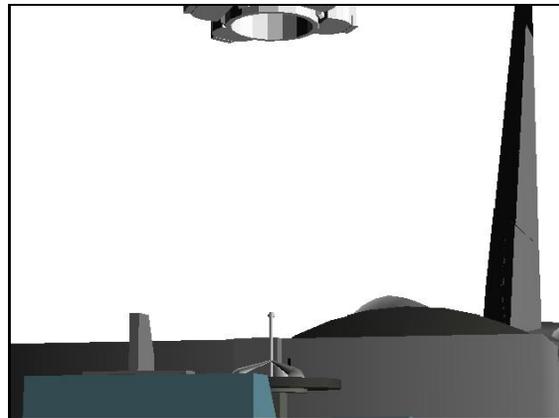


Figure 2.- Berthed ELC4 Pre-Grapple (72: Camera A: -15, +10: Zoom = 25).

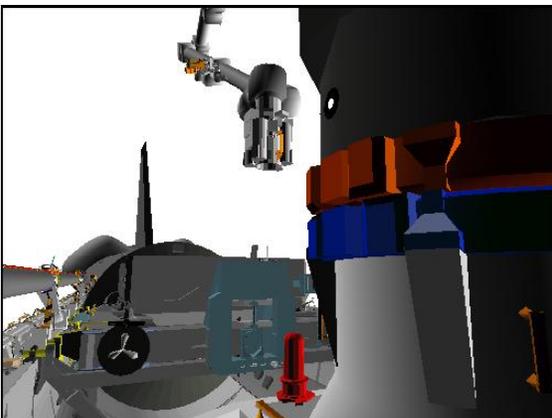


Figure 3.- Berthed ELC4 Pre-Grapple (Camera D: +25, +10).

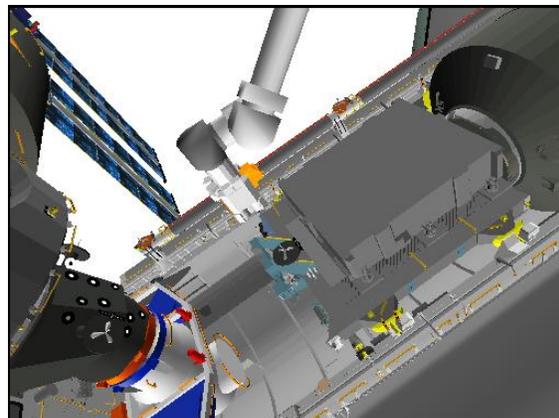


Figure 4.- Berthed ELC4 Pre-Grapple (SRMS Elbow: -65, -15).

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 2 of 40 pages

PCS MSS: SSRMS:

Verify 'Loaded Parameters' (three) – ELC4 Unberth, SSRMS, SY Held

Verify Unloaded Parameters – √
 Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

Verify Display – Orbiter>ELC4 FRGF

Verify Command – SSRMS>Internal

Verify SSRMS at ELC4 pre-grapple position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+74.5	-173.6	-189.1	-131.7	-128.6	-164.6	+177.2
X	Y	Z	Pitch	Yaw	Roll	
-150	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Held					
Disp	Orbiter>ELC4 FRGF					

MSS: SSRMS: MSS Safing:

cmd SSRMS: Remove (Verify Not Safed)

DCP BRAKES SSRMS → OFF (Verify OFF)

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.5)

1.2 Maneuvering to Within Grapple Envelope

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC Maneuver to within grapple envelope. (THC In, +X)

1.3 Slow Auto FRGF Capture

PCS MSS: SSRMS: Tip LEE:

cmd Capture ► Automatic ► Slow, Limp (Verify Speed – Slow)

1.120 ELC4 UNBERTH AND INSTALL

(RBT FS/ULF5/FIN 1/SPN) Page 3 of 40 pages

Verify 'Confirm or Terminate' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Capture

RHC TRIGGER → press (momentarily)

PCS Verify 'Snare' Close, Capture (two) – blue (12 s max)

Verify Capture to Latch – No (SCR 19282)

Verify 'Carriage' Tension ~ 5500 N (90 s max)

Verify 'Carriage' Retract – blue

Verify 'Carriage' Brakes – On (15s max)

Verify Loaded Parameters – √

Verify 'Loaded Parameters' (three) – ELC4 Unberth, SSRMS, SY Held

DCP BRAKES SSRMS → ON (Verify ON)

2. ELC4 UNBERTH SETUP

NOTE

This maneuver has the following clearance concerns:

1. ELC4 Trunnion Pin to OBSS Boom, minimum of 13cm (5in) at Z = -78. Monitor with Camera D and Tip Elbow.
2. ELC4 Trunnion Pin to OBSS FRGF, minimum of 9cm (3in) at Z = -99. Monitor with Camera C, Tip Elbow, and Lab Stbd Zenith.
3. ELC4 PVGF to PMM CBM, minimum of 16cm (6in) at Z = -144. Monitor with SRMS EE and Tip Elbow.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
71 (MON 2): Mux D/A D: (-4, -4) Zoom = 20 A: (+4, -4) Zoom = 20	24: Tip Elbow (+35, +25) 09: P1 Lower Outboard (+120, +20)	72 (DNLK): Camera C (0,0) 13: LAB Stbd Zenith (-50, -20)	Camera B (0, 0) Zoom = 15	SRMS EE Zoom = 25 SRMS Elbow (-45, -20)

1.120 ELC4 UNBERTH AND INSTALL
(RBT FS/ULF5/FIN 1/SPN) Page 4 of 40 pages

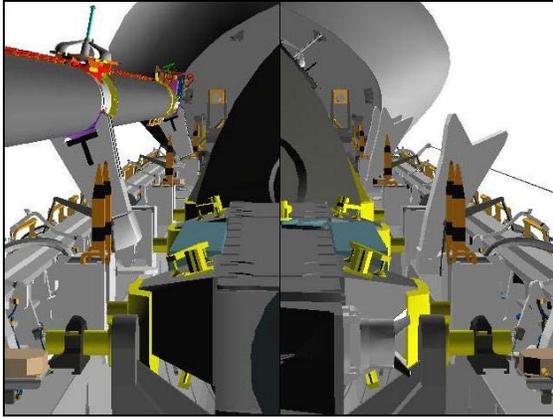


Figure 5.- Berthed ELC4 Grappled
(71: Mux D/A: -4,-4/+4,-4: Zoom = 20).

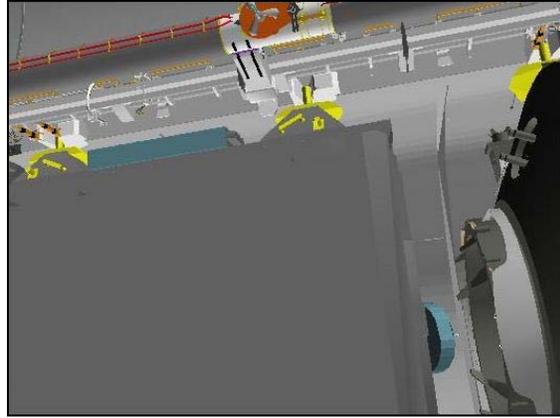


Figure 6.- Berthed ELC4 Grappled
(24: Tip Elbow: +35, +25).

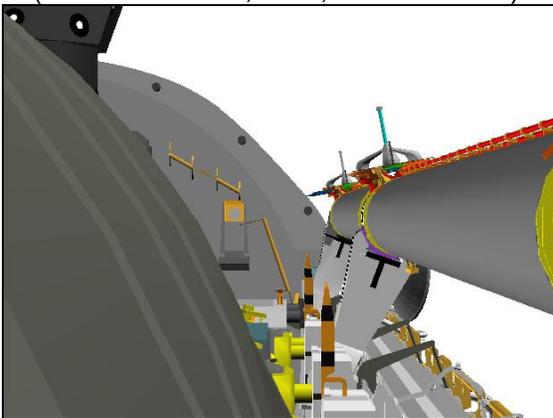


Figure 7.- Berthed ELC4 Grappled
(Camera C: 0, 0: Zoom = 15).

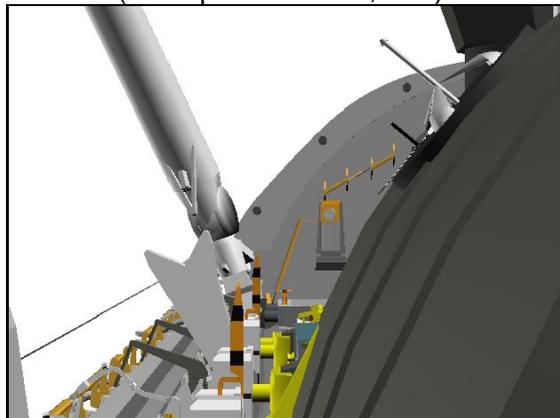


Figure 8.- Berthed ELC4 Grappled
(Camera B: 0, 0: Zoom = 15).

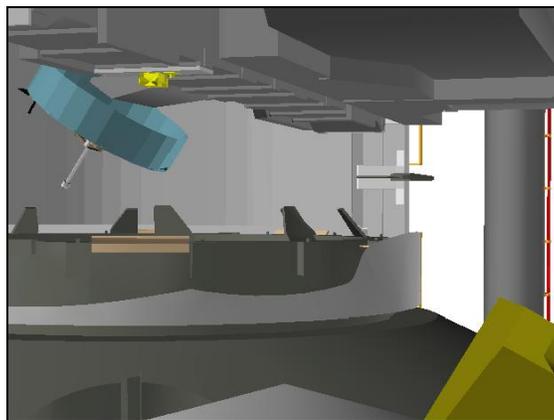


Figure 9.- Berthed ELC4 Grappled
(SRMS EE: Zoom = 25).

1.120 ELC4 UNBERTH AND INSTALL
(RBT FS/ULF5/FIN 1/SPN) Page 5 of 40 pages

PCS MSS: SSRMS:

Change Display ► Orbiter ► ELC4 Unberth (Verify Orbiter>ELC4 Unberth)

Change Command ► ISS ► OBAS (Verify ISS>OBAS)

Verify SSRMS at ELC4 Grappled position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+78.1	-173.6	-199.5	-117.9	-132.5	-168.1	+177.1
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Unberth, SY Held					
Disp	Orbiter>ELC4 Unberth					

* If using shuttle attitude control
* Verify in attitude, then DAP: FREE

MCC-H MCG: MCS Configuration: MCS Inhibits:
√ Desat Request – Inh
√ Auto Att Control handover to RS - Inh

On **MCC-H**, “GO for ELC4 Unberth.”

Notify **PRLA Operator**, “GO for PRLA Ops.”

NOTE
PRLA operator will perform steps 3-5.

NOTE
If ‘**R3Q - SSRMS LEE Uncommanded Derigidize**’ caution is annunciated or Carriage tension drops below 4400 N during PRLA release, refer to star block in step 6 after PRLA operator gives “SSRMS is Go for ELC4 Unberth.”

3. ACTIVATE LATCHES
On **SSRMS Operator**, “GO for PRLA Ops.”

NOTE
When MCA 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

6. MANUAL MANEUVER ELC4 TO PAYLOAD BAY HOVER

On **PRLA operator**, “SSRMS is GO for ELC4 Unberth.”

```

*****
* If 'R3Q - SSRMS LEE Uncommanded Derigidize' Caution was annunciated
* or Carriage tension dropped below 4400 N during PRLA release
*
PCS *   MSS: SSRMS: Tip LEE: 
*
*   cmd 'Carriage' Rigidize ► Slow (Verify Speed – Slow)
*
*   Verify 'Confirm or Terminate' prompt.
*
*   cmd Confirm (Verify RHC Trigger Hot icon)
*
*   Verify LEE Mode – Rigidize
RHC *   TRIGGER → Press (momentarily) (SCR 19064)
PCS *   Verify 'Carriage' Tension ~5500 N (90 s max)
*   Verify 'Carriage' Retract – blue
*****
DCP BRAKES SSRMS → OFF (Verify OFF)
  
```

√Vernier

```

PCS   MSS: SSRMS: Rate: 
      Set 'Scale' 'Vernier' Rate Scale: As Desired (1.0)
      MSS: SSRMS: 
      Enter Mode – Manual (Verify blue)
      MSS: SSRMS: SSRMS Manual: Joint Lock: 
      cmd Shoulder Yaw (Verify SY – Locked)
  
```

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 8 of 40 pages

THC/RHC Maneuver ELC4 to Hover position (within 5 cm/1 deg). (THC Up, -Z)

		Locked						
		SR	SY	SP	EP	WP	WY	WR
		+78.1	-173.6	-199.5	-117.9	-132.5	-168.1	+177.1
		X	Y	Z	Pitch	Yaw	Roll	
Berthed		0	0	0	0.0	0.0	0.0	
1: Z	-			-50				
2: Y	-		-5					
3: Z	-			-400				
Hover		0	-5	-400	0.0	0.0	0.0	
		SR	SY	SP	EP	WP	WY	WR
		+57.0	-173.6	-163.6	-154.1	-129.5	-147.1	+177.7
		FOR	Loaded – ELC4 Unberth, SY Lock					
		Disp	Orbiter>ELC4 Unberth					

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

 * If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
 * (ORB OPS, REBOOST/DAP) Steps 1-3

7. FOR OCAS TO ELC4 HANDOFF (7 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+50, +30)	09: P1 Lower Outboard (+120, +20)	72(DNLK): Camera C (0, +35)	Camera D (-5, +20)	SRMS Elbow (-65, +10)



Figure 10.- ELC4 Hover
 (03: S1 Lower Outboard: +50, +30).

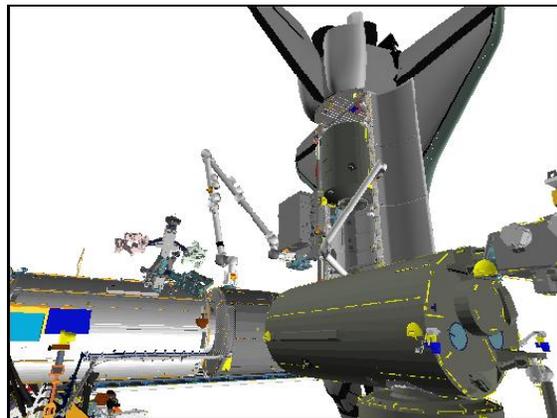


Figure 11.- ELC4 Hover
 (09: P1 Lower Outboard: +120, +20).

1.120 ELC4 UNBERTH AND INSTALL
(RBT FS/ULF5/FIN 1/SPN) Page 9 of 40 pages

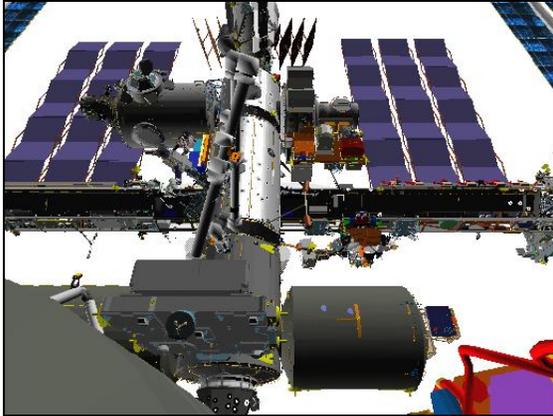


Figure 12.- ELC4 Hover
(72: Camera C: 0, +35).

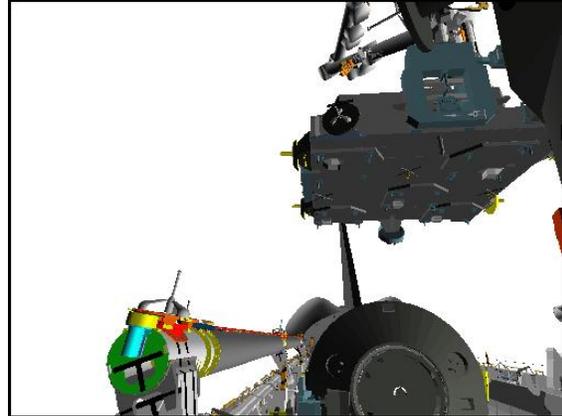


Figure 13.- ELC4 Hover
(Camera D: -5, +20).

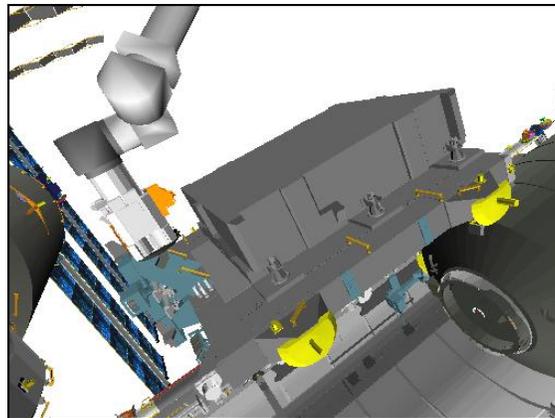


Figure 14.- ELC4 Hover
(SRMS Elbow: -65, +10).

NOTE

During this maneuver, expect the cross-cluster self collision warning to annunciate and return to norm (once.)

RHC RATE → COARSE (Verify Coarse on PCS)

PCS MSS: SSRMS:

Change Display ► Node2 ► PDGF (Verify Node2>PDGF)

Enter Mode – FOR OCAS (Verify blue)

MSS: SSRMS: SSRMS FOR OCAS: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

pick File ► ELC4 ► Handoff

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 10 of 40 pages

Verify 'FOR' 'Destination' for ELC4 Handoff position.

X	Y	Z	Pitch	Yaw	Roll
-520	-418	+1165	+129.1	-0.7	+89.0

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify FOR and errors are correct on FOR Position overlay.

	X	Y	Z	Pitch	Yaw	Roll
FOR	-403	-514	+99	+9.2	+1.1	+89.9
TGT	-520	-418	+1165	+129.1	-0.7	+89.0
ERR	+117	-96	-1066	-119.9	+1.8	+0.9

PCS

cmd Confirm (Verify Sequence Status – Auto Seq Sw-Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

Verify SSRMS at ELC4 Handoff position (within 5 cm/1 deg).

Locked	SR	SY	SP	EP	WP	WY	WR
	+57.0	-128.4	-131.0	-62.8	-230.0	-159.3	+107.0
	X	Y	Z	Pitch	Yaw	Roll	
	-520	-418	+1165	+129.1	-0.7	+89.0	
FOR	Loaded – ELC4 Unberth, SR Lock						
Disp	Node2>PDGF						

DCP

BRAKES SSRMS → ON (Verify ON)

RHC

RATE → VERNIER (Verify Vernier on PCS)

 * If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
 * (ORB OPS, REBOOST/DAP) Steps 1 and 2.

Notify **SRMS operator**, “SRMS is GO for ELC4 grapple at Handoff.”
 (PDRS Operations Checklist: ELC4 Nominal: ELC4 Handoff: Page FS 1-5, Step 1)

Configure Cameras as required for SRMS operator.

Monitor 2	Monitor 3
09: P1 Lower Outboard (+120, +20)	13: LAB Stbd Zenith (-30, 0)

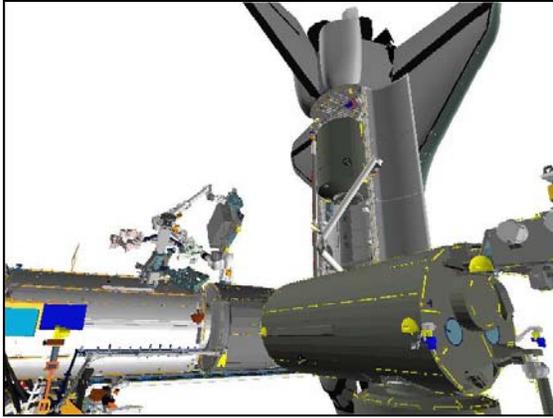


Figure 15.- SRMS ELC4 Unberth Viewing
 (09: P1 Lower Outboard: +120, +20).

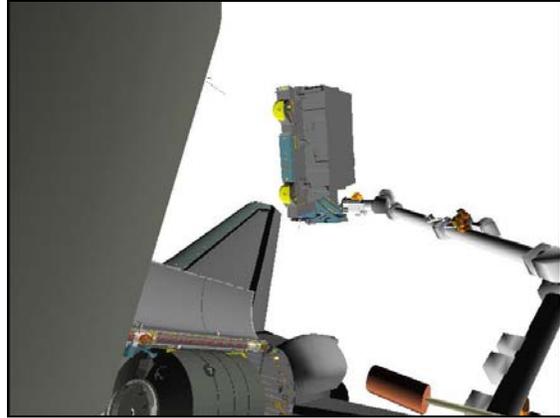


Figure 16.- SRMS ELC4 Unberth Viewing
 (13: LAB Stbd Zenith: -30, 0).

8. SSRMS RELEASE OF ELC4 FRGF AT HANDOFF

8.1 Setup

On **SRMS operator**, "SSRMS is GO for ELC4 release."

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+60, +30)	25: Tip LEE (Full Zoom Out)	13: LAB Stbd Zenith (-20,0)	Camera D (-30, +25)	SRMS Elbow (0, +5) Zoom = 35

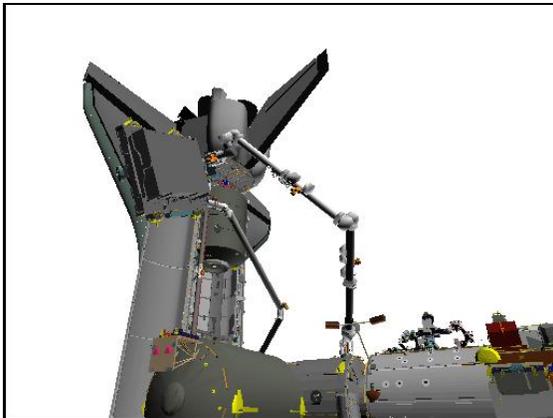


Figure 17.- ELC4 Port Hover
 (03: S1 Lower Outboard: +60, +30).

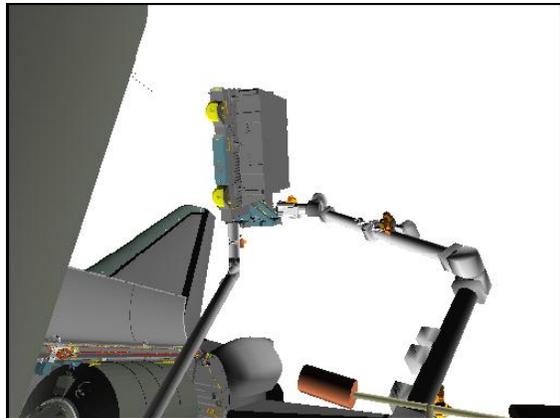


Figure 18.- ELC4 Port Hover
 (13: LAB Stbd Zenith: -20, 0).

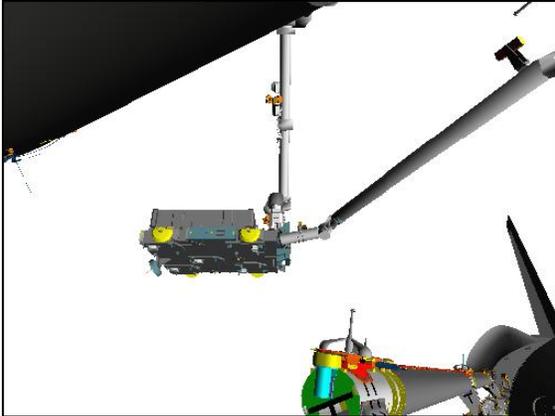


Figure 19.- ELC4 Port Hover
 (Camera D: -30, +25).

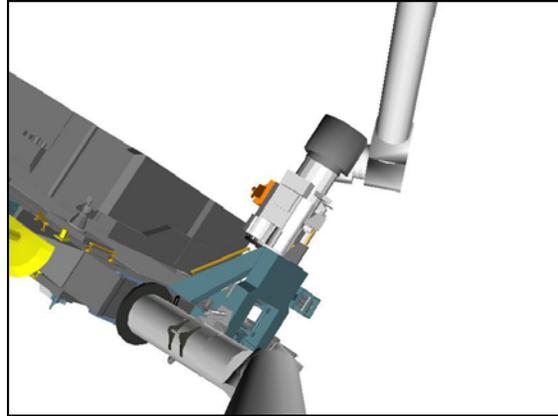


Figure 20.- ELC4 Port Hover
 (SRMS Elbow: 0, +5: Zoom = 35).

PCS

MSS: SSRMS:

Change Command ► SSRMS ► Internal (Verify SSRMS>Internal)

Change Display ► ISS ► ISSACS (Verify ISS>ISSACS)

DCP

BRAKES SSRMS → OFF (Verify OFF)

√ Vernier

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.5)

8.2 SSRMS Limping

PCS

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

Verify all joints – Limped

8.3 Slow Auto FRGF Release

MSS: SSRMS: Tip LEE:

cmd Release ► Automatic ► Slow (Verify Speed – Slow)

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Release

RHC

TRIGGER → press (momentarily)

1.120 ELC4 UNBERTH AND INSTALL
(RBT FS/ULF5/FIN 1/SPN) Page 13 of 40 pages

PCS Verify 'Carriage' Derigidize – blue (90 s max)
 Verify 'Snare' Open – blue (12 s max)
 Verify 'Carriage' Extend – blue (90 s max)

Verify Unloaded Parameters – √
Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

8.4 Backing off ELC4 at Handoff

MSS: SSRMS: Limp:

cmd None Limp (Verify Standby – blue)

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/RHC Maneuver SSRMS to Backoff position (within 5 cm/1 deg). (THC Out, -X)

Locked						
SR	SY	SP	EP	WP	WY	WR
+57.0	-131.4	-122.8	-65.8	-236.3	-158.0	+104.2
X	Y	Z	Pitch	Yaw	Roll	
+923	+860	+1568	+1.1	+0.1	+60.2	
FOR	Unloaded – LEE Tip, SR Lock					
Disp	ISS>ISSACS					

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

* If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
* (ORB OPS, REBOOST/DAP) Steps 1 and 2.

9. JOINT OCAS MANEUVER TO INTERMEDIATE (2.5 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+60, +30)	09: P1 Lower Outboard (+105, +15)	13: LAB Stbd Zenith (0,-10)	Camera C (+25, +40)	SRMS Elbow (0, +25)

1.120 ELC4 UNBERTH AND INSTALL
(RBT FS/ULF5/FIN 1/SPN) Page 14 of 40 pages



Figure 21.- ELC4 Handoff Released
(03: S1 Lower Outboard: +60, +30).

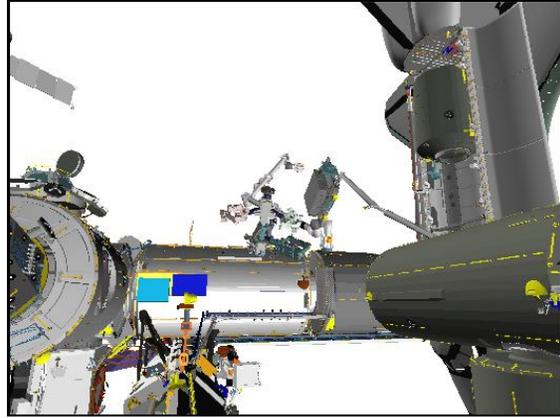


Figure 22.- ELC4 Handoff Released
(09: P1 Lower Outboard: +105, +15).

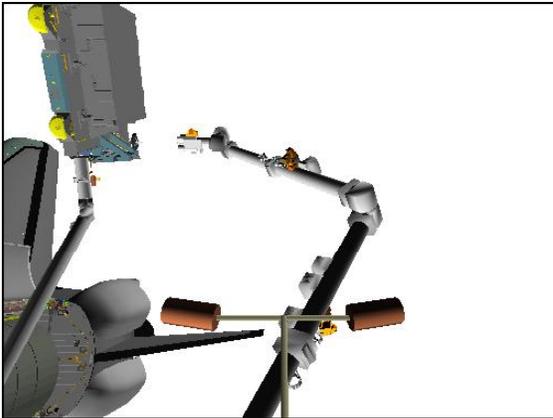


Figure 23.- ELC4 Handoff Released
(13: LAB Stbd Zenith: 0, -10).

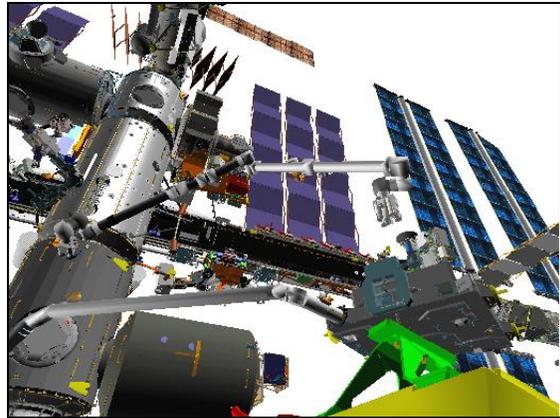


Figure 24.- ELC4 Handoff Released
(Camera C: +25, +40).

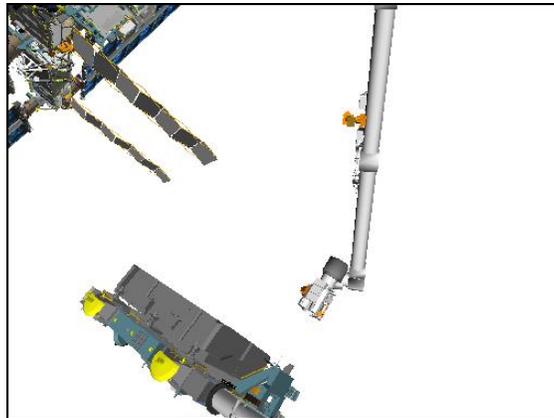


Figure 25.- ELC4 Handoff Released
(SRMS Elbow: 0, +25).

1.120 ELC4 UNBERTH AND INSTALL
(RBT FS/ULF5/FIN 1/SPN) Page 15 of 40 pages

NOTE
Expect singularity when: +15 > EP > -15.

RHC RATE → COARSE (Verify Coarse on PCS)

PCS MSS: SSRMS:

SSRMS

Change Loaded Parameters ► Walk Off ► MBS PDGF 1
Verify 'Loaded Parameters' (three) – MBS PDGF 1, SSRMS, SR Held

Change Display ► MBS ► PDGF 1 (Verify MBS>PDGF 1)

Verify Command – SSRMS>Internal

Enter Mode – Joint OCAS (Verify blue)

SSRMS Joint OCAS

pick File ► ELC4 ► Walkoff Intermediate

Verify 'Joint Angles' 'Destination' for Intermediate position.

SR	SY	SP	EP	WP	WY	WR
+20.0	-144.9	-120.0	+77.9	-119.4	-211.3	+114.9

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+57.0	-131.4	-122.8	-65.8	-236.3	-158.0	+104.2
TGT	+20.0	-144.9	-120.0	+77.9	-119.4	-211.3	+114.9
ERR	+37.0	+13.5	-2.8	-143.7	-116.9	+53.3	-10.7

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

SSRMS

Verify Posn Hold – orange

Verify SSRMS at Walkoff Intermediate position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+20.0	-144.9	-120.0	+77.9	-119.4	-211.3	+114.9
X	Y	Z	Pitch	Yaw	Roll	
-153	+408	+495	+5.8	-10.0	-20.8	
FOR	Unloaded – LEE Tip, SY Held					
Disp	MBS>PDGF 1					

10. FOR OCAS MANEUVER TO PDGF 1 PRE-GRAPPLE (2.5 MINUTES)

NOTE

This maneuver has the following clearance concerns.

1. SSRMS Tip Boom to Columbus Module, decreases to 60cm (24in). Monitor with SRMS Elbow, MBS Mast, or SPDM Body2 Cameras.
2. SSRMS Base Boom to UHF Antenna, decreases to 73cm (29in). Monitor with MBS Mast and SPDM Body2 Cameras.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+60, +10)	37: MBS Mast (+70, +20)	47: SPDM Body2 (-10, -25)	Camera C (+20, +30)	SRMS Elbow (-50, +55)

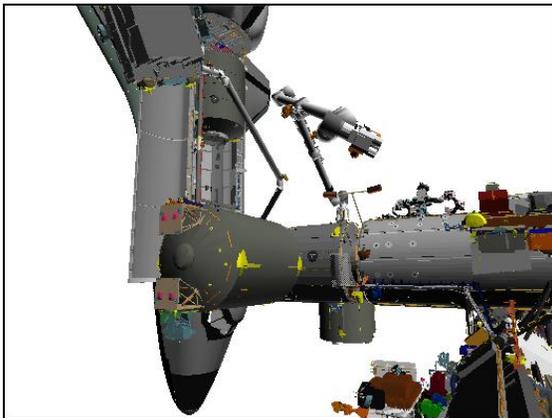


Figure 26.- Walkoff Intermediate (03: S1 Lower Outboard: +60, +10).

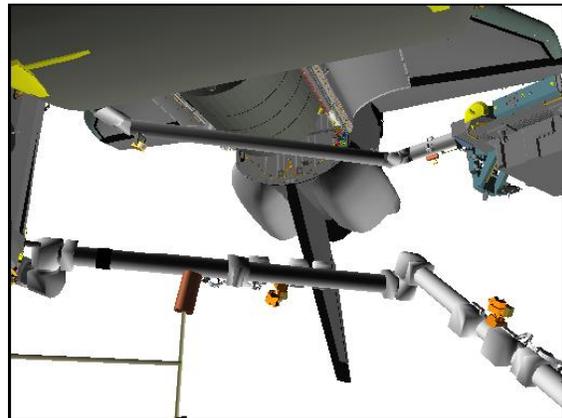


Figure 27.- Walkoff Intermediate (37: MBS Mast: +70, +20).

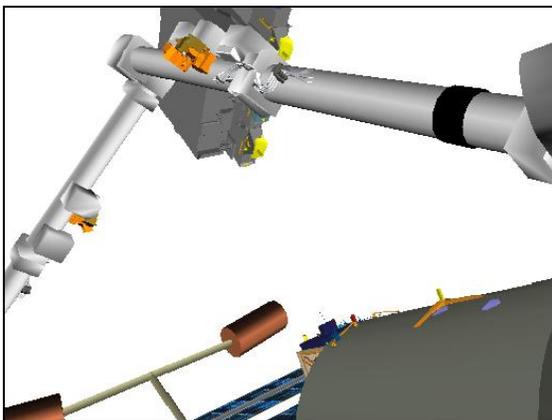


Figure 28.- Walkoff Intermediate (47: SPDM Body2: -10, -25).

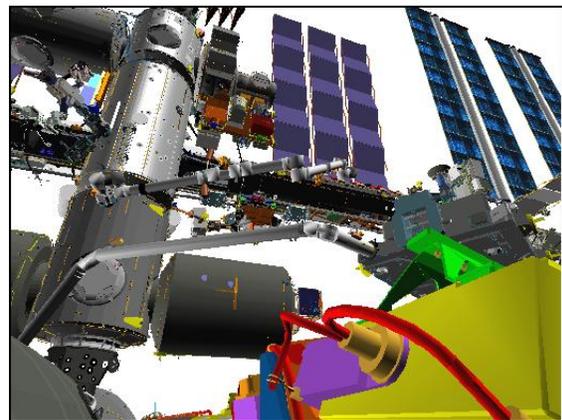


Figure 29.- Walkoff Intermediate (Camera C: +20, +30).

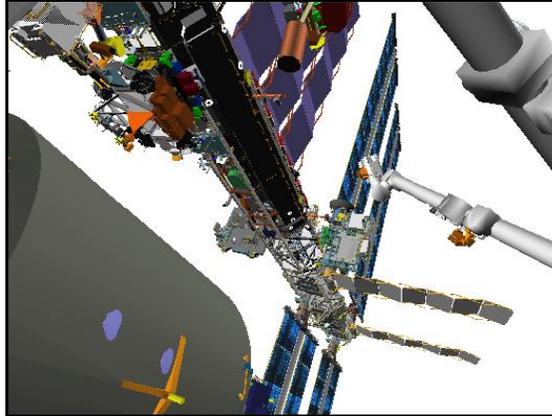


Figure 30.- Walkoff Intermediate
 (SRMS Elbow: -50, +55).

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS:

Enter Mode – FOR OCAS (Verify blue)

MSS: SSRMS: SSRMS FOR OCAS: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

pick File ► ELC4 ► MBS1 Pre-Grapple

Verify 'FOR' 'Destination' for Pre-Grapple position.

X	Y	Z	Pitch	Yaw	Roll
-65	0	0	0.0	0.0	0.0

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify FOR and errors are correct on FOR Position overlay.

	X	Y	Z	Pitch	Yaw	Roll
FOR	-153	+408	+495	+5.8	-10.0	-20.8
TGT	-65	0	0	0.0	0.0	0.0
ERR	-88	+408	+495	+5.8	-10.0	-20.8

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq Sw-Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 18 of 40 pages

Verify SSRMS at Pre-Grapple position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-11.0	-144.9	-73.8	+64.3	-116.2	-206.6	+109.8
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	MBS>PDGF 1					

11. GRAPPLING MBS PDGF 1

NOTE

This maneuver has the following clearance concerns.

1. SSRMS Tip Boom to Columbus Module, increases to 91cm (36in). Monitor with SRMS Elbow or Camera C.
2. SSRMS Base Boom to UHF Antenna, decreases to 60cm (24in). Monitor with MBS Mast.

11.1 Setup

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC 1 (MON 1)	SSC 2 (DTV)
37: MBS Mast (+70, +20)	25: Tip LEE (Full Zoom Out)	13: LAB Stbd Zenith (+110, +75)	Camera C (+20, +30)	SRMS Elbow (-60, +55)



Figure 31.- PDGF 1 Pre-Grapple
(37: MBS Mast: +70, +20).

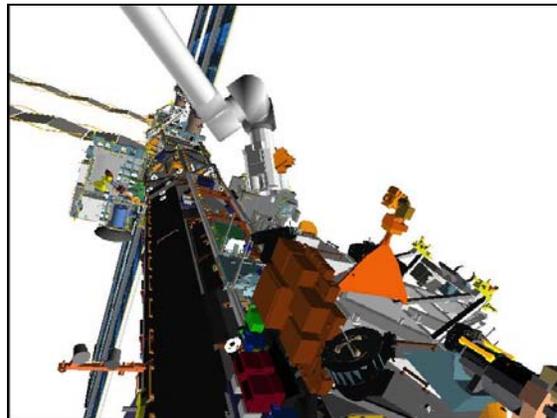


Figure 32.- PDGF 1 Pre-Grapple
(13: LAB Stbd Zenith: +110, +75).

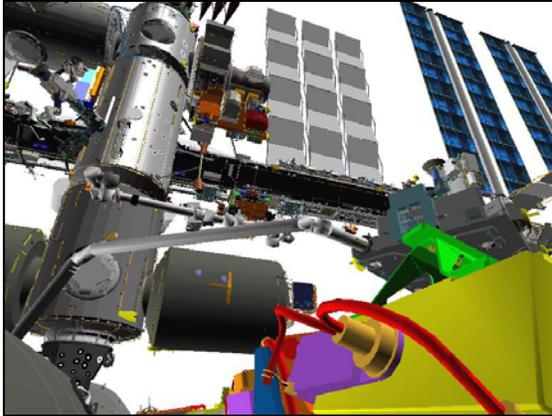


Figure 33.- PDGF 1 Pre-Grapple
 (Camera C: +20, +30).

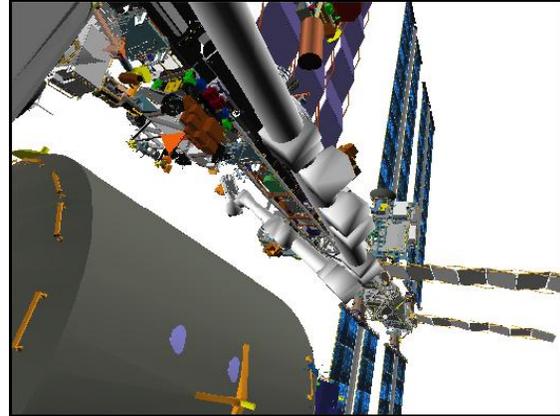


Figure 34.- PDGF 1 Pre-Grapple
 (SRMS Elbow: -60, +55).

√ Vernier

PCS MSS: SSRMS: Rate:
 Set 'Scale' 'Vernier' Rate Scale: As Desired (0.5)

11.2 Maneuvering to Within Grapple Envelope

MSS: SSRMS:
 Enter Mode – Manual (Verify blue)
 MSS: SSRMS: SSRMS Manual: Joint Lock:
cmd Shoulder Roll (Verify SR – Locked)

THC/RHC Maneuver to within grapple envelope. (THC In, +X)

11.3 Slow Auto PDGF Capture

PCS MSS: SSRMS: Tip LEE:
cmd Capture ► Automatic ► Slow, Limp (Verify Speed – Slow)
 Verify '**Confirm or Terminate**' prompt.
cmd Confirm (Verify RHC Trigger Hot icon)
 Verify LEE Mode – Auto Capture

RHC TRIGGER → press (momentarily)

PCS Verify 'Snare' Close, Capture (two) – blue (12 s max)
 Verify Capture to Latch – Yes (SCR 19282)
 Verify 'Carriage' Tension ~5500 N (90 s max)
 Verify 'Carriage' Retract – blue

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 20 of 40 pages

Verify 'Latch' Latch – blue (65 s max)

Verify Loaded Parameters – ✓
 Verify 'Loaded Parameters' (three) – MBS PDGF 1, SSRMS, SR Held

11.4 Mating Umbilicals

Verify with **MCC-H** that payload and PDGF power inhibits are in place.

NOTE

1. Expect '**R20 - MBS CRPCM 3P(R) Output Voltage 1 Stat Err**' Robotics Advisory message while umbilicals are mated. Message should return to norm.
2. Expect '**R3L - SSRMS Pwr Flags Fail**' Robotics Advisory message while Tip LEE is mated (SCR 19019).

MSS: SSRMS: Tip LEE: SSRMS Tip LEE

cmd 'Umbilical' Mate (Verify '**Confirm or Terminate**' prompt)

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Mate

RHC TRIGGER → Press (momentarily)

PCS Verify 'Umbilical' Mate – blue (10 s max)
 Verify 'Connector Continuity' Prime, Redundant (two) – Yes

11.5 Grapple Cleanup

Verify Posn Hold – orange

Expected PDGF 1 Grapple position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-11.0	-143.2	-71.7	+65.5	-120.1	-205.5	+111.3
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – MBS PDGF1, SR, Lock					
Disp	MBS> PDGF 1					

NOTE

Expect the following message when safing is commanded:
'R3Z - MSS OCS SSRMS Prime(Redun) ACU SRT Cat-1 Brk Stat Fail' (SCR 17495)
 This message should return to Norm.

DCP SAFING → SAFE (Verify ON)

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 21 of 40 pages

Notify **MCC-H**, “GO for SSRMS Operating Base Change” and
 Notify **SRMS Operator**, “SRMS is GO for maneuver to ELC4
 handback.”
 (PDRS Operations Checklist: ELC4 Nominal: ELC4 Handback:
 Page FS 1-9, Step 1)

Configure Cameras as required for SRMS operator.

Monitor 3
03: S1 Lower Outboard (+50,+30)

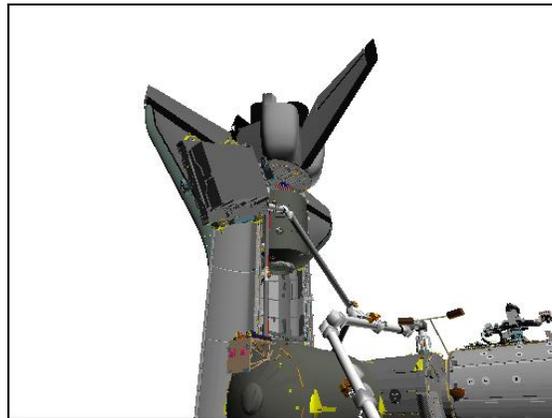


Figure 35.- SRMS ELC4 Handoff
 (03: S1 Lower Outboard: +50, +30).

12. SETUP FOR NODE2 PDGF RELEASE

On **MCC-H**, “SSRMS is GO for Node 2 Release.”

PCS MSS: SSRMS:

Verify 'Base LEE' – A
 Verify 'PDGF' – MBS 1

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
37: MBS Mast (+70, +25)	25: Tip LEE (Full Zoom Out)	03: S1 Lower Outboard (+60, +10)	Camera C (+5, +30)	SRMS Elbow (-50, +50)

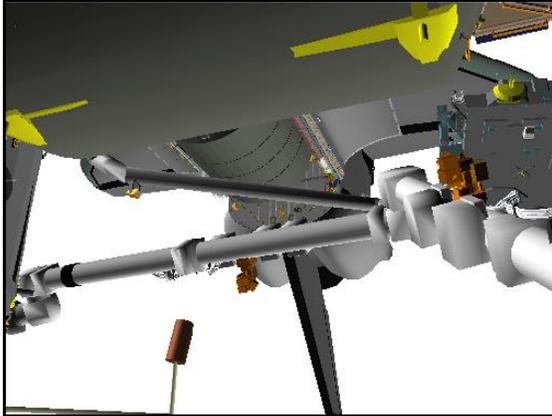


Figure 36.- Node 2 PDGF Grappled
 (37: MBS Mast: +70, +25).

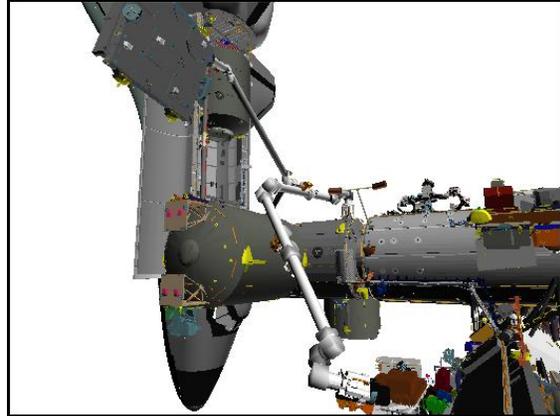


Figure 37.- Node 2 PDGF Grappled
 (03: S1 Lower Outboard: +60, +10).

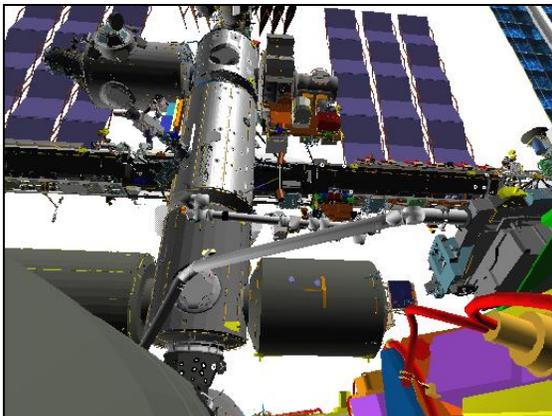


Figure 38.- Node 2 PDGF Grappled
 (Camera C: +5, +30).

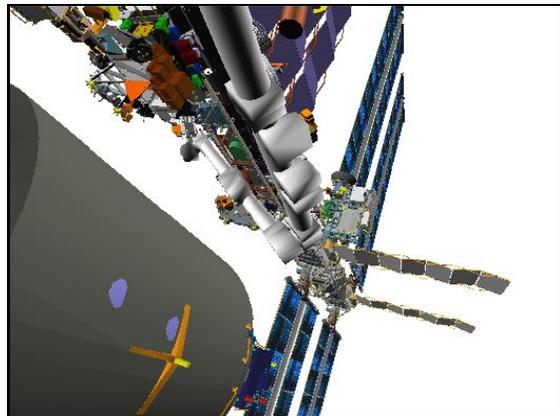


Figure 39.- Node 2 PDGF Grappled
 (SRMS Elbow: -50, +50).

PCS MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

DCP BRAKES SSRMS → OFF (Verify OFF)

√Vernier

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.5)

MSS: SSRMS:

Verify 'Loaded Parameters' (three) – Node 2 PDGF, SSRMS, SR Held

Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

Change Display ► Node2 ► PDGF (Verify Node2>PDGF)

Verify Command – SSRMS>Internal

13. NODE 2 PDGF RELEASE

NOTE

This maneuver has the following clearance concerns.

1. SSRMS Tip Boom to Columbus Module, increases from 91cm (36in) to 109cm (43in). Monitor with SRMS Elbow Camera.

2. SSRMS Base Boom to UHF Antenna, decreases to 48cm (19in). Monitor with MBS Mast, Camera C, and S1 LOOB Cameras.

- PCS 13.1 Limping SSRMS
MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped
- PCS 13.2 Rigidizing Carriage
MSS: SSRMS: Tip LEE:

cmd 'Carriage' Rigidize ► Slow (Verify Speed – Slow)

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Rigidize
- RHC TRIGGER → press (momentarily) (SCR 19064)
- PCS Verify 'Carriage' Tension ~ 5500 N (90 s max)
Verify 'Carriage' Retract – blue
Verify 'Carriage' Brakes – On (15 s max)
- 13.3 Slow Auto PDGF Release
Verify with **MCC-H** - Payload and PDGF power inhibits are in place.

MSS: SSRMS: Tip LEE:

cmd Release ► Automatic ► Slow (Verify Speed – Slow)

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 24 of 40 pages

Verify LEE Mode – Auto Release

RHC TRIGGER → press (momentarily)

PCS
 Verify 'Umbilical' Demate – blue (10 s max)
 Verify 'Latch' Unlatch – blue (65 s max)
 Verify 'Carriage' Derigidize – blue
 Verify 'Snare' Open – blue (12 s max)
 Verify 'Carriage' Extend – blue (90 s max)

Verify Unloaded Parameters – √
 Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

13.4 Backing Off Node 2 PDGF

MSS: SSRMS: Limp:

cmd None Limp (Verify Standby – blue)

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC Maneuver to 65cm Backoff position (within 5 cm/1 deg).
 (THC Out, -X)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+109.5	+205.5	-117.2	+58.2	-65.8	+144.5	-12.3
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	Node2>PDGF					

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

14. FOR OCAS MANEUVER TO ELC4 HANDBACK PRE-GRAPPLE (3 MINUTES)

NOTE

This maneuver has the following clearance concerns.

1. SSRMS Base Boom to Columbus Module, increases from 109cm (43in) to greater than 150cm (60in). Monitor with SRMS Elbow Camera.
2. SSRMS Tip Boom to UHF Antenna, increases from 48cm (19in) to greater than 150cm (60in). Monitor with MBS Mast and SPDM Body 2 Cameras.
3. SSRMS Wrist Cluster to ELC4, minimum of 86cm (34in). Monitor with SRMS Elbow, MBS Mast, or Lab Stbd Cameras.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
37: MBS Mast (+70, +25)	47: SPDM Body2 (+20, -10) 13: LAB Stbd Zenith (-20, -5)	03: S1 Lower Outboard (+60, +10)	Camera C (+5, +30)	SRMS Elbow (-50, +50)

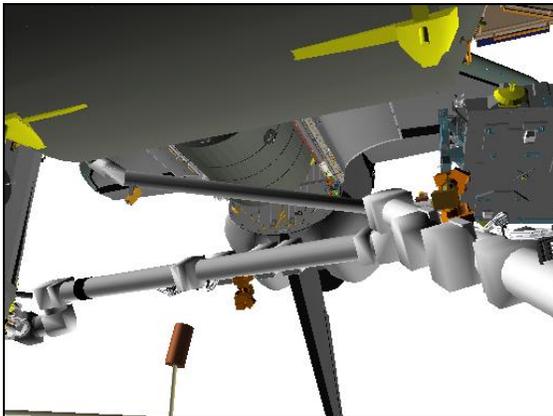


Figure 40.- Node 2 PDGF Backed Off
(37: MBS Mast: +70, +25).

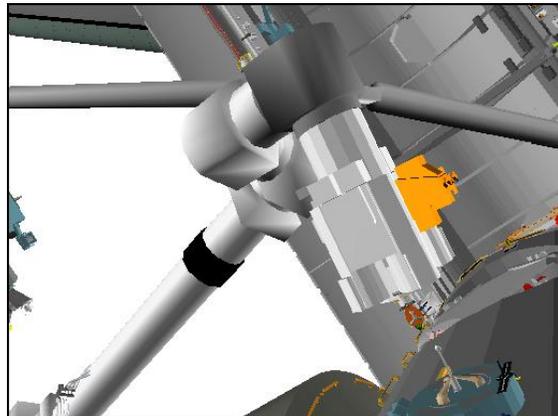


Figure 41.- Node 2 PDGF Backed Off
(47: SPDM Body2: +20, -10).

1.120 ELC4 UNBERTH AND INSTALL
(RBT FS/ULF5/FIN 1/SPN) Page 26 of 40 pages

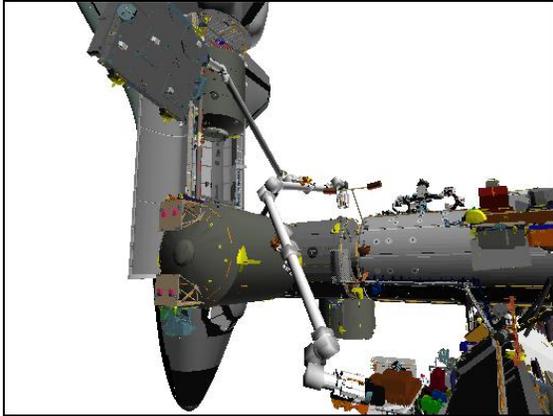


Figure 42.- Node 2 PDGF Backed Off
(03: S1 Lower Outboard: +60, +10).

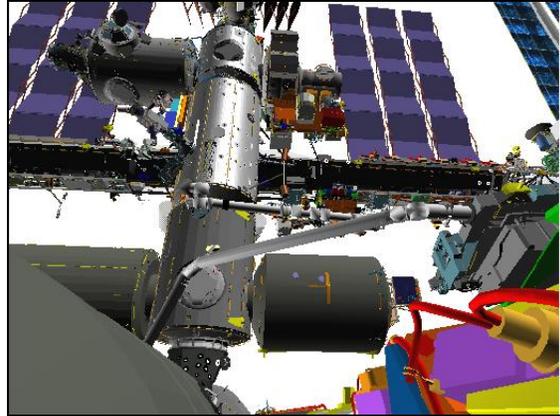


Figure 43.- Node 2 PDGF Backed Off
(Camera C: +5, +30).

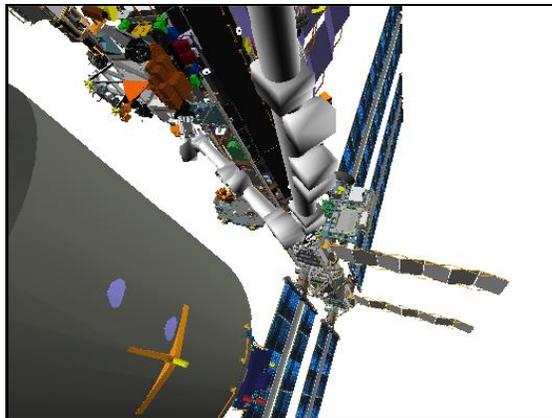


Figure 44.- Node 2 PDGF Backed Off
(SRMS Elbow: -50, +50).

PCS

MSS: SSRMS:

Change Loaded Parameters ► ELC ► ELC4 Install SYH
Verify 'Loaded Parameters' (three) – ELC4 Install, SSRMS, SY Held

Change Display ► ISS ► ISSACS (Verify ISS>ISSACS)

√Vernier

Enter Mode – FOR OCAS (Verify blue)

MSS: SSRMS: SSRMS FOR OCAS: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

pick File ► ELC4 ► Handback Pre-Grapple

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 27 of 40 pages

Verify 'FOR' 'Destination' for ELC4 Pre-Grapple at Handback position.

X	Y	Z	Pitch	Yaw	Roll
+952	+1384	+1335	0.0	-53.2	-65.1

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify FOR and errors are correct on FOR Position overlay.

	X	Y	Z	Pitch	Yaw	Roll
FOR	+757	-49	+785	+89.9	+9.3	-90.0
TGT	+952	+1384	+1335	0.0	-53.2	-65.1
ERR	-195	-1433	-550	+89.9	+62.5	-24.9

PCS

cmd Confirm (Verify Sequence Status – Auto Seq Sw-Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

Verify SSRMS at ELC4 200cm Pre-Grapple position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+81.8	+205.5	-175.2	+59.1	-115.7	+125.0	+144.8
X	Y	Z	Pitch	Yaw	Roll	
+952	+1384	+1335	0.0	-53.2	-65.1	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	ISS>ISSACS					

```
*****
* If using shuttle attitude control
*   Verify in attitude, then DAP: FREE
*****
```

15. ELC4 PVGF GRAPPLE AT HANDBACK SETUP

15.1 Setup

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON1)	SSC R (DTV)
37: MBS Mast (+110, +20)	25: Tip LEE (Full Zoom Out)	03: S1 Lower Outboard (+50, +10)	Camera D (-40, +30)	SRMS Elbow (-20, +25)

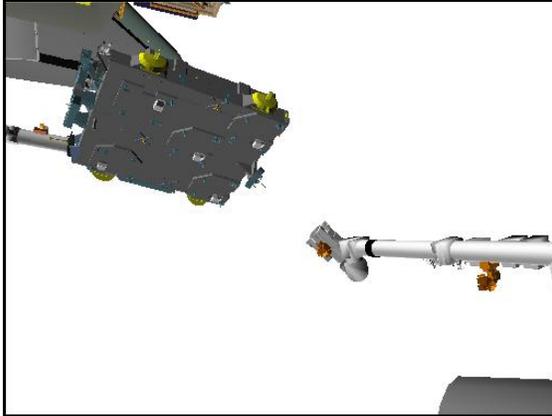


Figure 45.- ELC4 Handback Pre-Grapple
(37: MBS Mast: +110, +20).

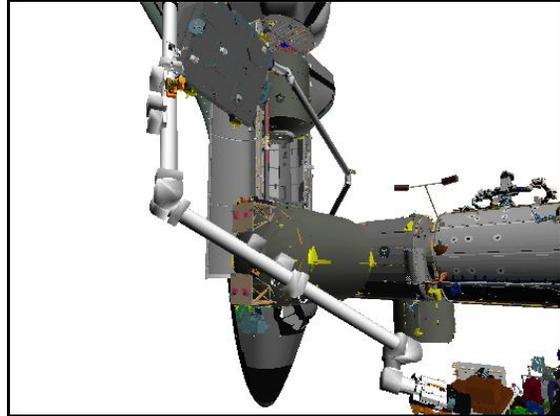


Figure 46.- ELC4 Handback Pre-Grapple
(03: S1 Lower Outboard: +50, +10).

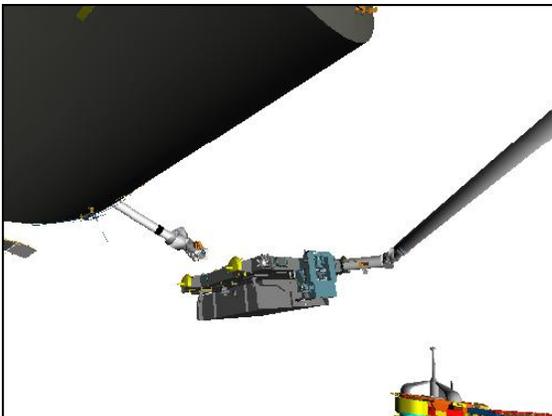


Figure 47.- ELC4 Handback Pre-Grapple
(Camera D: -40, +30).

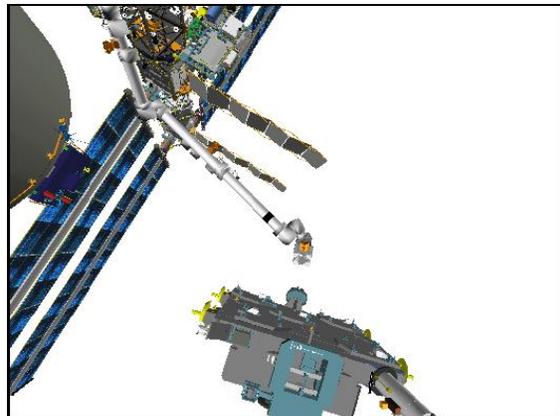


Figure 48.- ELC4 Handback Pre-Grapple
(SRMS Elbow: -20, +25).

√Vernier

PCS

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.5)

15.2 LEE B Snare Cable Cleanup

NOTE

This step will clear any C-Curves or S-Curves in the Tip LEE Snare Cables and setup the LEE for capture.

Coordinate with shuttle crew to fully zoom in the SRMS Elbow Camera to view Tip LEE Snare Cables.

1.120 ELC4 UNBERTH AND INSTALL
(RBT FS/ULF5/FIN 1/SPN) Page 29 of 40 pages

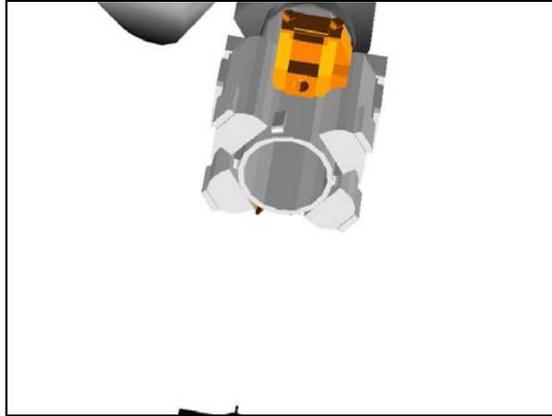


Figure 49.- View of Tip LEE Snare Cables
(SRMS Elbow: -17, +17: Full Zoom In).

PCS

MSS: SSRMS: Tip LEE:

cmd 'Snare' Close ► Slow, Soft Stops

Verify Speed – Slow

Verify Stops – Soft

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Close Snares

RHC

TRIGGER → press (hold until 'Snare' Brakes – On) (12 s max)

PCS

Verify 'Snare' Close – blue

MSS: SSRMS: Tip LEE:

cmd Capture ► Setup ► Slow (Verify Speed – Slow)

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify Trigger Hot icon)

Verify LEE Mode – Setup for Capture

RHC

TRIGGER → press (momentarily)

PCS

Verify 'Snare' Open – blue

15.3 Maneuvering to Grapple Envelope

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

1.120 ELC4 UNBERTH AND INSTALL

(RBT FS/ULF5/FIN 1/SPN) Page 30 of 40 pages

- PCS MSS: SSRMS: SSRMS Manual: Joint Lock: Joint Lock
- cmd** Shoulder Yaw (Verify SY – Locked)
- THC/RHC Maneuver to within grapple envelope. (THC In, +X)
- 15.4 Slow Auto PVGF Capture
- PCS MSS: SSRMS: Tip LEE: SSRMS Tip LEE
- cmd** Capture ► Automatic ► Slow, Limp (Verify Speed – Slow)
- Verify **'Confirm or Terminate'** prompt.
- cmd** Confirm (Verify RHC Trigger Hot icon)
- Verify LEE Mode – Auto Capture
- RHC TRIGGER → press (momentarily)
- PCS Verify 'Snare' Close, Capture (two) – blue (12 s max)
Verify Capture to Latch – Yes (SCR 19282)
Verify 'Carriage' Tension ~ 5500 N (90 s max)
Verify 'Carriage' Retract – blue
Verify 'Latch' Latch – blue (80s max)
- Verify Loaded Parameters – √
Verify 'Loaded Parameters' (three) – ELC4 Install, SSRMS, SY Held
- 15.5 Mating Umbilicals
Verify with **MCC-H** - Payload and PVGF power inhibits are in place.
- cmd** 'Umbilical' Mate (Verify **'Confirm or Terminate'** prompt)
- cmd** Confirm (Verify RHC Trigger Hot icon)
- Verify LEE Mode – Mate
- RHC TRIGGER → press (momentarily)
- PCS Verify 'Umbilical' Mate – blue (10 s max)
Verify 'Connector Continuity' Prime, Redundant (two) – Yes
- 15.6 Grapple Cleanup
- DCP BRAKES SSRMS → ON (Verify ON)

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 31 of 40 pages

Verify SSRMS Joints are within 5 deg.

SR	SY	SP	EP	WP	WY	WR
+94.5	+205.5	-176.3	+60.0	-128.1	+134.9	+153.9
X	Y	Z	Pitch	Yaw	Roll	
+1204	+745	+1285	+61.0	-80.9	+163.1	
FOR	Loaded – ELC4 Install, SY Held					
Disp	ISS>ISSACS					

Notify **SRMS operator**, “SRMS is GO for ELC4 release.”
 (PDRS Operations Checklist: ELC4 Nominal: ELC4 Handback:
 Page FS 1-10, Step 3)

Configure Cameras as required for SRMS operator.

Monitor 2
13: LAB Stbd Zenith (-30,+10)

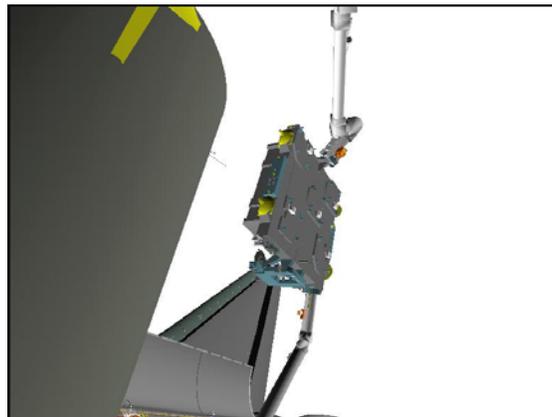


Figure 50.- SRMS ELC4 Ungrapple
 (13: LAB Stbd Zenith: -30, +10).

PCS

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

MSS: SSRMS: Power:

cmd 'Payload' Prime On (Verify On)

16. JOINT OCAS MANEUVER TO ELC4 PRE-INSTALL POSITION (14 MINUTES)

On **SRMS Operator**, “SSRMS is GO for ELC4 maneuver.”

```
*****
* If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
* (ORB OPS, REBOOST/DAP) Steps 1-3
*****
```

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 32 of 40 pages

NOTE

S1 Lower Outboard camera must be pointed to a specific direction in order to maintain 1.5M (5ft) clearance during this maneuver.

DCP Pan/Tilt S1 Lower Outboard Camera to: +85, -90.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
37: MBS Mast (+95, +30) 24: Tip Elbow (+30,-20)	13: LAB Stbd Zenith (-20, +70)	47: SPDM Body2 (-25,-15)	Camera C (+30, +35)	SRMS Elbow (-35, +25)

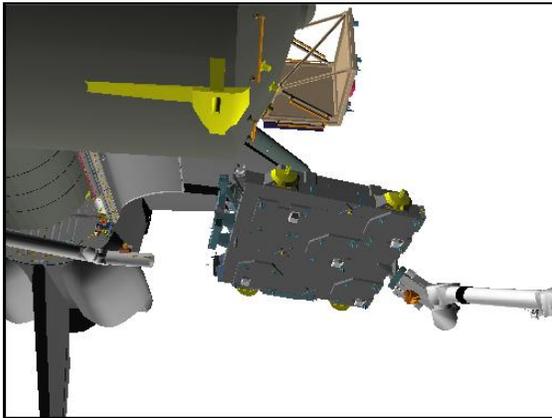


Figure 51.- ELC4 Handback Grappled
(37: MBS Mast: +95, +30).

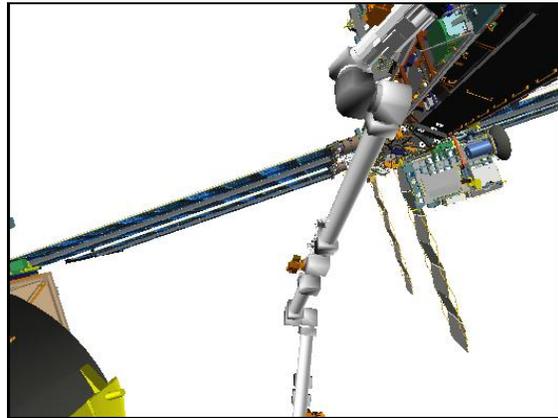


Figure 52.- ELC4 Handback Grappled
(13: LAB Stbd Zenith: -20, +70).

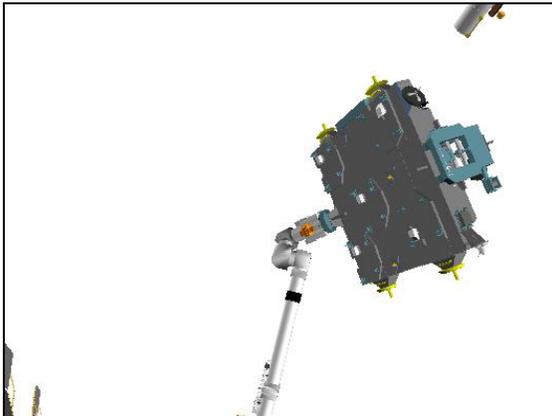


Figure 53.- ELC4 Handback Grappled
(47: SPDM Body2: -25, -15).

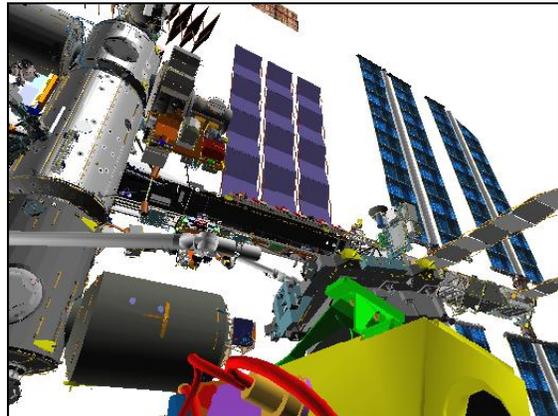


Figure 54.- ELC4 Handback Grappled
(Camera C: +30, +35).

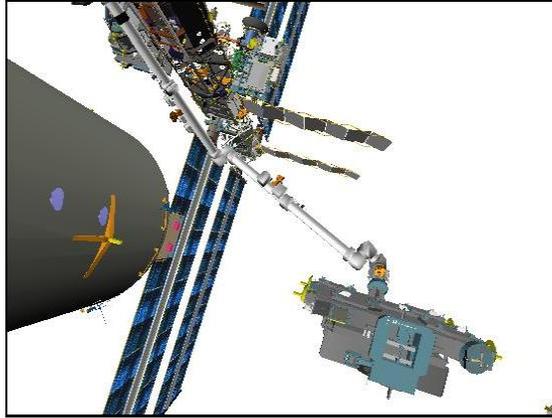


Figure 55.- ELC4 Handback Grappled
(SRMS Elbow: -35, +25).

Change Display ► S3 ► Lower Inboard PAS (Verify S3>Lower Inboard PAS)

DCP BRAKES SSRMS → OFF (Verify OFF)

RHC RATE → COARSE (Verify Coarse on PCS)

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► ELC4 ► Pre-Install

Verify 'Joint Angles' 'Destination' for ELC4 Pre-Install position.

SR	SY	SP	EP	WP	WY	WR
-17.8	+108.0	-133.9	+30.7	-86.4	+202.2	+224.5

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+94.5	+205.5	-176.3	+60.0	-128.1	+134.9	+153.9
TGT	-17.8	+108.0	-133.9	+30.7	-86.4	+202.2	+224.5
ERR	+112.3	+97.5	-42.4	+29.3	-41.7	-67.3	-70.6

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify SSRMS at ELC4 Pre-Install position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-17.8	+108.0	-133.9	+30.7	-86.4	+202.2	+224.5
X	Y	Z	Pitch	Yaw	Roll	
-350	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Held					
Disp	S3>Lower Inboard PAS					

 * If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
 * (ORB OPS, REBOOST/DAP) Steps 1-3

17. MANUAL MANEUVER TO ELC4 INSTALL

17.1 Install Setup

NOTE

Clearance between ELC4 and S1 LOOB decreases to 43cm (17in) at install. Monitor with the Tip Elbow and Camera C.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
24: Tip Elbow (+65, +10) 22: Base Elbow (+95, -15)	28: EBCS	13: LAB Stbd Zenith (+50, +65)	Camera C (+45, +32) Full zoom in	SRMS Elbow (-50, +55)

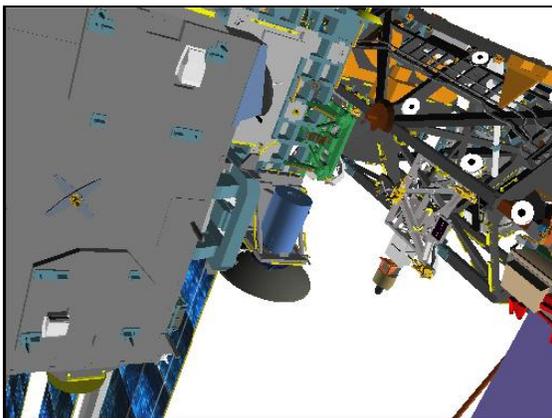


Figure 56.- ELC4 Pre-Install
 (24: Tip Elbow: +65, +10).

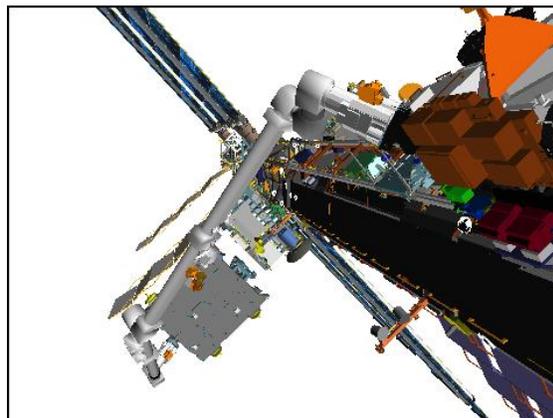


Figure 57.- ELC4 Pre-Install
 (13: LAB Stbd Zenith: +50, +65).

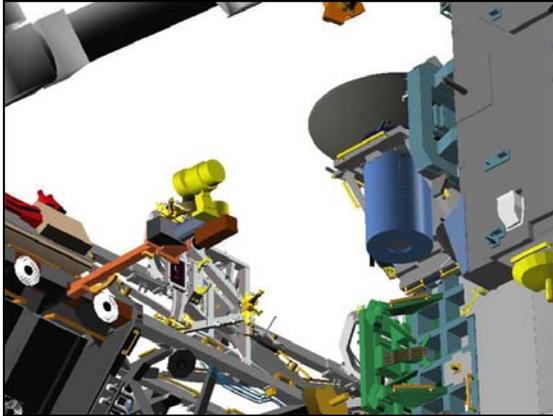


Figure 58.- ELC4 Pre-Install
(Camera C: +45, +32).

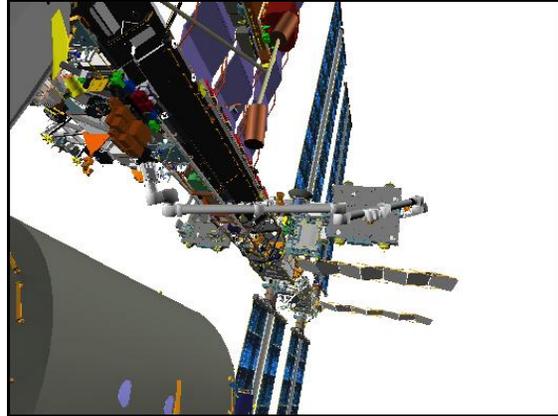


Figure 59.- ELC4 Pre-Install
(SRMS Elbow: -50, +55).

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (1.0)

17.2 Manual Maneuver to Alignment Position

MCC-H MCG: MCS Configuration: MCS Inhibits:
√ Desat Request – Inh
√ Auto Att Control handover to RS - Inh

On **MCC-H**, “SSRMS is GO for ELC4 Install.”

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC Maneuver ELC4 to Alignment position (within 5 cm/1 deg).
(THC In, +X)

	Locked					
SR	SY	SP	EP	WP	WY	WR
-19.0	+108.0	-143.4	+64.8	-112.3	+202.1	+224.1
X	Y	Z	Pitch	Yaw	Roll	
-90	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Lock					
Disp	S3>Lower Inboard PAS					

THC/RHC Make alignment corrections as needed.

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 36 of 40 pages

17.3 ELC4 Install on S3LI PAS

PCS

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 0.4 (Verify 0.4)

THC/RHC

Maneuver ELC4 2cm +X past last RTL indication. (THC In, +X)

Expected ELC4 Ready-to-Latch position.

Locked						
SR	SY	SP	EP	WP	WY	WR
-19.4	+108.0	-143.9	+71.7	-119.1	+202.1	+224.0
X	Y	Z	Pitch	Yaw	Roll	
-6	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Lock					
Disp	S3>Lower Inboard PAS					

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

17.4 SSRMS PAS Coordination

Notify **PAS operator**, "Maneuver to RTL complete - GO for First Phase Capture."

On **PAS operator**, "First Phase Capture complete - GO to limp SSRMS."

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

Notify **PAS operator**, "GO for Second Stage Capture - All joints limped."

On **PAS operator**, "Capture complete - GO for SSRMS Brakes On."

MSS: SSRMS: Power:

cmd 'Payload' Prime(Redundant) Off (Verify two Off)

DCP

BRAKES SSRMS → ON (Verify ON)

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 37 of 40 pages

Expected ELC4 Install position.

SR	SY	SP	EP	WP	WY	WR
-19.4	+108.0	-143.9	+72.1	-119.6	+202.1	+223.9
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Held					
Disp	S3>Lower Inboard PAS					

 * If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
 * (ORB OPS, REBOOST/DAP) Steps 1 and 2.

MCC-H If Desat Request was inhibited for prior operations:
 | MCG: MCS Configuration: MCS Inhibits: MCS Inhibits
 | **cmd** Desat Request Enable – (Verify – Ena)

18. ELC4 RELEASE SETUP

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
22: Base Elbow (+120, -10)	25: Tip LEE (Zoom Full Out)	13: LAB Stbd Zenith (+50, +60)	Camera C (+45, +35)	SRMS Elbow (-50, +55)

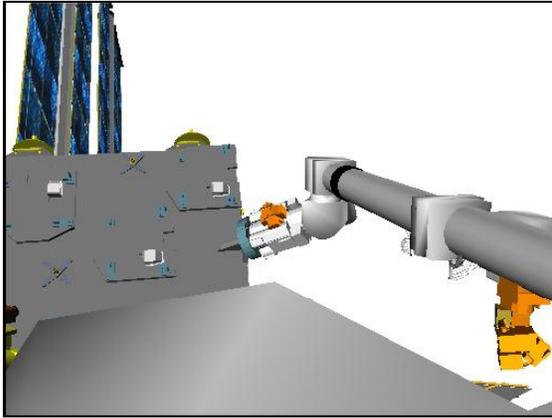


Figure 60.- ELC4 Installed
 (22: Base Elbow: +120, -10).

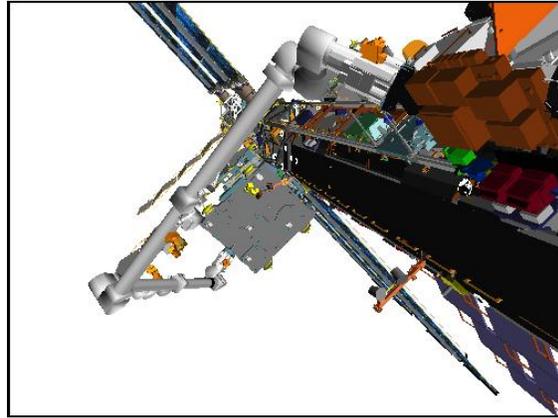


Figure 61.- ELC4 Installed
 (13: LAB Stbd Zenith: +50, +60).

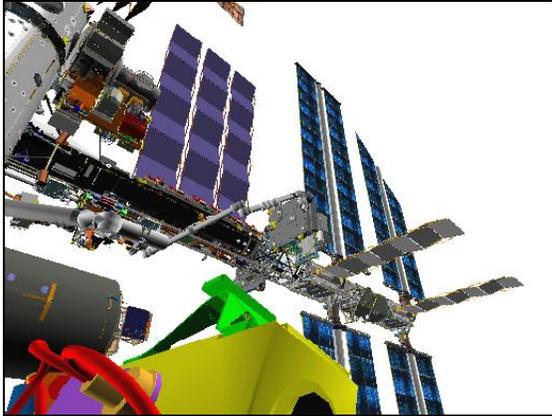


Figure 62.- ELC4 Installed
(Camera C: +45, +35).

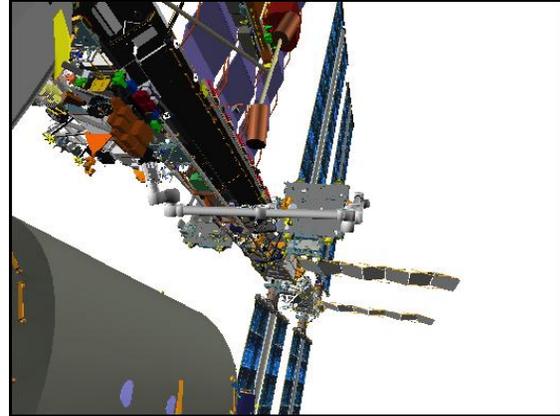


Figure 63.- ELC4 Installed
(SRMS Elbow: -50, +55).

On **MCC-H**, “SSRMS is GO for ELC4 Release.”

PCS

MSS: SSRMS:

Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

Change Display ► S3 ► ELC4 PVGF S3LI (Verify S3>ELC4 PVGF S3LI)

Verify Command – SSRMS>Internal

DCP

BRAKES SSRMS → OFF (Verify OFF)

√Vernier

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired. (0.5)

19. [ELC4 RELEASE AND BACKOFF](#)

19.1 [SSRMS Limping](#)

PCS

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

19.2 [Slow PVGF Release](#)

Verify with **MCC-H** - Payload and PVGF power inhibits are in place.

1.120 ELC4 UNBERTH AND INSTALL
 (RBT FS/ULF5/FIN 1/SPN) Page 39 of 40 pages

PCS MSS: SSRMS: Tip LEE: SSRMS Tip LEE

cmd Release ► Automatic ► Slow (Verify Speed – Slow)

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Release

RHC TRIGGER → press (momentarily)

PCS Verify 'Umbilical' Demate – blue (10 s max)
 Verify 'Latch' Unlatch – blue (65 s max)
 Verify 'Carriage' Derigidize – blue (90 s max)
 Verify 'Snare' Open – blue (12 s max)
 Verify 'Carriage' Extend – blue (90 s max)

Verify Unloaded Parameters – √
 Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

19.3 Backing Off ELC4 PVGF

MSS: SSRMS: Limp: SSRMS Limp

cmd None Limp (Verify Standby – blue)

MSS: SSRMS: SSRMS

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock: Joint Lock

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC Maneuver to Backoff position (within 5 cm/1 deg). (THC Out, -X)

	Locked					
SR	SY	SP	EP	WP	WY	WR
-9.0	+108.0	-140.5	+69.2	-108.9	+202.5	+227.4
X	Y	Z	Pitch	Yaw	Roll	
-185	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	S3>ELC4 PVGF S3LI					

NOTE

Expect the following message when safing is commanded:
**'R3Z - MSS OCS SSRMS Prime(Redun) ACU SRT Cat-1
 Brk Stat Fail'** (SCR 17495)
 This message should return to Norm.

1.120 ELC4 UNBERTH AND INSTALL
(RBT FS/ULF5/FIN 1/SPN) Page 40 of 40 pages

DCP SAFING → SAFE (Verify ON)

19.4 SRMS Maneuver to OBSS Pre-Grapple

Notify **SRMS Operator**, “SRMS is GO for Maneuver to OBSS Handoff Pre-Grapple.”

(PDRS Operations Checklist: ELC4 Nominal: MNVR to OBSS Handoff Pre-Grapple: Page FS-12, Step 1)

Configure Cameras as required for SRMS Operator.

Monitor 2
09: P1 Lower Outboard (+120, +20)

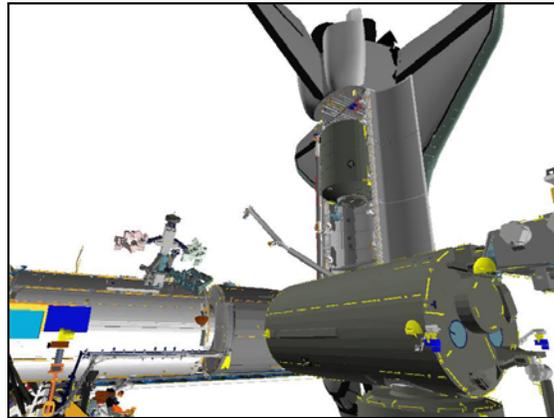


Figure 64.- SRMS ELC4 Backoff
(09: P1 Lower Outboard: +120, +20).

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

1. SETUP

Verify SRMS is at OBSS Handoff Pre-Grapple position

SY	SP	EP	WP	WY	WR
+23.9	+64.7	-34.2	-99.4	+11.4	-99.0

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+60, +20)	25: Tip LEE (Full Zoom Out)	72 (DNLK): Camera C (0, +8) HFOV = 34	Camera D (0, +10)	SRMS Elbow (-105, +15)

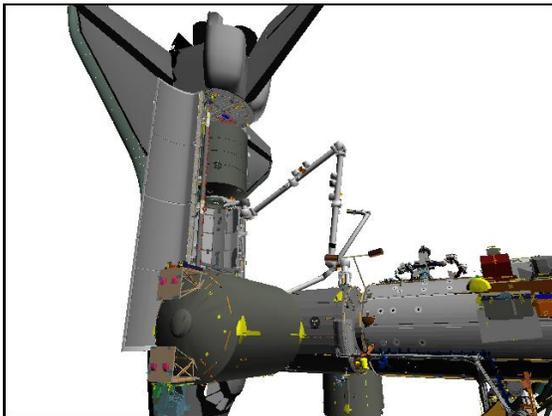


Figure 1.- OBSS Pre-Grapple (03: S1 Lower Outboard: +60, +20).

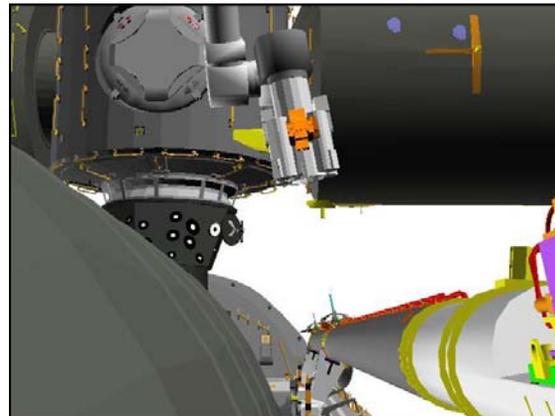


Figure 2.- OBSS Pre-Grapple (72: Camera C: 0, +8).

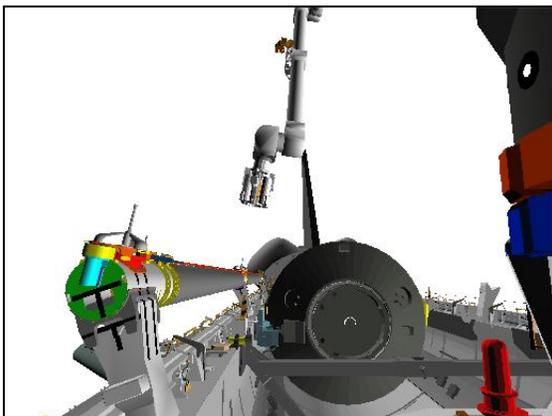


Figure 3.- OBSS Pre-Grapple (Camera D: 0, +10).

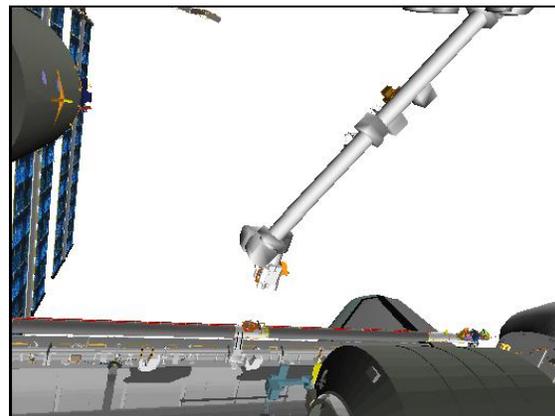


Figure 4.- OBSS Pre-Grapple (SRMS Elbow: -105, +15).

PCS

MSS: SSRMS:

Change Loaded Parameters ► OBSS ► OBSS Mid MPM SRH
 Verify 'Loaded Parameters' (two) – OBSS Mid MPM, SR Held

Verify Unloaded Parameters – ✓
 Change Unloaded Parameters ► Unloaded ► LEE Tip SRH

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 2 of 14 pages

Verify 'Unloaded Parameters' (two) – LEE Tip, SR Held

Change Display ► Orbiter ► OBSS FRGF (Verify Orbiter>OBSS FRGF)

Verify Command – SSRMS>Internal

Verify SSRMS at OBSS Pre-Grapple position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-82.2	-15.2	+8.5	-129.9	+29.4	-3.2	+6.3
X	Y	Z	Pitch	Yaw	Roll	
-150	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SR Held					
Disp	Orbiter>OBSS FRGF					

PCS MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

DCP BRAKES SSRMS → OFF (Verify OFF)

√Vernier

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.7)

2. OBSS GRAPPLE

2.1 Maneuvering to Grapple Envelope

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/RHC Maneuver to within grapple envelope. (THC In, +X)

2.2 Grapple

PCS MSS: SSRMS: Tip LEE:

cmd Capture ► Automatic ► Slow, Limp (Verify Speed – Slow)

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Capture

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 3 of 14 pages

RHC TRIGGER → Press (momentarily)

PCS Verify 'Snare' Close, Capture (two) – blue (12s max)
 Verify Capture to Latch – No (SCR 19282)
 Verify 'Carriage' Tension ~5500 N (90s max)
 Verify 'Carriage' Retract – blue
 Verify Motors – Inh

Verify Loaded Parameters – √

Verify 'Loaded Parameters' (three) – OBSS Mid MPM, SSRMS, SR Held

2.3 Grapple Cleanup

Verify Posn Hold – orange

DCP BRAKES SSRMS → ON (Verify ON)

PCS MSS: SSRMS:

Change Display ► Orbiter ► OBSS Mid MPM (Verify Orbiter>OBSS Mid MPM)

Change Command ► Orbiter ► OBSS Mid MPM (Verify Orbiter>OBSS Mid MPM)

Expected OBSS Grappled position.

Locked	SR	SY	SP	EP	WP	WY	WR
	-82.2	-16.4	-4.0	-118.2	+30.2	-3.2	+7.5
	X	Y	Z	Pitch	Yaw	Roll	
	0	0	0	0.0	0.0	0.0	
FOR	Loaded – OBSS Mid MPM, SR Held						
Disp	Orbiter>OBSS Mid MPM						

Review [SSRMS LEE CUE CARD \(SSRMS IS LOADED AND LEE CAUTION IS ANNUNCIATED\)](#), all (SODF: RBT GEN: REFERENCE: CUE CARD)

3. OBSS UNBERTH

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+60, +20)	24: Tip Elbow (-30, +5)	72(DNLK): Mux D/C (D: -15, 0) (C: +30, 0)	Camera B (+80, +10)	SRMS Elbow (-135, +15)

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 4 of 14 pages

NOTE

Clearance between OBSS and Columbus decreases to 112 cm (44 in).
Monitor using SRMS Elbow and Tip Elbow cameras.

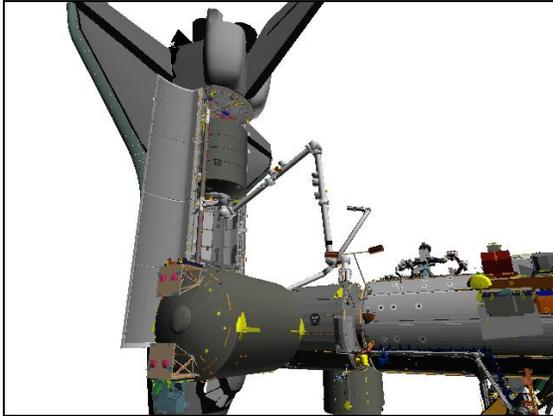


Figure 5.- OBSS Grappled
(03: S1 Lower Outboard: +60, +20).

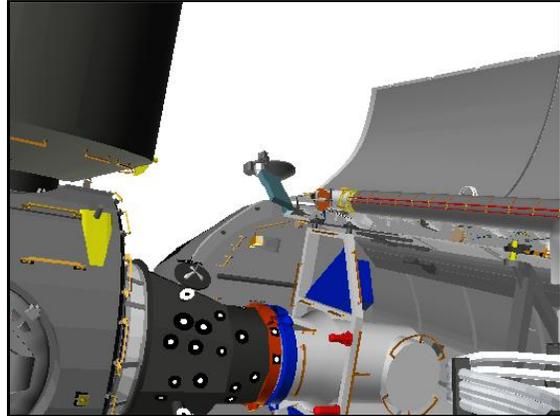


Figure 6.- OBSS Grappled
(24: Tip Elbow: -30, +5).

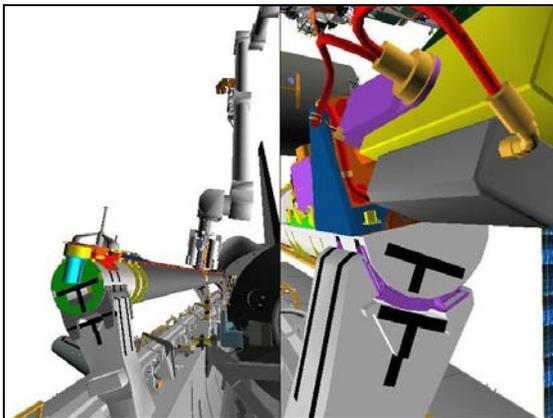


Figure 7.- OBSS Grappled
(72: Mux D/C).



Figure 8.- OBSS Grappled
(Camera B: +80, +10).

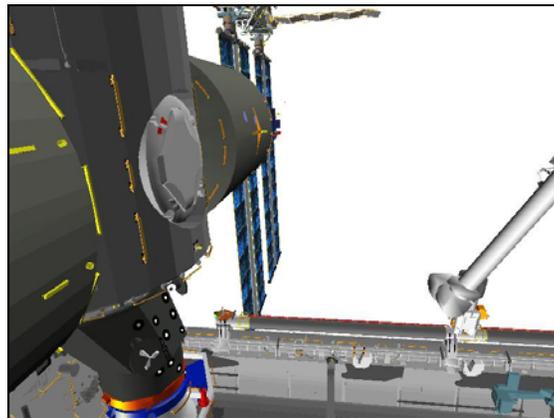


Figure 9.- OBSS Grappled
(SRMS Elbow: -135, +15).

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 5 of 14 pages

3.1 MRL Release

MCC-H	MCG: MCS Configuration: MCS Inhibits: MCS Inhibits ✓ Desat Request – Inh ✓ Auto Att Control handover to RS - Inh
-------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

```
*****
* If using shuttle attitude control
*   Verify in attitude, then DAP: FREE
*****
```

On **MCC-H**, "GO for OBSS Unberth."

Notify **SRMS Operator**, "GO to release stbd MRLs."

3.2 Maneuvering to Low Hover

On **SRMS Operator**, "GO for OBSS Unberth and Mnvr to Handoff."

```
*****
* If 'R3Q - SSRMS LEE Uncommanded Derigidize' Caution is
*   annunciated during MRL release
*   MSS: SSRMS: Tip LEE: SSRMS Tip LEE
*
*   cmd 'Carriage' Rigidize ► Slow (Verify Speed – Slow)
*
*   Verify 'Confirm or Terminate' prompt.
*
*   cmd Confirm (Verify RHC Trigger Hot icon)
*
*   Verify LEE Mode – Rigidize
*
*   TRIGGER → Press (momentarily) (SCR 19064)
*
*   Verify 'Carriage' Tension ~5500 N (90s max)
*   Verify 'Carriage' Retract – blue
*****
```

RHC

PCS

PCS

MSS: SSRMS: Rate: SSRMS Rate

Set 'Scale' 'Vernier' Rate Scale: As desired (1.0)

DCP

BRAKES SSRMS → OFF (Verify OFF)

✓ Vernier

PCS

MSS: SSRMS: SSRMS

Enter Mode – Manual (Verify blue)

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/RHC

Maneuver OBSS to Low Hover position (within 5 cm/1 deg). (THC Up, -Z)

Locked						
SR	SY	SP	EP	WP	WY	WR
-82.2	-25.3	+9.1	-126.5	+25.9	-3.5	+16.4
X	Y	Z	Pitch	Yaw	Roll	
0	0	-150	0.0	0.0	0.0	
FOR	Loaded – OBSS Mid MPM, SR Held					
Disp	Orbiter>OBSS Mid MPM					

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

 * If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
 * (ORB OPS, REBOOST/DAP) Steps 1, 2

4. FOR OCAS TO UNBERTH INTERMEDIATE (2 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+60, +20)	24: Tip Elbow (-30, +5)	72(DNLK): Camera D (-20, +20)	Camera C (+50,+50)	SRMS Elbow (-115, +15)

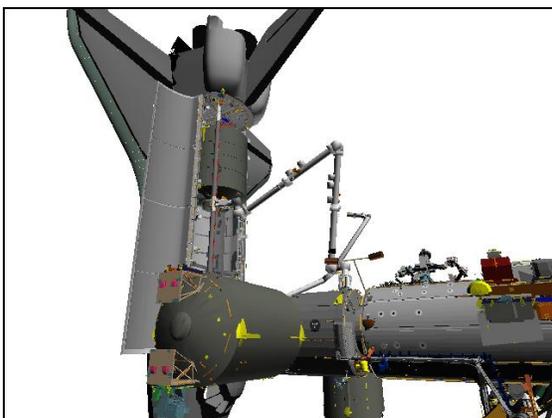


Figure 10.- Low Hover
(03: S1 Lower Outboard: +60, +20).

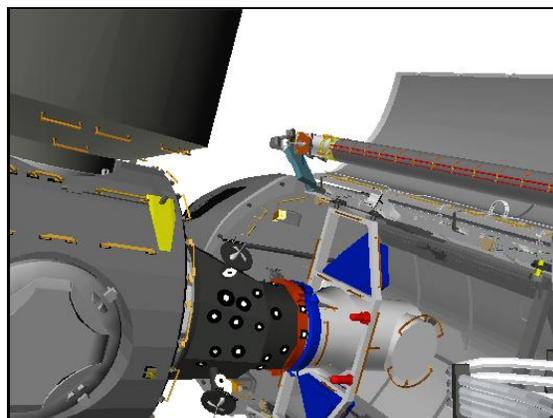


Figure 11.- Low Hover
(24: Tip Elbow: -30, +5).

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 7 of 14 pages

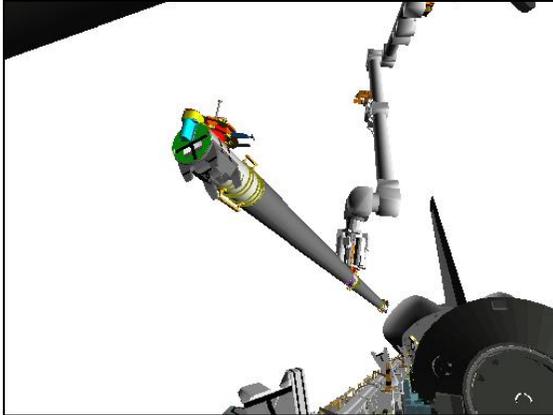


Figure 12.- Low Hover
(72: Camera D: -20, +20).



Figure 13.- Low Hover
(Camera C: +50, +50).

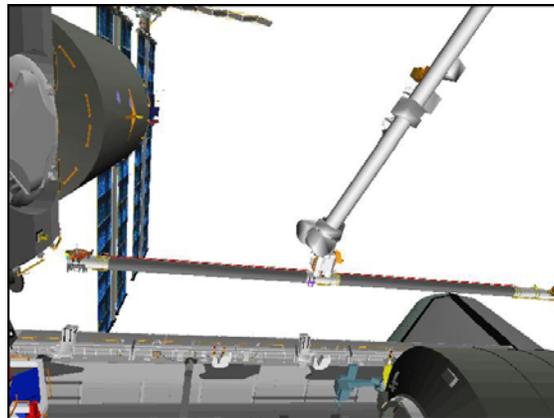


Figure 14.- Low Hover
(SRMS Elbow: -115, +15).

√Vernier

PCS

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

MSS: SSRMS:

Enter Mode – FOR OCAS (Verify blue)

MSS: SSRMS: SSRMS FOR OCAS: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

pick File ► OBSS ► Unberth Intermed

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 8 of 14 pages

Verify 'FOR' 'Destination' for Unberth Intermediate position.

X	Y	Z	Pitch	Yaw	Roll
+250	-200	-300	+5.0	-5.0	0.0

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify FOR and errors are correct on FOR Position overlay.

	X	Y	Z	Pitch	Yaw	Roll
FOR	0	0	-150	0.0	0.0	0.0
TGT	+250	-200	-300	+5.0	-5.0	0.0
ERR	-250	+200	+150	-5.0	+5.0	0.0

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

Verify SSRMS at Unberth Intermediate position (within 5 cm/1 deg).

Locked	SR	SY	SP	EP	WP	WY	WR
	-82.2	-37.8	+18.1	-103.4	-3.8	-2.7	+22.2
X	Y	Z	Pitch	Yaw	Roll		
+250	-200	-300	+5.0	-5.0	0.0		
FOR	Loaded – OBSS Mid MPM, SR Held						
Disp	Orbiter>OBSS Mid MPM						

5. FOR OCAS TO OBSS HANDOFF (4 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+60, +25)	09: P1 Lower Outboard (+120, +20)	72(DNLK): Camera D (-20, +20) Camera A (+10, +20)	Camera C (+45, +30)	SRMS Elbow (-105, +10)

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 9 of 14 pages

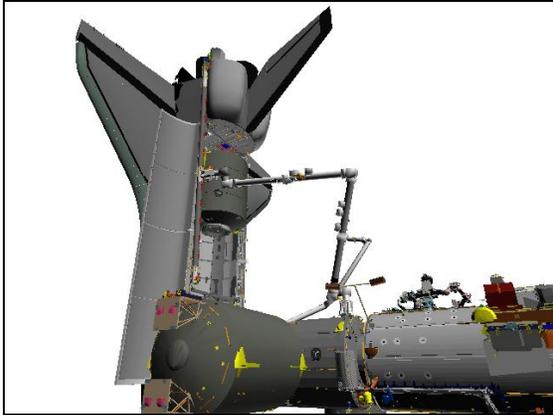


Figure 15.- Intermediate
(03: S1 Lower Outboard: +60, +25).

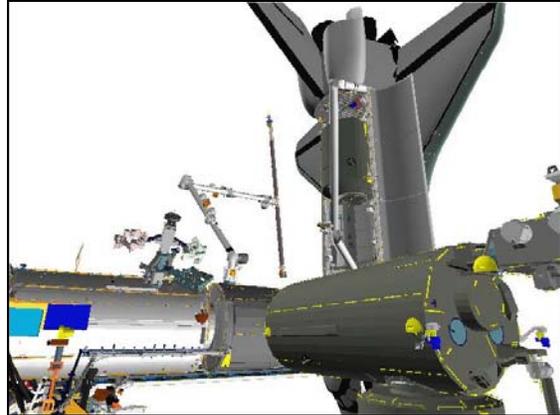


Figure 16.- Intermediate
(09: P1 Lower Outboard: +120, +20).

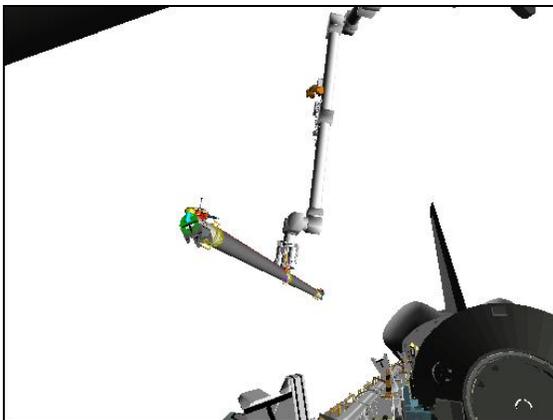


Figure 17.- Intermediate
(72: Camera D: -20, +20).

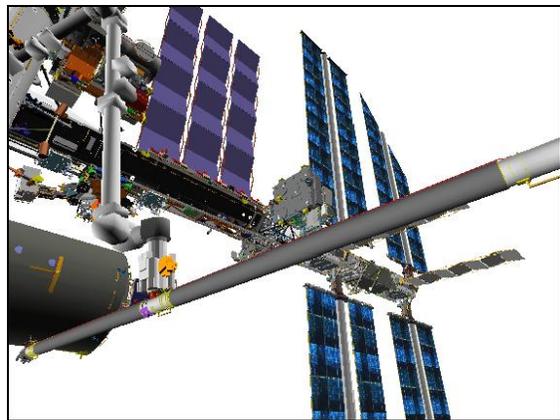


Figure 18.- Intermediate
(Camera C: +45, +30).

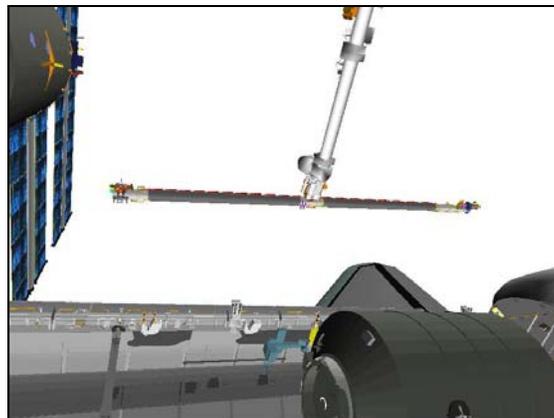


Figure 19.- Intermediate
(SRMS Elbow: -105, +10).

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 10 of 14 pages

√Vernier

SSRMS FOR OCAS

pick File ► OBSS ► Handoff

Verify 'FOR' 'Destination' for OBSS Handoff position.

X	Y	Z	Pitch	Yaw	Roll
+325	+705	-198	+91.2	-70.6	+47.3

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify FOR and errors are correct on FOR Position overlay.

	X	Y	Z	Pitch	Yaw	Roll
FOR	+250	-200	-300	+5.0	-5.0	0.0
TGT	+325	+705	-198	+91.2	-70.6	+47.3
ERR	-75	-905	-102	-86.2	+65.6	-47.3

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS: SSRMS

Verify Posn Hold – orange

Verify SSRMS at OBSS Handoff position (within 5 cm/1 deg).

Locked	SR	SY	SP	EP	WP	WY	WR
	-82.2	+28.1	+45.2	-125.9	+4.4	-1.0	-128.4
	X	Y	Z	Pitch	Yaw	Roll	
	+325	+705	-198	+91.2	-70.6	+47.3	
FOR	Loaded – OBSS Mid MPM, SR Held						
Disp	Orbiter>OBSS Mid MPM						

DCP

BRAKES SSRMS → ON (Verify ON)

MCC-H

MCG: MCS Configuration: MCS Inhibits: MCS Inhibits

√ Desat Request – Inh

√ Auto Att Control handover to RS - Inh

 * If using shuttle attitude control
 * Verify in attitude, then DAP: FREE

On **MCC-H**, “GO for SRMS OBSS Grapple.”

Notify **SRMS Operator**, “GO for SRMS OBSS Grapple.”

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 11 of 14 pages

(PDRS Operations Checklist: OBSS Nominal: OBSS Handoff from SSRMS: Page FS 3-4, Step 5)

Configure Cameras as Required for SRMS Operator

Monitor 1
09: P1 Lower Outboard (+130, +20)

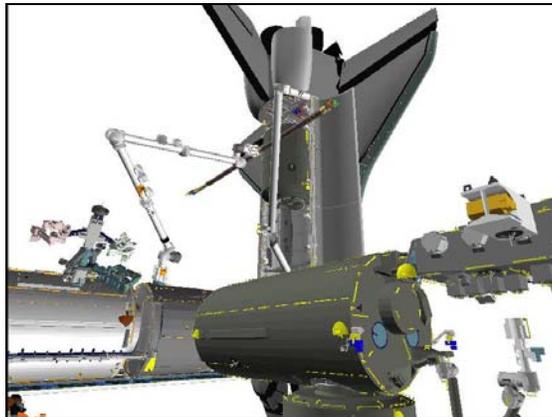


Figure 20.- SRMS OBSS Handoff (09: P1 Lower Outboard: +130, +20).

6. SETUP FOR UNGRAPPLE

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+65, +25)	25: Tip LEE (Full Zoom Out)	72(DNLK): Camera A (+6, +23) HFOV = 20	Camera C (-30, +40)	SRMS Elbow (-50, +20)

NOTE

Clearance between SSRMS and SPDM decreases to 96 cm (38 in). Monitor using S1 Lower Outboard camera.

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 12 of 14 pages

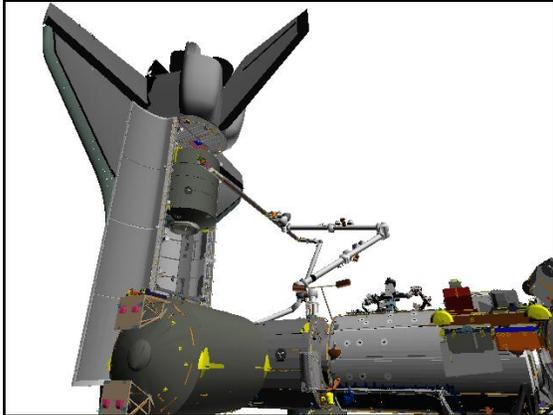


Figure 21.- OBSS Handoff
(03: S1 Lower Outboard: +65, +25).

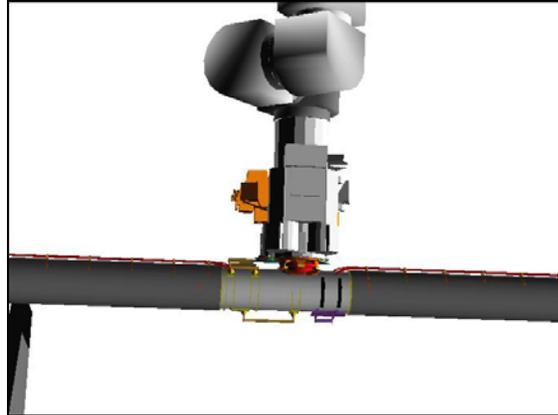


Figure 22.- OBSS Handoff
(72: Camera A: +10, +20).

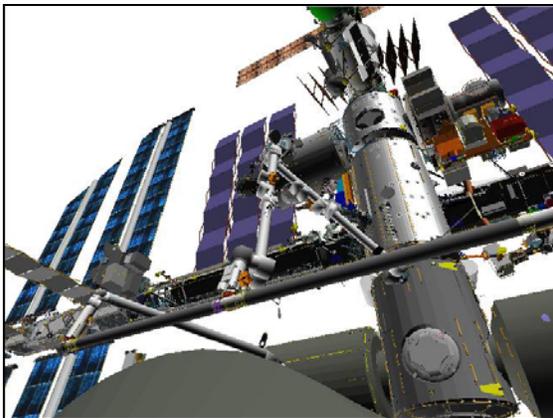


Figure 23.- OBSS Handoff
(Camera C: -30, +40).

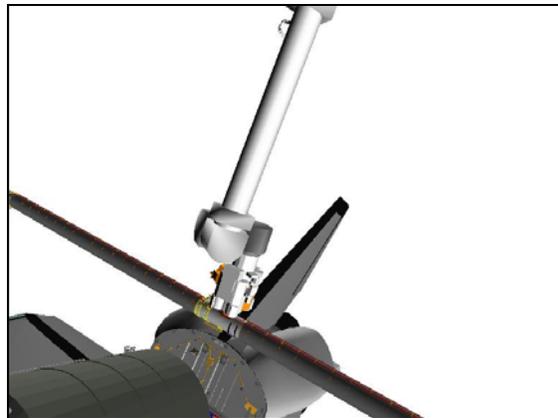


Figure 24.- OBSS Handoff
(SRMS Elbow: -50, +20).

PCS

MSS: SSRMS:

Verify 'Unloaded Parameters' (two) – LEE Tip, SR Held

Change Display ► ISS ► ISSACS (Verify ISS>ISSACS)

Change Command ► SSRMS ► Internal (Verify SSRMS>Internal)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.7)

7. OBSS RELEASE

7.1 SSRMS Limp

On **SRMS operator**, "GO for OBSS Ungrapple."

DCP

BRAKES SSRMS → OFF (Verify OFF)

√Vernier

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 13 of 14 pages

PCS

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

7.2 Auto Release

MSS: SSRMS: Tip LEE:

cmd Release ► Automatic ► Slow (Verify Speed – Slow)

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Release

RHC

TRIGGER → Press (momentarily)

PCS

Verify 'Carriage' Derigidize – blue (90 s max)

Verify 'Snare' Open – blue (12 s max)

Verify 'Carriage' Extend – blue (90 s max)

Verify Unloaded Parameters – √

Verify 'Unloaded Parameters' (two) – LEE Tip, SR Held

7.3 SSRMS Backoff

MSS: SSRMS: Limp:

cmd None Limp (Verify Standby – blue)

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

PCS

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/RHC

Maneuver to OBSS Backoff position (within 5 cm/1 deg). (THC Pull, -X)

Locked						
SR	SY	SP	EP	WP	WY	WR
-82.2	+28.3	+60.8	-131.7	-5.4	-1.1	-128.6
X	Y	Z	Pitch	Yaw	Roll	
+1014	-313	+1499	-12.8	+0.1	+89.8	
FOR	Unloaded – LEE Tip, SR Lock					
Disp	ISS>ISSACS					

1.210 SSRMS OBSS UNBERTH AND HANDOFF

(RBT FS/ULF5/FIN 1/SPN)

Page 14 of 14 pages

DCP BRAKES SSRMS → ON (Verify ON)

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

* If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
* (ORB OPS, REBOOST/DAP) Steps 1, 2

Notify **SRMS Operator**, "GO for mnvr to PMM Viewing position."
(PDRS Operations Checklist: OBSS Nominal: OBSS Mnvr to PMM
Install Viewing: Page FS 3-6, Step 1)

MCC-H If Desat Request was inhibited for prior operations:
| MCG: MCS Configuration: MCS Inhibits:
| **cmd** Desat Request Enable – (Verify – Ena)

Configure Cameras as Required for SRMS Operator

Monitor 1
09: P1 Lower Outboard (+130, +20)

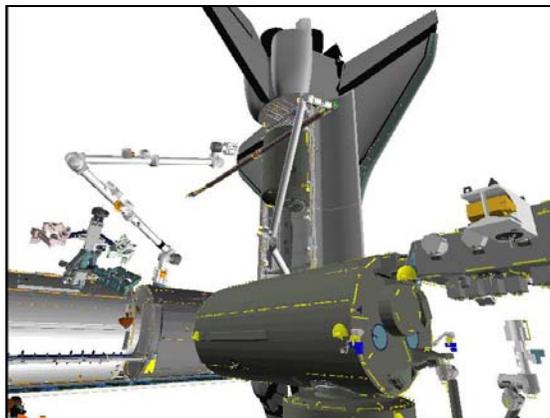


Figure 25.- SRMS OBSS Grappled
(09: P1 Lower Outboard: +130, +20).

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 1 of 17 pages

1. SETUP

NOTE

Callouts in grey are for shuttle crew.

On **SRMS operator** "Go for walkoff".

NOTE

1. SSRMS Base Elbow Camera – SPDM PDGF increases from 98 cm (38 in) monitor with S1 Lower Outboard camera.
2. SSRMS LEE – PMM reaches a minimum of 254 cm (100 in) monitor with Camera C or Camera A.
3. SSRMS Base Boom - Lab UHF Antenna reaches a minimum of 94 cm (37in) monitor with SPDM Body 2 Camera and Cupola Window 3
4. SSRMS Tip Boom – Columbus reaches a minimum of 99 cm (39 in) monitor with SPDM Body 2 and S1 Lower Outboard cameras

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+65, +25)	09: P1 Lower Outboard (+110, +20)	47: SPDM Body 2 (-10, -25)	Camera C (0, +35)	Camera A (-10, +20) SRMS Elbow (-140, +50)



Figure 1.- OBSS Backoff Position
(03: S1 Lower Outboard: +65, +25).

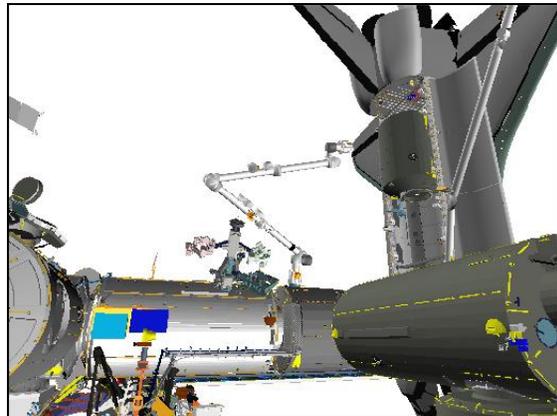


Figure 2.- OBSS Backoff Position
(09: P1 Lower Outboard: +110, +20).

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 2 of 17 pages

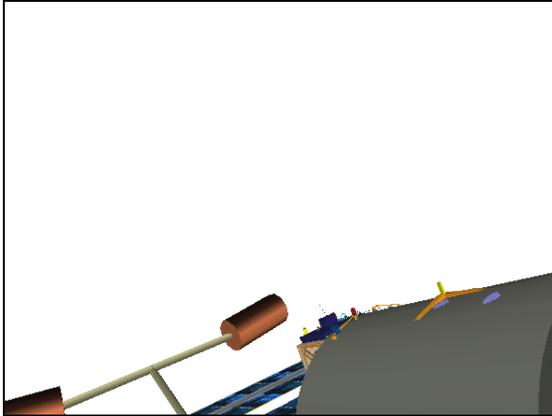


Figure 3.- OBSS Backoff Position
(47: SPDM Body 2: -10, -25).

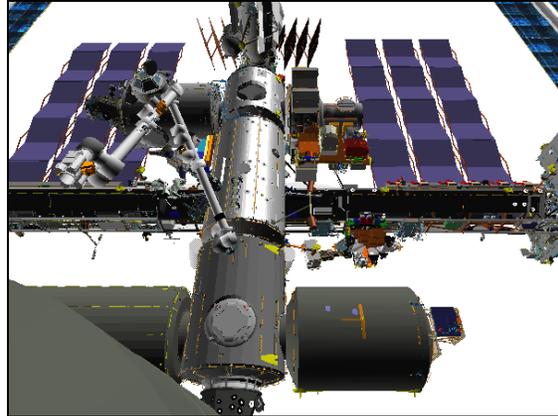


Figure 4.- OBSS Backoff Position
(Camera C: 0, +35).

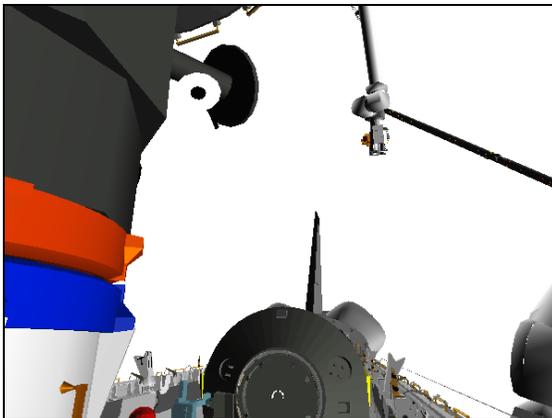


Figure 5.- OBSS Backoff Position
(Camera A: -10, +20).

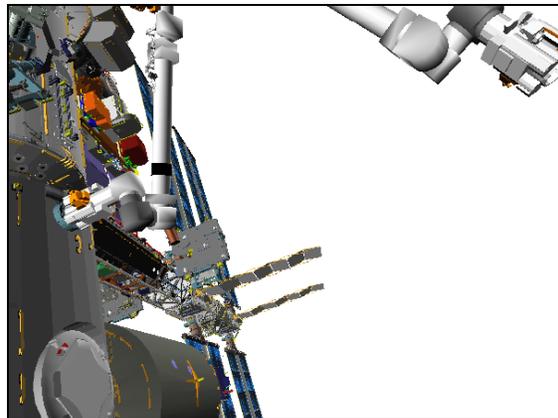


Figure 6.- OBSS Backoff Position
(SRMS Elbow: -140, +50).

Change Loaded Parameters ► Walk Off ► MBS PDGF 1
Verify 'Loaded Parameters' (three) – MBS PDGF 1, SSRMS, SR Held

Verify Unloaded Parameters – ✓
Change Unloaded Parameters ► Unloaded ► LEE Tip SRH
Verify 'Unloaded Parameters' (two) – LEE Tip, SR Held

Change Display ► MBS ► PDGF 1 (Verify MBS>PDGF 1)

Verify Command – SSRMS>Internal

Verify SSRMS at OBSS Backoff position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-82.2	+28.3	+60.8	-131.7	-5.4	-1.1	-128.6
X	Y	Z	Pitch	Yaw	Roll	
-202	+1950	-323	+151.5	+18.9	-39.6	
FOR	Unloaded – LEE Tip, SR Held					
Disp	MBS>PDGF 1					

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 3 of 17 pages

2. JOINT OCAS TO INTERMEDIATE 1 POSITION (5 MINUTES)

NOTE

Expect singularity warning when WY is near +90 degrees, when $-15 < EP < +15$, and near SY = 99.2 degree (Wrist over SR singularity).

DCP BRAKES SSRMS → OFF (Verify OFF)

√Vernier

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

Input 'Joint Angles' 'Destination' for Intermediate 1 position.

SR	SY	SP	EP	WP	WY	WR
-12.0	-100.0	-100.0	+20.0	-116.2	+153.4	+65.0

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-82.2	+28.3	+60.8	-131.7	-5.4	-1.1	-128.6
TGT	-12.0	-100.0	-100.0	+20.0	-116.2	+153.4	+65.0
ERR	-70.2	+128.3	+160.8	-151.7	+110.8	-154.5	-193.6

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 4 of 17 pages

Verify SSRMS at Intermediate 1 position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-12.0	-100.0	-100.0	+20.0	-116.2	+153.4	+65.0
X	Y	Z	Pitch	Yaw	Roll	
-1056	+470	+447	-68.3	-4.6	-97.9	
FOR	Unloaded – LEE Tip, SR Held					
Disp	MBS>PDGF 1					

3. JOINT OCAS TO INTERMEDIATE 2 POSITION (2 MINUTES)

NOTE

1. SSRMS Tip Elbow Camera to Columbus Module, decreases to 64 cm (25 in). Monitor with S1 Lower Outboard or MBS Mast camera.
2. SSRMS Base Boom to UHF Antenna, decreases to 81 cm (32 in). Monitor with MBS Mast camera.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+55, +10)	37: MBS Mast (+75, +25)	24: Tip Elbow (+15, 0)	Camera C (0, +35)	OBSS ITVC (+80, -70)

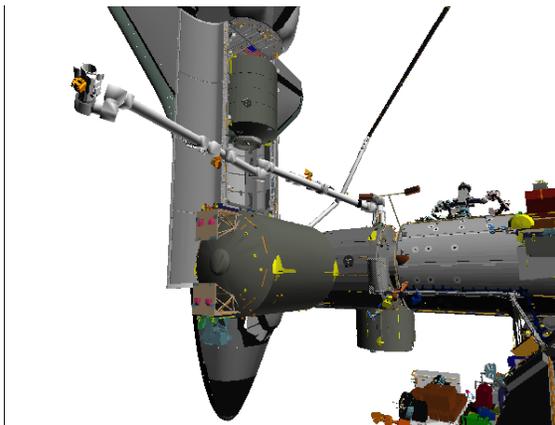


Figure 7.- Intermediate 1 Position
(03: S1 Lower Outboard: +55, +10).

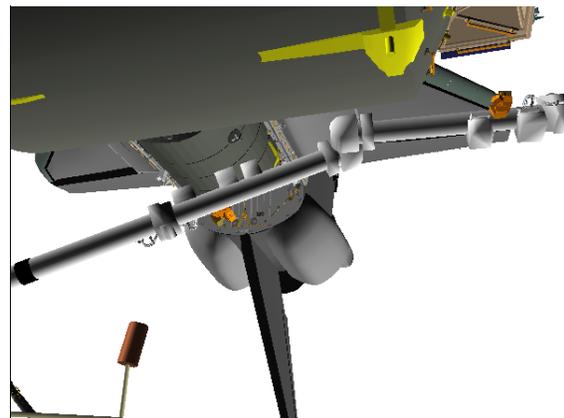


Figure 8.- Intermediate 1 Position
(37: MBS Mast: +75, +25).

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 5 of 17 pages

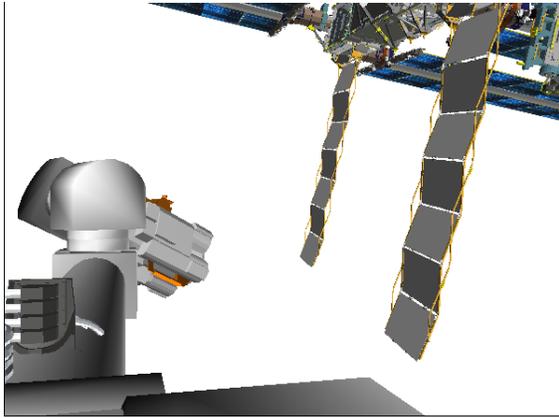


Figure 9.- Intermediate 1 Position
(24: Tip Elbow: +15, 0).

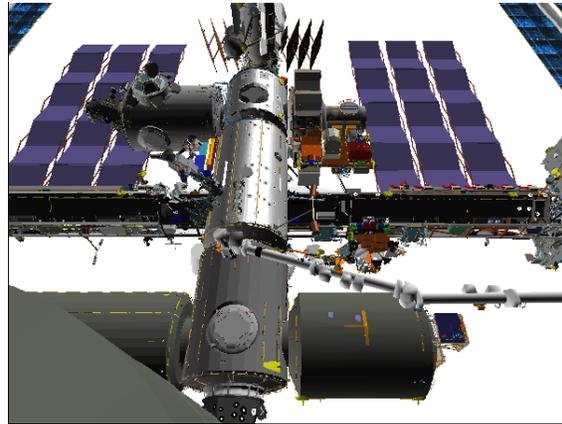


Figure 10.- Intermediate 1 Position
(Camera C: 0, +35).

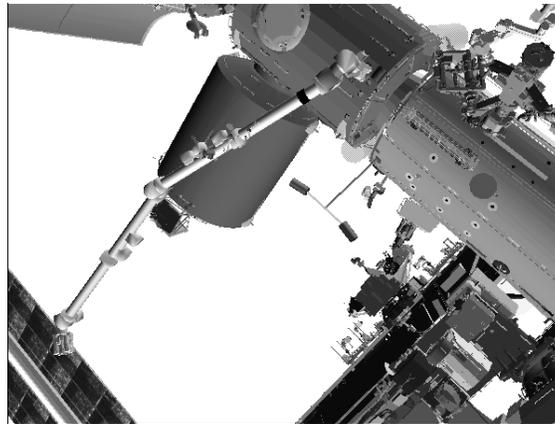


Figure 11.- Intermediate 1 Position
(OBSS ITVC: +80, -70).

SSRMS Joint OCAS

Input 'Joint Angles' 'Destination' for Intermediate 2 position.

SR	SY	SP	EP	WP	WY	WR
-11.0	-144.9	-73.8	+55.0	-116.2	+153.4	+109.8

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-12.0	-100.0	-100.0	+20.0	-116.2	+153.4	+65.0
TGT	-11.0	-144.9	-73.8	+55.0	-116.2	+153.4	+109.8
ERR	-1.0	+44.9	-26.2	-35.0	0.0	0.0	-44.8

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 6 of 17 pages

Verify Posn Hold – orange

Verify SSRMS at Intermediate 2 position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-11.0	-144.9	-73.8	+55.0	-116.2	+153.4	+109.8
X	Y	Z	Pitch	Yaw	Roll	
-173	-39	+72	-3.2	-7.7	-4.4	
FOR	Unloaded – LEE Tip, SR Held					
Disp	MBS>PDGF 1					

4. SINGLE JOINT TO MBS PDGF 1 PRE-GRAPPLE

NOTE

SSRMS Tip Elbow Camera – Columbus remains 64 cm (25 in) monitor with MBS Mast camera

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC 1 (MON 1)	SSC 2 (DTV)
37: MBS Mast (+75, +25)	25: Tip LEE (Full Zoom Out)	13: LAB Stbd Zenith (+110, +75)	Camera C (0, +35)	OBSS ITVC (+80, -70)

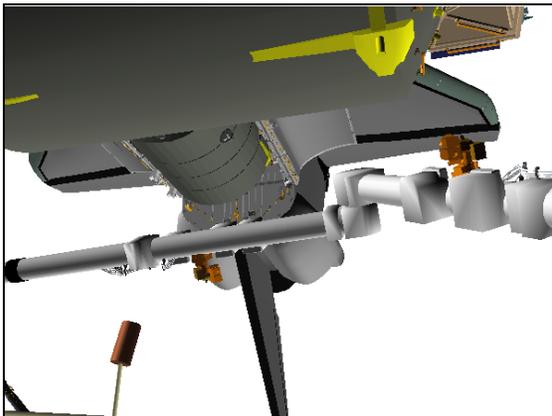


Figure 12.- Intermediate 2 Position
(37: MBS Mast: +75, +25).

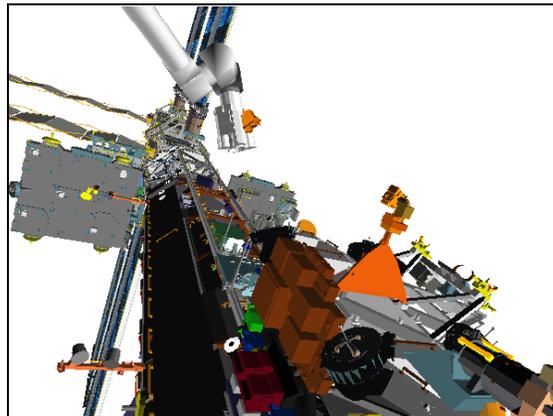


Figure 13.- Intermediate 2 Position
(13: Lab Stbd Zenith: +110, +75).

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 7 of 17 pages

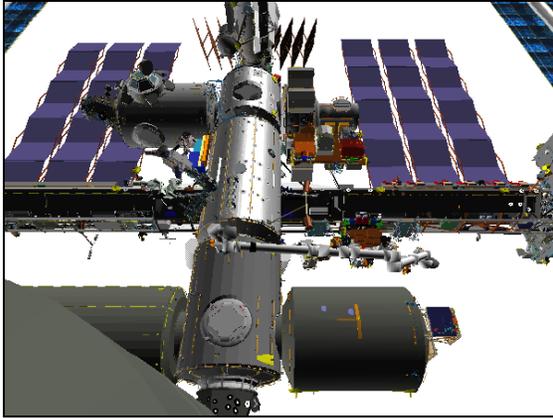


Figure 14.- Intermediate 2 Position
(Camera C: 0, +35).

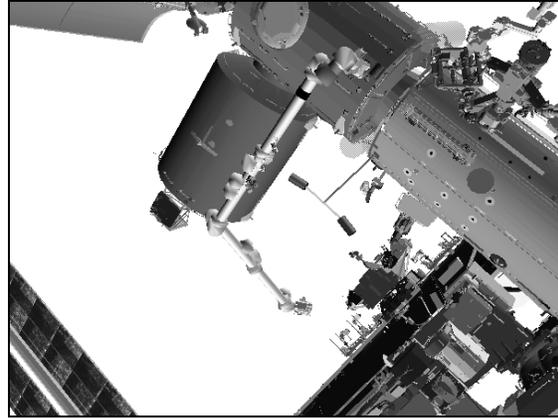


Figure 15.- Intermediate 2 Position
(OBSS ITVC: +80, -70).

PCS MSS: SSRMS:

Enter Mode – Single (Verify blue)

WARNING

The active joint must be checked on the PCS before initiating motion. Failure to do so may result in movement of the wrong joint.

DCP JOINT SELECT → Elbow Pitch (Verify EP – Selected on PCS)

THC Perform “+” Single Joint maneuver to EP: +64.3 (THC up).

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

Verify SSRMS at MBS PDGF 1 Pre-Grapple position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-11.0	-144.9	-73.8	+64.3	-116.2	+153.4	+109.8
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SR Held					
Disp	MBS>PDGF 1					

5. [GRAPPLING MBS PDGF 1](#)

NOTE

1. SSRMS Tip Boom - Columbus Module remains 64 cm (25 in). Monitor with Camera C.
2. SSRMS Base Boom - UHF Antenna remains 81 cm (32 in). Monitor with MBS Mast.

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 8 of 17 pages

5.1 Setup

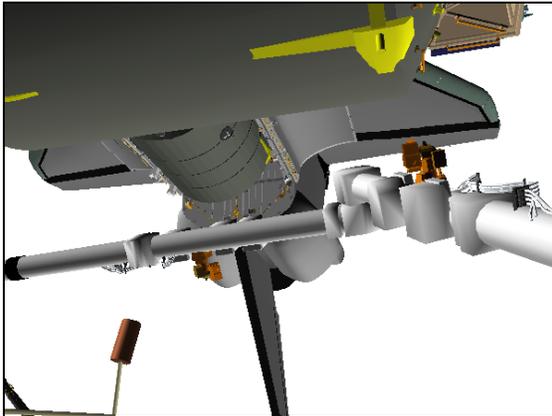


Figure 16.- PDGF 1 Pre-Grapple
(37: MBS Mast: +75, +25).

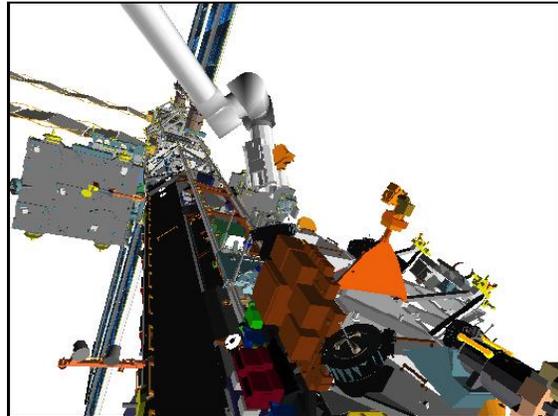


Figure 17.- PDGF 1 Pre-Grapple
(13: LAB Stbd Zenith: +110, +75).

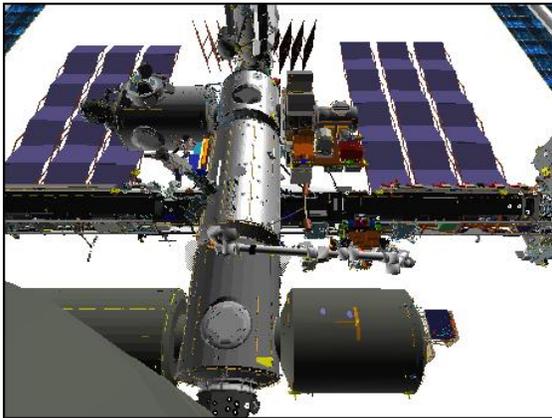


Figure 18.- PDGF 1 Pre-Grapple
(Camera C: 0, +35).

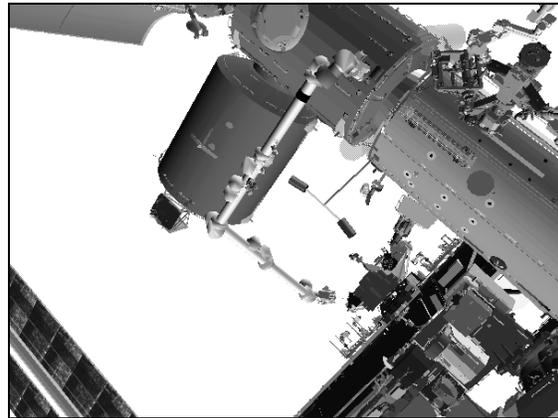


Figure 19.- PDGF 1 Pre-Grapple
(OBSS ITVC: +80, -70).

√ Vernier

PCS

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.5)

5.2 Maneuvering to Within Grapple Envelope

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/RHC

Maneuver to within grapple envelope. (THC In, +X)

5.3 Slow Auto PDGF Capture

13 OCT 10

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 9 of 17 pages

PCS MSS: SSRMS: Tip LEE:

cmd Capture ► Automatic ► Slow, Limp (Verify Speed – Slow)

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Capture

RHC TRIGGER → press (momentarily)

PCS Verify 'Snare' Close, Capture (two) – blue (12 s max)
Verify Capture to Latch – Yes (SCR 19282)
Verify 'Carriage' Tension ~5500 N (90 s max)
Verify 'Carriage' Retract – blue
Verify 'Latch' Latch – blue (65 s max)

Verify Loaded Parameters – √
Verify 'Loaded Parameters' (three) – MBS PDGF 1, SSRMS, SR Held

5.4 Mating Umbilicals

Verify with **MCC-H** that payload and PDGF power inhibits are in place.

NOTE

1. Expect '**R20 - MBS CRPCM 3P(R) Output Voltage 1 Stat Err**' Robotics Advisory message while umbilicals are mated. Message should return to norm. (SCR 37020)
2. Expect '**R3L - SSRMS Pwr Flags Fail**' Robotics Advisory message while Tip LEE is mated (SCR 19019).

MSS: SSRMS: Tip LEE:

cmd 'Umbilical' Mate (Verify '**Confirm or Terminate**' prompt)

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Mate

RHC TRIGGER → Press (momentarily)

PCS Verify 'Umbilical' Mate – blue (10 s max)
Verify 'Connector Continuity' Prime, Redundant (two) – Yes

5.5 Grapple Cleanup

Verify Posn Hold – orange

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 10 of 17 pages

Expected PDGF 1 Grapple position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-11.0	-143.2	-71.7	+65.5	-120.1	+154.5	+111.3
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – MBS PDGF1, SR Held					
Disp	MBS> PDGF 1					

NOTE

Expect the following message when safing is commanded:
**'R3Z - MSS OCS SSRMS Prime(Redun) ACU SRT Cat-1
 Brk Stat Fail'** (SCR 17495)
 This message should return to Norm.

DCP SAFING → SAFE (Verify ON)

Notify **MCC-H**, "GO for SSRMS Operating Base Change."

6. SETUP FOR NODE 2 PDGF RELEASE

On **MCC-H**, "SSRMS is GO for Node 2 Release."

PCS MSS: SSRMS:

Verify 'Base LEE' – A
 Verify 'PDGF' – MBS 1

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
37: MBS Mast (+70, +20)	25: Tip LEE (Full Zoom Out)	03: S1 Lower Outboard (+65, +10)	Camera C (0, +35)	OBSS ITVC (+80, -65)

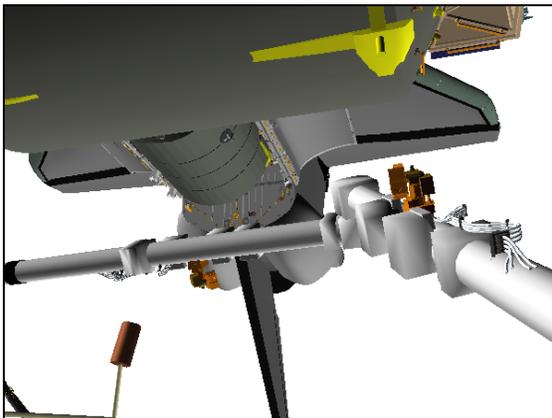


Figure 20.- PDGF 1 Grapple
(37: MBS Mast: +70, +20).

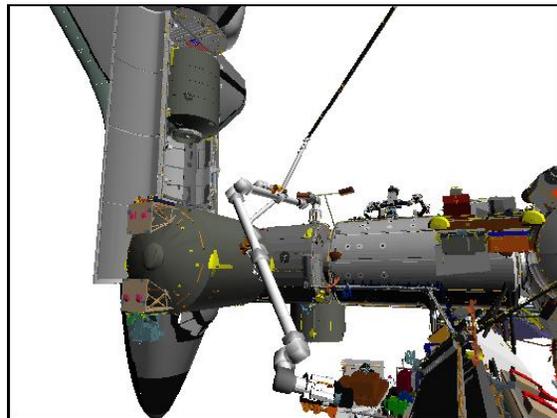


Figure 21.- PDGF 1 Grapple
(03: S1 Lower Outboard: +65, +10).

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 11 of 17 pages

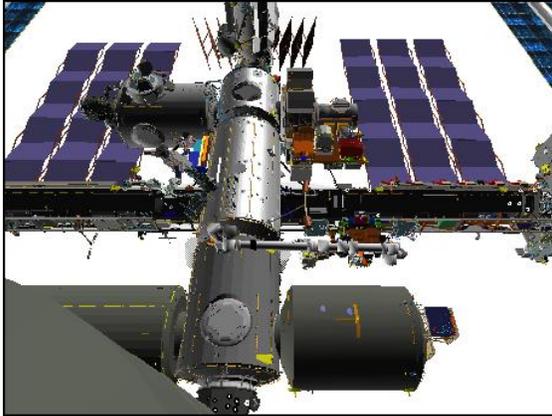


Figure 22.- PDGF 1 Grapple
(Camera C: 0, +35).

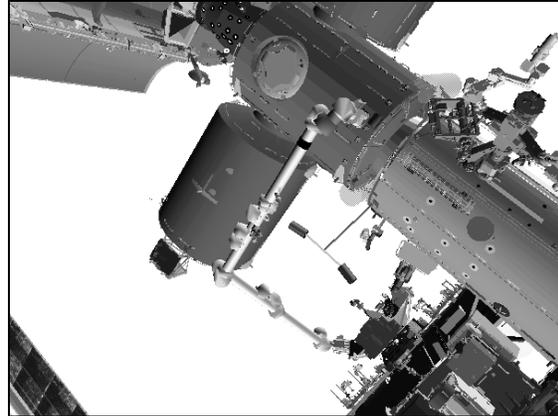


Figure 23.- PDGF 1 Grapple
(OBSS ITVC: +80, -65).

PCS MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

DCP BRAKES SSRMS → OFF (Verify OFF)

√Vernier

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.5)

MSS: SSRMS:

Verify Loaded Parameters – √

Verify 'Loaded Parameters' (three) – Node 2 PDGF, SSRMS, SR Held

Change Unloaded Parameters ► Unloaded ► LEE Tip SYH

Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

Change Display ► Node2 ► PDGF (Verify Node2>PDGF)

Verify Command – SSRMS>Internal

7. NODE 2 PDGF RELEASE

NOTE

1. SSRMS Base Boom - Columbus Module, increases from 76 cm (30 in) to 107 cm (42 in). Monitor with Camera C.
2. SSRMS Tip Boom - UHF Antenna, decreases to 61 cm (24 in). Monitor with MBS Mast.

7.1 Limping SSRMS

PCS MSS: SSRMS: Limp:

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 12 of 17 pages

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

7.2 Slow Auto PDGF Release

Verify with **MCC-H** - Payload and PDGF power inhibits are in place.

MSS: SSRMS: Tip LEE:

cmd Release ► Automatic ► Slow (Verify Speed – Slow)

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Release

RHC

TRIGGER → press (momentarily)

PCS

Verify 'Umbilical' Demate – blue (10 s max)

Verify 'Latch' Unlatch – blue (65 s max)

Verify 'Carriage' Derigidize – blue

Verify 'Snare' Open – blue (12 s max)

Verify 'Carriage' Extend – blue (90 s max)

Verify Unloaded Parameters – √

Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

7.3 Backing Off Node 2 PDGF

MSS: SSRMS: Limp:

cmd None Limp (Verify Standby – blue)

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 13 of 17 pages

THC/RHC

Maneuver to -65cm Backoff position (within 5 cm/1 deg).
(THC Out, -X)

Locked						
SR	SY	SP	EP	WP	WY	WR
+109.5	-154.5	-117.2	+58.2	-65.8	+144.5	-12.3
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	Node2>PDGF					

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

7.4 Snare Cable Cleanup

NOTE

This step will clear any C-Curves or S-Curves in the Tip LEE Snare Cables and setup for capture.

Configure Base Elbow camera to view Tip LEE Snare Cables.

Monitor 2
22: Base Elbow (+127, -5) Fully Zoomed In

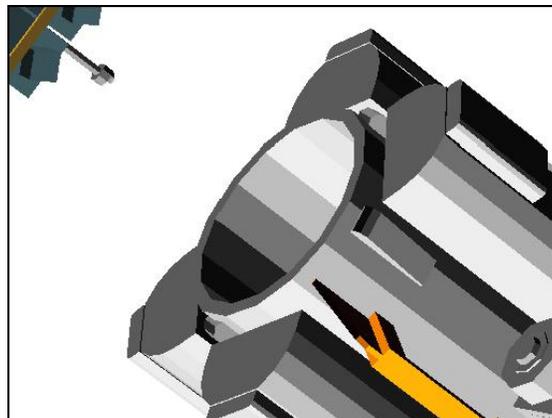


Figure 24.- View of Tip LEE Snare Cables
(22: Base Elbow: +127, -5).

PCS

MSS: SSRMS: Tip LEE:

cmd 'Snare' Close ► Slow, Soft Stops

Verify Speed – Slow

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 14 of 17 pages

Verify Stops – Soft

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Close Snares

RHC TRIGGER → press (hold until 'Snare' Brakes – On) (12 s max)

PCS Verify 'Snare' Close – blue

PCS MSS: SSRMS: Tip LEE: SSRMS Tip LEE

cmd Capture ► Setup ► Slow (Verify Speed – Slow)

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify Trigger Hot icon)

Verify LEE Mode – Setup for Capture

RHC TRIGGER → press (momentarily)

PCS Verify 'Snare' Open – blue

8. JOINT OCAS TO MT TRANSLATE CONFIG (2 MINUTES)

NOTE

1. SSRMS Base Boom - Columbus Module, increases from 107 cm (42 in). Monitor with Camera C.
2. SSRMS Tip Boom - UHF Antenna, increases from 61 cm (24 in). Monitor with MBS Mast.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
37: MBS Mast (+70, +20)	22: Base Elbow (+127, -5) (Zoom out full)	03: S1 Lower Outboard (+65, +10)	Camera C (0, +35)	OBSS ITVC (+80, -65)

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 15 of 17 pages



Figure 25.- Node 2 Backoff
(37: MBS Mast: +70, +20).

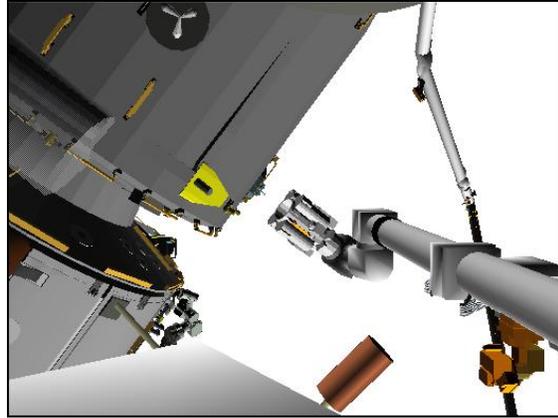


Figure 26.- Node 2 Backoff
(22: Base Elbow: +127, -5).

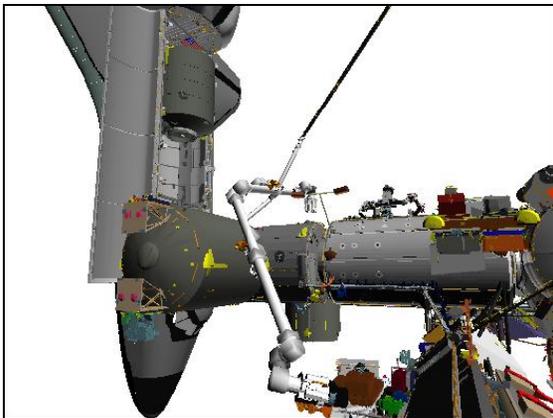


Figure 27.- Node 2 Backoff
(03: S1 Lower Outboard: +65, +10).

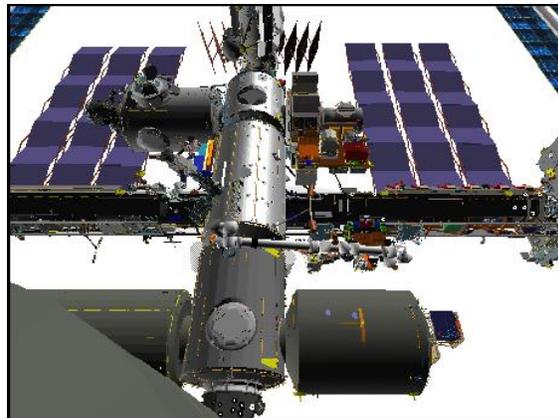


Figure 28.- Node 2 Backoff
(Camera C: 0, +35).



Figure 29.- Node 2 Backoff
(OBSS ITVC: +80, -65).

PCS

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

1.220 WALKOFF TO MBS AND MNVR TO TRANSLATE CONFIG

(RBT FS/ULF5/FIN/SPN) Page 16 of 17 pages

SSRMS Joint OCAS

Input 'Joint Angles' 'Destination' for MT Translate position.

SR	SY	SP	EP	WP	WY	WR
+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+109.5	-154.5	-117.2	+58.2	-65.8	+144.5	-12.3
TGT	+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9
ERR	+6.7	-10.7	+45.1	-37.5	+35.2	-10.9	-6.4

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS: SSRMS

Verify Posn Hold – orange

Verify SSRMS at MT Translate position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9
X	Y	Z	Pitch	Yaw	Roll	
-161	+22	+564	+38.9	-2.1	-17.9	
FOR	Unloaded – LEE Tip, SY Held					
Disp	Node2>PDGF					

NOTE

Expect the following message when safing is commanded:

'R3Z - MSS OCS SSRMS Prime(Redun) ACU SRT Cat-1 Brk Stat Fail' (SCR 17495)

This message should return to Norm.

DCP

SAFING → SAFE (Verify ON)

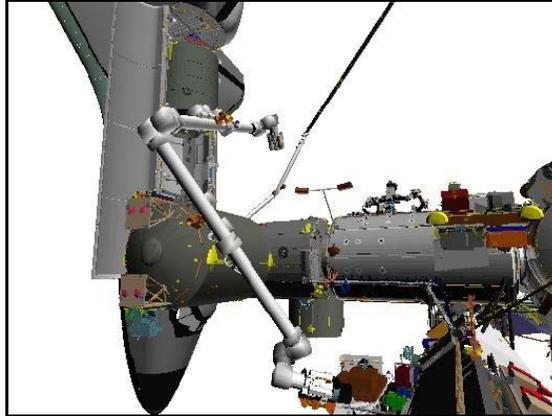


Figure 30.- MT Translate Position
(03: S1 Lower Outboard: +65, +10).

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1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 1 of 24 pages

NOTE

Prior to this procedure, MCC-H will be performing ground control operations to setup the SSRMS for PMM Unberth and Install. To avoid system conflicts, ensure ground control is complete before picking up with step 1.

√**MCC-H** Ground Control Complete

NOTE

Items in Grey are for shuttle crew or MCC-H (when noted.)

1. **SETUP**

Verify SRMS is grappled to OBSS and at PMM Install Viewing position.

SY	SP	EP	WP	WY	WR
+35.1	+38.6	-22.7	-0.4	-0.7	-40.1

Configure Cameras and overlays for grapple.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
09: P1 Lower Outboard (+120, +20)	25: Tip LEE (Full Zoom Out)	72(DNLK): Camera B (0, +10)	SRMS Elbow (-85, +10)	OBSS ITVC (+120, -45)

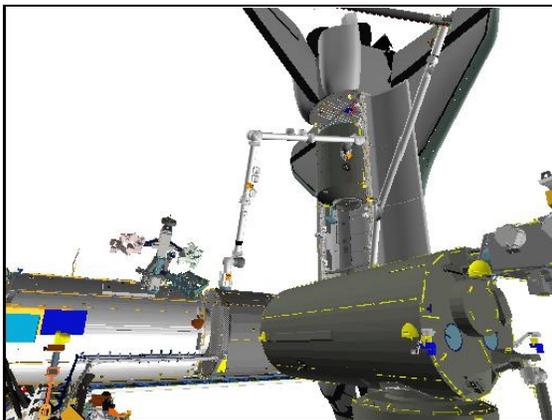


Figure 1.- PMM Pre-Grapple
(09: P1 Lower Outboard: +120, +20).

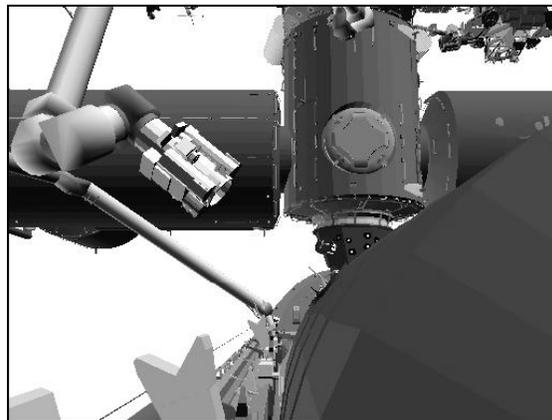


Figure 2.- PMM Pre-Grapple
(72: Camera B: 0, +10).

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 2 of 24 pages

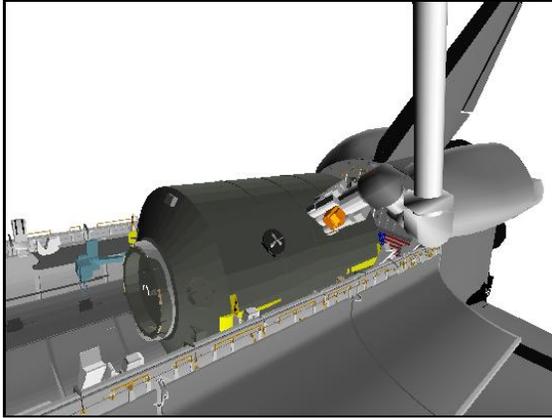


Figure 3.- PMM Pre-Grapple (SRMS Elbow: -85, +10).

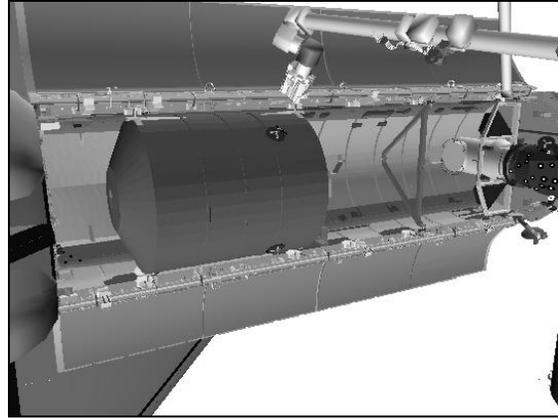


Figure 4.- PMM Pre-Grapple (OBSS ITVC: +120, -45).

PCS

MSS: SSRMS:

Verify Unloaded Parameters – √

Verify 'Unloaded Parameters' (two) – LEE Tip, SR Held

Verify 'Loaded Parameters' (three) – PMM Unberth, SSRMS, SR Held

Verify Display – Orbiter>PMM GF

Verify Command – SSRMS>Internal

MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

DCP

BRAKES SSRMS → OFF (Verify OFF)

√Vernier

PCS

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.6)

Verify SSRMS at PMM Pre-Grapple position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-90.1	+25.8	+7.4	-84.2	-228.3	-141.2	-77.1
X	Y	Z	Pitch	Yaw	Roll	
-150	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SR Held					
Disp	Orbiter>PMM GF					

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 3 of 24 pages

2. PMM GRAPPLE

NOTE

Clearance between Tip LEE and Orbiter decreases to 90cm (35in).
Monitor using Camera B.

- 2.1 Maneuvering to Grapple Envelope
- PCS MSS: SSRMS:
- Enter Mode – Manual (Verify blue)
- MSS: SSRMS: SSRMS Manual: Joint Lock:
- cmd** Shoulder Roll (Verify SR – Locked)
- THC/RHC Maneuver to within grapple envelope. (THC In, +X)
- 2.2 Slow Auto FRGF Capture
- PCS MSS: SSRMS: Tip LEE:
- cmd** Capture ► Automatic ► Slow, Limp (Verify Speed – Slow)
- Verify **'Confirm or Terminate'** prompt.
- cmd** Confirm (Verify RHC Trigger Hot icon)
- Verify LEE Mode – Auto Capture
- RHC TRIGGER → press (momentarily)
- PCS Verify 'Snare' Close, Capture (two) – blue (12 s max)
Verify Capture to Latch – No (SCR 19282)
Verify 'Carriage' Tension ~5500 N (90 s max)
Verify 'Carriage' Retract – blue
Verify Motors - Inh
- Verify Loaded Parameters – √
Verify 'Loaded Parameters' (three) – PMM Unberth, SSRMS, SR Held
- DCP BRAKES SSRMS → ON (Verify ON)

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 4 of 24 pages

3. PMM UNBERTH SETUP

Review [SSRMS LEE CUE CARD \(SSRMS IS LOADED AND LEE CAUTION IS ANNUNCIATED\)](#), all (SODF: RBT GEN: REFERENCE: CUE CARD).

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
09: P1 Lower Outboard (+125,+25)	13: LAB Stbd Zenith (-40,-20) 22: Base Elbow (-110, -15)	72(DNLK): Mux B/C B (0, -10) C (0, -10)	SRMS Elbow (-85,+10)	OBSS ITVC (+120, -45)

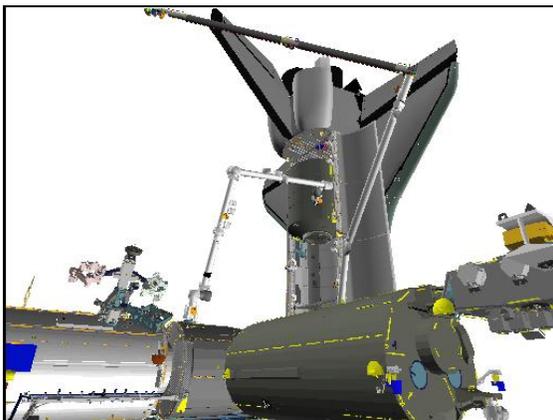


Figure 10.- PMM Grappled (09: P1 Lower Outboard: +125, +25).

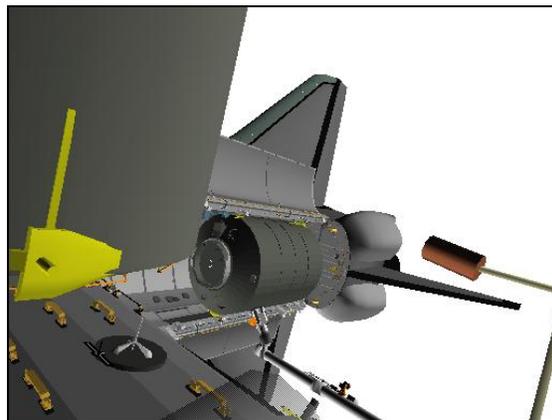


Figure 11.- PMM Grappled (13: LAB Stbd Zenith: -40, -20).

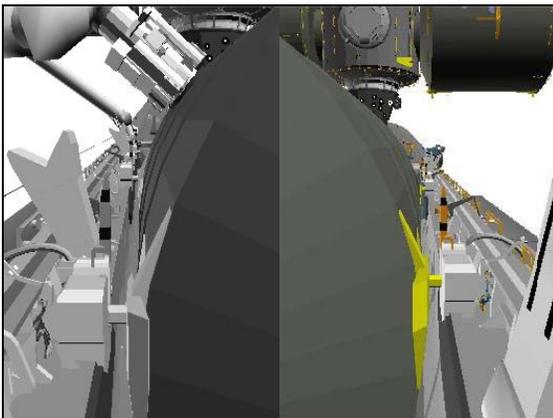


Figure 12.- PMM Grappled (72: Mux B/C).

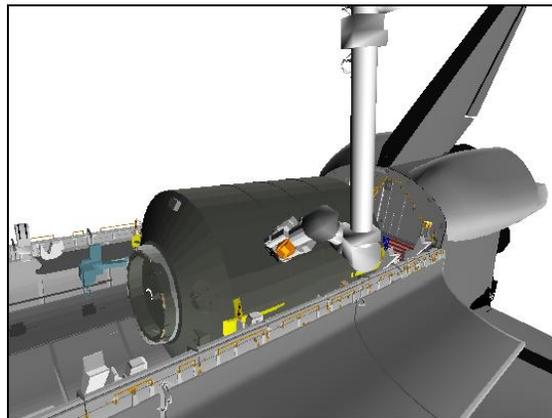


Figure 13.- PMM Grappled (SRMS Elbow: -85, +10).

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR
 (RBT FS/ULF5/FIN 1/SPN) Page 5 of 24 pages

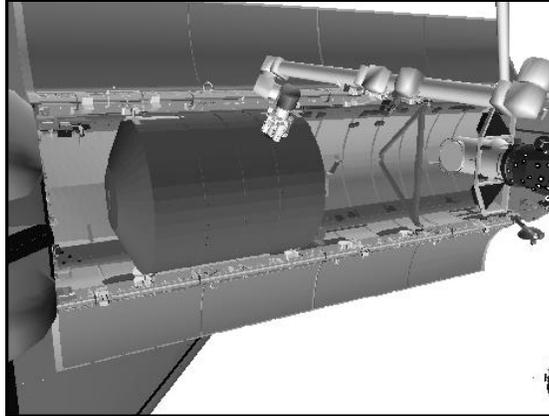


Figure 14.- PMM Grappled
 (OBSS ITVC: +120, -45).

PCS

MSS: SSRMS:

Change Display ► Orbiter ► PMM Unberth (Verify Orbiter>PMM Unberth)

Change Command ► ISS ► OBAS (Verify ISS>OBAS)

Verify SSRMS at Berthed PMM Grappled position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-90.1	+18.7	+0.8	-81.1	-219.7	-137.6	-69.2
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – PMM Unberth, SR Held					
Disp	Orbiter>PMM Unberth					

 * If using shuttle attitude control
 * Verify in attitude, then DAP: FREE

MCC-H

MCG: MCS Configuration: MCS Inhibits:

√ Desat Request – Inh

√ Auto Att Control handover to RS - Inh

On **MCC-H**, “Ready for ROEU, PRLA, and Unberth Ops.”

Notify **PRLA Operator**, “GO for ROEU and PRLA Ops.”

NOTE

Steps 4 to 8 will be performed by the shuttle crew to demate the PMM ROEU and open PMM PRLAs.

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 6 of 24 pages

NOTE

If 'R3Q - SSRMS LEE Uncommanded Derigidize' caution is annunciated or Carriage tension drops below 4400 N during PRLA release, refer to star block in step 9 after PRLA operator gives "Go for PMM Unberth."

4. ROEU DEMATE

4.1 Setup

On **SSRMS operator**, "GO for ROEU and PRLA Ops."

CCTV – Config for ROEU demate

DTV D (A)

4.2 Deadface ROEU

R1 PL PRI MN C – OFF (tb-bp)
SSP 1 PMM CH 1,2 HTR – OFF (tb-bp)
A15 APCU 1 OUTPUT – OFF

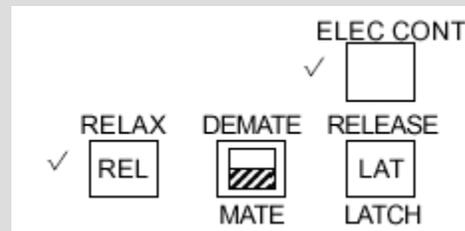
A6U Install ROEU A6U PANEL OVERLAY

PL RETEN LAT (five) – OFF
PL SEL – 2

SM 97 PL RETENTION

PL SEL 2 REL 2,3 (four): 0

* If any REL msw shows '1', expect single motor time.



4.3 Activating ROEU

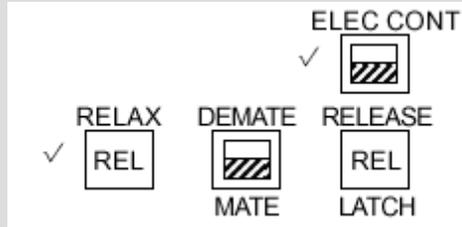
A6U PL RETEN LOGIC PWR SYS 1,2 (two) – ON
R13L BAY MECH PWR SYS 1,2 (two) – ON

4.4 Releasing Latches

Note single motor time (> 20 sec)

A6U RELEASE/LATCH – REL (tb-REL), 40 sec max
– OFF

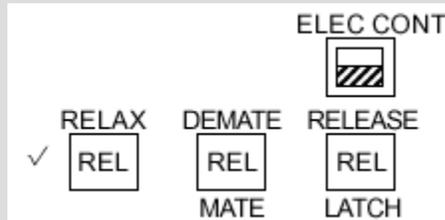
1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR
 (RBT FS/ULF5/FIN 1/SPN) Page 7 of 24 pages



4.5 Demating ROEU

Note single motor time (> 18 sec)

DEMATE/MATE – DEMATE (tb-REL), 36 sec max
 – OFF



A6U Remove ROEU A6U PANEL OVERLAY

CCTV – Config for SSRMS Ops



5. ACTIVATING LATCHES

A6U √PL RETEN LAT (five) – OFF
 PL SEL – 1



√PL SEL 1 RDY-FOR-LAT 1,2,3,4,5 (ten): 1
 √REL 1,2,3,4,5 (ten) : 0

 * If any REL msw shows '1', expect single motor time
 * (60 sec).

6. AKA RELEASE

A6U √PL RETEN LAT 5 tb – LAT
 √RDY 5 tb – gray

Note single motor time (> 30 sec).

PL RETEN LAT 5 – REL (tb-REL), 60 sec max
 – OFF

7. PRLA RELEASE

- √PL RETEN LAT 1,2,3,4 tb (four) – LAT
- √RDY 1,2,3,4 tb (four) – gray

Note single motor times (> 30 sec).

- PL RETEN LAT 1,2 (two) – REL (tb-REL), 60 sec max
– OFF
- 3,4 (two) – REL (tb-REL), 60 sec max
– OFF

8. DEACTIVATING LATCHES

- R13L PL RETEN LOGIC PWR SYS 1,2 (two) – OFF
- BAY MECH PWR SYS 1,2 (two) – OFF

Notify **SSRMS Operator**, “GO for PMM unberth.”

9. MANEUVERING PMM TO HOVER

On **PRLA Operator**, “GO for PMM Unberth”

* If ‘**R3Q - SSRMS LEE Uncommanded Derigidize**’ Caution was annunciated
 * during PRLA release or Carriage tension < 4400 N

PCS

- * MSS: SSRMS: Tip LEE:
- * **cmd** ‘Carriage’ Rigidize ► Slow (Verify Speed – Slow)
- * Verify ‘**Confirm or Terminate**’ prompt.
- * **cmd** Confirm (Verify RHC Trigger Hot icon)
- * Verify LEE Mode – Rigidize

RHC

* TRIGGER → Press (momentarily) (SCR 19064)

PCS

- * Verify ‘Carriage’ Tension ~5500 N (90 s max)
- * Verify ‘Carriage’ Retract – blue

DCP

BRAKES SSRMS → OFF (Verify – OFF)

√Vernier

PCS

MSS: SSRMS: Rate:

Set ‘Scale’ ‘Vernier’ Rate Scale: 1.0 (Verify 1.0)

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 9 of 24 pages

PCS MSS: SSRMS:

Enter Mode – Manual (Verify – blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/RHC Maneuver PMM to Hover position (within 5 cm/1 deg). (THC Up, -Z)

Locked						
SR	SY	SP	EP	WP	WY	WR
-90.1	+18.5	+43.6	-106.3	-237.1	-137.5	-68.9
X	Y	Z	Pitch	Yaw	Roll	
0	0	-550	0.0	0.0	0.0	
FOR	Loaded – PMM Unberth, SR Lock					
Disp	Orbiter>PMM Unberth					

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

```
*****
* If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
* (ORB OPS, REBOOST/DAP) Steps 1-3
*****
```

10. JOINT OCAS MANEUVER TO PRE-INSTALL (18 MINUTES)

NOTE

During the following maneuver clearance between the PMM and Soyuz Solar Array reaches a minimum of 155cm (61in.)
Monitor with Cupola Window 4 and S1 LOOB Camera.

Configure cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON1)	SSC R (DTV)
09: P1 Lower Outboard (+105, +25)	03: S1 Lower Outboard (+90, +65)	72(DNLK): Camera C (0, +20)	SRMS Elbow (-85, +35)	OBSS ITVC (+120, -45)

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR
(RBT FS/ULF5/FIN 1/SPN) Page 10 of 24 pages

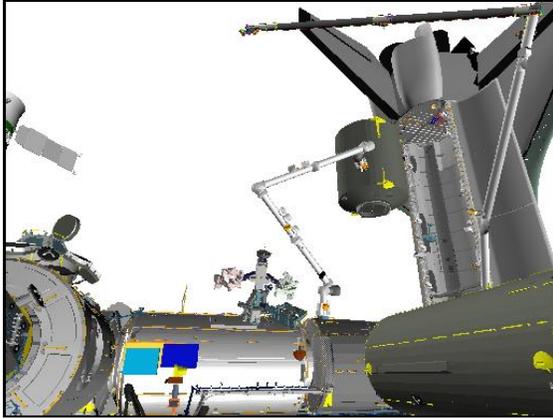


Figure 15.- PMM Hover
(09: P1 Lower Outboard: +105, +25).

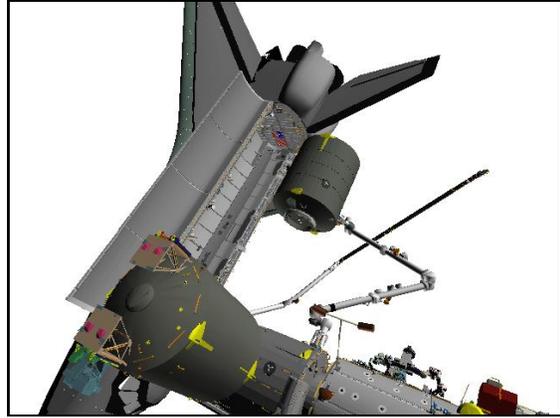


Figure 16.- PMM Hover
(03: S1 Lower Outboard: +90, +65).

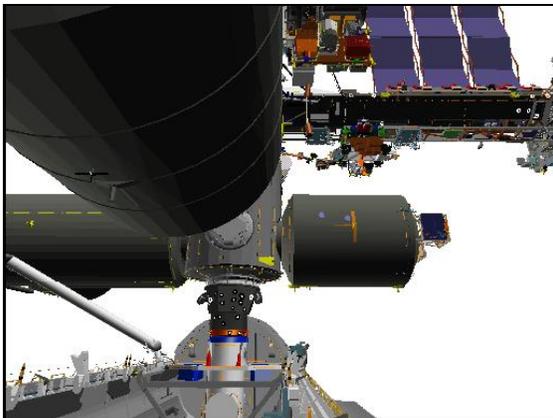


Figure 17.- PMM Hover
(72: Camera C: 0, +20).

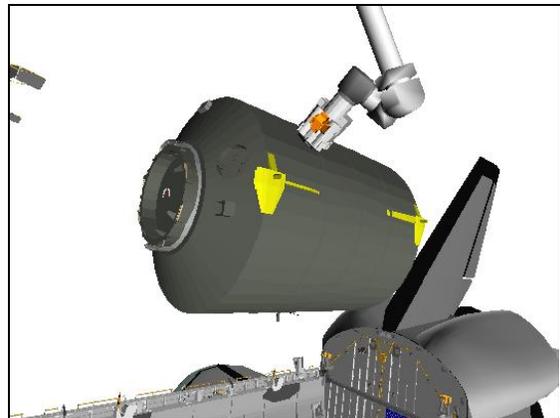


Figure 18.- PMM Hover
(SRMS Elbow: -85, +35).

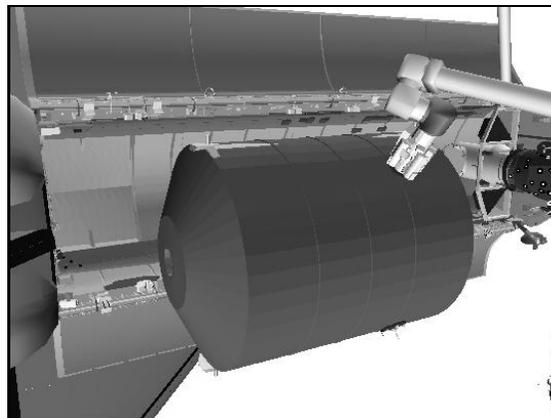


Figure 19.- PMM Hover
(OBSS ITVC: +120, -45).

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 11 of 24 pages

PCS

MSS: SSRMS:

Change Loaded Parameters ► PMM ► PMM CBCS Mate SYH
Verify 'Loaded Parameters' (three) – PMM CBCS Mate, SSRMS, SY Held

Change Unloaded Parameters ► Unloaded ► LEE Tip SYH
Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

Change Display ► Node1 ► PMM Mate CBCS (Verify Node1>PMM Mate CBCS)

Change Command ► SSRMS ► Internal (Verify SSRMS>Internal)

RHC

RATE → COARSE (Verify Coarse on PCS)

PCS

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► PMM ► Pre-Install

Verify 'Joint Angles' 'Destination' for Pre-Install position.

SR	SY	SP	EP	WP	WY	WR
+90.9	+9.9	-17.6	-98.3	-153.1	-220.9	-30.8

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-90.1	+18.4	+43.6	-106.3	-237.1	-137.4	-68.9
TGT	+90.9	+9.9	-17.6	-98.3	-153.1	-220.9	-30.8
ERR	-181.0	+8.5	+61.2	-8.0	-84.0	+83.5	-38.1

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 12 of 24 pages

Verify SSRMS at PMM Pre-Install position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+90.9	+9.9	-17.6	-98.3	-153.1	-220.9	-30.8
X	Y	Z	Pitch	Yaw	Roll	
+252	1	0	0.0	0.0	0.0	
FOR	Loaded – PMM CBCS Mate, SY Held					
Disp	Node1>PMM Mate CBCS					

 * If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
 * (ORB OPS, REBOOST/DAP) Steps 1-3

11. MANEUVERING PMM TO READY-TO-LATCH POSITION

NOTE

Clearance between the PMM and Airlock decreases to 44cm (17in) at RTLs. Monitor with Camera C.

Monitor clearance between the PMM and Node 3 Ammonia Lines with P1 Lower Outboard Camera, Base Elbow Camera, SPDM Body 2 Camera, and Cupola Window 4.

Configure Cameras and overlays as required. (USOS Eff)

Monitor 1	Monitor 2	Monitor 3	SSC L (MON1)	SSC R (DTV)
09: P1 Lower Outboard (+90, +20)	17: CBCS	22: Base Elbow (-85,+5) 47: SPDM Body2 (-135, -5)	SRMS Elbow (+155, +65)	Camera C (0, +55)

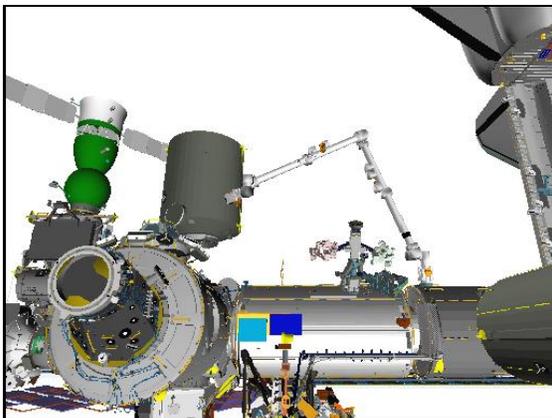


Figure 20.- PMM Pre-Install
(09: P1 Lower Outboard: +90, +20).

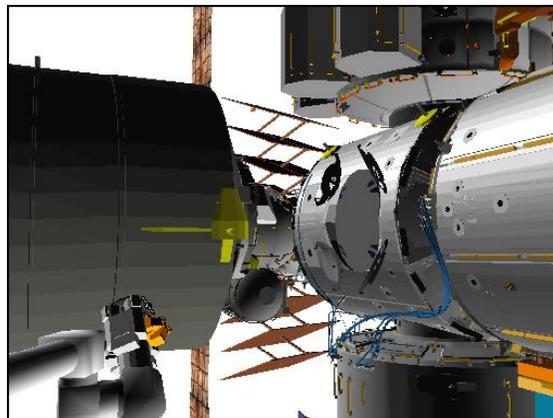


Figure 21.- PMM Pre-Install
(22: Base Elbow: -85, +5).

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 13 of 24 pages

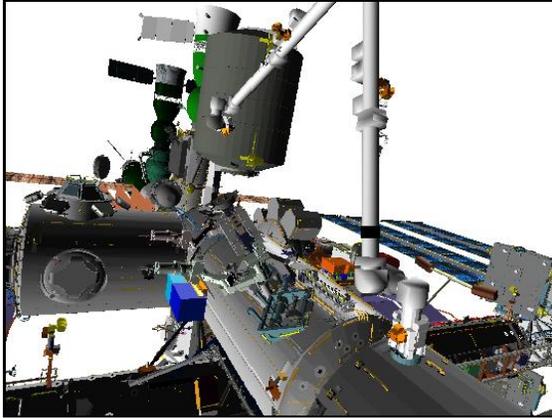


Figure 22.- PMM Pre-Install
(SRMS Elbow: +155, +65).

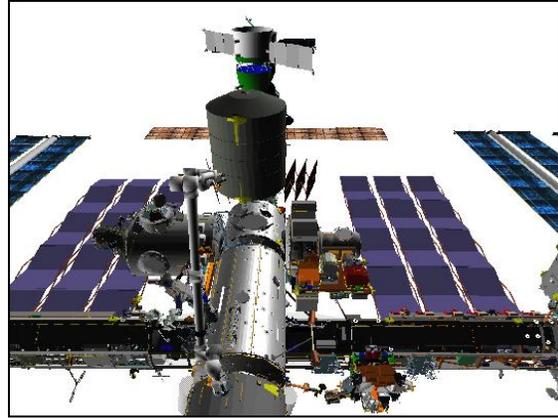


Figure 23.- PMM Pre-Install
(Camera C: 0, +55).

CBM-Operator	Verify {1.505 NODE 1 CBM VERIFY PRE-MATE STATUS}, all (SODF: S&M: NOMINAL: CBM), completed.
MCC-H	MCG: MCS Configuration: MCS Inhibits: <input type="checkbox"/> MCS Inhibits ✓ Desat Request – Inh ✓ Auto Att Control handover to RS - Inh

On **CBM Operator** and **MCC-H**, “GO for maneuver to Ready-to-Latch position.”

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS: Rate: SSRMS Rate

Set ‘Scale’ ‘Vernier’ Rate Scale: As Desired (0.6)

MSS: SSRMS: SSRMS

Verify Command – SSRMS>Internal

NOTE

Ensure PMM is fully aligned before FOR reaches X = 30cm.

✓ **MCC-H** before applying any HC input other than X (THC In/Out) after passing X=30cm.

Once all 4 RTL indications are annunciated, maintain -X THC input for 3 seconds, then ramp out.

✓ **MCC-H** before applying any HC input other than X (THC In/Out) to gain all 4 RTLs.

✓ **MCC-H** before moving in past X=7cm.

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 14 of 24 pages

PCS Enter Mode – Manual (Verify – blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC Maneuver PMM to Ready-To-Latch position until RTL (four) – green
(THC Out, -X) (Fly Red to Green)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+90.8	+9.9	-29.3	-105.1	-134.7	-220.8	-30.8
X	Y	Z	Pitch	Yaw	Roll	
+7	0	0	0.0	0.0	0.0	
FOR	Loaded – PMM CBCS Mate, SY Lock					
Disp	Node1>PMM Mate CBCS					

PCS MSS: SSRMS:

Verify Posn Hold – orange

NODE1: S&M: Nadir CBM

Verify RTL (four) – green

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

Notify **CBM operator**, “Maneuver to RTL complete, GO for First Stage Capture”.

12. SSRMS LIMPING

On **CBM operator**, “GO for SSRMS mode to limp.”

NOTE
Following SSRMS Mode to Limp, RTL indication may be lost due to RTL spring forces. RTL indication is not required prior to execution of Second Stage Capture.

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 15 of 24 pages

WARNING
If SSRMS fails to brakes-on from limp mode, continuation of Second Stage Capture may cause structural failure of SSRMS or primary structure. If CBM stops unexpectedly (and Cmd Code changes to 'Stop') or SSRMS safes during Second Stage Capture, $\sqrt{\text{MCC-H}}$ before proceeding.

Notify **CBM operator**, "SSRMS mode to limp complete, GO for Second Stage Capture."

13. PMM RELEASE SETUP

On **CBM operator**, "GO for SSRMS Release."

DCP BRAKES SSRMS → ON (Verify ON)

PCS MSS: SSRMS:

Expected PMM Install position.

SR	SY	SP	EP	WP	WY	WR
+90.8	+9.9	-29.7	-105.2	-134.2	-220.7	-30.8
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – PMM CBCS Mate, SY Held					
Disp	Node1>PMM Mate CBCS					

MCC-H If Desat Request was inhibited for prior operations:
 | MCG: MCS Configuration: MCS Inhibits:
 | **cmd** Desat Request Enable – (Verify – Ena)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
09: P1 Lower Outboard (+90, +20)	25: Tip LEE (Zoom Full Out)	22: Base Elbow (-95, -10)	OBSS ITVC (+45, -75)	Camera C (0, +45)

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR
 (RBT FS/ULF5/FIN 1/SPN) Page 16 of 24 pages

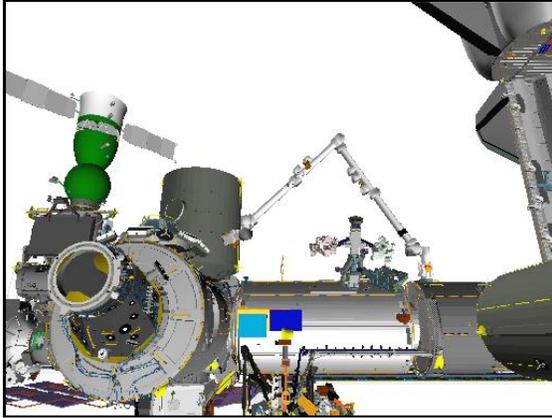


Figure 24.- PMM Installed
 (09: P1 Lower Outboard: +90, +20).

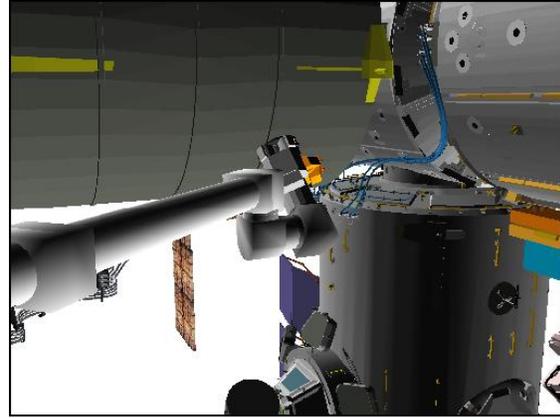


Figure 25.- PMM Installed
 (22: Base Elbow: -95, -10).

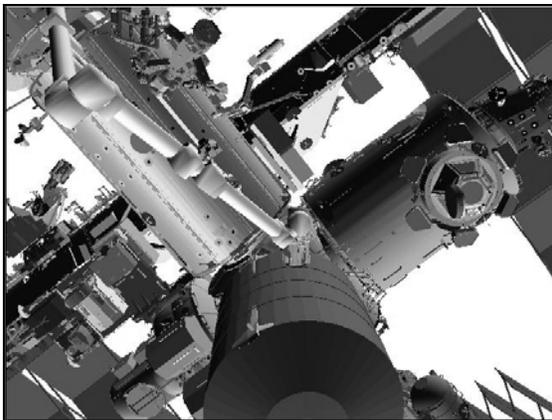


Figure 26.- PMM Installed
 (OBSS ITVC: +45, -75).

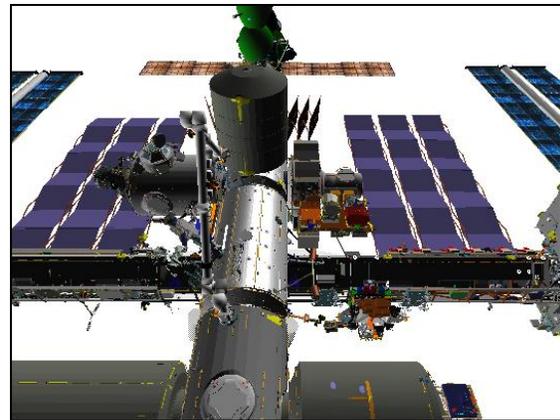


Figure 27.- PMM Installed
 (Camera C: 0, +45).

- PCS MSS: SSRMS:
- Change Display ► Node1 ► PMM Mated GF (Verify Node1>PMM Mated GF)
- Verify Command – SSRMS>Internal
- DCP BRAKES SSRMS → OFF (Verify OFF)
- √Vernier
- PCS MSS: SSRMS: Rate:
- Set 'Scale' 'Vernier' Rate Scale: as desired. (0.6)
- MSS: SSRMS: Limp:
- cmd** All Limp (Verify Limp – blue)

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 17 of 24 pages

PCS MSS: SSRMS:

Verify all joints – Limped

14. PMM RELEASE AND BACKOFF

14.1 Auto Release

MSS: SSRMS: Tip LEE:

cmd Release ► Automatic ► Slow (Verify Speed – Slow)

Verify 'Confirm or Terminate' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Release

RHC TRIGGER → press (momentarily)

PCS
 Verify 'Carriage' Derigidize – blue (90 s max)
 Verify 'Snare' Open – blue (12 s max)
 Verify 'Carriage' Extend – blue (90 s max)

Verify Unloaded Parameters – ✓
 Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

14.2 SSRMS Backoff

MSS: SSRMS: Limp:

cmd None Limp (Verify Standby – blue)

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC Maneuver SSRMS to Backoff position (within 5 cm/1 deg).
 (THC Out, -X)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+97.7	+9.9	-23.3	-113.9	-130.5	-227.5	-31.1
X	Y	Z	Pitch	Yaw	Roll	
-150	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	Node1>PMM Mated GF					

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR
 (RBT FS/ULF5/FIN 1/SPN) Page 18 of 24 pages

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

15. JOINT OCAS MANEUVER TO INTERMEDIATE POSITION (2 MINUTES)

NOTE

Clearance between the SSRMS Tip LEE and PMM reaches a minimum of 100cm (40in.) Monitor with Cupola Window 3 and OBSS ITVC Camera.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
09: P1 Lower Outboard (+100, +30)	03: S1 Lower Outboard (+115, +50)	22: Base Elbow (-90, 0)	OBSS ITVC (+45, -75)	Camera C (0, +45)

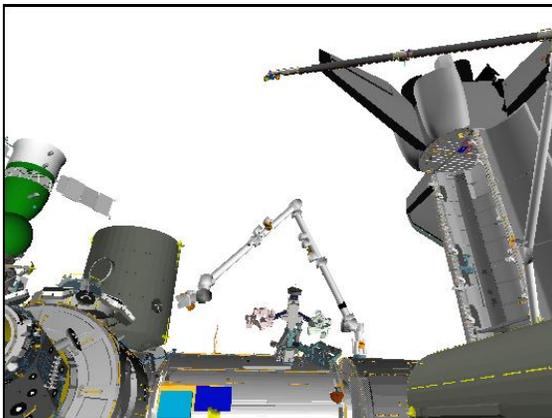


Figure 28.- PMM Backoff Position
(09: P1 Lower Outboard: +100, +30).

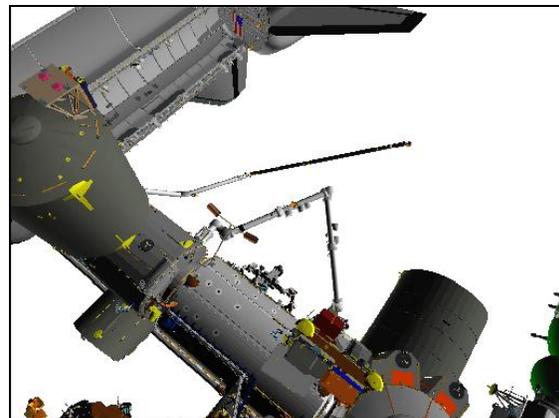


Figure 29.- PMM Backoff Position
(03: S1 Lower Outboard: +115, +50).

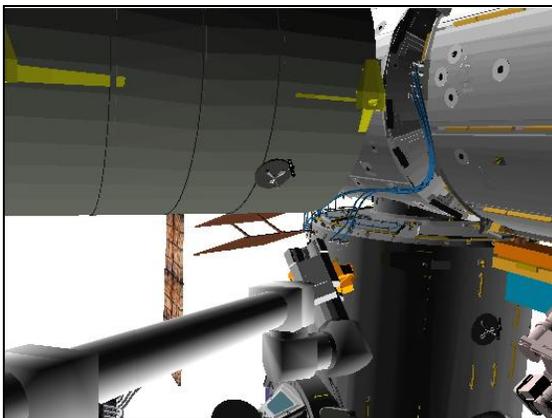


Figure 30.- PMM Backoff Position
(22: Base Elbow: -90, 0).

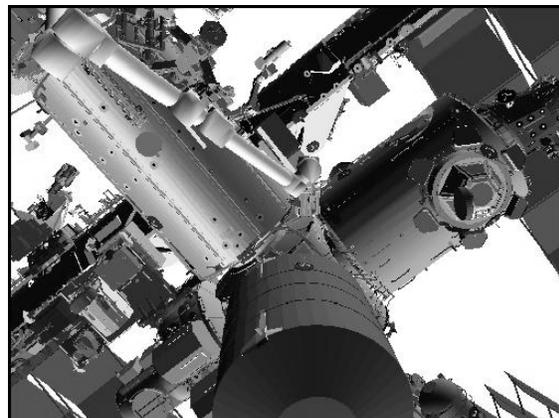


Figure 31.- PMM Backoff Position
(OBSS ITVC: +45, -75).

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR
 (RBT FS/ULF5/FIN 1/SPN) Page 19 of 24 pages

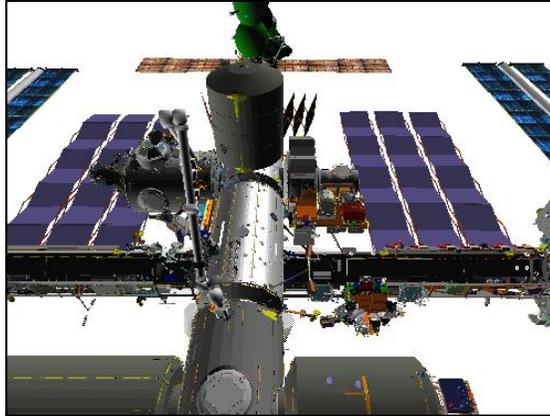


Figure 32.- PMM Backoff Position
 (Camera C: 0, +45).

√Vernier

PCS

MSS: SSRMS:

Change Display ► ISS ► ISSACS (Verify ISS>ISSACS)

Enter Mode – Joint OCAS (Verify blue)

Input 'Joint Angles' 'Destination' for Intermediate position.

SR	SY	SP	EP	WP	WY	WR
+40.0	+30.0	+25.0	-145.0	-180.0	-170.0	-88.8

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+97.7	+9.9	-23.3	-113.9	-130.5	-227.5	-31.1
TGT	+40.0	+30.0	+25.0	-145.0	-180.0	-170.0	-88.8
ERR	+57.7	-20.1	-48.3	+31.1	+49.5	-57.5	+57.7

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

SR	SY	SP	EP	WP	WY	WR
+40.0	+30.0	+25.0	-145.0	-180.0	-170.0	-88.8

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR

(RBT FS/ULF5/FIN 1/SPN) Page 20 of 24 pages

16. JOINT OCAS MANEUVER TO EVA 2 SETUP POSITION (8 MINUTES)

NOTE

This maneuver has the following clearance concerns:

1. Base Boom to LAB UHF Antenna reaches a minimum of 127cm (50in.) Monitor with Cupola Window 3, S1 LOOB, and SPDM Body 2 Cameras.
2. The SSRMS Wrist to Columbus External Carrier decreases to 94cm (37in.) Monitor with S1 Lower Outboard Camera.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
09: P1 Lower Outboard (+100, +30)	03: S1 Lower Outboard (+100, +55)	47: SPDM Body2 (+5, +15)	SRMS Elbow (-140, +50)	Camera C (0, +45)

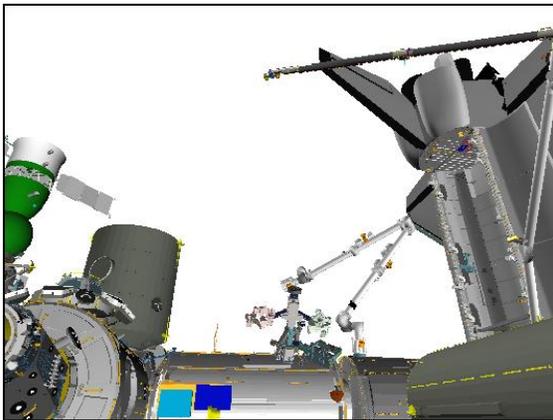


Figure 33.- Intermediate Position (09: P1 Lower Outboard: +100, +30).



Figure 34.- Intermediate Position (03: S1 Lower Outboard: +100, +55).

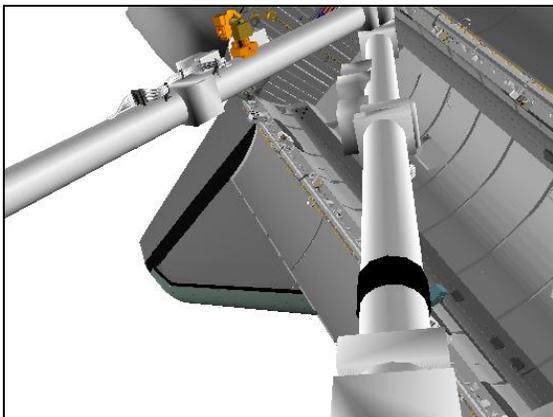


Figure 35.- Intermediate Position (47: SPDM Body2: +5, +15).

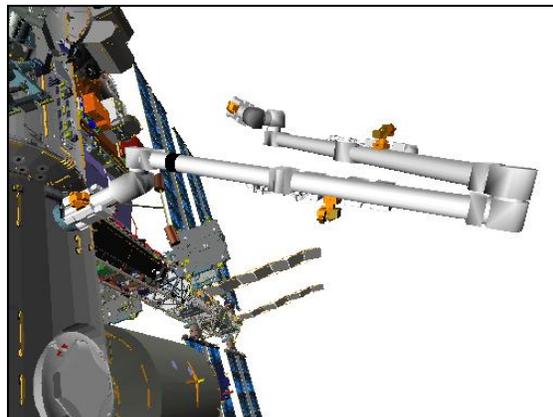


Figure 36.- Intermediate Position (SRMS Elbow: -140, +50).

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR
 (RBT FS/ULF5/FIN 1/SPN) Page 21 of 24 pages

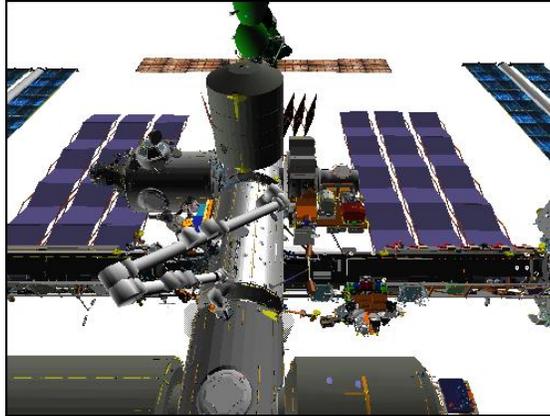


Figure 37.- Intermediate Position
 (Camera C: 0, +45).

NOTE

Expect Singularity Warning when $-15 < EP < +15$ deg, $SY = 90$ deg, and $WY = -90$ deg.

SSRMS Joint OCAS

Input 'Joint Angles' 'Destination' for EVA 2 Setup position.

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+40.0	+30.0	+25.0	-145.0	-180.0	-170.0	-88.8
TGT	-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9
ERR	+49.0	-123.3	+136.2	-221.3	-150.0	-162.0	+95.1

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS: SSRMS

Verify Posn Hold – orange

Verify SSRMS at EVA 2 Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1307	+1136	+731	+21.0	+61.2	+130.3	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

17. SINGLE JOINT MANEUVER TO APFR SETUP POSITION

NOTE

LEE to the Columbus Cargo Platform decreases to 71 cm (28 in), monitor with the Tip Elbow camera.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
24: Tip Elbow (+20, 0)	03: S1 Lower Outboard (+70, +60)	22: Base Elbow (+120, -5)	SRMS Elbow (-150, +20)	Camera C (+25, +20)

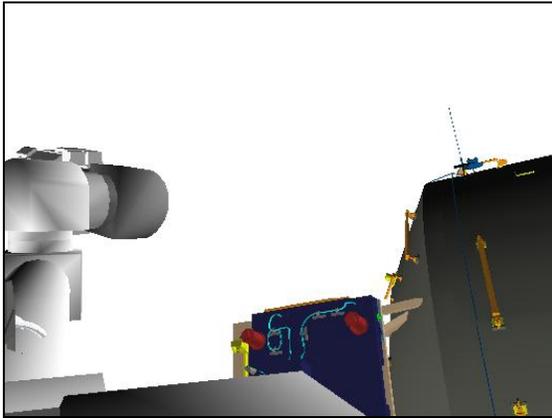


Figure 38.- EVA 2 Setup Position
(24: Tip Elbow: +20, 0).

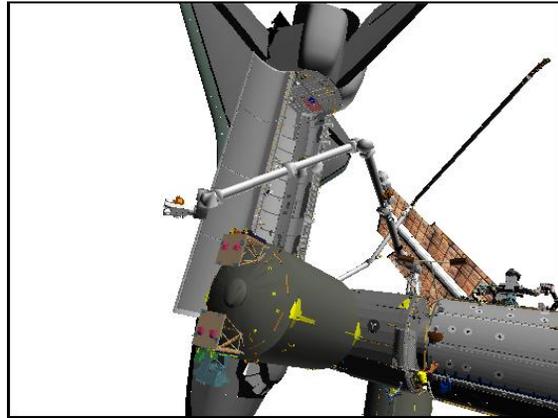


Figure 39.- EVA 2 Setup Position
(03: S1 Lower Outboard: +70, +60).

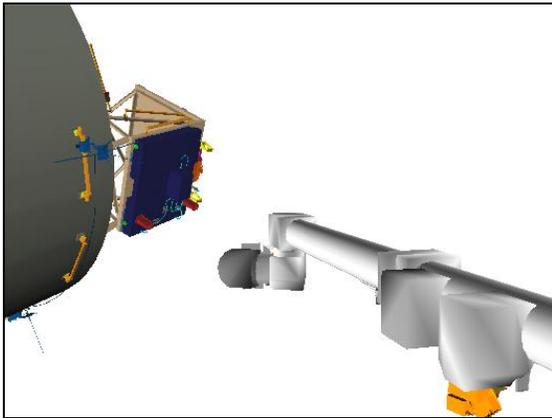


Figure 40.- EVA 2 Setup Position
(22: Base Elbow: +120, -5).

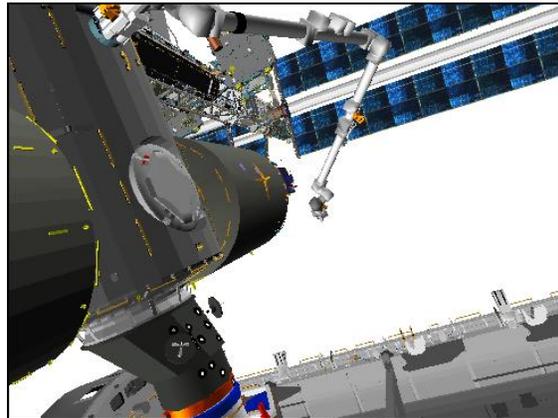


Figure 41.- EVA 2 Setup Position
(SRMS Elbow: -150, +20).

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR
 (RBT FS/ULF5/FIN 1/SPN) Page 23 of 24 pages

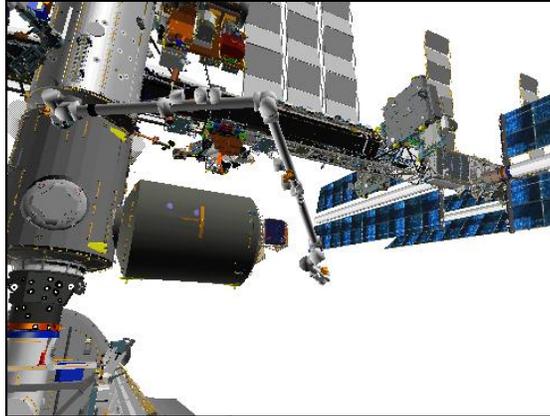


Figure 42.- EVA 2 Setup Position
 (Camea C: +25, +20).

√Vernier

PCS MSS: SSRMS:

Enter Mode – Single (Verify blue)

WARNING
The active joint must be checked on the PCS before initiating motion. Failure to do so may result in movement of the wrong joint.

DCP JOINT SELECT → Wrist Pitch (Verify WP – Selected on PCS)

THC Perform “+” Single Joint maneuver to WP: +47.8 (THC Up).

PCS MSS: SSRMS:

Verify SSRMS at APFR Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	+47.8	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1275	+950	+705	+58.3	-9.9	+97.1	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

NOTE
Expect the following message when safing is commanded: 'R3Z - MSS OCS SSRMS Prime(Redun) ACU SRT Cat-1 Brk Stat Fail' (SCR 17495) This message should return to Norm.

DCP SAFING → SAFE (Verify ON)

1.310 SSRMS PMM UNBERTH AND INSTALL TO NODE 1 NADIR
(RBT FS/ULF5/FIN 1/SPN) Page 24 of 24 pages

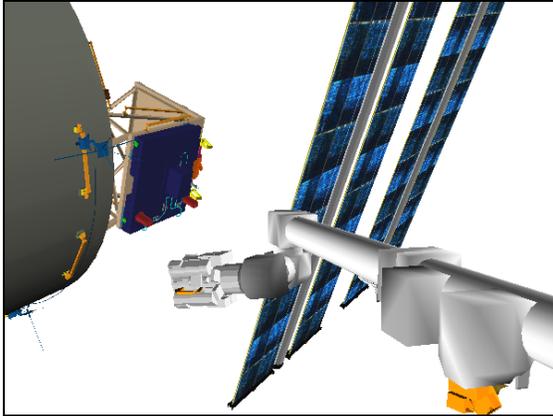


Figure 43.- APFR Setup Position
(22: Base Elbow: +120, -5).



Figure 44.- APFR Setup Position
(Camera C: +25, +20).

1. SETUP

NOTE
Items in grey are for shuttle crew or MCC-H (when noted.)

Verify SRMS is grappled to OBSS and at PMM Install Viewing position.

SY	SP	EP	WP	WY	WR
+35.1	+38.6	-22.7	-0.4	-0.7	-40.1

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+20, +30)	13: LAB Stbd Zenith (-10, +55)	37: MBS Mast (+80, +15)	Camera C (+30, +30)	OBSS ITVC (+80, -80)

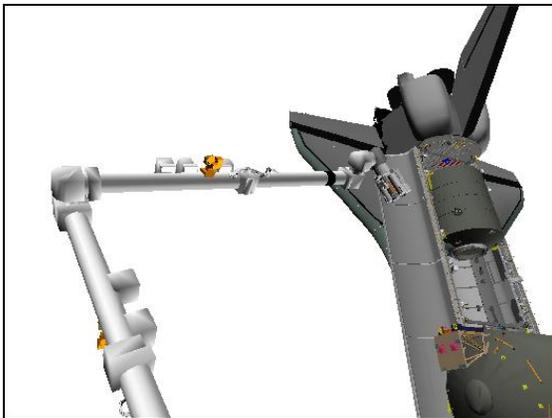


Figure 1.- MT Translate Position
 (03: S1 Lower Outboard: +20, +30).

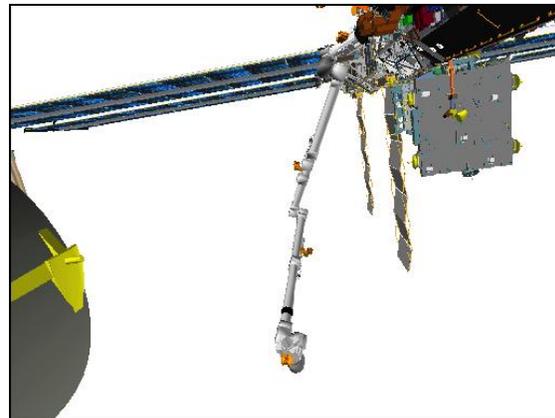


Figure 2.- MT Translate Position
 (13: LAB Stbd Zenith: -10, +55).

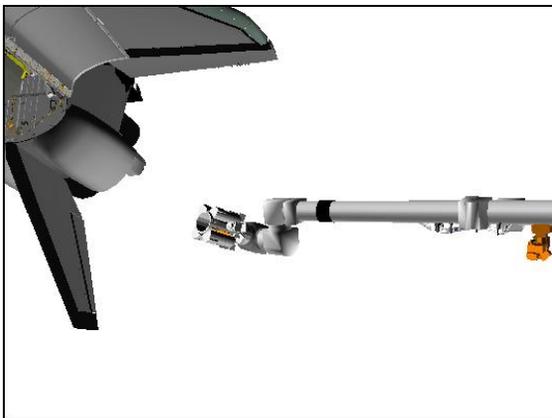


Figure 3.- MT Translate Position
 (37: MBS Mast: +80, +15).

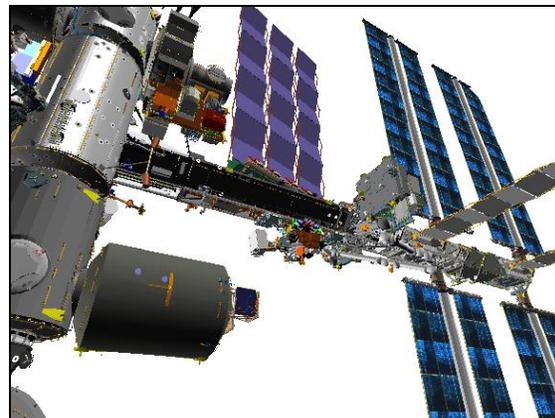


Figure 4.- MT Translate Position
 (Camera C: +30, +30).

1.405 SSRMS EVA 1 SUPPORT

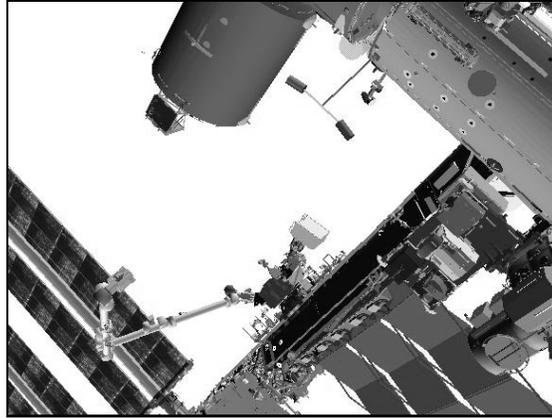


Figure 5.- MT Translate Position
(OBSS ITVC: +80, -80).

PCS

MSS: SSRMS:

Verify Unloaded Parameters – √

Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

Verify Display – ISS>ISSACS

Change Command ► ISS ► ISSACS/Internal (Verify
ISS>ISSACS/Internal)

Verify SSRMS at MT Translate position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9
X	Y	Z	Pitch	Yaw	Roll	
+734	+1350	+971	+87.4	-29.5	-109.1	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

2. JOINT OCAS TO APFR INSTALL SETUP POSITION (5 MINUTES)

MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

DCP

BRAKES SSRMS → OFF (Verify OFF)

RHC

RATE → VERNIER (Verify Vernier on PCS)

NOTE

Expect singularity warning when $+15 > EP > -15$, $SY = -90$,
and $WY = +90$.

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 3 of 27 pages

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

Input 'Joint Angles' 'Destination' for APFR Install Setup position.

SR	SY	SP	EP	WP	WY	WR
+107.1	-5.0	-77.5	-73.4	-70.2	+33.5	+172.0

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9
TGT	+107.1	-5.0	-77.5	-73.4	-70.2	+33.5	+172.0
ERR	-4.3	-138.8	-84.8	+169.1	-30.8	+121.9	-177.9

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify SSRMS at APFR Install Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+107.1	-5.0	-77.5	-73.4	-70.2	+33.5	+172.0
X	Y	Z	Pitch	Yaw	Roll	
+360	+710	+585	+179.3	+18.5	+100.5	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

3. MANUAL MANEUVER TO WIF ADAPTER AND APFR INSTALL

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+60, 0)	13: LAB Stbd Zenith (+40, +30)	37: MBS Mast (+30, -10)	Camera C (+30, +30)	OBSS ITVC (+80, -80)

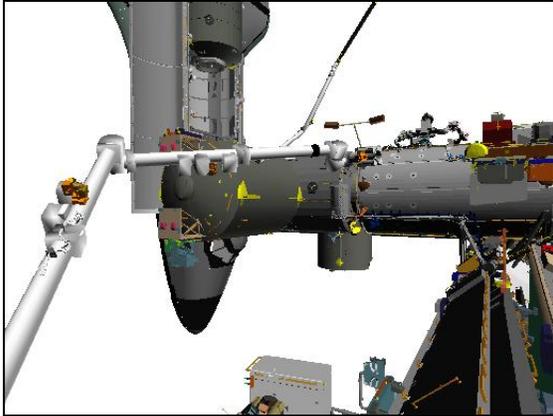


Figure 6.- APFR Install Setup Position
(03: S1 Lower Outboard: +60, 0).

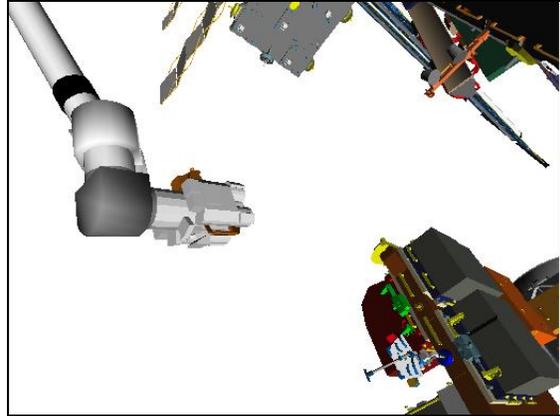


Figure 7.- APFR Install Setup Position
(13: LAB Stbd Zenith: +40, +30).

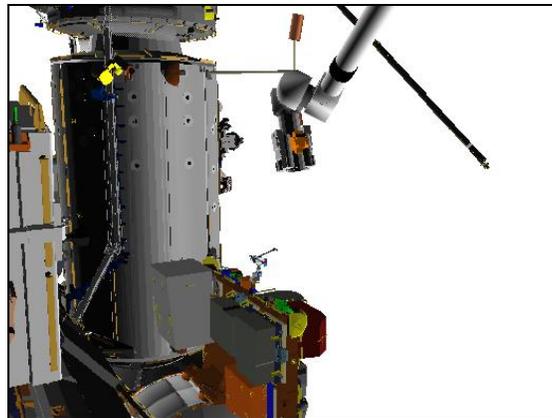


Figure 8.- APFR Install Setup Position
(37: MBS Mast: +30, -10).

PCS

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.7)

On **EVA**, "SSRMS is GO to maneuver to WIF Adapter and APFR Install position."

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 5 of 27 pages

THC/RHC Maneuver to APFR Install position (within 5 cm/1 deg). (THC Out, -X)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+102.4	-5.0	-87.3	-71.4	-59.5	+36.5	+167.6
X	Y	Z	Pitch	Yaw	Roll	
+160	+710	+585	+179.3	+18.5	+100.5	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

THC/RHC GCA as required for WIF Adapter/APFR Install.

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA**, “SSRMS is Ready for APFR Install.”

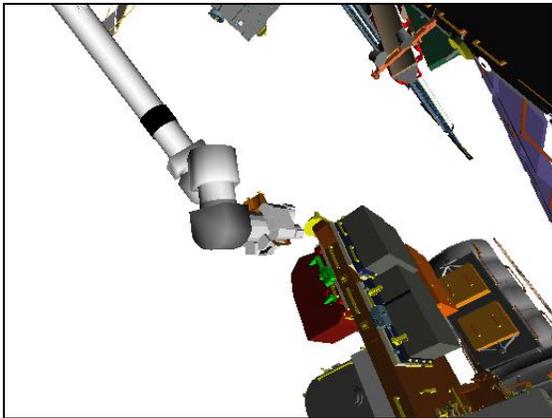


Figure 9.- APFR Install Position
(13: LAB Stbd Zenith: +50, +25).

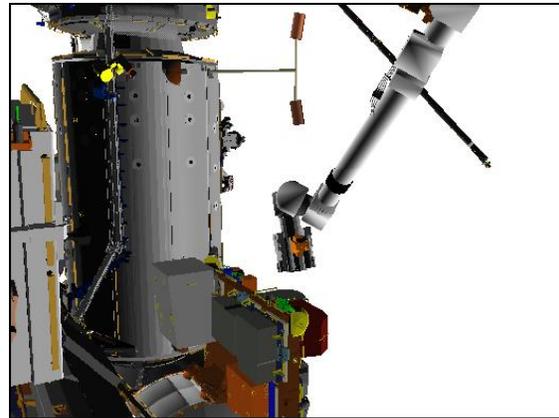


Figure 10.- APFR Install Position
(37: MBS Mast: +30, -10).

4. [MANUAL MANEUVER TO APFR INGRESS POSITION](#)

NOTE

Monitor clearance between APFR/Ingress Aid and ESP2 with MBS Mast Camera, LAB Stbd Zenith Camera, and EV1 Support.

On **EVA**, “SSRMS is GO for maneuver to APFR Ingress position.”

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 6 of 27 pages

THC/RHC Maneuver to APFR Ingress position (within 5 cm/1 deg). (THC Right, +Y)

Locked						
SR	SY	SP	EP	WP	WY	WR
+97.5	-5.0	-77.2	-90.8	-46.6	+39.4	+162.7
X	Y	Z	Pitch	Yaw	Roll	
+160	+879	+585	+179.3	+18.5	+100.5	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

THC/RHC GCA as required for APFR Ingress.

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA**, “SSRMS is Ready for APFR Ingress.”

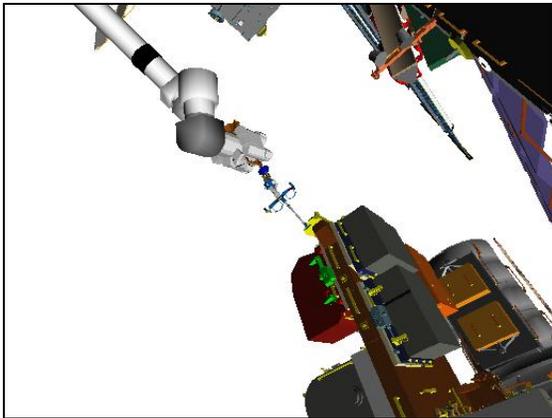


Figure 11.- APFR Ingress Position
(13: LAB Stbd Zenith: +50, +25).

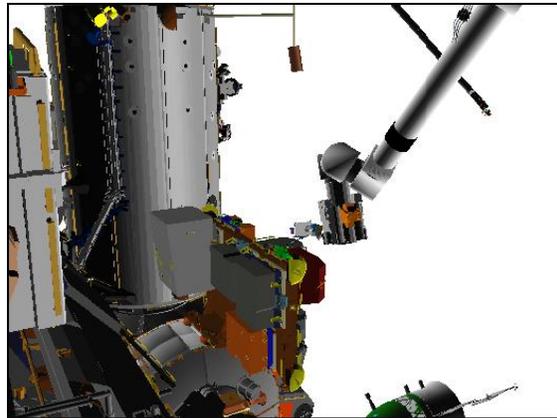


Figure 12.- APFR Ingress Position
(37: MBS Mast: +30, -15).

5. MANUAL MANEUVER TO BACKOFF POSITION

PCS MSS: SSRMS:

Change Unloaded Parameters ► EVA ► Chest 12/FF/F/12 SYH
Verify ‘Unloaded Parameters’ (two) – Chest 12/FF/F/12, SY Held

On **EVA**, “SSRMS is GO for maneuver to Backoff position.”

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 7 of 27 pages

THC/RHC Maneuver to APFR Ingress Backoff position (within 5 cm/1 deg).
(THC In, +X)

		Locked					
SR	SY	SP	EP	WP	WY	WR	
+103.1	-5.0	-66.1	-92.7	-59.7	+36.1	+168.3	
X	Y	Z	Pitch	Yaw	Roll		
+314	+635	+556	+179.3	+18.5	-96.4		
FOR	Unloaded – Chest 12/FF/F/12, SY Held						
Disp	ISS>ISSACS						

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

6. JOINT OCAS TO PM RETRIEVE SETUP (4 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+60, 0)	13: LAB Stbd Zenith (+35, +35)	37: MBS Mast (+30, -10)	Camera C (+30, +30)	OBSS ITVC (+80, -80)

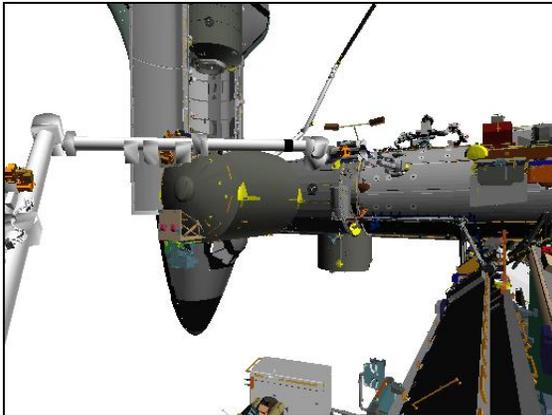


Figure 13.- APFR Ingress Backoff Position
(03: S1 Lower Outboard: +60, 0).

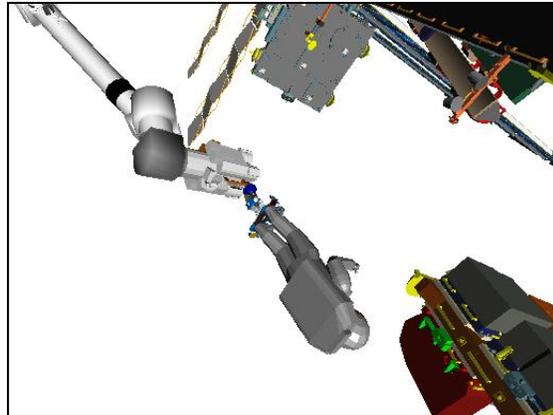


Figure 14.- APFR Ingress Backoff Position
(13: LAB Stbd Zenith: +35, +35).

1.405 SSRMS EVA 1 SUPPORT

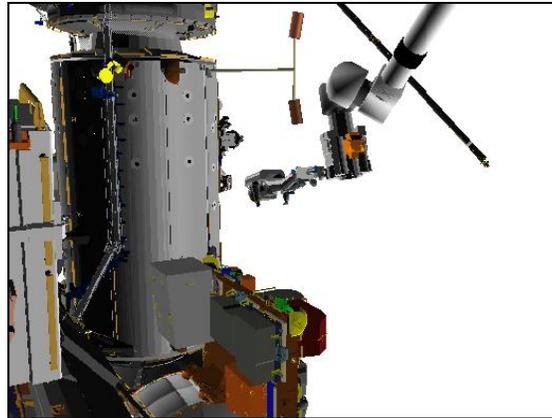


Figure 15.- APFR Ingress Backoff Position
(37: MBS Mast: +30, -10).

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

Input 'Joint Angles' 'Destination' for PM Retrieve Setup position.

SR	SY	SP	EP	WP	WY	WR
+140.1	-5.0	-34.5	-123.0	-42.8	+9.3	+15.8

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+103.1	-5.0	-66.1	-92.7	-59.7	+36.1	+168.3
TGT	+140.1	-5.0	-34.5	-123.0	-42.8	+9.3	+15.8
ERR	-37.0	0.0	-31.6	+30.3	-16.9	+26.8	+152.5

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify SSRMS at PM Retrieve Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+140.1	-5.0	-34.5	-123.0	-42.8	+9.3	+15.8
X	Y	Z	Pitch	Yaw	Roll	
+713	+1362	+17	+178.0	-13.7	+88.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 9 of 27 pages

7. MANUAL MANEUVER TO PM RETRIEVE

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+35, -25)	13: LAB Stbd Zenith (0, +90)	37: MBS Mast (0, +30)	Camera C (+30, +30)	OBSS ITVC (+80, -80)

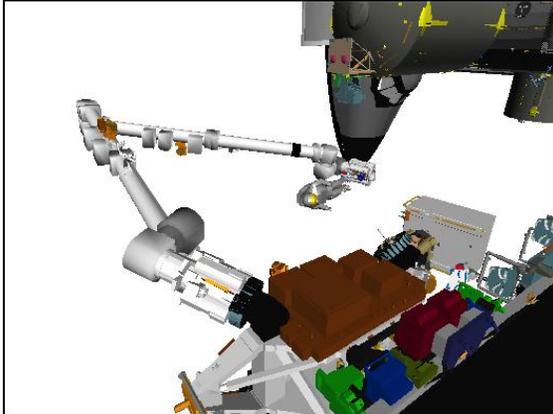


Figure 16.- PM Retrieve Setup
(03: S1 Lower Outboard: +35, -25).

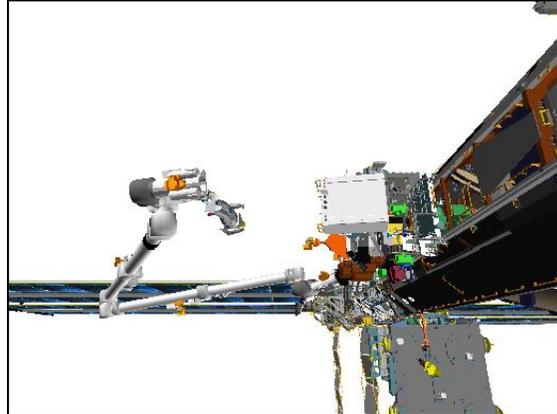


Figure 17.- PM Retrieve Setup
(13: LAB Stbd Zenith: 0, +90).

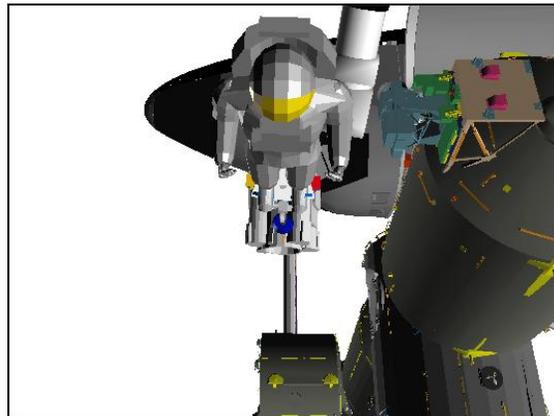


Figure 18.- PM Retrieve Setup
(37: MBS Mast: 0, +30).

PCS

MSS: SSRMS:

Change Command ► SSRMS ► Internal (Verify SSRMS>Internal)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.7)

Enter Mode – Manual (Verify blue)

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 10 of 27 pages

PCS MSS: SSRMS: SSRMS Manual: Joint Lock: Joint Lock

cmd Shoulder Yaw (Verify SY – Locked)

Notify **EVA**, “SSRMS is Maneuvering to PM Retrieve Position.”

THC/RHC Maneuver to PM Retrieve position (within 5 cm/1 deg). (THC In, +X)

Locked						
SR	SY	SP	EP	WP	WY	WR
+137.6	-5.0	-50.2	-125.4	-24.1	+10.2	+13.4
X	Y	Z	Pitch	Yaw	Roll	
+519	+1314	+10	+178.0	-13.7	+88.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

THC/RHC GCA as required.

PCS MSS: SSRMS: SSRMS

Enter Mode – Standby (Verify blue)

8. POA RELEASE OF PM AND MANUAL BACKOFF MANEUVER

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+35, -25)	32: MBS POA (Full Zoom Out)	24: Tip Elbow (-30, 0) 22: Base Elbow (-50, -10)	Camera C (+30, +30)	OBSS ITVC (+80, -80)

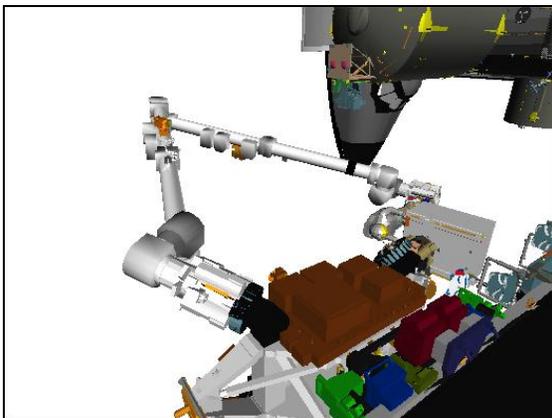


Figure 19.- PM Retrieve Position (03: S1 Lower Outboard: +35, -25).

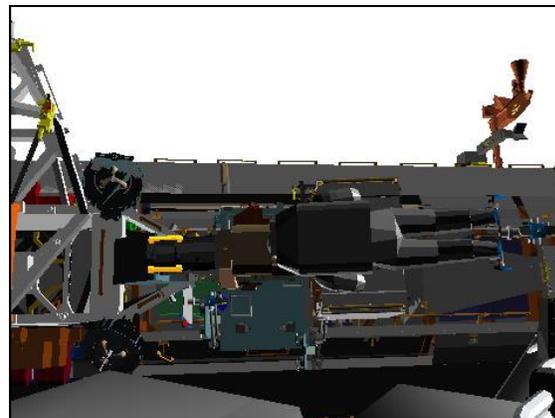


Figure 20.- PM Retrieve Position (24: Tip Elbow: -30, 0).

PCS MSS: SSRMS: SSRMS

Change Command ► MBS ► POA Fly Camera (Verify MBS>POA Fly Camera)

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 11 of 27 pages

MCC-H MCG: MCS Configuration: MCS Inhibits: MCS Inhibits
√ Desat Request – Inh
√ Auto Att Control handover to RS - Inh

On **MCC-H**, “SSRMS is GO for PM Maneuvers.”

On **EVA**, “EVA has PM, POA is GO to release PM AGB.”

MSS: SSRMS: SSRMS

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock: Joint Lock

cmd Shoulder Yaw (Verify SY – Locked)

MSS: SSRMS: MBS: MSS Safing: MSS Safing

cmd ‘MBS’ Remove (Verify Not Safed)

MSS: MBS: POA: POA

cmd Release ► Semi-Manual ► Slow (Verify Speed – Slow)

Verify ‘**Confirm or Terminate**’ prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify POA Mode – Semi-manual Release

RHC TRIGGER → Press (hold until ‘Carriage’ Brakes – On) (90 s max)

PCS Verify ‘Carriage’ Derigidize – blue

RHC TRIGGER → Press (hold until ‘Snare’ Brakes – On) (12 s max)

PCS Verify ‘Snare’ Open – blue

Notify **EVA**, “EVA is GO to remove PM AGB from POA.”

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 12 of 27 pages

On **EVA**, “SSRMS is GO to maneuver to Backoff Position.”

THC/RHC Maneuver to POA Backoff position (within 5 cm/1 deg). (THC Out, -X)

Locked						
SR	SY	SP	EP	WP	WY	WR
+138.0	-5.0	-59.0	-108.2	-32.5	+10.0	+13.8
X	Y	Z	Pitch	Yaw	Roll	
+550	+1137	+10	+178.0	-13.8	+88.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Notify **EVA**, “SSRMS is at Backoff Position.”

PCS MSS: MBS: POA:

RHC TRIGGER → Press (hold until 'Carriage' Brakes – On) (90 s max)

PCS Verify 'Carriage' Extend – blue

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

9. JOINT OCAS TO ESP2 SETUP POSITION (3 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+50, -20)	13: LAB Stbd Zenith (0, +90)	37: MBS Mast (0, 0)	Camera C (+30, +30)	OBSS ITVC (+80, -80)

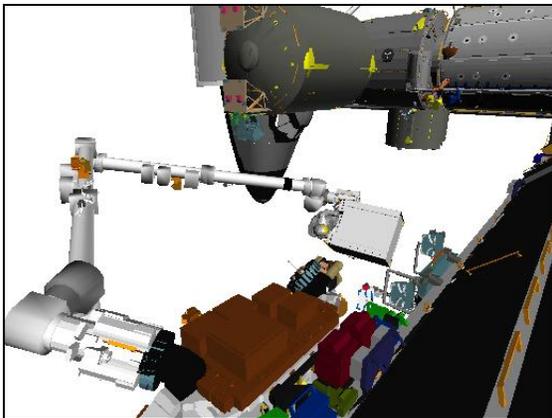


Figure 21.- POA Backoff Position (03: S1 Lower Outboard: +50, -20).

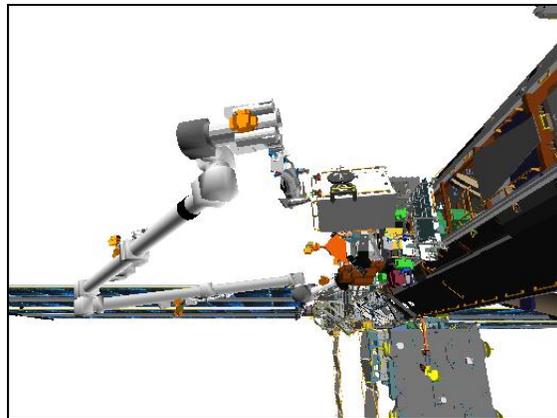


Figure 22.- POA Backoff Position (13: LAB Stbd Zenith: 0, +90).



Figure 23.- POA Backoff Position
 (37: MBS Mast: 0, 0).

PCS MSS: SSRMS: Rate:
 Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)
 MSS: SSRMS:
 Enter Mode – Joint OCAS (Verify blue)

Input 'Joint Angles' 'Destination' for ESP2 Setup position.

SR	SY	SP	EP	WP	WY	WR
+103.1	-5.0	-69.4	-76.9	-53.1	+34.9	+113.1

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+138.0	-5.0	-59.0	-108.2	-32.5	+10.0	+13.8
TGT	+103.1	-5.0	-69.4	-76.9	-53.1	+34.9	+113.1
ERR	+34.9	0.0	+10.4	-31.2	+20.6	-24.9	-99.3

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 14 of 27 pages

Verify SSRMS at ESP2 Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+103.1	-5.0	-69.4	-76.9	-53.1	+34.9	+113.1
X	Y	Z	Pitch	Yaw	Roll	
+450	+600	+519	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

10. MANUAL MANEUVER TO AGB REMOVAL AND PM INSTALL

NOTE

This maneuver has the following clearance concerns:

1. EV1 to LAB Stbd Zenith Camera decreases to approximately 90cm (36in.) Monitor with S1 LOOB and MBS Mast Cameras.
2. SSRMS to LAB UHF Antenna decreases to 129cm (51in.) Monitor with Camera C and OBSS ITVC.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+80, +5)	13: LAB Stbd Zenith (+50, +25)	37: MBS Mast (+25, -5)	Camera C (+30, +30)	OBSS ITVC (+80, -80)

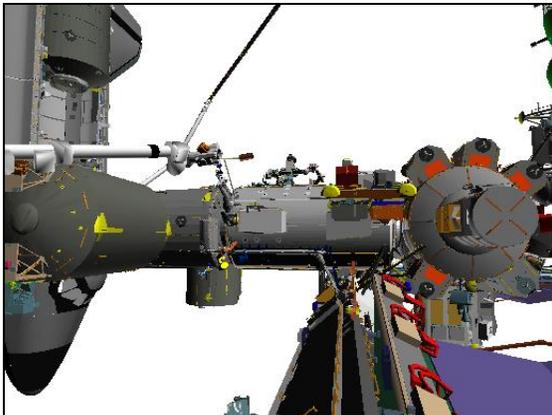


Figure 24.- ESP2 Setup Position (03: S1 Lower Outboard: +80, +5).

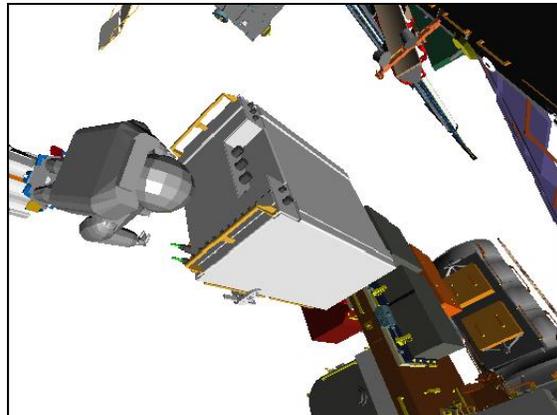


Figure 25.- ESP2 Setup Position (13: LAB Stbd Zenith: +50, +25).

1.405 SSRMS EVA 1 SUPPORT

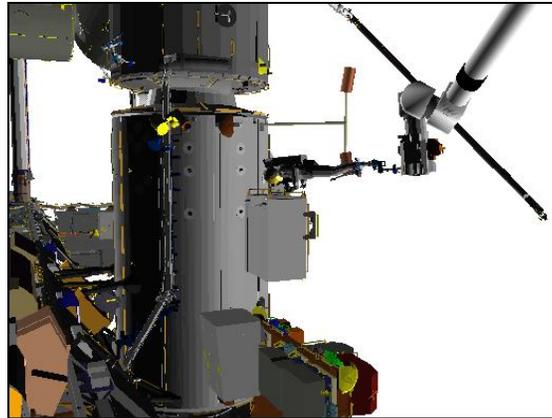


Figure 26.- ESP2 Setup Position
(37: MBS Mast: +25, -5).

PCS

MSS: SSRMS:

Change Command ► ISS ► ISSACS/Internal (Verify
ISS>ISSACS/Internal)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.7)

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

Notify **EVA**, “SSRMS is Maneuvering to Pre-Install position.”

THC/RHC

Maneuver to Pre-Install position (within 5 cm/1 deg). (THC Left, -Y)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+107.9	-5.0	-90.6	-40.1	-72.1	+33.1	+118.5
X	Y	Z	Pitch	Yaw	Roll	
+450	+358	+519	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 16 of 27 pages

THC/RHC Maneuver per GCA to AGB Removal position (within 5 cm/1 deg).
(THC Out, -X)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+103.8	-5.0	-99.0	-39.3	-61.7	+34.6	+113.9
X	Y	Z	Pitch	Yaw	Roll	
+240	+358	+519	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA**, “SSRMS is Ready for AGB Removal.”

On **EVA**, “SSRMS is GO to maneuver to Full Install position.”

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC Maneuver per GCA to Full Install position (within 5 cm/1 deg).
(THC Out, -X)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+101.7	-5.0	-104.4	-36.0	-58.0	+35.3	+111.5
X	Y	Z	Pitch	Yaw	Roll	
+138	+358	+519	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA**, “SSRMS is Ready for PM Bolting.”

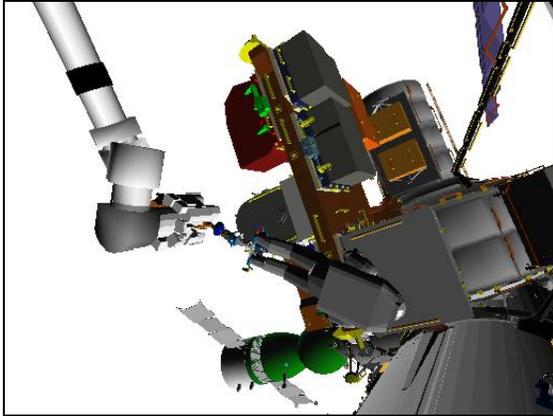


Figure 27.- PM Installed
 (13: LAB Stbd Zenith: +60, 0).

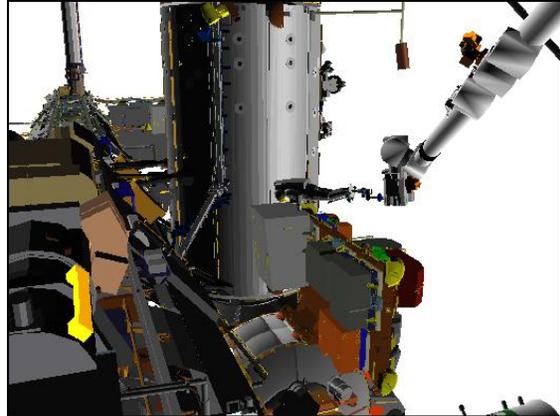


Figure 28.- PM Installed
 (37: MBS Mast: +20, -15).

11. MANUAL MANEUVERS FOR PM BOLTS AND VENT TOOL

NOTE

Monitor clearance from EV1 to LAB with Camera C.
 Monitor clearance from SSRMS to ESP2 with MBS Mast Camera.

On **EVA**, “Ready for SSRMS GCA to Vent Tool Install.”

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC Maneuver per GCA for Bolt Driving and Vent Tool Setup.

12. MANUAL MANEUVER TO AGB INSTALL POSITION

NOTE

To maintain optimal clearance between EV1 and ESP2: perform Station Nadir motion first, then Starboard motion, then Aft motion.
 Monitor clearance between EV1 and ESP2 with S1 LOOB Camera and MBS Mast Cameras.

On **EVA**, “SSRMS is GO for maneuver to AGB Install Position.”

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 18 of 27 pages

THC/RHC Maneuver per GCA to AGB Install position (within 5 cm/1 deg).

	Locked					
SR	SY	SP	EP	WP	WY	WR
+95.2	-5.0	-100.1	-41.3	-51.9	+37.1	+103.8
X	Y	Z	Pitch	Yaw	Roll	
+103	+444	+636	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA**, “SSRMS is Ready for AGB Install.”

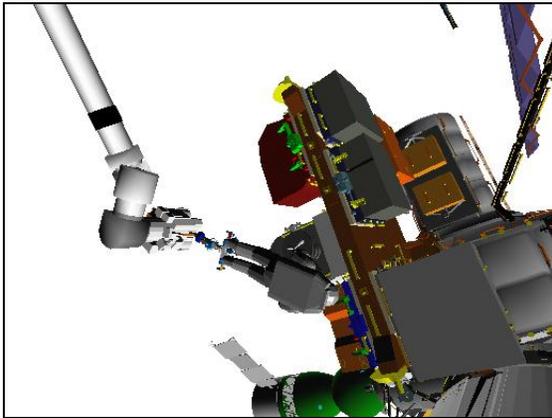


Figure 29.- AGB Install Position
(13: LAB Stbd Zenith: +55, +5).

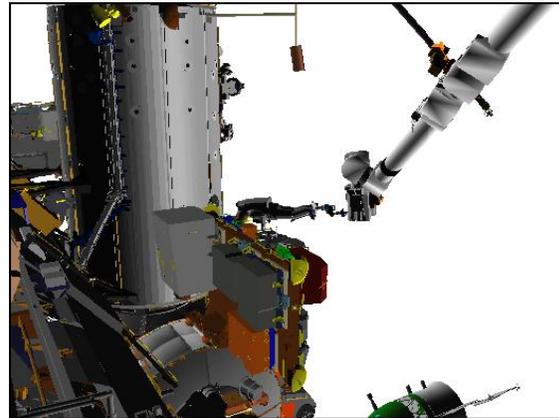


Figure 30.- AGB Install Position
(37: MBS Mast: +30, -15).

13. MANUAL MANEUVER TO AGB BACKOFF POSITION

On **EVA**, “SSRMS is GO to maneuver to Backoff Position.”

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 19 of 27 pages

THC/RHC Maneuver to AGB Backoff position (within 5 cm/1 deg). (THC In, +X)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+97.4	-5.0	-94.8	-44.8	-55.4	+36.6	+106.4
X	Y	Z	Pitch	Yaw	Roll	
+200	+444	+636	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

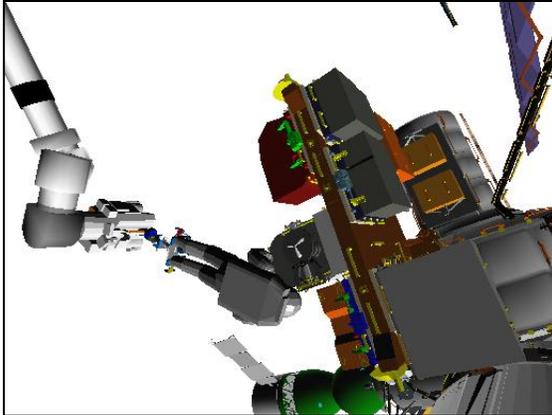


Figure 31.- AGB Backoff Position
(13: LAB Stbd Zenith: +55, +5).

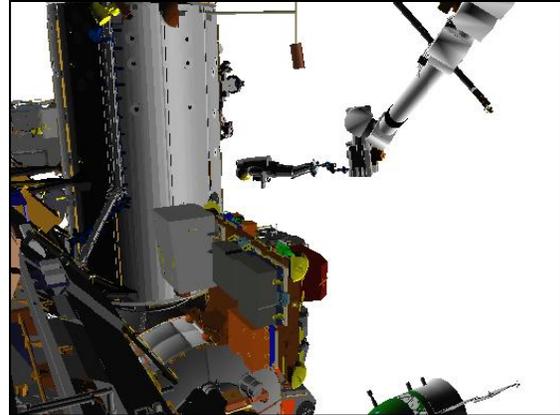


Figure 32.- AGB Backoff Position
(37: MBS Mast: +30, -15).

14. MANUAL MANEUVER TO CAP INSTALL POSITION

NOTE

To maintain optimal clearance between EV1 and ESP2: perform Station Zenith motion first, then Port motion, then Aft motion.

Monitor clearance between EV1 and ESP2 with S1 LOOB Camera and MBS Mast Cameras.

Notify **EVA**, “SSRMS is Maneuvering to Cap Install position.”

THC/RHC Maneuver to Cap Install position (within 5 cm/1 deg).

	Locked					
SR	SY	SP	EP	WP	WY	WR
+104.3	-5.0	-102.1	-42.7	-55.5	+34.5	+114.4
X	Y	Z	Pitch	Yaw	Roll	
+150	+360	+450	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

THC/RHC GCA as required.

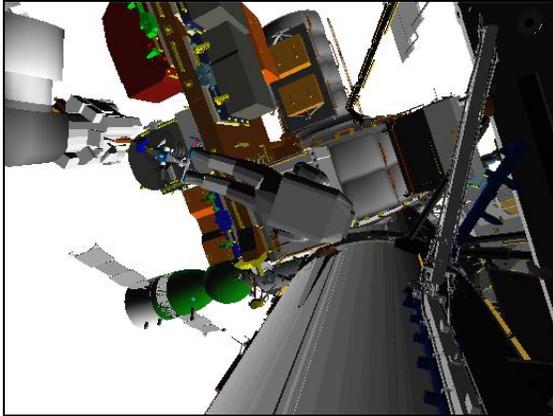


Figure 33.- Cap Install Position
 (13: LAB Stbd Zenith: +75, -10).

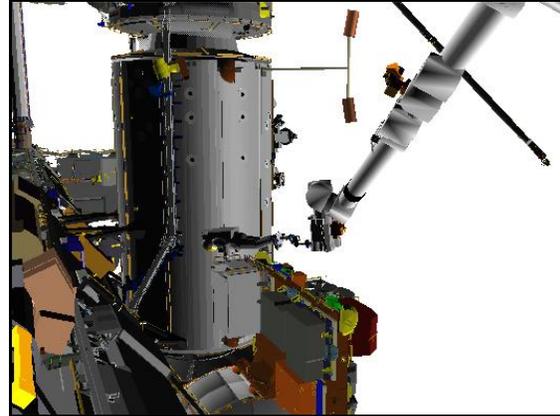


Figure 34.- Cap Install Position
 (37: MBS Mast: +25, -10).

15. MANUAL MANEUVER TO CAP INSTALL BACKOFF POSITION

On **EVA**, “SSRMS is GO to maneuver to Backoff position.”

THC/RHC Maneuver to Cap Install Backoff position (within 5 cm/1 deg).
 (THC In, +X)

		Locked					
SR	SY	SP	EP	WP	WY	WR	
+106.4	-5.0	-96.9	-45.5	-59.4	+33.7	+116.7	
X	Y	Z	Pitch	Yaw	Roll		
+250	+360	+450	-174.5	+4.1	-141.8		
FOR	Unloaded – Chest 12/FF/F/12, SY Held						
Disp	ISS>ISSACS						

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

MSS: SSRMS: Rate:

Set ‘Scale’ ‘Vernier’ Rate Scale: 1.0 (Verify 1.0)

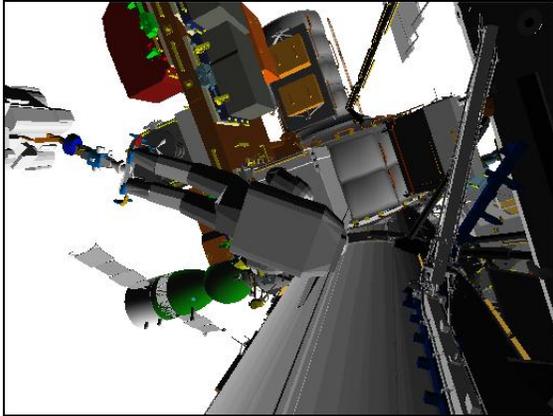


Figure 35.- Cap Install Backoff Position
 (13: LAB Stbd Zenith: +75, -10).

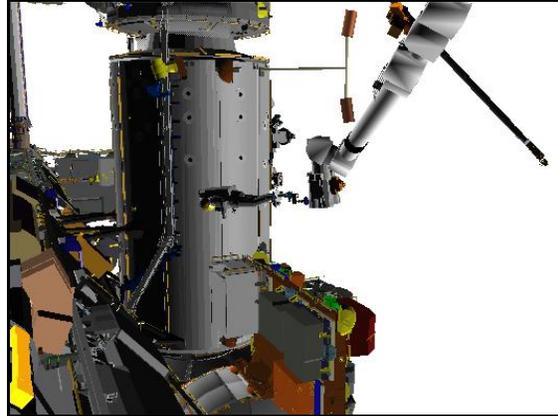


Figure 36.- Cap Install Backoff Position
 (37: MBS Mast: +25, -10).

16. FOR OCAS TO APFR EGRESS SETUP POSITION (2 MINUTES)

MSS: SSRMS:

Enter Mode – FOR OCAS (Verify blue)

MSS: SSRMS: SSRMS FOR OCAS: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

Input 'FOR' 'Destination' for APFR Egress Setup position.

X	Y	Z	Pitch	Yaw	Roll
+214	+635	+556	+179.3	+18.5	-96.5

cmd Load (Verify Sequence Status – Confirm or Cancel)

NOTE

Since the FOR Pitch is moving through ± 180 the error will read -353.8.
 The actual error is only +6.2 deg.

MON

Verify FOR and errors are correct on FOR Position overlay.

	X	Y	Z	Pitch	Yaw	Roll
FOR	+250	+360	+450	-174.5	+4.1	-141.8
TGT	+214	+635	+556	+179.3	+18.5	-96.5
ERR	+36	-275	-106	-353.8	-14.4	-45.3

PCS

cmd Confirm (Verify Sequence Status – Auto Seq Sw-Hot)

DCP

AUTO SEQ → PROC

1.405 SSRMS EVA 1 SUPPORT
 (RBT FS/ULF5/FIN/SPN) Page 22 of 27 pages

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify SSRMS at APFR Egress Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+100.4	-5.0	-71.5	-92.4	-52.9	+37.7	+165.7
X	Y	Z	Pitch	Yaw	Roll	
+214	+635	+556	+179.3	+18.5	-96.5	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

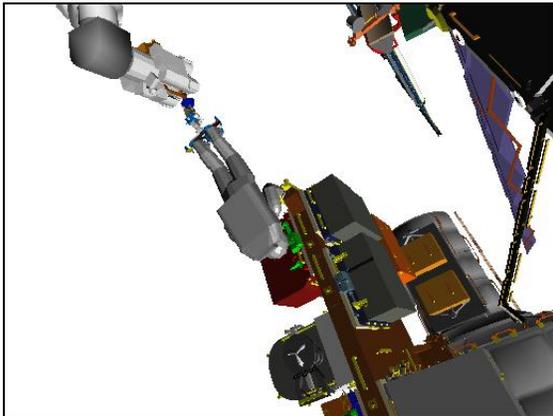


Figure 37.- APFR Egress Setup Position
 (13: LAB Stbd Zenith: +55, +20).

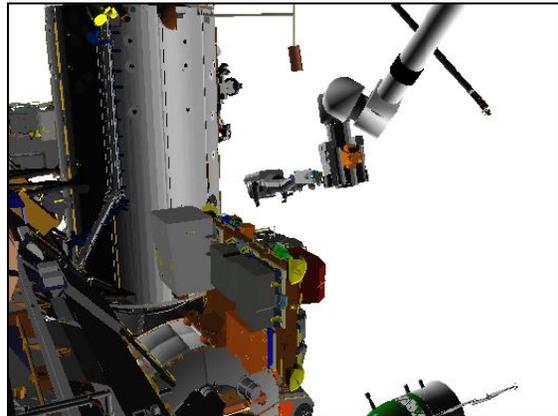


Figure 38.- APFR Egress Setup Position
 (37: MBS Mast: +30, -15).

17. MANUAL MANEUVER TO APFR EGRESS POSITION

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.7)

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC Maneuver to APFR Egress position (within 5 cm/1 deg). (THC Out, -X)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+97.5	-5.0	-77.2	-90.8	-46.6	+39.4	+162.7
X	Y	Z	Pitch	Yaw	Roll	
+114	+635	+556	+179.3	+18.5	-96.5	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 23 of 27 pages

THC/RHC GCA as required for APFR Egress.

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA**, “SSRMS is Ready for APFR Egress.”

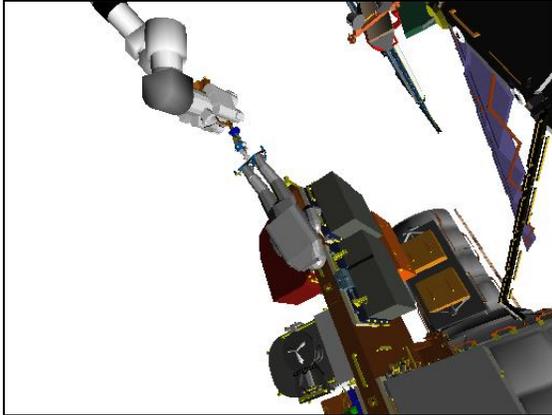


Figure 39.- APFR Egress
(13: LAB Stbd Zenith: +55, +20).

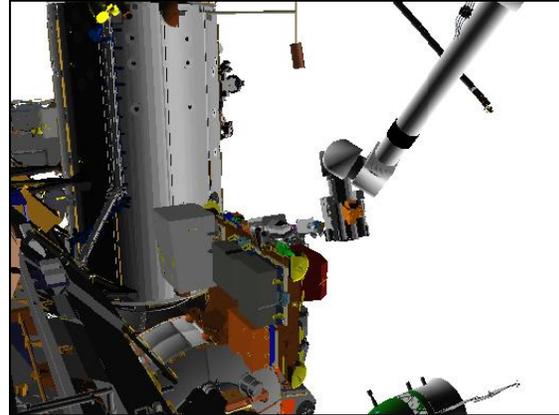


Figure 40.- APFR Egress
(37: MBS Mast: +30, -15).

18. MANUAL MANEUVER TO APFR REMOVAL POSITION

NOTE

Monitor Clearance between APFR and ESP2 with LAB Stbd Zenith Camera, MBS Mast Camera, and EV1 Support.

PCS MSS: SSRMS:

Change Unloaded Parameters ► Unloaded ► LEE Tip SYH
Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

On **EVA**, “SSRMS is GO to maneuver to APFR Removal position.”

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 24 of 27 pages

THC/RHC Maneuver to APFR Removal position (within 5 cm/1 deg). (THC Left, -Y)

		Locked					
SR	SY	SP	EP	WP	WY	WR	
+102.4	-5.0	-87.3	-71.4	-59.5	+36.5	+167.6	
X	Y	Z	Pitch	Yaw	Roll		
+160	+710	+585	+179.3	+18.5	+100.5		
FOR	Unloaded – LEE Tip, SY Held						
Disp	ISS>ISSACS						

THC/RHC GCA as required for APFR and WIF Adapter Removal.

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA**, “SSRMS is Ready for APFR Removal.”

19. MANUAL MANEUVER TO BACKOFF POSITION

NOTE

Due to EVA inhibits for CP3 Wedge Install, S1 LOOB Camera is unavailable for the rest of this procedure.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
22: Base Elbow (-125, -5)	13: LAB Stbd Zenith (+55, +20)	37: MBS Mast (+30, -15)	Camera C (+30, +30)	OBSS ITVC (+80, -80)

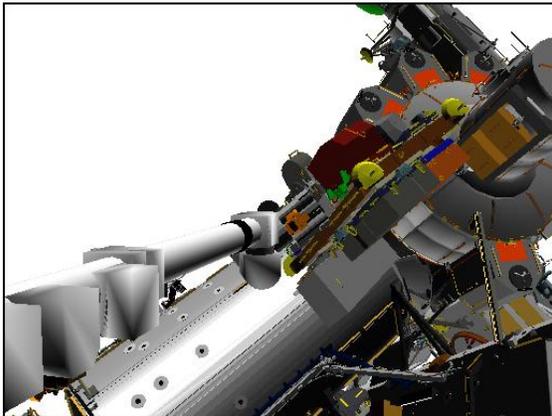


Figure 41.- APFR Removal Position
(22: Base Elbow: -125, -5).

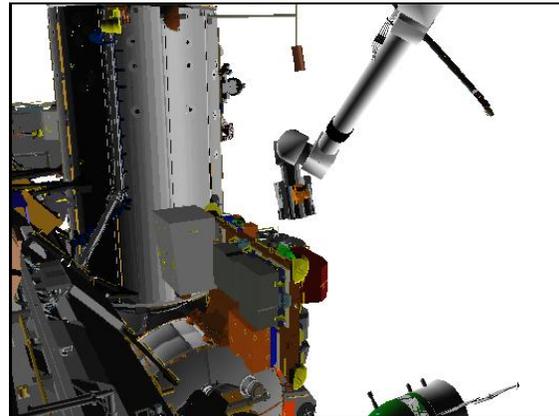


Figure 42.- APFR Removal Position
(37: MBS Mast: +30, -15).

On **EVA**, “SSRMS is GO to maneuver to Backoff position.”

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 25 of 27 pages

PCS MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC Maneuver to APFR Removal Backoff position (within 5 cm/1 deg).
(THC Push, +X)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+107.1	-5.0	-77.5	-73.4	-70.2	+33.5	+172.0
X	Y	Z	Pitch	Yaw	Roll	
+360	+710	+585	+179.3	+18.5	+100.5	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

20. JOINT OCAS MANEUVER TO TRANSLATE CONFIG (5 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
24: Tip Elbow (-125, -5)	13: LAB Stbd Zenith (+15, +35)	37: MBS Mast (+30, 0)	Camera C (+30, +30)	OBSS ITVC (+80, -80)

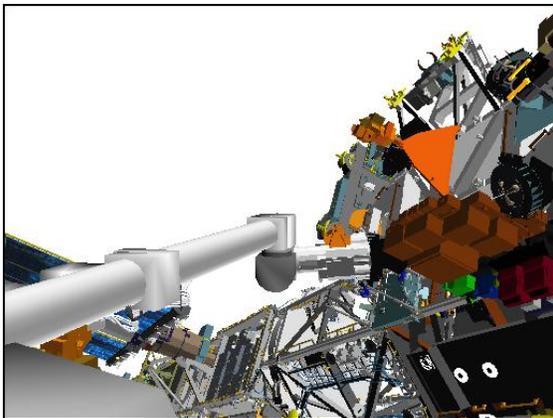


Figure 43.- APFR Removal Backoff
(24: Tip Elbow: -125, -5).

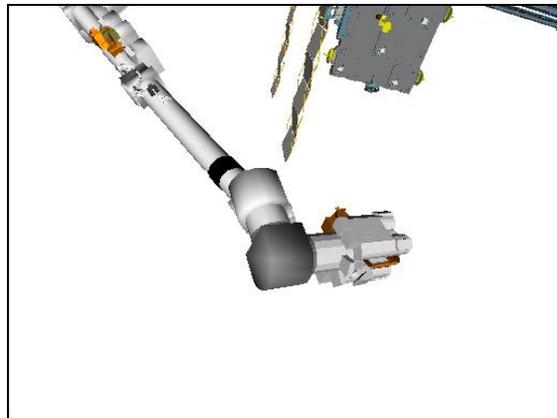


Figure 44.- APFR Removal Backoff
(13: LAB Stbd Zenith: +15, +35).

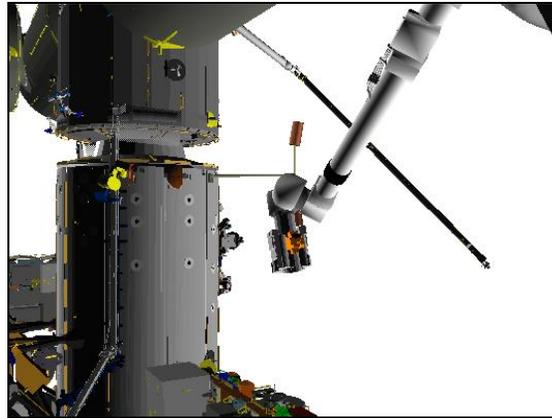


Figure 45.- APFR Removal Backoff
 (37: MBS Mast: +30, 0).

NOTE

Expect singularity warning when $-15 < EP < +15$, $SY = -90$, and $WY = +90$.

PCS

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

SSRMS Joint OCAS

Input 'Joint Angles' 'Destination' for MT Translate position.

SR	SY	SP	EP	WP	WY	WR
+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+107.1	-5.0	-77.5	-73.4	-70.2	+33.5	+172.0
TGT	+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9
ERR	+4.3	+138.8	+84.8	-169.1	+30.8	-121.9	+177.9

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

1.405 SSRMS EVA 1 SUPPORT

(RBT FS/ULF5/FIN/SPN) Page 27 of 27 pages

Verify SSRMS at MT Translate position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9
X	Y	Z	Pitch	Yaw	Roll	
+734	+1350	+971	+87.4	-29.5	-109.1	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

NOTE

Expect the following message when safing is commanded:

'R3Z - MSS OCS SSRMS Prime(Redun) ACU SRT Cat-1 Brk Stat Fail' (SCR 17495)

This message should return to Norm.

DCP

SAFING → SAFE (Verify ON)

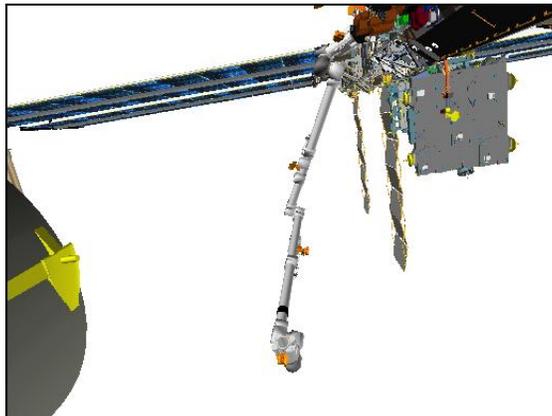


Figure 46.- MT Translate Position
(13: LAB Stbd Zenith: -10, +55).

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1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 1 of 42 pages

1. SETUP

NOTE

Items in Grey are for Shuttle crew or MCC-H (when noted.)

Camera C will be unavailable during PM Venting.

Verify SRMS at Sensor Clear position or EVA 2 Viewing Position.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+70, +60)	24: Tip Elbow (+20, 0)	22: Base Elbow (+120, -5)	Camera C (+25, +20)	SRMS Elbow (-150, +20)

PCS

MSS: SSRMS: SSRMS

Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

Verify Display – ISS>ISSACS

Change Command ► ISS ► ISSACS (Verify ISS>ISSACS)

Verify SSRMS at APFR Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	+47.8	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1275	+950	+705	+58.3	-9.9	+97.1	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

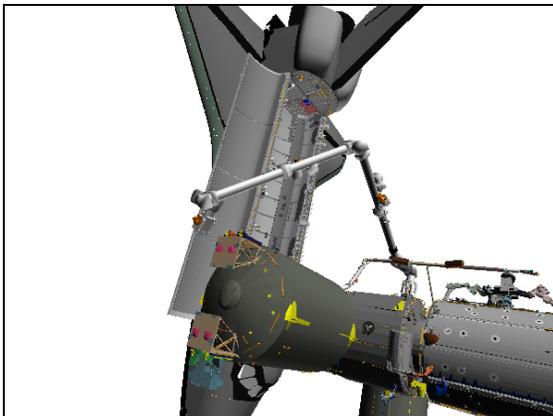


Figure 1.- APFR Setup Position
(03: S1 Lower Outboard: +70, +60).

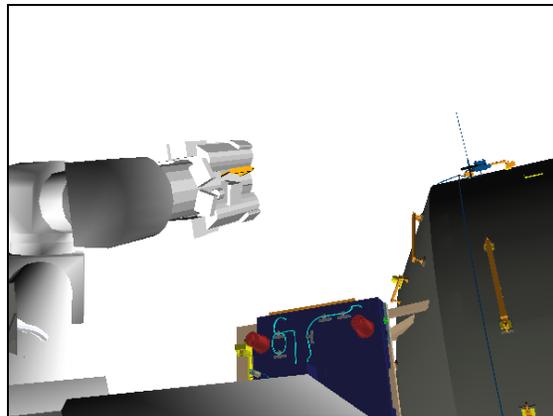


Figure 2.- APFR Setup Position
(24: Tip Elbow: +20, 0).

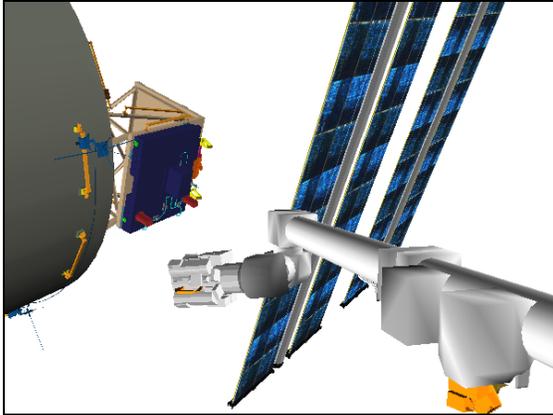


Figure 3.- APFR Setup Position
(22: Base Elbow: +120, -5).

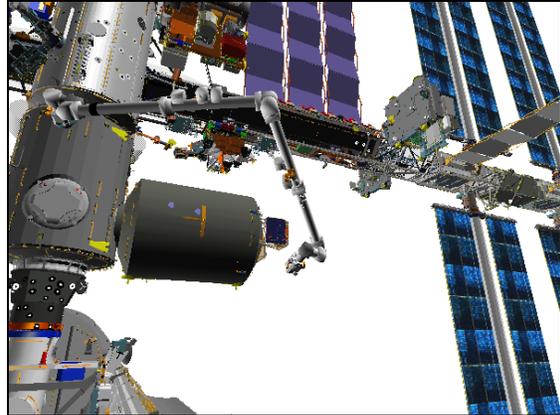


Figure 4.- APFR Setup Position
(Camera C: +25, +20).

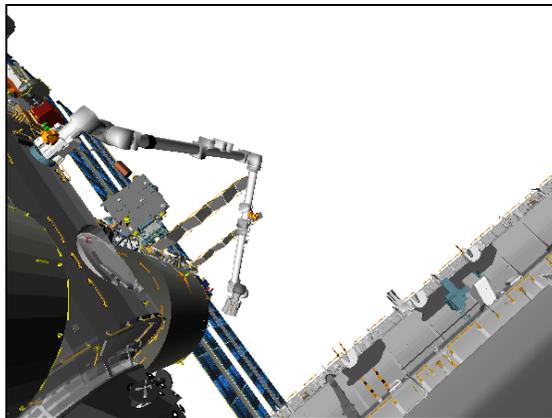


Figure 5.- APFR Setup Position
(SRMS Elbow: -150, +20).

2. WIF ADAPTER INSTALL MANUAL MANEUVER

MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

DCP BRAKES SSRMS → OFF (Verify OFF)

√Vernier

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.7)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 3 of 42 pages

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

Notify **EVA**: “Ready for GCA to WIF Adapter install position.”

THC/RHC GCA, as required, to WIF Adapter Install position.

PCS MSS: SSRMS:

Verify Posn Hold – orange

Notify **EVA**: “Ready for WIF Adapter Install.”

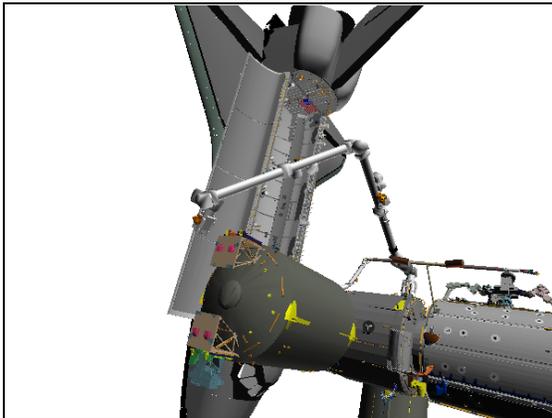


Figure 6.- WIF Adapter Install Position
(03: S1 Lower Outboard: +70, +60).

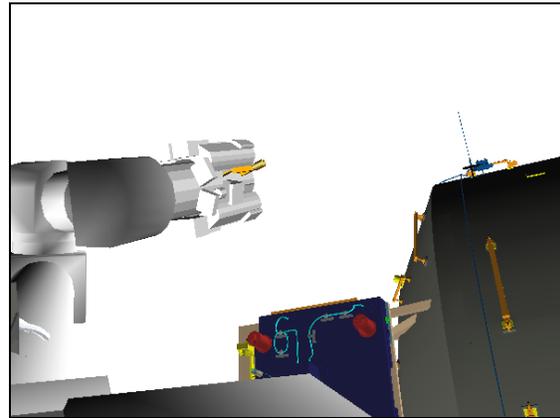


Figure 7.- WIF Adapter Install Position
(24: Tip Elbow: +20, 0).

3. APFR INSTALL MANEUVER

NOTE

Installed APFR to Columbus 64 cm (25 in), monitor with Tip Elbow camera.

On **EVA**: “WIF Adapter installed, ready for GCA to APFR install position.”

THC/RHC GCA, as required, to APFR Install position.

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA**: “Ready for APFR Install.”

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

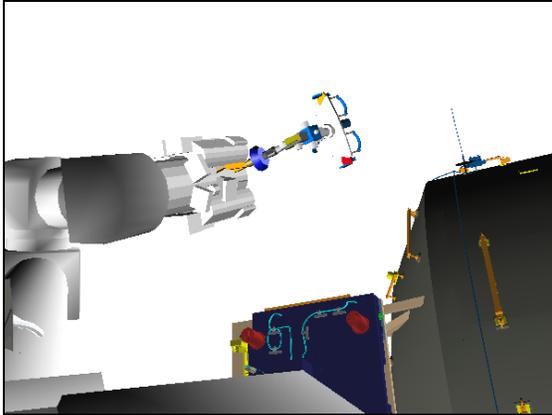


Figure 8.- APFR Install Position
(24: Tip Elbow: +20, 0).

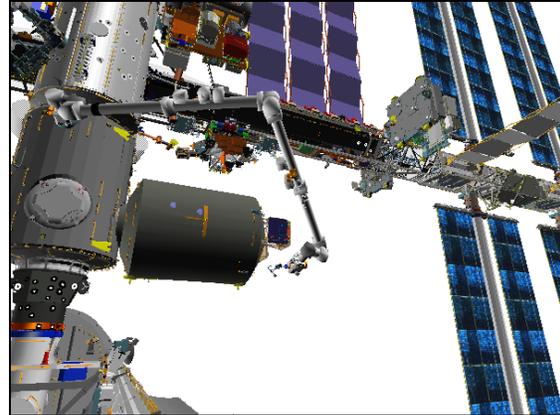


Figure 9.- APFR Install Position
(Camera C: +25, +20).

4. APFR BACKOFF MANUAL MANEUVER

On **EVA**: "Tethered to SSRMS, GO for maneuver to APFR backoff."

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC Maneuver SSRMS to APFR Backoff Position. (within 5 cm/1 deg). (THC Right/Down +Y/+Z)

	Locked					
SR	SY	SP	EP	WP	WY	WR
-14.8	+153.3	-122.3	+67.1	+64.7	-9.0	-189.0
X	Y	Z	Pitch	Yaw	Roll	
+1275	+1000	+980	+58.3	-9.9	+97.1	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

* If SSRMS is not within 5cm/1 degree of the expected position at the
* APFR Backoff position:
*

*PCS MSS: SSRMS:

* Enter Mode – Joint OCAS (Verify blue)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 6 of 42 pages

5. APFR INGRESS SETUP FOR OCAS (2 MINUTES)

NOTE

1. APFR Ingress Aid to LWAPA decreases to 66 cm (26 in), monitor with Base Elbow or S1 Lower Outboard Camera.
2. APFR to LWAPA decreases to 140 cm (55 in), monitor with S1 Lower Outboard or SRMS Elbow

Verify EVA is clear of nadir face of LWAPA before initiating motion.

Notify **EVA**: "Maneuvering to APFR Ingress Setup position."

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

PCS MSS: SSRMS:

Enter Mode – FOR OCAS (Verify blue)

MSS: SSRMS: SSRMS FOR OCAS: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

pick File ► EVA ► APFR Ingress Setup

Verify 'FOR' 'Destination' for APFR Ingress Setup position.

X	Y	Z	Pitch	Yaw	Roll
+1085	+900	+980	+92.6	+68.2	+98.3

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify FOR and errors are correct on FOR Position overlay.

	X	Y	Z	Pitch	Yaw	Roll
FOR	+1275	+1000	+980	+58.3	-9.9	+97.1
TGT	+1085	+900	+980	+92.6	+68.2	+98.3
ERR	+190	+100	0	-34.3	-78.1	-1.2

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq Sw-Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Verify SSRMS at APFR Ingress Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-11.0	+153.3	-144.5	+105.8	-26.8	+23.2	-150.4
X	Y	Z	Pitch	Yaw	Roll	
+1085	+900	+980	+92.6	+68.2	+98.3	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

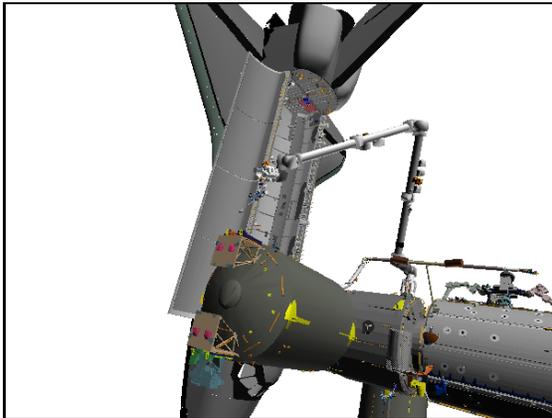


Figure 12.- APFR Ingress Setup Position (03: S1 Lower Outboard: +70, +60).

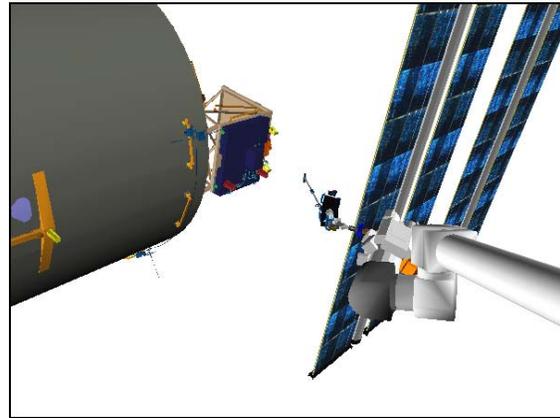


Figure 13.- APFR Ingress Setup Position (22: Base Elbow: +80, -5).

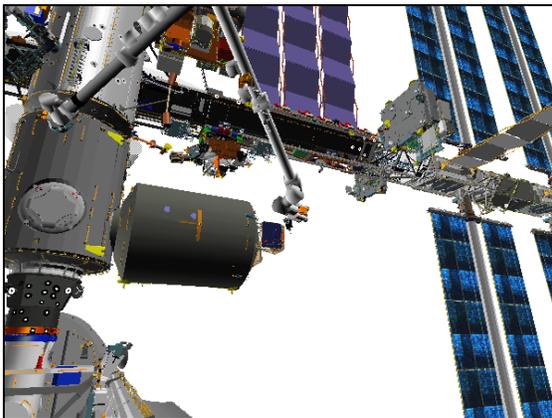


Figure 14.- APFR Ingress Setup (Camera C: +25, +20).

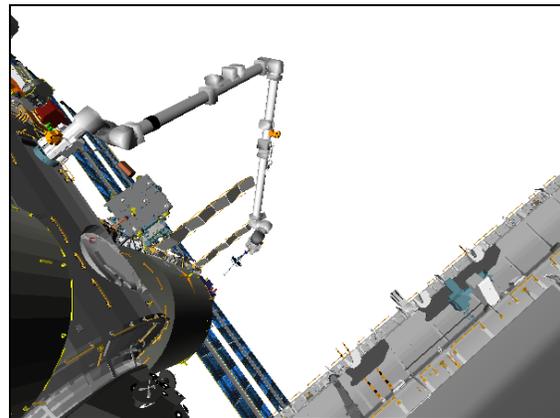


Figure 15.- APFR Ingress Setup (SRMS Elbow: -150, +20).

6. APFR INGRESS MANUAL MANEUVER

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+70, +60)	24: Tip Elbow (+10, 0)	22: Base Elbow (+80, -5)	Camera C (+25, +20)	SRMS Elb (-150, +30)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 8 of 42 pages

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.7)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

Notify **EVA**: "Maneuvering to APFR Ingress position."

THC/RHC Maneuver SSRMS to APFR Ingress Position. (within 5 cm/1 deg). (THC Up, -Z)

	Locked					
SR	SY	SP	EP	WP	WY	WR
-9.2	+153.3	-140.7	+107.2	-31.4	+21.7	-149.7
X	Y	Z	Pitch	Yaw	Roll	
+1085	+900	+920	+92.6	+68.2	+98.3	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Notify **EVA**: "Ready for GCA to APFR Ingress."

THC/RHC Maneuver SSRMS, if required, per EVA GCA, to APFR Ingress position.

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA**: "Ready for APFR Ingress"

7. SETUP FOR EVA ON SSRMS

PCS MSS: SSRMS:

Change Unloaded Parameters ► EVA ► Chest 12/NN/F/6 SYH

Verify 'Unloaded Parameters' (two) – Chest 12/NN/F/6, SY Held

Change Command ► ISS ► ISSACS/Internal (Verify ISS>ISSACS/Internal)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 9 of 42 pages

```
*****
* If additional GCA required to remove LWAPA
*
*DCP          BRAKES SSRMS → OFF (Verify OFF)
*
* PCS          MSS: SSRMS: 
*
*              Enter Mode – Manual (Verify blue)
*
*              MSS: SSRMS: SSRMS Manual: Joint Lock: 
*
*              cmd Shoulder Yaw (Verify SY – Locked)
*
*              Notify EVA: “Ready for GCA to LWAPA Retrieve position
*
*THC/RHC      Maneuver SSRMS, per EVA GCA, to LWAPA Retrieve.
*
*DCP          BRAKES SSRMS → ON (Verify ON)
*
*              Notify EVA: “Ready for LWAPA Retrieve.”
*****
```

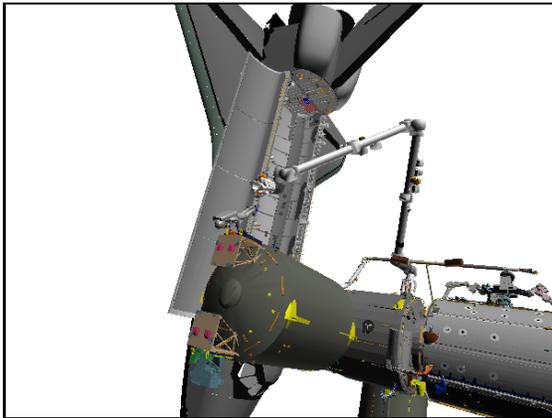


Figure 16.- LWAPA Retrieve
(03: S1 Lower Outboard: +70, +60).

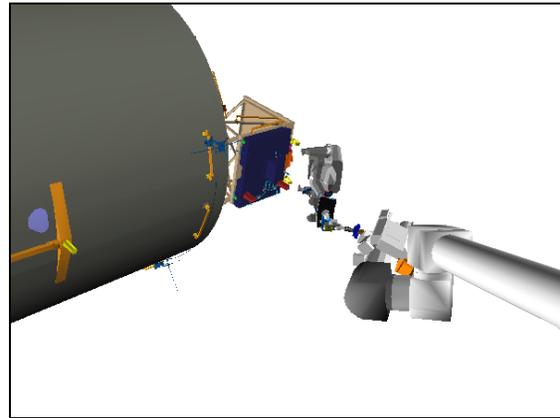


Figure 17.- LWAPA Retrieve
(22: Base Elbow: +80, -5).

8. COLUMBUS BACKOFF MANUAL MANEUVER

On EVA: “GO to maneuver to Columbus Backoff position.”

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC

Maneuver EVA to Columbus Backoff position (THC Down, +Z)
(within 10 cm/2 deg).

	Locked					
SR	SY	SP	EP	WP	WY	WR
-16.9	+153.3	-154.5	+97.9	-10.5	+28.0	-152.7
X	Y	Z	Pitch	Yaw	Roll	
+1098	+983	+1000	+81.8	-39.5	+85.8	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

* If the position/joint angles are not within 10cm/2 degrees of their
* expected values at the Columbus Backoff position.
*

*PCS MSS: SSRMS:

* Enter Mode – Joint OCAS (Verify blue)

*

* pick File ► EVA ► Col Backoff

* Verify 'Joint Angles' 'Destination' for Columbus Backoff position.

SR	SY	SP	EP	WP	WY	WR
-16.9	+153.3	-154.5	+97.9	-10.5	+28.0	-152.7

* **cmd** Load (Verify Sequence Status – Confirm or Cancel)

*MON Verify joint angles are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
TGT	-16.9	+153.3	-154.5	+97.9	-10.5	+28.0	-152.7

*PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

*DCP AUTO SEQ → PROC

*PCS MSS: SSRMS:

* Verify Posn Hold – orange

* Verify Joint Angle values.

	SR	SY	SP	EP	WP	WY	WR
	-16.9	+153.3	-154.5	+97.9	-10.5	+28.0	-152.7

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

Change Unloaded Parameters ► EVA ► Chest 12/NN/F/6 SRH
 Verify 'Unloaded Parameters' (two) – Chest 12/NN/F/6, SR Held

Change Display ► ISS ► OBAS (Verify ISS>OBAS)

Change Command ► ISS ► OBAS/Internal (Verify ISS>OBAS/Internal)

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

Verify with **SRMS Operator** that SRMS is in the EVA 2 Viewing position.

9. PAYLOAD BAY CLEARANCE JOINT OCAS (3.5 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+70, +60)	72 (DNLK): Camera C (+25, +20)	71 (MON 2) SRMS Elbow (-130, +40) [24: Tip Elbow (+20, 0)]	Camera A (0, +10)	OBSS ITVC (+130, -65)

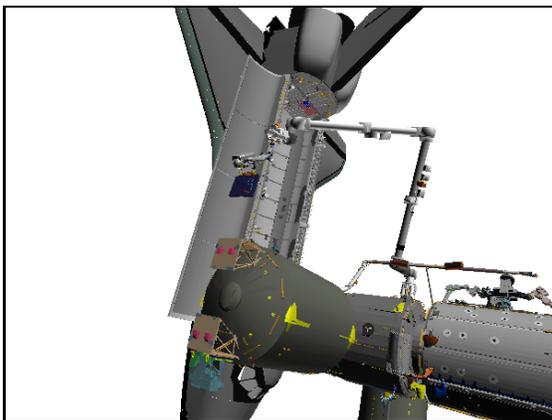


Figure 18.- Columbus Backoff (03: S1 Lower Outboard: +70, +60).

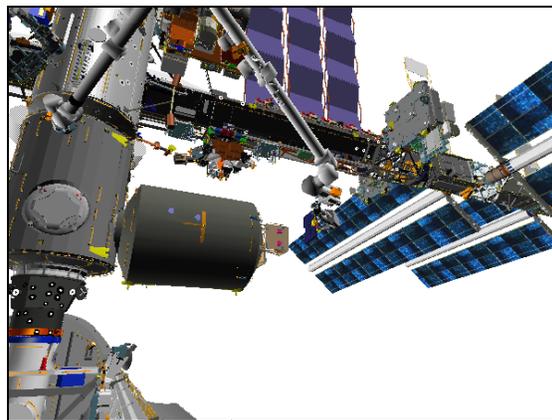


Figure 19.- Columbus Backoff (72: Camera C: +25, +20).

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

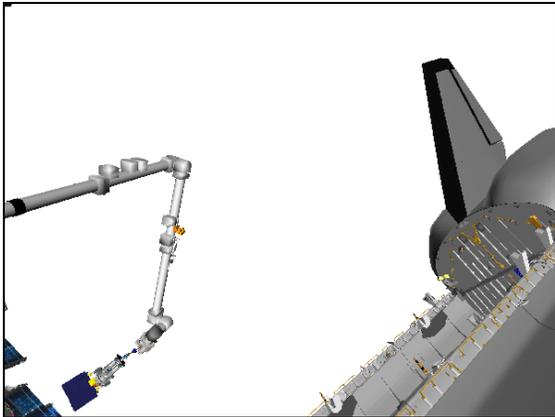


Figure 20.- Columbus Backoff
(71: SRMS Elbow: -130, +40).

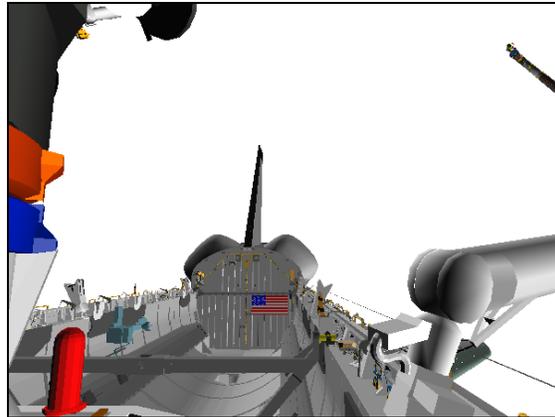


Figure 21.- Columbus Backoff
(Camera A: 0, +10).

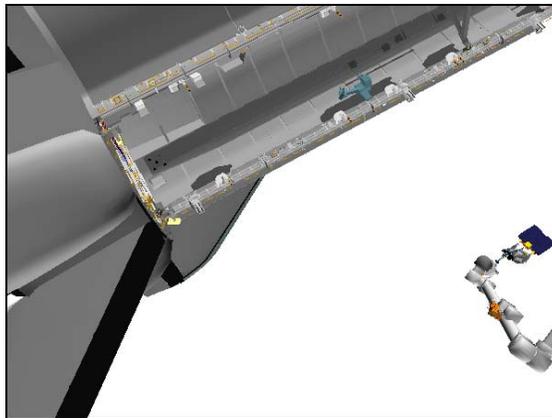


Figure 22.- Columbus Backoff
(OBSS ITVC: +130, -65).

RHC RATE → COARSE (Verify Coarse on PCS)

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► EVA ► Pld Bay Clearance

Verify 'Joint Angles' 'Destination' for Payload Bay Clearance position.

SR	SY	SP	EP	WP	WY	WR
-73.1	+179.1	-218.0	+57.9	-118.4	+134.5	-84.5

cmd Load (Verify Sequence Status – Confirm or Cancel)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 13 of 42 pages

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-16.9	+153.3	-154.5	+97.9	-10.5	+28.0	-152.7
TGT	-73.1	+179.1	-218.0	+57.9	-118.4	+134.5	-84.5
ERR	+56.2	-25.8	+63.5	+40.0	+107.9	-106.5	-68.2

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS: SSRMS

Verify Posn Hold – orange

Verify SSRMS at Payload Bay Clearance position (within 1 deg).

SR	SY	SP	EP	WP	WY	WR
-73.1	+179.1	-218.0	+57.9	-118.4	+134.5	-84.5

10. LWAPA APPROACH SINGLE JOINT MANEUVER

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+80, +65)	72 (DNLK): Camera C (-75, +35)	24: Tip Elbow (+20, 0)	Camera A (0, +10)	OBSS ITVC (+130, -65)

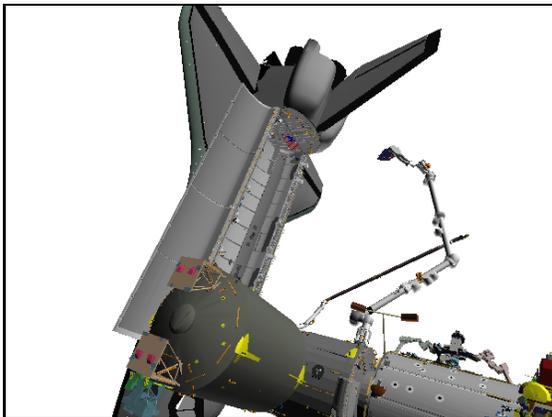


Figure 23.- Payload Bay Clearance (03: S1 Lower Outboard: +80, +65).

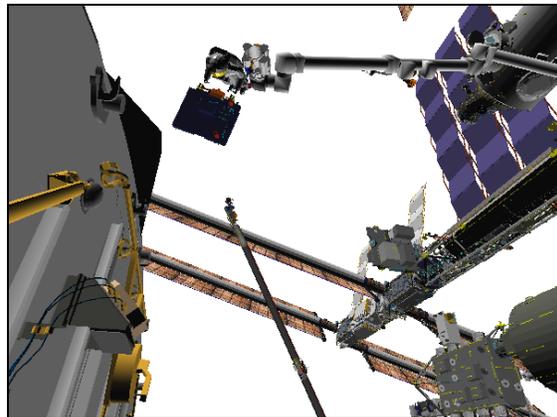


Figure 24.- Payload Bay Clearance (Camera C: -75, +35).

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

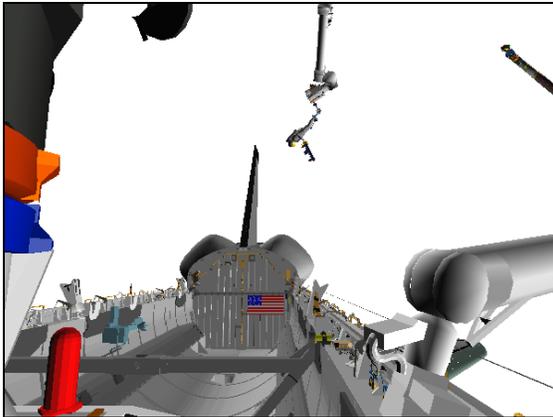


Figure 25.- Payload Bay Clearance
(Camera A: 0, +10).

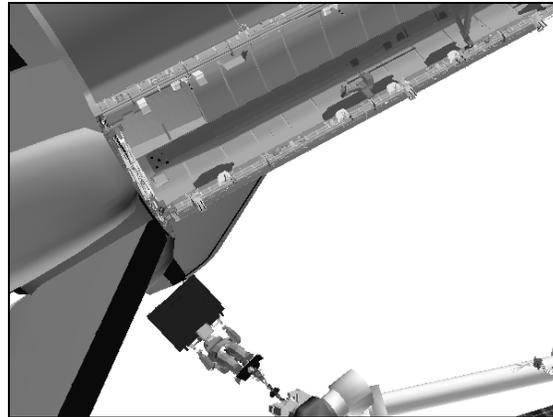


Figure 26.- Payload Bay Clearance
(OBSS ITVC: +130, -65).

NOTE

EV crewmember/LWAPA to the Payload Bay Aft Bulkhead decreases to approximately 66 cm (26 in), Monitor with Camera C.

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS: SSRMS

Enter Mode – Single (Verify blue)

WARNING

The active joint must be checked on the PCS before initiating motion. Failure to do so may result in movement of the wrong joint.

DCP JOINT SELECT → Shoulder Pitch (Verify SP – Selected on PCS)

Notify **EVA**: “Maneuvering to LWAPA Approach position.”

THC Perform “+” Single Joint maneuver to SP: -198.7 (THC up).

Verify SSRMS at LWAPA Approach position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-73.1	+179.1	-198.7	+57.9	-118.4	+134.5	-84.5
X	Y	Z	Pitch	Yaw	Roll	
-3215	-125	-1400	-91.5	-45.0	+89.8	
FOR	Unloaded – Chest 12/NN/F/6, SR Held					
Disp	ISS>OBAS					

PCS MSS: SSRMS: SSRMS

Enter Mode – Standby (Verify blue)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

11. LWAPA INSTALL MANUAL MANEUVER

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+80, +65)	72 (DNLK): Camera C (-75, +15)	24: Tip Elbow (+20, 0)	Camera A (0, 0) HFOV = 13	OBSS ITVC (+145, -60)

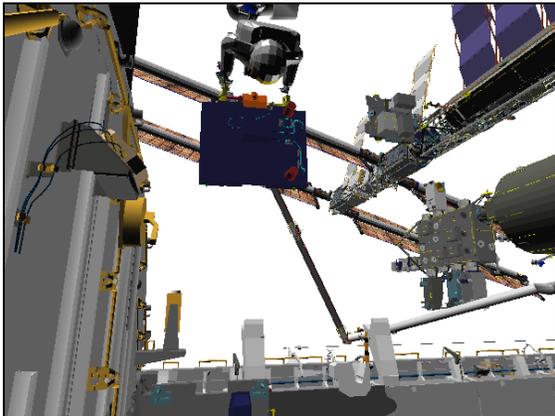


Figure 27.- LWAPA Approach Position (Camera C: -75, +15).

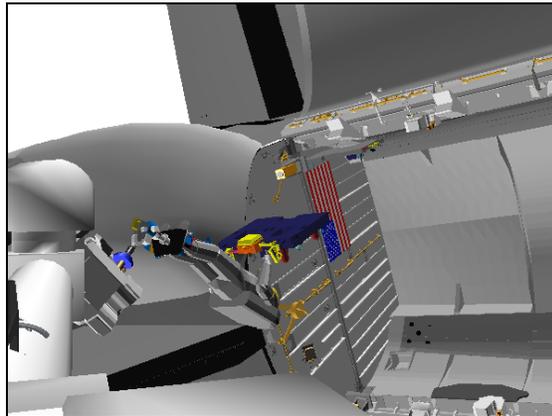


Figure 28.- LWAPA Approach Position (24: Tip Elbow: +20, 0).

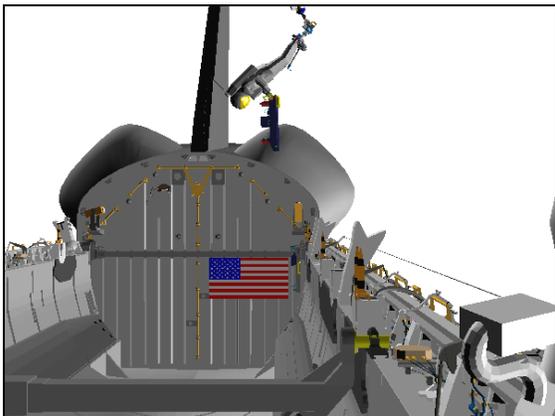


Figure 29.- LWAPA Approach Position (Camera A: 0, 0 HFOV = 13 deg).

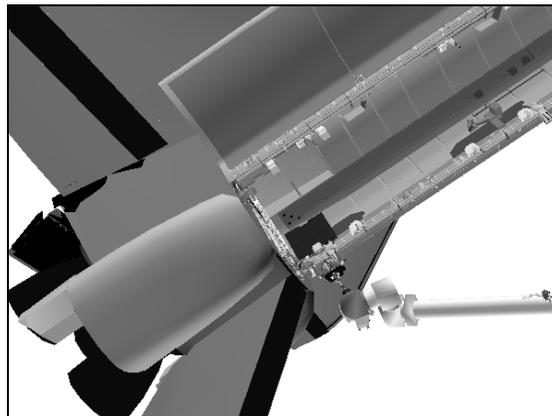


Figure 30.- LWAPA Approach Position (OBSS ITVC: +145, -60).

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

NOTE

This maneuver has the following clearance concerns:

1. EVA to Camera B decreases to approx. 48 cm (19 in), monitor with Camera C. The X axis (Shuttle Aft) limit for this clearance is -3235 cm.
2. EVA to Port MPM decreases to approx. 66 cm (26 in) monitor with Camera A
3. APFR to Port MPM decreases to 74 cm (29 in) monitor with Camera A.
4. LEE to Orbiter decreases to 102 cm (40 in) monitor with Camera A/Camera C

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.7)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

Notify **EVA**: "Ready for GCA to LWAPA Install position."

THC/RHC Maneuver, per EVA GCA, to LWAPA Install position. (THC Down, +Z)

Locked						
SR	SY	SP	EP	WP	WY	WR
-73.1	+182.9	-179.2	+42.1	-118.5	+135.3	-89.7
X	Y	Z	Pitch	Yaw	Roll	
-3215	-125	-1110	-91.5	-45.0	+89.8	
FOR	Unloaded – Chest 12/NN/F/6, SR Held					
Disp	ISS>OBAS					

Verify Posn Hold – orange

Notify **EVA**: "Ready for LWAPA install."

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

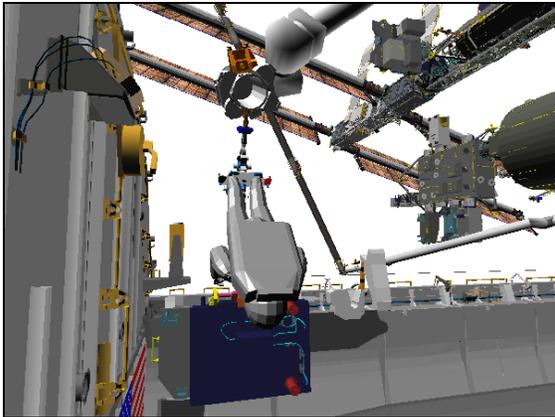


Figure 31.- LWAPA Install in Payload Bay (Camera C: -75, +5).

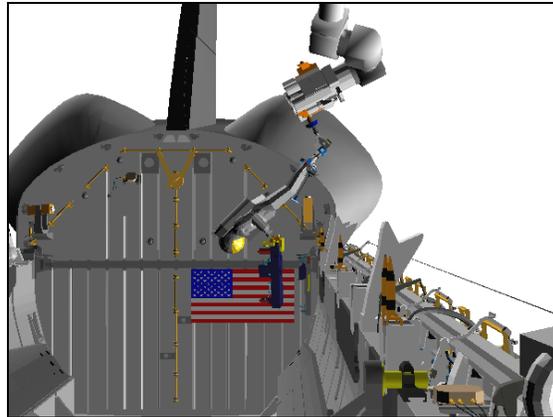


Figure 32.- LWAPA Install in Payload Bay (Camera A: 0, 0, HFOV = 13 deg).

12. LWAPA PGT POSITION MANEUVER

On **EVA**: "GO to maneuver to PGT position."

THC/RHC Maneuver, per EVA GCA, to PGT position.(RHC Forward, THC Down)

Locked						
SR	SY	SP	EP	WP	WY	WR
-73.1	+173.8	-178.9	+48.1	-136.4	+173.7	-75.7
X	Y	Z	Pitch	Yaw	Roll	
-3215	-125	-1065	-92.4*	-85.0	+88.9*	
FOR	Unloaded – Chest 12/NN/F/6, SR Held					
Disp	ISS>OBAS					

*Display Singularity

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA**: "In position for PGT"

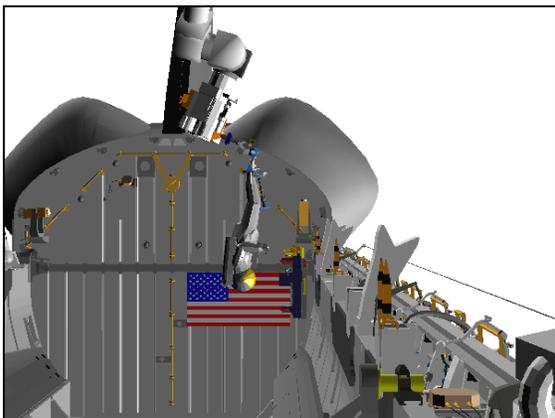


Figure 33.- PGT Position (Camera A: 0, 0, HFOV = 13 deg).

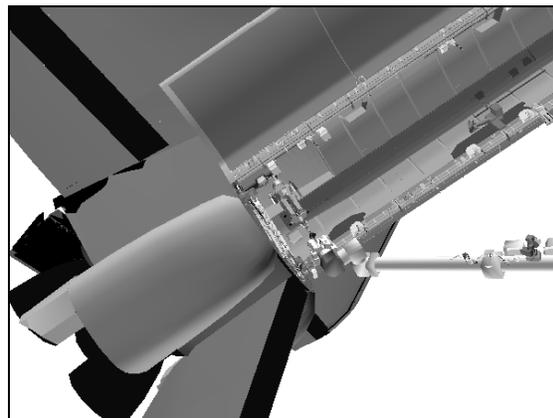


Figure 34.- PGT Position (OBSS ITVC: +145, -60).

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 18 of 42 pages

13. SPDM POWERDOWN FOR EVA INHIBIT (MCC)

MCC The following steps will be performed by the ground in parallel with Step 14.

Deroute all SPDM Cameras

Perform 6.334 MSS Powerdown, Step 6 (SPDM to Off)

14. LWAPA BACKOFF MANUAL MANEUVER

On **EVA**: "GO to maneuver to LWAPA Backoff position."

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/RHC Maneuver EVA to LWAPA Backoff position. (THC Up, -Z) (within 10 cm/2 deg).

Locked						
SR	SY	SP	EP	WP	WY	WR
-73.1	+168.1	-206.3	+65.6	-127.2	+173.4	-70.0
X	Y	Z	Pitch	Yaw	Roll	
-3215	-125	-1500	-92.9*	-85.0	+88.6*	
FOR	Unloaded – Chest 12/NN/F/6, SR Held					
Disp	ISS>OBAS					

*Display Singularity

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

* If position/joint angles are not within 10cm/2 degrees of their expected values at the LWAPA Backoff position.

*PCS MSS: SSRMS:

* Enter Mode – Joint OCAS (Verify blue)

*

* pick File ► EVA ► LWAPA Backoff

*

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

* Verify 'Joint Angles' 'Destination' for LWAPA Backoff position.

*

*

*

*

*

*

SR	SY	SP	EP	WP	WY	WR
-73.1	+168.1	-206.3	+65.6	-127.2	+173.4	-70.0

cmd Load (Verify Sequence Status – Confirm or Cancel)

*

*MON Verify joint angles are correct on Joint Angle Position overlay.

*

*

*

SR	SY	SP	EP	WP	WY	WR
-73.1	+168.1	-206.3	+65.6	-127.2	+173.4	-70.0

TGT

*

*PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

*

*DCP AUTO SEQ → PROC

*

*PCS MSS: SSRMS:

*

* Verify Posn Hold – orange

*

* Verify Joint Angle values.

*

*

*

*

SR	SY	SP	EP	WP	WY	WR
-73.1	+168.1	-206.3	+65.6	-127.2	+173.4	-70.0

* PCS MSS: SSRMS:

*

*

*

Enter Mode – Standby (Verify blue)

*

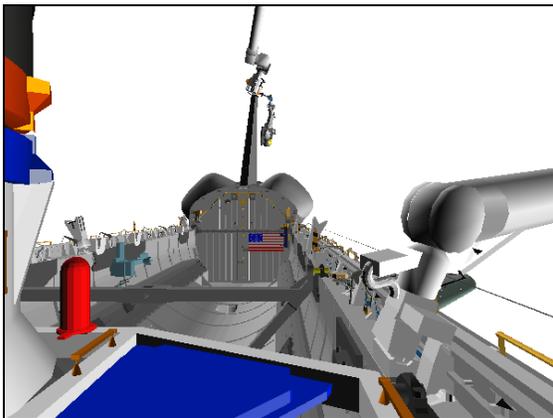


Figure 35.- LWAPA Backoff
(Camera A: 0, 0 Zoom out full).

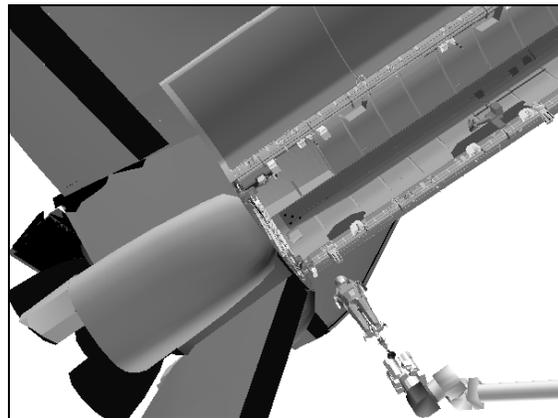


Figure 36.- LWAPA Backoff
(OBSS ITVC: +145, -60).

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

15. SPDM INTERMEDIATE JOINT OCAS (3 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+80, +65)	24: Tip Elbow (+20, 0)	09: P1 Lower Outboard (+120, +30)	Camera C (-45, +30)	OBSS ITVC (+70, -70)

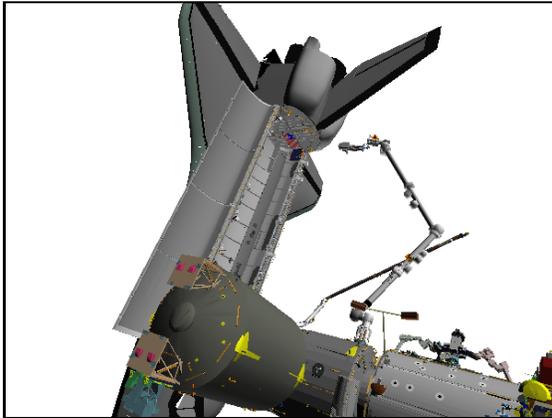


Figure 37.- LWAPA Backoff (03: S1 Lower Outboard: +70, +25).

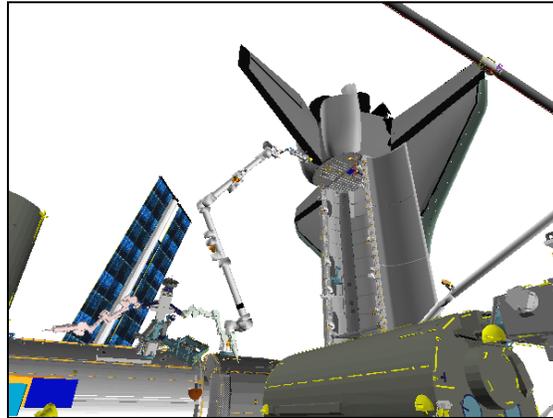


Figure 38.- LWAPA Backoff (09: P1 Lower Outboard: +120, +30).

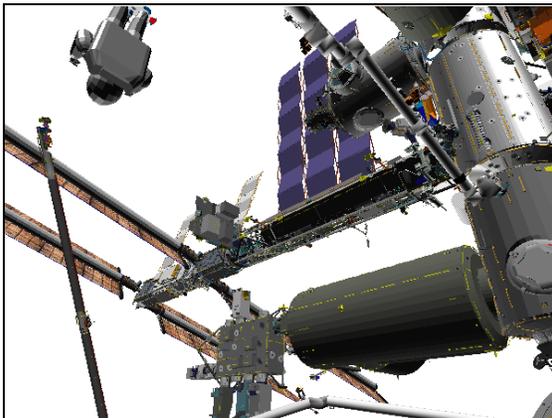


Figure 39.- LWAPA Backoff (Camera C: -45, +30).

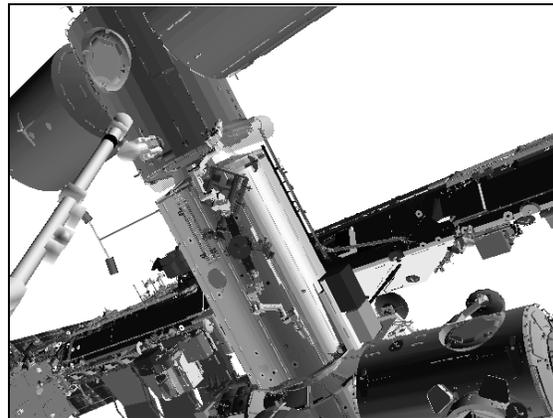


Figure 40.- LWAPA Backoff (OBSS ITVC: +70, -70).

PCS

MSS: SSRMS:

Change Unloaded Parameters ► EVA ► Chest 12/NN/F/6 SYH
Verify 'Unloaded Parameters' (two) – Chest 12/NN/F/6, SY Held

Change Display ► ISS ► ISSACS (Verify ISS>ISSACS)

Change Command ► SSRMS ► Internal (Verify SSRMS>Internal)

RHC

RATE → COARSE (Verify Coarse on PCS)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

PCS Enter Mode – Joint OCAS (Verify blue)

pick File ► EVA ► SPDM Intermediate

Verify 'Joint Angles' 'Destination' for SPDM Intermediate position.

SR	SY	SP	EP	WP	WY	WR
-192.9	+150.0	-215.0	+139.6	-141.0	+150.3	-39.5

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-73.1	+168.1	-206.3	+65.6	-127.2	+173.4	-70.0
TGT	-192.9	+150.0	-215.0	+139.6	-141.0	+150.3	-39.5
ERR	+119.8	+18.1	+8.7	-74.0	+13.8	+23.1	-30.5

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

SR	SY	SP	EP	WP	WY	WR
-192.9	+150.0	-215.0	+139.6	-141.0	+150.3	-39.5

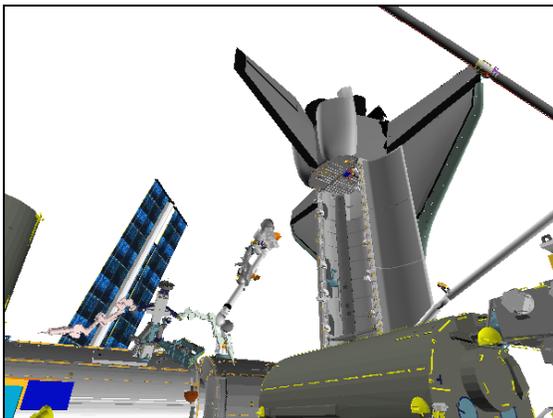


Figure 41.- SPDM Intermediate
(09: P1 Lower Outboard: +120, +30).

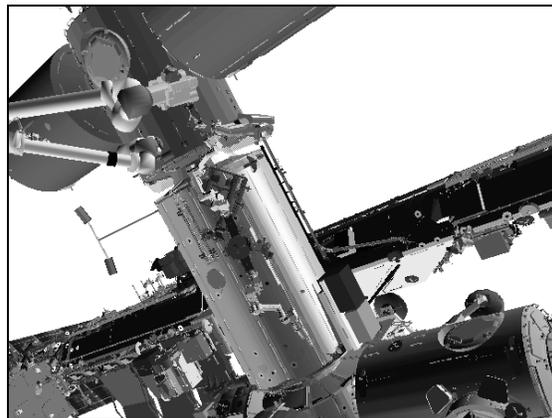


Figure 42.- SPDM Intermediate
(OBSS ITVC: -70, +70).

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 22 of 42 pages

16. SPDM CLPA 1 SETUP SINGLE JOINT MANEUVER

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
22: Base Elbow (+45, -15)	24: Tip Elbow (+20, 0)	09: P1 Lower Outboard (+100, +20)	Camera C (-45, +30)	OBSS ITVC (+70, -70)

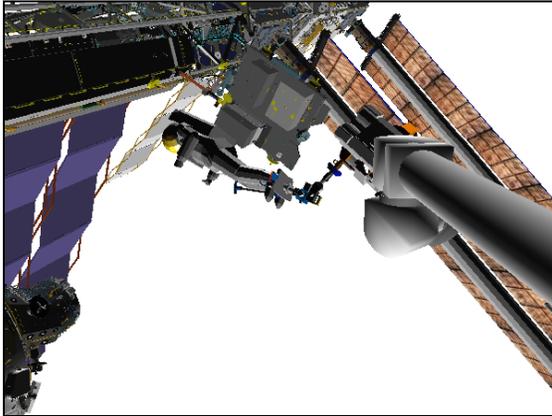


Figure 43.- SPDM Intermediate
(22: Base Elbow: +45, -15).

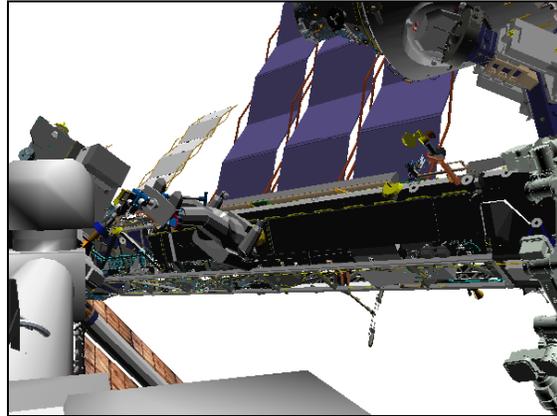


Figure 44.- SPDM Intermediate
(24: Tip Elbow: +20, 0).

NOTE

EVA to SPDM (EOTP) decreases to 104 cm (41 in), monitor with Tip Elbow.

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 1.0 (Verify 1.0)

PCS MSS: SSRMS:

Enter Mode – Single (Verify blue)

WARNING

The active joint must be checked on the PCS before initiating motion. Failure to do so may result in movement of the wrong joint.

DCP JOINT SELECT → Shoulder Pitch (Verify SP – Selected on PCS)

Notify **EVA**: “Maneuvering to CLPA 1 Setup position.”

THC Perform “+” Single Joint maneuver to SP: -158.2 (THC up).

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Verify SSRMS at CLPA 1 Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-192.9	+150.0	-158.2	+139.6	-141.0	+150.3	-39.5
X	Y	Z	Pitch	Yaw	Roll	
+409	-404	+602	-133.9	+36.2	+125.6	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

17. CLPA 1 INSTALL MANUAL MANEUVER

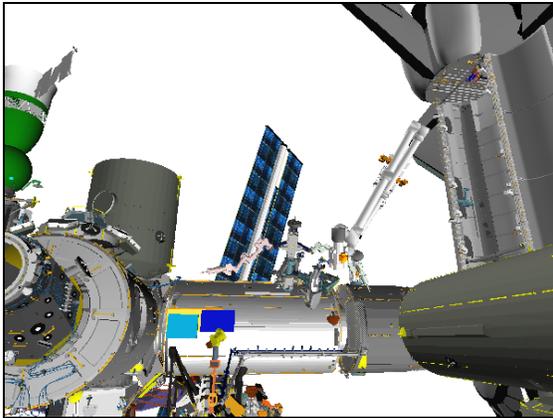


Figure 45.- CLPA 1 Setup
(09: P1 Lower Outboard: +100, +20).

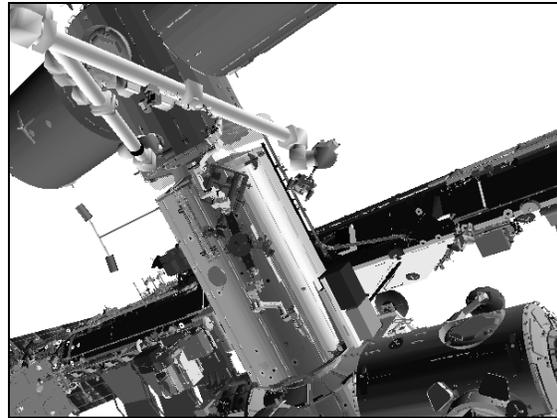


Figure 46.- CLPA 1 Setup
(OBSS ITVC: +70, -70).

NOTE

1. The cross-cluster self collision warning may annunciate during the maneuver to the CLPA 1 installation position.
2. APFR to the SPDM PDGF decreases to 58 cm (23 in) monitor with the Base Elbow or Tip Elbow camera.

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.7)

√Vernier

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

Notify **EVA**: "Ready for GCA to CLPA 1 Install position.

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 24 of 42 pages

THC/RHC Maneuver, per EVA GCA, to CLPA 1 Install position. (THC In, +X).

	Locked					
SR	SY	SP	EP	WP	WY	WR
-208.4	+150.0	-170.1	+142.0	-132.7	+154.9	-53.7
X	Y	Z	Pitch	Yaw	Roll	
+320	-310	+695	-133.9	+36.2	+125.6	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA**: “Ready for CLPA 1 install.”

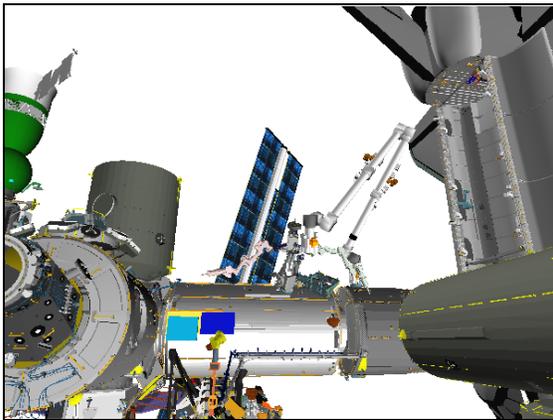


Figure 47.- CLPA 1 Install
(09: P1 Lower Outboard: +100, +20).

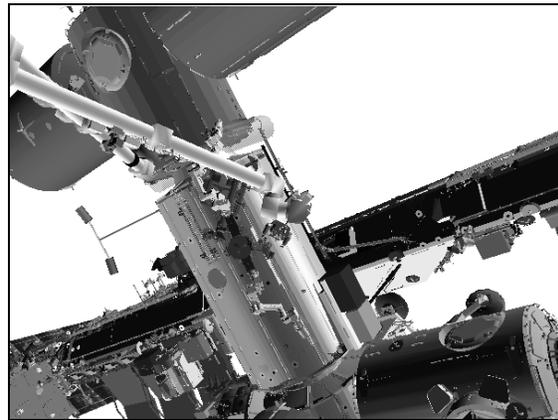


Figure 48.- CLPA 1 Install
(OBSS ITVC: +70, -70).

18. CLPA 1 BACKOFF MANUAL MANEUVER

On **EVA**, “GO to maneuver to CLPA 1 Backoff position.

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

THC/RHC Maneuver EVA to CLPA 1 Backoff position. (THC Out, -X) (5 cm/1 deg)

	Locked					
SR	SY	SP	EP	WP	WY	WR
-192.9	+150.0	-158.2	+139.6	-141.0	+150.3	-39.5
X	Y	Z	Pitch	Yaw	Roll	
+409	-404	+602	-133.9	+36.2	+125.6	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

* If the position/joint angles are not within 10cm/2 degrees of their
 * expected values at the CLPA 1 Backoff position.

*PCS MSS: SSRMS:

* Enter Mode – Joint OCAS (Verify blue)

* pick File ► EVA ► CLPA 1 Backoff

* Verify 'Joint Angles' 'Destination' for Columbus Backoff position.

SR	SY	SP	EP	WP	WY	WR
-192.9	+150.0	-158.2	+139.6	-141.0	+150.3	-39.5

* **cmd** Load (Verify Sequence Status – Confirm or Cancel)

*MON Verify joint angles are correct on Joint Angle Position overlay.

TGT	SR	SY	SP	EP	WP	WY	WR
	-192.9	+150.0	-158.2	+139.6	-141.0	+150.3	-39.5

*PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

*DCP AUTO SEQ → PROC

*PCS MSS: SSRMS:

* Verify Posn Hold – orange

* Verify Joint Angle values.

SR	SY	SP	EP	WP	WY	WR
-192.9	+150.0	-158.2	+139.6	-141.0	+150.3	-39.5

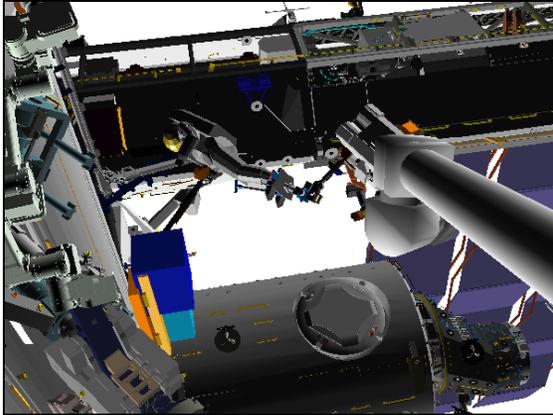


Figure 49.- CLPA 1 Backoff
(22: Base Elbow: +45, -15).

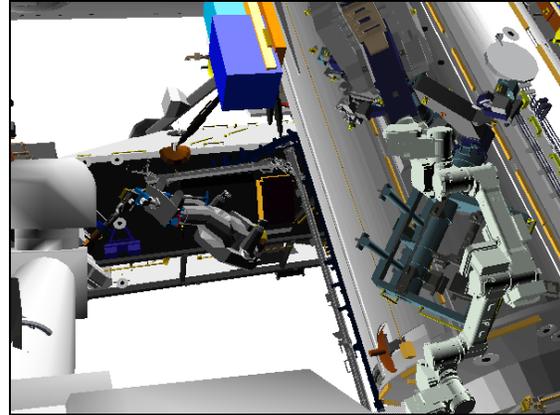


Figure 50.- CLPA 1 Backoff
(24: Tip Elbow: +20, 0).

MCC

19. SPDM POWER UP (MCC)
 The following steps will be performed by the ground in parallel with the EP1 Blanket operations

Perform 6.332 MSS Powerup
 Step 5 (SPDM to KA)
 On IV “Go to take SPDM to operational”
 Step 7.1 (SACU1 to Oper)
 Steps 8.3 and 8.4 (Power on SPDM VDU1 & Body1 camera)

Verify valid thermal data received from camera to confirm EVA connection

20. EP1 BLANKET SETUP POSITION FOR OCAS (1 MINUTE)

Enter Mode – FOR OCAS (Verify blue)

MSS: SSRMS: SSRMS FOR OCAS: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

pick File ► EVA ► EP1 Blanket Setup

Verify ‘FOR’ ‘Destination’ for EP1 Blanket Setup position.

X	Y	Z	Pitch	Yaw	Roll
+337	-412	+633	-87.5	+37.6	+88.5

cmd Load (Verify Sequence Status – Confirm or Cancel)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

MON Verify FOR and errors are correct on FOR Position overlay.

	X	Y	Z	Pitch	Yaw	Roll
FOR	+409	-404	+602	-133.9	+36.2	+125.6
TGT	+337	-412	+633	-87.5	+37.6	+88.5
ERR	+72	+8	-31	-46.4	-1.4	+37.1

PCS cmd Confirm (Verify Sequence Status – Auto Seq Sw-Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify SSRMS at EP1 Blanket Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-201.1	+150.0	-152.4	+129.5	-132.8	+161.9	-12.4
X	Y	Z	Pitch	Yaw	Roll	
+337	-412	+633	-87.5	+37.6	+88.5	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

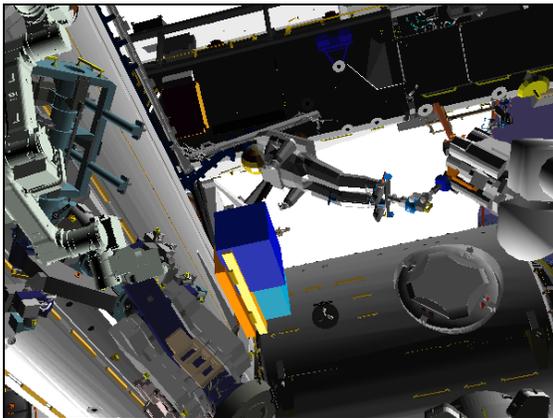


Figure 51.- EP1 Blanket Setup
(22: Base Elbow: +45, -15).

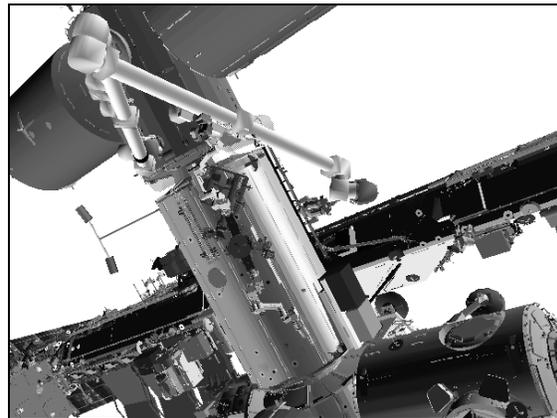


Figure 52.- EP1 Blanket Setup
(OBSS ITVC: +70, -70).

21. EP1 BLANKET REMOVAL MANUAL MANEUVER

NOTE

APFR to SPDM PDGF decreases to 58 cm (23 in) monitor with the Base Elbow or Tip Elbow camera.

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 28 of 42 pages

MSS: SSRMS: SSRMS Manual: Joint Lock: Joint Lock

cmd Shoulder Yaw (Verify SY – Locked)

Notify **EVA**: “Ready for GCA to EP1 Blanket Removal Position.”

THC/RHC Maneuver, per EVA GCA, to EP1 Blanket Removal. (THC In, +X).

	Locked					
SR	SY	SP	EP	WP	WY	WR
-209.8	+150.0	-168.8	+136.5	-125.6	+164.9	-19.6
X	Y	Z	Pitch	Yaw	Roll	
+342	-316	+758	-87.5	+37.6	+88.5	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

PCS

MSS: SSRMS: SSRMS

Verify Posn Hold – orange

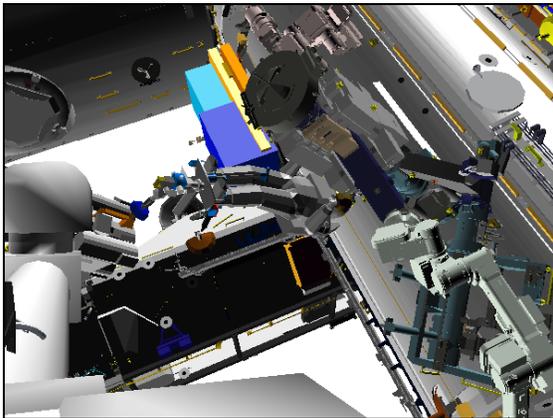


Figure 53.- EP1 Blanket Removal
(24: Tip Elbow: +20, 0).

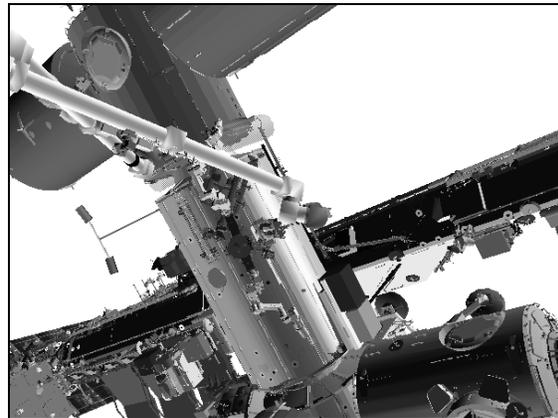


Figure 54.- EP1 Blanket Removal
(OBSS ITVC: +70, -70).

22. EP1 BACKOFF MANUAL MANEUVER

On **EVA** “GO maneuver to EP1 Backoff position.”

THC/RHC Maneuver EVA to EP1 Backoff position (THC Down +Z)
(within 5 cm/1 deg).

	Locked					
SR	SY	SP	EP	WP	WY	WR
-211.7	+150.0	-173.1	+110.1	-95.5	+165.5	-21.2
X	Y	Z	Pitch	Yaw	Roll	
+343	-585	+966	-87.5	+37.5	+88.4	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

* If position/joint angles are not within 5cm/1 degree of their expected
* values at the EP1 Backoff position.
*

*PCS MSS: SSRMS:

* Enter Mode – Joint OCAS (Verify blue)

*

* pick File ► EVA ► EP1 Backoff

* Verify 'Joint Angles' 'Destination' for EP1 Backoff position.

SR	SY	SP	EP	WP	WY	WR
-211.7	+150.0	-173.1	+110.1	-95.5	+165.5	-21.2

* **cmd** Load (Verify Sequence Status – Confirm or Cancel)

*MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
TGT	-211.7	+150.0	-173.1	+110.1	-95.5	+165.5	-21.2

* Verify **MCC-H** SPDM Power up complete.

*PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

*DCP AUTO SEQ → PROC

*PCS MSS: SSRMS:

* Verify Posn Hold – orange

* Verify Joint Angle values.

SR	SY	SP	EP	WP	WY	WR
-211.7	+150.0	-173.1	+110.1	-95.5	+165.5	-21.2

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

23. COLUMBUS INTERMEDIATE JOINT OCAS (4.5 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+80, +60)	24: Tip Elbow (+20, 0)	09: P1 Lower Outboard (+120, +20)	Camera C (-25, +20)	OBSS ITVC (+80, -60)

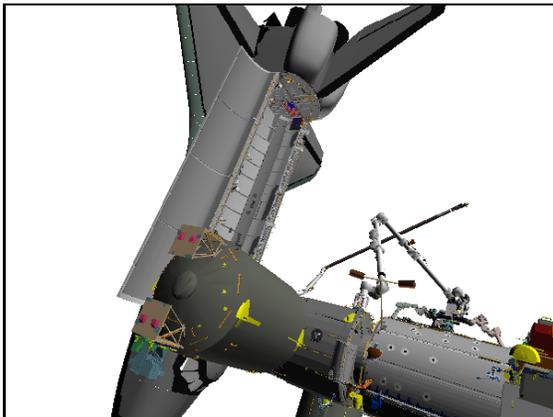


Figure 55.- EP1 Backoff (03: S1 Lower Outboard +80, +60).

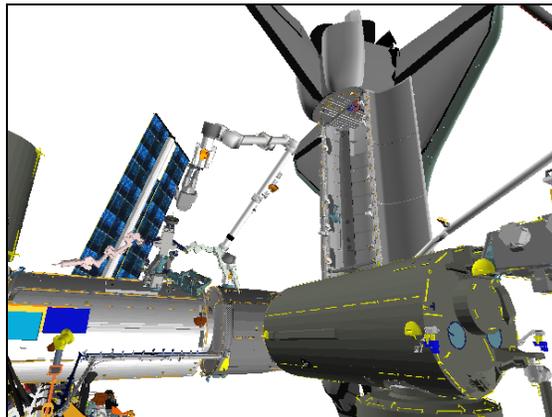


Figure 56.- EP1 Backoff (09: P1 Lower Outboard: +120, +20).

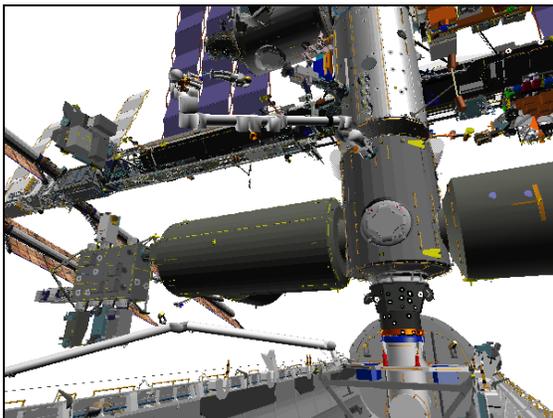


Figure 57.- EP1 Backoff (Camera C: -25, +20).

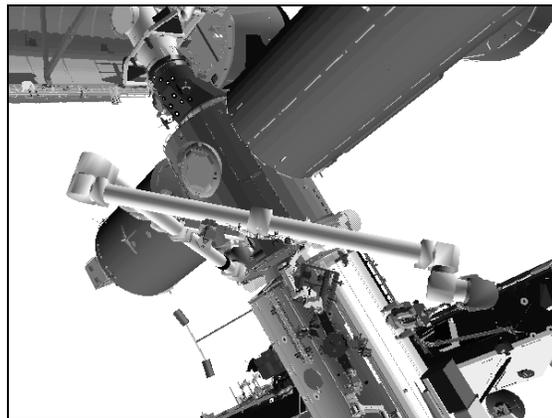


Figure 58.- EP1 Backoff (OBSS ITVC: +80, -60).

RHC

RATE → COARSE (Verify Coarse on PCS)

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► EVA ► COL Intermediate

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Verify 'Joint Angles' 'Destination' for Columbus Intermediate position.

SR	SY	SP	EP	WP	WY	WR
-50.0	+170.0	-210.0	+110.0	-110.0	+160.0	-10.0

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-211.7	+150.0	-173.1	+110.1	-95.5	+165.5	-21.2
TGT	-50.0	+170.0	-210.0	+110.0	-110.0	+160.0	-10.0
ERR	-161.7	-20.0	+36.9	+0.1	+14.5	+5.5	-11.2

Verify **MCC-H** SPDM Power up complete.

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

SR	SY	SP	EP	WP	WY	WR
-50.0	+170.0	-210.0	+110.0	-110.0	+160.0	-10.0

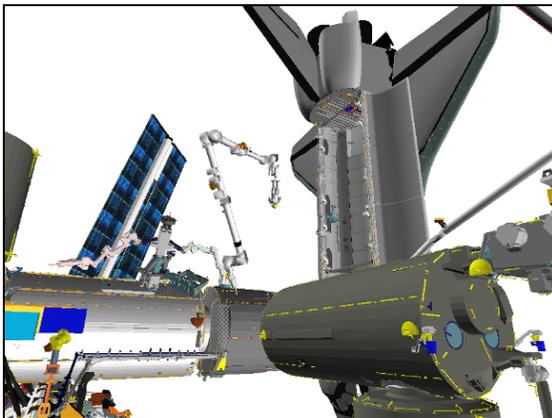


Figure 59.- Columbus Intermediate (09: P1 Lower Outboard: +120, +20).

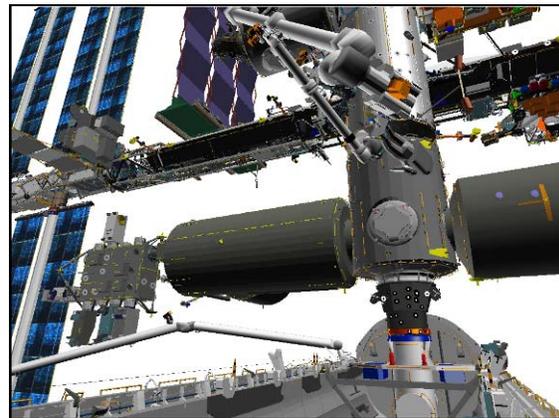


Figure 60.- Columbus Intermediate (Camera C: -25, +20).

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

24. COLUMBUS APPROACH JOINT OCAS (3 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+80, +60)	24: Tip Elbow (+20, 0)	09: P1 Lower Outboard (+120, +20)	Camera C (+25, +20)	OBSS ITVC (+100, -60)

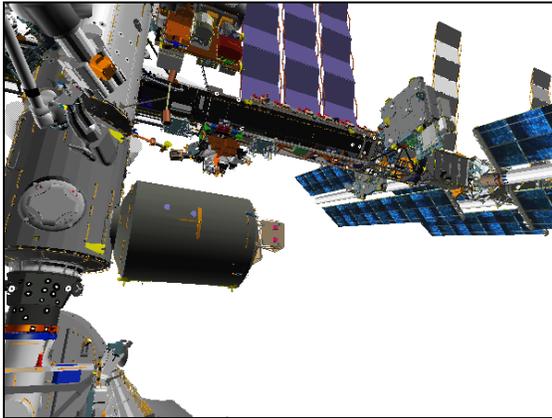


Figure 61.- Columbus Intermediate (Camera C: +25, +20).

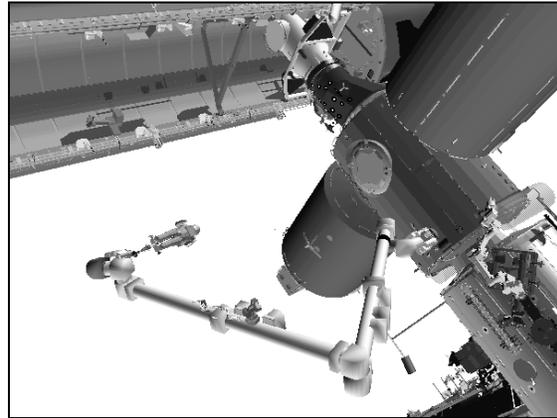


Figure 62.- Columbus Intermediate (OBSS ITVC: +100, -60).

SSRMS Joint OCAS

Input 'Joint Angles' 'Destination' for Columbus Approach position.

SR	SY	SP	EP	WP	WY	WR
-9.3	+153.3	-105.5	+61.5	-137.2	+155.7	-0.4

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-50.0	+170.0	-210.0	+110.0	-110.0	+160.0	-10.0
TGT	-9.3	+153.3	-105.5	+61.5	-137.2	+155.7	-0.4
ERR	-40.7	+16.7	-104.5	+48.5	+27.2	+4.3	-9.6

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Verify SSRMS at Columbus Approach position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-9.3	+153.3	-105.5	+61.5	-137.2	+155.7	-0.4
X	Y	Z	Pitch	Yaw	Roll	
+1287	+1125	+549	-48.9	-78.8	-44.3	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

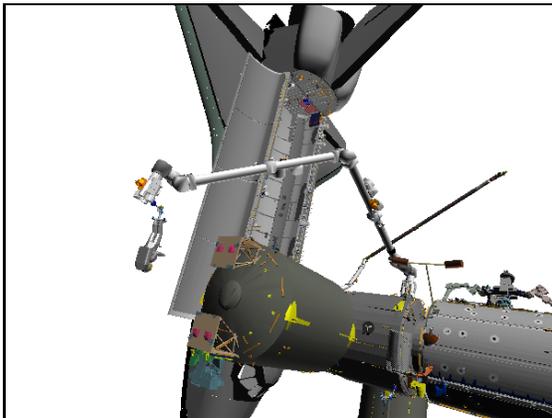


Figure 63.- Columbus Approach
(03: S1 Lower Outboard: +70, +60).

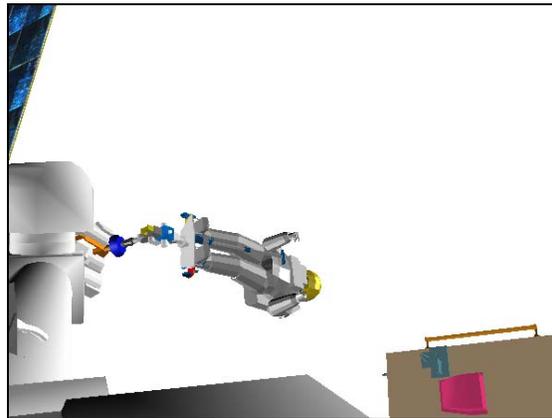


Figure 64.- Columbus Approach
(24: Tip Elbow: +20, 0).

25. APFR EGRESS MANUAL MANEUVER

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+70, +60)	24: Tip Elbow (+20, 0)	22: Base Elbow (+130, -5)	Camera C (+25, +20)	OBSS ITVC (+100, -60)



Figure 65.- Columbus Approach
(Camera C: +25, +20).

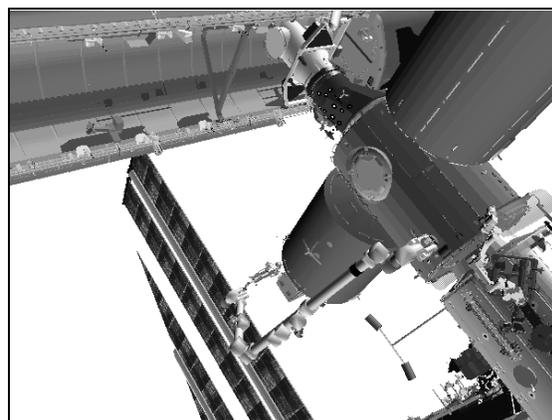


Figure 66.- Columbus Approach
(OBSS ITVC: +100, -60).

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

NOTE	
1.	APFR to Columbus decreases to 76 cm (30 in) monitor with the Tip Elbow camera
2.	Tip Boom to Columbus Cargo Platform decreases to 84 cm (33 in) monitor with S1 Lower Outboard camera.

PCS

MSS: SSRMS:

Change Command ► ISS ► ISSACS/Internal (Verify ISS>ISSACS/Internal)

RHC

RATE → VERNIER (Verify Vernier on PCS)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.7)

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

Notify **EVA**: “Ready for GCA to APFR Egress position.

THC/RHC

Maneuver, per EVA GCA, to APFR Egress position (THC Left, -Y)

	Locked						
SR	SY	SP	EP	WP	WY	WR	
-12.4	+153.3	-119.4	+91.1	-153.0	+155.6	-3.4	
X	Y	Z	Pitch	Yaw	Roll		
+1287	+880	+549	-48.9	-78.8	-44.3		
FOR	Unloaded – Chest 12/NN/F/6, SY Held						
Disp	ISS>ISSACS						

DCP

BRAKES SSRMS → ON (Verify ON)

Notify **EVA**: “Ready for APFR Egress”

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 35 of 42 pages

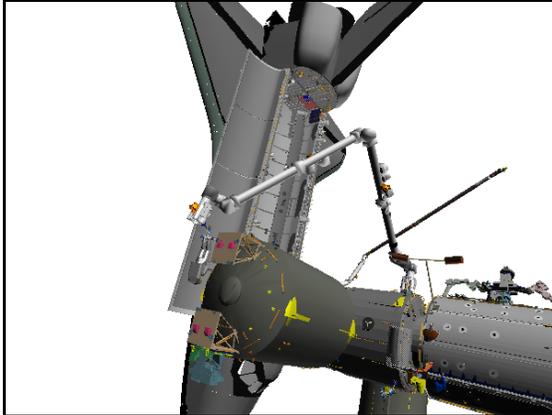


Figure 67.- APFR Egress
(03: S1 Lower Outboard: +70, +60).

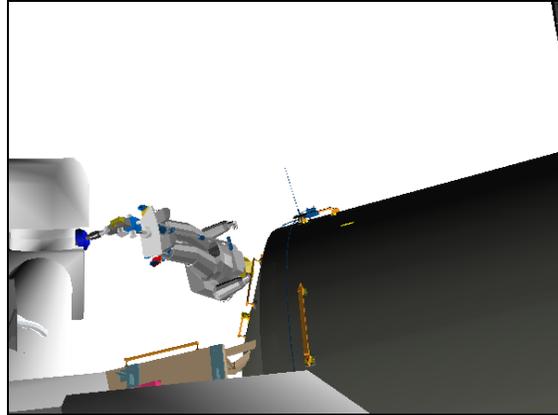


Figure 68.- APFR Egress
(22: Tip Elbow: +20, 0).

On **EVA**: “Go for APFR Backoff”

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC GCA, as required, to APFR Backoff position.

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

26. APFR REMOVAL MANUAL MANEUVER

Change Unloaded Parameters ► Unloaded ► LEE Tip SYH
Verify ‘Unloaded Parameters’ (two) – LEE Tip, SY Held

Change Command ► ISS ► ISSACS (Verify ISS>ISSACS)

On **EVA** “GO to maneuver to APFR Removal position.

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 36 of 42 pages

Notify **EVA** "Ready for GCA to APFR Removal position.

THC/RHC Maneuver, per EVA GCA, to APFR Removal position (THC Left, -Y)

	Locked					
SR	SY	SP	EP	WP	WY	WR
-12.9	+153.3	-120.9	+94.3	-154.8	+155.6	-3.9
X	Y	Z	Pitch	Yaw	Roll	
+1260	+960	+716	+87.4	+10.0	+98.8	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

DCP BRAKES SSRMS → ON (Verify ON)

Notify **EVA** "Ready for APFR Removal".

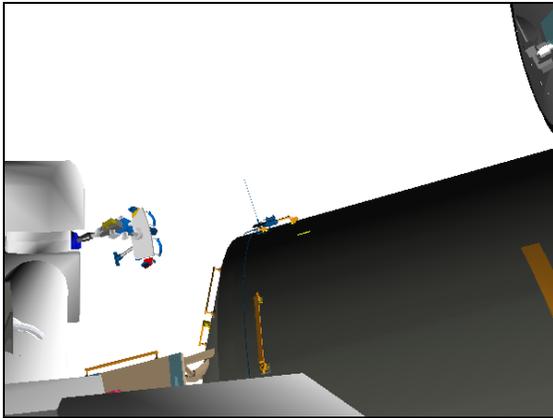


Figure 69.- APFR Removal
(24: Tip Elbow: +20, 0).

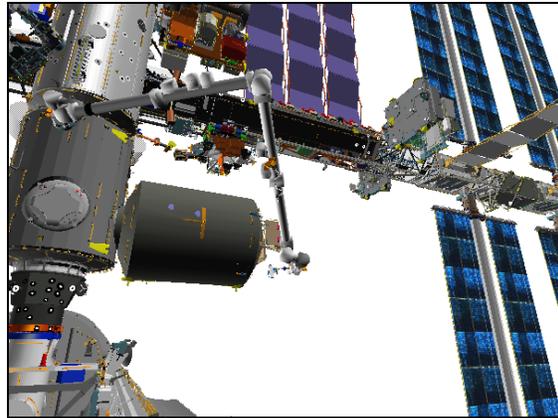


Figure 70.- APFR Removal
(Camera C: +25, +20).

27. APFR REMOVED BACKOFF MANUAL MANEUVER

On **EVA**: "APFR removed and clear of LEE. Go to maneuver to Backoff position."

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

THC/RHC Maneuver SSRMS to APFR Removed Backoff position. (THC Down, +Z)
(within 10 cm/2 deg).

	Locked					
SR	SY	SP	EP	WP	WY	WR
-17.3	+153.3	-132.7	+93.3	-142.2	+155.5	-8.2
X	Y	Z	Pitch	Yaw	Roll	
+1260	960	+900	+87.4	+10.0	+98.8	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

* If SSRMS is not within 10cm/2 degree of the expected position at the
* APFR Backoff position:
*

*PCS MSS: SSRMS:

* Enter Mode – Joint OCAS (Verify blue)

* Input 'Joint Angles' 'Destination' for APFR Backoff position.

SR	SY	SP	EP	WP	WY	WR
-17.3	+153.3	-132.7	+93.3	-142.2	+155.5	-8.2

* **cmd** Load (Verify Sequence Status – Confirm or Cancel)

*MON Verify joint angles are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
TGT	-17.3	+153.3	-132.7	+93.3	-142.2	+155.5	-8.2

*PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

*DCP AUTO SEQ → PROC

* PCS MSS: SSRMS:

* Verify Posn Hold – orange

* Verify Joint Angle values.

SR	SY	SP	EP	WP	WY	WR
-17.3	+153.3	-132.7	+93.3	-142.2	+155.5	-8.2

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

* PCS MSS: SSRMS:
 *
 * Enter Mode – Standby (Verify blue)
 *

28. ELBOW CLPA COVER SETUP JOINT OCAS (1.5 MINUTES)

DCP Pan/Tilt the SSRMS Tip Elbow Camera to +70, +20 for the CLPA Cover Install

Route Camera 22: Base Elbow to Monitor 2

Configure Cameras as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+70, +60)	22: Base Elbow (+105, -5)	72 (DNLK) SRMS Elb (-150, +20)	Camera C (+25, +20)	OBSS ITVC (+100, -60)

PCS MSS: SSRMS:SSRMS Tip Elb Camera Icon

cmd 'Power' Keep-Alive (Verify – Keep-Alive)

Notify IV: "Tip Elbow Camera is in Keep Alive and configured for the CLPA cover install".

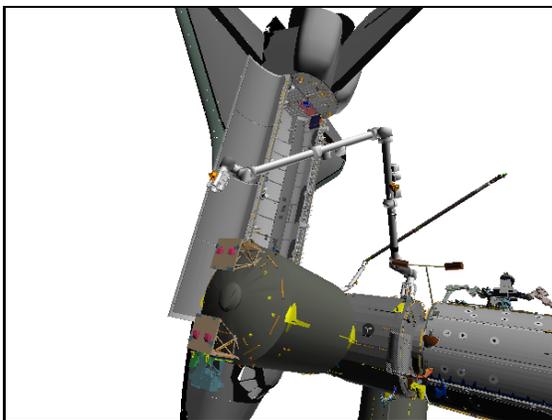


Figure 71.- APFR Backoff (03: S1 Lower Outboard: +70, +60).

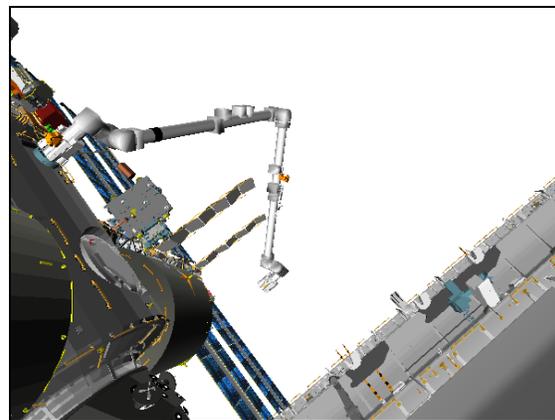


Figure 72.- APFR Backoff (72: SRMS Elbow: -150, +20).

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

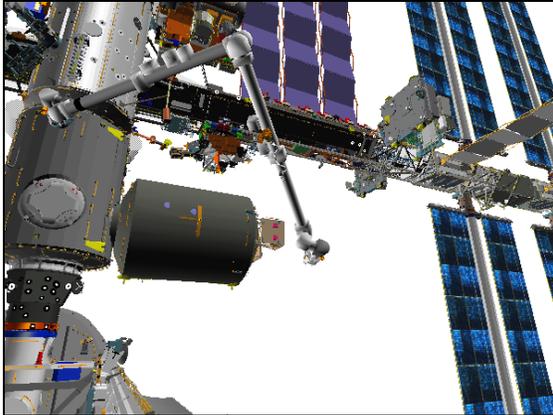


Figure 73.- APFR Backoff
(Camera C: +25, +20).

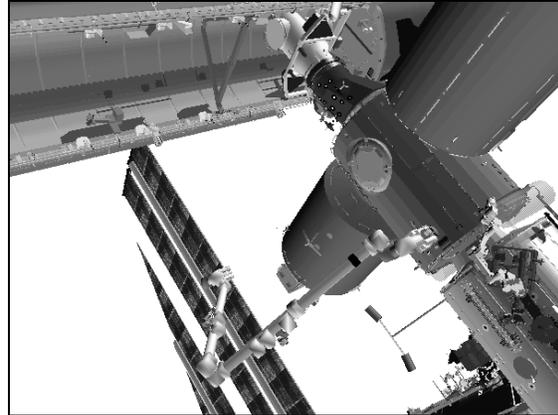


Figure 74.- APFR Backoff
(OBSS ITVC: +100, -60).

PCS

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► EVA ► CLPA Cover Setup

Verify 'Joint Angles' 'Destination' for CLPA Cover Setup position.

SR	SY	SP	EP	WP	WY	WR
-29.0	+217.0	-95.0	+23.0	-139.4	+155.5	+5.4

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-17.3	+153.3	-132.7	+93.3	-142.2	+155.5	-8.2
TGT	-29.0	+217.0	-95.0	+23.0	-139.4	+155.5	+5.4
ERR	+11.7	-63.7	-37.7	+70.3	-2.8	0.0	-13.6

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

SR	SY	SP	EP	WP	WY	WR
-29.0	+217.0	-95.0	+23.0	-139.4	+155.5	+5.4

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

29. ELBOW CLPA COVER INSTALL MANEUVER

Configure Cameras as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+70, +60)	22: Base Elbow (+155, -5)	72 (DNLK) SRMS Elb (-150, +20)	Camera C (+25, +20)	OBSS ITVC (+100, -60)

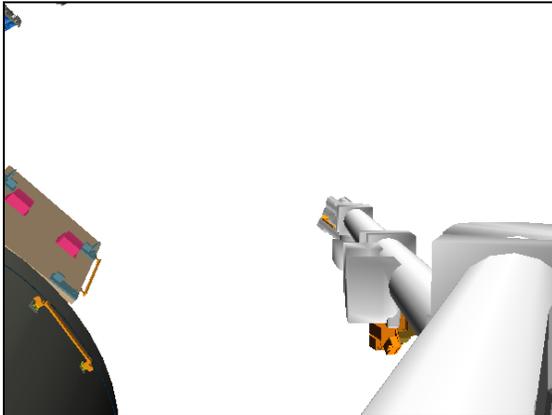


Figure 75.- CLPA Cover Setup (22: Base Elbow: +155, -5).

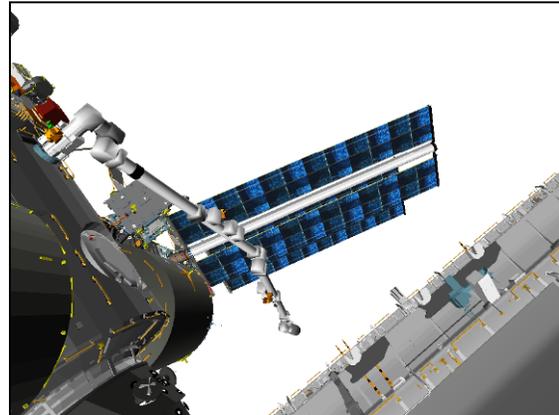


Figure 76.- CLPA Cover Setup (SRMS Elbow Camera: -150, +20).

NOTE

SSRMS Tip Boom to Columbus decreases to 30 cm (12 in), monitor with the Base Elbow Camera or SRMS Elbow.

PCS

MSS: SSRMS:

Enter Mode – Single (Verify blue)

√Vernier

WARNING

The active joint must be checked on the PCS before initiating motion. Failure to do so may result in movement of the wrong joint.

DCP

JOINT SELECT → Shoulder Pitch (Verify SP – Selected on PCS)

On **EVA**: “Go for GCA to Tip Elbow Camera Cover Install position.

THC

Perform “+” Single Joint maneuver, per EVA GCA, to SP: -83.0 (THC Up).

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

Notify **EVA**: “Ready for Tip Elbow Camera Cover Install.

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 41 of 42 pages

30. ELBOW CAMERA COVER BACKOFF MANEUVER

On **EVA**, “Tip Elbow Camera Cover Installed, go to maneuver to backoff position”

PCS MSS: SSRMS:

Enter Mode – Single (Verify blue)

WARNING
The active joint must be checked on the PCS before initiating motion. Failure to do so may result in movement of the wrong joint.

DCP JOINT SELECT → Shoulder Pitch (Verify SP – Selected on PCS)

THC Perform “-“ Single Joint maneuver, to SP: -95.0 (THC Down).

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

31. UNDOCK CONFIG JOINT OCAS (5.5 MINUTES)

<u>NOTE</u>
Expect singularity warning for EP between +15 and -15 deg.

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► Park ► Undock

Verify ‘Joint Angles’ ‘Destination’ for Undock position.

SR	SY	SP	EP	WP	WY	WR
-30.0	-28.0	-58.0	-60.0	-146.0	-149.2	-17.0

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-29.0	+217.0	-95.0	+23.0	-139.4	+155.5	+5.4
TGT	-30.0	-28.0	-58.0	-60.0	-146.0	-149.2	-17.0
ERR	+1.0	+245.0	-37.0	+83.0	+6.6	+304.7	+22.4

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

1.410 SSRMS EVA 2 SUPPORT

(RBT FS/ULF5/FIN/SPN)

Page 42 of 42 pages

DCP AUTO SEQ → PROC

PCS MSS: SSRMS: SSRMS

Verify Posn Hold – orange

Verify Joint Angle values.

SR	SY	SP	EP	WP	WY	WR
-30.0	-28.0	-58.0	-60.0	-146.0	-149.2	-17.0

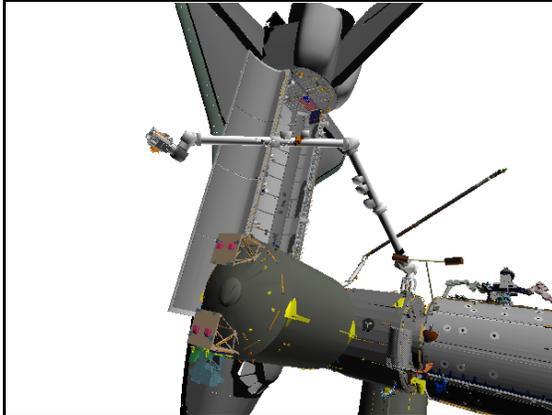


Figure 77.- Undock
(03: S1 Lower Outboard: +70, +60).

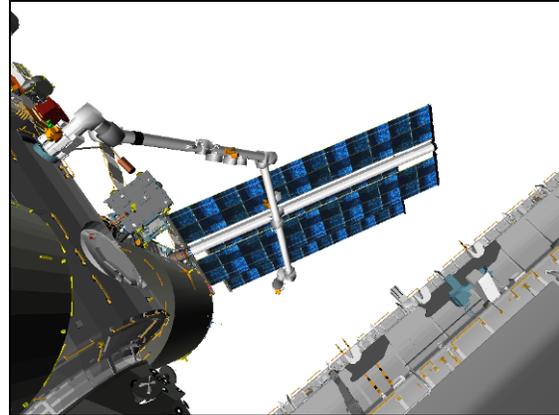


Figure 78.- Undock
(SRMS Elbow: -150, +20).

NOTE

Expect the following message when safing is commanded:

**'R3Z - MSS OCS SSRMS Prime(Redun) ACU SRT Cat-1 Brk Stat
Fail'** (SCR 17495)

This message should return to Norm.

DCP SAFING → SAFE (Verify ON)

1.510 MNVR TO FI VIEWING

(RBT FS/ULF5/FIN)

1. SETUP

Verify SRMS is grappled to OBSS at PMM Install viewing position.

SY	SP	EP	WP	WY	WR
+35.1	+38.6	-22.7	-0.4	-0.7	-40.1

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+85, +65)	09: P1 Lower Outboard (+115, +15) Zoom = 20mm	24: Tip Elbow (+5, -5)	Camera C (+20, +10)	Camera D (-50, 0)

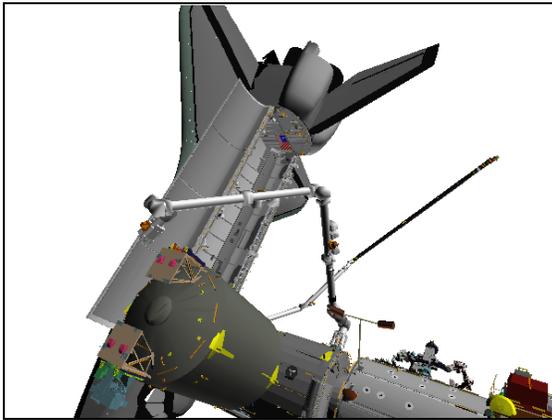


Figure 1.- APFR Setup Position
(03: S1 Lower Outboard: +85, +65).

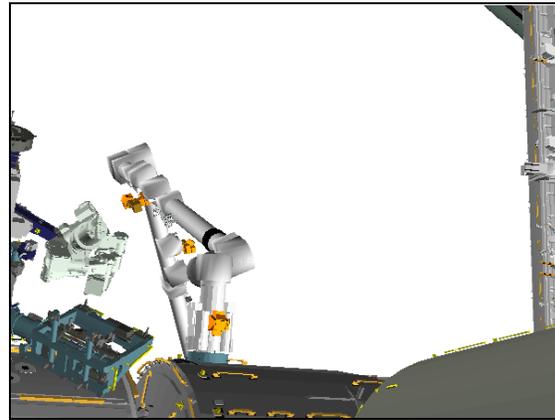


Figure 2.- APFR Setup Position
(09: P1 Lower Outboard: +115, +15,
Zoom = 20 mm).

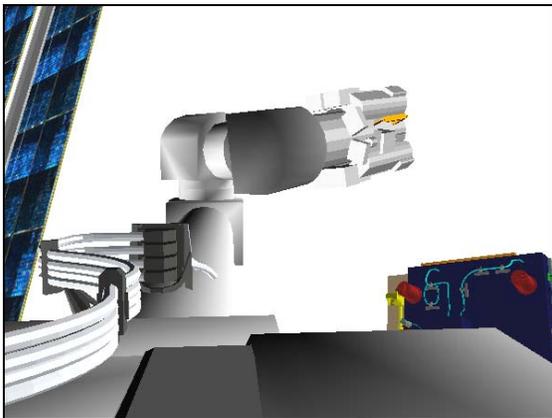


Figure 3.- APFR Setup Position
(24: Tip Elbow: +5, -5).

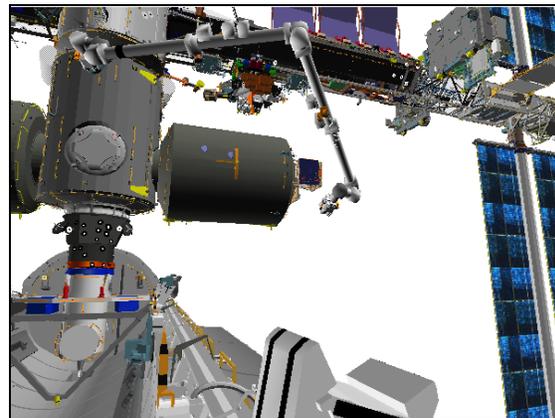


Figure 4.- APFR Setup Position
(Camera C: +20, +10).

1.510 MNVR TO FI VIEWING

(RBT FS/ULF5/FIN)

Page 2 of 8 pages

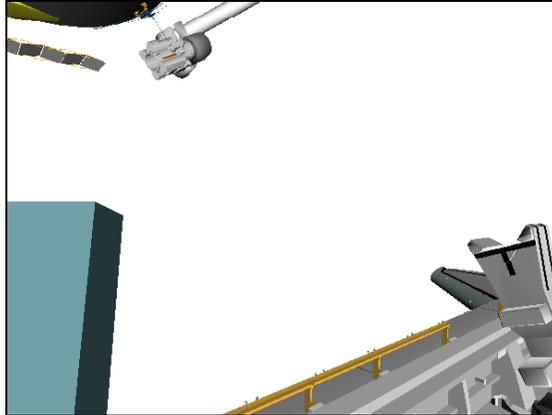


Figure 5.- APFR Setup Position
(Camera D: -50, 0).

Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

Verify Display – ISS>ISSACS

Verify SSRMS at APFR Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	+47.8	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1275	+950	+705	+58.3	-9.9	+97.1	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

2. SINGLE JOINT MANEUVER TO EVA 2 SETUP POSITION

PCS MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

DCP BRAKES SSRMS → OFF (Verify OFF)

√Vernier

PCS MSS: SSRMS:

Enter Mode – Single (Verify blue)

WARNING

The active joint must be checked on the PCS before initiating motion. Failure to do so may result in movement of the wrong joint.

1.510 MNVR TO FI VIEWING

(RBT FS/ULF5/FIN)

Page 3 of 8 pages

DCP JOINT SELECT → Wrist Pitch (Verify WP – Selected on PCS)

THC Perform “– “ Single Joint maneuver to WP: -30.0 (THC down).

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

Verify SSRMS at EVA 2 Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1307	+1136	+731	+21.0	+61.2	+130.3	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

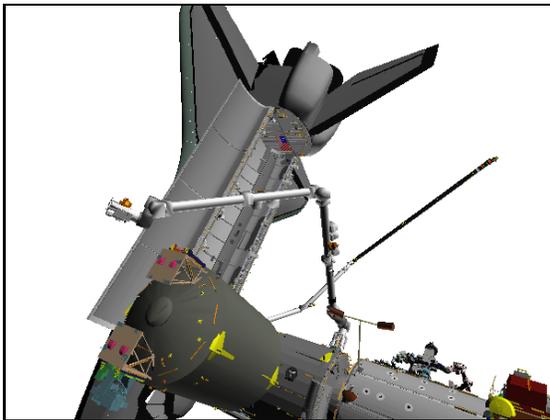


Figure 6.- EVA 2 Setup Position
(03: S1 Lower Outboard: +85, +65).

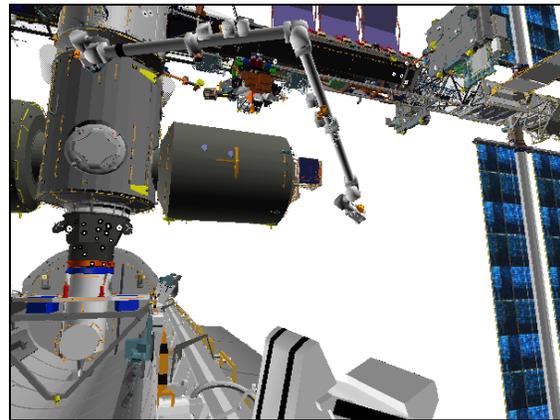


Figure 7.- EVA 2 Setup Position
(Camera C: +20, +10).).

3. JOINT OCAS TO INTERMEDIATE (5 MINUTES)

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

Input 'Joint Angles' 'Destination' for Intermediate position.

SR	SY	SP	EP	WP	WY	WR
-15.0	+100.0	-70.0	+17.0	-58.9	-160.0	+10.0

cmd Load (Verify Sequence Status – Confirm or Cancel)

1.510 MNVR TO FI VIEWING

(RBT FS/ULF5/FIN)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9
TGT	-15.0	+100.0	-70.0	+17.0	-58.9	-160.0	+10.0
ERR	+6.0	+53.3	-41.2	+59.3	+28.9	+152.0	-193.9

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

SR	SY	SP	EP	WP	WY	WR
-15.0	+100.0	-70.0	+17.0	-58.9	-160.0	+10.0

3. SINGLE JOINT TO FI VIEWING POSITION

NOTE

Clearance between Tip Boom and Orbiter Payload Bay Door decreases to 117 cm (46 in). Monitor with Base Elbow camera.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+85, +65)	22: Base Elbow (+150, -15)	24: Tip Elbow (+15, +5)	Camera C (+20, +10)	Camera D (-50, 0)

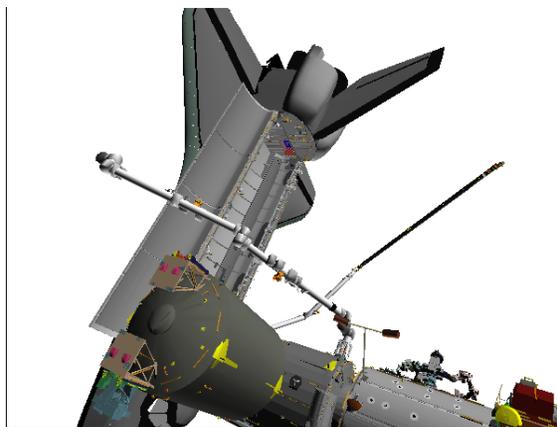


Figure 8.- Intermediate (03: S1 Lower Outboard: +85, +65).



Figure 9.- Intermediate (22: Base Elbow: +150, -15).

1.510 MNVR TO FI VIEWING

(RBT FS/ULF5/FIN)

Page 5 of 8 pages

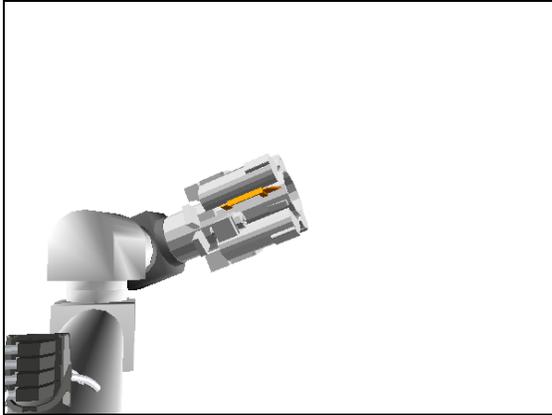


Figure 10.- Intermediate
(24: Tip Elbow: +15, +5).

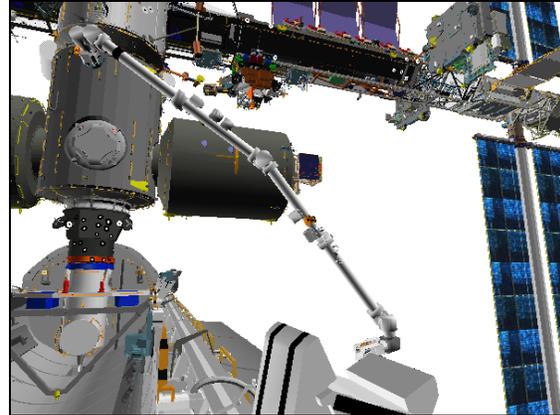


Figure 11.- Intermediate
(Camera C: +20, +10).



Figure 12.- Intermediate
(Camera D: -50, 0).

√Vernier

PCS

MSS: SSRMS:

Enter Mode – Single (Verify blue)

WARNING

The active joint must be checked on the PCS before initiating motion. Failure to do so may result in movement of the wrong joint.

DCP

JOINT SELECT → SHOULDER PITCH (Verify SP – Selected on PCS)

THC

Perform “+” Single Joint maneuver to SP: -56.7 (THC up).

1.510 MNVR TO FI VIEWING

(RBT FS/ULF5/FIN)

Verify SSRMS at FI Viewing Position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-15.0	+100.0	-56.7	+17.0	-58.9	-160.0	+10.0
X	Y	Z	Pitch	Yaw	Roll	
+2027	+624	+997	-107.8	-80.7	-18.9	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

DCP BRAKES SSRMS → ON (Verify ON)

Notify **SRMS Operator**, “SRMS is GO for Focused Inspection.”

4. FOCUSED INSPECTION VIEWING

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3
03: S1 Lower Outboard (+85, +65)	25: Tip LEE	24: Tip Elbow (+15, +5)

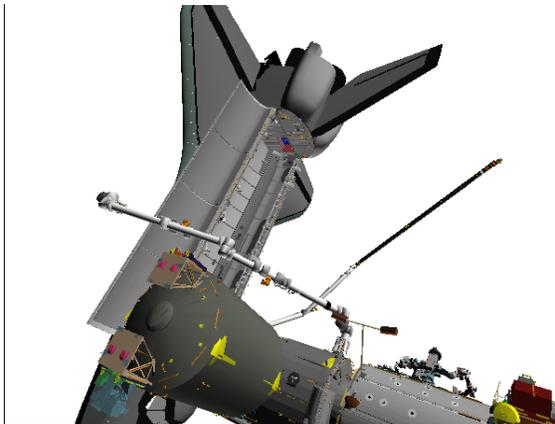


Figure 13.- FI Viewing (03: S1 Lower Outboard: +85, +65).

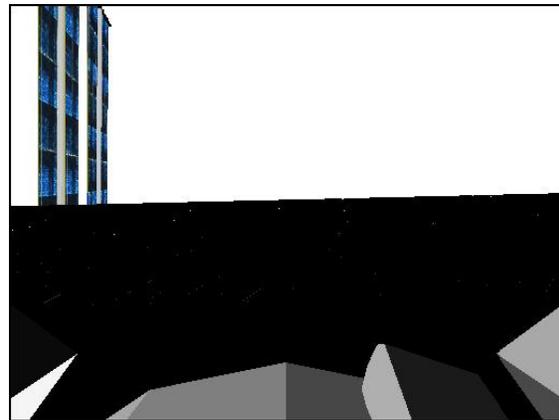


Figure 14.- FI Viewing (25: Tip LEE).

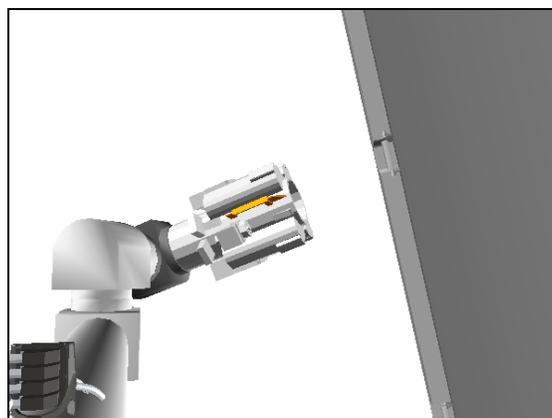


Figure 15.- FI Viewing (24: Tip Elbow: +15, +5).

1.510 MNVR TO FI VIEWING

(RBT FS/ULF5/FIN)

Page 7 of 8 pages

NOTE

The WY and WP joints can be used to position the Tip LEE Camera for Focused Inspection Survey Support.

Moving the WY in the negative direction (THC Down) will pan the Tip LEE view Left (Orbiter Forward.)

Moving the WY in the positive direction (THC Up) will pan the Tip LEE view Right (Orbiter Aft.)

Moving the WP in the positive direction (THC Up) will tilt the Tip LEE view Down (Orbiter Zenith.)

Moving the WP in the negative direction (THC Down) will tilt the Tip LEE view Up (Orbiter Nadir.)

DCP BRAKES SSRMS → OFF (Verify OFF)

RHC RATE – As Desired (COARSE permitted for WY or WP motion only)

PCS MSS: SSRMS:

Enter Mode – Single (Verify blue)

DCP JOINT SELECT → WRIST YAW (WRIST PITCH)

PCS Verify WY (WP) – Selected

THC Perform +WY or -WY (+WP or -WP) Single Joint maneuver as required for OBSS to Orbiter clearance viewing (-235.0 deg < WY < -55.0 deg) (-85.0 < WP < -35.0).

When Focused Inspection complete, return WY to -160.0 deg. (WP to -58.9 deg).

Verify SSRMS at FI Viewing Position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-15.0	+100.0	-56.7	+17.0	-58.9	-160.0	+10.0
X	Y	Z	Pitch	Yaw	Roll	
+2027	+624	+997	-107.8	-80.7	-18.7	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

DCP BRAKES SSRMS → ON (Verify ON)

1.510 MNVR TO FI VIEWING

(RBT FS/ULF5/FIN)

Page 8 of 8 pages

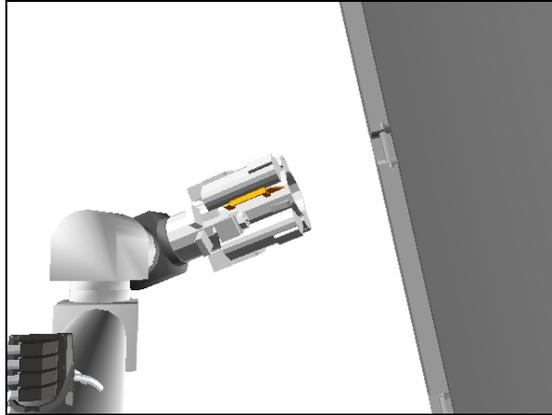


Figure 16.- FI Viewing
(24: Tip Elbow: +15, +5).

1.520 MNVR TO EVA 2 START

(RBT FS/ULF5/FIN/SPN)

1. SINGLE JOINT TO INTERMEDIATE POSITION

Verify SRMS is grappled to OBSS at PMM Install Viewing position.

SY	SP	EP	WP	WY	WR
+35.1	+38.6	-22.7	-0.4	-0.7	-40.1

Verify SSRMS at FI Viewing position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-15.0	+100.0	-56.7	+17.0	-58.9	-160.0	+10.0
X	Y	Z	Pitch	Yaw	Roll	
+2027	+624	+997	-107.8	-80.7	-18.9	
FOR	Unloaded – LEE Tip, SR Held					
Disp	ISS>ISSACS					

On **SRMS Operator** “SSRMS is GO for Maneuver to EVA 2 Start position.”

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+85, +65)	22: Base Elbow (+160, -15)	24: Tip Elbow (+15, +5)	Camera C (+20, +10)	Camera D (-50, 0)

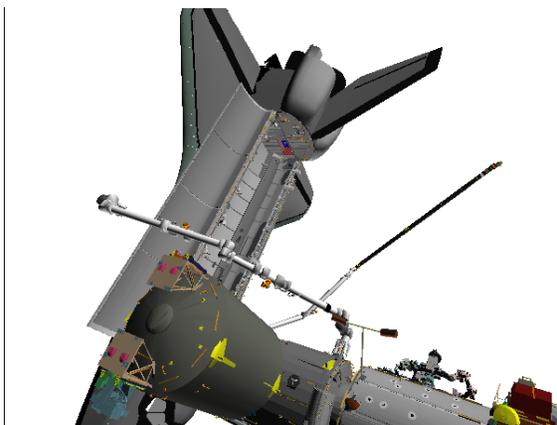


Figure 1.- FI Viewing
(03: S1 Lower Outboard: +85, +65).

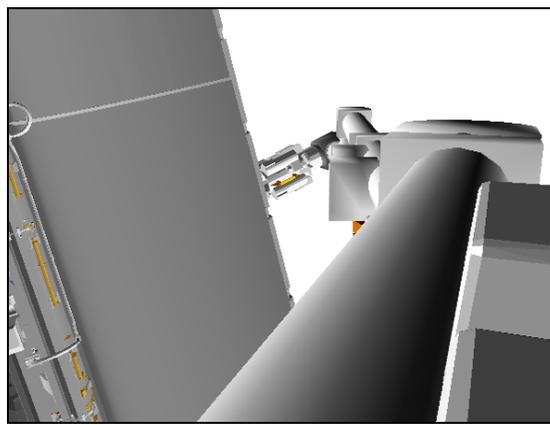


Figure 2.- FI Viewing
(22: Base Elbow: +160, -15).

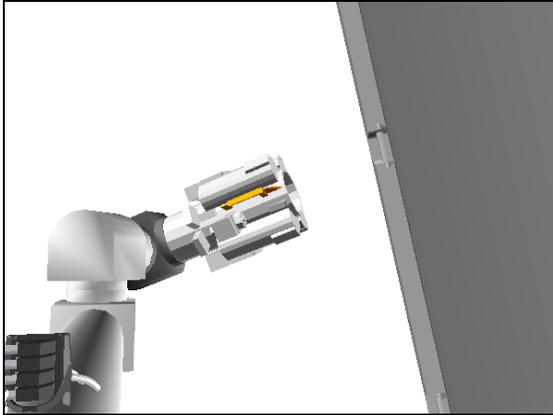


Figure 3.- FI Viewing
(24: Tip Elbow: +15, +5).

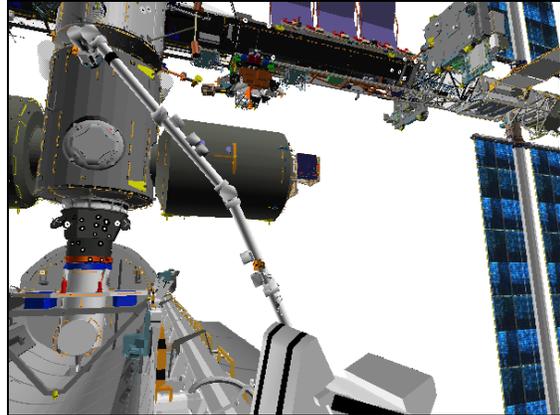


Figure 4.- FI Viewing
(Camera C: +20, +10).

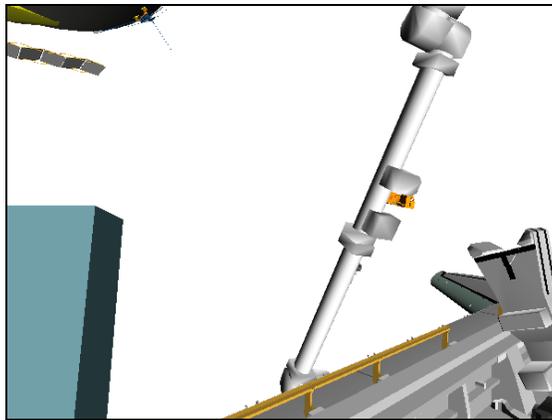


Figure 5.- FI Viewing
(Camera D: -50, 0).

DCP BRAKES SSRMS → OFF (Verify OFF)

√Vernier

PCS MSS: SSRMS:

Enter Mode – Single (Verify blue)

DCP JOINT SELECT → SHOULDER PITCH (Verify SP – Selected on PCS)

THC Perform “-“ Single Joint maneuver to SP: -70.0 (THC down).

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

1.520 MNVR TO EVA 2 START

(RBT FS/ULF5/FIN/SPN)

Page 3 of 7 pages

Verify SSRMS at FI Intermediate Position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-15.0	+100.0	-70.0	+17.0	-58.9	-160.0	+10.0
X	Y	Z	Pitch	Yaw	Roll	
+1851	+880	+1081	-35.8	-78.3	+56.8	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

2. JOINT OCAS TO EVA 2 SETUP (5 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+85, +65)	09: P1 Lower Outboard (+115, +15) Zoom = 20mm	24: Tip Elbow (+15, +5)	Camera C (+20, +10)	Camera D (-50, 0)

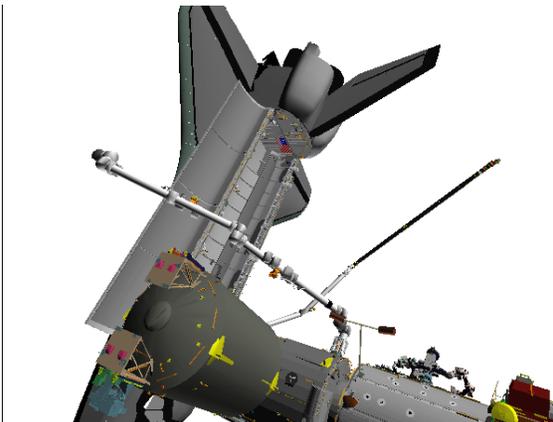


Figure 6.- Intermediate (03: S1 Lower Outboard: +85, +65).

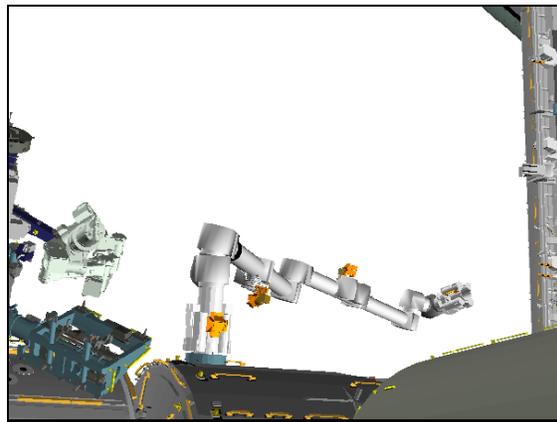


Figure 7.- Intermediate (09: P1 Lower Outboard: +115, +15).

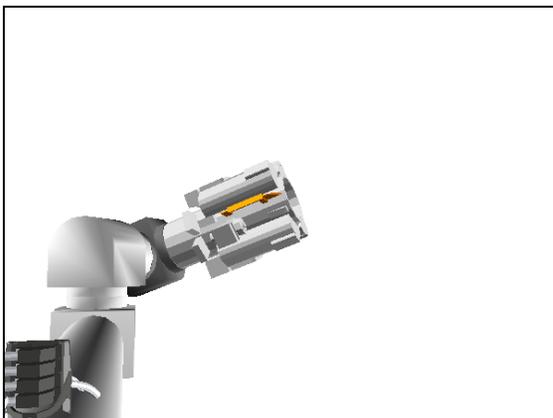


Figure 8.- Intermediate (24: Tip Elbow: +15, +5).

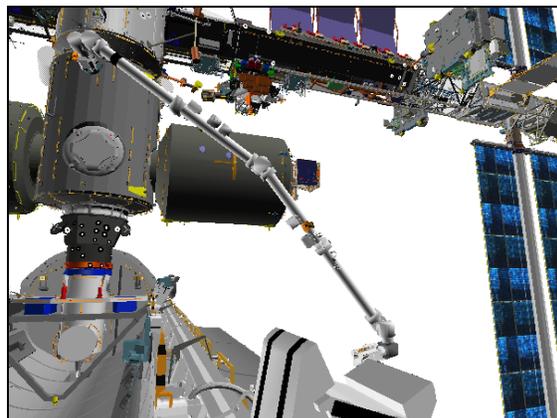


Figure 9.- Intermediate (Camera C: +20, +10).

1.520 MNVR TO EVA 2 START

(RBT FS/ULF5/FIN/SPN)

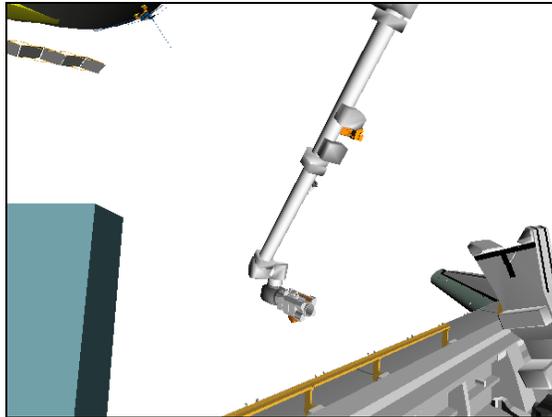


Figure 10.- Intermediate
(Camera D: -50, 0).

PCS

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

Input 'Joint Angles' 'Destination' for EVA 2 Setup position.

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-15.0	+100.0	-70.0	+17.0	-58.9	-160.0	+10.0
TGT	-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9
ERR	-6.0	-53.3	+41.2	-59.3	-28.9	-152.0	+193.9

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

1.520 MNVR TO EVA 2 START

(RBT FS/ULF5/FIN/SPN)

Page 5 of 7 pages

Verify SSRMS at EVA 2 Start Position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1307	+1136	+731	+21.0	+61.2	+130.3	
FOR	Unloaded – LEE Tip, SR Held					
Disp	ISS>ISSACS					

3. SINGLE JOINT MANEUVER TO APFR SETUP POSITION

NOTE

LEE to the Columbus Cargo Platform decreases to 71 cm (28 in), monitor with the Tip Elbow camera.

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+70, +60)	22: Base Elbow (+120, -5)	24: Tip Elbow (+20, 0)	Camera C (+25, +20)	SRMS Elbow (-150, +20)

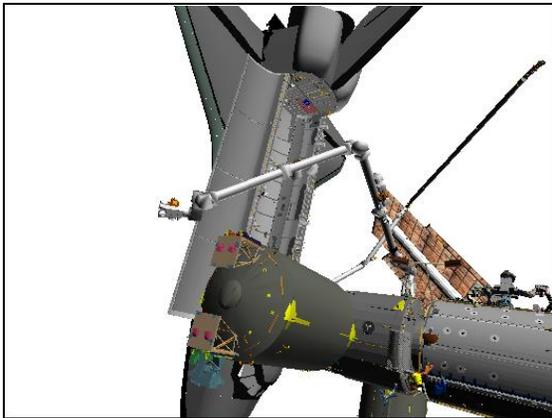


Figure 11.- EVA 2 Setup Position (03: S1 Lower Outboard: +70, +60).

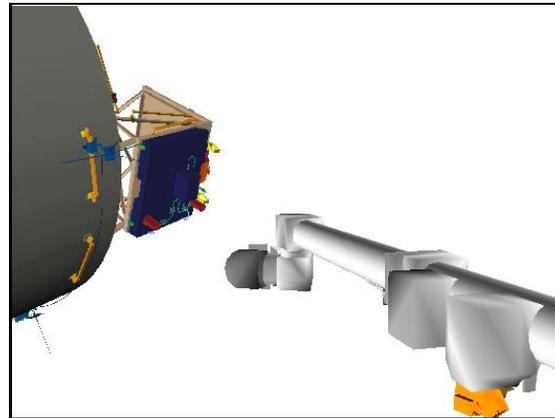


Figure 12.- EVA 2 Setup Position (22: Base Elbow: +120, -5).

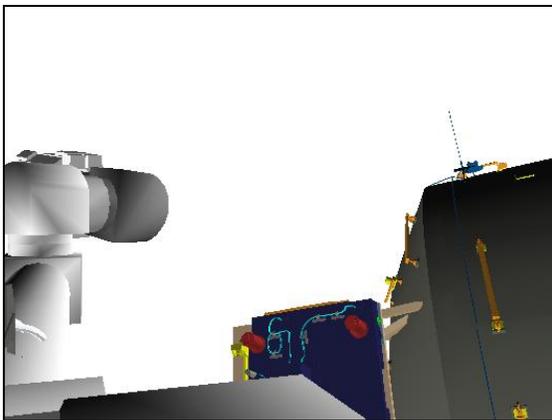


Figure 13.- EVA 2 Setup Position (24: Tip Elbow: +20, 0).

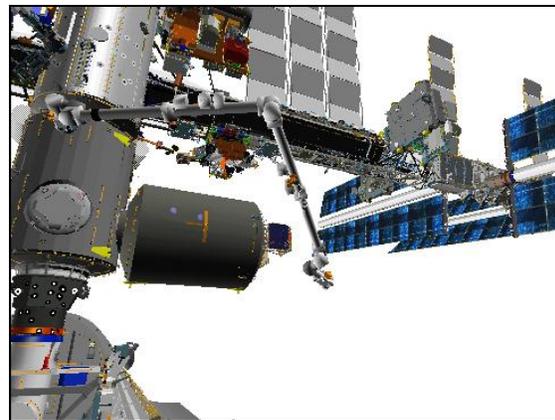


Figure 14.- EVA 2 Setup Position (Camera C: +25, +20).

1.520 MNVR TO EVA 2 START

(RBT FS/ULF5/FIN/SPN)

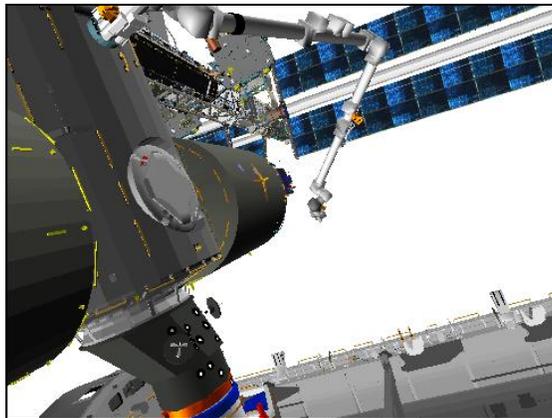


Figure 15.- EVA 2 Setup Position
(SRMS Elbow: -150, +20).

PCS MSS: SSRMS:

Enter Mode – Single (Verify blue)

WARNING
The active joint must be checked on the PCS before initiating motion. Failure to do so may result in movement of the wrong joint.

DCP JOINT SELECT → Wrist Pitch (Verify WP – Selected on PCS)

THC Perform “+” Single Joint maneuver to WP: +47.8 (THC Up).

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

Verify SSRMS at APFR Setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	+47.8	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1275	+950	+705	+58.3	-9.9	+97.1	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

<u>NOTE</u>
Expect the following message when safing is commanded: 'R3Z - MSS OCS SSRMS Prime(Redun) ACU SRT Cat-1 Brk Stat Fail' (SCR 17495)
This message should return to Norm.

1.520 MNVR TO EVA 2 START

(RBT FS/ULF5/FIN/SPN)

Page 7 of 7 pages

DCP

SAFING → SAFE (Verify ON)

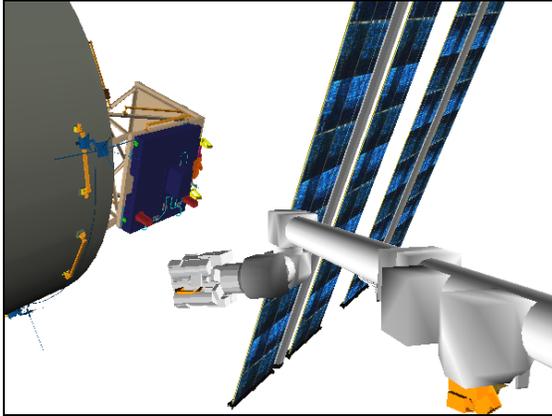


Figure 16.- APFR Setup Position
(22: Base Elbow: +120, -5).



Figure 17.- APFR Setup Position
(Camera C: +25, +20).

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CONTINGENCY

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2.120 SSRMS ELC4 INSTALL TO MCAS

(RBT FS/ULF5/FIN/SPN) Page 1 of 18 pages

NOTE

Callouts in Grey are for Shuttle Crew or MCC-H (when noted.)

1. JOINT OCAS TO INTERMEDIATE POSITION (4 MINUTES)

NOTE

S1 Lower Outboard camera must be pointed to a specific direction in order to maintain 1.5M (5ft) clearance during this maneuver.

DCP

Pan/Tilt S1 Lower Outboard Camera to: +85, -90.

Verify SSRMS at S3LI Pre-Install position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
-17.8	+108.0	-133.9	+30.7	-86.4	+202.2	+224.5
X	Y	Z	Pitch	Yaw	Roll	
-350	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Held					
Disp	S3>Lower Inboard PAS					

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
72(DNLK): Camera B (+50, +30)	13: LAB Stbd Zenith (+30, +60)	47: SPDM Body2 (-60, -40)	Camera C (+30, +30)	SRMS Elbow (-45, +55)

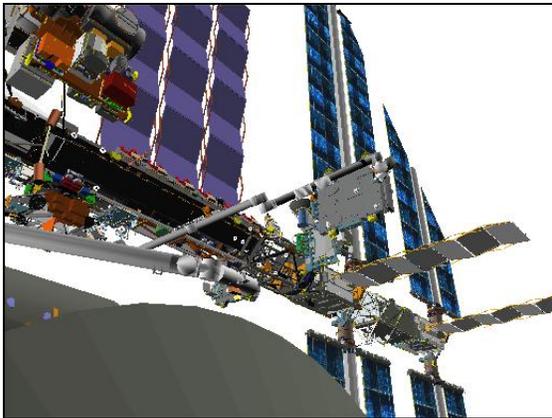


Figure 1.- S3LI Pre-Install Position
(Camera B: +50, +30).

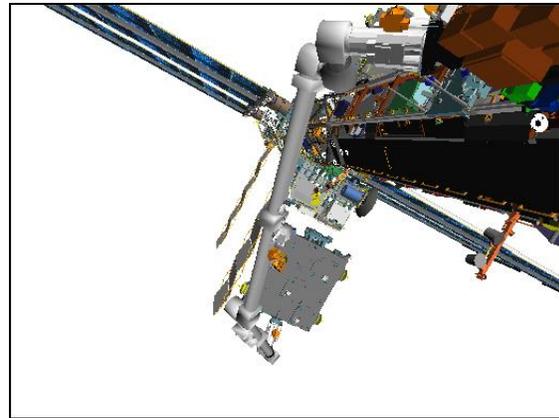


Figure 2.- S3LI Pre-Install Position
(13: LAB Stbd Zenith: +30, +60).

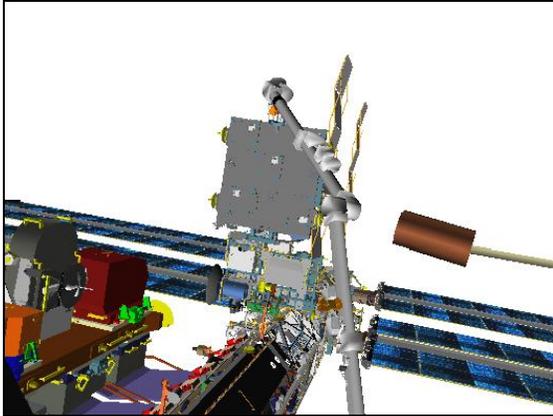


Figure 3.- S3LI Pre-Install Position
 (47: SPDM Body2: -60, -40).

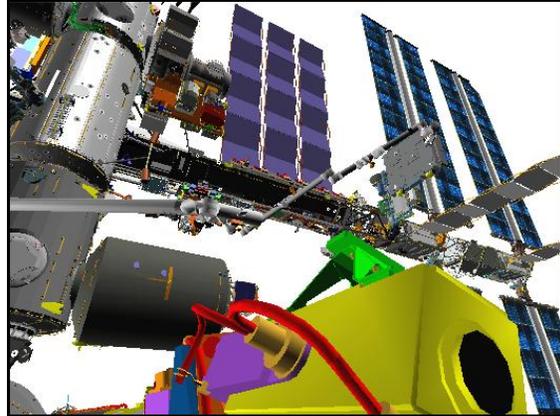


Figure 4.- S3LI Pre-Install Position
 (Camera C: +30, +30).

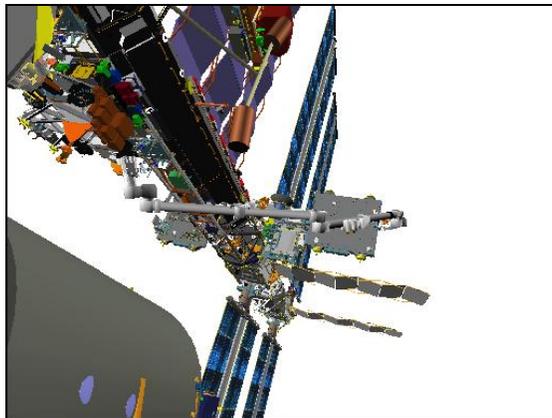


Figure 5.- S3LI Pre-Install Position
 (SRMS Elbow: -45, +55).

 * If using shuttle attitude control
 * Verify in attitude, then DAP: FREE

- DCP BRAKES SSRMS → OFF (Verify OFF)
- RHC RATE → COARSE (Verify Coarse on PCS)
- PCS MSS: SSRMS:
- Enter Mode – Joint OCAS (Verify blue)
-
- pick File ► Contingency ELC4 ► MCAS Intermediate

2.120 SSRMS ELC4 INSTALL TO MCAS

(RBT FS/ULF5/FIN/SPN) Page 3 of 18 pages

Verify 'Joint Angles' 'Destination' for MCAS Intermediate position.

SR	SY	SP	EP	WP	WY	WR
+20.0	+40.0	-110.0	+60.0	-86.0	+200.0	+220.0

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	-17.8	+108.0	-133.9	+30.7	-86.4	+202.2	+224.5
TGT	+20.0	+40.0	-110.0	+60.0	-86.0	+200.0	+220.0
ERR	-37.8	+68.0	-23.9	-29.3	-0.4	+2.2	+4.5

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

Verify SSRMS at MCAS Intermediate position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+20.0	+40.0	-110.0	+60.0	-86.0	+200.0	+220.0
X	Y	Z	Pitch	Yaw	Roll	
-643	+585	+388	-3.8	+38.3	+51.1	
FOR	Loaded – ELC4 Install, SY Held					
Disp	S3>Lower Inboard PAS					

 * If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
 * (ORB OPS, REBOOST/DAP) Steps 1-3

2. JOINT OCAS TO MCAS PRE-INSTALL POSITION (10 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+60, +5)	13: LAB Stbd Zenith (+30, +45)	22: Base Elbow (+105, -10)	Camera C (+30, +30)	SRMS Elbow (-60, +55)

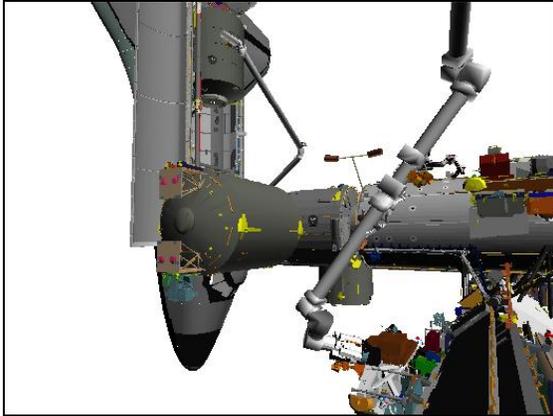


Figure 6.- MCAS Intermediate Position
(03: S1 Lower Outboard: +60, +5).



Figure 7.- MCAS Intermediate Position
(13: LAB Stbd Zenith: +30, +45).

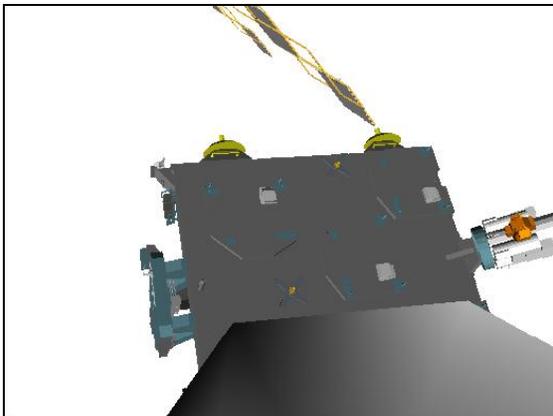


Figure 8.- MCAS Intermediate Position
(22: Base Elbow: +105, -10).

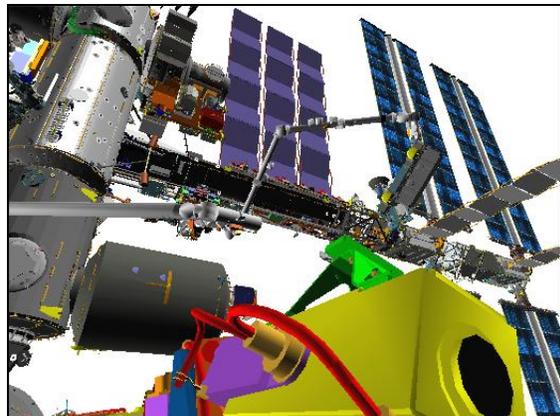


Figure 9.- MCAS Intermediate Position
(Camera C: +30, +30).

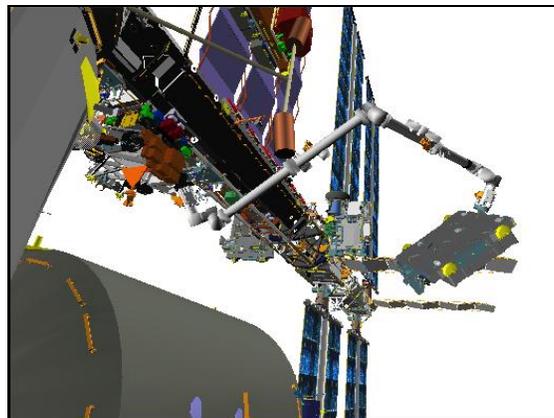


Figure 10.- MCAS Intermediate Position
(SRMS Elbow: -60, +55).

2.120 SSRMS ELC4 INSTALL TO MCAS
 (RBT FS/ULF5/FIN/SPN) Page 5 of 18 pages

PCS MSS: SSRMS: SSRMS

Change Display ► MBS ► MCAS (Verify MBS>MCAS)

SSRMS Joint OCAS

pick File ► Contingency ELC4 ► MCAS Pre-install

Verify 'Joint Angles' 'Destination' for MCAS Pre-Install position.

SR	SY	SP	EP	WP	WY	WR
+14.9	+17.0	+18.7	+100.2	-86.7	+142.7	+142.4

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+20.0	+40.0	-110.0	+60.0	-86.0	+200.0	+220.0
TGT	+14.9	+17.0	+18.7	+100.2	-86.7	+142.7	+142.4
ERR	+5.1	+23.0	-128.7	-40.2	+0.7	+57.3	+77.6

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP AUTO SEQ → PROC

PCS MSS: SSRMS: SSRMS

Verify Posn Hold – orange

Verify SSRMS at Pre-Install position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+14.9	+17.0	+18.7	+100.2	-86.7	+142.7	+142.4
X	Y	Z	Pitch	Yaw	Roll	
-200	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Held					
Disp	MBS>MCAS					

 * If using shuttle attitude control: ROBOTICS ATTITUDE MAINTENANCE
 * (ORB OPS, REBOOST/DAP) Steps 1-3

3. MCAS POWER APPLICATION

NOTE
Expect sporadic ' R4H - MBS MCU MCAS Latch(UMA) Cat-2 Cksum Fail ' Robotics Advisory messages (SCR 22667) while MBS IMCAs are powered.

2.120 SSRMS ELC4 INSTALL TO MCAS

(RBT FS/ULF5/FIN/SPN) Page 6 of 18 pages

PCS MSS: MBS: MSS Safing: MSS Safing

cmd 'MBS' Remove (Verify Not Safed)

MSS: MBS: POA Power: POA Power

cmd 'Prime' Keep-Alive (Verify Keep-Alive) (30s max)

cmd 'Redundant' Keep-Alive (Verify Keep-Alive) (30s max)

Verify a '**Unit_Failed_On**' discrete message has not been annunciated (SCR 23231)

MSS: MBS: Latch: MCAS Latch

Verify 'Active MBS IMCA' – None

Verify 'Power' – Off

MSS: MBS: Latch: Power: MCAS Latch IMCA Power

cmd Enable (Verify – ✓)

cmd Confirm (Verify – ✓)

cmd On (Verify – ✓)

MSS: MBS: Latch: MCAS Latch

Verify 'Active MBS IMCA' – MCAS Latch

Verify Mode – Standby

Verify 'Power' – On

Verify 'Latch' Closed – blank

Verify 'Latch' Open – ✓

Verify RTL 1 – blank

Verify RTL 2 – blank

Verify RTL 3 – blank

MSS: MBS: Latch: Commands ► BIT:

MCAS Latch POST and BIT

Verify all – blank

Verify a MSS Effector Overlay has MCAS data.

(Overlay will open on same monitor as the LEE MSS Effector Overlay).

2.120 SSRMS ELC4 INSTALL TO MCAS
 (RBT FS/ULF5/FIN/SPN) Page 7 of 18 pages

4. ELC4 INSTALL SETUP

Configure Cameras and overlays as required. (EBCS Target Overlay)

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
03: S1 Lower Outboard (+50, -20) 13: LAB Stbd Zenith (+160, +60)	28: EBCS Left	37: MBS Mast (-95, +20) 22: Base Elbow (+50, +10)	Camera C (+15, +25)	SRMS Elbow (-100, +50)

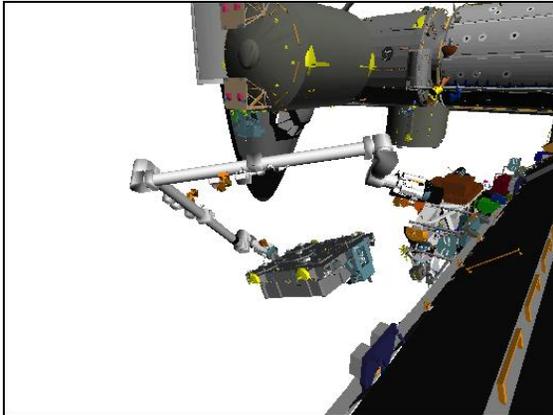


Figure 11.- MCAS Pre-Install Position (03: S1 Lower Outboard: +50, -20).

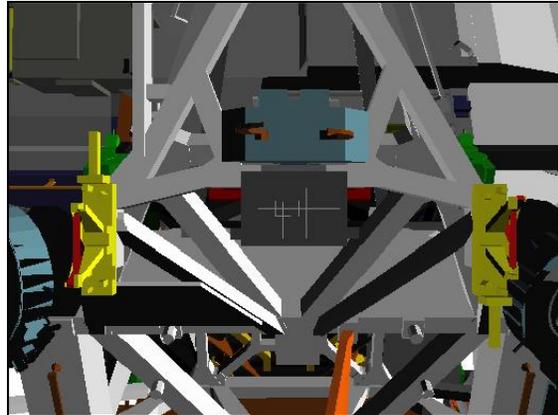


Figure 12.- MCAS Pre-Install Position (28: EBCS Left).

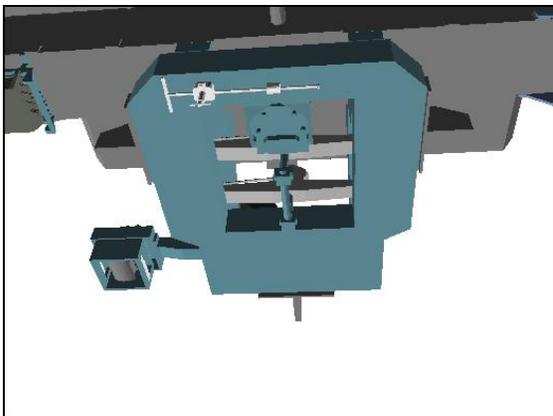


Figure 13.- MCAS Pre-Install Position (37: MBS Mast: -95, +20).

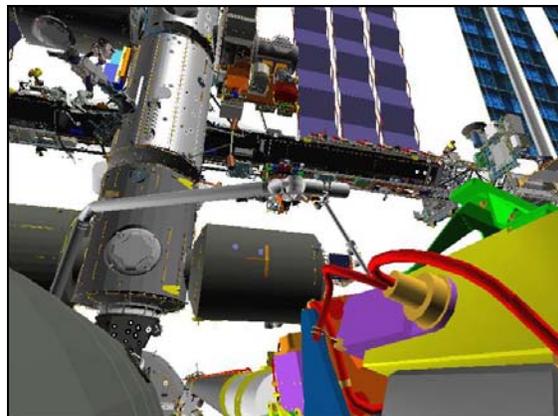


Figure 14.- MCAS Pre-Install Position (Camera C: +15, +25).

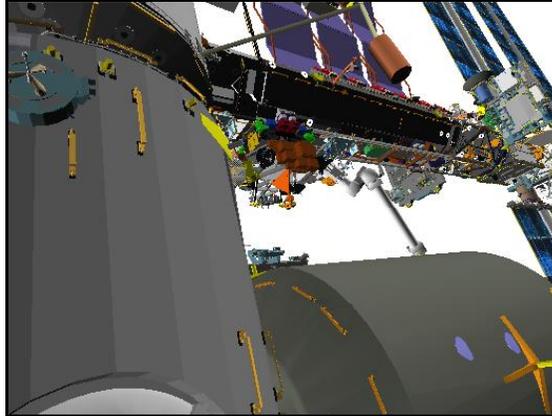


Figure 15.- MCAS Pre-Install Position
 (SRMS Elbow: -100, +50).

PCS MSS: SSRMS:

Verify Command – SSRMS>Internal

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (1.0)

5. ELC-4 INSTALL TO MCAS

5.1 Manual Maneuver to Alignment Position

MCC-H MCG: MCS Configuration: MCS Inhibits:

√ Desat Request – Inh

√ Auto Att Control handover to RS - Inh

On **MCC-H**, "GO for ELC-4 Install to MCAS."

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

2.120 SSRMS ELC4 INSTALL TO MCAS

(RBT FS/ULF5/FIN/SPN) Page 9 of 18 pages

THC/RHC Maneuver ELC4 to Alignment Position (within 5 cm/1 deg)
(THC In, +X)

Locked		SP	EP	WP	WY	WR
SR	SY	+15.5	+111.2	-95.1	+141.9	+144.1
+16.6	+17.0					
X	Y	Z	Pitch	Yaw	Roll	
-90	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Held					
Disp	MBS>MCAS					

THC/RHC Make alignment corrections as needed.

5.2 Manual Maneuver to RTL Position

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.5)

THC/RHC Maneuver ELC4 2cm +X past last RTL indication. (THC In, +X)

Expected ELC4 Ready-to-Latch position.

Locked		SP	EP	WP	WY	WR
SR	SY	+13.8	+119.1	-101.8	+141.1	+145.8
+18.1	+17.0					
X	Y	Z	Pitch	Yaw	Roll	
-6	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Held					
Disp	MBS>MCAS					

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

6. MCAS LATCH OPERATIONS

<u>NOTE</u>
All the MCAS Latch telemetry verifications in this step can be performed on the following 3 displays unless otherwise specified:
MSS: MBS: Latch: MCAS Latch
and
MSS: MBS: Latch: Commands ► Close: MCAS Latch Close Commands
and
MSS: MBS: Latch: Commands ► Initframe Details: MBS IMCA Initframe Details

6.1 Mode to On

MSS: MBS: Latch: Commands ► Close:
MCAS Latch Close Commands

cmd Safing Initframe

Verify 'Command Response' Initframe Received – ✓
Verify 'Command Response' Parameter Checksum Failed – blank
Verify 'Limits' Position Change – High: 0 Rev

PCS

MSS: MBS: Latch: Commands ► Close:
MCAS Latch Close Commands

cmd On

Verify Mode – On

6.2 Phase One Capture

MSS: MBS: Latch: Commands ► Close:
MCAS Latch Close Commands

cmd First Phase

Verify 'Command Response' Parameter Checksum Failed – blank
Verify 'Limits' Position Change – High: 1100 Rev (± 2)

Notify **MCC-H** "Go to send Modified First Stage Capture Init Frame"

<u>NOTE</u>
The following 2 tables are for MCC-H only.

Parameter	Value
Trajectory_Id	3
Stop_On_Ctrlr_Temp	1 – Stop
Stop_On_Electr_Temp	1 – Stop
Stop_On_Incremental_Change_Limit	1 – Stop
Stop_On_Rate_Error_Limit	0 – No_Stop
Stop_On_Torque_Limit	0 – No_Stop
Stop_On_Closed6	0 – No_Stop
Stop_On_Closed5	0 – No_Stop
Stop_On_Closed4	0 – No_Stop
Stop_On_Closed3	0 – No_Stop
Stop_On_Closed2	1 – Stop
Stop_On_Closed1	0 – No_Stop
Torque_Limit	0.757 N-m
Velocity_Limit	450 RPM
Accel_Decel_Time	2 s
Incremental_Change_Limit_High	920 rev
Incremental_Change_Limit_Low	0 rev
Ctrlr_Temp_Limit	1500 mV
Overspeed_Nocheck_Bit	0 – Not_Enabled
Clutch_Enable_Bit	1 – Enabled
Limit_Switch_Error_Bit	0 – Not_Enabled
Checksum_Remainder	23397

Ops Name	CIPUI
MBS_MCAS_IMCA_New_Partial_Initframe_Phase1_920	CMRM96IM0346K:1

On **MCC-H**, “Go to continue with First Stage Capture”

Verify ‘Command Response’ Parameter Checksum Failed – blank
Verify ‘Limits’ Position Change – High: 920 Rev (± 2)

MSS: MBS: Latch: Commands ► Close:

cmd Actuate

Verify ‘Mode’ – Enabled
Verify ‘Motor Status’ Position – incrementing
Verify ‘Mode’ – On (~2 minutes)
Verify ‘Motor Status’ Position: 920 Rev (± 2)
Verify ‘Latch’ Closed – blank
Verify ‘Latch’ Open – blank

6.3 Phase Two Capture

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

2.120 SSRMS ELC4 INSTALL TO MCAS

(RBT FS/ULF5/FIN/SPN) Page 12 of 18 pages

PCS

MSS: SSRMS: SSRMS

Verify all joints – Limped

MSS: MBS: Latch: Commands ► Close:

MCAS Latch Close Commands

cmd Second Phase

Verify 'Command Response' Parameter Checksum failed – blank

Verify 'Limits' Position Change – High: 1650 Rev (± 2)

MSS: MBS: Latch: Commands ► Close:

MCAS Latch Close Commands

cmd Actuate

Verify 'Mode' – Enabled

Verify 'Motor Status' Position – incrementing

Verify 'Mode' – On (~1 minute, 15 seconds)

Verify 'Motor Status' Position: 1650 Rev (± 2)

Verify 'Latch' Closed – blank

Verify 'Latch' Open – blank

6.4 Phase Three Capture

MSS: MBS: Latch: Commands ► Close:

MCAS Latch Close Commands

cmd Third Phase

Verify 'Command Response' Parameter Checksum Failed – blank

Verify 'Limits' Position Change – High: 3110 Rev (± 2)

MSS: MBS: Latch: Commands ► Close:

MCAS Latch Close Commands

cmd Actuate

Verify 'Mode' – Enabled

Verify 'Motor Status' Position – incrementing

Verify 'Mode' – On (~3 minutes, 20 seconds)

Verify 'Motor Status' Position: 3110 Rev (± 2)

Verify 'Latch' Closed – ✓

Verify 'Latch' Open – blank

2.120 SSRMS ELC4 INSTALL TO MCAS

(RBT FS/ULF5/FIN/SPN) Page 13 of 18 pages

6.5 MCAS Latch Powerdown

MSS: MBS: Latch: Commands ► Close:

MCAS Latch Close Commands

cmd Standby

Verify 'Mode' – Standby

MSS: MBS: Latch: Power: MCAS Latch IMCA Power

cmd Off (Verify Off – √)

Verify 'Active MBS IMCA' – None

Verify 'Power' – Off

MSS: SSRMS: Limp: SSRMS Limp

cmd None Limp (Verify Standby – blue)

MSS: SSRMS: Power: SSRMS Power

cmd 'Payload' Prime(Redundant) Off (Verify two Off)

7. MCAS UMBILICAL OPERATIONS

NOTE

All the MCAS UMA telemetry verifications in this step can be performed on the following displays unless otherwise specified:

MSS: MBS: UMA: MCAS UMA

and

MSS: MBS: UMA: Command ► Mate: Initframe Details:

MBS IMCA Initframe Details

7.1 UMA Power Application

MSS: MBS: UMA: Power: MCAS UMA IMCA Power

cmd Enable (Verify – √)

cmd Confirm (Verify – √)

cmd On (Verify – √)

Verify 'Power' – On

Verify 'Active MBS IMCA' – MCAS UMA

Verify 'Mode' – Standby

Verify 'Mated' – blank

Verify 'Demated' – √

MSS: MBS: UMA: Commands ► BIT:

MCAS UMA Post and BIT

Verify all – blank

2.120 SSRMS ELC4 INSTALL TO MCAS

(RBT FS/ULF5/FIN/SPN) Page 14 of 18 pages

7.2 Mode to On

MSS: MBS: UMA: Commands ► Mate:

MCAS UMA Mate Commands

cmd Safing Initframe

Verify 'Initframe Received' – √

Verify 'Parameter Checksum Failed' – blank

Verify 'Limits' 'Position Change – High': 0

MSS: MBS: UMA: Commands ► Mate:

MCAS UMA Mate Commands

cmd On

Verify 'Mode' – On

7.3 First Stage Mate

MSS: MBS: UMA: Commands ► Mate:

MCAS UMA Mate Commands

cmd First Phase

Verify 'Command Response' 'Parameter Checksum Failed' – blank

Verify 'Limits' 'Position Change – High': -450

MSS: MBS: UMA: Commands ► Mate:

MCAS UMA Mate Commands

cmd Actuate

Verify 'Mode' – Enabled

Verify 'Motor Status' 'Position' – decrementing

Verify 'Mode' – On (~1 minute)

Verify 'Motor Status' 'Position': -450 ± 2

Verify 'Mated' – blank

Verify 'Demated' – blank

7.4 Second Stage Mate

MSS: MBS: UMA: Commands ► Mate:

MCAS UMA Mate Commands

cmd Second Phase

Verify 'Command Response' 'Parameter Checksum Failed' – blank

Verify 'Limits' 'Position Change – High': -516

2.120 SSRMS ELC4 INSTALL TO MCAS

(RBT FS/ULF5/FIN/SPN) Page 15 of 18 pages

MSS: MBS: UMA: Commands ► Mate:

MCAS UMA Mate Commands

cmd Actuate

Verify 'Mode' – Enabled
 Verify 'Motor Status' 'Position' – decrementing
 Verify 'Mode' – On (~35 seconds)
 Verify 'Latch Status' – Switch 1
 Verify 'Motor Status' 'Position': -505 ± 5
 Verify 'Mated' – \checkmark
 Verify 'Demated' – blank

7.5 UMA Powerdown

MSS: MBS: UMA: Commands ► Mate:

MCAS UMA Mate Commands

cmd Standby

Verify 'Mode' – Standby

MSS: MBS: UMA: Power: MCAS UMA IMCA Power

cmd Off (Verify – \checkmark)

Expected ELC4 Install Position.

SR	SY	SP	EP	WP	WY	WR
+18.3	+17.0	+13.7	+119.6	-102.3	+141.0	+145.9
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Held					
Disp	MBS>MCAS					

```
*****
* If using shuttle attitude control: ROBOTICS ATTITUDE
* MAINTENANCE (ORB OPS, REBOOST/DAP) Steps 1-2.
*****
```

MCC-H

If Desat Request was inhibited for prior operations:
 | MCG: MCS Configuration: MCS Inhibits: MCS Inhibits
 | **cmd** Desat Request Enable – (Verify – Ena)

8. RELEASING ELC4

8.1 Setup

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3
03: S1 Lower Outboard (+50, -20)	25: Tip LEE (Zoom Full Out)	22: Base Elbow (+70, -5)

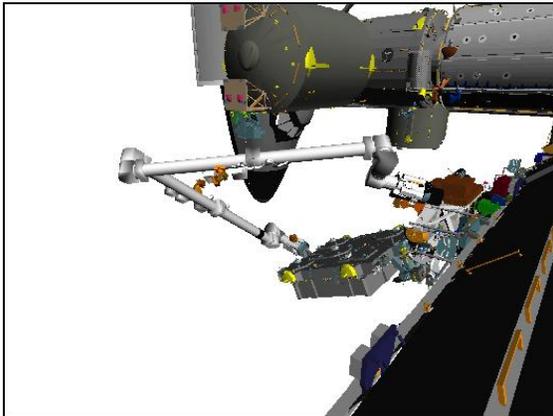


Figure 16.- ELC4 Installed on MCAS (03: S1 Lower Outboard: +50, -20).

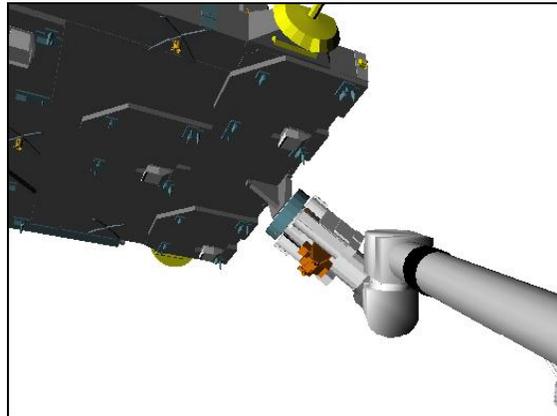


Figure 17.- ELC4 Installed on MCAS (22: Base Elbow: +70, -5).

Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

Change Display ► MBS ► ELC4 PVGF (Verify MBS>ELC4 PVGF)

Verify Command – SSRMS>Internal

√Vernier

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As Desired (0.5)

PCS

8.2 Limping SSRMS

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

8.3 PVGF Release

Verify with **MCC-H** - Payload and PDGF power inhibits have been confirmed

2.120 SSRMS ELC4 INSTALL TO MCAS

(RBT FS/ULF5/FIN/SPN) Page 17 of 18 pages

PCS

MSS: SSRMS: Tip LEE:

cmd Release ► Automatic ► Slow (Verify Speed – Slow)

Verify '**Confirm or Terminate**' prompt.

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Release

RHC

TRIGGER → press (momentarily)

PCS

Verify 'Umbilical' Demate – blue (10 s max)

Verify 'Latch' Unlatch – blue (65 s max)

Verify 'Carriage' Derigidize – blue (90 s max)

Verify 'Snare' Open – blue (12 s max)

Verify 'Carriage' Extend – blue (90 s max)

Verify Unloaded Parameters – √

Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held

8.4 Backing Off PVGF

MSS: SSRMS: Limp:

cmd None Limp (Verify Standby – blue)

√Vernier

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC

Maneuver to Modified Backoff position (within 5 cm/1 deg). (THC Out, -X)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+9.1	+17.0	+12.3	+105.4	-83.8	+145.7	+136.7
X	Y	Z	Pitch	Yaw	Roll	
-185	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Held					
Disp	MBS>ELC4 PVGF					

NOTE Expect the following message when safing is commanded: 'R3Z - MSS OCS SSRMS Prime(Redun) ACU SRT Cat-1 Brk Stat Fail' (SCR 17495) This message should return to Norm.

DCP SAFING → SAFE (Verify ON)

8.5 SRMS Maneuver to OBSS Pre-Grapple
Notify **SRMS Operator**, "SRMS is GO for Maneuver to OBSS Handoff Pre-Grapple."
(PDRS Operations Checklist: ELC4 Nominal: MNVR to OBSS Handoff Pre-Grapple: Page FS 1-12, Step 1)

Configure Cameras as required for SRMS Operator.

Monitor 2
09: P1 Lower Outboard (+120, +20)

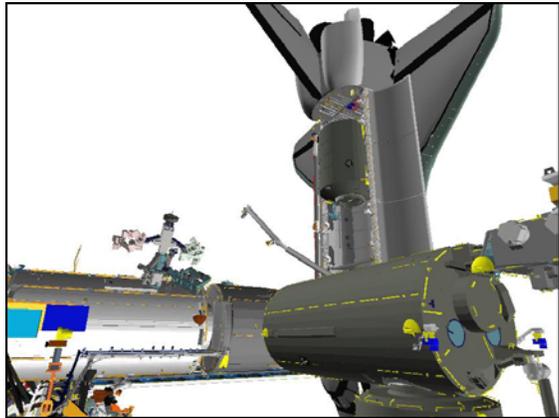


Figure 18.- SRMS ELC4 Backoff
(09: P1 Lower Outboard: +120, +20).

9. ELC-4 POWER APPLICATION

PCS MSS: MBS: MCAS P/L Power:

MCAS Payload Power

cmd Prime On (Verify – On)
cmd Redundant On (Verify – On)

2.310 SSRMS PMM INSTALL TO NODE 2 NADIR

(RBT FS/ULF5/FIN/SPN) Page 1 of 11 pages

1. JOINT OCAS TO INTERMEDIATE 1 (7 MINUTES)

Verify SSRMS at PMM Node 1 nadir pre-install position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+90.9	+9.9	-17.6	-98.3	-153.1	-220.9	-30.8
X	Y	Z	Pitch	Yaw	Roll	
+252	+1	0	0.0	0.0	0.0	
FOR	Loaded – PMM CBCS Mate, SY Held					
Disp	Node1>PMM Mate CBCS					

Change Display ► Node2 ► PMM Mate CBCS (Verify Node2>PMM Mate CBCS)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
09: P1 Lower Outboard (+95, +25)	13: LAB Stbd Zenith (+40, -40)	03: S1 Lower Outboard (+120, +45)	SRMS Elbow (-170,+70)	Camera C (0, +55)

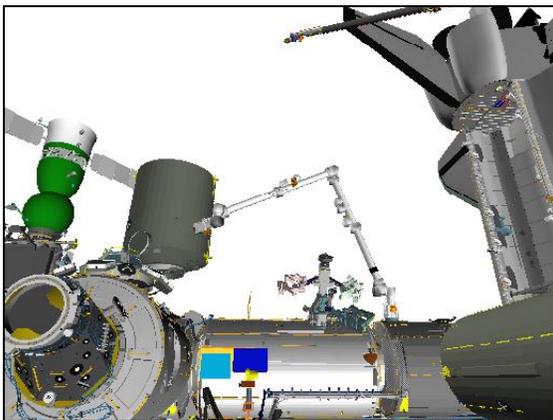


Figure 1.- PMM Node 1 Pre-Install Position (09: P1 Lower Outboard: +95, +25).

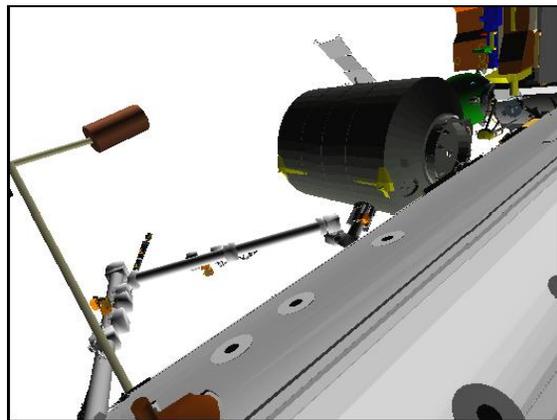


Figure 2.- PMM Node 1 Pre-Install Position (13: LAB Stbd Zenith: +40, -40).



Figure 3.- PMM Node 1 Pre-Install Position (03: S1 Lower Outboard: +120, +45).

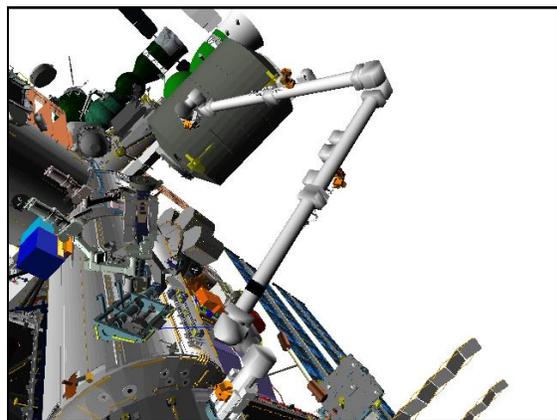


Figure 4.- PMM Node 1 Pre-Install Position (SRMS Elbow: -170, +70).

2.310 SSRMS PMM INSTALL TO NODE 2 NADIR

(RBT FS/ULF5/FIN/SPN) Page 2 of 11 pages

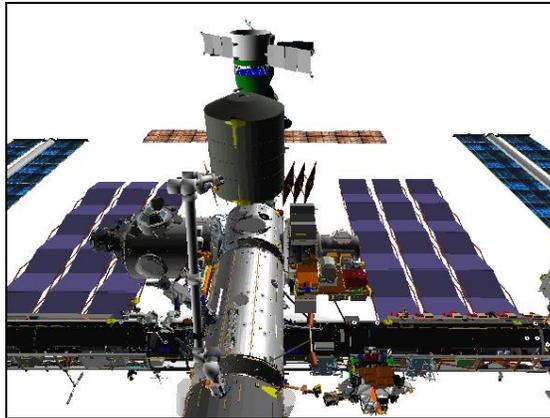


Figure 5.- PMM Node 1 Pre-Install Position
(Camera C: 0, +55).

```
*****
* If using shuttle attitude control
* Verify in attitude, then DAP: FREE
*****
```

DCP BRAKES SSRMS → OFF (Verify OFF)

RHC RATE → COARSE (Verify Coarse on PCS)

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► Contingency PMM ► Node 2 Intermed 1

Verify 'Joint Angles' 'Destination' for Intermediate 1 position.

SR	SY	SP	EP	WP	WY	WR
+95.0	+25.0	+5.0	-80.0	-153.1	-220.9	-30.8

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+90.9	+9.9	-17.6	-98.3	-153.1	-220.9	-30.8
TGT	+95.0	+25.0	+5.0	-80.0	-153.1	-220.9	-30.8
ERR	-4.1	-15.1	-22.6	-18.3	0.0	0.0	0.0

PCS **cmd** Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP AUTO SEQ → PROC

2.310 SSRMS PMM INSTALL TO NODE 2 NADIR

(RBT FS/ULF5/FIN/SPN) Page 3 of 11 pages

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

SR	SY	SP	EP	WP	WY	WR
+95.0	+25.0	+5.0	-80.0	-153.1	-220.9	-30.8

2. JOINT OCAS TO PMM INTERMEDIATE 2 POSITION (20 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
09: P1 Lower Outboard (+95, +25)	13: LAB Stbd Zenith (+30, -30)	03: S1 Lower Outboard (+120, +65)	SRMS Elbow (-135,+70)	Camera C (0, +55)

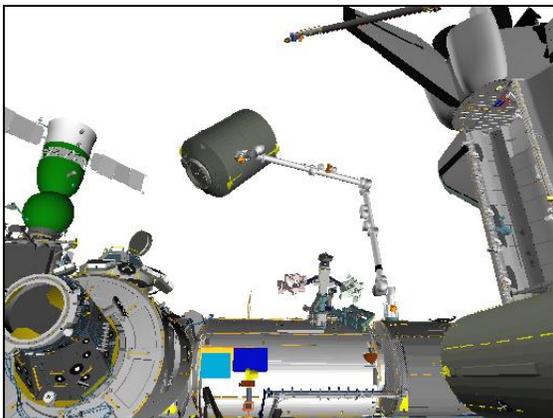


Figure 6.- PMM Intermediate 1 Position
(09: P1 Lower Outboard: +95, +25).

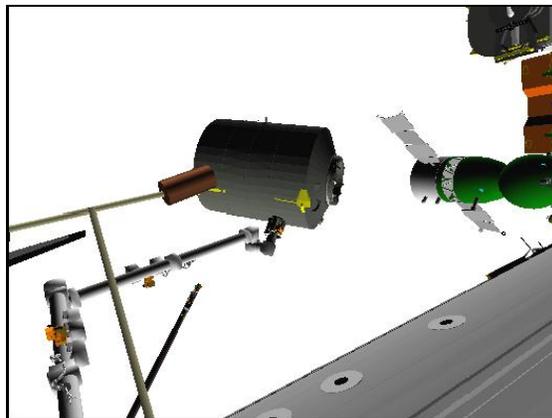


Figure 7.- PMM Intermediate 1 Position
(13: LAB Stbd Zenith: +30, -30).

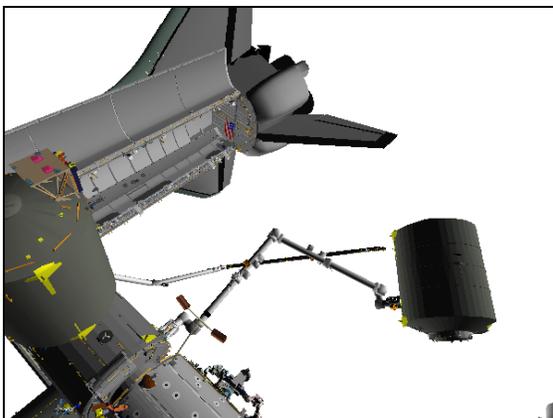


Figure 8.- PMM Intermediate 1 Position
(03: S1 Lower Outboard: +120, +65).

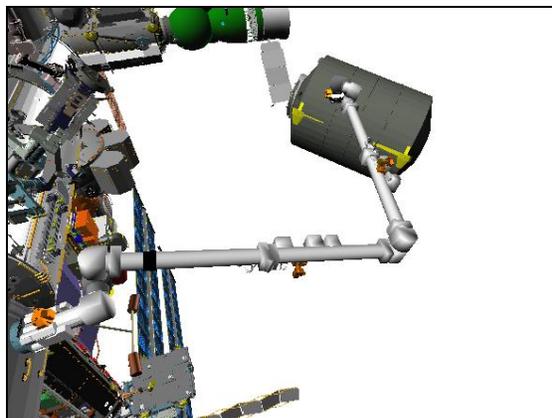


Figure 9.- PMM Intermediate 1 Position
(SRMS Elbow: -135, +70).

2.310 SSRMS PMM INSTALL TO NODE 2 NADIR

(RBT FS/ULF5/FIN/SPN) Page 4 of 11 pages

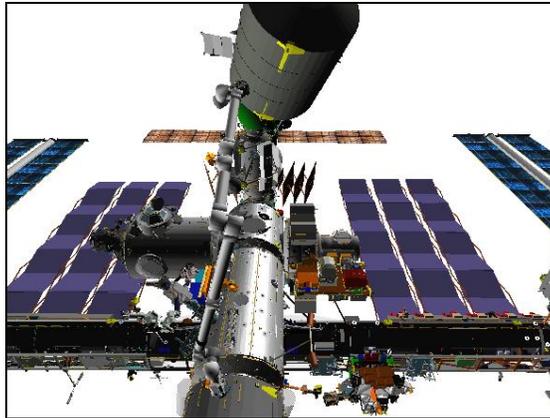


Figure 10.- PMM Intermediate 1 Position
(Camera C: 0, +55).

NOTE

Expect singularity warning when $-15 < EP < +15$.

√Coarse

SSRMS Joint OCAS

pick File ► Contingency PMM ► Node 2 Intermed 2

Verify 'Joint Angles' 'Destination' for Intermediate 2 position.

SR	SY	SP	EP	WP	WY	WR
+110.3	+25.0	-45.0	+80.0	-75.0	-220.9	+20.0

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+95.0	+25.0	+5.0	-80.0	-153.1	-220.9	-30.8
TGT	+110.3	+25.0	-45.0	+80.0	-75.0	-220.9	+20.0
ERR	-15.3	0.0	+50.0	-160.0	-78.1	0.0	-50.8

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

SR	SY	SP	EP	WP	WY	WR
+110.3	+25.0	-45.0	+80.0	-75.0	-220.9	+20.0

2.310 SSRMS PMM INSTALL TO NODE 2 NADIR

(RBT FS/ULF5/FIN/SPN) Page 5 of 11 pages

3. JOINT OCAS TO PMM NODE 2 PRE-INSTALL POSITION (11 MINUTES)

Configure Cameras and overlays as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON 1)	SSC R (DTV)
09: P1 Lower Outboard (+115, +25)	13: LAB Stbd Zenith (-10, -30)	03: S1 Lower Outboard (+100, +65)	SRMS Elbow (-105, +55)	Camera B (+35, +50)

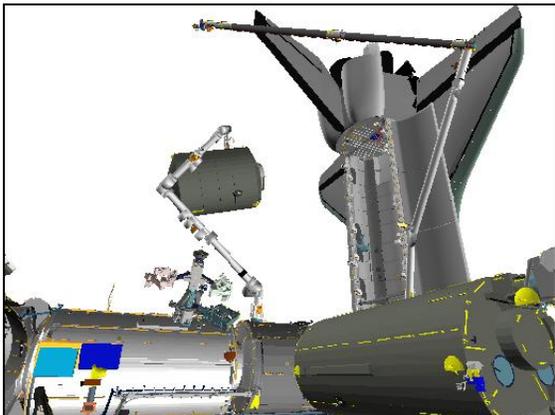


Figure 11.- PMM Intermediate 2 Position (09: P1 Lower Outboard: +115, +25).

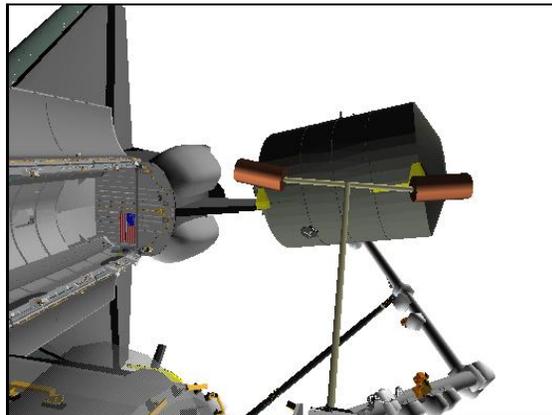


Figure 12.- PMM Intermediate 2 Position (13: LAB Stbd Zenith: -10, -30).



Figure 13.- PMM Intermediate 2 Position (03: S1 Lower Outboard: +100, +65).



Figure 14.- PMM Intermediate 2 Position (SRMS Elbow: -105, +55).

2.310 SSRMS PMM INSTALL TO NODE 2 NADIR

(RBT FS/ULF5/FIN/SPN) Page 6 of 11 pages

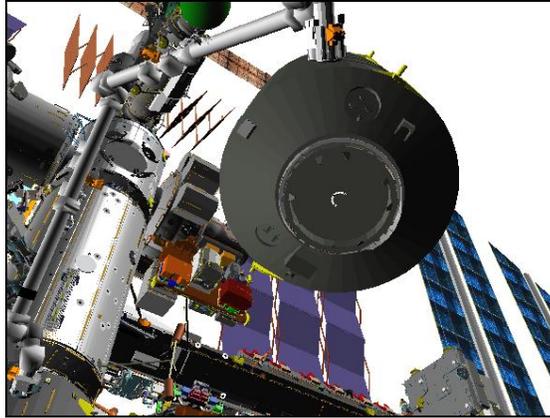


Figure 15.- PMM Intermediate 2 Position
(Camera B: +35, +50).

√Coarse

SSRMS Joint OCAS

pick File ► Contingency PMM ► Node 2 Pre-Install

Verify 'Joint Angles' 'Destination' for Pre-Install position.

SR	SY	SP	EP	WP	WY	WR
+110.3	-29.4	-9.2	+120.1	-66.6	-224.5	+29.5

cmd Load (Verify Sequence Status – Confirm or Cancel)

MON

Verify joint angles and errors are correct on Joint Angle Position overlay.

	SR	SY	SP	EP	WP	WY	WR
(current)	+110.3	+25.0	-45.0	+80.0	-75.0	-220.9	+20.0
TGT	+110.3	-29.4	-9.2	+120.1	-66.6	-224.5	+29.5
ERR	0.0	+54.4	-35.8	-40.1	-8.4	+3.6	-9.5

PCS

cmd Confirm (Verify Sequence Status – Auto Seq sw - Hot)

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS: SSRMS

Verify Posn Hold – orange

Verify SSRMS at PMM Node 2 Pre-Install position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+110.3	-29.4	-9.2	+120.1	-66.6	-224.5	+29.5
X	Y	Z	Pitch	Yaw	Roll	
+200	0	0	0.0	0.0	0.0	
FOR	Loaded – PMM CBCS Mate, SY Held					
Disp	Node2>PMM Mate CBCS					

2.310 SSRMS PMM INSTALL TO NODE 2 NADIR

(RBT FS/ULF5/FIN/SPN) Page 7 of 11 pages

4. MANEUVERING PMM TO READY-TO-LATCH POSITION

NOTE

Clearance between the Fwd Stdb PMM Trunnion Pin to SSRMS base LEE decreases to 53cm (21in) at RTLs. Monitor with Base Elbow Camera or OBSS ITVC.

Verify CBCS camera is setup on Node 2 nadir. (Tail Aft)

Configure cameras and CBCS PMM overlay as required.

Monitor 1	Monitor 2	Monitor 3	SSC L (MON1)	SSC R (DTV)
09: P1 Lower Outboard (+120, +20)	15: CBCS	22: Base Elbow (+35, -5)	SRMS Elbow (-155, +30)	OBSS ITVC (+80, -45)

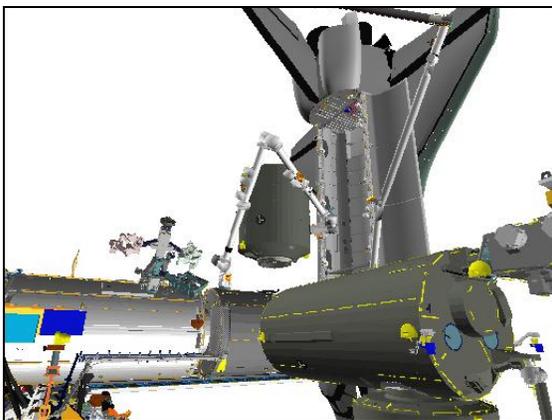


Figure 16.- Node 2 Pre-Install Position (09: P1 Lower Outboard: +120, +20).

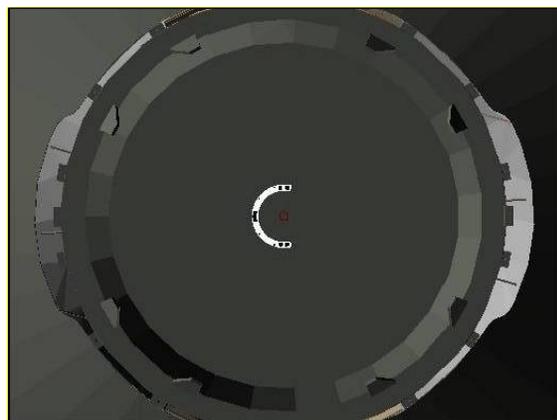


Figure 17.- Node 2 Pre-Install Position (15: CBCS).



Figure 18.- Node 2 Pre-Install Position (22: Base Elbow: +35, -5).

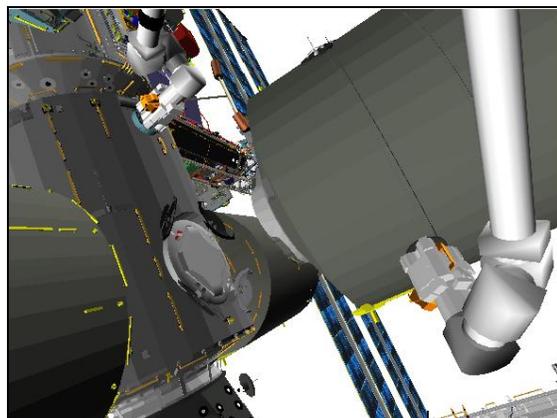


Figure 19.- Node 2 Pre-Install Position (SRMS Elbow: -155, +30).

2.310 SSRMS PMM INSTALL TO NODE 2 NADIR

(RBT FS/ULF5/FIN/SPN) Page 8 of 11 pages

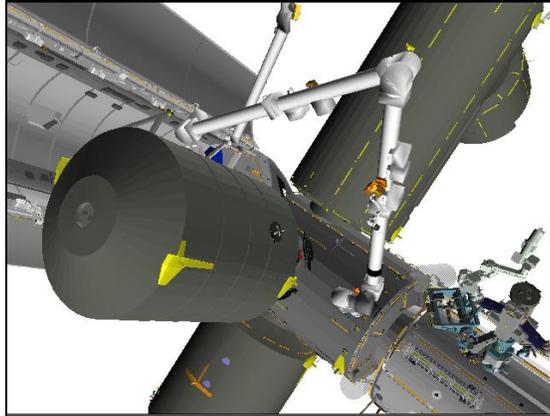


Figure 20.- Node 2 Pre-Install Position
(OBSS ITVC: +80, -45).

CBM-Operator Verify {1.505 NODE 1 CBM VERIFY PRE-MATE STATUS}, all (SODF: S&M: NOMINAL: CBM), completed.

MCC-H MCG: MCS Configuration: MCS Inhibits: MCS Inhibits
√ Desat Request – Inh
√ Auto Att Control handover to RS - Inh

On **CBM Operator** and **MCC-H**, “GO for maneuver to Ready-to-Latch position.”

PCS NODE2: S&M: Nadir CBM RTL Details

Monitor CBM RTLs using PCS.

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS: Rate: SSRMS Rate

Set ‘Scale’ ‘Vernier’ Rate Scale: As Desired (0.6)

MSS: SSRMS: SSRMS

Verify Command – SSRMS>Internal

2.310 SSRMS PMM INSTALL TO NODE 2 NADIR

(RBT FS/ULF5/FIN/SPN) Page 9 of 11 pages

NOTE

Ensure PMM is fully aligned before FOR reaches X = 30cm.

√**MCC-H** before applying any HC input other than X (THC In/Out) after passing X=30cm.

Once all 4 RTL indications are annunciated, maintain -X THC input for 3 seconds, then ramp out.

√**MCC-H** before applying any HC input other than X (THC In/Out) to gain all 4 RTLs.

√**MCC-H** before moving in past X=7cm.

PCS

MSS: SSRMS:

Enter Mode – Manual (Verify – blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

THC/RHC

Maneuver PMM to Ready-To-Latch position until RTL (four) – green (THC Out, -X) (Fly Red to Green)

	Locked					
SR	SY	SP	EP	WP	WY	WR
+96.4	-29.4	+7.1	+123.8	-73.3	-215.0	+19.5
X	Y	Z	Pitch	Yaw	Roll	
+7	0	0	0.0	0.0	0.0	
FOR	Loaded – PMM CBCS Mate, SY Held					
Disp	Node2>PMM Mate CBCS					

PCS

MSS: SSRMS:

Verify Posn Hold – orange

NODE2: S&M: Nadir CBM

Verify RTL (four) – green

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

Notify **CBM operator**, “Maneuver to RTL complete, GO for First Stage Capture”.

2.310 SSRMS PMM INSTALL TO NODE 2 NADIR

(RBT FS/ULF5/FIN/SPN) Page 10 of 11 pages

5. SSRMS LIMPING

On **CBM operator**, "GO for SSRMS mode to limp."

NOTE

Following SSRMS Mode to Limp, RTL indication may be lost due to RTL spring forces. RTL indication is not required prior to execution of Second Stage Capture.

PCS

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

WARNING

If SSRMS fails to brakes-on from limp mode, continuation of Second Stage Capture may cause structural failure of SSRMS or primary structure. If CBM stops unexpectedly (and Cmd Code changes to 'Stop') or SSRMS safes during Second Stage Capture, **√MCC-H** before proceeding.

Notify **CBM operator**, "SSRMS mode to limp complete, GO for Second Stage Capture."

6. SSRMS SAFING

On **CBM operator**, "GO for SSRMS Brakes ON/Safing, can ungrapple element per timeline."

NOTE

Expect the following message when safing is commanded:
'R3Z - MSS OCS SSRMS Prime(Redun) ACU SRT Cat-1 Brk Stat Fail' (SCR 17495)

This message should return to Norm.

DCP

SAFING → SAFE (Verify ON)

MSS: SSRMS:

Expected PMM Install position.

SR	SY	SP	EP	WP	WY	WR
+95.9	-29.4	+7.8	+123.8	-73.7	-214.6	+19.2
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – PMM CBCS Mate, SY Held					
Disp	Node2>PMM Mate CBCS					

2.310 SSRMS PMM INSTALL TO NODE 2 NADIR

(RBT FS/ULF5/FIN/SPN) Page 11 of 11 pages

MCC-H

If Desat Request was inhibited for prior operations:

| MCG: MCS Configuration: MCS Inhibits: **MCS Inhibits**

| **cmd** Desat Request Enable – (Verify – Ena)

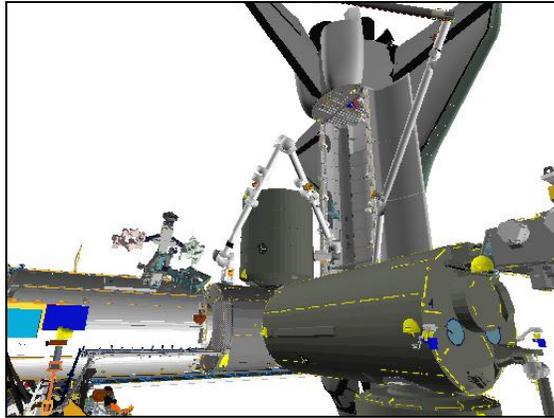


Figure 21.- PMM Installed on Node 2 Nadir
(09: P1 Lower Outboard: +120, +20).

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2.666 CBM LATCH STALL RECOVERY

(RBT FS/ULF5/FIN)

Page 1 of 1 pages

1. SSRMS SAFING AND BRAKES STATUS

On **CBM Operator**, "GO to perform CBM Latch Stall Recovery."

PCS MSS: SSRMS:

√MSS Safing – Not Safed

DCP √BRAKES SSRMS – OFF

2. SSRMS MODE ENTRY

PCS If Limp – blue

 MSS: SSRMS: Limp:

cmd None Limp (Verify Standby – blue)

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

3. SSRMS SETUP

MSS: SSRMS:

√Command – SSRMS>Internal

√Vernier

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 0.5 (Verify 0.5)

4. CBM MATING

THC Apply Full -X deflection (THC pull) for 5 seconds

PCS MSS: SSRMS:

Verify Posn Hold – orange

Enter Mode – Standby (Verify blue)

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

Notify **CBM Operator**, "GO to re-attempt Second Stage Capture."

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REFERENCE

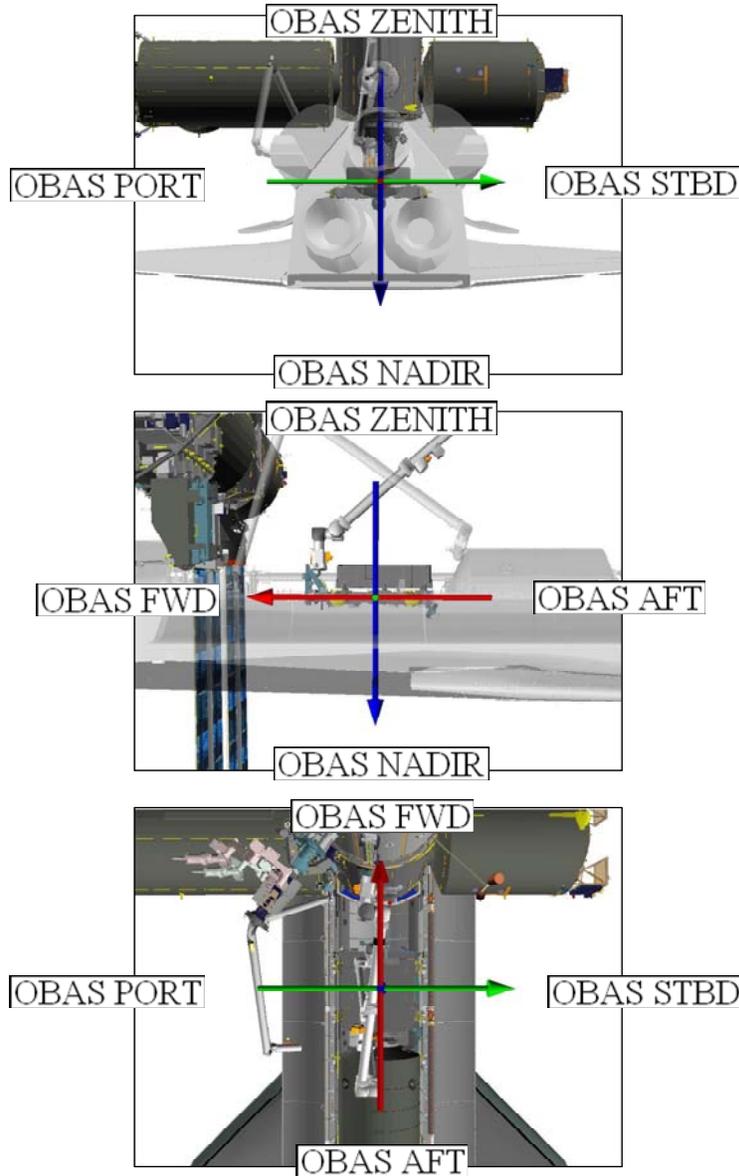
REFERENCE

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3.110 ELC4 UNBERTH - FOR AND DISPLAY

(RBT FS/ULF5/FIN)

Page 1 of 1 page



FOR: ELC4 Unberth

Display: Orbiter>ELC4 Unberth

Command: ISS>OBAS

Location: Center of rectangle formed by the 4 trunnion pins.

Orientation: matches the following when ELC4 fully berthed in Payload Bay

$$+X = -Z_{ISSACS}, +Y = +Y_{ISSACS}, +Z = +X_{ISSACS}$$

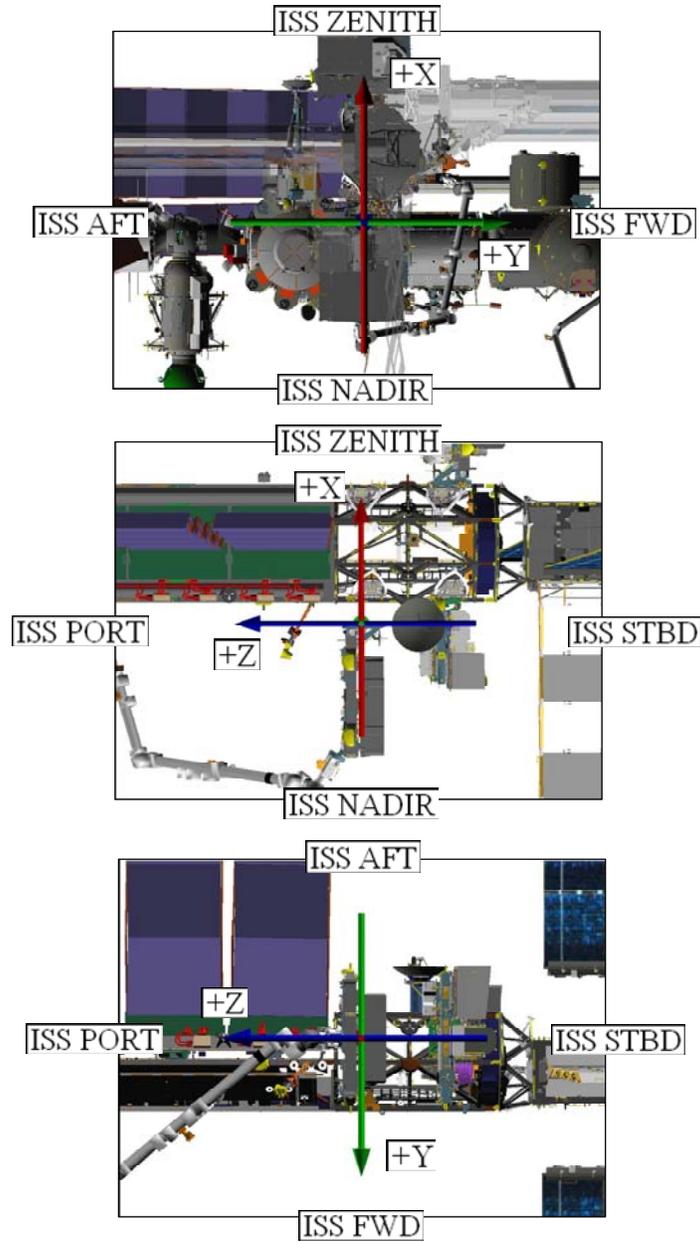
	Translational (cm/s)	Rotational (deg/s)
Coarse	4.9	0.39
Vernier	2.5	0.20

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3.120 ELC4 INSTALL - FOR AND DISPLAY

(RBT FS/ULF5/FIN)

Page 1 of 1 page



FOR: ELC4 Install

Display: S3>Lower Inboard PAS

Command: SSRMS>Internal

Location: Center of ELC4 Capture Bar

Orientation: matches the following when ELC4 fully mated to S3 Lower Inboard PAS

$$+X = -Z_{ISSACS}, +Y = +X_{ISSACS}, +Z = -Y_{ISSACS}$$

	Translational (cm/s)	Rotational (deg/s)
Coarse	4.90	0.39
Vernier	2.45	0.20

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3.130 ELC4 PAS RTL REFERENCE SHEET

(RBT FS/ULF5/FIN) Page 1 of 2 pages

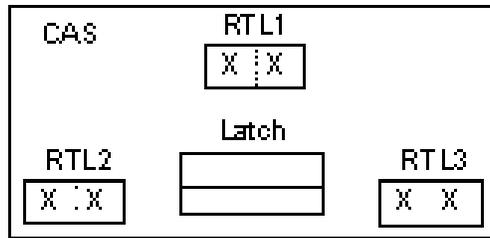


Figure 1. USOS Effector Overlay. Use only to determine which RTL indications have been annunciated. (Orientation doesn't match figure 2.)

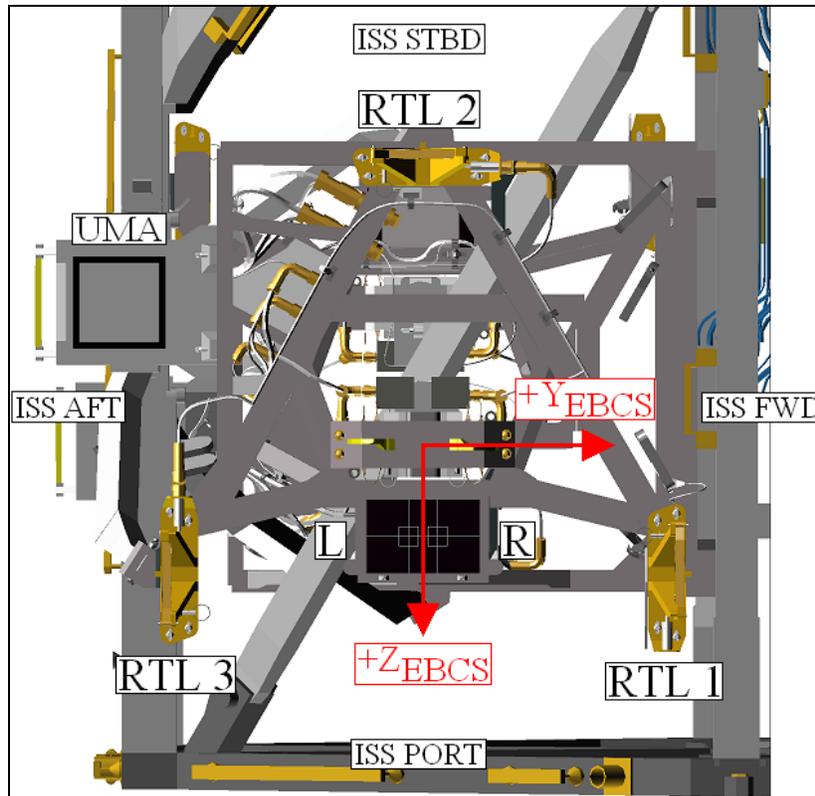


Figure 2.- Model of S3 Lower Inboard PAS structure. Use to correlate locations of Camera View, FOR, and RTLs. (Matches orientation of EBCS view.)

NOTE

- Because the ELC4 Install FOR isn't located at the geometric center of the 3 RTLs, **MCC-H** will provide both magnitude and direction of rotational motion required to acquire missing RTL(s).
- Because the ELC4 Install FOR isn't aligned with the EBCS view, rotational motion will be cross coupled with translational motion in the EBCS view.
- Both RTL 1 and RTL 3 should be visible using S1 LOOB or Tip Elbow cameras.

3.130 ELC4 PAS RTL REFERENCE SHEET

(RBT FS/ULF5/FIN) Page 2 of 2 pages

√**MCC-H** before using RHC Inputs to acquire missing RTLs.

Table I. RHC Inputs required for missing RTL Acquisition.

Missing RTL(s)	RHC Input
1	+Pitch, -Yaw
2	-Pitch
3	+Pitch, +Yaw
1, 2	-Pitch then -Yaw
2, 3	-Pitch then +Yaw
1, 3	+Pitch

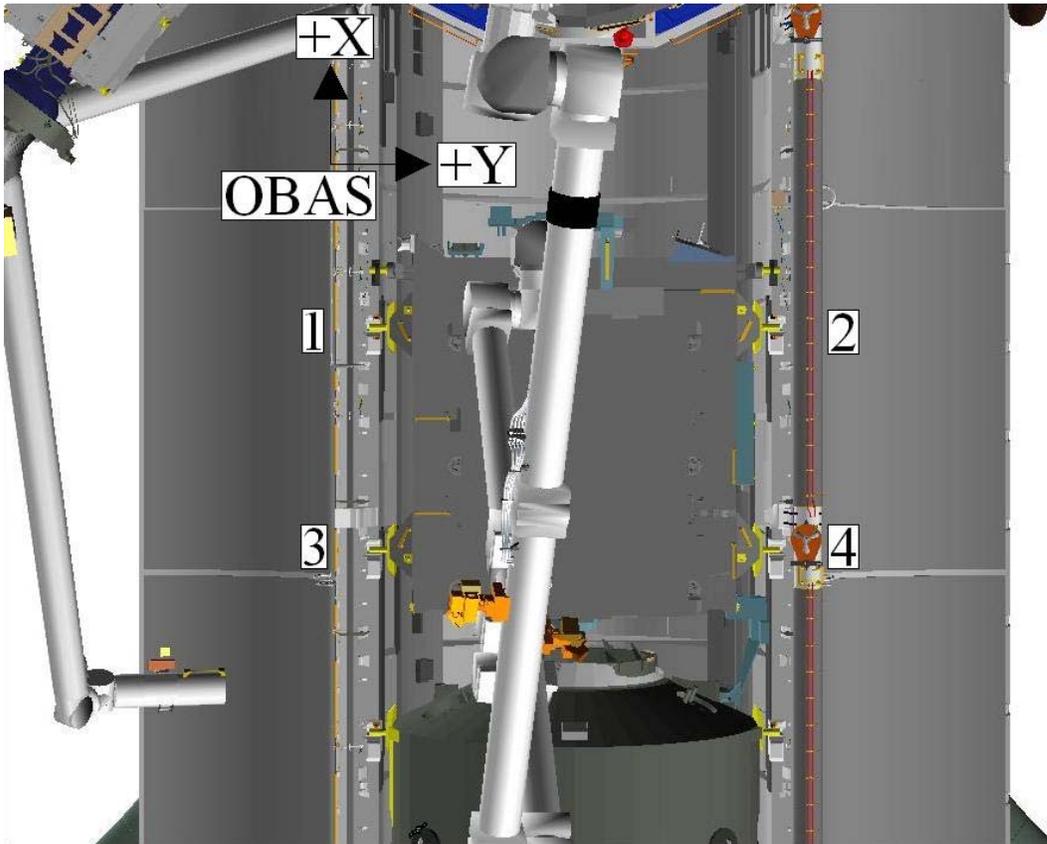


Figure 1. PRLA Configuration

Note: Soyus/Progres not shown on DC1 or MRM1 for clarity.

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3.150 ELC4 EBCS REFERENCE SHEET

(RBT FS/ULF5/FIN) Page 1 of 2 pages

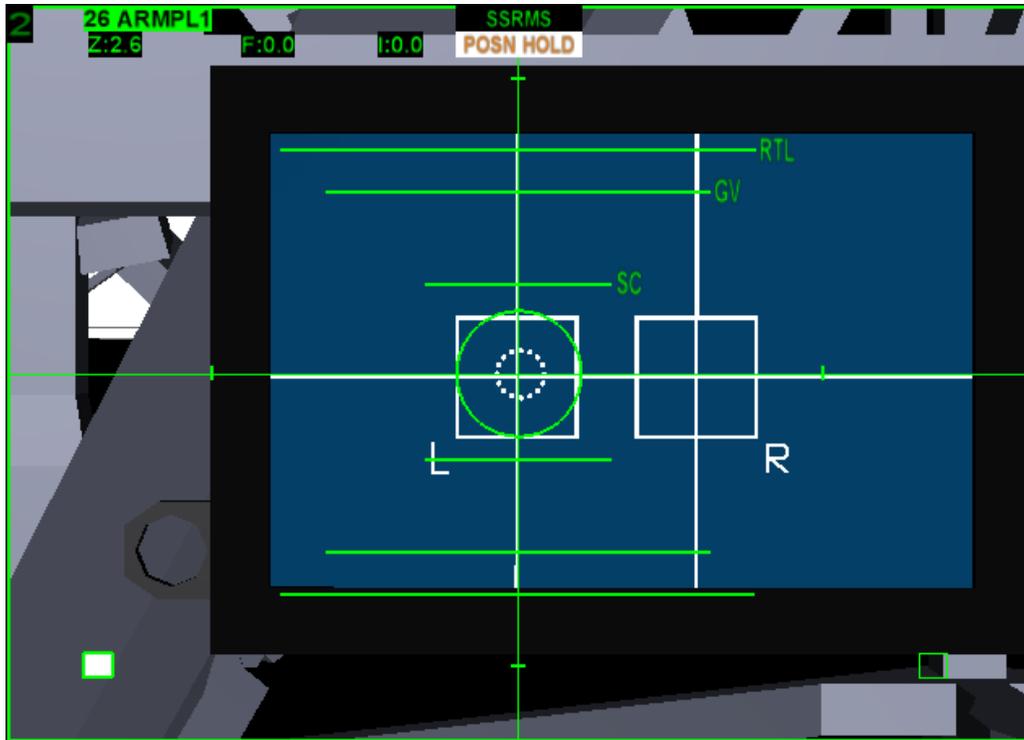


Figure 1. EBCS Camera View at X = -90cm

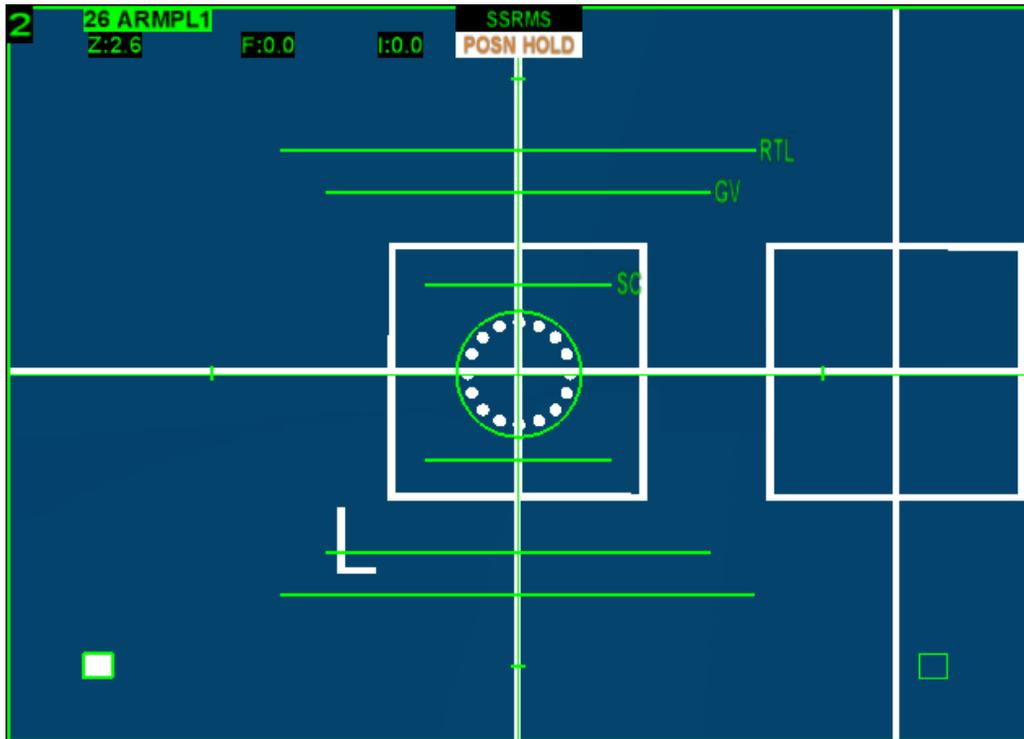


Figure 2. EBCS Camera View at X = -30cm

3.150 ELC4 EBCS REFERENCE SHEET

(RBT FS/ULF5/FIN) Page 2 of 2 pages

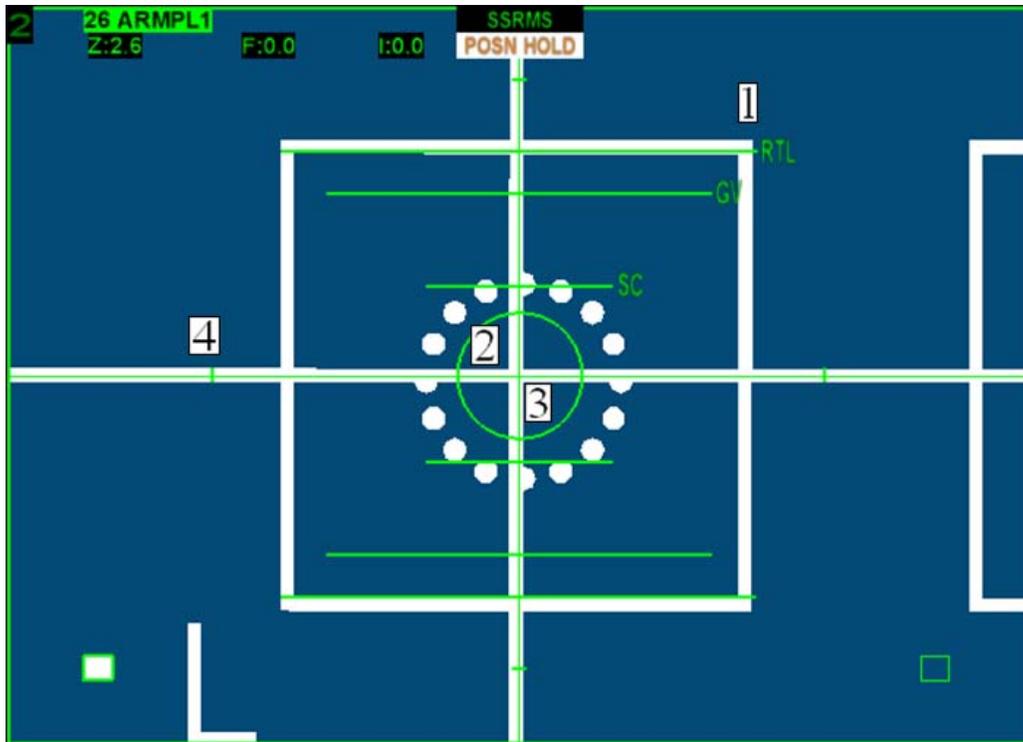


Figure 3. EBCS Camera View at X = -6cm

Alignment Requirements for Capture

X: Width of overlay RTL line is within width of target box.

Y: Overlay cross hair inside target box.

Z: Overlay cross hair inside target box.

Pitch: Center of LED ring inside overlay circle.

Yaw: Center of LED ring inside overlay circle.

Roll: Overlay tick marks contacting target cross tape.

Flight Rule ULF5-B10-7

1. Green overlay horizontal RTL lines within the horizontal lines of the white target box (range cue.)

2. Center of green overlay cross-hair within the white target box (lateral cue.)

3. Center of LED ring within the green overlay circle (wobble cue)

4. Green overlay cross-hair tick marks visually contacting the white target cross tape (roll cue)

3.210 OBSS MID MPM - FOR AND DISPLAY

(RBT FS/ULF5/FIN)

Page 1 of 1 page

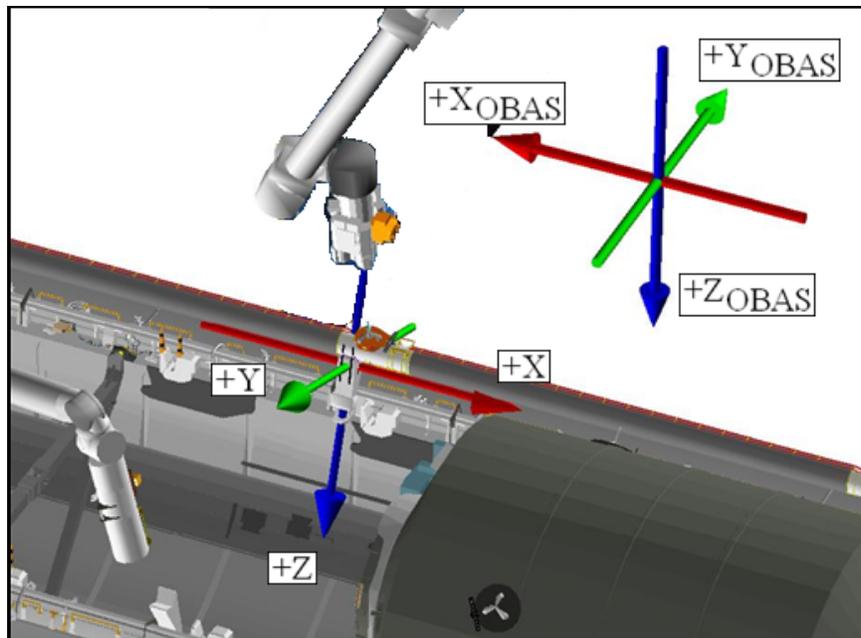


Figure 1.- OBSS Mid MPM FOR.

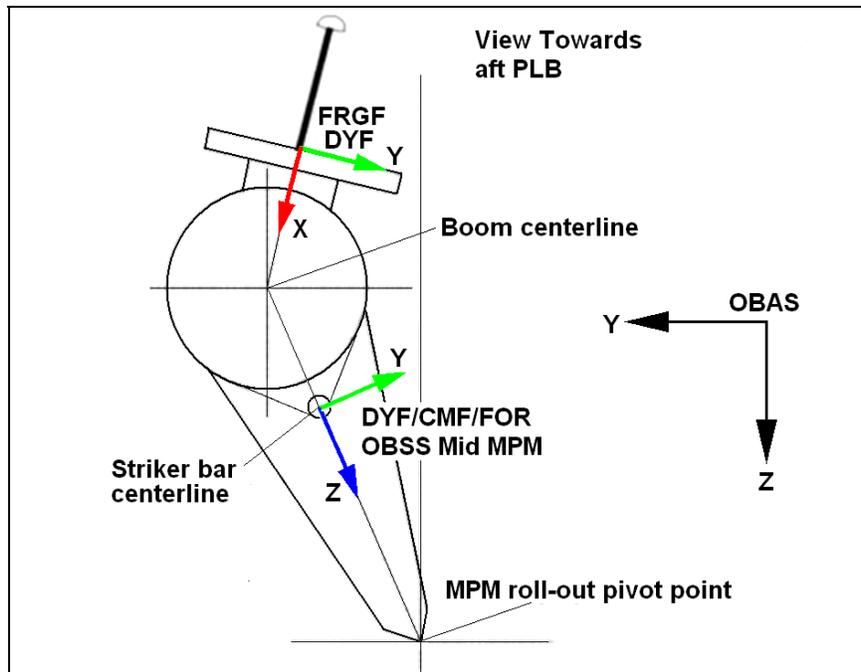


Figure 2.- OBSS Mid MPM Display Frame, Command Frame, and Frame of Reference.

Location:

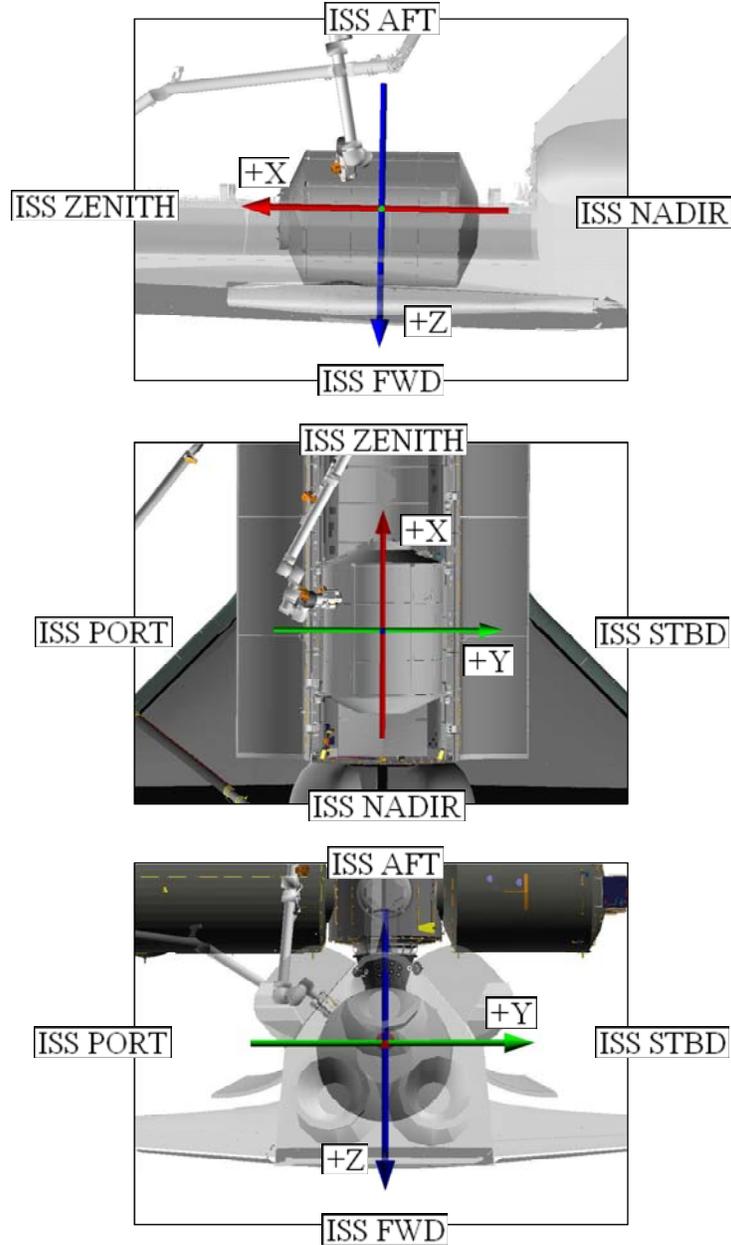
Located at MID MRL, midpoint of OBSS striker bar centerline, when OBSS is deployed and berthed onto Orbiter Stbd MPMs.

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3.310 PMM UNBERTH - FOR AND DISPLAY

(RBT FS/ULF5/FIN)

Page 1 of 1 page



FOR: PMM Unberth

Display: Orbiter>PMM Unberth

Command: ISS>OBAS

Location: Center of rectangle formed by the 4 trunnion pins.

Orientation: matches the following when PMM fully berthed in Payload Bay

$$+X = -Z_{ISSACS}, +Y = +Y_{ISSACS}, +Z = +X_{ISSACS}$$

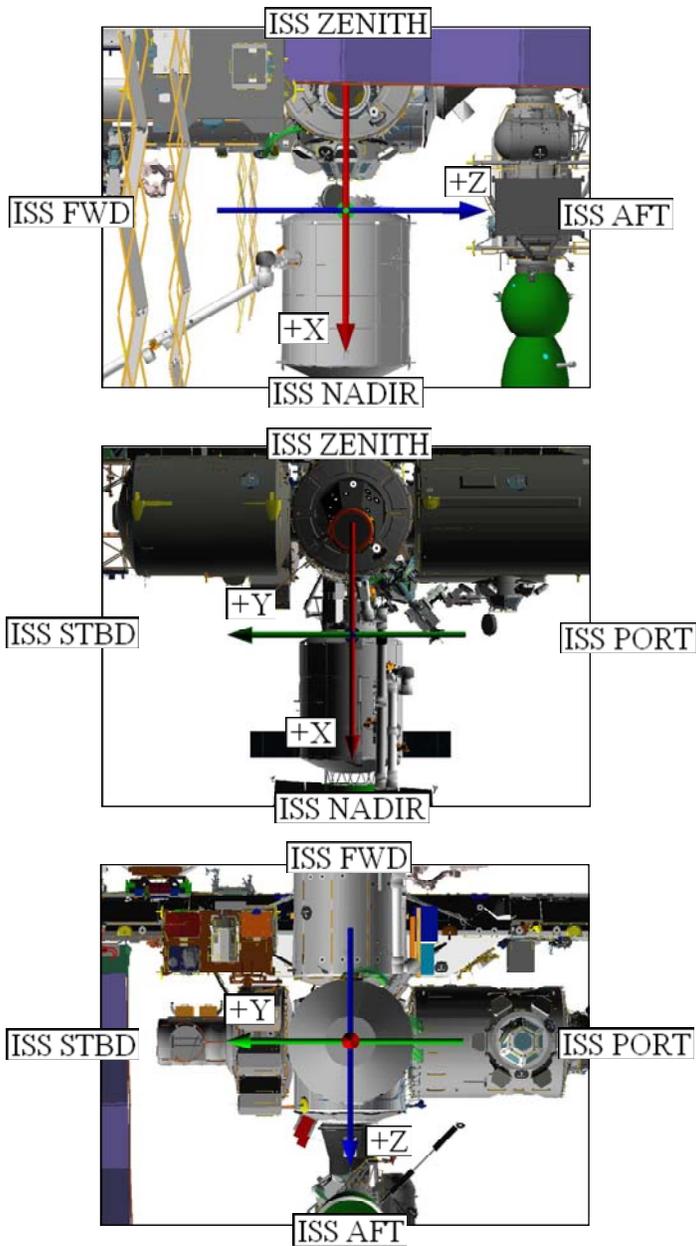
	Translational (cm/s)	Rotational (deg/s)
Coarse	2.64	0.19
Vernier	1.32	0.09

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3.320 PMM INSTALL - FOR AND DISPLAY

(RBT FS/ULF5/FIN)

Page 1 of 1 page



FOR: PMM CBCS Mate

Display: Node1>PMM Mate CBCS

Command: SSRMS>Internal

Location: PMM CBCS Target

Orientation: matches the following when PMM fully mated to Node 1 Nadir CBM

$$+X = +Z_{ISSACS}, +Y = +Y_{ISSACS}, +Z = -X_{ISSACS}$$

	Translational (cm/s)	Rotational (deg/s)
Coarse	2.64	0.19
Vernier	1.32	0.09

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3.330 PMM CBM RTL REFERENCE SHEET

(RBT FS/ULF5/FIN)

Page 1 of 1 page

PMM Install to Node 1 Nadir

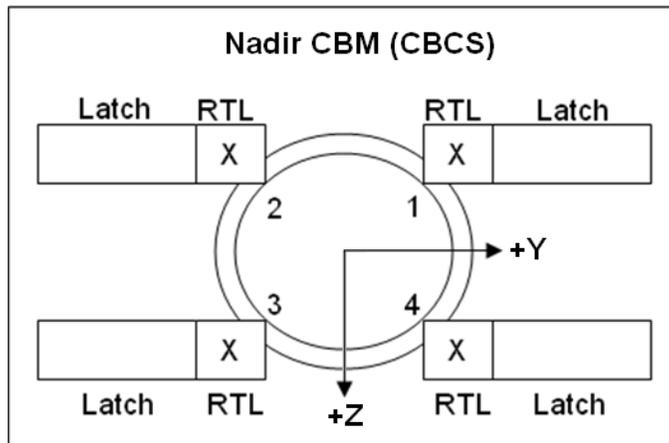


Figure 1. USOS Effector Overlay. Use only to determine which RTL indications have been annunciated. (Orientation doesn't match PCS Displays)

√**MCC-H** before using RHC Inputs to acquire missing RTLs.

Table I. RHC Inputs required for missing RTL Acquisition.

Missing RTL's	RHC Input*
1	- Pitch & + Yaw
2	+ Pitch & + Yaw
3	+ Pitch & - Yaw
4	- Pitch & - Yaw
1 & 2	+ Yaw
1 & 4	- Pitch
2 & 3	+ Pitch
3 & 4	- Yaw

* All inputs with respect to PMM CBCS Mate FOR.

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3.340 PMM PRLA CONFIGURATION

(RBT FS/ULF5/FIN)

Page 1 of 1 page

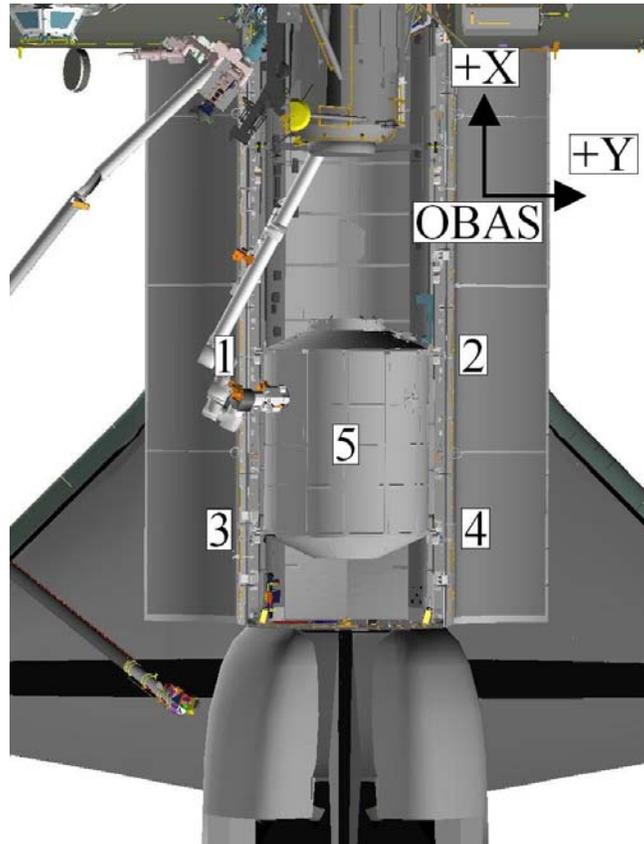


Figure 1. PRLA Configuration

Note: Soyus/Progress not shown on DC1 or MRM1 for clarity.

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3.350 PMM CBCS REFERENCE SHEET

(RBT FS/ULF5/FIN) Page 1 of 2 pages

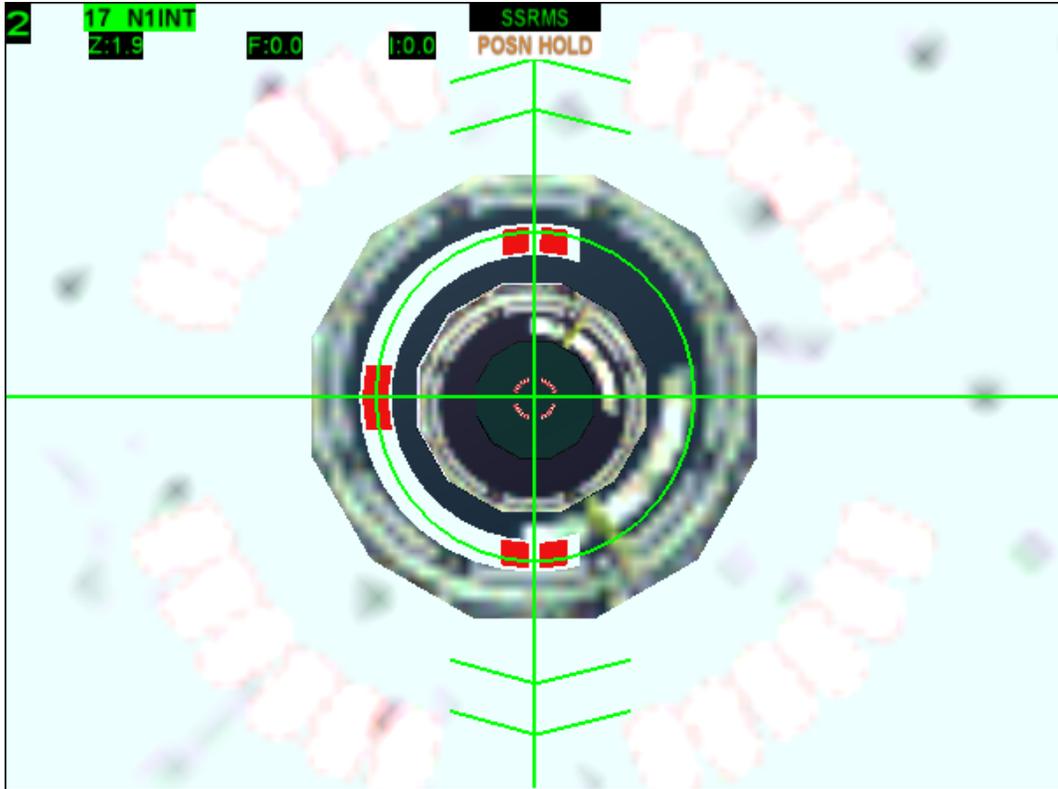


Figure 1. CBCS Camera View at X = -90cm

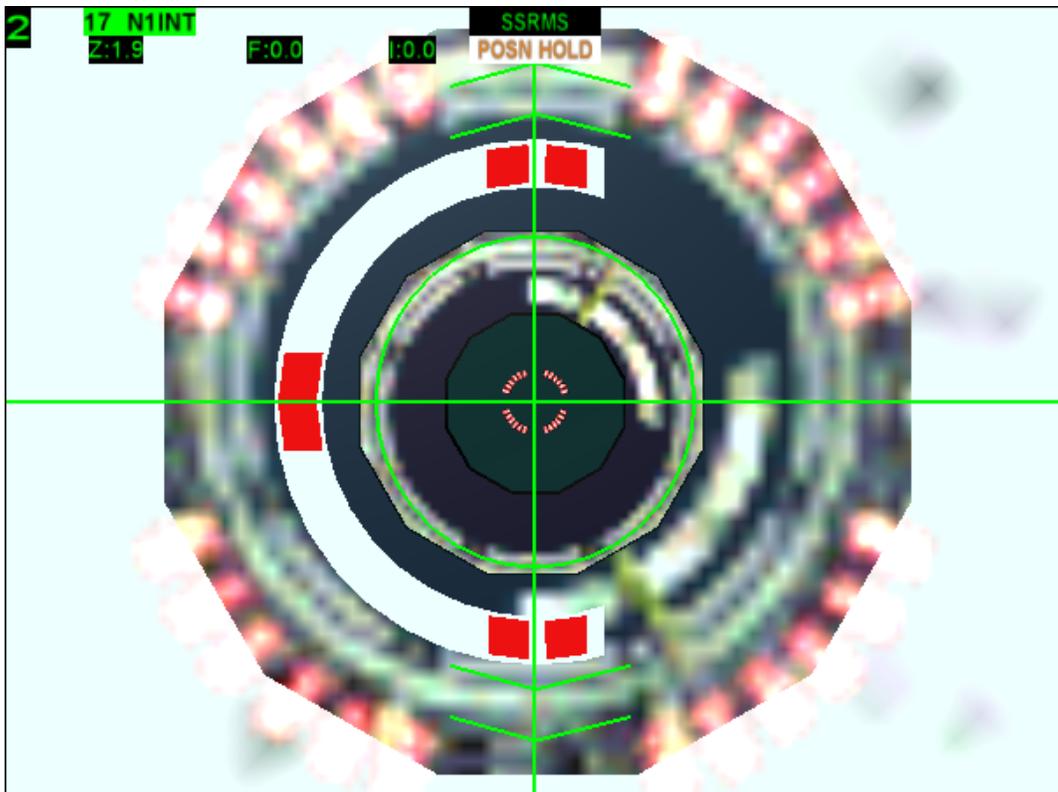


Figure 2. CBCS Camera View at X = -30cm

3.350 PMM CBCS REFERENCE SHEET

(RBT FS/ULF5/FIN) Page 2 of 2 pages

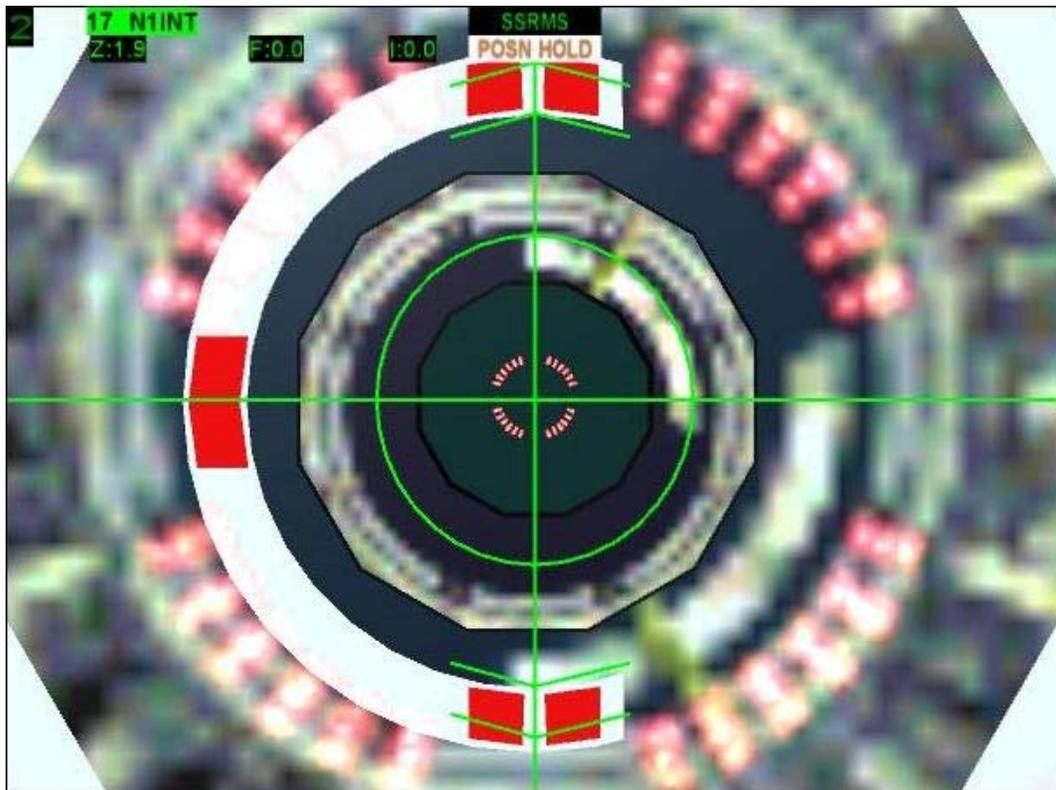


Figure 2. CBCS Camera View at X = -7cm

Alignment Requirements for Capture

X: RTL overlay chevron inside top and bottom red target chevrons.

Y: Overlay vertical line within top and bottom red target chevrons.

Z: Overlay horizontal line within left red target chevron.

Pitch: LED ring inside overlay circle.

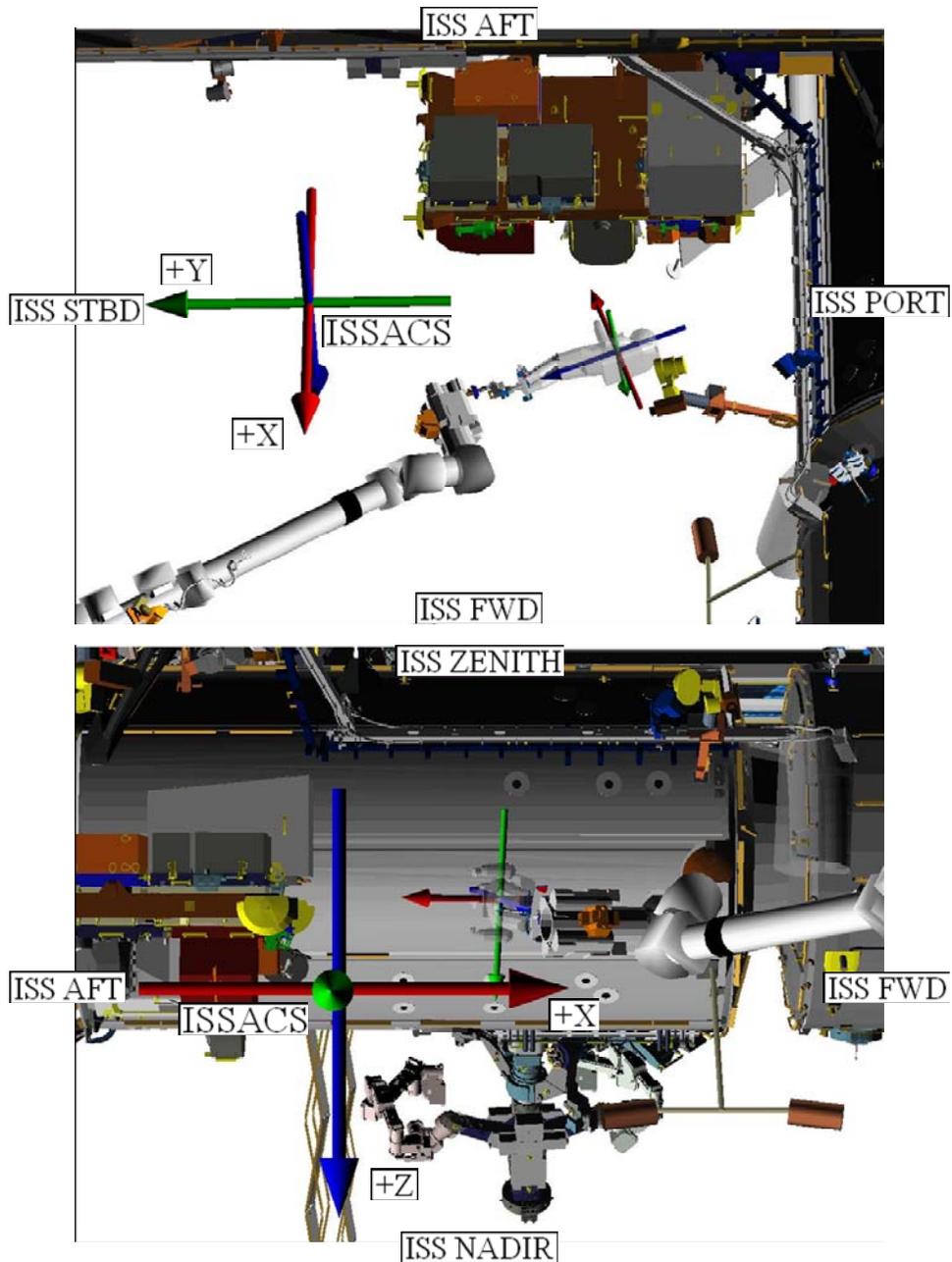
Yaw: LED ring inside overlay circle.

Roll: Vertical overlay line inside top and bottom red broken target chevrons.

3.405 EVA 1 SUPPORT - FOR AND DISPLAY

(RBT FS/ULF5/FIN)

Page 1 of 2 pages



FOR: Chest 12/FF/F/12

Display: ISS>ISSACS

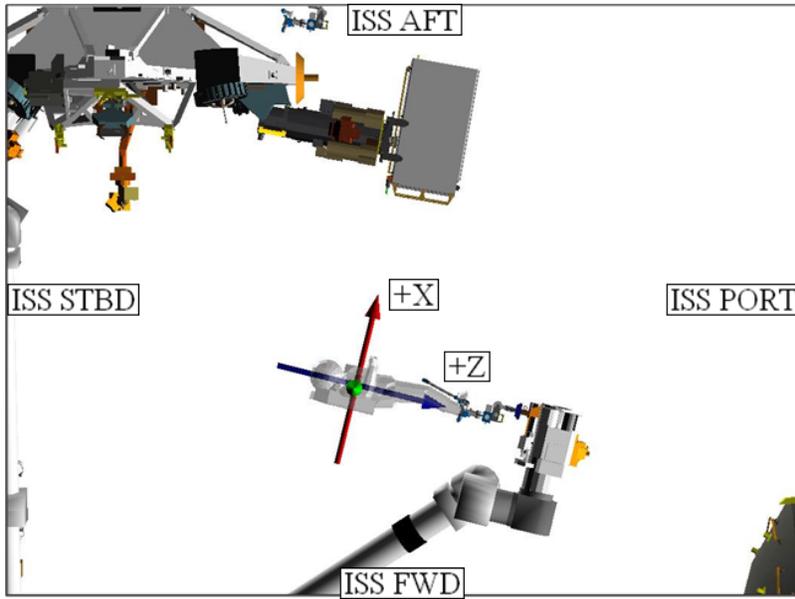
Command: ISS>ISSACS/Internal

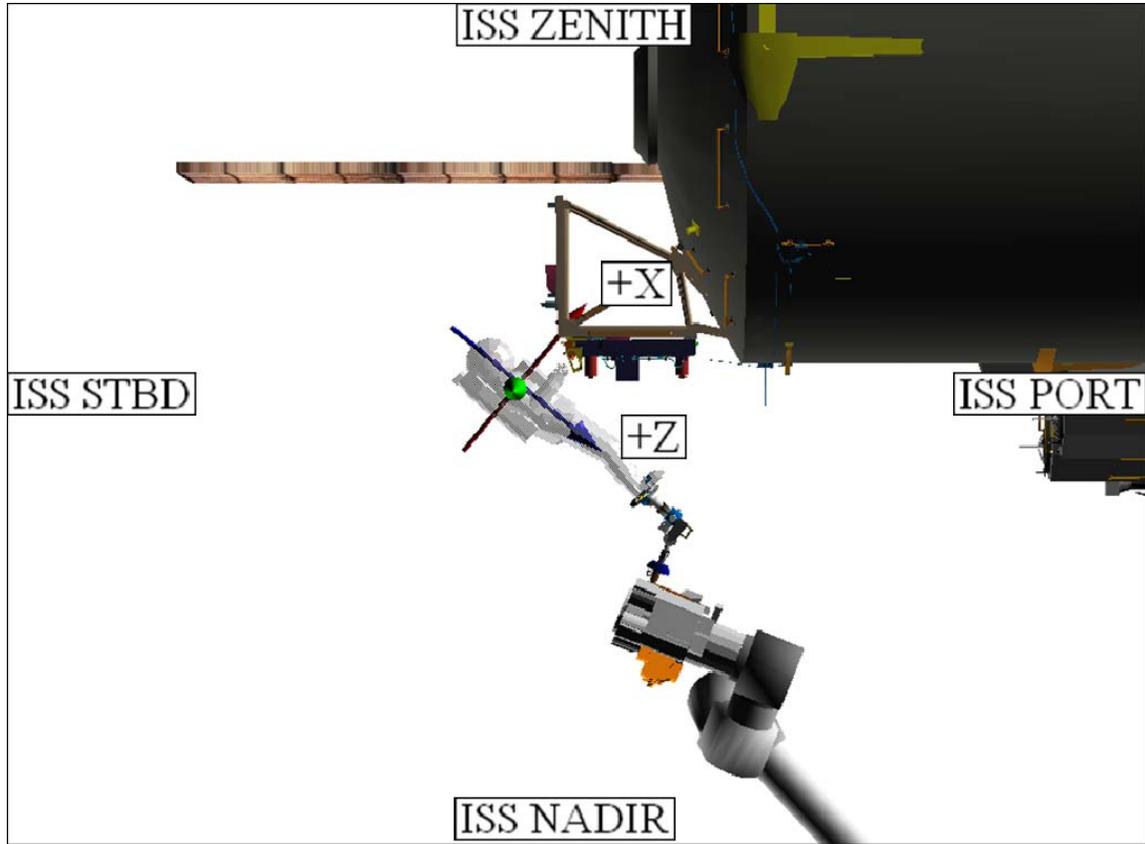
Location: Center of EVA Chest.

Orientation: +X = Body Forward, +Y = Body Right, +Z = Body Down

	Translational (cm/s)	Rotational (deg/s)
Coarse	11.0	1.20
Vernier	8.25	0.90

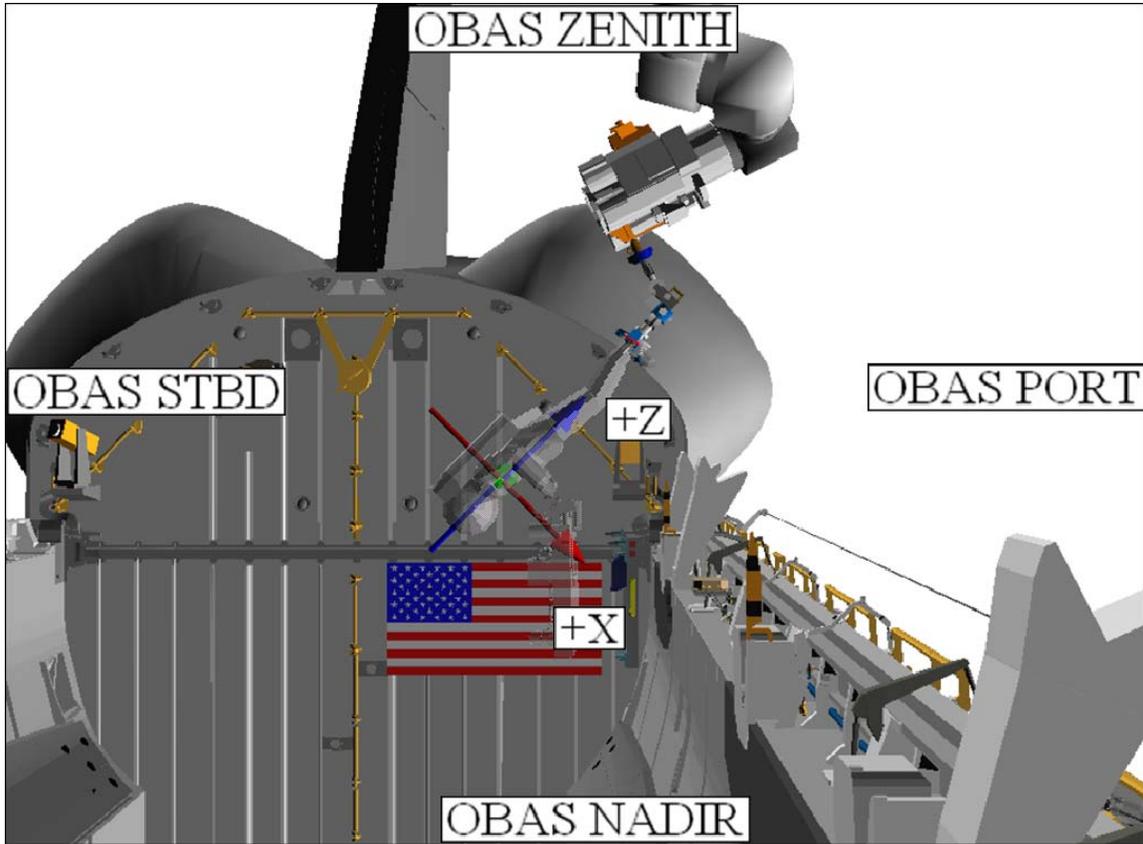
3.405 EVA 1 SUPPORT - FOR AND DISPLAY
(RBT FS/ULF5/FIN)





APFR Ingress

FOR: Chest 12/NN/F/6
Display: ISS>ISSACS
Command: ISS>ISSACS/Internal

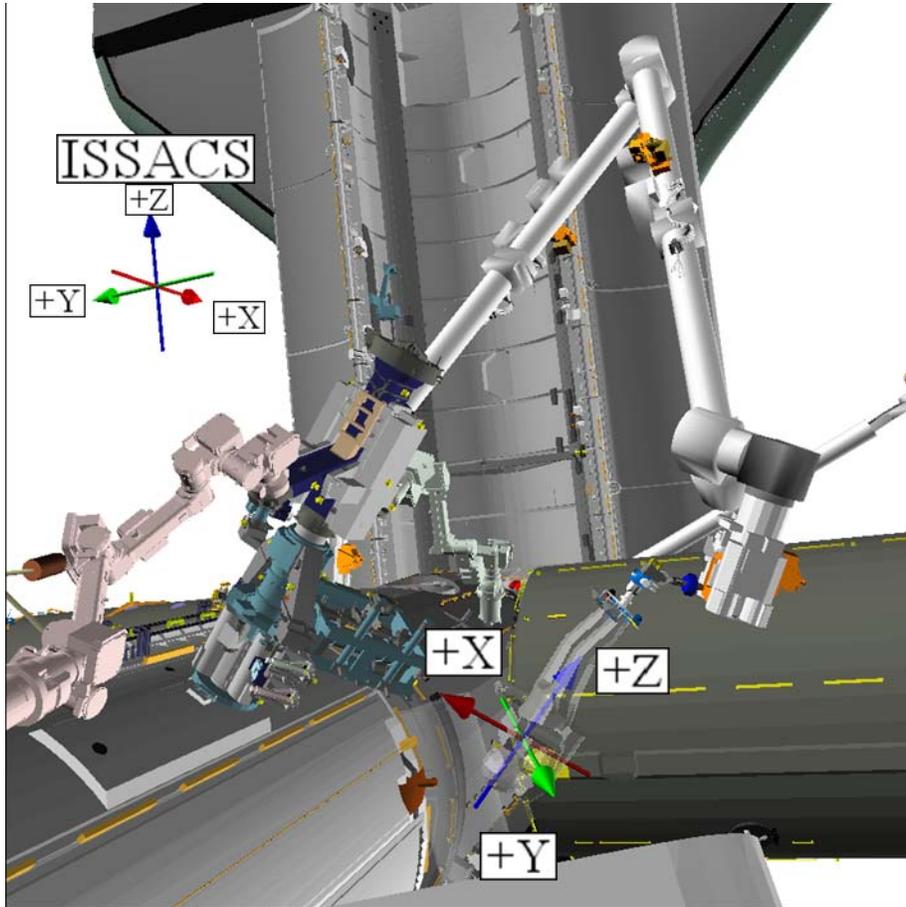


LWAPA Install

FOR: Chest 12/NN/F/6

Display: ISS>OBAS

Command: ISS>OBAS/Internal

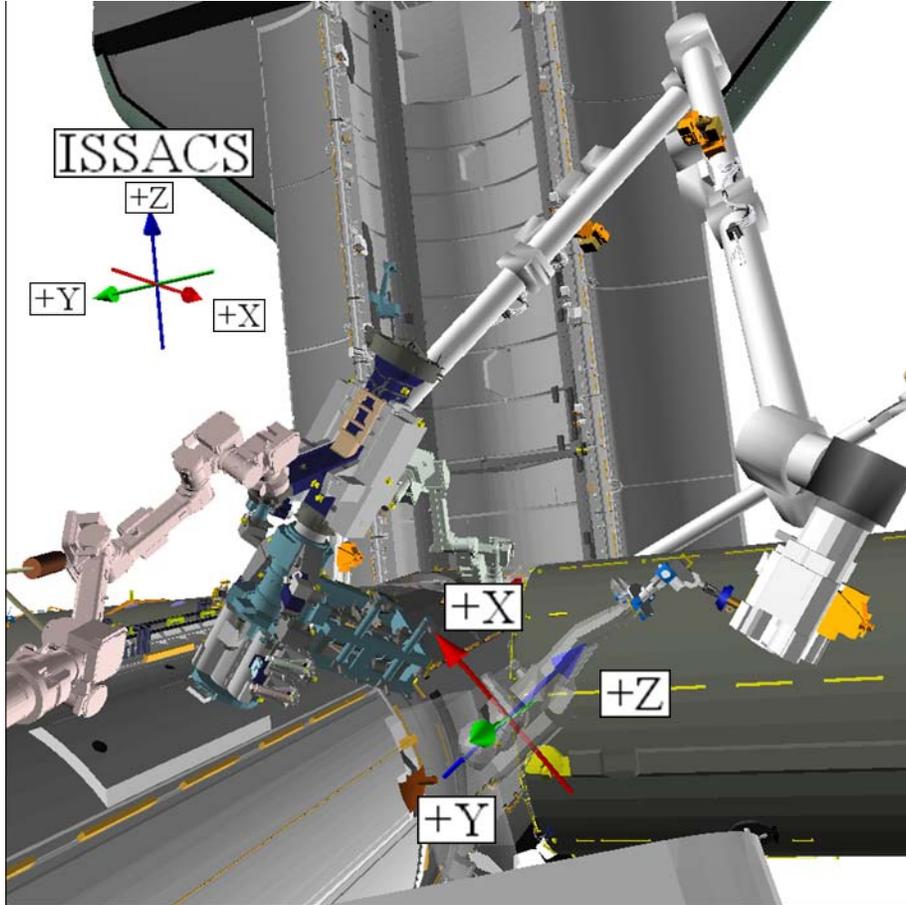


SPDM CLPA 1 Setup

FOR: Chest 12/NN/F/6

Display: ISS>ISSACS

Command: SSRMS>Internal



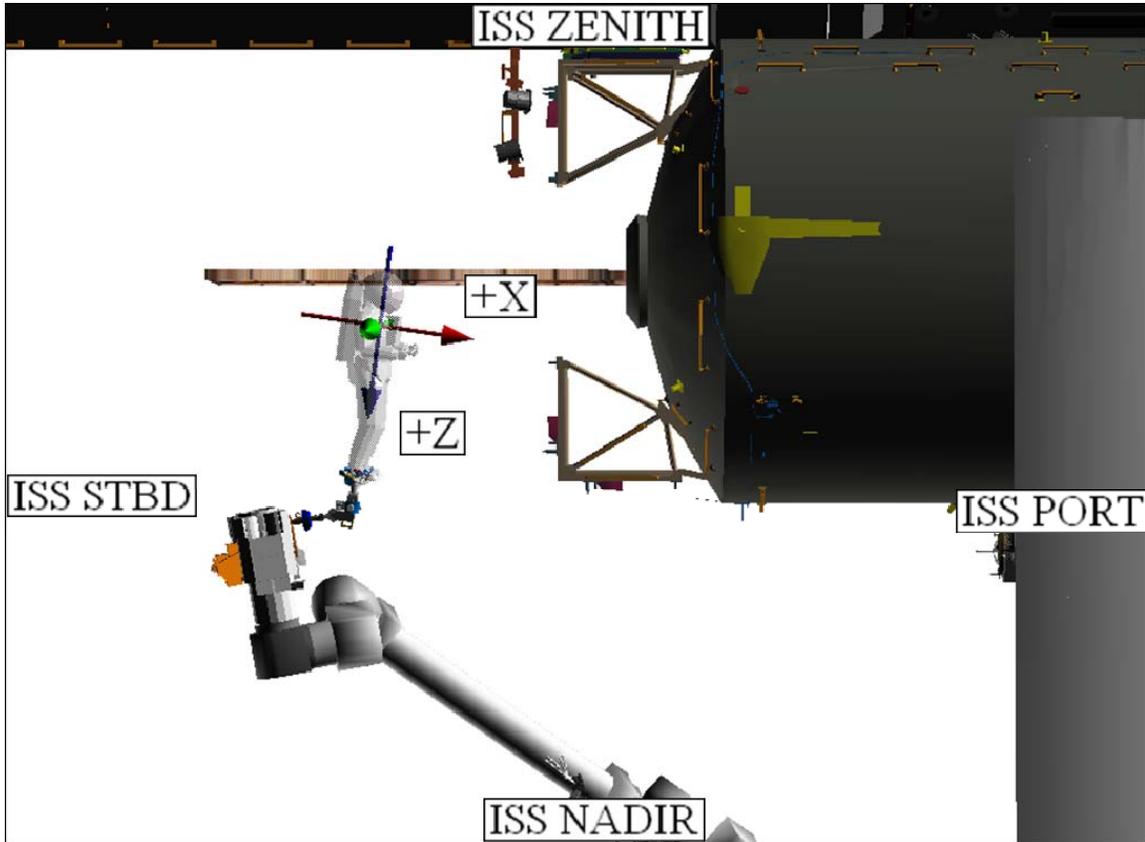
SPDM EP1 Blanket Setup

FOR: Chest 12/NN/F/6
Display: ISS>ISSACS
Command: SSRMS>Internal

3.410 EVA 2 SUPPORT - FOR AND DISPLAY

(RBT FS/ULF5/FIN)

Page 5 of 5 pages



APFR Egress Setup

FOR: Chest 12/NN/F/6

Display: ISS>ISSACS

Command: ISS>ISSACS/Internal

Location: Center of EVA Chest.

Orientation: +X = Body Forward , +Y = Body Right , +Z = Body Down

	Translational (cm/s)	Rotational (deg/s)
Coarse	11.0	1.20
Vernier	8.25	0.90

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3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 1 of 16 pages

Docking Park position

SR	SY	SP	EP	WP	WY	WR
+180.0	-180.0	-120.0	-130.0	-209.0	-180.0	+177.2
X	Y	Z	Pitch	Yaw	Roll	
-976	-3	-439	+56.5*	-89.8	-154.6*	
FOR	Unloaded – LEE Tip, SY Held					
Disp	Orbiter>ELC4 FRGF					

*Display Singularity

Joint OCAS maneuver to ELC4 pre-grapple position

SR	SY	SP	EP	WP	WY	WR
+74.5	-173.6	-189.1	-131.7	-128.6	-164.6	+177.2
X	Y	Z	Pitch	Yaw	Roll	
-150	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Held					
Disp	Orbiter>ELC4 FRGF					

Manual maneuver and capture to ELC4 grappled position.

SR	SY	SP	EP	WP	WY	WR
+78.1	-173.6	-199.5	-117.9	-132.5	-168.1	+177.1
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Unberth, SY Held					
Disp	Orbiter>ELC4 Unberth					

Manual maneuver to hover position.

SR	SY	SP	EP	WP	WY	WR
+57.0	-173.6	-163.6	-154.1	-129.5	-147.1	+177.7
X	Y	Z	Pitch	Yaw	Roll	
0	-5	-400	0.0	0.0	0.0	
FOR	Loaded – ELC4 Unberth, SY Held					
Disp	Orbiter>ELC4 Unberth					

FOR OCAS maneuver to ELC4 handoff position.

SR	SY	SP	EP	WP	WY	WR
+57.0	-128.4	-131.0	-62.8	-230.0	-159.3	+107.0
X	Y	Z	Pitch	Yaw	Roll	
-520	-418	+1165	+129.1	-0.7	+89.0	
FOR	Loaded – ELC4 Unberth, SR Lock					
Disp	Node2>PDGF					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 2 of 16 pages

Manual maneuver to ELC4 handoff backoff position.

SR	SY	SP	EP	WP	WY	WR
+57.0	-131.4	-122.8	-65.8	-236.3	-158.0	+104.2
X	Y	Z	Pitch	Yaw	Roll	
+923	+860	+1568	+1.1	+0.1	+60.2	
FOR	Unloaded – LEE Tip, SR Lock					
Disp	ISS>ISSACS					

Joint OCAS maneuver to walkoff intermediate position.

SR	SY	SP	EP	WP	WY	WR
+20.0	-144.9	-120.0	+77.9	-119.4	-211.3	+114.9
X	Y	Z	Pitch	Yaw	Roll	
-153	+408	+495	+5.8	-10.0	-20.8	
FOR	Unloaded – LEE Tip, SY Held					
Disp	MBS>PDGF 1					

FOR OCAS maneuver to MBS PDGF1 pre-grapple position.

SR	SY	SP	EP	WP	WY	WR
-11.0	-144.9	-73.8	+64.3	-116.2	-206.6	+109.8
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	MBS>PDGF 1					

Manual maneuver and capture to MBS PDGF 1 grappled position.

SR	SY	SP	EP	WP	WY	WR
-11.0	-143.2	-71.7	+65.5	-120.1	-205.5	+111.3
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – MBS PDGF1, SR, Lock					
Disp	MBS> PDGF 1					

Manual maneuver to Node 2 PDGF backoff position.

SR	SY	SP	EP	WP	WY	WR
+109.5	+205.5	-117.2	+58.2	-65.8	+144.5	-12.3
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	Node2>PDGF					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 3 of 16 pages

FOR OCAS maneuver to ELC4 200cm pre-grapple position.

SR	SY	SP	EP	WP	WY	WR
+81.8	+205.5	-175.2	+59.1	-115.7	+125.0	+144.8
X	Y	Z	Pitch	Yaw	Roll	
+952	+1384	+1335	0.0	-53.2	-65.1	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	ISS>ISSACS					

Manual maneuver and capture to ELC4 grappled at handback position.

SR	SY	SP	EP	WP	WY	WR
+94.5	+205.5	-176.3	+60.0	-128.1	+134.9	+153.9
X	Y	Z	Pitch	Yaw	Roll	
+1204	+745	+1285	+61.0	-80.9	+163.1	
FOR	Loaded – ELC4 Install, SY Held					
Disp	ISS>ISSACS					

Joint OCAS maneuver to ELC4 pre-install position.

SR	SY	SP	EP	WP	WY	WR
-17.8	+108.0	-133.9	+30.7	-86.4	+202.2	+224.5
X	Y	Z	Pitch	Yaw	Roll	
-350	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Held					
Disp	S3>Lower Inboard PAS					

Manual maneuver to ELC4 alignment position.

SR	SY	SP	EP	WP	WY	WR
-19.0	+108.0	-143.4	+64.8	-112.3	+202.1	+224.1
X	Y	Z	Pitch	Yaw	Roll	
-90	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Lock					
Disp	S3>Lower Inboard PAS					

Manual maneuver and capture to expected ELC4 installed position.

SR	SY	SP	EP	WP	WY	WR
-19.4	+108.0	-143.9	+72.1	-119.6	+202.1	+223.9
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – ELC4 Install, SY Held					
Disp	S3>Lower Inboard PAS					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 4 of 16 pages

Manual maneuver to ELC4 backoff position.

SR	SY	SP	EP	WP	WY	WR
-9.0	+108.0	-140.5	+69.2	-108.9	+202.5	+227.4
X	Y	Z	Pitch	Yaw	Roll	
-185	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	S3>ELC4 PVGF S3LI					

OBSS pre-grapple position.

SR	SY	SP	EP	WP	WY	WR
-82.2	-15.2	+8.5	-129.9	+29.4	-3.2	+6.3
X	Y	Z	Pitch	Yaw	Roll	
-150	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SR Held					
Disp	Orbiter>OBSS FRGF					

Manual maneuver and capture to OBSS grappled position.

SR	SY	SP	EP	WP	WY	WR
-82.2	-16.4	-4.0	-118.2	+30.2	-3.2	+7.5
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – OBSS Mid MPM, SR Held					
Disp	Orbiter>OBSS Mid MPM					

Manual maneuver to OBSS low hover position.

SR	SY	SP	EP	WP	WY	WR
-82.2	-25.3	+9.1	-126.5	+25.9	-3.5	+16.4
X	Y	Z	Pitch	Yaw	Roll	
0	0	-150	0.0	0.0	0.0	
FOR	Loaded – OBSS Mid MPM, SR Held					
Disp	Orbiter>OBSS Mid MPM					

FOR OCAS to unberth intermediate position.

SR	SY	SP	EP	WP	WY	WR
-82.2	-37.8	+18.1	-103.4	-3.8	-2.7	+22.2
X	Y	Z	Pitch	Yaw	Roll	
+250	-200	-300	+5.0	-5.0	0.0	
FOR	Loaded – OBSS Mid MPM, SR Held					
Disp	Orbiter>OBSS Mid MPM					

FOR OCAS to handoff position.

SR	SY	SP	EP	WP	WY	WR
-82.2	+28.1	+45.2	-125.9	+4.4	-1.0	-128.4
X	Y	Z	Pitch	Yaw	Roll	
+325	+705	-198	+91.2	-70.6	+47.3	
FOR	Loaded – OBSS Mid MPM, SR Held					
Disp	Orbiter>OBSS Mid MPM					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 5 of 16 pages

Manual maneuver to OBSS backoff position.

SR	SY	SP	EP	WP	WY	WR
-82.2	+28.3	+60.8	-131.7	-5.4	-1.1	-128.6
X	Y	Z	Pitch	Yaw	Roll	
+1014	-313	+1499	-12.8	+0.1	+89.8	
FOR	Unloaded – LEE Tip, SR Lock					
Disp	ISS>ISSACS					

Joint OCAS maneuver to intermediate 1 position.

SR	SY	SP	EP	WP	WY	WR
-12.0	-100.0	-100.0	+20.0	-116.2	+153.4	+65.0
X	Y	Z	Pitch	Yaw	Roll	
-1056	+470	+447	-68.3	-4.6	-97.9	
FOR	Unloaded – LEE Tip, SR Held					
Disp	MBS>PDGF 1					

Joint OCAS maneuver to intermediate 2 position.

SR	SY	SP	EP	WP	WY	WR
-11.0	-144.9	-73.8	+55.0	-116.2	+153.4	+109.8
X	Y	Z	Pitch	Yaw	Roll	
-173	-39	+72	-3.2	-7.7	-4.4	
FOR	Unloaded – LEE Tip, SR Held					
Disp	MBS>PDGF 1					

Single joint maneuver to MBS PDGF 1 pre-grapple position.

SR	SY	SP	EP	WP	WY	WR
-11.0	-144.9	-73.8	+64.3	-116.2	+153.4	+109.8
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SR Held					
Disp	MBS>PDGF 1					

Manual maneuver and capture to MBS PDGF 1 grappled position.

SR	SY	SP	EP	WP	WY	WR
-11.0	-143.2	-71.7	+65.5	-120.1	+154.5	+111.3
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – MBS PDGF1, SR Held					
Disp	MBS> PDGF 1					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 6 of 16 pages

Manual maneuver to -65cm backoff position.

	Locked					
SR	SY	SP	EP	WP	WY	WR
+109.5	-154.5	-117.2	+58.2	-65.8	+144.5	-12.3
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	Node2>PDGF					

Joint OCAS maneuver to MT translate position.

SR	SY	SP	EP	WP	WY	WR
+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9
X	Y	Z	Pitch	Yaw	Roll	
-161	+22	+564	+38.9	-2.1	-17.9	
FOR	Unloaded – LEE Tip, SY Held					
Disp	Node2>PDGF					

Joint OCAS maneuver to APFR install setup position.

SR	SY	SP	EP	WP	WY	WR
+107.1	-5.0	-77.5	-73.4	-70.2	+33.5	+172.0
X	Y	Z	Pitch	Yaw	Roll	
+360	+710	+585	+179.3	+18.5	+100.5	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to APFR install position.

SR	SY	SP	EP	WP	WY	WR
+102.4	-5.0	-87.3	-71.4	-59.5	+36.5	+167.6
X	Y	Z	Pitch	Yaw	Roll	
+160	+710	+585	+179.3	+18.5	+100.5	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to APFR ingress position.

SR	SY	SP	EP	WP	WY	WR
+97.5	-5.0	-77.2	-90.8	-46.6	+39.4	+162.7
X	Y	Z	Pitch	Yaw	Roll	
+160	+879	+585	+179.3	+18.5	+100.5	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 7 of 16 pages

Manual maneuver to APFR ingress backoff position.

SR	SY	SP	EP	WP	WY	WR
+103.1	-5.0	-66.1	-92.7	-59.7	+36.1	+168.3
X	Y	Z	Pitch	Yaw	Roll	
+314	+635	+556	+179.3	+18.5	-96.4	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Joint OCAS to PM retrieve setup position.

SR	SY	SP	EP	WP	WY	WR
+140.1	-5.0	-34.5	-123.0	-42.8	+9.3	+15.8
X	Y	Z	Pitch	Yaw	Roll	
+713	+1362	+17	+178.0	-13.7	+88.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to PM retrieve position.

SR	SY	SP	EP	WP	WY	WR
+137.6	-5.0	-50.2	-125.4	-24.1	+10.2	+13.4
X	Y	Z	Pitch	Yaw	Roll	
+519	+1314	+10	+178.0	-13.7	+88.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to POA backoff position.

SR	SY	SP	EP	WP	WY	WR
+138.0	-5.0	-59.0	-108.2	-32.5	+10.0	+13.8
X	Y	Z	Pitch	Yaw	Roll	
+550	+1137	+10	+178.0	-13.8	+88.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to ESP2 setup position (within 5 cm/1 deg).

SR	SY	SP	EP	WP	WY	WR
+103.1	-5.0	-69.4	-76.9	-53.1	+34.9	+113.1
X	Y	Z	Pitch	Yaw	Roll	
+450	+600	+519	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 8 of 16 pages

Manual maneuver to pre-install position.

SR	SY	SP	EP	WP	WY	WR
+107.9	-5.0	-90.6	-40.1	-72.1	+33.1	+118.5
X	Y	Z	Pitch	Yaw	Roll	
+450	+358	+519	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to AGB removal position.

SR	SY	SP	EP	WP	WY	WR
+103.8	-5.0	-99.0	-39.3	-61.7	+34.6	+113.9
X	Y	Z	Pitch	Yaw	Roll	
+240	+358	+519	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to full install position.

SR	SY	SP	EP	WP	WY	WR
+101.7	-5.0	-104.4	-36.0	-58.0	+35.3	+111.5
X	Y	Z	Pitch	Yaw	Roll	
+138	+358	+519	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to AGB install position.

SR	SY	SP	EP	WP	WY	WR
+95.2	-5.0	-100.1	-41.3	-51.9	+37.1	+103.8
X	Y	Z	Pitch	Yaw	Roll	
+103	+444	+636	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to AGB backoff position.

SR	SY	SP	EP	WP	WY	WR
+97.4	-5.0	-94.8	-44.8	-55.4	+36.6	+106.4
X	Y	Z	Pitch	Yaw	Roll	
+200	+444	+636	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 9 of 16 pages

Manual maneuver to cap install position.

SR	SY	SP	EP	WP	WY	WR
+104.3	-5.0	-102.1	-42.7	-55.5	+34.5	+114.4
X	Y	Z	Pitch	Yaw	Roll	
+150	+360	+450	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to cap install backoff position.

SR	SY	SP	EP	WP	WY	WR
+106.4	-5.0	-96.9	-45.5	-59.4	+33.7	+116.7
X	Y	Z	Pitch	Yaw	Roll	
+250	+360	+450	-174.5	+4.1	-141.8	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to APFR egress setup position.

SR	SY	SP	EP	WP	WY	WR
+100.4	-5.0	-71.5	-92.4	-52.9	+37.7	+165.7
X	Y	Z	Pitch	Yaw	Roll	
+214	+635	+556	+179.3	+18.5	-96.5	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to APFR egress position.

SR	SY	SP	EP	WP	WY	WR
+97.5	-5.0	-77.2	-90.8	-46.6	+39.4	+162.7
X	Y	Z	Pitch	Yaw	Roll	
+114	+635	+556	+179.3	+18.5	-96.5	
FOR	Unloaded – Chest 12/FF/F/12, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to APFR removal position.

SR	SY	SP	EP	WP	WY	WR
+102.4	-5.0	-87.3	-71.4	-59.5	+36.5	+167.6
X	Y	Z	Pitch	Yaw	Roll	
+160	+710	+585	+179.3	+18.5	+100.5	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 10 of 16 pages

Manual maneuver to APFR removal backoff position.

SR	SY	SP	EP	WP	WY	WR
+107.1	-5.0	-77.5	-73.4	-70.2	+33.5	+172.0
X	Y	Z	Pitch	Yaw	Roll	
+360	+710	+585	+179.3	+18.5	+100.5	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Joint OCAS maneuver to MT translate position.

SR	SY	SP	EP	WP	WY	WR
+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9
X	Y	Z	Pitch	Yaw	Roll	
+734	+1350	+971	+87.4	-29.5	-109.1	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

PMM pre-grapple position.

SR	SY	SP	EP	WP	WY	WR
-90.1	+25.8	+7.4	-84.2	-228.3	-141.2	-77.1
X	Y	Z	Pitch	Yaw	Roll	
-150	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SR Held					
Disp	Orbiter>PMM GF					

Manual maneuver and capture to PMM grappled position.

SR	SY	SP	EP	WP	WY	WR
-90.1	+18.7	+0.8	-81.1	-219.7	-137.6	-69.2
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – PMM Unberth, SR Held					
Disp	Orbiter>PMM Unberth					

Manual maneuver to PMM hover position.

SR	SY	SP	EP	WP	WY	WR
-90.1	+18.5	+43.6	-106.3	-237.1	-137.5	-68.9
X	Y	Z	Pitch	Yaw	Roll	
0	0	-550	0.0	0.0	0.0	
FOR	Loaded – PMM Unberth, SR Lock					
Disp	Orbiter>PMM Unberth					

Joint OCAS to PMM pre-install position.

SR	SY	SP	EP	WP	WY	WR
+90.9	+9.9	-17.6	-98.3	-153.1	-220.9	-30.8
X	Y	Z	Pitch	Yaw	Roll	
+252	1	0	0.0	0.0	0.0	
FOR	Loaded – PMM CBCS Mate, SY Held					
Disp	Node1>PMM Mate CBCS					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 11 of 16 pages

Manual maneuver and capture to to PMM installed position.

SR	SY	SP	EP	WP	WY	WR
+90.8	+9.9	-29.7	-105.2	-134.2	-220.7	-30.8
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR	Loaded – PMM CBCS Mate, SY Held					
Disp	Node1>PMM Mate CBCS					

Manual maneuver to backoff position.

SR	SY	SP	EP	WP	WY	WR
+97.7	+9.9	-23.3	-113.9	-130.5	-227.5	-31.1
X	Y	Z	Pitch	Yaw	Roll	
-150	0	0	0.0	0.0	0.0	
FOR	Unloaded – LEE Tip, SY Lock					
Disp	Node1>PMM Mated GF					

Joint OCAS to Intermediate position.

SR	SY	SP	EP	WP	WY	WR
+40.0	+30.0	+25.0	-145.0	-180.0	-170.0	-88.8

Joint OCAS to EVA 2 setup position.

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1307	+1136	+731	+21.0	+61.2	+130.3	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Single joint to APFR setup position.

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	+47.8	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1275	+950	+705	+58.3	-9.9	+97.1	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Single joint to EVA 2 setup position.

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1307	+1136	+731	+21.0	+61.2	+130.3	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 12 of 16 pages

Joint OCAS to intermediate position.

SR	SY	SP	EP	WP	WY	WR
-15.0	+100.0	-70.0	+17.0	-58.9	-160.0	+10.0
X	Y	Z	Pitch	Yaw	Roll	
+1851	+880	+1081	-35.8	-78.3	+56.8	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Single joint maneuver to FI viewing position.

SR	SY	SP	EP	WP	WY	WR
-15.0	+100.0	-56.7	+17.0	-58.9	-160.0	+10.0
X	Y	Z	Pitch	Yaw	Roll	
+2027	+624	+997	-107.8	-80.7	-18.7	
FOR	Unloaded – LEE Tip, SR Held					
Disp	ISS>ISSACS					

Single joint maneuver to intermediate position.

SR	SY	SP	EP	WP	WY	WR
-15.0	+100.0	-70.0	+17.0	-58.9	-160.0	+10.0
X	Y	Z	Pitch	Yaw	Roll	
+1851	+880	+1081	-35.8	-78.3	+56.8	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Joint OCAS maneuver to EVA 2 setup position.

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1307	+1136	+731	+21.0	+61.2	+130.3	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Single joint maneuver to APFR setup position.

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	+47.8	-8.0	-183.9
X	Y	Z	Pitch	Yaw	Roll	
+1275	+950	+705	+58.3	-9.9	+97.1	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 13 of 16 pages

Manual maneuver to APFR backoff position.

SR	SY	SP	EP	WP	WY	WR
-14.8	+153.3	-122.3	+67.1	+64.7	-9.0	-189.0
X	Y	Z	Pitch	Yaw	Roll	
+1275	+1000	+980	+58.3	-9.9	+97.1	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

FOR OCAS maneuver to APFR ingress setup position.

SR	SY	SP	EP	WP	WY	WR
-11.0	+153.3	-144.5	+105.8	-26.8	+23.2	-150.4
X	Y	Z	Pitch	Yaw	Roll	
+1085	+900	+980	+92.6	+68.2	+98.3	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to APFR ingress position.

SR	SY	SP	EP	WP	WY	WR
-9.2	+153.3	-140.7	+107.2	-31.4	+21.7	-149.7
X	Y	Z	Pitch	Yaw	Roll	
+1085	+900	+920	+92.6	+68.2	+98.3	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to Columbus backoff position.

SR	SY	SP	EP	WP	WY	WR
-16.9	+153.3	-154.5	+97.9	-10.5	+28.0	-152.7
X	Y	Z	Pitch	Yaw	Roll	
+1098	+983	+1000	+81.8	-39.5	+85.8	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

Joint OCAS to payload bay clearance position.

SR	SY	SP	EP	WP	WY	WR
-73.1	+179.1	-218.0	+57.9	-118.4	+134.5	-84.5

Single joint maneuver to LWAPA approach position.

SR	SY	SP	EP	WP	WY	WR
-73.1	+179.1	-198.7	+57.9	-118.4	+134.5	-84.5
X	Y	Z	Pitch	Yaw	Roll	
-3215	-125	-1400	-91.5	-45.0	+89.8	
FOR	Unloaded – Chest 12/NN/F/6, SR Held					
Disp	ISS>OBAS					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 14 of 16 pages

Manual maneuver to LAWPA install position.

SR	SY	SP	EP	WP	WY	WR
-73.1	+182.9	-179.2	+42.1	-118.5	+135.3	-89.7
X	Y	Z	Pitch	Yaw	Roll	
-3215	-125	-1110	-91.5	-45.0	+89.8	
FOR	Unloaded – Chest 12/NN/F/6, SR Held					
Disp	ISS>OBAS					

Manual maneuver to PGT position.

SR	SY	SP	EP	WP	WY	WR
-73.1	+173.8	-178.9	+48.1	-136.4	+173.7	-75.7
X	Y	Z	Pitch	Yaw	Roll	
-3215	-125	-1065	-92.4*	-85.0	+88.9*	
FOR	Unloaded – Chest 12/NN/F/6, SR Held					
Disp	ISS>OBAS					

Manual maneuver to LWAPA backoff position.

SR	SY	SP	EP	WP	WY	WR
-73.1	+168.1	-206.3	+65.6	-127.2	+173.4	-70.0
X	Y	Z	Pitch	Yaw	Roll	
-3215	-125	-1500	-92.9*	-85.0	+88.6*	
FOR	Unloaded – Chest 12/NN/F/6, SR Held					
Disp	ISS>OBAS					

*Display Singularity

Joint OCAS maneuver to SPDM intermediate position.

SR	SY	SP	EP	WP	WY	WR
-192.9	+150.0	-215.0	+139.6	-141.0	+150.3	-39.5

Single joint maneuver to CLPA 1 setup position.

SR	SY	SP	EP	WP	WY	WR
-192.9	+150.0	-158.2	+139.6	-141.0	+150.3	-39.5
X	Y	Z	Pitch	Yaw	Roll	
+409	-404	+602	-133.9	+36.2	+125.6	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to CLPA 1 install position.

SR	SY	SP	EP	WP	WY	WR
-208.4	+150.0	-170.1	+142.0	-132.7	+154.9	-53.7
X	Y	Z	Pitch	Yaw	Roll	
+320	-310	+695	-133.9	+36.2	+125.6	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 15 of 16 pages

Manual maneuver to CLPA 1 backoff position.

SR	SY	SP	EP	WP	WY	WR
-192.9	+150.0	-158.2	+139.6	-141.0	+150.3	-39.5
X	Y	Z	Pitch	Yaw	Roll	
+409	-404	+602	-133.9	+36.2	+125.6	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

FOR OCAS to EP1 blanket setup position.

SR	SY	SP	EP	WP	WY	WR
-201.1	+150.0	-152.4	+129.5	-132.8	+161.9	-12.4
X	Y	Z	Pitch	Yaw	Roll	
+337	-412	+633	-87.5	+37.6	+88.5	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to EP1 blanket removal position.

SR	SY	SP	EP	WP	WY	WR
-209.8	+150.0	-168.8	+136.5	-125.6	+164.9	-19.6
X	Y	Z	Pitch	Yaw	Roll	
+342	-316	+758	-87.5	+37.6	+88.5	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to EP1 backoff position.

SR	SY	SP	EP	WP	WY	WR
-211.7	+150.0	-173.1	+110.1	-95.5	+165.5	-21.2
X	Y	Z	Pitch	Yaw	Roll	
+343	-585	+966	-87.5	+37.5	+88.4	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

Joint OCAS to Columbus intermediate position.

SR	SY	SP	EP	WP	WY	WR
-50.0	+170.0	-210.0	+110.0	-110.0	+160.0	-10.0

Joint OCAS to Columbus approach position.

SR	SY	SP	EP	WP	WY	WR
-9.3	+153.3	-105.5	+61.5	-137.2	+155.7	-0.4
X	Y	Z	Pitch	Yaw	Roll	
+1287	+1125	+549	-48.9	-78.8	-44.3	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

3.600 PUBLISHED POSITIONS

(RBT FS/ULF5/FIN)

Page 16 of 16 pages

Manual maneuver to APFR egress position.

SR	SY	SP	EP	WP	WY	WR
-12.4	+153.3	-119.4	+91.1	-153.0	+155.6	-3.4
X	Y	Z	Pitch	Yaw	Roll	
+1287	+880	+549	-48.9	-78.8	-44.3	
FOR	Unloaded – Chest 12/NN/F/6, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to APFR removal position.

SR	SY	SP	EP	WP	WY	WR
-12.9	+153.3	-120.9	+94.3	-154.8	+155.6	-3.9
X	Y	Z	Pitch	Yaw	Roll	
+1260	+960	+716	+87.4	+10.0	+98.8	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Manual maneuver to APFR removed backoff position.

SR	SY	SP	EP	WP	WY	WR
-17.3	+153.3	-132.7	+93.3	-142.2	+155.5	-8.2
X	Y	Z	Pitch	Yaw	Roll	
+1260	960	+900	+87.4	+10.0	+98.8	
FOR	Unloaded – LEE Tip, SY Held					
Disp	ISS>ISSACS					

Joint OCAS to CLPA cover setup position.

SR	SY	SP	EP	WP	WY	WR
-29.0	+217.0	-95.0	+23.0	-139.4	+155.5	+5.4

Single joint maneuver to CLPA cover install position.

SR	SY	SP	EP	WP	WY	WR
-29.0	+217.0	-83.0	+23.0	-139.4	+155.5	+5.4

Single joint maneuver to CLPA cover setup position.

SR	SY	SP	EP	WP	WY	WR
-29.0	+217.0	-95.0	+23.0	-139.4	+155.5	+5.4

Joint OCAS maneuver to undock park position.

SR	SY	SP	EP	WP	WY	WR
-30.0	-28.0	-58.0	-60.0	-146.0	-149.2	-17.0

GROUND CONTROL

GROUND CONTROL

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- NOTE
1. Motion commands outside the 5' clearance cone to structure must be executed through completion during planned S-Band AOS. During Ku LOS, SSRMS motion may only be executed along trajectories through workspace that has been surveyed and found to match RPS.
 2. Motion commands inside the 5' clearance cone to structure must be executed through completion during planned S-Band and Ku-Band AOS.
 3. The SSRMS_Safing command (CIPUI: CMRM96IM0454K) should be unsafe prior to starting motion.
 4. After the destination angles are loaded, the autosequence can be cancelled using the SSRMS_Cancel_Manipulator_Command (CIPUI: CMRM96IM0015K).

- NOTE
- The procedure contains the following Safing Type A commands:
- CMRM96IM0848K Lab_RWS_Enable_Vernier
 CMRM96IM0851K:001 Lab_RWS_RHC_Trigger_Up_Auto
 CMRM96IM0854K Lab_RWS_SSRMS_Brakes_Off
 CMRM96IM0863K Lab_RWS_Proceed_With_Autosequence
- CMRM96IM0877K Cup_RWS_Enable_Vernier
 CMRM96IM0880K:001 Cup_RWS_RHC_Trigger_Up_Auto
 CMRM96IM0883K Cup_RWS_SSRMS_Brakes_Off
 CMRM96IM0892K Cup_RWS_Proceed_With_Autosequence

NOTE

If crew completed ELC4 release and backoff, perform step 2, verify SSRMS position at end of step 7.1, and perform steps 9 through end.

1. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip LEE	2 S1 LOOB (+60, +5)
3 LAB S/Z (+25, +45)	4 Tip Elbow (0, +5)

2. SSRMS SETUP FOR MOTION

Cmd Inv

Ops Name	CIPUI
SSRMS_Cancel_Safing	CMRM96IM0801K

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 2 of 41 pages

MSK Verify SSRMS – Not Safed

Ops Name	CIPUI
Lab_RWS_SSRMS_Brakes_Off	CMRM96IM0854K
Cup_RWS_SSRMS_Brakes_Off	CMRM96IM0883K

MSK Verify SSRMS 'MODE' – Standby

Ops Name	CIPUI
Lab_RWS_Enable_Vernier	CMRM96IM0848K
Cup_RWS_Enable_Vernier	CMRM96IM0877K

MSK Verify SSRMS Rates (two) – Vernier

Ops Name	CIPUI
SSRMS_Change_Rate_Scale_Vern_1.0	CMRM96IM0022K:001

MSK Verify SSRMS Vernier Rate Scale – 1.0

3. [SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS](#)

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_Pld_Param_GC_Prox_Unld_LEE_Tip_SY_Held	CMRM95SM0008K:101

Parameter	Value
File_ID	98
OCS_File_ID	97
Payload_ID	0
GF_ID	256

MSK Verify 'Unloaded Parameters' – GC Prox Unld LEE Tip, SY Held

4. [SSRMS SNAPSHOT](#)

Cmd Inv

Ops Name	CIPUI
Set_Snapshot_Coordinate_Frame	CMRM96IM0457K

MSK Verify SSRMS 'Cmd Coord Frame' (2) - SSRMS>Snapshot
Verify SSRMS 'Disp Coord Frame' (4) - SSRMS>Snapshot

5. PDGF AUTO RELEASE

NOTE
Release and back-off to pre-grapple motion commands must be executed through completion during planned S-Band and Ku-Band AOS.

Ops Name	CIPUI
SSRMS_Limp_Joints_All	CMRM96IM0123K

MSK Verify 'MODE' – Limped
 Verify SR to WR 'Status' (seven) – Limp

Downlink Verify downlink video is current.

Cmd Inv

Ops Name	CIPUI
SSRMS_Tip_LEE_Release_Auto_Slow	CMRM96IM0095K

Verify '**Confirm or Terminate**' prompt

NOTE
Once the trigger is hot, only safing or trigger commands should be sent to the Robotics equipment. If a configuration change is required, including routing MSS Cameras, safe the system using the SSRMS_SAFING command (CIPUI: CMRM96IM0454K) to exit LEE operations. (SCR 23262, 14662)

OSTPV Verify 7 minutes of S-Band and Ku-Band coverage remaining in this pass.

Ops Name	CIPUI
SSRMS_Tip_LEE_Confirm_Effector	CMRM96IM0729K

MSK Verify 'Trigger' Status – HOT
 Verify Pending Command – Auto Release

Ops Name	CIPUI
Lab_RWS_RHC_Trigger_Up_Auto	CMRM96IM0851K:001
Cup_RWS_RHC_Trigger_Up_Auto	CMRM96IM0880K:001

MSK Verify 'Umbilical' Mate – grey
 Verify 'Latch' Unlatch – blue
 Verify 'Carriage' Derigidize – blue
 Verify 'Snare' Open – blue
 Verify 'Carriage' Extend – blue

Ops Name	CIPUI
SSRMS_Limp_Joints_None	CMRM96IM0122K

MSK Verify 'MODE' – Standby
 Verify SR to WR 'Status' (seven) – Hold

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 4 of 41 pages

6. SSRMS ENTER FOR OCAS MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_FOR_OCAS_Mode	CMRM96IM0033K

MSK Verify SSRMS 'MODE' – FOR_OCAS

Ops Name	CIPUI
SSRMS_Select_Base_Joint_Lock_Yaw	CMRM96IM0051K

MSK Verify SSRMS SY 'STATUS' – LOCK

6.1 SSRMS FOR OCAS MANEUVER

Cmd Inv	Ops Name	CIPUI
	SSRMS_Set_FOR_OCAS_Dest_Step_6.1	CMRM96IM0053K:1

MSK Verify SSRMS current and target posn (within 1 cm/ 1deg)

FOR TGT ERR	X	Y	Z	Pitch	Yaw	Roll	
	-2	0	0	0.0	0.0	+0.1	
	-65	0	0	0.0	0.0	0.0	
	+63	0	0	0.0	0.0	+0.1	
	SR	SY	SP	EP	WP	WY	WR
	-19.3	+108.0	-143.9	+72.1	-119.5	+202.1	+224.0
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held							
DYF: SSRMS>Snapshot							

Verify PH/M Submode – Wait_conf
Verify SY – Locked

RPS Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV Verify 7 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink Verify SSRMS motion as expected.

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 5 of 41 pages

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-15.7	+108.0	-143.0	+71.5	-116.0	+202.3	+225.2
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
DYF: SSRMS>Snapshot						

7. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_DYF_S3>ELC4_PVGF_S3LI_POR_POS	CMRM96IM0451K:101
SSRMS_Change_DYF_S3>ELC4_PVGF_S3LI_POR_ORI	CMRM96IM0451K:102
SSRMS_Change_DYF_S3>ELC4_PVGF_S3LI_Trans_Vel	CMRM96IM0451K:103
SSRMS_Change_DYF_S3>ELC4_PVGF_S3LI_Rot_Vel	CMRM96IM0451K:104

Frame Data	Value
Frame_ID	55

MSK

Verify SSRMS 'Disp Coord Frame' – S3>ELC4 PVGF S3LI

MSK

Verify SSRMS Position (within 1cm/1deg)

SR	SY	SP	EP	WP	WY	WR
-15.7	+108.0	-143.0	+71.5	-116.0	+202.3	+225.2
X	Y	Z	Pitch	Yaw	Roll	
-64	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
DYF: S3>ELC4 PVGF S3LI						

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 6 of 41 pages

7.1 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_7.1	CMRM96IM0053K:2

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-64	0	0	0.0	0.0	0.0	
TGT	-185	0	0	0.0	0.0	0.0	
ERR	+121	0	0	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	-15.7	+108.0	-143.0	+71.5	-116.0	+202.3	+225.2
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held							
DYF: S3>ELC4 PVGF S3LI							

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 7 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-9.0	+108.0	-140.5	+69.2	-108.9	+202.5	+227.4
X	Y	Z	Pitch	Yaw	Roll	
-185	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
DYF: S3>ELC4 PVGF S3LI						

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 7 of 41 pages

8. SSRMS STANDBY MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_Standby_Mode	CMRM96IM0054K

MSK Verify SSRMS 'MODE' - Standby

9. CAMERA SETUP

Configure downlink views to observe expected motion:

1 SPDM Body 2 (-30, -35)	2 S1 LOOB (+160, +80)
3 LAB S/Z (+5, +30)	4 MBS Mast (+135, -10)

10. SSRMS LEE A SNARE CYCLING

Ops Name	CIPUI
SSRMS_Tip_LEE_Snare_Manual_Close_Slow_Soft_Stop	CMRM96IM0102K

MSK Verify '**Confirm or Terminate**' prompt.

OSTPV Verify 4 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Tip_LEE_Confirm_Effector	CMRM96IM0729K

MSK Verify 'Trigger' Status – HOT
Verify Pending Command – Close Snares

Ops Name	CIPUI
Lab_RWS_RHC_Trigger_Up_Manual_Snare	CMRM96IM0851K:002
Cup_RWS_RHC_Trigger_Up_Manual_Snare	CMRM96IM0880K:002

MSK Verify 'Snare' Close – blue (12 s max)

Ops Name	CIPUI
SSRMS_Tip_LEE_Setup_For_Capture_Slow	CMRM96IM0156K

MSK Verify '**Confirm or Terminate**' prompt.

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 8 of 41 pages

OSTPV Verify 5 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Tip_LEE_Confirm_Effector	CMRM96IM0729K

MSK Verify 'Trigger' Status – HOT
Verify Pending Command – Setup for Capture

Ops Name	CIPUI
Lab_RWS_RHC_Trigger_Up_Auto	CMRM96IM0851K:001
Cup_RWS_RHC_Trigger_Up_Auto	CMRM96IM0880K:001

MSK Verify 'Snare' Open – blue
Verify 'CAPT ST' – setup

11. [SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS](#)

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_Pld_Param_GC_Unld_L EE_Tip_SY_Held	CMRM95SM0008K:102

Parameter	Value
File_ID	82
OCS_File_ID	81
Payload_ID	0
GF_ID	256

MSK Verify 'Unloaded Parameters' – GC Unld LEE Tip, SY Held

12. [SSRMS CHANGE LOADED PAYLOAD PARAMETERS](#)

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_Pld_Param_Node_2_P DGF_SR_Held	CMRM95SM0008K:103

Parameter	Value
File_ID	69
OCS_File_ID	67
Payload_ID	20
GF_ID	4

MSK Verify 'Loaded Parameters' – Node 2 PDGF, SR Held

4.110 SSRMS WALKOFF TO NODE 2
(RBT FS/ULF5/FIN/SPN) Page 9 of 41 pages

13. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_DYF_Node2>PDGF_PO R_POS	CMRM96IM0451K:105
SSRMS_Change_DYF_Node2>PDGF_PO R_ORI	CMRM96IM0451K:106
SSRMS_Change_DYF_Node2>PDGF_Tran s_Vel	CMRM96IM0451K:107
SSRMS_Change_DYF_Node2>PDGF_Rot_ Vel	CMRM96IM0451K:108

Frame Data	Value
Frame_ID	13

MSK Verify SSRMS 'Disp Coord Frame' – Node2>PDGF

MSK Verify SSRMS Position (within 1cm/1deg)

SR	SY	SP	EP	WP	WY	WR
-9.0	+108.0	-140.5	+69.2	-108.9	+202.5	+227.4
X	Y	Z	Pitch	Yaw	Roll	
+193	+841	+1970	-23.6	+0.1	+10.1	
FOR: Unloaded - GC Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

14. CAMERA SETUP

Configure downlink views to observe expected motion:

1 SPDM Body 2 (-30, -35)	2 S1 LOOB (+60, +10)
3 LAB S/Z (+5, +30)	4 MBS Mast (+135, -10)

15. SSRMS JOINT OCAS MODE

Cmd Inv

Ops Name	CIPUI
SSRMS_Enter_Joint_OCAS_Mode	CMRM96IM0032K

MSK Verify SSRMS 'MODE' - Joint OCAS

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 10 of 41 pages

15.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_15.1	CMRM96IM0052K:1

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-9.0	+108.0	-140.5	+69.2	-108.9	+202.5	+227.4
TGT	+23.9	+136.5	-137.1	+67.6	-93.2	+186.8	+156.4
ERR	-32.9	-28.5	-3.4	+1.6	-15.7	+15.7	+71.0
	X	Y	Z	Pitch	Yaw	Roll	
	+193	+841	+1970	-23.6	+0.1	+10.1	
FOR: Unloaded - GC Unld LEE Tip, SY Held							
DYF: Node2>PDGF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+23.9	+136.5	-137.1	+67.6	-93.2	+186.8	+156.4
X	Y	Z	Pitch	Yaw	Roll	
-221	+732	+1613	-2.4	+38.4	-87.5	
FOR: Unloaded - GC Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 11 of 41 pages

15.2 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_15.2	CMRM96IM0052K:2

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	+23.9	+136.5	-137.1	+67.6	-93.2	+186.8	+156.4
TGT	+52.5	+161.3	-134.2	+66.2	-79.5	+173.2	+94.4
ERR	-28.6	-24.8	-2.9	+1.4	-13.7	+13.6	+62.0
	X	Y	Z	Pitch	Yaw	Roll	
	-221	+732	+1613	-2.4	+38.4	-87.5	
FOR: Unloaded - GC Unld LEE Tip, SY Held							
DYF: Node2>PDGF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+52.5	+161.3	-134.2	+66.2	-79.5	+173.2	+94.4
X	Y	Z	Pitch	Yaw	Roll	
-441	+545	+1142	+29.0	+38.4	+157.4	
FOR: Unloaded - GC Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

4.110 SSRMS WALKOFF TO NODE 2
 (RBT FS/ULF5/FIN/SPN) Page 12 of 41 pages

16. CAMERA SETUP

Configure downlink views to observe expected motion:

1 SPDM Body 2 (-15, -35)	2 S1 LOOB (+60, +10)
3 LAB S/Z (+5, 0)	4 MBS Mast (+85, 0)

16.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_16.1	CMRM96IM0052K:3

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	+52.5	+161.3	-134.2	+66.2	-79.5	+173.2	+94.4
TGT	+78.9	+184.2	-131.5	+64.9	-66.9	+160.7	+37.4
ERR	-26.4	-22.9	-2.7	+1.3	-12.6	+12.5	+57.0
	X	Y	Z	Pitch	Yaw	Roll	
	-441	+545	+1142	+29.0	+38.4	+157.4	
	FOR: Unloaded - GC Unld LEE Tip, SY Held						
	DYF: Node2>PDGF						

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

4.110 SSRMS WALKOFF TO NODE 2
 (RBT FS/ULF5/FIN/SPN) Page 13 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+78.9	+184.2	-131.5	+64.9	-66.9	+160.7	+37.4
X	Y	Z	Pitch	Yaw	Roll	
-433	+281	+652	+26.1	+16.9	+69.9	
FOR: Unloaded - GC Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

17. CAMERA SETUP

Configure downlink views to observe expected motion:

1 SPDM Body 2 (-15, -35)	2 S1 LOOB (+60, +10)
3 LAB S/Z (-15, -25)	4 MBS Mast (+65, +20)

17.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_17.1	CMRM96IM0052K:4

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	+78.9	+184.2	-131.5	+64.9	-66.9	+160.7	+37.4
TGT	+103.5	+205.5	-129.0	+63.7	-55.1	+149.1	-15.7
ERR	-24.6	-21.3	-2.5	+1.2	-11.8	+11.6	+53.1
	X	Y	Z	Pitch	Yaw	Roll	
	-433	+281	+652	+26.1	+16.9	+69.9	
FOR: Unloaded - GC Unld LEE Tip, SY Held							
DYF: Node2>PDGF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
 Confirm direction of pending motion

4.110 SSRMS WALKOFF TO NODE 2
 (RBT FS/ULF5/FIN/SPN) Page 14 of 41 pages

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+103.5	+205.5	-129.0	+63.7	-55.1	+149.1	-15.7
X	Y	Z	Pitch	Yaw	Roll	
-201	0	+251	+0.1	0.0	0.0	
FOR: Unloaded - GC Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

18. SSRMS STANDBY MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_Standby_Mode	CMRM96IM0054K

MSK Verify SSRMS 'MODE' - Standby

19. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv	Ops Name	CIPUI
	SSRMS_Change_Pld_Param_GC_Prox_Unld_LEE_Tip_SY_Held	CMRM95SM0008K:104

Parameter	Value
File_ID	98
OCS_File_ID	97
Payload_ID	0
GF_ID	256

MSK Verify 'Unloaded Parameters' – GC Prox Unld LEE Tip, SY Held

20. SSRMS ENTER FOR OCAS MODE

<u>NOTE</u>
During the maneuvers to Node 2 PDGF grapple, the Tip Boom to LAB UHF Antenna clearance reaches a minimum of 19in. and clearance between Base Boom and Columbus module reaches a minimum of 43in.

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_FOR_OCAS_Mode	CMRM96IM0033K

MSK Verify SSRMS 'MODE' – FOR_OCAS

Ops Name	CIPUI
SSRMS_Select_Base_Joint_Lock_Yaw	CMRM96IM0051K

MSK Verify SSRMS SY 'STATUS' – LOCK

20.1 SSRMS FOR OCAS MANEUVER

Cmd Inv	Ops Name	CIPUI
	SSRMS_Set_FOR_OCAS_Dest_Step_20.1	CMRM96IM0053K:3

MSK Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-201	0	+251	+0.1	0.0	0.0	
TGT	-160	0	+110	0.0	0.0	0.0	
ERR	-41	0	+141	+0.1	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	+103.5	+205.5	-129.0	+63.7	-55.1	+149.1	-15.7
	FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
	DYF: Node2>PDGF						

Verify PH/M Submode – Wait_conf
 Verify SY – Locked

RPS Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV Verify 7 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK Verify PH/M Submode – Wait_trigger
 Confirm direction of pending motion

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 16 of 41 pages

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+106.0	+205.5	-121.0	+57.3	-58.5	+147.2	-14.3
X	Y	Z	Pitch	Yaw	Roll	
-160	0	+110	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

21. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip LEE	2 S1 LOOB (+60, +10)
3 P1 LOOB (+111, +13)	4 MBS Mast (+65, +20)

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 17 of 41 pages

21.1 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_21.1	CMRM96IM0053K:4

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-160	0	+110	0.0	0.0	0.0	
TGT	-65	0	0	0.0	0.0	0.0	
ERR	-95	0	+110	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	+106.0	+205.5	-121.0	+57.3	-58.5	+147.2	-14.3
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held							
DYF: Node2>PDGF							

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 7 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+109.5	+205.5	-117.2	+58.2	-65.8	+144.5	-12.3
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 18 of 41 pages

21.2 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_21.2	CMRM96IM0053K:5

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-65	0	0	0.0	0.0	0.0	
TGT	-35	0	0	0.0	0.0	0.0	
ERR	-30	0	0	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	+109.5	+205.5	-117.2	+58.2	-65.8	+144.5	-12.3
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held							
DYF: Node2>PDGF							

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+110.3	+205.5	-118.6	+61.7	-68.6	+143.9	-11.7
X	Y	Z	Pitch	Yaw	Roll	
-35	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 19 of 41 pages

21.3 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_21.3	CMRM96IM0053K:6

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-35	0	0	0.0	0.0	0.0	
TGT	-16	0	0	0.0	0.0	0.0	
ERR	-19	0	0	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	+110.3	+205.5	-118.6	+61.7	-68.6	+143.9	-11.7
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held							
DYF: Node2>PDGF							

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+110.9	+205.5	-119.5	+63.8	-70.3	+143.5	-11.4
X	Y	Z	Pitch	Yaw	Roll	
-16	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

22. PDGF AUTO CAPTURE

<u>NOTE</u>
Capture command must be executed through completion during planned S-Band and Ku-Band AOS.

Downlink Verify Downlink video is current.
 Verify LEE within grapple envelope.

Cmd Inv	Ops Name	CIPUI
	SSRMS_Tip_LEE_Capture_Auto_Limp_Slow	CMRM96IM0092K

MSK Verify **'Confirm or Terminate'** prompt.

<u>NOTE</u>
Once the trigger is hot, only safing or trigger commands should be sent to the Robotics equipment. If a configuration change is required, including routing MSS Cameras, safe the system using the SSRMS_SAFING command (CIPUI: CMRM96IM0454K) to exit LEE operations. (SCR 23262, 14662)

OSTPV Verify 5 minutes of S-Band and Ku-Band coverage remaining in this pass.

Ops Name	CIPUI
SSRMS_Tip_LEE_Confirm_Effector	CMRM96IM0729K

MSK Verify 'Trigger' Status – HOT
 Verify Pending Command – Auto Capture

Ops Name	CIPUI
Lab_RWS_RHC_Trigger_Up_Auto	CMRM96IM0851K:001
Cup_RWS_RHC_Trigger_Up_Auto	CMRM96IM0880K:001

MSK Verify 'Snare' Close, Capture (two) – blue (12 s max)
 Verify 'Payload' Capture to Latch – Yes (SCR 19282)
 Verify 'Load Cell' Tension ~5500 N (90 s max)
 Verify 'Carriage' Retract – blue
 Verify 'Latch' Latch – blue (65 s max)
 Verify Inhibits (three) – Inh
 Verify 'Payload' Status – Captured

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 21 of 41 pages

23. SSRMS MATE UMBILICAL

Cmd Inv	Ops Name	CIPUI
	SSRMS_Tip_LEE_Umb_Auto_Mate	CMRM96IM0039K

MSK Verify '**Confirm or Terminate**' prompt.

Verify PDGF and Payload power removed.

OSTPV Verify 3 minutes of S-Band comm coverage remaining in this pass.

Ops Name	CIPUI
SSRMS_Tip_LEE_Confirm_Effector	CMRM96IM0729K

MSK Verify 'Trigger' Stauts – HOT
Verify Pending Command – Mate

Ops Name	CIPUI
Lab_RWS_RHC_Trigger_Up_Auto	CMRM96IM0851K:001
Cup_RWS_RHC_Trigger_Up_Auto	CMRM96IM0880K:001

MSK Verify 'Umbilical' Mate – blue (10 s max)
Verify 'Umbilical' Prime Cnt, Redun Cnt (two) – blue

24. SSRMS DERIGIDIZE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Tip_LEE_Carriage_Manual_Derigidize_Slow	CMRM95SM0002K

MSK Verify '**Confirm or Terminate**' prompt.

OSTPV Verify 3 minutes of S-Band comm coverage remaining in this pass.

Ops Name	CIPUI
SSRMS_Tip_LEE_Confirm_Effector	CMRM96IM0729K

MSK Verify 'Trigger' Status – HOT
Verify Pending Command – Derigidize

Ops Name	CIPUI
Lab_RWS_RHC_Trigger_Up_Auto	CMRM96IM0851K:001
Cup_RWS_RHC_Trigger_Up_Auto	CMRM96IM0880K:001

MSK Verify 'Carriage' Derigidize – blue
Verify 'Carriage' Brakes – ENG (90s max)

4.110 SSRMS WALKOFF TO NODE 2
 (RBT FS/ULF5/FIN/SPN) Page 22 of 41 pages

25. SSRMS SAFING

Cmd Inv	Ops Name	CIPUI
	SSRMS_Safing	CMRM96IM0454K

MSK Verify SSRMS - Safed

MSK Verify SSRMS Position (within 1cm/1deg)

SR	SY	SP	EP	WP	WY	WR
+111.3	+205.5	-120.1	+65.5	-71.7	+143.2	-11.1
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR: Loaded - Node 2 PDGF, SR Held						
DYF: Node2>PDGF						

26. SSRMS BASE CHANGE

Perfrom {6.334 MSS Powerdown}, to powerdown SSRMS to OFF, then:

Perform {6.435 MSS Operating Base Change}, to change SSRMS Base to LEE B, then:

Perform {6.332 MSS Powerup}, to powerup SSRMS components.

27. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip LEE	2 S1 LOOB (+55, 0)
3 LAB S/Z (+105, +80)	4 MBS Mast (+70, +25)

NOTE

During the following maneuvers to MBS PDGF 1 backoff, the SSRMS Base Boom to LAB UHF Antenna clearance reaches a minimum of 28in. and clearance between SSRMS Tip Boom to Columbus Module reaches a minimum of 25in. SSRMS will be greater than 5ft from structure when step 41.3 is completed.

28. SSRMS SETUP FOR MOTION

Cmd Inv	Ops Name	CIPUI
	SSRMS_Cancel_Safing	CMRM96IM0801K

MSK Verify SSRMS – Not Safed

4.110 SSRMS WALKOFF TO NODE 2
 (RBT FS/ULF5/FIN/SPN) Page 23 of 41 pages

Ops Name	CIPUI
Lab_RWS_SSRMS_Brakes_Off	CMRM96IM0854K
Cup_RWS_SSRMS_Brakes_Off	CMRM96IM0883K

MSK Verify SSRMS 'MODE' – Standby

Ops Name	CIPUI
Lab_RWS_Enable_Vernier	CMRM96IM0848K
Cup_RWS_Enable_Vernier	CMRM96IM0877K

MSK Verify SSRMS Rates (two) – Vernier

Ops Name	CIPUI
SSRMS_Change_Rate_Scale_Vern_1.0	CMRM96IM0022K:001

MSK Verify SSRMS Vernier Rate Scale – 1.0

29. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_Pld_Param_GC_Prox_Unld_LEE_Tip_SR_Held	CMRM95SM0008K:105

Parameter	Value
File_ID	94
OCS_File_ID	97
Payload_ID	0
GF_ID	256

MSK Verify 'Unloaded Parameters' – GC Prox Unld LEE Tip, SR Held

30. SSRMS SNAPSHOT

Cmd Inv

Ops Name	CIPUI
Set_Snapshot_Coordinate_Frame	CMRM96IM0457K

MSK Verify SSRMS 'Cmd Coord Frame' (2) - SSRMS>Snapshot
 Verify SSRMS 'Disp Coord Frame' (4) - SSRMS>Snapshot

31. PDGF AUTO RELEASE

NOTE
Release and back-off to pre-grapple motion commands must be executed through completion during planned S-Band and Ku-Band AOS.

4.110 SSRMS WALKOFF TO NODE 2
 (RBT FS/ULF5/FIN/SPN) Page 24 of 41 pages

Ops Name	CIPUI
SSRMS_Limp_Joints_All	CMRM96IM0123K

MSK Verify 'MODE' – Limped
 Verify SR to WR 'Status' (seven) – Limp

Downlink Verify downlink video is current.

Cmd Inv

Ops Name	CIPUI
SSRMS_Tip_LEE_Release_Auto_Slow	CMRM96IM0095K

Verify '**Confirm or Terminate**' prompt

NOTE
Once the trigger is hot, only safing or trigger commands should be sent to the Robotics equipment. If a configuration change is required, including routing MSS Cameras, safe the system using the SSRMS_SAFING command (CIPUI: CMRM96IM0454K) to exit LEE operations. (SCR 23262, 14662)

OSTPV Verify 7 minutes of S-Band and Ku-Band coverage remaining in this pass.

Ops Name	CIPUI
SSRMS_Tip_LEE_Confirm_Effector	CMRM96IM0729K

MSK Verify 'Trigger' Status – HOT
 Verify Pending Command – Auto Release

Ops Name	CIPUI
Lab_RWS_RHC_Trigger_Up_Auto	CMRM96IM0851K:001
Cup_RWS_RHC_Trigger_Up_Auto	CMRM96IM0880K:001

MSK Verify 'Umbilical' Mate – grey
 Verify 'Latch' Unlatch – blue
 Verify 'Carriage' Derigidize – blue
 Verify 'Snare' Open – blue
 Verify 'Carriage' Extend – blue

Ops Name	CIPUI
SSRMS_Limp_Joints_None	CMRM96IM0122K

MSK Verify 'MODE' – Standby
 Verify SR to WR 'Status' (seven) – Hold

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 25 of 41 pages

32. SSRMS ENTER FOR OCAS MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_FOR_OCAS_Mode	CMRM96IM0033K

MSK Verify SSRMS 'MODE' – FOR_OCAS

Ops Name	CIPUI
SSRMS_Select_Base_Joint_Lock_Roll	CMRM96IM0050K

MSK Verify SSRMS SR 'STATUS' – LOCK

32.1 SSRMS FOR OCAS MANEUVER

Cmd Inv	Ops Name	CIPUI
	SSRMS_Set_FOR_OCAS_Dest_Step_32.1	CMRM96IM0053K:7

MSK Verify SSRMS current and target posn (within 1 cm/ 1deg)

FOR TGT ERR	X	Y	Z	Pitch	Yaw	Roll	
	-2	0	+1	0.0	0.0	0.0	
	-65	0	0	0.0	0.0	0.0	
	+63	0	+1	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	-11.0	-143.3	-71.8	+65.5	-120.0	-205.6	+111.3
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: SSRMS>Snapshot							

Verify PH/M Submode – Wait_conf
Verify SR – Locked

RPS Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV Verify 7 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink Verify SSRMS motion as expected.

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 26 of 41 pages

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.0	-145.0	-73.8	+64.3	-116.2	-206.6	+109.8
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: SSRMS>Snapshot						

33. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Base Elbow (+130, -5)	2 S1 LOOB (+55, 0)
3 LAB S/Z (+10, +70)	4 MBS Mast (+70, +25)

34. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_DYF_MBS>PDGF_1_PO R_POS	CMRM96IM0451K:109
SSRMS_Change_DYF_MBS>PDGF_1_PO R_ORI	CMRM96IM0451K:110
SSRMS_Change_DYF_MBS>PDGF_1_Tra ns_Vel	CMRM96IM0451K:111
SSRMS_Change_DYF_MBS>PDGF_1_Rot _Vel	CMRM96IM0451K:112

Frame Data	Value
Frame_ID	7

MSK

Verify SSRMS 'Disp Coord Frame' – MBS>PDGF 1

MSK

Verify SSRMS Position (within 1cm/1deg)

SR	SY	SP	EP	WP	WY	WR
-11.0	-145.0	-73.8	+64.3	-116.2	-206.6	+109.8
X	Y	Z	Pitch	Yaw	Roll	
-65	0	-1	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 27 of 41 pages

34.1 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_34.1	CMRM96IM0053K:8

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-65	0	-1	0.0	0.0	0.0	
TGT	-120	+50	+120	0.0	0.0	0.0	
ERR	+55	-50	-121	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	-11.0	-145.0	-73.8	+64.3	-116.2	-206.6	+109.8
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: MBS>PDGF 1							

Verify PH/M Submode – Wait_conf

Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 7 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.0	-139.0	-79.1	+64.2	-113.0	-203.0	+115.1
X	Y	Z	Pitch	Yaw	Roll	
-120	+50	+120	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 28 of 41 pages

34.2 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_34.2	CMRM96IM0053K:9

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-120	+50	+120	0.0	0.0	0.0	
TGT	-160	+165	+200	0.0	0.0	0.0	
ERR	+40	-115	-80	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	-11.0	-139.0	-79.1	+64.2	-113.0	-203.0	+115.1
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: MBS>PDGF 1							

Verify PH/M Submode – Wait_conf

Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 7 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.0	-131.8	-88.6	+73.0	-114.4	-198.5	+121.1
X	Y	Z	Pitch	Yaw	Roll	
-160	+165	+200	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

35. SSRMS JOINT OCAS MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_Joint_OCAS_Mode	CMRM96IM0032K

MSK Verify SSRMS 'MODE' - Joint OCAS

35.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv	Ops Name	CIPUI
	SSRMS_Set_Joint_OCAS_Dest_Step_35.1	CMRM96IM0052K:5

MSK Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.0	-131.8	-88.6	+73.0	-114.4	-198.5	+121.1
TGT	+1.0	-138.0	-103.0	+78.6	-114.8	-208.8	+122.7
ERR	-12.0	+6.2	+14.4	-5.6	+0.4	+10.3	-1.6
	X	Y	Z	Pitch	Yaw	Roll	
	-160	+165	+200	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: MBS>PDGF 1							

Verify PH/M Submode – Wait_conf

RPS Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV Verify 6 mins of S-band & Ku-band comm remaining in this pass

	Ops Name	CIPUI
	SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK Verify PH/M Submode – Wait_trigger
 Confirm direction of pending motion

	Ops Name	CIPUI
	Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
	Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink Verify SSRMS motion as expected.

If unexpected motion is observed:

	Ops Name	CIPUI
	SSRMS_Safing	CMRM96IM0454K

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 30 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+1.0	-138.0	-103.0	+78.6	-114.8	-208.8	+122.7
X	Y	Z	Pitch	Yaw	Roll	
-189	+260	+270	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

36. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip Elbow (0, 0)	2 S1 LOOB (+55, +30)
3 LAB S/Z (-5, +35)	4 MBS Mast (+70, +25)

37. SSRMS STANDBY MODE

Cmd Inv

Ops Name	CIPUI
SSRMS_Enter_Standby_Mode	CMRM96IM0054K

MSK

Verify SSRMS 'MODE' - Standby

38. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_Pld_Param_GC_Unld_L EE_Tip_SR_Held	CMRM95SM0008K:106

Parameter	Value
File_ID	79
OCS_File_ID	81
Payload_ID	0
GF_ID	256

MSK

Verify 'Unloaded Parameters' – GC Unld LEE Tip, SR Held

39. SSRMS JOINT OCAS MODE

Cmd Inv

Ops Name	CIPUI
SSRMS_Enter_Joint_OCAS_Mode	CMRM96IM0032K

MSK

Verify SSRMS 'MODE' - Joint OCAS

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 31 of 41 pages

39.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_39.1	CMRM96IM0052K:6

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	+1.0	-138.0	-103.0	+78.6	-114.8	-208.8	+122.7
TGT	-0.5	-121.7	-100.5	+54.6	-114.8	-208.8	+122.7
ERR	+1.5	-16.3	-2.5	+24.0	0.0	0.0	0.0
	X	Y	Z	Pitch	Yaw	Roll	
	-189	+260	+270	0.0	0.0	0.0	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: MBS>PDGF 1							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-0.5	-121.7	-100.5	+54.6	-114.8	-208.8	+122.7
X	Y	Z	Pitch	Yaw	Roll	
-387	+287	+543	-21.6	-2.3	-18.0	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 32 of 41 pages

39.2 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_39.2	CMRM96IM0052K:7

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-0.5	-121.7	-100.5	+54.6	-114.8	-208.8	+122.7
TGT	-2.0	-105.0	-98.0	+30.0	-114.8	-208.8	+122.7
ERR	+1.5	-16.7	-2.5	+24.6	0.0	0.0	0.0
	X	Y	Z	Pitch	Yaw	Roll	
	-387	+287	+543	-21.6	-2.3	-18.0	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: MBS>PDGF 1							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-2.0	-105.0	-98.0	+30.0	-114.8	-208.8	+122.7
X	Y	Z	Pitch	Yaw	Roll	
-672	+374	+663	-47.0	+1.2	-31.3	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

4.110 SSRMS WALKOFF TO NODE 2
 (RBT FS/ULF5/FIN/SPN) Page 33 of 41 pages

40. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip Elbow (+160, 0)	2 S1 LOOB (+55, +30)
3 LAB S/Z (-5, +35)	4 MBS Mast (+70, +25)

40.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_40.1	CMRM96IM0052K:8

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-2.0	-105.0	-98.0	+30.0	-114.8	-208.8	+122.7
TGT	-12.0	-100.0	-83.0	+30.0	-114.8	-208.8	+122.7
ERR	+10.0	-5.0	-15.0	0.0	0.0	0.0	0.0
	X	Y	Z	Pitch	Yaw	Roll	
	-672	+374	+663	-47.0	+1.2	-31.3	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: MBS>PDGF 1							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 34 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-12.0	-100.0	-83.0	+30.0	-114.8	-208.8	+122.7
X	Y	Z	Pitch	Yaw	Roll	
-550	+334	+695	-46.2	+7.5	-27.3	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

40.2 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_40.2	CMRM96IM0052K:9

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-12.0	-100.0	-83.0	+30.0	-114.8	-208.8	+122.7
TGT	-15.0	-70.0	-83.0	+30.0	-114.8	-208.8	+122.7
ERR	+3.0	-30.0	0.0	0.0	0.0	0.0	0.0
	X	Y	Z	Pitch	Yaw	Roll	
	-550	+334	+695	-46.2	+7.5	-27.3	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: MBS>PDGF 1							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 35 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-15.0	-70.0	-83.0	+30.0	-114.8	-208.8	+122.7
X	Y	Z	Pitch	Yaw	Roll	
-666	+628	+828	-60.6	+33.5	-29.5	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

41. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip Elbow (+160, 0)	2 S1 LOOB (+55, +30)
3 LAB S/Z (-15, +10)	4 P1 LOOB (+110, +20)

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 36 of 41 pages

41.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_41.1	CMRM96IM0052K:10

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-15.0	-70.0	-83.0	+30.0	-114.8	-208.8	+122.7
TGT	-20.5	-48.0	-62.1	+30.0	-114.8	-208.8	+122.7
ERR	+5.5	-22.0	-20.9	0.0	0.0	0.0	0.0
	X	Y	Z	Pitch	Yaw	Roll	
	-666	+628	+828	-60.6	+33.5	-29.5	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: MBS>PDGF 1							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 7 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-20.5	-48.0	-62.1	+30.0	-114.8	-208.8	+122.7
X	Y	Z	Pitch	Yaw	Roll	
-498	+1144	+1034	-44.6	+58.6	-43.5	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

4.110 SSRMS WALKOFF TO NODE 2
 (RBT FS/ULF5/FIN/SPN) Page 37 of 41 pages

41.2 SSRMS JOINT OCAS MANEUVER

NOTE
Expect singularity warning when +15 > EP > -15 deg.

Cmd Inv	Ops Name	CIPUI
	SSRMS_Set_Joint_OCAS_Dest_Step_41.2	CMRM96IM0052K:11

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-20.5	-48.0	-62.1	+30.0	-114.8	-208.8	+122.7
TGT	-46.0	-34.4	-24.0	-32.0	-55.2	-123.8	+74.6
ERR	+25.5	-13.6	-38.1	+62.0	-59.6	-85.0	+48.1
	X	Y	Z	Pitch	Yaw	Roll	
	-498	+1144	+1034	-44.6	+58.6	-43.5	
	FOR: Unloaded - GC Unld LEE Tip, SR Held						
	DYF: MBS>PDGF 1						

Verify PH/M Submode – Wait_conf

RPS Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV Verify 7 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
 Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 38 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-46.0	-34.4	-24.0	-32.0	-55.2	-123.8	+74.6
X	Y	Z	Pitch	Yaw	Roll	
-871	+1362	+782	-39.8	-30.6	-130.3	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

41.3 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_41.3	CMRM96IM0052K:12

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-46.0	-34.4	-24.0	-32.0	-55.2	-123.8	+74.6
TGT	-65.5	-24.1	+5.1	-79.4	-9.6	-58.8	+37.8
ERR	+19.5	-10.4	-29.1	+47.4	-45.6	-65.0	+36.8
X	Y	Z	Pitch	Yaw	Roll		
-871	+1362	+782	-39.8	-30.6	-130.3		
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: MBS>PDGF 1							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 39 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-65.5	-24.1	+5.1	-79.4	-9.6	-58.8	+37.8
X	Y	Z	Pitch	Yaw	Roll	
-959	+1577	+329	-146.1	-42.7	+92.4	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

41.4 SSRMS JOINT OCAS MANEUVER

Configure downlink views to observe expected motion:

1 Tip LEE	2 S1 LOOB (+55, +30)
3 LAB S/Z (-25, -20)	4 P1 LOOB (+110, +20)

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_41.4	CMRM96IM0052K:13

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-65.5	-24.1	+5.1	-79.4	-9.6	-58.8	+37.8
TGT	-82.2	-15.2	+30.0	-120.0	+29.4	-3.2	+6.3
ERR	+16.7	-8.9	-24.9	+40.6	-39.0	-55.6	+31.5
	X	Y	Z	Pitch	Yaw	Roll	
	-959	+1577	+329	-146.1	-42.7	+92.4	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: MBS>PDGF 1							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

4.110 SSRMS WALKOFF TO NODE 2
 (RBT FS/ULF5/FIN/SPN) Page 40 of 41 pages

RPS/Downlink Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-82.2	-15.2	+30.0	-120.0	+29.4	-3.2	+6.3
X	Y	Z	Pitch	Yaw	Roll	
-690	+1714	-63	+174.7	+23.1	+45.3	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

41.5 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_41.5	CMRM96IM0052K:14

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-82.2	-15.2	+30.0	-120.0	+29.4	-3.2	+6.3
TGT	-82.2	-15.2	+8.5	-129.9	+29.4	-3.2	+6.3
ERR	0.0	0.0	+21.5	+9.9	0.0	0.0	0.0
	X	Y	Z	Pitch	Yaw	Roll	
	-690	+1714	-63	+174.7	+23.1	+45.3	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: MBS>PDGF 1							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
 Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

4.110 SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN/SPN) Page 41 of 41 pages

RPS/Downlink Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-82.2	-15.2	+8.5	-129.9	+29.4	-3.2	+6.3
X	Y	Z	Pitch	Yaw	Roll	
-764	+1485	-382	+151.1	+1.6	+52.2	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: MBS>PDGF 1						

42. SSRMS SAFING

Cmd Inv

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS - Safed

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4.115 SURVEY - SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN)

Page 1 of 3 pages

1. CAMERA SETUP

Configure the ISS Downlink per the following table:

1 P1 LOOB (+111, +13) FL=15mm	2 S1 LOOB (+60, +90)
3 LAB S/Z (0, +75)	

Verify SRMS at OBSS Pre-Grapple Position.

SY	SP	EP	WP	WY	WR
+23.9	+64.7	-34.2	-99.4	+11.4	-99.0

If crew did not perform release: Verify SSRMS at ELC4 grappled position.

SR	SY	SP	EP	WP	WY	WR
-19.4	+108.0	-143.9	+72.1	-119.6	+202.1	+223.9

If crew performed ELC4 release: Verify SSRMS at ELC4 backoff position.

SR	SY	SP	EP	WP	WY	WR
-9.0	+108.0	-140.5	+69.2	-108.9	+202.5	+227.4

NOTE

Order of Motion for SSRMS is as follows:

1. Red
2. Orange
3. Yellow
4. Green
5. Blue
6. Indigo
7. Violet

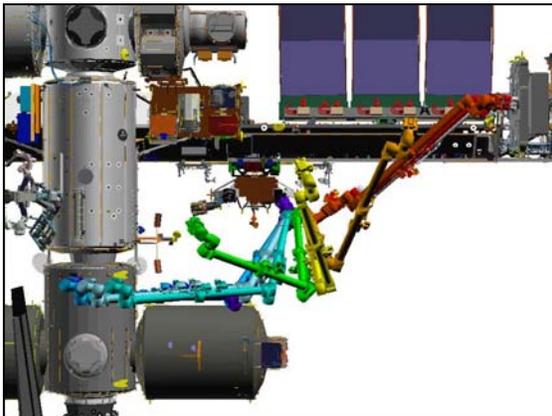


Figure 1.- ELC4 Release to N2 Grapple (ISS Nadir).

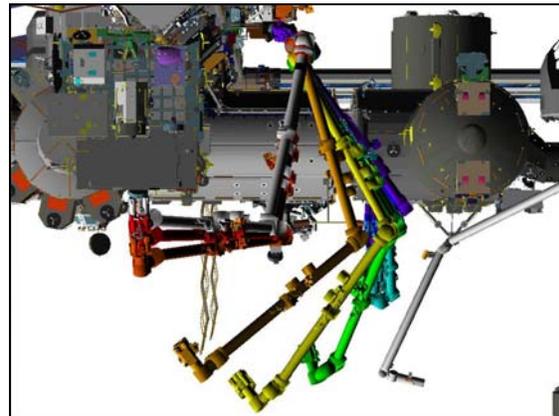


Figure 2.- ELC4 Release to N2 Grapple (ISS Starboard).

4.115 SURVEY - SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN)

Page 2 of 3 pages

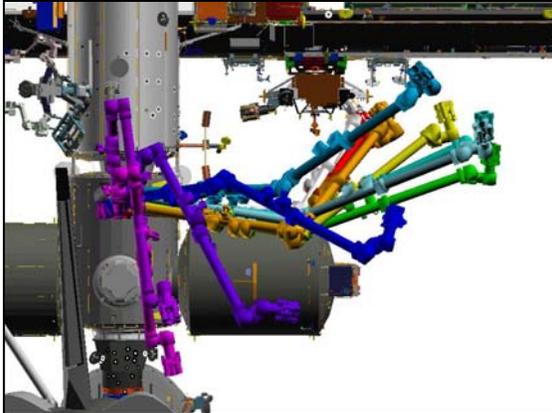


Figure 3.- N2 Rel. to OBSS Pre-Grapple (ISS Nadir).

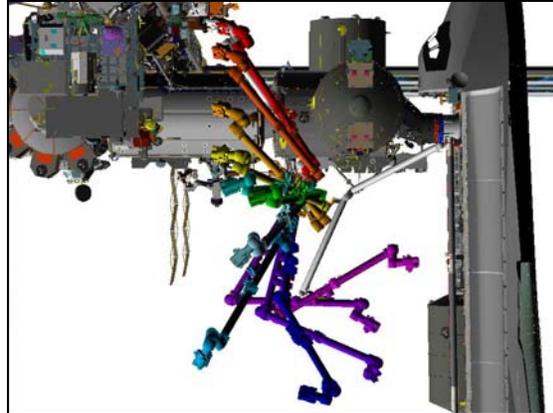


Figure 4.- N2 Rel. to OBSS Pre-Grapple (ISS Starboard).

2. S1 LOWER OUTBOARD WORKSPACE SURVEY

Coordinate with CATO to survey the SSRMS Workspace with the S1 Lower Outboard Camera.

	S1 LOOB	Survey Notes	Fig	Complete
Start Config	(+60, +90)	SSRMS Workspace	5	
1: Tilt Down	(+60, +5)	SSRMS Workspace	6	

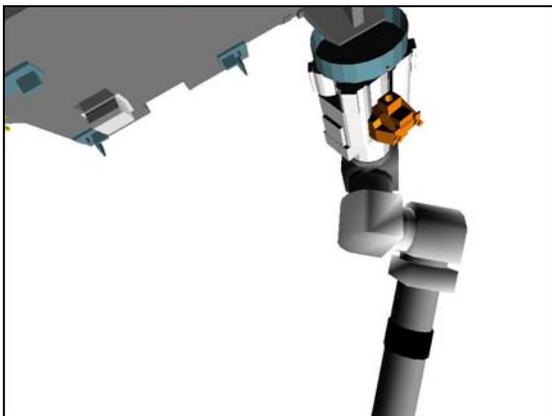


Figure 5.- Start (S1 Lower Outboard: +60, +90).

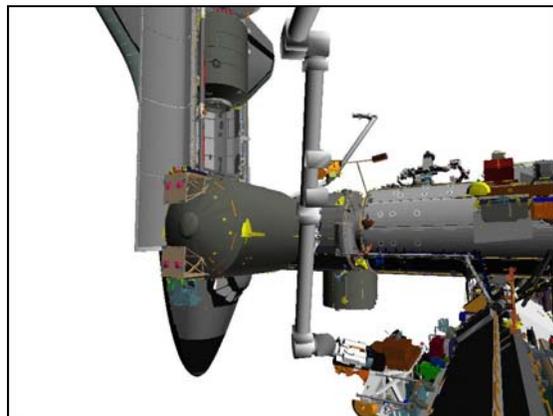


Figure 6.- Step 1 (S1 Lower Outboard: +60, +5).

3. LAB STARBOARD ZENITH SURVEY

Coordinate with CATO to survey the SSRMS Workspace with the LAB Stbd Zenith Camera.

	LAB Stbd Zenith	Survey Notes	Fig	Complete
Start Config	(+0, +75)	SSRMS Workspace	7	
1: Tilt Down	(0, -45)	SSRMS Workspace	8	
2: Pan Left	(-30, -45)	SSRMS Workspace	9	
3: Tilt Up	(-30, +35)	SSRMS Workspace	10	

4.115 SURVEY - SSRMS WALKOFF TO NODE 2

(RBT FS/ULF5/FIN)

Page 3 of 3 pages

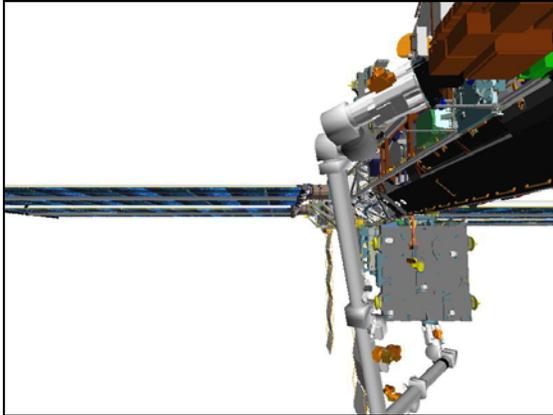


Figure 7.- Start
(LAB Stbd Zenith: 0, +75).

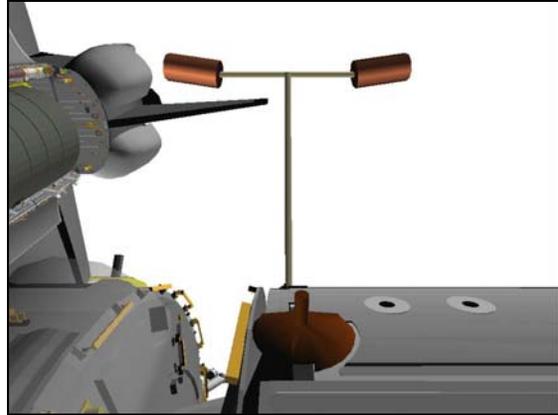


Figure 8.- Step 1
(LAB Stbd Zenith: 0, -45).

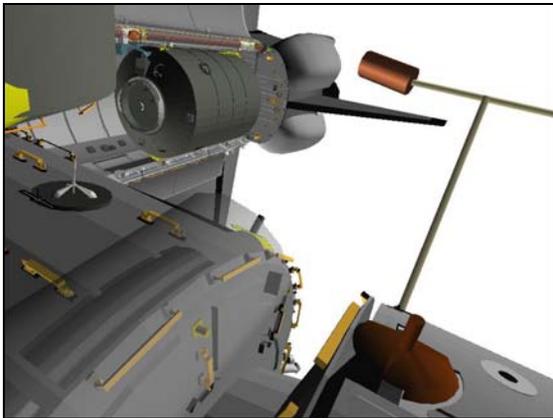


Figure 9.- Step 2
(LAB Stbd Zenith: -30, -45).

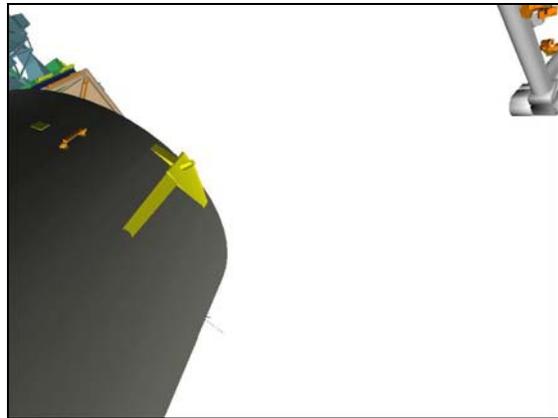


Figure 10.- Step 3
(LAB Stbd Zenith: -30, +35).

3. P1 LOWER OUTBOARD WORKSPACE VIEW



Figure 11.- Workspace View
(P1 LOOB: +111, +13: FL=15mm)

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4.120 SPDM SETUP FOR EVA 2

(RBT FS/ULF5/FIN)

Page 1 of 11 pages

NOTE

1. The SPDM_Safing command (CIPUI: CMRM96IM0456K) should be unsafed prior to starting SPDM motion.
2. After the destination angles are loaded, the autosequence can be cancelled using the appropriate command:
 - SPDM_Arm1_Cancel_Manipulator_Command (CIPUI: CMRM96IM0490K)
 - SPDM_Arm2_Cancel_Manipulator_Command (CIPUI: CMRM96IM0491K)
 - SPDM_Body_Cancel_Manipulator_Command (CIPUI: CMRM96IM0492K)
3. Expect **PSU RT A(B) Cat-2 Brake Arm Failure** robotics advisory message when SPDM brakes are released. Message should return to norm
4. SPDM FOR OCAS maneuvers may not reach their destinations due to a known software issue. In that case a discrete message will be raised indicating that the OCAS destination was not reached.
5. SPDM Arm FOR OCAS Destination will be rounded to the nearest 5mm when displayed to the operator. SPDM will maneuver to the operator commanded destination

NOTE

The procedure contains the following Safing Type A commands:

CMRM96IM0848K Lab_RWS_Enable_Vernier
 CMRM96IM0849K Lab_RWS_Enable_Coarse
 CMRM96IM0858K Lab_RWS_SPDM_Arm2_Brakes_Off
 CMRM96IM0860K Lab_RWS_SPDM_Arm1_Brakes_Off
 CMRM96IM0863K Lab_RWS_Proceed_With_Autosequence

CMRM96IM0878K Cup_RWS_Enable_Coarse
 CMRM96IM0877K Cup_RWS_Enable_Vernier
 CMRM96IM0887K Cup_RWS_SPDM_Arm2_Brakes_Off
 CMRM96IM0889K Cup_RWS_SPDM_Arm1_Brakes_Off
 CMRM96IM0892K Cup_RWS_Proceed_With_Autosequence

MSK

Verify SSRMS Position (within 1deg)

SR	SY	SP	EP	WP	WY	WR
-9.0	+153.3	-111.2	+76.3	-30.0	-8.0	-183.9

Verify Body Roll position (within 1 deg).

BR
-50.0

4.120 SPDM SETUP FOR EVA 2

(RBT FS/ULF5/FIN)

Page 2 of 11 pages

MSK Verify Arm 1 Position (within 1deg)

SR	SY	SP	EP	WP	WY	WR
-90.00	-45.00	+80.00	+45.00	-30.00	+37.50	0.00

MSK Verify Arm 2 Position (within 1deg)

SR	SY	SP	EP	WP	WY	WR
-90.00	-45.00	-110.00	-45.00	+69.50	+38.00	0.00

1. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Base Elbow (-25, +35)	2 P1 LOOB (+100, +15) FL = 15 mm
3 S1 LOOB (+110, +40) FL = 15 mm	4 SPDM Body 2 (-165, +15)

2. WORKSITE SURVEY

Perform visual survey of worksite

NOTE

1. Stow position (model)
2. EVA 2 position (blue)

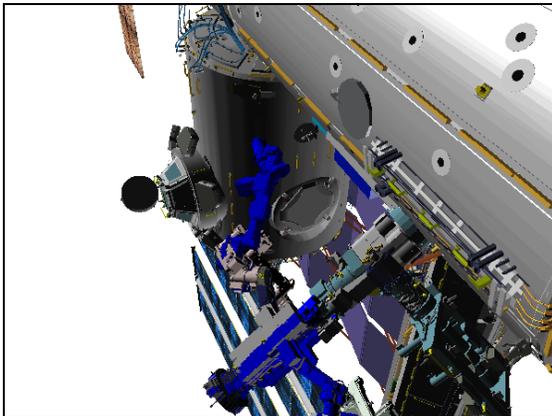


Figure 1.- Pre-Motion Survey
(22: Base Elbow: -25, +35).

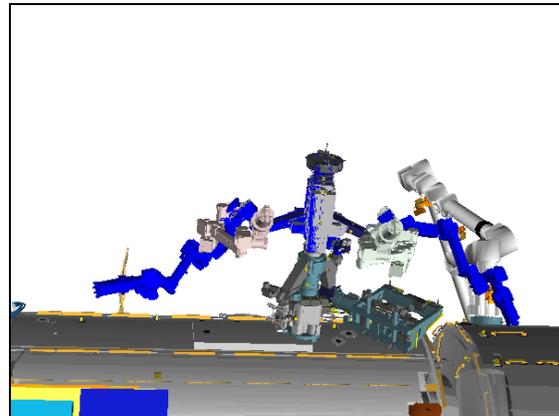


Figure 2.- Pre-Motion Survey
(09: P1 Lower Outboard: +100, +15)
FL = 15 mm.

4.120 SPDM SETUP FOR EVA 2

(RBT FS/ULF5/FIN)

Page 3 of 11 pages

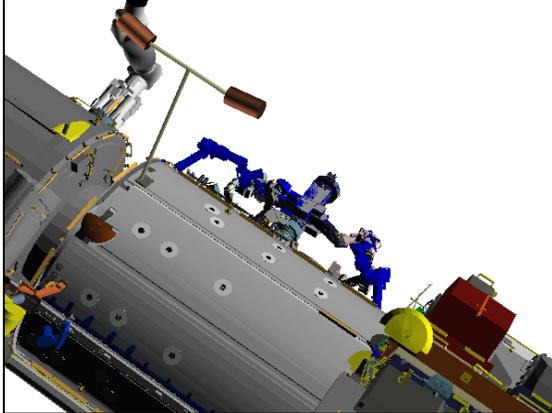


Figure 3.- Pre-Motion Survey
(03: S1 Lower Outboard: +110, +40)
FL = 15 mm.

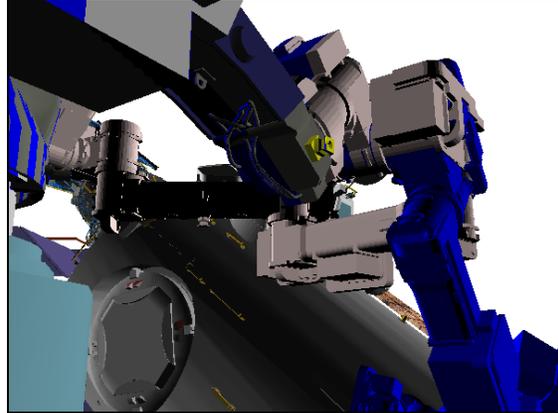


Figure 4.- Pre-Motion Survey
(47: SPDM Body2: -165, +15).

3. ARM 1 CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

Ops Name	CIPUI
SPDM_Arm1_Change_Pld_Param_OTCM_SY_Held	CMRM96IM0480K:101

Parameter	Value
File_ID	531
OCS_File_ID	404
Payload_ID	0
GF_ID	400

MSK

Verify 'Unloaded Parameters' – OTCM, SY Held

4. ARM 1 CHANGE DISPLAY FRAME

Cmd Inv

Ops Name	CIPUI
SPDM_Arm1_Change_DYF_SPDM>PDGF_POR_POS	CMRM96IM0452K:101
SPDM_Arm1_Change_DYF_SPDM>PDGF_POR_ORI	CMRM96IM0452K:102
SPDM_Arm1_Change_DYF_SPDM>PDGF_Trans_Vel	CMRM96IM0452K:103
SPDM_Arm1_Change_DYF_SPDM>PDGF_Rot_Vel	CMRM96IM0452K:104

Frame Data	Value
Frame_ID	17

4.120 SPDM SETUP FOR EVA 2

(RBT FS/ULF5/FIN)

Page 4 of 11 pages

MSK Verify Arm 1 'Disp Coord Frame' – SPDM>PDGF

5. [SPDM 1 CANCEL SAFING](#)

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm1_Cancel_Safing	CMRM96IM0803K

MSK Verify ARM 1 - Not Safed

6. [SPDM 1 BRAKES OFF](#)

Cmd Inv	Ops Name	CIPUI
	Lab_RWS_SPDM_Arm1_Brakes_Off	CMRM96IM0860K
	Cup_RWS_SPDM_Arm1_Brakes_Off	CMRM96IM0889K

MSK Verify Arm 1 'MODE' - Standby

7. [SELECT COARSE RATES](#)

Cmd Inv	Ops Name	CIPUI
	Lab_RWS_Enable_Coarse	CMRM96IM0849K
	Cup_RWS_Enable_Coarse	CMRM96IM0878K

MSK Verify Rates (two) - Coarse

8. [SPDM 1 JOINT OCAS MODE](#)

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm1_Enter_Joint_OCAS_Mode	CMRM96IM0526K

MSK Verify Arm1 'MODE' - Joint OCAS

4.120 SPDM SETUP FOR EVA 2

(RBT FS/ULF5/FIN)

Page 5 of 11 pages

8.1 ARM1 JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SPDM_Arm1_Set_Joint_OCAS_Dest_Step_8.1	CMRM96IM0628K:1

MSK

Verify Arm1 current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-90.00	-45.00	+80.00	+45.00	-30.00	+37.50	0.00
TGT	-90.00	-95.00	0.00	+45.00	-30.00	+37.50	0.00
ERR	0.00	+50.00	+80.00	0.00	0.00	0.00	0.00
	X	Y	Z	Pitch	Yaw	Roll	
	+25.4	+105.8	-211.1	+127.6	-4.0	-87.0	
FOR: Unloaded - OTCM, SY Held							
DYF: SPDM>PDGF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SPDM' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 7 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SPDM_Arm1_Confirm_Manipulator_Autoseq	CMRM96IM0507K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify Arm1 motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SPDM_Safing	CMRM96IM0456K

MSK

Verify Arm1 SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-90.00	-95.00	0.00	+45.00	-30.00	+37.50	0.00
X	Y	Z	Pitch	Yaw	Roll	
+248.9	+381.0	-80.7	+46.4	+73.5	-35.9	
FOR: Unloaded - OTCM, SY Held						
DYF: SPDM>PDGF						

4.120 SPDM SETUP FOR EVA 2

(RBT FS/ULF5/FIN)

Page 6 of 11 pages

9. SPDM SAFING

Cmd Inv	Ops Name	CIPUI
	SPDM_Safing	CMRM96IM0456K

MSK Verify Arm1, Body Prime(Redun), Arm2 (3) - Safed

10. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Base Elbow (-15, 15)	2 P1 LOOB (+100, +15) FL = 15 mm
3 S1 LOOB (+110, +40) FL = 15 mm	4 SPDM Body 2 (+100, 0)

11. ARM 2 CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm2_Change_Pld_Param_OTCM _SY_Held	CMRM96IM0481K:101

Parameter	Value
File_ID	531
OCS_File_ID	404
Payload_ID	0
GF_ID	400

MSK Verify 'Unloaded Parameters' – OTCM, SY Held

4.120 SPDM SETUP FOR EVA 2

(RBT FS/ULF5/FIN)

Page 7 of 11 pages

12. [ARM 2 CHANGE DISPLAY FRAME](#)

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm2_Change_DYF_SPDM>PDGF_POR_POS	CMRM96IM0453K:101
	SPDM_Arm2_Change_DYF_SPDM>PDGF_POR_ORI	CMRM96IM0453K:102
	SPDM_Arm2_Change_DYF_SPDM>PDGF_Trans_Vel	CMRM96IM0453K:103
	SPDM_Arm2_Change_DYF_SPDM>PDGF_Rot_Vel	CMRM96IM0453K:104

Frame Data	Value
Frame_ID	17

MSK Verify Arm 2 'Disp Coord Frame' – SPDM>PDGF

13. [SPDM 2 CANCEL SAFING](#)

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm2_Cancel_Safing	CMRM96IM0804K

MSK Verify 'ARM 2' - Not Safed

14. [SPDM 2 BRAKES OFF](#)

Cmd Inv	Ops Name	CIPUI
	Lab_RWS_SPDM_Arm2_Brakes_Off	CMRM96IM0858K
	Cup_RWS_SPDM_Arm2_Brakes_Off	CMRM96IM0887K

MSK Verify Arm 2 'MODE' - Standby

15. [SPDM 2 JOINT OCAS MODE](#)

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm2_Enter_Joint_OCAS_Mode	CMRM96IM0527K

MSK Verify Arm2 'MODE' - Joint OCAS

4.120 SPDM SETUP FOR EVA 2

(RBT FS/ULF5/FIN)

Page 8 of 11 pages

15.1 ARM2 JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SPDM_Arm2_Set_Joint_OCAS_Dest_Step_15.1	CMRM96IM0629K:1

MSK

Verify Arm2 current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-90.00	-45.00	-110.00	-45.00	+69.50	+38.00	0.00
TGT	-90.00	-45.00	-45.00	-65.00	+10.00	-10.00	0.00
ERR	0.00	0.00	-65.00	+20.00	+59.50	+48.00	0.00
	X	Y	Z	Pitch	Yaw	Roll	
	+24.9	-96.1	-221.0	+128.1	-3.5	-87.2	
FOR: Unloaded - OTCM, SY Held							
DYF: SPDM>PDGF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SPDM' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SPDM_Arm2_Confirm_Manipulator_Autoseq	CMRM96IM0508K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify Arm2 motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SPDM_Safing	CMRM96IM0456K

MSK

Verify Arm2 SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-90.00	-45.00	-45.00	-65.00	+10.00	-10.00	0.00
X	Y	Z	Pitch	Yaw	Roll	
+96.1	-202.9	-287.4	+79.8	+9.8	-88.2	
FOR: Unloaded - OTCM, SY Held						
DYF: SPDM>PDGF						

4.120 SPDM SETUP FOR EVA 2

(RBT FS/ULF5/FIN)

Page 9 of 11 pages

16. SELECT VERN RATES

Cmd Inv

Ops Name	CIPUI
Lab_RWS_Enable_Vernier	CMRM96IM0848K
Cup_RWS_Enable_Vernier	CMRM96IM0877K

MSK

Verify Rates (two) - Vernier

NOTE

SPDM Arm 2 – EOTP decreases to 56 cm (22 in), monitor with P1 Lower Outboard camera

4.120 SPDM SETUP FOR EVA 2

(RBT FS/ULF5/FIN)

Page 10 of 11 pages

16.1 ARM2 JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SPDM_Arm2_Set_Joint_OCAS_Dest_Step_16.1	CMRM96IM0629K:2

MSK

Verify Arm2 current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-90.00	-45.00	-45.00	-65.00	+10.00	-10.00	0.00
TGT	-20.00	-25.00	-45.00	-65.00	+10.00	-10.00	0.00
ERR	-70.00	-20.00	0.00	0.00	0.00	0.00	0.00
	X	Y	Z	Pitch	Yaw	Roll	
	+96.1	-202.9	-287.4	+79.8	+9.8	-88.2	
FOR: Unloaded - OTCM, SY Held							
DYF: SPDM>PDGF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SPDM' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 14 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SPDM_Arm2_Confirm_Manipulator_Autoseq	CMRM96IM0508K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify Arm2 motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SPDM_Safing	CMRM96IM0456K

MSK

Verify Arm2 SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-20.00	-25.00	-45.00	-65.00	+10.00	-10.00	0.00
X	Y	Z	Pitch	Yaw	Roll	
+260.0	-370.4	-79.2	+16.9	-30.2	-101.3	
FOR: Unloaded - OTCM, SY Held						
DYF: SPDM>PDGF						

4.120 SPDM SETUP FOR EVA 2

(RBT FS/ULF5/FIN)

Page 11 of 11 pages

17. SPDM SAFING

Cmd Inv

Ops Name	CIPUI
SPDM_Safing	CMRM96IM0456K

MSK

Verify Arm1, Body Prime(Redun), Arm2 (3) - Safed

18. CAMERA SETUP

Configure SPDM Body camera 2 for EVA (lens cover install position):

1 Base Elbow (-15, 15)	2 P1 LOOB (100, 15) FL = 15 mm
3 S1 LOOB (80, 15) FL = 15 mm	4 SPDM Body 2 (-168, -63)

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4.130 SPDM MANEUVER TO PARK

(RBT FS/ULF5/FIN)

Page 1 of 11 pages

NOTE

1. The SPDM_Safing command (CIPUI: CMRM96IM0456K) should be unsafe prior to starting SPDM motion.
2. After the destination angles are loaded, the autosequence can be cancelled using the appropriate command:
 - SPDM_Arm1_Cancel_Manipulator_Command (CIPUI: CMRM96IM0490K)
 - SPDM_Arm2_Cancel_Manipulator_Command (CIPUI: CMRM96IM0491K)
 - SPDM_Body_Cancel_Manipulator_Command (CIPUI: CMRM96IM0492K)
3. Expect **PSU RT A(B) Cat-2 Brake Arm Failure** robotics advisory message when SPDM brakes are released. Message should return to norm
4. SPDM FOR OCAS maneuvers may not reach their destinations due to a known software issue. In that case a discrete message will be raised indicating that the OCAS destination was not reached.
5. SPDM Arm FOR OCAS Destination will be rounded to the nearest 5mm when displayed to the operator. SPDM will maneuver to the operator commanded destination

NOTE

The procedure contains the following Safing Type A commands:

CMRM96IM0848K Lab_RWS_Enable_Vernier
 CMRM96IM0849K Lab_RWS_Enable_Coarse
 CMRM96IM0858K Lab_RWS_SPDM_Arm2_Brakes_Off
 CMRM96IM0860K Lab_RWS_SPDM_Arm1_Brakes_Off
 CMRM96IM0863K Lab_RWS_Proceed_With_Autosequence

CMRM96IM0878K Cup_RWS_Enable_Coarse
 CMRM96IM0877K Cup_RWS_Enable_Vernier
 CMRM96IM0887K Cup_RWS_SPDM_Arm2_Brakes_Off
 CMRM96IM0889K Cup_RWS_SPDM_Arm1_Brakes_Off
 CMRM96IM0892K Cup_RWS_Proceed_With_Autosequence

MSK

Verify SSRMS Position (within 1 deg)

SR	SY	SP	EP	WP	WY	WR
-30.0	-28.0	-58.0	-60.0	-146.0	-149.2	-17.0

Verify Body Roll position (within 1 deg).

BR
-50.0

4.130 SPDM MANEUVER TO PARK

(RBT FS/ULF5/FIN)

Page 2 of 11 pages

MSK Verify Arm 1 Position (within 1 deg)

SR	SY	SP	EP	WP	WY	WR
-90.00	-95.00	0.00	+45.00	-30.00	+37.50	0.00

MSK Verify Arm 2 Position (within 1 deg)

SR	SY	SP	EP	WP	WY	WR
-20.00	-25.00	-45.00	-65.00	+10.00	-10.00	0.00

1. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip Elbow (-150, +10) FL = 10 mm	2 P1 LOOB (+100, +15) FL = 15 mm
3 S1 LOOB (+110, +40) FL = 15 mm	4 Base Elbow (+30, -20)

2. WORKSITE SURVEY

Perform visual survey of worksite

NOTE

1. EVA 2 position (model)
2. Stow position (blue)

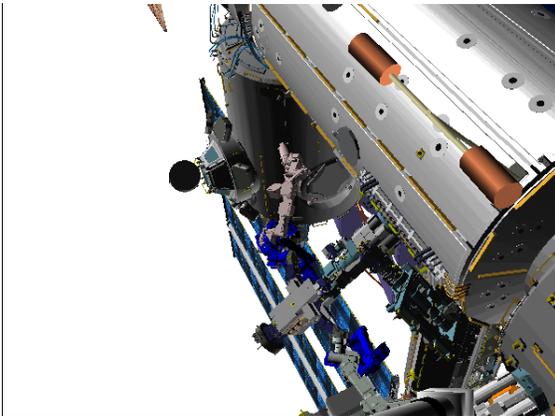


Figure 1.- Pre-Motion Survey
(24: Tip Elbow: -150, +10).



Figure 2.- Pre-Motion Survey
(09: P1 Lower Outboard: +100, +15)
FL = 15 mm..

4.130 SPDM MANEUVER TO PARK

(RBT FS/ULF5/FIN)

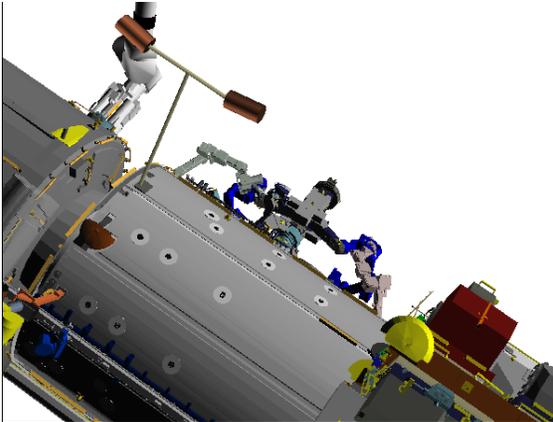


Figure 3.- Pre-Motion Survey
(03: S1 Lower Outboard: +110, +40)
FL = 15 mm..

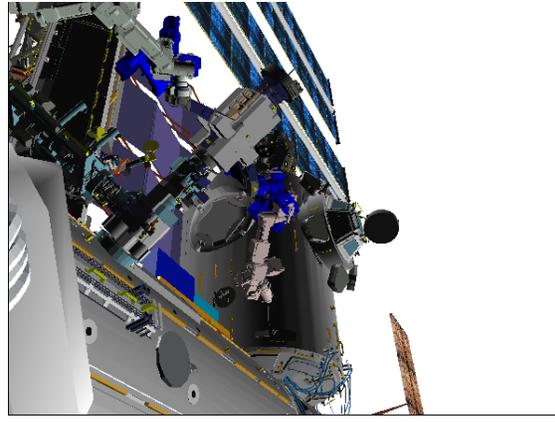


Figure 4.- Pre-Motion Survey
(22: Base Elbow: +30, -20).

3. ARM 1 CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

Ops Name	CIPUI
SPDM_Arm1_Change_Pld_Param_OTCM _SY_Held	CMRM96IM0480K:101

Parameter	Value
File_ID	531
OCS_File_ID	404
Payload_ID	0
GF_ID	400

MSK

Verify 'Unloaded Parameters' – OTCM, SY Held

4. ARM 1 CHANGE DISPLAY FRAME

Cmd Inv

Ops Name	CIPUI
SPDM_Arm1_Change_DYF_SPDM>PDGF _POR_POS	CMRM96IM0452K:101
SPDM_Arm1_Change_DYF_SPDM>PDGF _POR_ORI	CMRM96IM0452K:102
SPDM_Arm1_Change_DYF_SPDM>PDGF _Trans_Vel	CMRM96IM0452K:103
SPDM_Arm1_Change_DYF_SPDM>PDGF _Rot_Vel	CMRM96IM0452K:104

Frame Data	Value
Frame_ID	17

4.130 SPDM MANEUVER TO PARK

(RBT FS/ULF5/FIN)

Page 4 of 11 pages

MSK Verify Arm 1 'Disp Coord Frame' – SPDM>PDGF

5. [SPDM 1 CANCEL SAFING](#)

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm1_Cancel_Safing	CMRM96IM0803K

MSK Verify ARM 1 - Not Safed

6. [SPDM 1 BRAKES OFF](#)

Cmd Inv	Ops Name	CIPUI
	Lab_RWS_SPDM_Arm1_Brakes_Off	CMRM96IM0860K
	Cup_RWS_SPDM_Arm1_Brakes_Off	CMRM96IM0889K

MSK Verify Arm 1 'MODE' - Standby

7. [SELECT COARSE RATES](#)

Cmd Inv	Ops Name	CIPUI
	Lab_RWS_Enable_Coarse	CMRM96IM0849K
	Cup_RWS_Enable_Coarse	CMRM96IM0878K

MSK Verify Rates (two) - Coarse

8. [SPDM 1 JOINT OCAS MODE](#)

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm1_Enter_Joint_OCAS_Mode	CMRM96IM0526K

MSK Verify Arm1 'MODE' - Joint OCAS

4.130 SPDM MANEUVER TO PARK

(RBT FS/ULF5/FIN)

Page 5 of 11 pages

8.1 ARM1 JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SPDM_Arm1_Set_Joint_OCAS_Dest_Step_8.1	CMRM96IM0628K:1

MSK

Verify Arm1 current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-90.00	-95.00	0.00	+45.00	-30.00	+37.50	0.00
TGT	-90.00	-45.00	+80.00	+45.00	-30.00	+37.50	0.00
ERR	0.00	-50.00	-80.00	0.00	0.00	0.00	0.00
	X	Y	Z	Pitch	Yaw	Roll	
	+248.9	+381.0	-80.7	+46.4	+73.5	-35.9	
FOR: Unloaded - OTCM, SY Held							
DYF: SPDM>PDGF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SPDM' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 7 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SPDM_Arm1_Confirm_Manipulator_Autoseq	CMRM96IM0507K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify Arm1 motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SPDM_Safing	CMRM96IM0456K

MSK

Verify Arm1 SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-90.00	-45.00	+80.00	+45.00	-30.00	+37.50	0.00
X	Y	Z	Pitch	Yaw	Roll	
+25.4	+105.8	-211.1	+127.6	-4.0	-87.0	
FOR: Unloaded - OTCM, SY Held						
DYF: SPDM>PDGF						

4.130 SPDM MANEUVER TO PARK

(RBT FS/ULF5/FIN)

Page 6 of 11 pages

9. SELECT VERN RATES

Cmd Inv	Ops Name	CIPUI
	Lab_RWS_Enable_Vernier	CMRM96IM0848K
	Cup_RWS_Enable_Vernier	CMRM96IM0877K

MSK Verify Rates (two) - Vernier

10. SPDM SAFING

Cmd Inv	Ops Name	CIPUI
	SPDM_Safing	CMRM96IM0456K

MSK Verify Arm1, Body Prime(Redun), Arm2 (3) - Safed

11. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip Elbow (-140, 0) FL = 20 mm	2 P1 LOOB (+105, +10) FL = 15 mm
3 S1 LOOB (+80, +15) FL = 15 mm	4 SPDM Body 2 (+100, 0)

12. ARM 2 CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm2_Change_Pld_Param_OTCM _SY_Held	CMRM96IM0481K:101

Parameter	Value
File_ID	531
OCS_File_ID	404
Payload_ID	0
GF_ID	400

MSK Verify 'Unloaded Parameters' – OTCM, SY Held

4.130 SPDM MANEUVER TO PARK

(RBT FS/ULF5/FIN)

Page 7 of 11 pages

13. [ARM 2 CHANGE DISPLAY FRAME](#)

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm2_Change_DYF_SPDM>PDGF_POR_POS	CMRM96IM0453K:101
	SPDM_Arm2_Change_DYF_SPDM>PDGF_POR_ORI	CMRM96IM0453K:102
	SPDM_Arm2_Change_DYF_SPDM>PDGF_Trans_Vel	CMRM96IM0453K:103
	SPDM_Arm2_Change_DYF_SPDM>PDGF_Rot_Vel	CMRM96IM0453K:104

Frame Data	Value
Frame_ID	17

MSK Verify Arm 2 'Disp Coord Frame' – SPDM>PDGF

14. [SPDM 2 CANCEL SAFING](#)

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm2_Cancel_Safing	CMRM96IM0804K

MSK Verify 'ARM 2' - Not Safed

15. [SPDM 2 BRAKES OFF](#)

Cmd Inv	Ops Name	CIPUI
	Lab_RWS_SPDM_Arm2_Brakes_Off	CMRM96IM0858K
	Cup_RWS_SPDM_Arm2_Brakes_Off	CMRM96IM0887K

MSK Verify Arm 2 'MODE' - Standby

NOTE
SPDM Arm 2 – EOTP increases from 56 cm (22 in), monitor with P1 Lower Outboard camera

16. [SPDM 2 JOINT OCAS MODE](#)

Cmd Inv	Ops Name	CIPUI
	SPDM_Arm2_Enter_Joint_OCAS_Mode	CMRM96IM0527K

MSK Verify Arm2 'MODE' - Joint OCAS

4.130 SPDM MANEUVER TO PARK

(RBT FS/ULF5/FIN)

Page 8 of 11 pages

16.1 ARM2 JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SPDM_Arm2_Set_Joint_OCAS_Dest_Step_16.1	CMRM96IM0629K:1

MSK

Verify Arm2 current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-20.00	-25.00	-45.00	-65.00	+10.00	-10.00	0.00
TGT	-90.00	-45.00	-45.00	-65.00	+10.00	-10.00	0.00
ERR	+70.00	+20.00	0.00	0.00	0.00	0.00	0.00
	X	Y	Z	Pitch	Yaw	Roll	
	+260.0	-370.4	-79.2	+16.9	-30.2	-101.3	
FOR: Unloaded - OTCM, SY Held							
DYF: SPDM>PDGF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SPDM' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 14 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SPDM_Arm2_Confirm_Manipulator_Autoseq	CMRM96IM0508K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify Arm2 motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SPDM_Safing	CMRM96IM0456K

MSK

Verify Arm2 SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-90.00	-45.00	-45.00	-65.00	+10.00	-10.00	0.00
X	Y	Z	Pitch	Yaw	Roll	
+96.1	-202.9	-287.4	+79.8	+9.8	-88.2	
FOR: Unloaded - OTCM, SY Held						
DYF: SPDM>PDGF						

4.130 SPDM MANEUVER TO PARK

(RBT FS/ULF5/FIN)

Page 9 of 11 pages

17. SELECT COARSE RATES

Cmd Inv

Ops Name	CIPUI
Lab_RWS_Enable_Coarse	CMRM96IM0849K
Cup_RWS_Enable_Coarse	CMRM96IM0878K

MSK

Verify Rates (two) - Coarse

4.130 SPDM MANEUVER TO PARK

(RBT FS/ULF5/FIN)

Page 10 of 11 pages

17.1 ARM2 JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SPDM_Arm2_Set_Joint_OCAS_Dest_Step_17.1	CMRM96IM0629K:2

MSK

Verify Arm2 current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-90.00	-45.00	-45.00	-65.00	+10.00	-10.00	0.00
TGT	-90.00	-45.00	-110.00	-45.00	+69.50	+38.00	0.00
ERR	0.00	0.00	+65.00	-20.00	-59.50	-48.00	0.00
	X	Y	Z	Pitch	Yaw	Roll	
	+96.1	-202.9	-287.4	+79.8	+9.8	-88.2	
FOR: Unloaded - OTCM, SY Held							
DYF: SPDM>PDGF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SPDM' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 6 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SPDM_Arm2_Confirm_Manipulator_Autoseq	CMRM96IM0508K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify Arm2 motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SPDM_Safing	CMRM96IM0456K

MSK

Verify Arm2 SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-90.00	-45.00	-110.00	-45.00	+69.50	+38.00	0.00
X	Y	Z	Pitch	Yaw	Roll	
+25.2	-96.1	-221.2	+128.0	-3.5	-87.2	
FOR: Unloaded - OTCM, SY Held						
DYF: SPDM>PDGF						

4.130 SPDM MANEUVER TO PARK

(RBT FS/ULF5/FIN)

Page 11 of 11 pages

18. SELECT VERN RATES

Cmd Inv	Ops Name	CIPUI
	Lab_RWS_Enable_Vernier	CMRM96IM0848K
	Cup_RWS_Enable_Vernier	CMRM96IM0877K

MSK Verify Rates (two) - Vernier

19. SPDM SAFING

Cmd Inv	Ops Name	CIPUI
	SPDM_Safing	CMRM96IM0456K

MSK Verify Arm1, Body Prime(Redun), Arm2 (3) - Safed

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4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 1 of 48 pages

NOTE

1. Motion commands outside the 5' clearance cone to structure must be executed through completion during planned S-Band AOS. During Ku LOS, SSRMS motion may only be executed along trajectories through workspace that has been surveyed and found to match RPS.
2. Motion commands inside the 5' clearance cone to structure must be executed through completion during planned S-Band and Ku-Band AOS.
3. The SSRMS_Safing command (CIPUI: CMRM96IM0454K) should be unsafed prior to starting motion.
4. After the destination angles are loaded, the autosequence can be cancelled using the SSRMS_Cancel_Manipulator_Command (CIPUI: CMRM96IM0015K).

NOTE

The procedure contains the following Safing Type A commands:

CMRM96IM0848K Lab_RWS_Enable_Vernier
CMRM96IM0851K:001 Lab_RWS_RHC_Trigger_Up_Auto
CMRM96IM0854K Lab_RWS_SSRMS_Brakes_Off
CMRM96IM0863K Lab_RWS_Proceed_With_Autosequence

CMRM96IM0877K Cup_RWS_Enable_Vernier
CMRM96IM0880K:001 Cup_RWS_RHC_Trigger_Up_Auto
CMRM96IM0883K Cup_RWS_SSRMS_Brakes_Off
CMRM96IM0892K Cup_RWS_Proceed_With_Autosequence

1. SSRMS SETUP FOR MOTION

Cmd Inv	Ops Name	CIPUI
	SSRMS_Cancel_Safing	CMRM96IM0801K

MSK Verify SSRMS – Not Safed

Ops Name	CIPUI
Lab_RWS_SSRMS_Brakes_Off	CMRM96IM0854K
Cup_RWS_SSRMS_Brakes_Off	CMRM96IM0883K

MSK Verify SSRMS 'MODE' – Standby

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 2 of 48 pages

Ops Name	CIPUI
Lab_RWS_Enable_Vernier	CMRM96IM0848K
Cup_RWS_Enable_Vernier	CMRM96IM0877K

MSK Verify SSRMS Rates (two) – Vernier

Ops Name	CIPUI
SSRMS_Change_Rate_Scale_Vern_1.0	CMRM96IM0022K:001

MSK Verify SSRMS Vernier Rate Scale – 1.0

2. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_DYF_Node2>PDGF_PO R_POS	CMRM96IM0451K:101
SSRMS_Change_DYF_Node2>PDGF_PO R_ORI	CMRM96IM0451K:102
SSRMS_Change_DYF_Node2>PDGF_Tran s_Vel	CMRM96IM0451K:103
SSRMS_Change_DYF_Node2>PDGF_Rot_ Vel	CMRM96IM0451K:104

Frame Data	Value
Frame_ID	13

MSK Verify SSRMS 'Disp Coord Frame' – Node2>PDGF

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 3 of 48 pages

3. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_Pld_Param_GC_Unld_L EE_Tip_SY_Held	CMRM95SM0008K:101

Parameter	Value
File_ID	82
OCS_File_ID	81
Payload_ID	0
GF_ID	256

MSK

Verify 'Unloaded Parameters' – GC Unld LEE Tip, SY Held

MSK

Verify SSRMS Position (within 1cm/1deg)

SR	SY	SP	EP	WP	WY	WR
+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9
X	Y	Z	Pitch	Yaw	Roll	
-161	+22	+564	+38.9	-2.1	-17.9	
FOR: Unloaded - GC Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

4. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip Elbow (+15, -10)	2 MBS Mast (+70, +20)
3 LAB STBD (-20, 0)	4 S1 LOOB (+80, +50)

5. SSRMS JOINT OCAS MODE

Cmd Inv

Ops Name	CIPUI
SSRMS_Enter_Joint_OCAS_Mode	CMRM96IM0032K

MSK

Verify SSRMS 'MODE' - Joint OCAS

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 4 of 48 pages

5.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_5.1	CMRM96IM0052K:1

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9
TGT	+101.0	-154.5	-125.2	+65.4	-63.1	+146.3	-13.7
ERR	+1.8	+10.7	-37.1	+30.3	-37.9	+9.1	+7.8
	X	Y	Z	Pitch	Yaw	Roll	
	-161	+22	+564	+38.9	-2.1	-17.9	
FOR: Unloaded - GC Unld LEE Tip, SY Held							
DYF: Node2>PDGF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+101.0	-154.5	-125.2	+65.4	-63.1	+146.3	-13.7
X	Y	Z	Pitch	Yaw	Roll	
-191	+71	+202	+4.9	-3.6	+1.2	
FOR: Unloaded - GC Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 5 of 48 pages

6. SSRMS STANDBY MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_Standby_Mode	CMRM96IM0054K

MSK Verify SSRMS 'MODE' - Standby

7. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv	Ops Name	CIPUI
	SSRMS_Change_Pld_Param_GC_Prox_Unld_LEE_Tip_SY_Held	CMRM95SM0008K:102

Parameter	Value
File_ID	98
OCS_File_ID	97
Payload_ID	0
GF_ID	256

MSK Verify 'Unloaded Parameters' – GC Prox Unld LEE Tip, SY Held

8. SSRMS CHANGE LOADED PAYLOAD PARAMETERS

Cmd Inv	Ops Name	CIPUI
	SSRMS_Change_Pld_Param_Node_2_PDGF_SR_Held	CMRM95SM0008K:103

Parameter	Value
File_ID	69
OCS_File_ID	67
Payload_ID	20
GF_ID	4

MSK Verify 'Loaded Parameters' – Node 2 PDGF, SR Held

9. SSRMS JOINT OCAS MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_Joint_OCAS_Mode	CMRM96IM0032K

MSK Verify SSRMS 'MODE' - Joint OCAS

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 6 of 48 pages

9.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_9.1	CMRM96IM0052K:2

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	+101.0	-154.5	-125.2	+65.4	-63.1	+146.3	-13.7
TGT	+107.1	-154.5	-125.2	+65.4	-63.1	+146.3	-13.7
ERR	-6.1	0.0	0.0	0.0	0.0	0.0	0.0
	X	Y	Z	Pitch	Yaw	Roll	
	-191	+71	+202	+4.9	-3.6	+1.2	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held							
DYF: Node2>PDGF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+107.1	-154.5	-125.2	+65.4	-63.1	+146.3	-13.7
X	Y	Z	Pitch	Yaw	Roll	
-110	+1	+130	0.0	-0.1	+0.1	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 7 of 48 pages

10. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip Elbow (+15, -10)	2 MBS Mast (+70, +20)
3 Tip LEE	4 S1 LOOB (+80, +50)

11. SSRMS ENTER FOR OCAS MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_FOR_OCAS_Mode	CMRM96IM0033K

MSK Verify SSRMS 'MODE' – FOR_OCAS

Ops Name	CIPUI
SSRMS_Select_Base_Joint_Lock_Yaw	CMRM96IM0051K

MSK Verify SSRMS SY 'STATUS' – LOCK

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 8 of 48 pages

11.1 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_11.1	CMRM96IM0053K:1

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-110	+1	+130	0.0	-0.1	+0.1	
TGT	-65	0	0	0.0	0.0	0.0	
ERR	-45	+1	+130	0.0	-0.1	+0.1	
	SR	SY	SP	EP	WP	WY	WR
	+107.1	-154.5	-125.2	+65.4	-63.1	+146.3	-13.7
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held							
DYF: Node2>PDGF							

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+109.5	-154.5	-117.2	+58.1	-65.8	+144.5	-12.3
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 9 of 48 pages

11.2 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_11.2	CMRM96IM0053K:2

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-65	0	0	0.0	0.0	0.0	
TGT	-35	0	0	0.0	0.0	0.0	
ERR	-30	0	0	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	+109.5	-154.5	-117.2	+58.1	-65.8	+144.5	-12.3
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held							
DYF: Node2>PDGF							

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+110.3	-154.5	-118.6	+61.7	-68.5	+143.9	-11.7
X	Y	Z	Pitch	Yaw	Roll	
-35	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 10 of 48 pages

11.3 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_11.3	CMRM96IM0053K:3

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-35	0	0	0.0	0.0	0.0	
TGT	-16	0	0	0.0	0.0	0.0	
ERR	-19	0	0	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	+110.3	-154.5	-118.6	+61.7	-68.5	+143.9	-11.7
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held							
DYF: Node2>PDGF							

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
+110.9	-154.5	-119.4	+63.8	-70.2	+143.5	-11.4
X	Y	Z	Pitch	Yaw	Roll	
-16	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SY Held						
DYF: Node2>PDGF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 11 of 48 pages

12. PDGF AUTO CAPTURE

NOTE

Capture command must be executed through completion during planned S-Band and Ku-Band AOS.

Downlink Verify Downlink video is current.
Verify LEE within grapple envelope.

Cmd Inv	Ops Name	CIPUI
	SSRMS_Tip_LEE_Capture_Auto_Limp_Slow	CMRM96IM0092K

MSK Verify '**Confirm or Terminate**' prompt.

NOTE

Once the trigger is hot, only safing or trigger commands should be sent to the Robotics equipment. If a configuration change is required, including routing MSS Cameras, safe the system using the SSRMS_SAFING command (CIPUI: CMRM96IM0454K) to exit LEE operations. (SCR 23262, 14662)

OSTPV Verify 5 minutes of S-Band and Ku-Band coverage remaining in this pass.

Ops Name	CIPUI
SSRMS_Tip_LEE_Confirm_Effector	CMRM96IM0729K

MSK Verify 'Trigger' Status – HOT
Verify Pending Command – Auto Capture

Ops Name	CIPUI
Lab_RWS_RHC_Trigger_Up_Auto	CMRM96IM0851K:001
Cup_RWS_RHC_Trigger_Up_Auto	CMRM96IM0880K:001

MSK Verify 'Snare' Close, Capture (two) – blue (12 s max)
Verify 'Payload' Capture to Latch – Yes (SCR 19282)
Verify 'Load Cell' Tension ~5500 N (90 s max)
Verify 'Carriage' Retract – blue
Verify 'Latch' Latch – blue (65 s max)
Verify Inhibits (three) – Inh
Verify 'Payload' Status – Captured

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 12 of 48 pages

13. SSRMS MATE UMBILICAL

Cmd Inv	Ops Name	CIPUI
	SSRMS_Tip_LEE_Umb_Auto_Mate	CMRM96IM0039K

MSK Verify '**Confirm or Terminate**' prompt.

Verify PDGF and Payload power removed.

OSTPV Verify 3 minutes of S-Band comm coverage remaining in this pass.

Ops Name	CIPUI
SSRMS_Tip_LEE_Confirm_Effector	CMRM96IM0729K

MSK Verify 'Trigger' Stauts – HOT
Verify Pending Command – Mate

Ops Name	CIPUI
Lab_RWS_RHC_Trigger_Up_Auto	CMRM96IM0851K:001
Cup_RWS_RHC_Trigger_Up_Auto	CMRM96IM0880K:001

MSK Verify 'Umbilical' Mate – blue (10 s max)
Verify 'Umbilical' Prime Cnt, Redun Cnt (two) – blue

14. SSRMS DERIGIDIZE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Tip_LEE_Carriage_Manual_Derigidize_Slow	CMRM95SM0002K

MSK Verify '**Confirm or Terminate**' prompt.

OSTPV Verify 3 minutes of S-Band comm coverage remaining in this pass.

Ops Name	CIPUI
SSRMS_Tip_LEE_Confirm_Effector	CMRM96IM0729K

MSK Verify 'Trigger' Status – HOT
Verify Pending Command – Derigidize

Ops Name	CIPUI
Lab_RWS_RHC_Trigger_Up_Auto	CMRM96IM0851K:001
Cup_RWS_RHC_Trigger_Up_Auto	CMRM96IM0880K:001

MSK Verify 'Carriage' Derigidize – blue

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 13 of 48 pages

15. SSRMS SAFING

Cmd Inv	Ops Name	CIPUI
	SSRMS_Safing	CMRM96IM0454K

MSK Verify SSRMS - Safed

MSK Verify SSRMS Position (within 1cm/1deg)

SR	SY	SP	EP	WP	WY	WR
+111.3	-154.5	-120.1	+65.5	-71.6	+143.2	-11.1
X	Y	Z	Pitch	Yaw	Roll	
0	0	0	0.0	0.0	0.0	
FOR: Loaded - Node 2 PDGF, SR Held						
DYF: Node2>PDGF						

16. SSRMS BASE CHANGE

Perfrom {6.334 MSS Powerdown}, to powerdown SSRMS to OFF, then:

Perform {6.435 MSS Operating Base Change}, to change SSRMS Base, then:

Perform {6.332 MSS Powerup}, to powerup SSRMS components.

17. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv	Ops Name	CIPUI
	SSRMS_Change_Pld_Param_GC_Prox_Unld_LEE_Tip_SR_Held	CMRM95SM0008K:104

Parameter	Value
File_ID	94
OCS_File_ID	97
Payload_ID	0
GF_ID	256

MSK Verify 'Unloaded Parameters' – GC Prox Unld LEE Tip, SR Held

MSK Verify SSRMS Position (within 1cm/1deg)

SR	SY	SP	EP	WP	WY	WR
-11.1	-143.2	-71.6	+65.5	-120.1	+154.5	+111.3
X	Y	Z	Pitch	Yaw	Roll	
+168	+1452	+787	+114.6	-19.6	+176.1	
FOR: Loaded - Node 2 PDGF, SR Held						
DYF: Node2>PDGF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 14 of 48 pages

18. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip Elbow (0, 0)	2 MBS Mast (+70, +20)
3 Tip LEE	4 S1 LOOB (+65, +40)

19. SSRMS CANCEL SAFING

Cmd Inv	Ops Name	CIPUI
	SSRMS_Cancel_Safing	CMRM96IM0801K

MSK Verify SSRMS - Not Safed

20. SSRMS BRAKES OFF

Cmd Inv	Ops Name	CIPUI
	Lab_RWS_SSRMS_Brakes_Off	CMRM96IM0854K
	Cup_RWS_SSRMS_Brakes_Off	CMRM96IM0883K

MSK Verify SSRMS 'MODE' - Standby

21. SSRMS SNAPSHOT

Cmd Inv	Ops Name	CIPUI
	Set_Snapshot_Coordinate_Frame	CMRM96IM0457K

MSK Verify SSRMS 'Cmd Coord Frame' (2) - SSRMS>Snapshot
Verify SSRMS 'Disp Coord Frame' (4) - SSRMS>Snapshot

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 15 of 48 pages

22. PDGF AUTO RELEASE

NOTE

Release and back-off to pre-grapple motion commands must be executed through completion during planned S-Band and Ku-Band AOS.

Ops Name	CIPUI
SSRMS_Limp_Joints_All	CMRM96IM0123K

MSK Verify 'MODE' – Limped
Verify SR to WR 'Status' (seven) – Limp

Downlink Verify downlink video is current.

Cmd Inv

Ops Name	CIPUI
SSRMS_Tip_LEE_Release_Auto_Slow	CMRM96IM0095K

Verify '**Confirm or Terminate**' prompt

NOTE

Once the trigger is hot, only safing or trigger commands should be sent to the Robotics equipment. If a configuration change is required, including routing MSS Cameras, safe the system using the SSRMS_SAFING command (CIPUI: CMRM96IM0454K) to exit LEE operations. (SCR 23262, 14662)

OSTPV Verify 7 minutes of S-Band and Ku-Band coverage remaining in this pass.

Ops Name	CIPUI
SSRMS_Tip_LEE_Confirm_Effector	CMRM96IM0729K

MSK Verify 'Trigger' Status – HOT
Verify Pending Command – Auto Release

Ops Name	CIPUI
Lab_RWS_RHC_Trigger_Up_Auto	CMRM96IM0851K:001
Cup_RWS_RHC_Trigger_Up_Auto	CMRM96IM0880K:001

MSK Verify 'Umbilical' Mate – grey
Verify 'Latch' Unlatch – blue
Verify 'Carriage' Derigidize – blue
Verify 'Snare' Open – blue
Verify 'Carriage' Extend – blue

Ops Name	CIPUI
SSRMS_Limp_Joints_None	CMRM96IM0122K

MSK Verify 'MODE' – Standby
Verify SR to WR 'Status' (seven) – Hold

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 16 of 48 pages

23. SSRMS ENTER FOR OCAS MODE

Cmd Inv

Ops Name	CIPUI
SSRMS_Enter_FOR_OCAS_Mode	CMRM96IM0033K

MSK

Verify SSRMS 'MODE' – FOR_OCAS

Ops Name	CIPUI
SSRMS_Select_Base_Joint_Lock_Roll	CMRM96IM0050K

MSK

Verify SSRMS SR 'STATUS' – LOCK

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 17 of 48 pages

23.1 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_23.1	CMRM96IM0053K:4

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-2	0	0	0.0	0.0	0.0	
TGT	-35	0	0	0.0	0.0	0.0	
ERR	+33	0	0	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	-11.1	-143.2	-71.7	+65.5	-120.0	+154.5	+111.3
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: SSRMS>Snapshot							

Verify PH/M Submode – Wait_conf

Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-144.0	-72.8	+64.9	-118.0	+154.0	+110.5
X	Y	Z	Pitch	Yaw	Roll	
-35	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: SSRMS>Snapshot						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 18 of 48 pages

23.2 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_23.2	CMRM96IM0053K:5

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-35	0	0	0.0	0.0	0.0	
TGT	-65	0	0	0.0	0.0	0.0	
ERR	+30	0	0	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	-11.1	-144.0	-72.8	+64.9	-118.0	+154.0	+110.5
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: SSRMS>Snapshot							

Verify PH/M Submode – Wait_conf

Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-144.8	-73.7	+64.3	-116.2	+153.5	+109.8
X	Y	Z	Pitch	Yaw	Roll	
-65	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: SSRMS>Snapshot						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 19 of 48 pages

24. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_DYF_Orbiter>PMM_GF_POR_POS	CMRM96IM0451K:105
SSRMS_Change_DYF_Orbiter>PMM_GF_POR_ORI	CMRM96IM0451K:106
SSRMS_Change_DYF_Orbiter>PMM_GF_Trans_Vel	CMRM96IM0451K:107
SSRMS_Change_DYF_Orbiter>PMM_GF_Rot_Vel	CMRM96IM0451K:108

Frame Data	Value
Frame_ID	108

MSK

Verify SSRMS 'Disp Coord Frame' – Orbiter>PMM GF

MSK

Verify SSRMS Position (within 1cm/1deg)

SR	SY	SP	EP	WP	WY	WR
-11.1	-144.8	-73.7	+64.3	-116.2	+153.5	+109.8
X	Y	Z	Pitch	Yaw	Roll	
+150	+2143	-520	+173.1	+20.8	-151.3	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

25. CAMERA SETUP

Configure downlink views to observe expected motion:

1 Tip Elbow (0, 0)	2 MBS Mast (+70, +20)
3 LAB STBD (-20, +30)	4 S1 LOOB (+65, +40)

26. SSRMS JOINT OCAS MODE

Cmd Inv

Ops Name	CIPUI
SSRMS_Enter_Joint_OCAS_Mode	CMRM96IM0032K

MSK

Verify SSRMS 'MODE' - Joint OCAS

NOTE
Expect Singularity annunciation from Step 26.8 - 26.9 (SY/WY ~90) and Step 26.12 - 26.15 (EP=0)

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 20 of 48 pages

26.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.1	CMRM96IM0052K:3

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-144.8	-73.7	+64.3	-116.2	+153.5	+109.8
TGT	-11.1	-137.8	-74.2	+60.7	-117.7	+146.6	+106.6
ERR	0.0	-7.0	+0.5	+3.6	+1.5	+6.9	+3.2
	X	Y	Z	Pitch	Yaw	Roll	
	+150	+2143	-520	+173.1	+20.8	-151.3	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-137.8	-74.2	+60.7	-117.7	+146.6	+106.6
X	Y	Z	Pitch	Yaw	Roll	
+149	+2194	-372	-174.9	+23.5	-166.7	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 21 of 48 pages

26.2 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.2	CMRM96IM0052K:4

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-137.8	-74.2	+60.7	-117.7	+146.6	+106.6
TGT	-11.1	-130.8	-74.8	+57.1	-119.3	+139.7	+103.4
ERR	0.0	-7.0	+0.6	+3.6	+1.6	+6.9	+3.2
	X	Y	Z	Pitch	Yaw	Roll	
	+149	+2194	-372	-174.9	+23.5	-166.7	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-130.8	-74.8	+57.1	-119.3	+139.7	+103.4
X	Y	Z	Pitch	Yaw	Roll	
+156	+2220	-221	-161.9	+23.1	+177.5	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 22 of 48 pages

26.3 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.3	CMRM96IM0052K:5

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR	
Current	-11.1	-130.8	-74.8	+57.1	-119.3	+139.7	+103.4	
TGT	-11.1	-123.8	-75.3	+53.5	-120.8	+132.7	+100.2	
ERR	0.0	-7.0	+0.5	+3.6	+1.5	+7.0	+3.2	
	X	Y	Z	Pitch	Yaw	Roll		
	+156	+2220	-221	-161.9	+23.1	+177.5		
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held								
DYF: Orbiter>PMM GF								

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-123.8	-75.3	+53.5	-120.8	+132.7	+100.2
X	Y	Z	Pitch	Yaw	Roll	
+171	+2222	-72	-149.3	+19.4	+162.5	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 23 of 48 pages

26.4 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.4	CMRM96IM0052K:6

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-123.8	-75.3	+53.5	-120.8	+132.7	+100.2
TGT	-11.1	-116.8	-75.9	+49.8	-122.3	+125.8	+97.0
ERR	0.0	-7.0	+0.4	+3.7	+1.5	+6.9	+3.2
	X	Y	Z	Pitch	Yaw	Roll	
	+171	+2222	-72	-149.3	+19.4	+162.5	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-116.8	-75.9	+49.8	-122.3	+125.8	+97.0
X	Y	Z	Pitch	Yaw	Roll	
+195	+2200	+70	-137.9	+12.9	+149.1	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 24 of 48 pages

26.5 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.5	CMRM96IM0052K:7

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-116.8	-75.9	+49.8	-122.3	+125.8	+97.0
TGT	-11.1	-108.8	-76.5	+45.7	-124.1	+117.8	+93.3
ERR	0.0	-8.0	+0.6	+4.1	+1.8	+8.0	+3.7
	X	Y	Z	Pitch	Yaw	Roll	
	+195	+2200	+70	-137.9	+12.9	+149.1	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-108.8	-76.5	+45.7	-124.1	+117.8	+93.3
X	Y	Z	Pitch	Yaw	Roll	
+234	+2151	+216	-126.7	+2.9	+136.3	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 25 of 48 pages

26.6 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.6	CMRM96IM0052K:8

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-108.8	-76.5	+45.7	-124.1	+117.8	+93.3
TGT	-11.1	-100.8	-77.1	+41.6	-125.9	+109.9	+89.6
ERR	0.0	-8.0	+0.6	+4.1	+1.8	+7.9	+3.7
	X	Y	Z	Pitch	Yaw	Roll	
	+234	+2151	+216	-126.7	+2.9	+136.3	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-100.8	-77.1	+41.6	-125.9	+109.9	+89.6
X	Y	Z	Pitch	Yaw	Roll	
+284	+2080	+340	-117.0	-9.0	+125.9	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 26 of 48 pages

26.7 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.7	CMRM96IM0052K:9

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-100.8	-77.1	+41.6	-125.9	+109.9	+89.6
TGT	-11.1	-92.8	-77.7	+37.5	-127.6	+102.0	+85.9
ERR	0.0	-8.0	+0.6	+4.1	+1.7	+7.9	+3.7
	X	Y	Z	Pitch	Yaw	Roll	
	+284	+2080	+340	-117.0	-9.0	+125.9	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-92.8	-77.7	+37.5	-127.6	+102.0	+85.9
X	Y	Z	Pitch	Yaw	Roll	
+343	+1995	+437	-108.1	-22.1	+117.7	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 27 of 48 pages

26.8 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.8	CMRM96IM0052K:10

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-92.8	-77.7	+37.5	-127.6	+102.0	+85.9
TGT	-11.1	-83.8	-78.4	+32.8	-129.6	+93.1	+81.8
ERR	0.0	-9.0	+0.7	+4.7	+2.0	+8.9	+4.1
	X	Y	Z	Pitch	Yaw	Roll	
	+343	+1995	+437	-108.1	-22.1	+117.7	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-83.8	-78.4	+32.8	-129.6	+93.1	+81.8
X	Y	Z	Pitch	Yaw	Roll	
+417	+1890	+510	-98.1	-37.6	+111.2	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 28 of 48 pages

26.9 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.9	CMRM96IM0052K:11

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-83.8	-78.4	+32.8	-129.6	+93.1	+81.8
TGT	-11.1	-73.8	-79.2	+27.7	-131.8	+83.1	+77.2
ERR	0.0	-10.0	+0.8	+5.1	+2.2	+10.0	+4.6
	X	Y	Z	Pitch	Yaw	Roll	
	+417	+1890	+510	-98.1	-37.6	+111.2	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-73.8	-79.2	+27.7	-131.8	+83.1	+77.2
X	Y	Z	Pitch	Yaw	Roll	
+503	+1775	+548	-84.0	-55.1	+108.7	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 29 of 48 pages

26.10 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.10	CMRM96IM0052K:12

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-73.8	-79.2	+27.7	-131.8	+83.1	+77.2
TGT	-11.1	-62.8	-80.0	+22.0	-134.2	+72.2	+72.2
ERR	0.0	-11.0	+0.8	+5.7	+2.4	+10.9	+5.0
	X	Y	Z	Pitch	Yaw	Roll	
	+503	+1775	+548	-84.0	-55.1	+108.7	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-62.8	-80.0	+22.0	-134.2	+72.2	+72.2
X	Y	Z	Pitch	Yaw	Roll	
+595	+1663	+540	-51.9	-72.3	+123.7	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 30 of 48 pages

26.11 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.11	CMRM96IM0052K:13

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-62.8	-80.0	+22.0	-134.2	+72.2	+72.2
TGT	-11.1	-49.8	-81.0	+15.3	-137.1	+59.3	+66.2
ERR	0.0	-13.0	+1.0	+6.7	+2.9	+12.9	+6.0
	X	Y	Z	Pitch	Yaw	Roll	
	+595	+1663	+540	-51.9	-72.3	+123.7	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-49.8	-81.0	+15.3	-137.1	+59.3	+66.2
X	Y	Z	Pitch	Yaw	Roll	
+686	+1568	+480	+41.4	-72.7	-163.1	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 31 of 48 pages

26.12 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.12	CMRM96IM0052K:14

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-49.8	-81.0	+15.3	-137.1	+59.3	+66.2
TGT	-11.1	-33.8	-82.3	+7.0	-140.6	+43.5	+58.8
ERR	0.0	-16.0	+1.2	+8.3	+3.5	+15.9	+7.4
	X	Y	Z	Pitch	Yaw	Roll	
	+686	+1568	+480	+41.4	-72.7	-163.1	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-33.8	-82.3	+7.0	-140.6	+43.5	+58.8
X	Y	Z	Pitch	Yaw	Roll	
+759	+1519	+364	+82.9	-49.2	-148.6	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 32 of 48 pages

26.13 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.13	CMRM96IM0052K:15

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-33.8	-82.3	+7.0	-140.6	+43.5	+58.8
TGT	-11.1	-14.8	-83.7	-2.8	-144.7	+24.6	+50.1
ERR	0.0	-19.0	+1.4	+9.8	+4.1	+18.7	+8.7
	X	Y	Z	Pitch	Yaw	Roll	
	+759	+1519	+364	+82.9	-49.2	-148.6	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-14.8	-83.7	-2.8	-144.7	+24.6	+50.1
X	Y	Z	Pitch	Yaw	Roll	
+774	+1550	+229	+108.4	-23.3	-161.9	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 33 of 48 pages

26.14 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.14	CMRM96IM0052K:16

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-14.8	-83.7	-2.8	-144.7	+24.6	+50.1
TGT	-11.1	+5.2	-85.3	-13.1	-149.1	+4.8	+40.9
ERR	0.0	-20.0	+1.6	+10.3	+4.4	+19.8	+9.2
	X	Y	Z	Pitch	Yaw	Roll	
	+774	+1550	+229	+108.4	-23.3	-161.9	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	+5.2	-85.3	-13.1	-149.1	+4.8	+40.9
X	Y	Z	Pitch	Yaw	Roll	
+713	+1645	+150	+136.6	-7.0	+175.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 34 of 48 pages

26.15 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_26.15	CMRM96IM0052K:17

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	+5.2	-85.3	-13.1	-149.1	+4.8	+40.9
TGT	-11.1	+9.1	-85.6	-15.1	-150.0	+0.9	+39.1
ERR	0.0	-3.9	+0.3	+2.0	+0.9	+3.9	+1.8
	X	Y	Z	Pitch	Yaw	Roll	
	+713	+1645	+150	+136.6	-7.0	+175.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	+9.1	-85.6	-15.1	-150.0	+0.9	+39.1
X	Y	Z	Pitch	Yaw	Roll	
+694	+1666	+145	+142.6	-5.6	+170.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 35 of 48 pages

27. SSRMS STANDBY MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_Standby_Mode	CMRM96IM0054K

MSK Verify SSRMS 'MODE' - Standby

28. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv	Ops Name	CIPUI
	SSRMS_Change_Pld_Param_GC_Unld_L EE_Tip_SR_Held	CMRM95SM0008K:105

Parameter	Value
File_ID	79
OCS_File_ID	81
Payload_ID	0
GF_ID	256

MSK Verify 'Unloaded Parameters' – GC Unld LEE Tip, SR Held

29. CAMERA SETUP

Configure downlink views to observe expected motion:

1 P1 LOOB (+125, +30)	2 MBS Mast (+70, +20)
3 LAB STBD (-20, -20)	4 S1 LOOB (+70, +65)

30. SSRMS JOINT OCAS MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_Joint_OCAS_Mode	CMRM96IM0032K

MSK Verify SSRMS 'MODE' - Joint OCAS

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 36 of 48 pages

30.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_30.1	CMRM96IM0052K:18

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	+9.1	-85.6	-15.1	-150.0	+0.9	+39.1
TGT	-11.1	-70.0	-90.0	+20.0	-150.0	+80.0	+40.0
ERR	0.0	+79.1	+4.4	-35.1	0.0	-79.1	-0.9
	X	Y	Z	Pitch	Yaw	Roll	
	+694	+1666	+145	+142.6	-5.6	+170.0	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	-70.0	-90.0	+20.0	-150.0	+80.0	+40.0
X	Y	Z	Pitch	Yaw	Roll	
+772	+1586	+344	-88.9	-62.3	+30.7	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 37 of 48 pages

30.2 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_30.2	CMRM96IM0052K:19

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	-70.0	-90.0	+20.0	-150.0	+80.0	+40.0
TGT	-11.1	+20.0	-85.0	-20.0	-150.0	-10.0	-50.0
ERR	0.0	-90.0	-5.0	+40.0	0.0	+90.0	+90.0
	X	Y	Z	Pitch	Yaw	Roll	
	+772	+1586	+344	-88.9	-62.3	+30.7	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger
Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	+20.0	-85.0	-20.0	-150.0	-10.0	-50.0
X	Y	Z	Pitch	Yaw	Roll	
+646	+1701	+178	+157.0	-1.4	+71.7	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 38 of 48 pages

30.3 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_30.3	CMRM96IM0052K:20

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	+20.0	-85.0	-20.0	-150.0	-10.0	-50.0
TGT	-11.1	+21.7	-56.9	-27.0	-168.9	-41.0	-56.7
ERR	0.0	-1.7	-28.1	+7.0	+18.9	+31.0	+6.7
	X	Y	Z	Pitch	Yaw	Roll	
	+646	+1701	+178	+157.0	-1.4	+71.7	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	+21.7	-56.9	-27.0	-168.9	-41.0	-56.7
X	Y	Z	Pitch	Yaw	Roll	
+591	+1235	+558	-176.0	+15.2	+59.1	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 39 of 48 pages

30.4 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_30.4	CMRM96IM0052K:21

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	+21.7	-56.9	-27.0	-168.9	-41.0	-56.7
TGT	-11.1	+23.5	-27.9	-34.3	-188.3	-73.0	-63.6
ERR	0.0	-1.8	-29.0	+7.3	+19.4	+32.0	+6.9
	X	Y	Z	Pitch	Yaw	Roll	
	+591	+1235	+558	-176.0	+15.2	+59.1	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	+23.5	-27.9	-34.3	-188.3	-73.0	-63.6
X	Y	Z	Pitch	Yaw	Roll	
+372	+727	+771	-142.9	+25.6	+37.4	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 40 of 48 pages

30.5 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_30.5	CMRM96IM0052K:22

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR	
Current	-11.1	+23.5	-27.9	-34.3	-188.3	-73.0	-63.6	
TGT	-11.1	+25.4	+3.8	-42.2	-209.6	-108.0	-71.2	
ERR	0.0	-1.9	-31.7	+7.9	+21.3	+35.0	+7.6	
	X	Y	Z	Pitch	Yaw	Roll		
	+372	+727	+771	-142.9	+25.6	+37.4		
FOR: Unloaded - GC Unld LEE Tip, SR Held								
DYF: Orbiter>PMM GF								

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	+25.4	+3.9	-42.2	-209.6	-108.0	-71.2
X	Y	Z	Pitch	Yaw	Roll	
-6	+261	+752	-103.4	+24.3	+9.9	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 41 of 48 pages

30.6 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_30.6	CMRM96IM0052K:23

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	+25.4	+3.9	-42.2	-209.6	-108.0	-71.2
TGT	-11.1	+27.3	+35.0	-50.0	-230.5	-142.3	-78.6
ERR	0.0	-1.9	-31.1	+7.8	+20.9	+34.3	+7.4
	X	Y	Z	Pitch	Yaw	Roll	
	-6	+261	+752	-103.4	+24.3	+9.9	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-11.1	+27.3	+35.0	-50.0	-230.5	-142.3	-78.6
X	Y	Z	Pitch	Yaw	Roll	
-440	+6	+500	-68.6	+12.1	-9.8	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 42 of 48 pages

31. CAMERA SETUP

Configure downlink views to observe expected motion:

1 P1 LOOB (+125, +30)	2 MBS Mast (+70, +20)
3 LAB STBD (-20, -30)	4 S1 LOOB (+70, +65)

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 43 of 48 pages

31.1 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_31.1	CMRM96IM0052K:24

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-11.1	+27.3	+35.0	-50.0	-230.5	-142.3	-78.6
TGT	-58.1	+27.3	+19.4	-70.5	-230.5	-142.3	-78.6
ERR	+47.0	0.0	+15.6	+20.5	0.0	0.0	0.0
	X	Y	Z	Pitch	Yaw	Roll	
	-440	+6	+500	-68.6	+12.1	-9.8	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-58.1	+27.3	+19.4	-70.5	-230.5	-142.3	-78.6
X	Y	Z	Pitch	Yaw	Roll	
-188	+49	+327	-24.8	+7.8	-13.3	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 44 of 48 pages

31.2 SSRMS JOINT OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_Joint_OCAS_Dest_Step_31.2	CMRM96IM0052K:25

MSK

Verify SSRMS current and target pos (within 1 cm/ 1deg)

	SR	SY	SP	EP	WP	WY	WR
Current	-58.1	+27.3	+19.4	-70.5	-230.5	-142.3	-78.6
TGT	-90.1	+27.3	+8.8	-84.4	-230.5	-142.3	-78.6
ERR	+32.0	0.0	+10.6	+13.9	0.0	0.0	0.0
	X	Y	Z	Pitch	Yaw	Roll	
	-188	+49	+327	-24.8	+7.8	-13.3	
FOR: Unloaded - GC Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 mins of S-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-90.1	+27.3	+8.8	-84.4	-230.5	-142.3	-78.6
X	Y	Z	Pitch	Yaw	Roll	
-185	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 45 of 48 pages

32. SSRMS STANDBY MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_Standby_Mode	CMRM96IM0054K

MSK Verify SSRMS 'MODE' - Standby

33. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv	Ops Name	CIPUI
	SSRMS_Change_Pld_Param_GC_Prox_Unld_LEE_Tip_SR_Held	CMRM95SM0008K:106

Parameter	Value
File_ID	94
OCS_File_ID	97
Payload_ID	0
GF_ID	256

MSK Verify 'Unloaded Parameters' – GC Prox Unld LEE Tip, SR Held

34. CAMERA SETUP

Configure downlink views to observe expected motion:

1 P1 LOOB (+125, +30)	2 MBS Mast (+70, +20)
3 Tip LEE	4 S1 LOOB (+70, +65)

35. SSRMS ENTER FOR OCAS MODE

Cmd Inv	Ops Name	CIPUI
	SSRMS_Enter_FOR_OCAS_Mode	CMRM96IM0033K

MSK Verify SSRMS 'MODE' – FOR_OCAS

Cmd Inv	Ops Name	CIPUI
	SSRMS_Select_Base_Joint_Lock_Roll	CMRM96IM0050K

MSK Verify SSRMS SR 'STATUS' – LOCK

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 46 of 48 pages

35.1 SSRMS FOR OCAS MANEUVER

Cmd Inv

Ops Name	CIPUI
SSRMS_Set_FOR_OCAS_Dest_Step_35.1	CMRM96IM0053K:6

MSK

Verify SSRMS current and target posn (within 1 cm/ 1deg)

	X	Y	Z	Pitch	Yaw	Roll	
FOR	-185	0	0	0.0	0.0	0.0	
TGT	-150	0	0	0.0	0.0	0.0	
ERR	-35	0	0	0.0	0.0	0.0	
	SR	SY	SP	EP	WP	WY	WR
	-90.1	+27.3	+8.8	-84.4	-230.5	-142.3	-78.6
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held							
DYF: Orbiter>PMM GF							

Verify PH/M Submode – Wait_conf

Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT Incrementing

OSTPV

Verify 5 min of S-band & Ku-band comm remaining in this pass

Ops Name	CIPUI
SSRMS_Confirm_Manipulator_Autoseq	CMRM96IM0025K

MSK

Verify PH/M Submode – Wait_trigger

Confirm direction of pending motion

Ops Name	CIPUI
Lab_RWS_Proceed_With_Autosequence	CMRM96IM0863K
Cup_RWS_Proceed_With_Autosequence	CMRM96IM0892K

RPS/Downlink

Verify SSRMS motion as expected.

If unexpected motion is observed:

Ops Name	CIPUI
SSRMS_Safing	CMRM96IM0454K

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

SR	SY	SP	EP	WP	WY	WR
-90.1	+25.8	+7.4	-84.1	-228.4	-141.4	-77.0
X	Y	Z	Pitch	Yaw	Roll	
-150	0	0	0.0	0.0	0.0	
FOR: Unloaded - GC Prox Unld LEE Tip, SR Held						
DYF: Orbiter>PMM GF						

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 47 of 48 pages

36. SSRMS SAFING

Cmd Inv	Ops Name	CIPUI
	SSRMS_Safing	CMRM96IM0454K

MSK Verify SSRMS - Safed

37. SSRMS CHANGE LOADED PAYLOAD PARAMETERS

Cmd Inv	Ops Name	CIPUI
	SSRMS_Change_Pld_Param_PMM_Unberth_SR_Held	CMRM95SM0008K:107

Parameter	Value
File_ID	171
OCS_File_ID	164
Payload_ID	95
GF_ID	259

MSK Verify 'Loaded Parameters' – PMM Unberth, SR Held

38. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv	Ops Name	CIPUI
	SSRMS_Change_Pld_Param_LEE_Tip_SR_Held	CMRM95SM0008K:108

Parameter	Value
File_ID	76
OCS_File_ID	74
Payload_ID	0
GF_ID	256

MSK Verify 'Unloaded Parameters' – LEE Tip, SR Held

4.140 SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN/SPN)

Page 48 of 48 pages

39. SSRMS CHANGE COMMAND FRAME

Cmd Inv

Ops Name	CIPUI
SSRMS_Change_CDF_SSRMS>Internal_POR_Lin	CMRM96IM0449K:100
SSRMS_Change_CDF_SSRMS>Internal_POR_Ang	CMRM96IM0449K:101

Frame Data	Value
Frame_ID	0

MSK

Verify Cmd Coord Frame 'ID' (2) - 0

4.145 SURVEY - SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN)

Page 1 of 4 pages

Configure the ISS Downlink per the following table:

1 P1 LOOB (125, 30)	2 MBS Mast (+70, +20)
3 LAB STBD (-20, +30)	4 S1 LOOB (+65, +65)

Verify SSRMS at MT Xlate Position on MBS1 (within 1 deg).

SR	SY	SP	EP	WP	WY	WR
+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9

Verify the SRMS is in the PMM Install Viewing Position (within 1 deg).

SY	SP	EP	WP	WY	WR
+35.1	+38.6	-22.7	-0.4	-0.7	-40.1

1. P1 LOWER OUTBOARD CAMERA SURVEY

Coordinate with CATO to survey the SSRMS Workspace with the P1 Lower Outboard Camera.

	P1 LOOB	Survey Notes	Fig	Complete
Start Config	(+125, +30)	SSRMS Workspace	1	

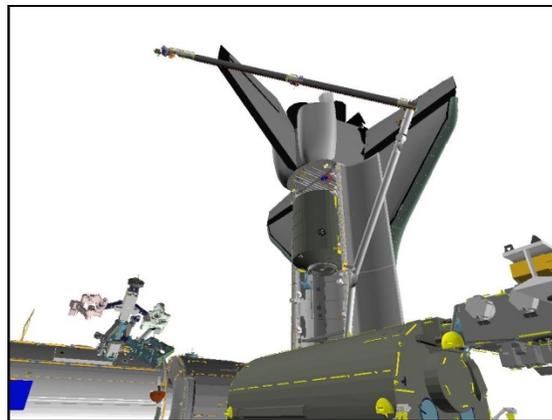


Figure 1.- SSRMS Workspace
(09: P1 Lower Outboard: +125, +30).

2. LAB STBD ZENITH CAMERA SURVEY

Coordinate with CATO to survey the SSRMS Workspace with the LAB Stbd Zenith Camera.

	LAB STBD	Survey Notes	Fig	Complete
Start Config	(-20, +30)	SSRMS Workspace	2	



Figure 2.- SSRMS Workspace
 (13: LAB Stbd Zenith: -20, +30).

3. S1 LOWER OUTBOARD CAMERA SURVEY

Coordinate with CATO to survey the SSRMS Workspace with the S1 Lower Outboard Camera.

	S1 LOOB	Survey Notes	Fig	Complete
Start Config	(+65, +65)	SSRMS Workspace	3	
1: Tilt Down	(+65, +50)	SSRMS Workspace	4	
2: Pan Right	(+80 , +50)	SSRMS Workspace	5	

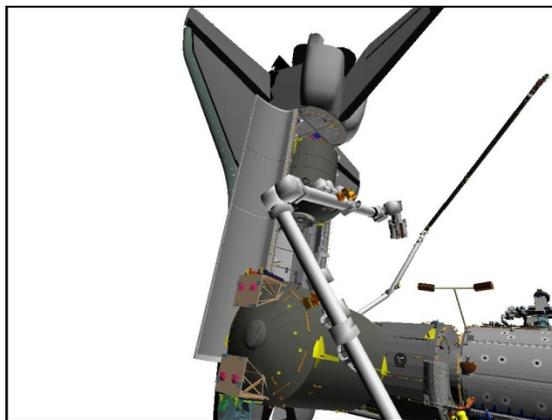


Figure 3.- SSRMS Workspace
 (03: S1 Lower Outboard: +65, +65).

4.145 SURVEY - SSRMS WALKOFF TO NODE 2 FOR PMM

(RBT FS/ULF5/FIN)

Page 3 of 4 pages

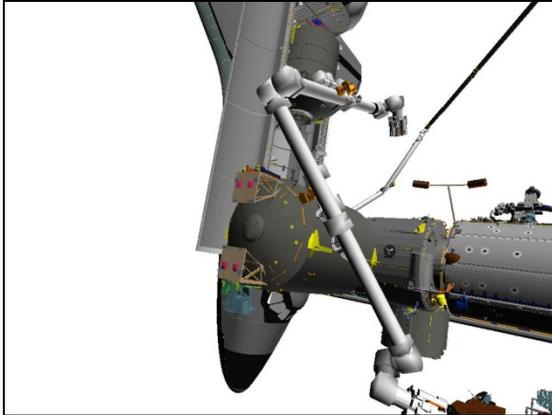


Figure 4.- SSRMS Workspace
(03: S1 Lower Outboard: +65, +50).

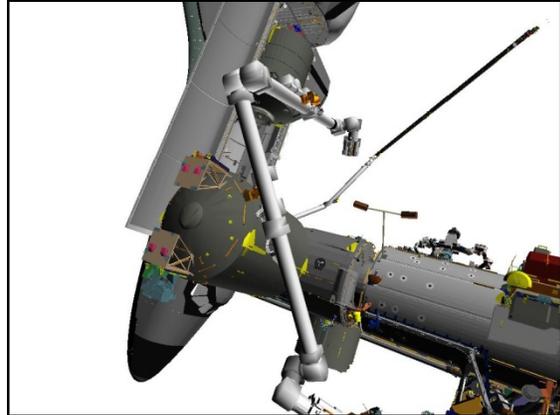


Figure 5.- SSRMS Workspace
(03: S1 Lower Outboard: +80, +50).

4. MBS MAST CAMERA SURVEY

MCCST

'MSS Cameras'

sel MBS Mast

cmd Activate Commanding

Verify Current Camera: MBS Mast

	MBS Mast	Stop at	Survey Notes	Fig	Done
Start Config	(+70, +20)	-	SSRMS Workspace	6	

cmd Finished Commanding



Figure 6.- SSRMS Workspace
(37: MBS Mast: +70, +20).

4.150 SURVEY - MT TRANSLATION WS3 TO WS2

(RBT FS/ULF5/FIN)

Page 1 of 3 pages

Configure the ISS Downlink per the following table:

1 MBS Mast (+175, -25)	2 Base Elbow (-35, -15) FL = 22mm
3 Tip Elbow (+120, +5) FL = 25mm	

Verify SSRMS at MT Xlate Position on MBS1 (within 1 deg).

SR	SY	SP	EP	WP	WY	WR
+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9

1. MBS MAST TRANSLATE CORRIDOR VIEW

MCCST

ROBO Camera Commander

'MSS Cameras'

sel MBS Mast

cmd Activate Commanding

Keyboard Commanding Window

Verify Current Camera: MBS Mast

Pan/Tilt MBS Mast Camera to +175, -25



Figure 1.- Translate Corridor View
(MBS Mast: +175, -25).

4.150 SURVEY - MT TRANSLATION WS3 TO WS2

(RBT FS/ULF5/FIN)

Page 2 of 3 pages

Keyboard Commanding Window

cmd Finished Commanding

MSS Camera Command Tool

cmd Deactivate Position (Verify Active Position - none)

2. TRANSLATION CORRIDOR SURVEY USING BASE ELBOW CAMERA

MCCST

ROBO Camera Commander

'MSS Cameras'

sel Base Elbow

cmd Activate Commanding

Keyboard Commanding Window

Verify Current Camera: Base Elbow

Step	Base Elbow	Stop At	Fig	Done
1. Start Config	(-35, -15) FL = 22mm	-	2	
2. Pan Left	(-75, -15) FL = 22mm	(-69, -15)	3	

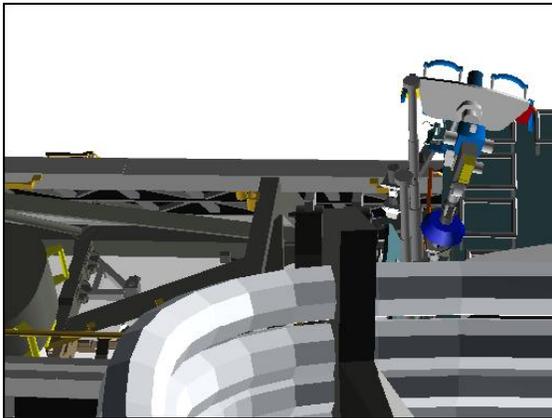


Figure 2.- Start Config
(Base Elbow: -35, -15: FL = 22).

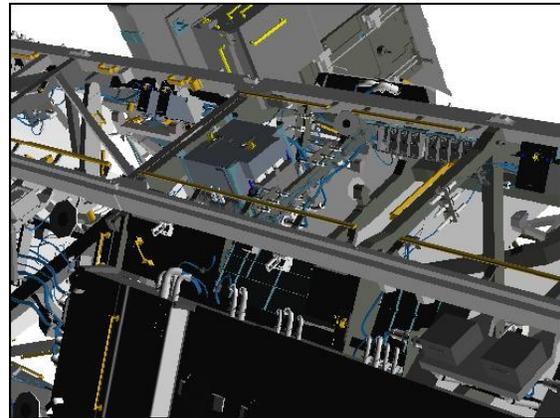


Figure 3.- Step 2
(Base Elbow: -75, -15: FL = 22).

Keyboard Commanding Window

cmd Finished Commanding

MSS Camera Command Tool

cmd Deactivate Position (Verify Active Position - none)

4.150 SURVEY - MT TRANSLATION WS3 TO WS2

(RBT FS/ULF5/FIN)

Page 3 of 3 pages

3. TRANSLATION CORRIDOR SURVEY USING TIP ELBOW CAMERA

MCCST

'MSS Cameras'

sel Tip Elbow

cmd Activate Commanding

Verify Current Camera: Tip Elbow

Step	Tip Elbow	Stop At	Fig	Done
1. Start Config	(+120, +5) FL = 25mm	-	4	
2. Pan Right	(+160, +5) FL = 25mm	(+154, +5)	5	

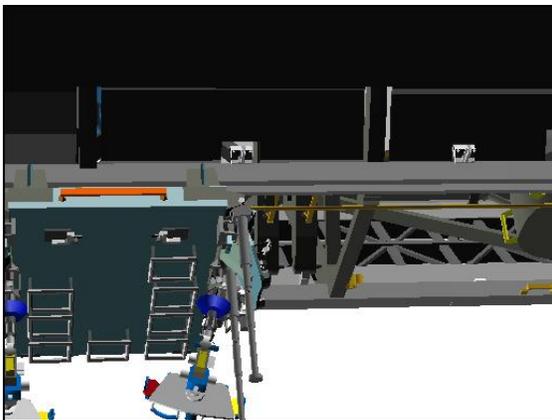


Figure 4.- Step 1
(Tip ELbow: +120, +5: FL = 25).

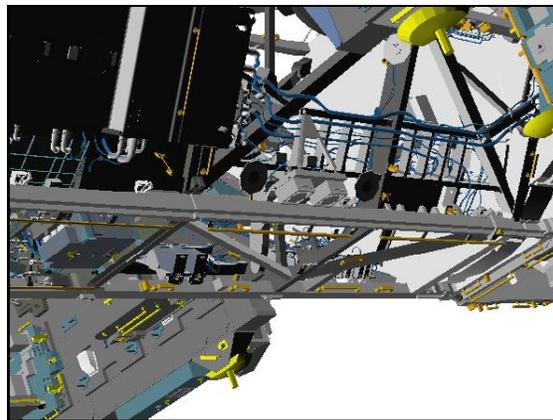


Figure 5.- Step 2
(Tip ELbow: +160, +5: FL = 25).

cmd Finished Commanding

cmd Deactivate Position (Verify Active Position - none)

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4.160 SURVEY - MT TRANSLATION WS2 TO WS3

(RBT FS/ULF5/FIN)

Page 1 of 4 pages

Configure the ISS Downlink per the following table:

1 Base Elbow (+28, -7) FL = 25mm	2 Lab Stbd Zenith (+120, +65)
3 Tip Elbow (+75, +2) FL = 25mm	

Verify SSRMS at MT Xlate Position on MBS1 (within 1 deg).

SR	SY	SP	EP	WP	WY	WR
+102.8	-143.8	-162.3	+95.7	-101.0	+155.4	-5.9

1. LAB STBD ZENITH CAMERA TRANSLATE CORRIDOR VIEW

Coordinate with CATO/Avenger to Survey the MT Translation Corridor with the LAB Stbd Zenith Camera.

Step	LAB Stbd Zenith	Fig	Done
1. Start Config	(+120, +65) FL = 5.68mm	1	
2. Zoom In	(+120, +65) FL = 12.5mm	2	
3. Tilt Down	(+120, +35) FL = 12.5mm	3	
4. Pan Right	(+130, +35) FL = 12.5mm	4	
5. Tilt Down	(+130, +10) FL = 12.5mm	5	

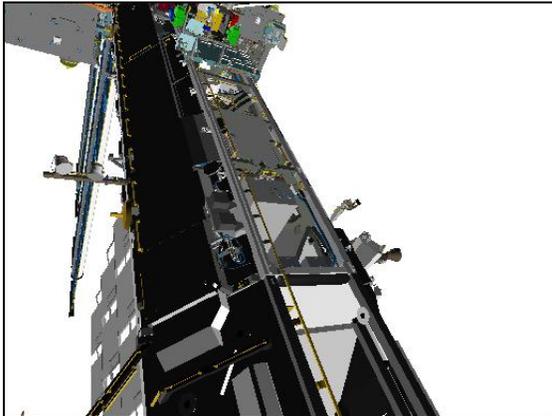


Figure 1.- Step 1
(LAB Stbd Zenith: +120, +65).

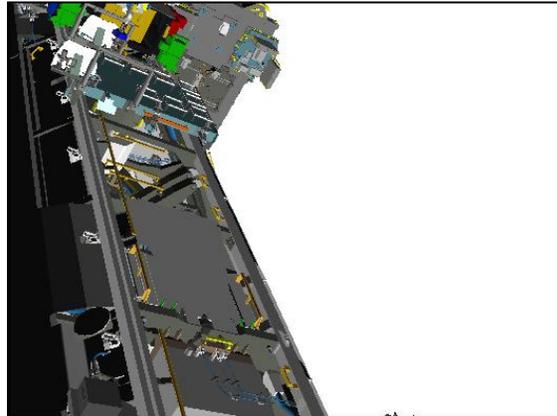


Figure 2.- Step 2
(LAB Stbd Zenith: +120, +65: FL = 12.5).

4.160 SURVEY - MT TRANSLATION WS2 TO WS3

(RBT FS/ULF5/FIN)

Page 2 of 4 pages

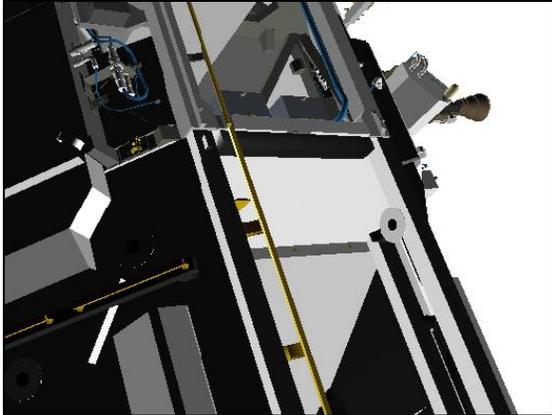


Figure 3.- Step 3
(LAB Stbd Zenith: +120, +35: FL = 12.5).

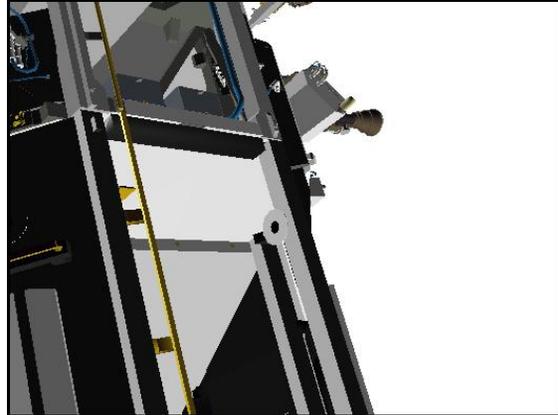


Figure 4.- Step 4
(LAB Stbd Zenith: +130, +35: FL = 12.5).

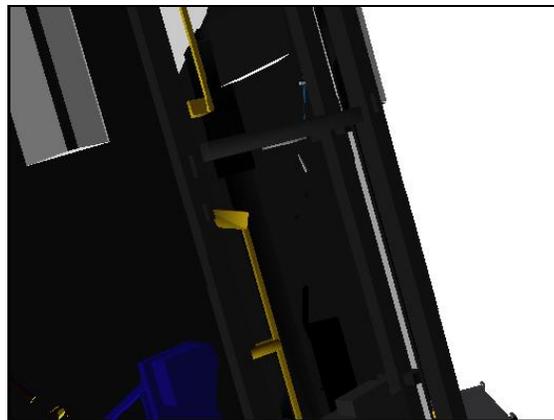


Figure 5.- Step 5
(LAB Stbd Zenith: +130, +10: FL = 12.5).

2. TRANSLATION CORRIDOR SURVEY USING BASE ELBOW CAMERA

MCCST

ROBO Camera Commander

'MSS Cameras'

sel Base Elbow

cmd Activate Commanding

Keyboard Commanding Window

Verify Current Camera: Base Elbow

4.160 SURVEY - MT TRANSLATION WS2 TO WS3

(RBT FS/ULF5/FIN)

Page 3 of 4 pages

Step	Base Elbow	Stop At	Fig	Done
1. Start Config	(+28, -7) FL = 25mm	-	2	
2. Pan Right	(+40, -7) FL = 25mm	(+34, -7)	3	

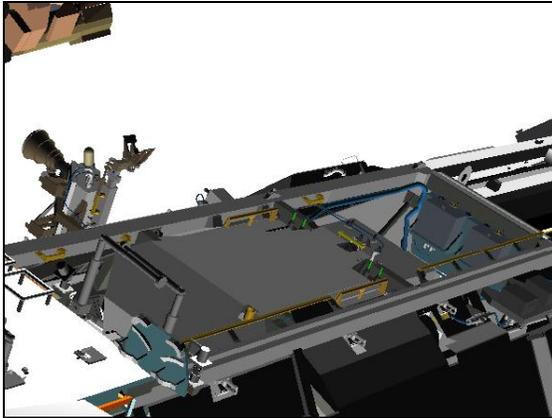


Figure 2.- Start Config
(Base Elbow: +28, -7).

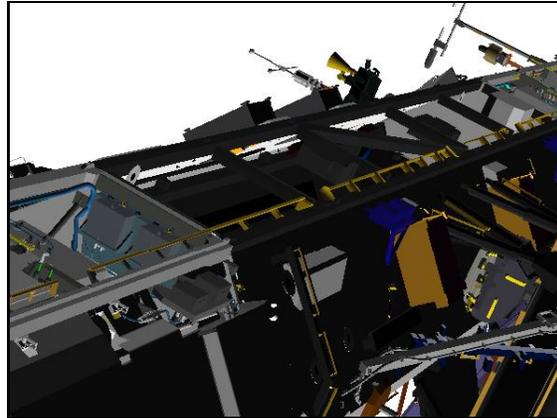


Figure 3.- Step 2
(Base Elbow: +40, -7).

cmd Finished Commanding

cmd Deactivate Position (Verify Active Position - none)

3. TRANSLATION CORRIDOR SURVEY USING TIP ELBOW CAMERA

MCCST

'MSS Cameras'

sel Tip Elbow

cmd Activate Commanding

Verify Current Camera: Tip Elbow

4.160 SURVEY - MT TRANSLATION WS2 TO WS3

(RBT FS/ULF5/FIN)

Page 4 of 4 pages

Step	Base Elbow	Stop At	Fig	Done
1. Start Config	(+75, +2) FL = 25mm	-	4	
2. Pan Left	(+55, +2) FL = 25mm	(+61, +5)	5	

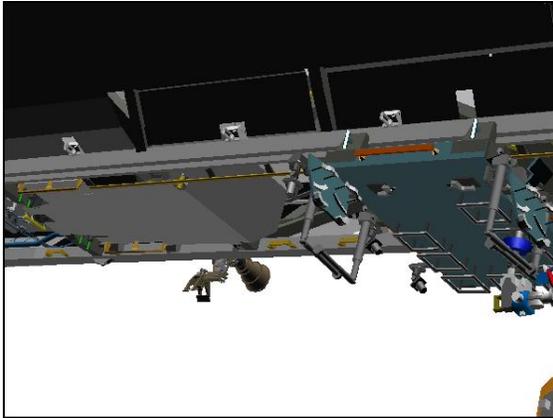


Figure 4.- Step 1
(Tip ELbow: +75, +2: FL = 25).

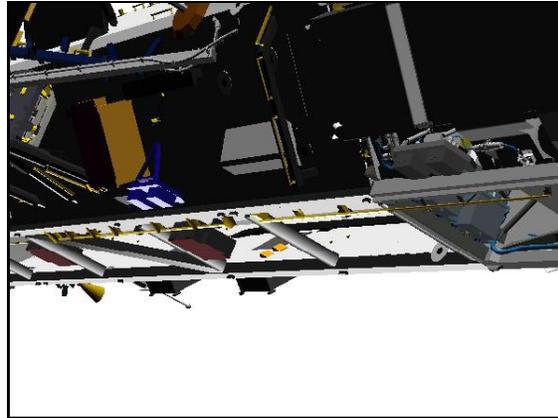


Figure 5.- Step 2
(Tip Elbow: +55, +2: FL = 25).

cmd Finished Commanding

cmd Deactivate Position (Verify Active Position - none)

4.170 CLPA 1 UNCAGE AND CHECKOUT

(RBT FS/ULF5/FIN)

Page 1 of 3 pages

1. CONFIGURE DOWNLINK

Configure downlink views to observe expected motion:

1 SPDM Body 1 (+90, -90)

2. POWER ON DOWNSTREAM SPDM VDU'S

Cmd Inv	Ops Name	CIPUI
	SPDM_VDU2_SACU1_Power_On	CMRM96IM0045K:022
	SPDM_LEE_VDU_SACU1_Power_On	CMRM96IM0045K:24

MSK Verify VDU2 SACU1 – On
Verify LEE VDU SACU1 – On

3. POWER ON CLPA 1 LIGHT

Cmd Inv	Ops Name	CIPUI
	SPDM_Body1_Light_Power_On	CMRM96IM0045K:032

MSK Verify CLPA1 Light – On

4. UNCAGE CLPA 1

Verify camera has had KA power applied for > 20 min

Set the commanded rate to 'Slow'

Perform the following pan/tilt motions:

	SPDM Body 1	Complete
Start Config	+90, -90	
1: Pan Left	+80, -90	
2: Tilt Up	+80, 0	

5. SPDM CLPA 1 CHECKOUT

Using the Shizzle Tool or CDDT display:

Pan / Tilt the camera to (+55, +25). Use of 'Drive To' is permissible.

Adjust Zoom setting to Fully In and Out

4.170 CLPA 1 UNCAGE AND CHECKOUT

(RBT FS/ULF5/FIN)

Page 2 of 3 pages

Adjust Focus setting to Fully Near and Far

Adjust Iris setting to Fully Open and Closed

Return camera to AEC (Auto: Avg)

Cycle through AEC settings:

- Norm
- Peak
- Average

Cycle through Color Balance settings:

- Tung
- Day
- Metal

Cycle through Gamma settings:

- 1.00
- 0.45

Cycle through Gain settings:

- -32 dB
- -16 dB
- 0 dB
- 12 dB
- 24 dB

Return camera to AEC (Auto: Avg)

Cycle through Shutter Speed settings:

- 1/30
- 1/1000
- 1/60
- 1/2000
- 1/125
- 1/4000
- 1/250
- 1/8000
- 1/500
- 1/12400

Return camera to AEC (Auto: Avg)

Cycle through Color Sup settings:

- On
- Off

4.170 CLPA 1 UNCAGE AND CHECKOUT
(RBT FS/ULF5/FIN) Page 3 of 3 pages

Cycle through Black Bal settings:

- On
- Off

Cycle through Sharpness settings:

- Low
- Normal
- High

Cycle through Smear Rej settings:

- On
- Off

Cycle through Line Boost settings:

- Freq
- Gain
- None

Pan / Tilt the camera to (+80, 0). Use of 'Drive To' is permissible.

Set the commanded rate to 'Fast'

Pan / Tilt the camera to (+160, -50). Use of 'Drive To' is permissible.

Pan / Tilt the camera to (+80, 0). Use of 'Drive To' is permissible.

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JSC-48540-ULF5
15 OCT 2010

APPLICABLE FOR ISS-ULF5



INTERNATIONAL SPACE STATION

ROBOTICS FS



Return on
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