| TIME (HR : MIN) | IV | Increment 16 10A Stage - US EVA 12 (Charlie) EV1 | EV2 |
|---|---|---|---|
| 00:00 --- | | **POST DEPRESS** (00:05) | **POST DEPRESS** (00:05) |
| | | **EGRESS/SETUP** (00:10) | **EGRESS/SETUP** (00:10) |
| - | | **REMOVE PORT SHUNT JUMPER** (00:30) | **CONFIGURE VENT TOOLS** (00:40) |
| -- | | | |
| - | | **VENT AND STOW PORT SHUNT JUMPER** (00:50) | |
| 01:00 --- | | | **REMOVE NODE 2 FLUID QD CAPS** (00:25) |
| - | | | **RELOCATE APFR** (00:15) |
| -- | | **RELEASE LOOP B FLUID TRAY** (00:50) | **RELEASE LOOP B FLUID TRAY** (00:50) |
| - | | | |
| 02:00 --- | | | |
| - | | **RELOCATE LOOP B FLUID TRAY** (00:30) | **RELOCATE LOOP B FLUID TRAY** (00:30) |
| -- | | | |
| - | | **SECURE LOOP B FLUID TRAY** (00:20) | **SECURE LOOP B FLUID TRAY** (00:20) |
| 03:00 --- | | **DEPLOY NODE 2 LOOP B FLUID TRAY** (00:20) | **DEPLOY NODE 2 LOOP B FLUID TRAY** (00:20) |
| - | | | |
| -- | | **VENT NODE 2 LOOP B FLUID TRAY** (00:40) | **MATE/OPEN TRAY HINGE QDS** (00:30) |
| - | | | |
| 04:00 --- | | | **MATE/OPEN NODE 2 QDS** (00:55) |
| - | | **MATE/OPEN S0 QDS** (00:45) | |
| -- | | | |
| - | | | |
| 05:00 --- | | **CONFIGURE LOOP B TRAY HEATER CABLE** (00:15) | **MATE NODE 2 STBD AVIONICS CABLES** (00:30) |
| - | | **NODE 2 STBD CBCS COVER & CBM PETALS** (00:10) | |
| -- | | **MATE PMA2-NODE 2 REDUNDANT UMBILICALS** (00:35) | **LAB-NODE 2 GAP SPANNER** (00:25) |
| - | | | |
| 06:00 --- | | **CLEANUP/INGRESS** (00:20) | **CLEANUP/INGRESS** (00:20) |
| - | **EVA = 6:25** | **PRE REPRESS** (00:05) | **PRE REPRESS** (00:05) |

# PRE US EVA 12 (CHARLIE) TOOL CONFIG

**EV1**

- ☐ MWS
  - ☐ BRT (L)
    - ☐ RET (eq-eq)
    - ☐ Wire Ties
      - ☐ Short (3 - for PMA routing)
      - ☐ Long (2)
  - ☐ T-Bar
    - ☐ RET (eq-eq) (2)
    - ☐ RET (eq-eq) w/ PIP pin (1)
    - ☐ Wire Ties (2)
    - ☐ Small Trash Bag
    - ☐ Socket Caddy
      - ☐ 7/16 Socket - 9 ext (w/ decoration)
    - ☐ RET (eq-eq) (2)
      - ☐ Over-gloves (2)
  - ☐ Swing Arm (R)
    - ☐ PGT [MTL **30.5**] S/N _____
      - ☐ PGT Battery S/N _____
    - ☐ RET (eq-eq)
- ☐ Waist Tether (R & L)
- ☐ D-ring Extender (R & L)
- ☐ SAFER
- ☐ WVS
- ☐ Safety Tether, 85'

**Crewlock Bag #4 (QD Tools)**

- ☐ w/ RET (Lg-sm)
- ☐ Adj Equip Tether (bag exterior)
- ☐ Wire-ties, Long (2 - shunt jumper) (on internal RET)
- ☐ 1" QD Release Tool (on internal RET)
- ☐ 1" QD Bail Drive Lever (on internal RET)
- ☐ RET (1 to internal tether point)
  - ☐ N2 Vent Tool
- ☐ RET (2 for SPDs - to internal tether points)
- ☐ RET (1 for vent tool - to ext bag handle)
- ☐ RET (1 to internal tether point)
  - ☐ Button depress tool (1-in)
- ☐ RET (1 to internal tether point)
  - ☐ AKT (1-in)

- ☐ Total RETs sm-sm used – 16
- ☐ Total RETs with PIP pin – 5
- ☐ Total RETs Lg-sm – 2
- ☐ Total Adj tethers – 7

**EV2**

- ☐ MWS
  - ☐ BRT (L)
    - ☐ RET (eq-eq)
    - ☐ Wire Tie
      - ☐ Short (3)
      - ☐ Long (2) (*fairleads*)
  - ☐ T-Bar
    - ☐ RET (eq-eq) w/ PIP pin (2)
    - ☐ Wire Ties (2)
    - ☐ Small Trash Bag
    - ☐ Socket Caddy
      - ☐ 7/16 Socket - 9 ext (w/ decoration)
    - ☐ RET (eq-eq) (2)
      - ☐ Over-gloves (2)
  - ☐ Swing Arm (R)
    - ☐ PGT [MTL **30.5**] S/N _____
      - ☐ PGT Battery S/N _____
    - ☐ RET (eq-eq)
- ☐ Waist Tether (R & L)
- ☐ D-ring Extender (R & L)
- ☐ SAFER
- ☐ WVS
- ☐ Safety Tether, 85'

**Crewlock Bag #1**

- ☐ RET (Lg-sm) (on bag exterior)
- ☐ Adj Equip Tether (bag exterior to secure bag at worksite)
- ☐ Adj Equip Tether (on internal RET)
  - ☐ SPD, 1" (2)
- ☐ Adj Equip Tether (on internal RET)
  - ☐ SPD, 1" (2)
- ☐ Digital camera
  - ☐ RET (tether camera in bag)
- ☐ RET
  - ☐ to Adj Equip Tether (caps) - ext bag handle
- ☐ Wire-tie Caddy (2 - internal RETs)
- ☐ Jettison Stowage Bag
  - ☐ RET (on drawstring, bundled in bag)
  - ☐ Adj Equip Tether - for handling (to RET, bundled in bag)
  - ☐ Adj Equip Tether (for handling) (to adj, around bundle)
- ☐ Gap Spanner (-305 for Lab/Node2)

**Prior to EVA, inspect:**

- ☐ RET cord for damage
- ☐ BRT for loose fittings/screws
- ☒ ~~MWS for loose screws~~
- ☐ Safety/waist tether load alleviating straps: no red
- ☐ Small trash bag bristles for damage/deformation

Note: Use Blue S/N Tethers

**Staging Bag**

- ☐ Fuse Tether (1)
  - ☐ Connector Cleaner Tool Kit
  - ☐ Connector Pin Straightener
  - ☐ Probe
  - ☐ Velcro/Tape Caddy
  - ☐ Pry Bar
- ☐ Fuse Tether (1)
  - ☐ PGT (spare) S/N _____
    - ☐ PGT Battery S/N _____
  - ☐ Wire Tie Caddy (w/ 9 wire ties)
  - ☐ Vise Grips
  - ☐ EVA Ratchet
  - ☐ Cheater Bar

☐ IV Bag

- ☐ Contamination Detection Kit
  - ☐ Gold Salt Coupon (6)
  - ☐ Color Chart (2)
  - ☐ ISS Contamination Sampler (2)
  - ☐ Shuttle Contamination Sampler (2)
  - ☐ Nitrogen Dioxide Draeger Tube (6)
  - ☐ Ammonia Draeger Tube (6)
- ☐ DCM Plug (2) - SAFER Hard Mount
- ☐ GP Caddy (2)
  - ☐ Thermal Mittens (2 pr)
- ☐ EVA Ratchet
- ☐ Socket Caddy
  - ☐ 1/2 x 8-in socket (IV Hatch)
  - ☐ 7/16 x 6-in socket (backup)

☐ D-ring extender on EVA hatch D-ring

☐ Long duration tie-down tethers (4)

# EVA BRIEFING CARD

EV 1/3_____ EV 2/4_____ IV 1_____ IV 2_____

| Exercise | | Campout |
|---|---|---|
| Wake-up (GMT) | ____ ____ : ____ ____ | Wake-up (GMT) |
| EVA Prep start | ____ ____ : ____ ____ | Repress for hygiene |
| Depress to 10.2 | ____ ____ : ____ ____ | Depress to 10.2 |
| Start purge | ____ ____ : ____ ____ | Start purge |
| PET 00:00 | ____ ____ : ____ ____ | PET 00:00 |

EVA Prep
- Get-up plan – clothing and EMU equip bag, Hygiene break
- Exercise protocol review, if required
- Equipment lock activities – IV responsibilities
- Suit donning plan – special requests
- SAFER, MWS, tools, CL positions and bag stowage
- Airlock depress review
- EV/IV comm protocol
- SRMS/SSRMS initial position

EV Crew Procedure Review
- Egress Plan
- Translations – tether swaps
- Order of tasks
- Glove inspections
- Ingress Plan

General Procedure Review
- Get ahead tasks
- Constraints – ground and flight
- Cautions and warnings review
- RMS operations – comm protocol/clearances
- Contingency procedures – crib sheet

Emergencies review
- Lost comm
- EMU malfunctions
- Lost tools
- Lost crewmember
- DCS
- Contamination

Post EVA
- Suit doffing responsibilities
- Post EVA plan

Lessons learned from previous EVAs

## US EVA 12 (CHARLIE) INHIBIT PAD

### USOS

**PCU**

NOTE

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

MCC-H 1. √PCUs (two) operational in discharge mode and one of the following:
- A. CCS PCU EVA Hazard Control enabled
- B. No more than two arrays unshunted
- C. No more than two arrays pointed < 105 deg from velocity vector

OR

2. One or no PCUs operational in discharge mode and one of the following:
- A. No more than two arrays unshunted
- B. No more than two arrays pointed < 105 deg from velocity vector

**Ground Radar**

MCC-H 1. √TOPO and FDO consoles, ground radar restrictions in place for EVA

**Lab Window**

IV 1. Close window shutter if EV crew less than 10 ft/3.5m from window

**Lab/Node 2 Loop B/Stbd Avionics Umbilical Mates**

MCC-H
1. MBSU 2 RBI 3 & 10 – Open, Close Cmd Inhibit
2. MBSU 3 RBI 2 & 3 – Open, Close Cmd Inhibit
3. ~~RPCM S01A_D RPC 2 – Open, Close Cmd Inhibit~~
4. RPCM S02B_D RPC 4 & 5 – Open, Close Cmd Inhibit

### USOS

**Lab Loop B Fluid Tray Heater Umbilical Mates**

MCC-H 1. RPCM S01A_D RPC 2 – Open, Close Cmd Inhibit

**Get Ahead: SSPTS Umbilical Mates**

MCC-H
1. DDCU LA1A or DDCU LA4A Converter – OFF
2. DDCU LA2A or DDCU LA3B Converter – OFF
3. RPCM LA1A4A_D RPC 3 – Open, Close Cmd Inhibit
4. RPCM LA2A3B_D RPC 1 – Open, Close Cmd Inhibit
5. RPCM Z13B_A RPC 2 – Open, Close Cmd Inhibit
6. RPCM Z14B_A RPC 2 – Open, Close Cmd Inhibit

Cont on next page

## US EVA 12 (CHARLIE) INHIBIT PAD

### RSOS

**SM Antennas**

MCC-M
1. Global Timing Sys 1(400.1 MHz) [GTS] – Deactivate
2. ARISS (HAM Radio) – Deactivate or VHF (144-146 MHz) TX only

**FGB Antennas**

MCC-M
1. ARISS – Deactivate

**FGB Thrusters**

MCC-M
1. √FGB MCS unpowered
2. √All FGB Attitude Control Thruster Valves (eighty) – closed
3. √FGB Attitude Control Manifold Valves – closed КШК1, КШК2, КШК4, КШК5, КШК9, ОКО3, ОКГ3, ОКО6, ОКГ6, ОКО7, ОКГ 7, ОКО8, ОКГ8

**Soyuz Antennas**

MCC-M
1. √Soyuz KURS A [КУРС А] – Deactivated

**Soyuz Thrusters**

MCC-M
1. √Soyuz manifolds (four) – closed ЭКО1, ЭКО2, ЭКГ1, ЭКГ2
2. √Soyuz MCS unpowered
3. √Soyuz Attitude Control Thruster Valves (fifty-two) – closed
4. √Soyuz Main Engine Valves (K1,K2,K3,K4,K5,K6) – closed

# EVA NOTES, CAUTIONS, AND WARNINGS

NOTES
1. For bolt install: report good/nominal torque and turns
2. For bolt release: report torque and turns if different from published range
3. EVA connectors: after disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
4. MLI handholds are not rated for crewmember translation loads
5. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity

CAUTION

**ISS Constraints**

D. Avoid inadvertent contact with:
1. Grapple fixture shafts (drylube)
2. PIP pins
3. Deployed MISSEs [A/L,P6]
4. Passive UMAs
5. MBS VDU, MCU, CRPCMs and Cameras (tape radiative surfaces, silver Teflon)
6. Deployed TUS cable
7. GPS Antenna (S13 paint) [S0]
8. UHF Antennas [Lab,P1]

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

F. For structural reasons:
1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
2. Avoid performing shaking motions (sinusoidal functions) more that four cycles
3. Avoid kicking S1/P1 radiator beam

If any of these occur, wait 2 to 5 min to allow structural response to dissipate

G. Other:
1. ITT Cannon connector: do not turn collar from WHITE to BLACK without a mating half attached
2. WIS Antennas: do not use as handholds [Z1,P4]
3. Do not local tether to gap spanners during fluid tray relocation translations
4. Minimize input loads while local tethered to a gap spanner
5. Inspection of the waist tether must be performed prior to local tethering to a gap spanner to verify no red band visible
6. If the crewmember comes off of structure while local tethered to a gap spanner, the waist tether must be inspected to verify no red band visible

**WARNING**

**ISS Constraints**

C. Avoid inadvertent contact with:
1. Grapple fixture targets and target pins
2. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
3. Stay 5 ft from moving MT on face 1

D. Handrails:
1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 566, A/L Tank 2 nad/fwd, P6 5389]

E. Pinch:
1. ITT Cannon connector rotating housing
2. EV side of IV hatch during hatch operations (also snag hazard) [A/L]

F. RF radiation exposure:
1. Stay 1 ft from UHF antenna when powered [Lab,P1]

G. Sharp edges:
1. Inner edges of WIF sockets
2. Nickel coated braided copper ground straps may contain frayed wires [P6,P4]
3. Keep hands away from SSRMS LEE opening and snares

H. Thermal:
1. EVA connectors with booties may become hot and exceed their design temp limit if left uncovered in direct sunlight
2. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
3. Uncovered trunnion pins may be hot
4. Do not touch EMU protective visor if temp has been, -134 for > 15 min
5. No EMU boot contact with foot restraint when temp < -120 deg F or > 200 deg F

# FLUID QD CUE CARD

**BLOCK A** (Close Valve with SPD):
Caution: If QD leaks, immediately open valve (pull bail fwd)

1. Open QD thermal bootie
2. Push bail fwd (open) with significant force to unstick male seal
3. Pull bail aft (against SPD) to hardstop
4. Push bail fwd again to full open
5. Remove SPD and temp stow
6. √Aft white band visible
7. √Detent button fully installed, up, and can be depressed
8. Assess side load prior to bail movement
9. Press detent button and move bail aft to close valve
10. Verify fwd white band visible
11. √Detent button up
12. ~~Rotate locking collar to locked~~

**BLOCK B** (Close Valve w/o SPD):
Caution: If QD leaks, immediately open valve (pull bail fwd)

1. √Aft white band visible
2. √Detent button fully installed, up, and can be depressed
3. Assess side load prior to bail movement
4. Press detent button and move bail aft to close valve
5. √Fwd white band visible
6. √Detent button up
7. ~~Rotate locking collar to locked~~

**BLOCK C** (Demate QD):

1. √Detent button - up
2. Assess & counteract side loads
3. Pull back on release ring
4. Demate QD
5. √Fwd white band not visible (release ring - retracted)
6. Inspect QDs for debris or damage
7. Reinstall thermal bootie

**BLOCK D** (Mate QD):

1. Open QD thermal bootie
2. Inspect QDs for debris or damage
3. √Detent button - up
4. ~~√Locking collar - locked~~
5. √Fwd white band - not visible
6. Assess & counteract side loads
7. Mate QD
8. √Fwd white band - visible
9. Snapback test (√Fwd white band still visible)
10. Pull test
11. Visual gap test

**BLOCK E** (Open Valve):

1. ~~Rotate locking collar - unlocked~~
2. Assess side load potential prior to opening valve
3. Depress detent button and move bail fwd to open valve
4. √Aft white band visible
5. √Detent button - up and can be depress
6. Close thermal bootie

**BLOCK F** (Open Valve with SPD install):
Note: These steps allow NH3 to flow through QD

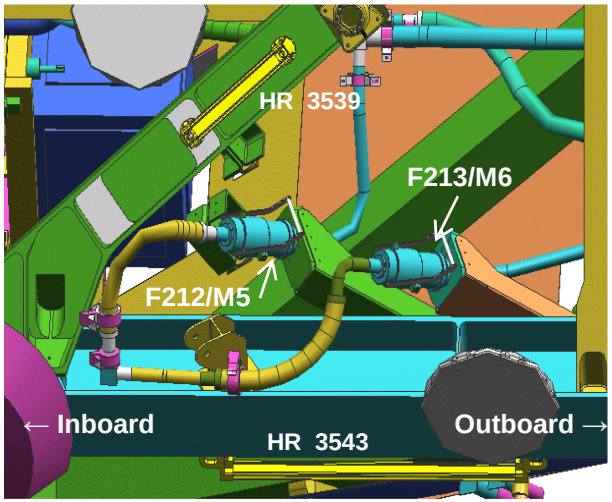
1. ~~Rotate locking collar - unlocked~~
2. Assess side load potential prior to opening valve
3. Depress detent button and move bail fwd to open valve
4. √Aft white band visible
5. √Detent button - up and can be depress
6. Install SPD
7. √Capture points (4) - (2 on collar boss, 2 on bail boss)
8. √Capture hooks engaged with push test on levers
9. Perform pull test on SPD
10. Assess side load
11. Verify bail moves aft, then push bail full fwd
12. Close thermal bootie

## US EVA 12 (CHARLIE) EGRESS/SETUP (00:10)

| IV | EV1 (FF) | EV2 (FF) |
|---|---|---|
| | **Initial Condition:** 85-ft safety tether (load alleviating reel end) on left D-ring extender. Right waist tether on EV2's 85-ft safety tether.<br>Over gloves donned.<br><br>EGRESS/SETUP (00:10)<br>1. Open A/L thermal cover<br>2. Egress airlock<br>3. Receive crewlock bag #4; stow on BRT<br>4. Translate to S0 face 6<br>5. Attach own 85' safety tether at S0 HR 3412 (zenith standoff)<br>- Engage crew hook slide lock - L<br>- Verify hook gate closed<br>- √ safety tether reel unlocked<br>6. Attach EV2's 85' safety tether at S0 HR 3413 (zenith standoff - route to stbd to clear)<br>- Engage crew hook slide lock - L<br>- Verify hook gate closed<br>7. Give EV2 GO to release waist tether<br>8. √SAFER man isol vlv – open (down)<br>9. √SAFER HCM – closed (down) | **Initial Condition:** Waist Tether (R) to center Airlock D-ring extender. 85-ft safety tether (load alleviating reel end) on left D-ring, and other end to EV1's right waist tether<br>Over gloves donned.<br><br>EGRESS/SETUP (00:10)<br>1. Transfer crewlock bag #4 to EV1<br>- Temp stow ret onto A/L D-ring<br>2. Egress A/L while still on waist tether<br>3. Temp stow crewlock bag #1 onto BRT<br>4. ON EV1 GO, release waist tether from A/L D-ring<br>5. √SAFER man isol vlv – open (down)<br>6. √SAFER HCM – closed (down)<br>7. Close A/L thermal cover |

## REMOVE S0 PORT NH3 SHUNT JUMPER (01:20)

### IV




Port Shunt Jumper Location

NOTE
If EV1 ahead of EV2, only close 1 valve. Wait until the vent tool is ready prior to closing the 2nd valve

1. MCC-H: Begin 22 min clock for shunt jumper once isolated and in sunlight.

### EV1

REMOVE S0 PORT SHUNT JUMPER (00:30)

1. Translate to S0 port shunt jumper (HR 3543)
2. Temp stow crewlock bag #4 at S0 HR 3544
3. Perform glove inspection
4. Doff over gloves
5. Open thermal shrouds to access port shunt jumper; report Velcro integrity
6. BRT to HR 3543

**CAUTION**
Notify MCC if direct sunlight on shunt jumper

7. Open QD thermal bootie; report Velcro integrity
8. Attach RET from crewlock bag to SPDs
9. Release jumper TA clamps (3)

**CAUTION**
If QD leaks significantly during closing, immediately open valve; inform MCC-H

NOTE
Both QD F212 & F213 will be closed and a leak check performed prior to demating

10. On MCC GO, Close valves on QDs, per **BLOCK A**:
    ☐ QD F212 (inboard, mated to M5)

### EV2

CONFIGURE VENT TOOLS (00:40)

1. Translate to vent tool extension bag location on S0 face 2
   - Fairlead at ISS marker 8100 w/ wire tie
2. If not already performed: Relocate bag to ISS port location on S0 face 2
   - Between handrails 3537 and 3540
   - Attach to handrail 3528 if desired
3. Perform glove inspection
4. Doff over gloves
5. Retrieve vent tool w/ vent tool extension
6. Attach MUT EE to vent tool
7. Attach MUT EE to S0 HR 3546 on face 2
8. Retrieve vent tool adapter
9. Remove cap from vent tool adapter
10. Remove cap from vent tool
11. Mate vent tool adapter to vent tool, per **BLOCK D** (no thermal bootie)
12. Open vent tool valve per **BLOCK E**
13. Translate to face 6; transfer vent tool to EV1 or tether to nearby structure
14. Perform glove inspection

## REMOVE S0 PORT NH3 SHUNT JUMPER (01:20)

| IV | EV1 | EV2 |
|---|---|---|
| | ☐ QD F213 (outboard, mated to M6)<br>11. Wait 3 min for MCC-H to perform $NH_3$ leak check<br>12. During wait, prep one end of wire tie from crewlock bag to jumper for stowage<br>- Single long, around one jumper bail end<br>13. Tether to shunt jumper<br><br>NOTE<br>Venting steps will immediately follow remove; install only 1 thermal bootie<br><br>14. On MCC go, demate QDs, per **BLOCK C**:<br>☐ QD F212 (inboard, mated to M5)<br>☐ QD F213 (outboard, mated to M6)<br><br>VENT/STOW SHUNT JUMPER (00:50)<br><br>15. Receive vent tool adapter/vent tool from EV2<br>16. Mate vent tool adapter to shunt jumper, per **BLOCK D**<br><br>**WARNING**<br>Next step will vent ammonia from shunt jumper. Verify EV2 clear.<br><br>17. ☐ Open QD valve per **BLOCK E** (no bootie)<br>18. Wait 1 minute for jumper venting<br>19. ☐ Close valve on jumper, per **BLOCK B**<br>20. ☐ Demate jumper, per **BLOCK C**<br>21. Reinstall QD booties on jumper<br>22. Stow jumper onto S0 truss beam<br>- Utilize 2nd wire-tie (2 total separate wire-ties)<br>- Each wire-tie must have three 180° twists | FLUID CAP REMOVAL (00:25)<br><br>1. Translate to Node 2 aft/port endcone<br>2. Temp stow crewlock bag #1 at Node 2 HR 0369<br>3. Tether; temp remove/open Node 2 $NH_3$ MLI cover<br><br>**WARNING**<br>Position self over caps to minimize possibility of ammonia contamination<br><br>4. Tether to QD pressure caps, remove from Node 2, and inspect for $NH_3$ crystals:<br>☐ M3 cap<br>☐ M4 cap<br>5. Re-install Node 2 $NH_3$ MLI cover<br>6. Stow caps in crewlock bag<br>7. Retrieve jettison stowage bag & adj equip tethers (2) from crewlock bag for tray manipulation<br><br>APFR RELOCATE (00:15)<br><br>1. Donn over gloves *(depends on translation path)*<br>2. Translate to APFR on Lab WIF 12 (stbd/zenith, fwd end)<br>3. Retrieve APFR; relocate to Lab WIF 11 (port/zenith, fwd end)<br>4. Configure APFR [1, QQ, A, 12]<br>- Verify locking collar black-on-black<br>- Perform pull test<br>5. Rotate ingress aid toward Lab surface<br><br>6. Perform glove inspection |

## REMOVE S0 PORT NH3 SHUNT JUMPER (01:20)

| IV | EV1 | EV2 |
|---|---|---|
| | 23. Close TA clamps previously restraining shunt jumper (3)<br>24. Translate to vent tool extension bag (S0 face 2)<br>25. ☐ Close vent tool valve, per **BLOCK B**<br>26. ☐ Demate vent tool adapter from vent tool, per **BLOCK C** (no bootie)<br>27. Put cap on vent tool<br>28. Put caps on vent tool adapter<br>29. Demate MUT EE from vent tool extension; attach to nearby HR<br>- Verify MUT EE jaws locked<br>30. Stow vent tool adapter, vent tool, and vent tool extension in vent tool extension bag<br>31. Perform glove inspection | |

## RELOCATE NODE 2 LOOP B FLUID TRAY (01:40)

| IV | EV1 | EV2 |
|---|---|---|
| | DEMATE TRAY FLUID QDS FROM TRAY (00:10)<br>1. Translate to Loop B tray near Bolt 10<br>2. BRT to nearby HR<br>3. Demate fluid QDs from fluid tray, per **BLOCK C**:<br>☐ F102 from M3<br>☐ F103 from M4<br>4. Restrain fluid QDs via long wire tie | DEMATE TRAY FLUID QDS FROM S0 (00:25)<br>1. Translate to port end of tray<br>2. BRT to Node 3 (Hab) tray HR<br>3. Demate fluid QDs from S0, per **BLOCK C** (no booties):<br>☐ F110 from M11<br>☐ F111 from M12<br>4. Install tray handling tethers and jettison stowage bag around QDs (restrain fluid QDs and bag via 2 wire ties, if necessary)<br>a. Undo adj tether from around bag; attach tether to port tether point on fluid tray handhold<br>- Verify eq hook on adj tether will not interfere with RET eq hook used during tray relocate; if two eq hooks will not fit, route adj tether to stbd tether point on handhold<br>b. Unfold bag; routed 2nd adj tether around fluid tray and attach to itself<br>c. Install jettison stowage bag around fluid QDs; pull bag over as much of tray as possible<br>d. Cinch drawstring |
| | RELEASE STANCHION BOLTS (00:40)<br>5. **PGT: B7, CCW2, 30.5 (25.5 ft-lb, 30 RPM) 2-in ext**<br>6. ☐ Release Bolt 1<br>11-15 turns, until bolt releases<br>7. Translate to S0 HR 3427 (weak side); BRT for Bolt 7 access<br>8. Configure PGT w/ 9-in ext; stow 2-in ext on caddy | RELEASE STANCHION BOLTS (00:25)<br>5. Reposition to other Node 3 (Hab) tray handrail as necessary; BRT<br>6. Configure PGT w/ 9-in ext |

| Bolt | Turns |
|---|---|
| 1 | |
| 7 | |
| 10 | |

## RELOCATE NODE 2 LOOP B FLUID TRAY (01:40)

| IV | EV1 | EV2 |
|---|---|---|
| | | 7. **PGT: B7, CCW2, 30.5**<br>**(25.5 ft-lb, 30 RPM)**<br>**9-in ext** |
| | On EV2 GO:<br>9. **PGT: B7, CCW2, 30.5**<br>**(25.5 ft-lb, 30 RPM)**<br>**9-in ext**<br>10. ☐ Release Bolt 7<br>19.5 - 21.5 turns, until bolt releases<br>11. Preconfigure PGT [B7, CW2, 30.5] for tray install<br>12. Stow PGT on swing arm | On EV1 Go:<br>8. ☐ Release Bolt 10<br>11.5 - 13.5 turns, until bolt releases<br>Remove 9-in ext from PGT; stow on socket caddy<br>9. If not already done, install tray handling tethers and jettison stowage bag around QDs (restrain fluid QDs and bag via 2 wire ties, if necessary)<br>a. Undo adj tether from around bag; attach tether to port tether point on fluid tray handhold<br>b. Unfold bag; routed 2nd adj tether around fluid tray and attach to itself<br>c. Install jettison stowage bag around fluid QDs; pull bag over as much of tray as possible<br>d. Cinch drawstring<br>Reposition and BRT to S0 HR 3488<br>10. Attach RET to fluid tray<br>11. Give EV1 GO for Bolt 7 release |
| | <u>RELOCATE FLUID TRAY TO LAB</u> (00:30)<br>1. On GO with EV2, remove fluid tray<br>2. If tethered to fluid tray, release RET<br>3. Translate to face 2 HR 3458 via gap spanner<br>4. BRT to HR 3458; notify EV2 ready to receive tray<br>5. Receive tray from EV2; attach tether<br>6. Hold tray posn until EV2 clears safety tether | <u>RELOCATE FLUID TRAY TO LAB</u> (00:30)<br>1. On GO with EV1, remove fluid tray<br>2. Mnvr fluid tray over stanchion and over to EV1<br>3. Verify EV1 tethered to; release RET from fluid tray<br>4. Clear safety tether of fluid tray; notify EV1<br>5. Translate to face 1; BRT to HR 3494 (short vert HR, weak side) |

## RELOCATE NODE 2 LOOP B FLUID TRAY (01:40)

| IV | EV1 | EV2 |
|---|---|---|
| | 7. On EV2 GO, mnvr tray ISS fwd and clear of EV2's translation path<br>8. Mnvr fluid tray to EV2; release RET<br><br>9. Translate to S0 face 1 HR 3445 (long vert HR)<br>10. BRT to nadir part of HR (weak side)<br>11. Rotate body to face ISS port as much as possible<br>12. Receive tray from EV2; attach tether<br>- Slowly mnvr fluid tray behind EV2 during translation to APFR<br><br>13. Mnvr fluid tray to EV2<br>14. Verify EV2 tethered to; release tether from fluid tray<br>15. Translate to aft end of Lab port avionics tray<br>16. BRT (heads down) to handhold on aft face of avionics tray<br><br>17. Receive tray from EV2<br>18. Mnvr tray to soft dock position | 6. Rotate body to face ISS stbd as much as possible<br><br>7. Receive tray from EV1; attach RET<br>8. Slide tray toward ISS port to clear EV1's translation path<br><br>9. Mnvr fluid tray to EV1<br>10. Verify EV1 tethered to; release tether from fluid tray<br>11. Translate to APFR on Lab WIF 11<br><br>NOTE<br>Verify safety tether routed over fluid tray when positioned at Lab APFR<br><br>12. BRT to Lab APFR<br>13. Receive fluid tray from EV1; attach tether<br>14. Slide tray toward ISS fwd/port to clear EV1's translation path<br><br>15. Mnvr fluid tray to EV1<br><br>16. Mnvr tray to soft dock position<br>- Translate along APFR ingress aid |

## RELOCATE NODE 2 LOOP B FLUID TRAY (01:40)

### IV

| Bolt | Turns | Torque | Green LED |
|---|---|---|---|
| 7 | | | |
| 10 | | | |

### EV1

ATTACH TRAY TO LAB (00:20)

19. Align tray with avionics tray soft-dock on stanchion 7
20. Soft-dock stanchion at Bolt 7 to avionics tray
21. **PGT: B7, CW2, 30.5**
    **(25.5 ft-lb, 30 RPM)**
    **9-in ext**
22. ☐ Fasten Bolt 7
    19-20.5 turns, until bolt fully engages
23. Remove 9-in ext; stow on caddy

**CAUTION**

No red band may be visible on waist tether prior to local tethering to gap spanner.

24. Assist EV2 w/ Bolt 10 engagement

25. Perform glove inspection

### EV2

ATTACH TRAY TO LAB (00:20)

17. Move tray as needed to assist EV1

Once Bolt 7 engaged:

18. Release RET from tray
19. Verify APFR at 1, QQ, A, 12
20. Ingress Lab APFR
21. Verify safety tether and QDs 102 and 103 clear of tray
22. Soft-dock stanchion at Bolt 10 to avionics tray
23. Configure PGT w/ 9-in ext
24. **PGT: B7, CW2, 30.5**
    **(25.5 ft-lb, 30 RPM)**
    **9-in ext**
25. ☐ Fasten Bolt 10
    19-20.5 turns, until bolt fully engages
26. Remove 9-in ext; stow on caddy

27. Perform glove inspection

## DEPLOY NODE 2 LOOP B FLUID TRAY (01:45)

| IV | EV1 | EV2 |
|---|---|---|
| | PREP TRAY FOR HINGE SECTION DEPLOY (00:10)<br>1. Release Velcro strap securing hinge blanket in place<br>2. Release remaining MLI at hinge location | PREP TRAY FOR HINGE DEPLOY (00:10)<br>1. Release wire-tie securing fluid QDs<br>2. Egress APFR; translate to crewlock bag<br>3. Retrieve adj tether with SPDs from crewlock bag (2) and stow on MWS<br>4. Release MLI on tray<br>5. Release hinge latch PIP-pin<br>6. Release hinge latch |
| | DEPLOY HINGED SECTION (00:10)<br>3. Translate to S0 fluid tray attachment location<br>4. BRT to handrail as necessary for deploy<br>NOTE<br>Verify safety tether zenith of BOB during deploy<br>5. As necessary, open S0 shroud to expose attachment fitting and fluid connector panel (where shunt jumper attached)<br>6. Attach latch assembly on fluid tray to S0 fitting<br>NOTE<br>Wait to insert fluid tray PIP pin until after EV2 has performed a fluid QD reach assessment at the BOB | DEPLOY HINGED SECTION (00:10)<br>7. Position self to deploy hinged section<br>8. Translate aft along tray while pushing upper section (BOB) to EV1 |

## DEPLOY NODE 2 LOOP B FLUID TRAY (01:45)

| IV | EV1 | EV2 |
|---|---|---|
| | VENT N2 FROM TRAY HOSES (00:40)<br><br>**CAUTION**<br>Do not begin venting clock until hinge connections completed.<br><br>7. Retrieve $N_2$ vent tool from crewlock bag #4<br><br>8. ☐ Mate $N_2$ vent tool to F102 per **BLOCK D**<br>9. Open vent tool on fluid tray umbilical:<br>☐ Open valve on F102, per **BLOCK E**<br>10. Wait 1 minute for venting<br>11. Close valve on F102, per **BLOCK B**<br>12. ☐ Demate $N_2$ vent tool, per **BLOCK C** (no booties)<br><br>13. ☐ Mate $N_2$ vent tool to F103, per **BLOCK D**<br>14. Open vent tool on fluid tray umbilical:<br>☐ Open valve on F103, per **BLOCK E**<br>15. Wait 1 minute for venting<br>16. Close valve on F103, per **BLOCK B**<br>17. ☐ Demate $N_2$ vent tool, per **BLOCK C**<br>18. Stow $N_2$ vent tool in crewlock bag #4<br><br>19. Perform glove inspection | MATE/OPEN HINGE QDS (00:30)<br><br>9. Release 1st TA-clamps on hose for each of the 2 QDs<br>10. BRT to square handrail on BOB<br>11. ☐ Remove M1 QD pressure cap from fluid tray (temp stow on MWS RET)<br>12. ☐ Demate F106 from M5/M2, per **BLOCK C** (no booties, no locking collar)<br>13. ☐ Mate F106 to M2, per **BLOCK D**<br>14. ☐ Open valve on F106 and install SPD, per **BLOCK F**<br>15. Stow M1 QD cap on RET hook (did hold SPD)<br><br>16. ☐ Remove M2 QD pressure cap from fluid tray (temp stow on MWS RET)<br>17. ☐ Demate F107 from M6/M1, per **BLOCK C** (no booties, no locking collar)<br>18. ☐ Mate F107 to M1, per **BLOCK D**<br>19. ☐ Open valve on F107 and install SPD, per **BLOCK F**<br>20. Stow M2 QD cap on RET hook (did hold SPD)<br><br>21. Perform glove inspection |

## DEPLOY NODE 2 LOOP B FLUID TRAY (01:45)

| IV | EV1 | EV2 |
|---|---|---|
| | MATE S0 FLUID QDS (00:20)<br>20. BRT to HR 3543<br>21. Open TA-clamps as necessary<br>NOTE<br>Verify safety tether clear prior to connector mates<br>22. Mate QDs on S0 end of tray fluid QDs, per **BLOCK D**:<br>☐ F102 (inboard) to M5<br>☐ F103 (outboard) to M6<br>23. If open, re-engage TA-clamps on ammonia rigid line prior to QD opening<br>24. If released, relatch BOB to S0 | MATE NODE 2 FLUID QDS (00:20)<br>22. Translate to Node 2<br>23. Remove Node 2 $NH_3$ stanchion MLI cover<br>24. Stow cover in crewlock bag<br>25. Retrieve adj tether with SPDs (2); stow adj tether (that had SPDs)<br>26. Release TA-clamps from fluid umbilicals as necessary<br>27. BRT at nearby HR<br>28. Remove jettison stowage bag with RET and adj tethers (and any wire ties); stow in crewlock bag<br>NOTE<br>Verify safety tether clear prior to connector mates<br>29. Mate fluid QDs to Node 2 $NH_3$ connector panel, per **BLOCK D**:<br>☐ Mate QD F110 to M3 (zenith)<br>☐ Mate QD F111 to M4 (nadir)<br>30. If open, re-engage TA-clamps on ammonia rigid line prior to QD opening |

## DEPLOY NODE 2 LOOP B FLUID TRAY (01:45)

| IV | EV1 | EV2 |
|---|---|---|
| | OPEN S0 FLUID QDS (00:25)<br><br>NOTE<br>Do not open valves until both sides of fluid tray mated<br><br>**CAUTION**<br>Both Node 2 QDs must be opened prior to opening the S0 QDs | OPEN NODE 2 FLUID QDS (00:25)<br><br>NOTE<br>Do not open valves until both sides of fluid tray mated<br><br>**CAUTION**<br>QDs with 90 deg bend are prone to galling.<br>Ensure no side loads when opening valve.<br>Limit handling loads to <25 lb after opening valve. |
| 1. IV: Verify with MCC-H, GO to open fluid QD valves | | On MCC GO:<br>31. Open valves on Node 2 tray fluid QDs, per **BLOCK F** (no thermal bootie steps):<br>☐ Open QD F110/M3 (zenith)<br>☐ Open QD F111/M4 (nadir) |
| 2. IV: WVS, EV2 - center cam (Node 2 fluid QDs) | Once QDs F110 and F111 open:<br>25. Open valves on S0 end of tray fluid QDs, per **BLOCK F**:<br>☐ Open QD F102/M5 (zenith/inboard)<br>☐ Open QD F103/M6 (nadir/outboard) | 32. Perform WVS closeout<br>33. Close MLI around fluid QDs<br>34. Secure MLI around Bolt 10<br>a. Unwrap MLI “burrito” from zenith inboard portion of tray<br>b. Tuck aft corner of “burrito” MLI under Bolt 10 handle |
| 3. IV: WVS, EV1 - center cam (Shunt jumper stowage & S0 fluid QDs) | 26. Perform WVS closeout<br>27. Close any TA-clamps opened<br>28. If not already performed, insert fluid tray latch PIP-pin into latch fitting<br>29. Close S0 MLI cover<br>30. Secure closeout cover flaps along underside of upper tray blanket<br>31. Secure any remaining tray MLI as necessary<br><br>32. Perform glove inspection | 35. Perform glove inspection |

## AVIONICS UMBILICALS / FLUID LINE HEATER UMBILICALS

| IV | EV1 | EV2 |
|---|---|---|
| 1. IV: WVS, EV1 - center cam (heater lines)<br><br>2. IV: Notify MCC-H go for aliveness test<br>3. IV: WVS, EV2 - center cam (avionics umbilicals) | <u>CONNECT FLUID LINE HEATER UMBILICALS</u> (00:15)<br><br>1. On avionics tray, open 1 TA-clamp, release wire harness; close TA-clamp<br>2. Demate P680 and P681 from panel A230<br>3. At hinged end, remove connector caps from J680 and J681<br>4. Attach caps to panel A230 on avionics tray<br>5. Mate connectors to fluid tray receptacle panel A151:<br>☐ P680 to J680<br>☐ P681 to J681<br><br>6. Perform WVS closeout<br><br>7. Secure hinge blanket<br>- Wrap Velcro strap at hinge around zenith avionics panel (A149)<br>- Use short wire-tie to secure Velcro strap<br>8. Verify all fluid tray MLI secured<br>9. Translate to crewlock bag #1<br>10. Retrieve wire tie caddy; stow on self | <u>CONNECT STBD AVIONICS UMBILICALS TO NODE 2</u> (00:30)<br><br>1. Stow adj tether (that had SPDs) in crewlock bag #1, if desired<br>2. Retrieve crewlock bag #1; stow on BRT<br>3. Translate to stbd side of Node 2<br>4. Temp stow crewlock bag #1; inform IV and EV1 of location (EV1 will need wire-tie caddy)<br>5. Remove Node 2 avionics MLI cover<br>6. Translate to crewlock bag #1<br>7. Stow MLI cover<br>8. Retrieve avionics umbilicals from temp stow location<br><br>**CAUTION**<br>P674 powers the HX valve, and the inhibits to that connection will be removed upon connection. Inform MCC if demate of P674 is required after inhibits removed.<br><br>9. Mate avionics umbilicals to Node 2:<br>☐ P674 to J674 (HX valves)<br>☐ P673 to J673<br>☐ P671 to J671<br>☐ P672 to J672<br>☐ P670 to J670<br><br>10. Notify IV, all stbd avionics umbilicals mated<br>11. Perform WVS closeout |

## STBD CBM LAUNCH LOCKS / LAB-NODE 2 GAP SPANNER

| IV | EV1 | EV2 |
|---|---|---|
| | STBD CBM PETAL LAUNCH LOCKS (00:10)<br><br>**CAUTION**<br>Both petal launch locks must be engaged to allow for translation on the petal<br><br>Release Node 2 CBM petal launch locks:<br>1. Stbd<br>☐ Release two zenith latches: use HR 0353<br>☐ Release two fwd latches: use HR 0312<br>☐ Release two nadir latches: use HR 0354<br>☐ Release two aft latches: use HR 0341<br><br>Get-Aheads:<br>2. Port (0:15)<br>☐ Release two aft latches<br>☐ Release two zenith latches: use HR 0350<br>☐ Release two fwd latches: use HR 0321<br>☐ Release two nadir latches: use HR 0304<br><br>3. Nadir (00:15)<br>☐ Release two aft latches<br>☐ Release two zenith latches: use HR 0355<br>☐ Release two fwd latches: use HR 0308<br>☐ Release two nadir latches: use HR 0356 | INSTALL LAB/NODE 2 GAP SPANNER (00:25)<br>1. Retrieve gap spanner from crewlock bag<br>2. Donn over gloves<br>3. Translate to Lab/Node 2 port side primary translation path<br>4. Install gap spanner located in trash bag:<br>☐ Lab handrail 0267 (nadir standoff)<br>☐ Node 2 handrail 0364 (zenith standoff)<br>5. Cinch gap spanner (90 deg rotation of buckle)<br>6. Verify cam buckle rotates 90 degrees |

## CONNECT PMA2 REDUNDANT UMBILICALS (00:35)

| IV | EV1 | EV2 |
|---|---|---|
| NOTE<br>No inhibits required for PMA2 redundant umbilical mates<br><br>4. IV: WVS, EV1 - center cam (PMA2/Node 2 redundant umbilicals)<br><br>5. IV: WVS, EV1 - center cam (PMA2/Node 2 redundant umbilicals)<br><br>6. IV: Notify MCC-H go for aliveness test | CONNECT PMA2 REDUNDANT UMBILICALS<br>(00:35)<br>1. Translate to PMA2 redundant umbilicals (ISS fwd/zenith side)<br>2. Release umbilicals from PMA2 temp stow location<br>3. Translate bundle to Node 2 connector panel (ISS stbd/zenith)<br><br>**CAUTION**<br>1. Avoid bend radii < 10 times cable diameter<br>2. Avoid pulling on cable during mate/demate<br><br>4. Temp secure umbilical bundle via wire tie to nearby handrail<br>5. Remove connector cover MLI; stow in trash bag<br>6. Verify safety tether clear<br>7. Connect umbilicals to Node 2 in any order:<br>BRT at HR 0359:<br>☐ P609 / J609<br>☐ P614 / J614<br>☐ Perform WVS photo closeout<br>☐ Slide thermal covers over zero-g connectors at Node 2 connector panel<br><br>BRT at HR 0360:<br>☐ P615 / J615<br>☐ P616 / J616<br>☐ Perform WVS photo closeout<br>☐ Slide thermal covers over zero-g connectors at Node 2 connector panel<br><br>8. Notify IV all PMA2/Node 2 redundant umbilicals mated | |

## CONNECT PMA2 REDUNDANT UMBILICALS (00:35)

| IV | EV1 | EV2 |
|---|---|---|
| | 9. Secure umbilicals in clamps and with wire-ties to keep them secured with a low profile:<br>☐ Node 2 handrail 0328<br>☐ Node 2 handrail 0315<br>☐ PMA2 handrail 0407<br>10. Verify all TA-clamps are closed | |

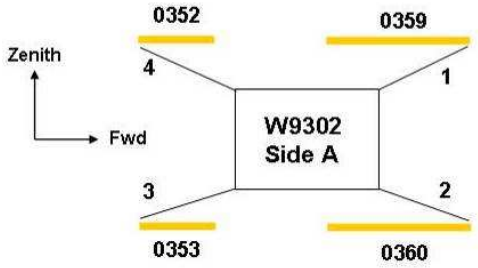
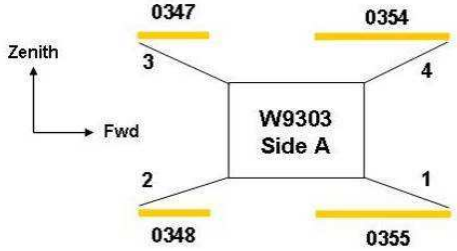
## US EVA 11 CLEANUP/INGRESS (00:20)

| IV | EV1 | EV2 |
|---|---|---|
| | CLEANUP/INGRESS (00:20)<br>1. Perform glove inspection<br>2. Donn over gloves<br>3. Translate to crewlock bag #4 on S0 face 6<br>4. Retrieve bag; stow on BRT<br>5. Translate to VTE bag on S0 face 2<br>6. Retrieve MUT EE; temp stow on self<br>7. Attach VTE bag to crewlock bag #4<br>8. Verify no tools/hardware left on face 1<br>- Clear for MT/MBS translation<br>9. Translate to safety tether anchor points at top of CETA spur<br>10. Verify EV2 anchored to airlock via waist tether<br>11. Unhook EV2's safety tether from S0; connect to own waist tether (daisy chain)<br>- Engage crew hook slide lock - L (both)<br>- Verify hook gate closed (both)<br>12. Unhook own safety tether from S0 handrail; temp stow on self<br>13. Perform tool inventory<br>14. Translate to zenith face of crewlock (VTE bag stowage location)<br>15. Stow VTE bag via crewlock handrails 0552, 0553, 0557, and 0558<br>16. Unhook safety tether from airlock external tether point<br>17. Hand in crewlock bag #4 to EV2<br>18. Ingress A/L<br>19. Remove SCU from stowage pouch<br>20. Remove DCM cover, Velcro to DCM<br>21. SCU->\|<-DCM, √SCU locked<br>22. Water – OFF | CLEANUP/INGRESS (00:20)<br>1. Perform glove inspection<br>2. Retrieve crewlock bag #1 from temp stow on Node 2; attach to BRT<br>3. Perform tool inventory<br>4. Translate to airlock<br>- Release fairlead and retrieve wire tie<br>5. Open A/L thermal cover<br>6. Attach waist tether (R) to airlock D-ring extender<br>- Engage crew hook slide lock - L<br>- Verify hook gate closed<br>7. Stow crewlock bag #1 in airlock<br>8. Ingress airlock<br>9. Receive crewlock bag #4; stow<br>10. Give EV1 GO for ingress<br>11. Remove SCU from stowage pouch<br>12. Remove DCM cover, Velcro to DCM<br>13. SCU->\|<-DCM, √SCU locked<br>14. Water – OFF |

## US EVA 11 CLEANUP/INGRESS (00:20)

| IV | EV1 | EV2 |
|---|---|---|
| | CAUTION<br>Do not close hatch until EMU WATER – OFF for 2 min<br><br>23. Close thermal cover, attach Velcro strap<br>24. Verify no hardware blocking hatch<br>25. EV Hatch – verify handle position per hatch decal; close and lock<br><br>Go to PRE REPRESS portion of {CREWLOCK DEPRESS/REPRESS CUE CARD} (SODF:ISS EVA SYS: EVA PREP/POST) | CAUTION<br>Do not close hatch until EMU WATER – OFF for 2 min |

## GET-AHEAD: SSPTS CABLE DEPLOY (01:00)

| IV | EV1 | EV2 |
|---|---|---|
| MCC-H 1. Verify inhibits are in place:<br><br>- DDCU LA1A or LA4A Converter - OFF<br>- DDCU LA2A or LA3B Converter - OFF<br>- RPCM LA1A4A_D RPC 03 - Open; CL CMD INH<br>- RPCM LA2A3B_D RPC 01 - Open; CL CMD INH<br>- RPCM Z13B_A RPC 02 - Open; CL CMD INH<br>- RPCM Z14B_A RPC 02 - Open; CL CMD INH | | |
|  | <u>W9302 (Between lab HRs 0271 and 0280)</u><br>1. Retrieve wire-tie caddy from crewlock bag #1<br>2. Follow EV1 and wire-tie cables to Node 2 HRs as necessary to maintain a clean translation path | <u>W9302 (zenith bag)</u><br>1. Disconnect straps on W9302<br>2. Tether bag for translation<br>3. Translate across Node 2 to PMA 2<br>4. Tether bag to Node 2 HRs 0352, 0353, 0359, 0360<br>5. Continue translating to PMA2 while releasing cable from side A<br>6. Mate SSPTS J3A to PMA2 P3 |
|  | <u>W9303 (stbd-nadir bag)</u><br>3. Retrieve wire-tie caddy<br>4. Follow EV2 and wire-tie cables to Node 2 HRs as necessary to maintain a clean translation path | <u>W9303 (Between Lab HRs 0274 and 0281)</u><br>7. Disconnect straps on W9303<br>8. Release wire-tie at Lab HR 0272<br>9. Tether to bag for translation<br>10. Translate across Node 2 to PMA2<br>11. Tether bag to Node 2 HRs 0347, 0348, 0354, 0355<br>12. Continue translating to PMA2 while releasing cable from side A<br>13. Mate SSPTS J16A to PMA2 P16 |

## GET-AHEAD: RELOCATE APFR FOR 1E (00:15)

| IV | EV1 | EV2 |
|---|---|---|
| | | RELOCATE APFR (00:15)<br>1. Translate to APFR on Lab WIF 6 (port side)<br>2. Retrieve APFR<br>3. Relocate to Node 2 WIF 14 (fwd endcone nadir)<br>4. Configure APFR [6, PP, A, 6]<br>- Verify locking collar black-on-black<br>- Perform pull test |

## S0 $NH_3$ SHUNT JUMPER REMOVAL - TASK DATA SHEET

**Estimated Task Duration:**

| | With RMS | Without RMS |
|---|---|---|
| One EV Crew | N/A | 1:20 |
| Two EV Crew | N/A | N/A |

**Tools:**

| EV1 (FF) | EV2 (FF) |
|---|---|
| Vent tools | N/A |
| BRT | |

**Note:**

1. Both QD-F210 & F211 will be closed and a leak check performed prior to demating
2. If EV1 ahead of EV2, only close 1 shunt jumper valve. Wait until the vent tool is ready prior to closing the 2nd valve
3. Venting steps will immediately follow removal of the shunt jumper. Therefore, install only 1 thermal bootie
4. Position self over Node 2 QD caps during removal to minimize possibility of ammonia contamination
5. Verify EV2 clear of vent tool prior venting ammonia from shunt jumper.

**Cautions:**

1. Notify MCC if direct sunlight on shunt jumper
2. If QD leaks significantly during closing, immediately open valve; inform MCC-H

**Warnings:**

a. None

## S0 $NH_3$ SHUNT JUMPER REMOVAL - TASK DATA SHEET

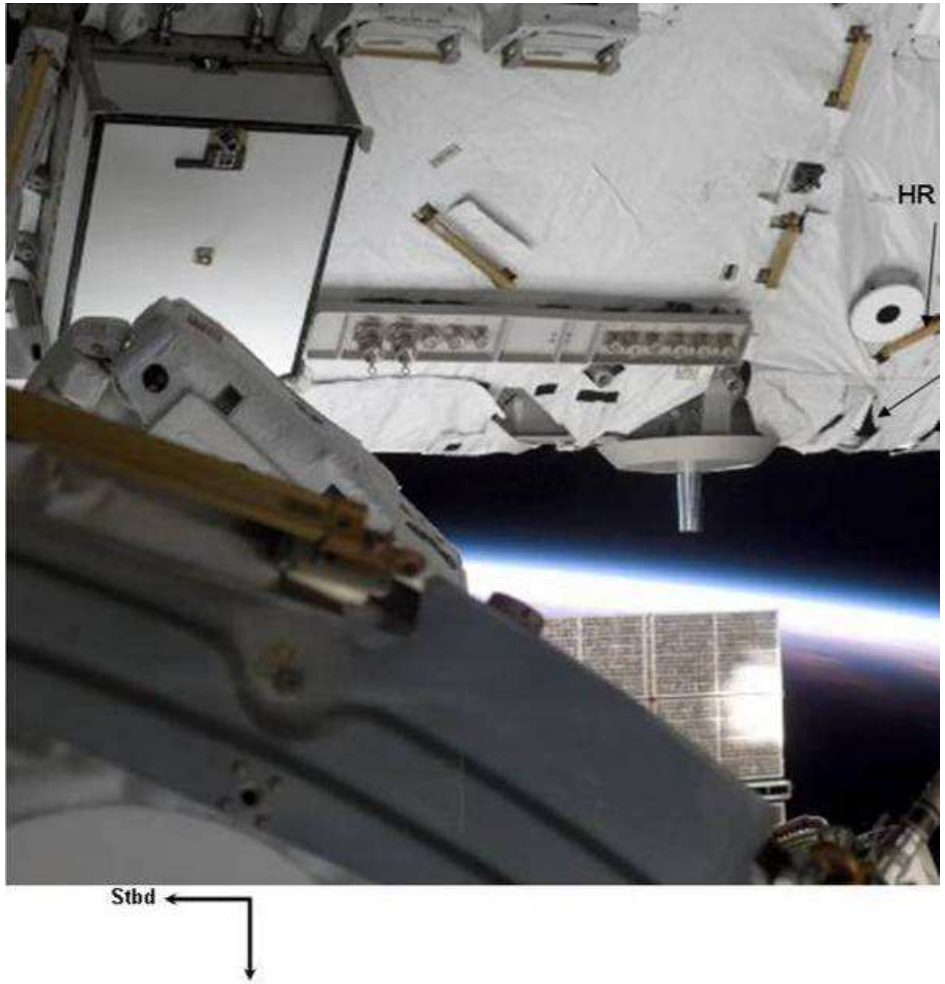



**Figure 1. S0 Port NH3 Shunt Jumper Overview**

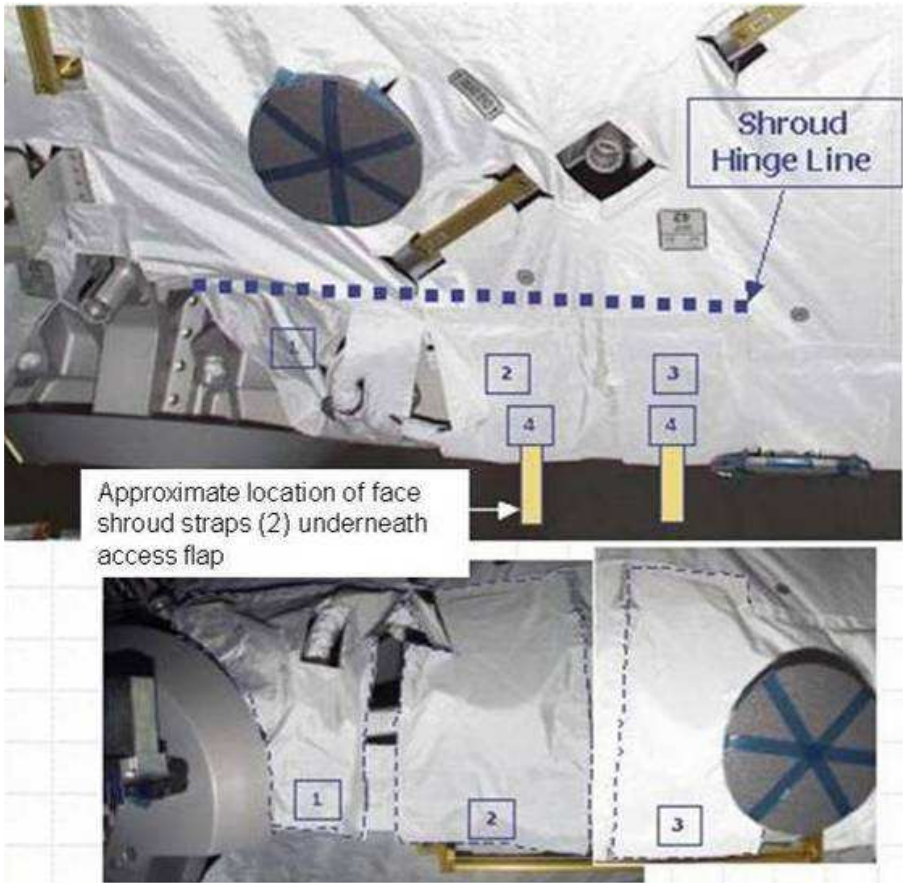



**Figure 2. S0 Port NH3 Shunt Jumper (Shroud installed)**

# RELOCATE & DEPLOY NODE 2 LOOP B FLUID TRAY – TASK DATA SHEET

**Estimated Task Duration:**

| | With RMS | Without RMS |
|---|---|---|
| One EV Crew | N/A | N/A |
| Two EV Crew | N/A | 0:30 (for tray relocate) |

**Tools:**

| EV3 (FF) | EV4 (FF) |
|---|---|
| PGT | PGT |
| BRT | BRT |
| 7/16 (wobble) Socket-9 ext | 7/16 (wobble) Socket-9 ext |
| Russian Wire-Tie | Russian Wire-Tie |
| | Jettison stowage bag |
| | Adj tethers (2) |

**EVA Fasteners:**

| Fastener Name | Label | Head Size | Qty | Ground Torque (ft-lb) | Recommended Release Torque (ft-lb) | Max Expected Release Torque (ft-lb) | Failure Torque (ft-lb) | Recommended Install Torque (ft-lb) | Min Install Torque (ft-lb) | Max Install Torque (ft-lb) | Turns (Clamp-up/Removal) | RPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fluid Umbilical Launch Restraints | 1 | 7/16 | 1 | 19.2 - 20.0 | 25.5 | 22.7 | 168.2 | N/A | N/A | N/A | 11 - 15 | 30 |
| Fluid Umbilical Stanchion Bolts | 7 | 7/16 | 1 | 20.0 | 25.5 | 34.9 | 160 | 25.5 | 0.7 | 160 | 19.5 - 21.5 (Release from S0)<br>19 - 20.5 (Install on Lab) | 30 |
| Fluid Umbilical Stanchion Bolts | 10 | 7/16 | 1 | N/A* | 25.5 | 38.3 | 160 | 25.5 | 0.7 | 160 | 11.5 - 13.5 (Release from S0)<br>19 - 20.5 (Install on Lab) | 30 |

* Bolt 10 has been release and re-installed on-orbit

**EVA Connectors:**

| Harness | From | To | Conn Size | Function |
|---|---|---|---|---|
| W9104-P270 | P680 (Dummy Panel) | J680 (Panel A151) | 15 | Heater Power |
| W9104-P272 | P681 (Dummy Panel) | J681 (Panel A151) | 17 | Heater Power |
| P665 | Lab | Node 2 | 13 | S0 VCSA Port 11 (f.o.) |
| P664 | Lab | Node 2 | 25 | S0 MDM to HX |
| P660 | Lab | Node 2 | 25 | S0 pwr to DDCU |
| P661 | Lab | Node 2 | 25 | S0 pwr to DDCU |
| P662 | Lab | Node 2 | 25 | S0 pwr to DDCU |
| P663 | Lab | Node 2 | 25 | S0 pwr to DDCU |
| P101 | Lab | Node 2 | 15 | PDGF to USL video (f.o.) |
| P105 | Lab | Node 2 | 15 | PDGF to USL video (f.o.) |
| P104 | Lab | Node 2 | 25 | So pwr to PDGF |
| P103 | Lab | Node 2 | 15 | PDGF to USL video (f.o.) |

| | | | | |
|---|---|---|---|---|
| P102 | Lab | Node 2 | 25 | S0 pwr to PDGF |
| P674 | Lab | Node 2 | 25 | S0 MDM to HX |
| P702 | Lab | Node 2 | 25 | S0 pwr to CAM |
| P673 | Lab | Node 2 | 25 | S0 pwr to DDCU |
| P671 | Lab | Node 2 | 25 | S0 pwr to DDCU |
| P672 | Lab | Node 2 | 25 | S0 pwr to DDCU |
| P670 | Lab | Node 2 | 25 | S0 pwr to DDCU |

Connector Inhibits:

| Task | Inhibit |
|---|---|
| P680 & P681 | RPCM S01A_D RPC 2 - Open, Close Cmd Inhibit |
| P101 | None |
| P102 | RPCM S04B_C RPC3 & 4 |
| P103 | None |
| P104 | RPCM S03A_C RPC 1 & 2 |
| P105 | None |
| P660 | MBSU 1 RBI 10 |
| P661 | MBSU 1 RBI 11 |
| P662 | MBSU 4 RBI 2 |
| P663 | MBSU 4 RBI 10 |
| P664 | RPCM S02B_D RPC 2<br>RPCM S01A_D RPC 4<br>RPCM S01A_D RPC 5 |
| P665 | None |
| P670 | MBSU 2 RBI 3 |
| P671 | MBSU 2 RBI 10 |
| P672 | MBSU 3 RBI 3 |
| P673 | MBSU 3 RBI 2 |
| P674 | RPCM S01A_D RPC 2<br>RPCM S02B_D RPC 4<br>RPCM S02B_D RPC 5 |

**Foot Restraints:**

| Task | WIF | APFR Setting |
|---|---|---|
| Secure Loop B fluid tray onto Lab | Lab WIF 11 | 1, QQ, A, 12 |

**Note:**

1. Verify safety tether stbd of BOB during deploy
2. Wait to insert fluid tray PIP pin until after EV2 has performed a fluid QD reach assessment at the BOB

**Cautions:**

1. No red band may be visible on waist tether prior to local tethering to gap spanner.

**Warnings:**

1. None

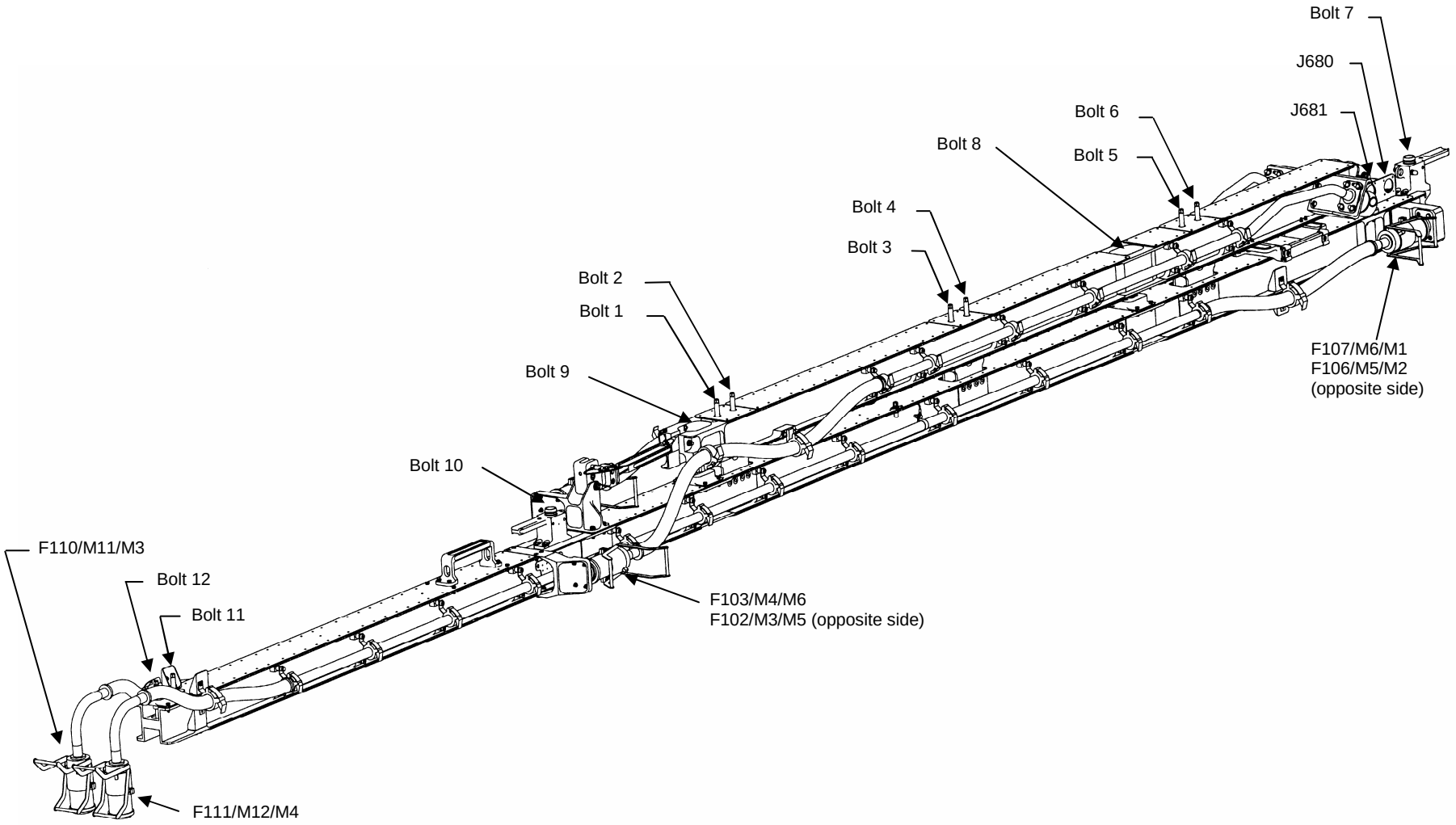



**Figure 3. Node 2 Port Fluid Tray**

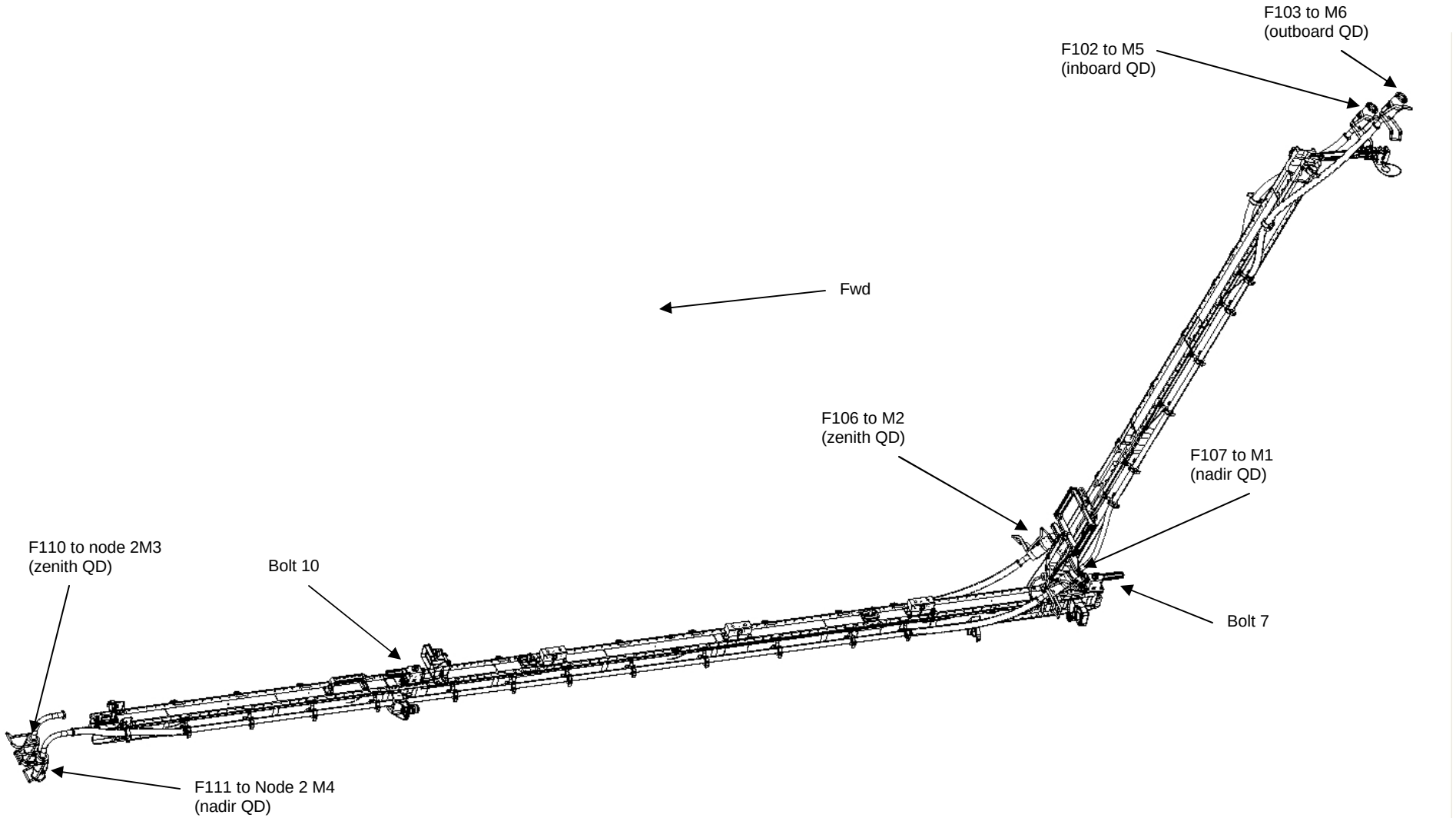



**Figure 4. Node 2 Loop B Fluid Tray (deployed config)**

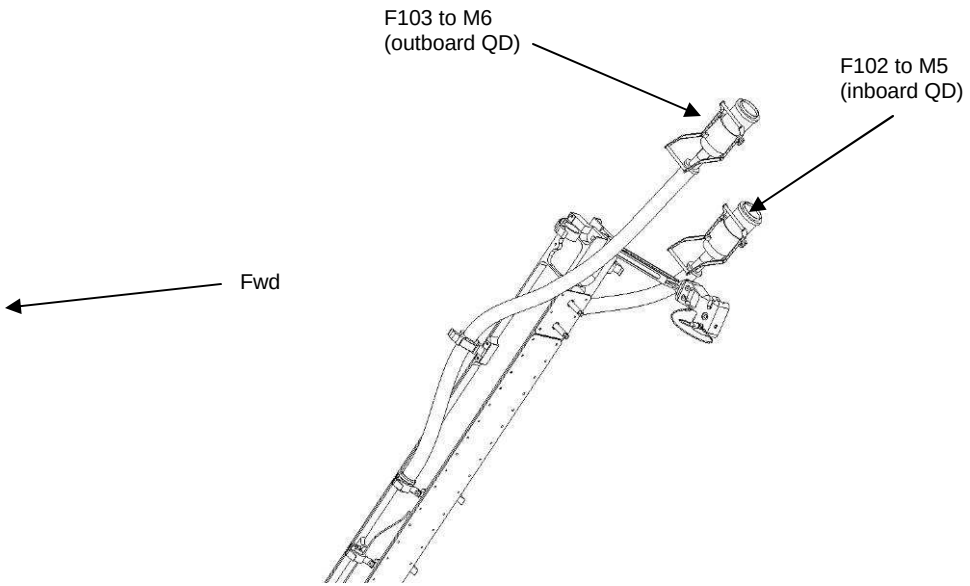



**Figure 5. Node 2 Loop B Fluid Tray - S0 QDs**

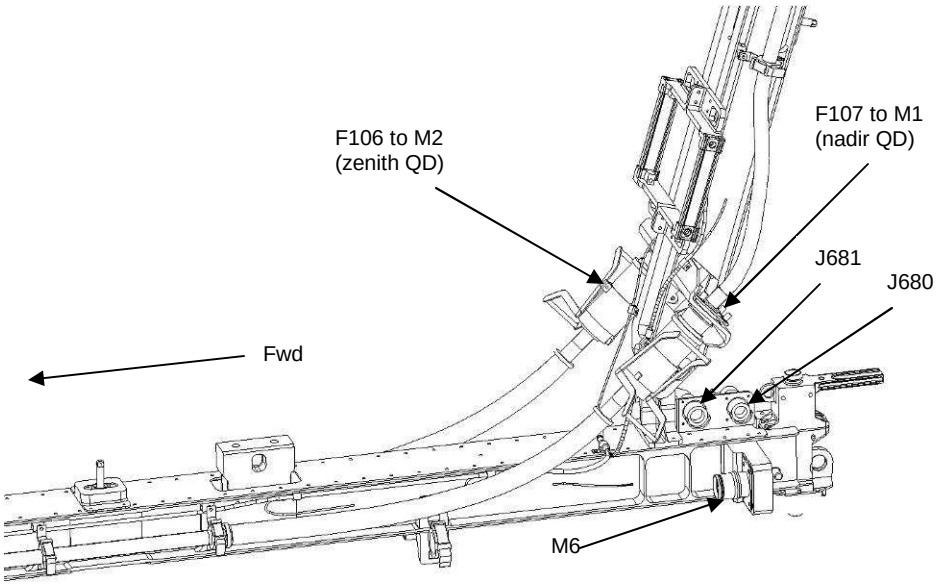



**Figure 6. Node 2 Loop B Fluid Tray - Hinge QDs (deployed config)**

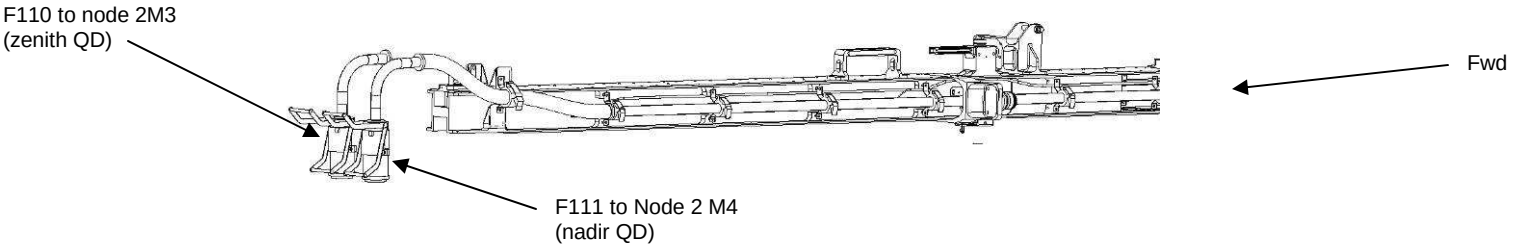



**Figure 7. Node 2 Loop B Fluid Tray - Node 2 QDs**

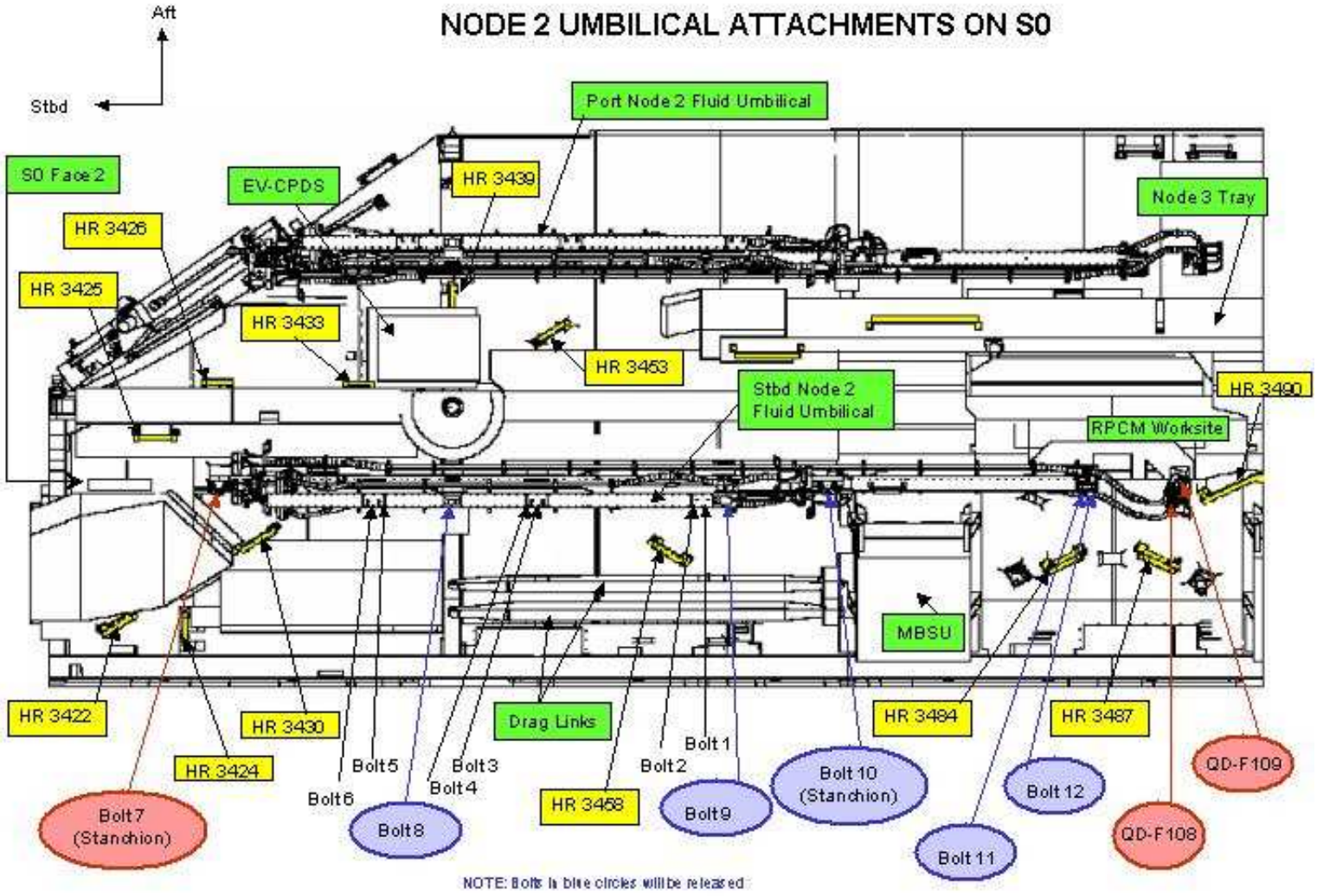



**Figure 8. Node 2 Fluid Tray Attachments on S0**

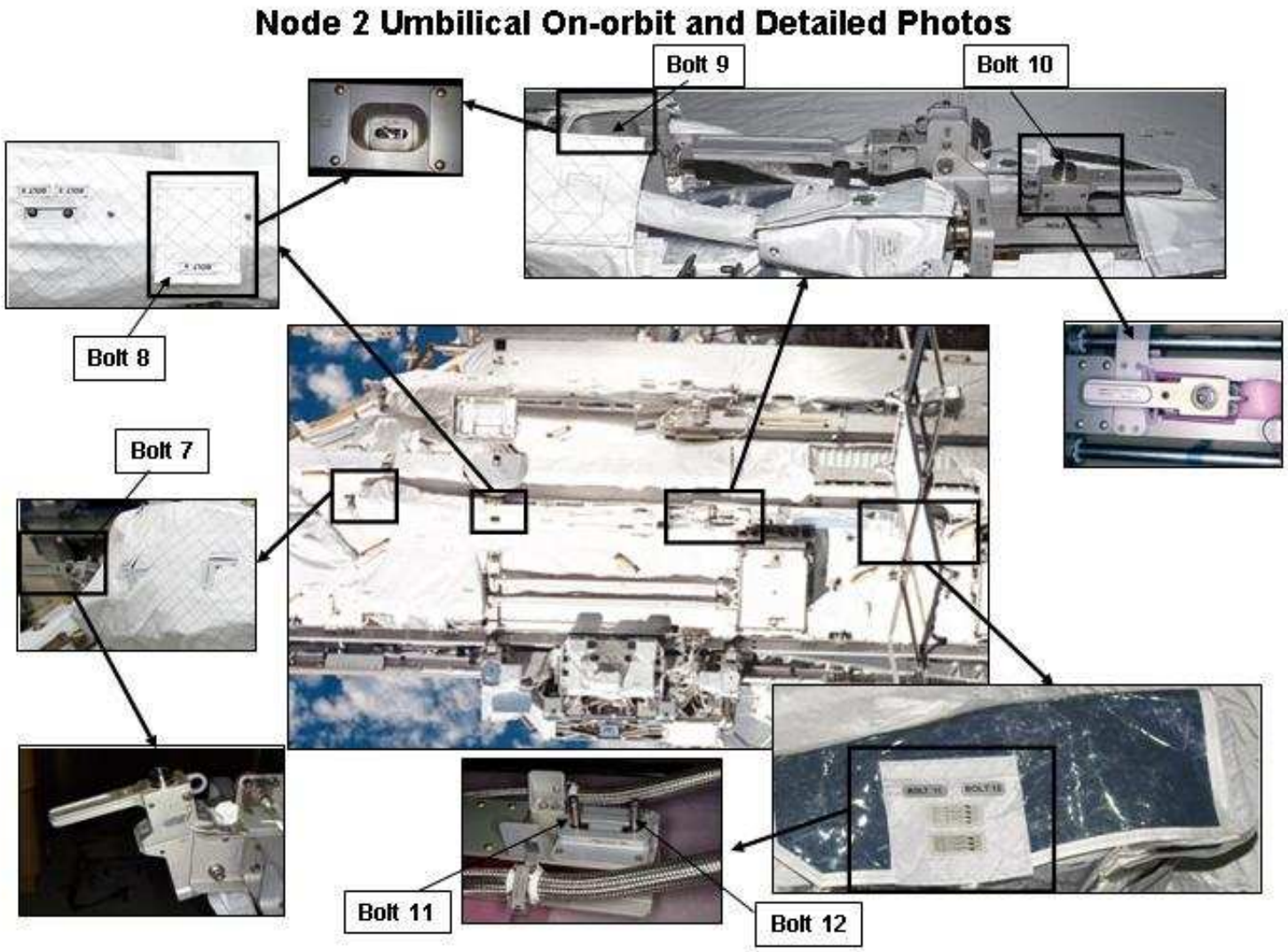



**Figure 9. Node 2 Fluid Trays On-Orbit Photos**

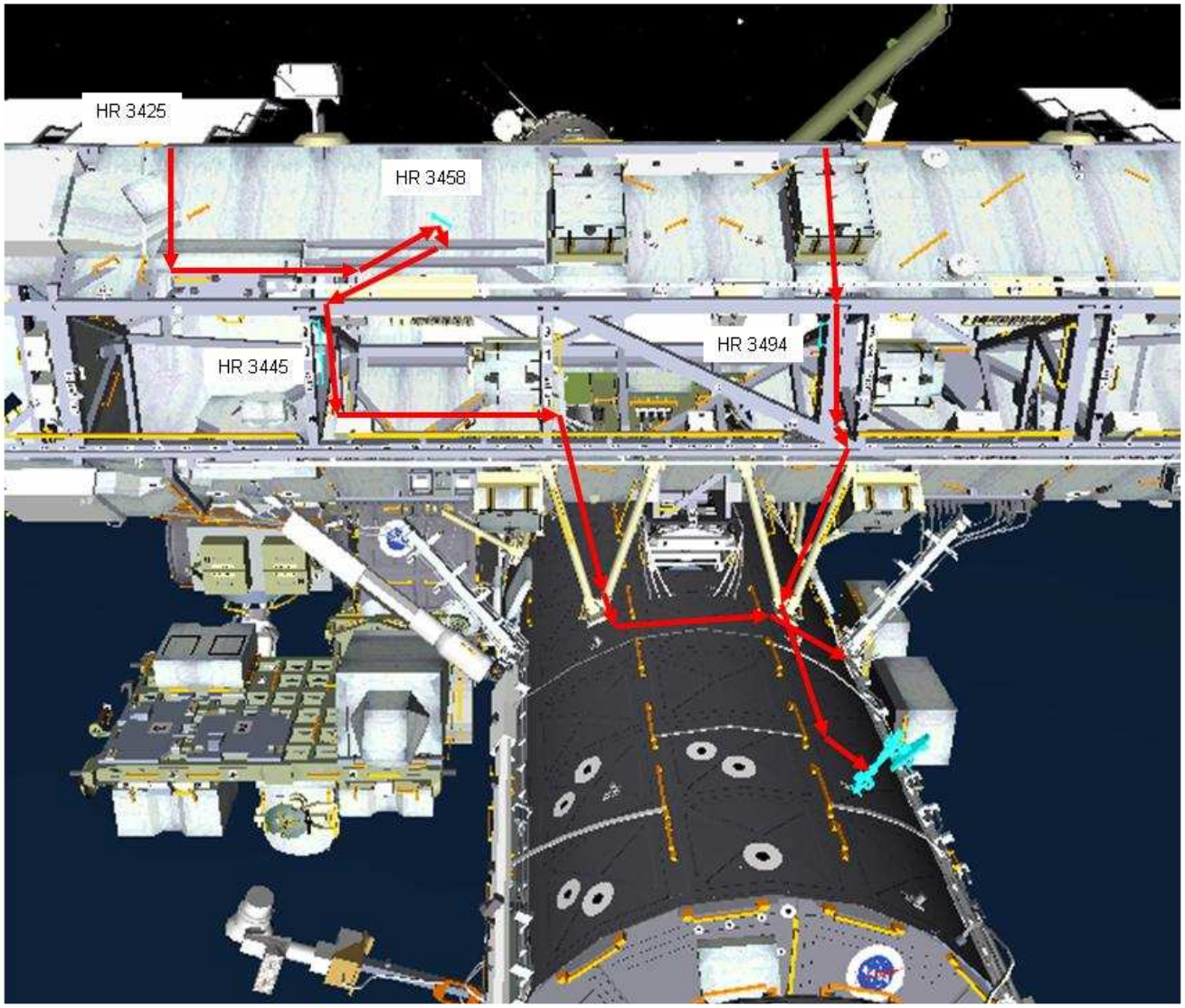



**Figure 10. Loop B Fluid Tray relocation translation paths (fwd side of S0)**

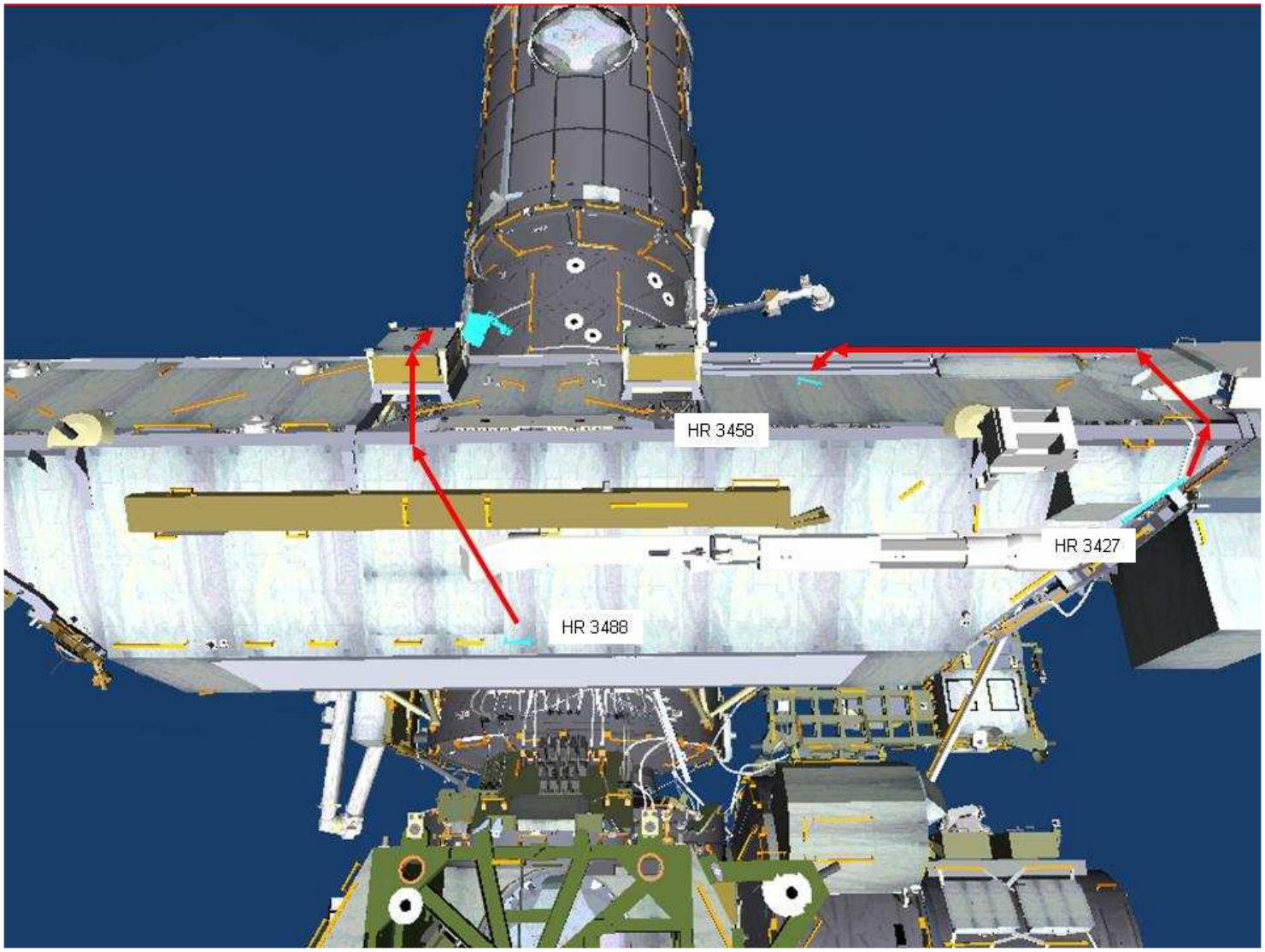
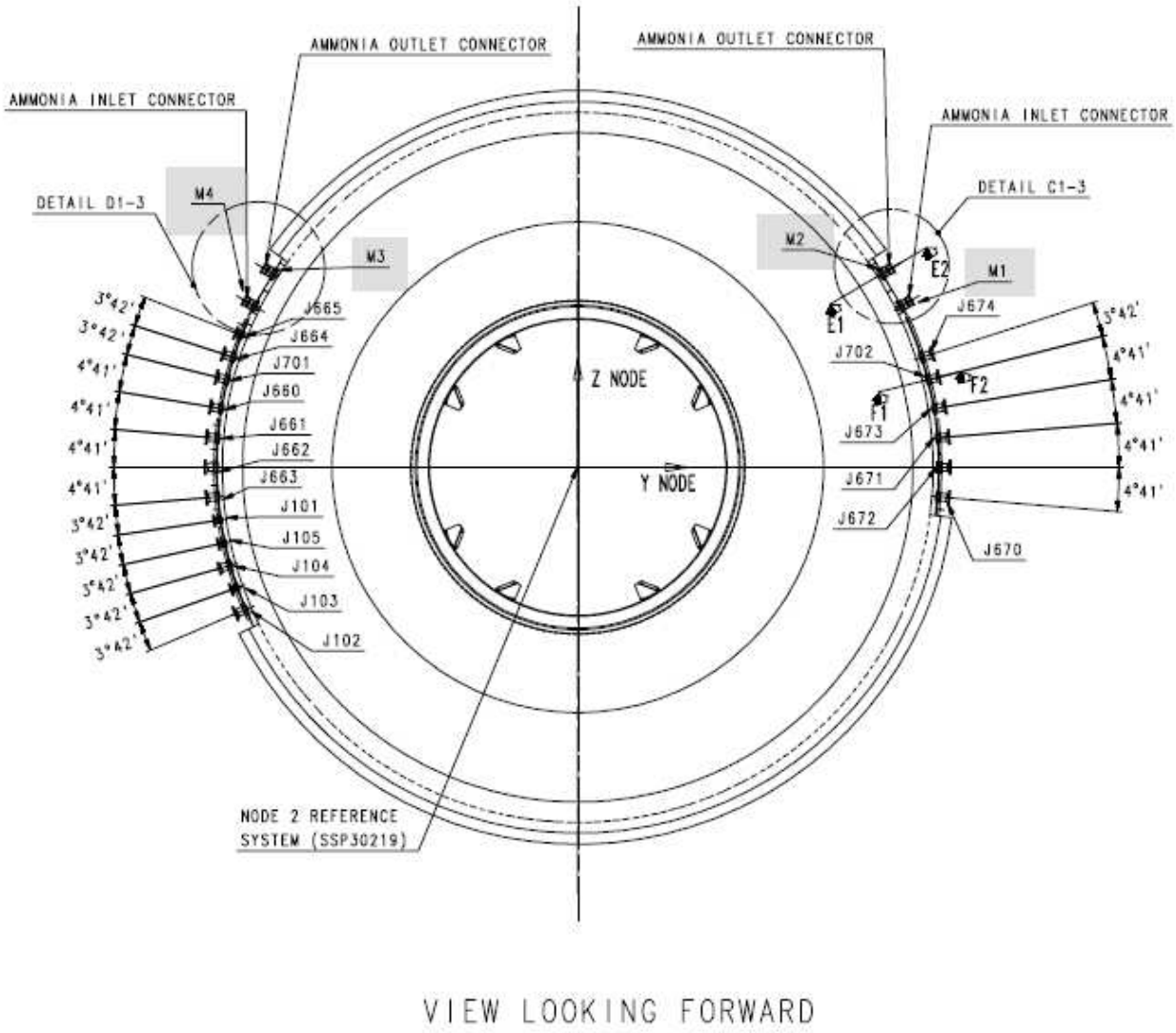



**Figure 11. Loop B Fluid Tray relocation translation paths (aft side of S0)**

## NODE 2 LOOP B AVIONICS TRAY – TASK DATA SHEET

J665 - J661

J663 - J102




M2 - J673

J674 - J670

**Figure 12. Node 2 Aft Connectors (Avionics and Fluid)**

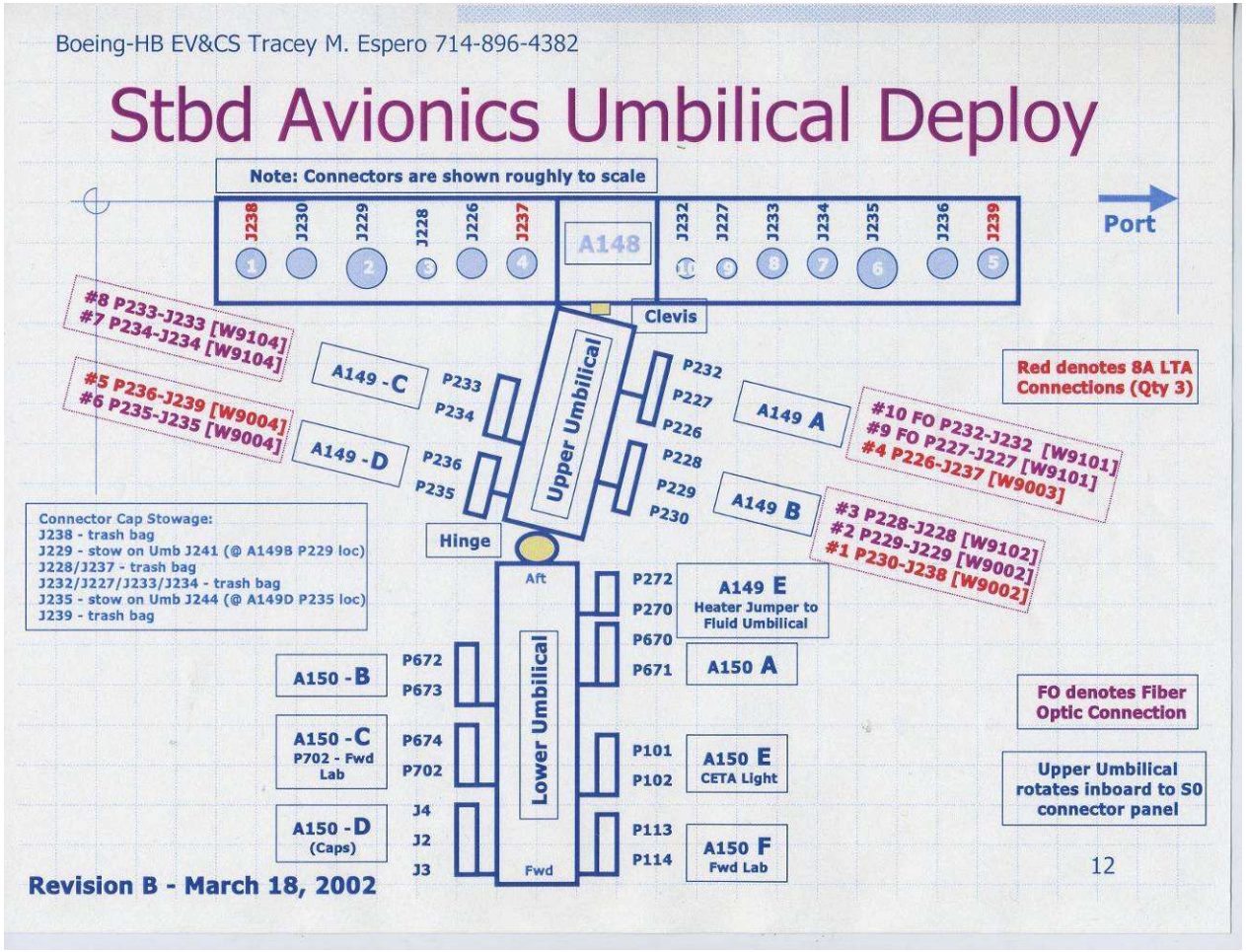



**Figure 13. Stbd Avionics Tray Connector Diagram**

# PMA2-TO-NODE 2 UMBILICALS - TASK DATA SHEET

Estimated Task Duration:

| | With RMS | Without RMS |
|---|---|---|
| One EV Crew | N/A | 0:35 (Primary)<br>0:35 (Redundant) |
| Two EV Crew | N/A | N/A |

Tools:

| EV1 (FF) | EV2 (FF) |
|---|---|
| BRT | BRT |
| Wire Ties | Wire Ties |

EVA Connectors:

| Harness | From | To | Conn Size | Function |
|---|---|---|---|---|
| P609 (R) | PMA 2 | Node 2 | 25 | None |
| P610 (P) | PMA 2 | Node 2 | 25 | None |
| P611 (P) | PMA 2 | Node 2 | 17 | Data – RTDs, GNC Moding |
| P612 (P) | PMA 2 | Node 2 | 21 | Shell Heaters |
| P613 (P) | PMA 2 | Node 2 | 15 | Data – 1553 A, Video |
| P614 (R) | PMA 2 | Node 2 | 15 | Data – 1553 B, Video |
| P615 (R) | PMA 2 | Node 2 | 15 | None |
| P616 (R) | PMA 2 | Node 2 | 15 | Data – Audio |

Connector Inhibits:

| **Task** | **Inhibit** |
|---|---|
| P609 (R) | None |
| P610 (P) | None |
| P611 (P) | None |
| P612 (P) | DDCU LA1A OR LA4A CONVERTER - OFF<br>RPCM N21A4A_B RPC 1-5, 12-16 - OPEN, CL CMD INH |
| P613 (P) | None |
| P614 (R) | None |
| P615 (R) | None |
| P616 (R) | None |

**Notes:**

1. Verify pin and EMI band integrity; verify connector free of FOD
2. No inhibits required for PMA2 redundant umbilical mates

**Cautions:**

1. Avoid bend radii < 10 times cable diameter
2. Avoid pulling on cable during mate/demate
3. Bail linkage on P613 is broken and will require modified technique

**Warnings:**

1. None

## PMA2-TO-NODE 2 UMBILICALS - TASK DATA SHEET

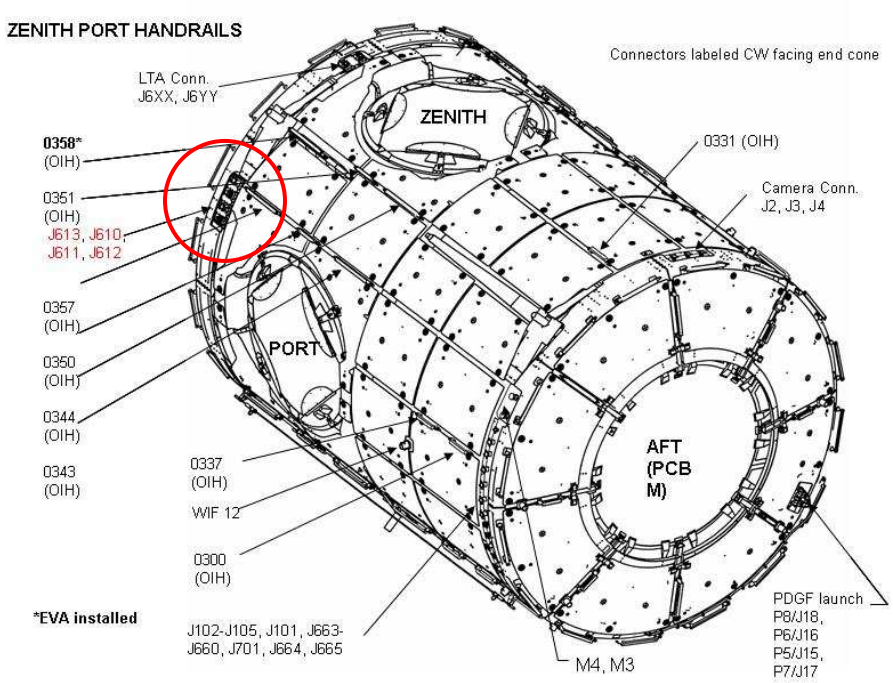



**Figure 14. Port/Zenith Node 2 Connector Panel**

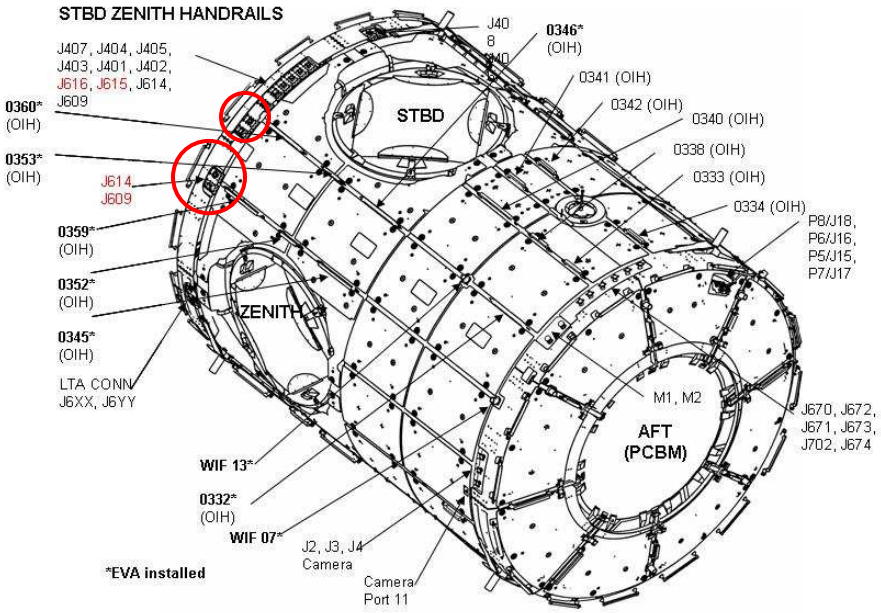



**Figure 15. Stbd/Zenith Node 2 Connector Panel**

## PMA2-TO-NODE 2 UMBILICALS - TASK DATA SHEET

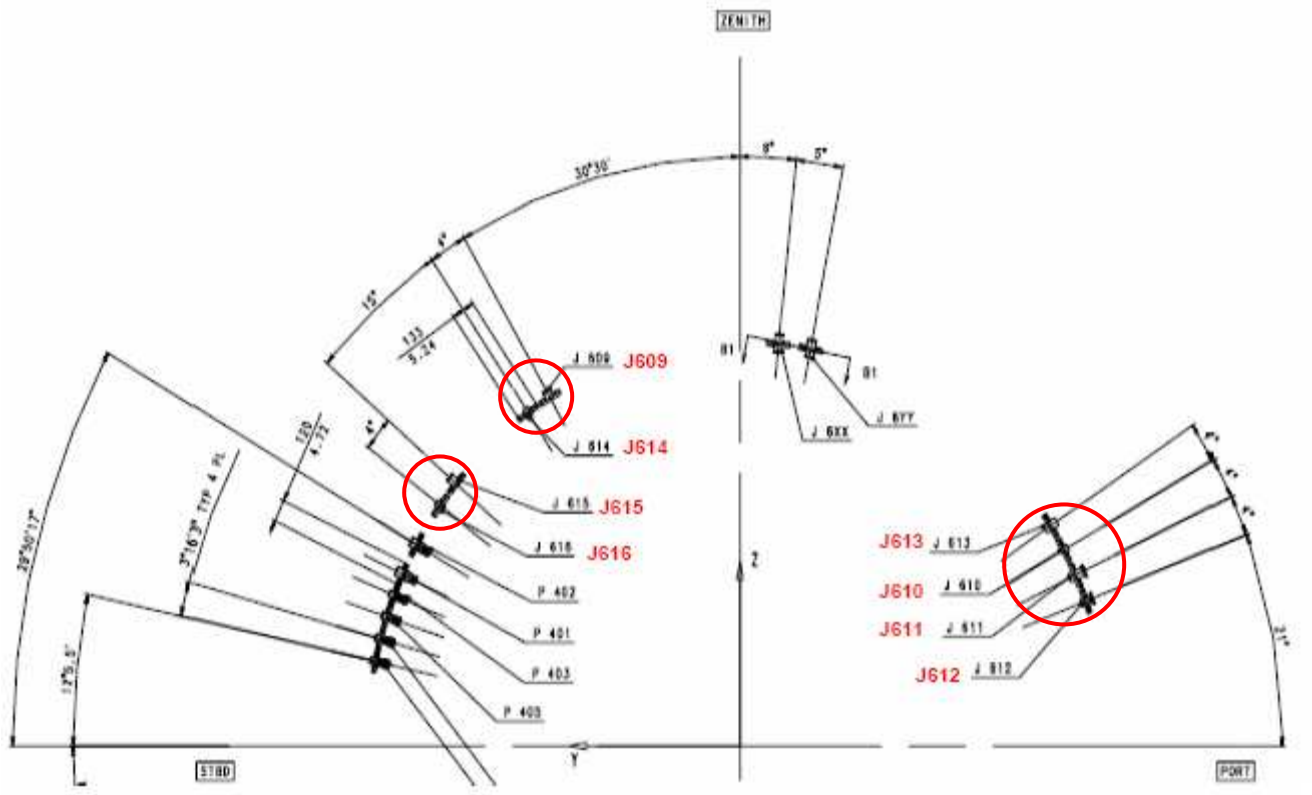



**Figure 16. Node 2 connectors**

## GET-AHEAD: SSPTS DEPLOY – TASK DATA SHEET

Estimated Task Duration:

| | With RMS | Without RMS |
|---|---|---|
| One EV Crew | N/A | 1:00 (per umbilical) |
| Two EV Crew | N/A | 1:00 (for both umbilicals) |

Tools:

| EV1 (FF) | EV2 (FF) |
|---|---|
| BRT | BRT |
| Wire Ties | Wire Ties |

EVA Connectors:

| Harness | From | To | Conn Size | Function |
|---|---|---|---|---|
| J3A/P3 | SSPTS | PMA 2 | 25 | TBD |
| J16A/P16 | SSPTS | PMA 2 | 25 | TBD |

Connector Inhibits:

| **Task** | **Inhibit** |
|---|---|
| P3/J3A | DDCU LA1A or DDCU LA4A Converter – OFF<br>RPCM LA1A4A_D RPC 3 – Open, Close Cmd Inhibit<br>RPCM Z14B_A RPC 2 – Open, Close Cmd Inhibit |
| P16/J16A | DDCU LA2A or DDCU LA3B Converter – OFF<br>RPCM LA2A3B_D RPC 1 – Open, Close Cmd Inhibit<br>RPCM Z13B_A RPC 2 – Open, Close Cmd Inhibit |

**Note:**

1. None

**Cautions:**

1. None

**Warnings:**

1. None

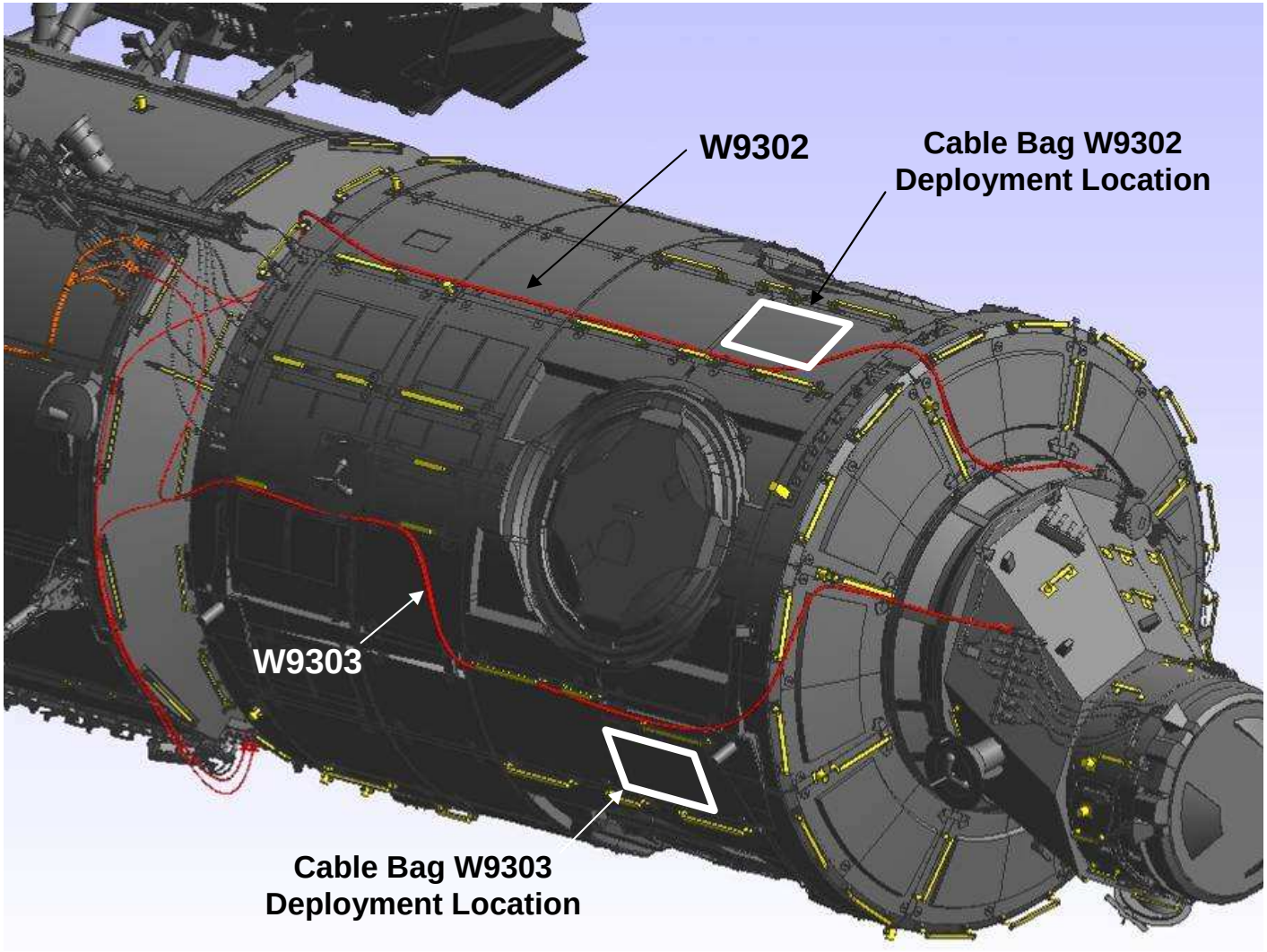



**Figure 17. SSPTS cables routed across Node 2**

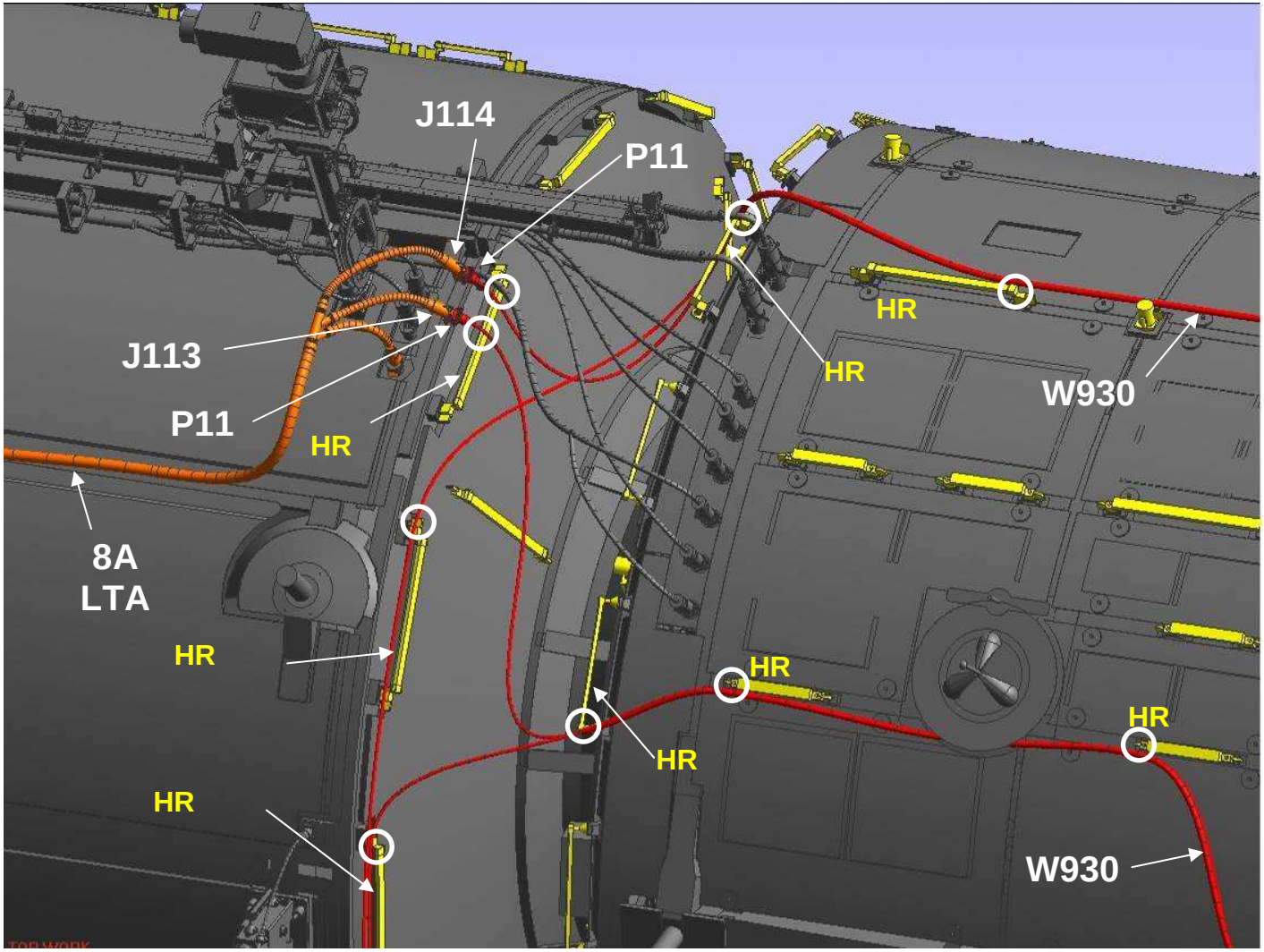



**Figure 18. SSPTS cable routing**

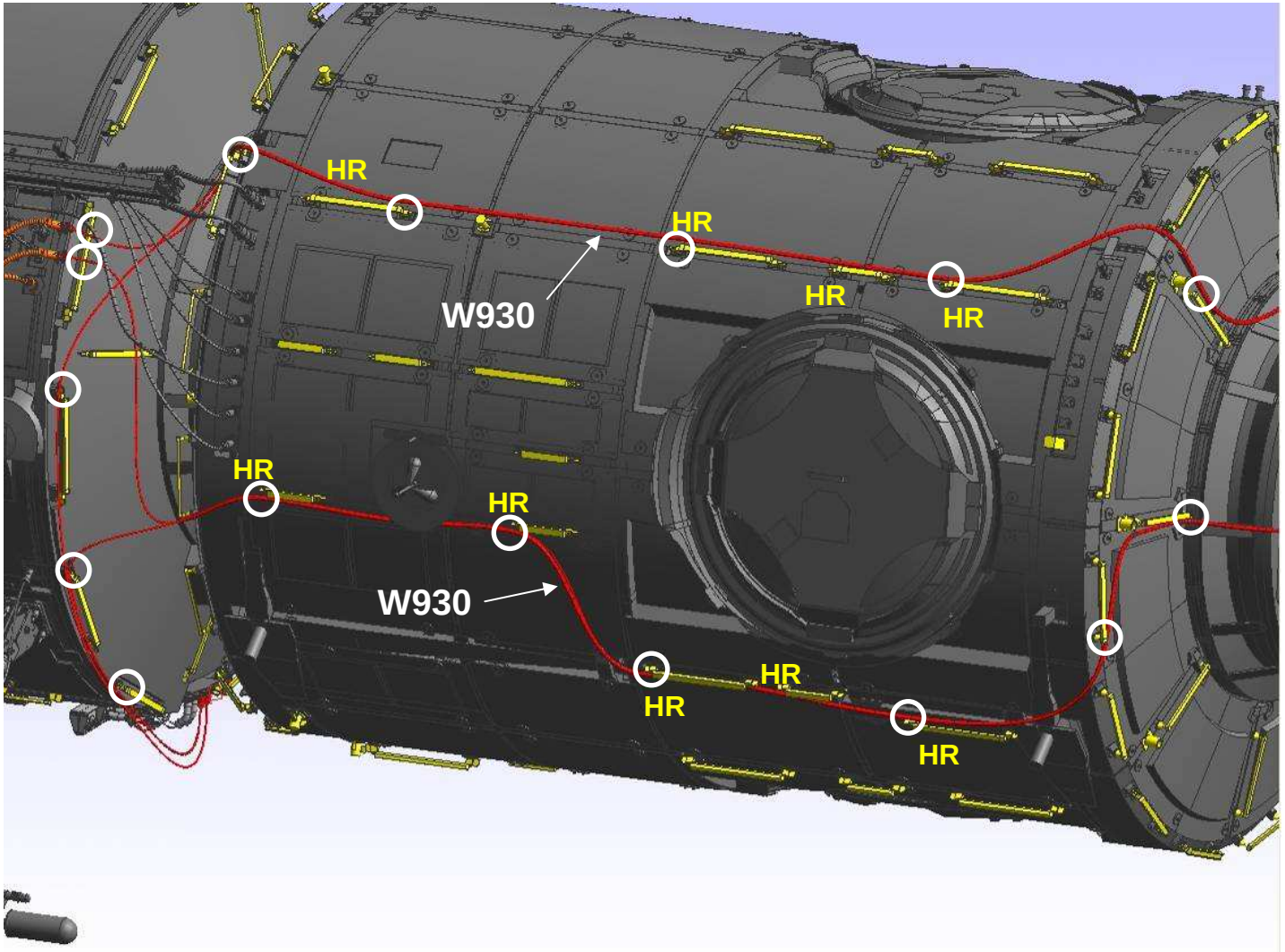



**Figure 19. SSPTS cable routing and wire-tie locations**

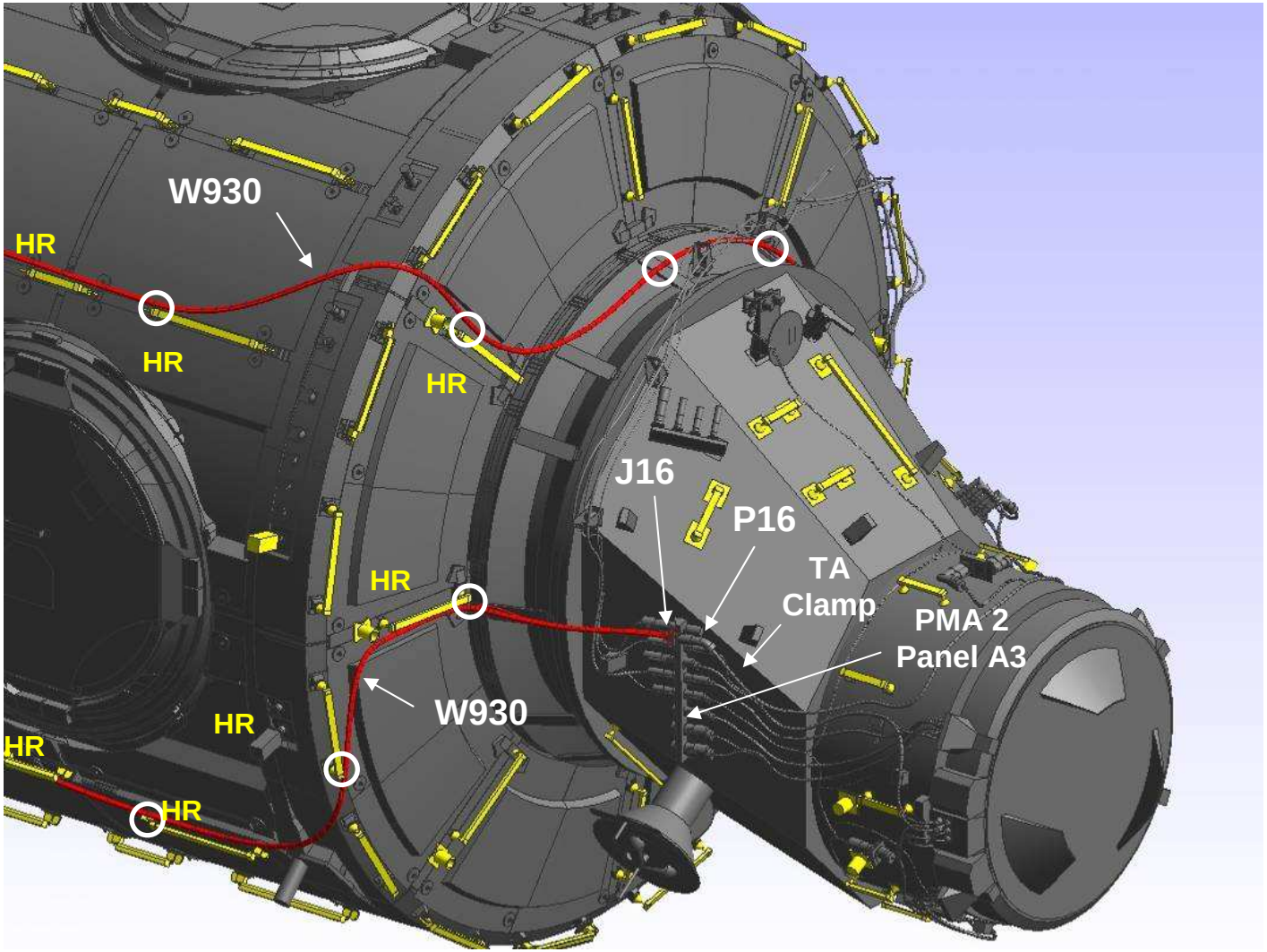



**Figure 20. SSPTS cable routing and wire-tie locations for fwd end stbd side**

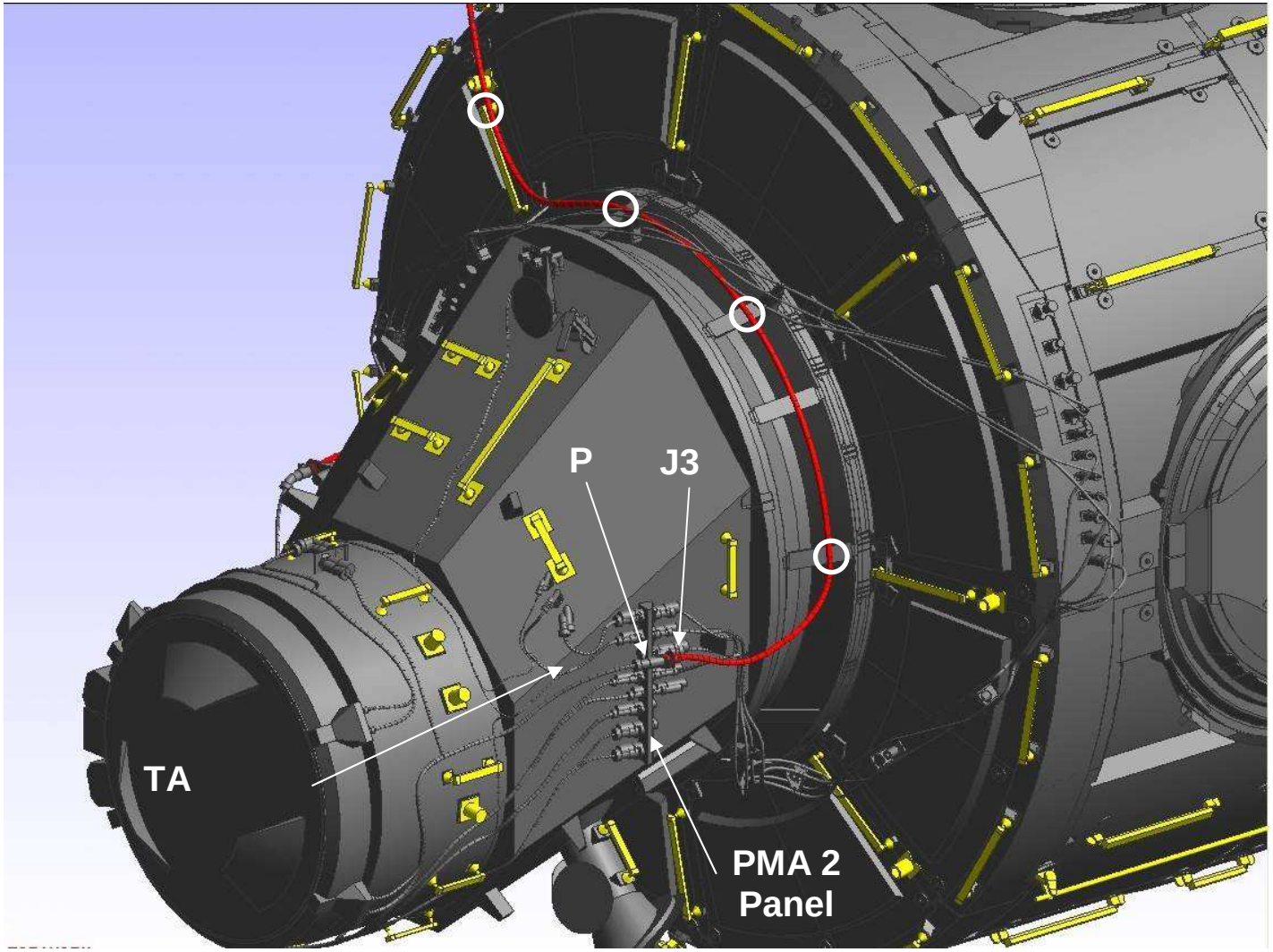



**Figure 21. SSPTS cable routing and wire-tie locations on fwd end port side**

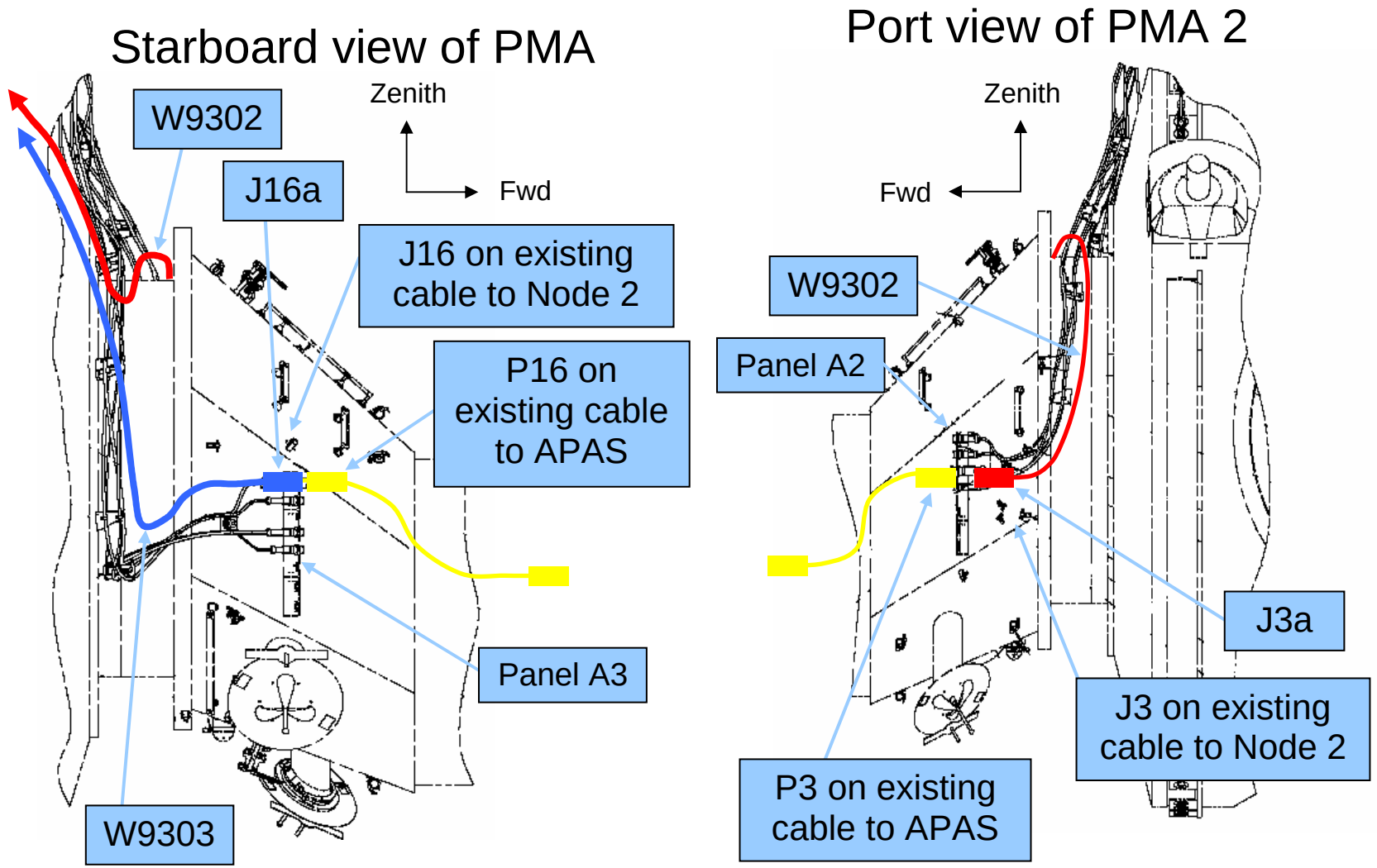



**Figure 22. SSPTS cable routing and connections on PMA2**

# POST US EVA 12 (CHARLIE) TOOL CONFIG

**EV1**

- ☐ MWS
  - BRT (L)
    - RET (eq-eq)
    - Wire Ties
      - Short (1)
      - Long (1)
  - T-Bar
    - RET (eq-eq) (2)
    - RET (eq-eq) w/ PIP pin (1)
    - Adj Tether (1)
    - Wire Ties (2)
    - Small Trash Bag
    - Socket Caddy
      - 7/16 Socket - 9 ext (w/ decoration)
      - 7/16 Socket - 2-in ext
    - RET (eq-eq) (2)
      - Over-gloves (2)
  - Wire Tie Caddy (1)
  - Swing Arm (R)
    - PGT [MTL **30.5**] S/N _____
      - PGT Battery S/N _____
    - RET (eq-eq)
- ☐ Waist Tether (R & L)
- ☐ D-ring Extender (R & L)
- ☐ SAFER
- ☐ WVS
- ☐ Safety Tether 85'

- ☐ Crewlock Bag #4 (QD Tools)
  - w/ RET (Lg-sm)
  - Adj Equip Tether (bag exterior)
  - 1" QD Release Tool (on internal RET)
  - 1" QD Bail Drive Lever (on internal RET)
  - RET (1 to internal tether point)
    - N2 Vent Tool
  - RET (2 for SPDs - to internal tether points)
  - RET (1 for vent tool - to ext bag handle)
  - RET (1 to internal tether point)
    - Button depress tool (1-in)
  - RET (1 to internal tether point)
    - AKT (1-in)

**EV2**

- ☐ MWS
  - BRT (L)
    - RETs (eq-eq)
    - Wire Ties
      - Short (3)
      - Long (2)
  - T-Bar
    - RET (eq-eq) (2)
    - RET (eq-eq) w/ PIP pin (1)
    - Wire Ties (2)
    - Small Trash Bag
      - ~~QD pressure caps (2, M1 and M2)~~
    - RET (eq-eq) (2)
      - Over-gloves (2)
    - Socket Caddy
      - 7/16 Socket - 9 ext (w/ decoration)
  - Swing Arm (R)
    - PGT [MTL **30.5**] S/N _____
      - PGT Battery S/N _____
    - RET (eq-eq)
- ☐ Waist Tether (R & L)
- ☐ D-ring Extender (R & L)
- ☐ SAFER
- ☐ WVS
- ☐ Safety Tether 85'

- ☐ Crewlock Bag #1
  - w/ RET (Lg-sm)
  - Adj Equip Tether (bag exterior to secure bag at worksite)
  - Adj Equip Tether (on internal RET, was for SPDs)
    - QD pressure caps (2, M1 and M2)
  - Adj Equip Tether (on internal RET, was for SPDs)
  - Digital camera w/ RET
  - RET
    - to Adj Equip Tether
      - Caps (2)
  - Node 2 MLI (ammonia)
  - Node 2 MLI (avionics)
  - Adj Equip (2 - for handling on ext bag handle)
  - Wire-tie (used to secure fluid QDs during relocate)
  - Jettison Stowage Bag
    - RET (on drawstring, bundled in bag)
    - Adj Equip Tether - for handling (to RET, bundled in bag)
    - Adj Equip Tether (for handling) (to adj, around bundle)

**AIRLOCK CONFIG**

- ☐ **Staging Bag**
  - Fuse Tether (1)
    - Connector Cleaner Tool Kit
    - Connector Pin Straightener
    - Probe
    - Velcro/Tape Caddy
    - Pry Bar
  - Fuse Tether (1)
    - PGT (spare) S/N _____
      - PGT Battery S/N _____
    - Wire Tie Caddy (w/ 9 wire ties)
    - Vise Grips
    - EVA Ratchet
    - Cheater Bar

- ☐ IV Bag
  - Contamination Detection Kit
    - Gold Salt Coupon (6)
    - Color Chart (2)
    - ISS Contamination Sampler (2)
    - Shuttle Contamination Sampler (2)
    - Nitrogen Dioxide Draeger Tube (6)
    - Ammonia Draeger Tube (6)
  - DCM Plug (2) - SAFER Hard Mount
  - GP Caddy (2)
    - Thermal Mittens (2 pr)
  - EVA Ratchet
  - Socket Caddy
    - 1/2 x 8-in socket (IV Hatch)
    - 7/16 x 6-in socket (backup)
- ☐ D-ring extender on EVA hatch D-ring

- ☐ Fuse Tether
  - Long duration tie-down tethers (4)