INTERNATIONAL SPACE STATION
ASSEMBLY OPERATIONS BOOK
ISS-5A.1

FINAL
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This document is under the configuration control of the Systems Operations Data File Control Board (SODFCB).
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NOTE
The APCUs are in a parallel configuration. When either APCU converter is turned ON, both APCU CONV talkbacks will be gray - APCU 1, 2 CONV (two) tb – gray.

CRT

1. VERIFYING ORBITER PAYLOAD BUS CONFIGURATION

R1
√PL PRI MNC tb – ON
√PL CAB MNB (MNA)
√PL AUX – ON

2. VERIFYING SWITCH POWER

SSP 1
√SW PWR 1 cb – CL

3. CLOSING APCU OUTPUT RELAY(S)

√APCU 1(2) CONV tb – bp

APCU 1(2) OUTPUT RLY → CL

4. TURNING APCU CONVERTER(S) ON

APCU 1(2) CONV → ON

√APCU 1(2) CONV tb – gray
√APCU 1(2) OUTPUT RLY tb – gray

CRT

SM 200 APCU Status

√APCU 1(2) OUT VOLTS RES HIGH: 122 --- 126.5 V
The APCUs are in a parallel configuration. When either APCU converter is turned ON, both APCU CONV talkbacks will be gray - APCU 1, 2 CONV (two) tb – gray.

CRT

SM 200 APCU Status

1. **TURNING APCU CONVERTER(S) OFF**
   - SSP 1
     - APCU 1(2) CONV → OFF
       - √APCU 1(2) CONV tb – bp
       - √APCU 1(2) OUTPUT RLY tb – bp

2. **OPENING APCU OUTPUT RELAY(S)**
   - APCU 1(2) OUTPUT RELAY → OP
ASSEMBLY
OBJECTIVE:
Install Centerline Berthing Camera System (CBCS) and perform hardware Checkout via the Station Support Computer (SSC) in preparation for MPLM installation on the Node 1 Nadir CBM.
At completion of element capture, CBCS is removed and stowed in preparation for vestibule ingress.
Installation steps 1 --- 44, removal steps 45 --- 53.

LOCATION:
Installed: Node 1 Nadir Hatch, LAB1S5
Stowed: √/Maintenance and Assembly Tasks Supplement (MATS)

DURATION:
1 hour

PARTS:
Video Interface Unit Assembly (VIU) (P/N SEG33112646-301)
Ku-Band Power Supply (P/N SEG46117451-301)
Bungee Straps (two) (P/N 15E6-3101-200-03)

Video In/Out Cable (P/N SEZ39131213-301)
VIU/CM Camcorder Video Cable (P/N SED39122269-301)

CBCS Stowage Bag:
CBCS Camera Case Assembly (P/N SEG33112759-301)
CBCS Camera Assembly (P/N SEG33112576-301)
Hatch Standoffs (four) (P/N 683-13160)
LED Control Unit Assembly (LCU) (P/N SEG33112643-301)
CBCS Camera Cable (P/N SEG33112641-301)
(Violet, Gold/Orange connectors)
CBCS Electronics Cable (P/N SEG33112638-301)
(Pink, Red/Yellow, Blue connectors)
CBCS 5A.1 Adapter Cable (P/N SEG33112650-301)
(Red connector)
CBCS Power Cable, UOP (P/N SEG46116745-301)
Multi-use Bracket (P/N SEG33107631-301)
Handrail Clamp (P/N SEG33107633-301)

MATERIALS:
Velcro Straps

TOOLS REQUIRED:
USOS IVA Tool Kit:
Kit C:
1" Deep Socket, 3/8" Drive
9/16" Socket, 3/8" Drive
Kit E:
Ratchet 3/8" Drive
Kit G:
(30-200 in-lbs) Trq Wrench, 3/8" Drive
Kit J:
  Wire Cutters
Space Station Computer (SSC)
ScopeMeter and Accessories Kit:
  Fluke 105B ScopeMeter
  Red and Black Test Leads
  Red and Black Test Pins
NODE 1 NADIR CBCS INSTALLATION/REMOVAL
(ASSY OPS/5A.1/FIN) Page 3 of 10 pages

Table of Items:
- CBCS Camera Assembly: SEG33112576-301
- CBCS Camera Cable (13 ft): SEG33112641-301
- LED Control Unit (LCU): SEG33112643-301
- Video Interface Unit (VIU): SEG33112646-301
- CBCS Electronics Cable (20ft): SEG33112638-301
- CBCS 5A.1 Adapter Cable (1.5ft): SEG33112650-301
- Ku Band Power Supply: SEG46117451-301
- CBCS Power Cable, UOP (21ft): SEG46116745-301
- VIU/CM Camcorder Video Cable (8ft): SED39122269-301
- Video In/Out Cable: SEZ39131213-301
- CBCS Power Cable, UOP: P2
- CBCS Power Cable: P1
- Station Support Computer (SSC): P1

CBCS Installation:
1. Verify no power applied to J3, J4 of LAB1SD4 UOP.
2. Install per Figure 2. Check Continuity. Refer to steps 4, 5, and 6.
4. Mount Camera with protrusion point in the direction of hatch open travel. Refer to Figures 5, 6 and steps 21, 22.
5. Verify DC illuminated on UOP. Apply power to CBCS by depressing Power Out switch of LAB1SD4 UOP. Refer to step 30.
7. Checkout CBCS via SSC, Station Apps (desktop icon), COSS Apps, Video Overlay. Refer to step 33.

Figure 1. Overview of CBCS Installation.
REFERENCED PROCEDURE(S):
CONTINUITY CHECK GENERIC

NOTE
1. If two crewmembers are available, this procedure can be split with crewmember one performing steps 1 --- 20, while crewmember two performs steps 21 --- 29.
2. When mating cables, several cables will be called out with a color in parentheses. When mating colored cables, ensure that the colors on both connectors match.

SAFING

WARNING
Failure to remove power may cause personal injury or equipment damage.

LAB1SD4
1. √No power applied to J3, J4 of LAB1SD4 UOP
   √Power Out Switch – RESET illuminated (white)
   √Fault/Test – dark
   √Test Select – DC illuminated (white)

LAB1S5
KU-BAND POWER SUPPLY INSTALLATION
2. Remove Air Volume Closeout (AVCO) from LAB1S5 and release Tie Wraps (four).
   Temporarily stow.


Figure 2.- Ku-Band Power Supply Installed on Connector Support Bracket Assembly LAB1S5.
4. Secure Ku-Band Power Supply to LAB1S5 Connector Support Bracket Assembly near grounding strap with connectors oriented to LAB1S4, bungee straps (two). Refer to Figure 2.

5. Rack grounding strap →|← Ku-Band Power Supply grounding strap, 1/4 turn fastener (one) (Ratchet 3/8" Drive, 9/16" Socket)


7. CBCS Power Cable, UOP P2 →|← J3 of LAB1SD4 UOP

8. CBCS Power Cable, UOP P1 →|← J1 of Ku-Band Power Supply

9. Secure excess CBCS Power Cable length to any unoccupied LAB1S5 secondary structure (Velcro Straps).

10. CBCS Electronics Cable P2 (pink) →|← J2 of Ku-Band Power Supply

11. CBCS Electronics Cable (red) P1 →|← P1 of CBCS 5A.1 Adapter Cable (red)

12. Locate W3222P1 on LAB1S5 Connector Support Bracket Assembly. Cut Tie-Wraps (two) (Wire Cutters). Discard Tie-Wraps. Refer to Figure 2.

13. CBCS 5A.1 Adapter Cable P2 →|← P1 W3222

**LED CONTROL UNIT (LCU), VIDEO INTERFACE UNIT (VIU) INSTALLATION**

15. Attach Handrail Clamp to Node Forward Handrail. Attach Multi-use Bracket to Handrail Clamp (seat track). Refer to Figure 3.

16. Attach LCU to Multi-use Bracket. Refer to Figure 3.

17. Velcro VIU to LCU. Refer to Figure 3.

18. CBCS Electronics Cable P4 (yellow) → J1 of LCU (green)

19. CBCS Electronics Cable P3 (blue) → J2 of VIU (light blue)
20. Configure LCU Settings.
   - Brightness Dial → 10
   - System Select Switch → SYS 1&2
   - Mode Switch → STEADY
   Refer to Figure 4.

CAMERA ASSEMBLY INSTALLATION

21. Snug Hatch Standoffs (four) to Node Nadir Hatch Ring Assembly, torque to 100 in-lbs (Ratchet 3/8" Drive, 1" Deep Socket, (30-200 in-lbs) Trq Wrench).
   Refer to Figure 5.

CAUTION
Do not let Camera Assembly impact hatch window glass because impact may damage glass anti-reflective coating.
Figure 6.- CBCS Camera Assembly Installed in Node 1 Nadir Hatch.

CAUTION
Ensure that all 1/4 turn fasteners are fully aligned and seated in hatch standoff receptacle before engaging any fastener. Improper alignment could cause captive rubber grommet to disengage from Camera Assembly and effect centerline alignment.

22. Mount CBCS Camera Assembly to standoffs with camera protrusion pointing with the direction of open hatch travel, 1/4 turn fasteners (four). Refer to Figure 6.

23. CBCS Camera Cable P2 (gold) →|← J2 of LCU (gold)

24. CBCS Camera Cable P3 (violet) →|← J3 of VIU (violet)

25. CBCS Camera Cable P1 (orange) →|← J1 of CBCS Camera Assembly (orange)

26. BNC connector P4 of CBCS Camera Cable, on cable near J2 of LCU (gold), mated

27. VIU/CM Camcorder Video Cable (VIU) →|← J1 of VIU

28. Video In/Out Cable →|← (Camcorder) VIU/CM Camcorder Video Cable

29. SSC (.Bytes) →|← Video In/Out Cable
CHECKOUT

CAUTION

Once UOP ENABLED, CBCS is energized.

√DC illuminated (white)

LAB1S
30. Enable LAB1SD4 UOP, depress Power Out Switch.

  √Power Out Switch – ENABLED illuminated (green)
  √Fault/Test – OK illuminated (green)
  √Test Select – DC illuminated (white)

31. Ku-Band Power Supply switch OUTPUT 28 V → ON

SSC
32. √SSC Power On

33. Desktop: Station Apps: COSS Apps: Video Overlay

34. Confirm CBCS video via SSC.

  Verify Camera Assembly LED illumination.

CLOSEOUT

LAB1S
35. Disable LAB1SD4 UOP, depress Power Out Switch.

  √Power Out Switch – RESET illuminated (white)
  √Fault/Test – dark
  √Test Select – DC illuminated (white)

36. Ku-Band Power Supply switch OUTPUT 28 V → OFF

SSC
37. Exit SSC Video Viewer Application, depress “Q” key.

38. Power off SSC.

39. VIU/CM Camcorder Video Cable (VIU) ←|→ J1 of VIU

40. Video In/Out Cable ←|→ (Camcorder) VIU/CM Camcorder Video Cable

41. Video In/Out Cable ←|→ (.printf.) SSC

42. Stow VIU/CM Camcorder Video Cable, Video In/Out Cable in CBCS Stowage Bag.

POST MAINTENANCE

43. Inform MCC-H of task completion.

44. √MATS for stowage of CBCS Stowage Bag

Stow tools, materials.
CBCS REMOVAL

LAB1
S5

45. Retrieve CBCS Stowage Bag.
√ MATS for stowage location

**WARNING**

Failure to remove power may cause personal injury or equipment damage.

46. √ No power applied to J3, J4 of LAB1SD4 UOP
 √ Power Out Switch – RESET illuminated (white)
 √ Fault/Test – dark
 √ Test Select – DC illuminated (white)

47. CBCS Power Cable, UOP P2 ←|→ J3 of UOP

 Remove two Bungees, Grounding Strap (Ratchet 3/8" Drive, 9/16" Socket).
 Temporarily stow.

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Once power off, cables can be removed in any order. Coil cables using Velcro Straps on cable.</td>
</tr>
<tr>
<td>2. CBCS Hatch Standoff Fittings remain on Hatch Ring Assembly to support 6A operations.</td>
</tr>
</tbody>
</table>

49. Remove all CBCS avionics cables and stow in CBCS Stowage Bag.

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stow Camera Assembly Inside Camera Case before stowing in CBCS Stowage Bag.</td>
</tr>
</tbody>
</table>

50. Remove Camera Assembly, VIU, LCU and stow in CBCS Stowage Bag.

**POST MAINTENANCE**

51. Inform MCC-H of task completion.

52. √ MATS for stowage location of CBCS Stowage Bag, Ku-Band Power Supply

53. Stow tools, materials.
OBJECTIVE:
Activate and check out Node 1 Port Active Common Berthing Mechanism (ACBM) and deploy capture latches.

LOCATION:
Node 1/AFD PCS

DURATION:
1.5 hour

REFERENCED PROCEDURE(S)
None

NOTE
1. Step titles followed by the notation “(AOS/HD)” indicate that AOS during the execution of that step is highly desired. If communication will be regained within 10 minutes prior to reaching such step, wait for AOS to perform.

2. For any off-nominal steps or any attention symbols that appear, refer to CBM PREP FOR MATE MALFUNCTION (SODF: ISS MAL: S&M).

1. VERIFYING UPSTREAM POWER CONFIGURATION
PCS
Z1: EPS: DDCU_Z13B

√Bus Voltage: 121 --- 128 V

FGB: EPS: RACU

√FGB_RACUs

√RACU 6 Converter – On
√RACU 6 Input Current ≥ 2.5 A
√Output Current: 0.3 --- 10 A
√Voltage: 121 --- 125 V

2. VERIFYING RPCM STATUS
Node 1: S&M

sel Port CBM

Node 1 Port CBM Display

sel RPCM N1RS2 C Primary Power

RPCM_N1RS2_C
√Integ Counter incrementing

Node 1 Port CBM Display

sel RPCM N1RS1 B Secondary Power

RPCM_N1RS1_B

√Integ Counter incrementing

3. **VERIFYING DATA CONFIGURATION**

Node 1 Port CBM Display

√MDM N1-2 – Primary
√MDM N1-1 – Secondary

Record Active UB-ORB-N1-1 Bus Channel: __________
Record Active UB-ORB-N1-2 Bus Channel: __________

4. **CLOSING SECONDARY RPCs (AOS/HD)**

Node 1 Port CBM Display

‘RPCM N1RS1 B’

sel RPC 5…

RPCM_N1RS1_B_RPC_5

**cmd** Close

√RPC Position – Cl

Node 1 Port CBM Display

‘RPCM N1RS1 B’

sel RPC 6…

RPCM_N1RS1_B_RPC_06

**cmd** Close

√RPC Position – Cl

Node 1 Port CBM Display

‘RPCM N1RS1 B’

sel RPC 13…

RPCM_N1RS1_B_RPC_13
cmd Close

√RPC Position – Cl

Node 1 Port CBM Display
‘RPCM N1RS1 B’

sel RPC 14…

RPCM_N1RS1_B_RPC_14

cmd Close

√RPC Position – Cl

5. ACTIVATING PORT CBM PRIMARY MASTER CONTROLLER

NOTE
Numerous (up to 20) command statuses of ‘No Broadcast’ may be indicated after activation of CBM Master Controller.

Node_1_Port_CBM_Prep_for_Mate
‘Activate master Controller’

cmd Activate UB-ORB-N1-1 Master Controller Execute
Wait 10 seconds.

√Mode – Activated
√Master – Primary
√Master Cmd Status – Complete
√Comm Error – no X

sel Built-In Test Failures

Node_1_Port_CBM_Active_Built_In_Test_Failures

√No X

Node 1 Port CBM Display
‘CBM Status’

√485 Timeout – no X
‘CBM Graphic’

Record Master Controller number: CPA _____
6. **INITIALIZING CONTROLLER POSITIONS ZERO**

   **NOTE**
   Numerous command statuses of ‘No Broadcast’ may be indicated after initial ‘Set All Positions to Zero Ch B’ command.

   ![Node 1 Port CBM Prep for Mate](image)
   ![Initialize Controller Positions](image)

   **cmd** Set All Positions to Zero 485 Ch B  **Execute**

   ![Node 1 Port CBM Display](image)
   ![CBM Status](image)

   √ Master Cmd Status – Complete

   ‘Powered Bolt Status’

   √ Cmd Status (sixteen) – Complete

   ‘Capture Latch Status’

   √ Cmd Status (four) – Complete

   **NOTE**
   Built-In Test command may be sent up to three times to clear all ‘No Broadcast’ indications.
If any Bolt or Latch Cmd Status – No Broadcast

cmd Active BIT Execute

‘Confirmation Request’

√Override Active BIT Command?

‘Initialize Controller Positions’

cmd Active BIT Execute

Wait 10 seconds.

Node 1 Port CBM Display

‘CBM Status’

√Master Cmd Status – Complete

‘Powered Bolt Status’

√Cmd Code (sixteen) – Built-In Test
√Cmd Status (sixteen) – Complete

‘Capture Latch Status’

√Cmd Code (four) – Built-In Test
√Cmd Status (four) – Complete

sel Built-In Test Failures

Node 1 Port CBM_Built_In_Test_Failures

√No X

Node 1 Port CBM Display

‘Powered Bolt Status’

√Posn (sixteen): 0 Rev

‘Capture Latch Status’

√Posn (four): 0 Deg
If any Bolt or Latch Posn ≠ 0

*Initialize Controller Positions*

**cmd** Set All Positions to Zero 485 Ch B **Execute**

*Test Bolt Drive* **cmd** Berthing Bolt Checkout **Execute**

*Confirmation Request*

**cmd** Yes **Execute**

Wait 72 seconds.
8. **DEACTIVATING PORT CBM PRIMARY MASTER CONTROLLER**

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steps 8 --- 17 verify secondary power/command path and deploy capture latches.</td>
</tr>
</tbody>
</table>

[Node_1_Port_CBM_Prep_for_Mate]

'Deactivate Port CBM'

**cmd** Deactivate  **Execute**

[Node 1 Port CBM Display]

'CBM Status’

√ Mode – Deactivated
√ Master – None

9. **OPENING SECONDARY RPCs**

[Node 1 Port CBM Display]

‘RPCM N1RS1 B’

sel RPC 5…

RPCM_N1RS1_B_RPC_5

**cmd** Open

√ RPC Position – Op

[Node 1 Port CBM Display]

‘RPCM N1RS1 B’

sel RPC 6…

RPCM_N1RS1_B_RPC_6

**cmd** Open

√ RPC Position – Op

[Node 1 Port CBM Display]

‘RPCM N1RS1 B’

sel RPC 13…

RPCM_N1RS1_B_RPC_13

**cmd** Open

√ RPC Position – Op
Node 1 Port CBM Display
‘RPCM N1RS1 B’

sel RPC 14…

RPCM_N1RS1_B_RPC_14

cmd Open

√RPC Position – Op

10. CLOSING PRIMARY RPCs

Node 1 Port CBM Display
‘RPCM N1RS2 C’

sel RPC 07…

RPCM_N1RS2_C_RPC_07

cmd Close

√RPC Position – Cl

Node 1 Port CBM Display
‘RPCM N1RS2 C’

sel RPC 08…

RPCM_N1RS2_C_RPC_08

cmd Close

√RPC Position – Cl

Node 1 Port CBM Display
‘RPCM N1RS2 C’

sel RPC 10…

RPCM_N1RS2_C_RPC_10

cmd Close

√RPC Position – Cl
11. **ACTIVATING PORT CBM SECONDARY MASTER CONTROLLER**

**NOTE**
Numerous (up to 20) command statuses of ‘**No Broadcast**’ may be indicated after activation of CBM Master Controller.

**cmd** Activate UB-ORB-N1-2 Master Controller  **Execute**
Wait 10 seconds.

√Mode – Activated
√Master – Secondary
√Master Cmd Status – Complete
√Comm Error – no X

**cmd** Select 485 Channel A  **Execute**

Node 1 Port CBM Display
‘CBM Status’

√485 Timeout – no X

‘CBM Graphic’

Record Master Controller number: CPA _____
13. Initializing Controller Positions Zero

**NOTE**
Numerous command statuses of ‘No Broadcast’ may be indicated after initial ‘Set All Positions to Zero Ch A’ command.

Node 1 Port CBM Prep for Mate
‘Initialize Controller Positions’

**cmd** Set All Positions to Zero 485 Ch A  **Execute**

Node 1 Port CBM Display
‘CBM Status’

√Master Cmd Status – Complete
√485 Channel – A
√485 Timeout – no X

**NOTE**
Built-In Test command may be sent up to three times to clear all ‘No Broadcast’ indications.
If any Bolt or Latch Cmd Status – No Broadcast

**cmd** Active BIT **Execute**

‘Confirmation Request’

√Override Active BIT Command?

‘Initialize Controller Positions’

**cmd** Active BIT **Execute**

Wait 10 seconds.

**Node 1 Port CBM Display**

‘CBM Status’

√Master Cmd Status – Complete

‘Powered Bolt Status’

√Cmd Code (sixteen) – Built-In Test
√Cmd Status (sixteen) – Complete

‘Capture Latch Status’

√Cmd Code (four) – Built-In Test
√Cmd Status (four) – Complete

sel Built-In Test Failures

**Node 1 Port CBM Built_In Test Failures**

√No X

**Node 1 Port CBM Display**

‘Powered Bolt Status’

√Posn (sixteen): 0 Rev

‘Capture Latch Status’

√Posn (four): 0 Deg
NODE 1 PORT CBM PREP FOR MATE PMA3

(ASYY OPS/5A.1/FIN) Page 12 of 15 pages

If any Bolt or Latch Posn ≠ 0

[Node 1 Port CBM Prep for Mate]
‘Initialize Controller Positions’

**cmd** Set All Positions to Zero 485 Ch B **Execute**

[Node 1 Port CBM Display]
‘CBM Status’

√ Master Cmd Status – Complete

‘Powered Bolt Status’

√ Cmd Code (sixteen) – Reload
√ Cmd Status (sixteen) – Complete
√ Posn (sixteen): 0 Rev

‘Capture Latch Status’

√ Cmd Code (four) – Reload
√ Cmd Status (four) – Complete
√ Posn (four): 0 Deg

****************************************************************

14. **DEPLOYING LATCH 1 TO 210 DEGREES (AOS/HD)**

**NOTE**

Check with **MCC** prior to opening petal covers to verify mating configuration, power and data channel redundancy, and confirm thermal status.

√ **MCC** for **GO**

[Node 1 Port CBM Prep for Mate]
‘Capture Latches to 210 Degrees’

**cmd** Deploy Latch 1 to 210 **Execute**

‘Confirmation Request’

√ Override Deploy Latch 1 Command?

**cmd** Yes **Execute**
Wait 108 seconds.

[Node 1 Port CBM Display]
‘CBM Status’

√ Master Cmd Status – Failed
13 OCT 00  31

‘Capture Latch Status’

√ Latch 1 Cmd Code – Deploy
√ Latch 1 Cmd Status – Binding
√ Latch 1 Posn: 200 --- 210 Deg
√ Latch 1 Capture Switch Cl – X

15. **DEPLOYING LATCH 2 TO 210 DEGREES (AOS/HD)**

   Node 1 Port CBM Prep for Mate
   ‘Capture Latches to 210 Degrees’

   **cmd** Deploy Latch 2 to 210  **Execute**

   ‘Confirmation Request’

   √ Override Deploy Latch 2 Command?

   **cmd** Yes  **Execute**
   Wait 108 seconds.

   Node 1 Port CBM Display
   ‘CBM Status’

   √ Master Cmd Status – Failed

   ‘Capture Latch Status’

   √ Master Cmd Status – Failed
   √ Latch 2 Cmd Code – Deploy
   √ Latch 2 Cmd Status – Binding
   √ Latch 2 Posn: 200 --- 210 Deg
   √ Latch 2 Capture Switch Cl – X

16. **DEPLOYING LATCH 3 TO 210 DEGREES (AOS/HD)**

   Node 1 Port CBM Prep for Mate
   ‘Capture Latches to 210 Degrees’

   **cmd** Deploy Latch 3 to 210  **Execute**

   ‘Confirmation Request’

   √ Override Deploy Latch 3 Command?

   **cmd** Yes  **Execute**
   Wait 108 seconds.

   Node 1 Port CBM Display
   ‘CBM Status’
17. DEPLOYING LATCH 4 TO 210 DEGREES (AOS/HD)

| Node 1 Port CBM Prep for Mate |
| ‘Capture Latches to 210 Degrees’ |

**cmd** Deploy Latch 4 to 210 **Execute**

‘Confirmation Request’

**cmd** Yes **Execute**

Wait 108 seconds.

| Node 1 Port CBM Display |
| ‘CBM Status’ |

**cmd** Stop **Execute**

| Node 1 Port CBM Display |
| ‘CBM Status’ |

Stop command may be issued up to three times to clear binding indications.
18. SETTING BOLT/LATCH START POSITIONS

Node 1 Port CBM Prep for Mate
'Reinitialize Controller Positions'

**cmd** Set Berthing Start Posns 485 Ch A **Execute**

Node 1 Port CBM Display
'CBM Status'

√ Master Cmd Status – Complete

‘Powered Bolt Status’

√ Bolt Cmd Code (sixteen) – Reload
√ Bolt Cmd Status (sixteen) – Complete
√ Bolt Posn (sixteen): 0 Revs

‘Capture Latch Status’

√ Latch Cmd Code (four) – Reload
√ Latch Cmd Status (four) – Complete
√ Latch Posn (four): 202 Deg

19. VERIFYING PETAL COVER DEPLOYMENT

Refer to Figure 1.

**NOTE**
Video should be recorded if LOS during step 19.
Downlink will be recorded if AOS with video capability.

Figure 1.- P/TV22 (CBM View).

√ CBM Petal Covers (four) fully deployed
√ Capture Latches (four) fully deployed and clear of the mating interface
√ Seal Surface clear of debris or damage
√ Mating corridor clear of obstructions
OBJECTIVE:
Activate and check out Node 1 Nadir Active Common Berthing Mechanism (ACBM) prior to demate of MPLM.

LOCATION:
NOD1/AFD EPCS

DURATION:
1 hour

REFERENCED PROCEDURE(S):
None

NOTE
1. Step titles followed by the notation “(AOS/HD)” indicate that AOS during the execution of that step is highly desired. If communication will be regained within 10 minutes of reaching such a step, wait until AOS to perform.

2. For any off-nominal steps or for any attention symbols that appear, refer to CBM PREP FOR DEMATE MALFUNCTION (SODF: ASSY OPS: S&M).

1. VERIFYING RPCM STATUS

PCS
Node 1: S&M
Node 1:S&M

sel Nadir CBM

Node 1 Nadir CBM Display

sel RPCM N13B B

RPCM_N13B_B

√Integ Counter incrementing

Node 1 Nadir CBM Display

sel RPCM N14B B

RPCM_N14B_B

√Integ Counter incrementing
2. **VERIFYING DATA CONFIGURATION**
   
   Node 1 Nadir CBM Display
   
   √ MDM N1-2 – Primary
   √ MDM N1-1 – Secondary
   
   Record Active UB-ORB-N1-1 Bus Channel: ___________
   Record Active UB-ORB-N1-2 Bus Channel: ___________

3. **ENABLING N13B B RPCs**
   
   **NOTE**
   Do not close RPCs during this step. This step enables the RPCs so they can be closed later in the procedure or following a malfunction.

   Node 1 Nadir CBM Display
   ‘RPCM N13B B’
   
   sel RPC 3
   
   RPCM_N13B_B_RPC_03
   
   cmd Close Cmd – Enable
   
   √ Close Cmd – Ena
   
   Node 1 Nadir CBM Display
   ‘RPCM N13B B’
   
   sel RPC 4
   
   RPCM_N13B_B_RPC_04
   
   cmd Close Cmd – Enable
   
   √ Close Cmd – Ena
   
   Node 1 Nadir CBM Display
   ‘RPCM N13B B’
   
   sel RPC 5
   
   RPCM_N13B_B_RPC_05
   
   cmd Close Cmd – Enable
   
   √ Close Cmd – Ena
4. **ENABLING AND CLOSING N14B B RPCs (AOS/HD)**

Node 1 Nadir CBM Display
‘RPCM N14B B’

sel RPC 11

RPCM_N14B_B_RPC_11

**cmd** Close Cmd – Enable

√Close Cmd – Ena

**cmd** Close

√RPC Position – Cl

Node 1 Nadir CBM Display
‘RPCM N14B B’

sel RPC 12

RPCM_N14B_B_RPC_12

**cmd** Close Cmd – Enable

√Close Cmd – Ena

**cmd** Close

√RPC Position – Cl

Node 1 Nadir CBM Display
‘RPCM N14B B’

sel RPC 13

RPCM_N14B_B_RPC_13
5. **ACTIVATING NADIR CBM UB-ORB-N1-1 MASTER CONTROLLER**

**NOTE**
Numerous (up to 20) command statuses of ‘No Broadcast’ may be indicated after activation of CBM Master Controller.

Node 1 Nadir CBM Display
‘Commands by Task’

sel Prep for Demate

Node 1 Nadir CBM Prep for Demate
‘Activate Master Controller’

**cmd** Activate UB-ORB-N1-1 Master Controller **Execute**
Wait 10 seconds.

Node 1 Nadir CBM Display
‘CBM Status’

- Mode – Activated
- Master – UB-ORB-N1-1
- Master Cmd Status – Complete
- Comm Error – no X
- 485 Timeout – no X
sel Built-In Test Failures

Node_1_CBMs_Active_Built_In_Test_Failures

√no X

Node 1 Nadir CBM Display
‘Functional CBM Representation (External View)’

Record Master Controller number: CPA ______

√RTL indications (four) – green

6. **INITIALIZING CONTROLLER POSITIONS ZERO**

![NOTE]

Numerous command statuses of ‘No Broadcast’ may be indicated after initial ‘Set All Positions to Zero 485 Ch B’ command.

Node 1 Nadir CBM Prep for Demate
‘Initialize Controller Positions’

**cmd** Set All Positions to Zero 485 Ch B **Execute**

Node 1 Nadir CBM Display
‘CBM Status’

√Master Cmd Status – Complete

‘Powered Bolt Status’

√Cmd Status (sixteen) – Complete

‘Capture Latch Status’

√Cmd Status (four) – Complete

![NOTE]

Built-In Test command may be sent up to three times to clear all ‘No Broadcast’ indications.
If any Bolt or Latch Cmd Status – No Broadcast

Node 1 Nadir CBM Prep for Demate
‘Initialize Controller Positions’

cmd Active BIT Execute
‘Confirmation Request’

√ Override Active BIT Command?
‘Initialize Controller Positions’

cmd Active BIT Execute
Wait 10 seconds.

Node 1 Nadir CBM Display
‘CBM Status’

√ Master Cmd Status – Complete
‘Powered Bolt Status’

√ Cmd Code (sixteen) – Built-In Test
√ Cmd Status (sixteen) – Complete
‘Capture Latch Status’

√ Cmd Code (four) – Built-In Test
√ Cmd Status (four) – Complete

sel Built-In Test Failures

Node 1 Nadir CBM Built In Test Failures

√ No X

Node 1 Nadir CBM Display
‘Powered Bolt Status’

√ Posn (sixteen): 0 Rev
‘Capture Latch Status’

√ Posn (four): 0 Deg
If any Bolt or Latch Posn ≠ 0

**Initialize Controller Positions**

```
Node 1 Nadir CBM Prep for Demate
  'Initialize Controller Positions'
```

**cmd** Set All Positions to Zero 485 Ch B **Execute**

**Node 1 Nadir CBM Display**

**'CBM Status'**

√Master Cmd Status – Complete

‘Powered Bolt Status’

√Cmd Code (sixteen) – Reload
√Cmd Status (sixteen) – Complete
√Posn (sixteen): 0 Rev

‘Capture Latch Status’

√Cmd Code (four) – Reload
√Cmd Status (four) – Complete
√Posn (four): 0 Deg

***************************************************************

**7. TESTING BOLT ACTUATORS (AOS/HD)**

**Node 1 Nadir CBM Prep for Demate**

‘Test Bolt Drive’

**cmd** Deberthing Bolt Checkout **Execute**

‘Confirmation Request’

Override Deberthing Bolt Check Command?

**cmd** Yes **Execute**

Wait 30 seconds.

**Node 1 Nadir CBM Display**

‘CBM Status’

√Master Cmd Status – Complete

‘Powered Bolt Status’

√Cmd Code (sixteen) – DBBoltck
√Cmd Status (sixteen) – Complete
√Posn (sixteen): 0 Rev
8. **DEACTIVATING NADIR CBM**

Node 1 Nadir CBM Prep for Demate

‘Deactivate CBM’

**cmd Deactivate** **Execute**

Node 1 Nadir CBM Display

‘CBM Status’

√ Mode – Deactivated

√ Master – None

9. **OPENING N14B B RPCs**

Node 1 Nadir CBM Display

‘RPCM N14B B’

**sel RPC 11**

**RPCM_N14B_B_RPC_11**

**cmd Open**

√ RPC Position – Op

Node 1 Nadir CBM Display

‘RPCM N14B B’

**sel RPC 12**

**RPCM_N14B_B_RPC_12**

**cmd Open**

√ RPC Position – Op

Node 1 Nadir CBM Display

‘RPCM N14B B’

**sel RPC 13**

**RPCM_N14B_B_RPC_13**

**cmd Open**

√ RPC Position – Op
sel RPC 14

RPCM_N14B_B_RPC_14

cmd Open

√RPC Position – Op

10. CLOSING N13B B RPCS (AOS/HD)

Node 1 Nadir CBM Display
‘RPCM N13B B’

sel RPC 3

RPCM_N13B_B_RPC_03

cmd Close

√RPC Position – Cl

Node 1 Nadir CBM Display
‘RPCM N13B B’

sel RPC 4

RPCM_N13B_B_RPC_04

cmd Close

√RPC Position – Cl

Node 1 Nadir CBM Display
‘RPCM N13B B’

sel RPC 5

RPCM_N13B_B_RPC_05

cmd Close

√RPC Position – Cl

Node 1 Nadir CBM Display
‘RPCM N13B B’

sel RPC 6

RPCM_N13B_B_RPC_06
cmd Close

√RPC Position – Cl

11. ACTIVATING NADIR CBM UB-ORB-N1-2 MASTER CONTROLLER

NOTE
Numerous (up to 20) command statuses of ‘No Broadcast’ may be indicated after activation of CBM Master Controller.

Node 1 Nadir CBM Prep for Demate
‘Activate Master Controller’

cmd Activate UB-ORB-N1-2 Master Controller Execute
Wait 10 seconds.

Node 1 Nadir CBM Display
‘CBM Status’

√/Mode – Activated
√/Master – UB-ORB-N1-2
√/Master Cmd Status – Complete
√/Comm Error – no X
√/485 Timeout – no X

sel Built-In Test Failures

Node_1_CBMACTive_Built_In_Test_Failures

√/no X

Node 1 Nadir CBM Display
‘Functional CBM Representation (External View)’

Record Master Controller number: CPA _____

12. SWITCHING RS 485 BUS TO CHANNEL A

Node 1 Nadir CBM Prep for Demate
‘Change 485 Channel’

cmd Select 485 Channel A Execute

Node 1 Nadir CBM Display
‘CBM Status’

√/Master Cmd Status – Complete
√/485 Channel – A
√/485 Timeout – no X
13. **INITIALIZING CONTROLLER POSITIONS ZERO**

**NOTE**
Numerous Command Statuses of ‘No Broadcast’ may be indicated after initial ‘Set All Positions to Zero Ch A’ command.

Node 1 Nadir CBM Prep for Demate
‘Initialize Controller Positions’

**cmd** Set All Positions to Zero 485 Ch A  **Execute**

Node 1 Nadir CBM Display
‘CBM Status’

√ Master Cmd Status – Complete

‘Powered Bolt Status’

√ Cmd Status (sixteen) – Complete

‘Capture Latch Status’

√ Cmd Status (four) – Complete

**NOTE**
Built-In Test command may be sent up to three times to clear all ‘No Broadcast’ indications.
If any Bolt or Latch Cmd Status – No Broadcast

Node 1 Nadir CBM Prep for Demate

‘Initialize Controller Positions’

**cmd** Active BIT **Execute**

‘Confirmation Request’

√Override Active BIT Command?

‘Initialize Controller Positions’

**cmd** Active BIT **Execute**

Wait 10 seconds.

Node 1 Nadir CBM Display

‘CBM Status’

√Master Cmd Status – Complete

‘Powered Bolt Status’

√Cmd Code (sixteen) – Built-In Test

√Cmd Status (sixteen) – Complete

‘Capture Latch Status’

√Cmd Code (four) – Built-In Test

√Cmd Status (four) – Complete

sel Built-In Test Failures

Node 1 Nadir CBM Active Built In Test Failures

√No X

******************************************************************************

Node 1 Nadir CBM Display

‘Powered Bolt Status’

√Posn (sixteen): 0 Rev

‘Capture Latch Status’

√Posn (four): 0 Deg
**NODE 1 NADIR CBM PREP FOR DEMATE**

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---

If any Bolt or Latch Posn ≠ 0

**Initialize Controller Positions**

**cmd** Set All Positions to Zero 485 Ch A **Execute**

**Node 1 Nadir CBM Display**

‘CBM Status’

√ Master Cmd Status – Complete

‘Powered Bolt Status’

√ Cmd Code (sixteen) – Reload

√ Cmd Status (sixteen) – Complete

√ Posn (sixteen): 0 Rev

‘Capture Latch Status’

√ Cmd Code (four) – Reload

√ Cmd Status (four) – Complete

√ Posn (four): 0 Deg

---

**14. DEPLOYING LATCH 1 TO 210 DEGREES (AOS/HD)**

**cmd** Deploy Latch 1 **Execute**

‘Confirmation Request’

√ Override Deploy Command?

**cmd** Yes **Execute**

Wait 108 seconds.

**Node 1 Nadir CBM Display**

‘CBM Status’

√ Master Cmd Status – Failed

‘Capture Latch Status’

√ Latch 1 Cmd Code – Deploy

√ Latch 1 Cmd Status – Binding

√ Latch 1 Posn: 200 --- 210 Deg
15. **DEPLOYING LATCH 2 TO 210 DEGREES (AOS/HD)**

   Node 1 Nadir CBM Prep for Demate
   ‘Deploy Capture Latches to 210 Degrees’

   **cmd** Deploy Latch 2  **Execute**
   ‘Confirmation Request’

   ✔ Override Deploy Command?
   
   **cmd** Yes  **Execute**
   Wait 108 seconds.

   Node 1 Nadir CBM Display
   ‘CBM Status’

   ✔ Master Cmd Status – Failed
   ‘Capture Latch Status’

   ✔ Latch 2 Cmd Code – Deploy
   ✔ Latch 2 Cmd Status – Binding
   ✔ Latch 2 Posn: 200 --- 210 Deg

16. **DEPLOYING LATCH 3 TO 210 DEGREES (AOS/HD)**

   Node 1 Nadir CBM Prep for Demate
   ‘Deploy Capture Latches to 210 Degrees’

   **cmd** Deploy Latch 3  **Execute**
   ‘Confirmation Request’

   ✔ Override Deploy Command?
   
   **cmd** Yes  **Execute**
   Wait 108 seconds.

   Node 1 Nadir CBM Display
   ‘CBM Status’

   ✔ Master Cmd Status – Failed
   ‘Capture Latch Status’

   ✔ Latch 3 Cmd Code – Deploy
   ✔ Latch 3 Cmd Status – Binding
   ✔ Latch 3 Posn: 200 --- 210 Deg
17. **DEPLOYING LATCH 4 TO 210 DEGREES (AOS/HD)**

Node 1 Nadir CBM Prep for Demate

‘Deploy Capture Latches to 210 Degrees’

**cmd** Deploy Latch 4 **Execute**

‘Confirmation Request’

√Override Deploy Command?

**cmd** Yes **Execute**

Wait 108 seconds.

Node 1 Nadir CBM Display

‘CBM Status’

√Master Cmd Status – Failed

‘Capture Latch Status’

√Latch 4 Cmd Code – Deploy
√Latch 4 Cmd Status – Binding
√Latch 4 Posn: 200 --- 210 Deg

18. **CLEARING BINDING COMMAND STATUSES**

**NOTE**

Stop command may be issued up to five times to clear binding indications.

Node 1 Nadir CBM Prep for Demate

**cmd** Stop **Execute**

Node 1 Nadir CBM Display

‘CBM Status’

√Master Cmd Status – Complete

‘Powered Bolt Status’

√Cmd Code (sixteen) – Stop
√Cmd Status (sixteen) – Complete

‘Capture Latch Status’

√Cmd Code (four) – Stop
√Cmd Status (four) – Complete
19. SETTING BOLT/LATCH START POSITIONS

   Node 1 Nadir CBM Prep for Demate
   ‘Reinitialize Controller Positions’

   cmd Set Deberthing Start Posns 485 Ch A Execute

   Node 1 Nadir CBM Display
   ‘CBM Status’

   √ Master Cmd Status – Complete

   ‘Powered Bolt Status’

   √ Cmd Code (sixteen) – Reload
   √ Cmd Status (sixteen) – Complete
   √ Posn (sixteen):  51 Rev

   ‘Capture Latch Status’

   √ Cmd Code (four) – Reload
   √ Cmd Status (four) – Complete
   √ Posn (four):  202 Deg

20. MOVING LATCHES TO CAPTURE POSITION

   Node 1 Nadir CBM Prep for Demate
   ‘Capture Passive CBM’

   cmd Capture for Deberth Execute

   ‘Confirmation Request’

   √ Override Capture Command?

   cmd Yes Execute
   Wait 108 seconds.

   Node 1 Nadir CBM Display
   ‘CBM Status’

   √ Master Cmd Status – Complete

   ‘Capture Latch Status’

   √ Latch 4 Cmd Code – Capture
   √ Latch 4 Cmd Status – Complete
   √ Latch 4 Posn: 11 --- 13 Deg
OBJECTIVE:
Demate MPLM from Node 1 Nadir Port using Common Berthing Mechanism (CBM).

LOCATION:
NOD1/AFD EPCS

DURATION:
45 minutes

REFERENCED PROCEDURE(S):
TBD PDRS

NOTE
For any off-nominal steps or for any attention symbols that appear, refer to CBM DEMATE MALFUNCTION (SODF: ASSY OPS: S&M).

1. VERIFYING N13B B RPCs CLOSED
   PCS
   Node 1: S&M
   Node 1:S&M
   sel Nadir CBM
   Node 1 Nadir CBM Display
   ‘RPCM N13B B’
   √RPC Position (four) – CI

2. VERIFYING CBM STATUS
   Node 1 Nadir CBM Display
   ‘CBM Status’
   √Mode – Activated
   √Master – UB-ORB-N1-2
   √Comm Error – No X
   √Master Cmd Status – Complete

3. VERIFYING MPLM CAPTURED
   Node 1 Nadir CBM Display
   ‘Capture Latch Status’
   √Posn (four): 11 --- 13 Deg
4. **LOOSENING CBM BOLTS**

   Node 1 Nadir CBM Display
   ‘Commands by Task’

   sel Demate

   Node 1 Nadir CBM Demate
   ‘Loosen Bolts’

   **cmd** Loosen  **Execute**

   ‘Confirmation Request’

   √Override Loosen Bolts Command?

   **cmd** Yes  **Execute**

   Wait 5 minutes.

   Node 1 Nadir CBM Display
   ‘CBM Status’

   √Master Cmd Status – Complete

   ‘Powered Bolt Status’

   √Cmd Code (sixteen) – LBolt
   √Cmd Status (sixteen) – Complete
   √Posn (sixteen):  50.4 --- 50.8

6. **REMOVING FIRST SET OF FOUR BOLTS**

   Node 1 Nadir CBM Demate
   ‘Remove Bolts’

   **cmd** Remove First Four  **Execute**

   ‘Confirmation Request’

   √Override Remove Bolts Command?

   **cmd** Yes  **Execute**

   Wait 6 minutes.

   Node 1 Nadir CBM Display
   ‘CBM Status’

   √Master Cmd Status – Complete

   ‘Powered Bolt Status’
7. **REMOVING SECOND SET OF FOUR BOLTS**

<table>
<thead>
<tr>
<th>Node 1 Nadir CBM Demate</th>
<th>‘Remove Bolts’</th>
</tr>
</thead>
</table>

**cmd** Remove Second Four **Execute**

‘Confirmation Request’

Override Remove Bolts_Command?

**cmd** Yes **Execute**

Wait 6 minutes.

<table>
<thead>
<tr>
<th>Node 1 Nadir CBM Display</th>
<th>‘CBM Status’</th>
</tr>
</thead>
</table>

**Master Cmd Status** – Complete

‘Powered Bolt Status’

**Cmd Code (eight)** – RBolts

**Cmd Status (eight)** – Complete

**Posn (eight)**: 21.4 --- 21.8

**Load (eight)**: 0

8. **REMOVING THIRD SET OF FOUR BOLTS**

**CAUTION**

1. To prevent damage to Active CBM (ACBM), Free Drift thruster inhibit is required from initiation of removal of the third set of four CBM powered bolts until MPLM is clear of Node 1 Nadir Port.

2. SRMS should be grappled to MPLM and brakes should be applied prior to performing step 8.

**A6U**

**DAP**: FREE

**TBD PDRS**

<table>
<thead>
<tr>
<th>Node 1 Nadir CBM Demate</th>
<th>‘Remove Bolts’</th>
</tr>
</thead>
</table>

**cmd** Remove Third Four **Execute**
‘Confirmation Request’

√Override Remove Bolts_Command?

**cmd Yes Execute**

Wait 6 minutes.

**Node 1 Nadir CBM Display**

‘CBM Status’

√Master Cmd Status – Complete

‘Powered Bolt Status’

√Cmd Code (twelve) – RBolts

√Cmd Status (twelve) – Complete

√Posn (twelve): 21.4 --- 21.8

√Load (twelve): 0

9. **REMOVING FINAL SET OF FOUR BOLTS**

**Node 1 Nadir CBM Demate**

‘Remove Bolts’

**cmd Remove Last Four Execute**

‘Confirmation Request’

√Override Remove Bolts_Command?

**cmd Yes Execute**

Wait 6 minutes.

**Node 1 Nadir CBM Display**

‘CBM Status’

√Master Cmd Status – Complete

‘Powered Bolt Status’

√Cmd Code (sixteen) – RBolts

√Cmd Status (sixteen) – Complete

√Posn (sixteen): 21.2 --- 21.8

√Load (sixteen): 0
10. **DEPLOYING CAPTURE LATCHES**

   Node 1 Nadir CBM Demate
   ‘Deploy Capture Latches’

   **cmd** Deploy  **Execute**
   ‘Confirmation Request’

   √ Override Deploy Command?

   **cmd** Yes  **Execute**
   Wait 108 seconds.

   Node 1 Nadir CBM Display
   ‘CBM Status’

   √ Master Cmd Status – Complete
   ‘Capture Latch Status’

   √ Cmd Code (four) – Deploy
   √ Cmd Status (four) – Complete
   √ Posn (four): 199 --- 200

11. **REINITIALIZING BOLT POSITIONS**

   Node 1 Nadir CBM Display
   ‘Commands by Type’

   sel Prebuilt Commands

   CBM Prebuilt Commands
   ‘CBM Nonactuation Commands’

   sel Set Bolt Positions

   CBM Set Bolt Posn_cmds

   **cmd** Set Bolt Posns Zero 485 Ch A  **Execute**

   Node 1 Nadir CBM Display
   ‘CBM Status’

   √ Master Cmd Status – Complete
   ‘Powered Bolt Status’

   √ Cmd Code (sixteen) – Reload
   √ Cmd Status (sixteen) – Complete
   √ Posn (sixteen): 0 Rev
12. **PREBERTHING INSPECTION OF ACTIVE CBM**

Refer to P/TV C/L.

NOTE

Video should be recorded if LOS during step 12. Downlink will be recorded if AOS with video capability.

![Figure 1.- CCTV Configuration for Inspection Camera B, C.](image)

- √ Capture latches (four) fully deployed and clear of the mating interface
- √ Mating corridor and surface are clear of obstructions

NOTE

Nadir CBM is now prepared for MPLM DEMATE

(FDF: PDRS OPS C/L, PMA2: Node 1 To Z1).
OBJECTIVE:
Verify status of Node 1 Port Active Common Berthing Mechanism (ACBM)
before beginning mate operations.

LOCATION:
Node 1/AFD EPCS

DURATION:
5 minutes

REFERENCED PROCEDURE(S):
TBD PDRS

NOTE
For any off-nominal steps or any attention
symbols that appear, refer to CBM PREP FOR
MATE MALFUNCTION (SODF: ISS MAL: S&M).

1. PRIMARY RPCS CLOSED VERIFICATION
   TBD PDRS

   PCS
   Node 1: S&M
       Node 1: S&M
   sel Port CBM
   Node 1 Port CBM Display
   ‘RPCM N1RS2 C Primary Power’
   √RPC Posn (four) – Cl

2. CBM STATUS VERIFICATION
   Node 1 Port CBM Display
   ‘CBM Status’
   √Mode – Activated
   √Master – Secondary
   √Comm Error – no X
   √Master Cmd Status – Complete
   ‘Capture Latch Status’
   √Posn (four): 202 Deg
   ‘Powered Bolt Status’
   √Posn (sixteen): 0 Rev
   ‘CBM Graphic’
   √RTL (four) – gray
OBJECTIVE:
Perform first stage capture following translation of PMA3 into ready to latch position for berthing to Node 1 Port Active Common Berthing Mechanism (ACBM).
CBM capture latches are driven from initial position of 202 degrees (fully deployed) to approximately 186 degrees.

LOCATION:
Node 1/AFD EPCS

DURATION:
5 minutes

REFERENCED PROCEDURE(S):
TBD PDRS

NOTE
1. Step titles followed by the notation “(AOS/M)” indicate that AOS during the execution of that step is mandatory. If currently LOS or expecting LOS prior to completion of an AOS/M step, wait for the next AOS to perform step.

2. For any off-nominal steps or any attention symbols that appear, refer to CBM MATE MALFUNCTION (SODF: ISS MAL: S&M).

3. Step 1 is performed with the SRMS in Position Hold Mode.

4. Capture sequence may be initiated with three of four RTLs closed. In this case, the latch associated with the open RTL must be masked.

1. READY TO LATCH INDICATORS (RTLS) CLOSED VERIFICATION
TBD PDRS

PCS
Node 1: S&M
Node 1:S&M

sel Port CBM

Node 1 Port CBM Display
‘CBM Graphic’

√RTL (four) – green
If RTL [X] (where [X] = 1 2 3 4) is gray after repeated attempts to gain ready to latch indication

√MCC for GO

sel Latch X

Latch X Details

sel Commands

Latch X Commands

**CMD** Mask Latch X  **Execute**

Node 1 Port CBM Display

‘CBM graphic’

√Latch X – Ø

**********************************************************

2. **FIRST STAGE CAPTURE PERFORMANCE (AOS/M)**

**CAUTION**

To prevent damage to Active CBM (ACBM), Free Drift is required from initiation of CBM capture latch operation until a minimum of eight alternating bolts (every other bolt) have completed the Abolts command. SRMS shall remain grappled to PMA3 until such time.

A6U  √DAP:  FREE

PCS  Node 1 Port CBM Display

‘Commands by Task’

sel Mate

Node_1_Port_CBM_Mate

‘Capture Passive CBM’

**CMD** Capture First Stage  **Execute**

√Override Capture First Stage Command?

**CMD** Yes  **Execute**

Wait 15 seconds.
√ Master Cmd Status – Complete
√ Cmd Code (four) – Capture
√ Cmd Status (four) – Complete
√ Posn (four): 185 --- 187 Deg
√ Capture Sw Op (four) – X
OBJECTIVE:
Perform second stage capture following first stage capture and transition of Shuttle Remote Manipulator System (SRMS) into test mode. Common Berthing Mechanism (CBM) capture latches are driven from initial position of approximately 186 degrees to 12 degrees in preparation for bolt drive.

LOCATION:
Node 1/AFD EPCS

DURATION:
5 minutes

REFERENCED PROCEDURE(S):
TBD PDRS

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Step titles followed by the notation “(AOS/M)” indicated that AOS during the execution of that step is mandatory. If currently LOS or expecting LOS prior to completion of an AOS/M step, wait for the next AOS to perform step.</td>
</tr>
<tr>
<td>2. If berthing must be completed with SRMS brakes on and second stage capture results in a latch jammed indication, refer to CBM BRAKES ON CAPTURE (SODF: ISS MAL: S&amp;M).</td>
</tr>
<tr>
<td>3. For any other off-nominal steps or any attention symbols that appear, refer to CBM MATE MALFUNCTION (SODF: ISS MAL: S&amp;M).</td>
</tr>
<tr>
<td>4. Step 1 is performed following SRMS transition to test mode.</td>
</tr>
<tr>
<td>5. Following SRMS transition to Test Mode, closed RTLs may open due to RTL spring forces. RTL closed indication is not required prior to execution of second stage capture.</td>
</tr>
</tbody>
</table>

1. **PERFORMING SECOND STAGE CAPTURE (AOS/M)**

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>To prevent damage to Active CBM (ACBM), Free Drift is required from initiation of CBM capture latch operation until a minimum of eight alternating bolts (every other bolt) have completed the ABolts command. SRMS shall remain grappled to PMA3 until such time.</td>
</tr>
</tbody>
</table>

TBD PDRS

PCS

Node 1: S&M

Node 1: S&M
sel Port CBM

Node 1 Port CBM Display
‘Commands by Task’

sel Mate

Node_1.Port_CBM_Mate
‘Capture Passive CBM’

cmd Capture Second Stage Execute

√Override Capture Second Stage Command?

cmd Yes Execute

Wait 60 seconds.

√Master Cmd Status – Complete
√Cmd Code (four) – Capture
√Cmd Status (four) – Complete
√Posn (four): 11 --- 13 Deg
OBJECTIVE:
Actuate powered bolts on Node 1 Port Active Common Berthing Mechanism (ACBM) to acquire nut assemblies on PMA3 Passive Common Berthing Mechanism (PCBM).

LOCATION:
Node 1/AFD EPCS

DURATION:
15 minutes

REFERENCED PROCEDURE(S):
None

NOTE
1. Step titles followed by the notation “(AOS/M)” indicate that AOS during the execution of that step is mandatory. If currently LOS or expecting LOS prior to completion of an AOS/M step, wait for the next AOS to perform step.

2. For any off-nominal steps or any attention symbols that appear, refer to CBM MATE MALFUNCTION (SODF: ISS MAL: S&M).

1. BOLTS ACQUISITION (AOS/M)

CAUTION
1. To prevent damage to Active CBM (ACBM), Free Drift is required from initiation of CBM capture latch operation until a minimum of eight alternating bolts (every other bolt) complete the ABolts command. SRMS shall remain grappled to PMA3 until such time.

2. A 12-hour thermal equilibrium hold is required after completion of ABolts command. Record date and time (GMT) after verification of nominal completion of ABolts command.

PCS
Node 1: S&M
Node 1:S&M

sel Port CBM

Node 1 Port CBM Display
‘Commands by Task’

sel Mate

Node_1_Port_CBM_Mate
‘Engage Passive CBM Nuts’

cmd Acquire Bolts Execute

√Override Acquire Bolts Command?
cmd Yes  Execute
Wait 7 minutes.

✓Master Cmd Status  – Complete
✓Cmd Code (sixteen)  – ABolts
✓Cmd Status (sixteen)  – Complete
✓Load (sixteen):  0 --- 7.78 kN
OBJECTIVE:
Complete mate of PMA3 to Node 1 Port port using Common Berthing Mechanism (CBM).

LOCATION:
Node 1/AFD EPCS

DURATION:
1 hour

REFERENCED PROCEDURE(S):
None

NOTE
1. Step titles followed by the notation “(AOS/M)” indicate that AOS during the execution of that step is mandatory. If currently LOS or expecting LOS prior to completion of an AOS/M step, wait for the next AOS to perform step.

2. Step titles followed by the notation “(AOS/HD)” indicate that AOS during the execution of that step is highly desired. If communication will be regained within 5 minutes of reaching such step, wait for AOS to perform.

3. For any off-nominal steps or any attention symbols that appear, refer to CBM MATE MALFUNCTION (SOFD: ISS MAL: S&M).

4. During intermediate and final torque performance, order of bolt tightening is as follows:
   - Bolts 2-2, 2-3, 4-2, 4-3
   - Bolts 2-1, 2-4, 4-1, 4-4
   - Bolts 1-1, 1-4, 3-1, 3-4
   - Bolts 1-2, 1-3, 3-2, 3-3

1. INTERMEDIATE TORQUE FIRST STAGE PERFORMANCE (AOS/M)

PCS
Node 1: S&M
Node 1: S&M

sel Port CBM

Node 1 Port CBM Display
‘Commands by Task’

sel Mate

Node_1_Port_CB_Mate
‘Perform Intermediate Torque sequence’

MCC for GO
NODE 1 PORT CBM BOLT LOADING PMA3

(ASSY OPS/5A.1/FIN) Page 2 of 7 pages

**cmd** Intermediate Bolting Stage 1  **Execute**

‘Confirmation Request’

√Override Intermediate Bolting Stage 1 Command?

**cmd** Yes  **Execute**

Wait 10 minutes.

√Master Cmd Status  – Complete
√Cmd Code (sixteen)  – IBolt
√Cmd Status (sixteen)  – Complete
√Load (sixteen):  0 --- 12.23 kN

2. **INTERMEDIATE TORQUE SECOND STAGE PERFORMANCE (AOS/M)**

   [Node_1_Port_CBMMate]

   ‘Perform Intermediate Torque Sequence’

√MCC for GO

**cmd** Intermediate Bolting Stage 2  **Execute**

‘Confirmation Request’

√Override Intermediate Bolting Stage 2 Command?

**cmd** Yes  **Execute**

Wait 10 minutes.

√Master Cmd Status  – Complete
√Cmd Code (sixteen)  – IBolt
√Cmd Status (sixteen)  – Complete
√Load (sixteen):  0 --- 16.68 kN

3. **INTERMEDIATE TORQUE THIRD STAGE PERFORMANCE (AOS/M)**

   [Node_1_Port_CBMMate]

   ‘Perform Intermediate Torque Sequence’

√MCC for GO

**cmd** Intermediate Bolting Stage 3  **Execute**

‘Confirmation Request’

√Override Intermediate Bolting Stage 3 Command?

**cmd** Yes  **Execute**

Wait 6 minutes.
4. **INTERMEDIATE TORQUE FOURTH STAGE PERFORMANCE (AOS/M)**

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Following Fourth Stage of the intermediate torque sequence, all 16 bolts should have preload in the range of 23.35 --- 25.58 kN. Otherwise, step 4 should be repeated until all 16 bolts achieve the specified preload.</td>
</tr>
</tbody>
</table>

Node_1_Port_CBM_Mate

‘Perform Intermediate Torque Sequence’

√MCC for GO

cmd Intermediate Bolting Stage 4 Execute

‘Confirmation Request’

√Override Intermediate Bolting Stage 4 Command?

cmd Yes Execute

Wait 4 minutes.

√Master Cmd Status – Complete
√Cmd Code (sixteen) – IBolt
√Cmd Status (sixteen) – Complete
√Load (sixteen): 23.35 --- 25.58 kN

If Load (sixteen) not 23.35 --- 25.58 kN, repeat step 4.

5. **INTERMEDIATE TORQUE FIFTH STAGE PERFORMANCE (AOS/M)**

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Following Fifth Stage of the intermediate torque sequence, all 16 bolts should have preload in the range of 45.59 --- 47.82 kN. Otherwise, step 5 should be repeated until all 16 bolts achieve the specified preload.</td>
</tr>
</tbody>
</table>

Node_1_Port_CBM_Mate

‘Perform Intermediate Torque Sequence’

√MCC for GO

cmd Intermediate Bolting Stage 5 Execute

‘Confirmation Request’

√Override Intermediate Bolting Stage 5 Command?
**NODE 1 PORT CBM BOLT LOADING PMA3**

(assy ops/5a.1/fin) page 4 of 7 pages

**cmd** Yes** Execute**

Wait 3 minutes.

- Master Cmd Status – Complete
- Cmd Code (sixteen) – IBolt
- Cmd Status (sixteen) – Complete
- Load (sixteen): 45.59 --- 47.82 kN

If Load (sixteen) not 45.59 --- 47.82 kN, repeat step 5.

6. **FINAL TORQUE SEQUENCE PERFORMANCE (AOS/M)**

<table>
<thead>
<tr>
<th><strong>NOTE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Following the final torque sequence, all 16 bolts should have preload in the range of 84.74 --- 86.96 kN. Otherwise, step 6 should be repeated until all 16 bolts achieve the specified preload.</td>
</tr>
</tbody>
</table>

**Node_1 Port CBM Mate**

‘Perform Final Torque Sequence’

- MCC for **GO**

**cmd** Final Bolting **Execute**

‘Confirmation Request’

- Override Final Bolting Command?

**cmd** Yes** Execute**

Wait 3 minutes.

- Master Cmd Status – Complete
- Cmd Code (sixteen) – FBolt
- Cmd Status (sixteen) – Complete
- Load (sixteen): 84.74 --- 86.96 kN

If Load (sixteen) not 84.74 --- 86.96 kN, repeat step 6.

7. **CAPTURE LATCHES CLOSURE (AOS/HD)**

**Node_1 Port CBM Mate**

‘Close Capture Latches’

- MCC for **GO**

**cmd** Close **Execute**

‘Confirmation Request’

- Override Close Command?
8. **NADIR CBM MASTER CONTROLLER DEACTIVATION**

<table>
<thead>
<tr>
<th>Node_1 Port CBM_Mate</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Deactivate CBM’</td>
</tr>
</tbody>
</table>

**cmd** Deactivate  **Execute**

- Master – Deactivated
- Master – None

9. **PRIMARY RPCS OPEN/INHIBIT**

<table>
<thead>
<tr>
<th>Node 1 Port CBM Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘RPCM N1RS2 C’</td>
</tr>
</tbody>
</table>

**sel RPC 07…**

![RPCM_N1RS2_C_RPC_07](image)

**cmd** Open

- RPC Position – Op

**cmd** Close Cmd – Inhibit

- Close Cmd – Inh

**sel RPC 08…**

![RPCM_N1RS2_C_RPC_08](image)

**cmd** Open

- RPC Position – Op

**cmd** Close Cmd – Inhibit

- Close Cmd – Inh
Node 1 Port CBM Display
‘RPCM N1RS2 C’

sel RPC 10…

RPCM_N1RS2_C_RPC_10

**cmd** Open

√RPC Position – Op

**cmd** Close Cmd – Inhibit

√Close Cmd – Inh

Node 1 Port CBM Display
‘RPCM N1RS2 C’

sel RPC 11…

RPCM_N1RS2_C_RPC_11

**cmd** Open

√RPC Position – Op

**cmd** Close Cmd – Inhibit

√Close Cmd – Inh

10. **SECONDARY RPCS INHIBIT**

Node 1 Port CBM Display
‘RPCM N1RS1 B’

sel RPC 05…

RPCM_N1RS1_B_RPC_05

√RPC Position – Op

**cmd** Close Cmd – Inhibit

√Close Cmd – Inh

Node 1 Port CBM Display
‘RPCM N1RS1 B’
NODE 1 PORT CBM BOLT LOADING PMA3

sel RPC 06…

RPCM_N1RS1_B_RPC_06

√RPC Position – Op

cmd Close Cmd – Inhibit

√Close Cmd – Inh

Node 1 Port CBM Display
‘RPCM N1RS1 B’

sel RPC 13…

RPCM_N1RS1_B_RPC_13

√RPC Position – Op

cmd Close Cmd – Inhibit

√Close Cmd – Inh

Node 1 Port CBM Display
‘RPCM N1RS1 B’

sel RPC 14…

RPCM_N1RS1_B_RPC_14

√RPC Position – Op

cmd Close Cmd – Inhibit

√Close Cmd – Inh
OBJECTIVE:
Verify status of Node 1 Nadir Active Common Berthing Mechanism (ACBM)
prior to beginning mate operations.

LOCATION:
Node 1/AFD EPCS

DURATION:
5 minutes

REFERENCED PROCEDURE(S):
TBD PDRS

NOTE
For any off-nominal steps or for any attention symbols that
appear, refer to CBM PREP FOR MATE MALFUNCTION
(SODF: ISS MAL: S&M).

1. PRIMARY RPCs CLOSED VERIFICATION
TBD PDRS

PCS
Node 1: S&M
Node 1: S&M

sel Nadir CBM

Node 1 Nadir CBM Display
‘RPCM N13B B Primary Power’

√RPC Posn (four) – Cl

2. CBM STATUS VERIFICATION

Node 1 Nadir CBM Display
‘CBM Status’

√Mode – Activated
√Master – Secondary
√Comm Error – No X
√Master Cmd Status – Complete

‘Capture Latch Status’

√Posn (four): 202 Deg

‘Powered Bolt Status’

√Posn (sixteen): 0 Rev

‘CBM Graphic’

√RTL (four) – Gray
OBJECTIVE:
Perform first stage capture following translation of MPLM into ready to latch position for berthing to Node 1 Nadir Active Common Berthing Mechanism (ACBM).
CBM capture latches are driven from initial position of 202 degrees (fully deployed) to approximately 186 degrees.

LOCATION:
Node 1/AFD EPCS

DURATION:
5 minutes

REFERENCED PROCEDURE(S):
TBD PDRS

NOTE
1. Step titles followed by the notation "(AOS/M)" indicate that AOS during the execution of that step is mandatory. If currently LOS or expecting LOS prior to completion of an AOS/M step, wait for the next AOS to perform step.

2. For any off-nominal steps or any attention symbols that appear, refer to CBM MATE MALFUNCTION (SODF: ISS MALFUNCTION: S&M).

3. Step 1 is performed with the SRMS in Position Hold Mode.

4. Capture sequence may be initiated with three of four RTLs closed. In this case, the latch associated with the open RTL must be masked.

1. READY TO LATCH INDICATORS (RTLs) CLOSED VERIFICATION
TBD PDRS

PCS        Node 1: S&M
           Node 1: S&M

sel Nadir CBM

Node 1 Nadir CBM Display
'CBM Graphic'

√RTL (four) – green
If RTL [X] is gray after repeated attempts to gain ready to latch indication where [X] = 1 2 3 4

On MCC GO

sel Latch X

Latch X Details

sel Commands

Latch X Commands

cmd Mask Latch X Execute

Node 1 Nadir CBM Display
‘CBM graphic’

√Latch X = Ø

***********************************************************************

2. FIRST STAGE CAPTURE PERFORMANCE (AOS/M)

CAUTION

To prevent damage to Active CBM (ACBM), Free Drift is required from initiation of CBM capture latch operation until a minimum of eight alternating bolts (every other bolt) have completed the Abolts command. SRMS shall remain grappled to MPLM until such time.

A6U √DAP: FREE

PCS Node 1 Nadir CBM Display
‘Commands by Task’

sel Mate

Node_1_Nadir_CBM_Mate
‘Capture Passive CBM’

cmd Capture First Stage Execute

√Override Capture First Stage Command?

cmd Yes Execute

Wait 15 seconds.
√Master Cmd Status – Complete
√Cmd Code (four) – Capture
√Cmd Status (four) – Complete
√Posn (four): 185 --- 187 Deg
√Capture Sw Op (four) – X
OBJECTIVE:
Perform second stage capture following first stage capture and transition of Shuttle Remote Manipulator System (SRMS) into test mode. Common Berthing Mechanism (CBM) capture latches are driven from initial position of approximately 186 degrees to approximately 12 degrees in preparation for bolt drive.

LOCATION:
Node 1/AFD EPCS

DURATION:
5 minutes

REFERENCED PROCEDURE(S):
TBD PDRS

NOTE
1. Step titles followed by the notation “(AOS/M)” indicated that AOS during the execution of that step is mandatory. If currently LOS or expecting LOS prior to completion of an AOS/M step, wait for the next AOS to perform step.

2. If berthing must be completed with SRMS brakes on and second stage capture results in a latch jammed indication, refer to CBM BRAKES ON CAPTURE (SODF: ISS MAL: S&M).

3. For any other off-nominal steps or any attention symbols that appear, refer to CBM MATE MALFUNCTION (SODF: ISS MAL: S&M).

4. Step 1 is performed following SRMS transition to test mode.

5. Following SRMS transition to Test Mode, closed RTLs may open due to RTL spring forces. RTL closed indication is not required prior to execution of second stage capture.

1. PERFORMING SECOND STAGE CAPTURE (AOS/M)

CAUTION
To prevent damage to Active CBM (ACBM), Free Drift is required from initiation of CBM capture latch operation until a minimum of eight alternating bolts (every other bolt) have completed the ABolts command. SRMS shall remain grappled to MPLM until such time.

TBD PDRS

PCS
Node 1: S&M
Node 1: S&M
sel Nadir CBM

Node 1 Nadir CBM Display
‘Commands by Task’

sel Mate

Node_1_Nadir_CBM_Mate
‘Capture Passive CBM’

**cmd** Capture Second Stage  **Execute**

√ Override Capture Second Stage Command?

**cmd** Yes  **Execute**
Wait 60 seconds.

√ Master Cmd Status – Complete
√ Cmd Code (four) – Capture
√ Cmd Status (four) – Complete
√ Posn (four): 11 --- 13 Deg
OBJECTIVE:
Actuate powered bolts on Node 1 Nadir Active Common Berthing Mechanism (ACBM) to acquire nut assemblies on MPLM Passive Common Berthing Mechanism (PCBM).

LOCATION:
Node 1/AFD EPCS

DURATION:
15 minutes

REFERENCED PROCEDURE(S):
None

NOTE
1. Step titles followed by the notation “(AOS/M)” indicate that AOS during the execution of that step is mandatory. If currently LOS or expecting LOS prior to completion of an AOS/M step, wait for the next AOS to perform step.
2. For any off-nominal steps or any attention symbols that appear, refer to CBM MATE MALFUNCTION (SODF: ISS MAL: S&M).

1. BOLTS ACQUISITION (AOS/M)

CAUTION
To prevent damage to Active CBM (ACBM), Free Drift is required from initiation of CBM capture latch operation until a minimum of eight alternating bolts (every other bolt) have completed the ABolts command. SRMS shall remain grappled to MPLM until such time.

PCS

Node 1: S&M
Node 1:S&M

sel Nadir CBM

Node 1 Nadir CBM Display
‘Commands by Task’

sel Mate

Node_1_Nadir_CB_Mate
‘Engage Passive CBM Nuts’

cmd Acquire Bolts Execute

√Override Acquire Bolts Command?
cmd Yes  Execute
Wait 7 minutes.

√Master Cmd Status  – Complete
√Cmd Code (sixteen) – ABolts
√Cmd Status (sixteen) – Complete
√Load (sixteen): 0 --- 7.78 kN
OBJECTIVE:
Complete mate of MPLM to Node 1 Nadir port using Common Berthing Mechanism (CBM).

LOCATION:
Node 1/AFD EPCS

DURATION:
1 hour

REFERENCED PROCEDURE(S):
None

NOTE
1. Step titles followed by the notation “(AOS/M)” indicate that AOS during the execution of that step is mandatory. If currently LOS or expecting LOS prior to completion of an AOS/M step, wait for the next AOS to perform step.

2. Step titles followed by the notation “(AOS/HD)” indicate that AOS during the execution of that step is highly desired. If communication will be regained within 5 minutes of reaching such step, wait for AOS to perform.

3. For any off-nominal steps or any attention symbols that appear, refer to CBM MATE MALFUNCTION (SOFD: ISS MAL: S&M).

4. During intermediate and final torque performance, order of bolt tightening is as follows:
   - Bolts 2-2, 2-3, 4-2, 4-3
   - Bolts 2-1, 2-4, 4-1, 4-4
   - Bolts 1-1, 1-4, 3-1, 3-4
   - Bolts 1-2, 1-3, 3-2, 3-3

1. INTERMEDIATE TORQUE FIRST STAGE PERFORMANCE (AOS/M)

PCS
Node 1: S&M
Node 1:S&M

sel Nadir CBM

Node 1 Nadir CBM Display
‘Commands by Task’

sel Mate

Node_1_Nadir_CBPMate
‘Perform Intermediate CBM Torque sequence’

√MCC for GO
cmd Intermediate Bolting Stage 1  Execute

‘Confirmation Request’

√Override Intermediate Bolting Stage 1 Command?

cmd Yes  Execute
Wait 10 minutes.

√Master Cmd Status  – Complete
√Cmd Code (sixteen)  – IBolt
√Cmd Status (sixteen)  – Complete
√Load (sixteen):  0 --- 12.23 kN

2. INTERMEDIATE TORQUE SECOND STAGE PERFORMANCE (AOS/M)

Node_1_Nadir_CBM_Mate
‘Perform Intermediate Torque Sequence’

√MCC for GO

cmd Intermediate Bolting Stage 2  Execute

‘Confirmation Request’

√Override Intermediate Bolting Stage 2 Command?

cmd Yes  Execute
Wait 10 minutes.

√Master Cmd Status  – Complete
√Cmd Code (sixteen)  – IBolt
√Cmd Status (sixteen)  – Complete
√Load (sixteen):  0 --- 16.68 kN

3. INTERMEDIATE TORQUE THIRD STAGE PERFORMANCE (AOS/M)

Node_1_Nadir_CBM_Mate
‘Perform Intermediate Torque Sequence’

√MCC for GO

cmd Intermediate Bolting Stage 3  Execute

‘Confirmation Request’

√Override Intermediate Bolting Stage 3 Command?

cmd Yes  Execute
Wait 6 minutes.
4. **INTERMEDIATE TORQUE FOURTH STAGE PERFORMANCE (AOS/M)**

![NOTE]

Following Fourth Stage of the intermediate torque sequence, all 16 bolts should have preload in the range of 23.35 --- 25.58 kN. Otherwise, step 4 should be repeated until all 16 bolts achieve the specified preload.

**Node 1_Nadir_CBM_Mate**

‘Perform Intermediate Torque Sequence’

√**MCC** for GO

**cmd** Intermediate Bolting Stage 4 **Execute**

‘Confirmation Request’

√Override Intermediate Bolting Stage 4 Command?

**cmd** Yes **Execute**

Wait 4 minutes.

√**Master Cmd Status** – Complete
√**Cmd Code (sixteen)** – IBolt
√**Cmd Status (sixteen)** – Complete
√**Load (sixteen):** 0 --- 21.13 kN

If Load (sixteen) not 23.35 --- 25.58 kN, repeat step 4.

5. **INTERMEDIATE TORQUE FIFTH STAGE PERFORMANCE (AOS/M)**

![NOTE]

Following Fifth Stage of the intermediate torque sequence, all 16 bolts should have preload in the range of 45.59 --- 47.82 kN. Otherwise, step 5 should be repeated until all 16 bolts achieve the specified preload.

**Node 1_Nadir_CBM_Mate**

‘Perform Intermediate Torque Sequence’

√**MCC** for GO

**cmd** Intermediate Bolting Stage 5 **Execute**

‘Confirmation Request’

√Override Intermediate Bolting Stage 5 Command?
cmd Yes  Execute
Wait 3 minutes.

√Master Cmd Status  – Complete
√Cmd Code (sixteen)  – IBolt
√Cmd Status (sixteen)  – Complete
√Load (sixteen):  45.59 --- 47.82 kN

If Load (sixteen) not 45.59 --- 47.82 kN, repeat step 5.

6.  **FINAL TORQUE SEQUENCE PERFORMANCE (AOS/M)**

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Following the final torque sequence, all 16 bolts should have preload in the range of 84.74 --- 86.96 kN. Otherwise, step 6 should be repeated until all 16 bolts achieve the specified preload.</td>
</tr>
</tbody>
</table>

Node_1_Nadir_CBM_Mate
‘Perform Final Torque Sequence’

√MCC for GO

cmd Final Bolting  Execute

‘Confirmation Request’

√Override Final Bolting Command?

cmd Yes  Execute
Wait 3 minutes.

√Master Cmd Status  – Complete
√Cmd Code (sixteen)  – FBolt
√Cmd Status (sixteen)  – Complete
√Load (sixteen):  84.74 --- 86.96 kN

If Load (sixteen) not 84.74 --- 86.96 kN, repeat step 6.

7.  **CAPTURE LATCHES CLOSURE (AOS/HD)**

Node_1_Nadir_CBM_Mate
‘Close Capture Latches’

√MCC for GO

cmd Close  Execute

‘Confirmation Request’

√Override Close Command?
cmd Yes Execute
Wait 10 minutes.

√Master Cmd Status – Complete
√Cmd Code (four) – Close
√Cmd Status (four) – Complete
√Posn (four): 0 --- 1 Deg

8. **NADIR CBM MASTER CONTROLLER DEACTIVATION**

Node_1_Nadir_CBM_Mate
‘Deactivate CBM’

cmd Deactivate Execute

√Mode – Deactivated
√Master – None

9. **PRIMARY RPCS OPEN/INHIBIT**

Node 1 Nadir CBM Display
‘RPCM N13B B’

sel RPC 03…

RPCM_N13B_B_RPC_03

cmd Open

√RPC Position – Op

cmd Close Cmd – Inhibit

√Close Cmd – Inh

Node 1 Nadir CBM Display
‘RPCM N13B B’

sel RPC 04…

RPCM_N13B_B_RPC_04

cmd Open

√RPC Position – Op

cmd Close Cmd – Inhibit

√Close Cmd – Inh
Node 1 Nadir CBM Display
‘RPCM N13B B’

sel RPC 05…

RPCM_N13B_B_RPC_05

**cmd** Open

√RPC Position – Op

**cmd** Close Cmd – Inhibit

√Close Cmd – Inh

Node 1 Nadir CBM Display
‘RPCM N13B B’

sel RPC 06…

RPCM_N13B_B_RPC_06

**cmd** Open

√RPC Position – Op

**cmd** Close Cmd – Inhibit

√Close Cmd – Inh

10. **SECONDARY RPCS INHIBIT**

Node 1 Nadir CBM Display
‘RPCM 14B B’

sel RPC 11…

RPCM_N14B_B_RPC_11

√RPC Position – Op

**cmd** Close Cmd – Inhibit

√Close Cmd – Inh

Node 1 Nadir CBM Display
‘RPCM 14B B’

sel RPC 12…
RPCM_N14B_B_RPC_12

√RPC Position – Op

cmd Close Cmd – Inhibit

√Close Cmd – Inh

Node 1 Nadir CBM Display
‘RPCM 14B B’

sel RPC 13…

RPCM_N14B_B_RPC_13

√RPC Position – Op

cmd Close Cmd – Inhibit

√Close Cmd – Inh

Node 1 Nadir CBM Display
‘RPCM 14B B’

sel RPC 14…

RPCM_N14B_B_RPC_14

√RPC Position – Op

cmd Close Cmd – Inhibit

√Close Cmd – Inh
OBJECTIVE:
Reconfigure the Docked Audio Interface Unit in the Lab Forward Endcone to perform its designed function after having been configured as a Russian Audio Interface Unit (RAIU) on Flight 5A. Provide a complete signal path to the RAIU installed on Avionics Rack #3 (installed earlier in Flight 5A.1).

LOCATION:
LAB1P0, LAB1P1, LAB1D2

DURATION:
30 minutes

PARTS:
DAIU-1 Address Connector W2465 (P/N 683-22465-1)

MATERIALS:
None

TOOLS REQUIRED:
Mini Maglite
Lid #2: Flashlight
INSP Mirror
 Drawer 2: Oval Inspection Mirror

REFERENCED PROCEDURE(S):
None

WARNING
Failure to remove power can result in electrical shock hazard.

SAFING
PCS
1. RPCM LA1B - E SAFING
   US Laboratory: EPS
     Lab: EPS

   sel DDCU LA1B Distribution

     DDCU LA1B Dist

   sel RPCM LA1B - E

     RPCM LA1B_E

   sel RPC 5

     RPCM LA1B_E_RPC_05
RPC Position – Open

**cmd** Close Cmd – Inhibit

**PCS**

2. **RPCM LAD22B-A SAFING**

   US Laboratory: EPS
   Lab: EPS

   sel LAB1D2

   Lab_Rack_LAB1D2

   sel RPCM LAD22B A

   RPCM_LAD22B_A

   sel RPC 8

   RPCM_LAD22B_A_RPC_08

RPC Position – Open

**cmd** Close Cmd – Inhibit

**RETRIEVAL**

3. Retrieve DAIU-1 Address Connector from location TBD.

**ACCESS**

4. Rotate down Rack Volume Closeout (RVCO) at LAB1P1.

DOCKED AUDIO TO RUSSIAN AUDIO I/F JUMPER CABLE REMOVAL

ASSY OPS/5A.1/FIN Page 3 of 5 pages

Figure 1.- DAIU-1 Location in LAB Forward Port Endcone.

Figure 2.- Forward Face of DAIU-1 Showing Address Connector Connected to J4.

REMOVING RAIU ADDRESS CONNECTOR AND INTERFACE CABLE

6. RAIU Address Connector W3999-2 → J4 of DAIU-1 (INSP Mirror)
   Refer to Figures 1 and 2.
   Stow Address Connector (location TBD).

7. RAIU Interface Cable W3999-1 ← J5 of DAIU-1 (INSP Mirror, Mini Maglite)
   Refer to Figures 1 and 2.
INSTALLING DAIU ADDRESS CONNECTOR AND WIRE HARNESS
8. DAIU-1 Address Connector W2465 →|← J4 of DAIU-1 (INSP Mirror, Mini Maglite)
   Refer to Figures 1 and 2.

   NOTE
   DAIU wire harness W2464 (P/N 683-22464-1) is tethered to endcone truss via Velcro Straps.

9. DAIU Wire Harness →|← J5 of DAIU-1 (INSP Mirror, Mini Maglite)
   Refer to Figures 1 and 2.

REPLACING FORWARD ENDCONE CLOSEOUT
10. Remove RAIU Interface Cable from along LAB shell. Remove cable from bottom of RVCO.
12. Rotate up Rack Volume Closeout (RVCO) at LAB1P1.

DISCONNECTING RAIU INTERFACE CABLE AT X3 STANDOFF
13. Remove RAIU Interface Cable and Velcro Straps securing it to X3 standoff.
14. Audio Wire W3328P3 (plug ID reads W3328P3 M/W J16 OF LAF2) ←|→ RAIU Interface Cable 1P9
15. Audio Wire W3328P3 →|← J16 of Avionics Rack 3 Utility Interface Panel (UIP) at LAB1D2

STOWAGE
16. Coil RAIU Interface Cable and stow (location TBD).

ENABLING RPC CLOSE COMMANDS
17. US Laboratory: EPS
   Lab: EPS
   sel DDCU LA1B Distribution
   DDCU LA1B Dist
   sel RPCM LA1B - E
   RPCM_LA1B_E
   sel RPC 5
   RPCM_LA1B_E_RPC_05
   cmd Close Cmd – Enable
18. RPCM LAD22B-A SAFING
   US Laboratory: EPS
   Lab: EPS

   sel LAB1D2

   Lab_Rack_LAB1D2

   sel RPCM_LAD22B_A

   RPCM_LAD22B_A

   sel RPC 8

   RPCM_LAD22B_A_RPC_08

   cmd Close Cmd – Enable

19. Inform MCC-H of task completion.
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OBJECTIVE:
To install Medium Rate Communications Outage Recorder (MCOR) Assembly.

LOCATION:
Installed: LAB1D2
Stowed: √ Maintenance and Assembly Task Supplement (MATS)

DURATION:
2 hours 20 minutes

PARTS:
Medium Rate Communications Outage Recorder (P/N SEG46117284-301)
MCOR Fan Cable Assembly (P/N SEG46117296-301)
Screws (P/N NAS1802-06-8)
Washers (P/N NAS1149EN632R)
Lock Nut (P/N MS21043-06)

MATERIALS:
Dry Wipes

TOOLS REQUIRED:
ISS Common IVA Tool Kit:
Kit A:
  3/16” X 5/32” Combination Wrench
Kit D:
  1/4” Hex Head, 3/8” Drive
  5/16” Hex Head, 3/8” Drive
  1/4” to 3/8” Adaptor
Kit E:
  Ratchet 3/8” Drive
Kit G:
(10-50 in-lbs) Trq Wrench, 1/4” Drive

REFERENCED PROCEDURE(S):
MCOR ACTIVATION AND CHECKOUT

SAFING

WARNING
Failure to remove power can result in electrical shock hazard.

1. √ Rack Power Switch – OFF position

VERIFYING LAB1D2 RPC SAFE

PCS 2. Lab: EPS: LAB1D2
   Lab_Rack_LAB1D2
sel RPC LAD22B A

RPCM_LAD22B_A

del RPC 05

RPCM_LAD22B_A_RPC_05

Verify RPC Position – Op
Verify Close Cmd – Inh

Figure 1.- Avionics Rack 3 Front View.

ACCESS
3. Unfasten fasteners (six) securing MCOR Modification Enclosure Assembly to MCOR Modification Faceplate (Ratchet 3/8” Drive; 5/16” Hex Head, 3/8” Drive).
Refer to Figure 1.

4. Rotate MCOR Modification Enclosure Assembly open.
CAUTION
Electrostatic Discharge (ESD) Hazard. Equipment contains parts sensitive to ESD damage.

Figure 2.- MCOR Fan Assembly.

INSTALLATION
5. Position MCOR Fan Cable Assembly on MCOR Modification Enclosure Assembly with air flow direction pointing into MCOR Modification Assembly Enclosure away from MCOR Modification Faceplate.

6. Install, tighten, torque fasteners (four), washers (eight), nuts (four) to 14 in-lbs securing replacement MCOR Fan Cable Assembly to MCOR Modification Enclosure Assembly (Ratchet 3/8” Drive; 1/4” Hex Head, 3/8” Drive; 3/16” X 5/32” Combination Wrench). Refer to Figure 2.

7. Position MCOR Fan Cable Assembly with large loop so cable will not be pulled when MCOR Modification Enclosure Assembly is lowered. Refer to Figure 2.

8. Install, tighten, torque fasteners (two) to 33 in-lbs securing clamps (two) to MCOR Modification Enclosure Assembly (Ratchet 3/8” Drive; 5/16” Hex Head, 3/8” Drive; (10-50 in-lbs) Trq Wrench, 1/4” Drive; 1/4” to 3/8” Adaptor; 1/4” Hex Head, 3/8” Drive; 3/16” X 5/32” Combination Wrench). Refer to Figure 2.

9. Install MCOR Assembly into MCOR Modification Enclosure Assembly noting alignment brackets (six).
10. Mate MCOR Main Power Cable Assembly connector plug to MCOR Assembly connector receptacle.
   Refer to Figure 3.
   P2→J2

11. Mate MCOR Fan Cable Assembly connector plug to MCOR Assembly connector receptacle.
    Refer to Figure 2.
    P1→J1

12. Tighten, torque fasteners securing retaining brackets (two) to MCOR Assembly (Ratchet, 3/8" Drive; 5/16" Hex Head, 3/8" Drive;
    (10-50 in-lbs) Trq Wrench, 1/4" Drive; 1/4" to 3/8" Adaptor).
    Refer to Figure 3.

13. Mate MCOR 1553 Data/Command Cable Assembly connector plug to MCOR Assembly connector receptacles.
    Refer to Figure 3.
    P2-A→J2-A
    P2-B→J2-B
14. Mate MCOR Fiber Optic Cable Assembly connector plug to MCOR Assembly connector receptacles.
   Refer to Figure 3.
   P3-1→|←J3-1
   P3-2→|←J3-2
   P4-1→|←J4-1
   P4-2→|←J4-2

15. Rotate MCOR Modification Enclosure Assembly closed.

16. Tighten fasteners (six) securing MCOR Modification Enclosure Assembly to MCOR Modification Faceplate (Ratchet 3/8" Drive; 5/16" Hex Head, 3/8" Drive).
   Refer to Figure 1.

CHECKOUT
17. ✓ Rack Power Switch – ON position

18. Perform **(MCOR ACTIVATION AND CHECKOUT)**, all (SODF: ASSY OPS: C&T), then:

POST MAINTENANCE
19. Inform **MCC-H** of task completion.

20. Stow tools, materials.
1. **UNSTOW**
   - TBD Ku-Band Receiver
   - Ku-Band Power Supply
   - PS/KU Adapter Assy
   - Mounting Bracket
   - Grounding Strap
   - SGTRC to Ku Data Cable
   - Ku to OCA Data Cable
   - US DC Power Cable (UOP to Power Supply), 6ft
   - High Rate Data Link Cable
   - OCA Router Test floppy diskette
   - 3Com Ethernet Network Card
   - Ethernet 10Base2 coax Cable, 3ft (TBD)
   - Ethernet T-Connector

2. **INTERFACING KU-BAND FORWARD LINK RECEIVER**
   - LAP1
     - Connect ground strap to rack ground connector.
     - SGTRC to Ku Data Cable → Ku-Band Receiver (J3)
   - LAX 3/P1
     - Disconnect W3346 P2 from 50 OHM terminator.
     - Install ESD dust cap on terminator.
     - W3346 P2 Cable → SGTRC to Ku Data Cable

3. **SETTING UP KU-BAND RECEIVER**
   - Ku-Band Receiver Power Cable → Ku-Band Power Supply (J1)
   - UOP (TBD) √ UOP pwr sw – Off
     - Ku-Band Receiver Power Cable → UOP
     - KU/OCA Data Cable → Ku-Band Receiver (J4)

4. **CABLING OCA ROUTER**
   - KU/OCA Data Cable → OCA Router (J1)
   - UOP (TBD) √ UOP pwr sw – Off
     - US DC Power Cable → OCA Router
     - US DC Power Cable → UOP
     - Connect floppy disk drive to OCA Router.
     - OCA HRDL/RS-422, Data Cable (OCA/HRDL Fiber Optic Data Cable) → OCA Router “XTMR” and “RCVR” Optical Ports
     - OCA HRDL/RS-422, Data Cable (OCA/HRDL Fiber Optic Data Cable) P7 → LAP UIP J7
5. **POWERING KU RECEIVER**

UOP (TBD)

UOP pwr sw → On
Ku-Band Power Supply sw → On
Ku-Band Receiver Pwr sw (CB1) → On (lt−on)
√Demod Lock lt – On

6. **TESTING OCA ROUTER**

Notify **MCC** OCA Router setup complete.
Insert floppy disk labeled “OCA Router Test.”

UOP (TBD)

UOP pwr sw → On
ThinkPad pwr sw → On

input “ISS”
input “T” to toggle screen

Wait for local received frames to begin incrementing.
Verify sequence errors are not incrementing.

input “R” to reset

Verify no sequence errors logged for at least 5 minutes.

input “H” to halt

√**MCC** to verify successful checkout

ThinkPad pwr sw → Off
Eject, stow floppy diskette.

7. **CONNECTING TO OPS LAN**

Insert 3Com Ethernet Network Card into OCA Router Laptop.
Install coax T connector.
Remove coax terminator from Ops LAN backbone.
Install coax terminator on network card at OCA Router.

Add 10Base2 Ethernet coax Cable to connect OCA Router to rest of Ops LAN backbone.

ThinkPad pwr sw → On

Inform **MCC** that OCA Router install complete.

From any SSC Client, select PingMaster icon from system tray.
Verify successful ping of onboard OCA Router IP Addresses.
If comm available, verify ping of ground network.
OBJECTIVE:
Install Video Tape Recorder (VTR) in the Mobile System Servicer Avionics #1 Rack.

LOCATION:
Installed: LAB1S5
Stowed: √Maintenance and Assembly Task Supplement (MATS)

DURATION:
40 minutes

PARTS:
Video Tape Recorder (P/N 683-51020-1)

MATERIALS:
Dry Wipes

TOOLS REQUIRED:
ISS Common IVA Tool Kit:
Kit D:
  5/32" Hex Head, 1/4" Drive
Kit E:
  Ratchet 1/4" Drive
  Speed Handle Assembly, 1/4" Drive
Kit F:
  5/16" Socket, 1/4" Drive
Kit G:
  (10-50 in-lbs) Trq Wrench, 1/4" Drive
Lid #1
  Static Wrist Tether

REFERENCED PROCEDURE(S):
MSS AVIONICS #1 RACK DEACTIVATION
MSS AVIONICS #1 RACK ACTIVATION
VDS VTR ACTIVATION AND DEACTIVATION
1.201 LAB RACK ROTATE
RWS-CUP (LAB) EXTERNAL RACK RELOCATION

SAFING

WARNING
Failure to remove power prior to maintenance may result in electrical shock hazard.

1. Perform {MSS AVIONICS RACK #1 DEACTIVATION}, all, (TBD).

2. RACK POWER SWITCH → OFF
3. Verifying LAB1S5 Rack Safed, Power Switch Off
   Lab: EPS: Rack Power: Rack Power 2
   *Rack Power 2*
   ‘Rack LAB1S5’

   Verify Switch Position – Off
   Verify Switch Avail – Yes
   Verify Monitoring Status – Ena

   ‘Rack Power LAB1S5’

   Verify RPCM_LA2A3B_F_RPC_04 Position – OP

   **ACCESSING**

4. Perform {RWS-CUP(LAB) EXTERNAL RACK RELOCATION},
   appropriate removal steps only (SODF: RBT: NOMINAL), then:
   Temporarily stow RWS.

5. Perform **(1.201 LAB RACK ROTATE)**, complete appropriate steps to
   Rotate Rack Down only (SODF: USOS S&M: 1.201), then:

   ![MSS/Avionics Rack #1 Aft Side View](image)

   Figure 1.- MSS/Avionics Rack #1 Aft Side View.

6. Unfasten lower aft rack side access panel fasteners (32)
   (Speed Handle Assembly, 5/32” Hex Head, 1/4” Drive).
   Refer to Figure 1.
   Temporarily stow rack side access panel.
REMOVAL

WARNING

Equipment contains parts sensitive to damage by Electrostatic Discharge (ESD).

7. Don Static Wrist Tether.
   Attach clip to unpainted, unanodized metal structure.

![Figure 2.- Video Tape Recorder - Rear View facing Port.](image)

8. W1191-P1 ←|→ J2
   Refer to Figure 2.

9. W1181-P7 ←|→ J1
   Refer to Figure 2.

10. Rotate rack up temporarily.

![Figure 3.- MSS/Avionics Rack #1 - Front View Facing Starboard. (Front Panels of Rack Removed).](image)
11. Open lower rack front access panel (thumb latches). Refer to Figure 3.

12. Unfasten VTR Scar Bracket Assembly fasteners (8) (Ratchet 1/4" Drive, 5/16" Socket).


REPLACEMENT

WARNING

For corrosion protection, all surfaces must be clean and dry before mating occurs.

14. Clean surfaces of VTR and coldplate with a Dry Wipe.

15. Slide VTR along coldplate alignment guides.

16. Hand tighten fasteners (8) securing VTR to coldplate.

17. Torque replacement VTR fasteners (8) to 16 in-lbs (5/16" Socket, (10-50 in-lbs) Trq Wrench, 1/4" Drive).

18. Close lower rack front access panel (thumb latches). Refer to Figure 3.

19. Rotate rack down to access rack side access panel.

20. W1181-P7 \(\rightarrow\) J1. Refer to Figure 2.

21. W1191-P1 \(\rightarrow\) J2 Refer to Figure 2.

22. Doff Static Wrist Tether.

CLOSEOUT

23. Align rack side access panel, tighten fasteners (32) (Speed Handle Assembly, 5/32" Hex Head, 1/4" Drive).

24. Perform \{1.201 LAB RACK ROTATE\}, complete appropriate steps to rotate rack up only (SODF: USOS S&M: 1.201), then:

CHECKOUT

25. RACK POWER Switch \(\rightarrow\) On
26. Verifying LAB1S5 Rack Power Switch On
   PCS Lab: EPS: Rack Power: Rack Power 2
   [Rack Power 2]
   ‘Rack LAB1S5’

   Verify Switch Position – On
   Verify Switch Avail – Yes
   Verify Monitoring Status – Ena

   ‘Rack Power On’

   cmd LAB1S5 Pwr On

   ‘Rack Power LAB1S5’

   Verify RPCM_LA2A3B_F_RPC_04 Position – Cl

27. Perform {MSS AVIONICS #1 RACK ACTIVATION}, all (TBD), then:

   POST MAINTENANCE

28. Inform MCC-H of task completion.

29. √MATS for stowage location of failed VTR

   Stow tools, materials.
OBJECTIVE:
Install Video Tape Recorder (VTR) in the Mobile System Servicer Avionics #2 Rack.

LOCATION:
Installed: LAB1P5
Stowed: √Maintenance and Assembly Task Supplement (MATS)

DURATION:
40 minutes

PARTS:
Video Tape Recorder (P/N 683-51020-1)

MATERIALS:
Dry Wipes

TOOLS REQUIRED:
ISS Common IVA Tool Kit:
Kit D:
   5/32" Hex Head, 1/4" Drive
Kit E:
   Ratchet 1/4" Drive
   Speed Handle
Kit F:
   5/16" Socket, 1/4" Drive
Kit G:
   (10-50 in-lbs) Trq Wrench, 1/4" Drive
Lid #1
   Static Wrist Tether

REFERENCED PROCEDURE(S):
VDS VTR ACTIVATION AND DEACTIVATION
LAB RACK ROTATE
RWS-CUP(LAB) EXTERNAL RACK RELOCATION

SAFING

WARNING
Failure to remove power prior to maintenance may result in electrical shock hazard.

1. RACK POWER SWITCH → OFF

2. Verifying LAB1P5 Rack Safed
   Lab: EPS: Rack Power: Rack Power 1
   [Rack Power 1 ]
   ‘Rack LAB1P5’
Verify Switch Position – Off
Verify Switch Avail – Yes
Verify Monitoring Status – Ena
‘Rack Power LAB1P5’
Verify RPCM_LA1A4A_F_RPC_04 Position – OP

ACCESSING
3. Perform {RWS-CUP(LAB) EXTERNAL RACK RELOCATION}, appropriate removal steps only (SODF: RBT: NOMINAL), then:
   Temporarily stow RWS.

4. Perform {LAB RACK ROTATE}, appropriate Rack Down steps only (SODF: USOS S&M: NOMINAL: RACK), then:

   ![Diagram of MSS/Avionics Rack #2 Forward Side View]

   Figure 1.- MSS/Avionics Rack #2 Forward Side View.

5. Loosen fasteners (32) securing lower forward rack side access panel (Speed Handle, 5/32” Hex Head, 1/4” Drive).
   Refer to Figure 1.
   Temporarily stow rack side access panel.
REMOVAL

WARNING
Equipment contains parts sensitive to damage by Electrostatic Discharge (ESD).

6. Don Static Wrist Tether.
   Attach clip to unpainted, unanodized metal structure.

7. W1291-P1 ←|→ J2
   Refer to Figure 2.

8. W1281-P7 ←|→ J1
   Refer to Figure 2.

9. Rotate rack up temporarily.

Figure 2.- Video Tape Recorder - Rear View Facing Starboard.

Figure 3.- MSS/Avionics Rack #2 - Front View Facing Port (Front Panels of Rack Removed).
10. Open lower rack front access panel (thumb latches). Refer to Figure 3.

11. Loosen VTR Scar Bracket Assembly fasteners (eight) (Ratchet 1/4” Drive 5/16” Socket).

12. Remove Scar Bracket Assembly. Label, temporarily stow.

**REPLACEMENT**

**WARNING**

For corrosion protection, all surfaces must be clean and dry before mating occurs.

13. Clean surfaces of VTR and coldplate with a Dry Wipe.

14. Slide VTR along coldplate alignment guides.

15. Hand tighten fasteners (8) securing VTR to coldplate.

16. Torque fasteners (8) on replacement VTR to 16 in-lbs (5/16” Socket; 10-50 in-lbs) Trq Wrench, 1/4” Drive).

17. Close lower rack front access panel (thumb latches). Refer to Figure 3.

18. Rotate rack down to access rack side access panel.

19. W1291-P1 →|← J2 Refer to Figure 2.

20. W1281-P7 →|← J1 Refer to Figure 2.


**CLOSE OUT**

22. Align rack side access panel, tighten fasteners (32) securing panel to rack (Speed Handle, 5/32” Hex Head, 1/4” Drive).

23. Perform {LAB RACK ROTATE}, appropriate Rack Up steps only, (SODF: USOS S&M: NOMINAL: RACK), then:

**CHECK OUT**

24. RACK POWER Switch → On
25. Closing LAB1P5 RPC

PCS

Lab: EPS: Rack Power: Rack Power 1

[Rack Power 1]

‘Rack LAB1P5’

Verify Switch Position – On
Verify Switch Avail – Yes
Verify Monitoring Status – Ena

‘Rack Power On’

**cmd** LAB1P5 Pwr On

‘Rack Power LAB1P5’

Verify RPCM_LA1A4A_F_RPC_04 Position – Cl

26. Perform {**VDS VTR ACTIVATION AND DEACTIVATION**}, appropriate Activation steps only (SODF: CNT: ACTIVATION AND CHECKOUT), then:

**POST MAINTENANCE**

27. Inform **MCC-H** of task completion.

28. √MATS for stowage location of failed VTR

Stow tools, materials.
OBJECTIVE:
Minimize duration of rack transfer operations by setting up and preparing ISS hardware prior to MPLM berthing and ingress.

LOCATION:
US LAB, Node 1

DURATION:
90 minutes

PARTS:
NOD1D4 Rack Translation Handles (one pair) (P/N 683-60120-1)
Velcro or Bungee Straps

TOOLS REQUIRED:
F5 Camera
ScopeMeter
ISS Common IVA Tool Kit:
Kit D:
  5/32” Hex Head, 3/8” Drive
  6” long, 3/8” Hex Head, 3/8” Drive
  5” long, 3/8” Ball Tip Hex Head, 3/8” Drive
Kit E:
  Ratchet, 3/8” Drive
  Ratchet, 1/4” Drive
  6” Ext, 1/4” Drive
Kit F:
  5/16” Socket, 1/4” Drive
Kit G:
  (30-200 in-lbs) Trq Wrench, 3/8” Drive
Kit I:
  4” Common Tip Screwdriver
Kit J:
  Connector Pliers
Kit R:
  6” long, 3/16” Hex Head, 3/8” Drive
Kit J:
  Wire Cutters

REFERENCED PROCEDURE(S):
1.402 SMOKE DETECTOR DEACTIVATION

LAB1SD5 SMOKE DETECTOR REMOVAL

NOTE
Smoke Detector LAB1SD5 is removed to provide required clearance for installation of MSS-1 Rack at LAB1S5.

1. For Smoke Detector LAB1SD5, perform 1.402 SMOKE DETECTOR DEACTIVATION, all (SODF: ECLSS: A&C: FDS), then:

25 OCT 00 119
LAB1SD5  2.  P1-W3219 ←|→ J1 (use Connector Pliers, if required).

3.  Remove fasteners (four) securing Smoke Detector bracket to standoff
     (Ratchet 1/4” Drive, 6” Ext, 5/16” Socket).
     Temporarily stow Smoke Detector.

**AIR VELOCITY CLOSEOUT (AVCO) REMOVAL**

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total of seven Air Velocity Closeouts (AVCO's) are removed. AVCO's are returned to ground in MPLM.</td>
</tr>
</tbody>
</table>

LAB1O6  4.  Remove top, bottom AVCO closeout seals from Lab standoff (Velcro).

5.  Release AVCO Tie Wraps, one each corner of AVCO (four).

6.  Fold, temporarily stow AVCO (P/N 683-60749-1).

7.  Repeat steps 4 --- 6 for following six locations: LAB1P3, LAB1S5, LAB1P5, LAB1D2, LAB1D4, LAB1S2.

**RACK CONNECTOR SUPPORT BRACKET ASSEMBLY DISENGAGEMENT**

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.  Connector Support Bracket Assemblies are unfastened from Lab standoff before MPLM berthing to save time during rack transfer operations.</td>
</tr>
</tbody>
</table>

2.  Keep umbilical connectors attached to bracket to better manage cables during rack installation.

8. While keeping Umbilical Cables attached, remove Connector Support Bracket Assembly from Lab Standoff, knurled-knob removal fasteners (four) (Ratchet 3/8" Drive, 5/32" Hex Head). Refer to Figure 1.

9. Temporarily restrain Connector Support Bracket Assembly (with attached cables) in standoff area, as required (Velcro or Bungee Straps).

10. Repeat steps 8 and 9 for following six locations: LAB1P3, LAB1S5, LAB1P5, LAB1D2, LAB1D4, LAB1S2.

RESTRAINTS & MOBILITY AIDS SETUP

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. An additional six 41.5&quot; Handrails are provided by removing two from each of the three PMAs.</td>
</tr>
</tbody>
</table>

| 2. Once MPLM is berthed, the following R&MA should be brought into MPLM (not shown): 41.5" Handrails (4), 8.5" Handrails (2), Short Duration Foot Restraints (2). |
Figure 2.- Recommended Node 1 R&MA Placement for Rack Transfer.
11. Set up Restraints & Mobility Aids (R&MA) for rack transfer. Refer to Figures 2, 3.

**STOWAGE OF LOOSE EQUIPMENT**

Prior to rack translation, equipment protruding into translation path must be removed to provide proper clearance. Recommend at least ~1.8 m (72 in) x 1.3 m (50 in) corridor for rack transfer.

12. All unnecessary equipment protruding into rack translation path has been removed and stowed (Node 1, US Lab)

**POST MAINTENANCE**

14. √Transfer Plan for stowage location of AVCOs (P/N 683-60749-1, seven)

15. Inform MCC-H of task completion.
OBJECTIVE:
Transfer 7 Racks from MPLM to ISS (US Lab).
This transfer activity releases MPLM Rack Launch Restraints, installs MPLM Pivot Pin Brackets, installs K-BAR Mechanisms, and then structurally attaches rack into US Lab.
Rack-to-US Lab umbilical cables are not mated during this procedure.

LOCATION:
MPLM, US Lab (Refer to Table 1.)

DURATION:
One rack/hour with two crewmembers.

PARTS:
Rack Translation Handles (one pair) (P/N 683-60120-1)
Rack Panel Cover Assy (one) (P/N SEG33107639-301)

The following items are stowed in MPLM:
K-BAR Assy, Left (seven) (P/N 683-62201-1)
K-BAR Assy, Right (seven) (P/N 683-62201-2)
MPLM Pivot-Pin Bracket, Narrow, Left (P/N 1600P051-401)
MPLM Pivot-Pin Bracket, Narrow, Right (P/N 1600P051-402)
MPLM Pivot-Pin Bracket, Wide, Left (P/N 1600P061-401)
MPLM Pivot-Pin Bracket, Wide, Right (P/N 1600P061-402)

MATERIALS:
Dry Wipes

TOOLS REQUIRED:
F5 Camera
ISS Common IVA Tool Kit:
Kit D:
5/32" Hex Head, 3/8" Drive
6" long, 3/8" Hex Head, 3/8" Drive
5" long, 3/8" Ball-Tip Hex Head, 3/8" Drive

Kit E:
Ratchet 3/8" Drive

Kit I:
4" Common Tip Screwdriver

Kit R:
6" long, 3/16" Hex Head, 3/8" Drive

Kit J:
Wire Cutters

REFERENCED PROCEDURE(S):
None
NOTE

1. All directional references (up, down, left, right) are with respect to front face of rack currently being transferred (as you face rack).

2. Specific Restraints & Mobility Aids (R&MA) are not called-out, assumed to be crew preference items.

3. Refer to {USOS: S&M: REF} for explanatory information, diagrams for each rack mechanism.

\[\text{All preparatory activities contained in PREP ISS FOR RACK TRANSFER are complete (SODF: AOP)}\]

SAFING

CAUTION

Prior to rack translation, equipment protruding into translation path must be removed to provide proper clearance. Recommend at least \(~1.8\) m (72 in) \times 1.3\) m (50 in) corridor for rack transfer.

\[\text{All unnecessary equipment protruding into rack translation path has been removed and stowed (MPLM, Node 1, US Lab)}\]

WARNING

Transfer only one rack at a time to provide necessary clearances for crew escape.
Figure 1.- Location of Rack Attachment Mechanisms.

### IDENTIFICATION OF RACK TO TRANSFER

Table 1. Order of 5A.1 Rack Transfer

<table>
<thead>
<tr>
<th>Order of Transfer</th>
<th>Rack</th>
<th>MPLM Stowed Position</th>
<th>Lab Installation Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DDCU-2</td>
<td>MPL1P2</td>
<td>LAB1O6</td>
</tr>
<tr>
<td>2</td>
<td>DDCU-1</td>
<td>MPL1S4</td>
<td>LAB1P3</td>
</tr>
<tr>
<td>3</td>
<td>MSS-1</td>
<td>MPL1P4</td>
<td>LAB1S5</td>
</tr>
<tr>
<td>4</td>
<td>MSS-2</td>
<td>MPL1S3</td>
<td>LAB1P5</td>
</tr>
<tr>
<td>5</td>
<td>AV-3</td>
<td>MPL1P3</td>
<td>LAB1D2</td>
</tr>
<tr>
<td>6</td>
<td>CHECS</td>
<td>MPL1A1</td>
<td>LAB1D4</td>
</tr>
<tr>
<td>7</td>
<td>HRF-1</td>
<td>MPL1A4</td>
<td>LAB1S2</td>
</tr>
</tbody>
</table>

2. Identify next rack to transfer, stowed MPLM position, US Lab installation position. 
   Refer to Table 1.

3. Verify RACK POWER switch – OFF

**ACCESS**

4. As required, install Handrails on adjacent racks.

5. If required, install Rack Panel Cover Assembly (P/N SEG3310739-301) onto rack being transferred.
**LAUNCH RESTRAINT DISENGAGEMENT**

**CAUTION**

Disengagement sequence must be followed exactly to allow any induced loads to be released safely back into structure. Begin at rack lower left.

---

**NOTE**

1. Rack Launch Restraint Locking Screw is non-captive. It is completely removed to prevent binding during Launch Restraint disengagement, then reinstalled.

2. Expect loud pop during release of first Rack Launch Restraint.

3. Refer to Figure 2 during execution of following section.

---

6. Remove left Locking Screw (Ratchet 3/8" Drive, 6" long 3/8" Hex Head).

7. Disengage left Rack Launch Restraint 10 to 12 turns until hard stop (Ratchet 3/8" Drive, 6" long 3/8" Hex Head).

8. Reinstall, snug left Locking Screw (Ratchet 3/8" Drive, 6" long 3/8" Hex Head).

9. Repeat steps 6 --- 8 for right Rack Launch Restraint.
MPLM PIVOT-PIN BRACKET INSTALLATION

NOTE
As required, when installing MPLM Pivot-Pin Brackets at center of MPLM (between rack bays 2, 3), use Brackets labeled “Center Stdoff RT, LFT.”

10. Choose appropriate pair of MPLM Pivot-Pin Brackets based on MPLM rack bay, Bracket labels.
   As required, remove pair from stowage, or MPLM standoff (Ratchet 3/8” Drive, 6” long 3/16” Hex Head).

11. Loosen left Rack Pivot Mechanism Knob one turn so Latch is free to move.
    Refer to Figures 2 and 3.

12. Slide left MPLM Pivot-Pin Bracket into rack left Pivot Pin Slot, engaging Rack Pivot Mechanism Latch.
    Refer to Table 2 and Figure 3.

Figure 3.- Rack Launch Restraint, Inside Left.
13. Attach left MPLM Pivot-Pin Bracket fasteners (six) onto MPLM Pivot Pin Bracket Interface (Ratchet 3/8" Drive, 6" long, 3/16" Hex Head). Refer to Figure 4.

14. Repeat steps 11 --- 13 for right MPLM Pivot-Pin Bracket.

**UPPER ATTACH MECHANISM DISENGAGEMENT**

15. Loosen left Locking Screw 10 --- 12 turns, or until threads completely disengage (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head). Refer to Figure 5.

**NOTE**

Left, right Upper Attach Mechanism Pinions have reverse gearing. To disengage left Pinion, turn \( \nearrow \). To disengage right Pinion, turn \( \searrow \).
16. Disengage left Pinion one full turn until hard stop (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head). Refer to Figure 5.

17. Repeat steps 15 and 16 for right Upper Attach Mechanism.

**K-BAR INSTALLATION**

18. Rotate rack down only ~15 cm (~5 inches).

![](image)

**Figure 6.** K-BAR Installed (Rack Upper Left).

**NOTE**
Refer to Figures 5 and 6 during execution of following section.

19. Place left K-BAR (P/N 693-62201-1) into left Upper Attach Mechanism Shear Pin View Hole.

20. Verify left Upper Attach Mechanism Locking Screw disengaged.
CAUTION
Do not force Upper Attach Mechanism Pinions. Mechanism should easily engage K-BAR.

NOTE
Left, right Upper Attach Mechanism Pinions have reverse gearing. To engage left Pinion, turn ⌈. To engage right Pinion, turn ⌊.

21. Engage left Upper Attach Mechanism Pinion, one full turn, into K-BAR until Shear Pin is visible at top of mechanism (Ratchet 3/8” Drive, 5” Long 3/8” Ball Tip Hex Head).

22. Snug left Upper Attach Mechanism Locking Screw (Ratchet 3/8” Drive, 5” Long 3/8” Ball Tip Hex Head).

23. Snug left K-BAR GSE Boss fastener (Ratchet 3/8” Drive, 5” Long 3/8” Ball Tip Hex Head).

24. K-BAR Thumb Latch → down position

25. Repeat steps 19 --- 24 for right K-BAR (P/N 683-62201-2).

RACK TRANSLATION PREPARATION

WARNING
1. Due to rack inertia, do not release rack prior to controlled stop.
2. Avoid pinch points between adjacent racks.

26. Slowly rotate rack down completely.
27. Install MPLM Knee Brace Struts (two) into MPLM Knee Brace Retention Device (two).
   Rotate Locking Clips in order to restrain Knee Brace Struts.
   Snug Adjustment Fasteners (two) (Ratchet 3/8” Drive, TBD Hex Head).
   Refer to Figure 7.

28. Attach both Translation Handles to rack top, bottom, 1/4 turn fasteners (two).

29. As required, remove all other Handrails from rack being transferred.

30. If required, Grounding Strap ←→ Rack Stud, quarter turn fastener (one).
    If required, Grounding Strap →↔ MPLM Standoff Stud, quarter turn fastener (one) (4” Common Tip Screwdriver).

31. Snug both Pivot Mechanism Knobs in unlatched, down position.
    Refer to Figures 2 and 3.
RACK TRANSFER MPLM TO ISS

RACK TRANSFORMATION TO LAB

WARNING

1. Translation rates must not exceed 8 cm/sec (3 inch/sec) through aisle, 3 cm/sec (1 inch/sec) through Hatches.
2. At least two crewmembers are required for rack translation.
3. Due to rack inertia, do not release rack prior to controlled stop.

32. Remove rack from Pivot-Pins, rotate as required into MPLM aisleway (three crewmembers may be required).

33. Loosen both Pivot Mechanism Knobs one turn so Latches are free to move. Refer to Figures 2 and 3.

34. Translate Rack to predetermined Lab installation location. Refer to Table 1.

RACK-TO-LAB STANDOFF INSTALLATION

CAUTION

Do not allow Umbilical Support Bracket Assembly, Umbilical Cables to block rack installation.

35. Restrain Umbilical Support Bracket Assembly out of Lab rack bay.

36. Align Rack Pivot-Pin Slots onto Standoff Pivot-Pins until Rack Pivot Mechanism Latches engage Standoff Pivot Pins (three crewmembers may be required). Keep rack rotated down.

37. Snug both Pivot Mechanism Knobs in latched, up position. Refer to Figures 2 and 3.

GROUNDING STRAP INSTALLATION

WARNING

Improper installation of Grounding Strap could result in electrical shock hazard.

38. If required, Inspect Grounding Strap contact surfaces for debris and clean (Dry Wipes).

39. Grounding Strap →|← Rack Stud, 1/4 turn fastener (one) (4" Common Tip Screwdriver)
FINAL INSTALLATION

CAUTION
All cables, equipment, tools must be removed from space behind, around rack to prevent equipment damage.

40. Remove both Translation Handles, 1/4 turn fastener (two).
41. Verify that rack rotation path is unobstructed.
42. K-BAR Thumb Latch → Up position

Figure 8.- K-BAR Capture Mechanism, on Lab Standoff.

NOTE
If K-BAR does not align with Capture Mechanism, loosen Adjustment Fastener using Ratchet 3/8" Drive, 5/32" Hex Head. Refer to Figure 8.

WARNING
1. Due to rack inertia, do not release rack prior to controlled stop.
2. Avoid pinch points between adjacent racks.

43. Slowly rotate rack up.
   Engage rack K-BAR Thumb Latches (two) into Capture Mechanisms located on lab standoff.
   Refer to Figures 6 and 8.

CLOSEOUT

WARNING
Do not mate Rack Umbilical Cables at this time. Rack Umbilicals are safed using a separate procedure.
44. Remove Rack Umbilical Cables from Connector Support Bracket Assembly, Tie Wraps, using (~20) (Wire Cutters). Temporarily stow Connector Support Bracket Assembly.

45. Position Rack Umbilical Cables inside of rack Utility Interface Panel (UIP) area. Attach UIP Closeout to rack, 1/4 turn fasteners (two).

46. If required, remove Rack Cover Panel Assembly. Temporarily stow.

**CHECKOUT**

47. Inform MCC-H that transfer activity for current rack is complete.

48. Repeat steps 2 --- 47 for next rack transfer. Refer to Table 1.

**POST RACK TRANSFER**

**WARNING**

Hatch seal must be thoroughly inspected after completion of entire rack transfer activity to ensure Hatch will seal properly.

49. Inspect each Hatch Seal along rack translation path for damage after installation of last rack (MPLM, Node 1 Nadir, Node 1 Forward, Lab Aft).

50. Photodocument all newly installed hardware including photos of rack Attachment Mechanisms, K-BAR, Utility Cables, etc (F5 Camera).

51. Note R&MA placement used during rack transfers (information will be used to train future crews).

52. Return the following equipment to the ground. Refer to Table 2.

<table>
<thead>
<tr>
<th>Item</th>
<th>Part Number</th>
<th>Stowage Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDCU-2 Connector Support Bracket Assy</td>
<td>683-56894-6</td>
<td>√Transfer List</td>
</tr>
<tr>
<td>DDCU-1 Connector Support Bracket Assy</td>
<td>683-56055-7</td>
<td>√Transfer List</td>
</tr>
<tr>
<td>MSS-1 Connector Support Bracket Assy</td>
<td>683-56055-7</td>
<td>√Transfer List</td>
</tr>
<tr>
<td>MSS-2 Connector Support Bracket Assy</td>
<td>683-56055-7</td>
<td>√Transfer List</td>
</tr>
<tr>
<td>AV-3 Connector Support Bracket Assy</td>
<td>683-56055-7</td>
<td>√Transfer List</td>
</tr>
<tr>
<td>CHECS Connector Support Bracket Assy</td>
<td>683-56055-7</td>
<td>√Transfer List</td>
</tr>
</tbody>
</table>

53. Stow remaining tools, equipment.

54. Inform MCC-H of task completion, status of hatch seals.
OBJECTIVE:
Remove all Panel Launch Restraint Fasteners from U.S. Lab racks transferred during Flight 5A.1. These fasteners prevent rack panels from opening during launch loads and must be removed on-orbit.

LOCATION:
LAB1P3 - DDCU-1 Rack
LAB1O6 - DDCU-2 Rack
LAB1S5 - MSS-1 Rack
LAB1P5 - MSS-2 Rack
LAB1D2 - AV-3 Rack
LAB1D4 - CHECS Rack
LAB1S2 - HRF-1 Rack

DURATION:
1.5 Hours

PARTS:
None

MATERIALS:
None

TOOLS REQUIRED:
Driver Drill Kit:
Driver Drill
1/4" Hex Shank

ISS Common IVA Tool Kit:
Kit D:
   5/32" Hex Head, 1/4" Drive
Kit E:
   Ratchet 1/4" Drive
   4" Ext, 1/4" Drive
Kit F:
   5/32" Socket, 1/4" Drive
   3/8" Socket, 1/4" Drive
   7/16" Socket, 1/4" Drive
REFERENCED PROCEDURE(S):
None

NOTE
1. Once bolts, washers, bushing, are removed from panels, stow in "Return to Houston Bag."
2. Each bushing has two parts. Ensure both parts of bushing have been removed from panels.

LAB1P3 - DDCU-1 RACK PANEL LAUNCH RESTRAINT REMOVAL
1. Remove Launch Restraint Bolts (eight), Washers (eight), Bushings (eight) from panel (Driver Drill, Hex Shank, 7/16" Socket).
2. Verify panel operation by opening, closing panel (one).

LAB1O6 - DDCU-2 RACK PANEL LAUNCH RESTRAINT REMOVAL
3. Remove Launch Restraint Bolts (eight), Washers (eight), Bushings (eight) from panel (Driver Drill, Hex Shank, 7/16" Socket).
4. Verify panel operation by opening, closing panel (one).

LAB1S5 - MSS-1 RACK PANEL LAUNCH RESTRAINT REMOVAL
5. Remove Launch Restraint Bolts (eight), Washers (eight), Bushings (eight) from panel (Driver Drill, Hex Shank, 7/16" Socket).
6. Verify panel operation by opening, closing panel (one).

LAB1P5 - MSS-2 RACK PANEL LAUNCH RESTRAINT REMOVAL
7. Remove Launch Restraint Bolts (eight), Washers (eight), Bushings (eight) from panel (Driver Drill, Hex Shank, 7/16" Socket).
8. Verify panel operation by opening, closing panel (one).

LAB1D2 - AV-3 RACK PANEL LAUNCH RESTRAINT REMOVAL
9. Remove Launch Restraint Bolts (sixteen), Washers (sixteen), Bushings (sixteen) from panels (Driver Drill, Hex Shank, 7/16" Socket).
10. Verify panel operation by opening, closing each panel (two).

LAB1D4 - CHECS RACK PANEL LAUNCH RESTRAINT REMOVAL
11. Remove Launch Restraint Hex Head Fasteners (six), Washers (six), from panel (Driver Drill, Hex Shank, 5/32" Hex Head).
12. Verify panel operation by opening, closing each panel (one).
13. TBD

14. Verify panel operation by opening, closing each panel (TBD).

**POST MAINTENANCE**

15. Report task completion to **MCC-H**.

16. Stow tools, equipment.
OBJECTIVE:
Gain access to equipment stowed on back of MPLM Resupply Stowage Platform (RSP) by rotation RSP down.
This task releases RSP Launch Restraints, installs MPLM Pivot Pin Brackets, then disengages RSP Upper Attach Mechanisms.
All RSP front fences must be folded down together prior to RSP rotation.

LOCATION:
MPLM Rack Bay

DURATION:
Rotate RSP Down:  30 minutes
Rotate RSP Up:  45 minutes

PARTS:
The following items are stowed in MPLM.
MPLM Pivot-Pin Bracket, Narrow, Left  (P/N 1600P051-401)
MPLM Pivot-Pin Bracket, Narrow, Right  (P/N 1600P051-402)
MPLM Pivot-Pin Bracket, Wide, Left  (P/N 1600P061-401)
MPLM Pivot-Pin Bracket, Wide, Right  (P/N 1600P061-402)

MATERIALS:
None

TOOLS REQUIRED:
ISS Common IVA Tool Kit:
Kit D:
   6" long, 3/8" Hex Head, 3/8" Drive
Kit E:
   Ratchet 3/8" Drive
Kit G:
   (30-200 in-lbs) Trq Wrench, 3/8" Drive
Kit R:
   6" long, 3/16" Hex Head, 3/8" Drive

REFERENCED PROCEDURE(S):
None

NOTE
1. All directional references (up, down, left, right) are with respect to front face of RSP currently being rotated (as you face rack).

2. Specific Restraints & Mobility Aids (R&MA) are not called-out, assumed to be crew preference items.

3. Refer to {USOS: S&M: REF} for explanatory information, diagrams for each rack mechanism.
**SAFING**

**CAUTION**

1. RSP front fences will impact adjacent racks if left in deployed position during RSP rotation.

2. When RSP is located in overhead rack bay (ISS Port; MPL1P), RSP bottom front fences will impact MPLM GLAs if left in deployed position during RSP rotation.

1. √ All RSP front fences have been folded down, strapped in stowed position on RSP requiring rotation

2. √ All unnecessary equipment protruding into RSP rotation path has been removed and stowed

---

*Figure 1.* Location of RSP Attachment Mechanisms.

---

**LAUNCH RESTRAINT DISENGAGEMENT**

**CAUTION**

Disengagement sequence must be followed exactly to allow any induced loads to be released safely back into structure. Begin at rack lower left.
NOTE
1. RSP Launch Restraint captive Locking Screw is completely removed to prevent binding with Launch Restraint then reinstalled.

2. Expect loud pop during release of first RSP Launch Restraint.

3. Refer to Figure 2 during execution of the following section.

3. Remove left Locking Screw (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head).

4. Disengage left RSP Launch Restraint 10 to 12 turns until hard stop (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head).

5. Reinstall, snug left Locking Screw (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head).

6. Repeat steps 3 --- 5 for right RSP Launch Restraint.

MPLM PIVOT-PIN BRACKET INSTALLATION

Table 1. Installation Locations of MPLM Pivot Pin Bracket

<table>
<thead>
<tr>
<th>MPLM Rack Bay Position</th>
<th>MPLM Pivot-Pin Bracket Part Number (L, R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay 1</td>
<td>1600P051-401, -402</td>
</tr>
<tr>
<td>Bay 2</td>
<td>1600P061-401, -402</td>
</tr>
<tr>
<td>Bay 3</td>
<td>1600P601-401, -402</td>
</tr>
<tr>
<td>Bay 4</td>
<td>1600P051-401, 402</td>
</tr>
</tbody>
</table>
7. Choose appropriate pair of MPLM Pivot-Pin Brackets based on MPLM Rack bay of RSP requiring rotation. As required remove pair from stowage, or MPLM standoff (Ratchet 3/8" Drive, 6" long, 3/16" Hex Head).

8. Loosen left RSP Pivot Mechanism Knob one turn so Latch is free to move. Refer to Figures 2 and 3.

9. Slide left MPLM Pivot-Pin Bracket into left RSP Pivot Pin Slot, engaging RSP Pivot Mechanism Latch. Refer to Table 2 and Figure 3.

10. Attach left MPLM Pivot-Pin Bracket fasteners (six) onto MPLM Pivot Pin Bracket Interface (Ratchet 3/8" Drive, 6" long, 3/16" Hex Head). Refer to Figure 4.
11. Snug left RSP Pivot Mechanism Knob in latched, up position. Refer to Figures 2 and 3.

12. Repeat steps 8 --- 11 for right MPLM Pivot-Pin Bracket.

UPPER ATTACH MECHANISM DISENGAGEMENT

13. Loosen left Locking Screw 10 to 12 turns, or until threads completely disengaged (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head). Refer to Figure 5.

NOTE
Left, right Upper Attach Mechanism Pinions have reverse gearing. To disengage left Pinion, turn ↖. To disengage right Pinion, turn ↗.

14. Disengage left Pinion one full turn until hard stop (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head). Refer to Figure 5.

15. Repeat steps 13 and 14 for right Upper Attach Mechanism.

ROTATING RSP DOWN
16. All unnecessary equipment protruding into RSP rotation path has been removed and stowed
WARNING

1. Due to RSP inertia, do not release rack prior to controlled stop.
2. Avoid pinch points between adjacent racks.

17. Slowly rotate RSP down completely. As required, temporarily restrain.

18. As required, unstow equipment from rear of RSP.

ROTATING RSP UP

CAUTION

1. All RSP rear fences must be either fully deployed (with all PIP Pins engaged) or folded down (with all straps engaged) prior to rotating RSP up.
2. All equipment, tools, must be removed from space behind, around RSP to prevent equipment damage.

![Figure 6.- RSP Fence PIP Pins, Typical.](Engaged PIP Pin, without fence deployed. Engaged PIP Pin, with fence deployed.)

19. All RSP rear fences are either fully deployed (with all PIP Pins engaged) or folded down (with all straps engaged) on RSP requiring rotation. As required, refer to MPLM Stowage/Transfer Plan for correct RSP rear fence configuration. Refer to Figure 6.
20. √MPLM Knee Brace Strut Spherical Bearings (two) are straight
Refer to Figure 7.

21. √All unnecessary equipment protruding into RSP rotation path has been removed and stowed

![Figure 7.- MPLM Knee Brace Assembly.](image)

**WARNING**

1. Due to rack inertia, do not release rack prior to controlled stop.
2. Avoid pinch points between adjacent racks.

22. Slowly rotate RSP up.
Insert MPLM Knee Brace Struts (two) into RSP Upper Attach Mechanism Shear Pin View Holes (two).
Refer to Figures 1, 5, and 7.

**UPPER ATTACH MECHANISM ENGAGEMENT**

23. Verify RSP left Upper Attach Mechanism Locking Screw is disengaged.
Refer to Figure 5.

**WARNING**

RSP Upper Attach Mechanisms must be fully engaged into MPLM Knee Braces to prevent structural failure due to reentry, landing loads.

**CAUTION**

Do not force Upper Attach Mechanism Pinions. Mechanism should easily engage MPLM Knee Brace.
NOTE
Left, right Upper Attach Mechanism Pinions have reverse gearing. To engage left Pinion, turn \( \rightleftharpoons \). To engage right Pinion, turn \( \rightleftharpoons \).

24. Engage left Upper Attach Mechanism Pinion, one full turn until hard stop, into MPLM Knee Brace Spherical Bearing. Shear Pin should be visible at top of mechanism (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head). Refer to Figures 5 and 7.

25. Snug left Upper Attach Mechanism Locking Screw (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head).


MPLM PIVOT-PIN BRACKET REMOVAL

NOTE
Refer to Figures 2 and 3 during execution of following section.

27. Loosen left RSP Pivot Mechanism Knob one turn so Latch is free to move.

28. Remove left MPLM Pivot-Pin Bracket fasteners (six) from MPLM Pivot Pin Bracket Interface (Ratchet 3/8" Drive, 6" long, 3/16" Hex Head).

29. Slide left MPLM Pivot-Pin Bracket out of left RSP Pivot Pin Slot (push Pivot Mechanism Knob down).

30. Snug left RSP Pivot Mechanism Knob in latched, up position.

31. Repeat steps 27 --- 30 for right MPLM Pivot-Pin Bracket.

LAUNCH RESTRAINT ENGAGEMENT

NOTE
1. RSP Launch Restraint captive Locking Screw is completely removed to prevent binding during Launch Restraint, then reinstalled.

2. Refer to Figure 2 during execution of following section.

32. Remove left Locking Screw (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head).
WARNING
RSP Launch Restraint must be fully engaged into MPLM Longeron Fittings to prevent structural failure due to reentry, landing loads.

33. Engage left Launch Restraint 10 to 12 turns until hard stop (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head).

NOTE
When both Launch Restraint, Locking Screw, are fully engaged, Locking screw will block access to Launch Restraint. Locking Screw will also be flush with RSP structure.

34. Reinstall, snug left Locking Screw (Ratchet 3/8" Drive, 6" long, 3/8" Hex Head).

√ Locking Screw blocking RSP Launch Restraint
√ Locking Screw flush with RSP structure

35. Repeat steps 32 --- 34 for right RSP Launch Restraint.

PREPARING RSP FOR REENTRY

WARNING
All RSP Locking Screws (four) must be torqued to prevent structural failure due to reentry, landing loads.

36. Torque left, right Launch Restraint Locking Screws (two) to 100 in-lbs ((30-200 in-lbs) Trq Wrench, 6" long, 3/8" Hex Head).
Refer to Figure 2.

CAUTION
Do not torque Upper Attach Mechanism Pinions (two).

37. Torque left, right Upper Attach Mechanism Locking Screws (two) to 100 in-lbs ((30-200 in-lbs) Trq Wrench, 6" long, 3/8" Hex Head).
Refer to Figure 5.

CLOSEOUT
38. √ All RSP front fences are either fully deployed (with all PIP Pins engaged) or folded down (with all straps engaged) on RSP
As required, refer to MPLM Stowage/Transfer Plan for correct RSP front fence configuration.
POST MAINTENANCE

39. As required, repeat procedure for next RSP.

40. As required, stow tools, equipment.

41. Inform MCC-H of task completion.
OBJECTIVE:
Mate all DDCU-1 Rack-to-Module Umbilical Cables. 
Rack Power Switch is placed in ON position; however, rack activation is done at a later time using a separate procedure.

LOCATION:
LAB1P3 - DDCU-1 Rack Utility Interface Panel (UIP)

DURATION:
30 minutes

PARTS:
None

MATERIALS:
None

TOOLS REQUIRED:
F5 Camera
ISS Common IVA Tool Kit:
Lid #1:
   Static Wrist Tether
Kit I:
   4” Common Tip Screwdriver

REFERENCED PROCEDURE(S):
None

DDCU-1 RACK SAFING

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Failure to remove power can result in electrical shock hazard.</td>
</tr>
<tr>
<td>2. Remote Sensor/Effecter Data Cable must be installed first to ensure proper operation of Rack Power Switch. Failure to comply can result in electrical shock hazard. Order of remaining cables does not matter.</td>
</tr>
</tbody>
</table>

LAB1P3 1. √ RACK POWER switch – OFF

2. If required, remove Utility Interface Panel Closeout from rack, 1/4 turn fasteners (two).
UMBILICAL CABLE INSTALLATION

CAUTION

1. When mating cables, verify pins straight, inspect both connector halves for debris, mate dust caps if applicable. Check for no red indicator ring.

2. Equipment contains parts sensitive to damage by Electrostatic Discharge (ESD).

3. Don Static Wrist Tether.
   Attach clip to unpainted, unanodized metal structure.

   Table 1. DDCU-1 Umbilical Connections

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENSOR/EFFECTOR - J20</td>
<td>W3310P5</td>
</tr>
</tbody>
</table>

4. Mate Sensor/Effecter Umbilical Connection.
   Refer to Table 1.

SAFING VERIFICATION

5. Verifying LAB1P3 Rack Safed
   PCS
   Lab: EPS: Rack Power: Rack Power 1
   Rack Power 1 CCS R1
   ‘Rack LAB1P3’

   Verify Switch Position – Off
   Verify Switch Avail – Yes
   Verify Monitoring Status – Ena

WARNING

Failure to remove power via EVA Circuit Interrupt Device (CID) can result in electrical shock hazard.

6. √MCC-H: EVA CID #1 – OFF

UMBILICAL CABLE INSTALLATION, CONTINUED

NOTE

TBD information on work-arounds for mating DDCU RPCM connections.
Table 2. DDCU-1 Umbilical Connections - cont.

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>XA32</td>
<td>W3344 XA32P1A</td>
</tr>
<tr>
<td>XA33</td>
<td>W3337 XA33P1A</td>
</tr>
<tr>
<td>XA34</td>
<td>W3335 XA34P1A</td>
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<tr>
<td>XA35</td>
<td>W3340 XA35P1A</td>
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<tr>
<td>XA36</td>
<td>W3338 XA36P1A</td>
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<tr>
<td>XA37</td>
<td>W3343 XA37P1A</td>
</tr>
<tr>
<td>XA38</td>
<td>W3308 XA38P1A</td>
</tr>
<tr>
<td>1553 DDCU 1 - A/J3</td>
<td>W3305P5</td>
</tr>
<tr>
<td>1553 DDCU 1 - B/J4</td>
<td>W3306P5</td>
</tr>
<tr>
<td>TCS SUPPLY - QP01</td>
<td>683-56836-175</td>
</tr>
<tr>
<td>TCS RETURN - QP02</td>
<td>683-56836-174</td>
</tr>
<tr>
<td>INPUT PWR DDCU 1 - J44</td>
<td>W3342P1</td>
</tr>
<tr>
<td>INPUT PWR DDCU 2 - J45</td>
<td>W3339P1</td>
</tr>
<tr>
<td>OUTPUT PWR DDCU 2 - J50</td>
<td>W3359P1</td>
</tr>
</tbody>
</table>

LAB1P3

7. Mate remaining Umbilical Connections.
   Refer to Table 2.

8. √ No leakage from QD connections

9. Remove Static Wrist Tether.
   Photodocument newly installed hardware (F5 Camera).

10. Attach Utility Interface Panel Closeout to rack, 1/4 turn fasteners (two).

CHECKOUT

11. ↓ MCC-H: “DDCU-1 Rack Umbilical Mate complete. Proceeding with Rack Power Switch to ON position.”

12. RACK POWER switch → ON

13. Verifying Rack Power Switch On

   PCS
   Lab: EPS: Rack Power: Rack Power 2
   Rack Power 2 CCS R1
   ‘Rack LAB1P3’

   Verify Switch Position – On
   Verify Switch Avail – Yes
   Verify Monitoring Status – Ena

14. ↓ MCC-H: “DDCU-1 Rack Power Switch is ON. EVA crew is go to rotate CID #1 to ON.”

POST MAINTENANCE

15. Inform MCC-H of task completion.

16. Stow tools, equipment.
OBJECTIVE:
Mate all DDCU-2 Rack-to-Module Umbilical Cables. Rack Power Switch is placed in ON position; however, rack activation is done at a later time using a separate procedure.

LOCATION:
LAB1O6 - DDCU-2 Rack Utility Interface Panel (UIP)

DURATION:
30 minutes

PARTS:
None

MATERIALS:
None

TOOLS REQUIRED:
F5 Camera
ISS Common IVA Tool Kit:
Lid #1:
    Static Wrist Tether
Kit I:
    4” Common Tip Screwdriver

REFERENCED PROCEDURE(S):
None

DDCU-2 RACK SAFING

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Failure to remove power can result in electrical shock hazard.</td>
</tr>
<tr>
<td>2. Sensor/Effecter Data Cable must be installed first to ensure proper operation of Rack Power Switch. Failure to comply can result in electrical shock hazard. Order of remaining cables does not matter.</td>
</tr>
</tbody>
</table>

LAB1O6 1. √ RACK POWER switch – OFF

2. If required, remove Utility Interface Panel Closeout from rack, 1/4 turn fasteners (two).
UMBILICAL CABLE INSTALLATION

CAUTION

1. When mating cables, verify pins straight, inspect both connector halves for debris, mate dust caps if applicable. Check for no red indicator ring.

2. Equipment contains parts sensitive to damage by Electrostatic Discharge (ESD).

3. Don Static Wrist Tether.
   Attach clip to unpainted, unanodized metal structure.

Table 1. DDCU-2 Umbilical Connections

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENSOR/EFFECTOR - J20</td>
<td>W3413P1</td>
</tr>
</tbody>
</table>

4. Mate Sensor/Effector Umbilical Connection.
   Refer to Table 1.

SAFING VERIFICATION

5. Verifying LAB106 Rack Safed
   PCS
   Lab: EPS: Rack Power: Rack Power 3
   Rack Power 3 CCS R1
   ‘Rack LAB106’

   Verify Switch Position – Off
   Verify Switch Avail – Yes
   Verify Monitoring Status – Ena

WARNING

Failure to remove power via EVA Circuit Interrupt Device (CID) can result in electrical shock hazard.

6. √MCC-H: EVA CID #4 – OFF

UMBILICAL CABLE INSTALLATION, CONTINUED

NOTE
TBD information on work-arounds for mating DDCU RPCM connections.
Table 2. DDCU-2 Umbilical Connections - cont.

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>XA25</td>
<td>W3423 XA25P1A</td>
</tr>
<tr>
<td>XA26</td>
<td>W3419 XA26P1A</td>
</tr>
<tr>
<td>XA27</td>
<td>W3404 XA27P1A</td>
</tr>
<tr>
<td>XA28</td>
<td>W3416 XA28P1A</td>
</tr>
<tr>
<td>XA29</td>
<td>W3420 XA29P1A</td>
</tr>
<tr>
<td>XA30</td>
<td>W3421 XA30P1A</td>
</tr>
<tr>
<td>XA31</td>
<td>W3212 XA31P1A</td>
</tr>
<tr>
<td>1553 DDCU 1 - A/J3</td>
<td>W3405P1</td>
</tr>
<tr>
<td>1553 DDCU 1 - B/J4</td>
<td>W3406P1</td>
</tr>
<tr>
<td>TCS SUPPLY - QP01</td>
<td>683-56836-109</td>
</tr>
<tr>
<td>TCS RETURN - QP02</td>
<td>683-56836-097</td>
</tr>
<tr>
<td>INPUT PWR DDCU 1 - J44</td>
<td>W3415P2</td>
</tr>
<tr>
<td>INPUT PWR DDCU 2 - J45</td>
<td>W3414P1</td>
</tr>
<tr>
<td>OUTPUT PWR DDCU 2 - J50</td>
<td>W3435P1</td>
</tr>
</tbody>
</table>

LAB1O6

7. Mate remaining Umbilical Connections.  
   Refer to Table 2.

8. √ No leakage from QD Connections

9. Remove Static Wrist Tether.  
   Photodocument newly installed hardware (F5 Camera).

10. Attach Utility Interface Panel Closeout to rack, 1/4 turn fasteners (two).

CHECKOUT

11. ↑ MCC-H: “DDCU-2 Rack Umbilical Mate complete. Proceeding with Rack Power Switch to ON position.”

12. RACK POWER switch → ON

13. Verifying Rack Power Switch On

   PCS Lab: EPS: Rack Power: Rack Power 3
   Rack Power 3 CCS R1
   ‘Rack LAB1O6’

   Verify Switch Position − On
   Verify Switch Avail − Yes
   Verify Monitoring Status − Ena

14. ↑ MCC-H: “DDCU-2 Rack Power Switch is ON. EVA crew is go to rotate CID #4 to ON.”

POST MAINTENANCE

15. Inform MCC-H of task completion.

16. Stow tools, equipment.
OBJECTIVE:
Mate all MSS-1 Rack-to-Module Umbilical Cables.
Rack Power Switch is placed in ON position; however, rack activation is done at a later time using a separate procedure.

LOCATION:
LAB1S5 - MSS-1 Rack Utility Interface Panel (UIP)

DURATION:
30 minutes

PARTS:
None

MATERIALS:
None

TOOLS REQUIRED:
F5 Camera
ISS Common IVA Tool Kit:
Lid #1:
    Static Wrist Tether

REFERENCED PROCEDURE(S):
None

MSS-1 RACK SAFING

WARNING
1. Failure to remove power can result in electrical shock hazard.
2. REMOTE SENSOR/EFFECTOR Data Cable must be installed first to ensure proper operation of Rack Power Switch. Failure to comply can result in electrical shock hazard. Order of remaining cables does not matter.

LAB1S5

1. √RACK POWER switch – OFF
2. If required, remove Utility Interface Panel Closeout from rack, 1/4 turn fasteners (two).

UMBILICAL CABLE INSTALLATION

CAUTION
1. When mating cables, verify pins straight, inspect both connector halves for debris, mate dust caps if applicable. Check for no red indicator ring.
2. Equipment contains parts sensitive to damage by Electrostatic Discharge (ESD).
3. Don Static Wrist Tether. 
   Attach clip to unpainted, unanodized metal structure.

   Table 1. MSS-1 Umbilical Connections

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA - REMOTE SENSOR/EFFECTOR - J20</td>
<td>W3215P1</td>
</tr>
</tbody>
</table>

   Refer to Table 1.

SAFING VERIFICATION

5. Verifying LAB1S5 Rack Safed

   PCS Lab: EPS: Rack Power: Rack Power 2
   Rack Power 2 CCS R1
   ‘Rack LAB1S5’

   Verify Switch Position  – Off
   Verify Switch Avail  – Yes
   Verify Monitoring Status  – Ena

   ‘Rack Power LAB1S5’

   sel RPCM_LA2A3B_F_RPC_04

   Verify Integ Counter incrementing
   Verify RPC Position – Open

   ‘Rack Power LAB1S5 RWS BCU’

   sel RPCM_LA1A4A_E_RPC_02

   Verify Integ Counter incrementing
   Verify RPC Position – Open

UMBILICAL CABLE INSTALLATION, CONTINUED

CAUTION

Handle Fiber Optic cable by connector only. Do not bend or apply pressure to cable during mating.
Table 2. MSS-1 Umbilical Connections - cont.

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUDIO - J11</td>
<td>W3220P1</td>
</tr>
<tr>
<td>VIDEO - J36</td>
<td>W3214P1</td>
</tr>
<tr>
<td>1553/PDGF - LOCAL/USER - BUS A - J3</td>
<td>W3205P1</td>
</tr>
<tr>
<td>1553/PDGF - LOCAL/USER - BUS B - J4</td>
<td>W3206P1</td>
</tr>
<tr>
<td>CVIU/VTR - J37</td>
<td>W3222P1</td>
</tr>
<tr>
<td>CVIU/VTR - J38</td>
<td>Do not mate at this time</td>
</tr>
<tr>
<td>VTR STATUS - J9</td>
<td>W3227P2</td>
</tr>
<tr>
<td>POWER - 120 VDC - J2</td>
<td>W3209P1</td>
</tr>
<tr>
<td>POWER - 120 VDC - J1</td>
<td>W3211P1</td>
</tr>
<tr>
<td>RWS - J52</td>
<td>W3235P1</td>
</tr>
<tr>
<td>RWS - J53</td>
<td>Do not mate at this time</td>
</tr>
<tr>
<td>RWS - J54</td>
<td>Do not mate at this time</td>
</tr>
<tr>
<td>RWS - J55</td>
<td>Do not mate at this time</td>
</tr>
<tr>
<td>QP01 - SUPPLY</td>
<td>683-56836-190</td>
</tr>
<tr>
<td>QP02 - RETURN</td>
<td>683-56836-189</td>
</tr>
</tbody>
</table>

LAB1S5 6. Mate remaining Umbilical Connections.  Refer to Table 2.

7. √No leakage from QD connections

8. Remove Static Wrist Tether.  Photodocument newly installed hardware (F5 Camera).

9. Attach Utility Interface Panel Closeout to rack, 1/4 turn fasteners (two).

CHECKOUT
10. ▼MCC-H: “MSS-1 rack umbilical mate complete. Proceeding with Rack Power Switch to ON position.”

11. RACK POWER switch → ON

12. Verifying Rack Power Switch On
   Lab: EPS: Rack Power: Rack Power 2
   Rack Power 2 CCS R1
   ‘Rack LAB1S5’

   Verify Switch Position – On
   Verify Switch Avail – Yes
   Verify Monitoring Status – Ena

POST MAINTENANCE
13. Inform MCC-H of task completion.

14. Stow tools, equipment.
OBJECTIVE:
Mate all MSS-2 Rack-to-Module Umbilical Cables. Rack Power Switch is placed in ON position; however, rack activation is done at a later time using a separate procedure.

LOCATION:
LAB1P5 - MSS-2 Rack Utility Interface Panel (UIP)

DURATION:
30 minutes

PARTS:
None

MATERIALS:
None

TOOLS REQUIRED:
F5 Camera
ISS Common IVA Tool Kit:
Lid #1:
  Static Wrist Tether

REFERENCED PROCEDURE(S):
None

MSS-2 RACK SAFING

WARNING
1. Failure to remove power can result in electrical shock hazard.
2. REMOTE SENSOR/EFFECTOR Data Cable must be installed first to ensure proper operation of Rack Power Switch. Failure to comply can result in electrical shock hazard. Order of remaining cables does not matter.

LAB1P5
1. √ RACK POWER switch – OFF
2. If required, remove Utility Interface Panel Closeout from rack, 1/4 turn fasteners (two).

UMBILICAL CABLE INSTALLATION

CAUTION
1. When mating cables, verify pins straight, inspect both connector halves for debris, mate dust caps if applicable. Check for no red indicator ring.
2. Equipment contains parts sensitive to damage by Electrostatic Discharge (ESD).
3. Don Static Wrist Tether.
   Attach clip to unpainted, unanodized metal structure.

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA - REMOTE SENSOR/EFFECTOR - J20</td>
<td>W3310P9</td>
</tr>
</tbody>
</table>

   Refer to Table 1.

**SAFING VERIFICATION**

5. Verifying LAB1P5 Rack Safed

   PCS Lab: EPS: Rack Power: Rack Power 1
   Rack Power 1 CCS R1
   ‘Rack LAB1P5’

   Verify Switch Position – Off
   Verify Switch Avail – Yes
   Verify Monitoring Status – Ena

   ‘Rack Power LAB1P5’

   sel RPCM_LA1A4A_F_RPC_04

   Verify Integ Counter incrementing
   Verify RPC Position – Open

   ‘Rack Power LAB1P5 RWS BCU’

   sel RPCM_LA2A3B_E_RPC_01

   Verify Integ Counter incrementing
   Verify RPC Position – Open

**UMBILICAL CABLE INSTALLATION, CONTINUED**

**CAUTION**

Handle Fiber Optic cable by connector only. Do not bend or apply pressure to cable during mating.
### Table 2. MSS-2 Umbilical Connections - cont.

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUDIO - J11</td>
<td>W3328P1</td>
</tr>
<tr>
<td>VIDEO - J36</td>
<td>W3322P5</td>
</tr>
<tr>
<td>1553/PDGF - LOCAL/USER - BUS A - J3</td>
<td>W3305P6</td>
</tr>
<tr>
<td>1553/PDGF - LOCAL/USER - BUS B - J4</td>
<td>W3306P6</td>
</tr>
<tr>
<td>CVIU/VTR - J37</td>
<td>W3356P1</td>
</tr>
<tr>
<td>CVIU/VTR - J38</td>
<td>Do not mate at this time.</td>
</tr>
<tr>
<td>VTR STATUS - J9</td>
<td>W3333P3</td>
</tr>
<tr>
<td>POWER - 120 VDC - J2</td>
<td>W3304P1</td>
</tr>
<tr>
<td>POWER - 120 VDC - J1</td>
<td>W3343P3</td>
</tr>
<tr>
<td>RWS - J52</td>
<td>W3357P1</td>
</tr>
<tr>
<td>RWS - J53</td>
<td>Do not mate at this time.</td>
</tr>
<tr>
<td>RWS - J54</td>
<td>Do not mate at this time.</td>
</tr>
<tr>
<td>RWS - J55</td>
<td>Do not mate at this time.</td>
</tr>
<tr>
<td>QP01 - SUPPLY</td>
<td>683-56836-190</td>
</tr>
<tr>
<td>QP02 - RETURN</td>
<td>683-56836-189</td>
</tr>
</tbody>
</table>

LAB1P5 6. Mate remaining Umbilical Connections. Refer to Table 2.

7. √No leakage from QD connections

8. Remove Static Wrist Tether. Photodocument newly installed hardware (F5 Camera).

9. Attach Utility Interface Panel Closeout to rack, 1/4 turn fasteners (two).

#### CHECKOUT

10. → **MCC-H**: “MSS-2 rack umbilical mate complete. Proceeding with Rack Power Switch to ON position.”

11. RACK POWER switch → ON

12. **Verifying Rack Power Switch On**

   PCS

   Lab: EPS: Rack Power: Rack Power 1
   Rack Power 1 CCS R1
   ‘Rack LAB1P5’

   Verify Switch Position  – On
   Verify Switch Avail   – Yes
   Verify Monitoring Status – Ena

#### POST MAINTENANCE

13. Inform **MCC-H** of task completion.

14. Stow tools, equipment.
OBJECTIVE:
Mate all AV-3 Rack-to-Module Umbilical Cables. Rack Power Switch is placed in ON position; however, rack activation is done at a later time using a separate procedure.

LOCATION:
LAB1D2 - AV-3 Rack Utility Interface Panel (UIP)

DURATION:
30 minutes

PARTS:
None

MATERIALS:
None

TOOLS REQUIRED:
F5 Camera
ISS Common IVA Tool Kit:
Lid #1:
  Static Wrist Tether

REFERENCED PROCEDURE(S):
None

AV-3 RACK SAFING

**WARNING**
1. Failure to remove power can result in electrical shock hazard.
2. REMOTE SENSOR/EFFECTOR Data Cable must be installed first to ensure proper operation of Rack Power Switch. Failure to comply can result in electrical shock hazard. Order of remaining cables does not matter.

LAB1D2 1. √ RACK POWER switch – OFF

2. If required, remove Utility Interface Panel Closeout from rack, 1/4 turn fasteners (two).

UMBILICAL CABLE INSTALLATION

**CAUTION**
1. When mating cables, verify pins straight, inspect both connector halves for debris, and mate dust caps, if applicable. Check for no red indicator ring.
2. Equipment contains parts sensitive to damage by Electrostatic Discharge (ESD).
3. Don Static Wrist Tether.
   Attach clip to unpainted, unanodized metal structure.

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>REMOTE SENSOR/EFFECTOR - J20</td>
<td>W3316P2</td>
</tr>
</tbody>
</table>

   Refer to Table 1.

**SAFING VERIFICATION**

5. Verifying LAB1D2 Rack Safed
   PCS Lab: EPS: Rack Power: Rack Power 2
   Rack Power 2 CCS R1
   ‘Rack LAB1D2’
   Verify Switch Position – Off
   Verify Switch Avail – Yes
   Verify Monitoring Status – Ena
   ‘Rack Power LAB1D2’
   sel RPCM_LA2B_C_RPC_04
   RPCM LA2B C_RPC_04
   Verify Integ Counter incrementing
   Verify RPC Position – Open

**UMBILICAL CABLE INSTALLATION, CONTINUED**

**CAUTION**

Handle Fiber Optic cables by connector only. Do not bend or apply pressure to cable during mating.

**NOTE**

Do not mate J16. This jumper will be connected later during audio checkout procedures.
AV-3 RACK UMBILICAL MATE
(ASSY OPS/5A.1/FIN) Page 3 of 4 pages

Table 2. AV-3 Umbilical Connections - cont.

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRL - J8</td>
<td>W3345P1</td>
</tr>
<tr>
<td>AUDIO - J16</td>
<td>Do Not Mate</td>
</tr>
<tr>
<td>GPS - J19</td>
<td>W3347P1</td>
</tr>
<tr>
<td>AUDIO BUS A - J38</td>
<td>W3327P5</td>
</tr>
<tr>
<td>ANALOG AUDIO - J39</td>
<td>None - Capped</td>
</tr>
<tr>
<td>AUDIO BUS B - J40</td>
<td>W3326P5</td>
</tr>
<tr>
<td>AUDIO - J15</td>
<td>W3348P1</td>
</tr>
<tr>
<td>AUDIO - J11</td>
<td>W3326P3</td>
</tr>
<tr>
<td>AUDIO - J12</td>
<td>W3327P3</td>
</tr>
<tr>
<td>AUDIO - J13</td>
<td>W3353P1</td>
</tr>
<tr>
<td>AUDIO - J14</td>
<td>W3346P5</td>
</tr>
<tr>
<td>HIGH RATE LINK - J5</td>
<td>W3330P2</td>
</tr>
<tr>
<td>HIGH RATE LINK - J6</td>
<td>W3330P3</td>
</tr>
<tr>
<td>VIDEO - J36</td>
<td>W3319P4</td>
</tr>
<tr>
<td>VIDEO - J37</td>
<td>W3323P2</td>
</tr>
<tr>
<td>1553 LOCAL/USER - BUS A - J3</td>
<td>W3305P2</td>
</tr>
<tr>
<td>1553 LOCAL/USER - BUS B - J4</td>
<td>W3306P2</td>
</tr>
<tr>
<td>TCS SUPPLY - QP01</td>
<td>683-56836-185</td>
</tr>
<tr>
<td>TCS RETURN - QP02</td>
<td>683-56836-187</td>
</tr>
<tr>
<td>HIGH RATE LINK - J7</td>
<td>W3330P4</td>
</tr>
<tr>
<td>POWER 120 VDC - J1</td>
<td>W3303P4</td>
</tr>
</tbody>
</table>

LAB1D2  6. Mate remaining Umbilical Connections.
        Refer to Table 2.

7. √No leakage from QD connections

8. Remove Static Wrist Tether.
   Photodocument newly installed hardware (F5 Camera).

9. Attach Utility Interface Panel Closeout to rack, 1/4 turn fasteners (two).

CHECKOUT

10. MCC-H: “AV-3 rack umbilical mate complete. Proceeding with Rack Power Switch to ON position."

11. RACK POWER switch → ON

12. Verifying Rack Power Switch On

PCS Lab: EPS: Rack Power: Rack Power 2
    Rack Power 2 CCS R1
    ‘Rack LAB1D2’
Verify Switch Position – On
Verify Switch Avail – Yes
Verify Monitoring Status – Ena

POST MAINTENANCE
13. Inform MCC-H of task completion.

14. Stow tools, equipment.
OBJECTIVE:
Mate all CHECS Rack-to-Module Umbilical Cables (except oxygen). Rack Power Switch is placed in ON position; however, rack activation is done at a later time using a separate procedure.

LOCATION:
LAB1D4 - CHECS Rack Utility Interface Panel (UIP)

DURATION:
30 minutes

PARTS:
None

MATERIALS:
None

TOOLS REQUIRED:
F5 Camera
ISS Common IVA Tool Kit:
Lid #1:
  Static Wrist Tether

REFERENCED PROCEDURE(S):
None

CHECS RACK SAFING

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Failure to remove power can result in electrical shock hazard.</td>
</tr>
<tr>
<td>2. DATA - REMOTE SENSOR/EFFECTOR Cable must be installed first to ensure proper operation of Rack Power Switch. Failure to comply can result in electrical shock hazard. Order of remaining cables does not matter.</td>
</tr>
</tbody>
</table>

LAB1D4 1. √RACK POWER switch – OFF

2. If required, remove Utility Interface Panel Closeout from rack, 1/4 turn fasteners (two).

UMBILICAL CABLE INSTALLATION

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When mating cables, verify pins straight, inspect both connector halves for debris, mate dust caps if applicable. Check for no red indicator ring.</td>
</tr>
<tr>
<td>2. Equipment contains parts sensitive to damage by Electrostatic Discharge (ESD).</td>
</tr>
</tbody>
</table>
3. Don Static Wrist Tether.
   Attach clip to unpainted, unanodized metal structure.

   Table 1. CHECS Umbilical Connections

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA - REMOTE SENSOR/EFFECTOR - J20</td>
<td>W3316P1</td>
</tr>
</tbody>
</table>

   Refer to Table 1.

SAFING VERIFICATION
5. Verifying LAB1D4 Rack Safed

   PCS Lab: EPS: Rack Power: Rack Power 2
   Rack Power 2 CCS R1
   ‘Rack LAB1D4’
   Verify Switch Position – Off
   Verify Switch Avail – Yes
   Verify Monitoring Status – Ena
   ‘Rack Power LAB1D4’
   sel RPCM_LA2B_C_RPC_03

   RPCM_LA2B_C_RPC_03
   Verify Integ Counter incrementing
   Verify RPC Position – Open

UMBILICAL CABLE INSTALLATION, CONTINUED

WARNING
Do not mate OXYGEN – QP10 Umbilical at this time. All Oxygen connections must be made post Joint Airlock delivery on Flight 7A.

Table 2. CHECS Umbilical Connections - cont.

<table>
<thead>
<tr>
<th>Rack Connector Label</th>
<th>Standoff Umbilical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1553 - LOCAL/USER - BUS A - J3</td>
<td>W3305P8</td>
</tr>
<tr>
<td>1553 - LOCAL/USER - BUS B - J4</td>
<td>W3306P8</td>
</tr>
<tr>
<td>OXYGEN - QP10</td>
<td>Do Not Mate</td>
</tr>
<tr>
<td>NITROGEN - QP09</td>
<td>683-56836-148</td>
</tr>
<tr>
<td>TCS - QP01 - SUPPLY</td>
<td>683-56836-177</td>
</tr>
<tr>
<td>TCS - QP02 - RETURN</td>
<td>683-56836-176</td>
</tr>
<tr>
<td>POWER - 120 VDC - J1</td>
<td>W3303P3</td>
</tr>
</tbody>
</table>
LAB1D4  6. Mate remaining Umbilical Connections.
   Refer to Table 2.

7. √No leakage from QD connections

8. Remove Static Wrist Tether.
   Photodocument newly installed hardware (F5 Camera).

9. Attach Utility Interface Panel Closeout to rack, 1/4 turn fasteners (two).

CHECKOUT
    Power Switch to ON position.”

11. RACK POWER switch → ON

12. Verifying Rack Power Switch On
   PCS
   Lab: EPS: Rack Power: Rack Power 2
   Rack Power 2 CCS R1
   ‘Rack LAB1D4’
   Verify Switch Position – On
   Verify Switch Avail – Yes
   Verify Monitoring Status – Ena

POST MAINTENANCE
13. Inform MCC-H of task completion.

14. Stow tools, equipment.
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OBJECTIVE:
Mate all HRF-1 Rack-to-Module Umbilical Cables.
Rack Power Switch is placed in ON position; however, rack activation is done at a later time using a separate procedure.

LOCATION:
LAB1S2 - HRF-1 Rack Utility Interface Panel (UIP)

DURATION:
30 minutes

PARTS:
None

MATERIALS:
None

TOOLS REQUIRED:
F5 Camera
ISS Common IVA Tool Kit:
Lid #1:
  Static Wrist Tether

REFERENCED PROCEDURE(S):
None

HRF-1 UMBILICAL LAUNCH RESTRAINT REMOVAL
1. Release HRF-1 Umbilical Launch Restraints (TBD).

HRF-1 UMBILICAL ACCUMULATOR REMOVAL
2. Remove HRF-1 Umbilical Accumulator (TBD).

HRF-1 RACK SAFING

WARNING
1. Failure to remove power can result in electrical shock hazard.

2. J43 FDS/MAINT Data Cable must be installed first to ensure proper operation of Rack Power Switch. Failure to comply can result in electrical shock hazard. Order of remaining cables does not matter.

LAB1S2
3. √RACK POWER switch – OFF

4. If required, remove Utility Interface Panel Closeout from rack, 1/4 turn fasteners (two).
UMBILICAL CABLE INSTALLATION

CAUTION

1. When mating cables, verify pins straight, inspect both connector halves for debris, mate dust caps if applicable. Check for no red indicator ring.

2. Equipment contains parts sensitive to damage by Electrostatic Discharge (ESD).

5. Don Static Wrist Tether.
Attach clip to unpainted, unanodized metal structure.

Table 1. HRF-1 Umbilical Connections

<table>
<thead>
<tr>
<th>Standoff Connector Label</th>
<th>Rack Umbilical Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>J43 - FDS/MAINT</td>
<td>UIP P43 M/W UIP J43</td>
</tr>
</tbody>
</table>

6. Mate Umbilical Connections.
Refer to Table 1.

SAFING VERIFICATION

7. Verifying LAB1S2 Rack Safed

PCS
Lab: EPS: Rack Power: Rack Power 1
‘Rack Power 1 CCS R1’
‘Rack LAB1S2’

Verify Switch Position  – Off
Verify Switch Avail      – Yes
Verify Monitoring Status – Ena

‘Rack Power LAB1S2’

sel RPCM_LA1A4A_B_RPC_01

RPCM_LA1A4A_B_RPC_01

Verify Integ Counter incrementing
Verify RPC Position – Open

‘Rack Power LAB1S2 Safing’

sel RPCM_LA2A3B_C_RPC_02

RPCM_LA2A3B_C_RPC_02

Verify Integ Counter incrementing
Verify RPC Position – Open
UMBILICAL CABLE INSTALLATION, CONTINUED

CAUTION

Do not cross connect TCS Moderate, Low temperature lines. Connections are identically keyed. HRF-1 Rack uses only TCS MOD SUPPLY, RETURN.

Table 2. HRF-1 Umbilical Connections - cont.

<table>
<thead>
<tr>
<th>Standoff Connector Label</th>
<th>Rack Umbilical Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2 - ESSENTIAL/AUX POWER</td>
<td>W462 UIP P2 M/W UIP J2</td>
</tr>
<tr>
<td>J1 - MAIN POWER</td>
<td>W462 UIP P1 M/W UIP J1</td>
</tr>
<tr>
<td>J16 - VIDEO/SYNC</td>
<td>UIP P16 M/W UIP J16</td>
</tr>
<tr>
<td>J7 - HRD</td>
<td>UIP P7 M/W UIP J7</td>
</tr>
<tr>
<td>J3 - 1553B-A</td>
<td>UIP P3 M/W UIP J3</td>
</tr>
<tr>
<td>J4 - 1553B-B</td>
<td>UIP P4 M/W UIP J4</td>
</tr>
<tr>
<td>J47 - LAN-2</td>
<td>UIP P47 M/W UIP J47</td>
</tr>
<tr>
<td>J46 - LAN-1</td>
<td>UIP P46 M/W J46</td>
</tr>
<tr>
<td>Do not mate, no US lab connection. Leave attached to HRF-1 Rack.</td>
<td>UIP P77 M/W UIP J77</td>
</tr>
<tr>
<td>VACUUM</td>
<td></td>
</tr>
<tr>
<td>WASTE GAS</td>
<td></td>
</tr>
<tr>
<td>TCS MOD SUPPLY</td>
<td></td>
</tr>
<tr>
<td>TCS MOD RETURN</td>
<td></td>
</tr>
<tr>
<td>GN2</td>
<td></td>
</tr>
<tr>
<td>TCS LOW SUPPLY</td>
<td>Do not mate, no HRF-1 connection</td>
</tr>
<tr>
<td>TCS LOW RETURN</td>
<td>Do not mate, no HRF-1 connection</td>
</tr>
</tbody>
</table>

LAB1S2  8. Mate remaining Umbilical Connections. Refer to Table 2.

9. √No leakage from QD connections

10. Remove Static Wrist Tether. Photodocument newly installed hardware (F5 Camera).

11. Attach Utility Interface Panel Closeout to rack, 1/4 turn fasteners (two).

CHECKOUT

12. ↓ MCC-H: “HRF-1 Rack Umbilical Mate complete. Proceeding with Rack Power Switch to ON position.”
13. RACK POWER switch → ON

14. Verifying Rack Power Switch On

PCS

Lab: EPS: Rack Power: Rack Power 1

[Rack Power 1 CCS R1]

‘Rack LAB1S2’

Verify Switch Position – On
Verify Switch Avail – Yes
Verify Monitoring Status – Ena

POST MAINTENANCE

15. Inform **MCC-H** of task completion.

16. Stow tools, equipment.
**TOOLS AND EQUIPMENT REQUIRED**

NOD1  Internal Sampling Adapter
D4_G2  Scopemeter
        5-ft Vacuum Access Jumper (VAJ)

**ISA/SCOPEMETER CHECKOUT**

1. Uncap one ISA-VAJ port.

2. √ Other ISA-VAJ Port (1of 2) – CAPPED

   **NOTE**
   Scopemeter will be face down with respect to
   ISA Pressure Module if installed properly.

3. Attach Scopemeter to ISA Pressure Module.

4. √ COM – COM, and V – V on Scopemeter to ISA Pressure Module
   connection

5. While depressing yellow button, set Scopemeter readout to V.
   1mV = 1mmHg, or Readout * 1000 = mmHg

6. Set ISA Pressure Module to mmHg.

7. Record ISA pressure: ______ mmHg

**PCS**

NODE 1: ECLSS

8. Record Node 1 Cab P: ______ mmHg
   Calculate delta P (ISA – Node 1): ______ mmHg
   
   If delta P > 20 mmHg
   √**MCC-H** for instructions

**ISA/VAJ/MPEV SETUP**

9. √ Hatch MPEV – CLOSED

10. Uncap MPEV.
11. Connect bent end of 5’ VAJ to MPEV.

12. Connect other end of VAJ to ISA (one VAJ port remains capped). Refer to Figure 1.

**WARNING**

Failure to secure ISA/VAJ assembly may result in damage to equipment and/or injury to crew.

13. Secure ISA/VAJ assembly to seat track with bungees and anchors.
Figure 2.- ISA Sample Valve.

**ISA/VAJ CONNECTION LEAK CHECK**

<table>
<thead>
<tr>
<th>Node</th>
<th>Fwd</th>
<th>Hatch</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.</td>
<td>√ISA Sample Port valve – CLOSED</td>
<td>Refer to Figure 2.</td>
</tr>
<tr>
<td>15.</td>
<td>Uncap ISA Sample Port Valve.</td>
<td></td>
</tr>
</tbody>
</table>

**WARNING**

Opening the MPEV will start the pressurization of the PMA and may cause a loud hissing noise. Crew in the vicinity should don ear plugs.

16. MPEV → OPEN

17. Wait 10 seconds.

18. MPEV → CLOSED

19. Monitor ISA pressure for 3 minutes.

   If ISA delta pressure is > 2 mmHg, suspect ISA/VAJ leak.

\textbf{\textit{MCC-H for instructions}}
PRESSURIZE PMA

WARNING

1. Opening the ISA Sample Port Valve will start the pressurization of the PMA and may cause a loud hissing noise. Crew in the vicinity should don ear plugs.

2. Keep clear of inlet of ISA Sample Port Valve when opened.

20. **MCC-H** report expected equalization time.

21. Hatch MPEV → OPEN

22. ISA Sample Port Valve → OPEN

PCS LAB: ECLSS

23. When dp/dt ~0

ISA Sample Port Valve → CLOSED

GROSS LEAK CHECK

ISA

24. Record ISA P1: ______ mmHg
    Record GMT ____/____:____:____ GMT
    Report values to **MCC-H**.
    If P1 < 200 mmHg
    \**MCC-H**
    If no comm with **MCC**, carefully cycle ISA Sample Port Valve as required until P is at least 200 mmHg.

    Wait 10 minutes for thermal stabilization.

25. Record ISA P2: ______ mmHg
    Record GMT ____/____:____:____ GMT
    Report values to **MCC-H**.
    Wait 30 minutes.

26. Record ISA P3: ______ mmHg
    Record GMT ____/____:____:____ GMT
    Report values to **MCC-H**.

27. If ΔP (P2-P3) > 20 mmHg, suspect vestibule leak.
    Hatch MPEV → CLOSED
    \**MCC-H** for instructions >>
OVERNIGHT FINE LEAK CHECK
28. Record ISA P4: ______ mmHg
   Record GMT _____/____:____:____ GMT
   Report values to MCC-H.

29. Hatch MPEV → CLOSED

30. ISA Pressure Module → OFF

31. Scopemeter → OFF

32. Wait overnight.

33. While depressing yellow button, set Scopemeter readout to V.
   1mV = 1mmHg, or Readout * 1000 = mmHg

34. ISA Pressure Module → mmHg

35. Hatch MPEV → OPEN

36. Record ISA P5: ______ mmHg
   Record GMT _____/____:____:____ GMT
   Report values to MCC-H.

37. If ΔP (P4-P5) > 20 mmHg, suspect vestibule leak.
   Hatch MPEV → CLOSED
   MCC-H for instructions >>

DETACH AND STOW EQUIPMENT
ISA 38. ISA Pressure Module → OFF

39. Scopemeter → OFF, detach from ISA Pressure Module

40. ISA Sample Port valve → OPEN

41. Cap ISA Sample Port valve.

42. Detach VAJ from ISA and MPEV.

43. Cap ISA VAJ Port.

44. Stow ISA, Scopemeter and VAJ in location from which retrieved.
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TOOLS AND EQUIPMENT REQUIRED:
Internal Sampling Adapter (ISA)
Scopemeter
External Sampling Adapter (ESA)
5 ft Vacuum Access Jumper (VAJ)
35 ft VAJ

INSTALLING ESA ON PMA2 SIDE OF HATCH

NOTE
Apply Braycote Lubricant if ESA O-ring surfaces are dry (use Rubber Gloves).

PCS
LAB: ECLSS: PCA
LAB ACS
‘LAB PCA’

1. Record Lab Cab Press: ______ mmHg
2. Record ESA gauge Pressure: ______ psi
3. If delta P (ESA P*51.7 – PCA Lab Cab P) > 25 mmHg, √MCC-H.
4. √Lab Fwd MPEV – CLOSED
5. ESA Handle → CLOSED
6. Align arrow on ESA handle with arrow on Lab Fwd Hatch MPEV.
7. Align ESA captive bolts (four) with holes on hatch panel surrounding MPEV.
8. Manually tighten ESA captive bolts in an “X” pattern until finger tight.
9. √ESA Sample Valve – CLOSED and CAPPED (Sample Valve handle will be perpendicular to flow path in closed position.)

ISA/SCOPEMETER CHECKOUT
10. Uncap one ISA-VAJ port.

NOTE
Scopemeter will be facedown with respect to ISA Pressure Module if installed properly.

11. Attach Scopemeter to ISA Pressure Module.
12. √COM – COM, and V – V on Scopemeter/ISA Pressure Module connection
13. While depressing yellow button, set Scopemeter readout to V
(1mV = 1mmHg, or Readout * 1000 = mmHg).

14. Set ISA Pressure Module to mmHg.

15. Record ISA P: ______ mmHg.

16. If delta P (ISA P – Lab Cab P (from step 1)) > 20 mmHg, √MCC-H. >>

**ISA/VAJ/MPEV SETUP**

![Diagram](image)

Figure 1.- ISA/VAJ/MPEV Connection (ESA and PCA connection not shown).

17. Connect bent end of 5 ft VAJ to Lab Fwd MPEV.

18. Connect other end of 5 ft VAJ to ISA per Figure 1.

19. Attach either end of 35 ft VAJ to second ISA VAJ Port.

20. Attach other end of 35 ft VAJ to PCA Vacuum Access Port.
LAB FWD MPEV LEAK CHECK

WARNING
Failure to secure ISA/VAJ Assembly may result in damage to equipment and/or injury to crew.

21. Secure ISA/VAJ Assembly to seat track with bungees and anchors.

![Open](image1.png) ![Closed](image2.png)

Figure 2.- ISA Sample Valve.

ISA/VAJ CONNECTION AND MPEV GROSS LEAK CHECK

22. √ Lab Fwd MPEV – CLOSED

23. √ ISA Sample Port valve – CLOSED and CAPPED
   Refer to Figure 2.

WARNING
Opening the VRIV will vent the ISA and VAJs to space and may cause a loud hissing noise. Crew in the vicinity should don Earplugs.

24. OPENING PCA VRIV

   PCS
   LAB: ECLSS: PCA
   LAB ACS
   ‘LAB PCA’

   sel VRIV

   [LAB PCA VRIV
   ‘Open’]

   cmd Arm
   cmd Open

   √ Position – OPEN

25. Wait 10 seconds.
26. CLOSING PCA VRIV

PCS
LAB: ECLSS: PCA
LAB ACS
‘LAB PCA’

sel VRIV

LAB PCA VRIV
‘Close’

cmd Close

√ Position – CLOSED

27. Record ISA Pressure P1: ______ mmHg
Record GMT: _____/____:____:____ GMT

28. Record ESA gauge pressure EP1: ______ psi
Record GMT: _____/____:____:____ GMT

29. Wait 3 minutes.

30. Record ISA Pressure P2: ______ mmHg

31. Record ESA gauge pressure EP2: ______ mmHg

32. If ISA delta P (P2-P1) > 2 mmHg, √MCC-H for instructions. >>

33. If ESA delta P (EP2-EP1) > 0.5 psi, √MCC-H for instructions. >>

34. During next ground communication opportunity, report all pressures and times from previous steps to MCC-H (LAB Cab Press, ESA Press, ISA Press, P1, P2, EP1, EP2).

35. ESA Handle/MPEV → OPEN

36. Repeat steps 24---34 once (to leak check the external MPEV seal). Proceed with overnight leak check.

MPEV OVERNIGHT FINE LEAK CHECK

37. √ESA Handle/MPEV – OPEN

38. ISA Pressure Module → OFF

39. Scopemeter → OFF

40. Wait 8 hours.
41. While depressing yellow button, set Scopemeter readout to V
   (1mV = 1mmHg, or Readout * 1000 = mmHg).

42. ISA Pressure Module → mmHg

43. Record ISA Pressure P3: _____ mmHg
   Record GMT: _____/____:____:____ GMT

44. Record ESA EP3: _____ psi
   Record GMT: _____/____:____:____ GMT

45. If ISA delta P (P3-P1) > 2 mmHg, √MCC-H for instructions. >>

46. If ESA delta P (EP3-EP1) > 0.5 psi, VAJ fine leak check may be required.
   √MCC-H for instructions >>

47. Report pressures and times to MCC-H.

DETACHING AND STOWING EQUIPMENT

WARNING

1. Opening the ISA Sample Valve will repressurize the ISA/VAJ Assembly and may cause a loud hissing noise. Crew in the vicinity should don Earplugs.

2. Keep clear of valve inlet when opening ISA Sample Valve.

48. √ISA Sample Port Valve – CLOSED

49. Uncap ISA Sample Valve.

50. ISA Sample Port valve → OPEN

51. Cap ISA Sample Port valve.

52. ISA Pressure Module → OFF

53. Scopemeter → OFF, detach from ISA Pressure Module

54. Detach VAJs from ISA, MPEV, and PCA.

55. Cap ISA VAJ Ports.

56. Stow ISA, Scopemeter and VAJ in location where first retrieved.

57. Completely loosen ESA captive bolts (four).

58. Remove, stow ESA from MPEV.

59. LAB Fwd MPEV → CLOSED
OBJECTIVE:
To fill Node 1 ITCS and Waste Water Lines.

LOCATION:
LAB1P7, LAB1S7, LAB1O6

DURATION:
6 hours

PARTS:
None

MATERIALS:
CWCs (two), empty
Restraint Mobility Aid (RMA) Storage:
   41.5" Hand Rail Assembly (four)
   Short Tether Equipment Anchors (STEAs) (eight)
   Long Tethers (eight)
   Short Tethers (eight)
35' Vacuum Access Jumper (VAJ)
Fluid System Servicer (FSS):
   Supply Tank (ST)
   Fluid Control Pump Assembly (FCPA)
FSS Stowage Compartment:
   20' FSS jumpers (two):
      FSS-72-1
      FSS-72-2
   18" Adapters (six):
      FSS-64-1
      FSS-68-1
      FSS-69-1
      FSS-69-2
      FSS-70-1
      FSS-77-1

TOOLS REQUIRED:
ISS Tool Kit:
   Kit E:
      3/8" to 1/4" Adapter
      Ratchet 3/8" Drive
   Kit D:
      1/4" Hex Head Driver, 1/4" Drive

REFERENCED PROCEDURE(S):
LAB RACK ROTATE
RUSSIAN TECHNICAL WATER CONVERSION
PREPARING FSS WORKSITE

1. Install 41.5" Handrails (two) in parallel on LAB1P6 seat tracks, 10 inches from adjacent rack face. Refer to Figure 1.

2. Install next set of 41.5" Handrails (two) on LAB1P5 end to end with first two Handrails. Refer to Figure 1.

3. Install one long tether per Handrail on one line of handrails. Refer to Figure 1.

4. Remove, fold beta cloth closeout covering top portion of DDCU #2 Rack. Temporarily stow.

5. Unfasten triangular restraint bracket fasteners (six) securing FCPA (Ratchet 3/8" Drive, 3/8" to 1/4" Adapter, 1/4" Hex Head Driver, 1/4" Drive).

6. Remove FCPA and transport to work site.

7. Remove any FSS Jumpers stowed in FCPA Temporarily stow.

8. Place FCPA on set of rails closest to aft endcone, secure with preinstalled long tether. Refer to Figure 1.
9. Temporarily reinstall FCPA restraint bracket.

10. Unfasten triangular restraint bracket fasteners (six) securing ST (Ratchet 3/8" Drive, 3/8" to 1/4" Adapter, 1/4" Hex Head Driver, 1/4" Drive).

11. Remove ST and transport to work site.


13. Place Supply Tank on the empty set of rails close to FCPA and secure with preinstalled long tether. Refer to Figure 1.


15. Install jumper from back of FCPA to the Supply Tank QD.

16. Install cable P202 from back of Supply Tank to connector J202 on the side of Control Monitor/Instrumentation box on the FCPA. P202→|←J202

17. Connect power cable from FCPA to UOP.
18. √Valve positions
   Selection Valve → INACT
   MV1 → BYPASS
   MV2 → CLOSED
   MV3 → DF1/SUPPLY

19. Main Power→ On
   √Power On LED lit, record quantity reading
   Refer to Figure 2.

   Number of LEDs Lit: ____

CONNECTING VAJ FROM FSS TO VAP
20. √VRIV and VRCV closed

PCS
US Lab: ECLSS
[US LAB:ECLSS]
NODE 1 FILL ITCS AND WASTE WATER LINES

(ASYY OPS/5A.1/FIN) Page 5 of 13 pages

√VRCV Posn – Closed
√VRIV Posn – Closed

NOTE
A Class 2 alarm will be initiated by the INT MDM following the completion of the following step

21. Disable PPR.

PCS
US Lab: ECLSS

PCA Commands

PCA Commands

\textbf{cmd} PPR Inhibit Arm

√Status – Armed

Repeat

\textbf{cmd} PPR Inhibit

√State – Inhibited

Repeat

22. Open VRCV.

PCS
US Lab: ECLSS

VRCV

VRCV

\textbf{cmd} Full Flow Arm

√Status – Armed

\textbf{cmd} Full Flow

√Full Flow Indicator – X
√Position – Open

Repeat
23. Close VRCV

PCS

US Lab: ECLSS

| US LAB:ECLSS |

VRCV

| VRCV |

cmd Close

√ Closed Indicator – X

√ Position – Closed

Repeat

24. Install STEAs (four) with short tethers to lab wall along route from FSS to VAP to secure VAJ.

25. Remove US Lab FWD Endcone Closeout Panel LAB1D0-02
Temporarily stow.

26. Remove cap from VAP.

27. VAJ → | ← VAJ CONNECTION on FCPA, hand tighten

28. Unroll VAJ and secure to wall with short tethers.

29. VAJ → | ← VAP, hand tighten

30. Open VRIV.

PCS

US Lab: ECLSS

| US LAB:ECLSS |

VRIV

| VRIV |

cmd Open Arm

√ Status – Arm

Repeat

cmd Open

√ Open Indicator – X

√ Position – Open

Repeat
31. Remove Aft LAB Closeout Panel.

32. FSS-72-1 → WATER LINE IN on FCPA

33. FSS-72-2 → WATER LINE OUT on FCPA

34. FSS-72-1 → MTL Return male QD located on Aft bulkhead

35. FSS-72-2 → MTL Supply male QD located on Aft bulkhead

PURGING MTL LINES
36. MV2 → Open

37. Rotate selector handle ← to PURGE/FILL mode.

38. Purge for 5 minutes (Pressure Gauge 1 should be in blue arc).

39. MV2 → CLOSE

RECONFIGURATION FOR LTL PURGE AND FILL
40. FSS-72-1 ← MTL Return male QD located on Aft bulkhead

41. FSS-72-2 ← MTL Supply male QD located on Aft bulkhead

42. FSS-72-1 ← FSS-69-1

43. FSS-69-1 ← LTL Return

44. FSS-72-2 ← FSS-69-2

45. FSS-69-2 ← LTL supply

PURGING LTL LINES
46. MV2 → Open

47. Purge for 5 minutes (Pressure Gauge 1 should be in blue arc).

48. MV2 → Close

FILL LTL LINES
49. FSS-72-1 ← WATER LINE IN on FCPA

50. FSS-69-1 ← LTL Return

51. MV2 → OPEN
52. MV1 → FILL
   Wait 6 minutes.

53. Rotate selector handle to INACT.

54. MV2 → CLOSE

55. MV1 → BYPASS

   NOTE
   LTL Supply line is now filled. LTL Return line is filled next.

56. FSS-69-2 ←|→ LTL Supply

57. FSS-69-2 →|← LTL Return

58. MV2 → OPEN

59. Rotate selector handle to PURGE/FILL mode.

60. MV1 → FILL
   Wait 6 minutes.

61. Rotate selector handle to INACT.

62. MV2 → CLOSE

63. MV1 → BYPASS

   NOTE
   LTL Return line is now filled.

**FILL MTL LINES**

64. FSS-69-2 ←|→ LTL Return

65. FSS-72-2 ←|→ FSS-69-2

66. FSS-72-2 →|← MTL Supply QD

67. FSS-69-1 ←|→ FSS-72-1

68. FSS-72-1 →|← MTL Return QD

69. FSS-72-1 →|← Water Line In on FCPA

70. MV2 → OPEN

71. Rotate selector handle to PURGE/FILL mode.
72. MV1 → FILL
   Wait 6 minutes.

73. Rotate selector handle to INACT.

74. MV2 → CLOSE

75. MV1 → BYPASS

   NOTE
   MTL Lines are now filled.

RECIRCULATION
76. Rotate selector handle to RECIRC.
   Wait 6 minutes.

77. Rotate selector handle to INACT.

CONFIGURING MTL AND LTL
78. Install MTL loop jumper?

MATING MTL AND LTL LINES
79. FSS-72-1 ←|→ MTL Return QD

80. FSS-72-2 ←|→ MTL Supply QD

81. Loosen MTL and LTL QDs from clam shell brackets (P/N 683-56655).

82. Connect QDs to their permanent locations?

RFCA ACTIVATION
83. Activate RFCA Valve.

DRAINING FSS OF ITCS WATER
84. Get FSS-70-1 Jumper, CWC Bag.

85. FSS-70-1 →|← CWC Bag

86. FSS-70-1 →|← CWC Bag port on FCPA


88. FSS-72-1 →|← FSS-69-1
   Refer to Figure 4.

89. FSS-69-1 →|← FSS-68-1
   Refer to Figure 4.

90. FSS-68-1 →|← FSS-72-2
   Refer to Figure 4.
91. $\sqrt{MV2} \to$ OPEN

92. Rotate selector handle $\leftarrow$ to DRAIN mode.

93. $\sqrt{PG-1}$ is in yellow range
    Drain for 6 minutes.

94. MV2 $\rightarrow$ CLOSE, for 3 minutes

95. Rotate Selector handle $\leftarrow$ to INACT.

96. MV2 $\rightarrow$ OPEN

97. Rotate selector handle $\leftarrow$ to PURGE/FILL mode.

98. Purge for 5 minutes (Pressure Gauge 1 should be in blue arc).

99. MV2 $\rightarrow$ CLOSE

100. Replace FSS-69-1 with FSS-69-2.

101. MV2 $\rightarrow$ OPEN

102. Rotate selector handle $\leftarrow$ to DRAIN mode.

103. $\sqrt{PG-1}$ is in yellow range
    Drain for 6 minutes.

104. MV2 $\rightarrow$ CLOSE, for 3 minutes

105. Rotate Selector handle $\leftarrow$ to INACT.

106. MV2 $\rightarrow$ OPEN

107. Rotate selector handle $\leftarrow$ to PURGE/FILL mode.

108. Purge for 5 minutes (Pressure Gauge 1 should be in blue arc).

109. MV2 $\rightarrow$ CLOSE

110. Disconnect FSS adapters
    FSS 69-2 $\leftrightarrow$ FSS 72-1
    FSS 72-1 $\leftrightarrow$ WATER LINE IN on FCPA
    FSS 69-2 $\leftrightarrow$ FSS 68-1
    FSS 68-1 $\leftrightarrow$ FSS 72-2

111. Stow Cap adapters FSS-69-1, FSS-69-2, FSS-68-1, FSS 72-1 in rack.
RETURNING SUPPLY TANK TO STORAGE
112. Disconnect cable from Control Monitor/Instrumentation box on the FCPA. Stow in Supply Tank.

113. Supply Tank QD ←|→ FCPA

114. Disconnect straps holding the Supply Tank to the Handrails.

115. Slide Supply Tank into rack and attach triangle bracket, and hand tighten one fastener.

PREPARING TO FILL WW LINES
116. Remove Node 1-Lab Axial Port Closeout.

117. Obtain one CWC of Russian Technical Water from shuttle (refer to RUSSIAN TECHNICAL WATER CONVERSION).

118. Tether RTW CWC to seat track near the back of the FCPA.

119. RTW CWC →|← FSS-64-1

120. FSS-64-1 →|← FCPA “SUPPLY TANK” hose

121. FSS 72-2 ←|→ WATER LINE OUT on FCPA Temporarily stow.

122. FSS 70-1 ←|→ CWC Bag port on FCPA

123. FSS 70-1 →|← WATER LINE OUT on FCPA

124. MV1 → FILL

125. MV2 → OPEN

126. Rotate selector handle ← to PURGE/FILL mode for 30 seconds.

127. Rotate selector handle ← to INACT.

128. MV1 → BYPASS

129. FSS 70-1 ←|→ WATER LINE OUT on FCPA

130. FSS 70-1 →|← CWC Bag port on FCPA

131. FSS-72-2 →|← WATER LINE OUT on FCPA

132. FSS-72-2 →|← Node 1 WW feedthrough A9
FILLING WW LINES
133. Rotate selector handle to PURGE/FILL mode.
134. Purge for 5 minutes (Pressure Gauge 1 should be in blue arc).
135. MV1 → FILL
   Wait 6 minutes.
136. Rotate selector handle to INACT.
137. MV2 → CLOSE
138. MV1 → BYPASS

   NOTE
   WW Lines are now filled.

CONFIGURE NODE 1 VESTIBULE
139. FSS-72-2 ←|→ Node 1 WW feedthrough A9
140. Connect WW vestibule jumper from LAB A9 to Node 1 A9 and dry any water that escapes.

DRAINING FCPA AND ADAPTERS
141. FSS-64-1 ←|→ FCPA “SUPPLY TANK”
142. FSS-72-2 →|← WATER LINE IN
143. MV2 → OPEN
144. Rotate selector handle to DRAIN mode.
145. PG-1 is in yellow range
   Drain for 6 minutes.
146. MV2 → CLOSE, for 3 minutes
147. Rotate selector handle to INACT.
148. MV2 → OPEN
149. Rotate selector handle to PURGE/FILL mode.
150. Purge for 5 minutes (Pressure Gauge 1 should be in blue arc).
151. MV2 → CLOSE
NODE 1 FILL ITCS AND WASTE WATER LINES

152. Close VRIV.

153. Rotate selector handle to INACT.

154. Main Power → Off

155. FSS-72-2 ←|→ WATER LINE OUT, cap

156. FSS-72-2 ←|→ WATER LINE IN, cap, and stow

157. FSS-70-1 ←|→ CWC Bag

158. FSS-70-1 ←|→ WATER COLLECTION on FCPA

159. VAJ ←|→ FCPA

160. Disconnect power cable from FCPA to UOP. 
    Coil cable on FCPA.

161. Untether FCPA from Handrails.

162. Slide FCPA into rack and attach triangle bracket. 
    Hand tighten one bolt.

163. VAJ ←|→ VAP

164. Coil VAJ while releasing and stowing short tethers.

165. Stow VAJ.

166. Replace Beta Cloth Closeout over FSS rack.

167. Remove Handrails, STEAs, and tethers then stow.

168. Install Closeout Panels.

169. Stow CWCs and Jumpers 64-1 and 70-1.
OBJECTIVE:
Install Lab 1 to Node 1 Oxygen and Nitrogen Vestibule jumpers essential to Flight 7A operations.

LOCATION:
Installed: Node 1, Lab 1 Vestibule
Stowed: √Maintenance and Assembly Task Supplement (MATS)

DURATION:
1 hour

PARTS:
Vestibule Outfitting Kit (VOK):
Fluid Jumpers:

<table>
<thead>
<tr>
<th>Jumper Name/Function</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen Recharge</td>
<td>683-13870-11</td>
</tr>
<tr>
<td>Nitrogen Recharge</td>
<td>683-13870-12</td>
</tr>
<tr>
<td>Oxygen Supply</td>
<td>683-13870-10</td>
</tr>
<tr>
<td>Nitrogen Supply</td>
<td>683-13870-9</td>
</tr>
</tbody>
</table>

MATERIALS:
Powder Free Latex Gloves
Dry Wipes
6" x 6" Ziplock Bags (2), P/N 528-21039-3
Braycote 601

TOOLS REQUIRED:
Mini Maglite
Portable Fan
Fluid Fitting Torque Device (FFTDL)
ISS Common IVA Tool Kit:
Kit E:
  Ratchet 1/4" Drive
  1/4" to 3/8" Adaptor
Kit G:
  (10-50 in-lbs) Trq Wrench, 1/4" Drive
Lid #2:
  Table Cloth
ACCESS

**CAUTION**

Care must be taken while working in the vicinity of Hatch Seal to avoid rubbing, scratching, or placing any type of direct pressure upon Seal. Damaging Hatch Seal could prevent Hatch from maintaining pressure when closed.

1. Remove Axial Port Closeout from LAB to Node 1 vestibule.
   Detach Velcro Strips.
   Loosen 1/4 turn fasteners.
   Roll Closeout from loose end toward attached end.
   Temporarily stow.

**INSTALLATION OF OXYGEN AND NITROGEN VESTIBULE JUMPERS**

Figure 1.- LAB Aft External Bulkhead Location of Feed-throughs
(Orientation from within Node 1 Looking Forward).
NOTE
Tables 1,2 are used with Step 2 to install Oxygen and Nitrogen Jumpers.

OXYGEN AND NITROGEN JUMPER INSTALLATION

2. Refer to Figure 2.
   Loosen Node 1 feedthrough cap with FFTD.
   Loosen cap from Node 1 end of jumper by hand.
   Bring jumper end in close proximity to corresponding bulkhead feedthrough.

3. Remove Node 1 feedthrough cap by hand.
   Inspect feedthrough for debris, Braycote.
   Report any debris to MCC-H.
   Clean as directed (Dry Wipes).
   Apply Braycote to feedthrough as needed.

4. Remove cap from Node 1 side of jumper by hand. (Hold cap then twist nut.)
   Inspect jumper connector for debris.
   Report any debris to MCC-H.
   Clean as directed (Dry-Wipes).
   Install jumper onto Node 1 feedthrough (hand tight).
   Jumper cap →|← feedthrough cap
   Repeat for Lab feedthrough.
5. Set torque driver to specified input torque.
   Refer to Table 2 and FFTD Calibration Card for torque settings.
   
   Torque both ends of jumper with FFTD.
   Refer to Table 2

   **NOTE**
   Refer to FFTD calibration card for corresponding input torque values.

<table>
<thead>
<tr>
<th>Jumper Name/Function</th>
<th>Node 1 Fwd Bulkhead Interface</th>
<th>LAB Aft Bulkhead Interface</th>
<th>Part Number</th>
<th>Output Torque (in-lbs)</th>
<th>FFD Head Size (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Supply</td>
<td>A1</td>
<td>A1</td>
<td>683-13870-9</td>
<td>170-200</td>
<td>0.875 0.625</td>
</tr>
<tr>
<td>Oxygen Supply</td>
<td>A2</td>
<td>A2</td>
<td>683-13870-10</td>
<td>170-200</td>
<td>0.875 0.625</td>
</tr>
<tr>
<td>Nitrogen Recharge</td>
<td>A17</td>
<td>A17</td>
<td>683-13870-12</td>
<td>170-200</td>
<td>0.875 0.625</td>
</tr>
<tr>
<td>Oxygen Recharge</td>
<td>A16</td>
<td>A18</td>
<td>683-13870-11</td>
<td>170-200</td>
<td>0.875 0.625</td>
</tr>
</tbody>
</table>

**CAUTION**
Failure to maintain clean environment during oxygen system maintenance could result in fire hazard.

**NOTE**
Refer to Reference Information Section of the Increment IFM book for FFTD Assembly and usage procedures.

6. Install Nitrogen and Oxygen jumpers per Tables 1 and 2.
   Refer to Figure 1 for feedthrough locations.
   Torque Gamah fittings per Table 2 (FFTD, 1/4" to 3/8" Adaptor, (10-50 in-lbs) Trq Wrench, 1/4" Drive).
   Temporarily stow caps (VOK).

**INSTALLATION OF AXIAL PORT CLOSEOUT**
7. Remove Axial Port Closeout from stowage.
8. Unroll Closeout while installing over CBM Vestibule. Attach 1/4 turn fasteners, insert into mounting brackets, tighten 1/4 turn fasteners. Refer to Figure 3.

9. Overlap ends of Closeout, if necessary, detaching 1/4 turn fasteners at end of Closeout. Reattach 1/4 turn fasteners at end of Closeout by inserting through tabs on other end of Closeout. Press Velcro at Closeout ends together. Refer to Figure 4.
Figure 5.- D-rings for Closeout.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure rings for 1/4 turn fasteners are flush to prevent damage to D-rings if the Hatch is closed. Refer to Figure 5.</td>
</tr>
</tbody>
</table>

POST MAINTENANCE

10. Inform MCC-H of task completion.

11. √MATS for stowage location of materials

   Stow tools, materials.
OBJECTIVE:
Install Lab 1 to PMA2 Oxygen and Nitrogen Vestibule jumpers essential to Flight 7A operations.

LOCATION:
Installed: PMA2, Lab 1 Vestibule
Stowed: √Maintenance and Assembly Task Supplement (MATS)

DURATION:
1 hour

PARTS:
None

MATERIALS:
Powder Free Latex Gloves
Dry Wipes
6” x 6” Ziplock Bags (2), P/N 528-21039-3

TOOLS REQUIRED:
Mini Maglite
Portable Fan
Fluid Fitting Torque Device (FFTD)
ISS Common IVA Tool Kit:
Kit A:
    7/8” Combination Wrench
Kit E:
    Ratchet, 1/4” Drive
    1/4” to 3/8” Adaptor
Kit G:
    (10-50 in-lbs) Trq Wrench, 1/4” Drive
Lid #2:
    Table Cloth

ACCESS

CAUTION
Care must be taken while working in the vicinity of Hatch Seal to avoid rubbing, scratching, or placing any type of direct pressure upon Seal. Damaging Hatch Seal could prevent Hatch from maintaining pressure when closed.

1. Remove Axial Port Closeout from LAB to NOD1 vestibule.
   Detach Velcro Strips.
   Loosen 1/4 turn fasteners.
   Roll Closeout from loose end toward attached end.
   Temporarily stow.
RECONFIGURING OXYGEN AND NITROGEN LINES

Figure 1.- PMA2 Cut-away View Showing Path of Oxygen and Nitrogen Recharge lines - View Looking Aft.

Figure 2.- LAB Fwd External Bulkhead (Orientation from within PMA2 Looking Aft).
OXYGEN AND NITROGEN JUMPER INSTALLATION

2. Refer to Figure 2.
Loosen LAB feedthrough cap with FFTD.
Loosen cap from end of recharge line by hand.
Bring recharge line in close proximity to corresponding bulkhead feedthrough.
Remove LAB feedthrough cap by hand.
Inspect feedthrough for debris and Braycote.
Report any debris to MCC-H.
Clean as directed (Dry Wipes).
Apply Braycote to feedthrough as needed.

3. Remove cap from end of recharge line by hand (hold cap, twist nut).
Inspect recharge line connector for debris.
Report any debris to MCC-H.
Clean as directed (Dry Wipes).
Install recharge line onto LAB feedthrough hand tight.
Recharge line cap → Jumper (uncapped) → feedthrough cap
CAUTION
Failure to maintain clean environment during oxygen system maintenance could result in fire hazard.

NOTE
Refer to Reference Information Section of the Increment IFM book for FFTD assembly and usage procedures.

Table 1. Nitrogen and Oxygen Recharge Line Reconfiguration

<table>
<thead>
<tr>
<th>Recharge Line Name/Function</th>
<th>LAB Fwd Bulkhead Interface</th>
<th>Output Torque* (in-lbs)</th>
<th>FFTD Head Size (in)</th>
<th>Drive Head</th>
<th>Reaction Head</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Recharge</td>
<td>A19</td>
<td>170-200</td>
<td>0.875</td>
<td>0.625</td>
<td></td>
</tr>
<tr>
<td>Oxygen Recharge</td>
<td>A18</td>
<td>170-200</td>
<td>0.875</td>
<td>0.625</td>
<td></td>
</tr>
</tbody>
</table>

4. Release Nitrogen Recharge line (thumb latch). Refer to Figure 1 for location of Nitrogen Recharge line and thumb latch.

5. Nitrogen Recharge line ←|→ dead-end connector bracket 7/8" Combination Wrench

6. Nitrogen Recharge line →|← feedthrough (A19) per Tables 1 and 2. Refer to Figure 2 for feedthrough locations. Temporarily stow caps (ZipLock Bag).

7. Release Oxygen Recharge line (thumb latches (2)). Refer to Figure 1 for location of Nitrogen Recharge line and thumb latches.

8. Oxygen Recharge line ←|→ dead-end connector bracket (7/8" Combination Wrench)

9. Oxygen Recharge line →|← feedthrough (A18) per Tables 1 and 2. Refer to Figure 2 for feedthrough locations. Temporarily stow caps (Ziplock Bag).

10. Torque Gamah fittings per Table 2 (FFTD, 1/4" to 3/8" Adaptor, (10-50 in-lbs) Trq Wrench, 1/4" Drive). Refer to FFTD Calibration card for correct input torque settings.
INSTALLATION OF AXIAL PORT CLOSEOUT

11. Remove Axial Port Closeout from stowage.

NOTE
The flexible bands in the sleeves of the Closeout are placed along the curved portion of the Hatch opening.

12. Unroll Closeout while installing over CBM Vestibule. Attach 1/4 turn fasteners, insert into mounting brackets, tighten 1/4 turn fasteners. Refer to Figure 5.

13. Overlap ends of Closeout, if necessary, detaching 1/4 turn fasteners at end of Closeout. Reattach 1/4 turn fasteners at end of Closeout by inserting through tabs on other end of Closeout. Press Velcro at Closeout ends together. Refer to Figure 6.
CAUTION
Ensure rings for 1/4 turn fasteners are flush to prevent damage to D-rings if the Hatch is closed. Refer to Figure 5.

POST MAINTENANCE

15. √MATS for stowage location of materials.
   Stow tools, materials.
ACTIVATION AND CHECKOUT
1. **POWERING ON MCOR**

PCS
C&T: Ku band: MCOR: RPCM LAD22B_A RPC 05

RPCM LAD22B_A RPC 05

**cmd** RPC 05 Position – Close (Verify – Cl)

2. **ENABLING RT (BUS I/O) FOR MCOR**

PCS
C&T: Ku band: MCOR: CB CT BIA 23 RT

CB_CT_BIA23_RT_STATUS

‘RT Address and Name: 10 COR’

sel Enable

**cmd** Execute (Verify – Enable)

3. **VERIFYING DEFAULT CONFIGURATION AND HEALTH**

PCS
C&T: Ku band: MCOR

MCOR Overview

Verify Mode – Standby

‘Memory’

Verify ‘Memory Recorded’: 0 %
Verify ‘Fragmentation’ – <TBD

‘Command Status’

Verify ‘Cmd Accept Cnt’: 0

‘Health’

Verify ‘Heartbeat’ – <incrementing>
Verify ‘Temp’ – TBD

4. **DOCUMENTING MEMORY CONFIGURATION**

PCS
C&T: Ku band: MCOR

MCOR Overview

Record ‘Memory Recorded’: ____________ %
Record ‘Bad Memory’: ____________ MBits

5. **INITIATING BUILT IN TEST**

**NOTE**

COR Mode should not be in Playback or Record mode prior to Initiating BIT.

PCS
C&T: Ku band: MCOR: Health Status

MCOR Health Status
Verify ‘COR Mode’ – Standby

**cmd** Initiate Bit

C&T: Ku band: MCOR

**MCOR Overview**

‘Command Status’

Verify ‘Cmd Accept Cnt’ – <incremented>
Verify ‘Mode’ – BIT

Wait TBD seconds.

6. **VERIFYING BUILT IN TEST RESULTS**
   C&T: Ku band: MCOR
   **MCOR Overview**

Verify ‘Mode’ – Standby

‘Health’

Verify ‘Heart Beat’ – <incrementing>
Verify ‘BIT Error’ – No

7. **VERIFYING INPUT CHANNEL ACTIVITY PRESENT**
   C&T: Ku band: MCOR
   **MCOR Overview**

Verify dynamic line between APS 1 and Ch 4 appears blue.
Verify dynamic line between APS 2 and Ch 8 appears blue.

8. **ENABLING RECORDING OF INPUT CHANNELS 4 AND 8**
   C&T: Ku band: MCOR: Record
   **MCOR Record Mode**

‘Select Channel Record State’

Pick Ch 4 – Enable
Pick Ch 8 – Enable
**cmd** Set

‘Channel 4’

Verify ‘Record State’ – Enable
Verify ‘Overflow’ – No
Verify ‘Error Counter’: 0

‘Channel 8’
Verify ‘Record State’ – Enable
Verify ‘Overflow’ – No
Verify ‘Error Counter’: 0

9. VERIFYING MCOR MODE

PCS
C&T: Ku band: MCOR

MCOR Overview

Verify Mode – Record

‘Record’

Verify Ch 4 Recorder symbol lighted.
Verify Ch 8 Recorder symbol lighted.

‘Memory’

Verify ‘Memory Recorded’ – <incrementing>

Wait 15 minutes before preceding to step 10.

10. DISABLING RECORDING OF INPUT CHANNELS 4 AND 8

PCS
C&T: Ku band: MCOR: Record

MCOR Record Mode

‘Select Channel Record State’

Pick Ch 4 – Disable
Pick Ch 8 – Disable
cmd Set

‘Channel 4’

Verify ‘Record State’ – Disabled

‘Channel 8’

Verify ‘Record State’ – Disabled

11. VERIFYING MCOR MODE

PCS
C&T: Ku band: MCOR

MCOR Overview

Verify Mode – Standby

‘Record’

Verify Ch 4 Recorder symbol not lighted.
Verify Ch 8 Recorder symbol not lighted.
MEMO

MCOR INITIAL ACTIVATION AND CHECKOUT

(ASSY OPS/5A.1/FIN)

Page 4 of 12 pages

‘Memory’

Record ‘Memory Recorded’: __________%

12. CONFIGURING PLAYBACK CHANNEL A WITH PERCENT RANGE

PCS

C&T: Ku band: MCOR: Ch A Config

MCOR Channel A Config

‘Config Playback with Percent Range’

Pick Plbk Output Ch: 4

‘Input Ch to Plbk’

Pick Ch 4 – Yes
Pick Ch 8 – No
Pick Plbk Rate: 10 Mbps

Input Start: 0 %
Input Stop: 50 %

Verify ‘Ch Configured’ – Yes
Verify ‘Plbk In Progress’ – No
Verify ‘Plbk Output Ch’: 4

‘Input Ch Selected To Plbk’

Verify Ch 4 – Yes
Verify Ch 8 – No
Verify ‘Plbk Rate’: 10 Mbps
Verify ‘Time Range Selected’ – No
Verify ‘% Range Selected’ – Yes
Verify ‘Start’: 0 %
Verify ‘Stop’: 50 %

C&T: Ku band: MCOR

MCOR Overview

Verify dynamic line between Ch 4 Recorder symbol and Plbk.
Ch A section appears gray.

Verify dynamic line between Ch A Plbk section and Ch 4.
HRFM section appears gray.

13. CONFIGURING PLAYBACK CHANNEL B WITH PERCENT RANGE

PCS

C&T: Ku band: MCOR: Ch B Config

MCOR Channel B Config

‘Config Playback with Percent Range’

Pick Plbk Output Ch: 8
‘Input Ch to Plbk’

Pick Ch 4 – No
Pick Ch 8 – Yes
Pick Plbk Rate: 10 Mbps

input Start: 0 %
input Stop: 50 %

**cmd** Set

Verify ‘Ch Configured’ — Yes
Verify ‘Plbk In Progress’ — No
Verify ‘Plbk Output Ch’: 8

‘Input Ch Selected To Plbk’

Verify Ch 4 – No
Verify Ch 8 – Yes
Verify ‘Plbk Rate’: 10 Mbps
Verify ‘Time Range Selected’ – No
Verify ‘% Range Selected’ – Yes
Verify ‘Start’: 0 %
Verify ‘Stop’: 50 %

C&T: Ku band: MCOR

MCOR Overview

Verify dynamic line between Ch 8 Recorder symbol and Plbk.
Ch B section appears gray.

Verify dynamic line between Ch B Plbk section and Ch 8.
HRFM section appears gray.

**PCS 14.** **CONFIGURING HRFM HDR CHANNELS 4 AND 8**
Using an input Rate of 12 Mbps, perform Ku-Band Payload Channel
Configuration, steps TBD (SODF: C&T), then:
(TBD: This may be a POIC procedure, coordination required)

**MCC-H 15.** **VERIFYING KU-BAND AOS AND RETURN LINK**

**TBD**

**POIC 16.** POIC ⇒ **MCC-H**, “POIC is configured and ready to receive MCOR
playback data.” (DVIS Loop TBD)
17. **ENABLE CH A PLAYBACK**

PCS

C&T: Ku band: MCOR: Playback

MCOR Playback Mode

'Select channel playback state:'

Pick Ch A – Enable
Pick Ch B – Disable

**cmd** Set

‘Channel playback state’

Verify ‘Ch A’ – Enabled
Verify ‘Ch B’ – Disabled

18. **VERIFY MCOR PLAYBACK OPERATION**

PCS

C&T: Ku band: MCOR

MCOR Overview

‘Mode’ (Verify – Playback)

Below ‘Ch A Config’ button:

‘Current’

Verify ‘Percent’ – <incrementing>
Verify dynamic line between APS1 and HRFM TBD.

POIC

19. **POIC ⇒ MCC-H, “MCOR playback data is/is not being received at POIC.”**

If playback data is being received wait TBD minutes before continuing to step 20.

20. **DISABLING CH A AND ENABLE CH B PLAYBACK**

PCS

C&T: Ku band: MCOR: Playback

MCOR Playback Mode

'Select channel playback state:'

Pick Ch A – Disable
Pick Ch B – Enable

**cmd** Set

‘Channel playback state’

Verify ‘Ch A’ – Disabled
Verify ‘Ch B’ – Enabled
21. **VERIFYING MCOR PLAYBACK OPERATION**

PCS

C&T: Ku band: MCOR

MCOR Overview

‘Mode’ (Verify – Playback)

Below ‘Ch B Config’ button:

‘Current’

Verify ‘Percent’ – <incrementing>

Verify dynamic line between APS2 and HRFM TBD.

POIC

22. **POIC ⇒ MCC-H**, “MCOR playback data is/is not being received at POIC.”

If playback data is being received wait TBD minutes before continuing to step 23.

23. **DISABLING CH B PLAYBACK**

PCS

C&T: Ku band: MCOR: Playback

MCOR Playback Mode

‘Select channel playback state:’

Pick Ch A – Disable
Pick Ch B – Disable

**cmd** Set

‘Channel playback state’

Verify ‘Ch A’ – Disabled
Verify ‘Ch B’ – Disabled

24. **VERIFYING MCOR MODE**

PCS

C&T: Ku band: MCOR

MCOR Overview

Verify Mode – Standby

25. **CONFIGURING PLAYBACK CHANNEL A TO PLBK ALL DATA**

PCS

C&T: Ku band: MCOR: Ch A Config

MCOR Channel A Config

‘Config Plbk to Plbk All Data’

Pick Plbk Output Ch: 4

‘Input Ch to Plbk’

Ch 4 – Yes
Ch 8 – No
26. CONFIGURING PLAYBACK CHANNEL B TO PLBK ALL DATA

PCS

C&T: Ku band: MCOR: Ch B Config

MCOR Channel B Config

‘Config Plbk to Plbk All Data’

Pick Plbk Output Ch: 8

‘Input Ch to Plbk’

Ch 4 – No
Ch 8 – Yes

input Plbk Rate: 5 Mbps

cmd Set

Verify ‘Ch Configured’ – Yes
Verify ‘Plbk In Progress’ – No
Verify ‘Plbk Output Ch’: 8

‘Input Ch Selected To Plbk’

Verify Ch 4 – Yes
Verify Ch 8 – No
Verify ‘Plbk Rate’: 5 Mbps
Verify ‘Time Range Selected’ – Yes

MCC-H

27. Verifying Ku-Band AOS and Return Link

TBD

POIC

28. POIC ⇒ MCC-H, “POIC is configured and ready to receive MCOR playback data.” (DVIS Loop TBD)
29. **ENABLING CH A PLAYBACK**

PCS

C&T: Ku band: MCOR: Playback

**MCOR Playback Mode**

'Select channel playback state:'

Pick Ch A – Enable
Pick Ch B – Disable

**cmd** Set

'Channel playback state'

Verify 'Ch A' – Enabled
Verify 'Ch B' – Disabled

30. **VERIFYING MCOR PLAYBACK OPERATION**

PCS

C&T: Ku band: MCOR

**MCOR Overview**

'Mode' (Verify – Playback)

Below 'Ch A Config’ button

'Current'

Verify 'Time' – <incrementing>

Verify dynamic blue lines between APS1 and HRFM TBD.

31. **POIC ⇒ MCC-H, “MCOR playback data is/is not being received at POIC.”**

POIC

If playback data is being received wait TBD minutes before continuing to step 32.

32. **DISABLING CH A AND ENABLE CH B PLAYBACK**

PCS

C&T: Ku band: MCOR: Playback

**MCOR Playback Mode**

'Select channel playback state:'

Pick Ch A – Disable
Pick Ch B – Enable

**cmd** Set

'Channel playback state'

Verify 'Ch A’ – Disabled
Verify 'Ch B' – Enabled
33. **VERIFYING MCOR PLAYBACK OPERATION**

PCS

C&T: Ku band: MCOR

[MCOR Overview]

`Mode` (Verify – Playback)

Below `Ch B Config` button:

`Current`

Verify `Time` – <incrementing>

Verify dynamic line between APS2 and HRFM TBD.

POIC 34. POIC ⇒ **MCC-H**, “MCOR playback data is/is not being received at POIC.”

If playback data is being received wait TBD minutes before continuing to step 35.

35. **DISABLING CH B PLAYBACK**

PCS

C&T: Ku band: MCOR: Playback

[MCOR Playback Mode]

`Select channel playback state:`

Pick Ch A – Disable
Pick Ch B – Disable

**cmd** Set

`Channel playback state`

Verify `Ch A` – Disabled
Verify `Ch B` – Disabled

36. **VERIFYING MCOR MODE**

PCS

C&T: Ku band: MCOR

[MCOR Overview]

Verify Mode – Standby

37. **UNPROTECTING MEMORY BY PERCENT RANGE**

PCS

C&T: Ku band: MCOR: UNPROTECT

[MCOR Memory Unprotect]

`Unprotect Percent Range`

`Input Channel Selected`

Pick Ch 4 – Yes
Pick Ch 8 – No

input Start: 0 %
input Stop: 50 %

**cmd** Set
Verify ‘Unprotect in Progress’ – Yes

Wait TBD minutes.

Verify ‘Unprotect in Progress’ – No

**PCS 38. UNPROTECTING ALL DATA**

C&T: Ku band: MCOR: UNPROTECT

- MCOR Memory Unprotect
- ‘Unprotect All Data’
- ‘Input Channel Selected’

Pick Ch 4 – Yes
Pick Ch 8 – Yes

**cmd** Set

Verify ‘Unprotect in Progress’ – Yes

Wait TBD minutes.

Verify ‘Unprotect in Progress’ – No

C&T: Ku band: MCOR

- MCOR Overview
- ‘Memory’

Verify ‘Memory Recorded’ – TBD %

**MCC-H 39. DISPLAYING AND PRINT MCOR HEALTH STATUS**

C&T: Ku band: MCOR: Health Status

- MCOR Health Status

Print window from console and attach to logs.

**PCS 40. DEFRAGMENTING MEMORY**

**NOTE**

MCOR should be in the Standby mode prior to initiating Defrag.

C&T: Ku band: MCOR: Defrag

- MCOR Memory Defragment

Verify COR Mode – Standby

Verify DEFRAg in Progress – Not Running

Record Fragmentation – ________

**cmd** Set
Verify COR Mode – Defrag
Verify DEFRAG in Progress – Running

Wait 1 minute.

PCS 41. **VERIFYING DEFRAGMENTATION IS COMPLETE**
C&T: Ku band: MCOR: Defrag
   MCOR Memory Defragment

Verify COR Mode – Standby
Verify DEFRAG in Progress – Not Running
Verify Fragmentation – TBD

PCS 42. **INITIATING RESET**
C&T: Ku band: MCOR
   MCOR Overview
   ‘Command Status’

Record Cmd Accept Cnt: 

C&T: Ku band: MCOR: Reset
   MCOR Reset

**cmd** Reset

PCS 43. **VERIFYING RESET TO POWER ON DEFAULT CONFIGURATION**
C&T: Ku band: MCOR
   MCOR Overview
   ‘Command Status’

Verify Cmd Accept Cnt – <incremented>

‘Mode’ (Verify – Standby)
‘Memory’

Verify Memory Recorded: 0%

44. **ISS ↓ MCC-H,** “MCOR Activation and Checkout complete.”

45. **MCC-H ⇒ POIC,** “You have a go to begin MCOR nominal operations.”
NOTE
1. This procedure consists of Power Up, BIT, System Tests and Pointing Modes.
2. Ground only: ODIN must perform the following steps: 1, 2, 8, 11, and 13.

1. **INHIBITING RT (BUS) FDIR FOR HRFM AND HRM**

   PCS C&T: Ku band
   - [Ku_band_Overview](#)
     - ‘High Rate Frame Multiplexer’

   sel Config
   - [Ku_band_HRFM_Configuration](#)

   sel CB CT 2 RT Status
   - [CB_CT_2_RT_Status](#)
     - ‘RT Address and Name: 10 HRFM’

   √ Inhibit FDIR – Inh

   ‘RT Address and Name: 11 HRM’

   √ Inhibit FDIR – Inh

2. **INHIBITING RT (BUS) FDIR FOR TRC AND VBSP**

   PCS C&T: Ku band
   - [Ku_band_Overview](#)
     - ‘Transmitter/Receiver Controller’

   sel Config
   - [Ku_band_TRC_Configuration](#)

   sel CB CT 3 RT Status
   - [CB_CT_3_RT_Status](#)
     - ‘RT Address and Name: 08 SGTRC’

   √ Inhibit FDIR – Inh

   ‘RT Address and Name: 13 VBSP’

   √ Inhibit FDIR – Inh
3. **POWERING ON SGANT**

   PCS
   C&T: Ku band: RPCM Z13B B RPC 05
   RPCM Z13B B RPC 05
   
   **cmd** RPC Position – Close (Verify – Cl)

4. **POWERING ON VBSP**

   PCS
   C&T: Ku band: RPCM LAD22B A RPC 02
   RPCM LAD22B A RPC 02
   
   **cmd** RPC Position – Close (Verify – Cl)

5. **POWERING ON HRFM**

   PCS
   C&T: Ku band: RPCM LAD22B A RPC 06
   RPCM LAD22B A RPC 06
   
   **cmd** RPC Position – Close (Verify – Cl)

6. **POWERING ON HRM**

   PCS
   C&T: Ku band: RPCM LAD22B A RPC 07
   RPCM LAD22B A RPC 07
   
   **cmd** RPC Position – Close (Verify – Cl)

7. **POWERING ON TRC**

   PCS
   C&T: Ku band: RPCM Z13B B RPC 14
   RPCM Z13B B RPC 14
   
   **cmd** RPC Position – Close (Verify – Cl)

8. **ENABLING RT (BUS) FOR HRFM AND HRM**

   PCS
   C&T: Ku band
   
   **sel Config**
   Ku_band_HRFM_Configuration
   
   **sel CB CT 2 RT Status**
   CB_CT_2_RT_Status
   ‘RT Address and Name: 10 HRFM’
   
   **cmd** 10 HRFM Enable Execute

Verify 10 HRFM RT Status – Ena
‘RT Address and Name: 11 HRM’

**cmd** 11 HRM Enable  **Execute**

Verify 11 HRM RT Status – Ena

9. **VERIFYING HRFM AND HRM ORU HEALTH**

PCS C&T: Ku band: High Rate Frame Multiplexer  
*Ku_band_HRFM*

‘Bit Summary’

Verify POST/ECM – Pass
Verify Environmental – Pass

C&T: Ku band: High Rate Modem  
*Ku_band_HRM*

‘Bit Summary’

Verify POST/ECM – Pass
Verify Environmental – Pass

10. **CONFIGURING HRM OUTPUT**

**NOTE**
The HRM output must be configured for the TRC Environmental flag to Pass.

PCS C&T: Ku band  
*Ku_band_Overview*

‘High Rate Modem’

sel Config

*Ku_band_HRM_Configuration*

sel HRM Output Rate

*HRM_Output_Rate*

**cmd** 25 Mbps

Verify Pending Output Rate: 25 Mbps

sel Execute HRM Function Config

*Execute_HRM_Function_Config*

**cmd** Execute Function Config

Verify no Xs in the “Miscompare” column for HRM Output Data Rate.
11. **ENABLING RT (BUS) FOR TRC AND VBSP**

**PCS**

C&T: Ku band

[**Ku_band_Overview**](#)

‘Transmitter/Receiver Controller’

**sel Config**

[**Ku_band_TRC_Configuration**](#)

**sel CB CT 3 RT Status**

[**CB_CT_3_RT_Status**](#)

‘RT Address and Name: 08 SGTRC’

**cmd** 08 SGTRC Enable  **Execute**

Verify 08 SGTRC RT Status – Ena

‘RT Address and Name: 13 VBSP’

**cmd** 13 VBSP Enable  **Execute**

Verify 13 VBSP RT Status – Ena

12. **VERIFYING TRC AND VBSP ORU HEALTH**

**PCS**

C&T: Ku band: Transmitter/Receiver Controller

[**Ku_band_TRC**](#)

‘Bit Summary’

Verify POST/ECM – Pass

Verify Environmental – Pass

C&T: Ku band: Video Baseband Signal Processor

[**Ku_band_VBSP**](#)

‘Bit Summary’

Verify POST/ECM – Pass

Verify Environmental – Pass

13. **ENABLING RT (BUS) FDIR FOR HRFM AND HRM**

**PCS**

C&T: Ku band

[**Ku_band_Overview**](#)

‘High Rate Frame Multiplexer’

**sel Config**

[**Ku_band_HRFM_Configuration**](#)

**sel CB CT 2 RT Status**
CB_CT_2_RT_Status
‘RT Address and Name: 10 HRFM’

**cmd** 10 HRFM Enable FDIR  **Execute**

Verify 10 HRFM RT FDIR Status – Ena

‘RT Address and Name: 11 HRM’

**cmd** 11 HRM Enable FDIR  **Execute**

Verify 11 HRM RT FDIR Status – Ena

14. **ENABLING RT (BUS) FDIR FOR TRC AND VBSP**

PCS

C&T: Ku band

**Ku_band_Overview**

‘Transmitter/Receiver Controller’

sel Config

**Ku_band_TRC_Configuration**

sel CB CT 3 RT Status

CB_CT_3_RT_Status
‘RT Address and Name: 08 SGTRC’

**cmd** 08 SGTRC Enable FDIR  **Execute**

Verify 08 SGTRC RT FDIR Status – Ena

‘RT Address and Name: 13 VBSP’

**cmd** 13 VBSP Enable FDIR  **Execute**

Verify 13 VBSP RT FDIR Status – Ena

**NOTE**

1. The following steps will verify the Ku-Band Health and Status of the ORUs.

2. Each Ku-Band ORU Built-In Tests (BIT) take 1 to 10 seconds to complete.

3. Because of S-Band Downlink telemetry rates, the operator may not be able to verify that an ORU BIT status is ‘Active’ when the ORU BIT is commanded.
15. **VBSP SELF-TEST AND VERIFICATION**

PCS

C&T: Ku band

- [Ku_band_Overview](#)
- ‘Video Baseband Signal Processor’

sel Config

- [Ku_band_VBSP_Configuration](#)

sel Built In Test

- [VBSP_BIT](#)

**cmd** BIT Start

Verify BIT Status – Active

Wait 1 minute.

√BIT Status – Inactive

C&T: Ku band

sel Video Baseband Signal Processor

- [Ku_band_VBSP](#)
- ‘BIT Summary’

Verify Equipment Self Test – Pass
Verify Environmental – Pass

16. **HRFM SELF-TEST AND VERIFICATION**

PCS

C&T: Ku band

- [Ku_band_Overview](#)
- ‘High Rate Frame Multiplexer’

sel Config

- [Ku_band_HRFM_Configuration](#)

sel Built In Test

- [HRFM_BIT](#)

**cmd** BIT Start

Verify BIT Status – Active

Wait 1 minute.
17. HRM SELF-TEST AND VERIFICATION

PCS

C&T: Ku band

Ku_band_Overview

‘High Rate Modem’

sel Config

Ku_band_HRM_Configuration

sel HRM Test

HRM_Test

cmd Start BIT Test

Verify Test Status – Self Test

Wait 1 minute.

√Test Status – Inactive

C&T: Ku band: High Rate Modem

Ku_band_HRM

‘BIT Summary’

Verify Equipment Self Test – Pass

Verify Environmental – Pass

18. CONFIGURING HRM OUTPUT

NOTE

The HRM output must be configured for the TRC Environmental flag to Pass.

PCS

C&T: Ku band

Ku_band_Overview

‘High Rate Modem’

sel Config

Ku_band_HRM_Configuration
sel HRM Output Rate

HRM_Output_Rate

**cmd** 25 Mbps

Verify Pending Output Rate: 25 Mbps

sel Execute HRM Function Config

Execute_HRM_Function_Config

**cmd** Execute Function Config

Verify no Xs in the “Miscompare” column for HRM Output Data Rate.

### 19. TRC SELF-TEST AND VERIFICATION

<table>
<thead>
<tr>
<th><strong>NOTE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The TRC has two different Self-Tests. They must be performed one at a time.</td>
</tr>
<tr>
<td>2. The operator may not see all TRC test iterations listed on BIT Status.</td>
</tr>
</tbody>
</table>

PCS C&T: Ku band

Ku_band_Overview

‘Transmitter/Receiver Controller’

sel Config

Ku_band_TRC_Configuration

sel Built In Test

TRC_BIT

**cmd** TRC BIT Start

Verify BIT Status – Post ECM
Verify BIT Status – Encoder Resolver IF
Verify BIT Status – Tracking Modulator IF
Verify BIT Status – Rcvr Gain
Verify BIT Status – Electrical Stop

Wait 1 minute.

\( \sqrt{ } \) BIT Status – Inactive
20. TRC ANTENNA GROUP SELF-TEST AND VERIFICATION

PCS

C&T: Ku band

Ku_band_Overview

‘Transmitter/Receiver Controller’

sel Config

Ku_band_TRC_Configuration

sel Built In Test

TRC_BIT

cmd Ant Group BIT Start

Verify BIT Status – Position Loop

Wait 1 minute.

√BIT Status – Inactive

C&T: Ku band: Transmitter/Receiver Controller

Ku_band_TRC

‘BIT Summary’

Verify Equipment Self Test – Pass
Verify Environmental – Pass

21. CONFIGURING FOR KU-BAND PARK MODE

NOTE

1. A dedicated Ku-Band TDRS must be available for the rest of the procedure.

2. Ku-Band Antenna Group Pointing Modes will take several orbits.

PCS

C&T: Ku band: Antenna Management

Ku Band Antenna Management

√TDRS Selection – None
C&T: Ku band  
Ku Band Overview  
‘Transmitter/Receiver Controller’

sel Config  
Ku Band TRC Configuration

√Actual Pointing Mode – Inhibit

sel Pointing Mode  
TRC Pointing Mode  

cmd Open Loop

Verify Pending Pointing Mode – Open Loop

sel Execute TRC Function Config  

Execute TRC Function Config  

cmd Execute Function Config

Verify no Miscompare button is illuminated for TRC Pointing Mode.

NOTE
1. The following steps will provide movement to the SGANT. Gimbals, Pointing Encoders, and Command response will be tested.

2. The Input range for the Ku-Band Antenna Gimbals are:  
   Elevation [-65 to 65 degrees]  
   Cross-Elevation [-120 to 120 degrees]

22. PARK KU-BAND ANTENNA

PCS  
C&T: Ku band: Antenna Management: Park Antenna  
Ku Band Park Antenna

input Cross-Elevation – [X] where [X] = 0 0 -120 12 0

input Elevation – [Y] where [Y] = -65 65 0 0 0

cmd Set

C&T: Ku band: Antenna Management  
Ku Band Antenna Management

Verify Cross-Elevation – X (moving toward X)  
Verify Elevation – Y (moving toward Y)

Repeat
23. **CONFIGURING FOR KU-BAND OPEN LOOP POINTING MODE**

PCS

**C&T: Ku band**

Ku Band Overview

‘Transmitter/Receiver Controller’

sel Config

Ku Band TRC Configuration

√Actual Pointing Mode – Inhibit

C&T: Ku band: Antenna Management: Handover Mode

Ku Band Handover Mode

**NOTE**

Early (Late) Handover Mode will automatically select the available TDRS.

**cmd** Early (Late)

Verify H/O Mode Status – Early (Late)

**NOTE**

All seven Ku-Band masks are enabled by default. Pointing masks 1, 2, and 3 are not to be disabled.

24. **CONFIGURING KU-BAND POINTING MASK**

PCS

**C&T: Ku band: Antenna Management: Mask Control**

Ku Band Pointing Mask Control

‘Disable Pointing Mask’

input Mask State # – [X] where [X] = 4 5 6 7

**cmd** Load

Verify Mask # [X] State – Ready

‘Execute’

**cmd** Set

Verify Mask # [X] Status – Disabled

Repeat

25. **KU-BAND OPEN LOOP POINTING MODE**

PCS

**C&T: Ku band**

Ku Band Overview

‘Transmitter/Receiver Controller’
sel Config

Ku Band TRC Configuration

sel Pointing Mode

TRC Pointing Mode

cmd Open Loop

Verify Pending Pointing Mode – Open Loop

sel Execute TRC Function Config

Execute TRC Function Config

cmd Execute Function Config

Verify no Miscompare button is illuminated for TRC Pointing Mode.

NOTE
The ISS Antenna Management (IAM) may be required to verify the SGANT moving toward selected TDRS.

26. VERIFYING KU-BAND OPEN LOOP POINTING MODE

PCS

C&T: Ku band: Transmitter/Receiver Controller

Ku_Band TRC

‘Antenna Position’

Verify EL Position – <moving toward TDRS>
Verify X-EL Position – <moving toward TDRS>

Verify SGANT movement for several TDRS Handovers. Obtain several Printouts of Display.

27. STOP KU-BAND OPEN LOOP POINTING MODE

PCS

C&T: Ku band

Ku Band Overview

‘Transmitter/Receiver Controller’

sel Config

Ku Band TRC Configuration

sel Pointing Mode

TRC Pointing Mode

cmd Inhibit
Verify Pending Pointing Mode – Inhibit

sel Execute TRC Function Config

Execute TRC Function Config

**cmd** Execute Function Config

Verify no Xs in “Miscompare” column for TRC Pointing Mode.

### 28. CONFIGURING KU-BAND AUTOTRACK POINTING MODE

**NOTE**

The Ku-Band Subsystem Nominal configuration is as follows:
- Pointing Mode = Autotrack
- Continuous Retry = Enable
- TDRS H/O = Auto (Late/Early)

PCS

C&T: Ku band: Antenna Management: Autotrack Retry

Ku Band Autotrack Retry

**cmd** Enable

Verify Autotrack Retry – Enable

C&T: Ku band: Antenna Management

Ku Band Antenna Management

√ H/O Mode Status – Early (Late)

‘Mask Control’

√ Mask # Status – Enable (for required Masks)

### 29. KU-BAND AUTOTRACK POINTING MODE

PCS

C&T: Ku band

Ku Band Overview

‘Transmitter/Receiver Controller’

sel Config

Ku Band TRC Configuration

sel Pointing Mode

TRC Pointing Mode

**cmd** Autotrack
Verify Pending Pointing Mode – Autotrack

sel Execute TRC Function Config

**Execute TRC Function Config**

**cmd** Execute Function Config

Verify No Miscompare button is illuminated for TRC Pointing Mode.

**NOTE**
The ISS Antenna Management (IAM) may be required to verify the SGANT moving toward selected TDRS.

### 30. VERIFYING KU-BAND AUTOTRACK POINTING MODE

#### PCS C&T: Ku band: Transmitter/Receiver Controller

**Ku_Band_TRC**

‘Configuration’

Verify Ant Mode – Autotrack

‘Antenna Position’

Verify Autotrack Stat – Acq Lock (Wait up to 85 seconds.)
Verify EL Position – <increasing or decreasing>
Verify X-EL Position – <increasing or decreasing>

Verify SGANT movement for several TDRS Handovers.
Obtain several printouts of display.

### KU-BAND SYSTEM TESTS

**NOTE**
1. Ku-Band System tests will verify ORU health and Ground interface status.
2. **MCC/WSFC** must be configured for the Downlink data.

### 31. HIGH RATE MODEM SYSTEM TEST AND VERIFICATION

#### PCS C&T: Ku band

**Ku_band_Overview**

‘High Rate Modem’

sel Config

**Ku_band_HRM_Configuration**

sel HRM Output Rate
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32. CONFIGURING DOWNLINK RATE FOR HRFM SYSTEM TEST

**NOTE**
HRM and HRFM Output Data Rates must match.

PCS
C&T: Ku band
‘High Rate Modem’

sel Config

sel HRM Output Rate

HRM_Output_Rate

HRM and HRFM Output Data Rates must match.

Verify Pending Output Rate: 25 Mbps

sel Execute HRM Function Config

Execute_HRM_Function_Config

cmd Execute Function Config

Verify no Xs in the “Miscompare” column for HRM Output Rate.

sel HRM Test

HRM_Test

cmd Start System Test


Run Test for 5 minutes.

sel HRM Test

HRM_Test

cmd Stop Test

Verify HRM Test – Inactive
cmd 50 Mbps

Verify Pending Output Rate: 50 Mbps

sel Execute HRM Function Config

Execute_HRM_Function_Config

cmd Execute Function Config

Verify no Miscompare button is illuminated for HRM Output Data Rate.

C&T: Ku band

Ku_band_Overview

‘High Rate Frame Multiplexer’

sel Config

Ku_band_HRFM_Configuration

sel Output Rate

HRFM_Output_Rate

cmd 50 Mbps

Verify Pending Output Rate: 50 Mbps

sel Execute HRFM Function Config

Execute_HRFM_Function_Config

cmd Execute Function Config

Verify no Miscompare button is illuminated for HRFM Output Data Rate.

33. HIGH RATE FRAME MULTIPLEXER SYSTEM TEST

C&T: Ku band

Ku_band_Overview

‘High Rate Frame Multiplexer’

sel Config

Ku_band_HRFM_Configuration

NOTE

The HRFM System Test can only be scored by GC one channel at a time.
'HRFM VBSP Ch[X]' where [X] = 1 2 3 4

sel Mode

**HRFM_VBSP_Ch[X]_Mode**

**cmd** Test

Verify Pending Mode – Test

sel Rate

**HRFM_VBSP_Ch[X]_Rate**

'Resolution Rate'

'6 Bit'

**cmd** 2.0

Verify Pending Resolution Rate: 2.0

sel T/O

**HRFM_VBSP_Ch[X]_Timeout**

**cmd** 4.096 seconds

Verify Pending Timeout: 4.096

Repeat
'HRFM HDR Ch[X]'  where [X] = [1, 2, 3, 4, 5, 6, 7, 8]

self Mode

```
HRFM_HDR_Ch[X]._Mode
```

cmd Mode – Test

Verify Pending Mode – Test

self Type

```
HRFM_HDR_Ch[X]._Type
```

cmd Type – CCSDS

Verify Pending Type – CCSDS

self Rate

```
HRFM_HDR_Ch[X]._Rate
```

input Upload Rate: 2 Mbps

cmd Set

Verify Pending Rate: 2 Mbps

self T/O

```
HRFM_HDR_Ch[X]._Timeout
```

cmd T/O: 4.096 seconds

Verify Pending Timeout: 4.096 seconds

Repeat

self Execute HRFM Function Config

```
Execute_HRFM_Function_Config
```

cmd Execute Function Config

Verify no Xs HRFM VBSP/HDR Ch (1 --- 4)/(1 --- 8) “Miscpr” columns.

Verify MCC-H processing HRFM VBSP/HDR Channel data.

Run test for 3 minutes on each channel.
34. **CONFIGURING HRFM FOR VBSP SYSTEM TEST**

PCS

C&T: Ku band

Ku_band_Overview

‘High Rate Frame Multiplexer’

sel Config

Ku_band_HRFM_Configuration

‘HRFM VBSP Ch[X]’ where [X] = 1 2 3 4

sel Mode

HRFM_VBSP_Ch[X] Mode

**cmd** Normal

Verify Pending Mode – Normal

sel Rate

HRFM_VBSP_Ch[X] Rate

‘Field Rate’

**cmd** 0

Verify Pending Resolution Rate: 0

Repeat

‘HRFM HDR Ch[X]’ where [X] = 1 2 3 4 5 6 7 8

sel Mode

HRFM_HDR_Ch[X] Mode

**cmd** Mode – Normal

Verify Pending Mode – Normal

sel Rate

HRFM_HDR_Ch[X] Rate

input Upload Rate: 0

**cmd** Set

Verify Pending Rate: 0

Repeat
35. VIDEO BASEBAND SIGNAL PROCESSOR SYSTEM TEST

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. VBSP Channel number and VBSP HRFM Channel number should be the same.</td>
</tr>
<tr>
<td>2. Only one VBSP Channel can be configured to test mode at a time.</td>
</tr>
<tr>
<td>3. VBSP 60 Frame/8 bit cannot be performed because it exceeds the HRFM Bandwidth.</td>
</tr>
</tbody>
</table>

PCS

C&T: Ku band

Ku_band_Overview

‘Video Baseband Signal Processor’

sel Config

Ku_band_VBSP_Configuration

‘Channel [X]’ where [X] = 1 2 3 4

sel Mode

VBSP_Ch[X]_Mode

cmd Test

Verify Pending Mode – Test

36. CONFIGURING VBSP RESOLUTION

PCS

C&T: Ku band

Ku_band_Overview

‘Video Baseband Signal Processor’

sel Config

Ku_band_VBSP_Configuration

‘Channel [X]’

sel Mode
KU-BAND SUBSYSTEM ACTIVATION AND CHECKOUT

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VBSP_Ch[ X ] Mode

'Channel [ X ]'

sel Resolution

VBSP_Ch[ X ] Resolution

**cmd** 6 (8) bit

Verify Pending Resolution: 6(8) bit

37. **CONFIGURING HRFM DATA RATE**

PCS C&T: Ku band

Ku_band_Overview

'High Rate Frame Multiplexer'

sel Config

Ku_band_HRFM_Configuration

'HRFM VBSP Ch [ X ]'

sel Rate

HRFM_VBSP_Ch[ X ] Rate

If channel [ X ] resolution is 6 bit

'Resolution Rate'

'6 Bit'

**cmd** [ Y ] where [ Y ] = 48 24.5 12.5 6.5 2

Verify Pending Resolution Rate – [ Y ]

If channel [ X ] resolution is 8 bit

'Resolution Rate'

'8 Bit'

**cmd** [ Y ] where [ Y ] = 32 16.5 8.5 2.5

Verify Pending Resolution Rate – [ Y ]

sel Execute HRFM Function Config

Execute_HRFM_Function_Config

**cmd** Execute Function Config

Verify no Xs HRFM VBSP Ch (1 --- 4).
38. **CONFIGURING VBSP FIELD RATES**

PCS

C&T: Ku band

Ku_band_Overview

‘Video Baseband Signal Processor’

sel Config

Ku_band_VBSP_Configuration

‘Channel [X]’

sel Field Rate

VBSP_Ch[X]_Field_Rate

If channel [X] resolution is 6 bit

\[ \text{cmd } [Z] \quad \text{where } [Z] = 60 \ 30 \ 15 \ 7.5 \ 1.875 \]

Verify Pending Field Rate – [Z]

If channel [X] resolution is 8 bit

\[ \text{cmd } [Z] \quad \text{where } [Z] = 30 \ 15 \ 7.5 \ 1.875 \]

Verify Pending Field Rate – [Z]

sel Execute VBSP Function Config

Execute_VBSP_Function_Config

\text{cmd} \quad \text{Execute Function Config}

Verify no Xs Miscompare button illuminated for VBSP Channels (1 --- 4).

MCC-H

Verify processing VBSP Channel [X] Video Test Pattern data.

Run Test for 5 minutes.

Repeat Steps 37 and 38 for the next listed value for data rate, [Y], and field rate, [Z].

39. **CONFIGURING HRFM AND VBSP FOR NEXT TEST**

PCS

C&T: Ku band

Ku_band_Overview

‘High Rate Frame Multiplexer’

sel Config

Ku_band_HRFM_Configuration

‘HRFM VBSP Ch [X]’
sel Rate

HRFM_VBSP_Ch[X]_Rate
‘Resolution Rate’
‘6 Bit’

cmd 0

Verify Pending Resolution Rate: 0

Ku_band_HRFM_Configuration

sel Execute HRFM Function Config

Execute_HRFM_Function_Config

cmd Execute Function Config

Verify no Xs HRFM VBSP/HDR Ch (1 --- 4)/(1 --- 8) “Miscpr” columns.

C&T: Ku band
Ku_band_Overview
‘Video Baseband Signal Processor’

sel Config

Ku_band_VBSP_Configuration
‘Channel [X]’

sel Field Rate

VBSP_Ch[X]_Field_Rate

cmd 0

Verify Pending Field Rate: 0

Ku_band_VBSP_Configuration

sel Execute VBSP Function Config

Execute_VBSP_Function_Config

cmd Execute Function Config

Verify no Xs Miscompare button illuminated for VBSP Channels 1 --- 4.

Repeat steps 36 --- 39 for 8 Bit Resolution.
40. **DECONFIGURING VBSP CHANNEL UNDER TEST**

PCS

C&T: Ku band

<table>
<thead>
<tr>
<th>Ku_band_Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Video Baseband Signal Processor’</td>
</tr>
</tbody>
</table>

sel Config

<table>
<thead>
<tr>
<th>Ku_band_VBSP_Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Channel [X]’</td>
</tr>
</tbody>
</table>

sel Mode

<table>
<thead>
<tr>
<th>VBSP_Ch[X]_Mode</th>
</tr>
</thead>
</table>

**cmd** Normal

Verify Pending Mode – Normal

sel Execute VBSP Function Config

| Execute_VBSP_Function_Config |

**cmd** Execute Function Config

Verify no Xs Miscompare button illuminated for VBSP Channels 1 --- 4.

Repeat steps 35 --- 40 for the other VBSP channels.

---

**NOTE**

1. Ku-Band ORU System tests are completed.

2. The following steps will configure Ku-Band Subsystem to its Nominal configuration for **MCC-H** to POIC equipment handover.

41. **CONFIGURING HRFM DATA RATE**

PCS

C&T: Ku band

<table>
<thead>
<tr>
<th>Ku_band_Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘High Rate Frame Multiplexer’</td>
</tr>
</tbody>
</table>

sel Config

| Ku_band_HRFM_Configuration |
'HRFM HDR Ch[X]' where [X] = [1 2 3 4 5 6 7 8]

sel Rate

[HRFM_HDR_Ch[X]_Rate]

'Enter Mbps. Rate'

input Rate: 0
cmd Set

Verify Pending Rate: 0

Repeat

'HRFM VBSP Ch [X]' where [X] = [1 2 3 4]

sel Rate

[HRFM_VBSP_Ch[X]_Rate]

'Resolution Rate'

'6 Bit'

cmd 0

Verify Pending Resolution Rate: 0

Repeat

sel Execute HRFM Function Config

[Execute_HRFM_Function_Config]

cmd Execute Function Config

Verify no Xs HRFM VBSP/HDR Ch (1 --- 4)/(1 --- 8) "Miscpr” columns.

42. **MCC-H** to POIC Ku-Band Equipment Handover per Generic JOIP Volume C, SOP 9.13: Activation, Checkout, and Handover of the PEHG, APS, COR, and HRFM.
The Ku-Band subsystem must be activated and checked out prior to Ku-Band Receiver Activation.

1. **KU-BAND RECEIVER UOP POWERUP**
   
   **PCS**
   Lab: EPS
   
   sel DDCU TBS
   sel RPCM TBS
   sel RPC TBS
   
   Verify Close Cmd – Ena
   
   RPC TBS cmd – CL
   
   Verify RPC TBS – CL
   
   **UOP**
   UOP TBS sw – ON

2. **KU-BAND POWER SUPPLY POWERUP**
   
   OUTPUT 28 V J2 sw → ON
   
   Verify 2 front panel LEDs – ON
   
   **NOTE**
   Demodulated and bit sync LEDs will only indicate lock if the SGANT and TRC are powered on and a modulated Ku-Band forward link signal is present.

3. **KU-BAND RECEIVER POWERUP**
   
   CB1 → ON
   
   Verify front panel Power LED – ON
   Verify Demod Lock and Bit Sync Lock front panel LEDs – ON
1. **POWERING ON COMMON VIDEO INTERFACE UNITS 3 AND 6**

   PCS C&T: Video: ORU Detail: CVIU
   Video CVIU

   sel CVIU 3

   [RPCM LAP51A4A A RPC 06]

   **cmd** RPC Position – Close (Verify – Cl)

   Video CVIU

   sel CVIU 6

   [RPCM LAS52A3B A RPC 06]

   **cmd** RPC Position – Close (Verify – Cl)

2. **SENDING TEST PATTERN**

   PCS C&T: Video: ORU Detail: SCU 1
   Video SCU 1
   ‘Signal Generator’

   sel SCU Configuration

   [SCU 1 Config]
   ‘Test Pattern Selection’

   **cmd** Color Bar

   Verify Test Pattern Selection – Color Bar

3. **ROUTING TEST PATTERN TO COMMON VIDEO INTERFACE UNIT**

   PCS C&T: Video: ORU Detail: VSU 1
   Video VSU 1

   sel Switch Program

   [VSU1 Switch Program]

   **cmd** Set
   Pick Input 10: SCU 1 Test Patt
   Pick Output 03: VTR 1/ORB

   **cmd** SCU1 SWEP

   C&T: Video: ORU Detail: VSU 2
   Video VSU 2
4. **POWERING ON VIDEO TAPE RECORDERS 1 AND 2**

PCS

C&T: Video: ORU Detail: VTR 1

C&T: Video: ORU Detail: VTR 2

5. **CONFIGURING AND CHECKING OUT VIDEO TAPE RECORDERS 1 AND 2**

PCS

C&T: Video: ORU Detail: VTR 1

C&T: Video: ORU Detail: VTR 2
cmd Set

Verify Serial Slot Number – Unconfigured

Video VTR 1
‘VTR Controls’

sel IO

VTR1 IO

cmd Enable

Verify Status – Enable

Video VTR 1
‘VTR Status’

√Drum, Reel and Loading Moter – blank
√Parity/Framing – blank
√Command – blank
√Drew – blank

‘Tape Status’

√Cassette In – No Tape
√Interval Record Length: 10 seconds
√End of Tape – blank
√Beginning of Tape – blank
√Tape Unthread – Done
√Threading Motor On – OFF

‘Serial I/O Status’

√State – Configure
√Service Class – Class 1
√Character Size: 8 Bit
√Baud Rate: 9 K
√Stop Bit: 1
√Parity – Even
√Buffer Freeze – Freeze
√Duplex Mode – Full four
√Interrupt Threshold: 1024

C&T: Video: ORU Detail: VTR 2
Video VTR 2
‘Serial I/O Status’
sel Serial I/O Config

**VTR Serial I/O Config**
‘Reset Serial I/O Channel’

Pick Channel 1, Slot 3

**cmd** Set

Verify Serial Slot Number – Unconfigured

‘Config Serial I/O Channel’

Pick Channel 1, Slot 3

**cmd** Set

Verify Serial Slot Number – Unconfigured

**Video VTR 2**
‘VTR Controls’

sel IO

**VTR2 IO**

**cmd** Enable

Verify Status – Enable

**Video VTR 2**
‘VTR Status’

√Record Event Mark – blank
√Drum, Reel and Loading Motor – blank
√Parity/Framing – blank
√Command – blank
√Drew – blank

‘Tape Status’

√Cassette In – No Tape
√Interval Record Length: 10 seconds
√End of Tape – blank
√Beginning of Tape – blank
√Tape Unthread – Done
√Threading Motor On – OFF
‘Serial I/O Status’

√State – Configure
√Service Class – Class 1
√Character Size: 8 Bit
√Baud Rate: 9 K
√Stop Bit: 1
√Parity – Even
√Buffer Freeze – Freeze
√Duplex Mode – Full four
√Interrupt Threshold: 1024

6. **TESTING VIDEO TAPE RECORDER 1**

CM1

Retrieval of Tape from storage place.

LAB: MSS LAB RACK: VTR 1 Front Panel

Unlock VTR1 cassette door.
Open VTR1 cassette door.
Insert Tape Cartridge.
Close VTR1 cassette door.
Lock VTR1 cassette door.

√Local/Remote Button – Remote

PCS

C&T: Video: ORU Detail: VTR 1
[Video VTR 1]

‘Tape Status’

√Cassette In – Tape
√Beginning of Tape – Detected

‘VTR Controls’

sel Mode

[Mode]

cmd Record

Verify VTR Mode – Record

NOTE

The user will need to record for at least 3 minutes.

cmd Stop

Verify VTR Mode – Stop
Video VTR 1
‘VTR Counter Status’

√ Tape Counter + 0:03:00

‘VTR Controls’

sel Mode

VTR 1 Mode

**cmd** Rewind

Verify VTR Mode – Rewind

---

**NOTE**
The user will have to wait until the VTR has finished rewinding before going on to the next step.

**cmd** Play

Verify VTR Mode – Play

**cmd** Stop

Verify VTR Mode – Stop

**cmd** Rewind

Verify VTR Mode – Rewind

**cmd** Unthread

Verify VTR Mode – Unthread

CM1 LAB: MSS LAB RACK: VTR 1 Front Panel

Unlock VTR 1 cassette door.
Open VTR 1 cassette door.
Remove Tape Cartridge.
Close VTR 1 cassette door.
Lock VTR 1 cassette door.

√ Local/Remote Button – Remote
7. TESTING VIDEO TAPE RECORDER 2

CM1 Retrieve Tape.

LAB: MSS CUP RACK: VTR 2 Front Panel

Unlock VTR 1 cassette door.
Open VTR 1 cassette door.
Insert Tape Cartridge.
Close VTR 1 cassette door.
Lock VTR 1 cassette door.

√Local/Remote Button – Remote

PCS C&T: Video: ORU Detail: VTR 2

Video VTR 2
‘Tape Status’

√Cassette In – Tape
√Beginning of Tape – Detected

‘VTR Controls’

sel Mode

VTR 2 Mode

cmd Record

Verify VTR Mode – Record

NOTE
The user will need to record for at least 3 minutes.

cmd Stop

Verify VTR Mode – Stop

C&T: Video: ORU Detail: VTR 2

Video VTR 2
‘VTR Counter Status’

√Tape Counter + 0:03:00

Video VTR 2
‘VTR Controls’

sel Mode

VTR 2 Mode
cmd Rewind

Verify VTR Mode – Rewind

NOTE
The user will have to wait until the VTR has finished rewinding before going on to the next step.

cmd Play

Verify VTR Mode – Play

cmd Stop

Verify VTR Mode – Stop

cmd Rewind

Verify VTR Mode – Rewind

cmd Unthread

Verify VTR Mode – Unthread

CM1 LAB: MSS CUP RACK: VTR 2 Front Panel

Unlock VTR 2 cassette door.
Open VTR 2 cassette door.
Remove Tape Cartridge.
Close VTR 2 cassette door.
Lock VTR 2 cassette door.

√ Local/Remote Button – Remote

Place Tape Cassette in storage place.

8. POWERING OFF COMMON VIDEO INTERFACE UNITS 3 AND 6

PCS C&T: Video: ORU Detail: CVIU

Video CVIU

sel CVIU 3

RPCM LAP51A4A A RPC 06

cmd RPC Position – Open (Verify – Op)

C&T: Video: ORU Detail: CVIU

Video CVIU
9. **POWERING OFF VIDEO TAPE RECORDERS 1 AND 2**

PCS: Video: ORU Detail: VTR 1

C&T: Video: ORU Detail: VTR 1

Video VTR 1

VTR Controls

sel IO

VTR 1 IO

**cmd** Inhibit

Verify Status – Inhibit

C&T: Video: ORU Detail: VTR 2

Video VTR 2

VTR Controls

sel IO

VTR 2 IO

**cmd** Inhibit

Verify Status – Inhibit

C&T: Video: ORU Detail: VTR 2

Video VTR 2

‘Serial I/O Status’
sel Serial I/O Config

'VTR Serial I/O Config'
'Reset Serial I/O Channel'

Pick Channel 1, Slot 3

cmd Set

Verify Serial Slot Number – Unconfigured

C&T: Video: ORU Detail: VTR 1

sel RPCM LAP51A4A A RPC 01

RPCM LAP51A4A A RPC 01

cmd RPC Position – Open (Verify – Op)

C&T: Video: ORU Detail: VTR 2

sel RPCM LAS52A3B A RPC 01

RPCM LAS52A3B A RPC 01

cmd RPC Position – Open (Verify – Op)
1. **VERIFYING RPCM OPERATION**

PCS

LAB: EPS; DDCU LA3B Distribution

DDCU LA3B Dist

sel RPCM LA2A3B F

RPCM LA2A3B F

√Integ Counter incrementing

√Bus Voltage: 121 --- 128 V

2. **SUPPLYING POWER TO RACK LAB1S5 (RWS-CUPOLA)**

RPCM LA2A3B F

sel RPC 4

RPCM LA2A3B F RPC 4

‘RPC Position’

`cmd` Close Cmd – Enable

√Status – Ena

`cmd` Close

√Position – Cl

3. **VERIFYING RPCM LAS52A3B A OPERATION**

RPCM LAS52A3B A

sel Firmware

RPCM LAS52A3B A Firmware

‘Clear Commands’

`cmd` Common Clear

√Power On Reset – Blank

√ORU Health – OK

RPCM LAS52A3B A

√Integ Counter incrementing

√RPC (1 --- 18) – Open

√Input Current: < 4 A

√Bus Voltage: 121 --- 128 V

√Baseplate Temp < 49° C
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1. **VERIFYING RPCM OPERATION**

   PCS LAB: EPS: DDCU LA1A Distribution
   
   sel RPCM LA1A4A F
   
   **RPCM LA1A4A F**
   
   √ Integ Counter incrementing
   √ Bus Voltage: 121 --- 128 V

2. **SUPPLYING POWER TO RACK LAB1P5 (RWS-LAB)**

   sel RPC 4
   
   **RPCM LA1A4A F RPC 4**
   
   ‘RPC Position’
   
   cmd Close Cmd – Enable
   
   √ Status – Ena
   
   cmd Close
   
   √ Position – Cl

3. **VERIFYING RPCM LAP51A4A A OPERATION**

   sel Firmware
   
   **RPCM LAP51A4A A Firmware**
   
   ‘Clear Commands’
   
   cmd Common Clear
   
   √ Power On Reset – Blank
   √ ORU Health – OK
   
   **RPCM LAP51A4A A**
   
   √ Integ Counter incrementing
   √ RPC (1 --- 18) – Open
   √ Input Current: < 4 A
   √ Bus Voltage: 121 --- 128 V
   √ Baseplate Temp < 49° C
This Page Intentionally Blank
1. **VERIFYING RPCM OPERATION**
   
   **PCS**
   
   LAB: EPS: DDCU LA2B Distribution
   
   DDCU LA2B Dist
   
   sel RPCM LA2B C
   
   RPCM LA2B C
   
   √ Integ Counter – incrementing
   
   √ Bus Voltage: 121 --- 128 V
   
2. **SUPPLYING POWER TO RACK LAB1D4 (CHeCS)**
   
   RPCM LA2B C
   
   sel RPC 3
   
   RPCM LA2B C RPC 3
   
   ‘RPC Position’
   
   **cmd** Close (Verify – Cl)
   
3. **VERIFYING RPCM LAD42B A OPERATION**
   
   RPCM LAD42B A
   
   sel Firmware
   
   RPCM LAD42B A Firmware
   
   ‘Clear Commands’
   
   **cmd** Common Clear
   
   √ Power On Reset – Blank
   
   √ ORU Health – OK
   
   RPCM LAD42B A
   
   √ Integ Counter – incrementing
   
   √ RPC (1 --- 18) – Open
   
   √ Input Current < 4 A
   
   √ Bus Voltage: 121 --- 128 V
   
   √ Baseplate Temp < 49° C
NOTE
This procedure is used for GPS1 on flight 5A and for GPS2 on flight 5A.1. Use [X] = 1 for 5A and [X] = 2 for 5A.1.

1. CLOSING GPS RECEIVER PROCESSOR RPC

PCS
MCS: GPS RP Check
GPS RP Check
‘Power’

Verify RPC Position GPS[X] – Op

If using GPS1
sel RPCM LA1B-F-RPC-13

RPCM LA1B-F-RPC-13

If using GPS2
sel RPCM LAD22B-A-RPC-09

RPCM LAD22B-A-RPC-09
‘Close Cmd’

Verify Close Cmd – Ena

‘RPC Position’

cmd Close (Verify – Cl)

NOTE
Closing the RPC starts the Boot Sequence and causes self test to occur. Wait up to 20 seconds before proceeding.

2. VERIFYING GPS RECEIVER HEALTH AND STATE PARAMETERS

GPS RP Check
‘GPS Receiver/Processor Health’
‘GPS[X]’

Verify GPS Operational Status – No Satellites(No Time)
Verify Almanac Status – Not complete
Verify Self Survey Needed – Yes
Verify Time Needed – Yes
Verify User Ephemeris Needed – Yes

‘State Vector’
NOTE
This state vector data is not valid as indicated but demonstrates GPS RP operability.

Verify that all data fields contain data.

3. **VERIFYING SIGI RECEIVER HEALTH AND STATE PARAMETERS**

   ‘SIGI Receiver Health’

Verify for GPS[X] that the following telemetry is within the given range of values.
Record the exact value in the space provided.

SIGI Status Part 1 _____ (0 --- 15)
SIGI Status Part 2 _____ (0 --- 15)

Power Supply Status – OK

Inertial Electronics Status – OK
IE Detail Part 1 _____ (0 --- 255)
IE Detail Part 2 _____ (0 --- 255)

System Processor Status – OK
SP Detail Part 1 _____ (0 --- 255)
SP Detail Part 2 _____ (0 --- 255)

Bus I/O Detail _____ (0 --- 255)

Internal Comm Detail _____ (0 --- 255)

To verify data status and indications for the above data fields, refer to
SIGI RECEIVER TELEMETRY CONVERSION MATRIX, all (SODF: MCS: REFERENCE), then:

4. **OPENING GPS RECEIVER PROCESSOR RPC**

GPS RP Check

‘Power’

If using GPS1
sel RPCM LA1B-F-RPC-13

RPCM LA1B-F-RPC-13

If using GPS2
sel RPCM LAD22B-A-RPC-09

RPCM LAD22B-A-RPC-09

‘Open Cmd’
Verify Open Cmd – Ena

‘RPC Position’

**cmd** Open (Verify – Op)
OBJECTIVE:
Activate and Checkout Lab Cradle Assembly (LCA) after installation on US Lab by driving Capture Latch Assembly with both Integrated Motor Controller Actuators (IMCAs).

LOCATION:
US Lab

DURATION:
TBD

REFERENCED PROCEDURE(S):
None

NOTE
1. To Prevent nuisance alarms until communications between the LCA IMCAs and the C&C MDM have been established the IMCAs Fault Detection Isolation and Recovery (FDIR) Remote Terminal (RT) capability should be inhibited.

2. To prevent the LCA IMCAs from failure notification due to a "Watchdog Timeout" condition communications between the C&C MDM and the LCA IMCAs must be established before applying power to the IMCAs.

1. INHIBITING RT FDIR FOR IMCA - 1 AND IMCA - 2

PCS
CDH Summary: Primary C&C MDM
Primary CCS MDM

sel CB EXT 1

CB EXT 1

sel RT Status

CB EXT 1 RTStatus
‘13 LCA IMCA - 1’

cmd Inhibit FDIR Execute

√RT FDIR Status – Inh

CDH Summary: Primary C&C MDM
Primary CCS MDM

sel CB EXT 2

CB EXT 2
sel RT Status

<table>
<thead>
<tr>
<th>CB EXT 2 RT Status</th>
<th>'13 LCA IMCA - 2'</th>
</tr>
</thead>
</table>

**cmd** Inhibit FDIR  **Execute**

√RT FDIR Status – Inh

2. **ACTIVATING LCA IMCA - 2**

CDH Summary: Primary C&C MDM

<table>
<thead>
<tr>
<th>Primary CCS MDM</th>
</tr>
</thead>
</table>

sel CB EXT 2

<table>
<thead>
<tr>
<th>CB EXT 2</th>
</tr>
</thead>
</table>

sel RT Status

<table>
<thead>
<tr>
<th>CB EXT 2 RT Status</th>
</tr>
</thead>
</table>

**cmd** 13 LCA Latch 2 RT Status Enable  **Execute**

√RT Status – Ena

### NOTE

1. The IMCA will take 6 seconds to complete Power On Self-Test (POST) and mode to Standby after power has been applied.

2. Feedback to operator is based upon cyclic data rate.

---

LAB: S&M: LAB CRADLE ASSEMBLY

<table>
<thead>
<tr>
<th>LAB CRADLE ASSEMBLY</th>
</tr>
</thead>
</table>

‘IMCA - 2 Power’

sel LA2B G RPC 9

<table>
<thead>
<tr>
<th>RPCM LA2B G RPC 09</th>
</tr>
</thead>
</table>

**cmd** Close Cmd – Enable  **Execute**

Verify Close Cmd – Ena

**cmd** RPC Position – Close  **Execute**

Verify RPC Position – Cl

---

LAB: S&M: LAB CRADLE ASSEMBLY

<table>
<thead>
<tr>
<th>LAB CRADLE ASSEMBLY</th>
</tr>
</thead>
</table>
Verify Mode IMCA - 2 – Standby

‘Command Response’

Verify Initframe Received IMCA - 2 – blank

‘Latch Position’

Verify Closed IMCA - 2, IMCA - 1 – green
Verify Opened IMCA - 2, IMCA - 1 – blank

sel Built-In Test Errors IMCA - 2

<table>
<thead>
<tr>
<th>LCA IMCA - 2 Built In Test Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Active BIT’</td>
</tr>
</tbody>
</table>

Verify ROM Checksum – blank
Verify DSP RAM – blank
Verify 1553B RAM – blank
Verify CPU – blank
Verify 1553B BIT – blank
Verify Watchdog Timer – blank
Verify Motor Power Not Enabled – blank
Verify Brake and Clutch – blank
Verify Position Sensor Excitation – blank

3. **ENABLING RT FDIR FOR IMCA - 2**

CDH Summary: Primary C&C MDM

| Primary CCS MDM |

sel CB EXT 2

| CB EXT 2 |

sel RT Status

| CB EXT 2 RT Status |

**cmd** 13 LCA Latch 2 RT FDIR Status Enable **Execute**

√RT FDIR Status – Ena

4. **INITIALIZING LCA IMCA - 2 WITH SAFING INITFRAME**

LAB: S&M: LAB CRADLE ASSEMBLY

| LAB CRADLE ASSEMBLY |

sel Commands IMCA - 2
LCA IMCA 2 Commands
‘Latch Commands’

sel Checkout Commands

LCA IMCA 2 Latch Checkout Commands

cmd Safing Initframe  Execute

cmd Update Initframe Details  Execute

LAB: S&M: LAB CRADLE ASSEMBLY

LAB CRADLE ASSEMBLY
‘Command Response’

Verify Initframe Received IMCA - 2 – X
Verify Parameter Checksum Failed IMCA - 2 – blank

sel Initframe Details IMCA - 2

LCA IMCA - 2 Initframe Details
‘Limits’

Verify Position:  0
Verify Shaft Speed:  0
Verify RTD Voltage:  1500
Verify Torque:  0
Verify Power:  473.082
Verify Accel/Decel Time:  0

‘Stop On’

Verify Position    – X
Verify RTD Voltage – X
Verify Torque     – X
Verify Latch Closed – X
Verify Latch Open  – X
Verify RTL 1 Closed – X
Verify RTL 2 Closed – X
Verify RTL 3 Closed – X
Verify RTL 4 Closed – X
Verify Inverter Temp – X
Verify Rate Error  – X

‘Clutch/Switch Settings’

Verify Monitor Limit Switches    – blank
Verify Enable Clutch            – blank
Verify Perform Overspeed Reverse Test – blank
5. **ACTIVATING LCA IMCA - 1**

CDH Summary: Primary C&C MDM

- Primary CCS MDM

 sel CB EXT 1

  **CB EXT 1**

 sel RT Status

  **CB EXT 1 RT Status**

 **cmd** 13 LCA Latch 1 RT Status Enable  **Execute**

√RT Status – Ena

**NOTE**
The IMCA will take 6 seconds to complete Power On Self Test (POST) and mode to Standby after power has been applied.

LAB: S&M: LAB CRADLE ASSEMBLY

LAB CRADLE ASSEMBLY

‘IMCA - 1 Power’

 sel LA1B F RPC 9

  **RPCM LA1B F RPC 09**

 **cmd** Close Cmd – Enable  **Execute**

Verify Close Cmd – Ena

 **cmd** RPC Position – Close  **Execute**

Verify RPC Position – Cl

LAB: S&M: LAB CRADLE ASSEMBLY

LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1, IMCA - 2 – Standby

‘Command Response’

Verify Initframe Received IMCA - 1 – blank

‘Latch Position’

Verify Closed IMCA - 1, IMCA - 2 – green
sel Built-In Test Errors IMCA - 1

[LCA IMCA - 1 Built In Test Errors]
‘Active BIT’

Verify ROM Checksum – blank
Verify DSP RAM – blank
Verify 1553B RAM – blank
Verify CPU – blank
Verify 1553B BIT – blank
Verify Watchdog Timer – blank
Verify Motor Power Not Enabled – blank
Verify Brake and Clutch – blank
Verify Position Sensor Excitation – blank

6. **ENABLING RT FDIR FOR IMCA - 1**
CDH Summary: Primary C&C MDM
[Primary CCS MDM]

sel CB EXT 1

[CB EXT 1]

sel RT Status

[CB EXT 1 RT Status]

**cmd** 13 LCA Latch 1 RT FDIR Status Enable **Execute**

\(\sqrt{\text{RT FDIR Status}} – \text{Ena}\)

7. **INITIALIZING LCA IMCA - 1 WITH SAFING INITFRAME**
LAB: S&M: LAB CRADLE ASSEMBLY

[LAB CRADLE ASSEMBLY]

sel Commands IMCA - 1

[LCA IMCA 1 Commands]
‘Latch Commands’

sel Checkout Commands

[LCA IMCA 1 Latch Checkout Commands]

**cmd** Safing Initframe **Execute**

**cmd** Update Initframe Details **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

[LAB CRADLE ASSEMBLY]
‘Command Response’
Verify Initframe Received IMCA - 1 – X
Verify Parameter Checksum Failed IMCA - 1 – blank

sel Initframe Details IMCA - 2

[box]
LCA IMCA 2 Initframe Details
‘Limits’

Verify Position: 0
Verify Shaft Speed: 0
Verify RTD Voltage: 1500
Verify Torque: 0
Verify Power: 473.082
Verify Accel/Decel Time: 0

‘Stop On’

Verify Position – X
Verify RTD Voltage – X
Verify Torque – X
Verify Latch Closed – X
Verify Latch Open – X
Verify RTL 1 Closed – X
Verify RTL 2 Closed – X
Verify RTL 3 Closed – X
Verify RTL 4 Closed – X
Verify Inverter Temp – X
Verify Rate Error – X

‘Clutch/Switch Settings’

Verify Monitor Limit Switches – blank
Verify Enable Clutch – blank
Verify Perform Overspeed Reverse Test – blank

8. VERIFYING LCA RTL INDICATORS CLEARED

LAB: S&M: LAB CRADLE ASSEMBLY

[box]
LAB CRADLE ASSEMBLY

‘RTL-1’

Verify IMCA - 1, IMCA - 2 – blank

‘RTL-2’

Verify IMCA - 1, IMCA - 2 – blank

‘RTL-3’

Verify IMCA - 1, IMCA - 2 – blank
9. **MCC-H**  EV, “Go for Lab Cradle Assembly RTL Checkout.”

10. **LCA RTL-1 CHECK**  
    LAB: S&M: LAB CRADLE ASSEMBLY  
    EV  MCC-H, “RTL-1 Depress.”

11. **LCA RTL-2 CHECK**  
    LAB: S&M: LAB CRADLE ASSEMBLY  
    EV  MCC-H, “RTL-2 Depress.”

12. **LCA RTL-3 CHECK**  
    LAB: S&M: LAB CRADLE ASSEMBLY  
    EV  MCC-H, “RTL-3 Depress.”
'RTL-3'

Verify IMCA - 1, IMCA - 2 – gray

13. **LCA RTL-4 CHECK**

LAB: S&M: LAB CRADLE ASSEMBLY

EV ↓ **MCC-H**, “RTL-4 Depress.”

‘RTL-4’

Verify IMCA - 1, IMCA - 2 – green

EV ↓ **MCC-H**, “RTL-4 Released.”

‘RTL-4’

Verify IMCA - 1, IMCA - 2 – gray

14. **EV ↓ MCC-H**, “Lab Cradle Assembly go for Capture Latch Check.”

15. **IMCA - 2 TO ON MODE**

LAB: S&M: LAB CRADLE ASSEMBLY

sel Commands IMCA - 2

**LCA IMCA 2 Commands**

‘Mode Commands’

cmd On Execute

LAB: S&M: LAB CRADLE ASSEMBLY

Verify Mode IMCA - 2 – On

16. **INITIALIZING IMCA - 2 WITH PARTIAL UNLATCHING CHECK**

**INITFRAME**

LAB: S&M: LAB CRADLE ASSEMBLY

sel Commands IMCA - 2

**LCA IMCA - 2 Commands**

‘Latch Commands’

sel Checkout Commands
LCA IMCA 2 Latch Checkout Commands

**cmd** Partial Unlatch Check Initframe  **Execute**

**cmd** Update Initframe Details  **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

LAB CRADLE ASSEMBLY

‘Command Response’

Verify Initframe Received IMCA - 2 – X  
Verify Parameter Checksum Failed IMCA - 2 – gray

sel Initframe Details IMCA - 2

LCA IMCA - 2 Initframe Details

‘Limits’

Verify Position:  -1696.64
Verify Shaft Speed:  450.007
Verify RTD Voltage:  1500
Verify Torque:  0.790583
Verify Power:  473.082
Verify Accel/Decel Time:  2.005

‘Stop On’

Verify Position – X
Verify RTD Voltage – X
Verify Torque – blank
Verify Latch Closed – blank
Verify Latch Open – X
Verify RTL 1 Closed – blank
Verify RTL 2 Closed – blank
Verify RTL 3 Closed – blank
Verify RTL 4 Closed – blank
Verify Inverter Temp – X
Verify Rate Error – X

‘Clutch/Switch Settings’

Verify Monitor Limit Switches – blank
Verify Enable Clutch – X
Verify Perform Overspeed Reverse Test – X

17. IMCA - 2 TO ENABLE MODE

LAB: S&M: LAB CRADLE ASSEMBLY

LAB CRADLE ASSEMBLY

sel Commands IMCA - 2
18. **VERIFYING IMCA - 2 STOP CONDITIONS**

LAB: S&M: LAB CRADLE ASSEMBLY

Verify Mode IMCA - 2 – Enabled
Verify Latch Status IMCA - 2 – In Progress

-Motor Status-
Verify Position IMCA - 2: -1697
Verify Latch Status IMCA - 2 – Stopped

-Nominal Stop Flag-
Verify Position Change IMCA - 2 – green

-Latch Position-
Verify Closed IMCA - 2, IMCA - 1 – blank

19. **CLEARING IMCA - 2 STOP FLAGS**

LAB: S&M: LAB CRADLE ASSEMBLY

Clear All Stop Flags

-Latch Position-
Verify Position Change IMCA - 2 – gray
20. **INITIALIZING IMCA - 2 WITH UNLATCH CHECK INITFRAME**

LAB: S&M: LAB CRADLE ASSEMBLY

** sel Commands IMCA - 2 **

** LCA IMCA 2 Commands **

'Latch Commands'

** sel Checkout Commands **

** LCA IMCA 2 Latch Checkout Commands **

** cmd ** Unlatch Check Initframe ** Execute **

** cmd ** Update Initframe Details ** Execute **

PCS

LAB: S&M: LAB CRADLE ASSEMBLY

** LAB CRADLE ASSEMBLY **

'Command Response'

Verify Initframe Received IMCA - 2 – X
Verify Parameter Checksum Failed IMCA - 2 – gray

** sel Initframe Details IMCA - 2 **

** LCA IMCA 2 Initframe Details **

'Limits'

Verify Position: -2982.21
Verify Shaft Speed: 450.007
Verify RTD Voltage: 1500
Verify Torque: 0.790583
Verify Power: 473.082
Verify Accel/Decel Time: 2.005

'Stop On'

Verify Position – X
Verify RTD Voltage – X
Verify Torque – blank
Verify Latch Closed – blank
Verify Latch Open – X
Verify RTL 1 Closed – blank
Verify RTL 2 Closed – blank
Verify RTL 3 Closed – blank
Verify RTL 4 Closed – blank
Verify Inverter Temp – X
Verify Rate Error – X
21. **IMCA - 2 TO ENABLE MODE**

LAB: S&M: LAB CRADLE ASSEMBLY

sel Commands IMCA - 2

| LCA IMCA 2 Commands |

sel Checkout Commands

| LCA IMCA 2 Checkout Commands |

**cmd** Actuate  **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

Verify Mode IMCA - 2 – Enabled
Verify Latch Status IMCA - 2 – In Progress

22. **VERIFYING IMCA - 2 STOP CONDITIONS**

LAB: S&M: LAB CRADLE ASSEMBLY

Verify Mode IMCA - 2 – On

‘Motor Status’

Verify Position IMCA - 2: -2960 to -2982
Verify Latch Status IMCA - 2 – Stopped, Latch Open

‘Nominal Stop Flags’

Verify Latch Open IMCA - 2 – green

‘Latch Position’

Verify Open IMCA - 2, IMCA - 1 – green
23. **IMCA - 2 TO STANDBY MODE**

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 2

LCA IMCA 2 Commands
‘Mode Commands’

**cmd** Standby **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 2 – Standby
‘Command Response’

Verify Initframe Received IMCA - 2 – blank
‘Latch Position’

Verify Open IMCA - 2 – green

24. **INITIALIZING LCA IMCA - 2 WITH SAFING INITFRAME**

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 2

LCA IMCA 2 Commands
‘Latch Commands’

sel Checkout Commands

LCA IMCA 2 Latch Checkout Commands

**cmd** Safing Initframe **Execute**

**cmd** Update Initframe Details **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY
‘Command Response’

Verify Initframe Received IMCA - 2 – X
Verify Parameter Checksum Failed IMCA - 2 – blank

sel Initframe Details IMCA - 2
LCA IMCA 2 Initframe Details

‘Limits’

Verify Position: 0
Verify Shaft Speed: 0
Verify RTD Voltage: 1500
Verify Torque: 0
Verify Power: 473.082
Verify Accel/Decel Time: 0

‘Stop On’

Verify Position – X
Verify RTD Voltage – X
Verify Torque – X
Verify Latch Closed – X
Verify Latch Open – X
Verify RTL 1 Closed – X
Verify RTL 2 Closed – X
Verify RTL 3 Closed – X
Verify RTL 4 Closed – X
Verify Inverter Temp – X
Verify Rate Error – X

‘Clutch/Switch Settings’

Verify Monitor Limit Switches – blank
Verify Enable Clutch – blank
Verify Perform Overspeed Reverse Test – blank

25. **IMCA - 2 TO ON MODE**
LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 2

LCA IMCA 2 Commands

‘Mode Commands’

**cmd On Execute**

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 2 – On
26. **INITIALIZING IMCA - 2 WITH PARTIAL LATCH CHECK INITFRAME**

LAB: S&M: LAB CRADLE ASSEMBLY

 sel Commands IMCA - 2

<table>
<thead>
<tr>
<th>LCA IMCA 2 Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Latch Commands’</td>
</tr>
</tbody>
</table>

 sel Checkout Commands

<table>
<thead>
<tr>
<th>LCA IMCA 2 Latch Checkout Commands</th>
</tr>
</thead>
</table>

 **cmd** Partial Latch Check Initframe **Execute**

 **cmd** Update Initframe Details **Execute**

LAB: S&M LAB CRADLE ASSEMBLY

 sel Initframe Details IMCA - 2

<table>
<thead>
<tr>
<th>LCA IMCA 2 Initframe Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Limits’</td>
</tr>
</tbody>
</table>

 Verify Initframe Received IMCA - 2 – X
 Verify Parameter Checksum Failed IMCA - 2 – gray

 sel Initframe Details IMCA - 2

<table>
<thead>
<tr>
<th>LCA IMCA 2 Initframe Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Limits’</td>
</tr>
</tbody>
</table>

 Verify Position: 1696.64
 Verify Shaft Speed: 450.007
 Verify RTD Voltage: 1500
 Verify Torque: 0.790583
 Verify Power: 473.082
 Verify Accel/Decel Time: 2.005

 ‘Stop On’

 Verify Position – X
 Verify RTD Voltage – X
 Verify Torque – blank
 Verify Latch Closed – X
 Verify Latch Open – blank
 Verify RTL 1 Closed – blank
 Verify RTL 2 Closed – blank
 Verify RTL 3 Closed – blank
 Verify RTL 4 Closed – blank
 Verify Inverter Temp – X
 Verify Rate Error – X
‘Clutch/Switch Settings’
Verify Monitor Limit Switches – blank
Verify Enable Clutch – X
Verify Perform Overspeed Reverse Test – X

27. **IMCA - 2 TO ENABLE MODE**
LAB: S&M LAB CRADLE ASSEMBLY

sel Commands IMCA - 2

LCA IMCA 2 Commands

sel Checkout Commands

LCA IMCA 2 Checkout Commands

**cmd Actuate Execute**

LAB: S& downtown LAB CRADLE ASSEMBLY

Verify Mode IMCA - 2 – Enabled
Verify Latch Status IMCA - 2 – In Progress

28. **VERIFYING IMCA - 2 STOP CONDITIONS**
LAB: S&M LAB CRADLE ASSEMBLY

Verify Mode IMCA - 2 – On

‘Motor Status’

Verify Position IMCA - 2: 1699
Verify Latch Status IMCA - 2 – Stopped

‘Nominal Stop Flags’

Verify Position Change IMCA - 2 – blank

‘Latch Position’

Verify Open IMCA - 2, IMCA - 1 – blank

29. **CLEARING IMCA - 2 STOP FLAGS**
LAB: S&M LAB CRADLE ASSEMBLY

sel Commands IMCA - 2
LAB CRADLE ASSEMBLY CHECKOUT

LCA IMCA - 2 Commands

**cmd** Clear All Stop Flags  **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY
‘Nominal Stop Flags’

Verify Position Change IMCA - 2 – gray

**30. INITIALIZING IMCA - 2 WITH LATCH CHECK INITFRAME**

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 2

LCA IMCA 2 Commands
‘Latch Commands’

sel Checkout Commands

LCA IMCA 2 Latch Checkout Commands

**cmd** Latch Check Initframe  **Execute**

**cmd** Update Initframe Details  **Execute**

LAB: S&M LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY
‘Command Response’

Verify Initframe Received IMCA - 2 – X
Verify Parameter Checksum Failed IMCA - 2 – gray

sel Initframe Details IMCA - 2

LCA IMCA 2 Initframe Details
‘Limits’

Verify Position:  2982.21
Verify Shaft Speed:  450.007
Verify RTD Voltage:  1500
Verify Torque:  0.790583
Verify Power:  473.082
Verify Accel/Decel Time:  2.005

‘Stop On’
Verify Position – X
Verify RTD Voltage – X
Verify Torque – blank
Verify Latch Closed – X
Verify Latch Open – blank
Verify RTL 1 Closed – blank
Verify RTL 2 Closed – blank
Verify RTL 3 Closed – blank
Verify RTL 4 Closed – blank
Verify Inverter Temp – X
Verify Rate Error – X

‘Clutch/Switch Settings’

Verify Monitor Limit Switches – blank
Verify Enable Clutch – X
Verify Perform Overspeed Reverse Test – X

31. IMCA - 2 TO ENABLE MODE
LAB: S&M LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 2

LCA IMCA 2 Commands

sel Checkout Commands

LCA IMCA 2 Checkout Commands

`cmd` Actuate `Execute`

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 2 – Enabled
Verify Latch Status IMCA - 2 – In Progress

32. VERIFYING IMCA - 2 STOP CONDITIONS
LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 2 – On

‘Motor Status’

Verify Position IMCA - 2: 2988

Verify Latch Status IMCA - 2 – Stopped, Latch Closed
‘Nominal Stop Flags’

Verify Latch Closed IMCA - 2 – green

‘Latch Position’

Verify Closed IMCA - 2, IMCA - 1 – green

33. **IMCA - 2 TO STANDBY MODE**
LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 2

<table>
<thead>
<tr>
<th>LCA IMCA 2 Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Mode Commands’</td>
</tr>
</tbody>
</table>

**cmd** Standby **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 2 – Standby

‘Command Response’

Verify Initframe Received IMCA - 2 – blank

‘Latch Position’

Verify Closed IMCA - 2 – green

---

**NOTE**
Steps 27 --- 60 will checkout the LCA IMCA - 1.

34. **IMCA - 1 TO ON MODE**
LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

<table>
<thead>
<tr>
<th>LCA IMCA 1 Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Mode Commands’</td>
</tr>
</tbody>
</table>

**cmd** On **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1 – On
35. **INITIALIZING IMCA - 1 WITH PARTIAL UNLATCHING CHECK**

**INITFRAME**

LAB: S&M: LAB CRADLE ASSEMBLY

**LAB CRADLE ASSEMBLY**

sel Commands IMCA - 1

**LCA IMCA 1 Commands**

‘Latch Commands’

sel Checkout Commands

**LCA IMCA 1 Latch Checkout Commands**

**cmd** Partial Unlatch Check Initframe **Execute**

**cmd** Update Initframe Details **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

**LAB CRADLE ASSEMBLY**

‘Command Response’

Verify Initframe Received IMCA - 1 – X
Verify Parameter Checksum Failed IMCA - 1 – gray

sel Initframe Details IMCA - 1

**LCA IMCA 1 Initframe Details**

‘Limits’

Verify Position: -1696.64
Verify Shaft Speed: 450.007
Verify RTD Voltage: 1500
Verify Torque: 0.790583
Verify Power: 473.082
Verify Accel/Decel Time: 2.005

‘Stop On’

Verify Position – X
Verify RTD Voltage – X
Verify Torque – blank
Verify Latch Closed – blank
Verify Latch Open – X
Verify RTL 1 Closed – blank
Verify RTL 2 Closed – blank
Verify RTL 3 Closed – blank
Verify RTL 4 Closed – blank
Verify Inverter Temp – X
Verify Rate Error – X
‘Clutch/Switch Settings’

Verify Monitor Limit Switches – blank
Verify Enable Clutch – X
Verify Perform Overspeed Reverse Test – X

36. **IMCA - 1 TO ENABLE MODE**

LAB: S&M: LAB CRADLE ASSEMBLY

<table>
<thead>
<tr>
<th>sel Commands IMCA - 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCA IMCA 1 Commands</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>sel Checkout Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCA IMCA 1 Checkout Commands</td>
</tr>
</tbody>
</table>

**cmd Actuate  Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1 – Enabled
Verify Latch Status IMCA - 1 – In Progress

37. **VERIFYING IMCA - 1 STOP CONDITIONS**

LAB: S&M: LAB CRADLE ASSEMBLY

<table>
<thead>
<tr>
<th>sel Commands IMCA - 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCA IMCA 1 Commands</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>sel Checkout Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCA IMCA 1 Checkout Commands</td>
</tr>
</tbody>
</table>

Verify Mode IMCA - 1 – On

‘Motor Status’

Verify Position IMCA - 1: -1697
Verify Latch Status IMCA - 1 – Stopped, Position

‘Nominal Stop Flag’

Verify Position Change IMCA - 1 – green

‘Latch Position’

Verify Closed IMCA - 1, IMCA - 2 – blank
38. **CLEARING IMCA - 1 STOP FLAGS**

LAB: S&M: LAB CRADLE ASSEMBLY

| LAB CRADLE ASSEMBLY |

sel Commands IMCA - 1

LCA IMCA 1 Commands

**cmd** Clear All Stop Flags **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

| LAB CRADLE ASSEMBLY |

‘Nominal Stop Flags’

Verify Position Change IMCA - 1 – gray

39. **INITIALIZING IMCA - 1 WITH UNLATCH CHECK INITFRAME**

LAB: S&M: LAB CRADLE ASSEMBLY

| LAB CRADLE ASSEMBLY |

sel Commands IMCA - 1

LCA IMCA 1 Commands

‘Latch Commands’

sel Checkout Commands

LCA IMCA 1 Latch Checkout Commands

**cmd** Unlatch Check Initframe **Execute**

**cmd** Update Initframe Details **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

| LAB CRADLE ASSEMBLY |

‘Command Response’

Verify Initframe Received IMCA - 1 – X

Verify Parameter Checksum Failed IMCA - 1 – gray

sel Initframe Details IMCA - 1

LCA IMCA 1 Initframe Details

‘Limits’

Verify Position: -2988.07

Verify Shaft Speed: 450.007

Verify RTD Voltage: 1500

Verify Torque: 0.790583

Verify Power: 473.082

Verify Accel/Decel Time: 2.005
‘Stop On’
Verify Position – X
Verify RTD Voltage – X
Verify Torque – blank
Verify Latch Closed – blank
Verify Latch Open – X
Verify RTL 1 Closed – blank
Verify RTL 2 Closed – blank
Verify RTL 3 Closed – blank
Verify RTL 4 Closed – blank
Verify Inverter Temp – X
Verify Rate Error – X

‘Clutch/Switch Settings’
Verify Monitor Limit Switches – blank
Verify Enable Clutch – X
Verify Perform Overspeed Reverse Test – X

40. IMCA - 1 TO ENABLE MODE
LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

LCA IMCA 1 Commands

sel Checkout Commands

LCA IMCA 1 Checkout Commands

cmd Actuate Execute

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1 – Enabled
Verify Latch Status IMCA - 1 – In Progress

41. VERIFYING IMCA - 1 STOP CONDITIONS
LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1 – On

‘Motor Status’
Verify Position IMCA - 1: -2960 to -2982
Verify Latch Status IMCA - 1 – Stopped, Latch Open

‘Nominal Stop Flags’

Verify Latch Open IMCA - 1 – green

‘Latch Position’

Verify Open IMCA - 1, IMCA - 2 – green

42. **IMCA - 1 TO STANDBY MODE**

LAB: S&M: LAB CRADLE ASSEMBLY

| LAB CRADLE ASSEMBLY |

sel Commands IMCA - 1

LCA IMCA 1 Commands

‘Mode Commands’

**cmd** Standby **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

| LAB CRADLE ASSEMBLY |

Verify Mode IMCA - 1, IMCA - 2 – Standby

‘Latch Position’

Verify Open IMCA - 1, IMCA - 2 – green

43. **INITIALIZING LCA IMCA - 1 WITH SAFING INITFRAME**

LAB: S&M: LAB CRADLE ASSEMBLY

| LAB CRADLE ASSEMBLY |

sel Commands IMCA - 1

LCA IMCA 1 Commands

‘Latch Commands’

sel Checkout Commands

LCA IMCA 1 Latch Checkout Commands

**cmd** Safing Initframe **Execute**

**cmd** Update Initframe Details **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

| LAB CRADLE ASSEMBLY |

‘Command Response’
Verify Initframe Received IMCA - 1 – X
Verify Parameter Checksum Failed IMCA - 1 – blank

sel Initframe Details IMCA - 1

**LCA IMCA 1 Initframe Details**

‘Limits’

Verify Position: 0
Verify Shaft Speed: 0
Verify RTD Voltage: 1500
Verify Torque: 0
Verify Power: 473.082
Verify Accel/Decel Time: 0

‘Stop On’

Verify Position – X
Verify RTD Voltage – X
Verify Torque – X
Verify Latch Closed – X
Verify Latch Open – X
Verify RTL 1 Closed – X
Verify RTL 2 Closed – X
Verify RTL 3 Closed – X
Verify RTL 4 Closed – X
Verify Inverter Temp – X
Verify Rate Error – X

‘Clutch/Switch Settings’

Verify Monitor Limit Switches – blank
Verify Enable Clutch – blank
Verify Perform Overspeed Reverse Test – blank

**44. IMCA - 1 TO ON MODE**

LAB: S&M: LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

**LCA IMCA 1 Commands**

‘Mode Commands’

**cmd On Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1 – On
45. INITIALIZING IMCA - 1 WITH PARTIAL LATCH CHECK INITFRAME

LAB: S&M: LAB CRADLE ASSEMBLY

 sel Commands IMCA - 1

<table>
<thead>
<tr>
<th>LCA IMCA 1 Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Latch Commands'</td>
</tr>
</tbody>
</table>

 sel Checkout Commands

 | LCA IMCA 1 Latch Checkout Commands |

 cmd Partial Latch Check Initframe Execute
 cmd Update Initframe Details Execute

LAB: S&M LAB CRADLE ASSEMBLY

 sel Initframe Details IMCA - 1

<table>
<thead>
<tr>
<th>LCA IMCA 1 Initframe Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Limits'</td>
</tr>
</tbody>
</table>

Verify Position: 1696.64
Verify Shaft Speed: 450.007
Verify RTD Voltage: 1500
Verify Torque: 0.790583
Verify Power: 473.082
Verify Accel/Decel Time: 2.005

'Stop On'

Verify Position – X
Verify RTD Voltage – X
Verify Torque – blank
Verify Latch Closed – X
Verify Latch Open – blank
Verify RTL 1 Closed – blank
Verify RTL 2 Closed – blank
Verify RTL 3 Closed – blank
Verify RTL 4 Closed – blank
Verify Inverter Temp – X
Verify Rate Error – X
‘Clutch/Switch Settings’

Verify Monitor Limit Switches – blank
Verify Enable Clutch – X
Verify Perform Overspeed Reverse Test – X

46. **IMCA - 1 TO ENABLE MODE**

LAB: S&M LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

**LCA IMCA - 1 Commands**

sel Checkout Commands

**LCA IMCA - 1 Checkout Commands**

**cmd** Actuate  **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

**LAB CRADLE ASSEMBLY**

Verify Mode IMCA - 1 – Enabled
Verify Latch Status IMCA - 1 – In Progress

47. **VERIFYING IMCA - 1 STOP CONDITIONS**

LAB: S&M: LAB CRADLE ASSEMBLY

**LAB CRADLE ASSEMBLY**

Verify Mode IMCA - 1 – On

‘Motor Status’

Verify Position IMCA - 1: 1697
Verify Latch Status IMCA - 1 – Stopped, Position

‘Nominal Stop Flags’

Position Change IMCA - 1 – green

‘Latch Position’

Verify Open IMCA - 1, IMCA - 2 – blank
48. CLEARING IMCA - 1 STOP FLAGS

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

LCA IMCA - 1 Commands

**cmd** Clear All Stop Flags **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY
‘Nominal Stop Flags’

Verify Position Change IMCA - 1 – gray

49. INITIALIZING IMCA - 1 WITH LATCH CHECK INITFRAME

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

LCA IMCA 1 Commands
‘Latch Commands’

sel Checkout Commands

LCA IMCA 1 Latch Checkout Commands

**cmd** Latch Check Initframe **Execute**
**cmd** Update Initframe Details **Execute**

LAB: S&M LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY
‘Command Response’

Verify Initframe Received IMCA - 1 – X
Verify Parameter Checksum Failed IMCA - 1 – gray

sel Initframe Details IMCA - 1

LCA IMCA 1 Initframe Details
‘Limits’

Verify Position: 2982.21
Verify Shaft Speed: 450.007
Verify RTD Voltage: 1500
Verify Torque: 0.790583
Verify Power: 473.082
Verify Accel/Decel Time: 2.005
‘Stop On’

Verify Position – X
Verify RTD Voltage – X
Verify Torque – blank
Verify Latch Closed – X
Verify Latch Open – blank
Verify RTL 1 Closed – blank
Verify RTL 2 Closed – blank
Verify RTL 3 Closed – blank
Verify RTL 4 Closed – blank
Verify Inverter Temp – X
Verify Rate Error – X

‘Clutch/Switch Settings’

Verify Monitor Limit Switches – blank
Verify Enable Clutch – X
Verify Perform Overspeed Reverse Test – X

50. IMCA - 1 TO ENABLE MODE

LAB: S&M LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

LCA IMCA - 1 Commands

sel Checkout Commands

LCA IMCA - 1 Checkout Commands

cmd Actuate Execute

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1 – Enabled
Verify Latch Status IMCA - 1 – In Progress

51. VERIFYING IMCA - 1 STOP CONDITIONS

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1 – On

‘Motor Status’

Verify Position IMCA - 1: 2960 --- 2982
Verify Latch Status IMCA - 1 – Stopped, Latch Closed
‘Nominal Stop Flags’

Verify Latch Closed IMCA - 1 – green

‘Latch Position’

Verify Closed IMCA - 1, IMCA - 2 – green

52. **IMCA - 1 TO STANDBY MODE**

LAB: S&M: LAB CRADLE ASSEMBLY  
LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

<table>
<thead>
<tr>
<th>LCA IMCA 1 Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Mode Commands’</td>
</tr>
</tbody>
</table>

**cmd** Standby **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY  
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1, IMCA - 2 – Standby

‘Latch Position’

Verify Closed IMCA - 1, IMCA - 2 – green

53. **INITIALIZING LCA IMCA - 1 WITH SAFING INITFRAME**

LAB: S&M: LAB CRADLE ASSEMBLY  
LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

<table>
<thead>
<tr>
<th>LCA IMCA 1 Commands</th>
</tr>
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<tbody>
<tr>
<td>‘Latch Commands’</td>
</tr>
</tbody>
</table>

sel Checkout Commands

<table>
<thead>
<tr>
<th>LCA IMCA 1 Latch Checkout Commands</th>
</tr>
</thead>
</table>

**cmd** Safing Initframe **Execute**  
**cmd** Update Initframe Details **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY  
LAB CRADLE ASSEMBLY

‘Command Response’

Verify Initframe Received IMCA - 1 – X
Verify Parameter Checksum Failed IMCA - 1 – blank
sel Initframe Details IMCA - 1

LCA IMCA 1 Initframe Details

'Limits'

Verify Position:  0
Verify Shaft Speed:  0
Verify RTD Voltage:  1500
Verify Torque:  0
Verify Power:  473.082
Verify Accel/Decel Time:  0

'Stop On'

Verify Position – X
Verify RTD Voltage – X
Verify Torque – X
Verify Latch Closed – X
Verify Latch Open – X
Verify RTL 1 Closed – X
Verify RTL 2 Closed – X
Verify RTL 3 Closed – X
Verify RTL 4 Closed – X
Verify Inverter Temp – X
Verify Rate Error – X

'Clutch/Switch Settings'

Verify Monitor Limit Switches – blank
Verify Enable Clutch – blank
Verify Perform Overspeed Reverse Test – blank

54. **IMCA - 1 TO ON MODE**

LAB: S&M: LAB CRADLE ASSEMBLY

LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

LCA IMCA 1 Commands

'Mode Commands'

**cmd On Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1 – On
55. **INITIALIZING IMCA - 1 WITH UNLATCH CHECK INITFRAME**

LAB: S&M: LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

<table>
<thead>
<tr>
<th>LCA IMCA 1 Commands</th>
<th>‘Latch Commands’</th>
</tr>
</thead>
</table>

sel Checkout Commands

<table>
<thead>
<tr>
<th>LCA IMCA 1 Latch Checkout Commands</th>
</tr>
</thead>
</table>

**cmd** Unlatch Check Initframe  **Execute**

**cmd** Update Initframe Details  **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

<table>
<thead>
<tr>
<th>LCA IMCA 1 Latch Checkout Commands</th>
</tr>
</thead>
</table>

‘Command Response’

Verify Initframe Received IMCA - 1 – X

Verify Parameter Checksum Failed IMCA - 1 – gray

sel Initframe Details IMCA - 1

<table>
<thead>
<tr>
<th>LCA IMCA 1 Initframe Details</th>
</tr>
</thead>
</table>

‘Limits’

Verify Position: -2982.21

Verify Shaft Speed: 450.007

Verify RTD Voltage: 1500

Verify Torque: 0.790583

Verify Power: 473.082

Verify Accel/Decel Time: 2.005

‘Stop On’

Verify Position – X

Verify RTD Voltage – X

Verify Torque – blank

Verify Latch Closed – blank

Verify Latch Open – X

Verify RTL 1 Closed – blank

Verify RTL 2 Closed – blank

Verify RTL 3 Closed – blank

Verify RTL 4 Closed – blank

Verify Inverter Temp – X

Verify Rate Error – X
'Clutch/Switch Settings'

Verify Monitor Limit Switches – blank
Verify Enable Clutch – X
Verify Perform Overspeed Reverse Test – X

NOTE
The LCA Capture Latch drive time from the closed to the open position is approximately 7 minutes.

56. **IMCA - 1 TO ENABLE MODE**
LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

LCA IMCA 1 Commands

sel Checkout Commands

LCA IMCA 1 Checkout Commands

**cmd** Actuate **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1 – Enabled
Verify Latch Status IMCA - 1 – In Progress

57. **VERIFYING IMCA - 1 STOP CONDITIONS**
LAB: S&M: LAB CRADLE ASSEMBLY
LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1 – On

‘Motor Status’

Verify Position IMCA - 1: -2988
Verify Latch Status IMCA - 1 – Stopped, Latch Open

‘Nominal Stop Flags’

Verify Latch Open IMCA - 1 – green

‘Latch Position’

Verify Open IMCA - 1, IMCA - 2 – green
58. **IMCA - 1 TO STANDBY MODE**

LAB: S&M: LAB CRADLE ASSEMBLY

sel Commands IMCA - 1

LCA IMCA 1 Commands

‘Mode Commands’

**cmd Standby**  **Execute**

LAB: S&M: LAB CRADLE ASSEMBLY

Verify Mode IMCA - 1, IMCA - 2 – Standby

‘Latch Position’

Verify Open IMCA - 1, IMCA - 2 – green

**NOTE**
To prevent nuisance alarms while deactivating the LCA IMCAs, inhibit RT FDIR before removing power from IMCAs.

59. **INHIBITING RT FDIR FOR IMCA - 1 AND IMCA - 2**

CDH Summary: Primary C&C MDM

Primary CCS MDM

sel CB EXT 1

CB EXT 1

sel RT Status

CB EXT 1 RT Status

**cmd 13 LCA Latch 1 RT FDIR Status Inhibit**  **Execute**

√RT FDIR Status – Inh

CDH Summary: Primary C&C MDM

Primary CCS MDM

sel CB EXT 2

CB EXT 2

sel RT Status
LAB CRADLE ASSEMBLY
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CB EXT 2 RT Status

*cmd* 13 LCA Latch 2 RT FDIR Status Inhibit *Execute*

√RT FDIR Status – Inh

60. **DEACTIVATING LCA IMCA - 2 AND IMCA - 1**

LAB: S&M: LAB CRADLE ASSEMBLY

`LAB CRADLE ASSEMBLY`

‘IMCA - 2 Power’

sel LA2B G RPC 9

RPCM LA2B G RPC 09

*cmd* RPC Position – Open *Execute*

Verify RPC Position – Op

*cmd* Close Cmd – Inhibit *Execute*

Verify Close Cmd – Inh

LAB: S&M: LAB CRADLE ASSEMBLY

`LAB CRADLE ASSEMBLY`

‘IMCA - 1 Power’

sel LA1B F RPC 9

RPCM LA1B F RPC 09

*cmd* RPC Position – Open *Execute*

Verify RPC Position – Op

*cmd* Close Cmd – Inhibit *Execute*

Verify Close Cmd – Inh

CDH Summary: Primary C&C MDM

`Primary CCS MDM`

sel CB EXT 2

CB EXT 2

sel RT Status
CB EXT 2 RT Status

**cmd** 13 LCA Latch 2 RT Status Inhibit  **Execute**

√RT Status – Inh

CDH Summary: Primary C&C MDM
Primary CCS MDM

sel CB EXT 1

CB EXT 1

sel RT Status

CB EXT 1 RT Status

**cmd** 13 LCA Latch 1 RT Status Inhibit  **Execute**

√RT Status – Inh
MIDDECK PAYLOAD
1. **VIDEO OPERATIONS**

MF57H Perform {PHOTO/TV CHECKLIST}, Scene PTV10 H-Reflex, then:

√ Rec Mode button is activated

2. **PGSC ASSEMBLY**

PGSC 2.1 If PGSC not configured, then

Perform {PGSC SETUP}, all (SODF) then:

PGSC 2.2 If PGSC not powered off, then

Perform {PGSC POWEROFF}, all (SODF) then:

3. **SYSTEM ASSEMBLE**

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The first and last references to any equipment will contain the complete hardware label name. Intermediate references may only contain the descriptive operations name without the payload name or parenthetical information.</td>
</tr>
<tr>
<td>2. If desired, crewmember may retrieve and employ Government Furnished Equipment: cable restraints.</td>
</tr>
</tbody>
</table>

TBD 3.1 Unstow HRF H-REFLEX (HOFFMANN REFLEX) EXPERIMENT KIT (MCGAMRU-046 (Trays A,B,C)

TBD 3.2 Unlock and temporarily stow H-REFLEX EXPERIMENT KIT (Trays A,B,C).

H-Reflex Exp Kit (Tray B) 3.3 Unstow and temporarily stow HRF H-REFLEX TEST UNIT (HRTU) (MCGAMRU-041).

H-Reflex Exp Kit (Tray C) 3.4 Unstow HRF H-REFLEX PCMCIA FLASH CARD (DP-ATA/4-CE).

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLASH CARD must be firmly seated.</td>
</tr>
</tbody>
</table>

PGSC 3.5 Insert FLASH CARD into upper PCMCIA slot on PGSC.

H-Reflex Exp Kit (Tray C) 3.6 Unstow HRF H-REFLEX DATA ACQUISITION CARD/CABLE (DAQ700).
3.7 Insert card end of DATA ACQUISITION CARD/CABLE into lower PCMCIA slot on PGSC.

3.8 Attach PGSC with Velcro to top of HRTU.

**CAUTION**
When inserting DATA ACQUISITION CARD/CABLE to HRTU I/O J1, place fingers on upper indents on sides of card; otherwise, cable pins could break. Refer to {FIGURE 2 DATA ACQUISITION CARD CABLE INSERTION} (SODF).

3.9 DATA ACQUISITION CARD/CABLE P1 → HRTU I/O J1

3.10 Unstow (as required):
- “HRF H-REFLEX EMG CABLE (MCGAMRU-042)”
- “HRF H-REFLEX STIMULUS CABLE (MCGAMRU-043)”
- “HRF H-REFLEX CUT-OUT CABLE (MCGAMRU-044)”

3.11 Connect
- EMG CABLE P2 → EMG J2
- CUT-OUT CABLE P4 → C-0 J4
- STIMULUS CABLE P3 → STIM J3

3.12 Attach all assembled units to floor. Refer to {FIGURE 1 EXPERIMENT SETUP} (SODF) for completed setup.

3.13 Unstow HRF H-REFLEX FOOT RERAINT (MCGAMRU-045).

4. SUBJECT SPECIFIC SETUP
4.1 Configure FOOT RERAINT in open position. Refer to {FIGURE 1 EXPERIMENT SETUP} for completed setup and FOOT RERAINT in open position.

4.2 Secure to floor at the following distances (from the vertical bulkhead to the closest edge of the FOOT RERAINT) as indicated in the table below:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>
5. SUBJECT PREPARATION

H-Reflex 5.1 Unstow, as required:
- Recording Electrodes (three)
- Stimulus Return Path Electrode (one)
- Electrode Paste
- Alcohol Swab (one)
- Dry Wipes (two)
- HRF H-REFLEX ELECTRODE LOCATING AID (MCGAMRU - 050)

5.2 Prepare, place Recording Electrodes per (FIGURE 3 SUBJECT RECORDING ELECTRODE PLACEMENT):

<table>
<thead>
<tr>
<th>Subject</th>
<th>Distance (Upper Electrode)</th>
<th>Distance (Lower Electrode)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

H-Reflex Stow HRF H-REFLEX ELECTRODE LOCATING AID.

Exp Kit (Tray A)

Wipe all electrode placement areas (three recording areas, one stimulus return path and one stimulus) with Alcohol Swab.

Refer to (FIGURE 3 SUBJECT RECORDING ELECTRODE PLACEMENT) and (FIGURE 4 HRF H-REFLEX KNEE BRACE, SUBJECT ELECTRODE PLACEMENT) (SODF).

Remove excess alcohol with Dry Wipe.

Discard used Dry Wipe and Alcohol Swab.

Place the two posterior Recording Electrodes on the midline of the leg, at marked locations.

NOTE
Anterior Recording Electrode should be low enough so as to not interfere with lower arm of HRF H-REFLEX KNEE BRACE.

Place anterior Recording Electrode on tibia as shown in (FIGURE 3 SUBJECT RECORDING ELECTRODE PLACEMENT) (SODF).

TBD 5.3 Place small quantity of Electrode Paste on sponge area of Stimulus Return Path Electrode.
5.4 Place Stimulus Return Path Electrode as shown on {FIGURE 4 HRF H-REFLEX KNEE BRACE, SUBJECT ELECTRODE PLACEMENT} (SODF) (just above patella).

5.5 Place small quantity of Electrode Paste behind knee and stow (Tray A).

6. **SUBJECT SETUP**

6.1 Unstow:

- **H-Reflex Exp Kit**
  - HRF H-REFLEX KNEE BRACE (MCGAMRU-014)
  - HRF H-REFLEX SUBJECT WAIST RESTRAINT (MCGAMRU-021) (two) (Tray B)

6.2 Secure subject by routing SUBJECT WAIST RESTRAINT(two) through foot loop and around subject per {FIGURE 1 EXPERIMENT SETUP} (SODF) for completed setup.

6.3 Loosen both knobs →, retract Stimulating Electrode and unwrap Nomex Strap.

6.4 Fit KNEE BRACE loosely on left leg. Refer to {FIGURE 4 HRF H-REFLEX KNEE BRACE, SUBJECT ELECTRODE PLACEMENT} (SODF).

6.5 Secure feet to FOOT RESTRAINT.

6.6 Position on left side of subject within arm’s reach.

6.7 TO KNEE BRACE ELECTRODE → | ← Stimulating Electrode (on KNEE BRACE) (See {FIGURE 4 HRF H-REFLEX KNEE BRACE, SUBJECT ELECTRODE PLACEMENT}).

6.8 TO STIM RTN PATH ELECTRODE → | ← Stimulus Return Path Electrode Refer to {FIGURE 4 HRF H-REFLEX KNEE BRACE, SUBJECT ELECTRODE PLACEMENT} (SODF).

6.9 TO ANTERIOR ELECTRODE (Green Lead) → | ← Anterior Electrode

TO POSTERIOR UPPER ELECTRODE (Red Lead) → | ← Posterior Upper Electrode

TO POSTERIOR LOWER ELECTRODE (Black lead) → | ← Posterior Lower Electrode

6.10 Adjust KNEE BRACE straps (two) and tighten ↑ Adjusting Knob (blue)
6.11 Position Stimulating Electrode on Electrode Paste behind knee by firmly pushing up on Stimulating Electrode shaft. Refer to [FIGURE 4 HRF H-REFLEX KNEE BRACE SUBJECT ELECTRODE PLACEMENT]

Knee Brace Tighten Electrode Adjusting Knob (silver) to hold Stimulating Electrode in place at the following positions (medial, mid-line, or lateral) as seen in the table below.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

7. POSTERIOR TIBIAL NERVE LOCATION

HRTU 7.1 √STIM STR dial set to zero (full).

7.2 √PGSC is setup and operational.

7.3 Double click H-Reflex Icon on desktop.

******************************************************
If [H-Reflex:FlashCardReq’d]
‘Flash card required. Please restart program with card in place’ message will be displayed.

If [H-Reflex: Setup Error]
‘DAQ-700 card required. Please restart program with card in place’ message will be displayed.

sel OK

√All cables are connected securely and both cards are firmly seated
If DATA ACQUISITION CARD/CABLE is to be ejected or reseated, PGSC must be powered down.

Go to step 7.3
******************************************************

HRTU 7.4 √PWR Lt (green) on front panel – ON

******************************************************
If PWR Lt on front panel – OFF
Exit experiment software.
Restart at step 7.3

If problem persists, √MCC-H.

******************************************************
7.5 √LOW BATT Lt on front panel – OFF

******************************************************************************************
If LOW BATT Lt (red) on front panel – ON
Continue through steps 11.5.
******************************************************************************************

PGSC 7.6 [H-Reflex]

sel File
sel New session

7.7 [H-Reflex:Subj.Ident.]

‘Subj. Initials’

enter Subject’s initials

√IN – Selected

sel OK

7.8 [H-Reflex:New Sess.Conf.]

sel Yes

7.9 [H-Reflex]

sel Locate

**NOTE**
Selecting Go on the laptop display will trigger a stimulus shock every three seconds.

Cut-out 7.10 Press and hold while posterior tibial nerve is located.

PGSC 7.11 sel Go

HRTU 7.12 Confirm proper placement of Stimulating Electrode:
Turn STIM STR dial ▲ to increase stimulus strength until response appears.
Adjust STIM STR dial to verify that maximum M-wave can be obtained.

******************************************************************************************
If no shock delivered
√STIM STR dial not set too low
√Cut-Out Switch is depressed

If shock is still not delivered, √MCC-H.
******************************************************************************************
EFFECTS OF ALTERED GRAVITY ON SPINAL CORD EXCITABILITY
(MIDDECK)

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30 OCT 00  

**********************************************************
If maximum M-wave is not found
Release Cut-Out Switch.
Move Stimulating Electrode to new location.
Cut-Out Switch → Press and hold
Repeat search for site of maximal response.
**********************************************************

7.13 Once posterior tibial nerve is confirmed:
Adjust STIM STR dial to minimum threshold (until just able to
produce H-wave response)
PGSC Spacebar → Press (to stop)

8. DATA ACQUISITION

8.1 Begin Acquire phase of protocol.
PGSC sel Acquire

8.2 Press and hold.
Cut-Out Cable

8.3 sel Go
PGSC

8.4 Obtain M and H-wave recruitment curves by varying STIM STR as
60 shocks are applied to the subject as follows:
(Refer to {FIGURE 5 M AND H WAVE EXAMPLE})
HRTU

For approximately first 20 shocks, increase shock strength with STIM
STR dial from Threshold (just able to see H wave) to maximal M
wave with no (or extremely small) H wave.

For approximately next 20 shocks, decrease shock strength with
STIM STR dial from maximal M wave and no (or extremely
small) H wave, down to Threshold.

For approximately last 20 shocks, manipulate STIM STR dial back
to maximal H wave. Use any remaining shocks to bracket the
maximum H wave response.
8.5 At end of data collection:
   If acceptable data on screen:
   Spacebar → Press (to continue)

   *****************************************************
   If acceptable data was not collected
   Perform {H-REFLEX CORRECTIVE FOR
   UNACCEPTABLE DATA}, all (SODF) then:
   *****************************************************

HRTU 8.6 Turn STIM STR dial to zero (full →)

9. EXPERIMENT SOFTWARE AND HARDWARE SHUTDOWN
9.1 Exit experiment software.

PGSC H-Reflex
   sel File
   sel Exit

   H-Reflex:Exit?
   sel Yes

HRTU 9.2 √PWR Lt – OFF

   *****************************************************
   If PWR Lt (green) – ON
   Restart and exit H-Reflex Experiment Software.
   If problem persists, √MCC-H.
   *****************************************************

10. EQUIPMENT REMOVAL
10.1 Loosen Stimulating Electrode and KNEE BRACE knobs.

10.2 Disconnect EMG CABLE from Recording Electrodes (three):
   TO ANTERIOR ELECTRODE (green Lead ← | → Anterior Electrode
   TO POSTERIOR UPPER ELECTRODE (red Lead) ← | → Posterior
   Lower Electrode
   TO POSTERIOR LOWER ELECTRODE (black lead) ← | → Posterior
   Lower Electrode

10.3 STIMULUS CABLE ← | → Stimulus Return Path Electrode

10.4 STIMULUS CABLE ← | → Stimulating Electrode
10.5 Release feet from FOOT RESTRAINT.

10.6 Remove KNEE BRACE from subject.

10.7 Release SUBJECT WAIST RESTRAINT (two) from waist.

10.8 Using Dry Wipe, clean area behind knee and clean Stimulating Electrode.

10.9 Discard Dry Wipe.

10.10 Prepare KNEE BRACE for stowage:
Slide Stimulating Electrode all the way in.
Loosely tighten Electrode Adjusting Knob
Collapse KNEE BRACE and wrap Nomex belts and HRF H-REFLEX SUBJECT WAIST RESTRAINT around it.

10.11 Stow HRF H-REFLEX KNEE BRACE.

10.12 Remove electrodes from leg:
Remove Recording Electrodes (three), Stimulus Return Path Electrode
Using Dry Wipe, clean location of Stimulus Return Path Electrode.
Discard used Dry Wipe, Recording Electrodes, Stimulus Return Path Electrode in trash.

11. EXPERIMENT SHUTDOWN

11.1 Collapse and stow HRF H-REFLEX FOOT RESTRAINT.

11.2 Remove FLASH CARD.
Double click PCMCIA icon in lower right portion of task bar.

PC Card (PCMCIA) Properties

sel Standard IDE/ESDI Hard Disk Controller - Socket 1
sel Stop

Standard IDE/ESDI Hard Disk Controller – Socket 1

sel OK

Remove FLASH CARD from upper PCMCIA slot on side of PGSC.

11.3 Stow HRF H-REFLEX PCMCIA FLASH CARD in Tray C.
11.4 Remove DATA ACQUISITION CARD/CABLE.

![PC Card (PCMCIA) Properties](#)

sel National Instruments-DAQCard-700 - Socket 2
sel Stop

National Instruments-DAQCard-700 - Socket 2

sel OK

Remove DATA ACQUISITION CARD/CABLE from lower PCMCIA slot on side of PGSC.

![PC Card (PCMCIA) Properties](#)

sel OK

11.5 Disconnect and stow in H-REFLEX EXPERIMENT KIT Tray C.

<table>
<thead>
<tr>
<th>HRTU</th>
<th>HRF H-REFLEX DATA ACQUISITION CARD/CABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>I/O J1 by pressing outward on gray tabs of the HRTU</td>
</tr>
<tr>
<td>P2</td>
<td>EMG J2</td>
</tr>
<tr>
<td>P3</td>
<td>STIM J3</td>
</tr>
<tr>
<td>P4</td>
<td>C-O J4</td>
</tr>
</tbody>
</table>

****************************************************************
If during experiment run, LOW BATT Lt (red) lit on front panel of HRTU
Perform {H-REFLEX CORRECTIVE FOR HRTU LOW BATTERY LIGHT}, all (SODF) then:
****************************************************************

11.6 Remove PGSC and stow HRF H-REFLEX TEST UNIT (HRTU).

11.7 Stack trays A,B,C, lock together.

11.8 Stow HRF H-REFLEX (HOFFMANN REFLEX) EXPERIMENT KIT.

11.9 As required, perform [PGSC RECONFIGURATION] or [PGSC SHUTDOWN], all (SODF), then:

**TBD**  12. VIDEO OPERATIONS

√All actions performed from {PHOTO/TV CHECKLIST} - Scene PTV10 H-Reflex
Remove Video Tape from Camcorder.
With Sharpie, label with the words “H-Reflex” with time and date added.
Stow in Jettison Stowage Bag (for return to Houston).
TRANSFER
DEORBIT PREP
APCU AMPS \(\uparrow\) (ASSY OPS/5A.1/FIN) Page 1 of 2 pages

APCU TEMP, block 1 (SODF: ASSY OPS: MALFUNCTION: APCU)
APCU VOLTS, block 1 (SODF: ASSY OPS: MALFUNCTION: APCU)

1 Verify that the LOADs on the MPLM are functioning properly.
2 MCC will determine between a transducer shift and a real single converter failure.
3 Total output for each APCU must be maintained less than 14.7 amps and each conv output must be maintained less than 8.5 amps.

APCU Status

If any APCU CONV AMPS \(\geq 8.5\)

PL AUX - ON
Nominal Config:
PRI PL MNC – ON (tb-ON)
PL CAB – MNB(MNA)
PL AUX - ON
L12(SSP 1) cb sw pwr 1 (CB2) – cl

Dual Config:
L12(SSP 1)
APCU 1 CONV – ON (tb-gray)
APCU 1 OUTPUT RLY – CLOSE (tb-gray)
APCU 2 CONV – ON (tb-gray)
APCU 2 OUTPUT RLY – CLOSE (tb-gray)

Single Config one bus powered:
L12(SSP 1)
APCU 1(2) CONV – ON (tb-gray)
APCU 1(2) OUTPUT RLY – CLOSE (tb-gray)
APCU 2(1) CONV – OFF (tb-gray)
APCU 2(1) OUTPUT RLY – OPEN (tb-bp)

Single Config both buses powered:
L12(SSP 1)
APCU 1(2) CONV – OFF (tb-gray)
APCU 1(2) OUTPUT RLY – CLOSE (tb-gray)
APCU 2(1) CONV – ON (tb-gray)
APCU 2(1) OUTPUT RLY – CLOSE (tb-gray)

\(\uparrow\)APCU Status

APCU 1(2) TRIP \(-4.40\)

All APCU 1,2 CONV A, B AMPS \(>8.5\)

Neither

Any APCU 1(2) CONV A(B) AMPS \(>8.5?\)

\(\uparrow\)MPLM LOADs

Are the LOADs on the MPLM functioning properly?

\(\uparrow\)MCC-H

Transducer shift or single conv failure.

\(\uparrow\)MCC-H

Affected APCU CONV A AMPS = CONV B AMPS \(\pm 3?\)

Yes

Yes

No

No

9

Yes

No

8

3

10

11

12

No

No

13

Yes

No

14

APCU heavily loaded.

Managed APCU loads so that CONV A amps + CONV B amps < 14.7 amps.

• Until total output, per APCU, < 14.7 amps and single CONV output < 8.5 amps, perform APCU LOAD POWERDOWN (SODF: ISS MAL: MALFUNCTION: EPS), then:

Continue nominal operations.
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Is CONV A amps + CONV B amps still &gt; 14.7 or single converter amps &gt; 8.5?</td>
</tr>
<tr>
<td>14</td>
<td>No</td>
</tr>
<tr>
<td>15</td>
<td>Continue with current configuration.</td>
</tr>
</tbody>
</table>
| 16   | (L12/SSP 1)  
• Affected APCU CONV – OFF (tb-bp)  
• Affected APCU OUTPUT RLY – OPEN (tb-bp) |
| 17   | On MCC GO  
• Affected APCU CONV – ON (tb-gray)  
• APCU AMPS  
  CONV A + CONV B amps > 14.7 or single converter amps > 8.5? |
| 18   | No |
|      | (L12/SSP 1)  
• APCU 1(2) CONV – OFF (tb-bp) |
|      | APCU TRIP, block 47 (SODF: ISS MAL: MALFUNCTION: EPS) |
|      | Yes |
|      | APCU TRIP, block 24 (SODF: ISS MAL: MALFUNCTION: EPS) |

30 OCT 00
SPEC voltage for APCU in the 120 Volts mode is 122 to 126.5 volts. If APCU volts are outside this range but stable and usable for ISS loads, consideration will be given to continuing APCU operation.

APCU tripped but failed to set trip indicator (possible for a short circuit directly at the APCU output).

APCU TEMP, block 1 (SODF: ASSY OPS: MALFUNCTION: APCU)

1. APCU Status
   - SM 200 APCU STATUS
   - APCU 1(2) TRIP > -4.40
   - Any APCU 1(2) CONV A(B) Amps > 8.5
   - Affected APCU VOLTS
     - All APCU 1,2 OUT VOLTS (four) > 121 and < 127
     - All APCU 1,2 OUT VOLTS (four) = OSL
     - APCU 1(2) OUT VOLTS RES HIGH and OUT VOLTS RES LOW = OSL
     - All APCU 1,2 OUT VOLTS RES HIGH = OUT VOLTS RES LOW ± 2
   - None of the above

2. Transient voltage shift.
   - Continue nominal operations.

3. APCU TRIP, block 1 (SODF: ASSY OPS: MALFUNCTION: APCU)
   - APCU AMPS, block 1 (SODF: ASSY OPS: MALFUNCTION: APCU)

4. APCU voltage regulation problem.

5. Transducer failure.
   - Continue nominal operations.

6. APCU 1(2) OUT VOLTS RES HIGH between 115 and 130.5?
   - MCC available?
     - Yes
       - MCC
     - No
       - Transient voltage shift.

7. APCU 1(2) OUT VOLTS RES HIGH > 127 or APCU 1(2) CONV A amps + CONV B amps > 14.7 or Single CONV amps > 8.5?
   - Neither
     - Take APCU Switches to OFF
       - (L12/SSP 1) APCU 1,2 CONV (two) – OFF (tb-bp)
       - APCU 1,2 OUTPUT RLY – OPEN (tb-bp)

8. APCU TRIP > -4.40 or APCU 1 CONV A amps, volts TRIP STATUS
   - APCU 1 CONV – ON (tb-gray)
     - APCU 1,2 OUT VOLTS (four) – OSL
     - APCU 1 TRIP > -4.40 or APCU 1 CONV A amps + CONV B amps > 14.7 or Single CONV amps > 8.5?

9. Unannunciated trip.
   - APCU TRIP, block 35 (SODF: ASSY OPS: MALFUNCTION: APCU)
MCC will determine cause of the power interruption.

When in PL Bay, MPLM MDM and PDB are powered by APCUs, but shell heaters are powered directly from PRI PL. When on ISS, all MPLM power is provided by APCUs until power is swapped over to ISS DDCU.

11 Take APCU 1 Converter OFF

13 Take APCU 1 Converter OFF

14 (L12/SSP 1)
   • APCU 2 CONV – ON (tb-gray)
   • APCU 2 CONV amps, volts TRIP STATUS
   • APCU 2 TRIP > -4.40 or
   • APCU 2 CONV A amps + CONV B amps > 14.7 or
   • Single CONV amps > 8.5
   Neither
   
   APCU 1,2 OUT VOLTS (four) – OSL
   
   APCU 2 TRIP > -4.40 or
   • APCU 2 CONV A amps + CONV B amps > 14.7 or
   • Single CONV amps > 8.5
   Neither

16 Loss of CAB PL1 bus or control power to APCU 1.

17 Verify APCU Output Relay configuration.
   Both APCU 1 and 2 Output relays closed at time of failure?

20 Loss of AUX B bus or control power to APCU 2.

22 Switch to Alternate PL CAB Power Source
   (ORB R1)
   • PL CAB – MNB (MNA)
   • PL CAB – MNA (MBN)

23 Repower APCU Converter
   (L12/SSP 1)
   • APCU 1 CONV – ON (tb-gray)
   • APCU 1 CONV – ON (tb-gray)
   • APCU 1,2 OUTPUT RLY – CLOSE (tb-bp)
   • APCU 2 CONV – ON (tb-gray)

24 Loss of power or control signal to APCUs.

26 Temporary loss of PL CAB bus.

27 (L12/SSP 1)
   • APCU 1 CONV – OFF (tb-gray)

APCU CONTROLLED REPOWER, all (SODF: TBD)

30 OCT 00
APCU tripped but failed to set trip indicator (possible for a short circuit directly at the APCU output).

APCU VOLTS ↓↑
(ASSY OPS/5A.1/FIN)

11

30 Take APCU 1 Converter OFF

(L12/SSP 1)
• APCU 1 CONV – OFF (tb-gray)

31

(L12/SSP 1)
• APCU 2 CONV – ON (tb-gray)
• APCU 2 CONV amps, volts TRIP STATUS
APCU 1,2 OUT VOLTS (four) – OSL
APCU 2 TRIP > -4.40 or APCU 2 CONV A amps + CONV B amps > 14.7 or Single CONV amps > 8.5
 Neither

32 APCU 2 unannunciated trip.

33 Loss of AUX B Bus or control power to APCU 2.

35 Verify APCU Output Relay configuration.
Both APCU 1 and 2 Output relays closed at time of failure?
 No

36 Reconfigure to APCU 1

(L12/SSP 1)
• APCU 2 CONV – OFF (tb-bp)
• APCU 1, 2 OUTPUT RLY (two) – CLOSE (tb-gray)
• APCU 1 CONV – ON (tb-gray)
• APCU 1,2 OUTPUT RLY tb (two) – gray

APCU CONTROLLED REPOWER, step 2 (SODF: TBD)

38

37 Reconfigure to APCU 1 and ICC

(L12/SSP 1)
• APCU 2 CONV – OFF (tb-gray)
• APCU 2(1) OUTPUT RLY – CLOSE (lb-gray)
• APCU 1 CONV – ON (lb-gray)
• APCU 2(1) OUTPUT RLY tb – gray

APCU CONTROLLED REPOWER, step TBD (SODF: TBD)

39 Reconfigure for ICC

(L12/SSP 1)
• APCU 2 CONV – OFF (tb-gray)
• APCU 1, 2 OUTPUT RLY (two) – CLOSE (tb-gray)
• APCU 1 CONV – ON (tb-gray)
• APCU 2 OUTPUT RLY tb (two) – gray

APCU CONTROLLED REPOWER, step TBD (SODF: TBD)

40

(L12/SSP 1)
• APCU 2 CONV – OFF (tb-gray)
• APCU 1, 2 OUTPUT RLY (two) – CLOSE (tb-gray)
• APCU 1 CONV – ON (tb-gray)
• APCU 1,2 OUTPUT RLY tb (two) – gray

APCU CONTROLLED REPOWER, step TBD (SODF: TBD)

30 OCT 00
APCU tripped but failed to set trip indicator (possible for a short circuit directly at the APCU output).

When in PL Bay, MPLM MDM and PDB are powered by APCUs, but shell heaters are powered directly from PRI PL. When on ISS, all MPLM power is provided by APCUs until power is swapped over to ISS DDCU.

There is a single point failure which will cause both the HIGH and LOW RES VOLTS to read low (broken wire).
When in PL Bay, MPLM MDM and PDB are powered by APCUs, but shell heaters are powered directly from PRI PL. When on ISS, all MPLM power is provided by APCUs until power is swapped over to ISS DDCU.
When in PL Bay, MPLM MDM and PDB are powered by APCUs, but shell heaters are powered directly from PRI PL. When on ISS, all MPLM power is provided by APCUs until power is swapped over to ISS DDCU.

**Nominal Config:**
- PRI PL MNC – ON (tb-ON)
- PL CAB – MNB(MNA)
- PL AUX – ON
- L12(SSP 1)
- cb SW PWR 1 (CB2) – cl

**Dual Config:**
- L12(SSP 1)
- APCU 1 CONV – ON (tb-gray)
- APCU 1 OUTPUT RLY – CLOSE (tb-gray)
- APCU 2 CONV – ON (tb-gray)
- APCU 2 OUTPUT RLY – CLOSE (tb-gray)

**Single Config one bus powered:**
- L12(SSP 1)
- APCU 1 (2) CONV – ON (tb-gray)
- APCU 1 (2) OUTPUT RLY – CLOSE (tb-gray)
- APCU 2 (1) CONV – OFF (tb-gray)
- APCU 2 (1) OUTPUT RLY – OPEN (tb-bp)

**Single Config both buses powered:**
- L12(SSP 1)
- APCU 1 (2) CONV – OFF (tb-gray)
- APCU 1 (2) OUTPUT RLY – CLOSE (tb-gray)
- APCU 2 (1) CONV – ON (tb-gray)
- APCU 2 (1) OUTPUT RLY – CLOSE (tb-gray)

**APCU Status**
- SM 200 APCU Status
- APCU 1(2) TRIP > -4.40
- Any APCU 1(2) CONV A(B) AMPS > 8.5
- APCU 1(2) VOLTS RES HIGH < 122 or > 126.5
- None of the above

**APCU Temp**

<table>
<thead>
<tr>
<th>1</th>
<th>APCU Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>All APCU 1.2 CONV A,B TEMPS (four) ≥ 130 and/or rising or ≤ 20?</td>
</tr>
<tr>
<td>3</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>(L12/SSP 1)</td>
</tr>
<tr>
<td>6</td>
<td>• MCC</td>
</tr>
<tr>
<td>7</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>Single CONV TEMP ≥ 130 or ≤ 20?</td>
</tr>
<tr>
<td>9</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>Yes</td>
</tr>
<tr>
<td>11</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>Yes</td>
</tr>
<tr>
<td>13</td>
<td>No</td>
</tr>
<tr>
<td>14</td>
<td>(L12/SSP 1)</td>
</tr>
<tr>
<td>15</td>
<td>• MCC</td>
</tr>
<tr>
<td>16</td>
<td>Activate other APCU</td>
</tr>
<tr>
<td>17</td>
<td>APCU 2(1) CONV – ON (tb-gray)</td>
</tr>
<tr>
<td>18</td>
<td>APCU 1(2) CONV – OFF (tb-gray)</td>
</tr>
</tbody>
</table>

**MCC**
- will determine whether Off-Nominal temperature readings were caused by a transducer shift or a real circuitry failure.
- In parallel config, when one converter is powered, both CONV – ON talkbacks will be gray.
1. Request PSP Dummy CMDs
   • MCC will uplink PSP Dummy CMDs and verify telemetry.
   • PSP Dummy CMD 2 (then 1)
   • PSP CONFIG ID 2(1)
   • UMB #4(1)
   • No SM/PSP LOAD errors
   • PSP I/F to OIU OFF(ON)

2. Power Cycle PSP 1(2)
   (A1L)
   • S-BD PL CNTL – CMD
   • S-BD PL PWR SYS – OFF
   • S-BD PL CNTL – PNL
   • S-BD PL PWR SYS – 1(2)
   • S-BD PL CNTL – CMD
   • S-BD PL PWR SYS – OFF
   • Error message 'S62 BCE BYP PSP 1(2)
   SM 62 PCM MU/PL COMM
   I/O RESET PSP 2(1) – ITEM 7(6) EXEC

3. OIU CMD
   SM 212 OIU
   • Bus 2 A – * (ITEM 8)
   • BUS 2 B – ITEM 9 EXEC (*)
   CMD successful?

4. Transient PSP 1(2) Failure.

5. Determine Current OIU FMT
   SM 212 OIU
   • FMT (ITEM 1), and log____

6. Return BUS 2 to Nominal Configuration
   SM 212 OIU
   • BUS 2 A – ITEM 8 EXEC (*)

7. Pwr Cycle OIU 1(2)
   On MCC GO
   (SSP1)
   • OIU – ctr, then
   • OIU 1(2) – ON
   • OIU tb – UP(DN)
   • Expect 'S62 PDI DECOM FAIL'

8. Continue nominal operations.

9. OIU FMT previously 255?
   Yes

10. Power cycle will place OIU in Format 255. OIU Station TLM will be lost until OIU CMD recovered. OIU H&S TLM will also be lost if PDI is not configured for OIU FMT 255.

Nominal Config:
(A1L)
S-BD PL CNTL – CMD
PWR SYS – 1
PWR SEL – PSP
PSP OUTPUT – PL UMB
(SSP1)
OIU 1 – ON (tb-UP)
(R1)
CAB PL – MNB

No response to OIU Configuration or Routed Commands
9 Determine Affected DECOM

DECOM indicating (↑), and log ___.

12 OIU CMD by Attempting to Load Original OIU FMT

SM 212 OIU
- ITEM 1 + X X EXEC, where X X X is original OIU FMT logged in block 5.
- PDI DCM SYSN for affected DECOM

All three 'B', 'W', 'F' columns display an ‘*’?

15 Transient OIU 1(2) failure.

16 - Continue nominal operations.

10 OIU CMD

SM 212 OIU
- BUS 2 B – ITEM 9 EXEC (*)

CMD successful?

7

Yes

No

11 Transient OIU 1(2) failure.

13 Return BUS 2 to Nominal Configuration

SM 212 OIU
- BUS 2 A – ITEM 8 EXEC (*)

14 - Continue nominal operations.
17 Switch to OIU 2(1)

On MCC GO (SSP1)
• OIU – OIU 2(1) ON
• OIU tb – DN(UP)

If OIU FMT previously 255 error message, ‘S62 BCE BYP PSP 1(2)’

Switch to PSP 2(1) (A1L)
• S-BD PL CNTL – CMD
• S-BD PL PWR OUTPUT – PL UMB
• S-BD PL PWR SYS – 2(1)
• S-BD PL SEL – PSP
• S-BD PL CNTL – PNL.CMD

• Error message ‘S62 BCE BYP PSP 1(2)’.

SM 62 PCMMU/PL COMM
• I/O RESET PSP 2(1) – ITEM 7(6) EXEC (*)

Config PDI for OIU 2(1)
• sel DECOM – ITEM 9 +X EXEC
• sel INPUT – ITEM 12 +2(1) EXEC
• LOAD – ITEM 13 EXEC

OIU FMT previously 255?

Yes

18 SM 212 OIU
• BUS 2 B – ITEM 9 EXEC (*)

CMD successful?

Yes

21 • Continue nominal operations.

No

19 PSP 1(2) to OIU 1(2) interface failure.

20 Return BUS 2 to Nominal Configuration

SM 212 OIU
• BUS 2 A – ITEM 8 EXEC (*)

22 • MCC

17

23 OIU CMD by Attempting to Load Original OIU FMT

SM 212 OIU
• ITEM 1 + X X X EXEC, where X X X is original OIU FMT logged in block 5.
• PDI DCM SYSN for affected DECOM

All three ‘B’, ‘W’, ‘F’ columns display an ‘*’?

Yes

24 • MCC

No

25 PSP 1(2) to OIU 1(2) interface failure.

26 • Continue nominal operations.
COMM

SM 212 OIU TEMP

Nominal Config:
(R1)
CAB PL – MNB
(SSP 1)
OIU – OIU 1(2) ON
OIU tb – UP(DN)

OIU message: OIU TEMP > 212

1. [SM 212 OIU]
   OIU 1(2) TEMP?
   No

2. Yes
   AOS or LOS?
   AOS

3. MCC

4. Select OIU 2(1)
   SSP1
   OIU – OIU 2(1) ON
   (tb-DN(UP))

5. Switch to PSP 2(1)
   (A1L)
   • \(\backslash S\)-BD PL CNTL – CMD
   • \(\backslash S\)-BD PSP CMD OUTPUT – PL UMB
   • S-BD PWR SYS – 2(1)
   • \(\backslash S\)-BD PWR SEL – PSP
   • S-BD PL CNTL – PNL.CMD
   • Error message ‘S62 BCE BYP PSP 1(2)’
   S62 PCMMU/PL COMM
   • I/O RESET PSP 2(1) – ITEM 7(6) EXEC

6. Configure PDI for OIU 2(1)
   • sel DECOM – ITEM 9 +X EXEC
   • sel INPUT – ITEM 12 +2(1) EXEC
   • LOAD – ITEM 13 EXEC

7. Load OIU FMT and Config if Required
   • MCC for correct OIU FMT/CONFIG
   • Perform LOAD OIU FMT/CONF (FDF, ORB OPS FS, COMM/INST), then:

8. Continue nominal operations.
1. OIU to PDI problems would annunciate a 'S62 PDI DECOM FAIL' message if FDA enabled.

2. MCC-H will likely direct STS or ISS crew to perform LOSS OF PCS TELEMETRY (POST CCS) (SODF: JNT OPS: MALFUNCTION).

3. Reloading the OIU format forces a resync with the GNC MDM.

4. OIU active device mapping occurs with format load.
Malfunction restores operational capability; additional troubleshooting to determine BIA failure may be performed later.

OIU powerup configuration on OIU BUS 3 is RT on Ch A.

Swap to OIU 2(1)

- OIU PWR – OIU 2(1) ON
- OIU tb – DN (UP)

AOS with MCC-H?

Configuration for Ground Commanding of PL COMM

- SPEC 62 not loaded
- MCC-H for further actions

Reconfigure PSP, PDI, OIU

- S-BD PL CNTL – CMD
- S-BD PSP OUTPUT – PL UMB
- S-BD PWR SYS – 2(1)
- S-BD PWR SEL – PSP
- S-BD PL CNTL – PNL, CMD

Expect error message: ‘S62 BCE BYP PSP 1(2)’

Conf for Ground Commanding of PL COMM

- SPEC 62 not loaded
- MCC-H for further actions

I/O RESET PSP 2(1) – ITEM 7(6) EXEC
- sel DECOM – ITEM 9 + X EXEC
- sel INPUT – ITEM 12 + 2(1) EXEC
- LOAD – ITEM 13 EXEC

SM 212 OIU

- ITEM 18 + 0 0 9 EXEC
- Continue nominal operations.
S62 PDI DECOM FAIL

Nominal Config:
(A1L)
PL DATA INTLVR
PWR – ON
(R1)
PL PRI MNC – ON
(tb-bp)
(R1)
CAB PL – MNB
(SSP1)
OIU 1 ON (tb-UP)

1. Message accompanied by 'S62 BCE BYP PDI'?
   - Yes → 2.4e 'S62 BCE BYP PDI' (FDF, MAL, COMM)
   - No

2. Any DECOM indicating fail?
   - Yes
     - 3. SM 212 OIU
        - OIU SYNC
        - AD 1 LOCK – YES?
        - 4. Transient PDI DECOM failure.
        - 5. Continue nominal operations.
   - No

3. Reload DECOM Indicating Fail
   - SM 62 PCMMU/PL COMM
     - sel DECOM – ITEM 9 + X EXEC
     - sel FMT – ITEM 10 + X X EXEC
     - Load – ITEM 11 EXEC
   - Load – CPLT?
   - Yes
   - 8. DECOM still indicating fail (?)?
   - No
   - Yes
   - 10. Select B/U DECOM Configuration (If Required)
     - For alt PDI config, perform LOAD PDI DECOM FORMAT, all
       (FDF, ORB OPS FS, COMM/INST), then:
     - • Continue nominal operations.
     - No

11. Select B/U DECOM Configuration (If Required)
    - • For alt PDI configuration, perform LOAD PDI DECOM FORMAT, all
      (FDF, ORB OPS FS, COMM/INST), then:
    - • For alt TFL, perform LOAD PCMMU FORMAT, all (FDF ORB
      OPS FS, COMM/INST), then:
    - B/U DECOM indicating fail (?)?
    - Yes
    - 12. • Continue nominal operations.
    - No

12. PL TLM system to PDI I/F failure or PL TLM system failure.
TCS not addressed in malfunction; it is not enabled.

MCC may direct crew to confirm PL PRI receiving power.

Alternate (OIU 2) requires PSP 2.

Configuration to Nominal PDI DECOM FORMATS (if Required)
- Perform LOAD PDI DECOM FORMAT (FDF, ORB OPS FS, COMM/INST), then:

Determine affected PL.
- OIU (INPUT 1,2)

Cycle OIU 1(2) Power
- (SSP1) OIU – ctr (tb-bp) OIU – OIU 1(2) ON (tb-UP(DN))
- Perform LOAD OIU FMT/CONFIG, all (FDF, ORB OPS FS, COMM/INST), then:

Zero Out Original DECOM Source
- SM 62 PCMMU/PL COMM
- sel DECOM – ITEM 9 +X EXEC
- sel INPUT – ITEM 12 +0 EXEC
- LOAD – ITEM 13 EXEC
- Notify MCC.
- Continue nominal operations.

PDI DECOM lock?
- Yes
- OIU power transient.
- No

Switch to OIU 2(1)
- (SSP1) OIU – 2(1) ON (tb-DN(UP))
Switch to PSP 2(1)
- (A1L) S-BD PL CNTL – CMD
- S-BD PL PSP OUTPUT – PL UMB
- S-BD PL PWR SYS – 2(1)
- S-BD PL SEL – PSP
- S-BD PL CNTL – PNL,CMDS
- Error message 'S62 BCE BYP PSP 1(2)'

PDI DECOM lock?
- Yes
- Config PDI for OIU 2(1)
- sel DECOM – ITEM 9 +X EXEC
- sel INPUT – ITEM 12 +0 EXEC
- LOAD – ITEM 13 EXEC
- Perform LOAD OIU FMT/CONFIG, all (FDF, ORB OPS FS, COMM/INST), then:

- No

- OIU (1/2) to PDI interface failed.
- Yes
- PDI failure.
- No

- MCC

27 OCT 00
This mal only treats OIU to MPLM interface problems, and MPLM interface problems. OIU to PDI problems would annunciate a S62 PDI DECOM FAIL msg.

Loss of MPLM telemetry does not annunciate S212 OIU AD NOLK, since OIU is BC.

Reloading OIU format does not force a resync when OIU is BC.

MCC-H may recommend starting in block 4, depending on the error signature.

OIU power-up config on OIU BUS 2 (MPLM via ROEU) is BC on ch A.

PSP swap must be performed prior to sending format command to OIU.

TBR - If unable to verify MPLM pressure and temperature, MPLM is still go for unberthing from PL BAY.

### Nominal Config:

(R1)
PL PRI MNC tb-ON
PL CAB –
MNB(MNA)
PL AUX – ON

(SSP1)
OIU PWR – OIU 1 (2) ON
OIU tb – UP (DN)
APCU 2 CONV – ON
APCU 2 OUTPUT
RLY – CLOSE

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Cycle OIU 1(2)</td>
</tr>
<tr>
<td>2</td>
<td>OIU 1(2) transient Failure.</td>
</tr>
<tr>
<td>3</td>
<td>Continue nominal operations.</td>
</tr>
<tr>
<td>4</td>
<td>Swap to OIU 2(1)</td>
</tr>
<tr>
<td>5</td>
<td>AOS with MCC-H?</td>
</tr>
<tr>
<td>6</td>
<td>Reconfigure PDI, PSP, OIU</td>
</tr>
<tr>
<td>7</td>
<td>OIU 1(2) failure.</td>
</tr>
<tr>
<td>8</td>
<td>Attempt MPLM power cycle</td>
</tr>
<tr>
<td>9</td>
<td>Continue nominal operations.</td>
</tr>
<tr>
<td>10</td>
<td>MPLM OR APCU Transient failure.</td>
</tr>
<tr>
<td>11</td>
<td>Continue nominal operations.</td>
</tr>
<tr>
<td>12</td>
<td>MPLM MDM, APCU, or I/F failure.</td>
</tr>
</tbody>
</table>

### MCC-H reports no or loss of MPLM telemetry while MPLM in PL Bay

/MCC-H recovered telemetry? Yes

/MCC-H for recovered telemetry?

/SPEC 62 not loaded

/MCC-H for further actions

Yes

/S-BD PL CNTL – CMD

/S-BD PSP OUTPUT – PL UMB

/S-BD PWR SYS – 2(1)

/S-BD PWR SEL – PSP

/S-BD PL CNTL – PNL, CMD

/MCC-H recovered telemetry?

Yes

/MCC-H for recovered telemetry?

Yes

/MCC-H recovered telemetry?

Yes

/MCC-H for recovered telemetry?

No

/MCC-H for recovered telemetry?

No

/MCC-H for recovered telemetry?

No

/MCC-H for recovered telemetry?

No

/MCC-H for recovered telemetry?

No
1. Remove PGSC from HRF H-REFLEX TEST UNIT (HRTU).

2. Unstow JEWELERS SCREWDRIVER SET FLAT TIP and Duct Tape.

3. Remove screws (eight) of HRTU cover.
   Temporarily stow onto Duct Tape.
   Remove cover.
   Remove all (four) Batteries (9-Volt).

   **NOTE**
   It is important to properly align positive and negative ends of Batteries.

4. Replace used Batteries with replacement Batteries (four).

5. Write “used” on Restraint Tape in kit with Marking Pen after stowing used Batteries.

6. Retrieve all screws (eight).
   Temporarily stow and replace in HRTU cover.

7. Stow JEWELERS SCREWDRIVER SET FLAT TIP and Duct Tape.

8. Go to **EFFECTS OF ALTERED GRAVITY ON SPINAL CORD EXCITABILITY (MIDDECK)**, begin with step 11.7 (SODF: ASSY OPS: MIDDECK PAYLOAD).
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NOTE
The major cause of unacceptable data is splitting of the M Wave curve. This is a result of the stimulating electrode shifting, usually during maximum stimulation. The shifting results in the stimulating electrode positioning itself in the most stable position. An example of a split M Wave curve (unacceptable data) is provided below.

Figure 6.- Unacceptable Data Example.

1. Do not reposition Simulating Electrode if Stimulating Electrode relocates itself. Check that Electrode Adjusting Knob (silver) is tightened.

PGSC 2. Spacebar → Press

3.  H-Reflex

    sel File
    sel New session
4. **H-Reflex: Subj. Ident.**
   
   ‘Subj. Initials’
   
   enter Subject’s initials
   
   √IN – Selected
   
   sel OK

5. **H-Reflex: New Sess. Conf.**

   sel Yes

6. Go to {EFFECTS OF ALTERED GRAVITY ON SPINAL CORD EXCITABILITY (MIDDECK)}, begin with step 8 (SODF: ASSY OPS: MIDDECK PAYLOAD).
## ORBITER ELECTRICAL BUS LOSS MATRIX

### ORBITER EPS BUSES

<table>
<thead>
<tr>
<th>ORBITER EPS BUSES</th>
<th>ESS</th>
<th>MNA DA1</th>
<th>MNB DA2</th>
<th>FC3</th>
<th>MNC DA3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1BC (DA1)</td>
<td>2CA (DA2)</td>
<td>3AB (DA3)</td>
<td>PNL O14</td>
<td>MPC 1</td>
</tr>
<tr>
<td></td>
<td>PNL O13, R14,</td>
<td>PNL O13, R14,</td>
<td>PNL O13</td>
<td></td>
<td>PNL A6L (R)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CABIN</td>
</tr>
<tr>
<td></td>
<td>PL1</td>
<td>PL2</td>
<td>PL3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ORBITER EQUIPMENT

<table>
<thead>
<tr>
<th>ORBITER EQUIPMENT</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIU 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OIU 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APCU 1</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>APCU 2</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>ODS X1 Conn Mate Ind Pwr</td>
<td>XR</td>
<td>XR</td>
</tr>
<tr>
<td>ODS X2 Conn Mate Ind Pwr</td>
<td>XR</td>
<td>XR</td>
</tr>
<tr>
<td>TCS</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Video Processing Unit (VPU)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>OSVS</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SVS Keel (Videospection) Cam/Illum/Htr Pwr</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Primary C/L Camera</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Secondary C/L Camera</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>PDIP 1</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>PDIP 2</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Payload Timing Buffer</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

### ISS EQUIPMENT

<table>
<thead>
<tr>
<th>ISS EQUIPMENT</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPLM Shell Htr Pwr (+28 VDC)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>MPLM MDM/PDB Pwr (+124 VDC via APCU 1)</td>
<td></td>
<td>XC</td>
</tr>
<tr>
<td>EAS/FCFS Htr Pwr (+124 VDC via APCU 2)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>PMA 2 Hooks - Group 1, 2 - Sys A</td>
<td>XRC</td>
<td>X</td>
</tr>
<tr>
<td>PMA 2 Hooks - Group 1, 2 - Sys B</td>
<td>XRC</td>
<td>X</td>
</tr>
</tbody>
</table>

### PAYLOAD BUS CONTROL POWER

<table>
<thead>
<tr>
<th>PAYLOAD BUS CONTROL POWER</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabin P/L Bus - MNB Cntl Pwr</td>
<td>XRC</td>
<td>XRC</td>
</tr>
<tr>
<td>Aux P/L Bus B - MNB Cntl Pwr</td>
<td>XRC</td>
<td>XRC</td>
</tr>
<tr>
<td>P/L PRI - MNC DA3 Cntl Pwr</td>
<td>XRC</td>
<td>XRC</td>
</tr>
</tbody>
</table>

X - Total Loss of Operational Power
XR - Loss of Redundant Power
XC - Total Loss of Control Power
XRC - Loss of Redundant Control Power
P - Primary Power Source
(R) - Redundant Power Source (requires crew action to use)
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FC1
ESS 1BC (DA1)
CABIN PL - MNA CNTL PWR
AUX PLA - CNTL PWR
ESS1BC O13 & R14
PNL O13: A – CB 2
PNL A6L – CB 1
PMA2 APAS HOOKS – SYS A (redundant control power)

MNA DA1
MNA MPC1
PNL A6L
PMA2 APAS HOOKS – SYS A CBs (open/close operational power)
AUX PLA (not used)
CABIN PL1 (redundant power available - MNB MPC2 nominally used)
CABIN PL2 (redundant power available - MNB MPC2 nominally used)
CABIN PL3 (redundant power available - MNB MPC2 nominally used)

FC2
ESS 2CA (DA2)
CABIN PL - MNB CNTL PWR
AUX PLB - CNTL PWR
ESS2CA O13 & R14
PNL O13: C – CB 10
PNL A6L – CB 6
PMA2 APAS HOOKS – SYS B (redundant control power)

MNB DA2
PRI PL (redundant power available - MNC DA3 nominally used)
MNB R15 (R14)
PNL R15 (R14)
CB 70
VIDEO PROCESSING UNIT (VPU)

MNB O15
PNL O15: B – CB 34
PNL A6L – CB 1
PMA2 APAS HOOKS – SYS A (redundant control power)

MNB MPC2
PNL A6L
PMA2 APAS HOOKS – SYS B CBs (open/close operational power)
AUX PLB
SSP 1
FUSE 3
OIU 2
SSP 2
FUSE 3
APCU 2 CONV
APCU 2 OUTPUT RLY
TCS (fed directly from MPC2 - same output used for AUX PLB)
CABIN PL1 (redundant power available)
  SSP 1
  CB 2
   APCU 1 CONV
   APCU 1 OUTPUT RLY
   PNL AW18H (J2)
   SEC C/L CAM (nominally disconnected)
  SSP 2
  CB 2
   SVS KEEL CAM PWR
   SVS KEEL CAM ILLUM

CABIN PL2 (redundant power available)
  SSP 1
  CB 1
   PDIP 1
    DC POWER 2 (PCS power port)
    Ku-Band RATE (OCA data routing relay - HDR or LDR)
  CB 3
   PDIP 1
    DC POWER 1 (PCS power port)
    ODS X1 CONN MATE TLM (redundant power)
    ODS X2 CONN MATE TLM (redundant power)
  SSP 2
  CB 1
   PDIP 2
    DC POWER 1 (TCS or SSV PGSC power port)
  CB 3
   PDIP 2
    DC POWER 2 (TCS or SSV PGSC power port)
    MPLM DATA (data routing relay - to OIU or T-0 umbilical)

CABIN PL3 (redundant power available)
  OSVS Patch Panel (OPP) – CB 1
  OSVS (fed directly from MPC2 - same output used for CAB PL3)
  SSP 1
   FUSE 1
    PAYLOAD TIMING BUFFER
   FUSE 4
    OIU 1
  CB 4
   ODS X1 CONN MATE TLM (redundant power)
   ODS X2 CONN MATE TLM (redundant power)
  SSP 2
   FUSE 1
    PNL AW18H (J1)
    PRI C/L CAM
FC3
PRI PL (redundant power available - MNC DA3 nominally used)
MNC DA3
  MNC O16
  PNL O16: B – CB 30
    PNL A6L – CB 6
      PMA2 APAS HOOKS – SYS B (redundant control power)
PRI PL (redundant power available)
  APCU 1 (input +28 VDC power to be converted to +124 VDC)
    ROEU
      MPLM MDM (PLB only)
      MPLM CABIN FAN (PLB only)
  APAS
    MPLM ACTIVATION POWER (ISS only)
  APCU 2 (input +28 VDC power to be converted to +124 VDC)
    SPDU
      EAS HEATER CIRCUITS (PLB only)
      PFCS HEATER CIRCUITS (PLB only)
    MPLM SHELL HEATER CIRCUITS (PLB only)
OIU 1
MPLM (PLB only) Command and Telemetry Path (redundant path available via OIU 2)

OIU 2
MPLM (PLB only) Command and Telemetry Path (redundant path available via OIU 1)

FF1
Uplink through NSP 1 (secondary path)

FF3
Uplink through NSP 2 (primary path)

PF1 (PL1)
ISS Primary Command Path (via PSP 1 – UMB 1 and OIU 1)
APCU 1 telemetry
OIU 1 telemetry (operating status)
DIH Card 06 – Channel 02
Input 15 – ODS X1/PMA2 X2 connector mate telemetry (redundant)
Input 14 – ODS X2/PMA2 X1 connector mate telemetry (redundant)

PF2 (PL2)
ISS Redundant Command Path (via PSP 2 – UMB 1 and OIU 2)
APCU 2 telemetry
OIU 2 telemetry (operating status)
OSVS interface
DIH Card 06 – Channel 02
Input 08 – ODS X1/PMA2 X2 connector mate telemetry (redundant)
Input 09 – ODS X2/PMA2 X1 connector mate telemetry (redundant)

OF1
PCMMU 1 – mode select
PCMMU 1, 2 – ON/OFF power select
Ku-Band Gyro – temperature telemetry (reference Flight Rule 11-53)
PL Bay MECH Sys 1, 2 – power switch telemetry
ROEU Latch 2, 3 (MATE/DEMATE, LAT/REL, ELEC CONT) - Sys B – telemetry

DSC OF1
PCMMU 1 – mode select
Ku-Band Gyro – temperature telemetry (reference Flight Rule 11-53)

OF2
PSP 1, 2 – bit and frame sync
PCMMU 2 – mode select
PL AUX B – RPC ON discrete telemetry
ROEU Latch 1 (RELAX) - Sys B – telemetry
ROEU Latch 2 (MATE/DEMATE) – telemetry
ROEU Latch 3 (LAT/REL) – telemetry
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DSC OF2
  PCMMU 2 – mode select

OF3
  Orbiter Comm System telemetry (reference OI MDM/DSC Failure Impacts)
  PL PRI (MNC, MNB, FC3) – ON discrete telemetry

DSC OF3
  Ku-Band A-gimbal – temperature telemetry (reference Flight Rule 11-53)

OF4
  PSP Command Capability
  If only one port is lost, command capability can be regained by switching to the
  opposite PCMMU.
  UHF – all status telemetry (except AGC)
  Ku–Band – RADAR mode and output power
  S-band, Ku-band – PNL/CMD switch – position telemetry
  PSP, GCIL – ON/OFF telemetry
  Orbiter Comm System – telemetry (reference OI MDM/DSC Failure Impacts)
  CAB P/L (MNA, MNB), PL AUX – ON discrete telemetry
  ROEU Latch 2, 3 (MATE/DEMATE, LAT/REL, ELEC CONT) - Sys A – telemetry

DSC OM1
  MNC bus – voltage telemetry

DSC OM2
  Ku-Band B-gimbal – telemetry (reference Flight Rule 11-53)
  MNA, MNB bus – voltage telemetry

OA1
  ODS X4/PMA2 X3 – connector mate telemetry
  PMA2 - Group 1 - passive hooks (1, 3, 5) – closed telemetry
  PMA2 - Group 1 - passive hooks (7, 9, 11) – closed telemetry

DSC OA1
  ODS X4/PMA2 X3 – connector mate telemetry power
  PMA2 - Group 1 - passive hooks (1, 3, 5) – closed telemetry power
  PMA2 - Group 1 - passive hooks (7, 9, 11) – closed telemetry power

OA2
  ODS X3/PMA2 X4 – connector mate telemetry
  PMA2 - Group 2 - passive hooks (2, 4, 6) – closed telemetry
  PMA2 - Group 2 - passive hooks (8, 10, 12) – closed telemetry

DSC OA2
  ODS X3/PMA2 X4 – connector mate telemetry power
  PMA2 - Group 2 - passive hooks (2, 4, 6) – closed telemetry power
  PMA2 - Group 2 - passive hooks (8, 10, 12) – closed telemetry power

OA3
  ROEU Latch 1 (RELAX) - Sys A – telemetry
  P/L SEL 1, 2 (latch 1) - Primary LAT/R-F-L/REL – latch status telemetry
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DEVICE TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3</td>
<td>APCU 1 CONV</td>
<td><strong>ON</strong> (up) – Applies CAB PL1 power to activate both APCU 1 power converters.</td>
</tr>
<tr>
<td></td>
<td>Toggle switch, two-position</td>
<td><strong>OFF</strong> (dn) – Removes CAB PL1 power to deactivate both APCU 1 power converters.</td>
</tr>
<tr>
<td></td>
<td>(Maintained - Maintained)</td>
<td></td>
</tr>
<tr>
<td>DS3</td>
<td>APCU 1 CONV</td>
<td><strong>gray</strong> – Indicates both APCU 1 power converters are activated, outputting +124 VDC power within the APCU ORU.</td>
</tr>
<tr>
<td></td>
<td>Event indicator, two-position</td>
<td><strong>bp</strong> – Indicates both APCU 1 power converters are deactivated.</td>
</tr>
<tr>
<td>S4</td>
<td>APCU 1 OUTPUT RLY</td>
<td><strong>CLOSE</strong> (up) – Applies CAB PL1 power to close APCU 1 output relay.</td>
</tr>
<tr>
<td></td>
<td>Toggle switch, two-position</td>
<td><strong>OPEN</strong> (dn) – Removes CAB PL1 power to open APCU 1 output relay.</td>
</tr>
<tr>
<td></td>
<td>(Maintained - Maintained)</td>
<td></td>
</tr>
<tr>
<td>DS4</td>
<td>APCU 1 OUTPUT RLY</td>
<td><strong>gray</strong> – Indicates APCU 1 output relay is closed, flowing parallel, +124 VDC APCU power to MPLM (in PLB or on ISS via APAS X-connectors).</td>
</tr>
<tr>
<td></td>
<td>Event indicator, two-position</td>
<td><strong>bp</strong> – Indicates APCU 1 output relay is open, removing all APCU power from MPLM (in PLB or on ISS).</td>
</tr>
<tr>
<td>S6</td>
<td>APCU 2 CONV</td>
<td><strong>ON</strong> (up) – Applies AUX PLB power to activate both APCU 2 power converters.</td>
</tr>
<tr>
<td></td>
<td>Toggle switch, two-position</td>
<td><strong>OFF</strong> (dn) – Removes AUX PLB power to deactivate both APCU 2 power converters.</td>
</tr>
<tr>
<td></td>
<td>(Maintained - Maintained)</td>
<td></td>
</tr>
<tr>
<td>DS6</td>
<td>APCU 2 CONV</td>
<td><strong>gray</strong> – Indicates both APCU 2 power converters are activated, outputting +124 VDC power within the APCU ORU.</td>
</tr>
<tr>
<td></td>
<td>Event indicator, two-position</td>
<td><strong>bp</strong> – Indicates both APCU 2 power converters are deactivated.</td>
</tr>
<tr>
<td>S7</td>
<td>APCU 2 OUTPUT RLY</td>
<td><strong>CLOSE</strong> (up) – Applies AUX PLB power to close APCU 2 output relay.</td>
</tr>
<tr>
<td></td>
<td>Toggle switch, two-position</td>
<td><strong>OPEN</strong> (dn) – Removes AUX PLB power to open APCU 2 output relay.</td>
</tr>
<tr>
<td></td>
<td>(Maintained - Maintained)</td>
<td></td>
</tr>
<tr>
<td>DS7</td>
<td>APCU 2 OUTPUT RLY</td>
<td><strong>gray</strong> – Indicates APCU 2 output relay is closed, flowing parallel, +124 VDC APCU power to EAS and PFCS heaters (on ICC).</td>
</tr>
<tr>
<td></td>
<td>Event indicator, two-position</td>
<td><strong>bp</strong> – Indicates APCU 2 output relay is open, removing all APCU power from EAS and PFCS heaters (on ICC).</td>
</tr>
<tr>
<td>ITEM</td>
<td>DEVICE TYPE</td>
<td>FUNCTION</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>S8</td>
<td>MPLM CHAN 1 HTR PWR</td>
<td>Toggle switch, two-position (Maintained - Maintained)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ON (up)</strong> – Applies PL PRI power to MPLM HCU to enable cycling of MPLM +28 VDC heater circuits 1 --- 11 (while in PLB).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>OFF (dn)</strong> – Removes PL PRI power from MPLM HCU to inhibit cycling of MPLM +28 VDC heater circuits 1 --- 11 (while in PLB).</td>
</tr>
<tr>
<td>DS8</td>
<td>MPLM CHAN 1 HTR PWR</td>
<td>Event indicator, two-position</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>gray</strong> – Indicates PL PRI power has been applied to NSTS CB No. 1 relay of MPLM HCU, enabling cycling of MPLM +28 VDC heater circuits 1 --- 11 (while in PLB).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>bp</strong> – Indicates PL PRI power has been removed from NSTS CB No. 1 relay of MPLM HCU, inhibiting cycling of MPLM +28 VDC heater circuits 1 --- 11 (while in PLB).</td>
</tr>
<tr>
<td>S10</td>
<td>MPLM CHAN 1 ROFU/PDA HTR PWR</td>
<td>Toggle switch, two-position (Maintained - Maintained)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>None – ROFU/PDA heaters are not installed for passive MPLM flights.</td>
</tr>
<tr>
<td>DS10</td>
<td>MPLM CHAN 1 ROFU/PDA HTR PWR</td>
<td>Event indicator, two-position</td>
</tr>
<tr>
<td></td>
<td></td>
<td>None – ROFU/PDA heaters are not installed for passive MPLM flights.</td>
</tr>
<tr>
<td>S11</td>
<td>MPLM CHAN 2 HTR PWR</td>
<td>Toggle switch, two-position (Maintained - Maintained)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ON (up)</strong> – Applies PL PRI power to MPLM HCU to enable cycling of MPLM +28 VDC heaters circuits 12 --- 22 (while in PLB).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>OFF (dn)</strong> – Removes PL PRI power from MPLM HCU to inhibit cycling of MPLM + 28 VDC heater circuits 12 --- 22 (while in PLB).</td>
</tr>
<tr>
<td>DS11</td>
<td>MPLM CHAN 2 HTR PWR</td>
<td>Event indicator, two-position</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>gray</strong> – Indicates PL PRI power has been applied to NSTS CB No. 2 relay of MPLM HCU, enabling cycling of MPLM +28 VDC heater circuits 12 --- 22 (while in PLB).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>bp</strong> – Indicates PL PRI power has been removed from NSTS CB No. 2 relay of MPLM HCU, inhibiting cycling of MPLM +28 VDC heater circuits 12 --- 22 (while in PLB).</td>
</tr>
<tr>
<td>S12</td>
<td>MPLM CHAN 2 ROFU/PDA HTR PWR</td>
<td>Toggle switch, three-position (Maintained - Maintained - Maintained)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>None – ROFU/PDA heaters are not installed for passive MPLM flights.</td>
</tr>
<tr>
<td>ITEM</td>
<td>DEVICE TYPE</td>
<td>FUNCTION</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>DS12</td>
<td>MPLM</td>
<td>None – ROFU/PDA heaters are not installed for passive MPLM flights.</td>
</tr>
<tr>
<td></td>
<td>CHAN 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ROFU/PDA HTR PWR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Event indicator, two-position</td>
<td></td>
</tr>
<tr>
<td>DS13</td>
<td>OIU PWR</td>
<td>UP – Indicates CAB PL3 power has been applied to OIU 1.</td>
</tr>
<tr>
<td></td>
<td>Event indicator, three-position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bp – Indicates all power has been removed from OIU 1 and 2.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DN – Indicates AUX PLB power has been applied to OIU 2.</td>
<td></td>
</tr>
<tr>
<td>S15</td>
<td>TCS PWR</td>
<td>ON (up) – Applies AUX PLB power to TCS.</td>
</tr>
<tr>
<td></td>
<td>Toggle switch, two-position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Maintained - Maintained)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OFF (dn) – Removes AUX PLB power from TCS.</td>
<td></td>
</tr>
<tr>
<td>DS15</td>
<td>TCS PWR</td>
<td>gray – Indicates AUX PLB power has been applied to TCS.</td>
</tr>
<tr>
<td></td>
<td>Event indicator, two-position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bp – Indicates AUX PLB power has been removed from TCS.</td>
<td></td>
</tr>
<tr>
<td>S20</td>
<td>ODS CONN MATE X1 TLM PWR</td>
<td>ON (up) – Applies CAB PL2 and CAB PL3 (redundant) power across the ODS X1-to-PMA2 X2 interface, providing for the indication of a successful connection.</td>
</tr>
<tr>
<td></td>
<td>Toggle switch, two-position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Maintained - Maintained)</td>
<td></td>
</tr>
<tr>
<td>S22</td>
<td>ODS CONN MATE X2 TLM PWR</td>
<td>ON (up) – Applies CAB PL2 and CAB PL3 (redundant) power across the ODS X2-to-PMA2 X1 interface, providing for the indication of a successful connection.</td>
</tr>
<tr>
<td></td>
<td>Toggle switch, two-position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintained - Maintained)</td>
<td></td>
</tr>
<tr>
<td>S24</td>
<td>OIU PWR</td>
<td>OIU 1 ON (up) – Applies CAB PL3 power to OIU 1.</td>
</tr>
<tr>
<td></td>
<td>Toggle switch, three-position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Maintained - Maintained - Maintained)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OFF (ctr) – Removes all power from OIU 1 and 2.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OIU 2 ON (dn) – Applies AUX PLB power to OIU 2.</td>
<td></td>
</tr>
<tr>
<td>ITEM</td>
<td>DEVICE TYPE</td>
<td>FUNCTION</td>
</tr>
<tr>
<td>------</td>
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</tr>
</tbody>
</table>
| CB1  | PDIP 1 PWR 2 / KuBAND RLY | Circuit breaker, five-amp  
   closed (in) – Applies CAB PL2 power directly to PDIP 1 switches for DC POWER 2 and Ku BAND RATE.  
   open (out) – Removes CAB PL2 power from PDIP 1 switches for DC POWER 2 and Ku BAND RATE.  |
| CB2  | SW PWR 1 | Circuit breaker, five-amp  
   closed (in) – Applies CAB PL1 power directly to SSP 1 switches for APCU 1, 2 and also to SSP 2 switch for SEC C/L CAM.  
   open (out) – Removes CAB PL1 power from SSP 1 switches for APCU 1, 2 and also from SSP 2 switch for SEC C/L CAM.  |
| CB3  | PDIP 1 PWR 1 | Circuit breaker, five-amp  
   closed (in) – Applies CAB PL2 power directly to SSP 1 switches for ODS CONN MATE X1, X2 TLM PWR and also to PDIP 1 switch for DC POWER 1.  
   open (out) – Removes CAB PL2 power from SSP 1 switches for ODS CONN MATE X1, X2 TLM PWR and also from PDIP 1 switch for DC POWER 1.  |
| CB4  | SW PWR 2 | Circuit breaker, five-amp  
   closed (in) – Applies CAB PL3 power directly to SSP 1 switches for ODS CONN MATE X1, X2 TLM PWR.  
   open (out) – Removes CAB PL3 power from SSP 1 switches for ODS CONN MATE X1, X2 TLM PWR.  |
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DEVICE TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3</td>
<td>SVS KEEL CAM PWR</td>
<td>Toggle switch, two-position (Maintained - Maintained) ON (up) – Applies CAB PL1 power to SVS Keel Camera, located in PLB (Bay 10). OFF (dn) – Removes CAB PL1 power from SVS Keel Camera, located in PLB (Bay 10).</td>
</tr>
<tr>
<td>S4</td>
<td>SVS KEEL CAM ILLUM</td>
<td>Toggle switch, two-position (Maintained - Maintained) ON (up) – Applies CAB PL1 power to illuminator of SVS Keel Camera, located in PLB (Bay 10). OFF (dn) – Removes CAB PL1 power from illuminator of SVS Keel Camera, located in PLB (Bay 10).</td>
</tr>
<tr>
<td>S12</td>
<td>C/L CAM PWR</td>
<td>Toggle switch, three-position (Maintained - Maintained - Maintained) PRI (up) – Applies CAB PL3 power to primary Centerline Camera, which is connected at PNL AW18H. OFF (ctr) – Removes all power from PNL AW18H and any Centerline Camera connected to it. SEC (dn) – Applies CAB PL1 power to secondary Centerline Camera, which is connected at PNL AW18H (if needed).</td>
</tr>
<tr>
<td>CB1</td>
<td>PDIP 2 PWR 1</td>
<td>Circuit breaker, five-amp closed (in) – Applies CAB PL2 power directly to PDIP 2 switch for DC POWER 1. open (out) – Removes CAB PL2 power from PDIP 2 switch for DC POWER 1.</td>
</tr>
<tr>
<td>CB2</td>
<td>SW PWR 2</td>
<td>Circuit breaker, five-amp closed (in) – Applies CAB PL1 power directly to SSP 2 switches for SVS KEEL CAM PWR and ILLUM. open (out) – Removes CAB PL1 power from SSP 2 switches for SVS KEEL CAM PWR and ILLUM.</td>
</tr>
<tr>
<td>CB3</td>
<td>PDIP 2 PWR 2/ MPLM RLY</td>
<td>Circuit breaker, five-amp closed (in) – Applies CAB PL2 power directly to PDIP 2 switches for DC POWER 2 and MPLM DATA. open (out) – Removes CAB PL2 power from PDIP 2 switches for DC POWER 2 and MPLM DATA.</td>
</tr>
<tr>
<td>CB4</td>
<td>(unlabeled)</td>
<td>Circuit breaker, five-amp none</td>
</tr>
</tbody>
</table>