



# International Space Station Assembly Operations

## ISS-1E GROUND

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**Mission Operations Directorate  
Operations Division**

**14 SEP 07**

*These procedures are available  
electronically on the SODF Homepage  
at <http://mod.jsc.nasa.gov/do3>*

National Aeronautics and  
Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas




***United Space Alliance***

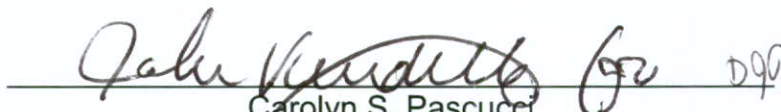


**INTERNATIONAL SPACE STATION  
ASSEMBLY OPERATIONS  
ISS-1E GROUND**

14 SEP 07

APPROVED BY:

  
Audrey K. Ogburn  
Book Manager

  
Carolyn S. Pascucci  
Manager, Station Procedures Management

  
SODF Coordinator

ACCEPTED BY:

  
Michael T. Hurt  
SODF Manager

This document is under the configuration control of the Systems Operations Data File Control Board (SODFCB).

Incorporates the following:
CR: Multi_FileU385 Multi_FileU386

Uplinked Messages (or Approved Flight Notes) replaced by this revision,  
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None

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ACTIVATION AND CHECKOUT

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# NODE 2 O2 RECHARGE LINE LEAK CHECK

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 3 pages

## OBJECTIVE:

The purpose of this procedure is to leak check the Node 2 O2 Recharge Line after the Node 2/Lab and PMA Vestibule Jumpers are installed.

## INITIAL CONDITIONS

The ISS Oxygen System is configured as follows for EVA Operations:

The O2 LO P (VL009) AND O2 HI P (VL010) Valves → Closed.

The O2 XOVER (VL011) Valves → Opened.

The ROOBA (TO: QD11 OR SPARE) QD → QD011.

The O2 Recharge Line QD → ROOBA (TO: O2 RECHARGE LINE) QD.

The O2 Lo P Supply Valve → Open

The O2 HI P Supply Valve → Closed

The GO2 XFER PANEL FLOW VALVE → Opened.

The Orbiter Oxygen System:

## TOOLS AND EQUIPMENT REQUIRED:

None

### WARNING

During the overnight leak check, the O2 Lo P Supply Valve and VL009 will be closed. As a result, the PBA Ports cannot be used to provide oxygen to the PBAs. Also, the RSP (Respiratory Support Pack) will not have O2 supplied to it. If hard line oxygen is required to supplement the oxygen supply in the PBA Bottles, perform {3.212 ISS EMERGENCY O2 CONFIGURATION}, all (SODF: ECLSS: MALFUNCTION: ACS).

## 1. CONFIGURING O2 SYSTEM FOR LEAK CHECK

PCS

- 1.1 Airlock: ECLSS: Oxygen System  
AL Oxygen System  
'O2 Low Pressure Supply Valve'  
**cmd** Close (√Actual Position – Closed)  
  
'O2 Hi Pressure Supply Valve'  
  
√Actual Position – Closed

AL1A2

- 1.2 VL011 (O2 Xover Vlv) → Closed

# NODE 2 O2 RECHARGE LINE LEAK CHECK

(ASSY OPS/1E/FIN/MULTI E)

Page 2 of 3 pages

ODS Vest  
GO2 Xfer  
Panel

1.3 FLOW → CLOSED

PCS

1.4 Airlock: ECLSS: Oxygen System

AL Oxygen System

'Low Pressure'

Verify Supply Press > 5515 kPa (800 psia).

If Supply Press < 5515 kPa (800 psia); √ **MCC-H**

## 2. INITIATING OVERNIGHT LEAK CHECK

Airlock: ECLSS: Oxygen System

AL Oxygen System

'Low Pressure'

Record Supply Press: \_\_\_\_\_ kPa

Record Tank Temp: \_\_\_\_\_ deg C

Record GMT: \_\_\_\_\_

Report above values to **MCC-H**.

Wait at least 10 hours or **On MCC-H GO**, proceed.

## 3. TERMINATING LEAK CHECK

Airlock: ECLSS: Oxygen System

AL Oxygen System

'Low Pressure'

Record Supply Press: \_\_\_\_\_ kPa

Record Tank Temp: \_\_\_\_\_ deg C

Record GMT: \_\_\_\_\_

Report above values to **MCC-H**.

**On MCC-H GO**, proceed to step 4.

## 4. POST LEAK CHECK O2 SYSTEM RECONFIG

ODS Vest  
GO2 Xfer  
Panel

4.1 FLOW → OPEN

AL1A2

4.2 VL011 (O2 Xover Vlv) → OPEN



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OBJECTIVE:

The purpose of this procedure is to purge the Node 2 O2 lines of debris, configure for Prebreathe using shuttle O2 and perform a complete O2 system purge.

TOOLS AND EQUIPMENT REQUIRED:

(NOD1P4\_D)

GO2 Transfer Flex Hose Assy P/N V857-643003-002 (MC276-0054/2001)

(A/L1O1)

Powder-Free Gloves

Teflon Bags P/N 300045-08

Clean Room Tape P/N 3M/1251

Wire Ties or Velcro Straps

Flashlight

Earplugs

Fluid Fitting Torque Device (FFTD) and Gamah Seal Maintenance Kit

Fluid Fitting Torque Device (S/N 001)

ISS IVA Toolbox

Drawer 2:

5/32" Hex Head, 1/4" Drive

Driver Handle, 1/4" Drive

1/4" to 3/8" Adaptor

(10-50 in-lbs) Torque Wrench, 1/4" Drive

Drawer 3:

Inspection Mirror

1. REMOVING CLOSEOUT PANELS

- |         |     |  |
|---------|-----|--|
| A/L1OA2 | 1.1 | Unfasten A/L1OA2 closeout panel fasteners (Driver Handle, 1/4" Drive; 5/32" Hex Head, 1/4" Drive).<br>Temporarily stow A/L1OA2 Closeout Panel. |
|---------|-----|--|

NOTE

VL011 (O2 Xover Vlv) is behind panel A/L1A2; however, once A/L1OA2 is removed, VL011 can be reached from above. Removal of panel A/L1A2 is at the crew's discretion.

If required, remove panel A/L1A2.

- |        |     |  |
|--------|-----|--|
| A/L1A1 | 1.2 | Reconfigure/remove EDDA and handrails as necessary for access to the A/L1A2 panel. |
|--------|-----|--|

- A/L1A2
- ~
- 1.3 Unfasten blue ESSS cover fasteners.  
Cover is located deck aft of IV Hatch (Driver Handle, 1/4" Drive; 5/32" Hex Head, 1/4" Drive).  
Temporarily stow ESSS cover panel.
  - 1.4 Unfasten A/L1A2 closeout panel fasteners (Driver Handle, 1/4" Drive; 5/32" Hex Head, 1/4" Drive).  
Temporarily stow A/L1A2 Closeout Panel.

2. [CONFIGURING ISS O2 SYSTEM](#)

- A/L10A2
  - 2.1 VL009 (O2 Lo P) → CLOSED
  - 2.2 VL010 (O2 Hi P) → CLOSED
- A/L1A2
  - 2.3 √VL011 (O2 Xover Vlv) – CLOSED
- PCS
  - 2.4 C&W Summ  

Caution & Warning Summary

  
 'Event Code Tools'  
 sel Inhibit  
  

Inhibit an Event

  
  
 input Event Code – 6 6 0 9 (O2 Hi P Supply Pressure Low - A/L)  
  
**cmd Arm**  
**cmd Execute**
  - 2.5 Airlock: ECLSS: Oxygen System  

AL Oxygen System

  
 'O2 Low Pressure Supply Valve'  
 √Actual Position – Open  
  
 'O2 Hi Pressure Supply Valve'  
  
**cmd Open** (√Actual Position – Open)

3. REDUCING ISS O2 SYSTEM PRESSURE TO AMBIENT

NOTE

1. When possible, connection and disconnection of QDs requires adjoining lines to be at approximately ambient pressure on both sides of the QD.
2. As the Low Pressure O2 system pressure bleeds down and O2 is introduced into the cabin, the following messages will be received:  
 'O2 Lo P Supply Pressure Low - A/L'  
 'PCA O2 Line Pressure Low - A/L'  
 'PCA O2 Line Pressure Low - LAB'  
 'O2 UIA Supply Pressure Low - A/L'
3. The messages will return to normal as the O2 system is repressurized (step 6).

3.1 Airlock: ECLSS: Oxygen System

AL Oxygen System

'AL PCA O2 Intro Valve'

cmd Open (√Position – Open)

'Low Pressure'

When PCA O2 Line Press <160 kPa (23 psi) or **On MCC-H GO**, proceed.

'AL PCA O2 Intro Valve'

cmd Close (√Position – Closed)

C-Lk  
AL1D2

3.2 Unstow PHA Bag #1.  
Remove cap from Relief Valve, PHA port.  
Inspect for debris.

Relief Valve of PHA Bag #1 →|← PHA port

Quick Don Mask →|← Relief Valve

PHA Mask

3.3 Mask O2 control → EMERGENCY

NOTE

Per SCR 20626, the Airlock O2 High Pressure Supply Pressure sensor (ALEA32SR0001P) has a bias of -669 kPa (-97 psia). The pressure checks in steps 3.4, 3.6, and 6.5 have been adjusted accordingly.

PCS

3.4 Airlock: ECLSS: Oxygen System

AL Oxygen System

'High Pressure'

When Supply Press = L and UIA Supply Press < 160 kPa (23 psi) or **On MCC-H GO**, proceed.

- PHA Mask 3.5 Mask O2 control → NORMAL
- 3.6 Quick Don Mask ←|→ Relief Valve  
 Relief Valve of PHA Bag #1 ←|→ PHA port  
 Cap Relief Valve, PHA port.

**CAUTION**

In order to protect the orbiter O2 system and prevent relief valve cracking in the ISS O2 recharge system, the ISS supply pressures must be below 6136 kPa (890 psia) prior to opening VL011 (O2 Xover Vlv) in step 3.7.

- PCS 3.7 Airlock: ECLSS: Oxygen System  
AL Oxygen System  
 'Low Pressure'  
 Verify Supply Press < 6136 kPa (890 psia).  
  
 'High Pressure'  
  
 Verify Supply Press < 5467 kPa (793 psia)

- AL1A2 3.8 VL011 (O2 Xover Vlv) → OPEN

4. [CONFIGURING PMA/ODS O2 SYSTEM](#)

- ODS Vest  
GO2 Xfer  
Panel 4.1 √FLOW – CLOSED

**WARNING**

Opening the ODS Vestibule Transfer Panel Vent may cause a loud hissing noise. Crew in the vicinity should don Earplugs.

- 4.2 Don Earplugs.
- 4.3 VENT → OPEN
- 4.4 Check GO2 Xfer Panel Pressure Gauge reading ~0 psi.  
 Doff Earplugs.



CAUTION	
1.	Failure to maintain clean environment during oxygen system maintenance could result in fire hazard. If gloves become contaminated, replace immediately with clean gloves.
2.	Minimize the amount of time open fluid connectors and caps/plugs are exposed to cabin air to prevent contamination of the oxygen system. Open connectors and caps/plugs can be covered by Teflon Bags or Powder-Free Gloves. Failure to comply could result in a fire hazard.
3.	All fittings should be inspected for contaminants before mating. If debris is found, √MCC-H.
4.	Inspect GO2 Transfer Flex Hose Assy for any cracks or anomalies. If found, notify MCC-H.

4.5 Inspect GO2 Transfer Flex Hose Assy for any cracks or anomalies.  
If found, notify MCC-H.

4.6 Don Powder-Free Gloves.

<u>NOTE</u>	
QDs must be closed to remove plugs and disconnect lines. As needed, refer to Figures 3 and 4 at the end of this procedure for information on the high-pressure quick disconnects.	

4.7 Uncap GO2 Xfer Panel QD.  
Close GO2 Transfer Flex Hose Assy bent-end QD.  
Remove plug.  
Inspect both QDs for debris.

Install hose so that it can be routed along the ODS Flange as shown in Figure 1.

GO2 Transfer Flex Hose Assy bent-end →|← GO2 Xfer Panel QD  
Hard mate/open QD.

Cover caps and plugs.



Figure 1. ODS Vestibule Xfer Panel Hose Routing.

- |                               |      |   |
|-------------------------------|------|---|
| PMA                           | 4.8  | Uncap Oxygen Recharge QD.<br>Close GO2 Transfer Flex Hose Assy straight-end QD.<br>Remove plug.<br>Inspect both QDs for debris.<br><br>GO2 Transfer Flex Hose Assy straight-end → ← Oxygen Recharge QD<br>Hard mate/open QD.<br>Cover caps and plugs. |
| PMA/ODS                       | 4.9  | Secure GO2 Transfer Flex Hose Assy to PMA/ODS Extension Duct and ODS Flange with Velcro straps.   |
| ODS Vest<br>GO2 Xfer<br>Panel | 4.10 | VENT → CLOSED   |
|                               | 4.11 | Doff Gloves.  |

5. [SECURING NODE 2/LAB VESTIBULE O2 RECHARGE JUMPER](#)

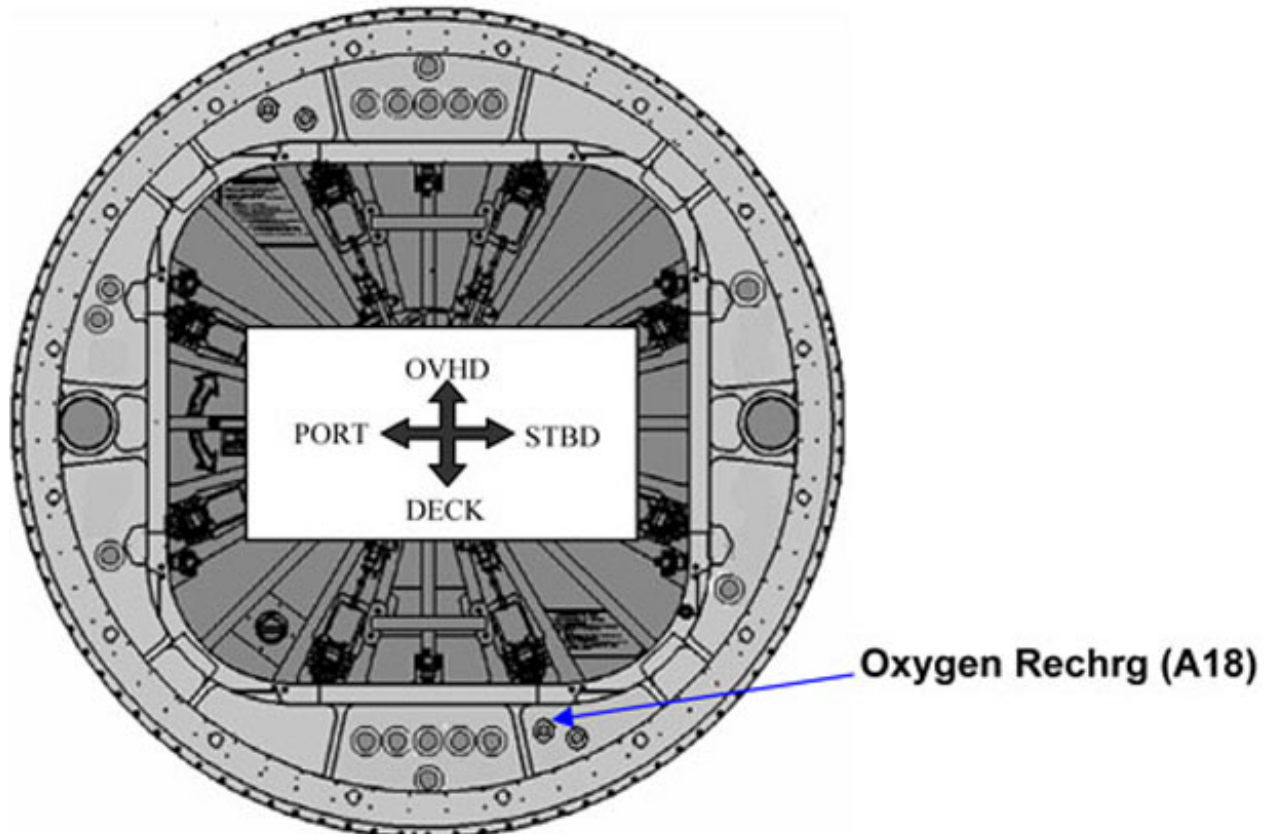


Figure 2. NOD2 Aft External Bulkhead Location of Feed-throughs. Bold text appears on NOD2 Bulkhead labels next to feed-throughs.(orientation from within LAB1 looking forward)

**CAUTION**

The O2 Recharge Jumper in the Node2/Lab Vestibule must be physically secured prior to the N2 purge to prevent movement of the jumper and possible hardware damage.

- 5.1 Remove Axial Port Closeout from Deck area of Node 2/Lab Vestibule (Velcro, 1/4 turn fasteners).
- 5.2 Locate Node 2/Lab Vestibule O2 Recharge Jumper at A18. Refer to Figure 2.  
N2 end of jumper will be connected to the N2 bulkhead; the Lab end of jumper will be free.
- 5.3 Secure free end of jumper to any part of primary structure within reach of jumper (Wire Ties? Velcro Straps?).  
Ensure jumper cannot move once Node 2 O2 lines are charged.

<b>WARNING</b>
<p>1. The Lab/Node 2 Vestibule Jumper must be secure and directed into the cabin during the purge or the Lab/Node 2 Vestibule Jumper may move, possibly causing crew injury. During the purge, high pressure oxygen and potential debris will be exiting the Lab/Node 2 Vestibule Jumper. As a result, crewmembers should not place any part of their bodies in front of the Lab/Node 2 Vestibule Jumper outlet.</p>
<p>2. Purging through the Lab/Node 2 Vestibule Jumper may cause a loud hissing noise. Crew should don Earplugs.</p>

6. PURGING NODE 2 O2 LINES

ODS Vest  
GO2 Xfer  
Panel

6.1 √**MCC-H** to verify proper cryo configuration

6.2 Don Ear Plugs.

6.3 **On MCC-H GO, FLOW → OPEN**

Middeck  
Floor

6.4 Verify EMU O2 ISOL VLV – OPEN

<u>NOTE</u>
The Lab dP/dt will be monitored by <b>MCC-H</b> during the 5 minute purge to verify that the Lab/Node2 Vestibule Jumper is purging properly.

PCS

6.5 Lab: ECLSS

Lab ECLSS

Verify dP/dt > 0.05 mmHg/min.

6.6 Wait 5 minutes.

ODS Vest  
GO2 Xfer  
Panel

6.7 FLOW → CLOSED

PCS

6.8 Lab: ECLSS

Lab ECLSS

Verify dP/dt < 0.05 mmHg/min.

6.9 Doff Ear Plugs

6.10 Report to **MCC-H**, "Node 2 purge is complete."

**On MCC-H GO**, proceed to step 7.

7. [CONNECTING THE NODE 2/LAB O2 VESTIBULE JUMPER](#)

7.1 Release Node 2/Lab Vestibule Jumper from restraint to primary structure (Wire Ties or Velcro Straps).

**Table 1. O2 Recharge (Low Pressure) Jumper**

Jumper Name / Function	NOD2 Aft Blkhd	LAB Fwd Blkhd	Part Number	Input Torque	Output Torque	FFTD Gear Size (in.)	
				(in-lb)	(in-lb)	Drive Head	Reaction Head
Oxygen Recharge	Oxygen Recharging	A18	683-16347-37	38	185	0.875	0.625

NOTE

Refer to [{A.2.3 Mating/Demate of Gamah Fittings Using the FFTD}](#) (SODF: ISS IFM: REFERENCE: APPENDIX A: ISS IVA TOOLS) for details on Gamah Fittings.

7.2 Inspect jumper for damage to braided hose or gamah fittings. Report any damage to **MCC-H**.

- 7.2.1 Loosen LAB Gamah fitting feed-through cap (FFTD; 1/4" to 3/8" Adaptor; (10-50 in-lbs) Torque Wrench, 1/4" Drive).
- 7.2.2 Loosen jumper Gamah plug by hand.
- 7.2.3 Don Powder-Free Gloves.
- 7.2.4 Remove LAB Gamah fitting feed-through cap by hand. Stow cap in Ziplock bag.
- 7.2.5 Inspect LAB Gamah fitting feed-through for debris, damage. Report any damage to **MCC-H**.
- 7.2.6 If required, apply one drop of braycote to feed-through threads. Spread braycote around threads by hand.
- 7.2.7 Remove jumper Gamah plug by hand. Stow plug in Ziplock bag.
- 7.2.8 Inspect jumper Gamah fitting for debris, damage, or used seal.

Report any damage to **MCC-H**.

7.2.9 Jumper →|← feed-through hand tight.

7.2.10 Torque Gamah fitting to 38 in-lb per Table 1 (FFTD;  
1/4" to 3/8" Adaptor; (10-50 in-lbs) Torque Wrench,  
1/4" Drive).

8. CONFIGURING THE O2 RECHARGE LINE

8.1 Don new pair of Powder-Free Gloves.

A/L10A2 8.2 √O2 Recharge Line →|← ROOBA (TO: O2 Recharge Line) QD  
√Hard mate/open QD

8.3 Uncap QD011.  
Close ROOBA (TO: QD11 or Spare) QD.  
ROOBA (TO: QD11 or Spare) QD ←|→ SPARE QD.

Inspect both QDs for debris.

ROOBA (TO: QD11 or Spare) QD →|← QD011  
Hard mate/open QD.

Use cap from QD011 to cover SPARE QD.

8.4 Doff Gloves.

9. VERIFYING O2 SYSTEM PRESSURE INTEGRITY PART 1

ODS Vest  
GO2 Xfer  
Panel Floor 9.1 FLOW → OPEN

9.2 Wait 5 minutes.

PCS 9.3 Airlock: ECLSS: Oxygen System  
AL Oxygen System  
'Low Pressure'  
Verify Supply Press > 5515 kPa (800 psia).  
Verify PCA O2 Line Press: 689 to 930 kPa (100 to 135 psia).

'High Pressure'

Verify Supply Press > 4846 kPa (703 psia).  
Verify UIA Supply Press: 5343 to 6308 kPa (775 to 915 psia).

AL ECLSS  
'Equipment Lock'

Verify dP/dt < 0.05 mmHg/min.

10. PURGING O2 SYSTEM OF AIR

10.1 Airlock: ECLSS: Oxygen System

'AL PCA O2 Intro Valve'

**cmd** Open – (√Position – Open)

10.2 Lab: ECLSS: PCA: O2 Intro

'Lab PCA O2 Intro Valve'

**cmd** Open – (√Position – Open)

'Cabin Press'

Verify dP/dt > 0.05 mmHg/min

Wait 16 minutes

10.3 Airlock: ECLSS: Oxygen System

'AL PCA O2 Intro Valve'

**cmd** Close – (√Position – Close)

10.4 Lab: ECLSS: PCA: O2 Intro

'Lab PCA O2 Intro Valve'

**cmd** Close – (√Position – Close)

'Cabin Press'

Verify dP/dt < 0.05 mmHg/min

11. VERIFYING O2 SYSTEM PRESSURE INTEGRITY PART 2

11.1 Don new pair of Powder-Free Gloves.

A/L1A0

11.2 Remove cap from Relief Valve, A/L PHA port.  
Inspect for debris  
Relief Valve of PHA Bag #1 →|← A/L PHA port  
Quick Don Mask →|← Relief Valve

11.3 Don PHA Mask.

- PHA Mask
- 11.4 Mask O2 control → EMERGENCY
  - 11.5 Momentarily pull Mask away from face.  
√O2 flow
  - 11.6 Mask O2 control → NORMAL
  - 11.7 Doff Mask.
  - 11.8 Relief Valve of PHA Bag #1 ←|→ PHA port  
Depress Mask O2 control to bleed down line.  
Quick Don Mask ←|→ Relief Valve  
Install cap on Relief Valve, PHA port.  
Stow PHA Bag #1 in C-Lk.

- PCS
- 11.9 Airlock: ECLSS: Oxygen System  
AL Oxygen System  
 'O2 Hi Pressure Supply Valve'  
**cmd** Close – (√Actual Position – Closed)

12. [INSTALLING CLOSEOUT PANELS](#)

If required

- A/L1A2
- 12.1 Install A/L1A2 Closeout Panel, snug fasteners (Driver Handle 1/4" Drive; 5/32" Hex Head, 1/4" Drive).
  - 12.2 Install blue ESSS cover, snug fasteners.  
Cover installs deck aft of IV Hatch (Driver Handle 1/4" Drive; 5/32" Hex Head, 1/4" Drive).
- A/L10A2
- 12.3 Install A/L10A2 Closeout Panel, snug fasteners (Driver Handle 1/4" Drive; 5/32" Hex Head, 1/4" Drive).
  - 12.4 Stow tools and equipment.
  - 12.5 Notify **MCC-H**, "Prebreathe Using Shuttle O2 Setup complete."



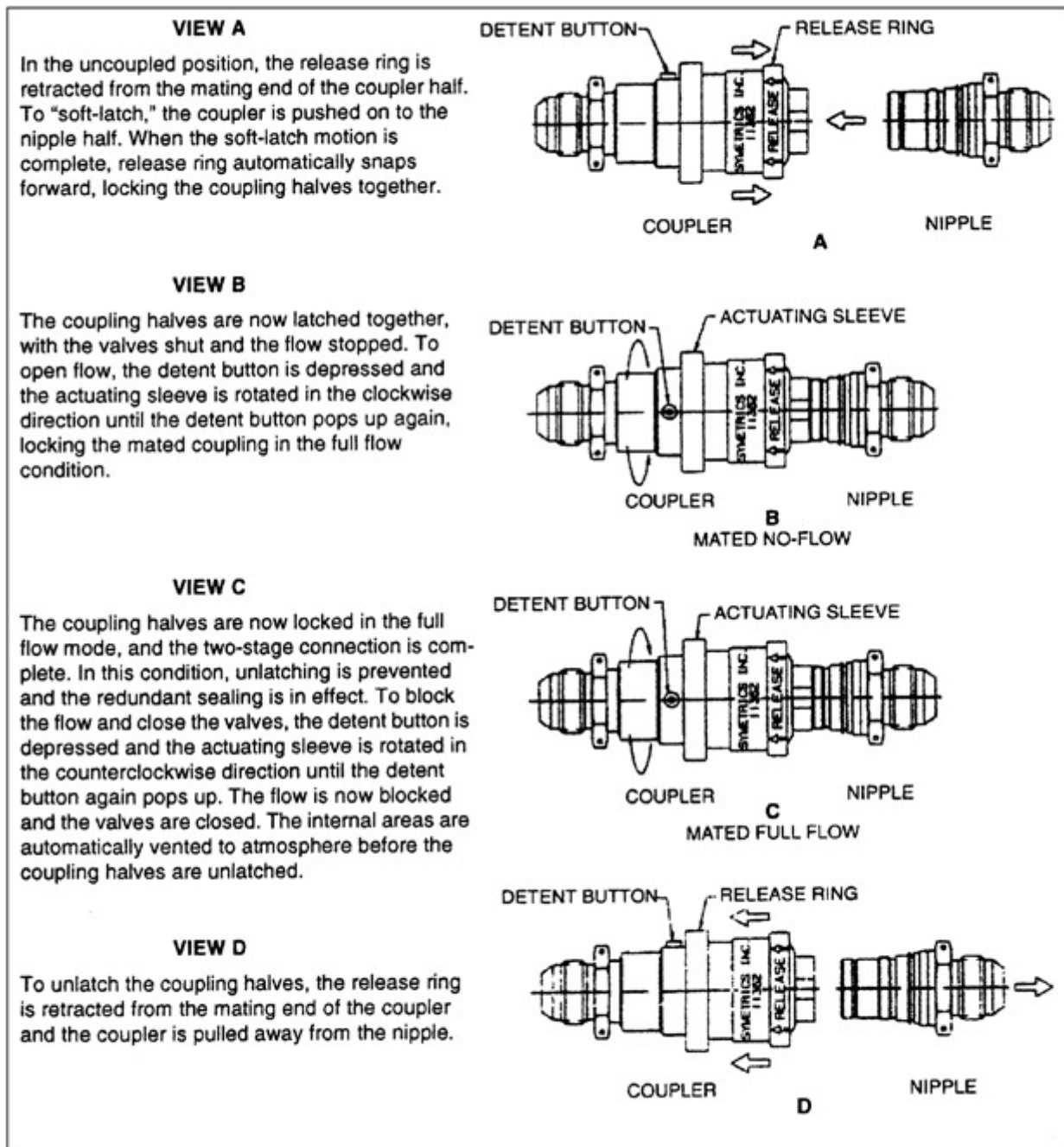


Figure 3. Two-Stage High-Pressure QDs.

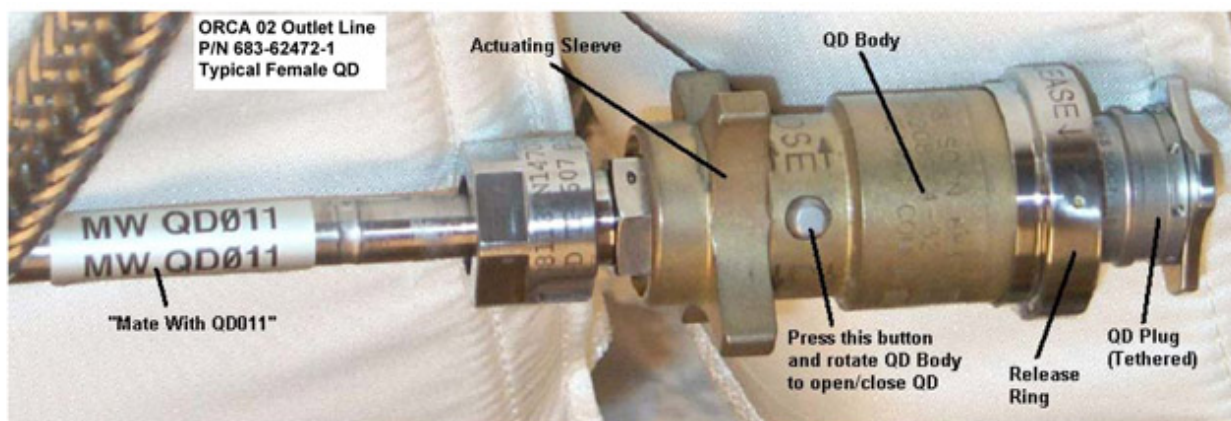


Figure 4. High-Pressure QD.

## NODE 2 PASSIVE ITCS LINE QD DISCONNECT

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 2 pages

### OBJECTIVE:

Disconnect the MTL and LTL Passive ITCS Lines from the Node 2 IATCS system in preparation for the connection of the Columbus Module IATCS lines in Node 2 Starboard Vestibule.

### LOCATION:

Node 2 Starboard Alcove (MTL)

Node 2 Deck Rack (LTL)

### DURATION:

1 hour

### PARTS:

TCS Plug (two) (P/N 683-16348-811)

TCS Cap (two) (P/N 683-16348-810)

### MATERIALS:

Tie Wraps

### TOOLS:

#### ISS IVA TOOL BOX

Drawer 2:

5/32" Hex, 1/4" Drive

Ratchet, 1/4" Drive

### REFERENCED PROCEDURE(S):

None

1. [ACCESS MTL QD - PANEL NOD2S0-11](#)
  - 1.1 Remove NOD2S0-11, 10 captive fasteners (5/32" Hex, 1/4" Drive, Ratchet, 1/4" Drive).
2. [DEMATE MTL QD](#)
  - 2.1 Node 2 MTL QD ←|→ Columbus MTL Passive Line QD
  - 2.2 Plug (P/N 683-16348-811) →|← Columbus MTL Passive Line QD  
Cap (P/N 683-16348-810) →|← Node 2 MTL QD
  - 2.3 Secure female QD to secondary structure (tiewraps)
3. [SECURE MTL QD - PANEL NOD2-S011](#)
  - 3.1 Install NOD2S0-11, 10 captive fasteners (5/32" Hex, 1/4" Drive, Ratchet, 1/4" Drive).
4. [ACCESS LTL QD - ROTATE NODE 2 DECK RACK](#)

4.1 Rotate Rack Down [{1.211 Node 2 Rack Rotate}](#), step 1 (SODF: STRUC AND MECH: 1. NOMINAL: 1.2 RACK)

5. [DEMATE LTL QD](#)

5.1 Node 2 MTL QD ←|→ Columbus LTL Passive Line QD

5.2 Plug (P/N 683-16348-811) →|← Columbus LTL Passive Line QD  
Cap (P/N 683-16348-810) →|← Node 2 MTL QD

5.3 Secure female QD to secondary structure (tiewraps)

6. [SECURING - LTL QD](#)

6.1 Rotate Rack Up [{1.211 Node 2 Rack Rotate}](#), step 2 (SODF: STRUC AND MECH: 1. NOMINAL: 1.2 RACK)

## NODE 2/COL VESTIBULE PRESSURIZATION AND LEAK CHECK

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 10 pages

### OBJECTIVE:

Utilize Internal Sampling Adapter (ISA), Vacuum Access Jumper (VAJ), Multimeter, and ISA Scopemeter Pressure Probe to pressurize and verify integrity of pressure in Node 2/COL vestibule to perform a gross and fine leak check of the Node 2/COL vestibule.

### INITIAL CONDITIONS:

Node 2 Stbd Hatch Closed.

Node 2 Stbd Aft (Fwd) IMV Valves Closed

A least 1 cabin total pressure sensor available.

### LOCATION:

Node 2 Starboard

### DURATION:

1 hour 55 minutes Total Crew Time

25 minutes for Multimeter, ISA, VAJ Setup

70 minutes for Equalization and Leak Check Wait Times

20 minutes for Leak Check Term, Multimeter, ISA, VAJ Teardown

### CREW:

One

### MATERIALS:

9V Alkaline Battery (if Battery changeout required)

Earplugs

### TOOLS:

Internal Sampling Adapter (ISA) P/N 97M55830-1

Vacuum Access Jumper-78-1 5ft P/N 683-17111-1

ISA Scopemeter Pressure Probe P/N 1525,760MMHGA/30PSIA

Digital Multimeter Kit: P/N 10118-10018-04

Multimeter

### ISS IVA Toolbox:

Drawer 3

#0 Phillips Screwdriver (if Battery changeout required)

## 1. SETTING UP ISA

### NOTE

ISA has two identical ISA VAJ Ports. To ensure proper ISA Scopemeter Pressure Probe accuracy verification, one ISA VAJ Port must be uncapped.

- 1.1 Gamah Cap ←|→ ISA VAJ Port  
√Gamah Cap →|← remaining ISA VAJ Port  
Hand tighten.

1.2 √ISA Scopemeter Pressure Probe →|← ISA


2. SETTING UP MULTIMETER

NOTE

Plug marked "COM" must be inserted in COM jack on Multimeter. ISA Scopemeter Pressure Probe slide switch will face toward Multimeter Rotary Switch.

2.1 ISA Scopemeter Pressure Probe V plug →|← VΩ jack (right side, red)  
 COM plug →|← COM jack

2.2 √ISA Scopemeter Pressure Probe – OFF

2.3 Rotary Switch ↻ 

2.4 Verify voltage reading > 100 mVDC (good ISA Scopemeter Pressure Probe Battery indication).

If voltage reading < 100 mVDC, ISA Scopemeter Pressure Probe Battery must be replaced.

9V Battery replaced by removing non-captive screw on back of probe (#0 Phillips Screwdriver).


2.5 ISA Scopemeter Pressure Probe → mmHgA

3. VERIFYING ISA SCOPEMETER PRESSURE PROBE ACCURACY

NOTE

ISA Scopemeter Pressure Probe outputs 1 mV per pressure unit measured. Example: 0.760 V = 760 mV = 760 mmHgA

Multimeter

3.1 Rotary Switch ↻ 

3.2 Record ISA Scopemeter Pressure Probe P<sub>1</sub>: \_\_\_\_\_ mmHg

PCS

3.3 US Lab: ECLSS

Lab: ECLSS

Record Cab Press P<sub>2</sub>: \_\_\_\_\_ mmHg

# NODE 2/COL VESTIBULE PRESSURIZATION AND LEAK CHECK

(ASSY OPS/1E/FIN/MULTI E)

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```
*****  
*      If  $\Delta P |P_2 - P_1| > 20$  mmHg  
*      |  
*      |      ISS  $\downarrow$  MCC-H, "ISA Scopemeter Pressure  
*      |      Probe inaccurate."  
*      |  
*      |       $\checkmark$ MCC-H for further instructions  
*      |  
*****
```

## 4. CONNECTING VAJ, ISA, POSITIVE PRESSURE RELIEF ASSEMBLY (PPRA)

Node 2  
Stbd Hatch

- 4.1  $\checkmark$ Node 2 Starboard PPRV Sample Port Valve – CLOSE  
Refer to Figure 3.
- 4.2 Gamah cap  $\leftrightarrow$  ISA Sampling Port  
ISA Sampling Port Valve  $\rightarrow$  CLOSED  
Refer to Figure 1.

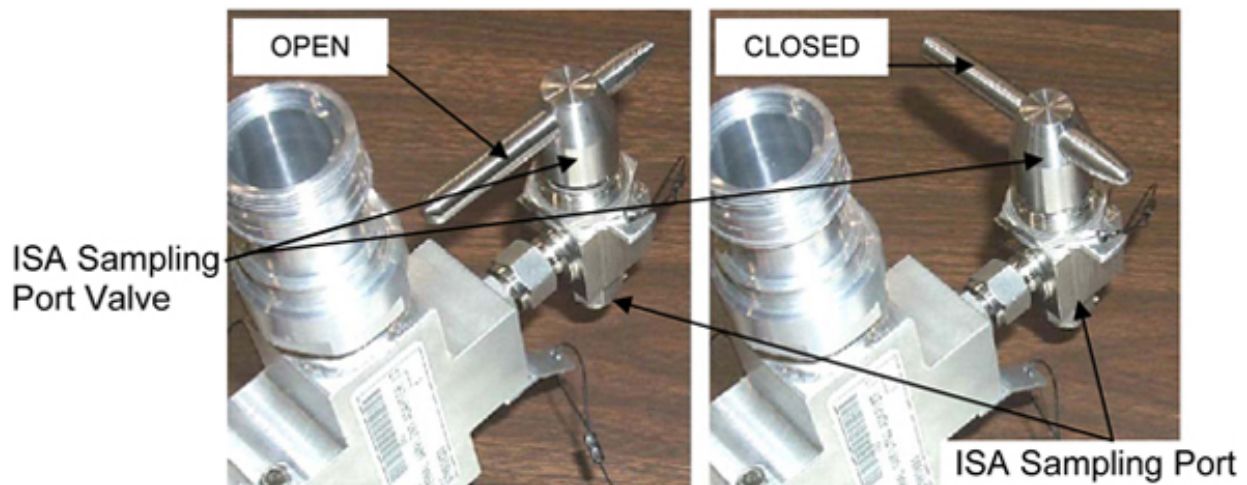


Figure 1. ISA Sampling Port Valve.

- 4.3 Gamah Cap  $\leftrightarrow$  VAJ-78-1 5ft (both ends)  
Inspect seals for any visible damage.  
  
Notify **MCC-H** if any damage noted to seals.
- 4.4 VAJ-78-1 5ft (straight end)  $\rightarrow$  $\leftarrow$  ISA VAJ Port  
Hand tighten.  
Refer to Figure 2.
- 4.5 Gamah cap  $\leftrightarrow$  Node 2 Starboard PPRV Sample Port  
VAJ-78-1 5ft (bent end)  $\rightarrow$  $\leftarrow$  Node 2 Starboard PPRV Sample Port  
Hand tighten.  
Refer to Figures 2 and 3.

**WARNING**

VAJ will move when pressurized or evacuated. Failure to secure ISA/VAJ Assembly may result in injury to crew or damage to equipment.

4.6 Secure ISA/VAJ Assembly.

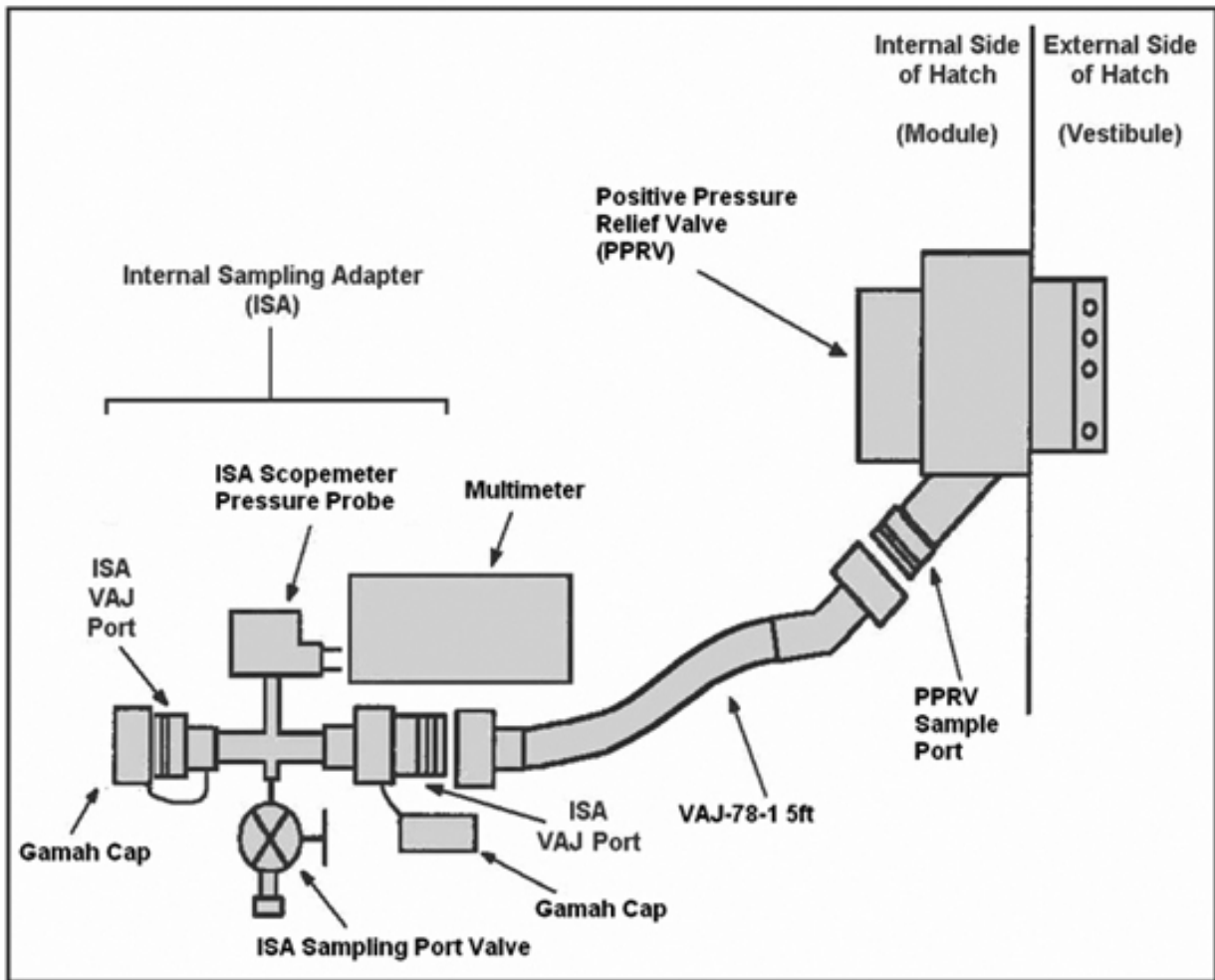


Figure 2. ISA/VAJ/PPRV/Multimeter Connection.



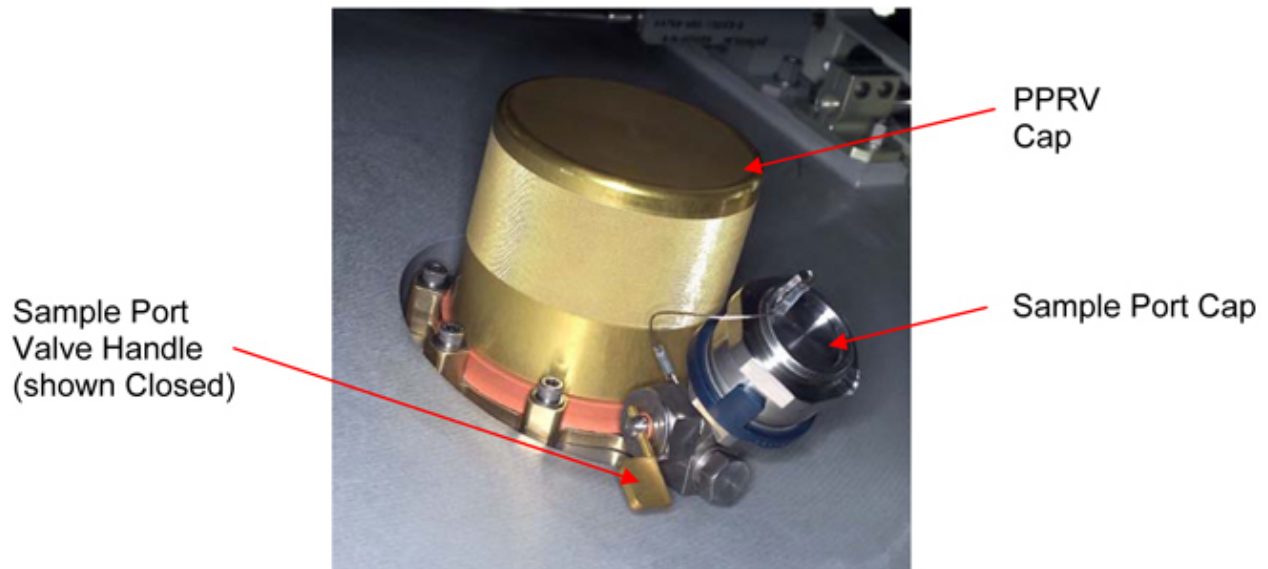


Figure 3. Hatch PPRV.

5. LEAK CHECKING ISA/VAJ CONNECTION

WARNING

Opening the PPRV Sample Port Valve will start the depressurization of the ISA/VAJ setup and may cause a loud hissing noise.

- |                      |  |
|----------------------|--|
|                      | <p>5.1 Don Earplugs.</p>   |
| Node 2<br>Stbd Hatch | <p>5.2 Node 2 Starboard PPRV Sample Port Valve → OPEN</p>  |
| Multimeter           | <p>5.3 Wait 5 minutes to depressurize ISA/VAJ setup.</p> <p>5.4 Rotary Switch ↻ <math>\overline{mV}</math></p> <p>5.5 Record ISA Scopemeter Pressure Probe <math>P_3</math>: _____<br/>                 mmHg<br/>                 Record GMT: _____ GMT</p> <p>5.6 Node 2 Starboard PPRV Sample Port Valve → CLOSE</p> <p>5.7 Wait 3 minutes for thermal stabilization.</p> <p>5.8 Record ISA Scopemeter Pressure Probe <math>P_4</math>: _____<br/>                 mmHg<br/>                 Record GMT: _____ GMT</p> <p>5.9 Wait 5 minutes for ISA/VAJ leak check.</p> |

# NODE 2/COL VESTIBULE PRESSURIZATION AND LEAK CHECK

(ASSY OPS/1E/FIN/MULTI E)

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- 5.10 Record ISA Scopemeter Pressure Probe  $P_5$ : \_\_\_\_\_  
mmHg  
Record GMT: \_\_\_\_\_ GMT

```
*****
*          If  $\Delta P | P_5 - P_4 | > 5$  mmHg during monitoring period
*          |
*          |          ISS  $\downarrow$  MCC-H, "Suspected ISA/VAJ leak."
*          |
*          |           $\surd$ MCC-H for further instructions
*          |
*****
```

## 6. PARTIALLY PRESSURIZING VESTIBULE

### WARNING

Opening the ISA Sampling Port Valve and Node 2 Starboard PPRV Sample Port Valve will equalize ISS with the ISA/VAJ and Vestibule and may cause a loud hissing noise. Crew in the vicinity should don Earplugs.

- 6.1 Don Earplugs.
- 6.2 Node 2 Starboard PPRV Sample Port Valve  $\rightarrow$  OPEN.

Node 2  
Stbd Hatch

### NOTE

1. To obtain accurate measurements, pressure readings should be taken only when ISA Sampling Port Valve is closed.
2. Pressure readings should be noted every 2 minutes, but do not need to be recorded or reported to **MCC-H**.
3. Vestibule should pressurize to 260 mmHgA in approximately 4 minutes.

- 6.3 ISA Sampling Port Valve  $\rightarrow$  OPEN  
Refer to Figure 1.
- 6.4 Wait 2 minutes to begin incremental pressurization of vestibule.
- 6.5 ISA Sampling Port Valve  $\rightarrow$  CLOSED  
Note ISA Scopemeter Pressure Probe reading.
- 6.6 Repeat steps 6.3 to 6.5 until ISA Scopemeter Pressure Probe P  $\sim$  260 mmHgA ( $\sim$ 4 minutes).
- 6.7  $\surd$ ISA Sampling Port Valve – CLOSED
- 6.8 Doff Ear Plugs.

# NODE 2/COL VESTIBULE PRESSURIZATION AND LEAK CHECK

(ASSY OPS/1E/FIN/MULTI E)

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## 7. PERFORMING GROSS LEAK CHECK OF VESTIBULE

7.1 Record ISA Scopemeter Pressure Probe  $P_6$ : \_\_\_\_\_  
mmHgA  
Record GMT: \_\_\_\_\_ GMT

7.2 Wait 10 minutes for thermal stabilization.

7.3 Record ISA Scopemeter Pressure Probe  $P_7$ : \_\_\_\_\_  
mmHgA  
Record GMT: \_\_\_\_\_ GMT

Notify **MCC-H** of pressure reading.

Node 2  
Stbd Hatch

7.4 Node 2 Starboard PPRV Sample Port Valve → CLOSE

7.5 Wait 30 minutes for vestibule gross leak check.

7.6 Node 2 Starboard PPRV Sample Port Valve → OPEN

7.7 Record ISA Scopemeter Pressure Probe  $P_8$ : \_\_\_\_\_  
mmHgA  
Record GMT: \_\_\_\_\_ GMT

Notify **MCC-H** of pressure reading.

7.8 Node 2 Starboard PPRV Sample Port Valve → CLOSE

```
*****  
*          If  $\Delta P$  |  $P_8 - P_7$  | > 5 mmHg during monitoring period  
*          |  
*          |          ISS ↓ MCC-H, "Suspected Vestibule leak."  
*          |  
*          |          √MCC-H for further instructions  
*          |  
*****
```

## 8. COMPLETING VESTIBULE PRESSURIZATION

### WARNING

Opening the ISA Sampling Port Valve and Node 2 Starboard PPRV Sample Port Valve will equalize ISS with the vestibule and may cause a loud hissing noise. Crew in the vicinity should don Ear Plugs.

8.1 Don Ear Plugs.

Multimeter

8.2 Rotary Switch ↶ 

## NODE 2/COL VESTIBULE PRESSURIZATION AND LEAK CHECK

(ASSY OPS/1E/FIN/MULTI E)


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- 8.3 ISA Sampling Port Valve → OPEN
- Node 2  
Stbd Hatch
- 8.4 Node 2 Starboard PPRV Sample Port Valve → OPEN
- PCS
- 8.5 US Lab: ECLSS  
Lab: ECLSS  
Monitor LAB Cab Press for 10 minutes
- If LAB Cab Press decreases by more than 10 mmHg
- ISA Sample Port Valve → CLOSED
  - Node 2 Starboard PPRV Sample Port Valve → CLOSE
- √MCC-H for instructions >>
- 8.6 When  $dP/dt \approx 0$ , proceed.
- 8.7 ISA Sampling Port Valve → CLOSED
- 8.8 Node 2 Starboard PPRV Sample Port Valve → CLOSE
- 8.9 Doff Ear Plugs.
9. [VESTIBULE FINE LEAK CHECK](#)
- Node 2  
Stbd Hatch
- 9.1 Node 2 Starboard PPRV Sample Port Valve → OPEN
- 9.2 Record ISA Scopemeter Pressure Probe  $P_9$ : \_\_\_\_\_  
mmHgA  
Record GMT: \_\_\_\_\_ GMT
- Notify MCC-H of pressure reading.
- 9.3 Node 2 Starboard PPRV Sample Port Valve → CLOSE
- 9.4 Wait 10 minutes for thermal stabilization.
- Node 2 Starboard PPRV Sample Port Valve → OPEN
- 9.5 Record ISA Scopemeter Pressure Probe  $P_{10}$ : \_\_\_\_\_  
mmHgA  
Record GMT: \_\_\_\_\_ GMT
- Notify MCC-H of pressure reading.
- Node 2 Starboard PPRV Sample Port Valve → CLOSE
- 9.6 ISA Scopemeter Pressure Probe → OFF

# NODE 2/COL VESTIBULE PRESSURIZATION AND LEAK CHECK

(ASSY OPS/1E/FIN/MULTI E)

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- Multimeter
- 9.7 Rotary Switch ↻ OFF
  - 9.8 Wait 8 hours.
  - 9.9 Rotary Switch ↻ 
  - 9.10 ISA Scopemeter Pressure Probe → mmHgA
  - 9.11 Node 2 Starboard PPRV Sample Port Valve → OPEN
  - 9.12 Record ISA Scopemeter Pressure Probe  $P_{11}$ :  
\_\_\_\_\_ mmHgA  
Record GMT: \_\_\_\_\_ GMT
  - Notify **MCC-H** of pressure reading.
  - 9.13 Node 2 Starboard PPRV Sample Port Valve → CLOSE

```
*****
*      If  $\Delta P | P_{11} - P_{10} | > 20$  mmHg during monitoring period
*      |
*      |      ISS ↓ MCC-H, "Suspected Vestibule fine
*      |      leak."
*      |
*      |      √MCC-H for further instructions
*      |
*****
```

## 10. DISASSEMBLING AND STOWING EQUIPMENT

- Multimeter
- 10.1 ISA Scopemeter Pressure Probe → OFF
  - 10.2 Rotary Switch ↻ OFF
  - 10.3 Multimeter ←|→ ISA Scopemeter Pressure Probe
  - 10.4 VAJ-78-1 5ft (bent end) ←|→ Node 2 Starboard PPRV Sample Port  
Gamah cap →|← Node 2 Starboard PPRV Sample Port  
Gamah Cap →|← VAJ-78-1 5ft (bent end)  
Hand tighten.
  - 10.5 VAJ-78-1 5ft (straight end) ←|→ ISA VAJ Port  
Gamah Cap →|← VAJ-78-1 5ft (straight end)  
Hand tighten.  
  
Gamah Cap →|← ISA VAJ Port  
Hand tighten.
  - 10.6 ISA Sampling Port Valve → OPEN

Cap →|← ISA Sampling Port  
Refer to Figure 1.

- 10.7 Check for FOD within 1m radius.
- 10.8 ISS ↓ **MCC-H**, "Vestibule pressurization and leak check completed."
- 10.9 Stow tools and materials.  
Update IMS with stowage location of hardware
- 10.10 Open Node 2 Starboard Hatch per decal.

# NODE 2 PREP FOR COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 15 pages

## OBJECTIVE:

Prepare Node 2 for utility connectors required to powerup and activate the Columbus module.

### NOTE

Do not plug portable fan into Node 2 UOP 3. UOP 3 will be powered down later in this procedure.

1. [INSTALL AND ACTIVATE PORTABLE FAN \(IF REQUIRED\)](#)  
Perform [{2.511 PFA SETUP FOR VENTILATION}](#), steps 1 and 2 (SODF: ECLSS: NOMINAL: THC)
2. [POWER DOWN EQUIPMENT ON DDCU N2D4B AND N2D1B](#)

### NOTE

1. Inhibit RT FDIR to RTs that will lose power, but will still be monitored during the powerdown (i.e., RPCMs).
2. Expect multiple loss of comm messages when DDCU converters are powered off.

PCS

#### 2.1 [Inhibit Node 2 MTL SFCA Closed Loop Control](#)

Node 2: TCS: MTL SFCA

[Node2 MTL SFCA Commands](#)

'Commands'

'MTL SFCA'

**cmd** CLC – Inh

Verify CLC – Inh

#### 2.2 [Verify Node 2 MT Loop PPA Inlet Pressure](#)

Node 2: TCS

'PPA'

Verify Pump in Press: 166 to 193 kPa

#### 2.3 [Inhibit RPCM N21B4B-B RT FDIR and RT I/O](#)

CDH Summary: Primary Int

[Primary Int MDM](#)

sel LB SEPS N2-14

sel RT Status

[LB SEPS N2 14 RT Status](#)

**cmd** 09 RPCM\_N21B4B\_B RT FDIR Status – Inhibit FDIR  
**Execute** (Verify – Inh)

**cmd 09** RPCM\_N21B4B\_B RT Status – Inhibit **Execute** (Verify – Inh)

2.4 [Inhibit RPCM N21B4B-A RT FDIR](#)

CDH Summary: Primary PMCU

MDM Primary PMCU

sel LB EPS N2 14

sel RT Status

LB EPS N2 14 RT Status

**cmd 13** RPCM\_N21B4B\_A RT FDIR Status – Inhibit FDIR **Execute** (Verify – Inh)

2.5 [Inhibit DDCU N2D1B RT FDIR](#)

CDH Summary: Primary PMCU: LB EPS N2 14: RT Status

**cmd 24** DDCU N2D1B RT FDIR Status – Inhibit FDIR **Execute** (Verify – Inh)

2.6 [Inhibit DDCU N2D4B RT FDIR](#)

CDH Summary: Primary PMCU: LB EPS N2 14: RT Status

**cmd 25** DDCU N2D4B RT FDIR Status – Inhibit FDIR **Execute** (Verify – Inh)

**On MCC-H GO**

3. [POWER DOWN DDCU N2D4B AND N2D1B](#)

3.1 Verify starboard CBM Operations must be complete prior to deactivating DDCUs.

3.2 [Deactivate DDCU N2D4B](#)

**NOTE**

DDCU N2D4B Output Voltage will read 124V until DDCU N2D1B converter is turned off.

Task: Node 2 COL Reconfig: DDCU N2D4B

sel Converter

DDCU N2D4B Converter

'Converter Off'

**cmd Arm**

**cmd Off**



'Power Share Ratio, %'

√DDCU N2D4B = 0

√DDCU N2D1B = 100

OR

'Power Share Ratio, %'

√DDCU N2D4B = 0

√DDCU N2D1B = 0

3.3 [Deactivate DDCU N2D1B](#)

Task: Node 2 COL Reconfig: DDCU N2D1B

sel Converter

DDCU N2D1B Converter

'Converter Off'

cmd Arm

cmd Off

√Output Voltage < 12.8 V

4. [UNPOWER DDCU N2D4B AND N2D1B](#)

NOTE

Expect DDCU Loss of Comm Caution messages when RBIs are opened.

4.1 [Unpower DDCU N2D4B](#)

Task: Node 2 COL Reconfig: MBSU 4 RBI 10

MBSU 4 RBI 10

cmd Open

√Cmdded Position – Op

√MBSU 4 RBI 10 Voltage: -5 to 5 V

Task: Node 2 COL Reconfig

'DDCU N2D4B'

Verify Integration Counter – <not incrementing>

4.2 [Unpower DDCU N2D1B](#)

Task: Node 2 COL Reconfig: MBSU 1 RBI 11

MBSU 1 RBI 11

**cmd** Open

√Cmded Position – Op

√MBSU 1 RBI 11 Voltage: -5 to 5 V

Task: Node 2 COL Reconfig

Node2 - COL Reconfiguration

'DDCU N2D1B'

Verify Integration Counter – <not incrementing>

5. [DEACTIVATE ECLSS EQUIPMENT FOR PORT DDCU POWERDOWNS](#)

5.1 Ensure that at least one of the Shuttle Booster Fans be running to ensure proper IMV exchange between the Shuttle and ISS due to the Node 2 Fwd Stbd IMV Fan being deactivated.

5.2 [Shutdown Node 2 Fwd Stbd IMV Fan](#)

Node 2: ECLSS: IMV Fwd Stbd Fan

Node 2 IMV Fwd Stbd Fan

'State'

'Off'

**cmd** Arm (Verify Status – Arm)

**cmd** Off

Verify State – Off

Verify Speed: 7164 ± 3 RPM

5.3 [Disable Node 2 Fwd Stbd IMV](#)

Node 2: ECLSS: IMV Fwd Stbd Valve

Node 2 IMV Fwd Stbd Vlv

'State'

'Inhibit'

**cmd** Arm (Verify Status – Arm)

**cmd** Inhibit (Verify State – Inhibited)

- 5.4 [Disable Node 2 Aft Port IMV](#)  
Node 2: ECLSS: IMV Aft Port Valve  
Node 2 IMV Aft Port Vlv  
'State'  
'Inhibit'

**cmd** Arm (Verify Status – Arm)

**cmd** Inhibit (Verify State – Inhibited)

NOTE

There will be no smoke detection capability in Node 2 with the CCAA powered down. The crew is the primary method of fire detection.

- 5.5 [Deactivate Node 2 CCAA](#)  
Node 2: ECLSS: Node 2 CCAA: CCAA Commands  
Node 2 CCAA Commands

**cmd** Stop

Verify State – EIB Off

Verify Command Status – Stop Complete

sel Node 2 CCAA

Node 2 CCAA

'Water Separator'

Verify Speed: 4964 RPM

'Fan'

Verify Speed: 2000 RPM

- 5.6 [Inhibiting Node 2 Cabin Smoke Detector 1](#)  
Node 2: ECLSS: SD 1  
'Monitoring'

**cmd** Monitoring – Inhibit (Verify – Inhibited)

- 5.7 [Deactivate Node 2 Cabin Smoke Detector 2](#)  
Node 2: ECLSS: SD 2  
'Monitoring'

**cmd** Monitoring – Inhibit (Verify – Inhibited)

sel RPCM N22A3B C RPC 01

√Open Cmd – Ena

**cmd** RPC Position – Open (Verify – Op)

6. [POWERDOWN ECLSS EQUIPMENT FOR PORT DDCU  
POWERDOWNS](#)

6.1 If pressed for time, steps 6.2 through 6.7 can be skipped.

6.2 [Unpower Node 2 Fwd Stbd IMV Fan](#)

Node 2: ECLSS: IMV Fwd Stbd Fan: RPCM N22A3B A RPC  
11

√Open Cmd – Ena

**cmd** RPC Position – Open (Verify – Op)

6.3 [Unpower Node 2 Fwd Stbd IMV Valve](#)

Node 2: ECLSS: IMV Fwd Stbd Valve: RPCM N22A3B C RPC  
03

√Open Cmd – Ena

**cmd** RPC Position – Open (Verify – Op)

6.4 [Unpower Node 2 Aft Port IMV Valve](#)

Node 2: ECLSS: IMV Aft Port Valve: RPCM N22A3B C RPC  
04

√Open Cmd – Ena

**cmd** RPC Position – Open (Verify – Op)

6.5 [Unpower Node 2 CCAA](#)

Node 2: ECLSS: CCAA: CCAA Commands: RPCM N22A3B C  
RPC 13

√Open Cmd – Ena

**cmd** RPC Position – Open (Verify – Op)

## NODE 2 PREP FOR COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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Node 2: ECLSS: CCAA: CCAA Commands: RPCM N22A3B C  
RPC 14

RPCM N22A3B C RPC 14

√Open Cmd – Ena

**cmd** RPC Position – Open (Verify – Op)

Node 2: ECLSS: CCAA: CCAA Commands: RPCM N22A3B C  
RPC 15

RPCM N22A3B C RPC 15

√Open Cmd – Ena

**cmd** RPC Position – Open (Verify – Op)

Node 2: ECLSS: CCAA: CCAA Commands: RPCM N22A3B C  
RPC 17

RPCM N22A3B C RPC 17

√Open Cmd – Ena

**cmd** RPC Position – Open (Verify – Op)

C&W Summ

Caution & Warning Summary

'Event Code Tools'

sel Inhibit

Inhibit an Event

input Event Code – 1 5 0 7 (SDS Aft Vlv Failed – Node 2)

**cmd** Arm

**cmd** Execute

### 7. [CONFIGURE TCS EQUIPMENT FOR PORT DDCU POWERDOWNS](#)

#### 7.1 [Inhibit LTL NIA Auto Repress Function](#)

Node 2: TCS: LTL PPA: Node2 LTL NIA Commands

Node2 LTL NIA Commands

**cmd** LTL NIA State – Inh

Verify LTL NIA State – Inh

7.2 [Inhibit Node 2 LTL Load Shed Function](#)

Node 2: TCS: Thermal Load Reduction

Node2 Thermal Load Reduction

'Auto Thermal Load Shed'

**cmd** Inhibit – Arm (Verify – √)

**cmd** Inhibit – Inh

Verify Auto Thermal Load Shed – Inh

7.3 [Shutdown Node 2 LTL](#)

**NOTE**

Expect **Caution 'Thermal Safing Node 2 LTL Load Shed Timer Started-Node2'** 12288 followed 5 minutes later by **Caution 'Thermal Safing Node 2 Load Shed Inhibited- Node2'** 12293. No further action required.

Node 2: TCS: LTL Software

Node2 LTL Software Commands

'LTL IATCS'

**cmd** Shutdown – Arm (Verify – X)

**cmd** Shutdown – Shutdown

Verify IATCS Status – Idle

Node 2: TCS: IATCS Details

IATCS Details

'TWMV Software'

Verify LTL CLC – Inh

'Regen TWMV Software'

Verify LTL CLC – Inh

'SFCA Software'

Verify LTL Mod Vlv CLC – Inh

'PPA Software'

Verify LTL – Shutdown

Node 2: TCS

'PPA'

Verify Pmp Spd < 54 rpm

7.4 [Inhibit RT FDIR and RT I/O for LTL PPA](#)

CDH Summary: Primary Int MDM: LB SYS N2-2: RT Status

**cmd 09 PPA N2-2 RT FDIR Status – Inhibit FDIR Execute**  
(Verify – Inh)

**cmd 09 PPA N2-2 RT Status – Inhibit Execute** (Verify – Inh)

8. [CONFIGURE NODE 2-2 MDM FOR POWERDOWN](#)

8.1 [Inhibit N2 MDM RT FDIR](#)

CDH: Primary INT

Verify Frame Count – incrementing

Verify Processing State – Operational

sel LB SYS N2 2

sel RT Status

**cmd 24 MDM N2-2 RT FDIR Status – Inhibit FDIR Execute**  
(Verify – Inh)

8.2 [Inhibit Node 2 MDM RT on Primary INT MDM](#)

CDH: Primary INT

sel LB SYS N2 2

sel RT Status

**cmd 24 MDM N2 2 RT Status – Inhibit Execute** (Verify – Inh)

8.3 [Unpower N2-2 MDM SDO Card](#)

Node 2: EPS: RPCM N22A3A B: RPC 2

√Open Cmd – Ena

**cmd RPC Position – Open** (Verify – Op)

Node 2: EPS: RPCM N22A3A B: RPC 4

RPCM N22A3A B RPC 04

√Open Cmd – Ena

cmd RPC Position – Open (Verify – Op)

8.4 [Unpower N2-2 MDM](#)

Node 2: EPS: RPCM N22A3A B: RPC 1

RPCM N22A3A B RPC 01

√Open Cmd – Ena

cmd RPC Position – Open (Verify – Op)

9. [CONFIGURE NODE 2 EPS FOR PORT DDCU POWERDOWNS](#)

NOTE

1. Inhibit RT FDIR to RTs that will lose power, but will still be monitored during the powerdown (i.e., RPCMs).
2. Expect multiple loss of comm messages when DDCU converters are powered off.

9.1 [Deactivate Loads on Node 2 UOP3 \(if required\)](#)

TBD: shutdown all equipment on N2 UOP3, check PiP

9.2 [Unpower Node 2 UOP3 \(if required\)](#)

Node 2: EPS: UOPs

Node2 UOPs

cmd UOP 3 NOD2PD4 – Open (Verify – Op)

9.3 [Inhibit RPCM N22A3A B RT FDIR and RT I/O](#)

CDH Summary: Primary Int

Primary Int MDM

sel LB SEPS N2-23

sel RT Status

CDH Summary: Primary Int: LB SEPS N2-23: RT Status

LB SEPS N2 23 RT Status

cmd 09 RPCM\_N22A3A\_B RT FDIR Status – Inhibit FDIR  
**Execute** (Verify – Inh)

cmd 09 RPCM\_N22A3A\_B RT Status – Inhibit **Execute** (Verify – Inh)



9.4 [Inhibit RPCM N22A3A C RT FDIR](#)

LB EPS N2 23 RT Status

**cmd 11** RPCM\_N22A3A\_C RT FDIR Status – Inhibit FDIR  
**Execute** (Verify – Inh)

9.5 [Inhibit RPCM N22A3A A RT FDIR](#)

CDH Summary: Primary PMCU: LB EPS N2 23: RT Status

LB EPS N2 23 RT Status

**cmd 13** RPCM\_N22A3A\_A RT FDIR Status – Inhibit FDIR  
**Execute** (Verify – Inh)

9.6 [Inhibit Primary PMCU MDM RT FDIR for Port DDCUs](#)

CDH Summary: Primary PMCU: LB EPS N2 23: RT Status

LB EPS N2 23 RT Status

**cmd 24** DDCU N2P2A RT FDIR Status – Inhibit FDIR **Execute**  
 (Verify – Inh)

**cmd 25** DDCU N2P3A RT FDIR Status – Inhibit FDIR **Execute**  
 (Verify – Inh)

10. [POWER DOWN C&T EQUIPMENT FOR PORT DDCU POWERDOWNS](#)

10.1 [Deactivate Node 2 ATU 2](#)

C&T

CNT Group Overview

NOTE

ISS C&W and Voice Communication in Node 2 is now only available from Node 2 ATU 1 (Starboard).

sel Node 2 ATU 2

Node 2 ATU 2

'Configuration'

**cmd** State – Standby (Verify – Standby)

Verify which IAC is Active and Powered on.  
 Use the commands for the Active and Powered IAC.

**cmd** Bus I/O – Inhibit (Verify – Inhibit)

Node 2 ATU 2

sel RPCM N22A3A A RPC 02

RPCM N22A3A A RPC 02

cmd RPC Position – Open (Verify – Op)

10.2 [Deactivate ABC 4](#)

C&T

CNT Group Overview

sel ABC 4

ABC 4

Verify which IAC is Active and Powered on.  
Use the commands for the Active and Powered IAC.

cmd Bus I/O – Inhibit (Verify – Inhibit)

sel RPCM N22A3A A RPC 01

RPCM N22A3A A RPC 01

cmd RPC Position – Open (Verify – Op)

11. [POWER DOWN DDCU N2P2A AND N2P3A](#)

NOTE

DDCU N2P2A Output Voltage will read 124V until DDCU N2P3A converter is turned off.

11.1 [Deactivate DDCU N2P2A](#)

Task: Node 2 COL Reconfig: DDCU N2P2A

sel Converter

DDCU N2P2A Converter

'Converter Off'

cmd Arm

cmd Off

'Power Share Ratio, %'

√DDCU N2P2A = 0

√DDCU N2P3A = 100

OR

'Power Share Ratio, %'

√DDCU N2P2A = 0

√DDCU N2P3A = 0

11.2 [Deactivate DDCU N2P3A](#)

Task: Node 2 COL Reconfig: DDCU N2P3A

sel Converter

DDCU N2P3A Converter

'Converter Off'

cmd Arm

cmd Off

√Output Voltage < 12.8V

12. [UNPOWER DDCU N2P2A AND N2P3A](#)

**NOTE**

Expect DDCU Loss of Comm Caution messages when RBIs are opened.

12.1 [Unpower DDCU N2P2A](#)

Task: Node 2 COL Reconfig: MBSU 2 RBI 3

MBSU 2 RBI 3

cmd Open

√Cmdded Position – Op

√MBSU 2 RBI 3 Voltage = -5 to 5 V

Task: Node 2 COL Reconfig

'DDCU N2P2A'

Verify Integration Counter – <not incrementing>

12.2 [Unpower DDCU N2P3A](#)

Task: Node 2 COL Reconfig: MBSU 3 RBI 3

MBSU 3 RBI 3

cmd Open

√Cmdded Position – Op

√MBSU 3 RBI 3 Voltage: -5 to 5 V

Task: Node 2 COL Reconfig  
'DDCU N2P3A'

Verify Integration Counter – <not incrementing>

13. [1553 BUS SAFING STEPS](#)

13.1 [Disable BC Comm Fail FDIR](#)

CDH: Primary C&C: Recovery Retry: CCS MDM

**cmd** BC Comm Fail – Inhibit **Execute** (Verify – Inh)

13.2 [Select Channel A for 1553 Bus and Inh Auto Ch Switching](#)

CDH: Primary C&C

sel CB Int 1

sel Bus Status

√Channel Selected – A

**cmd** Auto Channel Switch Status – Inhibit **Execute** (Verify – Inh)

CDH: Primary C&C

sel CB Int 2

sel Bus Status

√Channel Selected – A

**cmd** Auto Channel Switch Status – Inhibit **Execute** (Verify – Inh)

## NODE 2 PREP FOR COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

Page 15 of 15 pages

CDH: Primary PL

sel LB CheCS COL

sel Bus Status

√Channel Selected – A

**cmd** Auto Channel Switch Status – Inhibit **Execute** (Verify – Inh)

sel LB PL COL

sel Bus Status

√Channel Selected – A

**cmd** Auto Channel Switch Status – Inhibit **Execute** (Verify – Inh)

14. [GO FOR COLUMBUS UTILITY CONNECTIONS](#)

Inform IV crew all inhibits in place, give "Go for Node 2 to Columbus Utility Connectors."

[{COLUMBUS VESTIBULE OUTFITTING}](#), steps 5 thru all (SODF: ASSY OPS: ACTIVATION AND CHECKOUT)

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**Parameters 1. Table1**

RPCM [X]	RPC [Y]	Load
[X]	[Y]	Load
N22B3A_B	3	N2 Three Way Valve REG HX Pwr
N22A3A_B	16	N2 Three Way Valve CTB Pwr
N22A3A_B	17	N2 LTL PPA Pwr

**Parameters 2. Table2**

Rack	[X] DDCU
Rack	[X]
Port	N2P3A
Port	N2P2A
Ovhd	N2O2B
Ovhd	N2O3A

OBJECTIVE:

Recover Node 2 after utility connections required to powerup and activate the Columbus module are mated.

INITIAL CONDITIONS:

1. Node 2 DDCUs are deactivated.
2. Node 2 to Columbus power connectors mates are complete.

**On MCC-H "GO"**

1. [POWER UP DDCU N2P2A AND N2P3A](#)

1.1 [Power DDCU N2P2A](#)

Task: Node2 - Columbus Reconfig: MBSU 2 RBI 3

**cmd** Close Arm

**cmd** Close

√cmded Position – CI

Task: Node2 - Columbus Reconfig: DDCU N2P2A

√Integration Counter – incrementing

√Input Voltage: 119.2 to 168.8 V

sel Firmware

DDCU N2P2A Firmware

'Clear Commands'

If Power on Reset – X

**cmd** Common Clear

√Power On Reset – blank

1.2 [Power DDCU N2P3A](#)

Task: Node2 – Columbus Reconfig: MBSU 3 RBI 3

MBSU 3 RBI 3

**cmd** Close Arm

**cmd** Close

√cmded Position – CI

Task: Node2 – Columbus Reconfig: DDCU N2P3A

DDCU N2P3A

√Integration Counter – incrementing

√Input Voltage: 119.2 to 168.8 V

sel Firmware

DDCU N2P3A Firmware

'Clear Commands'

If Power on Reset – X

**cmd** Common Clear

√Power On Reset – blank

2. [ACTIVATE DDCU N2P2A AND N2P3A](#)

2.1 [Activate DDCU N2P2A](#)

Task: Node2 – Columbus Reconfig: DDCU N2P2A

sel Converter

DDCU N2P2A Converter

**cmd** Converter On – Arm

**cmd** Converter On – On

DDCU N2P2A



- √Input Current: -4 to 4 A
- √Out Current: -4 to 4 A
- √Output Voltage: 123.0 to 126.0 V
- √Converter Temp < 43.8° C
- √Power Supply Temp < 49.5° C
- √Baseplate Temp < 40.3° C

2.2 [Activate DDCU N2P3A](#)

Task: Node2 - Columbus Reconfig: DDCU N2P3A

sel Converter

DDCU N2P3A Converter

**cmd** Converter On – Arm

**cmd** Converter On – On

DDCU N2P3A

- √Input Current: -4 to 4 A
- √Output Current: -4 to 4 A
- √Output Voltage: 123.0 to 126.0 V
- √Converter Temp < 43.8° C
- √Power Supply Temp < 49.5° C
- √Baseplate Temp < 40.3° C

3. [POWER UP DDCU N2D4B AND N2D1B](#)

3.1 [Power DDCU N2D4B](#)

Task: Node2 - Columbus Reconfig: MBSU 4 RBI 10

MBSU 4 RBI 10

**cmd** Close Arm

**cmd** Close

√cmded Position – CI

Task: Node2 - Columbus Reconfig: DDCU N2D4B

DDCU N2D4B

- √Integration Counter – incrementing
- √Input Voltage: 119.2 to 168.8 V

sel Firmware

DDCU N2D4B Firmware

'Clear Commands'

If Power on Reset – X

**cmd** Common Clear

√Power On Reset – blank

3.2 [Power DDCU N2D1B](#)

Task: Node2 – Columbus Reconfig: MBSU 1 RBI 11

MBSU 1 RBI 11

**cmd** Close Arm

**cmd** Close

√cmded Position – CI

Task: Node2 – Columbus Reconfig: DDCU N2D1B

DDCU N2D1B

√Integration Counter – incrementing

√Input Voltage: 119.2 to 168.8 V

sel Firmware

DDCU N2D1B Firmware

'Clear Commands'

If Power on Reset – X

**cmd** Common Clear

√Power On Reset – blank

4. [ACTIVATE DDCU N2D4B AND N2D1B](#)

4.1 [Activate DDCU N2D4B](#)

Task: Node2 – Columbus Reconfig: DDCU N2D4B

sel Converter

DDCU N2D4B Converter

**cmd** Converter On – Arm

**cmd** Converter On – On

DDCU N2D4B

- √Input Current: -4 to 4 A
- √Output Current: -4 to 4 A
- √Output Voltage: 123.0 to 126.0 V
- √Converter Temp < 43.8° C
- √Power Supply Temp < 49.5° C
- √Baseplate Temp < 40.3° C

4.2 [Activate DDCU N2D1B](#)

Task: Node2 – Columbus Reconfig: DDCU N2D1B

sel Converter

DDCU N2D1B Converter

**cmd** Converter On – Arm

**cmd** Converter On – On

DDCU N2D1B

- √Input Current: -4 to 4 A
- √Output Current: -4 to 4 A
- √Output Voltage: 123.0 to 126.0 V
- √Converter Temp < 43.8° C
- √Power Supply Temp < 49.5° C
- √Baseplate Temp < 40.3° C

5. [ENABLE RT FDIR AND RT I/O FOR PORT AND DECK DDCUS](#)

5.1 [Enable RT FDIRs on LB EPS N2 14](#)

CDH Summary: Primary PMCU: LB EPS N2 14: RT Status

**cmd** 24 DDCU N2D1B RT FDIR Status – Enable FDIR **Execute** (Verify – Ena)

**cmd** 25 DDCU N2D4B RT FDIR Status – Enable FDIR **Execute** (Verify – Ena)

**cmd** 13 RPCM N21B4B\_A RT FDIR Status – Enable FDIR **Execute** (Verify – Ena)

5.2 [Enable RT FDIRs on LB EPS N2 23](#)

CDH Summary: Primary PMCU: LB EPS N2 23: RT Status

LB EPS N2 23 RT Status

**cmd** 24 DDCU N2P2A RT FDIR Status – Enable FDIR **Execute** (Verify – Ena)

**cmd** 25 DDCU N2P3A RT FDIR Status – Enable FDIR **Execute** (Verify – Ena)

**cmd 11** RPCM N22A3A\_C RT FDIR Status – Enable FDIR **Execute**  
(Verify – Ena)

**cmd 13** RPCM N22A3A\_A RT FDIR Status – Enable FDIR **Execute**  
(Verify – Ena)

**cmd 9** RPCM N22A3A\_B RT FDIR Status – Enable FDIR **Execute**  
(Verify – Ena)

5.3 [Enable RT I/O AND RT FDIRs on LB SEPS N2 14](#)

CDH Summary: Primary INT: LB SEPS N2 14: RT Status

LB SEPS N2 14 RT Status

**cmd 09** RPCM N21B4B\_B RT Status – Enable **Execute** (Verify – Ena)

**cmd 09** RPCM N21B4B\_B RT FDIR Status – Enable FDIR **Execute**  
(Verify – Ena)

5.4 [Enable RT I/O AND RT FDIRs on LB SEPS N2 23](#)

CDH Summary: Primary INT: LB SEPS N2 23: RT Status

LB SEPS N2 23 RT Status

**cmd 09** RPCM N22A3A\_B RT Status – Enable **Execute** (Verify – Ena)

**cmd 09** RPCM N22A3A\_B RT FDIR Status – Enable FDIR **Execute**  
(Verify – Ena)

6. [ACTIVATE AND CHECKOUT N2-2 MDM](#)

6.1 [Verify Primary Int MDM Status](#)

CDH Summary: Primary Int

Verify Frame Count – Incrementing

Verify Processing State – Operational

6.2 [Verify RT FDIR for N2-2 MDM is Inhibited](#)

CDH Summary: Primary Int: LB SYS N2 2: RT Status

√24 MDM N2-2 RT FDIR Status – Inh

6.3 [Power On N2-2 MDM](#)

CDH Summary: N2-2 MDM

'RPCM N22A3A-B'

sel RPC 01

√Close Cmd – Ena

**cmd** RPC Position – Close (Verify – Cl)

Wait up to 5 minutes for MDM to go through bootup and POST

6.4 [Enable RT for N2-2 MDM](#)

CDH Summary: Primary Int: LB SYS N2 2: RT Status

LB SYS N2 2 RT Status

cmd 24 MDM N2-2 RT Status – Enable **Execute** (Verify – Ena)

6.5 [Verify N2-2 MDM Status in Operational State](#)

CDH Summary: N2-2 MDM

N2-2 MDM

Verify Frame Count – Incrementing  
Verify Processing State – Operational

'MDM ID Node 2-2'

√Sync Status – In Sync

```

*****
*                               |
*                               | If not In Sync
*                               |
*                               | sel Sync Status
*                               |
*                               | N2-2 Sync Status
*                               |
*                               |
*                               | cmd Sync to BIA Execute
*                               |
*                               | Wait at least 30 seconds.
*                               |
*                               |
*                               | N2-2 MDM
*                               |
*                               | Verify Sync Status – In Sync
*                               |
*****

```

sel MDM BIT Status

N2-2 MDM BIT Summary Table A

'Word 1: Summary'

Verify N2-2 BST-A is clear

```

*****
*                               |
*                               | If BST not blank
*                               |
*                               | CDH: Node 2-2 MDM: MDM Utilities
*                               |
*                               |

```

```
* ~
*
* N2-2 MDM Utilities
*
* 'Clear Latched Data in BST A'
*
* cmd Clear Execute
*
*****
```

6.6 [Power On N2-2 MDM SDO Card](#)

CDH Summary: N2-2 MDM

'RPCM N22A3A-B'

```
sel RPC [X] where [X] = 
  √Close Cmd – Ena
  cmd RPC Position – Close (Verify – CI)
Repeat
```

6.7 [Enable N2-2 MDM RT FDIR](#)

CDH Summary: N2-2: LB SYS N2 2: RT Status

cmd 24 MDM N2-2 RT FDIR Status – Enable FDIR **Execute** (Verify – Ena)

7. [RECOVER ECLSS EQUIPMENT AFTER PORT DDCU POWERDOWNS](#)

7.1 [Activate Node 2 Cabin Smoke Detectors](#)

Node 2: ECLSS: SD1

Verify Obscuration, % Contamination < 25  
Verify Scatter, % Obscuration per Meter < 1

**NOTE**

If using time tagged commands, wait 2 seconds between issuance of RPC close and SD Monitoring Enable commands.

'Monitoring'

cmd Monitoring – Enable

√Status – Enabled

Wait 5 seconds

'Active BIT'

√Failure – blank

'Passive BIT'

√Lens Status – Clean

√Failure – blank

7.2 [Node 2 Smoke Detector 2 Activation](#)

Node 2: ECLSS: SD2

Node 2 Smoke Detector 2

sel N22A3B C RPC 01

RPCM N22A3B C 01

**cmd** RPC Position – Close (√RPC Position – Closed)

Node 2 Smoke Detector 2

Verify Obscuration, % Contamination < 25

Verify Scatter, % Obscuration per Meter < 1

NOTE

If using time tagged commands, wait 2 seconds between issuance of RPC close and SD Monitoring Enable commands.

'Monitoring'

**cmd** Monitoring – Enable

√Status – Enabled

Wait 5 seconds

'Active BIT'

√Failure – blank

'Passive BIT'

√Lens Status – Clean

√Failure – blank

7.3 [Activate and Checkout Node 2 CCAA](#)  
 Perform {1.5XX NODE 2 CCAA ACTIVATION}, Steps TBD (SODF:  
 ECLSS: ACTIVATION AND CHECKOUT: THC)

7.4 [Verify Node 2 CCAA Dry Out Valves In Correct Config](#)

Node 2: EPS: RPCM N22A3B\_C

RPCM N22A3B\_C

'RPC'

sel RPC [X] where [X] = 

8	9	10	11
---	---	----	----

  
 √RPC Position – Open  
 Repeat

Node 2: ECLSS: Node 2 CCAA

Node 2 CCAA

'HX FCV Position'

Verify Op – √  
 Verify C – <blank>

'Bypass FCV Position'

Verify Op – <blank>  
 Verify CI – √

7.5 [Activate Node 2 Aft Port IMV Valve](#)

Node 2: ECLSS: IMV Aft Port Vlv

Node 2 IMV Aft Port Valve

sel RPCM N22A3B C RPC 04

√Close Cmd – Ena

**cmd** RPC Position – Close (Verify – CI)

Node 2 IMV Aft Port Valve

'State'  
 'Enable'

**cmd** Arm



√Arm Status – Armed

**cmd** Enable

√State – Enabled

√Position – Open

7.6 [Activate Node 2 Fwd Stbd IMV Valve](#)

Node 2: ECLSS: IMV Fwd Stbd Vlv

sel RPCM N22A3B C RPC 03

√Close Cmd – Ena

**cmd** RPC Position – Close (Verify – Cl)

'State'

'Enable'

**cmd** Arm

√Arm Status – Armed

**cmd** Enable

√State – Enabled

√Position – Open

7.7 [Repower Node 2 Fwd IMV Fan](#)

Node 2: ECLSS: IMV Fwd Stbd Fan

sel RPCM N22A3B A RPC 11

√Close Cmd – Ena

**cmd** RPC Position – Close (Verify – Cl)

'On'

**cmd On**

√State – In Transit

Wait 15 seconds.

√State – On

√Speed, rpm: 7462 to 9500

7.8 [Configuring MCA C&W](#)

sel Enable

Enable an Event

input Event Code – 1 5 0 7 (SDS Aft Vlv Failed – Node 2)

**cmd Execute**

8. [ACTIVATE AND CHECKOUT NODE 2 LOW TEMPERATURE LOOP](#)

8.1 [Activate Node 2 LTL Components](#)

**Table 1. LTL Components**

RPCM [X]	RPC [Y]	Load
N22A3A_B	3	N2 Three Way Valve REG HX Pwr
N22A3A_B	16	N2 Three Way Valve CTB Pwr
N22A3A_B	17	N2 LTL PPA Pwr

Refer to Table 1 for X and Y references that follow

Node 2: EPS: RPCM [X]: RPC [Y]

RPCM [X]: RPC [Y]

√Close Cmd – Ena

**cmd** RPC Position – Close (Verify – CI)

Repeat

8.2 [Enable RT I/O for LTL PPA](#)

Node 2: CDH: Node 2-2 MDM: LB SYS N2-2: RT Status

LB SYS N2-2 RT Status

**cmd 09 PPA N2-2 RT Status – Enable Execute** (Verify – Ena)

8.3 [Configuring Node 2 LTL Three Way Mix Valves](#)

Node 2: TCS: LTL TWMV

Node2 LTL TWMV Commands

'LTL TWMV'

**cmd Startup Execute**

Verify Software – Started

'Temp Setpt'

input - 4 . 5

**cmd Set Execute**

√Temp Setpt – 4.5 deg C

Node 2: TCS: LTL Regen TWMV

Node2 LTL Regen TWMV Commands

'LTL Regen TWMV'

**cmd Startup Execute**

Verify Software – Started

'Temp Setpt'

input - 17 . 3

**cmd Set Execute**

√Temp Setpt – 17.3 deg C

8.4 [Checking SFCA Software Status](#)

**NOTE**

In order to ensure that the LTL SFCA Mod Valve is fully opened prior to starting the pump, the LTL SFCA Software must be verified to be shutdown prior to sending the LTL ITCS Activation command per SPN 25927/4495.

sel LTL SFCA

Node2 LTL SFCA Commands

'Commands'

√SFCA Software – Shutdown

8.5 [Sending Activation Command](#)

NOTE

The following Caution messages may be annunciated following activation:

'Node 2 LTL Regen TWMV Undertemp-Node2' (EC 2811)

'Node 2 LTL Regen TWMV Overtemp-Node2' (EC 2812)

'Node 2 LTL SFCA Uncontrolled DP-Node 2' (EC 2828)

No action is required.

sel Node2 LTL Software Commands

Node2 LTL Software Commands

'LTL IATCS'

'IATCS Activation'

**cmd** Startup – Startup

√IATCS Activation – In Prog

Wait up to 3 minutes

'LTL IATCS'

Verify IATCS Status – Oper

Verify IATCS Activation – Not in Prog

Node 2: TCS: IATCS Details

IATCS Details

'TWMV Software'

Verify LTL CLC – Ena

'Regen TWMV Software'

Verify LTL CLC – Ena

'SFCA Software'

Verify Mod Vlv CLC – Ena

'PPA Software'

Verify LTL – Started

Node 2: TCS

'PPA'

Verify Pmp Spd – 12075 to 14575 rpm

8.6 [Verify LTL Parameters](#)

Node 2: TCS

Node2: TCS

'TWMV'

Verify LTL Out Temp: 0 to 22 deg C

'Regen HX'

Verify LTL Out Temp: 0 to 22 deg C

'PPA'

Verify LTL Avg Accum Qty: 40 to 85%

Verify LTL Pmp In Press: 124 to 193 kPa

Verify LTL HR Flow: 830 to 1284 kg/hr

Verify LTL Out Temp: 0 to 22 deg C

Verify LTL Filter dP: 6.8 to 55.2 kPa

Verify LTL Gas Trap dP: 13.8 to 55.2 kPa

'SFCA'

Verify LTL Mod Vlv dP: 96.5 to 110 kPa

8.7 [Enable Node 2 LTL Auto Repress](#)

Node 2: TCS: LTL PPA: Node 2 LTL NIA Commands

Node2 LTL NIA Commands

cmd LTL NIA State – Ena (Verify – Ena)

Node 2: TCS

'FDIR'

Verify LTL Leak Rcvry – Ena

8.8 [Configuring FDIR](#)

Node 2: TCS

'PPA'

Record LTL Avg Accum Qty: \_\_\_\_\_ %

sel LTL Software

**Node2 LTL Software Commands**

'Leak Recovery'

**cmd** Set Normal Leak Limits – Set

'Failure Recovery'

Verify Fail Rcvy – Ena

Verify SFCA Overpress Protection Status – Ena

9. [Give "Go" for Columbus 1E Berthed Survival Mode Activation Start](#)  
**MCC-H** ↑ ISS, "Go to start Columbus Berthed Survival Mode Activation procedure"

10. [VERIFY ACTIVE COOLING FOR PORT AND OVHD DDCUS](#)

**Table 2. DDCU Information**

<b>Rack</b>	<b>[X] DDCU</b>
Port	N2P3A
	N2P2A
Ovhd	N2O2B
	N2O3A

Refer to Table 2 for X references that follow

Node 2: EPS: DDCU [X]

**DDCU [X]**

Verify Converter Temp < 43.8 deg C

Verify Pwr Supply Temp < 49.5 deg C

Verify Baseplate Temp < 40.3 deg C

Repeat

11. [COMPLETE CONFIGURATION OF RPCMS](#)  
Perform [{5.420 RPCM POWER ON RESET}](#), for RPCMs XXXX (GROUND: EPS: CORRECTIVE: SECONDARY POWER SYSTEM), then:

12. [ACTIVATE REMAINING NODE 2 CHANNEL 23 EQUIPMENT](#)

- 12.1 [Activate ABC-4](#)

C&T: ABC 4: RPCM N22A3A A RPC 01

**RPCM N22A3A A RPC 01**

√Close Cmd – Ena

**cmd** RPC Position – Close (Verify – CI)

**ABC 4**

Verify which IAC is Active and Powered on.  
Use the commands for the Active and Powered IAC.

**cmd** Bus I/O – Enable (Verify – Enable)

12.2 [Activate Node 2 ATU2](#)

C&T: Node2 ATU2: RPCM N22A3A A RPC 02

**RPCM N22A3A A RPC 02**

√Close Cmd – Ena

**cmd** RPC Position – Close (Verify – CI)

12.3 [Connect Node 2 ATU 2 to Conferences \(as desired\)](#)

C&T

**CNT Group Overview**

Verify which IAC is Active and Powered on.  
Use the commands for the Active and Powered IAC.

sel Node 2 ATU 2

**Node 2 ATU 2**

**cmd** Bus I/O – Enable (Verify – Enable)

'Configuration'

**cmd** State – Active (Verify – Active)

sel IAC[X] Call Select where [X] = Active and Powered IAC 1(2)

**IAC[X] Call Select**

'Public 1(2,3,4,5)'

sel Call Setup

Public 1(2,3,4,5) Call Select

cmd N2 ATU 2

Repeat call configuration as necessary.

13. [ACTIVATE REMAINING NODE 2 CHANNEL 14 EQUIPMENT](#)

13.1 [Repower Node 2 MTL NIA AVV, NIA NIV and SFCA](#)

Node 2: EPS: RPCM N21B4B B

RPCM N21B4B\_B

'RPC'

sel RPC [X] where [X] = 

2	15	16
---	----	----

√Close Cmd – Ena

cmd RPC Position – Close (Verify – CI)

Repeat

13.2 [Enable MTL SFCA Closed Loop Control](#)

Node 2: TCS: MTL SFCA

Node2 MTL SFCA Commands

'MTL SFCA'

cmd CLC – Ena (Verify – Ena)

14. [DEINSTALL AND DEACTIVATE PORTABLE FAN \(IF REQUIRED\)](#)

Perform [{2.XXX PFA TEARDOWN}](#), all steps (SODF: ECLSS)

15. [SWITCH 1553 BUSES TO CHANNEL A AND ENABLE CH SWITCHING](#)

15.1 [Config CB INT-1 Bus](#)

CDH: Primary C&C

Primary CCS MDM

sel CB INT-1

CB INT-1

sel Bus Status

CB INT-1 Bus Status



**cmd** Channel Selected – Select Ch A **Execute** (Verify – A)

**cmd** Auto Channel Switch Status – Enable **Execute** (Verify – Ena)

15.2 [Config CB INT-2 Bus](#)

CDH: Primary C&C

Primary CCS MDM

sel CB INT-2

CB INT-2

sel Bus Status

CB INT-2 Bus Status

**cmd** Channel Selected – Select Ch A **Execute** (Verify – A)

**cmd** Auto Channel Switch Status – Enable **Execute** (Verify – Ena)

15.3 [Config LB CHeCS Bus](#)

CDH: Primary PL

Primary PL MDM

sel LB CHECS-APM

LB\_CHECS\_APM

sel Bus Status

LB\_CHECS\_APM\_Bus\_Status

**cmd** Channel Selected – Select Ch A **Execute** (Verify – A)

**cmd** Auto Channel Switch Status – Enable **Execute** (Verify – Ena)

15.4 [Config LB PL APM Bus](#)

CDH: Primary PL

Primary PL MDM

sel LB PL APM

LB\_PL\_APM

sel Bus Status

LB\_PL\_APM\_Bus\_Status

**cmd** Channel Selected – Select Ch A **Execute** (Verify – A)

**cmd** Auto Channel Switch Status – Enable **Execute** (Verify – Ena)

15.5 [Enable BC Comm Fail FDIR](#)

CDH: Primary C&C: Recovery Retry: CCS MDM

CCS Recovery Retry

**cmd** BC Comm Fail – Enable **Execute** (Verify – Ena)

## COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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### OBJECTIVE:

Configure the Node 2-to-Columbus Vestibule: Includes Vestibule Operational steps to integrate the Columbus to Node 2 with the exception of Nitrogen Jumper Installation. The Nitrogen Jumper Install in this procedure is for contingency only, since it does not include purging the jumper.

### **CAUTION**

Prior to Jumper installation, inspect Jumper Connector for bent pins and debris. Failure to do so could result in damage to Jumper during installation.

### NOTE

This procedure is designed to be worked in conjunction with {COLUMBUS ACTIVATION FLOWCHART}, all (SODF: ASSY OPS: NOMINAL: ACTIVATION AND CHECKOUT)  
Fitchecks performed on the ground indicate that some jumpers may have interference problems with connectors on CBM bolt and latch hardware. If interference is seen on-orbit, CBM Powered Bolt Connectors may be removed and cable connectors capped as required.

### LOCATION:

Installed: Node 2, Columbus Vestibule

Stowed: √Inventory Management System (IMS)

### DURATION:

2.0 hours

### PARTS:

Mittens (two) (P/N 683-13896-37)

Radial Port Closeout (P/N 683-60461-11)

Vestibule Outfitting Kit (VOK)

### NOTE

One Cargo Transfer Bag (CTB, Single) contains the contents of the Vestibule Outfitting Kit listed below.

Ground Straps (two) (P/N 683-13477-7)

12" x 12" Ziplock Bag (4) (P/N 528-50000-5)

Each 12" x 12" Ziplock Bag (for CPA Removal) contains:

24" x 24" Ziplock Bag (1) (P/N 528-50000-8)

Protective Cap (one) (P/N NATC-RPC-N-15-0)

Protective Cap (one) (P/N NATC-PPC-N-15-0)

Protective Cap (two) (P/N NATC-RPC-N-11-0)

Protective Cap (two) (P/N NATC-PPC-N-11-0)

Protective Cap (six) (P/N NATC-RPC-N-13-0)

Protective Cap (six) (P/N NATC-PPC-N-13-0)

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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Table 1. Power/Data Jumpers

Jumper Function	Jumper Nomenclature	Wire Harness Reference Designator	Wire Harness Assembly Part Number
Power Feed (APM 1, 2A/3A)	EMC EO	W5013	1F46373-1 D
Power Feed (APM 2, 1A/4A)	EMC EO	W5012	1F46371-1
1553B, LB-A	EMC RF	W5001	1F46349-1 B
1553B, LB-B	EMC RF	W5002	1F46351-1
Hardwired Instrumentation HO-R PDU1/VTC1 - N and PDU2/VTC2 - R	EMC HO	W5010	1F46367-1
Hardwired Instrumentation HO-N PDU1/VTC1 - R and PDU2/VTC2 - N	EMC HO	W5003	1F46353-1
Hardwired Instrumentation ML-R VTC1/2 - R and PDU1 Input Current	EMC ML	W5006	1F46359-1
Hardwired Instrumentation ML-N VTC1/2 - N and PDU2 Input Current	EMC ML	W5007	1F46361-1
LAN2 (Ethernet) / OPS LAN	EMC CLASS RF	W5015	1F46377-1
Fiber Optic 1	FO	W5009	1F46365-1
Fiber Optic 2	FO	W5004	1F46355-1
Intravehicular Antenna Assembly	EMC RF	W5005	1F46357-1

Table 2. Fluid Jumpers

Fluid Jumper Function	Jumper Nomenclature	Part Number
Condensate Water	Waste Water	683-13870-71
LTL Supply	LTCS Supply	683-13896-7
LTCS Return	MTCS Return	683-13896-8
Low Pressure Nitrogen	Low Press Nitrogen	683-13870-70
MTL Supply	MTCS Supply	683-13871-3
MTL Return	MTCS Return	683-13871-4
Air Sampling	AR Sample	683-13870-72
IMV Supply	Node 2 IMV Supply	683-13870-73
IMV Return	Node 2 IMV Return	683-13870-74

## MATERIALS:

Velcro Straps  
Gray Tape  
Marking Pen  
MD WCS Towel  
Braycote

## TOOLS REQUIRED:

Mini Maglite  
Portable Fan  
Fluid Fitting Torque Device (FFTD) and Gamah Seal Maintenance Kit  
Nitrogen Oxygen Purge Adapter (NOPA)

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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## USOS IVA TOOL KIT:

### Drawer 2:

- Ratchet 1/4" Drive
- 1/4" to 3/8" Adapter
- 4" Ext 1/4" Drive
- 5/32" Hex Head, 1/4" Drive
- 1/4" Hex Head, 1/4" Drive
- 3/16" Hex Head, 1/4" Drive
- 1/4" Socket, 1/4" Drive
- 3/8" Socket, 1/4" Drive
- 7/16" Socket, 1/4" Drive
- 7/16" Deep Socket, 1/4" Drive
- 1/2" Deep Socket, 1/4" Drive
- (5-35 in-lbs) Trq Driver, 1/4" Drive
- (40-200 in-lbs) Trq Wrench, 1/4" Drive
- (40-200 in-lbs) Trq Wrench, 3/8" Drive

### Drawer 5:

- Scissors
- Static Wrist Tether

## REFERENCED PROCEDURE(S):

- 1.105 CBM CENTER DISK COVER REMOVAL
- 1.102 ACBM TO PCBM GROUND STRAP INSTALLATION
- 1.101 CBM CONTROLLER PANEL ASSEMBLY REMOVAL - GENERIC

### 1. OPENING NODE 2 STARBOARD HATCH

- 1.1 Open Node 2 Starboard Hatch per decal.

#### **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.

- 1.2 Inspect vestibule for condensation.  
If required, wipe any condensate from vestibule (Towel).  
ISS ↓ **MCC-H** if condensation found.

### 2. REMOVING CBM CENTER DISK COVER

- 2.1 Perform {1.105 CBM CENTER DISK COVER REMOVAL}, all (SODF: S&M: NOMINAL: VESTIBULE), then:

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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## 3. REMOVING COLUMBUS PCBM THERMAL BLANKET

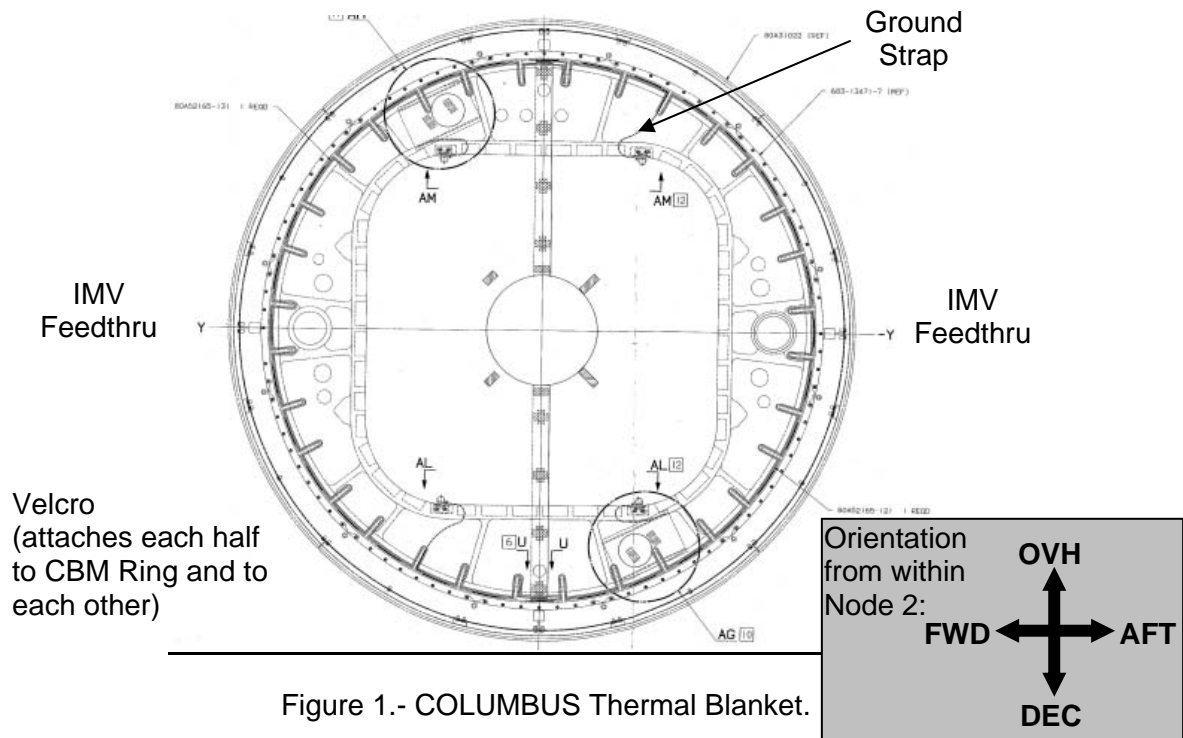


Figure 1.- COLUMBUS Thermal Blanket.

- 3.1 Access ground Fasteners by partially removing Columbus PCBM Thermal Blanket (Velcro). Refer to Figure 1.
- 3.2 Disengage ground Fasteners from bulkhead, 1/4 Turn ↺ Fasteners (4" Common Tip Screwdriver).

**CAUTION**  
PCBM Thermal Blanket is rolled instead of folded to prevent damage to the multilayer insulation of the Blanket.

- 3.3 Pull Blanket from mounting surface (Velcro). Roll Blanket, temporarily stow.

## 4. INSTALLING ACBM TO PCBM GROUND STRAPS

**NOTE**  
To facilitate the installation of two Ground Straps, PCBM Alignment Guides may be removed. Do not re-install the Alignment Guides if removed.

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

4.1 Perform {1.102 ACBM TO PCBM GROUND STRAP INSTALLATION}, all (SODF: S&M: NOMINAL: VESTIBULE), then:

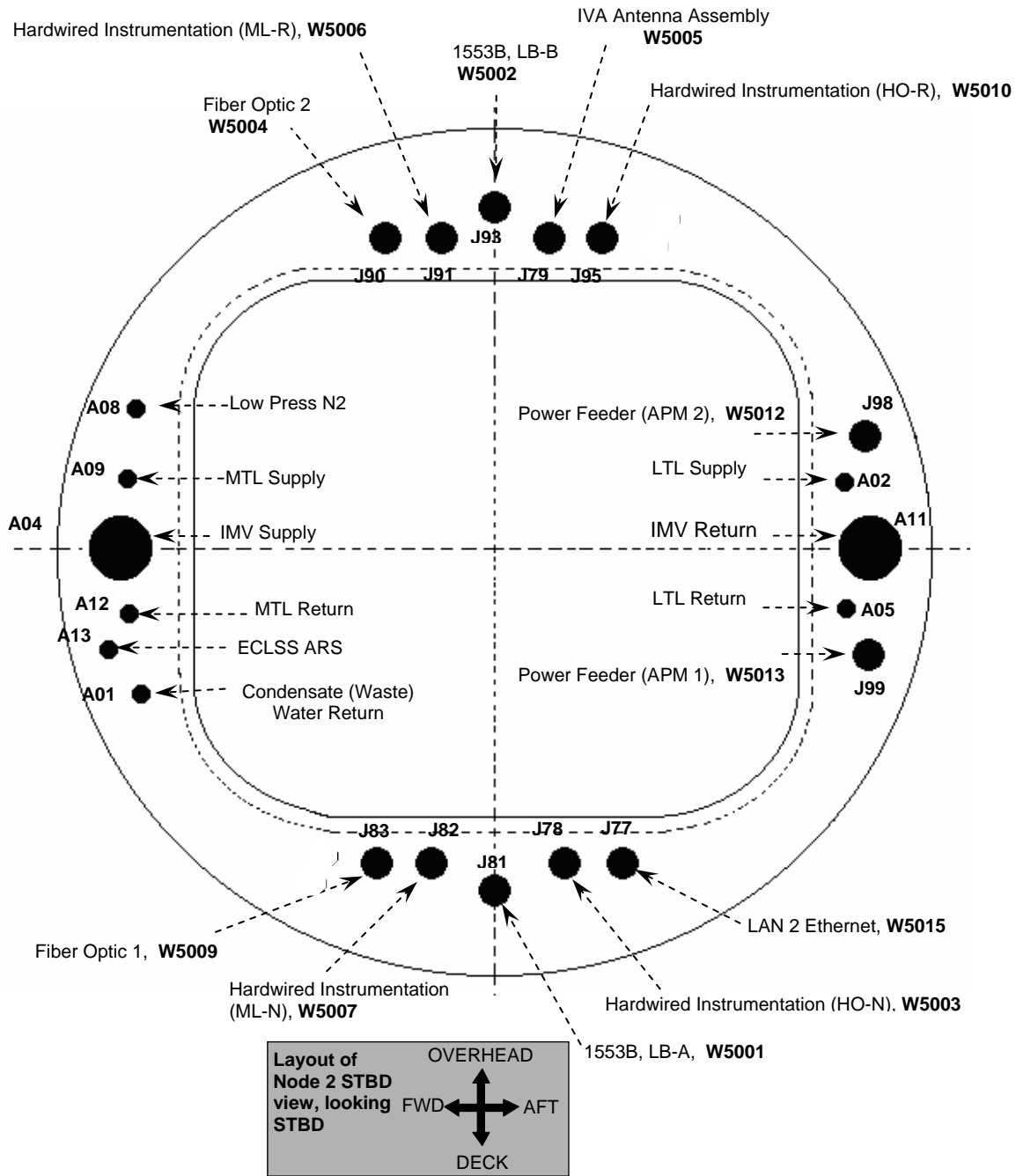


Figure 2.- NODE 2 STBD Interface (Orientation from Node 2 Looking Stbd).

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

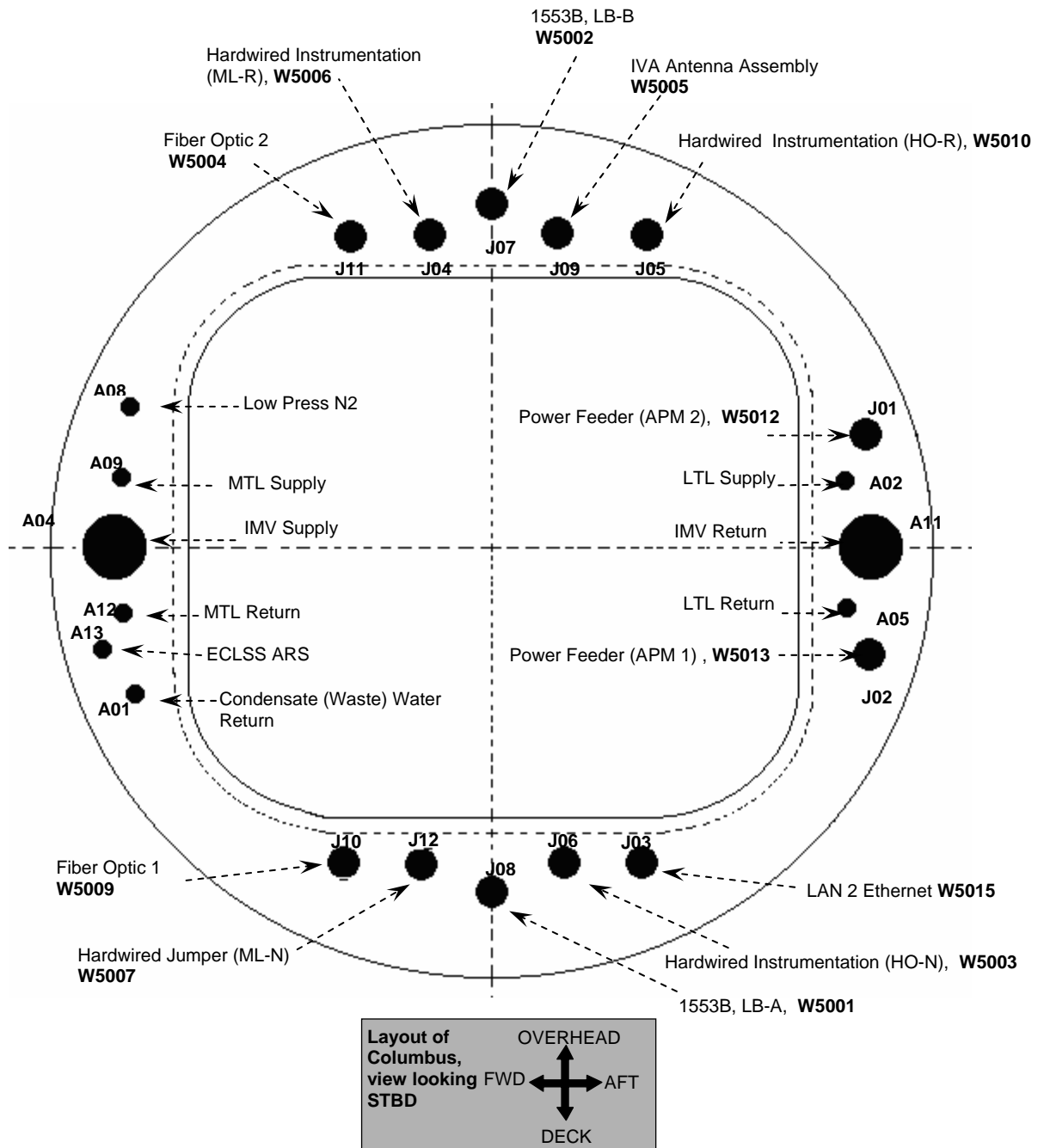


Figure 3.- COLUMBUS Interface (Orientation from Node 2 Looking Starboard).

## 5. INSTALLING COLUMBUS POWER JUMPERS

<b>WARNING</b>
Power must be removed before proceeding with COL Power Jumper installations. Failure to remove power can result in electrical shock hazard.



# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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## 5.1 **MCC-H**

Verify GO for Columbus Utility Connections, block 10 of {**COLUMBUS ACTIVATION FLOWCHART**} (SODF: ASSY OPS/NOMINAL: ACTIVATION AND CHECKOUT).

Table 3. Columbus Power Jumpers

Jumper Name/Function	Node 2 STBD Bulkhead Interface	COL Bulkhead Interface	Wire Harness Reference Designator	Wire Harness Assembly Part Number	Cable Color	Quadrant
POWER FEEDER (APM 1, 2A/3A)	J99	J02	W5013	1F46373-1	Blue and Yellow	Right Lower
POWER FEEDER (APM 2, 1A/4A)	J98	J01	W5012	1F46371-1	Blue and Yellow	Right Upper

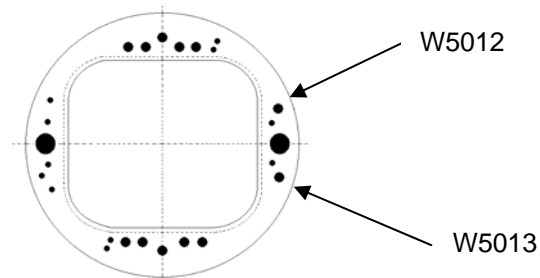


Figure 4.- Columbus Power Jumper Installation Location.

5.2 Protective Cap ←|→ Node 2 Bulkhead (J99)

Protective Cap ←|→ COL Bulkhead (J02)

Refer to Table 3.

Place untethered caps (Node side) in 12" x 12" Ziplock Bag.

5.3 Protective Caps (two) ←|→ POWER FEEDER APM 1 (W5013)

Stow caps in 12" x 12" Ziplock Bag.

5.4 Install POWER FEEDER APM 1 (W5013).

POWER FEEDER APM 1 (W5013) P99 →|← J99 (Node 2)

POWER FEEDER APM 1 (W5013) P02 →|← J02 (COL)

5.5 Protective Cap ←|→ Node 2 Bulkhead (J98)

Protective Cap ←|→ COL Bulkhead (J01)

Place untethered cap (Node side) in 12" x 12" Ziplock Bag.

5.6 Protective Caps (two) ←|→ POWER FEEDER APM 2 (W5012)

Stow caps in 12" x 12" Ziplock Bag.

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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5.7 Install POWER FEEDER APM 2 (W5012).

P98 →|← J98 (Node 2 side)

P01 →|← J01 (COL side)

5.8 ISS ↓ **MCC-H**, "GO for **MCC-H** DDCU powerup."

## 6. INSTALLING HARDWIRED INSTRUMENTATION JUMPERS

Table 4. Columbus Hardwired Jumpers

Jumper Name/Function	Node 2 STBD Bulkhead Interface	COL Bulkhead Interface	Wire Harness Reference Designator	Wire Harness Assembly Part Number	Cable Color	Quadrant
Hardwired Instrumentation HO-R PDU1/VTC1 - N and PDU2/VTC2 - R	J95	J05	W5010	1F46367-1	Green	Upper Right
Hardwired Instrumentation ML-R VTC1/2 - R and PDU1 Input Current	J91	J04	W5006	1F46359-1	White	Upper Left
Hardwired Instrumentation HO-N PDU1/VTC1 - R and PDU2/VTC2 - N	J78	J06	W5003	1F46353-1	Green	Lower Right
Hardwired Instrumentation ML-N VTC1/2 - N and PDU2 Input Current	J82	J12	W5007	1F46361-1	White	Lower Left

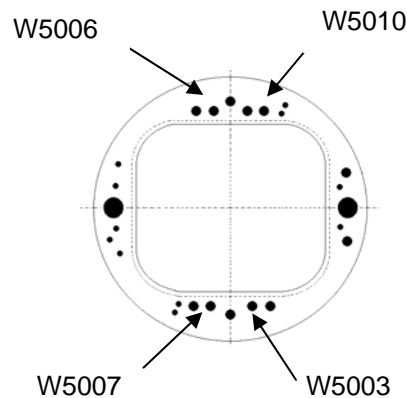


Figure 5.- Columbus Hardwire Instrumentation Jumper Installation Location.

6.1 Protective Cap (4) ←|→ Node 2 Bulkhead (J95, J78, J91, J82)

Protective Cap (4) ←|→ COL Bulkhead (J05, J06, J04, J12)

Refer to Table 4.

Place untethered caps (Node side) in 12" x 12" Ziplock Bag.

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

- 6.2 Protective Cap ←|→ Hardwired Instrumentation HO-R (W5010)
- Protective Cap ←|→ Hardwired Instrumentation HO-N (W5003)
- Protective Cap ←|→ Hardwired Instrumentation ML-R (W5006)
- Protective Cap ←|→ Hardwired Instrumentation ML-N (W5007)

Place caps in 12" x 12" Ziplock Bag.

## 6.3 Install "HARDWIRED INSTRUMENTATION" Jumpers

Hardwired Instrumentation HO-R (W5010) P95 →|← J95 (NOD 2)

Hardwired Instrumentation HO-R (W5010) P05 →|← J05 (COL)

Hardwired Instrumentation ML-R (W5006) P91 →|← J91 (NOD2)

Hardwired Instrumentation ML-R (W5006) P04 →|← J04 (COL)

Hardwired Instrumentation HO-N (W5003) P78 →|← J78 (NOD2)

Hardwired Instrumentation HO-N (W5003) P06 →|← J06 (COL)

Hardwired Instrumentation ML-N (W5007) P82 →|← J82 (NOD2)

Hardwired Instrumentation ML-N (W5007) P12 →|← J12 (COL)

- 6.4 ISS ↓ **MCC-H**, "HARDWIRED INSTRUMENTATION Jumper Installation complete."

## 7. INSTALLING 1553 DATA JUMPERS

Table 5. 1553B, LB-B Jumper

Jumper Name/Function	Node 2 STBD Bulkhead Interface	COL Bulkhead Interface	Wire Harness Reference Designator	Wire Harness Assembly Part Number	Cable Color	Quadrant
1553B, LB-B	J93	J07	W5002	1F46349-1	Orange	Upper Center

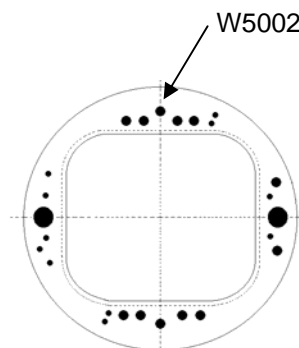


Figure 6.- 1553B, LB-B Jumper Installation Location.

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E) Page 10 of 24 pages

## 7.1 Removing Terminators and Caps

Terminator ←|→ J93 (NOD2)

Terminator ←|→ J07 (COL)

Protective Cap ←|→ P07 (W5002)

Protective Cap ←|→ P93 (W5002)

Place terminators and caps in 24" x 24" Ziplock Bag.

## 7.2 Installing 1553B, LB-B (W5002)

1553B, LB-B (W5002) P07 →|← J07 (COL)

1553B, LB-B (W5002) P93 →|← J93 (NOD2)

PCS

## 7.3 Switching CB Int-1 From Channel A to Channel B

C&DH: MDM C&C Primary

sel CB Int 1

sel Bus Status

'Channel Selected'

**cmd** Select Ch B (Verify – B)

'Auto Channel Switch Status'

**cmd** Inhibit (Verify – Inh)

## 7.4 Switching CB Int-2 From Channel A to Channel B

C&DH: MDM C&C Primary

sel CB Int 2

sel Bus Status

'Channel Selected'

**cmd** Select Ch B (Verify – B)

'Auto Channel Switch Status'

**cmd** Inhibit (Verify – Inh)

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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## 7.5 Switching LB CHeCKS COL From Channel A to Channel B

C&DH: MDM PL Primary

Primary PL MDM

sel LB CHeCKS COL

LB CHECKS COL

sel Bus Status

LB CHECKS COL Bus Status

'Channel Selected'

**cmd** Select Ch B (Verify – B)

'Auto Channel Switch Status'

**cmd** Inhibit (Verify – Inh)

## 7.6 Switching LB PL COL From Channel A to Channel B

C&DH: MDM PL Primary

Primary PL MDM

sel LB PL COL

LB PL COL

sel Bus Status

LB PL COL Bus Status

'Channel Selected'

**cmd** Select Ch B (Verify – B)

'Auto Channel Switch Status'

**cmd** Inhibit (Verify – Inh)

Table 6. 1553B, LB-A Jumper

Jumper Name/Function	Node 2 STBD Bulkhead Interface	COL Bulkhead Interface	Wire Harness Reference Designator	Wire Harness Assembly Part Number	Cable Color	Quadrant
1553B, LB-A	J81	J08	W5001	1F46349-1	Orange	Lower Center

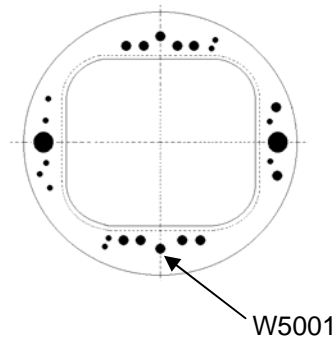


Figure 7.- 1553B, LB-A Jumper Installation Location.

**7.7 Removing Terminators and Caps**

Terminator ←|→ J81 (NOD2)

Terminator ←|→ J08 (COL)

Protective Cap ←|→ P08 (W5001)

Protective Cap ←|→ P81 (W5001)

Place terminators and caps in 24" x 24" Ziplock Bag.

**7.8 Installing 1553B, LB-A (W5001)**

1553B, LB-A (W5001) →|← J08 (COL)

1553B, LB-A (W5001) →|← J81 (NOD2)

ISS ↓ **MCC-H**, "1553 jumper installation complete."

**8. REMOVING CBM CONTROLLER PANEL ASSEMBLIES**

8.1 Remove CBM CPAs in order: Forward and Aft CPAs first, followed by Overhead and Deck CPAs, perform {[1.101 CBM CONTROLLER PANEL ASSEMBLY REMOVAL - GENERIC](#)}, steps 3, 4 and 6; Desiccant Bag is not required (SODF: S&M: NOMINAL: VESTIBULE), then:

**9. INSTALLING ITCS JUMPERS**

**WARNING**

The ITCS jumpers are filled with ITCS fluid. Care must be taken when uncapping and bending the jumper to prevent excess fluid release into the cabin. Safety Goggles must be donned during activity.

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

CAUTION
1. Inspect fluid connectors for damage and debris. Verify seals are installed at both ends. Failure to comply may result in damage to the fluid connectors.
2. Towels or other absorbent materials should not come in contact with coolant in jumpers or plumbing lines to prevent loss due to wicking. Failure to comply may result in loss of coolant.

NOTE
Fitchecks performed on the ground indicate that LTCS jumper may have interference problems with Power Bolt connectors. If interference is seen on-orbit, CBM Powered Bolt Connectors may be removed and cable connectors capped as required.

Table 7. TCS LTL/MTL Jumpers

Jumper Name/Function	Node 2 STBD Bulkhead Interface	COL COLUMBUS Bulkhead Interface	Part Number	Jumper Description	Quadrant
LTCS Supply	A02	A02	683-13896-7	Insulated Straight	Right Upper
LTCS Return	A05	A05	683-13896-8	Insulated Straight	Right Lower
MTCS Supply	A09	A09	683-13871-3	Braided Omega	Left Upper
MTCS Return	A12	A12	683-13871-4	Braided Omega	Left Lower

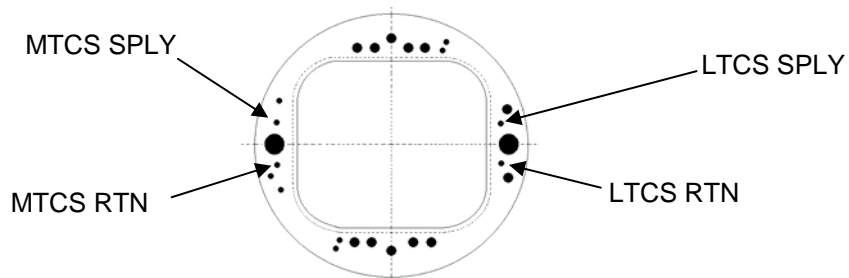


Figure 8.- TCS Jumper Installation Location.

## COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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### 9.1 Installing LTL Supply Jumper

QD Cap ←|→ A02 (COL)

QD Cap ←|→ A02 (NOD2)

QD Plug (2) ←|→ LTCS Supply

LTCS Supply →|←← A02 (COL)

LTCS Supply →|←← A02 (NOD2)

Place untethered caps in 12" x 12" Ziplock Bag.

### 9.2 Installing LTL Return Jumper

QD Cap ←|→ A05 (COL)

QD Cap ←|→ A05 (NOD2)

QD Plug (2) ←|→ LTCS Supply

LTCS Return →|← A05 (COL)

LTCS Return →|← A05 (NOD2)

Place caps and plugs in 12" x 12" Ziplock Bag.

### 9.3 Install Thermal Mittens on LTL Supply and Return QDs on COL and NOD2.

### 9.4 Installing MTL Supply Jumper

QD Cap ←|→ A09 (COL)

QD Cap ←|→ A09 (NOD2)

QD Plug (2) ←|→ MTCS Supply

MTCS Supply →|← A09 (COL)

MTCS Supply →|← A09 (NOD2)

Place untethered caps in 12" x 12" Ziplock Bag.

### 9.5 Installing MTL Return Jumper

QD Cap ←|→ A12 (COL)

QD Cap ←|→ A12 (NOD2)

QD Plug (2) ←|→ MTCS Supply

MTCS Return →|← A12 (COL)

MTCS Return →|← A12 (NOD2)

ISS ↓ **MCC-H**, "TCS Jumper Installation complete."



# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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## 10. INSTALLING CONDENSATE JUMPER

Table 8. FFTD Data for Waste Water/Condensate Jumper

Jumper Name/Function	Node 2 Starboard Bulkhead Interface	Columbus Port Bulkhead Interface	Part Number	Input Torque (in-lbs)	Output Torque (in-lbs)	FFTD Head Size (inch)		Jumper Description	Quadrant
						Drive Head	Reaction Head		
Waste Water/Condensate Jumper	A01	A01	683-13870-71	38	185	0.875	0.625	Silver Braid	Left Lower

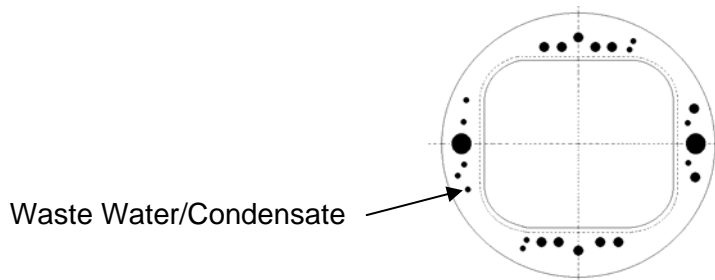


Figure 9.- Waste Water/Condensate Jumper Installation Location.

### 10.1 QD Cap ←|→ A01 (NOD2)

Loosen COL A01 Cap (FFTD, Ratchet 3/8" Drive)

Cap ←|→ A01 (COL)

### 10.2 Cap (2) ←|→ Waste Water Jumper

### 10.3 Installing Waste Water Jumper

Waste Water →|← A01 (COL): Torque Gamah fittings per Table 8 (FFTD, (30-200 in-lbs) Trq Wrench, 3/8" Drive)

Waste Water →|← A01 (NOD2)

### 10.4 Female cap →|← Male cap

Stow in Ziplock Bag.

Attach caps, Ziplock Bag to vestibule bulkhead (Gray Tape).

## 11. INSTALLING IMV RETURN DUCT (A11)

Table 9. IMV Return Duct

Jumper Name/Function	Node 2 STBD Bulkhead Interface	COL COLUMBUS Bulkhead Interface	Part Number	Jumper Description	Quadrant
Node 2 IMV Return	A11	A11	683-13870-74	Gray Duct	Right Center

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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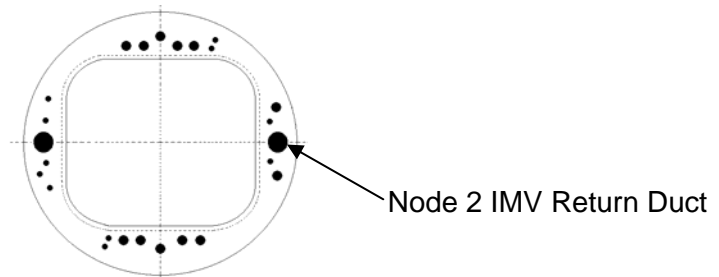


Figure 10.- Node 2 IMV Return Duct Installation Location.

## 11.1 Manually Cycle (Open then Close) Node 2 IMV Valves.



Figure 11.- Remote Manual Operator (RMO) with Indicator in Closed Position.

Node 2 Starboard Forward IMV RMO ☞ Open  
Node 2 Starboard Aft IMV RMO ☞ Open  
Node 2 Starboard Aft IMV RMO ☜ Closed

### NOTE

A small amount of Braycote may be used to help keep IMV Jumper O-rings in place during jumper installation.

- 11.2 Loosen V-Band Clamp and remove IMV Cap from Node Starboard (A11) IMV Flange (Ratchet 1/4", 7/16" Deep Socket).  
Place IMV Cap in 24" x 24" Ziplock Bag.
- 11.3 Install IMV Jumper O-Rings (two), one on each end of IMV Jumper.  
If required, apply small amount of Braycote in two to three places around O-Ring grooves to prevent O-Rings from floating out.
- 11.4 Loosen V-Band Clamp and remove IMV Flange Saver from COLUMBUS (A11) IMV Flange (Ratchet 1/4", 1/2" Deepwell Socket).  
Place IMV Flange Saver in 24" x 24" Ziplock Bag.

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

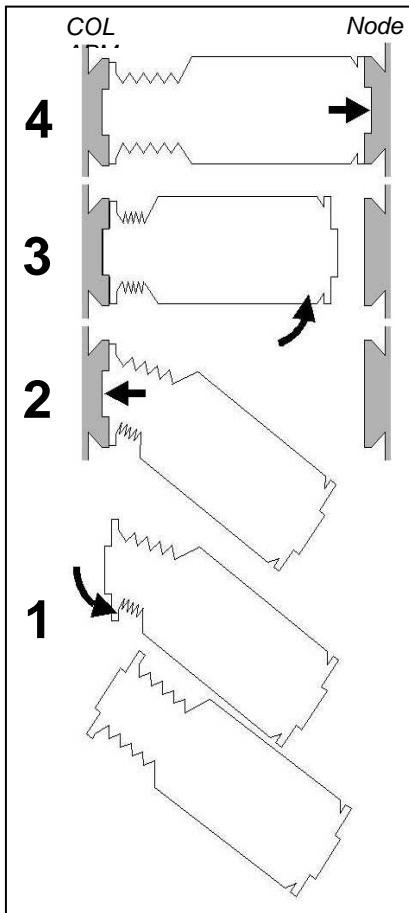


Figure 12.- Recommended Method for IMV Duct Installation.

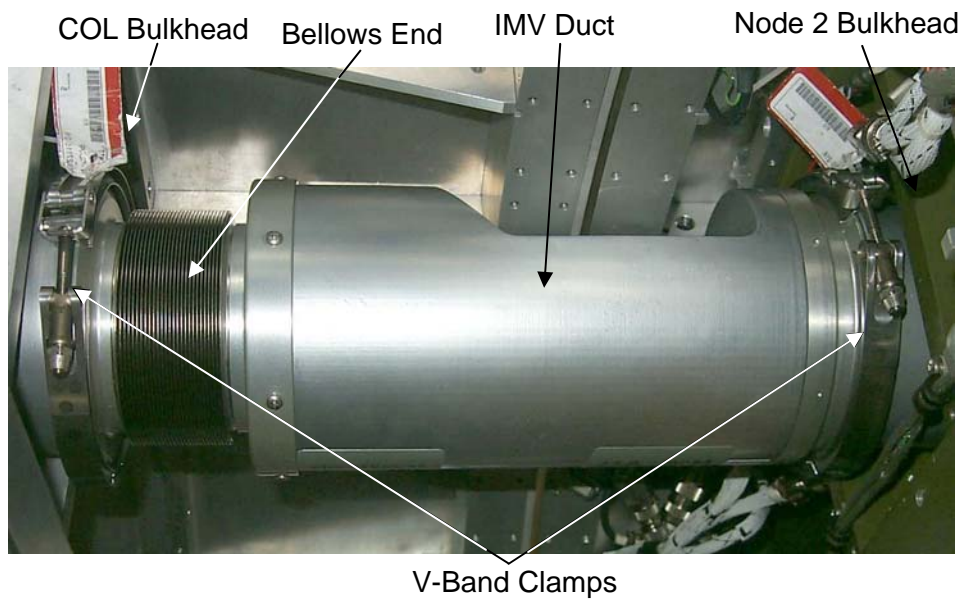


Figure 13.- A11 IMV Duct Installed.

## COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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- 11.5 Install (A11) IMV Return Duct by compressing Return Duct and sliding it into place.  
Orient flat side of Duct toward the CBM rings.
- 11.6 Secure Duct to Node 2 IMV Flange with V-Band clamp, tighten to 35 in-lbs (Ratchet 1/4", 7/16" Deep Socket, (5-35 in-lbs) Trq Driver).
- 11.7 Secure Duct to COLUMBUS IMV Flange with V-Band clamp, tighten to 35 in-lbs (Ratchet 1/4", 1/2" Deep Socket, (40-200 in-lbs) Trq Wrench).

### 12. INSTALLING IMV SUPPLY DUCT (A04)

Table 10. IMV Supply Duct

Jumper Name/Function	Node 2 STBD Bulkhead Interface	COL COLUMBUS Bulkhead Interface	Part Number	Jumper Description	Quadrant
Node 2 IMV Supply	A04	A04	683-13870-73	Gray Duct	Left Center

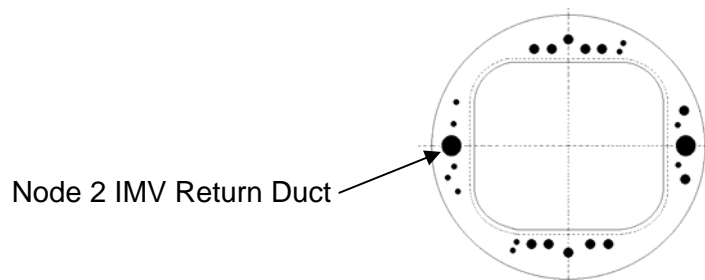


Figure 14.- Node 2 IMV Supply Duct Installation Location.

- 12.1 Using flashlight and dental mirror (if required) verify no threads visible on set screw on IMV Valve.  
Report results to **MCC-H**.
- 12.2 Loosen V-Band Clamp and remove IMV Cap from Node Starboard (A04) IMV Flange (Ratchet 1/4", 7/16" Deep Socket).  
Place IMV Cap in 24" x 24" Ziplock Bag.
- 12.3 Install IMV Jumper O-Rings (two), one on each end of IMV Jumper.  
If required, apply small amount of Braycote in two to three places around O-Ring grooves to prevent O-Rings from floating out.
- 12.4 Loosen V-Band Clamp and remove IMV Flange Saver from COLUMBUS (A04) IMV Flange (Ratchet 1/4", 1/2" Deepwell Socket).  
Place IMV Flange Saver in 24" x 24" Ziplock Bag.
- 12.5 Install (A04) IMV Supply Duct by compressing Supply Duct and sliding it into place.  
Orient flat side of Duct toward the CBM rings.

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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- 12.6 Secure Duct to Node 2 IMV Flange with V-Band clamp, tighten to 35 in-lbs (Ratchet 1/4", 7/16" Deep Socket, (5-35 in-lbs) Trq Driver).
- 12.7 Secure Duct to COLUMBUS IMV Flange with V-Band clamp, tighten to 35 in-lbs (Ratchet 1/4", 1/2" Deep Socket, (40-200 in-lbs) Trq Wrench).
- 12.8 Node 2 Starboard Forward IMV RMO ↻ 'Closed'

## 13. INSTALLING FIBER OPTIC JUMPERS

<b>CAUTION</b>
Minimum allowable bend radius of the fiber optic cable is 2 inches. Failure to comply with minimum bend radius will damage the fiber optic cable.

Table 11. Fiber Optic Jumpers

Jumper Name/Function	Node 2 STBD Bulkhead Interface	COL COLUMBUS Bulkhead Interface	Reference Designator	Part Number	Cable Color	Quadrant
FO / Fiber Optic 1	J83	J10	W5009	1F46365-1	Purple	Lower Left
FO / Fiber Optic 2	J90	J11	W5004	1F46355-1	Purple	Upper Left

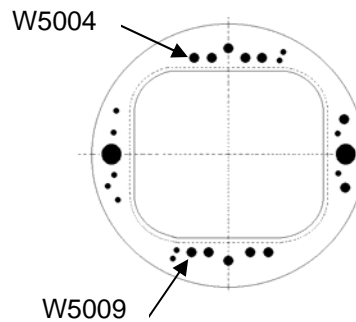


Figure 15.- Fiber Optic Jumper Installation Location.

- 13.1 Cap ←|→ J83 (NOD2)  
Cap ←|→ J10 (COL)  
  
Place untethered caps in 12" x 12" Ziplock Bag.
- 13.2 Caps (2) ←|→ FO (W5009) P83, P10  
  
Place caps in 12" x 12" Ziplock Bag.
- 13.3 FO (W5009) P83 →|← J83 (NOD2)  
FO (W5009) P10 →|← J10 (COL)
- 13.4 Cap ←|→ J90 (NOD2)  
Cap ←|→ J11 (COL)  
  
Place untethered caps in 12" x 12" Ziplock Bag.

## COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E) Page 20 of 24 pages

13.5 Caps (2) ←|→ FO (W5004) P90, P11

Place caps in 12" x 12" Ziplock Bag.

13.6 FO (W5004) P90 →|← J90 (NOD2)

FO (W5004) P11 →|← J11 (COL)

### 14. INSTALLING AR SAMPLE JUMPER

Table 12. AR Sample Jumper

Jumper Name/Function	Node 2 STBD Bulkhead Interface	COL COLUMBUS Bulkhead Interface	Part Number	Jumper Description	Quadrant
ECLSS AR Sample	A13	A13	683-13870-72	Silver Braid	Left Lower

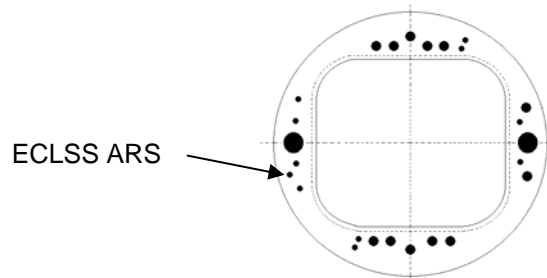


Figure 16.- ECLSS AR Sample Jumper Installation Location.

#### NOTE

The AR Sample Jumper is installed by hand. Fasten AR Sample Jumper fitting to bulkhead by turning ↻ until Feedthrough Locking Key engages the QD housing.

- 14.1 Install AR Sample Jumper Assembly (683-13870-72).  
 Remove COL Feedthrough Cap by hand.  
 Remove cap from COL side of jumper by hand.  
 Install jumper onto COL feedthrough until Feedthrough Locking Key engages the QD housing.  
 Repeat for Node feedthrough.  
 Place caps in 24" x 24" Ziplock Bag.

### 15. INSTALLING ETHERNET JUMPER (LAN)

Table 13. LAN Ethernet Jumper

Jumper Name/Function	Node 2 STBD Bulkhead Interface	COL COLUMBUS Bulkhead Interface	Reference Designator	Part Number	Cable Color	Quadrant
LAN2 Ethernet	J77	J03	W5015	1F46377-1	Green	Lower Right

# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

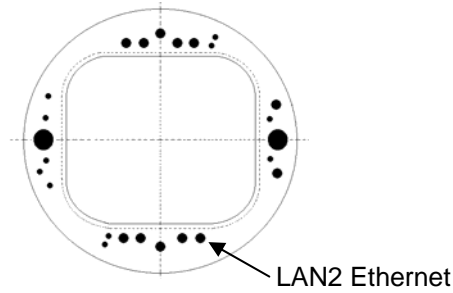


Figure 17.- LAN Ethernet Jumper Installation Location.

15.1 Cap ←|→ NOD2 J77  
Cap ←|→ COL J03

15.2 Caps (2) ←|→ LAN2 Ethernet (W5015) P77, P03

15.3 LAN2 Ethernet (W5015) P77 →|← J77 (NOD2)  
LAN2 Ethernet (W5015) P03 →|← J03 (COL)

## 16. INSTALLING IVA ANTENNA ASSEMBLY

Table 14. IVA Antenna Assembly Jumper

Jumper Name/Function	Node 2 STBD Bulkhead Interface	COL COLUMBUS Bulkhead Interface	Reference Designator	Part Number	Cable Color	Quadrant
IVA Antenna Assembly	J79	J09	W5005	1F46357-1 C	Light Purple	Upper Right

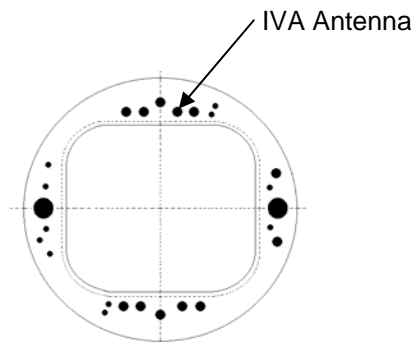


Figure 18.- IVA Antenna Jumper Installation Location.

16.1 Cap ←|→ NOD2 J79  
Cap ←|→ COL J09

16.2 Caps (2) ←|→ IVA Antenna Assembly (W5005) P79, P09

# COLUMBUS VESTIBULE OUTFITTING

- 16.3 IVA Antenna Assembly (W5005) P79 →|← J79 (NOD2)  
IVA Antenna Assembly (W5005) P09 →|← J09 (COL)

16.4 Notify **MCC-H** of task completion.

NOTE

Fitchecks performed on the ground indicate that Low Press Nitrogen jumper may have interference problems with Power Bolt Load Cell connector. If interference is seen on-orbit, CBM Powered Bolt Load Cell Connector may be removed and cable connectors capped as required.

\*\*\*\*\*

\* **17. INSTALLING NITROGEN JUMPER**

**CAUTION**

Open fluid connectors should be exposed to cabin air for a minimum amount of time to prevent contamination of the Nitrogen system.

NOTE

Installation of the Nitrogen Jumper is for contingency only based on Columbus IATCS Accumulator Nitrogen pressure. Fitchecks performed on the ground indicate that this jumper may have interference problems with CBM hardware. If interference is seen on-orbit, perform step 18 to disconnect the CBM hardware.

Table 15. FFTD Data for Low Pressure Nitrogen Jumper

Jumper Name/Function	Node 2 Starboard Bulkhead Interface	Columbus Port Bulkhead Interface	Part Number	Input Torque (in-lbs)	Output Torque (in-lbs)	FFTD Head Size (inch)		Jumper Description	Quadrant
						Drive Head	Reaction Head		
Low Press Nitrogen	A08	A08	683-13870-70	38	185	0.875	0.625	Silver Braid	Left Lower

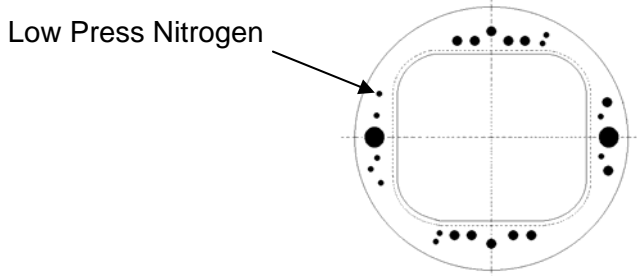


Figure 19.- Low Press Nitrogen Jumper Installation Location.



# COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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## 17.1 $\sqrt{\text{MCC-H}}$

Verify if Nitrogen Jumper Installation required at this time.

If required, perform remaining steps of section 17 to install Nitrogen vestibule jumper without purging.

## 17.2 Vent Node 2 Nitrogen Low Pressure (Supply) Lines:

Airlock: ECLSS: Nitrogen System

AL Nitrogen System

'N2 Supply Valve'

**cmd** Close ( $\sqrt{\text{Actual Position}}$  – Closed)

### NOTE

1. Connection and disconnection of QDs requires adjoining lines to be at approximately ambient pressure on both sides of the QD, when possible.

2. As the N2 system pressure bleeds down and N2 is introduced into the cabin, the following messages may be received:

'PCA N2 Line Pressure Low – A/L',  
'PCA N2 Line Pressure Low – LAB'

3. The messages will return to normal when the N2 system is repressurized.

Airlock: ECLSS: Nitrogen System

AL Nitrogen System

'AL PCA N2 Intro Valve'

**cmd** Open ( $\sqrt{\text{Actual Position}}$  – Open)

Wait 2 minutes or **On MCC-H GO**, proceed.

'AL PCA N2 Intro Valve'

**cmd** Close ( $\sqrt{\text{Actual Position}}$  – Closed)

## 17.3 Isolate Node 2 from COL Low Pressure Nitrogen Line:

Open Closeout Panel NOD2SO\_24, temp stow.

Demate Low Press QD behind Panel.

## 17.4 Loosen Node 2 feedthrough cap with FFTD.

## 17.5 Loosen cap from Node 2 side of jumper by hand.

## 17.6 Bring jumper end in close proximity to corresponding bulkhead feedthrough.

## COLUMBUS VESTIBULE OUTFITTING

(ASSY OPS/1E/FIN/MULTI E)

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- \*  
\* 17.7 ✓ Don Latex Gloves
- \*  
\* 17.8 Remove Node 2 feedthrough cap by hand.
- \*  
\* 17.9 Inspect feedthrough for debris.  
\* Report any debris to **MCC-H**.  
\* Clean as directed (Dry Wipes).
- \*  
\* 17.10 Inspect feedthrough threads for Braycote Lubricant.  
\* If no Braycote Lubricant present, apply one drop of Braycote Lubricant sparingly to first two  
\* threads of feedthrough.  
\* Spread Braycote Lubricant around threads by hand.
- \*  
\* 17.11 Doff, discard Latex Gloves.  
\* Don new pair of Latex Gloves.
- \*  
\* 17.12 Remove cap from Node 2 side of jumper by hand (hold cap then twist nut).
- \*  
\* 17.13 ✓ Unused, undamaged Metal Seal installed on jumper
- \*  
\* 17.14 Inspect jumper for debris.  
\* Report any debris to **MCC-H**.  
\* Clean as directed (Dry Wipes).
- \*  
\* 17.15 Install jumper onto Node 2 feedthrough hand tight.
- \*  
\* 17.16 Jumper Cap →|← feedthrough cap.  
\* Stow in Ziplock Bag.
- \*  
\* 17.17 Doff, discard Latex Gloves.
- \*  
\* 17.18 Repeat for Columbus feedthrough.
- \*  
\* 17.19 Set Trq Driver to specified input torque.  
\* Refer to Table 15 and FFTD Calibration Card for torque settings.
- \*  
\* 17.20 Torque both sides of jumper with FFTD.  
\* Refer to Table 15.

\*\*\*\*\*

### 18. INSTALLING RADIAL PORT CLOSEOUT

- 18.1 Install Radial Port Closeout in Vestibule (1/4 Turn Fasteners).

### 19. VESTIBULE OUTFITTING CLEANUP

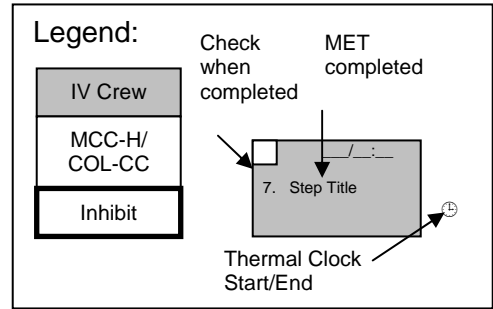
- 19.1 Stow Ziplock Bags with untethered caps in VOK CTB.
- 19.2 Verify Transfer List for CTB Stowage Locations.
- 19.3 Stow tools, materials.

# COLUMBUS ACTIVATION FLOWCHART

(ASSY OPS/1E/FIN/MULTI E) Page 1 of 6 pages

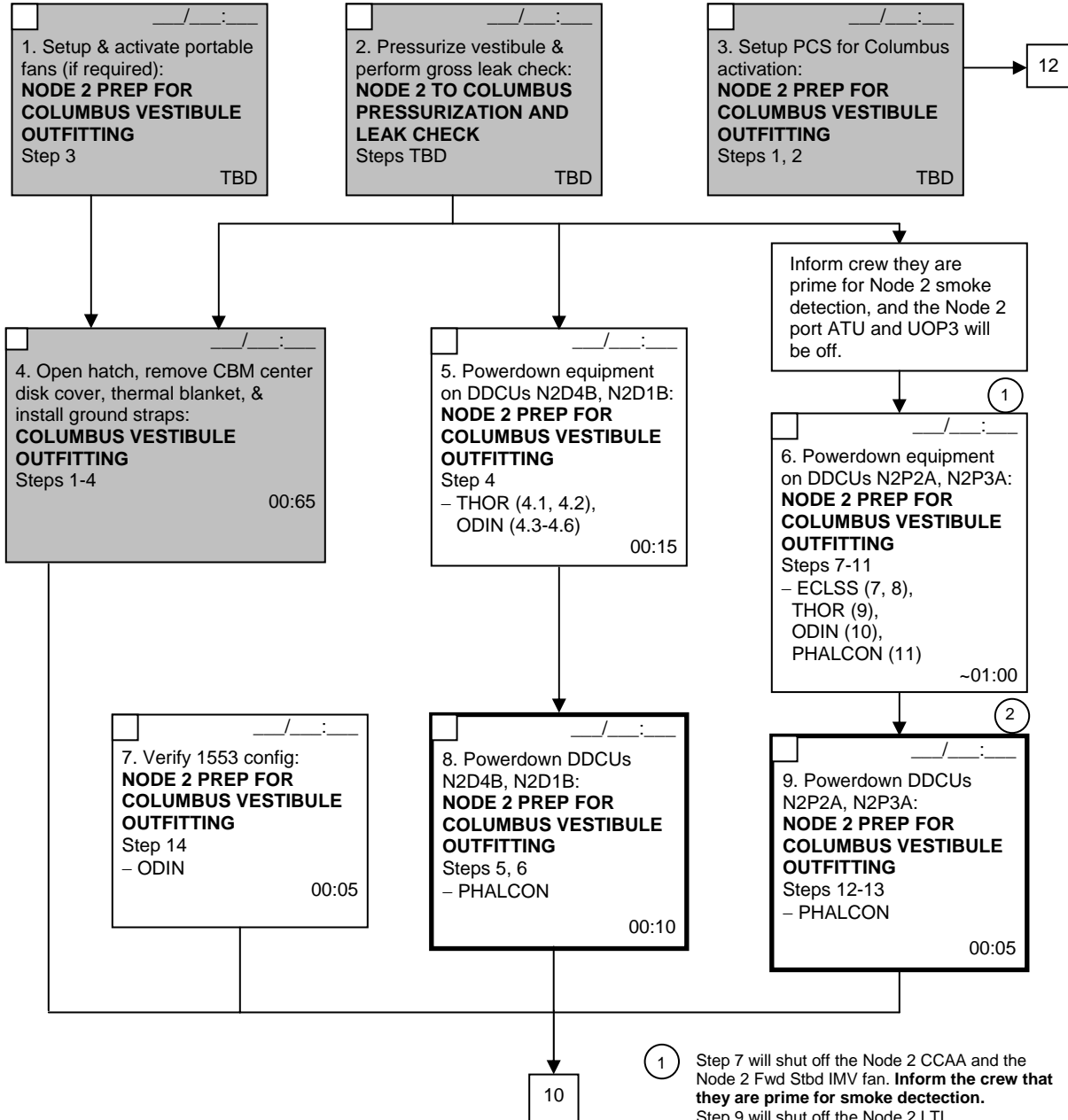
## Initial Conditions:

1. Columbus is berthed to NODE 2 Starboard port.
2. CBM operations are complete and the NODE 2 Starboard CPAs are powered off.
3. Node 2 MTL passive jumper QD disconnect complete.
4. ☺ Columbus 24 hour thermal clock started with APCU (SSRMS PL) power removal at \_\_\_/\_\_\_:\_\_\_ (clock ends at block 17).



Can be done at same time as Blocks 5, 6

Can be done at same time as Blocks 5, 6



① Step 7 will shut off the Node 2 CCAA and the Node 2 Fwd Stbd IMV fan. **Inform the crew that they are prime for smoke detection.** Step 9 will shut off the Node 2 LTL. Step 11 will remove power from Node 2 UOP 3.

② Steps 12 and 13 will remove power from Node 2 ATU 2, ABC 4 and the LTL PPA. The Node 2 ATU 1, ABC 3 and MTL PPA will remain powered on from DDCU N2S1B and N2S4A. **Inform the crew that ATU 2 will not be functional.**

# COLUMBUS ACTIVATION FLOWCHART

(ASSY OPS/1E/FIN/MULTI E) Page 2 of 6 pages

4, 7, 8, 9

10. GO for Columbus umbilical connections:  
**NODE 2 PREP FOR COLUMBUS VESTIBULE  
 OUTFITTING** Step 15  
 and  
**COLUMBUS VESTIBULE OUTFITTING** Step 5.1

11. Connect power jumpers:  
**COLUMBUS VESTIBULE OUTFITTING**  
 Steps 5.2 - 5.8  
 00:15

3 → 12. Connect hardline and 1553 jumpers:  
**COLUMBUS VESTIBULE OUTFITTING**  
 Steps 6-7  
 00:35

13. GO for NODE2 DDCU  
 Powerup and MDM activation:  
**COLUMBUS VESTIBULE  
 OUTFITTING**  
 Step 5.8

15. Remove CPAs:  
**COLUMBUS VESTIBULE OUTFITTING**  
 Step 8  
 – Remove CPAs fwd, aft only  
 01:15

24, 25, 27-32

14. NODE2 DDCU N2P2A, N2P3A,  
 N2D4B, N2D1B powerup and N2-2  
 MDM activation:  
**NODE 2 RECOVERY**  
 Steps 1-6  
 – PHALCON (1-4)  
 ODIN (5, 6)  
 00:40

4 → 16. Powerup PDUs and VTCs:  
**COLUMBUS BERTHED  
 SURVIVAL MODE ACTIVATION**  
 Steps 1-4  
 – ODIN (1, 3, 4.1, 4.3)  
 – PHALCON (2)  
 – COL-CC (4.2, 4.4-4.6)  
 00:15

18, 19, 20, 21, 22, 23

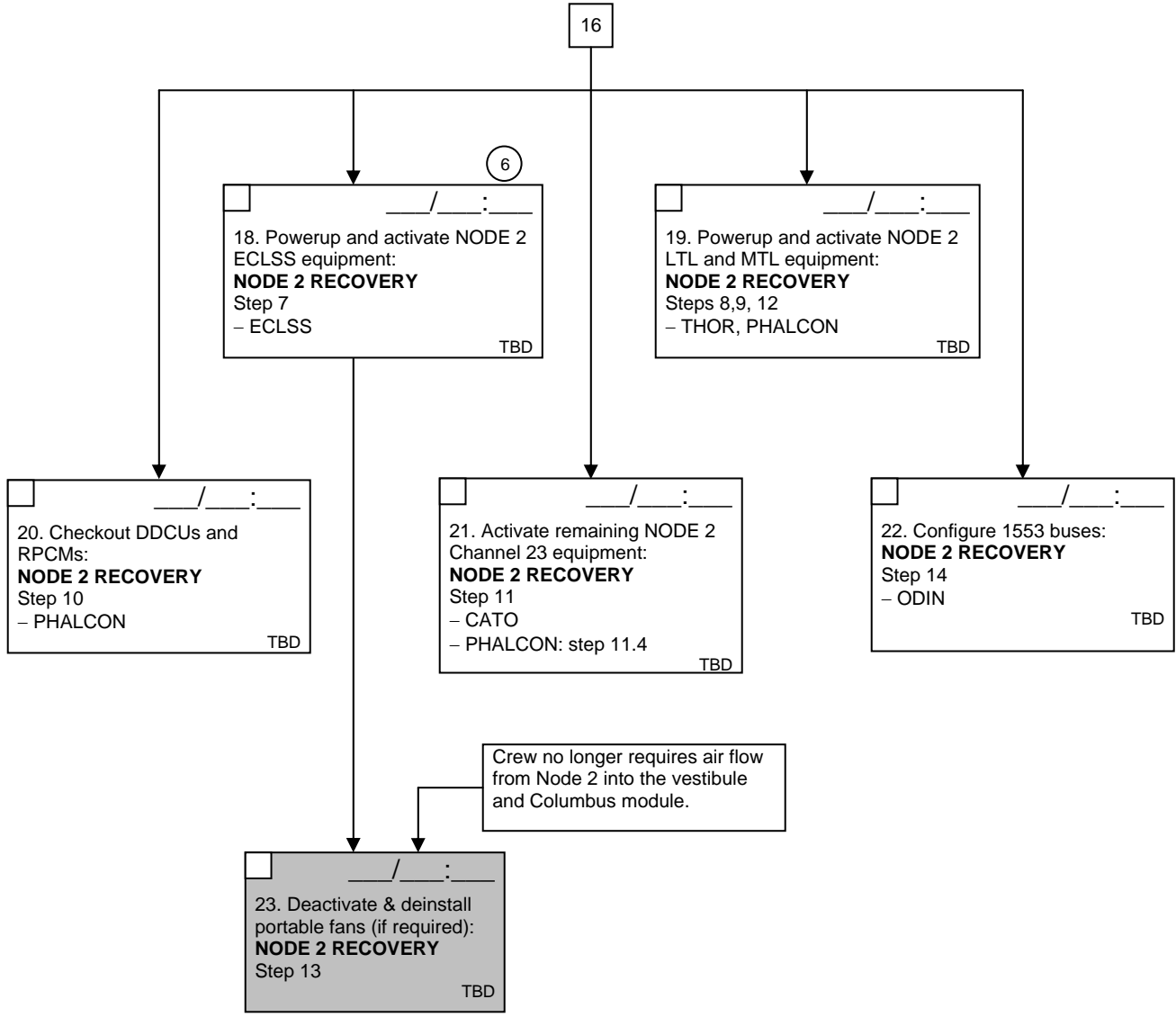
5 → 17. Configure VTCs, activate  
 PDU cross-strap bus, module  
 lights and activate heaters:  
**COLUMBUS BERTHED  
 SURVIVAL MODE  
 ACTIVATION**  
 Steps 5-7  
 – ODIN: steps 5.9 - 5.12  
 – COL-CC: remaining steps  
 00:10

⊕ Step 7 ends Columbus thermal clock

32

- 3 Hardline and 1553 jumpers can be connected in parallel or before power jumper if there is a problem with the power jumper or inhibits. This flow represents the preferred path.
- 4 It is highly desired to complete block 16 prior to moving on to the remaining blocks, in order to keep the team focused on critical activation activities
- 5 When convenient confirm with the crew that the Columbus lights have been turned on after the completion of block 17.

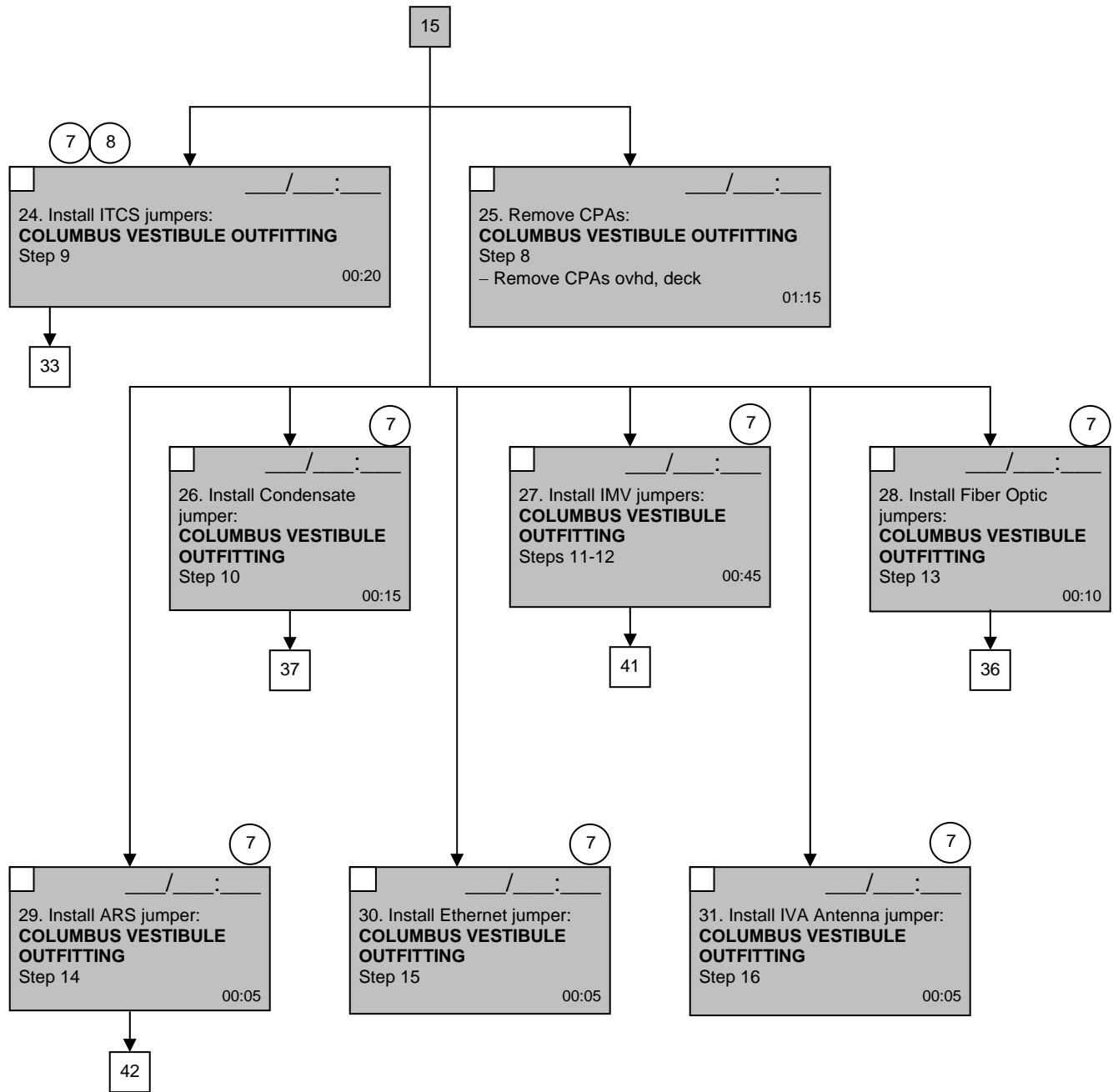
**COLUMBUS ACTIVATION FLOWCHART**  
 (ASSY OPS/1E/FIN/MULTI E) Page 3 of 6 pages



6 Step 7 will restore the Node 2 CCAA, Node 2 IMV and Node 2 smoke detectors. Inform the crew that they are no longer prime for smoke detection in Node 2.

# COLUMBUS ACTIVATION FLOWCHART

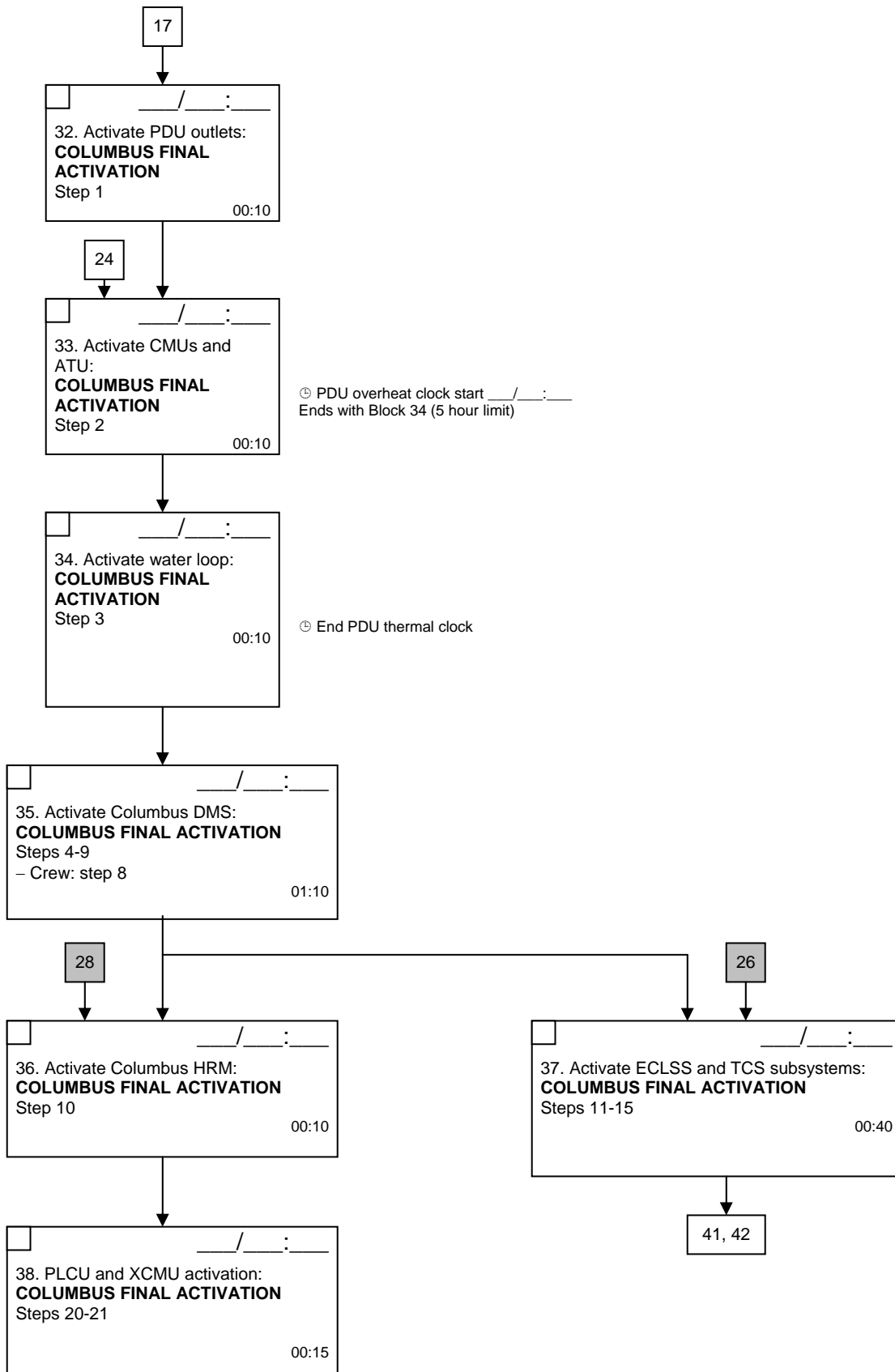
(ASSY OPS/1E/FIN/MULTI E) Page 4 of 6 pages



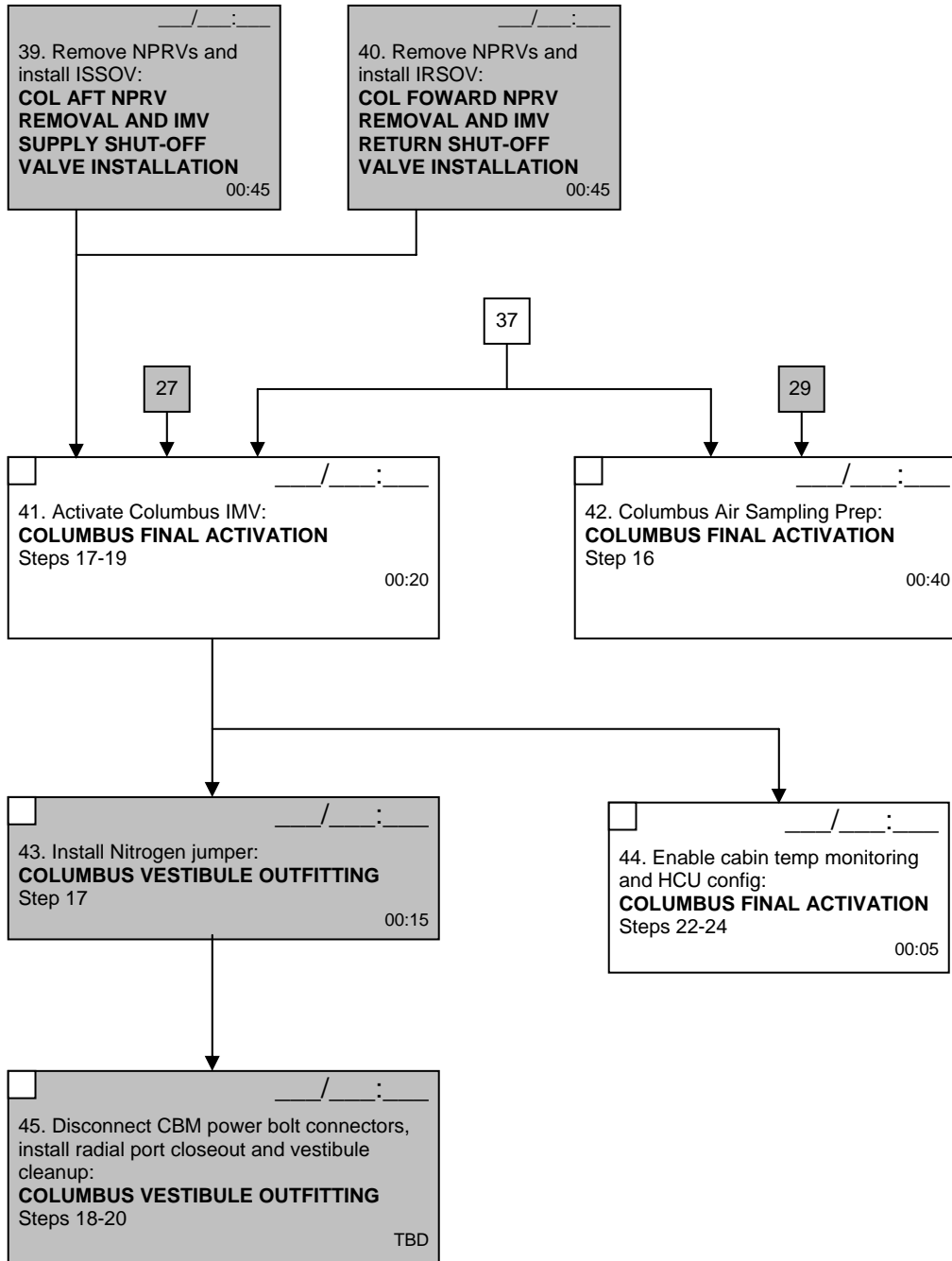
- 7 Jumper Priority:
1. TCS
  2. Condensate
  3. IMV
  4. Fiber Optic
  5. Nitrogen (block 41)
  6. ARS
  7. Ethernet
  8. IVA Antenna

- 8 Block 33 (CMU activation) can be performed after ITCS jumper installation, but cooling will not be supplied to CMUs. It is desired to install ITCS jumpers first.

**COLUMBUS ACTIVATION FLOWCHART**  
 (ASSY OPS/1E/FIN/MULTI E) Page 5 of 6 pages



**COLUMBUS ACTIVATION FLOWCHART**  
 (ASSY OPS/1E/FIN/MULTI E) Page 6 of 6 pages





# COLUMBUS BERTHED SURVIVAL MODE ACTIVATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 14 pages

## OBJECTIVE:

Initial activation of Columbus module through HCU activation. This procedure will end the thermal clock started when the module is removed from the PL Bay.

## INITIAL CONDITIONS:

DDCUs N2D4B and N2D1B repowered (config TBD)

DDCUs N2P2A and N2P3A repowered

N2-1 and N2-2 MDMs nominal

Hardwired connectors mated

1553 connections mated

Power connections mated

VTC Redundancy Management inhibited

1. VERIFYING NODE MDMS ARE NOMINAL
  - 1.1 Verifying N2-1 MDM

PCS CDH Summary: N2-1  
Node 2-1 MDM

Verify Frame Count – <incrementing>  
Verify Processing State – Operational
  - 1.2 Verifying N2-2 MDM

CDH Summary: N2-2  
Node 2-2 MDM

Verify Frame Count – <incrementing>  
Verify Processing State – Operational
2. ACTIVATING PDU
  - 2.1 Activating PDU1 Nominal Converter 1

PCS Task: COL Berthed Survival Mode  
COL Berthed Survival Mode  
'Power Distribution Unit'

**cmd** PDU1 Nom Pwr – On

Verify PDU1 Nom Pwr Status – On  
Verify PDU1 VTC1 Pwr Bus Status – On  
Verify PDU1 Main Input Current < 5 A
  - 2.2 Activating PDU1 Nominal Converter 2

COL Berthed Survival Mode  
'Power Distribution Unit'

cmd PDU1 Redun Pwr – On

Verify PDU1 Redun Pwr Status – On  
Verify PDU1 VTC2 Pwr Bus Status – On  
Verify PDU1 Main Input Current < 5 A

2.3 [Activating PDU2 Nominal Converter 1](#)

COL Berthed Survival Mode

'Power Distribution Unit'

cmd PDU2 Nom Pwr – On

Verify PDU2 Nom Pwr Status – On  
Verify PDU2 VTC2 Pwr Bus Status – On  
Verify PDU2 Main Input Current < 5 A

2.4 [Activating PDU2 Nominal Converter 2](#)

COL Berthed Survival Mode

'Power Distribution Unit'

cmd PDU2 Redun Pwr – On

Verify PDU2 Redun Pwr Status – On  
Verify PDU2 VTC1 Pwr Bus Status – On  
Verify PDU2 Main Input Current < 5 A

3. [ENABLING COMMUNICATION WITH C&C MDM](#)

NOTE

Expect C&W messages.

PCS

3.1 [Inhibiting VTC Redundancy Management](#)

Task: COL Berthed Survival Mode

COL Berthed Survival Mode

'Vital Telemetry and Telecommand Controller'

'Inhibit VTC Redun Management'

- √Master VTC Recovery Step 1 – Inh
- √Master VTC Recovery Step 2 – Inh
- √Slave VTC Recovery – Inh

3.2 [Enabling RT I/O with VTC1](#)

Task: COL Berthed Survival Mode: CB INT 1 RT Status

CB INT 1 RT Status

cmd 21 VTC 1 RT Status – Enable **Execute** (Verify – Ena)

3.3 [Enabling RT I/O with VTC2](#)

Task: COL Berthed Survival Mode: CB INT 2 RT Status

CB INT 2 RT Status

cmd 21 VTC 2 RT Status – Enable **Execute** (Verify – Ena)

4. [ACTIVATING AND INITIALIZING VTC1 AND VTC2](#)

NOTE

- 1. Steps 4.1 through 4.4 require AOS.
- 2. VTC1 Ready Status indication can be acquired only when VTC2 is in Idle Mode.

PCS

4.1 [Activating VTC1 Idle Mode via Nom Power A](#)

Task: COL Berthed Survival Mode

COL Berthed Survival Mode

'VTC1 Nominal Config'

cmd VTC1 Nom Pwr A – On

Verify VTC1 Nom Pwr A Status – On

Verify VTC1 Nom Pwr A Current < 2.14 A

Verify VTC1 Idle Config Mode – Idle Mode

COL-CC

4.2 [Enabling VTC1 Pre-emptive telemetry packets \(Ground Only\)](#)

**COL-CC** to enable VTC1 pre-emptive telemetry packets.

Wait for “Go” to continue.

NOTE

Packet swapping initiated from **COL-CC**: Enable VTC1\_Gnd\_Tlm\_Pkt\_PHY1\_VTC (1Hz)

Perform [{2.2.41 VTC GROUND PACKET SWAPPING}](#) (EODF: GROUND NOMINAL). then:

**COL-CC** to give a “Go” to continue.

PCS

4.3 [Activating VTC2 Idle Mode via Nom Power A](#)

COL Berthed Survival Mode

'VTC2 Nominal Config'

cmd VTC2 Nom Pwr A – On

Verify VTC2 Nom Pwr A Status – On

Verify VTC2 Nom Pwr A Current < 2.14 A

Verify VTC2 Idle Config Mode – Idle Mode

# COLUMBUS BERTHED SURVIVAL MODE ACTIVATION

(ASSY OPS/1E/FIN/MULTI E)

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Verify VTC1 Nom Ready Status – Ready

Verify VTC2 Nom Ready Status – Ready

**MCC-H gives COL-CC “Go” to continue**

COL-CC

## 4.4 [Enabling VTC2 Pre-emptive telemetry packets \(Ground Only\)](#)

COL-CC to enable VTC2 pre-emptive telemetry packets.

Wait for “Go” to continue.

### NOTE

Packet swapping initiated from COL-CC: Enable  
VTC2\_Gnd\_Tlm\_Pkt\_PHY1\_VTC (1Hz)

Perform [{2.2.41 VTC GROUND PACKET SWAPPING}](#) (EODF: GROUND NOMINAL). then:

COL-CC to give a “Go” to continue.

PCS

## 4.5 [Activating VTC1 Nom Power B](#)

COL Berthed Survival Mode

'VTC1 Nominal Config'

**cmd** VTC1 Nom Pwr B – On

Verify VTC1 Nom Pwr B Status – On

Verify VTC1 Nom Pwr A Current < 1.33 A

Verify VTC1 Nom Pwr B Current < 1.08 A

Verify VTC1 Nom Temp < 48 °C

**cmd** VTC1\_Nom\_Pwr\_B\_On\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify VTC1\_Nom\_Pwr\_B\_Stat\_VTC – ON

Verify VTC1\_Nom\_Pwr\_A\_Current\_VTC – <1.33 A

Verify VTC1\_Nom\_Pwr\_B\_Current\_VTC – <1.08 A

Verify VTC1\_Nom\_Temp\_VTC – < 48 °C

## 4.6 [Activating VTC2 Nom Power B](#)

COL Berthed Survival Mode

'VTC2 Nominal Config'

**cmd** VTC2 Nom Pwr B – On

Verify VTC2 Nom Pwr B Status – On

Verify VTC2 Nom Pwr A Current < 1.33 A

Verify VTC2 Nom Pwr B Current < 1.08 A

Verify VTC2 Nom Temp < 48 °C

```
cmd VTC2_Nom_Pwr_B_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

```
Verify VTC2_Nom_Pwr_B_Stat_VTC – ON
Verify VTC2_Nom_Pwr_A_Current_VTC – <1.33 A
Verify VTC2_Nom_Pwr_B_Current_VTC – <1.08 A
Verify VTC2_Nom_Temp_VTC – < 48 °C
```

5. [CONFIGURING VTC1 TO MASTER AND VTC2 TO SLAVE](#)

PCS

5.1 [Initializing VTC2 in Slave Mode](#)

Task: COL Berthed Survival Mode

COL Berthed Survival Mode

'Vital Telemetry and Telecommand Controller'

**cmd** VTC 2 Initialization (Default) – Slave

```
Verify VTC2 Mode – Slave
Verify VTC2 Idle Config Mode – Not Idle
```

```
cmd VTC_Initialization_Cmd_SW
prm Init_Mode – 0 (SLAVE)
prm Init_Limit_Set – 0 (DEFAULT)
prm Init_APM_Mode – 2 (N/A)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify VTC2_INT_DATA_MASTER_SLAVE_MODE_SW – SLAVE
Verify VTC2_INT_DATA_IDLE_CONF_MODE_SW – NOT_IDLE
```

5.2 [Enabling Physical Telemetry Packets](#)

COL Berthed Survival Mode

'Vital Telemetry and Telecommand Controller'

**cmd** Tlm Packet Physical 4 – Enable  
**cmd** Tlm Packet Physical 5 – Enable

```
cmd VTC_Tlm_Pkt_Ena_Cmd_SW
prm Packet_ID – VTC2_Tlm_Pkt_PHY4_VTC
prm Action – 1 (ENABLE)
prm Checksum_Flag – 1 (ENABLE)
prm Dump_Pipe – 0 (TLM_P)
prm APID_Value – 1268
data Onboard_Node – SYS_CCSDS_End_Point_VTC2
```

```
cmd VTC_Tlm_Pkt_Ena_Cmd_SW
prm Packet_ID – VTC2_Tlm_Pkt_PHY5_VTC
prm Action – 1 (ENABLE)
prm Checksum_Flag – 1 (ENABLE)
prm Dump_Pipe – 0 (TLM_P)
prm APID_Value – 1268
data Onboard_Node – SYS_CCSDS_End_Point_VTC2
```

5.3 [Notifying VTC1 that VTC2 is in Slave Mode](#)

COL Berthed Survival Mode

'Vital Telemetry and Telecommand Controller'

cmd Notify VTC1 – VTC2 in Slave Mode – Notify

```
cmd VTC_Notify_Mode_Cmd_SW
prm New_Mode – 0 (SLAVE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

5.4 [Initializing VTC1 in Master Mode](#)

COL Berthed Survival Mode

'Vital Telemetry and Telecommand Controller'

cmd VTC1 Initialization (Default, Vital) – Master

Verify VTC1 Mode – Master  
Verify VTC1 DMS Mode – Vital  
Verify VTC1 Idle Config Mode – Not Idle

```
cmd VTC_Initialization_Cmd_SW
prm Init_Mode – 1 (MASTER)
prm Init_Limit_Set – 0 (DEFAULT)
prm Init_APM_Mode – 1 (VITAL)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify VTC1_INT_DATA_MASTER_SLAVE_MODE_SW – MASTER
Verify VTC1_INT_DATA_APM_MODE_SW – VITAL
Verify VTC1_INT_DATA_IDLE_CONF_MODE_SW – NOT_IDLE
```

5.5 [Enabling Logical Telemetry Packets](#)

COL Berthed Survival Mode

'Vital Telemetry and Telecommand Controller'

cmd Tlm Packet Logical 1 – Enable  
cmd Tlm Packet Logical 2 – Enable

```
cmd VTC_Tlm_Pkt_Ena_Cmd_SW
```

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```
prm Packet_ID – VTC_Tlm_Pkt_LOG1_VTC
prm Action – 1 (ENABLE)
prm Checksum_Flag – 1 (ENABLE)
prm Dump_Pipe – 0 (TLM_P)
prm APID_Value – 1267
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

cmd VTC_Tlm_Pkt_Ena_Cmd_SW
prm Packet_ID – VTC_Tlm_Pkt_LOG2_VTC
prm Action – 1 (ENABLE)
prm Checksum_Flag – 1 (ENABLE)
prm Dump_Pipe – 0 (TLM_P)
prm APID_Value – 1267
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

COL-CC

## 5.6 [Swapping DMS Telemetry Packets \(Ground Only\)](#)

COL-CC to swap nominal DMS telemetry packets.

Wait for “Go” to continue.

### NOTE

Packet swapping initiated from COL-CC:  
Disable VTC1\_Gnd\_Tlm\_Pkt\_PHY2\_VTC (1Hz)  
Disable VTC2\_Gnd\_Tlm\_Pkt\_PHY2\_VTC (1Hz)  
Enable VTC\_Gnd\_Tlm\_Pkt\_LOG1\_VTC (1Hz)  
Enable VTC\_Gnd\_Tlm\_Pkt\_LOG2\_VTC (1Hz)

Perform [{2.2.41 VTC GROUND PACKET SWAPPING}](#) (EODF: GROUND NOMINAL). then:

COL-CC to give a “Go” to continue.

PCS

## 5.7 [Enabling VTC Vital Bus FDIR](#)

Task: COL Berthed Survival Mode

'COL Activation Overview Displays'

sel DMS

sel Vital Bus

cmd Vital Bus Recon – Enable

Verify Vital Bus Recon – Enable

```
cmd VTC_Vital_Sys_Bus_Recon_Ena_Cmd_SW
prm BUS_ID – 0 (Vital)
prm RECONFIGURATION_ENABLE – 1 (Enable)
data Onboard_Node – SYS_CCSDS_End_Point_VTCM

Verify VTC_MASTER_Vital_Bus_Recon_Ena_SW_PP –
ENABLE
```

PCS 5.8 [Enabling VTC System Bus FDIR](#)  
Task: COL Berthed Survival Mode  
  
'COL Activation Overview Displays'  
  
sel DMS  
  
  
sel System Bus  
  
  
cmd System Bus Recon – Enable  
  
Verify System Bus Recon – Enable

```
cmd VTC_Vital_Sys_Bus_Recon_Ena_Cmd_SW
prm BUS_ID – 1 (System)
prm RECONFIGURATION_ENABLE – 1 (Enable)
data Onboard_Node – SYS_CCSDS_End_Point_VTCM

Verify VTC_MASTER_System_Bus_Recon_Ena_SW_PP –
ENABLE
```

PCS 5.9 [Enabling RT FDIR with VTC1](#)  
Task: COL Berthed Survival Mode: CB INT 1 RT Status  
  
  
cmd 21 VTC 1 RT FDIR Status – Enable FDIR **Execute** (Verify – Ena)  
  
5.10 [Enabling RT FDIR with VTC2](#)  
Task: COL Berthed Survival Mode: CB INT 2 RT Status  
  
  
cmd 21 VTC 2 RT FDIR Status – Enable FDIR **Execute** (Verify – Ena)



PCS 5.11 [Enabling VTC Redundancy Management](#)  
 Task: COL Berthed Survival Mode  
 COL Berthed Survival Mode  
 'Vital Telemetry and Telecommand Controller'  
 'Enable VTC Redun Management'

**cmd** Master VTC Recovery Step 1 – Enable (Verify – Ena)  
**cmd** Master VTC Recovery Step 2 – Enable (Verify – Ena)  
**cmd** Slave VTC Recovery – Enable (Verify – Ena)

MCC-H 5.12 [Enabling C&W For VTC Redundancy Management \(Ground Only\)](#)  
 Enable the following events in the Primary and Backup C&C MDMs.

If ground unable to complete,  
 Perform [{2.101 CAUTION AND WARNING EVENT MANAGEMENT}](#), step 2 (SODF: C&DH: NOMINAL) per Table 1, then

**Table 1. C&W Events for DMS Master & Slave Recovery**

Event	Text	Class
13608	DMS MASTER VTC Recovery Step 1 Failure - COL	C
13609	DMS MASTER VTC Recovery Step 2 Failure - COL	C
13610	DMS SLAVE VTC Recovery Failure - COL	C

6. [ACTIVATING PDU CROSS STRAPPED POWER BUS](#)

PCS 6.1 [Verifying Microcontroller Status](#)  
 Task: COL Berthed Survival Mode  
 COL Berthed Survival Mode  
 'PDU Redun Pwr Bus Act'

Verify PDU1 Nom Cntl – On  
 Verify Redun Cntl – Off  
 Verify PDU2 Nom Cntl – On  
 Verify Redun Cntl – Off

Verify PDU1\_Nom\_Cntl\_Stat\_VTC – ON

```
Verify PDU1_Redun_Cntl_Stat_VTC – OFF
Verify PDU2_Nom_Cntl_Stat_VTC – ON
Verify PDU2_Redun_Cntl_Stat_VTC – OFF
```

6.2 [Verifying VTC1 Two-Stage Buffer Status](#)

COL Berthed Survival Mode

'PDU Redun Pwr Bus Act'

√VTC1 Buffer – Empty

```
*****
*          If VTC1 Buffer – Full
*          |
*          |          cmd VTC1 Buffer – Clear
*          |
*          |          Verify VTC1 Buffer – Empty
*          |
*          |
*****
```

```
√VTC1_INT_DATA_TWOSTEP_FULL_SW – EMPTY

If VTC1_INT_DATA_TWOSTEP_FULL_SW – FULL
|
|          cmd VTC_Cancel_Two_Stage_Cmd_Cmd_SW
|          data Onboard_Node – SYS_CCSDS_End_Point_VTC1
|
|          Verify VTC1_INT_DATA_TWOSTEP_FULL_SW –
|          EMPTY
```

6.3 [Activating All PDU1 and PDU2 Aux Converters for 120V Outlets](#)

COL Berthed Survival Mode

'PDU Redun Pwr Bus Act'

Record PCS ID: \_\_\_\_\_

'Aux Converters Activation'

**cmd** Start ACS PDU Config – Arm

pick PCS/C-X to VTC-Com1 (where X=PCS ID)

**cmd** Start ACS PDU Config – Set

**COL-CC** to verify PDU SSPC Aux Converter status.

Wait for “Go” to continue.

```
cmd PDU_Config_ACS (ARM)
data SW_CMD – VTC_Start_Terminate_ACS_Cmd_SW
```

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**data** Action – 1 (START)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify VTC1\_INT\_DATA\_TWOSTEP\_FULL\_SW – FULL

**cmd** VTC\_Execute\_2\_Stage\_Cmd\_SW (EXEC)

Verify PDU1\_SSPC\_Aux\_Conv1\_Stat\_VTC – ON

Verify PDU1\_SSPC\_Aux\_Conv2\_Stat\_VTC – ON

Verify PDU1\_SSPC\_Aux\_Conv3\_Stat\_VTC – ON

Verify PDU1\_SSPC\_Aux\_Conv4\_Stat\_VTC – ON

Verify PDU1\_SSPC\_Aux\_Conv5\_Stat\_VTC – ON

Verify PDU1\_SSPC\_Aux\_Conv6\_Stat\_VTC – ON

Verify PDU1\_SSPC\_Aux\_Conv7\_Stat\_VTC – ON

Verify PDU1\_SSPC\_Aux\_Conv8\_Stat\_VTC – ON

Verify PDU1\_SSPC\_Aux\_Conv9\_Stat\_VTC – ON

Verify PDU2\_SSPC\_Aux\_Conv1\_Stat\_VTC – ON

Verify PDU2\_SSPC\_Aux\_Conv2\_Stat\_VTC – ON

Verify PDU2\_SSPC\_Aux\_Conv3\_Stat\_VTC – ON

Verify PDU2\_SSPC\_Aux\_Conv4\_Stat\_VTC – ON

Verify PDU2\_SSPC\_Aux\_Conv5\_Stat\_VTC – ON

Verify PDU2\_SSPC\_Aux\_Conv6\_Stat\_VTC – ON

Verify PDU2\_SSPC\_Aux\_Conv7\_Stat\_VTC – ON

Verify PDU2\_SSPC\_Aux\_Conv8\_Stat\_VTC – ON

Verify PDU2\_SSPC\_Aux\_Conv9\_Stat\_VTC – ON

**COL-CC** gives “Go” to continue

### 6.4 [Activating PDU1 to PDU2 Power Outlet](#)

COL Berthed Survival Mode

'Cross Strapped Power Bus Act'

**cmd** PDU 1/2 Redun Pwr Bus – On

Verify PDU 1/2 Redun Pwr Bus Status – On

**cmd** PDU1\_PDU2\_Redun\_Pwr\_Bus\_On\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PDU1\_PDU2\_Redun\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON

### 6.5 [Activating PDU2 to PDU1 Power Outlet](#)

COL Berthed Survival Mode

'Cross Strapped Power Bus Act'

**cmd** PDU 2/1 Redun Pwr Bus – On

Verify PDU 2/1 Redun Pwr Bus Status – On

**cmd** PDU2\_PDU1\_Redun\_Pwr\_Bus\_On\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PDU2\_PDU1\_Redun\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON

6.6 [Activating PDU1 Cross Strapped Converter](#)

COL Berthed Survival Mode

'Converter Activation'

**cmd** PDU1 Cross Strapped Conv – On

Verify PDU1 Cross Strapped Conv Status – On

**cmd** PDU1\_Cross\_Strapped\_Conv\_On\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PDU1\_Cross\_Strapped\_Conv\_Stat\_VTC – ON

6.7 [Activating PDU2 Cross Strapped Converter](#)

COL Berthed Survival Mode

'Converter Activation'

**cmd** PDU2 Cross Strapped Conv – On

Verify PDU2 Cross Strapped Conv Status – On

**cmd** PDU2\_Cross\_Strapped\_Conv\_On\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify PDU2\_Cross\_Strapped\_Conv\_Stat\_VTC – ON

6.8 [Activating PDU Lights Power Buses](#)

PCS

COL: EPS: Lights

COL PDU 1-2 Lights VTC1

**cmd** PDU 2 Outlet 21 – On (Verify – On)

**cmd** PDU 1 Outlet 21 – On (Verify – On)

**cmd** PDU2\_MLU\_Pwr\_Bus\_On\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1  
Verify PDU2\_MLU\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON  
**cmd** PDU1\_MLU\_Pwr\_Bus\_On\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1  
Verify PDU1\_MLU\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON

7. [ACTIVATING HEATER CONTROL UNIT](#)

PCS

7.1 [Activating HCU1 Power Bus](#)

Task: COL Berthed Survival Mode

COL Berthed Survival Mode

'Heater Control Unit'

**cmd** PDU1 HCU1 Pwr Bus On – On

Verify PDU1 HCU1 Pwr Bus Status – On

Verify PDU1 HCU1 Input Current < 10 A

**cmd** PDU1\_HCU1\_Pwr\_Bus\_On\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1  
Verify PDU1\_HCU1\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON  
Verify PDU1\_HCU1\_Pwr\_Bus\_Current\_VTC\_PP – < 10 A

7.2 [Activating HCU2 Power Bus](#)

COL Berthed Survival Mode

'Heater Control Unit'

**cmd** PDU2 HCU2 Pwr Bus – On

Verify PDU2 HCU2 Pwr Bus Status – On

Verify PDU2 HCU2 Input Current < 10 A

**cmd** PDU2\_HCU2\_Pwr\_Bus\_On\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1  
Verify PDU2\_HCU2\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON  
Verify PDU2\_HCU2\_Pwr\_Bus\_Current\_VTC\_PP – < 10 A

Verifying Heater Control Loop Status (Ground Only)

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### NOTE

TLM only available after 30 sec delay following HCU power on because of HCU SW initialization.

Verify HCU1\_AO\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

Verify HCU1\_AD\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

Verify HCU1\_AR\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

Verify HCU1\_FD\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

Verify HCU1\_FO\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

Verify HCU1\_FR\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

Verify HCU2\_AO\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

Verify HCU2\_AD\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

Verify HCU2\_AR\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

Verify HCU2\_FD\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

Verify HCU2\_FO\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

Verify HCU2\_FR\_Htr\_Cntl\_Loop\_Stat\_VTC – ENABLED

OBJECTIVE:

Continuing activation of Columbus Module.

INITIAL CONDITIONS:

Columbus Berthed Survival Mode Activation is complete.

1. ACTIVATING PDU OUTLET

PCS

1.1 Activating PDU1 Subsystem Power Buses 1 thru 5

Task: COL Final Activation - Part 1

COL Final Activation - Part 1

'PDU Outlet Activation'

PDU1 Subsys Pwr Bus [X] where [X] = [1] [2] [3] [4] [5]  
**cmd** PDU1 Subsys Pwr Bus [X] – On  
Verify PDU1 Subsys Pwr Bus Posn [X] – On  
Repeat

```
cmd PDU1_Subsys_Pwr_Bus1_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU1_Subsys_Pwr_Bus1_On_Off_Stat_VTC_PP – ON

cmd PDU1_Subsys_Pwr_Bus2_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU1_Subsys_Pwr_Bus2_On_Off_Stat_VTC_PP – ON

cmd PDU1_Subsys_Pwr_Bus3_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU1_Subsys_Pwr_Bus3_On_Off_Stat_VTC_PP – ON

cmd PDU1_Subsys_Pwr_Bus4_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU1_Subsys_Pwr_Bus4_On_Off_Stat_VTC_PP – ON

cmd PDU1_Subsys_Pwr_Bus5_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify PDU1\_Subsys\_Pwr\_Bus5\_On\_Off\_Stat\_VTC\_PP – ON

1.2 [Activating PDU1 Subsystem Power Buses 6 thru 10](#)

COL Final Activation - Part 1

'PDU Outlet Activation'

PDU1 Subsys Pwr Bus [X] where [X] = [6] [7] [8] [9] [10]  
 cmd PDU1 Subsys Pwr Bus [X] – On  
 Verify PDU1 Subsys Pwr Bus Posn [X] – On  
 Repeat

```

cmd PDU1_Subsys_Pwr_Bus6_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU1_Subsys_Pwr_Bus6_On_Off_Stat_VTC_PP – ON

cmd PDU1_Subsys_Pwr_Bus7_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU1_Subsys_Pwr_Bus7_On_Off_Stat_VTC_PP – ON

cmd PDU1_Subsys_Pwr_Bus8_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU1_Subsys_Pwr_Bus8_On_Off_Stat_VTC_PP – ON

cmd PDU1_Subsys_Pwr_Bus9_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU1_Subsys_Pwr_Bus9_On_Off_Stat_VTC_PP – ON

cmd PDU1_Subsys_Pwr_Bus10_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU1_Subsys_Pwr_Bus10_On_Off_Stat_VTC_PP – ON
    
```

1.3 [Activating PDU2 Subsystem Power Buses 1 thru 5](#)

COL Final Activation - Part 1

'PDU Outlet Activation'



```

PDU2 Subsys Pwr Bus [X] where [X] = [1] [2] [3] [4] [5]
    cmd PDU2 Subsys Pwr Bus [X] – On
    Verify PDU2 Subsys Pwr Bus Posn [X] – On
Repeat
    
```

```

cmd PDU2_Subsys_Pwr_Bus1_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU2_Subsys_Pwr_Bus1_On_Off_Stat_VTC_PP – ON

cmd PDU2_Subsys_Pwr_Bus2_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU2_Subsys_Pwr_Bus2_On_Off_Stat_VTC_PP – ON

cmd PDU2_Subsys_Pwr_Bus3_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU2_Subsys_Pwr_Bus3_On_Off_Stat_VTC_PP – ON

cmd PDU2_Subsys_Pwr_Bus4_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU2_Subsys_Pwr_Bus4_On_Off_Stat_VTC_PP – ON

cmd PDU2_Subsys_Pwr_Bus5_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify PDU2_Subsys_Pwr_Bus5_On_Off_Stat_VTC_PP – ON
    
```

1.4 [Activating PDU2 Subsystem Power Buses 6 thru 10](#)

COL Final Activation - Part 1

'PDU Outlet Activation'

```

PDU2 Subsys Pwr Bus [X] where [X] = [6] [7] [8] [9] [10]
    cmd PDU2 Subsys Pwr Bus [X] – On
    Verify PDU2 Subsys Pwr Bus Posn [X] – On
Repeat
    
```

```
cmd PDU2_Subsys_Pwr_Bus6_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify PDU2\_Subsys\_Pwr\_Bus6\_On\_Off\_Stat\_VTC\_PP – ON

```
cmd PDU2_Subsys_Pwr_Bus7_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify PDU2\_Subsys\_Pwr\_Bus7\_On\_Off\_Stat\_VTC\_PP – ON

```
cmd PDU2_Subsys_Pwr_Bus8_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify PDU2\_Subsys\_Pwr\_Bus8\_On\_Off\_Stat\_VTC\_PP – ON

```
cmd PDU2_Subsys_Pwr_Bus9_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify PDU2\_Subsys\_Pwr\_Bus9\_On\_Off\_Stat\_VTC\_PP – ON

```
cmd PDU2_Subsys_Pwr_Bus10_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify PDU2\_Subsys\_Pwr\_Bus10\_On\_Off\_Stat\_VTC\_PP – ON

### 1.5 [Activating PDU1 D1 Rack Power](#)

COL Final Activation - Part 1

'PDU Outlet Activation'

'PDU1'

```
cmd Rack D1 Pwr Bus – On
```

Verify Rack D1 Pwr Bus – On

```
cmd PDU1_Rack_D1_Pwr_Bus_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify PDU1\_Rack\_D1\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON

1.6 [Activating PDU2 D1 Rack Power](#)

COL Final Activation - Part 1

'PDU Outlet Activation'  
'PDU2'

**cmd** Rack D1 Pwr Bus – On

Verify Rack D1 Pwr Bus – On

**cmd** PDU2\_Rack\_D1\_Pwr\_Bus\_On\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PDU2\_Rack\_D1\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON

1.7 [Activating WPA1 & WPA2 Accumulator Pressure Sensors \(Ground Only\)](#)

COL-CC

COL-CC to activate WPA1 and WPA2 Accumulator Pressure Sensors.

Wait for “Go” to continue.

NOTE

1. This step can only be performed by COL-CC.
2. If the sensor readings show values below 165 kPa a pressurization of the accumulator is required prior to payload rack connector mate. Continue with [step 1.8](#).
3. If both readings of either pair of WPA Accumulator Pressure sensors are out of limits after the monitoring has been enabled, the system will automatically safe to Berthed Survival Mode.

**cmd** WPA1\_Accum\_Press\_Snsr1\_Pwr\_On\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WPA1\_Accum\_Abs\_Press1\_VTC – 165 -195 kPa

**cmd** WPA1\_Accum\_Press\_Snsr2\_Pwr\_On\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify WPA1\_Accum\_Abs\_Press2\_VTC – 165 -195 kPa

**cmd** WPA2\_Accum\_Press\_Snsr1\_Pwr\_On\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify WPA2\_Accum\_Abs\_Press1\_VTC – 165 -195 kPa

```

cmd WPA2_Accum_Press_Snsr2_Pwr_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify WPA2_Accum_Abs_Press2_VTC – 165 -195 kPa

Activation of the VTC C&W monitoring for the WPA1 and WPA2
Accumulator Pressure Sensors

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – WPA1_Accum_Abs_Press1_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify WPA1_Accum_Abs_Press1_VTC_MEF – ENABLED

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – WPA1_Accum_Abs_Press2_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify WPA1_Accum_Abs_Press2_VTC_MEF – ENABLED

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – WPA2_Accum_Abs_Press1_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify WPA2_Accum_Abs_Press1_VTC_MEF – ENABLED

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – WPA2_Accum_Abs_Press2_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify WPA2_Accum_Abs_Press2_VTC_MEF – ENABLED

COL-CC gives "Go" to continue.
    
```

MCC-H 1.8 [Enabling C&W for Previous Monitorings \(Ground Only\)](#)  
 Enable the following events in the Primary and Backup C&C MDMs.

If ground unable to complete,  
 | Perform [{2.101 CAUTION AND WARNING EVENT MANAGEMENT}](#), Step 2 (SODF: C&DH: NOMINAL)  
 | per Table 1, then

Table 1. C&W Events for WPA1 and WPA2

Event	Text	Class
13538	WPA1 Accumulator Pressure Sensor 1 High - COL	W
13539	WPA1 Accumulator Pressure Sensor 2 High - COL	W
13540	WPA2 Accumulator Pressure Sensor 1 High - COL	W
13541	WPA2 Accumulator Pressure Sensor 2 High - COL	W

PCS

1.9 [Verifying Total Pressure Sensors](#)

COL Final Activation - Part 1

'Total Pressure Sensor'

Verify TPS1 Air Pressure: 719 to 783 mmHg

Verify TPS2 Air Pressure: 719 to 783 mmHg

Verify TPS3 Air Pressure: 719 to 783 mmHg

Verify TPS4 Air Pressure: 719 to 783 mmHg

Verify TPS1\_Air\_Press\_VTC – 719 - 783 mmHg

Verify TPS2\_Air\_Press\_VTC – 719 - 783 mmHg

Verify TPS3\_Air\_Press\_VTC – 719 - 783 mmHg

Verify TPS4\_Air\_Press\_VTC – 719 - 783 mmHg

2. [ACTIVATING CMU 1-4](#)

NOTE

1. CMU4 needs to be activated for CMU1 Ready Status to be available.

2. The water loop must be activated within 5 hours of CMU activation.

PCS

2.1 [Activating Nominal Power A Supplies](#)

Task: COL Final Activation - Part 1

COL Final Activation - Part 1

'Command and Measurement Unit Activation'

**cmd** CMU 1 Nom Pwr A – On

Verify CMU 1 Nom Pwr A Status – On

Verify CMU 1 Nom Pwr A Current < 1.35 A

**cmd** CMU 2 Nom Pwr A – On

Verify CMU 2 Nom Pwr A Status – On  
Verify CMU 2 Nom Pwr A Current < 1.35 A  
Verify CMU 2 Ready Status – Ready

**cmd** CMU 3 Nom Pwr A – On

Verify CMU 3 Nom Pwr A Status – On  
Verify CMU 3 Nom Pwr A Current < 1.35 A  
Verify CMU 3 Ready Status – Ready

**cmd** CMU 4 Nom Pwr A – On

Verify CMU 4 Nom Pwr A Status – On  
Verify CMU 4 Nom Pwr A Current < 1.35 A  
Verify CMU 4 Ready Status – Ready

Verify CMU 1 Ready Status – Ready

**cmd** CMU1\_Nom\_Pwr\_A\_On\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CMU1\_Nom\_Pwr\_A\_Stat\_VTC – ON  
Verify CMU1\_Nom\_Pwr\_A\_Current\_VTC – <1.35 A

**cmd** CMU2\_Nom\_Pwr\_A\_On\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CMU2\_Nom\_Pwr\_A\_Stat\_VTC – ON  
Verify CMU2\_Nom\_Pwr\_A\_Current\_VTC – <1.35 A  
Verify CMU2\_Nom\_Ready\_Stat\_ACT\_PP – READY

**cmd** CMU3\_Nom\_Pwr\_A\_On\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CMU3\_Nom\_Pwr\_A\_Stat\_VTC – ON  
Verify CMU3\_Nom\_Pwr\_A\_Current\_VTC – <1.35 A  
Verify CMU3\_Nom\_Ready\_Stat\_ACT\_PP – READY

**cmd** CMU4\_Nom\_Pwr\_A\_On\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CMU4\_Nom\_Pwr\_A\_Stat\_VTC – ON  
Verify CMU4\_Nom\_Pwr\_A\_Current\_VTC – <1.35 A

Verify CMU4\_Nom\_Ready\_Stat\_ACT\_PP – READY

Verify CMU1\_Nom\_Ready\_Stat\_ACT\_PP – READY

## 2.2 [Activating Nominal Power B Supplies](#)

COL Final Activation - Part 1

'Command and Measurement Unit Activation'

**cmd** CMU 1 Nom Pwr B – On

Verify CMU 1 Nom Pwr B Status – On

Verify CMU 1 Nom Pwr B Current < 0.75 A

Verify CMU 1 Nom Pwr A Current < 0.75 A

**cmd** CMU 2 Nom Pwr B – On

Verify CMU 2 Nom Pwr B Status – On

Verify CMU 2 Nom Pwr B Current < 0.75 A

Verify CMU 2 Nom Pwr A Current < 0.75 A

**cmd** CMU 3 Nom Pwr B – On

Verify CMU 3 Nom Pwr B Status – On

Verify CMU 3 Nom Pwr B Current < 0.75 A

Verify CMU 3 Nom Pwr A Current < 0.75 A

**cmd** CMU 4 Nom Pwr B – On

Verify CMU 4 Nom Pwr B Status – On

Verify CMU 4 Nom Pwr B Current < 0.75 A

Verify CMU 4 Nom Pwr A Current < 0.75 A

**cmd** CMU1\_Nom\_Pwr\_B\_On\_ACT -

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CMU1\_Nom\_Pwr\_B\_Stat\_ACT\_PP – ON

Verify CMU1\_Nom\_Pwr\_B\_Current\_ACT\_PP – <0.75 A

Verify CMU1\_Nom\_Pwr\_A\_Current\_VTC – <0.75 A

**cmd** CMU2\_Nom\_Pwr\_B\_On\_ACT

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CMU2\_Nom\_Pwr\_B\_Stat\_ACT\_PP – ON

Verify CMU2\_Nom\_Pwr\_B\_Current\_ACT\_PP – <0.75 A

Verify CMU2\_Nom\_Pwr\_A\_Current\_VTC – <0.75 A

```

cmd CMU3_Nom_Pwr_B_On_ACT
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify CMU3_Nom_Pwr_B_Stat_ACT_PP – ON
Verify CMU3_Nom_Pwr_B_Current_ACT_PP – <0.75 A
Verify CMU3_Nom_Pwr_A_Current_VTC – <0.75 A

cmd CMU4_Nom_Pwr_B_On_ACT
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify CMU4_Nom_Pwr_B_Stat_ACT_PP – ON
Verify CMU4_Nom_Pwr_B_Current_ACT_PP – <0.75 A
Verify CMU4_Nom_Pwr_A_Current_VTC – <0.75 A
    
```

3. [ACTIVATING WATER LOOP](#)

NOTE

1. TCS Jumpers must be installed prior to beginning this step.
2. Expect valve operations to take up to 15 seconds for verification.

3.1 [Configuring Loop A IFHX and Loop B IFHX for Water Loop Activation](#)

PCS

COL: TCS: MTL IFHX

COL MTL IFHX Commands

'COL MTL IFHX NH3'

'Isol Vlv'

Verify Position – Closed

**cmd** Cntrl Avail Open – Ena (Verify Cntrl Avail – Ena)

**cmd** Position – Open (Verify Position – Open)

'Byp Vlv'

Verify Position – Bypass

**cmd** Cntrl Avail Flothru – Ena (Verify Cntrl Avail – Ena)

**cmd** Position – Flothru (Verify Position – Flothru)

COL: TCS: LTL IFHX

COL LTL IFHX Commands

'COL LTL IFHX NH3'

'Isol Vlv'



Verify Position – Closed

**cmd** Cntrl Avail Open – Ena (Verify – Cntrl Avail Ena)

**cmd** Position – Open (Verify – Position Open)

'Byp Vlv'

Verify Position – Bypass

**cmd** Cntrl Avail Flothru – Ena (Verify – Cntrl Avail Ena)

**cmd** Position – Flothru (Verify – Position Flothru)

3.2 [Configuring Water On/Off Valve](#)

Task: COL Final Activation - Part 2

COL Final Activation - Part 2

'Water Loop Activation'

'Water On Off Valves'

Verify WOOV1 Posn – Open

Verify WOOV2 Posn – Closed

Verify WOOV3 Posn – Open

Verify WOOV4 Posn – Open

Verify WOOV5 Posn – Open

Verify WOOV6 Posn – Open

Verify WOOV7 Posn – Open

Verify WOOV8 Posn – Open

Verify WOOV9 Posn – Open

Verify WOOV10 Posn – Closed

Verify WOOV1\_Open\_Stat\_VTC\_PP – OPEN

Verify WOOV2\_Close\_Stat\_VTC\_PP – CLOSED

Verify WOOV3\_Open\_Stat\_VTC\_PP – OPEN

Verify WOOV4\_Open\_Stat\_VTC\_PP – OPEN

Verify WOOV5\_Open\_Stat\_VTC\_PP – OPEN

Verify WOOV6\_Open\_Stat\_VTC\_PP – OPEN

Verify WOOV7\_Open\_Stat\_VTC\_PP – OPEN

Verify WOOV8\_Open\_Stat\_VTC\_PP – OPEN

Verify WOOV9\_Open\_Stat\_VTC\_PP – OPEN

Verify WOOV10\_Close\_Stat\_VTC\_PP – CLOSED

Water Flow Selection Valve Configuration Verification

Verify WFSV\_ISPR\_A1\_Open\_Stat\_VTC – OPEN

Verify WFSV\_ISPR\_A2\_Open\_Stat\_VTC – OPEN

Verify WFSV\_ISPR\_A3\_Open\_Stat\_VTC – OPEN

Verify WFSV\_ISPR\_A4\_Open\_Stat\_VTC – OPEN  
 Verify WFSV\_ISPR\_F1\_Open\_Stat\_VTC – OPEN  
 Verify WFSV\_ISPR\_F2\_Open\_Stat\_VTC – OPEN  
 Verify WFSV\_ISPR\_F3\_Open\_Stat\_VTC – OPEN  
 Verify WFSV\_ISPR\_F4\_Open\_Stat\_VTC – OPEN  
 Verify WFSV\_ISPR\_O1\_Open\_Stat\_VTC – OPEN  
 Verify WFSV\_ISPR\_O2\_Open\_Stat\_VTC – OPEN

3.3 [Activating and Verifying WMV1 Shutoff Valve](#)

COL Final Activation - Part 2

'3 Way Modulating Valves'  
 'WMV1'

**cmd** WMV1 SOV Pwr – On

Verify WMV1 SOV Pwr – On  
 Verify WMV1 SOV1 Posn – Open  
 Verify WMV1 SOV2 Posn – Open

**cmd** WMV1\_SOV\_Pwr\_On\_ACT  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1  
  
 Verify WMV1\_SOV\_Pwr\_Stat\_ACT\_PP – ON  
 Verify WMV1\_SOV1\_Open\_Stat\_ACT\_PP – OPEN  
 Verify WMV1\_SOV2\_Open\_Stat\_ACT\_PP – OPEN

3.4 [Deactivating WMV1 Shutoff Section](#)

COL Final Activation - Part 2

'3 Way Modulating Valves'  
 'WMV1'

**cmd** WMV1 SOV Pwr – Off

Verify WMV1 SOV Pwr – Off

**cmd** WMV1\_SOV\_Pwr\_Off\_ACT  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1  
  
 Verify WMV1\_SOV\_Pwr\_Stat\_ACT\_PP – OFF

3.5 [Activating and Verifying WMV2 Shutoff Valve](#)

COL Final Activation - Part 2

'3 Way Modulating Valves'  
 'WMV2'

**cmd** WMV2 SOV Pwr – On

Verify WMV2 SOV Pwr – On

Verify WMV2 SOV1 Posn – Closed

Verify WMV2 SOV2 Posn – Closed

**cmd** WMV2\_SOV\_Pwr\_On\_ACT

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WMV2\_SOV\_Pwr\_Stat\_ACT\_PP – ON

Verify WMV2\_SOV1\_Close\_Stat\_ACT\_PP – CLOSED

Verify WMV2\_SOV2\_Close\_Stat\_ACT\_PP – CLOSED

3.6 [Deactivating WMV2 Shutoff Section](#)

COL Final Activation - Part 2

'3 Way Modulating Valves'

'WMV2'

**cmd** WMV2 SOV Pwr – Off

Verify WMV2 SOV Pwr – Off

**cmd** WMV2\_SOV\_Pwr\_Off\_ACT

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WMV2\_SOV\_Pwr\_Stat\_ACT\_PP – OFF

3.7 [Activating and Verifying WMV3 Shutoff Valve](#)

COL Final Activation - Part 2

'3 Way Modulating Valves'

'WMV3'

**cmd** WMV3 SOV Pwr – On

Verify WMV3 SOV Pwr – On

Verify WMV3 SOV1 Posn – Open

Verify WMV3 SOV2 Posn – Open

**cmd** WMV3\_SOV\_Pwr\_On\_ACT

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WMV3\_SOV\_Pwr\_Stat\_ACT\_PP – ON

Verify WMV3\_SOV1\_Open\_Stat\_ACT\_PP – OPEN

Verify WMV3\_SOV2\_Open\_Stat\_ACT\_PP – OPEN

3.8 [Deactivating WMV3 Shutoff Section](#)

COL Final Activation - Part 2

'3 Way Modulating Valves'

'WMV3'

**cmd** WMV3 SOV Pwr – Off

Verify WMV3 SOV Pwr – Off

**cmd** WMV3\_SOV\_Pwr\_Off\_ACT**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WMV3\_SOV\_Pwr\_Stat\_ACT\_PP – OFF

3.9 [Activating and Verifying WMV4 Shutoff Valve](#)

COL Final Activation - Part 2

'3 Way Modulating Valves'

'WMV4'

**cmd** WMV4 SOV Pwr – On

Verify WMV4 SOV Pwr – On

Verify WMV4 SOV1 Posn – Closed

Verify WMV4 SOV2 Posn – Closed

**cmd** WMV4\_SOV\_Pwr\_On\_ACT**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WMV4\_SOV\_Pwr\_Stat\_ACT\_PP – ON

Verify WMV4\_SOV1\_Close\_Stat\_ACT\_PP – CLOSED

Verify WMV4\_SOV2\_Close\_Stat\_ACT\_PP – CLOSED

3.10 [Deactivating WMV4 Shutoff Section](#)

COL Final Activation - Part 2

'3 Way Modulating Valves'

'WMV4'

**cmd** WMV4 SOV Pwr – Off

Verify WMV4 SOV Pwr – Off

**cmd** WMV4\_SOV\_Pwr\_Off\_ACT**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WMV4\_SOV\_Pwr\_Stat\_ACT\_PP – OFF

3.11 [Closing Bypass Valves WOOV5 and WOOV7](#)

COL Final Activation - Part 2

'Bypass Valves'

**cmd** WOOV5 – Close

Verify WOOV5 Posn – Closed

**cmd** WOOV7 – Close

Verify WOOV7 Posn – Closed

**cmd** WOOV5\_Vlv\_Close\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WOOV5\_Close\_Stat\_VTC\_PP – CLOSED

**cmd** WOOV7\_Vlv\_Close\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WOOV7\_Close\_Stat\_VTC\_PP – CLOSED

3.12 [Activating WMV1 Modulating Section](#)

COL Final Activation - Part 2

'WMV1 MDV Pwr'

**cmd** WMV1 MDV Pwr – On

Verify WMV1 MDV Pwr – On

**cmd** WMV1\_MDV\_Pwr\_On\_ACT

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WMV1\_MDV\_Pwr\_Stat\_ACT\_PP – ON

3.13 [Activating WPA1](#)

COL Final Activation - Part 2

'WPA1 Pwr'

**cmd** WPA1 Pwr – On

Verify WPA1 Pwr – On

**cmd** WPA1\_Pwr\_On\_ACT

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WPA1\_Pwr\_Stat\_ACT\_PP – ON

3.14 [Starting up WPA1 Pump Operation](#)

COL Final Activation - Part 2

'WPA1 Pump'

NOTE

This step activates active cooling via the water loop and terminates the thermal clock started with CMU Activation in step 2.

**cmd** WPA1 Pump – Init

Verify Pump dP > 30 kPa

Verify Mass Flow > 230 kg/h

Verify Nom Plenum dP > 18 kPa

Verify Redun Plenum dP > 18 kPa

**cmd** WPA1\_Pump\_Init\_ACT -

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify WPA1\_Pump\_DP\_ACT\_PP – > 30 kPa

Verify WPA1\_Mass\_Flow\_ACT\_PP – > 230 kg/h

Verify DPSB1\_Nom\_Plenum\_DP\_VTC – > 18 kPa

Verify DPSB2\_Redun\_Plenum\_DP\_VTC – > 18 kPa

3.15 [Enabling Monitoring of Delta Pressure Sensor Block](#)

COL Final Activation - Part 2

'Delta Pressure Sensor Block'

NOTE

If both readings of the DPSB dP are out of limits after the monitoring has been enabled, the system will automatically safe to Berthed Survival Mode.

**cmd** DPSB1 Nom Plenum dP Mon – Enable

Verify DPSB1 Nom Plenum dP Mon Status – Enabled

**cmd** DPSB2 Redun Plenum dP Mon – Enable

Verify DPSB2 Redun Plenum dP Mon Status – Enabled

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – DPSB1\_Nom\_Plenum\_DP\_VTC

```

prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify DPSB1_Nom_Plenum_DP_VTC_MEF – ENABLED

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – DPSB2_Redun_Plenum_DP_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify DPSB2_Redun_Plenum_DP_VTC_MEF – ENABLED

```

3.16 [Verifying Wet Temperatures](#)

COL Final Activation - Part 2

'Wet Temperature Sensor Block'  
'WTSB1 Nom Plenum Temp 3'

Verify WTSB1 Nom Plenum Temp 3 < 24 deg C

'WTSB2 Redun Plenum Temp 3'

Verify WTSB2 Redun Plenum Temp 3 < 24 deg C

```

*****
*       If WTSB1 Nom Plenum Temp 3 ≥ 24 deg C
*       or
*       WTSB2 Redun Plenum Temp 3 ≥ 24 deg C
*
*       wait 5 minutes then re-verify
*****

```

```

Verify WTSB1_Nom_Plenum_Temp3_VTC – < 24°C
Verify WTSB2_Redun_Plenum_Temp3_VTC – < 24°C

```

3.17 [Enabling Monitoring of WTSB Measurements](#)

COL Final Activation - Part 2

'Wet Temperature Sensor Block'

<b>NOTE</b>
If both readings of the WTSB Plenum Temp3 are out of limits after the monitoring has been enabled, the system will automatically safe to Berthed Survival Mode.

**cmd** WTSB1 Nom Plenum Temp 3 Monitor – Enable

Verify WTSB1 Nom Plenum Temp 3 Monitor Status – Enabled

**cmd** WTSB2 Redun Plenum Temp 3 Monitor – Enable

Verify WTSB2 Redun Plenum Temp 3 Monitor Status – Enabled

```

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – WTSB1_Nom_Plenum_Temp3_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify WTSB1_Nom_Plenum_Temp3_VTC_MEF – ENABLED

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – WTSB2_Redun_Plenum_Temp3_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify WTSB2_Redun_Plenum_Temp3_VTC_MEF – ENABLED
    
```

3.18 [Enabling C&W in USOS for Previous Monitorings \(Ground Only\)](#)

MCC-H

Enable the following events in the Primary and Backup C&C MDMs.

If ground unable to complete,

Perform [{2.101 CAUTION AND WARNING EVENT MANAGEMENT}](#), Step 2 (SODF: C&DH: NOMINAL) per Table 2, then

**Table 2. C&W Events for DPSB & WTSB**

Event	Text	Class
13534	Cooling Loop Delta Pressure Sensor 1 Low - COL	W
13535	Cooling Loop Delta Pressure Sensor 2 Low - COL	W
14165	Cooling Loop Temperature Sensor 1 High - COL	W
14166	Cooling Loop Temperature Sensor 2 High - COL	W

3.19 [Activating ATU Power Bus](#)

PCS

COL: EPS: PDU1 120V Outlets Subsys/Payloads:

COL PDU1 120V Outlets VTC1

'PDU1'

'Outlet Num 20'



**cmd** ATU1 Pwr Bus – On

Verify ATU1 Pwr Bus – On

COL: EPS: PDU2 120V Outlets Subsys/Payloads:

**COL PDU2 120V Outlets VTC1**

'PDU2'

'Outlet Num 20'

**cmd** ATU2 Pwr Bus – On

Verify ATU2 Pwr Bus – On

**cmd** PDU1\_ATU1\_Pwr\_Bus\_On\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PDU1\_ATU1\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON

**cmd** PDU2\_ATU2\_Pwr\_Bus\_On\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PDU2\_ATU2\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON

PCS

3.20 [Enabling I/O for COL ATU 1 and ATU 2](#)

C&T: COL 1

Verify which IAC is Active and Powered on.

Use the commands for the Active and Powered IAC.

**COL ATU 1**

**cmd** BUS I/O – Enable (Verify – Enable)

**CNT Group Overview**

sel COL ATU 2

**COL ATU 2**

**cmd** BUS I/O – Enable (Verify – Enable)

3.21 [Configure COL ATU 1 and ATU 2 for Public Call Configuration](#)**NOTE**

The ATU will go into standby mode 2 minutes after being commanded active if the ATU has not been placed in a public call. The ATU has to be in active mode to be placed into a public call.

PCS

C&amp;T: COL 1

Verify which IAC is Active and Powered on.

Use the commands for the Active and Powered IAC.

**COL ATU 1**

**cmd** State – Active (Verify – Active)

**CNT Group Overview**

sel COL ATU 2

**COL ATU 2**

**cmd** State – Active (Verify – Active)

**CNT Group Overview**

sel 'IAC[X]' Call Select where [X] = Active and Powered IAC  
1(2)

**IAC[X] Call Select**

'Public 1(2,3,4,5)'

sel Call Setup

**Public1(2,3,4,5) Call Select**

'Talk/Listen (TL)'

**cmd** ATU COL 1 TL

**cmd** ATU COL 2 TL

Repeat as necessary to achieve the desired configuration.

3.22 [Verifying Voice Loop Configuration](#)

**IAC[X] Call Select**

Verify COL1 and COL 2 in Public 1(2,3,4,5)

4. [ACTIVATING NETWORK CLSW](#)

PCS

4.1 [Activating CLSW 1 Power A](#)

Task: COL Final Activation - Part 3

COL Final Activation - Part 3

'Network CLSW'

**cmd** CLSW 1 Pwr A – On

Verify CLSW 1 Pwr A Status – On

Verify CLSW 1 Pwr A Current &lt; 2.5 A

Verify CLSW 1 Pwr A Ready Status – Ready

**cmd** CLSW1\_Pwr\_A\_On\_ACT**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CLSW1\_Pwr\_A\_Stat\_ACT\_PP – ON

Verify CLSW1\_Pwr\_A\_Current\_ACT\_PP – &lt; 2.5 A

Verify CLSW1\_Ready\_Stat\_ACT\_PP – READY

4.2 [Activating CLSW 1 Power B](#)COL Final Activation - Part 3

'Network CLSW'

**cmd** CLSW 1 Pwr B – On

Verify CLSW 1 Pwr B Status – On

Verify CLSW 1 Pwr B Current &lt; 2.2 A

Verify CLSW 1 Pwr A Current &lt; 0.7 A

**cmd** CLSW1\_Pwr\_B\_On\_ACT**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CLSW1\_Pwr\_B\_Stat\_ACT\_PP – ON

Verify CLSW1\_Pwr\_B\_Current\_ACT\_PP – &lt; 2.2 A

Verify CLSW1\_Pwr\_A\_Current\_ACT\_PP – &lt; 0.7 A

4.3 [Activating CLSW 2 Power A](#)COL Final Activation - Part 3

'Network CLSW'

**cmd** CLSW 2 Pwr A – On

Verify CLSW 2 Pwr A Status – On

Verify CLSW 2 Pwr A Current &lt; 2.5 A

Verify CLSW 2 Pwr A Ready Status – Ready

```
cmd CLSW2_Pwr_A_On_ACT
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify CLSW2\_Pwr\_A\_Stat\_ACT\_PP – ON  
 Verify CLSW2\_Pwr\_A\_Current\_ACT\_PP – < 2.5 A  
 Verify CLSW2\_Ready\_Stat\_ACT\_PP – READY

4.4 [Activating CLSW 2 Power B](#)

COL Final Activation - Part 3

'Network CLSW'

**cmd** CLSW 2 Pwr B – On

Verify CLSW 2 Pwr B Status – On  
 Verify CLSW 2 Pwr B Current < 2.2 A  
 Verify CLSW 2 Pwr A Current < 0.7 A

```
cmd CLSW2_Pwr_B_On_ACT
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify CLSW2\_Pwr\_B\_Stat\_ACT\_PP – ON  
 Verify CLSW2\_Pwr\_B\_Current\_ACT\_PP – < 2.2 A  
 Verify CLSW2\_Pwr\_A\_Current\_ACT\_PP – < 0.7 A

5. [ACTIVATING MASS MEMORY UNIT](#)

PCS

5.1 [Activating MMU2 Power A](#)

Task: COL Final Activation - Part 3

COL Final Activation - Part 3

'Mass Memory Unit'

**cmd** MMU2 Pwr A – On

Verify MMU2 Pwr A Status – On  
 Verify MMU2 Pwr A Current < 1.58 A

```
cmd MMU2_Pwr_A_On_ACT
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify MMU2\_Pwr\_A\_Stat\_ACT\_PP – ON  
 Verify MMU2\_Pwr\_A\_Current\_ACT\_PP – <1.58 A

5.2 [Activating MMU2 Power B](#)

COL Final Activation - Part 3

'Mass Memory Unit'

**cmd** MMU2 Pwr B – On

Verify MMU2 Pwr B Status – On

Verify MMU2 Pwr B Current &lt; 0.12 A

Verify MMU2 Pwr A Current &lt; 1.58 A

**cmd** MMU2\_Pwr\_B\_On\_ACT**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify MMU2\_Pwr\_B\_Stat\_ACT\_PP – ON

Verify MMU2\_Pwr\_B\_Current\_ACT\_PP – &lt; 0.12 A

Verify MMU2\_Pwr\_A\_Current\_ACT\_PP – &lt;1.58 A

5.3 [Commanding MMU2 to Slave Mode](#)

COL Final Activation - Part 3

'Mass Memory Unit'

**cmd** Boot MMU 2 – Slave

Wait up to 5 minutes for MMU2 Ready Status to be displayed.

Verify MMU2 Ready Status – Ready

**cmd** VTC\_Boot\_SPC\_Cmd\_SW**prm** RT\_Address – 27 (RT address of MMU2)**prm** Mode – 9 (MMU\_SLAVE)**prm** Session Number – 1**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTCM

Verify MMU2\_Ready\_Stat\_ACT\_PP – READY

5.4 [Activating MMU1 Power A](#)

COL Final Activation - Part 3

'Mass Memory Unit'

**cmd** MMU1 Pwr A – On

Verify MMU1 Pwr A Status – On

Verify MMU1 Pwr A Current &lt; 1.58 A

**cmd** MMU1\_Pwr\_A\_On\_ACT**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**cmd** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify MMU1\_Pwr\_A\_Stat\_ACT\_PP – ON

Verify MMU1\_Pwr\_A\_Current\_ACT\_PP – <1.58 A

### 5.5 [Activating MMU1 Power B](#)

COL Final Activation - Part 3

'Mass Memory Unit'

**cmd** MMU1 Pwr B – On

Verify MMU1 Pwr B Status – On

Verify MMU1 Pwr B Current < 0.12 A

Verify MMU1 Pwr A Current < 1.58 A

**cmd** MMU1\_Pwr\_B\_On\_ACT

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify MMU1\_Pwr\_B\_Stat\_ACT\_PP – ON

Verify MMU1\_Pwr\_B\_Current\_ACT\_PP – < 0.12 A

Verify MMU1\_Pwr\_A\_Current\_ACT\_PP – <1.58 A

### 5.6 [Commanding MMU1 to Master Mode](#)

COL Final Activation - Part 3

'Mass Memory Unit'

**cmd** Boot MMU 1 – Master

Wait up to 5 minutes for MMU1 Ready Status to be displayed.

Verify MMU1 Ready Status – Ready

**cmd** VTC\_Boot\_SPC\_Cmd\_SW

**prm** RT\_Address – 17 (RT address of MMU1)

**prm** Mode – 7 (MMU\_MASTER\_DEFAULT)

**prm** Session Number – 1

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTCM

Verify MMU1\_Ready\_Stat\_ACT\_PP – READY

## 6. [ACTIVATING MISSION MANAGEMENT COMPUTER](#)

### NOTE

1. Steps 6.3 through 6.7 require AOS.
2. Expect DMS C&W messages.

PCS

6.1 [Inhibiting Redun Management for MMC](#)

Task: COL Final Activation - Part 3

COL Final Activation - Part 3

'Mission Management Computer'

√MMC Redun Management – Inh

6.2 [Enabling RT I/O for MMC](#)

Task: COL Final Activation - Part 3: CB INT 2 RT Status

CB INT 2 RT Status

**cmd** 22 MMC RT Status – Enable **Execute** (Verify – Ena)

6.3 [Activating MMC Power A](#)

Task: COL Final Activation - Part 3

COL Final Activation - Part 3

'Mission Management Computer'

**cmd** MMC Pwr A – On

Verify MMC Pwr A Status – On

Verify MMC Pwr A Current < 1.19 A

**cmd** MMC\_Pwr\_A\_On\_ACT

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**cmd** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify MMC\_Pwr\_A\_Stat\_ACT\_PP – ON

Verify MMC\_Pwr\_A\_Current\_ACT\_PP – < 1.19 A

6.4 [Activating MMC Power B](#)

COL Final Activation - Part 3

'Mission Management Computer'

**cmd** MMC Pwr B – On

Verify MMC Pwr B Status – On

Verify MMC Pwr B Current < 0.12 A

Verify MMC Pwr A Current < 1.19 A

**cmd** MMC\_Pwr\_B\_On\_ACT

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify MMC\_Pwr\_B\_Stat\_ACT\_PP – ON

Verify MMC\_Pwr\_B\_Current\_ACT\_PP – < 0.12 A

Verify MMC\_Pwr\_A\_Current\_ACT\_PP – < 1.19 A

6.5 [Initializing Command MMC S/W](#)**NOTE**

During the MMC boot process, the configuration FLAPs MMC Cold Start and MMC Start-Up are executed automatically.

The MMC Cold Start FLAP:

- Starts monitorings of the MMC node
- Executes the MMC Startup FLAP

The MMC Start-Up FLAP:

- Resets the station mode compatibility variable and venting valve inhibit status
- Activates MMC hosted application software (COAP IDF task)
- Starts the SNCD CVT packet to the US MDM
- Starts the pre-emptive TIm packet for DMS data to Col-CC
- Starts the pre-emptive TIm packet for USM data to Col-CC

**COL Final Activation - Part 3**

'Mission Management Computer'

**cmd** MMC Boot – MMC Default

Verify SPC2 Boot Report – 66048

Wait up to 5 minutes for MMC to boot before checking Ready Status.

Verify MMC Ready Status – Ready

Wait for “Go” to continue.

**cmd** VTC\_Boot\_SPC\_Cmd\_SW

**prm** RT\_Address – 8 (RT address of SPC2)

**prm** Mode – 1 (MMC\_DEFAULT)

**prm** Session Number – 1 (TBC)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTCM

Verify VTC\_MASTER\_SPC2\_Boot\_Report\_SW\_PP – 66048

Verify MMC\_Ready\_Stat\_ACT\_PP – READY

**COL-CC** to give a “Go” to continue.

6.6 [Enabling RT FDIR for MMC](#)

Task: COL Final Activation - Part 3: CB INT 2 RT Status

**CB INT 2 RT Status**

**cmd** 22 MMC RT FDIR Status – Enable FDIR **Execute** (Verify – Ena)



6.7 [Enabling MMC Redundancy Management](#)

Task: Columbus Final Act - Part 3

COL Final Activation - Part 3

'Mission Management Computer'

**cmd** MMC Redun Management – Ena (Verify – Ena)

6.8 [Enabling CCSDS Checksum Validation on MMC \(Ground Only\)](#)

**cmd** DMS\_CCSDS\_Checksum\_Ena\_Cmd\_SW

**data** ONBOARD\_NODE –

SYS\_CCSDS\_End\_Point\_MMC\_DMS\_SERV

6.9 [Enabling CCSDS Checksum Validation on MMU \(Ground Only\)](#)

**cmd** DMS\_CCSDS\_Checksum\_Ena\_Cmd\_SW

**data** ONBOARD\_NODE –

SYS\_CCSDS\_End\_Point\_MMU\_DMS\_SERV

7. [ACTIVATING DATA MANAGEMENT COMPUTER](#)

NOTE

1. Steps 7.1 through 7.6 require AOS.
2. Expect DMS C&W messages.

PCS

7.1 [Activating DMC Power A](#)

Task: COL Final Activation - Part 3

COL Final Activation - Part 3

'Data Management Computer'

**cmd** DMC Pwr A – On

Verify DMC Pwr A Status – On

Verify DMC Pwr A Current < 1.19 A

**cmd** DMC\_Pwr\_A\_On\_ACT

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify DMC\_Pwr\_A\_Stat\_VTC – ON

Verify DMC\_Pwr\_A\_Current\_VTC – < 1.19 A

7.2 [Activating DMC Power B](#)

COL Final Activation - Part 3

'Data Management Computer'

**cmd** DMC Pwr B – On

Verify DMC Pwr B Status – On  
Verify DMC Pwr B Current < 0.12 A  
Verify DMC Pwr A Current < 1.19 A

**cmd** DMC\_Pwr\_B\_On\_ACT  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify DMC\_Pwr\_B\_Stat\_VTC – ON  
Verify DMC\_Pwr\_B\_Current\_VTC – < 0.12 A  
Verify DMC\_Pwr\_A\_Current\_VTC – < 1.19 A

7.3 [Initializing DMC S/W](#)

COL Final Activation - Part 3

'Data Management Computer'

**cmd** DMC Boot – DMC Default

Wait up to 5 minutes for DMC to boot before checking the SPC1 Boot Report

Verify SPC1 Boot Report – 4096

**cmd** VTC\_Boot\_SPC\_Cmd\_SW  
**prm** RT\_Address – 7  
**prm** Mode – 0  
**prm** Session\_Number – 1  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTCM

Verify VTC\_MASTER\_SPC1\_Boot\_Report\_SW\_PP – 4096

7.4 [Configuring DMC as Bus Controller](#)

**NOTE**

All activation telemetry on PCS and ground displays will be invalid at the completion of step 7.4. These invalid parameters will be indicated by a cyan telemetry field.

NOTE

During the DMC boot process, the configuration FLAPs 'DMC Cold Start' and 'DMC Start-Up' are executed automatically.

The DMC Cold Start FLAP:

- Starts several monitorings on the DMC node
- Starts the RT acquisition of active DMS equipment
- Initializes several DMS related S/W variables
- Executes the DMC Startup FLAP

The DMC Start-Up FLAP:

- Starts several monitorings of system measurements
- Starts the RT acquisition of active system equipment
- Initializes several S/W variables

COL Final Activation - Part 3

'Data Management Computer'

**cmd** VTC Vital To Nominal Mode – Nominal

Wait up to 15 minutes for DMC to boot up before checking Ready Status.

Verify DMC Ready Status – Ready

**cmd** VTC\_Vital\_To\_Nom\_Mode\_Chg\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTCM

Verify DMC\_Ready\_Stat\_VTC – READY

7.5 [Enabling DMC and SPARE Monitoring to Support DMC FDIR in VTC \(Ground Only\)](#)

COL-CC

DMC and SPARE monitoring to be enabled by ground.

Wait for "Go" to continue.

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – DMC\_Pwr\_A\_Current\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify DMC\_Pwr\_A\_Current\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – DMC\_Pwr\_B\_Current\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify DMC\_Pwr\_B\_Current\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – DMC\_Temp\_VTC

**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify DMC\_Temp\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – DMC\_Sec\_Voltage\_Stat\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify DMC\_Sec\_Voltage\_Stat\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – DMC\_Ready\_Stat\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify DMC\_Ready\_Stat\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – SPARE\_Pwr\_A\_Stat\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify SPARE\_Pwr\_A\_Stat\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – SPARE\_Pwr\_B\_Stat\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify SPARE\_Pwr\_B\_Stat\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – SPARE\_Temp\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify SPARE\_Temp\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – SPARE\_Sec\_Voltage\_Stat\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify SPARE\_Sec\_Voltage\_Stat\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

```

prm Monitored_Item_ID – SPARE_Ready_Stat_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify SPARE_Ready_Stat_VTC_MEF – ENABLED

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – SPARE_Pwr_A_Current_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify SPARE_Pwr_A_Current_VTC_MEF – ENABLED

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – SPARE_Pwr_B_Current_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify SPARE_Pwr_B_Current_VTC_MEF – ENABLED

COL-CC to give a “Go” to continue.
    
```

PCS

7.6

[Enabling DMC FDIR in VTC](#)

COL Final Activation - Part 3

'Data Management Computer'

**cmd** Enable DMC FDIR – Enable (Verify – Enabled)

```

cmd VTC_DMC_Recon_Ena_Cmd_SW
prm Action: – 1 = ENABLE
data Onboard_Node: – SYS_CCSDS_End_Point_VTCM

Verify VTC_MASTER_DMC_Recon_Enable_SW_PP –
ENABLED
    
```

MCC-H

7.7

[Enabling C&W for the DMS and PDU1/2 Cautions \(Ground Only\)](#)

Enable the following events in the Primary and Backup C&C MDMs.

If ground unable to complete,

Perform [{2.101 CAUTION AND WARNING EVENT MANAGEMENT}](#), Step 2 (SODF: C&DH: NOMINAL) per Table 3, then;

Table 3. C&W Events for DMS and PDU1/2

Event	Text	Class
13570	DMS I/O Unit (CMU1) Redundant Branch Failure - COL	C
13572	DMS I/O Unit (CMU2) Redundant Branch Failure - COL	C
13574	DMS I/O Unit (CMU3) Redundant Branch Failure - COL	C
13576	DMS I/O Unit (CMU4) Redundant Branch Failure - COL	C
13579	Power Distribution Unit (PDU1) Redun Controller Failure - COL	C
13581	Power Distribution Unit (PDU2) Redun Controller Failure - COL	C

7.8 [Enabling CCSDS Checksum Validation on DMC \(Ground Only\)](#)

```
cmd DMS_CCSDS_Checksum_Ena_Cmd_SW
data ONBOARD_NODE –
SYS_CCSDS_End_Point_DMC_DMS_SERV
```

7.9 [Swapping DMS Telemetry Packets \(Ground Only\)](#)

COL-CC

COL-CC to swap nominal DMS telemetry packets.

Wait for “Go” to continue.

<p><b>NOTE</b></p> <p>Packet swapping initiated from Col-CC:                  Disable VTC_Gnd_Tlm_Pkt_LOG1_VTC (1Hz)                  Disable VTC_Gnd_Tlm_Pkt_LOG2_VTC (1Hz)                  Disable VTC1_Gnd_Tlm_Pkt_PHY1_VTC (1Hz)                  Disable VTC2_Gnd_Tlm_Pkt_PHY1_VTC (1Hz)</p> <p>Perform <a href="#">{2.2.41 VTC GROUND PACKET SWAPPING}</a> (EODF: GROUND: NOMINAL), then:</p>
--

	<u>NOTE</u>
	<p>Automatically started TIm Packets:  MMC_Gnd_TIm_Pkt_DMS1_DMC (0.1 Hz)  MMC_Gnd_TIm_Pkt_USM3_DMC (0.1 Hz)</p> <p>Packet swapping initiated from Col-CC:  Enable MMC_Gnd_TIm_Pkt_COAP_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_DMS2_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_EPDS1_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_EPDS2_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_TCS1_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_TCS2_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_ECLSS1_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_ECLSS2_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_USM1_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_USM2_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_Monitoring_Stat1_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_Monitoring_Stat2_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_FLAP_Variables1_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_FLAP_Variables2_DMC (0.1Hz)  Enable MMU_Gnd_TIm_Pkt_LAPAP_DMC (0.1Hz)  Enable MMC_Gnd_TIm_Pkt_DMS_Off_Nominal_DMC (0.1 Hz)  Enable MMC_Gnd_TIm_Pkt_System_Activation_DMC (1 Hz)</p> <p>Perform <a href="#">{2.2.42 NOMINAL DMS PACKET SWAPPING}</a> (EODF: GROUND: NOMINAL). then:</p> <p>COL-CC to give "Go" to continue.</p>

8. [ACTIVATING PORTABLE WORKSTATION](#)

<u>NOTE</u>
<p>1. Steps 1 through 7 must be complete before PWS activation.  2. Ground can continue to step 9.</p>

Perform [{PWS ACTIVATION}](#), all (SODF: ASSY OPS: ACTIVATION AND CHECKOUT), then

9. [ENABLING PDU FOR NOMINAL SYSTEM SUPPORT](#)

<u>NOTE</u>
Steps 9.1 through 9.4 can only be verified by the COL-CC.

9.1 [Enabling Nominal System Bus Control for PDU1 Subsys Power Buses](#)

PCS

Task: COL Final Activation - Part 3: COL EPDS Auto Cmd Sequences

[COL EPDS Automated Command Sequences VTC1](#)

√VTC1 Buffer Status – Empty

```

*****
*           If VTC1 Buffer - Full
*           |
*           | sel VTC1 Cancel 2 Step Command
*           |
*           | COL Cancel 2 - Stage Cmd VTC 1
*           |
*           |
*           | cmd Cancel 2 - Stage Cmd Execute (Verify
*           | - Empty)
*           |
*           |
*****
    
```

'PDU1'

'Subsys Pwr Bus Control Enable ACS'

Verify Status - Enabled

Record PCS ID: \_\_\_\_\_

**cmd** Start - Arm

pick PCS/C-X to VTC-Com1 (where X=PCS ID)

**cmd** Start - Set

√VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP - EMPTY

If VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP - FULL

```

    cmd VTC_Cancel_Two_Stage_Cmd_Cmd_SW
    data Onboard_Node SYS_CCSDS_End_Point_VTC1

    Verify VTC1_Two_Stage_Buffer_Status_SW_PP -
    EMPTY
    
```

**cmd** PDU1\_Subsys\_Pwr\_Bus\_Sys\_Cntl\_Ena\_ACS (ARM)

**data** SW\_CMD - VTC\_Start\_Terminate\_ACS\_Cmd\_SW

**data** Action - 1 (START)

**data** Onboard\_Node - SYS\_CCSDS\_End\_Point\_VTC1

Verify VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP - FULL

**cmd** VTC\_Execute\_2\_Stage\_Cmd\_SW (EXEC)

Verify PDU1\_ATU1\_Pwr\_Bus\_Sys\_Cntl\_Stat\_DMC - ENABLED

Verify PDU1\_CTCU1\_Pwr\_Bus\_Sys\_Cntl\_Stat\_DMC -  
ENABLED

Verify PDU1\_Rack\_D1\_Pwr\_Bus\_Sys\_Cntl\_Stat\_DMC -  
ENABLED

Verify PDU1\_Fan\_Pwr\_Bus\_Sys\_Cntl\_Stat\_DMC - ENABLED



```

Verify PDU1_PDU2_Redun_Pwr_Bus_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_Subsys_Pwr_Bus1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_Subsys_Pwr_Bus2_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_Subsys_Pwr_Bus3_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_Subsys_Pwr_Bus4_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_Subsys_Pwr_Bus5_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_Subsys_Pwr_Bus6_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_Subsys_Pwr_Bus7_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_Subsys_Pwr_Bus8_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_Subsys_Pwr_Bus9_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_Subsys_Pwr_Bus10_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_SUP1_Pwr_Out1_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_SUP1_Pwr_Out2_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_SUP1_Pwr_Out3_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_SUP2_Pwr_Out1_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_SUP2_Pwr_Out2_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_SUP2_Pwr_Out3_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU1_VDPU_Pwr_Bus_Sys_Cntl_Stat_DMC –
ENABLED

```

9.2 [Enabling Nominal System Bus Control for PDU2 Subsys Power Buses](#)

COL EPDS Automated Command Sequences VTC1

√VTC1 Buffer Status – Empty

```

*****
*           If VTC1 Buffer – Full
*           |
*           | sel VTC1 Cancel 2 Step Command
*           |
*           | COL Cancel 2 - Stage Cmd VTC 1
*           |
*           |
*           | cmd Cancel 2 – Stage Cmd Execute (Verify
*           | – Empty)
*           |
*****

```

'PDU2'

'Subsys Pwr Bus Control Enable ACS'

Verify Status – Enabled

Record PCS ID: \_\_\_\_\_

**cmd** Start – Arm

pick PCS/C-X to VTC-Com1 (where X=PCS ID)

**cmd** Start – Set

√VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP – EMPTY

If VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP – FULL

**cmd** VTC\_Cancel\_Two\_Stage\_Cmd\_Cmd\_SW  
**data** Onboard\_Node SYS\_CCSDS\_End\_Point\_VTC1

Verify VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP –  
 EMPTY

**cmd** PDU2\_Subsys\_Pwr\_Bus\_Sys\_Cntl\_Ena\_ACS (ARM)

**data** SW\_CMD – VTC\_Start\_Terminate\_ACS\_Cmd\_SW

**data** Action – 1 (START)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP – FULL

**cmd** VTC\_Execute\_2\_Stage\_Cmd\_SW (EXEC)

Verify PDU2\_ATU2\_Pwr\_Bus\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify PDU2\_CTCU2\_Pwr\_Bus\_Sys\_Cntl\_Stat\_DMC –  
 ENABLED

Verify PDU2\_Rack\_D1\_Pwr\_Bus\_Sys\_Cntl\_Stat\_DMC –  
 ENABLED

Verify PDU2\_Fan\_Pwr\_Bus\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify PDU2\_PDU1\_Redun\_Pwr\_Bus\_Sys\_Cntl\_Stat\_DMC –  
 ENABLED

Verify PDU2\_Subsys\_Pwr\_Bus1\_Sys\_Cntl\_Stat\_DMC –  
 ENABLED

Verify PDU2\_Subsys\_Pwr\_Bus2\_Sys\_Cntl\_Stat\_DMC –  
 ENABLED

Verify PDU2\_Subsys\_Pwr\_Bus3\_Sys\_Cntl\_Stat\_DMC –  
 ENABLED

Verify PDU2\_Subsys\_Pwr\_Bus4\_Sys\_Cntl\_Stat\_DMC –  
 ENABLED

```

Verify PDU2_Subsys_Pwr_Bus5_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_Subsys_Pwr_Bus6_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_Subsys_Pwr_Bus7_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_Subsys_Pwr_Bus8_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_Subsys_Pwr_Bus9_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_Subsys_Pwr_Bus10_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_SUP3_Pwr_Out1_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_SUP3_Pwr_Out2_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_SUP3_Pwr_Out3_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_SUP4_Pwr_Out1_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_SUP4_Pwr_Out2_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_SUP4_Pwr_Out3_SSPC1_Sys_Cntl_Stat_DMC –
ENABLED
Verify PDU2_VDPU_Pwr_Bus_Sys_Cntl_Stat_DMC –
ENABLED

```

9.3 [Enabling Nominal System Bus Control for ECLSS Valves](#)

Task: COL Final Activation - Part 3: COL ECLSS Auto Cmd Sequences

ECLSS Automated Command Sequences VTC1

√VTC1 Buffer Status – Empty

```

*****
*           If VTC1 Buffer – Full
*           |
*           |   sel VTC1 Cancel 2 Step Command
*           |
*           |   COL Cancel 2 - Stage Cmd VTC 1
*           |
*           |   cmd Cancel 2 – Stage Cmd Execute (Verify
*           |   – Empty)
*           |
*****

```

'ECLSS Valve System Control'

Verify Enable Status – Ena

Record PCS ID: \_\_\_\_\_

**cmd** Start – Arm

pick PCS/C-X to VTC-Com1 (where X=PCS ID)

**cmd** Start - VTC1 – Set

√VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP – EMPTY

If VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP – FULL

**cmd** VTC\_Cancel\_Two\_Stage\_Cmd\_Cmd\_SW

**data** Onboard\_Node SYS\_CCSDS\_End\_Point\_VTC1

Verify VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP –  
EMPTY

**cmd** ECLSS\_Vlv\_Sys\_Cntl\_Ena\_ACS (ARM)

**data** SW\_CMD – VTC\_Start\_Terminate\_ACS\_Cmd\_SW

**data** Action – 1 (START)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP – FULL

**cmd** VTC\_Execute\_2\_Stage\_Cmd\_SW (EXEC)

Verify NLSOV1\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify NLSOV2\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify NLSOV3\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify NLSOV4\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify VADD\_Vlv1\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify VADD\_Vlv2\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify VEDD\_Vlv1\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify VEDD\_Vlv2\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify WLSOV\_ISPR\_A1\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify WLSOV\_ISPR\_A2\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify WLSOV\_ISPR\_A3\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify WLSOV\_ISPR\_A4\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify WLSOV\_ISPR\_F1\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify WLSOV\_ISPR\_F2\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify WLSOV\_ISPR\_F3\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify WLSOV\_ISPR\_F4\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify WLSOV\_ISPR\_O1\_Sys\_Cntl\_Stat\_DMC – ENABLED

Verify WLSOV\_ISPR\_O2\_Sys\_Cntl\_Stat\_DMC – ENABLED

9.4 [Enabling Nominal System Bus Control for TCS Valves](#)

Task: COL Final Activation - Part 3: COL TCS Auto Cmd Sequences

COL TCS Automated Command Sequences VTC 1

√VTC1 Buffer Status – Empty

```

*****
*           If VTC1 Buffer – Full
*           |
*           | sel VTC1 Cancel 2 Step Command
*           |
*           | COL Cancel 2 - Stage Cmd VTC 1
*           |
*           | cmd Cancel 2 – Stage Cmd Execute (Verify
*           | – Empty)
*           |
*****
    
```

'TCS Valve System Control Enable ACS'

Verify Status – Enabled

Record PCS ID: \_\_\_\_\_

**cmd** Start – Arm

pick PCS/C-X to VTC-Com1 (where X=PCS ID)

**cmd** Start – Set

Wait for “Go” to continue.

```

√VTC1_Two_Stage_Buffer_Status_SW_PP – EMPTY

If VTC1_Two_Stage_Buffer_Status_SW_PP – FULL
|
| cmd VTC_Cancel_Two_Stage_Cmd_Cmd_SW
| data Onboard_Node SYS_CCSDS_End_Point_VTC1
|
| Verify VTC1_Two_Stage_Buffer_Status_SW_PP –
| EMPTY
    
```

```

cmd TCS_Vlv_Sys_Cntl_Ena_ACS (ARM)
data SW_CMD – VTC_Start_Terminate_ACS_Cmd_SW
data Action – 1 (START)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify VTC1_Two_Stage_Buffer_Status_SW_PP – FULL
    
```

**cmd VTC\_Execute\_2\_Stage\_Cmd\_SW (EXEC)**

Verify WOOV1\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WOOV2\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WOOV3\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WOOV4\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WOOV5\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WOOV6\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WOOV7\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WOOV8\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WOOV9\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WOOV10\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WFSV\_ISPR\_A1\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WFSV\_ISPR\_A2\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WFSV\_ISPR\_A3\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WFSV\_ISPR\_A4\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WFSV\_ISPR\_F1\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WFSV\_ISPR\_F2\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WFSV\_ISPR\_F3\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WFSV\_ISPR\_F4\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WFSV\_ISPR\_O1\_Sys\_Cntl\_Stat\_DMC – ENABLED  
 Verify WFSV\_ISPR\_O2\_Sys\_Cntl\_Stat\_DMC – ENABLED

COL-CC to give a “Go” to continue.

- PWS
  - 9.5 [Activating PDU Outlet via DMC](#)
    - Activation Part 1
    - COL Activation Part 1
    - 'PDU Outlet Activation'
    - 'PDU1 CTCU1 Pwr Bus'
    - cmd Pwr On Execute (OK)**
    - Verify Pwr – ON
    - 'PDU1 VDPU Pwr Bus'
    - cmd Pwr On Execute (OK)**
    - Verify Pwr – ON
    - 'PDU1 Fan Pwr Bus'
    - cmd Pwr On Execute (OK)**
    - Verify Pwr – ON

'PDU2 CTCU2 Pwr Bus'

**cmd** Pwr On **Execute** (OK)

Verify Pwr – ON

'PDU2 VDPU Pwr Bus'

**cmd** Pwr On **Execute** (OK)

Verify Pwr – ON

'PDU2 Fan Pwr Bus'

**cmd** Pwr On **Execute** (OK)

Verify Pwr – ON

**cmd** PDU1\_CTCU1\_Pwr\_Bus\_On\_AP

**data** Onboard\_Reception\_Node –  
SYS CCSDS End Point DMC DMS SERV  
**data** Onboard\_Execution\_Node –  
USM SW DMC USS Swoop Instance

Verify PDU1\_CTCU1\_Pwr\_Bus\_On\_Off\_Stat\_DMC – ON

**cmd** PDU1\_VDPU\_Pwr\_Bus\_On\_AP

**data** Onboard\_Reception\_Node –  
SYS CCSDS End Point DMC DMS SERV  
**data** Onboard\_Execution\_Node –  
USM SW DMC USS Swoop Instance

Verify PDU1\_VDPU\_Pwr\_Bus\_On\_Off\_Stat\_DMC – ON

**cmd** PDU1\_Fan\_Pwr\_Bus\_On\_AP

**data** Onboard\_Reception\_Node –  
SYS CCSDS End Point DMC DMS SERV  
**data** Onboard\_Execution\_Node –  
USM SW DMC USS Swoop Instance

Verify PDU1\_Fan\_Pwr\_Bus\_On\_Off\_Stat\_DMC – ON

**cmd** PDU2\_CTCU2\_Pwr\_Bus\_On\_AP

**data** Onboard\_Reception\_Node –  
SYS CCSDS End Point DMC DMS SERV  
**data** Onboard\_Execution\_Node –  
USM SW DMC USS Swoop Instance

Verify PDU2\_CTCU2\_Pwr\_Bus\_On\_Off\_Stat\_DMC – ON

```
cmd PDU2_VDPU_Pwr_Bus_On_AP
data Onboard_Reception_Node -
SYS CCSDS End Point DMC DMS SERV
data Onboard_Execution_Node -
USM SW DMC USS Swop Instance

Verify PDU2_VDPU_Pwr_Bus_On_Off_Stat_DMC - ON

cmd PDU2_Fan_Pwr_Bus_On_AP
data Onboard_Reception_Node -
SYS CCSDS End Point DMC DMS SERV
data Onboard_Execution_Node -
USM SW DMC USS Swop Instance

Verify PDU2_Fan_Pwr_Bus_On_Off_Stat_DMC - ON
```

10. [ACTIVATING AND CONFIGURING HIGH RATE MULTIPLEXER](#)

NOTE

1. Fiber Optic Jumper installation must be complete before starting this step.
2. The HRM can route COL data to the USOS Ku Band system upon completion of this step. Downlink of this data stream to COL-CC will require configuration of the Ku-Band system.

COL-CC

10.1 [Swapping DMS Telemetry Packets \(Ground Only\)](#)  
COL-CC to swap nominal DMS telemetry packets.

Wait for "Go" to continue.

NOTE

Packet swapping initiated from Col-CC:  
Enable MMC\_Gnd\_TIm\_Pkt\_COMMS1\_DMC (0.1Hz)  
Enable MMC\_Gnd\_TIm\_Pkt\_HRM\_Diagnostics\_DMC (0.1Hz)

Perform [{2.2.42 NOMINAL DMS PACKET SWAPPING}](#) (EODF: GROUND: NOMINAL). then:

COL-CC to give a "Go" to continue.

PWS

10.2 [Activating HRM](#)  
Activation Part 1  
[COL Activation Part 1](#)  
'HRM Activation'



NOTE

The following command starts the FLAP 'HRM Activation', which:

- Switches ON both HRM Pwr converters
- Activates the nominal HRM-core, if the nominal HRM-core activation fails, the redundant HRM-core is automatically activated instead
- Starts RT acquisition & monitoring of HRM data
- Enables the HRM-MMU link (Master MMU)

**cmd Activate Execute (OK)**

Wait up to one minute for verification

- Verify Pwr A – ON
- Verify Pwr B – ON
- Verify Pwr A Current < 1.07 A
- Verify Pwr B Current < 1.07 A
- Verify Nom Core Stat – ON
- Verify Nom Ready Stat – READY

**cmd HRM\_Activation\_AP**

**data** Onboard\_Reception\_Node –  
SYS CCSDS End Point DMC DMS SERV  
**data** Onboard\_Execution\_Node –  
USM SW DMC USS Swoop Instance

- Verify HRM\_Pwr\_A\_Stat\_DMC – ON
- Verify HRM\_Pwr\_B\_Stat\_DMC – ON
- Verify HRM\_Pwr\_A\_Current\_DMC – < 1.07 A
- Verify HRM\_Pwr\_B\_Current\_DMC – < 1.07 A
- Verify HRM\_Nom\_Core\_Stat\_DMC – ON
- Verify HRM\_Nom\_Ready\_Stat\_DMC – READY

- Verify HRM\_Nom\_Branch\_Avail\_Stat\_SW – AVAIL
- Verify HRM\_Nom\_Sec\_Voltage\_Stat\_DMC – OK

PWS

10.3 [Configuring HRM](#)

Activation Part 1

COL Activation Part 1

'HRM Configuration (with CDI)'

**cmd Configure Execute (OK)**

- Verify Serial Path TIm Input Selected – AUTO\_SEL
- Verify Output Datarate = 86 x 0.5 Mbps

**cmd HRM\_Configuration\_with\_CDI\_AP**

```

data Onboard_Reception_Node –
SYS CCSDS End Point DMC DMS SERV
data Onboard_Execution_Node –
USM SW DMC USS Swop Instance
prm VCID_CDI – COMMON_ALLOC_VCID
prm Config_IF_CDI – CONFIG01_CONFIG_HRM
prm Execute_Setup_Flag – 1 (TRUE)
prm Command_Delay – 0.1 [s]
prm Start_Stop_RT_Acq – 0 (FALSE)
prm Silent – 0 (RECEIVE MESSAGE)

Verify HRM_Serial_Path_TIm_Input_Selected_DMC –
AUTO_SEL
Verify HRM_Output_Datarate_DMC = 86

Verify HRM_LAN_Input_Selected_DMC – AUTO_SEL
Verify HRM_High_Speed_Output_Selected_DMC – BOTH_ON
Verify HRM_Config_Interface_CDI_SW – 278640513
Verify HRM_VCID_Allocation_CDI_SW – 278640531

After starting Ku band data flow Col-CC has to coordinate the
HRM and Ku-Band System configuration with POIC
    
```

Wait for “Go” to continue.

11. [ACTIVATING WATER PUMP ASSEMBLY CONDENSING HEAT EXCHANGER CONTROL LOOP](#)

11.1 [Starting WPA1 RT \(Ground Only\)](#)

```

cmd DMS_RT_Start_RT_Acquisition_Cmd
prm REMOTE_TERMINAL_ID –
MIL 1553B Bus RT Svstem Bus WPA1
data Onboard_Node –
SYS CCSDS End Point DMC DMS SERV

Verify WPA1_Sys_Bus_Ena_Stat_SW – ENABLED
    
```

11.2 [Checking WPA1 Delta Pressure Values](#)

PWS

TCS:

TCS Functional Overview

'Delta Pressure Sensor Blocks'

Verify DPSB 1 WPA1 DP1 > 18 kPa

Verify DPSB 3 WPA1 DP2 > 18 kPa

```

Verify WPA1_DPSB1_Plenum_DP1_DMC > 18 kPa
Verify WPA1_DPSB3_Plenum_DP2_DMC > 18 kPa
    
```

PWS

11.3 [Activating WPA Condensing Heat Exchanger Control Loop](#)

Activation Part 1

**COL Activation Part 1**

'WPA Final Activation (CHX Cntl Loop Activation)'

**NOTE**

The following command starts the FLAP 'WPA Final Activation' that:

- Determines active WPA
- Starts data acquisition from the WPA
- Enables the plenum delta pressure control loop
- Enables the CHX inlet temperature control loop

During the execution of the FLAP expect the following event message on the System Message Panel:

FLAP WPA\_Final\_Activation\_AP RT MIL\_1553B\_Bus\_RT\_System\_Bus\_WPA1 on Node  
 USM\_SW\_DMC\_USS\_Swop\_Instance already started, when Receiving a Start Cmd

**cmd Activate Execute (OK)**

Verify WPA1 CHX Temp Cntl Loop Stat: ACTIVE  
 Verify WPA1 Plenum Delta Press Cntl Loop Stat: ACTIVE  
 Verify WMV3 MDV Pwr: ON  
 Verify WPA1 Accum Liq Qty1: 1 to 12 L  
 Verify WPA1 Accum Liq Qty2: 1 to 12 L

TCS:

**TCS Functional Overview**

'Delta Pressure Sensor Blocks'

Verify DPSB 1 WPA1 DP1: 40 to 44 kPa  
 Verify DPSB 3 WPA1 DP2: 40 to 44 kPa

```

cmd WPA_Final_Activation_AP
data Onboard_Reception_Node –
SYS CCSDS End Point DMC DMS SERV
data Onboard_Execution_Node –
USM SW DMC USS Swop Instance

Verify WPA1_CHX_Temp_Cntl_Loop_Stat_DMC – ACTIVE
Verify WPA1_Plenum_Delta_Press_Cntl_Loop_Stat_DMC –
ACTIVE
Verify WMV3_MDV_Pwr_Stat_DMC – ON
Verify WPA1_Accum_Liq_Qty1_DMC = 1 -- 12 L
Verify WPA1_Accum_Liq_Qty2_DMC = 1 -- 12 L

Verify WPA1_DPSB1_Plenum_DP1_DMC = 40 -- 44 kPa
    
```

Verify WPA1\_DPSB3\_Plenum\_DP2\_DMC = 40 -- 44 kPa

Verify WPA\_Active\_Pump\_SW – WPA 1

#### 11.4 [Enabling FDIR for Water Loop Reconfiguration](#)

DMS: FDIR Configuration

**FDIR Configuration**

'Accumulator Overpressure FDIR'

**cmd Enable Execute (OK)**

Verify Status – ENABLE

'WPA Switchover FDIR'

**cmd Enable Execute (OK)**

Verify Status – ENABLE

'LTHX Overtemperature FDIR'

**cmd Enable Execute (OK)**

Verify Status – ENABLE

**cmd DMS\_ACQ\_Write\_Dis\_SW\_Variable\_Cmd\_SW**

**prm** Item\_SID –

WPA Accum Overpressure FDIR Ena Stat SW

**prm** Value: – \$ENABLED

**data** Onboard\_Node –

SYS CCSDS End Point DMC DMS SERV

Verify WPA\_Accum\_Overpressure\_FDIR\_Ena\_Stat\_SW –  
ENABLED

**cmd DMS\_ACQ\_Write\_Dis\_SW\_Variable\_Cmd\_SW**

**prm** Item\_SID – WPA\_Recon\_FDIR\_Ena\_Stat\_SW

**prm** Value – \$ENABLED

**data** Onboard\_Node –

SYS CCSDS End Point DMC DMS SERV

Verify WPA\_Recon\_FDIR\_Ena\_Stat\_SW – ENABLED

**cmd DMS\_ACQ\_Write\_Dis\_SW\_Variable\_Cmd\_SW**

**prm** Item\_SID – WPA\_Enter\_BSM\_FDIR\_Ena\_Stat\_SW

**prm** Value – \$ENABLED

**data** Onboard\_Node –

SYS CCSDS End Point DMC DMS SERV

Verify WPA\_Enter\_BSM\_FDIR\_Ena\_Stat\_SW – ENABLED

PWS

11.5 [Start LTHX Temperature Monitoring](#)

Menu Bar: DMS Monitoring: 5 - COMMS TCS Payload

DMS Monitoring 5 - COMMS TCS Payload

'TCS'

Verify WTSB6 Low HX Temp1:  $\leq 7.6$  DegC

Verify WTSB6 Low HX Temp2:  $\leq 7.6$  DegC

'DMS Monitoring'

'Enable/Disable'

sel TCS

DMS Monitoring Enable/Disable 5A

'Enable Monitoring WTSB'

**cmd** WTSB6 Low HX Temp1 **Execute** (OK)

**cmd** WTSB6 Low HX Temp2 **Execute** (OK)

sel Close

DMS Monitoring 5 - COMMS TCS Payload

'TCS'

Verify the background color of measurements

WTSB6 Low HX Temp1: Green

WTSB6 Low HX Temp2: Green

Verify WTSB6\_Low\_HX\_Temp1\_DMC –  $\leq 7.6$  °C

Verify WTSB6\_Low\_HX\_Temp2\_DMC –  $\leq 7.6$  °C

**cmd** DMS\_MONIT\_Ena\_Monitoring\_Cmd\_SW

**prm** MT\_ID – DMC\_Sys\_Monitoring\_Table\_SW

**prm** EI\_ID – WTSB6\_Low\_HX\_Temp1\_DMC

**prm** LIMIT\_SET\_ID – 0 (limit set 1)

**data** Onboard\_Node –

SYS CCSDS End Point DMC DMS SERV

Verify WTSB6\_Low\_HX\_Temp1\_DMC\_MS – NORMAL\_1

**cmd** DMS\_MONIT\_Ena\_Monitoring\_Cmd\_SW

**prm** MT\_ID – DMC\_Sys\_Monitoring\_Table\_SW

**prm** EI\_ID – WTSB6\_Low\_HX\_Temp2\_DMC

**prm** LIMIT\_SET\_ID – 0 (limit set 1)

**data** Onboard\_Node –

SYS\_CCSDS\_End\_Point\_DMC\_DMS\_SERV

Verify WTSB6\_Low\_HX\_Temp2\_DMC\_MS – NORMAL\_1

12. [ACTIVATING SMOKE DETECTOR](#)

COL-CC

12.1 [Swapping DMS Telemetry Packets \(Ground Only\)](#)

COL-CC to swap nominal DMS telemetry packets.

Wait for “Go” to continue.

**NOTE**

Packet swapping initiated from Col-CC:  
 Enable VTC1\_Gnd\_Tlm\_Pkt\_PHY1\_VTC (1Hz)  
 Enable VTC2\_Gnd\_Tlm\_Pkt\_PHY1\_VTC (1Hz)

Perform [{2.2.41 VTC GROUND PACKET SWAPPING}](#) (EODF: GROUND: NOMINAL). then:

COL-CC to give “Go” to continue.

PCS

12.2 [Powering Up Smoke Detector 1](#)

Task: Columbus Final Activation - Part 3: Smoke Detector Activation

'Smoke Detectors'

sel Cabin SD1

sel PDU1 120V Outlets

'PDU 1'

**cmd** Outlet No. 24 SD1 Pwr Bus – On (Verify – On)

**cmd** PDU1\_SD1\_Pwr\_Bus\_On\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PDU1\_SD1\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON

12.3 [Verifying Smoke Detector 1 Power Status](#)

Verify Obscuration, % Contamination < 25

Verify Scatter, % Obscuration per Meter < 1

Verify Cabin\_SD1\_Obscuration\_VTC\_PP – < 25

Verify Cabin\_SD1\_Scatter\_VTC\_PP – < 1

12.4 [Enabling Smoke Detector 1](#)

**COL Cabin Smoke Detector 1**

'Monitoring'

**cmd** Enable

Verify Status – Enabled

'Active BIT'

Verify Failure – blank

'Fire Status'

Verify Lens Status – Clean

Verify Out of Range – blank

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – Cabin\_SD\_1

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify Cabin\_SD\_1\_EF – ENABLED

Verify VTC1\_Cabin\_SD\_1\_Stat\_MVD – OK

12.5 [Powering Up Smoke Detector 2](#)

Task: Columbus Final Activation - Part 3: Smoke Detector Activation

**COL Fire Display**

'Smoke Detectors'

sel Cabin SD2

**COL Cabin Smoke Detector 2**

sel PDU2 120V Outlets

**COL PDU2 120V Outlets VTC1**

'PDU 2'

**cmd** Outlet No. 24 SD2 Pwr Bus – On (Verify – On)

**cmd** PDU2\_SD2\_Pwr\_Bus\_On\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PDU2\_SD2\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – ON

12.6 [Verifying Smoke Detector 2 Power Status](#)

COL Cabin Smoke Detector 2

Verify Obscuration, % Contamination < 25

Verify Scatter, % Obscuration per Meter < 1

Verify Cabin\_SD2\_Obscuration\_VTC\_PP – < 25

Verify Cabin\_SD2\_Scatter\_VTC\_PP – <1

12.7 [Enabling Smoke Detector 2](#)

COL Cabin Smoke Detector 2

'Monitoring'

**cmd** Enable

Verify Status – Enabled

'Active BIT'

Verify Failure – blank

'Fire Status'

Verify Lens Status – Clean

Verify Out of Range – blank

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – Cabin\_SD\_2

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify Cabin\_SD\_2\_EF – ENABLED

Verify VTC2\_Cabin\_SD\_2\_Stat\_MVD – OK

12.8 [Enabling US C&W for Columbus Smoke Detectors 1 and 2 \(Ground Only\)](#)

MCC-H

Enable the following events in the Primary and Backup C&C MDMs.

If ground unable to complete,

Perform [{2.101 CAUTION AND WARNING EVENT MANAGEMENT}](#), Step 2 (SODF: C&DH: NOMINAL) per Table 4, then



Table 4. C&W Events for COL Smoke Detectors 1 & 2

Event	Text	Class
13500	FIRE Smoke Detector 1 Cabin - COL	E
13501	FIRE Smoke Detector 2 Cabin - COL	E

13. [ACTIVATING CONDENSATE WATER SEPARATOR ASSEMBLY](#)

NOTE

Condensate Jumper must be installed prior to beginning this step.

PCS

13.1 [Opening Columbus Condensate Line Shut Off Valve](#)

COL: ECLSS: CLSOV

COL CLSOV VTC1

**cmd** Position – Open

Verify Position Ind – Open

**cmd** CLSOV\_Vlv\_Open\_VTC  
**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CLSOV\_Vlv\_Open\_Stat\_VTC\_PP – OPEN

PWS

13.2 [Activating CWSA](#)

Activation Part 1: Activation Part 2: Activation Part 3

COL Activation Part 3

'CWSA1 Activation'

NOTE

The following command starts FLAP 'CWSA1 Activation' that:  
 Checks the availability of the CWSA  
 Powers on the CWSA  
 Enables the monitoring of the CWSA parameters  
 Enables the monitoring of the LCOS parameters

**cmd** Activate **Execute** (OK)

Wait 20 seconds for telemetry stabilization.

Verify Pwr: ON

Verify Delta P Air: > 0.5 kPa

Verify Motor Speed: 4500 to 6800 rpm  
 Verify Input Current: < 0.50 A

```

cmd CWSA1_Activation_AP
data Onboard_Reception_Node –
    SYS CCSDS End Point DMC DMS SERV
data Onboard_Execution_Node –
    USM SW DMC USS Swop Instance

    Verify CWSA1_Pwr_Stat_DMC – ON
    Verify CWSA1_Delta_P_Air_DMC – >0.5 kPa
    Verify CWSA1_Motor_Speed_DMC – 4500-6800 rpm
    Verify CWSA1_Input_Current_DMC – <0.5 A
    
```

PWS 13.3

Enabling CWSA FDIR  
 DMS: FDIR Configuration  
FDIR Configuration  
 'CWSA Switchover FDIR'

**cmd** Enable **Execute** (OK)  
 Verify Status – ENABLE

```

cmd DMS_ACQ_Write_Dis_SW_Variable_Cmd_SW
prm Item SID – CWSA_FDIR_Ena_Stat_SW
prm Value – $ENABLED
data Onboard_Node –
    SYS CCSDS End Point DMC DMS SERV

    Verify CWSA_FDIR_Ena_Stat_SW – ENABLED
    
```

PWS 14.

ACTIVATING CABIN FAN ASSEMBLY  
 Activation Part 1: Activation Part 2: Activation Part 3  
COL Activation Part 3  
 'CFA1 Activation (w/o monitoring)'

**cmd** Pwr\_On **Execute** (OK)  
 Verify Pwr: ON  
 Verify Delta P: > 0.25 kPa  
 Verify Fan Speed: 7500 to 8500 rpm  
 Verify Input Current: < 1.5A

```

cmd CFA1_Pwr_On_AP
data Onboard_Reception_Node –
    SYS CCSDS End Point DMC DMS SERV
data Onboard_Execution_Node – USM_SW_DMC_USS_Swop_Instance

    Verify CFA1_Pwr_Stat_DMC – ON
    
```

Verify CFA1\_Delta\_P\_DMC – >0.25 kPa  
 Verify CFA1\_Fan\_Speed\_DMC – 7500-8500 rpm  
 Verify CFA1\_Input\_Current\_DMC – <1.5 A

15. ACTIVATING CABIN TEMP CONTROL UNIT

15.1 Activating CTCU

PWS

Activation Part 1: Activation Part 2: Activation Part 3

COL Activation Part 3

'CTCU1 Activation'

NOTE

The following command starts the FLAP 'CTCU1 Activation' that:

- Checks that the other CTCU is not controlling the TCV
- Checks the availability of the CTCU
- Checks that at least one CFA is active
- Powers on the CTCU
- Enables monitoring of the CTCU parameters
- Activates the TCV
- Enables cabin temperature control

**cmd** Activate **Execute** (OK)

NOTE

The cabin temperature may need time to stabilize to the nominal temperature range. If the cabin temperature is out of the expected values, continue with the procedure.

Verify Pwr: ON

Verify Health Stat: OK

Verify Cntl Loop Stat: ENABLED

Verify TCV\_Cntl Stat: ENABLED

Verify Avg Cabin Temp: 18 to 27 deg C

**cmd** CTCU1\_Activation\_AP

**data** Onboard\_Reception\_Node –  
 SYS CCSDS End Point DMC DMS SERV

**data** Onboard\_Execution\_Node –  
 USM SW DMC USS Swop Instance

Verify CTCU1\_Pwr\_Stat\_DMC – ON

Verify CTCU1\_Health\_Stat\_DMC – OK

Verify CTCU1\_Cntl\_Loop\_Stat\_DMC – ENABLED

Verify CTCU1\_TCV\_Cntl\_Stat\_DMC – ENABLED

Verify CTCU1\_Avg\_Cabin\_Temp\_DMC – 18-27 °C

PWS

15.2 [Enabling FDIR for CTCU Reconfiguration](#)

DMS: FDIR Configuration

**FDIR Configuration**

'CTCU Switchover FDIR'

**cmd** Enable **Execute** (OK)

Verify Status – ENABLE

**cmd** DMS\_ACQ\_Write\_Dis\_SW\_Variable\_Cmd\_SW

**prm** Item SID – CTCU\_FDIR\_Ena\_Stat\_SW

**prm** Value – \$ENABLED

**data** Onboard\_Node –

SYS CCSDS End Point DMC DMS SERV

Verify CTCU\_FDIR\_Ena\_Stat\_SW – ENABLED

16. [OPENING SAMPLE LINE SHUTOFF VALVE](#)

**NOTE**

1. The AR Sample Jumper must be installed prior to opening the Sample Line Shutoff Valve.
2. Pressure equalization of the Columbus Module must be performed before opening the Sample Line Shutoff Valves.

PCS

COL: ECLSS: Air Loop: SLSOV

**COL SLSOV VTC1**

**cmd** Position – Open

Verify Position Ind – Open

**cmd** SLSOV\_Vlv\_Open\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify SLSOV\_Vlv\_Open\_Stat\_VTC\_PP – OPEN

17. [ESTABLISHING INTERMODULE VENTILATION](#)

**NOTE**

1. IMV duct installation must be completed before starting this step.
2. NPRA Valve removal and IMV valve installation must be completed prior to this step.

PCS

17.1 [Activating Node 2 IMV Stbd Aft Valve](#)

Node 2: ECLSS: IMV Stbd Aft Vlv

**Node 2 IMV Stbd Aft Vlv**

sel RPCM N22A3B C RPC 02

RPCM N22A3B C RPC 02

cmd RPC Position – Close (Verify – Cl)

Node 2 IMV Stbd Aft Vlv

'Enable'

cmd Arm (√Arm Status – Armed)

cmd Enable (√State – Enabled)

17.2 [Opening Node 2 IMV Stbd Aft Valve](#)

'Open'

cmd Arm (√Arm Status – Armed)

cmd Open

√Position – In Transit

Wait 25 seconds.

√Position – Open

17.3 [Activating Node 2 IMV Stbd Fwd Valve](#)

Node 2: ECLSS: IMV Stbd Fwd Vlv

Node 2 IMV Stbd Fwd Vlv

sel RPCM N22A3B C RPC 06

RPCM N22A3B C RPC 06

cmd RPC Position – Close (Verify – Cl)

Node 2 IMV Stbd Fwd Vlv

'Enable'

cmd Arm (√Arm Status – Armed)

cmd Enable (√State – Enabled)

17.4 [Opening Node 2 IMV Stbd Fwd Valve](#)

Node 2 IMV Stbd Fwd Vlv

'Open'

cmd Arm (√Arm Status – Armed)

cmd Open

√Position – In Transit

Wait 25 seconds.

√Position – Open

17.5 [Closing Columbus IMV Valves](#)

COL: ECLSS: Air Loop: ISSOV

COL IMV Valves VTC1

'IMV Return Shutoff Valve'

**cmd** Position – Close

Verify Position Ind – Closed

'IMV Supply Shutoff Valve'

**cmd** Position – Close

Verify Position Ind – Closed

**cmd** IRSOV\_Vlv\_Close\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify IRSOV\_Vlv\_Close\_Stat\_VTC\_PP – CLOSED

**cmd** ISSOV\_Vlv\_Close\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**cmd** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify ISSOV\_Vlv\_Close\_Stat\_VTC\_PP – CLOSED

17.6 [Opening Columbus IMV Valves](#)

COL: ECLSS: Air Loop: ISSOV

COL IMV Valves VTC1

'IMV Return Shutoff Valve'

**cmd** Position – Open

Verify Position Ind – Open

'IMV Supply Shutoff Valve'

**cmd** Position – Open

Verify Position Ind – Open

```

cmd IRSOV_Vlv_Open_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify IRSOV_Vlv_Open_Stat_VTC_PP – OPEN

cmd ISSOV_Vlv_Open_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
cmd Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify ISSOV_Vlv_Open_Stat_VTC_PP – OPEN

```

17.7 Activating Columbus IMV Supply Fan

COL: ECLSS: Air Loop: ISFA

COL IMV Fans

√VTC2 Buffer Status – Empty

```

*****
*           If VTC2 Buffer – Full
*           |
*           | sel VTC2 Cancel 2 Step Command
*           |
*           | COL Cancel 2 - Stage Cmd VTC 2
*           |
*           |
*           | cmd Cancel 2 – Stage Cmd Execute (Verify
*           | – Empty)
*           |
*****

```

'Set Speed - VTC2 hardware'

NOTE

The following ACS sets the IMV Supply Fan speed to 9960 rpm.

Record PCS\_ID: \_\_\_\_\_

**cmd** Start – Arm

pick PCS/C-X to VTC-Com2 (where X=PCS ID)

**cmd** Start – Set

'IMV Supply Fan Assembly'

**cmd** State – On

Verify dP: > 0.4 kPa

Verify Fan Speed: 9460 to 10460 rpm  
Verify Fan Temp: < 60 degC  
Verify ISFA Power: On

```

√VTC2_Two_Stage_Buffer_Status_SW_PP – EMPTY

If VTC2_Two_Stage_Buffer_Status_SW_PP – FULL
|
|   cmd VTC_Cancel_Two_Stage_Cmd_Cmd_SW
|   data Onboard_Node – SYS_CCSDS_End_Point_VTC2
|
|   Verify VTC2_Two_Stage_Buffer_Status_SW_PP –
|   EMPTY

```

```

cmd ISFA_SPEED_SET_ACS (ARM)
data SW_CMD – VTC_Start_Terminate_ACS_Cmd_SW
data Action – 1 (START)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify VTC1_Two_Stage_Buffer_Status_SW_PP – FULL

cmd VTC_Execute_2_Stage_Cmd_SW (EXEC)

cmd ISFA_On_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify ISFA_Delta_P_MVD – > 0.4 kPa
Verify ISFA_Fan_Speed_MVD – 9460 -10460 rpm
Verify ISFA_Fan_Temp_VTC – < 60 degC
Verify ISFA_Pwr_Stat_MVD – ON

```

17.8 [Activating Columbus IMV Return Fan](#)

COL: ECLSS: Air Loop: IRFA

COL IMV Fans

√VTC1 Buffer Status – Empty

```

*****
*   If VTC1 Buffer – Full
*   |
*   |   sel VTC1 Cancel 2 Step Command
*   |
*   |   COL Cancel 2 - Stage Cmd VTC 1
*   |
*   |   cmd Cancel 2 – Stage Cmd Execute (Verify
*   |   – Empty)
*   |
*****

```



'Set Speed – VTC1 Hardwire'

NOTE

The following ACS sets the IMV Return Fan speed to 8800 rpm.

Record PCS ID: \_\_\_\_\_

**cmd** Start – Arm

pick PCS/C-X to VTC-Com1 (where X=PCS ID)

**cmd** Start – Set

'IMV Return Fan Assembly'

**cmd** State – On

Verify dP: > 0.3 kPa

Verify Fan Speed: 8300 to 9300 rpm

Verify Fan Temp: < 60 degC

Verify IRFA Power: On

√VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP – EMPTY

If VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP – FULL

**cmd** VTC\_Cancel\_Two\_Stage\_Cmd\_Cmd\_SW

**data** Onboard\_Node SYS\_CCSDS\_End\_Point\_VTC1

Verify VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP – EMPTY

**cmd** IRFA\_SPEED\_SET\_ACS (ARM)

**data** SW\_CMD – VTC\_Start\_Terminate\_ACS\_Cmd\_SW

**data** Action – 1 (START)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify VTC1\_Two\_Stage\_Buffer\_Status\_SW\_PP – FULL

**cmd** VTC\_Execute\_2\_Stage\_Cmd\_SW (EXEC)

**cmd** IRFA\_On\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node: – SYS\_CCSDS\_End\_Point\_VTC1

Verify IRFA\_Delta\_P\_MVD – >0.3 kPa

Verify IRFA\_Fan\_Speed\_MVD – 8300-9300 rpm  
 Verify IRFA\_Fan\_Temp\_VTC – < 60 degC  
 Verify IRFA\_Pwr\_Stat\_MVD – ON

17.9 [Enabling VTC Monitoring for IRFA and ISFA Safing \(Ground Only\)](#)

COL-CC

COL-CC to enable IRFA and ISFA monitoring

Wait for “Go” to continue.

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – ISFA\_Fan\_Temp\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify ISFA\_Fan\_Temp\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – ISFA\_Delta\_P\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify ISFA\_Delta\_P\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – ISFA\_Fan\_Speed\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify ISFA\_Fan\_Speed\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – IRFA\_Fan\_Temp\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify IRFA\_Fan\_Temp\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – IRFA\_Delta\_P\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify IRFA\_Delta\_P\_VTC\_MEF – ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – IRFA\_Fan\_Speed\_VTC  
**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

**cmd** IRFA\_Fan\_Speed\_VTC\_MEF – ENABLED

**COL-CC** to give a “Go” to continue.

18. [ACTIVATING COLUMBUS ECLSS FDIR FOR NOMINAL OPS](#)

PWS

18.1 [Configuring for CFA to Nominal Ops](#)

Activation Part 1: Activation Part 2: Activation Part 3

**COL Activation Part 3**

'Cabin Loop Final Activation'

'CFA1'

**NOTE**

The following command starts the FLAP 'CFA1 Activation' that:

- Checks the availability of the CFA
- Sets the Cabin Fan Speed to 9200 rpm
- Powers on the CFA
- Enables monitoring of the CFA parameters

**cmd** Activate **Execute** (OK)

Verify Pwr: ON

Verify Delta P: 0.61 to 1.5 kPa

Verify Fan Speed: 8700 to 9700 rpm

Verify Input Current: < 1.5 A

Verify Cab Air Massflow: 240 to 510 m3/h

**cmd** CFA1\_Activation\_AP

**data** Onboard\_Reception\_Node –  
SYS CCSDS End Point DMC DMS SERV

**data** Onboard\_Execution\_Node –  
USM SW DMC USS Swoop Instance

Verify CFA1\_Pwr\_Stat\_DMC – ON

Verify CFA1\_Delta\_P\_DMC – 0.61 - 1.5 kPa

Verify CFA1\_Fan\_Speed\_DMC – 8700 - 9700 rpm

Verify CFA1\_Input\_Current\_DMC – <1.5 A

Verify AFS1\_Cab\_Air\_Massflow\_MVD – 240 - 510 m3/h

18.2 [Enabling IMV Monitoring](#)

PWS

ECLSS: ECLSS Commands

**ECLSS Commands**

'Monitoring Commands'

NOTE

The following command starts the FLAP 'IMV Ena Fan Mon' that enables the monitoring of the IRFA and ISFA input currents and delta pressures.

**cmd** IMV Fan Mon Ena **Execute** (OK)

PWS

Main Panel: DMS Monitoring: 2 - ECLSS

DMS Monitoring 2 - ECLSS

'System on DMC'

Verify the background color of measurements

ISFA Delta P: Green  
 ISFA Input Current: Green  
 IRFA Delta P: Green  
 IRFA Input Current: Green

**cmd** IMV\_Ena\_Fan\_Mon\_AP  
**data** Onboard\_Reception\_Node –  
 SYS CCSDS End Point DMC DMS SERV  
**data** Onboard\_Execution\_Node –  
 USM SW DMC USS Swoop Instance

Verify ISFA\_Delta\_P\_MVD\_MS – NORMAL\_1  
 Verify ISFA\_Input\_Current\_DMC\_MS – NORMAL\_1  
 Verify IRFA\_Delta\_P\_MVD\_MS – NORMAL\_1  
 Verify IRFA\_Input\_Current\_DMC\_MS – NORMAL\_1

18.3 [Enabling IMV/CFA FDIR](#)

DMS: FDIR Configuration

FDIR CONFIG

'IRFA FDIR'

**cmd** Enable **Execute** (OK)

Verify Status – ENABLE

'ISFA FDIR'

**cmd** Enable **Execute** (OK)

Verify Status – ENABLE

'CFA Switchover FDIR'

**cmd** Enable **Execute** (OK)

Verify Status – ENABLE

```

cmd DMS_ACQ_Write_Dis_SW_Variable_Cmd_SW
prm Item SID – IRFA_FDIR_Ena_Stat_SW
prm Value – $ENABLE
data Onboard_Node –
SYS CCSDS End Point DMC DMS SERV

Verify IRFA_FDIR_Ena_Stat_SW – ENABLED

cmd DMS_ACQ_Write_Dis_SW_Variable_Cmd_SW
prm Item SID – ISFA_FDIR_Ena_Stat_SW
prm Value – $ENABLED
data Onboard_Node –
SYS CCSDS End Point DMC DMS SERV

Verify ISFA_FDIR_Ena_Stat_SW – ENABLED

cmd DMS_ACQ_Write_Dis_SW_Variable_Cmd_SW
prm Item SID – CFA_FDIR_Ena_Stat_SW
prm Value – $ENABLE
data Onboard_Node –
SYS CCSDS End Point DMC DMS SERV

Verify CFA_FDIR_Ena_Stat_SW – ENABLED
    
```

PCS

18.4 [Activating VTC Monitoring for Air Flow Sensors](#)

COL: ECLSS: Atmos

COL Atmosphere

Verify Airflow Sensor 1 Massflow: > 240 m3/hr

**cmd** Airflow Sensor 1 Massflow Monitoring – Enable (Verify – Enabled)

Verify Airflow Sensor 2 Massflow: > 240 m3/hr

**cmd** Airflow Sensor 2 Massflow Monitoring – Enable (Verify – Enabled)

```

Verify AFS1_Cab_Air_Massflow_VTC – > 240 m3/hr

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – AFS1_Cab_Air_Massflow_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify AFS1_Cab_Air_Massflow_VTC_MEF – ENABLED

Verify AFS2_Cab_Air_Massflow_VTC > 240 m3/hr
    
```

```

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – AFS2_Cab_Air_Massflow_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify AFS2_Cab_Air_Massflow_VTC_MEF – ENABLED
    
```

MCC-H 18.5 [Enabling C&W for the Previous Monitorings \(Ground Only\)](#)  
 Enable the following events in the Primary and Backup C&C MDMs.

If ground unable to complete,  
 Perform [{2.101 CAUTION AND WARNING EVENT MANAGEMENT}](#), Step 2 (SODF: C&DH: NOMINAL) per Table 5, then

**Table 5. C&W Events for Cabin Air Flow**

Event	Text	Class
13532	Cabin Air Flow Sensor 1 Low - COL	W
13533	Cabin Air Flow Sensor 2 Low - COL	W
13605	Cabin Air Return Grid Clogging - COL	C

PCS 18.6 [Activating VTC Monitoring for TPS](#)

COL: ECLSS: Atmos

COL Atmosphere

Verify Air Press 1: 719 -- 770 mmHg

**cmd** Air Press 1 Monitoring Status – Enable (Verify – Enabled)

Verify Air Press 3: 719 -- 770 mmHg

**cmd** Air Press 3 Monitoring Status – Enable (Verify – Enabled)

```

Verify TPS1_Air_Press_VTC – 719 -- 770 mmHg

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – TPS1_Air_Press_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify TPS1_Air_Press_VTC_MEF – ENABLED
    
```

Verify TPS3\_Air\_Press\_VTC – 719 -- 770 mmHg

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID – TPS3\_Air\_Press\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify TPS3\_Air\_Press\_VTC\_MEF – ENABLED

MCC-H 18.7 [Enabling C&W for TPS \(Ground Only\)](#)  
 Enable the following events in the Primary and Backup C&C MDMs.

If ground unable to complete,  
 Perform [{2.101 CAUTION AND WARNING EVENT MANAGEMENT}](#), Step 2 (SODF: C&DH: NOMINAL) per Table 6, then

**Table 6. C&W Events for TPS1 and TPS3**

Event	Text	Class
13526	Total Pressure Sensor 1 Low - COL	W
13527	Total Pressure Sensor 3 Low - COL	W

PCS 18.8 [Enabling Monitoring for PPOS and PPCS](#)  
 COL: ECLSS: Atmos  
COL Atmosphere

Verify ppO2 Sensor 1: 124 -- 188 mmHg

**cmd** ppO2 Sensor 1 Monitoring Status – Enable (Verify – Enabled)

Verify ppO2 Sensor 2: 124 -- 188 mmHg

**cmd** ppO2 Sensor 2 Monitoring Status – Enable (Verify – Enabled)

Verify ppCO2 Sensor 1: < 10 mmHg

**cmd** ppCO2 Sensor 1 Monitoring Status – Enable (Verify – Enabled)

Verify ppCO2 Sensor 2: < 10 mmHg

**cmd** ppCO2 Sensor 2 Monitoring Status – Enable (Verify – Enabled)

Verify PPOS1\_Press\_VTC – 124 -- 188 mmHg

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – PPOS1\_Press\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PPOS1\_Press\_VTC\_MEF – ENABLED

Verify PPOS2\_Press\_VTC – 124 -- 188 mmHg

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – PPOS2\_Press\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify PPOS2\_Press\_VTC\_MEF – ENABLED

Verify PPCS1\_Press\_VTC – < 10 mmHg

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – PPCS1\_Press\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PPCS1\_Press\_VTC\_MEF – ENABLED

Verify PPCS2\_Press\_VTC – < 10 mmHg

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – PPCS2\_Press\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC2

Verify PPCS2\_Press\_VTC\_MEF – ENABLED

COL-CC 18.9

Swapping DMS Telemetry Packets (Ground Only)

COL-CC to swap nominal DMS telemetry packets.

Wait for “Go” to continue.

NOTE

Packet swapping initiated from Col-CC:  
 Disable VTC1\_Gnd\_TIm\_Pkt\_PHY1\_VTC (1Hz)  
 Disable VTC2\_Gnd\_TIm\_Pkt\_PHY1\_VTC (1Hz)



Perform [{2.2.41 VTC GROUND PACKET SWAPPING}](#) (EODF: GROUND: NOMINAL). then:

COL-CC to give a “Go” to continue.

19. [DISABLING PPR FUNCTION](#)

PCS

19.1 [Closing PPRA Valves](#)

Task: COL Final Activation – Part 3: COL PPRA

COL PPRA 1-2 VTC1

√PPRA1 Position – Close

√PPRA2 Position – Close

√PPRA1\_Vlv\_Close\_Stat\_VTC\_PP – CLOSED

If PPRA1\_Vlv\_Close\_Stat\_VTC\_PP – OPEN

**cmd** PPRA1\_Vlv\_Close\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PPRA1\_Vlv\_Close\_Stat\_VTC\_PP – CLOSED

√PPRA2\_Vlv\_Close\_Stat\_VTC\_PP – CLOSED

If PPRA2\_Vlv\_Close\_Stat\_VTC\_PP – OPEN

**cmd** PPRA2\_Vlv\_Close\_VTC

**data** SW\_CMD – VTC\_Disc\_Out\_Cmd\_Cmd\_SW

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PPRA2\_Vlv\_Close\_Stat\_VTC\_PP – CLOSED

19.2 [Enabling VTC Monitoring of PPRA](#)

COL PPRA 1-2 VTC1

**cmd** PPRA1 Close Status Monitoring – Enabled (Verify – Enabled)

**cmd** PPRA2 Close Status Monitoring – Enabled (Verify – Enabled)

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – PPRA1\_Vlv\_Close\_Stat\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PPRA1\_Vlv\_Close\_Stat\_Monitoring\_Ena\_VTC\_PP –  
ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – PPRA2\_Vlv\_Close\_Stat\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify PPRA2\_Vlv\_Close\_Stat\_Monitoring\_Ena\_VTC\_PP –  
ENABLED

### 19.3 [Enabling VTC Monitoring of CDAs](#)

COL: ECLSS: Cabin Depress Assemblies

COL Cabin Depress Assemblies

sel CDA 1 Vlv 1 Vlv 2

COL CDA 1 - 2 Valve Control VTC1

'CDA 1 Valve 1'

**cmd** Close Status Monitoring – Enable (Verify – Enabled)

'CDA 1 Valve 2'

**cmd** Close Status Monitoring – Enable (Verify – Enabled)

'CDA 2 Valve 1'

**cmd** Close Status Monitoring – Enable (Verify – Enabled)

'CDA 2 Valve 2'

**cmd** Close Status Monitoring – Enable (Verify – Enabled)

COL Cabin Depress Assemblies

sel CDA 3 Vlv 1 Vlv 2

COL CDA 3 - 4 Valve Control VTC1

'CDA 3 Valve 1'

**cmd** Close Status Monitoring – Enable (Verify – Enabled)

'CDA 3 Valve 2'

**cmd** Close Status Monitoring – Enable (Verify – Enabled)

'CDA 4 Valve 1'

**cmd** Close Status Monitoring – Enable (Verify – Enabled)

'CDA 4 Valve 2'

**cmd** Close Status Monitoring – Enable (Verify – Enabled)

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – CDA1\_Vlv1\_Close\_Stat\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CDA1\_Vlv1\_Close\_Stat\_Monitoring\_Ena\_VTC\_PP –  
ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – CDA1\_Vlv2\_Close\_Stat\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CDA1\_Vlv2\_Close\_Stat\_Monitoring\_Ena\_VTC\_PP –  
ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – CDA2\_Vlv1\_Close\_Stat\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CDA2\_Vlv1\_Close\_Stat\_Monitoring\_Ena\_VTC\_PP –  
ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – CDA2\_Vlv2\_Close\_Stat\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CDA2\_Vlv2\_Close\_Stat\_Monitoring\_Ena\_VTC\_PP –  
ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

**prm** Monitored\_Item\_ID – CDA3\_Vlv1\_Close\_Stat\_VTC

**prm** Action – 1 (ENABLE)

**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1

Verify CDA3\_Vlv1\_Close\_Stat\_Monitoring\_Ena\_VTC\_PP –  
ENABLED

**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW

```

prm Monitored_Item_ID – CDA3_Vlv2_Close_Stat_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify CDA3_Vlv2_Close_Stat_Monitoring_Ena_VTC_PP –
ENABLED

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – CDA4_Vlv1_Close_Stat_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify CDA4_Vlv1_Close_Stat_Monitoring_Ena_VTC_PP –
ENABLED

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – CDA4_Vlv2_Close_Stat_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify CDA4_Vlv2_Close_Stat_Monitoring_Ena_VTC_PP –
ENABLED
    
```

19.4 [Enabling VTC monitoring of VVMRVs](#)

COL: ECLSS: Payload VV

Columbus Payload Vacuum and Venting

sel VEMRV

Columbus VEDD - VTC1

'Venting Manual Repressurization Valve'

**cmd** Close Monitoring – Enable (Verify – Enabled)

Columbus Payload Vacuum and Venting

sel VAMRV

Columbus VADD - VTC1

'Vacuum Manual Repressurization Valve'

**cmd** Close Monitoring – Enable (Verify – Enabled)

```

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – VEMRV_Vlv_Close_Stat_VTC
prm Action – 1 (ENABLE)
    
```

```

data Onboard_Node – SYS_CCSDS_End_Point_VTC1

Verify VEMRV_Vlv_Close_Stat_Monitoring_Ena_VTC_PP –
ENABLED

cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – VAMRV_Vlv_Close_Stat_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2

Verify VAMRV_Vlv_Close_Stat_Monitoring_Ena_VTC_PP –
ENABLED
    
```

20. ACTIVATING PLCU

PWS

Activation Part 1: Activation Part 2: Activation Part 3: Activation Part 4:

COL Activation Part 4

'PLCU Activation (In Default Mode)'

NOTE

The following command starts the FLAP 'PLCU Act In Default Mode' that:

- Checks that the SPC3 is not active
- Switches SPC3 power A and power B on
- Boot the PLCU in default mode
- Enables the monitoring of the SPC3 ready status

**cmd** Activate **Execute** (OK)

Verify Pwr A: – On

Verify Pwr B: – On

Verify Ready Stat: – Ready

Verify Pwr A Current: < 1.19 A

Verify Pwr B Current: < 0.12 A

Verify Sec Voltage Stat: – OK

```

cmd PLCU_Act_In_Default_Mode_AP
data Onboard_Reception_Node –
SYS CCSDS End Point DMC DMS SERV
data Onboard_Execution_Node – USM_SW_DMC_USS_Swop_Instance

Verify PLCU_Pwr_A_Stat_DMC – ON
Verify PLCU_Pwr_B_Stat_DMC – ON
Verify PLCU_Ready_Stat_DMC – READY
Verify PLCU_Pwr_A_Current_DMC – <1.19 A
Verify PLCU_Pwr_B_Current_DMC – < 0.12 A
Verify PLCU_Sec_Voltage_Stat_DMC – OK
    
```

20.1 [Enabling CCSDS Checksum Validation on PLCU \(Ground Only\)](#)

```
cmd DMS_CCSDS_Checksum_Ena_Cmd_SW
data ONBOARD_NODE -
SYS_CCSDS_End_Point_PLCU_DMS_SERV
```

21. [ACTIVATING XCMU](#)

PWS

Activation Part 1: Activation Part 2: Activation Part 3: Activation Part 4

COL Activation Part 4

'XCMU Activation'

<p><u>NOTE</u></p> <p>The following command starts the FLAP 'XCMU Activation' that:                  Checks that the XCMU is available                  Checks that the redundant XCMU is off                  Switches XCMU nom power A and nom power B on                  Enables the monitoring of the nominal XCMU ready status</p>
--

**cmd** Activate **Execute** (OK)

- Verify Nom Pwr A – On
- Verify Nom Pwr B – On
- Verify Nom Ready Stat – Ready
- Verify Nom Pwr A Current < 0.64 A
- Verify Nom Pwr B Current < 0.64 A
- Verify Nom Sec Voltage Stat – OK

```
cmd XCMU_Activation_AP
data Onboard_Reception_Node -
SYS CCSDS End Point DMC DMS SERV
data Onboard_Execution_Node - USM_SW_DMC_USS_Swop_Instance

Verify XCMU_Nom_Pwr_A_Stat_DMC - ON
Verify XCMU_Nom_Pwr_B_Stat_DMC - ON
Verify XCMU_Nom_Ready_Stat_DMC - READY
Verify XCMU_Nom_Pwr_A_Current_DMC - <0.64 A
Verify XCMU_Nom_Pwr_B_Current_DMC - <0.64 A
Verify XCMU_Nom_Sec_Voltage_Stat_DMC - OK
```

22. [ENABLING CABIN TEMPERATURE MONITORING](#)

PWS

Main Panel: DMS Monitoring: 2 - ECLSS

DMS Monitoring 2 - ECLSS

'System on DMC'

- Verify CTCU1 Cabin Temp1: 18 to 27 deg C
- Verify CTCU1 Cabin Temp2: 18 to 27 deg C

# COLUMBUS FINAL ACTIVATION

(ASSY OPS/1E/FIN/MULTI E)

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Verify CTCU1 Cabin Temp3: 18 to 27 deg C

Verify HS1 Air Humidity: 20 to 73 %

Verify HS2 Air Humidity: 20 to 73 %

ECLSS: ECLSS Commands:

**ECLSS Commands**

'Monitoring Commands'

**cmd** CTCU Cabin Air Mon Ena **Execute** (OK)

Main Panel: DMS Monitoring: 2 - ECLSS

**DMS Monitoring 2 - ECLSS**

'System on DMC'

Verify the background color of measurements

CTCU1 Cabin Temp1: Green

CTCU1 Cabin Temp2: Green

CTCU1 Cabin Temp3: Green

HS1 Air Humidity: Green

HS2 Air Humidity: Green

Verify CTCU1\_Cabin\_Temp1\_DMC – 18 - 27 °C

Verify CTCU1\_Cabin\_Temp2\_DMC – 18 - 27 °C

Verify CTCU1\_Cabin\_Temp3\_DMC – 18 - 27 °C

Verify HS1\_Air\_Humidity\_DMC – 20 - 73 %

Verify HS2\_Air\_Humidity\_DMC – 20 - 73 %

**cmd** CTCU\_Ena\_Cabin\_Air\_Mon\_AP

**data** Onboard\_Reception\_Node –

SYS CCSDS End Point DMC DMS SERV

**data** Onboard\_Execution\_Node – USM\_SW\_DMC\_USS\_Swop\_Instance

Verify CTCU1\_Cabin\_Temp1\_DMC\_MS – NORMAL\_1

Verify CTCU1\_Cabin\_Temp2\_DMC\_MS – NORMAL\_1

Verify CTCU1\_Cabin\_Temp3\_DMC\_MS – NORMAL\_1

Verify HS1\_Air\_Humidity\_DMC\_MS – NORMAL\_1

Verify HS2\_Air\_Humidity\_DMC\_MS – NORMAL\_1

## 23. [ENABLE WPA TEMPERATURE & FDIR MONITORINGS](#)

PWS

Main Panel: DMS Monitoring: 5 – COMMS TCS Payload

**DMS Monitoring 5 – COMMS TCS Payload**

'System on DMC'

'TCS'

NOTE

The following parameters initiate a Water Pump Switchover if values are out of limits after monitorings are enabled:

WTSB1/2 Nom/Red Plenum Temp3

WPA1 WTSB1 Plenum Temp1/2

WPA1 WTSB3 CHX Temp1/2

Verify WTSB1 Nom Plenum Temp3: > 14 deg C

Verify WTSB2 Redun Plenum Temp3: > 14 deg C

Verify WTSB5 Moderate HX Temp1: < 16 deg C

Verify WTSB5 Moderate HX Temp2: < 16 deg C

Verify WTSB6 Low HX Temp1: < 7.7 deg C

Verify WTSB6 Low HX Temp2: < 7.7 deg C

'WPA1'

Verify WPA1 WTSB1 Plenum Temp1: 15 - 22 deg C

Verify WPA1 WTSB1 Plenum Temp2: 15 - 22 degC

Verify WPA1 WTSB3 CHX Temp1: < 12 deg C

Verify WPA1 WTSB3 CHX Temp2: < 12 deg C

TCS: TCS Commands:

TCS Commands

'Monitoring Command'

**cmd WTSB Mon Ena Execute (OK)**

Main Panel: DMS Monitoring: 5 – COMMS TCS Payload

DMS Monitoring 5 – COMMS TCS Payload

'System on DMC'

'TCS'

Verify the background color of measurements

WTSB1 Nom Plenum Temp3: Green

WTSB2 Redun Plenum Temp3: Green

WTSB5 Moderate HX Temp1: Green

WTSB5 Moderate HX Temp2: Green

WTSB6 Low HX Temp1: Green

WTSB6 Low HX Temp2: Green

'WPA1'

Verify the background color of measurements

WPA1 WTSB1 Plenum Temp1: Green

WPA1 WTSB1 Plenum Temp2: Green



WPA1 WTSB3 CHX Temp1: Green  
 WPA1 WTSB3 CHX Temp2: Green

```

Verify WTSB1_Nom_Plenum_Temp3_MVD > 14 deg C
Verify WTSB2_Redun_Plenum_Temp3_MVD > 14 deg C
Verify WTSB5_Medium_HX_Temp1_DMC < 16 deg C
Verify WTSB5_Medium_HX_Temp2_DMC < 16 deg C
Verify WTSB6_Low_HX_Temp1_DMC < 7.7 deg C
Verify WTSB6_Low_HX_Temp2_DMC < 7.7 deg C

Verify WPA1_WTSB1_Plenum_Temp1_DMC – 15 - 22 deg C
Verify WPA1_WTSB1_Plenum_Temp2_DMC – 15 - 22 deg C
Verify WPA1_WTSB3_CHX_Temp1_DMC < 12 deg C
Verify WPA1_WTSB3_CHX_Temp2_DMC < 12 deg C

cmd WTSB_Monitoring_Ena_AP
data Onboard_Reception_Node –
SYS CCSDS End Point DMC DMS SERV
data Onboard_Execution_Node – USM_SW_DMC_USS_Swop_Instance

Verify WTSB1_Nom_Plenum_Temp3_MVD_MS – NORMAL_1
Verify WTSB2_Redun_Plenum_Temp3_MVD_MS – NORMAL_1
Verify WTSB5_Medium_HX_Temp1_DMC_MS – NORMAL_1
Verify WTSB5_Medium_HX_Temp2_DMC_MS – NORMAL_1
Verify WTSB6_Low_HX_Temp1_DMC_MS – NORMAL_1
Verify WTSB6_Low_HX_Temp2_DMC_MS – NORMAL_1

Verify WPA1_WTSB3_CHX_Temp1_DMC_MS – NORMAL_1
Verify WPA1_WTSB3_CHX_Temp2_DMC_MS – NORMAL_1
Verify WPA1_WTSB1_Plenum_Temp1_DMC_MS – NORMAL_1
Verify WPA1_WTSB1_Plenum_Temp2_DMC_MS – NORMAL_1
    
```

24. [CONFIGURING HCU FOR NOMINAL OPS](#)

NOTE

HCU monitoring was enabled automatically as part of DMC boot process.

PWS

- 24.1 [Disabling Nominal Monitoring of HCU2](#)  
 Main Panel: DMS Monitoring: 2 - ECLSS  
DMS Monitoring 2 - ECLSS  
 'DMS Monitoring'  
 'Enable/Disable'  
  
 sel Enable/Disable ECLSS

DMS Monitoring Enable/Disable 2

'Disable Monitoring'

cmd HCU2 Health Stat **Execute** (OK)

DMS Monitoring 2 - ECLSS

'System on DMC'

Verify the background color of measurement

HCU2 Health Stat: White

```
cmd DMS_MONIT_Dis_Monitoring_Cmd_SW
prm MT_ID – DMC_Sys_Monitoring_Table_SW
prm EI_ID – HCU2_Health_Stat_DMC
data Onboard_Node –
SYS CCSDS End Point DMC DMS SERV
```

Verify HCU2\_Health\_Stat\_DMC\_MS – NOTMON\_1

COL-CC 24.2 [Swapping DMS Telemetry Packets \(Ground Only\)](#)  
COL-CC to swap vital DMS telemetry packet.

Wait for “Go” to continue.

NOTE

Packet swapping initiated from Col-CC:  
Enable VTC\_Gnd\_Tlm\_Pkt\_LOG2\_VTC (1Hz)

Perform [{2.2.41 VTC GROUND PACKET SWAPPING}](#) (EODF: GROUND: NOMINAL). then:

COL-CC to give a “Go” to continue.

PCS 24.3 [Deactivating HCU2 Power Bus](#)  
COL: EPS: PDU 2 120 V Subsys/Payloads Switch Details

COL PDU2 120V Switch Details VTC1

'PDU2'

cmd Outlet No. 28 – Off (Verify – Off)

```
cmd PDU2_HCU2_Pwr_Bus_Off_VTC
data SW_CMD – VTC_Disc_Out_Cmd_Cmd_SW
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify PDU2\_HCU2\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_PP – OFF

COL-CC 24.4 [Enabling HCU vital monitoring \(ground step only\)](#)  
COL-CC to enable HCU Monitoring

Wait for "Go" to continue

```
cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – HCU1_Prim_Current_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify HCU1\_Prim\_Current\_VTC\_MEF – ENABLED

```
cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – HCU1_CDA1_Htr_Temp_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify HCU1\_CDA1\_Htr\_Temp\_Monitoring\_Ena\_VTC\_PP – ENABLED

```
cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – HCU1_CDA2_Htr_Temp_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC1
```

Verify HCU1\_CDA2\_Htr\_Temp\_Monitoring\_Ena\_VTC\_PP – ENABLED

```
cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – HCU2_CDA3_Htr_Temp_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2
```

Verify HCU2\_CDA3\_Htr\_Temp\_Monitoring\_Ena\_VTC\_PP – ENABLED

```
cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – HCU2_CDA4_Htr_Temp_VTC
prm Action – 1 (ENABLE)
data Onboard_Node – SYS_CCSDS_End_Point_VTC2
```

Verify HCU2\_CDA4\_Htr\_Temp\_Monitoring\_Ena\_VTC\_PP – ENABLED

24.5 [Enable PDU1 HCU1 power bus vital system monitoring \(ground step only\)](#)

COL-CC

COL-CC to enable PDU1 HCU1 Monitoring

Wait for "Go" to continue

```
cmd VTC_Monitoring_Ena_Cmd_SW
prm Monitored_Item_ID – PDU1_HCU1_Pwr_Bus_Current_VTC
```

**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1  
  
Verify PDU1\_HCU1\_Pwr\_Bus\_Current\_VTC\_MEF – ENABLED  
  
**cmd** VTC\_Monitoring\_Ena\_Cmd\_SW  
**prm** Monitored\_Item\_ID –  
PDU1\_HCU1\_Pwr\_Bus\_On\_Off\_Stat\_VTC  
**prm** Action – 1 (ENABLE)  
**data** Onboard\_Node – SYS\_CCSDS\_End\_Point\_VTC1  
  
Verify PDU1\_HCU1\_Pwr\_Bus\_On\_Off\_Stat\_VTC\_MEF –  
ENABLED

COL-CC                      24.6      [Swapping DMS Telemetry Packets \(Ground Only\)](#)  
COL-CC to swap vital DMS telemetry packet.  
  
Wait for “Go” to continue.

**NOTE**

Packet swapping initiated from Col-CC:  
Disable VTC\_Gnd\_Tlm\_Pkt\_LOG2\_VTC (1Hz)

Perform [{2.2.41 VTC GROUND PACKET SWAPPING}](#) (EODF:  
GROUND: NOMINAL). then:  
  
COL-CC to give a “Go” to continue.

OBJECTIVE:

Open Columbus Port hatch, evaluate Columbus for obvious FOD, obtain an atmospheric grab sample and ingress Columbus.

LOCATION:

Node2/Columbus

DURATION:

25 minutes for COL Ingress

10 minutes for Hatch Open (Step 1)

15 minutes evaluating Columbus and Grab Sample (Step 2)

CREW:

One

PARTS:

None

MATERIALS:

Dry Wipes

Towels

Surgical Mask

Sharpie

TOOLS:

DCS 760 Camera (for Nominal Ingress)

Eye Protection

Mini-Maglite

ISS Vacuum Cleaner

REFERENCE PROCEDURES:

None

1. OPENING COLUMBUS PORT HATCH
  - 1.1 Temporarily cease Portable Fan air flow into Node 2-Columbus Vestibule area.
  - 1.2 Don Eye Protection and Surgical Mask.
  - 1.3 Open Hatch per decal.
2. EVALUATING COLUMBUS AND OBTAIN GRAB SAMPLE
  - 2.1 Visually inspect for FOD in Columbus Module.  
Vacuum FOD as required.  
  
If no FOD or after any FOD has been vacuumed, doff Eye Protection and Surgical Mask and Restart Portable Fan.

- COL
- 2.2 Ingress COL.
  - 2.3 Visually inspect COL for condensation, atmosphere quality, general condition.  
Photo document affected area, if required (DCS 760 Camera).
  - 2.4 Unstow Grab Sample Container (GSC) from stowage location.
  - 2.5 Remove tethered inlet cap.
- NOTE

When taking sample, hold GSC far away from body.
- 2.6 Open valve for 10 seconds. (Keep GSC far away from body)
- NOTE

A click sound occurs when valve has been closed to the proper position.
- 2.7 Close valve until it slips and locks. (Click sound occurs)
  - 2.8 Record sampling data on GSC label (Day/HH:MM in GMT and location of sample). (Sharpie)
  - 2.9 Replace tethered inlet cap.
  - 2.10 Call down S/N of GSC to **MCC-H**
  - 2.11 Stow GSC for return.

# COL AFT NPRV REMOVAL AND IMV RETURN SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 14 pages

## OBJECTIVE:

To remove the Negative Pressure Relief Valve (NPRV) from the Aft side of Columbus Bulkhead and to install the IMV Return Shut-Off Valve (IRSOV).

## LOCATION:

Installed: COL1A0 (NPRV and IRSOV)

## DURATION:

45 min

## CREW:

One

## PARTS:

IRSOV P/N B40482-3

V-Band Clamp P/N M27536/2

FDS Cover COLP0-6 P/N 9233CA721-401

FDS Cover COLP0-6A P/N 9233CA723-401

FDS Cover COLP0-7 P/N 9233CA725-401

## MATERIALS:

Braycote 601 Lubricant

Disposable Gloves (powder-free Latex gloves)

Dry Wipes

## TOOLS:

Headlamp Light Source Assy P/N SEZ33114010-301

DCS 760 Camera

Scissors

## ISS Toolkit:

Drawer 2:

7/16" Deep Socket, 1/4" Drive

Drawer 3:

4" Common Tip Screwdriver

## Columbus Tool Kit:

Tool Bag 1:

Ratchet Wrench, 1/4"

Torque Wrench 4-20 Nm

Ratchet Tool, 1/4" Drive

1. REMOVING THE AFT NPRV

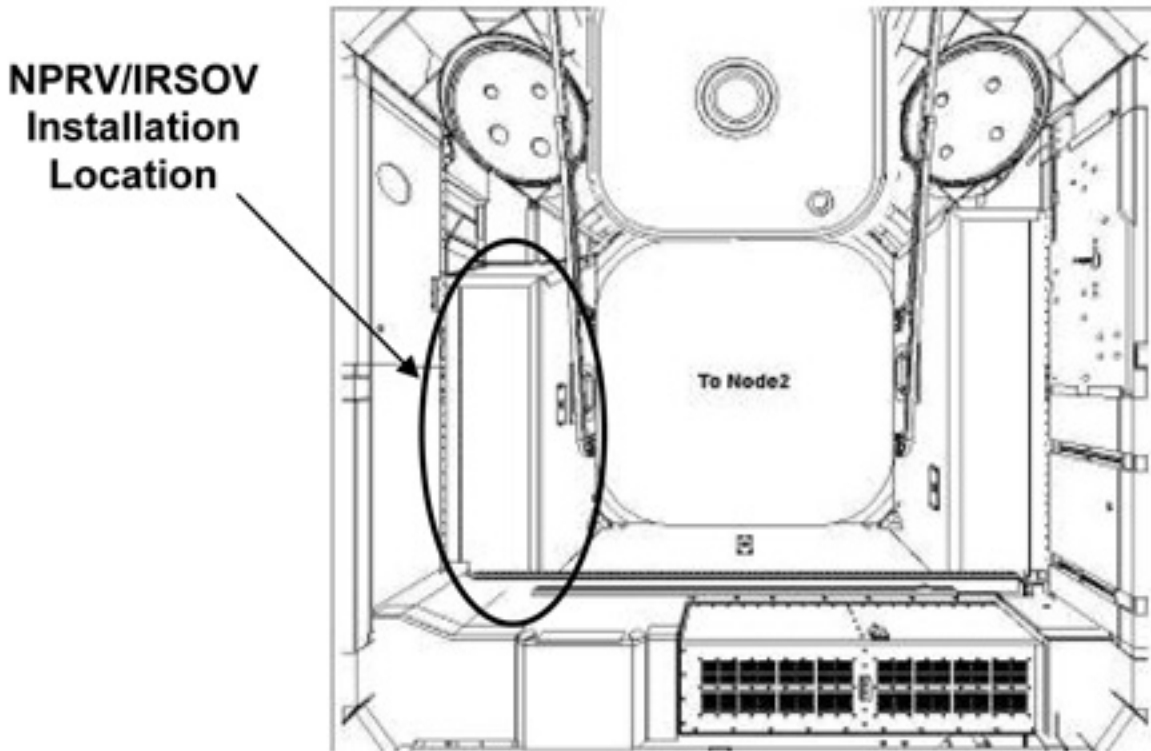


Figure 1. NPRV/IRSOV Working Location (Columbus Port Cone)

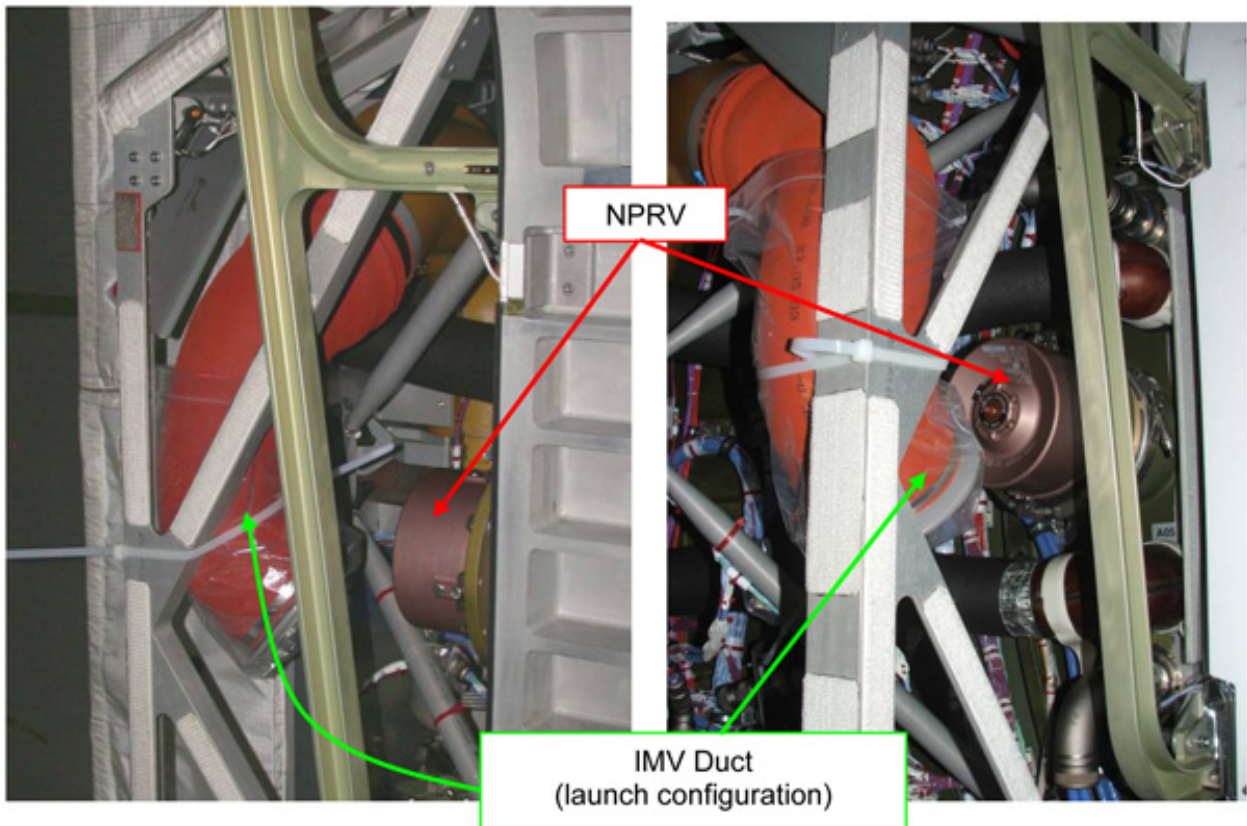


Figure 2. NPRV at COL1A0: view from Hatch (left) and from Columbus Cabin (right)



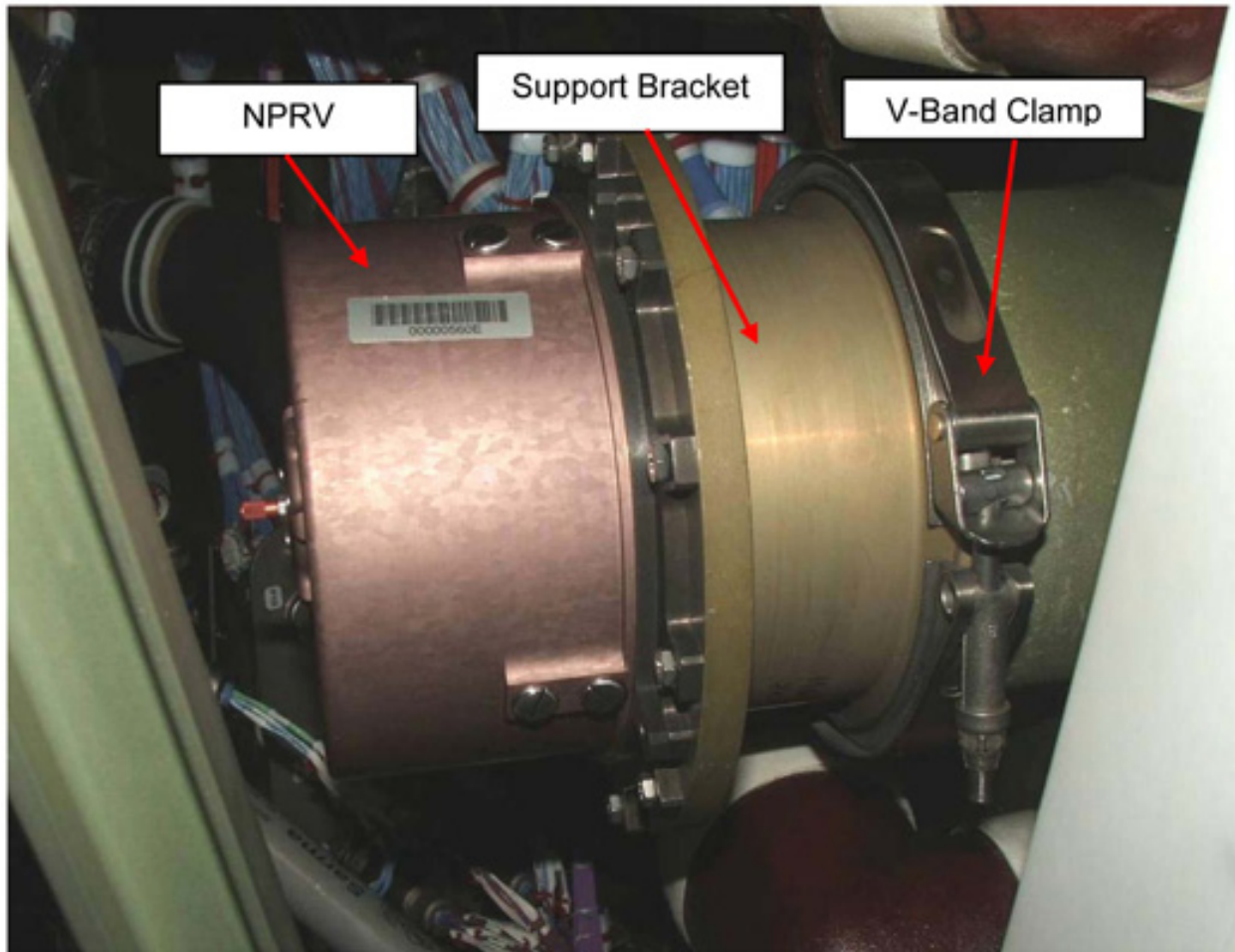


Figure 3. View of NPRV, Support Bracket and V-Band Clamp

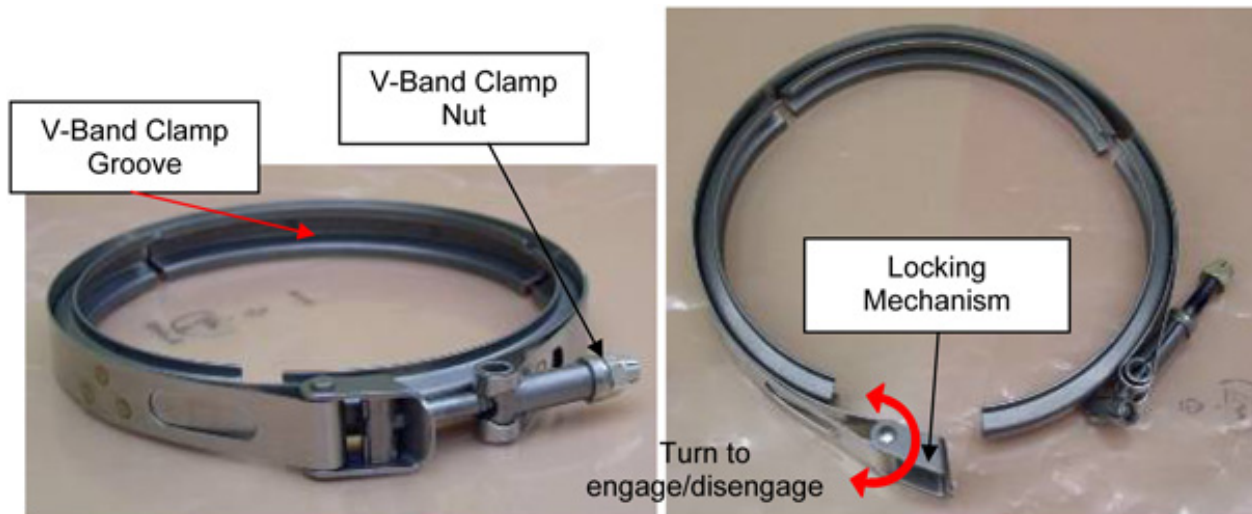


Figure 4. V-Band Clamp in engaged (left) and disengaged (right) configurations.

1.1 Don headlamp.

- 1.2 Loosen the V-Band clamp nut (5 complete turns, CCW) (Ratchet Wrench, 1/4"; 7/16" Deep Socket, 1/4" Drive), then disengage the locking mechanism.  
Refer to Figures 3, 4.
- 1.3 Remove the V-Band Clamp and temporary stow.

**NOTE**

The NPRV is installed on a Support Bracket that interfaces with the Bulkhead flange. The NPRV is removed together with the Bracket.

- 1.4 Remove the NPRV from the Bulkhead flange.  
Temporary stow.  
Refer to Figure 3.

2. **INSPECTING THE HARDWARE**

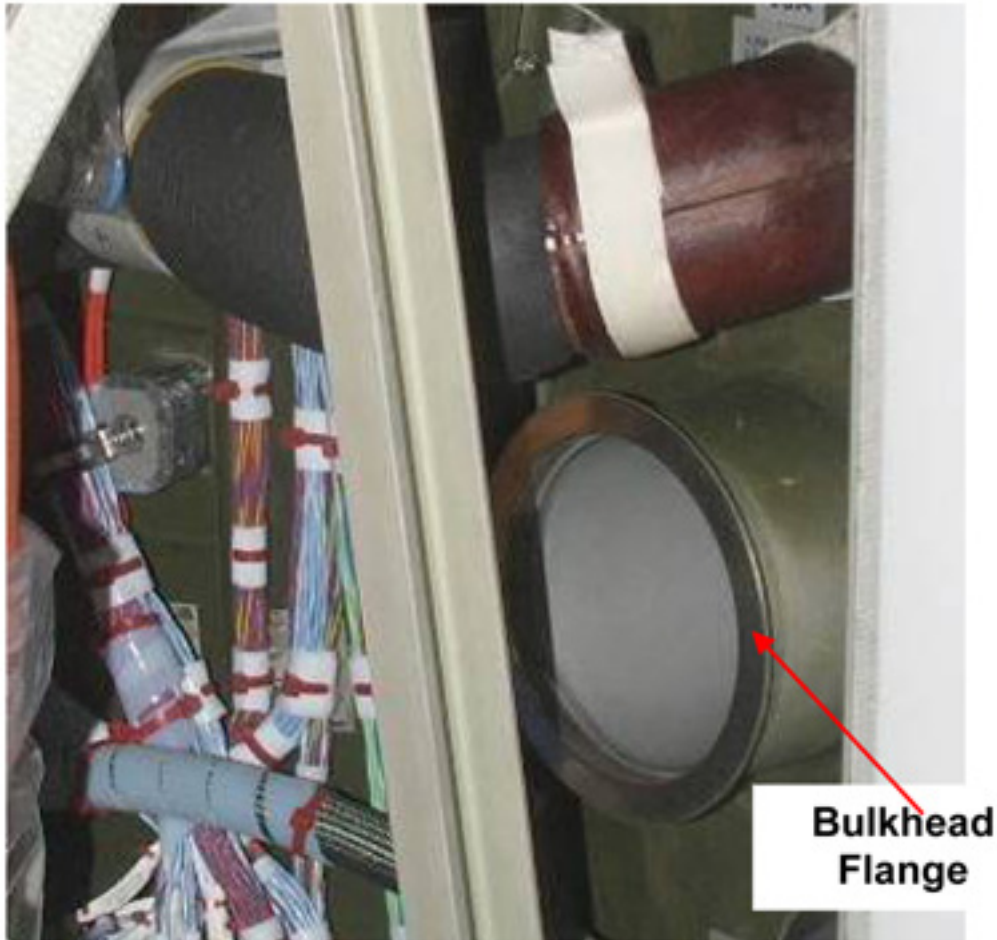


Figure 5. Bulkhead Flange

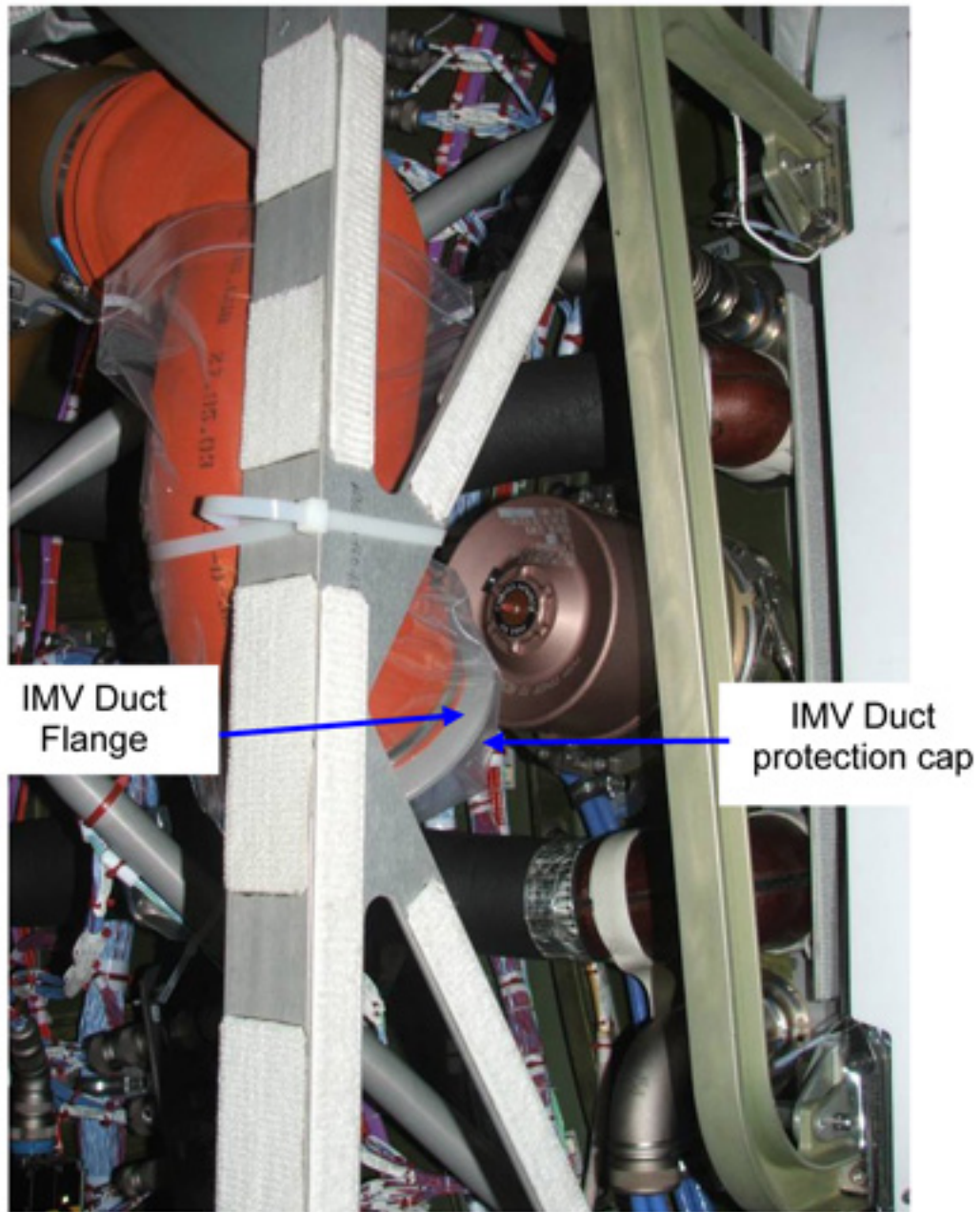


Figure 6. IMV Duct Flange



Figure 7. IMV Shut Off Valve (Typical)

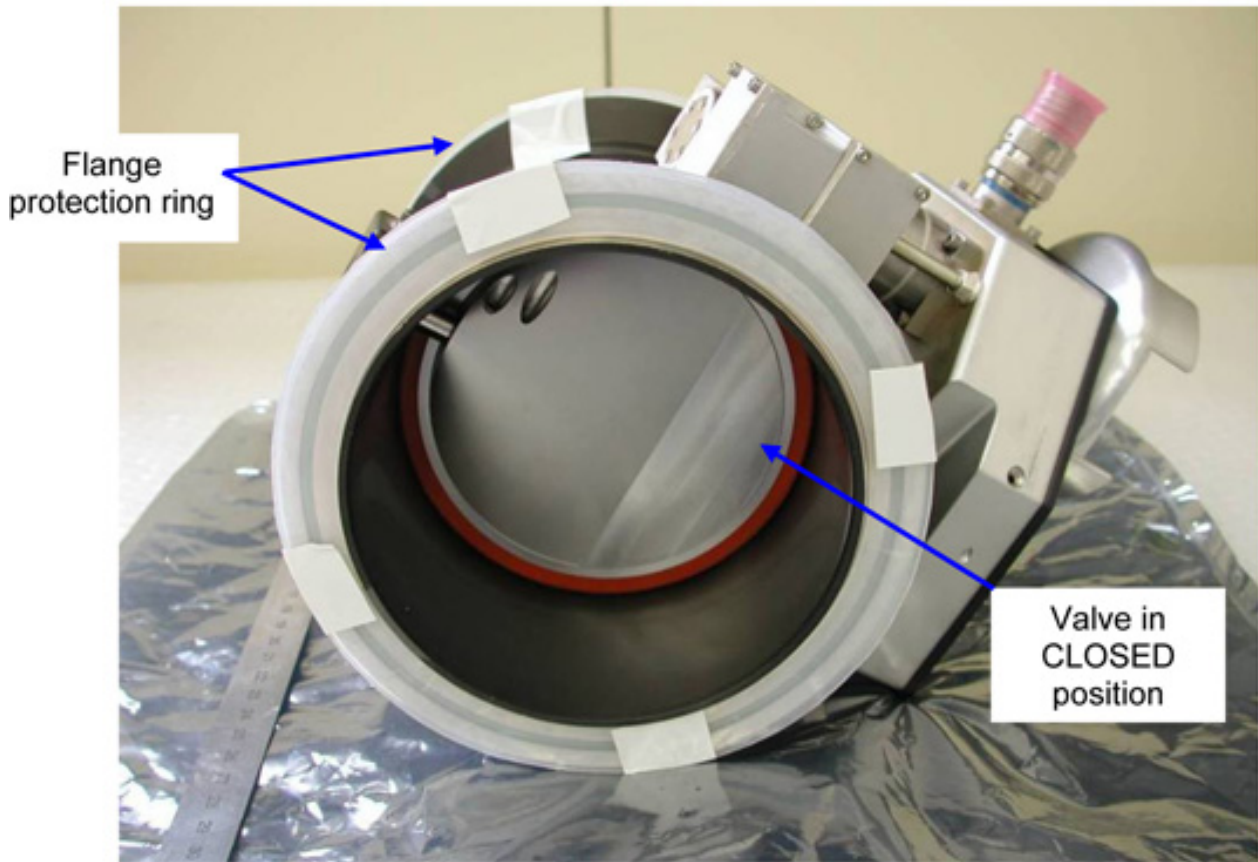


Figure 8. Flange protection rings on the IRSOV Flanges

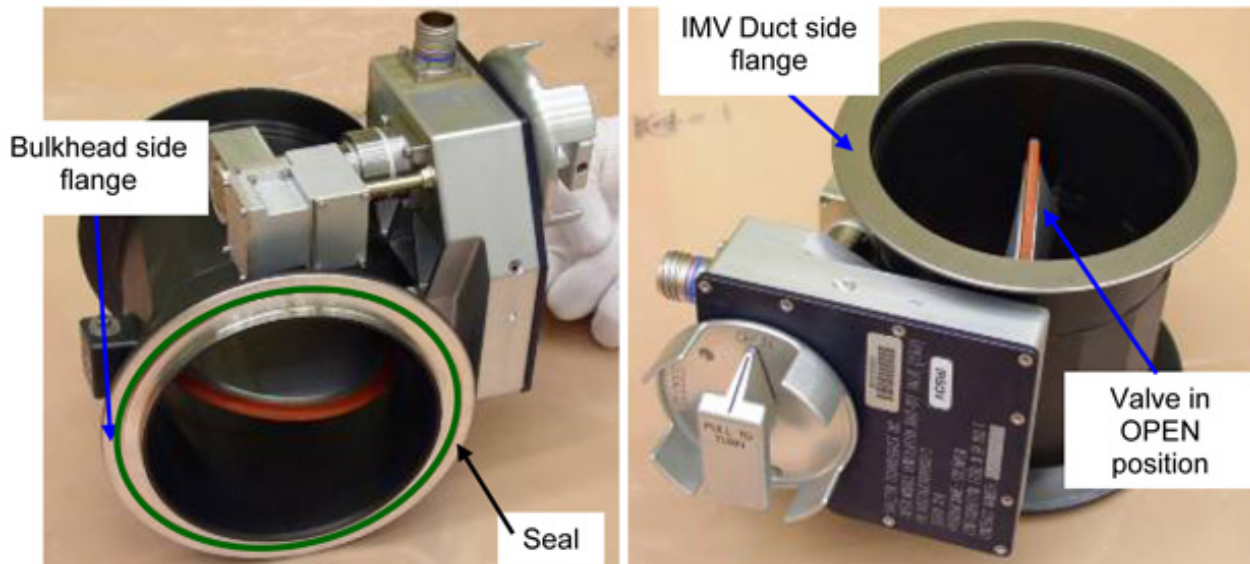


Figure 9. View of the IMV SOV flanges (protection)

- 2.1 Remove the seal protection cap on the IMV Duct Flange. Temporary stow. Refer to Figure 6.

- 2.2 Visually inspect the bulkhead flange and the IMV Duct flange surfaces for damages (Flashlight).  
Refer to Figures 5, 6.
- 2.3 Remove the flange protection rings on the IRSOV Flanges.  
Temporary stow.  
Refer to Figure 8.
- 2.4 Inspect the IRSOV flange surfaces and seal for damage and debris.  
(Visually) Report any damage or debris.  
Refer to Figure 9.
- 2.5 √IRSOV is in CLOSED position  
Refer to Figures 8 and 9.

3. INSTALLING THE IRSOV

- 3.1 Don Disposable Gloves (powder-free Latex gloves).
- 3.2 Apply small amount of Braycote 601 to fingertip.  
Work Braycote 601 Lubricant between fingertips until a very thin film is achieved with no visible white pieces of Braycote 601 present.
- 3.3 Apply thin layer of Braycote 601 on IRSOV flange seal using lubricated fingertips.  
Wipe off excess (Dry Wipes).
- 3.4 Doff Disposable Gloves.
- 3.5 Pre-position V-Band Clamp on the IRSOV Bulkhead side Flange, then align and mate the IRSOV on the Bulkhead flange with V-Band Clamp.

NOTE

To ease following steps, turn the V-Band Clamp until nut and locking mechanism are facing toward Columbus cabin.

- 3.6 Engage the V-Band Clamp locking mechanism, snug nut (Ratchet Wrench, 1/4"; 7/16" Deep Socket, 1/4" Drive).

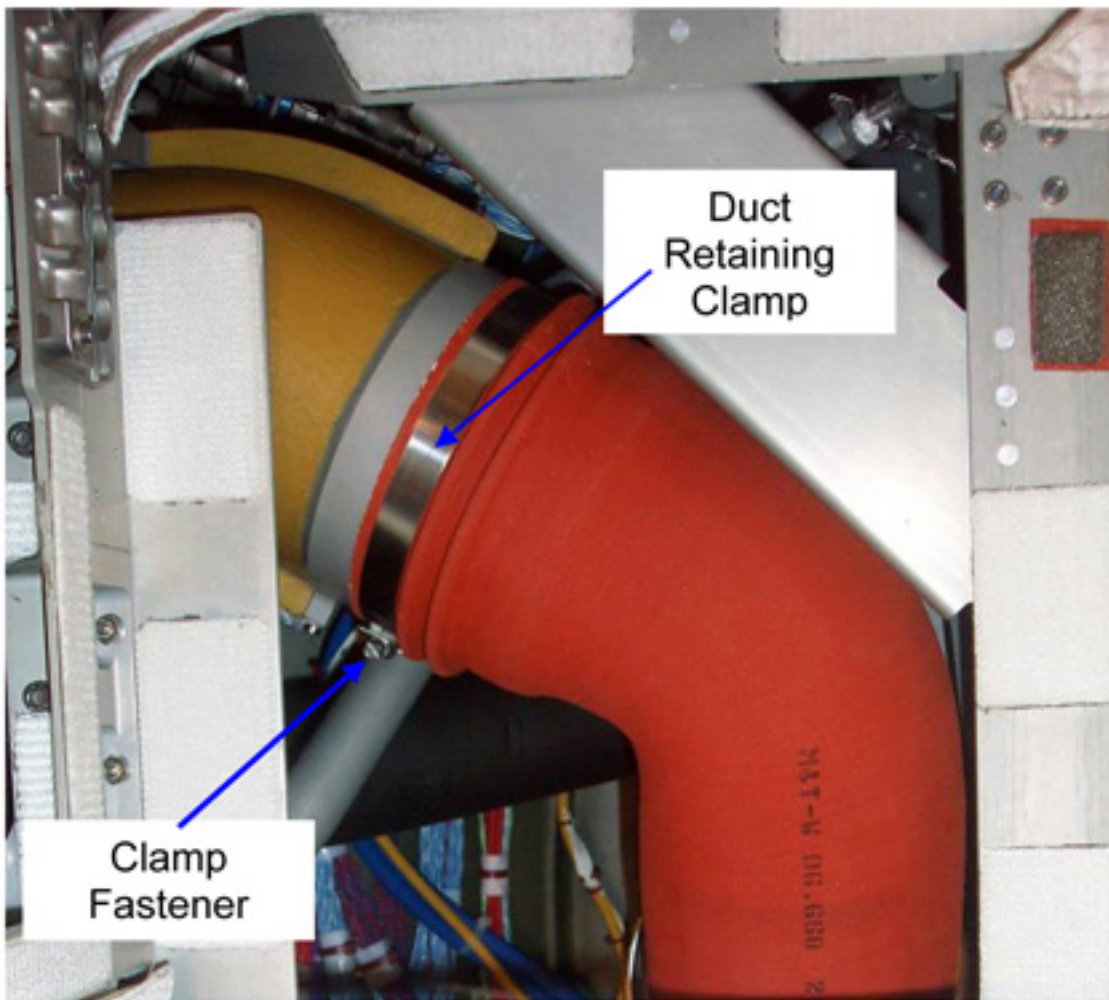


Figure 10. IMV Duct Retaining Clamp

- 3.7 Loosen the IMV Duct Retaining Clamp, fastener (4" Common Tip Screwdriver) and leave on the IMV Duct. Refer to Figure 10.

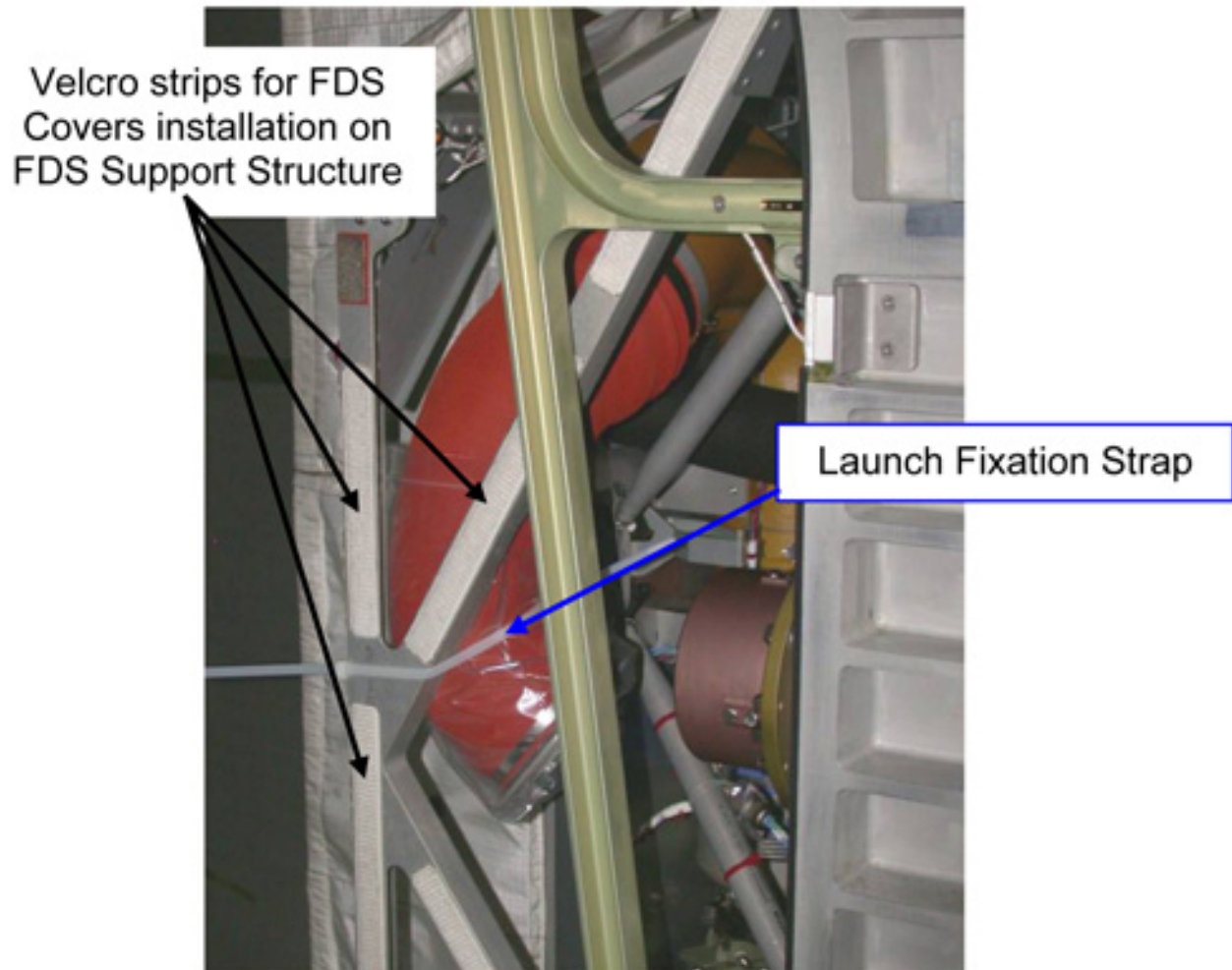


Figure 11. IMV Duct Launch Fixation Straps



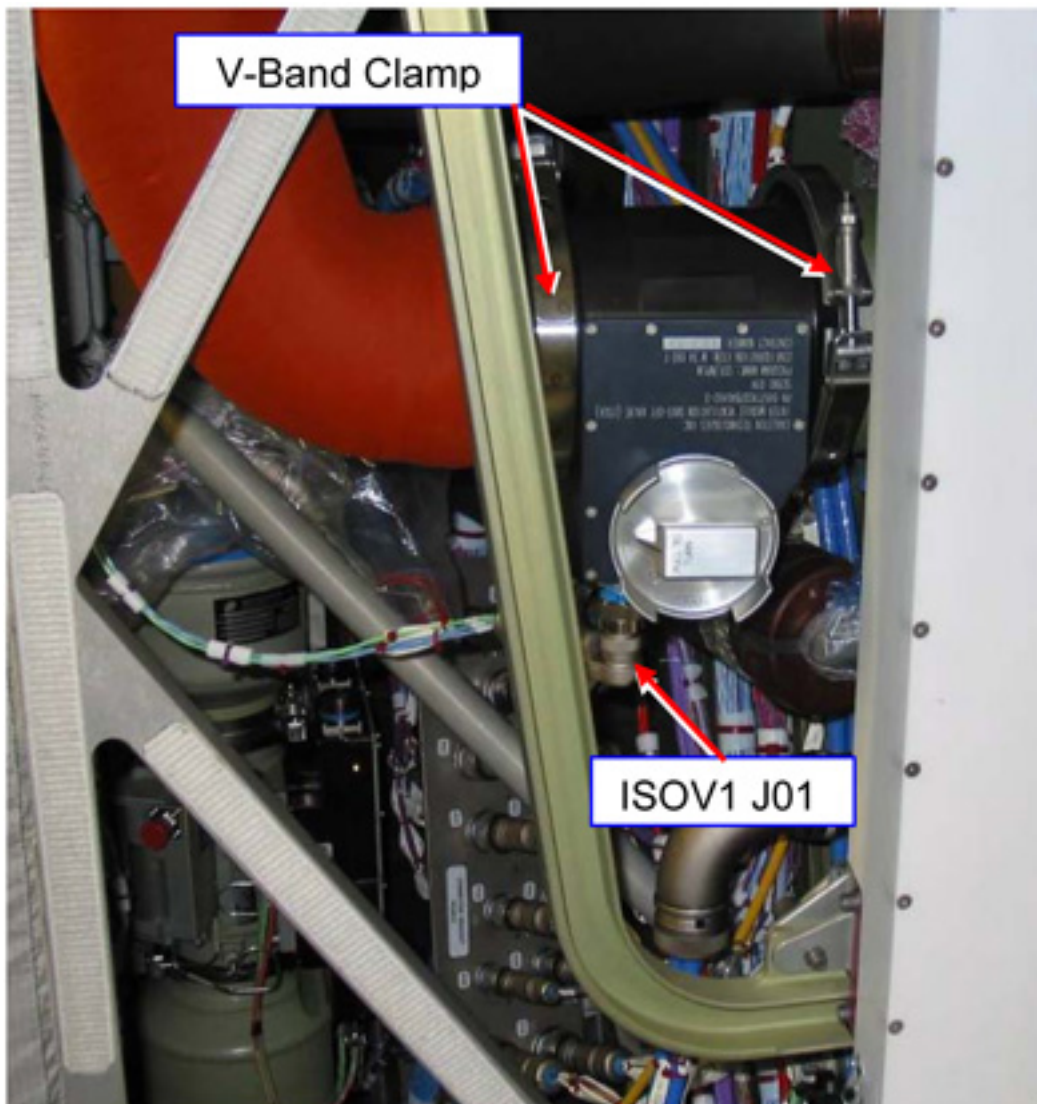
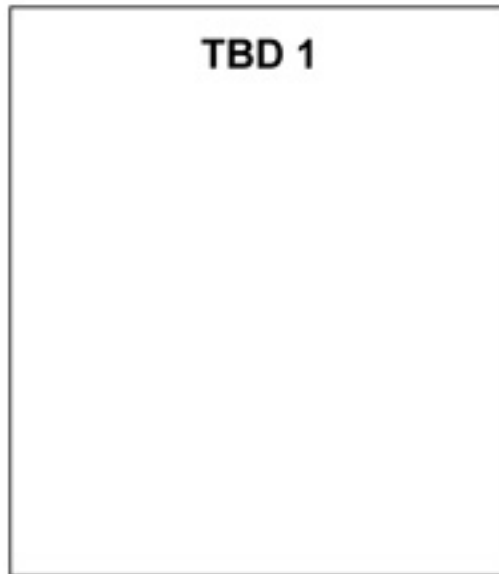


Figure 12. View of IRSOV in installed configuration

- 3.8 Remove the launch fixation straps restraining the IMV Duct (Scissors).  
Temporary stow.  
Refer to Figure 11.
- 3.9 Rotate the IMV Duct until the IMV Duct Flange is aligned with the  
IRSOV Flange (about 45 to 90 degrees).
- 3.10 Tighten IMV Duct Retaining Clamp, snug fastener (4" Common Tip  
Screwdriver).  
Refer to Figure 10.
- 3.11 Install the V-Band Clamp mating the valve to the IMV Duct.  
Refer to Figures 9 and 12.
- 3.12 Engage the V-Band Clamp locking mechanism, snug nut (Ratchet  
Wrench, 1/4"; 7/16" Deep Socket, 1/4" Drive).

- 3.13 Torque the two IRSOV V-Band Clamps nut to 4.5 Nm (Torque Wrench 4-20 Nm; Ratchet Tool, 1/4" Drive; 7/16" Deep Socket, 1/4" Drive).



**Figure 13. IRSOV Power and Data Connector (ISOV1 J01) in launch configuration**

- 3.14 Release connector ISOV1 J01 from launch restraints (**TBD2**), then remove the connector protection cap and temporary stow. Refer to Figure 13.
- 3.15 Remove IRSOV connector protection cap and temporary stow.
- 3.16 ISOV1 J01 →|← P01 on IRSOV  
Refer to Figure 12.
- 3.17 Photo document the installed IRSOV (DCS 760 Camera).

4. INSTALLING THE FDS COVERS

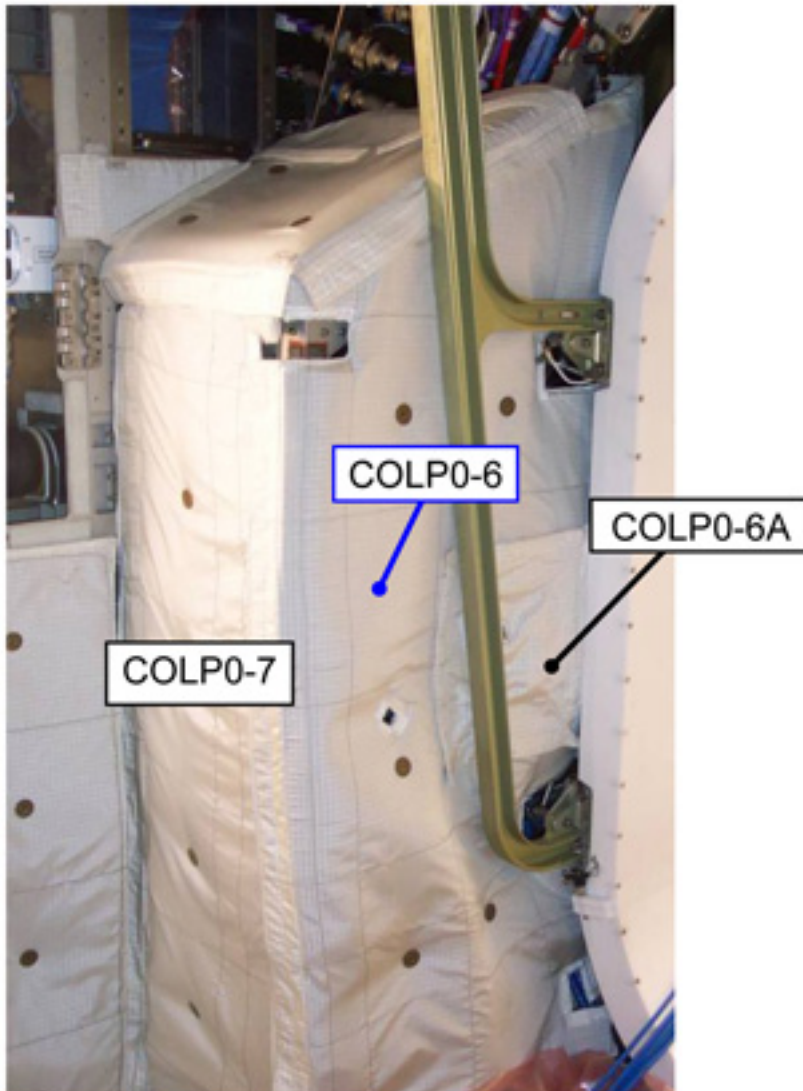


Figure 14. FDS Covers installed on PA Panel

- 4.1 ✓ For FOD around work area within 1m radius.

NOTE

1. The FDS Covers are installed on the FDS support structure by means of "structure to blanket" and "blanket to blanket" Velcro strips. Refer to Figure 11.
2. FDS Cover COLP0-6A should be already installed on COLP0-6.

- 4.2 Install FDS Cover COLP0-7, then COLP0-6 (including COLP0-6A) on FDS Support Structure.  
Refer to Figures 11 and 14.
- 4.3 Stow hardware per Daily Stowage Note.

4.4 Notify ground when complete.

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 14 pages

## OBJECTIVE:

To remove the Negative Pressure Relief Valve (NPRV) from the Forward side of Columbus Bulkhead and to install the IMV Supply Shut-Off Valve (ISSOV).

## LOCATION:

Installed: COL1F0 (NPRV and ISSOV)

## DURATION:

45 min

## CREW:

One

## PARTS:

ISSOV P/N B40482-3

V-Band Clamp P/N M27536/2

FDS Cover COLP0-9 P/N 9233CA911-401

FDS Cover COLP0-10 P/N 9233CA913-401

FDS Cover COLP0-10A P/N 9233CA915-401

## MATERIALS:

Braycote 601 Lubricant

Disposable Gloves (powder-free Latex gloves)

Dry Wipes

## TOOLS:

Headlamp Light Source Assy P/N SEZ33114010-301

DCS 760 Camera

Scissors

## ISS Toolkit:

Drawer 2:

7/16" Deep Socket, 1/4" Drive

Drawer 3:

4" Common Tip Screwdriver

## Columbus Tool Kit:

Tool Bag 1:

Ratchet Wrench, 1/4"

Torque Wrench 4-20 Nm

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

## 1. REMOVING THE FORWARD NPRV

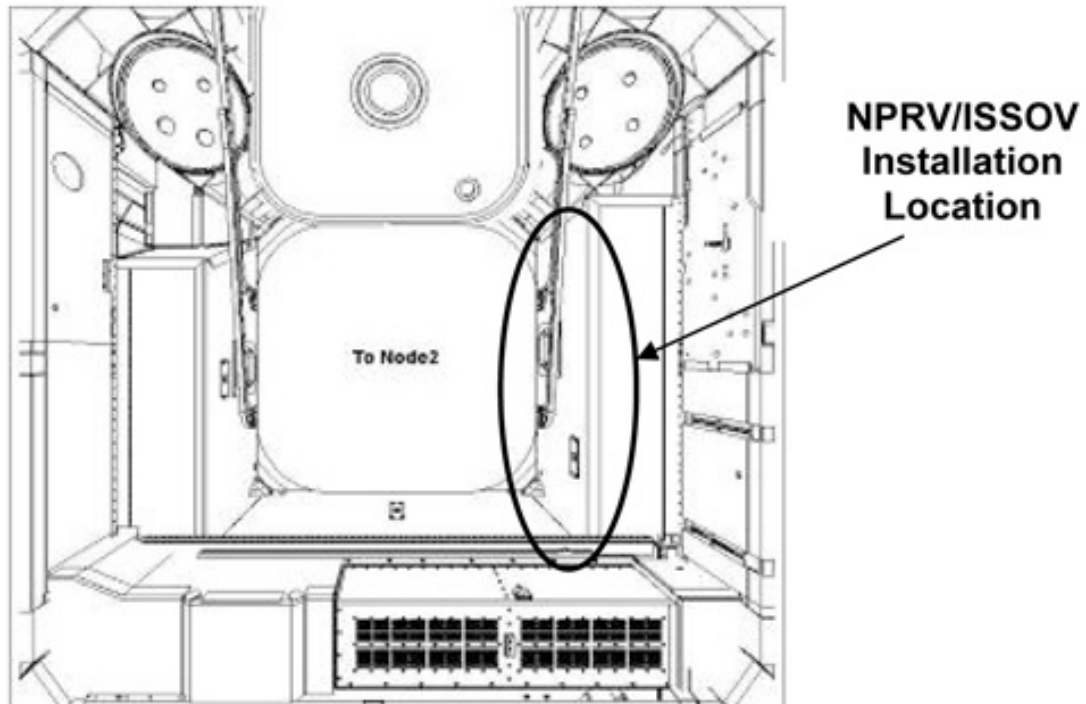


Figure 1. NPRV/ISSOV Working Location (Columbus Port Cone)

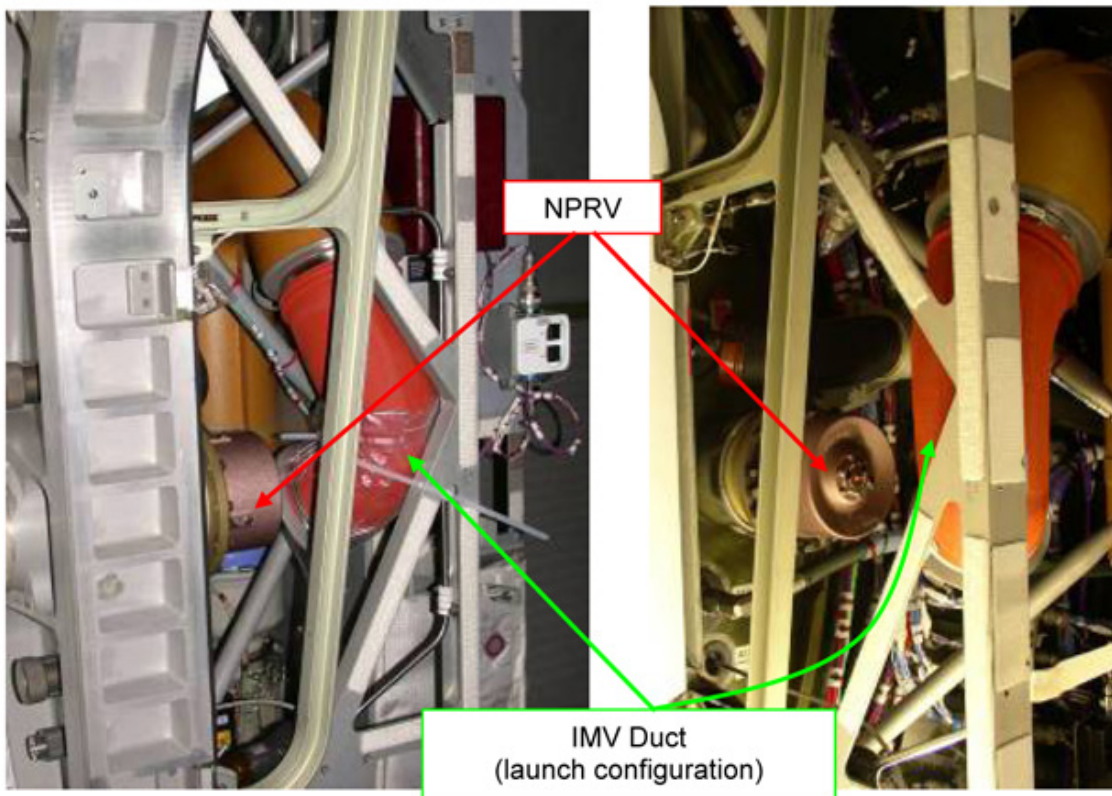


Figure 2. NPRV at COL1F0: view from Hatch (left) and from Columbus Cabin (right)

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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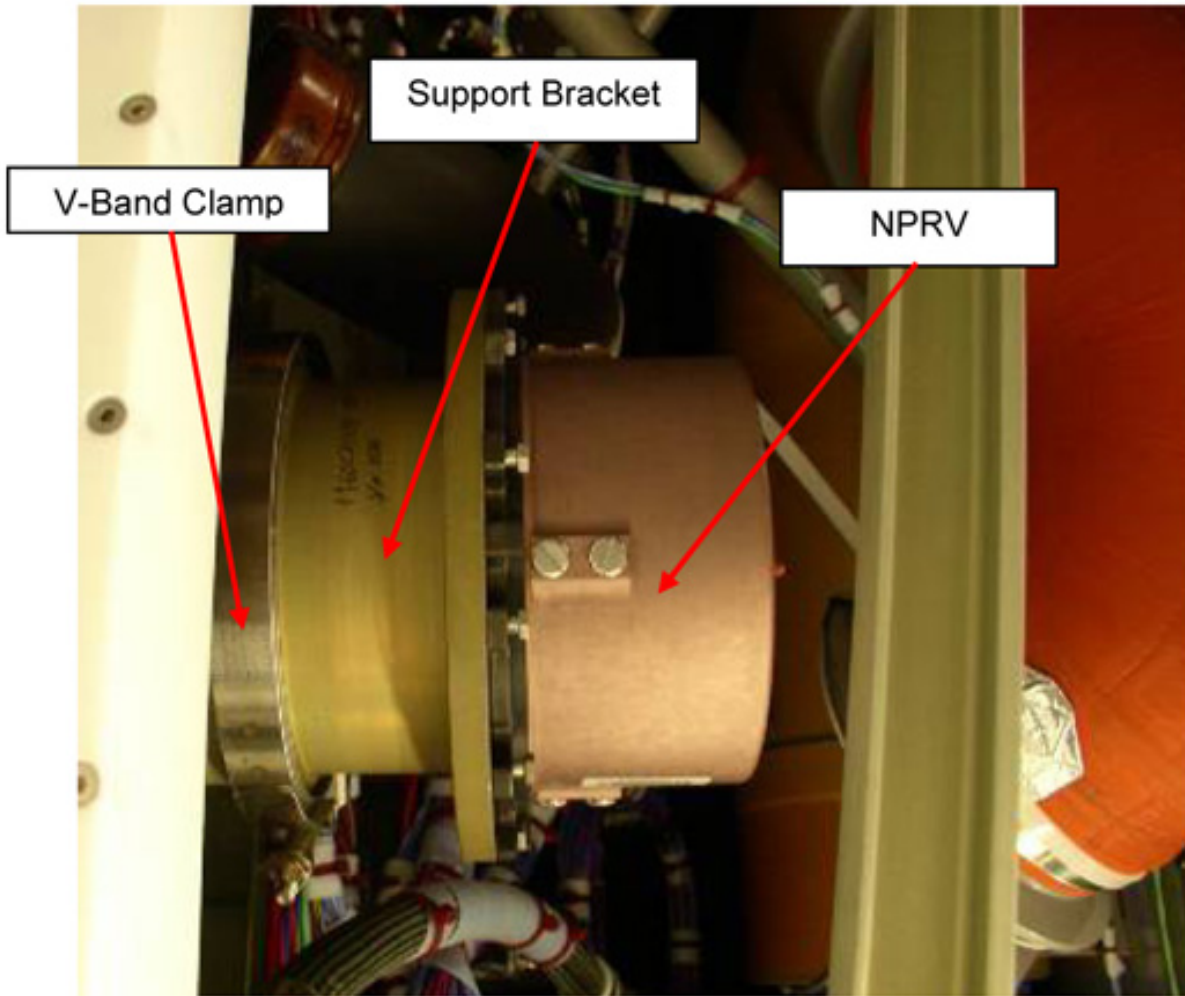


Figure 3. View of NPRV, Support Bracket and V-Band Clamp

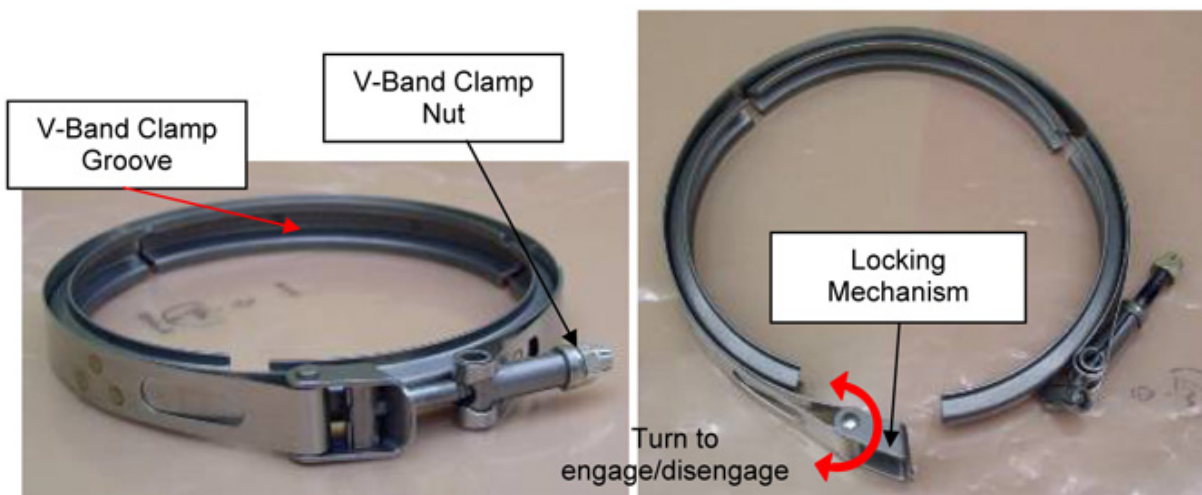


Figure 4. V-Band Clamp in engaged (left) and disengaged (right) configurations.

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 4 of 14 pages

- 1.1 Loosen the V-Band clamp nut (5 CCW complete turns) (Ratchet Wrench, 1/4"; 7/16" Deep Socket, 1/4" Drive), then disengage the locking mechanism.  
Refer to Figures 3, 4.
- 1.2 Remove the V-Band Clamp and temporary stow.

## NOTE

The NPRV is installed on a Support Bracket that interfaces with the Bulkhead flange. The NPRV is removed together with the Bracket.

- 1.3 Remove the NPRV from the Bulkhead flange.  
Temporary stow.  
Refer to Figure 3.

## 2. INSPECTING THE HARDWARE



Figure 5. Bulkhead Flange



# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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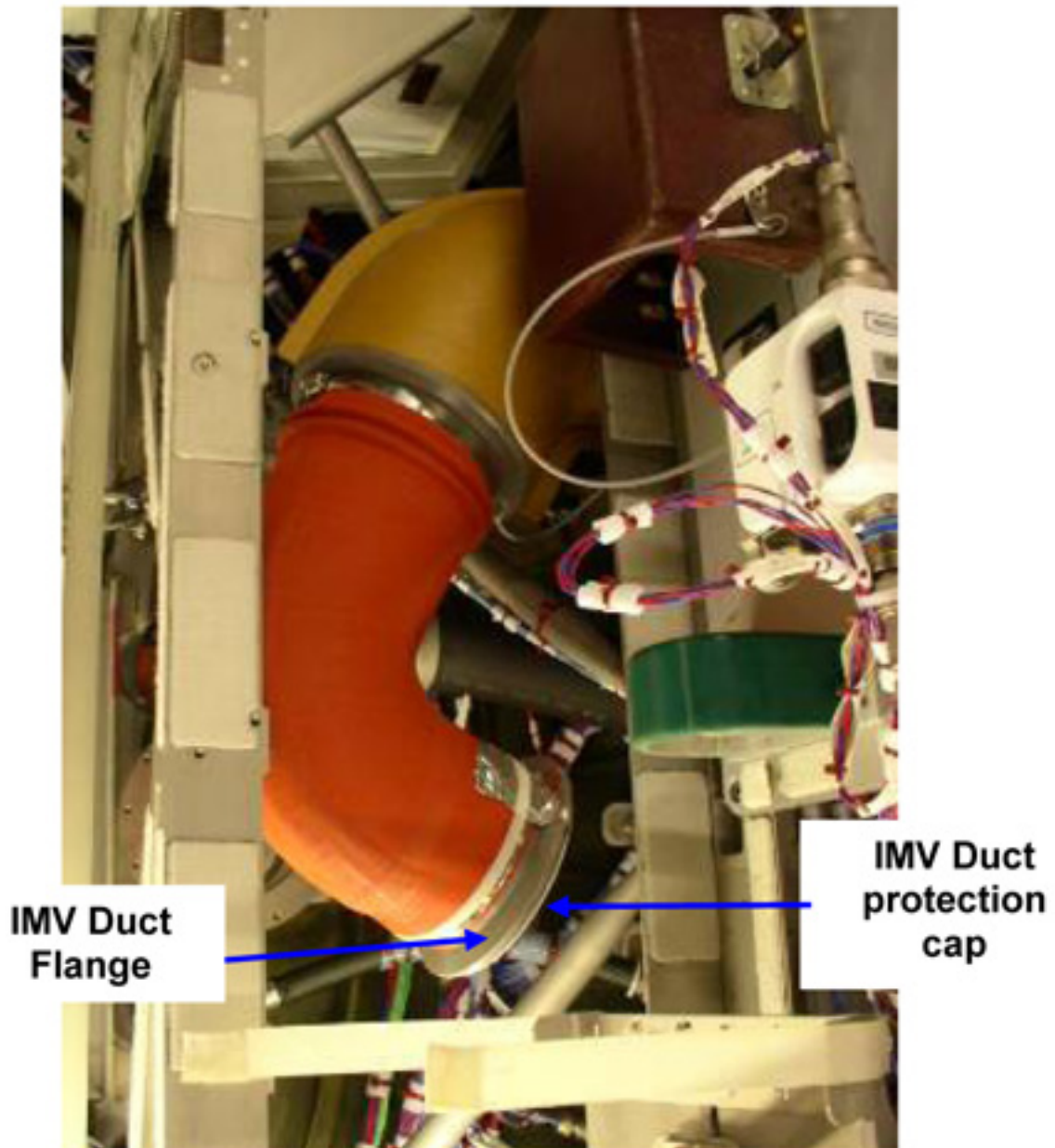


Figure 6. IMV Duct Flange

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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Figure 7. IMV Shut Off Valve (Typical)

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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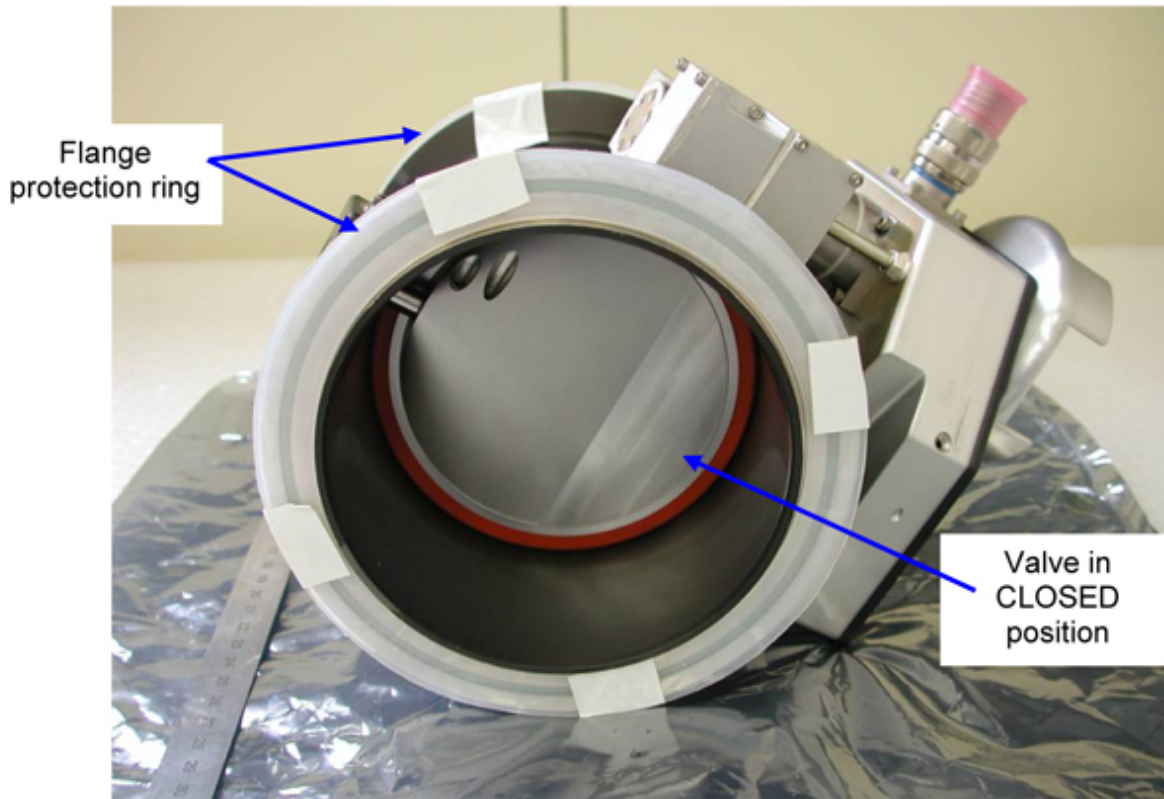


Figure 8. Flange protection rings on the ISSOV Flanges

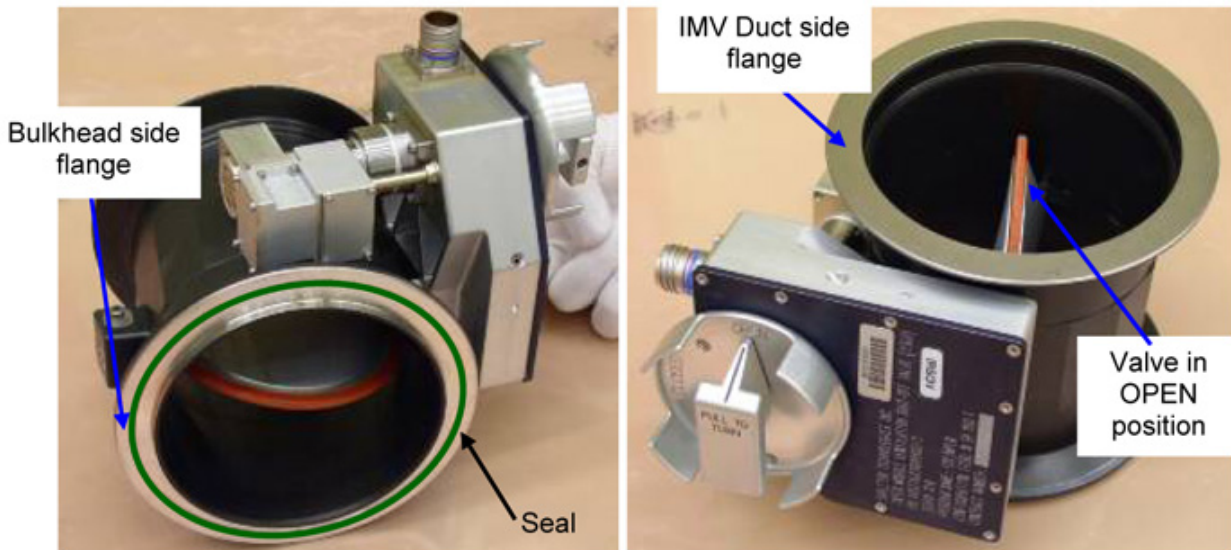


Figure 9. View of the IMV SOV flanges (protection)

- 2.1 Remove the seal protection cap on the IMV Duct Flange. Temporary stow. Refer to Figure 6.
- 2.2 Visually inspect the bulkhead flange and the IMV Duct flange surfaces for damages.

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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Refer to Figures 5 and 6.

- 2.3 Remove the flange protection rings on the ISSOV Flanges.  
Temporary stow.  
Refer to Figure 8.
- 2.4 Inspect the ISSOV flange surfaces and seal for damage and debris.  
(Visually) Report any damage or debris.  
Refer to Figure 9.
- 2.5  $\sqrt$ ISSOV is in CLOSED position  
Refer to Figure 8 and 9.

## 3. INSTALLING THE ISSOV

- 3.1 Don Disposable Gloves (powder-free Latex gloves).
- 3.2 Apply small amount of Braycote 601 to fingertip.  
Work Braycote 601 Lubricant between fingertips until a very thin film is achieved with no visible white pieces of Braycote 601 present.
- 3.3 Apply thin layer of Braycote 601 on ISSOV flange seal using lubricated fingertips.  
Wipe off excess (Dry Wipes).
- 3.4 Doff Disposable Gloves.

### CAUTION

The ISSOV can be installed with one orientation only: the flange provided with seal shall be installed against the Bulkhead flange (refer to Figure 8). Failure to comply may result in incomplete Columbus isolation from ISS in case of module depressurization.

- 3.5 The ISSOV shall be installed with the manual override knob facing toward the cabin side.  
Refer to Figure 12.
- 3.6 Pre-position V-Band Clamp on the ISSOV Bulkhead side Flange, then align and mate the ISSOV on the Bulkhead flange with V-Band Clamp.

### NOTE

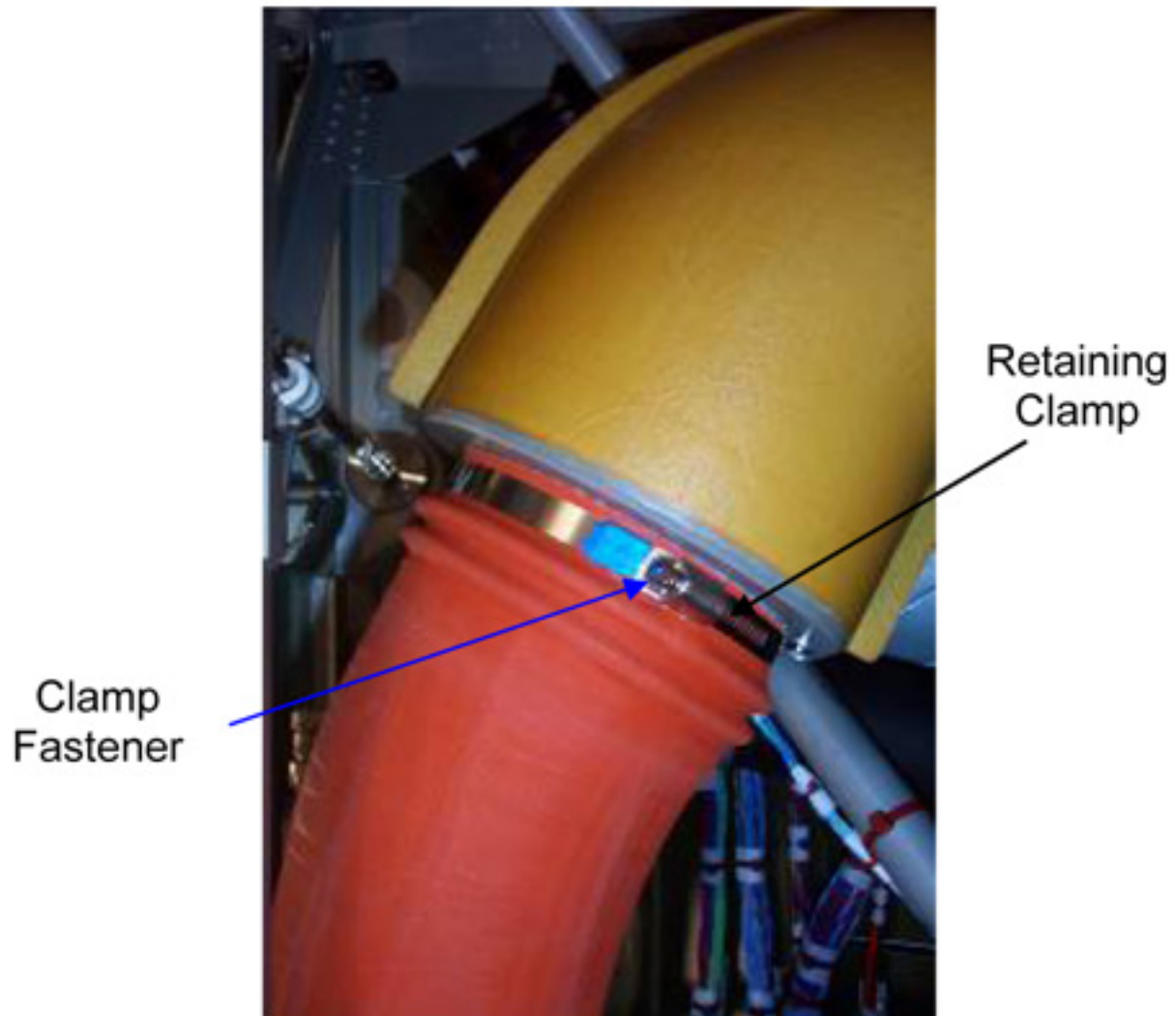
To ease following steps, turn the V-Band Clamp until nut and locking mechanism are facing toward Columbus cabin.

- 3.7 Engage the V-Band Clamp locking mechanism, tighten nut (Ratchet Wrench, 1/4"; 7/16" Deep Socket, 1/4" Drive).

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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**Figure 10. IMV Duct Retaining Clamp**

- 3.8 Loosen the IMV Duct Retaining Clamp without removing from the IMV Duct, fastener (4" Common Tip Screwdriver) and leave on the IMV Duct. Refer to Figure 10.

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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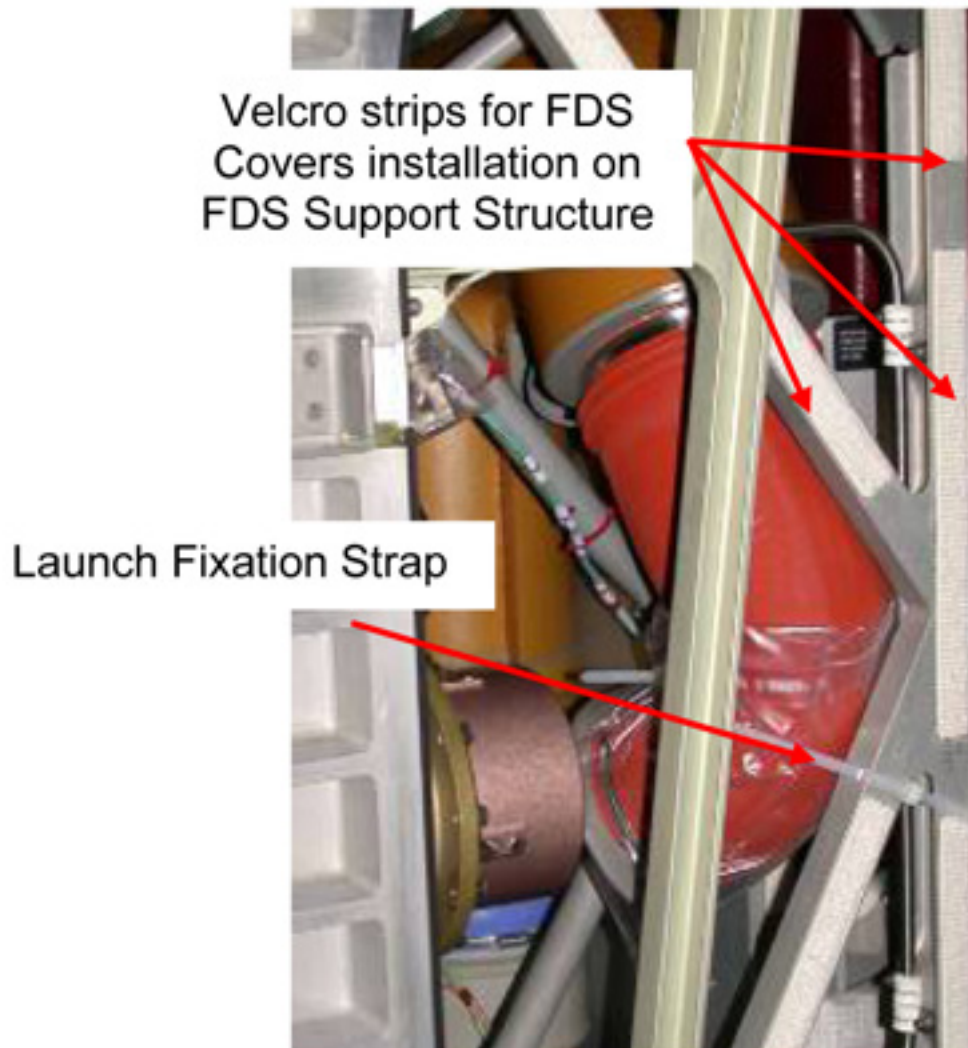
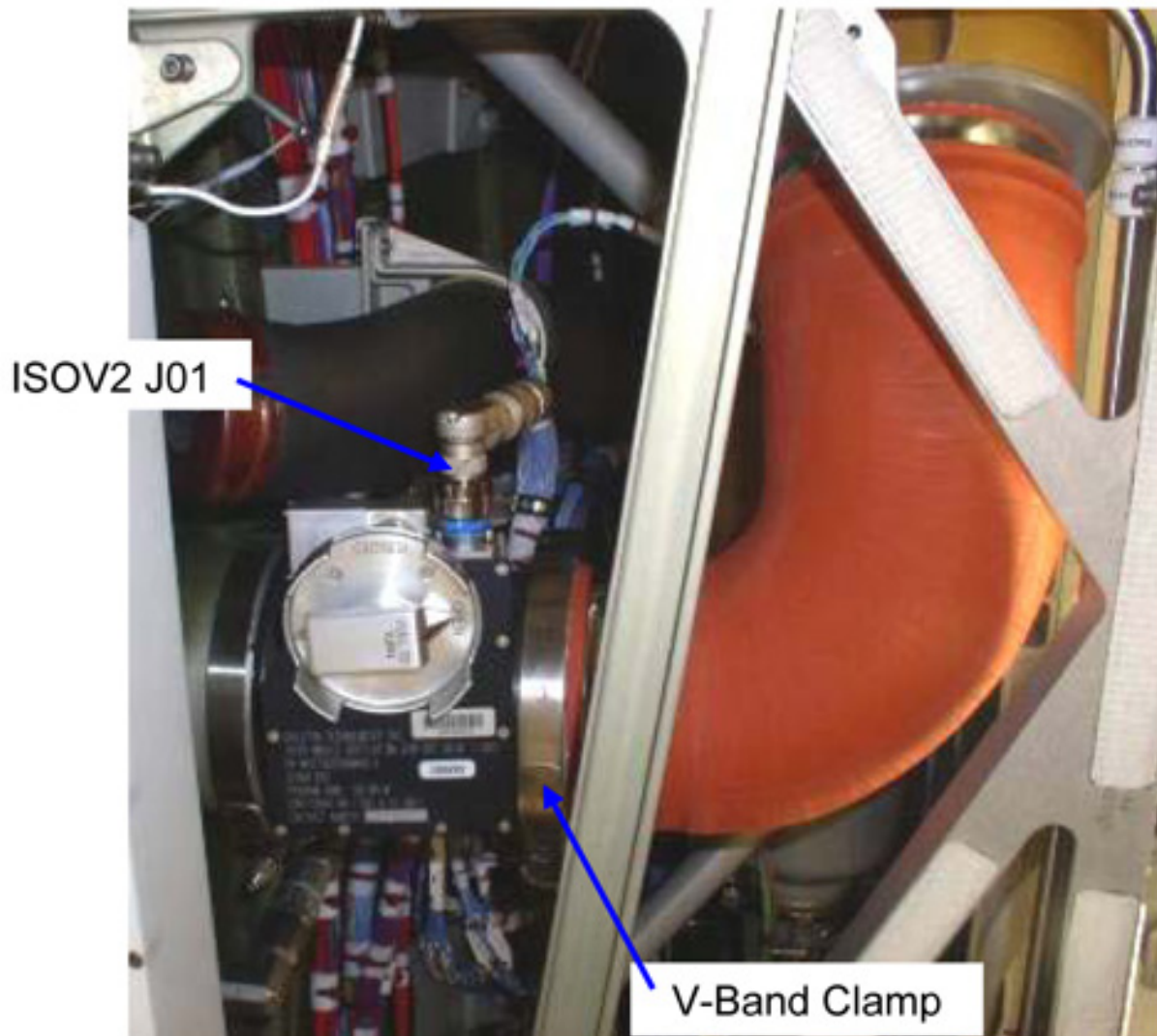


Figure 11. IMV Duct Launch Fixation Straps

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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**Figure 12. View of ISSOV in installed configuration**

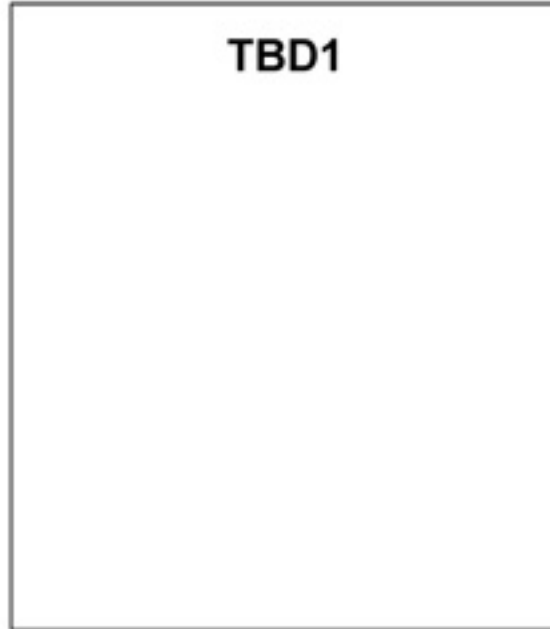
- 3.9 Remove the launch fixation straps restraining the IMV Duct.  
Temporary stow.  
Refer to Figure 11.
- 3.10 Rotate the IMV Duct until the IMV Duct Flange is aligned with the  
ISSOV Flange (about 90 degrees).
- 3.11 Tighten IMV Duct Retaining Clamp, snug fastener (4" Common Tip  
Screwdriver).  
Refer to Figure 10.
- 3.12 Install the V-Band Clamp mating the valve to the IMV Duct.  
Refer to Figures 9 and 12.
- 3.13 Engage the V-Band Clamp locking mechanism, tighten nut (Ratchet  
Wrench, 1/4"; 7/16" Deep Socket, 1/4" Drive).

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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- 3.14 Torque the two ISSOV V-Band Clamps nut to 4.5 Nm (Torque Wrench 4-20 Nm; Ratchet Tool, 1/4" Drive; 7/16" Deep Socket, 1/4" Drive).



**Figure 13. ISSOV Power and Data Connector (ISOV2 J01) in launch configuration**

- 3.15 Release connector ISOV2 J01 from launch restraints (**TBD2**), then remove the connector protection cap and temporary stow. Refer to Figure 13.
- 3.16 Remove ISSOV connector protection cap and temporary stow.
- 3.17 ISOV2 J01 →|← P01 on ISSOV  
Refer to Figure 12.
- 3.18 Photo document the installed ISSOV (DCS 760 Camera).



# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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## 4. [INSTALLING THE FDS COVERS](#)

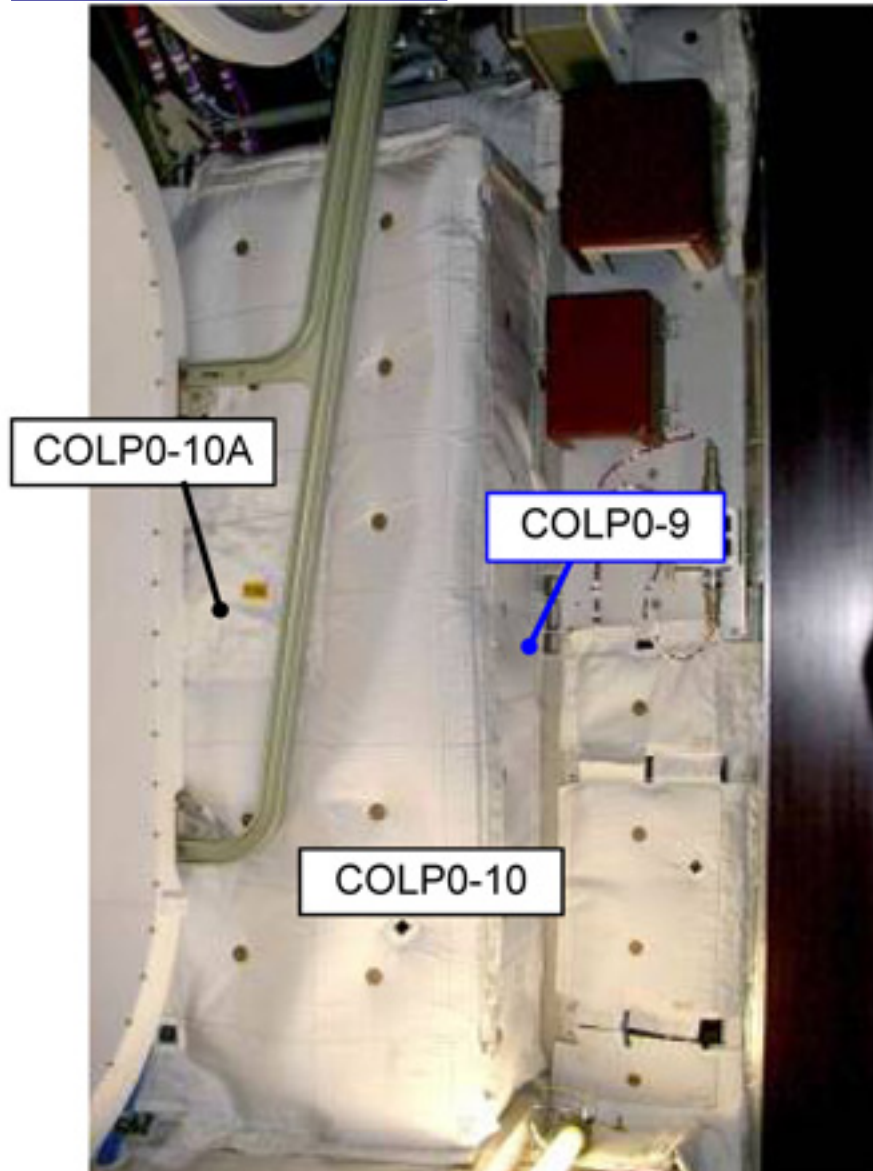


Figure 14. FDS Covers installed on PF Panel

- 4.1  $\sqrt{\text{for FOD around work area within 1m radius.}}$

### NOTE

1. The FDS Covers are installed on the FDS support structure by means of “structure to blanket” and “blanket to blanket” Velcro strips. Refer to Figure 11.
2. FDS Cover COLP0-10A should be already installed on COLP0-10.

- 4.2 Install FDS Cover COLP0-9, then COLP0-10 (including COLP0-10A) on FDS Support Structure.  
Refer to Figures 11 and 14.

# COL FORWARD NPRV REMOVAL AND IMV SUPPLY SHUT-OFF VALVE INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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- 4.3 Stow hardware per Daily Stowage Note
- 4.4 Stow tools, removed NPRV. Update IMS.
- 4.5 Notify ground when complete.

OBJECTIVE:

Depressurization of the redundant water pump accumulator.

1. [WATER PUMP ASSEMBLY1 ACCUMULATOR SETUP](#)

NOTE

If both pressure sensors are below 165 kPa the accumulator has to be pressurized to its nominal operations range (165 to 195 kPa). The following Initial Conditions are needed for the WPA Accumulator pressurization:

- 1. Sufficient Nitrogen Supply (Supply Pressure > 1537 psi (10600 Kpa)
- 2. ISS nitrogen supply valve to Columbus is open
- 3. NLSOV1 or NLSOV2 are open

PWS

1.1 [Water Pump Assembly 1 Accumulator Check](#)

TCS: WPA1:

WPA 1

'Accumulator'

Verify Pressure 1: 165 to 195 kPa

Verify Pressure 2: 165 to 195 kPa

If pressure readings  $\geq$  165 kPa perform [step 2](#)

Verify WPA1\_Accum\_Pressure1\_DMC – 165-195 kPa

Verify WPA1\_Accum\_Pressure2\_DMC – 165-195 kPa

If pressure readings  $\geq$  165 kPa perform [step 2](#)

1.2 [NLSOV3 Reconfiguration to open Position](#)

ECLSS: Payload N2: NLSOV3:

NLSOV 3

'ECLSS Nitrogen Line Shut Off Valve 3'

'Commands'

**cmd** Open **Execute** (OK)

Verify Posn – OPEN

**cmd** NLSOV3\_Open\_AP

**data** Onboard\_Reception\_Node

SYS CCSDS End Point DMC DMS SERV

**data** Onboard\_Execution\_Node

USM SW DMC USS Swoop Instance

Verify NLSOV3\_Vlv\_Open\_Stat\_DMC – OPEN

1.3 [Start Accumulator Pressurization](#)

TCS: TCS Commands:

TCS Commands

'TCS Configuration Commands'

'WPA Command'

NOTE

The following FLAP:

- identifies the currently active WPA
- Checks that the N2 valve supplying the WPA is open
- Pressurizes the WPA Accumulator above 165kPa

**cmd** WPA Active Accum Re-pressurization **Execute** (OK)

TCS: WPA1: WPA1 Commands:

WPA1 Commands

'TCS Water Pump Assembly 1 Commands'

Verify Accum Cntl Loop Stat – ACTIVE

**cmd** WPA\_Active\_Accum\_Repressurization\_AP

**prm** SILENT 0 (Send messages to ground)

**data** Onboard\_Reception\_Node

SYS CCSDS End Point DMC DMS SERV

**data** Onboard\_Execution\_Node

USM SW DMC USS Swop Instance

Verify WPA1\_Accum\_Cntl\_Loop\_Stat\_DMC – ACTIVE

1.4 [Control Law Termination Verification](#)

Wait up to 14 minutes for following verifications

Verify Accum Cntl Loop Stat – INACTIVE

PWS SMP

Verify "FLAP WPA\_Active\_Accum\_Repressurization\_AP Called FLAP Returned with Status Success"

Wait up to 14 minutes for following verifications

Verify WPA1\_Accum\_Cntl\_Loop\_Stat\_DMC – INACTIVE

Verify in the Message Handler:

**"FLAP WPA\_Active\_Accum\_Repressurization\_AP Called FLAP Returned with Status Success"**

1.5 [Accumulator Pressure Verification](#)

PWS

TCS: WPA1:

WPA 1

'Accumulator'

One of the following pressure measurements needs to be in the specified range:

Verify Pressure 1: 165 to 195 kPa

Verify Pressure 2: 165 to 195 kPa

One of the following pressure measurements needs to be in the specified range:

Verify WPA1\_Accum\_Pressure1\_DMC – 165-195 kPa

Verify WPA1\_Accum\_Pressure2\_DMC – 165-195 kPa

1.6 [Closing of NLSOV3 Valve](#)

ECLSS: Payload N2: NLSOV3:

**NLSOV 3**

'ECLSS Nitrogen Line Shut Off Valve 3'

'Commands'

**cmd Close Execute (OK)**

Verify Posn – CLOSED

**cmd NLSOV3\_Vlv\_Close\_AP**

**data Onboard\_Reception\_Node**

SYS CCSDS End Point DMC DMS SERV

**data Onboard\_Execution\_Node**

USM SW DMC USS Swop Instance

Verify NLSOV3\_Vlv\_Close\_Stat\_DMC – CLOSED

2. [WATER PUMP ASSEMBLY2 ACCUMULATOR SETUP](#)

**NOTE**

If both pressure sensors are below 130 kPa the accumulator has to be pressurized to its nominal operations range (130 to 150 kPa).

2.1 [Water Pump Assembly 1 Accumulator Check](#)

TCS: WPA2:

**WPA 2**

'Accumulator'

Verify Abs Press1 Sensor → VTC1: 130 to 150 kPa

Verify Abs Press2 Sensor → VTC2: 130 to 150 kPa

If pressure readings ≥130 kPa and ≤150 kPa terminate procedure

Verify WPA2\_Accum\_Abs\_Press1\_MVD – 130-150 kPa

Verify WPA2\_Accum\_Abs\_Press2\_MVD – 130-150 kPa

If pressure readings  $\geq 130$  kPa and  $\leq 150$  kPa terminate procedure

2.2 [NLSOV4 Reconfiguration to open Position](#)

ECLSS: Payload N2: NLSOV4:

NLSOV 4

'ECLSS Nitrogen Line Shut Off Valve 4'

'Commands'

**cmd** Open **Execute** (OK)

Verify Posn – OPEN

**cmd** NLSOV4\_Vlv\_Open\_AP

**data** Onboard\_Reception\_Node

SYS CCSDS End Point DMC DMS SERV

**data** Onboard\_Execution\_Node

USM SW DMC USS Swoop Instance

Verify NLSOV4\_Vlv\_Open\_Stat\_DMC – OPEN

2.3 [Start Accumulator Pressurization](#)

TCS: TCS Commands:

TCS Commands

'TCS Configuration Commands'

'WPA Commands'

NOTE

The following FLAP:

- identifies the currently active WPA
- Switch on the alternate WPA
- Set the accumulator pressure control set-point
- Pressurizes the WPA Accumulator between 130 to 150 kPa

**cmd** WPA Accum Depressurization **Execute** (OK)

TCS: WPA2: WPA2 Commands:

WPA 2 Commands

'TCS Water Pump Assembly 2 Commands'

Verify Accum Cntl Loop Stat – ACTIVE

**cmd** WPA\_Accum\_Depressurization\_AP

**prm** SILENT 0 (Send messages to ground)

**data** Onboard\_Reception\_Node

SYS\_CCSDS\_End\_Point\_DMC\_DMS\_SERV

**data** Onboard\_Execution\_Node  
USM SW DMC USS Swop Instance

Verify WPA2\_Accum\_Cntl\_Loop\_Stat\_DMC – ACTIVE

2.4 [Control Law Termination Verification](#)

Wait up to 19 minutes for following verifications

Verify Pwr Stat – OFF

PWS SMP

Verify " FLAP WPA\_Accum\_Depressurization\_AP Called FLAP Returned with Status Success "

Wait up to 19 minutes for following verifications

Verify in the Message Handler:

**"FLAP WPA\_Accum\_Depressurization\_AP Called FLAP Returned with Status Success"**

Verify WPA2\_Pwr\_Stat\_DMC – OFF

2.5 [Accumulator Pressure Verification](#)

PWS

TCS: WPA2:

WPA 2

'Accumulator'

One of the following pressure measurements needs to be in the specified range:

Verify Abs Press1 Sensor → VTC1: 130 to 150 kPa

Verify Abs Press2 Sensor → VTC2: 130 to 150 kPa

One of the following pressure measurements needs to be in the specified range:

Verify WPA2\_Accum\_Abs\_Press1\_MVD – 130-150 kPa

Verify WPA2\_Accum\_Abs\_Press2\_MVD – 130-150 kPa

2.6 [Closing of NLSOV4 Valve](#)

ECLSS: Payload N2: NLSOV4

NLSOV4

'ECLSS Nitrogen Line Shut Off Valve 4'

'Commands'

**cmd** Close **Execute** (OK)

Verify Posn – CLOSED

**cmd** NLSOV4\_Vlv\_Close\_AP

**data** Onboard\_Reception\_Node

SYS\_CCSDS\_End\_Point\_DMC\_DMS\_SERV

# WPA ACCUMULATOR SETUP

(ASSY OPS/1E/FIN/MULTI E)

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**data** Onboard\_Execution\_Node  
USM SW DMC USS Swop Instance

Verify NLSOV4\_Vlv\_Close\_Stat\_DMC – CLOSED



# COLUMBUS NITROGEN JUMPER INSTALL AND PURGE

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 5 pages

## OBJECTIVE:

Install the Nitrogen supply jumper between Node 2 and the Columbus module and purge the nitrogen system to remove any contamination from the lines. Verify that the connection and Columbus Nitrogen system do not increase the nominal leak rate of the integrated Nitrogen system.

## INITIAL CONDITIONS:

## PARTS:

Low Pressure Nitrogen Jumper - P/N: 683-13870-70

## TOOLS:

Fluid Fitting Torque Device (FFTD)

Gamah Seal Maintenance Kit

Nitrogen Oxygen Purge Adapter (NOPA) P/N 683-42344-7

Latex Gloves (4 pairs)

Braycote Lubricant

Ziplock Bag

## 1. ISOLATE AND DEPRESSURIZE THE NITROGEN SUPPLY SYSTEM

### CAUTION

Open fluid connectors should be exposed to cabin air for a minimum amount of time to prevent contamination of the Nitrogen system.

#### 1.1 Don Gloves.

If Gloves become contaminated, replace immediately with clean Gloves.

#### 1.2 Close Nitrogen Low Pressure Supply Valve

PCS

Airlock: ECLSS: N2 Supply Valve

AL N2 Supply Valve

**cmd** AL N2 Supply Valve – Close (Verify Ind – √)

#### 1.3 Vent Nitrogen Supply Line

US Lab: ECLSS: PCA: N2 Intro Valve

LAB PCA N2 Intro Valve

**cmd** LAB PCA N2 Intro Valve – Open (Verify Position – Open)

Wait 10 seconds

**cmd** LAB PCA N2 Intro Valve – Close (Verify Position – Close)

## 2. REMOVE VESTIBULE BARRIER

Remove Node 2-to-Columbus Vestibule Barrier Assembly (quarter turn fasteners)(16)

# COLUMBUS NITROGEN JUMPER INSTALL AND PURGE

(ASSY OPS/1E/FIN/MULTI E)

Page 2 of 5 pages

## 3. INSTALL COLUMBUS NITROGEN JUMPER

**Table 1. Nitrogen Low Pressure Jumper**

Jumper Name/ Function	Node 2 Starboard Bulkhead Interface	Columbus Port Bulkhead Interface	Part Number	Input Torque (in-lbs)	Output Torque (in-lbs)	FFTD Head Size (inch)	
						Drive Head	Reaction Head
Low Pressure Nitrogen	A08	A08	683-13870-70	38	185	0.875	0.625

- 3.1 Remove Node 2 feedthrough cap with FFTD.
- 3.2 Remove cap from Node 2 side of jumper by hand.
- 3.3 Bring jumper end in close proximity to corresponding bulkhead feedthrough.
- 3.4 Don Latex Gloves
- 3.5 Remove Node 2 feedthrough cap by hand.
- 3.6 Inspect feedthrough for debris. Report any debris to **MCC-H**. Clean as directed (Dry Wipes).
- 3.7 Inspect feedthrough threads for Braycote Lubricant.  
  
If no Braycote Lubricant present, apply one drop of Braycote Lubricant sparingly to first two threads of feedthrough. Spread Braycote Lubricant around threads by hand.
- 3.8 Doff, Latex Gloves.  
Don new pair of Latex Gloves.
- 3.9 Remove cap from Node 2 side of jumper by hand (hold cap then twist nut).
- 3.10 √Unused, undamaged Metal Seal installed on jumper
- 3.11 Inspect jumper for debris. Report any debris to **MCC-H**. Clean as directed (Dry Wipes).
- 3.12 Install jumper onto Node 2 feedthrough hand tight.
- 3.13 Jumper Cap →|← feedthrough cap. Stow in Ziplock Bag.

# COLUMBUS NITROGEN JUMPER INSTALL AND PURGE

(ASSY OPS/1E/FIN/MULTI E)

Page 3 of 5 pages

- 3.14 Doff Latex Gloves
- 3.15 Repeat steps 3.1 through 3.14 for Columbus feedthrough.
- 3.16 Set Trq Driver to specified input torque  
Refer to Table 1 and FFTD Calibration Card for torque settings.
- 3.17 Torque both sides of jumper with FFTD.  
Refer to Table 1.

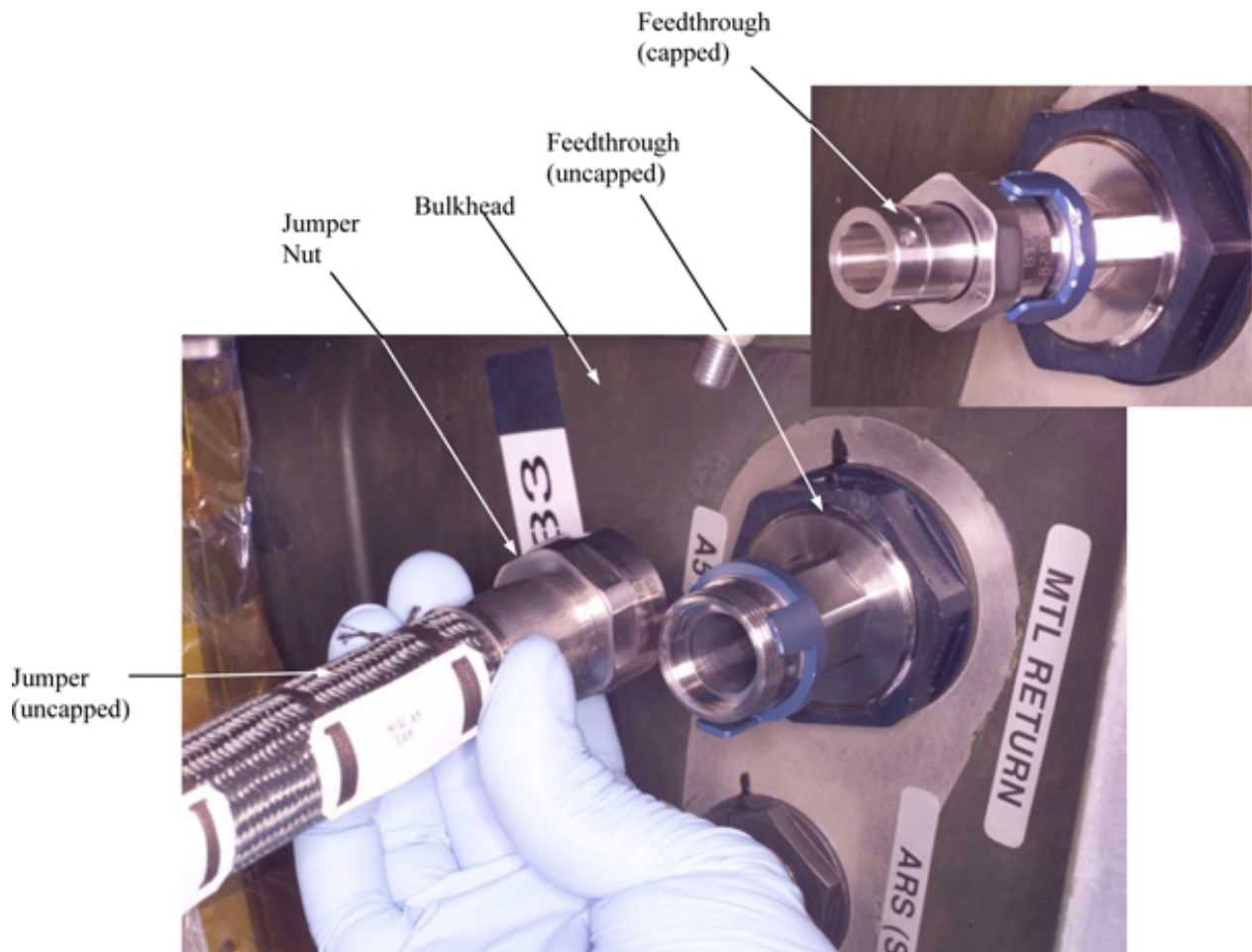


Figure 1. Typical Gamah Fitting Connection

## 4. PURGE NITROGEN SYSTEM

### 4.1 Open Nitrogen Line Shut Off Valves

Columbus: ECLSS: Payload N2: NLSOV1

Columbus Nitrogen Line Shutoff Valves 1 and 2

cmd NLSOV1 Position – Open (Verify Ind – Open)

cmd NLSOV2 Position – Open (Verify Ind – Open)

# COLUMBUS NITROGEN JUMPER INSTALL AND PURGE

(ASSY OPS/1E/FIN/MULTI E)

Page 4 of 5 pages

```
cmd NLSOV1_Vlv_Open_AP
data Onboard_Reception_Node -
SYS CCSDS END Point DMC DMS SERV

data Onboard_Execution_Node -
USM SW DMC USS Swop Instance

Verify NLSOV1_Vlv_Open_Stat_DMC - OPEN

cmd NLSOV2_Vlv_Open_AP
data Onboard_Reception_Node -
SYS CCSDS END Point DMC DMS SERV

data Onboard_Execution_Node -
USM SW DMC USS Swop Instance

Verify NLSOV2_Vlv_Open_Stat_DMC - OPEN
```

COL1F1            4.2        [Install NOPA in Columbus](#)  
Remove cap from Nitrogen QD on Utility Interface Panel  
Connect NOPA to Nitrogen QD

4.3        [Purge Nitrogen Lines](#)  
Airlock: ECLSS: N2 Supply Valve

```
cmd AL N2 Supply Valve - Open (Verify Ind - √)
Wait 30 seconds
cmd AL N2 Supply Valve - Close (Verify Ind - √)
```

COL1F1            4.4        [Reconnect Nitrogen Line](#)  
Disconnect NOPA from Nitrogen line QD  
Connect Nitrogen line QD to Utility Interface Panel

PCS                4.5        [Close Redundant Nitrogen Line Shut Off Valve](#)  
Columbus: ECLSS: Payload N2: NLSOV2

```
cmd NLSOV2 Position - Close (Verify Ind - √)
```

```
cmd NLSOV2_Vlv_Close_AP
data Onboard_Reception_Node -
SYS CCSDS END Point DMC DMS SERV

data Onboard_Execution_Node -
USM SW DMC USS Swop Instance

Verify NLSOV2_Vlv_Close_Stat_DMC - CLOSED
```

## 5. [NITROGEN SYSTEM LEAK CHECK](#)

# COLUMBUS NITROGEN JUMPER INSTALL AND PURGE

(ASSY OPS/1E/FIN/MULTI E)

Page 5 of 5 pages

## 5.1 [Open Nitrogen Supply Valve](#)

Airlock: ECLSS: N2 Supply Valve

AL N2 Supply Valve

**cmd** AL N2 Supply Valve – Open (Verify Ind – √)

## 5.2 [Monitor Nitrogen Pressure](#)

### NOTE

Less than 100 mmHg loss in 30 minutes is acceptable.

Ground will monitor Nitrogen Low pressures for 30 minutes.

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# NITROGEN RECHARGE SYSTEM PURGE AND SETUP FOR TRANSFER

(ASSY OPS/1E/FIN/HC/MULTI E) Page 1 of 7 pages

## OBJECTIVE:

The purpose of this procedure is to purge the Nitrogen Recharge System and setup the Nitrogen System to transfer nitrogen from the shuttle nitrogen tanks to the ISS Airlock nitrogen tanks via equalization.

## TOOLS AND EQUIPMENT REQUIRED:

(NOD1P4\_D)

GN2 Transfer Flex Hose Assy P/N V857-643003-008 (MC276-0054/1001)

High Pressure N2 Male Purge Adapter (NOPA) (PN 683-42344-4)

Flashlight

Earplugs

Gray Tape

(NOD1D4\_G2)

## ISS IVA Toolbox

Drawer 2:

5/32" Hex Head, 1/4" Drive

Ratchet, 1/4" Drive

Drawer 3:

Inspection Mirror

### 1. CONFIGURING ISS N2 SYSTEM

1.1 √**MCC-H** for ISS payload nitrogen configuration

AL10A2 1.2 VL013 (N2) → CLOSED

PCS 1.3 Airlock: ECLSS: Nitrogen System

AL Nitrogen System

'N2 Supply Valve'

√Actual Position – Open

### 2. REDUCING ISS N2 SYSTEM PRESSURE TO AMBIENT

#### NOTE

1. Connection and disconnection of QDs requires adjoining lines to be at approximately ambient pressure on both sides of the QD, when possible.
2. As the N2 system pressure bleeds down and N2 is introduced into the cabin, the following messages may be received:  
'N2 Supply Pressure Low – A/L'  
'PCA N2 Line Pressure Low – A/L'  
'PCA N2 Line Pressure Low – LAB'
3. The messages will return to normal as the N2 system is repressurized (step 4).

# NITROGEN RECHARGE SYSTEM PURGE AND SETUP FOR TRANSFER

(ASSY OPS/1E/FIN/HC/MULTI E) Page 2 of 7 pages

Airlock: ECLSS: Nitrogen System

AL Nitrogen System

'AL PCA N2 Intro Valve'

cmd Open (√Actual Position – Open)

Wait 2 minutes or On MCC-H GO, proceed.

'AL PCA N2 Intro Valve'

cmd Close (√Actual Position – Closed)

### 3. CONFIGURING PMA/ODS FOR N2 TRANSFER

ODS Vest  
GN2 Xfer  
Panel

3.1 √FLOW – CLOSED

WARNING
1. Opening the ODS Vestibule Transfer Panel Vent may cause a loud hissing noise. Crew in the vicinity should don ear plugs.
2. Inspect GN2 Transfer Flex Hose Assy for any cracks or anomalies. If so, √MCC-H.

3.2 Don ear plugs

3.3 VENT → OPEN

3.4 √GN2 Xfer Panel pressure gauge reading ~0 psi, doff Earplugs

CAUTION
Minimize the amount of time open fluid connectors are exposed to cabin air to prevent contamination. If debris is found during inspections, √MCC-H.

<u>NOTE</u>
QDs must be closed to remove caps. As needed, refer to Figure 2 at the end of this procedure for reference information on the high pressure quick disconnects.

3.5 Inspect GN2 Transfer Flex Hose Assy for any cracks or anomalies.

If so, √MCC-H.

3.6 Uncap GN2 Xfer Panel QD.



- 3.7 Close GN2 Transfer Flex Hose Assy bent-end QD.  
Remove plug.  
Inspect both QDs for debris.
- 3.8 Install hose so that it can be routed along the ODS Flange as shown in Figure 1.  
  
GN2 Transfer Flex Hose Assy bent-end →|← GN2 Xfer Panel QD  
Hard mate/open QD.



**Figure 1. ODS Vestibule Xfer Panel Hose Routing.**

- PMA
  - 3.9 Uncap Nitrogen Recharge QD.
  - 3.10 Close GN2 Transfer Flex Hose Assy straight-end QD.  
Remove plug.  
Inspect both QDs for debris.
  - 3.11 GN2 Transfer Flex Hose Assy straight-end →|← Nitrogen Recharge QD  
Hard mate/open QD.
- PMA/ODS
  - 3.12 Secure GN2 Transfer Flex Hose Assy to PMA/ODS Extension Duct and ODS Flange with Velcro straps.

ODS Vest  
 GN2 Xfer  
 Panel

3.13 VENT → CLOSED

4. PURGING NITROGEN RECHARGE SYSTEM

ACCESS AIRLOCK QD12:

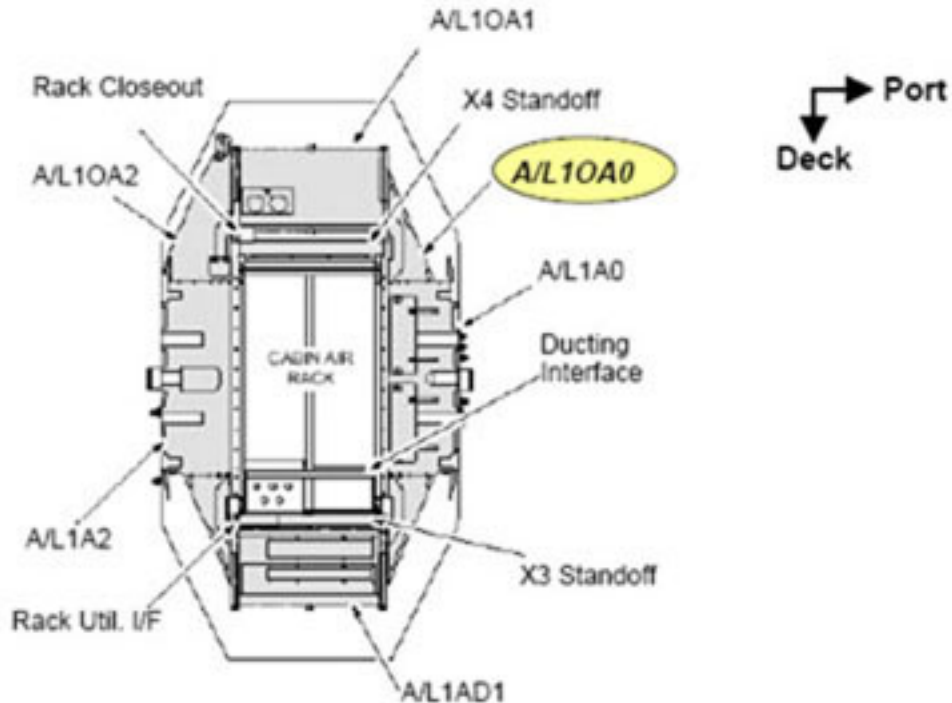


Figure 2. Location of Closeout Panel A/L10A0.

A/L10A0

- 4.1 Unfasten Closeout Panel A/L10A0 fasteners (ten), remove panel (Ratchet, 1/4" Drive; 5/32" Hex Head). Temporarily stow panel. Refer to Figure 2.

NOTE

The N2 Recharge QD will be labeled "QD012" and will be closest to you when reaching into the A/L10A0 volume.

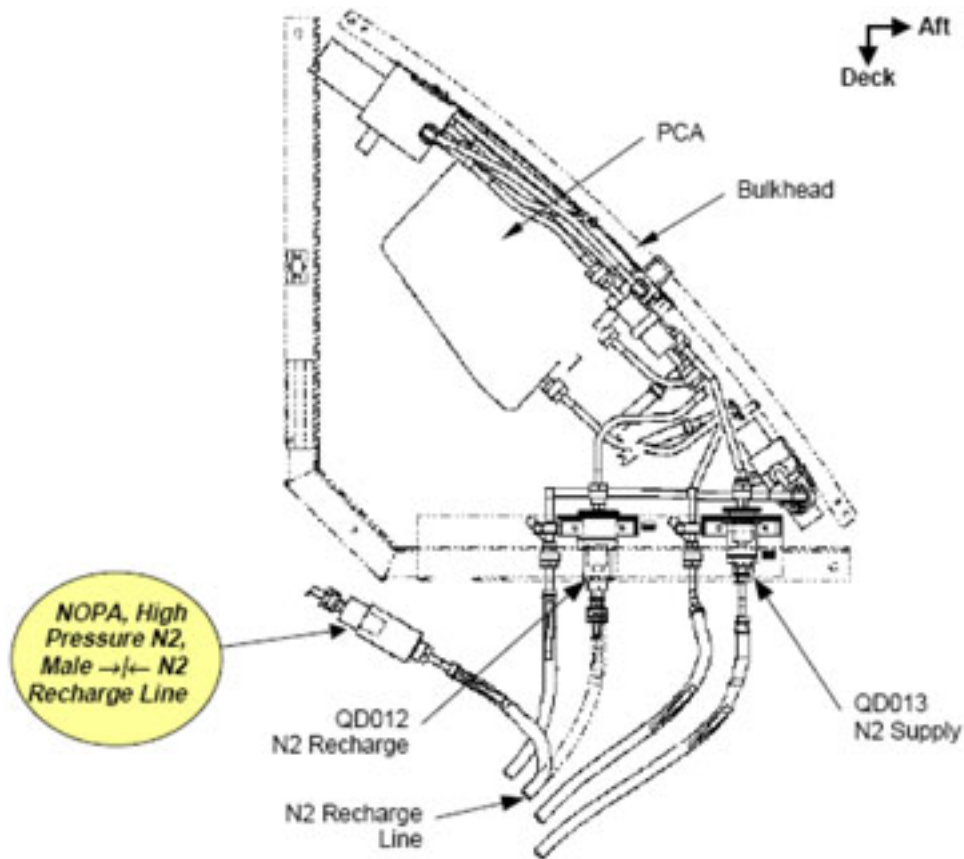


Figure 3. End View of Standoff Above Cabin Air Rack in Equipment Lock.

- 4.2 N2 Recharge Line ←|→ QD012.  
 High Pressure N2 Male Purge Adapter →|← N2 Recharge Line.  
 Refer to Figure 3.  
 Secure flexible line to structure with Gray Tape.

<b>WARNING</b>
The next steps will initiate flow from the Shuttle Tanks through the purge adapter attached to N2 Recharge Line in the airlock into the cabin and may cause a loud hissing noise. Crew in the vicinity should don earplugs.

- |                     |     |  |
|---------------------|-----|--|
| ML86B:D             | 4.3 | cb MN A MMU GN2 SPLY ISOL VLV A - cl   |
| R13L                | 4.4 | MMU GN2 SPLY ISOL VLV A - OP (tb-OP)   |
|                     | 4.5 | Shuttle inform ISS "Ready to flow N2." |
| ODS GN2<br>Xfer Pnl | 4.6 | FLOW → OPEN                            |
|                     | 4.7 | ISS inform Shuttle "Flowing N2."       |

Wait TBD minutes

4.8 FLOW → CLOSED

Report results to **MCC-H**.

4.9 High Pressure N2 Male Purge Adapter ←|→ N2 Recharge Line

4.10 N2 Recharge Line →|← QD012 (Visually inspect before mating)

4.11 Verify QD012 Fully Mated

5. [VERIFYING N2 TRANSFER SYSTEM PRESSURE INTEGRITY](#)

ML86B:D 5.1 cb MN A MMU GN2 SPLY ISOL VLV A → cl

R13L 5.2 MMU GN2 SPLY ISOL VLV A → OP (tb-OP)

ODS Vest  
GN2 Xfer  
Panel 5.3 FLOW → OPEN

5.4 Wait 5 minutes.

PCS 5.5 Airlock: ECLSS  
AL ECLSS  
'Equipment Lock'

Verify  $dP/dt < 0.05$  mmHg/min

A/L10A0 5.6 Replace Closeout Panel A/L10A0  
Fasten Closeout Panel fasteners (ten) (Ratchet, 1/4" Drive,  
5/32" Hex Head)

5.7 Inform **MCC-H** when complete with panel installation.

6. [INITIATING N2 TRANSFER](#)

A/L10A2 6.1 **On MCC-H GO**, VL013 (N2) → OPEN

Notify **MCC-H** of task completion

NOTE

Nitrogen transfer normally occurs for several hours or days  
and termination will be scheduled via a separate activity.

6.2 **On MCC-H GO**, go to [{3.103 NITROGEN TRANSFER TERMINATION}](#) (SODF: JNT OPS: MATED OPERATIONS).

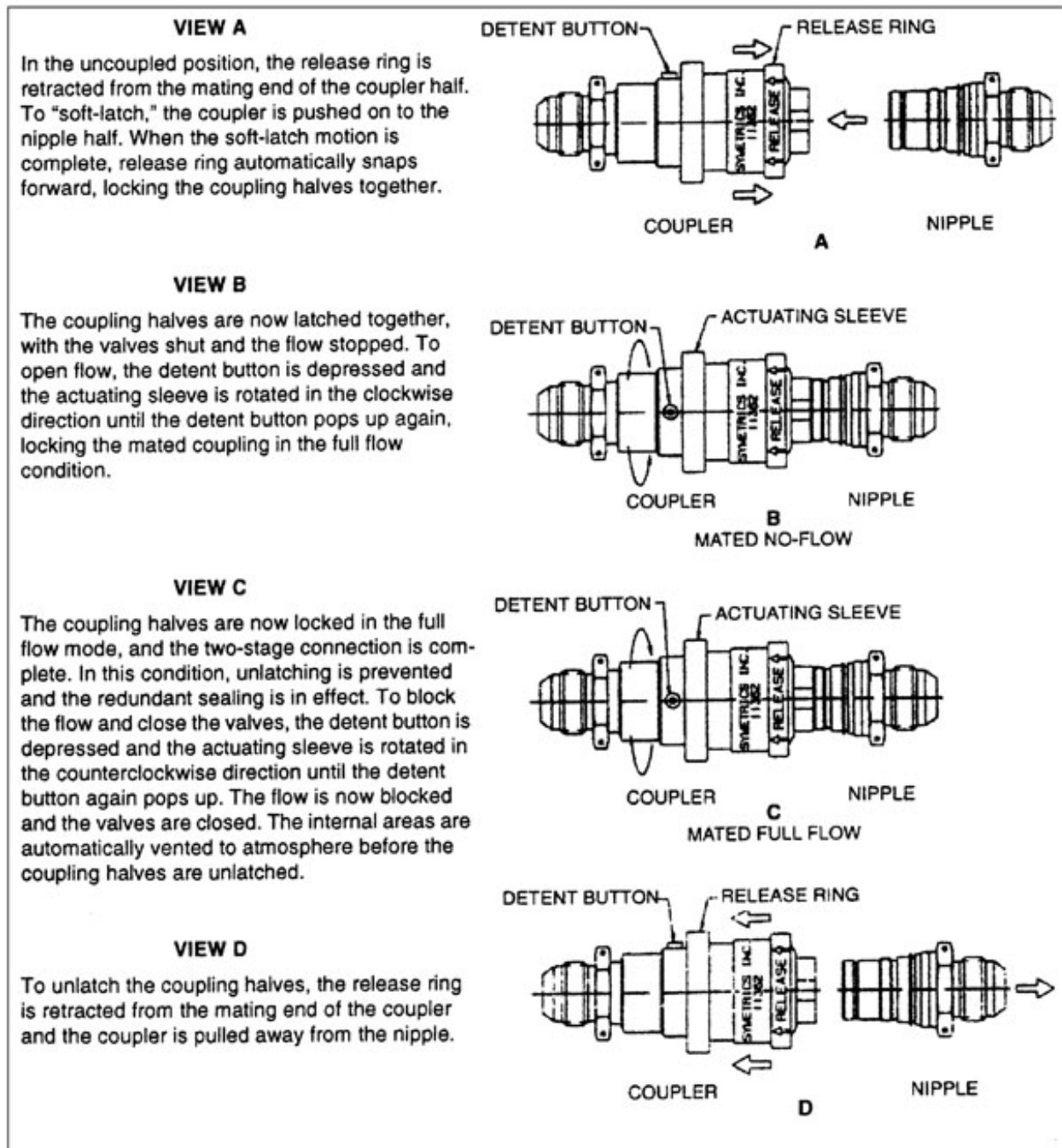


Figure 4. Two-Stage High Pressure QDs.

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# SSC INSTALLATION IN COLUMBUS

(ASSY OPS/1E/FIN/HC/MULTI E) Page 1 of 3 pages

## OBJECTIVE:

To deploy SSC in Columbus module using nominal SUP 2 connection.

### NOTE

Procedure assumes that the laptop is already configured with an A31p 60 GB Hard Drive, loaded with the current increment software, and configured for use on ISL.

## UNSTOW

Multi-Use Bracket P/N: SEG33107631-301

Laptop Desk P/N: SED33108703-302

A31P 120V DC Power Supply P/N: SEG33116412-303

A31P 16V DC Power Cable P/N: SDG33115374-301

120VDC Pwr/Ethernet Cable P/N: SEG39131206-303

A31p Laptop P/N: SEG33115360-302, - 303

### 1. VERIFYING POWER OFF

PWS

EPDS: 120V Payload: PDU1 Outlets 16

PDU1 Outlets 16

'SSPC1'

√Pwr – OFF

'SSPC2'

√Pwr – OFF

### 2. INSTALL LAPTOP / MATE CABLE CONNECTIONS

COL

2.1 Multi-Use Bracket →|← COL seat-track in desired location

2.2 Laptop Desk →|← Multi-Use Bracket

2.3 A31P 16V DC Power Cable →|← A31P 120V DC Power Supply

2.4 120VDC Pwr/Ethernet Cable →|← A31P 120V DC Power Supply

2.5 120VDC Pwr/Ethernet Cable →|← A31P Laptop Ethernet Port  
(reference Figure 1)

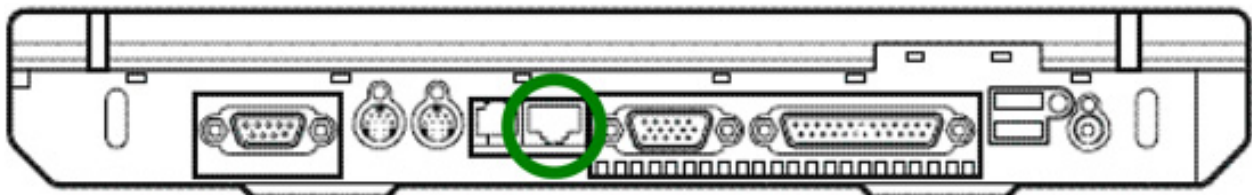


Figure 1. A31p Ethernet Port circled in green.

# SSC INSTALLATION IN COLUMBUS

- 2.6 A31P 16V DC Power Cable →|← A31P Laptop
- 2.7 A31P Laptop →|← Laptop Desk

**WARNING**

Do not connect or disconnect loads when the SUP Power light is illuminated. Power output is enabled and this presents a shock hazard. Loads should be connected or disconnected only when the SUP Power light is not illuminated

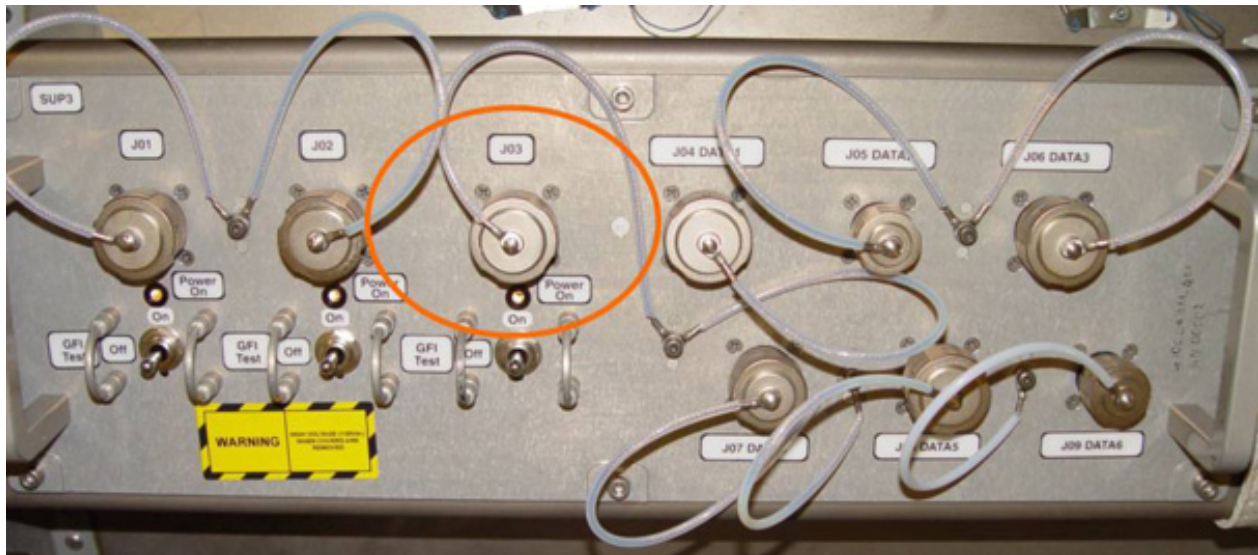


Figure 2. SUP Panel, J03 port circled

### 3. [MATE POWER CABLE TO SUP 2](#)

COL SUP 2

- 3.1 √SUP 2 J03 Power On Lt – Off
- 3.2 120VDC Pwr/Ethernet Cable →|← SUP 2 J03 (reference Figure 2)

### 4. [POWERING ON SUP 2](#)

PWS

- 4.1 [SUP 2 POWER ON FOR SSC](#)  
EPDS: 120V Payload: PDU1 Outlets 16

PDU1 Outlets 16

'Commands'

**cmd Pwr On Execute (OK)**

'SSPC1'

√Pwr – ON



## SSC INSTALLATION IN COLUMBUS

(ASSY OPS/1E/FIN/HC/MULTI E) Page 3 of 3 pages

'SSPC2'

√Pwr – ON

### 5. POWERING ON COLUMBUS SSC

- |           |     |  |
|-----------|-----|--|
| COL SUP 2 | 5.1 | √SUP 2 J03 Power On Lt – On  |
| SSC       | 5.2 | A31P 120V DC Power Supply → On   |
|           | 5.3 | A31p Laptop power → On   |
|           | 5.4 | At Login , press [Ctrl+Alt+Delete].  |
|           | 5.5 | Input standard crew personal logon information. For appropriate logon information, refer to <a href="#">{5.202 SSC USER LOGON ACCOUNTS}</a> , all (SODF: POC: REFERENCE: OPS LAN). |
|           | 5.6 | sel OK   |

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# REMOVAL OF NODE 2 STBD PPRV AND INSTALL MPEV

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 5 pages

## OBJECTIVE:

Remove the Stbd PPRV from Node 2 and install a Manual Pressure Equalization Valve (MPEV).

## LOCATIONS:

Stowed: √Inventory Management System (IMS)

Installed: Node 2 Stbd Hatch

## DURATION:

30 minutes

## CREW:

One

## PARTS:

MPEV P/N 2353028-2-1

## MATERIALS:

Dry Wipes

Braycote Lubricant

Gray Tape

Latex Gloves

Sharpie

Ziploc Bag

## TOOLS:

### ISS IVA Toolbox:

Drawer 2:

5/32" Hex Head Driver, 1/4" Drive

Ratchet, 1/4" Drive

4" Ext, 1/4" Drive

(40-200 in-lb) Trq Wrench, 1/4" Drive

## REFERENCED PROCEDURE(S):

None

### NOTE

1. Removal/installation both occur on cabin (dome) side of Hatch.
2. Hatch should remain open, stowed throughout procedure.

# REMOVAL OF NODE 2 STBD PPRV AND INSTALL MPEV

(ASSY OPS/1E/FIN/MULTI E)

Page 2 of 5 pages

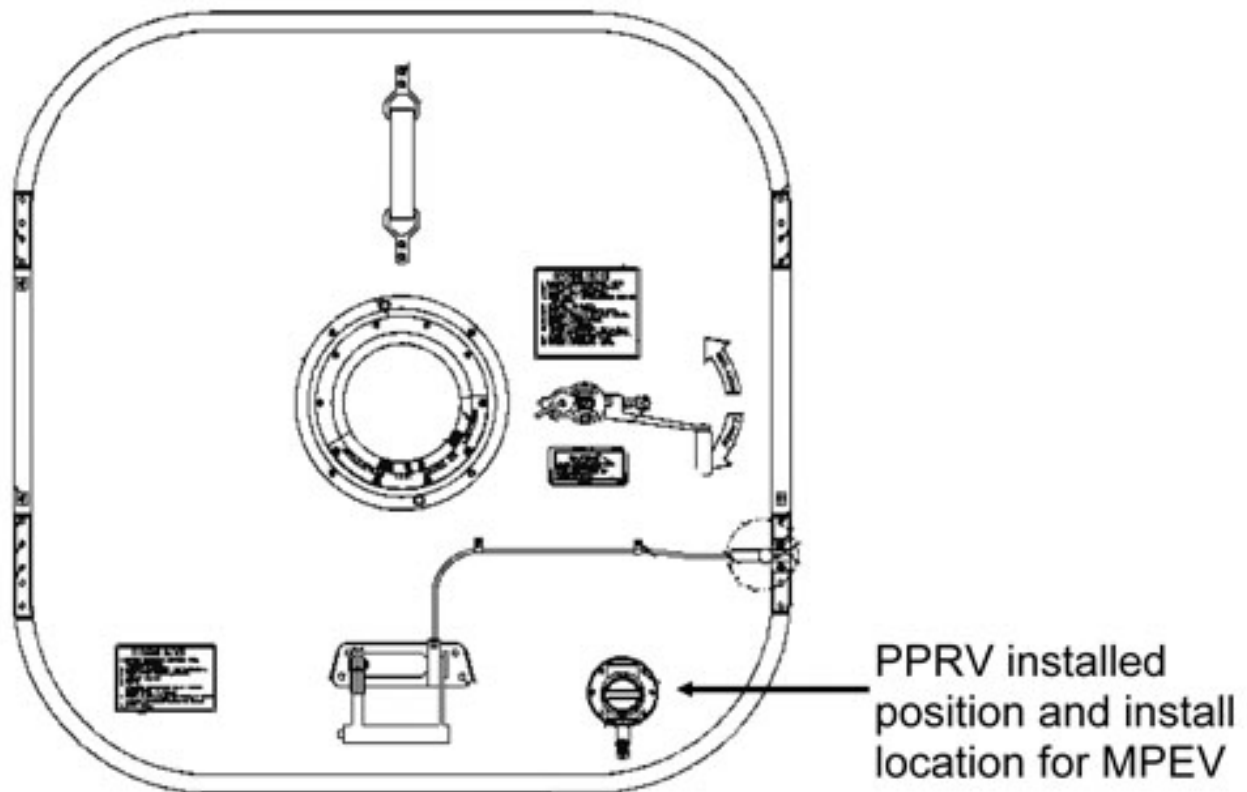


Figure 1. Hatch (dome side).

## 1. PPRV REMOVAL

- 1.1 Remove PPRV, fasteners (six) (Ratchet, 1/4" Drive; 4" Ext; 5/32" Hex Head).  
Label, temporary stow (Gray Tape, Sharpie).  
Record part number of PPRV: \_\_\_\_\_  
Record serial number of PPRV: \_\_\_\_\_  
Refer to Figure 1.
- 1.2 Remove PPRV Spacer.
- 1.3 Clean Hatch at PPRV removal location (Dry Wipes).
- 1.4 Temporarily stow PPRV.

2. UNSTOW MPEV FROM NODE 2 STARBOARD MIDBAY

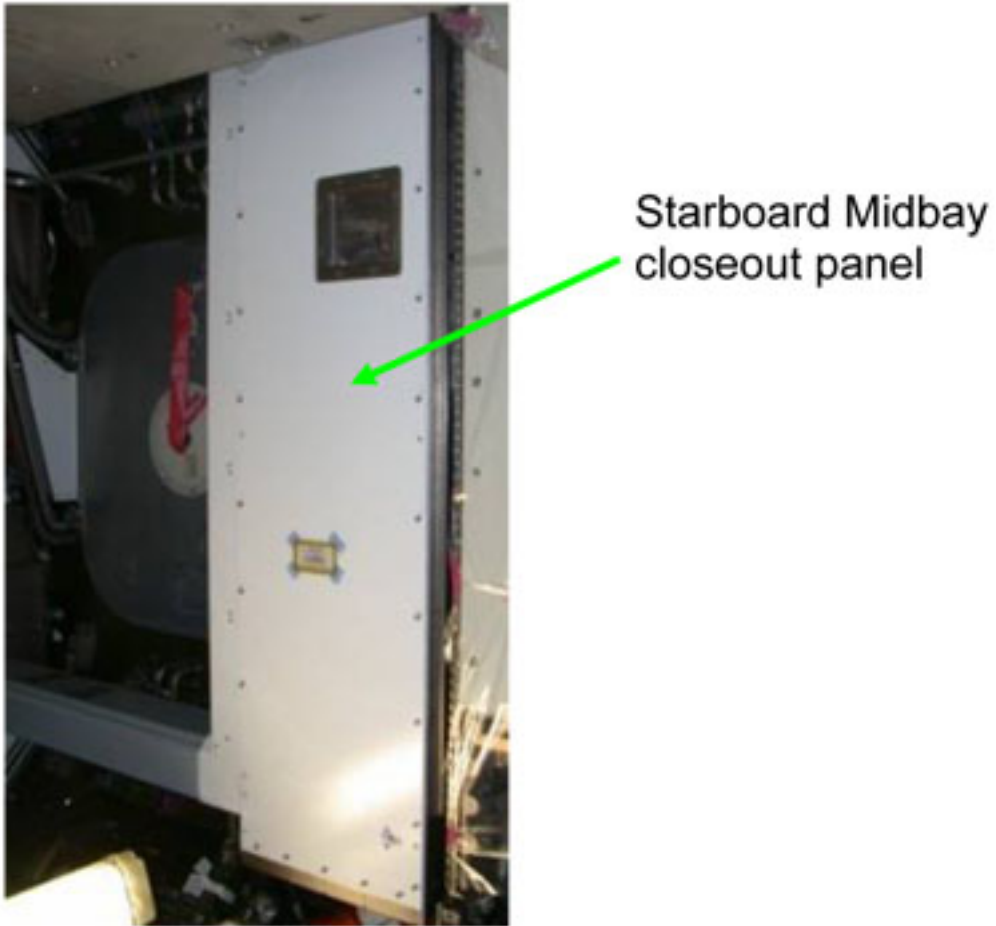


Figure 2. Starboard Midbay with closeout

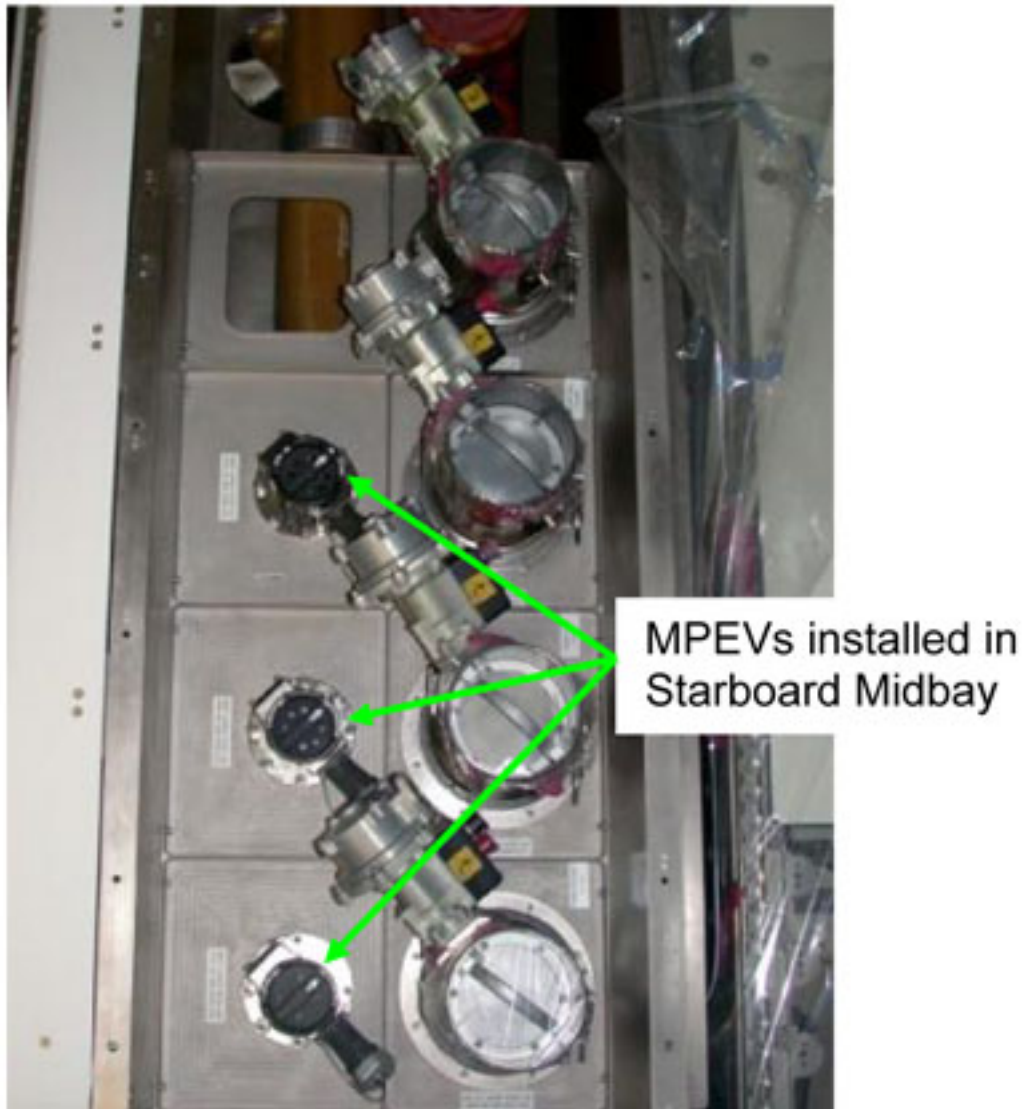


Figure 3. Starboard Midbay with closeout removed

- 2.1 Remove Starboard Midbay closeout panel NOD2S3-01, fasteners (six) (Ratchet, 1/4" Drive; 5/32" Hex Head Driver).
- 2.2 Remove MPEV from stowed location at NOD2S3-01, fasteners (six) (Ratchet, 1/4" Drive; 5/32" Hex Head Driver). Refer to Figure 3.
- 2.3 Record part number of MPEV: \_\_\_\_\_  
Record serial number of MPEV: \_\_\_\_\_
- 2.4 Place PPRV and spacer in Ziploc bag. Temp stow Ziploc bag.
- 2.5 Replace Starboard Midbay closeout panel NOD2S3-01, fasteners (six) (Ratchet, 1/4" Drive; 5/32" Hex Head Driver).

3. MPEV INSTALLATION

## REMOVAL OF NODE 2 STBD PPRV AND INSTALL MPEV

(ASSY OPS/1E/FIN/MULTI E)

Page 5 of 5 pages

- 3.1 √Replacement MPEV – OPEN, cap removed

### NOTE

Equalization valve must be oriented correctly. Refer to Figure 1 for proper installation orientation (nozzle toward bottom).



Figure 4. MPEV Shown in Closed Position.

- 3.2 Don latex gloves.
- 3.3 Apply a small amount of Braycote to MPEV seals and position MPEV in proper installation orientation (Latex gloves, Braycote Lubricant). Refer to Figures 1, 4.
- 3.4 Doff latex gloves.
- 3.5 Tighten, torque fasteners (six) in star pattern, to 66 in-lbs [Ratchet, 1/4" Drive; 5/32" Hex Head; 4" Ext; (40-200 in-lbs) Trq Wrench].

### WARNING

MPEV must be closed for module pressure, equalization to be prepared for emergency Hatch closing.

- 3.6 MPEV → CLOSED, capped.
- 3.7 Check for FOD around work area within 3' radius.
- 3.8 Photo document final configuration (DCS 760 Camera).

## 4. POST MAINTENANCE

- 4.1 ISS ↓ **MCC-H** task completion, part numbers, serial numbers
- 4.2 Update IMS with stowage locations.  
Stow tools, equipment.

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# NODE2/COLUMBUS VESTIBULE DEPRESSURIZATION AND LEAK CHECK

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 14 pages

## OBJECTIVE:

Utilize Internal Sampling Adapter (ISA), Vacuum Access Jumper (VAJ), Multimeter, ISA Scopemeter Pressure Probe to depress Node2/Lab vestibule for overnight leak check.

## LOCATION:

Lab Forward Endcone

## DURATION:

1 hours

20 minutes for Vestibule Leak Check Setup

30 minute - wait for Vestibule Depressurization

10 minutes for Overnight Teardown

20 minutes for Vestibule Leak Check Setup

8 hours - wait for Vestibule Leak Check

20 minutes for Multimeter, ISA, VAJ Teardown

## CREW:

One

## MATERIALS:

9V Alkaline Battery (if Battery changeout required)

Gray Tape

Ear Plugs

## TOOLS:

Internal Sampling Adapter (ISA) P/N 97M55830-1

Vacuum Access Jumper-78-1 5ft P/N 683-17111-1

Vacuum Access Jumper-83-1 35ft P/N 683-17111-2

ISA Scopemeter Pressure Probe P/N 1525,760MMHGA/30PSIA

## Digital Multimeter Kit:

P/N 10118-10018-04

Multimeter

## ISS IVA Toolbox:

Drawer 3

#0 Phillips Screwdriver (if Battery change out required)

### 1. COLUMBUS EGRESS/CLOSEOUT

- |     |     |  |
|-----|-----|--|
| COL | 1.1 | <u>{1.201 POSITIVE PRESSURE RELIEF ASSEMBLY (PPRA) ACTIVATION}, all (ESA SODF:ECLSS:Activation &amp; Checkout)</u> |
|     | 1.2 | Close COL Hatch per decal  |
|     | 1.3 | Close Node 2 Stbd Hatch per decal  |

2. SETTING UP ISA

NOTE

ISA has two identical ISA VAJ Ports. To ensure proper ISA Scopemeter Pressure Probe accuracy verification, one ISA VAJ Port must be uncapped.

2.1 Gamah Cap  $\leftrightarrow$  ISA VAJ Port

2.2  $\sqrt$ ISA Scopemeter Pressure Probe  $\rightarrow$ ISA

3. SETTING UP MULTIMETER

NOTE

Plug marked "COM" must be inserted in COM jack on Multimeter. ISA Scopemeter Pressure Probe slide switch will face toward Multimeter Rotary Switch.

3.1 ISA Scopemeter Pressure Probe V plug  $\rightarrow$  V $\Omega$  jack (right side, red)  
COM plug  $\rightarrow$  COM jack

3.2  $\sqrt$ ISA Scopemeter Pressure Probe – OFF

3.3

Rotary Switch  $\curvearrowright$

mV

3.4 Verify voltage reading > 100 mV DC (good ISA Scopemeter Pressure Probe Battery indication).

If voltage reading < 100 mV DC, ISA Scopemeter Pressure Probe Battery must be replaced.

Replace 9V Battery by removing noncaptive screw on back of probe (#0 Phillips Screwdriver).

3.5 ISA Scopemeter Pressure Probe  $\rightarrow$  mm HgA

4. VERIFYING ISA SCOPEMETER PRESSURE PROBE ACCURACY

NOTE

ISA Scopemeter Pressure Probe outputs 1 mV per pressure unit measured.  
Example: 0.760V = 760 mV = 760 mm HgA

Multimeter

4.1

Rotary Switch  $\curvearrowright$

V

4.2 Record ISA Scopemeter Pressure Probe  $P_1$ :  
 \_\_\_\_\_ mmHgA0.

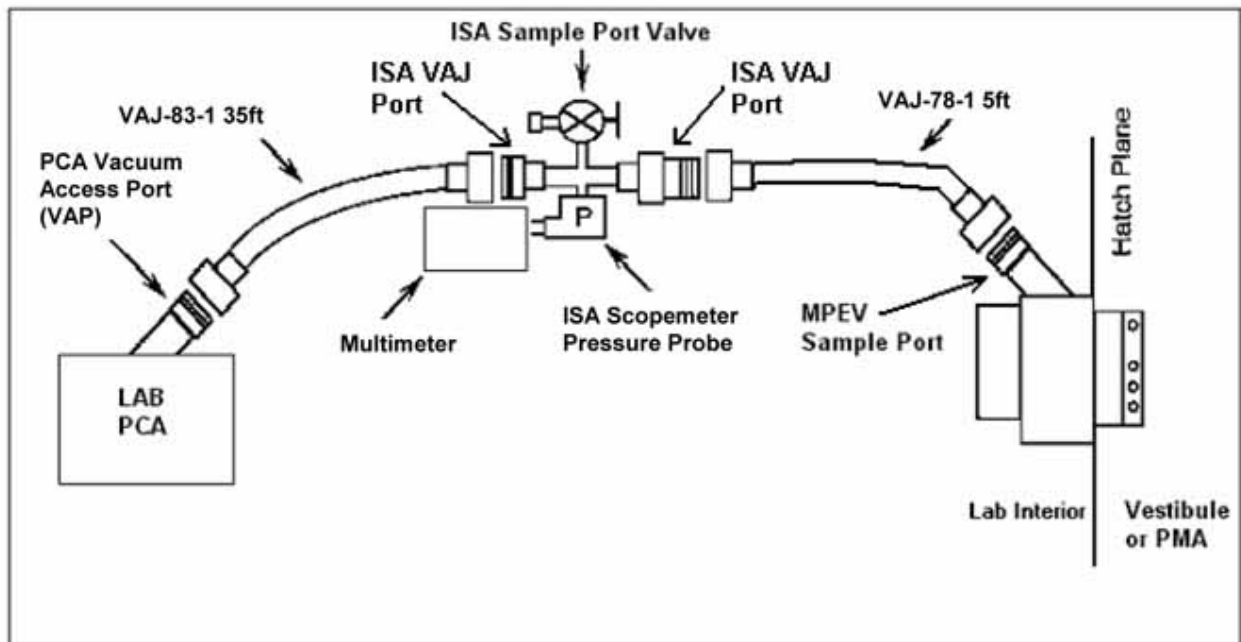
PCS

4.3 US Lab: ECLSS  
 Lab: ECLSS  
 Record Cab Press  $P_2$ : \_\_\_\_\_ mmHgA  
 Verify  $\Delta P |P_2 - P_1| < 20$  mmHg

5. CONNECTING VAJ, ISA, MANUAL PRESSURE EQUALIZATION VALVE (MPEV)

Node 2  
 Stbd Hatch

- 5.1  $\surd$ Node 2 Stbd MPEV – CLOSED
- 5.2 Gamah Cap  $\leftrightarrow$  VAJ-78-1 5ft (both ends)  
 Verify seals are not damaged (visually).
- 5.3 VAJ-78-1 5ft (straight end)  $\rightarrow$  ISA VAJ Port  
 Hand tighten.  
 (Refer to Figure 1.)



**Figure 1. ISA/VAJ/MPEV Connection.**

- 5.4 Cap  $\leftrightarrow$  Node 2 Stbd MPEV  
 VAJ-78-1 5ft (bent end)  $\rightarrow$  Node 2 Stbd MPEV  
 Hand tighten.  
 (Refer to Figure 1.)

MCC-H

5.5 [Verifying Vent Relief Isolation Valve \(VRIV\) and Vent Relief Control Valve \(VRCV\) Closed](#)

Lab: ECLSS: PCA

'Pressure Control Assembly'

sel VRCV (Icon)

√Position – Closed

Lab: ECLSS: PCA

'Pressure Control Assembly'

sel VRIV (Icon)

√Position – Closed

5.6 Remove closeout panel LAB1D0-02, 1/4-turn fasteners (nine).

5.7 Gamah Cap ←|→ PCA Vacuum Access Port (VAP)  
Temporarily stow Gamah Cap on closeout panel (Gray Tape).

5.8 Gamah Cap ←|→ VAJ-83-1 35ft (both ends)  
Verify seals are not damage (Visually).

5.9 VAJ-83-1 35ft (bent end) →|← PCA VAP  
Hand tighten.  
(Refer to Figure 1.)

5.10 Gamah Cap ←|→ ISA VAJ Port (capped)  
VAJ-83-1 35ft (straight end) →|← ISA VAJ Port  
Hand tighten.  
(Refer to Figure 1.)

<b>WARNING</b>
VAJ will move when pressurized or evacuated. Failure to secure ISA/VAJ Assembly may result in injury to crew and/or damage to equipment.

5.11 Secure ISA/VAJ Assembly.

6. [INHIBITING POSITIVE PRESSURE RELIEF](#)

NOTE

'Positive P Relief Failure - LAB' caution will be received after PPR is inhibited. No action required. This message will return to normal once PPR is re-enabled.

**On MCC-H GO**

PCS

US Lab: ECLSS: PCA: PCA Commands

LAB PCA Commands

'Positive Press Relief'  
'Inhibit'

cmd Arm (√Status – Armed)

cmd Inhibit

√Positive Pressure Relief Status – Inhibited

7. [LEAK CHECKING ISA/VAJ CONNECTION](#)

7.1 ISA Sampling Port Valve → CLOSED  
(Refer to Figure 2.)

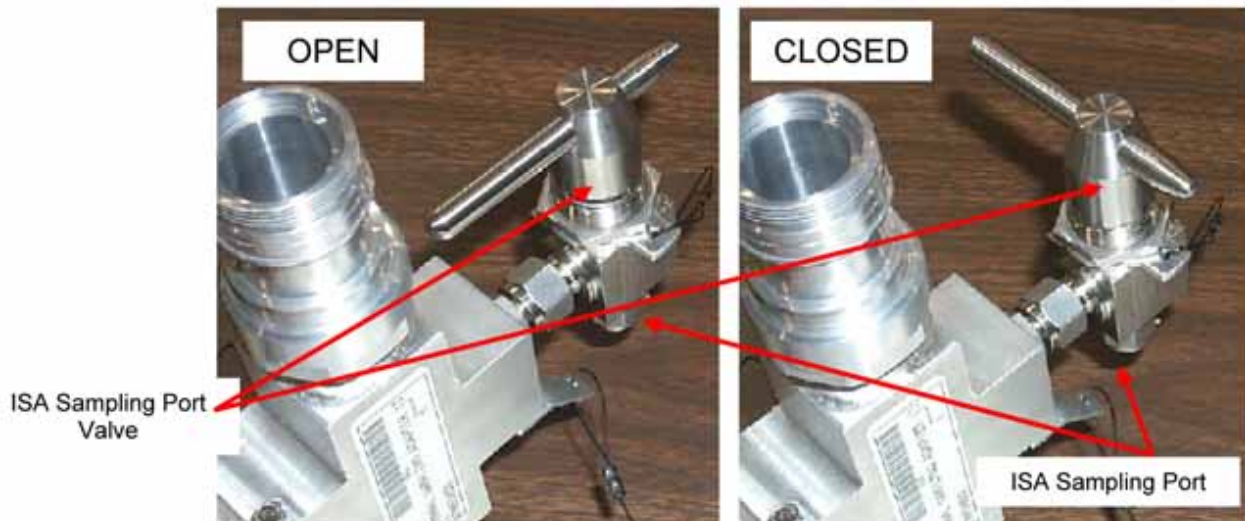


Figure 2. ISA Sampling Port Valve.

**WARNING**

Opening the VRIV will vent the ISA and VAJs to space and may cause a loud hissing noise.

7.2 Don Ear Plugs.

- 7.3 [Opening PCA VRIV](#)  
US Lab: ECLSS: PCA  
  
'Pressure Control Assembly'  
  
sel VRIV  
  
  
'Open'  
  
**cmd** Arm (√Status – Armed)  
**cmd** Open  
  
√Position – Open  
√Open Indicator – √
- 7.4 Wait 10 minutes to depressurize ISA/VAJ setup.
- 7.5 Doff Ear Plugs.
- 7.6 [Closing PCA VRIV](#)  
US Lab: ECLSS: PCA  
  
'Pressure Control Assembly'  
  
sel VRIV  
  
  
'Close'  
  
**cmd** Close  
  
√Position – Closed  
√Closed Indicator – √
- 7.7 Wait 3 minutes for thermal stabilization.
- 7.8 Rotary Switch ↻ **mV**
- Multimeter 7.9 Record ISA Scopemeter Pressure Probe **P<sub>3</sub>**:  
\_\_\_\_\_ mmHg  
Record GMT: \_\_\_\_\_ GMT
- 7.10 Wait 5 minutes for leak check.

7.11 Record ISA Scopemeter Pressure Probe **P<sub>3</sub>**:  
 \_\_\_\_\_ mmHg  
 Record GMT: \_\_\_\_\_ GMT

```
*****
*      If  $\Delta P | P_4 - P_3 | > 20$  mmHg during monitoring
*      period
*      |
*      |      ISS  $\downarrow$  MCC-H of suspected ISA/VAJ leak.
*      |
*      |       $\surd$ MCC-H for further instructions
*
*****
```

8. DEPRESSURIZING VESTIBULE

**WARNING**

Opening the Node 2 Stbd MPEV will vent vestibule to space and may cause a loud hissing noise.

- |                      |     |  |
|----------------------|-----|--|
|                      | 8.1 | Don Ear Plugs.   |
|                      | 8.2 | <p><u>Opening PCA VRIV</u></p> <p>US Lab: ECLSS: PCA</p> <div style="border: 1px solid black; display: inline-block; padding: 2px;">Lab ACS</div><br>'Pressure Control Assembly' <p>sel VRIV</p> <div style="border: 1px solid black; display: inline-block; padding: 2px;">LAB PCA VRIV</div><br>'Open' <p><b>cmd</b> Arm (<math>\surd</math>Status – Armed)<br/> <b>cmd</b> Open</p> <p><math>\surd</math>Position – Open<br/> <math>\surd</math>Open Indicator – <math>\surd</math></p> |
| Node 2<br>Stbd Hatch | 8.3 | Node 2 Stbd MPEV → OPEN  |
|                      | 8.4 | Wait approximately 30 minutes or until ISA Press < 10 mmHgA.   |
| Multimeter           | 8.5 | $\surd$ ISA Pressure < 10 mmHgA  |
|                      | 8.6 | Node 2 Stbd MPEV → CLOSED  |
|                      | 8.7 | Doff Ear Plugs.  |

8.8 Wait an additional 10 minutes for thermal stabilization.

8.9 Closing PCA VRIV

US Lab: ECLSS: PCA

Lab ACS

'Pressure Control Assembly'

sel VRIV

LAB PCA VRIV

'Close'

**cmd** Close

√Position – Closed

√Closed Indicator – √

9. VESTIBULE PRESSURE CHECK 1

9.1 Node 2 Stbd MPEV → OPEN

9.2 Record ISA Scopemeter Pressure Probe **P<sub>5</sub>**:  
\_\_\_\_\_ mmHg  
Record GMT: \_\_\_\_\_ GMT

9.3 Node 2 Stbd MPEV → CLOSED

10. ENABLING POSITIVE PRESSURE RELIEF

PCS

US Lab: ECLSS: PCA: PCA Commands

LAB PCA Commands

'Positive Press Relief'

**cmd** Enable (√Positive Pressure Relief Status – Enabled)

11. DISASSEMBLING EQUIPMENT FOR LEAK CHECK CONFIG

11.1 ISA Scopemeter Pressure Probe → OFF

Multimeter

11.2 Rotary Switch ↶ OFF  
Multimeter ←|→ ISA Scopemeter Pressure Probe

11.3 Cap ←|→ ISA Sampling Port  
ISA Sample Port → OPEN (for pressurization, stowage)  
Cap →|← ISA Sampling Port  
Refer to Figure 2.

11.4 VAJ-83-1 35ft (bent end) ←|→ PCA VAP  
Gamah Cap →|← VAJ-83-1 35ft



# NODE2/COLUMBUS VESTIBULE DEPRESSURIZATION AND LEAK CHECK

(ASSY OPS/1E/FIN/MULTI E)

Page 9 of 14 pages

Hand tighten.

Secure VAJ-83-1 35ft (bent end) for overnight stowage.

- 11.5 Inspect seal on PCA VAP Gamah Cap for any visible damage.  
Notify **MCC-H** if any damage noted to seals.


Gamah Cap →|← PCA VAP

Hand tighten.

- 11.6 Install closeout panel LAB1D0-02, 1/4-turn fasteners (nine).

- 11.7 Wait 8 hours for leak check.

## 12. SETTING UP MULTIMETER

- 12.1 Rotary Switch ↻ 

- 12.2 Verify voltage reading > 100 mV DC (good ISA Scopemeter Pressure Probe Battery indication).

If voltage reading < 100 mV DC, ISA Scopemeter Pressure Probe Battery must be replaced.

9V Battery replaced by removing noncaptive screw on back of probe (#0 Phillips Screwdriver).

- 12.3 ISA Scopemeter Pressure Probe → mm HgA

## 13. VERIFYING ISA SCOPEMETER PRESSURE PROBE ACCURACY

### NOTE

ISA Scopemeter Pressure Probe outputs 1 mV per pressure unit measured. Example: 0.760V = 760 mV = 760 mm HgA

Multimeter

- 13.1 Rotary Switch ↻ 

- 13.2 Record ISA Scopemeter Pressure Probe  $P_6$ :  
\_\_\_\_\_ mmHgA

PCS

- 13.3 US Lab: ECLSS

Record Cab Press  $P_7$  : \_\_\_\_\_ mmHgA

Verify  $\Delta P |P_7 - P_6| < 20$  mmHg

## 14. CONNECTING VAJ, ISA, MANUAL PRESSURE EQUALIZATION VALVE (MPEV)

- 14.1 Remove closeout panel LAB1D0-02, 1/4-turn fasteners (nine).

- 14.2 Gamah Cap ←|→ PCA Vacuum Access Port (VAP)  
Temporarily stow Gamah Cap on closeout panel (Gray Tape).
- 14.3 Gamah Cap ←|→ VAJ-83-1 35ft (bent end)  
Verify seals are not damaged (Visually).
- 14.4 VAJ-83-1 35ft (bent end) →|← PCA VAP  
Hand tighten.  
(Refer to Figure 1.)

<b>WARNING</b>
VAJ will move when pressurized or evacuated. Failure to secure ISA/VAJ Assembly may result in injury to crew and/or damage to equipment.

14.5 Secure ISA/VAJ Assembly.

15. INHIBITING POSITIVE PRESSURE RELIEF

<u>NOTE</u>
'Positive P Relief Failure - LAB' caution will be received after PPR is inhibited. No action required. This message will return to normal once PPR is re-enabled.

PCS

US Lab: ECLSS: PCA: PCA Commands

LAB PCA Commands

'Positive Press Relief'

'Inhibit'

**cmd** Arm (√Status – Armed)

**cmd** Inhibit

√Positive Pressure Relief Status – Inhibited

16. LEAK CHECKING ISA/VAJ CONNECTION

16.1 ISA Sampling Port Valve → CLOSED  
Refer to Figure 2.

16.2 √Node 2 Stbd MPEV – CLOSED

<b>WARNING</b>
Opening the VRIV will vent the ISA and VAJs to space and may cause a loud hissing noise.

16.3 Don Ear Plugs.

16.4 [Opening PCA VRIV](#)

US Lab: ECLSS: PCA

Lab ACS

'Pressure Control Assembly'

sel VRIV

LAB PCA VRIV

'Open'

cmd Arm (√Status – Armed)

cmd Open

√Position – Open

√Open Indicator – √

16.5 Wait 10 minutes to depressurize ISA/VAJ setup.

16.6 Doff Ear Plugs.

16.7 [Closing PCA VRIV](#)

US Lab: ECLSS: PCA

Lab ACS

'Pressure Control Assembly'

sel VRIV

LAB PCA VRIV


'Close'

cmd Close

√Position – Closed

√Closed Indicator – √

16.8 Wait 3 minutes for thermal stabilization.

16.9 Rotary Switch ↻ 

Multimeter

16.10 Record ISA Scopemeter Pressure Probe **P<sub>8</sub>**:  
\_\_\_\_\_ mmHg  
Record GMT: \_\_\_\_\_ GMT

16.11 Wait 5 minutes for leak check.

16.12

Record ISA Scopemeter Pressure Probe **P<sub>9</sub>**:  
\_\_\_\_\_ mmHg  
Record GMT: \_\_\_\_\_ GMT

\*\*\*\*\*  
\*  
\* If  $\Delta P | P_9 - P_8 | > 10$  mmHg during monitoring  
\* period  
\* |  
\* ISS  $\downarrow$  **MCC-H** of suspected ISA/VAJ leak.  
\* |  
\*  $\sqrt$ **MCC-H** for further instructions  
\*  
\*\*\*\*\*

17. [VESTIBULE PRESSURE CHECK 2](#)

17.1 Node 2 MPEV  $\rightarrow$  OPEN

17.2

Record ISA Scopemeter Pressure Probe **P<sub>10</sub>**:  
\_\_\_\_\_ mmHg  
Record GMT: \_\_\_\_\_ GMT

\*\*\*\*\*  
\*  
\* If  $\Delta P | P_{10} - P_5 | > 20$  mmHg during 8 hour  
\* monitoring period  
\* |  
\* ISS  $\downarrow$  **MCC-H** of suspected vestibule leak.  
\* |  
\*  $\sqrt$ **MCC-H** for further instructions  
\*  
\*\*\*\*\*

17.3 Node 2 Stbd MPEV  $\rightarrow$  CLOSED

17.4 Notify **MCC-H** of pressures, GMTs recorded

18. [ENABLING POSITIVE PRESSURE RELIEF](#)

PCS

US Lab: ECLSS: PCA: PCA Commands

LAB PCA Commands

'Positive Press Relief'

**cmd** Enable ( $\sqrt$ Positive Pressure Relief Status – Enabled)

19. [DISASSEMBLING AND STOWING EQUIPMENT](#)

Node 2  
Stbd Hatch

19.1  $\sqrt$ Node 2 Stbd MPEV – CLOSED

19.2 ISA Scopemeter Pressure Probe  $\rightarrow$  OFF

# NODE2/COLUMBUS VESTIBULE DEPRESSURIZATION AND LEAK CHECK

(ASSY OPS/1E/FIN/MULTI E)

Page 13 of 14 pages

- Multimeter
- 19.3 Rotary Switch ↻ OFF  
Multimeter ←|→ ISA Scopemeter Pressure Probe
  - 19.4 Cap ←|→ ISA Sampling Port  
ISA Sample Port → OPEN (for pressurization, stowage)  
Cap →|← ISA Sampling Port  
(Refer to Figure 2.)
  - 19.5 VAJ-78-1 5ft (straight end) ←|→ ISA VAJ Port  
VAJ-78-1 5ft (bent end) ←|→ Node 2 Stbd MPEV  
Gamah Cap →|← VAJ-78-1 5ft (both ends)  
Hand tighten.  
Gamah Cap →|← ISA VAJ Port  
Hand tighten.
  - 19.6 Verify seal on Node 2 Stbd MPEV Cap is not damaged (Visually).  
Cap →|← Node 2 Stbd MPEV  
Hand tighten.
  - 19.7 VAJ-83-1 35ft ←|→ PCA VAP  
VAJ-83-1 35ft ←|→ ISA VAJ Port  
Gamah Cap →|← VAJ-83-1 35ft (both ends)  
Hand tighten.  
Gamah Cap →|← ISA VAJ Port  
Hand tighten.
  - 19.8 Verify seal on PCA VAP Gamah Cap is not damaged (Visually).  
Gamah Cap →|← PCA VAP  
Hand tighten.
  - 19.9 Check for FOD within 1m radius.
  - 19.10 Install closeout panel LAB1D0-02, 1/4-turn fasteners (nine).
  - 19.11 ISS ↓ **MCC-H**, "Vestibule depressurization and leak check completed."
  - 19.12 Stow tools and materials.  
Update IMS with stowage location of hardware.
20. [INGRESS COLUMBUS](#)
- 20.1 Node 2 Stbd MPEV → OPEN
  - 20.2 US Lab: ECLSS  

LAB ECLSS
-----------

When dp/dt ~ 0 (approximately 30 seconds).

CONTINUE

- COL
- 20.3 Open Node 2 Stbd Hatch per decal
  - 20.4 Open COL Hatch per decal
  - 20.5 [{1.202 POSITIVE PRESSURE RELIEF ASSEMBLY \(PPRA\) DEACTIVATION}](#), all (ESA SODF:ECLSS:Activation & Checkout)
  - 20.6 ISS ↓ **MCC-H**, "COL Hatch is open."

# 1.501 NODE 2 PWS INSTALLATION SETUP

(ASSY OPS/1E/FIN/HC/MULTI E) Page 1 of 3 pages

## OBJECTIVE:

Established the data and power connection for the COL PWS to the Node 2 UOP.

### NOTE

Precondition: PWS installation performed according to procedure { 3.103 COL PCS/SSC/PWS INSTALLATION/REMOVAL}, all (ESA SODF: MSM: NOMINAL)

## LOCATION:

N2: UOP 1(2) /J4

## DURATION:

15 minutes

## PARTS:

COL PWS A31P Laptop P/N SEG33115360-303

A31p 16V DC Power Cable P/N SEG33116459-301

120VDC Pwr/Ethernet Cable P/N SEG39131206-303

US DC Power Supply (120VDC) P/N SEG33116412-302 or -303

### **WARNING**

Failure to remove power and apply close inhibit could result in electrical shock hazard.

NODE2  
UOP

1.

#### VERIFYING POWER REMOVED

√POWER OUT – RESET (illuminated white)

√FAULT/TEST – not illuminated

Refer to Figure 1

√TEST SELECT – not illuminated

sw US DC input Power Supply (120V) - Off

(P/N SEG33116412-302 or P/N SEG33116412-303)

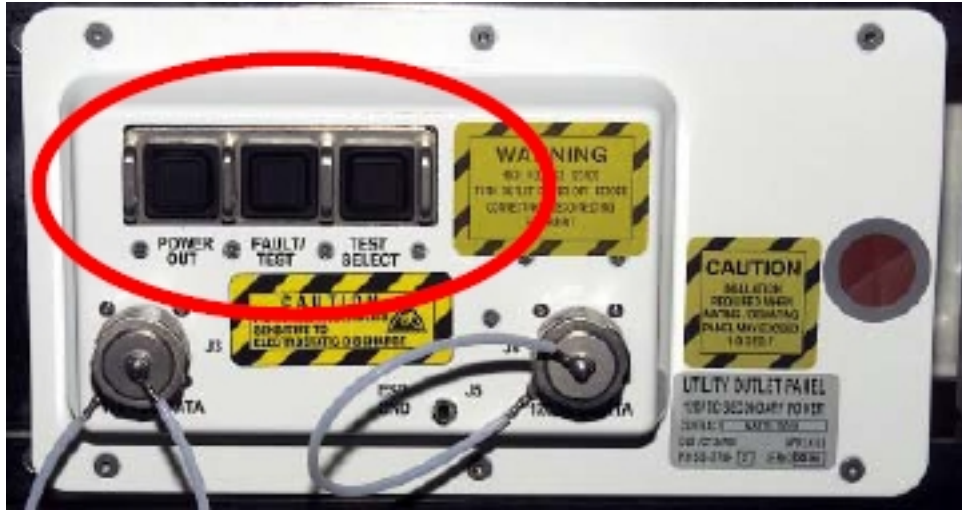


Figure 1. USOS UOP

2. [MAKING COL PWS POWER AND DATA CABLE CONNECTIONS](#)

NOTE

Figure 2 at the end of this procedure illustrates the cable connections to be made by crew.

- |         |  |
|---------|--|
| PWS     | <p>2.1 120VDC Pwr/Ethernet Cable → ← COL PWS, A31P Laptop Ethernet connector</p> <p>2.2 A31p 16V DC Power Cable → ← COL PWS, A31P Laptop power inlet</p> <p>2.3 Connect 16V Cable Assembly A31p with DC Power supply</p> <p style="padding-left: 40px;">DC Power Cable A31p 16V P/N SEG33116459-301 → ← A31P 120VDC Power Supply P/N SEG33116412-302 or P/N SEG33116412-303 in connector J2</p> <p>2.4 Connect Power Cable Assembly Data /120V with DC Power supply</p> <p style="padding-left: 40px;">120VDC Pwr/Ethernet Cable → ← A31P 120VDC Power Supply P/N SEG33116412-302 or P/N SEG33116412-303 in connector J1</p> |
| NODE2   | <p>2.5 Connect Power/Data cable with UOP Data Outlet</p>   |
| UOP1(2) | <p>120VDC Pwr/Ethernet Cable → ← UOP J4 according to table 1.</p>  |

- |                  |   |
|------------------|---|
| NODE2<br>UOP1(2) | <p>3. <a href="#">TURNING POWER ON FOR COL PWS</a></p> <p>POWER OUT → Press (switch depress)</p> <p>√POWER OUT – ENABLE (illuminated green)</p> <p>√FAULT/TEST – OK (illuminated green)</p> |
|------------------|---|



√TEST SELECT – not illuminated

- Pwr Sply 4. [TURNING ON A31P DC CONVERTER](#)  
sw US DC Input Power Supply (120V) - On (Lt On)

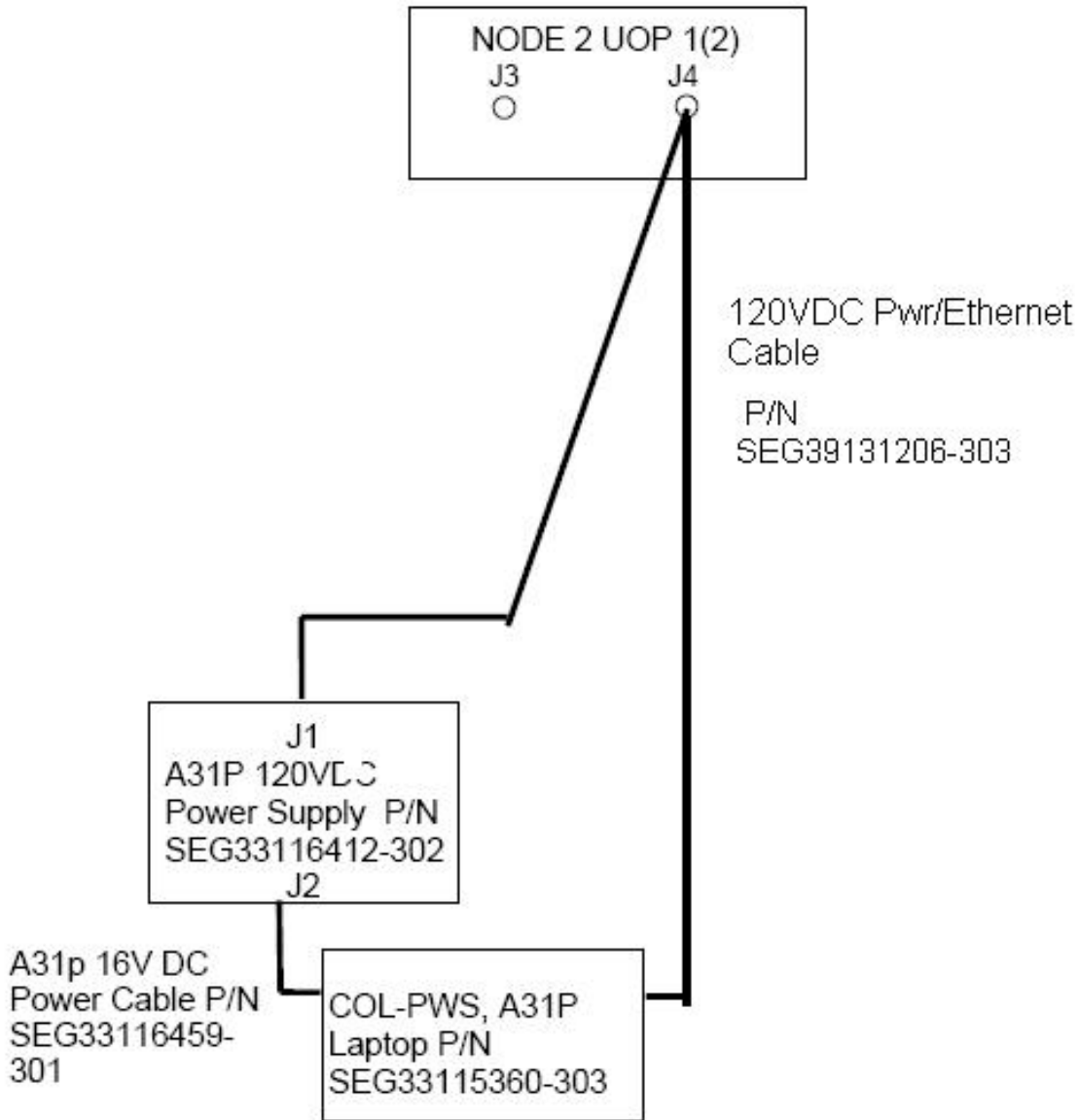


Figure 2. COL PWS Configuration

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# 1.511 NODE 2 PWS DEINSTALLATION

**OBJECTIVE:**

Power off Node 2 UOP outlets and A31P power converter. Disconnect cable assemblies from COL PWS and Node 2.

<b>WARNING</b>
Failure to remove power and apply close inhibit could result in electrical shock hazard

1. A31P POWER SUPPLY OFF

√COL-PWS Powered Off

Pwr Supply A31p 120V DC Power Supply Input Power sw → OFF (Lt Off)  
Refer to Figure 1.



Figure 1. USOS A31p120V DC Power Supply Input Side with Power Switch on Left, Output Side with Output Power Light on Right.

2. NODE2 UOP POWER AND DATA CONNECTION FOR PWS

NODE2  
UOP1(2)

Record the number of the Node 2 UOP which provides Data and Power to that COL PWS which shall be disconnected according to table 1

Table 1. NODE 2 UOP power and data provision

Pwr and Data (Nom)	UOP 1	J4
Pwr and Data (Red)	UOP 2	J4

Record the Node 2 UOP number [x] UOP: \_\_\_\_\_  
with [x ] = 1 to 2

3. NODE2 UOP(X) POWER OFF FOR PWS

NODE2  
UOP[x]

√POWER OUT – ■(blue RESET)

Refer to Figure 2.



Figure 2. USOS UOP

NODE2  
 UOP[x] 4. [VERIFYING POWER OFF](#)  
 ✓UOP[x] Power Light – Lt Off

5. [DISCONNECTING PWS POWER AND DATA CABLE](#)

**NOTE**

Figure 3 at the end of this procedure illustrates the cable and interfaces

- PWS
- 5.1 Disconnect power cable, 120VDC Pwr/Ethernet Cable from PWS  
 120VDC Pwr/Ethernet Cable P/N SEG39131206-303 ←|→ COL-PWS, A31P Laptop P/N SEG33115360-303 Ethernet connector
  - 5.2 A31p 16V DC Power Cable P/N SEG33116459-301 ←|→ COL-PWS, A31P Laptop P/N SEG33115360-303 power inlet
  - 5.3 DC Power Cable A31p 16V P/N SEG33116459-301 ←|→ A31P 120VDC Power Supply P/N SEG33116412-302(-303) in connector J2
  - 5.4 Disconnect 120VDC Pwr/Ethernet Cable from DC Power supply  
 120VDC Pwr/ Ethernet Cable P/N SEG39131206-303 ←|→ A31P 120VDC Power Supply P/N SEG33116412-302(-303) in connector J1
- NODE2  
 UOP[x] 5.5 Disconnect 120VDC Pwr/ Ethernet Cable from UOP

# 1.511 NODE 2 PWS DEINSTALLATION

120VDC Pwr/Ethernet Cable P/N SEG39131206-303 ←|→ UOP J4 according to Table 1

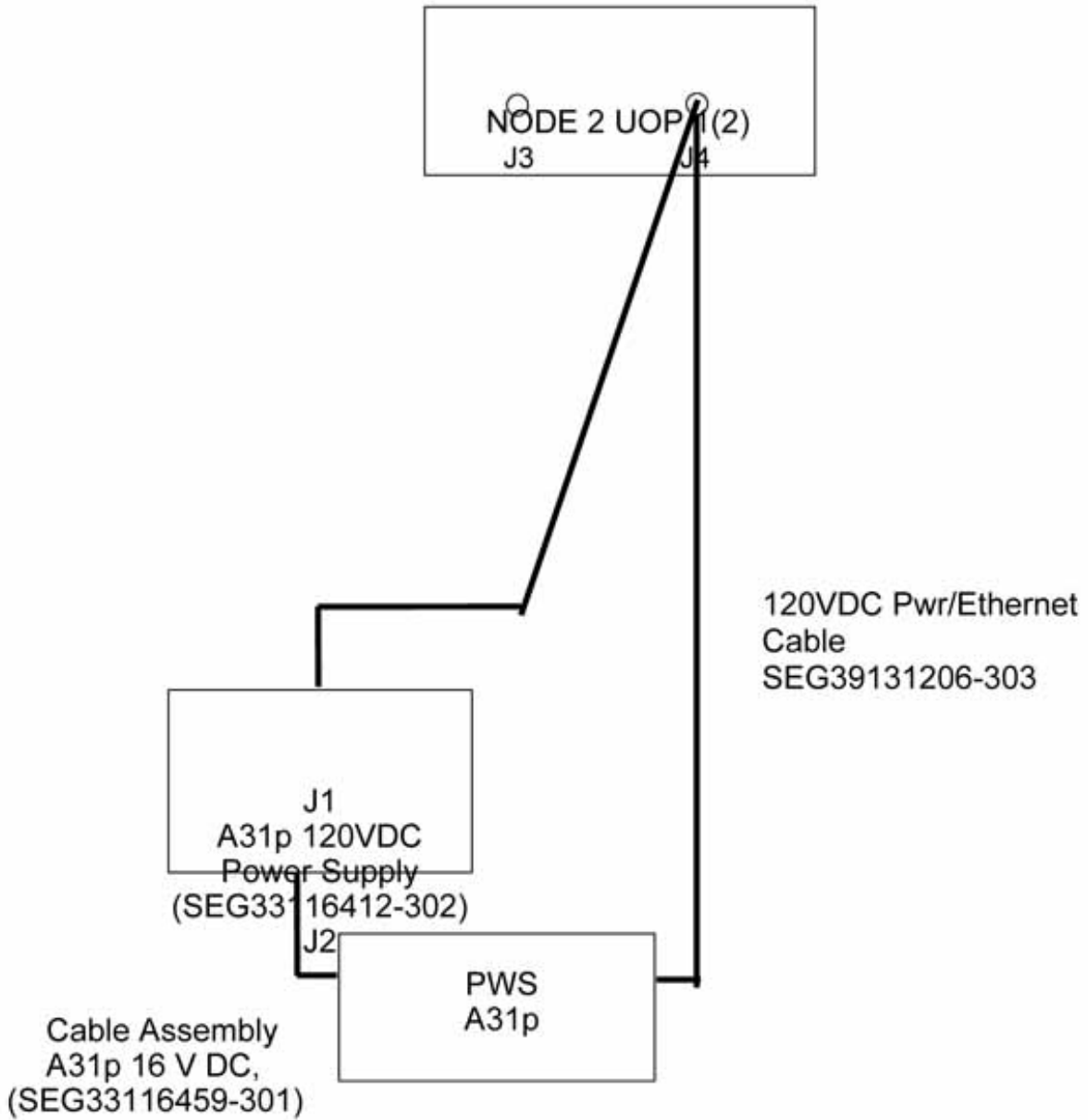


Figure 3. COL PWS Configuration.

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# COL PORTABLE BREATHING APPARATUS INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 9 pages

## OBJECTIVE:

Install a fully assembled Portable Breathing Apparatus (PBA) to an empty stowage bracket and verify that it is free of damage to ensure its functionality.

## LOCATION:

Stowed: √Inventory Management System (IMS)

Installed:

COL1PF (PBA1)

COL1SD (PBA2)

## DURATION:

10 minutes

## CREW

One

## PARTS:

Portable Breathing Apparatus (P/N 105428)

## MATERIALS:

Dry Wipes

Sharpie

Kapton Tape

## TOOLS:

DCS 760 CAMERA

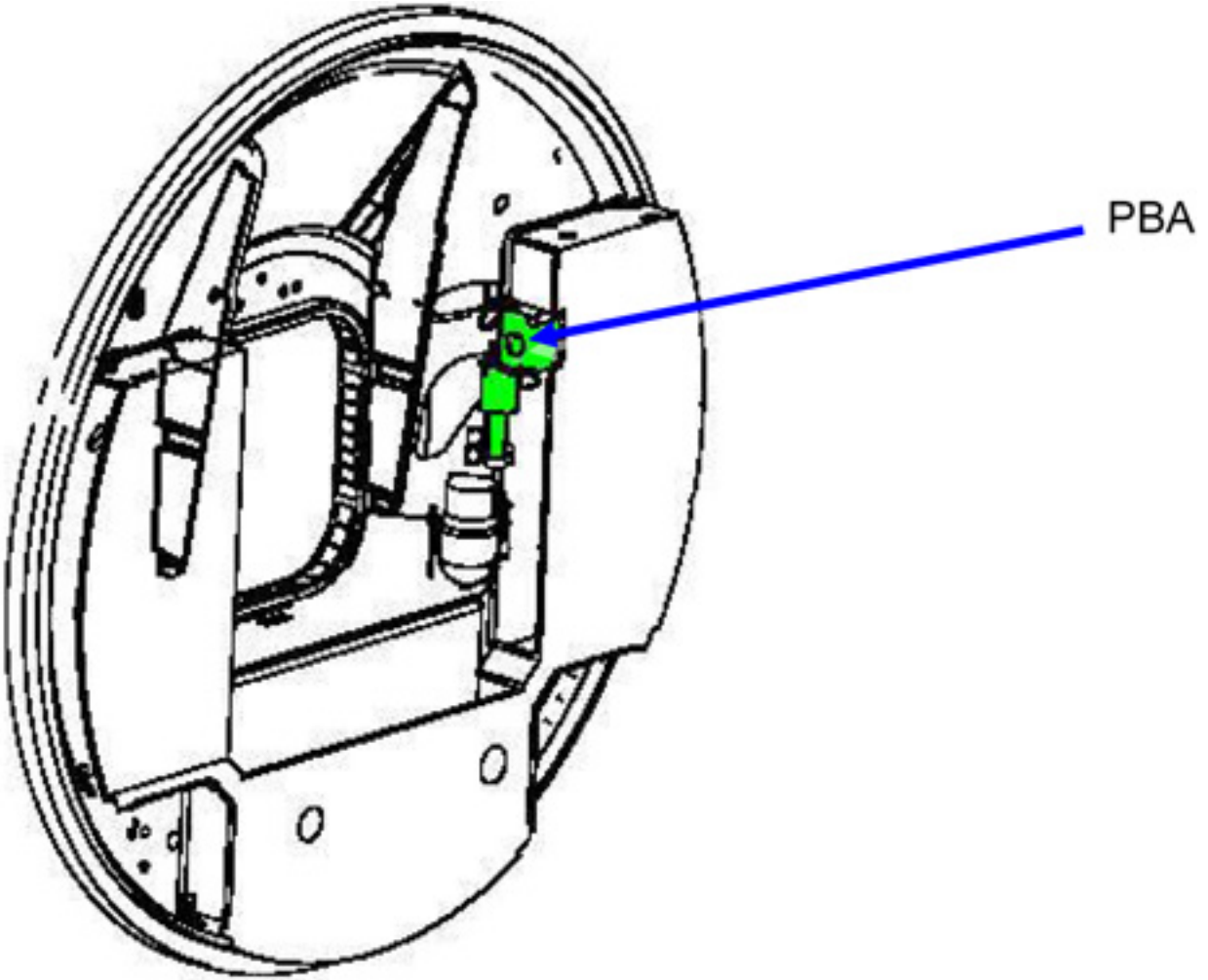


Figure 0-1 PBA Installation Location (Port Cone)



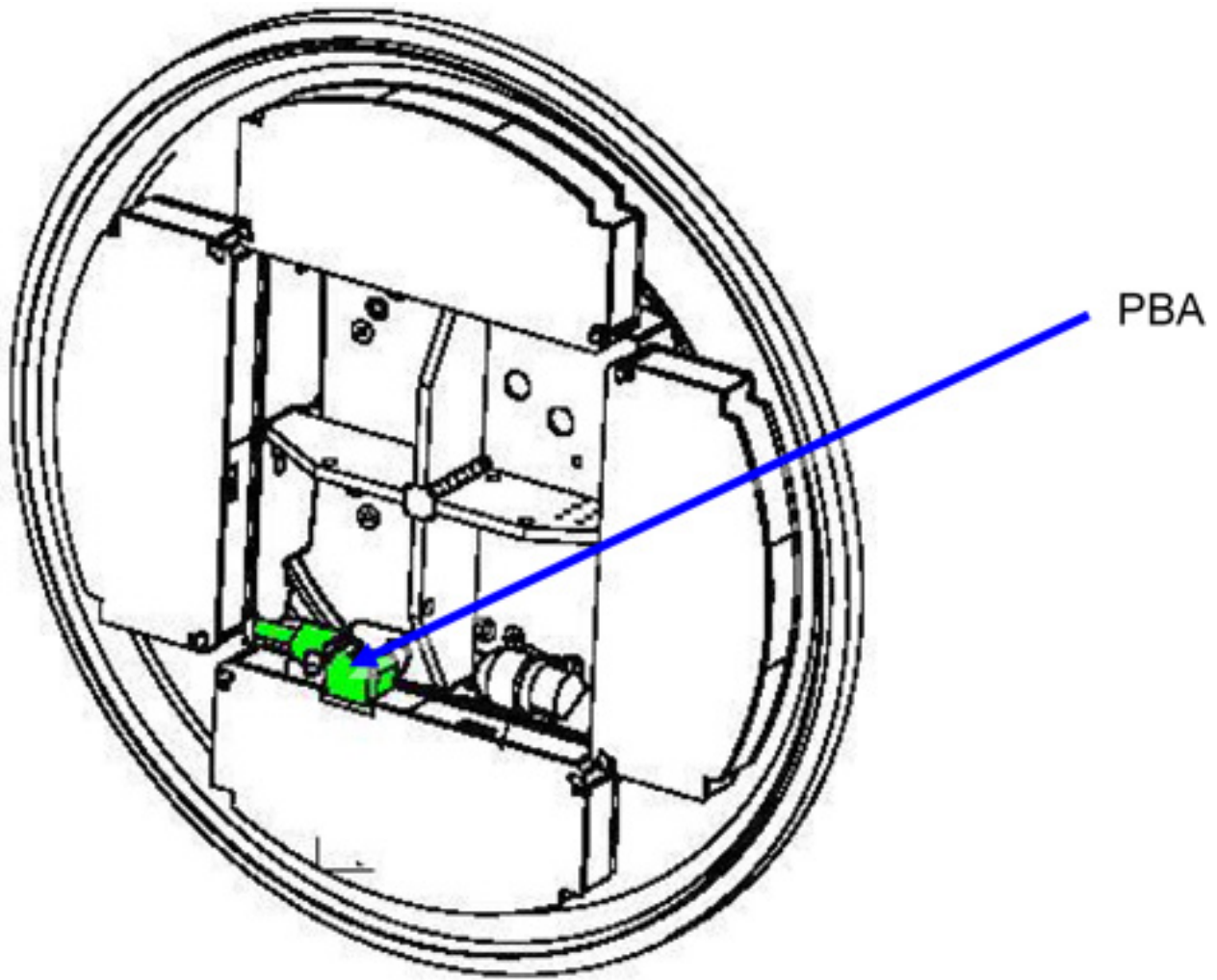


Figure 0-2 PBA Installation Location (Starboard Cone)

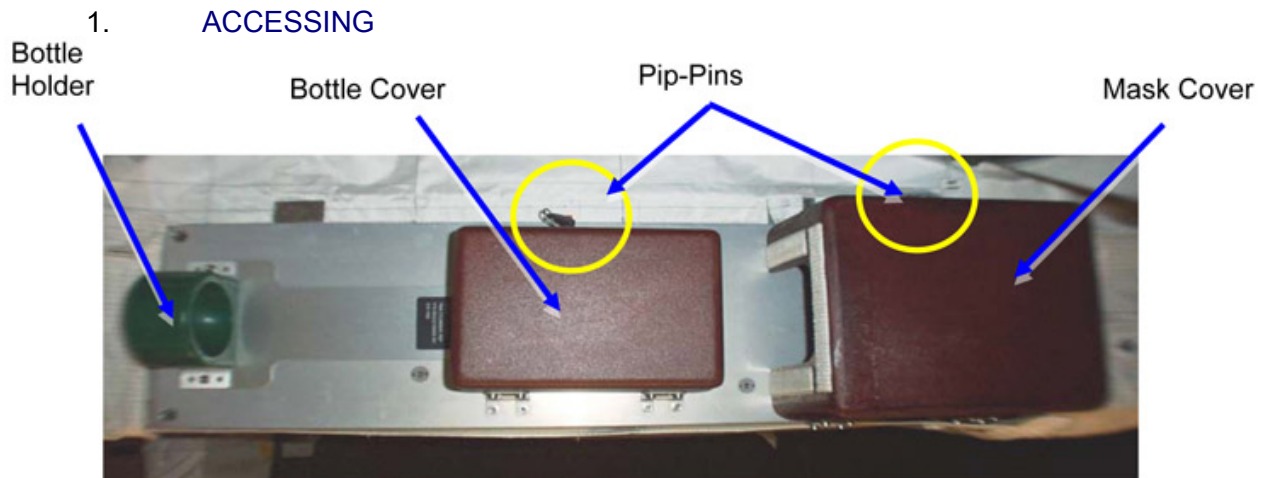


Figure 1-1 PBA1(2) Stowage Bracket Assembly (Covers Installed)

# COL PORTABLE BREATHING APPARATUS INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 4 of 9 pages

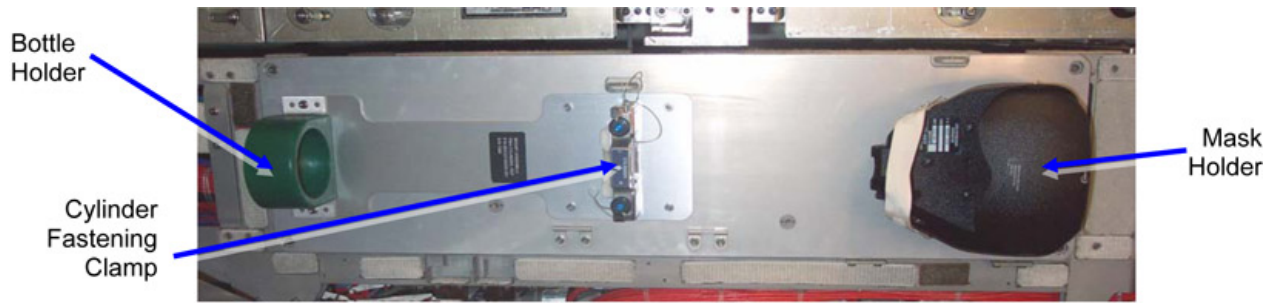


Figure 1-2 PBA1(2) Stowage Bracket Assembly (Covers Removed)

- 1.1 Release (tethered) pip-pins (2) and remove mask and bottle cover, (tmpry stow). Refer to Figure 1-1.

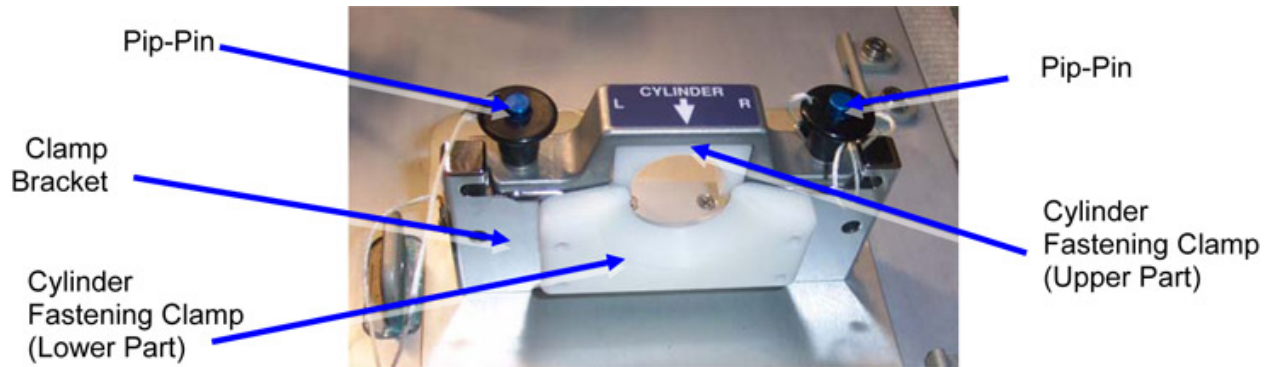


Figure 1-3 Cylinder (O2 Bottle) Fastening Clamb (Launch Configuration)

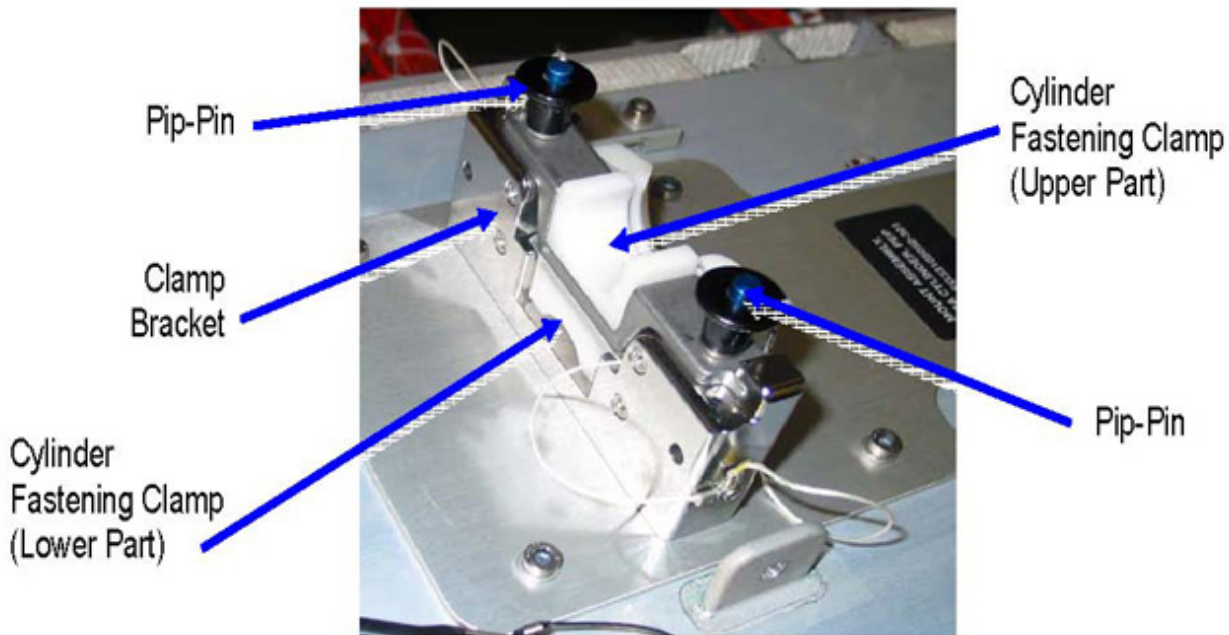


Figure 1-4 Cylinder (O2 Bottle) Fastening Clamp (On-Orbit Configuration)

- 1.2 Release (tethered) pip-pins (2) and remove cylinder fastening clamp upper & lower part. Refer to Figure 1-3.
- 1.3 Re-insert upper / lower part cylinder fastening clamp upside down into clamp bracket, secure with pip-pins (2). Refer to Figure 1-4.

2. INSPECTION

<b>CAUTION</b>
Do not activate any of the PBA hardware. Activation of this hardware could leave it in an off nominal configuration for emergency response.

# COL PORTABLE BREATHING APPARATUS INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 6 of 9 pages



Figure 2-1 Acceptable Pressure Gauge Reading (Kapton Tape not shown)

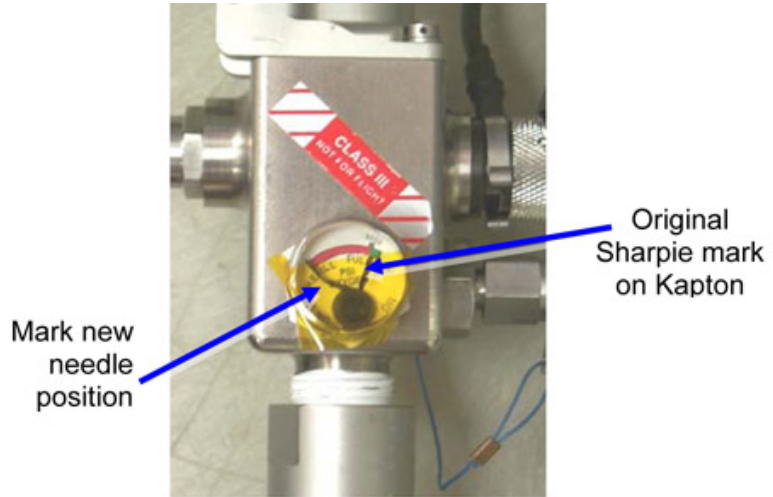


Figure 2-2 Pressure Gauge (w/ Kapton Tape and Mark)

- 2.1 Inspect Reducer / Cylinder (O<sub>2</sub> Bottle)
  - 2.1.1 Verify oxygen bottle does not have any obvious physical damage, corrosion, or audible leakage.
  - 2.1.2 Apply Kapton tape to pressure gauge. Mark needle position using extra fine point Sharpie pen. Refer to Figure 2-2.
  - 2.1.3 Verify oxygen bottle pressure gauge needle in the GREEN zone ( $\geq 3000$  psig).  
Bottle is considered acceptable if needle between the GREEN and RED zones.  
Refer to Figure 2-1.

```

*****
*           If needle is in the RED zone
*           |
*           |   Mark new needle position on Kapton tape
*           |   (extra fine point Sharpie pen),
*           |   Photograph gauge, including bar code label
*           |   in photograph,
*           |   Notify COL-CC.
*           |   Refer to Figures 2-1 / Figure 2-2.
*           |
*****

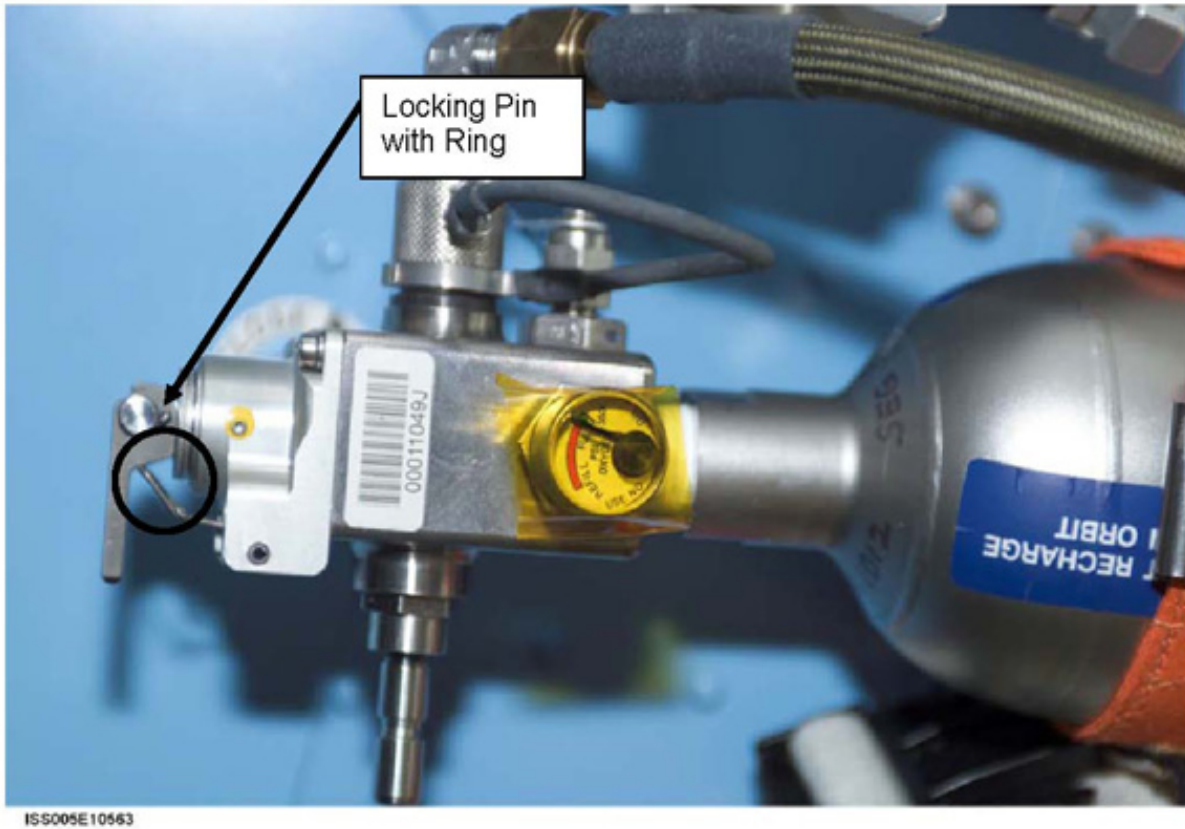
```

2.2 Inspect Mask / Hose

- 2.2.1 Verify mask pressure harness, visor does not have any obvious physical damage, deterioration, tears, debris, scratches, or cracking.
- 2.2.2 Verify the length of the PBA hose from mask to bottle does not have any obvious physical damage, deterioration, cuts, flattening, kinking, or cracking around the mating area of the hose.
- 2.2.3 Verify mask regulator does not have any obvious physical damage, and that it is set in the NORMAL mode.
- 2.2.4 If required, clean mask visor using Dry Wipes.
- 2.2.5 Verify microphone module, microphone, communication cable, and earphone cable assembly are secure and free of damage.
- 2.2.6 Pack inflatable harness into mask.

3. INSTALLATION

- 3.1 Remove Locking Pin with ring from each PBA Unit (ref Figure 3-2). Discard Locking Pin with Ring.



ISS005E10563

Figure 3-1 PBA Locking Pin with Ring

Fastening  
Strap



Figure 3-2 PBA1(2) at Installation Location  
(Protection Covers not installed)

- 3.2 Place Oxygen bottle on holder and into clamp.  
Refer to Figure 3-2.
- 3.3 Place quick-don mask on mask holder, secure by strap.  
Refer to Figure 3-2.

# COL PORTABLE BREATHING APPARATUS INSTALLATION

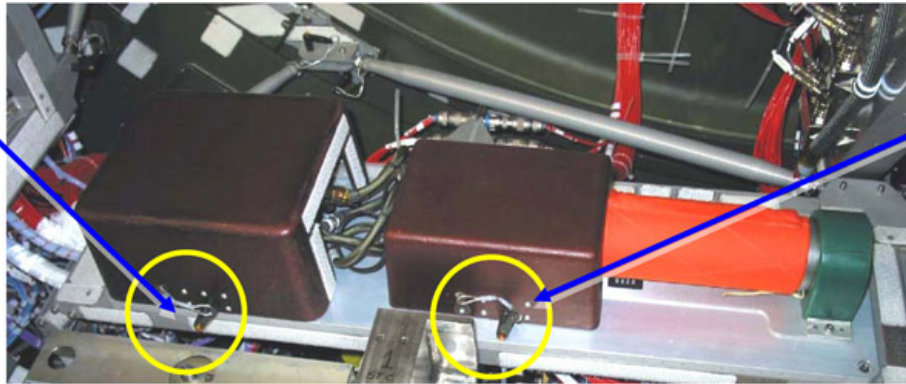
(ASSY OPS/1E/FIN/MULTI E)

Page 9 of 9 pages

3.4 Restrain O2 hose to hose holder.

## 4. CLOSEOUT

Pip - Pin



Pip - Pin

Figure 4-1 PBA1(2) at Installation Location  
(Protection Covers installed)

- 4.1 Phoyo document the PBA1(2) as installed (DCS 760 Camera)
- 4.2 Attach mask and bottle cover, secure by inserting pip-pins (2).
- 4.3 Verify hose is not pinched/kinked and the cover is free of obstruction.  
Refer to Figure 4-1.

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# COL PORTABLE FIRE EXTINGUISHER INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 7 pages

## OBJECTIVE:

Install a Portable Fire Extinguisher (PFE) to an empty stowage support bracket and verify that it is free of damage to ensure functionality. Procedure is applicable for both PFEs.

## LOCATION:

Installed:

COL1PF (PFE1)

COL1SD (PFE2)

Stowed: √Inventory Management System (IMS)

## DURATION:

10 minutes

## CREW

One

## PARTS:

Portable Fire Extinguisher (P/N 683-10050-1)

## TOOLS:

LAB1

DCS 760 CAMERA

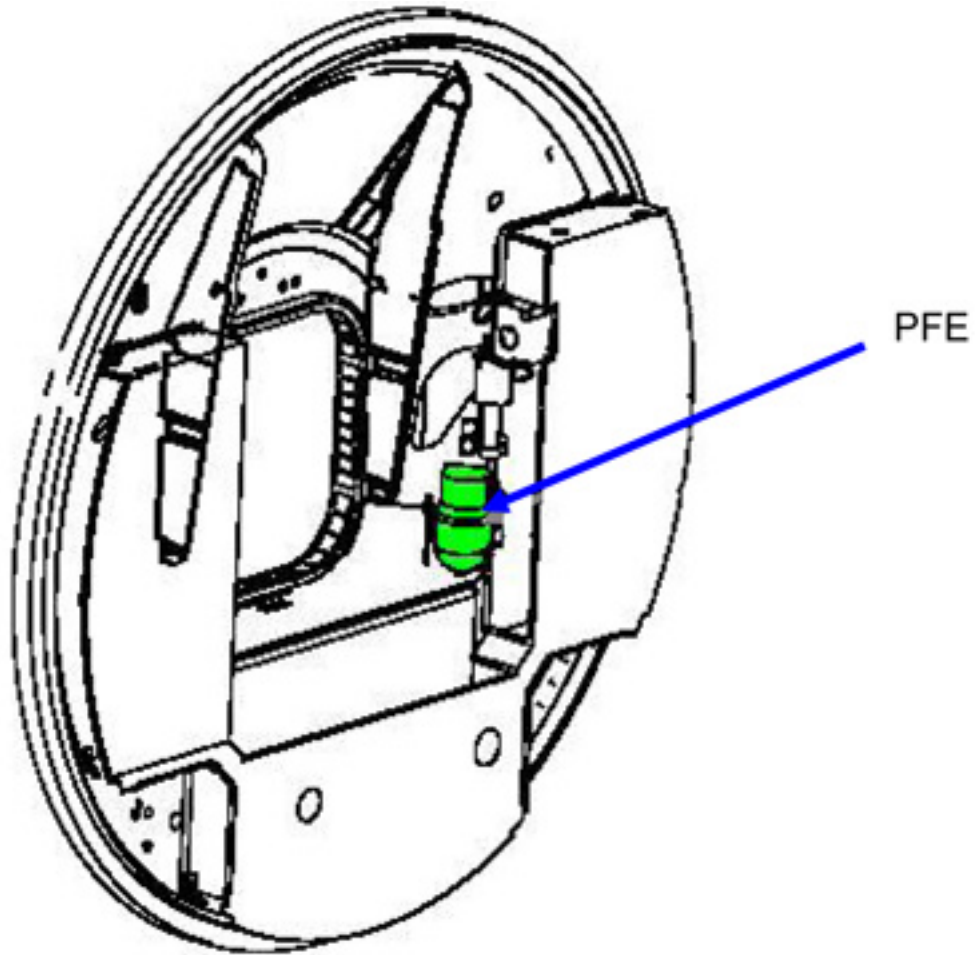


Figure 0-1 PFE Installation Location (Port Cone)

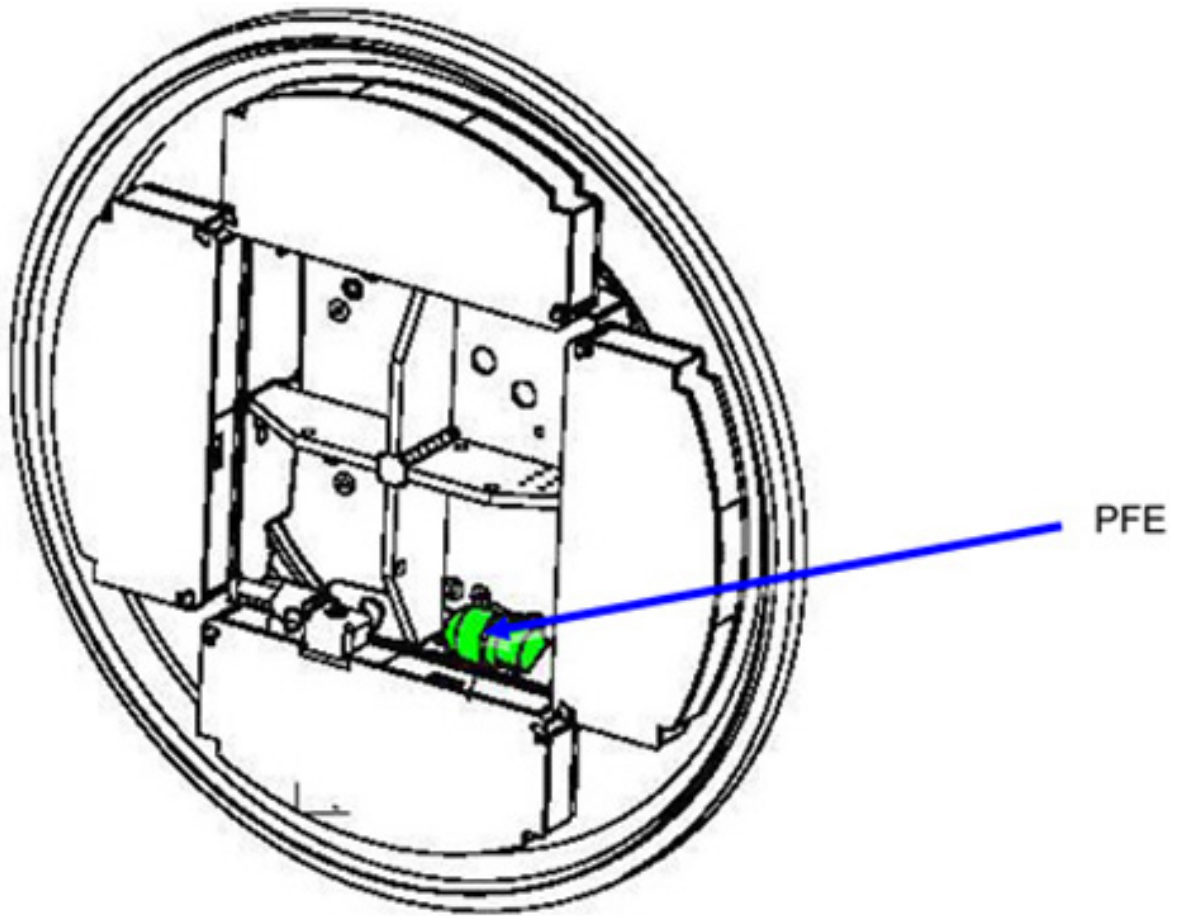


Figure 0-2 PFE Installation Location (Starboard Cone)

1. ACCESSING

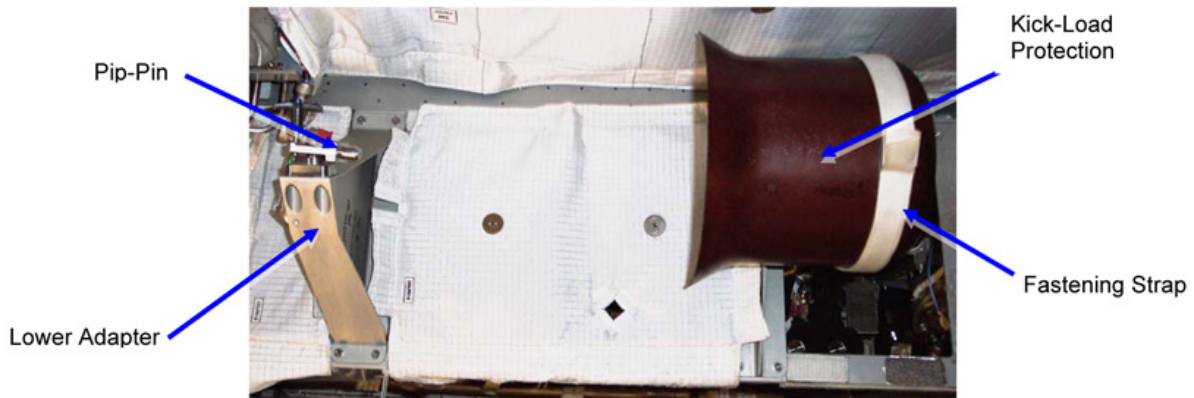


Figure 1-1 PFE1(2) Stowage Support Bracket

- 1.1 Release fastening strap and remove kick-load protection, temporary stow.

Refer to Figure 1-1.

¼-Turn  
Fastener



Figure 1-2 Upper Clamp w/ ¼-Turn Fastener

Pip-Pin

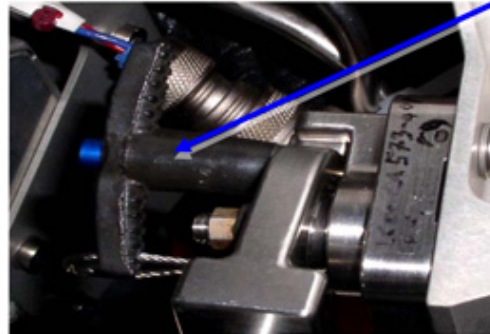


Figure 1-3 Pip-Pin at Lower Adapter

- 1.2 Release ¼-turn fastener (captive) and open upper clamp. Refer to Figure 1-2.
- 1.3 Release pip-pin (tethered) from lower adapter. Refer to Figure 1-3.
- 1.4 Rotate lower adapter outwards and into cabin.

2. INSPECTION



Figure 2-1 PFE1(2) Details

## COL PORTABLE FIRE EXTINGUISHER INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 5 of 7 pages

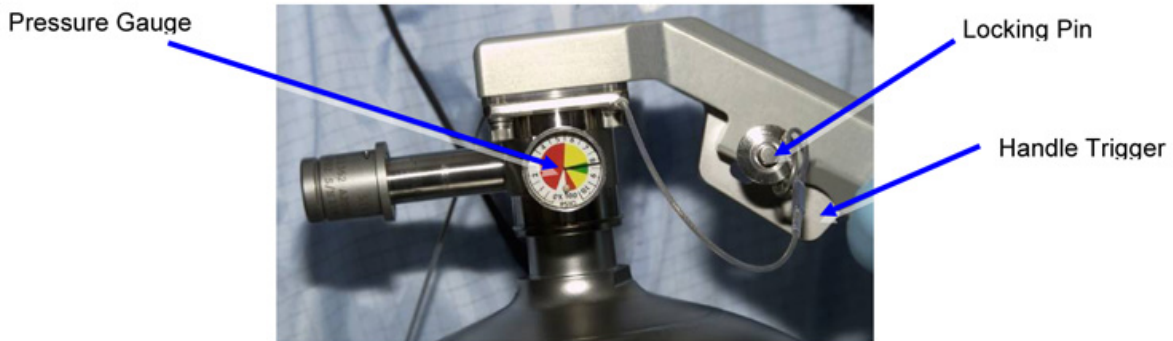


Figure 2-2 PFE1(2) Pressure Gauge and Handle Details

- 2.1 Verify both nozzles are tethered to bottle and are inserted in cover pockets.  
Refer to Figure 2-1.
- 2.2 Verify no obvious physical damage to bottle or cover, or audible leakage.
- 2.3 Verify area nozzle pockets are securely fastened and that both nozzles are free of damage.  
Refer to Figure 2-1.
- 2.4 Verify that pressure gauge needle is in GREEN zone (800 to 900 psig).  
Refer to Figure 2-2.
- 2.5 Apply Kapton tape to pressure gauge. Mark needle position using extra fine point Sharpie pen.
- 2.6 Verify that locking pin is inserted through hole in handle trigger and is fully seated to prevent unintentional discharge.  
Refer to Figure 2-2.

3. INSTALLATION

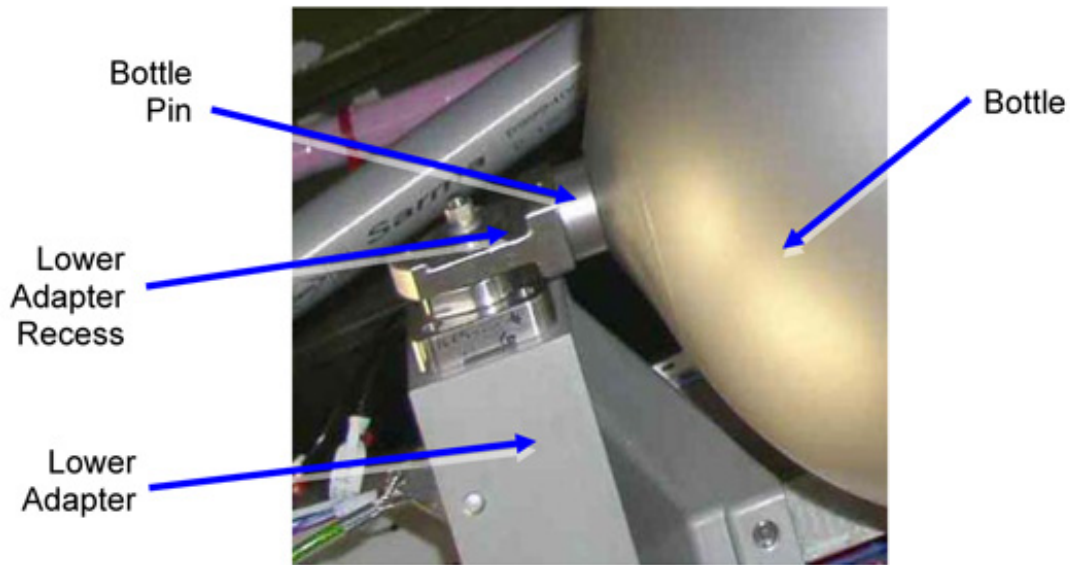


Figure 3-1 Details of Lower Adapter

- 3.1 Place PFE1(2) on lower adapter by inserting bottle pin into recess. Refer to Figure 3-1.
- 3.2 Rotate PFE1(2) into stowed position.
- 3.3 Stow lower adapter pip-pin, attach to velcro.

4. CLOSEOUT

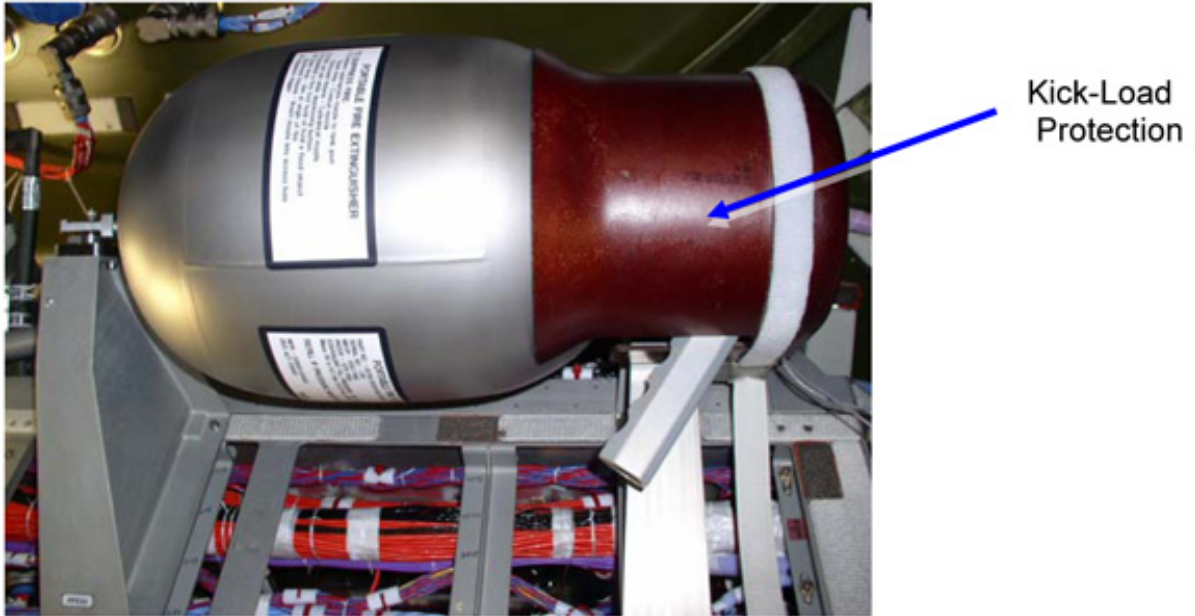


Figure 4-1 PFE1(2) on Stowage Bracket  
(Bottle cover not installed)

- 4.1 Verify PFE1(2) is correctly located on support bracket and free of obstruction.  
Refer to Figure 4-1.
- 4.2 Photo document the PFE1(2) as installed (DCS 760 Camera)
- 4.3 Install kick-load protection.  
Refer to Figure 4-1.

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## COL EMERGENCY LIGHT POWER SUPPLY- ENABLE

(ASSY OPS/1E/FIN/HC/MULTI E) Page 1 of 5 pages

### OBJECTIVE:

Activate the Emergency Light function inside Columbus by enabling the Emergency Light Power Supply (ELPS) unit.

### LOCATION:

COL1PDC

### DURATION:

10 minutes

### CREW:

One

### PARTS:

None

### MATERIALS:

Ziplock Bag 4x4

Sharpie

### TOOLS:

Maglite

### ISS IVA Toolbox

Drawer 3:

Inspection Mirror



Figure 0-1 Emergency Light Power Supply Unit  
(Typical Configuration, not installed)

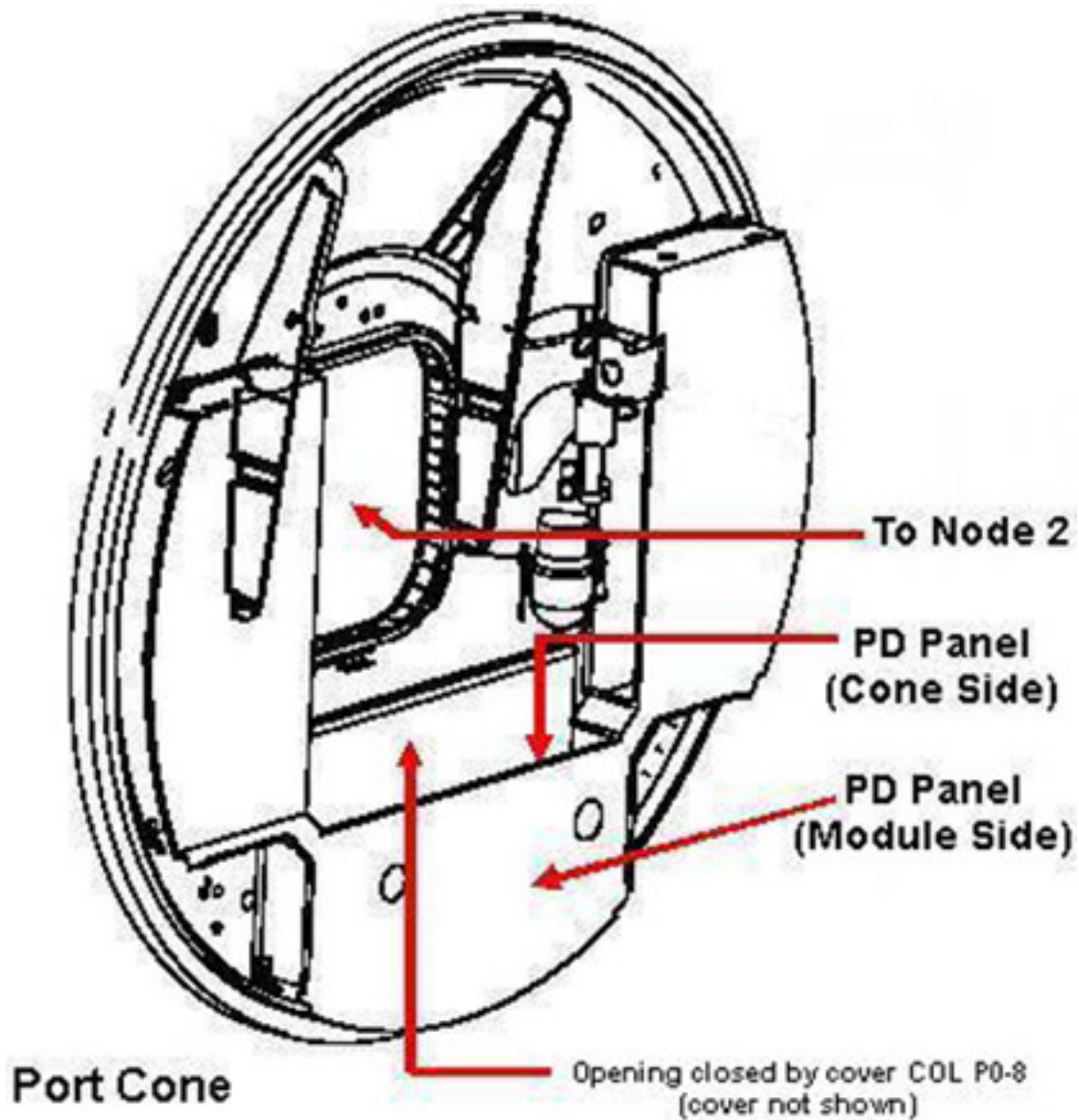


Figure 0-2 ELPS Installation Location

1. [ACCESSING](#)
  - 1.1 Remove closeout cover COLP0-8.  
Temporarily stow.  
Refer to Figure 0-2.

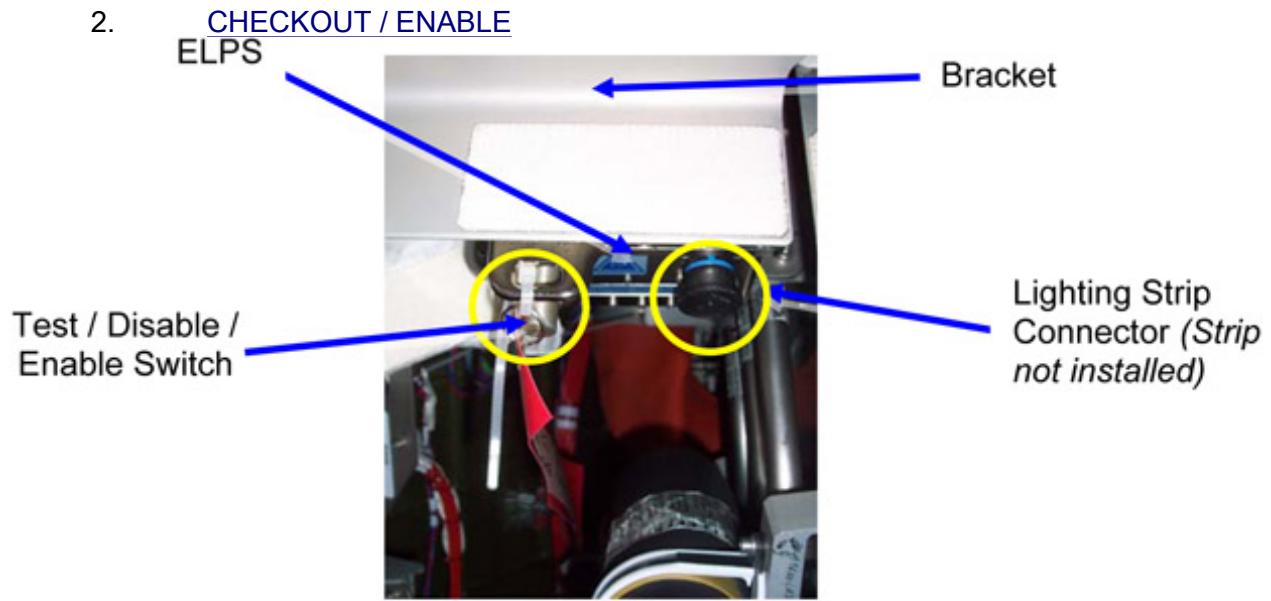


Figure 2-1 ELPS PDC Panel Installation

- 2.1 Remove protection cap from TEST / DISABLE / ENABLE switch, stow in Ziplock bag.

NOTE

Protection cap shall not be reinstalled on ELPS.

- 2.2 Label Ziplock bag, temporary stow (Sharpie).
- 2.3 sw TEST / DISABLE / ENABLE → TEST (hold switch until proper indication).  
Refer to Figure 2-1.

NOTE

Flashing LED indicates battery charging only, if charge capacity is > 80% LED will remain ON.

- 2.4 ✓ ELPS Status LED – illuminated (Inspection Mirror, Maglite).  
Verify ELPS Status LED – not flashing.
- 2.5 ✓ Emergency Egress Light Strip – illuminated.
- 2.6 sw TEST / DISABLE / ENABLE → ENABLE.  
Refer to Figure 2-1.

3. POST MAINTENANCE

- 3.1 Install closeout cover COLP0-8.

- 3.2 ISS ↓ **COL-CC** of task completion.
- 3.3 Update IMS, stow tools / equipment.

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## PORTABLE FOOT LOOP DESTOWAGE

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 6 pages

### OBJECTIVE:

Destow the four Portable Foot Loops from the launch stowage position, install and set the inclination of the foot plate.

### LOCATION:

Stowed: COL1D2

### DURATION:

20 min

### CREW:

One

### PARTS:

None

### MATERIALS:

None

### TOOLS:

#### Columbus Tool Kit:

##### Tool Bag 1:

Ratchet Wrench 1/4"

102mm Extension, 1/4" Drive

##### Tool Bag 3:

M5 (4mm) Hex Head Driver, 1/4" Drive

### REFERENCED PROCEDURE(S):

None

# PORTABLE FOOT LOOP DESTOWAGE

(ASSY OPS/1E/FIN/MULTI E)

Page 2 of 6 pages

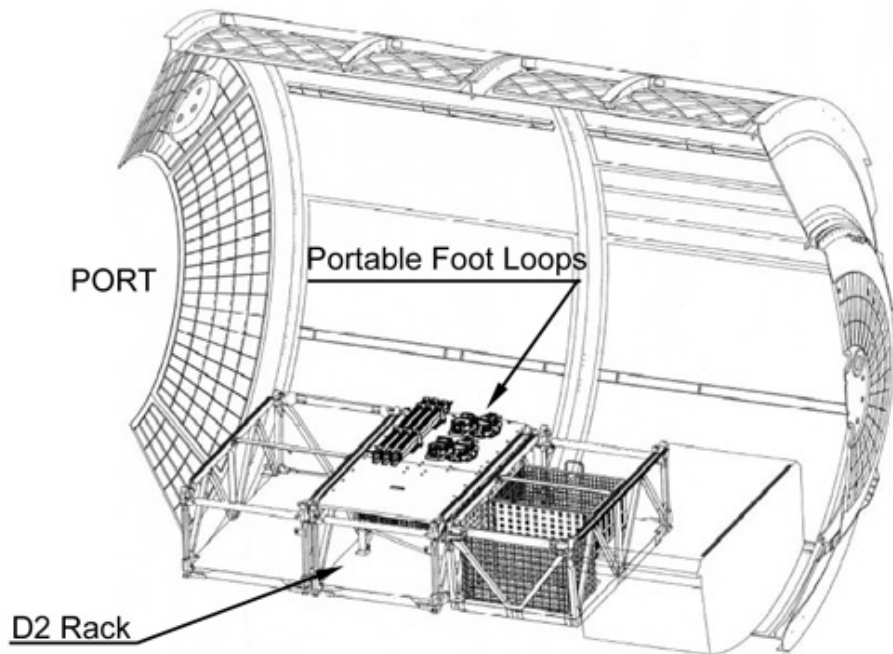


Figure 1. Columbus D2 Rack – Portable Foot Loops Stowage Location at Launch

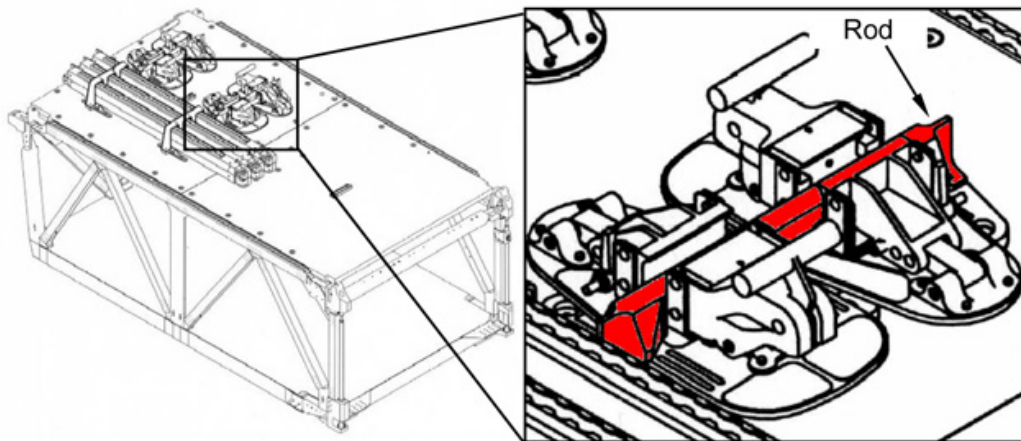


Figure 2. Portable Foot Loop – Launch position

## 1. DESTOWING PORTABLE FOOT LOOPS

### NOTE

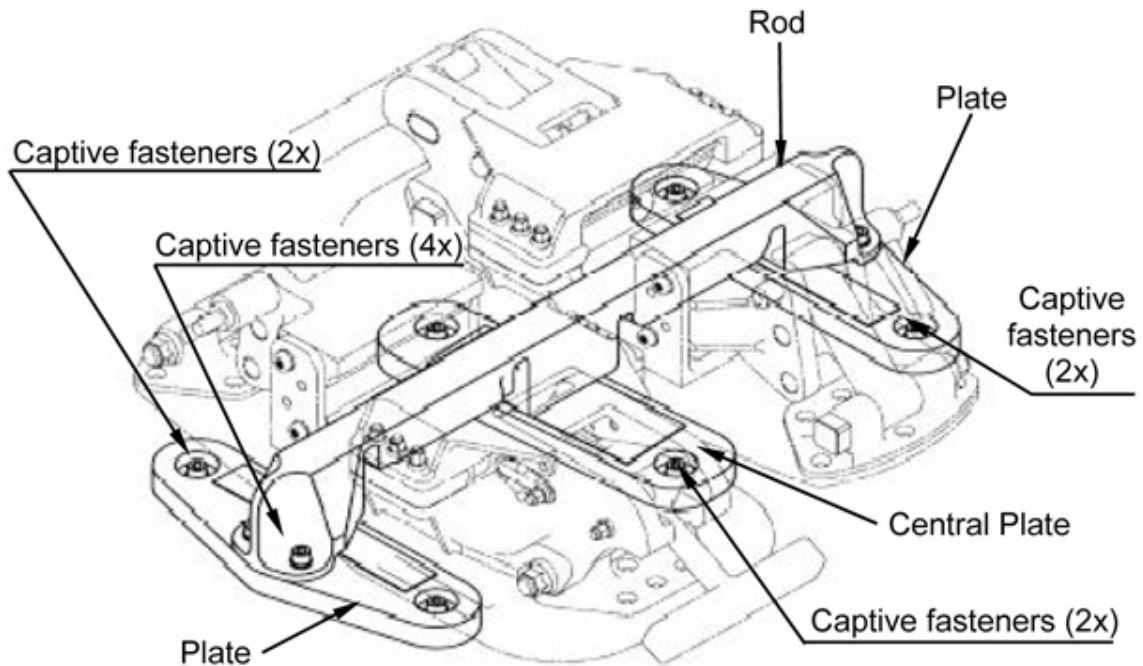
1. Two couples of Portable Foot Loops are installed onto D2 Rack: following steps are repeated for both the locations.
2. Portable Foot Loops are restrained by mean of a removable Rod and three removable Plates.
3. Rod and Plates fasteners are captive.
4. One Rod restrains a couple of Portable Foot Loops.
5. For this section refer to Figures 2 and 3.



## PORTABLE FOOT LOOP DESTOWAGE

(ASSY OPS/1E/FIN/MULTI E)

Page 3 of 6 pages



**Figure 3. Portable Foot Loop bracket assy**

- 1.1 Remove restraining Rod, fasteners (four) (Ratchet Wrench 1/4"; 102 mm Extension, 1/4" Drive; M5 (4mm) Hex Head Driver 1/4" Drive) Temporary stow.

**NOTE**

To complete the Portable Foot Loop destowage, plates (three) installed onto D2 Rack are removed.

- 1.2 Remove Portable Foot Loops (two) from the stowage position. Temporary stow.
- 1.3 Remove Plates (two), fasteners (four each) (Ratchet Wrench 1/4"; 102 mm Extension, 1/4" Drive; M5 (4 mm) Hex Head Driver 1/4" Drive). Temporary stow.
- 1.4 Remove Central Plate, fasteners (two) (Ratchet Wrench 1/4"; 102 mm Extension, 1/4" Drive; M5 (4 mm) Hex Head Driver 1/4" Drive). Temporary stow.
- 1.5 Repeat for the other launch stowage location.

# PORTABLE FOOT LOOP DESTOWAGE

(ASSY OPS/1E/FIN/MULTI E)

## 2. INSTALLING THE PORTABLE FOOT LOOP

### NOTE

1. The Portable Foot Loop can only be installed on handrails. It does not fit on Columbus Banisters.
2. following steps are repeated for each Portable Foot Loop.
3. For this section refer to Figures 4 and 5.

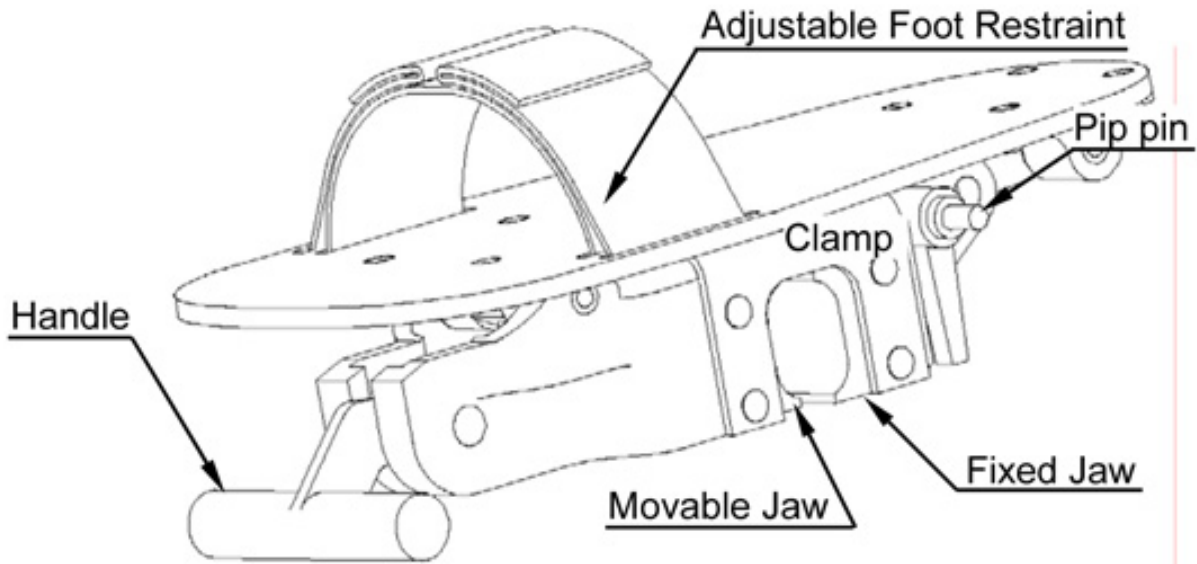


Figure 4. Portable Foot Loop Configuration

- 2.1 Push Handle down 1/4 turn to open clamp.

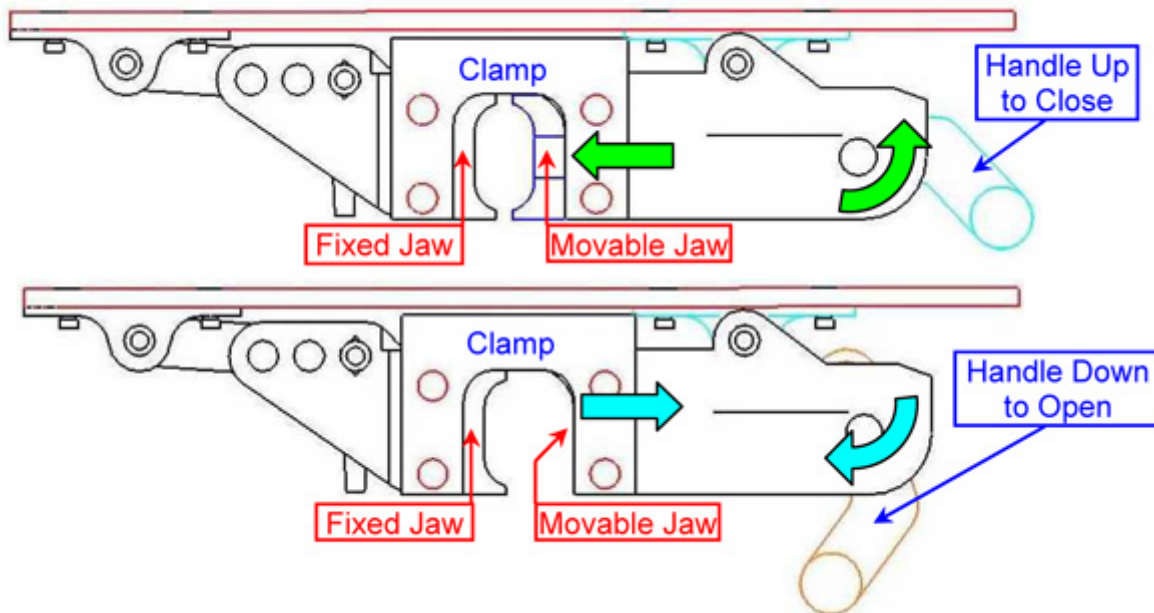


Figure 5. Portable Foot Loop Clamp Operations

- 2.2 Install Portable Foot Loop on the selected handrail.
- 2.3 Pull handle up 1/4 turn to close clamp.
- 2.4 Adjust Foot Restraint to accommodate foot.

3. SETTING FOOT PLATE INCLINATION

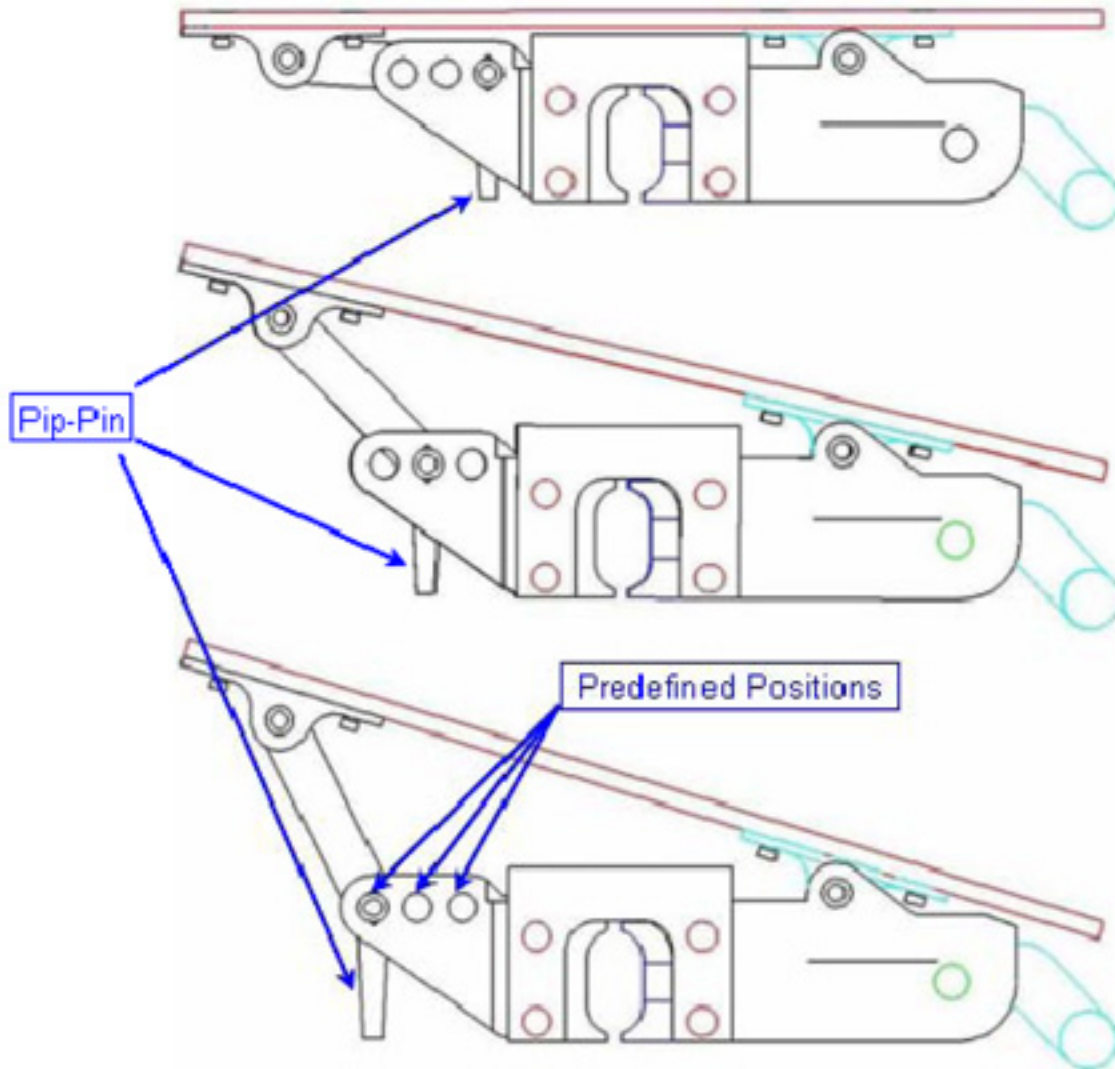


Figure 6. Portable Foot Loop Inclination

- 3.1 Remove Pip-Pin to unlatch Inclination Mechanism. Refer to Figure 4.
- 3.2 Slide the Inclination Mechanism to one of the three predefined positions.
- 3.3 Install Pip-Pin to latch Inclination Mechanism.

4. POST REMOVAL

## PORTABLE FOOT LOOP DESTOWAGE

(ASSY OPS/1E/FIN/MULTI E)

Page 6 of 6 pages

- 4.1 ISS ↓ COL-CC of task completion, stowage location of Rod and Plates and installation location of Portable Foot Loops.  
Stow tools.

## **PARTITION POSTS DESTOWAGE**

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 7 pages

### OBJECTIVE:

Destow the three Columbus Partition Posts from their launch stowage position and install in dedicated Columbus locations.

### LOCATION:

Stowed: COL1D2

### DURATION:

25 min

### CREW:

One

### PARTS:

None

### MATERIALS:

None

### TOOLS:

#### Columbus Tool Kit:

##### Tool Bag 1:

Ratchet Wrench 1/4"

##### Tool Bag 2:

6" Extension, 1/4" Drive

##### Tool Bag 3:

M5 (4mm) Hex Head Driver, 1/4" Drive

### ITEMS TO UNSTOW WITHIN PROCEDURE:

None

### REFERENCED PROCEDURE(S):

None

# PARTITION POSTS DESTOWAGE

(ASSY OPS/1E/FIN/MULTI E)

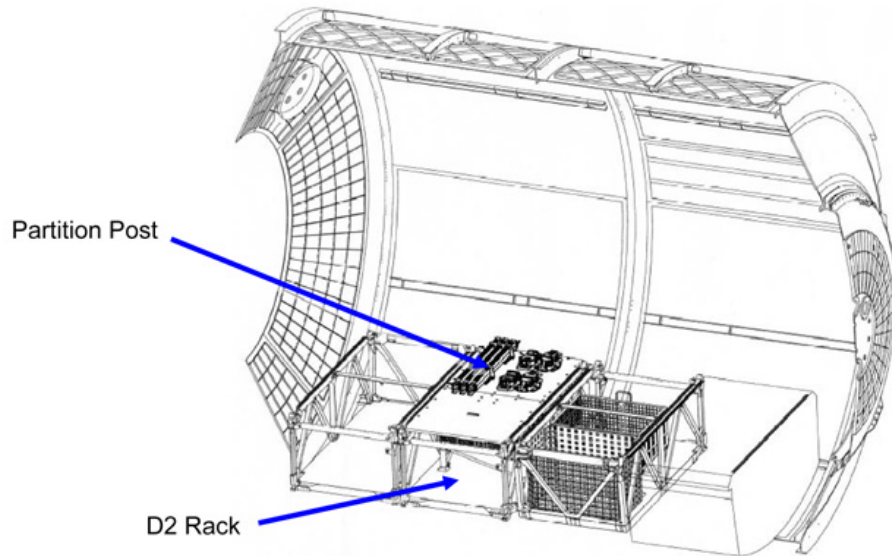


Figure 0-1 Columbus D2 Rack at Launch – Partition Post Stowage location

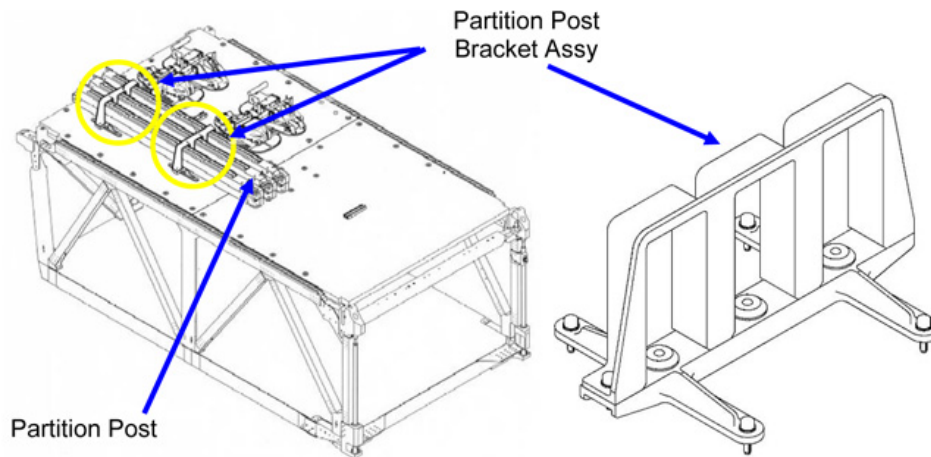


Figure 0-2 Partition Post – Launch position

## 1. DESTOWING PARTITION POST

### NOTE

1. Partition Posts are stowed onto D2 Rack by mean of two removable brackets. Refer to Figure 2.
2. Each Partition Post is folded in two pieces at launch.
3. All fasteners on brackets are captive.

## PARTITION POSTS DESTOWAGE

(ASSY OPS/1E/FIN/MULTI E)

Page 3 of 7 pages

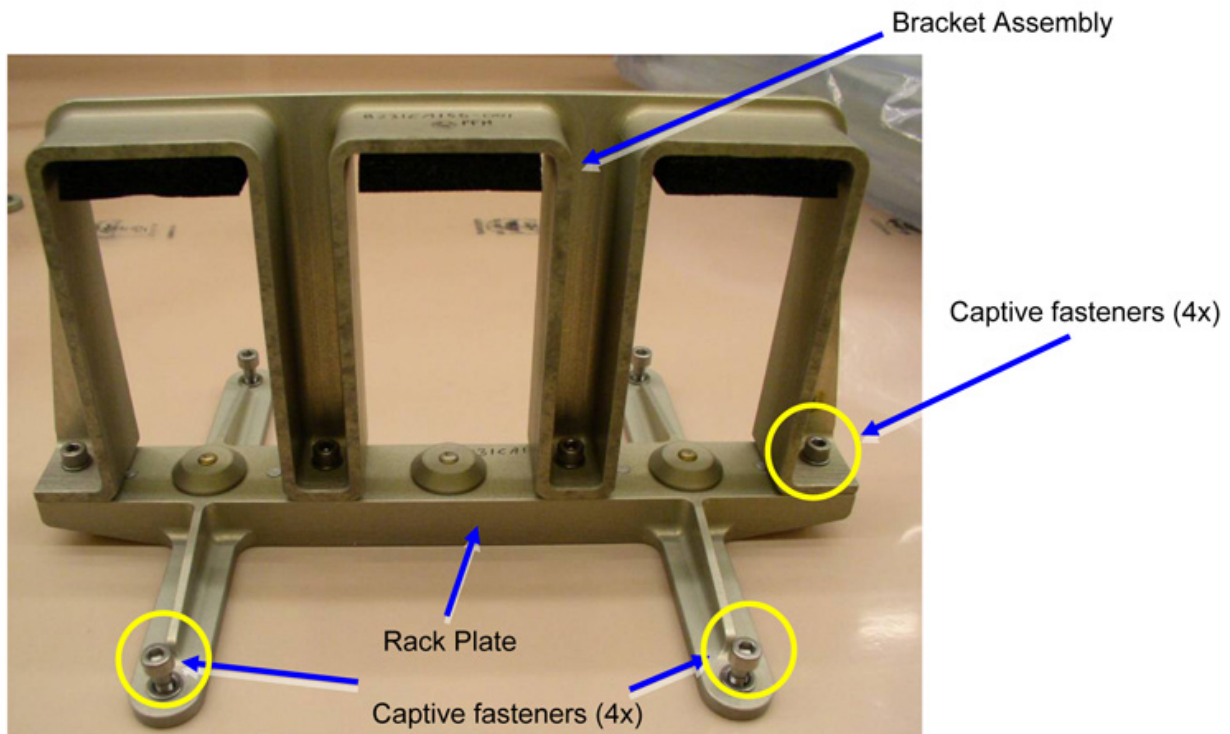


Figure 1-1 Partition Post Bracket Assembly (before installation)

- 1.1 Remove Bracket Assemblies (two), fasteners (four each) (Ratchet Wrench 1/4"; 6" Extension, 1/4" Drive; M5 (4mm) Hex Head Driver 1/4" Drive).  
Temporary stow.  
Refer to Figure 1-1.
- 1.2 Remove Partition Post (three) from the stowage position.  
Temporary stow.

### NOTE

To complete the Partition Post destowage task, Rack Plates (two) installed onto D2 Rack front panel have to be removed.

- 1.3 Remove Rack Plates (two), fasteners (four each) (Ratchet Wrench 1/4"; M5 (4mm) Hex Head Driver, 1/4" Drive).  
Temporary stow.  
Refer to Figure 1-1.

## PARTITION POSTS DESTOWAGE

(ASSY OPS/1E/FIN/MULTI E)

Page 4 of 7 pages

### 2. INSTALLING THE PARTITION POST

#### NOTE

1. Each Partition Post has to be unfolded before installation. Refer to Figure 2-1.
2. When unfolded the Partition Post is divided in two semi Partition Posts. Refer to Figure 2-2.
3. Partition Post Quick Release Pins are tethered to the Partition Post.

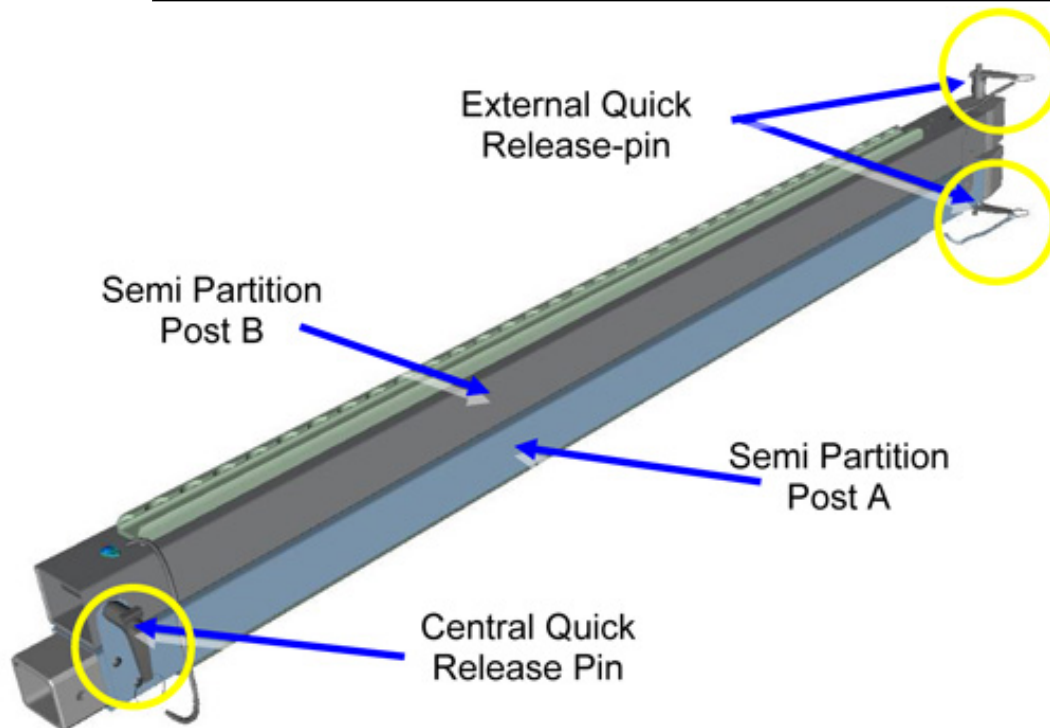


Figure 2-1 Folded Partition Post

- 2.1 Remove central quick release pin, then unfold Partition Post. Refer to Figure 2-1.



## PARTITION POSTS DESTOWAGE

(ASSY OPS/1E/FIN/MULTI E)

Page 5 of 7 pages

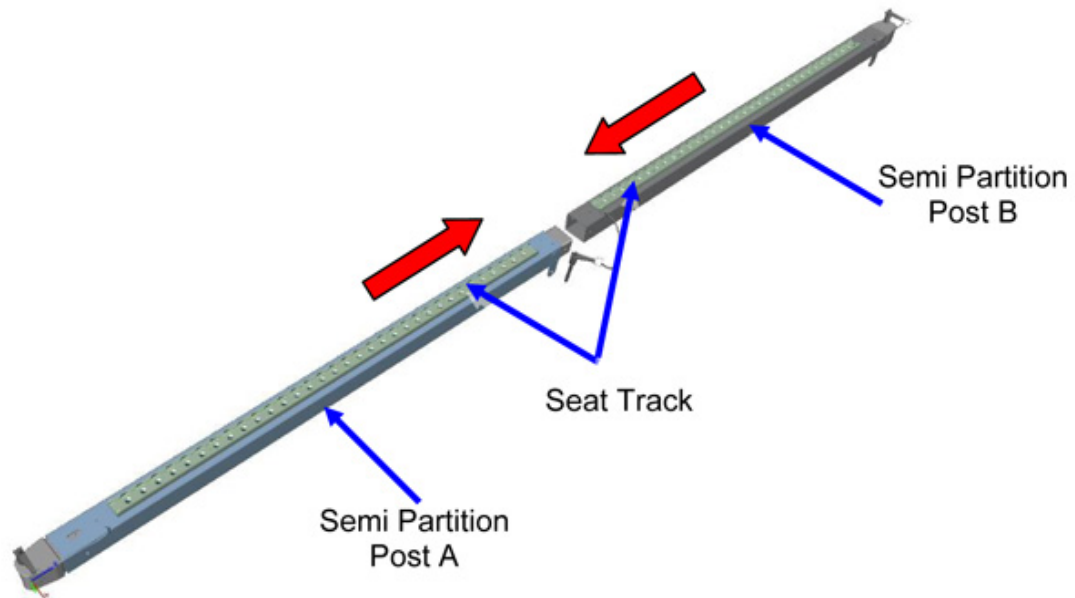


Figure 2-2 Assembly of the two semi Partition Posts

- 2.2 Insert semi Partition Post A in semi Partition Post B, then secure with central quick release pin. Refer to Figure 2-2.

# PARTITION POSTS DESTOWAGE

(ASSY OPS/1E/FIN/MULTI E)

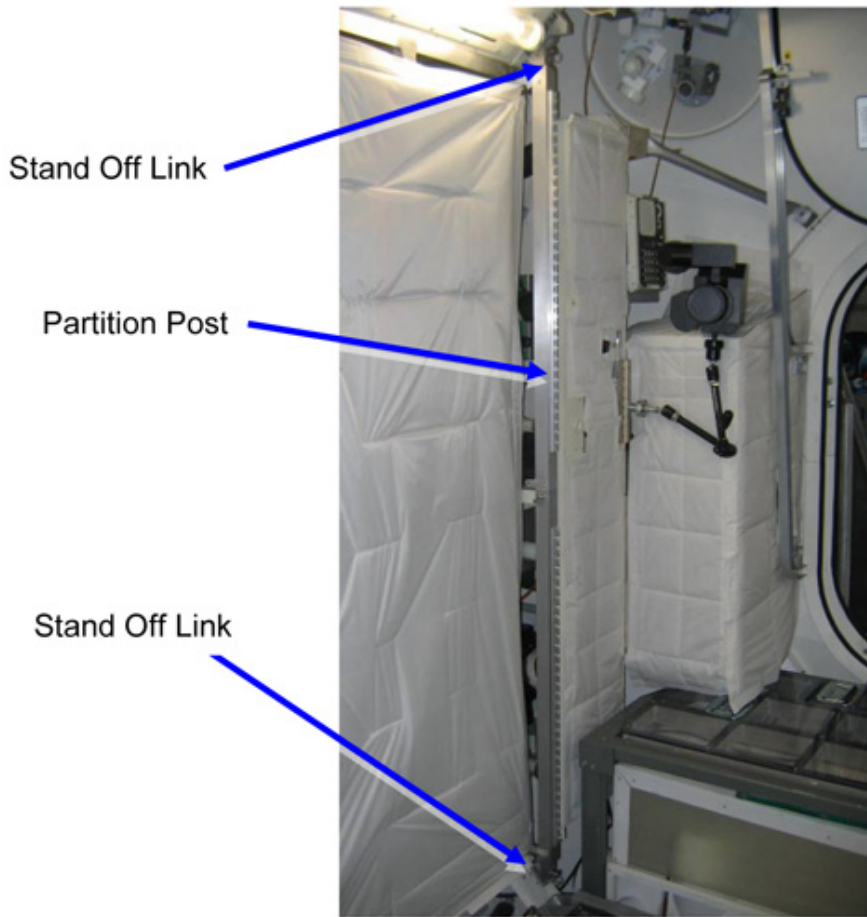


Figure 2-3 Partition Post installed at rack bay A1 (training Mock Up)

- 2.3 Release both external quick release pins from the Partition Post. Refer to Figure 1-2.

**NOTE**

1. The Partition Post Seat Track shall face the Columbus cabin.
2. The Partition Post is installed on two opposite rack bay stand off links. Refer to Figure2-3.
3. For initial Columbus outfitting, the three Partition Posts are installed according to Table 1 locations.

**Table 1. Initial Partition Post Locations**

Locations	Rack Bay side
COL1A1	Port side
COL1F2	Stbd side
COL1A4	Stbd side

## PARTITION POSTS DESTOWAGE

(ASSY OPS/1E/FIN/MULTI E)

Page 7 of 7 pages

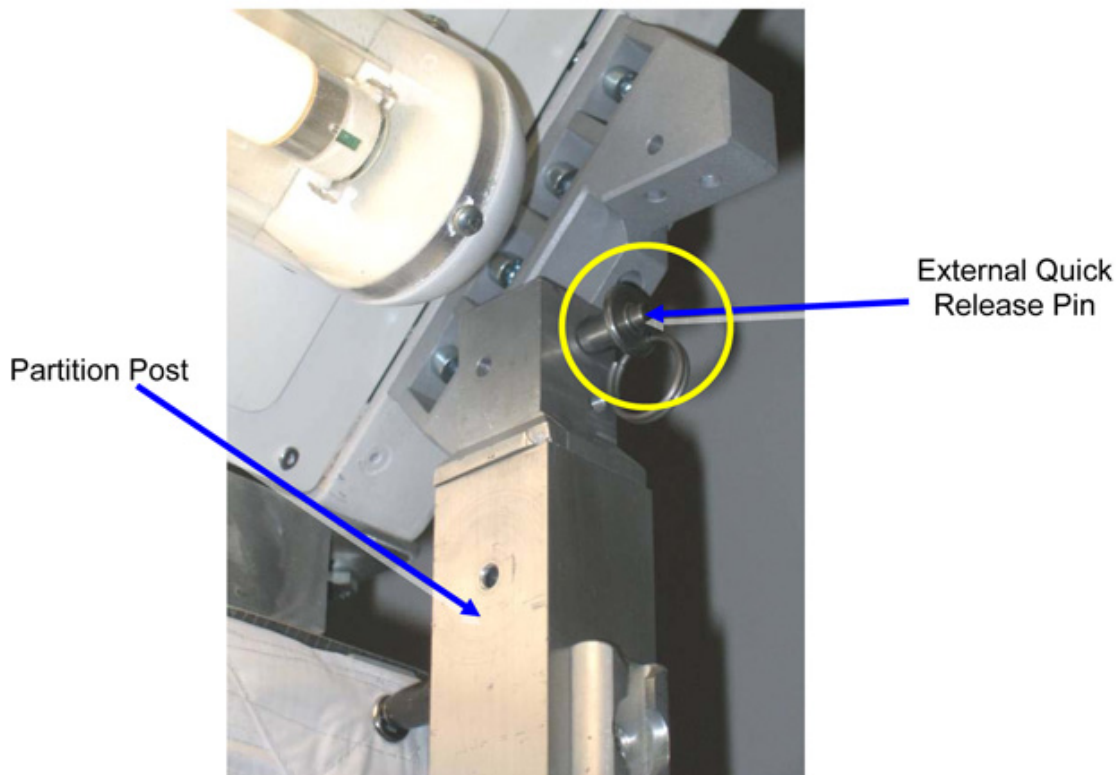


Figure 2-4 Partition Post secured to the Stand Off Link (Typical, Training Mock Up)

- 2.4 Install Partition Post sliding sideways into the Standoff Links.  
Refer to Figures 2-3 and 2-4.  
Partition Post locations according to Table 1.
- 2.5 Secure the Partition Post to the stand off links (external quick release pins).  
Refer to Figure 2-4.
- 2.6 Photo document the installed Partition Post (DCS 760 Camera).
- 2.7 Repeat steps 2.1 to 2.6 for all location.
- 2.8 ISS ↓ **COL-CC** of task completion.  
Stow tools, Partition Post Bracket Assemblies.

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## 1.101 PARTITION POST REMOVAL/INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 6 pages

### OBJECTIVE:

Remove and install the Partition Post from/onto the stand off links.

### LOCATION:

Installed: COL1A[X], COL1F[X], COL1O[X] and COL1D4 where [X] = 1 to 4

Stowed: √Inventory Management System (IMS)

### DURATION:

Removal: 10 min

Installation: 10 min

### CREW:

One

### PARTS:

Partition Post P/N 9231CA101-401

### MATERIALS:

None

### REFERENCED PROCEDURE(S):

1.208 PIVOT PIN BRACKET INSTALLATION/REMOVAL

1.209 K-BAR CAPTURE MECHANISM INSTALLATION/REMOVAL

#### 1. REMOVING THE PARTITION POST

- 1.1 If required remove Crew Mobility Aids from Partition Post Seat Track.  
Refer to Figure 1.

## 1.101 PARTITION POST REMOVAL/INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 2 of 6 pages

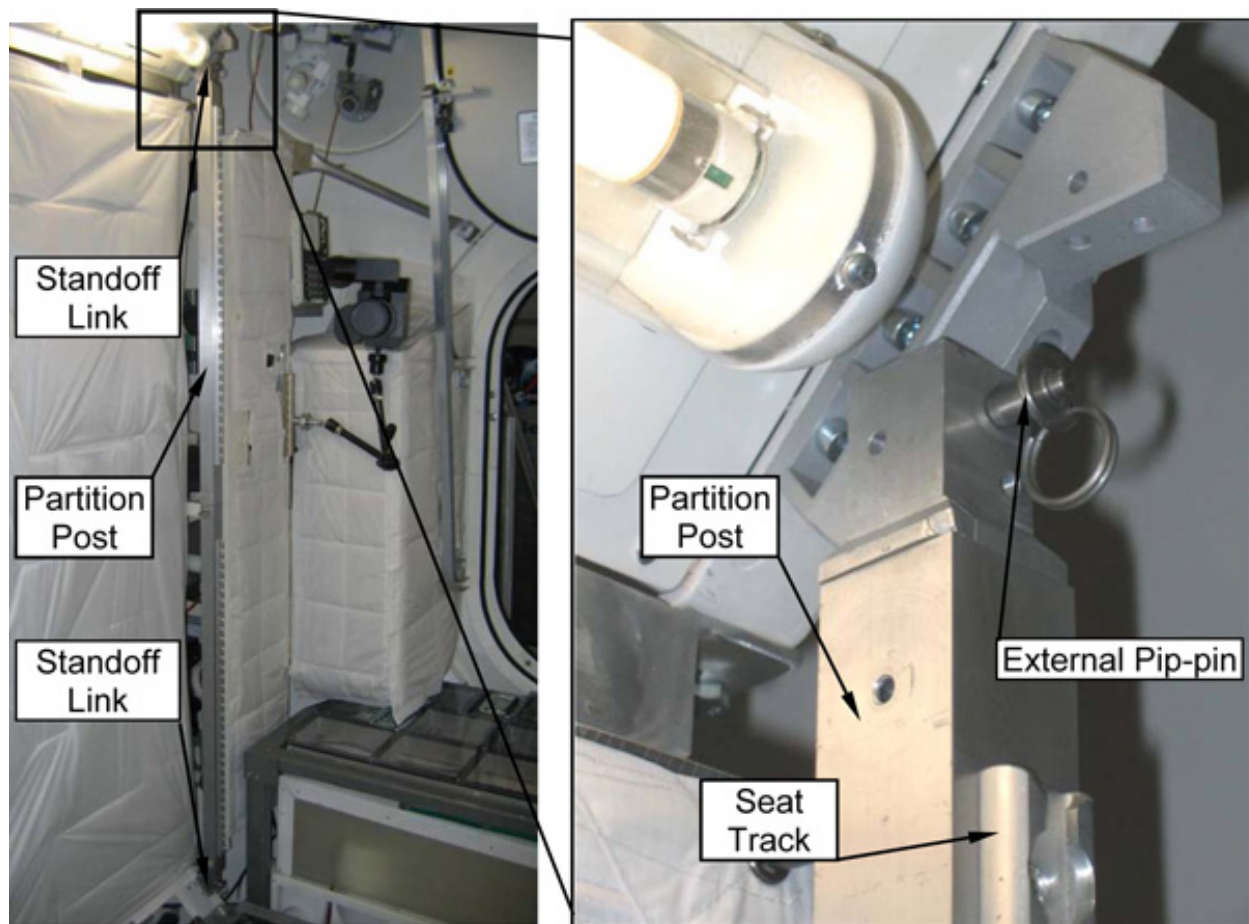


Figure 1. Partition Post installed at rack bay A1 (training Mock Up)

### NOTE

Pip-pins are tethered to the Partition Post.

- 1.2 Remove Partition Post External Pip-pin from upper standoff link. Refer to Figure 1.
- 1.3 Remove Partition Post External Pip-pin from lower standoff link,
- 1.4 Remove Partition Post sliding sideways out from the standoff link.

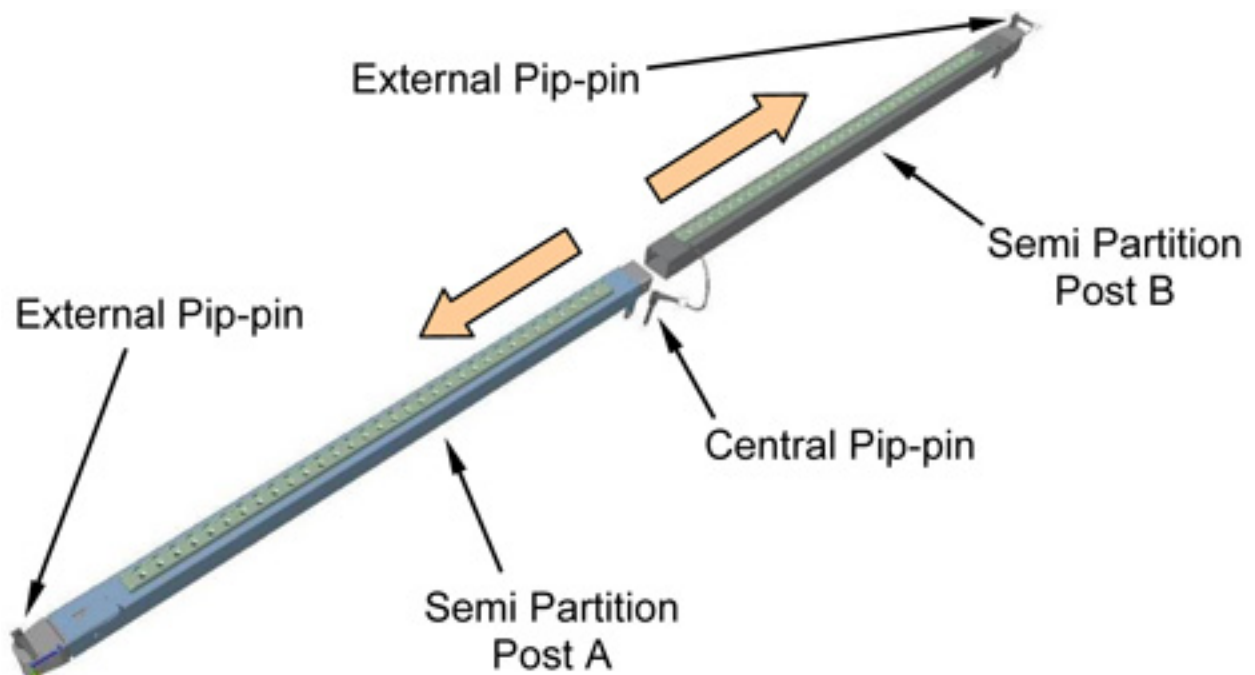
### NOTE

In case the Partition Post needs to be stowed, perform steps 1.5, 1.6 and 1.7.

## 1.101 PARTITION POST REMOVAL/INSTALLATION

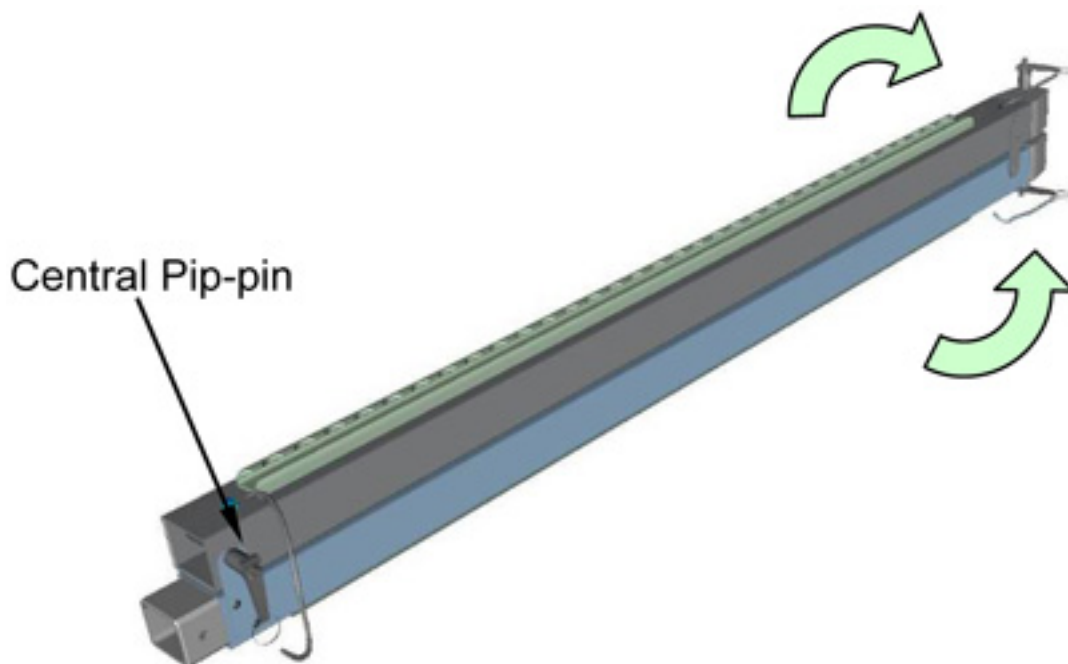
(ASSY OPS/1E/FIN/MULTI E)

Page 3 of 6 pages



**Figure 2. Disassembly of the two semi Partition Posts**

- 1.5 Insert External Pip-pin into their dedicated holes on the Partition Post. Refer to Figure 2.
- 1.6 Remove Central Pip-pin from the Partition Post and disassemble the Semi Partition Post A and B. Refer to Figure 2.



**Figure 3. Folded Partition Post**

## 1.101 PARTITION POST REMOVAL/INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 4 of 6 pages

- 1.7 Fold the Semi Partition Post A and B and install Central Pip-pin.  
Refer to Figure 3.
- 1.8 ISS ↓ **COL-CC** of task completion.  
Stow Partition Post as required, then update IMS.

### 2. INSTALLING THE PARTITION POST

#### NOTE

The installation location of the Partition Post on the Standoff Link is the same of the K-Bar Capture Mechanism and of the Pivot Pin Bracket. To install the Partition Post it is necessary to remove either the K-Bar Capture Mechanism or the Pivot Pin Bracket.

- 2.1 If necessary remove K-Bar Capture Mechanism (Left or Right) from the standoff link, perform [{1.209 K-BAR CAPTURE MECHANISM INSTALLATION/REMOVAL}](#), step 2 (ESA SODF: MSM: NOMINAL: RACK)  
Temporary stow.
- 2.2 If necessary remove Pivot Pin Bracket (Left or Right) from the standoff link, perform [{1.208 PIVOT PIN BRACKET INSTALLATION/REMOVAL}](#), step 2 (ESA SODF: MSM: NOMINAL: RACK)  
Temporary stow.

#### NOTE

1. Each Partition Post has to be unfolded before installation. If Partition Post are already unfolded steps 2.3 and 2.4 are not necessary. Refer to Figure 4.
2. When unfolded the Partition Post is divided in two semi Partition Posts. Refer to Figure 5.
3. Partition Post Pip-pins are tethered to the Partition Post.



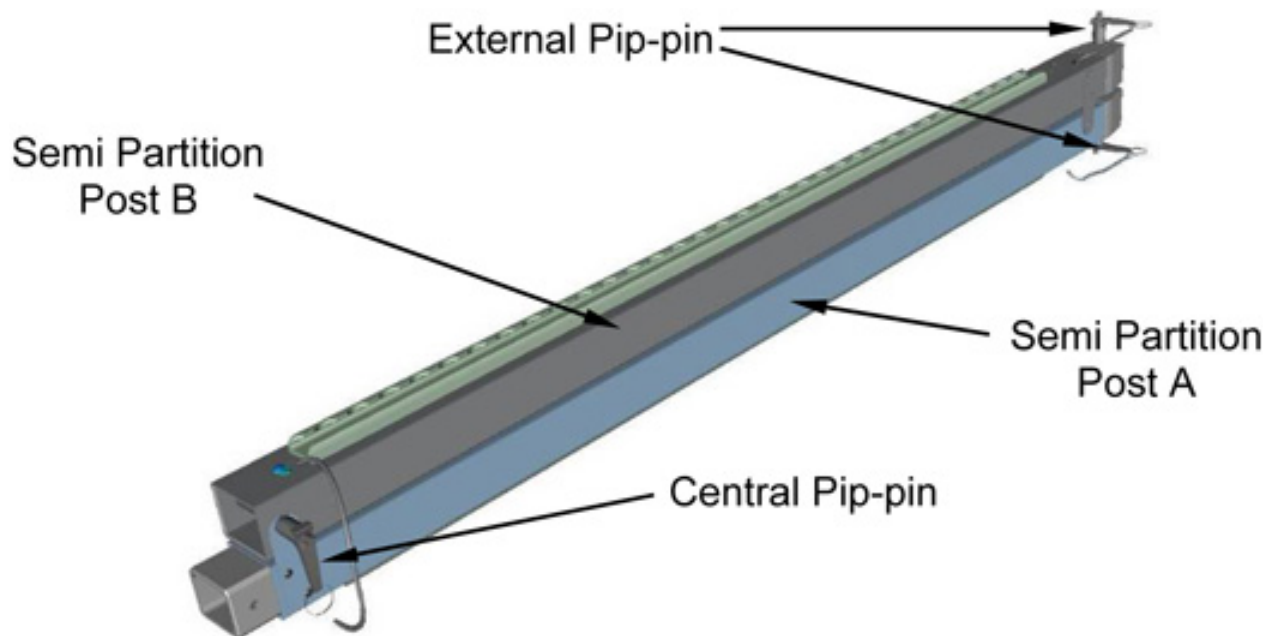


Figure 4. Folded Partition Post

- 2.3 Unfold the Partition Post by removing the Central Pip-pin. Refer to Figure 4.

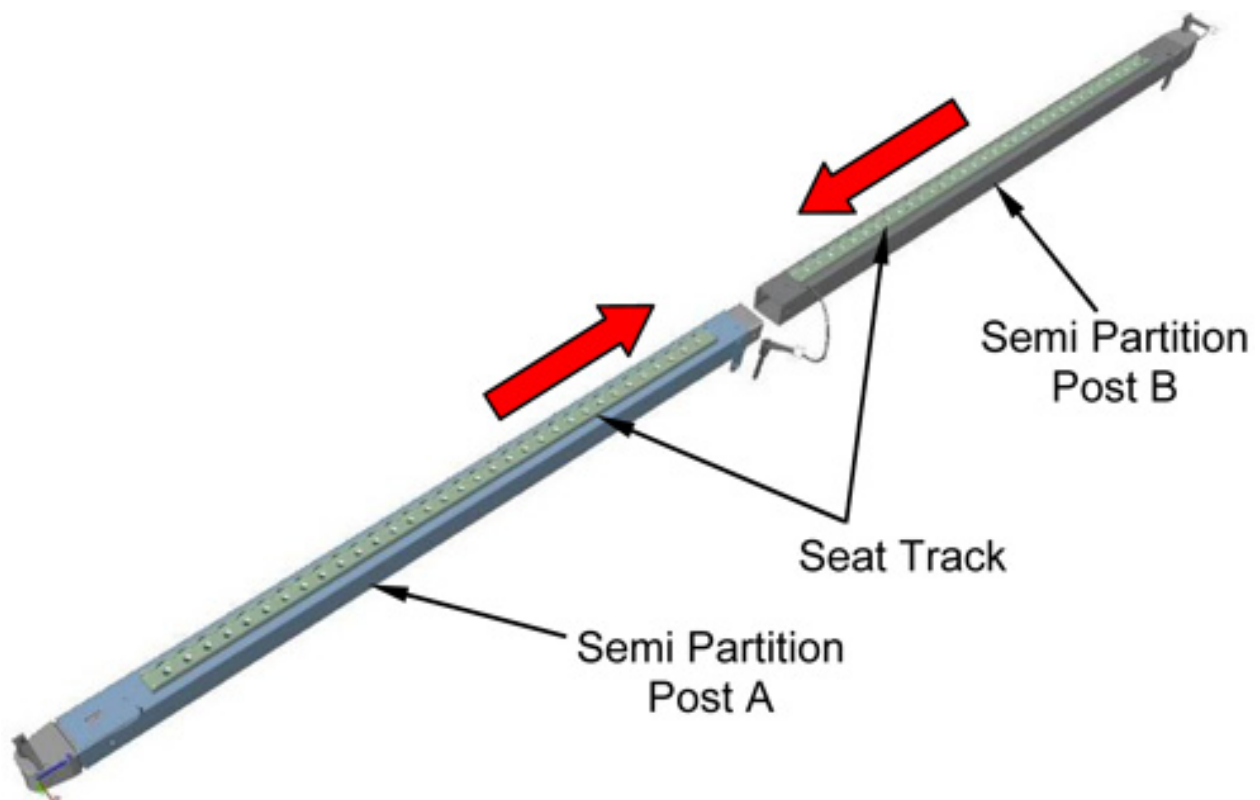


Figure 5. Assembly of the two semi Partition Posts

- 2.4 Insert semi Partition Post A in semi Partition Post B, then secure with Central Pip-pin.

## 1.101 PARTITION POST REMOVAL/INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 6 of 6 pages

Refer to Figure 5.

- 2.5 Release both External Pip-pins from the Partition Post.  
Refer to Figure 4.

### NOTE

1. The Partition Post Seat Track shall face the Columbus cabin.
2. The Partition Post is installed on two opposite rack bay stand off links. Refer to Figure 1.

- 2.6 Install Partition Post sliding sideway into the Standoff Links.  
Refer to Figure 1.
- 2.7 Secure the Partition Post to the standoff links (External Pip-pins, two).  
Refer to Figure 1.
- 2.8 ISS ↓ **COL-CC** of task completion and installation location of Partition Post.
- 2.9 Update IMS.

## 1.102 PARTITION SOFT COVER REMOVAL/INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 7 pages

### OBJECTIVE:

Remove or install a Partition Soft Cover from/in an empty ISPR rack bay.

### LOCATION:

Installed: COL1A[X], COL1F[X], COL1O[X], COL1D4 where [X] = 1 to 4

Stowed: √Inventory Management System (IMS)

### DURATION:

Removal: 10 min (each Partition Soft Cover)

Installation: 10 min (each Partition Soft Cover)

### CREW:

One

### PARTS:

Partition Soft Cover P/N 9231CA311-401

### MATERIALS:

None

### TOOLS:

None

### REFERENCED PROCEDURE(S):

None

1. [REMOVING PARTITION SOFT COVER](#)

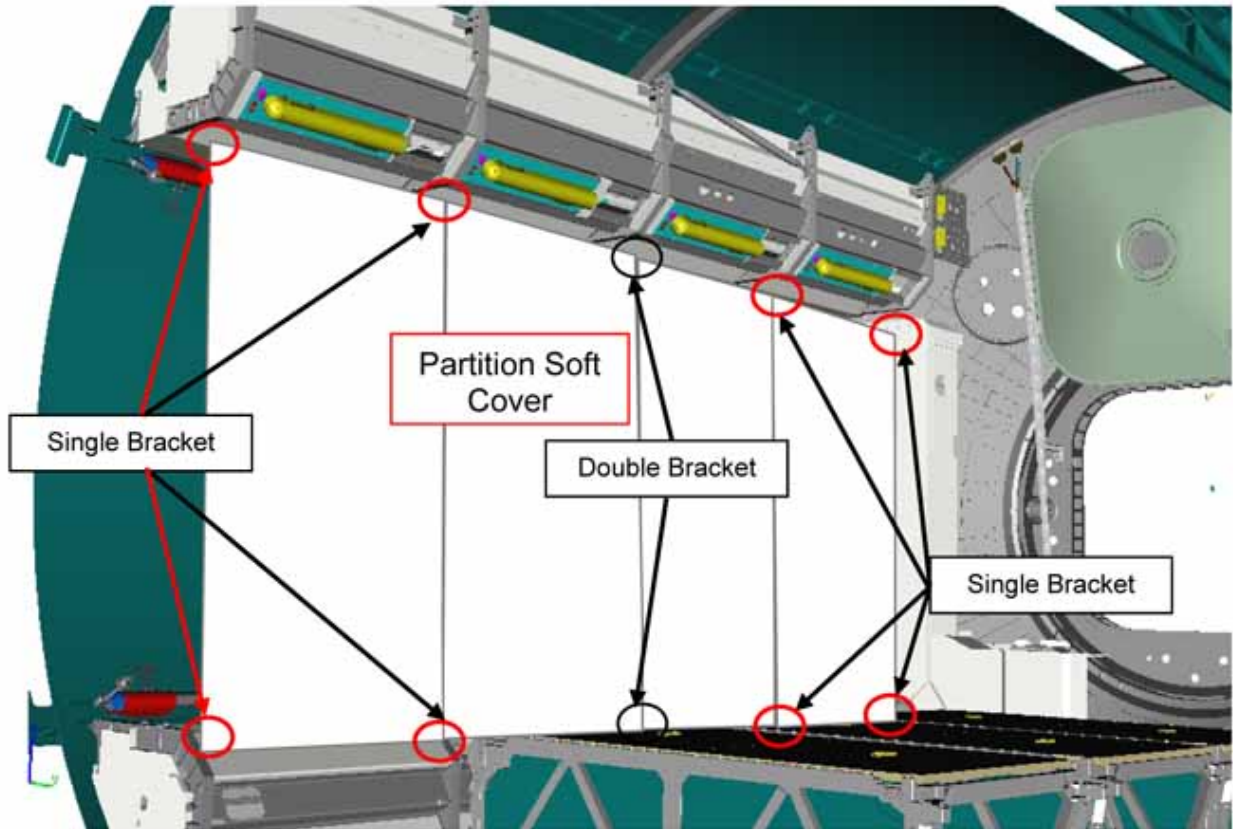


Figure 1. Location of Partition Soft Cover installation brackets on stand offs, typical

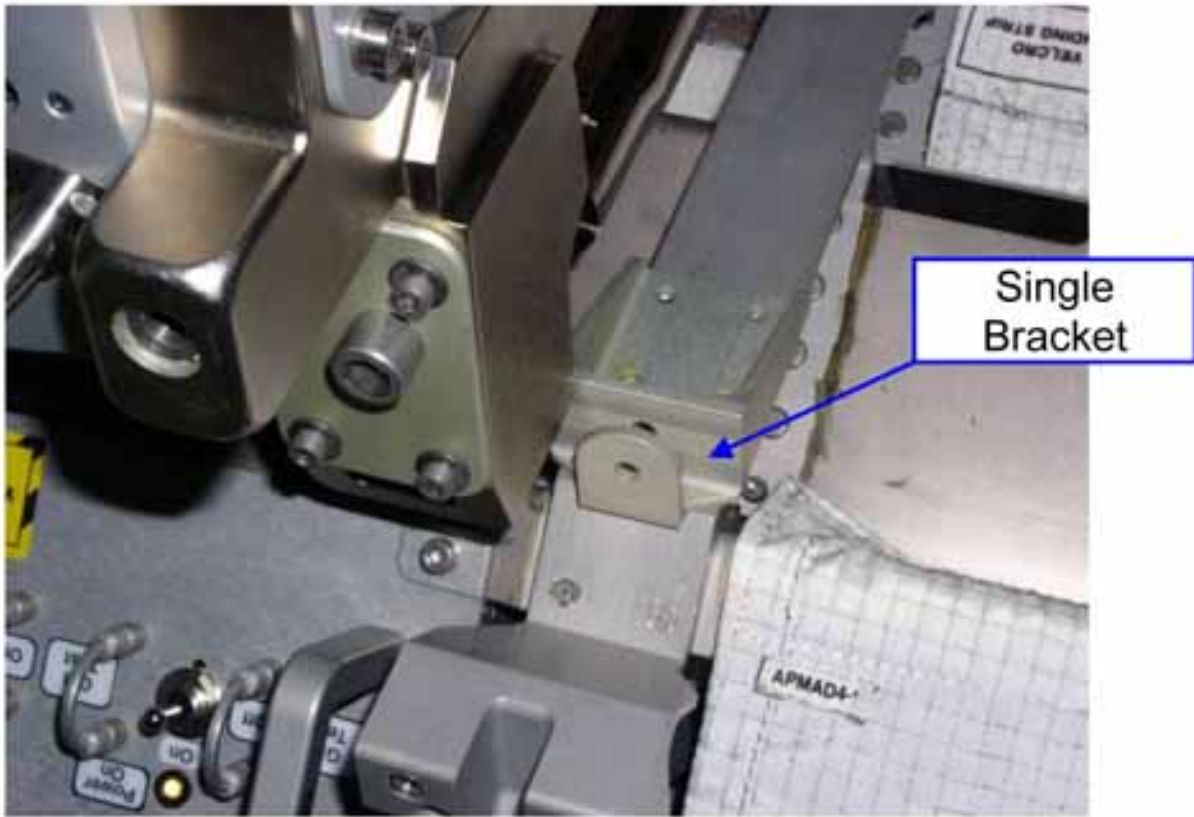


Figure 2. Single Bracket.

## 1.102 PARTITION SOFT COVER REMOVAL/INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 4 of 7 pages

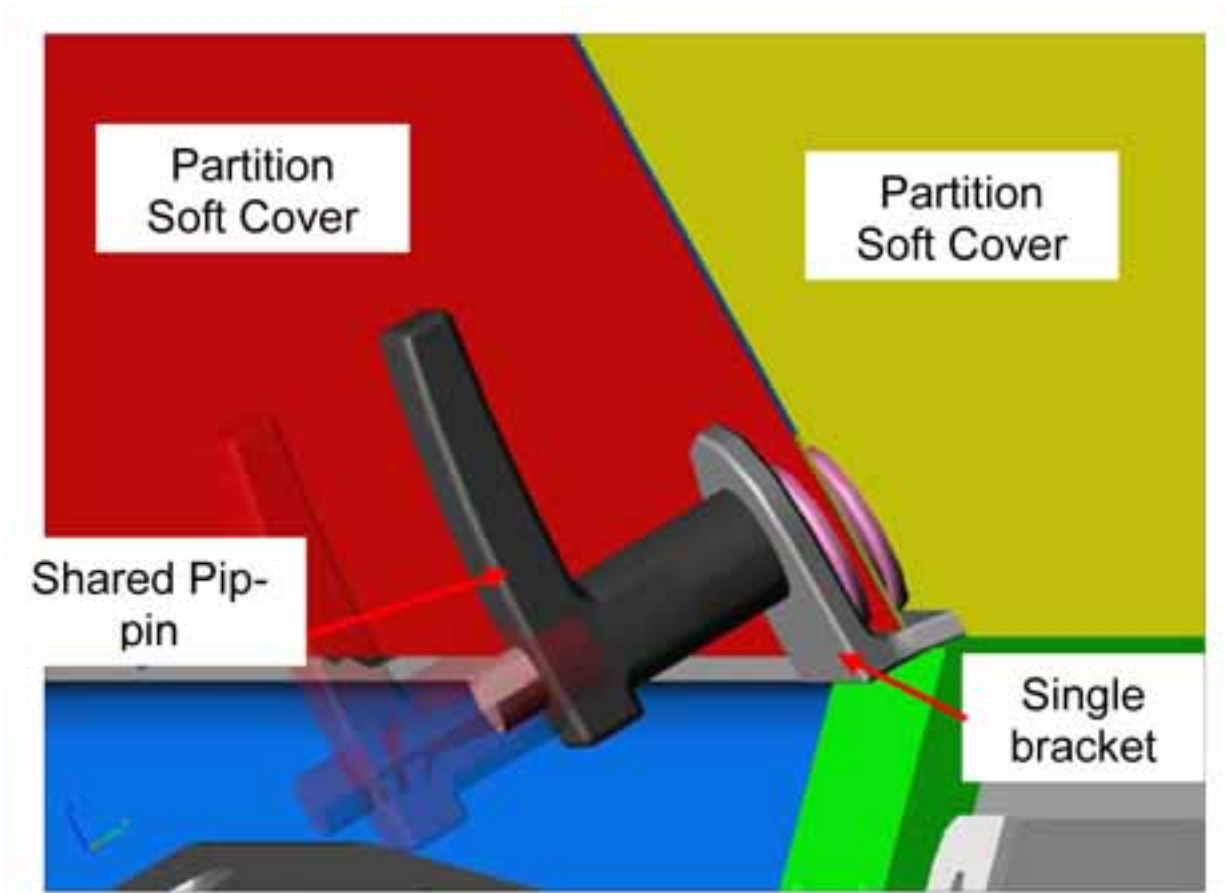


Figure 3. Two adjacent Partition Soft Covers installed on a single bracket.

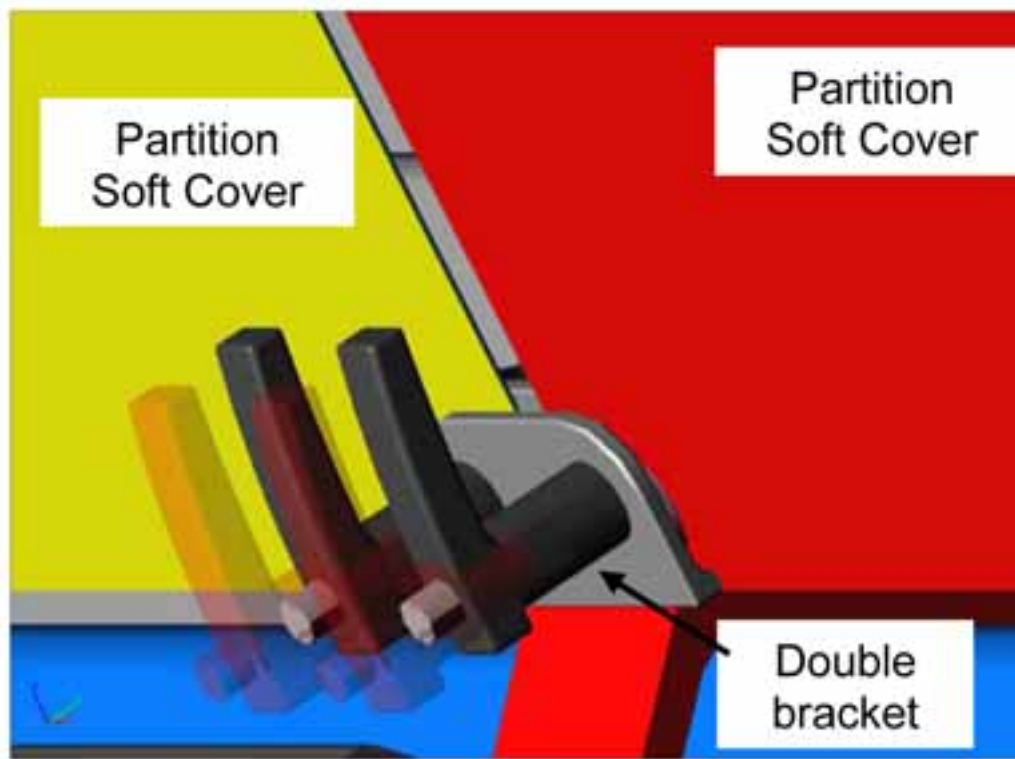


Figure 4. Adjacent Partition Soft Covers installed on a double bracket.

## 1.102 PARTITION SOFT COVER REMOVAL/INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 6 of 7 pages

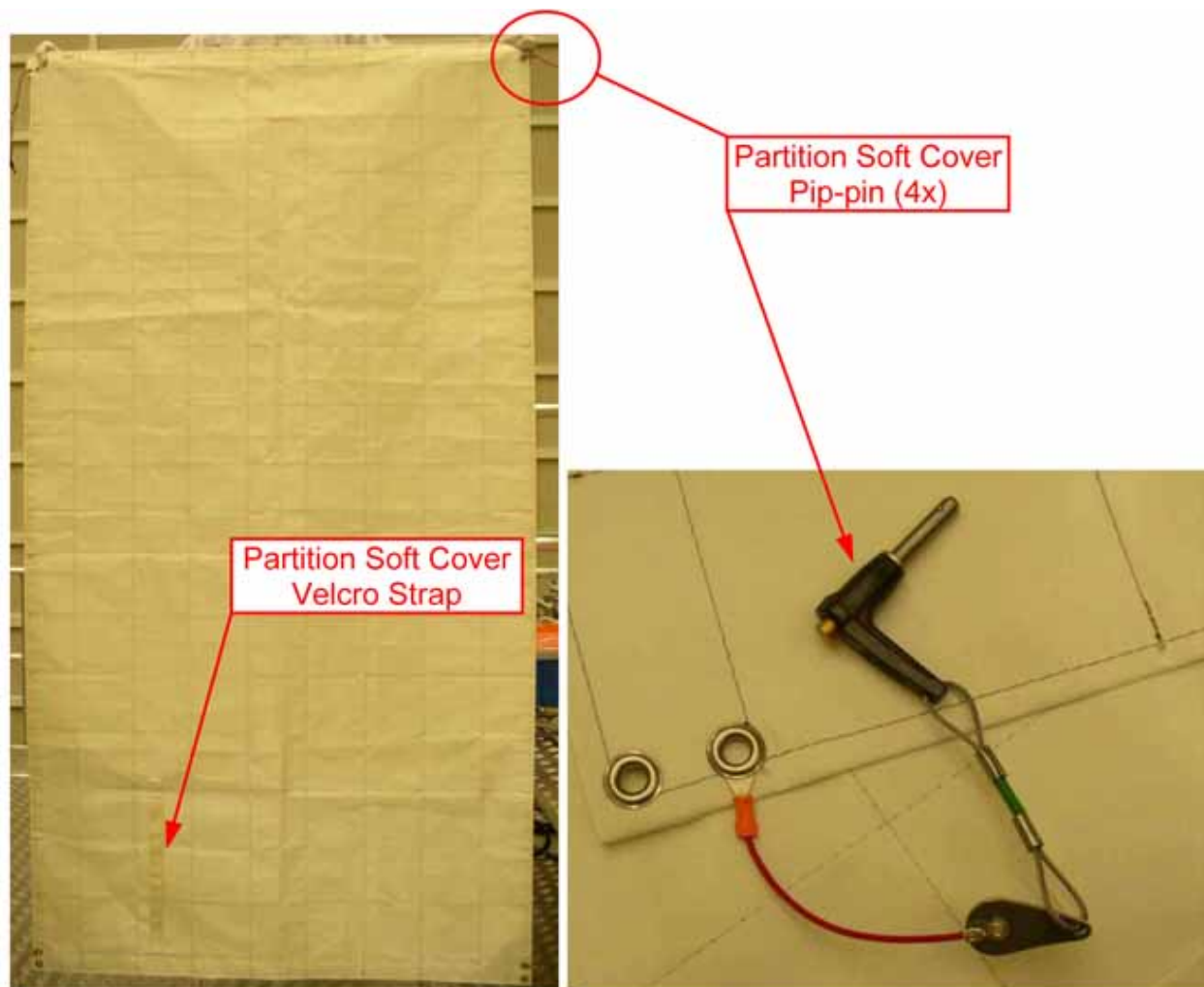


Figure 5. Partition Soft Cover and Pip-pin, Typical

### NOTE

1. Following steps are repeated for all the locations where a Partition Soft Covers is to be removed from.
2. Pip-pins are tethered to the Partition Soft Cover.
3. Partition Soft Covers are installed on double and single installation brackets. The single brackets installed between bays 1, 2 and 3, 4 are provided with 1 single pip-pin interface hole. Partition Soft Covers of these adjacent bays are installed on the brackets sharing the same pip-pin of one of the two covers. Refer to figures 2 and 3.

- 1.1 Release Partition Soft Cover corners from installation brackets (Pip-Pins), then remove.  
Refer to Figures 1 and 5.
- 1.2 If adjacent Partition Soft Covers are installed  
| Check for their correct fastening to the single brackets with pip-pins.



## 1.102 PARTITION SOFT COVER REMOVAL/INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

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**Figure 6. Partition Soft Cover Stowage Configuration.**

- 1.3 Record S/N of removed Partition Soft Cover: \_\_\_\_\_
- 1.4 Roll removed Partition Soft Cover, then fasten with Velcro strap. Refer to Figure 6.
- 1.5 Stow Partition Soft Cover.
- 1.6 ISS ↓ **COL-CC** of task completion, S/N and stowage location of Partition Soft Cover.

## 2. INSTALLING PARTITION SOFT COVER

### NOTE

1. Following steps are repeated for all the locations where a Partition Soft Covers is to be installed.
2. Pip-pins are tethered to the Partition Soft Cover.
3. Partition Soft Covers are installed on double or single installation brackets. The single brackets installed between bays 1, 2 and 3, 4 are provided with 1 single pip-pin interface hole. Partition Soft Covers of these adjacent bays are installed on the brackets sharing the same pip-pin of one of the two covers. Refer to figures 2 and 3.

- 2.1 Undo Velcro strap and unroll Partition Soft Cover. Refer to Figures 5 and 6.
- 2.2 Record S/N of Partition Soft Cover: \_\_\_\_\_
- 2.3 Install Partition Soft Cover on the installation brackets, Pip Pins (4). Refer to Figures 1, 3 and 4.
- 2.4 ISS ↓ **COL-CC** of task completion, S/N and installation location of Partition Soft Cover.

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## 1.201 COL DECK RACK D1 / D2 / D3 OPEN & CLOSE

(ASSY OPS/1E/FIN/HC/MULTI E) Page 1 of 3 pages

### OBJECTIVE:

Establish access to deck rack internal volume by removing either one or two deck rack floor panels and to re-install the floor panel (s) to close-out the rack internal volume.

### LOCATION:

Installed:

COL1D1 (Forward / Aft)

COL1D2 (Forward / Aft)

COL1D3 (Forward / Aft)

Stowed:

√Inventory Management System (IMS)

### DURATION:

5 minutes (single panel)

### CREW

One

### PARTS:

None

### MATERIALS:

None

### TOOLS:

COL1

### Tool Bag 1

Ratchet Wrench, 1/4" Drive

Ratchet Tool, 1/4" Drive

102 mm Extension 1/4" Drive

4-20 Nm Torque Wrench 1/4" Drive

T30 Torx Head 1/4" Drive

Adjustable Tether

Eyelet (2)

Portable Handle

LAB1

### Deployed:

DCS Camera

### ITEMS TO UNSTOW WITHIN PROCEDURE:

None

### REFERENCED PROCEDURE

None

1. REMOVAL

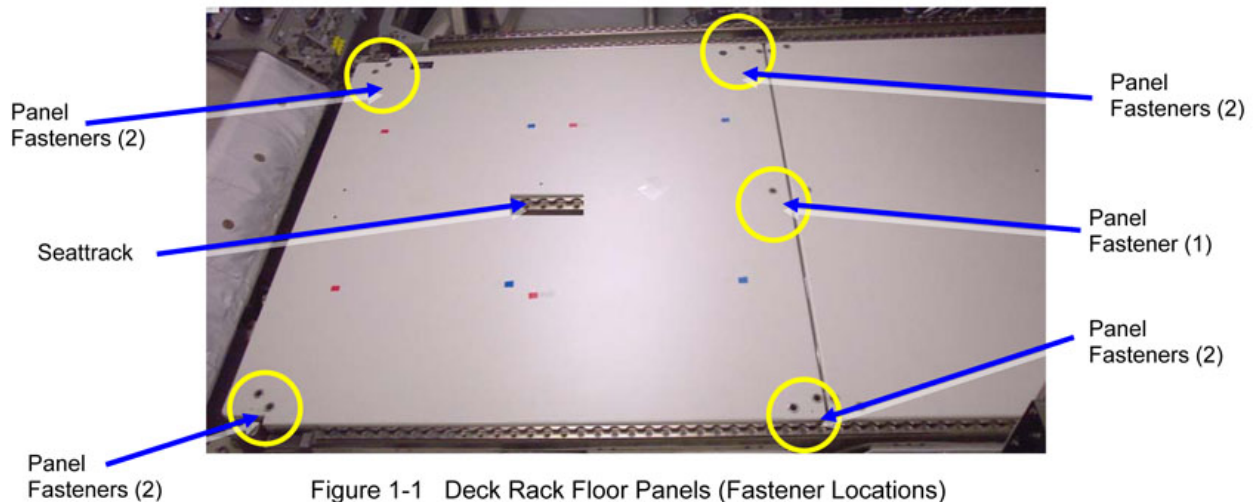


Figure 1-1 Deck Rack Floor Panels (Fastener Locations)

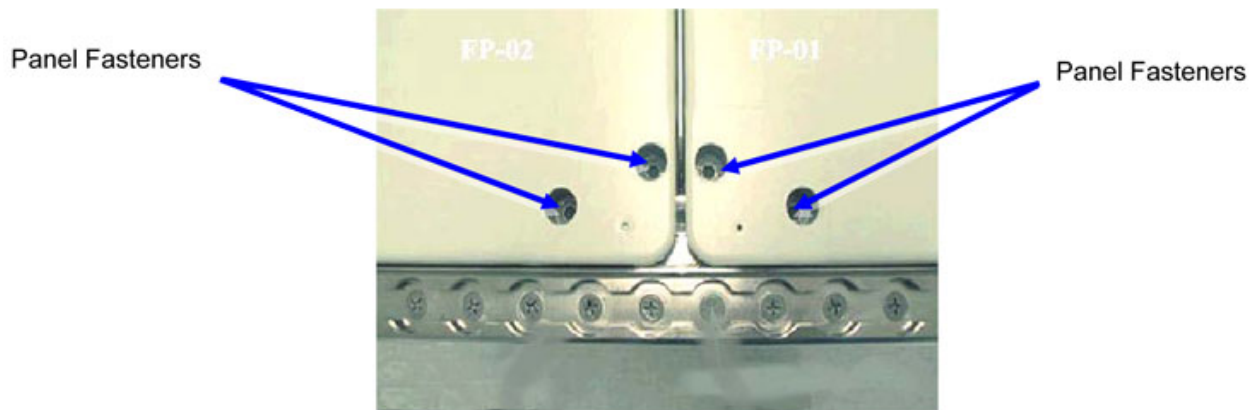


Figure 1-2 Panel Fastener Details

NOTE

- 1. Floor panels can be removed in any order.
- 2. Floor panels are not interchangeable on deck rack structure.

- 1.1 Install portable handle to floor panel seattrack.
- 1.2 Unscrew panel fasteners (9), any order (Ratchet Wrench 1/4" Drive; 102 mm Extension 1/4" Drive; T30 Torx Head 1/4" Drive). Fasteners are captive. Refer to Figure 1-1 / Figure 1-2.

**WARNING**

Removal of floor panel COL\_D2\_A or floor panel COL\_D3\_F grants direct access to PDU1(2) wire harness outlets. Outlets may of extreme temperature of > 100° C. Contact must be avoided, warning labels to be observed strictly.

## 1.201 COL DECK RACK D1 / D2 / D3 OPEN & CLOSE

(ASSY OPS/1E/FIN/HC/MULTI E) Page 3 of 3 pages

- 1.3 Remove panel, temporarily stow (adjustable tether, eyelets).
- 1.4 ISS ↓ **COL-CC** of task completion, temporarily stow tools / equipment as necessary.

### 2. INSTALLATION

#### NOTE

1. Floor panels can be installed in any order.
2. Floor panels are not interchangeable on deck rack structure.

- 2.1 √No FOD around work area.
- 2.2 Remove floor panel from stowage and place on deck rack, check for correct key pin orientation on rack structure and panel label. Install portable handle to floor panel seat track if not present.
- 2.3 Screw-in panel fasteners (9), any order, no torque tightening (Ratchet Wrench 1/4" Drive; 102 mm Extension 1/4" Drive; T30 Torx Head 1/4" Drive).
- 2.4 Torque tighten panel fasteners (9), any order at 5 Nm (44.2 in-lbs) (4-20 Nm Torque Wrench; Ratchet Tool 1/4" Drive; 102 mm Extension 1/4" Drive; T30 Torx Head 1/4" Drive).

### 3. CLOSEOUT

- 3.1 Take photograph of installed floor panels (DCS camera)
- 3.2 ISS ↓ **COL-CC** of task completion.
- 3.3 Stow tools / equipment, update IMS for stowage locations.

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# COL VIDEO CAMERA ASSEMBLY INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 9 pages

## OBJECTIVE:

Assemble and install a single Video Camera Assembly (VCA) inside the starboard / port cone of Columbus.

## LOCATION:

Stowed: √Inventory Management System (IMS)

Installed:

COL1PAM (VCA1)

COL1SCOF (VCA2)

## DURATION:

1 hour (single camera)

## CREW:

One

## PARTS:

Camera Body (P/N 20130C18311A)

Zoom Lens (P/N 53901H006001)

View Finder (P/N 53904H004001)

Pan / Tilt Unit (P/N 00630C18661A)

Power / Data Harness (P/N 48030D103140)

Zip Lock Bag (P/N 528-50000-5)

## MATERIALS:

None

## TOOLS:

LAB1

## DEPLOYED:

DCS Camera

## ITEMS TO UNSTOW WITHIN PROCEDURE:

None

## REFERENCED PROCEDURES:

None

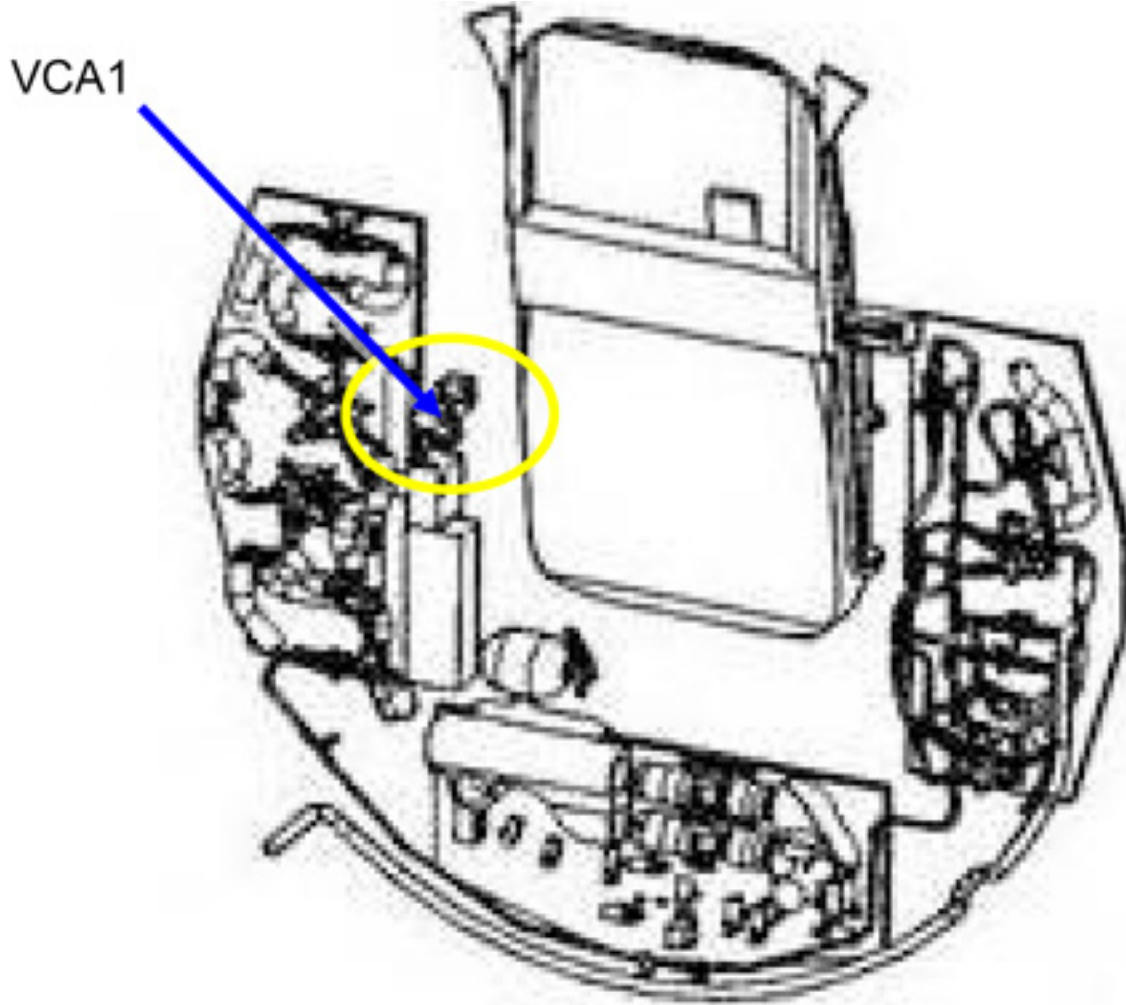


Figure 0-1 VCA1 Installation Location (Port Cone)



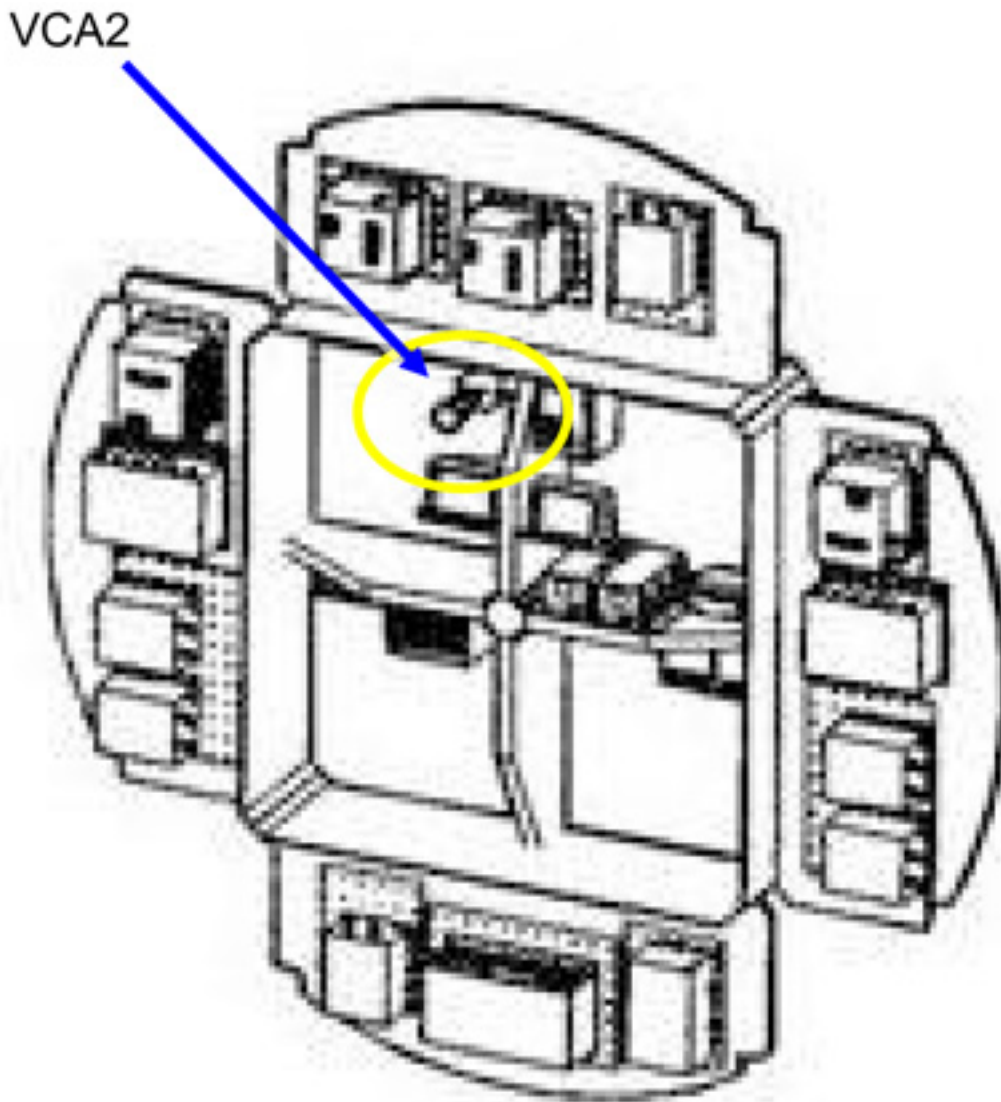


Figure 0-2 VCA2 Installation Location (Starboard Cone)

1. [INSTALL PAN / TILT UNIT](#)

NOTE

Each VCA is stored disassembled inside a dedicated transport container. Components shall be removed from the container only for immediate installation.

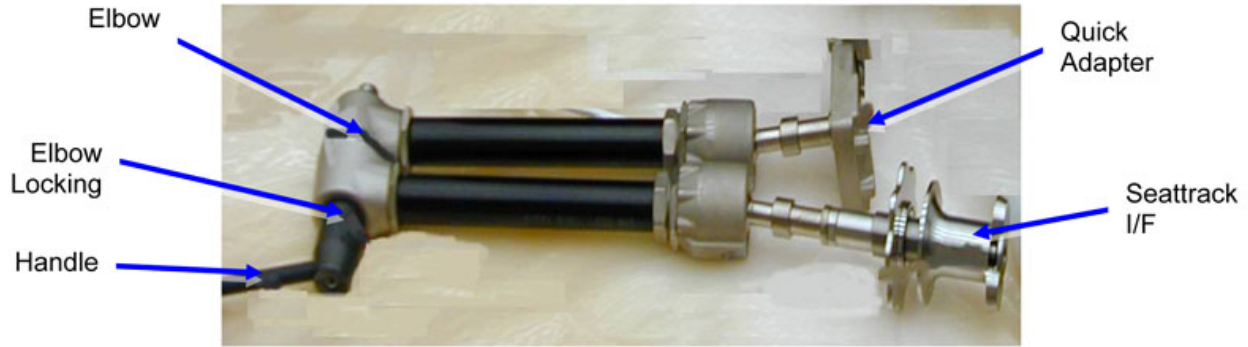


Figure 1-1 Pan / Tilt Unit

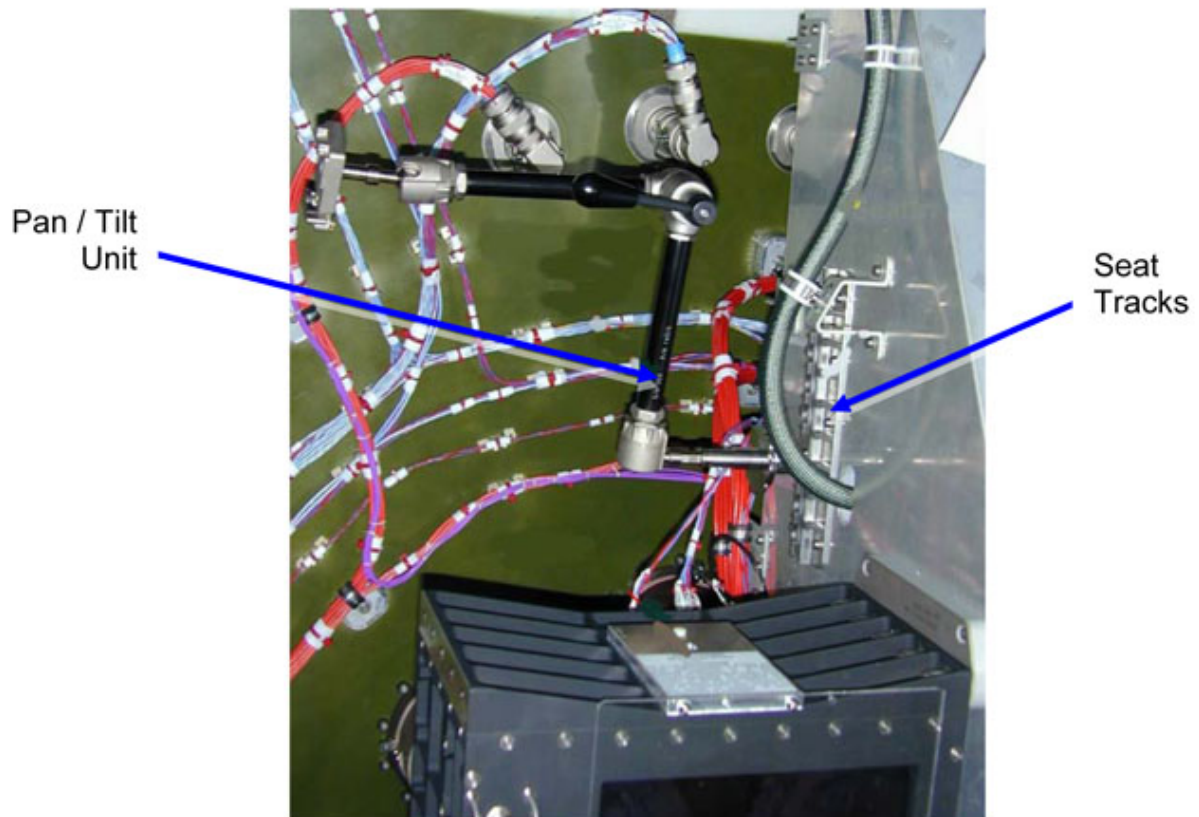


Figure 1-2 Pan / Tilt Unit Installed (Typical)

- 1.1 Install Pan / Tilt Unit on seattrack.
- 1.2 Turn elbow locking knob  $\curvearrowright$  to unlock and unfold Pan / Tilt Unit as required for camera installation.
- 1.3 Turn elbow locking knob  $\curvearrowleft$  to lock.
2. INSTALL CAMERA BODY ON PAN / TILT UNIT
  - 2.1 Align the suitable side of the camera shoe under the dovetail sled of the quick adapter.

- 2.2 Lean camera shoe against quick adapter while pressing on it.
- 2.3 √Locking knob of quick adapter has turned into LOCK position.
- 2.4 √Camera shoe is fitted completely to mounting surface of quick adapter.
- 2.5 Turn safety knob at bottom of quick adapter ↻ to LOCK position.

3. ADJUST VIEW FINDER

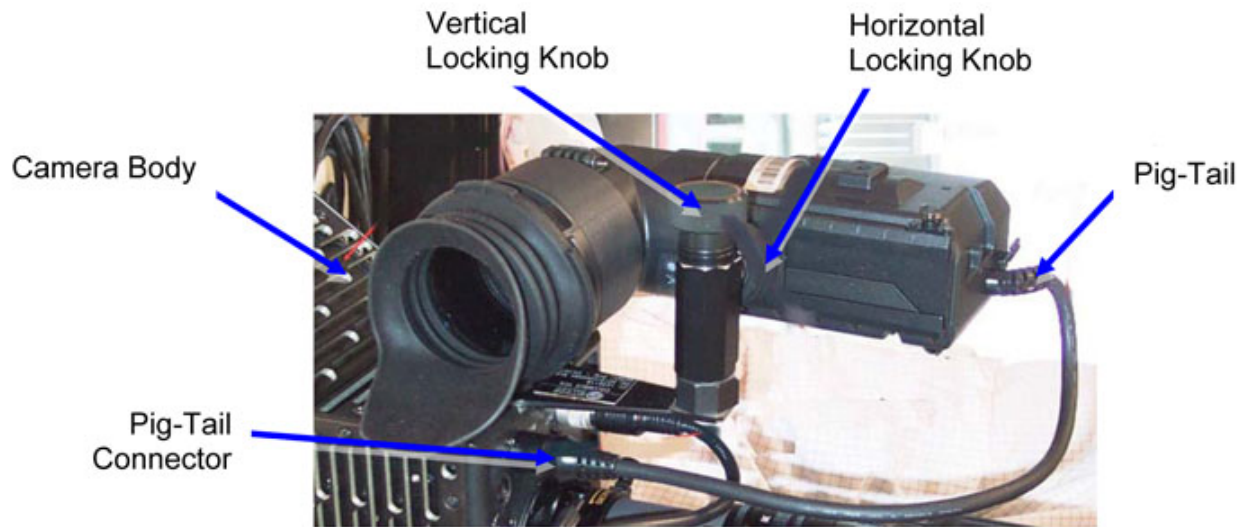


Figure 3-1 View Finder

**NOTE**

View Finder, installed on the camera body, is in stowed configuration and needs adjustment only, it shall not be removed.

- 3.1 Turn horizontal locking knob ↻ to unlock.  
Refer to Figure 3-1.
- 3.2 Rotate view finder ↻ around vertical axis, stop at suitable position.
- 3.3 √Check position by looking through the view finder.
- 3.4 Turn horizontal locking knob ↻ to lock.
- 3.5 Turn vertical locking knob ↻ to unlock  
Refer to Figure 3-1.
- 3.6 Slide view finder, stop at suitable position.
- 3.7 √Check position by looking through the view finder.
- 3.8 Turn vertical locking knob ↻ to lock

- 3.9 Connect view finder pig-tail.  
Remove protective caps (two) from pig-tail and camera body connector and place into Ziplock bag.  
Connect View Finder pig-tail →|← View Finder connector (on camera body).  
Refer to Figure 3-1.

4. MOUNT & SET-UP LENS



Figure 4-1 Lens

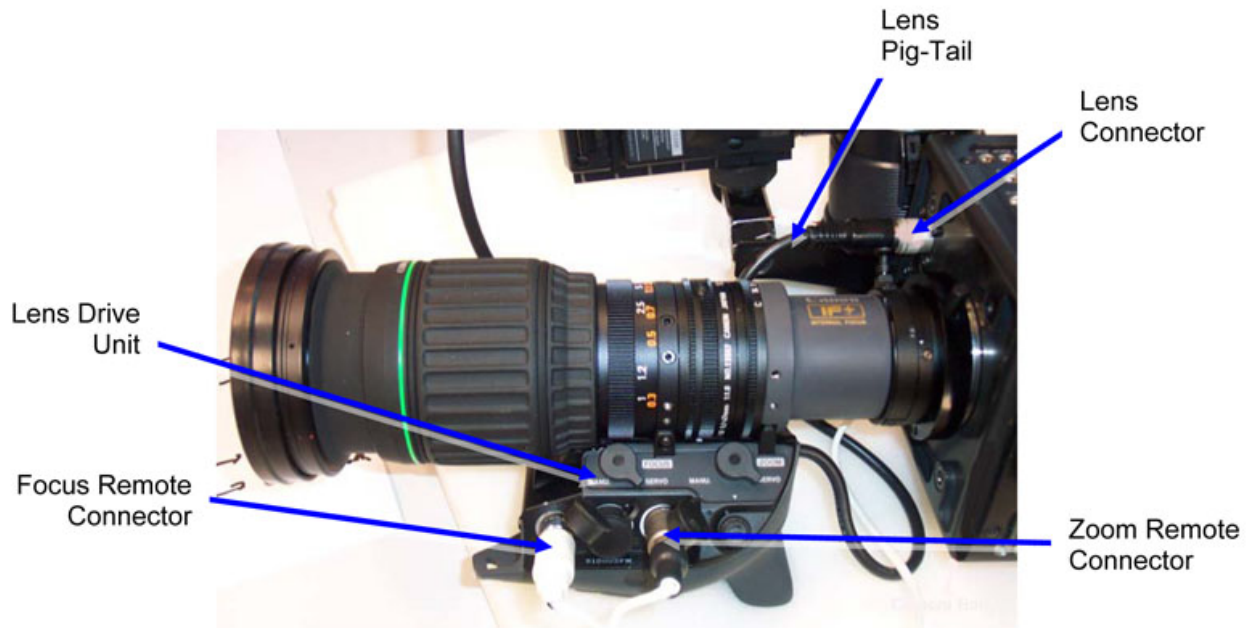


Figure 4-2 Lens Connector on Camera Body

**CAUTION**

Camera and pig-tail connectors are highly sensitive for damages. Prior to installation carefully inspect connectors on pig-tail and on camera body for bent pins and / or debris. Failure to do so could result in damage to pig-tail and camera body connector.

**NOTE**

Focus remote / zoom remote cable is not label, connectors are identified by color:  
White connector → Focus Remote  
Black Connector → Zoom Remote

- 4.1 Mount lens on camera body  
Remove protective caps from lens and camera body and place into Ziplock bag.  
Align positioning pin on lens mount to slot on camera mount, press lens into camera mount surface.
- 4.2 Turn camera bayonet ring ↻ until lens mount is firmly fixed.
- 4.3 Connect lens pig-tail to camera body  
Remove protective caps (two) from pig-tail and camera body connector and place into Ziplock bag.  
Lens pig-tail →|← lens connector (on camera body).  
Refer to Figure 4-2.
- 4.4 Connect focus remote connector to lens drive unit

Remove protective cap from cable and place into Ziplock bag.  
White marked connector (on cable) →|← white receptacle (of lens drive unit).  
Turn locking ring ↻ to tighten.  
Refer to Figure 4-2.

- 4.5 Connect zoom remote connector to lens drive unit  
Remove protective cap from cable and place into Ziplock bag.  
Black marked connector (on cable) →|← black receptacle (of lens drive unit).  
Turn locking ring ↻ to tighten.  
Refer to Figure 4-2.

5. CONNECT POWER / DATA HARNESS

**NOTE**  
VCA1 connects to SUP4 / J08, VCA2 connects to SUP1 / J08.

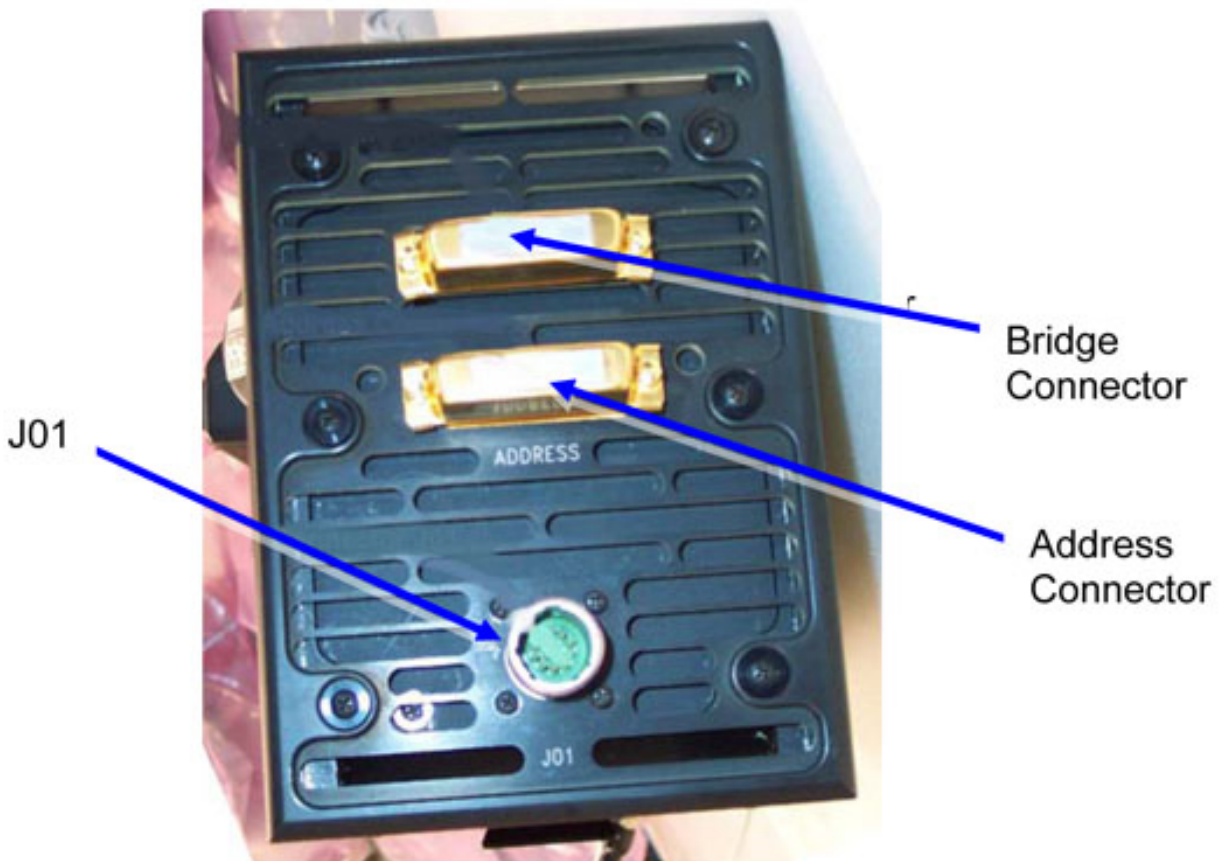


Figure 5-1 Cable Harness Connector J01

- 5.1 Connect power / data harness to camera  
Remove protective caps from harness and camera body and place into Ziplock bag.

P01 (cable) →|← J01 (camera body).  
Turn locking ring ↻ to tighten.  
Refer to Figure 5-1.

- 5.2 Connect power / data harness to SUP [X] where [X] = [1][4]  
Remove protective caps from harness place into Ziplock bag.  
P08 (cable) →|← J08 (SUP).  
Turn locking ring ↻ to tighten.

6. CLOSEOUT

- 6.1 Take picture of installed VCA (DCS 760 Camera)
- 6.2 ISS ↓ **COL-CC** of task completion.
- 6.3 Stow equipment.
- 6.4 Ziplock bag placed in VCA transport container.
- 6.5 √IMS for VCA transport bag stowage location.

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# COL VIDEO EQUIPMENT ACTIVATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 9 pages

## OBJECTIVE:

This procedure activates the VDPU, VCA1&2, VMN1&2 and VCR1&2 separated from the Columbus Final Activation procedure and will be performed after Video Camera installation.

### 1. VDPU ACTIVATION

#### 1.1 Swapping DMS telemetry packets (Ground-only)

##### NOTE

No Crew activity required.

Packet swapping initiated from Col-CC:

Disable MMC\_Gnd\_Tlm\_Pkt\_COMMS1\_DMC (0.1Hz)

Enable MMC\_Gnd\_Tlm\_Pkt\_COMMS1\_DMC (1Hz)

Enable MMC\_Gnd\_Tlm\_Pkt\_COMMS2\_DMC (1Hz)

COL-CC to swap nominal DMS telemetry packets, wait for "GO" to continue

#### 1.2 Verify PDU1 Outlet status

PWS

EPDS: 120 V Subsys

PDU1-2 120V Subsys

Verify PDU1 VDPU Pwr Bus (Status, Current) – ON, < 0.38 A

Verify PDU1\_VDPU\_Pwr\_Bus\_On\_Off\_Stat\_DMC – ON

Verify PDU1\_VDPU\_Pwr\_Bus\_Current\_DMC < 0.38 A

#### 1.3 Activate the VDPU in Nominal Configuration

COMMS: VDPU Commands

VDPU Commands

'commands'

##### NOTE

The following command starts the FLAP VDPU Activation, which performs:

- establish the selected PDU1 - CU1 configuration

- switch on internal power

- select the CU1

- update the VDPU context information (FLAP S/W variables)

- start RT acquisition & monitoring of VDPU data

- switch on the VDPU subunits

Wait up to 2 minutes for VDPU start-up.

**cmd** Activation-PDU1 Cntl Unit1 **Execute** (OK)

'VDPU Power'

# COL VIDEO EQUIPMENT ACTIVATION

(ASSY OPS/1E/FIN/MULTI E)

Page 2 of 9 pages

Verify Pwr1 Stat1 – ON  
Verify Pwr1 Stat2 – ON  
Verify Pwr2 Stat1 – OFF  
Verify Pwr2 Stat2 – OFF

'Cntl Unit'

Verify Nom Pwr Stat1 – ON  
Verify Nom Pwr Stat2 – ON  
Verify Redun Pwr Stat1 – OFF  
Verify Redun Pwr Stat2 – OFF

Verify Act Pwr Channel – PDU1  
Verify Act Cntl Unit – CU1

COMMS: VDPU Sections

COMMS VDPU Sections

Verify Cntl Unit Act Nom – ON  
Verify Cntl Unit Act Redun – OFF  
Verify Health Stat1 Nom – OK  
Verify Health Stat1 Redun – NOT\_OK  
Verify Health Stat2 Nom – OK  
Verify Health Stat2 Redun – NOT\_OK  
Verify I/F Unit Pwr – ON

COMMS: VDPU Sections: VDPU Subunits

VDPU Subunits

Verify I/F Unit Sec 3.3 V:  $3.3\text{ V} \pm 0.3\text{ V}$   
Verify I/F Unit Sec 5 V:  $5.0\text{ V} \pm 0.5\text{ V}$   
Verify SW Mode – SWITCH  
Verify Switch Auto Test Stat – OK

**cmd** VDPU\_Activation\_AP  
**prm** Constellation \$PDU1\_CU1  
**data** Onboard-Reception-Node -  
SYS CCSDS End Point DMC DMS SERV  
**data** Onboard-Execution-Node -  
USM SW DMC USS Swoop Instance

Verify VDPU\_Pwr1\_Stat1\_DMC – ON  
Verify VDPU\_Pwr1\_Stat2\_DMC – ON  
Verify VDPU\_Pwr2\_Stat1\_DMC – OFF  
Verify VDPU\_Pwr2\_Stat2\_DMC – OFF  
Verify VDPU\_Nom\_Cntl\_Unit\_Pwr\_Stat1\_DMC – ON

Verify VDPU\_Nom\_Cntl\_Unit\_Pwr\_Stat2\_DMC – ON  
 Verify VDPU\_Redun\_Cntl\_Unit\_Pwr\_Stat1\_DMC – OFF  
 Verify VDPU\_Redun\_Cntl\_Unit\_Pwr\_Stat2\_DMC – OFF

Verify VDPU\_Active\_Pwr\_Channel\_Stat\_SW – PDU1  
 Verify VDPU\_Active\_Cntl\_Unit\_Stat\_SW – CU1  
 Verify VDPU\_Nom\_Cntl\_Unit\_Act\_DMC – ON  
 Verify VDPU\_Redun\_Cntl\_Unit\_Act\_DMC – OFF  
 Verify VDPU\_Nom\_Health\_Stat1\_DMC – OK  
 Verify VDPU\_Nom\_Health\_Stat2\_DMC – OK  
 Verify VDPU\_Redun\_Health\_Stat1\_DMC – NOT\_OK  
 Verify VDPU\_Redun\_Health\_Stat2\_DMC – NOT\_OK  
 Verify VDPU\_I/F\_Unit\_Pwr\_Stat\_DMC – ON  
 Verify VDPU\_I/F\_Unit\_Sec\_3.3 V\_DMC: 3.3 V ± 0.3 V  
 Verify VDPU\_I/F\_Unit\_Sec\_5V\_DMC: 5.0 V ± 0.5 V  
 Verify VDPU\_SW\_Mode\_DMC – SWITCH  
 Verify VDPU\_Nom\_Input\_Current1\_DMC < 1.12 A  
 Verify VDPU\_Nom\_Input\_Current2\_DMC < 1.12 A  
 Verify VDPU\_Redun\_Input\_Current1\_DMC < 0.1 A  
 Verify VDPU\_Redun\_Input\_Current2\_DMC < 0.1 A  
 Verify VDPU\_Switch\_Auto\_Test\_Stat\_DMC – OK

2. VCA1 ACTIVATION

2.1 Activate the VCA1

COMMS: VCA1

VCA1

Verify Pwr – OFF

NOTE

1:FLAP performs:  
 Check that VDPU subunits have been activated, check that VCA 1 not already switched ON, set the switch to route a synchronization signal to the VCA 1, set the switch to route VCA 1 signal via line 1 to USOS VSU, switch the corresponding VCA 1 power outlet ON, update the VDPU context information.

The VDPU default configuration after the VCA Activation FLAP is : VCA1 Sync line is connected to SSMB Sync (1 = SSMB Sync) and ISS line 1 video signal connected to VCA1 line (19 = VCA1)

'Commands'

**cmd Activation Execute (OK)**

Verify Pwr – ON  
 Verify Act Stat – ON  
 Verify Sync Connected: 1  
 Verify ISS Line1 Connected: 19  
 Verify Pwr Stat1 – ON  
 Verify Pwr Stat2 – ON

Verify VDPU\_VCA1\_Pwr\_Stat\_DMC – OFF  
 Verify VDPU\_VCA1\_Pwr\_Stat\_SW – OFF

**cmd** VCA1\_Activation\_AP  
**data** Onboard\_Execution\_Node –  
 USM SW DMC USS Swoop Instance  
**data** Onboard\_Reception\_Node –  
 SYS CCSDS End Point DMC DMS SERV

Verify VDPU\_VCA1\_Pwr\_Stat\_DMC – ON  
 Verify VDPU\_VCA1\_Pwr\_Stat\_SW – ON  
 Verify VDPU\_VCA1\_Sync\_Cnct\_DMC: 1 (SSMB Sync)  
 Verify VDPU\_SSMB\_Line1\_Cnct\_DMC: 19 (VCA1)  
 Verify VDPU\_VCA1\_Pwr\_Stat1\_DMC – ON  
 Verify VDPU\_VCA1\_Pwr\_Stat2\_DMC – ON

3. VCA2 ACTIVATION

3.1 Activate the VCA2

COMMS: VCA2

VCA2

Verify Pwr – OFF

NOTE

1. FLAP performs:  
 Check that VDPU subunits have been activated, check that VCA 2 not already switched ON, set the switch to route a synchronization signal to the VCA 2, set the switch to route VCA 2 signal via line 2 to USOS VSU, switch the corresponding VCA 2 power outlet ON, update the VDPU context information.

The VDPU default configuration after the VCA Activation FLAP is : VCA2 Sync line is connected to SSMB Sync (1 = SSMB Sync) and ISS line 2 video signal connected to VCA 2 line (20 = VCA 2)

'Commands'

**cmd** Activation **Execute** (OK)

Verify Pwr – ON  
 Verify Act Stat – ON  
 Verify Sync Connected: 1  
 Verify ISS Line1 Connected: 20  
 Verify Pwr Stat1 – ON  
 Verify Pwr Stat2 – ON

Verify VDPU\_VCA2\_Pwr\_Stat\_DMC – OFF  
 Verify VDPU\_VCA2\_Pwr\_Stat\_SW – OFF

**cmd** VCA2\_Activation\_AP  
**data** Onboard\_Execution\_Node –  
 USM SW DMC USS Swoop Instance  
**data** Onboard\_Reception\_Node –  
 SYS CCSDS End Point DMC DMS SERV

Verify VDPU\_VCA2\_Pwr\_Stat\_DMC – ON  
 Verify VDPU\_VCA2\_Pwr\_Stat\_SW – ON  
 Verify VDPU\_VCA2\_Sync\_Cnct\_DMC: 1 (SSMB Sync)  
 Verify VDPU\_SSMB\_Line2\_Cnct\_DMC: 20 (VCA2)  
 Verify VDPU\_VCA2\_Pwr\_Stat1\_DMC – ON  
 Verify VDPU\_VCA2\_Pwr\_Stat2\_DMC – ON

4. [VMN1 ACTIVATION](#)

<p><b>NOTE</b>                  Crew has to activate Video Monitors manually.</p>
---

4.1 [Verify PDU1 Power Outlets](#)

EPDS: PDU1 28V Subsys

[PDU1 28V Subsys](#)

Verify Subsys Pwr Bus1 – ON

Verify PDU1\_Subsys\_Pwr\_Bus1\_On\_Off\_Stat\_DMC – ON

4.2 [Activate the VMN1](#)

Verify Power ON/OFF LED – OFF

SCM

VMN Toggle Switch → ON

Verify Power ON/OFF LED – ON (green)

PWS

COMMS: VMN1

[VMN1](#)

Verify Pwr – ON

# COL VIDEO EQUIPMENT ACTIVATION

(ASSY OPS/1E/FIN/MULTI E)

Page 6 of 9 pages

Verify Input Current < 1.1 A

Verify Temp < 55° C

Verify VMN1\_Pwr\_Stat\_DMC – OFF

**cmd** VMN1\_Activation\_AP

**data** Onboard\_Execution\_Node -  
USM SW DMC USS Swop Instance

**data** Onboard\_Reception\_Node -  
SYS CCSDS End Point DMC DMS SERV

Verify VMN1\_Pwr\_Stat\_DMC – ON

Verify VMN1\_Input\_Current\_DMC < 1.1 A

Verify VMN1\_Temp\_DMC < 55 °C

## 5. VMN2 ACTIVATION

### NOTE

Crew has to activate Video Monitors manually.

### 5.1 Verify PDU2 Power Outlets

EPDS: PDU2 28V Subsys

PDU2 28V Subsys

Verify Subsys Pwr Bus2 – ON

Verify PDU2\_Subsys\_Pwr\_Bus2\_On\_Off\_Stat\_DMC – ON

### 5.2 Activate the VMN2

Verify Power ON/OFF LED – OFF

SCM

VMN Toggle Switch → ON

Verify Power ON/OFF LED – ON (green)

PWS

COMMS: VMN2

VMN2

Verify Pwr – ON

Verify Input Current < 1.1 A

Verify Temp < 55° C

Verify VMN2\_Pwr\_Stat\_DMC – OFF

**cmd** VMN2\_Activation\_AP

**data** Onboard\_Execution\_Node -  
USM SW DMC USS Swop Instance

**data** Onboard\_Reception\_Node -  
SYS\_CCSDS\_End\_Point\_DMC\_DMS\_SERV

Verify VMN2\_Pwr\_Stat\_DMC – ON  
 Verify VMN2\_Input\_Current\_DMC < 1.1 A  
 Verify VMN2\_Temp\_DMC < 55 °C

6. VCR1 ACTIVATION

6.1 Verify PDU1 Power Outlets

EPDS: PDU1 28V Subsys

PDU2 28V Subsys

Verify Subsys Pwr Bus4 – ON

Verify PDU1\_Subsys\_Pwr\_Bus4\_On\_Off\_Stat\_DMC – ON

6.2 Activate the VCR1

COMMS: VCR1

VCR1

'Commands'

Verify Pwr – OFF

NOTE

VCR1 Activation FLAP performs: Power on VCR 1, enable monitoring, activate acquisition from VCR 1, switch VCR 1 to nominal mode, check that recorder is in remote mode.

**cmd** Activation **Execute** (OK)

Verify Pwr – ON

Verify Act Stat – OK

Verify Input Current < 1.37 A

Verify Temp < 55° C

Verify Operate Stat – NOMINAL

Verify Remote Local Stat – REMOTE

Verify VCR1\_Pwr\_Stat\_DMC – OFF

**cmd** VCR1\_Activation\_AP

**data** Onboard\_Execution\_Node -  
USM SW DMC USS Swop Instance

**data** Onboard\_Reception\_Node -  
SYS CCSDS End Point DMC DMS SERV

Verify VCR1\_Pwr\_Stat\_DMC – ON

Verify VCR1\_Act\_Stat\_DMC – OK

Verify VCR1\_Input\_Current\_DMC < 1.37 A

Verify VCR1\_Temp\_DMC < 55 °C

Verify VCR1\_Ops\_Stat\_DMC – NOMINAL

Verify VCR1\_Remote\_Local\_Stat\_DMC – REMOTE

NOTE

VCR 1 is now ready for tape insertion and VCR operation (record / playback)

7. VCR2 ACTIVATION

7.1 Verify PDU2 Power Outlets

EPDS: PDU2 28V Subsys

PDU2 28V Subsys

Verify Subsys Pwr Bus2 – ON

Verify PDU2\_Subsys\_Pwr\_Bus2\_On\_Off\_Stat\_DMC – ON

7.2 Activate the VCR2

COMMS: VCR2

VCR2

'Commands'

Verify Pwr – OFF

NOTE

VCR2 Activation FLAP performs: Power on VCR 2, enable monitoring, activate acquisition from VCR 2, switch VCR 2 to nominal mode, check that recorder is in remote mode.

**cmd** Activation **Execute** (OK)

Verify Pwr – ON

Verify Act Stat – OK

Verify Input Current < 1.37 A

Verify Temp < 55° C

Verify Operate Stat – NOMINAL

Verify Remote Local Stat – REMOTE

Verify VCR2\_Pwr\_Stat\_DMC – OFF

**cmd** VCR2\_Activation\_AP

**data** Onboard\_Execution\_Node -

USM SW DMC USS Swop Instance

**data** Onboard\_Reception\_Node -

SYS CCSDS End Point DMC DMS SERV

Verify VCR2\_Pwr\_Stat\_DMC – ON

Verify VCR2\_Act\_Stat\_DMC – OK

Verify VCR2\_Input\_Current\_DMC < 1.37 A



## COL VIDEO EQUIPMENT ACTIVATION

(ASSY OPS/1E/FIN/MULTI E)

Page 9 of 9 pages

Verify VCR2\_Temp\_DMC < 55 °C  
Verify VCR2\_Ops\_Stat\_DMC – NOMINAL  
Verify VCR2\_Remote\_Local\_Stat\_DMC – REMOTE

### NOTE

VCR 2 is now ready for tape insertion and VCR operation  
(record / playback)

7.3

### Swapping DMS telemetry packets (Ground-only)

### NOTE

No Crew activity required.

Packet swapping initiated from Col-CC:

Disable MMC\_Gnd\_Tlm\_Pkt\_COMMS1\_DMC (1Hz)

Disable MMC\_Gnd\_Tlm\_Pkt\_COMMS2\_DMC (1Hz)

Enable MMC\_Gnd\_Tlm\_Pkt\_COMMS1\_DMC (0.1Hz)

Enable MMC\_Gnd\_Tlm\_Pkt\_COMMS2\_DMC (0.1Hz)

COL-CC to swap nominal DMS telemetry packets, wait for “GO”  
to continue

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# 1.500 COL PWS INSTALLATION SETUP

(ASSY OPS/1E/FIN/HC/MULTI E) Page 1 of 5 pages

## OBJECTIVE:

To establish connection link between COL SUPs and COL PWS.

### NOTE

Precondition: PWS installation performed according to procedure [{3.103 COL PCS/SSC/PWS INSTALLATION/REMOVAL}](#), all (ESA SODF: MSM: NOMINAL)

### LOCATION:

COL: SUP 1(2,3,4)

### DURATION:

15 minutes

### PARTS:

COL PWS, A31P Laptop P/N SEG33115360-303

A31p 16V DC Power Cable P/N SEG33116459-301

Power Cable Assembly, PCS UOP 120VDC P/N SEZ 39129260-311

Columbus Ethernet Cable P/N SEG33115757-301

A31P 120VDC Power Supply P/N SEG33116412-302

### **WARNING**

Failure to remove power and apply close inhibit could result in electrical shock hazard!

- SUP 1. [VERIFYING POWER OFF](#)  
√COL SUP [X] Power Light PWR 2(3), J02(3) – Lt Off
- Refer to Figure 1 and Table 3
- PCS COL: EPS: SUPs (UOPs)  
[COL PDU 1-2 SUPs VTC1](#)  
Off / On Status
- Verify SUP [X] Outlet 2 – Off

# 1.500 COL PWS INSTALLATION SETUP

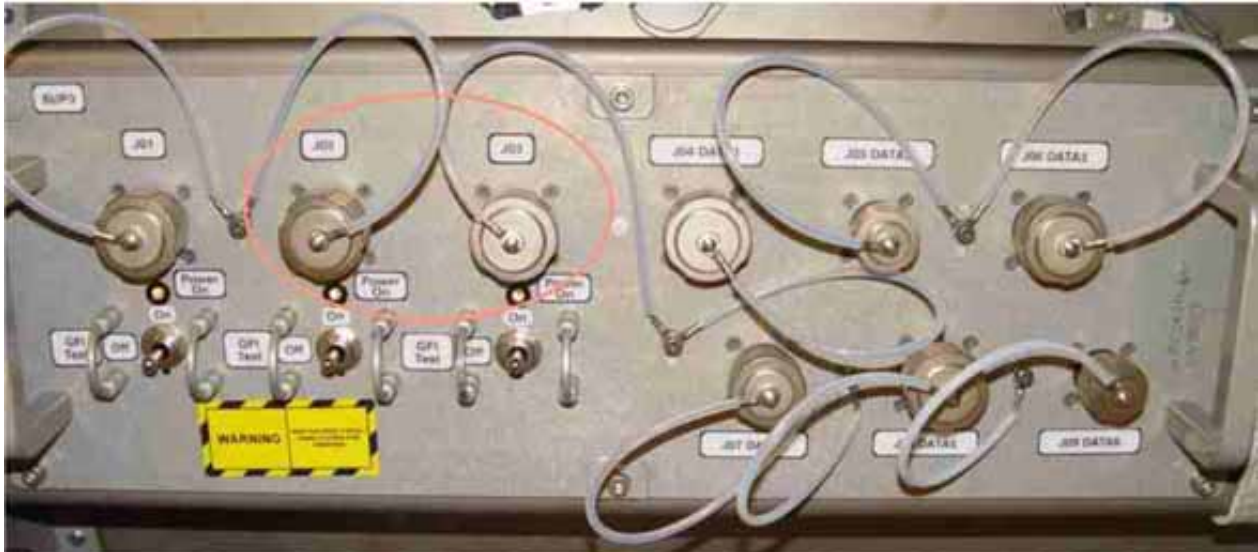


Figure 1. Highlighted SUP Power Outlet 2 (3) and Power Indication Light location

## 2. [MAKING COL PWS POWER AND DATA CABLE CONNECTIONS](#)

### NOTE

Figure 3 at the end of this procedure illustrates the cable connections to be made by crew.

- |         |  |
|---------|--|
| 2.1     | Connect LAN cable with COL PWS   |
| PWS     | Columbus Ethernet Cable P/N SEG33115757-301 → ← COL PWS, A31P Laptop P/N SEG33115360-303 Ethernet connector              |
| 2.2     | Connect 16V Cable Assembly A31p with COL PWS   |
|         | Power Cable A31p 16VDC P/N SEG33116459-301 → ← COL PWS, A31P Laptop P/N SEG33115360-303 power inlet                      |
| 2.3     | Connect 16V Cable Assembly A31p with DC Power supply   |
|         | Power Cable A31p 16VDC P/N SEG33116459-301 → ← A31P 120VDC Power Supply P/N SEG33116412-302 connector J2                 |
| 2.4     | Connect Cable Assembly 120VDC with DC Power supply   |
|         | Power Cable Assembly, PCS UOP 120VDC P/N SEZ 39129260 -311 → ← A31P 120VDC Power Supply P/N SEG33116412-302 connector J1 |
| 2.5     | Connect Columbus Ethernet cable with SUP Data Outlet   |
| COL SUP | Columbus Ethernet Cable P/N SEG33115757-301 → ← SUP J05(J09) according to Table 1 and Figure 2                           |

# 1.500 COL PWS INSTALLATION SETUP

**Table 1. COL SUP data provision.**

SUP	DMS LAN	Connector
SUP 1	Nominal Redundant	DATA 2, J05 DATA 6, J09
SUP 2	Nominal Redundant	DATA 2, J05 DATA 6, J09
SUP 3	Nominal Redundant	DATA 2, J05 DATA 6, J09
SUP 4	Nominal Redundant	DATA 2, J05 DATA 6, J09



**Figure 2. SUP J05 and J09 location**

- 2.6 Connect DC Power Cable 120VDC with SUP [X] 120VDC Power outlets

COL SUP

Power Cable Assembly, PCS UOP 120VDC P/N SEZ 39129260 -311 →|← SUP [X] High Voltage outlets according to Table 2 and Figure 2.

**Table 2. COL SUP power provision.**

SUP	Connector
SUP 1	PWR 2, J02
SUP 2	PWR 2, J02
SUP 3	PWR 3, J03
SUP 4	PWR 2, J02

# 1.500 COL PWS INSTALLATION SETUP

### 3. SUP [X] POWER ON FOR PWS

<b>NOTE</b> Crew to inform Ground to perform the step if no PWS is active, either in Node 2 or in Columbus.
--

Activate PDU Outlet according used SUP PWR Connector as provided by Table 3.

**Table 3. COL SUP power provision.**

SUP	Connector	PDU	Outlet
SUP 1	PWR 2, J02	PDU 1	Outlet 12
SUP 2	PWR 2, J02	PDU 1	Outlet 15
SUP 3	PWR 3, J03	PDU 2	Outlet 11
SUP 4	PWR 2, J02	PDU 2	Outlet 15

PWS

EPDS: 120V Payload: PDU1(2) Outlets 11(12,15)

PDU1(2) Outlets 11(12,15)

'Commands'

**cmd Pwr On Execute (OK)**

'SSPC1'

√Pwr – ON

'SSPC2'

√Pwr – ON

SUP

√SUP [X] Power Light PWR 2(3), J02(J03) – Lt On

**cmd PDU1(2)\_SUP[X]\_Pwr\_Out2(3)\_On\_AP**

**data Onboard\_Reception\_Node –**

**SYS CCSDS End Point DMC DMS SERV**

**data Onboard\_Execution\_Node – USM\_SW\_DMC\_USS\_Swop\_Instance**

For SUP1:

√PDU1\_SUP1\_Pwr\_Out2\_SSPC1\_On\_Off\_Stat\_DMC – ON

√PDU1\_SUP1\_Owr\_Out2\_SSPC2\_On\_Off\_Stat\_DMC – ON

For SUP2:

√PDU1\_SUP2\_Pwr\_Out2\_SSPC1\_On\_Off\_Stat\_DMC – ON

√PDU1\_SUP2\_Pwr\_Out2\_SSPC2\_\_On\_Off\_Stat\_DMC – ON

For SUP3:

√PDU2\_SUP3\_Pwr\_Out3\_SSPC1\_On\_Off\_Stat\_DMC – ON

√PDU2\_SUP3\_Pwr\_Out3\_SSPC2\_On\_Off\_Stat\_DMC – ON

# 1.500 COL PWS INSTALLATION SETUP

For SUP4:

√PDU2\_SUP4\_Pwr\_Out2\_SSPC1\_On\_Off\_Stat\_DMC – ON

√PDU2\_SUP4\_Pwr\_Out2\_SSPC2\_On\_Off\_Stat\_DMC – ON

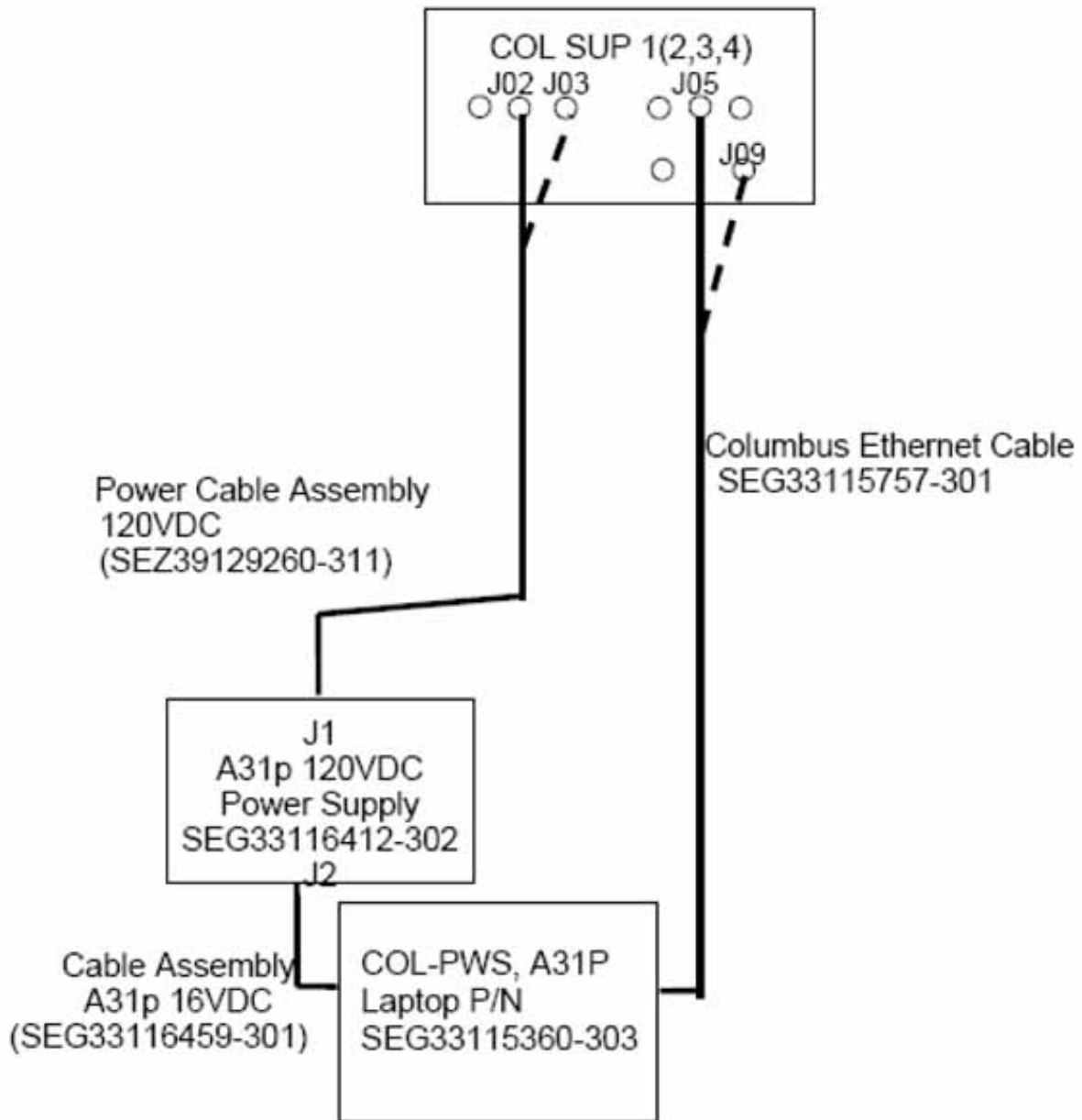


Figure 3. COL PWS Configuration

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OBJECTIVE:

Power On of related SUP power outlet and PWS and further Activation of COL-PWS for executing Columbus Laptop Application (LAPAP) Software.

NOTE

Precondition: PWS installation performed according to PWS location, either COL or Node2:  
[{1.500 COL PWS INSTALLATION SETUP}](#), all (SODF:POC: ACTIVATION & CHECKOUT)  
 or  
[{1.501 NODE 2 PWS INSTALLATION SETUP}](#), all (SODF:POC: ACTIVATION & CHECKOUT)

1. [SUP \[X\] POWER ON FOR PWS](#)

NOTE

Crew to inform Ground to perform the step if no PWS is active, either in Node 2 or in Columbus.

Activate PDU Outlet according used SUP PWR Connector as provided by Table 1.

**Table 1. COL SUP power provision.**

SUP	Connector	PDU	Outlet
SUP 1	PWR 2, J02	PDU 1	Outlet 12
SUP 2	PWR 2, J02	PDU 1	Outlet 15
SUP 3	PWR 3, J03	PDU 2	Outlet 11
SUP 4	PWR 2, J02	PDU 2	Outlet 15

PWS

EPDS: 120V Payload: PDU1(2) Outlets 11(12,15)

PDU1(2) Outlets 11(12,15)

'Commands'

**cmd** Pwr On **Execute** (OK)

'SSPC1'

√Pwr – ON

'SSPC2'

√Pwr – ON

COL SUP

√SUP [x] Power Light PWR 2(3), J02(J03) – Lt On

**cmd** PDU1(2)\_SUP[x]\_Pwr\_Out2(3)\_On\_AP  
**data** Onboard\_Reception\_Node –  
 SYS CCSDS End Point DMC DMS SERV  
**data** Onboard\_Execution\_Node – USM\_SW\_DMC\_USS\_Swop\_Instance

For SUP1:  
√PDU1\_SUP1\_Pwr\_Out2\_SSPC1\_On\_Off\_Stat\_DMC – ON  
√PDU1\_SUP1\_Owr\_Out2\_SSPC2\_On\_Off\_Stat\_DMC – ON

For SUP2:  
√PDU1\_SUP2\_Pwr\_Out2\_SSPC1\_On\_Off\_Stat\_DMC – ON  
√PDU1\_SUP2\_Pwr\_Out2\_SSPC2\_On\_Off\_Stat\_DMC – ON

For SUP3:  
√PDU2\_SUP3\_Pwr\_Out3\_SSPC1\_On\_Off\_Stat\_DMC – ON  
√PDU2\_SUP3\_Pwr\_Out3\_SSPC2\_On\_Off\_Stat\_DMC – ON

For SUP4:  
√PDU2\_SUP4\_Pwr\_Out2\_SSPC1\_On\_Off\_Stat\_DMC – ON  
√PDU2\_SUP4\_Pwr\_Out2\_SSPC2\_On\_Off\_Stat\_DMC – ON

PWS

2. [PWS POWER ON](#)  
sw PWS Laptop Power → On
  
3. [PWS OPERATING SYSTEM \(OS\) BOOT UP](#)

- 3.1 Boot of Operating System  
Verify Appearance of SunOS messages
  
- 3.2 PWS LAN link to DMS

At backside of A31p at ethernet connector line indicator:  
Verify Green LED – On

4. [PWS COL CD-ROM DISK SETUP](#)

NOTE

1. Step 3 only to be performed if a new version of the Columbus CD-ROM contents requires an exchange of the Disk.
2. The Disk exchange has to be performed before finalization of the SunOS Boot-Up.

Push PWS CD-ROM Drive OPEN button → Cartridge Opens

Insert COLUMBUS ODF CD-ROM DISK into Cartridge

Close PWS CD-ROM Drive Cartridge

√PWS CD-ROM Drive LED – On

NOTE

1. Laptop desktop environment appearance and Laptop Application starts.
2. Total PWS Application S/W initialization will need 8 minutes.

5. COLUMBUS LAPTOP APPLICATION BOOT

At backside of A31p at ethernet connector traffic indicator:  
Verify Yellow LED – Blinking

- √Middle of Screen – COL Synoptic Home Page
- √Bottom of Screen – SMP Window
- √Top of Screen – Date&Time Window

In the order of appearance:

- √Left Side of Screen – ANNOTATION Icon
- √Left Side of Screen – MASTER TIME Icon
- √Left Side of Screen – Netscape Icon

6. DATE TIME GROUP (DTG) APPLICATION CHECKOUT

Verify in DTG – Time increments constantly

7. SYSTEM MESSAGE PANEL (SMP) APPLICATION CHECKOUT

Verify in SMP – Appearance of System Messages

8. MONITORING AND CONTROL DISPLAY (MCD) APPLICATION CHECKOUT

COL Synoptics Home Page

Verify Counter in upper right corner – Incrementing

9. CREW DOCUMENTATION APPLICATION CHECKOUT

9.1 Select Netscape

If Netscape is an Icon  
| Restore the 'Netscape' Window

√'Columbus Crew Documentation' page

9.2 Select Documentation Help

sel Button: Help (Help)

√Operation of CD-ROM drive – Short blink of LED

√Appearance of Online-Help – Help on Online Help page

9.3 Minimize Netscape Window

sel Minimize button in Window Decoration Line

√Netscape Icon

10. MASTER TIMELINE VIEWER APPLICATION CHECKOUT

10.1 Restore/Open MTL Viewer

Verify in MTL-Viewer Window – Time indicator updating once per minute

10.2 Request new MTL data

sel 'Display' button

√MTL Display Request Window

10.3 Set timeslice for new MTL Viewer data

Set Block Size: 01:00

10.4 Confirm Request

sel YES

Verify Appearance of Question Window

sel YES in Question Window

If a Warning Box is displayed indication that in the timeframe no activity is scheduled

sel OK button

continue with step 10.5

If a Warning Box is displayed indicating 'Error updating MTL subset data'

sel OK button

click on Cancel button in MTL Display Request Window

continue with step 10.6

10.5 MTL Data

Verify in MTL Viewer Window – MTL data for time range 01:00h

10.6 Minimize MTL Viewer Window

sel Minimize button in Window Decoration Line

√MTL Icon

11. ANNOTATION APPLICATION CHECKOUT

11.1 Restore/Open ANNOTATION application Window

√Annotation Box Window Open

11.2 Get Annotation File List

sel LIST

√'Annotation File List' Window open

√Names of currently existing Annotation Files listed

11.3 Deselect Annotation List

sel Cancel

√'Annotation File List' Window closed

11.4 Minimize Annotation Window

sel Minimize button in Window Decoration Line

√ANN Icon

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## 2.199 PWS DEACTIVATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 4 pages

### OBJECTIVE:

Final deactivation of the COL PWS application software and run down of PWS operating system. Switch off A31P power supply and related SUP power outlet.

- PWS
1. [STOP PWS APPLICATION SOFTWARE](#)
    - If PWS does not accept inputs from keyboard or mouse
      - | Go to [step 3](#)
    - 1.1 Annotation
      - If Annotation Files are open
        - | sel save
        - | Iconize Annotation Window
    - 1.2 Monitoring and Control Displays
      - √MCD – Only COL Synoptics Home Page
    - 1.3 Master Timeline
      - sel MTL
      - sel Quit
      - On MTL Question Window:
        - sel YES
      - √MTL window – Closed
  2. [POWERING DOWN PWS](#)
    - Right Mouse Click and Hold in the Root Window area:
      - In the Columbus Segment Menu,
        - sel Shutdown
        - sel Application Shutdown
      - On LAPAP Shutdown Confirmation Window:
        - sel YES
      - Wait until workspace contains no window
      - Right Mouse Click and Hold in the Root Window area:
        - In the Columbus Segment Menu,
          - sel Shutdown
          - sel Laptop Shutdown
        - On Quit MWM Confirmation Window:
          - sel YES

Verify the appearance of the Operating System message – 'Type any key to continue'

**NOTE**

Do not perform any typing after appearance of the message 'Type any key to continue'. This will lead to a not desired reboot of the Laptop. If message does not appear within 90 seconds, then proceed anyway.

3. TURNING OFF POWER

Inform Ground prior performing the step.

Press PWS power button → Off

√PWS Power Light – Off (Lt Off)

4. A31P POWER SUPPLY OFF

√COL-PWS Powered Off

Pwr Supply A31p 120V DC Power Supply Input Power sw → OFF (Lt Off)  
Refer to Figure 1.



Figure 1. USOS A31p120V DC Power Supply Input Side with Power Switch on Left, Output Side with Output Power Light on Right.

5. SUP [X] POWER OFF TO PWS RELATED OUTLETS

If no COL-PWS is active, ground will perform step

Select SUP in Columbus to which deactivated PWS is connected to  
o SUP 1 o SUP 2 o SUP 3 o SUP 4"

**NOTE**

Deactivate PDU Outlet related to the COL PWS which shall be disconnected from SUP, with used PWR Connector indicating the Outlet as provided by table 1.



Table 1. COL SUP power provision.

SUP	Connector	PDU	Outlet
SUP 1	PWR 2, J02	PDU 1	Outlet 12
SUP 2	PWR 2, J02	PDU 1	Outlet 15
SUP 3	PWR 3, J03	PDU 2	Outlet 11
SUP 4	PWR 2, J02	PDU 2	Outlet 15

EPDS: 120V Payload: PDU1(2) Outlets

PDU1(2) Outlet 11 (12,15)

'commands'

cmd Pwr Off **Execute** (OK)

'SSPC1'

√Pwr – Off

'SSPC2'

√Pwr – Off

√SUP[x] Power Light PWR1, J02(J03) – Lt Off

Refer to Figure 2

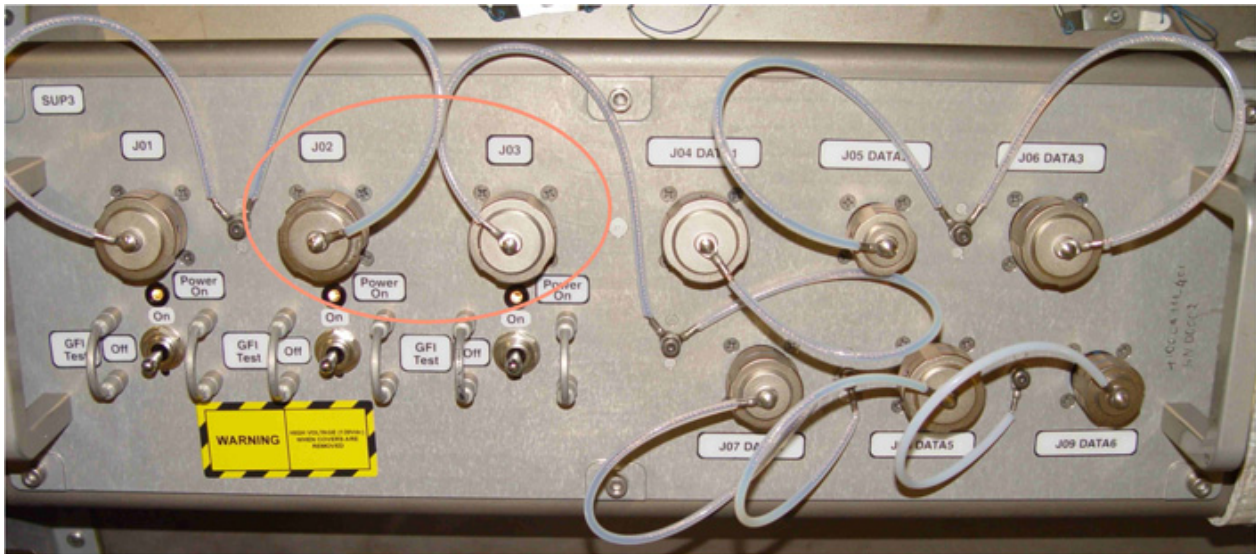


Figure 2. COL SUP with Output Power Light on left Side

PCS

COL: EPS: SUPs (UOPs)

COL PDU 1-2 SUPs VTC1

'Off / On Status'

Verify SUP [x] Outlet 2(3) – Off

**cmd** PDU1(2)\_SUP1(2,3,4)\_Pwr\_Out2(3)\_Off\_AP

**data** Onboard\_Reception\_Node: –

SYS CCSDS End Point DMC DMS SERV

**data** Onboard\_Execution\_Node: – USM\_SW\_DMC\_USS\_Swop\_Instance

For SUP1:

√PDU1\_SUP1\_Pwr\_Out2\_SSPC1\_On\_Off\_Stat\_DMC – OFF

√PDU1\_SUP1\_Pwr\_Out2\_SSPC2\_On\_Off\_Stat\_DMC – OFF

For SUP2:

√PDU1\_SUP2\_Pwr\_Out2\_SSPC1\_On\_Off\_Stat\_DMC – OFF

√PDU1\_SUP2\_Pwr\_Out2\_SSPC2\_On\_Off\_Stat\_DMC – OFF

For SUP3:

√PDU2\_SUP3\_Pwr\_Out3\_SSPC1\_On\_Off\_Stat\_DMC – OFF

√PDU2\_SUP3\_Pwr\_Out3\_SSPC2\_On\_Off\_Stat\_DMC – OFF

For SUP4:

√PDU2\_SUP4\_Pwr\_Out2\_SSPC1\_On\_Off\_Stat\_DMC – OFF

√PDU2\_SUP4\_Pwr\_Out2\_SSPC2\_On\_Off\_Stat\_DMC – OFF

# UNLOCK IMV SUPPLY FAN LAUNCH AVM

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 7 pages

## OBJECTIVE:

Unlock the Intermodule Ventilation (IMV) Supply Fan Assembly (ISFA) launch Anti Vibration Mounts (AVM).

## LOCATION:

Installed: COL1PFC

Stowed: √Inventory Management System (IMS)

## DURATION:

15 minutes

## CREW:

One

## PARTS:

N/A

## MATERIALS:

None

## TOOLS:

Headlamp Light Source Assy P/N SEZ33114010-301

## Columbus Tool Kit:

Tool Bag 1:

Ratchet Wrench, 1/4"

Tool Bag 2:

10" Extension, 1/4" Drive

Tool Bag 3:

M6 (5 mm) Hex Head Driver, 1/4" Drive

## REFERENCED PROCEDURE(S):

None

## SAFING:

None

1. ACCESSING

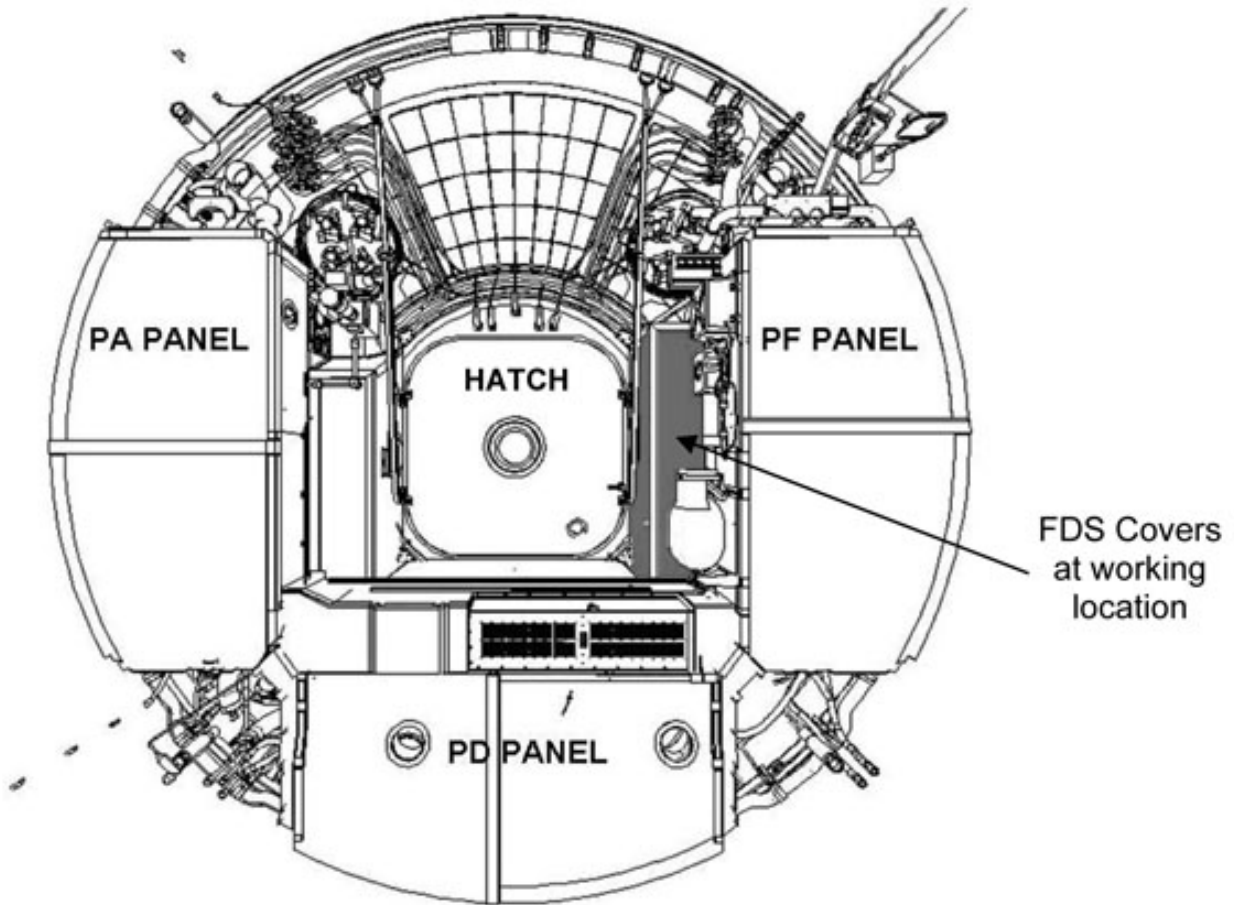


Figure 1: Columbus Port Cone Layout (view from Starboard)

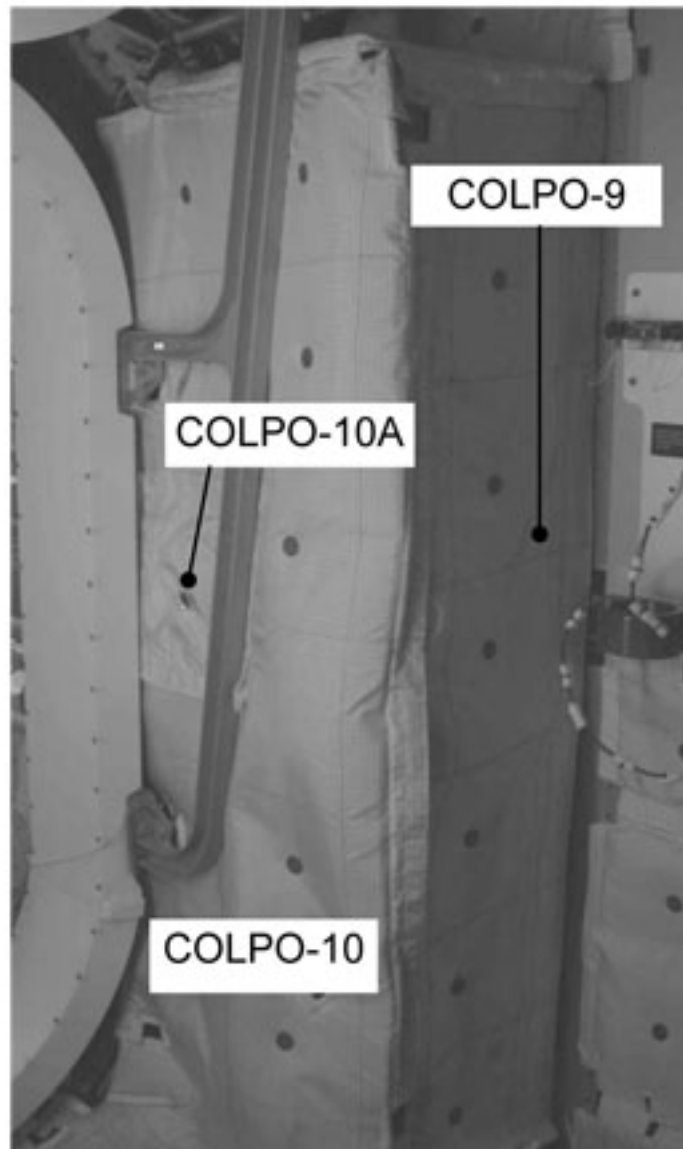


Figure 2: COL1PF FDS Cover Panels

NOTE

FDS Cover Panel COLPO-10A is removed together with COLPO-10.

- 1.1 Remove FDS Cover Panel COLPO-10 then COLPO-9.  
Refer to Figure 2.  
Temporarily stow.

2. LAUNCH AVM UNLOCKING

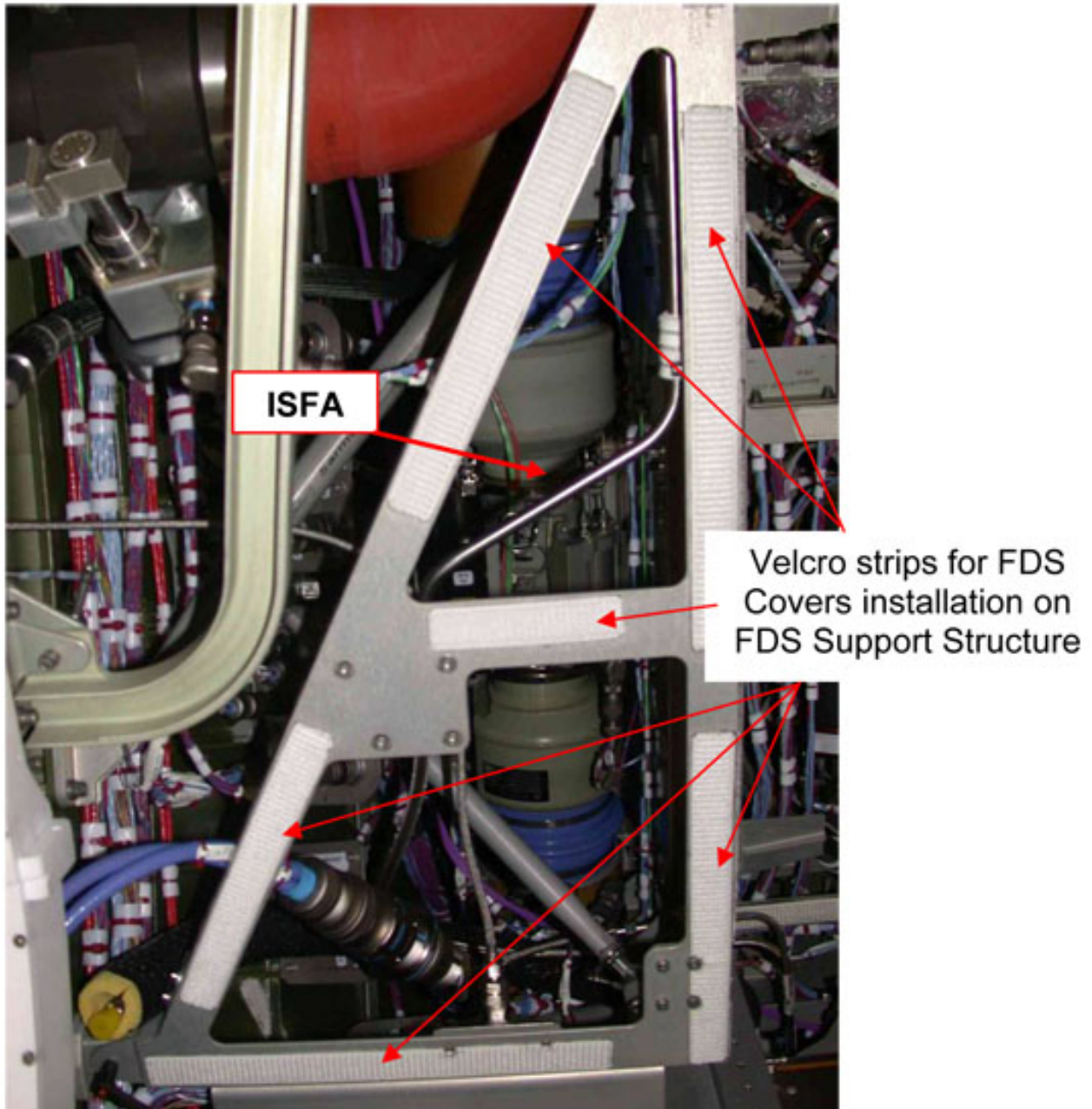


Figure 3: ISFA installation location on COL1PFC

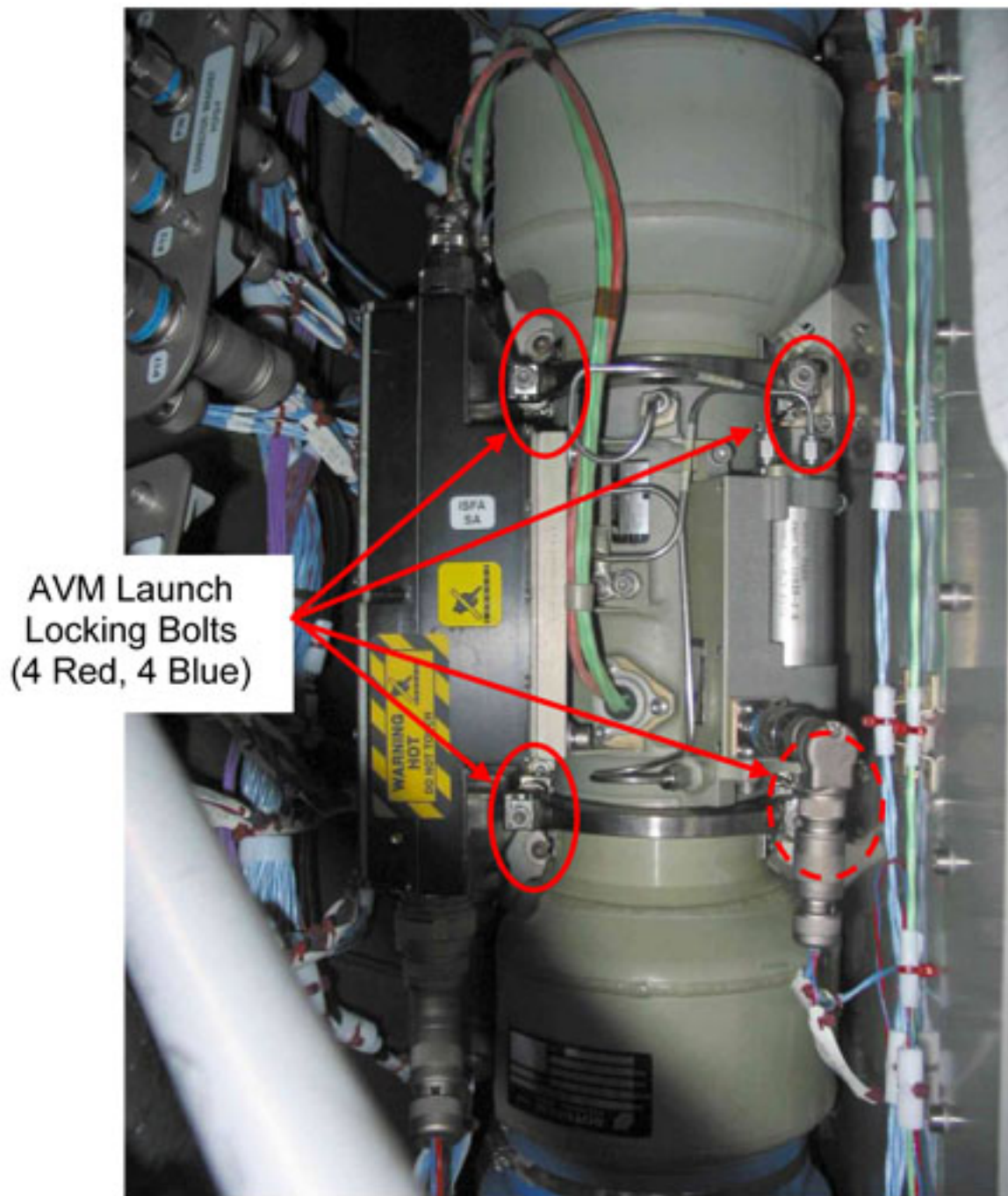


Figure 4: ISFA AVM Launch locking bolts location

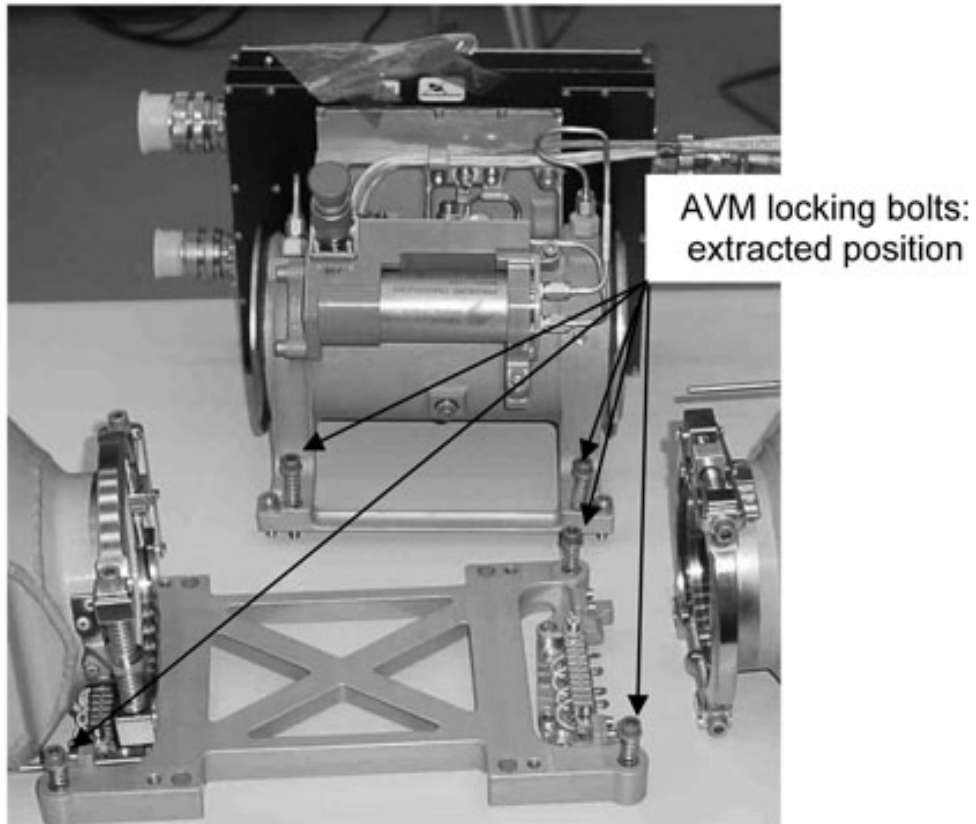


Figure 5: view of the ISFA spring loaded locking bolts before installation

NOTE

1. To improve the working location lighting, don the Headlamp Light Source Assy.
2. The AVM Locking Bolts are colour coded (4 blue and 4 red) to ease their identification.
3. The 8 AVM locking bolts are spring loaded. When completely loosened, the bolts are pushed up by the spring. Refer to Figure 5.

- 2.1 Release ISFA AVM locking bolts (4 red, 4 blue) (Ratchet Wrench, 1/4"; 10" Extension, 1/4" Drive; M6 (5 mm) Hex Head Driver, 1/4" Drive). Refer to Figure 4 and Figure 5.

3. CLOSEOUT

- 3.1 √For FOD around work area within 1 m radius.

NOTE

1. The FDS Covers are installed on the support structure by means of "structure to blanket" and "blanket to blanket" Velcro strips. Refer to Figure 3.
2. FDS Cover COLPO-10A should be already installed on COLPO-10.



## UNLOCK IMV SUPPLY FAN LAUNCH AVM

(ASSY OPS/1E/FIN/MULTI E)

Page 7 of 7 pages

- 3.2 Install FDS Cover Panel COLPO-9, then COLPO-10 (including COLPO-10A) on FDS Structure.  
Refer to Figure 2.
- 3.3 ISS ↓ **COL-CC**: task completion.  
Stow tools, equipment.

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# UNLOCK IMV RETURN FAN LAUNCH AVM

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 7 pages

## OBJECTIVE:

Unlock the Intermodule Ventilation (IMV) Return Fan Assembly (IRFA) Anti Vibration Mounts (AVM) launch locking bolts.

## LOCATION:

Installed: COL1PAC

Stowed: √Inventory Management System (IMS)

## DURATION:

15 minutes

## CREW:

One

## PARTS:

None

## MATERIALS:

None

## TOOLS:

Headlamp Light Source Assy P/N SEZ33114010-301

## Columbus Tool Kit:

Tool Bag 1:

Ratchet Wrench, 1/4"

Tool Bag 2:

10" Extension, 1/4" Drive

Tool Bag 3:

M6 (5 mm) Hex Head Driver, 1/4" Drive

## REFERENCED PROCEDURE(S):

None

1. ACCESSING

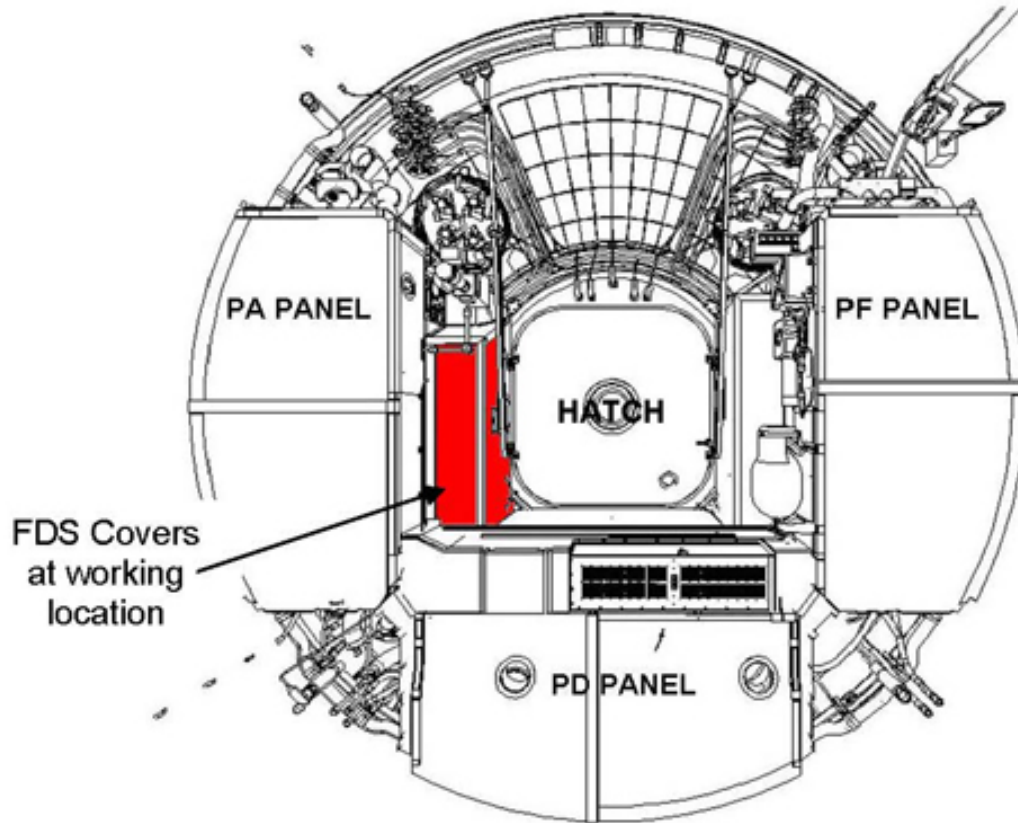


Figure 1. Columbus Port Cone Layout (view from Starboard)

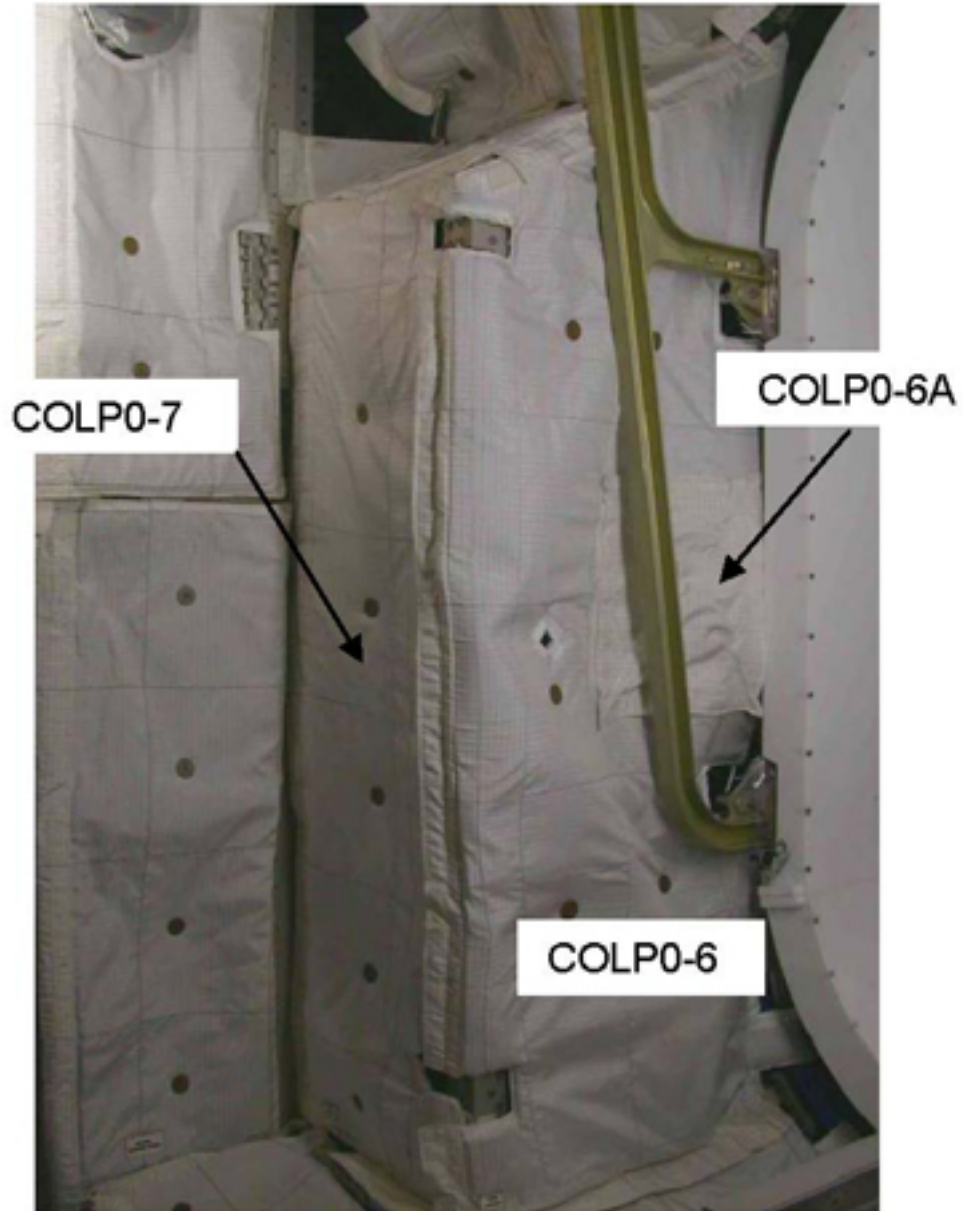


Figure 2. COL1PA FDS Cover Panels

NOTE

FDS Cover Panel COLP0-6A is removed together with COLP0-6.

- 1.1 Remove FDS Cover Panel COLP0-6, then COLP0-7.  
Refer to Figure 2.  
Temporarily stow.

2. UNLOCKING AVM LAUNCH LOCKING BOLTS

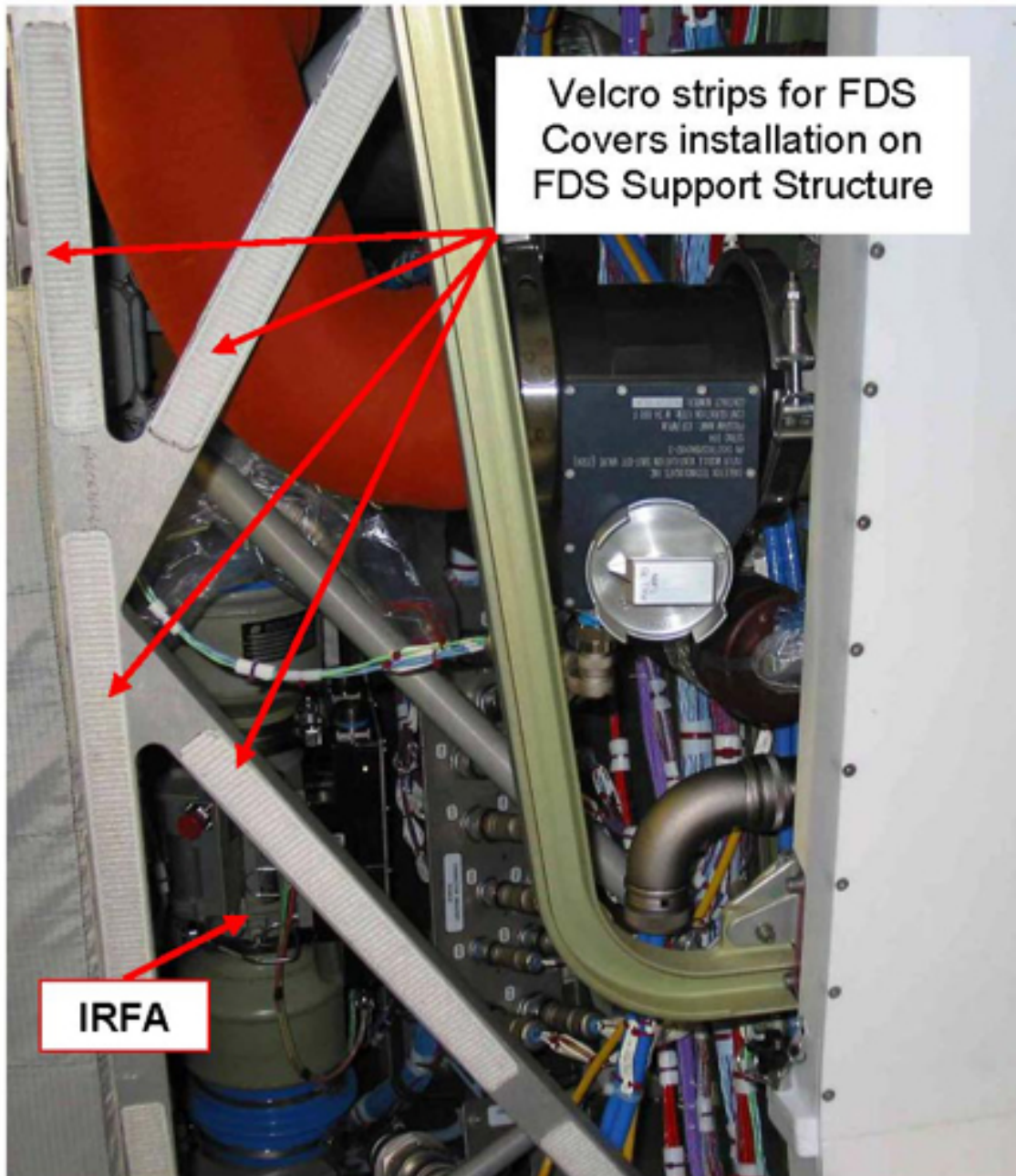


Figure 3. IRFA installation location on COL1PAC

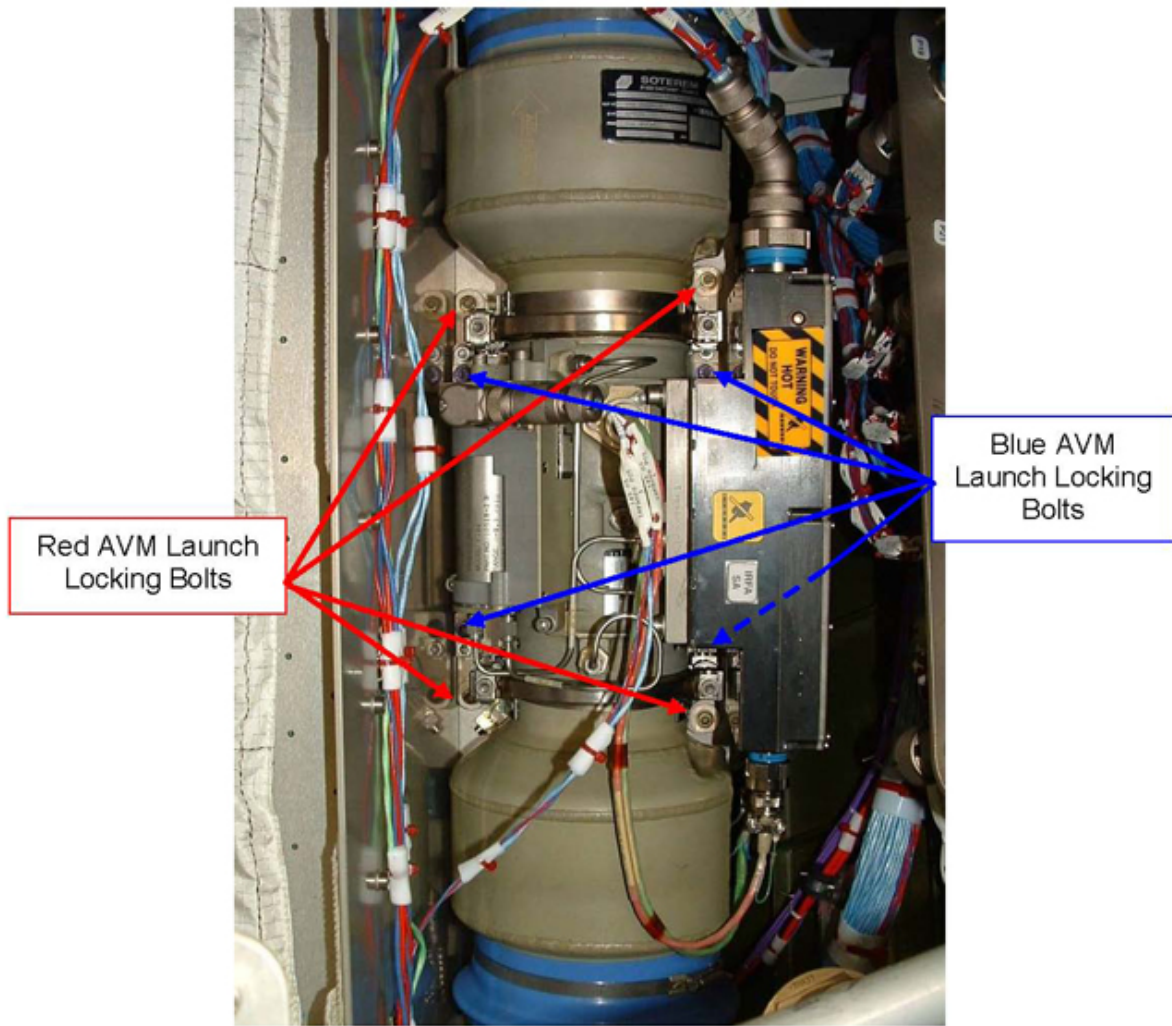


Figure 4. IRFA AVM Launch locking bolts location

## UNLOCK IMV RETURN FAN LAUNCH AVM

(ASSY OPS/1E/FIN/MULTI E)

Page 6 of 7 pages

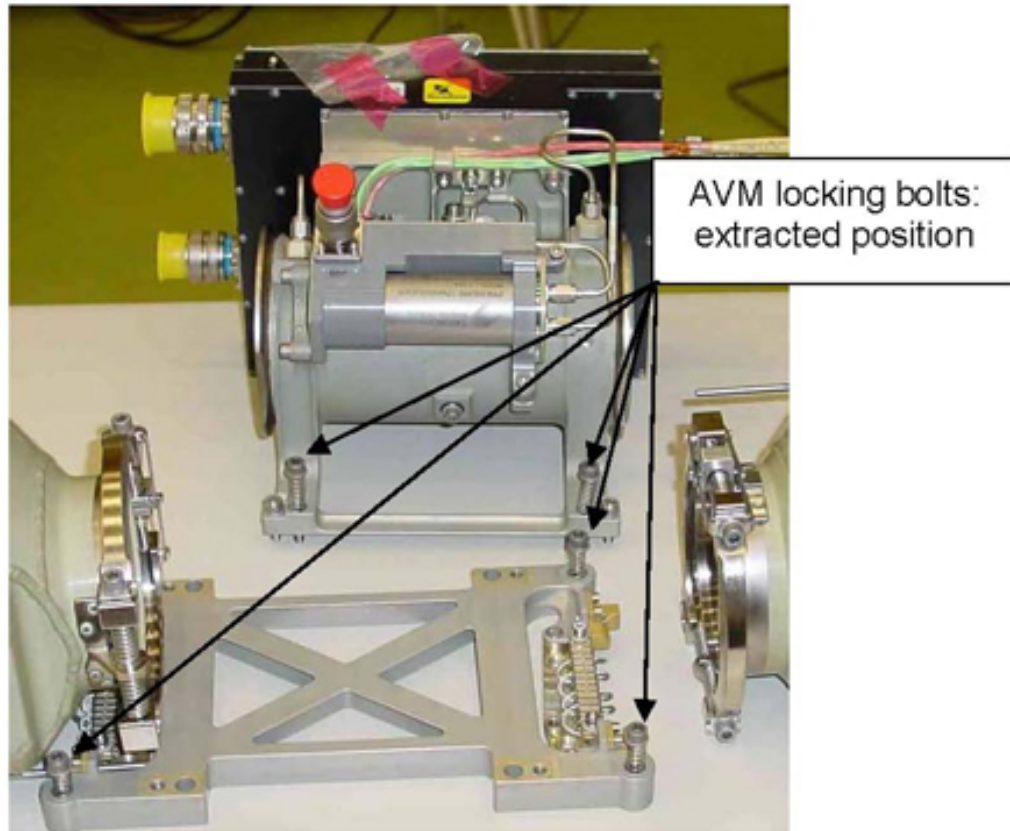


Figure 5. IRFA spring loaded locking bolts before installation

### NOTE

1. To improve the working location lighting, don the Headlamp Light Source Assy.
2. The AVM launch locking bolts are colour coded (4 blue and 4 red) to ease their identification.
3. The 8 AVM launch locking bolts are spring loaded. When completely loosened, the bolts are pushed up by the spring. Refer to Figure 5.

- 2.1 Completely loosen IRFA AVM launch locking bolts (4 red, 4 blue) (Ratchet Wrench, 1/4"; 10" Extension, 1/4" Drive; M6 (5 mm) Hex Head Driver, 1/4" Drive)  
Refer to Figures 4 and 5.

### 3. CLOSEOUT

- 3.1 √For FOD around work area within 1 m radius.



## UNLOCK IMV RETURN FAN LAUNCH AVM

(ASSY OPS/1E/FIN/MULTI E)

Page 7 of 7 pages

### NOTE

1. The FDS Covers are installed on the support structure by means of “structure to blanket” and “blanket to blanket” Velcro strips. Refer to Figure 3.
2. FDS Cover COLP0-6A should be already installed on COLP0-6.

- 3.2 Install FDS Cover COLP0-7, then COLP0-6 (including COLP0-6A) on FDS Support Structure.  
Refer to Figure 2.
- 3.3 ISS ↓ **COL-CC** of task completion.  
Stow tools.

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# UNLOCK CABIN FAN LAUNCH AVM

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 7 pages

## OBJECTIVE:

Unlock the Anti Vibration Mounts (AVM) launch locking bolts of Cabin Fan Assembly (CFA) 1, 2.

## LOCATION:

Installed: COL1PDM

## DURATION:

15 minutes

## CREW:

One

## PARTS:

None

## MATERIALS:

None

## TOOLS:

Headlamp Light Source Assy P/N SEZ33114010-301

## Columbus Tool Kit

Tool Bag 1:

Ratchet Wrench 1/4"

Tool Bag 2:

10" Extension, 1/4" Drive

M6 (5mm) Hex Head Driver 1/4" Drive

## REFERENCED PROCEDURE(S):

1.203 COL DECK RACK D1 ROTATE

4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS

1. SAFING AND ACCESSING

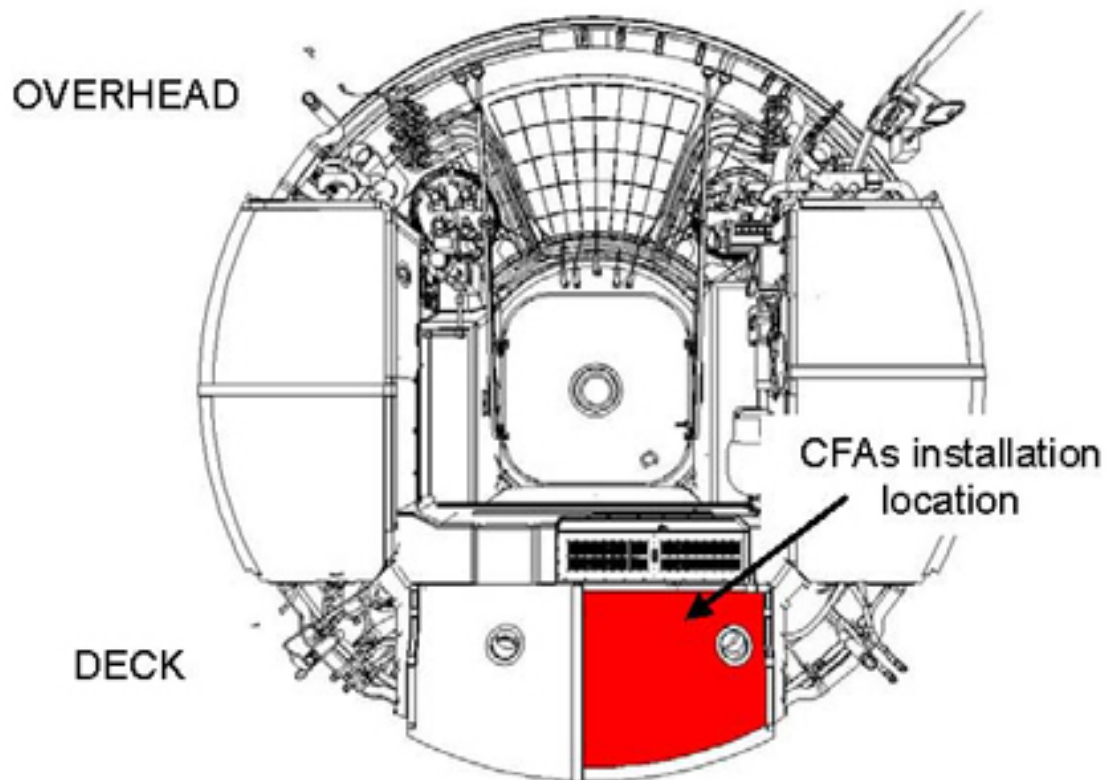


Figure 1. Columbus Port Cone Panels (viewing from starboard, racks not shown)

- 1.1 Rotate down Rack D1, perform [{1.203 COL DECK RACK D1 ROTATE}](#), steps 1 to 5.3 (ESA SODF: MSM: NOMINAL: RACK), then:

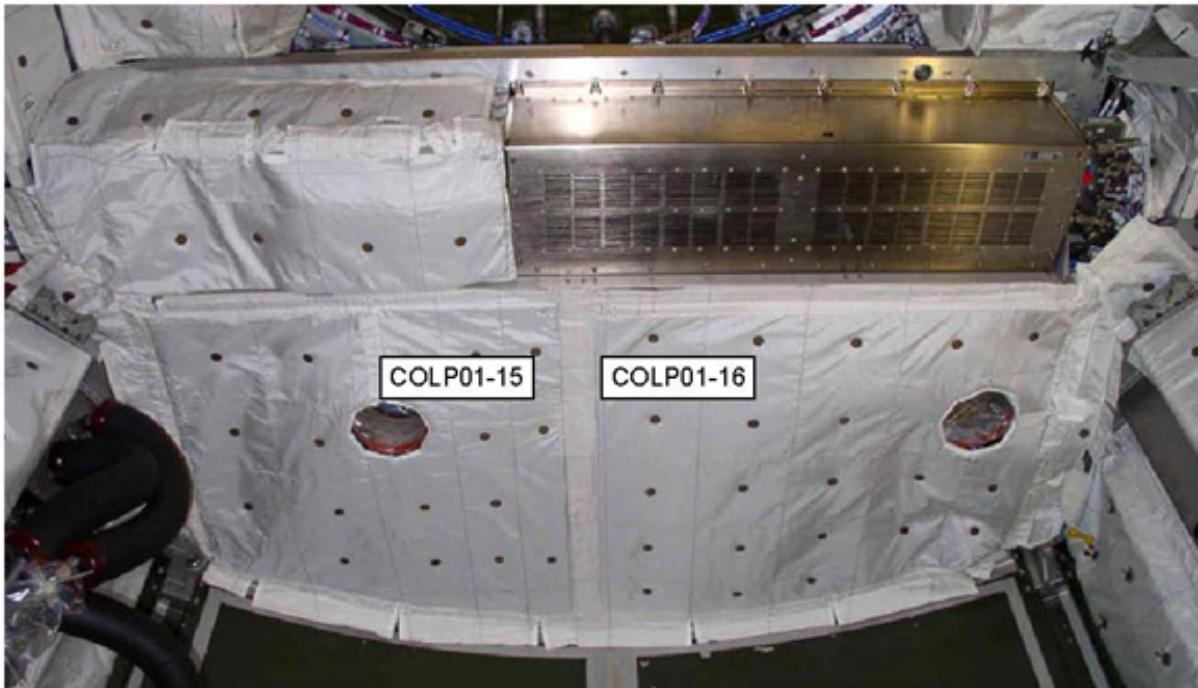


Figure 2. COL1PDM FDS Cover Panels Configuration

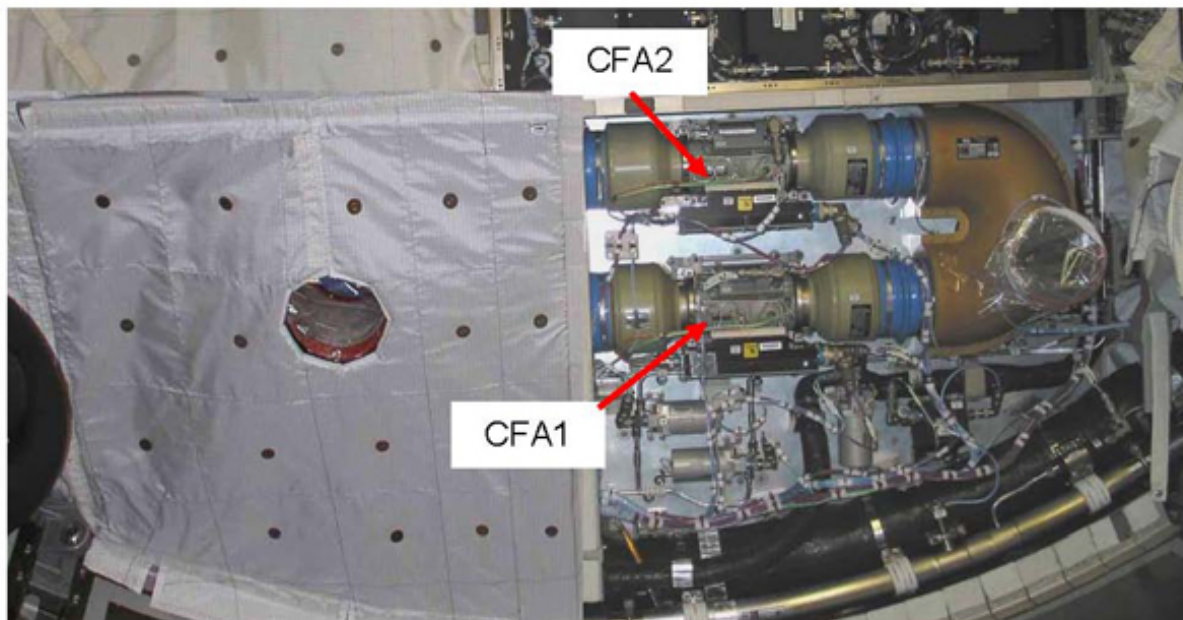


Figure 3. CFA1 and CFA2 on PDM Panel

## WARNING

PDM panel enclosed volume can be saturated with GN2 from the Nitrogen Line Shut Off Valves. (NLSOV). GN2 can displace the atmospheric oxygen resulting in possible crew illness. A Portable Fan for ventilating the volume shall be used for at least 2 minutes after FDS covers removal and prior to accessing the working location when performing activities on equipment installed on the PDM panel.

## NOTE

Position the Portable Fan Assembly (PFA) to blow on the PDM panel.

- 1.2 Setup a PFA near working location, perform [{4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS}](#), steps 1 to 2.8 (ESA SODF: IFM: ECLSS: REFERENCE), then:
- 1.3 PFA Speed Control Knob → Half Flow
- 1.4 √PFA is running.

## NOTE

1. To get access to the two CFAs it is sufficient to remove the Fire Detection and Suppression (FDS) Cover Panel COLP01-16. To ease re-installation do not completely detach the cover from the PDM panel support structure.
2. The FDS Cover is installed on the PDM panel support structure by means of “structure to blanket” and “blanket to blanket” Velcro strips.

- 1.5 Remove FDS Cover Panel COLP01-16.  
Refer to Figures 2 and 3.
- 1.6 PFA Speed Control Knob → Full Flow  
Wait 2 to 3 minutes.
- 1.7 sw PFA Power → OFF

2. UNLOCKING AVM LOCKING BOLTS

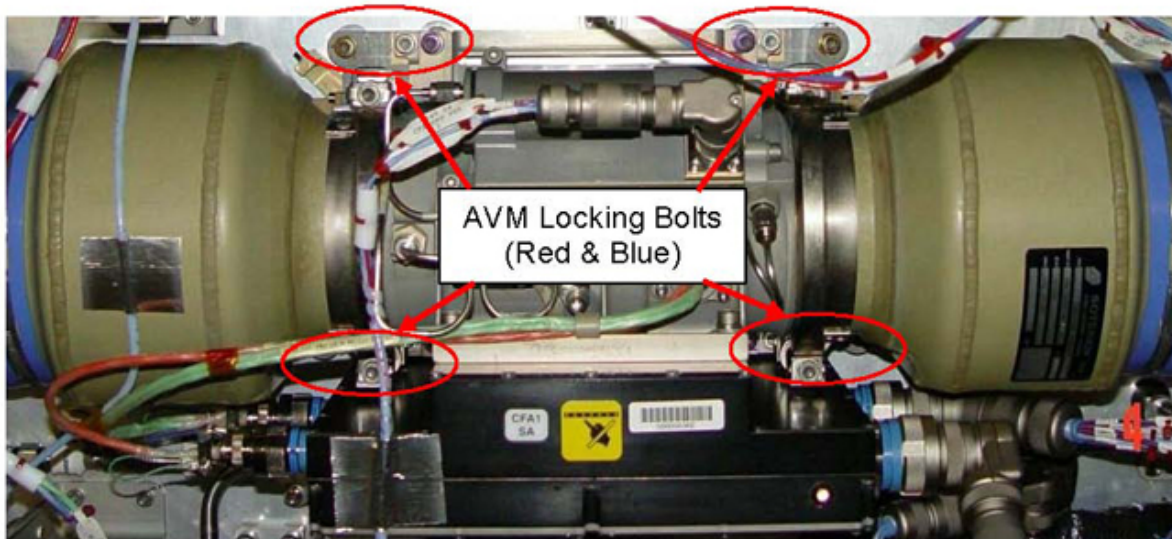


Figure 4. Identification of CFA AVM Locking Bolts, Typical

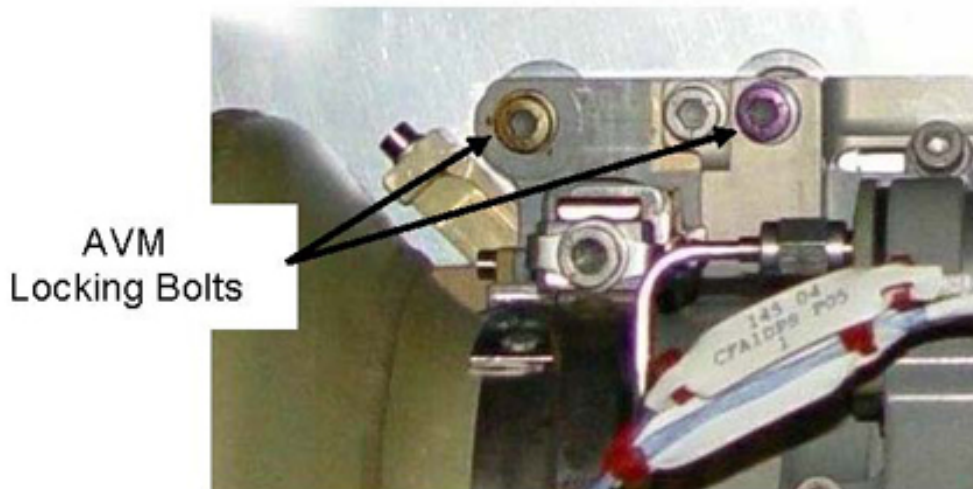


Figure 5. Close view on the CFA AVM Locking Bolts

NOTE

1. The AVM locking bolts are colour coded (blue and red) to ease their identification.
2. The 8 AVM locking bolts are spring loaded. When completely loosened, the bolts are pushed up by the spring. Refer to Figure 6.
3. To improve the working location lighting, don the Headlamp Light Source Assy.

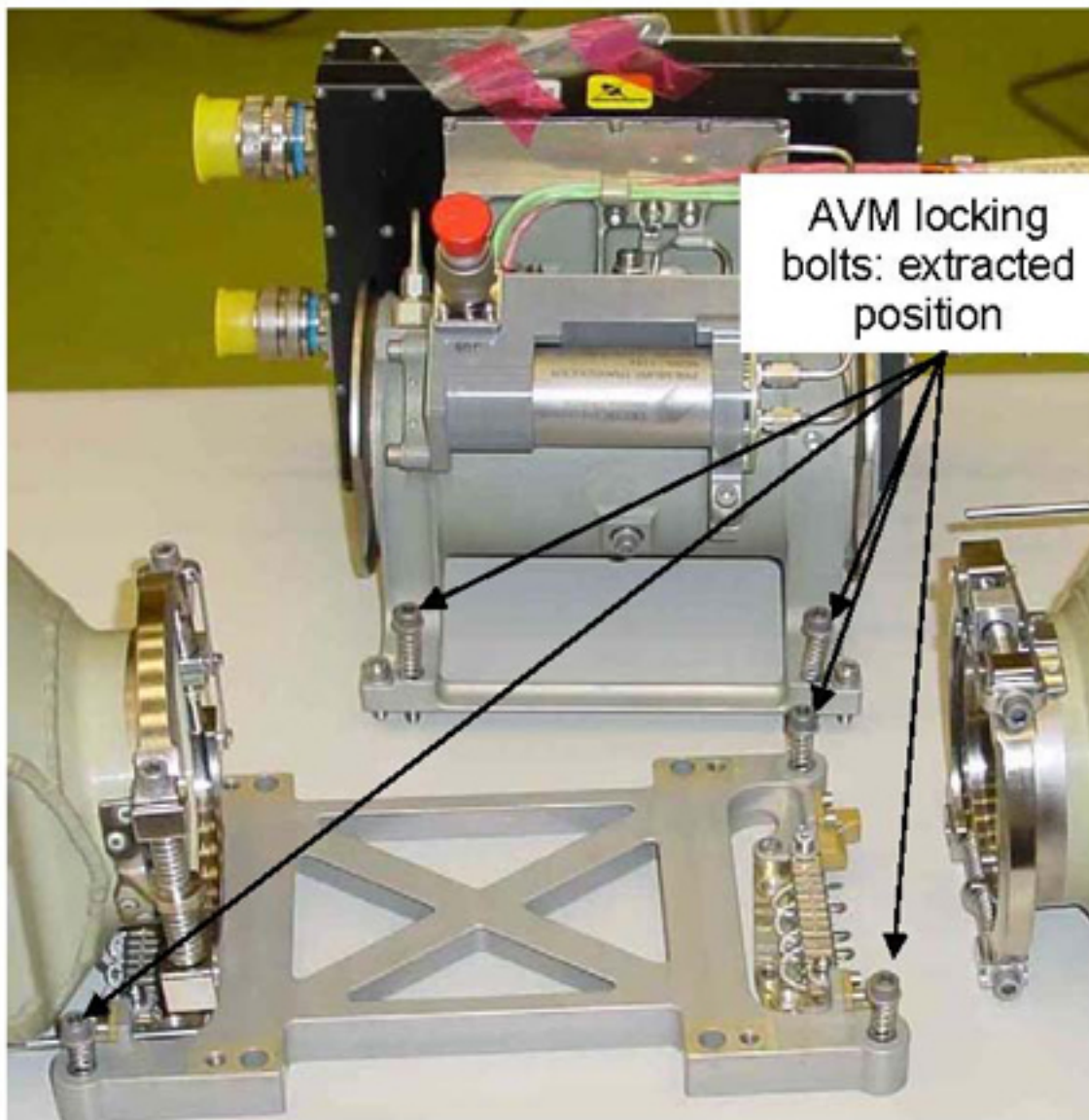


Figure 6. CFA before installation: view of the spring loaded locking bolts

- 2.1 Completely loosen CFA1 AVM locking bolts (eight, red and blue) (Ratchet Wrench 1/4"; 10" Extension, 1/4" Drive; M6 (5mm) Hex Head Driver 1/4" Drive). Refer to Figures 4, 5 and 6.
- 2.2 Completely loosen CFA2 AVM locking bolts (eight, red and blue) (Ratchet Wrench 1/4"; 10" Extension, 1/4" Drive; M6 (5mm) Hex Head Driver 1/4" Drive).
3. CLOSEOUT
  - 3.1 √For FOD around work area within 1 m radius.
  - 3.2 Install FDS Cover Panel COLP01-16.



## UNLOCK CABIN FAN LAUNCH AVM

(ASSY OPS/1E/FIN/MULTI E)

Page 7 of 7 pages

- 3.3 Remove PFA, perform [{4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS}](#), steps 3.2 to 4.1 (ESA SODF: IFM: ECLSS: REFERENCE), then:
- 3.4 Rotate Rack D1 up, perform [{1.203 COL DECK RACK D1 ROTATE}](#), steps 6 to 9.1 (ESA SODF: MSM: NOMINAL: RACK), then:
- 3.5 ISS ↓ **COL-CC** for task completion.  
Stow tools, equipment.

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# UNLOCK WPA1 AND WPA2 AVM

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 6 pages

## OBJECTIVE:

Unlock the Columbus Water Pump Assemblies (WPA1 and WPA2) Anti-Vibration Mount (AVM) in the Columbus D1 Rack.

## LOCATION:

Installed: COL1D1

## DURATION:

35 minutes

## CREW:

One

## PARTS:

None

## MATERIALS:

None

## TOOLS:

Columbus Tool Kit

Adjustable Tethers (2)

Eyelets (4)

Portable Handle

Tool Bag 1:

Ratchet Wrench 1/4"

Torque Wrench 4-20 Nm

Ratchet Tool, 1/4" Drive

M8 (13 mm) Socket, 1/4" Drive

T30 Torx Driver, 1/4" Drive

Tool Bag 2:

6" Extension, 1/4" Drive

## REFERENCED PROCEDURE(S):

4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS

### 1. SAFING AND ACCESSING

#### **WARNING**

D1 rack volume can be saturated with GN2 from the WPA accumulators. GN2 can displace the atmospheric oxygen resulting in possible crew illness. When performing activities on equipment installed inside D1 rack a Portable Fan for ventilating the rack volume shall be used for at least 2 minutes after floor panels removal and prior to accessing the working location.

# UNLOCK WPA1 AND WPA2 AVM

(ASSY OPS/1E/FIN/MULTI E)

- 1.1 Setup a Portable Fan Assembly near COL1D1 location, perform [4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS](#), steps 1 to 2.7 (ESA SODF: IFM: ECLSS: REFERENCE), then:

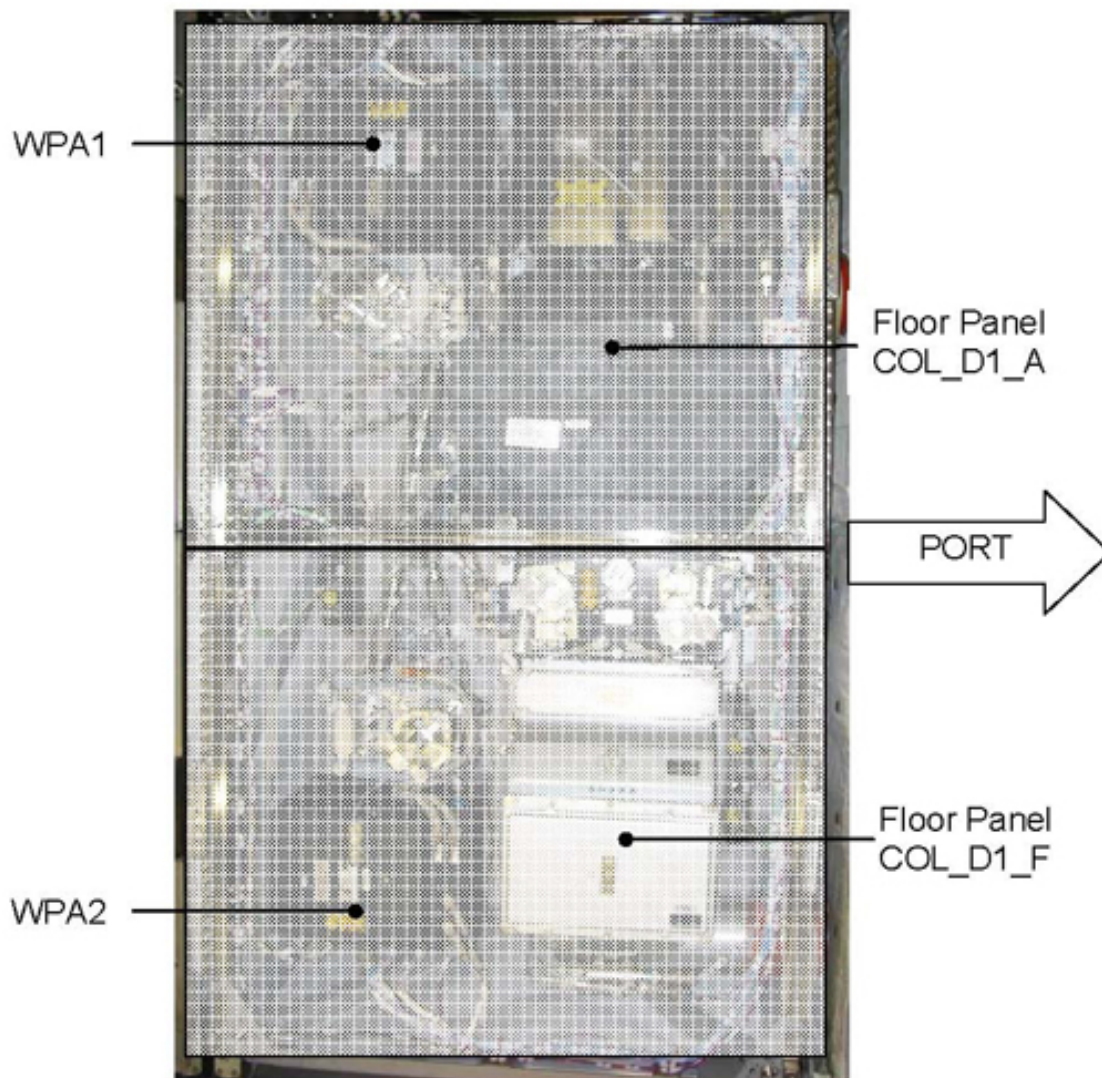


Figure 1. D1 Rack Floor Panels And Internal Layout

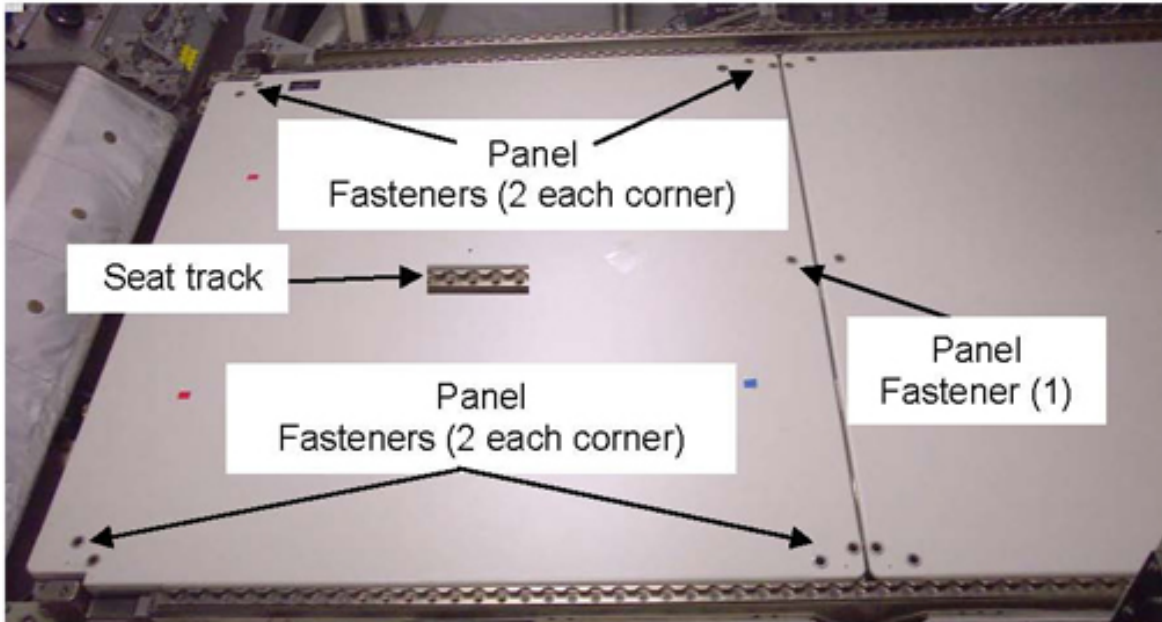


Figure 2. Deck Rack Floor Panels (Fastener Locations, Typical)

- 1.2 Install Portable Handle on D1 panel COL\_D1\_A seat track.
- 1.3 Loosen panel fasteners (9), any order (Ratchet Wrench 1/4"; 6" Extension, 1/4" Drive; T30 Torx Driver, 1/4" Drive). Fasteners are captive. Refer to Figure 2.
- 1.4 Remove panel, temporarily stow and restrain, as required (adjustable tether, eyelets).
- 1.5 Repeat steps 1.2 to 1.4 for panel COL\_D1\_F.
- 1.6 Position the PFA to blow inside the D1 internal volume.
- 1.7 sw PFA power switch → ON
- 1.8 PFA Speed Control Knob → Full Flow  
Wait 2 to 3 minutes.
- 1.9 sw PFA power switch → OFF

2. [UNLOCKING WPA AVM](#)

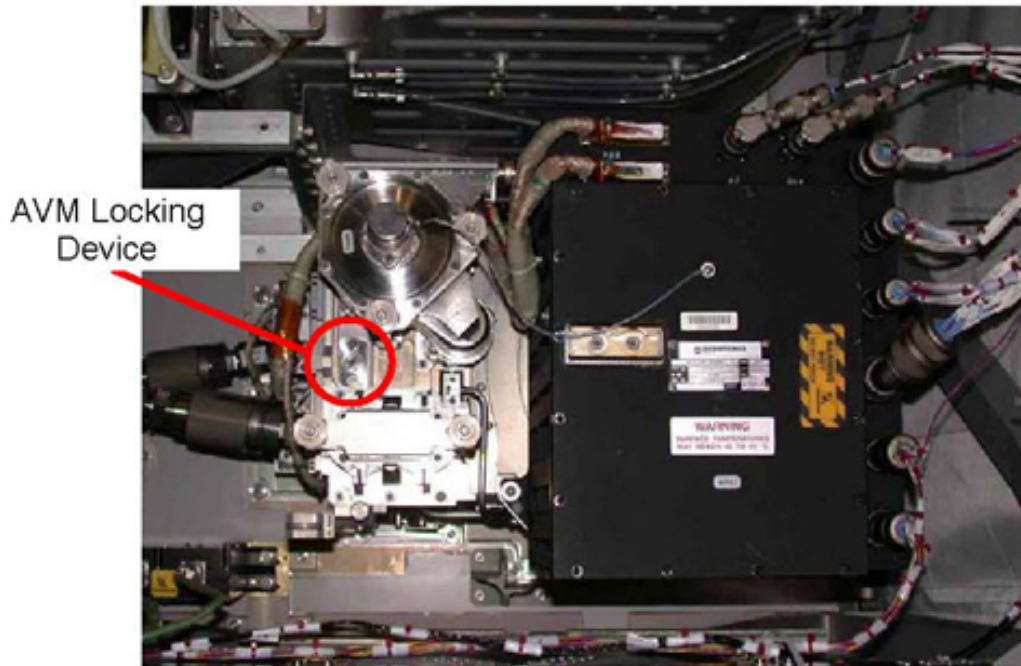


Figure 3. AVM Locking Device on WPA, view from top of D1 Rack

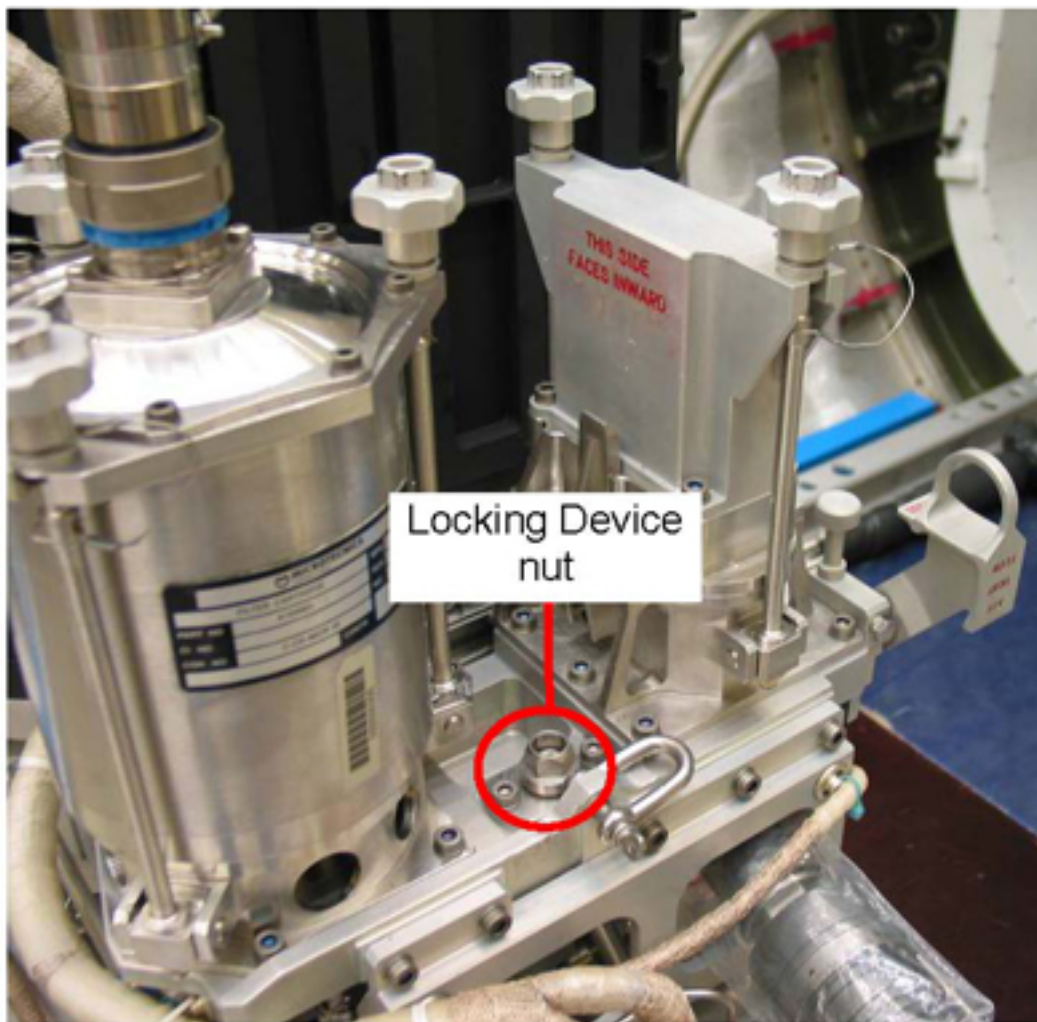


Figure 4. AVM Locking Device Nut

**NOTE**

1. It is not required to stop the running WPA to unlock the AVM
2. The AVM Locking Device Nut is provided with a hard stop to prevent its complete removal.

- 2.1 WPA1, 2 AVM Locking Device Nut ↺ (about 3 complete turns) (Ratchet Wrench 1/4"; 6" Extension, 1/4" Drive; M8 (13 mm) Socket, 1/4" Drive). Refer to Figures 3 and 4.

3. CLOSEOUT

- 3.1 √For FOD inside D1 Rack.
- 3.2 Remove PFA, perform [{4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS}](#), steps 3.2 to 4.1 (ESA SODF: IFM: ECLSS: REFERENCE)), then:

NOTE

1. Floor panels can be installed in any order.
2. Floor panels are not interchangeable on deck rack structure. Refer to Figure 2 for correct orientation.

- 3.3 Retrieve floor panels and place on deck rack, aligning and inserting on alignment pins on rack structure.
- 3.4 Snug fasteners (9 each panel), any order (Ratchet Wrench 1/4"; 6" Extension, 1/4" Drive; T30 Torx Driver, 1/4" Drive).
- 3.5 Torque fasteners (9 each panel, any order) to 5 Nm (Torque Wrench 4-20 Nm; Ratchet Tool, 1/4" Drive; 6" Extension, 1/4" Drive; T30 Torx Driver, 1/4" Drive).
- 3.6 √For FOD around work area within 1 m radius
- 3.7 Stow tools and PFA.  
ISS ↓ **COL-CC** for task completion.



# UNLOCK CWSA SA LAUNCH AVM

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 8 pages

## OBJECTIVE:

To unlock the launch Anti Vibration Mounts (AVM) locking bolts of both Columbus Condensate Water Separator Assembly – Fan Sub-Assemblies (CWSA SA).

## LOCATION:

Installed: COL1D1

## DURATION:

35 minutes

## CREW:

One

## PARTS:

None

## MATERIALS:

None

## TOOLS:

Headlamp Light Source Assy P/N SEZ33114010-301

### Columbus Tool Kit:

Adjustable Tethers (2)

Eyelets (4)

Tool Bag 1:

Ratchet Wrench 1/4"

Torque Wrench 4-20 Nm

Ratchet Tool, 1/4" Drive

T30 Torx Driver, 1/4" Drive

Tool Bag 2:

T-Handle Square 3/8"

10" Extension, 1/4" Drive

455 mm Extension, 3/8" Drive

6" Extension, 1/4" Drive

Tool Bag 3:

M5 (4mm) Hex Head Driver 1/4" Drive

Adaptor 3/8" to 1/4"

M6 (5mm) Hex Head Driver 1/4" Drive

## REFERENCED PROCEDURE(S):

4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS

1. [SAFING AND ACCESSING RACK D1](#)

**WARNING**

D1 rack volume can be saturated with GN2 from the WPA accumulators. GN2 can displace the atmospheric oxygen resulting in possible crew illness. When performing activities on equipment installed inside D1 rack a Portable Fan for ventilating the rack volume shall be used for at least 2 minutes after floor panels removal and prior to accessing the working location.

- 1.1 Setup a Portable Fan Assembly near COL1D1 location, perform [{4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS}](#), steps 1 to 2.7 (ESA SODF: IFM: ECLSS: REFERENCE), then:

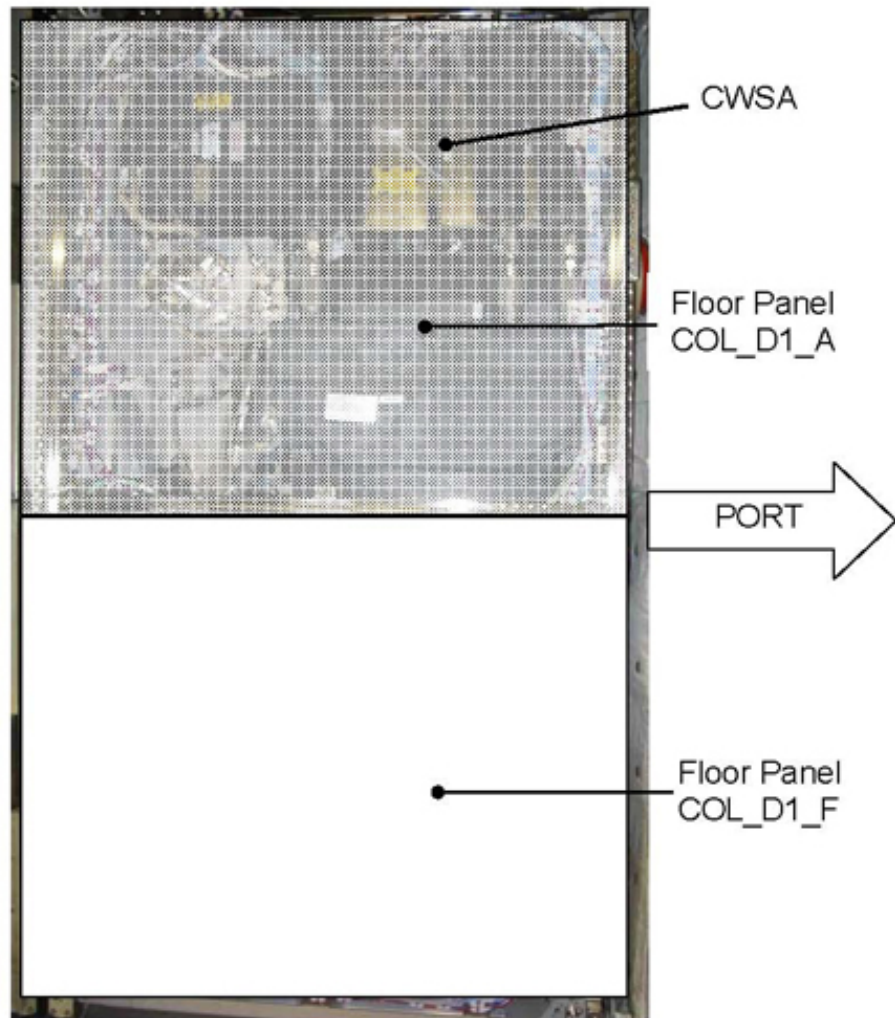
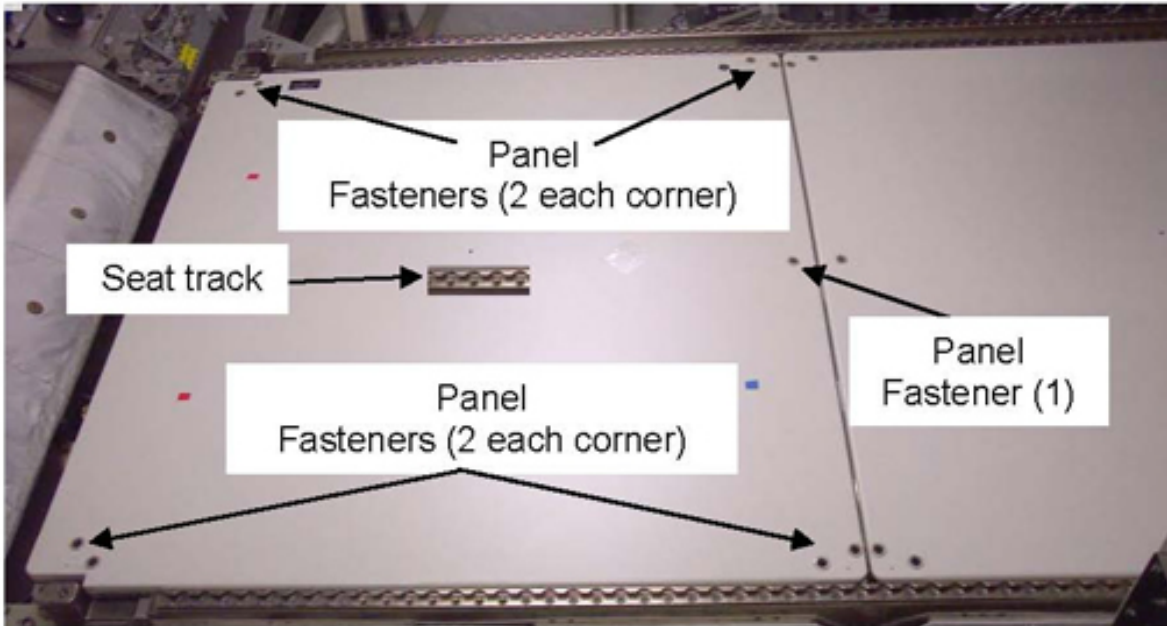


Figure 1. D1 Rack Floor Panels And Internal Layout



**Figure 2. Deck Rack Floor Panels (Fastener Locations, Typical)**

- 1.2 Install Portable Handle on D1 panel COL\_D1\_A seat track.
- 1.3 Loosen panel fasteners (9), any order (Ratchet Wrench 1/4"; 6" Extension, 1/4" Drive; T30 Torx Driver, 1/4" Drive). Fasteners are captive.  
Refer to Figure 2.
- 1.4 Remove panel, temporarily stow (adjustable tether, eyelets).
- 1.5 Position the PFA to blow inside the D1 internal volume.
- 1.6 sw PFA power switch → ON
- 1.7 PFA Speed Control Knob → Full Flow  
Wait 2 to 3 minutes.
- 1.8 sw PFA power switch → OFF

2. [ACCESSING CWSA SA](#)

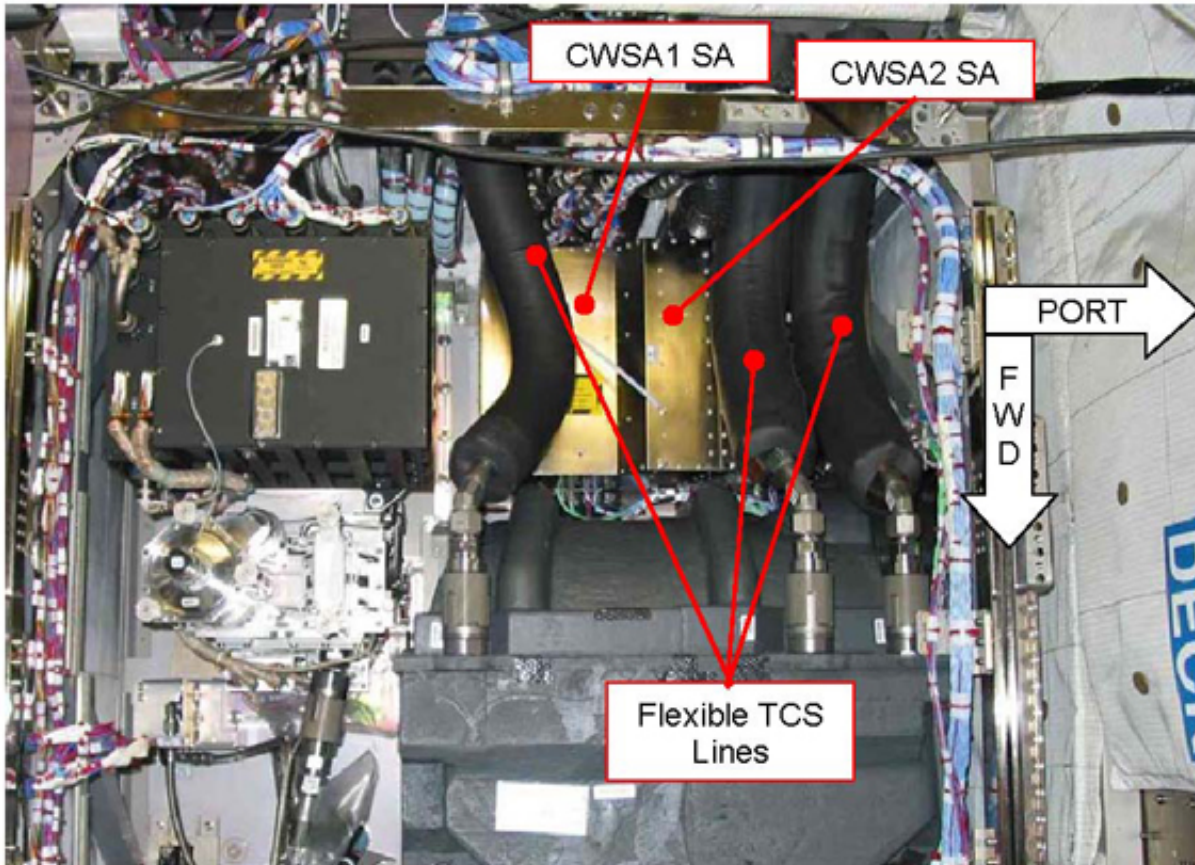


Figure 3. Flexible TCS piping over CWSA Sub Assemblies covers

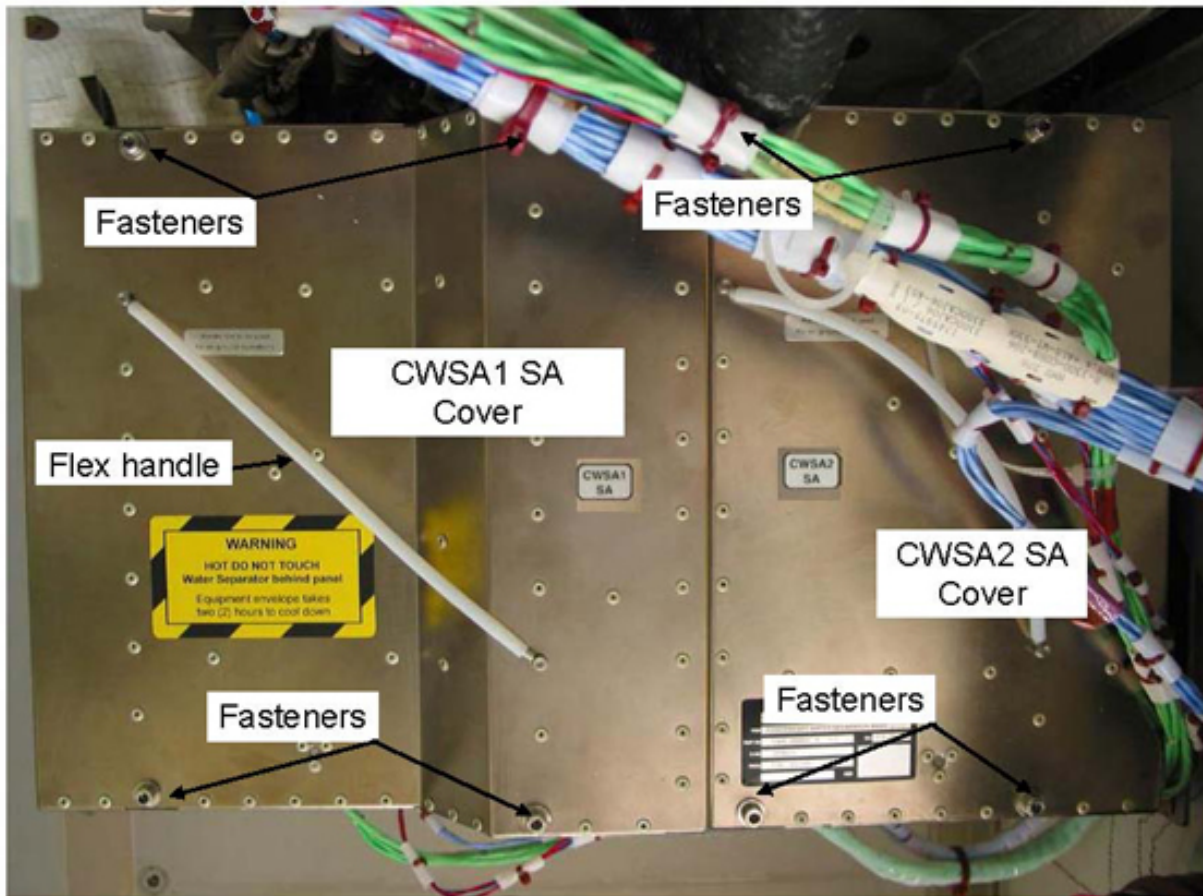


Figure 4. CWSA with covers installed (TCS piping not shown for clarity)

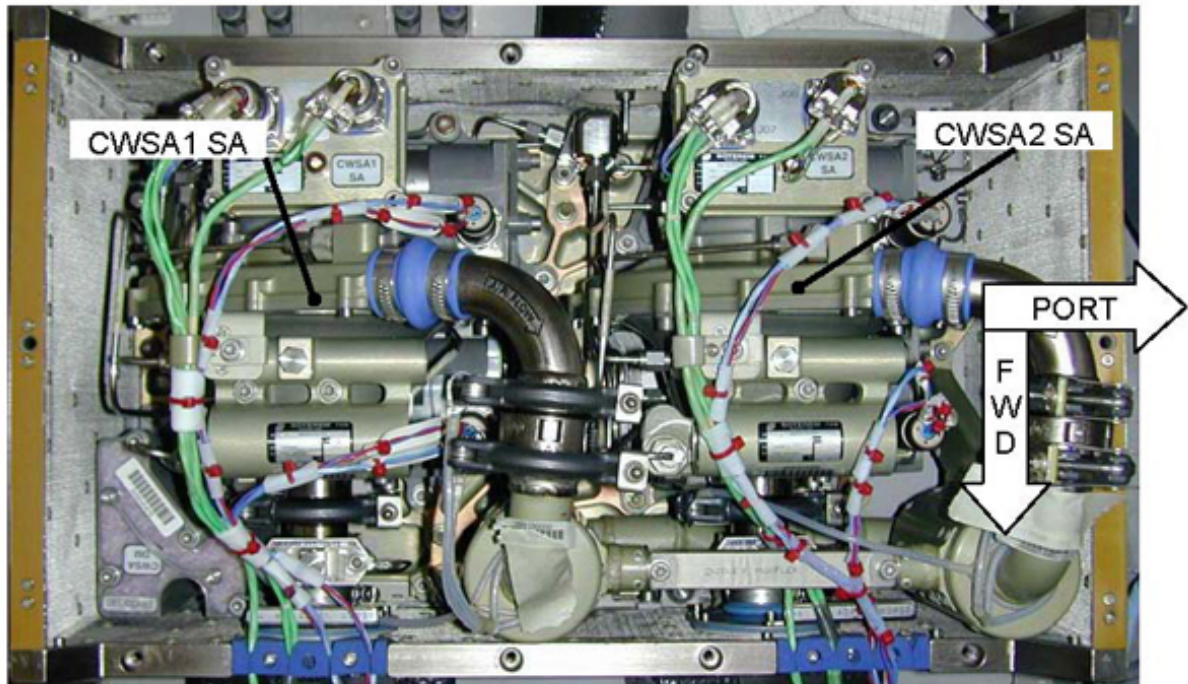


Figure 5. CWSA Configuration

NOTE

1. The 3 TCS lines passing over the CWSA covers are flexible. Move them as required to improve accessibility to the CWSA.
2. Each CWSA SA cover is provided with a flex handle to allow for its removal.

- 2.1 Loosen both CWSA1 SA and CWSA2 SA cover fasteners (four each) (Ratchet Wrench 1/4"; M5 (4mm) Hex Head Driver 1/4" Drive). Refer to Figure 4.
- 2.2 Remove CWSA1 SA cover, then CWSA2 SA cover. Temporarily stow.

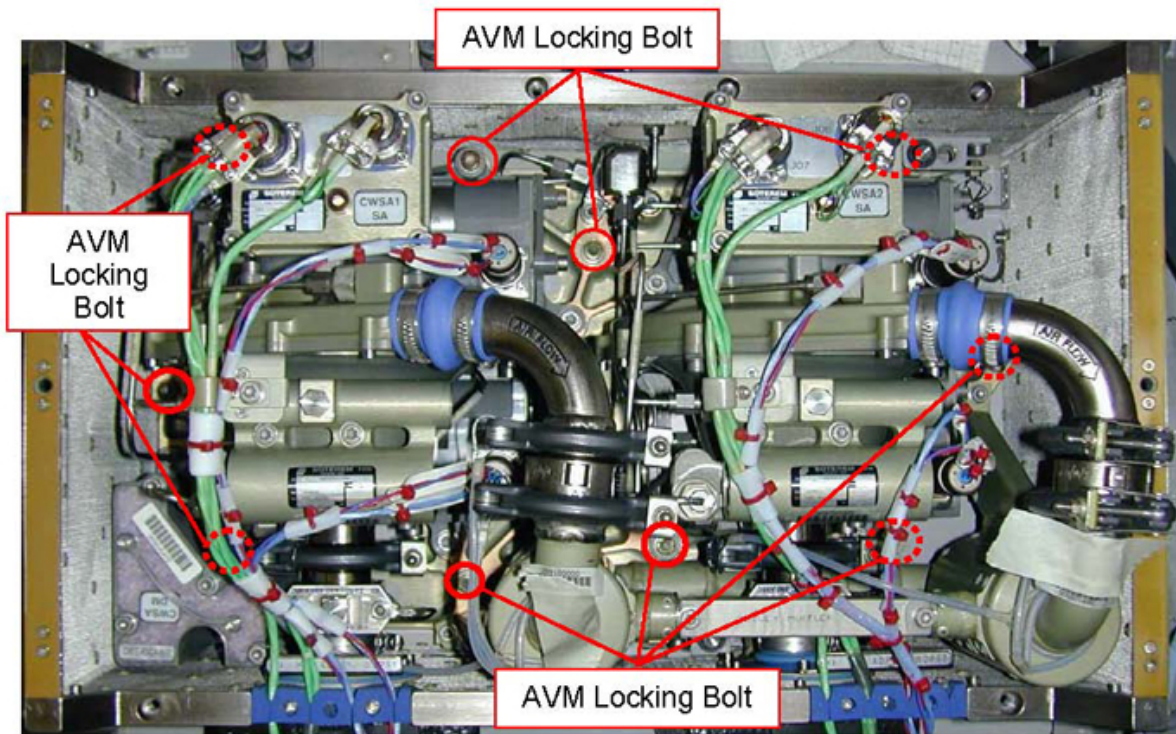


Figure 6. AVM Locking Bolts Identification

3. UNLOCKING AVM LOCKING BOLTS

NOTE

1. The AVM Locking Bolts are colour coded (pink) to ease their identification.
2. The AVM locking bolts are spring loaded. When completely loosened, the bolts are pushed up by the spring.
3. To improve the working location lighting, don the Headlamp Light Source Assy.

- 3.1 Completely loosen AVM Locking Bolts (ten) (T-Handle Square 3/8"; 455 mm Extension, 3/8" Drive; Adaptor 3/8" to 1/4"; M6 (5mm) Hex Head Driver 1/4" Drive). Refer to Figure 6.

4. CLOSEOUT

- 4.1 √For FOD within the CWSA casing.
- 4.2 Install CWSA2 SA cover, snug fasteners (four) (Ratchet Wrench 1/4"; M5 (4mm) Hex Head Driver 1/4" Drive).
- 4.3 Install CWSA1 SA cover, snug fasteners (four) (Ratchet Wrench 1/4"; 10" Extension, 1/4" Drive; M5 (4mm) Hex Head Driver 1/4" Drive).

## UNLOCK CWSA SA LAUNCH AVM

(ASSY OPS/1E/FIN/MULTI E)

Page 8 of 8 pages

- 4.4 Torque CWSA1, 2 SA cover fasteners (four each cover) to 5 Nm (Torque Wrench 4-20 Nm; Ratchet Tool, 1/4" Drive; M5 (4mm) Hex Head Driver 1/4" Drive).
- 4.5 √For FOD inside D1 Rack.
- 4.6 Remove PFA, perform [{4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS}](#), steps 3.2 to 4.1 (ESA SODF: IFM: ECLSS: REFERENCE), then:
- 4.7 Retrieve floor panel COL\_D1\_A and place on deck rack, align alignment label on panel with alignment pin on rack structure.
- 4.8 Snug fasteners (nine), any order (Ratchet Wrench 1/4"; 6" Extension, 1/4" Drive; T30 Torx Driver, 1/4" Drive).
- 4.9 Torque fasteners (nine, any order) to 5 Nm (Torque Wrench 4-20 Nm; Ratchet Tool, 1/4" Drive; 6" Extension, 1/4" Drive; T30 Torx Driver, 1/4" Drive).
- 4.10 √For FOD around work area within 1 m radius
- 4.11 Stow tools and PFA.  
ISS ↓ **COL-CC** for task completion.



## 1.602 WPA1(2) TCS LOOP DEGASSING

(ASSY OPS/1E/FIN/HC/MULTI E) Page 1 of 18 pages

### OBJECTIVE:

Remove gas bubbles from the Columbus Active Thermal Control System water loop, using the On-Orbit Support Equipment (OSE) WPA Hydrocyclone installed on the running Water Pump Assembly (WPA).

### LOCATIONS:

Installed: COL1D1

Stowed: √Inventory Management System (IMS)

### DURATION:

75 minutes

### CREW:

One

### PARTS:

None

### MATERIALS:

Disposable Plastic Bag P/N 2AK-7646-420

Marking Pen

Dry Wipes

Gray Tape

Ziplock Bag

### TOOLS:

WPA Hydrocyclone P/N C157115-1

Portable Fan Assembly P/N 96M52440-1

DCS 760 Camera

Flashlight

### ISS IVA Toolbox:

Drawer 4:

6" Long Mini Pliers Straight

### Columbus Tool Kit

Tool Bag 1:

Ratchet Wrench, 1/4"

Torque Wrench 4-20 Nm

Ratchet Tool, 1/4" Drive

102 mm Extension, 1/4" Drive

M8 (13 mm) Socket, 1/4" Drive

T30 Torx Driver, 1/4" Drive

Tool Bag 1A:

Adjustable Tether

Portable Handle

# 1.602 WPA1(2) TCS LOOP DEGASSING

Eyelet (2)

## REFERENCED PROCEDURE(S):

4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS

### 1. CHECKING THE SYSTEM CONFIGURATION STATUS

<b>NOTE</b>
Operating the WPA Hydrocyclone with a Water Pump Assembly water flow rate < 525 Kg/h may result in a non effective functioning of the WPA Hydrocyclone itself, leading to a longer time to complete the water loop degassing.

**Table 1. Running WPA and related hardware identification**

RUNNING WPA[X]	NLSOV[Y]	D1 RACK FLOOR PANEL COL_D1_[Z]
WPA1	3	A
WPA2	4	F

1.1 Identifying running WPA[X], where X = Refer to Table 1.

PWS

COL: TCS Functional Overview

TCS Functional Overview

'Water Pump Assemblies'

Active WPA - WPA[X]

Record ACTIVE WPA[X]: \_\_\_\_\_

<b>CAUTION</b>
The WPA Accumulator control law shall be disabled and the NLSOV 3(4) shall be closed before installation of the WPA Hydrocyclone. Failure to comply may result in WPA Hydrocyclone over pressurization with consequent equipment damage and possible water leakage in Columbus cabin.

1.2 Verifying following parameters of running WPA[X].

COL: TCS Functional Overview: WPA[X]

TCS Functional Overview

sel WPA[X]

WPA[X]

'Accumulator'

## 1.602 WPA1(2) TCS LOOP DEGASSING

(ASSY OPS/1E/FIN/HC/MULTI E) Page 3 of 18 pages

Verify Cntl Loop Stat: INACTIVE  
Verify Abs Press1: 165 to 195 kPa  
Verify Abs Press2: 165 to 195 kPa

'Filter'

Verify Delta Press1 < 30 kPa  
Verify Delta Press2 < 30 kPa

1.3 Verifying NLSOV[Y] status, where [Y] = Refer to Table 1.

COL: ECLSS Functional Overview

sel Payload N2

sel NLSOV[Y]

'ECLSS Nitrogen Line Shut Off Valve[Y]'

Verify Posn - CLOSED

2. ACCESSING THE RUNNING WPA

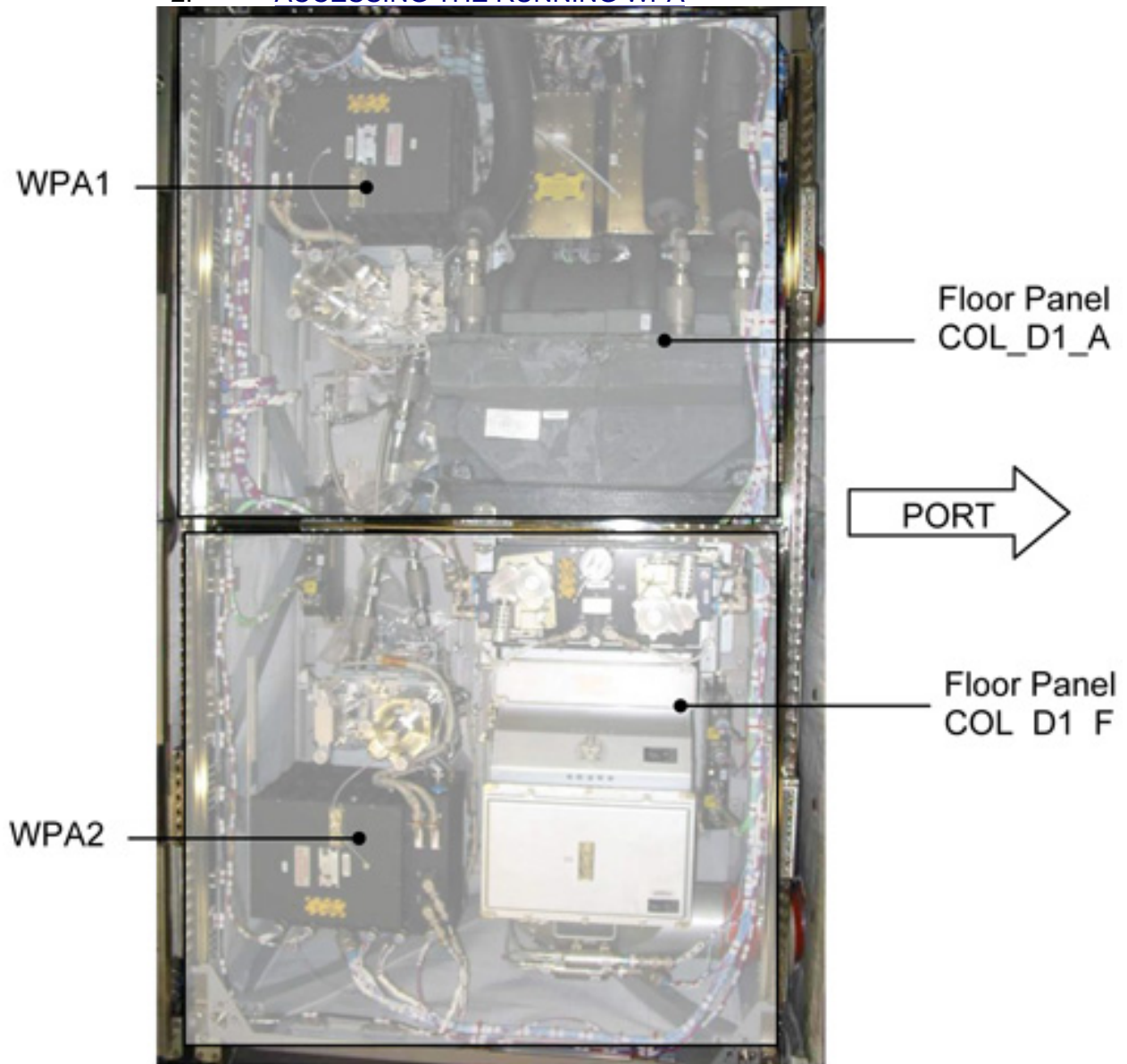


Figure 1. D1 Rack Floor Panels and Hardware Location

NOTE

The Portable Fan Assembly (PFA) is installed but not switched ON at this point of the procedure.

- 2.1 Install a PFA near COL1D1 location, perform [4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS](#), steps 1 to 2.7 (ESA SODF: IFM: ECLSS: REFERENCE), then:

## 1.602 WPA1(2) TCS LOOP DEGASSING

(ASSY OPS/1E/FIN/HC/MULTI E) Page 5 of 18 pages

### NOTE

It is sufficient to remove one floor panel only to access the running WPA where to install the WPA Hydrocyclone. Refer to Table 2 for panel identification.

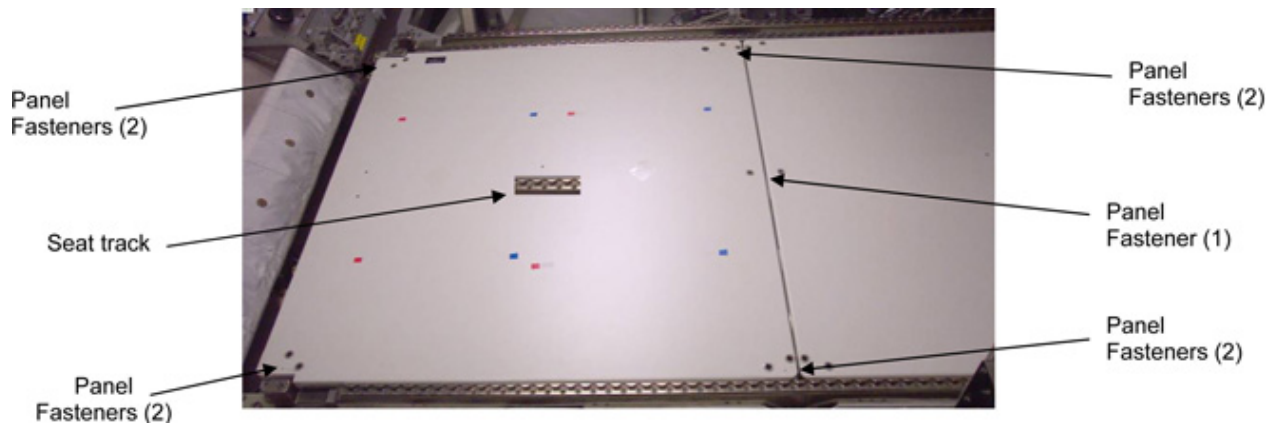


Figure 2. Deck Rack Floor Panels (Fastener Locations, Typical)

- 2.2 Install portable handle on floor panel COL\_D1\_[Z] seat track. Refer to Table 2 for panel identification.
- 2.3 Unscrew panel fasteners (9), any order (Ratchet Wrench, 1/4"; 102 mm Extension, 1/4" Drive; T30 Torx Driver, 1/4" Drive). Refer to Figure 2.
- 2.4 Remove panel, temporarily stow (adjustable tether, eyelets).
- 2.5 Position the PFA to blow inside the D1 internal volume.
- 2.6 sw PFA Power → ON
- 2.7 PFA Speed Control Knob → Full Flow  
Wait 2 to 3 minutes.
- 2.8 sw PFA Power → OFF

## 1.602 WPA1(2) TCS LOOP DEGASSING

(ASSY OPS/1E/FIN/HC/MULTI E) Page 6 of 18 pages

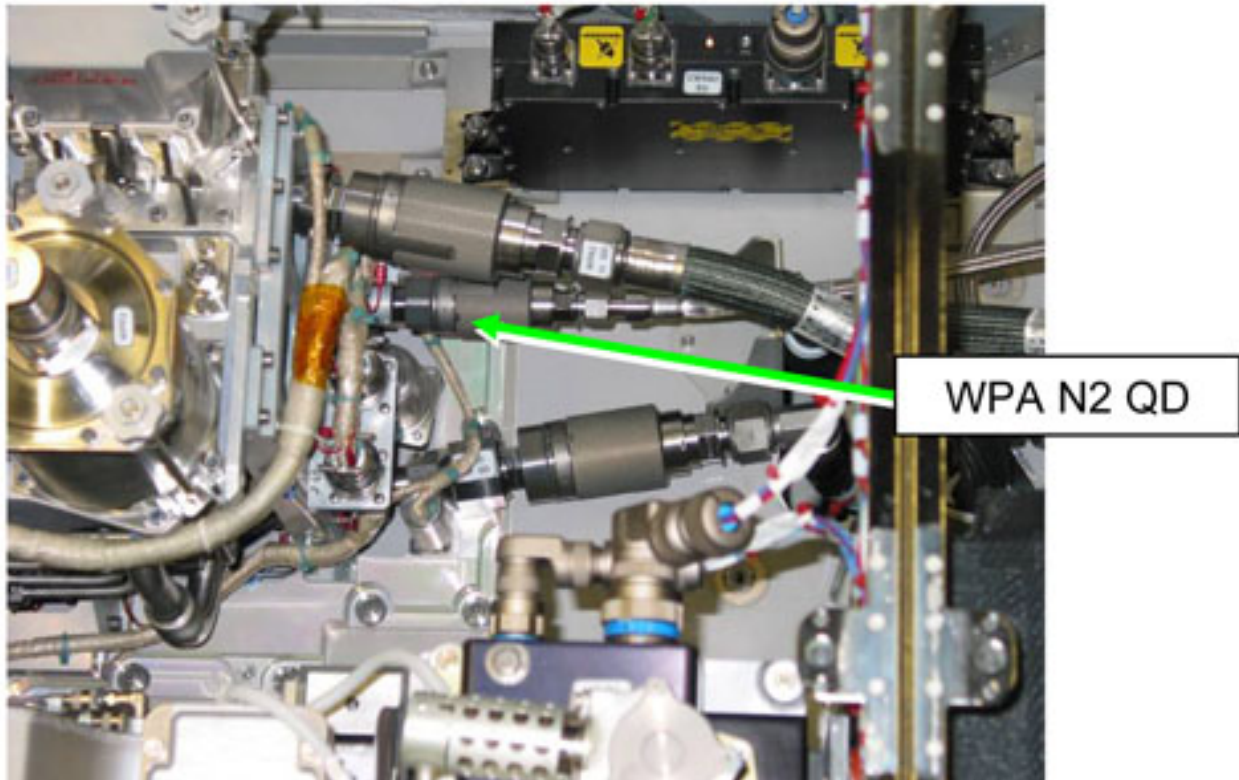


Figure 3. WPA N2 QD identification (Typical)

- 2.9 Disconnect WPA[X] N2 QD.  
Refer to Figure 3.

3. INSTALLING THE WPA HYDROCYCLONE

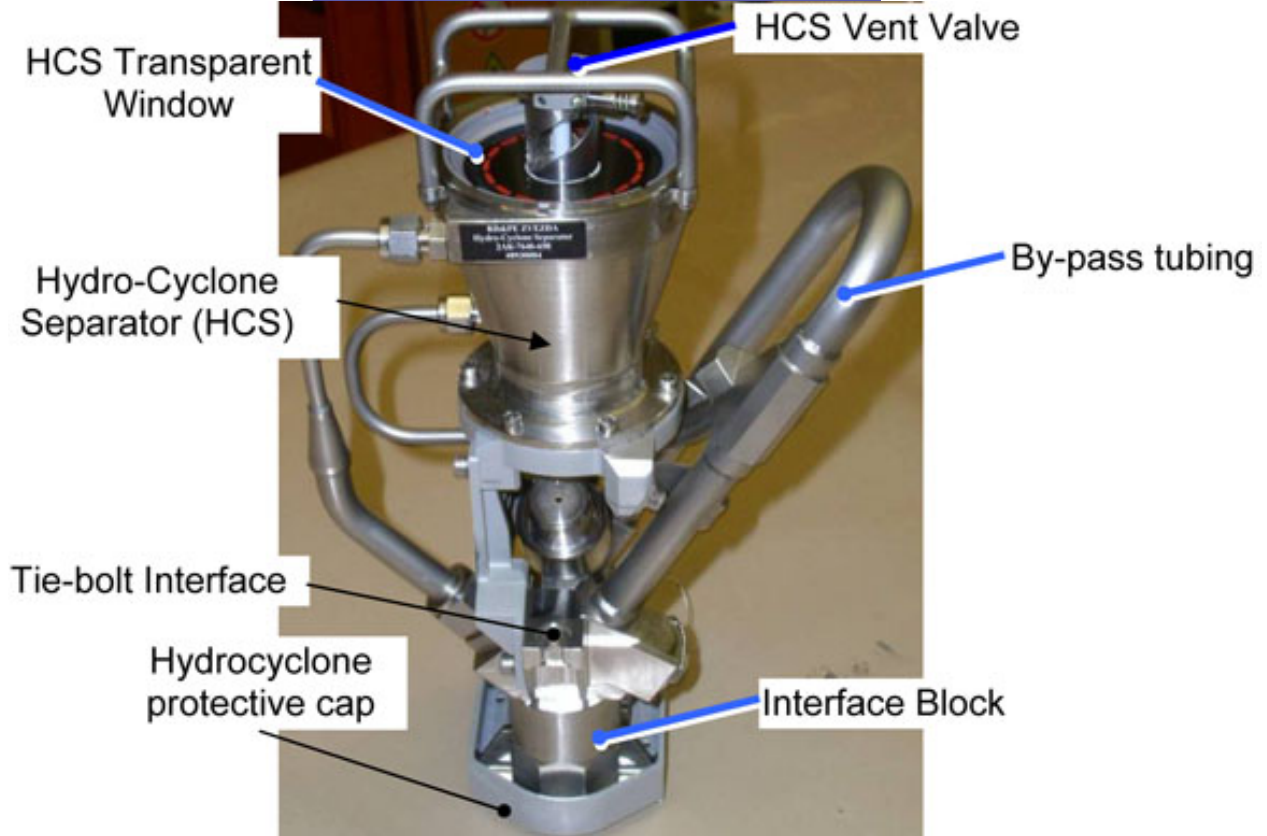


Figure 4. Configuration of the Complete WPA Hydrocyclone

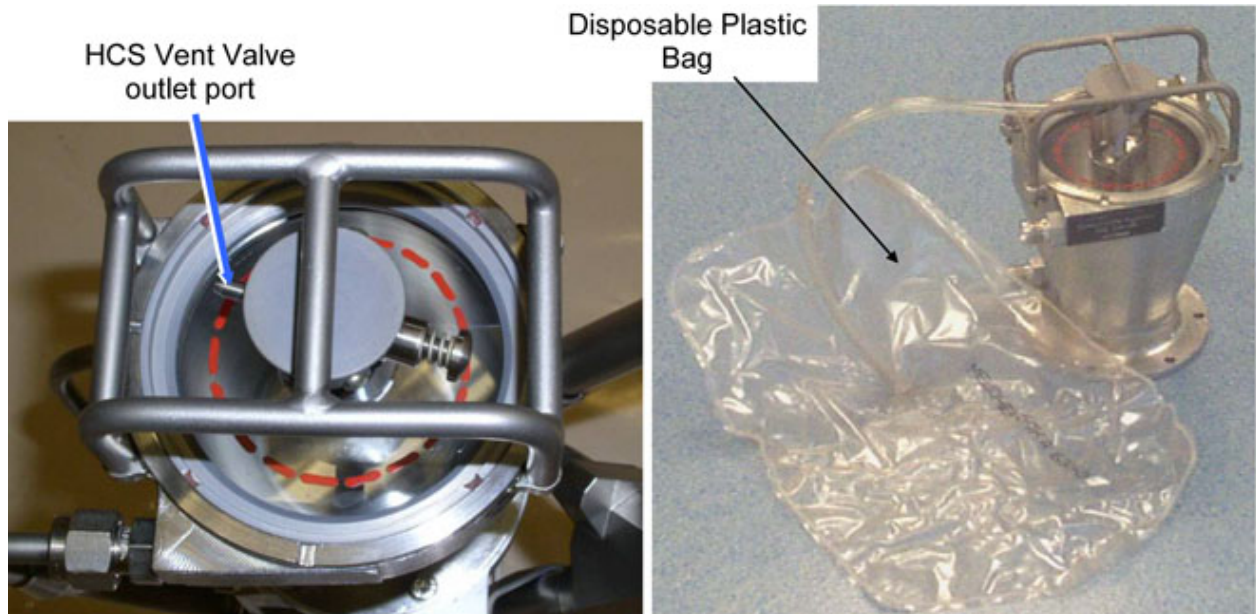


Figure 5. HCS Vent Valve and Disposable Bag Installed (piping not shown)

- 3.1 Connect a Disposable Plastic Bag to the outlet port of the Hydrocyclone Separator (HCS) Vent Valve. Refer to Figure 5.

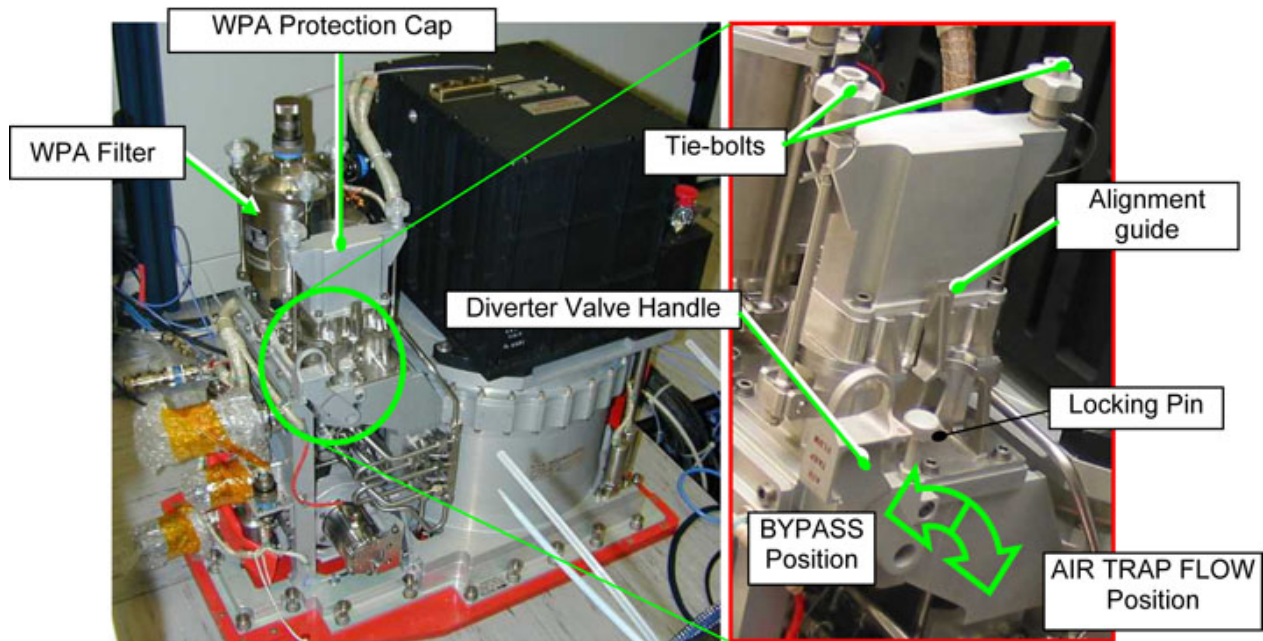


Figure 6. WPA Hydrocyclone Installation Location, Typical

NOTE

1. To prevent misalignment the thumbnuts of the two tie-bolts should be loosened progressively one turn each.
2. The thumbnuts are tethered to the tie-bolts.

- 3.2 Progressively loosen the WPA tie-bolt thumbnuts (two)  $\curvearrowright$  about 20 turns until the tie-bolts tilt outward (Ratchet Wrench, 1/4"; 102 mm Extension, 1/4" Drive; M8 (13 mm) Socket, 1/4" drive). Refer to Figure 6.
- 3.3 Remove WPA Protection Cap from Water Pump Assembly. Refer to Figure 6.



## 1.602 WPA1(2) TCS LOOP DEGASSING

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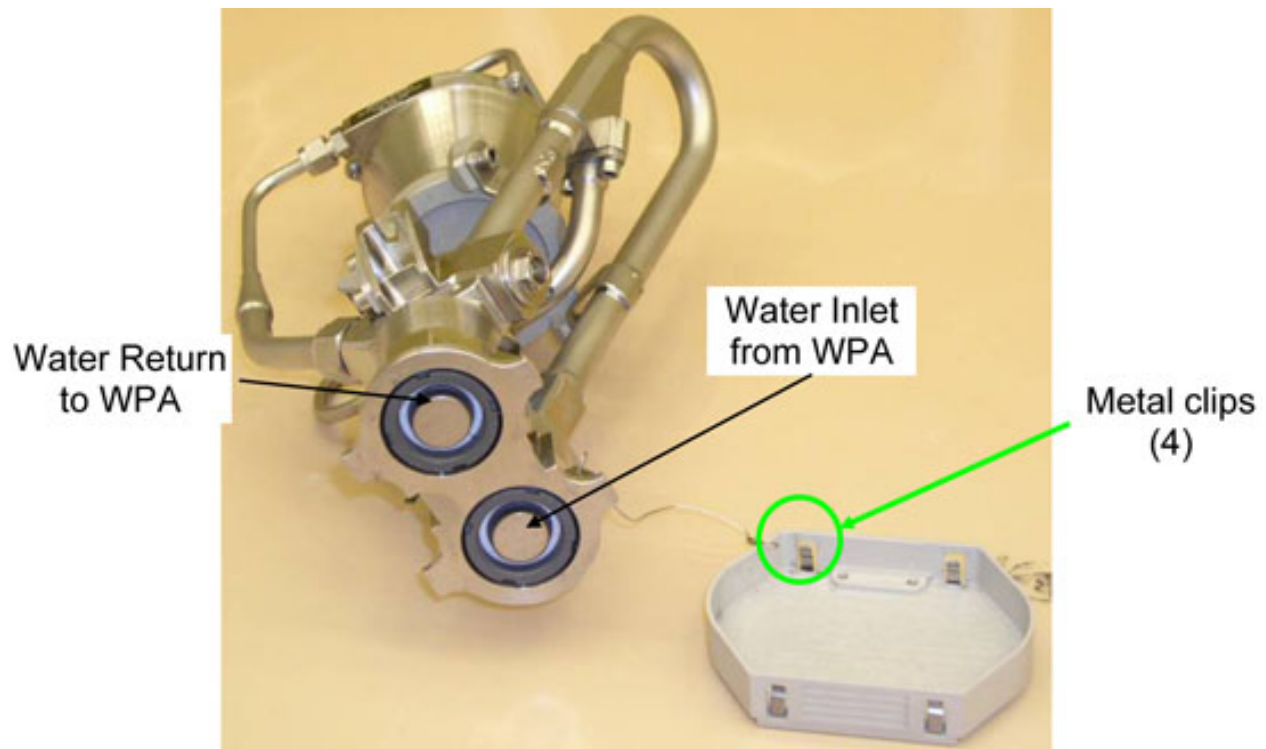


Figure 7. View of the WPA Hydrocyclone QDs (protective cap removed).

### NOTE

The WPA Hydrocyclone protective cap is tethered to the interface block. The cap is provided with metal clips to keep it in place when installed on the OSE and can be removed pulling by hand.

- 3.4 Remove the WPA Hydrocyclone protective cap and inspect WPA Hydrocyclone sealing surfaces for damage and debris. Refer to Figure 7.

## 1.602 WPA1(2) TCS LOOP DEGASSING

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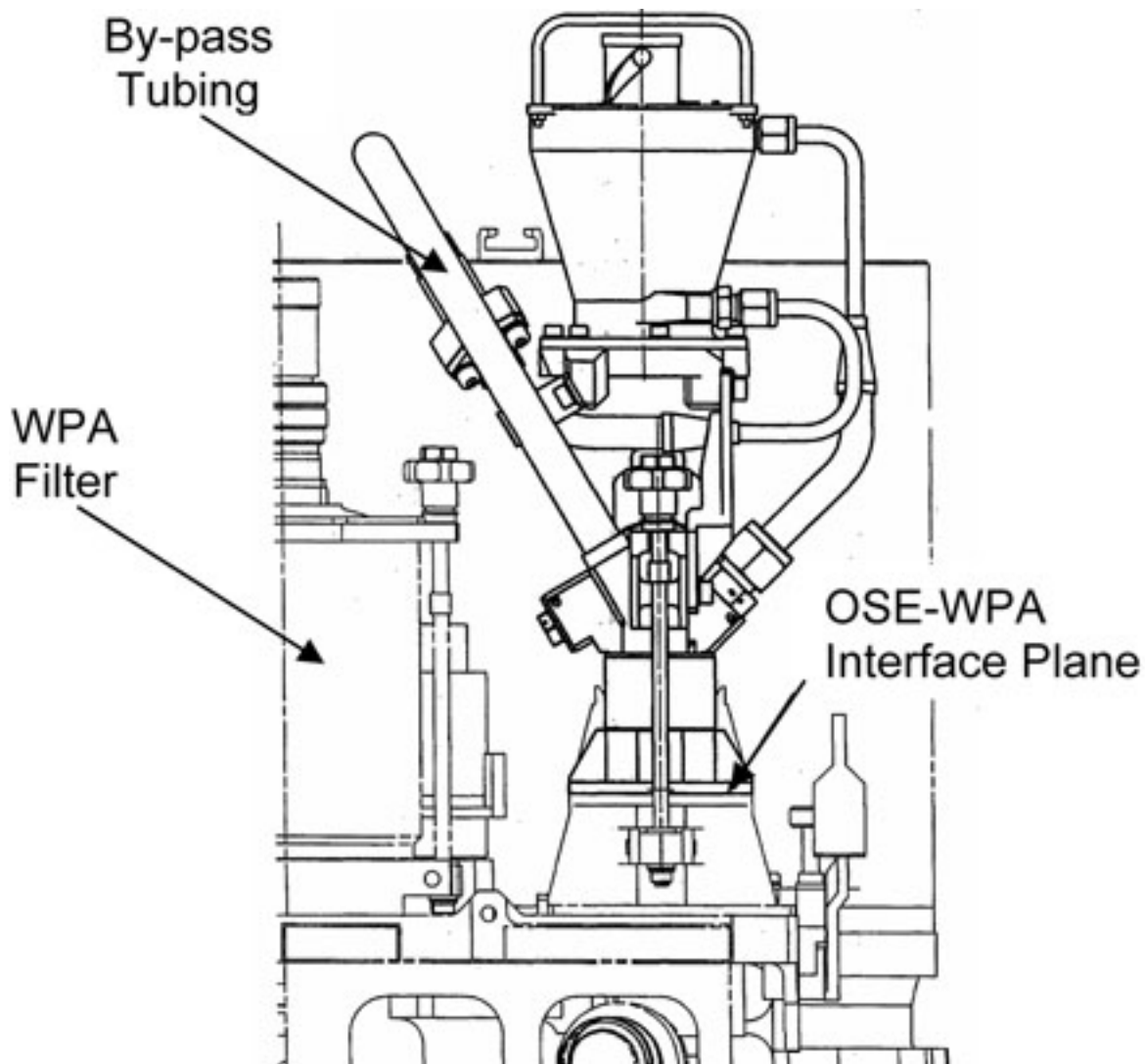


Figure 8. WPA Hydrocyclone installed on the WPA.

### CAUTION

Avoid kickloads while moving around an installed WPA Hydrocyclone since the WPA Hydrocyclone itself exceeds the height of the D1 Rack floor panels level.

- 3.5 Align and install the WPA Hydrocyclone on the WPA with the By-pass tubing oriented against the WPA Filter. Refer to Figure 6 and 8.
- 3.6 Engage the WPA tie-bolts (two) on the OSE tie-bolt interface progressively one turn each to prevent excessive misalignment, then tighten nuts (about 20 turns ↻) (Ratchet Wrench, 1/4"; 102 mm Extension, 1/4" Drive; M8 (13 mm) Socket, 1/4" Drive).

## 1.602 WPA1(2) TCS LOOP DEGASSING

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- 3.7 Torque tie-bolt thumbnuts (2) to 5.5 Nm (Torque Wrench 4-20 Nm, 1/4" Drive; Ratchet Tool, 1/4" Drive; 102 mm Extension, 1/4" Drive; M8 (13 mm) Socket, 1/4" Drive).
- 3.8 ✓No open gap is visible at the interface plane between the WPA Hydrocyclone and the WPA (Flashlight).

### 4. DEGASSING THE WATER LOOP

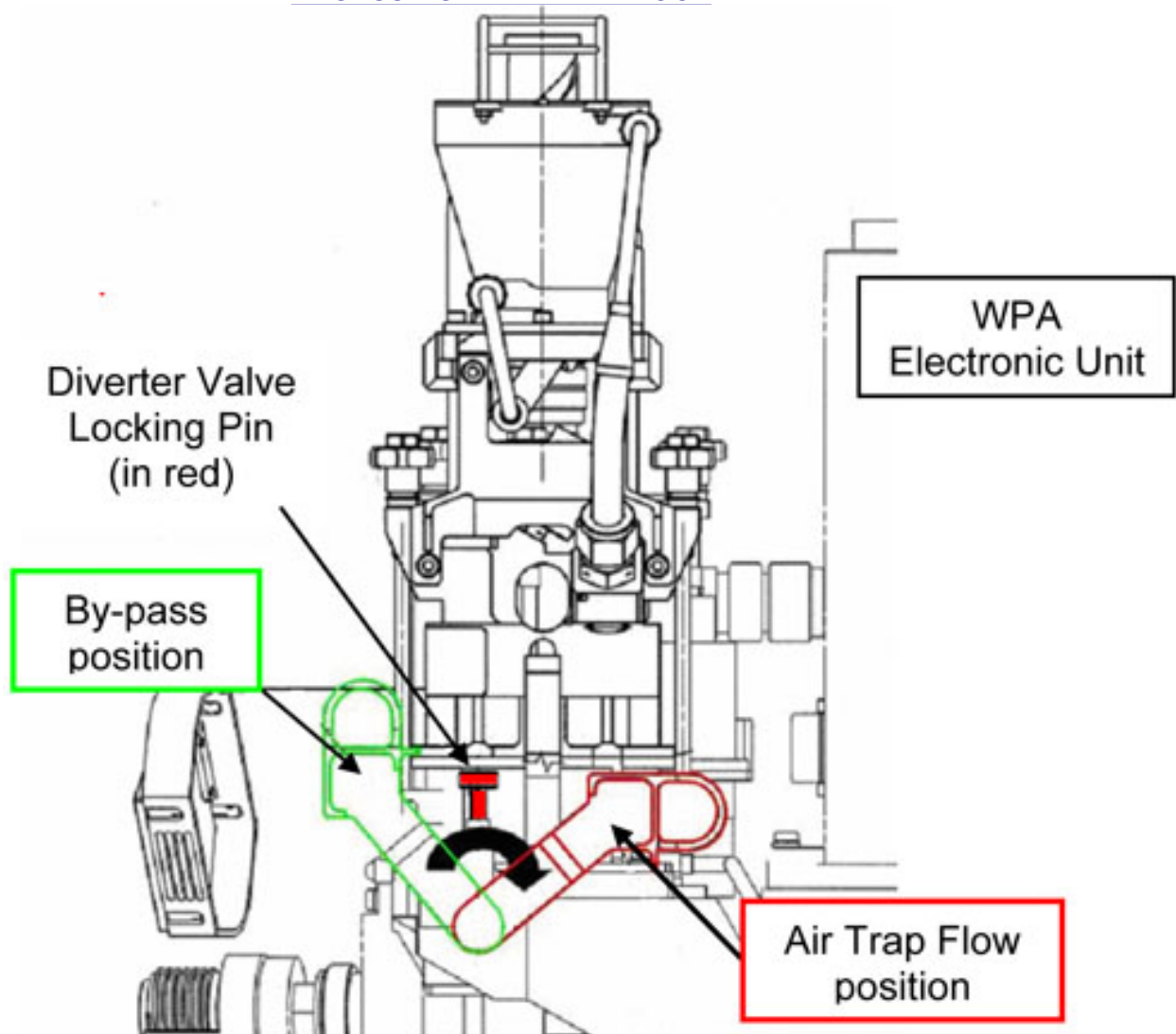


Figure 9. Diverter Valve Handle positions

#### NOTE

1. As soon as the Diverter Valve Handle is moved in the Air Trap Flow position, water will start running through the WPA Hydrocyclone loop and the degassing process will start.
2. The Diverter Valve locking pin remains in the unlocked position when pulled.

# 1.602 WPA1(2) TCS LOOP DEGASSING

- 4.1 Pull the Diverter Valve locking pin then move the Diverter Valve Handle 1/4 turn ↻ from BYPASS to AIR TRAP FLOW position. Refer to Figure 9.
- 4.2 Push and insert the Diverter Valve locking pin.
- 4.3 Verify absence of water leakage at the WPA Hydrocyclone/WPA interface (Flashlight).

```
*****
*      If water leakage is identified at the WPA
*      Hydrocyclone/WPA interface:
*
*      Pull the Diverter Valve locking pin then move
*      the Diverter Valve Handle 1/4 turn ↻ from
*      AIR TRAP FLOW to BYPASS position.
*      Refer to Figure 9.
*
*      Push and insert the Diverter Valve locking
*      pin.
*
*      Wipe off any spilled out water drop (Dry
*      Wipes).
*
*      ISS ↓ COL-CC for identified leakage.
*****
```

- 4.4 ISS ↓ COL-CC "Beginning to remove air from TCS loop."

<p><b>NOTE</b></p> <p>1. To ensure that also the TCS Water Loop branches providing cooling to the Payloads are degassed, the Water Flow Selection Valves (WFSV) of the locations corresponding to installed ISPRs shall be in OPEN position.</p> <p>2. The correct WFSV OPEN/CLOSE command can only be issued by COL-CC.</p>
--

- 4.5 Photodocument installed WPA Hydrocyclone (DCS 760 Camera).
- 4.6 On COL-CC GO Verify running WPA[X] Water Flow.

COL: TCS Functional Overview: WPA[X]

TCS Functional Overview

sel WPA[X]

WPA[X]

'Flowmeter'

Verify Water flow: 800 to 900 kg/h

4.7 Record Starting Time  $T_S$ : \_\_\_\_\_

4.8 Determine Degassing Completion Time  $T_{DE} = T_S + 45$  minutes

$T_{DE}$  \_\_\_/\_\_\_:\_\_\_:\_\_\_

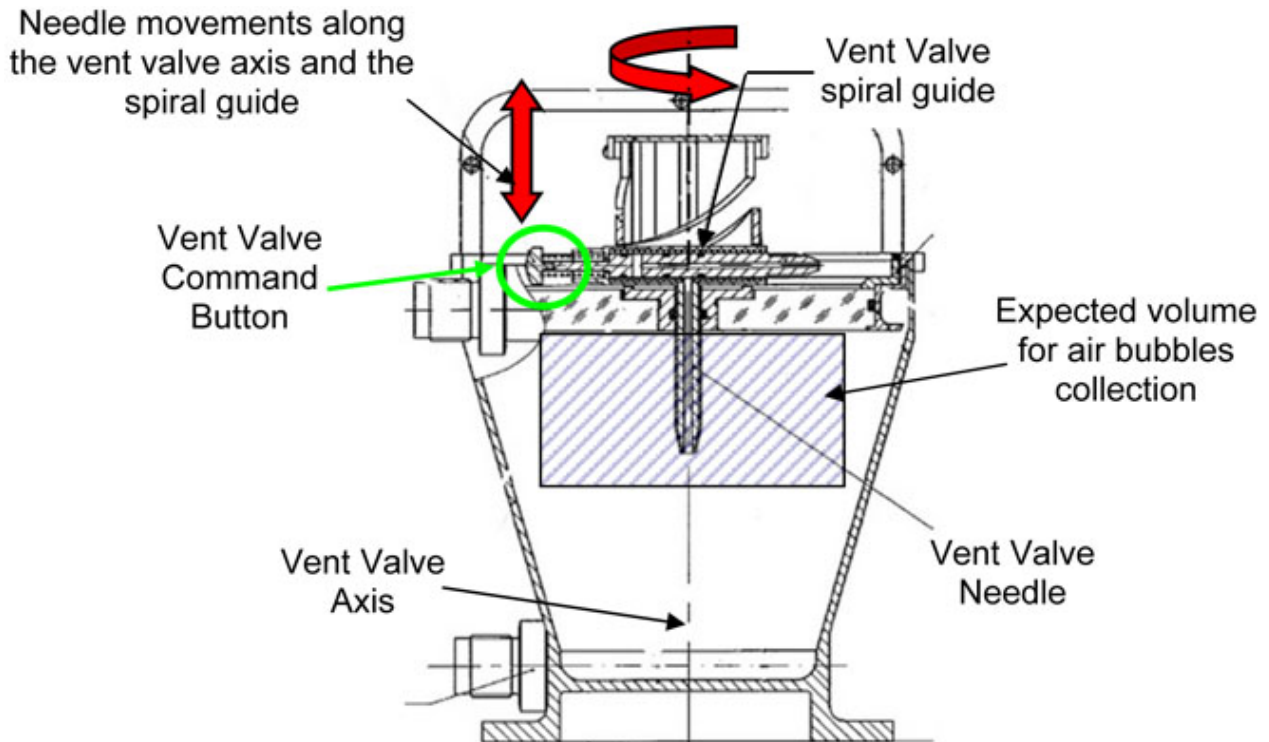


Figure 10. Cross section of the Hydrocyclone Separator (HCS)

NOTE

1. Due to the centrifuge effects, the air bubbles are expected to be collected along the Vent Valve axis, on the upper third of the HCS. Refer to Figure 10.
2. Air bubbles shall not outgrow the dotted red circle on the HCS transparent window (refer to Figure 5). If larger than the dotted red circle diameter, bubbles will be carried over again into the water stream and back into the water loop, thus making the degassing process longer.

4.9 Wait until small air bubbles form in the HCS and coalesce into larger bubbles before continuing.

4.10 Twist the Vent Valve along the spiral guide, thus moving the tip of the valve needle until it reaches the bubble position. Refer to Figure 10.



### 5. REMOVING THE WPA HYDROCYCLONE

#### CAUTION

The WPA Hydrocyclone shall not be removed if the Diverter Valve is in the AIR TRAP FLOW position.  
Failure to comply will result in a WPA dead head condition with no water flow.

- 5.1 Pull the Diverter Valve locking pin and move the Diverter Valve Handle 1/4 turn ↻ from AIR TRAP FLOW to BYPASS position. Refer to Figure 9.
- 5.2 Push and insert the Diverter Valve locking pin.
- 5.3 Unscrew the tie-bolts thumbnuts (two) by progressively unfastening one turn on each to prevent misalignment, about 20 turns until the tie-bolts can tilt outward (Ratchet Wrench, 1/4"; 102 mm Extension, 1/4" Drive; M8 (13 mm) Socket, 1/4" Drive).
- 5.4 Remove the WPA Hydrocyclone, then wipe off any residual water from the WPA Hydrocyclone QDs (Dry Wipes).
- 5.5 Check the WPA Hydrocyclone fluid interfaces are visibly clean and there is no leakage, then install the tethered protective cap on the WPA Hydrocyclone interface block until the metal clips clicks in.  
Temporarily stow.  
Refer to Figure 4 and 7.

## 1.602 WPA1(2) TCS LOOP DEGASSING

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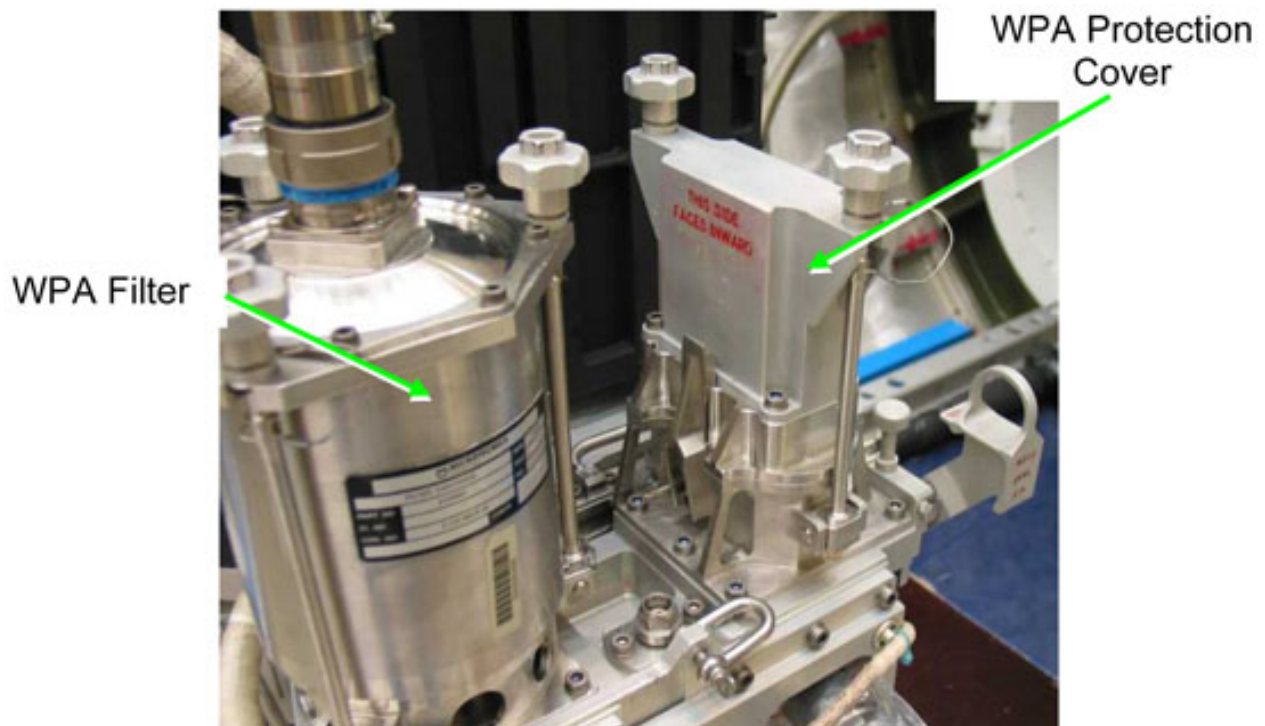


Figure 11. WPA/Hydrocyclone interface cover as installed

- 5.6 Wipe off any residual water from the WPA QDs (Dry Wipes), then verify no contamination on seals. Align and install WPA Protection Cover on the WPA with the label THIS SIDE FACES INWARD facing the WPA Filter. Refer to Figure 11.
- 5.7 Engage the WPA tie-bolts (two) on the WPA protection cap by progressively fastening one tie-bolt at a time then tighten nuts (about 20 turns ↻) (Ratchet Wrench, 1/4"; 102 mm Extension, 1/4" Drive; M8 (13 mm) Socket, 1/4" Drive).
- 5.8 Torque tie-bolt thumbnuts (2) to 5.5 Nm (Torque Wrench 4-20 Nm, 1/4" Drive; Ratchet Tool, 1/4" Drive; 102 mm Extension, 1/4" Drive; M8 (13 mm) Socket, 1/4" Drive).
- 5.9 Verify absence of water leakage at the WPA /WPA Protection Cover interface (Flashlight).
- 5.10 Press once the Vent Valve to release any WPA Hydrocyclone residual pressure within the Disposable Plastic Bag.



## 1.602 WPA1(2) TCS LOOP DEGASSING

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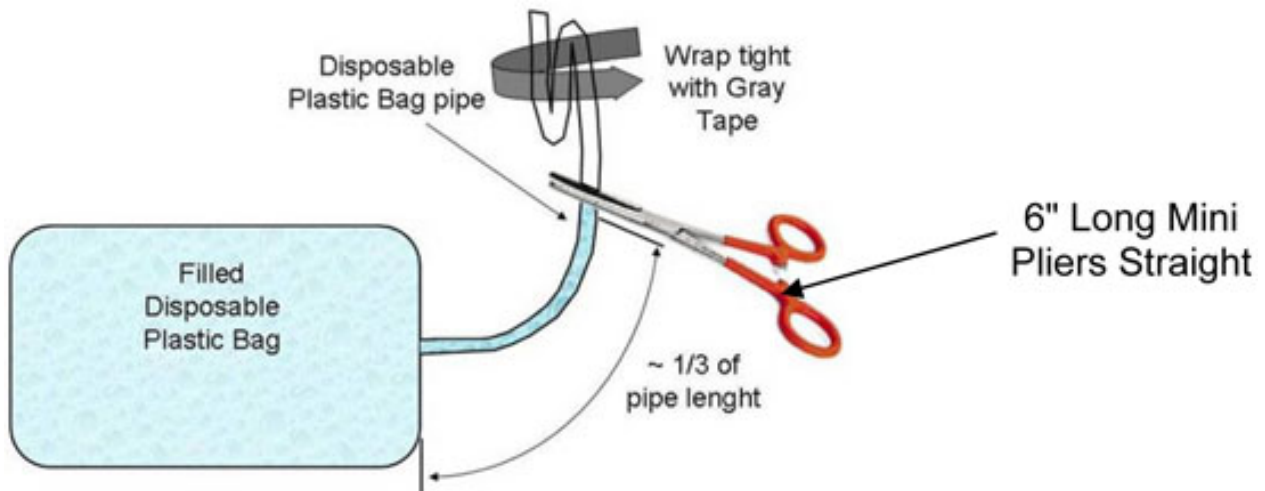


Figure 12. Disposable Plastic Bag pipe pinching

5.11 If only one Disposal Plastic Bag has been used  
Continue with step 5.12.

If more than one Disposable Plastic Bag has been used  
Retrieve the first Disposable Plastic Bag from tempory stowage.  
Perform steps 5.12, 5.14 to 5.16, then  
Continue from step 5.12 on the Disposable Plastic Bag attached to the WPA Hydrocyclone.

### NOTE

Use caution to avoid cutting the Disposable Plastic Bag pipe.

5.12 Pinch the Disposable Plastic Bag pipe at a distance of about 1/3 from the bag (6" Long Mini Pliers Straight). Refer to Figure 12.

5.13 Pull off the Disposable Plastic Bag from the HCS Vent Valve outlet port. Refer to Figure 5.

5.14 Fold the final part of the Disposable Plastic Bag pipe twice, wrap tight (Gray Tape), then remove the pliers. Refer to Figure 12.

5.15 ✓No water leakage out of the Disposable Plastic Bag.

5.16 Seal Disposable Plastic bag in Ziplock bag.  
Tempory stow.

5.17 Seal WPA Hydrocyclone in Ziplock bag.

## 1.602 WPA1(2) TCS LOOP DEGASSING

(ASSY OPS/1E/FIN/HC/MULTI E) Page 18 of 18 pages

Temporarily stow.

- 5.18 Connect WPA[X] N2 QD  
Refer to Figure 3.

### 6. CLOSEOUT

- 6.1 √For FOD inside D1 rack work area.
- 6.2 Retrieve floor panel COL\_D1\_[Z] and place on deck rack, check for correct alignment pin orientation on rack structure and panel label.
- 6.3 Screw-in two panel fasteners at two opposite corners of the floor panel, no torque tightening (Ratchet Wrench, 1/4"; 102 mm Extension, 1/4" Drive; T30 Torx Head, 1/4" Drive).
- 6.4 Torque tighten panel fasteners, any order at 5 Nm (Torque Wrench 4-20 Nm; Ratchet Tool, 1/4" Drive; 102 mm Extension, 1/4" Drive; T30 Torx Head, 1/4" Drive).
- 6.5 Remove PFA, perform [{4.301 PORTABLE FAN ASSEMBLY INSTALLATION IN COLUMBUS}](#), steps 3.2 and 4.1 (ESA SODF: IFM: ECLSS: REFERENCE), then:

### 7. POST MAINTENANCE

- 7.1 Stow WPA Hydrocyclone, expended Disposable Plastic Bags, tools.  
Update IMS with stowage locations.
- 7.2 ISS ↓ COL-CC and report the total number of Vent Valve cycles  $C_{TOTAL} + 1$ . The  $C_{TOTAL}$  were recorded in step 4.12.

## 1.105 KNEE BRACE ASSEMBLY REMOVAL WITH ISPR IN THE RACK BAY

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 15 pages

### OBJECTIVE:

This procedure is applicable to the locations in which an ISPR rack remains installed and is not relocated after launch.

The procedure includes the installation of the Pivot Pin Brackets, the removal of the Knee Brace Assembly, the installation of the K-BAR Assy and of the K-BAR Capture Mechanism to complete the rack bay and rack mechanical configuration.

### LOCATION:

Installed: COL101 (FSL)

Stowed: √Inventory Management System (IMS)

### DURATION:

65 min

### CREW:

One – First 20 minutes (steps 1 to 3)

Two – 45 minutes for rack rotations and closeout (steps 4 to 9)

### PARTS:

Capture Mechanism, Right P/N 683-62201-28

Capture Mechanism, Left P/N 683-62201-27

K-BAR Assy, Right P/N 683-62201-4

K-BAR Assy, Left P/N 683-62201-3

Pivot Pin Bracket, Right P/N 1100CA101-401

Pivot Pin Bracket, Left P/N 1100CA101-402

### MATERIALS:

Earplugs

### TOOLS:

DCS 760 Camera

Flashlight

### Columbus Tool Kit:

ISPR Locking Pin Tool for EPM/FSL P/N C31C939001-100

### Tool Bag 1:

Torque Wrench 4-20 Nm

Ratchet Wrench 1/4"

Eyelet (2)

Adjustable Tether (2)

Flat Screw Driver 4 mm

### Tool Bag 2:

Ratchet Wrench 3/8"

3/16" Hex Head Driver 3/8" Drive

3/8" Hex Head Driver 3/8" Drive

Tool Bag 3:

Ratchet Tool 3/8" Drive

ISS IVA Toolbox

Drawer 3:

6" Long, 5/32" Hex Head, 3/8" Drive

REFERENCED PROCEDURE(S):

None

1. **DISENGAGING RACK LAUNCH RESTRAINTS**

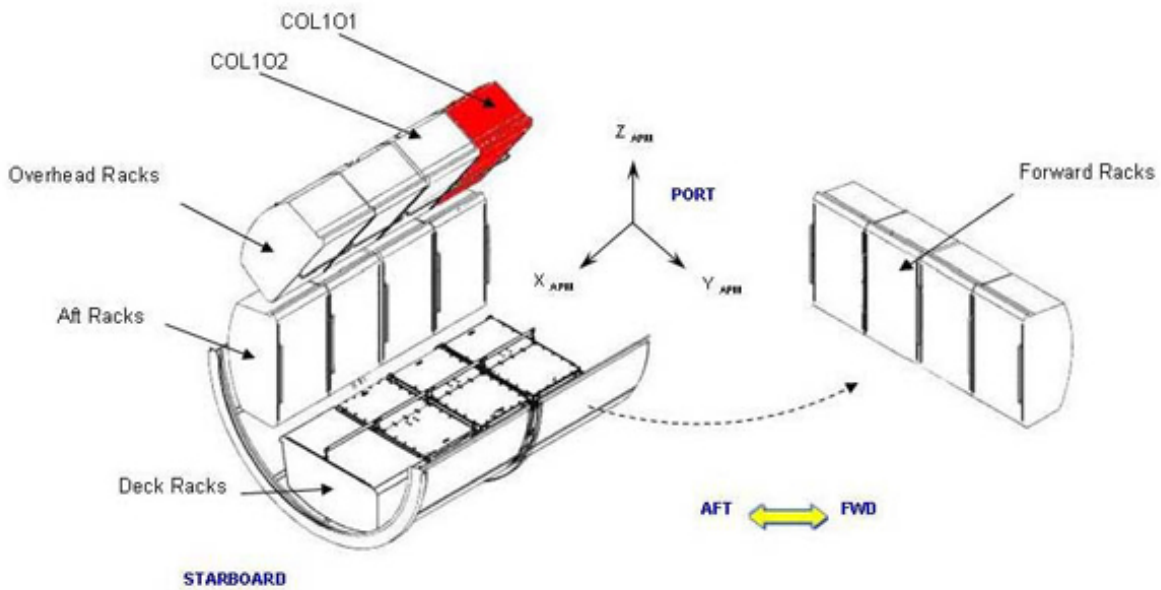


Figure 1. FSL location identification

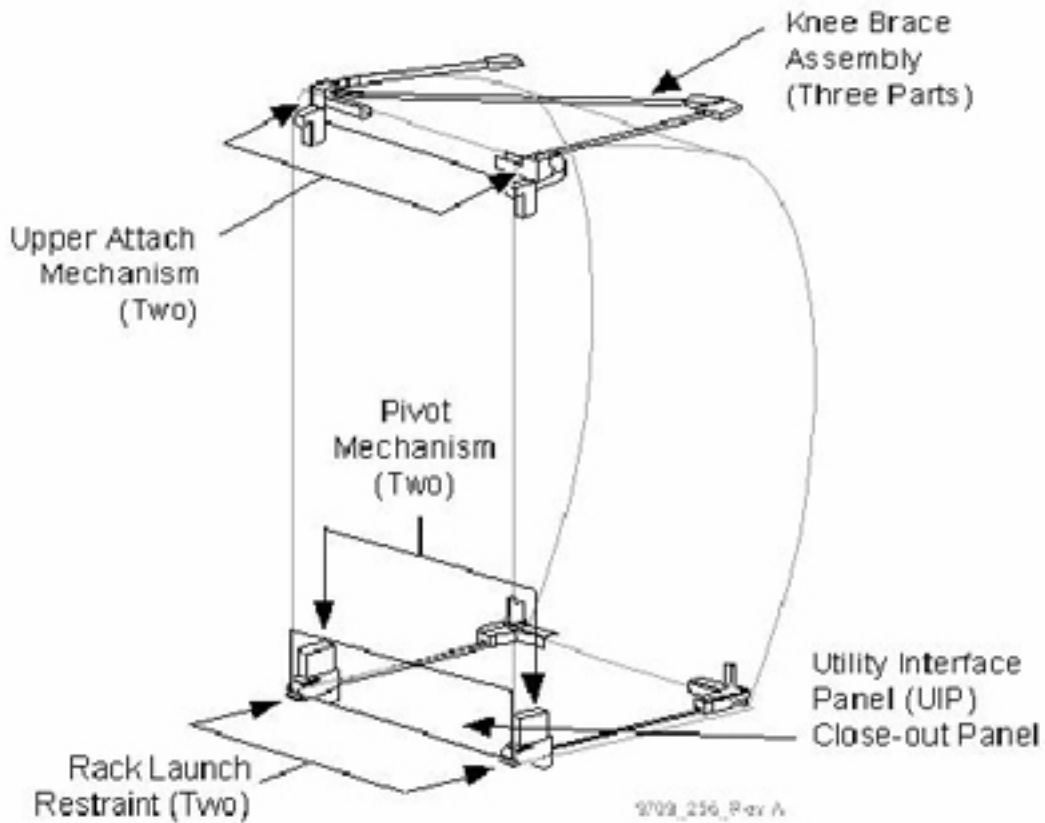


Figure 2. ISPR Rack Attachment Mechanisms.

NOTE

All directional references (up, down, left, right) are with respect to front face of rack, as facing the installed rack.

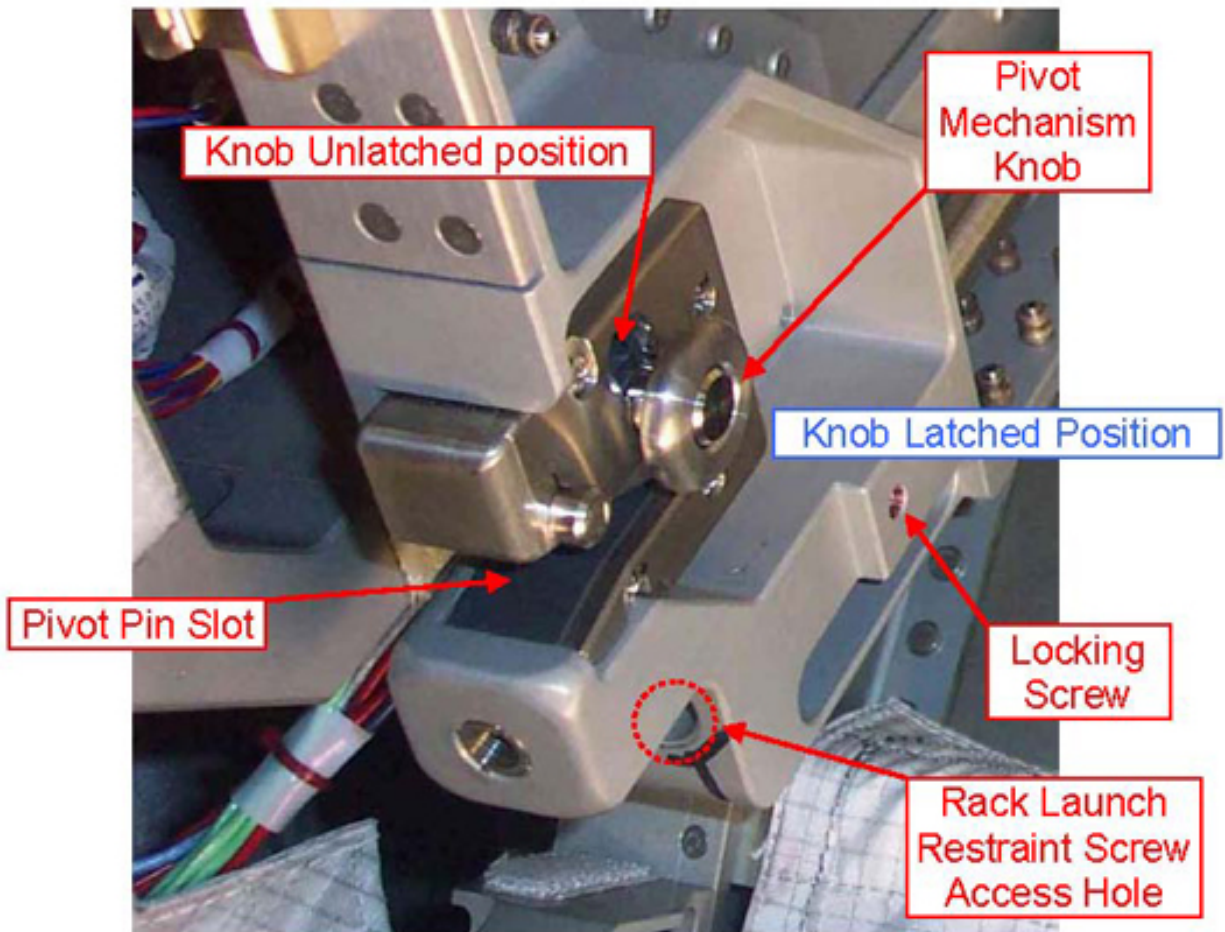


Figure 3. ISPR Rack Launch Restraint (Left), Typical.

**CAUTION**

Disengagement sequence must be followed exactly to allow any induced loads to be released safely back into structure.

**NOTE**

Expect loud "pop" during release of first Rack Launch Restraint

- 1.1 Unfasten Left Locking Screw until loose (Ratchet Wrench 1/4"; FSL ISPR Tool).  
Refer to Figure 3.
- 1.2 Left Rack Launch Restraint Screw  $\curvearrowright$  (10 to 12 turns) (Ratchet Wrench 3/8"; 3/8" Hex Head Driver 3/8" Drive)  
Refer to Figure 3.
- 1.3 Unfasten Right Locking Screw until loose (Ratchet Wrench 1/4"; FSL ISPR Tool).  
Refer to Figure 3.

- 1.4 Right Rack Launch Restraint Screw ↻ (10 to 12 turns) (Ratchet Wrench 3/8"; 3/8" Hex Head Driver 3/8" Drive).

2. INSTALLING PIVOT PIN BRACKETS

NOTE

Refer to Figures 3, 4, 5 and 6 during following section.

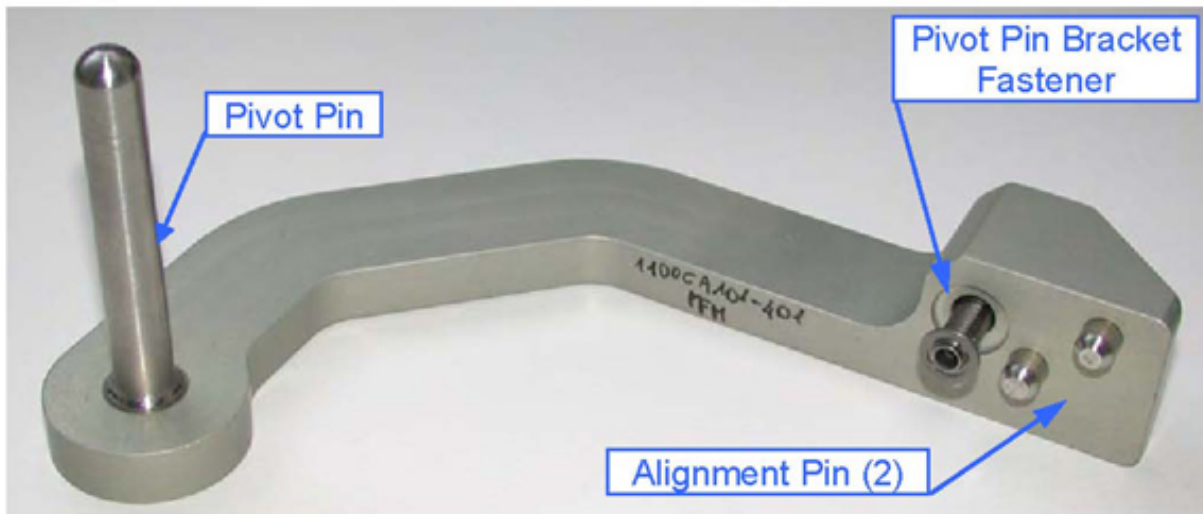


Figure 4. Pivot Pin Bracket, Right (P/N 1100CA101-401)

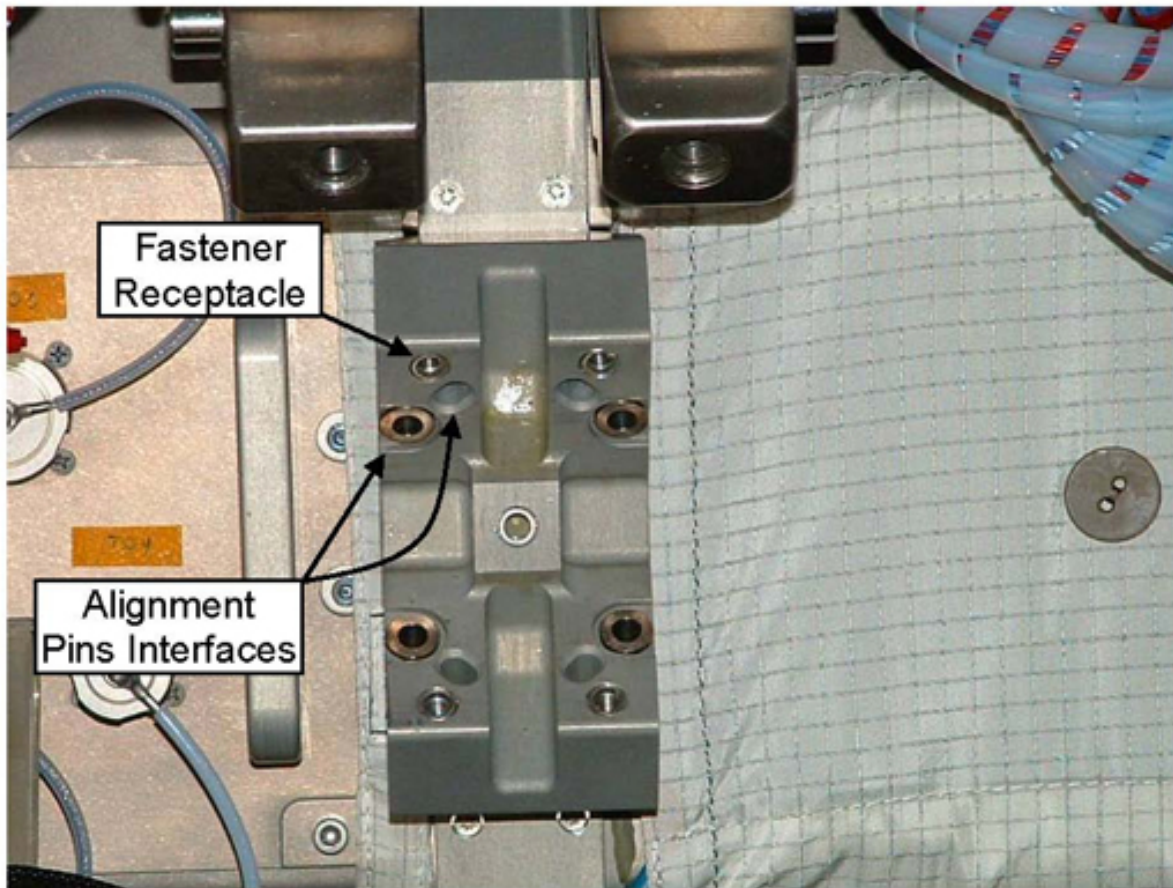


Figure 5. Columbus Stand Off Link

NOTE

The Pivot Pin Bracket is provided with 2 alignment pins to allow its correct installation on stand off links.

- 2.1 Loosen from latched down position, then tighten in unlatched up position both Right and Left Pivot Mechanism Knobs (one full turn).



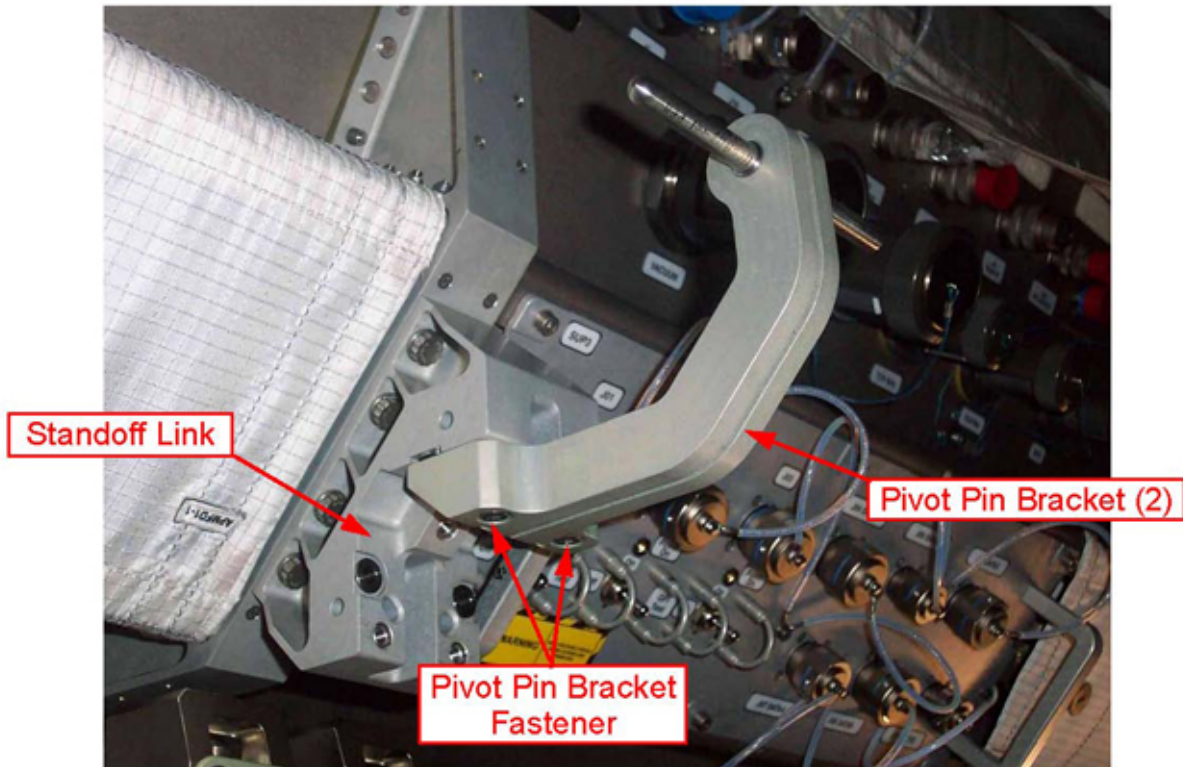


Figure 6. Typical Installation of Pivot Pin Brackets (two) at Columbus Standoff (racks not installed).

- 2.2 Record IMS barcode number of Pivot Pin Brackets.  
Right: \_\_\_\_\_  
Left: \_\_\_\_\_
- 2.3 Install Pivot Pin Bracket, Right tighten fastener (one) (Ratchet Wrench 3/8"; 3/16" Hex Head Driver, 3/8" Drive).
- 2.4 Install Pivot Pin Bracket, Left tighten fastener (one) (Ratchet Wrench 3/8"; 3/16" Hex Head Driver 3/8" Drive).
- 2.5 Torque both Left and Right Pivot Pin Bracket fastener to 9 Nm (Torque Wrench 4-20 Nm; Ratchet Tool, 3/8" Drive; 3/16" Hex Head Driver, 3/8" Drive).

**NOTE**

When loosened, the Pivot Mechanism Knob moves automatically to the latched position by mean of the internal spring.

- 2.6 Loose both Right and Left Pivot Mechanism Knobs (one full turn), then tighten in latched, down position.

3. DISENGAGING UPPER ATTACH MECHANISM

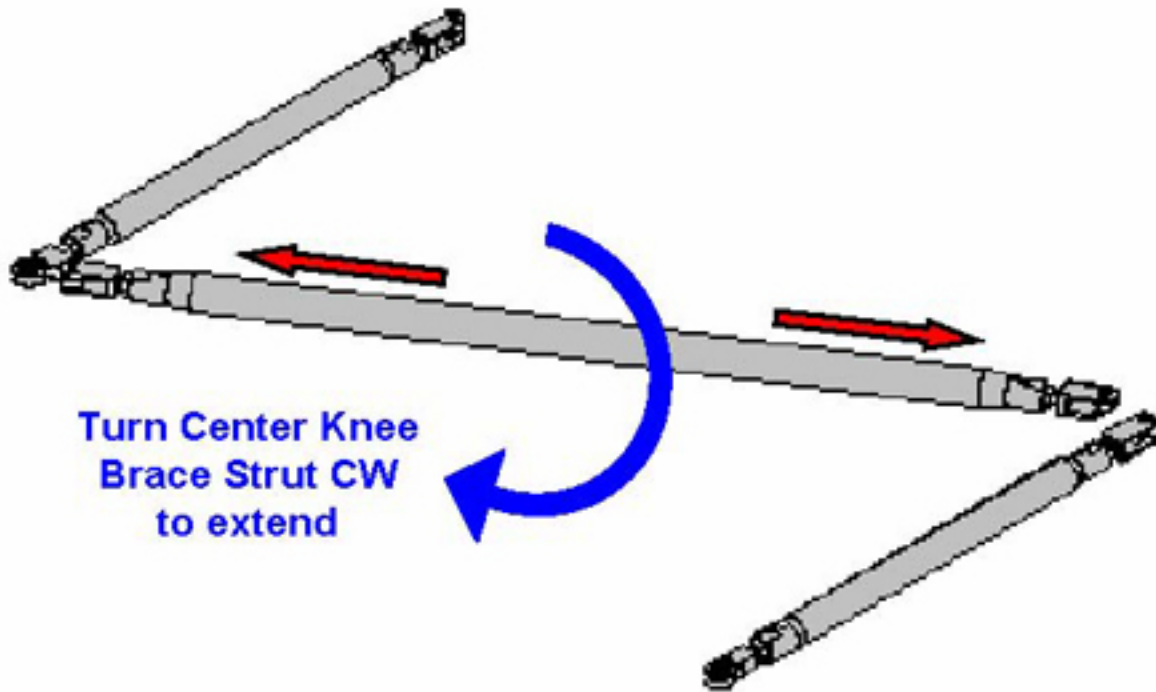


Figure 7. Knee Brace Assembly

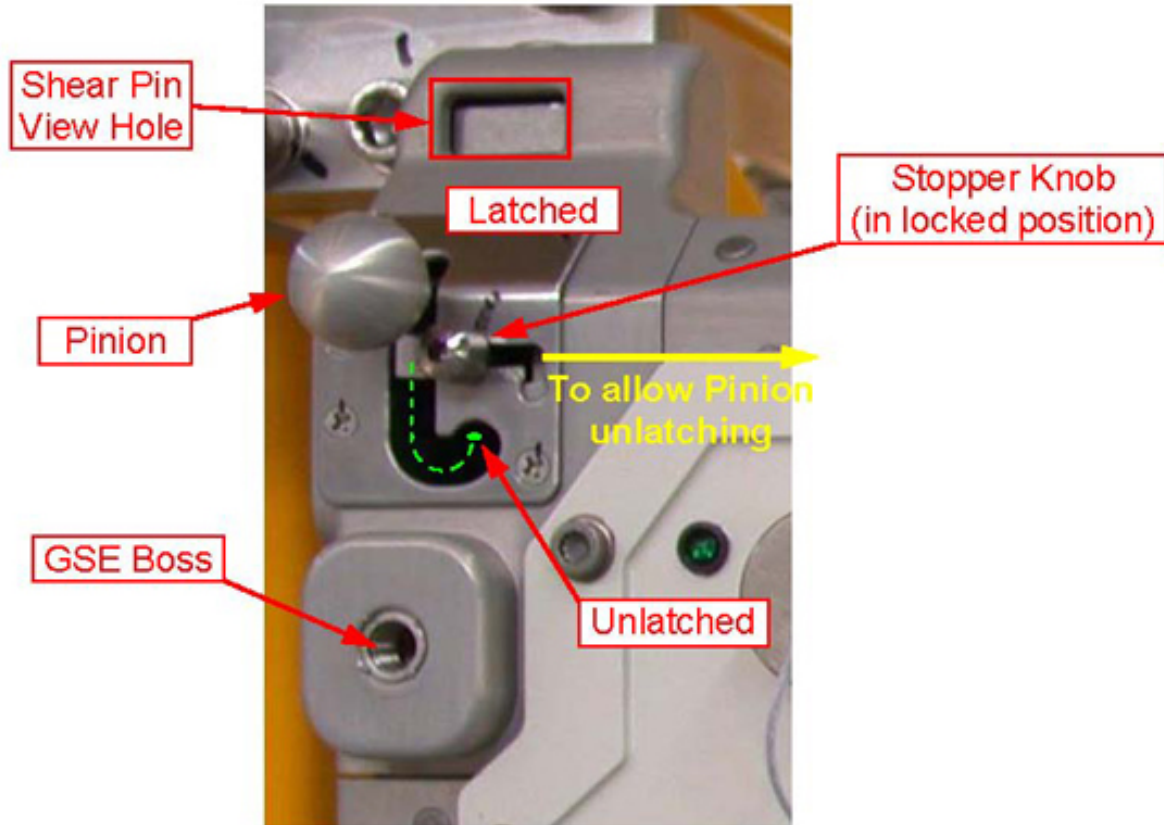


Figure 8. ISPR Upper Attach Mechanism (Left), Typical.

NOTE

1. The Center Knee Brace Strut has been pre-loaded on ground by turning strut CCW to shorten. In order to help rack re-engagement, this strut should be re-adjusted CW on-orbit prior to rotating down.
2. The Pinion is maintained in the latched position by mean of an internal spring.

- 3.1 Adjust Center Knee Brace Strut 1-2 turns CW, until loose.
- 3.2 Loosen left Upper Attach Mechanism Stopper Knob (Ratchet Wrench 3/8"; 6" Long, 5/32" Hex Head, 3/8" Drive). Move to the right to allow Pinion unlatching. Refer to Figure 8.
- 3.3 Left Pinion → Unlatched. Refer to Figure 8.
- 3.4 Loosen right Upper Attach Mechanism Stopper Knob (Ratchet Wrench 3/8"; 6" Long, 5/32" Hex Head, 3/8" Drive). Move to the left to allow Pinion unlatching.
- 3.5 Right Pinion → Unlatched.

4. [INSTALLING THE K-BAR ASSEMBLY](#)

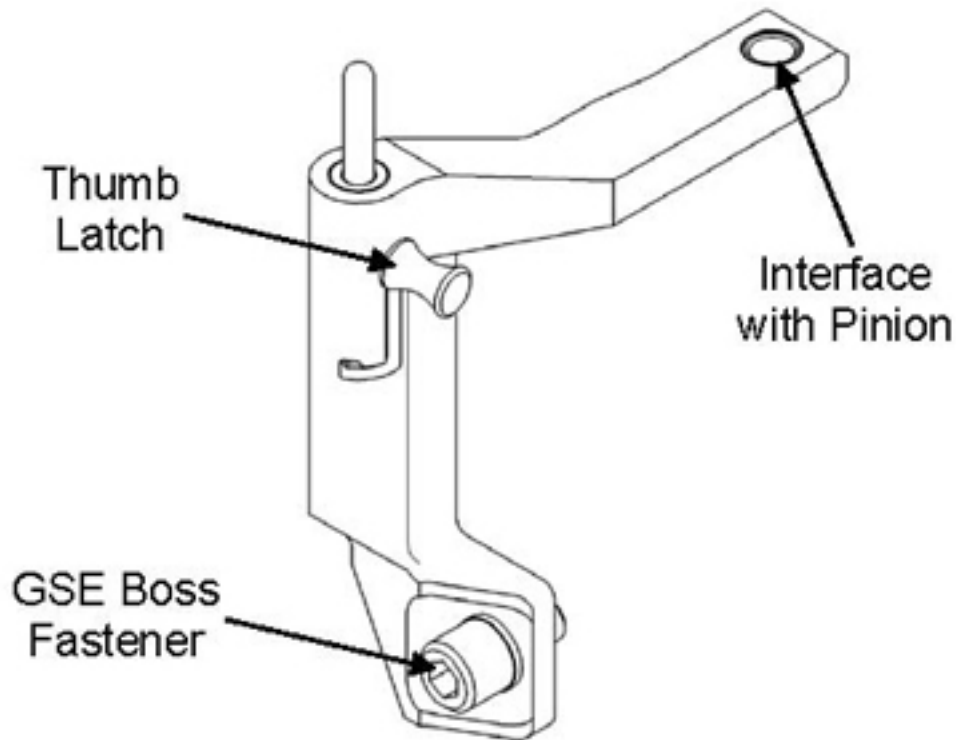


Figure 9. K-BAR Assy, Left

**NOTE**

For the execution of following steps refer to Figures 8 and 9.

- 4.1 ✓ Rack rotation path is unobstructed.
- 4.2 Rotate rack down about 15 cm.
- 4.3 ✓ Left Upper Attach Mechanism Pinion is in unlatched position.
- 4.4 ✓ Left Stopper Knob is in unlocked position.
- 4.5 Install K-BAR Assy, Left into left Upper Attach Mechanism Shear Pin View Hole.

**CAUTION**

Do not force Upper Attach Mechanism Pinions. Mechanism should easily engage K-BAR Assy. Failure to comply may result in equipment damage.

- 4.6 Left Pinion → Latched.  
✓ Shear Pin is visible at top of mechanism.

## 1.105 KNEE BRACE ASSEMBLY REMOVAL WITH ISPR IN THE RACK BAY

(ASSY OPS/1E/FIN/MULTI E)

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- 4.7 Set Stopper Knob in locked position, tighten fastener (Ratchet Wrench 3/8"; 6" Long, 5/32" Hex Head, 3/8" Drive).
  - 4.8 Tighten K-BAR Assy, Left GSE Boss fastener (Ratchet Wrench 3/8"; 3/8" Hex Head Driver 3/8" Drive).
  - 4.9 K-BAR Thumb Latch → Down.
  - 4.10 Repeat steps 4.2 to 4.8 for K-BAR Assy, Right.
5. [ROTATING ISPR DOWN](#)
- 5.1 √Rack rotation path unobstructed.
  - 5.2 Slowly rotate rack down to a controlled stop, temporarily restrain, as required (Eyelets, Adjustable Tethers).
  - 5.3 After the Rack is tilted down, it shall be properly restrained to avoid any obstruction of the passage to Node 2 due to uncontrolled rack rotation.
6. [REMOVING THE KNEE BRACE ASSEMBLY](#)

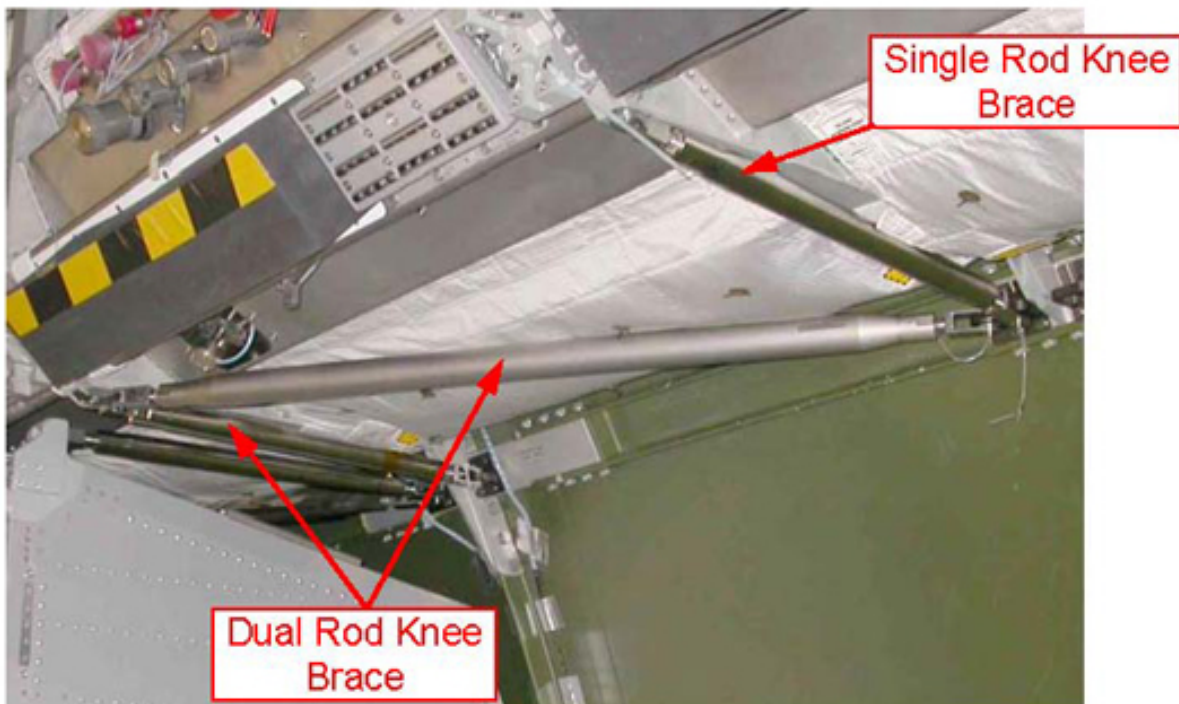


Figure 10. Knee Brace Assembly Installed, Typical.

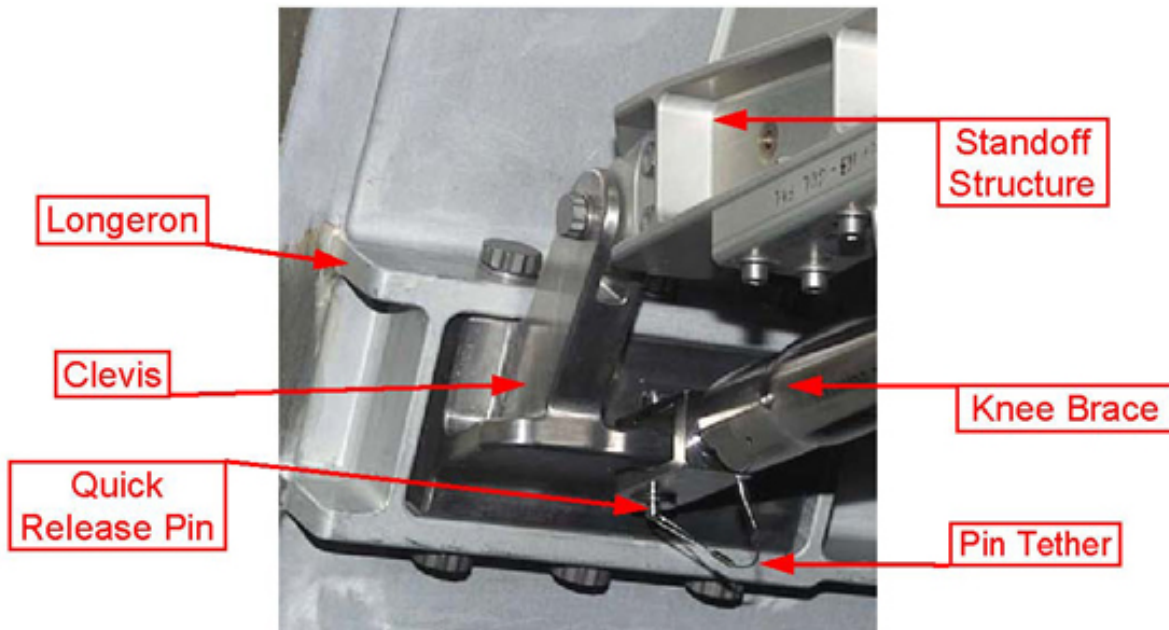


Figure 11. Knee Brace Attachment to Stand-off, Typical.

- 6.1 Remove Single, Double Rod Knee Brace Assembly sections by pulling captive pip-pins (three) from Stand-off Clevis. Temporarily stow.  
Refer to Figures 10 and Figure 11.

7. INSTALLING THE K-BAR CAPTURE MECHANISM

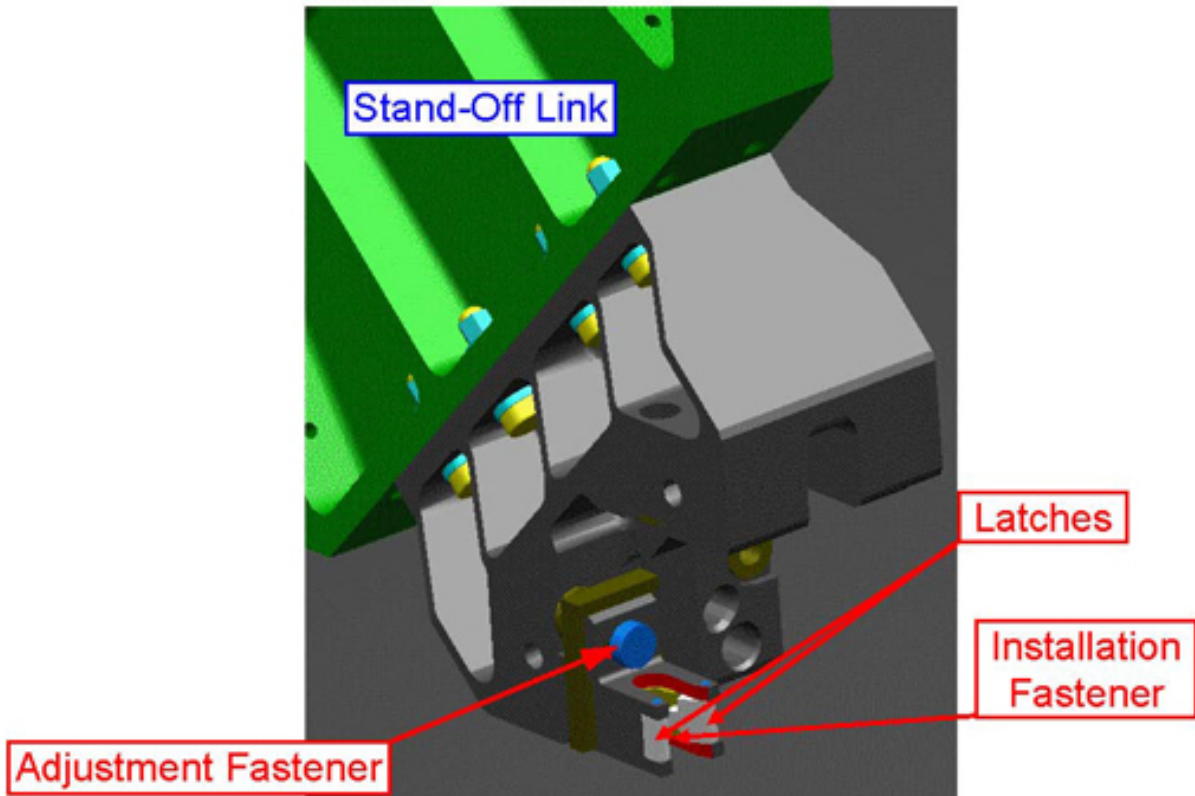


Figure 12. Columbus K-BAR Capture Mechanism

NOTE

1. K-BAR Capture Mechanism is provided with a locating pin to fit in the appropriate Stand-Off Link seat.
2. Tool for fastening the Installation Fastener must be inserted between the mechanism latches.
3. For the execution of following steps refer to Figure 12.

- 7.1 Install K-BAR Capture Mechanism, Right on the Stand-Off Link, tighten fastener (one) (Ratchet Wrench 3/8"; 6" Long, 5/32" Hex Head, 3/8" Drive).
- 7.2 Install K-BAR Capture Mechanism, Left on the Stand-Off Link, tighten fastener (one) (Ratchet Wrench 3/8"; 6" Long, 5/32" Hex Head, 3/8" Drive).
- 7.3 Torque both K-BAR Capture Mechanisms fastener (one each) to 6 Nm (Torque Wrench 4-20 Nm; Ratchet Tool 3/8" Drive; 6" Long, 5/32" Hex Head, 3/8" Drive).

8. ROTATING ISPR UP

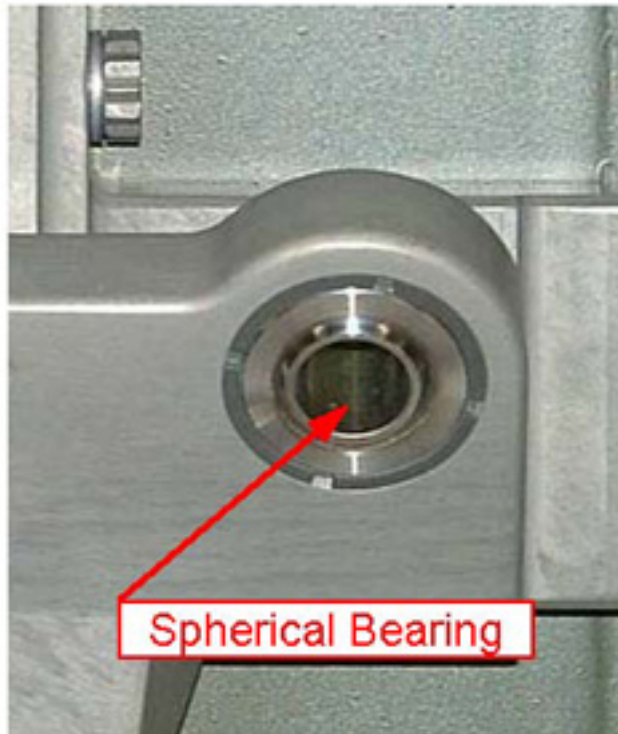


Figure 13. Typical Lower Rear Attachment on Columbus Longeron

8.1 Left and Right K-BAR Thumb Latches → Up

NOTE

If Spherical Bearings are not straight, it may prevent rack mechanism re-engagement. A common tip screwdriver can be used to straighten Spherical Bearings.

- 8.2 ✓ Standoff Lower Rear Spherical Bearings straight (Flashlight, Flat Screw Driver, 4 mm).  
Refer to Figure 13.
- 8.3 ✓ Rack rotation path is unobstructed, then release from restraints.
- 8.4 Slowly rotate rack up to a controlled stop, until K-BAR Thumb Latches (two) engage with K-BAR Capture Mechanism on Stand-off.



# 1.105 KNEE BRACE ASSEMBLY REMOVAL WITH ISPR IN THE RACK BAY

(ASSY OPS/1E/FIN/MULTI E)

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```
*****
*      If K-BAR Thumb Latch does not align with Capture Mechanism
*
*      |
*      |
*      |      Loosen Adjustment Fastener (Ratchet Wrench 3/8";
*      |      6" Long, 5/32" Hex Head, 3/8" Drive).
*      |      Refer to Figure 10.
*      |
*      |      Adjust the K-BAR Capture Mechanism as required.
*      |
*      |      Tighten Adjustment Fastener (Ratchet Wrench 3/8";
*      |      5/32" Hex Head 3/8" Drive).
*      |
*****
```

## 9. POST MAINTENANCE

- 9.1 ISS ↓ **COL-CC** "All Rack to Module Restraints have been released".
- 9.2 Photo document the new rack configuration (DCS 760 Camera).
- 9.3 √Transfer List for stowage location of Knee Brace Assembly.
- 9.4 Stow tools, then update IMS with Parts installation location.

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## 1.202 COL ISPR ROTATION

(ASSY OPS/1E/FIN/HC/MULTI E) Page 1 of 4 pages

### OBJECTIVE:

Rotate an ISPR installed in Columbus aft, forward or overhead rack bays to access the ISPR rear, the standoff bays, the primary shell or cone panel areas.

### LOCATION:

Installed: Refer to Table 1

**Table 1. Columbus ISPR Locations**

LOCATION	ISPR
COL1F1	EDR
COL1O1	FSL
COL1D4	ETC
COL1A2	BIOLAB
COL1A3	EPM

### DURATION:

10 minutes for ISPR rotation down (not includes time required for removal of hardware installed on ISPR front)

10 minutes for ISPR rotation up (not includes time required for installation of hardware on ISPR front)

### CREW:

Two

### TOOLS:

#### Columbus Tool Kit

Eyelet (2)

Adjustable Tether (2)

#### 1. ROTATING ISPR DOWN

- 1.1 Remove any equipment and restraints and mobility aids installed on the ISPR front panel.  
Temporary stow.

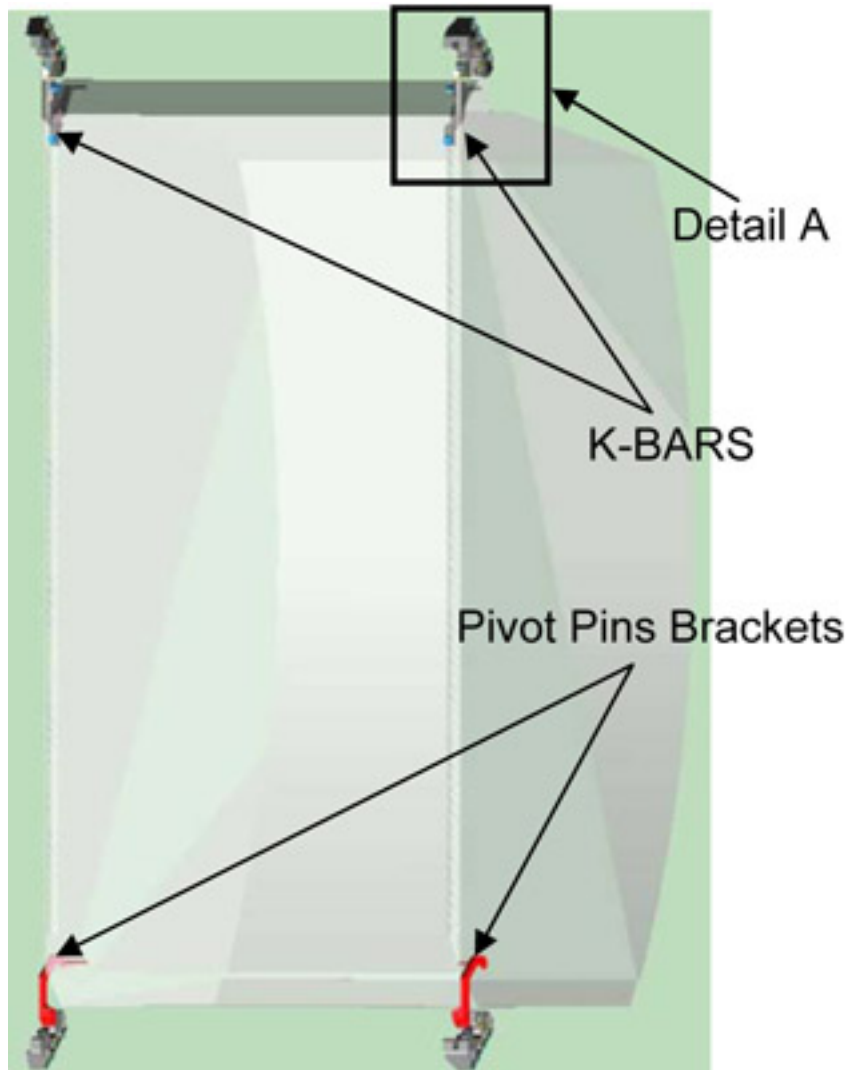


Figure 1. ISPR Attachment Mechanisms

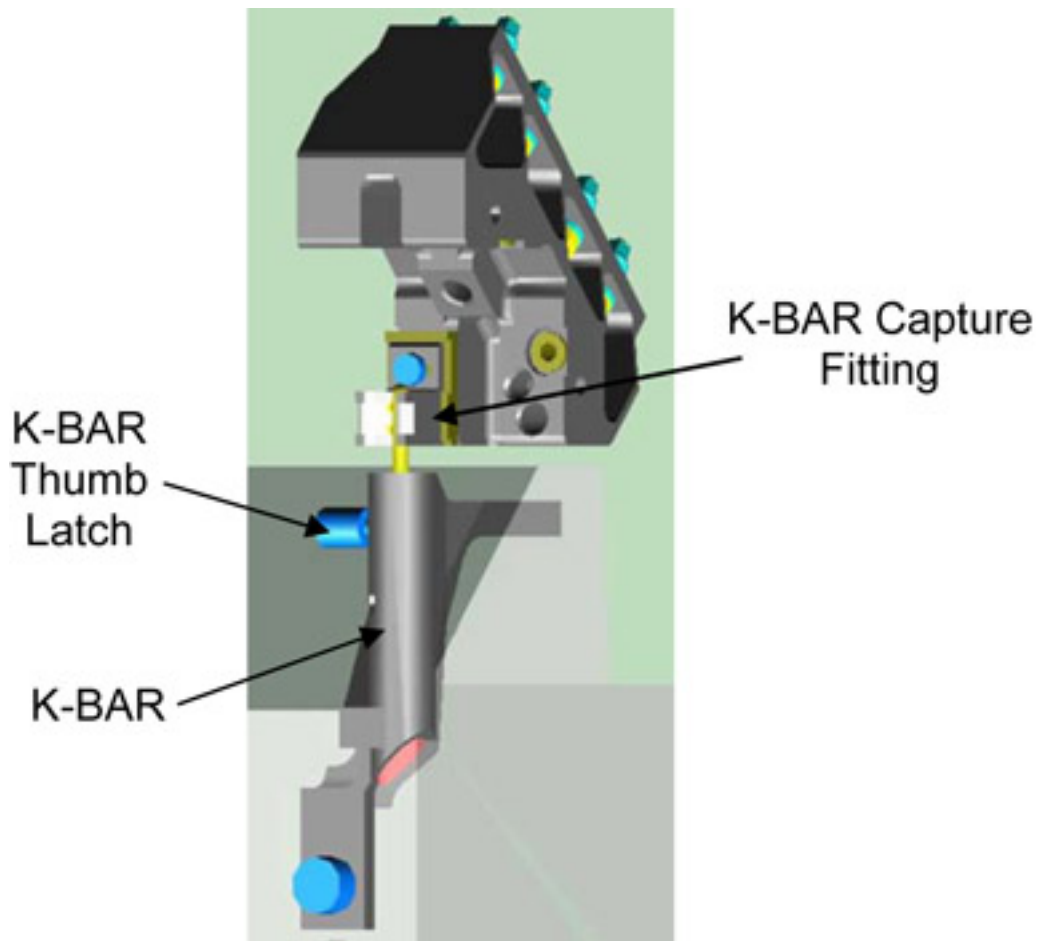


Figure 2. Detail A – K-BAR (in up position) and K-BAR Capture Fitting

- 1.2 Verify Pivot Pin Brackets, Left and Right are installed on Stand Off Links.  
Refer to Figure 1.

## 1.202 COL ISPR ROTATION

(ASSY OPS/1E/FIN/HC/MULTI E)

Page 4 of 4 pages

\*\*\*\*\*  
\* If Pivot Pin Bracket are not installed, perform [{1.208 PIVOT](#)  
\* [PIN BRACKET INSTALLATION / REMOVAL](#)}, step 1 (SODF:  
\* [ASSY OPS: ACTIVATION AND CHECKOUT](#)), then:  
\*\*\*\*\*

- 1.3 √ISPR rotation path unobstructed.
- 1.4 ISPR K-BAR Thumb Latches (two) → Down position.
- 1.5 Slowly rotate ISPR down to a controlled stop, temporarily restrain, as required (Eyelets, Adjustable Tethers).

Refer to Figure 2.

### 2. [ROTATING ISPR UP](#)

- 2.1 √Rack rotation path is unobstructed, then release ISPR from restraints.
- 2.2 Slowly rotate ISPR up to a controlled stop, until K-BAR Thumb Latches (two) engage with K-BAR Capture Fittings on Stand Off.
- 2.3 ISPR K-BAR Thumb Latches (two) → Up position.  
Refer to Figure 3.

# 1.205 COL MOBILE SYSTEM STOWAGE PROVISION (MSSP) REMOVAL / INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 5 pages

## OBJECTIVE:

To remove a single Mobile System Stowage Provision (MSSP) from either D2 or D3, stow temporarily inside Columbus and re-installing the MSSP back into the original deck rack.

## LOCATION:

Installed:

COL1D2

COL1D3

## DURATION:

1 hour

30 minutes removal

30 minutes installation

## CREW

One

## TOOLS:

COL1

### Tool Bag 1

Eyelets (2)

Adjustable Tether (1)

T30 Torx® Head 1/4" Drive

### Tool Bag 2

T-Handle 3/8" Drive

455 mm Extension 3/8" Drive

### Tool Bag 3

3/8" to 1/4" Adapter

LAB1

## Deployed

DCS 760 Camera

## REFERENCED PROCEDURE(S):

1.201 COL DECK RACK D1 / D2 / D3 OPEN & CLOSE

1.212 COL FLOOR INTERFACE BAR REMOVAL / INSTALLATION

# 1.205 COL MOBILE SYSTEM STOWAGE PROVISION (MSSP) REMOVAL / INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 2 of 5 pages

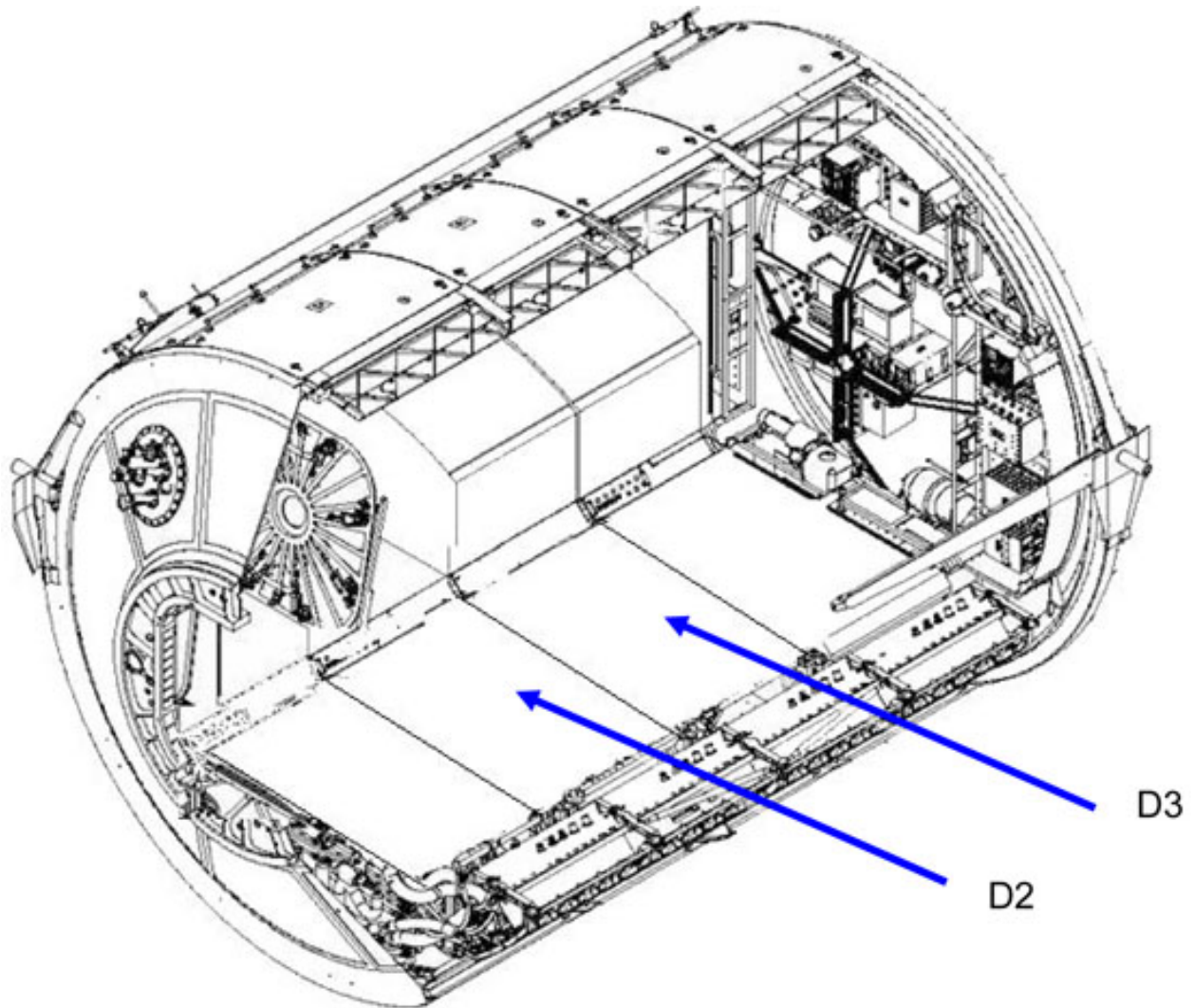


Figure 0-1 Columbus Deck Rack D2 / D3 Configuration

## 1. ACCESSING

- 1.1 ✓Floor Panels → Installed, perform [{1.201 COL DECK RACK D1 / D2 / D3 OPEN & CLOSE}](#) (SODF: ASSY OPS: ACTIVATION AND CHECKOUT), step 1 and step 2 only, remove both panels.
- 1.2 ✓Floor Interface Bar → Installed, perform [{1.212 COL FLOOR PANEL INTERFACE BAR REMOVAL / INSTALLATION}](#) (SODF: ASSY OPS: ACTIVATION AND CHECKOUT), step 1 to step 3

### NOTE

Figure 1-1 following shows the typical FSSP and MSSP deck rack installation, any stowed equipment is not shown.



# 1.205 COL MOBILE SYSTEM STOWAGE PROVISION (MSSP) REMOVAL / INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 3 of 5 pages

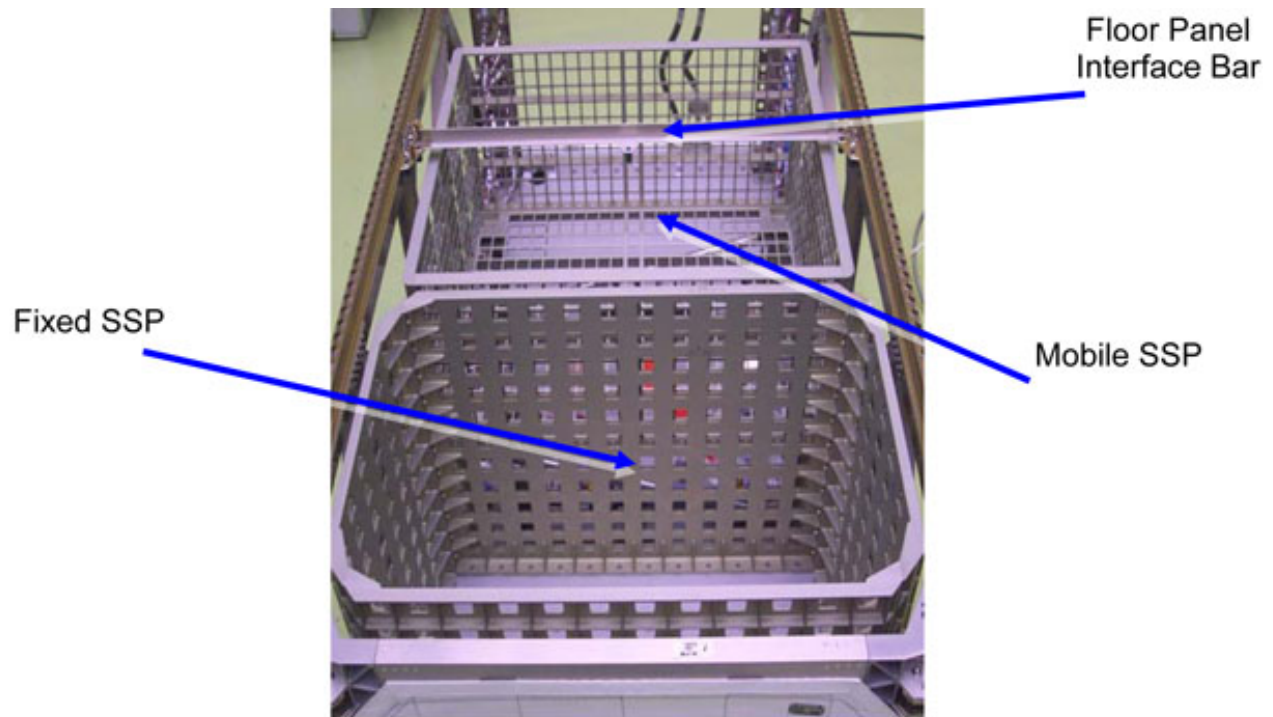


Figure 1-1 MSSP Inside Deck Rack

## 2. REMOVAL

- 2.1 Check MSSP fasteners (4) for tool accessibility. Remove equipment from MSSP and temporary stow as necessary.
- 2.2 Unscrew MSSP fasteners (4) in any order (T-Handle 3/8" Drive; 455mm Extension 3/8" Drive; 3/8"-to-1/4" Adapter; T30 Torx Head 1/4" Drive). Fasteners are captive. Refer to Figure 2-1.



Figure 2-1 MSSP Fastener Locations

## 1.205 COL MOBILE SYSTEM STOWAGE PROVISION (MSSP) REMOVAL / INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 4 of 5 pages

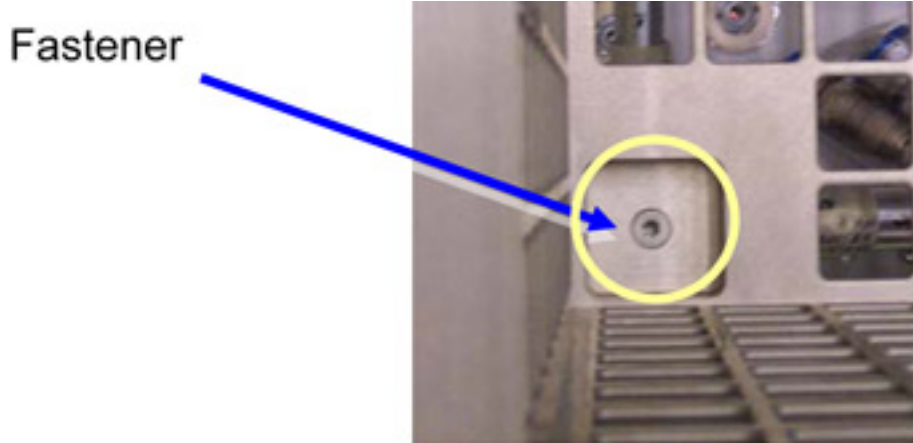


Figure 2-2 MSSP Fastener (Details)

- 2.3 Remove MSSP from deck rack using soft handles and temporary stow (Adjustable Tether, Eyelets).
- 2.4 Stow tools and equipment.

### 3. INSTALLATION

- 3.1 Check MSSP fasteners (4) for tool accessibility.  
Remove equipment from MSSP and temporary stow as necessary.

#### NOTE

MSSP installed inside deck rack with its long edges oriented in parallel with Columbus x-axis.

- 3.2 √For FOD inside deck rack.
- 3.3 Release MSSP from stowage and insert into deck, align MSSP using guiding pins
- 3.4 Screw-in MSSP fasteners (4) in any order, no torque tightening (T-Handle 3/8" Drive; 455mm Extension 3/8" Drive; 3/8"-to-1/4" Adapter; T30 Torx Head 1/4" Drive).

### 4. CLOSEOUT

- 4.1 Photo document MSSP installed inside deck rack (DCS 760 camera).
- 4.2 Reload equipment into MSSP as necessary.
- 4.3 Install Floor Interface Bar, perform [{1.212 COL FLOOR INTERFACE BAR REMOVAL / INSTALLATION}](#) (SODF: ASSY OPS: ACTIVATION AND CHECKOUT)step 4 and step 5 only, then

## 1.205 COL MOBILE SYSTEM STOWAGE PROVISION (MSSP) REMOVAL / INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 5 of 5 pages

- 4.4 Install floor panels, perform [{1.201 COL DECK RACK D1 / D2 / D3 OPEN & CLOSE}](#) (SODF: ASSY OPS: ACTIVATION AND CHECKOUT), step 3 and step 4 only, then
- 4.5 Stow per Daily Stowage Note.

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## 1.207 COLUMBUS ISPR RACK RELOCATION

(ASSY OPS/1E/FIN/HC/MULTI E) Page 1 of 14 pages

### Parameters 1. choice1

ISPR[X]	FROM BAY COL1[Y]	TO BAY COL1[Z]	ISPR TOOL [W]
[X]	[Y]	[Z]	[W]
EPM	O3	A3	ISPR Locking Pin Tool For EPM/FSL
BIOLAB	O2	A2	ISPR Locking Pin Tool For ETC/BIOLAB
EDR	O4	F1	1/8" Hex Head, 1/4" Drive

### OBJECTIVE:

To relocate Columbus ISPR racks from the launch to the stage locations.

### LOCATION:

Installed: Refer to Table 1.

Table 1. Columbus ISPR locations

ISPR[X]	FROM BAY COL1[Y]	TO BAY COL1[Z]
EPM	O3	A3
BIOLAB	O2	A2
EDR	O4	F1

### DURATION:

65 minutes (each location)

### CREW:

Two

### PARTS:

Handrails (two) P/N 9221CA101-401

Pivot Pin Bracket, Right P/N 1100CA101-401

Pivot Pin Bracket, Left P/N 1100CA101-402

### TOOLS:

DCS 760 Camera

### ISS IVA Toolbox:

Drawer 1:

Combination wrench, 12 point, 9/16"

Drawer 2:

1/8" Hex Head, 1/4" Drive

Drawer 3:

Inspection Mirror

### Columbus Tool Kit

Tool Bag 1:

## 1.207 COLUMBUS ISPR RACK RELOCATION

(ASSY OPS/1E/FIN/HC/MULTI E) Page 2 of 14 pages

Ratchet Wrench 1/4"

Torque Wrench 4-20 Nm

M8 (13 mm) Socket 1/4" Drive

Tool Bag 2:

Ratchet Wrench 3/8"

3/8" Hex Head Driver, 3/8" Drive

3/16" Hex Head Driver 3/8" Drive

Tool Bag 3:

5/32" Hex Head Driver, 3/8" Drive

Ratchet Tool 3/8" Drive

ISPR Locking Pin Tool For EPM/FSL

ISPR Locking Pin Tool For ETC/BIO LAB

REFERENCED PROCEDURE(S):

1.101 PARTITION POST REMOVAL / INSTALLATION

1.102 PARTITION SOFT COVER REMOVAL / INSTALLATION

1.209 K-BAR CAPTURE MECHANISM INSTALLATION / REMOVAL

### 1. DISENGAGING RACK LAUNCH RESTRAINTS

#### NOTE

Following steps are repeated for all the Columbus ISPR Rack requiring relocation.

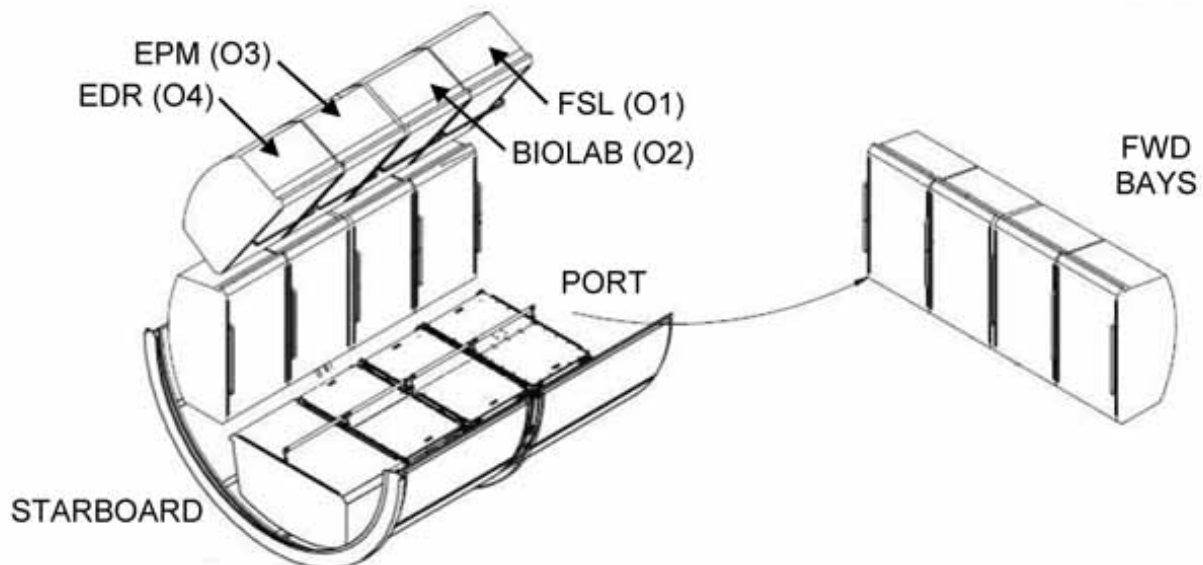


Figure 1. Columbus ISPR racks location at launch

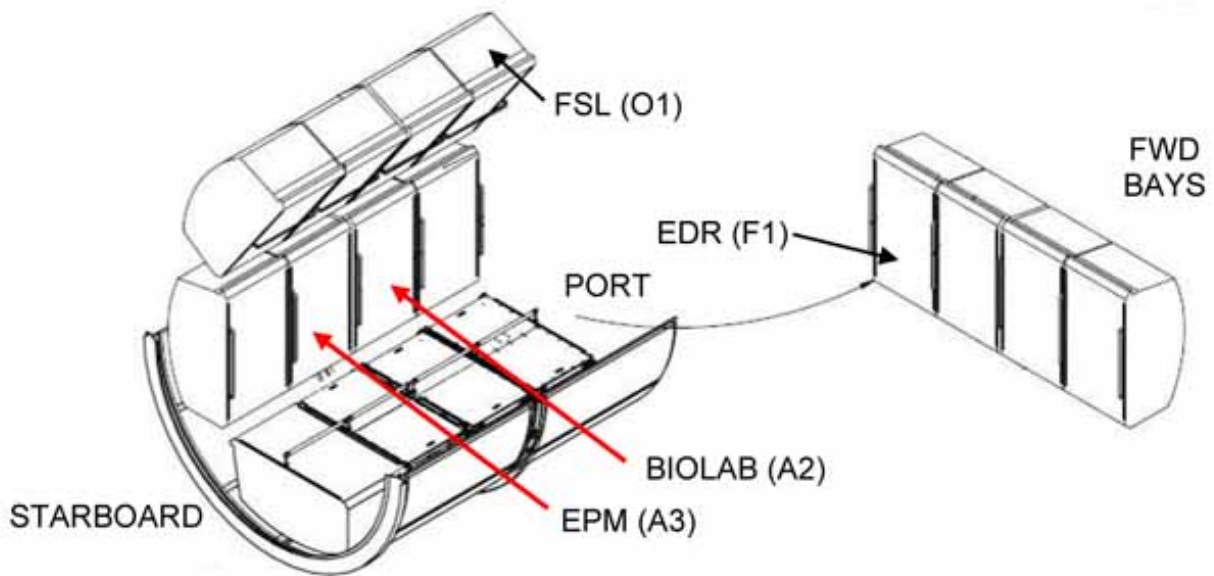


Figure 2. Columbus ISPR Racks location after on-orbit relocation

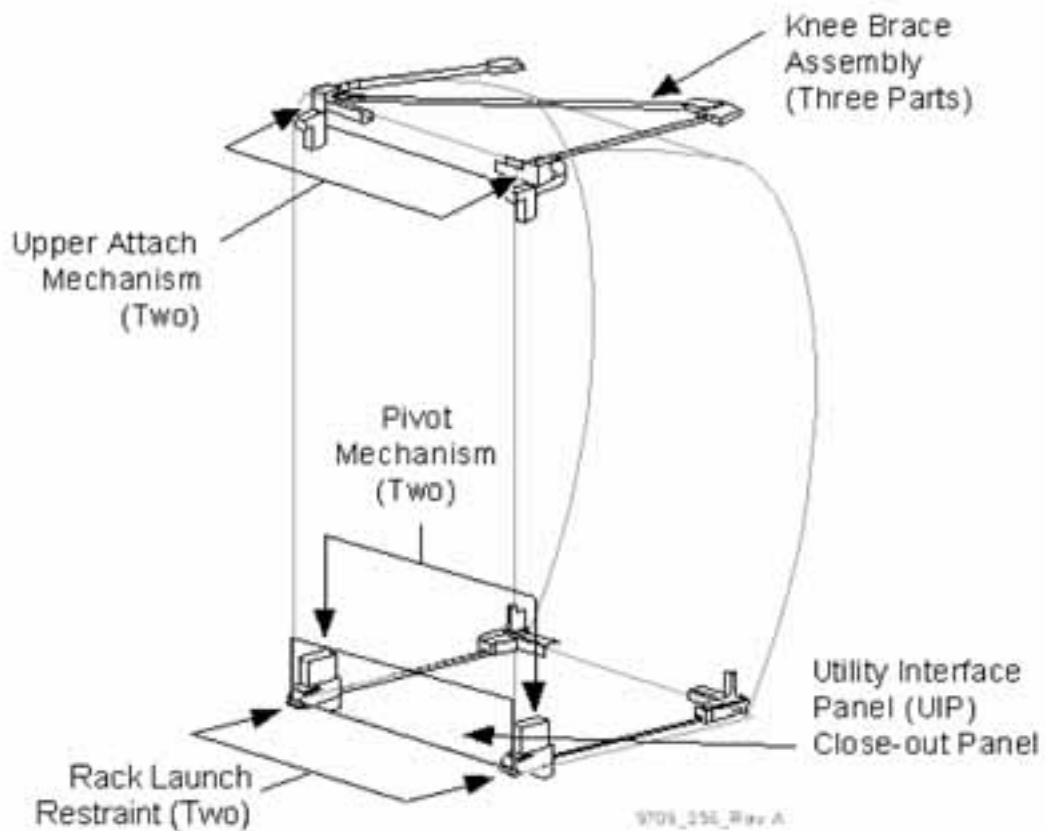


Figure 3. ISPR Rack Attachment Mechanisms.

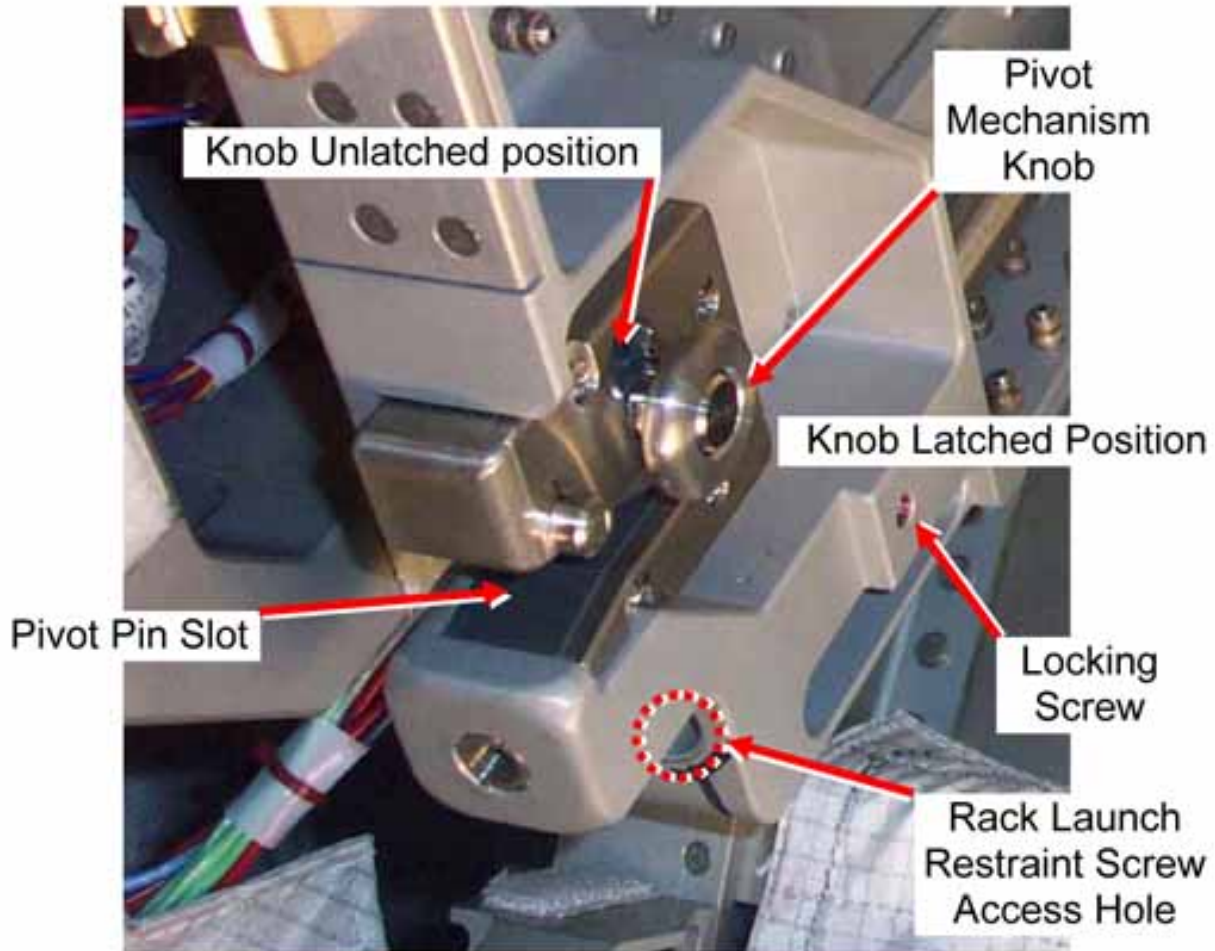


Figure 4. ISPR Rack Launch Restraint (Left), Typical.

NOTE

1. The interface size of the Rack Launch Restraint Locking Screws of Columbus ISPRs is slightly different from rack to rack. To operate the Locking Screws, the use of a dedicated ISPR Tool is required for each different Columbus ISPR. Refer to Table 2 for the identification of the tool to be used.
2. Expect loud "pop" during release of first Rack Launch Restraint.
3. For following steps refer to Figure 4.

Table 2. ISPR Rack and relevant ISPR Tool identification

ISPR[X]	ISPR TOOL [W]
EPM	ISPR Locking Pin Tool For EPM/FSL
BIOLAB	ISPR Locking Pin Tool For ETC/BIOLAB
EDR	1/8" Hex Head, 1/4" Drive



## 1.207 COLUMBUS ISPR RACK RELOCATION

(ASSY OPS/1E/FIN/HC/MULTI E) Page 5 of 14 pages

- 1.1 Unfasten left Locking Screw until loose (Ratchet Wrench 1/4"; ISPR Tool [W]).  
Refer to Tables 1 and 2.
  - 1.2 Left Rack Launch Restraint Screw ↻ (10 to 12 turns) (Ratchet Wrench 3/8"; 3/8" Hex Head Driver, 3/8" Drive).
  - 1.3 Unfasten right Locking Screw until loose (Ratchet Wrench 1/4"; ISPR Tool [W]).
  - 1.4 Right Rack Launch Restraint Screw ↻ (10 to 12 turns) (Ratchet Wrench 3/8"; 3/8" Hex Head Driver 3/8" Drive).
  - 1.5 Loose then snug in unlatched, up position both Right and Left Pivot Mechanism Knobs (one full turn).
2. [DISENGAGING UPPER ATTACH MECHANISM](#)

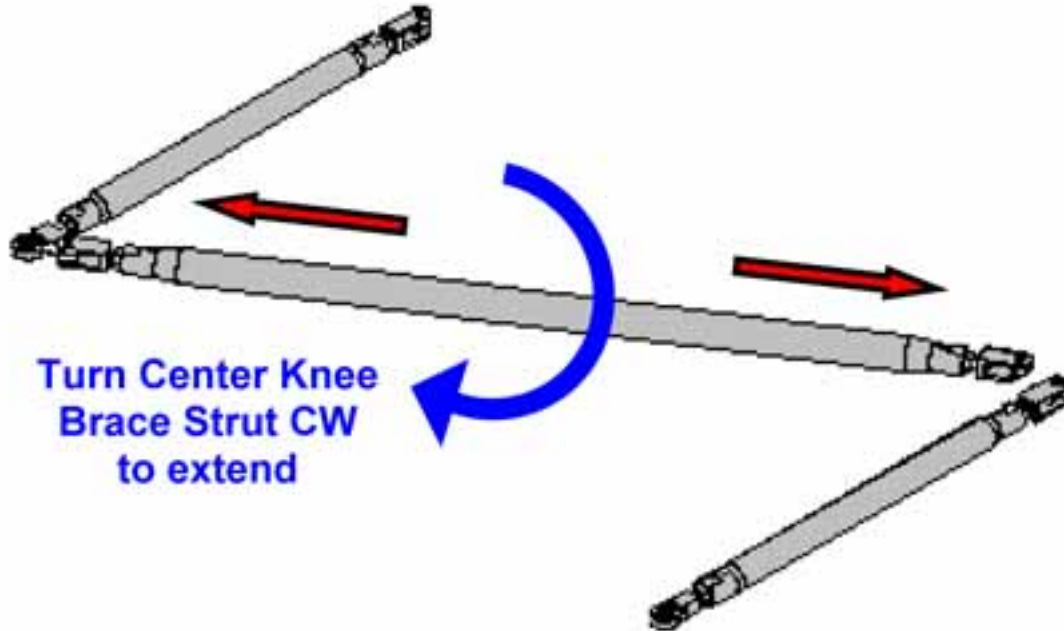


Figure 5. Knee Brace Assembly

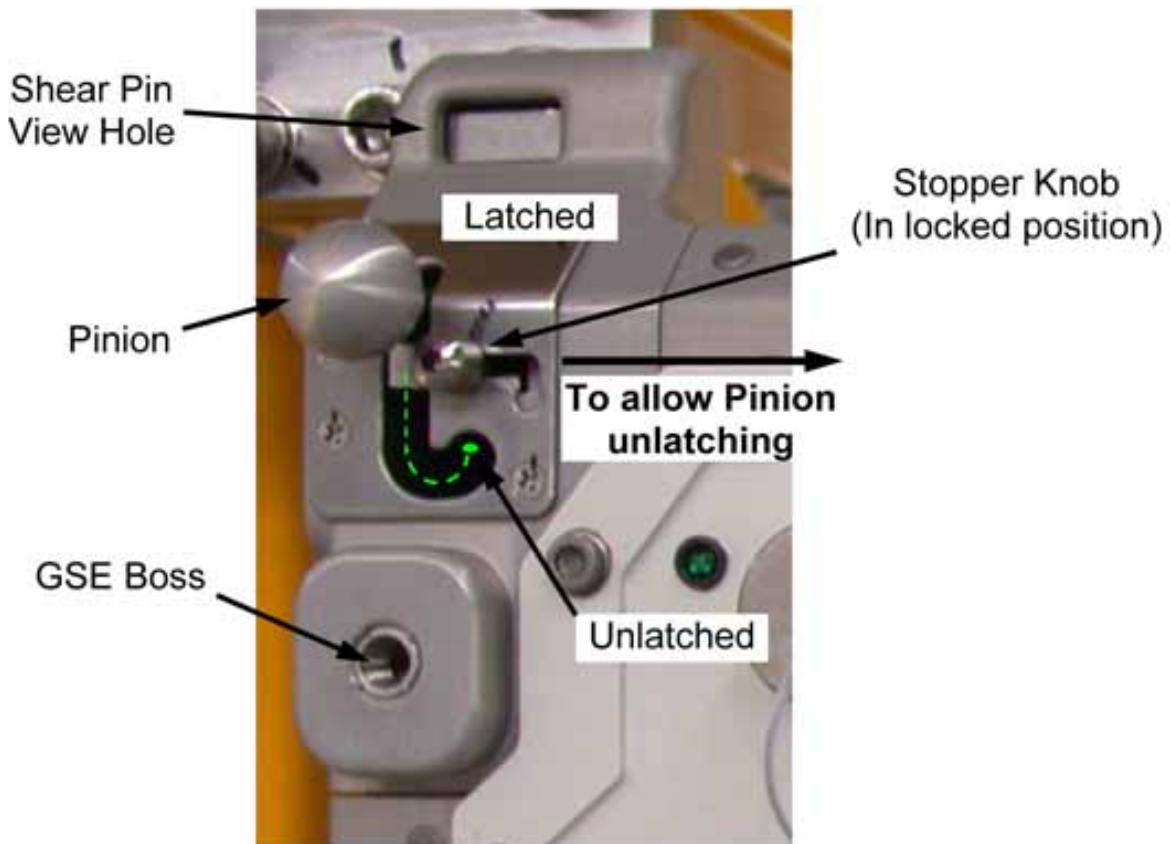


Figure 6. ISPR Upper Attach Mechanism (Left), Typical.

**NOTE**

1. The Center Knee Brace Strut has been pre-loaded on ground. In order to help the rack rotation, this strut should be re-adjusted CW on-orbit prior to rotating down.
2. The Pinion is maintained in the latched position by mean of an internal spring.

- 2.1 Adjust Center Knee Brace Strut 1-2 turns CW, until loose.  
Refer to Figure 5.
- 2.2 Loosen left Upper Attach Mechanism Stopper Knob (Ratchet Wrench 3/8"; 5/32" Hex Head Driver, 3/8" Drive).  
Move to the right to allow Pinion unlatching.  
Refer to Figure 6.
- 2.3 Left Pinion → Unlatched.  
Refer to Figure 6.
- 2.4 Loosen right Upper Attach Mechanism Stopper Knob (Ratchet Wrench 3/8"; 5/32" Hex Head Driver, 3/8" Drive).  
Move to the left to allow Pinion unlatching.

2.5 Right Pinion → Unlatched.

3. [RELOCATING THE ISPR\[X\]](#)

**NOTE**

For following steps, refer to Table 1.

3.1 Install handrails (two) on ISPR [X] Seat Tracks.

3.2 If installed, remove the Partition Post from rack bay COL1[Z], perform [{1.101 PARTITION POST REMOVAL / INSTALLATION}](#), step 2 (SODF: ASSY OPS: ACTIVATION AND CHECKOUT), then:

3.3 If installed, remove the Partition Soft Cover from rack bay COL1[Z], perform [{1.102 PARTITION SOFT COVER REMOVAL / INSTALLATION}](#), step 1 (SODF: ASSY OPS: ACTIVATION AND CHECKOUT), then:

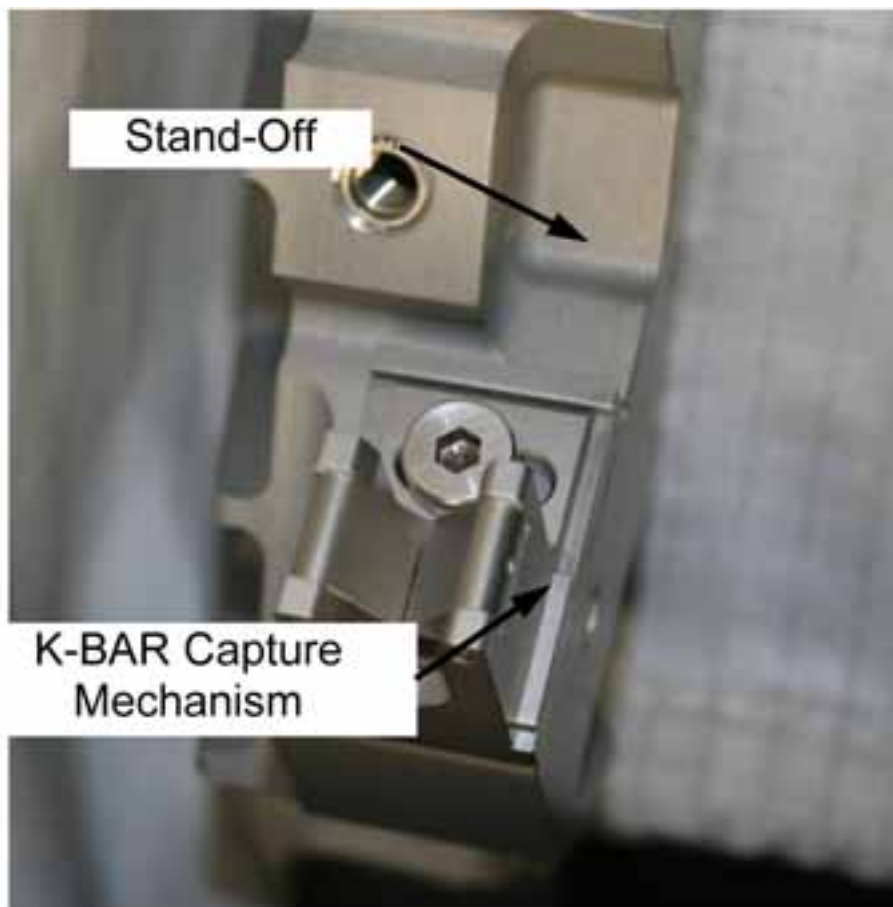


Figure 7. Columbus K-BAR Capture Mechanism Installed On Stand Off Link

3.4 Verify COL1[Z] rack bay is outfitted with K-BAR Capture Mechanisms (two).

Refer To Figure 7.

```
*****  
*      If K-BAR Capture Mechanisms not installed,  
*      |      perform {1.209 K-BAR CAPTURE MECHANISM  
*      |      INSTALLATION / REMOVAL}, step 1 (SODF: ASSY  
*      |      OPS: ACTIVATION AND CHECKOUT), then:  
*      |  
*****
```

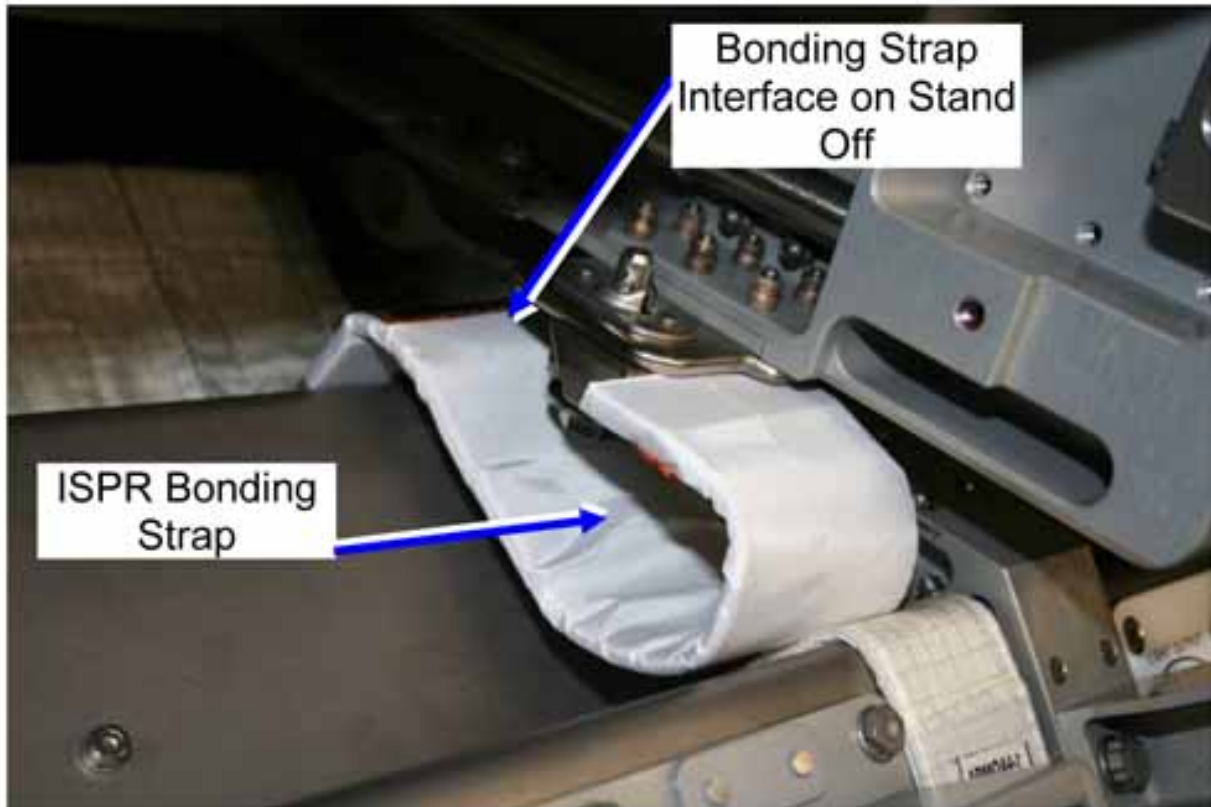


Figure 8. ISPR Bonding Strap interface on Stand Off

NOTE

The Inspection Mirror can be used to get a better view of the ISPR Bonding Strap installation interface on the Stand Off.

- 3.5 Loosen the ISPR[X] Bonding Strap from the Stand Off interface, quarter-turn fastener (one) (Ratchet Wrench 1/4"; 102 mm Extension 1/4" Drive; M8 (13 mm) Socket 1/4" Drive). Refer to Figure 8.
- 3.6 Remove ISPR[Y] from COL1[X] rack bay.
- 3.7 Move rack to rack bay COL1[Y].

4. INSTALLING THE PIVOT PIN BRACKETS

**NOTE**

Refer to Figures 4, 9, 10 and 11 during following section.

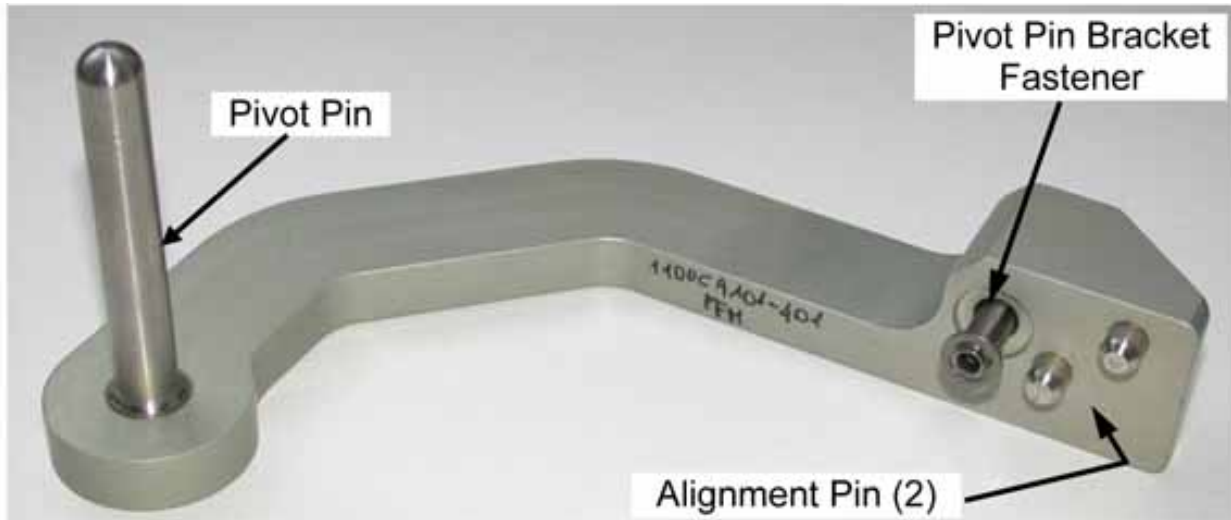


Figure 9. Pivot Pin Bracket, Right (P/N 1100CA101-401)

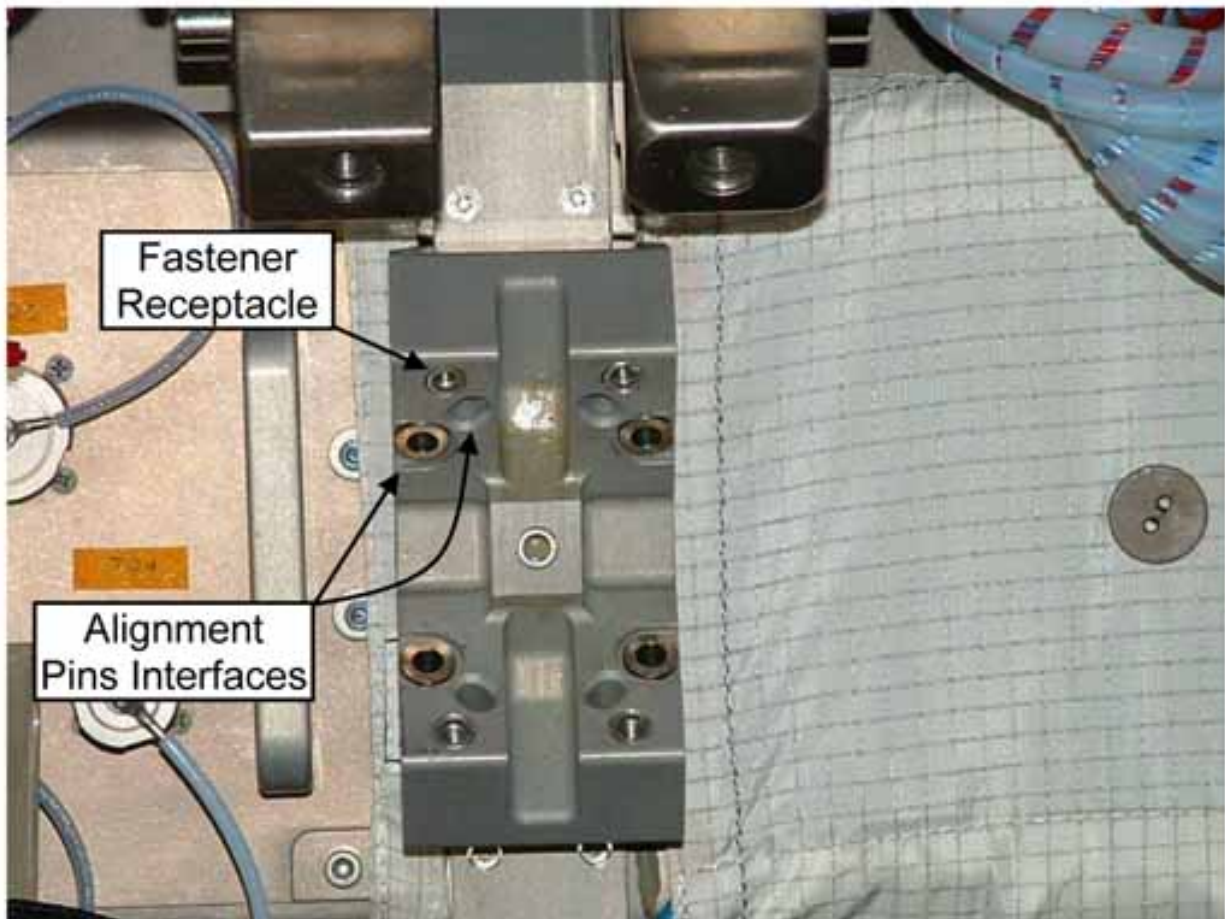


Figure 10. Columbus Stand Off Link

## 1.207 COLUMBUS ISPR RACK RELOCATION

(ASSY OPS/1E/FIN/HC/MULTI E) Page 10 of 14 pages

### NOTE

The Pivot Pin Bracket is provided with 2 alignment pins to allow its correct installation on stand off links.

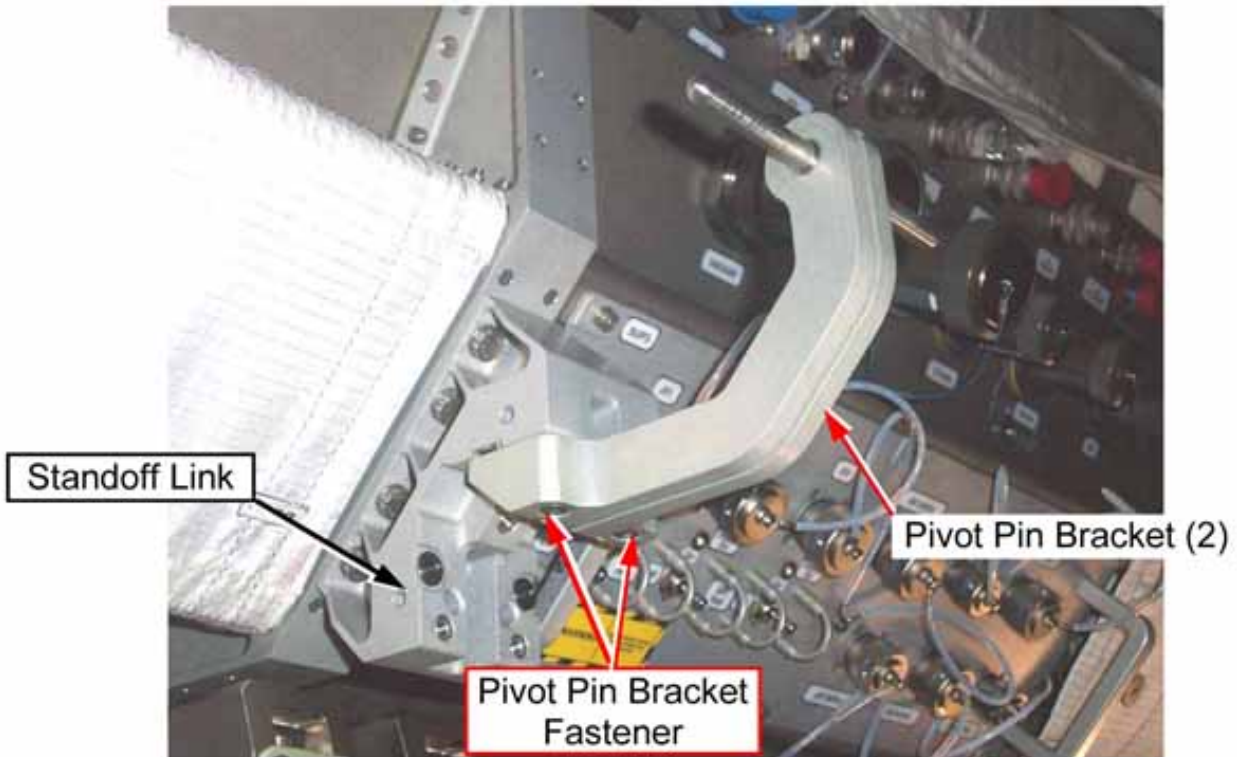


Figure 11. Typical Installation of Pivot Pin Brackets (two) at Columbus Standoff (rack not installed).

- 4.1 Record IMS barcode number of Pivot Pin Brackets. Barcodes will be reported to ground.  
Right: \_\_\_\_\_  
Left: \_\_\_\_\_
- 4.2 Install Pivot Pin Bracket, Right snug fastener (one) (Ratchet Wrench 3/8"; 3/16" Hex Head Driver, 3/8" Drive).
- 4.3 Install Pivot Pin Bracket, Left snug fastener (one) (Ratchet Wrench 3/8"; 3/16" Hex Head Driver 3/8" Drive).
- 4.4 Torque both Left and Right Pivot Pin Brackets fastener to 9 Nm (Torque Wrench 4-20 Nm; Ratchet Tool, 3/8" Drive; 3/16" Hex Head Driver, 3/8" Drive).
- 4.5 Loosen both right and left Pivot Mechanism Knobs (one full turn), then tighten in latched, down position.

5. INSTALLING THE K-BAR ASSY

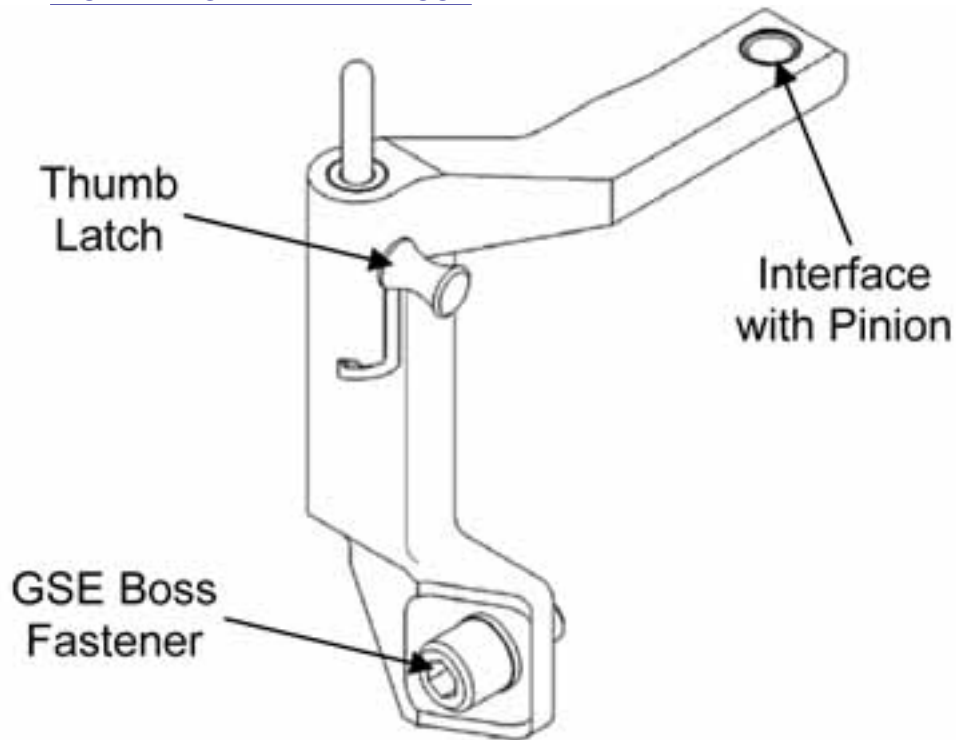


Figure 12. K-BAR Assy, Left

**NOTE**

For the execution of following steps refer to Figures 6 and 12.

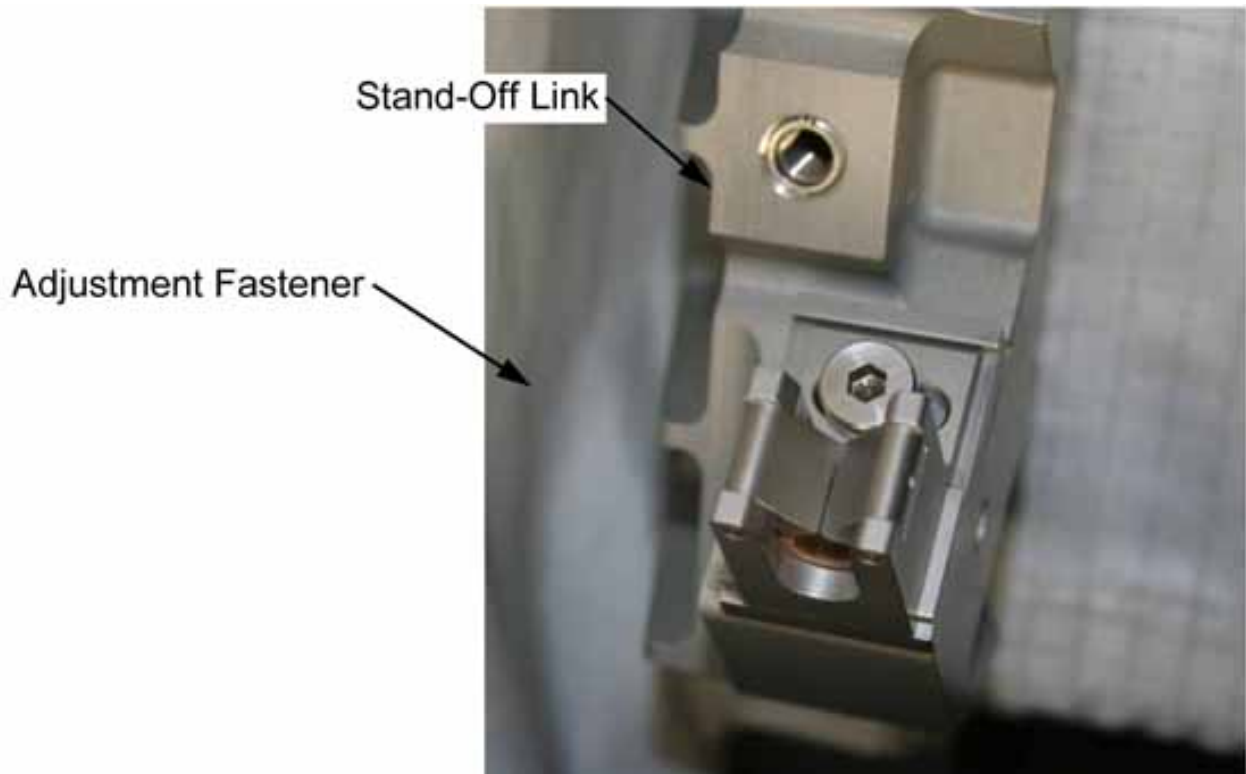
- 5.1 Rotate ISPR[X] rack down about 15 cm.
- 5.2 √Left Upper Attach Mechanism Pinion is in unlatched position.
- 5.3 √Left Stopper Knob is in unlocked position.
- 5.4 Install K-BAR Assy, Left into left Upper Attach Mechanism Shear Pin View Hole.

**CAUTION**

Do not force Upper Attach Mechanism Pinions. Mechanism should easily engage K-BAR Assy. Failure to comply may result in equipment damage.

- 5.5 Left Pinion → Latched  
√Shear Pin is visible at top of mechanism.
- 5.6 Set Stopper Knob in locked position, snug fastener (Ratchet Wrench 3/8"; 5/32" Hex Head Driver, 3/8" Drive).
- 5.7 Tighten K-BAR Assy, Left GSE Boss fastener (Ratchet Wrench 3/8"; 3/8" Hex Head Driver, 3/8" Drive).

- 5.8 K-BAR Thumb Latch → Up.
- 5.9 Repeat steps 5.2 to 5.8 for K-BAR Assy, Right.
- 5.10 Slowly rotate ISPR[X] rack up to a controlled stop, until K-BAR Thumb Latches (two) engage with K-BAR Capture Mechanism on Stand-off.



**Figure 13. Adjustment Fastener on K-BAR Capture Mechanism**



# 1.207 COLUMBUS ISPR RACK RELOCATION

\*\*\*\*\*  
\* If K-BAR Thumb Latch does not align with K-BAR Capture  
\* Mechanism  
\* | Loosen Adjustment Fastener (Ratchet Wrench 3/8";  
\* | 5/32" Hex Head Driver, 3/8" Drive).  
\* | Refer to Figure 13.  
\* |  
\* | Adjust the K-BAR Capture Mechanism as required.  
\* |  
\* | Tighten Adjustment Fastener (Ratchet Wrench 3/8";  
\* | 5/32" Hex Head Driver, 3/8" Drive).  
\* |  
\*\*\*\*\*

5.11 Remove handrails, tempy stow.

## 6. INSTALLING THE ISPR BONDING STRAP ON STAND OFF

NOTE

The Inspection Mirror can be used to get a better view of the ISPR Bonding Strap installation interface on the Stand Off.

6.1 Install ISPR Bonding Strap on ISPR Bonding Strap Interface on Stand Off, quarter-turn fastener (one) (Combination wrench, 12 point, 9/16"). Refer to Figure 8.

6.2 Photo document ISPR[X] in the new installation location. (DCS 760 Camera)

## 7. REMOVING THE KNEE BRACE ASSEMBLY

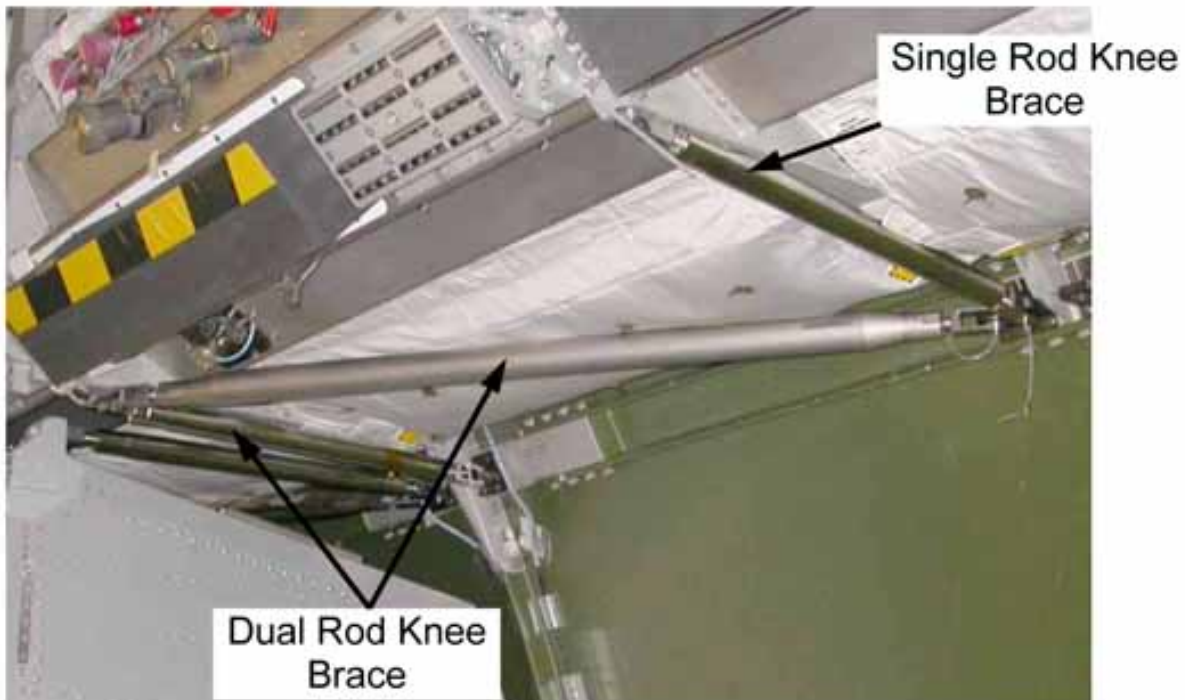
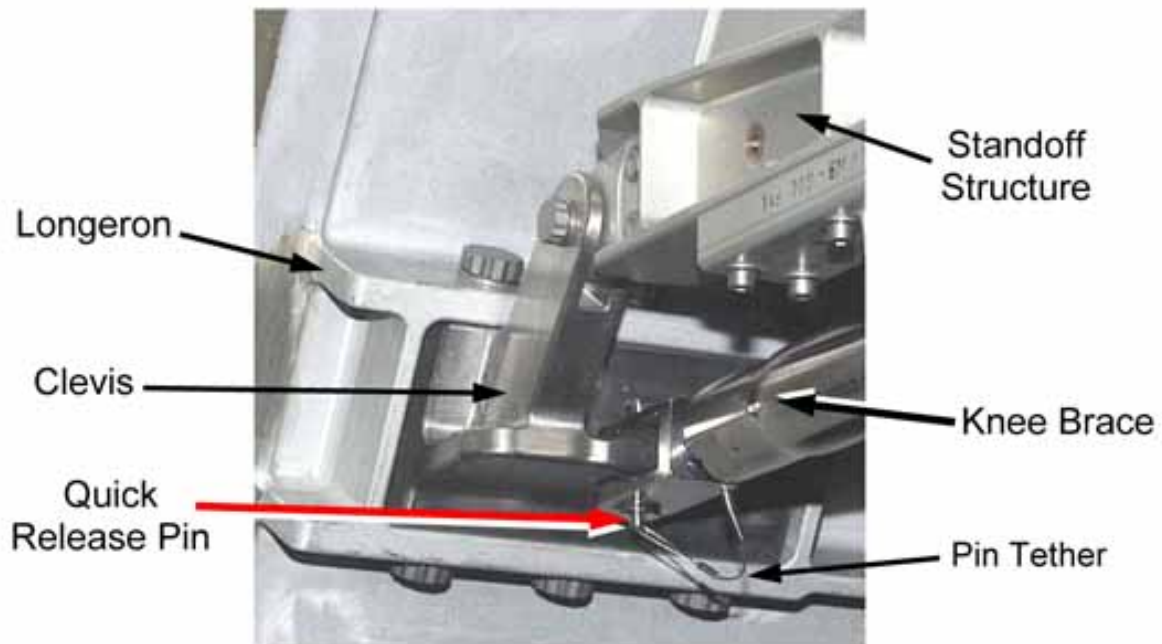


Figure 14. Knee Brace Assembly Installed.



**Figure 15. Knee Brace Attachment to Stand-off.**

- 7.1 Remove Single, Double Rod Knee Brace Assembly sections from empty COL1[Y] rack bay by pulling captive pip-pins (three) from Stand-off Clevis.  
Refer to Figures 14 and Figure 15.
- 7.2 Stow hardware per Daily Stowage Note.

## 1.208 PIVOT PIN BRACKET INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 8 pages

### OBJECTIVE:

Install/remove the Pivot Pin Brackets for ISPR racks on/from the Standoff Links.

### LOCATION:

Installed: COL1A[X], COL1F[X], COL1O[X], COL1D4 where [X] = 1 to 4

Stowed: √Inventory Management System (IMS)

### DURATION:

Installation: 10 min (each couple)

Removal: 10 min (each couple)

### CREW:

One

### PARTS:

Pivot Pin Bracket, Right P/N 1100CA101-401

Pivot Pin Bracket, Left P/N 1100CA101-402

### MATERIALS:

None

### TOOLS:

#### Columbus Tool Kit:

Tool Bag 1:

Torque Wrench 4-20 Nm

Tool Bag 2:

Ratchet Wrench 3/8"

3/16" Hex Head Driver 3/8" Drive

Tool Bag 3:

Ratchet Tool 3/8" Drive

### REFERENCED PROCEDURE(S):

None

#### 1. INSTALLING PIVOT PIN BRACKETS

#### NOTE

Directional references left and right are defined with respect to front face of rack bay, as facing an installed rack.

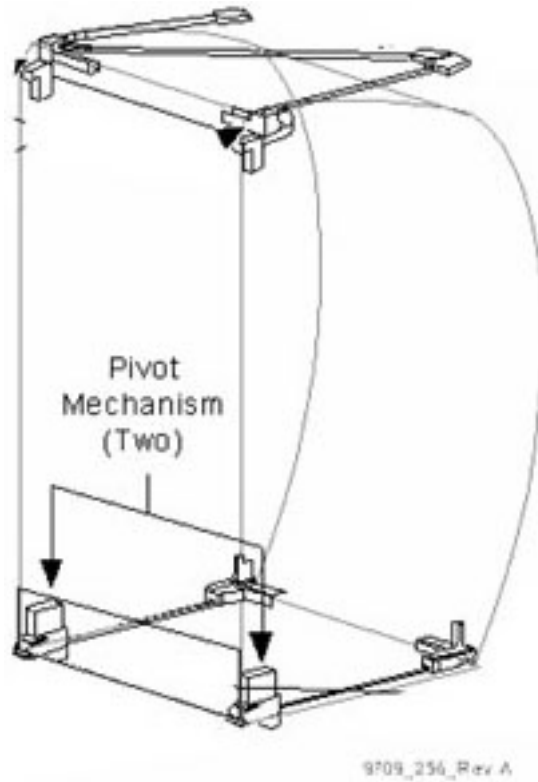


Figure 1. ISPR Pivot Mechanism location identification.

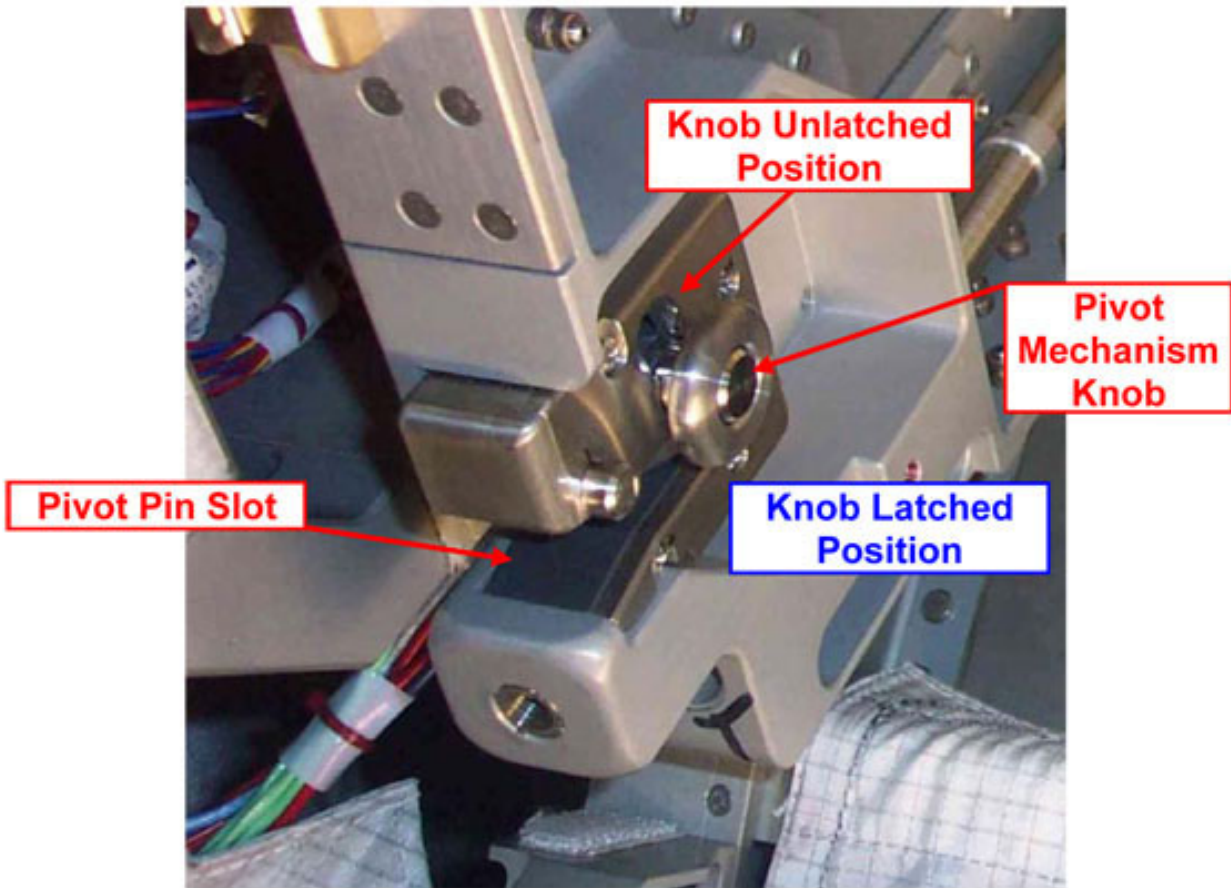


Figure 2. Close view on one ISPR Pivot Mechanism (Left).

NOTE

Step 1.1 is not required if Pivot Pin Brackets are installed in a location corresponding to an empty bay.

- 1.1 Loosen then tighten in unlatched, up position both right and left ISPR Pivot Mechanism Knobs (one full turn). Refer to Figure 1 and Figure 2.

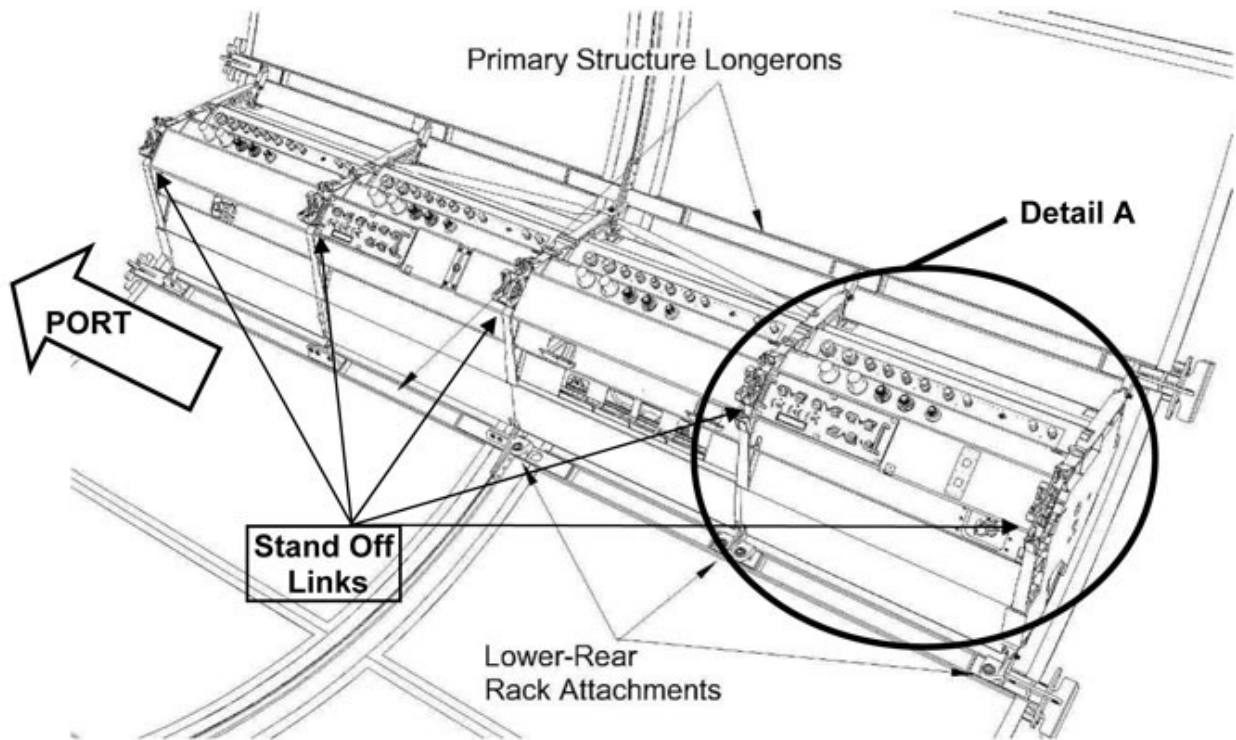


Figure 3. Stand Off Links location on FD Stand Off (Typical for all Stand Offs)

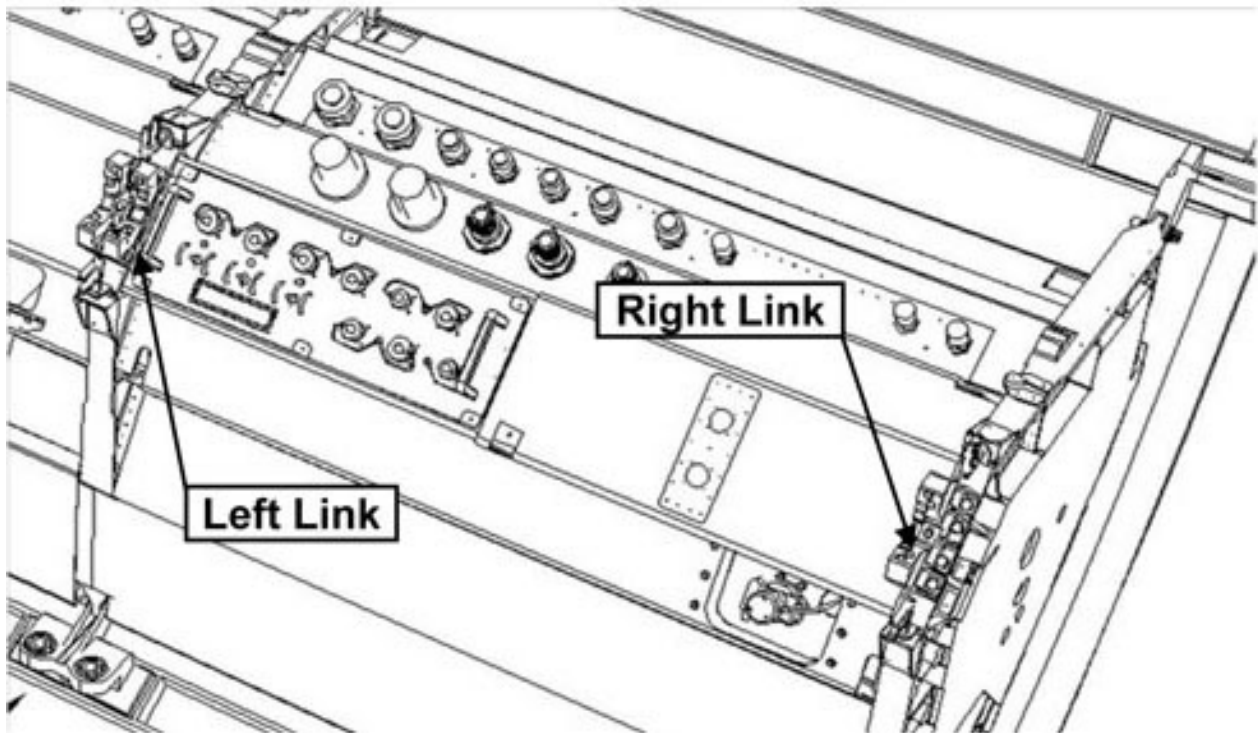


Figure 4. View of Detail A: Standoff Links identification

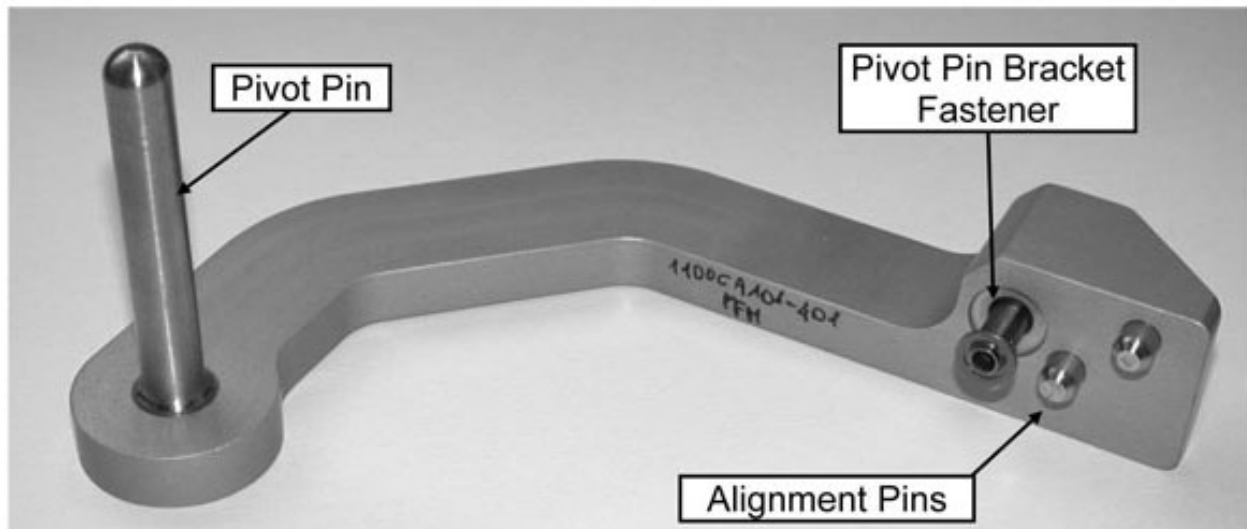


Figure 5. Pivot Pin Bracket (Right Assembly)

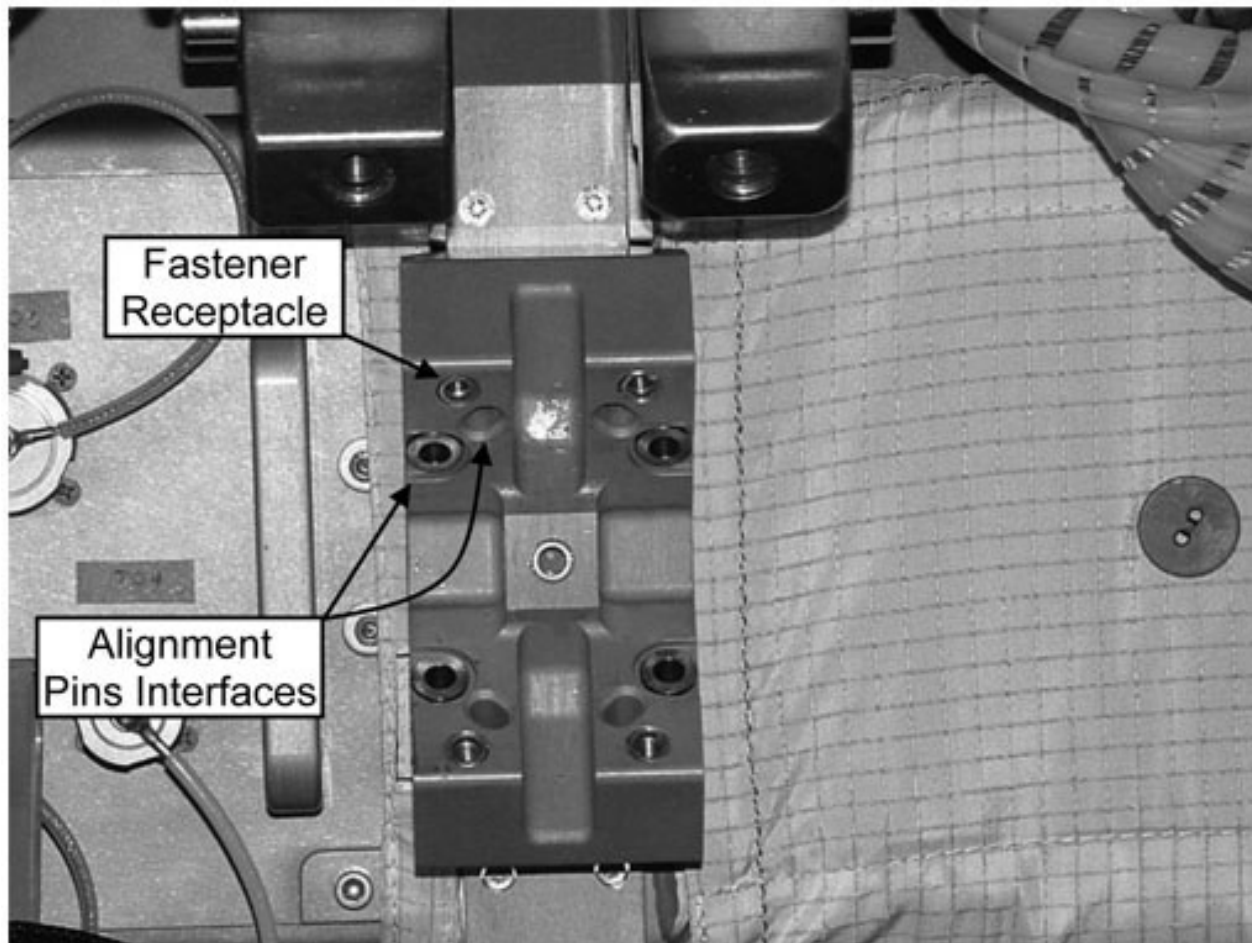


Figure 6. Columbus Stand Off Link

**NOTE**

The Pivot Pin Bracket is provided with 2 alignment pins to allow its correct installation on stand off links.

## 1.208 PIVOT PIN BRACKET INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/MULTI E)

Page 6 of 8 pages

- 1.2 Record IMS barcode number of Pivot Pin Brackets.  
Right: \_\_\_\_\_  
Left: \_\_\_\_\_
- 1.3 Install Pivot Pin Bracket, Right, tighten fastener (one) (Ratchet Wrench 3/8"; 3/16" Hex Head Driver, 3/8" Drive).  
Refer to Figures 2, 5, and 6.
- 1.4 Install Pivot Pin Bracket, Left, tighten fastener (one) (Ratchet Wrench 3/8"; 3/16" Hex Head Driver 3/8" Drive).  
Refer to Figures 2, 5, and 6.
- 1.5 Torque both left and right Pivot Pin Brackets fastener to 8.7 Nm (Torque Wrench 4-20 Nm; Ratchet Tool 3/8" Drive; 3/16" Hex Head Driver 3/8" Drive).  
Refer to Figures 2, 5, and 6.

### NOTE

The Pivot Mechanism Knob moves automatically to the latched position after release.

If Pivot Pin Brackets are installed in a location corresponding to an empty bay, step 1.6 is not required.

- 1.6 Turn both right and left Pivot Mechanism Knobs (one full turn), then tighten in latched, down position.  
Refer to Figure 2.
- 1.7 ISS ↓ **COL-CC** of task completion, IMS barcode number and installation location of Pivot Pin Brackets.  
Stow tools.



2. REMOVING PIVOT PIN BRACKETS

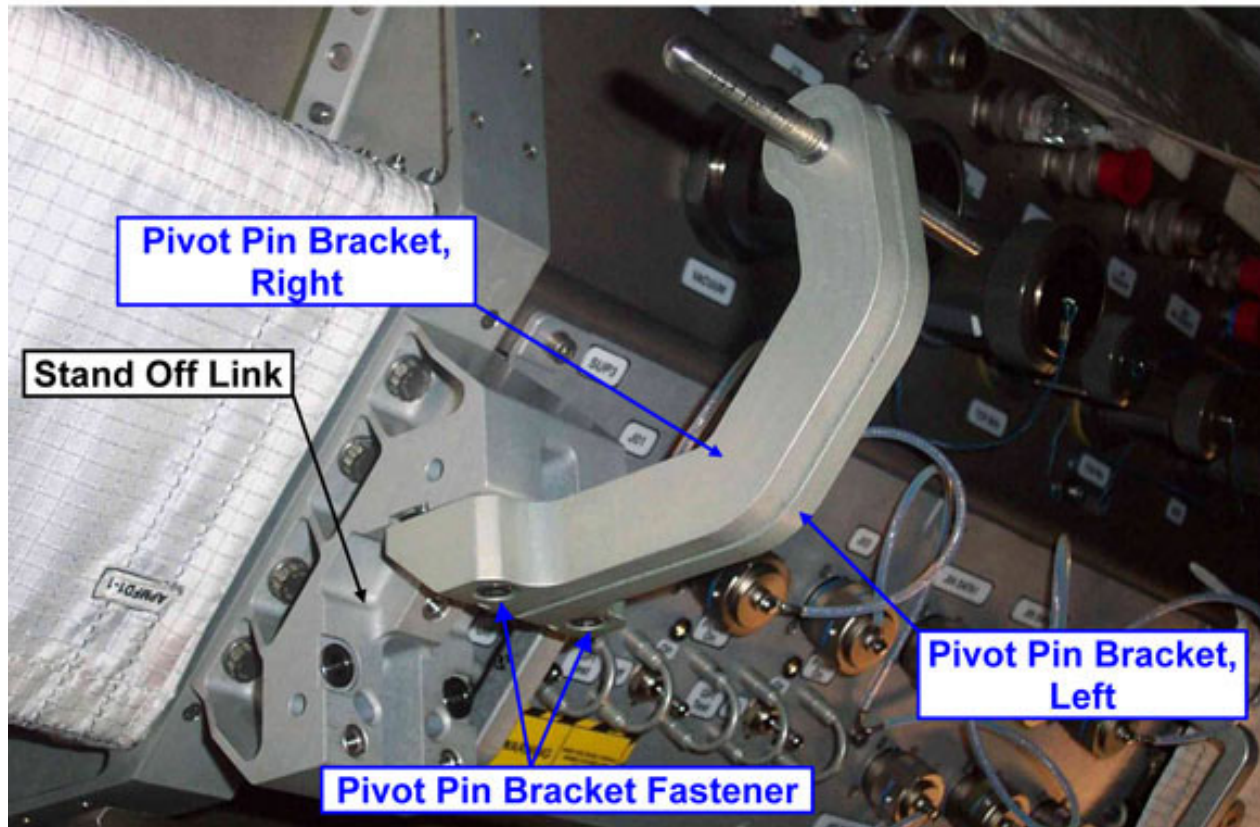


Figure 7. Pivot Pin Brackets Installed in two adjacent Stand-Off bays

If Pivot Pin Brackets are removed from a location corresponding to an empty bay, step 2.1 is not required.

- 2.1 Loosen then tighten in unlatched, up position both right and left ISPR Pivot Mechanism Knobs (one full turn).  
Refer to Figures 1 and 2.
- 2.2 Loosen both right and left Pivot Pin Brackets fastener (Ratchet Wrench 3/8"; 3/16" Hex Head Driver 3/8" Drive).  
Refer to Figure 7.
- 2.3 Remove right and left Pivot Pin Brackets.
- 2.4 Record IMS barcode number of removed Pivot Pin Brackets.  
Right: \_\_\_\_\_  
Left: \_\_\_\_\_

Temporarily stow.

If Pivot Pin Brackets are removed from a location corresponding to an empty bay, step 2.5 is not required.

- 2.5 Loosen both right and left Pivot Mechanism Knobs (one full turn), then tighten in latched, down position.

Refer to Figure 2.

- 2.6 Stow tools, removed Pivot Pin Brackets.
- 2.7 ISS ↓ **COL-CC** of task completion, IMS barcode number and stowage location of removed Pivot Pin Bracket.

## 1.209 K-BAR CAPTURE MECHANISM INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 7 pages

### OBJECTIVE:

Install the K-BAR Capture Fittings on the Standoff Links configuring a rack bay to allow on-orbit installation of an ISPR. Remove the K-BAR Capture Fittings from the Standoff Links configuring a rack bay for on-orbit installation of the ARIS provisions or for the installation of Partition Post(s).

### LOCATION:

Stowed: √Inventory Management System (IMS)

Installed: COL1A[X], COL1F[X], COL1O[X] and COL1D4 where [X] = 1 to 4

### DURATION:

Installation: 10 min (each couple)

Removal: 10 min (each couple)

### CREW:

One

### PARTS:

K-BAR Capture Fitting, Right P/N 683-62201-28

K-BAR Capture Fitting, Left P/N 683-62201-27

### MATERIALS:

None

### TOOLS:

DCS Camera

### Columbus Tool Kit:

Tool Bag 1:

Torque Wrench 4-20 Nm

Tool Bag 2:

Ratchet Wrench 3/8"

Tool Bag 3:

Ratchet Tool 3/8" Drive

Tool Bag 3:

5/32" Hex Head Driver 3/8" Drive

### REFERENCED PROCEDURE(S):

None

1. INSTALLING THE K-BAR CAPTURE MECHANISM

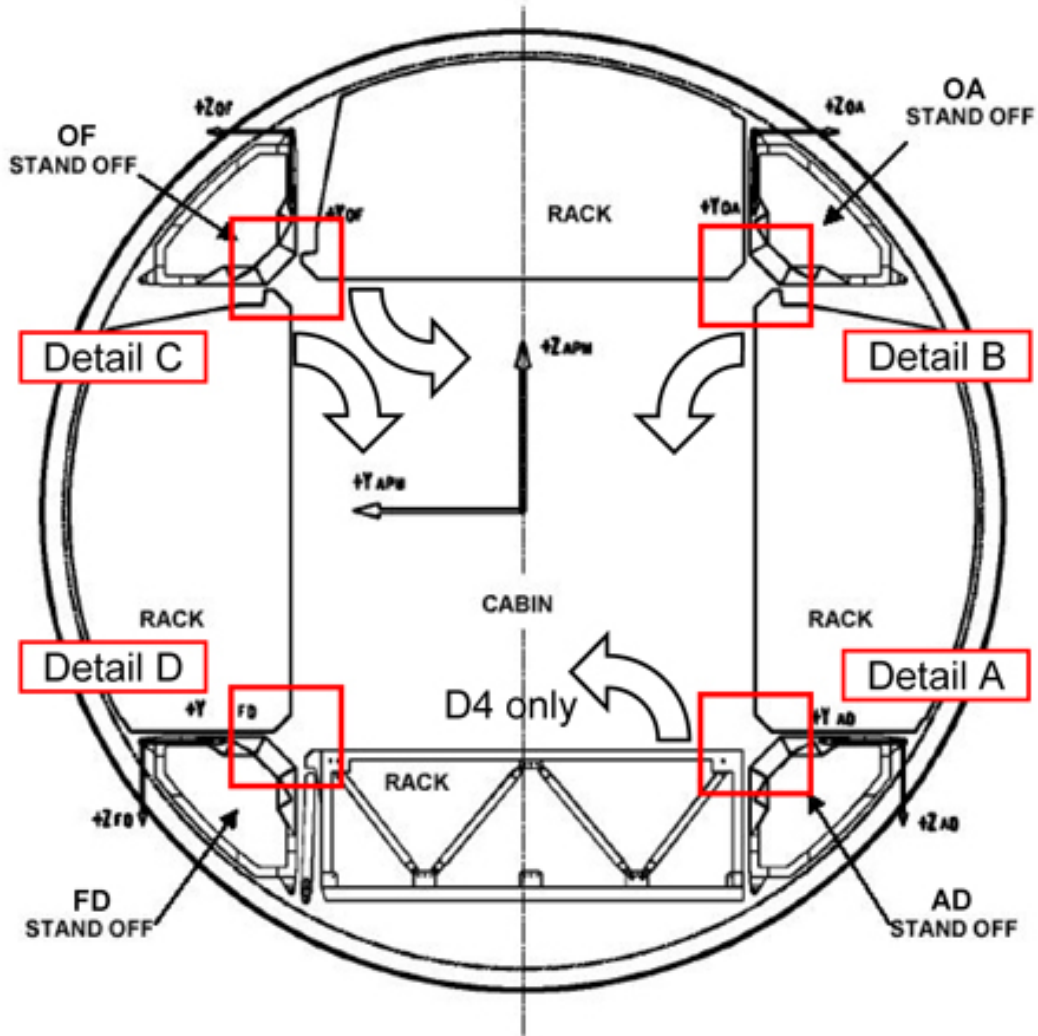


Figure 1. Columbus ISPR Rack rotation directions – Looking Starboard

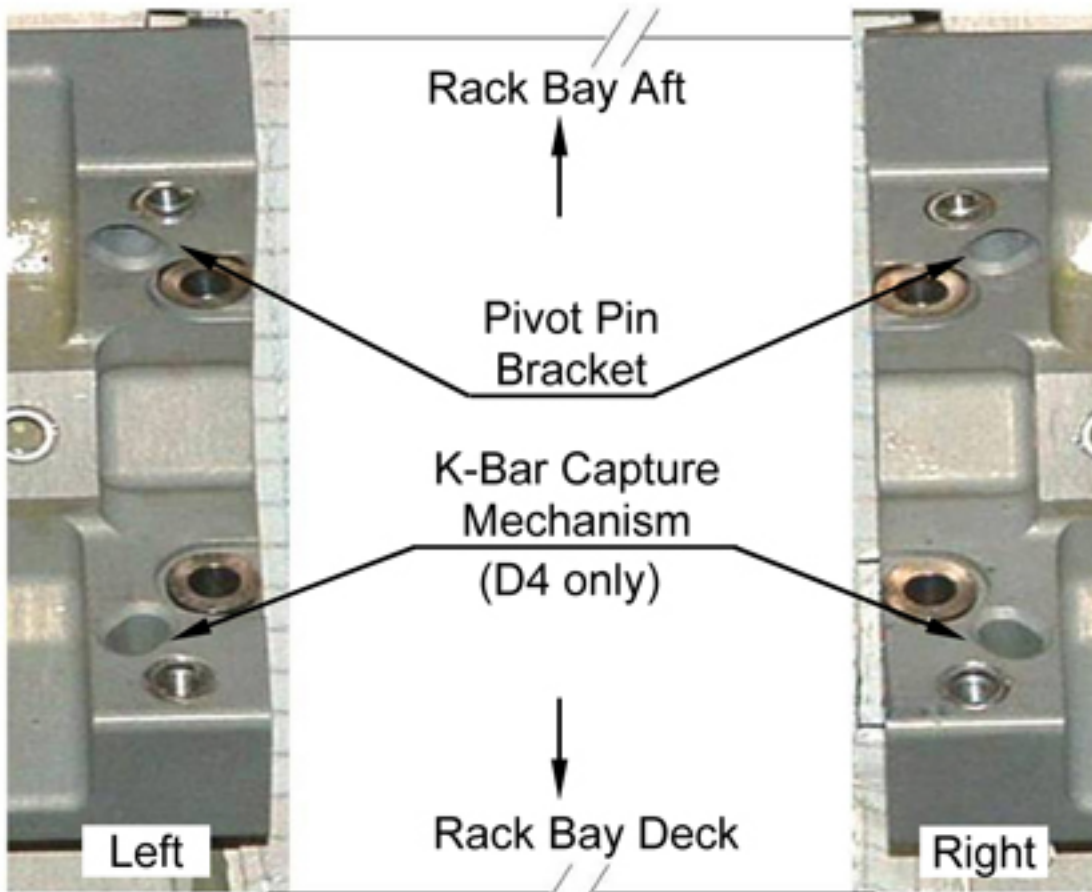


Figure 2. Detail A - Hardware installation on Standoff links AD

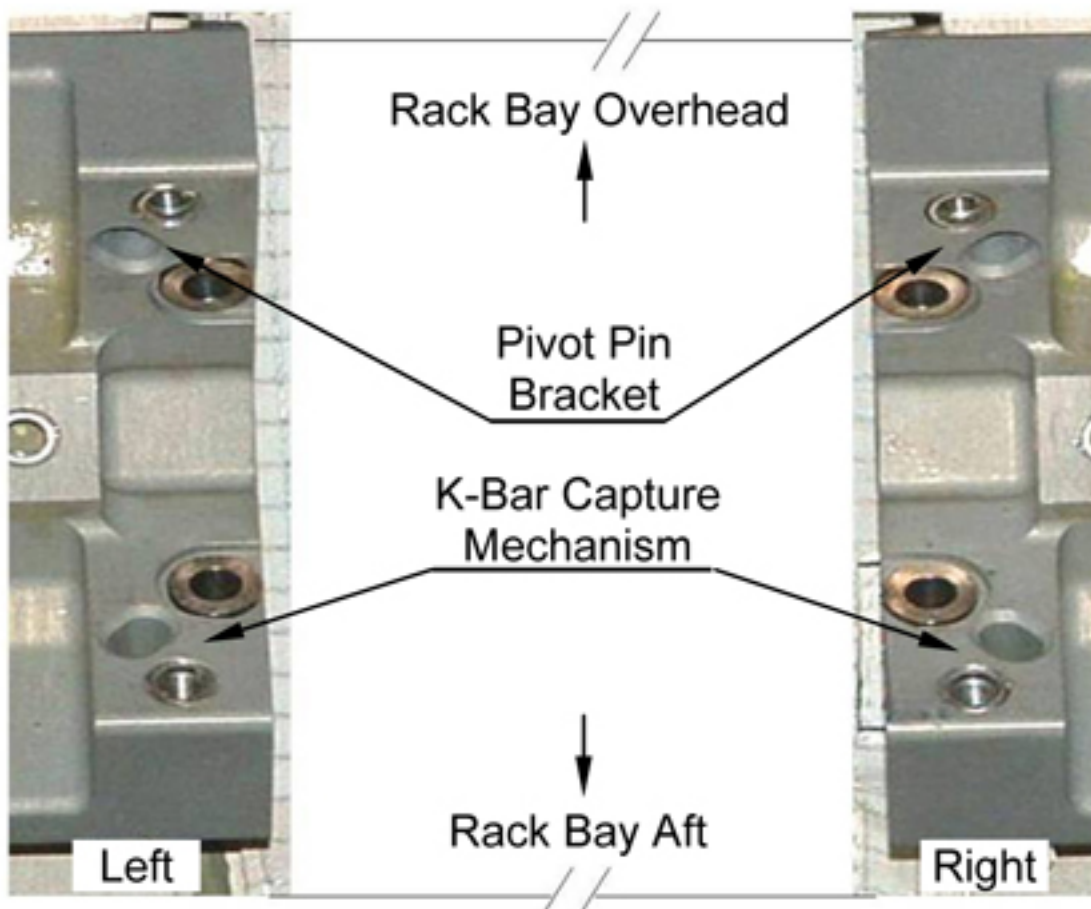


Figure 3. Detail B - Hardware installation on Standoff links OA

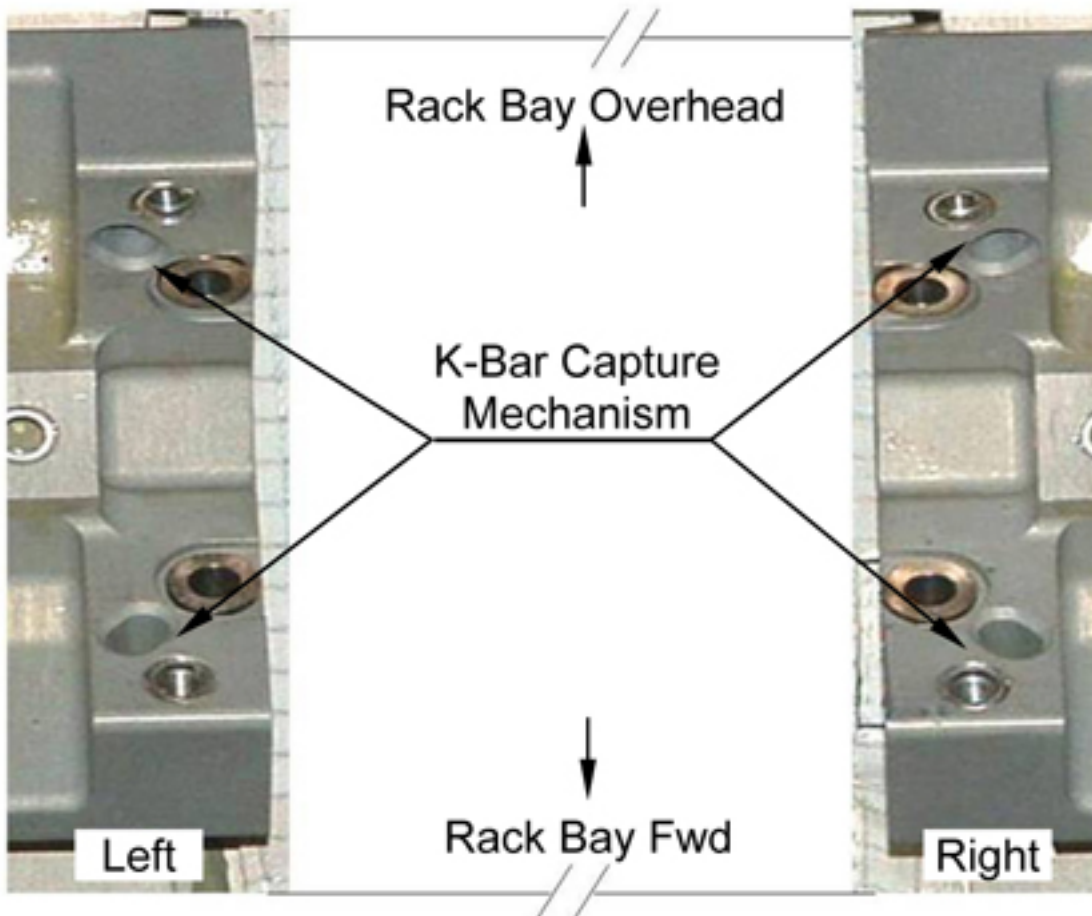


Figure 4. Detail C - Hardware installation on Standoff links OF

## 1.209 K-BAR CAPTURE MECHANISM INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/MULTI E)

Page 6 of 7 pages

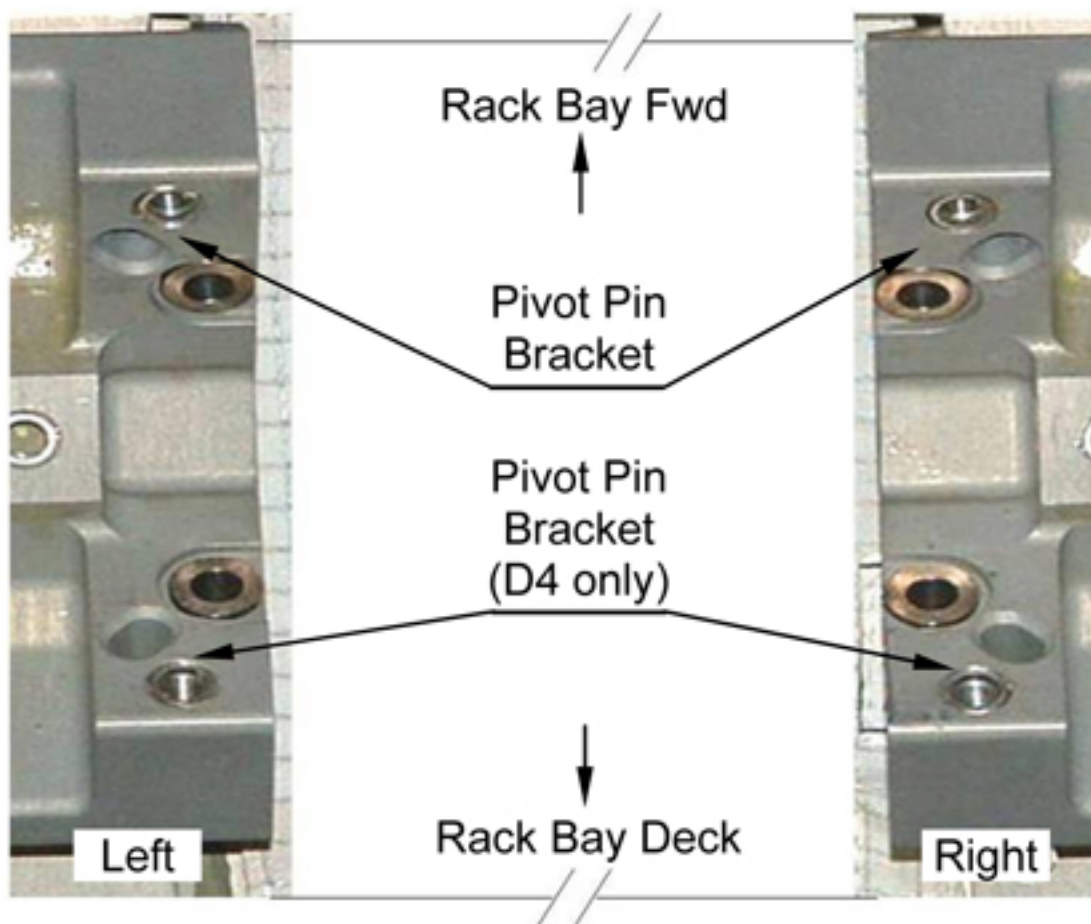


Figure 5. Detail D - Hardware installation on Standoff links FD

### NOTE

1. Following steps are applicable to all locations.
2. Directional references left and right are defined with respect to front face of rack bay, as facing an installed rack.
3. For stand off AD, K-BAR Capture Fittings are installed on D4 bay only.
4. The K-BAR Capture Fitting is provided with a locating pin to fit in the appropriate Standoff Link seat.

- 1.1 Record K-BAR Capture Fitting, Right S/N: \_\_\_\_\_  
Record K-BAR Capture Fitting, Left S/N: \_\_\_\_\_
- 1.2 Install K-BAR Capture Fitting, Right on the Stand-Off Link, snug fastener (one) (Ratchet Wrench 3/8"; 5/32" Hex Head Driver, 3/8" Drive).  
Refer to Figure 1 and Figure 2 to 5.
- 1.3 Install K-BAR Capture Fitting, Left on the Stand-Off Link, snug fastener (one) (Ratchet Wrench 3/8"; 5/32" Hex Head Driver, 3/8" Drive).  
Refer to Figure 1 and Figure 2 to 5.



## 1.209 K-BAR CAPTURE MECHANISM INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/MULTI E)

Page 7 of 7 pages

- 1.4 Torque both K-BAR Capture Fittings, Left and Right fastener (one) to 6 Nm (Torque Wrench 4-20 Nm; Ratchet Tool 3/8" Drive; 5/32" Hex Head Driver, 3/8" Drive).
- 1.5 Photo document the installed K-BAR Capture Fittings.
- 1.6 Repeat steps 1.1 to 1.5 for all the locations.
- 1.7 ISS ↓ **COL-CC** of task completion, S/Ns and installation locations of K-BAR Capture Fittings.  
Stow tools.

### 2. REMOVING THE K-BAR CAPTURE MECHANISM

#### NOTE

1. Following steps are applicable to all locations.
2. Directional references left and right are defined with respect to front face of rack bay, as facing an installed rack.

- 2.1 Remove K-BAR Capture Fitting, Right from Standoff Link, fastener (one) (Ratchet Wrench 3/8"; 5/32" Hex Head Driver, 3/8" Drive).  
Refer to Figure 1 and Figure 2 to 5.
- 2.2 Remove K-BAR Capture Fittings, Left from Standoff Link, fastener (one) (Ratchet Wrench 3/8"; 5/32" Hex Head Driver, 3/8" Drive).  
Refer to Figure 1 and Figure 2 to 5.
- 2.3 Record removed K-BAR Capture Fitting, Right S/N: \_\_\_\_\_  
Record removed K-BAR Capture Fitting, Left S/N: \_\_\_\_\_
- 2.4 Stow tools, removed K-BAR Capture Fittings.
- 2.5 ISS ↓ **COL-CC** of task completion, S/Ns and stowage locations of K-BAR Capture Fittings.

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## 1.210 K-BAR INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 7 pages

### OBJECTIVE:

Install and remove the K-BAR Assemblies on/from the ISPR Upper Attach Mechanisms.

### LOCATION:

Stowed: √Inventory Management System (IMS)

Installed: COL1A[X], COL1F[X], COL1O[X], COL1D4 where [X] = 1 to 4

### DURATION:

Install: 15 minutes (each couple)

Remove: 10 minutes (each couple)

### CREW:

One

### PARTS:

IHI K-BAR Assy, Left P/N 683-62201-3

IHI K-BAR Assy, Right P/N 683-62201-4

### MATERIALS:

None

### TOOLS:

DCS 760 Camera

### Columbus Tool Kit:

Tool Bag 2:

Ratchet Wrench 3/8"

3/8" Hex Head Driver, 3/8" Drive

Tool Bag 3:

5/32" Hex Head Driver, 3/8" Drive

### REFERENCED PROCEDURE(S):

1.208 PIVOT PIN BRACKET INSTALLATION / REMOVAL

1.209 K-BAR CAPTURE MECHANISM INSTALLATION / REMOVAL

## 1.210 K-BAR INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/MULTI E)

Page 2 of 7 pages

### 1. INSTALLING THE K-BAR ASSY

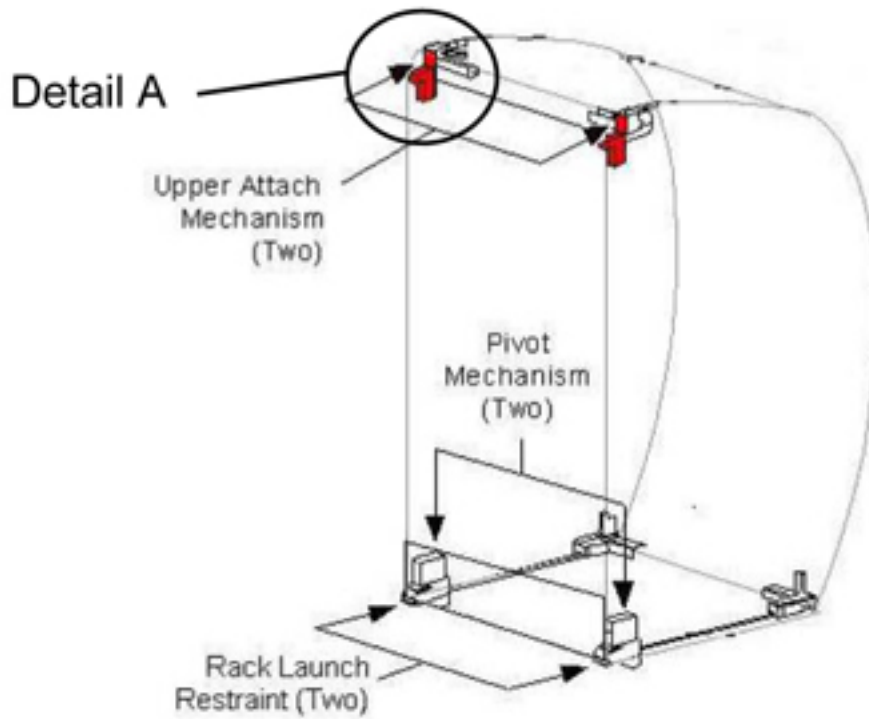


Figure 1. ISPR Attachment Mechanisms

## 1.210 K-BAR INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/MULTI E)

Page 3 of 7 pages

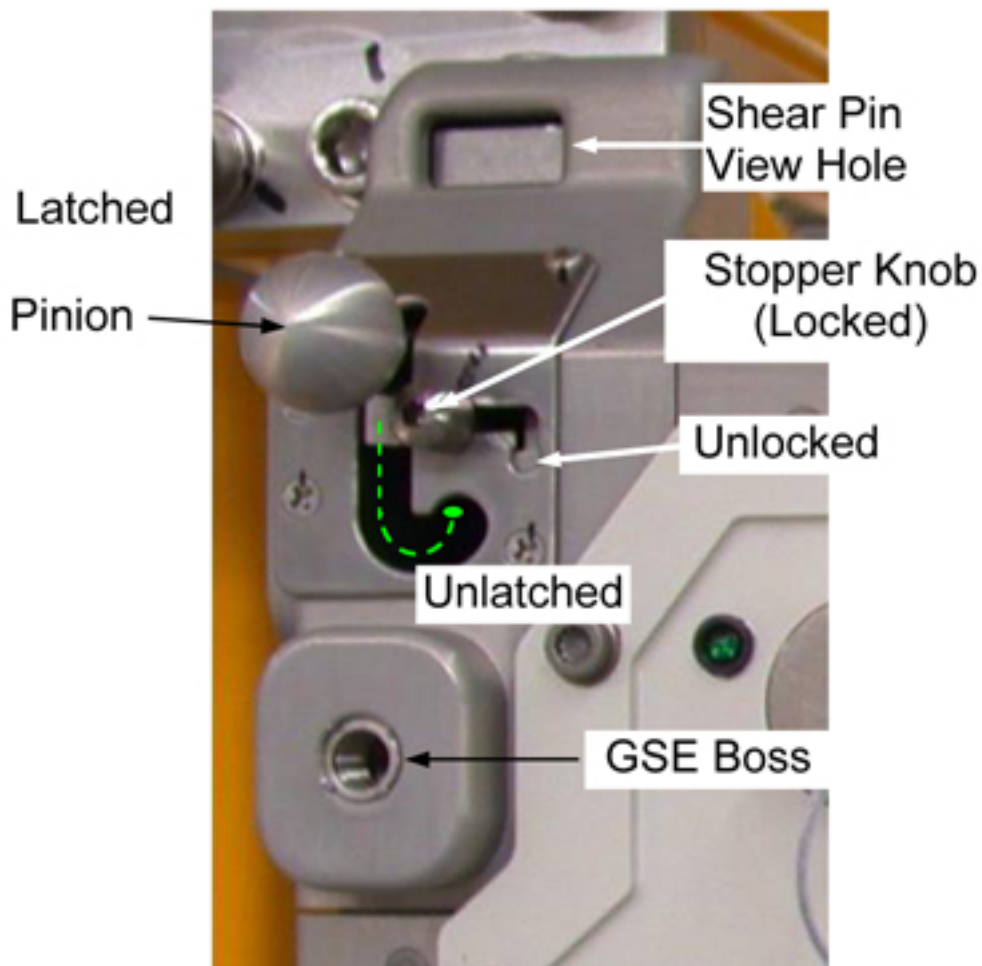


Figure 2. Detail A – Left Rack Upper Attach Mechanism, Typical.

### CAUTION

Do not force Upper Attachment Mechanism Pinions. Mechanism should easily engage K-Bar. Ensure Stopper Knob unlocked. Failure to comply may result in equipment damage.

### NOTE

1. IHI K-BAR Assy can be installed only if the rack has been disengaged from the Knee Brace and rotated down of about 15 cm.
2. If installed in rack bay the Knee Brace Assembly shall be removed, since this would prevent the complete rack rotation to the up position.

- 1.1 Loosen left Upper Attach Mechanism Stopper Knob (Ratchet Wrench 3/8"; 5/32" Hex Head Driver, 3/8" Drive). Move to the right to allow Pinion unlatching. Refer to Figure 2.
- 1.2 Left Pinion → Unlatched.

## 1.210 K-BAR INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/MULTI E)

Page 4 of 7 pages

Refer to Figure 2.

- 1.3 Loosen right Upper Attach Mechanism Stopper Knob (Ratchet Wrench 3/8"; 5/32" Hex Head Driver, 3/8" Drive).  
Move to the left to allow Pinion unlatching.
- 1.4 Right Pinion → Unlatched.
- 1.5 Verify Pivot Pin Brackets are installed.

```
*****  
*      If Pivot Pin Brackets are not installed,  
*      |      perform {1.208 PIVOT PIN BRACKET  
*      |      INSTALLATION / REMOVAL}, step 1 (SODF: ASSY  
*      |      OPS: ACTIVATION AND CHECKOUT), then:  
*      |  
*****
```

- 1.6 Record IHI K-BAR Assy, Left S/N: \_\_\_\_\_
- 1.7 Rotate rack down of about 15 cm.

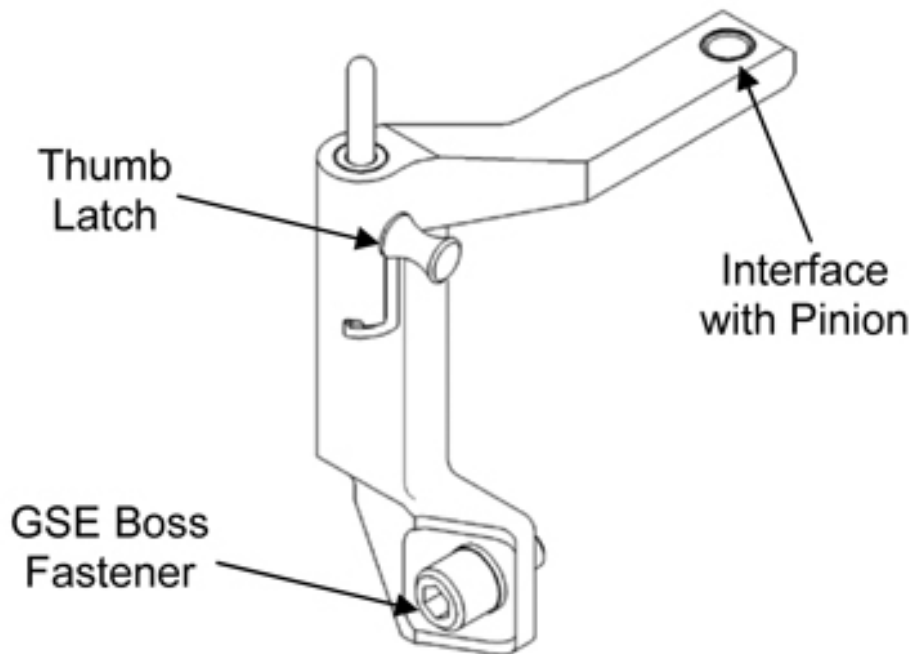


Figure 3. IHI K-BAR Assy.

- 1.8 Install IHI K-BAR Assy, Left into left Upper Attach Mechanism Shear Pin View Hole.  
Refer to Figure 2.

## 1.210 K-BAR INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/MULTI E)

Page 5 of 7 pages

### CAUTION

Do not force Upper Attach Mechanism Pinions. Mechanism should easily engage K-BAR Assy. Failure to comply may result in equipment damage.

### NOTE

The Pinion is maintained in the latched position by mean of an internal spring.

- 1.9 Left Pinion → Latched.  
√Shear Pin is visible at top of mechanism.
- 1.10 Set Stopper Knob in locked position, snug fastener (Ratchet Wrench 3/8"; 5/32" Hex Head Driver, 3/8" Drive).
- 1.11 Snug IHI K-BAR Assy, Left GSE Boss fastener (Ratchet Wrench 3/8"; 3/8" Hex Head Driver, 3/8" Drive).
- 1.12 IHI K-BAR Thumb Latch → Up.
- 1.13 Repeat steps 1.6 --- 1.12 for IHI K-BAR Assy, Right.
- 1.14 Verify K-BAR Capture Fittings are installed on Stand Off links.

```
*****
*       If K-BAR Capture Fittings are not installed,
*       |
*       |       perform {1.209 K-BAR CAPTURE MECHANISM
*       |       INSTALLATION / REMOVAL}, step 1 (SODF: ASSY
*       |       OPS: ACTIVATION AND CHECKOUT), then:
*       |
*****
```

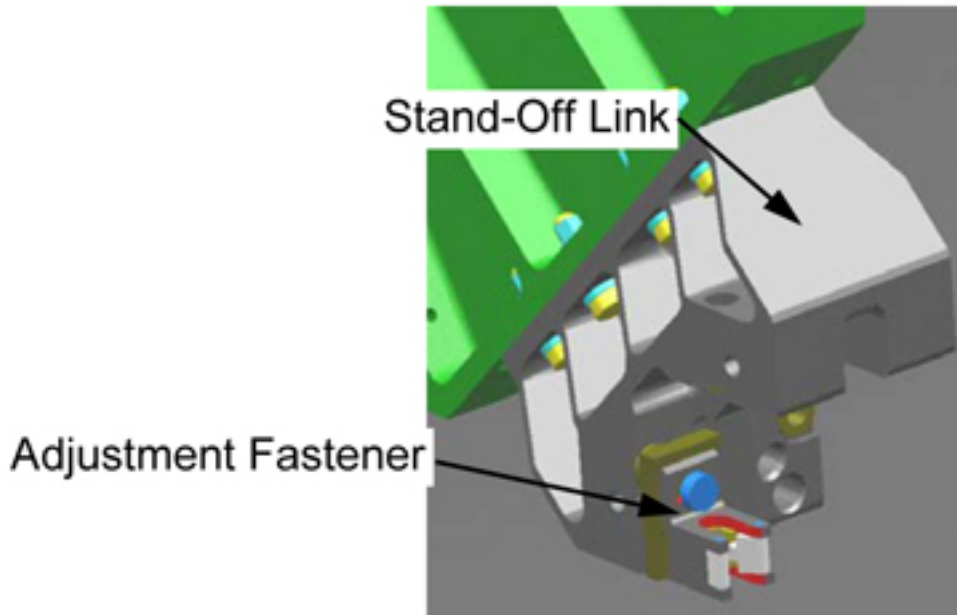


Figure 4. Adjustment Fastener on K-BAR Capture Fitting

- 1.15 Slowly rotate rack up to a controlled stop, until IHI K-BAR Assy Thumb Latches (two) engage with K-BAR Capture Fittings on Stand-off.

```

*****
*       If IHI K-BAR Thumb Latch does not align with K-BAR Capture
*       Fitting
*       |
*       |       Loosen Adjustment Fasteners (two) (Ratchet Wrench
*       |       3/8"; 5/32" Hex Head Driver, 3/8" Drive).
*       |       Refer to Figure 3.
*       |
*       |       Adjust the K-BAR Capture Fittings as required.
*       |
*       |       Snug Adjustment Fasteners (two) (Ratchet Wrench
*       |       3/8"; 5/32" Hex Head Driver, 3/8" Drive).
*       |
*****
    
```

- 1.16 Photo document the installed K-BAR Assemblies (DCS 760 Camera).
- 1.17 ISS ↓ **COL-CC** for task completion, S/N and installation location of IHI K-BAR Assemblies.  
Stow tools.

2. REMOVING THE IHI K-BAR ASSY

NOTE

K-Bar can be removed only if disengaged from the K-BAR Capture Fittings.

- 2.1 IHI K-BAR Assy, Left Thumb Latch → Down.



## 1.210 K-BAR INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/MULTI E)

Page 7 of 7 pages

- 2.2 Loosen IHI K-BAR Assy, Left GSE Boss fastener (Ratchet Wrench 3/8"; 3/8" Hex Head Driver, 3/8" Drive).  
Refer to Figure 2.
- 2.3 Loosen left Upper Attach Mechanism Stopper Knob (until threads completely disengaged) (Ratchet Wrench 3/8"; 5/32" Hex Head Driver, 3/8" Drive).  
Move to the right to allow Pinion unlatching.  
Refer to Figure 2.
- 2.4 Left Pinion → Unlatched.  
Refer to Figure 2.
- 2.5 Remove IHI K-BAR Assy, Left.
- 2.6 Record removed IHI K-BAR Assy, Left S/N: \_\_\_\_\_  
Temporary stow.
- 2.7 Repeat steps 2.1 to 2.6 for IHI K-BAR Assy, Right.
- 2.8 √For FOD within a 1 m radius.
- 2.9 Stow tools, removed IHI K-BAR Assemblies.
- 2.10 ISS ↓ **COL-CC** for task completion, S/N and stowage location of removed IHI K-BAR Assemblies.

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## 1.211 ISPR BONDING INSTALLATION/REMOVAL

(ASSY OPS/1E/FIN/HC/MULTI E) Page 1 of 4 pages

### OBJECTIVE:

Install/remove the ISPR Bonding Straps in/from the Columbus rack bays.

### LOCATION:

Installed: Refer to Table 1

Stowed: √Inventory Management System (IMS)

**Table 1. Columbus ISPR Bonding Strap Available Installation Locations**

<b>Aft Rack Bays</b>	<b>Forward Rack Bays</b>	<b>Overhead Rack Bays</b>
COL1A1	COL1F1	COL1O1
COL1A2	COL1F2	COL1O2
COL1A3	COL1F3	-
COL1A4	COL1F4	-

### DURATION:

Installation: 10 min each

Removal: 10 min each

### CREW:

One

### PARTS:

Bonding Strap P/N 3000CA001-001

### MATERIALS:

None

### TOOLS:

ISS Tool Kit:

Drawer 1

Combination wrench, 12 Point, 9/16"

102mm Extension, 1/4" Drive

Columbus Tool Kit:

Tool Bag 1:

Ratchet Wrench 1/4"

M8 (13 mm) Socket 1/4" Drive

### REFERENCED PROCEDURE(S):

None

1. INSTALLING A BONDING STRAP

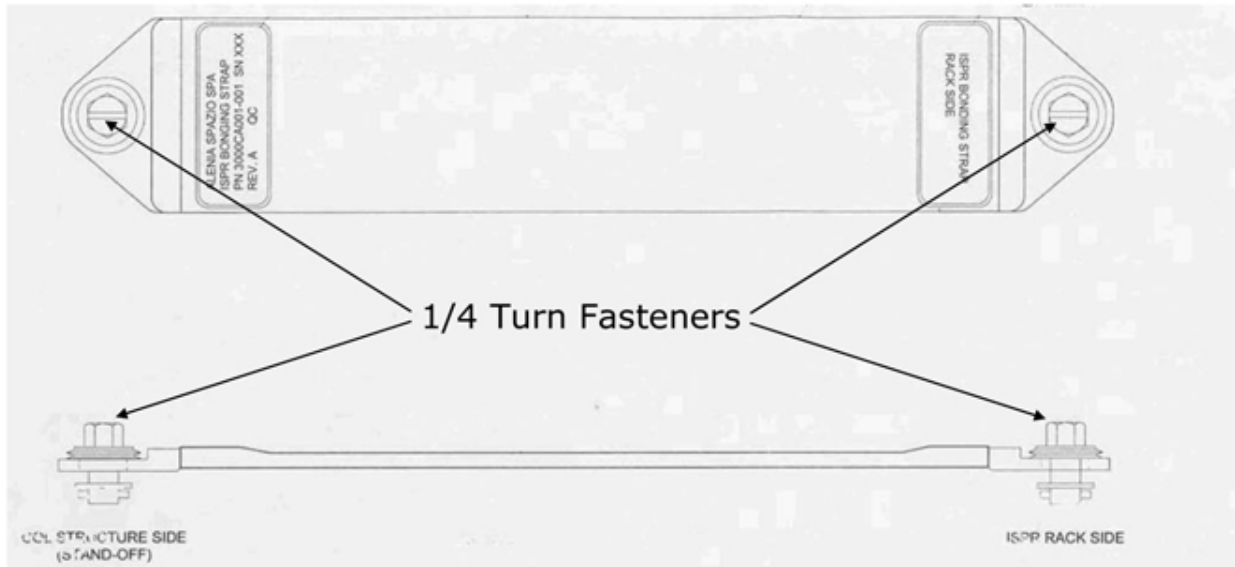


Figure 1. Bonding Strap Configuration, Typical

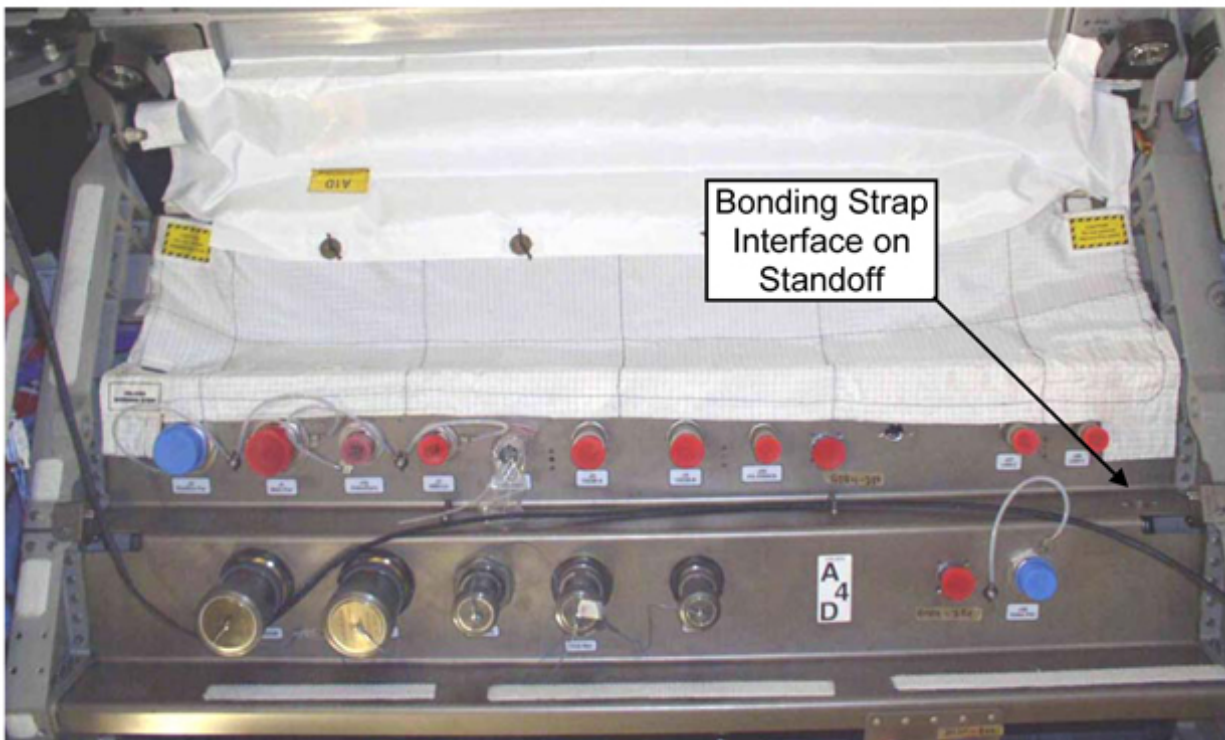


Figure 2. ISPR Bonding Strap Installation location on Standoff (Typical)

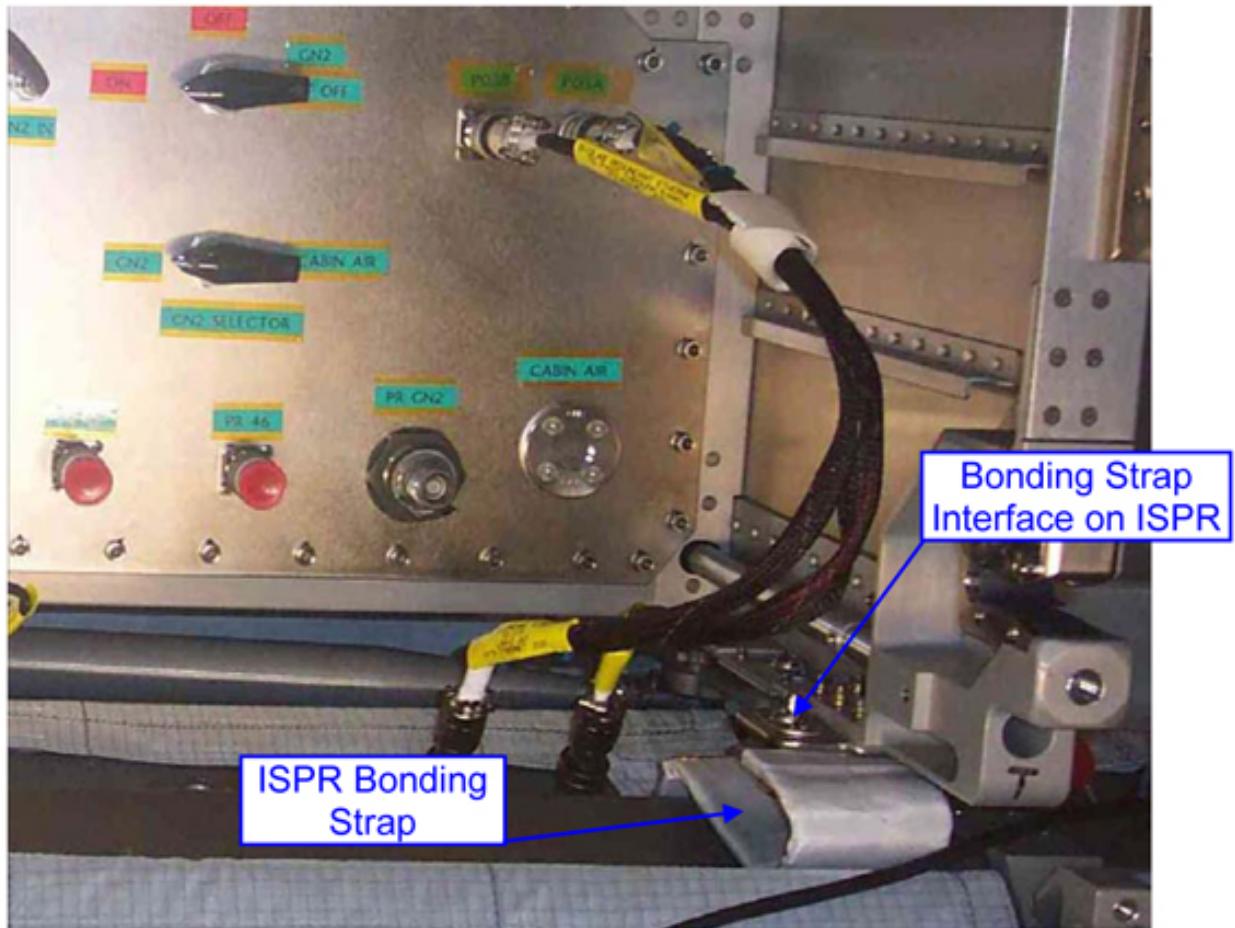


Figure 3. Bonding Strap Accommodation, Typical.

NOTE

Following steps are repeated for all the locations where an ISPR Bonding Strap is installed.

- 1.1 Record P/N of ISPR Bonding Strap: \_\_\_\_\_  
Record S/N of ISPR Bonding Strap: \_\_\_\_\_
- 1.2 Install ISPR Bonding Strap on standoff, quarter-turn fastener (one) (Ratchet Wrench 1/4"; 102 mm Extension 1/4" Drive; M8 (13 mm) Socket 1/4" Drive).  
Refer to Figures 1 and 2.
- 1.3 Install ISPR Bonding Strap on ISPR Bonding Strap Interface, quarter-turn fastener (one) (Combination wrench, 12 Point, 9/16").  
Refer to Figure 3.
- 1.4 ISS ↓ **COL-CC** of task completion, P/N, S/N and installation location of Bonding Strap.  
Stow tools.

2. REMOVING A BONDING STRAP

NOTE

Following steps are repeated for all the locations where an ISPR Bonding Strap is removed from.

- 2.1 Remove Bonding Strap from ISPR Bonding Strap Interface, quarter-turn fastener (one) (Ratchet Wrench 1/4"; 102 mm Extension 1/4" Drive; M8 (13 mm) Socket 1/4" Drive).  
Refer to Figure 3.
- 2.2 Remove Bonding Strap from stand off, quarter-turn fastener (one) (Ratchet Wrench 1/4"; 102 mm Extension 1/4" Drive; M8 (13 mm) Socket 1/4" Drive).  
Refer to Figures 1 and 3.
- 2.3 Record P/N of removed Bonding Strap: \_\_\_\_\_  
Record S/N of removed Bonding Strap: \_\_\_\_\_
- 2.4 Stow tools and parts.
- 2.5 ISS ↓ **COL-CC** of task completion, P/N and S/N of removed Bonding Strap.

## 1.212 COL FLOOR PANEL INTERFACE BAR REMOVAL/INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 3 pages

### OBJECTIVE:

Remove a Floor Panel Interface Bar from either deck rack D1, D2 or D3 and stow temporarily inside Columbus, re-install Floor Panel Interface Bar to either deck rack D1, D2 or D3.

### LOCATION:

Installed:

COL1D1

COL1D2

COL1D3

### DURATION:

20 minutes

### CREW

One

### PARTS:

None

### MATERIALS:

None

### TOOLS :

COL1

### Tool Bag 1

Ratchet Wrench, 1/4" Drive

Ratchet Tool, 1/4" Drive

102 mm Extension 1/4" Drive

4-20 Nm Torque Wrench 1/4" Drive

T30 Torx Head 1/4" Drive

Portable Handle

LAB1

### Deployed:

DCS 760 Camera

### REFERENCED PROCEDURE:

1.201 COL DECK RACK D1 / D2 / D3 OPEN & CLOSE

#### 1. [ACCESSING](#)

#### NOTE

Access to a Floor Panel Interface Bar requires removal of both floor panels covering the deck rack.

# 1.212 COL FLOOR PANEL INTERFACE BAR REMOVAL/INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

- 1.1 Check for floor panels, when present remove floor panels (2), perform [{1.201 COL DECK RACK D1 / D2 / D3 OPEN & CLOSE}](#) (SODF: ASSY OPS: ACTIVATION AND CHECKOUT) step 1 and step 2 only

## 2. REMOVAL

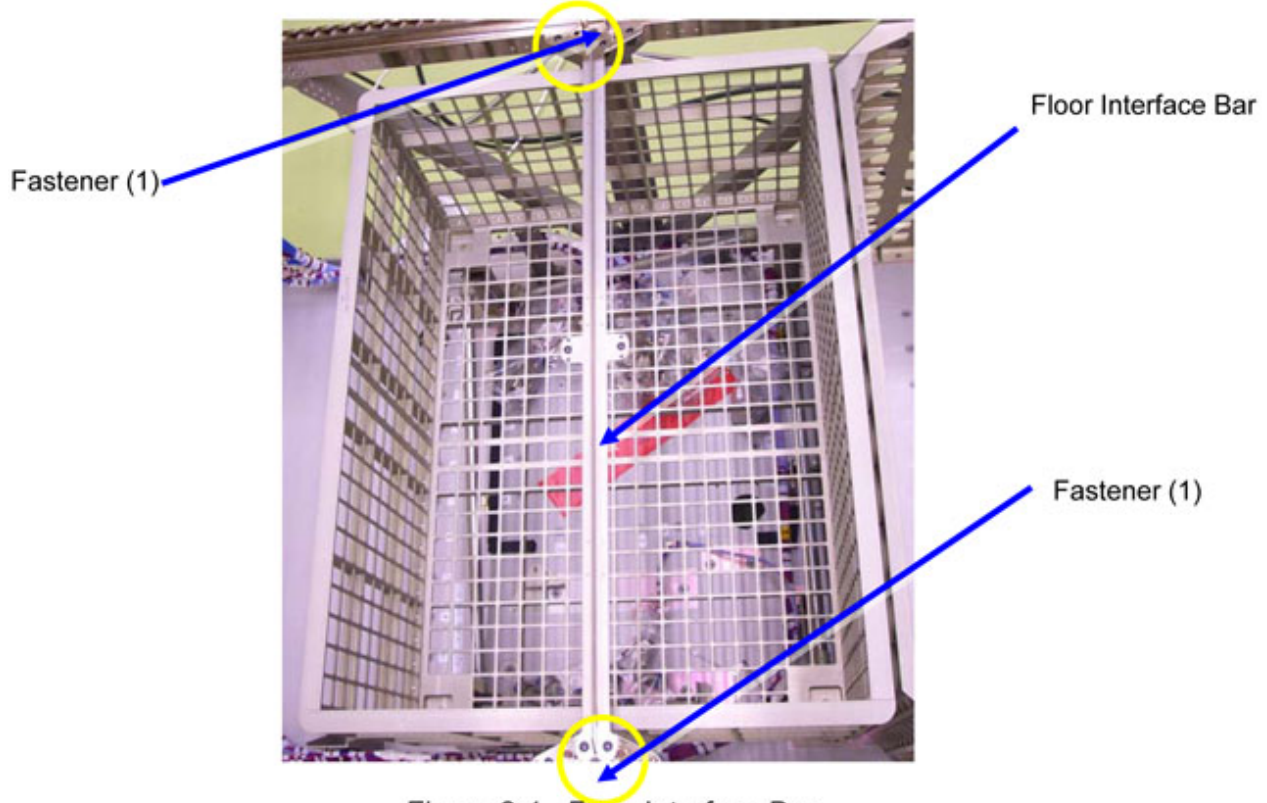


Figure 2-1 Floor Interface Bar

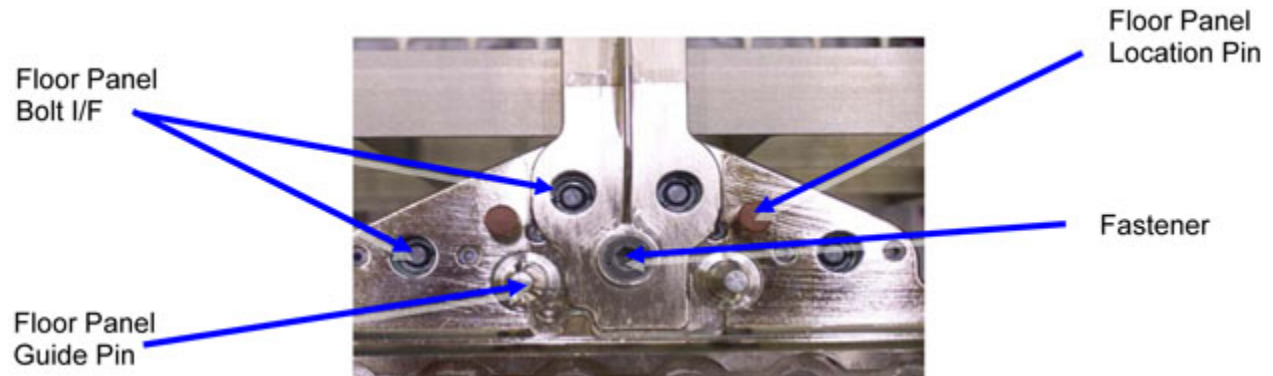


Figure 2. Floor Interface Bar Fastener

- 2.1 Unscrew Floor Interface Bar fasteners (2) in any order (Ratchet Wrench 1/4" Drive; 102mm Extension 1/4" Drive; T30 Torx Head 1/4" Drive). Fasteners are captive. Refer to Figure 2.
- 2.2 Remove Floor Interface Bar from deck rack, temporary stow.
- 2.3 Temporarily stow tools / equipment as necessary.



## 1.212 COL FLOOR PANEL INTERFACE BAR REMOVAL/INSTALLATION

(ASSY OPS/1E/FIN/MULTI E)

Page 3 of 3 pages

### 3. INSTALLATION

- 3.1 Check for FOD around work area within 3' radius to reduce risk of crew injury by FOD hazard.
- 3.2 Remove Floor Interface Bar from temporary stowage.

#### NOTE

Floor Interface Bar can be installed to deck rack regardless of its aft / forward orientation.

- 3.3 Fasten Floor Interface Bar to deck rack structure.  
Screw-in Floor Interface Bar fasteners (2) in any order, no torque tightening (Ratchet Wrench 1/4" Drive; 102mm Extension 1/4" Drive; T30 Torx Head 1/4" Drive).  
Fasteners are captive.
- 3.4 Torque tighten fasteners (2) in any order at 5 Nm (44.2 in-lbs) (4-20 Nm Torque Wrench; Ratchet Tool 1/4" Drive; 102mm Extension 1/4" Drive; T30 Torx Head 1/4" Drive).  
Fasteners are captive.

### 4. CLOSEOUT

- 4.1 Photo Document the Floor Interface Bar as installed on deck rack structure. (DCS 760 Camera)
- 4.2 Check with **COL-CC** for installation of floor panels, when required perform [{1.201 COL DECK RACK D1 / D2 / D3 OPEN & CLOSE}](#), (SODF: ASSY OPS: ACTIVATION AND CHECKOUT), step 3 and step 4 only

### 5. POST MAINTENANCE

- 5.2 Stow tools / equipment.

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# APCU ACTIVATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 1 page

- R1
1. VERIFYING ORBITER PAYLOAD BUS CONFIGURATION  
√tb PL PRI MNC – ON  
√PL CAB – MNA(MNB)  
√PL AUX – ON
- SSP 1
2. VERIFYING SWITCH POWER  
√cb SW PWR 1 – cl
  3. CLOSING APCU OUTPUT RELAY  
√tb APCU 1(2) CONV – bp  
  
APCU 1(2) OUTPUT RLY – cl
  4. TURNING APCU CONVERTER(S) ON  
APCU 1(2) CONV – ON  
  
√tb APCU 1(2) CONV – gray  
√tb APCU 1(2) OUTPUT RLY – gray
- CRT
- SM 200 APCU Status
- √APCU 1(2) OUT VOLTS RES HIGH: 122 to 126.5 V

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NOTE

Expect 'S200 APCU 1(2) VOLT LMT' message when APCU Converters are powered OFF.

CRT

SM 200 APCU Status

SSP 1

1. TURNING APCU CONVERTER(S) OFF  
APCU 1(2) CONV - OFF  
  
√tb APCU 1(2) CONV - bp  
√tb APCU 1(2) OUTPUT RLY - bp
2. OPENING APCU OUTPUT RELAY  
APCU 1(2) OUTPUT RELAY - OP

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DEORBIT PREPARATION

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## PAYLOAD DEACTIVATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 1 page

- |         |    |  |
|---------|----|--|
| L12U    | 1. | cb SW PWR 1 - op<br>cb PDIP 1 PWR 2/KuBAND RLY - op<br>cb X1/X2 SW - op<br>cb X1/X2 SW PDIP 1 PWR 1 - op |
| L12L    | 2. | cb PDIP 2 PWR 2 - op<br>cb PDIP 2 PWR 1 - op   |
| L12     | 3. | Ku BAND RATE - OFF   |
| R1      | 4. | PL CAB - OFF   |
| ML86B:E | 5. | cb MNB MAR 2 - op  |

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N/A

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# PAYLOAD ENTRY SWITCH LIST/VERIFICATION

(ASSY OPS/1E/FIN/MULTI E)

Page 1 of 2 pages

## PAYLOAD PWR CONFIG

- |              |    |   |
|--------------|----|---|
| TIG-1:55 R1  | 1. | √PL CAB – OFF<br>√PL PRI MNC – ctr (tb-OFF)<br>√PL PRI MNB – ctr (tb-OFF)<br>√PL PRI FC3 – ctr (tb-OFF)<br>√PL AUX – ON<br>√PL AFT MNB – OFF<br>√PL AFT MNC – OFF   |
| L12U (SSP 1) | 2. | √APCU 1 CONV – OFF (tb-bp)<br>√APCU 1 OUTPUT RLY – OPEN (tb-bp)<br>√APCU 2 CONV – OFF (tb-bp)<br>√APCU 2 OUTPUT RLY – OPEN (tb-bp)<br>√cb SW PWR 1 – op<br>√cb PDIP 1 PWR 2/KuBAND RLY – op<br>√tb OIU PWR – bp<br>√TCS PWR – OFF (tb-bp)<br>√cb X1/X2 SW PDIP1 PWR1 – op<br>√ODS CONN MATE X1 TLM PWR – OFF<br>√ODS CONN MATE X2 TLM PWR – OFF<br>√OIU PWR – OFF |
| L12L (SSP 2) | 3. | √cb PDIP 2 PWR 2 – op<br>√C/L CAM PWR – OFF<br>√cb PDIP 2 PWR 1 – op  |
| L12 (PDIP 1) | 4. | √Ku BAND RATE – OFF<br>√DC PWR 1 – OFF<br>√DC PWR 2 – OFF   |
| L11 (PDIP 2) | 5. | √DC PWR 1 – OFF<br>√DC PWR 2 – OFF  |
| ML86B:E      | 6. | √cb MNB MAR 1 – cl<br>√cb MNB MAR 2 – op  |
| ML85E        | 7. | √DC 10 AMP MNB S2 – OFF<br>√DC 10 AMP MNB S3 – ON<br>√DC 10 AMP MNB S4 – OFF<br>√DC 10 AMP MNB S5 – OFF   |
|              | 8. | √cb DC 10 AMP MNB CB2 – op<br>√cb DC 10 AMP MNB CB3 – cl  |

**PAYLOAD ENTRY SWITCH LIST/VERIFICATION**  
(ASSY OPS/1E/FIN/MULTI E) Page 2 of 2 pages

√cb DC 10 AMP MNB CB4 – op  
√cb DC 10 AMP MNB CB5 – op

REFERENCE

REFERENCE

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OBJECTIVE:

This display monitors health and status of the two APCUs and is available in SM OPS 2. The APCUs are used to power the Columbus Launch To Activation (LTA) heaters while the element is in the PLB as well OBSS heaters. The display is generic and has been used on several missions. Figure 1 is a view of this display.

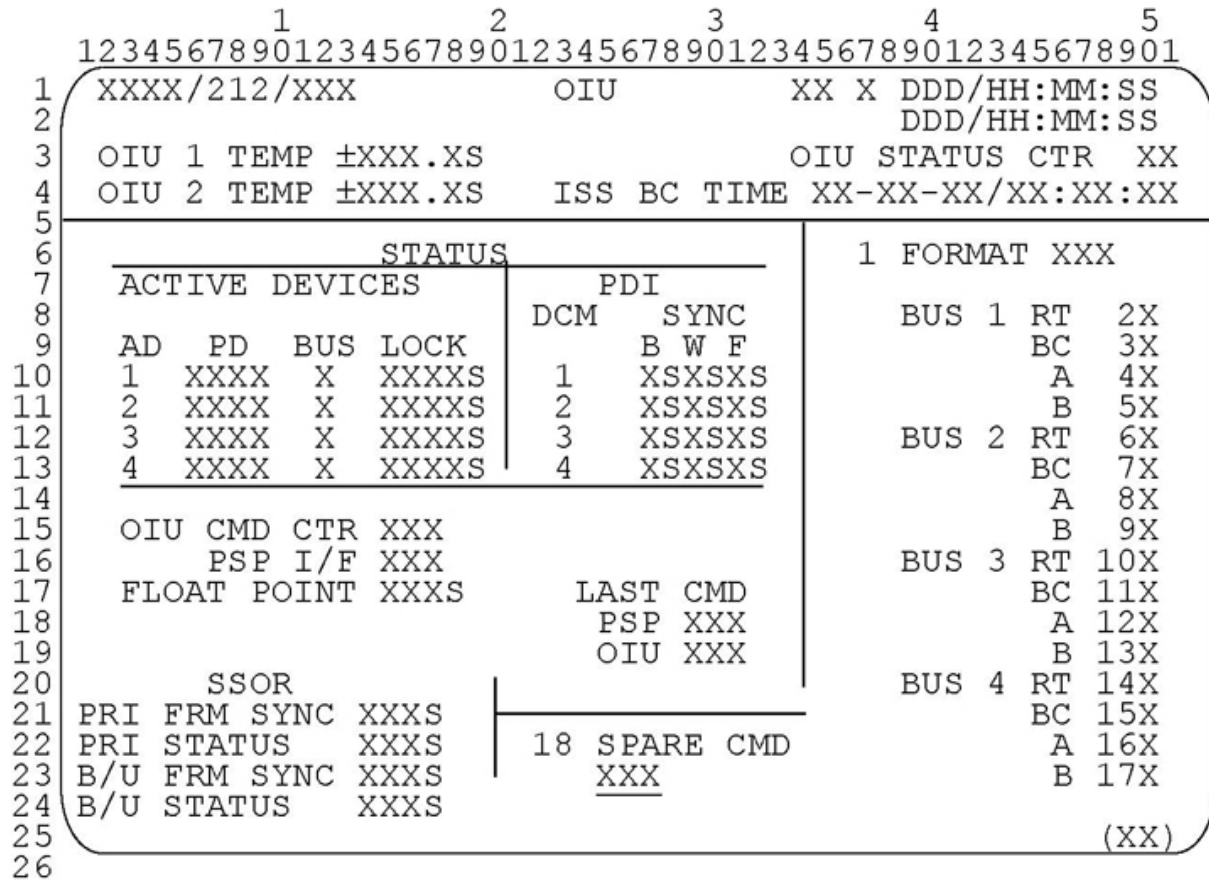


Figure 1. APCU Status - MCDS Display.

TITLE: APCU STATUS

TYPE: SPEC 200

PARAMETER CHARACTERISTICS

Table 1. Parameter Characteristics

CRT Name	MSID	UNITS	DISPLAY RANGE	STATUS IND [3]					FDA LIMITS	
				M	H	L	↑	↓	LO	HI
APCU1 CONVA OUT AMPS	P50 C90 03V	amps	0 to 12.0	M	H	L	↑			8.5
APCU1 CONVA TEMP	P50 T900 2V	deg F	0 to 212. 0	M	H	L	↑	↓	20	130
APCU1 CONVB OUT AMPS	P50 C90 04V	amps	0 to 12.0	M	H	L	↑			8.5
APCU1 CONVB TEMP	P50 T900 5V	deg F	0 to 212. 0	M	H	L	↑	↓	20	130
APCU1 OUT VOLTS RES LOW	[1] P50 V900 1V	volts	0 to 180. 0	M	H	L				
APCU1 OUT VOLTS RES HIGH	[1] P50 V900 0V	volts	110 to 160. 0	M	H	L	↑	↓	122	126. 5
APCU1 TRIP	[2] P50 V900 6V	volts	-5.00 to 5.00	M	H	L	↑			-4.40

Continuation of Table ...

APC U 2 CON V A OUT AMP S		P50 C90 09V	amp s	0 to 12.0	M	H	L	↑			8.5
APC U 2 CON V A TEM P		P50 T901 0V	deg F	0 to 212. 0	M	H	L	↑	↓	20	130
APC U 2 CON V B OUT AMP S		P50 C90 11V	amp s	0 to 12.0	M	H	L	↑			8.5
APC U 2 CON V B TEM P		P50 T901 2V	deg F	0 to 212. 0	M	H	L	↑	↓	20	130
APC U 2 OUT VOL TS RES LOW	[1]	P50 V900 7V	volts	0 to 180. 0	M	H	L				
APC U 2 OUT VOL TS RES HIG H	[1]	P50 V900 8V	volts	110 to 160. 0	M	H	L	↑	↓	122	126. 5
APC U 2 TRIP	[2]	P50 V901 3V	volts	-5.00 to 5.00	M	H	L	↑			-4.40

REMARKS

[1] OUT VOLTS LOW displays the measurements from the low-resolution voltage sensor. OUT VOLTS HIGH displays the measurements from the high-resolution voltage sensor.

[2] APCU TRIP indicates the status of the APCU shutdown logic. This status can be interpreted using Table 2.

**Table 2.**

TRIP (STATUS VOLTAGE)	TRIP CAUSE (S)			
	OV	OUV	OC	IUV
+4.88	X	X	X	X
+4.23	X	X	X	
+3.59	X	X		X
+2.95	X	X		
+2.27	X		X	X
+1.62	X		X	
+0.98	X			X
+0.34	X			
-0.30		X	X	X
-0.95		X	X	
-1.59		X		X
-2.23		X		
-2.91			X	X
-3.56			X	
-4.20				X
-4.86 (no trip)				
<b>NOTES</b>				
OV: Output Overvoltage				
OUV: Output Undervoltage				
OC: Output Overcurrent				
IUV: Input Undervoltage				
Tolerance for all reported voltages is 0.20 V.				

[3] The parameter status field for all parameters will be blank for normal operation or will display an "M" for missing data. For analog parameters, this field will also display an "H" or "L" for offscale data. Some parameters displayed will be limit-sensed for SM alerts or C&W alarms. For discretes that are limit-sensed, the undesirable state is defined in the FDA low limit field and the FDA high limit field is left blank. Satisfaction of the undesirable state triggers a "↓" indication. For analogs that are limit-sensed, an "↑" or a "↓" will be displayed when the parameter exceeds either an upper or lower limit. The symbols driven in the parameter status field have the following display priority from highest to lowest: "M", "H", "L", "↑", "↓". All symbols driven in the parameter status column will be displayed four times the normal intensity.

XXXX/205/XXX		ISS MCS MODING		XX X DDD/HH:MM:SS	
				DDD/HH:MM:SS	
STATUS			CONTINGENCY DOCKING		
US GNC MODE	XXXXXXXXX	DOCK SOFTWARE ENA		10	
RS GNC MODE	XXXXXXXXX	SEQUENCE INIT		11X	
US/RS GNC COMM	XXXX	CONTINGENCY UNDOCKING			
GNC MDM FRAME COUNT	XX	POST DEP CNTL MODE		XXXXXXXXX	
US PRI GNC MDM	XXXXS	UNDOCK SOFTWARE ENA		12	
CMG ATT CNTL	XXXXS	SEQUENCE INIT		13X	
REROUTE TO SSOR 1			TIME SINCE SEP		XXX
ROUTE NORM HARDLINE 2			OFF NOMINAL COMMANDS		
NO OP COMMAND 3 XXX			INCORP MASS PROP		14
15INHIBITS ENA INH			DOCKED IND		15X
MODE XTION	4 8 XXX	UNDOCKED IND		16X	
ATT MNVR	5 XXX	HOLD CURRENT ATTITUDE		17	
DESAT REQ	6 XXX	RS TAKE LVLH ATT CNTL		18	
ATT CNTL SHDN	7 XXX	HANDOVER CNTL TO ORB			
20HANDOVER CNTL TO ISS			RS PREP FOR CMG DESAT		19
US DRIFT AVAIL XXX			THRSTR AVAIL FOR DESAT		XXX
MODE TO DRIFT 9			MODE TO CMG TA		20
25			(XX)		

**Figure 1. ISS MCS Moding Display - SPEC 205.**

For 12A thru 10A, there was no planned use of this display. For all flights after 10A, the purpose of this display is to allow the orbiter crew to command the ISS at dock and undock and provide the capability to execute the attitude control handover procedures. Specifically, the orbiter crew can command the ISS to free drift upon contact, or to activate attitude control upon separation. The orbiter crew could command at dock and undock from this display starting at 12A, however there is full redundancy in the ISS MCS moding system at that point until the redundancy is removed during Stage 10A. Stage 10A places Node 2 between the Lab and PMA2, and Node 2 does not contain any automatic ACS Moding wiring for undocking and only one string for docking, as opposed to two strings for each prior to Node 2.

For the capability of executing the attitude control handover procedures, the communication link will nominally be through the OIU / GNC Hardline. Therefore, all the commands on Spec 205 have a routing code for the OIU / GNC Hardline. For commanding the ISS at dock and undock, the communication link will nominally be through the SSOR. Since all the Spec 205 commands have a routing code through the OIU / GNC Hardline, the orbiter crew will send a reroute command that reroutes all Hardline commands to the SSOR.

PARAMETER CHARACTERISTICS

Table 1.

CRT NAME	MSID	UNITS	DISPLAY RANGE	STATUS IND					FDA LIMITS	
				M	H	L	↑	↓	LO	HI
STATUS [1]										
US GNC MODE [2]	P79X0845E P79X0846E P79X0847E		Refer to remarks							
RS GNC MODE [3]	P79X0842E P79X0843E P79X0844E		Refer to remarks							
US/RS GNC COMM [4]	P79X0857E		0 = 'GOOD' 1 = overb right 'FAIL'							
GNC MDM FRAME COUNT [5]	P79U0856D		Refer to remarks							
US PRI GNC MDM [6]	P79X0854E		0 = 'GOOD' 1 = overb right 'FAIL'				↓	1		

Continuation of Table ...

CMG ATT CNTL [7]	P79X 0853 E		0 = 'GOO D' 1 = overb right 'LOS T'						↓	1	
NO OP COM MAN D	P79U 0855 D										
INHIBITS											
MOD E XTIO N	P79X 0807 E		0 = 'ENA' 1 = 'INH'								
ATT MNV R	P79X 0812 E		0 = 'ENA' 1 = 'INH'								
DES AT REQ	P79X 0813 E		0 = 'ENA' 1 = 'INH'								
ATT CNTL SHD N	P79X 0806 E		0 = 'ENA' 1 = 'INH'								
HANDOVER CNTL TO ORB											
US DRIF T AVAI L [8]	P79X 0814 E		0 = 'NO' 1 = 'YES'								
CONTINGENCY DOCKING [9]											
DOC K SEQ UEN CE INIT [10]	P79X 0858 E		0 = blank 1 = " * "								
CONTINGENCY UNDOCKING [11]											
POS T DEP CNTL MOD E [12]	P79X 0818 E P79X 0819 E		Refer to remar ks								

Continuation of Table ...

UNDOCK SEQUENCE INIT	P79X0859E		0 = blank 1 = “*”							
TIME SINCE SEP [13]	P79W0860D	secs								
OFF NOMINAL COMMANDS [14]										
DOCKED IND	P79X0811E		0 = blank 1 = “*”							
UNDOCKED IND	P79X0811E		0 = “*” 1 = blank							
HANDOVER CONTL TO ISS										
THRUSTER AVAILABLE FOR DESIGN AT [15]	P79X0805E		0 = 'NO' 1 = 'YES'							

REMARKS

[1] The US (United States) GNC MODE and the RS (Russian Segment) GNC MODE allow the orbiter crew to know how the station is controlling attitude. For nominal ISS attitude control, the US GNC Mode = CMG TA, and the RS GNC Mode = CMG TA. If the RS was controlling, the US GNC Mode = Drift (although depending on the failure scenario, it could be any one of the modes), and the RS GNC Mode = Thruster. If the Orbiter was controlling, the US GNC Mode = Drift (although depending on the failure scenario, it could be any one of the modes), and the RS GNC Mode = CMG TA or Indicatr.

[2] The US GNC MODE allows the orbiter crew to know how the US station is controlling attitude.



**Table 2.**

MSID	P79X0 845E	0	0	0	0	1	1	1
1	P79X0 846E	0	0	1	1	0	0	1
1	P79X0 847E	0	1	0	1	0	1	0
1	Display ed Text:	DEFA ULT	WAIT	RESE RVED	STAN DBY	CMG ONLY	CMG TA	UDG

[3] The RS GNC MODE allows the orbiter crew to know how the RS station is controlling attitude.

**Table 3.**

MSID	P79X0 842E	0	0	0	0	1	1	1
1	P79X0 843E	0	0	1	1	0	0	1
1	P79X0 844E	0	1	0	1	0	1	0
1	Display ed Text:	RESE RVED	THRU STER	GY ONLY	GY+T H/US	GY+T H/RS	REBO OST	CMG TA

[4] The US/RS GNC LOSS COMM: This Caution and Warning (C&W) is used in the handover of attitude control from Orbiter to CMG TA procedure, and if it is in alarm, the handover will not work. This C&W is coded on this Spec as conditional, which utilizes the overbright and flash functionality.

[5] GNC MDM FRAME COUNT: This parameter is used to determine if the entire Spec in general is getting updated data from the ISS. This parameter is normally displayed in decimal form resulting in an increment counter. But due to flight software constraints, this parameter will be displayed in hex form. Hex is sufficient because this parameter just needs to update.

[6] US PRI GNC MDM FAIL: This Caution and Warning (C&W) is used in the handover of attitude control from Orbiter to CMG TA procedure, and if it is in alarm, the handover will not work. This C&W is FDA'd as a Class 3 Alert, which when TMBU enabled, will have an onboard audible alarm, a light indication, an Onboard Fault Summary message, and a down arrow on the Spec parameter status field. This C&W is coded on this Spec as conditional, which utilizes the overbright and flash functionality.

[7] LOSS CMG ATT CNTL: This Caution and Warning (C&W) is used in the handover of attitude control from Orbiter to CMG TA procedure, and if it is in alarm, the handover will not work. This C&W is FDA'd as a Class 3 Alert, which when TMBU enabled, will have an onboard audible alarm, a light indication, an Onboard Fault Summary message, and a down arrow on the Spec parameter status field. This C&W is coded on this Spec as conditional, which utilizes the overbright and flash functionality.

[8] US DRIFT AVAIL: If this parameter, US Drift Available = Yes, then the command Item 9 MODE TO DRIFT will be accepted by the ISS US GNC MDM.

[9] CONTINGENCY DOCKING: These commands do not have any nominally planned use, but if there is a loss of redundancy to mode the ISS to free drift at docking, then MCC may decide to use this section.

[10] DOCK SEQUENCE INIT: This parameter is set high if item 11 was commanded to start the manual ACS Moding software to execute and mode the ISS to free drift.

[11] CONTINGENCY UNDOCKING: These commands do not have any nominally planned use, but if there is a loss of redundancy to mode the ISS to attitude control after undocking, then MCC may decide to use this section.

[12] POST DEP CNTL MODE: The Post Departure Control Mode can be set to CMG TA, CMG Only, or RS CNTL. If this parameter reads RS CNTL, then after undocking, if the ACS Moding software properly executes, the ISS will resume control on Russian thruster control.

**Table 4.**

MSID	P79X0818E	0	0
1	P79X0819E	0	1
0	Displayed Text:	CMG TA	CMG ONLY

[13] TIME SINCE SEP: When the manual software is initiated or when the automatic software is initiated by the sensors, this time since separation parameter begins to count up from zero to a commanded value (typically 100 seconds) at which time the ISS will resume attitude control using the control method defined by the Post Departure Control Mode parameter.

[14] OFF NOMINAL COMMANDS: These commands do not have any nominally planned use, but may be used in MCC determined contingencies.

[15] THRSTR AVAIL FOR DESAT: telemetry feedback for Item 19 RS PREP FOR CMG DESAT. If that command is successful, then this parameter will show YES, and the RS is prepared to enter CMG TA mode.

ITEM ENTRY CHARACTERISTICS

Item 1: REROUTE TO SSOR: All the commands on this Spec are hardcoded with a routing code = 1, which is for the OIU / GNC Hardline. If the commands are to be sent through the SSOR, then this reroute command will tell the OIU that for any command with a routing code of 1, to change it to 2, which is the routing code for SSOR.

Item 2: ROUTE TO NORMAL HARDLINE: If there was an activity that required commanding from Spec 205 through the SSOR and that commanding activity is complete, then this route to normal command should be sent. All the commands on this Spec are hardcoded with a routing code = 1, which is for the OIU / GNC Hardline. But, for commanding through the SSOR, the OIU can be configured to take all routing codes of 1 and change it to 2, which is SSOR. So, to return the OIU to a nominal configuration, this command will tell the OIU that for all commands with routing code of 1, to assign it a routing code of 1.

Item 3: NO OP COMMAND: The commands to reroute to SSOR and route to normal hardline do not have any telemetry feedback. As a form of feedback, this no op command is sent and the command accept counter telemetry will increment, thus verifying the routing commands success.

Item 4: MODE XTION ENA is used to command the Mode Transition Inhibit to a status of either enabled. The telemetry feedback is ENA.

Item 5: ATT MNVR ENA is used to command the Attitude Maneuver Inhibit to a status of enabled. The telemetry feedback is ENA or INH.

Item 6: DESAT REQ ENA is used to command the Desat Request Inhibit to a status of enabled. The telemetry feedback is ENA or INH.

Item 7: ATT CNTL SHDN ENA is used to command the Attitude Control Shutdown Inhibit to a status of enabled. The telemetry feedback is ENA or INH.

Item 8: MODE XTION INH is used to command the Mode Transition Inhibit to a status of either inhibited. The telemetry feedback is INH.

Item 9: MODE TO DRIFT commands the ISS US GNC Mode to Drift.

Item 10: DOCK SOFTWARE ENA commands the manual dock software within the ACS Moding software to be enabled.

Item 11: DOCK SEQUENCE INIT commands the manual dock software within the ACS Moding software to execute, if the manual dock software is enabled per Item 10. The software that executes is the same software that the automatic ACS Moding software executes if the Capture Long sensors worked.

Item 12: UNDOCK SOFTWARE ENA commands the manual undock software within the ACS Moding software to be enabled.

Item 13: UNDOCK SEQUENCE INIT commands the manual undock software within the ACS Moding software to execute, if the manual undock software is enabled per Item 12. The software that executes is the same software that the automatic ACS Moding software executes if the Interface Sealed sensors and Separation sensors worked.

Item 14: INCORP MASS PROP is a command that incorporates the US GNC mass properties from a buffer location to active use.

Item 15, 16: DOCKED IND and UNDOCKED IND are manual commands that toggle a bit in the Primary C&C MDM automatic ACS Moding software. This bit is used by the Russian Segment to update their mass properties.

Item 17: HOLD CURRENT ATTITUDE is a command to the US GNC MDM that performs a snap and hold at the current attitude, assuming the US GNC Mode is already in CMG TA and controlling attitude.

Item 18: RS TAKE LVLH ATT CNTL is an ISS Tier 1 command that tells the Russian Segment to take attitude control in Thrusters in the LVLH reference frame. This command is an off nominal command without handshake between the US GNC MDM and the RS TBM. The nominal command to have the Russian Segment take control 6-17 is with handshake, which means there is some Tier 2 communication between the US GNC MDM and the RS TBM.

Item 19 RS PREP FOR CMG DESAT is a Tier 1 command that prepares the Russian Segment for CMG TA mode.

Item 20: MODE TO CMG TA is a command that changes the US GNC Mode to CMG TA using CCDB slot number 1, and also will change the RS GNC Mode to CMG TA if it is not already so.

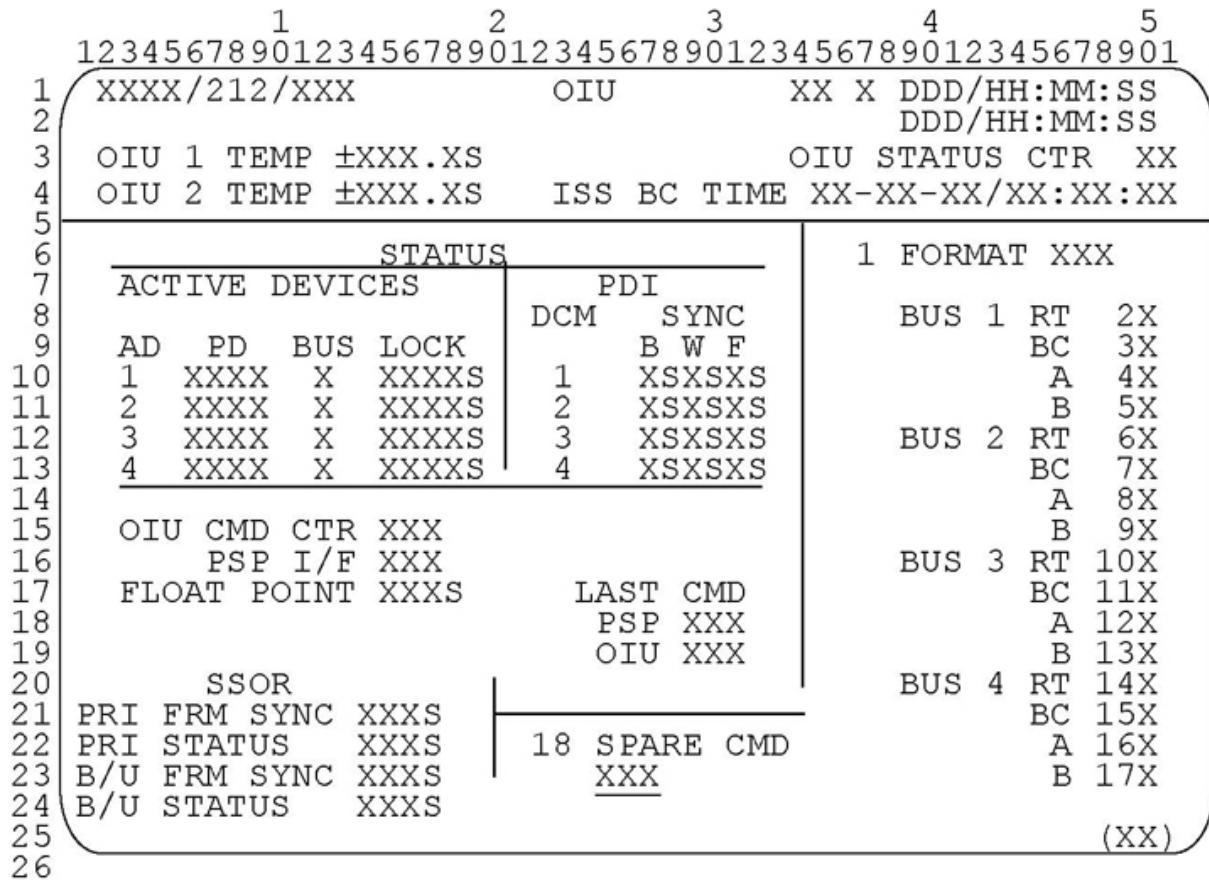


Figure 1. ISS C&W Display - SPEC 211.

The SM 211 ISS C&W display is available in SM OPS 2 and is used for monitoring pertinent ISS C&W telemetry. Since the PCS does not have the capacity to annunciate alarm tones, the tone status flag from the ISS will be used to trigger the orbiter C&W system.

PARAMETER CHARACTERISTICS

1. ASDA

CRT NAME	MSID	UNITS	DISPLAY RANGE	STATUS IND [1]					FDA LIMITS	
				M	H	L	↑	↓	LO	HI
FIRE	P79X0803E			M				↓	1	
PRESS	P79X0801E			M				↓	1	
TOX ATM	P79X0802E			M				↓	1	
CAUT	P79X0830E			M				↓	1	
WARN	P79X0831E			M				↓	1	

REMARKS

1] The parameter status field for all parameters will be blank for normal operation or will display an "M" for missing data. For analog parameters, this field will also display an "H" or "L" for offscale data. Some parameters displayed will be limit-sensed for SM alerts or C&W alarms. For discretes that are limit-sensed, the undesirable state is defined in the FDA low limit field and the FDA high limit field is left blank. Satisfaction of the undesirable state triggers a "↓" indication. For analogs that are limit-sensed, an "↑" or a "↓" will be displayed when the parameter exceeds either an upper or lower limit. The symbols driven in the parameter status field have the following display priority from highest to lowest: "M", "H", "L", "↑", "↓". All symbols driven in the parameter status column will be displayed four times normal intensity.

[2] When the tone status flag is set for any FIRE, pressure (PRESS), toxic atmosphere (TOX ATM), caution (CAUT), or warning (WARN) event, a "↓" will be displayed in the appropriate status field. The FIRE, PRESS, and TOX ATM events will initiate a master alarm light and tone, B/U C&W light on panel F7, and a fault message. WARN and CAUT events will initiate an alert light, tone, and fault message. The PCS can be referenced for additional details on the fault condition.

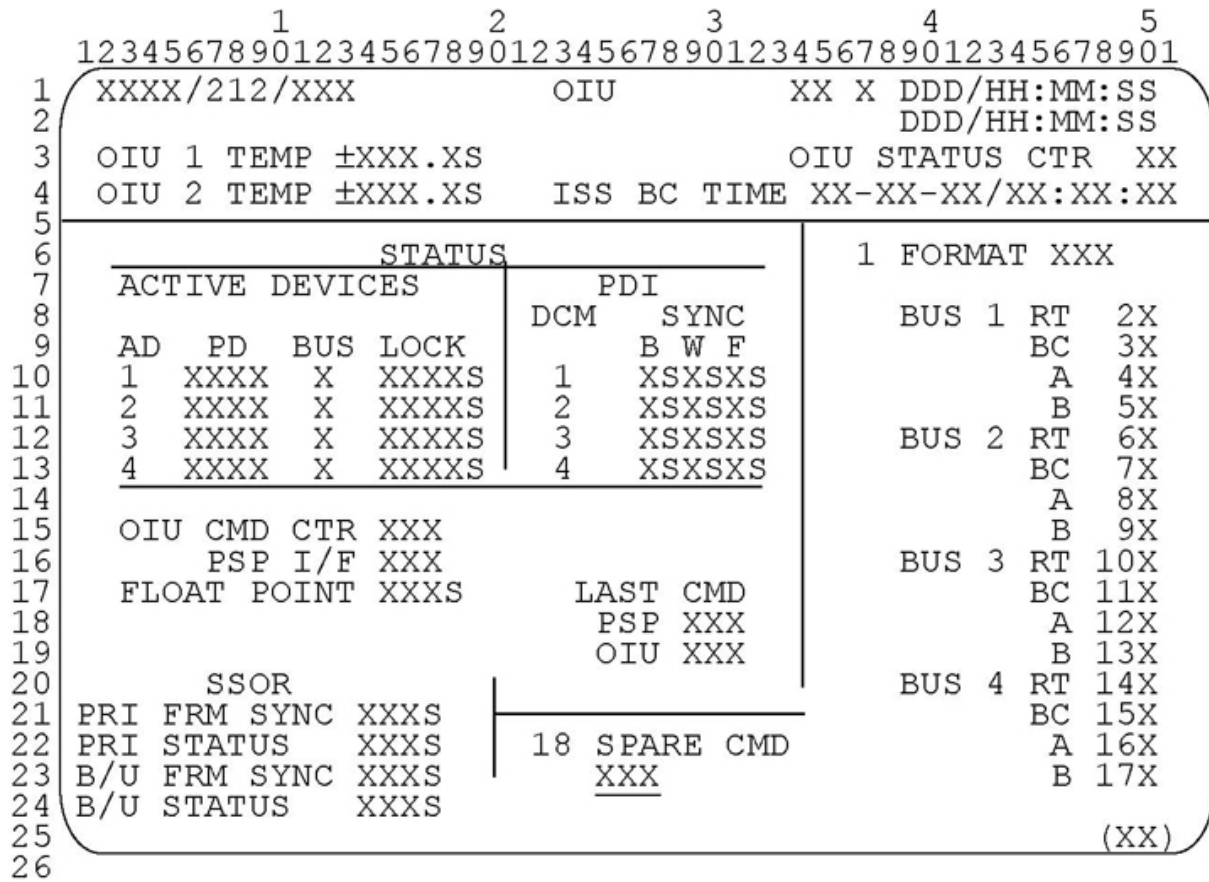


Figure 1. OIU Display - SPEC 212.

The SM 212 OIU display is available in SM OPS 2 and is used to configure the OIU for cargo element operations, monitor OIU status, and monitor relevant PDI, PSP, and SSOR statuses.

PARAMETER CHARACTERISTICS

1. SDFS

CRT NAME	MSID	UNITS	DISPLAY RANGE	STATUS IND					FDA LIMITS	
				M	H	L	↑	↓	LO	HI
OIU 1 TEM P [1]	P50T 4000 V	deg F	-23.4 to +304.3	M	H	L	↑	↓		212
OIU 2 TEM P [1]	P50T 4001 V	deg F	-23.4 to +304.3	M	H	L	↑	↓		212
OIU STATUS CTR [2]	P50U 4106 D	sec	00 to 59							
ISS BC TIME [2]	P50U 4112 D, P50U 4113 D, P50U 4111 D, P50U 4114 D, P50U 4115 D, P50U 4116 D	time	Refer to remarks							



Continuation of Table ...

AD 1 PD [3]	P50X 4401 E, P50X 4402 E, P50X 4403 E, P50X 4404 E, P50X 4405 E, P50X 4406 E		Refer to remar ks					↓	1	
AD 2 PD [3]	P50X 4411 E, P50X 4412 E, P50X 4413 E, P50X 4414 E, P50X 4415 E, P50X 4416 E		Refer to remar ks					↓	1	

Continuation of Table ...

AD 3 PD [3]	P50X 4421 E, P50X 4422 E, P50X 4423 E, P50X 4424 E, P50X 4425 E, P50X 4426 E		Refer to remar ks							
AD 4 PD [3]	P50X 4431 E, P50X 4432 E, P50X 4433 E, P50X 4434 E, P50X 4435 E, P50X 4436 E		Refer to remar ks							
AD 1 BUS [4]	P50U 4055 D	n/a	0 to 7							
AD 2 BUS [4]	P50U 4065 D	n/a	0 to 7							
AD 3 BUS [4]	P50U 4075 D	n/a	0 to 7							
AD 4 BUS [4]	P50U 4085 D	n/a	0 to 7							

Continuation of Table ...

AD 1 LOC K [5]	P50X 4440 E, P50X 4441 E		0,0 = 'NON E' 0,1 = 'YES' 1,0 = 'NO' 1,1 = 'N/A'	M				↓	1,0	
AD 2 LOC K [5]	P50X 4450 E, P50X 4451 E		0,0 = 'NON E' 0,1 = 'YES' 1,0 = 'NO' 1,1 = 'N/A'	M				↓	1,0	
AD 3 LOC K [5]	P50X 4460 E, P50X 4461 E		0,0 = 'NON E' 0,1 = 'YES' 1,0 = 'NO' 1,1 = 'N/A'	M				↓	1,0	
AD 4 LOC K [5]	P50X 4470 E, P50X 4471 E		0,0 = 'NON E' 0,1 = 'YES' 1,0 = 'NO' 1,1 = 'N/A'	M				↓	1,0	
PDI DCM 1 B,W, F SYN C [13]	V75X 6403 D, V75X 6402 D, V75X 6401 D		0 = blank , 1 = " * " 0 = blank , 1 = " * " 0 = blank , 1 = " * "	M M M				↓ ↓ ↓	0 0 0	

Continuation of Table ...

PDI DCM 2 B,W, F SYN C [13]	V75X 6407 D, V75X 6406 D, V75X 6405 D		0 = blank , 1 = " * "	M M M				↓ ↓ ↓	0 0 0	
PDI DCM 3 B,W, F SYN C [13]	V75X 6411 D, V75X 6410 D, V75X 6409 D		0 = blank , 1 = " * "	M M M				↓ ↓ ↓	0 0 0	
PDI DCM 4 B,W, F SYN C [13]	V75X 6415 D, V75X 6414 D, V75X 6413 D		0 = blank , 1 = " * "	M M M				↓ ↓ ↓	0 0 0	
OIU CMD CTR [6]	P50U 4132 A	n/a	0 to 255							
OIU PSP I/F [7]	P50X 4283 E		0 = 'OK', 1 = 'ERR'							
FLOA T POIN T [8]	P50X 4288 E		0 = 'OK', 1 = 'ERR'	M				↓	1	

Continuation of Table ...

PSP LAST CMD [10]	V92X 1102 X, V92X 1116 X, V92X 1129 X		1,0,1 = 'REJ' 0,1,1 = 'INC' else = 'OK'							
OIU LAST CMD [11]	P50X 4281 E, P50X 4303 E, P50X 4287 E		1,0,0 or 0,1,0 or 1,1,0 or 0,0,1 or 1,0,1 or 0,1,1 or 1,1,1 = 'REJ' else = 'OK'							
SSO R PRI FRM SYN C [12]	V74X 2050 E		0 = 'NO', 1 = 'YES'	M				↓	0	
SSO R PRI STAT US [12]	V74X 2051 E		0 = 'BAD', 1 = 'OK'	M				↓	0	
SSO R B/U FRM SYN C [12]	V74X 2053 E		0 = 'NO', 1 = 'YES'	M				↓	0	
SSO R B/U STAT US [12]	V74X 2052 E		0 = 'BAD', 1 = 'OK'	M				↓	0	

Continuation of Table ...

FOR MAT [14]	P50U 4010 A	n/a	0 to 255							
BUS 1 RT [15]	P50X 4021 E		0 = " * ", 1 = blank							
BUS 1 BC [15]	P50X 4021 E		0 = blank , 1 = " * "							
BUS 1 A [15]	P50X 4041 E		0 = " * ", 1 = blank							
BUS 1 B [15]	P50X 4041 E		0 = blank , 1 = " * "							
BUS 2 RT [15]	P50X 4022 E		0 = " * ", 1 = blank							
BUS 2 BC [15]	P50X 4022 E		0 = blank , 1 = " * "							
BUS 2 A [15]	P50X 4042 E		0 = " * ", 1 = blank							
BUS 2 B [15]	P50X 4042 E		0 = blank , 1 = " * "							
BUS 3 RT [15]	P50X 4023 E		0 = " * ", 1 = blank							
BUS 3 BC [15]	P50X 4023 E		0 = blank , 1 = " * "							
BUS 3 A [15]	P50X 4043 E		0 = " * ", 1 = blank							
BUS 3 B [15]	P50X 4043 E		0 = blank , 1 = " * "							

Continuation of Table ...

BUS 4 RT [15]	P50X 4024 E		0 = " * ", 1 = blank							
BUS 4 BC [15]	P50X 4024 E		0 = blank , 1 = " * "							
BUS 4 A [15]	P50X 4044 E		0 = " * ", 1 = blank							
BUS 4 B [15]	P50X 4044 E		0 = blank , 1 = " * "							
SPA RE CMD [16]	P93J 0101 C	n/a	1 to 12							

REMARKS

[1] The OIU TEMP parameters will read 140° F when the OIU associated with that measurement is OFF. Note that this is the only sure method to determine which OIU is powered up from this display alone. Additional insight is available via the panel L12 OIU PWR tb.

[2] OIU STATUS CTR displays the OIU time parameter for seconds, reading from 00 to 59 and resetting to 00 again. This indicates OIU health by constantly counting from 00 to 59 and recycling when the OIU telemetry is being processed by the PDI. ISS BC TIME follows the format MM-DD-YY/HH:MM:SS and comes from whichever device is BC to the OIU. This parameter will read all zeros at powerup, will show the correct BC time at the time the BC comes up and starts sending telemetry to the OIU, and will remain static at the last good sample when the incoming telemetry from that BC goes away.

[3] ACTIVE DEVICES: The OIU active device (AD) status section provides insight for OIU processing on the external telemetry sources with which the OIU can interface. Status shown for each AD (1 to 4) includes the physical device (PD) assigned to that AD, the BUS being used to acquire that device's telemetry, and a LOCK status indication. The computation used to drive the PD field is defined in the following table:

MSI D	Argu ment 1	0	0	0	0	0	0	0	0	0	0
0	Argu ment 2	0	0	0	0	0	0	0	0	0	0
0	Argu ment 3	0	0	0	0	0	0	0	0	1	1
1	Argu ment 4	0	0	0	0	1	1	1	1	0	0
0	Argu ment 5	0	0	1	1	0	0	1	1	0	0
1	Argu ment 6	0	1	0	1	0	1	0	1	0	1
0	Displ ayed Text:	OIU	GNC 1	GNC 2	SR-1	SR-2	MP- 1	MP- 2	N1-1	N1-2	FGB 1

If none of the above conditions are met, the default text displayed is ERR. Note that PD = OIU when no active device is assigned and is also displayed when OIU format supports an OIU error log dump, GNC1 and GNC2 are the ISS Tier 2 Guidance, Navigation and Control MDMs, SR-1 and SR-2 are the Space to Space Orbiter Radios (SSOR), MP-1 and MP-2 are the MPLM MDMs, N1-1 and N1-2 are the Node MDMs, and FGB1 and FGB2 are the ISS FGB MDMs.

[4] BUS: Indicates the OIU bus 1 to 7, 0 indicates OIU bus 8. Note that the OIU hardware currently supports only buses 1 to 4.

[5] LOCK: 'NONE' if the current OIU format does not have an AD for this display location. 'YES' if the OIU is RT and in sync with the AD (ISS BC or SSOR). 'YES' if the AD is OIU in error log dump format (OIU must be in sync with itself). 'NO' if the OIU is RT and was in sync with the AD but has lost lock on the AD (ISS BC or SSOR). N/A if the OIU is BC to the AD, except if the AD is SSOR. Note that if LOCK goes from 'YES' to 'NO', the OIU stops attempting to acquire sync with that AD. To force the OIU to attempt to resync with an AD, the OIU format must be reloaded.

[6] OIU CMD CTR will start at 000 at powerup, and will increment by one whenever the OIU receives a valid command from the PSP. The counter reads in decimal, and will count from 000 to 255 and roll over to 000. All commands, whether from the MCC or the MCDS, will cause the counter to increment if received and processed by the OIU.

[7] PSP I/F indicates OK if the OIU is receiving the 16 Khz command carrier from either PSP1 or PSP2. ERR is displayed if no command carrier is being received.



[8] The OIU can convert one ISS floating point parameter value per PDI minor frame (maximum of 100 per major frame) into a shuttle PDI-compatible parameter value. If an ISS floating point value is invalid or results in an invalid floating point value/operation during the conversion process, the OIU annunciates an error. The FLOAT POINT display parameter will read ERR for this condition or 'OK' if no floating point error/operation is detected.

[9] The parameter status field for all parameters will be blank for normal operation or will display an "M" for missing data. For analog parameters, this field will also display an "H" or "L" for offscale data. Some parameters displayed will be limit-sensed for SM alerts or C&W alarms. For discrettes that are limit-sensed, the undesirable state is defined in the FDA low limit field and the FDA high limit field is left blank. Satisfaction of the undesirable state triggers a "↓" indication. For analogs that are limit-sensed, an "↑" or a "↓" will be displayed when the parameter exceeds either an upper or lower limit. The symbols driven in the parameter status field have the following display priority from highest to lowest: "M", "H", "L", "↑", "↓". All symbols driven in the parameter status column will be displayed four times normal intensity.

[10] PSP LAST CMD indicates the command acceptance for crew originated command: 'OK' if the PSP has not rejected a crew command, REJ if the PSP rejected the last crew command, or INC if the PSP was not able to complete the transfer of the last crew command. The REJ and INC indications are cleared by the next successfully processed PSP command from either crew or ground.

[11] OIU LAST CMD indicates the command acceptance by the OIU. REJ is displayed if the OIU has detected either a parity error or an incorrect byte count in a command received from the PSP. Otherwise, 'OK' is displayed.

[12] For both the primary (PRI) and a backup (B/U) Space to Space Orbiter Radio (SSOR), the FRM SYNC indication gives the status of the frame synchronizer. YES indicates SSOR frame sync with the ISS Space to Space Station Radio (SSSR), 'NO' indicates no SSOR frame sync, or the SSOR is off, or the SSOR is not present. The STATUS indication yields 'OK' if the SSOR is operating normally, or indicates 'BAD' if the SSOR BITE has sensed a failure.

[13] PDI DCM SYNC gives indication of the Bit (B), Word (W), and Frame (F) synchronizer statuses for all four PDI decommutators. For each DCM, the B, W, and F columns will be blank if the decomm is not in bit, word, or frame sync, respectively. An asterisk will be displayed in each of the B, W, or F columns if the sync conditions do exist. Note that the decomm actually processing OIU telemetry is dependent on orbiter PDI/PCMMU config.

[14] FORMAT: Indicates the currently loaded OIU format.

[15] BUS 1 to 4: The OIU bus processing state [Bus Controller (BC) or Remote Terminal (RT)] and channelization (A or B) is indicated by asterisks for each of buses 1 to 4.

[16] SPARE CMD: Displays the item entry index associated with the last Item 18.

ITEM ENTRY CHARACTERISTICS

Item 1: FORMAT: indexed command item entry used to changing the OIU format (ITEM 1 + XXX EXEC). The valid decimal format numbers for entry via MCDS on STS-117 are 001 to 020, 250, 251, 254, and 255.

Item 2 to 17: BUS 1 to BUS 4: This section allows changing the OIU's current bus processing state [Bus Controller (BC) or Remote Terminal (RT)] and bus channel (A or B) for any of the currently implemented four OIU buses. For example, if Bus 3 is BC, and using Channel A, there will be an asterisk next to Items 11 and 12. To change Bus 3 to RT, an ITEM 10 EXEC is performed. In the case of the bus channelization (A or B), the displayed telemetry indicates which channel is prime for command and telemetry transactions on that bus if the OIU is BC on that bus. If the OIU is BC on a bus, it will try to send a command for an AD using the prime channel. If the OIU receives no status message from that AD, it tries again on the prime channel, then it tries on the alternate channel. If the AD has not responded, it declares failure and stops trying to send a command to that AD. When the OIU is RT on a bus, it will respond on either channel, depending on which channel received a transaction from the BC; therefore, the channel indication has no meaning when the OIU is RT on a bus.

Item 18: SPARE CMD: an indexed command that allows performing the following internal OIU function mapping:

- Item 18 + 1: Change FGB MDM active device to FGB-2 MDM physical device\*.
- Item 18 + 2: Change FGB MDM active device to FGB-1 MDM physical device\*.
- Item 18 + 3: Change Node 1 MDM active device to N1-2 MDM physical device\*.
- Item 18 + 4: Change Node 1 MDM active device to N1-1 MDM physical device\*.
- Item 18 + 5: Move FGB -2 MDM physical device to OIU Bus 4 \*.
- Item 18 + 6: Move FGB -2 MDM physical device to OIU Bus 3 \*.
- Item 18 + 7: Move FGB -1 MDM physical device to OIU Bus 4 \*.
- Item 18 + 8: Move FGB -1 MDM physical device to OIU Bus 3 \*.
- Item 18 + 9: Move N1-1 MDM physical device to OIU Bus 4 \*.
- Item 18 + 10: Move N1-1 MDM physical device to OIU Bus 3 \*.
- Item 18 + 11: Move N1-2 MDM physical device to OIU Bus 4 \*.
- Item 18 + 12: Move N1-2 MDM physical device to OIU Bus 3 \*.
- Item 18 + 13: Change GNC MDM active device to GNC-2 MDM physical device.
- Item 18 + 14: Change GNC MDM active device to GNC-1 MDM physical device.
- Item 18 + 15: Move GNC-1 MDM physical device to OIU Bus 4 (LB ORB N2-2).
- Item 18 + 16: Move GNC-1 MDM physical device to OIU Bus 3 (LB ORB N2-1).
- Item 18 + 17: Move GNC-2 MDM physical device to OIU Bus 4 (LB ORB N2-2).
- Item 18 + 18: Move GNC-2 MDM physical device to OIU Bus 3 (LB ORB N2-1).

Items accompanied by “ \* ” are not used on STS-117.

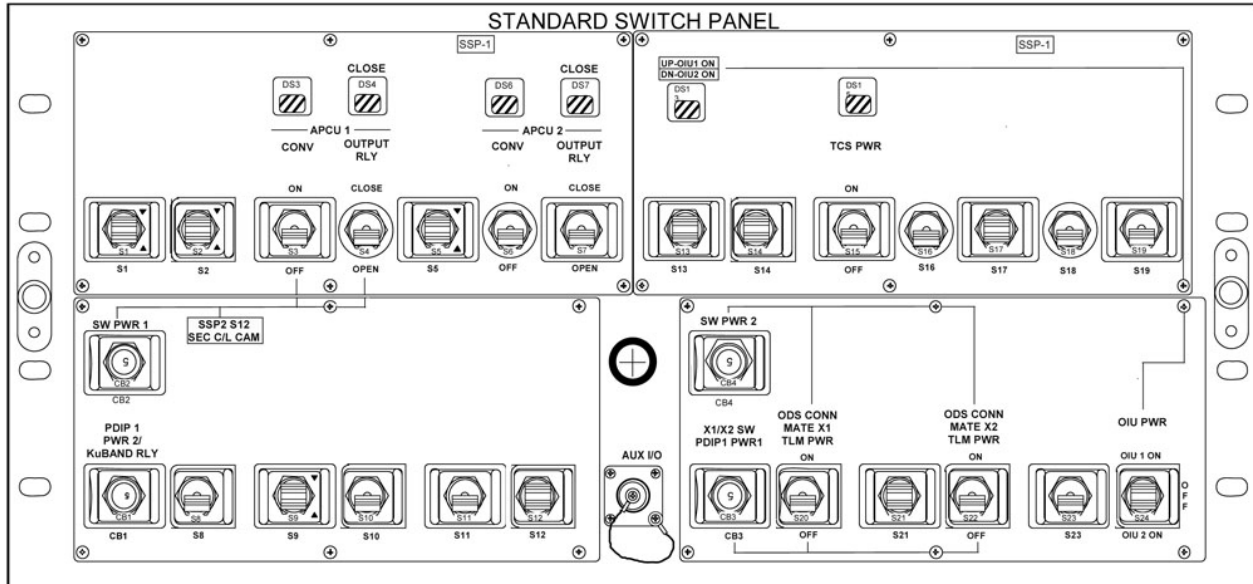


Figure 1. Standard Switch Panel 1.

ITEM	DEVICE TYPE	FUNCTION
CB2 SW PWR 1	Circuit breaker, 5 amp	closed (in) - Applies orbiter CAB PL1 power to SSP1 S3 and S4, and SSP2 S12. open (out) - Removes power from SSP1 S3 and S4, and SSP2 S12.
CB1 PDIP 1 PWR 2/ KuBAND RLY	Circuit breaker, 5 amp	closed (in) - Applies orbiter CAB PL2 power to the PDIP1 DC PWR 2 outlet and KuBAND RATE switch. open (out) - Removes power from PDIP DC PWR 2 outlet and KuBAND RATE switch.
S3 APCU 1 CONV	Toggle switch, two - position (Maintained - Maintained)	ON (up) - Applies power to the APCU 1 converter OFF (dn) - Removes power from the APCU 1 converter
DS3 APCU 1 CONV	Event indicator, two - position	gray - Indicates APCU 1 converter powered bp - Indicates APCU 1 converter not powered
S4 APCU 1 OUTPUT RLY	Toggle switch, two - position (Maintained - Maintained)	CLOSE (up) - Closes the APCU 1 output relay OPEN (dn) - Opens the APCU 1 output relay

Continuation of Table ...

ITEM	DEVICE TYPE	FUNCTION
DS4 APCU 1 OUTPUT RLY	Event indicator, two - position	gray - Indicates APCU 1 output relay is closed bp - Indicates APCU 1 output relay is open
S6 APCU 2 CONV	Toggle switch, two - position (Maintained - Maintained)	ON (up) - Applies power to the APCU 2 converter OFF (dn) - Removes power from the APCU 2 converter
DS6 APCU 2 CONV	Event indicator, two - position	gray - Indicates APCU 2 converter powered bp - Indicates APCU 2 converter not powered
S7 APCU 2 OUTPUT RLY	Toggle switch, two - position (Maintained - Maintained)	CLOSE (up) - Closes the APCU 2 output relay OPEN (dn) - Opens the APCU 2 output relay
DS7 APCU 2 OUTPUT RLY	Event indicator, two - position	gray - Indicates APCU 2 output relay is closed bp - Indicates APCU 2 output relay is open
DS13	Event indicator, three - position	UP - Indicates that CAB PL3 power is being supplied to OIU 1. bp - Indicates power is removed from OIU 1 and OIU 2. DN - Indicates that AUX PLB power is being supplied to OIU 2.
S15 TCS PWR	Toggle switch, two - position (Maintained - Maintained)	ON (up) - Applies power to TCS. OFF (dn) - Removes power from TCS.
DS15 TCS PWR	Event indicator, two - position	gray - Indicates TCS powered. bp - Indicates TCS not powered.
CB4 X1/X2 SW	Circuit breaker, 5 amp	closed (in) - Applies orbiter CAB PL3 power to SSP1 S20 and S22. open (out) - Removes power from SSP1 S20 and S22.

**STANDARD SWITCH PANEL 1**

(ASSY OPS/1E/FIN/MULTI E)

Continuation of Table ...

ITEM	DEVICE TYPE	FUNCTION
<p>CB3 X1/X2 SWITCH PDIP1 PWR 1</p>	<p>Circuit breaker, 5 amp</p>	<p>closed (in) - Applies orbiter CAB PL2 to PDIP1 DC PWR 1 outlet and redundant power to SSP1 S20 and S22. open (out) - Removes power from PDIP DC PWR 1 outlet and redundant power from SSP1 S20 and S22.</p>
<p>S20 ODS CONN MATE X1 TLM PWR</p>	<p>Toggle switch, two - position (Maintained - Maintained)</p>	<p>ON (up) - Supplies CAB PL2 and CAB PL3 power for PMA 2 X1 connector mate signal. OFF (dn) - Removes power for PMA 2 X1 connector mate signal.</p>
<p>S22 ODS CONN MATE X2 TLM PWR</p>	<p>Toggle switch, two - position (Maintained - Maintained)</p>	<p>ON (up) - Supplies CAB PL2 and CAB PL3 power for PMA 2 X2 connector mate signal. OFF (dn) - Removes power for PMA 2 X2 connector mate signal.</p>
<p>S24 OIU PWR</p>	<p>Toggle switch, three - position (Maintained - Maintained - Maintained)</p>	<p>OIU 1 ON (up) - Provides CAB PL3 power to OIU 1. OFF (ctr) - Removes power from OIU 1 and OIU 2. OIU 2 ON (dn) - Provides AUX PLB power to OIU 2.</p>

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# STANDARD SWITCH PANEL 2

(ASSY OPS/1E/FIN/MULTI E)

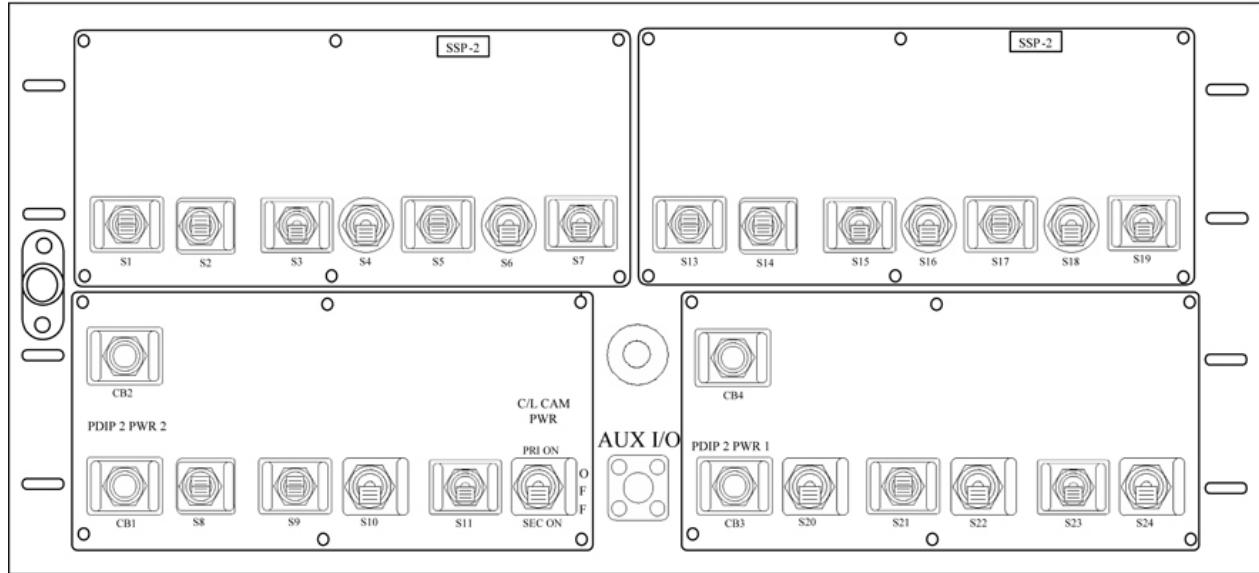


Figure 1. Standard Switch Panel 2.

Item	Device Type	Function
CB1 PDIP 2 PWR 2	Circuit breaker, 5 amp	closed (in) - Applies orbiter CAB PL2 power to PDIP2 DC PWR 1 outlet. open (out) - Removes power from PDIP2 DC PWR 1 outlet.
S12 C/L CAM PWR	Momentary switch	PRI - Applies CAB PL3 power to PRI C/L CAM. SEC - Applies CAB PL 1 power to SEC C/L CAM.
CB3 PDIP 2 PWR 1	Circuit breaker, 5 amp	closed (in) - Applies orbiter CAB PL2 power to PDIP2 DC PWR 1 outlet open (out) - Removes power from PDIP2 DC PWR 1 outlet.

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