Space Shuttle Program
FLIGHT DATA FILE

JSC-48089-116

Spacehab Operations Checklist

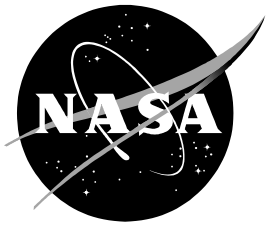
STS-116

Mission Operations Directorate
Operations Division

Final
October 27, 2006

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



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SMS FDF CHANGE NOTIFICATION

SIM PACK

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SMS UNIQUE? ☒ YES ☐ NO

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FABRICATED ITEM CHANGE? ☒ NONE ☐ CUE CARDS ☐ TRANSPARENCIES ☐ Other _____

INSTRUCTIONS TO USER:

Remove pages 1-1 thru 1-10 and replace with pages 1-1 thru 1-12

AUTHORITY FOR CHANGE* (Approved 482 numbers, approved issue at print shop, supervisors deem mandatory, etc.):

Supervisor Deems Mandatory

*Refer to Crew Procedures Management Plan

OTHER AFFECTED FDF BOOKS

None

Are all SIM PACKS submitted? ☒ YES ☐ NO

IMPLEMENTATION REQUIREMENTS

☐ Limited Distribution (List in comments)

☐ NO EARLIER THAN (Date and/or Sim ID) _____

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COMMENTS:

MISSION OPERATIONS DIRECTORATE

SPACEHAB OPERATIONS CHECKLIST
STS-116

FINAL
October 27, 2006

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LIST OF EFFECTIVE PAGES

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REV B	06/14/06
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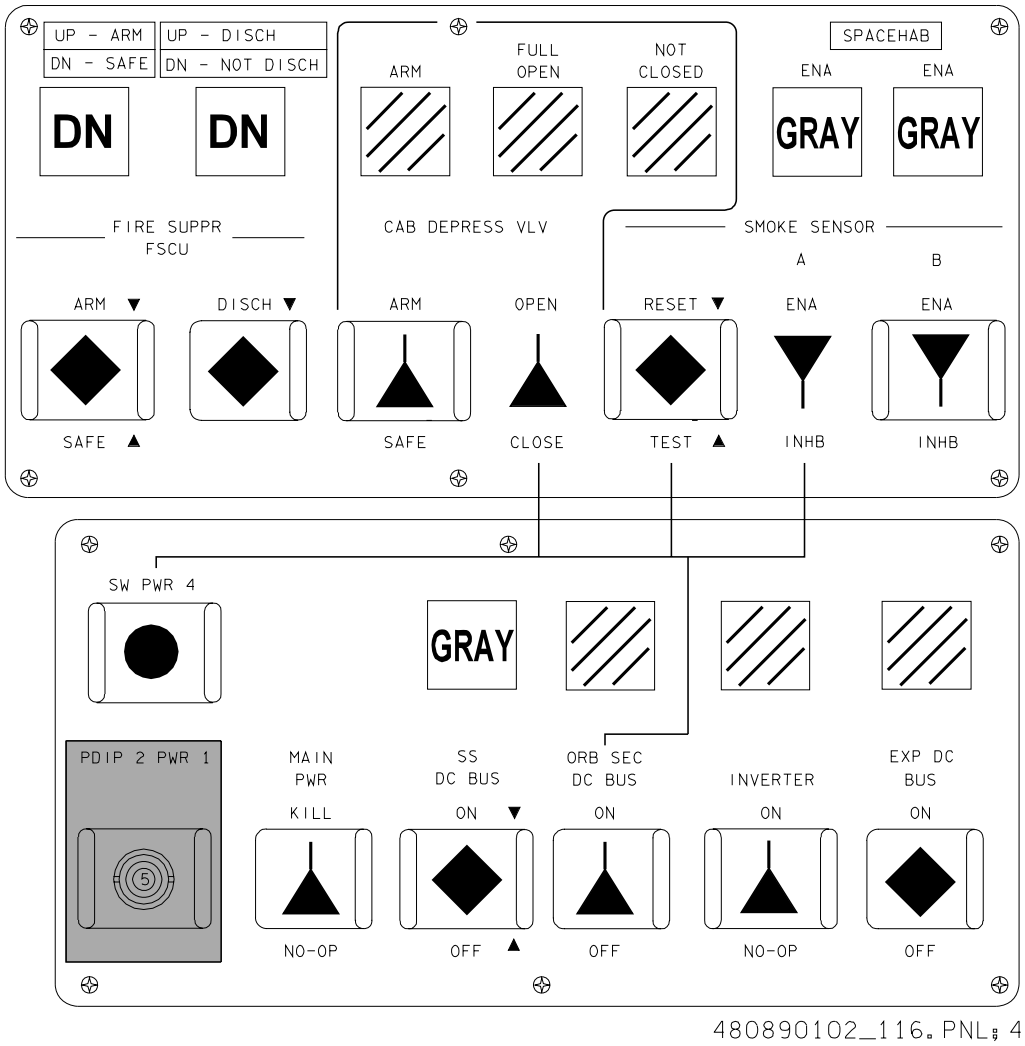
ORBITER FLOW PROP VLVS VERIFICATION

L1 1. √FLOW PROP VLV LOOP 1,2 (two) – ctr (tb-ICH)

PREACTIVATION CHECKOUT

R1 2. √PL PRI MNC – ctr (tb-ON)
3. √AUX – ON
4. √AFT MNB – ON
5. √CAB – MNA

SSP 2 6. Verify SSP 2 config as shown below:



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SSP 1 7. √cb SW PWR 2 – op
8. √ORB H2O LINE HTR PWR A – OFF (B ENA)
9. √B – OFF (A ENA)

SMOKE SENSOR A TEST – CONCENTRATION

SM 215 SPACEHAB ECS

CRT 10. √FIRE SMOKE CONC A,B (two): -0.1 to 0.5

SSP 2 11. SMOKE SENSOR B – INHB (tb-bp)

NOTE

Expect MASTER ALARM, siren, and FDA '215 SH SMOKE A' msg

12. SMOKE SENSOR – TEST (hold 10 sec, release)

L1 13. √DETECTION B PAYLOAD lt – PAYLOAD lt on

SSP 2 14. SENSOR – RESET

L1 15. √DETECTION B PAYLOAD lt – lt off

SMOKE SENSOR A TEST – RATE

NOTE

Expect MASTER ALARM, siren, and FDA '215 SH SMOKE A' msg

SSP 2 16. SMOKE SENSOR – TEST (hold until alarm ~25 sec)

L1 17. √DETECTION B PAYLOAD lt – PAYLOAD lt on

SSP 2 18. SENSOR – RESET

L1 19. √DETECTION B PAYLOAD lt – lt off

SSP 2 20. SENSOR B – ENA (tb-gray)

SMOKE SENSOR B TEST – CONCENTRATION

SM 215 SPACEHAB ECS

CRT 21. √FIRE SMOKE CONC A,B (two): -0.1 to 0.5

SSP 2 22. SMOKE SENSOR A – INHB (tb-bp)

NOTE

Expect MASTER ALARM, siren, and FDA '215 SH SMOKE B' msg

23. SMOKE SENSOR – TEST (hold 10 sec, release)

L1 24. √DETECTION B PAYLOAD lt – PAYLOAD lt on

SSP 2 25. SENSOR – RESET

L1 26. √DETECTION B PAYLOAD lt – lt off

SMOKE SENSOR B TEST – RATE

NOTE

Expect MASTER ALARM, siren, and FDA '215 SH SMOKE B' msg

SSP 2 27. SMOKE SENSOR – TEST (hold until alarm ~25 sec)

L1 28. √DETECTION B PAYLOAD lt – PAYLOAD lt on

SSP 2 29. SENSOR – RESET

L1 30. √DETECTION B PAYLOAD lt – lt off

SSP 2 31. SENSOR A – ENA (tb-gray)

ECS ACTIVATION

SM 215 SPACEHAB ECS

CRT 32. √WFCEU MODE THERM, ITEM 1 – (*****)

NOTE

Expect SM ALERT, '215 SH WFCEU MODE' msg
Expect ↓ next to ITEM 1 on SPEC 215
May take up to 1 min before alarm annunciates

33. WFCEU MODE HX IN – ITEM 2 EXEC (no feedback)
34. √CMD REC – YES (for 5 sec)
35. MTR 1 ON – ITEM 32 EXEC (no feedback)
36. √WFCEU CMD REC – YES (for 5 sec)

SM 214 SPACEHAB ACT/DEAC

37. FANS CABIN ORB – ITEM 66 EXEC (*****)

EPS ACTIVATION

SSP 2
38. ORB SEC DC BUS – ON (tb-gray)
39. EXP DC BUS – ON (tb-gray)
40. – ctr

SM SYS SUMM 1

CRT
41. √DC VOLTS MN C > 24 and < 32

SM 214 SPACEHAB ACT/DEAC

42. √BUS EMER VOLTS > 24 and < 32
43. √AUX A AMPS ≥ 0 and < 7
44. √AFT B AMPS ≥ 0 and < 7
45. √MAIN VOLTS > 24 and < 32
46. √SEC VOLTS > 24 and < 32
47. √EXP VOLTS > 24 and < 32
48. √SS AMPS > 0 and < 98
49. √WFCEU VOLTS > 24 and < 32
50. Configure Spacehab power buses on SPEC 214 per the following table:

DC	ON		OFF	
INVERTER	1		2	*
EXP BUS	3	*	4	
EXCP 1/2	5	*	6	
3	7		8	*
4	9		10	*
5	11		12	*
6	13		14	*
DM FN/LT	15		16	*
RACK 1	17		18	*
2	19		20	*
UTIL AFT	21		22	*
FWD	23	*	24	
SPARE	25		26	*
PTB/CCTV	27	*	28	
LIGHTS	29		30	
AC				
UTIL	41		42	*
RACK 1	43		44	*
2	45		46	*
SPARE 1	47	*	48	
2	49		50	*

CAUTION AND WARNING CONFIG

SH PPO2 1

R13U

51. C/W PARAM SEL tw (three) – 065
52. PARAM – ENA
53. PARAM STATUS – INH, hold
54. √STATUS lt 065 – off

SH PPCO2 1

55. C/W PARAM SEL tw (three) – 075
56. PARAM – ENA
57. PARAM STATUS – INH, hold
58. √C/W PARAM STATUS lt 075 – off

SH ARS FAN DP 2

59. C/W PARAM SEL tw (three) – 085
60. PARAM – ENA
61. PARAM STATUS – INH, hold
62. √STATUS lt 085 – off

SH CABIN TOTAL PRESSURE

63. C/W PARAM SEL tw (three) – 095
64. PARAM – ENA
65. PARAM STATUS – INH, hold
66. √STATUS lt 095 – off
67. PARAM SEL tw (three) – 120

FLIGHT DECK CUE CARD SETUP

68. Remove two cue cards from Ziplock Bag in back of SH OPS:
    HAZARDOUS SPILL RESPONSE - SPACEHAB MODULE deploy on flight deck (crew preference)
    HAZARDOUS SPILL RESPONSE - ORBITER CABIN (WITH SPACEHAB MODULE HATCH OPEN) deploy on flight deck (crew preference)

MIDDK

1. Unstow from Middeck Bag “D”:
   Spacehab Booster Fan Bypass duct
   Plastic Ties (green) (six each)
   Cap (3”)
   Velcro Straps (black) (twelve each)

EXT A/L

2. Disconnect Airlock/Tunnel Adapter I/F Duct from Airlock Floor Fitting (See Figure 1-1)
3. Install Cap (3”) on Airlock floor fitting

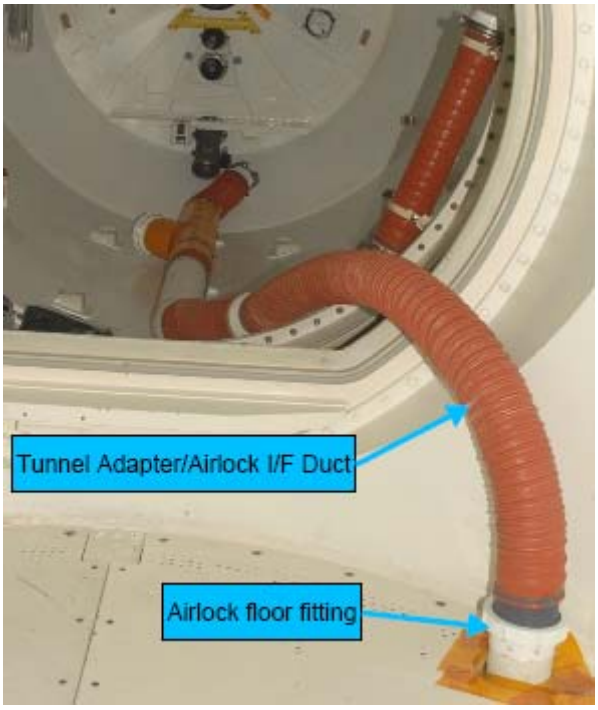

Figure 1-1.- Airlock/Tunnel Adapter I/F Duct (view looking aft from Airlock)

TNL ADP (fwd)

4. Cut Plastic Tie (green) aft of reducer of Airlock/Tunnel Adapter I/F Duct (See Figure 1-2)

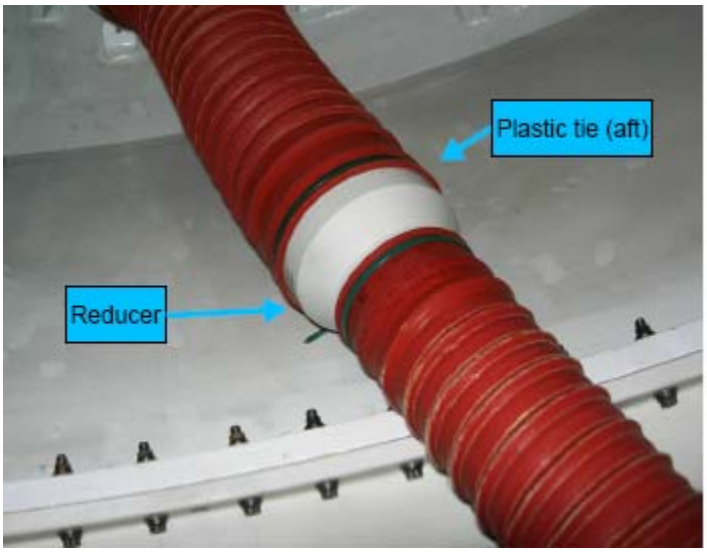

Figure 1-2.- Airlock/Tunnel Adapter I/F Duct reducer (view looking aft into Tunnel Adapter from Airlock)

TNL ADP (fwd)

5. Remove Flex Duct (3”) with reducer (See Figure 1-3) and stow in STBD straps of Tunnel Extension (near Booster Fan)

Figure 1-3.- Airlock/Tunnel Adapter I/F Duct reducer removal (view looking aft into Tunnel Adapter from Airlock)

6. Connect Booster Fan Bypass Duct for Spacehab to Tunnel Adapter Duct (4”) via Male/Male splice. Secure with Plastic Tie (See Figure 1-4 and 1-5)

7. Route Booster Fan Bypass Duct for Spacehab to middeck and secure with Velcro straps

Figure 1-4.- Aft end of Booster Fan Bypass duct for Spacehab (Note: No screen)

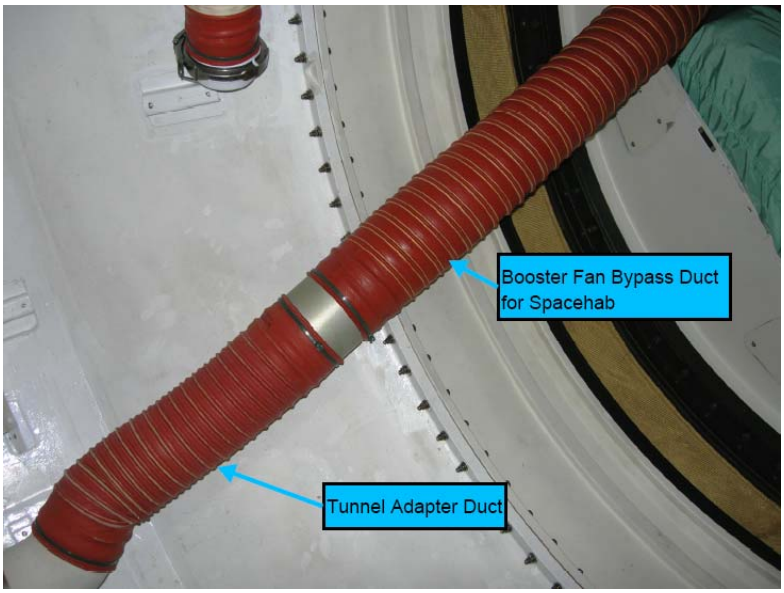

Figure 1-5.- Booster Fan Bypass duct for Spacehab connected to Tunnel Adapter ducting (Port fwd view of Tunnel Adapter)

TUNNEL CONFIG

VERIFY MODULE ENVIRONMENT

SM 214 SPACEHAB ACT/DEAC

CRT 1. DC LIGHTS ON – ITEM 29 EXEC (no feedback)

SM 215 SPACEHAB ECS

2. √HALON MULTI – NO
3. √SINGLE – NO
4. √HAB P > 13.8 and < 15.4 psi
5. √PPO2 1,2 (two) > 2.7 psi

NOTE

Due to an impedance problem, PPCO2 1 is biased causing it to have a lower value

6. √HAB PPCO2 1 < 5.1 mmHg
7. √2 < 7.6 mmHg

SPACEHAB HATCH OPENING AND DUCT CONFIG

TNL ADP (aft) 8. Disconnect tunnel adapter aft flex duct from PL ISOL vlv

9. Remove cap, stow on Velcro pad near valve
10. Reconnect tunnel adapter aft flex duct to PL ISOL vlv

NOTE

Possible FDA 'S66 CABIN O2(N2) FLO 1(2)' msg or dP/dT klaxon alarm

SH Hatch 11. Vent Equal vlv caps (two), remove and stow
12. Equal vlv (two) – NORM
13. √$\Delta P \leq 0.2$ psid

TNL ADP (aft) 14. PL ISOL vlv – OP

15. Open hatch per decal
16. Swing hatch from seal until locked-open catch engaged

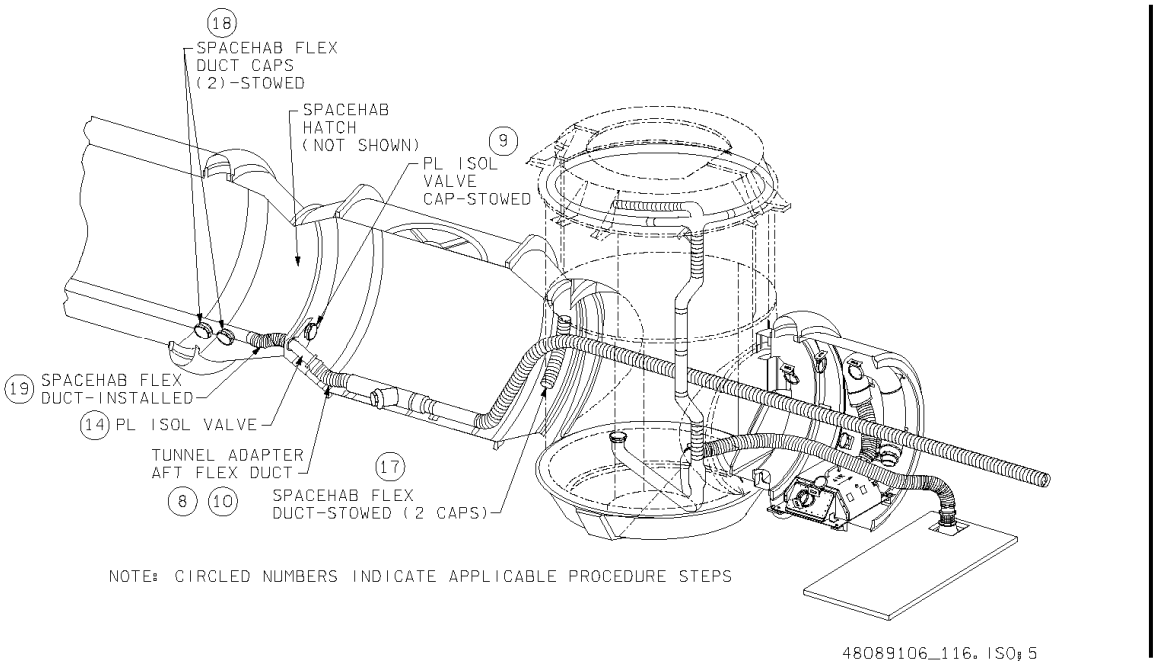

Figure 1-6.- Tunnel config (Activation)

TNL ADP (fwd)

17. Unstow Spacehab flex duct from launch brackets
18. Remove caps (two) from inlet and outlet of flex duct, stow

SH Tunnel

19. Install Spacehab flex duct between tunnel duct inlet and PL ISOL vlv outlet using 3-in overcenter clamps (two)

BPSMU CONFIG

20. Unstow:

MA16D

BPSMU
8-ft BPSMU cable

21. Perform SH BPSMU CONFIG, Cue Card (stowed in back of SH OPS), then:
22. Contact MCC to verify good audio via BPSMU
23. Ingress module

VALVE CONFIG

Fwd Bkhd
1. √CAB DEPRESS vlv – cl
2. NPRV cover (two) – cl

OVHD
3. NPRV cover (two) – cl

MCP LAMP TEST

MCP
4. LAMP TEST – ON (hold)
5. √C&W/FDA lts (six) – lts on
6. √FSS ARMED lt – lt on
7. √FIRE SUPPR DISCH pb – lt on
8. √MAIN PWR KILL pb – lt on
9. √CABIN TEMP (°F) – 88
10. LAMP TEST – OFF
11. √Above lts – off

ARS KILL SW CONFIG

EXCP2
12. ARS – KILL ENA

SEBS CONFIG

NOTE

SEBS should be deployed such that the Mask bag zipper is partially open for quick access and the Mask hose is not blocked by any straps or bungees

FC11
13. Unstrap 0.5 CTB and temp stow near FC11 (crew preference)

FC06
14. Unstow Tissue Box if desired from Subsystem Stow 3 and deploy (crew preference)
15. Unstow foam and attach to Adapter Plate at FC11
16. Unstow SEBS
17. √SEBS gauge needle location consistent with pre-flight marking on Kapton tape

FC11
18. Deploy SEBS and secure with straps
19. Connect SEBS Mask to SEBS

AC11
20. Unstow SEBS from Subsystem Stow 5
21. √SEBS gauge needle location consistent with pre-flight marking on Kapton tape
22. Unstow Clamps (four) and Fixed Long Bungees (two) from Ziplock Bag (in foam cutout)

TNL ADP
23. Deploy SEBS in Tunnel Adapter (fwd port) using Clamps (four) and Fixed Long Bungees (two)
24. Connect SEBS Mask to SEBS

SUPPORT EQUIPMENT DEPLOYMENT

AC11
25. Unstow trash bags (two)
26. Unstow seat track studs and temp stow

AC08
27. Unstow Gray Tape from Subsystem Stow 4
28. Deploy trash bags using Velcro and Gray Tape (crew preference)
29. Temp stow Gray Tape for future use (crew preference)
30. Unstow VW Bag and deploy (crew preference), remove clamps from bag and temp stow

CUE CARD SETUP

SH OPS

31. Remove three cue cards from Ziplock Bag in back of SH OPS:
    SPACEHAB FIRE ALARM attach to Velcro (crew preference)
    HAZARDOUS SPILL RESPONSE – SPACEHAB MODULE attach to Velcro (crew preference)
    HAZARDOUS SPILL RESPONSE – ORBITER CABIN (WITH SPACEHAB MODULE HATCH OPEN) attach to Velcro (crew preference)

SPACEHAB SMOKE SENSOR TEST

32. Notify CDR/PLT: "Smoke Sensor Test in progress, expect Master Alarm"

NOTE

Expect FDA '215 SH SMOKE A,B' msg, MASTER ALARM, Siren (via BPSMU)

MCP

33. SMOKE SENSOR sw – TEST (wait 10 sec)
34. – NORM
35. √MASTER ALARM lt – lt on

BPSMU

36. Verify alarm tone via BPSMU

MCP

37. √SMOKE SENSOR A,B ALARM lt (two) – lt on
38. SMOKE SENSOR sw – RESET
39. √SMOKE SENSOR A,B ALARM lt (two) – lt off
40. √MASTER ALARM lt – lt off

PGSC CHECKOUT

41. Perform SUBSYSTEM PGSC ACTIVATION (ON-ORBIT), then:

If Subsystem PGSC to be powered off for power savings:

Exit Spacehab software:

42. Press [ALT]/[Q] to exit software
43. [Shft]/[F10] to confirm
44. Shut down Windows
45. √Automatic pwr off PGSC
46. Close PGSC

Pwr Supply

47. A31P 28VDC Pwr Supply INPUT POWER sw – OFF (OUTPUT POWER lt off)

48. Notify MCC: SPACEHAB ACTIVATION complete

DOCKING

SPACEHAB PREP FOR DOCKING 2-2
RECONFIG POST DOCKING 2-4

SPACEHAB PREP FOR DOCKING

MODULE CONFIG

If Subsystem PGSC activated:

Exit Spacehab software:

FC06
1. Press [ALT]/[Q] to exit software
2. [Shft]/[F10] to confirm
3. Shut down Windows
4. √Automatic pwr off PGSC
5. Close PGSC

Pwr Supply
6. A31P 28VDC Pwr Supply INPUT POWER sw – OFF (OUTPUT POWER lt off)

EXCP1
7. cb DC3 – OFF

MCP
8. CABIN TEMP SEL tw (two) – 76

OVHD
9. √Viewport Outer Cover closed
10. √Inner Safety Cover installed
11. √HTR – OFF (LED unlit)
12. Temp stow BPSMU on SH side of hatch

SH Hatch
13. Disconnect BPSMU cable QD

TUNNEL CONFIG

NOTE

Debris screen should remain in place once duct is removed

TNL ADP (aft)
14. Disconnect Spacehab flex duct from screen assembly on tunnel duct inlet fitting and PL ISOL vlv outlet
15. Install Spacehab flex duct inlet and outlet caps that were temp stowed

TNL ADP (fwd)
16. Stow Spacehab flex duct in tunnel adapter launch brackets

SH Hatch
17. Close hatch per decal
18. Equal vlv (two) – OFF
19. Install Equal vlv caps (two)

TNL ADP (aft)
20. Disconnect tunnel adapter aft flex duct from PL ISOL vlv
21. Inspect valve/duct seals for lint/debris, clean if necessary
22. Remove PL ISOL vlv cap from Velcro pad located near valve
23. Inspect for debris, clean if necessary and replace inside duct
24. Reconnect tunnel adapter aft flex duct to PL ISOL vlv using 3-in overcenter clamp
25. PL ISOL vlv – CL

26. Relocate SEBS from tunnel adapter to middeck and temp stow

SM 214 SPACEHAB ACT/DEAC

CRT
27. DC LIGHTS OFF – ITEM 30 EXEC (no feedback)

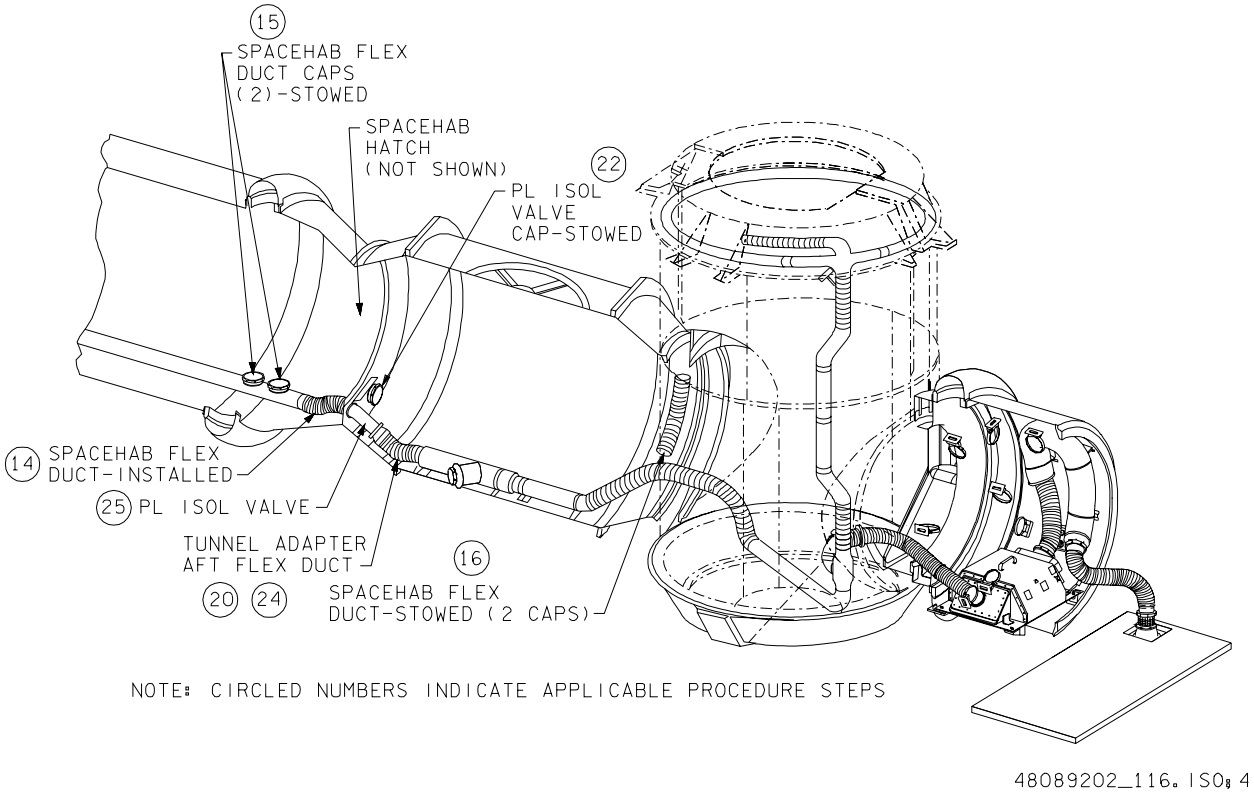

Figure 2-1.- Tunnel config (Prep for Docking)

SPACEHAB RECONFIG POST DOCKING

VERIFY MODULE ENVIRONMENT

SM 214 SPACEHAB ACT/DEAC

CRT
1. DC LIGHTS ON – ITEM 29 EXEC (no feedback)

SM 215 SPACEHAB ECS

2. √HALON MULTI – NO
3. √SINGLE – NO
4. √HAB P > 13.8 and < 15.4 psi
5. √PPO2 1,2 (two) > 2.7 psi

NOTE

Due to an impedance problem, PPCO2 1 is biased causing it to have a lower value

6. √HAB PPCO2 1 < 5.1 mmHg
7. √2 < 7.6 mmHg

TUNNEL ADAPTER CONFIG

Middeck
8. Relocate SEBS from middeck to tunnel adapter and secure using Clamps (four) and Fixed Long Bungees (two)

TNL ADP (aft)
9. Disconnect flex duct from PL ISOL vlv
10. Remove PL ISOL vlv cap from inside duct
11. Stow cap on Velcro pad near valve
12. Reconnect flex duct to PL ISOL vlv using 3-in overcenter clamp

NOTE

Possible FDA 'S66 CABIN O2(N2) FLO 1(2)' msg or dP/dT klaxon alarm

SH Hatch
13. Vent Equal vlv caps (two), remove and stow
14. Equal vlv (two) – NORM
15. √$\Delta P \leq 0.2$ psid

TNL ADP (aft)
16. PL ISOL vlv – OP

SH Hatch
17. Open hatch per decal
18. Swing hatch from seal until locked-open catch engaged

TNL ADP (fwd)
19. Unstow flex duct from launch brackets
20. Remove caps (two) from inlet and outlet of flex duct, stow

SH Tunnel
21. Install flex duct between tunnel duct inlet and PL ISOL vlv outlet using 3-in overcenter clamps (two)
22. Reconnect BPSMU cable QD
23. Retrieve BPSMU from temp stow
24. Contact MCC to verify good audio via BPSMU

SUBSYSTEM PGSC ACTIVATION

If Subsystem PGSC to be activated:

EXCP1
25. Go to SUBSYSTEM PGSC ACTIVATION (ON-ORBIT), steps 11-18

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VIEWPORT

VIEWPORT

INNER SAFETY COVER REMOVAL

1. Visually inspect glass for failures

Bottom of VP

2. Unscrew handscrews (three)
3. Remove Safety Cover

WARNING
Do not forcibly remove Inner Safety Cover
Keep Inner Safety Cover installed any time viewport not in use

4. If Inner Safety Cover not easily removable, retighten handscrews and terminate ops
5. Temp stow Inner Safety Cover

INNER SAFETY COVER INSTALLATION

VP HTR CNTL PNL

1. √VP HTR – OFF
2. √VP HTR lt – lt off
3. Retrieve Safety Cover from temp stow

WARNING
Viewport glass, flange, and controls may be hot

Bottom of VP

4. Position Safety Cover to viewport flange and align handscrews with holes on flange
5. Hand tighten handscrews (three)

OUTER COVER OPENING

WARNING
Keep Outer Cover closed at any time viewport not in use
Outer Cover should not be left open more than 35 min with Sun in FOV or more than 2 hr when exposed to deep space

RAISING OUTER COVER

Next to VP

1. Pull handwheel collar down, turn ccw to hard stop, release

2. Rotate handwheel collar ccw until audible clicking (~6 turns)

WARNING
To prevent condensation, htr should be turned on immediately after Outer Cover opened in cold flight attitude

ROTATING OUTER COVER

3. Twist handle cw about handle axis until hard stop (~135°) and hold while rotating ccw about main shaft axis until hard stop (~180°)

WARNING
Htr should not be powered on more than 20 min with Sun in FOV

VIEWPORT HEATER

If in cold attitude (√Execute Package for htr ON times):

VP HTR CNTL PNL

4. VP HTR – ON

5. √VP HTR lt – lt on

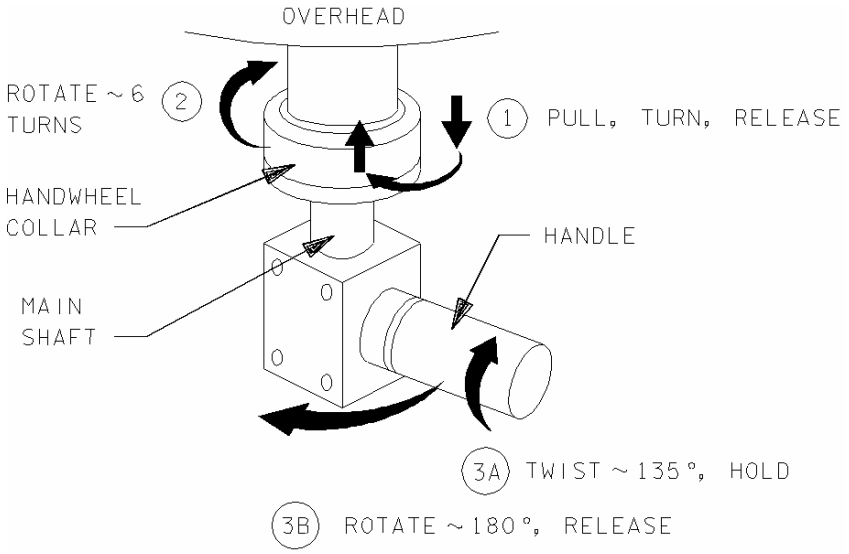

Figure 3-1.- Viewport opening

OUTER COVER CLOSING

WARNING
Viewport glass, flange, and controls may be hot
Htr must be deactivated before closing Outer Cover

VIEWPORT HEATER

VP HTR CNTL PNL

1. √VP HTR – OFF

2. √VP HTR lt – lt off

ROTATING OUTER COVER

Next to VP

3. Twist handle cw about handle axis until hard stop (~135°) and hold while rotating cw about main shaft axis until hard stop (~180°)

LOWERING OUTER COVER

4. Rotate handwheel collar cw until audible clicking (~6 turns)

5. Pull handwheel collar down, turn cw until pin aligned with LOCK CENTRAL arrow, release

6. Verify handwheel lockpin engaged by wiggling handwheel collar

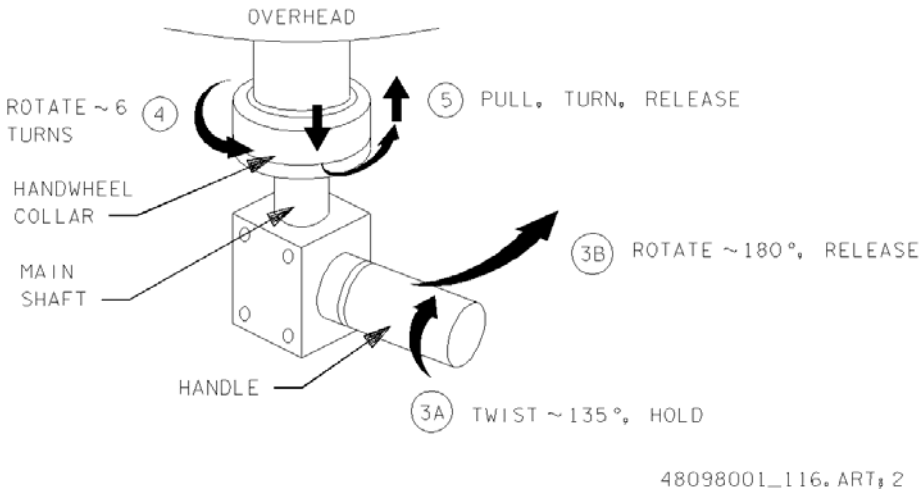

Figure 3-2.- Viewport closing

HEATER ACTIVATION

> WARNING
> Viewport heater must not be switched on in hot attitude or before Outer Cover opened

1. √Outer Cover open (visual)

VP HTR CNTL PNL

2. VP HTR – ON

3. √VP HTR lt – lt on

HEATER DEACTIVATION

> WARNING
> Heater should not be deactivated in cold flight attitude with open Outer Cover

VP HTR CNTL PNL

1. VP HTR – OFF

2. √VP HTR lt – lt off

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PRE/POST SLEEP CONFIG

SPACEHAB PRE-SLEEP CONFIG

If Subsystem PGSC activated:
Exit Spacehab software:

FC06
1. Press [ALT]/[Q] to exit software
2. [Shft]/[F10] to confirm
3. Shut down Windows
4. √Automatic pwr off PGSC
5. Close PGSC

Pwr Supply
6. A31P 28VDC Pwr Supply INPUT POWER sw – OFF (OUTPUT POWER lt off)

EXCP1
7. cb DC3 – OFF

If Outer Viewport Cover open:
8. Perform OUTER COVER CLOSING (ON-ORBIT), then:

SM 214 SPACEHAB ACT/DEAC

CRT
9. DC LIGHTS OFF – ITEM 30 EXEC (no feedback)
or

MCP
LIGHTS – OFF

SPACEHAB POST-SLEEP CONFIG

SM 214 SPACEHAB ACT/DEAC

CRT
1. DC LIGHTS ON – ITEM 29 EXEC (no feedback)
or

MCP
LIGHTS – ON

Ovhd
2. √Emergency Light Dimmer – MAX

If Subsystem PGSC to be activated:

EXCP1
3. cb DC3 – ON

Pwr Suply
4. A31P 28VDC Pwr Supply INPUT PWR sw – ON (OUTPUT POWER lt on)

FC06
5. PGSC pwr – on
6. √Windows displayed
7. Double-click SHUTTLE APPS folder on desktop
8. SPACEHAB folder
9. SPACEHAB MONITOR icon

PGSC: SPACEHAB SUMMARY

10. √Spacehab tlm is present on display
11. √GMT displayed is correct

If GMT update desired:
12. Press [ALT]/[G]
13. [2] to set GMT
14. Update GMT time
15. Press [Shft]/[F10] to confirm
16. [Shft]/[F1] to return to display

WAVEOFF

SPACEHAB INGRESS AFTER WAVEOFF

1. √AIRLOCK SETUP FOR INGRESS [21] (DEORBIT PREP, DEORBIT PREP BACKOUT) performed

VERIFY MODULE ENVIRONMENT

[SM 214 SPACEHAB ACT/DEAC]

CRT
2. DC LIGHTS ON – ITEM 29 EXEC (no feedback)

[SM 215 SPACEHAB ECS]

3. √HALON MULTI – NO
4. √SINGLE – NO
5. √HAB P > 13.8 and < 15.4 psi
6. √PPO2 1,2 (two) > 2.7 and < 3.6 psi

NOTE

Due to an impedance problem, PPCO2 1 is biased causing it to have a lower value

7. √HAB PPCO2 1 < 5.1 mmHg
8. √2 < 7.6 mmHg

SPACEHAB HATCH OPENING AND DUCT CONFIG

TNL ADP (aft)
9. Disconnect tunnel adapter aft flex duct from PL ISOL vlv
10. Remove cap, stow on Velcro pad near valve
11. Reconnect flex duct to PL ISOL vlv

NOTE

Possible FDA 'S66 CABIN O2(N2) FLO 1(2)' msg or dP/dT klaxon alarm

SH Hatch
12. Vent Equal vlv caps (two), remove and stow
13. Equal vlv (two) – NORM
14. √$\Delta P \leq 0.2$ psid

TNL ADP (aft)
15. PL ISOL vlv – OP
16. Open hatch per decal
17. Swing hatch from seal until locked-open catch engaged

TNL ADP (fwd)
18. Unstow flex duct from launch brackets
19. Remove caps (two) from inlet and outlet of flex duct, stow

SH Tunnel
20. Install flex duct between tunnel duct inlet and PL ISOL vlv outlet using 3-in overcenter clamps (two)

MA16L
21. Unstow:
    BPSMU
    8-ft BPSMU cable
22. Perform SH BPSMU CONFIG (PHOTO/TV, BPSMU), then:

SEBS CONFIG

FC11 23. Unstrap 0.5 CTB and temp stow near FC11 (crew preference)

AC05 24. Unstow Foam, attach to Adapter Plate at FC11

25. Unstow SEBS from Subsystem Stow 3 and connect SEBS Mask to SEBS

26. √SEBS gauge – FULL

FC11 27. Deploy SEBS and secure with straps

AC11 28. Unstow SEBS from Subsystem Stow 5 and connect SEBS Mask to SEBS

29. √SEBS gauge – FULL

30. Unstow Clamps (four) and Fixed Long Bungees (two) from Ziplock Bag (in foam cutout)

TNL ADP 31. Deploy SEBS in Tunnel Adapter (fwd port) using Clamps (four) and Fixed Long Bungees (two)

CUE CARD SETUP

32. Remove three cue cards from Ziplock Bag in back of SH OPS:
    SPACEHAB FIRE ALARM attach to Velcro (crew preference)
    HAZARDOUS SPILL RESPONSE - SPACEHAB MODULE attach to Velcro (crew preference)
    HAZARDOUS SPILL RESPONSE - ORBITER CABIN (WITH SPACEHAB MODULE HATCH OPEN) attach to Velcro (crew preference)

SPACEHAB CLOSEOUT AFTER WAVEOFF

SECURE MODULE

TNL ADP
1. Retrieve SEBS, Clamps (four), and Fixed Long Bungees (two) from Tunnel Adapter

AC11
2. Disconnect SEBS Mask from SEBS and stow SEBS in Subsystem Stow 5
3. Stow Clamps (four), and Fixed Long Bungees (two) in Ziplock Bag (in foam cutout)

FC11
4. Unstrap SEBS

AC05
5. Disconnect SEBS Mask from SEBS, stow SEBS in Subsystem Stow 3
6. Stow foam from FC11
7. √Module debris screen locations (four) for loose items/equipment

AC11
8. Stow any remaining loose equipment in Subsystem Stow 5

MCP
9. CABIN TEMP SEL tw (two) – 74

Ovhd
10. √EXP VENT vlv – CL
11. √Viewport Outer Cover closed
12. √Inner Safety Cover installed
13. √HTR – OFF (LED unlit)

CUE CARD STOW

14. Remove cue cards (three) from crew preference location

SH OPS
15. Stow cue cards in Ziplock Bag in back of SH OPS

BPSMU TEARDOWN

16. Disconnect BPSMU cable QD

MA16L
17. Stow:
    - BPSMU
    - 8-ft BPSMU cable

TUNNEL CONFIG

NOTE

Debris screen should remain in place once duct is removed

TNL ADP (aft)
18. Disconnect flex duct from screen assembly on tunnel duct inlet fitting and PL ISOL vlv outlet
19. Install flex duct inlet and outlet caps

TNL ADP (fwd)
20. Stow flex duct in tunnel adapter launch brackets

SH Hatch
21. Close hatch per decal
22. Equal vlv (two) – OFF
23. Install Equal vlv caps (two)

TNL ADP (aft)
24. Disconnect flex duct from PL ISOL vlv
25. Inspect valve/duct seals for lint/debris, clean if necessary
26. Remove PL ISOL vlv cap from Velcro pad located near valve
27. Inspect vlv cap for debris, clean if necessary and replace inside duct
28. Reconnect flex duct to PL ISOL vlv using 3-in overcenter clamp
29. PL ISOL vlv – CL

SYSTEM CONFIG

SM 214 SPACEHAB ACT/DEAC

CRT
30. DC LIGHTS OFF – ITEM 30 EXEC (no feedback)

SUBSYSTEM PGSC

SUBSYSTEM PGSC ACTIVATION

AC02 1. Unstow from Subsystem Stow 1:
Subsystem PGSC (SEG33115360-303)
PGSC Table (if desired) (9062897-501)
A31P 28VDC Pwr Supply (SEG33116428-301)
Enhanced A31p 16VDC Pwr Cable (SEG33116459-301)
RS-422 Adapter (SEZ39121212-301)
RS-422 PCMCIA Card/Cable (Quatech) (SDZ39129284-301)

CONNECT POWER CABLES

EXCP1 2. √ cb DC3 - OFF
Pwr Sply 3. √A31P 28VDC Pwr Supply INPUT PWR sw – OFF (OUTPUT PWR lt off)
FC06 4. Connect A31P 28VDC Pwr Supply J1 to pre-routed DC Pwr Cable P1 (SED39122875-301)
5. Connect Enhanced A31p 16VDC Pwr Cable P2 to A31P 28VDC Pwr Supply J2
PGSC 6. Connect Enhanced A31p 16VDC Pwr Cable P1 to PGSC power port

CONNECT DATA CABLES

FC06 7. Connect RS-422 Adapter J2 to pre-routed RS-422 Data Cable P1 (SED39126965-301)
8. Connect RS-422 PCMCIA Card/Cable CHANNEL A to RS-422 Adapter J1
PGSC 9. Insert RS-422 PCMCIA Card into PCMCIA slot on PGSC (either slot is OK)

POWER UP PGSC

If PGSC Desk desired:
10. Deploy PGSC table and attach PGSC (crew preference)

EXCP1 11. cb DC3 – ON
Pwr Suply 12. A31P 28VDC Pwr Supply INPUT PWR sw – ON (OUTPUT PWR lt – lt on)
PGSC 13. PGSC Pwr – on

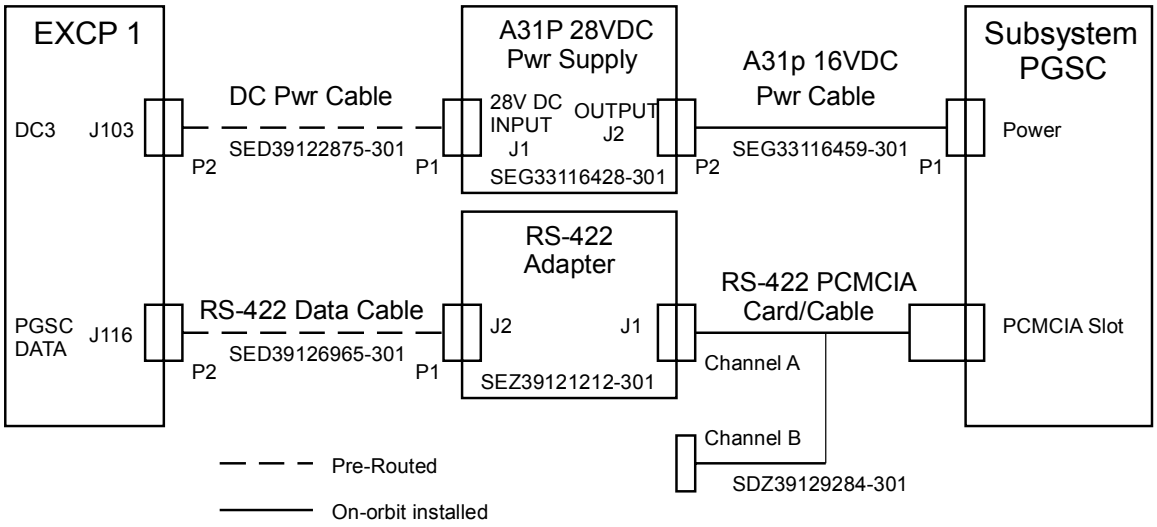

Figure 3-3.- Subsystem PGSC Cable Routing

START SPACEHAB MONITOR SOFTWARE

14. √Windows displayed
15. Double-click: SHUTTLE APPS folder on desktop
16. SPACEHAB folder
17. SPACEHAB MONITOR icon

PGSC: SPACEHAB SUMMARY

18. √Spacehab tlm is present on display
19. Press [ALT]/[G]
20. [1] to set launch time
21. Input launch GMT - Contact MCC if time not readily available
22. Press [Shft]/[F10] to confirm
23. [2] to set GMT
24. √GMT displayed is correct, change if necessary
25. Press [Shft]/[F10] to confirm
26. [Shft]/[F1] to return to display

SUBSYSTEM PGSC DEACTIVATION

	POWER DOWN PGSC
PGSC	Exit Spacehab software: 1. Press [ALT]/[Q] to exit software 2. Press [Shft]/[F10] to confirm
	3. Shut down Windows
	4. √Automatic pwr off of PGSC
	5. Close PGSC
Pwr Supply	6. A31P 28VDC Pwr Supply INPUT PWR sw – OFF (OUTPUT PWR lt off)
EXCP1	7. cb DC3 – OFF
	DISCONNECT PWR CABLES
FC06	8. Disconnect Enhanced A31p 16VDC Pwr Cable P1 from PGSC pwr port
	9. Disconnect Enhanced A31p 16VDC Pwr Cable P2 from A31P 28VDC Pwr Supply J2
	10. Disconnect A31P 28VDC Pwr Supply J1 from pre-routed DC Pwr Cable P1
AC02	11. Stow A31P 28VDC Pwr Supply and Enhanced A31p 16VDC Pwr Cable
FC06	12. Coil and stow pre-routed DC Pwr Cable
	DISCONNECT DATA CABLES
	13. Eject RS-422 PCMCIA Card from PCMCIA slot on PGSC
	14. Disconnect RS-422 PCMCIA Card/Cable CHANNEL A from RS-422 Adapter J1
	15. Disconnect RS-422 Adapter J2 from pre-routed RS-422 Data Cable P1
AC02	16. Stow RS-422 Adapter and RS-422 PCMCIA Card/Cable
FC06	17. Coil and stow pre-routed RS-422 Data Cable
	If deployed:
AC02	18. Stow PGSC table
	19. Stow PGSC

SUBSYSTEM PGSC RECOVERY

EXCP 1
1. cb DC3 – ON

Pwr Supply
2. A31P 28VDC Pwr Supply INPUT PWR sw – ON
   (OUTPUT PWR lt – lt on)

PGSC
3. PGSC pwr – on
4. √Windows displayed
5. Double-click SHUTTLE APPS folder on desktop
6. SPACEHAB folder
7. SPACEHAB MONITOR icon

PGSC: SPACEHAB SUMMARY

8. √Spacehab tlm is present on display
9. √GMT displayed is correct

If GMT update desired:

10. Press [ALT]/[G]
11. [2] to set GMT
12. Update GMT time
13. Press [Shft]/[F10] to confirm
14. [Shft]/[F1] to return to display

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PORTABLE LIGHT

PORTABLE LIGHT SETUP

FC06	1. Unstow portable fluorescent light from Subsystem Stow 2
EXCP1	2. √cb AC1 – OFF
	3. Connect light cable to EXCP1 connector J94
	4. Route/secure cable and light as desired
	5. cb AC1 – ON
	6. Portable fluorescent light sw – ON

PORTABLE LIGHT STOW

	1. Portable fluorescent light sw – OFF
EXCP1	2. cb AC1 – OFF
	3. Demate light cable from EXCP1 connector J94
FC06	4. Stow portable fluorescent light in Subsystem Stow 2

DC VACUUM

DC VACUUM CLEANER SETUP

MF71C	1. Unstow, assemble Vacuum Cleaner, suction hose, crevice tool, and DC pwr cable
AC05	2. Unstow DC Vacuum Cleaner Y-Cable 9063176-521
	3. Mate Y-Cable connector J1 to DC Vacuum pwr cable connector P1
VAC	4. √Vacuum Cleaner pwr – off
	5. √Vacuum Cleaner in low pwr mode
EXCP1	6. √cb DC 1 – OFF
	7. √DC 2 – OFF
	8. Mate Y-Cable connector P96 to EXCP1 connector J96
	9. Mate Y-Cable connector P100 to EXCP1 connector J100
	10. cb DC 1 – ON
	11. DC 2 – ON
VAC	12. Vacuum Cleaner pwr – on

DC VACUUM CLEANER STOW

VAC	1. Vacuum Cleaner pwr – off
EXCP1	2. cb DC 1 – OFF
	3. DC 2 – OFF
	4. Demate Y-Cable connectors P96, P100 from EXCP1 connectors J96, J100
	5. Demate Y-Cable connector J1 from DC Vacuum pwr cable connector P1
MF71C	6. Stow Vacuum Cleaner, suction hose, crevice tool, and DC pwr cable
AC05	7. Stow DC Vacuum Cleaner Y-Cable 9063176-521

ENTRY PREP

ARS FAN CLAMP REPLACEMENT 4-2
MODULE CLOSEOUT 4-3
TUNNEL CONFIG 4-4
ENTRY SYSTEM CONFIG 4-5

ARS FAN CLAMP REPLACEMENT

TOOLS REQD:	SPACEHAB	
AC08	1/4-in Torque Wrench 7/16-in 6-point Deepwell Socket 1/4-in Driver Handle	I
AC11 D05	1. Remove Clamps from Subsystem Stow 5 2. Remove pip pins, open floor panel 3. Install Fan Clamps (two) around fan and mounting bracket 4. Torque nuts on Fan Clamps (two) to 30 in-lb (1/4-in Driver Handle, 1/4-in Torque Wrench, 7/16-in 6-point Deepwell Socket) 5. Close floor panel, replace pip pins	I
AC08	6. Stow tools	I

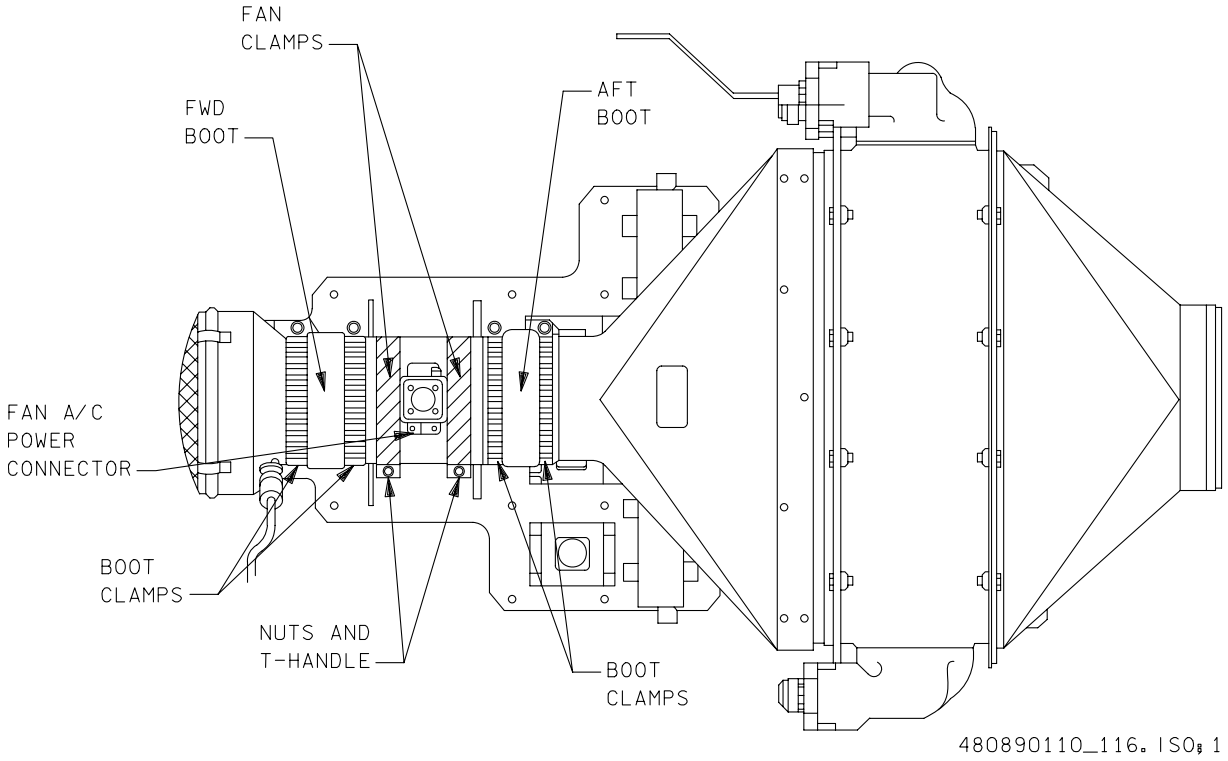


Figure 4-1.- Fan/HX assy (top view)

ENTRY PREP

MODULE CLOSEOUT

SS PGSC DEACT

If SS PGSC deployed:

1. Perform SUBSYSTEM PGSC DEACTIVATION (ON-ORBIT), then:

PORTABLE LIGHT DEACT

If portable light deployed:

2. Portable fluorescent light sw – OFF

EXCP1

3. cb AC1 – OFF
4. Demate light cable from EXCP1 connector J94

FC06

5. Stow portable fluorescent light in Subsystem Stow 2

SECURE MODULE

TNL ADP

6. Retrieve SEBS, Clamps (four), and Fixed Long Bungees (two) from Tunnel Adapter

AC11

7. Disconnect SEBS Mask from SEBS and stow SEBS in Subsystem Stow 5
8. Stow Clamps (four), and Fixed Long Bungees (two) in Ziplock Bag (in foam cutout)
9. Remove Trash Liners from deployed Trash Bags, tape Liners shut, stow Liners in middeck wet or dry trash bags
10. Remove Trash Bags from deployed location, fold, and stow in Subsystem Stow 5

FC11

11. Unstrap SEBS

AC05

12. Disconnect SEBS Mask from SEBS, stow SEBS in Subsystem Stow 3
13. Stow Tissue Box (if used) and foam (from FC11)

AC08

14. Stow Gray Tape in Subsystem Stow 4
15. Stow VW Bag

FC11

16. Place temp stowed CTB into former SEBS location
17. √Module debris screen locations (four) for loose items/equipment

AC11

18. Stow any remaining loose equipment in Subsystem Stow 5

MCP

19. CABIN TEMP SEL tw (two) – 74

Ovhd

20. √EXP VENT vlv – CL
21. √Viewport Outer Cover closed
22. √Inner Safety Cover installed
23. √HTR – OFF (LED unlit)

CUE CARD STOW

24. Remove cue cards (three) from crew preference location

SH OPS

25. Stow cue cards in Ziplock Bag in back of SH OPS

BPSMU TEARDOWN

SH Hatch

26. Disconnect BPSMU Cable QD

MA16L

27. Stow:
    - BPSMU
    - 8-ft BPSMU Cable

TUNNEL CONFIG

NOTE

Debris screen should remain in place once duct is removed

SH Tunnel

1. Disconnect Spacehab flex duct from screen assembly on tunnel duct inlet fitting and PL ISOL vlv outlet
2. Install Spacehab flex duct inlet and outlet caps

TNL ADP (fwd)

3. Stow Spacehab flex duct in tunnel adapter launch brackets

SH Hatch

4. Close hatch per decal
5. Equal vlv (two) – OFF
6. Install Equal vlv caps (two)

TNL ADP (aft)

7. Disconnect tunnel adapter aft flex duct from PL ISOL vlv, inspect valve/duct seals for lint/debris, clean if necessary
8. Remove PL ISOL vlv cap from Velcro pad located near valve
9. Inspect for debris, clean if necessary and replace inside duct
10. Reconnect tunnel adapter aft flex duct to PL ISOL vlv
11. PL ISOL vlv – CL

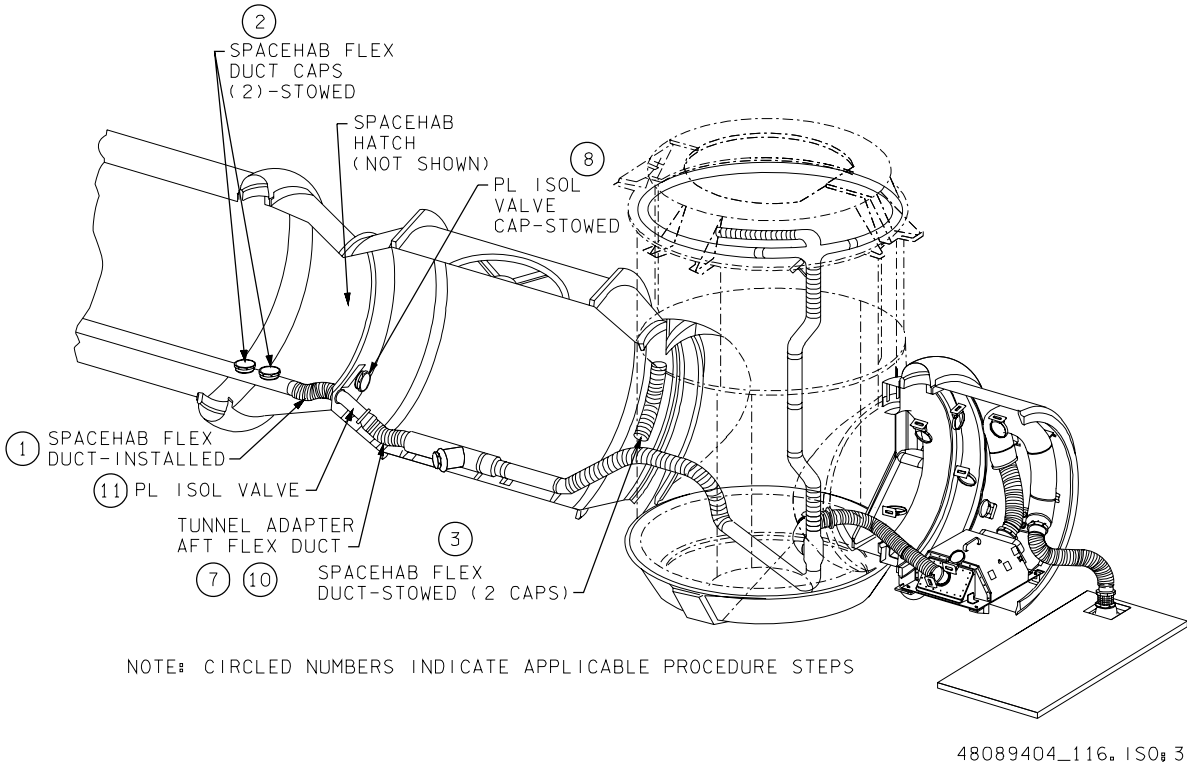


Figure 4-2.- Tunnel config (Entry Prep)

ENTRY SYSTEM CONFIG

INVERTER ACT

SM 214 SPACEHAB ACT/DEAC

CRT

1. DC INVERTER ON – ITEM 1 EXEC (*****)

2. √BUS INV ΦA,ΦB,ΦC VOLTS (three) > 105.4 and < 124.6

ECS CONFIG

NOTE

Expect MASTER ALARM, msgs:
'214 SH ARS FAN DP 1'
'214 SH ARS FAN DP 2'

3. FANS ARS OFF – ITEM 61 EXEC (*****)
4. INV – ITEM 63 EXEC (*****)
5. ON – ITEM 67 EXEC (*****)
6. √ΔP 1,2 (two) > 0.2 and < 5.5

NOTE

Possible ALERT, msgs:
'214 SH H2O FL ARS'
'214 SH H2O FL CAB'

7. H2O PUMP 1/2 OFF – ITEM 71 EXEC (*****)
8. 2 INV – ITEM 72 EXEC (*****)
9. 1 ON/2 OFF – ITEM 74 EXEC (*****)
10. √IN P > 30 and < 80
11. √OUT P > 40 and < 105
12. √HX H2O FLOW ARS > 75
    √CABIN > 250

13. √BUS INV ΦA,ΦB,ΦC AMPS (three) > 0 and < 2.9

14. DC LIGHTS OFF – ITEM 30 EXEC (no feedback)

EPS CONFIG

NOTE

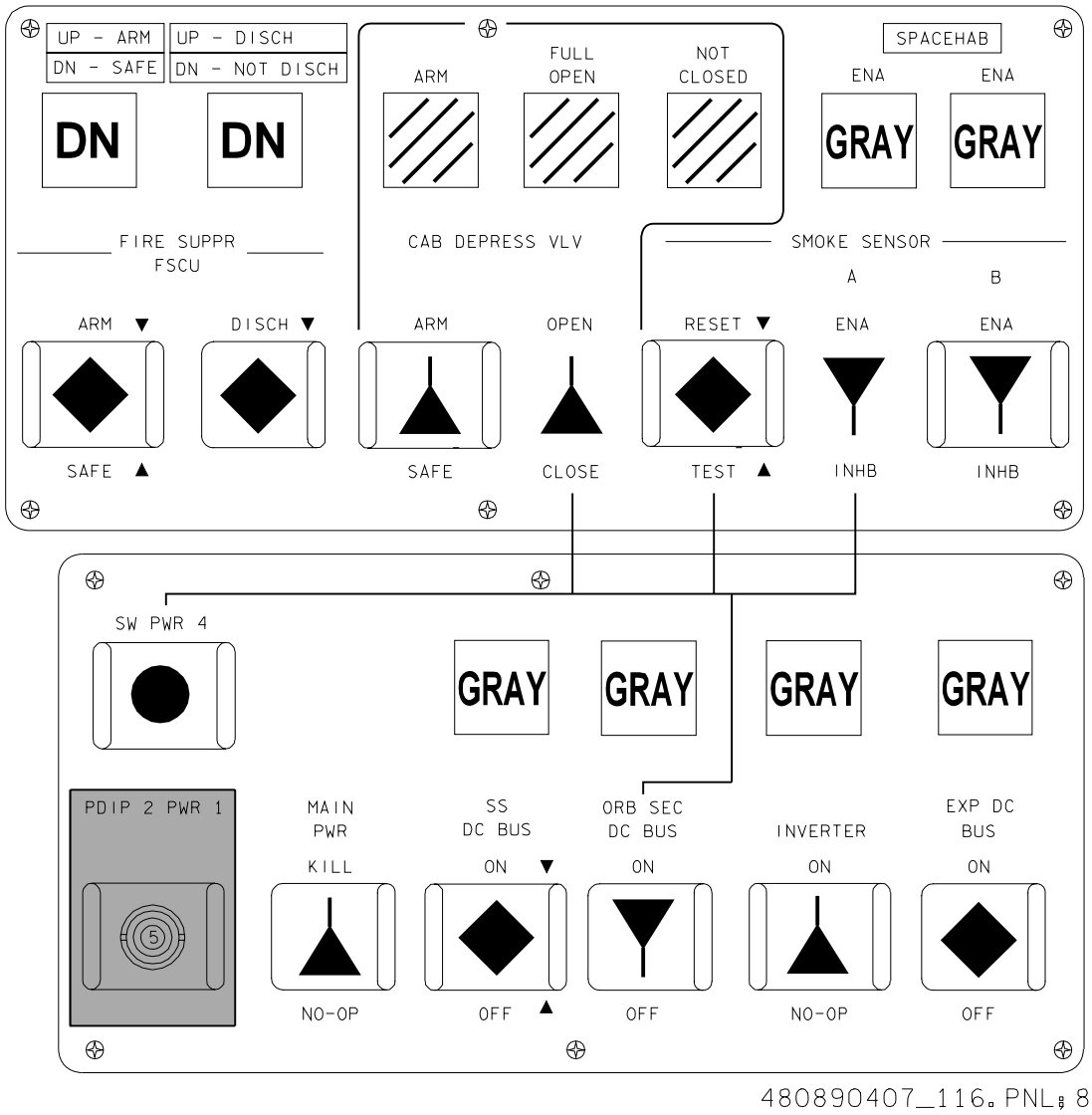
Item 27 will remain on because relay tied to SS BUS tb on SSP2

15. Configure Spacehab power buses on SPEC 214 per the following table:

DC	ON		OFF	
INVERTER	1	*	2	
EXP BUS	3	*	4	
EXCP 1/2	5		6	*
3	7		8	*
4	9		10	*
5	11		12	*
6	13		14	*
DM FN/LT	15		16	*
RACK 1	17		18	*
2	19		20	*
UTIL AFT	21		22	*
FWD	23		24	*
SPARE	25		26	*
PTB/CCTV	27	*	28	
LIGHTS	29		30	
AC				
UTIL	41		42	*
RACK 1	43		44	*
2	45		46	*
SPARE 1	47		48	*
2	49		50	*

MA73C:E 16. cb AC3 PL 3Φ – op

SSP 2 17. Verify SSP 2 config as shown below:



SSP 1 18. √cb SW PWR 2 – op
19. √ORB H2O LINE HTR PWR A – OFF (B ENA)
20. B – OFF (A ENA)

CAUTION AND WARNING CONFIG
SH CABIN FAN DP 2
If SH Cabin Fan was ON:

R13U 21. C/W PARAM SEL tw (three) – 055
22. PARAM – INH
23. PARAM STATUS – INH, hold
24. √STATUS lt 055 – on

SH PPO2 1
25. C/W PARAM SEL tw (three) – 065
26. PARAM – INH
27. PARAM STATUS – INH, hold
28. √STATUS lt 065 – on

SH PPCO2 1

29. C/W PARAM SEL tw (three) – 075
30. PARAM – INH
31. PARAM STATUS – INH, hold
32. √STATUS lt 075 – on

SH CABIN TOTAL PRESS

33. C/W PARAM SEL tw (three) – 095
34. PARAM – INH
35. PARAM STATUS – INH, hold
36. √STATUS lt 095 – on
37. PARAM SEL tw (three) – 120
38. Notify MCC:
    SPACEHAB ENTRY PREP complete

SPACEHAB CONTINGENCY PROCEDURES

MN PWR KILL RECOVERY 5-3
MN PWR KILL RECOVERY – ARS FAN AND PUMP ON ORBITER AC 5-4
INVERTER AC 5-6
SPACEHAB TOTAL DEACT 5-9
MODULE CLOSEOUT 5-10
TUNNEL CLOSEOUT 5-11
SYSTEM CONFIG 5-12
SPACEHAB 30-MIN DEACTIVATION 5-17
SPACEHAB 30-MIN DEACTIVATION 5-18
SPACEHAB POST-FIRE EVALUATION 5-21
SPACEHAB POST-FIRE EVALUATION 5-22

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MN PWR KILL RECOVERY

MN PWR KILL RECOVERY – ARS FAN AND PUMP ON ORBITER AC

SYSTEM SAFING

Pwr Supply 1. A31P 28VDC Pwr Supply INPUT PWR sw – OFF (OUTPUT PWR lt off)
EXCP 1 2. cb DC 3 – OFF

SM 214 SPACEHAB ACT/DEAC

CRT 3. DC LIGHTS OFF – ITEM 30 EXEC (no feedback)

PREACTIVATION CHECKOUT

R1 4. √PL PRI MNC – ctr (tb-ON)
5. √AUX – ON
6. √AFT MNB – ON
7. √CAB – MNA

EPS RECOVERY

SSP 2 8. √MN PWR – NO-OP
9. √INVERTER – NO-OP
10. ORB SEC DC BUS – OFF
11. – ON (tb-gray)
12. EXP DC BUS – ON (tb-gray)
13. – ctr
14. SS DC BUS – ON (tb-gray)

SM 214 SPACEHAB ACT/DEAC

CRT 15. √BUS EMER VOLTS > 24 and < 32
16. √AUX A AMPS ≥ 0 and < 7
17. √AFT B AMPS ≥ 0 and < 7
18. √MAIN VOLTS > 24 and < 32
19. √SEC VOLTS > 24 and < 32
20. √EXP VOLTS > 24 and < 32

ECS RECOVERY

SM 214 SPACEHAB ACT/DEAC

21. √FANS ARS ON, ITEM 67 – (*****)
22. √ORB, ITEM 65 – (*****)
23. √ΔP 1,2 (two) > 0.2 and < 5.5
24. √H2O PUMP 2 ORB, ITEM 73 – (*****)
25. √2 ON/1 OFF, ITEM 75 – (*****)
26. √IN P > 30 and < 80
27. √OUT P > 40 and < 105
28. √HX H2O FLOW ARS > 75
29. √CABIN > 250
30. √BUS WFCEU VOLTS > 24 and < 32

SM 215 SPACEHAB ECS

31. √WFCEU MODE THERM, ITEM 1 – (*****)

NOTE

Expect SM ALERT, '215 SH WFCEU MODE' msg
Expect ↓ next to ITEM 1 on SPEC 215
May take up to 1 min before alarm annunciates

32. WFCEU MODE HX IN – ITEM 2 EXEC (no feedback)
33. √CMD REC – YES (for 5 sec)
34. MTR 1 ON – ITEM 32 EXEC (no feedback)
35. √WFCEU CMD REC – YES (for 5 sec)

EPS CONFIG

SM 214 SPACEHAB ACT/DEAC

36. DC LIGHTS ON – ITEM 29 EXEC (no feedback)

If SS PGSC to be repowered:

37. Go to SUBSYSTEM PGSC RECOVERY (ON-ORBIT)

If portable light to be used:

EXCP1

38. cb AC1 – ON
39. Portable fluorescent light sw – ON

MN PWR KILL RECOVERY – ARS FAN AND PUMP ON INVERTER AC

H2O LN HTR ACT

C3 1. √H2O LN HTRS – ON
SSP 1 2. √cb SW PWR 2 – cl
3. √ORB H2O LINE HTR PWR A – ON
4. √B – OFF (A ENA)

SYSTEM SAFING

Pwr Supply 5. A31P 28VDC Pwr Supply INPUT PWR sw – OFF (OUTPUT PWR lt off)
EXCP 1 6. cb DC 3 – OFF

SM 214 SPACEHAB ACT/DEAC

CRT 7. DC LIGHTS OFF – ITEM 30 EXEC (no feedback)

PREACTIVATION CHECKOUT

R1 8. √PL PRI MNC – ctr (tb-ON)
9. √AUX – ON
10. √AFT MNB – ON
11. √CAB – MNA

EPS RECOVERY

SSP 2 12. √MN PWR – NO-OP
13. √INVERTER – NO-OP
14. ORB SEC DC BUS – OFF
15. – ON (tb-gray)
16. EXP DC BUS – ON (tb-gray)
17. – ctr
18. SS DC BUS – ON (tb-gray)

SM 214 SPACEHAB ACT/DEAC

CRT 19. √BUS EMER VOLTS > 24 and < 32
20. √AUX A AMPS ≥ 0 and < 7
21. √AFT B AMPS ≥ 0 and < 7
22. √MAIN VOLTS > 24 and < 32
23. √SEC VOLTS > 24 and < 32
24. √EXP VOLTS > 24 and < 32

ECS RECOVERY

25. FANS ARS OFF – ITEM 61 EXEC (*****)
26. √INV, ITEM 63 – (*****)
27. √H2O PUMP 2 INV, ITEM 72 – (*****)
28. 1/2 OFF – ITEM 71 EXEC (*****)
29. √BUS WFCEU VOLTS > 24 and < 32

SM 215 SPACEHAB ECS

30. √WFCEU MODE THERM, ITEM 1 – (*****)

NOTE

Expect SM ALERT, '215 SH WFCEU MODE' msg.
Expect ↓ next to ITEM 1 on SPEC 215
May take up to 1 min before alarm annunciates

31. WFCEU MODE HX IN – ITEM 2 EXEC (no feedback)
32. √CMD REC – YES (for 5 sec)
33. MTR 1 ON – ITEM 32 EXEC (no feedback)
34. √WFCEU CMD REC – YES (for 5 sec)

EPS CONFIG

SM 214 SPACEHAB ACT/DEAC

35. DC INVERTER ON – ITEM 1 EXEC (*****)
36. √BUS INV ΦA,ΦB,ΦC VOLTS (three) > 105.4 and < 124.6
37. DC LIGHTS ON – ITEM 29 EXEC (no feedback)
38. FANS ARS ON – ITEM 67 EXEC (*****)
39. √ΔP 1,2 (two) > 0.2 and < 5.5
40. H2O PUMP 2 ON/1 OFF – ITEM 75 EXEC (*****)
41. √IN P > 30 and < 80
42. √OUT P > 40 and < 105
43. √HX H2O FLOW ARS > 75
44. √CABIN > 250

H2O LN HTR CONFIG

NOTE

Expect SM ALERT, msgs:
'215 SH H2O HTR HAB'
'215 SH H2O HTR ORB'

C3
45. H2O LN HTRS – OFF

SSP 1
46. ORB H2O LINE HTR PWR A – OFF(B ENA)
47. √B – OFF(A ENA)
48. cb SW PWR 2 – op

If SS PGSC to be recovered:

49. Go to SUBSYTEM PGSC RECOVERY (ON-ORBIT)

If portable light to be used:

EXCP1
50. cb AC1 – ON
51. Portable fluorescent light sw – ON

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SPACEHAB TOTAL DEACT
(Powers down module except for emergency (AFT B, AUX A, CAB PL) pwr)

MODULE CLOSEOUT

FAN CLAMP REPLACEMENT

1. Perform ARS FAN CLAMP REPLACEMENT (ENTRY PREP), then:

SS PGSC DEACT

If SS PGSC deployed:

2. Perform SUBSYSTEM PGSC DEACTIVATION (ON-ORBIT), then:

PORTABLE LIGHT DEACT

If portable light deployed:

3. Portable fluorescent light sw – OFF

EXCP1

4. cb AC1 – OFF
5. Demate light cable from EXCP1 connector J94

FC06

6. Stow portable fluorescent light in Subsystem Stow 2

SECURE MODULE

TNL ADP

7. Retrieve SEBS, Clamps (four), and Fixed Long Bungees (two) from Tunnel Adapter

AC11

8. Disconnect SEBS Mask from SEBS and stow SEBS in Subsystem Stow 5
9. Stow Clamps (four), and Fixed Long Bungees (two) in Ziplock Bag (in foam cutout)
10. Remove Trash Liners from deployed Trash Bags, tape Liners shut, stow Liners in middeck wet or dry trash bags
11. Remove Trash Bags from deployed location, fold, and stow

FC11

12. Unstrap SEBS

AC05

13. Disconnect SEBS Mask from SEBS, stow SEBS in Subsystem Stow 3
14. Stow Tissue Box (if used) and foam (from FC11)

AC08

15. Stow Gray Tape in Subsystem Stow 4
16. Stow VW Bag

FC11

17. Place temp stowed CTB into former SEBS location
18. √Module debris screen locations (four) for loose items/equipment

AC11

19. Stow any remaining loose equipment in Subsystem Stow 5

Ovhd

20. √EXP VENT vlv – CL
21. √Viewport Outer Cover closed
22. √Inner Safety Cover installed
23. √HTR – OFF (lt off)

CUE CARD STOW

24. Remove cue cards (three) from crew preference location

SH OPS

25. Stow cue cards in Ziplock Bag in back of SH OPS

STOW BPSMU

SH Hatch

26. Disconnect BPSMU cable QD

MA16L

27. Stow:
    - BPSMU
    - 8-ft BPSMU cable

TUNNEL CLOSEOUT

NOTE

Debris screen should remain in place once duct is removed

SH Tunnel	1. Disconnect Spacehab flex duct from screen assembly on tunnel duct inlet fitting and PL ISOL vlv outlet
	2. Install Spacehab flex duct inlet and outlet caps
TNL ADP (fwd)	3. Stow Spacehab flex duct in tunnel adapter launch brackets
SH Hatch	4. Close hatch per decal
	5. Equal vlv (two) – OFF
	6. Install Equal vlv caps (two)
TNL ADP (aft)	7. Disconnect tunnel adapter aft flex duct from PL ISOL vlv, inspect valve/duct seals for lint/debris, clean if neccessary
	8. Remove PL ISOL vlv cap from Velcro pad located near valve
	9. Inspect for debris, clean if necessary, and replace inside duct
	10. Reconnect tunnel adapter aft flex duct to PL ISOL vlv
	11. PL ISOL vlv – CL

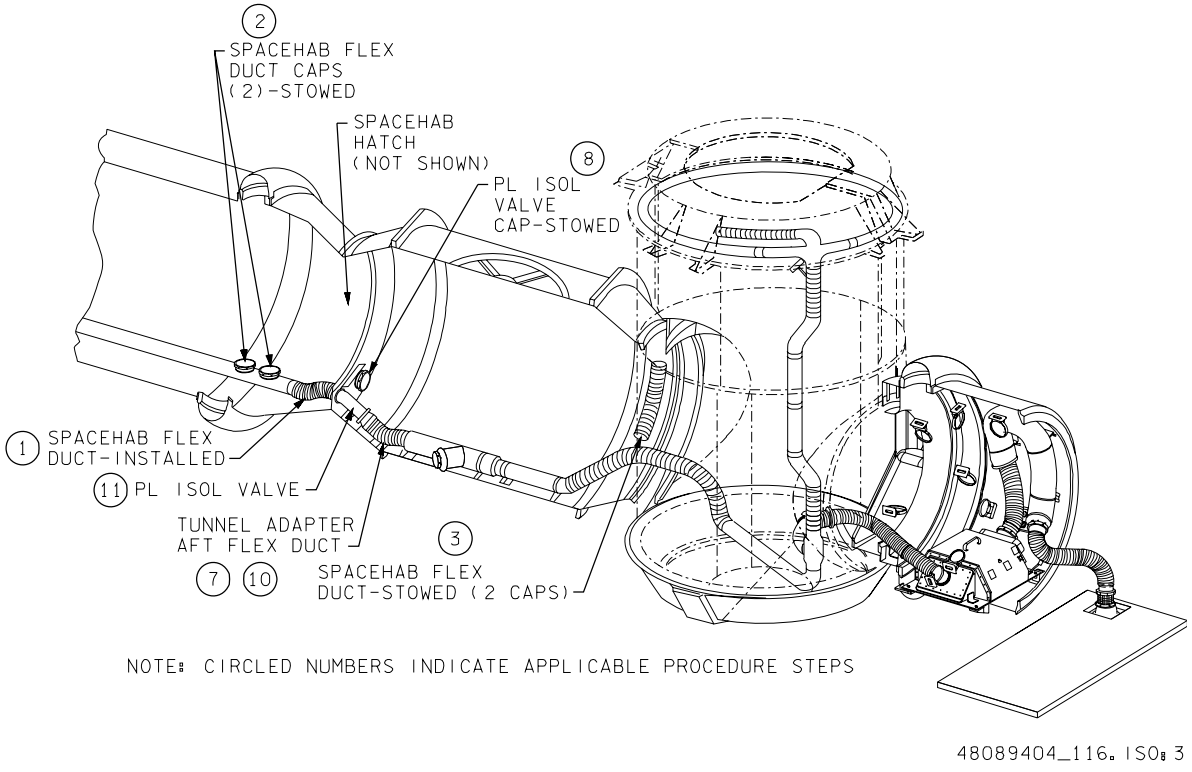


Figure 5-1.- Tunnel Config (Total Deact)

SYSTEM CONFIG

H2O LINE HEATERS CONFIG

C3
1. H2O LN HTRS – ON

SSP 1
2. cb SW PWR 2 – cl
3. ORB H2O LINE HTR PWR A – ON
4. √B – OFF(A ENA)

SM 215 SPACEHAB ECS

CRT
5. √H2O LN HTR HAB STATUS – 1
6. √ORB AMPS > 1

ECS CONFIG

NOTE

Expect SM ALERT, msgs:
'214 SH H2O FL ARS'
'214 SH H2O FL CAB'

SM 214 SPACEHAB ACT/DEAC

7. H2O PUMP 1/2 OFF – ITEM 71 EXEC (*****)
8. 2 INV – ITEM 72 EXEC (*****)

NOTE

Expect MASTER ALARM, msgs:
'214 SH ARS FAN DP 1'
'214 SH ARS FAN DP 2'

9. FANS ARS OFF – ITEM 61 EXEC (*****)
10. INV – ITEM 63 EXEC (*****)
11. DC LIGHTS OFF – ITEM 30 EXEC (no feedback)

12. Configure Spacehab power buses on SPEC 214 per the following table:

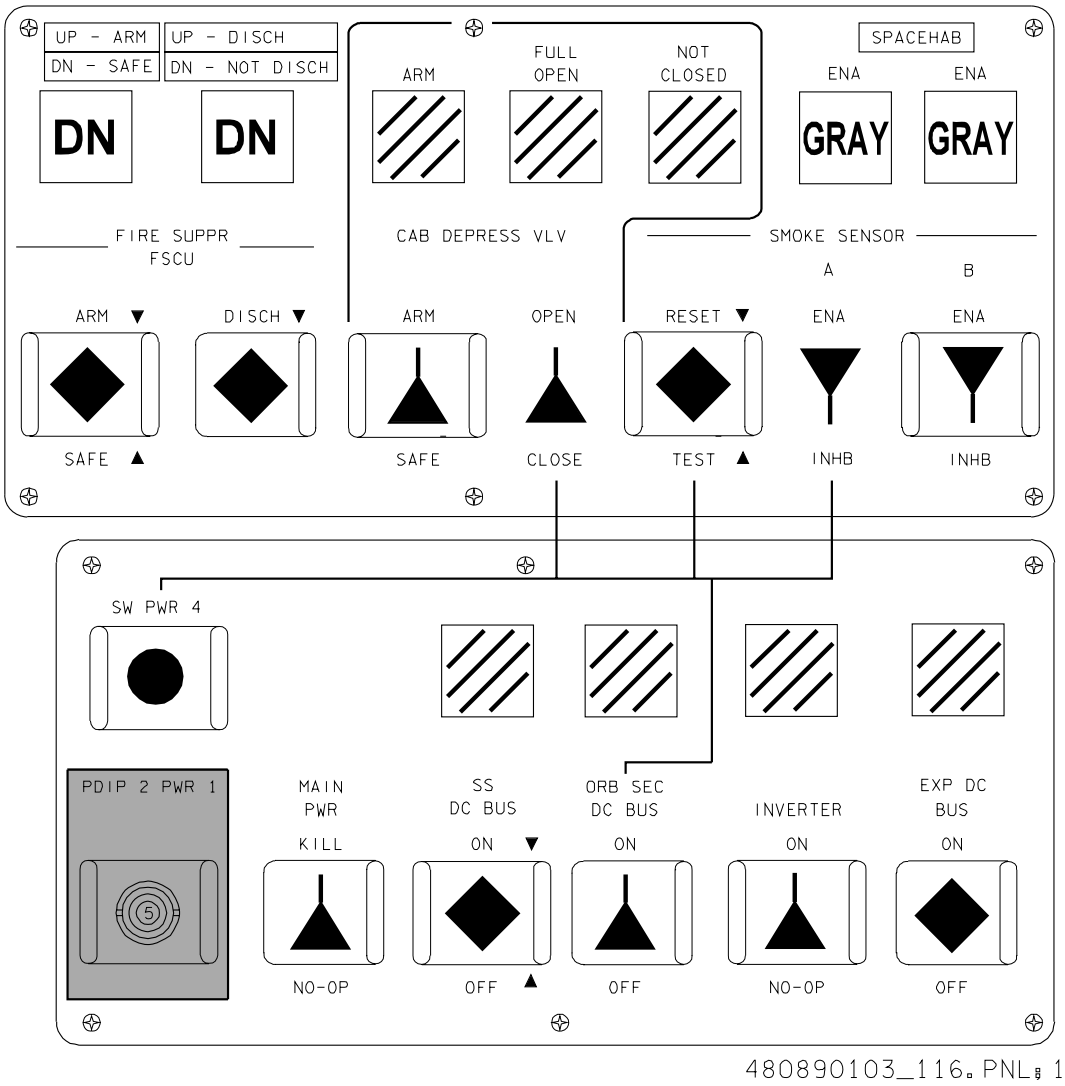
DC	ON		OFF	
INVERTER	1		2	*
EXP BUS	3	*	4	
EXCP 1/2	5		6	*
3	7		8	*
4	9		10	*
5	11		12	*
6	13		14	*
DM FN/LT	15		16	*
RACK 1	17		18	*
2	19		20	*
UTIL AFT	21		22	*
FWD	23		24	*
SPARE	25		26	*
PTB/CCTV	27		28	*
LIGHTS	29		30	
AC				
UTIL	41		42	*
RACK 1	43		44	*
2	45		46	*
SPARE 1	47		48	*
2	49		50	*

MA73C:E 13. cb AC3 PL 3Φ – op

NOTE
Expect SM ALERT, msgs:
'214 SH EXP BUS V'
'214 SH WFCEU V'

SSP 2 14. EXP DC BUS – OFF (tb-bp)
15. – ctr
16. ORB SEC DC BUS – OFF (tb-bp)
17. SS DC BUS – OFF (tb-bp)

18. Verify SSP 2 config as shown below



CAUTION AND WARNING CONFIG

If SH Cabin Fan was ON:

R13U SH CABIN FAN DP 2

19. C/W PARAM SEL tw (three) – 055
20. PARAM – INH
21. PARAM STATUS – INH, hold
22. √STATUS lt 055 – on

SH PPO2 1

23. C/W PARAM SEL tw (three) – 065
24. PARAM – INH
25. PARAM STATUS – INH, hold
26. √STATUS lt 065 – on

SH PPCO2 1

27. C/W PARAM SEL tw (three) – 075
28. PARAM – INH
29. PARAM STATUS – INH, hold
30. √STATUS lt 075 – on

SH ARS FAN DP 2

31. C/W PARAM SEL tw (three) – 085
32. PARAM – INH
33. PARAM STATUS – INH, hold
34. √STATUS lt 085 – on

SH CABIN TOTAL PRESS

35. C/W PARAM SEL tw (three) – 095
36. PARAM – INH
37. PARAM STATUS – INH, hold
38. √STATUS lt 095 – on
39. PARAM SEL tw (three) – 120

REMOVE PRIMARY PWR

R1A1 40. √PL PRI MNB tb – OFF
41. √FC3 tb – OFF

NOTE

Expect SM ALERT, msgs:
'214 SH MN BUS V'
'214 SH SEC BUS V'

42. PL PRI MNC – OFF (tb-OFF)
43. Notify MCC:
SPACEHAB TOTAL DEACT complete

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SPACEHAB 30-MIN DEACTIVATION

SH 30-MIN DEACT

SPACEHAB 30-MIN DEACTIVATION

1. Safe Penetrators:
   √PFE secured in brackets on fwd bulkhead, stbd of hatch opening
   √SEBS secured at FC11

VP
2. √Viewport Outer Cover closed
3. √Inner Safety Cover installed and handscrews (three) tight

VP HTR CNTL PNL
4. √VP HTR – OFF (lt off)

NOTE

If full 30 min not available, reserve 5-10 min for steps 11-27 and perform as much of steps 5 -10 as possible

Deactivate/Stow as time permits (If deployed):

PGSC:

5. Perform SUBSYSTEM PGSC DEACTIVATION (ON-ORBIT), then:

Rack front trays (reattach to racks):

6. Perform RACK FRONT STOWAGE TRAY REPLACEMENT (TRANSFER), then:

Portable Light:

7. Portable fluorescent light sw – OFF

EXCP 1
8. cb AC1 – OFF
9. Demate light cable from EXCP1 connector J94

FC06
10. Stow portable fluorescent light in Subsystem Stow 2

TNL ADP
11. Retrieve SEBS, Clamps (four), and Fixed Long Bungees (two) from Tunnel Adapter

AC11
12. Disconnect SEBS Mask from SEBS and stow SEBS and Mask in Subsystem Stow 5
13. Stow Clamps (four) , and Fixed Long Bungees (two) in Ziplock Bag (in foam cutout)

EXCP2
14. ARS – FAN OFF

SH Hatch
15. Disconnect BPSMU Cable QD
16. Remove BPSMU and 8-ft cable from Spacehab
17. Close hatch per decal
18. Equal vlv (two) – OFF
19. Install Equal vlv caps (two)

TNL ADP (aft)
20. Disconnect tunnel adapter aft flex duct from PL ISOL vlv
21. Remove PL ISOL vlv cap from Velcro pad located near valve
22. Replace inside duct
23. Reconnect tunnel adapter aft flex duct to PL ISOL vlv using 3-in overcenter clamp
24. PL ISOL VLV – CL

SM 214 SPACEHAB ACT/DEAC

CRT
25. FANS CABIN ON – ITEM 68 EXEC (*****)

MA16L
26. Stow BPSMU and 8-ft cable
27. √MCC for power config

SH 30-MIN DEACT

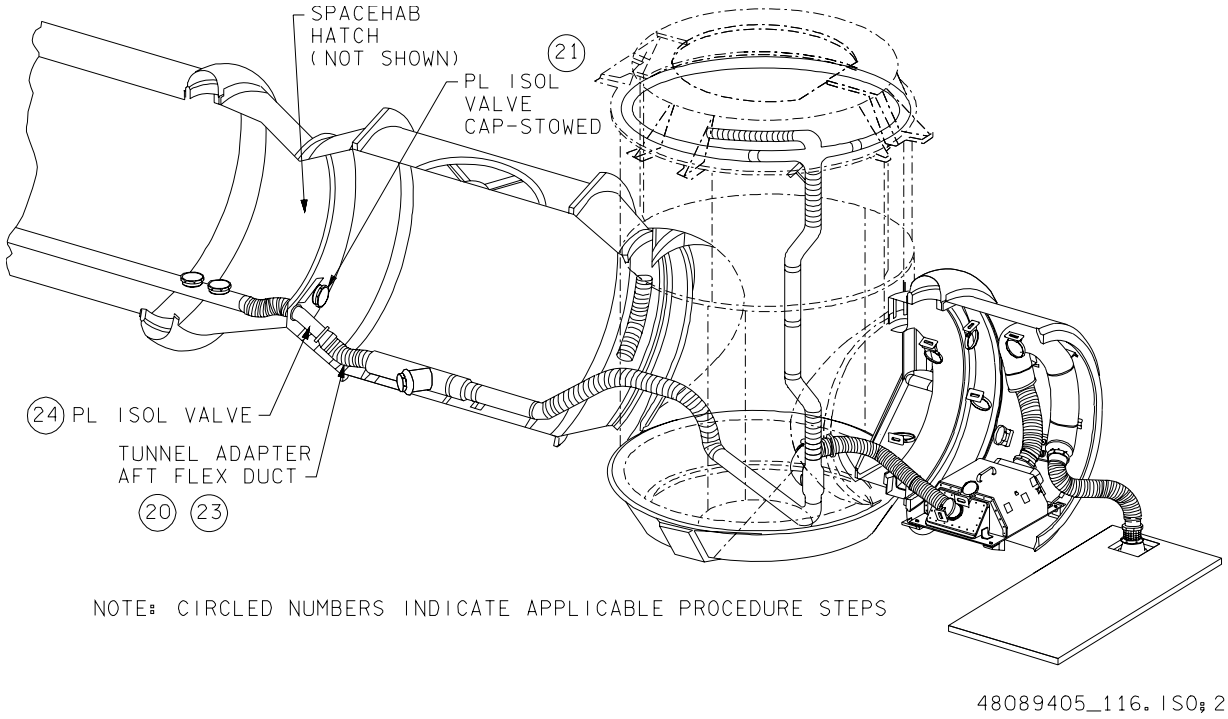

Figure 5-2.- Tunnel Config (30-min Deact)

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SPACEHAB POST-FIRE EVALUATION

NOTE

Applicable only if handheld fire extinguisher discharged in Spacehab. If Spacehab Fire Suppression System bottles discharged, Spacehab will not be reingressed.

This procedure will be used to evaluate Spacehab environment. Based on CSA-CP readings, MCC may request orbiter atmosphere cleanup steps as well

DEPRESS ORBITER BY 0.2 PSI

SM 66 ENVIRONMENT

1. Log CABIN PRESS _____._____

MO10W 2. 14.7 CAB REG INLET SYS 1(2) vlv – CL

AW82B 3. Vent, remove, stow AIRLK DEPRESS vlv cap

NOTE

Expect possible dP/dT klaxon

4. AIRLK DEPRESS vlv – 5

CRT When CABIN PRESS = 0.2 less than starting point in step 1,

AW82B 5. AIRLK DEPRESS vlv – CL

6. Reinstall AIRLK DEPRESS vlv cap

SAMPLE SPACEHAB AIR

MO69M 7. Don, activate QDM. Use longest available hose (if not already connected)

CSA-CP 8. MODE pb – press, hold until 'RELEASE' displayed

9. Wait ~1 min for nominal display

10. Sampling Pump sw – ON

SH Hatch 11. Position CSA-CP sensor near one Equal vlv

12. √Equal vlv cap (one) removed

13. Equal vlv (one) – NORM, wait 30 sec

14. – OFF

CSA-CP 15. Record readings in air sampling table, 5-23; report to MCC

16. Doff, deactivate QDM

FOLLOW ON SAMPLES

NOTE

Repeat (as needed) every 15 min or on MCC call

17. √MCC for steps 1-6 to see if additional orbiter depress reqd

18. Perform steps 7-16

CONFIGURE SUBSYSTEMS FOR ATMOSPHERIC SCRUBBING

On MCC GO:

SM 214 SPACEHAB ACT/DEAC

CRT 19. √FANS CABIN ORB, ITEM 66 – (*****)

20. ON – ITEM 68 EXEC (*****)

21. √ΔP1,2 (two) > 0.2 and < 5.5

RETURN TO NOMINAL OPS

On MCC GO:

TNL ADP (aft) 22. PL ISOL vlv – OP

SH Hatch 23. Open hatch per decal

24. Reconnect BPSMU cable QD

25. Contact MCC to verify good audio via BPSMU

EXCP2 26. ARS – KILL ENA

Fwd Bkhd 27. CAB DEPRESS vlv – cl

SM 214 SPACEHAB ACT/DEAC

CRT 28. √FANS ARS ORB, ITEM 65 – (*****)

29. ON – ITEM 67 EXEC (*****)

30. √ΔP 1,2 (two) > 0.2 and < 5.5

NOTE

Expect possible 'S66 CAB O2 (N2) FLO 1 (2)' msg

MO10W 31. 14.7 CAB REG INLET SYS 1(2) vlv – OP

AIR SAMPLING TABLE

NOTE

For % O2 in table below, use S78
(SM SYS SUMM 1) O2 CONC

Air sampling table				
Time (MET)	O2%	CO	HCN	HCL

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RACK FRONT STOWAGE TRAY REMOVAL 6-2
REPLACEMENT 6-3

RACK FRONT STOWAGE TRAY REMOVAL

VW Bag
PORT/STBD
Rack

1. Remove Bungee Straps (four), temp stow
2. Remove pip pins (four) from latched position on tray
3. Rotate levers (four) to disengaged position (see Figure 6-1)
4. Insert pip pins to keep levers (four) into disengaged position
5. While pulling tray slightly away from seat track, slide tray half a position up(down) so posts are in circular areas of seat track
6. Remove tray from seat track
7. Remove pip pins (four) from tray
8. Rotate levers (four) into engaged position
9. Replace pip pins (four)
10. Clamshell two trays together, then temp stow using Bungee Straps

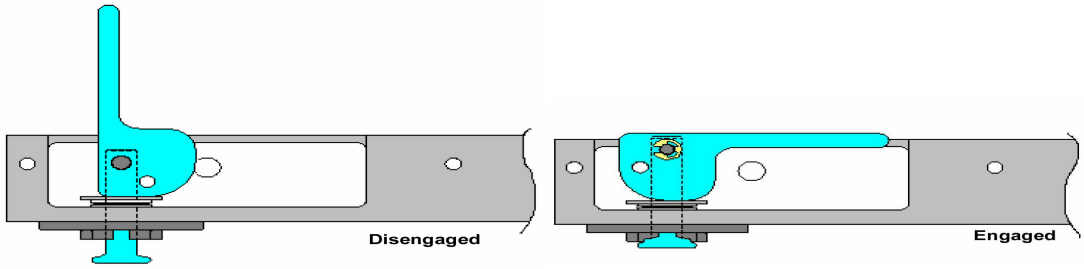

Figure 6-1.- Lever Positions

RACK FRONT STOWAGE TRAY REPLACEMENT

1. Retrieve temporarily stowed tray
2. Remove pip pins (four) from latched position on tray
3. Rotate levers (four) into disengaged position (see Figure 6-2)

PORT/STBD Rack

4. Replace pip pins (four) to keep levers in disengaged position before placing tray on rack front
5. Place tray into rack seat track, aligning top tray marks on both sides half a position up(down) from required number labeled on seat track (refer to Table 6-1)
6. Slide tray to locked position

Table 6-1. Alignment For Rack Front Stowage Tray to Seat Track Position

Rack Location	Tray 1	Tray 2	Tray 3	Tray 4
Fwd Starboard	3	23	43	63
Fwd Port	3	23	43	N/A

7. √Tray engaged with seat track
8. Remove pip pins (four)
9. While holding tray in place, rotate top levers into engaged position. Repeat for bottom levers
10. Replace pip pins (four) to lock levers into engaged position

VW Bag

11. Stow bungee straps

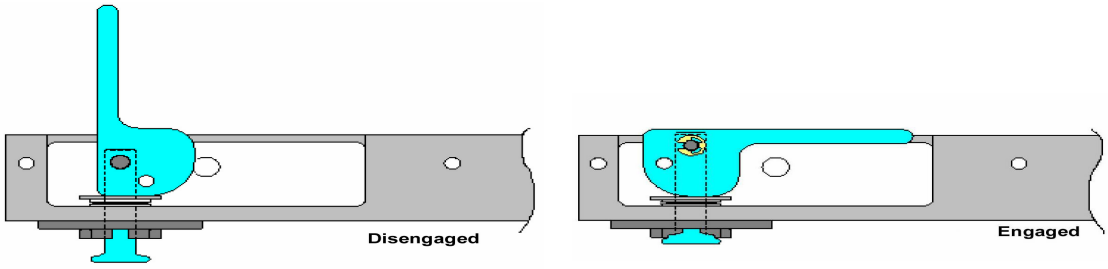

Figure 6-2.- Lever Positions

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SPACEHAB EXPERIMENTS

(N/A)

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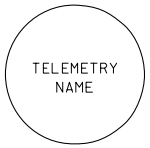
REFERENCE DATA

SUBSYSTEM FIGURES 8-3
EXCP PLUG-IN PLAN 8-11

REF DATA LEGEND

TELEMETRY BUBBLES:



TELEMETRY BUBBLES ARE SHOWN FOR SENSORS THAT THE CREW CAN SEE ON THEIR SPEC PAGES. SENSORS THAT HAVE NO TELEMETRY BUBBLE INDICATE THAT THE TELEMETRY IS AVAILABLE TO THE GROUND, BUT IS NOT AVAILABLE TO THE CREW

TELEMETRY DESCRIPTION:

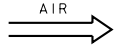
SPEC: abc = CREW SPEC PAGE NUMBER abc
FDA: "xyz" = FDA MESSAGE (xyz) ASSOCIATED WITH THIS TELEMETRY
<v OR >w = FDA LIMITS (v IS LOWER LIMIT, w IS UPPER LIMIT)
MAL: d = MALFUNCTION NUMBER 'd' IN THE SH OPS C/L

TELEMETRY SOURCES:

[Y] SENSOR TYPE Y
Y: V = VOLTAGE
I = CURRENT
T = TEMPERATURE
P = PRESSURE OR PARTIAL PRESSURE
S = SMOKE
D = DEWPOINT
F = FLOWRATE
Q = QUANTITY
H = POSITION
ΔP = DELTA PRESSURE

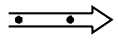
AIR/WATER LOOP SYMBOLS: AIR LOOP:

AIR



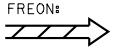
ARROW INDICATES DIRECTION OF FLOW

WATER LOOP:



ARROW INDICATES DIRECTION OF FLOW

FREON:



ARROW INDICATES DIRECTION OF FLOW

HEATER:

SYMBOL USED TO REPRESENT WATER LINE HEATERS, NOT MEANT TO INDICATE ACTUAL NUMBER OF HEATERS, BUT RATHER TO SHOW WHERE THEY ARE FUNCTIONALLY

QUICK DISCONNECT:

SYMBOL USED TO REPRESENT QUICK DISCONNECTS THAT THE CREW MIGHT ACCESS IN A PUBLISHED IFM. QD'S THAT ARE NOT ACCESSED ARE NOT SHOWN

CIRCUIT SYMBOLS: FUSE:

FXX = FUSE NUMBER (SOME FUSES DO NOT HAVE NUMBERS)
YY A = FUSE RATING IN AMPS

CIRCUIT BREAKER (PUSH/PULL TYPE):

CBXX = CIRCUIT BREAKER NUMBER
YY A = CIRCUIT BREAKER RATING IN AMPS

CIRCUIT BREAKER (SWITCH TYPE):

DCXX = CIRCUIT BREAKER NUMBER (ON EXCP)
YY A = CIRCUIT BREAKER RATING IN AMPS

RELAY:

XXX = RELAY DESIGNATION XXX (SOME RELAYS DO NOT HAVE NUMBERS)
K = RELAY, PC = POWER CONTACTOR
LOCATION = LOCATION AT WHICH RELAY IS CONTROLLED
PANEL: xyz
PANEL = STANDARD SWITCH PANEL (SSP), C3A5, R1, ETC.
xyz = NOMENCLATURE ON SSP
SPEC xyz (ITEM A/B)
SPEC xyz = CREW SPEC PAGE NUMBER
ITEM A/B = ITEM ENTRIES ON SPEC (ON/OFF)

BUS:

V_{xyz} = BUS NAME xyz

MAIN POWER KILL:

THIS SYMBOL IS PLACED BY ALL RELAYS THAT ARE AFFECTED BY A MAIN POWER KILL SIGNAL. THE MAIN POWER KILL SIGNAL CAUSES THE AFFECTED RELAYS TO OPEN

48089602_116.SCH:5

SUBSYSTEM FIGURES

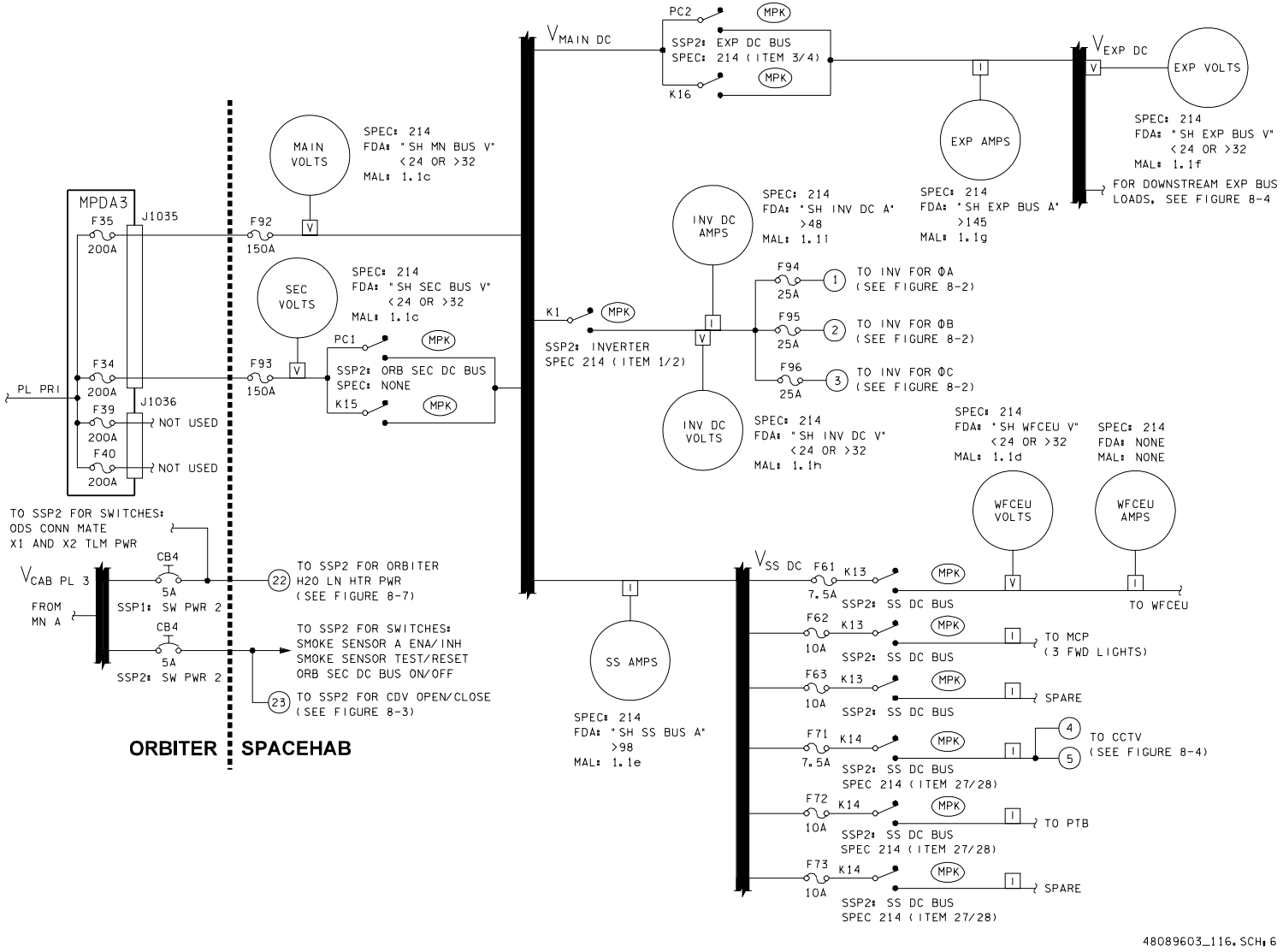


Figure 8-1.- Spacehab DC Power

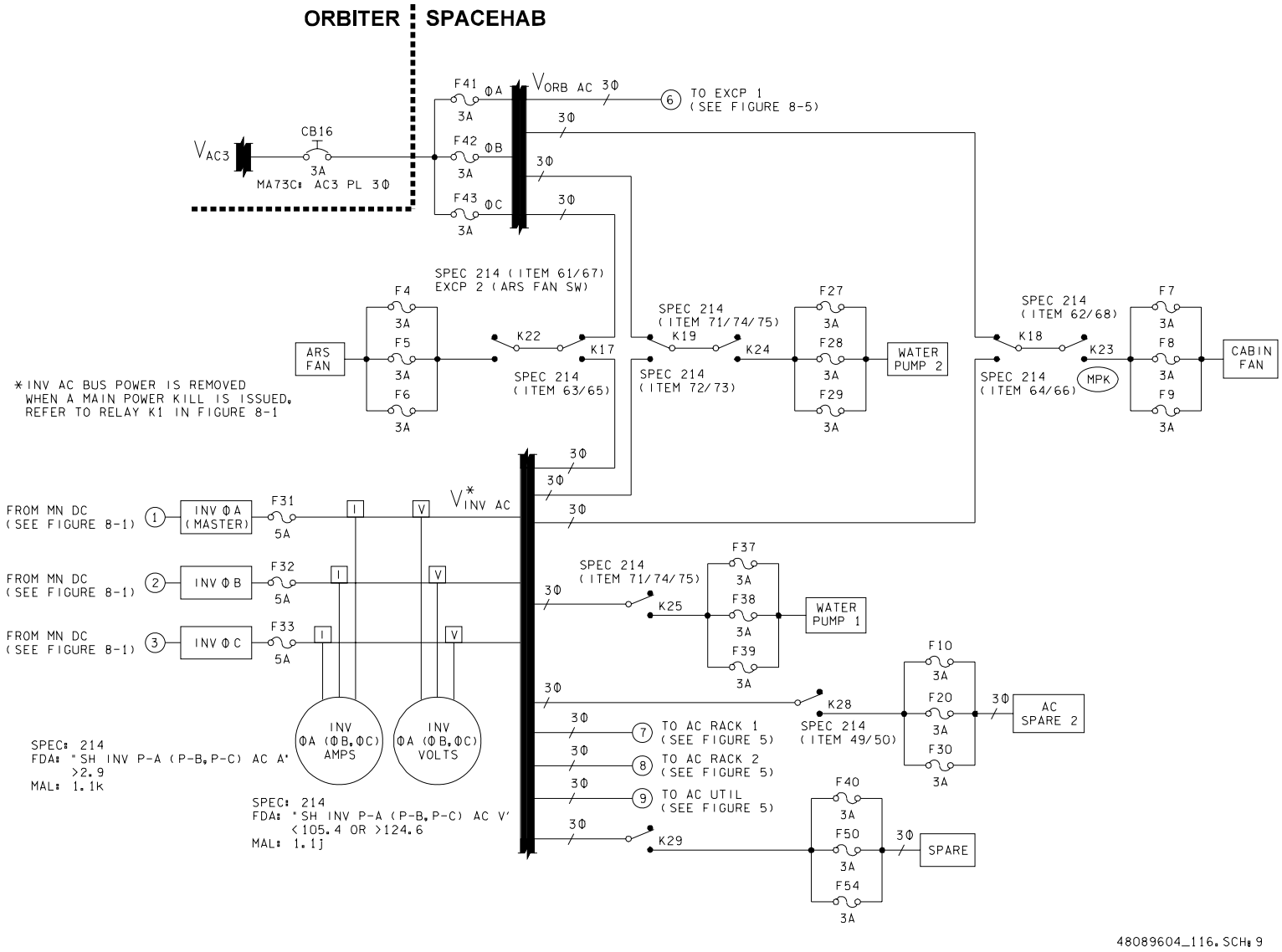


Figure 8-2.- Spacehab AC Power

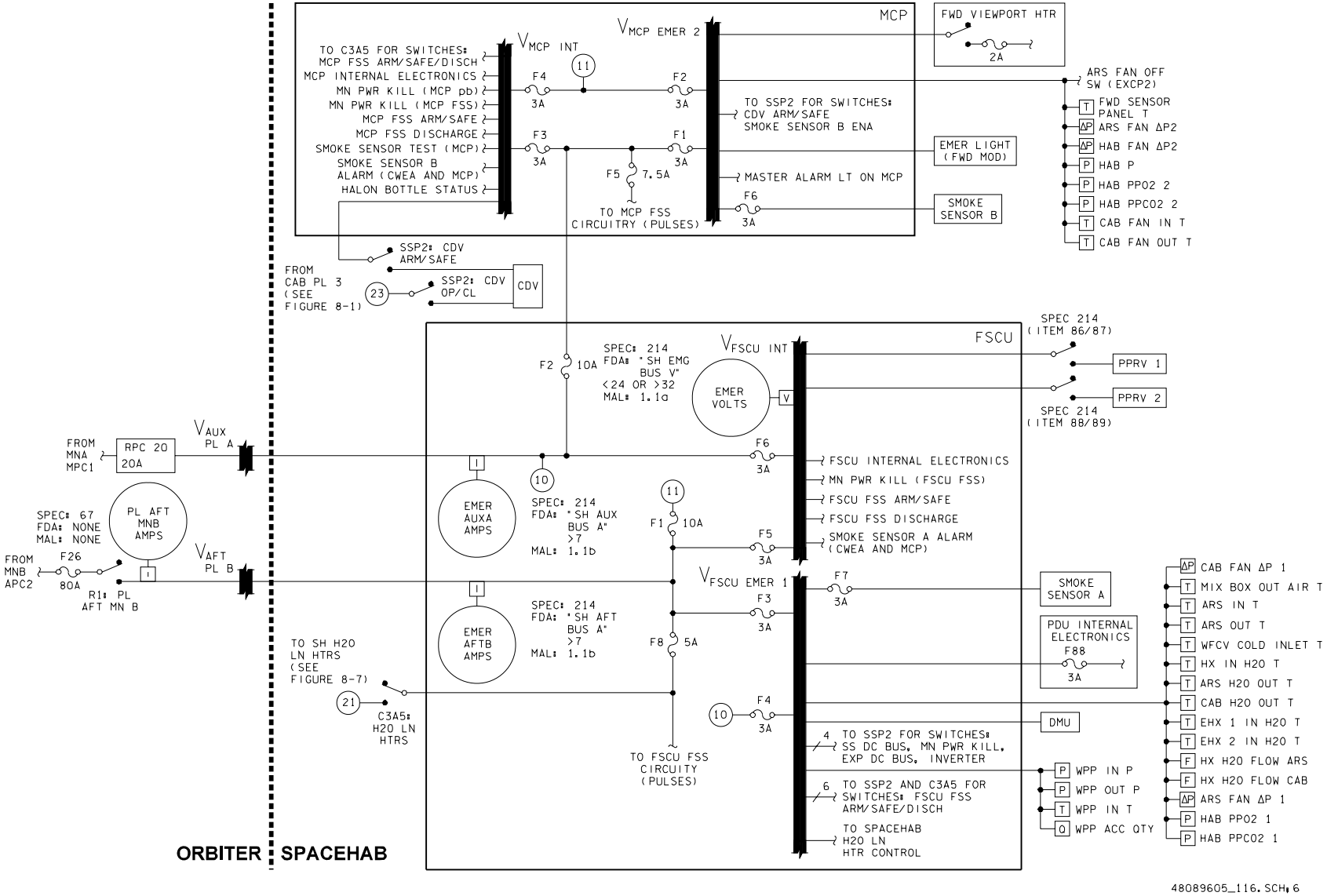


Figure 8-3.- Spacehab Emergency Power

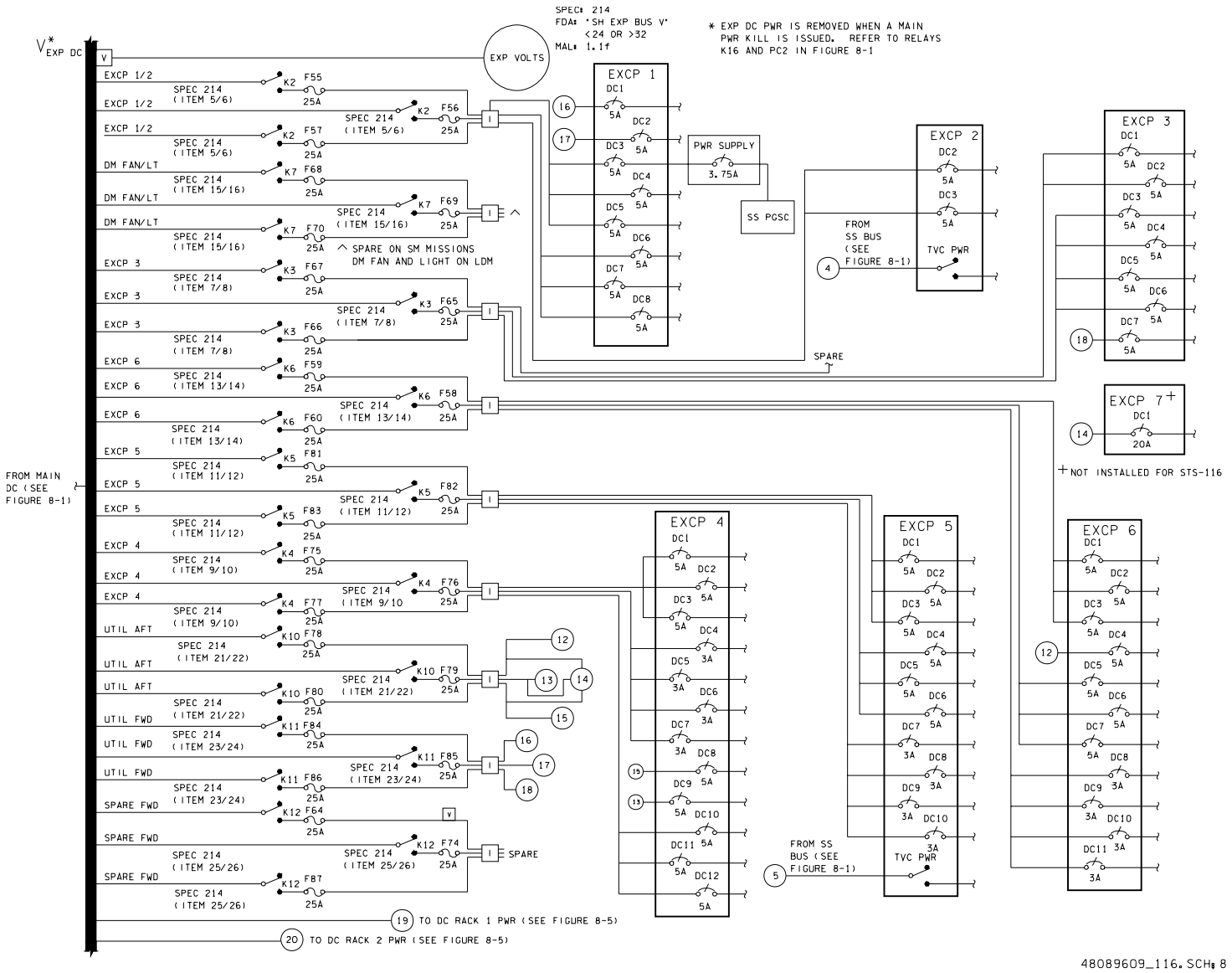


Figure 8-4.- Spacehab Experiment Power: Bulkhead DC

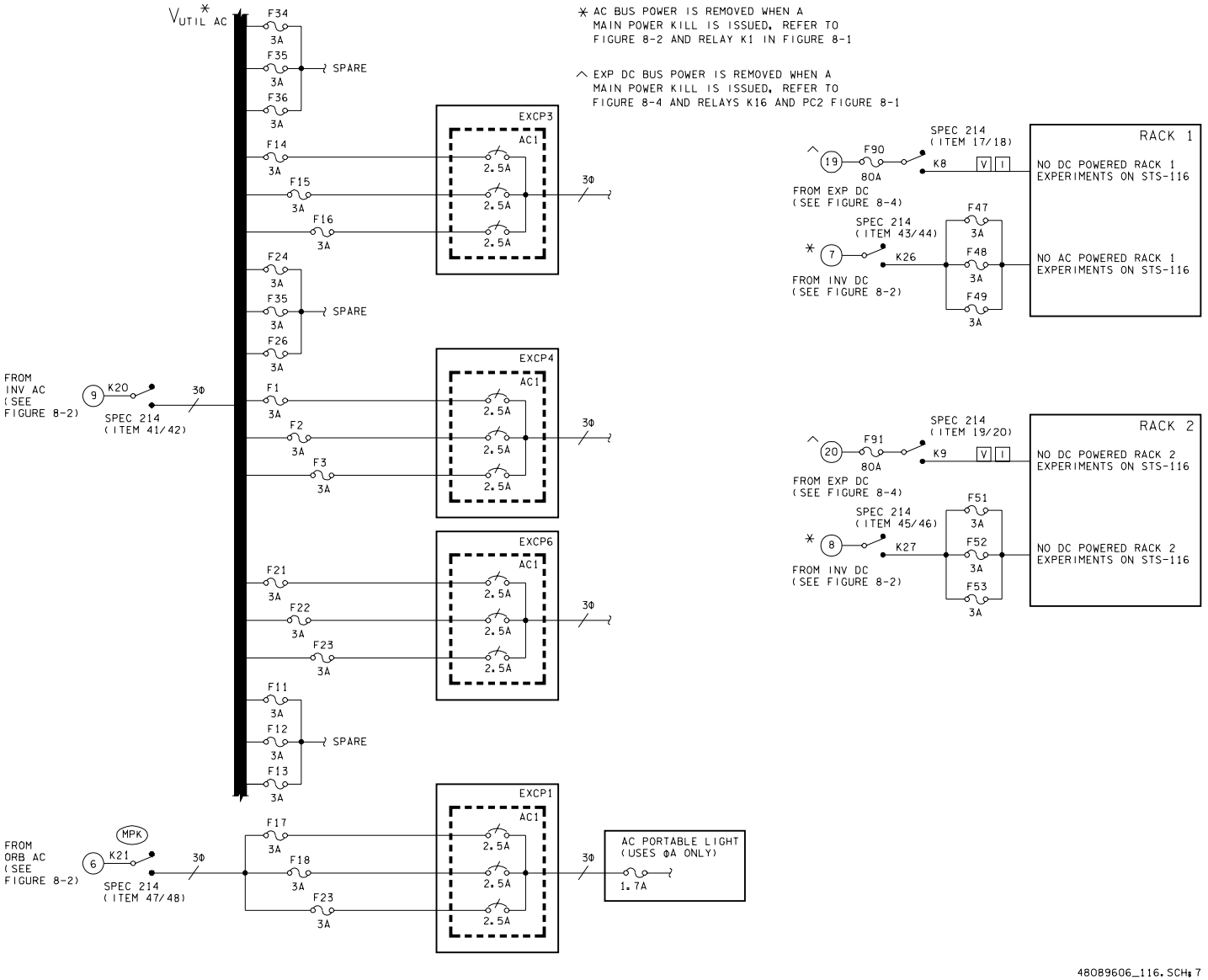


Figure 8-5.- Spacehab Experiment Power: Bulkhead AC and Rack Experiments

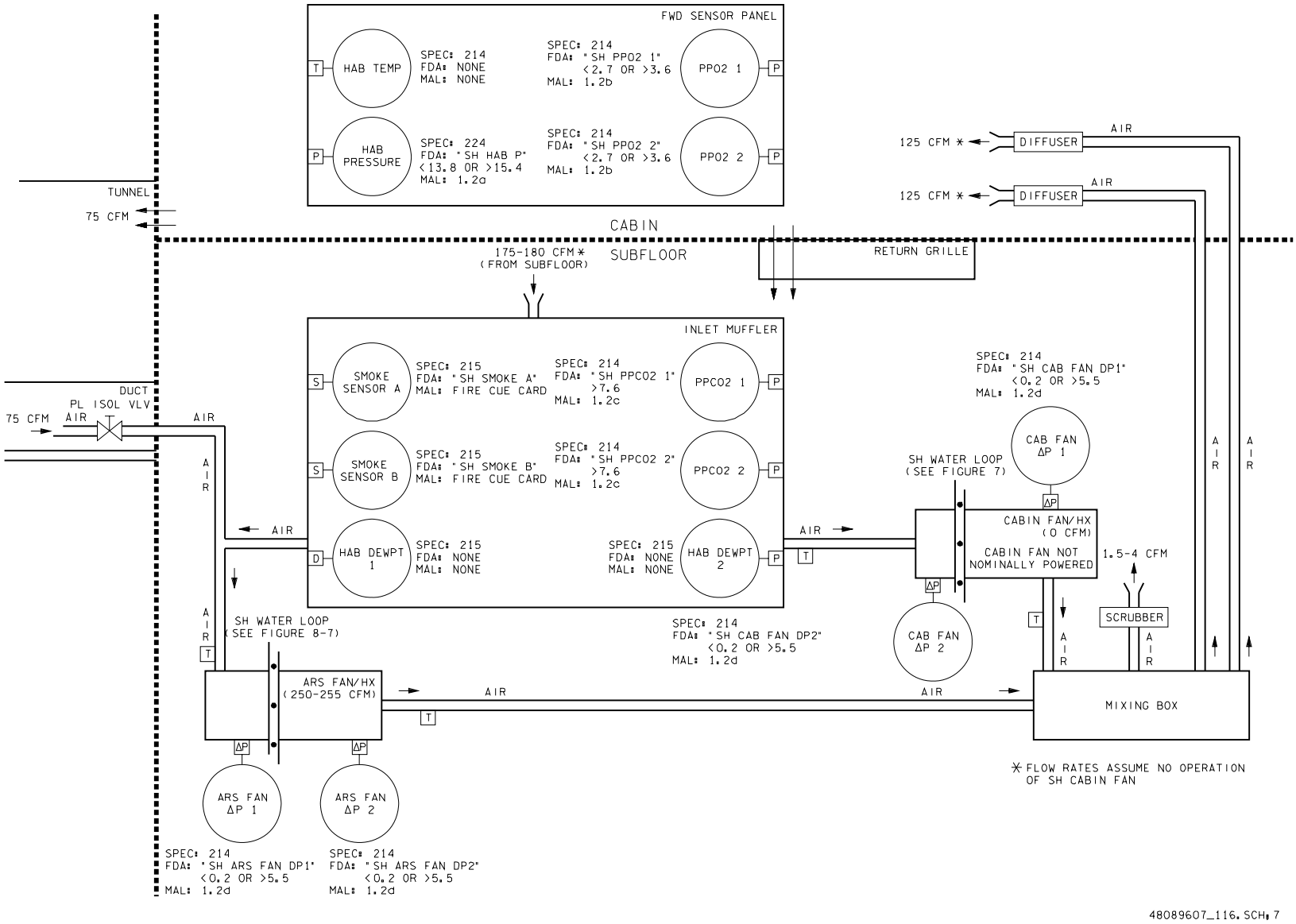


Figure 8-6.- Spacehab Air Loop

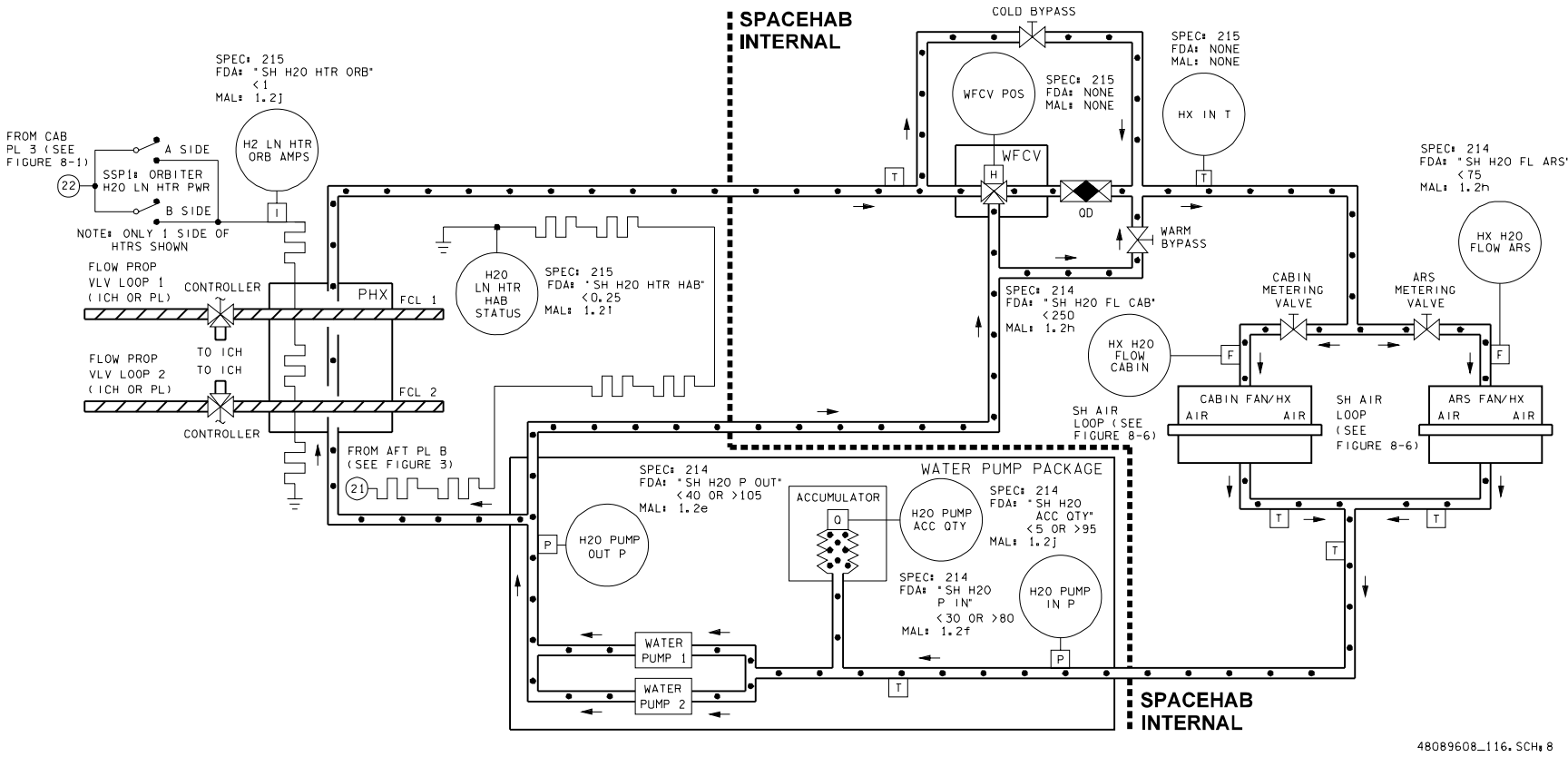


Figure 8-7.- Spacehab Water Loop

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EXCP PLUG-IN PLAN

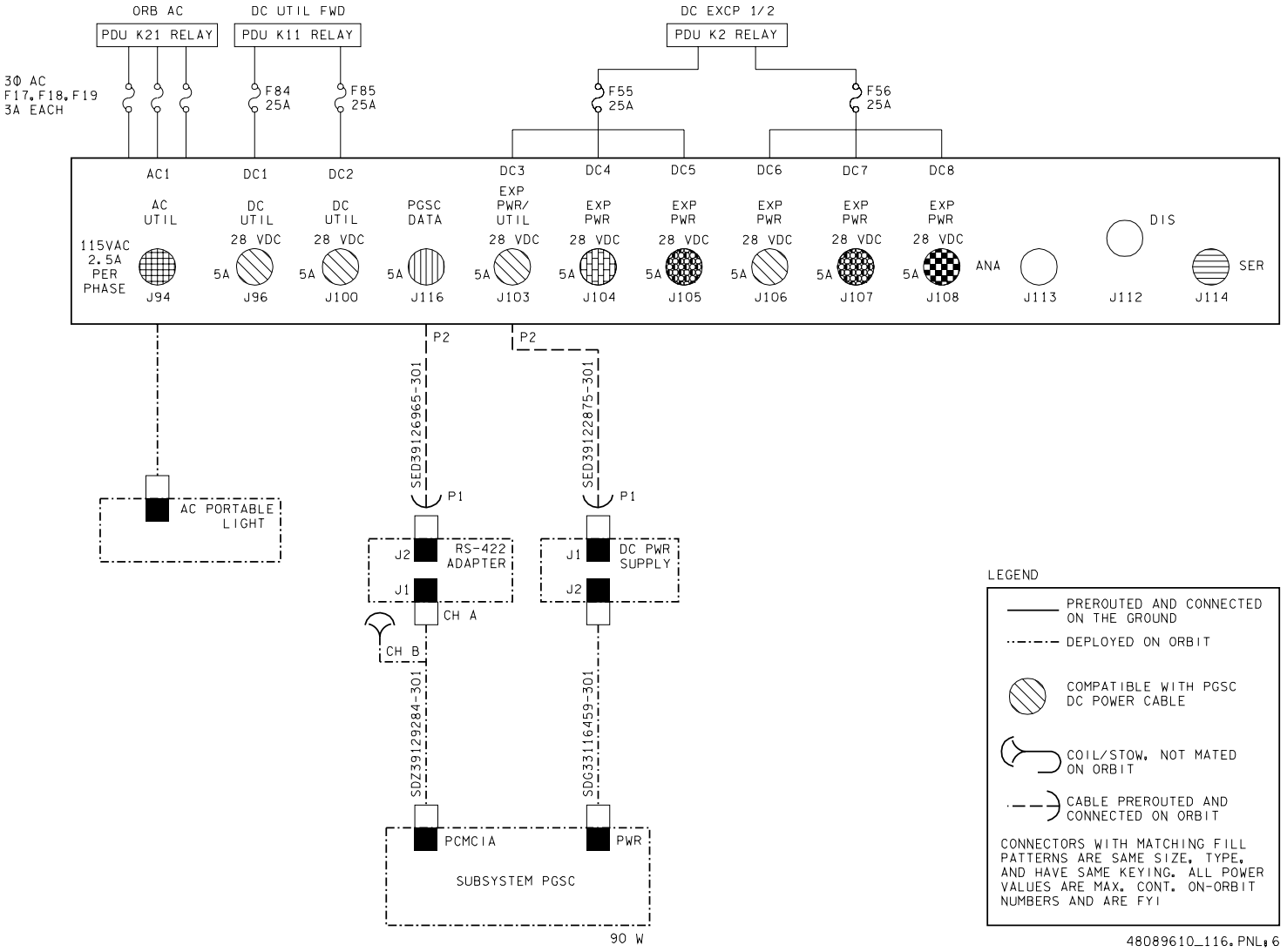

Figure 8-8.- EXCP 1

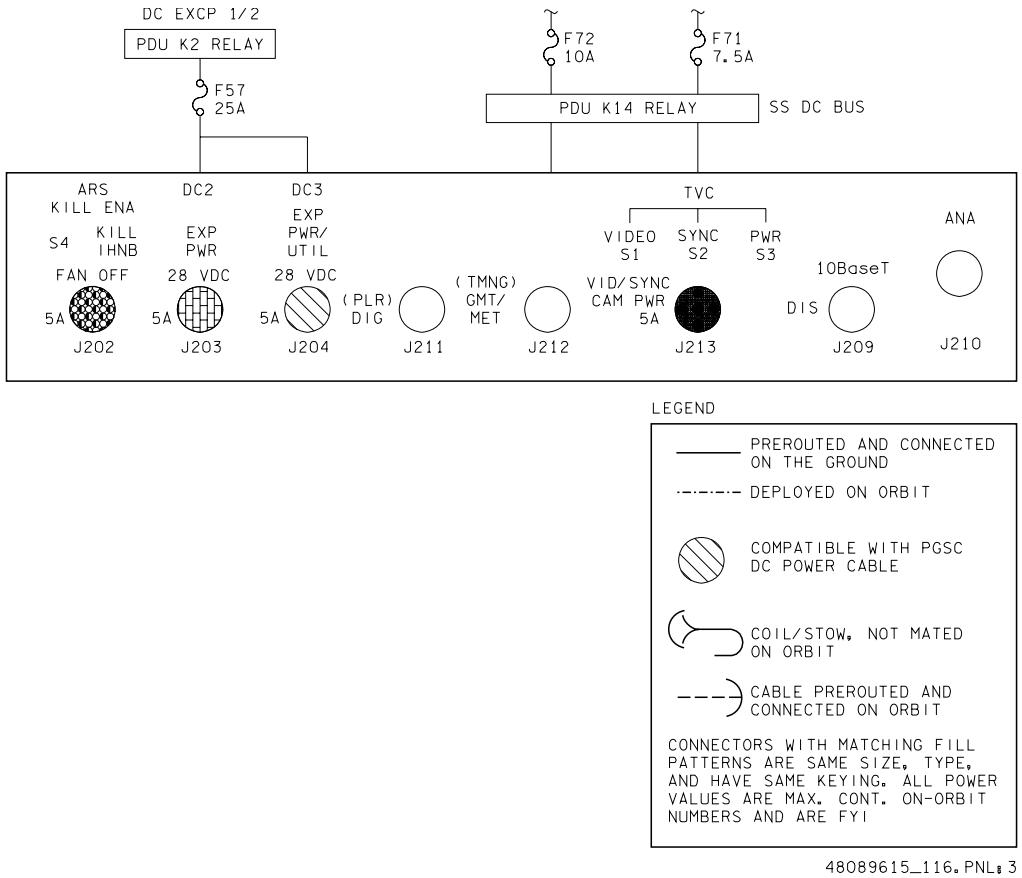

Figure 8-9.- EXCP 2

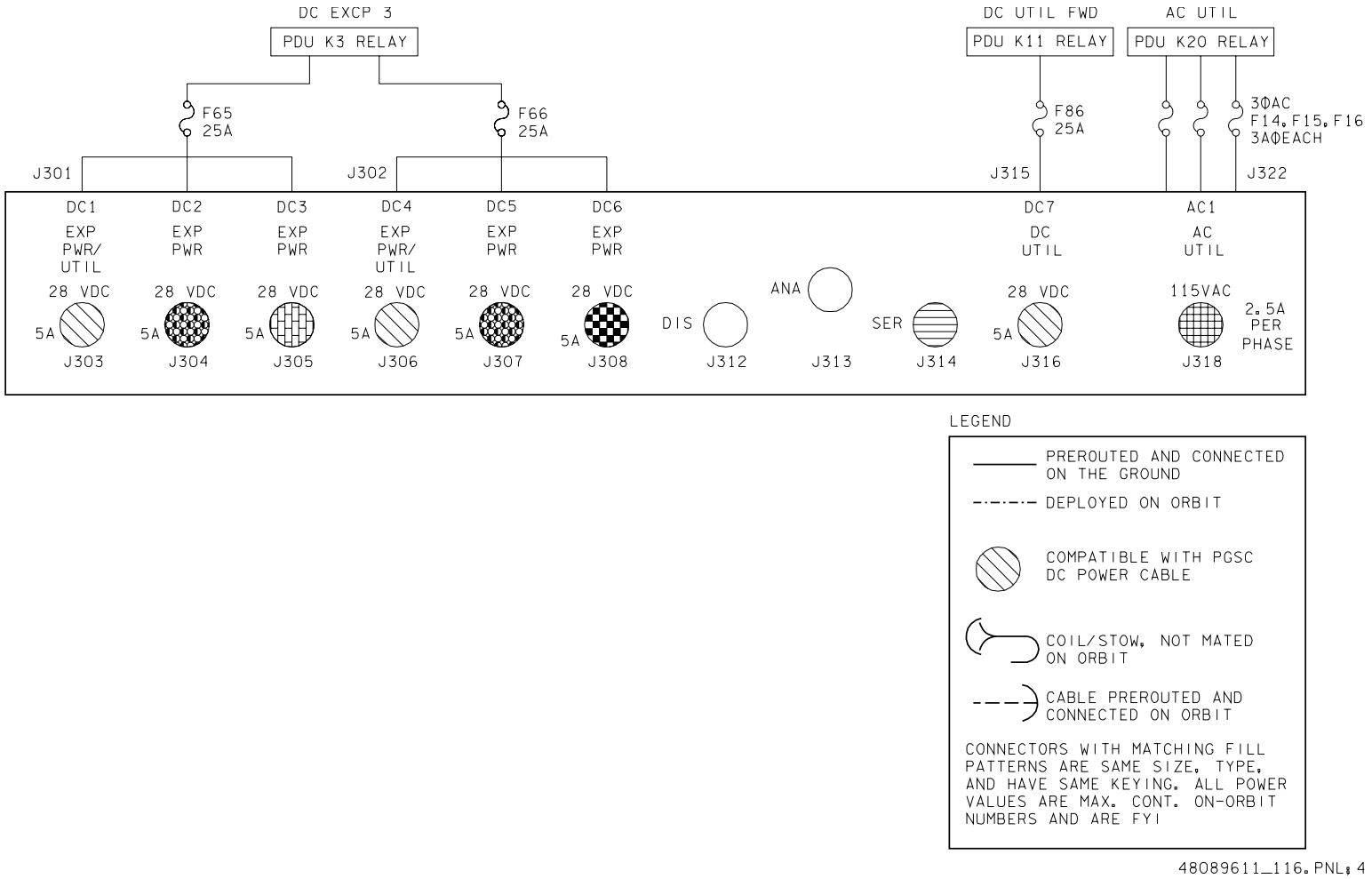

Figure 8-10.- EXCP 3

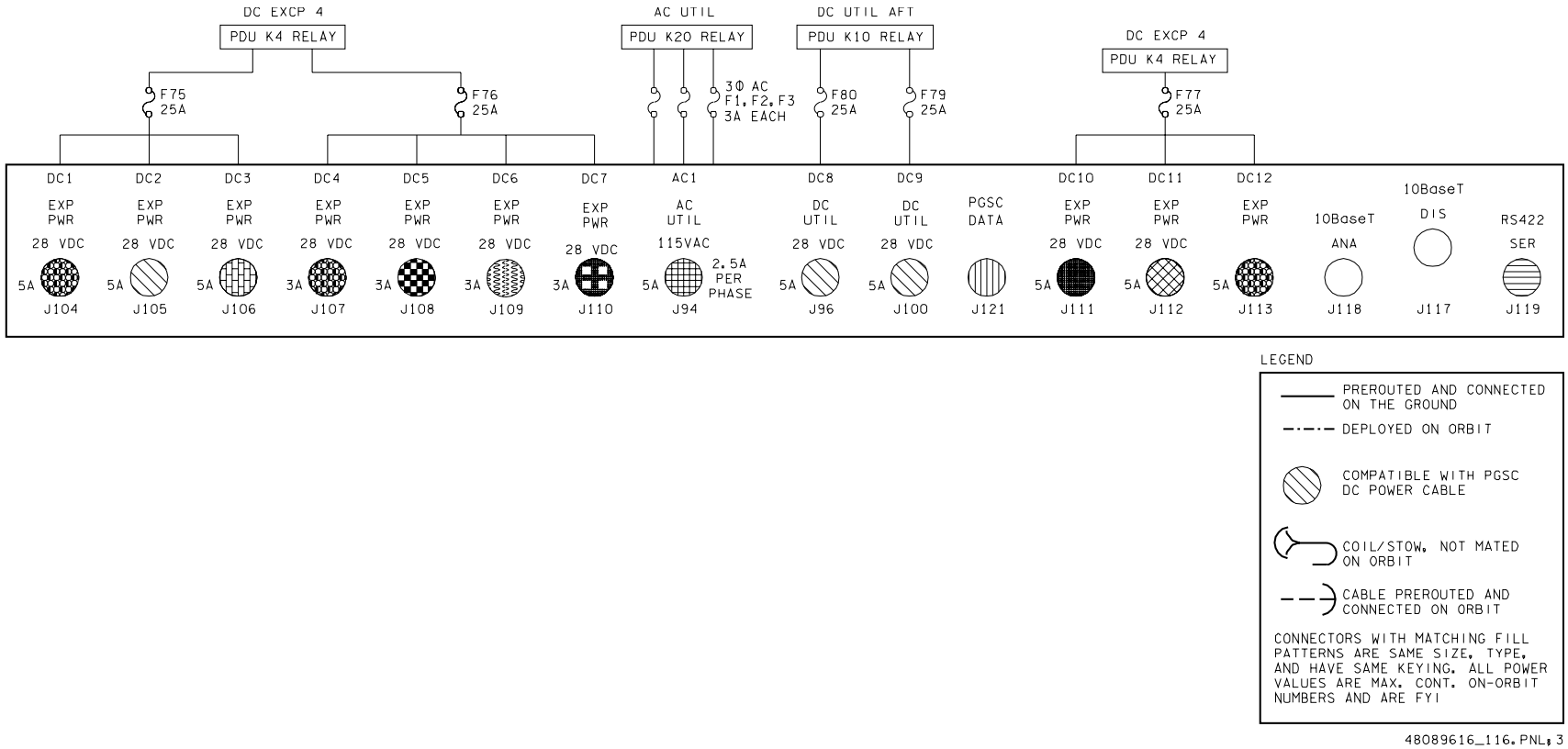

Figure 8-11.- EXCP 4

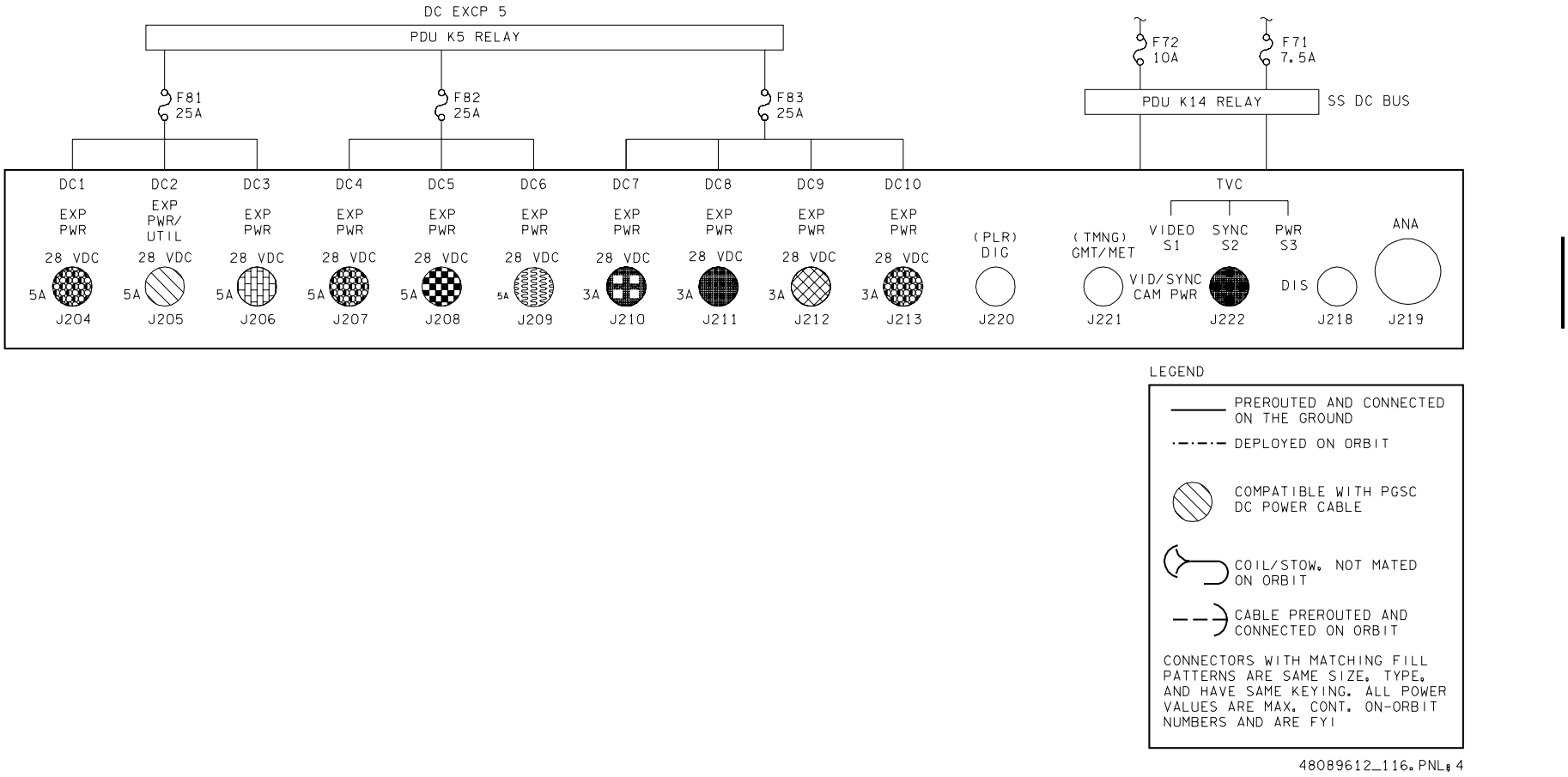

Figure 8-12.- EXCP 5

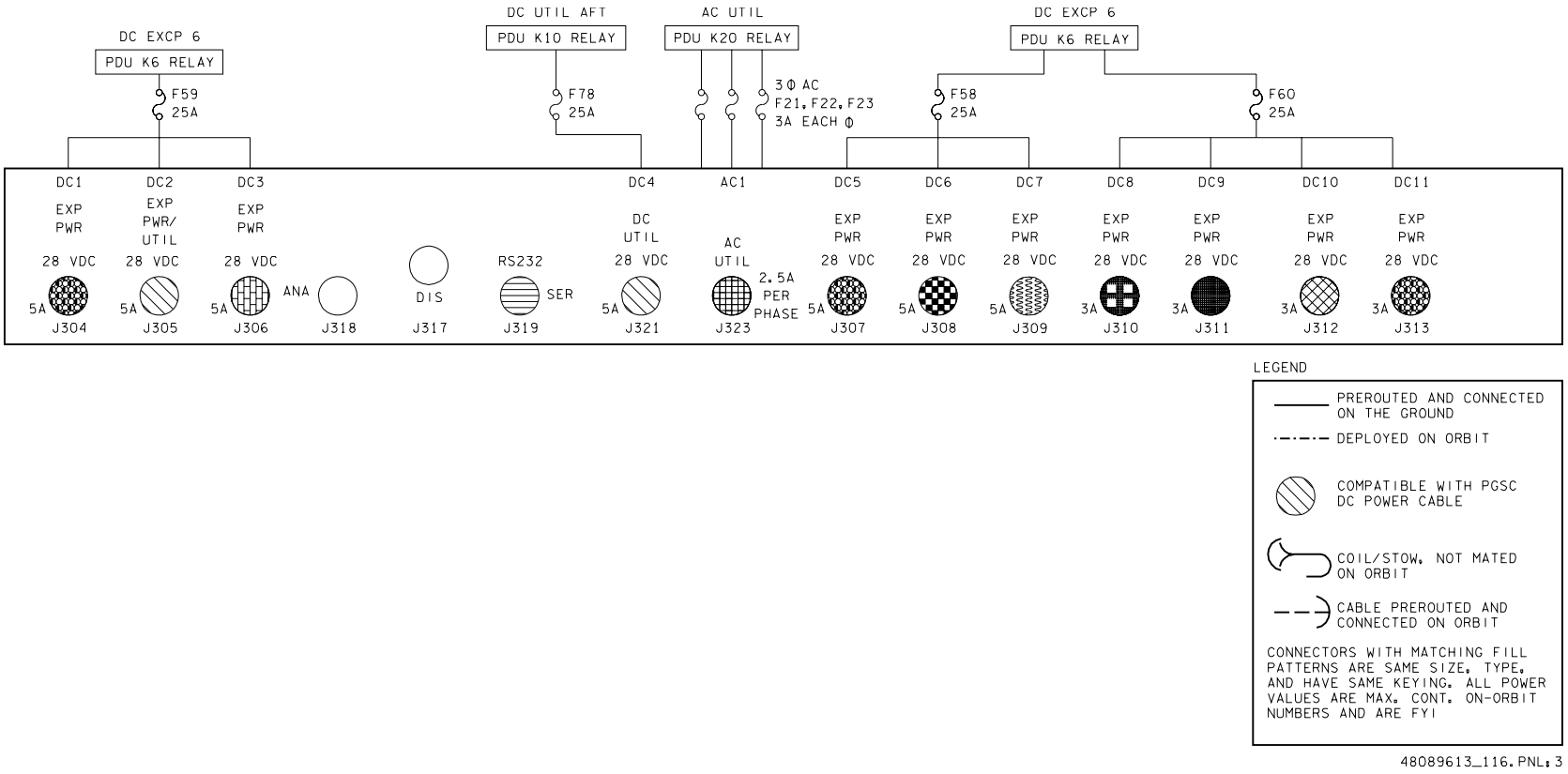

Figure 8-13.- EXCP 6

CUE CARD CONFIG

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FAB USE ONLY
(reduced copy)
CC 9-3
SH OPS/116/FIN

TOP

FIRE CONFIRMATION (HATCH OPEN)

If any of following:
- MCP L1 CRT: SMOKE SENSOR ALARM A or B lt – lt on
- MCP L1 CRT: SMOKE DETECTION B PAYLOAD lt – lt on
- MCP L1 CRT: '215 SH SMOKE A or B' FDA msg
- MCP L1 CRT: Visible fire or smoke smell
  1. Go to step 3

Else:
2. Fire alarm caused by orbiter >>

EXCP2
3. ARS – FAN OFF or
   SM 214 SPACEHAB ACT/DEAC
4. FANS ARS OFF – ITEM 61 EXEC (*)
5. Retrieve and strap on SEBS (do not activate)

If visible fire or smoke smell:
6. Don and activate SEBS

Orbiter Crew:
7. If docked, perform JOINT EMERGENCY EGRESS (Cue Card)
8. Remove pwr source (if possible), evaluate

If successful, take CSA-CP readings, √MCC >>

If no joy:

WARNING
Discharge is propulsive

9. Use PFE as reqd, evaluate

If no joy:

MCP Fwd Blkhd
10. MN PWR KILL pb – push (lt on)
11. CAB DEPRESS VLV – OP
12. Safe penetrators (if not secure):
    None for STS-116

SH Hatch
13. Egress module with SEBS, PFE
14. Disconnect BPSMU cable QD
15. Close hatch per decal

TNL ADP
16. Equal vlv (two) – OFF
17. PL ISOL VLV – CL
18. Inform CDR/PLT, "Module secured"
    SM 214 SPACEHAB ACT/DEAC

CRT
19. FANS CABIN ON – ITEM 68 EXEC (*)
    SM 215 SPACEHAB ECS

If indications of fire still exist (increasing smoke conc, PPCO2, or Hab temp):
20. Go to FIRE SUPPRESSION >>

If no visible fire or smoke smell:
21. √MCC

FIRE CONFIRMATION (HATCH CLOSED)

BFS 206 SH LAUNCH/ENTRY
SM 215 SPACEHAB ECS

If FIRE SMOKE CONC A,B (both) > 2:
1. Go to FIRE SUPPRESSION >>

If only one FIRE SMOKE CONC A(B) > 2:
2. Perform SMOKE SENSOR B(A) TEST (for sensor < 2), then:

If Sensor B(A) fails test (for sensor < 2):
- If FIRE SMOKE CONC A(B) > 2 and increasing:
  3. Go to FIRE SUPPRESSION, steps 1-10 >>
- Else:
  4. Fire not confirmed >>

If Sensor B(A) passes test (for sensor < 2):
5. Fire not confirmed >>

If FIRE SMOKE CONC A,B (both) < 2:
6. Fire not confirmed

SSP 2 CRT
7. SMOKE SENSOR – RESET
8. If ALARM A(B) – YES recurs: √MCC

HOOK VELCRO

SPACEHAB FIRE ALARM

FIRE SUPPRESSION

C3 SPACEHAB FIRE SUPPR:
1. MCP, FSCU (two) – ARM
2. (two) – DISCH
3. (two) – NO-OP
4. (two) – SAFE
5. H2O LN HTRS – ON

SSP 1
6. cb SW PWR 2 – cl
7. ORB H2O LINE HTR PWR A – ON
8. √B – OFF(A ENA)
   SM 215 SPACEHAB ECS
9. √H2O LN HTR HAB STATUS – 1
10. √ORB AMPS > 1

On MCC call (if AOS) or indications of fire still exist (increasing smoke conc, PPCO2 or SH temp):

SSP 2
11. CAB DEPRESS VLV – ARM (tb-gray)
12. – OPEN (tb-gray after 3 min)

MA73C:E R1
13. cb AC3 PL 3Φ – op
14. PL AUX – OFF

SMOKE SENSOR A TEST

SSP2
1. SMOKE SENSOR B – INHB (tb-bp)

NOTE
Expect MASTER ALARM, siren, and '215 SH SMOKE A' msg after release

2. SMOKE SENSOR – TEST (hold 10 sec, release)
3. – RESET

NOTE
Expect MASTER ALARM, siren, and '215 SH SMOKE A' msg after approx 25 sec

4. SMOKE SENSOR – TEST (hold until alarm ~25 sec)
5. – RESET

If sensor A fails either portion of test, sensor failed:
6. SMOKE SENSOR B – ENA (tb-gray)
7. A – INHB (tb-bp)

If sensor A passes both portions of test, sensor good

SMOKE SENSOR B TEST

SSP 2
1. SMOKE SENSOR A – INHB (tb-bp)

NOTE
Expect MASTER ALARM, siren, and '215 SH SMOKE B' msg after release

2. SMOKE SENSOR – TEST (hold 10 sec, release)
3. – RESET

NOTE
Expect MASTER ALARM, siren, and '215 SH SMOKE B' msg after approx 25 sec

4. SMOKE SENSOR – TEST (hold until alarm ~25 sec)
5. – RESET

If sensor B fails either portion of test, sensor failed:
6. SMOKE SENSOR A – ENA (tb-gray)
7. B – INHB (tb-bp)

If sensor B passes both portions of test, sensor good

SH OPS-1a/116/O/E

NOTE

One card stowed in back of SH OPS. Second card stowed in Middeck Cue Card Kit. Third card predeployed near L12

FAB USE ONLY

(reduced copy)

CC 9-4

SH OPS/116/FIN

TOP
BACK OF 'SPACEHAB FIRE ALARM'

SPACEHAB CABIN LEAK ISOLATION

SH OVHD
1. √EXP VENT VLV – cl
2. √NPRV covers (two) – cl (push firmly)

SH FWD BKHD
3. √CDV – CL
4. √NPRV covers (two) – cl (push firmly)

SM 215 SPACEHAB ECS

CRT
5. PPRV ISO VLV 1 CL – ITEM 87 EXEC (*)
6. 2 CL – ITEM 89 EXEC (*)
7. Perform SPACEHAB EMERGENCY EGRESS

If orbiter dP/dT positive or zero, SH Leak confirmed:

SM 215 SPACEHAB ECS

If HAB P > 10.0 and consumables permit, on MCC GO:

SH HATCH
8. Remove Equal vlv caps (two), temp stow
9. SH HATCH Equal vlv (two) – NORM
10. Open SH HATCH

TNL ADP
11. PL ISOL VLV – OP
12. Re-deploy BPSMU from ODS to SH, placing QD near hatch
13. Go to SPACEHAB 30-MIN DEACT (SH OPS, SH CONTINGENCY PROCS) >>

If HAB P < 10.0, deactivate Spacehab:

SM 214 SPACEHAB ACT/DEAC

14. FANS ARS OFF – ITEM 61 EXEC (*)
15. Go to SPACEHAB EMERGENCY DEACT, steps 1-8, 10 >>

If orbiter dP/dT still negative, return to calling procedure

HOOK VELCRO

SPACEHAB EMERGENCY DEACTIVATION

CDR/PLT perform:

C3
1. H2O LN HTRS – ON

SSP 1
2. cb SW PWR 2 – cl
3. ORB H2O LINE HTR PWR A – ON
4. √B – OFF (A ENA)

SM 215 SPACEHAB ECS

5. √H2O LN HTR HAB STATUS – 1
6. √ORB AMPS > 1

MA73C:E
7. cb AC3 PL 3Φ – op

R1
8. PL AUX – OFF

SH Crew perform:

9. Perform SPACEHAB EMERGENCY EGRESS, then:

SSP 2
10. MN PWR – KILL

SPACEHAB EMERGENCY EGRESS

1. Safe Penetrators (if not secured):
   √PFE secured in brackets or fwd bulkhead, stbd of hatch opening
   √SEBS secured at FC11

EXCP2
2. ARS – FAN OFF

If Viewport open:

VP
3. Close Viewport
4. √VP HTR – OFF

5. Egress module

SH Hatch
6. Disconnect BPSMU Cable QD
7. Close, latch per decal
8. Equal vlv (two) – OFF

TNL ADP (aft)
9. PL ISOL VLV – CL

SH OPS-1b/116/O/E

NOTE
One card stowed in back of SH OPS. Second card stowed in Middeck Cue Card Kit. Third card predeployed near L12

TOP

HOOK VELCRO

HAZARDOUS SPILL RESPONSE – SPACEHAB MODULE

LEVEL 4 (RED) MOST HAZARDOUS SPILL (NONCONTAINABLE)

1. Inform other crew, MCC – "Level 4 spill in Spacehab"

SH CLEANUP CREW:

2. Don/activate SEBS (2 crewmembers)

Fwd Blkhd 3. CAB DEPRESS vlv – OP

4. Safe Penetrators (if not secure): PFE

5. Egress module with SEBS

SH Hatch 6. Disconnect BPSMU Cable QD

7. Close hatch (per decal)

8. Equal vlv (two) – OFF and install caps

FLIGHT DECK CREW:

SM 214 SPACEHAB ACT/DEAC

9. FANS ARS OFF – ITEM 61 EXEC (*****)

If Spacehab Cabin fan ON:

10. FANS CABIN OFF – ITEM 62 EXEC (*****)

OTHER CREW:

TNL ADP (aft) 11. PL ISOL VLV – CL

12. Evacuate to orbiter, √MCC

RED

LEVEL 3 (ORANGE) HAZARDOUS SPILL (CONTAINABLE)

1. Inform other crew, MCC – "Level 3 spill in Spacehab"

SH CLEANUP CREW:

2. Don/activate SEBS (2 crewmembers), Silver Shield Gloves

FLIGHT DECK CREW:

If Booster Fan active:

MO13Q 3. ARLK FAN A(B) – OFF

SM 214 SPACEHAB ACT/DEAC

4. FANS ARS OFF – ITEM 61 EXEC (*****)

If Spacehab Cabin fan ON:

5. FANS CABIN OFF – ITEM 62 EXEC (*****)

OTHER CREW:

TNL ADP (aft) 6. PL ISOL VLV – CL

7. Evacuate to orbiter

CCK 8. Clean up spill w/Dry Wipes. Bag, label, stow in Wet Trash

If cleanup fails:

Fwd Blkhd 9. CAB DEPRESS vlv – OP

10. Safe Penetrators (if not secure): PFE

11. Egress module with SEBS

SH Hatch 12. Disconnect BPSMU cable QD

13. Close hatch (per decal)

14. Equal vlv (two) – OFF and install caps

FLIGHT DECK CREW:

SM 214 SPACEHAB ACT/DEAC

15. FANS ARS ON – ITEM 67 EXEC (*****)

16. √MCC >>

17. Deactivate/doff SEBS, gloves. Stow gloves in Wet Trash

18. Inform other crew, MCC: "Spill in module cleaned up"

TNL ADP (aft) 19. PL ISOL VLV – OP

FLIGHT DECK CREW:

On MCC GO:

SM 214 SPACEHAB ACT/DEAC

20. FANS ARS ON – ITEM 67 EXEC (*)

21. √ΔP 1,2 (two) > 0.2 and < 6.0

If Booster Fan in bypass config >>

MO13Q 22. ARLK FAN A(B) – ON

ORANGE

HOOK VELCRO

SH OPS-2a/116/O/D

(reduced copy)

HOOK VELCRO

HAZARDOUS SPILL RESPONSE – SPACEHAB MODULE (Cont)

LEVEL 2 (YELLOW) HAZARDOUS SPILL
LEVEL 1 (BLUE) LEAST HAZARDOUS SPILL
LEVEL 0 (GREEN) NONHAZARDOUS SPILL

1. Inform other crew, MCC: "Level 2(1,0) spill in Spacehab"

If Level 2 spill:

CCK 2. All crew in module don goggles, masks, Silver Shield Gloves

If Level 1 spill:

CCK 3. All crew in module don goggles, masks, latex gloves

If Level 0 controlled spill, >>

FLIGHT DECK CREW:

If Booster Fan active:

MO13Q 4. ARLK FAN A(B) – OFF

SM 214 SPACEHAB ACT/DEAC

5. FANS ARS OFF – ITEM 61 EXEC (*)

If Spacehab Cabin fan ON:

6. FANS CABIN OFF – ITEM 62 EXEC (*)

OTHER CREW:

TNL ADP (aft) 7. PL ISOL VLV – CL

CCK 8. Clean up spill w/Dry Wipes. Bag, label, stow in Wet Trash

If Level 2(1,0) cleanup fails:

Fwd Blkhd 9. CAB DEPRESS vlv – OP
10. Safe Penetrators (if not secure): PFE, SEBS
11. Egress module
SH Hatch 12. Disconnect BPSMU cable QD
13. Close hatch (per decal)
14. Equal vlv (two) – OFF and install caps

FLIGHT DECK CREW:

SM 214 SPACEHAB ACT/DEAC

15. FANS CABIN ON – ITEM 68 EXEC (*)
16. √MCC >>
17. Doff masks, goggles, gloves. Stow gloves in Wet Trash
18. Inform other crew, MCC: "Spill in module cleaned up"

TNL ADP (aft) 19. PL ISOL VLV – OP

FLIGHT DECK CREW:

On MCC GO:

SM 214 SPACEHAB ACT/DEAC

20. FANS ARS ON – ITEM 67 EXEC (*)
21. √ΔP 1,2 (two) > 0.2 and < 6.0

If Booster Fan in bypass config >>

MO13Q 22. ARLK FAN A(B) – ON

YELLOW

HOOK VELCRO

(reduced copy)

HOOK VELCRO

HAZARDOUS SPILL RESPONSE – ORBITER CABIN (WITH SH MODULE HATCH OPEN)

LEVEL 4 (RED) MOST HAZARDOUS SPILL (NONCONTAINABLE)

1. Inform other crew, MCC – "Level 4 spill in cabin"
2. All crew don/activate QDMs
3. QDM Regulator mode – EMERGENCY (red knob cw)

If Booster Fan active:

MO13Q 4. AIRLK FAN A(B) – OFF, then:

If hatches to ISS open:

5. Simo, perform JOINT EMERGENCY EGRESS (Cue Card), continue with this proc

L1 6. CAB TEMP sel – COOL

WCS 7. MODE – COMMODE/MANUAL/EMU

8. COMMODE CNTL – PULL UP (wait 15 sec), PUSH FWD

OCAC 9. √OCAC PWR – ON

10. Perform SPACEHAB EMERGENCY EGRESS (Cue Card)

11. √MCC

RED

LEVEL 3 (ORANGE) HAZARDOUS SPILL (CONTAINABLE)

1. Inform other crew, MCC – "Level 3 spill in cabin"
2. All crew don/activate QDMs
3. QDM Regulator mode – Emergency (red knob cw)

If Booster Fan active:

MO13Q 4. AIRLK FAN A(B) – OFF, then:

If hatches to ISS open:

5. Simo, perform JOINT EMERGENCY EGRESS (Cue Card), continue with this proc

L1 6. CAB FAN A(B) – OFF (max 30 min)

7. IMU FAN B(A,C) – OFF (max 90 min)

OCAC 8. OCAC PWR – OFF

SM 214 SPACEHAB ACT/DEAC

9. FANS ARS OFF – ITEM 61 EXEC (*)

CCK 10. Cleanup crew don Silver Shield Gloves, clean up spill w/Dry Wipes. Bag, label, stow in Wet Trash

If cleanup fails, perform steps 14 and 15, then go to Level 4 step 6 >>

11. QDM Regulator mode – NORM (red knob ccw)
12. Doff Quick Don Masks, gloves. Stow gloves in Wet Trash
13. Inform other crew, MCC – "Spill in cabin cleaned up"

L1 14. CAB FAN A(B) – ON

15. IMU FAN B(A,C) – ON

OCAC 16. OCAC PWR – ON

SM 214 SPACEHAB ACT/DEAC

17. FANS ARS ON – ITEM 67 EXEC (*)
18. √ΔP1,2 (two) > 0.2 and < 6.0

If Booster Fan in bypass config >>

MO13Q 19. AIRLK FAN A(B) – ON

ORANGE

HOOK VELCRO

HOOK
VELCRO

HAZARDOUS SPILL RESPONSE – ORBITER CABIN (WITH SH MODULE HATCH OPEN)

LEVEL 2 (YELLOW) HAZARDOUS SPILL
LEVEL 1 (BLUE) LEAST HAZARDOUS SPILL
LEVEL 0 (GREEN) NONHAZARDOUS SPILL

1. Inform other crew, MCC – "Level 2(1,0) spill in cabin"

If Level 2 spill:

CCK 2. Cleanup crew in vicinity don goggles, masks, and gloves (√MCC for Silver Shield or latex)

If Level 1 spill:

CCK 3. Cleanup crew in vicinity don goggles, masks, latex gloves

If Level 0 controlled spill, >>

If Booster Fan active:

MO13Q 4. AIRLK FAN A(B) – OFF, then:

L1 5. CAB FAN A(B) – OFF (max 30 min)

6. IMU FAN B(A,C) – OFF (max 90 min)

OCAC 7. OCAC PWR – OFF

SM 214 SPACEHAB ACT/DEAC

8. FANS ARS OFF – ITEM 61 EXEC (*****) (for Level 1 and 2 only)

CCK 9. Clean up spill w/Dry Wipes. Bag, label, stow in Wet Trash

If Level 2(1,0) cleanup fails, perform steps 12 and 13, then go to Level 4 step 5 >>

10. As reqd, doff goggles, masks, gloves. Stow gloves in Wet Trash

11. Inform other crew, MCC – "Spill in cabin cleaned up"

L1 12. CAB FAN A(B) – ON

13. IMU FAN B(A,C) – ON

OCAC 14. OCAC PWR – ON

SM 214 SPACEHAB ACT/DEAC

15. FANS ARS ON – ITEM 67 EXEC (*****) (for Level 1 and 2 only)

16. √ΔP1,2 (two) > 0.2 and < 6.0

If Booster Fan in bypass config >>

MO13Q 17. AIRLK FAN A(B) – ON

YELLOW

HOOK
VELCRO

(reduced copy)

TOP

SPACEHAB FIRE ALARMS (ASCENT/ENTRY)

BFS 206 SH LAUNCH/ENTRY

* If only one sensor available, *
* confirmation is the *
* following: *
* CONC ≥ 1.9 and incr *
* Go to step 3 *

If both CONC ≥ 1.9:
| 1. Go to step 3
Else:
2. Fire not confirmed >>

C3 SPACEHAB FIRE SUPPR:
3. MCP – ARM
4. – DISCH
5. FSCU – ARM
6. – DISCH
7. – NO-OP
8. – SAFE
9. MCP – NO-OP
10. – SAFE

SH OPS-4a/116/O/B

TOP
BACK OF 'SPACEHAB FIRE ALARMS (ASCENT/ENTRY)

HOOK VELCRO

SH OPS-4b/116/O/A

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Space Shuttle Program
FLIGHT DATA FILE

JSC-48089-116
FINAL

SPACEHAB OPS CHECKLIST

STS
116

Flight Cover (trim bottom to expose tabs)