



International Space Station Robotics Group Robotics Book - Flight Specific

ISS-ULF4

Mission Operations Directorate
Operations Division

30 APR 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



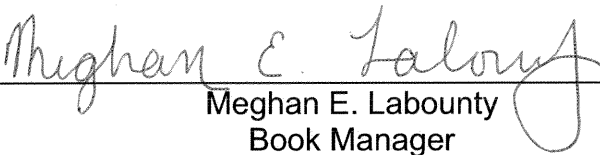
United Space Alliance

PST CODE: ROBO FSP ULF4 FIN 2

**INTERNATIONAL SPACE STATION
ROBOTICS GROUP
ROBOTICS BOOK - FLIGHT SPECIFIC
ISS-ULF4**

30 APR 10

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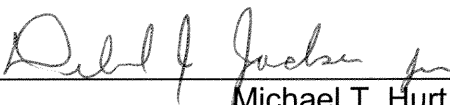


Manager Flight Procedures 098



SODF Coordinator

ACCEPTED BY:



Michael T. Hurt
SODF Manager

| Incorporates the following: | |
|-----------------------------|-------------------|
| CR: Robotics_FS-00976 | Robotics_FS-00980 |
| Robotics_FS-00977 | Robotics_FS-00981 |
| Robotics_FS-00978 | Robotics_FS-00986 |
| Robotics_FS-00979 | |

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

None

**INTERNATIONAL SPACE STATION
ROBOTICS GROUP
ROBOTICS BOOK - FLIGHT SPECIFIC
ISS-ULF4**

LIST OF EFFECTIVE PAGES

30 APR 10

| | | | |
|---------------|-------------|---------|-----------|
| Sign Off..... | * 30 APR 10 | 34..... | 22 APR 10 |
| ii..... | * 30 APR 10 | 35..... | 22 APR 10 |
| iii..... | * 30 APR 10 | 36..... | 22 APR 10 |
| iv..... | * 30 APR 10 | 37..... | 22 APR 10 |
| v..... | * 30 APR 10 | 38..... | 22 APR 10 |
| vi..... | * 30 APR 10 | 39..... | 22 APR 10 |
| vii..... | 30 APR 10 | 40..... | TPIB |
| viii..... | 30 APR 10 | 41..... | 27 APR 10 |
| 1..... | 30 APR 10 | 42..... | 27 APR 10 |
| 2..... | 30 APR 10 | 43..... | 27 APR 10 |
| 3..... | 29 APR 10 | 44..... | 27 APR 10 |
| 4..... | 29 APR 10 | 45..... | 27 APR 10 |
| 5..... | 29 APR 10 | 46..... | 27 APR 10 |
| 6..... | 29 APR 10 | 47..... | 27 APR 10 |
| 7..... | 29 APR 10 | 48..... | 27 APR 10 |
| 8..... | 29 APR 10 | 49..... | 27 APR 10 |
| 9..... | 29 APR 10 | 50..... | 27 APR 10 |
| 10..... | 29 APR 10 | 51..... | 27 APR 10 |
| 11..... | 29 APR 10 | 52..... | TPIB |
| 12..... | 29 APR 10 | 53..... | 27 APR 10 |
| 13..... | 29 APR 10 | 54..... | 27 APR 10 |
| 14..... | 29 APR 10 | 55..... | 27 APR 10 |
| 15..... | 29 APR 10 | 56..... | 27 APR 10 |
| 16..... | 29 APR 10 | 57..... | 27 APR 10 |
| 17..... | 29 APR 10 | 58..... | 27 APR 10 |
| 18..... | 29 APR 10 | 59..... | 27 APR 10 |
| 19..... | 29 APR 10 | 60..... | 27 APR 10 |
| 20..... | 29 APR 10 | 61..... | 27 APR 10 |
| 21..... | 29 APR 10 | 62..... | 27 APR 10 |
| 22..... | TPIB | 63..... | 26 APR 10 |
| 23..... | 16 APR 10 | 64..... | 26 APR 10 |
| 24..... | 16 APR 10 | 65..... | 26 APR 10 |
| 25..... | 22 APR 10 | 66..... | 26 APR 10 |
| 26..... | 22 APR 10 | 67..... | 26 APR 10 |
| 27..... | 22 APR 10 | 68..... | 26 APR 10 |
| 28..... | 22 APR 10 | 69..... | 26 APR 10 |
| 29..... | 22 APR 10 | 70..... | 26 APR 10 |
| 30..... | 22 APR 10 | 71..... | 26 APR 10 |
| 31..... | 22 APR 10 | 72..... | 26 APR 10 |
| 32..... | 22 APR 10 | 73..... | 26 APR 10 |
| 33..... | 22 APR 10 | 74..... | 26 APR 10 |

* - Omit from flight book

| | | | |
|----------|-----------|----------|-------------|
| 75..... | 26 APR 10 | 125..... | 27 APR 10 |
| 76..... | 26 APR 10 | 126..... | 27 APR 10 |
| 77..... | 26 APR 10 | 127..... | 27 APR 10 |
| 78..... | 26 APR 10 | 128..... | 27 APR 10 |
| 79..... | 28 APR 10 | 129..... | 27 APR 10 |
| 80..... | 28 APR 10 | 130..... | 27 APR 10 |
| 81..... | 28 APR 10 | 131..... | 27 APR 10 |
| 82..... | 28 APR 10 | 132..... | 27 APR 10 |
| 83..... | 28 APR 10 | 133..... | 27 APR 10 |
| 84..... | 28 APR 10 | 134..... | TPIB |
| 85..... | 28 APR 10 | 135..... | 12 APR 10 |
| 86..... | 28 APR 10 | 136..... | 12 APR 10 |
| 87..... | 28 APR 10 | 137..... | 12 APR 10 |
| 88..... | 28 APR 10 | 138..... | 12 APR 10 |
| 89..... | 28 APR 10 | 139..... | 12 APR 10 |
| 90..... | 28 APR 10 | 140..... | 12 APR 10 |
| 91..... | 28 APR 10 | 141..... | 12 APR 10 |
| 92..... | 28 APR 10 | 142..... | 12 APR 10 |
| 93..... | 28 APR 10 | 143..... | 12 APR 10 |
| 94..... | 28 APR 10 | 144..... | 12 APR 10 |
| 95..... | 28 APR 10 | 145..... | 12 APR 10 |
| 96..... | 28 APR 10 | 146..... | 12 APR 10 |
| 97..... | 28 APR 10 | 147..... | 12 APR 10 |
| 98..... | 28 APR 10 | 148..... | TPIB |
| 99..... | 28 APR 10 | 149..... | 30 APR 10 |
| 100..... | 28 APR 10 | 150..... | 30 APR 10 |
| 101..... | 28 APR 10 | 151..... | 26 APR 10 |
| 102..... | 28 APR 10 | 152..... | 26 APR 10 |
| 103..... | 28 APR 10 | 153..... | 26 APR 10 |
| 104..... | 28 APR 10 | 154..... | 26 APR 10 |
| 105..... | 28 APR 10 | 155..... | 26 APR 10 |
| 106..... | 28 APR 10 | 156..... | 26 APR 10 |
| 107..... | 28 APR 10 | 157..... | 26 APR 10 |
| 108..... | 28 APR 10 | 158..... | 26 APR 10 |
| 109..... | 28 APR 10 | 159..... | 26 APR 10 |
| 110..... | 28 APR 10 | 160..... | 26 APR 10 |
| 111..... | 27 APR 10 | 161..... | 26 APR 10 |
| 112..... | 27 APR 10 | 162..... | 26 APR 10 |
| 113..... | 27 APR 10 | 163..... | 26 APR 10 |
| 114..... | 27 APR 10 | 164..... | 26 APR 10 |
| 115..... | 27 APR 10 | 165..... | 26 APR 10 |
| 116..... | 27 APR 10 | 166..... | 26 APR 10 |
| 117..... | 27 APR 10 | 167..... | * 30 APR 10 |
| 118..... | 27 APR 10 | 168..... | * 30 APR 10 |
| 119..... | 27 APR 10 | 169..... | * 26 APR 10 |
| 120..... | 27 APR 10 | 170..... | * 26 APR 10 |
| 121..... | 27 APR 10 | 171..... | * 26 APR 10 |
| 122..... | 27 APR 10 | 172..... | * 26 APR 10 |
| 123..... | 27 APR 10 | 173..... | * 26 APR 10 |
| 124..... | TPIB | 174..... | * 26 APR 10 |

* - Omit from flight book

| | | | |
|----------|-------------|----------|-------------|
| 175..... | * 26 APR 10 | 228..... | * 29 APR 10 |
| 176..... | * 26 APR 10 | 229..... | * 29 APR 10 |
| 177..... | * 26 APR 10 | 230..... | * 29 APR 10 |
| 178..... | * 26 APR 10 | 231..... | * 29 APR 10 |
| 179..... | * 26 APR 10 | 232..... | * 29 APR 10 |
| 180..... | * 26 APR 10 | 233..... | * 29 APR 10 |
| 181..... | * 26 APR 10 | 234..... | * 29 APR 10 |
| 182..... | * TPIB | 235..... | * 29 APR 10 |
| 183..... | * 28 APR 10 | 236..... | * 29 APR 10 |
| 184..... | * 28 APR 10 | 237..... | * 29 APR 10 |
| 185..... | * 28 APR 10 | 238..... | * 29 APR 10 |
| 186..... | * 28 APR 10 | 239..... | * 29 APR 10 |
| 187..... | * 28 APR 10 | 240..... | * 29 APR 10 |
| 188..... | * 28 APR 10 | 241..... | * 29 APR 10 |
| 189..... | * 28 APR 10 | 242..... | * 29 APR 10 |
| 190..... | * 28 APR 10 | 243..... | * 29 APR 10 |
| 191..... | * 28 APR 10 | 244..... | * 29 APR 10 |
| 192..... | * 28 APR 10 | 245..... | * 29 APR 10 |
| 193..... | * 28 APR 10 | 246..... | * 29 APR 10 |
| 194..... | * 28 APR 10 | 247..... | * 29 APR 10 |
| 195..... | * 28 APR 10 | 248..... | * 29 APR 10 |
| 196..... | * 28 APR 10 | 249..... | * 29 APR 10 |
| 197..... | * 28 APR 10 | 250..... | * 29 APR 10 |
| 198..... | * 28 APR 10 | 251..... | * 29 APR 10 |
| 199..... | * 28 APR 10 | 252..... | * 29 APR 10 |
| 200..... | * 28 APR 10 | 253..... | * 29 APR 10 |
| 201..... | * 28 APR 10 | 254..... | * 29 APR 10 |
| 202..... | * 28 APR 10 | 255..... | * 29 APR 10 |
| 203..... | * 28 APR 10 | 256..... | * 29 APR 10 |
| 204..... | * 28 APR 10 | 257..... | * 29 APR 10 |
| 205..... | * 28 APR 10 | 258..... | * 29 APR 10 |
| 206..... | * 28 APR 10 | 259..... | * 29 APR 10 |
| 207..... | * 28 APR 10 | 260..... | * 29 APR 10 |
| 208..... | * 28 APR 10 | 261..... | * 29 APR 10 |
| 209..... | * 28 APR 10 | 262..... | * 29 APR 10 |
| 210..... | * 28 APR 10 | 263..... | * 29 APR 10 |
| 211..... | * 28 APR 10 | 264..... | * 29 APR 10 |
| 212..... | * 28 APR 10 | 265..... | * 29 APR 10 |
| 213..... | * 28 APR 10 | 266..... | * 29 APR 10 |
| 214..... | * 28 APR 10 | 267..... | * 29 APR 10 |
| 215..... | * 28 APR 10 | 268..... | * 29 APR 10 |
| 216..... | * 28 APR 10 | 269..... | * 29 APR 10 |
| 217..... | * 28 APR 10 | 270..... | * 29 APR 10 |
| 218..... | * 28 APR 10 | 271..... | * 29 APR 10 |
| 219..... | * 28 APR 10 | 272..... | * 29 APR 10 |
| 220..... | * 28 APR 10 | 273..... | * 29 APR 10 |
| 221..... | * 28 APR 10 | 274..... | * 29 APR 10 |
| 222..... | * 28 APR 10 | 275..... | * 29 APR 10 |
| 223..... | * 28 APR 10 | 276..... | * 29 APR 10 |
| 224..... | * TPIB | 277..... | * 29 APR 10 |
| 225..... | * 29 APR 10 | 278..... | * 29 APR 10 |
| 226..... | * 29 APR 10 | 279..... | * 29 APR 10 |
| 227..... | * 29 APR 10 | 280..... | * 29 APR 10 |

* - Omit from flight book

281 * 29 APR 10
282 * 29 APR 10
283 * 27 APR 10
284 * 27 APR 10
285 * 27 APR 10
286 * 27 APR 10
287 * 27 APR 10
288 * 27 APR 10
289 * 27 APR 10
290 * 27 APR 10
291 * 27 APR 10
292 * 27 APR 10
293 * 27 APR 10
294 * 27 APR 10
295 * 27 APR 10
296 * 27 APR 10
297 * 27 APR 10
298 * 27 APR 10
299 * 27 APR 10
300 * 27 APR 10
301 * 27 APR 10
302 * 27 APR 10
303 * 19 APR 10
304 * 19 APR 10
305 * 19 APR 10
306 * 19 APR 10
307 * 19 APR 10
308 * 19 APR 10
309 * 19 APR 10
310 * 19 APR 10
311 * 19 APR 10
312 * 19 APR 10
313 * 19 APR 10
314 * 19 APR 10
315 * 19 APR 10
316 * 19 APR 10
317 * 19 APR 10
318 * 19 APR 10
319 * 19 APR 10
320 * 19 APR 10
321 * 19 APR 10
322 * 19 APR 10
323 * 19 APR 10
324 * 19 APR 10

* - Omit from flight book

CONTENTS

| | <u>GND</u> | <u>ISS</u> |
|----------------------------------------|------------|------------|
| NOMINAL | 1 | 1 |
| MRM-1 | | |
| 1.101 MRM-1 Handoff and Docking | 3 | 3 |
| 1.201 MRM-1 Auto Safing Recovery | 23 | 23 |
| ICC-VLD | | |
| 2.101 ICC Transfer to POA | 25 | 25 |
| 2.201 ICC Setup for EVA2 | 41 | 41 |
| 2.301 ICC Return to POA | 53 | 53 |
| 2.401 ICC Transfer to PLB | 63 | 63 |
| EVA SUPPORT | | |
| 3.101 EVA1 Support..... | 79 | 79 |
| 3.201 EVA2 Support..... | 111 | 111 |
| 3.301 EVA3 Support..... | 125 | 125 |
| OBSS | | |
| 4.101 OBSS Unberth and Handoff | 135 | 135 |
| REFERENCE | 149 | 149 |
| 5.100 Reference Data | 151 | 151 |
| GROUND CONTROL | 167 | IPV |
| 6.101 ICC Release | 169 | IPV |
| 6.201 EVA1 Setup..... | 183 | IPV |
| 6.301 MRM-1 Setup | 225 | IPV |
| 6.401 EVA2 Setup..... | 283 | IPV |
| 6.501 ICC Berth Setup | 303 | IPV |

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NOMINAL

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1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 1 of 19 pages

NOTE

1. Steps in gray are to be performed by MRM-1 operator.
2. MRM-1 commands can only be issued to the Active TCU.
3. Verify SRMS at MRM-1 HANDOFF position:
SY = -25.0, +53.4, -50.3, -59.7, +30.2, +28.6 = WR
4. If SSRMS brakes are applied while MRM-1 is powered, MRM-1 will lose sync and MRM data may be lost.

1. PREP FOR MRM-1 DOCKING (GROUND)

NOTE

1. This step is performed by **MCC-H** to configure the command and telemetry path between the MRM and C&C and enable Point-to-point sync between the CEU and the MRM TCUs.
2. Expect PDGF LB Payload 1 and 2 telemetry and sync error messages when Pt2Pt sync is enabled. Messages will remain in alarm until comm is established with TCUs.

Cmd Inv Enable payload data routing.

| Ops Name | CIPUI |
|------------------------------------------|---------------|
| Prim_CCS_Enable_Routing_MSS_Payload_Data | LADD95SM0121K |

MSK Verify Prime CCS Payload Routing In Progress – True

Cmd Inv For the active workstation, enable point-to-point sync.

| Ops Name | CIPUI |
|-------------------------------------|-------------------|
| LAB_RWS_Enable_Payload_Data_Acq_MRM | CMRM96IM0089K:001 |
| Cup_RWS_Enable_Payload_Data_Acq_MRM | CMRM96IM0172K:001 |

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 2 of 19 pages

| Parameter | Value |
|--------------------------------|-----------------|
| Enable P/L Boxcar Indicator 1 | Enable |
| MSS_BUS_ID_1 | 1 - MSS_PDGF_LB |
| MSS_BUS_RT_Address_1 | 2 |
| MSS_BUS_RT_Subaddress_1 | 14 |
| Point_2_Point_Sync_Indicator_1 | Enable |
| Enable P/L Boxcar Indicator 2 | Enable |
| MSS_BUS_ID_2 | 1 - MSS_PDGF_LB |
| MSS_BUS_RT_Address_2 | 4 |
| MSS_BUS_RT_Subaddress_2 | 14 |
| Point_2_Point_Sync_Indicator_2 | Enable |
| Enable P/L Boxcar Indicator 3 | Disable |
| MSS_BUS_ID_3 | N/A |
| MSS_BUS_RT_Address_3 | N/A |
| MSS_BUS_RT_Subaddress_3 | N/A |
| Point_2_Point_Sync_Indicator_3 | Disable |

PCS CDH: [CDH Summary](#)

Verify 'Station Mode' – Ext Ops

2. [HAND CONTROLLER CALIBRATION](#)

THC/
RHC Deflect all THC and RHC axes to positive and negative hard stops.

3. [SETUP](#)

Verify RS video conversion and routing setup complete.

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------------|--------------------------|-----------------------------------------|-----------------------|----------------------|
| 03: S1 Lower Outboard (+60, +35) | 25: Tip LEE (FL=9 mm) | 09: P1 Lower Outboard (+130, +35) | Camera C (-5, +25) | Camera D (0, +20) |

PCS MSS: SSRMS: [SSRMS](#)

Change Loaded Parameters ► MRM1 ► MRM1 Install SRH
Verify 'Loaded Parameters' (three) – MRM1 Install, SSRMS, SR Held

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

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

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 3 of 19 pages

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

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

| | | | | | | |
|-------|-----------------------------|-------|-------|-------|--------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| -39.8 | +90.2 | -17.2 | +45.0 | -68.1 | -142.9 | +58.3 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1299 | +313 | +1499 | +37.4 | -89.3 | -174.1 | |
| FOR | Unloaded – LEE Tip, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

4. GRAPPLING MRM-1 PVGE

4.1 Setup

On SRMS operator GO for MRM-1 Grapple:

MSS: SSRMS: Thrusters:

Verify 'Desat Request:' Inhibit
Verify 'Auto Att Control Handover to RS' – Inh

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

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 required

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

4.2 Grappling MRM-1 PVGF

Maneuver to within grapple envelope.

THC/
RHC

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 4 of 19 pages

PCS

MSS: SSRMS: Tip LEE:

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

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

CAUTION

Due to end-to-end system latency, the RHC Trigger is hot up to 3 seconds prior to receiving a Trigger Hot icon status on the PCS.

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 to exit LEE operations (SCR 23262, 14662).

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Capture

RHC

TRIGGER → Press (momentarily)

PCS

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

Verify Capture to Latch – Yes (SCR 19282)

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

Verify 'Carriage' Retract – blue

Verify 'Latch' Latch – blue (80s max)

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

Expected MRM-1 Grapple position:

| SR | SY | SP | EP | WP | WY | WR |
|-------|--------------------------------|-------|-------|-------|--------|-------|
| -39.8 | +86.1 | -19.6 | +57.6 | -80.5 | -139.8 | +54.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1315 | -5 | +2050 | -88.5 | -0.4 | -134.4 | |
| FOR | Loaded – MRM1 Install, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

4.3 Mating LEE Umbilicals

MSS: SSRMS: Tip LEE:

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

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Mate

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 5 of 19 pages

RHC TRIGGER → Press (momentarily)

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

4.4 Applying Payload Power to MRM-1

NOTE

It will take approximately 30 seconds for the RPC status to update on the PCS.

S0: EPS: RPCM S04BD:

Verify Close Cmd – Ena

cmd RPC Position – Close (Verify CI)

S0: EPS: RPCM S03AD:

Verify Close Cmd – Ena

cmd RPC Position – Close (Verify CI)

5. ACTIVATING MRM-1 SYSTEMS (GO#1)

NOTE

It will take approximately 2 minutes for the MRM-1 displays to update after power is applied as MRM systems are activated.

RS
Laptop

Verify 'ISS' Mode – Transfer
Verify 'ISS' Step – Waiting for Positioning
Verify 'ISS' Status – Comm Established

Verify 'MRM1' Mode – SSRMS Transfer
Verify 'MRM1' Step – Gnd Waiting
Verify 'MRM1 State Monitoring' Free Run – gray
Verify GND Waiting – black

On MCC-H GO

sel 'TCU 1(2)' Continue Mode

cmd Yes

1.101 MRM-1 HANDOFF AND DOCKING

Verify GND Waiting – gray
 Verify 'MRM1' Step – RS Preparation for Transfer

Verify GND Waiting – black (~1 minute)
 Verify 'MRM1' Step – Waiting for USOS Readiness
 Verify 'MRM1' Status – Ready for Transfer

6. SRMS RELEASE MRM-1

On MCC GO, MRM-1 systems activated.

DCP BRAKES SSRMS → ON (Verify ON)

Give SRMS operator GO for MRM-1 Release.

PCS MSS: SSRMS: Rate:

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

MSS: SSRMS:

Change Display ► FGB ► MRM1 Install (Verify FGB>MRM1 Install)

7. JOINT OCAS TO PRE-DOCK CLEARANCE

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------|------------------------------------------------------------------|----------------------------------|--------------------|-------------------------------------------------|
| 03: S1 Lower Outboard (+80, +35) | 24: Tip Elbow (0, +10) 37: MBS Mast (+120, +20) | 09: P1 Lower Outboard (+95, +35) | Camera C (-5, +25) | Camera D (0, +20) Camera B (+40, +20) |

On SRMS operator GO to maneuver MRM-1:

 * If using shuttle attitude control
 * | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 to 3
 * | (ORB OPS, REBOOST/DAP), then:

DCP BRAKES SSRMS → OFF (Verify OFF)

RHC RATE → COARSE (Verify Coarse on PCS)

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► MRM1 ► Pre-Dock Clearance

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 7 of 19 pages

Verify 'Joint Angles' 'Destination' for Pre-Dock Clearance position.

| SR | SY | SP | EP | WP | WY | WR |
|------|-------|-------|-------|--------|--------|-------|
| +7.2 | +81.0 | -26.1 | -56.2 | -180.8 | -181.3 | -73.5 |

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) | -39.8 | +86.1 | -19.6 | +57.6 | -80.5 | -139.8 | +54.8 |
| TGT | +7.2 | +81.0 | -26.1 | -56.2 | -180.8 | -181.3 | -73.5 |
| ERR | -47.0 | +5.1 | +6.5 | +113.8 | +100.3 | +41.5 | +128.3 |

PCS

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

| <u>NOTE</u> |
|------------------------------------------------------------|
| Expect singularity warning for EP between -15 and +15 deg. |

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|------|-------|-------|-------|--------|--------|-------|
| +7.2 | +81.0 | -26.1 | -56.2 | -180.8 | -181.3 | -73.5 |

8. [FOR OCAS TO MRM-1 PRE-DOCK](#)

Verify with **MCC-H**, Port and Stbd TRRJ's parked for MRM-1 Docking viewing.

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|---------------------------------|------------------------|----------------------------------|--------------------------------|---------------------|
| 03: S1 Lower Outboard (+120, 0) | 71: Camera C (-5, +60) | 09: P1 Lower Outboard (+65, +10) | SRMS Elbow (-130, +100) | Camera B (+10, +60) |

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 Roll (Verify SR – Locked)

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 8 of 19 pages

SSRMS FOR OCAS

pick File ► MRM1 ► Pre-Dock

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

| X | Y | Z | Pitch | Yaw | Roll |
|------|---|---|-------|-----|------|
| -120 | 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 | -270 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| TGT | -120 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| ERR | -150 | 0 | 0 | 0.0 | 0.0 | 0.0 |

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-Dock position (within 5 cm/1 deg).

| | | | | | | |
|------|--------------------------------|-------|-------|--------|--------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +7.2 | +91.8 | -26.5 | -65.9 | -170.4 | -179.9 | -84.3 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -120 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – MRM1 Install, SR Held | | | | | |
| Disp | FGB>MRM1 Install | | | | | |

MSS: SSRMS: SSRMS

Enter Mode – Standby (Verify blue)

 * If using shuttle attitude control
 * | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 and 2
 * | (ORB OPS, **REBOOST/DAP**), then:

Give SRMS operator GO for Maneuver to Dock Viewing Position.

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 9 of 19 pages

9. MRM-1 DOCKING SYSTEM SETUP

9.1 MRM-1 ADS Powerup and Status Verification (GO#2)

NOTE

1. Two hour timer will begin to count up for ADS avionics thermal constraints when ADS is powered.
2. In this step, the GND Waiting status will transition back to black after the command is issued but the MRM-1 ADS will remain in monitoring mode.

On MCC-H GO

RS
Laptop

MRM1 Mode Control

sel 'TCU 1(2)' Continue Mode

cmd Yes

SSRMS Transfer

Verify GND Waiting – gray
Verify 'MRM1' Step – Waiting for positioning
Verify 'MRM1' Status – USOS Waiting for positioning
Verify 'Active Docking System State' ADS Mode – Monitoring
Verify ADS – blue (powered), timer incrementing

Verify GND Waiting – black

Verify ADS – gray (unpowered) (~6:30 minutes)
Verify 'Active Docking System State' ADS Mode – Off
Verify 'Telemetry' DM Status – DM OFF, Final Position
Verify 'Telemetry' Hooks – Drives OFF, Init Pos
Verify 'Telemetry' Latches – Drives OFF, Init Pos

9.2 Extending MRM-1 Probe (GO#3)

On MCC-H GO

MRM1 Mode Control

sel 'TCU 1(2)' Continue Mode

cmd Yes

SSRMS Transfer

Verify Gnd Waiting – gray
Verify 'MRM1' Step – Waiting for ВИПШ complete
Verify 'MRM1' Status – ВИПШ Mode

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 10 of 19 pages

Verify ADS – blue (powered), timer incrementing
Verify ‘Active Docking System State’ ADS Mode – Probe Extension
Verify ‘Telemetry’ DM Status – DM12 ON, Travel Position
Verify ‘Telemetry’ ЛПШ1, ЛПШ2 (two) – incrementing

Verify Gnd Waiting – black
Verify ‘MRM1’ Step – Waiting for Forward Motion
Verify ‘MRM1’ Status – RS Ready for Forward Motion
Verify ‘Active Docking System State’ ADS Mode – Off
Verify ‘Telemetry’ ЛПШ1, ЛПШ2 (two) ~440 mm
Verify ‘Telemetry’ DM Status – DM OFF, Init Pos (~6 minutes)

* If probe extension was not completed nominally
* | Perform [10.1 EXTENSION OF DOCKING PROBE](#), all
* | (RODF: SM MOTION CONTROL AND NAVIGATION
* | SYSTEM), then:

9.3 Powering On ADS and Sensor Package (GO#4)

NOTE

1. Two hour timer will continue to count up for ADS avionics thermal constraints when ADS is powered.
2. Expect ‘**No Auto Docking Signal**’ fault status when ADS is powered. Fault will remain until mechanical capture is completed.

On MCC-H GO

MRM1 Mode Control

sel ‘TCU 1(2)’ Continue Mode

cmd Yes

SSRMS Transfer

Verify GND Waiting – gray
Verify ‘MRM1’ Step – ADS On, then SSRMS Free Drift Waiting
Verify ‘MRM1’ Status – RS Ready for Forward motion
Verify ADS – blue (powered), timer incrementing.
Verify Contact 1, Capture, Contact 2 (3) – gray

Verify GND Waiting – black
Verify ‘Active Docking System State’ ADS Mode – Auto: Standby

1.101 MRM-1 HANDOFF AND DOCKING

9.4 Powering On TV Camera System

NOTE

One hour timer will begin to count up for TV system thermal constraints when Camera is powered.

TV Control

sel 'TCU 1(2)' – TV ON

cmd Yes (Verify TV icon blue) (~30 seconds)

Verify TV timer incrementing.

sel 'TCU 1(2)' – Narrow-Angle Lens

cmd Yes

10. MANEUVERING TO MRM-1 ALIGNMENT POSITION

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|---------------------------------|--------------------------------------|----------------------------------|----------------|-------------------------------------------|
| 03: S1 Lower Outboard (+120, 0) | 17: MRM-1 Docking, Narrow FOV | 09: P1 Lower Outboard (+65, +10) | SRMS EE | Camera B (+10, +60) Camera C (-5, +60) |

Verify MRM-1 Docking Camera in Narrow FOV, and adjust brightness as required.

Verify SRMS at MRM-1 dock viewing position.

On MCC-H GO for Docking, MRM-1 docking system activated.

PCS

MSS: SSRMS: Thrusters: Thruster Controls for MSS Ops

Verify 'Desat Request:' Inhibit

Verify 'Auto Att Control Handover to RS' – Inh

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

MSS: SSRMS: SSRMS

Enter Mode – Manual (Verify blue)

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

cmd Shoulder Roll (Verify SR – Locked)

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 12 of 19 pages

THC/
RHC

Maneuver SSRMS to MRM-1 Alignment position (within 5 cm/1 deg).

| | | | | | | |
|--------|--------------------------------|-------|-------|--------|--------|-------|
| Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| +7.2 | +97.5 | -27.2 | -68.8 | -166.9 | -179.2 | -89.9 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -60 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – MRM1 Install, SR Held | | | | | |
| Disp | FGB>MRM1 Install | | | | | |

11. MANEUVERING TO MRM-1 DOCK POSITION

NOTE

1. The strategy for MRM-1 docking is as follows:
 - a. SSRMS operator will maneuver until DK1 sensor is activated.
 - b. Upon Contact 1 sensor activation, SSRMS operator will continue motion for 10 seconds.
 - c. Capture and Contact 2 sensors will activate if alignment is good.
 - d. If Contact 2 sensor not activated after 10 seconds of motion, SSRMS operator will stop motion. Proceed to step 12.
 - e. If Contact 2 sensor is activated, SSRMS operator will stop motion. Proceed to step 13.
2. Contact 2 sensor indication may not be sustained during docking. Persistent Contact 2 indication is not required to initiate probe retraction.
3. Approach rate should be ~1.9 cm/s during the maneuver to docking.
4. Notify **MCC-H** when Contact 1, Contact 2, and capture indications are received.

Maneuver SSRMS to MRM-1 Dock position.

| | | | | | | |
|--------|--------------------------------|-------|-------|--------|--------|-------|
| Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| +7.2 | +104.1 | -28.1 | -71.2 | -163.8 | -178.4 | -96.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – MRM1 Install, SR Held | | | | | |
| Disp | FGB>MRM1 Install | | | | | |

RS
Laptop

SSRMS Transfer

Verify Contact 1 – green

THC/
RHC

Continue SSRMS motion for 10 seconds.

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 13 of 19 pages

| | |
|--------|-----------------------------------|
| RS | SSRMS Transfer |
| Laptop | Verify Capture – green |
| | Verify Contact 1, 2 (two) – green |
| | Verify 'ISS' Status – Capture |

If Contact 2 sensor not activated during berthing, proceed to step 12.
If Contact 2 sensor activated at least once, proceed to step 13.

12. MRM-1 DOCKING WITH POHS OFF

| <u>NOTE</u> | |
|-------------------------------------------------------------------------------------------------|--|
| The sequence of events for MRM-1 Docking with Translational POHS OFF is as follows: | |
| a. SSRMS operator corrects MRM-1 alignment if possible. | |
| b. SSRMS enters limp mode for 30 seconds. | |
| c. SSRMS operator loads MRM-1 Install Trans POHS OFF Loaded Frame to increase SSRMS compliance. | |
| d. SSRMS operator maneuvers SSRMS until DK2 sensor is activated. | |

12.1 Performing Additional Alignment

Perform additional alignment as necessary.

THC/
RHC

| | | | | | | |
|--------|--------------------------------|-------|-------|--------|--------|-------|
| Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| +7.2 | +104.1 | -28.1 | -71.2 | -163.8 | -178.4 | -96.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – MRM1 Install, SR Held | | | | | |
| Disp | FGB>MRM1 Install | | | | | |

12.2 SSRMS Limp

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

Wait 30 seconds.

MSS: SSRMS: Limp:

cmd None Limp (Verify Standby – blue)

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 14 of 19 pages

12.3 Maneuvering to Docking

MSS: SSRMS:

Change Loaded Parameters ► MRM1 ► MRM1 Install TP OFF
SRH

Verify 'Loaded Parameters' (three) – MRM1 Install TP OFF,
SSRMS, SR Held

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: 0.3 (Verify 0.3)

THC/
RHC

Maneuver SSRMS to MRM-1 Docking position
(within 5 cm/1 deg).

| | | | | | | |
|--------|---------------------------------------|-------|-------|--------|--------|-------|
| Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| +7.2 | +104.1 | -28.1 | -71.2 | -163.8 | -178.4 | -96.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – MRM1 Install TP OFF, SR Held | | | | | |
| Disp | FGB>MRM1 Install | | | | | |

RS
Laptop

Verify Capture – Green
Verify Contact 1, Contact 2 (two) – green
Verify 'ISS' Status – Capture

13. SSRMS LIMP

NOTE

Contact 2 Sensor indication may be lost if SSRMS is backed off due to contact forces after limping.

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 15 of 19 pages

MSS: SSRMS:

Verify all joints – Limped

14. [MRM-1 AUTOMATIC DOCKING \(GO#5\)](#)

NOTE

MRM-1 TV Camera will be powered off after probe retraction is completed.

On MCC-H GO

RS
Laptop

Verify Free_Run – gray

sel 'TCU 1(2)' Continue Mode

cmd Yes

Verify Gnd Waiting – gray

Verify 'MRM1' Step – Automatic Docking On, then Interface Alignment
Waiting

Verify 'MRM1' Status – Automatic Docking

Verify Autosaf Disable – gray

Verify 'Active Docking System State' ADS Mode – Auto: Retraction

Verify 'Telemetry' DM Status – DM12 On, Travel Pos

Verify 'Telemetry' ЛПШ1, ЛПШ2 (two) – decrementing

Verify 'Interface Sensors' ДКР – green (~5:30 minutes)

Verify 'Interface Sensors' Д3С – green

Verify 'Telemetry' ЛПШ1, ЛПШ2 (two) – ~40 mm

Verify 'MRM1' Status – Interface Aligned, then Ready for ISS Power

Verify 'MRM1' Step – Hooks Closure Waiting

Verify 'Telemetry' Hooks – Drive12 On, Travel Pos

Verify 'Telemetry' DM Status – DM Off, Travel Pos

Verify 'Active Docking System State' ADS Mode – Auto: Hooks Closure

Verify 'Interface Sensors' ДОГ – Green

Verify 'MRM1' Status – Hooks Closed

Verify 'Telemetry' Hooks – Drive OFF, Final Pos (~8:30 minutes)

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 16 of 19 pages

Verify 'MRM1' Step – Waiting for Docking Complete
 Verify 'Active Docking System State' ADS Mode – Auto: Latch Retraction
 Verify 'Telemetry' Latches – Drive On, Travel Pos

Verify 'Telemetry' Latches – Drive OFF, Final Pos (~11:30 minutes)

Verify 'Active Docking System State' ADS Mode – Auto: Probe in final position

Verify 'Telemetry' DM Status – DM12 On, Travel Pos
 Verify 'Telemetry' ЛПШ1, ЛПШ2 (two) – decrementing

Verify 'Telemetry' DM Status – DM Off, Final Pos

Verify 'Telemetry' ЛПШ1, ЛПШ2 (two) – 4 mm

Verify 'Active Docking System State' ADS Mode – Auto: Complete, then Off (~12:30 minutes)

Verify 'MRM1' Step – End of Cyclogram

Verify 'MRM1' Status – ISS Power (~13 minutes)

* If automatic docking interrupted due to an MSS problem
 * | **On MCC-H GO**, perform [1.201 MRM-1 AUTO SAFING RECOVERY](#)
 * | (SODF: RBT FS: NOMINAL: MRM-1), then:

* If automatic docking was not completed nominally due to a failure
 * | in the MRM or docking mechanism
 * | **On MCC-H GO**, perform [10.2 MRM-1 MANUAL DOCKING OPERATIONS](#), all (RODF: SM MOTION CONTROL AND NAVIGATION SYSTEM), then:

DCP SAFING → SAFE (Verify ON)

Expected MRM-1 Docked position:

| SR | SY | SP | EP | WP | WY | WR |
|------|--------------------------------|-------|-------|--------|--------|--------|
| +7.2 | +108.1 | -28.6 | -72.3 | -162.2 | -177.9 | -100.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +32 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – MRM1 Install, SR Held | | | | | |
| Disp | FGB>MRM1 Install | | | | | |

* If using shuttle attitude control
 * | Perform [ROBOTICS ATTITUDE MAINTENANCE](#), steps 1 and 2
 * | (ORB OPS, [REBOOST/DAP](#)), then:

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 17 of 19 pages

15. MRM-1 RELEASE

NOTE

Due to a timing issue, transient SSRMS comm errors and safing may be raised when payload power is removed. If errors occur, cancel safing per step 15.2 before sending any commands to the SSRMS, including video routing.

15.1 Removing SSRMS Payload Power

On MCC-H GO

S0: EPS: RPCM S04BD:

cmd RPC Position – Open (Verify Op)

S0: EPS: RPCM S03AD:

cmd RPC Position – Open (Verify Op)

Give **MCC-H GO** for MRM-1 Interface Integration.

15.2 SSRMS Setup

On **MCC-H GO**, MRM-1 Activation from ISS complete.

PCS

MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

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

Change Display ► MRM1 ► MRM1 Installed PVGF (Verify MRM1>MRM1 Installed PVGF)

Verify Command – SSRMS>Internal

DCP

BRAKES SSRMS → OFF (Verify OFF)

15.3 Auto Release - Push Off

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-----------------------------------|--------------------|----------------------------------|---------------|---------------------|
| 03: S1 Lower Outboard (+110, +15) | 25: Tip LEE | 09: P1 Lower Outboard (+80, +15) | SRMS EE | Camera B (+10, +50) |

PCS

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 18 of 19 pages

Verify all joints – Limped

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 (10s max)
 Verify ‘Latch’ Unlatch – blue (65s max)
 Verify ‘Carriage’ Retract – gray (90s max)
 Verify ‘Snare’ Open – blue (12s max)
 Verify ‘Carriage’ Derigidize – blue
 Verify ‘Carriage’ Extend – blue (90s max)

15.4 SSRMS Backoff

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 Roll (Verify SR – Locked)

MSS: SSRMS: Rate: SSRMS Rate

Set ‘Scale’ ‘Vernier’ Rate Scale: as desired

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

| | | | | | | |
|--------|-----------------------------|-------|-------|--------|--------|--------|
| Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| +7.2 | +108.8 | -17.3 | -89.9 | -156.0 | -177.8 | -101.2 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Unloaded – LEE Tip, SR Held | | | | | |
| Disp | MRM1>MRM1 Installed PVGF | | | | | |

DCP BRAKES SSRMS → ON (Verify ON)

1.101 MRM-1 HANDOFF AND DOCKING

(RBT FS/ULF4/FIN 1/MULTI R/SPN/HC) Page 19 of 19 pages

Give SRMS operator GO for maneuver to OBSS Handoff
Pre-Grapple position.

16. POST MRM-1 DOCKING CONFIGURATION (GROUND)

NOTE

This step is performed by **MCC-H** to deconfigure the command and telemetry path between the MRM and C&C and disable Point-to-point sync between the CEU and the MRM TCUs.

Cmd Inv Disable payload data routing.

| Ops Name | CIPUI |
|-------------------------------------------|---------------|
| Prim_CCS_Disable_Routing_MSS_Payload_Data | LADD95SM0120K |

MSK Verify Prime CCS Payload Routing In Progress – False

Cmd Inv For the active workstation, disable point-to-point sync.

| Ops Name | CIPUI |
|--------------------------------------|-------------------|
| LAB_RWS_Disable_Payload_Data_Acq_MRM | CMRM96IM0089K:002 |
| Cup_RWS_Disable_Payload_Data_Acq_MRM | CMRM96IM0172K:002 |

| Parameter | Value |
|--------------------------------|-----------------|
| Enable P/L Boxcar Indicator 1 | Disable |
| MSS_BUS_ID_1 | 1 - MSS_PDGF_LB |
| MSS_BUS_RT_Address_1 | 2 |
| MSS_BUS_RT_Subaddress_1 | 14 |
| Point_2_Point_Sync_Indicator_1 | Disable |
| Enable P/L Boxcar Indicator 2 | Disable |
| MSS_BUS_ID_2 | 1 - MSS_PDGF_LB |
| MSS_BUS_RT_Address_2 | 4 |
| MSS_BUS_RT_Subaddress_2 | 14 |
| Point_2_Point_Sync_Indicator_2 | Disable |
| Enable P/L Boxcar Indicator 3 | Disable |
| MSS_BUS_ID_3 | N/A |
| MSS_BUS_RT_Address_3 | N/A |
| MSS_BUS_RT_Subaddress_3 | N/A |
| Point_2_Point_Sync_Indicator_3 | Disable |

MCC-H Reconfigure RS for US Attitude Control Support.

Return ISS to Standard Mode.

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NOTE

1. This procedure can be executed if an MSS failure during MRM-1 probe retraction results in MRM-1 autosafing and ADS power off.
2. Steps in gray are to be performed by MRM-1 operator.
3. MRM-1 commands can only be issued to the Active TCU.
4. The 'KC Faults' field will display an error message until the docking mechanism drives are repowered to resume probe retraction.

1. SSRMS CONFIGURATION
On MCC-H GO

DCP Safing → Safe (verify ON)

PCS MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

2. SETTING MRM-1 CYCLOGRAM STEP

NOTE

In this step, the MRM-1 cyclogram is reset to the beginning of the ADS powerup step; prior to GO #4.

RS

Laptop

Verify Free_Run – gray

sel 'TCU 1(2)' Set Cyclogram Step

input 'parameter inf3 value' – 2 1 2

sel Set Parameter

cmd Yes

MRM Mode Control

Verify 'MRM1' Step – Waiting for Forward Motion

Verify 'MRM1' Status – Automatic Docking

Verify Gnd Waiting – black

3. [POWERING UP MRM-1 ADS \(GO#4\)](#)

MRM1 Mode Control

sel 'TCU 1(2)' Continue Mode

cmd Yes

SSRMS Transfer

Verify GND Waiting – gray

Verify 'MRM1' Step – ADS On, then SSRMS Free Drift Waiting

Verify 'MRM1' Status – Automatic Docking

Verify ADS – blue (powered), timer incrementing

Verify GND Waiting – black

Verify 'Active Docking System State' ADS Mode – Auto: Standby

Go to [1.101 MRM-1 HANDOFF AND DOCKING](#), step 14 (SODF:
RBT FS: NOMINAL: MRM-1).

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 1 of 15 pages

NOTE

1. Steps in gray are to be performed by PRLA operator.
2. Verify SRMS at ICC Viewing position
SY = +20.0, +20.0, -25.0, +5.0, 0.0, 0.0 = WR

THC/
RHC

1. HAND CONTROLLER CALIBRATION

Deflect all THC and RHC axes to positive and negative hard stops.

2. SETUP

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------|------------------------|-----------------------------------|-------------------|------------------------|
| 03: S1 Lower Outboard (+70, +15) | 24: Tip Elbow (0, +20) | 09: P1 Lower Outboard (+125, +15) | Camera A (-6, +3) | SRMS Elbow (-100, +60) |

PCS

MSS: SSRMS:

Change Loaded Parameters ► ICC ► ICC Unberth SYH

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

Verify Unloaded Parameters – ✓

Change Unloaded Parameters ► Unloaded ► LEE Tip SYH

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

Change Display ► Orbiter ► ICC PVGF1 (Verify Orbiter>ICC PVGF1)

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

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

| SR | SY | SP | EP | WP | WY | WR |
|--------|-----------------------------|--------|--------|-------|--------|-----|
| +230.0 | +150.0 | -190.0 | +130.0 | 0.0 | -150.0 | 0.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -953 | -99 | +67 | -126.9 | -58.6 | -126.2 | |
| FOR | Unloaded – LEE Tip, SY Held | | | | | |
| Disp | Orbiter>ICC PVGF1 | | | | | |

3. JOINT OCAS TO ICC PRE-GRAPPLE

MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

DCP

BRAKES SSRMS → OFF (Verify OFF)

RHC

RATE → VERNIER (Verify Vernier on PCS)

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 2 of 15 pages

PCS MSS: SSRMS: Rate:

√'Scale' 'Vernier' Current: 1.0

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► ICC PLB ► ICC PLB Pre-Grap

Verify 'Joint Angles' 'Destination' for ICC PLB Pre-Grap position.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|-------|-------|-------|-------|
| +202.9 | +151.8 | -153.3 | +83.9 | -13.3 | -19.5 | +12.5 |

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) | +230.0 | +150.0 | -190.0 | +130.0 | 0.0 | -150.0 | 0.0 |
| TGT | +202.9 | +151.8 | -153.3 | +83.9 | -13.3 | -19.5 | +12.5 |
| ERR | +27.1 | -1.8 | -36.7 | +46.1 | +13.3 | -130.5 | -12.5 |

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 |
|--------|--------|--------|-------|-------|-------|-------|
| +202.9 | +151.8 | -153.3 | +83.9 | -13.3 | -19.5 | +12.5 |

4. GRAPPLING ICC PVGF

4.1 Setup

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------------|----------------------------------------|-----------------------------------------|----------------------|------------------------|
| 03: S1 Lower Outboard (+70, +15) | 25: Tip LEE (Full Zoom Out) | 09: P1 Lower Outboard (+125, +15) | Camera A (-6, +3) | SRMS Elbow (-85, 0) |

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 3 of 15 pages

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: as required

RHC/
THC

4.2 Maneuvering to within Grapple Envelope
Maneuver to within grapple envelope.

PCS

4.3 Grapple
MSS: SSRMS: Tip LEE:

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

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

CAUTION

Due to end-to-end system latency, the RHC Trigger is hot up to 3 seconds prior to receiving a Trigger Hot icon status on the PCS.

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 to exit LEE operations (SCR 23262, 14662).

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Capture

RHC

TRIGGER → Press (momentarily)

PCS

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

Verify Capture to Latch – Yes (SCR 19282)

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

Verify 'Carriage' Retract – blue

Verify 'Latch' Latch – blue (80s max)

Verify with **MCC-H** SSRMS payload power removed.

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

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Mate

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 4 of 15 pages

RHC TRIGGER → Press (momentarily)

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

DCP BRAKES SSRMS → ON (Verify ON)

4.4 Payload Power

S0: EPS: RPCM S04BD:

Verify Close Cmd – Ena

cmd RPC Position – Close (Verify CI)

S0: EPS: RPCM S03AD:

Verify Close Cmd – Ena

cmd RPC Position – Close (Verify CI)

4.5 Grapple Cleanup

PCS

MSS: SSRMS:

Verify Loaded Parameters – ✓

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

MSS: SSRMS: Snapshot:

cmd Snapshot

Verify Command, Display (two) – SSRMS>Snapshot

MSS: SSRMS: Rate:

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

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

| SR | SY | SP | EP | WP | WY | WR |
|--------|-------------------------------|--------|-------|------|-------|-------|
| +200.1 | +151.8 | -142.4 | +66.1 | -7.9 | -17.1 | +12.2 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – ICC Unberth, SY Held | | | | | |
| Disp | SSRMS>Snapshot | | | | | |

5. PRLA RELEASE

MSS: SSRMS: Thrusters:

Verify 'Auto Att Control Handover to RS' – Inh

Verify 'Desat Request' – Inh

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

Give PRLA operator GO for ICC PRLA Release.

| |
|----------------------------------------------------------------|
| <u>NOTE</u> Steps 5.1 to 5.4 are performed by shuttle crew. |
|----------------------------------------------------------------|

5.1 Activating Latches

On SSRMS operator: GO for ICC PRLA Release.

| |
|----------------------------------------------------------------------------|
| <u>NOTE</u> 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 |

| | | |
|------|--------------------------------|-------|
| A6U | √PL RETEN LAT 1,2,3,4,5 (five) | – OFF |
| | PL SEL | – 1 |
| | LOGIC PWR SYS 1,2 (two) | – ON |
| R13L | BAY MECH PWR SYS 1,2 (two) | – ON |

| |
|--------------------|
| SM 97 PL RETENTION |
|--------------------|

| | | |
|-----|-----------------------------------------|-----|
| CRT | √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 seconds).

5.2 AKA Release

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

Note single motor time (> 30 seconds).

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

5.3 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 seconds).

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

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

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

MA73C:A MCA LOGIC MNC MID 2 – ON
 :B MNB MID 4 – ON

Notify SSRMS operator: ICC PRLA released. GO for Maneuver to ICC Hover position.

6. ICC HOVER

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------|----------------------------------|---------------------------------------|
| 71: Mux D/A D (-5, 0) A (+5, 0) | 22: Base Elbow (+120, 0) 24: Tip Elbow (0, +10) | 09: P1 Lower Outboard (+115, +25) | Camera C (0, 0) | SRMS Elbow (-85, 0) Keel |

NOTE
ICC to OBSS ~5 in – Cam D.

On PRLA operator: ICC PRLA released. GO for Maneuver to ICC Hover position.

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS: SSRMS

Enter Mode – Manual (Verify blue)

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

cmd Shoulder Yaw (Verify SY – Locked)

MSS: SSRMS: Rate: SSRMS Rate

Set 'Scale' 'Vernier' Rate Scale: as required

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

THC/
RHC

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

| | | | | | | |
|--------|-------------------------------|--------|--------|-------|-------|-------|
| | Locked | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| +213.6 | +151.8 | -176.1 | +111.7 | -12.6 | -28.7 | +14.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | -500 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – ICC Unberth, SY Held | | | | | |
| Disp | SSRMS>Snapshot | | | | | |

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

 * If using shuttle attitude control
 * | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 to 3
 * | (ORB OPS, **REBOOST/DAP**), then:

7. JOINT OCAS TO INTERMEDIATE 1

Configure Cameras and overlays as required.

| | | | | |
|-----------------------------------------|---------------------------|-----------------------------------|--------------------------|------------------------|
| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
| 03: S1 Lower Outboard (+70, +15) | 22: Base Elbow (+90, -10) | 09: P1 Lower Outboard (+115, +25) | Camera B (0, +20) | SRMS Elbow (+165, +70) |

| |
|----------------------------------------|
| NOTE |
| SGANT to SSRMS Tip Boom ~43 – P1 LOOB. |

RHC

RATE → COARSE (Verify Coarse on PCS)

PCS

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► ICC PLB ► Intermediate 1

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

| | | | | | | |
|--------|--------|--------|-------|-------|-------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +180.0 | +155.0 | -210.0 | +94.2 | -12.6 | -28.7 | +14.4 |

cmd Load (Verify Sequence Status – Confirm or Cancel)

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

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

| | SR | SY | SP | EP | WP | WY | WR |
|------------|---------------|---------------|---------------|--------------|--------------|--------------|--------------|
| (current) | +213.6 | +151.8 | -176.1 | +111.7 | -12.6 | -28.7 | +14.4 |
| TGT | +180.0 | +155.0 | -210.0 | +94.2 | -12.6 | -28.7 | +14.4 |
| ERR | +33.6 | -3.2 | +33.9 | +17.5 | 0.0 | 0.0 | 0.0 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|-------|-------|-------|-------|
| +180.0 | +155.0 | -210.0 | +94.2 | -12.6 | -28.7 | +14.4 |

8. JOINT OCAS TO INTERMEDIATE 2

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------|-------------------------------------------------|-----------------------------------|---------------------|-----------------------|
| 03: S1 Lower Outboard (+70, +15) | 22: Base Elbow (+95, 0) 24: Tip Elbow (0, 0) | 09: P1 Lower Outboard (+125, +20) | Camera B (-30, +40) | SRMS Elbow (+20, +55) |

RHC RATE → VERNIER (Verify Vernier on PCS)

pick File ► ICC PLB ► Intermediate 2

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

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|-------|-------|--------|--------|
| +111.0 | +170.0 | -190.0 | +94.2 | -87.3 | -180.0 | +120.0 |

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) | +180.0 | +155.0 | -210.0 | +94.2 | -12.6 | -28.7 | +14.4 |
| TGT | +111.0 | +170.0 | -190.0 | +94.2 | -87.3 | -180.0 | +120.0 |
| ERR | +69.0 | -15.0 | -20.0 | 0.0 | +74.7 | +151.3 | -105.6 |

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

DCP AUTO SEQ → PROC

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|-------|-------|--------|--------|
| +111.0 | +170.0 | -190.0 | +94.2 | -87.3 | -180.0 | +120.0 |

9. JOINT OCAS TO POA PRE-INSTALL

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|--------------------------------------------|----------------------------------------|---------------------------------------|------------------------|---------------------------|
| 52: JEM EF A (+110, -10) | 37: MBS Mast (+15, 0) | 09: P1 Lower Outboard (+125, 0) | Camera B (-20, +40) | SRMS Elbow (+127, +40) |
| 51: JEM EXT A (-140, -60) | 32: MBS POA | | | |

MSS: SSRMS: Rate:

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

pick File ► ICC PLB ► POA Pre-Install

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

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|-------|-------|--------|--------|
| +111.0 | +192.6 | -105.3 | +94.2 | -87.3 | -159.0 | +169.7 |

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) | +111.0 | +170.0 | -190.0 | +94.2 | -87.3 | -180.0 | +120.0 |
| TGT | +111.0 | +192.6 | -105.3 | +94.2 | -87.3 | -159.0 | +169.7 |
| ERR | 0.0 | -22.6 | -84.7 | 0.0 | 0.0 | -21.0 | -49.7 |

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 |
|--------|--------|--------|-------|-------|--------|--------|
| +111.0 | +192.6 | -105.3 | +94.2 | -87.3 | -159.0 | +169.7 |

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 10 of 15 pages

Enter Mode – Standby (Verify blue)

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

Change Display ► MBS ► POA (Verify MBS>POA)

Change Command ► MBS ► POA Fly Camera (Verify MBS>POA Fly Camera)

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

| SR | SY | SP | EP | WP | WY | WR |
|--------|-----------------------------------|--------|-------|-------|--------|--------|
| +111.0 | +192.6 | -105.3 | +94.2 | -87.3 | -159.0 | +169.7 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – ICC Install POA, SY Held | | | | | |
| Disp | MBS>POA | | | | | |

10. INSTALLING ICC ON POA

10.1 Setup

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|--------------------------------------------------------------------------|-----------------------|-----------------------------------------|---------------|-------------|
| 13: LAB Stbd Zenith (+150, -20) 22: Base Elbow (+75, -15) | 32: POA (FL = 9mm) | 09: P1 Lower Outboard (+105, -10) | | |

MSS: SSRMS: MBS: MSS Safing:

cmd 'MBS' Remove (Verify Not Safed)

MSS: SSRMS: MBS:

Change POA Payload ► ICC ► PVGF2

Verify 'POA Payload' – ICC

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: as required

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

10.2 Attitude Control Configuration

MSS: SSRMS: Thrusters: Thruster Controls for MSS Ops

Verify 'Desat Request:' Inhibit
 Verify 'Auto Att Control Handover to RS' – Inh

 * If using shuttle attitude control
 * | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 to 3
 * | (ORB OPS, **REBOOST/DAP**), then:

10.3 Maneuvering to within Grapple Envelope

NOTE

1. ICC install is performed using "Fly Camera" Command frame (THC +X Push to bring ICC into POA).
2. If CETA Brakes fully deployed, ICC to CETA Brake ~19" – Base Elbow.

THC/
RHC

Maneuver ICC to within grapple envelope (within 5 cm 1 deg).

| | | | | | | | |
|--------|-----------------------------------|-------|-------|-------|--------|--------|--|
| | Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR | |
| +110.8 | +192.6 | -99.6 | +98.3 | -97.1 | -158.8 | +169.8 | |
| X | Y | Z | Pitch | Yaw | Roll | | |
| +16 | 0 | 0 | 0.0 | 0.0 | 0.0 | | |
| FOR | Loaded – ICC Install POA, SY Held | | | | | | |
| Disp | MBS>POA | | | | | | |

11. POA ICC GRAPPLE

PCS

11.1 Grapple

MSS: MBS: POA: POA

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

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

cmd Confirm (Verify RHC Trigger Hot icon)

Verify POA Mode – Auto Capture

RHC

TRIGGER → Press (momentarily)

PCS

Verify 'Snare' Close, Capture (two) – blue (12s max)
 Verify Capture to Latch – Yes (SCR 19282)
 Verify 'Carriage' Tension ~5500 N (90s max)
 Verify 'Carriage' Retract – blue
 Verify 'Latch' Latch – blue (80s max)

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 12 of 15 pages

DCP 11.2 Grapple Cleanup
SAFING → SAFE (Verify ON)

PCS MSS: SSRMS:

Change Display ► MBS ► Stowed ICC PVGF1 (Verify
MBS>Stowed ICC PVGF1)

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

* If using shuttle attitude control
* | Perform [ROBOTICS ATTITUDE MAINTENANCE](#), steps 1 and 2
* | (ORB OPS, [REBOOST/DAP](#)), then:

12. [SSRMS ICC RELEASE](#)

NOTE

1. Steps 12 and 13 will nominally be performed by the ground.
2. Due to a timing issue, transient SSRMS comm errors and safing may occur when payload power is removed. If safing occurs, cancel safing before issuing any commands to the SSRMS.

12.1 Removing SSRMS Payload Power

S0: EPS: RPCM S04BD:

cmd RPC Position – Open (Verify Op)

S0: EPS: RPCM S03AD:

cmd RPC Position – Open (Verify Op)

12.2 Retracting SSRMS Umbilical

MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

MSS: SSRMS: Tip LEE:

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

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Demate

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 13 of 15 pages

RHC TRIGGER → Press (momentarily)

PCS Verify 'Umbilical' Demate – blue (10s max)
Verify 'Connector Continuity' Prime, Redundant (two) – No

12.3 Mating POA Umbilical

MSS: MBS: POA:

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

cmd Confirm (Verify RHC Trigger Hot icon)

Verify POA Mode – Mate

RHC TRIGGER → Press (momentarily)

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

12.4 Applying POA Payload Power

MSS: MBS: POA P/L POWER:

cmd 'Prime' – ON (Verify ON)

cmd 'Redundant' – ON (Verify ON)

12.5 SSRMS Limp

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|------------------------------|----------------------------------------|-----------------------------------------|---------------|-------------|
| 22: Base Elbow (+85, -15) | 25: Tip LEE (Full Zoom Out) | 09: P1 Lower Outboard (+105, -10) | | |

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Verify Command – SSRMS>Internal

√Vernier

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

2.101 ICC TRANSFER TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

12.6 Auto Release - Push Off

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 'Latch' Unlatch – blue (65s max)
 Verify 'Carriage' Retract – gray (90s max)
 Verify 'Snare' Open – blue (12s max)
 Verify 'Carriage' Derig – blue (90s max)
 Verify 'Carriage' Extend – blue (90s max)

12.7 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)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: as required

THC/
RHC

Back off from grapple fixture to ICC Backoff position.

| | Locked | | | | | |
|--------|-----------------------------|--------|-------|-------|--------|--------|
| SR | SY | SP | EP | WP | WY | WR |
| +114.2 | +192.6 | -100.3 | +88.6 | -87.3 | -162.1 | +170.2 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Unloaded – LEE Tip, SY Held | | | | | |
| Disp | MBS>Stowed ICC PVGF1 | | | | | |

13. JOINT OCAS TO MT SURVEY

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|------------------------------|-------------------------------------------------|---------------------------------------|------------------------|-------------|
| 22: Base Elbow (+95, -15) | 07: P1 Lower Inboard (-175, -15) | 09: P1 Lower Outboard (+105, 0) | Camera B (-20, +30) | |

√Vernier

PCS MSS: SSRMS: Rate:

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

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► ICC PLB ► MT Survey

Verify 'Joint Angles' 'Destination' for MT Survey position.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|--------|-------|--------|------|
| +115.0 | +160.0 | -155.0 | +110.0 | -75.0 | -130.0 | +5.0 |

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) | +114.2 | +192.6 | -100.3 | +88.6 | -87.3 | -162.1 | +170.2 |
| TGT | +115.0 | +160.0 | -155.0 | +110.0 | -75.0 | -130.0 | +5.0 |
| ERR | -0.8 | +32.6 | +54.7 | -21.4 | -12.3 | -32.1 | +165.2 |

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 |
|--------|--------|--------|--------|-------|--------|------|
| +115.0 | +160.0 | -155.0 | +110.0 | -75.0 | -130.0 | +5.0 |

DCP SAFING → SAFE (Verify ON)

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2.201 ICC SETUP FOR EVA2

(RBT FS/ULF4/FIN 1/SPN/HC)

| <u>NOTE</u> | |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Expected Solar array configuration for EVA2 is as follows: <ul style="list-style-type: none"> a. Port SARJ: 225 deg (L) b. 2A BGA: 65 deg (L) c. 4B BGA: 130 deg (L) |
| 2. | Verify SRMS at Battery R&R Viewing position: SY = +30.0, +20.0, -25.0, +5.0, -10.0, +100.0 = WR |
| 3. | MSS Effector overlay may reflect POA mechanism. If a LEE caution is annunciated, verify LEE telemetry on LEE PCS page. |

THC/
RHC

1. HAND CONTROLLER CALIBRATION

Deflect all THC and RHC axes to positive and negative hard stops.

2. SETUP

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-----------------------------------|---------------------------------|-----------------------------------------------------|------------------------|-------------|
| 09: P1 Lower Outboard (-180, +40) | 07: P1 Lower Inboard (-120, +5) | 22: Base Elbow (-5, 0) 24: Tip Elbow (+175, -14) | OBSS ITVC (+125, -110) | |

PCS

MSS: SSRMS: SSRMS

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

Verify Unloaded Parameters – √

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

Change Display ► MBS ► Stowed ICC PVGF1 (Verify MBS>Stowed ICC PVGF1)

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

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

| | | | | | | |
|------|-----------------------------|--------|-------|--------|--------|--------|
| SR | SY | SP | EP | WP | WY | WR |
| +2.6 | +113.0 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +961 | +1119 | -52 | -80.4 | -7.6 | +153.0 | |
| FOR | Unloaded – LEE Tip, SY Held | | | | | |
| Disp | MBS>Stowed ICC PVGF1 | | | | | |

2.201 ICC SETUP FOR EVA2

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 2 of 11 pages

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: 1.0 (Verify 1.0)

Verify with **MCC-H** Port SARJ and BGAs configured for EVA2.

3. JOINT OCAS TO PRE-GRAPPLE INTERMEDIATE

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► ICC WS8 ► Pre-Grapple Intermed

NOTE

SSRMS Base Boom to ICC clearance ~33 in BELB, TELB.
Expect singularity warning for EP between -15 and 15 degrees.

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-------|-----|-------|--------|-------|------|
| +70.0 | +20.0 | 0.0 | -30.0 | -200.0 | -70.0 | +8.6 |

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) | +2.6 | +113.0 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |
| TGT | +70.0 | +20.0 | 0.0 | -30.0 | -200.0 | -70.0 | +8.6 |
| ERR | -67.4 | +93.0 | -105.0 | +113.8 | +92.1 | -89.2 | +105.8 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

2.201 ICC SETUP FOR EVA2

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 3 of 11 pages

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|-------|-------|-----|-------|--------|-------|------|
| +70.0 | +20.0 | 0.0 | -30.0 | -200.0 | -70.0 | +8.6 |

4. JOINT OCAS TO PRE-GRAPPLE

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-----------------------------------------|---------------------------------------|------------------------------------------------------------|---------------------------|-------------|
| 09: P1 Lower Outboard (-140, -10) | 07: P1 Lower Inboard (-120, -5) | 24: Tip Elbow (-155, -10) 37: MBS Mast (+15, +55) | OBSS ITVC (+125, -135) | |

pick File ► ICC WS8 ► Pre-Grapple

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-------|-------|--------|--------|------|------|
| +66.2 | -27.0 | +32.5 | -129.7 | -107.8 | +2.2 | +8.6 |

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) | +70.0 | +20.0 | 0.0 | -30.0 | -200.0 | -70.0 | +8.6 |
| TGT | +66.2 | -27.0 | +32.5 | -129.7 | -107.8 | +2.2 | +8.6 |
| ERR | +3.8 | +47.0 | -32.5 | +99.7 | -92.2 | -72.2 | 0.0 |

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 |
|-------|-------|-------|--------|--------|------|------|
| +66.2 | -27.0 | +32.5 | -129.7 | -107.8 | +2.2 | +8.6 |

5. GRAPPLE ICC PVGF

5.1 Setup

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|------------------------------------------|----------------------------------------------|-----------------------------------------|---------------------------|-------------|
| 51: JEM EXT A (-5, +30) | 25: Tip LEE (Full Zoom Out) | 24: Tip Elbow (-30, 0) | OBSS ITVC (+120, -120) | |

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

MSS: SSRMS: Rate:

Set ‘Scale’ ‘Vernier’ Rate Scale: as required

5.2 Grapple Envelope

NOTE

Expect cross cluster self collision warning to announce during maneuver to grapple envelope. Warning will clear during step 6.

RHC/
THC

Maneuver to within grapple envelope.

5.3 Grapple

PCS

MSS: SSRMS: Tip LEE:

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

Verify ‘**Confirm or Terminate**’ prompt.

CAUTION

Due to end-to-end system latency, the RHC Trigger is hot up to 3 seconds prior to receiving a Trigger Hot icon status on the PCS.

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 to exit LEE operations (SCR 23262, 14662).

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Capture

RHC

TRIGGER → Press (momentarily)

PCS

Verify ‘Snare’ Close, Capture (two) – blue (12s max)

Verify Capture to Latch – Yes (SCR 19282)

Verify ‘Carriage’ Tension ~5500 N (90s max)

Verify ‘Carriage’ Retract – blue

Verify ‘Latch’ Latch – blue (80s max)

2.201 ICC SETUP FOR EVA2

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 5 of 11 pages

DCP 5.4 Grapple Cleanup
BRAKES SSRMS → ON (Verify ON)

PCS MSS: SSRMS:

Verify Loaded Parameters – √

Verify 'Loaded Parameters' (three) – ICC Install POA, SSRMS, SY Held

Change Display ► MBS ► POA (Verify MBS>POA)

Change Command ► MBS ► POA Fly Camera (Verify MBS>POA Fly Camera)

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

| | | | | | | |
|-------|-----------------------------------|-------|--------|-------|------|------|
| SR | SY | SP | EP | WP | WY | WR |
| +65.2 | -27.0 | +37.3 | -142.7 | -99.2 | +2.6 | +7.9 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – ICC Install POA, SY Held | | | | | |
| Disp | MBS>POA | | | | | |

5.5 Power Inhibits

MSS: MBS: MSS Safing:

cmd 'MBS' Remove (Verify Not Safed)

MSS: MBS: POA P/L POWER:

cmd 'Prime' – OFF (Verify OFF)

cmd 'Redundant' – OFF (Verify OFF)

MSS: SSRMS: Power:

Verify 'Payload' Prime – Off

Verify 'Payload' Redundant – Off

5.6 POA Demate

MSS: MBS: POA:

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

cmd Confirm (Verify RHC Trigger Hot icon)

Verify POA Mode – Demate

2.201 ICC SETUP FOR EVA2

(RBT FS/ULF4/FIN 1/SPN/HC)

RHC TRIGGER → Press (momentarily)

PCS Verify 'Umbilical' Demate – blue (10s max)
Verify 'Connector Continuity' Prime, Redundant (two) – No

5.7 SSRMS Mate

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 (10s max)
Verify 'Connector Continuity' Prime, Redundant (two) – Yes

5.8 Payload Power

MSS: SSRMS: Power:

cmd 'Payload' Redundant – ON (Verify ON)

6. POA RELEASE

6.1 Setup

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------|------------------------------------|------------------------------------------------------------------------------|---------------------------|-------------|
| 51: JEM EXT A (-5, +30) | 32: POA (Full Zoom Out) | 24: Tip Elbow (-35, -5) 37: MBS Mast (-10, -10) | OBSS ITVC (+130, -120) | |

MSS: MBS:

Verify 'POA Payload' – ICC

6.2 Attitude Control Configuration

MSS: SSRMS: Thrusters:

Verify 'Desat Request:' Inhibit
Verify 'Auto Att Control Handover to RS' – Inh

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

- DCP 6.3 SSRMS Limp
BRAKES SSRMS → OFF (Verify OFF)
- PCS MSS: SSRMS: Limp:
- cmd** All Limp (Verify Limp – blue)
- MSS: SSRMS:
- Verify all joints – Limped
- 6.4 Auto-Release Commands
MSS: MBS: POA:
- cmd** Release ► Automatic ► Slow (Verify Speed – Slow)
- Verify ‘**Confirm or Terminate**’ prompt.
- cmd** Confirm (Verify RHC Trigger Hot icon)
- Verify POA Mode – Auto Release
- RHC TRIGGER → Press (momentarily)
- PCS Verify ‘Latch’ Unlatch – blue (65s max)
Verify ‘Carriage’ Retract – gray (90s max)
Verify ‘Snare’ Open – blue (12s max)
Verify ‘Carriage’ Derig – blue (90s max)
Verify ‘Carriage’ Extend – blue (90s max)
- 6.5 Maneuvering Clear of POA
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)
- MSS: SSRMS: Rate:
- Set ‘Scale’ ‘Vernier’ Rate Scale: as required

- NOTE
1. ICC uninstall is performed using “Fly Camera” Command frame (THC -X Pull to separate ICC from POA).
 2. If CETA Brakes fully deployed:
ICC to CETA Brake ~15 in – JEM EXT A or OBSS ITVC.
 3. Clearance between ICC trunnion and P4 Radiator expected to be about 31 in Monitor with Tip Elbow.
 4. Clearance between ICC SGANT FSE and P4-2A Solar Array expected to be about 31 in Monitor with OBSS ITVC.

THC/
RHC

Maneuver to POA Clearance position (within 5 cm/1 deg).

| Locked | | SR | SY | SP | EP | WP | WY | WR |
|--------|-----------------------------------|-------|-------|-------|--------|-------|------|-------|
| | | +68.3 | -27.0 | +23.0 | -130.4 | -98.6 | +1.4 | +10.3 |
| | | X | Y | Z | Pitch | Yaw | Roll | |
| | | +150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – ICC Install POA, SY Held | | | | | | | |
| Disp | MBS>POA | | | | | | | |

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

 * If using shuttle attitude control
 * | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 to 3
 * | (ORB OPS, **REBOOST/DAP**), then:

7. JOINT OCAS TO INTERMEDIATE 1

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------|-----------------------------------------------------------------------------|------------------------------|---------------------------|-------------|
| 51: JEM EXT A (-5, +20) | 37: MBS Mast (-10, 0) 09: P1 Lower Outboard (-130, -30) | 22: Base Elbow (-40, -15) | OBSS ITVC (+125, -130) | |

MSS: SSRMS: Rate:

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

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

SSRMS Joint OCAS

pick File ► ICC WS8 ► Intermediate 1

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|--------|--------|-------|-------|
| +86.0 | 0.0 | +26.0 | -110.0 | -130.0 | +16.0 | +39.0 |

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) | +68.3 | -27.0 | +23.0 | -130.4 | -98.6 | +1.4 | +10.3 |
| TGT | +86.0 | 0.0 | +26.0 | -110.0 | -130.0 | +16.0 | +39.0 |
| ERR | -17.7 | -27.0 | -3.0 | -20.4 | +31.4 | -14.6 | -28.7 |

PCS

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

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS: **SSRMS**

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|--------|--------|-------|-------|
| +86.0 | 0.0 | +26.0 | -110.0 | -130.0 | +16.0 | +39.0 |

8. JOINT OCAS TO INTERMEDIATE 2

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|---------------------------|----------------------------|-----------------------------------------|---------------------------|-------------|
| 51: JEM EXT A (0, +20) | 37: MBS Mast (-15, +30) | 09: P1 Lower Outboard (-130, -30) | OBSS ITVC (+120, -110) | |

SSRMS Joint OCAS

pick File ► ICC WS8 ► Intermediate 2

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|--------|-------|-------|-------|
| +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |

cmd Load (Verify Sequence Status – Confirm or Cancel)

2.201 ICC SETUP FOR EVA2

(RBT FS/ULF4/FIN 1/SPN/HC)

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

| | | | | | | | |
|------------|--------------|------------|--------------|---------------|--------------|--------------|--------------|
| | SR | SY | SP | EP | WP | WY | WR |
| (current) | +86.0 | 0.0 | +26.0 | -110.0 | -130.0 | +16.0 | +39.0 |
| TGT | +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |
| ERR | 0.0 | 0.0 | 0.0 | 0.0 | -160.0 | +47.0 | -30.0 |

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 |
| +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |

9. JOINT OCAS TO EVA2 START

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|---------------------------|----------------------------|-----------------------------------------|---------------------------|-------------|
| 51: JEM EXT A (0, +20) | 37: MBS Mast (-20, +40) | 09: P1 Lower Outboard (-135, -30) | OBSS ITVC (+120, -110) | |

pick File ► ICC WS8 ► EVA2 Start

Verify 'Joint Angles' 'Destination' for EVA2 Start position.

| | | | | | | |
|-------|-----|-------|-------|-------|-------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +77.0 | 0.0 | -39.0 | -55.0 | +30.0 | -31.0 | +69.0 |

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) | +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |
| TGT | +77.0 | 0.0 | -39.0 | -55.0 | +30.0 | -31.0 | +69.0 |
| ERR | +9.0 | 0.0 | +65.0 | -55.0 | 0.0 | 0.0 | 0.0 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|-------|-------|-------|-------|
| +77.0 | 0.0 | -39.0 | -55.0 | +30.0 | -31.0 | +69.0 |

DCP BRAKES SSRMS → ON (Verify ON)

```
*****  
* If using shuttle attitude control  
* | Go to ROBOTICS ATTITUDE MAINTENANCE, steps 1 and 2  
* | (ORB OPS, REBOOST/DAP).  
*****
```

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1. SETUP

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------|------------------------|----------------------------------------------------------------------|---------------------------|------------------------|
| 51: JEM EXT A (-5, +20) | 37: MBS Mast (0, 0) | 09: P1 Lower Outboard (-120, -20) 24: Tip Elbow (0, +10) | OBSS ITVC (+130, -120) | Camera B (-55, +10) |

PCS MSS: SSRMS:

Verify Loaded Parameters – ✓

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

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

Change Display ► MBS ► POA (Verify MBS>POA)

Change Command ► MBS ► POA Fly Camera (Verify MBS>POA Fly Camera)

Verify SSRMS at Battery F Clearance position (within 20 cm/1 deg).

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----------------------------------|-------|--------|-------|--------|-------|
| +78.9 | 0.0 | -59.6 | -38.3 | +13.9 | -14.3 | +40.5 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1678 | -271 | +99 | -164.4 | +50.0 | -171.8 | |
| FOR | Loaded – ICC Install POA, SY Held | | | | | |
| Disp | MBS>POA | | | | | |

DCP BRAKES SSRMS → OFF (Verify OFF)

✓Vernier

PCS MSS: SSRMS: Rate:

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

2. JOINT OCAS TO INTERMEDIATE 2

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► ICC WS8 ► Intermediate 2

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|--------|-------|-------|-------|
| +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |

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) | +78.9 | 0.0 | -59.6 | -38.3 | +13.9 | -14.3 | +40.5 |
| TGT | +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |
| ERR | -7.1 | 0.0 | -85.6 | +71.7 | -16.1 | +16.7 | -28.5 |

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 |
|-------|-----|-------|--------|-------|-------|-------|
| +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |

3. JOINT OCAS TO INTERMEDIATE 1

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|---------------------------|----------------------------|----------------------------------------------------------------------|---------------------------|------------------------|
| 51: JEM EXT A (0, +20) | 37: MBS Mast (-15, +30) | 09: P1 Lower Outboard (-140, -30) 24: Tip Elbow (0, +10) | OBSS ITVC (+110, -120) | Camera B (-55, +10) |

pick File ► ICC WS8 ► Intermediate 1

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|--------|--------|-------|-------|
| +86.0 | 0.0 | +26.0 | -110.0 | -130.0 | +16.0 | +39.0 |

cmd Load (Verify Sequence Status – Confirm or Cancel)

2.301 ICC RETURN TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

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

| | | | | | | | |
|------------|--------------|------------|--------------|---------------|---------------|--------------|--------------|
| | SR | SY | SP | EP | WP | WY | WR |
| (current) | +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |
| TGT | +86.0 | 0.0 | +26.0 | -110.0 | -130.0 | +16.0 | +39.0 |
| ERR | 0.0 | 0.0 | 0.0 | 0.0 | +160.0 | -47.0 | +30.0 |

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 |
| +86.0 | 0.0 | +26.0 | -110.0 | -130.0 | +16.0 | +39.0 |

4. JOINT OCAS TO POA PRE-GRAPPLE

Configure Cameras and overlays as required.

| | | | | |
|----------------------------|----------------------------|------------------------------------------------------------------------------------|---------------------------|------------------------|
| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
| 51: JEM EXT A (-5, +25) | 37: MBS Mast (-15, +35) | 24: Tip Elbow (-30, +15) 09: P1 Lower Outboard (-130, -30) | OBSS ITVC (+110, -130) | Camera B (-55, +10) |

NOTE

- The following are clearance concerns at the end of the maneuver:
- a. ICC trunnion to P4 Radiator ~32 in – Tip Elbow.
 - b. ICC SGANT FSE to 2A Array ~31 in – P1 LOOB or OBSS ITVC.
 - c. ICC PVGF to P4 ~48 in – P1 LOOB or OBSS ITVC.

pick File ► ICC WS8 ► POA Pre-Grapple

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

| | | | | | | |
|-------|-------|-------|--------|-------|------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +68.3 | -27.0 | +23.0 | -130.4 | -98.6 | +1.4 | +10.3 |

cmd Load (Verify Sequence Status – Confirm or Cancel)

2.301 ICC RETURN TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 4 of 10 pages

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

| | SR | SY | SP | EP | WP | WY | WR |
|------------|--------------|--------------|--------------|---------------|--------------|-------------|--------------|
| (current) | +86.0 | 0.0 | +26.0 | -110.0 | -130.0 | +16.0 | +39.0 |
| TGT | +68.3 | -27.0 | +23.0 | -130.4 | -98.6 | +1.4 | +10.3 |
| ERR | +17.7 | +27.0 | +3.0 | +20.4 | -31.4 | +14.6 | +28.7 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----------------------------------|-------|--------|-------|------|-------|
| +68.3 | -27.0 | +23.0 | -130.4 | -98.6 | +1.4 | +10.3 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – ICC Install POA, SY Held | | | | | |
| Disp | MBS>POA | | | | | |

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

5. POA GRAPPLE ICC PVGF

5.1 Setup

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------|------------------------------------|---------------------------------------------------------------------------|---------------------------|------------------------|
| 51: JEM EXT A (-5, +25) | 32: POA (Full Zoom Out) | 24: Tip Elbow (-60, -5) 09: P1 Lower Outboard (-130, -30) | OBSS ITVC (+110, -110) | Camera B (-55, +10) |

MSS: SSRMS: MBS: MSS Safing:

cmd 'MBS' Remove (Verify Not Safed)

MSS: SSRMS: MBS:

Change POA Payload ► ICC ► PVGF2

Verify 'POA Payload' – ICC

MSS: SSRMS:

Verify Command – MBS> POA Fly Camera

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: as required

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

5.2 Attitude Control Configuration

MSS: SSRMS: Thrusters:

Verify 'Desat Request:' Inhibit

Verify 'Auto Att Control Handover to RS' – Inh

* If using shuttle attitude control

* | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 to 3

* | (**ORB OPS**, **REBOOST/DAP**), then:

5.3 Grapple Envelope

| |
|-----------------------------------------------------------------------------------------------------------------------------------|
| NOTE |
| 1. ICC install is performed using "Fly Camera" Command frame (THC +X Push to bring ICC into POA). |
| 2. If CETA Brakes fully deployed: ICC to CETA Brake ~19" – Base Elbow. |
| 3. Expect cross cluster self collision warning to announce during maneuver to grapple envelope. Warning will clear during step 6. |

RHC/
THC

Maneuver to within grapple envelope.

PCS

5.4 POA Grapple

MSS: MBS: POA:

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

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

cmd Confirm (Verify RHC Trigger Hot icon)

Verify POA Mode – Auto Capture

2.301 ICC RETURN TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 6 of 10 pages

- RHC TRIGGER → Press (momentarily)
- PCS Verify 'Snare' Close, Capture (two) – blue (12s max)
 Verify Capture to Latch – Yes (SCR 19282)
 Verify 'Carriage' Tension ~5500 N (90s max)
 Verify 'Carriage' Retract – blue
 Verify 'Latch' Latch – blue (80s max)

- DCP 5.5 Grapple Cleanup
 BRAKES SSRMS → ON (Verify ON)

PCS MSS: SSRMS:

Expected POA Grapple position:

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----------------------------------|-------|--------|-------|------|------|
| +65.2 | -27.0 | +37.3 | -142.7 | -99.2 | +2.6 | +7.9 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – ICC Install POA, SY Held | | | | | |
| Disp | MBS>POA | | | | | |

Change Display ► MBS ► Stowed ICC PVGF1 (Verify MBS>Stowed ICC PVGF1)

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

 * If using shuttle attitude control
 * | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 and 2
 * | (**ORB OPS, REBOOST/DAP**), then:

6. SSRMS ICC RELEASE

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------|----------------------------------------------|------------------------------------------------------|---------------------------|------------------------|
| 51: JEM EXT A (-5, +30) | 25: Tip LEE (Full Zoom Out) | 22: Base Elbow (-45, -15) | OBSS ITVC (+110, -130) | Camera B (-55, +10) |

6.1 Removing SSRMS Payload Power

MSS: SSRMS: Power:

cmd 'Payload' Redundant – OFF (Verify OFF)

6.2 Retracting SSRMS Umbilical

MSS: SSRMS: Tip LEE:

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

2.301 ICC RETURN TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 7 of 10 pages

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Demate

RHC TRIGGER → Press (momentarily)

PCS Verify 'Umbilical' Demate – blue (10s max)
Verify 'Connector Continuity' Prime, Redundant (two) – No

6.3 Mating POA Umbilical

MSS: MBS: POA:

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

cmd Confirm (Verify RHC Trigger Hot icon)

Verify POA Mode – Mate

RHC TRIGGER → Press (momentarily)

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

6.4 Applying POA Payload Power

MSS: MBS: POA P/L POWER:

cmd 'Prime' – ON (Verify ON)

cmd 'Redundant' – ON (Verify ON)

6.5 SSRMS Limp

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Verify Command – SSRMS>Internal

√Vernier

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

2.301 ICC RETURN TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

6.6 Auto Release - Push Off

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 'Latch' Unlatch – blue (65s max)
 Verify 'Carriage' Retract – gray (90s max)
 Verify 'Snare' Open – blue (12s max)
 Verify 'Carriage' Derig – blue (90s max)
 Verify 'Carriage' Extend – blue (90s max)

6.7 SSRMS Backoff

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)

MSS: SSRMS: Rate: SSRMS Rate

Set 'Scale' 'Vernier' Rate Scale: as required

THC/
RHC

Back off from grapple fixture to ICC Backoff position.

| | | | | | | |
|-------|-----------------------------|-------|--------|--------|------|------|
| | Locked | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| +66.2 | -27.0 | +32.5 | -129.7 | -107.8 | +2.2 | +8.6 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Unloaded – LEE Tip, SY Held | | | | | |
| Disp | MBS>Stowed ICC PVGF1 | | | | | |

2.301 ICC RETURN TO POA

(RBT FS/ULF4/FIN 1/SPN/HC)

7. JOINT OCAS TO PRE-GRAPPLE INTERMEDIATE

Configure Cameras and overlays as required.

| | | | | |
|----------------------------|------------------------------------------|--------------------------------------------------------------|---------------------------|------------------------|
| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
| 51: JEM EXT A (-5, +30) | 37: MBS Mast (-35, +25) | 09: P1 Lower Outboard (-140, -30) | OBSS ITVC (+100, -110) | Camera B (-55, +10) |

PCS MSS: SSRMS: Rate:

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

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► ICC WS8 ► Pre-Grapple Intermed

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

| | | | | | | |
|-------|-------|-----|-------|--------|-------|------|
| SR | SY | SP | EP | WP | WY | WR |
| +70.0 | +20.0 | 0.0 | -30.0 | -200.0 | -70.0 | +8.6 |

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) | +66.2 | -27.0 | +32.5 | -129.7 | -107.8 | +2.2 | +8.6 |
| TGT | +70.0 | +20.0 | 0.0 | -30.0 | -200.0 | -70.0 | +8.6 |
| ERR | -3.8 | -47.0 | +32.5 | -99.7 | +92.2 | +72.2 | 0.0 |

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 |
| +70.0 | +20.0 | 0.0 | -30.0 | -200.0 | -70.0 | +8.6 |

8. JOINT OCAS TO MT TRANSLATE

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|---------------------------|--------------------------------------------------------|----------------------------------------|---------------------------|------------------------|
| 51: JEM EXT A (-5, +5) | 37: MBS Mast (0, +55) 22: Base Elbow (-20, 0) | 09: P1 Lower Outboard (-140, +5) | OBSS ITVC (+100, -110) | Camera B (-55, +10) |

SSRMS Joint OCAS

pick File ► ICC WS8 ► MT Translate

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

| SR | SY | SP | EP | WP | WY | WR |
|------|--------|--------|-------|--------|--------|--------|
| +2.6 | +113.0 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |

NOTE

1. SSRMS Base Boom and ICC ~33 in – BELB.
2. Expect singularity warning for EP between -15 and 15 degrees.

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) | +70.0 | +20.0 | 0.0 | -30.0 | -200.0 | -70.0 | +8.6 |
| TGT | +2.6 | +113.0 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |
| ERR | +67.4 | -93.0 | +105.0 | -113.8 | -92.1 | +89.2 | -105.8 |

PCS

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

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS: **SSRMS**

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|------|--------|--------|-------|--------|--------|--------|
| +2.6 | +113.0 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |

DCP

SAFING → SAFE (Verify ON)

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 1 of 16 pages

- THC/
RHC
1. [HAND CONTROLLER CALIBRATION](#)
Deflect all THC and RHC axes to positive and negative hard stops.
 2. [SETUP](#)
Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|------------------------------|----------------------------------------|-----------------------------------------|------------------------|-------------|
| 22: Base Elbow (+90, -10) | 07: P1 Lower Inboard (-160, +10) | 09: P1 Lower Outboard (+120, +10) | Camera B (-20, +40) | |

PCS MSS: SSRMS:

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

Verify Unloaded Parameters – √

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

Change Display ► MBS ► Stowed ICC PVGF1 (Verify MBS>Stowed ICC PVGF1)

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

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

| | | | | | | |
|--------|-----------------------------|--------|--------|-------|--------|------|
| SR | SY | SP | EP | WP | WY | WR |
| +115.0 | +160.0 | -155.0 | +110.0 | -75.0 | -130.0 | +5.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -315 | +102 | -809 | +24.2 | -35.3 | -117.6 | |
| FOR | Unloaded – LEE Tip, SY Held | | | | | |
| Disp | MBS>Stowed ICC PVGF1 | | | | | |

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: 1.0 (Verify 1.0)

3. [JOINT OCAS TO ICC PRE-GRAPPLE](#)

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 2 of 16 pages

SSRMS Joint OCAS

pick File ► ICC PLB ► ICC POA Pre-Grp

Verify 'Joint Angles' 'Destination' for ICC POA-Grp position.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|-------|-------|--------|--------|
| +114.2 | +192.6 | -100.3 | +88.6 | -87.3 | -162.1 | +170.2 |

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) | +115.0 | +160.0 | -155.0 | +110.0 | -75.0 | -130.0 | +5.0 |
| TGT | +114.2 | +192.6 | -100.3 | +88.6 | -87.3 | -162.1 | +170.2 |
| ERR | +0.8 | -32.6 | -54.7 | +21.4 | +12.3 | +32.1 | -165.2 |

PCS

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

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS: SSRMS

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|-------|-------|--------|--------|
| +114.2 | +192.6 | -100.3 | +88.6 | -87.3 | -162.1 | +170.2 |

4. GRAPPLE ICC PVGE

4.1 Setup

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|------------------------------|----------------------------------------------|---------------------------------------|---------------|-------------|
| 22: Base Elbow (+90, -15) | 25: Tip LEE (Full Zoom Out) | 09: P1 Lower Outboard (+120, 0) | | |

MSS: SSRMS: Rate: SSRMS Rate

Set 'Scale' 'Vernier' Rate Scale: as required

MSS: SSRMS: SSRMS

Enter Mode – Manual (Verify blue)

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

cmd Shoulder Yaw (Verify SY – Locked)

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 3 of 16 pages

RHC/
THC 4.2 Grapple Envelope
Maneuver to within grapple envelope.

PCS 4.3 Grapple
MSS: SSRMS: Tip LEE:

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

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

CAUTION

Due to end-to-end system latency, the RHC Trigger is hot up to 3 seconds prior to receiving a Trigger Hot icon status on the PCS.

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 to exit LEE operations (SCR 23262, 14662).

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Capture

RHC TRIGGER → Press (momentarily)

PCS Verify 'Snare' Close, Capture (two) – blue (12s max)
Verify Capture to Latch – Yes (SCR 19282)
Verify 'Carriage' Tension ~5500 N (90s max)
Verify 'Carriage' Retract – blue
Verify 'Latch' Latch – blue (80s max)

DCP 4.4 Grapple Cleanup
BRAKES SSRMS → ON (Verify ON)

PCS MSS: SSRMS:

Verify Loaded Parameters – √

Verify 'Loaded Parameters' (three) – ICC Install POA, SSRMS, SY Held

Change Display ► MBS ► POA (Verify MBS>POA)

Change Command ► MBS ► POA Fly Camera (Verify MBS>POA Fly Camera)

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 4 of 16 pages

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

| SR | SY | SP | EP | WP | WY | WR |
|--------|-----------------------------------|-------|-------|-------|--------|--------|
| +110.8 | +192.6 | -98.8 | +98.6 | -98.2 | -158.8 | +169.7 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – ICC Install POA, SY Held | | | | | |
| Disp | MBS>POA | | | | | |

4.5 Power Inhibits

MSS: MBS: MSS Safing:

cmd 'MBS' Remove (Verify Not Safed)

MSS: MBS: POA P/L POWER:

cmd 'Prime' – OFF (Verify OFF)

cmd 'Redundant' – OFF (Verify OFF)

4.6 POA Demate

MSS: MBS: POA:

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

cmd Confirm (Verify RHC Trigger Hot icon)

Verify POA Mode – Demate

RHC

TRIGGER → Press (momentarily)

PCS

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

Verify 'Connector Continuity' Prime, Redundant (two) – No

4.7 SSRMS Mate

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 (10s max)

Verify 'Connector Continuity' Prime, Redundant (two) – Yes

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 5 of 16 pages

4.8 Payload Power

S0: EPS: RPCM S04BD:

Verify Close Cmd – Enable (Verify Ena)

cmd RPC Position – Close (Verify Cl)

S0: EPS: RPCM S03AD:

Verify Close Cmd – Enable (Verify Ena)

cmd RPC Position – Close (Verify Cl)

5. POA RELEASE

5.1 Setup

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|--------------------------------------------------------------------------------|------------------------------------|-----------------------------------------|------------------------|-------------|
| 13: LAB Stbd Zenith (+160, -20) 22: Base Elbow (+75, -15) | 32: POA (Full Zoom Out) | 09: P1 Lower Outboard (+105, -10) | Camera B (-20, +40) | |

MSS: MBS:

Verify 'POA Payload' – ICC

5.2 Attitude Control Configuration

MSS: SSRMS: Thrusters:

Verify 'Desat Request:' Inhibit

Verify 'Auto Att Control Handover to RS' – Inh

* If using shuttle attitude control

* Verify in attitude, then DAP: FREE.

5.3 SSRMS Limp

DCP

BRAKES SSRMS → OFF (Verify OFF)

PCS

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 6 of 16 pages

5.4 Auto-Release Commands

MSS: MBS: POA:

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

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

cmd Confirm (Verify RHC Trigger Hot icon)

Verify POA Mode – Auto Release

RHC

TRIGGER → Press (momentarily)

PCS

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

Verify 'Carriage' Retract – gray (90s max)

Verify 'Snare' Open – blue (12s max)

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

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

5.5 Maneuvering Clear of POA

MSS: SSRMS: Limp:

cmd None Limp (Verify Standby – blue)

MSS: SSRMS: Rate:

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

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

NOTE

1. ICC install is performed using "Fly Camera" Command frame (THC -X Pull to separate ICC from POA).
2. If CETA Brakes fully deployed, ICC to CETA Brake ~19" – Base Elbow.

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

THC/
RHC

Maneuver to POA Clearance position (within 5 cm/1 deg).

| | | | | | | |
|--------|-----------------------------------|--------|-------|-------|--------|--------|
| | Locked | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| +111.0 | +192.6 | -105.3 | +94.2 | -87.3 | -159.0 | +169.7 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – ICC Install POA, SY Held | | | | | |
| Disp | MBS>POA | | | | | |

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

 * If using shuttle attitude control
 * | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 to 3
 * | (ORB OPS, REBOOST/DAP), then:

6. JOINT OCAS TO INTERMEDIATE 2

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------|------------------------|-------------|
| 51: JEM EF A (+100, +20) 52: JEM EXT A (-165, -20) | 07: P1 Lower Inboard (-180, -25) 37: MBS Mast (0, 0) | 09: P1 Lower Outboard (+120, 0) | Camera B (-20, +40) | |

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► ICC PLB ► Intermediate 2

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

| | | | | | | |
|--------|--------|--------|-------|-------|--------|--------|
| SR | SY | SP | EP | WP | WY | WR |
| +111.0 | +170.0 | -190.0 | +94.2 | -87.3 | -180.0 | +120.0 |

NOTE
 SGANT to SSRMS Tip Boom ~43" – P1 LOOB.

cmd Load (Verify Sequence Status – Confirm or Cancel)

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

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

| | | | | | | | |
|------------|---------------|---------------|---------------|--------------|--------------|---------------|---------------|
| | SR | SY | SP | EP | WP | WY | WR |
| (current) | +111.0 | +192.6 | -105.3 | +94.2 | -87.3 | -159.0 | +169.7 |
| TGT | +111.0 | +170.0 | -190.0 | +94.2 | -87.3 | -180.0 | +120.0 |
| ERR | 0.0 | +22.6 | +84.7 | 0.0 | 0.0 | +21.0 | +49.7 |

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 |
| +111.0 | +170.0 | -190.0 | +94.2 | -87.3 | -180.0 | +120.0 |

7. JOINT OCAS TO INTERMEDIATE 1

Configure Cameras and overlays as required.

| | | | | |
|-----------------------------------------|---------------------------------------------------------------------|-----------------------------------|---------------------|------------------------|
| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
| 03: S1 Lower Outboard (+70, +15) | 24: Tip Elbow (+30, +20) 22: Base Elbow (+90, -15) | 09: P1 Lower Outboard (+120, +25) | Camera B (-10, +40) | SRMS Elbow (+130, +45) |

pick File ► ICC PLB ► Intermediate 1

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

| | | | | | | |
|--------|--------|--------|-------|-------|-------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +180.0 | +155.0 | -210.0 | +94.2 | -12.6 | -28.7 | +14.4 |

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) | +111.0 | +170.0 | -190.0 | +94.2 | -87.3 | -180.0 | +120.0 |
| TGT | +180.0 | +155.0 | -210.0 | +94.2 | -12.6 | -28.7 | +14.4 |
| ERR | -69.0 | +15.0 | +20.0 | 0.0 | -74.7 | -151.3 | +105.6 |

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

DCP AUTO SEQ → PROC

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 9 of 16 pages

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|-------|-------|-------|-------|
| +180.0 | +155.0 | -210.0 | +94.2 | -12.6 | -28.7 | +14.4 |

8. JOINT OCAS TO ICC HOVER

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------|----------------------------------------------------|-----------------------------------|---------------------|------------------------------------------|
| 03: S1 Lower Outboard (+70, +15) | 22: Base Elbow (+90, -10) 24: Tip Elbow (-5, 0) | 09: P1 Lower Outboard (+115, +25) | Camera B (-30, +45) | SRMS Elbow (-80, +25) Camera A (0, 0) |

RHC RATE → COARSE (Verify Coarse on PCS)

pick File ► ICC PLB ► ICC Hover

Verify 'Joint Angles' 'Destination' for ICC Hover position.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|--------|-------|-------|-------|
| +213.6 | +151.8 | -176.1 | +111.7 | -12.6 | -28.7 | +14.4 |

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) | +180.0 | +155.0 | -210.0 | +94.2 | -12.6 | -28.7 | +14.4 |
| TGT | +213.6 | +151.8 | -176.1 | +111.7 | -12.6 | -28.7 | +14.4 |
| ERR | -33.6 | +3.2 | -33.9 | -17.5 | 0.0 | 0.0 | 0.0 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|--------|-------|-------|-------|
| +213.6 | +151.8 | -176.1 | +111.7 | -12.6 | -28.7 | +14.4 |

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

12. AKA LATCH

A6U √PL RETEN LAT 5 tb – REL

Note single motor drive times (> 30 seconds).

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

√RDY 5 tb – gray

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

If any PL RETEN LAT RDY tb – bp

√**MCC** for GO to perform the following off-nominal (starred block)

A6U,
CRT

* If any PL RETEN LAT RDY tb – bp or any RDY-FOR-LAT : 0
* √**MCC** for GO to perform the following:

A6U

* √PL RETEN LAT 5 tb – LAT

* Note single motor time (> 30 seconds).

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

* Notify SSRMS operator, AKA Released.

THC/
RHC

* Maneuver to ICC Berthed position (Until shuttle
 callout of PL RETEN LAT RDY 1,2,3,4 tb (four) – gray).

* Repeat step 12.

13. PRLA LATCH

A6U √PL RETEN LAT 1,2,3,4 tb (four) – REL
 √RDY 1,2,3,4 tb (four) – gray

Note single motor drive times (> 30 seconds).

PL RETEN LAT 3,4 (two) – LAT (tb-LAT), 60s max
 – OFF

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

Give SSRMS operator GO for limping.

PCS

MSS: SSRMS:

Enter Mode – Standby (Verify blue)

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 13 of 16 pages

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

Give PRLA operator GO for forward latches.

| | |
|---------|---------------------------------------------------------|
| A6U | PL RETEN LAT 1,2 (two) – LAT (tb-LAT), 60s max – OFF |
| | 14. <u>DEACTIVATING LATCHES</u> |
| | PL RETEN PL SEL – MON |
| | LOGIC PWR SYS 1,2 (two) – OFF |
| R13L | BAY MECH PWR SYS 1,2 (two) – OFF |
| | If MCA LOGIC switches were turned off in step 11 |
| MA73C:A | MCA LOGIC MNC MID 2 – ON |
| B | MNB MID 4 – ON |
| | Give SSRMS operator GO for ICC Release. |

DCP SAFING → SAFE (Verify ON)

* If using shuttle attitude control
* | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 and 2
* | (ORB OPS, **REBOOST/DAP**), then:

15. ICC RELEASE

15.1 Removing SSRMS Payload Power

NOTE

Due to a timing issue, transient SSRMS comm errors and safing may occur when payload power is removed. If safing occurs, cancel safing before issuing any commands to the SSRMS.

S0: EPS: RPCM S04BD:

cmd RPC Position – Open (Verify Op)

S0: EPS: RPCM S03AD:

cmd RPC Position – Open (Verify Op)

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 14 of 16 pages

15.2 Setup for Release
PCS MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

MSS: SSRMS:

Change Display ► Orbiter ► ICC PVGF1 (Verify Orbiter>ICC PVGF1)

Verify Command – SSRMS>Internal

15.3 SSRMS Limp
Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------|------------------------------------|------------------------------------------|-----------------|-------------|
| 03: S1 Lower Outboard (+70, +15) | 25: Tip LEE (Full Zoom Out) | 09: P1 Lower Outboard (+125, +15) | Camera B (0, 0) | |

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

√Vernier

MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

15.4 Auto Release - Push Off
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

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 15 of 16 pages

RHC TRIGGER → Press (momentarily)

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

15.5 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)

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: as required

THC/
RHC

Back off from grapple fixture to ICC Clearance position.

| | | | | | | |
|--------|-------------------------------------|--------|-------|-------|-------|-------|
| | <input type="text" value="Locked"/> | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| +202.9 | +151.8 | -153.3 | +83.9 | -13.3 | -19.5 | +12.5 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Unloaded – LEE Tip, SY Held | | | | | |
| Disp | Orbiter>ICC PVGF1 | | | | | |

16. JOINT OCAS TO DOCKING

Configure Cameras and overlays as required.

| | | | | |
|----------------------------------|-------------------------------|-----------------------------------|-------------------|------------------------|
| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
| 03: S1 Lower Outboard (+70, +15) | 24: Tip Elbow (0, +20) | 09: P1 Lower Outboard (+125, +15) | Camera B (0, +30) | SRMS Elbow (-100, +60) |

PCS MSS: SSRMS: Rate:

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

2.401 ICC TRANSFER TO PLB

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 16 of 16 pages

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► ICC PLB ► Docking

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

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|--------|-----|--------|-----|
| +230.0 | +150.0 | -190.0 | +130.0 | 0.0 | -150.0 | 0.0 |

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) | +202.9 | +151.8 | -153.3 | +83.9 | -13.3 | -19.5 | +12.5 |
| TGT | +230.0 | +150.0 | -190.0 | +130.0 | 0.0 | -150.0 | 0.0 |
| ERR | -27.1 | +1.8 | +36.7 | -46.1 | -13.3 | +130.5 | +12.5 |

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 |
|--------|--------|--------|--------|-----|--------|-----|
| +230.0 | +150.0 | -190.0 | +130.0 | 0.0 | -150.0 | 0.0 |

DCP

SAFING → SAFE (Verify ON)

Give SRMS operator a GO for Maneuver to OBSS Undock.

3.101 EVA1 SUPPORT

| <u>NOTE</u> | |
|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Verify SRMS at SGANT & EOTP Viewing position: | SY= +53.0, +62.0, -23.0, +107.0, +48.0, +64.0 =WR |
| 2. Verify SPDM at EOTP Stow position: | BR = +60.0 Arm1: SR = +85.0, -110.0, -120.0, +80.0, -50.0, -80.0, -50.0 = WR Arm2: SR = -95.0, -45.0, -120.0, -20.0, +30.0, -120.0, -22.0 = WR |
| 3. Verify JEM RMS at Stow position: | SY= 0.0, +90.0, -149.0, -31.0, 0.0, 0.0 =WR |
| 4. During Joint OCAS maneuvers, expect singularity warning for EP between -15 and +15 deg. | |

1. SETUP

| <u>NOTE</u> | |
|----------------------------------------------------------------------|--|
| Steps 1 to 6 will nominally be performed by MCC-H during FN3. | |

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------|------------------------|-------------|
| 52: JEM EF A (+100, -5) 51: JEM EXT A (-170, -25) | 09: P1 Lower Outboard (+120, -5) 37: MBS Mast (+100, 0) | 07: P1 Lower Inboard (-180, +40) | Camera B (-20, +30) | |

PCS MSS: SSRMS:

Verify Unloaded Parameters – √

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

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

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

| | | | | | | |
|------|-----------------------------|--------|-------|--------|--------|--------|
| SR | SY | SP | EP | WP | WY | WR |
| +2.6 | +133.8 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +432 | -359 | +895 | +95.0 | +45.8 | +179.9 | |
| FOR | Unloaded – LEE Tip, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

2. JOINT OCAS TO INTERMEDIATE 1 (1 MINUTE)

MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 2 of 32 pages

DCP BRAKES SSRMS → OFF (Verify OFF)

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS: Rate:

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

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► EVA1 ► Intermediate 1

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

| SR | SY | SP | EP | WP | WY | WR |
|------|--------|--------|--------|--------|--------|--------|
| +2.6 | +120.0 | -110.0 | +140.0 | -107.9 | -159.2 | +114.4 |

NOTE

SSRMS to JEM clearance ~49 in – Cam B, JEM EF A.
SSRMS to ICC clearance ~44 in – JEM EXT A.
SSRMS to LAB clearance ~35 in – P1LOIB, Cam B.

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) | +2.6 | +133.8 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |
| TGT | +2.6 | +120.0 | -110.0 | +140.0 | -107.9 | -159.2 | +114.4 |
| ERR | 0.0 | +13.8 | +5.0 | -56.2 | 0.0 | 0.0 | 0.0 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|------|--------|--------|--------|--------|--------|--------|
| +2.6 | +120.0 | -110.0 | +140.0 | -107.9 | -159.2 | +114.4 |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 3 of 32 pages

3. JOINT OCAS TO INTERMEDIATE 2 (3 MINUTES)

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-------------------------------------------------------------|------------------------------------------|----------------------------------------|------------------------|-------------|
| 51: JEM EXT A (-160, +15) 52: JEM EF A (+100, +10) | 22: Base Elbow (+45, -15) | 07: P1 Lower Inboard (-180, -15) | Camera B (-20, +30) | |

pick File ► EVA1 ► Intermediate 2

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-------|-----|-------|--------|--------|--------|
| +25.0 | +90.0 | 0.0 | +98.0 | -107.9 | -159.2 | +114.4 |

NOTE

1. SSRMS to SPDM clearance ~44 in – JEM EXT A.
2. SSRMS to JEM clearance ~53 in – JEM EXT A, Cam B.
3. SSRMS to LAB clearance ~50 in – P1LOIB.

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) | +2.6 | +120.0 | -110.0 | +140.0 | -107.9 | -159.2 | +114.4 |
| TGT | +25.0 | +90.0 | 0.0 | +98.0 | -107.9 | -159.2 | +114.4 |
| ERR | -22.4 | +30.0 | -110.0 | +42.0 | 0.0 | 0.0 | 0.0 |

PCS

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

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|-------|-------|-----|-------|--------|--------|--------|
| +25.0 | +90.0 | 0.0 | +98.0 | -107.9 | -159.2 | +114.4 |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 4 of 32 pages

4. JOINT OCAS TO INTERMEDIATE 3

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|------------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------|---------------|-------------|
| 51: JEM EXT A (-170, +30) | 03: S1 Lower Outboard (+70, -15) | 07: P1 Lower Inboard (-180, -30) 13: LAB Stbd Zenith (-170, -35) | | |

SSRMS Joint OCAS

pick File ► EVA1 ► Intermediate 3

Verify 'Joint Angles' 'Destination' for Intermediate 3 position.

| SR | SY | SP | EP | WP | WY | WR |
|-------|-------|-----|-------|--------|--------|-------|
| -30.0 | +45.0 | 0.0 | +98.0 | -107.9 | -159.1 | +12.0 |

NOTE

1. SSRMS to SPDM clearance ~54 in – LAB, S1 LOOB.
2. SSRMS to LAB clearance ~55 in – LAB, S1 LOOB, JEM EXT A.
3. SSRMS to JEM-PS clearance ~41 in – LAB, S1 LOOB.
4. SSRMS to MBS Mast clearance ~31 in – JEM EXT A.

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) | +25.0 | +90.0 | 0.0 | +98.0 | -107.9 | -159.2 | +114.4 |
| TGT | -30.0 | +45.0 | 0.0 | +98.0 | -107.9 | -159.1 | +12.0 |
| ERR | +55.0 | +45.0 | 0.0 | 0.0 | 0.0 | -0.1 | +102.4 |

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 |
|-------|-------|-----|-------|--------|--------|-------|
| -30.0 | +45.0 | 0.0 | +98.0 | -107.9 | -159.1 | +12.0 |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 5 of 32 pages

5. JOINT OCAS TO PRE-APFR SETUP

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-------------------------------------------------------------|----------------------------------|---------------------------------------|---------------|-------------|
| 52: JEM EF A (+120, +55) 51: JEM EXT A (-150, +50) | 22: Base Elbow (+100, -10) | 13: LAB Stbd Zenith (-165, -35) | | SRMS EE |

SSRMS Joint OCAS

pick File ► EVA1 ► Pre-APFR Setup

Verify 'Joint Angles' 'Destination' for Pre-APFR Setup position.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|--------|-------|--------|-------|
| -190.0 | +110.5 | -116.2 | +130.1 | -84.8 | -159.1 | +12.0 |

NOTE

SSRMS to SPDM clearance ~41 in – JEM EXT A.

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) | -30.0 | +45.0 | 0.0 | +98.0 | -107.9 | -159.1 | +12.0 |
| TGT | -190.0 | +110.5 | -116.2 | +130.1 | -84.8 | -159.1 | +12.0 |
| ERR | +160.0 | -65.5 | +116.2 | -32.1 | -23.1 | 0.0 | 0.0 |

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-APFR Setup position (within 5 cm/1 deg).

| SR | SY | SP | EP | WP | WY | WR |
|--------|-----------------------------|--------|--------|-------|--------|-------|
| -190.0 | +110.5 | -116.2 | +130.1 | -84.8 | -159.1 | +12.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +421 | -1465 | -400 | -54.5 | +12.5 | -120.0 | |
| FOR | Unloaded – LEE Tip, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

DCP

BRAKES SSRMS → ON (Verify ON)

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 6 of 32 pages

6. SPDM BODY MANEUVER TO EVA SUPPORT POSITION

PCS MSS: SPDM: MSS Safing:

cmd 'SPDM' 'Body' Remove (Verify Not Safed)

DCP BRAKES SPDM Body → OFF (Verify OFF)

PCS MSS: SPDM:

Enter Mode – Joint OCAS (Verify blue)

Enter 'Destination' 'BR': +190

cmd Load (Verify Sequence Status – Confirm or Cancel)

Verify BR current, target and error.

| | |
|---------------|---------------|
| | BR |
| Current | +60.0 |
| Target | +190.0 |
| Error | -130.0 |

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

DCP AUTO SEQ → PROC

PCS MSS: SPDM:

Verify Posn Hold – orange

Verify 'BR': +190.0

MSS: MSS Safing:

cmd 'SPDM' – Apply (Verify 'Body' – Safed)

7. GCA TO APFR SETUP

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-----------------------------|-----------------------------------|------------------------------|---------------|-------------|
| 52: JEM EF A (+130, +50) | 24: Tip Elbow (+15, 0) | 22: Base Elbow (+50, -10) | WVS 1 | SRMS EE |

THC/
RHC Deflect all THC and RHC axes to positive and negative hard stops.

PCS MSS: SSRMS:

Verify Unloaded Parameters – √

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

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 7 of 32 pages

Verify Display – ISS>ISSACS

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

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

| SR | SY | SP | EP | WP | WY | WR |
|--------|-----------------------------|--------|--------|-------|--------|-------|
| -190.0 | +110.5 | -116.2 | +130.1 | -84.8 | -159.1 | +12.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +421 | -1465 | -400 | -54.5 | +12.5 | -120.0 | |
| FOR | Unloaded – LEE Tip, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

On EV GO, ready to maneuver to APFR Setup.

DCP BRAKES SSRMS → OFF (Verify OFF)

RHC RATE → VERNIER (Verify Vernier on PCS)

NOTE

1. SSRMS to ICC clearance ~26 in – JEM EF A, TELB.
2. SSRMS to P1 UHF Antenna clearance ~49 in – JEM EF A, BELB.

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/
RHC Perform EVA GCA, as required, for APFR Install.

Expected APFR Install position:

| Locked | | SR | SY | SP | EP | WP | WY | WR |
|----------|--|--------|-----------------------------|--------|--------|--------|--------|-------|
| Expected | | -190.0 | +110.7 | -103.5 | +138.6 | -105.9 | -159.2 | +12.2 |
| | | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | | +421 | -1465 | -211 | -54.5 | +12.5 | -120.0 | |
| | | FOR | Unloaded – LEE Tip, SR Held | | | | | |
| | | Disp | ISS>ISSACS | | | | | |

DCP BRAKES SSRMS → ON (Verify ON)

Notify EV: Brakes on. Ready for APFR setup.

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 8 of 32 pages

8. GCA TO APFR INGRESS

On EV GO, ready to maneuver to APFR Ingress position.

BRAKES SSRMS → OFF (Verify OFF)

| <u>NOTE</u> | |
|-------------|---------------------------------------------------------|
| 1. | SSRMS to P1 truss clearance ~47 in – JEM EF A, SRMS EE. |
| 2. | APFR Settings 12/PP/F/6. |
| 3. | APFR to ICC ~8 in – TELB. |

PCS

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/
RHC

Perform EVA GCA, as required, for APFR Ingress.

Expected APFR Ingress position:

| | | Locked | | | | | | |
|----------|------|-----------------------------|--------|--------|--------|-------|--------|-------|
| | | SR | SY | SP | EP | WP | WY | WR |
| Expected | | -190.0 | +123.0 | -106.9 | +130.6 | -90.7 | -163.6 | +24.3 |
| | | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | | +287 | -1465 | -304 | -54.5 | +12.5 | -120.0 | |
| | FOR | Unloaded – LEE Tip, SR Held | | | | | | |
| | Disp | ISS>ISSACS | | | | | | |

DCP

BRAKES SSRMS → ON (Verify ON)

Notify EV: Brakes on. Ready for APFR Ingress.

PCS

MSS: SSRMS:

Change Unloaded Parameters ► EVA ► Chest 12/PP/F/6 SRH
Verify 'Unloaded Parameters' (two) – Chest 12/PP/F/6, SR Held

Expected APFR Ingress position:

| | | SR | SY | SP | EP | WP | WY | WR |
|--|------|-------------------------------------|--------|--------|--------|-------|--------|-------|
| | | -190.0 | +123.0 | -106.9 | +130.6 | -90.7 | -163.6 | +24.3 |
| | | X | Y | Z | Pitch | Yaw | Roll | |
| | | +422 | -1372 | -225 | +46.9 | +41.7 | +163.2 | |
| | FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | | |
| | Disp | ISS>ISSACS | | | | | | |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 9 of 32 pages

9. GCA TO BOOM HANDOFF

Configure Cameras and overlays as required.

| | | | | |
|-----------------------------|---------------------------|------------------------------|---------------|-------------|
| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
| 52: JEM EF A (+130, +40) | 24: Tip Elbow (+15, 0) | 22: Base Elbow (+55, -10) | WVS 1 | SRMS EE |

On EV GO, ready to maneuver to Boom Handoff position.

DCP BRAKES SSRMS → OFF (Verify OFF)

| |
|----------------------------------------------------------------------|
| <u>NOTE</u> SSRMS LEE to Truss clearance ~42 in – JEM EF A, BELB. |
|----------------------------------------------------------------------|

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/
RHC Perform EVA GCA, as required, for Boom Handoff.

Expected Boom Handoff position:

| | | | | | | | |
|----------|--------|-------------------------------------|-------|--------|--------|--------|-------|
| | Locked | | | | | | |
| | SR | SY | SP | EP | WP | WY | WR |
| Expected | -190.0 | +109.7 | -81.9 | +124.2 | -113.7 | -159.9 | +29.9 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | +440 | -1520 | -20 | +57.7 | +59.2 | +153.7 | |
| | FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| | Disp | ISS>ISSACS | | | | | |

10. MANEUVERING TO BOOM BACKOFF

On EV GO, ready to maneuver to Boom Backoff position.

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

Perform GCA, as required, to clear the ICC, then:

Maneuver to the Boom Backoff Clearance position (within 20 cm/5 deg).

| | | | | | | | |
|--|--------|-------------------------------------|--------|--------|-------|--------|-------|
| | Locked | | | | | | |
| | SR | SY | SP | EP | WP | WY | WR |
| | -190.0 | +109.3 | -101.2 | +113.4 | -83.6 | -159.8 | +29.5 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +440 | -1520 | -350 | +57.7 | +59.2 | +153.7 | |
| | FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| | Disp | ISS>ISSACS | | | | | |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 10 of 32 pages

PCS MSS: SSRMS:

Enter Mode – Standby (Verify blue)

Give a GO to EV1 to rotate the Boom.

11. JOINT OCAS TO BOOM PRE-INSTALL (7 MINUTES)

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------|---------------|-----------------------|
| 37: MBS Mast (-60, 0) 52: JEM EF A (+135, +60) | 24: Tip Elbow (0,0) 03: S1 Lower Outboard (+100, -20) | 13: LAB Stbd Zenith (+160, -25) 22: Base Elbow (+80, -10) | WVS 1 | SRMS EE zoom full out |

On EV GO, Maneuver to Z1.

RHC RATE → COARSE (Verify Coarse on PCS)

NOTE

During the Joint OCAS maneuver, expect singularity warning for WY between -100 and -80 deg.

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

SSRMS Joint OCAS

pick File ► EVA1 ► Boom Pre-Install

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

| SR | SY | SP | EP | WP | WY | WR |
|--------|-------|--------|-------|------|-------|--------|
| -190.0 | +35.0 | -129.8 | -72.3 | -1.7 | +37.1 | +101.1 |

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) | -190.0 | +109.3 | -101.2 | +113.4 | -83.6 | -159.8 | +29.5 |
| TGT | -190.0 | +35.0 | -129.8 | -72.3 | -1.7 | +37.1 | +101.1 |
| ERR | 0.0 | +74.3 | +28.6 | +185.7 | -81.9 | -196.9 | -71.6 |

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

DCP AUTO SEQ → PROC

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 11 of 32 pages

PCS MSS: SSRMS:

Verify Posn Hold – orange

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

| | | | | | | |
|--------|-------------------------------------|--------|-------|-------|--------|--------|
| SR | SY | SP | EP | WP | WY | WR |
| -190.0 | +35.0 | -129.8 | -72.3 | -1.7 | +37.1 | +101.1 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -464 | +47 | -450 | -28.7 | +72.8 | +142.0 | |
| FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

12. GCA TO BOOM INSTALL

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|---------------------------------------|----------------------------|-----------------------------|---------------|-------------|
| 13: LAB Stbd Zenith (+160, -20) | 24: Tip Elbow (-125, 0) | 22: Base Elbow (-125, 0) | WVS 1 | |

On EV GO, ready to maneuver to Boom Install position.

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS:

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

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/
RHC Perform EVA GCA, as required, for Boom Install.

Expected Boom Install position:

| | | | | | | | |
|----------|--------|-------------------------------------|-------------|-------|-------|--------|--------|
| | Locked | | | | | | |
| | SR | SY | SP | EP | WP | WY | WR |
| Expected | -190.0 | +33.4 | -134.8 | -77.2 | +8.6 | +35.6 | +100.3 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | -464 | +47 | -297 | -28.7 | +72.8 | +142.0 | |
| | FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| | Disp | ISS>ISSACS | | | | | |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 12 of 32 pages

13. MANEUVERING TO BOOM INSTALL CLEARANCE

On EV GO, ready to maneuver to clear of the boom.

Perform GCA, as required, to clear the Boom, then:

Maneuver to the Boom Install Clearance position (within 20 cm/5 deg).

| | | | | | | |
|--------|-------------------------------------|-------------|-------|-------|--------|--------|
| Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| -190.0 | +33.7 | -124.2 | -74.8 | -4.5 | +35.9 | +100.5 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -463 | -10 | -520 | -28.7 | +72.8 | +142.0 | |
| FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

14. JOINT OCAS TO SGANT REMOVAL INTERMEDIATE 1 (9 MINUTES)

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|---------------------------------------------------------------------|-----------------------------------------------------------|---------------------------------------|---------------|----------------|
| 52: JEM EF A (+135, +60) 37: MBS Mast (-20, +35) | 24: Tip Elbow (-125, 0) 22: Base Elbow (-125, 0) | 13: LAB Stbd Zenith (-180, -30) | WVS 1 | SRMS EE |

RHC RATE → COARSE (Verify Coarse on PCS)

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► EVA1 ► SGANT Rmv Intrmd 1

Verify 'Joint Angles' 'Destination' for SGANT Rmv Intrmd 1 position.

| SR | SY | SP | EP | WP | WY | WR |
|--------|-------|-------|-------|-------|--------|-------|
| -121.2 | +36.2 | +26.4 | +70.0 | -11.9 | -141.4 | +96.1 |

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) | -190.0 | +33.7 | -124.2 | -74.8 | -4.5 | +35.9 | +100.5 |
| TGT | -121.2 | +36.2 | +26.4 | +70.0 | -11.9 | -141.4 | +96.1 |
| ERR | -68.8 | -2.5 | -150.6 | -144.8 | +7.4 | +177.3 | +4.4 |

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

DCP AUTO SEQ → PROC

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 13 of 32 pages

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|--------|-------|-------|-------|-------|--------|-------|
| -121.2 | +36.2 | +26.4 | +70.0 | -11.9 | -141.4 | +96.1 |

15. JOINT OCAS TO SGANT REMOVAL INTERMEDIATE 2 (1 MINUTE)

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-----------------------------|---------------------------------------------------------------|-----------------------------------------|---------------|-------------|
| 52: JEM EF A (+125, +60) | 22: Base Elbow (+100, -10) 24: Tip Elbow (+125, -10) | 09: P1 Lower Outboard (+150, -20) | WVS 1 | SRMS EE |

RHC RATE → VERNIER (Verify Vernier on PCS)

pick File ► EVA1 ► SGANT Rmv Intrmd 2

Verify 'Joint Angles' 'Destination' for SGANT Rmv Intrmd 2 position.

| SR | SY | SP | EP | WP | WY | WR |
|--------|-------|-------|--------|-------|--------|-------|
| -125.1 | +36.2 | +34.7 | +102.4 | -31.4 | -161.6 | +70.0 |

NOTE

SSRMS to ICC clearance ~43 in – JEM EF A, TELB.

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) | -121.2 | +36.2 | +26.4 | +70.0 | -11.9 | -141.4 | +96.1 |
| TGT | -125.1 | +36.2 | +34.7 | +102.4 | -31.4 | -161.6 | +70.0 |
| ERR | +3.9 | 0.0 | -8.3 | -32.4 | +19.5 | +20.2 | +26.1 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 14 of 32 pages

Verify SSRMS at SGANT Rmv Intrmd 2 position (within 5 cm/1 deg).

| SR | SY | SP | EP | WP | WY | WR |
|--------|-------------------------------------|-------|--------|-------|--------|-------|
| -125.1 | +36.2 | +34.7 | +102.4 | -31.4 | -161.6 | +70.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +660 | -1371 | +254 | +97.2 | -31.0 | +124.8 | |
| FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

Enter Mode – Standby (Verify blue)

Change Unloaded Parameters ► EVA ► Chest 12/PP/F/6 SYH
Verify 'Unloaded Parameters' (two) – Chest 12/PP/F/6, SY Held

Change Command ► MBS ► ICC EVA (Verify MBS>ICC EVA)

Change Display ► MBS ► ICC EVA (Verify MBS>ICC EVA)

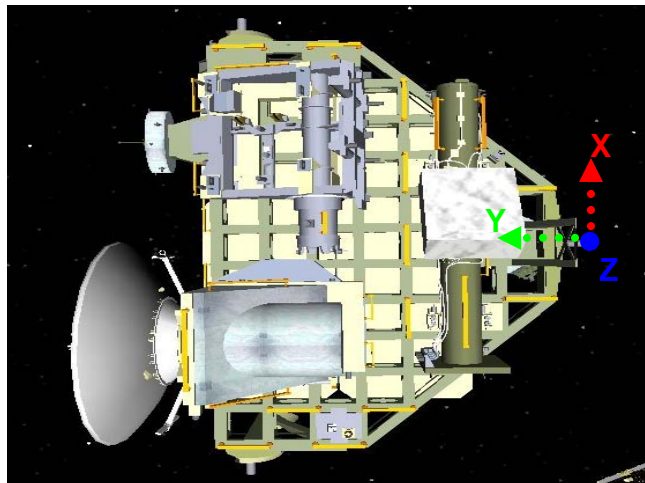


Figure 1.- MBS ICC EVA Frame, Z Out of Page.

16. GCA TO SGANT BOLT 1

On EV GO, ready to maneuver to SGANT Bolt 1.

NOTE

1. EV Helmet to ICC clearance – EV callouts, JEM EF A.
2. SSRMS to SGANT Dish ~28 in – JEM EF A, SRMS EE.

Enter Mode – Manual (Verify blue)

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

cmd Shoulder Yaw (Verify SY – Locked)

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 15 of 32 pages

THC/
RHC

Perform EVA GCA, as required, for SGANT Bolts.

Expected SGANT Bolt 1 position (THC +X):

| | | Locked | | | | | | |
|----------|------|-------------------------------------|-------|-------|--------|-------|--------|-------|
| | | SR | SY | SP | EP | WP | WY | WR |
| Expected | | -110.1 | +36.2 | +36.3 | +110.5 | -33.1 | -173.0 | +65.8 |
| | | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | | -153 | +275 | +98 | -8.1 | +32.8 | +3.0 | |
| | FOR | Unloaded – Chest 12/PP/F/6, SY Held | | | | | | |
| | Disp | MBS>ICC EVA | | | | | | |

17. [GCA TO SGANT BOLT 2](#)

On EV GO, ready to maneuver to SGANT Bolt 2.

| <u>NOTE</u> | |
|-------------------------------------------------|--|
| SSRMS to SGANT Dish ~22 in – JEM EF A, SRMS EE. | |

Perform EVA GCA, as required, for SGANT Bolts.

Expected SGANT Bolt 2 position (THC -Z):

| | | Locked | | | | | | |
|----------|------|-------------------------------------|-------|-------|--------|-------|--------|-------|
| | | SR | SY | SP | EP | WP | WY | WR |
| Expected | | -110.6 | +36.2 | +33.4 | +113.6 | -33.5 | -172.7 | +66.0 |
| | | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | | -148 | +278 | +62 | -8.1 | +32.8 | +3.1 | |
| | FOR | Unloaded – Chest 12/PP/F/6, SY Held | | | | | | |
| | Disp | MBS>ICC EVA | | | | | | |

18. [GCA TO SGANT EXTRACT](#)

On EV GO, ready for SGANT Extract.

| <u>NOTE</u> | |
|----------------------------------------------------------------------------------------|--|
| 1. Monitor clearance between SGANT and SSRMS Tip Boom with P1LOOB and SRMS EE Cameras. | |
| 2. SSRMS to ICC clearance ~28 in – JEM EF A, SRMS EE. | |

3.101 EVA1 SUPPORT

Perform EVA GCA, as required, for SGANT Extraction.
 +Y to clear dish from the FSE, then
 -X to maneuver clear from ICC

Expected SGANT Extraction position:

| | | | | | | | | |
|----------|--------|-------------------------------------|-------|-------|-------|--------|-------|--|
| | | Locked | | | | | | |
| | SR | SY | SP | EP | WP | WY | WR | |
| Expected | -125.3 | +36.2 | +29.4 | +99.1 | -22.9 | -161.5 | +70.1 | |
| | X | Y | Z | Pitch | Yaw | Roll | | |
| Expected | -310 | +387 | +89 | -8.1 | +32.8 | +3.1 | | |
| | FOR | Unloaded – Chest 12/PP/F/6, SY Held | | | | | | |
| | Disp | MBS>ICC EVA | | | | | | |

Give a GO to EV1 to reorient the SGANT Dish.

19. SINGLE JOINT TO SGANT INSTALL INTERMEDIATE

On EV GO, Translate to Z1.

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. |

THC

Perform Single Joint maneuver to SGANT Install Intermediate position (within 1 deg).

| | | | | | | | | |
|--------------|--------|-------------------------------------|-------|-------|-------|--------|-------|--|
| | SR | SY | SP | EP | WP | WY | WR | |
| Extract | -125.3 | +36.2 | +29.4 | +99.1 | -22.9 | -161.5 | +70.1 | |
| 1: EP – | | | | +80.0 | | | | |
| 2: WP – | | | | | -40.0 | | | |
| Intermediate | -125.3 | +36.2 | +29.4 | +80.0 | -40.0 | -161.5 | +70.1 | |
| | X | Y | Z | Pitch | Yaw | Roll | | |
| | -359 | +439 | +204 | +10.4 | +16.4 | -32.7 | | |
| | FOR | Unloaded – Chest 12/PP/F/6, SY Held | | | | | | |
| | Disp | MBS>ICC EVA | | | | | | |

20. JOINT OCAS TO SGANT PRE-INSTALL (9 MINUTES)

Configure Cameras and overlays as required.

| | | | | |
|--------------------------------|---------------------------------------------------------|------------------------------------------------------------------------------------|---------------|-------------|
| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
| 37: MBS Mast (-30, +25) | 22: Base Elbow (+115, -10) 24: Tip Elbow (-170, -10) | 13: LAB Stbd Zenith (-170, -35) 09: P1 Lower Outboard (+150, -20) | WVS 1 | SRMS EE |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 17 of 32 pages

RHC RATE → COARSE (Verify Coarse on PCS)

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► EVA1 ► SGANT Pre-Install

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

| SR | SY | SP | EP | WP | WY | WR |
|--------|-------|--------|-------|-------|-------|-------|
| -145.0 | +25.6 | -125.1 | -31.0 | -35.5 | +47.2 | -69.2 |

NOTE

1. SSRMS Base Boom to SPDM ~23 in – TELB, SRMS EE.
2. SSRMS Base Boom to MBS Mast Camera ~38 in – SRMS EE.

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) | -125.3 | +36.2 | +29.4 | +80.0 | -40.0 | -161.5 | +70.1 |
| TGT | -145.0 | +25.6 | -125.1 | -31.0 | -35.5 | +47.2 | -69.2 |
| ERR | +19.7 | +10.6 | +154.5 | +111.0 | -4.5 | -208.7 | +139.3 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Enter Mode – Standby (Verify blue)

Change Unloaded Parameters ► EVA ► Chest 12/PP/F/6 SRH
Verify 'Unloaded Parameters' (two) – Chest 12/PP/F/6, SR Held

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

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

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 18 of 32 pages

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

| | | | | | | |
|--------|-------------------------------------|--------|-------|-------|-------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| -145.0 | +25.6 | -125.1 | -31.0 | -35.5 | +47.2 | -69.2 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -469 | +166 | -580 | +75.7 | -50.8 | -17.0 | |
| FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

21. GCA TO SGANT INSTALL

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|------------------------------|-----------------------------|---------------------------------------|---------------|-------------|
| 24: Tip Elbow (-150, -10) | 22: Base Elbow (-155, 0) | 13: LAB Stbd Zenith (-180, -35) | WVS 1 | |

On EV GO, ready to maneuver to SGANT Install position.

RHC RATE → VERNIER (Verify Vernier on PCS)

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

| NOTE |
|------------------------------------------------------------------------------|
| 1. SSRMS Base Boom to SPDM Tool Holster Assembly clearance ~19 in – TELB. |
| 2. SSRMS Tip Boom to truss ~44 in – BELB. |

THC/
RHC Perform EVA GCA, as required, for SGANT Install.

Expected SGANT Install position:

| Locked | SR | SY | SP | EP | WP | WY | WR |
|----------|--------|-----------------------------|--------|-------|-------|-------|-------|
| Expected | -145.0 | +29.5 | -127.5 | -38.8 | -26.2 | +51.0 | -67.9 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | -468 | +166 | -414 | +75.7 | -51.0 | -16.9 | |
| | FOR | Unloaded – LEE Tip, SR Held | | | | | |
| | Disp | ISS>ISSACS | | | | | |

DCP BRAKES SSRMS → ON (Verify ON)

Notify EV: Brakes on. Ready for SGANT Install.

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 19 of 32 pages

22. SINGLE JOINT TO SGANT CLEAR

On EV GO, ready to maneuver to SGANT Clear position.

BRAKES SSRMS → OFF (Verify OFF)

| |
|--------------------------------------------------|
| NOTE |
| SSRMS Base Boom to SPDM clearance ~27 in – TELB. |

PCS MSS: SSRMS:

Enter Mode – Single (Verify blue)

THC Perform Single Joint maneuver to SGANT Clear position (within 1 deg).

| | | | | | | | |
|----------------------------------------------|--------|-------------------------------------|--------|--------|-------|-------|-------|
| Install 1: WY – 2: SP + SGANT Clear | SR | SY | SP | EP | WP | WY | WR |
| | -145.0 | +29.5 | -127.5 | -38.8 | -26.2 | +51.0 | -67.9 |
| | | | | | | +10.0 | |
| | | | -119.0 | | | | |
| | -145.0 | +29.5 | -119.0 | -38.8 | -26.2 | +10.0 | -67.9 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -383 | +363 | -476 | +141.0 | -46.9 | +38.6 | |
| | FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| | Disp | ISS>ISSACS | | | | | |

23. JOINT OCAS TO EOTP REMOVAL INTERMEDIATE (7 MINUTES)

Configure Cameras and overlays as required.

| | | | | |
|---------------------------------------------------------------------|-----------------------------|---------------------------------------|---------------|----------------|
| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
| 24: Tip Elbow (-150, -10) 52: JEM EF A (+135, +60) | 22: Base Elbow (-150, 0) | 13: LAB Stbd Zenith (-180, -15) | WVS 1 | SRMS EE |

RHC RATE → COARSE (Verify Coarse on PCS)

Enter Mode – Joint OCAS (Verify blue)

pick File ► EVA1 ► EOTP Rmv Intermed

Verify 'Joint Angles' 'Destination' for EOTP Rmv Intermed position.

| | | | | | | |
|--------|-------|-------|--------|--------|--------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| -190.0 | +91.8 | -77.6 | +114.2 | -115.4 | +189.3 | +38.6 |

cmd Load (Verify Sequence Status – Confirm or Cancel)

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 20 of 32 pages

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

| | SR | SY | SP | EP | WP | WY | WR |
|------------|---------------|--------------|--------------|---------------|---------------|---------------|--------------|
| (current) | -145.0 | +29.5 | -119.0 | -38.8 | -26.2 | +10.0 | -67.9 |
| TGT | -190.0 | +91.8 | -77.6 | +114.2 | -115.4 | +189.3 | +38.6 |
| ERR | +45.0 | -62.3 | -41.4 | -153.0 | +89.2 | -179.3 | -106.5 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify SSRMS at EOTP Rmv Intermed position.

| SR | SY | SP | EP | WP | WY | WR |
|--------|-------------------------------------|-------|--------|--------|--------|-------|
| -190.0 | +91.8 | -77.6 | +114.2 | -115.4 | +189.3 | +38.6 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +520 | -1629 | -32 | +120.7 | +71.5 | +79.3 | |
| FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

24. GCA TO EOTP RELEASE

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-----------------------------|----------------------------------------------------------|--------------------------------------------------|---------------|-------------|
| 52: JEM EF A (+140, +50) | 24: Tip Elbow (+20 -5) 22: Base Elbow (+65, -5) | 09: P1 Lower Outboard (+140, -40) | WVS 1 | SRMS EE |

On EV GO, ready to maneuver to EOTP Bolt set 1 position.

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS:

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

Change Display ► MBS ► ICC EVA (Verify MBS>ICC EVA)

| <u>NOTE</u> |
|----------------------------------------------------|
| 1. SSRMS to ICC clearance ~51 in – TELB, JEM EF A. |
| 2. APFR to ICC clearance ~18 in – JEM EF A. |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 21 of 32 pages

Enter Mode – Manual (Verify blue)

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

cmd Shoulder Roll (Verify SR – Locked)

THC/
RHC

Perform EVA GCA to Release the first set of EOTP Bolts.

Expected EOTP Bolt set 1 Release position:

| | | | | | | | |
|----------|--------|-------------------------------------|--------|--------|--------|--------|-------|
| | Locked | | | | | | |
| | SR | SY | SP | EP | WP | WY | WR |
| Expected | -190.0 | +99.1 | -101.5 | +134.3 | -110.6 | +187.8 | +45.8 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | +75 | +295 | +47 | +72.0 | -40.3 | -21.6 | |
| | FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| | Disp | MBS>ICC EVA | | | | | |

On EV GO, ready to maneuver to EOTP Bolt set 2 position:

Perform EVA GCA to Release the second set of EOTP Bolts.

Expected EOTP Bolt set 2 Release position:

| | | | | | | | |
|----------|--------|-------------------------------------|--------|--------|--------|--------|-------|
| | Locked | | | | | | |
| | SR | SY | SP | EP | WP | WY | WR |
| Expected | -190.0 | +100.5 | -104.0 | +130.1 | -103.8 | +187.5 | +47.2 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | +141 | +311 | +53 | +72.0 | -40.3 | -21.6 | |
| | FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| | Disp | MBS>ICC EVA | | | | | |

On EV GO, ready to maneuver EOTP release setup position.

Perform EVA GCA to Release setup position.

Expected EOTP Release setup position:

| | | | | | | | |
|----------|--------|-------------------------------------|--------|--------|--------|--------|-------|
| | Locked | | | | | | |
| | SR | SY | SP | EP | WP | WY | WR |
| Expected | -190.0 | +103.1 | -101.0 | +132.7 | -109.0 | +186.9 | +49.8 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | +103 | +273 | +77 | +72.0 | -40.3 | -21.6 | |
| | FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| | Disp | MBS>ICC EVA | | | | | |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 22 of 32 pages

25. MANEUVERING TO EOTP REMOVAL BACKOFF

On EV GO, ready to maneuver to EOTP Removal Backoff position.

NOTE
SSRMS to ICC clearance ~53 in – TELB, JEM EF A.

PCS

MSS: SSRMS: SSRMS

Change Command ► MBS ► ICC EVA (Verify MBS>ICC EVA)

THC/
RHC

Perform manual maneuver, as required, to clear the ICC (+Z), then:

Maneuver to the EOTP Removal Backoff position (within 20 cm/5 deg).
(+Z then +Y)

| | | | | | | |
|--------|-------------------------------------|-------|--------|--------|--------|-------|
| Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| -190.0 | +89.0 | -84.4 | +111.9 | -106.9 | +189.8 | +35.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +103 | +499 | +195 | +71.9 | -40.3 | -21.6 | |
| FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| Disp | MBS>ICC EVA | | | | | |

Give a GO to EV1 to rotate the EOTP.

26. JOINT OCAS TO EOTP PRE-INSTALL (7 MINUTES)

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|--------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------|---------------|-------------|
| 52: JEM EF A (+150, +55) 47: SPDM Body 2 (+85, -20) | 24: Tip Elbow (+30, 0) 22: Base Elbow (+65, -5) | 37: MBS Mast (-60, 0) 13: LAB Stbd Zenith (-180, -30) | WVS 1 | SRMS EE |

RHC

RATE → COARSE (Verify Coarse on PCS)

On EV GO, maneuver to EOTP Install position.

Enter Mode – Joint OCAS (Verify blue)

SSRMS Joint OCAS

pick File ► EVA1 ► EOTP Pre-Install

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

| | | | | | | |
|--------|-------|--------|--------|--------|-------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| -190.0 | +52.4 | -103.1 | -109.7 | -153.6 | +10.8 | -84.0 |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 23 of 32 pages

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) | -190.0 | +89.0 | -84.4 | +111.9 | -106.9 | +189.8 | +35.8 |
| TGT | -190.0 | +52.4 | -103.1 | -109.7 | -153.6 | +10.8 | -84.0 |
| ERR | 0.0 | +36.6 | +18.7 | +221.6 | +46.8 | +179.0 | +119.8 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

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

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

| SR | SY | SP | EP | WP | WY | WR |
|--------|-------------------------------------|--------|--------|--------|-------|-------|
| -190.0 | +52.4 | -103.1 | -109.7 | -153.6 | +10.8 | -84.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +268 | -575 | -465 | -157.9 | -13.0 | -83.0 | |
| FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

27. GCA TO EOTP INSTALL

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-----------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------|---------------|-------------|
| 51: JEM EXT A (-150, +45) 47: SPDM Body 2 (+85, -20) | 22: Base Elbow (-65, 0) | 13: LAB Stbd Zenith (-180, -40) | WVS 1 | |

On EV GO, ready to maneuver to EOTP softdock position.

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS:

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

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 24 of 32 pages

THC/
RHC Perform EVA GCA to install the EOTP

Expected EOTP softdock position:

| | | | | | | | | |
|----------|--------|-------------------------------------|--------|--------|--------|-------|-------|--|
| | Locked | | | | | | | |
| | SR | SY | SP | EP | WP | WY | WR | |
| Expected | -190.0 | +55.3 | -112.9 | -116.4 | -137.0 | +7.9 | -84.3 | |
| | X | Y | Z | Pitch | Yaw | Roll | | |
| Expected | +337 | -551 | -282 | -157.9 | -13.0 | -83.0 | | |
| | FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | | |
| | Disp | ISS>ISSACS | | | | | | |

28. GCA TO EOTP EDF TORQUE AND APFR EGRESS

On EV GO, ready to maneuver to EOTP EDF Torque position.

| | |
|-------------|--------------------------------------------------------------------|
| NOTE | |
| 1. | EV Helmet to SPDM LEE Camera approximately less than 10 in – BELB. |
| 2. | EV Callouts SSRMS LEE to SPDM Arm1 ~36 in – BELB, EV Callouts. |

Perform EVA GCA, as required, to torque the EOTP EDFs.

Expected EOTP EDF position:

| | | | | | | | | |
|----------|--------|-------------------------------------|--------|--------|--------|-------|-------|--|
| | Locked | | | | | | | |
| | SR | SY | SP | EP | WP | WY | WR | |
| Expected | -190.0 | +56.7 | -118.0 | -119.4 | -128.9 | +6.5 | -84.4 | |
| | X | Y | Z | Pitch | Yaw | Roll | | |
| Expected | +374 | -554 | -197 | -157.9 | -13.0 | -83.0 | | |
| | FOR | Unloaded – Chest 12/PP/F/6, SR Held | | | | | | |
| | Disp | ISS>ISSACS | | | | | | |

DCP BRAKES SSRMS → ON (Verify ON)

Notify EV brakes on, ready for APFR reconfiguration to 12/PP/G/6.

Notify **MCC-H** Ready for SPDM Powerdown (SPDM Cameras lost).

After APFR egress:

PCS MSS: SSRMS:

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

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

3.101 EVA1 SUPPORT

Expected APFR Egress position:

| | | | | | | | | |
|----------|--------|-----------------------------|--------|--------|--------|-------|-------|--|
| | SR | SY | SP | EP | WP | WY | WR | |
| Expected | -190.0 | +56.7 | -118.0 | -119.4 | -128.9 | +6.5 | -84.4 | |
| | X | Y | Z | Pitch | Yaw | Roll | | |
| Expected | +413 | -380 | -234 | -6.5 | -75.3 | +79.2 | | |
| | FOR | Unloaded – LEE Tip, SR Held | | | | | | |
| | Disp | ISS>ISSACS | | | | | | |

29. MANUAL TO APFR EGRESS CLEARANCE

On EV GO, APFR egressed:

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

NOTE
SSRMS to S0 truss clearance ~48 in – LAB.

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/
RHC Perform GCA, as required, to clear EOTP, then:

Maneuver to APFR Egress Clearance position (within 5 cm/1 deg).

| | | | | | | | | |
|--------|--------|-----------------------------|--------|--------|--------|-------|-------|--|
| Locked | | | | | | | | |
| | SR | SY | SP | EP | WP | WY | WR | |
| | -190.0 | +48.1 | -118.4 | -116.5 | -131.6 | +15.1 | -83.4 | |
| | X | Y | Z | Pitch | Yaw | Roll | | |
| | +290 | -380 | -234 | -6.5 | -75.2 | +79.2 | | |
| | FOR | Unloaded – LEE Tip, SR Held | | | | | | |
| | Disp | ISS>ISSACS | | | | | | |

30. SINGLE JOINT TO APFR TRUSS CLEARANCE

NOTE
1. Footplate to S0 truss clearance ~42 in – LAB.
2. Footplate to SPDM clearance ~45 in – LAB, BELB.

PCS MSS: SSRMS:

Enter Mode – Single (Verify blue)

DCP JOINT SELECT → WRIST ROLL (Verify WR – Selected on PCS)

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 26 of 32 pages

THC Perform “-” Single Joint maneuver to WR: -170.0 (THC down).

DCP BRAKES SSRMS → ON (Verify ON)

31. [MANUAL TO APFR REMOVAL](#)

On EV GO, ready to maneuver to APFR Removal position.

BRAKES SSRMS → OFF (Verify OFF)

NOTE

1. EV is still tethered to the SSRMS.
2. Verify with EV that the STBD CETA cart Brake Handle is down.
3. APFR Foot Plate to SPDM Arm1 ~48 in – BELB, LAB.
4. SSRMS Wrist to S0 Truss ~28 in – LAB, EV Callouts.

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Roll (Verify SR – Locked)

THC/
RHC Perform EVA GCA, as required, to remove APFR.

Expected APFR Removal position (within 5 cm/1 deg):

| Locked | SR | SY | SP | EP | WP | WY | WR |
|--------|-----------------------------|-------|--------|--------|--------|-------|--------|
| | -190.0 | +46.8 | -124.2 | -117.5 | -124.8 | +16.3 | -170.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +290 | -380 | -150 | -6.5 | -75.2 | -7.4 | |
| FOR | Unloaded – LEE Tip, SR Held | | | | | | |
| Disp | ISS>ISSACS | | | | | | |

DCP BRAKES SSRMS → ON (Verify ON)

32. [MANUAL TO TRUSS CLEARANCE](#)

On EV GO: APFR removed. Maneuver to Truss Clearance Position.

BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Manual (Verify blue)

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 27 of 32 pages

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

cmd Shoulder Roll (Verify SR – Locked)

THC/
RHC

Maneuver to Truss Clearance position (within 5 cm/1 deg).

| | | | | | | |
|--------|-----------------------------|--------|--------|--------|-------|--------|
| Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| -190.0 | +51.2 | -106.9 | -109.9 | -149.7 | +11.9 | -170.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +290 | -380 | -450 | -6.5 | -75.2 | -7.4 | |
| FOR | Unloaded – LEE Tip, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

DCP SAFING → SAFE (Verify ON)

Give SRMS operator GO for Maneuver to MRM1 Pre-Grapple.

33. SPDM BODY MANEUVER TO STOW POSITION

NOTE

The remaining steps in this procedure will nominally be performed by **MCC-H** during FN4.

PCS MSS: SPDM: MSS Safing: MSS Safing

cmd 'SPDM' 'Body' Remove (Verify Not Safed)

DCP BRAKES SPDM Body → OFF (Verify OFF)

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SPDM: SPDM Body

Enter Mode – Joint OCAS (Verify blue)

Enter 'Destination' 'BR': +60

cmd Load (Verify Sequence Status – Confirm or Cancel)

Verify BR current, target and error.

| | |
|---------|--------|
| Current | BR |
| Target | +190.0 |
| Error | +60.0 |
| | +130.0 |

NOTE

SSRMS LEE to SPDM minimum clearance ~31 in – BELB, TELB.

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 28 of 32 pages

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

DCP AUTO SEQ → PROC

PCS MSS: SPDM:

Verify Posn Hold – orange

Verify 'BR': +60.0

MSS: MSS Safing:

cmd 'SPDM' – Apply (Verify 'Body' – Safed)

34. JOINT OCAS MANEUVER TO INTERMEDIATE 3

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|--------------------------------------|------------------------------------------------------------------|---------------------------------------|---------------|-------------|
| 51: JEM EXT A (-150, +45) | 22: Base Elbow (0, +5) 24: Tip Elbow (-90, -10) | 13: LAB Stbd Zenith (-180, -35) | | |

DCP BRAKES SSRMS → OFF (Verify OFF)

Enter Mode – Joint OCAS (Verify blue)

pick File ► EVA1 ► Intermediate 3

Verify 'Joint Angles' 'Destination' for Intermediate 3 position.

| SR | SY | SP | EP | WP | WY | WR |
|-------|-------|-----|-------|--------|--------|-------|
| -30.0 | +45.0 | 0.0 | +98.0 | -107.9 | -159.1 | +12.0 |

NOTE

1. SSRMS to JEM-PS clearance ~41 in – LAB.
2. SSRMS to MBS Mast clearance ~25 in – JEM EXT A.
3. SSRMS to SPDM clearance ~55 in – JEM EXT A, TELB.

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) | -190.0 | +51.2 | -106.9 | -109.9 | -149.7 | +11.9 | -170.4 |
| TGT | -30.0 | +45.0 | 0.0 | +98.0 | -107.9 | -159.1 | +12.0 |
| ERR | -160.0 | +6.2 | -106.9 | -207.9 | -41.8 | +171.0 | -182.4 |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 29 of 32 pages

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 |
|-------|-------|-----|-------|--------|--------|-------|
| -30.0 | +45.0 | 0.0 | +98.0 | -107.9 | -159.1 | +12.0 |

35. JOINT OCAS TO INTERMEDIATE 2 (3 MINUTES)

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|--------------------------------------------------------------|-----------------------------------------|-----------------------------------------|---------------|-------------|
| 13: LAB Stbd Zenith (-150, -45) 51: JEM EXT A (-150, +45) | 03: S1 Lower Outboard (+70, -10) | 07: P1 Lower Inboard (-180, -30) | | |

Enter Mode – Joint OCAS (Verify blue)

pick File ► EVA1 ► Intermediate 2

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-------|-----|-------|--------|--------|--------|
| +25.0 | +90.0 | 0.0 | +98.0 | -107.9 | -159.2 | +114.4 |

NOTE

1. SSRMS to LAB clearance ~55 in – P1LOIB.
2. SSRMS to MBS Mast clearance ~31 in – JEM EXT A.
3. SSRMS to SPDM clearance ~54 in – S1LOOB, LAB.
4. SSRMS to ICC clearance ~49 in – JEM EXT A.

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) | -30.0 | +45.0 | 0.0 | +98.0 | -107.9 | -159.1 | +12.0 |
| TGT | +25.0 | +90.0 | 0.0 | +98.0 | -107.9 | -159.2 | +114.4 |
| ERR | -55.0 | -45.0 | 0.0 | 0.0 | 0.0 | +0.1 | -102.4 |

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 30 of 32 pages

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 |
|-------|-------|-----|-------|--------|--------|--------|
| +25.0 | +90.0 | 0.0 | +98.0 | -107.9 | -159.2 | +114.4 |

36. JOINT OCAS TO INTERMEDIATE 1 (3 MINUTES)

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-------------------------------------------------------------|-----------------------------------------|----------------------------------------|--------------------------------|-------------|
| 51: JEM EXT A (-160, +15) 52: JEM EF A (+110, +10) | 22: Base Elbow (-25, +5) | 07: P1 Lower Inboard (+160, -20) | Camera B (-20, +30) | |

Enter Mode – Joint OCAS (Verify blue)

pick File ► EVA1 ► Intermediate 1

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

| SR | SY | SP | EP | WP | WY | WR |
|------|--------|--------|--------|--------|--------|--------|
| +2.6 | +120.0 | -110.0 | +140.0 | -107.9 | -159.2 | +114.4 |

NOTE

1. SSRMS to JEM clearance ~52 in – JEM EXT A.
2. SSRMS to LAB clearance ~51 in – P1LOIB.
3. SSRMS to SPDM clearance ~45 in – JEM EXT A.

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) | +25.0 | +90.0 | 0.0 | +98.0 | -107.9 | -159.2 | +114.4 |
| TGT | +2.6 | +120.0 | -110.0 | +140.0 | -107.9 | -159.2 | +114.4 |
| ERR | +22.4 | -30.0 | +110.0 | -42.0 | 0.0 | 0.0 | 0.0 |

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

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 31 of 32 pages

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|------|--------|--------|--------|--------|--------|--------|
| +2.6 | +120.0 | -110.0 | +140.0 | -107.9 | -159.2 | +114.4 |

37. JOINT OCAS TO LAB CLEARANCE (1 MINUTE)

Enter Mode – Joint OCAS (Verify blue)

Input 'Joint Angles' 'Destination' for LAB Clearance position.

| SR | SY | SP | EP | WP | WY | WR |
|------|--------|--------|-------|--------|--------|--------|
| +2.6 | +133.8 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |

NOTE

1. SSRMS to JEM clearance ~49 in – JEM EXT A, Cam B.
2. SSRMS to LAB clearance ~35 in – MBS Mast, P1LOIB.

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) | +2.6 | +120.0 | -110.0 | +140.0 | -107.9 | -159.2 | +114.4 |
| TGT | +2.6 | +133.8 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |
| ERR | 0.0 | -13.8 | -5.0 | +56.2 | 0.0 | 0.0 | 0.0 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

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

3.101 EVA1 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 32 of 32 pages

Verify SSRMS at LAB Clearance position.

| SR | SY | SP | EP | WP | WY | WR |
|------|-----------------------------|--------|-------|--------|--------|--------|
| +2.6 | +133.8 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -307 | +34 | -80 | -3.5 | -8.2 | +3.1 | |
| FOR | Unloaded – LEE Tip, SR Held | | | | | |
| Disp | LAB>PDGF | | | | | |

38. SINGLE JOINT TO LAB PRE-GRAPPLE

MSS: SSRMS:

Enter Mode – Single (Verify blue)

DCP JOINT SELECT → SHOULDER PITCH (Verify SP – Selected on PCS)

THC Perform “+” Single Joint maneuver to SP: -95.5 (THC up).

Verify SSRMS at LAB Pre-Grapple position.

| SR | SY | SP | EP | WP | WY | WR |
|------|-----------------------------|-------|-------|--------|--------|--------|
| +2.6 | +133.8 | -95.5 | +83.8 | -107.9 | -159.2 | +114.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Unloaded – LEE Tip, SR Held | | | | | |
| Disp | LAB>PDGF | | | | | |

DCP SAFING → SAFE (Verify ON)

3.201 EVA2 SUPPORT

| <u>NOTE</u> | |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Expected Solar array configuration for EVA2 is as follows: <ol style="list-style-type: none"> a. Port SARJ : 225 deg (L) b. 2A BGA: 64.6875 deg (L) c. 4B BGA: 129.3750 deg (L) |
| 2. | Verify SRMS at Battery R&R Viewing position: SY = +30.0, +20.0, -25.0, +5.0, -10.0, +100.0 = WR |
| 3. | APFR settings for P6 WIF 12: <ol style="list-style-type: none"> a. Battery A: 6/NN/F/6 b. Batteries B - D: 6/QQ/H/6 |
| 4. | EV on ICC is required to be static when SSRMS is in motion due to loads constraints. |
| 5. | MSS Effector overlay may reflect POA mechanism. If a LEE caution is annunciated, verify LEE telemetry on LEE PCS page. |

1. SETUP

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|---------------------------|------------------------------|-----------------------------|---------------|-------------|
| 32: MBS POA | 37: MBS Mast (0, 0) | 51: JEM EXT A (-10, +10) | WVS 1 | WVS 2 |
| 24: Tip Elbow (-10, 0) | 22: Base Elbow (-135, -5) | 52: JEM EF F (+60, +20) | | |

PCS

MSS: SSRMS:

Verify Loaded Parameters – √

Change Loaded Parameters ► ICC ► ICC Battery R&R SYH

Verify 'Loaded Parameters' (three) – ICC Battery R&R, SSRMS, SY Held

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

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

Verify Command – SSRMS>Internal

3.201 EVA2 SUPPORT

Verify SSRMS at EVA2 Start position (within 5 cm/1 deg).

| | | | | | | |
|-------|-----------------------------------|-------|-------|-------|-------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +77.0 | 0.0 | -39.0 | -55.0 | +30.0 | -31.0 | +69.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +747 | -3926 | -50 | -36.0 | +0.8 | +21.6 | |
| FOR | Loaded – ICC Battery R&R, SY Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

DCP BRAKES SSRMS → OFF (Verify OFF)

√Vernier

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: As required

2. JOINT OCAS TO BATT A SETUP

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

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► Battery R&R ► Batt A Setup

Verify 'Joint Angles' 'Destination' for Batt A Setup position.

| | | | | | | |
|-------|-----|-------|-------|------|-------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +80.3 | 0.0 | -53.9 | -34.6 | +5.7 | -14.7 | +66.0 |

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) | +77.0 | 0.0 | -39.0 | -55.0 | +30.0 | -31.0 | +69.0 |
| TGT | +80.3 | 0.0 | -53.9 | -34.6 | +5.7 | -14.7 | +66.0 |
| ERR | -3.3 | 0.0 | +14.9 | -20.4 | +24.3 | -16.3 | +3.0 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

3.201 EVA2 SUPPORT

Verify Joint Angle values.

| | | | | | | |
|-------|-----|-------|-------|------|-------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +80.3 | 0.0 | -53.9 | -34.6 | +5.7 | -14.7 | +66.0 |

MSS: SSRMS: Snapshot:

cmd Snapshot

Verify Display – SSRMS>Snapshot

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

DCP BRAKES SSRMS → ON (Verify ON)

 * If using shuttle attitude control
 * | Perform [ROBOTICS ATTITUDE MAINTENANCE](#), steps 1 to 3
 * | ([ORB OPS](#), [REBOOST/DAP](#)), then:

3. [SETUP FOR GCA](#)

| <u>NOTE</u> | |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | SSRMS Brakes should be applied while the EV crew is performing bolt release and tie-down operations on the ICC. |
| 2. | Shuttle thruster firings are permitted if SSRMS and ICC are within 5 ft of published position, greater than 2 ft from structure and SSRMS in Posn Hold or with Brakes On. |
| 3. | If Attitude Control Maintenance is required, perform ROBOTICS ATTITUDE MAINTENANCE , steps 1 and 2 (ORB , OPS , REBOOST/DAP), then: |
| 4. | Prior to SSRMS motion, Verify in attitude, then DAP: FREE |

| BODY Direction | Expected Input |
|--------------------------|----------------------|
| In toward EV chest (out) | THC Pull (push) |
| To EV Left (right) | THC Left (right) |
| Up(Down) | THC Up(Down) |
| Pitch Up(Down) | RHC Pitch Up(Down) |
| Yaw Left(Right) | RHC Yaw Left(Right) |
| Roll Left(Right) | RHC Roll Left(Right) |

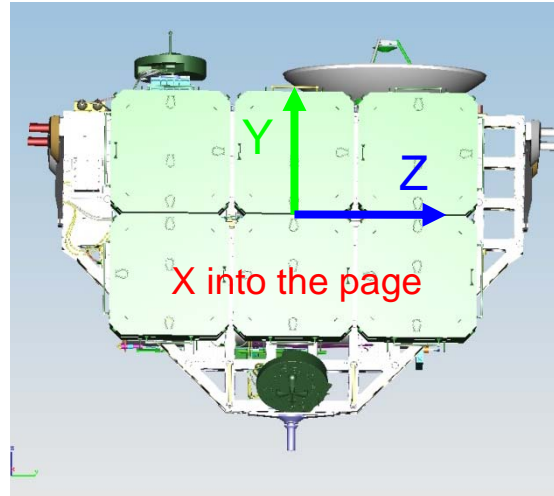


Figure 1.

4. BATTERY A R&R

4.1 GCA to Batt A R&R Position

NOTE

1. ICC trunnion to P6 PDGF clearance ~34 in – TELB, JEM EXT A
2. ICC trunnion to P6 truss clearance ~42 in – MBS Mast, JEM EXT A
3. ICC trunnion to P6 WIF12 APFR ~27 in – POA

On EV GO:

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)

3.201 EVA2 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 5 of 13 pages

THC/
RHC Maneuver ICC per EVA GCA to Batt A R&R position (THC -X Pull).

Expected joint angles and FOR:

| | | Locked | | | | | | |
|----------|-------------|-----------------------------------|-------|-------|-------|-------|-------|--|
| Expected | SR | SY | SP | EP | WP | WY | WR | |
| | +83.3 | 0.0 | -55.3 | -37.7 | +10.2 | -11.7 | +65.6 | |
| Expected | X | Y | Z | Pitch | Yaw | Roll | | |
| | -100 | 0 | 0 | 0.0 | 0.0 | 0.0 | | |
| | FOR | Loaded – ICC Battery R&R, SY Held | | | | | | |
| | Disp | SSRMS>Snapshot | | | | | | |

DCP BRAKES SSRMS → ON (Verify ON)

Give EV GO for Battery A release.

4.2 Separating ICC from Batt A

On EV GO, ready for EVA GCA to separate ICC from Battery A.

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 ICC to separate ICC from Battery A (THC +X Push).

4.3 Installing Old Battery

On EV GO, ready for EVA GCA to install old Battery.

Maneuver ICC to install old Battery (THC -X Pull).

DCP

BRAKES SSRMS → ON (Verify ON)

Give GO to EV2 to install old Battery.

5. BACKOFF TO BATT A CLEARANCE

On EV GO (verify tethers clear):

BRAKES SSRMS → OFF (Verify OFF)

PCS

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

3.201 EVA2 SUPPORT

MSS: SSRMS: SSRMS Manual: Joint Lock:

cmd Shoulder Yaw (Verify SY – Locked)

Maneuver to Batt A Clearance position (within 20 cm/5 deg).
(THC +X Push)

| | Locked | | | | | |
|----------|-----------------------------------|----------|--------------|------------|-------------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +80.3 | 0.0 | -53.9 | -34.6 | +5.7 | -14.7 | +66.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – ICC Battery R&R, SY Held | | | | | |
| Disp | SSRMS>Snapshot | | | | | |

6. JOINT OCAS TO BATT B SETUP

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► Battery R&R ► Batt B Setup

Verify 'Joint Angles' 'Destination' for Batt B Setup position.

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|-------|-------|-------|-------|
| +83.2 | 0.0 | -49.3 | -55.0 | +20.1 | -10.0 | +40.1 |

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) | +80.3 | 0.0 | -53.9 | -34.6 | +5.7 | -14.7 | +66.0 |
| TGT | +83.2 | 0.0 | -49.3 | -55.0 | +20.1 | -10.0 | +40.1 |
| ERR | -2.9 | 0.0 | -4.6 | +20.4 | -14.4 | -4.7 | +25.9 |

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 |
|-------|-----|-------|-------|-------|-------|-------|
| +83.2 | 0.0 | -49.3 | -55.0 | +20.1 | -10.0 | +40.1 |

3.201 EVA2 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 7 of 13 pages

DCP BRAKES SSRMS → ON (Verify ON)

MSS: SSRMS: Snapshot:

cmd Snapshot

Verify Display – SSRMS>Snapshot

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

7. BATTERY B R&R

7.1 GCA to Batt B R&R Position

On EV GO (verify tethers clear):

| <u>NOTE</u> | |
|-------------|-------------------------------------------------------------|
| 1. | ICC trunnion to P6 truss clearance ~22 in – TELB, JEM EXT A |
| 2. | ICC trunnion to P6 PDGF clearance ~36 in – TELB, JEM EXT A |
| 3. | ICC trunnion to P6 WIF12 APFR ~29 in – POA |

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 ICC per EVA GCA to Batt B R&R position (THC -X Pull).

Expected joint angles and FOR:

| | Locked | | | | | | | |
|----------|--------|-----------------------------------|-------|-------|-------|------|-------|--|
| | SR | SY | SP | EP | WP | WY | WR | |
| Expected | +84.7 | 0.0 | -53.5 | -55.2 | +24.5 | -8.5 | +39.9 | |
| | X | Y | Z | Pitch | Yaw | Roll | | |
| Expected | -100 | 0 | 0 | 0.0 | 0.0 | 0.0 | | |
| | FOR | Loaded – ICC Battery R&R, SY Held | | | | | | |
| | Disp | SSRMS>Snapshot | | | | | | |

DCP

BRAKES SSRMS → ON (Verify ON)

Give EV GO for Battery B release.

3.201 EVA2 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 8 of 13 pages

7.2 Separating ICC from Batt B

On EV GO, ready for EVA GCA to separate ICC from Battery B.

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 ICC to separate ICC from Battery B (THC +X Push).

7.3 Installing Old Battery

On EV GO, ready for EVA GCA to install old Battery.

Maneuver ICC to install old Battery (THC -X Pull).

DCP

BRAKES SSRMS → ON (Verify ON)

Give GO to EV2 to install old Battery.

8. BATTERY C R&R

8.1 GCA to Batt C R&R Position

On EV GO (verify tethers clear):

NOTE

1. ICC trunnion to P6 truss clearance ~33 in – TELB, JEM EXT A
2. ICC trunnion to P6 PDGF clearance ~42 in – TELB, JEM EXT A
3. ICC trunnion to P6 WIF12 APFR ~29 in – POA

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)

3.201 EVA2 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 9 of 13 pages

THC/
RHC Maneuver ICC per EVA GCA to Batt C R&R position (THC +Z Down).

Expected joint angles and FOR:

| | Locked | | | | | | |
|----------|--------|-----------------------------------|-------|-------|-------|-------|-------|
| | SR | SY | SP | EP | WP | WY | WR |
| Expected | +80.2 | 0.0 | -55.6 | -54.3 | +25.7 | -13.0 | +40.4 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | -100 | 0 | +110 | 0.0 | 0.0 | 0.0 | |
| | FOR | Loaded – ICC Battery R&R, SY Held | | | | | |
| | Disp | SSRMS>Snapshot | | | | | |

DCP BRAKES SSRMS → ON (Verify ON)

Give EV GO for Battery C release.

8.2 Separating ICC from Batt C

On EV GO, ready for EVA GCA to separate ICC from Battery C.

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 ICC to separate ICC from Battery C (THC +X Push).

8.3 Installing Old Battery

On EV GO, ready for EVA GCA to install old Battery.

Maneuver ICC to install old Battery (THC -X Pull).

DCP BRAKES SSRMS → ON (Verify ON)

Give GO to EV2 to install old Battery.

If not performing Battery D R&R, Go to step 10.

3.201 EVA2 SUPPORT

9. BATTERY D R&R

9.1 GCA to Batt D R&R Position

On EV GO (verify tethers clear):

| <u>NOTE</u> | |
|-------------|---------------------------------------------------------------|
| 1. | ICC trunnion to P6 truss clearance ~19 in – TELB, JEM EXT A |
| 2. | ICC trunnion to P6 PDGF clearance ~16 in – TELB, JEM EXT A |
| 3. | ICC trunnion to P6 WIF12 APFR clearance ~22 in – EV crew, POA |

BRAKES SSRMS → OFF (Verify OFF)

Enter Mode – Manual (Verify blue)

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

cmd Shoulder Yaw (Verify SY – Locked)

THC/
RHC

Maneuver ICC per EVA GCA to Batt D R&R position.

Expected joint angles and FOR:

| | Locked | | | | | | | |
|----------|-------------|-----------------------------------|-------------|-------|-------|------|-------|--|
| | SR | SY | SP | EP | WP | WY | WR | |
| Expected | +89.9 | 0.0 | -61.0 | -39.1 | +15.8 | -3.4 | +39.4 | |
| | X | Y | Z | Pitch | Yaw | Roll | | |
| Expected | -125 | -75 | -115 | 0.0 | 0.0 | 0.0 | | |
| | FOR | Loaded – ICC Battery R&R, SY Held | | | | | | |
| | Disp | SSRMS>Snapshot | | | | | | |

DCP

BRAKES SSRMS → ON (Verify ON)

Give EV GO for Battery D release.

9.2 Separating ICC from Batt D

On EV GO, ready for EVA GCA to separate ICC from Battery D.

BRAKES SSRMS → OFF (Verify OFF)

PCS

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 ICC to separate ICC from Battery D (THC +X Push).

3.201 EVA2 SUPPORT

9.3 Installing Old Battery

On EV GO, ready for EVA GCA to install old Battery.

Maneuver ICC to install old Battery (THC -X Pull).

DCP

BRAKES SSRMS → ON (Verify ON)

Give GO to EV2 to install old Battery.

10. BACKOFF TO BATT D CLEARANCE

On EV GO (verify tethers clear):

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)

Maneuver to Batt D Clearance position (within 20 cm/5 deg).

| | Locked | | | | | |
|------------|-----------------------------------|-------------|--------------|------------|-------------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +87.9 | 0.0 | -55.3 | -38.7 | +9.7 | -5.3 | +39.6 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +20 | -75 | -115 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – ICC Battery R&R, SY Held | | | | | |
| Disp | SSRMS>Snapshot | | | | | |

Enter Mode – Standby (Verify blue)

```
*****
* If using shuttle attitude control
* |   Perform ROBOTICS ATTITUDE MAINTENANCE, steps 1 to 3
* |   (ORB OPS, REBOOST/DAP), then:
*****
```

3.201 EVA2 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 12 of 13 pages

11. JOINT OCAS TO ONP INTERMEDIATE POSITION

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|------------------------------------------|------------------------|--------------------------|---------------|-------------|
| 09: P1 Lower Outboard (-130, -20) | 37: MBS Mast (0, +10) | 51: JEM EXT A (-10, +25) | WVS 1 | |
| | 24: Tip Elbow (-10, 0) | 52: JEM EF F (+60, +20) | | |

RHC RATE → COARSE (Verify Coarse on PCS)

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► Battery R&R ► ONP Intermediate

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|--------|-------|-------|-------|
| +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |

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) | +87.9 | 0.0 | -55.3 | -38.7 | +9.7 | -5.3 | +39.6 |
| TGT | +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |
| ERR | +1.9 | 0.0 | -81.3 | +71.3 | -20.3 | +25.7 | -29.4 |

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 |
|-------|-----|-------|--------|-------|-------|-------|
| +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |

3.201 EVA2 SUPPORT

12. JOINT OCAS TO OVERNIGHT PARK

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-----------------------------------|-------------------------------------------------------|---------------------------------------------------|---------------|-------------|
| 09: P1 Lower Outboard (-150, -20) | 37: MBS Mast (-30, +40) 22: Base Elbow (-150, -10) | 51: JEM EXT A (0, +30) 52: JEM EF F (+60, +40) | | |

SSRMS Joint OCAS

pick File ► Battery R&R ► Overnight Park

Verify 'Joint Angles' 'Destination' for Overnight Park position.

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|-------|-------|-------|-------|
| +86.0 | 0.0 | +46.0 | -70.0 | +70.0 | -31.0 | +45.0 |

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) | +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |
| TGT | +86.0 | 0.0 | +46.0 | -70.0 | +70.0 | -31.0 | +45.0 |
| ERR | 0.0 | 0.0 | -20.0 | -40.0 | -40.0 | 0.0 | +24.0 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS: **SSRMS**

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|-------|-------|-------|-------|
| +86.0 | 0.0 | +46.0 | -70.0 | +70.0 | -31.0 | +45.0 |

DCP SAFING → SAFE (Verify ON)

 * If using shuttle attitude control
 * | Go to **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 and 2
 * | (**ORB OPS**, **REBOOST/DAP**).

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3.301 EVA3 SUPPORT

| <u>NOTE</u> | |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Expected Solar array configuration for EVA3 is as follows: a. Port SARJ : 225 deg (L) b. 2A BGA: 64.6875 deg (L) c. 4B BGA: 129.3750 deg (L) |
| 2. | Verify SRMS at Battery R&R Viewing position: SY = +30.0, +20.0, -25.0, +5.0, -10.0, +100.0 = WR |
| 3. | APFR settings for P6 WIF 12: 6/QQ/H/6. |
| 4. | EV on ICC is required to be static when SSRMS in motion due to loads constraints. |
| 5. | MSS Effector overlay may reflect POA mechanism. If a LEE caution is annunciated, verify LEE telemetry on LEE PCS page. |

- THC/
RHC
- HAND CONTROLLER CALIBRATION
Deflect all THC and RHC axes to positive and negative hard stops.
 - SETUP
Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-----------------------------------|-------------------------|---------------------------------------------------------|---------------|-------------|
| 09: P1 Lower Outboard (-150, -20) | 37: MBS Mast (-80, +65) | 51: JEM EXT A (+25, +30) 52: JEM EF F (+75, +60) | | |

PCS MSS: SSRMS:

- Verify Loaded Parameters – √
Verify 'Loaded Parameters' (three) – ICC Battery R&R, SSRMS, SY Held
- Verify 'Unloaded Parameters' (two) – LEE Tip, SY Held
- Change Display ► ISS ► ISSACS (Verify ISS>ISSACS)
- Verify Command – SSRMS>Internal
- Verify SSRMS at Overnight Park position (within 5 cm/1 deg).

| | | | | | | |
|-------|-----------------------------------|-------|--------|-------|--------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +86.0 | 0.0 | +46.0 | -70.0 | +70.0 | -31.0 | +45.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1875 | -2296 | -482 | -134.2 | +59.0 | +177.9 | |
| FOR | Loaded - ICC Battery R&R, SY Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

3.301 EVA3 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 2 of 9 pages

MSS: SSRMS: MSS Safing:

cmd 'SSRMS' Remove (Verify Not Safed)

DCP BRAKES SSRMS → OFF (Verify OFF)

RHC RATE → COARSE (Verify Coarse on PCS)

3. JOINT OCAS TO ONP INTERMEDIATE POSITION (6 MINUTES)

Verify with **MCC-H** Port SARJ and BGAs configured for EVA3.

* If using shuttle attitude control

* Verify in attitude, then DAP: FREE

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

pick File ► Battery R&R ► ONP Intermediate

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|--------|-------|-------|-------|
| +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |

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) | +86.0 | 0.0 | +46.0 | -70.0 | +70.0 | -31.0 | +45.0 |
| TGT | +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |
| ERR | 0.0 | 0.0 | +20.0 | +40.0 | +40.0 | 0.0 | -24.0 |

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 |
|-------|-----|-------|--------|-------|-------|-------|
| +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |

3.301 EVA3 SUPPORT

 * If using shuttle attitude control
 * | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 to 3
 * | (**ORB OPS, REBOOST/DAP**), then:

4. JOINT OCAS TO BATT D SETUP (9 MINUTES)

| <u>NOTE</u> | |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | SSRMS Brakes should be applied while the EV crew is performing bolt release and tie-down operations on the ICC. |
| 2. | Shuttle thruster firings are permitted if SSRMS and ICC are within 5 ft of published position, greater than 2 ft from structure, and SSRMS in Posn Hold or with Brakes On. |
| 3. | If Attitude Control Maintenance is required, perform ROBOTICS ATTITUDE MAINTENANCE , steps 1 and 2 (ORB OPS, REBOOST/DAP), then: |
| 4. | Prior to SSRMS motion, Verify in attitude, Then DAP: FREE |

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|--------------------|----------------------------|----------------------------------------------------------------|----------------|-------------|
| 32: MBS POA | 37: MBS Mast (-10, +30) | 51: JEM EXT A (-10, +15) 52: JEM EF A (-105, +25) | WVS EV1 | |

RHC RATE → VERNIER (Verify Vernier on PCS)

PCS MSS: SSRMS: Rate:

√Scale 'Vernier' Current: 1.0

Input 'Joint Angles' 'Destination' for Batt D Setup position.

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----|-------|-------|------|------|-------|
| +87.9 | 0.0 | -55.3 | -38.7 | +9.7 | -5.3 | +39.6 |

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) | +86.0 | 0.0 | +26.0 | -110.0 | +30.0 | -31.0 | +69.0 |
| TGT | +87.9 | 0.0 | -55.3 | -38.7 | +9.7 | -5.3 | +39.6 |
| ERR | -1.9 | 0.0 | +81.3 | -71.3 | +20.3 | -25.7 | +29.4 |

3.301 EVA3 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 4 of 9 pages

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 |
|-------|-----|-------|-------|------|------|-------|
| +87.9 | 0.0 | -55.3 | -38.7 | +9.7 | -5.3 | +39.6 |

MSS: SSRMS: Snapshot:

cmd Snapshot

Verify Display – SSRMS>Snapshot

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

DCP BRAKES SSRMS → ON (Verify ON)

5. SETUP FOR GCA

| BODY Direction | Expected Input |
|--------------------------|----------------------|
| In toward EV chest (out) | THC Pull (push) |
| To EV Left (right) | THC Left (right) |
| Up(Down) | THC Up(Down) |
| Pitch Up(Down) | RHC Pitch Up(Down) |
| Yaw Left(Right) | RHC Yaw Left(Right) |
| Roll Left(Right) | RHC Roll Left(Right) |

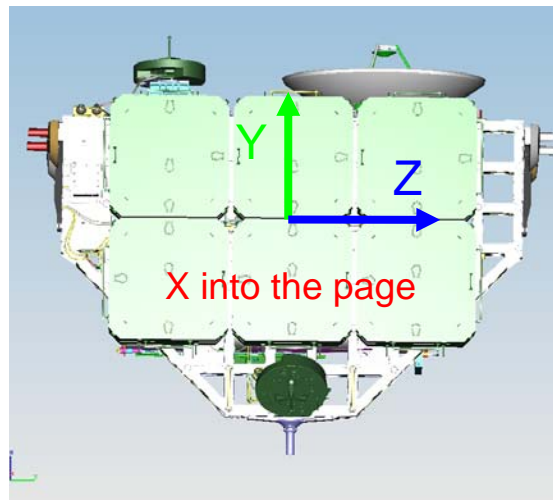


Figure 1.

3.301 EVA3 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 5 of 9 pages

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|-----------------------------------|--------------------------------------|-----------------------------|---------------|--------------|
| 32: MBS POA | 37: MBS Mast (0, 0) | 51: JEM EXT A (-10, +10) | WVS 1 | WVS 2 |
| 24: Tip Elbow (-10, 0) | 22: Base Elbow (-135, +5) | 52: JEM EF F (+60, +20) | | |

PCS MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: as required

If not performing Battery D R&R, Go to step 7.

6. BATTERY D R&R

6.1 GCA to Batt D R&R Position

On EV GO:

| <u>NOTE</u> | |
|-------------|----------------------------------------------------------------|
| 1. | ICC trunnion to P6 truss clearance ~19 in – TELB, JEM EXT A. |
| 2. | ICC trunnion to P6 PDGF clearance ~16 in – TELB, JEM EXT A. |
| 3. | ICC trunnion to P6 WIF12 APFR clearance ~22 in – EV crew, POA. |

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 ICC per EVA GCA to Batt D R&R position (THC -X Pull).

Expected joint angles and FOR:

| | | Locked | | | | | | |
|----------|------|-----------------------------------|-----|-------|-------|-------|------|-------|
| | | SR | SY | SP | EP | WP | WY | WR |
| Expected | | +89.9 | 0.0 | -61.0 | -39.1 | +15.8 | -3.4 | +39.4 |
| | | X | Y | Z | Pitch | Yaw | Roll | |
| Expected | | -145 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| | FOR | Loaded – ICC Battery R&R, SY Held | | | | | | |
| | Disp | SSRMS>Snapshot | | | | | | |

3.301 EVA3 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 6 of 9 pages

DCP BRAKES SSRMS → ON (Verify ON)

Give EV GO for Battery D release.

6.2 Separating ICC from Batt D

On EV GO, ready for EVA GCA to separate ICC from Battery D.

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

Mnvr ICC to separate ICC from Battery D (THC +X Push).

6.3 Installing Old Battery

On EV GO, ready for EVA GCA to install old Battery.

Mnvr ICC to install old battery (THC -X Pull).

DCP

BRAKES SSRMS → ON (Verify ON)

Give Go to EV2 to install old Battery.

7. BATTERY E R&R

7.1 GCA to Batt E R&R Position

NOTE

1. ICC trunnion to P6 truss clearance ~35 in – MBS Mast, JEM EXT A.
2. ICC trunnion to P6 PDGF ~37 in – POA.
3. ICC trunnion to P6 WIF12 APFR ~24 in – POA.

On EV GO:

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)

3.301 EVA3 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 7 of 9 pages

THC/
RHC Maneuver ICC per EVA GCA to Batt E R&R position.

Expected joint angles and FOR:

| | | | | | | | | |
|----------|-------------|-----------------------------------|-------------|-------|-------|------|-------|--|
| | | Locked | | | | | | |
| | SR | SY | SP | EP | WP | WY | WR | |
| Expected | +84.5 | 0.0 | -61.3 | -40.1 | +17.2 | -8.7 | +40.0 | |
| | X | Y | Z | Pitch | Yaw | Roll | | |
| Expected | -120 | 0 | +130 | 0.0 | 0.0 | 0.0 | | |
| | FOR | Loaded – ICC Battery R&R, SY Held | | | | | | |
| | Disp | SSRMS>Snapshot | | | | | | |

DCP BRAKES SSRMS → ON (Verify ON)

Give EV GO for Battery E release.

7.2 Separating ICC from Batt E

On EV GO, ready for EVA GCA to separate ICC from Battery E.

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 ICC to separate ICC from Battery E (THC +X Push)

7.3 Installing Old Battery

On EV GO, ready for EVA GCA to install old Battery.

Maneuver ICC to install old Battery (THC -X Pull).

DCP

BRAKES SSRMS → ON (Verify ON)

Give GO to EV2 to install old Battery.

8. BATTERY F R&R

8.1 GCA to Batt F R&R Position

On EV GO (verify tethers clear):

| |
|---------------------------------------------------------------------|
| NOTE |
| 1. ICC trunnion to P6 truss clearance ~50 in – MBS Mast, JEM EXT A. |
| 2. ICC trunnion to P6 PDGF ~37 in – POA. |
| 3. ICC trunnion to P6 WIF12 APFR ~29 in – POA. |

3.301 EVA3 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 8 of 9 pages

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 ICC per EVA GCA to Batt F R&R position (THC +Z Down).

Expected joint angles and FOR:

| | | Locked | | | | | |
|----------|-------|-----------------------------------|-------|-------|-------|-------|-------|
| Expected | SR | SY | SP | EP | WP | WY | WR |
| | +80.3 | 0.0 | -63.5 | -38.6 | +18.0 | -12.9 | +40.4 |
| Expected | X | Y | Z | Pitch | Yaw | Roll | |
| | -120 | 0 | +240 | 0.0 | 0.0 | 0.0 | |
| | FOR | Loaded – ICC Battery R&R, SY Held | | | | | |
| | Disp | SSRMS>Snapshot | | | | | |

DCP

BRAKES SSRMS → ON (Verify ON)

Give EV GO for Battery F release.

8.2 Separating ICC from Batt F

On EV GO, ready for EVA GCA to separate ICC from Battery F.

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 ICC to separate ICC from Battery F (THC +X Push).

8.3 Installing Old Battery

On EV GO, ready for EVA GCA to install old Battery.

Maneuver ICC to install old Battery (THC -X Pull).

DCP

BRAKES SSRMS → ON (Verify ON)

Give GO to EV2 to install old Battery.

3.301 EVA3 SUPPORT

(RBT FS/ULF4/FIN 1/HC) Page 9 of 9 pages

9. BACKOFF TO BATT F CLEARANCE

On EV GO (verify tethers clear):

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)

Maneuver to Batt F Clearance position (within 20 cm/5 deg).
(THC +X Push)

| | Locked | | | | | |
|------------|-----------------------------------|-------|-------|-------|-------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| +78.9 | 0.0 | -59.6 | -38.3 | +13.9 | -14.3 | +40.5 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -20 | 0 | +240 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded - ICC Battery R&R, SY Held | | | | | |
| Disp | SSRMS>Snapshot | | | | | |

DCP

BRAKES SSRMS → ON (Verify ON)

* If using shuttle attitude control
* | Go to **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 and 2
* | (**ORB OPS, REBOOST/DAP**).

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4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC)

Page 1 of 13 pages

NOTE

1. Verify SRMS at OBSS Handoff Pre-grapple position:
SY = +24.0, +64.8, -34.4, -99.4, +11.3, -99.0 = WR
2. Callouts in gray are for shuttle crew.

1. SETUP

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------------|-----------------------------------------|--------------------------------------|----------------------|---------------------------|
| 03: S1 Lower Outboard (+80, +30) | 09: P1 Lower Outboard (+100, +20) | 13: LAB Stbd Zenith (+40, -30) | Camera C (+5, +5) | SRMS Elbow (-120, +90) |

PCS

MSS: SSRMS:

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

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

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

Verify Command – SSRMS>Internal

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----------------------------|-------|--------|--------|--------|--------|
| +7.2 | +108.8 | -17.3 | -89.9 | -156.0 | -177.8 | -101.2 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -2375 | -170 | +304 | -178.8 | -10.6 | -29.7 | |
| FOR | Unloaded – LEE Tip, SR Held | | | | | |
| Disp | Orbiter>OBSS FRGF | | | | | |

√Vernier

MSS: SSRMS: Rate:

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

2. JOINT OCAS TO OBSS PRE-GRAPPLE

On SRMS operator GO, SRMS at OBSS Handoff Pre-Grapple, and GO for OBSS Unberth.

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 2 of 13 pages

SSRMS Joint OCAS

pick File ► OBSS ► OBSS Pre-Grapple

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|--------|--------|-------|
| -40.0 | +93.1 | -15.2 | +75.5 | -198.3 | -185.0 | +55.2 |

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) | +7.2 | +108.8 | -17.3 | -89.9 | -156.0 | -177.8 | -101.2 |
| TGT | -40.0 | +93.1 | -15.2 | +75.5 | -198.3 | -185.0 | +55.2 |
| ERR | +47.2 | +15.7 | -2.1 | -165.4 | +42.3 | +7.2 | -156.4 |

PCS

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

NOTE
Expect singularity warning for EP between -15 and 15 degrees.

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS: SSRMS

Verify Posn Hold – orange

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|-----------------------------|-------|-------|--------|--------|-------|
| -40.0 | +93.1 | -15.2 | +75.5 | -198.3 | -185.0 | +55.2 |
| 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 | | | | | |

3. OBSS GRAPPLE

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------|------------------------------------|--------------------------------|-------------------|------------------------|
| 03: S1 Lower Outboard (+60, +30) | 25: Tip LEE (Full Zoom Out) | 13: LAB Stbd Zenith (-50, -20) | Camera C (+5, +5) | SRMS Elbow (-120, +15) |

3.1 Maneuvering to Grapple Envelope

MSS: SSRMS: Rate: SSRMS Rate

Set 'Scale' 'Vernier' Rate Scale: as desired

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 3 of 13 pages

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.

PCS

3.2 Grapple

MSS: SSRMS: Tip LEE:

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

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

CAUTION

Due to end-to-end system latency, the RHC Trigger is hot up to 3 seconds prior to receiving a Trigger Hot icon status on the PCS.

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 to exit LEE operations (SCR 23262, 14662).

cmd Confirm (Verify RHC Trigger Hot icon)

Verify LEE Mode – Auto Capture

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

3.3 Grapple Cleanup

Verify Posn Hold – orange

DCP

BRAKES SSRMS → ON (Verify ON)

PCS

MSS: SSRMS:

Verify Loaded Parameters – √

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

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 4 of 13 pages

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

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

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: as desired

Expected OBSS Grapple position.

| | | | | | | |
|-------|--------------------------------|------|-------|--------|--------|-------|
| SR | SY | SP | EP | WP | WY | WR |
| -40.0 | +93.7 | -2.4 | +54.4 | -190.1 | -184.5 | +55.6 |
| 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), then:

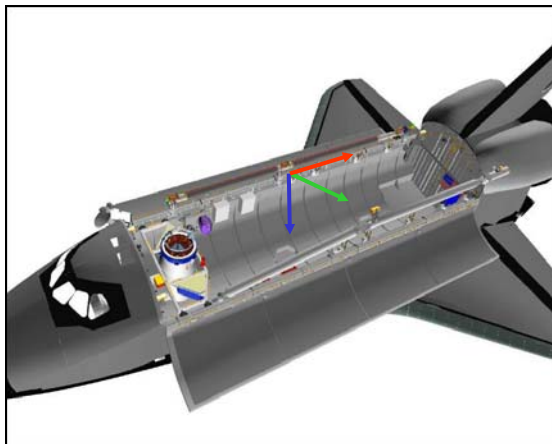


Figure 1.- OBSS Mid MPM FOR.

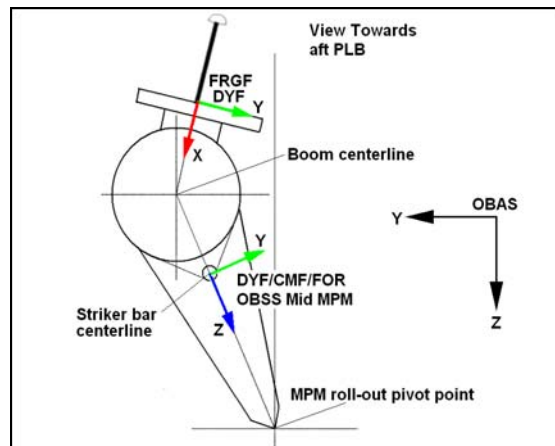


Figure 2.- OBSS Mid MPM Command Frame, Display Frame and FOR.

4. [OBSS UNBERTH](#)

Configure Cameras and overlays as required.

| | | | | |
|----------------------------------|-------------------------------------|-----------------------------------|---------------------|------------------------|
| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
| 03: S1 Lower Outboard (+60, +30) | 71: Mux D/C (D: -25, 0) (C: +25, 0) | 09: P1 Lower Outboard (+115, +20) | Camera B (+80, +10) | SRMS Elbow (-120, +15) |

4.1 [Attitude Control Configuration](#)

MSS: SSRMS: Thrusters:

Verify 'Desat Request:' – Inh

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 5 of 13 pages

Verify 'Auto Att Control Handover to RS' – Inh

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

4.2 MRL Release

Give shuttle crew GO to deactivate stbd RMS heaters and release stbd MRLs.

| |
|-----------------------------------------------------------------------------|
| NOTE |
| Standby for OBSS thermal clock start time: ___/___:___:___ |
| SRMS SPEE power must be applied within 90 minutes to prevent sensor damage. |

* 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

4.3 Maneuvering to Low Hover

On shuttle crew GO for OBSS unberth and SSRMS maneuver to Handoff:

| |
|------------------------------------------------|
| NOTE |
| OBSS to Columbus clearance ~44 in – SRMS Elbow |

DCP

BRAKES SSRMS → OFF (Verify OFF)

PCS

MSS: SSRMS: SSRMS

Enter Mode – Manual (Verify blue)

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 6 of 13 pages

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 -Z Up)

| | | | | | | |
|--------|--------------------------------|-------------|-------|--------|--------|-------|
| Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| -40.0 | +95.3 | -15.6 | +71.2 | -193.8 | -183.3 | +56.7 |
| 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
 * | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 and 2
 * | (ORB OPS, **REBOOST/DAP**), then:

5. FOR OCAS TO UNBERTH INTERMEDIATE
 Configure Cameras and overlays as required.

| | | | | |
|----------------------------------------|-------------------------------------------|-------------------------------------|-------------------------------|---------------------------|
| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
| 03: S1 Lower Outboard (+60, +30) | 22: Base Elbow (+105, +20) | 24: Tip Elbow (-30, +40) | Camera D (-25,+30) | SRMS Elbow (-120, +15) |

√Vernier

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

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 7 of 13 pages

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

| X | Y | Z | Pitch | Yaw | Roll |
|------|------|------|-------|-----|------|
| +250 | -200 | -300 | 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 | 0 | 0 | -150 | 0.0 | 0.0 | 0.0 |
| TGT | +250 | -200 | -300 | 0.0 | 0.0 | 0.0 |
| ERR | -250 | +200 | +150 | 0.0 | 0.0 | 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 |
|--------|--------------------------------|-------|-------|-------|--------|--------|-------|
| | -40.0 | +92.2 | -17.2 | +45.0 | -165.8 | -185.6 | +54.6 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +250 | -200 | -300 | 0.0 | 0.0 | 0.0 | |
| FOR | Loaded – OBSS Mid MPM, SR Held | | | | | | |
| Disp | Orbiter>OBSS Mid MPM | | | | | | |

6. [FOR OCAS TO OBSS HANDOFF](#)

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------|----------------------------|---------------------------------------|---------------------|------------------------|
| 03: S1 Lower Outboard (+60, +30) | 22: Base Elbow (+125, +20) | 13: LAB Stbd Zenith (-10, -30) | Camera D (-25, +30) | SRMS Elbow (-115, +15) |

pick File ► OBSS ► Handoff

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

| X | Y | Z | Pitch | Yaw | Roll |
|------|------|------|-------|-------|-------|
| +325 | +704 | -198 | +91.3 | -70.6 | +47.4 |

cmd Load (Verify Sequence Status – Confirm or Cancel)

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 8 of 13 pages

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

| | | | | | | |
|-----|-------------|-------------|-------------|--------------|--------------|--------------|
| | X | Y | Z | Pitch | Yaw | Roll |
| FOR | +250 | -200 | -300 | 0.0 | 0.0 | 0.0 |
| TGT | +325 | +704 | -198 | +91.3 | -70.6 | +47.4 |
| ERR | -75 | -904 | -102 | -91.3 | +70.6 | -47.4 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

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

| | | | | | | |
|--------|--------------------------------|-------|-------|--------|--------|-------|
| Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| -40.0 | +58.9 | -22.4 | +93.1 | -208.1 | -193.2 | -59.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +325 | +704 | -198 | +91.3 | -70.6 | +47.4 | |
| FOR | Loaded – OBSS Mid MPM, SR Held | | | | | |
| Disp | Orbiter>OBSS Mid MPM | | | | | |

DCP BRAKES SSRMS → ON (Verify ON)

7. [VERIFICATION OF ATTITUDE CONTROL CONFIGURATION](#)

PCS MSS: SSRMS: Thrusters:

Verify 'Desat Request:' – Inh

Verify 'Auto Att Control Handover to RS' – Inh

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

Give SRMS operator GO for OBSS grapple.

8. [SETUP FOR UNGRAPPLE](#)

Configure Cameras and overlays as required.

| | | | | |
|----------------------------------|--------------------|------------------------------|--------------------------|-------------------------------------|
| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
| 03: S1 Lower Outboard (+60, +30) | 25: Tip LEE | 13: LAB Stbd Zenith (0, -30) | Camera B (0, +50) | Camera A (+7, +25) HFOV = 17 |

MSS: SSRMS:

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

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 9 of 13 pages

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

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

√Vernier

MSS: SSRMS: Rate:

Set 'Scale' 'Vernier' Rate Scale: as desired

9. OBSS RELEASE (CARRIAGE PUSHOFF)

9.1 SSRMS Limp

On SRMS operator GO for OBSS Ungrapple:

DCP BRAKES SSRMS → OFF (Verify OFF)

PCS MSS: SSRMS: Limp:

cmd All Limp (Verify Limp – blue)

MSS: SSRMS:

Verify all joints – Limped

9.2 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' Retract – gray (90s max)

Verify 'Snare' Open – blue (12s max)

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

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

MSS: SSRMS:

Verify Unloaded Parameters – √

9.3 SSRMS Backoff

MSS: SSRMS: Limp:

cmd None Limp (Verify Standby – blue)

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 10 of 13 pages

MSS: SSRMS:

Enter Mode – Manual (Verify blue)

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 -X Pull)

| | | | | | | |
|--------|-----------------------------|-------|--------|--------|--------|-------|
| Locked | | | | | | |
| SR | SY | SP | EP | WP | WY | WR |
| -40.0 | +56.6 | -32.6 | +106.9 | -211.2 | -194.9 | -61.1 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1015 | -312 | +1499 | -12.8 | +0.1 | +89.8 | |
| FOR | Unloaded – LEE Tip, SR Held | | | | | |
| Disp | ISS>ISSACS | | | | | |

DCP

BRAKES SSRMS → ON (Verify ON)

 * If using shuttle attitude control
 * | Perform **ROBOTICS ATTITUDE MAINTENANCE**, steps 1 and 2
 * | (ORB OPS, **REBOOST/DAP**), then:

10. JOINT OCAS TO INTERMEDIATE 1

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------------|------------------------------------|-------------------------------------------------|------------------------|-------------|
| 03: S1 Lower Outboard (+90, +30) | 37: MBS Mast (+110, -5) | 09: P1 Lower Outboard (+95, +20) | Camera B (+20, +50) | |

PCS MSS: SSRMS:

Change Display ► MBS ► PDGF 3 (Verify MBS>PDGF 3)

MSS: SSRMS: Rate:

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

DCP

BRAKES SSRMS → OFF (Verify OFF)

PCS

MSS: SSRMS:

Enter Mode – Joint OCAS (Verify blue)

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 11 of 13 pages

SSRMS Joint OCAS

pick File ► OBSS ► Intermediate 1

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|--------|--------|-------|--------|--------|------|
| -40.0 | +170.0 | -120.0 | +55.0 | -100.0 | -134.8 | +6.6 |

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 | +56.6 | -32.6 | +106.9 | -211.2 | -194.9 | -61.1 |
| TGT | -40.0 | +170.0 | -120.0 | +55.0 | -100.0 | -134.8 | +6.6 |
| ERR | 0.0 | -113.4 | +87.4 | +51.9 | -111.2 | -60.1 | -67.7 |

PCS

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

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS: **SSRMS**

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|-------|--------|--------|-------|--------|--------|------|
| -40.0 | +170.0 | -120.0 | +55.0 | -100.0 | -134.8 | +6.6 |

11. JOINT OCAS TO INTERMEDIATE 2

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------------------|-----------------------------|----------------------------------------|----------------------|-------------|
| 03: S1 Lower Outboard (+90, +20) | 37: MBS Mast (+105, -10) | 09: P1 Lower Outboard (+95, +20) | Camera B (0, +50) | |

SSRMS Joint OCAS

pick File ► OBSS ► Intermediate 2

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

| SR | SY | SP | EP | WP | WY | WR |
|-------|--------|--------|--------|-------|--------|------|
| +55.0 | +150.0 | -200.0 | +110.0 | -79.9 | -134.8 | +6.6 |

cmd Load (Verify Sequence Status – Confirm or Cancel)

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 12 of 13 pages

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

| | SR | SY | SP | EP | WP | WY | WR |
|------------|--------------|---------------|---------------|---------------|--------------|---------------|-------------|
| (current) | -40.0 | +170.0 | -120.0 | +55.0 | -100.0 | -134.8 | +6.6 |
| TGT | +55.0 | +150.0 | -200.0 | +110.0 | -79.9 | -134.8 | +6.6 |
| ERR | -95.0 | +20.0 | +80.0 | -55.0 | -20.1 | 0.0 | 0.0 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|-------|--------|--------|--------|-------|--------|------|
| +55.0 | +150.0 | -200.0 | +110.0 | -79.9 | -134.8 | +6.6 |

12. JOINT OCAS TO INTERMEDIATE 3

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|--------------------------------|--------------------------|-----------------------------------|---------------------|-------------|
| 24: Tip Elbow (+5, +15) | 37: MBS Mast (+105, -10) | 09: P1 Lower Outboard (+115, +20) | Camera B (-10, +35) | |

pick File ► OBSS ► Intermediate 3

Verify 'Joint Angles' 'Destination' for Intermediate 3 position.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|--------|-------|--------|------|
| +115.0 | +160.0 | -150.0 | +110.0 | -79.9 | -134.8 | +6.6 |

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) | +55.0 | +150.0 | -200.0 | +110.0 | -79.9 | -134.8 | +6.6 |
| TGT | +115.0 | +160.0 | -150.0 | +110.0 | -79.9 | -134.8 | +6.6 |
| ERR | -60.0 | -10.0 | -50.0 | 0.0 | 0.0 | 0.0 | 0.0 |

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

DCP AUTO SEQ → PROC

PCS MSS: SSRMS:

Verify Posn Hold – orange

4.101 OBSS UNBERTH AND HANDOFF

(RBT FS/ULF4/FIN 1/SPN/HC) Page 13 of 13 pages

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|--------|-------|--------|------|
| +115.0 | +160.0 | -150.0 | +110.0 | -79.9 | -134.8 | +6.6 |

13. JOINT OCAS TO MBS PDGF3 PRE-GRAPPLE

Configure Cameras and overlays as required.

| Monitor 1 | Monitor 2 | Monitor 3 | SSC 1 (MON 1) | SSC 2 (DTV) |
|----------------------------|----------------------------|---------------------------------------|------------------------|-------------|
| 24: Tip Elbow (+5, +15) | 37: MBS Mast (+65, +10) | 09: P1 Lower Outboard (+115, 0) | Camera B (-10, +35) | |

pick File ► OBSS ► MBS3 Pre-Grapple

Verify 'Joint Angles' 'Destination' for MBS3 Pre-Grapple position.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|-------|-------|--------|------|
| +116.8 | +161.2 | -117.3 | +81.1 | -79.9 | -134.8 | +6.6 |

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) | +115.0 | +160.0 | -150.0 | +110.0 | -79.9 | -134.8 | +6.6 |
| TGT | +116.8 | +161.2 | -117.3 | +81.1 | -79.9 | -134.8 | +6.6 |
| ERR | -1.8 | -1.2 | -32.7 | +28.9 | 0.0 | 0.0 | 0.0 |

PCS

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

DCP

AUTO SEQ → PROC

PCS

MSS: SSRMS:

Verify Posn Hold – orange

Verify Joint Angle values.

| SR | SY | SP | EP | WP | WY | WR |
|--------|--------|--------|-------|-------|--------|------|
| +116.8 | +161.2 | -117.3 | +81.1 | -79.9 | -134.8 | +6.6 |

DCP

SAFING → SAFE (Verify ON)

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REFERENCE

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1. MRM1 RELATED CS AND FOR

1.1 MRM1 Maneuver FOR

Description: Used to maneuver MRM1 in freespace and maneuver to pre-docking.

GUI Name: MRM1>MRM1 Mnvr

GF Used: MRM1 PVGF

Type: FOR

Location: Located at the tip of the Probe head when probe is fully retracted.

Orientation: Same as MRM1 Install, matches view through MRM1 Camera.

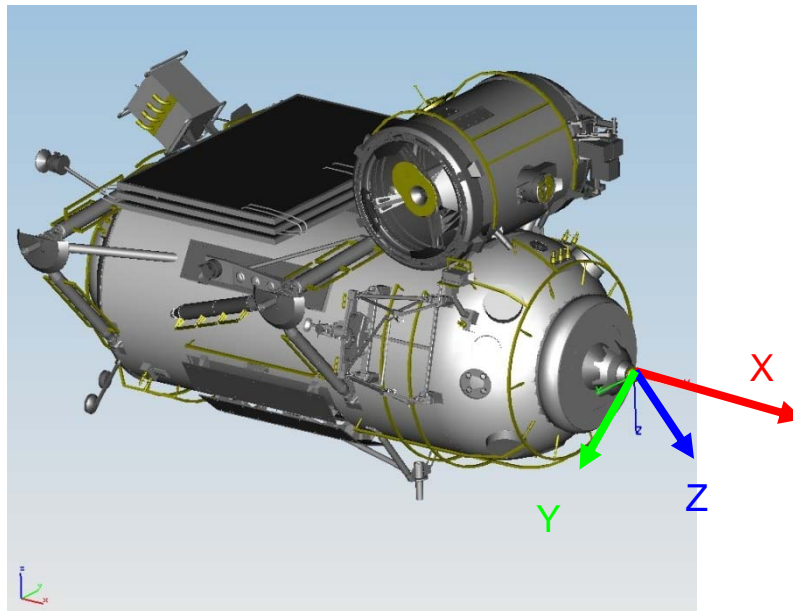


Figure 1.- MRM1 Maneuver FOR.

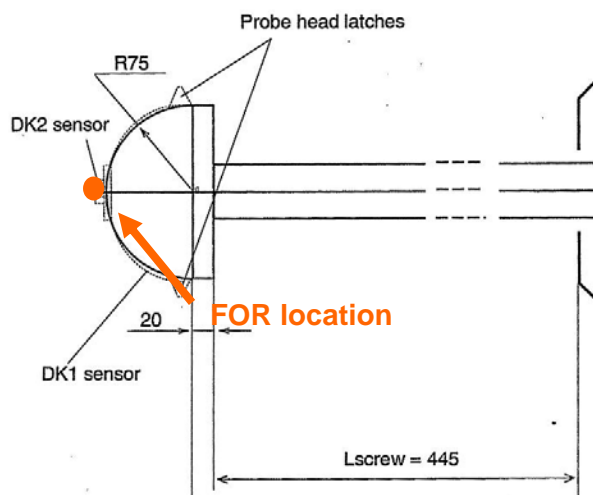


Figure 2.- Probe Tip.

1.2 MRM1 Install FOR

Description: Used to install MRM on FGB Nadir Probe/Cone Docking Mechanism (PCDM) using MRM1 Camera system.

GUI Name: MRM1>MRM1 Install
MRM1>MRM1 Install TP OFF (same with Translational POHS off)

GF Used: MRM1 PVGF

Type: FOR

Location: Located at the tip of the Probe head when the Probe is fully extended.

Orientation: Aligned with view from MRM1 Camera.

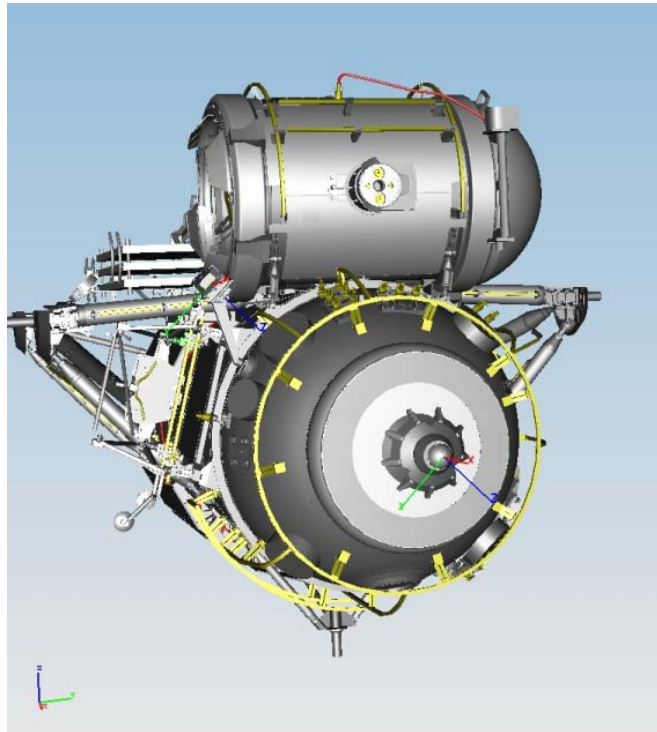


Figure 3.- MRM1 Install FOR.

1.3 MRM1 Install ISSACS FOR

Description: Used to install MRM on FGB Nadir Probe/Cone Docking Mechanism (PCDM) using ISSACS reference system.

GUI Name: MRM1>MRM1 Install ISSACS
MRM1>MRM Ins ISSAC TP OFF (same with Translation POHS off)

GF Used: MRM1 PVGF

Type: FOR

Location: Located at the tip of the Probe head when the Probe is fully extended.

Orientation: Aligned with ISSACS when MRM1 is aligned for docking.

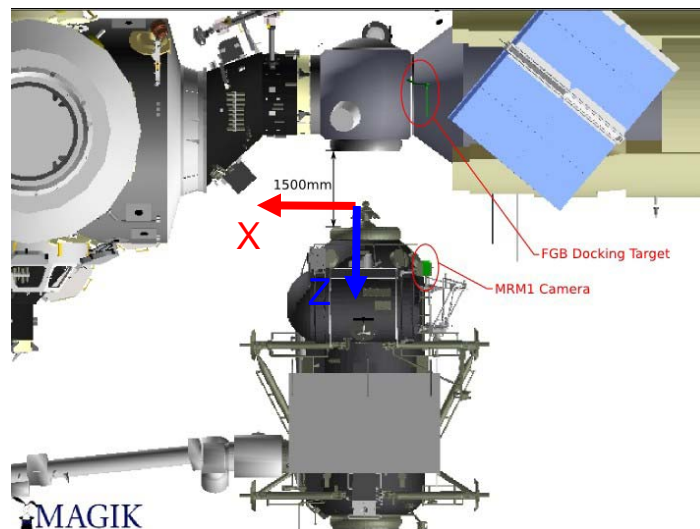


Figure 4.- MRM1 Install ISSACS.

1.4 FGB MRM1 Install Display Frame

Description: Used to install MRM1 on FGB Nadir using the Probe/Cone Docking Mechanism (PCDM).

GUI Name: FGB>MRM1 Install

Ref. Frame: ISSACS

Type: DPF

Location: Located at the tip of the Probe head when the Probe is fully extended and the Probe is at the bottom contact point (DK2) of the FGB Nadir PCDM.

Digitals should read all zero when the extended probe bottoms out during docking.

Orientation: Aligned with MRM1 Install FOR.

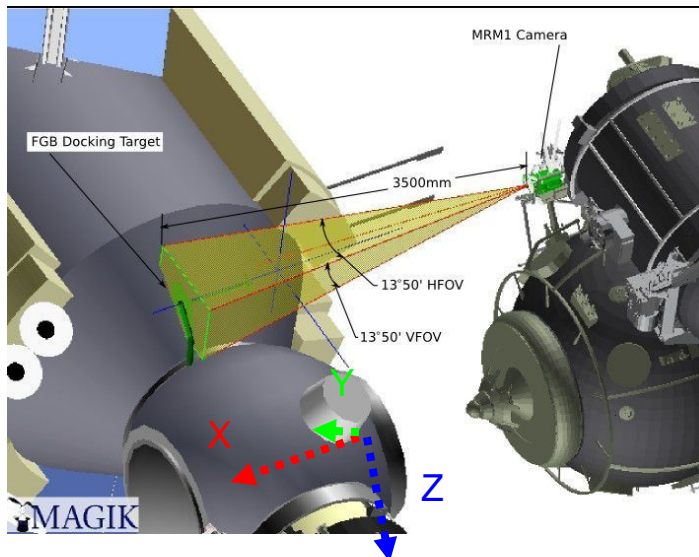


Figure 5.- MRM1 Install DPF.

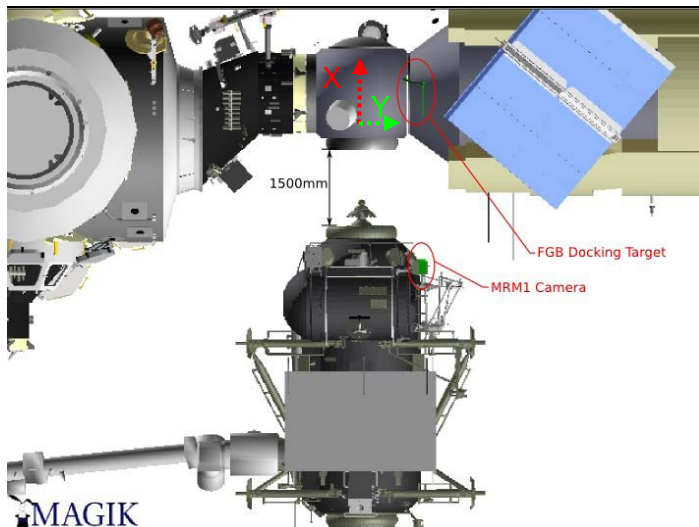


Figure 6.- MRM1 Install DPF.

1.5 FGB MRM1 Install ISSACS Display Frame

Description: Used to install MRM1 on FGB Nadir using the Probe/Cone Docking Mechanism (PCDM); aligned with ISSACS.

GUI Name: FGB>MRM1 Install ISSACS

Ref. Frame: ISSACS

Type: DPF

Location: Located at the tip of the Probe head when the Probe is fully extended and the Probe is at the bottom contact point (DK2) of the FGB Nadir PCDM.

Digitals should read all zero when the extended probe bottoms out during docking when using the MRM1 Install ISSACS FOR.

Orientation: Aligned with ISSACS.

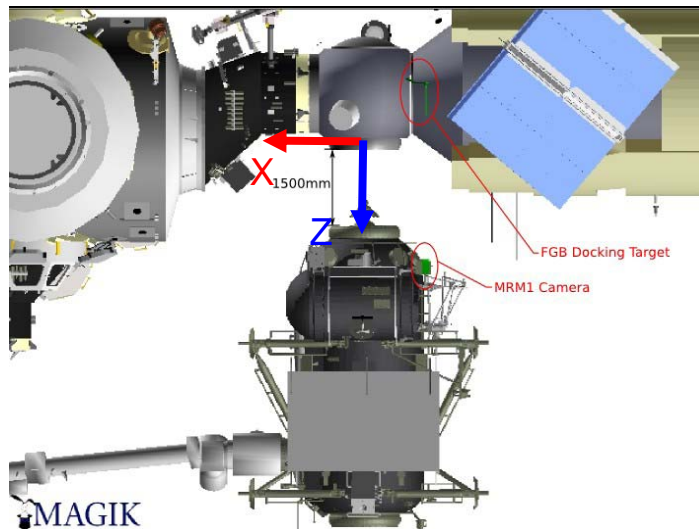


Figure 7.- MRM1 Install ISSACS DPF.

2. ICC RELATED CS AND FOR (SSRMS UNBERTH)

This section describes the CS and FOR frames related to the following robotic operations:

- a. SSRMS grapples ICC PVGF1
- b. SSRMS unberths ICC from Payload Bay
- c. SSRMS mates ICC PVGF2 to MBS POA
- d. SSRMS releases ICC PVGF1

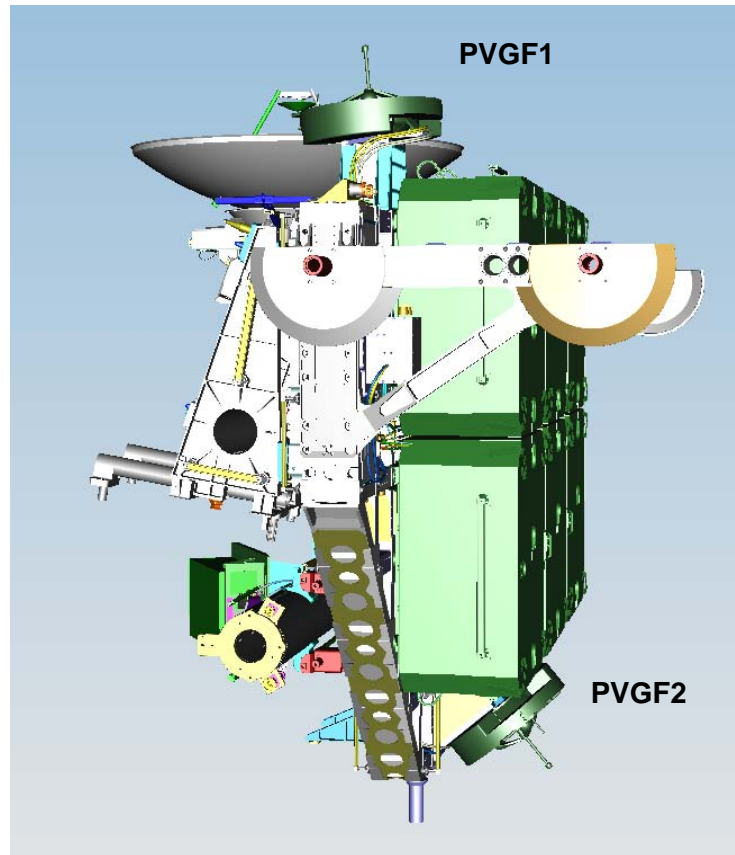


Figure 8.- ICC-VLD PVGF Locations.

2.1 ICC Grapple Display Frame

Description: Used to grapple or ungrapple ICC PVGF1 when ICC is in the Payload Bay.

GUI Name: Orbiter>ICC PVGF1

GF Used: PVGF

Type: DPF

Ref. Frame: ISSACS

Location: Located at ICC PVGF1 origin when ICC is berthed in Orbiter Payload Bay.

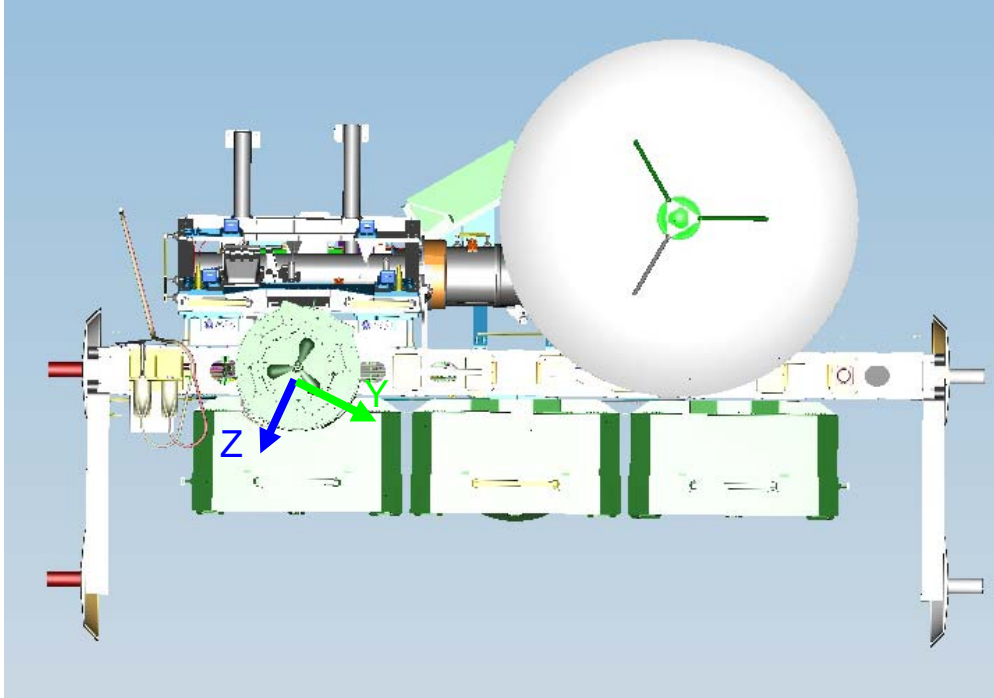


Figure 9.- ICC PVGF1 in Payload Bay DPF.

2.2 ICC Unberth or Berth FOR

Description: Used to unberth or berth ICC from the Orbiter Payload Bay when grappled to ICC PVGF1.

GUI Name: ICC>ICC Unberth

Type: FOR

GF Used: PVGF1

Location: Located in the geometric center of the trunnion pin plane.

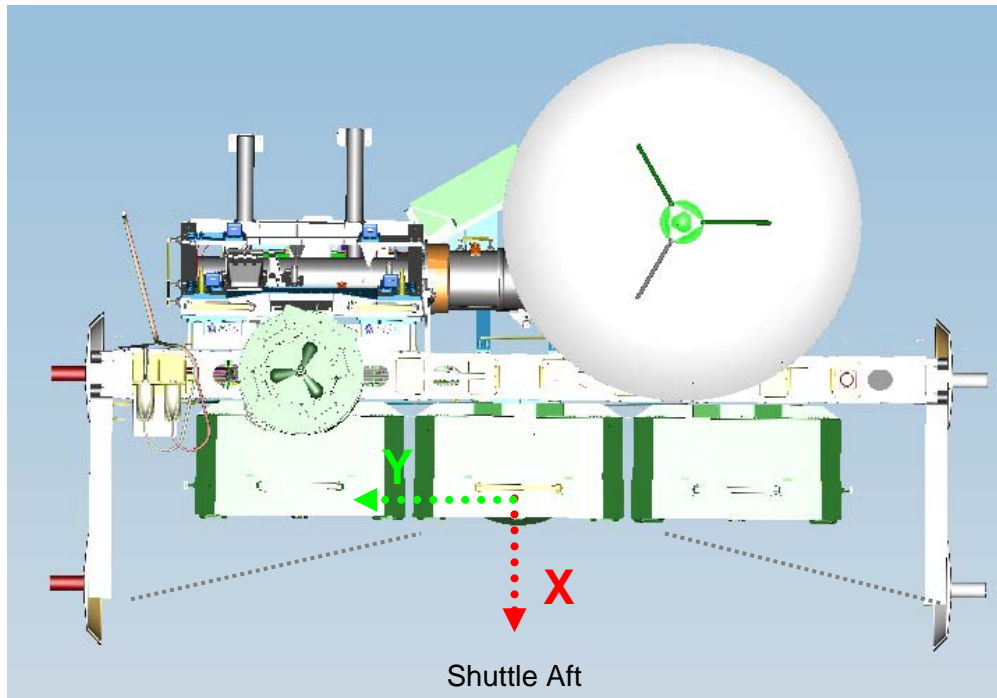


Figure 10.- ICC Unberth FOR.

2.3 ICC Unberth or Berth DPF

Description: Used to unberth or berth ICC from the Orbiter Payload Bay when grappled to ICC PVGF1.

GUI Name: Orbiter>ICC Unberth

Ref. Frame: ISSACS

Type: DPF

Location: Located in the geometric center of the trunnion pin plane when the ICC is berthed in the Payload Bay. Co-located with ICC Unberth FOR when ICC is berthed.

Orientation: Aligned with ICC Unberth FOR when ICC is fully berthed.

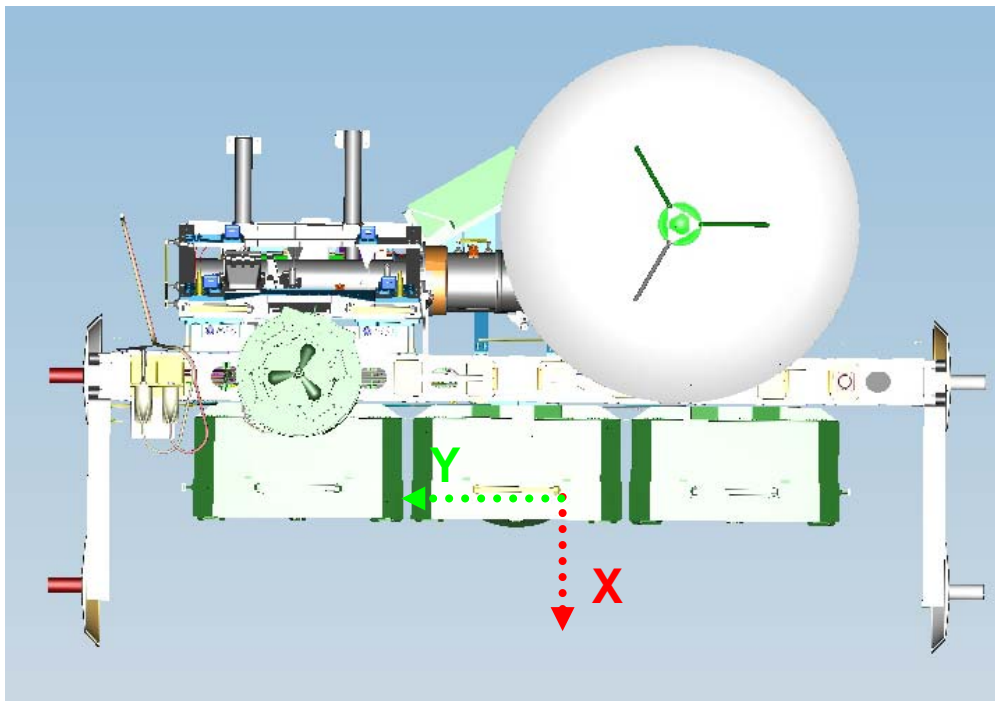


Figure 11.- ICC Unberth DPF.

2.4 ICC Install POA FOR

Description: Used to stow ICC via PVGF2 on MBS POA when SSRMS is grappled to ICC PVGF1.

GUI Name: ICC>ICC Install POA

Type: FOR

GF Used: ICC PVGF1

Location: FOR is located at ICC PVGF2.

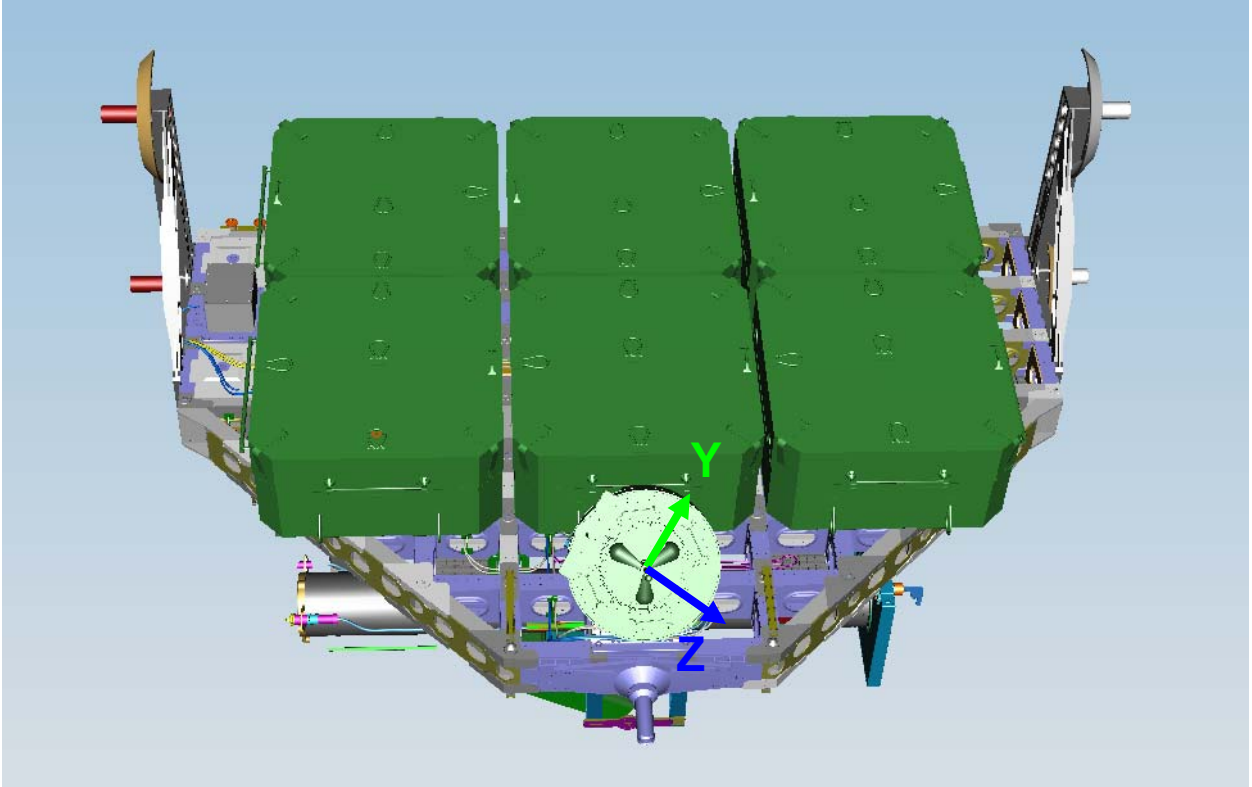


Figure 12.- ICC Install POA FOR.

2.5 Stowed ICC PVGF1 Display Frame

Description: Used to ungrapple PVGF1 when ICC is stowed on MBS POA via PVGF2.

GUI Name: MBS>Stowed ICC PVGF1

Ref. Frame: MOCS

Type: DPF

Location: Located at ICC PVGF1 origin when ICC is in POA.

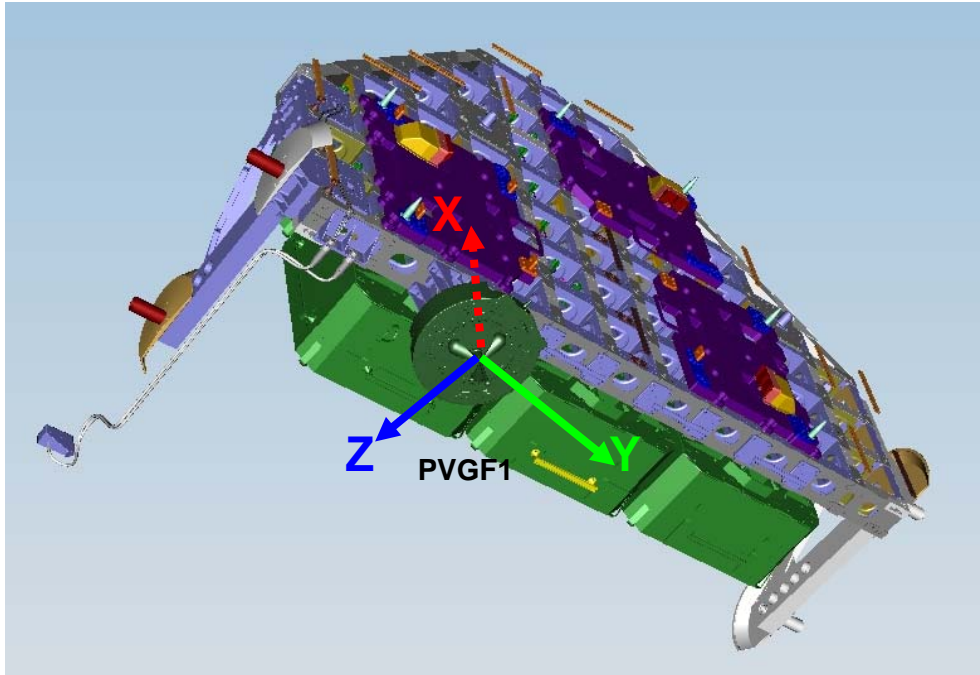


Figure 13.- Stowed ICC PVGF1.

2.6 ICC Battery R&R FOR

Description: Used to maneuver ICC during EVA.

GUI Name: ICC>ICC Battery R&R

Type: FOR

GF Used: ICC PVGF1

Location: At the plane of Batteries with MLI installed, at the geometric center of all six Batteries, between the center Batteries.

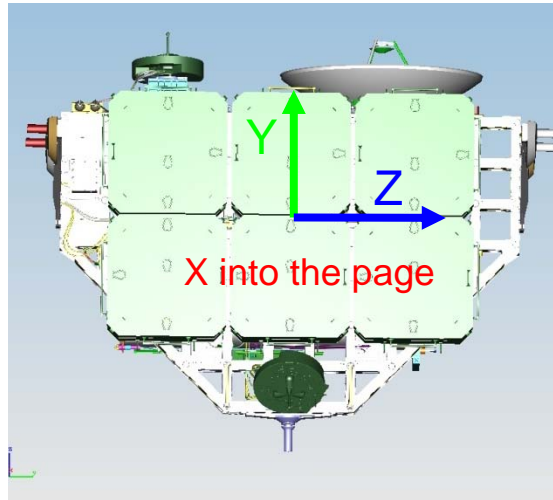


Figure 14.- ICC Battery R&R FOR.

2.7 ICC Battery R&R Display Frame

Description: Used to access Batteries stowed on the ICC when ICC is stowed in POA via PVGF2 and EV is on SSRMS.

GUI Name: MBS>ICC Battery R&R

Ref. Frame: MOCS

Type: DPF

Location: At the plane of Batteries with MLI installed, at the geometric center of all six Batteries, between the center Batteries, when ICC stowed in POA via PVGF2.

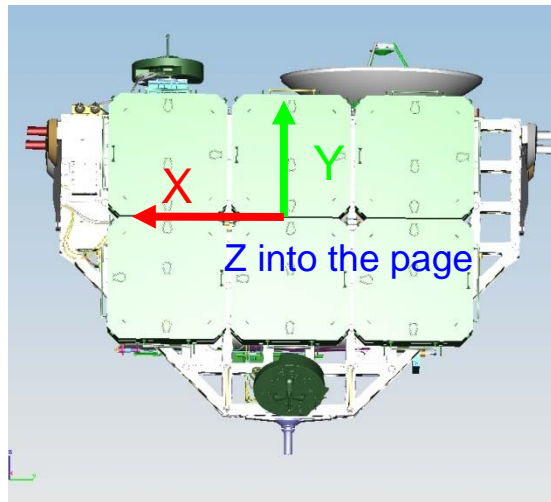


Figure 15.- ICC Battery R&R DPF.

2.8 ICC EVA Display and Command Frame

Description: Used to access ORUs on the ICC when ICC is stowed in POA via PVGF2 and EV is on SSRMS.

GUI Name: MBS>ICC EVA

Ref. Frame: MOCS

Type: DPF and CMF

Location: Centered at the base of the keel pin.

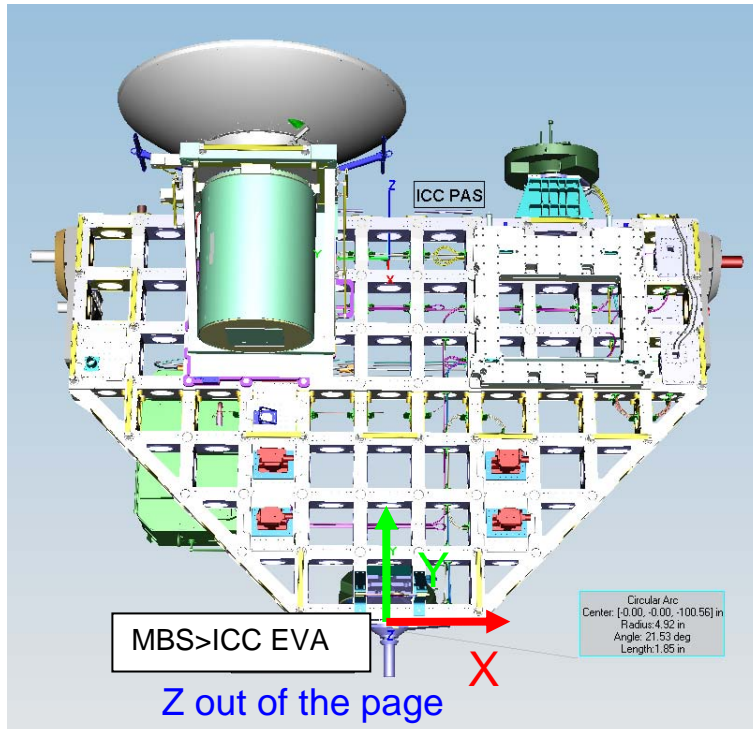


Figure 16.- ICC EVA Display and Command Frame.

3. OBSS RELATED CS AND FOR

3.1 OBSS MID MPM Command Frame, Display Frame, and FOR

Description: Used to grapple OBSS FRGF when OBSS is in the Payload Bay.

GUI Name: Orbiter>OBSS Mid MPM

GF Used: OBSS FRGF

Type: CMF, DPF, and FOR

Location: Located at MID MRL, midpoint of OBSS striker bar centerline, when OBSS is deployed and berthed onto orbiter Stbd MPMs.

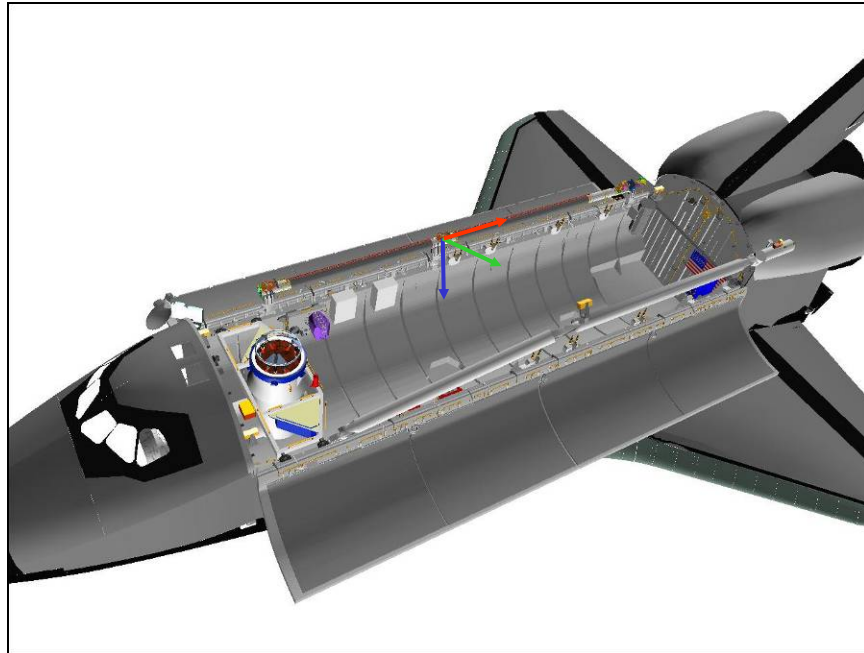


Figure 17.- OBSS Mid MPM FOR.

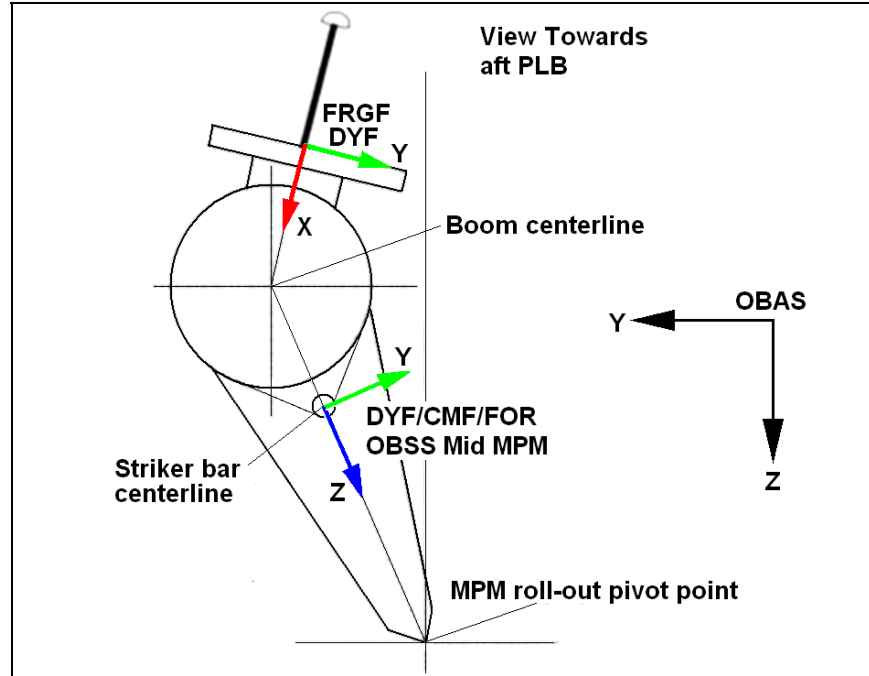


Figure 18.- OBSS Mid MPM Command Frame, Display Frame, and FOR.

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 unsafed prior to starting motion.
4. After the destination angles are loaded, the autosequence can be canceled using the SSRMS_Cancel_Manipulator_Command (CIPUI: CMRM96IM0015K).
5. 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. PRE-MOTION SURVEY

Configure downlink views to observe expected motion:

| | |
|--------------------------------------------------|---------------------------------------------------|
| 1 P1 LOIB (-180, -35) | 2 P1 LOOB (+115, 0) |
| 3 Tip Elbow (+10, 0) | 4 JEM EF A (+105, +10) |

Verify ISS is in expected configuration.

2. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------------------------|-------------------|
| 6_101_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 |

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

Page 2 of 13 pages

MSK Verify 'Unloaded Parameters' – GC Prox Unld LEE Tip, SY Held

3. SSRMS CHANGE LOADED PAYLOAD PARAMETERS

| Ops Name | CIPUI |
|-------------------------------------------------|-------------------|
| 6_101_SSRMS_Change_Pld_Param_MBS_PDGF_3_SR_Held | CMRM95SM0008K:102 |

| Parameter | Value |
|-------------|-------|
| File_ID | 69 |
| OCS_File_ID | 67 |
| Payload_ID | 20 |
| GF_ID | 11 |

MSK Verify 'Loaded Parameters' – MBS PDGF 3, SR Held

4. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|-----------------------------|---------------------------|
| 1 P1 LOIB (-180, -35) | 2 P1 LOOB (+115, 0) |
| 3 Tip Elbow (+10, 0) | 4 Tip LEE |

5. ICC POWERDOWN

NOTE

Due to a timing issue, SSRMS comm errors and safing may occur when payload power is removed. If safing occurs, remove safing per step 6 before issuing commands to the SSRMS.

| Ops Name | CIPUI |
|-----------------------|---------------|
| RPCM_S04B_D_RPC_01_Op | S0PR96IM0662K |

MSK Lab PDGF Prime P/L Pwr – Op

| Ops Name | CIPUI |
|-----------------------|---------------|
| RPCM_S03A_D_RPC_01_Op | S0PR96IM0616K |

MSK Lab PDGF Redun P/L Pwr – Op

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

Page 3 of 13 pages

6. SSRMS CANCEL SAFING

| Cmd Inv | Ops Name | CIPUI |
|---------|---------------------|---------------|
| | SSRMS_Cancel_Safing | CMRM96IM0801K |

MSK Verify SSRMS – Not Safed

7. SSRMS DEMATE UMBILICAL

| Cmd Inv | Ops Name | CIPUI |
|---------|---------------------------------|---------------|
| | SSRMS_Tip_LEE_Umb_Manual_Demate | CMRM96IM0026K |

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' Status – HOT
Verify Pending Command – Demate

| Ops Name | CIPUI |
|-----------------------------|-------------------|
| Lab_RWS_RHC_Trigger_Up_Auto | CMRM96IM0851K:001 |
| Cup_RWS_RHC_Trigger_Up_Auto | CMRM96IM0880K:001 |

Verify 'Umbilical' Mate – gray (10s max)

8. MBS CANCEL SAFING

| Cmd Inv | Ops Name | CIPUI |
|---------|-------------------|---------------|
| | MBS_Cancel_Safing | CMRM96IM0802K |

MSK Verify MBS – Not Safed

9. POA MATE UMBILICAL

| Cmd Inv | Ops Name | CIPUI |
|---------|-----------------------|---------------|
| | MBS_POA_Umb_Auto_Mate | CMRM96IM0220K |

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

Verify PDGF and Payload power removed.

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

Page 4 of 13 pages

OSTPV Verify 3 minutes of S-Band comm coverage remaining in this pass.

| Ops Name | CIPUI |
|--------------------------|---------------|
| MBS_POA_Confirm_Effector | CMRM96IM0730K |

MSK Verify 'Trigger' Status – HOT
Verify Pending Command – Mate

| Ops Name | CIPUI |
|-----------------------------|-------------------|
| Lab_RWS_RHC_Trigger_Up_Auto | CMRM96IM0851K:001 |
| Cup_RWS_RHC_Trigger_Up_Auto | CMRM96IM0880K:001 |

Verify 'Umbilical' Mate – blue (10s max)
Verify 'Umbilical' Prime Cnt, Redun Cnt (two) – blue

10. [ICC POWERUP - PRIME](#)

Cmd Inv

| Ops Name | CIPUI |
|---------------------------------------|-----------------|
| MBS_POA_Umbilical_Prime_Power_Feed_On | CMRM96IM0143K:1 |

MSK Verify Prime Pwr – On

11. [ICC POWERUP - REDUNDANT](#)

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|-----------------|
| MBS_POA_Umbilical_Redundant_Power_Feed_On | CMRM96IM0143K:2 |

MSK Verify Redun Pwr – On

12. [SELECTING VERN RATES](#)

Cmd Inv

| Ops Name | CIPUI |
|------------------------|---------------|
| Lab_RWS_Enable_Vernier | CMRM96IM0848K |
| Cup_RWS_Enable_Vernier | CMRM96IM0877K |

MSK Verify Rates (two) – Vernier

13. [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

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

Page 5 of 13 pages

14. SSRMS SNAPSHOT

| Cmd Inv | Ops Name | CIPUI |
|---------|-------------------------------|---------------|
| | Set_Snapshot_Coordinate_Frame | CMRM96IM0457K |

MSK Verify SSRMS 'Cmd Coord Frame' (two) – SSRMS>Snapshot
 Verify SSRMS 'Disp Coord Frame' (four) – SSRMS>Snapshot

15. 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 |

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 |

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

Page 6 of 13 pages

Verify 'Umbilical' Mate – gray
Verify 'Latch' Unlatch – blue
Verify 'Carriage' Retract – gray
Verify 'Snare' Open – blue
Verify 'Carriage' Derigidize – blue
Verify 'Carriage' Extend – blue

| Ops Name | CIPUI |
|------------------------|---------------|
| SSRMS_Limp_Joints_None | CMRM96IM0122K |

Verify 'MODE' – Standby
Verify SR to WR 'Status' (seven) – Hold

16. [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 |

Verify SSRMS SY 'STATUS' – LOCK

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

16.1 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|-----------------|
| 6_101_SSRMS_Set_FOR_OCAS_Dest_Step_16.1 | CMRM96IM0053K:1 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----|-----------------------------------------------|----------|----------|------------|------------|------------|--------|
| | 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 |
| | +110.9 | +192.6 | -98.8 | +98.5 | -98.1 | -158.8 | +169.7 |
| | 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 4 minutes of S-Band and 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 |

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| | | | | | | |
|-----------------------------------------------|--------|-------|-------|-------|--------|--------|
| SR | SY | SP | EP | WP | WY | WR |
| +111.7 | +192.6 | -99.3 | +96.5 | -95.7 | -159.7 | +169.8 |
| 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: SSRMS>Snapshot | | | | | | |

17. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------------------|-------------------|
| 6_101_SSRMS_Change_DYF_MBS>Stowed_ICC_PVGF1_POR_POS | CMRM96IM0451K:101 |
| 6_101_SSRMS_Change_DYF_MBS>Stowed_ICC_PVGF1_POR_ORI | CMRM96IM0451K:102 |
| 6_101_SSRMS_Change_DYF_MBS>Stowed_ICC_PVGF1_Trans_Vel | CMRM96IM0451K:103 |
| 6_101_SSRMS_Change_DYF_MBS>Stowed_ICC_PVGF1_Rot_Vel | CMRM96IM0451K:104 |

| Frame Data | Value |
|------------|-------|
| Frame_ID | 120 |

MSK

Verify SSRMS 'Disp Coord Frame' – MBS>Stowed ICC PVGF1

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

17.1 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|-----------------|
| 6_101_SSRMS_Set_FOR_OCAS_Dest_Step_17.1 | CMRM96IM0053K:2 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

FOR
TGT
ERR

| X | Y | Z | Pitch | Yaw | Roll | | |
|-----------------------------------------------|----------|----------|------------|------------|------------|--------|--|
| -35 | 0 | +1 | +0.1 | 0.0 | +0.3 | | |
| -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | | |
| +115 | 0 | +1 | +0.1 | 0.0 | +0.3 | | |
| SR | SY | SP | EP | WP | WY | WR | |
| +111.7 | +192.6 | -99.3 | +96.5 | -95.7 | -159.7 | +169.8 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>Stowed ICC PVGF1 | | | | | | | |

Verify PH/M Submode – Wait_conf
Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 5 minutes of S-Band and 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 |

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

Page 10 of 13 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|--------|-------|-------|--------|--------|
| +114.2 | +192.6 | -100.3 | +88.7 | -87.4 | -162.1 | +169.9 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>Stowed ICC PVGF1 | | | | | | |

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 |
|------------------------------------------------------|-------------------|
| 6_101_SSRMS_Change_Pld_Param_GC_Unld_LEE_Tip_SY_Held | CMRM95SM0008K:103 |

| 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

20. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|-----------------------------|---------------------------------------------|
| 1 P1 LOIB (-180, -35) | 2 Base Elbow (+95, -10) |
| 3 Tip Elbow (+10, 0) | 4 JEM EF A (+105, +10) |

21. SSRMS JOINT OCAS MODE

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------|---------------|
| SSRMS_Enter_Joint_OCAS_Mode | CMRM96IM0032K |

MSK

Verify SSRMS 'MODE' – Joint OCAS

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

21.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|-----------------|
| 6_101_SSRMS_Set_Joint_OCAS_Dest_Step_21.1 | CMRM96IM0052K:1 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|---------------|---------------|---------------|--------------|--------------|---------------|--------------|
| Current | +114.2 | +192.6 | -100.3 | +88.7 | -87.4 | -162.1 | +169.9 |
| TGT | +114.6 | +177.2 | -126.2 | +98.8 | -81.5 | -146.9 | +91.9 |
| ERR | -0.4 | +15.4 | +25.9 | -10.1 | -5.9 | -15.2 | +78.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -150 | 0 | 0 | 0.0 | 0.0 | +0.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>Stowed ICC PVGF1 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 5 minutes 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 is 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 |
|------------------------------------------|--------|--------|--------|-------|-------|--------|-------|
| | +114.6 | +177.2 | -126.2 | +98.8 | -81.5 | -146.9 | +91.9 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -267 | -73 | -416 | +4.1 | -18.8 | -59.4 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>Stowed ICC PVGF1 | | | | | | | |

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

21.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|-----------------|
| 6_101_SSRMS_Set_Joint_OCAS_Dest_Step_21.2 | CMRM96IM0052K:2 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------------------------------------|---------------|---------------|---------------|---------------|--------------|---------------|-------------|
| | SR | SY | SP | EP | WP | WY | WR |
| Current | +114.6 | +177.2 | -126.2 | +98.8 | -81.5 | -146.9 | +91.9 |
| TGT | +115.0 | +160.0 | -155.0 | +110.0 | -75.0 | -130.0 | +5.0 |
| ERR | -0.4 | +17.2 | +28.8 | -11.2 | -6.5 | -16.9 | +86.9 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -267 | -73 | -416 | +4.1 | -18.8 | -59.4 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>Stowed ICC PVGF1 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS , GMT incrementing

OSTPV

Verify 5 minutes 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 |

6.101 ICC RELEASE

(RBT FS/ULF4/FIN/SPN/HC)

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| | | | | | | |
|------------------------------------------|--------|--------|--------|-------|--------|------|
| SR | SY | SP | EP | WP | WY | WR |
| +115.0 | +160.0 | -155.0 | +110.0 | -75.0 | -130.0 | +5.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -315 | +102 | -809 | +24.2 | -35.3 | -117.6 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>Stowed ICC PVGF1 | | | | | | |

22. [SSRMS SAFING](#)

Cmd Inv

| | |
|--------------|---------------|
| Ops Name | CIPUI |
| SSRMS_Safing | CMRM96IM0454K |

MSK

Verify SSRMS – Safed

23. [MBS SAFING](#)

Cmd Inv

| | |
|------------|---------------|
| Ops Name | CIPUI |
| MBS_Safing | CMRM96IM0455K |

MSK

Verify MBS – Safed

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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 and SPDM_Safing commands should be unsafed prior to starting motion.
4. After the destination angles are loaded, the autosequence can be canceled using the SSRMS_Cancel_Manipulator or SPDM_Cancel_Manipulator commands.
5. 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
 CMRM96IM0855K Lab_RWS_SSRMS_Brakes_On
 CMRM96IM0856K Lab_RWS_SPDM_Body_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
 CMRM96IM0884K Cup_RWS_SSRMS_Brakes_On
 CMRM96IM0885K Cup_RWS_SPDM_Body_Brakes_Off
 CMRM96IM0892K Cup_RWS_Proceed_With_Autosequence

1. PRE-MOTION SURVEY

Configure downlink views to observe expected motion:

| | |
|------------------------------------------------------|---------------------------------------------------|
| 1 S1 LOOB (+75, -10) | 2 MBS Mast (+105, +15) |
| 3 LAB Stbd Zn (-170, -35) | 4 P1 LOOB (+120, 0) |

1.1 MBS Mast Survey

| | Camera | Survey Notes | Comp |
|--------------|-------------|------------------------------------|------|
| Start Config | (+105, +15) | | |
| 1: Pan Left | (-105, +15) | JEM, ICC, SPDM, SSRMS Workspace | |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 2 of 41 pages

2. 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 |

Verify SSRMS 'MODE' – Standby

| Ops Name | CIPUI |
|------------------------|---------------|
| Lab_RWS_Enable_Vernier | CMRM96IM0848K |
| Cup_RWS_Enable_Vernier | CMRM96IM0877K |

Verify SSRMS Rates (two) – Vernier

| Ops Name | CIPUI |
|----------------------------------|-------------------|
| SSRMS_Change_Rate_Scale_Vern_1.0 | CMRM96IM0022K:001 |

Verify SSRMS Vernier Rate Scale – 1.0

3. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------------------------|-------------------|
| 6_201_SSRMS_Change_Pld_Param_GC_Prox_Unld_LEE_Tip_SY_Held | CMRM95SM0008K:111 |

| 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

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 3 of 41 pages

4. SSRMS CHANGE LOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------------|-------------------|
| 6_201_SSRMS_Change_Pld_Param_MBS_PDGF_3_SR_Held | CMRM95SM0008K:112 |

| Parameter | Value |
|-------------|-------|
| File_ID | 69 |
| OCS_File_ID | 67 |
| Payload_ID | 20 |
| GF_ID | 11 |

MSK

Verify 'Loaded Parameters' – MBS PDGF 3, SR Held

5. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

| Ops Name | CIPUI |
|---------------------------------------------|-------------------|
| 6_201_SSRMS_Change_DYF_MBS>PDGF_3_POR_POS | CMRM96IM0451K:111 |
| 6_201_SSRMS_Change_DYF_MBS>PDGF_3_POR_ORI | CMRM96IM0451K:112 |
| 6_201_SSRMS_Change_DYF_MBS>PDGF_3_Trans_Vel | CMRM96IM0451K:113 |
| 6_201_SSRMS_Change_DYF_MBS>PDGF_3_Rot_Vel | CMRM96IM0451K:114 |

| Frame Data | Value |
|------------|-------|
| Frame_ID | 9 |

MSK

Verify SSRMS 'Disp Coord Frame' – MBS>PDGF 3

Verify SSRMS Position (within 1 cm/1 deg).

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|--------|--------|-------|--------|------|
| +115.0 | +160.0 | -155.0 | +110.0 | -75.0 | -130.0 | +5.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -95 | +40 | +452 | +1.3 | +3.8 | +2.2 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 4 of 41 pages

6. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|-------------------------------------------|-----------------------------------------|
| 1 Tip Elbow (0, +15) | 2 P1 LOOB (+120, 0) |
| 3 P1 LOIB (-155, -15) | 4 JEM EF A (+120, +15) |

7. SSRMS JOINT OCAS MODE

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------|---------------|
| SSRMS_Enter_Joint_OCAS_Mode | CMRM96IM0032K |

MSK

Verify SSRMS 'MODE' – Joint OCAS

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 5 of 41 pages

7.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_7.1 | CMRM96IM0052K:81 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|---------------|---------------|---------------|---------------|--------------|---------------|-------------|
| Current | +115.0 | +160.0 | -155.0 | +110.0 | -75.0 | -130.0 | +5.0 |
| TGT | +115.5 | +160.3 | -145.0 | +102.3 | -76.3 | -131.3 | +5.4 |
| ERR | -0.5 | -0.3 | -10.0 | +7.7 | +1.3 | +1.3 | -0.4 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -95 | +40 | +452 | +1.3 | +3.8 | +2.2 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 6 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|--------|--------|-------|--------|------|
| +115.5 | +160.3 | -145.0 | +102.3 | -76.3 | -131.3 | +5.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -126 | +51 | +340 | +1.1 | +2.7 | +1.6 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

7.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_7.2 | CMRM96IM0052K:82 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|---------------|---------------|---------------|--------------|--------------|---------------|-------------|
| Current | +115.5 | +160.3 | -145.0 | +102.3 | -76.3 | -131.3 | +5.4 |
| TGT | +116.0 | +160.6 | -135.0 | +94.7 | -77.6 | -132.5 | +5.8 |
| ERR | -0.5 | -0.3 | -10.0 | +7.7 | +1.3 | +1.3 | -0.4 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -126 | +51 | +340 | +1.1 | +2.7 | +1.6 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 7 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +116.0 | +160.6 | -135.0 | +94.7 | -77.6 | -132.5 | +5.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -146 | +47 | +220 | +0.8 | +1.7 | +1.1 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

7.3 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_7.3 | CMRM96IM0052K:83 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|---------------|---------------|---------------|--------------|--------------|---------------|-------------|
| Current | +116.0 | +160.6 | -135.0 | +94.7 | -77.6 | -132.5 | +5.8 |
| TGT | +116.4 | +161.0 | -125.0 | +87.0 | -78.9 | -133.8 | +6.3 |
| ERR | -0.5 | -0.3 | -10.0 | +7.7 | +1.3 | +1.3 | -0.4 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -146 | +47 | +220 | +0.8 | +1.7 | +1.1 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 8 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +116.4 | +161.0 | -125.0 | +87.0 | -78.9 | -133.8 | +6.3 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -154 | +27 | +96 | +0.4 | +0.7 | +0.5 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

7.4 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_7.4 | CMRM96IM0052K:84 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|---------------|---------------|---------------|--------------|--------------|---------------|-------------|
| Current | +116.4 | +161.0 | -125.0 | +87.0 | -78.9 | -133.8 | +6.3 |
| TGT | +116.8 | +161.2 | -117.3 | +81.1 | -79.9 | -134.8 | +6.6 |
| ERR | -0.4 | -0.2 | -7.7 | +5.9 | +1.0 | +1.0 | -0.3 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -154 | +27 | +96 | +0.4 | +0.7 | +0.5 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is as expected.

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 9 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 |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +116.8 | +161.2 | -117.3 | +81.1 | -79.9 | -134.8 | +6.6 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

8. [CAMERA SETUP](#)

Configure downlink views to observe expected motion:

| | |
|-----------------------------|------------------------------|
| 1 Tip Elbow (0, +15) | 2 Tip LEE |
| 3 MBS Mast (-25, -15) | 4 JEM EF A (+120, +15) |

9. [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 |

Verify SSRMS SY 'STATUS' – LOCK

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

9.1 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|----------------------------------------|------------------|
| 6_201_SSRMS_Set_FOR_OCAS_Dest_Step_9.1 | CMRM96IM0053K:81 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | X | Y | Z | Pitch | Yaw | Roll | |
|-----------------------------------------------|------------|----------|----------|------------|------------|------------|------|
| FOR | -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| TGT | -65 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| ERR | -85 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| | SR | SY | SP | EP | WP | WY | WR |
| | +116.8 | +161.2 | -117.3 | +81.1 | -79.9 | -134.8 | +6.6 |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +113.5 | +161.2 | -118.7 | +85.6 | -85.5 | -132.0 | +4.5 |
| 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: MBS>PDGF 3 | | | | | | |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 11 of 41 pages

9.2 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|----------------------------------------|------------------|
| 6_201_SSRMS_Set_FOR_OCAS_Dest_Step_9.2 | CMRM96IM0053K:82 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | 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 |
| | +113.5 | +161.2 | -118.7 | +85.6 | -85.5 | -132.0 | +4.5 |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +112.2 | +161.2 | -119.1 | +87.0 | -87.6 | -131.0 | +3.6 |
| 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: MBS>PDGF 3 | | | | | | |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 12 of 41 pages

Downlink 9.3 SSRMS FOR OCAS Maneuver
Verify Downlink video is current.
Verify LEE aligned with GF.

| Ops Name | CIPUI |
|----------------------------------------|------------------|
| 6_201_SSRMS_Set_FOR_OCAS_Dest_Step_9.3 | CMRM96IM0053K:83 |

MSK Verify SSRMS current and target position (within 1 cm/1 deg).

| | 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 |
| | +112.2 | +161.2 | -119.1 | +87.0 | -87.6 | -131.0 | +3.6 |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf
Verify SY – Locked

RPS Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV Verify 7 minutes of S-Band and 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 13 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +111.4 | +161.2 | -119.3 | +87.9 | -88.9 | -130.3 | +3.1 |
| 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: MBS>PDGF 3 | | | | | | |

10. 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 |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 14 of 41 pages

Verify 'Snare' Close, Capture (two) – blue (12s max)
Verify 'Payload' Capture to Latch – Yes (SCR 19282)
Verify 'Load Cell' Tension ~5500 N (90s max)
Verify 'Carriage' Retract – blue
Verify 'Latch' Latch – blue (65s max)
Verify Inhibits (three) – Inh
Verify 'Payload' Status – Captured

11. 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' Status – HOT
Verify Pending Command – Mate

| Ops Name | CIPUI |
|-----------------------------|-------------------|
| Lab_RWS_RHC_Trigger_Up_Auto | CMRM96IM0851K:001 |
| Cup_RWS_RHC_Trigger_Up_Auto | CMRM96IM0880K:001 |

Verify 'Umbilical' Mate – blue (10s max)
Verify 'Umbilical' Prime Cnt, Redun Cnt (two) – blue

12. 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 |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 15 of 41 pages

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 |

Verify 'Carriage' Retract – gray
Verify 'Carriage' Brakes – ENG (90s max)

13. [SSRMS SAFING](#)

Cmd Inv

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

MSK Verify SSRMS – Safed

Verify SSRMS Position (within 1 cm/1 deg).

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------|--------|--------|-------|-------|--------|------|
| +110.8 | +161.2 | -119.4 | +88.5 | -90.0 | -129.8 | +2.6 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Loaded - MBS PDGF 3, SR Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

14. [SSRMS BASE CHANGE](#)

To powerdown SSRMS to OFF, perform [6.334 MSS POWERDOWN](#), all (SODF: RBT GEN: NOMINAL: MSS STATE TRANSITIONS), then:

To change SSRMS Base, perform [6.435 MSS OPERATING BASE CHANGE](#), all (SODF: RBT GEN: NOMINAL: SSRMS STATE TRANSITIONS), then:

To powerup SSRMS components, perform [6.332 MSS POWERUP](#), all (SODF: RBT GEN: NOMINAL: MSS STATE TRANSITIONS), then:

15. [SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS](#)

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------------------------|-------------------|
| 6_201_SSRMS_Change_Pld_Param_GC_Prox_Unld_LEE_Tip_SR_Held | CMRM95SM0008K:113 |

| 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

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 16 of 41 pages

16. [CAMERA SETUP](#)

Configure downlink views to observe expected motion:

| | |
|--------------------------------------------------|------------------------------------------------|
| 1 P1 LOIB (+140, +30) | 2 P1 LOOB (+120, 0) |
| 3 JEM EF A (+115, 0) | 4 Tip LEE |

17. [SSRMS CANCEL SAFING](#)

| | | |
|---------|---------------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | SSRMS_Cancel_Safing | CMRM96IM0801K |

MSK Verify SSRMS – Not Safed

18. [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

19. [SSRMS SNAPSHOT](#)

| | | |
|---------|-------------------------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | Set_Snapshot_Coordinate_Frame | CMRM96IM0457K |

MSK Verify SSRMS 'Cmd Coord Frame' (two) – SSRMS>Snapshot
Verify SSRMS 'Disp Coord Frame' (four) – SSRMS>Snapshot

20. [SSRMS RIGIDIZE](#)

| | | |
|---------|---------------------------------------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | SSRMS_Tip_LEE_Carriage_Manual_Rigidize_Slow | CMRM95SM0000K |

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 |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 17 of 41 pages

MSK Verify 'Trigger' Status – HOT
Verify Pending Command – Rigidigize

| Ops Name | CIPUI |
|-----------------------------|-------------------|
| Lab_RWS_RHC_Trigger_Up_Auto | CMRM96IM0851K:001 |
| Cup_RWS_RHC_Trigger_Up_Auto | CMRM96IM0880K:001 |

Verify 'Load Cell' Tension ~5500 N (90s max)
Verify 'Carriage' Retract – blue
Verify 'Carriage' Brakes – ENG

21. 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 |

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 |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 18 of 41 pages

Verify 'Umbilical' Mate – gray
Verify 'Latch' Unlatch – blue
Verify 'Carriage' Retract – gray
Verify 'Snare' Open – blue
Verify 'Carriage' Derigidize – blue
Verify 'Carriage' Extend – blue

| Ops Name | CIPUI |
|------------------------|---------------|
| SSRMS_Limp_Joints_None | CMRM96IM0122K |

Verify 'MODE' – Standby
Verify SR to WR 'Status' (seven) – Hold

22. [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 |

Verify SSRMS SR 'STATUS' – LOCK

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

22.1 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|------------------|
| 6_201_SSRMS_Set_FOR_OCAS_Dest_Step_22.1 | CMRM96IM0053K:84 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----------------------------------------------|------------|----------|----------|------------|------------|------------|--------|
| | 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 |
| | +2.6 | +129.8 | -90.0 | +88.5 | -119.3 | -161.2 | +110.8 |
| 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 minutes of S-Band and 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 20 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|-------|-------|--------|--------|--------|
| +2.6 | +130.6 | -91.4 | +87.7 | -116.9 | -160.8 | +111.5 |
| 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 | | | | | | |

23. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|-------------------|
| 6_201_SSRMS_Change_DYF_LAB>PDGF_POR_POS | CMRM96IM0451K:115 |
| 6_201_SSRMS_Change_DYF_LAB>PDGF_POR_ORI | CMRM96IM0451K:116 |
| 6_201_SSRMS_Change_DYF_LAB>PDGF_Trans_Vel | CMRM96IM0451K:117 |
| 6_201_SSRMS_Change_DYF_LAB>PDGF_Rot_Vel | CMRM96IM0451K:118 |

| Frame Data | Value |
|------------|-------|
| Frame_ID | 12 |

MSK

Verify SSRMS 'Disp Coord Frame' – LAB>PDGF

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

23.1 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|------------------|
| 6_201_SSRMS_Set_FOR_OCAS_Dest_Step_23.1 | CMRM96IM0053K:85 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----|-----------------------------------------------|----------|----------|------------|------------|------------|--------|
| | X | Y | Z | Pitch | Yaw | Roll | |
| FOR | -36 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| TGT | -200 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| ERR | +164 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| | SR | SY | SP | EP | WP | WY | WR |
| | +2.6 | +130.6 | -91.4 | +87.7 | -116.9 | -160.8 | +111.5 |
| | FOR: Unloaded - GC Prox Unld LEE Tip, SR Held | | | | | | |
| | DYF: LAB>PDGF | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 22 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|-------|-------|--------|--------|--------|
| +2.6 | +135.2 | -96.8 | +81.6 | -104.0 | -158.5 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -200 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

24. SSRMS STANDBY MODE

Cmd Inv

| Ops Name | CIPUI |
|--------------------------|---------------|
| SSRMS_Enter_Standby_Mode | CMRM96IM0054K |

MSK

Verify SSRMS 'MODE' – Standby

25. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|----------------------------------------------------------|-------------------|
| 6_201_SSRMS_Change_Pld_Param_ GC_Unld_LEE_Tip_SR_Held | CMRM95SM0008K:114 |

| 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

26. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|--------------------------------------------------|---------------------------------------------------|
| 1 P1 LOIB (+140, +20) | 2 P1 LOOB (+120, 0) |
| 3 JEM EF A (+115, 0) | 4 Tip Elbow (-10, +10) |

27. SSRMS JOINT OCAS MODE

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------|---------------|
| SSRMS_Enter_Joint_OCAS_Mode | CMRM96IM0032K |

MSK

Verify SSRMS 'MODE' – Joint OCAS

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 23 of 41 pages

27.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_27.1 | CMRM96IM0052K:85 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------------|---------------|---------------|--------------|------------|---------------|---------------|
| Current | +2.6 | +135.2 | -96.8 | +81.6 | -104.0 | -158.5 | +115.8 |
| TGT | +2.6 | +133.8 | -100.0 | +90.0 | 0.0 | -158.5 | +115.8 |
| ERR | 0.0 | +1.4 | +3.2 | -8.4 | -104.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -200 | 0 | 0 | 0.0 | -0.1 | 0.0 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|--------|--------|--------|-------|--------|--------|
| +2.6 | +133.8 | -100.0 | +90.0 | 0.0 | -158.5 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -248 | +232 | -147 | +101.7 | +37.6 | -98.2 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

27.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_27.2 | CMRM96IM0052K:86 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------------|---------------|---------------|---------------|------------|---------------|---------------|
| Current | +2.6 | +133.8 | -100.0 | +90.0 | 0.0 | -158.5 | +115.8 |
| TGT | +2.6 | +133.8 | -100.0 | +120.0 | 0.0 | -158.5 | +115.8 |
| ERR | 0.0 | 0.0 | 0.0 | -30.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -248 | +232 | -147 | +101.7 | +37.6 | -98.2 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|--------|--------|--------|-------|--------|--------|
| +2.6 | +133.8 | -100.0 | +120.0 | 0.0 | -158.5 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -34 | +449 | -156 | +123.9 | +17.6 | -120.0 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

28. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|------------------------------------------------|-------------------------------------|
| 1 P1 LOIB (+160, 0) | 2 P1 LOOB (+120, 0) |
| 3 JEM EF A (+115, 0) | 4 Tip Elbow (-10, +10) |

28.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_28.1 | CMRM96IM0052K:87 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------------|---------------|---------------|---------------|--------------|---------------|---------------|
| Current | +2.6 | +133.8 | -100.0 | +120.0 | 0.0 | -158.5 | +115.8 |
| TGT | +2.6 | +133.8 | -100.0 | +135.0 | -90.0 | -120.0 | +115.8 |
| ERR | 0.0 | 0.0 | 0.0 | -15.0 | +90.0 | -38.5 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -34 | +449 | -156 | +123.9 | +17.6 | -120.0 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 26 of 41 pages

RPS/
Downlink

Verify SSRMS motion is 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 |
|------------------------------------------|--------|--------|--------|-------|--------|--------|
| +2.6 | +133.8 | -100.0 | +135.0 | -90.0 | -120.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +218 | +505 | -157 | +59.2 | +6.2 | -49.2 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 27 of 41 pages

28.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_28.2 | CMRM96IM0052K:88 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------------|---------------|---------------|---------------|--------------|--------------|---------------|
| Current | +2.6 | +133.8 | -100.0 | +135.0 | -90.0 | -120.0 | +115.8 |
| TGT | -2.0 | +125.0 | -100.0 | +135.0 | -90.0 | -90.0 | +115.8 |
| ERR | +4.6 | +8.8 | 0.0 | 0.0 | 0.0 | -30.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +218 | +505 | -157 | +59.2 | +6.2 | -49.2 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 | +125.0 | -100.0 | +135.0 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +254 | +455 | -249 | +70.9 | -14.2 | -50.4 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 28 of 41 pages

29. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|--------------------------------------------------|-------------------------------------|
| 1 P1 LOIB (+160, -20) | 2 P1 LOOB (+120, 0) |
| 3 JEM EF A (+115, 0) | 4 Tip Elbow (-10, +10) |

29.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_29.1 | CMRM96IM0052K:89 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|---------------|--------------|---------------|--------------|--------------|---------------|
| Current | -2.0 | +125.0 | -100.0 | +135.0 | -90.0 | -90.0 | +115.8 |
| TGT | +17.5 | +106.0 | -42.0 | +116.5 | -90.0 | -90.0 | +115.8 |
| ERR | -19.5 | +19.0 | -58.0 | +18.5 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +254 | +455 | -249 | +70.9 | -14.2 | -50.4 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 29 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 |
|------------------------------------------|--------|-------|--------|-------|-------|--------|
| +17.5 | +106.0 | -42.0 | +116.5 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +581 | +484 | -402 | +87.9 | -2.4 | -69.6 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

29.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_29.2 | CMRM96IM0052K:90 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------------------------------------|--------------|--------------|--------------|---------------|--------------|--------------|---------------|
| | SR | SY | SP | EP | WP | WY | WR |
| Current | +17.5 | +106.0 | -42.0 | +116.5 | -90.0 | -90.0 | +115.8 |
| TGT | +35.0 | +89.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| ERR | -17.5 | +17.0 | -52.0 | +16.5 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +581 | +484 | -402 | +87.9 | -2.4 | -69.6 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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.

| NOTE |
|----------------------------------|
| Expected SY singularity warning. |

| Ops Name | CIPUI |
|-----------------------------------|---------------|
| Lab_RWS_Proceed_With_Autosequence | CMRM96IM0863K |
| Cup_RWS_Proceed_With_Autosequence | CMRM96IM0892K |

RPS/

Downlink

Verify SSRMS motion is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 31 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------|-------|--------|-------|-------|--------|
| +35.0 | +89.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +904 | +812 | -577 | +93.8 | +13.6 | -88.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

30. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|------------------------------------------------------|-------------------------------------------------|
| 1 LAB Stbd Zn (-180, -35) | 2 S1 LOOB (+75, -10) |
| 3 Base Elbow (+5, +5) | 4 Tip Elbow (-10, +10) |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

30.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_30.1 | CMRM96IM0052K:91 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------------------------------------|--------------|--------------|--------------|---------------|--------------|--------------|---------------|
| | SR | SY | SP | EP | WP | WY | WR |
| Current | +35.0 | +89.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| TGT | +13.0 | +74.1 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| ERR | +22.0 | +14.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +904 | +812 | -577 | +93.8 | +13.6 | -88.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 33 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------|-------|--------|-------|--------|--------|
| +13.0 | +74.1 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +944 | +1240 | -587 | +101.4 | +26.8 | -112.7 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

30.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_30.2 | CMRM96IM0052K:92 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------------|--------------|--------------|---------------|--------------|--------------|---------------|
| Current | +13.0 | +74.1 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| TGT | -9.0 | +59.2 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| ERR | +22.0 | +14.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +944 | +1240 | -587 | +101.4 | +26.8 | -112.7 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 34 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------|-------|--------|-------|--------|--------|
| -9.0 | +59.2 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +782 | +1640 | -561 | +120.1 | +31.5 | -142.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

30.3 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_30.3 | CMRM96IM0052K:93 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|--------------|--------------|---------------|--------------|--------------|---------------|
| Current | -9.0 | +59.2 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| TGT | -30.0 | +45.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| ERR | +21.0 | +14.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +782 | +1640 | -561 | +120.1 | +31.5 | -142.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 35 of 41 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------|-------|--------|-------|--------|--------|
| -30.0 | +45.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +466 | +1906 | -521 | +139.8 | +23.8 | -168.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

31. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|--------------------------------------------------|-------------------------------------|
| 1 MBS Mast (-65, +15) | 2 S1 LOOB (+75, -10) |
| 3 Base Elbow (+5, +5) | 4 Tip Elbow (-10, +10) |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 36 of 41 pages

31.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_31.1 | CMRM96IM0052K:94 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|---------------|--------------|--------------|---------------|--------------|---------------|--------------|
| Current | -30.0 | +45.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| TGT | -102.0 | +74.5 | -46.8 | +113.5 | -87.7 | -121.1 | +69.1 |
| ERR | +72.0 | -29.5 | +56.8 | -13.5 | -2.3 | +31.1 | +46.7 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +466 | +1906 | -521 | +139.8 | +23.8 | -168.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|-------|-------|--------|-------|--------|-------|
| -102.0 | +74.5 | -46.8 | +113.5 | -87.7 | -121.1 | +69.1 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +369 | +1781 | -488 | +130.7 | -15.1 | +131.6 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

31.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_201_SSRMS_Set_Joint_OCAS_Dest_Step_31.2 | CMRM96IM0052K:95 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------------------------------------|---------------|---------------|---------------|---------------|--------------|---------------|--------------|
| | SR | SY | SP | EP | WP | WY | WR |
| Current | -102.0 | +74.5 | -46.8 | +113.5 | -87.7 | -121.1 | +69.1 |
| TGT | -190.0 | +110.5 | -116.2 | +130.1 | -84.8 | -159.1 | +12.0 |
| ERR | +88.0 | -36.0 | +69.4 | -16.6 | -2.9 | +38.0 | +57.1 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +369 | +1781 | -488 | +130.7 | -15.1 | +131.6 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
| | -190.0 | +110.5 | -116.2 | +130.1 | -84.8 | -159.1 | +12.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +42 | +1701 | -67 | +131.2 | -41.0 | +31.8 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 38 of 41 pages

32. SSRMS BRAKES ON

| Cmd Inv | Ops Name | CIPUI |
|---------|-------------------------|---------------|
| | Lab_RWS_SSRMS_Brakes_On | CMRM96IM0855K |
| | Cup_RWS_SSRMS_Brakes_On | CMRM96IM0884K |

MSK Verify SSRMS 'MODE' – Braked

33. SSRMS CHANGE DISPLAY FRAME

| Cmd Inv | Ops Name | CIPUI |
|---------|---------------------------------------------|-------------------|
| | 6_201_SSRMS_Change_DYF_iss>issacs_POR_POS | CMRM96IM0451K:119 |
| | 6_201_SSRMS_Change_DYF_iss>issacs_POR_ORI | CMRM96IM0451K:120 |
| | 6_201_SSRMS_Change_DYF_iss>issacs_Trans_Vel | CMRM96IM0451K:121 |
| | 6_201_SSRMS_Change_DYF_iss>issacs_Rot_Vel | CMRM96IM0451K:122 |

| Frame Data | Value |
|------------|-------|
| Frame_ID | 6 |

MSK Verify SSRMS 'Disp Coord Frame' – ISS>ISSACS

34. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

| Cmd Inv | Ops Name | CIPUI |
|---------|----------------------------------------------|-------------------|
| | 6_201_SSRMS_Change_Pld_Param_LEE_Tip_SR_Held | CMRM95SM0008K:115 |

| Parameter | Value |
|-------------|-------|
| File_ID | 76 |
| OCS_File_ID | 74 |
| Payload_ID | 0 |
| GF_ID | 256 |

MSK Verify 'Unloaded Parameters' – LEE Tip, SR Held

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 39 of 41 pages

35. [CAMERA SETUP](#)

Configure downlink views to observe expected motion:

| | |
|----------------------------------------------------|------------------------------------------------------|
| 1 | 2 S1 LOOB (+80, -15) |
| 3 Base Elbow (-50, +25) | 4 LAB Stbd Zn (-180, -35) |

36. [BODY CHANGE LOADED PAYLOAD PARAMETERS](#)

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------------------|------------------|
| 6_201_SPDM_Body_Change_Pld_Param_MBS_PDGF_2_SR_Held | CMRM96IM0482K:11 |

| Parameter | Value |
|-------------|-------|
| File_ID | 430 |
| OCS_File_ID | 429 |
| Payload_ID | 20 |
| GF_ID | 8 |

MSK

Verify 'Loaded Parameters' – MBS PDGF 2, SR Held

37. [BODY CHANGE UNLOADED PAYLOAD PARAMETERS](#)

Cmd Inv

| Ops Name | CIPUI |
|---------------------------------------------------|------------------|
| 6_201_SPDM_Body_Change_Pld_Param_Body_LEE_SR_Held | CMRM96IM0482K:12 |

| Parameter | Value |
|-------------|-------|
| File_ID | 402 |
| OCS_File_ID | 401 |
| Payload_ID | 0 |
| GF_ID | 256 |

MSK

Verify 'Unloaded Parameters' – Body LEE, SR Held

38. [SPDM BODY CANCEL SAFING](#)

Cmd Inv

| Ops Name | CIPUI |
|-------------------------|---------------|
| SPDM_Body_Cancel_Safing | CMRM96IM0805K |

MSK

Verify BODY PRIME(REDUN) – Not Safed

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 40 of 41 pages

39. SPDM BODY BRAKES OFF

| Cmd Inv | Ops Name | CIPUI |
|---------|------------------------------|---------------|
| | Lab_RWS_SPDM_Body_Brakes_Off | CMRM96IM0856K |
| | Cup_RWS_SPDM_Body_Brakes_Off | CMRM96IM0885K |

MSK Verify Body 'MODE' – Standby

40. SPDM BODY JOINT OCAS MODE

| Cmd Inv | Ops Name | CIPUI |
|---------|---------------------------------|---------------|
| | SPDM_Body_Enter_Joint_OCAS_Mode | CMRM96IM0528K |

MSK Verify Body 'MODE' – Joint OCAS

40.1 SPDM BodyJoint OCAS Maneuver

| Cmd Inv | Ops Name | CIPUI |
|---------|-----------------------------------------------|------------------|
| | 6_201_SPDM_Body_Set_Joint_OCAS_Dest_Step_40.1 | CMRM96IM0630K:11 |

MSK Verify current position and OCAS Target position (within 1 deg).

| | |
|---------|---------------|
| Current | BR |
| Dest | +60.0 |
| Error | +190.0 |
| | -130.0 |

Verify PH/M Submode – Wait_conf

RPS Verify 'SPDM' – Active, Telemetry, AOS, GMT incrementing

OSTPV Verify 7 minutes of S-Band comm remaining in this pass.

| Ops Name | CIPUI |
|---------------------------------------|---------------|
| SPDM_Body_Confirm_Manipulator_Autoseq | CMRM96IM0509K |

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 body roll motion is as expected.

6.201 EVA1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 41 of 41 pages

If unexpected motion is observed:

| Ops Name | CIPUI |
|-------------|---------------|
| SPDM_Safing | CMRM96IM0456K |

MSK

Verify 'JT STAT' – Hold

Verify Body Roll position (within 1 deg).

| |
|--------|
| BR |
| +190.0 |

41. [SPDM SAFING](#)

Cmd Inv

| Ops Name | CIPUI |
|-------------|---------------|
| SPDM_Safing | CMRM96IM0456K |

MSK

Verify Arm1, Body Prime(Redun), Arm2(3) – Safed

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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 and SPDM_Safing commands should be unsafed prior to starting motion.
4. After the destination angles are loaded, the autosequence can be canceled using the SSRMS_Cancel_Manipulator and SPDM_Body_Cancel_Manipulator commands.
5. 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
 CMRM96IM0856K Lab_RWS_SPDM_Body_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
 CMRM96IM0885K Cup_RWS_SPDM_Body_Brakes_Off
 CMRM96IM0892K Cup_RWS_Proceed_With_Autosequence

1. PRE-MOTION SURVEY

Configure downlink views to observe expected motion:

| | |
|-------------------------------------------------|------------------------------------------------------|
| 1 P1 LOOB (+120, 0) | 2 LAB Stbd Zn (-165, -40) |
| 3 S1 LOOB (+70, +25) | 4 MBS Mast (+110, +10) |

1.1 P1 LOOB Survey

| | Camera | Survey Notes | Comp |
|--------------|--------------------|----------------------|------|
| Start Config | (+120, 0) | | |
| 1: Tilt Up | (+120, +10) | JEM, LAB, PLB Config | |
| 2: Pan Left | (+95, +10) | LAB, Node 3, Cup | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 2 of 58 pages

1.2 S1 LOOB Survey

| | Camera | Survey Notes | Comp |
|--------------|------------|-----------------------|------|
| Start Config | (+70, +25) | | |
| 1: Pan Right | (+95, +25) | Orbiter, LAB, Airlock | |
| 2: Tilt Down | (+95, -15) | SPDM, SSRMS Workspace | |
| 3: Pan Left | (+65, -15) | SSRMS Workspace | |
| 4: Pan Right | (+85, -15) | | |

1.3 LAB STBD Zenith Survey

| | Camera | Survey Notes | Comp |
|--------------|-------------|-----------------------|------|
| Start Config | (-165, -40) | | |
| 1: Pan Left | (-180, -40) | SPDM, SSRMS workspace | |
| 2: Tilt Up | (-180, -35) | Start Config | |

1.4 MBS Mast Survey

| | Camera | Survey Notes | Comp |
|--------------|------------|---------------------------|------|
| Start Config | (+110, 10) | | |
| 1: Pan Left | (-35, +10) | JEM, ICC, SSRMS Workspace | |
| 2: Tilt Down | (-35, -5) | MBS | |
| 3: Pan Left | (-95, -5) | SSRMS workspace | |

2. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|---------------------------------------------------|------------------------------------------------------|
| 1 Tip Elbow (-50, +10) | 2 LAB Stbd Zn (-180, -35) |
| 3 S1 LOOB (+80, -15) | 4 N/A (0, 0) |

3. BODY CHANGE LOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|---------------------------------------------------------|------------------|
| 6_301_SPDM_Body_Change_Pld_Param _MBS_PDGF_2_SR_Held | CMRM961M0482K:21 |

| Parameter | Value |
|-------------|-------|
| File_ID | 430 |
| OCS_File_ID | 429 |
| Payload_ID | 20 |
| GF_ID | 8 |

MSK

Verify 'Loaded Parameters' – MBS PDGF 2, SR Held

29 APR 10

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 3 of 58 pages

4. BODY CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------------------|------------------|
| 6_301_SPDM_Body_Change_Pld_Param _Body_LEE_SR_Held | CMRM96IM0482K:22 |

| Parameter | Value |
|-------------|-------|
| File_ID | 402 |
| OCS_File_ID | 401 |
| Payload_ID | 0 |
| GF_ID | 256 |

MSK Verify 'Unloaded Parameters' – Body LEE, SR Held

5. SPDM BODY CANCEL SAFING

Cmd Inv

| Ops Name | CIPUI |
|-------------------------|---------------|
| SPDM_Body_Cancel_Safing | CMRM96IM0805K |

MSK Verify BODY PRIME(RELUN) – Not Safed

6. SPDM BODY BRAKES OFF

Cmd Inv

| Ops Name | CIPUI |
|------------------------------|---------------|
| Lab_RWS_SPDM_Body_Brakes_Off | CMRM96IM0856K |
| Cup_RWS_SPDM_Body_Brakes_Off | CMRM96IM0885K |

MSK Verify Body 'MODE' – Standby

7. SPDM BODY JOINT OCAS MODE

Cmd Inv

| Ops Name | CIPUI |
|---------------------------------|---------------|
| SPDM_Body_Enter_Joint_OCAS_Mode | CMRM96IM0528K |

MSK Verify Body 'MODE' – Joint OCAS

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 4 of 58 pages

7.1 SPDM Body Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|----------------------------------------------|------------------|
| 6_301_SPDM_Body_Set_Joint_OCAS_Dest_Step_7.1 | CMRM96IM0630K:21 |

MSK

Verify current position and OCAS Target position (within 1 deg).

| | |
|---------|---------------|
| Current | BR |
| Dest | +190.0 |
| Error | +60.0 |
| | +130.0 |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SPDM' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutess of S-Band comm remaining in this pass.

| Ops Name | CIPUI |
|---------------------------------------|---------------|
| SPDM_Body_Confirm_Manipulator_Autoseq | CMRM96IM0509K |

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 body roll motion is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|-------------|---------------|
| SPDM_Safing | CMRM96IM0456K |

MSK

Verify 'JT STAT' – Hold

Verify Body Roll position (within 1 deg).

| |
|-------|
| BR |
| +60.0 |

8. SPDM SAFING

Cmd Inv

| Ops Name | CIPUI |
|-------------|---------------|
| SPDM_Safing | CMRM96IM0456K |

MSK

Verify Arm1, Body Prime(Redun), Arm2 (3) – Safed

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 5 of 58 pages

9. 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 |

Verify SSRMS 'MODE' – Standby

| Ops Name | CIPUI |
|------------------------|---------------|
| Lab_RWS_Enable_Vernier | CMRM96IM0848K |
| Cup_RWS_Enable_Vernier | CMRM96IM0877K |

Verify SSRMS Rates (two) – Vernier

| Ops Name | CIPUI |
|----------------------------------|-------------------|
| SSRMS_Change_Rate_Scale_Vern_1.0 | CMRM96IM0022K:001 |

Verify SSRMS Vernier Rate Scale – 1.0

10. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|------------------------------------------------------|-------------------|
| 6_301_SSRMS_Change_Pld_Param_GC_Unld_LEE_Tip_SR_Held | CMRM95SM0008K:121 |

| 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

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

11. SSRMS CHANGE LOADED PAYLOAD PARAMETERS

| Cmd Inv | Ops Name | CIPUI |
|---------|-----------------------------------------------|-------------------|
| | 6_301_SSRMS_Change_Pld_Param_LAB_PDGF_SR_Held | CMRM95SM0008K:122 |

| Parameter | Value |
|-------------|-------|
| File_ID | 69 |
| OCS_File_ID | 67 |
| Payload_ID | 20 |
| GF_ID | 1 |

MSK Verify 'Loaded Parameters' – LAB PDGF, SR Held

12. SSRMS CHANGE DISPLAY FRAME

| Cmd Inv | Ops Name | CIPUI |
|---------|-------------------------------------------|-------------------|
| | 6_301_SSRMS_Change_DYF_Lab>PDGF_POR_POS | CMRM96IM0451K:121 |
| | 6_301_SSRMS_Change_DYF_Lab>PDGF_POR_ORI | CMRM96IM0451K:122 |
| | 6_301_SSRMS_Change_DYF_Lab>PDGF_Trans_Vel | CMRM96IM0451K:123 |
| | 6_301_SSRMS_Change_DYF_Lab>PDGF_Rot_Vel | CMRM96IM0451K:124 |

| Frame Data | Value |
|------------|-------|
| Frame_ID | 12 |

MSK Verify SSRMS 'Disp Coord Frame' – Lab>PDGF

Verify SSRMS position (within 1 cm/1 deg).

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------|--------|--------|--------|--------|--------|
| -190.0 | +51.2 | -106.9 | -109.9 | -149.7 | +11.9 | -170.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +744 | +873 | +62 | +157.5 | +48.5 | +106.5 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

13. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|----------------------------------------------------|------------------------------------------------------|
| 1 Tip Elbow (0, 0) | 2 LAB Stbd Zn (-180, -15) |
| 3 JEM EXT A (-165, +50) | 4 MBS Mast (-95, +5) |

14. SSRMS JOINT OCAS MODE

| | | |
|---------|-----------------------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | SSRMS_Enter_Joint_OCAS_Mode | CMRM96IM0032K |

MSK Verify SSRMS 'MODE' – Joint OCAS

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

14.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_14.1 | CMRM96IM0052K:21 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|---------------|--------------|--------------|--------------|---------------|-------------|---------------|
| Current | -190.0 | +51.2 | -106.9 | -109.9 | -149.7 | +11.9 | -170.4 |
| TGT | -158.7 | +48.5 | -88.8 | -72.4 | -129.6 | -6.6 | -114.2 |
| ERR | -31.3 | +2.7 | -18.1 | -37.5 | -20.1 | +18.5 | -56.2 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +744 | +873 | +62 | +157.5 | +48.5 | +106.5 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 9 of 58 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------|-------|--------|--------|--------|--------|
| -158.7 | +48.5 | -88.8 | -72.4 | -129.6 | -6.6 | -114.2 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1135 | +713 | +22 | +164.2 | -1.6 | -177.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

14.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_14.2 | CMRM96IM0052K:22 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|---------------|--------------|--------------|--------------|---------------|--------------|--------------|
| Current | -158.7 | +48.5 | -88.8 | -72.4 | -129.6 | -6.6 | -114.2 |
| TGT | -133.5 | +47.8 | -69.5 | -38.7 | -121.8 | -22.9 | -69.2 |
| ERR | -25.2 | +0.7 | -19.3 | -33.7 | -7.7 | +16.3 | -45.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +1135 | +713 | +22 | +164.2 | -1.6 | -177.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 10 of 58 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------|-------|--------|--------|--------|-------|
| -133.5 | +47.8 | -69.5 | -38.7 | -121.8 | -22.9 | -69.2 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1421 | +737 | -404 | -178.1 | -37.5 | -139.2 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

- 14.3 SSRMS Joint OCAS Maneuver
Configure Cameras to observe expected motion.

| | |
|------------------------------------------|-----------------------------------------------|
| 1 Tip Elbow (0, 0) | 2 LAB Stbd Zn (-160, -15) |
| 3 S1 LOOB (+70, -20) | 4 MBS Mast (-105, +35) |

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_14.3 | CMRM96IM0052K:23 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------|------------------------------------------|--------------|--------------|--------------|---------------|--------------|--------------|
| | SR | SY | SP | EP | WP | WY | WR |
| Current | -133.5 | +47.8 | -69.5 | -38.7 | -121.8 | -22.9 | -69.2 |
| TGT | -112.8 | +47.3 | -53.6 | -10.9 | -115.5 | -36.3 | -32.2 |
| ERR | -20.7 | +0.6 | -15.9 | -27.7 | -6.4 | +13.4 | -37.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +1421 | +737 | -404 | -178.1 | -37.5 | -139.2 | |
| | FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| | DYF: LAB>PDGF | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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.

| |
|----------------------------------|
| NOTE |
| Expected EP singularity warning. |

| Ops Name | CIPUI |
|-----------------------------------|---------------|
| Lab_RWS_Proceed_With_Autosequence | CMRM96IM0863K |
| Cup_RWS_Proceed_With_Autosequence | CMRM96IM0892K |

RPS/
Downlink

Verify SSRMS motion is as expected.

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 12 of 58 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 |
| -112.8 | +47.3 | -53.6 | -10.9 | -115.5 | -36.3 | -32.2 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1400 | +862 | -898 | +173.8 | -61.4 | -136.9 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

14.4 SSRMS Joint OCAS Maneuver

Cmd Inv

| | |
|-------------------------------------------|------------------|
| Ops Name | CIPUI |
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_14.4 | CMRM96IM0052K:24 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------------------------------------|--------------|--------------|--------------|--------------|---------------|--------------|-------------|
| | SR | SY | SP | EP | WP | WY | WR |
| Current | -112.8 | +47.3 | -53.6 | -10.9 | -115.5 | -36.3 | -32.2 |
| TGT | -92.7 | +46.7 | -38.1 | +16.0 | -109.3 | -49.4 | +3.8 |
| ERR | -20.1 | +0.6 | -15.5 | -27.0 | -6.2 | +13.1 | -36.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +1400 | +862 | -898 | +173.8 | -61.4 | -136.9 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 13 of 58 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 |
|------------------------------------------|-------|-------|--------|--------|--------|------|
| -92.7 | +46.7 | -38.1 | +16.0 | -109.3 | -49.4 | +3.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1161 | +1138 | -1259 | +127.3 | -57.1 | -174.4 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

- 14.5 SSRMS Joint OCAS Maneuver
Configure Cameras to observe Expected motion.

| | |
|----------------------------|-----------------------------------------------|
| 1 Tip Elbow (0, 0) | 2 LAB Stbd Zn (-160, -35) |
| 3 S1 LOOB (+70, -20) | 4 MBS Mast (-80, +50) |

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_14.5 | CMRM96IM0052K:25 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------|------------------------------------------|--------------|--------------|--------------|---------------|--------------|--------------|
| | SR | SY | SP | EP | WP | WY | WR |
| Current | -92.7 | +46.7 | -38.1 | +16.0 | -109.3 | -49.4 | +3.8 |
| TGT | -71.4 | +46.1 | -21.8 | +44.5 | -102.7 | -63.2 | +41.8 |
| ERR | -21.3 | +0.6 | -16.3 | -28.5 | -6.5 | +13.8 | -38.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +1161 | +1138 | -1259 | +127.3 | -57.1 | -174.4 | |
| | FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| | DYF: LAB>PDGF | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 15 of 58 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------|-------|--------|--------|--------|-------|
| -71.4 | +46.1 | -21.8 | +44.5 | -102.7 | -63.2 | +41.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +841 | +1541 | -1299 | +118.3 | -26.4 | -175.9 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

14.6 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_14.6 | CMRM96IM0052K:26 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|--------------|-------------|--------------|--------------|--------------|--------------|
| Current | -71.4 | +46.1 | -21.8 | +44.5 | -102.7 | -63.2 | +41.8 |
| TGT | -50.1 | +45.6 | -5.5 | +73.0 | -96.2 | -76.9 | +79.8 |
| ERR | -21.3 | +0.6 | -16.3 | -28.5 | -6.5 | +13.8 | -38.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +841 | +1541 | -1299 | +118.3 | -26.4 | -175.9 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 16 of 58 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------|------|--------|-------|--------|-------|
| -50.1 | +45.6 | -5.5 | +73.0 | -96.2 | -76.9 | +79.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +610 | +1858 | -974 | +126.7 | +4.9 | -168.2 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

14.7 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_14.7 | CMRM96IM0052K:27 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|--------------|--------------|---------------|--------------|--------------|---------------|
| Current | -50.1 | +45.6 | -5.5 | +73.0 | -96.2 | -76.9 | +79.8 |
| TGT | -30.0 | +45.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| ERR | -20.1 | +0.6 | -15.5 | -27.0 | -6.2 | +13.1 | -36.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +610 | +1858 | -974 | +126.7 | +4.9 | -168.2 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|-------|-------|--------|-------|--------|--------|
| -30.0 | +45.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +466 | +1906 | -521 | +139.8 | +23.8 | -168.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

15. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|-------------------------------------------------|---------------------------------------------------|
| 1 Tip Elbow (0, 0) | 2 LAB Stbd Zn (-160, -35) |
| 3 S1 LOOB (+70, -15) | 4 MBS Mast (-140, +45) |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

15.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_15.1 | CMRM96IM0052K:28 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------------|--------------|--------------|---------------|--------------|--------------|---------------|
| Current | -30.0 | +45.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| TGT | -8.0 | +59.9 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| ERR | -22.0 | -14.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +466 | +1906 | -521 | +139.8 | +23.8 | -168.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|-------|-------|--------|-------|--------|--------|
| -8.0 | +59.9 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +794 | +1624 | -563 | +119.1 | +31.6 | -140.9 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

15.2 SSRMS Joint OCAS Maneuver

Configure downlink views to observe expected motion:

| | |
|--------------------------------------------------|----------------------------------------|
| 1 P1 LOIB (+160, -20) | 2 LAB Stbd Zn (-160, -35) |
| 3 S1 LOOB (+70, -15) | 4 MBS Mast (-140, +45) |

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_15.2 | CMRM96IM0052K:29 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------|------------------------------------------|--------------|--------------|---------------|--------------|--------------|---------------|
| | SR | SY | SP | EP | WP | WY | WR |
| Current | -8.0 | +59.9 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| TGT | +14.0 | +74.8 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| ERR | -22.0 | -14.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +794 | +1624 | -563 | +119.1 | +31.6 | -140.9 | |
| | FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| | DYF: LAB>PDGF | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 20 of 58 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------|-------|--------|-------|--------|--------|
| +14.0 | +74.8 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +947 | +1220 | -587 | +100.7 | +26.3 | -111.4 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

15.3 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_15.3 | CMRM96IM0052K:30 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|--------------|--------------|---------------|--------------|--------------|---------------|
| Current | +14.0 | +74.8 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| TGT | +35.0 | +89.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| ERR | -21.0 | -14.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +947 | +1220 | -587 | +100.7 | +26.3 | -111.4 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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.

| <u>NOTE</u> |
|----------------------------------|
| Expected SY singularity warning. |

| Ops Name | CIPUI |
|-----------------------------------|---------------|
| Lab_RWS_Proceed_With_Autosequence | CMRM96IM0863K |
| Cup_RWS_Proceed_With_Autosequence | CMRM96IM0892K |

RPS/

Downlink

Verify SSRMS motion is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 21 of 58 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------|-------|--------|-------|-------|--------|
| +35.0 | +89.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +904 | +812 | -577 | +93.8 | +13.6 | -88.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

16. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|-----------------------------|------------------------------|
| 1 P1 LOIB (+160, -20) | 2 P1 LOOB (+120, 0) |
| 3 JEM EF A (+115, 0) | 4 Tip Elbow (-10, +10) |

16.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_16.1 | CMRM96IM0052K:31 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|---------------|--------------|---------------|--------------|--------------|---------------|
| Current | +35.0 | +89.0 | +10.0 | +100.0 | -90.0 | -90.0 | +115.8 |
| TGT | +19.2 | +104.4 | -37.0 | +115.0 | -90.0 | -90.0 | +115.8 |
| ERR | +15.8 | -15.4 | +47.0 | -15.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +904 | +812 | -577 | +93.8 | +13.6 | -88.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

RPS/
Downlink

Verify SSRMS motion is 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 |
|------------------------------------------|--------|-------|--------|-------|-------|--------|
| +19.2 | +104.4 | -37.0 | +115.0 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +613 | +503 | -424 | +88.9 | -1.0 | -71.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

16.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_16.2 | CMRM96IM0052K:32 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------------|---------------|---------------|---------------|--------------|--------------|---------------|
| Current | +19.2 | +104.4 | -37.0 | +115.0 | -90.0 | -90.0 | +115.8 |
| TGT | -2.0 | +125.0 | -100.0 | +135.0 | -90.0 | -90.0 | +115.8 |
| ERR | +21.2 | -20.6 | +63.0 | -20.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +613 | +503 | -424 | +88.9 | -1.0 | -71.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 23 of 58 pages

RPS/
Downlink

Verify SSRMS motion is 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 | +125.0 | -100.0 | +135.0 | -90.0 | -90.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +254 | +455 | -249 | +70.9 | -14.2 | -50.4 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

17. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|------------------------------------------------|-------------------------------------|
| 1 P1 LOIB (+160, 0) | 2 P1 LOOB (+120, 0) |
| 3 JEM EF A (+115, 0) | 4 Tip Elbow (-10, +10) |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 24 of 58 pages

17.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_17.1 | CMRM96IM0052K:33 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------------|---------------|---------------|---------------|--------------|---------------|---------------|
| Current | -2.0 | +125.0 | -100.0 | +135.0 | -90.0 | -90.0 | +115.8 |
| TGT | +2.6 | +133.8 | -100.0 | +135.0 | -90.0 | -120.0 | +115.8 |
| ERR | -4.6 | -8.8 | 0.0 | 0.0 | 0.0 | +30.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +254 | +455 | -249 | +70.9 | -14.2 | -50.4 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|--------|--------|--------|-------|--------|--------|
| +2.6 | +133.8 | -100.0 | +135.0 | -90.0 | -120.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +218 | +505 | -157 | +59.2 | +6.2 | -49.2 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

17.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_17.2 | CMRM96IM0052K:34 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------------|---------------|---------------|---------------|------------|---------------|---------------|
| Current | +2.6 | +133.8 | -100.0 | +135.0 | -90.0 | -120.0 | +115.8 |
| TGT | +2.6 | +133.8 | -100.0 | +120.0 | 0.0 | -120.0 | +115.8 |
| ERR | 0.0 | 0.0 | 0.0 | +15.0 | -90.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +218 | +505 | -157 | +59.2 | +6.2 | -49.2 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|--------|--------|--------|------|--------|--------|
| +2.6 | +133.8 | -100.0 | +120.0 | 0.0 | -120.0 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +32 | +395 | -184 | +92.8 | -5.5 | -116.6 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

18. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|--------------------------------------------------|-------------------------------------|
| 1 P1 LOIB (+140, +20) | 2 P1 LOOB (+120, 0) |
| 3 JEM EF A (+115, 0) | 4 Tip Elbow (-10, +10) |

18.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_18.1 | CMRM96IM0052K:35 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------------|---------------|---------------|--------------|------------|---------------|---------------|
| Current | +2.6 | +133.8 | -100.0 | +120.0 | 0.0 | -120.0 | +115.8 |
| TGT | +2.6 | +133.8 | -100.0 | +90.0 | 0.0 | -158.5 | +115.8 |
| ERR | 0.0 | 0.0 | 0.0 | +30.0 | 0.0 | -38.5 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +32 | +395 | -184 | +92.8 | -5.5 | -116.6 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

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 |
| +2.6 | +133.8 | -100.0 | +90.0 | 0.0 | -158.5 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -248 | +232 | -147 | +101.7 | +37.6 | -98.2 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

18.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| | |
|-------------------------------------------|------------------|
| Ops Name | CIPUI |
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_18.2 | CMRM96IM0052K:36 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------------------------------------|-------------|---------------|--------------|--------------|---------------|---------------|---------------|
| | SR | SY | SP | EP | WP | WY | WR |
| Current | +2.6 | +133.8 | -100.0 | +90.0 | 0.0 | -158.5 | +115.8 |
| TGT | +2.6 | +135.3 | -96.8 | +81.6 | -103.9 | -158.5 | +115.8 |
| ERR | 0.0 | -1.5 | -3.2 | +8.4 | +103.9 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -248 | +232 | -147 | +101.7 | +37.6 | -98.2 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 28 of 58 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 |
| +2.6 | +135.3 | -96.8 | +81.6 | -103.9 | -158.5 | +115.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -200 | 0 | +1 | -0.1 | 0.0 | -0.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

19. SSRMS STANDBY MODE

Cmd Inv

| | |
|--------------------------|---------------|
| Ops Name | CIPUI |
| SSRMS_Enter_Standby_Mode | CMRM96IM0054K |

MSK

Verify SSRMS 'MODE' – Standby

20. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

| | |
|-----------------------------------------------------------|-------------------|
| Ops Name | CIPUI |
| 6_301_SSRMS_Change_Pld_Param_GC_Prox_Unld_LEE_Tip_SR_Held | CMRM95SM0008K:123 |

| 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

21. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|--------------------------------------------------|------------------------------------------------|
| 1 P1 LOIB (+140, +30) | 2 P1 LOOB (+120, 0) |
| 3 JEM EF A (+115, 0) | 4 Tip LEE |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

22. 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 |

Verify SSRMS SR 'STATUS' – LOCK

22.1 SSRMS FOR OCAS Maneuver

| Cmd Inv | Ops Name | CIPUI |
|---------|-----------------------------------------|------------------|
| | 6_301_SSRMS_Set_FOR_OCAS_Dest_Step_22.1 | CMRM96IM0053K:21 |

MSK Verify SSRMS current and target position (within 1 cm/1 deg).

| FOR TGT ERR | X | Y | Z | Pitch | Yaw | Roll | |
|-----------------------------------------------|------------|----------|----------|------------|------------|------------|--------|
| | -200 | 0 | +1 | -0.1 | 0.0 | -0.1 | |
| | -65 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| | -135 | 0 | +1 | -0.1 | 0.0 | -0.1 | |
| | SR | SY | SP | EP | WP | WY | WR |
| | +2.6 | +135.3 | -96.8 | +81.6 | -103.9 | -158.5 | +115.8 |
| FOR: Unloaded - GC Prox Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf
Verify SR – Locked

RPS Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV Verify 7 minutes of S-Band and 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 is as expected.

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 30 of 58 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 |
| +2.6 | +131.4 | -92.6 | +86.8 | -114.6 | -160.4 | +112.2 |
| 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: LAB>PDGF | | | | | | |

22.2 SSRMS FOR OCAS Maneuver

Cmd Inv

| | |
|-----------------------------------------|------------------|
| Ops Name | CIPUI |
| 6_301_SSRMS_Set_FOR_OCAS_Dest_Step_22.2 | CMRM96IM0053K:22 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----|-----------------------------------------------|----------|----------|------------|------------|------------|--------|
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -65 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR | -35 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| TGT | | | | | | | |
| ERR | -30 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| | SR | SY | SP | EP | WP | WY | WR |
| | +2.6 | +131.4 | -92.6 | +86.8 | -114.6 | -160.4 | +112.2 |
| | FOR: Unloaded - GC Prox Unld LEE Tip, SR Held | | | | | | |
| | DYF: LAB>PDGF | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is as expected.

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 31 of 58 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 |
|-----------------------------------------------|--------|-------|-------|--------|--------|--------|
| +2.6 | +130.6 | -91.4 | +87.7 | -116.9 | -160.8 | +111.5 |
| 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: LAB>PDGF | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 32 of 58 pages

Downlink 22.3 SSRMS FOR OCAS Maneuver
 Verify Downlink video is current.
 Verify LEE aligned with GF.

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|------------------|
| 6_301_SSRMS_Set_FOR_OCAS_Dest_Step_22.3 | CMRM96IM0053K:23 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----|-----------------------------------------------|----------|----------|------------|------------|------------|--------|
| | 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 |
| | +2.6 | +130.6 | -91.4 | +87.7 | -116.9 | -160.8 | +111.5 |
| | FOR: Unloaded - GC Prox Unld LEE Tip, SR Held | | | | | | |
| | DYF: LAB>PDGF | | | | | | |

Verify PH/M Submode – Wait_conf
 Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 33 of 58 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|-------|-------|--------|--------|--------|
| +2.6 | +130.1 | -90.6 | +88.2 | -118.3 | -161.1 | +111.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -16 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

23. 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 |

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

Verify 'Carriage' Retract – blue
Verify 'Latch' Latch – blue (65s max)
Verify Inhibits (three) – Inh
Verify 'Payload' Status – Captured

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 34 of 58 pages

24. 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' Status – HOT
Verify Pending Command – Mate

| Ops Name | CIPUI |
|-----------------------------|-------------------|
| Lab_RWS_RHC_Trigger_Up_Auto | CMRM96IM0851K:001 |
| Cup_RWS_RHC_Trigger_Up_Auto | CMRM96IM0880K:001 |

Verify 'Umbilical' Mate – blue (10s max)
Verify 'Umbilical' Prime Cnt, Redun Cnt (two) – blue

25. 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 |

Verify 'Carriage' Retract – gray
Verify 'Carriage' Brakes – ENG (90s max)

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 35 of 58 pages

26. SSRMS SAFING

| | | |
|---------|--------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | SSRMS_Safing | CMRM96IM0454K |

MSK Verify SSRMS – Safed

Verify SSRMS position (within 1 cm/1 deg).

| | | | | | | |
|---------------------------------|--------|-------|-------|--------|--------|--------|
| SR | SY | SP | EP | WP | WY | WR |
| +2.6 | +129.7 | -89.9 | +88.5 | -119.5 | -161.2 | +110.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Loaded - LAB PDGF, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

27. SSRMS BASE CHANGE

To powerdown SSRMS to OFF, perform [6.334 MSS POWERDOWN](#), all (SODF: RBT GEN: MSS STATE TRANSITIONS), then:

To change SSRMS Base, perform [6.435 MSS OPERATING BASE CHANGE](#), all (SODF: RBT GEN: SSRMS STATE TRANSITIONS), then:

To powerup SSRMS components, perform [6.332 MSS POWERUP](#), all (SODF: RBT GEN: MSS STATE TRANSITIONS), then:

28. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

| | | |
|---------|---------------------------------------------------------------|-------------------|
| Cmd Inv | Ops Name | CIPUI |
| | 6_301_SSRMS_Change_Pld_Param_GC _Prox_Unld_LEE_Tip_SY_Held | CMRM95SM0008K:124 |

| 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

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 36 of 58 pages

29. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|--------------------------------------------------|------------------------------------------------|
| 1 P1 LOIB (-160, -20) | 2 P1 LOOB (+120, 0) |
| 3 Tip Elbow (0, +10) | 4 Tip LEE |

30. SSRMS CANCEL SAFING

| Cmd Inv | Ops Name | CIPUI |
|---------|---------------------|---------------|
| | SSRMS_Cancel_Safing | CMRM96IM0801K |

MSK Verify SSRMS – Not Safed

31. 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

32. SSRMS SNAPSHOT

| Cmd Inv | Ops Name | CIPUI |
|---------|-------------------------------|---------------|
| | Set_Snapshot_Coordinate_Frame | CMRM96IM0457K |

MSK Verify SSRMS 'Cmd Coord Frame' (two) – SSRMS>Snapshot
Verify SSRMS 'Disp Coord Frame' (four) – SSRMS>Snapshot

33. SSRMS RIGIDIZE

| Cmd Inv | Ops Name | CIPUI |
|---------|---------------------------------------------|---------------|
| | SSRMS_Tip_LEE_Carriage_Manual_Rigidize_Slow | CMRM95SM0000K |

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 – Rigidize

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 37 of 58 pages

| Ops Name | CIPUI |
|-----------------------------|-------------------|
| Lab_RWS_RHC_Trigger_Up_Auto | CMRM96IM0851K:001 |
| Cup_RWS_RHC_Trigger_Up_Auto | CMRM96IM0880K:001 |

Verify 'Load Cell' Tension ~5500 N (90s max)

Verify 'Carriage' Retract – blue

Verify 'Carriage' Brakes – ENG

34. 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 |

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 |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 38 of 58 pages

Verify 'Umbilical' Mate – gray
Verify 'Latch' Unlatch – blue
Verify 'Carriage' Retract – gray
Verify 'Snare' Open – blue
Verify 'Carriage' Derigidize – blue
Verify 'Carriage' Extend – blue

| Ops Name | CIPUI |
|------------------------|---------------|
| SSRMS_Limp_Joints_None | CMRM96IM0122K |

Verify 'MODE' – Standby
Verify SR to WR 'Status' (seven) – Hold

35. [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 |

Verify SSRMS SY 'STATUS' – LOCK

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

35.1 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|------------------|
| 6_301_SSRMS_Set_FOR_OCAS_Dest_Step_35.1 | CMRM96IM0053K:24 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----|-----------------------------------------------|----------|----------|------------|------------|------------|------|
| | 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 |
| | +110.8 | +161.2 | -119.5 | +88.5 | -89.8 | -129.8 | +2.6 |
| | 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 minutes of S-Band and 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 40 of 58 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| | | | | | | |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| SR | SY | SP | EP | WP | WY | WR |
| +112.2 | +161.2 | -119.1 | +87.0 | -87.5 | -131.0 | +3.6 |
| 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: SSRMS>Snapshot | | | | | | |

36. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------------|-------------------|
| 6_301_SSRMS_Change_DYF_MBS>PDGF _3_POR_POS | CMRM96IM0451K:125 |
| 6_301_SSRMS_Change_DYF_MBS>PDGF _3_POR_ORI | CMRM96IM0451K:126 |
| 6_301_SSRMS_Change_DYF_MBS>PDGF _3_Trans_Vel | CMRM96IM0451K:127 |
| 6_301_SSRMS_Change_DYF_MBS>PDGF _3_Rot_Vel | CMRM96IM0451K:128 |

| Frame Data | Value |
|------------|-------|
| Frame_ID | 9 |

MSK

Verify SSRMS 'Disp Coord Frame' – MBS>PDGF 3

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 41 of 58 pages

36.1 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|------------------|
| 6_301_SSRMS_Set_FOR_OCAS_Dest_Step_36.1 | CMRM96IM0053K:25 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----------------------------------------------|-------------|----------|----------|------------|------------|------------|------|
| | X | Y | Z | Pitch | Yaw | Roll | |
| FOR | -34 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| TGT | -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| ERR | +116 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| | SR | SY | SP | EP | WP | WY | WR |
| | +112.2 | +161.2 | -119.1 | +87.0 | -87.5 | -131.0 | +3.6 |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
| +116.7 | +161.2 | -117.3 | +81.1 | -79.6 | -134.8 | +6.7 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 42 of 58 pages

37. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|-----------------------------|---------------------------------------------|
| 1 P1 LOIB (-160, -20) | 2 P1 LOOB (+120, 0) |
| 3 Tip Elbow (0, +10) | 4 JEM EXT A (-140, +30) |

38. SSRMS JOINT OCAS MODE

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------|---------------|
| SSRMS_Enter_Joint_OCAS_Mode | CMRM96IM0032K |

MSK

Verify SSRMS 'MODE' – Joint OCAS

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 43 of 58 pages

38.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_38.1 | CMRM96IM0052K:37 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|---------------|---------------|---------------|--------------|--------------|---------------|-------------|
| Current | +116.7 | +161.2 | -117.3 | +81.1 | -79.6 | -134.8 | +6.7 |
| TGT | +116.2 | +160.8 | -128.3 | +90.8 | -79.8 | -134.8 | +4.4 |
| ERR | +0.6 | +0.4 | +11.0 | -9.7 | +0.1 | +0.1 | +2.3 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +116.2 | +160.8 | -128.3 | +90.8 | -79.8 | -134.8 | +4.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -140 | +22 | +135 | +0.3 | -0.4 | -0.9 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 44 of 58 pages

38.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_38.2 | CMRM96IM0052K:38 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|---------------|---------------|---------------|---------------|--------------|---------------|-------------|
| Current | +116.2 | +160.8 | -128.3 | +90.8 | -79.8 | -134.8 | +4.4 |
| TGT | +115.6 | +160.4 | -139.3 | +100.5 | -79.9 | -134.9 | +2.2 |
| ERR | +0.6 | +0.4 | +11.0 | -9.7 | +0.1 | +0.1 | +2.2 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -140 | +22 | +135 | +0.3 | -0.4 | -0.9 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
|-----------------------------------------------|--------|--------|--------|-------|--------|------|
| +115.6 | +160.4 | -139.3 | +100.5 | -79.9 | -134.9 | +2.2 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -115 | +23 | +266 | +0.7 | -0.8 | -1.9 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

38.3 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_38.3 | CMRM96IM0052K:39 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|---------------|---------------|---------------|---------------|--------------|---------------|------------|
| Current | +115.6 | +160.4 | -139.3 | +100.5 | -79.9 | -134.9 | +2.2 |
| TGT | +115.0 | +160.0 | -150.0 | +110.0 | -80.0 | -135.0 | 0.0 |
| ERR | +0.6 | +0.4 | +10.7 | -9.5 | +0.1 | +0.1 | +2.2 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -115 | +23 | +266 | +0.7 | -0.8 | -1.9 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
|-----------------------------------------------|--------|--------|--------|-------|--------|-----|
| +115.0 | +160.0 | -150.0 | +110.0 | -80.0 | -135.0 | 0.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -77 | +5 | +388 | +1.1 | -1.2 | -2.8 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 46 of 58 pages

39. SSRMS STANDBY MODE

| | | |
|---------|--------------------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | SSRMS_Enter_Standby_Mode | CMRM96IM0054K |

MSK Verify SSRMS 'MODE' – Standby

40. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

| | | |
|---------|----------------------------------------------------------|-------------------|
| Cmd Inv | Ops Name | CIPUI |
| | 6_301_SSRMS_Change_Pld_Param_GC _Unld_LEE_Tip_SY_Held | CMRM95SM0008K:125 |

| 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

41. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|------------------------------------------------|--------------------------------------------------|
| 1 MBS Mast (+90, 0) | 2 P1 LOOB (+100, +10) |
| 3 Tip Elbow (0, +10) | 4 S1 LOOB (+90, +20) |

42. SSRMS JOINT OCAS MODE

| | | |
|---------|-----------------------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | SSRMS_Enter_Joint_OCAS_Mode | CMRM96IM0032K |

MSK Verify SSRMS 'MODE' – Joint OCAS

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

42.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_42.1 | CMRM96IM0052K:40 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|---------------|---------------|---------------|--------------|---------------|------------|
| Current | +115.0 | +160.0 | -150.0 | +110.0 | -80.0 | -135.0 | 0.0 |
| TGT | +87.0 | +155.3 | -173.3 | +110.0 | -80.0 | -135.0 | 0.0 |
| ERR | +28.0 | +4.7 | +23.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -77 | +5 | +388 | +1.1 | -1.2 | -2.8 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|--------|--------|--------|-------|--------|-----|
| +87.0 | +155.3 | -173.3 | +110.0 | -80.0 | -135.0 | 0.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +200 | +184 | +650 | -2.4 | -18.1 | +20.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 48 of 58 pages

42.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_42.2 | CMRM96IM0052K:41 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|---------------|---------------|---------------|--------------|---------------|------------|
| Current | +87.0 | +155.3 | -173.3 | +110.0 | -80.0 | -135.0 | 0.0 |
| TGT | +55.0 | +150.0 | -200.0 | +110.0 | -80.0 | -135.0 | 0.0 |
| ERR | +32.0 | +5.3 | +26.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +200 | +184 | +650 | -2.4 | -18.1 | +20.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|--------|--------|--------|-------|--------|-----|
| +55.0 | +150.0 | -200.0 | +110.0 | -80.0 | -135.0 | 0.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +366 | +174 | +1007 | -9.3 | -29.9 | +45.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 49 of 58 pages

43. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|--------------------------------------|-------------------------------------|
| 1 | 2 |
| MBS Mast (+90, -20) | P1 LOOB (+85, +20) |
| 3 | 4 |
| Tip Elbow (0, +10) | S1 LOOB (+90, +20) |

43.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_43.1 | CMRM96IM0052K:42 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|---------------|---------------|--------------|--------------|---------------|--------------|
| Current | +55.0 | +150.0 | -200.0 | +110.0 | -80.0 | -135.0 | 0.0 |
| TGT | +23.0 | +154.8 | -174.4 | +92.4 | -76.2 | -137.5 | +18.7 |
| ERR | +32.0 | -4.8 | -25.6 | +17.6 | -3.8 | +2.5 | -18.7 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +366 | +174 | +1007 | -9.3 | -29.9 | +45.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

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 |
| +23.0 | +154.8 | -174.4 | +92.4 | -76.2 | -137.5 | +18.7 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +918 | +95 | +1031 | -43.3 | -63.6 | +38.5 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

43.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| | |
|-------------------------------------------|------------------|
| Ops Name | CIPUI |
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_43.2 | CMRM96IM0052K:43 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------------------------------------|-------------|---------------|---------------|--------------|--------------|---------------|--------------|
| | SR | SY | SP | EP | WP | WY | WR |
| | +23.0 | +154.8 | -174.4 | +92.4 | -76.2 | -137.5 | +18.7 |
| Current | -3.0 | +158.7 | -153.6 | +78.1 | -73.1 | -139.6 | +33.8 |
| TGT | +26.0 | -3.9 | -20.8 | +14.3 | -3.1 | +2.1 | -15.2 |
| ERR | X | Y | Z | Pitch | Yaw | Roll | |
| | +918 | +95 | +1031 | -43.3 | -63.6 | +38.5 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

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 |
| -3.0 | +158.7 | -153.6 | +78.1 | -73.1 | -139.6 | +33.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1291 | -313 | +1190 | -132.4 | -70.3 | -29.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

43.3 SSRMS Joint OCAS Maneuver

Cmd Inv

| | |
|-------------------------------------------|------------------|
| Ops Name | CIPUI |
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_43.3 | CMRM96IM0052K:44 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------------------------------------|--------------|---------------|---------------|--------------|--------------|---------------|--------------|
| | SR | SY | SP | EP | WP | WY | WR |
| Current | -3.0 | +158.7 | -153.6 | +78.1 | -73.1 | -139.6 | +33.8 |
| TGT | -26.0 | +162.2 | -135.2 | +65.5 | -70.4 | -141.4 | +47.2 |
| ERR | +23.0 | -3.5 | -18.4 | +12.6 | -2.7 | +1.8 | -13.4 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +1291 | -313 | +1190 | -132.4 | -70.3 | -29.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is as expected.

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

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 |
| -26.0 | +162.2 | -135.2 | +65.5 | -70.4 | -141.4 | +47.2 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1365 | -862 | +1370 | -174.3 | -49.8 | -51.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

43.4 SSRMS Joint OCAS Maneuver

Cmd Inv

| | |
|-------------------------------------------|------------------|
| Ops Name | CIPUI |
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_43.4 | CMRM96IM0052K:45 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|------------------------------------------|--------------|---------------|---------------|--------------|--------------|---------------|--------------|
| | SR | SY | SP | EP | WP | WY | WR |
| | -26.0 | +162.2 | -135.2 | +65.5 | -70.4 | -141.4 | +47.2 |
| Current | -45.0 | +165.0 | -120.0 | +55.0 | -68.1 | -142.9 | +58.3 |
| TGT | +19.0 | -2.8 | -15.2 | +10.5 | -2.3 | +1.5 | -11.1 |
| ERR | X | Y | Z | Pitch | Yaw | Roll | |
| | +1365 | -862 | +1370 | -174.3 | -49.8 | -51.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 53 of 58 pages

RPS/
Downlink

Verify SSRMS motion is 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 |
| -45.0 | +165.0 | -120.0 | +55.0 | -68.1 | -142.9 | +58.3 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +1194 | -1341 | +1469 | +170.1 | -29.8 | -48.8 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

44. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|---------------------------------------------------|-------------------------------------------------|
| 1 MBS Mast (+120, -20) | 2 P1 LOOB (+85, 0) |
| 3 Tip Elbow (0, +10) | 4 S1 LOOB (+75, +25) |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

44.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_44.1 | CMRM96IM0052K:46 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|---------------|--------------|--------------|--------------|---------------|--------------|
| Current | -45.0 | +165.0 | -120.0 | +55.0 | -68.1 | -142.9 | +58.3 |
| TGT | -43.4 | +141.7 | -88.0 | +51.9 | -68.1 | -142.9 | +58.3 |
| ERR | -1.6 | +23.3 | -32.0 | +3.1 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +1194 | -1341 | +1469 | +170.1 | -29.8 | -48.8 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|--------|-------|--------|-------|--------|-------|
| -43.4 | +141.7 | -88.0 | +51.9 | -68.1 | -142.9 | +58.3 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +896 | -1744 | +1266 | -168.7 | +0.4 | -44.0 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 55 of 58 pages

44.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_44.2 | CMRM96IM0052K:47 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|---------------|--------------|--------------|--------------|---------------|--------------|
| Current | -43.4 | +141.7 | -88.0 | +51.9 | -68.1 | -142.9 | +58.3 |
| TGT | -42.0 | +122.1 | -61.0 | +49.3 | -68.1 | -142.9 | +58.3 |
| ERR | -1.4 | +19.6 | -27.0 | +2.6 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +896 | -1744 | +1266 | -168.7 | +0.4 | -44.0 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|--------|-------|--------|-------|--------|-------|
| -42.0 | +122.1 | -61.0 | +49.3 | -68.1 | -142.9 | +58.3 |
| X | Y | Z | Pitch | Yaw | Roll | |
| +365 | -1884 | +1360 | -160.3 | +29.7 | -44.4 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 56 of 58 pages

44.3 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_44.3 | CMRM96IM0052K:48 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|---------------|--------------|--------------|--------------|---------------|--------------|
| Current | -42.0 | +122.1 | -61.0 | +49.3 | -68.1 | -142.9 | +58.3 |
| TGT | -40.8 | +104.6 | -37.0 | +46.9 | -68.1 | -142.9 | +58.3 |
| ERR | -1.2 | +17.5 | -24.0 | +2.3 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | +365 | -1884 | +1360 | -160.3 | +29.7 | -44.4 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|--------|-------|--------|-------|--------|-------|
| -40.8 | +104.6 | -37.0 | +46.9 | -68.1 | -142.9 | +58.3 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -152 | -1714 | +1552 | -160.6 | +56.6 | -43.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

44.4 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_301_SSRMS_Set_Joint_OCAS_Dest_Step_44.4 | CMRM96IM0052K:49 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------|
| Current | -40.8 | +104.6 | -37.0 | +46.9 | -68.1 | -142.9 | +58.3 |
| TGT | -39.8 | +90.2 | -17.2 | +45.0 | -68.1 | -142.9 | +58.3 |
| ERR | -1.0 | +14.4 | -19.8 | +1.9 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -152 | -1714 | +1552 | -160.6 | +56.6 | -43.3 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|-------|-------|--------|-------|--------|-------|
| -39.8 | +90.2 | -17.2 | +45.0 | -68.1 | -142.9 | +58.3 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -516 | -1368 | +1665 | +177.2 | +77.3 | -23.8 | |
| FOR: Unloaded - GC Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.301 MRM-1 SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 58 of 58 pages

45. SSRMS SAFING

Cmd Inv

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

MSK

Verify SSRMS – Safed

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 1 of 20 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 canceled using the SSRMS_Cancel_Manipulator_Command (CIPUI: CMRM96IM0015K).
5. 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. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|-----------------------------------------------------|---------------------------------------------------|
| 1 P1 LOOB (+120, 0) | 2 MBS Mast (+115, +10) |
| 3 Base Elbow (+110, -15) | 4 Tip Elbow (+5, +10) |

1.1 MBS Mast Survey

| | Camera | Survey Notes | Comp |
|--------------|-------------|-----------------|------|
| Start Config | (+115, +10) | | |
| 1: Pan Left | (+60, +10) | LAB, JEM, | |
| 2: Tilt Up | (+60, +30) | JEM, EF | |
| 3: Pan Left | (-25, +30) | SSRMS workspace | |
| 4: Tilt Down | (-25, -15) | MBS | |

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 2 of 20 pages

2. 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 |

Verify SSRMS 'MODE' – Standby

| | |
|------------------------|---------------|
| Ops Name | CIPUI |
| Lab_RWS_Enable_Vernier | CMRM96IM0848K |
| Cup_RWS_Enable_Vernier | CMRM96IM0877K |

Verify SSRMS Rates (two) – Vernier

| | |
|----------------------------------|-------------------|
| Ops Name | CIPUI |
| SSRMS_Change_Rate_Scale_Vern_1.0 | CMRM96IM0022K:001 |

Verify SSRMS Vernier Rate Scale – 1.0

3. SSRMS CHANGE DISPLAY FRAME

| | | |
|-------------------------------------------|---------------------------------------------|-------------------|
| Cmd Inv | Ops Name | CIPUI |
| | 6_401_SSRMS_Change_DYF_MBS>PDGF_3_POR_POS | CMRM96IM0451K:131 |
| | 6_401_SSRMS_Change_DYF_MBS>PDGF_3_POR_ORI | CMRM96IM0451K:132 |
| | 6_401_SSRMS_Change_DYF_MBS>PDGF_3_Trans_Vel | CMRM96IM0451K:133 |
| 6_401_SSRMS_Change_DYF_MBS>PDGF_3_Rot_Vel | CMRM96IM0451K:134 | |

| | |
|------------|-------|
| Frame Data | Value |
| Frame_ID | 9 |

MSK Verify SSRMS 'Disp Coord Frame' – MBS>PDGF 3

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 3 of 20 pages

4. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|---------------------------------------------------------------|-------------------|
| 6_401_SSRMS_Change_Pld_Param_GC _Prox_Unld_LEE_Tip_SY_Held | CMRM95SM0008K:131 |

| 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

5. SSRMS CHANGE LOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------------------|-------------------|
| 6_401_SSRMS_Change_Pld_Param_ MBS_PDGF_3_SR_Held | CMRM95SM0008K:132 |

| Parameter | Value |
|-------------|-------|
| File_ID | 69 |
| OCS_File_ID | 67 |
| Payload_ID | 20 |
| GF_ID | 11 |

MSK

Verify 'Loaded Parameters' – MBS PDGF 3, SR Held

Verify SSRMS position (within 1 cm/1 deg).

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +116.8 | +161.2 | -117.3 | +81.1 | -79.9 | -134.8 | +6.6 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -151 | 0 | 0 | +0.1 | 0.0 | +0.1 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 4 of 20 pages

6. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|--------------------------------|--------------------------------------|
| 1 P1 LOOB (+120, 0) | 2 MBS Mast (-25, -15) |
| 3 Base Elbow (+110, -15) | 4 Tip LEE (0, 0) |

7. 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 |

Verify SSRMS SY 'STATUS' – LOCK

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 5 of 20 pages

7.1 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|----------------------------------------|------------------|
| 6_401_SSRMS_Set_FOR_OCAS_Dest_Step_7.1 | CMRM96IM0053K:61 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----------------------------------------------|------------|----------|----------|------------|------------|------------|------|
| | X | Y | Z | Pitch | Yaw | Roll | |
| FOR | -151 | 0 | 0 | +0.1 | 0.0 | +0.1 | |
| TGT | -65 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| ERR | -86 | 0 | 0 | +0.1 | 0.0 | +0.1 | |
| | SR | SY | SP | EP | WP | WY | WR |
| | +116.8 | +161.2 | -117.3 | +81.1 | -79.9 | -134.8 | +6.6 |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 6 of 20 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +113.5 | +161.2 | -118.7 | +85.6 | -85.5 | -132.0 | +4.5 |
| 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: MBS>PDGF 3 | | | | | | |

7.2 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|----------------------------------------|------------------|
| 6_401_SSRMS_Set_FOR_OCAS_Dest_Step_7.2 | CMRM96IM0053K:62 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | 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 |
| | +113.5 | +161.2 | -118.7 | +85.6 | -85.5 | -132.0 | +4.5 |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is as expected.

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 7 of 20 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 |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +112.2 | +161.2 | -119.1 | +87.0 | -87.6 | -131.0 | +3.6 |
| 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: MBS>PDGF 3 | | | | | | |

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 8 of 20 pages

Downlink 7.3 SSRMS FOR OCAS Maneuver
Verify Downlink video is current.
Verify LEE aligned with GF.

Cmd Inv

| Ops Name | CIPUI |
|----------------------------------------|------------------|
| 6_401_SSRMS_Set_FOR_OCAS_Dest_Step_7.3 | CMRM96IM0053K:63 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | 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 |
| | +112.2 | +161.2 | -119.1 | +87.0 | -87.6 | -131.0 | +3.6 |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf
Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is as expected.

If unexpected motion is observed:

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 9 of 20 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +111.4 | +161.2 | -119.3 | +87.9 | -88.9 | -130.3 | +3.1 |
| 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: MBS>PDGF 3 | | | | | | |

8. 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 |

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

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 10 of 20 pages

Verify 'Carriage' Retract – blue
Verify 'Latch' Latch – blue (65s max)
Verify Inhibits (three) – Inh
Verify 'Payload' Status – Captured

9. 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' Status – HOT
Verify Pending Command – Mate

| Ops Name | CIPUI |
|-----------------------------|-------------------|
| Lab_RWS_RHC_Trigger_Up_Auto | CMRM96IM0851K:001 |
| Cup_RWS_RHC_Trigger_Up_Auto | CMRM96IM0880K:001 |

Verify 'Umbilical' Mate – blue (10s max)
Verify 'Umbilical' Prime Cnt, Redun Cnt (two) – blue

10. 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

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 11 of 20 pages

| Ops Name | CIPUI |
|-----------------------------|-------------------|
| Lab_RWS_RHC_Trigger_Up_Auto | CMRM96IM0851K:001 |
| Cup_RWS_RHC_Trigger_Up_Auto | CMRM96IM0880K:001 |

Verify 'Carriage' Retract – gray
Verify 'Carriage' Brakes – ENG (90s max)

11. SSRMS SAFING

| Cmd Inv | Ops Name | CIPUI |
|---------|--------------|---------------|
| | SSRMS_Safing | CMRM96IM0454K |

MSK Verify SSRMS – Safed

Verify SSRMS Position (within 1 cm/1 deg).

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------|--------|--------|-------|-------|--------|------|
| +110.8 | +161.2 | -119.4 | +88.5 | -90.0 | -129.8 | +2.6 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Loaded - MBS PDGF 3, SR Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

12. SSRMS BASE CHANGE

To powerdown SSRMS to OFF, perform [6.334 MSS POWERDOWN](#), all (SODF: RBT GEN: NOMINAL: MSS STATE TRANSITIONS), then:

To change SSRMS Base, perform [6.435 MSS OPERATING BASE CHANGE](#), all (SODF: RBT GEN: NOMINAL: SSRMS STATE TRANSITIONS), then:

To powerup SSRMS components, perform [6.332 MSS POWERUP](#), all (SODF: RBT GEN: NOMINAL: MSS STATE TRANSITIONS), then:

13. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

| Cmd Inv | Ops Name | CIPUI |
|---------|-----------------------------------------------------------|-------------------|
| | 6_401_SSRMS_Change_Pld_Param_GC_Prox_Unld_LEE_Tip_SR_Held | CMRM95SM0008K:133 |

| 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

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 12 of 20 pages

14. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|---------------------------------------------|--------------------------------------------|
| 1 P1 LOOB (+120, 0) | 2 MBS Mast (+100, +10) |
| 3 Base Elbow (-10, +10) | 4 Tip LEE |

15. SSRMS CANCEL SAFING

| | | |
|---------|---------------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | SSRMS_Cancel_Safing | CMRM96IM0801K |

MSK Verify SSRMS – Not Safed

16. 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

17. SSRMS SNAPSHOT

| | | |
|---------|-------------------------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | Set_Snapshot_Coordinate_Frame | CMRM96IM0457K |

MSK Verify SSRMS 'Cmd Coord Frame' (two) – SSRMS>Snapshot
Verify SSRMS 'Disp Coord Frame' (four) – SSRMS>Snapshot

18. SSRMS RIGIDIZE

| | | |
|---------|---------------------------------------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | SSRMS_Tip_LEE_Carriage_Manual_Rigidize_Slow | CMRM95SM0000K |

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 – Rigidigize

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 13 of 20 pages

| Ops Name | CIPUI |
|-----------------------------|-------------------|
| Lab_RWS_RHC_Trigger_Up_Auto | CMRM96IM0851K:001 |
| Cup_RWS_RHC_Trigger_Up_Auto | CMRM96IM0880K:001 |

Verify 'Load Cell' Tension ~5500 N (90s max)
Verify 'Carriage' Retract – blue
Verify 'Carriage' Brakes – ENG

19. 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 |

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 |

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 14 of 20 pages

Verify 'Umbilical' Mate – gray
Verify 'Latch' Unlatch – blue
Verify 'Carriage' Retract – gray
Verify 'Snare' Open – blue
Verify 'Carriage' Derigidize – blue
Verify 'Carriage' Extend – blue

| Ops Name | CIPUI |
|------------------------|---------------|
| SSRMS_Limp_Joints_None | CMRM96IM0122K |

Verify 'MODE' – Standby
Verify SR to WR 'Status' (seven) – Hold

20. SSRMS ENTER FOR OCAS MODE

Cmd Inv

| Ops Name | CIPUI |
|---------------------------|---------------|
| SSRMS_Enter_FOR_OCAS_Mode | CMRM96IM0033K |

Verify SSRMS 'MODE' – FOR_OCAS

| Ops Name | CIPUI |
|-----------------------------------|---------------|
| SSRMS_Select_Base_Joint_Lock_Roll | CMRM96IM0050K |

Verify SSRMS SR 'STATUS' – LOCK

6.401 EVA2 SETUP

20.1 SSRMS FOR OCAS Maneuver

| Ops Name | CIPUI |
|-----------------------------------------|------------------|
| 6_401_SSRMS_Set_FOR_OCAS_Dest_Step_20.1 | CMRM96IM0053K:64 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----------------------------------------------|------------|----------|----------|------------|------------|------------|--------|
| | 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 |
| | +2.6 | +129.8 | -90.0 | +88.5 | -119.3 | -161.2 | +110.8 |
| 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 minutes of S-Band and 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 |

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 16 of 20 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|-------|-------|--------|--------|--------|
| +2.6 | +130.6 | -91.4 | +87.7 | -116.9 | -160.8 | +111.5 |
| 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 | | | | | | |

21. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------------|-------------------|
| 6_401_SSRMS_Change_DYF_LAB>PDGF _POR_POS | CMRM96IM0451K:135 |
| 6_401_SSRMS_Change_DYF_LAB>PDGF _POR_ORI | CMRM96IM0451K:136 |
| 6_401_SSRMS_Change_DYF_LAB>PDGF _Trans_Vel | CMRM96IM0451K:137 |
| 6_401_SSRMS_Change_DYF_LAB>PDGF _Rot_Vel | CMRM96IM0451K:138 |

| Frame Data | Value |
|------------|-------|
| Frame_ID | 12 |

MSK

Verify SSRMS 'Disp Coord Frame' – LAB>PDGF

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 17 of 20 pages

21.1 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|------------------|
| 6_401_SSRMS_Set_FOR_OCAS_Dest_Step_21.1 | CMRM96IM0053K:65 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----|-----------------------------------------------|----------|----------|------------|------------|------------|--------|
| | X | Y | Z | Pitch | Yaw | Roll | |
| FOR | -36 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| TGT | -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| ERR | +114 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| | SR | SY | SP | EP | WP | WY | WR |
| | +2.6 | +130.6 | -91.4 | +87.7 | -116.9 | -160.8 | +111.5 |
| | FOR: Unloaded - GC Prox Unld LEE Tip, SR Held | | | | | | |
| | DYF: LAB>PDGF | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 |

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 18 of 20 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|-------|-------|--------|--------|--------|
| +2.6 | +133.7 | -95.4 | +83.8 | -108.0 | -159.2 | +114.4 |
| 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: LAB>PDGF | | | | | | |

22. SSRMS STANDBY MODE

Cmd Inv

| Ops Name | CIPUI |
|--------------------------|---------------|
| SSRMS_Enter_Standby_Mode | CMRM96IM0054K |

MSK

Verify SSRMS 'MODE' – Standby

23. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|----------------------------------------------------------|-------------------|
| 6_401_SSRMS_Change_Pld_Param_GC _Unld_LEE_Tip_SR_Held | CMRM95SM0008K:134 |

| 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

24. SSRMS JOINT OCAS MODE

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------|---------------|
| SSRMS_Enter_Joint_OCAS_Mode | CMRM96IM0032K |

MSK

Verify SSRMS 'MODE' – Joint OCAS

6.401 EVA2 SETUP

24.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_401_SSRMS_Set_Joint_OCAS_Dest_Step_24.1 | CMRM96IM0052K:61 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|-------------|---------------|---------------|--------------|---------------|---------------|---------------|
| Current | +2.6 | +133.7 | -95.4 | +83.8 | -108.0 | -159.2 | +114.4 |
| TGT | +2.6 | +113.0 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |
| ERR | 0.0 | +20.7 | +9.6 | 0.0 | -0.1 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes 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 is 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 |
|------------------------------------------|--------|--------|-------|--------|--------|--------|
| +2.6 | +113.0 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -287 | +38 | -313 | +10.6 | -5.5 | +19.9 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.401 EVA2 SETUP

(RBT FS/ULF4/FIN/SPN) Page 20 of 20 pages

25. SSRMS SAFING

| | | |
|---------|--------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | SSRMS_Safing | CMRM96IM0454K |

MSK Verify SSRMS – Safed

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 canceled using the SSRMS_Cancel_Manipulator_Command (CIPUI: CMRM96IM0015K).
5. 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. PRE-MOTION SURVEY

Configure downlink views to observe expected motion:

| | |
|---------------------------------------------------|--------------------------------------------------|
| 1 P1 LOOB (+120, 0) | 2 MBS Mast (-35, -15) |
| 3 Base Elbow (+100, 0) | 4 Tip Elbow (+5, +10) |

1.1 MBS Mast Survey

| | Camera | Survey Notes | Comp |
|--------------|-------------|----------------------|------|
| Start Config | (-35, -15) | | |
| 1: Tilt Up | (-35, +30) | MBS | |
| 2: Pan Right | (+110, +30) | JEM, SSRMS Workspace | |
| 3: Tilt Down | (+110, 0) | JEM, LAB | |

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 2 of 22 pages

2. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|----------------------------------------------------------|-------------------|
| 6_501_SSRMS_Change_Pld_Param_GC _Unld_LEE_Tip_SR_Held | CMRM95SM0008K:141 |

| 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

3. SSRMS CHANGE LOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|---------------------------------------------------|-------------------|
| 6_501_SSRMS_Change_Pld_Param_ LAB_PDGF_SR_Held | CMRM95SM0008K:142 |

| Parameter | Value |
|-------------|-------|
| File_ID | 69 |
| OCS_File_ID | 67 |
| Payload_ID | 20 |
| GF_ID | 1 |

MSK

Verify 'Loaded Parameters' – LAB PDGF, SR Held

4. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------------|-------------------|
| 6_501_SSRMS_Change_DYF_LAB>PDGF _POR_POS | CMRM96IM0451K:141 |
| 6_501_SSRMS_Change_DYF_LAB>PDGF _POR_ORI | CMRM96IM0451K:142 |
| 6_501_SSRMS_Change_DYF_LAB>PDGF _Trans_Vel | CMRM96IM0451K:143 |
| 6_501_SSRMS_Change_DYF_LAB>PDGF _Rot_Vel | CMRM96IM0451K:144 |

| Frame Data | Value |
|------------|-------|
| Frame_ID | 12 |

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 3 of 22 pages

MSK Verify SSRMS 'Disp Coord Frame' – LAB>PDGF

Verify SSRMS position (within 1 cm/1 deg).

| | | | | | | |
|------------------------------------------|--------|--------|-------|--------|--------|--------|
| SR | SY | SP | EP | WP | WY | WR |
| +2.6 | +113.0 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -287 | +38 | -313 | +10.6 | -5.5 | +19.9 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

5. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|--------------------------------------------|--------------------------------------------|
| 1 P1 LOOB (+120, 0) | 2 MBS Mast (+110, +20) |
| 3 Base Elbow (+100, 0) | 4 Tip LEE |

6. 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 |

Verify SSRMS 'MODE' – Standby

| | |
|------------------------|---------------|
| Ops Name | CIPUI |
| Lab_RWS_Enable_Vernier | CMRM96IM0848K |
| Cup_RWS_Enable_Vernier | CMRM96IM0877K |

Verify SSRMS Rates (two) – Vernier

| | |
|----------------------------------|-------------------|
| Ops Name | CIPUI |
| SSRMS_Change_Rate_Scale_Vern_1.0 | CMRM96IM0022K:001 |

Verify SSRMS Vernier Rate Scale – 1.0

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 4 of 22 pages

7. SSRMS JOINT OCAS MODE

| Cmd Inv | Ops Name | CIPUI |
|---------|-----------------------------|---------------|
| | SSRMS_Enter_Joint_OCAS_Mode | CMRM96IM0032K |

MSK Verify SSRMS 'MODE' – Joint OCAS

7.1 SSRMS Joint OCAS Maneuver

| Cmd Inv | Ops Name | CIPUI |
|---------|------------------------------------------|------------------|
| | 6_501_SSRMS_Set_Joint_OCAS_Dest_Step_7.1 | CMRM96IM0052K:71 |

MSK Verify SSRMS current and target position (within 1 cm/1 deg).

| Current | SR | SY | SP | EP | WP | WY | WR |
|------------|------------------------------------------|---------------|--------------|--------------|---------------|---------------|---------------|
| | +2.6 | +113.0 | -105.0 | +83.8 | -107.9 | -159.2 | +114.4 |
| TGT | +2.6 | +133.8 | -95.5 | +83.8 | -107.9 | -159.2 | +114.4 |
| ERR | 0.0 | -20.8 | -9.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -287 | +38 | -313 | +10.6 | -5.5 | +19.9 | |
| | FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| | DYF: LAB>PDGF | | | | | | |

Verify PH/M Submode – Wait_conf

RPS Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV Verify 7 minutes 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 is as expected.

If unexpected motion is observed:

| | Ops Name | CIPUI |
|--|--------------|---------------|
| | SSRMS_Safing | CMRM96IM0454K |

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 5 of 22 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|------------------------------------------|--------|-------|-------|--------|--------|--------|
| +2.6 | +133.8 | -95.5 | +83.8 | -107.9 | -159.2 | +114.4 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -151 | 0 | 0 | 0.0 | 0.0 | -0.1 | |
| FOR: Unloaded - GC Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

8. SSRMS STANDBY MODE

Cmd Inv

| Ops Name | CIPUI |
|--------------------------|---------------|
| SSRMS_Enter_Standby_Mode | CMRM96IM0054K |

MSK

Verify SSRMS 'MODE' – Standby

9. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------------------------|-------------------|
| 6_501_SSRMS_Change_Pld_Param_GC_Prox_Unld_LEE_Tip_SR_Held | CMRM95SM0008K:143 |

| 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

10. 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 |

Verify SSRMS SR 'STATUS' – LOCK

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 6 of 22 pages

10.1 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|------------------|
| 6_501_SSRMS_Set_FOR_OCAS_Dest_Step_10.1 | CMRM96IM0053K:71 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----------------------------------------------|------------|----------|----------|------------|------------|------------|--------|
| | X | Y | Z | Pitch | Yaw | Roll | |
| FOR | -151 | 0 | 0 | 0.0 | 0.0 | -0.1 | |
| TGT | -65 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| ERR | -86 | 0 | 0 | 0.0 | 0.0 | -0.1 | |
| | SR | SY | SP | EP | WP | WY | WR |
| | +2.6 | +133.8 | -95.5 | +83.8 | -107.9 | -159.2 | +114.4 |
| FOR: Unloaded - GC Prox Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
| +2.6 | +131.4 | -92.6 | +86.8 | -114.6 | -160.4 | +112.2 |
| 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: LAB>PDGF | | | | | | |

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

10.2 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|------------------|
| 6_501_SSRMS_Set_FOR_OCAS_Dest_Step_10.2 | CMRM96IM0053K:72 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | 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 |
| | +2.6 | +131.4 | -92.6 | +86.8 | -114.6 | -160.4 | +112.2 |
| FOR: Unloaded - GC Prox Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
|-----------------------------------------------|--------|-------|-------|--------|--------|--------|
| +2.6 | +130.6 | -91.4 | +87.7 | -116.9 | -160.8 | +111.5 |
| 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: LAB>PDGF | | | | | | |

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 8 of 22 pages

10.3 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|------------------|
| 6_501_SSRMS_Set_FOR_OCAS_Dest_Step_10.3 | CMRM96IM0053K:73 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | 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 |
| | +2.6 | +130.6 | -91.4 | +87.7 | -116.9 | -160.8 | +111.5 |
| FOR: Unloaded - GC Prox Unld LEE Tip, SR Held | | | | | | | |
| DYF: LAB>PDGF | | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SR – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
|-----------------------------------------------|--------|-------|-------|--------|--------|--------|
| +2.6 | +130.1 | -90.6 | +88.2 | -118.3 | -161.0 | +111.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -16 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 9 of 22 pages

11. 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 |

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

Verify 'Carriage' Retract – blue
Verify 'Latch' Latch – blue (65s max)
Verify Inhibits (three) – Inh
Verify 'Payload' Status – Captured

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 10 of 22 pages

12. 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' Status – HOT
Verify Pending Command – Mate

| Ops Name | CIPUI |
|-----------------------------|-------------------|
| Lab_RWS_RHC_Trigger_Up_Auto | CMRM96IM0851K:001 |
| Cup_RWS_RHC_Trigger_Up_Auto | CMRM96IM0880K:001 |

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

Verify 'Umbilical' Prime Cnt, Redun Cnt (two) – blue

13. 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 |

Verify 'Carriage' Retract – gray

Verify 'Carriage' Brakes – ENG (90s max)

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 11 of 22 pages

14. SSRMS SAFING

Cmd Inv

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

MSK

Verify SSRMS – Safed

Verify SSRMS position (within 1 cm/1 deg).

| SR | SY | SP | EP | WP | WY | WR |
|---------------------------------|--------|-------|-------|--------|--------|--------|
| +2.6 | +129.7 | -89.9 | +88.5 | -119.5 | -161.2 | +110.7 |
| X | Y | Z | Pitch | Yaw | Roll | |
| 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Loaded - LAB PDGF, SR Held | | | | | | |
| DYF: LAB>PDGF | | | | | | |

15. SSRMS BASE CHANGE

To powerdown SSRMS to OFF, perform [6.334 MSS POWERDOWN](#), all (SODF: RBT GEN: NOMINAL: MSS STATE TRANSITIONS), then:

To change SSRMS Base, perform [6.435 MSS OPERATING BASE CHANGE](#), all (SODF: RBT GEN: NOMINAL: SSRMS STATE TRANSITIONS), then:

To powerup SSRMS components, perform [6.332 MSS POWERUP](#), all (SODF: RBT GEN: NOMINAL: MSS STATE TRANSITIONS), then:

16. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|--------------------------------------------------|---------------------------------------------------|
| 1 P1 LOOB (+120, 0) | 2 Tip Elbow (+10, +10) |
| 3 MBS Mast (-35, -15) | 4 Tip LEE |

17. SSRMS CHANGE UNLOADED PAYLOAD PARAMETERS

Cmd Inv

| Ops Name | CIPUI |
|---------------------------------------------------------------|-------------------|
| 6_501_SSRMS_Change_Pld_Param_GC _Prox_Unld_LEE_Tip_SY_Held | CMRM95SM0008K:144 |

| 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

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 12 of 22 pages

18. SSRMS CANCEL SAFING

| Cmd Inv | Ops Name | CIPUI |
|---------|---------------------|---------------|
| | SSRMS_Cancel_Safing | CMRM96IM0801K |

MSK Verify SSRMS – Not Safed

19. 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

20. SSRMS SNAPSHOT

| Cmd Inv | Ops Name | CIPUI |
|---------|-------------------------------|---------------|
| | Set_Snapshot_Coordinate_Frame | CMRM96IM0457K |

MSK Verify SSRMS 'Cmd Coord Frame' (two) – SSRMS>Snapshot
Verify SSRMS 'Disp Coord Frame' (four) – SSRMS>Snapshot

21. SSRMS RIGIDIZE

| Cmd Inv | Ops Name | CIPUI |
|---------|---------------------------------------------|---------------|
| | SSRMS_Tip_LEE_Carriage_Manual_Rigidize_Slow | CMRM95SM0000K |

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 – Rigidigize

| | Ops Name | CIPUI |
|--|-----------------------------|-------------------|
| | Lab_RWS_RHC_Trigger_Up_Auto | CMRM96IM0851K:001 |
| | Cup_RWS_RHC_Trigger_Up_Auto | CMRM96IM0880K:001 |

Verify 'Load Cell' Tension ~5500 N (90s max)
Verify 'Carriage' Retract – blue
Verify 'Carriage' Brakes – ENG

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 13 of 22 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 |

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 |

Verify 'Umbilical' Mate – gray
Verify 'Latch' Unlatch – blue
Verify 'Carriage' Retract – gray
Verify 'Snare' Open – blue
Verify 'Carriage' Derigidize – blue
Verify 'Carriage' Extend – blue

| Ops Name | CIPUI |
|------------------------|---------------|
| SSRMS_Limp_Joints_None | CMRM96IM0122K |

Verify 'MODE' – Standby
Verify SR to WR 'Status' (seven) – Hold

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 14 of 22 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_Yaw | CMRM96IM0051K |

Verify SSRMS SY 'STATUS' – LOCK

23.1 SSRMS FOR OCAS Maneuver

| | | |
|---------|-----------------------------------------|------------------|
| Cmd Inv | Ops Name | CIPUI |
| | 6_501_SSRMS_Set_FOR_OCAS_Dest_Step_23.1 | CMRM96IM0053K:74 |

MSK Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|---------------------|-----------------------------------------------|----------|----------|------------|------------|------------|------|
| FOR TGT ERR | X | Y | Z | Pitch | Yaw | Roll | |
| | -2 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| | -35 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| | +33 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| | SR | SY | SP | EP | WP | WY | WR |
| | +110.8 | +161.2 | -119.5 | +88.5 | -89.8 | -129.8 | +2.6 |
| | 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 minutes of S-Band and 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 is as expected.

If unexpected motion is observed:

| | |
|--------------|---------------|
| Ops Name | CIPUI |
| SSRMS_Safing | CMRM96IM0454K |

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 15 of 22 pages

MSK

Verify SSRMS SR to WR 'Status' (seven) – Hold

| SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +112.2 | +161.2 | -119.1 | +87.0 | -87.5 | -131.0 | +3.6 |
| 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: SSRMS>Snapshot | | | | | | |

24. SSRMS CHANGE DISPLAY FRAME

Cmd Inv

| Ops Name | CIPUI |
|---------------------------------------------|-------------------|
| 6_501_SSRMS_Change_DYF_MBS>PDGF 3_POR_POS | CMRM96IM0451K:145 |
| 6_501_SSRMS_Change_DYF_MBS>PDGF 3_POR_ORI | CMRM96IM0451K:146 |
| 6_501_SSRMS_Change_DYF_MBS>PDGF 3_Trans_Vel | CMRM96IM0451K:147 |
| 6_501_SSRMS_Change_DYF_MBS>PDGF 3_Rot_Vel | CMRM96IM0451K:148 |

| Frame Data | Value |
|------------|-------|
| Frame_ID | 9 |

MSK

Verify SSRMS 'Disp Coord Frame' – MBS>PDGF 3

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 16 of 22 pages

24.1 SSRMS FOR OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-----------------------------------------|------------------|
| 6_501_SSRMS_Set_FOR_OCAS_Dest_Step_24.1 | CMRM96IM0053K:75 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | | | | | | | |
|-----|-----------------------------------------------|----------|----------|------------|------------|------------|------|
| | X | Y | Z | Pitch | Yaw | Roll | |
| FOR | -34 | +1 | 0 | 0.0 | 0.0 | 0.0 | |
| TGT | -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| ERR | +116 | +1 | 0 | 0.0 | 0.0 | 0.0 | |
| | SR | SY | SP | EP | WP | WY | WR |
| | +112.2 | +161.2 | -119.1 | +87.0 | -87.5 | -131.0 | +3.6 |
| | FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| | DYF: MBS>PDGF 3 | | | | | | |

Verify PH/M Submode – Wait_conf

Verify SY – Locked

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
| | +116.7 | +161.2 | -117.3 | +81.1 | -79.7 | -134.8 | +6.6 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| | FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| | DYF: MBS>PDGF 3 | | | | | | |

25. CAMERA SETUP

Configure downlink views to observe expected motion:

| | |
|--------------------------------|-------------------------------------------|
| 1 Tip Elbow (+10, +10) | 2 P1 LOIB (-180, -35) |
| 3 Base Elbow (+110, -20) | 4 P1 LOOB (+120, 0) |

26. SSRMS JOINT OCAS MODE

| | | |
|---------|-----------------------------|---------------|
| Cmd Inv | Ops Name | CIPUI |
| | SSRMS_Enter_Joint_OCAS_Mode | CMRM96IM0032K |

MSK Verify SSRMS 'MODE' – Joint OCAS

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

26.1 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_501_SSRMS_Set_Joint_OCAS_Dest_Step_26.1 | CMRM96IM0052K:72 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|---------------|---------------|---------------|--------------|--------------|---------------|-------------|
| Current | +116.7 | +161.2 | -117.3 | +81.1 | -79.7 | -134.8 | +6.6 |
| TGT | +116.3 | +160.9 | -127.3 | +88.7 | -78.4 | -133.5 | +6.2 |
| ERR | +0.5 | +0.3 | +10.0 | -7.7 | -1.2 | -1.3 | +0.4 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -150 | 0 | 0 | 0.0 | 0.0 | 0.0 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +116.3 | +160.9 | -127.3 | +88.7 | -78.4 | -133.5 | +6.2 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -153 | +33 | +124 | +0.4 | +1.0 | +0.6 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 19 of 22 pages

26.2 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_501_SSRMS_Set_Joint_OCAS_Dest_Step_26.2 | CMRM96IM0052K:73 |

MSK

Verify SSRMS current and target position (within 1 cm/ 1deg).

| | SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|---------------|---------------|---------------|--------------|--------------|---------------|-------------|
| Current | +116.3 | +160.9 | -127.3 | +88.7 | -78.4 | -133.5 | +6.2 |
| TGT | +115.8 | +160.6 | -137.3 | +96.4 | -77.2 | -132.2 | +5.8 |
| ERR | +0.5 | +0.3 | +10.0 | -7.7 | -1.2 | -1.3 | +0.4 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -153 | +33 | +124 | +0.4 | +1.0 | +0.6 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
|-----------------------------------------------|--------|--------|-------|-------|--------|------|
| +115.8 | +160.6 | -137.3 | +96.4 | -77.2 | -132.2 | +5.8 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -142 | +50 | +247 | +0.8 | +2.0 | +1.2 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 20 of 22 pages

26.3 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_501_SSRMS_Set_Joint_OCAS_Dest_Step_26.3 | CMRM96IM0052K:74 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|---------------|---------------|---------------|---------------|--------------|---------------|-------------|
| Current | +115.8 | +160.6 | -137.3 | +96.4 | -77.2 | -132.2 | +5.8 |
| TGT | +115.4 | +160.2 | -147.3 | +104.1 | -76.0 | -131.0 | +5.3 |
| ERR | +0.5 | +0.3 | +10.0 | -7.7 | -1.2 | -1.3 | +0.4 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -142 | +50 | +247 | +0.8 | +2.0 | +1.2 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
|-----------------------------------------------|--------|--------|--------|--------|-------|--------|------|
| | +115.4 | +160.2 | -147.3 | +104.1 | -76.0 | -131.0 | +5.3 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -120 | +50 | +366 | +1.1 | +3.0 | +1.7 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 21 of 22 pages

26.4 SSRMS Joint OCAS Maneuver

Cmd Inv

| Ops Name | CIPUI |
|-------------------------------------------|------------------|
| 6_501_SSRMS_Set_Joint_OCAS_Dest_Step_26.4 | CMRM96IM0052K:75 |

MSK

Verify SSRMS current and target position (within 1 cm/1 deg).

| | SR | SY | SP | EP | WP | WY | WR |
|-----------------------------------------------|---------------|---------------|---------------|---------------|--------------|---------------|-------------|
| Current | +115.4 | +160.2 | -147.3 | +104.1 | -76.0 | -131.0 | +5.3 |
| TGT | +115.0 | +160.0 | -155.0 | +110.0 | -75.0 | -130.0 | +5.0 |
| ERR | +0.4 | +0.2 | +7.7 | -5.9 | -1.0 | -1.0 | +0.3 |
| | X | Y | Z | Pitch | Yaw | Roll | |
| | -120 | +50 | +366 | +1.1 | +3.0 | +1.7 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | | |

Verify PH/M Submode – Wait_conf

RPS

Verify 'SSRMS' – Active, Telemetry, AOS, GMT incrementing

OSTPV

Verify 7 minutes of S-Band and 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 is 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 |
|-----------------------------------------------|--------|--------|--------|-------|--------|------|
| +115.0 | +160.0 | -155.0 | +110.0 | -75.0 | -130.0 | +5.0 |
| X | Y | Z | Pitch | Yaw | Roll | |
| -95 | +40 | +452 | +1.3 | +3.8 | +2.2 | |
| FOR: Unloaded - GC Prox Unld LEE Tip, SY Held | | | | | | |
| DYF: MBS>PDGF 3 | | | | | | |

6.501 ICC BERTH SETUP

(RBT FS/ULF4/FIN/SPN/HC)

Page 22 of 22 pages

27. SSRMS SAFING

Cmd Inv

| Ops Name | CIPUI |
|--------------|---------------|
| SSRMS_Safing | CMRM96IM0454K |

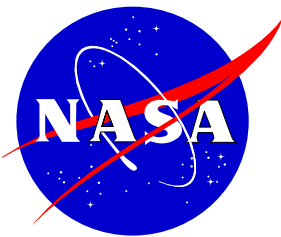
MSK

Verify SSRMS – Safed



INTERNATIONAL SPACE STATION

ROBOTICS FS



Return on
STS-132



