

03.104 CDRA Failure

(03. HSS/VA Procedure)

OBJECTIVE:

To replace the Zeolite 5A and 13X Filters on the Carbon Dioxide Removal Assembly (CDRA).
To remove trapped CO₂ and H₂O from saturated Zeolite filters for recycle and reuse.

EQUIPMENT:

Zeolite 5A filter (will be gathered during the procedure)
Zeolite 13X filter (will be gathered during the procedure)
Zeolite Regeneration Unit
Flashlight
Shop vacuum
Portable anemometer
PPE safety glasses
PPE gloves
PPE static wrist tether
2x Orange caution cone

REFERENCES:

Serial Number Tracking Spreadsheet
Airflow Tracking Spreadsheet

NOTE

The CDRA requires the use of the Fan Dampener Assembly (FDA) for proper operation. The assembly prevents particulate matter from interfering with the infrared sensor and damaging the sampling pump. If the filter becomes clogged, the assembly must be replaced.

NOTE

See parameters tab in HSS display to determine which canister will need to be replaced. 5A is for CO₂ removal and 13X is for H₂O removal.

1. DEACTIVATE MAIN CABIN FANS

NOTE

The sounds of the Main Cabin Fans 1 and 2 and the TCCS Auxiliary Fans will diminish as each are turned off. The TCCS Auxiliary Fans status can also be observed due to loss of vibration by touching each of the fan housing bodies.

- 1.1 Open HSS on Surface Pro and navigate to CDRA tab.

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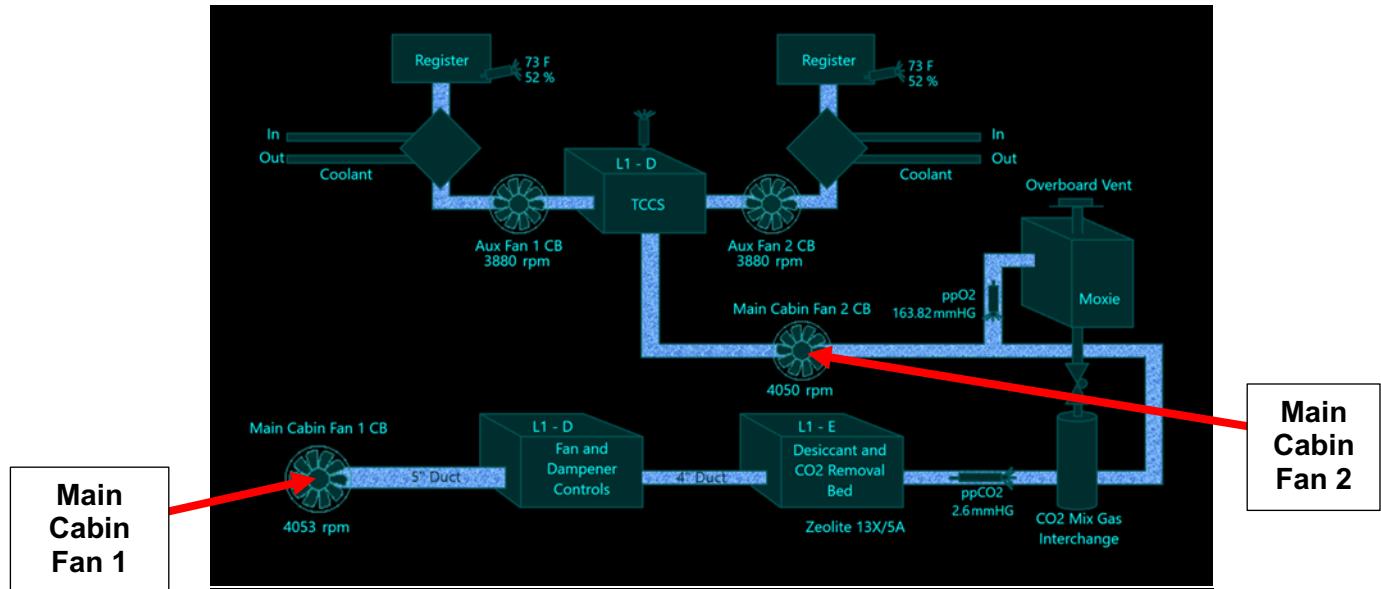


Figure 1: Main Cabin Fan Power Switches in HSS CDRA

1.2 On HSS CDRA display, touch Main Cabin Fan 1 icon to deactivate fan. (see Figure 1)
1.2.1 Verify fan has audibly shutoff.

1.3 On HSS CDRA display, touch Main Cabin Fan 2 icon to deactivate fan. (see Figure 1)
1.3.1 Verify fan has audibly shutoff.

2. DEACTIVATE AUX CABIN FANS

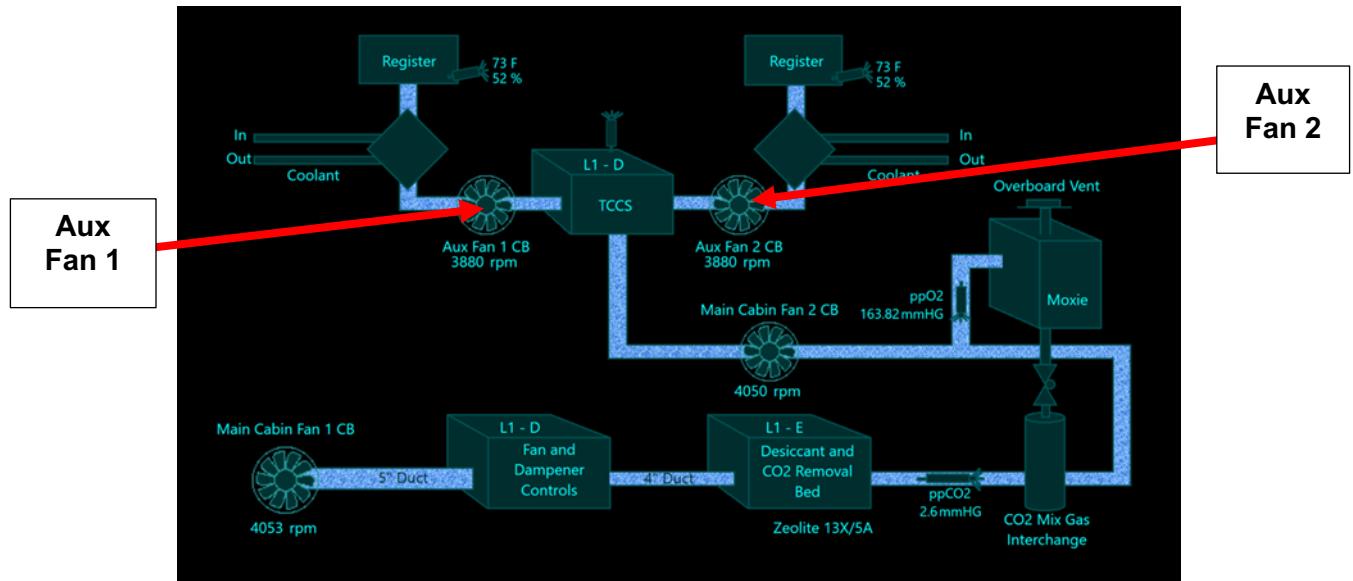


Figure 2: Aux Cabin Fan Power Switches in HSS CDRA

2.1 On HSS CDRA display, touch Aux Cabin Fan 1 icon to deactivate fan (see Figure 2).

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- 2.2 On HSS CDRA display, touch Aux Cabin Fan 2 icon to deactivate fan (see Figure 2).
- 2.3 Move stowage as necessary in order to access the TCCS Panel.
- 2.4 On TCCS Panel, switch power switches of Aux Cabin Fan 1 and Aux Cabin Fan 2 to "OFF" (see Figure 3).



Figure 3: Trace Contaminant Control Subassembly (TCCS) Panel

3. DEACTIVATE FAN DAMPENER ASSEMBLY (FDA)

- 3.1 Remove sliding floor panel 1D and temp stow.
- 3.2 Place orange caution cone next to open work area L1D subfloor to warn other crewmembers.
- 3.3 Don gloves and safety glasses.
- 3.4 Don static wrist tether and attach to any unpainted metallic surface.

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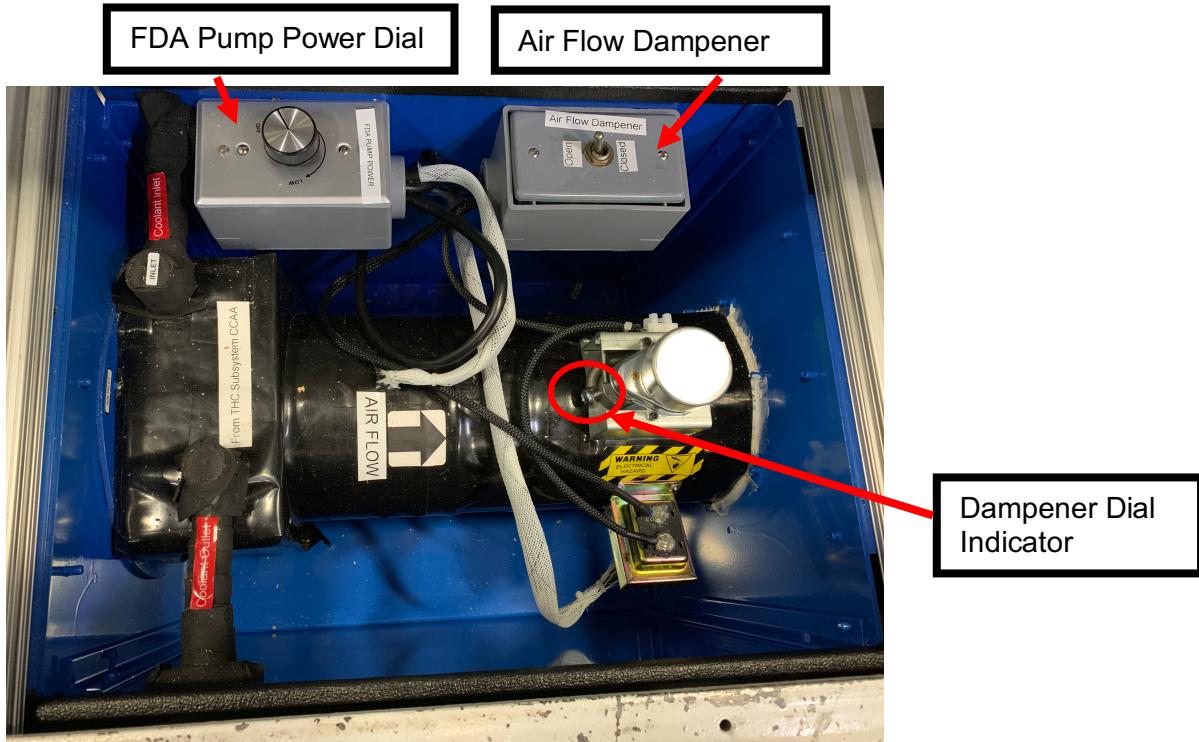


Figure 4: Fan Dampener Assembly (FDA) Pump

- 3.5 Turn FDA Pump Power Dial counterclockwise to "OFF". (see Figure 4) Listen for a click.

NOTE

Read step 3.7 before executing 3.6. Step 3.7 is time dependent and can be missed if not actively watching the Dampener Dial Indicator.

- 3.6 Flip Air Flow Dampener switch to "Closed". (see Figure 4)
- 3.7 Confirm Dampener Dial Indicator (metal Philips head screw with spring attached) rotates to fully closed. (see Figure 4)
- 3.8 Detach static wrist tether.

L1E Subf 4. REMOVE SATURATED ZEOLITE 5A AND 13X FILTERS

- 4.1 Remove floor panel 1E and temp stow. Place orange cone next to 1E.
- 4.2 Attach static wrist tether to any unpainted metallic surface.

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Figure 5: Zeolite Filter Assembly

- 4.3 Inspect filter assembly with flashlight for debris and clean as necessary with shop vacuum. (see Figure 5)
- 4.4 Remove Zeolite 5A Filter from filter assembly Location 2.
- 4.5 Record number of used Zeolite 5A Filter S/N in the Serial Number Tracking Spreadsheet.
- 4.6 Remove Zeolite 13X Filter from filter assembly Location 1.
- 4.7 Record in Serial Number Tracking Spreadsheet.
- 4.8 Detach static wrist tether from metallic surface.

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5. RETRIEVE CLEAN ZEOLITE 5A AND 13X FILTERS

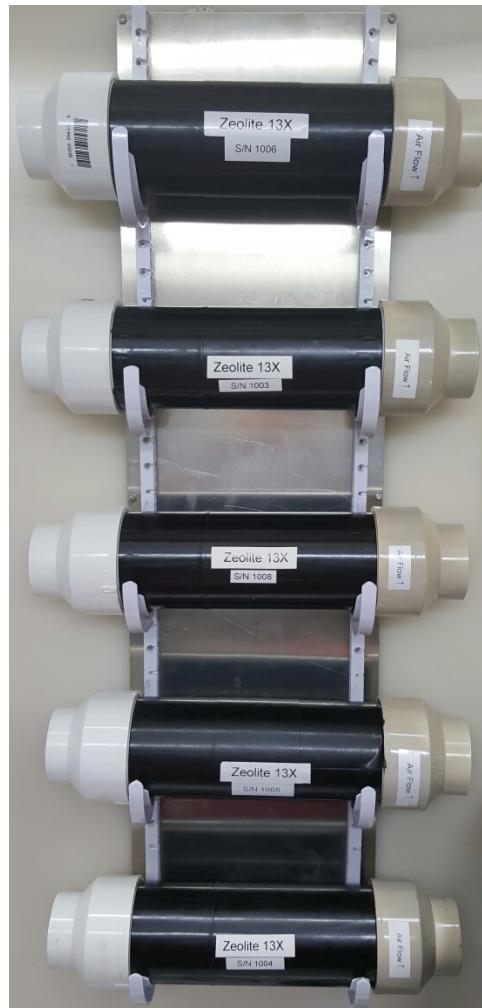


Figure 6: Zeolite Canister Rack

- 5.1 Remove QTY 1 clean Zeolite 5A Filter from Zeolite Rack located on Airlock Module Wall C. (see Figure 6)
 - 5.1.1 Set used Zeolite 5A Filter aside to be regenerated later in the procedure.
- 5.2 Inspect clean Zeolite 5A Filter with flashlight for damage/debris.
- 5.3 Remove QTY 1 clean Zeolite 13X Filter from Zeolite Rack located on Airlock Module Wall C. (see Figure 6)
 - 5.3.1 Set used Zeolite 13X Filter aside to be regenerated later in the procedure.
- 5.4 Inspect clean Zeolite 13X Filter with flashlight for damage/debris.

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6. INSERT CLEAN ZEOLITE 5A AND 13X FILTERS

- 6.1 Attach static wrist tether to any unpainted metallic surface near floor panel 1E.
- 6.2 Inspect interior of hose and filter assembly with flashlight for debris and clean as necessary with shop vacuum.
- 6.3 Insert clean Zeolite 5A Filter to filter assembly Location 2.
- 6.4 Record in Serial Number Tracking Spreadsheet.
- 6.5 Confirm clean Zeolite 5A Filter has same air flow direction as FDA.
- 6.6 Insert clean Zeolite 13X Filter to filter assembly Location 1.
- 6.7 Record in Serial Number Tracking Spreadsheet.
- 6.8 Confirm clean Zeolite 13X Filter has same air flow direction as FDA.
- 6.9 Replace floor panel 1E and safely latch.
- 6.10 Detach static wrist tether.

NOTE

The CO₂ and H₂O from the Zeolite filters will be added to the reactants and products respectively for the Sabatier process as a means to create a closed-loop cycle for cabin air on POLARIS. Start the Sabatier process and have it running while you complete the procedures.

7. PUT SABATIER IN STANDBY MODE

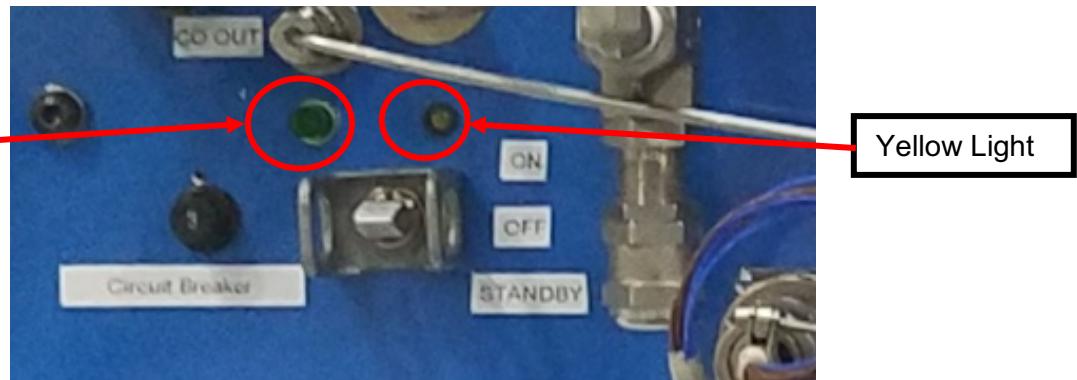


Figure 7: Sabatier Panel

- 7.1 On the Sabatier Panel, move the power switch to “STANDBY”. (see Figure 7)
- 7.2 Confirm yellow light blinks indicating Sabatier is in Standby mode. (see Figure 7)

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GMWS 8. ASSEMBLE ZEOLITE REGENERATION UNIT TO SABATIER

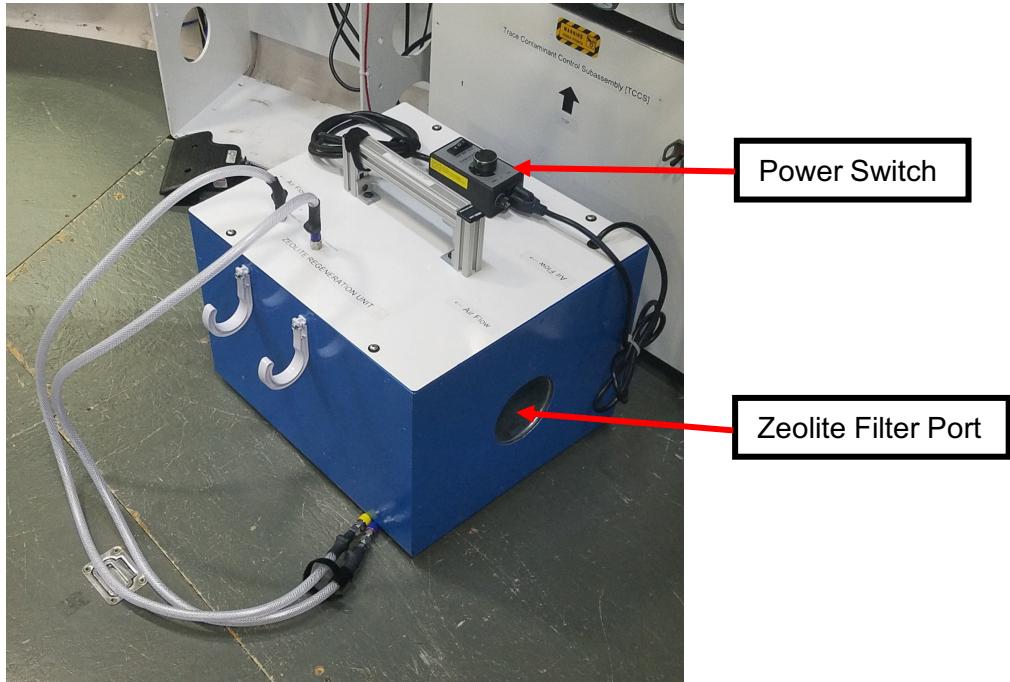


Figure 8: Zeolite Regeneration Unit (ZRU)

- 8.1 Move Zeolite Regeneration Unit (ZRU) in front of Sabatier. (see Figure 8)
- 8.2 Don static wrist tether and attach to unpainted metallic surface.
- 8.3 Unfurl the CO₂ (yellow taped) and H₂O (blue taped) hoses and quick disconnects (QDs).
- 8.4 Connect yellow QD to yellow port on Sabatier.
- 8.5 Confirm the yellow QD fully snaps into place by audible click sound and giving the hose a slight tug.
- 8.6 Connect blue QD to blue port on Sabatier.
- 8.7 Confirm the blue QD fully snaps into place by audible click sound and giving the hose a slight tug.

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Figure 9: ZRU Power Switch

- 8.8 Confirm power switch on ZRU is in the “OFF” position. (see Figure 9)
- 8.9 Unfurl power cable and plug power cable into outlet strip on right of Sabatier. (see Figure 10)
- 8.10 Detach static wrist tether from metallic surface.

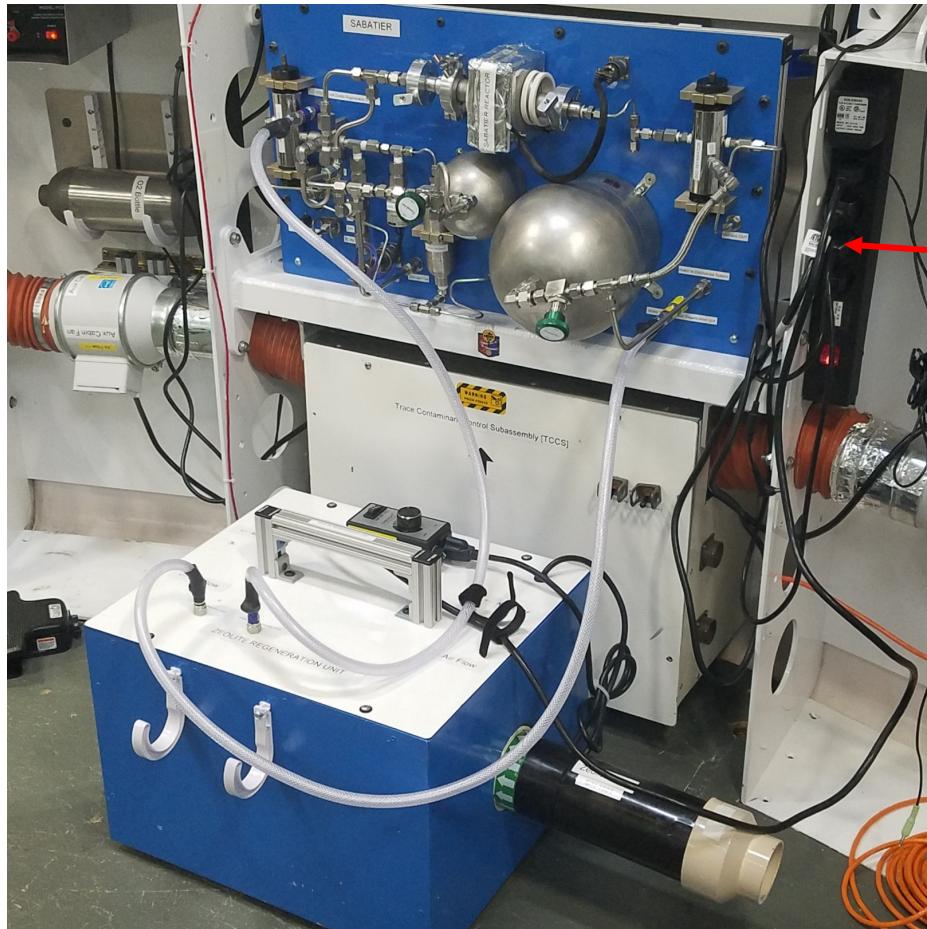


Figure 10: ZRU Unit Connected to Power Strip

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9. INSERT SATURATED ZEOLITE 5A AND 13X FILTERS INTO ZRU

- 9.1 Attach static wrist tether to unpainted metallic surface.
- 9.2 Temp stow Zeolite 13X filter.
- 9.3 Insert Zeolite 5A filter into ZRU port. (see Figure 8 and Figure 10)
- 9.4 Confirm air flow arrows on Zeolite 5A filter are correct.
- 9.5 Power on ZRU to “FULL” power (see Figure 9).
- 9.6 Detach static wrist tether from metallic surface.
- 9.7 Notify MCC, via Mission Log, that ZRU power on.
- 9.8 Set timer for 10 minutes to ensure ZRU removes all absorbed CO₂ and H₂O.
- 9.9 Attach static wrist tether to unpainted metallic surface.
- 9.10 Power off ZRU. (see Figure 9)
- 9.11 Swap Zeolite 5A filter with Zeolite 13X filter.
- 9.12 Confirm air flow arrows on Zeolite 13X filter are correct.
- 9.13 Temp stow Zeolite 5A filter.
- 9.14 Power on ZRU to “FULL” power. (see Figure 9)
- 9.15 Detach static wrist tether from metallic surface.
- 9.16 Notify MCC, via Mission Log, that ZRU power on.

NOTE

While the used filters are being regenerated, continue on with the procedure.

10. ACTIVATE FDA PUMP

NOTE

FDA Pump Power Dial can be set from Low to High. When on, always leave dial set to medium.

- 10.1 Attach Static wrist tether to an unpainted metallic surface near floor panel 1D.
- 10.2 Flip Air Flow Dampener switch to “OPEN” (see Figure 4).

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10.2.1 Check that the Dampener Dial Indicator (metal Philips head screw with spring attached) rotates to fully open (see Figure 4).

10.3 Turn FDA Pump Power Dial to “ON” by rotating clockwise. After hearing click, stop rotation at Midpoint. (see Figure 4).

11. ACTIVATE MAIN CABIN FANS

11.1 On HSS CDRA display, touch Main Cabin Fan 1 icon to activate fan. (see Figure 1)
11.1.1 Verify fan has audibly turned on.

11.2 On HSS CDRA display, touch Main Cabin Fan 2 icon to activate fan. (see Figure 1)
11.2.1 Verify fan has audibly turned on.

11.3 Replace floor panel 1D and safely latch.

11.4 Detach and doff static wrist tether.

12. ACTIVATE AUX CABIN FANS

12.1 On TCCS Panel, flip power switches of Aux Cabin Fan 1 and Aux Cabin Fan 2 to “ON”.
(see Figure 3)

12.2 Move stowage as necessary in order to access the TCCS Panel.

12.3 On HSS CDRA display, touch Aux Cabin Fan 1 icon to activate fan. (see Figure 2)

12.4 On HSS CDRA display, touch Aux Cabin Fan 2 icon to activate fan. (see Figure 2)

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13. PERFORM ECLSS VENT CHECK



Figure 11: Cabin Output Vent C/D

Figure 12: Cabin Output Vent D/E

- 13.1 Gather portable anemometer and take reading in m/s of exhaust flow at cabin output vents C/D and D/E (Figures 11 and 12). Hold anemometer within an inch of the vent for 20 seconds to gather an accurate reading and record the highest reading, day, and time in Airflow Tracking Spreadsheet.
- 13.2 Confirm airflow is within expected range. (Reading should be greater than 0.5 m/s.)
- 13.3 Doff PPE gloves and safety glasses. Stow all equipment including orange caution cones.

14. PUT SABATIER IN STANDBY MODE

- 14.1 Don PPE safety glasses.
- 14.2 Don PPE gloves.

15. RETRIEVE SATURATED ZEOLITE 5A AND 13X FILTERS

- 15.1 Wait 10 minutes to ensure ZRU removes all adsorbed CO₂ and H₂O.
- 15.2 Attach static wrist tether to unpainted metallic surface.
- 15.3 Power off ZRU (see Figure 9).
- 15.4 Remove ZRU power cable plug from outlet strip to right of Sabatier.

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- 15.5 Furl power cord and use Velcro tie to secure.
- 15.6 Disconnect blue QD from Sabatier.
- 15.7 Disconnect yellow QD from Sabatier.
- 15.8 Furl hoses and QDs together around stow hooks and use Velcro tie to secure.
- 15.9 Remove Zeolite 13X filter from ZRU.
- 15.10 Doff static wrist tether.

ALC 16. RETURN RECYCLED ZEOLITE FILTERS TO AIRLOCK

- 16.1 Attach recycled Zeolite 5A filter to Zeolite Rack located on Airlock Module Wall C.
- 16.2 Attach recycled Zeolite 13X filter to Zeolite Rack located on Airlock Module Wall C.

GMWS 17. RETURN SABATIER TO ON CONFIGURATION

- 17.1 Switch Sabatier to “ON”. (see Figure 7)
- 17.2 Confirm green light illuminates indicating Sabatier is in “On” mode.
- 17.3 Doff all PPE and stow.