



# International Space Station Assembly Operations Book

## ISS-12A.1

Mission Operations Directorate  
Operations Division

27 OCT 06

This publication replaces  
all previous publications.  
These procedures are available  
electronically on the SODF Homepage  
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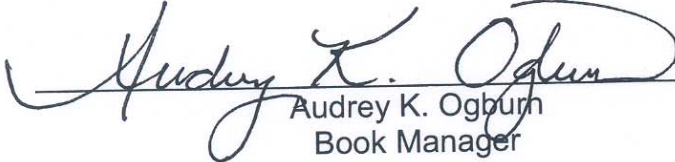


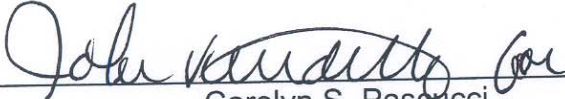


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ASSEMBLY OPERATIONS BOOK  
ISS-12A.1**

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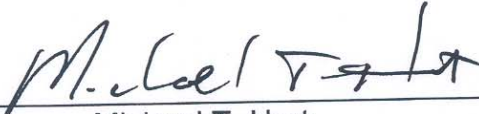
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POWER RECONFIGURATION

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# CHANNEL 2/3 POWER RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 1 of 8 pages

**ASSUMPTIONS:**

- LVLH
- Campout is EVA protocol
- ROOBA fully functional
- Port SARJ on String 1 and rotating
- MT at Worksite 3 in CETA-CETA-MT config prior to EVA
- P6 4B Array is retracted
- CMGs 2, 3, 4 are powered from Z1; CMG 1 powered from S0

## Channel 2/3 Pwr Rcnfg

**Legend:**

- IV Crew
- EV Crew
- MCC-H
- Inhibit**
- IV & EV Crew

Check when completed      GMT completed

Time (Min)

7. Step Title

Thermal Clock Start/End

Note: Block titles in Bold are Procedure Names

**CHANNEL 2/3 RECONFIG INITIAL CONDITIONS**

ADCO

- all GPS Antennas are on String 2

ODIN

- Tier 1 & 2 MDMs are powered from Channel 1/4
- Verify Single Node Mighty Mouse PPL

CATO

- S-band String 1 configured for Primary
- UHF system configured to UHF-2
- Audio and UHF FDIR inhibited
- IAC-1 Prime

THOR

- ORUs preheated to proper temps (ref FR 12A.1\_C2-84)
- P1 TRRJ in Autotrack (taken to Directed Position in Block **B5**), S1 TRRJ Shutdown
- EATCS Loop B Fill Complete and EATCS Pressure > 2592 kPa (390 psi)
- IATCS in Single LT

ECLSS

- LAB1P6 CCAA prime

PHALCON

- Payload racks off (except MELFI)
- A/L patch panel reconfig complete (A/L avionics powered from Ch 1/4 string)

BME

- VOA & Defib Powered down

CIO

- UOPs and Ops LAN in proper config

Russian Power:

- Remove power from FGB ARCUs 51, 52 and SM CHTs 23, 24: Block **43**
- Reapply power to FGB ARCUs 51, 52 and SM CHTs 23, 24: Block **49**

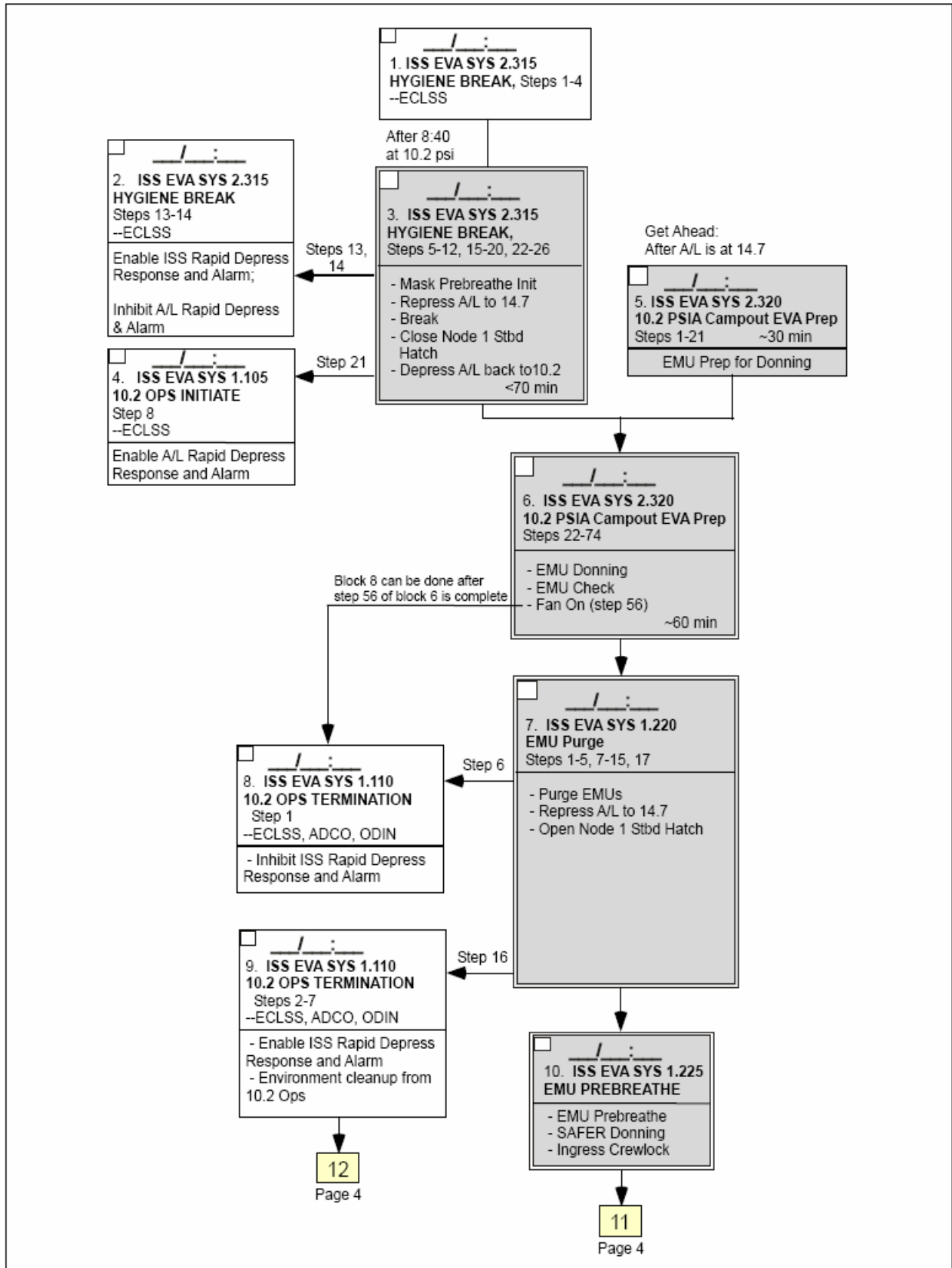
Articulating Components:

	Stop Rotating	Start Rotating
SARJ	does not stop	does not stop
S1 TRRJ (Loop A)	locked at docking	block <b>60</b>
P1 TRRJ (Loop B)	block <b>B5</b>	block <b>60</b>

# CHANNEL 2/3 POWER RECONFIGURATION

(ASSY OPS/12A.1/FIN)

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# CHANNEL 2/3 POWER RECONFIGURATION

(ASSY OPS/12A.1/FIN)

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Disciplines will perform  
Blocks B1-B15 in parallel

**B1. Av Rack Jumper Installation**  
 Avionics Rack Equipment Powerdowns  
 **AVIONICS RACK POWER JUMPER INSTALLATION LAB1D3 TO LAB1D5 (AV1 RACK),**  
Step 1 (MCC-H)  
 **AVIONICS RACK POWER JUMPER INSTALLATION LAB1D3 TO LAB1D5 (AV1 RACK),**  
Step 2, 3, 4 (CREW)  
 Power on C&C-2 MDM  
--ODIN, CATO, PHALCON, IV  
~30 min

**B2. Verify all Tier 1 & 2 MDMs are on Channel 1/4**  
--ODIN

**B3. RT FDIR Inhibits**  
--ODIN

**B4. Pre EVA Config Script**  
--ODIN

**B13. Deact GNC-2 MDM**  
--ODIN

**B5. THOR Powerdowns**  
 **2.417 LOOP A(B) TRRJ INITIATE DIRECTED POSITION OR AUTOTRACK,**  
Loop B (Port) TRRJ to directed position (\_\_\_°)   
 **VERIFY ETCS LOOP A(B) CONFIGURATION (for Loop B)**  
--THOR ~40 min

**B6. CHANNEL 2/3 POWERDOWN TRUSS HEATER PREP**  
--THOR ~15 min

**B7. THOR Prep for MDM Transitions**  
 **TCS 4.205 LAB IATCS RECONFIGURATION FOR LA2 MDM TRANSITION,**  
Steps 1-7  
 **TCS 4.235 LAB IATCS RECONFIGURATION FOR LA3 MDM TRANSITION OR FAILURE, Step 1**  
--THOR ~15 min

**B11. ADCO Powerdowns**  
 **MCS 2.608 GPS SHUTDOWN**  
 **MCS 2.606 RGA SHUTDOWN**  
--ADCO

**B14. 12A.1 SSAS HEATER RECONFIGURATION - CHANNEL 2/3**  
--OSO

**B8. ECLSS Powerdowns**  
 Node 1 Smoke Detector 2  
 Lab SD5 Smoke Detector  
 Node 1 Fwd Port IMV Valve  
 Node 1 Fwd Stbd IMV Valve  
 Lab Aft Port IMV Valve  
 Lab Aft Stbd IMV Valve  
 Lab Fwd Stbd IMV Fan  
 Deactivate CHeCS Rack AAA & SD  
--ECLSS ~10 min

**B9. EPS SYSTEM CONFIGURATION FOR EVA 2 POWERDOWN**  
 Inhibit Rack RPSs  
 Confirm MCC-M prepared for CHT/ARCU pwrdn  
--PHALCON ~15min

**B10. Payload Rack Config**  
 Verify MELFI is configured on Channel 4A  
--POIC

**B12. Configure Internal and External Video**  
--CATO

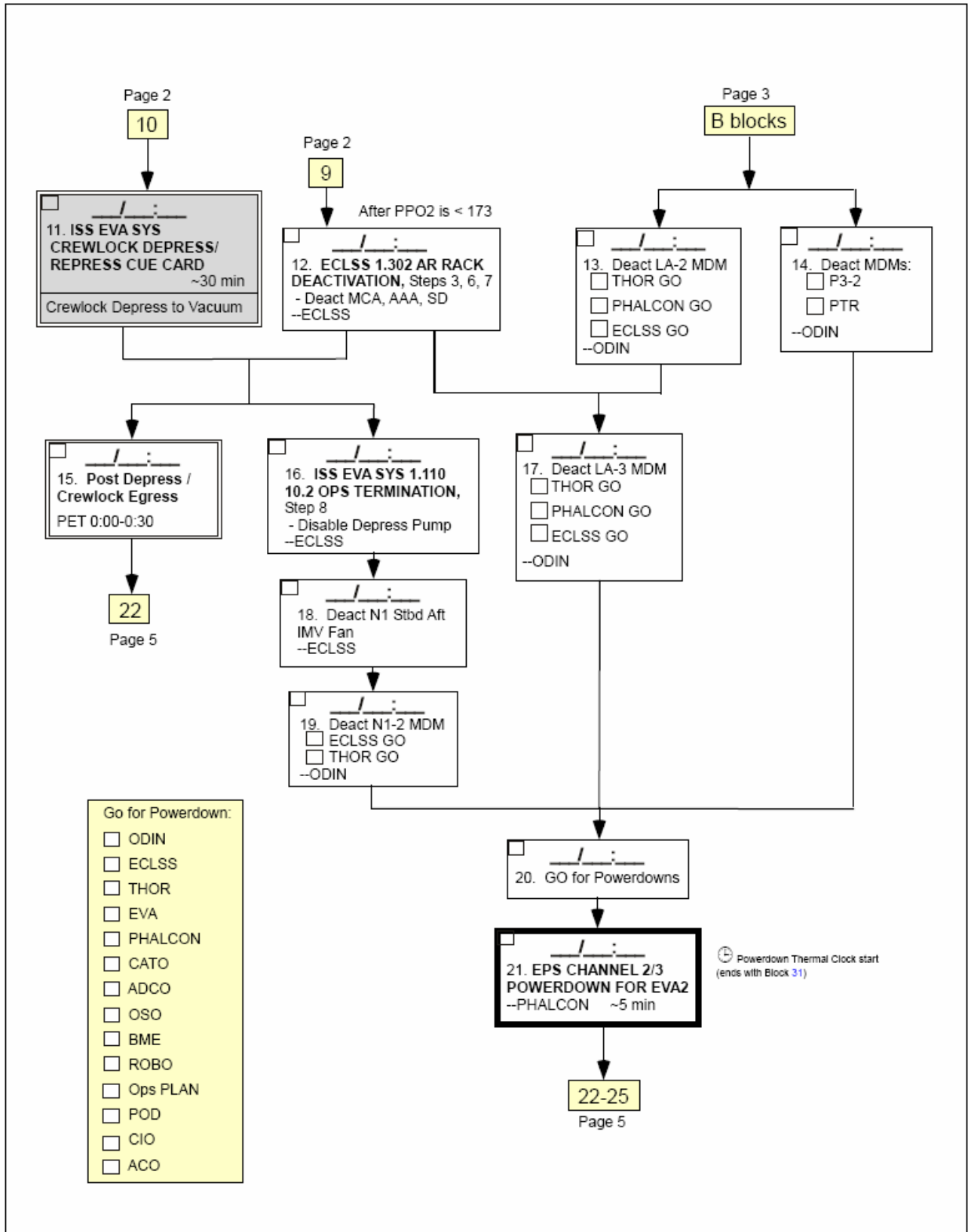
**B15. Verify MSS configured for single string ops**  
--ROBO

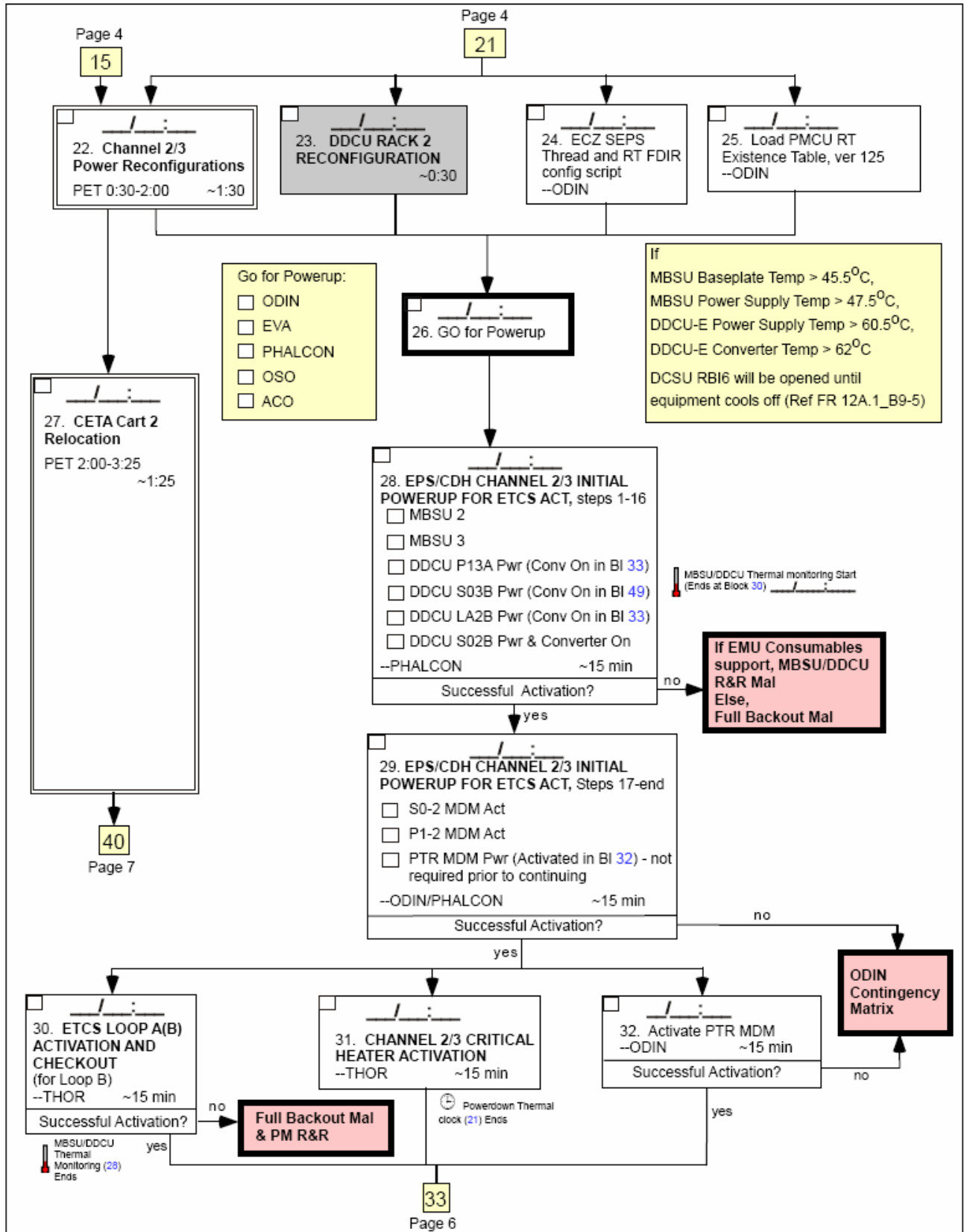
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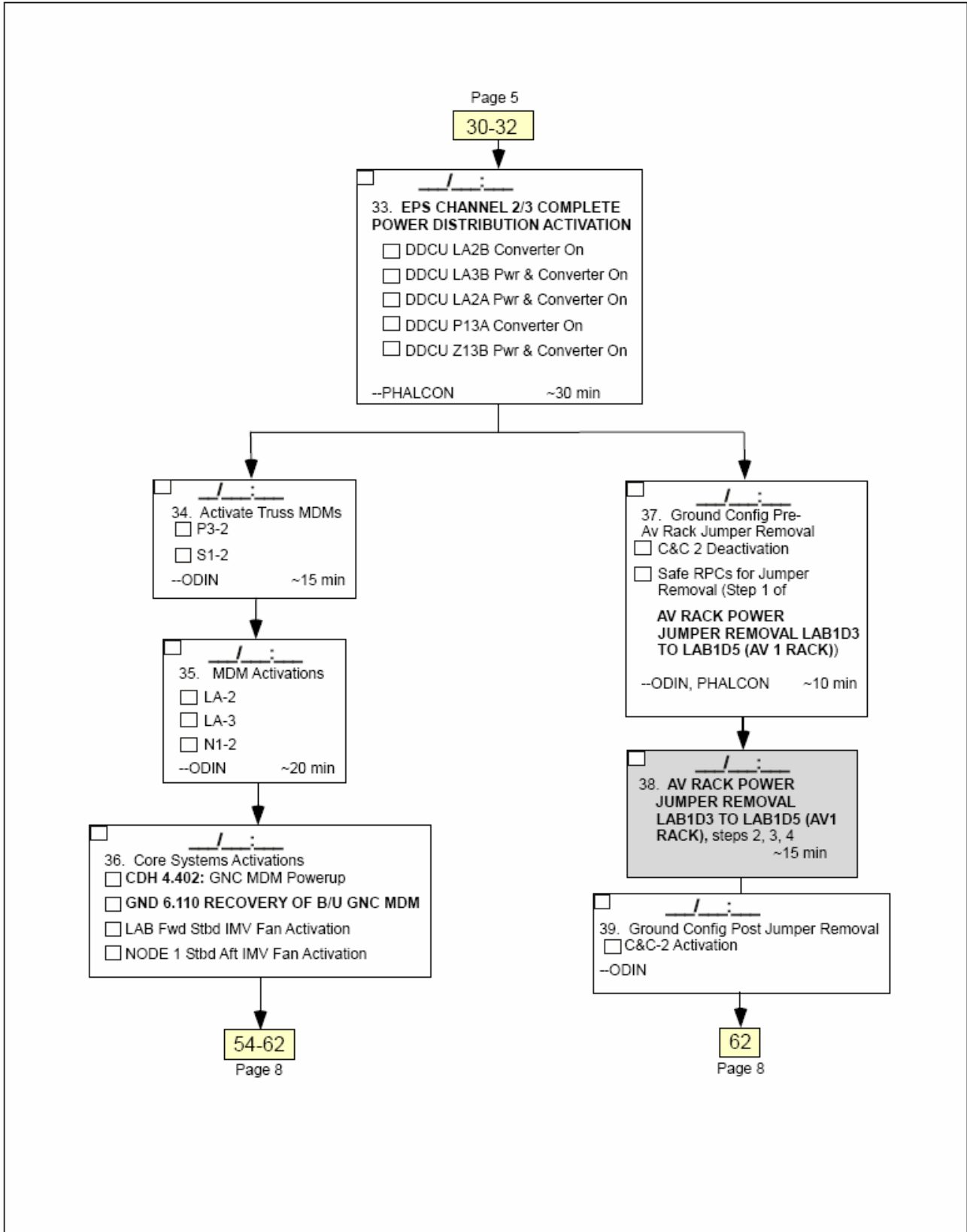
Page 4

# CHANNEL 2/3 POWER RECONFIGURATION

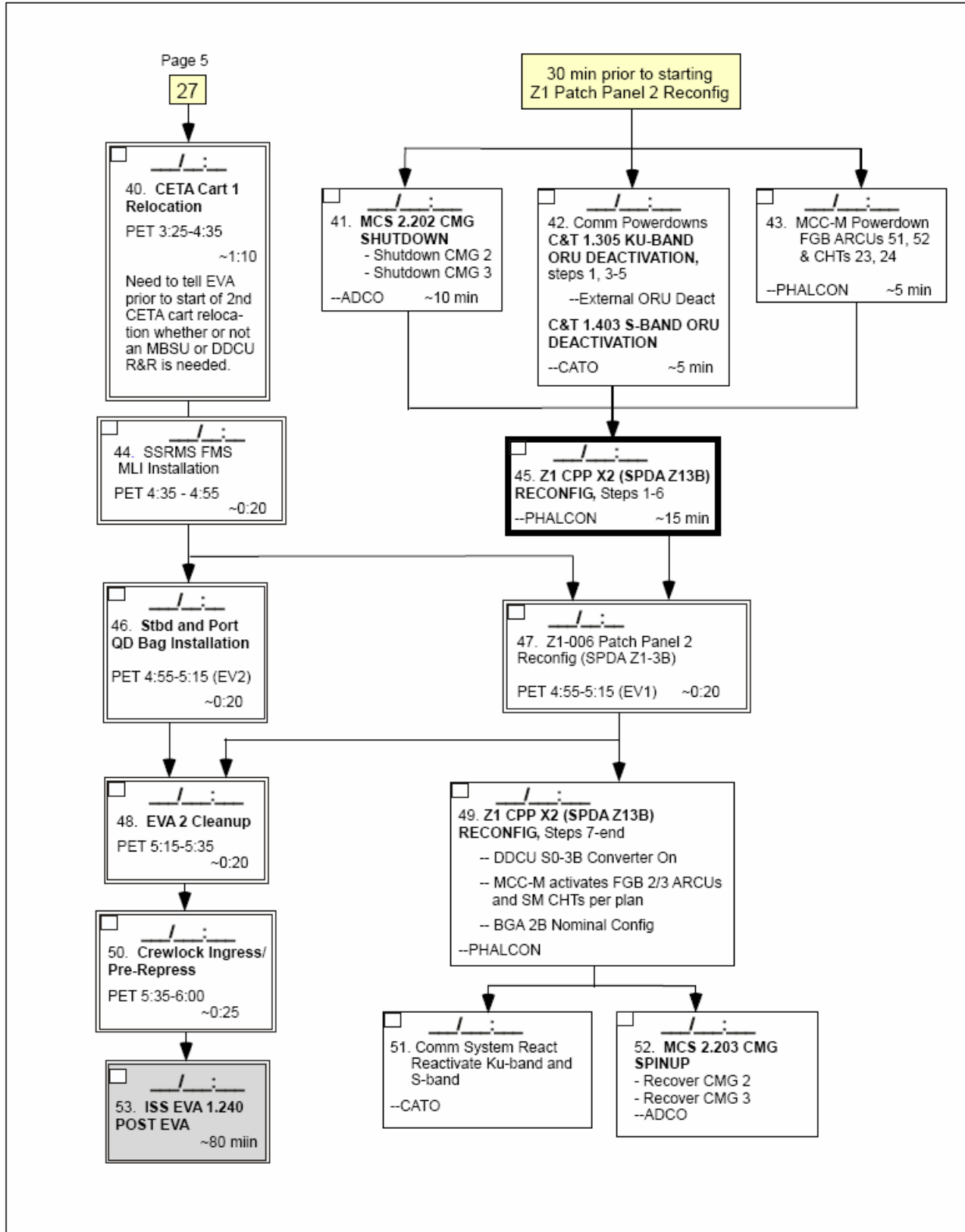
(ASSY OPS/12A.1/FIN) Page 4 of 8 pages

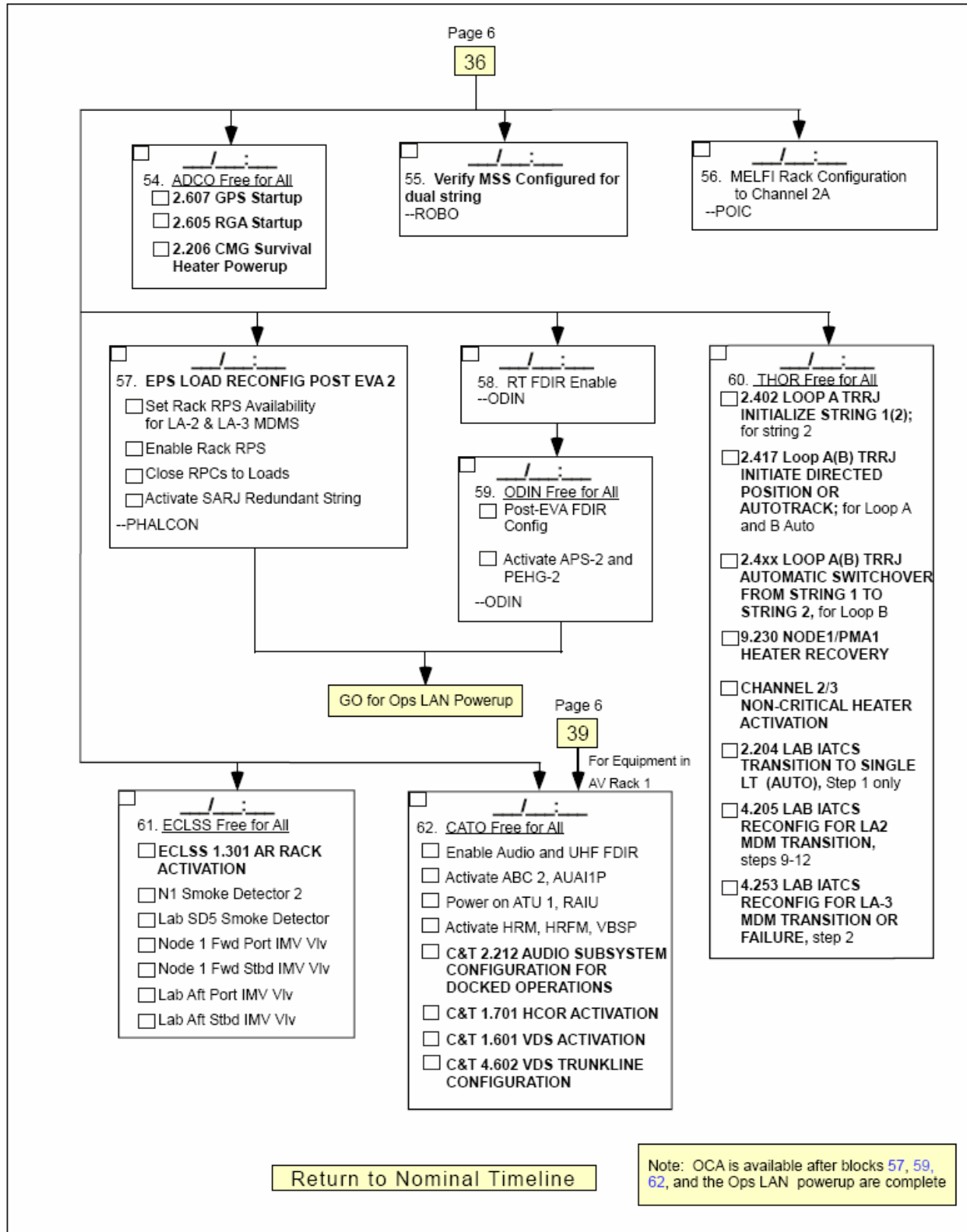












**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
	Initial Conditions	<p><u>ADCO</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> All GPS Antennas are on String 2</li> </ul> <p><u>ODIN</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tier 1 and 2 MDMs are powered from Channel 1/4</li> <li><input type="checkbox"/> Verify Single Node Mighty Mouse PPL</li> </ul> <p><u>CATO</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> S-Band String 1 configured for Primary</li> <li><input type="checkbox"/> UHF system configured to UHF-2</li> <li><input type="checkbox"/> Audio and UHF FDIR inhibited</li> <li><input type="checkbox"/> IAC-1 Prime</li> </ul> <p><u>THOR</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> ORUs preheated to proper temperature Reference FR 12A.1_C2-84.</li> <li><input type="checkbox"/> P1 TRRJ in Autotrack (TRRJ is taken to Directed Position in Block B5) S1 TRRJ Shutdown per FR 12A.1_B18-26</li> <li><input type="checkbox"/> EATCS Loop B Fill Complete and ETCS pressure &gt; 2592 kPa (390 psi): Expected to be complete Flight Day 5 (Pressure will be rechecked in Block B5).</li> <li><input type="checkbox"/> IATCS in Single LT</li> </ul> <p><u>ECLSS</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> LAB1P6 CCAA Prime</li> </ul> <p><u>PHALCON</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Payload racks off (except MELFI)</li> <li><input type="checkbox"/> A/L patch panel reconfiguration complete (A/L avionics powered from Channel 1/4 string)</li> </ul>		
		(Continued)		

**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 2 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
		<u>BME</u> <input type="checkbox"/> VOA and Defib powered down (done the night before) <u>CIO</u> UOPs and Ops LAN in proper configuration		
B1	AV Rack Jumper Installation	Avionics Rack Equipment Powerdown {4.303 CC MDM TRANSITION C: TRANSITIONING CC 3(1, 2) MDM FROM STANDBY(BACKUP) TO FAILED/DIAGNOSTIC/OFF} (SODF: C&DH: CORRECTIVE: MDM STATE TRANSITIONS TIER I)  Power down CC 2.  {4.602 VDS TRUNKLINE CONFIGURATION} (SODF: C&T: CORRECTIVE: VIDEO) for USOS trunk lines 1 to 13, 17 to 22 and MSS trunk lines 2, 6, 7  {1.603 VDS DEACTIVATION} (SODF: C&T: ACTIVATION AND CHECKOUT: VIDEO) for VSU-2  {LAB SYSTEM RACK POWER JUMPER INSTALLATION LAB1D3 TO LAB1D5 (AV1 RACK)}, step 1 (SODF: ASSY OPS: NOMINAL: S&M)  Performed by Ground.  {LAB SYSTEM RACK POWER JUMPER INSTALLATION LAB1D3 TO LAB1D5 (AV1 RACK)}, steps 2 to 4 (SODF: ASSY OPS: NOMINAL: S&M)  Performed by Crew.  {4.302 CC MDM TRANSITION B: TRANSITIONING CC 3(1,2) MDM FROM OFF TO STANDBY(BACKUP)} (SODF: C&DH: CORRECTIVE: MDM STATE TRANSITIONS TIER I)  Power up CC 2.		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 3 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?																
B2	Verify all Tier 1 and 2 MDMs are on Channel 1/4	Logical IDs: <table border="1"> <thead> <tr> <th>Primary:</th> <th>Other:</th> </tr> </thead> <tbody> <tr> <td>C&amp;C-1</td> <td>C&amp;C-3 Backup C&amp;C-2 Standby</td> </tr> <tr> <td>INT-1</td> <td>INT-2 Off</td> </tr> <tr> <td>GNC-1</td> <td>GNC-2 Backup</td> </tr> <tr> <td>PMCU-1</td> <td>PMCU-2 Off</td> </tr> <tr> <td>EXT-1</td> <td>EXT-2 Off</td> </tr> <tr> <td>PL-1</td> <td>PL-2 Off</td> </tr> <tr> <td>N1-2</td> <td>N1-1 Secondary</td> </tr> </tbody> </table>	Primary:	Other:	C&C-1	C&C-3 Backup C&C-2 Standby	INT-1	INT-2 Off	GNC-1	GNC-2 Backup	PMCU-1	PMCU-2 Off	EXT-1	EXT-2 Off	PL-1	PL-2 Off	N1-2	N1-1 Secondary		
Primary:	Other:																			
C&C-1	C&C-3 Backup C&C-2 Standby																			
INT-1	INT-2 Off																			
GNC-1	GNC-2 Backup																			
PMCU-1	PMCU-2 Off																			
EXT-1	EXT-2 Off																			
PL-1	PL-2 Off																			
N1-2	N1-1 Secondary																			
B3	RT FDIR Inhibits	ODIN FDIR INHIBIT script (reference DEC ALPHA) This is a “nice to have” block that will prevent buses from switching. Inhibit RT FDIR for RPCM and ORU to be powered off.																		
B4	Pre-EVA Config Script	Pre_EVA_FDIR_Config Inh Recovery For Tier 2 MDMs (except INT and PMCU) Inh BC Comm Fail Inh Auto Trans to Diag for INT and PMCU																		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 4 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
B5	THOR Powerdowns	<p>{2.417 LOOP A(B) TRRJ INITIATE DIRECTED POSITION OR AUTOTRACK} (SODF: TCS: NOMINAL: TRRJ)</p> <p>Puts P1 TRRJ in Directed Position at an appropriate <math>\Gamma</math> per Flight Rule 12A.1_B18-27, S1 TRRJ already positioned per rule 12A.1_B18_26.</p> <p>{VERIFY ETCS LOOP A(B) CONFIGURATION} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: TCS)</p> <p>Loop B ETCS Repress only if required should not be necessary due to initial conditions.</p> <p>The repress takes ~20 minutes. It is desired to perform the repress before time-critical activities begin. This repress is required to achieve a Pump Inlet Pressure of at least 2592 kPa at PM Activation time (reference FR 12A.1_B18-11).</p>		
B6	{CHANNEL 2/3 POWERDOWN TRUSS HEATER PREP} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: TCS)	Assures that T-stat heaters on Channel 1/4 are powered.		
B7	<p>{4.205 LAB IATCS RECONFIGURATION FOR LA2 MDM TRANSITION}, steps 1 to 7 (SODF: TCS: CORRECTIVE: IATCS)</p> <p>{4.235 LAB IATCS RECONFIGURATION FOR LA3 MDM TRANSITION OR FAILURE}, step 1 (SODF: TCS: CORRECTIVE: IATCS)</p>	<p>Both procedures record applicable RFCA parameters prior to MDM deactivation.</p> <p>4.205 also configures IFHX heaters as well as verifying stable ITCS performance prior to inhibiting TWMVs.</p>		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
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	Callout	Definition/Comment	Expected Messages	Suppressed?
B8	ECLSS Power Downs	<p>{1.402 SMOKE DETECTOR DEACTIVATION}, steps 1 and 2 (SODF: ECLSS: ACTIVATION AND CHECKOUT: FDS)</p> <p>Node 1 Smoke Detector 2 LAB SD5 Smoke Detector</p> <p>{2.506 IMV VALVE RECONFIGURATION POST CCS}, step 4 (SODF: ECLSS: NOMINAL: THC)</p> <p>Node 1 Fwd Port IMV Valve Node 1 Fwd Stbd IMV Valve LAB Aft Port IMV Valve LAB Aft Stbd IMV Valve</p> <p>{1.504 IMV FAN ACTIVATION/DEACTIVATION POST CCS}, step 3 (SODF: ECLSS: ACTIVATION AND CHECKOUT: THC)</p> <p>LAB Fwd Stbd IMV Fan</p> <p>{1.511 CHECS RACK VENTILATION SHUTDOWN}, (SODF: ECLSS: ACTIVATION AND CHECKOUT: THC) LAB1D4 AAA and Smoke Detector</p>		
B9	<p>{EPS SYSTEM CONFIGURATION FOR EVA 2 POWERDOWN}</p> <p>(SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)</p>	<p>This block cannot be performed until the Prime CC MDM is on Channel 1/4 (verified in Block B2).</p> <p>Inhibit Rack RPS Monitoring for LA 2 and LA 3 MDMs (must do prior to LA 2, 3 Deactivation).</p> <p>Confirm <b>MCC-M</b> prepared for CHT/ARCU powerdown.</p>		
B10	Payload Rack Configuration	<p>Verify MELFI is configured on Channel 4A.</p> <p>LA 2 MDM controls LAB1O1, LAB1O2, LAB1O3, LAB1O4 and LAB1O5 smoke detectors.</p> <p>LA 3 MDM controls LAB1P2, LAB1P4, and LAB1S4 smoke detectors.</p>		
B11	ADCO Powerdowns	<p>{2.608 GPS SHUTDOWN} (SODF: MCS: NOMINAL: ATTITUDE AND STATE DETERMINATION)</p> <p>{2.606 RGA SHUTDOWN} (SODF: MCS: NOMINAL: ATTITUDE AND STATE DETERMINATION)</p>		

**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 6 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
B12	Configure Internal and External Video	VIDEO: {1.602 VDS CVIU POWERUP AND POWERDOWN} (SODF: C&T: ACTIVATION AND CHECKOUT: VIDEO)  For powering down CVIUs 4, 5, 6, 8  {1.603 VDS DEACTIVATION} (SODF: C&T: ACTIVATION AND CHECKOUT: VIDEO) for VSU-3 and EVSU-2  <u>NOTE</u> Comm equipment not powered off in this block or in block B1 is not powered down gracefully.  Ku-Band is available until Block 21.		
B13	Deactivate GNC 2 MDM	{4.403 GNC MDM TRANSITION C: TRANSITION BACKUP GNC MDM 2(1) FROM WAIT TO DIAGNOSTIC/OFF WHILE PRIMARY GNC MDM IS OPERATIONAL} (SODF: C&DH: CORRECTIVE: MDM STATE TRANSITIONS TIER II)		
B14	{12A.1 SSAS HEATER RECONFIGURATION - CHANNEL 2/3} (SODF: ASSY OPS: S&M)			
B15	Verify MSS is configured for Single String 1A/4B Ops	LAB RWS Active, SSRMS and MBS operational on Prime string.		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN)

	Callout	Definition/Comment	Expected Messages	Suppressed?
1	{2.315 HYGEINE BREAK}, steps 1 to 4 (SODF: ISS EVA SYS: OVERNIGHT CAMPOUT)			
2	{2.315 HYGEINE BREAK}, steps 13 to 14 (SODF: ISS EVA SYS: OVERNIGHT CAMPOUT)	Enable ISS Rapid Depress Response and Alarm; Inhibit A/L Rapid Depress and Alarm.		
3	{2.315 HYGEINE BREAK}, steps 5 to 12, 15 to 20, 22 to 26 (SODF: ISS EVA SYS: OVERNIGHT CAMPOUT)	- Mask Prebreathe Init - Repress A/L to 14.7 (step 11) - Hygiene Break - Close Node 1 Stbd Hatch - Depress A/L to 10.2 (step 20)		
4	{1.105 ISS AIRLOCK 10.2 PSIA OPERATIONS INITIATION}, step 8 (SODF: ISS EVA SYS: 10.2 PSIA OPS)	Enable A/L Rapid Depress Response and Alarm. Called from Step 21 of Block 3.		
5	{2.320 10.2 PSIA CAMPOUT EVA PREP}, steps 1 to 21 (SODF: ISS EVA SYS: OVERNIGHT CAMPOUT)	EMU Prep for Donning  These steps can be done in advance while the EV crew is taking their hygiene break. The steps can be done after the A/L has been depressed to 10.2, as well.		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**

(ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
6	{2.320 10.2 PSIA CAMPOUT EVA PREP}, steps 22 to 74 (SODF: ISS EVA SYS: OVERNIGHT CAMPOUT)	- EMU Donning - EMU Check - Suit Fan on		
7	{1.220 EMU PURGE}, steps 1 to 5, 7 to 15, 17 (SODF: ISS EVA SYS: EVA PREP/POST)	- Purge EMUs - A/L Repress to 14.7 (step 9) - Open Node 1 Stbd Hatch		
8	{1.110 ISS AIRLOCK 10.2 PSIA OPERATIONS TERMINATION }, step 1 (SODF: ISS EVA SYS: EVA PREP/POST)	Inhibit ISS Rapid Depress Response and Alarm.  This step can be performed as soon as the Suit Fan is on (Step 56 of Block 6) and must be performed prior to A/L repress (Step 9 of Block 7).		
9	{1.110 ISS AIRLOCK 10.2 PSIA OPERATIONS TERMINATION }, step 2 to 7 (SODF: ISS EVA SYS: EVA PREP/POST)	Enable ISS Rapid Depress Response and Alarm.  Environment cleanup from 10.2 Ops.  Perform this step after the Node 1 Stbd Hatch is open (Step 10 of Block 7).		
10	{1.225 EMU PREBREATHE} (SODF: ISS EVA SYS: EVA PREP/POST)	- EMU Prebreathe - SAFER Donning - Ingress Crewlock		
11	{CREWLOCK DEPRESS/REPRESS CUE CARD} (SODF: ISS EVA SYS: EVA PREP/POST)	Crewlock Depress to Vacuum		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 9 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
12	{1.302 ATMOSPHERE REVITALIZATION RACK DEACTIVATION}, steps 3, 6, 7 (SODF: ECLSS: ACTIVATION AND CHECKOUT: ARS)	Do not perform step 8 at this time. Deactivates MCA, AAA, and Smoke Detector in the LAB1D6 rack (TCCS is deactivated earlier in the day). This rack will not be unpowered until ECLSS can confirm PPO2 < 173 mm.		
13	Deact LA 2 MDM	{4.503 LAB MDM TRANSITION C: TRANSITIONING LAB MDM FROM OPERATIONAL/MIN OPS TO STANDBY/DIAGNOSTIC/OFF} (SODF: C&DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III) <input type="checkbox"/> THOR: Must be in single LT (initial condition) <input type="checkbox"/> PHALCON: Rack RPSs must be disabled (Block B9) <input type="checkbox"/> ECLSS: Must be complete with Block B8.		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 10 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
14	Deact MDMs P3 2 PTR	<p>{4.631 P3 MDM TRANSITION C: TRANSITIONING P3 MDM FROM NORMAL/WAIT TO WAIT/DIAGNOSTIC/OFF} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p> <p>{4.627 PTR MDM TRANSITION C: TRANSITIONING PTR MDM FROM NORMAL/WAIT TO WAIT/DIAGNOSTIC/OFF} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p> <p>The controlled deactivation of these MDMs can be skipped if EVA is ahead of <b>MCC</b> and it is desired to open RBI 6 prior to completing this block. Skipping this block will require ODIN clean up steps to be performed after powerup.</p>		
15	Post Depress/Crewlock Egress	Reference EVA Timeline. PET 0:00 - 0:30		
16	{1.110 ISS AIRLOCK 10.2 PSIA OPERATIONS TERMINATION}, step 8 (SODF: ISS EVA SYS: 10.2 PSIA OPS)	Disable Depress Pump.		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
17	Deactivate LA 3 MDM	<p>{4.503 LAB MDM TRANSITION C: TRANSITIONING LAB MDM FROM OPERATIONAL/MIN OPS TO STANDBY/DIAGNOSTIC/OFF} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> THOR: Must be in single LT (initial condition).</li> <li><input type="checkbox"/> PHALCON: Rack RPSs must be disabled (Block B9).</li> <li><input type="checkbox"/> ELCSS: Must be complete with Blocks B8, 9, and 12.</li> </ul>		
18	Deactivate N1 Stbd Aft IMV Fan	<p>{1.504 IMV FAN ACTIVATION/DEACTIVATION POST CCS}, step 3 (SODF: ECLSS: ACTIVATION AND CHECKOUT: THC)          N1 Stbd Aft IMV Fan</p>		
19	Deactivate N1 2 MDM	<p>{4.602 NODE 1 MDM TRANSITION B: N1-2 TO DIAGNOSTIC/STANDBY/OFF FROM PRIMARY AND N1-1 TO PRIMARY FROM SECONDARY} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> ECLSS: N1 Stbd Aft IMV Fan must be deactivated (Block 18).</li> <li><input type="checkbox"/> THOR: Node 1 Heater inhibits should be in place (Block B5).</li> </ul>		
20	Go for Powerdown	Everyone but PHALCON must be complete with powerdown activities.		

# CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE

(ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
21	<p>{EPS CHANNEL 2/3 POWERDOWN FOR EVA 2} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)</p>	<p>All Thermostatically Controlled heaters are turned off.                      This block starts the Powerdown Thermal Clock (ends in Block 31).</p> <p><u>NOTE</u></p> <p>1. P1 2, S1 2, and S0 2 MDMs are powered off nongracefully by this block.</p> <p>2. Intermodule Comm goes down in this block with the RAIU. Ku goes down in this block with the HRM, HRFM, and VBSP.</p> <p>2B RBI 6 open                      Verify 2A RBI 6 open.</p>		
22	Channel 2/3 Power Reconfigurations	<p>Reference EVA Timeline.                      PET 00:30 - 02:00</p>		
23	<p>{DDCU RACK 2 RECONFIGURATION}</p> <p>(SODF: ASSY OPS: NOMINAL: S&amp;M)</p>	<p>DDCU LA2A and LA3B configured to allow parallel mode operations. Includes installing the Channel 2/3 - LAB Cable Assembly Jumper.</p>		
24	ECZ SEPS Thread and RT FDIR configuration script	<p>Verify S1, P1, and S0 configuration after pulling power.                      Configure RT FDIR.</p>		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 13 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
25	Load PMCU RT Existence Table Version 125 to Pri PMCU	<p>This allows the PMCU to see the MBSU. This can be done earlier if needed, but alarms will be received because the PMCU will be looking for MBSUs that are not yet connected.</p> <p>Version 125 is designed for the configuration where Channel 2/3 has parallel DDCUs and Channel 1/4 does not.</p> <p>Must be done prior to Block 28.</p>		
26	Go for Powerup	EVA Power Reconfigurations and DDCU Patch Panel Reconfigurations must be complete for GO.		
27	CETA Cart 2 Relocation	<p>Reference EVA Timeline.</p> <p>PET 02:00 - 03:25</p>		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
28	{EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION}, steps 1 to 16 (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	<ul style="list-style-type: none"> <li><input type="checkbox"/> MBSU 2</li> <li><input type="checkbox"/> MBSU 3</li> <li><input type="checkbox"/> DDCU P13A Power (converter not turned on until Block 33)</li> <li><input type="checkbox"/> DDCU S03B Power (converter not turned on until Block 49)</li> <li><input type="checkbox"/> DDCU LA2B Power (converter not turned on until Block 33)</li> <li><input type="checkbox"/> DDCU S02B Power and Converter On</li> </ul> <p>If an MBSU or DDCU failure is detected and EMU consumables support, an R&amp;R of the failed box will be performed. If a failure is detected and EMU consumables do not support, a complete backout of the EVA Power Reconfigurations is required and the EPS will be returned back to the pre-12A.1 configuration for this channel.</p> <p>This block starts MBSU/DDCU Thermal Monitoring. Ends with Block 30.</p> <p><u>Constraints</u> MBSU Baseplate temp &lt; 45.5° C            MBSU Power Supply Temp &lt; 47.5° C            DDCU Power Supply Temp &lt; 60.5° C            DDCU Converter Temp &lt; 62° C</p>		
29	{EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION}, steps 17 to end (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	<ul style="list-style-type: none"> <li><input type="checkbox"/> S0 2 MDM</li> <li><input type="checkbox"/> P1 2 MDM</li> <li><input type="checkbox"/> PTR MDM Powered (Activated in Block 32)</li> </ul> <p>Reference ODIN Contingency Matrix for workarounds if off-nominal activation.</p>		



**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 15 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
30	{ETCS LOOP A(B) ACTIVATION AND CHECKOUT} for Loop B (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: TCS)	<p>Successful activation of the Pump Module in this procedure ends MBSU/DDCU Thermal Monitoring (started in Block 28).</p> <p>If the PM Activation is not successful, the power system must be put into a pre-EVA configuration, using the Full Backout Mal procedure. A Pump Module R&amp;R will be attempted at the next available opportunity.</p> <p>PHALCON will give GO for this block in Step 21 of Block 29.</p>		
31	{CHANNEL 2/3 CRITICAL HEATER ACTIVATION} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: TCS)	<p>This block ends the Powerdown Thermal Clock (started in Block 21).</p>		
32	Activate PTR MDM	<p>{4.626 PTR MDM TRANSITION B:            TRANSITIONING PTR MDM FROM OFF TO            WAIT} (SODF: C&amp;DH: CORRECTIVE)</p> <p>The RPC for the PTR MDM is closed in Step 24 of Block 29.</p> <p>Reference ODIN Contingency Matrix for workarounds if off-nominal activation.</p> <p>PTR MDM can be used to read NTA, ATA, and PM pressures. The PTR MDM is activated at this time to prepare off-nominal activation of the P1-2 MDM.</p>		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 16 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
33	{EPS CHANNEL 2/3 COMPLETE POWER DISTRIBUTION ACTIVATION} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	<ul style="list-style-type: none"> <li><input type="checkbox"/> DDCU LA2B Converter On (powered in Block 28)</li> <li><input type="checkbox"/> DDCU LA3B Power and Converter On</li> <li><input type="checkbox"/> DDCU LA2A Power and Converter On</li> <li><input type="checkbox"/> DDCU P13A Converter On (powered in Block 28)</li> <li><input type="checkbox"/> DDCU Z13B Power and Converter On</li> </ul> <p>This block should be completed prior to proceeding with remaining blocks to allow PHALCON to bring up the most critical equipment first.</p>		
34	Activate Truss MDMs P3 2 S1 2	<p>{4.630 P3 MDM TRANSITION B: TRANSITIONING P3 MDM FROM OFF TO WAIT} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p> <p>{4.614 S1 MDM TRANSITION B: TRANSITIONING S1 MDM FROM OFF TO WAIT} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p>		
35	MDM Activations LA 2 LA 3 N1 2	<p>For LA 2, {4.502 LAB MDM TRANSITION B: TRANSITIONING LAB MDM FROM OFF TO OPERATIONAL} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p> <p>For LA 3, {4.502 LAB MDM TRANSITION B: TRANSITIONING LAB MDM FROM OFF TO OPERATIONAL} (SODF: C&amp;DH: CORRECTIVE)</p> <p>For N1 2, {4.603 NODE 1 MDM TRANSITION C: N1-2 TO PRIMARY FROM OFF/DIAGNOSTIC/STANDBY WHILE N1-1 IS PRIMARY} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p>	<p>LA 2: LA 3: 'CVV Vacuum Line Pressure Xdcr Out of Range-LAB' N1 2:</p>	

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 17 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
36	Core Systems Activations	<p>For GNC 2, {4.402 GNC MDM TRANSITION B: TRANSITIONING GNC BACKUP MDM 2(1) FROM OFF TO WAIT WHILE PRIMARY GNC IS OPERATIONAL} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER II)</p> <p>{6.110 RECOVERY OF BACKUP GNC MDM} (SODF: GND: MCS: ACTIVATION AND CHECKOUT)</p> <p>{1.504 IMV FAN ACTIVATION/DEACTIVATION POST CCS}, steps 1 to 2 (SODF: ECLSS: ACTIVATION AND CHECKOUT: THC)</p> <p>LAB Fwd Stbd IMV Fan Node 1 Stbd Aft IMV Fan</p> <p><u>NOTE</u> The purpose of this block is to allow certain systems to be brought up as soon as possible without being stepped on by "Free for All" commanding. "Free for All" steps should not be started until this block is complete.</p>		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 18 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
37	Ground Configuration Pre-AV Rack Jumper Removal	Deactivate CC 2 {4.303 CC MDM TRANSITION C: TRANSITIONING CC 3(1, 2) MDM FROM STANDBY(BACKUP) TO FAILED/DIAGNOSTIC/OFF} (SODF: C&DH: CORRECTIVE: MDM STATE TRANSITIONS TIER I)  Safe RPCs for Jumper Removal {LAB SYSTEM RACK POWER JUMPER REMOVAL LAB1D3 TO LAB1D5 (AV1 RACK)}, step 1 (SODF: ASSY OPS: NOMINAL: S&M)  The AV Rack Jumper should be removed as soon as possible to reduce the amount of time that the CC MDMs are on the same power channel, but it can be deferred to the next day if necessary.	'RPCM LAD52B_A Loss of Comm-LAB'	N
38	{LAB SYSTEM RACK POWER JUMPER REMOVAL LAB1D3 TO LAB1D5 (AV1 RACK)}, steps 2 to 4 (SODF: ASSY OPS: NOMINAL: S&M)	Returns power from Channel 2/3 to AV Rack 1, LAB1D5.	'RPCM LAD52B_A Loss of Comm-LAB' clears	
39	Ground Configuration Post AV Rack Jumper Removal	CC 2 Activation {4.302 CC MDM TRANSITION B: TRANSITIONING CC 3(1,2) MDM FROM OFF TO STANDBY(BACKUP)} (SODF: C&DH: CORRECTIVE: MDM STATE TRANSITIONS TIER I)		

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# CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE

(ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
40	CETA Cart 1 Relocation	Reference EVA Timeline. PET 03:25 - 04:35  EVA must be told prior to the start of the second CETA Cart (Cart 1) relocation whether or not an MBSU or DDCU R&R will be required to allow time for R&R completion. Determination of whether to do an R&R or not will be made based on Suit Consumables.		
41	{2.202 CMG SHUTDOWN} (SODF: MCS: NOMINAL: CMGs)	Start ~30 minutes prior to EV crew performing the Z1 Patch Panel 2 Reconfiguration.  Disconnect Spin Motor from CMGs 2 and 3.  The CMGs will not be completely spun down.		
42	Comm Powerdowns	{1.305 KU-BAND ORU DEACTIVATION} steps 1, 3 to 5 (SODF: C&T: ACTIVATION AND CHECKOUT: KU BAND)  {1.403 S-BAND ORU DEACTIVATION} (SODF: C&T: ACTIVATION AND CHECKOUT: S-BAND)  Start ~30 minutes prior to EV crew performing the Z1 Patch Panel 2 Reconfiguration.		
43	<b>MCC-M</b> Powerdown FGB ARCUs 51, 52 & SM CHTs 23, 24	Start ~30 minutes prior to EV crew performing the Z1 Patch Panel 2 Reconfiguration.		
44	SSRMS FMS MLI Installation	Reference EVA Timeline. PET 04:35-04:55		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN)

	Callout	Definition/Comment	Expected Messages	Suppressed?
45	{Z1 CPP X2 (SPDA Z13B) RECONFIG}, steps 1 to 6 (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	Inhibit for Z1 Patch Panel 2 Reconfiguration.  Includes positioning the 2B array for plasma protection (may be done in parallel with CMG Disconnect, Ku-Band External ORU Deactivation, and ARCU/CHT powerdown).		
46	Stbd and Port QD Bag Installation	Reference EVA Timeline. PET 04:55-05:15 (EV2)		
47	Z1-006 Patch Panel 2 Reconfiguration (SPDA Z1-3B)	Reference EVA Timeline. PET 04:55-05:15 (EV1)		
48	EVA 2 Cleanup	Reference EVA Timeline. PET 05:15 - 05:35		
49	{Z1 CPP X2 (SPDA Z13B) RECONFIGURATION}, steps 7 to end (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	DDCU S0-3B Converter On (powered in Block 28).  <b>MCC-M</b> activates FGB 2/3 ARCUs and SM CHTs per plan.  BGA 2B Nominal Configuration.		
50	Crewlock Ingress/Pre-Repress	Reference EVA Timeline. PET 05:35 - 06:00		

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# CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE

(ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
51	Comm System React	<p>{1.304 KU-BAND ORU ACTIVATION} (SODF: C&amp;T: ACTIVATION AND CHECKOUT: KU BAND)</p> <p>{2.241 KU-BAND PAYLOAD CHANNEL CONFIGURATION} (SODF: GROUND: C&amp;T: NOMINAL)</p> <p>{2.242 KU-BAND VIDEO CHANNEL CONFIGURATION} (SODF: GROUND: C&amp;T: NOMINAL)</p> <p>{1.401 S-BAND ORU ACTIVATION}, (SODF: C&amp;T: ACTIVATION AND CHECKOUT: S-BAND)</p> <p>Reactivate S-Band 2</p> <p>{2.303 S-BAND HIGH DATA RATE CONFIGURATION AND LINK ACTIVATION }, steps 1, 2, 3, and 8 (SODF: C&amp;T: NOMINAL: S-BAND)</p>		
52	{2.203 CMG SPIN UP}, Recover CMGs 2 and 3 (SODF: MCS: NOMINAL: CMGS)	<p><u>NOTE</u></p> <p>The CMGs will require ~1 hour to spin up to 6600 rpm, but this block is complete as soon as the commanding is complete.</p>		
53	{1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST)			
54	ADCO Free for All	<p>{2.607 GPS STARTUP} (SODF: MCS: NOMINAL: ATTITUDE AND STATE DETERMINATION)</p> <p>{2.605 RGA STARTUP} (SODF: MCS: NOMINAL: ATTITUDE AND STATE DETERMINATION)</p> <p>{2.206 CMG SURVIVAL HEATER POWERUP} (SODF: MCS: NOMINAL: CMGS)</p>		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN)

	Callout	Definition/Comment	Expected Messages	Suppressed?
55	Verify MSS Configured for Dual String Ops	Power MBS to Keep-Alive on redundant string. Verify PHALCON/THOR scripts have repowered the MT.		
56	MELFI Rack Configuration to Channel 2A			
57	{EPS LOAD RECONFIGURATION POST EVA 2} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	LA 2 and LA 3 MDMs must be up before these steps can be performed. Set Rack RPS Availability for LA 2 and LA 3 MDMs Enable Rack RPS Close RPCs to Loads Heaters Lights UOPs TUS VSC Power Defib Activate SARJ Redundant String		
58	RT FDIR Enable	ODIN RT FDIR Enable Script (reference DEC ALPHA)		
59	ODIN Free for All	Post-EVA FDIR Configuration Activate APS-2 and PEHG-2.		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN)

	Callout	Definition/Comment	Expected Messages	Suppressed?
60	THOR Free For All	<p>{2.402 LOOP A TRRJ INITIALIZE STRING 1(2)};            for String 2 (SODF: TCS: NOMINAL: TRRJ)</p> <p>For Loop A and B to Autotrack {2.417 LOOP A(B)            TRRJ INITIATE DIRECTED POSITION OR            AUTOTRACK} (SODF: TCS: NOMINAL: TRRJ)</p> <p>For Loop B {2.406 LOOP A(B) TRRJ STRING 2 TO            STRING 1 SWITCHOVER} (SODF: TCS:            NOMINAL: TRRJ)</p> <p>{9.230 NODE1/PMA1 HEATER RECOVERY}            (SODF: GND SYS: TCS: NOMINAL)</p> <p>{CHANNEL 2/3 NON-CRITICAL HEATER            ACTIVATION} (SODF: ASSY OPS: ACTIVATION            AND CHECKOUT: TCS)</p> <p>{2.204 LAB IATCS TRANSITION TO SINGLE LT            (AUTO)}, step 1 (SODF: TCS: NOMINAL: IATCS)</p> <p>Verifies RPC positions before subsequent transition            attempts.</p> <p>{4.205 LAB IATCS RECONFIGURATION FOR LA2            MDM TRANSITION}, steps 7 to 10 (SODF: TCS:            CORRECTIVE: IATCS)</p> <p>{4.235 LAB IATCS RECONFIGURATION FOR LA            3 MDM TRANSITION OR FAILURE}, step 2            (SODF: TCS: CORRECTIVE: IATCS)</p>		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN) Page 24 of 25 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
61	ECLSS Free for All	<p>{1.301 ATMOSPHERE REVITALIZATION RACK ACTIVATION} (SODF: ECLSS: ACTIVATION AND CHECKOUT: ARS)</p> <p>CDRA will be powered after EVA 2 and is needed for METOX Regen. Will be powered per timed activity.</p> <p>{1.401 SMOKE DETECTOR ACTIVATION} (SODF: ECLSS: ACTIVATION AND CHECKOUT: FDS)            N1 SD2            LAB SD5</p> <p>{2.506 IMV VALVE RECONFIGURATION POST CCS}, step 1 (SODF: ECLSS: NOMINAL: THC)            Node 1 Fwd Port IMV Vlv            Node 1 Fwd Stbd IMV Vlv            LAB Aft Port IMV Vlv            LAB Aft Stbd IMV Vlv</p>		

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**CHANNEL 2/3 POWER RECONFIGURATION DEFINITIONS TABLE**  
 (ASSY OPS/12A.1/FIN)

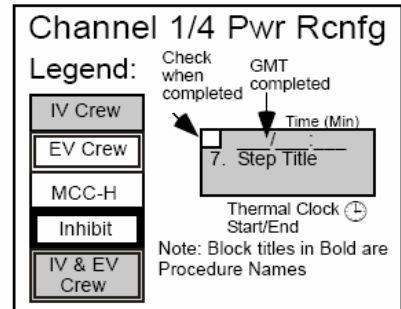
	Callout	Definition/Comment	Expected Messages	Suppressed?
62	CATO Free for All	Enable Audio and UHF FDIR. Activate ABC-2, AUAI1P. Power on ATU 1, RAIU. Activate HRM, HRFM, and VBSP. {2.212 AUDIO SUBSYSTEM CONFIGURATION FOR DOCKED OPS} (SODF: C&T: NOMINAL: AUDIO) {1.701 HCOR ACTIVATION} (SODF: C&T: ACTIVATION AND CHECKOUT: HCOR) For both VSUs {1.601 VDS ACTIVATION} (SODF: C&T: ACTIVATION AND CHECKOUT: VIDEO) {4.602 VDS TRUNKLINE CONFIGURATION} (SODF: C&T: CORRECTIVE: VIDEO) <u>NOTE</u> Comm checks are desired after the Internal Audio configuration is complete; therefore, it is desired that this block be completed 2 hours prior to crew sleep. If not completed before sleep, comm checks should be performed after crew wake. The UHF will remain powered and functioning as the big loop until checks are performed.		

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**ASSUMPTIONS:**

- LVLH
- Campout is EVA Protocol
- ROOBA fully functional
- Port SARJ on String 2 and rotating
- MT at Workstation #3 in MT-CETA-CETA config
- P6 4B Array is retracted
- CMGs 2, 3, 4 are powered from Z1; CMG 1 powered from S0



**CHANNEL 1/4 RECONFIG INITIAL CONDITIONS**

ADCO

- all GPS Antennas are on String 1

ODIN

- Tier 1 & 2 MDMs are powered from Channel 2/3

CATO

- S-band String 2 configured for Primary
- UHF system configured to UHF-1
- Audio and UHF FDIR inhibited
- IAC-2 is prime

THOR

- ORUs preheated to proper temps (ref FR 12A.1\_C2-84)
- S1 TRRJ in Autotrack, P1 TRRJ in Autotrack  
(both radiators taken to Directed Position in Block A5);
- EATCS Loop A Fill Complete & ETCS Pressure > 2592 kPa (390 psi)
- Lab Window Shutter Shut (required for LA-1 MDM powerdown)
- IATCS in Single MT

ECLSS

- LAB1S6 CCAA prime

PHALCON

- Payload racks off (except ER4 and MELFI)
- A/L Patch Panel Reconfig complete (A/L avionics powered from Ch 2/3 string)
- Node 1 Y-Jumper installed (DDCU Z14B loads powered by RACU 6)

CIO

- UOPs and Ops LAN in proper config

BME

- EV-CPDS in standby

Russian Power:

- Remove power from all FGB ARCUs and SM CHTs: Block 38\*
- Reapply power to SM CHTs and FGB ARCUs: Block 47\*
- \*Assumes S0/N1 Primary Power Jumper installed but not connected

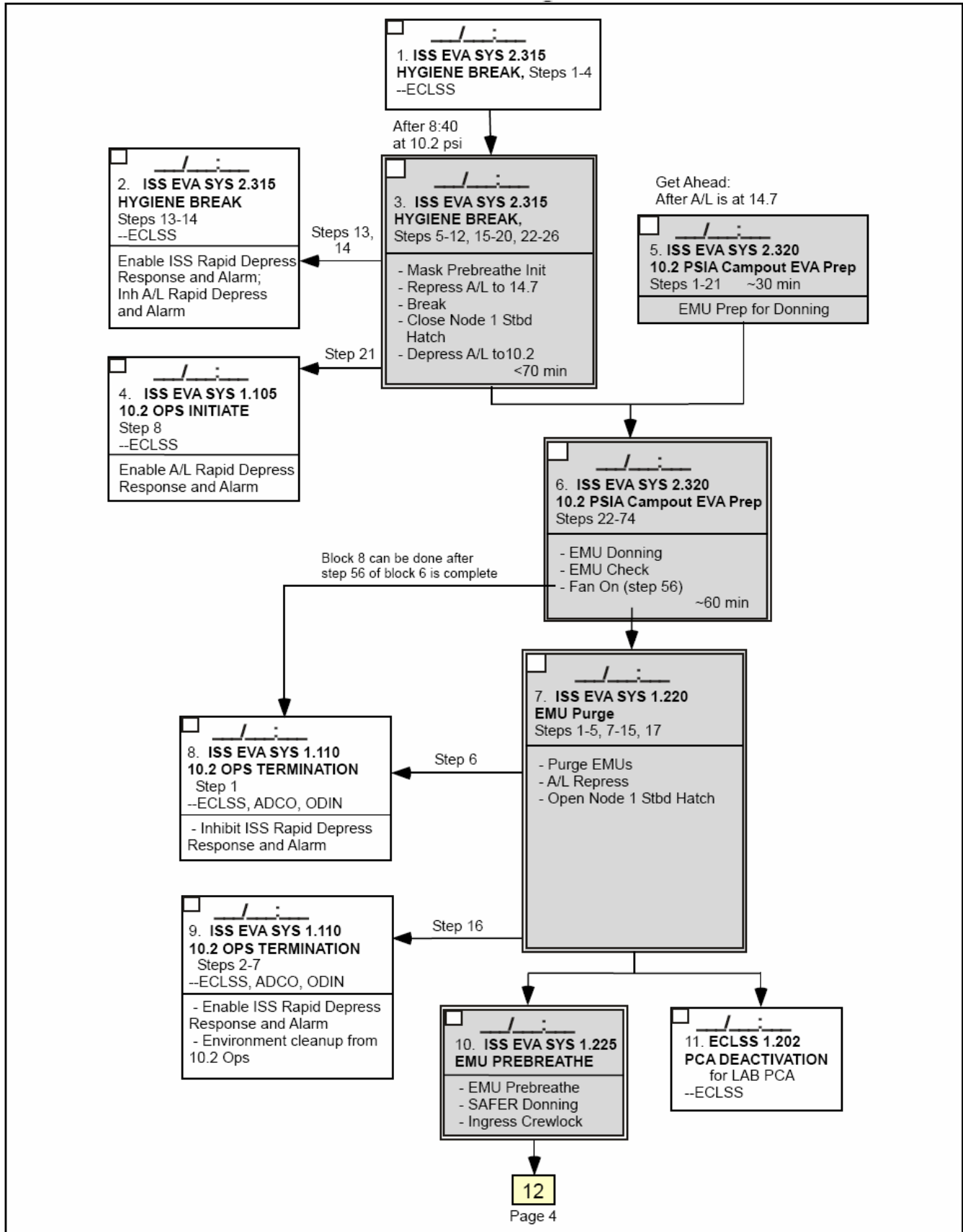
Articulating Components:

	Stop Rotating	Start Rotating
SARJ	does not stop	does not stop
P1 TRRJ	block A5	block 58
S1 TRRJ	block A5	block 58

# CHANNEL 1/4 POWER RECONFIGURATION

(ASSY OPS/12A.1/FIN)

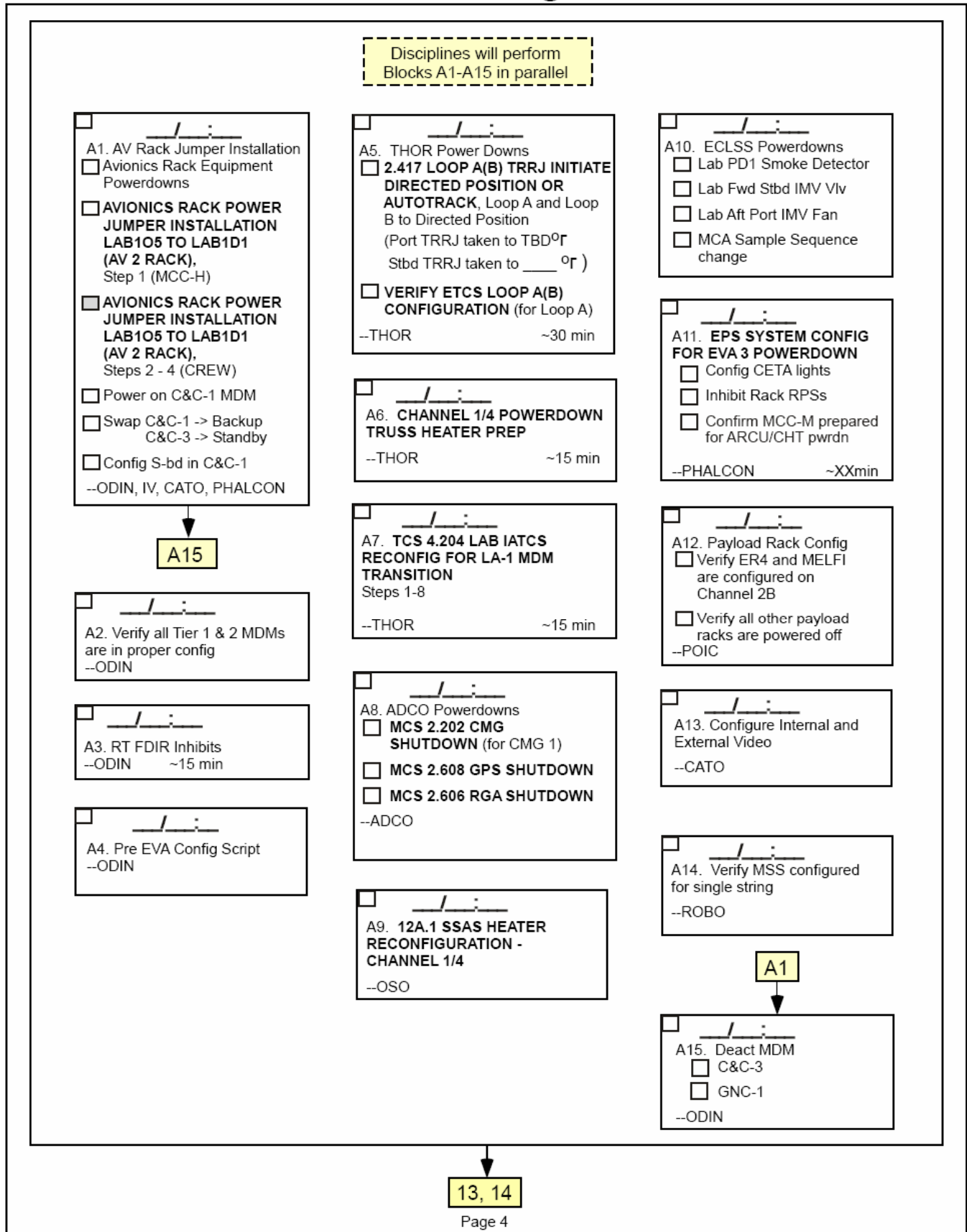
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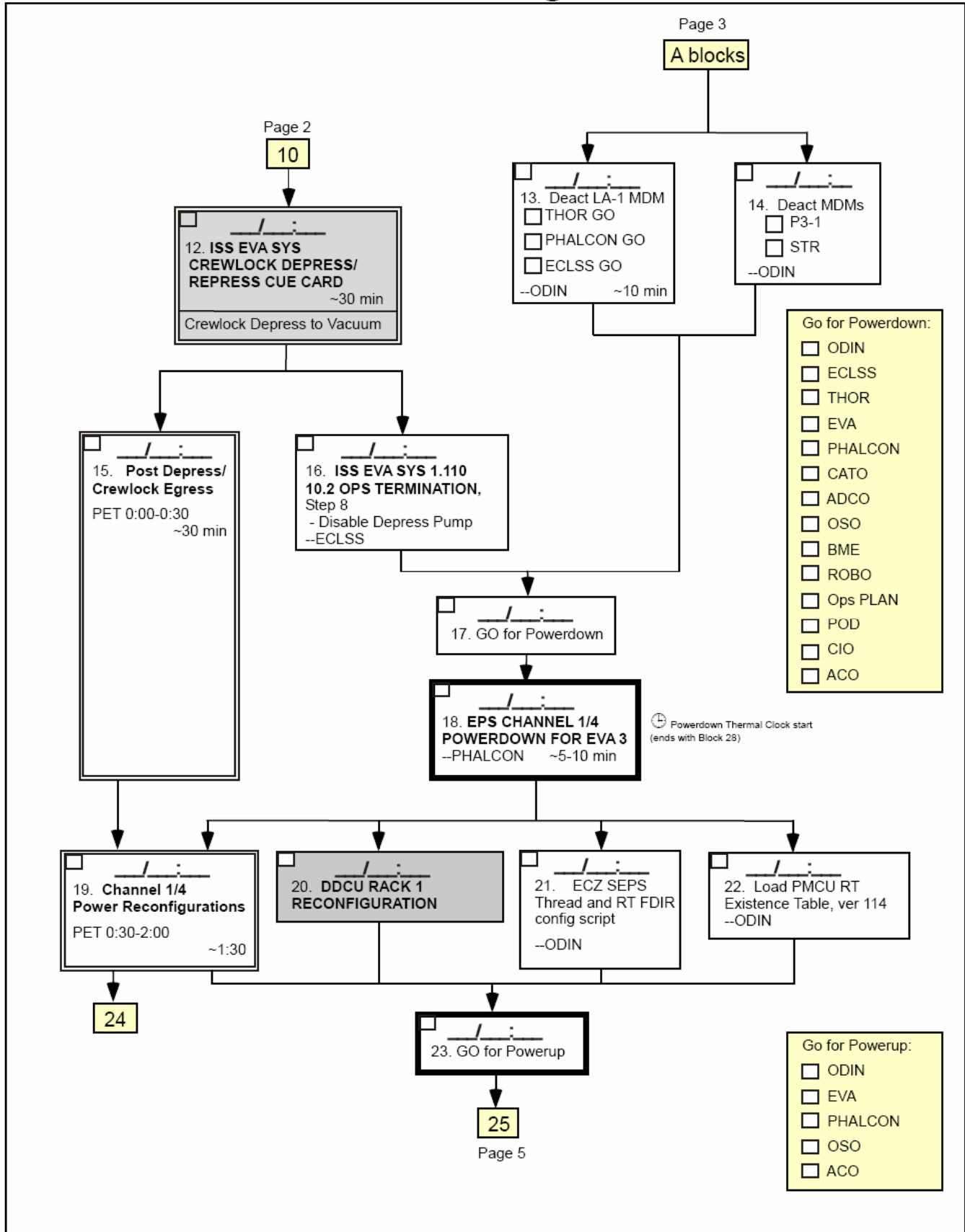


# CHANNEL 1/4 POWER RECONFIGURATION

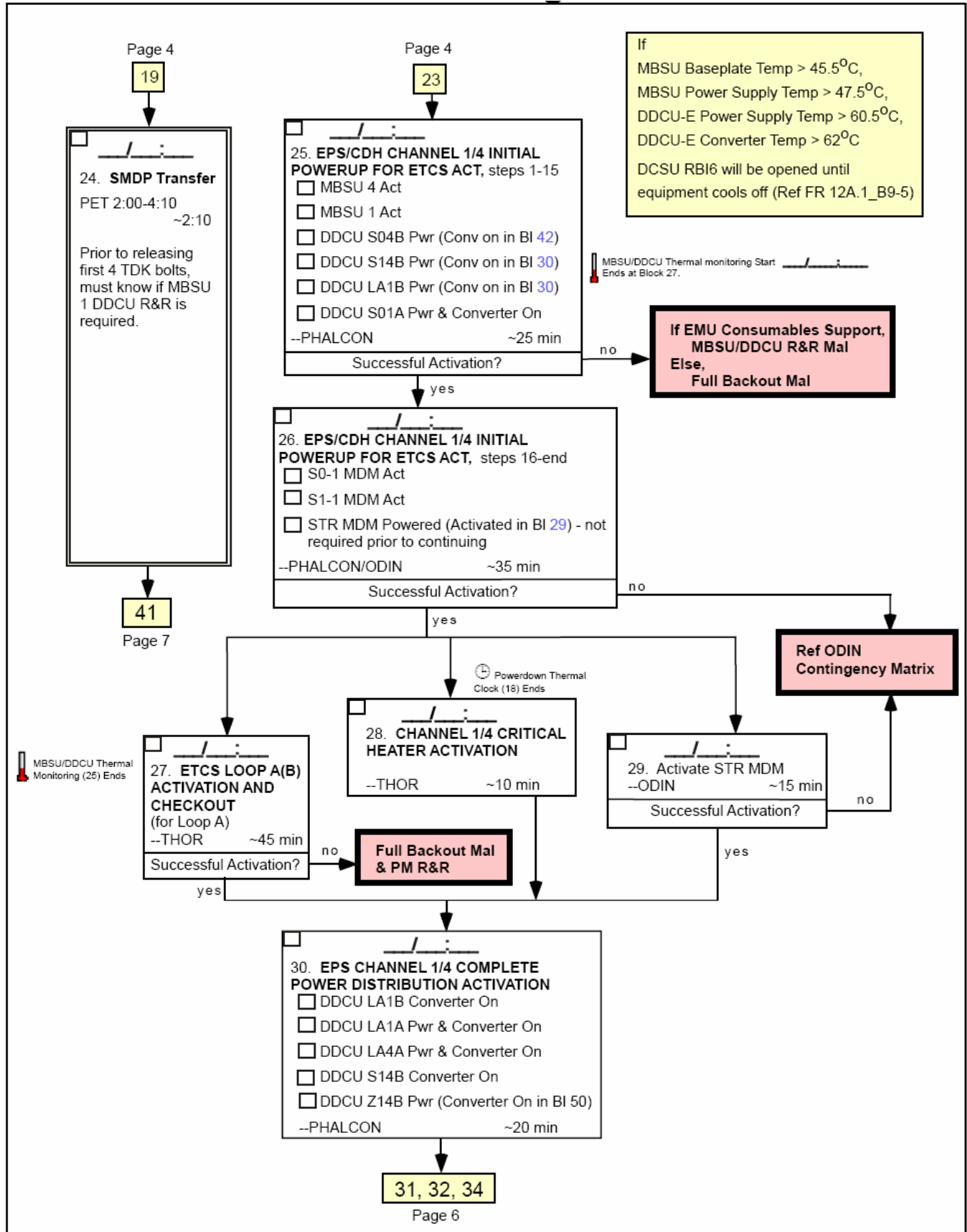
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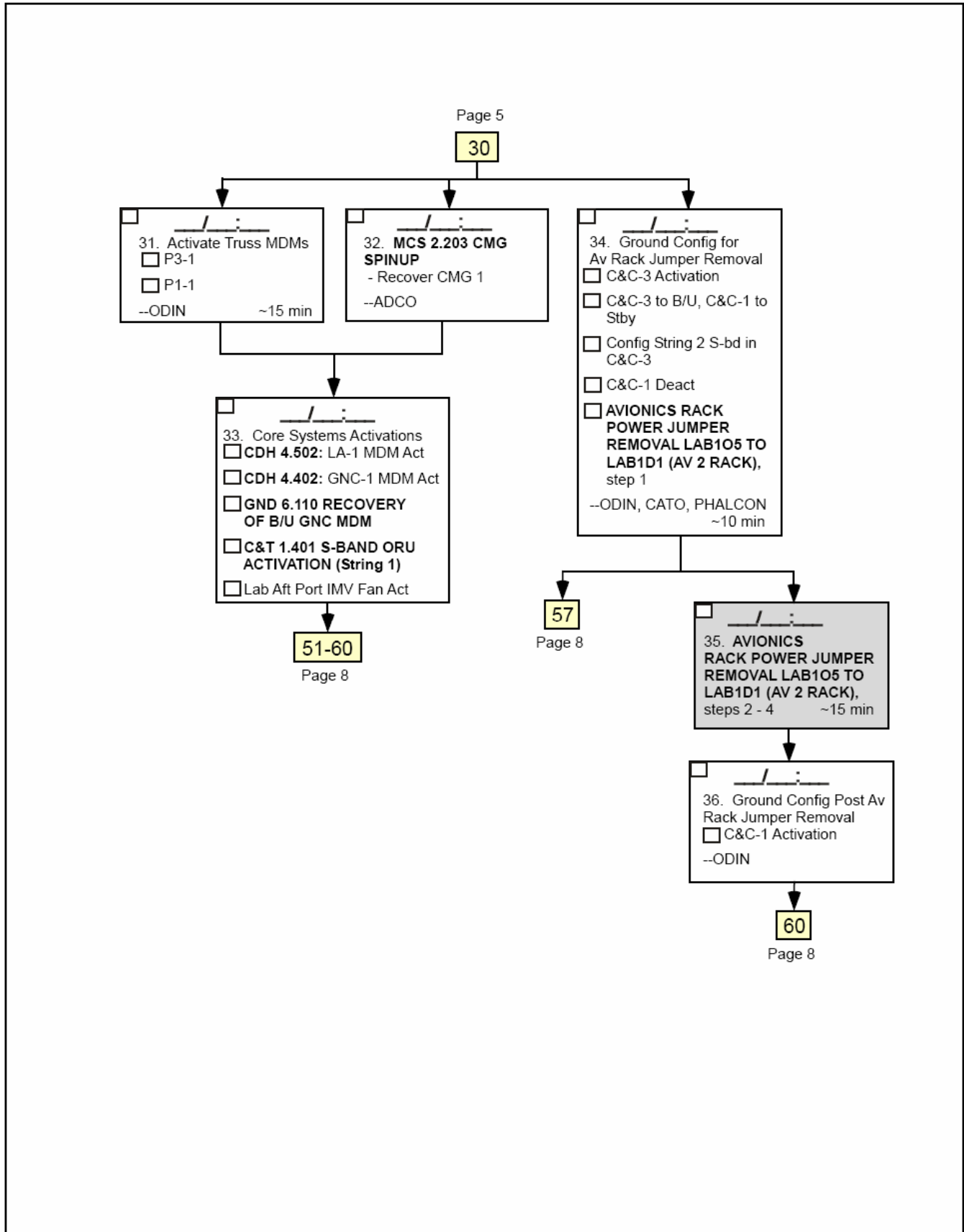
Page 3 of 8 pages







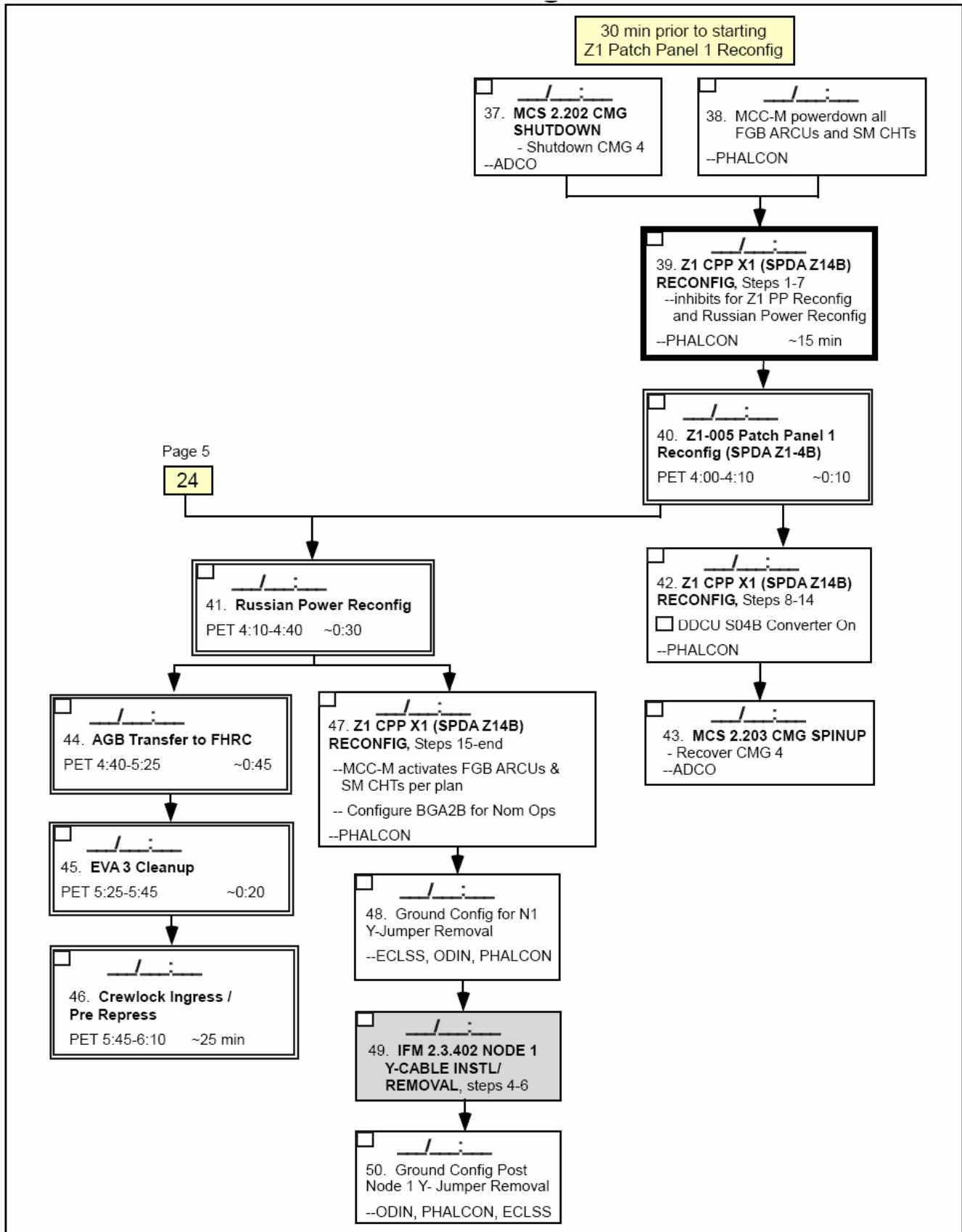




# CHANNEL 1/4 POWER RECONFIGURATION

(ASSY OPS/12A.1/FIN)

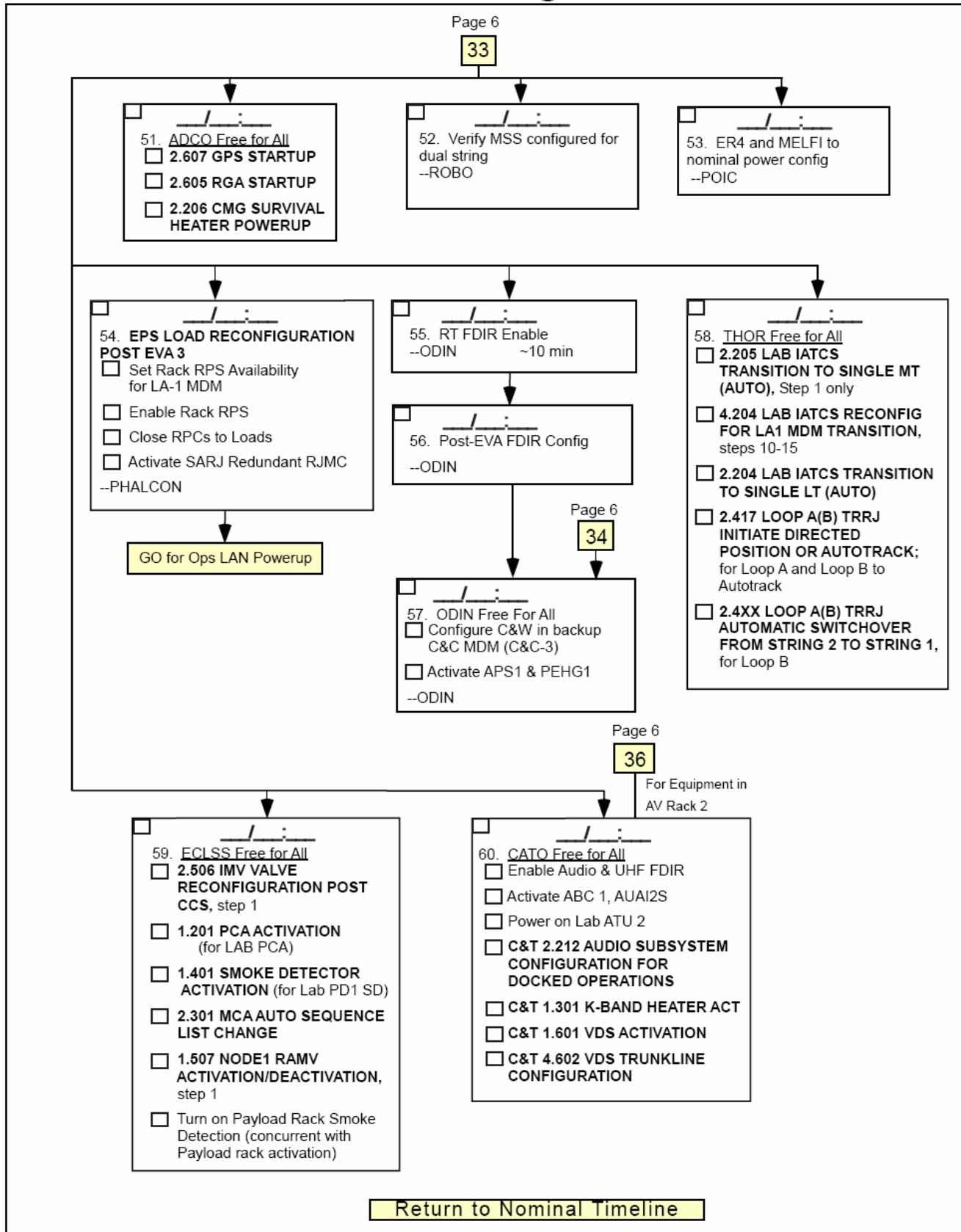
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# CHANNEL 1/4 POWER RECONFIGURATION

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# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

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	Callout	Definition/Comment	Expected Messages	Suppressed?
	Initial Conditions	<p><u>ADCO</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> All GPS Antennas are on String 1</li> </ul> <p><u>ODIN</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tier 1 and 2 MDMs are powered from Channel 2/3</li> </ul> <p><u>CATO</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> S-Band 2 Configured for Primary</li> <li><input type="checkbox"/> UHF System configured to UHF-1: planned prior to docking</li> <li><input type="checkbox"/> Audio and UHF FDIR inhibited</li> <li><input type="checkbox"/> IAC-2 is Prime</li> </ul> <p><u>THOR</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> ORUs preheated to proper temperatures Reference FR 12A.1_C2-84.</li> <li><input type="checkbox"/> S1, P1 TRRJ in Autotrack (Both TRRJ taken to Directed Position in Block A5)</li> <li><input type="checkbox"/> EATCS Loop A Fill Complete and EATCS Pressure &gt; 2592 kPa (390 psi) (Pressure will be rechecked in Block A5)</li> <li><input type="checkbox"/> LAB Window Shutter Shut</li> <li><input type="checkbox"/> IATCS in Single MT</li> </ul> <p><u>ECLSS</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> LAB1S6 CCAA Prime: planned prior to docking</li> </ul> <p><u>PHALCON</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Payload racks off (Except ER4 and MELFI)</li> <li><input type="checkbox"/> A/L Patch Panel Reconfigurations complete (A/L avionics powered from Channel 2/3 string)</li> <li><input type="checkbox"/> Node 1 Y-Jumper installed (DDCU Z14B loads powered by RACU 6).</li> </ul> <p style="text-align: center;">(Continued)</p>	'RPCM LA1B_D Loss of Comm-LAB'	Y

# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

(ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
		<p><u>CIO</u>  <input type="checkbox"/> UOPs and Ops LAN in proper configuration</p> <p><u>BME</u>  <input type="checkbox"/> EV-CPDS to Standby</p>		
A1	AV Rack Jumper Installation	<p>Avionics Rack Equipment Powerdown  {4.303 CC MDM TRANSITION C: TRANSITIONING CC 3(1, 2) MDM FROM STANDBY(BACKUP) TO FAILED/DIAGNOSTIC/OFF} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER I)</p> <p>Power down CC 1.</p> <p>{4.602 VDS TRUNKLINE CONFIGURATION} (SODF: C&amp;T: CORRECTIVE: VIDEO) for USOS trunklines 1, 2, 5 to 7, 10, 14 to 22 and MSS trunklines 1, 3, 4, 5, 8, 9  {1.603 VDS DEACTIVATION} (SODF: C&amp;T: ACTIVATION AND CHECKOUT: VIDEO) for VSU-1</p> <p>{LAB SYSTEM RACK POWER JUMPER INSTALLATION LAB1O5 TO LAB1D1 (AV2 RACK)}, step 1 (SODF: ASSY OPS: NOMINAL: S&amp;M)</p> <p>Performed by Ground.</p> <p>{LAB SYSTEM RACK POWER JUMPER INSTALLATION LAB1O5 TO LAB1D1 (AV2 RACK)}, steps 2 to 4 (SODF: ASSY OPS: NOMINAL: S&amp;M)</p> <p>Performed by Crew.</p> <p>{4.302 CC MDM TRANSITION B: TRANSITIONING CC 3(1,2) MDM FROM OFF TO STANDBY(BACKUP)} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER I)</p> <p>Power on CC 1.</p> <p>Swap CC 1 to Backup, CC 3 to Standby.</p> <p>Configuring S-Band in CC 1 (CATO).</p>	<p>'RPCM LAD11B_A  Loss of Comm-LAB'</p> <p>'RPCM LAD11B_A  Loss of Comm-LAB'  clears</p>	N

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# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

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	Callout	Definition/Comment	Expected Messages	Suppressed?																
A2	Verify all Tier 1 and 2 MDMs are in proper configuration	Logical IDs: <table border="1"> <thead> <tr> <th>Primary:</th> <th>Other:</th> </tr> </thead> <tbody> <tr> <td>C&amp;C-2</td> <td>C&amp;C-1 Backup C&amp;C-3 Standby</td> </tr> <tr> <td>INT-2</td> <td>INT-1 Off</td> </tr> <tr> <td>GNC-2</td> <td>GNC-1 Backup</td> </tr> <tr> <td>PMCU-2</td> <td>PMCU-1 Off</td> </tr> <tr> <td>EXT-2</td> <td>EXT-1 Off</td> </tr> <tr> <td>PL-2</td> <td>PL-1 Off</td> </tr> <tr> <td>N1-2</td> <td>N1-1 Secondary</td> </tr> </tbody> </table>	Primary:	Other:	C&C-2	C&C-1 Backup C&C-3 Standby	INT-2	INT-1 Off	GNC-2	GNC-1 Backup	PMCU-2	PMCU-1 Off	EXT-2	EXT-1 Off	PL-2	PL-1 Off	N1-2	N1-1 Secondary		
Primary:	Other:																			
C&C-2	C&C-1 Backup C&C-3 Standby																			
INT-2	INT-1 Off																			
GNC-2	GNC-1 Backup																			
PMCU-2	PMCU-1 Off																			
EXT-2	EXT-1 Off																			
PL-2	PL-1 Off																			
N1-2	N1-1 Secondary																			
A3	RT FDIR Inhibits	ODIN FDIR INHIBIT Script (reference DEC ALPHA)  This is a "nice to have" block that will prevent buses from switching.																		
A4	Pre-EVA Configuration Script	Pre-EVA_FDIR_Config																		
A5	THOR Power Downs	<p>{2.417 LOOP A(B) TRRJ INITIATE DIRECTED POSITION OR AUTOTRACK} (SODF: TCS: NOMINAL: TRRJ)                      Loop A and Loop B to Directed Position (Port = TBD<sup>o</sup>, Stbd dependent on β).</p> <p>{VERIFY ETCS LOOP A(B) CONFIGURATION} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: TCS)                      Loop A ETCS Repress only if required, should not be necessary due to initial conditions.</p> <p>The repress takes ~20 minutes. It is desired to perform the repress before time-critical activities begin. This repress is required to achieve a Pump Inlet Pressure of at least 2592 kPa at PM Activation time (reference FR 12A.1_B18-11).</p>																		

# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

(ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
A6	{CHANNEL 1/4 POWERDOWN TRUSS HEATER PREP} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: TCS)	Assures that T-stat heaters on Channel 2/3 are powered.		
A7	{4.204 LAB IATCS RECONFIGURATION FOR LA1 MDM TRANSITION}, steps 1 to 8 (SODF: TCS: CORRECTIVE: IATCS)	Records applicable RFCA parameters prior to MDM deactivation. Configures PMA2, LAB Window, and IFHX Heaters as well as verifying stable ITCS performance prior to inhibiting TWMVs.		
A8	ADCO Powerdowns	<p>{2.202 CMG SHUTDOWN} (SODF: MCS: NOMINAL: CMGs)</p> <p>Disconnect Spin Motor from CMG 1. The CMG will not be completely spun down.</p> <p>{2.608 GPS SHUTDOWN} (SODF: MCS: NOMINAL: ATTITUDE AND STATE DETERMINATION)</p> <p>{2.606 RGA SHUTDOWN} (SODF: MCS: NOMINAL: ATTITUDE AND STATE DETERMINATION)</p>		
A9	{12A.1 SSAS HEATER RECONFIGURATION - CHANNEL 1/4} (SODF: ASSY OPS: S&M)			
A10	ECLSS Powerdowns	<p>{1.402 SMOKE DETECTOR DEACTIVATION} (SODF: ECLSS: ACTIVATION AND CHECKOUT: FDS) LAB PD1 Smoke Detector Deactivation</p> <p>LAB Fwd Stbd IMV Valve</p> <p>Keep Open but deactivate per {2.506 IMV VALVE RECONFIGURATION POST CCS}, step 4 (SODF: ECLSS: NOMINAL: THC)</p> <p>LAB Aft Port IMV Fan</p> <p>{1.504 IMV FAN ACTIVATION/DEACTIVATION POST CCS}, step 3 (SODF: ECLSS: ACTIVATION AND CHECKOUT: THC)</p> <p>MCA Sample Sequence Change</p>		

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# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

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	Callout	Definition/Comment	Expected Messages	Suppressed?
A11	{EPS SYSTEM CONFIGURATION FOR EVA 3 POWERDOWN} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	Turn on LAB, S1-2 CETA Lights.  Inhibit Rack RPS Monitoring at D1, D3, P1, P3, P5, P6, S1, S2, and S3 Must be performed prior to deactivating LA 1 MDM.  Confirm <b>MCC-M</b> prepared for ARCU/CHT powerdown.		
A12	Payload Rack Configuration	Verify ER4 and MELFI are configured to Channel 2B.  Verify all other payload racks are off.  Since all racks are off, Smoke Detection is inhibited.  LA 1 MDM controls LAB1S2 (HRF), LAB1S3 (MSG), and LAP1 smoke detectors.		
A13	Configure Internal and External Video	VIDEO: {1.602 VDS CVIU POWERUP AND POWERDOWN} (SODF: C&T: ACTIVATION AND CHECKOUT: VIDEO)  For powering down CVIUs 1, 2, 3, and 12  {1.603 VDS DEACTIVATION} (SODF: C&T: ACTIVATION AND CHECKOUT: VIDEO) for EVSU 1, 3  <u>NOTE</u> Comm equipment not powered off in this block or in block A1 is not powered down gracefully.		
A14	Verify MSS configured for single string	Cup RWS active, SSRMS and MBS operational on redundant string		

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**CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE**

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	Callout	Definition/Comment	Expected Messages	Suppressed?
A15	Deactivate MDMs CC 3 GNC 1	<p>{4.303 CC MDM TRANSITION C: TRANSITIONING CC 3(1, 2) MDM FROM STANDBY(BACKUP) TO FAILED/DIAGNOSTIC/OFF} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER I)</p> <p>{LAB SYSTEM RACK POWER JUMPER INSTALLATION LAB105 TO LAB1D1 (AV 2 RACK)}, steps 1 to 11 must be complete (Block A1) (SODF: ASSY OPS: NOMINAL: S&amp;M)</p> <p>{4.403 GNC MDM TRANSITION C: TRANSITION BACKUP GNC MDM 2(1) FROM WAIT TO DIAGNOSTIC/OFF WHILE PRIMARY GNC MDM IS OPERATIONAL} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER II)</p>		

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**CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE**

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	Callout	Definition/Comment	Expected Messages	Suppressed?
1	{2.315 HYGEINE BREAK}, steps 1 to 4 (SODF: ISS EVA SYS: OVERNIGHT CAMPOUT)			
2	{2.315 HYGEINE BREAK}, steps 13 to 14 (SODF: ISS EVA SYS: OVERNIGHT CAMPOUT)	Enable ISS Rapid Depress Response and Alarm.  Inihabit A/L Rapid Depress and Alarm.		
3	{2.315 HYGEINE BREAK}, steps 5 to 12, 15 to 20, 22 to 26 (SODF: ISS EVA SYS: OVERNIGHT CAMPOUT)	- Mask Prebreathe Init - Repress A/L to 14.7 (step 11) - Hygeine Break - Close Node 1 Stbd Hatch - Depress A/L to 10.2 (step 20)		
4	{1.105 ISS AIRLOCK 10.2 PSIA OPERATIONS INITIATION}, step 8 (SODF: ISS EVA SYS: 10.2 PSIA OPS)	Enable A/L Rapid Depress Response and Alarm.  Called from step 21 of Block 3. To be performed after the Airlock is depressed to 10.2 psi (step 20 of Block 3).		
5	{2.320 10.2 PSIA CAMPOUT EVA PREP}, steps 1 to 21 (SODF: ISS EVA SYS: OVERNIGHT CAMPOUT)	EMU Prep for Donning		

# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

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	Callout	Definition/Comment	Expected Messages	Suppressed?
6	{2.320 10.2 PSIA CAMPOUT EVA PREP}, steps 22 to 74 (SODF: ISS EVA SYS: OVERNIGHT CAMPOUT)	- EMU Donning - EMU Check - EMU Suit Fan on (in step 56)		
7	{1.220 EMU PURGE}, steps 1 to 5, 7 to 15, 17 (SODF: ISS EVA SYS: EVA PREP/POST)	- Purge EMUs - A/L Repress to 14.7 (step 9) - Open Node 1 Stbd Hatch		
8	{1.110 ISS AIRLOCK 10.2 PSIA OPERATIONS TERMINATION }, step 1 (SODF: ISS EVA SYS: 10.2 PSIA OPS)	Inhibit ISS Rapid Depress Response and Alarm.  This step can be performed as soon as the Suit Fan is on (Step 56 of Block 6) and must be performed prior to A/L repress (Step 9 of Block 7).		
9	{1.110 ISS AIRLOCK 10.2 PSIA OPERATIONS TERMINATION }, steps 2 to 7 (SODF: ISS EVA SYS: 10.2 PSIA OPS)	Enable ISS Rapid Depress Response and Alarm.  Environment cleanup from 10.2 Ops.  Perform this step after the Node 1 Stbd Hatch is open (Step 10 of Block 7).		
10	{1.225 EMU PREBREATHE} (SODF: ISS EVA SYS: EVA PREP/POST)	- EMU Prebreathe - SAFER Donning - Ingress Crewlock		
11	{1.202 PCA DEACTIVATION} (SODF: ECLSS: ACTIVATION AND CHECKOUT: ACS)	For LAB PCA  This procedure must occur after the Node 1 Starboard hatch is opened (Step 10 of Block 7).  Not a constraint for the EVA pressing forward.		

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# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

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	Callout	Definition/Comment	Expected Messages	Suppressed?
12	{CREWLOCK DEPRESS/REPRESS CUE CARD}, (SODF: ISS EVA SYS: EVA PREP/POST)	Crewlock Depress to Vacuum		
13	Deactivate LA 1 MDM	{4.503 LAB MDM TRANSITION C: TRANSITIONING LAB MDM FROM OPERATIONAL/MIN OPS TO STANDBY/DIAGNOSTIC/OFF} (SODF: C&DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)  Condition: <input type="checkbox"/> THOR: must be in Single MT (Initial Condition) <input type="checkbox"/> PHALCON: Rack RPSs must be disabled (Block A11) <input type="checkbox"/> ECLSS: Must be done with Block A10.	'LAB RFCA LAB103 Undertemp-LAB'	
14	Deactivate MDMs P3 1 STR	{4.631 P3 MDM TRANSITION C: TRANSITIONING P3 MDM FROM NORMAL/WAIT TO WAIT/DIAGNOSTIC/OFF} (SODF: C&DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)  {4.619 STR MDM TRANSITION C: TRANSITIONING STR MDM FROM NORMAL/WAIT TO WAIT/DIAGNOSTIC/OFF} (SODF: C&DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)	'Prime EXT Detected P3 1 MDM Failed - P3'	
15	Post Depress/Crewlock Egress	Reference EVA Timeline. PET 0:00 - 0:30		
16	{1.110 ISS AIRLOCK 10.2 PSIA OPERATIONS TERMINATION}, step 8 (SODF: ISS EVA SYS: 10.2 PSIA OPS)	Disable Depress Pump.		
17	Go for Powerdown	Everyone but PHALCON should be done with their steps.		

# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

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	Callout	Definition/Comment	Expected Messages	Suppressed?
18	{EPS CHANNEL 1/4 POWERDOWN FOR EVA 3} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	All Thermostatically Controlled Heaters are turned off at this point.  Start Powerdown Thermal Clock Powerdown Thermal Clock ends in Block 28.  4B RBI 6 open 4A RBI 6 open	Many	
19	Channel 1/4 Power Reconfigurations	Reference EVA Timeline.  PET 00:30 - 02:00	-----	
20	{DDCU RACK 1 RECONFIGURATION} (SODF: ASSY OPS: NOMINAL: S&M)	DDCU LA1A and LA4A configured to allow parallel mode operations. Includes installing Channel 1/4 - LAB Cable Assembly Jumper.	None	
21	ECZ SEPS Thread and RT FDIR configuration script	Verify S1, P1, and S0 configuration after pulling power  Configure RT FDIR.	-----	
22	Load PMCU RT Existence Table Version 114 to Pri PMCU	This allows the PMCU to see the MBSU. This can be done earlier if needed, but alarms will be received because the PMCU will be looking for MBSUs that are not yet connected.  Must be done prior to Block 25.	Many	
23	Go for Powerup	EVA Power Reconfigurations and DDCU Patch Panel reconfigurations must be complete for GO.	-----	
24	SMDP Transfer	Reference EVA Timeline.  PET 02:00 - 04:10  Need to tell EVA if an MBSU or DDCU R&R will be required prior to EV crew releasing first four TDK bolts.	-----	

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# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

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	Callout	Definition/Comment	Expected Messages	Suppressed?
25	<p>{EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION}, steps 1 to 15 (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> MBSU 4 Activation</li> <li><input type="checkbox"/> MBSU 1 Activation</li> <li><input type="checkbox"/> DDCU S04B Power (converter not turned on until Block 42)</li> <li><input type="checkbox"/> DDCU S14B Power (converter not turned on until Block 30)</li> <li><input type="checkbox"/> DDCU LA1B Power (converter not turned on until Block 30)</li> <li><input type="checkbox"/> DDCU S01A Power and Converter On</li> </ul> <p>If an MBSU or DDCU failure is detected and EMU consumables support, an R&amp;R of the failed box will be performed.</p> <p>If a failure is detected after the time which EMU consumables could support an R&amp;R, a complete backout of the EVA Power Reconfigurations is required and the EPS will be returned to the pre-12A.1 configuration for this channel.</p> <p>This block starts the MBSU/DDCU Thermal Monitoring. Ends with Block 27.</p> <p><u>Constraints</u>    MBSU Baseplate temp &lt;45.5° C  MBSU Power Supply Temp &lt; 47.5° C  DDCU Power Supply Temp &lt; 60.5° C  DDCU Converter Temp &lt; 62° C</p>		
26	<p>{EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION}, steps 16 to end (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> S0 1 MDM Activation</li> <li><input type="checkbox"/> S1 1 MDM Activation</li> <li><input type="checkbox"/> STR MDM Powered (Activated in Block 29)</li> </ul> <p>Reference ODIN Contingency Matrix for workarounds if off-nominal activation.</p>		

# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

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	Callout	Definition/Comment	Expected Messages	Suppressed?
27	<p>{ETCS LOOP A(B) ACTIVATION AND CHECKOUT} for Loop A (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: TCS)</p>	<p>Successful activation of the Pump Module in this procedure ends MBSU/DDCU Thermal Monitoring (started in Block 25).</p> <p>If the PM Activation is not successful, the power system must be put into a pre-EVA configuration, using the Full Backout Mal procedure. A Pump Module R&amp;R will be attempted at the next available opportunity.</p> <p>PHALCON will give go for this block in Step 19 of Block 26.</p>		
28	<p>{CHANNEL 1/4 CRITICAL HEATER ACTIVATION}, (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: TCS)</p>	<p>Ends Powerdown Thermal Clock (started Block 18).</p>		
29	<p>Activate STR MDM</p>	<p>{4.618 STR MDM TRANSITION B: TRANSITIONING STR MDM FROM OFF TO WAIT} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p> <p>The RPC for the STR MDM is closed in Step 22 of Block 26.</p> <p>STR MDM can be used to read NTA, ATA, and PM pressures. The STR MDM is activated at this time to prepare off-nominal activation of the S1 1 MDM.</p>		
30	<p>{EPS CHANNEL 1/4 COMPLETE POWER DISTRIBUTION ACTIVATION} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> DDCU LA1B Converter On (powered in Block 25)</li> <li><input type="checkbox"/> DDCU LA1A Power and Converter On</li> <li><input type="checkbox"/> DDCU LA4A Power and Converter On</li> <li><input type="checkbox"/> DDCU S14B Converter On (powered in Block 25).</li> <li><input type="checkbox"/> DDCU Z14B Power (Converter On in Block 50)</li> </ul> <p>This block should be completed prior to proceeding with remaining blocks to allow PHALCON to bring up the most critical equipment first.</p>		



**CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE**

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	Callout	Definition/Comment	Expected Messages	Suppressed?
31	Activate Truss MDMs P3-1 P1-1	<p>{4.630 P3 MDM TRANSITION B: TRANSITIONING P3 MDM FROM OFF TO WAIT} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p> <p>{4.622 P1 MDM TRANSITION B: TRANSITIONING P1 MDM FROM OFF TO WAIT} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p>		
32	{2.203 CMG SPIN UP}, Recover CMG 1 (SODF: MCS: NOMINAL: CMGS)	<p><u>NOTE</u></p> <p>The CMG will require ~1 hour to spin up to 6600 rpm, but this block is complete as soon as commanding is complete.</p>		

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**CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE**

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	Callout	Definition/Comment	Expected Messages	Suppressed?
33	Core Systems Activations	<p>{4.502 LAB MDM TRANSITION B: TRANSITIONING LAB MDM FROM OFF TO OPERATIONAL} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER III )</p> <p>Activate LA 1 MDM.</p> <p>{4.402 GNC MDM TRANSITION B: TRANSITIONING GNC BACKUP MDM 2(1) FROM OFF TO WAIT WHILE PRIMARY GNC IS OPERATIONAL} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER II)</p> <p>Activate GNC 1 MDM.</p> <p>{6.110 RECOVERY OF BACKUP GNC MDM} (SODF: GND AVIONICS: MCS: ACTIVATION AND CHECKOUT)</p> <p>For String 1 {1.401 S-BAND ORU ACTIVATION} (SODF: C&amp;T: ACTIVATION AND CHECKOUT: S-BAND)</p> <p>{1.504 IMV FAN ACTIVATION/DEACTIVATION POST CCS}, steps 1 to 2 (SODF: ECLSS: ACTIVATION AND CHECKOUT: THC)</p> <p>LAB Aft Port IMV Fan</p> <p><u>NOTE</u></p> <p>The purpose of this block is to allow certain systems to be brought up as soon as possible without being stepped on by "Free for All" commanding. "Free for All" steps should not be started until this block is complete.</p>		

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**CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE**

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	Callout	Definition/Comment	Expected Messages	Suppressed?
34	Ground Configuration for AV Rack Jumper Removal	<p>{4.302 CC MDM TRANSITION B: TRANSITIONING CC 3(1,2) MDM FROM OFF TO STANDBY(BACKUP)} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER I)</p> <p>CC 3 Activation</p> <p>{4.305 C&amp;C MDM TRANSITION E: SWAPPING THE BACKUP AND STANDBY C&amp;C MDM} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER I)</p> <p>Swap CC 3 to Backup, CC 1 to Standby</p> <p>Configure String 2 S-Band in CC 3.</p> <p>{4.303 CC MDM TRANSITION C: TRANSITIONING CC 3(1, 2) MDM FROM STANDBY(BACKUP) TO FAILED/DIAGNOSTIC/OFF} (SODF: C&amp;DH: CORRECTIVE: MDM STATE TRANSITIONS TIER I)</p> <p>Deactivate CC 1.</p> <p>{LAB SYSTEM RACK POWER JUMPER REMOVAL LAB1O5 TO LAB1D1 (AV2 RACK)}, step 1 (SODF: ASSY OPS: NOMINAL: S&amp;M)</p> <p>Safe RPCs for Jumper Removal.</p> <p>The AV Rack Jumper should be removed as soon as possible to reduce the amount of time that the CC MDMs are jumpered, but it can be deferred to the next day if necessary.</p>	'RPCM LAD11B_A Loss of Comm-LAB'	N
35	{LAB SYSTEM RACK POWER JUMPER REMOVAL LAB1O5 TO LAB1D1 (AV2 RACK)}, steps 2 to 4 (SODF: ASSY OPS: NOMINAL: S&M)	Returns power from Channel 1/4 to AV Rack 2, LAB1D1.	'RPCM LAD11B_A Loss of Comm-LAB' clears	

# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

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	Callout	Definition/Comment	Expected Messages	Suppressed?
36	Ground Configuration post AV Rack Jumper Removal	{4.302 CC MDM TRANSITION B: TRANSITIONING CC 3(1,2) MDM FROM OFF TO STANDBY(BACKUP)} (SODF: C&DH: CORRECTIVE: MDM STATE TRANSITIONS TIER I)  Activate CC 1.		
37	{2.202 CMG SHUTDOWN} (SODF: MCS: NOMINAL: CMGs)	Start ~30 minutes prior to EV crew performing the Z1 Patch Panel 1 Reconfiguration.  Disconnect Spin Motor from CMG 4.  The CMG will not be completely spun down.		
38	<b>MCC-M</b> powerdown all FGB ARCUs and SM CHTs	Start ~30 minutes prior to EV crew performing the Z1 Patch Panel 1 Reconfiguration.		
39	{Z1 CPP X1 (SPDA Z14B) RECONFIGURATION}, steps 1 to 7 (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	Inhibit for Z1 Patch Panel Reconfiguration and Russian Power Reconfiguration.  Includes positioning the 2B array for plasma protection (may be done in parallel with CMG Disconnect, Ku-Band External ORU Deactivation, and ARCU/CHT powerdown).		
40	Z1-005 Patch Panel 1 Reconfiguration (ZPDA Z1-4B)	Reference EVA Timeline.  PET 04:00 - 04:10		
41	Russian Power Reconfiguration	Reference EVA Timeline.  PET 04:10 - 04:40		
42	{Z1 CPP X1 (SPDA Z14B) RECONFIGURATION}, steps 8 to 14 (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	DDCU S0-4B Converter On (powered in Block 25).		

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**CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE**

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	Callout	Definition/Comment	Expected Messages	Suppressed?
43	{2.203 CMG SPIN UP}, Recover CMG 4 (SODF: MCS: NOMINAL: CMGS)	<u>NOTE</u> The CMG will take ~1 hour to spin up to 6600 rpm, but this block is complete as soon as the commanding is complete.		
44	AGB Transfer to FHRC	Reference EVA Timeline. PET 04:40 - 05:25		
45	EVA 3 Cleanup	Reference EVA Timeline. PET 05:25-05:45	-----	
46	Crewlock Ingress/Pre-Repress	Reference EVA Timeline. PET 05:45-06:10	-----	
47	{Z1 CPP X1 (SPDA Z14B) RECONFIGURATION}, steps 15 to end (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	<b>MCC-M</b> activates FGB ARCUs and SM CHTs per plan. Configure BGA 2B for Nominal Ops.		

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**CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE**

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	Callout	Definition/Comment	Expected Messages	Suppressed?
48	Ground Configuration for Node 1 Y-Jumper Removal	<p>This should not be done until the Russian Power Reconfiguration is complete and <b>MCC-M</b> has repowered CHTs and ARCUs.</p> <p>Unpower ECLSS Loads                      Node 1 Cabin Fan                      Node 1 Smoke Detector 1                      Node 1 Smoke Detector 2 (because Cabin Fan is off)                      Node 1 Aft Port IMV Fan                      Node 1 RAMV                      Node 1 IMV valves                          Stbd Fwd                          Stbd Aft                          Aft Port                          Aft Stbd</p> <p>{4.607 NODE 1 MDM TRANSITION G: N1-1 TO OFF/DIAGNOSTIC/STANDBY FROM SECONDARY WHILE N1-2 IS PRIMARY} (SODF: CDH: CORRECTIVE: MDM STATE TRANSITIONS TIER III)</p> <p>Unpower N1 1 MDM.</p> <p>{1.204 RACU 6 DEACTIVATION} (SODF: EPS: ACTIVATION AND CHECKOUT: SECONDARY POWER SYSTEM)</p> <p>{2.3.402 N14B Y-JUMPER INSTALLATION/REMOVAL} step 1 (SODF: IFM: NODE 1: MANUAL FAULT ISOLATION AND RECOVER/EPS)</p> <p>The Node 1 Y-Jumper should be removed as soon as possible but it can be deferred to the next day if necessary.</p>		

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# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

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	Callout	Definition/Comment	Expected Messages	Suppressed?
49	<p>{2.3.402 N14B Y-JUMPER INSTALLATION/REMOVAL}, steps 4 to 6 (SODF: ISS IFM: NODE 1: MANUAL FAULT ISOLATION AND RECOVERY/EPS)</p>	<p>Reconfigure Channel 1/4 power back to DDCU Z14B loads.</p>		
50	<p>Ground Configuration Post Node 1 Y-Jumper Removal</p>	<p>{1.203 FGB RACU 6 ACTIVATION} (SODF: EPS: ACTIVATION AND CHECKOUT: SECONDARY POWER SYSTEM)</p> <p>{1.223 FGB RACU 6 CONTROLLED REPOWER} (SODF: EPS: ACTIVATION AND CHECKOUT: SECONDARY POWER SYSTEM)</p> <p>Repower N1 1 MDM.</p> <p>{1.225 Z1 DDCU Z14B CONTROLLED REPOWER} (SODF: EPS: ACTIVATION AND CHECKOUT: SECONDARY POWER SYSTEM)</p> <p>ECLSS will repower loads that were unpowered in Block 48 per {4.205 NODE MDM RECONFIGURATION}, step 4.4 (SODF: C&amp;DH: CORRECTIVE: MDM RECONFIGURATION) and {1.401 SMOKE DETECTOR ACTIVATION}, all (SODF: ECLSS: ACTIVATION AND CHECKOUT: FDS), for Node 1 Smoke Detector 2.</p>		
51	<p>ADCO Free for All</p>	<p>{2.607 GPS STARTUP} (SODF: MCG: NOMINAL: ATTITUDE AND STATE DETERMINATION)</p> <p>{2.605 RGA STARTUP} (SODF: MCG: NOMINAL: ATTITUDE AND STATE DETERMINATION)</p> <p>{2.206 CMG SURVIVAL HEATER POWERUP} (SODF: MCG: NOMINAL: CMGS)</p>		

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# CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE

(ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
52	Verify MSS configured for dual string	Power MBS to Keep-Alive on prime string. Verify PHALCON/THOR scripts have repowered the MT.		
53	ER4 and MELFI Power Reconfiguration to nominal power channel			
54	{EPS LOAD RECONFIGURATION POST EVA 3} (SODF: ASSY OPS: ACTIVATION AND CHECKOUT: EPS)	<p>LA-1 must be up before these steps can be performed.                      Set Rack RPS Availability for LA 1 MDM.</p> <p>Enable Rack RPS.</p> <p>Close RPCs to Loads                      Luminaire Heaters                      Lights                      UOPs</p> <p>Activate SARJ Redundant RJMC.</p>		
55	RT FDIR Enable	ODIN RT FDIR Enable Script (Reference DEC ALPHA)		
56	Post-EVA FDIR Configuration	Post_EVA_FDIR_Config Script		
57	ODIN Free For All	<p>Configure C&amp;W in backup.</p> <p>Activate APS1 and PEHG1.</p>		

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**CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE**

(ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
58	THOR Free For All	<p>{2.205 LAB IATCS TRANSITION TO SINGLE MT (AUTO)}, step 1 (SODF: TCS: NOMINAL: IATCS)</p> <p>{4.204 LAB IATCS RECONFIG FOR LA1 MDM TRANSITION}, steps 10 to 15 (SODF: TCS: CORRECTIVE: IATCS)</p> <p>This procedure will configure the IATCS system in Single mode.</p> <p>{2.204 LAB IATCS TRANSITION TO SINGLE LT (AUTO)} (SODF: TCS: CORRECTIVE: IATCS)</p> <p>For Loops A and B {2.417 LOOP A(B) TRRJ INITIATE DIRECTED POSITION OR AUTOTRACK} (SODF: TCS: NOMINAL: TRRJ) puts Loops A and B TRRJ in Autotrack.</p> <p>For Loop B {2.406 LOOP A(B) TRRJ STRING 2 TO STRING 1 SWITCHOVER} (SODF: TCS: NOMINAL: TRRJ) puts Loop B TRRJ on the 1/4 power domain for redundancy purposes. Loop A stays on String 2.</p>		

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**CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE**

(ASSY OPS/12A.1/FIN)

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	Callout	Definition/Comment	Expected Messages	Suppressed?
59	ECLSS Free for All	<p>{2.506 IMV VALVE RECONFIGURATION POST CCS}, step 1 (SODF: ECLSS: NOMINAL: THC) LAB Fwd Stbd IMV Valve</p> <p>{1.201 PCA ACTIVATION} (SODF: ECLSS: ACTIVATION AND CHECKOUT: ACS) for LAB PCA</p> <p>{1.401 SMOKE DETECTOR ACTIVATION} (SODF: ECLSS: ACTIVATION AND CHECKOUT: FDS) for LAB PD1 Smoke Detector</p> <p>{2.301 MCA AUTO SEQUENCE LIST CHANGE} (SODF: ECLSS: NOMINAL: ARS) Return to Node, LAB, A/L Nominal Sample</p> <p>{1.507 NODE 1 RAMV ACTIVATION/DEACTIVATION} step 1, (SODF: ECLSS: ACTIVATION AND CHECKOUT: THC)</p> <p>Turn on Payload rack Smoke Detection (concurrent with Payload Rack Activation, if required).</p>		

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**CHANNEL 1/4 POWER RECONFIGURATION DEFINITIONS TABLE**

(ASSY OPS/12A.1/FIN)

Page 23 of 23 pages

	Callout	Definition/Comment	Expected Messages	Suppressed?
60	CATO Free For All	<p>Enable Audio FDIR and UHF FDIR.                      Activate ABC-1, AUAI2S.                      Power on LAB ATU-2.</p> <p>{2.212 AUDIO SUBSYSTEM CONFIGURATION FOR DOCKED OPS} (SODF: C&amp;T: NOMINAL: AUDIO)                      {1.301 KU-BAND HEATER ACTIVATION} (SODF: C&amp;T: ACTIVATION AND CHECKOUT: KU-BAND)                      {1.601 VDS ACTIVATION} (SODF: C&amp;T: ACTIVATION AND CHECKOUT: VIDEO)                      {4.602 VDS TRUNKLINE CONFIGURATION} (SODF: C&amp;T: CORRECTIVE: VIDEO)</p> <p><u>NOTE</u></p> <p>Comm checks are desired after the Internal Audio configuration is complete; therefore, it is desired that this block be completed 2 hours prior to crew sleep. If not completed before sleep, comm checks should be performed after crew wake. The UHF will remain powered and functioning as the big loop until checks are performed.</p>		

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# EPS SYSTEM CONFIGURATION FOR EVA 2 POWERDOWN

(ASSY OPS/12A.1/FIN) Page 1 of 1 page

## OBJECTIVE:

The purpose of this procedure is to prepare EPS equipment for the powerdown of the 2/3 domain for EVA reconfiguration.

### NOTE

This step must be done after swapping to a prime C&C powered by the 1/4 channel.

## **MCC-H** 1. INHIBITING RACK RPS MONITORING FOR LA 2 AND LA 3 MDMS

US Lab: EPS: Rack Power: Rack Power 3

Rack Power 3

'Monitoring Status'

If Rack LAB1[XX] Monitoring Status – Ena

where [XX] = O1, O2, O3, O4, O5, O6, S6

'Rack Power Monitoring MCC-H Commands Only'

**cmd** LAB1[XX] Inhibit

'Monitoring Status'

√Rack LAB1[XX] – Inh

Lab Rack Power

sel Rack Power 2

Rack Power 2

'Monitoring Status'

If Rack LAB1[XX] Monitoring Status – Ena

where [XX] = D2, D4, D5, D6, P2, P4, S4, S5

'Rack Power Monitoring MCC-H Commands Only'

**cmd** LAB1[XX] Inhibit

'Monitoring Status'

√Rack LAB1[XX] – Inh

## 2. PREPARING FOR RUSSIAN FEED POWERDOWN

Confirm **MCC-M** prepared for powerdown of SM CHTs 23 and 24 and FGB ARCUs 51 and 52.

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## EPS CHANNEL 2/3 POWERDOWN FOR EVA 2

(ASSY OPS/12A.1/FIN) Page 1 of 3 pages

### OBJECTIVE:

This procedure completes the Channel 2/3 Powerdown and sets the required safety inhibits for the electrical connector reconfiguration.

#### NOTE

Do not begin final powerdown until A/L Depress has been completed and Depress Pump powered down.

### PCS 1. DEACTIVATING DDCU LA2A AND LA3B

US Lab: EPS

sel LAB1O6

Lab Rack LAB1O6

sel DDCU LA2A

DDCU LA2A

sel Converter

DDCU LA2A Converter

'Converter Off'

**cmd** Off

DDCU LA2A

Verify Out Current: -4 to 4 A

Verify Out Voltage < 3 V

Lab Rack LAB1O6

sel DDCU LA3B

DDCU LA3B

sel Converter

DDCU LA3B Converter

'Converter Off'

**cmd** Off

DDCU LA3B

Verify Out Current: -4 to 4 A

Verify Out Voltage < 3 V

## EPS CHANNEL 2/3 POWERDOWN FOR EVA 2

(ASSY OPS/12A.1/FIN) Page 2 of 3 pages

### 2. DEACTIVATING DDCU Z13B

Z1: EPS

sel DDCU Z13B

sel Converter

'Converter Off'

**cmd** Off

Verify Out Current: -4 to 4 A

Verify Out Voltage < 3 V

### 3. DEACTIVATING DDCU LA2B

US Lab: EPS

sel DDCU LA2B Distribution

sel DDCU LA2B

sel Converter

'Converter Off'

**cmd** Off

Verify Out Current: -4 to 4 A

Verify Out Voltage < 3 V

### 4. SETTING EDF FOR 2B RBI 6 OPEN

**cmd** <Cmd Inv: P4\_EDF\_DCSU\_SCA\_Bus\_Fltd\_V\_Sel\_Tmpl -  
(P6PX96IM0123K)>



## EPS CHANNEL 2/3 POWERDOWN FOR EVA 2

(ASSY OPS/12A.1/FIN) Page 3 of 3 pages

pick DCSU\_SCA\_x ► 17413 - 33797 ► DCSU SCA P6UPR 2B  
pick PV\_Cmd\_Hdr ► 2 ► Fire  
pick PV\_EDF\_DCSU\_SCA\_Bus\_Fltr\_Sel ► 1 ► PV DCSU SCA Bus  
Conv Voltage

### 5. SETTING EDF FOR 2A RBI 6 OPEN

**cmd** <Cmd Inv: P4\_EDF\_DCSU\_SCA\_Bus\_Fltrd\_V\_Sel\_Tmplt -  
(P4PX95SM0123K)>

pick DCSU\_SCA\_x ► 17157 ► DCSU SCA P4LWR 2A  
pick PV\_Cmd\_Hdr ► 2 ► Fire  
pick PV\_EDF\_DCSU\_SCA\_Bus\_Fltr\_Sel ► 1 ► PV DCSU SCA Bus  
Conv Voltage

### 6. OPENING DCSU 2B RBI 6

P6: EPS

sel DCSU 2B

DCSU 2B

sel RBI 6

'Cmded Position'

**cmd** Open (√ – Op)

Verify Voltage < 4 V

Verify Current < 7 A

### 7. VERIFYING DCSU 2A RBI 6 OPEN

P4: EPS

sel DCSU 2A

DCSU 2A

sel RBI 6

'Cmded Position'

√ – Op

Verify Voltage < 4 V

Verify Current < 7 A

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# EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

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

## OBJECTIVE:

This procedure performs the critical EPS and CDH activation steps required to establish a configuration in which the EATCS system can be activated to provide cooling.

### NOTE

1. The post-reconfiguration reactivation sequence is organized to accomplish two goals. The first is to activate and verify the health of the external ORUs that would require R&R in the event of failure. A connectivity and aliveness check are performed on the truss MBSUs and DDCUs. A connectivity check is also performed on the LAB core DDCU to ensure critical redundancy can be restored. Once these checkouts are complete, critical activation proceeds to activate cooling for Truss hardware.
2. Confirm uplink of PMCU Existence Table 4 Version 125 to Primary PMCU (PMCU 1) prior to beginning procedure.

- PCS
1. CLOSING DCSU 2B RBI 6  
P6: EPS: DCSU 2B  
DCSU 2B

sel RBI 6

DCSU 2B RBI 6  
'Cmded Position'

**cmd** Close – Arm  
**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 147 V

2. CLOSING DCSU 2A RBI 6  
P4: EPS: DCSU 2A  
DCSU 2A

sel RBI 6

DCSU 2A RBI 6  
'Cmded Position'

**cmd** Close – Arm  
**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 147 V

## EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

(ASSY OPS/12A.1/FIN) Page 2 of 15 pages

### 3. VERIFYING MBSU 2 INTG CNTR AND COMMON CLEAR

S0: EPS

sel MBSU 2

MBSU 2

Verify Integration Counter – incrementing

sel Firmware

MBSU 2 Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power On Reset – blank

### 4. CLOSING MBSU 2 RBI 8

MBSU 2

sel RBI 8

MBSU 2 RBI 8

Verify Voltage > 145 V

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\text{CI}}$ )

MBSU 2

'Bus B'

Verify Bus B Voltage > 145 V

### 5. CLOSING MBSU 2 RBI 1

S0: EPS

sel MBSU 2

MBSU 2

sel RBI 1

MBSU 2 RBI 1

Verify Voltage > 145 V

## EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

(ASSY OPS/12A.1/FIN) Page 3 of 15 pages

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

'Bus A'

Verify Bus A Voltage > 145 V

### 6. CLOSING MBSU 2 RBI 6

sel RBI 6

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

### 7. CLOSING MBSU 2 RBI 7

sel RBI 7

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

### 8. VERIFYING MBSU 3 INTG CNTR AND COMMON CLEAR

S0: EPS

sel MBSU 3

Verify Integration Counter – incrementing

sel Firmware

'Clear Commands'

## EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

(ASSY OPS/12A.1/FIN) Page 4 of 15 pages

**cmd** Common Clear

Verify Power On Reset – blank

### 9. [CLOSING MBSU 3 RBI 7](#)

sel RBI 7

Verify Voltage > 145 V

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Bus A Voltage > 145 V

### 10. [CLOSING MBSU 3 RBI 9](#)

S0: EPS: MBSU 3

sel RBI 9

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Bus 3B Voltage = Bus 3A Voltage

### 11. [CLOSING MBSU 3 RBI 4](#)

S0: EPS: MBSU 3:

sel RBI 4

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

sel DDCU P13A

## EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

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

**DDCU P13A**

Verify Integration Counter – incrementing

### 12. CLOSING MBSU 3 RBI 13

S0: EPS: MBSU 3: **MBSU 3**

sel RBI 13

**MBSU 3 RBI 13**

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

**MBSU 3**

sel DDCU S03B

**DDCU S03B**

Verify Integration Counter – incrementing

### 13. CLOSING MBSU 2 RBI 11

S0: EPS: MBSU 2: **MBSU 2**

sel RBI 11

**MBSU 2 RBI 11**

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

**MBSU 2**

sel DDCU LA2B

**DDCU LA2B**

Verify Integration Counter – incrementing

### 14. CLOSING MBSU 2 RBI 12

**MBSU 2**

sel RBI 12

**MBSU 2 RBI 12**

'Cmded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

15. VERIFYING DDCU S02B INTG CNTR AND COMMON CLEAR

**MBSU 2**

sel DDCU S02B

**DDCU S02B**

Verify Integration Counter – incrementing

sel Firmware

**DDCU S02B Firmware**

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

16. ACTIVATING DDCU S02B CONVERTER

**DDCU S02B**

'Input'

Verify Current: -4 to 4A

Verify Voltage > 145V

sel Converter

**DDCU S02B Converter**

**cmd** Converter On – Arm

**cmd** Converter On

**DDCU S02B**

'Output'

Verify Voltage: 120.8 to 128.8V

17. ACTIVATING MDM S0 2

17.1 Enabling RT for RPCM S02B C

CDH Primary C&C: CB EXT 2: RT Status

**CB EXT 2 RT Status**



## EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

(ASSY OPS/12A.1/FIN) Page 7 of 15 pages

**cmd 25** RPCM S0-2B-C RT Status – Enable **Execute**  
(√ – Ena)

Verify RPCM S02B\_C Integration Counter – incrementing (icon blue with green corners)

### 17.2 Closing RPCM S02B C RPC 16

S0: EPS: RPCM S02B\_C

sel RPC 16

√Close Command – Ena

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

Wait 5 minutes.

### 17.3 Activating S0 2 MDM (and Logical Threads)

#### 17.3.1 Enabling RT for MDM S0 2

CDH: Primary EXT:

sel LB SYS P 2

sel RT Status

**cmd 27** S0 2 MDM RT Status – Enable **Execute**

√27 S0 2 MDM RT Status – Ena

CDH: S0-2:

Verify Frame Count – incrementing

Verify Processing State – Wait

√Sync Status – In Sync

# EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

(ASSY OPS/12A.1/FIN)

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```
*****
* If Sync Status – Loss of Sync
* sel Sync Status
*
* 
*
* cmd Sync to BIA Execute
*
* 
*
* Wait at least 30 seconds.
*
* Verify Sync Status – In Sync
*****
```

## 17.3.2 Enabling RT FDIR for MDM S0 2

CDH: Primary EXT:

sel LB SYS P 2

sel RT Status

**cmd 27 S0 2 MDM RT FDIR Status – Enable FDIR Execute**

√27 S0 2 MDM RT FDIR Status – Ena

## 17.3.3 Transitioning MDM S0-2 to Operational State

CDH: S0-2:

sel Processing State

'Current State'

**cmd Transition to Normal State Execute**

Wait 60 seconds.

√Current State – NORMAL

## EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

(ASSY OPS/12A.1/FIN)

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### 17.3.4 Handing Over SEPS 23 Thread from S0 1 to S0 2

#### NOTE

1. The following should be coordinated between C&DH, EPS, and TCS.
2. The S0\_SEPS\_14 application should be enabled in the S0 1 MDM before the S0\_PTCS application is enabled, since the PTCS is dependent on SEPS for closed loop mode control (default). The same applies to the S0\_SEPS\_23 and S0\_PTCS applications enabled in the S0 2 MDM.

CDH: S0-1: S0 1 MDM  
'Software Control'

sel Applications

S0 1 Applications

√UB\_SEPS\_S0\_23 – Inh (Verify – Inh)

If commanded, wait 2 minutes.

CDH: CDH Summary

Verify S0 1 MDM Seps\_Cntl\_S0\_23 – RT

CDH: S0-2: S0 2 MDM  
'Software Control'

sel Applications

S0 2 Applications

**cmd** UB\_SEPS\_S0\_23 – Ena (Verify – Ena)

If commanded, wait 2 minutes.

CDH: CDH Summary

Verify S0 2 MDM Seps\_Cntl\_S0\_23 – BC

## EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

(ASSY OPS/12A.1/FIN) Page 10 of 15 pages

S0: EPS:   
'RPCM S02B'

All Integration Counters – incrementing (icons blue with green corners)

### 17.3.5 Configuring S0 2 Application

CDH: S0-2:   
'Software Control'

sel Applications

**cmd** PTCS – Ena **Execute** (Verify – Ena)

### 18. CLOSING RPC S02B A 1

sel RPCM S02B A

sel RPC 1

√Close Command – Ena

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

### 19. VERIFYING RPCM P12B A THRU D INTG CNTR

P1: EPS

'RPCM P12B'

Integration Counters A-D – incrementing (icons blue with green corners)

### 20. ACTIVATING MDM P1 2

<b>NOTE</b> MDM RPC is preset to power on once power is applied to bus.
--

# EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

(ASSY OPS/12A.1/FIN) Page 11 of 15 pages

## 20.1 Ena RT for MDM P1 2

CDH: Primary EXT:

sel LB SYS P 2

sel RT Status

**cmd 23 P1-2 MDM RT Status – Enable Execute** (√ – Ena)

CDH: P1-2:

Verify Frame Count – incrementing  
Verify Processing State – Wait

√Sync Status – In Sync

```
*****
* If Sync Status – Loss of Sync
* | sel Sync Status
* |
* | 
* |
* | cmd Sync to BIA Execute
* |
* | 
* |
* | Wait at least 30 seconds.
* |
* | Verify Sync Status – In Sync
*****
```

## 20.2 Ena RT FDIR for MDM P1 2

CDH: Primary EXT:

sel LB SYS P 2

sel RT Status

**cmd 23 P1-2 MDM RT FDIR Status – Enable FDIR Execute** (√ – Ena)

## EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

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

### 20.3 Transitioning MDM P1 2 to Operational

CDH: P1-2: P1 2 MDM

sel Processing State

P1 2 Processing State Transitions

**cmd** Transition to Normal State **Execute**

Wait 60 seconds.

√Current State – NORMAL

### 20.4 Handing Over SEPS P1 23 Thread from P1 1 to P1 2

CDH: P1-1: P1 1 MDM

'Software Control'

sel Applications

P1 1 Applications

**cmd** UB\_SEPS\_P1\_23 – Inh **Execute**

Wait 2 minutes.

CDH: P1-1: P1 1 MDM

Verify SPD1 Bus 2 Mode – RT

CDH: P1-2: P1 2 MDM

'Software Control'

sel Applications

P1 2 Applications

**cmd** UB\_SEPS\_P1\_23 – Ena **Execute**

Wait 2 minutes.

CDH: P1-2: P1 2 MDM

Verify SPD0 Bus 2 Mode – BC

P1: EPS: P1: EPS

# EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

(ASSY OPS/12A.1/FIN) Page 13 of 15 pages

Select each of the following RPCMs:

- P1 2B-A
- P1 2B-B
- P1 2B-C
- P1 2B-D

Verify Integration Counter – incrementing

### NOTE

PTCS in the P1 1 MDM is cycled below to inhibit multielement heaters, controlled by that MDM, which has low setpoints. This is done in preparation for the P1 2 to assume control of the heaters in the affected patches with higher setpoints.

CDH: P1-1: Applications:

**cmd** PTCS – Inh (√ – Inh)

√RPCs in Table 1 – Open

P1: EPS:

Table 1. P1 1 MDM Controlled Heaters

RPCM	RPC	Op Name on RPCM Summary Display
P11A-A	13	Capture Latch P1-P3 IMCA-1 Htr 2
	10	Loop B NTA Tank Htr 1
	6	Utility Rail P11A Ops Htr
P14B-G	4	Utility Rail P12B Surv Htr

CDH: P1-1: Applications:

**cmd** PTCS – Ena (√ – Ena)

CDH: P1-2:

'Software Control'

sel Applications

**cmd** PTCS – Ena **Execute** (√ – Ena)

## 21. GIVING GO FOR EATCS ACTIVATION

Give THOR go to perform ETCS Loop B Activation.

## 22. CLOSING RPC S02B A 2

sel RPCM S02B A

## EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

(ASSY OPS/12A.1/FIN) Page 14 of 15 pages

**RPCM S02B A**

sel RPC 2

**RPCM S02B A RPC 02**

√Close Command – Ena

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

S1: EPS

'RPCM S12B'

Integration Counters A-B – incrementing (icons blue with green corners)

### 23. ACTIVATING CRITICAL HEATERS

Perform {CHANNEL 2/3 CRITICAL HEATER ACTIVATION}, steps TBD  
(SODF: ASSY OPS: POWER RECONFIGURATION: TCS), then:

### 24. CLOSING RPC TO PTR MDM

P1: EPS: RPCM P12B C: **RPCM P12B C**

sel Firmware

**RPCM P12B C Firmware**

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

**RPCM P12B C**

sel RPC 3

**RPCM P12B C RPC 03**

√Close Command – Ena

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

### 25. SETTING EDF FOR 2B RBI 6 CLOSED

**cmd** <Cmd Inv: P6\_EDF\_DCSU\_SCA\_Bus\_Fltrd\_V\_Sel\_Tmplt -  
(P6PX96IM0123K)>

pick DCSU\_SCA\_x ► 33797 ► DCSU SCA P6UPR 2B

pick PV\_Cmd\_Hdr ► 2 ► Fire

pick PV\_EDF\_DCSU\_SCA\_Bus\_Fltr\_Sel ► 0 ► Mid Value Sel



## EPS/CDH CHANNEL 2/3 INITIAL POWERUP FOR ETCS ACTIVATION

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### 26. SETTING EDF FOR 2A RBI 6 CLOSED

**cmd** <Cmd Inv: P4\_EDF\_DCSU\_SCA\_Bus\_Fltrd\_V\_Sel\_Tmpl -  
(P4PX95SM0123K)>

pick DCSU\_SCA\_x ► 17157 ► DCSU SCA P4LWR 2A

pick PV\_Cmd\_Hdr ► 2 ► Fire

pick PV\_EDF\_DCSU\_SCA\_Bus\_Fltr\_Sel ► 0 ► Mid Value Sel

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# EPS CHANNEL 2/3 COMPLETE POWER DISTRIBUTION ACTIVATION

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## OBJECTIVE:

This procedure completes the activation of the Channel 1/4 Power Distribution once active cooling has been established via EATCS. Once complete, all Channel 2/3 loads will have power available.

### 1. VERIFYING DDCU LA2B INTG CNTR AND COMMON CLEAR

sel DDCU LA2B

Verify Integration Counter – incrementing

sel Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

### 2. ACTIVATING DDCU LA2B CONVERTER

'Input'

Verify Current: -4 to 4 A

Verify Voltage > 145 V

sel Converter

**cmd** Converter On – Arm

**cmd** Converter On

'Output'

Verify Voltage: 120.8 to 128.8 V

### 3. VERIFYING RPCM INTG CNTR (LA2B A–H)

'RPCM LA2B'

Verify RPCM LA2B Integration Counters – incrementing (icons blue with green corners)

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### 4. CLOSING SOURCE RPCs FOR LAD62B A, LAD52B A, LAD42B A, LAD22B A, LAS62B A

sel DDCU LA2B Dist

'RPCM LA2B'

sel C

sel RPC 1

'Rack Power Switch'

Verify Position – CI

Verify Monitoring – Ena

'RPC Position'

√Close Cmd – Ena

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

sel RPC 2

'Rack Power Switch'

Verify Position – CI

Verify Monitoring – Ena

'RPC Position'

√Close Cmd – Ena

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

sel RPC 3

'Rack Power Switch'

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Verify Position – CI  
Verify Monitoring – Ena

'RPC Position'

√Close Cmd – Ena

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

**RPCM LA2B C**

sel RPC 4

**RPCM LA2B C RPC 04**

'Rack Power Switch'

Verify Position – CI  
Verify Monitoring – Ena

'RPC Position'

√Close Cmd – Ena

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

**DDCU LA2B Dist**

'RPCM LA2B'

sel F

**RPCM LA2B F**

sel RPC 1

**RPCM LA2B F RPC 01**

'Rack Power Switch'

Verify Position – CI  
Verify Monitoring – Ena

'RPC Position'

√Close Cmd – Ena

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

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### 5. VERIFYING RPCM INTG CNTRS (LAD62B A, LAD52B A, LAD42B A, LAD22B A, LAS62B A)

**DDCU LA2B Dist**

Verify RPCM LAD62B A Integration Counter – incrementing (icon blue with green corners)

Verify RPCM LAD52B A Integration Counter – incrementing (icon blue with green corners)

Verify RPCM LAD42B A Integration Counter – incrementing (icon blue with green corners)

Verify RPCM LAD22B A Integration Counter – incrementing (icon blue with green corners)

Verify RPCM LAS62B A Integration Counter – incrementing (icon blue with green corners)

### 6. CLOSING MBSU 3 RBI 11

S0: EPS: MBSU 3

**MBSU 3**

sel RBI 11

**MBSU 3 RBI 11**

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

#### NOTE

Parallel DDCUs LA3B and LA2A will activate with the default sharing ratio of 50/50.

### 7. CLOSING MBSU 2 RBI 4

S0: EPS: MBSU 2

**MBSU 2**

sel RBI 4

**MBSU 2 RBI 4**

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

## EPS CHANNEL 2/3 COMPLETE POWER DISTRIBUTION ACTIVATION

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### 8. VERIFYING DDCU LA3B INTG CNTR AND COMMON CLEAR

S0: EPS: MBSU 3

sel DDCU LA3B

Verify Integration Counter – incrementing

sel Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

### 9. ACTIVATING DDCU LA3B CONVERTER

'Input'

Verify Current: -4 to 4 A

Verify Voltage > 145 V

sel Converter

**cmd** Converter On – Arm

**cmd** Converter On

'Output'

Verify Voltage: 120.8 to 128.8 V

### 10. VERIFYING RPCM INTG CNTRS (LA2A3B A-G)

'RPCM LA2A3B'

Verify RPCM Integration Counters – incrementing (icons blue with green corners)

## EPS CHANNEL 2/3 COMPLETE POWER DISTRIBUTION ACTIVATION

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### 11. VERIFYING DDCU LA2A INTG CNTR AND COMMON CLEAR

S0: EPS: MBSU 2

sel DDCU LA2A

Verify Integration Counter – incrementing

sel Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

### 12. ACTIVATING DDCU LA2A CONVERTER

'Input'

Verify Current: -4 to 4 A

Verify Voltage > 145 V

sel Converter

**cmd** Converter On – Arm

**cmd** Converter On

Verify Voltage: 120.8 to 128.8 V

Share Ratio – 50 %

### 13. CLOSING SOURCE RPCS FOR AL2A3B A–B, LAS52A3B A

S0: EPS: MBSU 3

sel DDCU LA3B

sel DDCUs LA3B (and LA2A) Distribution

'RPCM LA2A3B'



## EPS CHANNEL 2/3 COMPLETE POWER DISTRIBUTION ACTIVATION

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sel D

sel RPC 3

√Close Command – Ena

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

'RPCM LA2A3B'

sel RPC F

sel RPC 4

'Rack Power Switch'

Verify Position – CI

Verify Monitoring – Ena

'RPC Position'

√Close Command – Ena

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

### 14. [RPCM INTG CNTRS \(AL2A3B A–B, LAS52A3B A\)](#)

'RPCM AL2A3B'

RPCM Integration Counters – incrementing (icons blue with green corners)

'RPCM LAS52A3B'

RPCM Integration Counter – incrementing (icon blue with green corners)

### 15. [VERIFYING DDCU P13A INTG CNTR AND COMMON CLEAR](#)

S0: EPS: MBSU 3

sel DDCU P13A

## EPS CHANNEL 2/3 COMPLETE POWER DISTRIBUTION ACTIVATION

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DDCU P13A

Verify Integration Counter – incrementing

sel Firmware

DDCU P13A Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

### 16. DDCU P13A CONVERTER ON

DDCU P13A

'Input'

Verify Current: -4 to 4 A

Verify Voltage > 145 V

sel Converter

DDCU P13A Converter

**cmd** Converter On – Arm

**cmd** Converter On

DDCU P13A

'Output'

Verify Voltage: 120.8 to 128.8 V

### 17. RPCM INTG CNTRS (P13A E–G, S03A A–F, S13A E–G, P33A C–F)

DDCU P13A

Verify all RPCM Integration Counters except S33A – incrementing (icons blue with green corners)

### 18. CLOSING SOURCE RPC FOR MT3A A

DDCU P13A

sel DDCU P13A Distribution

DDCU P13A Dist

'RPCM S03A'

sel E

RPCM S03A E

## EPS CHANNEL 2/3 COMPLETE POWER DISTRIBUTION ACTIVATION

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sel RPC 18

√Close Command – Ena

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

### 19. VERIFYING RPCM INTG CNTR (MT3A A)

'RPCM MT3A A'

Verify Integration Counter – incrementing (icon blue with green corners)

### 20. CLOSING RPC S02B B RPC 1

S0: EPS: RPCM S02B B

sel RPC 1

√Close Command – Ena

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

### 21. VERIFYING INTEGRATION COUNTERS

S0: EPS: DDCU S02B: DDCU S02B Distribution

'RPCM S12B'

√RPCM A,B Integration Counters – incrementing (icons blue with green corners)

'RPCM P32B'

√RPCM A Integration Counter – incrementing (icon blue with green corners)

### 22. CLOSING MBSU 3 RBI 10

S0: EPS: MBSU 3

sel RBI 10

'Cmded Position'

**cmd** Close – Arm

## EPS CHANNEL 2/3 COMPLETE POWER DISTRIBUTION ACTIVATION

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**cmd** Close (√ – CI)

Verify Voltage > 145 V

### 23. VERIFYING DDCU Z13B INTG CNTR AND COMMON CLEAR

**MBSU 3**

sel DDCU Z13B

**DDCU Z13B**

Verify Integration Counter – incrementing

sel Firmware

**DDCU Z13B Firmware**

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

### 24. ACTIVATING DDCU Z13B CONVERTER

**DDCU Z13B**

'Input'

Verify Current: -4 to 4 A

Verify Voltage > 145 V

sel Converter

**DDCU Z13B Converter**

**cmd** Converter On – Arm

**cmd** Converter On

**DDCU Z13B**

'Output'

Verify Voltage: 120.8 to 128.8 V

### 25. VERIFYING RPCM INTG CNTRS (N13B A–C, N1RS2 A–C)

NODE 1: EPS

**NODE 1:EPS**

'RPCM N1RS2'

Verify all Integration Counters – incrementing (icons blue with green corners)

'RPCM N13B'

## EPS CHANNEL 2/3 COMPLETE POWER DISTRIBUTION ACTIVATION

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Verify all Integration Counters – incrementing (icons blue with green corners)

### NOTE

MBSU 3 RBI 01 is closed to provide redundant power input to MBSU 3 Power Supply in the event of MBSU 2 RBI 6 Failure.

#### 26. CLOSING MBSU 3 RBI 1

S0: EPS: MBSU 3

sel RBI 1

'Cmded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

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# Z1 CPP X2 (SPDA Z13B) RECONFIGURATION

(ASSY OPS/12A.1/FIN)

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## OBJECTIVE:

This procedure will safe connectors for Z1 CPP Reconfiguration and reactivate critical heaters once the reconfiguration is complete.

### 1. VERIFYING RUSSIAN POWER FEEDS OFF

Confirm **MCC-M** has powered off SM CHTs 23 and 24 and FGB ARCUs 51 and 52.

#### NOTE

Solar Array 2B must be positioned more than 90 degrees away from velocity vector to provide plasma mitigation while PCU 1 is off.

### 2. POSITIONING BGA 2B FOR PCU POWERDOWN

Perform {2.102 PVM CONFIGURE BGA XX TO DIRECTED POSITION MODE}, all (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM), then:

### 3. VERIFYING DDCU S03B CONVERTER OFF

DDCU S03B

'Output'

Verify Voltage < 3V

### 4. COMMANDING PCU 1 TO STANDBY MODE

Z1:EPS:

Z1:EPS

sel Plasma Contactor 1

PCU 1

'PEU'

sel Normal Operation

PCU 1 Normal Operation

**cmd** Contactor Off – Arm

**cmd** Contactor Off – Off

Verify Mode/State – Standby

#### NOTE

PCU FDIR will shunt all active arrays when PCU 1 commanded to Standby. 2B positioning in Step 2 provides required plasma protection and allows for immediate unshunting of all arrays.

## Z1 CPP X2 (SPDA Z13B) RECONFIGURATION

(ASSY OPS/12A.1/FIN)

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**cmd**<Cmd Inv: SSU\_2B\_PVCE\_1\_2\_3\_On – (P6PS96IM0035K)>  
**cmd**<Cmd Inv: P4\_Ssu\_2A\_PVCE\_1\_2\_3\_On – (P4PS95SM0034K)>  
**cmd**<Cmd Inv: P4\_Ssu\_4A\_PVCE\_1\_2\_3\_On – (P4PS95SM0035K)>

### 5. OPENING POWER SOURCE TO RPDA Z13B

P6:EPS:Dcsu 2B:RPCM 2B\_B

**RPCM\_2B\_B**

sel RPC 1

**RPCM 2B B RPC 01**

'RPC Position'

**cmd** Open (√ – Op)

**cmd** Close Command – Inhibit (√ – Inh)

### 6. GIVING GO FOR EVA RECONFIGURATION

**MCC-H** ↑ EVA “Go for Z1 CPP reconfiguration”

### 7. VERIFYING EVA RECONFIGURATION COMPLETE

EVA ↓ **MCC-H** “Z1 CPP Reconfig complete”

### 8. VERIFYING MBSU 3 RBI 13 CLOSED

S0:EPS:MBSU 3

**MBSU 3**

sel RBI 13

**MBSU 3 RBI 13**

'Cmded Position'

Verify – CI

Verify Voltage > 145 V

### 9. DDCU S03B INTG CNTR AND COMMON CLEAR

**MBSU 3**

sel DDCU S03B

**DDCU S03B**

Verify Integration Counter – incrementing

sel Firmware

**DDCU S03B Firmware**

'Clear Commands'

**cmd** Common Clear



Verify Power on Reset – blank

10. DDCU S03B CONVERTER ON

DDCU S03B  
'Input'

Verify Current: -4 to 4 A  
Verify Voltage > 145 V

sel Converter

DDCU S03B Firmware

**cmd** Converter On – Arm  
**cmd** Converter On

DDCU S03B  
'Output'

Verify Voltage – 120 to 128 V

11. VERIFYING RPCM INTG CNTRS (Z13B A–B)

Z1:EPS  
Z1:EPS  
'RPCM Z13B'

Integration Counters – incrementing (icons blue with green corners)

12. CLOSING RPCS TO LOADS

NOTE

Table 1 RPC Configuration specifies RPCs to be closed once the EPS distribution is fully reactivated. Loads being reactivated include keep-alive heaters for EPS and comm equipment.

Refer to Table 1 for RPC Configuration.

Record RPCs that require Closing from Table 1

RPCM [X] = \_\_\_\_\_

Close – RPC [Y] = \_\_\_\_\_

PCS

[Element]: EPS  
[Element]: EPS

sel RPCM [X]

RPCM [X]

# Z1 CPP X2 (SPDA Z13B) RECONFIGURATION

(ASSY OPS/12A.1/FIN)

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sel RPC [Y] where [Y] = RPC from Table 1  
**cmd** Close (Verify – Cl)  
 Repeat

Table 1. RPC Configuration

[Element]	DDCU Dist	[X] = RPCM	[Y] = RPC Close	Load
Reactivate Ku-Band Loads				
Z1	S03B	Z13B_B	05	Ku Antenna
Z1	S03B	Z13B_B	14	Ku SGTRC
Z1	S03B	Z13B_B	01	EAS/SASA Surv Htr
Z1	S03B	Z13B_B	07	EETCS Lp A/B FlxHs Htr
Reactivate FGB Power Feeds and Redundant PCU				
Z1	S03B	Z13B_A	03	FGB Pwr PMA1 D
Z1	S03B	Z13B_A	01	FGB Pwr PMA1 B
Z1	S03B	Z13B_B	15	PCU 1 (Z13B)
EPS Hardware Keep Alive Heaters				
Z1	S03B	Z13B_B	06	DDCU Z14B Htr 1
Z1	S03B	Z13B_B	11	DDCU Z13B Htr 1
Z1	S03B	Z13B_B	16	PCU 2 Htr

## 13. REACTIVATING PCU 2

### NOTE

PCU 2 was reactivated in Step 12 and should be in Manual Mode.

Perform {1.117 Z1 PCU 1(2) QUICK ACTIVATION FROM MANUAL MODE} (SODF: EPS: ACTIVATION AND CHECKOUT: PRIMARY POWER SYSTEM).

## 14. REACTIVATING RUSSIAN POWER FEEDS

Give **MCC-M** "Go" to reactivate SM CHTs and FGB ARCUs per plan.

## 15. CONFIGURING BGA 2B FOR NOMINAL OPERATIONS

Once EVA has ingress or PCU 2 returned to discharge, 2B Solar Array can be returned to nominal operations per array plan.

## EPS LOAD RECONFIGURATION POST EVA 2

(ASSY OPS/12A.1/FIN) Page 1 of 3 pages

### OBJECTIVE:

The purpose of this procedure is to reactivate EPS loads and establish nominal configuration once the critical reactivation steps are complete.

#### NOTE

These steps must be done after LA 2 and LA 3 MDM activation.

**MCC-H**

### 1. SETTING RACK RPS AVAILABILITY FOR LA 2 AND LA 3 MDMS

US Lab: EPS: Rack Power: Rack Power 3

Rack Power 3

'Switch Avail'

If Rack LAB1[XX] Switch Avail – No where [XX] = O1(O2, O3, O4, S6)

'Change Rack Power Switch Availability'

input Rack: L A B 1 [X X]

input Available: Y e s

**cmd Set**

'Switch Avail'

√Rack LAB1[XX] – Yes

If Rack LAB1[XX] Switch Avail – Yes where [XX] = O5(O6)

'Change Rack Power Switch Availability'

input Rack: L A B 1 [X X]

input Available: N o

**cmd Set**

'Switch Avail'

√Rack LAB1[XX] – No

Lab Rack Power

sel Rack Power 2

Rack Power 2

'Switch Avail'

If Rack LAB1[XX] Switch Avail – No

where [XX] = D2(D4, D5, D6, P2, P4, S4, S5)

'Change Rack Power Switch Availability'

input Rack: L A B 1 [X X]

input Available: Y e s

**cmd Set**

'Switch Avail'

√Rack LAB1[XX] – Yes

## EPS LOAD RECONFIGURATION POST EVA 2

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### 2. ENABLING RACK RPS MONITORING FOR LA 2 AND LA 3 MDMS

US Lab: EPS: Rack Power: Rack Power 3

Rack Power 3

'Monitoring Status'

If Rack LAB1[XX] Monitoring Status – Inh

where [XX] = O1(O2, O3, O4, S6)

'Rack Power Monitoring **MCC-H** Commands Only'

**cmd** LAB1[XX] Enable

'Monitoring Status'

√Rack LAB1[XX] – Ena

Lab Rack Power

sel Rack Power 2

Rack Power 2

'Monitoring Status'

If Rack LAB1[XX] Monitoring Status – Inh

where [XX] = D2(D4, D5, D6, P2, P4, S4, S5)

'Rack Power Monitoring **MCC-H** Commands Only'

**cmd** LAB1[XX] Enable

'Monitoring Status'

√Rack LAB1[XX] – Ena

### 3. CLOSING RPCS TO LOADS

#### NOTE

Table 1 RPC Configuration specifies RPCs to be closed once the EPS distribution is fully reactivated. Loads being reactivated include keep-alive heaters, interior lights, emergency lights, and UOPs. Additional systems RPC closes are including for efficiency in commanding.

Refer to Table 1 for RPC Configuration.

Record RPCs that require closing from Table 1.

RPCM [X] = \_\_\_\_\_

Close - RPC [Y] = \_\_\_\_\_

PCS

[Element]: EPS

[Element]: EPS

sel RPCM [X]

RPCM [X]

## EPS LOAD RECONFIGURATION POST EVA 2

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sel RPC [Y] where [Y] = RPC from Table 1  
**cmd** Close (Verify – CI)  
 Repeat

Table 1. RPC Configuration

[Element]	DDCU Dist	[X] = RPCM	[Y] = RPC Close	Load
GLAs and Emergency Lights				
Node 1	Z13B	N13B_A	01	Emer Lt
Node 1	Z13B	N13B_A	05	Lt
Node 1	Z13B	N13B_A	13	Lt
Node 1	Z13B	N13B_B	01	Lt
Node 1	Z13B	N13B_B	02	Emer Lt
Node 1	Z13B	N13B_C	01	Lt
Node 1	Z13B	N13B_C	02	Emer Lt
LAB	LA2B	LA2B_A	01	Lt
LAB	LA2B	LA2B_A	02	Lt
LAB	LA2B	LA2B_A	03	Lt
LAB	LA2B	LA2B_B	05	Lt
LAB	LA2B	LA2B_B	06	Lt
LAB	LA2B	LA2B_B	07	Lt
LAB	LA2B	LA2B_B	11	Emer Lt
LAB	LA2B	LA2B_G	11	Emer Lt
UOPs				
Node 1	Z13B	N13B_A	17	UOP
Node 1	Z13B	N1RS2_C	17	UOP
Node 1	Z13B	N1RS2_C	18	UOP
LAB	LA2B	LA2B_H	18	UOP
LAB	LA2A3B	LA2A3B_C	03	UOP
LAB	LA2A3B	LA2A3B_C	04	UOP
LAB	LA2A3B	LAS52A3B_A	18	Cupola RWS UOP
Other Discipline Loads				
S0	P13A	S03A_E	02	TUS 2 VSC Pwr 1
S0	P13A	S03A_F	02	TUS 1 VSC Pwr 2
LAB	LA2B	LAD42B A	17	Defibrillator

#### 4. ACTIVATING SARJ REDUNDANT STRING

P3: EPS: RPCM P32B A

RPCM P32B A

sel RPC 4

RPCM P32B A RPC 04

**cmd** Close (√ – CI)

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## EPS SYSTEM CONFIGURATION FOR EVA 3 POWERDOWN

(ASSY OPS/12A.1/FIN) Page 1 of 2 pages

### OBJECTIVE:

The purpose of this procedure is to configure EPS hardware for the powerdown of the 1/4 domain.

#### 1. CONFIGURING CETA LIGHTS FOR 1/4 POWERDOWN

S0: EPS: RPCM S02B C

sel RPC 15

√Close Cmd – Ena

**cmd** Close (√ – CI)

Node 1: EPS: RPCM N1RS1 C

sel RPC 4

√RPC Position – CI

S1: EPS: RPCM S12B A

sel RPC 3

√Close Cmd – Ena

**cmd** Close (√ – CI)

#### 2. INHIBITING RACK RPC MONITORING FOR LA-1 CONTROLLED RPSS

US Lab: EPS: Rack Power: Rack Power 1

'Monitoring Status'

## EPS SYSTEM CONFIGURATION FOR EVA 3 POWERDOWN

(ASSY OPS/12A.1/FIN) Page 2 of 2 pages

If Rack LAB1[XX] Monitoring Status – Ena  
where [XX] = D1, D3, P1, P3, P5, P6, S1, S2, S3  
'Rack Power Monitoring MCC-H Commands Only'  
  
**cmd** LAB1[XX] Inhibit  
  
'Monitoring Status'  
  
√Rack LAB1[XX] – Inh

### 3. DEACTIVATING RUSSIAN SEGMENT POWER

Confirm **MCC-M** prepared for powerdown of all SM CHTs and FGB ARCU.



## EPS CHANNEL 1/4 POWERDOWN FOR EVA 3

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### OBJECTIVE:

This procedure completes the Channel 1/4 Powerdown and sets the required safety inhibits for the electrical connector reconfiguration during 12A.1 EVA 3.

#### NOTE

Do not begin final powerdown until A/L Depress has been completed and Depress Pump powered down.

### **MCC-H** 1. DEACTIVATING DDCU LA4A AND LA1A US Lab: EPS

sel LAB1P3

Lab Rack LAB1P3

sel DDCU LA4A

DDCU LA4A

sel Converter

DDCU LA4A Converter

'Converter Off'

**cmd** Off

DDCU LA4A

Verify Out Current: -4 to 4 A

Verify Out Voltage < 3 V

Lab Rack LAB1P3

sel DDCU LA4A

DDCU LA1A

sel Converter

DDCU LA1A Converter

'Converter Off'

**cmd** Off

DDCU LA1A

Verify Out Current: -4 to 4 A

Verify Out Voltage < 3 V

## EPS CHANNEL 1/4 POWERDOWN FOR EVA 3

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### 2. DEACTIVATING DDCU Z14B

Z1: EPS

sel DDCU Z14B

sel Converter

'Converter Off'

**cmd** Off

Verify Out Current: -4 to 4 A

Verify Out Voltage < 3 V

### 3. DEACTIVATING DDCU LA1B

US Lab: EPS

sel DDCU LA1B Distribution

sel DDCU LA1B

sel Converter

'Converter Off'

**cmd** Off

Verify Out Current: -4 to 4 A

Verify Out Voltage < 3 V

### 4. SETTING EDF FOR 4B RBI 6 OPEN

**cmd** <Cmd Inv: P4\_EDF\_DCSU\_SCA\_Bus\_Fltd\_V\_Sel\_Tmpl -  
(P6PX96IM0123K)>

## EPS CHANNEL 1/4 POWERDOWN FOR EVA 3

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pick DCSU\_SCA\_x ► 17413 ► DCSU SCA P6LWR 4B  
pick PV\_Cmd\_Hdr ► 2 ► Fire  
pick PV\_EDF\_DCSU\_SCA\_Bus\_Fltr\_Sel ► 1 ► PV DCSU SCA Bus  
Conv Voltage

### 5. SETTING EDF FOR 4A RBI 6 OPEN

**cmd** <Cmd Inv: P4\_EDF\_DCSU\_SCA\_Bus\_Fltrd\_V\_Sel\_Tmplt -  
(P4PX95SM0123K)>

pick DCSU\_SCA\_x ► 33541 ► DCSU SCA P4UPR 4A  
pick PV\_Cmd\_Hdr ► 2 ► Fire  
pick PV\_EDF\_DCSU\_SCA\_Bus\_Fltr\_Sel ► 1 ► PV DCSU SCA Bus  
Conv Voltage

### 6. OPENING DCSU 4B RBI 6

P6: EPS

sel DCSU 4B

sel RBI 6

'Cmdded Position'

**cmd** Open (√ – Op)

Verify Voltage < 4 V

Verify Current < 7 A

### 7. OPENING DCSU 4A RBI 6

**NOTE**  
Expect LOC C&W for Lab and Z1 DDCUs.

P4: EPS

sel DCSU 4A

sel RBI 6

'Cmdded Position'

**cmd** Open (√ – Op)

Verify Voltage < 4 V

Verify Current < 7 A

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# EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION

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## OBJECTIVE:

This procedure performs the critical EPS and CDH activation steps required to establish a configuration in which the EATCS system can be activated to provide cooling.

### NOTE

1. The post-reconfiguration reactivation sequence is organized to accomplish two goals. The first is to activate and verify the health of the external ORUs that would require R&R in the event of failure. A connectivity and aliveness check are performed on the truss MBSUs and DDCUs. A connectivity check is also performed on the Lab core DDCU to ensure critical redundancy can be restored. Once these checkouts are complete, critical activation proceeds to activate cooling for truss hardware.
2. Confirm uplink of PMCU Existence Table 4 Version 114 to Primary PMCU (PCMU 2) prior to beginning procedure.

## 1. CLOSING DCSU 4A RBI 6

PCS P4: EPS: DCSU 4A: DCSU 4A  
sel RBI 6

DCSU 4A RBI 6  
'Cmded Position'

**cmd** Close – Arm  
**cmd** Close ( $\sqrt{\text{CI}}$ )

Verify Voltage > 147 V

## 2. VERIFYING MBSU 4 INTG CNTR AND COMMON CLEAR

S0: EPS: MBSU 4: MBSU 4

Verify Integration Counter – incrementing

sel Firmware

MBSU 4 Firmware  
'Clear Commands'

**cmd** Common Clear

Verify Power On Reset – blank

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## 3. CLOSING MBSU 4 RBI 1

MBSU 4

sel RBI 1

MBSU 4 RBI 1

Verify Voltage > 145 V

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

MBSU 4

'Bus A'

Verify Bus A Voltage > 145 V

## 4. CLOSING MBSU 4 RBI 9

S0: EPS: MBSU 4: MBSU 4

sel RBI 9

MBSU 4 RBI 9

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Bus 4A Voltage = Bus 4B Voltage

## 5. CLOSING MBSU 4 RBI 6

MBSU 4

sel RBI 6

MBSU 4 RBI 6

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

## EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION

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### 6. CLOSING MBSU 4 RBI 7

MBSU 4

sel RBI 7

MBSU 4 RBI 7

'Cmded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

### 7. VERIFYING MBSU 1 INTG CNTR AND COMMON CLEAR

S0: EPS: MBSU 1: MBSU 1

Verify Integration Counter – incrementing

sel Firmware

MBSU 1 Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power On Reset – blank

### 8. CLOSING MBSU 1 RBI 7

MBSU 1

sel RBI 7

MBSU 1 RBI 7

Verify Voltage > 145 V

'Cmded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Bus A Voltage > 145 V

### 9. CLOSING MBSU 1 RBI 9

S0: EPS: MBSU 1: MBSU 1

# EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION

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sel RBI 9

MBSU 1 RBI 9  
'Cmdded Position'

**cmd** Close – Arm  
**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Bus 1A Voltage = Bus 1B Voltage

## 10. CLOSING MBSU 4 RBI 12

S0: EPS: MBSU 4:  MBSU 4

sel RBI 12

MBSU 4 RBI 12  
'Cmdded Position'

**cmd** Close – Arm  
**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

MBSU 4

sel DDCU S04B

DDCU S04B

Verify Integration Counter – incrementing

## 11. CLOSING MBSU 4 RBI 11

S0: EPS: MBSU 4:  MBSU 4

sel RBI 11

MBSU 4 RBI 11  
'Cmdded Position'

**cmd** Close – Arm  
**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

MBSU 4



# EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION

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sel DDCU S14B

Verify Integration Counter – incrementing

## 12. CLOSING MBSU 1 RBI 12

S0: EPS: MBSU 1:

sel RBI 12

'Cmded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

sel DDCU LA1B

Verify Integration Counter – incrementing

## 13. CLOSING MBSU 1 RBI 4

sel RBI 4

'Cmded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145V

## 14. VERIFYING DDCU S01A INTG CNTR AND COMMON CLEAR

sel DDCU S01A

# EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION

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Verify Integration Counter – incrementing

sel Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

## 15. ACTIVATING DDCU S01A CONVERTER

'Input'

Verify Current: -4 to 4A

Verify Voltage > 145 V

sel Converter

**cmd** Converter On – Arm

**cmd** Converter On

'Output'

Verify Voltage: 120.8 to 128.8 V

## 16. ACTIVATING MDM S0 1

### 16.1 RT Ena for S01A C

CDH: Primary C&C: CB EXT 1: RT Status

**cmd** 25 RPCM S0-1A-C RT Status – Enable **Execute**  
(√ – Ena)

Verify RPCM S01A\_C Integration Counter – incrementing  
(icon blue with green corners)

### 16.2 Closing RPCM S01A C RPC 16

S0: EPS: RPCM S01A\_C: RPC 16

√Close Command – Ena

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

Wait 5 minutes.

# EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION

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## 16.3 Activating S0 1 MDM (and Logical Threads)

### 16.3.1 RT Ena for MDM S0 1

CDH: Primary EXT:

sel LB SYS S 1  
sel RT Status

**cmd 27 S0 1 MDM RT Status – Enable Execute**

CDH: S0-1:

Verify Frame Count – incrementing  
Verify Processing State – Wait

√Sync Status – In Sync

```
*****
* If Sync Status – Loss of Sync
* | sel Sync Status
* |
* | 
* |
* | cmd Sync to BIA Execute
* |
* | 
* |
* | Wait at least 30 seconds.
* |
* | Verify Sync Status – In Sync
*****
```

### 16.3.2 RT FDIR Ena for MDM S0 1

CDH: Primary EXT:

sel LB SYS S 1  
sel RT Status

**cmd 27 S0 1 MDM RT FDIR Status – Enable FDIR Execute**

√27 S0 1 MDM RT FDIR Status – Ena

### 16.3.3 Transitioning MDM S0 1 to Operational State

CDH: S0-1(2):

sel Processing State

**S0 1(2) Processing State Transitions**

'Current State'

**cmd** Transition to Normal State **Execute**

Wait 60 seconds.

√Current State – NORMAL

16.3.4 Handing Over S0 threads from S0 2 to S0 1

**NOTE**

1. The following should be coordinated between C&DH, EPS, and TCS.
2. The S0\_SEPS\_14 application should be enabled in the S0 1 MDM before the S0\_PTCS application is enabled, since the PTCS is dependent on SEPS for closed loop mode control (default). The same applies to the S0\_SEPS\_23 and S0\_PTCS applications enabled in the S0 2 MDM.

CDH: S0-2: **S0 2 MDM**

'Software Control'

sel Applications

**S0 2 Applications**

√UB\_SEPS\_S0\_14 – Inh (Verify – Inh)

If commanded, wait 2 minutes.

CDH: **CDH Summary**

Verify S0 2 MDM Seps\_Cntl\_S0\_14 – RT

CDH: S0-1: **S0 1 MDM**

'Software Control'

sel Applications

**S0 1 Applications**

**cmd** UB\_SEPS\_S0\_14 – Ena (Verify – Ena)

# EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION

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If commanded, wait 2 minutes.

CDH:

Verify S0 1 MDM Seps\_Cntl\_S0\_14 – BC

S0: EPS:   
'RPCM S01A'

All Integration Counters – incrementing (icons blue with green corners)

## NOTE

SDO card switches cannot be closed until the corresponding SEPS application (LT) has been enabled. The SDO card is effective only if its host MDM is operational (in Normal mode).

## Configuring S0 1 Application

CDH: S0-1:   
'Software Control'

sel Applications

**cmd** PTCS – Ena **Execute** (Verify – Ena)

## 17. [CLOSING RPC S01A A 2](#)

S0: EPS: DDCU S01A:

sel RPCM S01A A

sel Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

sel RPC 2

√Close Command – Ena

cmd RPC Position – Close (Verify – Cl)

18. ACTIVATING MDM S1 1

**NOTE**  
MDM is preset to power on once power is applied to bus.

18.1 Ena RT for MDM S1 1

CDH: Primary EXT: LB SYS S1: RT Status

LB SYS S1 RT Status

cmd 25 S1 1 MDM RT Status – Enable **Execute** (√ – Ena)

18.2 Verifying S1 1 MDM Status

CDH: S1-1: S1 1 MDM

Verify Frame Count – incrementing

Verify Processing State – WAIT

√Sync Status – In Sync

```
*****
* If Sync Status – Loss of Sync
* | sel Sync Status
* |
* | S1 1 Sync Status
* |
* | cmd Sync to BIA Execute
* |
* | S1 1 MDM
* |
* | Wait at least 30 seconds.
* |
* | Verify Sync Status – In Sync
*****
```

18.3 Ena RT FDIR for MDM S1 1

CDH: Primary EXT: LB SYS S1: RT Status

LB SYS S1 RT Status

cmd 25 S1 1 MDM RT FDIR Status – Enable

FDIR **Execute** (√ – Ena)

18.4 Transitioning MDM S1 1 to Operational

CDH: S1-1: Processing State

S1 1 Processing State Transitions

'Current State'

cmd Transition to Normal State **Execute**

# EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION

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May take up to 60 seconds.

Verify Current State – Normal

## 18.5 Handing Over S1 Threads from S1 2 to S1 1

### NOTE

The S1\_SEPS\_14 application should be enabled in the S1 1 MDM before any other application is enabled. The same applies to the S1\_SEPS\_23 and S1\_PTCS applications enabled in the S1 2 MDM.

CDH: S1 2: Applications: S1 2 Applications

Verify UB\_SEPS\_S1\_14 – Inh

```
*****
* If UB_SEPS_S1_14 – Ena
*   √EATCS PTC – Inh
*   √PCVP Comm – Inh
*
*   cmd UB_SEPS_S1_14 – Inh Execute
*
*   Wait 2 minutes.
*
*   Verify UB_SEPS_S1_14 – Inh
*****
```

CDH: CDH Summary

Verify S1-2 MDM Seps Cntl S1 14 – RT

CDH: S1-1: Applications: S1 1 Applications

**cmd UB\_SEPS\_S1\_14 – Ena Execute** (Verify – Ena)

Wait 2 minutes.

CDH: CDH Summary

Verify S1 1 MDM Seps\_Cntl\_S1\_14 – BC

S1: EPS: S1: EPS  
'RPCM S11A'

All Integration Counters – incrementing (icons blue with green corners)

# EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION

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## NOTE

PTCS in the S1-2 MDM is cycled below to inhibit multielement heaters, controlled by that MDM, which have low setpoints. This is done in preparation for the S1 1 to assume control of the heaters in the affected patches with higher setpoints.

CDH: S1-2: Applications:

**cmd** PTCS – Inh (√ – Inh)

√RPCs in Table below – Open

S1: EPS:

Table 1. S1 2 MDM Controlled Heaters

RPCM	RPC	Op Name on RPCM Summary Display
S12B A	13	Capture Latch S1-S3 Htr-1
	06	Utility Rail S12B Ops Htr
S13A G	04	Utility Rail S11A Surv Htr

CDH: S1-2: Applications:

**cmd** PTCS – Ena (√ – Ena)

CDH: S1-1: Applications

**cmd** PTCS – Ena **Execute** (Verify – Ena)

## 19. GIVING GO FOR EATCS ACTIVATION

Give THOR go to perform {ETCS LOOP A(B) ACTIVATION AND CHECKOUT}, all (SODF: ASSY OPS: POWER RECONFIGURATION: TCS), then:

## NOTE

The following steps will be run only if it is determined that heater activation must take place to preserve ORUs.

## 20. CLOSING RPC S01A A 1

sel RPC 1



## EPS/CDH CHANNEL 1/4 INITIAL POWERUP FOR ETCS ACTIVATION

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√Close Command – Ena

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

P1: EPS:   
'P11A'

Verify RPCM P11A\_A and P11A\_B Integration Counters – incrementing  
(icons blue with green corners)

### 21. ACTIVATING CRITICAL HEATERS

Perform {CHANNEL 1/4 CRITICAL HEATER ACTIVATION}, all (SODF:  
ASSY OPS: POWER RECONFIGURATION:TCS), then:

### 22. CLOSING RPC TO STR MDM

S1: EPS: RPCM S11A C:

sel Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

sel RPC 3

√Close Cmd – Ena

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

### 23. SETTING EDF FOR 4A RBI 6 CLOSED

**cmd** <Cmd Inv: P4\_EDF\_DCSU\_SCA\_Bus\_Fltrd\_V\_Sel\_Tmpl -  
(P4PX95SM0123K)>

pick DCSU\_SCA\_x ► 33541 ► DCSU SCA P6UPR 4A

pick PV\_Cmd\_Hdr ► 2 ► Fire

pick PV\_EDF\_DCSU\_SCA\_Bus\_Fltr\_Sel ► 0 ► Mid Value Sel

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# EPS CHANNEL 1/4 COMPLETE POWER DISTRIBUTION ACTIVATION

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## OBJECTIVE:

This procedure completes the activation of the Channel 1/4 Power Distribution once active cooling has been established via EATCS. Once complete, all Channel 1/4 loads will have power available.

### 1. VERIFYING DDCU LA1B INTG CNTR AND COMMON CLEAR

sel DDCU LA1B

Verify Integration Counter – incrementing

sel Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

### 2. ACTIVATING DDCU LA1B CONVERTER

'Input'

Verify Current: -4 to 4 A

Verify Voltage > 145

sel Converter

**cmd** Converter On – Arm

**cmd** Converter On

'Output'

Verify Voltage: 120.8 to 128.8 V

### 3. VERIFYING RPCM LA1B A-H INTG CNTRS

sel DDCU LA1B Distribution

## EPS CHANNEL 1/4 COMPLETE POWER DISTRIBUTION ACTIVATION

(ASSY OPS/12A.1/FIN) Page 2 of 10 pages

'RPCM LA1B'

Verify RPCM LA1B Integration Counters – incrementing (icons blue with green corners)

### 4. CLOSING SOURCE RPC FOR LAP61B A

'RPCM LA1B'

sel D

sel RPC 3

'Rack Power Switch'

Verify Position – CI

Verify Monitoring – Ena

'RPC Position'

√Close Cmd – Ena

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

### 5. VERIFYING RPCM LAP61B A INTG CNTR

Verify RPCM LAP61B Integration Counter – incrementing (icon blue with green corners)

### 6. CLOSING MBSU 1 RBI 3

S0: EPS: MBSU 1

sel RBI 3

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close (√ – CI)

Verify Voltage > 145 V

## EPS CHANNEL 1/4 COMPLETE POWER DISTRIBUTION ACTIVATION

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### NOTE

Parallel DDCUs LA1A and LA4A will activate with the default sharing ratio of 50/50.

#### 7. CLOSING MBSU 4 RBI 3

S0: EPS: MBSU 4

MBSU 4

sel RBI 3

MBSU 4 RBI 3

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\text{V}}$  – CI)

Verify Voltage > 145 V

#### 8. VERIFYING DDCU LA1A INTG CNTR AND COMMON CLEAR

MBSU 1

sel DDCU LA1A

DDCU LA1A

Verify Integration Counter – incrementing

sel Firmware

DDCU LA1A Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

#### 9. ACTIVATING DDCU LA1A CONVERTER

DDCU LA1A

'Input'

Verify Current: -4 to 4 A

Verify Voltage > 145 V

sel Converter

DDCU LA1A Converter

**cmd** Converter On – Arm

**cmd** Converter On

## EPS CHANNEL 1/4 COMPLETE POWER DISTRIBUTION ACTIVATION

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**DDCU LA1A**

'Output'

Verify Voltage: 120.8 to 128.8 V

### 10. RPCM INTG CNTRS (LA1A4A A-G)

**DDCU LA1A**

sel DDCUs LA1A (and LA4A) Distribution

**DDCU LA1A4A Dist**

'RPCM LA1A4A'

Verify RPCM Integration Counters – incrementing (icons blue with green corners)

### 11. VERIFYING DDCU LA4A INTG CNTR AND COMMON CLEAR

**MBSU 4**

sel DDCU LA4A

**DDCU LA4A**

Verify Integration Counter – incrementing

sel Firmware

**DDCU LA4A Firmware**

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

### 12. ACTIVATING DDCU LA4A CONVERTER

**DDCU LA4A**

'Input'

Verify Current: -4 to 4 A

Verify Voltage > 145 V

sel Converter

**DDCU LA4A Converter**

**cmd** Converter On – Arm

**cmd** Converter On

Verify Voltage: 120.8 to 128.8 V

Share Ratio – 50 %

## EPS CHANNEL 1/4 COMPLETE POWER DISTRIBUTION ACTIVATION

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### 13. CLOSING SOURCE RPC FOR LAP51A4A A AND AL1A4A A,B

S0: EPS: MBSU 1: DDCU LA1A

sel DDCUs LA1A (and LA4A) Distribution

'RPCM LA1A4A'

sel F

sel RPC 3

√Close Command – Ena

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

sel RPC 4

'Rack Power Switch'

Verify Position – Cl

Verify Monitoring – Ena

'RPC Position'

√Close Command – Ena

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

### 14. VERIFYING RPCM AL1A4A A, B AND LAP51A4A A INTG CNTRS

'RPCM LAP51A4A A'

Verify RPCM Integration Counter – incrementing (icon blue with green corners)

'RPCM AL1A4A'

Verify RPCM Integration Counters – incrementing (icons blue with green corners)

## EPS CHANNEL 1/4 COMPLETE POWER DISTRIBUTION ACTIVATION

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### 15. VERIFYING DDCU S14B INTG CNTR AND COMMON CLEAR

**MBSU 4**

sel DDCU S14B

**DDCU S14B**

Verify Integration Counter – incrementing

sel Firmware

**DDCU S14B Firmware**

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

### 16. ACTIVATING DDCU S14B CONVERTER

**DDCU S14B**

'Input'

Verify Current: -4 to 4 A

Verify Voltage > 145 V

sel Converter

**DDCU S14B Converter**

**cmd** Converter On – Arm

**cmd** Converter On

**DDCU S14B**

'Output'

Verify Voltage: 120.8 to 128.8 V

### 17. VERIFYING RPCM S14B E-G, S04B A-F, P14B E-G, P34B C,E,F INTG CNTRS

**DDCU S14B**

Verify all RPCM Integration Counters except S34B C, E, F – incrementing  
(icons blue with green corners)



## EPS CHANNEL 1/4 COMPLETE POWER DISTRIBUTION ACTIVATION

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### 18. CLOSING SOURCE RPC FOR MT 4B-A

'RPCM S04B'

sel F

sel RPC 17

√Close Command – Ena

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

### 19. VERIFYING RPCM MT4B A INTG CNTR

sel DDCU S14B Dist

#### NOTE

DDCU S14B Dist Display incorrectly shows MT4B A being fed by the S04B E RPCM. It is actually fed from the S04B F RPCM.

'RPCM MT4B'

Integration Counter – incrementing (icon blue with green corners)

### 20. CLOSING RPC S01A B RPC 1

S0: EPS: RPCM S01A B

sel RPC 1

√Close Command – Ena

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

### 21. VERIFYING S01A INTEGRATION COUNTERS

S0: EPS: DDCU S01A: DDCU S01A Distribution

'RPCM P11A'

Verify RPCM A,B Integration Counters – incrementing (icons blue with green corners)

## EPS CHANNEL 1/4 COMPLETE POWER DISTRIBUTION ACTIVATION

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'RPCM P31A'

Verify RPCM A Integration Counter – incrementing (icon blue with green corners)

### 22. CLOSING MBSU 4 RBI 13

S0: EPS: MBSU 4

sel RBI 13

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close (√ – CI)

Verify Voltage > 145 V

### 23. VERIFYING DDCU Z14B INTG CNTR AND COMMON CLEAR

sel DDCU Z14B

Verify Integration Counter – incrementing

sel Firmware

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

### 24. ACTIVATING DDCU Z14B CONVERTER

'Input'

Verify Current: -4 to 4 A

Verify Voltage > 145 V

sel Converter

## EPS CHANNEL 1/4 COMPLETE POWER DISTRIBUTION ACTIVATION

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**cmd** Converter On – Arm

**cmd** Converter On

**DDCU Z14B**  
'Output'

Verify Voltage: 120.8 to 128.8 V

### 25. VERIFYING RPCM N14B A-C INTG CNTRS

**DDCU Z14B**  
'RPCM N14B'

Verify Integration Counters – incrementing (icons blue with green corners)

### 26. CLOSING MBSU 4 RBI 8

**MBSU 4**

sel RBI 8

**MBSU 4 RBI 8**  
'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 147 V

### 27. CLOSING DCSU 4 RBI 6

P4: EPS: DCSU 4B

**DCSU 4B**

sel RBI 6

**DCSU 4B RBI 6**  
'Cmdded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 147 V

### 28. SETTING EDF FOR 4B RBI 06 CLOSED

**cmd** <Cmd Inv: P4\_EDF\_DCSU\_SCA\_Bus\_Fltrd\_V\_Sel\_Tmplt -  
(P6PX96IM0123K)>

pick DCSU\_SCA\_x ► 17413 ► DCSU SCA P6LWR 4B

pick PV\_Cmd\_Hdr ► 2 ► Fire

pick PV\_EDF\_DCSU\_SCA\_Bus\_Fltr\_Sel ► 0 ► Mid Value Sel

# EPS CHANNEL 1/4 COMPLETE POWER DISTRIBUTION ACTIVATION

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## 29. CLOSING MBSU 1 RBI 6

S0: EPS: MBSU 1

sel RBI 6

'Cmded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

## 30. CLOSING MBSU 3 RBI 6

S0: EPS: MBSU 3

sel RBI 6

'Cmded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

### NOTE

MBSU 1 RBI 01 is closed to provide redundant power input to MBSU 1 Power Supply in the event of MBSU 4 RBI 6 Failure.

## 31. CLOSING MBSU 1 RBI 1

S0: EPS: MBSU 1

sel RBI 1

'Cmded Position'

**cmd** Close – Arm

**cmd** Close ( $\sqrt{\quad}$  – CI)

Verify Voltage > 145 V

# Z1 CPP X1 (SPDA Z14B) RECONFIGURATION

(ASSY OPS/12A.1/FIN)

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## OBJECTIVE:

This procedure will safe connectors for the Z1 SPDA Reconfiguration and activate critical heaters once reconfiguration is complete.

### CAUTION

S-Band equipment has a time-to-undertemp < one hour. Step 5 should not be performed until EVA crew is ready to perform Z1 CPP reconfiguration tasks. Once EVA is complete, steps 9 to13 should be completed as soon as possible to prevent hardware damage.

#### 1. VERIFYING RUSSIAN POWER FEEDS OFF

Confirm **MCC-M** has powered off all SM CHTs and all FGB ARCUs.

#### NOTE

Solar Array 2B must be positioned more than 90 degrees away from velocity vector to provide plasma mitigation while PCU 2 is off.

#### 2. POSITIONING BGA 2B FOR PCU POWERDOWN

Perform {2.102 PVM CONFIGURE BGA XX TO DIRECTED POSITION MODE}, all (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM), then:

#### 3. VERIFYING DDCU S04B CONVERTER OFF

DDCU S04B

'Output'

Verify Voltage < 3 V

#### 4. COMMANDING PCU 2 TO STANDBY MODE

Z1: EPS:

sel Plasma Contactor 2

PCU 2

'PEU'

sel Normal Operation

PCU 2 Normal Operation

**cmd** Contactor Off – Arm

**cmd** Contactor Off – Off

Verify Mode/State – Standby

# Z1 CPP X1 (SPDA Z14B) RECONFIGURATION

(ASSY OPS/12A.1/FIN)

Page 2 of 6 pages

## NOTE

PCU FDIR will shunt all active arrays when PCU 2 commanded to Standby. 2B positioning in Step 2 provides required plasma protection and allows for immediate unshunting of all arrays.

**cmd**<Cmd Inv: SSU\_2B\_PVCE\_1\_2\_3\_On – (P6PS96IM0035K)>

**cmd**<Cmd Inv: P4\_SSU\_2A\_PVCE\_1\_2\_3\_On – (P4PS95SM0034K)>

**cmd**<Cmd Inv: P4\_SSU\_4A\_PVCE\_1\_2\_3\_On – (P4PS95SM0035K)>

## 5. OPENING POWER SOURCE TO RPCM Z14B\_B

P6:EPS:DCSU 4B:RPCM 4B\_B

RPCM\_4B\_B

sel RPC 1

RPCM 4B B RPC 01

'RPC Position'

**cmd** Open (√ – Op)

**cmd** Close Command – Inhibit (√ – Inh)

## 6. POWERING OFF RUSSIAN FEEDS FOR RECONFIGURATION

Z1:EPS:RPCM Z13B\_A

RPCM\_Z13B\_A

sel RPC 1

RPCM Z13B\_A\_ RPC 01

'RPC Position'

**cmd** Open (√ – Op)

**cmd** Close Command – Inhibit (√ – Inh)

RPCM\_Z13B\_A

sel RPC 3

RPCM Z13B\_A\_ RPC 03

'RPC Position'

**cmd** Open (√ – Op)

**cmd** Close Command – Inhibit (√ – Inh)

S0:EPS:MBSU 3

MBSU 3

sel RBI 5

**MBSU 3 RBI 05**

'Cmded Position'

Verify – Op  
Verify Close Cmd – Inh

7. GIVING GO FOR EVA RECONFIGURATION

**MCC-H** ↑ EVA “Go for Z1 CPP reconfiguration and Russian reconfiguration”

8. VERIFYING EVA Z1 CPP RECONFIGURATION COMPLETE

EVA ↓ **MCC-H** “Z1 CPP Reconfig complete”

9. VERIFYING MBSU 4 RBI 12 CLOSED

S0:EPS:MBSU 4

**MBSU 4**

sel RBI 12

**MBSU 4 RBI 12**

'Cmded Position'

Verify – CI  
Verify Voltage > 145 V

10. DDCU S04B INTG CNTR AND COMMON CLEAR

**MBSU 4**

sel DDCU S04B

**DDCU S04B**

Verify Integration Counter – incrementing

sel Firmware

**DDCU S04B Firmware**

'Clear Commands'

**cmd** Common Clear

Verify Power on Reset – blank

11. DDCU S04B CONVERTER ON

DDCU S04B

'Input'

Verify Current: -4 to 4 A

Verify Voltage > 145 V

sel Converter

DDCU S04B Converter

**cmd** Converter On – Arm

**cmd** Converter On

DDCU S04B

'Output'

Verify Voltage – 120.8 to 128.8 V

12. RPCM INTG CNTRS (RPCM Z14B A,B)

DDCU S04B

'RPCM Z14B'

Integration Counters – incrementing (Icons blue with green corners)

13. CLOSING RPCS TO LOADS

NOTE

Table 1 RPC Configuration specifies RPCs to be closed once the EPS distribution is fully reactivated. Loads being reactivated include keep-alive heaters and Russian Power feeds.

Refer to Table 1 for RPC Configuration.

Record RPCs that require Closing from Table 1

RPCM [X] = \_\_\_\_\_

Close – RPC [Y] = \_\_\_\_\_

PCS

[Element]: EPS

[Element]: EPS

sel RPCM [X]

RPCM [X]

sel RPC [Y] where [Y] = RPC from Table 1

**cmd** Close (Verify – Cl)

Repeat



# Z1 CPP X1 (SPDA Z14B) RECONFIGURATION

(ASSY OPS/12A.1/FIN)

Page 5 of 6 pages

Table 1. RPC Configuration

[Element]	DDCU Dist	[X] = RPCM	[Y] = RPC Close	Load
Reactivate S-Band, Ku-band, EETCS Heaters				
Z1	S04B	Z14B_B	4	S-Band-2 ACBSP Htr
Z1	S04B	Z14B_B	3	S-Band-2 Transponder Htr
Z1	S04B	Z14B_B	2	S-Band-2 ACBSP Htr
Z1	S04B	Z14B_B	6	Ku TRC Htr
Z1	S04B	Z14B_B	5	KU SGANT Htr
Z1	S04B	Z14B_B	1	EAS/SAS Surv Htr
Z1	S04B	Z14B_B	7	EETCS Lp A/B FlxHs Htr
Reactivating Redundant PCU				
Z1	S04B	Z14B_B	15	PCU 2 (Z14B)
EPS Hardware Keep Alive Heaters				
Z1	S04B	Z14B_B	11	DDCU Z14B Htr 2
Z1	S04B	Z14B_B	14	PCU 1 Htr
Z1	S04B	Z14B_B	16	DDCU Z13B Htr 2

## 14. [REACTIVATING PCU 2](#)

### NOTE

PCU 2 was reactivated in Step 13 and should be in Manual Mode.

Perform {1.117 Z1 PCU 1(2) QUICK ACTIVATION FROM MANUAL MODE}, all (SODF: EPS: ACTIVATION AND CHECKOUT: PRIMARY POWER SYSTEM).

### WARNING

Do not perform the last two steps until EV Crew Confirms that Russian Power Reconfiguration steps have been completed. Energized connectors pose a shock hazard.

## 15. [VERIFYING RUSSIAN EVA RECONFIGURATION COMPLETE](#)

EVA ↓ **MCC-H** "Russian Power Reconfig complete"

## 16. [CLOSING MBSU 3 RBI 5 \(RS PMA 1D FEED\)](#)

S0:EPS:MBSU 3

MBSU 3

sel RBI 5

MBSU 3 RBI 5

'Cmdded Position'

**cmd** Close – Arm

**cmd** Close (√ – Cl)

- Verify Voltage > 145 V
17. CLOSING RPC Z13B A RPC 1  
Z1:EPS:RPCM Z13B A  
  
  
sel RPC 1  
  
  
√Close Command – Ena  
**cmd** RPC Position – Close (Verify –CI)
  
  18. CLOSING RPC Z14B A RPC 3  
Z1:EPS:RPCM Z14B A  
  
  
sel RPC 3  
  
  
√Close Command – Ena  
**cmd** RPC Position – Close (Verify –CI)
  
  19. CLOSING RPC Z14B A RPC 1  
Z1:EPS:RPCM Z14B A  
  
  
sel RPC 1  
  
  
√Close Command – Ena  
**cmd** RPC Position – Close (Verify –CI)
  
  20. ACTIVATING RUSSIAN POWER FEEDS  
Give **MCC-M** “Go” to reactivate SM CHTs and FGB ARCUs per plan.
  
  21. CONFIGURING BGA 2B FOR NOMINAL OPERATIONS  
Once EVA has ingressed or PCU 2 returned to discharge, 2B Solar Array can be returned to nominal operations per array plan.

## EPS LOAD RECONFIGURATION POST EVA 3

(ASSY OPS/12A.1/FIN) Page 1 of 3 pages

### OBJECTIVE:

This procedure reactivates EPS loads and establishes nominal configuration once the critical reactivation steps are complete.

#### **MCC-H** 1. SETTING RACK RPS AVAILABILITY FOR LA 1 MDM

US Lab: EPS: Rack Power: Rack Power 1

'Switch Avail'

If Rack LAB1[XX] Switch Avail – No where [XX] = D1(P5, P6, S2, S3)

'Change Rack Power Switch Availability'

input Rack – L A B 1 [X X]

input Available – Y e s

**cmd** Set

'Switch Avail'

√Rack LAB1[XX] – Yes

If Rack LAB1[XX] Switch Avail – Yes where [XX] = P1(P3, S1, D3)

'Change Rack Power Switch Availability'

input Rack – L A B 1 [X X]

input Available – N o

**cmd** Set

'Switch Avail'

√Rack LAB1[XX] – No

#### 2. ENABLING RACK RPS MONITORING FOR LA-1 CONTROLLED RPSS

US Lab: EPS: Rack Power: Rack Power 1

'Monitoring Status'

If Rack LAB1[XX] Monitoring Status – Inh where [XX] = D1(P5, P6, S2, S3)

'Rack Power Monitoring MCC-H Commands Only'

**cmd** LAB1[XX] Enable

'Monitoring Status'

√Rack LAB1[XX] – Ena

# EPS LOAD RECONFIGURATION POST EVA 3

(ASSY OPS/12A.1/FIN) Page 2 of 3 pages

## 3. CLOSING RPCs TO LOADS

### NOTE

Table 1 RPC Configuration specifies RPCs to be closed once the EPS distribution is fully reactivated. Loads being reactivated include keep-alive heaters, interior lights, emergency lights, and UOPs. Additional systems RPC closes are including for efficiency in commanding.

Refer to Table 1 for RPC Configuration.

Record RPCs that require Closing from Table 1.

RPCM [X] = \_\_\_\_\_

Close – RPC [Y] = \_\_\_\_\_

[Element]: EPS

[Element]: EPS

sel RPCM [X]

RPCM [X]

sel RPC [Y] where [Y] = RPC from Table 1

**cmd** Close (√ – CI)

Repeat

# EPS LOAD RECONFIGURATION POST EVA 3

(ASSY OPS/12A.1/FIN) Page 3 of 3 pages

Table 1. RPC Configuration

[Element]	DDCU Dist	[X] = RPCM	[Y] = RPC Close	Load
<b>EPS Hardware Keep Alive Heaters</b>				
S0	S01A	S01A_C	15	Lab CETA Lum Htr
S1	S01A	S11A_B	6	S1 CETA Lum Htr
<b>GLAs and Emergency Lights</b>				
Node 1	Z14B	N14B_A	1	Emer Lt
Node 1	Z14B	N14B_B	1	Lt
Node 1	Z14B	N14B_B	2	Emer Lt
Node 1	Z14B	N14B_C	1	Emer Lt
Node 1	Z14B	N14B_C	2	Lt
Node 1	Z14B	N14B_C	15	Lt
Node 1	Z14B	N14B_C	16	Lt
LAB	LA1B	LA1B_A	1	Lt
LAB	LA1B	LA1B_A	2	Lt
LAB	LA1B	LA1B_A	3	Lt
LAB	LA1B	LA1B_E	1	Emer Lt
LAB	LA1B	LA1B_F	1	Lt
LAB	LA1B	LA1B_F	2	Lt
LAB	LA1B	LA1B_F	3	Lt
LAB	LA1B	LA1B_F	14	Emer Lt
<b>UOPs</b>				
Node 1	Z14B	N14B_C	17	UOP
LAB	LA1B	LA1B_G	18	UOP
LAB	LA1A4A	LA1A4A_C	5	UOP
LAB	LA1A4A	LA1A4A_C	6	UOP
LAB	LA1A4A	LAP51A4A_A	18	Lab RWS UOP
<b>Other Discipline Loads</b>				
S0	S01A	S01A C	3	EV-CPDS

#### 4. ACTIVATING SARJ REDUNDANT RJMC

P3: EPS: RPCM P31A A

RPCM P31A A

sel RPC 4

RPCM P31A A RPC 04

cmd Close (√ – Cl)

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# CHANNEL 2/3 POWERDOWN TRUSS HEATER PREP

(ASSY OPS/12A.1/FIN) Page 1 of 3 pages

## OBJECTIVE:

The purpose of this procedure is to verify redundant truss heaters are powered in preparation for a Channel 2/3 powerdown.

### 1. VERIFYING STR SDO CARD AND RBVM HEATERS

PCS

S1: EPS

'RPCM S11A'

sel C

RPCM\_S11A\_C

sel RPC [X] where [X] = 4 5 6

√RPC Position – CI

Repeat

S1: CDH: STR MDM: SDO 3

STR SDO 3

'Ch'

For [X] = 2 3 7 8 12 13

Verify Ch [X] – X

Repeat

### 2. VERIFYING S1 THERMOSTATICALLY CONTROLLED HEATERS ON CHANNEL 1/4

Refer to Table 1.

Table 1.

RPCM [X]	RPC [Y]	Load
S11A B	02	S-Band 1 BSP Htr (S1)
S11A B	06	CETA Light S1-2 Htr
S11A B	12	S-Band 1 RFG Htr (S1)
S11A B	15	S-Band 1 xpdr Htr (S1)
S11A C	07	S1 Misc Thermal Group 4 Htrs
S11A A	16	Video Port 2 FPMU Cleaning Lamp (Camera Lum Htr)

S1: EPS: RPCM [X]: RPC [Y]

RPCM\_[X]\_RPC\_[Y]

√RPC Position – CI

Repeat

# CHANNEL 2/3 POWERDOWN TRUSS HEATER PREP

(ASSY OPS/12A.1/FIN) Page 2 of 3 pages

### 3. VERIFYING S0 THERMOSTATICALLY CONTROLLED HEATERS ON CHANNEL 1/4

Refer to Table 2.

Table 2.

RPCM [X]	RPC [Y]	Load
S01A C	15	CETA Light LAB Htr
S01A E	02	Video EVSU 2 Htr
S01A E	04	GPS Antenna 1 (str 1)
S01A E	05	GPS Antenna 2 (str 1)
S01A E	06	GPS Antenna 3 (str 1)
S01A E	07	GPS Antenna 4 (str 1)
S04B E	04	TUS-2 VSC Htr-2
S04B F	04	TUS-1 VSC Htr-1
S04B F	17	Power Bus MT4B
MT4B A	08	IUA-1 Htr-1, IUA-2 Htr-2, and UMA Htr-1
MT4B A	12	LTU Htr-1
MT4B A	13	AMP-1 Htr-1 and Op Pwr
MT4B A	14	AMP-2 Htr-1 and Op Pwr
MT4B A	16	LDU Htr-1 and RSU Htr-1

S0: EPS: RPCM [X]: RPC [Y]

RPCM\_[X]\_RPC\_[Y]

√RPC Position – CI

Repeat

### 4. VERIFYING P1 THERMOSTATICALLY CONTROLLED HEATERS ON CHANNEL 1/4

Refer to Table 3.

Table 3.

RPCM [X]	RPC [Y]	Load
P11A B	14	P1 Thermal Group 1 Htrs
P11A B	15	P1 Thermal Group 2 Htrs
P11A B	16	P1 Thermal Group 3 Htrs
P14B G	11	PTR MDM Htr
P11A B	12	Video Port 7 Camera Htr
P11A B	02	Video Port 7 Lum Htr
P11A A	02	Video Port 8 WETA Htr 1
P11A A	16	Video Port 8 WETA Htr 2



**CHANNEL 2/3 POWERDOWN TRUSS HEATER PREP**

(ASSY OPS/12A.1/FIN) Page 3 of 3 pages

P1: EPS: RPCM [X]: RPC [Y]  
RPCM\_[X]\_RPC\_[Y]  
√RPC Position – CI  
Repeat

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# ETCS LOOP A(B) ACTIVATION AND CHECKOUT

(ASSY OPS/12A.1/FIN)

Page 1 of 13 pages

## OBJECTIVE:

This procedure activates an ETCS loop prior to the IFHXs being switched over to S0 MDM control.

### CAUTION

MBSUs 1,4(2,3) and DDCUs S01A, S04B, S14B(S02B, S03B,P13A) are not receiving cooling. The DDCUs will overheat in 4 hours without cooling (6 hours for MBSUs).

### NOTE

IFHXs are not connected to the Ammonia Loop at this time.

PCS

## 1. VERIFYING SOFTWARE CONFIGURATION

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Commands'

√EXT ETCS Manager – Ena

**cmd** S1-1(P1-2) PCVP Comm – Ena (√ – Ena)

√S1-1(P1-2) PTC – Inh

**cmd** S0-1(S0-2) HAC – Ena

'Telemetry'

'ETCS'

√Mode – Standby

## 2. ENABLING PUMP AND TANK CONTROL

S1(P1): TCS: NTA: Loop A(B) NTA Valves: Loop A(B) NTA Additional Valves

Loop A(B) NTA Additional Valves

'Commands'

**cmd** GPRV Power On Init Inhibit – Arm (√ – √)

**cmd** GPRV Power On Init Inhibit – Inhibit (√ – Inh)

### NOTE

Expect possible Caution message, '**ETCS Loop A(B) GPRV Control Sequence Failed - S1(P1)**' event code: 4427 (Loop A) 4224 (Loop B), when PTC Enable command is sent due to SCR 26930/SPN 3018. No action is required.

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Commands'

# ETCS LOOP A(B) ACTIVATION AND CHECKOUT

(ASSY OPS/12A.1/FIN)

Page 2 of 13 pages

**cmd** S1-1(P1-2) ETCS PTC – Ena (√ – Ena)

Expect possible ETCS Temperature based Caution and Warning messages.

S1(P1): EPS: RPCM S11A A(RPCM P12B A)  
RPCM S11A A (RPCM P12B A)

√RPC 06 Loop A(B) PM Radiator Bypass Flowmeter – CI

S1(P1): EPS: RPCM S11A C(RPCM P12B C)  
RPCM S11A C (RPCM P12B C)

√RPC 09 Loop A PM Outlet Flow Temp Meter (Loop B PM Outflow Temp Meter) – CI

√RPC 12 S1 1(P1 2) MDM SDO Card 8A – CI

### 3. ACTIVATING POWER FOR PCVP

#### NOTE

Pump RPMs will increase as software filters initialize, giving a false indication of a pump startup. Also, the FCV moves to the 10 deg position upon PCVP powerup.

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup  
Loop A(B) Manual Startup  
'Commands'

**cmd** RPCM S11A D(P12B D) RPC 1 (PCVP) – Close (√ – CI)

### 4. VERIFYING ATA VALVE POSITIONS

#### **CAUTION**

If the valve position is indeterminate, driving the valve in the direction opposite its last direction of motion can potentially result in damage to the valve seal. If the valve position is indeterminate, √**MCC-H**.

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup  
Loop A(B) Manual Startup  
'Telemetry'  
'Valves'

√ATA Vent Vlv – Closed

#### **CAUTION**

The Vent Valve must be closed prior to opening the Isolation valves; otherwise, ammonia will be vented overboard.

# ETCS LOOP A(B) ACTIVATION AND CHECKOUT

(ASSY OPS/12A.1/FIN)

Page 3 of 13 pages

√ATA Tank 1 Isol Vlv – Open

√ATA Tank 2 Isol Vlv – Open

## 5. VERIFYING NTA VALVE POSITIONS

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Telemetry'

'Valves'

### CAUTION

If the valve position is indeterminate, driving the valve in the direction opposite its last direction of motion can potentially result in damage to the valve seal. If the valve position is indeterminate, √MCC-H.

√NTA Isol Vlv1 – Open

√NTA Isol Vlv2 – Open

√NTA N2 Supply Vlv – Open

## 6. SETTING LOOP STARTUP PRESSURE

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Telemetry'

'PCVP'

If PM Inlet Pressure  $\geq$  2592 kPa

Go to step 7.

If PM Inlet Pressure  $<$  2592 kPa

S1(P1): TCS: Loop A(B) Software: Loop A(B) RPC Commands

Loop A(B) RPC Commands

'Commands'

'Loop A(B) Components'

'RPCM Starboard (Port)'

√RPCM S11A C(P12B C) 12 - NTA Vlv – Cl

S1(P1): TCS

S1(P1): Loop A(B) Overview

'NTA (Nitrogen Tank Assembly)'

Record GPRV Out Press \_\_\_\_\_ kPa

# ETCS LOOP A(B) ACTIVATION AND CHECKOUT

(ASSY OPS/12A.1/FIN)

Page 4 of 13 pages

## NOTE

The following command will attempt to activate the GPRV. GPRV powerup may not succeed due to a known inrush current problem. If GPRV powerup is successful, software will initialize the GPRV setpoint to one of several loop pressure readings. This could vent a small amount of N2 overboard from the S1(P1) NTA.

**MCC-H**

Build and uplink the following GPRV Pwr On command from Command Inventory.

For Loop A

Uplink: <Cmd Inv: ETCS\_LoopA\_S1\_1\_SDO\_CI\_Tmplt – S1TE96IM0006K>, using a picklist value of 21 for Effector

For Loop B

Uplink: <Cmd Inv: ETCS\_LoopB\_P1\_2\_SDO\_CI\_Tmplt – P1TE96IM0001K>, using a picklist value of 277 for Effector

Repeat step 6 until GPRV Out Press changes by at least 414 kPa.

Using PM Inlet Pressure as pressure source and 2689 kPa as pressure setpoint, perform {2.506 CHANGE ETCS LOOP (A)B PRESSURE - AUTO}, all (SODF: TCS: NOMINAL: ETCS), then:

Continue procedure, perform steps 7 through 12 and 17 through 22.

## 7. VERIFYING PM VALVE POSITIONS

### CAUTION

If the valve position is indeterminate, driving the valve in the direction opposite its last direction of motion can potentially result in damage to the valve seal. If the valve position is indeterminate, √**MCC-H**.

PCS

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Telemetry'

'Valves'

√PM Byp Vlv – Open

√PM Inlet Vlv – Open

√PM Rad Rtn Isol Vlv – Open

√PM Out Isol Vlv – Open

# ETCS LOOP A(B) ACTIVATION AND CHECKOUT

(ASSY OPS/12A.1/FIN)

Page 5 of 13 pages

## 8. UPLOADING PCVP OPS DATA

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup: Loop A(B)  
PCVP Ops Data

Loop A(B) PCVP Ops Data

'Commands'

'PCVP Ops Data'

input values per Table 2

**cmd Set**

'Feedback'

Verify PCVP Operating State – Startup

```
*****
* If MCC-H is unavailable
* | S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup
* | Loop A(B) Manual Startup
* | 'Commands'
* |
* | cmd PCVP Ops Data – Set Startup
* |
* | NOTE
* | The parameters of the PCVP Ops Data – Set Startup
* | command is available in Table 2 at the end of the ETCS
* | Contingency Loop A(B) Restart.
*****
```

NOTE  
Successful completion of step 9 is not required to execute step 10.

## 9. POSITIONING FCV TO FULL BYPASS

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Commands'

input FCV Position Control Setpoint –  $-2 \pm$  deg

**cmd Set**

Verify FCV Position Control Setpoint: -2 deg

'Telemetry'

'PCVP'

Verify FCV Position:  $-2 \pm 2$  deg

# ETCS LOOP A(B) ACTIVATION AND CHECKOUT

(ASSY OPS/12A.1/FIN)

Page 6 of 13 pages

## 10. STARTING PUMP

### NOTE

Temperature based FDIR response is not active in Standby or Startup Mode (although some Caution and Warning messages are active).

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Commands'

input PCVP Speed Setpt – 1 1 5 0 0 rpm

**cmd Set**

√Pump Speed: 11,500 ± 20 rpm

'Telemetry'

'PCVP'

Verify PM Out Flow > 2150 kg/hr

\*\*\*\*\*

\* If Pump does not start

\* | S1(P1): TCS: Loop A(B) Software: Loop A(B) ETCS

\* | Manager Details

\* | Loop A(B) ETCS Manager Details

\* | 'Telemetry'

\* | 'ETCS Manager'

\* | 'Application Layer Response'

\* |

\* | If Wrong Operational State – √

\* | Perform {4.607 ETCS LOOP A(B) PUMP START

\* | **COMMAND OVERRIDE**}, all (SODF: TCS:

\* | CORRECTIVE: ETCS), then:

\* |

\* | If otherwise

\* | S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual

\* | Startup

\* | Loop A(B) Manual Startup

\* | 'Commands'

\* |

\* | **cmd PCVP Firmware – Cold Start**

\* |

\* | Repeat steps 8 to 10.

\*\*\*\*\*



# ETCS LOOP A(B) ACTIVATION AND CHECKOUT

(ASSY OPS/12A.1/FIN)

Page 7 of 13 pages

## 11. ENABLING FCV CONTROL

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Commands'

### NOTE

Flow has been established to MBSUs and external DDCUs.

**cmd** PCVP FCV Temp Cntrl – Ena

√PCVP FCV Temp Cntl – Temp Cntl

## 12. INHIBITING IN-LINE HEATERS

### NOTE

1. In-line heaters cannot be powered until DDCU S14B(P13A) and RPCM S14B G(P13A G) checkout is completed.

2. According to SCR 26929, the Line Htr Inhibit Arm command is sufficient to inhibit PM Line Heaters; the Inhibit confirmation command is not required.

S1(P1): TCS: PM: Loop A(B) PM Htrs

Loop A(B) PM Htrs

'Commands'

'In-line Htrs'

**cmd** Availability – Inh Arm (√ – Inh)

## 13. OVERRIDING N2 SUPPLY VALVE ARM COMMAND

S1(P1): TCS: Loop A(B) Software: Loop A(B) Off-Nominal Commands

Loop A(B) Off-Nominal Commands

'Commands'

In the ETCS Cmd Override field  
sel the desired input value

input ETCS Cmd Override – 3 Ena PTC Vlv

**cmd** Set

Verify ETCS Cmd Override – Ena PTC Vlv

## 14. ARMING NTA SUPPLY VALVE

S1(P1): TCS: NTA: Loop A(B) NTA Valves

Loop A(B) NTA Valves

'Commands'

'NTA Valves'

**cmd** N2 Supply Valve Close – Arm (√ – √)

# ETCS LOOP A(B) ACTIVATION AND CHECKOUT

(ASSY OPS/12A.1/FIN)

Page 8 of 13 pages

## 15. OVERRIDING N2 SUPPLY VALVE CLOSE COMMAND

S1(P1): TCS: Loop A(B) Software: Loop A(B) Off-Nominal Commands

Loop A(B) Off-Nominal Commands

'Commands'

In the ETCS Cmd Override field

sel the desired input value

input ETCS Cmd Override – 4 Opr PTC Vlv

**cmd** Set

Verify ETCS Cmd Override – Opr PTC Vlv

## 16. CLOSING NTA SUPPLY VALVE

S1(P1): TCS: NTA: Loop A(B) NTA Valves

Loop A(B) NTA Valves

'Commands'

'NTA Valves'

**cmd** N2 Supply Valve Close – Close

√N2 Supply Valve Position – Closed

## 17. VERIFYING LOOP MODE

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Telemetry'

'ETCS'

Verify Mode – Startup

## 18. WARMING RADIATOR QDS (IF REQUIRED)

S1(P1): TCS: PM

Loop A(B) PM

'Telemetry'

'Byp'

If Temp < -17.8° C

Line heaters can be enabled only during insolation periods.

During insolation

S1(P1): TCS: PM: Loop A(B) PM Htrs

Loop A(B) PM Htrs

'Commands'

'In-line Htrs'

**cmd** Availability – Ena (√ – Ena)

~

# ETCS LOOP A(B) ACTIVATION AND CHECKOUT

(ASSY OPS/12A.1/FIN)

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'Telemetry'  
'In-line Htrs'

Verify Htr1,2 RPCs – Closed

5 minutes before eclipse  
**cmd** Availability – Inh (√ – Inh)

Repeat as required until temp  $\geq -17.8^{\circ}$  C for 5 minutes then continue to heat soak during insolation.

If Temp  $\geq -17.8^{\circ}$  C and  $< 2.8^{\circ}$  C

S1(P1): TCS: PM: Loop A(B) PCVP Commands

Loop A(B) PCVP Commands

'Commands'  
'FCV Mode'

input Position Cntl Setpt: 3 deg

**cmd** Set

√FCV Mode – Position  
√Position Control Setpt – 3 deg

Wait 3 hours.

**cmd** State – Ena

√FCV Mode – Temp Cntl

At the end of the 3-hour period

S1(P1): TCS: PM: Loop A(B) PM Heaters

Loop A(B) PM Heaters

'Commands'  
'In-line Htrs'

**cmd** Availability – Inh (√ – Inh)

# ETCS LOOP A(B) ACTIVATION AND CHECKOUT

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## 19. VERIFYING ETCS ALGORITHM CONFIGURATION

Refer to Table 1.

Table 1

Parameter	Display	State
High Temp FDIR	LoopA(B) PCVP FDIR	Ena
Low Temp FDIR	LoopA(B) PCVP FDIR	Ena
Over Speed FDIR	LoopA(B) PCVP FDIR	Ena
Under Speed FDIR	LoopA(B) PCVP FDIR	Ena
Controller Bit	LoopA(B) PCVP FDIR	Ena
RLC Control Mode	LoopA(B) PCVP FDIR	Ena
NH3 Line Htr FDIR	LoopA(B) FDIR	Ena
NH3 Return FDIR	LoopA(B) FDIR	Ena
Large Leak Restart	LoopA(B) FDIR	Inh
Large Leak Safing	LoopA(B) FDIR	Ena
Overtemp Restart	LoopA(B) FDIR	Inh
Overtemp Shutdown	LoopA(B) FDIR	Ena
PM Valve Shutdown	LoopA(B) FDIR	Ena
Inadvt PM Valve Restart	LoopA(B) FDIR	Inh
Pump Shutdown	LoopA(B) FDIR	Ena
Inadvt Shutdown Restart	LoopA(B) FDIR	Inh
PM Outlet Overpress	LoopA(B) FDIR	Ena
PM High Press Shutdown	LoopA(B) FDIR	Ena
PM Undertemp	LoopA(B) FDIR	Ena
Insufficient NH3	LoopA(B) FDIR	Ena
TRRJ Fail Response	LoopA(B) FDIR	Ena
Undertemp Restart	LoopA(B) FDIR	Inh
Auto Restart	LoopA(B) FDIR	Inh
HAC Undertemp	LoopA(B) FDIR	Ena
HX Mismatch	LoopA(B) FDIR	Ena
ATA Overpress	LoopA(B) FDIR	Ena
ATA Bellows Overpress	LoopA(B) FDIR	Ena
GPRV ECU Failed	LoopA(B) FDIR	Ena
S0 Undertemp Restart	LoopA(B) FDIR	Inh

## 20. CHANGING PCVP STATE

### NOTE

Upon PCVP Transition to Normal State, PCVP based FDIR becomes active.

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup: Loop A(B)  
PCVP Ops Data

LoopA(B) PCVP Ops Data

'Commands'

'PCVP Ops Data'

input values per Table 3

# ETCS LOOP A(B) ACTIVATION AND CHECKOUT

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**cmd** Set

Verify PCVP Operating State – Normal

## 21. SETTING GPRV TO NOMINAL OPERATING PRESSURE

### NOTE

The following procedure will vent nitrogen to space to lower loop pressure.

Using a GPRV setpoint of 2068 kPa, perform {2.506 CHANGE ETCS LOOP A(B) PRESSURE - AUTO}, all (SODF: TCS: NOMINAL: ETCS), then:

## 22. UPDATING FDI DATA (CLEAR WARM RESET COUNTER)

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup: Loop A(B)  
PCVP FDIR

Loop A(B) PCVP FDIR

'Commands'

'Limits'

If Warm Reset Count: 0 >>

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Commands'

**cmd** PCVP FDIR Data – Set

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup: Loop A(B)  
PCVP FDIR Data

LoopA(B) PCVP FDIR

'Commands'

'Limits'

Verify Warm Reset Count: 0

**ETCS LOOP A(B) ACTIVATION AND CHECKOUT**

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Table 2. Ground-Built PCVP Startup Ops Data Command Parameters  
(Op Nom: Upload Startup Ops Data 6.1)

	Parameter Name	Value	Notes
1	TEMP_CTRL_BAND	0.22222	Deg C
2	TEMP_TOL_BAND	0.16667	Deg C
3	POSITION_CTRL_BAND	4.0823	Kg/hr
4	POSITION_TOL_BAND	2.26796	Kg/hr
5	TEMP_RLC_ON_BAND	1.66667	Deg C
6	TEMP_RLC_OFF_BAND	0.27778	Deg C
7	FLOW_RLC_ON_BAND	408.233	Kg/hr
8	FLOW_RLC_OFF_BAND	272.155	Kg/hr
9	FLOW_CTRL_BAND	362.874	Kg/hr
10	FLOW_TOL_BAND	226.796	Kg/hr
11	FLOW_CTRL_GAIN	2.205	Kg/hr
12	FLOW_SETPOINT	2812.27	Kg/hr
13	TEMP_SETPOINT	6.1111	Deg C
14	PCVP_STATE	0	0 = Startup 1 = Standby 2 = Normal
15	TEMP_DWELL_TIME	10.0	Seconds
16	RLC_ACTIVATION_FLOW	2721.55	Kg/hr
17	TEMP_ACT_BAND_RAD	3.88889	Deg C
18	TEMP_ACT_BAND_BYP	0.55556	Deg C
19	RAD_BYP_CROSS_HYST_BAND	0.0	Deg C
20	BCV_STOP_HYST_POS	4.0824	
21	BCV_HYST_ACTIVE_TIME	4.0	Seconds
22	PREFILTER_GAIN	0.0	
23	PREFILTER_A0	1.667	
24	PREFILTER_A1	-1.667	
25	PREFILTER_B1	-0.833	

**ETCS LOOP A(B) ACTIVATION AND CHECKOUT**

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Table 3. Ground-Built PCVP Normal State Ops Data Command  
 Parameters for 6.1 deg C Setpoint  
 (Op Nom: Upload Normal State Ops Data 6.1)

	Parameter Name	Value	Notes
1	TEMP_CTRL_BAND	0.22222	Deg C
2	TEMP_TOL_BAND	0.16667	Deg C
3	POSITION_CTRL_BAND	4.08233	Kg/hr
4	POSITION_TOL_BAND	2.26796	Kg/hr
5	TEMP_RLC_ON_BAND	1.66667	Deg C
6	TEMP_RLC_OFF_BAND	.27778	Deg C
7	FLOW_RLC_ON_BAND	408.233	Kg/hr
8	FLOW_RLC_OFF_BAND	272.155	Kg/hr
9	FLOW_CTRL_BAND	362.874	Kg/hr
10	FLOW_TOL_BAND	226.796	Kg/hr
11	FLOW_CTRL_GAIN	2.205	Kg/hr
12	FLOW_SETPOINT	2812.27	Kg/hr
13	TEMP_SETPOINT	6.1111	Deg C
14	PCVP_STATE	2	0 = Startup 1 = Standby 2 = Normal
15	TEMP_DWELL_TIME	10.0	Seconds
16	RLC_ACTIVATION_FLOW	2721.55	Kg/hr
17	TEMP_ACT_BAND_RAD	3.88889	Deg C
18	TEMP_ACT_BAND_BYP	0.55556	Deg C
19	RAD_BYP_CROSS_HYST_BAND	0.0	Deg C
20	BCV_STOP_HYST_POS	4.0824	
21	BCV_HYST_ACTIVE_TIME	4.0	Seconds
22	PREFILTER_GAIN	0.0	
23	PREFILTER_A0	1.667	
24	PREFILTER_A1	-1.667	
25	PREFILTER_B1	-0.833	

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## CHANNEL 2/3 CRITICAL HEATER ACTIVATION

(ASSY OPS/12A.1/FIN) Page 1 of 3 pages

### OBJECTIVE:

This procedure activates all critical and nonredundant thermostatic and software controlled heater strings post Channel 2/3 power restoration.

#### 1. ACTIVATING P1/PTR HEATERS ON CHANNEL 2/3

Refer to Table 1.

Table 1. P1/PTR Thermostatically Controlled Heaters

RPCM [X]	RPC [Y]	Load
P12B A	02	Video Port 9 Camera Htr
P12B A	16	Video Port 9 Lum Htr
P12B C	04	P1 Misc Thermal Group 1 Htrs
P12B C	05	P1 Misc Thermal Group 2 Htrs
P12B C	06	P1 Misc Thermal Group 3 Htrs
P12B C	07	P1 Misc Thermal Group 4 Htrs

PCS

```

P1: EPS: RPCM [X]: RPC [Y]
  [RPCM_ [X]_ RPC_ [Y]]
  √Close Cmd – Ena
  cmd RPC Position – Close (Verify – Cl)
Repeat
    
```

#### 2. ACTIVATING THERMOSTATICALLY CONTROLLED HEATERS ON S0 AND MT CHANNEL 2/3

##### 2.1 S0 Channel 2/3 Thermostatically Controlled Heaters

Refer to Table 2.

Table 2. S0 Thermostatically Controlled Heaters

RPCM [X]	RPC [Y]	Load
S02B C	03	EV-CPDS Htr
S02B C	12	Video Port 13 Lum Htr
S02B C	13	Video Port 13 Camera Htr
S02B E	02	Video EVSU1 Htr
S02B E	03	Video EVSU3 Htr
S03A E	02	TUS-2 VSC Pwr 1
S03A E	04	TUS-2 VSC Htr-1
S03A F	02	TUS-1 VSC Pwr 2
S03A F	04	TUS-1 VSC Htr-2
S03A E	18	Power Bus MT3A
MT3A A	08	IUA-1 Htr-2, IUA-2 Htr-1, and UMA Htr-2
MT3A A	12	LTU Htr-2
MT3A A	13	AMP-1 Htr-2 and Op Pwr
MT3A A	14	AMP-2 Htr-2 and Op Pwr
MT3A A	16	LDU Htr-2 and RSU Htr-2

## CHANNEL 2/3 CRITICAL HEATER ACTIVATION

(ASSY OPS/12A.1/FIN) Page 2 of 3 pages

S0: EPS: RPCM [X]: RPC [Y]  
 RPCM [X] RPC [Y]

√Close Cmd – Ena

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

Repeat

### NOTE

Only 1 string of GPS Antenna Assembly heaters should be activated at any time. √ADCO to determine if the following GPS Antenna Assembly Heaters should be activated.

### 2.2 GPS Antenna Assembly Heaters

Refer to Table 3.

Table 3. S0 GPS Antenna Assembly Heaters

RPCM [X]	RPC [Y]	Load
S02B E	05	GPS Antenna 1 (str 2)
S02B E	06	GPS Antenna 2 (str 2)
S02B E	07	GPS Antenna 3 (str 2)
S02B E	08	GPS Antenna 4 (str 2)

S0: EPS: RPCM [X]: RPC [Y]  
 RPCM [X] RPC [Y]

√Close Cmd – Ena

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

Repeat

### 3. ACTIVATING THERMOSTATICALLY CONTROLLED HEATERS ON S1 CHANNEL 2/3

Refer to Table 4.

Table 4. S1 Thermostatically Controlled Heaters

RPCM [X]	RPC [Y]	Load
S12B A	16	Video Port 3 Lum Htr
S12B A	04	CETA Light S1-1 Htr <b>**√MCC-H to determine if component installed yet**</b>
S12B A	02	Video Port 3 Camera Htr
S12B B	14	S1 Thermal Group 1 Htrs
S12B B	15	S1 Thermal Group 2 Htrs
S12B B	16	S1 Thermal Group 3 Htrs
S13A G	11	STR MDM Htr

## CHANNEL 2/3 CRITICAL HEATER ACTIVATION

(ASSY OPS/12A.1/FIN) Page 3 of 3 pages

S1: EPS: RPCM [X]: RPC [Y]  
RPCM [X] RPC [Y]  
√Close Cmd – Ena  
**cmd** RPC Position – Close (Verify – Cl)  
Repeat

### 4. ACTIVATING MT SOFTWARE CONTROLLED HEATERS

MSS: MT: Thermal: RPCM MT3A Bracket Heater Icon

RPCM MT 3A Bracket Heater

'Htr Availability'

**cmd** Enable – Ena (Verify – ENA)

**cmd** Control Mode State – Closed Loop (Verify – Closed Loop)

MSS: MT: Thermal: TUS2 Gearbox Heater Icon

MT TUS 2 Gearbox Heater

'Htr Availability'

**cmd** Enable – Ena (Verify – ENA)

**cmd** Control Mode State – Closed Loop (Verify – Closed Loop)

### 5. ENABLING HTRS CONTROLLED BY LOWER SETPOINTS

MCC-H

Enable heaters in Table 5 for closed loop control after heaters with elevated setpoints are maintaining temperatures above the lower setpoint of the associated heater.

Refer to Table 5.

Table 5. Lower Setpoints

Required Temp (°C)
Utility Rail P11A Oper Heater > -30
Utility Rail P12B Surv Heater > -30
Loop B Accumulator Heater 2 > -34
Utility Rail P14B Surv Heater > -30
Loop A PM Accumulator Heater 2 > -34
Loop A NTA Tank Heater 2 > -28
Utility Rail S13A Surv Heater > -30
Utility Rail S14B Surv Heater > -30
Capture Latch S1-S3 Heater-1 > -38
Utility Rail S12B Ops Heater > -30

#### NOTE

The Survival Heater for the S11A Utility Rail defaults with control = inh and is left in that state upon recovery due to a failed temperature sensor. If enabled, the heater will transition to open loop control which is desirable only for loss of control/power to the operational heater.

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# CHANNEL 2/3 NON-CRITICAL HEATER ACTIVATION

(ASSY OPS/12A.1/FIN) Page 1 of 1 page

## OBJECTIVE:

This procedure activates all noncritical or redundant heater strings. It also inhibits the ETCS NH3 umbilical heaters.

### NOTE

All steps in this procedure will nominally be executed via THOR command script.

1. ACTIVATING ETCS LOOP B SECONDARY RAD BEAM HEATERS  
Perform {1.505 ETCS LOOP A(B) SECONDARY RADIATOR BEAM HEATER ACTIVATION}, all (SODF: TCS: ACTIVATION AND CHECKOUT: ETCS), then:
2. ACTIVATING REDUNDANT THERMOSTATIC HEATERS POWERED FROM NODE 1  
Refer to Table 1.

Table 1.

RPCM [X]	RPC [Y]	Load
N13BA	03	ESP 1 Primary Htrs
N13BB	11	Z1 Dome Htr 2
N1RS2B	06	ESP 2 Primary Htr
N1RS2B	10	ESP 2 Primary Htr
N1RS2B	11	ESP 2 Primary Htr

NODE1: EPS: RPCM [X]: RPC [Y]

RPCM\_[X]\_RPC\_[Y]

√Close Cmd – Ena

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

Repeat

3. INHIBITING LOOP A S0 NH3 UMBILICAL HEATERS

PCS

S0: TCS: S0 Htr Availability

S0 Htr Availability

'Command'

'Loop A'

'Htr[X] Availability' where [X] =

**cmd** Inhibit – Arm (√ – √)

**cmd** Inhibit – Inh

√Htr[X] Availability – Inh

Repeat

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# ETCS LOOP A(B) CONFIGURATION VERIFICATION

(ASSY OPS/12A.1/FIN) Page 1 of 4 pages

## OBJECTIVE:

Configures the ETCS valves and loop pressures to be able to support ETCS activation.

PCS 1. VERIFYING SOFTWARE CONFIGURATION  
S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup  
Loop A(B) Manual Startup  
'Commands'

√EXT ETCS Manager – Ena  
√S1 1(P1 2) PCVP Comm – Ena (√ – Ena)  
√S1 1 (P1 2) ETCS PTC – Ena

**cmd** S0 1 (S0 2) HAC – Ena

## 2. VERIFYING ATA VALVE POSITIONS

### CAUTION

The valves listed below must complete the transition to the desired position. If the valve stops when in transition and is commanded in a different direction, it will be damaged.

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup  
Loop A(B) Manual Startup  
'Telemetry'  
'Valves'

√ATA Vent Vlv – Closed

### CAUTION

The Vent Valve must be closed prior to opening the Isolation valves. Otherwise, ammonia will be vented overboard.

√ATA Tank 1 Isol Vlv – Open  
√ATA Tank 2 Isol Vlv – Open

## 3. CONFIGURING NTA VALVE

S1(P1): TCS: NTA: Loop A(B) NTA Valves  
Loop A(B) NTA Valves  
'Commands'  
'NTA Valves'

**cmd** Both Isol Valves Close – Arm (√ – √)  
**cmd** Both Isol Valves Close – Closed

√Isol Valve 1 and 2 Position – Closed

# ETCS LOOP A(B) CONFIGURATION VERIFICATION

(ASSY OPS/12A.1/FIN) Page 2 of 4 pages

NOTE

The NTA Isolation Valves must be closed in order to open the N2 Supply Valve.

S1(P1): TCS: NTA: Loop A(B) NTA Valves

Loop A(B) NTA Valves

'Commands'

'NTA Valves'

**cmd** N2 Supply Valve Open – Arm ( $\surd$  –  $\surd$ )

**cmd** N2 Supply Valve Open – Open

$\surd$ N2 Supply Valve Position – Open

NOTE

The NTA Isol Valves will not open unless the GPRV Out Pressure = highest ATA Tank in pressure  $\pm$  97 kPa.

S1(P1): TCS: NTA: Loop A(B) NTA Valves

Loop A(B) NTA Valves

'Commands'

'NTA Valves'

**cmd** Both Isol Valves Open – Arm ( $\surd$  –  $\surd$ )

**cmd** Both Isol Valves Open – Open

$\surd$ Isol Valve 1 and 2 Position – Open

\*\*\*\*\*  
\* If the Isol Valves will not open  
\* | Perform {2.508 INCREASE ETCS LOOP A(B) PRESSURE –  
\* | MANUAL}, steps 3 and 4 (SODF: TCS: NOMINAL: ETCS),  
\* | then:  
\*\*\*\*\*

#### 4. SETTING LOOP STARTUP PRESSURE

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Telemetry'

'PCVP'



# ETCS LOOP A(B) CONFIGURATION VERIFICATION

(ASSY OPS/12A.1/FIN) Page 3 of 4 pages

If PM Inlet Press  $\geq$  2592 kPa, then:

Go to step 5.

If PM Inlet Press  $<$  2592 kPa, then:

S1(P1): TCS: NTA: Loop A(B) NTA Valves

Loop A(B) NTA Valves

'Commands'

'NTA Valves'

**cmd** N2 Supply Valve Open – Arm ( $\surd$  –  $\surd$ )

**cmd** N2 Supply Valve Open – Open

$\surd$ N2 Supply Valve Position – Open

'GPRV'

'Setpoint'

sel Press Source: 5 – PM Inlet

$\surd$ Press Source – PM Inlet

input Setpoint – 2 6 8 9 kPa

**cmd** Setpoint – Set

## NOTE

GPRV Software will select a setpoint value that is one step higher than the current pressure (not the commanded setpoint). When the loop pressure reaches the setpoint value, a higher setpoint (the next step value) will be commanded by software. This process will continue until the commanded setpoint  $\pm$  97 kPa is reached.

'Telemetry'

'PM'

Monitor Inlet Press value as it approaches 2689 kPa.

## NOTE

When the PM Inlet pressure value reaches 2592 kPa, the ETCS Manager App Busy flag will clear.

S1(P1): TCS: Loop A(B) Software: Loop A(B) ETCS Manager Details

Loop A(B) ETCS Manager Details

'Telemetry'

'ETCS Manager'

'Application Layer Response'

$\surd$ App Busy – blank

# ETCS LOOP A(B) CONFIGURATION VERIFICATION

(ASSY OPS/12A.1/FIN)

Page 4 of 4 pages

## 5. VERIFYING PM VALVE POSITIONS

### CAUTION

The valves listed below must complete the transition to the desired position. If the valve stops when in transition and is commanded in a different direction, it will be damaged.

S1(P1): TCS: Loop A(B) Software: Loop A(B) Manual Startup

Loop A(B) Manual Startup

'Telemetry'

'Valves'

√PM Byp Vlv – Open

√PM Inlet Vlv – Open

√PM Rad Rtn Isol Vlv – Open

'Commands'

**cmd** PM Out Isol Valve Open – Arm (√ – X)

**cmd** PM Out Isol Valve Open – Open

√PM Out Isol Valve Open – Open

## 6. RECONFIGURING SOFTWARE

S1(P1): TCS: Loop A(B) Software: Loop A(B) Logical Thread

Loop A(B) Logical Thread

'Commands'

'S1(P1) MDM'

**cmd** S1 1 (P1 2) ETCS PTC – Inh (√ – Inh)

**cmd** S1 1(P1 2) PCVP Comm – Inh (√ – Inh)

'S0 1(S0 2) MDM'

**cmd** S0 1 (S0 2) ETCS HAC – Inh (√ – Inh)

# CHANNEL 1/4 POWERDOWN TRUSS HEATER PREP

(ASSY OPS/12A.1/FIN)

Page 1 of 2 pages

## OBJECTIVE:

The purpose of this procedure is verify redundant truss heaters are powered in preparation for a Channel 1/4 powerdown.

### 1. VERIFYING PTR SDO CARD AND RBVM HEATERS

PCS

P1: EPS

'RPCM P12B'

sel C

RPCM\_P12B\_C

sel RPC [X] where [X] = 4 5 6

√RPC Position – CI

Repeat

P1: CDH: PTR MDM: SDO 3

PTR SDO 3

'Ch'

For [X] = 2 3 7 8 12 13

Verify Ch [X] – X

Repeat

### 2. VERIFYING THERMOSTATICALLY CONTROLLED HEATERS ON S1 CHANNEL 2/3

Refer to Table 1.

Table 1.

RPCM [X]	RPC [Y]	Load
S12B A	16	Video Port 3 Lum Htr
S12B A	02	Video Port 3 Camera Htr
S12B B	14	S1 Thermal Group 1 Htrs
S12B B	15	S1 Thermal Group 2 Htrs
S12B B	16	S1 Thermal Group 3 Htrs
S13A G	11	STR MDM Htr

S1: EPS: RPCM [X]: RPC [Y]

RPCM\_[X]\_RPC\_[Y]

√RPC Position – CI

Repeat

# CHANNEL 1/4 POWERDOWN TRUSS HEATER PREP

(ASSY OPS/12A.1/FIN)

Page 2 of 2 pages

## 3. VERIFYING THERMOSTATICALLY CONTROLLED HEATERS ON S0 AND MT CHANNEL 2/3

Refer to Table 2.

Table 2.

RPCM [X]	RPC [Y]	Load
S02B C	03	EV-CPDS Htr
S02B C	12	Video Port 13 Lum Htr
S02B C	13	Video Port 13 Camera Htr
S02B E	02	Video EVSU1 Htr
S02B E	03	Video EVSU3 Htr
S02B E	05	GPS Antenna 1 (str 2)
S02B E	06	GPS Antenna 2 (str 2)
S02B E	07	GPS Antenna 3 (str 2)
S02B E	08	GPS Antenna 4 (str 2)
S03A E	04	TUS-2 VSC Htr-1
S03A F	04	TUS-1 VSC Htr-2
S03A E	18	Power Bus MT3A
MT3A A	08	IUA-1 Htr-2, IUA-2 Htr-1, and UMA Htr-2
MT3A A	12	LTU Htr-2
MT3A A	13	AMP-1 Htr-2 and Op Pwr
MT3A A	14	AMP-2 Htr-2 and Op Pwr
MT3A A	16	LDU Htr-2 and RSU Htr-2

S0: EPS: RPCM [X]: RPC [Y]

RPCM\_[X]\_RPC\_[Y]

√RPC Position – CI

Repeat

## 4. VERIFYING THERMOSTATICALLY CONTROLLED HEATERS ON P1 CHANNEL 2/3

Refer to Table 3.

Table 3.

RPCM [X]	RPC [Y]	Load
P12B A	02	Video Port 9 Camera Htr
P12B A	16	Video Port 9 Lum Htr
P12B C	07	P1 Misc Thermal Group 4 Htrs

P1: EPS: RPCM [X]: RPC [Y]

RPCM\_[X]\_RPC\_[Y]

√RPC Position – CI

Repeat

# CHANNEL 1/4 CRITICAL HEATER ACTIVATION

(ASSY OPS/12A.1/FIN) Page 1 of 4 pages

## OBJECTIVE:

This procedure activates all critical and nonredundant thermostatic and software controlled heater strings post Channel 1/4 power restoration.

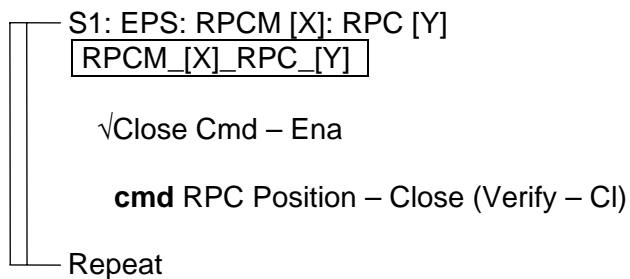
### 1. ACTIVATING S1 THERMOSTATICALLY CONTROLLED HEATERS S-BAND STRING 1 HEATERS AND FPMU HEATER

Refer to Table 1.

Table 1. S1 Thermostatically Controlled Heaters

RPCM [X]	RPC [Y]	Load
S11A B	02	S-Band1 BSP Htr (S1)
S11A B	06	CETA Light S1-2 Htr
S11A B	12	S-Band1 RFG Htr (S1)
S11A B	15	S-Band1 XPDR Htr (S1)
S11A A	2	Video Port 2 FPMU Surv Htr (Camera Htr)
S11A A	16	Video Port 2 FPMU Cleaning Lamp (Camera Lum Htr) **√MCC-H to determine if component installed yet**
S11A C	4	S1 Misc Thermal Group 1 Htrs
S11A C	5	S1 Misc Thermal Group 2 Htrs
S11A C	6	S1 Misc Thermal Group 3 Htrs
S11A C	7	S1 Misc Thermal Group 4 Htrs

PCS



# CHANNEL 1/4 CRITICAL HEATER ACTIVATION

(ASSY OPS/12A.1/FIN) Page 2 of 4 pages

## 2. ACTIVATING THERMOSTATICALLY CONTROLLED HEATERS ON S0 AND MT CHANNEL 1/4

### 2.1 S0 Channel 1/4 Thermostatically Controlled Heaters Refer to Table 2.

Table 2. S0 Thermostatically Controlled Heaters

RPCM [X]	RPC [Y]	Load
S01A C	15	CETA Light LAB Htr
S01A E	02	Video EVSU2 Htr
S04B E	02	TUS-2 VSC Pwr-2
S04B E	04	TUS-2 VSC Htr-2
S04B F	02	TUS-1 VSC Pwr-1
S04B F	04	TUS-1 VSC Htr-1
S04B F	17	Power Bus MT4B
MT4B A	08	IUA-1 Htr-1, IUA-2 Htr-2 and UMA Htr-1
MT4B A	12	LTU Htr-1
MT4B A	13	AMP-1 Htr-1 and Op Pwr
MT4B A	14	AMP-2 Htr-1 and Op Pwr
MT4B A	16	LDU Htr-1 and RSU Htr-1

S0: EPS: RPCM [X]: RPC [Y]  
    RPCM [X]\_RPC [Y]  
    √Close Cmd – Ena  
    **cmd** RPC Position – Close (Verify – Cl)  
Repeat

# CHANNEL 1/4 CRITICAL HEATER ACTIVATION

(ASSY OPS/12A.1/FIN) Page 3 of 4 pages

## NOTE

Only 1 string of GPS Antenna Assembly heaters should be activated at any time. √ADCO to determine if the following GPS Antenna Assembly Heaters should be activated.

### 2.2 GPS Antenna Assembly Heaters

Refer to Table 3.

Table 3. S0 GPS Antenna Assembly Heaters

RPCM [X]	RPC [Y]	Load
S01A E	04	GPS Antenna 1 (str 1)
S01A E	05	GPS Antenna 2 (str 1)
S01A E	06	GPS Antenna 3 (str 1)
S01A E	07	GPS Antenna 4 (str 1)

S0: EPS: RPCM [X]: RPC [Y]

RPCM [X]\_RPC [Y]

√Close Cmd – Ena

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

Repeat

### 3. ACTIVATING THERMOSTATICALLY CONTROLLED P1 HEATERS ON P1 CHANNEL 1/4

Refer to Table 4.

Table 4. P1 Thermostatically Controlled Heaters

RPCM [X]	RPC [Y]	Load
P11A B	14	P1 Thermal Group 1 Htrs
P11A B	15	P1 Thermal Group 2 Htrs
P11A B	16	P1 Thermal Group 3 Htrs
P11A B	12	Video Port 7 Camera Htr
P11A B	02	Video Port 7 Lum Htr
P11A A	02	Video Port 8 WETA Htr 1
P11A A	16	Video Port 8 WETA Htr 2
P14B G	11	PTR MDM Htr

P1: EPS: RPCM [X]: RPC [Y]

RPCM [X]\_RPC [Y]

√Close Cmd – Ena

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

Repeat

# CHANNEL 1/4 CRITICAL HEATER ACTIVATION

(ASSY OPS/12A.1/FIN) Page 4 of 4 pages

## 4. ACTIVATING MT SOFTWARE CONTROLLED HEATERS

MSS: MT: Thermal: RPCM MT4B Bracket Heater Icon

RPCM MT 4B Bracket Heater

'Htr Availability'

**cmd** Enable – Ena (Verify – ENA)

**cmd** Control Mode State – Closed Loop (Verify – Closed Loop)

MSS: MT: Thermal: TUS1 Gearbox Heater Icon

MT TUS 1 Gearbox Heater

'Htr Availability'

**cmd** Enable – Ena (Verify – ENA)

**cmd** Control Mode State – Closed Loop (Verify – Closed Loop)

## 5. ENABLING HTRs CONTROLLED BY LOWER SETPOINTS

**MCC-H**

Enable heaters in Table 5 for closed loop control after heaters with elevated setpoints are maintaining temperatures above the lower setpoint of the associated heater.

Table 5. Lower Setpoints

Required Temp (°C)
Utility Rail P11A Oper Htr > -30
Utility Rail P12B Surv Htr > -30
Loop B Accumulator Htr 2 > -34
Utility Rail P14B Surv Htr > -30
Loop A PM Accumulator Htr 2 > -34
Loop A NTA Tank Htr 2 > -28
Utility Rail S13A Surv Htr > -30
Utility Rail S14B Surv Htr > -30
Capture Latch S1-S3 Htr-1 > -38
Utility Rail S12B Ops Htr > -30



# CHANNEL 1/4 NON-CRITICAL HEATER ACTIVATION

(ASSY OPS/12A.1/FIN) Page 1 of 2 pages

## OBJECTIVE:

The purpose of this procedure is to activate all noncritical or redundant heater strings. Additionally, it will inhibit the ETCS NH3 umbilical heaters.

### NOTE

All steps in this procedure will nominally be executed via THOR command script.

1. ACTIVATING ETCS LOOP A SECONDARY RAD BEAM HEATERS  
Perform {1.505 ETCS LOOP A(B) SECONDARY RADIATOR BEAM HEATER ACTIVATION}, all (SODF: TCS: ACTIVATION AND CHECKOUT: ETCS), then:
2. ACTIVATING REDUNDANT THERMOSTATIC HEATERS POWERED FROM NODE 1  
Refer to Table 1.

Table 1.

RPCM [X]	RPC [Y]	Load
N14BB	03	Z1 Dome Htr 1
N1RS1B	04	ESP 1 Secondary Htrs

PCS

NODE1: EPS: RPCM [X]: RPC [Y]  
RPCM\_[X]\_RPC\_[Y]  
  
√Close Cmd – Ena  
  
**cmd** RPC Position – Close (Verify – Cl)  
  
Repeat

3. ACTIVATING REDUNDANT THERMOSTATIC HEATERS POWERED FROM S0  
Refer to Table 2.

Table 2.

RPCM [X]	RPC [Y]	Load
S04BF	10	ESP 2 Sec Htrs
S04BF	12	ESP 2 Sec Htrs
S04BF	13	ESP 2 Sec Htrs

S0: EPS: RPCM [X]: RPC [Y]  
RPCM\_[X]\_RPC\_[Y]  
  
√Close Cmd – Ena  
  
**cmd** RPC Position – Close (Verify – Cl)  
  
Repeat

# CHANNEL 1/4 NON-CRITICAL HEATER ACTIVATION

(ASSY OPS/12A.1/FIN) Page 2 of 2 pages

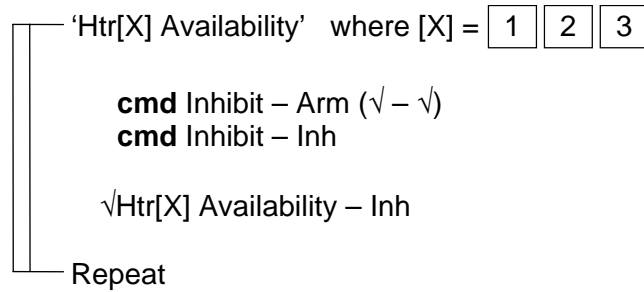
## 4. INHIBITING LOOP B S0 NH3 UMBILICAL HEATERS

S0: TCS: S0 Htr Availability

S0 Htr Availability

'Command'

'Loop B'



# AIRLOCK POWER RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 1 of 7 pages

## OBJECTIVE:

Reconfigure Airlock Avionics Rack Umbilical Interface Panel to swap Power Bus Channels A and B on FD5 and FD7 in preparation for channel powerdowns. The procedure requires powering down the entire Airlock.

## LOCATION:

A/L1F1 - Airlock Avionics Rack Umbilical Interface Panel (UIP)

## DURATION:

30 minutes (Does not include time for graceful Airlock equipment powerdown)

## CREW:

One

## TOOLS:

Mini-Maglite

DCS 760 Camera

ISS IVA Toolbox:

Drawer 5:

Static Wrist Tether

## REFERENCED PROCEDURE(S):

{5.420 RPCM POWER ON RESET} (SODF: GND SYSTEMS: EPS: CORRECTIVE)

### 1. INHIBITING RPCM RT FDIR AND AIRLOCK SAFING

#### 1.1 CDH Summary: Primary INT

Primary Int MDM

sel LB SEPS N2-14

sel RT Status

LB SEPS N2 14 RT Status

'25 RPCM LA1A4A\_F'

√RT FDIR Status – Inh

'RT FDIR Status'

**cmd Inhibit FDIR Execute**

Primary Int MDM

sel LB SEPS HAB 23

sel RT Status

LB SEPS HAB 23 RT Status

'24 RPCM LA2A3B D'

√RT FDIR Status – Inh

'RT FDIR Status'

**cmd** Inhibit FDIR **Execute**

**WARNING**

Failure to remove power will result in electrical shock.

**CAUTION**

All equipment in Airlock must be powered down before removing power from upstream RPCMs.

NOTE

1. Swapping Airlock Power Buses will require swapping power supplied to Bus A,B loads listed in Table 1.
2. Be prepared to use Mini-Maglite. The lights in the Airlock will be turned off in step 1.

# AIRLOCK POWER RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 3 of 7 pages

Table 1. Airlock Power Allocation Configurations.  
(FD7 initial configuration shown in parentheses.)

LAB RPCM	Bus	Airlock RPCM	Loads
LA1A4A F RPC 3 (LA2A3B D RPC 3)	B	AL1A4A A	Depressurization Pump
		AL1A4A B	Battery Charger 1 to 4 Primary A/L Shell Htr 1 to 5 Metox Regen Controller ORCA
LA2A3B D RPC 3 (LA1A4A F RPC 3)	A	AL2A3B A	ATU 4 (EMU 1), ATU 6 CVIU 7 GLA AL1OF1, AL1F3, AL1A3 ELPS Airlock Fwd A/L UOP A/L MDM A/L PCA A/L Cab Smoke Detector
		AL2A3B B	ATU 5 (EMU 2) EMU ACP A/L CCAA EIB A/L CCAA TCCV A/L CCAA H2O Separator A/L Duct Smoke Detector O2 LP Supply Valve O2 HP Supply Valve N2 Supply Valve A/L CCAA Fan GLA AL10A1 ELPS Airlock Fwd Airlock PSA

## 1.2 Removing Input Power to Airlock

PCS

Airlock: EPS: RPCM LA1A4A F RPC 3

RPCM LA1A4A F RPC 3

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

**cmd** Close Cmd – Inhibit (Verify – Inh)

sel RPCM LA2A3B D RPC 3

RPCM LA2A3B D RPC 3

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

**cmd** Close Cmd – Inhibit (Verify – Inh)

Umbilical Interface Panel Closeout

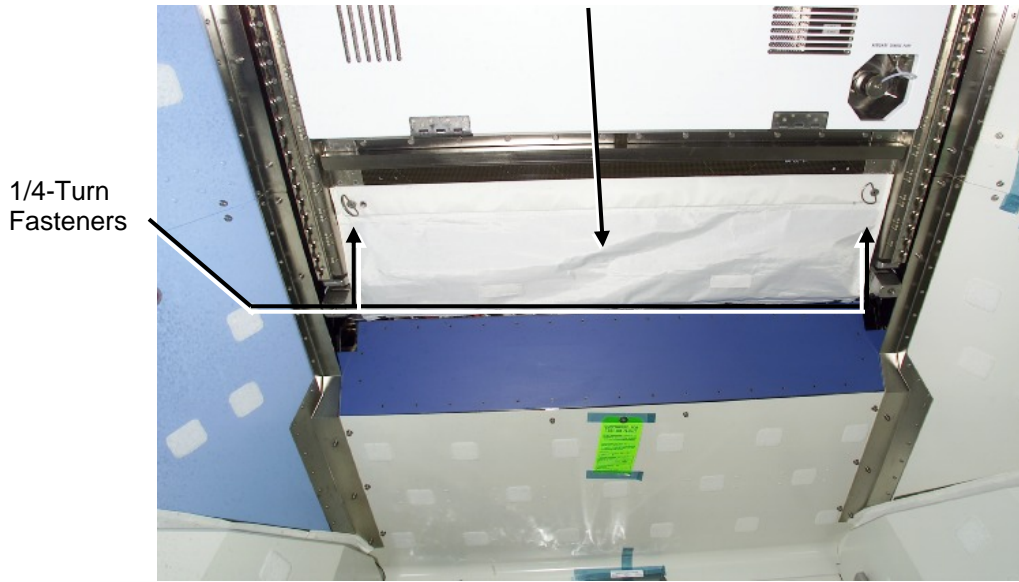


Figure 1.- Airlock Avionics Rack UIP Closeout.

**2. FD5 RECONFIGURATION (CHANNEL 2/3 POWERDOWN PREP)**

<b>CAUTION</b>
Equipment contains parts sensitive to damage by Electrostatic Discharge (ESD).

- 2.1 **On MCC-H GO**, open UIP Closeout, 1/4-turn fasteners (two). Refer to Figure 1.
- 2.2 Don Static Wrist Tether. Secure clip to unpainted metal surface.

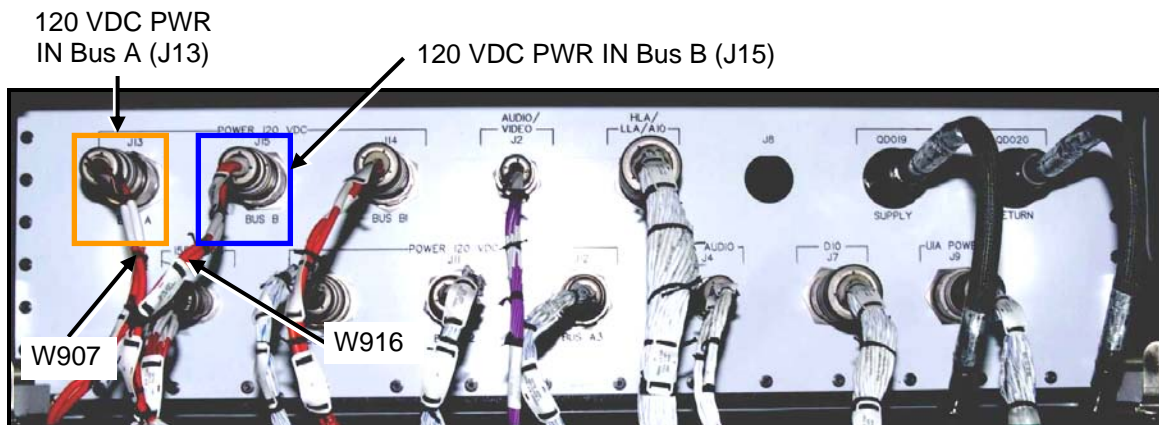


Figure 2.- Avionics Rack Umbilical Interface Panel FD5 Initial Configuration (Nominal Increment Ops Configuration).

## AIRLOCK POWER RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 5 of 7 pages

- 2.3 W907P2 ←|→ J13 Bus A Avionics Rack UIP  
W916P2 ←|→ J15 Bus B Avionics Rack UIP  
Refer to Figure 2.
- 2.4 W907P2 →|← J15 Bus B Avionics Rack UIP  
W916P2 →|← J13 Bus A Avionics Rack UIP  
Refer to Figure 2.
- 2.5 Doff Static Wrist Tether.
- 2.6 Check for FOD around work area within 1 m radius.
- 2.7 Photo-document new configuration (DCS 760 Camera).
- 2.8 Close UIP Closeout, 1/4-turn fasteners (two).  
Refer to Figure 1.
- 2.9 ISS ↓ **MCC-H** reconfiguration complete
- 2.10 Stow tools, equipment.

### 3. FD7 RECONFIGURATION (CHANNEL 1/4 POWERDOWN PREP)

#### CAUTION

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

- 3.1 **On MCC-H GO**, open UIP Closeout, 1/4-turn fasteners (two).  
Refer to Figure 1.
- 3.2 Don Static Wrist Tether.  
Secure clip to unpainted metal surface.

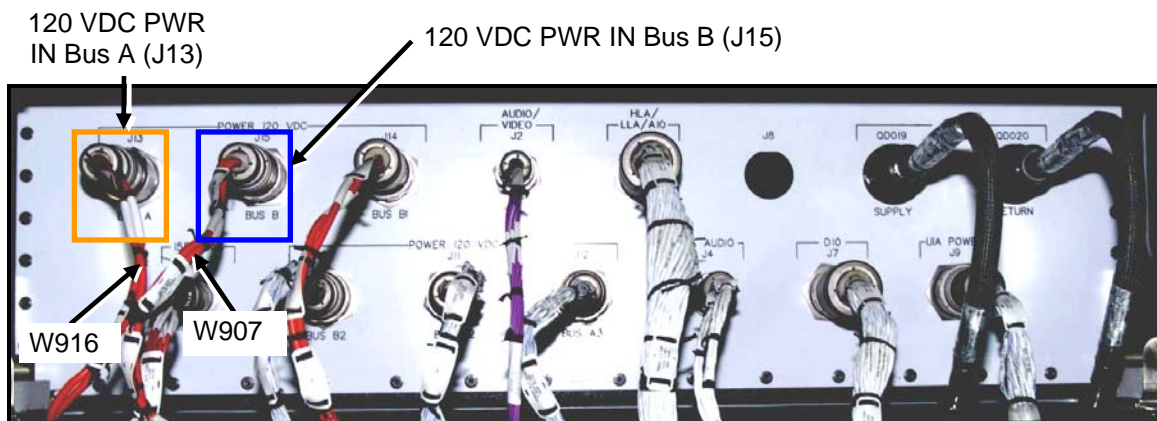


Figure 3.- Avionics Rack Umbilical Interface Panel FD7 Initial Configuration.

## AIRLOCK POWER RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 6 of 7 pages

- 3.3 W907P2 ←|→ J15 Bus B Avionics Rack UIP  
W916P2 ←|→ J13 Bus A Avionics Rack UIP  
Refer to Figure 3.
- 3.4 W907P2 →|← J13 Bus A Avionics Rack UIP  
W916P2 →|← J15 Bus B Avionics Rack UIP  
Refer to Figure 3.
- 3.5 Doff Static Wrist Tether.
- 3.6 Check for FOD around work area within 1 m radius.
- 3.7 Photo-document new configuration (DCS 760 Camera).
- 3.8 Close UIP Closeout, 1/4-turn fasteners (two).  
Refer to Figure 1.
- 3.9 ISS ↓ **MCC-H** reconfiguration complete
- 3.10 Stow tools, equipment.

### 4. CHECKOUT, RESTORE AIRLOCK, AND REENABLE RPCM RT FDIR

PCS

#### 4.1 Powering Up Airlock

Airlock: EPS: RPCM LA1A4A F RPC 3

RPCM LA1A4A F RPC 3

**cmd** Close Cmd – Enable (Verify – Ena)

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

sel RPCM LA2A3B D RPC 3

RPCM LA2A3B D RPC 3

**cmd** Close Cmd – Enable (Verify – Ena)

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

#### 4.2 Airlock: EPS: Lights

Airlock Lights

**cmd** 'AIR1OF1' RPCM AL2A3B A RPC 4 Position – Close  
(Verify – Cl)

**cmd** 'AIR1F3' RPCM AL2A3B A RPC 12 Position – Close  
(Verify – Cl)

**cmd** 'AIR1A2' RPCM AL2A3B A RPC 13 Position – Close  
(Verify – Cl)

**cmd** 'AIR1OA1' RPCM AL2A3B B RPC 9 Position – Close  
(Verify – Cl)



## AIRLOCK POWER RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 7 of 7 pages

### 4.3 CDH Summary: Primary INT

Primary Int MDM

sel LB SEPS N2-14  
sel RT Status

LB SEPS N2 14 RT Status

'25 RPCM LA1A4A\_F'  
'RT FDIR Status'

**cmd Enable FDIR Execute**

Primary Int MDM

sel LB SEPS HAB 23  
sel RT Status

LB SEPS HAB 23 RT Status

'24 RPCM LA2A3B D'  
RT FDIR Status'

**cmd Enable FDIR Execute**

### **MCC-H** 5. CLEARING DOWNSTREAM POWER ON RESETS

For RPCMs AL1A4A A,B and AL2A3B A,B, go to {5.420 RPCM POWER ON RESET}, all (SODF: GND SYSTEMS: EPS: CORRECTIVE).

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# LAB SYSTEM RACK POWER JUMPER INSTALLATION LAB1D3 TO LAB1D5 (AV1 RACK)

(ASSY OPS/12A.1/FIN) Page 1 of 3 pages

## OBJECTIVE:

Install the Lab System Rack Power Jumper to provide power to CC 2 MDM for redundancy during power reconfigurations (2/3 channel powerdown). Rack power is supplied from Payload Rack (LAB1D3) to Avionics Rack 1 (LAB1D5).

## LOCATION:

LAB1

Stowed: √Inventory Management System

## DURATION:

25 minutes

10 minutes to safe

15 minutes to access, install jumper

## CREW:

One

## PARTS:

Lab System Rack Power Jumper (W8226) P/N 683-28226-1

## MATERIALS:

Velcro Straps

## TOOLS:

DCS760 Camera

ISS IVA TOOLBOX

Drawer 4:

Connector Pliers (if required)

## **WARNING**

Failure to remove power can result in electrical shock hazard.

## NOTE

1. The following Caution message will be received after Avionics Rack 1 (LAB1D5) is safed:  
**'RPCM LAD52B\_A Loss of Comm-LAB'**
2. No action required. This message will return to normal once the jumper is installed and Avionics Rack 1 (LAB1D5) is checked out.

## 1. SAFING

**MCC-H**

1.1 Safing Payload Rack LAB1D3 J1 Connector

US Lab: EPS: Rack Power: Rack Power 1

Rack Power 1

'Rack Power LAB1D3'

sel RPCM LA1A4A F RPC 1

# LAB SYSTEM RACK POWER JUMPER INSTALLATION LAB1D3 TO LAB1D5 (AV1 RACK)

(ASSY OPS/12A.1/FIN) Page 2 of 3 pages

RPCM LA1A4A F RPC 01

√RPC Position – Open (Verify – Op)

**cmd** Close Cmd Inhibit (Verify – Inh)

## 1.2 Safing LAB1D5 Avionics Rack 1

US Lab: EPS: Rack Power: Rack Power 2

Rack Power 2

'Rack Power LAB1D5'

sel RPCM LA2B C RPC 2

RPCM LA2B C RPC 02

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

**cmd** Close Cmd Inhibit (Verify – Inh)

### NOTE

Installation of the jumper will begin at the LAB1D5 Utility Interface Panel (UIP) and route forward to the LAB1D3 Standoff UIP (Z-Panel). Refer to Figure 1.

(View from the Forward Endcone looking Aft.)

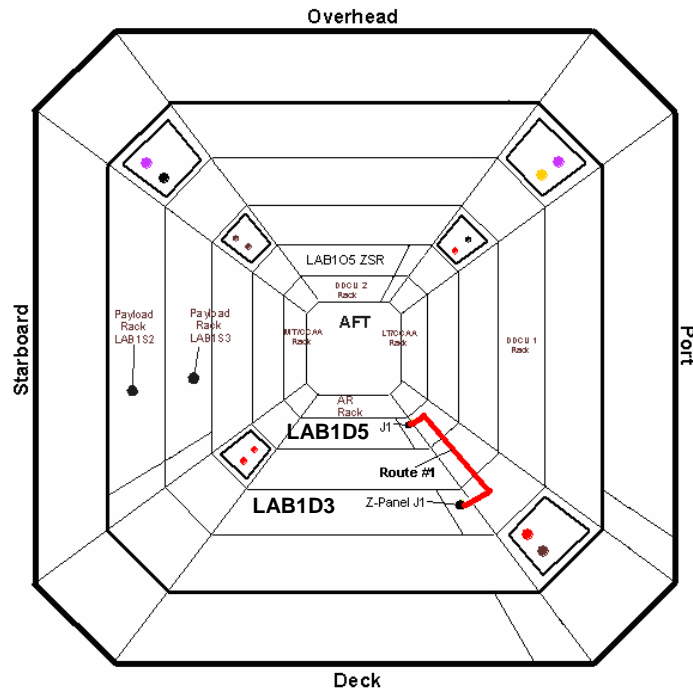


Figure 1.- Lab System Rack Power Jumper Route From LAB1D5 UIP to LAB1D3 Standoff UIP.

# LAB SYSTEM RACK POWER JUMPER INSTALLATION LAB1D3 TO LAB1D5 (AV1 RACK)

(ASSY OPS/12A.1/FIN) Page 3 of 3 pages

## 2. INSTALLING JUMPER

- LAB1D5
- 2.1 Locate the Avionics Rack 1 UIP at the bottom of the rack.  
Open UIP Closeout, 1/4-turn fasteners (two).
  - 2.2 Remove Power 120VDC umbilical from UIP.  
W3303P2 ←|→ J1
  - 2.3 Install Lab System Rack Power Jumper on UIP.  
W8226P1 →|← J1  
Cap →|← W3303P2
- LAB1D3
- 2.4 If required, open standoff UIP Closeout, 1/4-turn fasteners (two).
  - 2.5 Remove Main Power Cap from Standoff UIP (Z-Panel).  
Cap ←|→ J1
  - 2.6 Install Lab System Rack Power Jumper on standoff UIP (Z-Panel).  
W8226P2 →|← J1
  - 2.7 Restrain the Lab System Rack Power Jumper along route as necessary (Velcro Straps).  
Refer to Figure 1.
  - 2.8 ISS ↓ **MCC-H**, "Lab System Rack Power Jumper installation complete and ready for rack power up."

### NOTE

With the Lab System Rack Power Jumper installed, the Rack Power Switch (RPS) on the LAB1D5 Rack will no longer remove power from the Rack when turned off. Power must be removed by opening RPCM LA1A4A F RPC 01.

## 3. CHECKOUT

PCS Powering Up Avionics Rack 1 LAB1D5 Via Jumper  
US Lab: EPS: Rack Power: Rack Power 1

Rack Power 1

'Rack Power LAB1D3'

sel RPCM LA1A4A F RPC 1

RPCM LA1A4A F RPC 01

**cmd** Close Enable (Verify – Ena)

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

## 4. POST MAINTENANCE

- 4.1 Photo-document jumper configuration (DCS760 Camera).
- 4.2 Stow materials, jumper if necessary.  
Update IMS with locations.

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## 12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 2/3

(ASSY OPS/12A.1/FIN) Page 1 of 6 pages

### OBJECTIVE:

Perform nominal SSAS Heater preheat prior to Power Channel 2/3 powerdown (EVA #2). Reconfigure SSAS Truss Heaters after completion of 12A.1 Power Channel 2/3 Reconfiguration.

### NOTE

1. P1P3 SSAS Heater Availability was inhibited after the ISS Inboard Truss Elements P3 and P1 were mated together, with the exception of two Bolt Bus Controller (BBC) Heaters. However, the MDM default for SSAS Heater Availability is Enabled until the PPLs can be updated. These SSAS P1P3 Heaters must be reinhibited following an MDM powerdown. The P1P3 BBC Heaters will remain enabled until the BBC wire harnesses are physically disconnected via EVA.
2. Step 1: S1S3(P1P3) SSAS BBC 2 Preheat  
EVA 2  
Step 2: Verifying MDM Configuration  
Step 3: Verifying S&M Heater Availability  
Step 4: Inhibiting P1P3 SSAS Heaters  
Step 5: Repowering S1S3 SSAS IMCA 2  
Step 6: Enabling S1S3 Capture Latch Heater 1 Availability

### LOCATION:

Installed: Integrated Truss Segments S1S3 and P1P3

### DURATION:

Heater Preheat – Varies

Heater Reconfiguration – 40 minutes

### 1. S1S3(P1P3) SSAS BBC 2 PREHEAT

If S1S3(P1P3) SSAS BBC 2 Heater Preheat is required by Flight Specific Flight Rules and/or Thermal Analysis, perform {11.102 S&M HEATER PREHEAT} (SODF: GND SUPPORT: S&M: NOMINAL), then:

Refer to Table 1.

Table 1. Preheat Session Data

Activity Requiring S&M Heater Preheat	EVA 2 - Channel 2/3 Power Down and Reconfiguration
Time of Planned Activity	
S&M Heaters to be Preheated	S1S3 SSAS BBC 2 Htr P1P3 SSAS BBC 2 Htr
Length of Planned Preheat	
Planned Start of S&M Heater Preheat	
Target S&M Heater Temperature (if applicable)	

## 12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 2/3

(ASSY OPS/12A.1/FIN) Page 2 of 6 pages

### 2. VERIFYING MDM CONFIGURATION

#### NOTE

1. Steps 2 through 6 will not be performed until the Channel 2/3 Power Reconfiguration (12A.1 - EVA 2) and powerup are complete.
2. If any verifications in step 2 are incorrect, steps 3 through 6 cannot be performed until the responsible Flight Control Discipline corrects the configuration (ODIN/TITAN for MDM, Phalcon/ATLAS for SEPS).

PCS

#### 2.1 Verifying S1 2 MDM Configuration

S1: C&DH

S1:C&DH

sel S1-2

S1-2 MDM

Verify Frame Count – incrementing

'Software Control'

sel Applications

S1-2 Applications

Verify PTCS – Ena

Verify UB\_SEPS\_S1\_23 – Ena

#### 2.2 Verifying P1 2 MDM Configuration

P1: C&DH

P1:C&DH

sel P1-2

P1-2 MDM

Verify Frame Count – incrementing

'Software Control'

sel Applications

P1-2 Applications

Verify PTCS – Ena

Verify UB\_SEPS\_P1\_23 – Ena



## 12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 2/3

(ASSY OPS/12A.1/FIN) Page 3 of 6 pages

### 3. VERIFYING S&M HEATER AVAILABILITY

#### 3.1 Verifying SDMS SCU Heater Availability

SNM\_Heaters.MSK

'HTR AVAIL'

Verify SDMS SCU 1 HTR Availability – Ena

Verify SDMS SCU 2 HTR Availability – Ena

#### 3.2 Verifying S1S3 SSAS Heater Availability

SNM\_Heaters.MSK

'HTR AVAIL'

Verify S1S3 SSAS Capture Latch HTR 1 Availability – Inh

Verify S1S3 SSAS Capture Latch HTR 2 Availability – Ena

Verify S1S3 SSAS BBC 1 HTR Availability – Ena

Verify S1S3 SSAS BBC 2 HTR Availability – Ena

Verify S1S3 SSAS MBA 1 HTR 1 Availability – Ena

Verify S1S3 SSAS MBA 1 HTR 2 Availability – Ena

Verify S1S3 SSAS MBA 2 HTR 1 Availability – Ena

Verify S1S3 SSAS MBA 2 HTR 2 Availability – Ena

Verify S1S3 SSAS MBA 3 HTR 1 Availability – Ena

Verify S1S3 SSAS MBA 3 HTR 2 Availability – Ena

Verify S1S3 SSAS MBA 4 HTR 1 Availability – Ena

Verify S1S3 SSAS MBA 4 HTR 2 Availability – Ena

#### 3.3 Verifying P1P3 SSAS Heater Availability

SNM\_Heaters.MSK

'HTR AVAIL'

Verify P1P3 SSAS Capture Latch HTR 1 Availability – Inh

Verify P1P3 SSAS Capture Latch HTR 2 Availability – Inh

Verify P1P3 SSAS BBC 1 HTR Availability – Ena

Verify P1P3 SSAS BBC 2 HTR Availability – Ena

Verify P1P3 SSAS MBA 1 HTR 1 Availability – Inh

Verify P1P3 SSAS MBA 1 HTR 2 Availability – Ena

Verify P1P3 SSAS MBA 2 HTR 1 Availability – Inh

Verify P1P3 SSAS MBA 2 HTR 2 Availability – Ena

Verify P1P3 SSAS MBA 3 HTR 1 Availability – Inh

Verify P1P3 SSAS MBA 3 HTR 2 Availability – Ena

## 12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 2/3

(ASSY OPS/12A.1/FIN) Page 4 of 6 pages

Verify P1P3 SSAS MBA 4 HTR 1 Availability – Inh  
Verify P1P3 SSAS MBA 4 HTR 2 Availability – Ena

### 4. INHIBITING P1P3 SSAS HEATERS

#### 4.1 Inhibiting P1P3 SSAS MBA 1 Htr 2

P1: S&M

P1:S&M

'P1P3 - MBA-Htr'

sel MBA 1 Htr 2

P1P3 SSAS MBA 1 Htr 2

'Inhibit'

**cmd** Arm

Verify Htr 2 Availability – Inh Armed

**cmd** Inhibit

Verify Htr 2 Availability – Inh

#### 4.2 Inhibiting P1P3 SSAS MBA 2 Htr 2

P1:S&M

'P1P3 - MBA-Htr'

sel MBA 2 Htr 2

P1P3 SSAS MBA 2 Htr 2

'Inhibit'

**cmd** Arm

Verify Htr 2 Availability – Inh Armed

**cmd** Inhibit

Verify Htr 2 Availability – Inh

#### 4.3 Inhibiting P1P3 SSAS MBA 3 Htr 2

P1:S&M

'P1P3 - MBA-Htr'

sel MBA 3 Htr 2

P1P3 SSAS MBA 3 Htr 2

'Inhibit'

**cmd** Arm

## 12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 2/3

(ASSY OPS/12A.1/FIN) Page 5 of 6 pages

Verify Htr 2 Availability – Inh Armed

**cmd** Inhibit

Verify Htr 2 Availability – Inh

### 4.4 Inhibiting P1P3 SSAS MBA 4 Htr 2

**P1:S&M**

'P1P3 - MBA-Htr'

sel MBA 4 Htr 2

**P1P3 SSAS MBA 4 Htr 2**

'Inhibit'

**cmd** Arm

Verify Htr 2 Availability – Inh Armed

**cmd** Inhibit

Verify Htr 2 Availability – Inh

## 5. REPOWERING S1S3 SSAS IMCA 2

### 5.1 Verifying Bus RT Status

S1: S&M: SSAS S1/S3

**S1S3 SSAS Overview**

sel Primary Ext MDM

**Primary Ext MDM**

sel LB MECH S2

**LB MECH S2**

sel RT Status

**LB MECH S2 RT Status**

'10 SSAS S1/S3 L2'

√RT Status – Inh

√RT FDIR Status – Inh

Verify RT Comm Failed Status – blank

## 12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 2/3

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### 5.2 Closing S1S3 SSAS IMCA 2 RPC

S1S3 SSAS Overview

'IMCA-2 Pwr'

sel S13A G RPC 15

RPCM S13A G RPC 15

√Integration Counter – Incrementing

√Close Cmd – Ena

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

## 6. ENABLING S1S3 CAPTURE LATCH HEATER 1 AVAILABILITY

### 6.1 Verifying Capture Latch Htr 1 Temperature

SNM\_Heaters.MSK

Verify S1/S3 Capture Latch Htr 1 Temp > -38 deg C

If Temp ≤ -38 deg C, then wait until temperature > -38 deg C before enabling heater control (step 6.2).

### 6.2 Enabling Capture Latch Htr 1

S1: S&M

S1:S&M

'Capture Latch Htr'

sel Capture Latch Htr 1

S1S3 SSAS Capture Latch Htr 1

'Htr 1 Availability'

**cmd** Enable (Verify – Enable)

## DDCU RACK 2 RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 1 of 4 pages

### OBJECTIVE:

Reconfigure DDCU LA2A and DDCU LA3B to parallel mode, install a DDCU Parallel Connector, and install the Channel 2/3 - Lab Cable Assembly. The DDCU Parallel Connector contains resistors that allow parallel mode to function properly. The Channel 2/3 - Lab Cable Assembly is installed as part of a Mod Kit to allow the use of the Lab Truss Contingency Jumper post 12A.1.

### LOCATION:

Installed: DDCU-2 Rack (LAB106)  
Stowed: √Inventory Management System

### DURATION:

30 minutes

### CREW:

Two

### PARTS:

DDCU Parallel Connector P/N RM3697-001  
Channel 2/3 - Lab Cable Assembly (W15347) P/N 1F15347-1

### TOOLS:

DCS 760 Camera  
ISS IVA TOOLBOX

Drawer 2:

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

Drawer 3:

Speed Handle Assembly

### REFERENCED PROCEDURE(S):

None

#### 1. SAFING

#### **WARNING**

Failure to remove power may result in electrical shock hazard.

√**MCC-H** that DDCU Rack 2 is safed before continuing

#### 2. ROTATING DDCU-2 RACK DOWN

#### **WARNING**

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

CAUTION
1. Do not allow rack to impact equipment protruding into rotation path.
2. Do not allow rack umbilicals to over-extend.
3. Any portable cables, equipment must be removed from area around rack.

- LAB1P3 2.2 ✓ Rack rotation path unobstructed
- 2.3 Disengage rack K-BAR from standoff, thumb latches (two). Slowly rotate rack down, temporarily restrain as required.
- 2.4 Unfasten, remove rack Rear Access Panel, captive fasteners (forty-four) (5/32" Hex Head; Speed Handle Assembly). Temporarily stow.

3. CONFIGURING DDCU LA2A TO PARALLEL MODE

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

- 3.1 Don Static Wrist Tether.  
Refer to Figure 1.

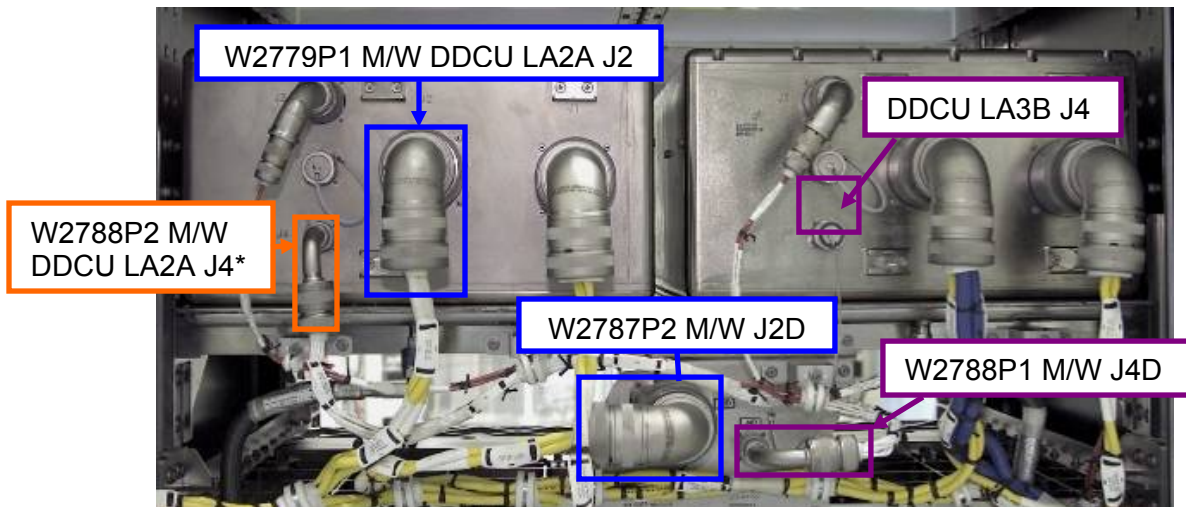


Figure 1.- DDCU-1 Rack (LAB1P3) Rear View.  
Similar configuration for DDCU-2 (LAB1O6).  
(\*W2788P2 demated from J4 connector, taped to DDCU during Increment 4)

- 3.2 W2779P1 ←|→ J2 (DDCU LA2A)  
W2787P2 ←|→ J2D (Dummy Panel)  
Refer to Figure 1.

## DDCU RACK 2 RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 3 of 4 pages

- 3.3 W2787P2 →|← J2 (DDCU LA2A)  
W2779P1 →|← J2D (Dummy Panel)  
Refer to Figure 1.
- 3.4 Remove Kapton tape, connector cap from DDCU LA2A J4  
(W2788P2).  
Temporarily stow connector caps.
- 3.5 W2788P2 →|← J4 (DDCU LA2A)  
Refer to Figure 1.

#### 4. INSTALLING DDCU PARALLEL CONNECTOR ON DDCU LA3B

##### NOTE

DDCU Parallel Connector has two connections (J1 and P4) to interface between DDCU LA3B and W2788P1.

- 4.1 Tethered cap ←|→ J4 (DDCU LA3B)  
Cap ←|→ P4 (DDCU Parallel Connector)  
DDCU Parallel Connector P4 →|← J4 (DDCU LA3B)  
Temporarily stow cap.  
Refer to Figures 1 and 2.

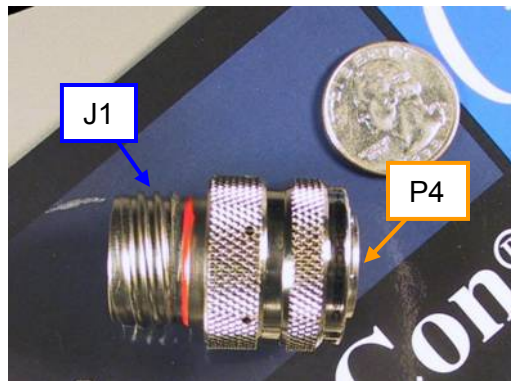


Figure 2.- DDCU Parallel Connector Shown Without Caps.

- 4.2 W2788P1 ←|→ J4D (Dummy Panel)  
Cap ←|→ J1 (DDCU Parallel Connector)  
W2788P1 →|← J1 (DDCU Parallel Connector)  
Cap →|← J4D (Dummy Panel)  
Refer to Figures 1 and 2.
  - 4.3 Doff Static Wrist Tether.
  - 4.4 Photo-document final configuration (DCS 760 Camera).
- #### 5. ROTATING DDCU-2 RACK UP
- 5.1 Replace and fasten rack Rear Access Panel and tighten captive fasteners (forty-four) (5/32" Hex Head; Speed Handle Assembly).

## DDCU RACK 2 RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 4 of 4 pages

### WARNING

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

### CAUTION

1. Do not allow rack to impact equipment protruding into rotation path.
2. Do not allow rack umbilicals to over-extend.
3. Any portable cables, equipment must be removed from area around rack.

5.2 ✓ Rack rotation path unobstructed

5.3 Rack K-BAR thumb latches (two) → Up  
Slowly rotate rack up.

5.4 Engage rack K-BAR into standoff capture mechanism, thumb latches (two).

## 6. INSTALLING CHANNEL 2/3 - LAB CABLE (W15347)

6.1 Locate DDCU-2 Rack UIP at bottom of rack.  
Open UIP closeout, 1/4-turn fasteners (two).

6.2 W3435P1 ←|→ J50 (DDCU-2 Rack UIP)

6.3 W15347J50A →|← W3435P1  
W15347P1A →|← J50 (DDCU-2 Rack UIP)

6.4 Photo-document final configuration (DCS 760 Camera).

## 7. CLOSEOUT

Close UIP Closeout, 1/4-turn fasteners (two).

## 8. POST MAINTENANCE

8.1 ISS ↓ **MCC-H** of task completion

8.2 Stow tools, equipment.  
Update IMS.



# LAB SYSTEM RACK POWER JUMPER REMOVAL LAB1D3 TO LAB1D5 (AV1 RACK)

(ASSY OPS/12A.1/FIN) Page 1 of 3 pages

## OBJECTIVE:

Remove the Lab System Rack Power Jumper connecting Payload Rack (LAB1D3) to Avionics Rack 1 (LAB1D5). Jumper was installed to provide a redundant CC 2 MDM during power reconfigurations (2/3 channel powerdown).

## LOCATION:

LAB1

Stowed: √Inventory Management System

## DURATION:

25 minutes

10 minutes to safe

15 minutes to access, remove jumper

## CREW:

One

## PARTS:

Lab System Rack Power Jumper (W8226) P/N 683-28226-1

## MATERIALS:

Velcro Straps

## TOOLS:

DCS760 Camera

ISS IVA TOOLBOX

Drawer 4:

Connector Pliers (if required)

## **WARNING**

Failure to remove power can result in electrical shock hazard.

## NOTE

1. With the Lab System Rack Power Jumper installed, the Rack Power Switch (RPS) on the LAB1D5 rack will no longer remove power from the rack when turned off. Power must be removed by opening RPCM LA1A4A F RPC 01.
2. The following Caution message will be received after power is removed from the jumper by opening RPCM LA1A4A F RPC 01:  
**'RPCM LAD52B\_A Loss of Comm-LAB'**
3. No action required. This message will return to normal once the jumper is removed and Avionics Rack 1 (LAB1D5) is checked out.

# LAB SYSTEM RACK POWER JUMPER REMOVAL LAB1D3 TO LAB1D5 (AV1 RACK)

(ASSY OPS/12A.1/FIN)

Page 2 of 3 pages

## 1. SAFING

MCC-H

### 1.1 Safing Payload Rack LAB1D3 J1 Connector

US Lab: EPS: Rack Power: Rack Power 1

**Rack Power 1**

'Rack Power LAB1D3'

sel RPCM LA1A4A F RPC 1

**RPCM LA1A4A F RPC 01**

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

**cmd** Close Cmd Inhibit (Verify – Inh)

### 1.2 Verifying LAB1D5 Avionics Rack 1 Safed

US Lab: EPS: Rack Power: Rack Power 2

**Rack Power 2**

'Rack Power LAB1D5'

sel RPCM LA2B C RPC 2

**RPCM LA2B C RPC 02**

Verify RPC Position – Open (Verify – Op)

Verify Close Cmd Inhibit (Verify – Inh)

### NOTE

Removal of the jumper will begin at the LAB1D5 Utility Interface Panel (UIP) and route forward to the LAB1D3 Standoff UIP (Z-Panel). Refer to Figure 1.

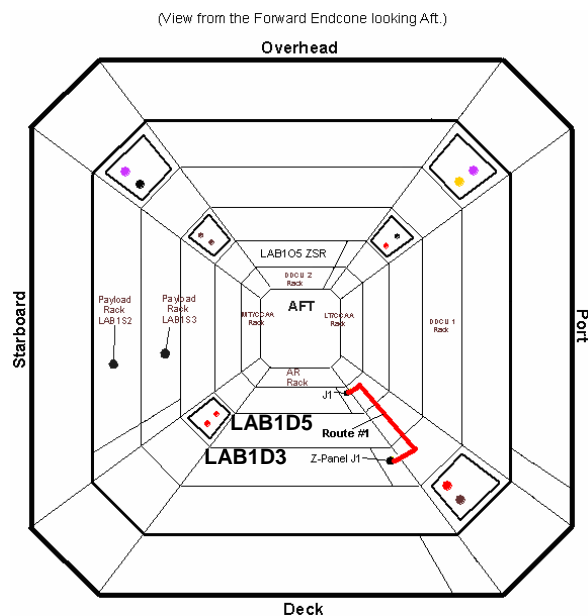


Figure 1.- Lab System Rack Power Jumper Route From LAB1D5 UIP to LAB1D3 Standoff UIP.

# LAB SYSTEM RACK POWER JUMPER REMOVAL LAB1D3 TO LAB1D5 (AV1 RACK)

(ASSY OPS/12A.1/FIN) Page 3 of 3 pages

## 2. REMOVING JUMPER

- LAB1D5
- 2.1 Locate the Avionics Rack 1 UIP at the bottom of the rack.
  - 2.2 Remove Lab System Rack Power Jumper from UIP.  
W8226P1 ←|→ J1  
Cap ←|→ W3303P2
  - 2.3 Install Power 120VDC umbilical to UIP.  
W3303P2 →|← J1
  - 2.4 Close UIP Closeout, 1/4-turn fasteners (two).
- LAB1D3
- 2.5 Remove Lab System Rack Power Jumper from standoff UIP (Z-Panel).  
W8226P2 ←|→ J1
  - 2.6 Install Main Power Cap to LAB1D3 standoff UIP (Z-Panel).  
Main Power Cap →|← J1
  - 2.7 Close UIP Closeout, 1/4-turn fasteners (two).
  - 2.8 Loosely coil Lab System Rack Power Jumper.
  - 2.9 ISS ↓ **MCC-H**, "Lab System Rack Power Jumper removal complete and ready for rack power up."

## 3. CHECKOUT

- PCS
- Powering Up LAB1D5 Avionics Rack 1  
US Lab: EPS: Rack Power: Rack Power 2  
Rack Power 2  
'Rack LAB1D5'
- Verify Switch Position – On  
Verify Switch Avail – Yes  
Verify Monitoring Status – Ena
- 'Rack Power LAB1D5'
- sel RPCM LA2B C RPC 2
- RPCM LA2B C RPC 02
- cmd** Close Enable (Verify – Ena)  
**cmd** RPC Position Close (Verify – Cl)

## 4. POST MAINTENANCE

- 4.1 Photo-document jumper configuration (DCS760 Camera).
- 4.2 Stow materials, jumper if necessary.  
Update IMS with locations.

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# LAB SYSTEM RACK POWER JUMPER INSTALLATION LAB1O5 TO LAB1D1 (AV2 RACK)

(ASSY OPS/12A.1/FIN) Page 1 of 3 pages

## OBJECTIVE:

Install the Lab System Rack Power Jumper to provide power to CC 1 MDM for redundancy during flight-specific power reconfigurations (1/4 channel powerdown). Rack power is supplied from Payload Rack (LAB1O5) to Avionics Rack 2 (LAB1D1).

## LOCATION:

LAB1

Stowed: √Inventory Management System

## DURATION:

25 minutes

10 minutes to safe

15 minutes to access, install jumper

## CREW:

One

## PARTS:

Lab System Rack Power Jumper (W8226) P/N 683-28226-1

## MATERIALS:

Velcro Straps

## TOOLS:

DCS760 Camera

ISS IVA TOOLBOX

Drawer 4:

Connector Pliers (if required)

## **WARNING**

Failure to remove power can result in electrical shock hazard.

## NOTE

1. The following Caution message will be received after Avionics Rack 2 (LAB1D1) is safed:  
**'RPCM LAD11B\_A Loss of Comm-LAB'**
2. No action required. This message will return to normal once the jumper is installed and Avionics Rack 2 (LAB1D1) is checked out.

## 1. SAFING

**MCC-H**

1.1 Safing Payload Rack LAB1O5 J1 Connector

US Lab: EPS: Rack Power: Rack Power 3

Rack Power 3

'Rack Power LAB1O5'

sel RPCM LA2A3B F RPC 1

# LAB SYSTEM RACK POWER JUMPER INSTALLATION LAB105 TO LAB1D1 (AV2 RACK)

(ASSY OPS/12A.1/FIN) Page 2 of 3 pages

RPCM LA2A3B F RPC 01

√RPC Position – Open (Verify – Op)

**cmd** Close Cmd Inhibit (Verify – Inh)

## 1.2 Safing LAB1D1 Avionics Rack 2

US LAB: EPS: Rack Power: Rack Power 1

Rack Power 1

'Rack Power LAB1D1'

sel RPCM LA1B D RPC 4

RPCM LA1B D RPC 04

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

**cmd** Close Cmd Inhibit (Verify – Inh)

### NOTE

Installation of the jumper will begin at the LAB1D1 Rack Utility Interface Panel (UIP) and route AFT to the LAB105 Standoff UIP (Z-Panel). Refer to Figure 1.

(View from the Forward Endcone looking Aft.)

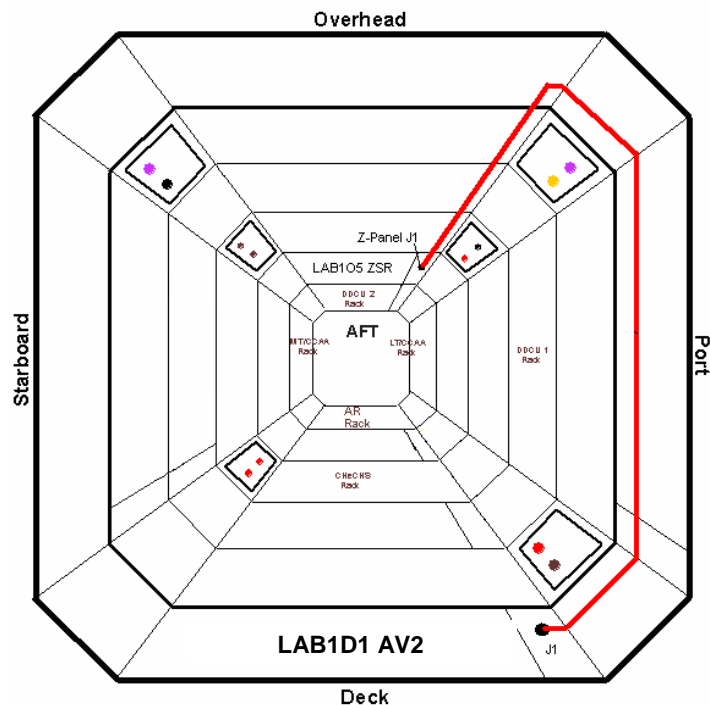


Figure 1.- Lab System Rack Power Jumper Route From LAB1D1 UIP to LAB105 Standoff UIP.

# LAB SYSTEM RACK POWER JUMPER INSTALLATION LAB105 TO LAB1D1 (AV2 RACK)

(ASSY OPS/12A.1/FIN) Page 3 of 3 pages

## 2. INSTALLING JUMPER

- LAB1D1
- 2.1 Locate the Avionics Rack 2 UIP at the bottom of the rack. Open UIP Closeout, 1/4-turn fasteners (two).
  - 2.2 Remove Power 120VDC umbilical from UIP.  
W8250CP1 ←|→ J1
  - 2.3 Install Lab System Rack Power Jumper on UIP.  
W8226P1 →|← J1  
Cap →|← W8250CP1
- LAB105
- 2.4 If required, open standoff UIP Closeout, 1/4-turn fasteners (two).
  - 2.5 Remove Main Power Cap from LAB105 standoff UIP (Z-Panel).  
Main Power Cap ←|→ J1
  - 2.6 Install Lab System Rack Power Jumper on standoff UIP (Z-Panel).  
W8226P2 →|← J1
  - 2.7 Restrain the Lab System Rack Power Jumper along route as necessary (Velcro Straps).  
Refer to Figure 1.
  - 2.8 ISS ↓ **MCC-H**, "Lab System Rack Power Jumper installation complete, ready for rack power up."

### NOTE

With the Lab System Rack Power Jumper installed, the Rack Power Switch (RPS) on the LAB1D1 Rack will no longer remove power from the Rack when turned off. Power must be removed by opening RPCM LA2A3B F RPC 01.

## 3. CHECKOUT

PCS Powering Up Avionics Rack 2 LAB1D1 Via Jumper

US Lab: EPS: Rack Power: Rack Power 3

Rack Power 3

'Rack Power LAB105'

sel RPCM LA2A3B F RPC 1

RPCM LA2A3B F RPC 01

**cmd** Close Enable (Verify – Ena)

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

## 4. POST MAINTENANCE

- 4.1 Photo-document jumper configuration (DCS760 Camera).
- 4.2 Stow materials, if necessary.  
Update IMS with locations.

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## 12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 1/4

(ASSY OPS/12A.1/FIN) Page 1 of 6 pages

### OBJECTIVE:

Perform nominal SSAS Heater preheat prior to Power Channel 1/4 powerdown (EVA #3). Reconfigure SSAS Truss Heaters after completion of 12A.1 Power Channel 1/4 Reconfiguration.

### NOTE

1. P1P3 SSAS Heater Availability was inhibited after the ISS Inboard Truss Elements P3 and P1 were mated together, with the exception of two Bolt Bus Controller (BBC) Heaters. However, the MDM default for SSAS Heater Availability is Enabled until the PPLs can be updated. These SSAS P1P3 Heaters must be reinhibited following an MDM powerdown. The P1P3 BBC Heaters will remain enabled until the BBC wire harnesses are physically disconnected via EVA.
2. Step 1: S1S3(P1P3) SSAS BBC 1 Preheat  
EVA 3  
Step 2: Verifying MDM Configuration  
Step 3: Verifying S&M Heater Availability  
Step 4: Inhibiting P1P3 SSAS Heaters  
Step 5: Repowering S1S3 SSAS IMCA 1

### LOCATION:

Installed: Integrated Truss Segments S1S3 and P1P3

### DURATION:

Heater Preheat - Varies

Heater Reconfiguration - 30 minutes

### 1. S1S3(P1P3) SSAS BBC 2 PREHEAT

If S1S3(P1P3) SSAS BBC 1 Heater Preheat is required by Flight Specific Flight Rules and/or Thermal Analysis, perform {11.102 S&M HEATER PREHEAT} (SODF: GND SUPPORT: S&M: NOMINAL), then:

Refer to Table 1.

Table 1. Preheat Session Data

Activity Requiring S&M Heater Preheat	EVA 3 - Channel 1/4 Power Down and Reconfiguration
Time of Planned Activity	
S&M Heaters to be Preheated	S1S3 SSAS BBC 1 Htr P1P3 SSAS BBC 1 Htr
Length of Planned Preheat	
Planned Start of S&M Heater Preheat	
Target S&M Heater Temperature (if applicable)	

## 12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 1/4

(ASSY OPS/12A.1/FIN) Page 2 of 6 pages

### 2. VERIFYING MDM CONFIGURATION

#### NOTE

1. Steps 2 through 5 will not be performed until the Channel 1/4 Power Reconfiguration (12A.1 - EVA 3) and powerup are complete.
2. If any verifications in step 2 are incorrect, steps 3 through 5 cannot be performed until the responsible Flight Control Discipline corrects the configuration (ODIN/TITAN for MDM, Phalcon/ATLAS for SEPS).

PCS

#### 2.1 Verifying S1 1 MDM Configuration

S1: C&DH

S1:C&DH

sel S1-1

S1-1 MDM

Verify Frame Count – incrementing

'Software Control'

sel Applications

S1-1 Applications

Verify PTCS – Ena

Verify UB\_SEPS\_S1\_14 – Ena

#### 2.2 Verifying P1 1 MDM Configuration

P1: C&DH

P1:C&DH

sel P1-1

P1-1 MDM

Verify Frame Count – incrementing

'Software Control'

sel Applications

P1-1 Applications

Verify PTCS – Ena

Verify UB\_SEPS\_P1\_14 – Ena

## 12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 1/4

(ASSY OPS/12A.1/FIN) Page 3 of 6 pages

### 3. VERIFYING S&M HEATER AVAILABILITY

#### 3.1 Verifying SDMS SCU Heater Availability

`SNM_Heaters.MSK`

'HTR AVAIL'

Verify SDMS SCU 1 HTR Availability – Ena

Verify SDMS SCU 2 HTR Availability – Ena

#### 3.2 Verifying S1S3 SSAS Heater Availability

`SNM_Heaters.MSK`

'HTR AVAIL'

Verify S1S3 SSAS Capture Latch HTR 1 Availability – Ena

Verify S1S3 SSAS Capture Latch HTR 2 Availability – Ena

Verify S1S3 SSAS BBC 1 HTR Availability – Ena

Verify S1S3 SSAS BBC 2 HTR Availability – Ena

Verify S1S3 SSAS MBA 1 HTR 1 Availability – Ena

Verify S1S3 SSAS MBA 1 HTR 2 Availability – Ena

Verify S1S3 SSAS MBA 2 HTR 1 Availability – Ena

Verify S1S3 SSAS MBA 2 HTR 2 Availability – Ena

Verify S1S3 SSAS MBA 3 HTR 1 Availability – Ena

Verify S1S3 SSAS MBA 3 HTR 2 Availability – Ena

Verify S1S3 SSAS MBA 4 HTR 1 Availability – Ena

Verify S1S3 SSAS MBA 4 HTR 2 Availability – Ena

#### 3.3 Verifying P1P3 SSAS Heater Availability

`SNM_Heaters.MSK`

'HTR AVAIL'

Verify P1P3 SSAS Capture Latch HTR 1 Availability – Inh

Verify P1P3 SSAS Capture Latch HTR 2 Availability – Inh

Verify P1P3 SSAS BBC 1 HTR Availability – Ena

Verify P1P3 SSAS BBC 2 HTR Availability – Inh

Verify P1P3 SSAS MBA 1 HTR 1 Availability – Ena

Verify P1P3 SSAS MBA 1 HTR 2 Availability – Inh

Verify P1P3 SSAS MBA 2 HTR 1 Availability – Ena

Verify P1P3 SSAS MBA 2 HTR 2 Availability – Inh

Verify P1P3 SSAS MBA 3 HTR 1 Availability – Ena

Verify P1P3 SSAS MBA 3 HTR 2 Availability – Inh

## 12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 1/4

(ASSY OPS/12A.1/FIN) Page 4 of 6 pages

Verify P1P3 SSAS MBA 4 HTR 1 Availability – Ena  
Verify P1P3 SSAS MBA 4 HTR 2 Availability – Inh

### 4. INHIBITING P1P3 SSAS HEATERS

#### 4.1 Inhibiting P1P3 SSAS MBA 1 Htr 1

P1: S&M

P1:S&M

'P1P3 - MBA-Htr'

sel MBA 1 Htr 1

P1P3 SSAS MBA 1 Htr 1

'Inhibit'

**cmd** Arm

Verify Htr 1 Availability – Inh Armed

**cmd** Inhibit

Verify Htr 1 Availability – Inh

#### 4.2 Inhibiting P1P3 SSAS MBA 2 Htr 1

P1:S&M

'P1P3 - MBA-Htr'

sel MBA 2 Htr 1

P1P3 SSAS MBA 2 Htr 1

'Inhibit'

**cmd** Arm

Verify Htr 1 Availability – Inh Armed

**cmd** Inhibit

Verify Htr 1 Availability – Inh

#### 4.3 Inhibiting P1P3 SSAS MBA 3 Htr 1

P1:S&M

'P1P3 - MBA-Htr'

sel MBA 3 Htr 1

P1P3 SSAS MBA 3 Htr 1

'Inhibit'

**cmd** Arm

## 12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 1/4

(ASSY OPS/12A.1/FIN) Page 5 of 6 pages

Verify Htr 1 Availability – Inh Armed

**cmd** Inhibit

Verify Htr 1 Availability – Inh

### 4.4 Inhibiting P1P3 SSAS MBA 4 Htr 1

**P1:S&M**

'P1P3 - MBA-Htr'

sel MBA 4 Htr 1

**P1P3 SSAS MBA 4 Htr 1**

'Inhibit'

**cmd** Arm

Verify Htr 1 Availability – Inh Armed

**cmd** Inhibit

Verify Htr 1 Availability – Inh

## 5. REPOWERING S1S3 SSAS IMCA 1

### 5.1 Verifying Bus RT Status

S1: S&M: SSAS S1/S3

**S1S3 SSAS Overview**

sel Primary Ext MDM

**Primary Ext MDM**

sel LB MECH S1

**LB MECH S1**

sel RT Status

**LB MECH S1 RT Status**

'10 SSAS S1/S3 L1'

√RT Status – Inh

√RT FDIR Status – Inh

Verify RT Comm Failed Status – blank

**12A.1 SSAS HEATER RECONFIGURATION – CHANNEL 1/4**  
(ASSY OPS/12A.1/FIN) Page 6 of 6 pages

5.2 Closing S1S3 SSAS IMCA 1 RPC

'IMCA-1 Pwr'

sel S14B G RPC 15

√Integration Counter – Incrementing

√Close Cmd – Ena

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

# DDCU RACK 1 RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 1 of 4 pages

## OBJECTIVE:

Reconfigure DDCU LA4A and DDCU LA1A to parallel mode, install a DDCU Parallel Connector, and install the Channel 1/4 - Lab Cable Assembly. The DDCU Parallel Connector contains resistors that allow parallel mode to function properly. The Channel 1/4 - Lab Cable Assembly is installed as part of a Mod Kit to allow the use of the Lab Truss Contingency Jumper post 12A.1.

## LOCATION:

Installed: DDCU-1 Rack (LAB1P3)

Stowed: √Inventory Management System

## DURATION:

30 minutes

## CREW:

Two

## PARTS:

DDCU Parallel Connector P/N RM3697-001

Channel 1/4 - Lab Cable Assembly (W15345) P/N 1F15345-1

## TOOLS:

DCS 760 Camera

### ISS IVA TOOLBOX

Drawer 2:

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

Drawer 3:

Speed Handle Assembly

## REFERENCED PROCEDURE(S):

None

### 1. SAFING

#### **WARNING**

Failure to remove power may result in electrical shock hazard.

√**MCC-H** that DDCU Rack 1 is safed before continuing

### 2. ROTATING DDCU-1 RACK DOWN

LAB1P3

- 2.1 Remove CEVIS at CEVIS Seat Track Adapters (four).  
Temporarily stow, restrain CEVIS.

#### **WARNING**

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

## DDCU RACK 1 RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 2 of 4 pages

### CAUTION

1. Do not allow rack to impact equipment protruding into rotation path.
2. Do not allow rack umbilicals to over-extend.
3. Any portable cables, equipment must be removed from area around rack.

2.2 ✓ Rack rotation path unobstructed

2.3 Disengage rack K-BAR from standoff, thumb latches (two). Slowly rotate rack down, temporarily restrain as required.

2.4 Unfasten, remove rack Rear Access Panel, captive fasteners (forty-four) (5/32" Hex Head; Speed Handle Assembly). Temporarily stow.

### 3. CONFIGURING DDCU LA4A TO PARALLEL MODE

#### CAUTION

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

3.1 Don Static Wrist Tether. Refer to Figure 1.

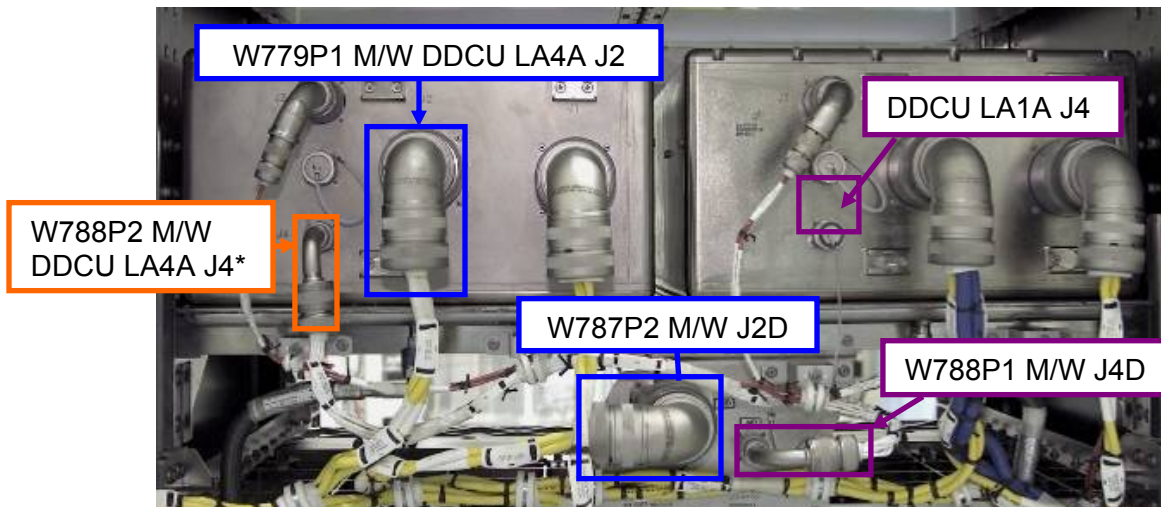


Figure 1.- DDCU-1 Rack (LAB1P3) Rear View.  
(\*W788P2 demated from J4 connector, taped to DDCU during Increment 4)

3.2 W779P1 ←|→ J2 (DDCU LA4A)  
W787P2 ←|→ J2D (Dummy Panel)  
Refer to Figure 1.

3.3 W787P2 →|← J2 (DDCU LA4A)  
W779P1 →|← J2D (Dummy Panel)  
Refer to Figure 1.



## DDCU RACK 1 RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 3 of 4 pages

3.4 Remove Kapton tape, connector cap from DDCU LA4A J4 (W788P2).  
Temporarily stow connector caps.

3.5 W788P2 →|← J4 (DDCU LA4A)  
Refer to Figure 1.

### 4. INSTALLING DDCU PARALLEL CONNECTOR ON DDCU LA1A

#### NOTE

DDCU Parallel Connector has two connections (J1 and P4) to interface between DDCU LA1A and W788P1.

4.1 Tethered cap ←|→ J4 (DDCU LA1A)  
Cap ←|→ P4 (DDCU Parallel Connector)  
DDCU Parallel Connector P4 →|← J4 (DDCU LA1A)  
Temporarily stow cap.  
Refer to Figures 1 and 2.

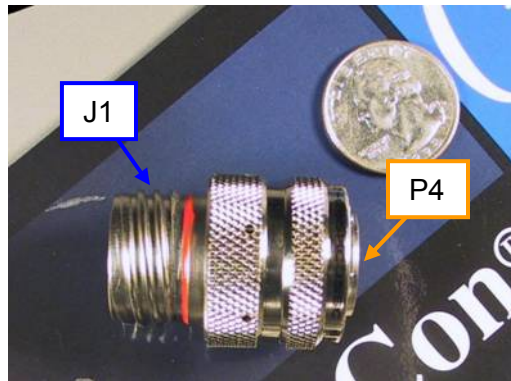


Figure 2.- DDCU Parallel Connector  
Shown Without Caps.

4.2 W788P1 ←|→ J4D (Dummy Panel)  
Cap ←|→ J1 (DDCU Parallel Connector)  
W788P1 →|← J1 (DDCU Parallel Connector)  
Cap →|← J4D (Dummy Panel)  
Refer to Figures 1 and 2.

4.3 Doff Static Wrist Tether.

4.4 Photo-document final configuration (DCS 760 Camera).

### 5. ROTATING DDCU-1 RACK UP

5.1 Replace and fasten rack Rear Access Panel and tighten captive fasteners (forty-four) (5/32" Hex Head; Speed Handle Assembly).

## DDCU RACK 1 RECONFIGURATION

(ASSY OPS/12A.1/FIN) Page 4 of 4 pages

### WARNING

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

### CAUTION

1. Do not allow rack to impact equipment protruding into rotation path.
2. Do not allow rack umbilicals to over-extend.
3. Any portable cables, equipment must be removed from area around rack.

5.2 ✓ Rack rotation path unobstructed

5.3 Rack K-BAR thumb latches (two) → Up  
Slowly rotate rack up.

5.4 Engage rack K-BAR into standoff capture mechanism, thumb latches (two).

## 6. INSTALLING CHANNEL 1/4 - LAB CABLE (W15345)

6.1 Locate DDCU-1 Rack UIP at bottom of rack.  
Open UIP closeout, 1/4-turn fasteners (two).

6.2 W8250AP1 ←|→ J50 (DDCU-1 Rack UIP)

6.3 W15345J50A →|← W8250AP1  
W15345P1A →|← J50 (DDCU-2 Rack UIP)

6.4 Photo-document final configuration (DCS 760 Camera).

## 7. CLOSEOUT

7.1 Close UIP Closeout, 1/4-turn fasteners (two).

7.2 Replace CEVIS using CEVIS Seat Track Adapters (four).  
Temporarily stow, restrain CEVIS.

## 8. POST MAINTENANCE

8.1 ISS ↓ **MCC-H** of task completion

8.2 Stow tools, equipment.  
Update IMS.

# LAB SYSTEM RACK POWER JUMPER REMOVAL LAB1O5 TO LAB1D1 (AV2 RACK)

(ASSY OPS/12A.1/FIN) Page 1 of 3 pages

## OBJECTIVE:

Remove the Lab System Rack Power Jumper connecting Payload Rack (LAB1O5) to Avionics Rack 2 (LAB1D1). Jumper was installed to provide power to CC 1 MDM for redundancy during power reconfigurations (1/4 channel powerdown).

## LOCATION:

LAB1

Stowed: √Inventory Management System

## DURATION:

25 minutes

10 minutes to safe

15 minutes to access, remove jumper

## CREW:

One

## PARTS:

Lab System Rack Power Jumper (W8226) P/N 683-28226-1

## MATERIALS:

Velcro Straps

## TOOLS:

DCS760 Camera

ISS IVA TOOLBOX

Drawer 4:

Connector Pliers (if required)

## **WARNING**

Failure to remove power can result in electrical shock hazard.

## NOTE

1. With the Lab System Rack Power Jumper installed, the Rack Power Switch (RPS) on the LAB1D1 Rack will no longer remove power from the rack when turned off. Power must be removed by opening RPCM LA2A3B F RPC 01.
2. The following Caution message will be received after power is removed from the jumper by opening RPCM LA2A3B F RPC 01:  
**'RPCM LAD11B\_A Loss of Comm-LAB'**
3. No action required. This message will return to normal once the jumper is removed and Avionics Rack 2 (LAB1D1) is checked out.

# LAB SYSTEM RACK POWER JUMPER REMOVAL LAB1O5 TO LAB1D1 (AV2 RACK)

(ASSY OPS/12A.1/FIN)

Page 2 of 3 pages

## 1. SAFING

MCC-H

### 1.1 Safing Payload Rack LAB1O5 J1 Connector

US LAB: EPS: Rack Power: Rack Power 3

**Rack Power 3**

'Rack Power LAB1O5'

sel RPCM LA2A3B F RPC 1

**RPCM LA2A3B F RPC 01**

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

**cmd** Close Cmd Inhibit (Verify – Inh)

### 1.2 Verifying LAB1D1 Avionics Rack 2 Safed

US Lab: EPS: Rack Power: Rack Power 1

**Rack Power 1**

'Rack Power LAB1D1'

sel RPCM LA1B D RPC 4

**RPCM LA1B D RPC 04**

Verify RPC Position – Open (Verify – Op)

Verify Close Cmd Inhibit (Verify – Inh)

### NOTE

Removal of the jumper will begin at the LAB1D1 Rack Utility Interface Panel (UIP) and route AFT to the LAB1O5 standoff UIP (Z-Panel). Refer to Figure 1.

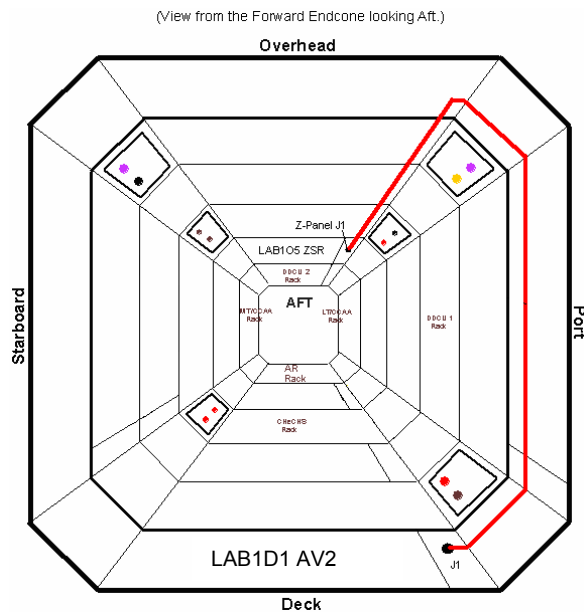


Figure 1.- Lab System Rack Power Jumper Route From LAB1D1 UIP to LAB1O5 Standoff UIP.

# LAB SYSTEM RACK POWER JUMPER REMOVAL LAB1O5 TO LAB1D1 (AV2 RACK)

(ASSY OPS/12A.1/FIN) Page 3 of 3 pages

## 2. REMOVING JUMPER

- LAB1D1
- 2.1 Locate the Avionics Rack 2 UIP at the bottom of the rack.
  - 2.2 Remove Lab System Rack Power Jumper from UIP.  
W8226P1 ←|→ J1  
Cap ←|→ W8250CP1
  - 2.3 Install Power 120VDC umbilical to rack UIP.  
W8250CP1 →|← J1
  - 2.4 Close UIP Closeout, 1/4-turn fasteners (two).
- LAB1O5
- 2.5 Remove Lab System Rack Power Jumper from standoff UIP (Z-Panel).  
W8226P2 ←|→ J1
  - 2.6 Install Main Power Cap to LAB1O5 standoff UIP (Z-Panel).  
Main Power Cap →|← J1
  - 2.7 Close UIP Closeout, 1/4-turn fasteners (two).
  - 2.8 Loosely coil Lab System Rack Power Jumper.
  - 2.9 ISS ↓↓ **MCC-H**, "Lab System Rack Power Jumper removal complete, ready for rack power up."

## 3. CHECKOUT

- PCS
- Powering Up LAB1D1 Avionics Rack 2  
US Lab: EPS: Rack Power: Rack Power 1  
Rack Power 1  
'Rack LAB1D1'

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

'Rack Power LAB1D1'

sel RPCM LA1B D RPC 4

RPCM LA1B D RPC 04

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

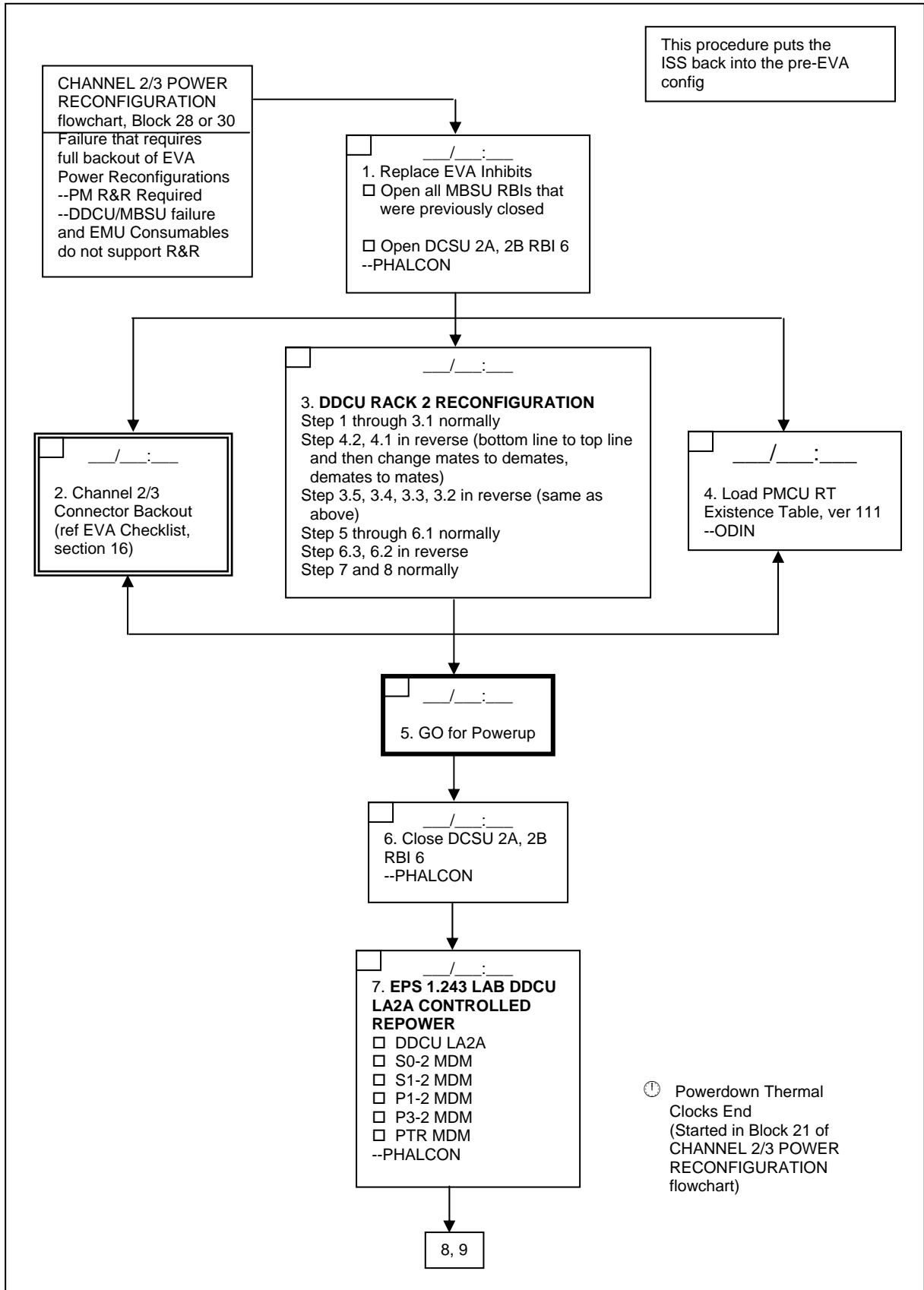
## 4. POST MAINTENANCE

- 4.1 Photo-document jumper configuration (DCS760 Camera).
- 4.2 Stow materials, jumper if necessary.  
Update IMS with locations.

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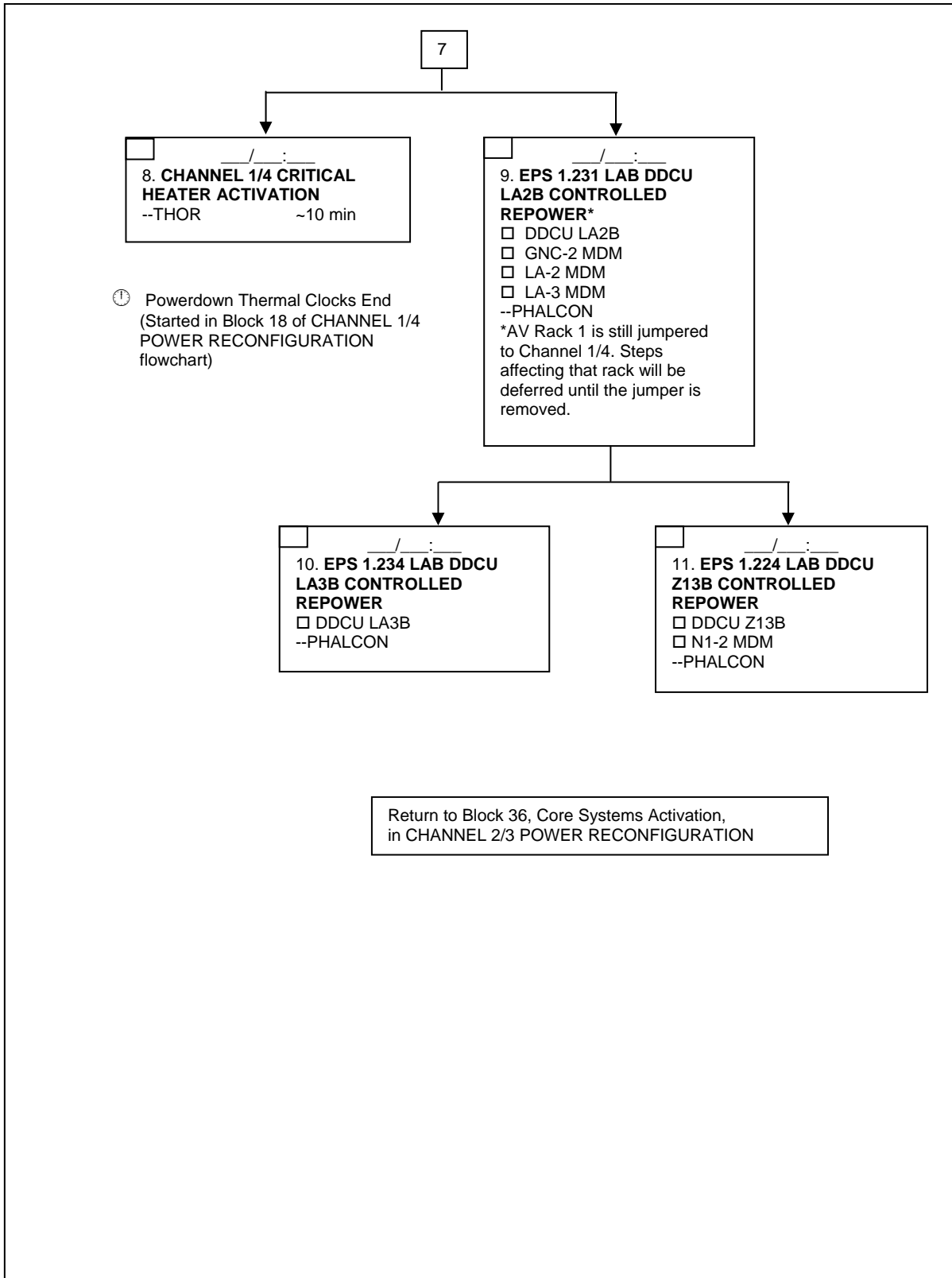
# CHANNEL 2/3 FULL BACKOUT

(ASSY OPS/12A.1/FIN)



# CHANNEL 2/3 FULL BACKOUT

(ASSY OPS/12A.1/FIN)

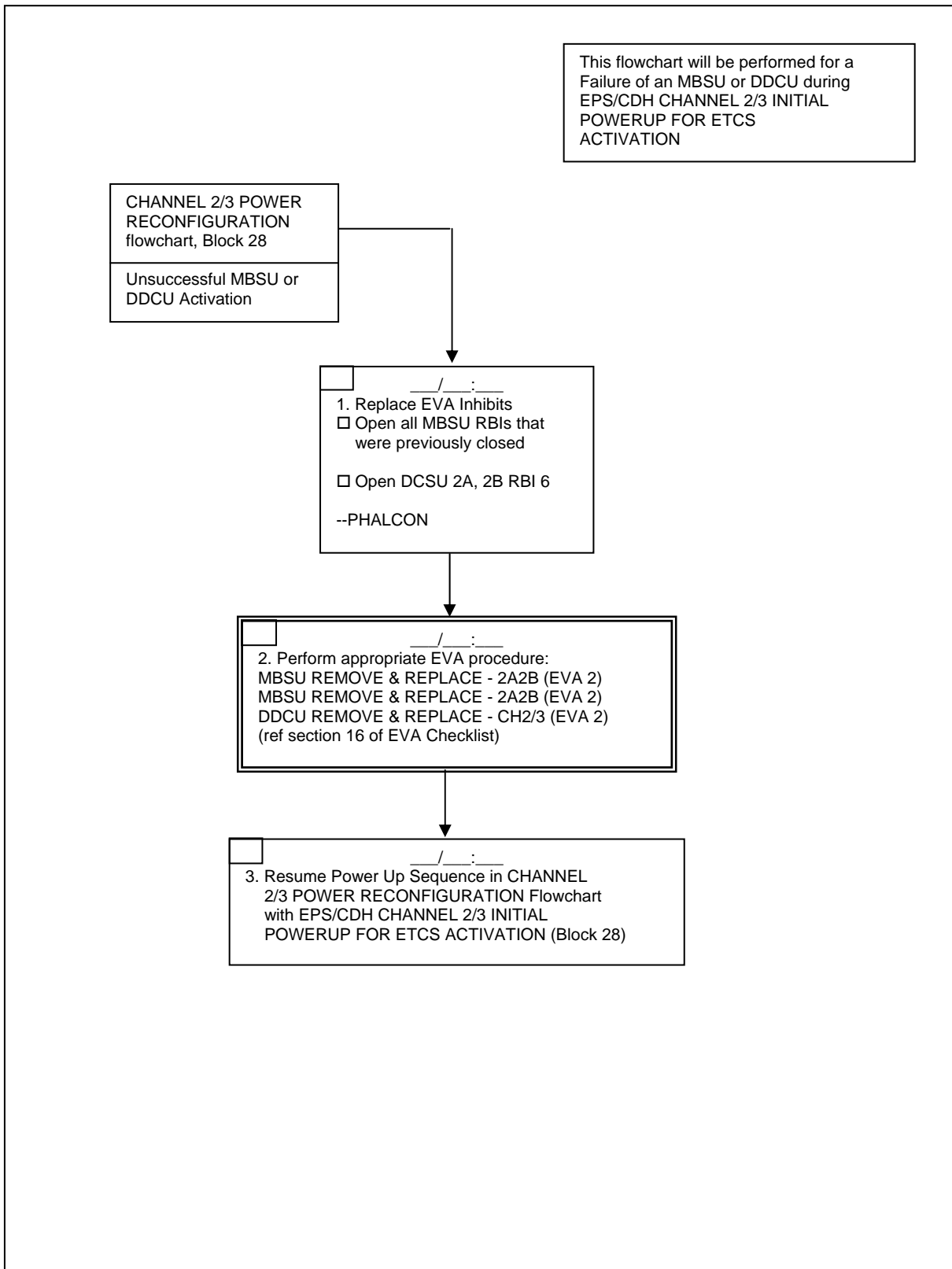




# CHANNEL 2/3 MBSU/DDCU R&R FLOWCHART

(ASSY OPS/12A.1/FIN)

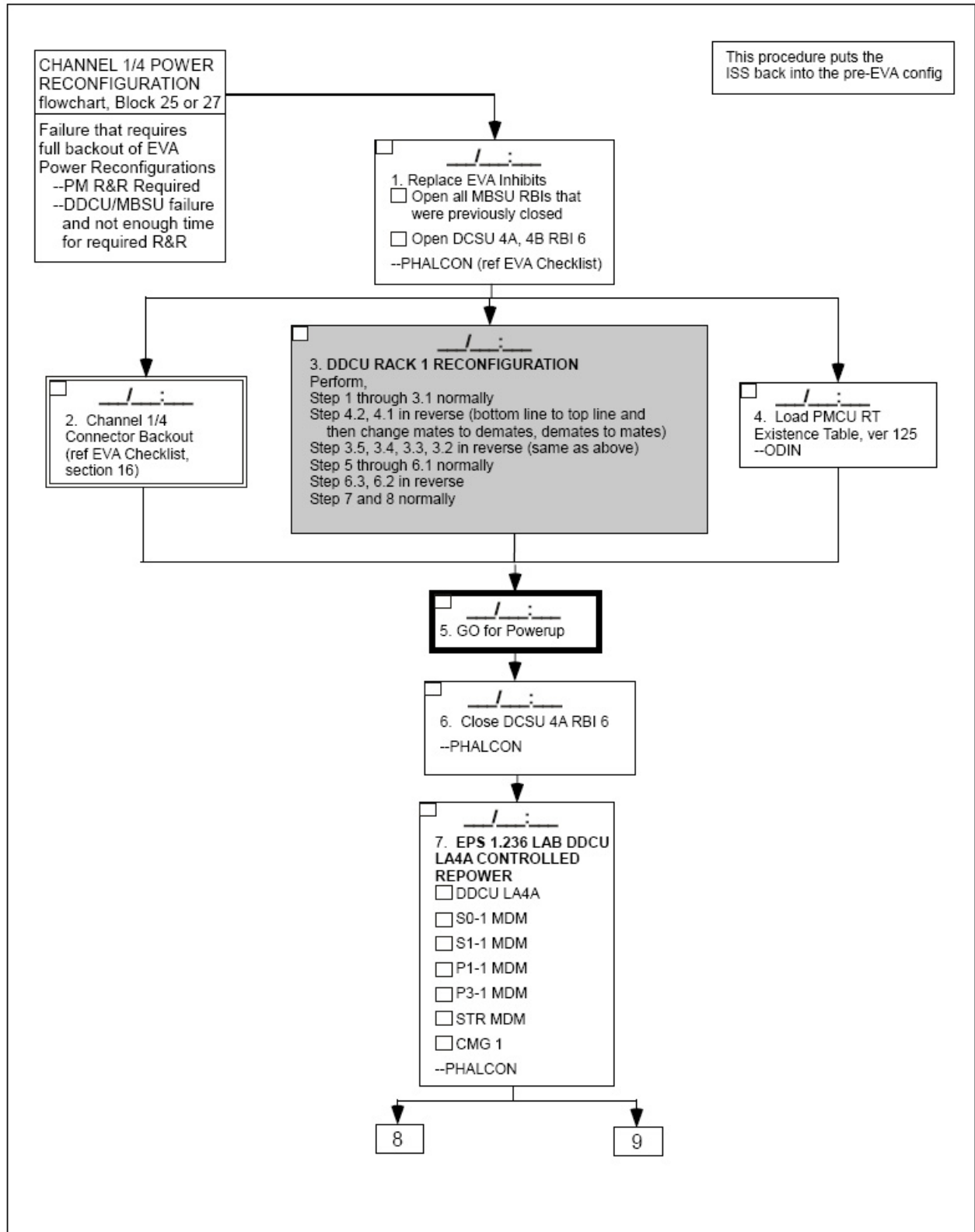
Page 1 of 1 pages



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# CHANNEL 1/4 FULL BACKOUT

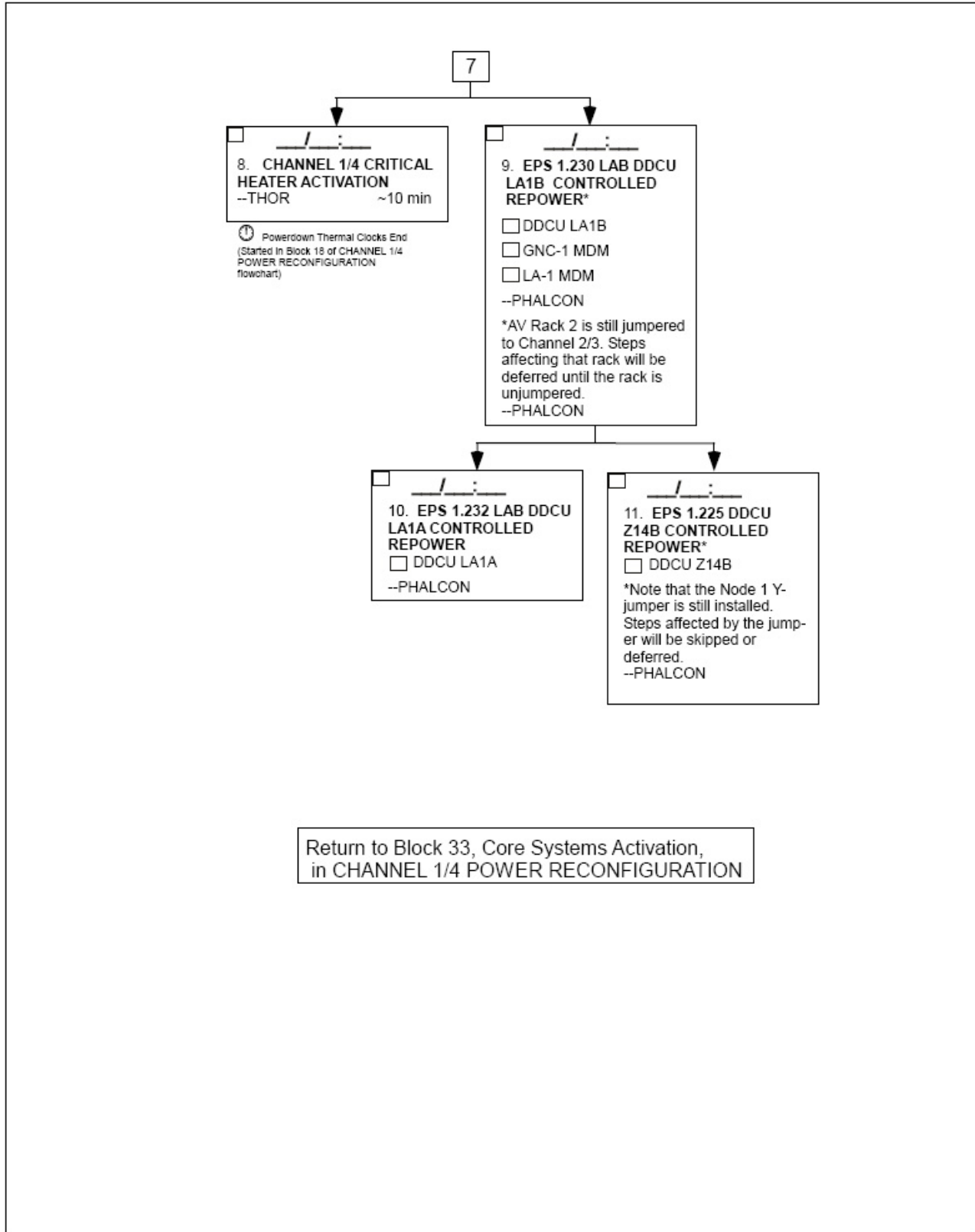
(ASSY OPS/12A.1/FIN)



# CHANNEL 1/4 FULL BACKOUT

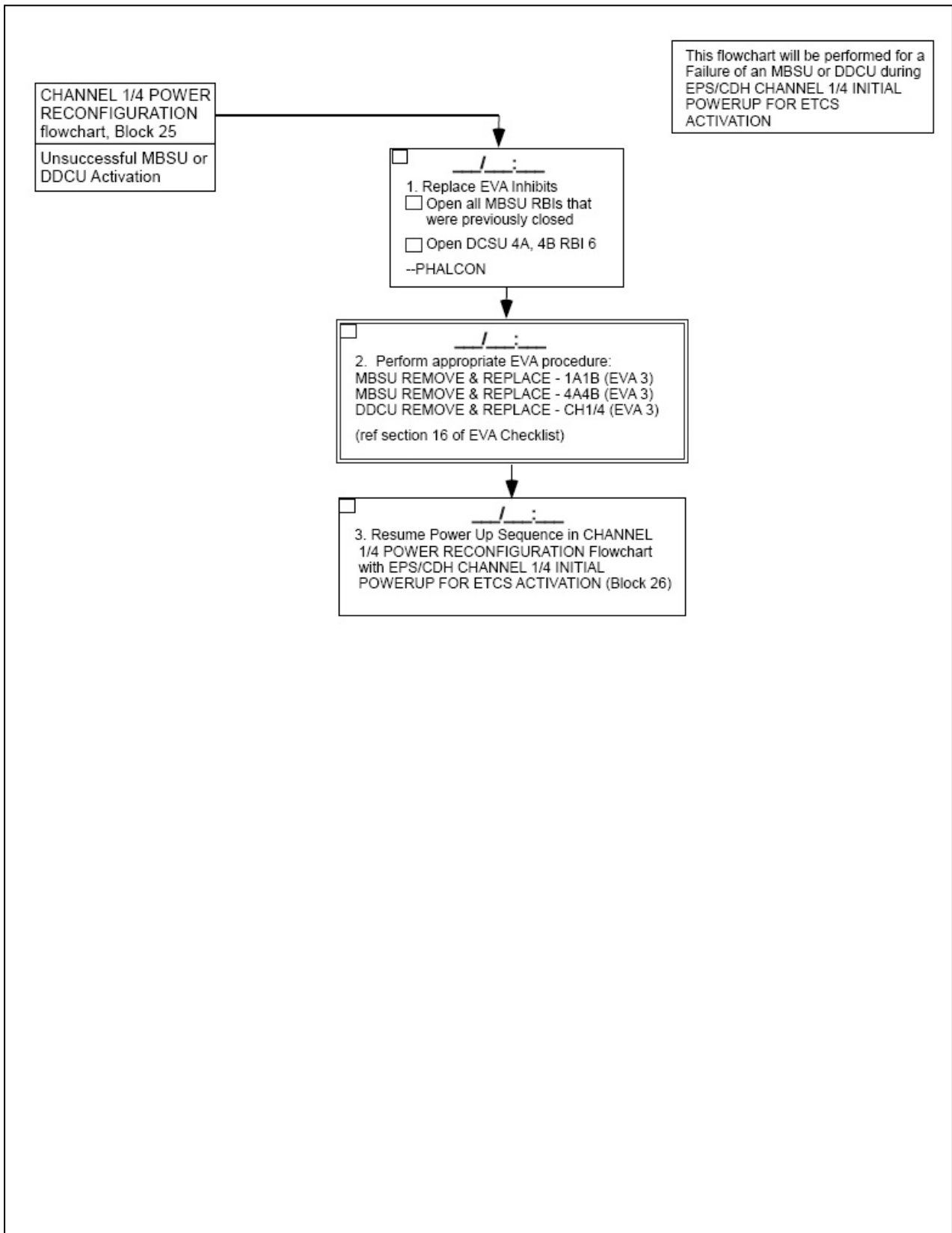
(ASSY OPS/12A.1/FIN)

Page 2 of 2 pages



# CHANNEL 1/4 MBSU/DDCU R&R FLOWCHART

(ASSY OPS/12A.1/FIN) Page 1 of 1 pages



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**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 2/3 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

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MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
Primary CC	MDM or CH 1 of SPD Card (A8/Slot 02) and/or  CH 2 of SPD Card (A5/Slot 01)	Cannot communicate on CB EXT-1 and/or CB EXT-2, respectively, thus losing command path to EXT 1 and/or EXT 2 MDMs.	None. CCS RM will recover lost capability by making the backup CC MDM the primary CC MDM. Three CC MDMs will be available with the use of the 12A.1 LAB AR Rack Jumper.	(1) Leave BC Comm Fail FDIR enabled.  (2) Before or during EVA, no action since second CC will be available with use of 12A.1 LAB AR Rack Jumper. Proceed with activation.
Primary PMCU	MDM or CH 2 of SPD Card (A5/Slot 01) and/or  CH 2 of SPD Card (A4/Slot 03)	Cannot communicate on LB PMCU-2 and/or LB PMCU-3, respectively, thus losing command path to MBSU S0-2A/2B, DDCU S0-2B, DDCU P1-3A, and/or MBSU S0-3A/3B, DDCU S0-3B.	Transition backup PMCU MDM to primary and continue with reconfiguration /activation.	None. Note: PMCU 1 and PMCU 2 are both powered from the 1/4 power domain due to the use of the 12A.1 LAB AR Rack Jumper.
GNC 1 (Primary)	MDM	(1) Loss of CMG control, loss of GPS and RGA data, and loss of OIU interface.  (2) Loss of Slot 00, 01, 02, 03, and 05 SPD Cards.	Transition to alternate attitude control in accordance with flight rule C8-51 and maintain high rate S-Band using manual S-Band gimbal pointing commands.	(3) Before reconfiguration, prepare manual S-Band gimbal pointing commands to maintain high rate data transfer in case pointing capability is lost.  (4) Consider installing Node 1 Y-Jumper and LAB SPDA Jumper to route power from RACU 5 to SPDA LAAFT-2B to allow activation of GNC 2 MDM. Also, provides power for LA 2 and LA 3 MDMs.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 2/3 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

240

<b>MDM</b>	<b>Lost Component</b>	<b>Consequences Without Response</b>	<b>Operational Workaround Requirements</b>	<b>Procedural Considerations</b>
GNC 1 (Primary)	CH 1 of SPD Card (A7/Slot 00)  CH 1 of SPD Card (A8/Slot 02)	Cannot communicate on LB GNC-1, thus losing command path to CMG-1, RGA-1, and SIGI-1.  Cannot communicate on LB GNC-4, thus losing command path to CMG-4.	Same as above for loss of GNC 1 MDM. CMGs 2 and 3, RGA-2, and SIGI-2 are not available during Channel 2/3 reconfiguration.	Same as above for loss of GNC 1 MDM.
GNC 1 (Primary)	CH 2 of SPD Card (A4/Slot 03)  CH 1 of SPD Card (A3/Slot 05)	Cannot communicate on LB ORB-N2-2, thus losing command path to OIU.  Cannot communicate on LB ORB-N2-1, thus losing command path to OIU.	OIU command uplink and data uplink paths to ISS are not available; must rely on Station S-Band for comm.	None.
EXT 1 (Primary)	MDM	(3) Lost redundancy in EXTs and no insight into 1/4 truss devices during Channel 2/3 powerdown.  (4) Loss of Slot 01 SPD Card and Slot 05 SPD Card functionality.	Proceed without EXT 1 MDM. Powerup MBSUs/DDCUs required for SPDA S0-2B activation and then power on EXT 2 and S0 2 MDMs concurrently to support EATCS Loop B startup.	(5) Reenable CCS RM for EXTs after Channel 2/3 power is reactivated and as soon as possible after functionality of EXT 2 MDM has been restored.
EXT 1 (Primary)	CH 2 of SPD Card (A5/Slot 01)  CH 1 of SPD Card (A3/Slot 05)	Cannot communicate on LB SYS-P-2, thus losing command path to S0 2 and P1 2 (and PTR) MDMs.  Cannot communicate on LB SYS-P-1, thus losing command path to P1 1 MDM if needed.	Same as above for loss of EXT 1 MDM.	(6) If this failure occurred during powerdown before the start of the EVA, proceed without EXT 1 and rely on EXT 2 during powerup.



**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 2/3 RECONFIGURATION**  
 (ASSY OPS/12A.1/FIN)

241

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
S0 2	MDM	Loss of Slot 01 SPD Card, Slot 07 LLA Card, and Slot 03 DIO Card functionality.	(1) Enable SEPS_23 application in S0 1 MDM to be able to apply power to SPDA P1-2B.  (2) Complete Loop B startup with command validation overrides on pump speed command or open PM outlet valve command.	Number 2 in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.
S0 2	BIA on IOCU Card (after powerup and operational S0 2)	Loss of S0 2 MDM interface.	(3) Enable SEPS_23 application in S0 1 MDM to be able to apply power to SPDA P1-2B and/or continue with Loop B startup, even if repeated attempts are needed due to possible bus contention until power is recycled to S0 2 MDM.  (4) Complete Loop B startup with command validation overrides on pump speed command or open PM outlet valve command.	(7) Number 2 in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.  (8) Problem indication: RPCM integration counter will be stale and RT status indication will be stale. BST A and BST B will not be accessible. S0 2 MDM Fail C&W message will be generated.  (9) Reapply power to S0 2 MDM and return to S0 MDM nominal configuration after Loop B startup has been completed and stable operations are achieved.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 2/3 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

242

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
S0 2	CH 1 of SPD Card (A6/Slot 01)	Cannot communicate on UB SEPS-S0-23, thus losing command path to S0-2B/3A RPCMs, particularly RPCM S0-2B-A.	<p>(5) Disable SEPS_23 application in S0 2 MDM and enable it in S0 1 MDM to be able to apply power to SPDA P1-2B; leave S0 2 MDM running.</p> <p>(6) Complete Loop B startup with command validation overrides on pump speed command or open PM outlet valve command.</p>	<p>(10) Number 2 in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.</p> <p>(11) Must disable EATCS_HAC application in S0 2 MDM in order to switch SEPS control of UB SEPS-S0-23 to S0 1 MDM. As a result, lose HX valve status parameters from S0 2 MDM.</p> <p>(12) Problem indication: RPCM integration counter will be stale and RT status indication will be RT or BU on displays. BST A and BST B will register error to indicate HW problem.</p>
S0 2	LLA Card (A3/Slot 07)	Cannot acquire MBSU and DDCU coldplate heater measurements.	Use MBSU/DDCU internal baseplate temperature to determine if active cooling is being achieved for the MBSUs and DDCUs.	None.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 2/3 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

243

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
S0 2	DIO Card (A5/Slot 03)	Lost insight into HX valve positions for HXs connected to S0 2 MDM; this is needed by EXT EATCS_M_B and P1 EATCS_PTC, even though HXs are not connected.	Complete Loop B startup with command validation overrides for pump speed command or open PM outlet valve command.	Item in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.
P1 2	MDM	<p>(5) Lose sensor data from NTA, ATA, and PM-B.</p> <p>(6) Loss of Slot 00 SPD Card, Slot 03 AIO Card, Slot 02 DIO Card, Slot 05 HLA Card, Slot 07 LLA Card, Slot 06 SDO Card, and Slot 08 SDO Card functionality.</p>	<p>(7) Enable SEPS_23, PCVP_COMM, and EATCS_PTC applications in P1 1 MDM.</p> <p>(8) Proceed with Loop B startup using PCVP data available through P1 1 MDM.</p> <p>(9) Activate PTR MDM to read RBVM pressures for Loop B startup.</p>	(13) Must have insight to pressure readings before starting Loop B so Operational Workaround Requirements column number 3 will be performed.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 2/3 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

244

<b>MDM</b>	<b>Lost Component</b>	<b>Consequences Without Response</b>	<b>Operational Workaround Requirements</b>	<b>Procedural Considerations</b>
P1 2	BIA on IOCU Card (after powerup and operational P1 2)	Loss of P1 2 MDM interface.	<p>(10) Power off P1 2 MDM by removing power from P1-2B SPDA, enable SEPS_23 application in P1 1 MDM, and reapply power to P1-2B SPDA to be able to power and control PM-B and continue with Loop B startup.</p> <p>(11) Complete Loop B startup assuming proper valve configuration before power reconfiguration.</p>	<p>(14) Number 2 in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.</p> <p>(15) Problem indication: RPCM integration counter will be stale and RT status indication will be stale. BST A and BST B will not be accessible. P1 2 MDM Fail C&amp;W message will be generated.</p> <p>(16) Reapply power to P1 2 MDM and return to P1 MDM nominal configuration after Loop B startup has been completed and stable operations are achieved.</p>

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 2/3 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

245

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
P1 2	CH 1 of SPD Card (A8/Slot 00)	<p>(7) Cannot communicate on UB SEPS-P1-23.</p> <p>(8) Cannot repress if needed before Loop B startup and cannot reduce system pressure to normal operating pressure at completion of Loop B startup.</p> <p>(9) Lose all P1 EATCS Loop B FDIR, particularly high/low pressure FDIR, ATA overpressure FDIR, ATA bellows overpressure FDIR, inadvertent pump shutdown FDIR, inadvertent valve motion detection, but retain PCVP FDIR.</p>	<p>(12) Disable SEPS_23 application in P1 2 MDM and enable it in P1 1 MDM to be able to power and control PM-B; leave P1 2 MDM running.</p> <p>(13) Complete Loop B startup assuming proper valve configuration before power reconfiguration.</p> <p>(14) If P1 2 MDM is unreliable, activate PTR MDM and use RBVM pressures to verify system pressure.</p> <p>(15) Use PM-B, ATA, and NTA data available from operational P1 2 MDM.</p>	<p>(17) Number 2 in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.</p> <p>(18) Problem indication: RPCM integration counter will be stale and RT status indication will be RT or BU on displays. BST A and BST B will register error to indicate HW problem.</p>

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 2/3 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

246

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
P1 2	AIO Card (A5/Slot 03)	<p>(10) Cannot repress if needed before Loop B startup and cannot reduce system pressure to normal operating pressure at completion of Loop B startup, which may result in inadvertent pump shutdown shortly after startup.</p> <p>(11) Lose high pressure FDIR and ATA bellows overpressure FDIR.</p> <p>(12) May cause loss of system pressure depending on how card fails.</p>	<p>(16) Inhibit high pressure, ATA tank overpressure, and ATA bellows overpressure FDIR, and continue with Loop B startup.</p> <p>(17) Turn GPRV off after fill and repress during powerdown.</p> <p>(18) Inhibit auto GPRV poweron before enabling EATCS_PTC during powerup so GPRV does not get changed accidentally. High pressure FDIR could turn on GPRV automatically.</p>	None.
P1 2	DIO Card (A9/Slot 02)	<p>(13) Lose insight into PM-B, ATA, and NTA valve positions.</p> <p>(14) Lose inadvertent valve motion detection.</p>	<p>(19) Proceed with Loop B startup.</p> <p>(20) To prevent failure of responses to other FDIR detections, set sensor overrides for valve position indicators.</p>	TBD if overriding sensors is acceptable to TCS community.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 2/3 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

247

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
P1 2	HLA Card (A4/Slot 05)	<p>(15) Lose insight into PM-B, ATA, and NTA pressures.</p> <p>(16) Depending on failure mode of HLA card, probably not able to drop system pressure after Loop B startup.</p> <p>(17) Lose high/low system pressure FDIR, ATA overpressure FDIR, and ATA bellows overpressure FDIR.</p> <p>(18) Cannot repress if system pressure drops.</p>	Inhibit applicable FDIR, activate PTR MDM, and proceed with Loop B startup.	(19) Perform instructions in Operational Workaround Requirements column.
P1 2	LLA Card (A3/Slot 07)	Lose temperature sensors PM-B flowmeters, and ATA level sensors, all of which is used to verify proper Loop B startup.	Inhibit applicable FDIR and proceed with Loop B startup.	TBD if inhibiting FDIR is acceptable to TCS community.
P1 2	SDO Card (A11/Slot 06)	<p>(19) Cannot open PM-B outlet valve.</p> <p>(20) Cannot perform Loop B startup if PM outlet valve is closed.</p>	None. Loop B startup is not possible without preconfiguration.	Preconfigure PM-B outlet valve to open position (possible since no HXs are connected). PM-B outlet valve position is deciding point for EVA; if cannot open the valve, do not proceed with EVA. The PM-B outlet valve is closed for filling the loop with ammonia before the EVA.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 2/3 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

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MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
P1 2	SDO Card (A12/Slot 08)	(21) Cannot power on GPRV, so cannot reduce system pressure after Loop B startup.  (22) Responses to FDIR detections will not be able to cycle NTA/ATA valves.	Inhibit applicable FDIR and proceed with Loop B startup.	(20) Do not power up GPRV during critical activation sequence; deal with this issue during nominal activation cleanup.
PTR	MDM	Loss of Slot 02 HLA Card and Slot 00 LLA Card functionality.	None. Proceed with Loop B startup.	None.
PTR	HLA Card (A6/Slot 02)	Lose insight into RBVM pressures.	None. Proceed with Loop B startup.	None.
PTR	LLA Card (A5/Slot 00)	Lose insight into RBVM temperature sensors; impacts RGAC operation.	None. Proceed with Loop B startup.	(21) Port TRRJ will be in autotrack up until powerdown and will be in directed position mode afterwards through the EVA and Loop B startup. Port TRRJ may be returned to autotrack mode before end of EVA.  (22) RGAC will be run in PM RAD mode rather than FTC Off mode while TRRJ is in autotrack mode.



**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 2/3 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

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MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
LA 1	MDM	Lose insight into smoke detectors, SDS Valves, IMV valve, ISPR Fans, Water Vent system, MCA, LAB Rack TCS RFCA and sensors, LTL sensors, PTCS sensors.	None. Proceed with Loop B startup.	No unique procedures. For details, refer to {3.703 C&DH SSR-3: LAB 1 MDM FAILURE} (SODF: C&DH: MALFUNCTION: SSR).

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**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

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MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
Primary CC	MDM or CH 1 of SPD Card (A8/Slot 02) and/or  CH 2 of SPD Card (A5/Slot 01)	Cannot communicate on CB EXT-1 and/or CB EXT-2, respectively, thus losing command path to EXT 1 and/or EXT 2 MDMs.	None. CCS RM will recover lost capability by making the backup CC MDM the primary CC MDM. Two CC MDMs will be available with the use of the 12A.1 LAB AR Rack Jumper.	(1) Two CC MDMs not required to proceed with reconfiguration  (2) Leave BC Comm Fail FDIR enabled.  (3) Before EVA, per 12A.1 flight rule scavenge CC 3 MDM. After EVA, just proceed with activation.
Primary PMCU	MDM or CH 2 of SPD Card (A8/Slot 02) and/or  CH 2 of SPD Card (A7/Slot 00)	Cannot communicate on LB PMCU-1 and/or LB PMCU-4, respectively, thus losing command path to MBSU S0-1A/4B, DDCU S0-1A, DDCU S1-4B, and/or MBSU S0-4A/4B, DDCU S0-4B.	Transition backup PMCU MDM to primary and continue with reconfiguration/activation.	None. Note: PMCU 1 and PMCU 2 are both powered from the 2/3 power domain due to the use of the 12A.1 LAB AR Rack Jumper.
GNC 2 (Primary)	MDM	(1) Loss of CMG control, loss of GPS and RGA data, and loss of OIU interface.  (2) Loss of Slot 00, 01, 02, 03, and 05 SPD Cards.	Transition to alternate attitude control in accordance with flight rule C8-51 and maintain high rate S-Band using manual S-Band gimbal pointing commands.	Before reconfiguration, prepare manual S-Band gimbal pointing commands to maintain high rate data transfer in case pointing capability is lost.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

252

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
GNC 2 (Primary)	CH 1 of SPD Card (A5/Slot 01)  CH 2 of SPD Card (A8/Slot 02)	Cannot communicate on LB GNC-2, thus losing command path to CMG-2, RGA-2, and SIGI-2.  Cannot communicate on LB GNC-3, thus losing command path to CMG-3.	Same as above for loss of GNC 2 MDM. CMGs 1 and 4, RGA-1, and SIGI-1 are not available during Channel 1/4 reconfiguration.	Same as above for loss of GNC 2 MDM.
GNC 2 (Primary)	CH 2 of SPD Card (A4/Slot 03)  CH 1 of SPD Card (A3/Slot 05)	Cannot communicate on LB ORB-N2-2, thus losing command path to OIU.  Cannot communicate on LB ORB-N2-1, thus losing command path to OIU.	OIU command uplink and data uplink paths to ISS are not available; must rely on Station S-Band for comm.	None.
EXT 2 (Primary)	MDM	(3) Lost redundancy in EXTs and no insight into 2/3 truss devices during Channel 1/4 powerdown.  (4) Loss of Slot 02 SPD Card and Slot 03 SPD Card functionality.	Proceed without EXT 2 MDM. Powerup MBSUs/DDCUs required for SPDA S0-1A activation and then power on EXT 1 and S0 1 MDMs concurrently to support EATCS Loop A startup.	(4) Reenable CCS RM for EXTs after Channel 1/4 power is reactivated and as soon as possible after functionality of EXT 1 MDM has been restored.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

253

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
EXT 2 (Primary)	CH 1 of SPD Card (A8/Slot 02)  CH 2 of SPD Card (A4/Slot 03)	Cannot communicate on LB SYS-S-1, thus losing command path to S0 1 and S1 1 (and STR) MDMs.  Cannot communicate on LB SYS-S-2, thus losing command path to S1 2 MDM if needed.	Same as above for loss of EXT 2 MDM.	(5) If this failure occurred during powerdown before the start of the EVA, proceed without EXT 2 and rely on EXT 1 during powerup.
S0 1	MDM	Loss of Slot 01 SPD Card, Slot 07 LLA Card, and Slot 03 DIO Card functionality.	(1) Enable SEPS_14 application in S0 2 MDM to be able to apply power to SPDA S1-1A.  (2) Complete Loop A startup with command validation overrides on pump speed command or open PM outlet valve command.	Number 2 in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
S0 1	BIA on IOCU Card (after powerup and operational S0-1)	Loss of S0 1 MDM interface.	<p>(3) Power off S0 1 MDM and enable SEPS_14 application in S0 2 MDM to be able to apply power to SPDA S1-1A and/or continue with Loop A startup.</p> <p>(4) Complete Loop A startup with command validation overrides on pump speed command or open PM outlet valve command.</p>	<p>(6) Number 2 in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.</p> <p>(7) Problem indications: RPCM integration counter will be stale and RT status indication will be stale. BST A and BST B will not be accessible. S0 1 MDM Fail C&amp;W message will be generated.</p> <p>(8) Reapply power to S0 1 MDM and return to S0 MDM nominal configuration after Loop A startup has been completed and stable operations are achieved.</p>

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**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

255

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
S0 1	CH 1 of SPD Card (A6/Slot 01)	Cannot communicate on UB SEPS-S0-14, thus losing command path to S0-1A/4B RPCMs, particularly RPCM S0-1A-A.	<p>(5) Disable SEPS_14 application in S0 1 MDM and enable it in S0 2 MDM to be able to apply power to SPDA S1-1A; leave S0 1 MDM running.</p> <p>(6) Complete Loop A startup with command validation overrides on pump speed command or open PM outlet valve command.</p>	<p>(9) Number 2 in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.</p> <p>(10) Must disable EATCS_HAC application in S0-1 MDM in order to switch SEPS control of UB SEPS-S0-14 to S0 2 MDM. As a result, lose HX valve status parameters from S0 1 MDM.</p> <p>(11) Problem indications: RPCM integration counter will be stale and RT status indication will be RT or BU on displays. BST A and BST B will register error to indicate HW problem.</p>
S0 1	LLA Card (A3/Slot 07)	Cannot acquire MBSU and DDCU coldplate heater measurements.	Use MBSU/DDCU internal baseplate temperatures to determine if active cooling is being achieved for the MBSUs and DDCUs.	None.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
S0 1	DIO Card (A5/Slot 03)	Lost insight into HX valve positions for HXs connected to S0 1 MDM; this is needed by EXT EATCS_M_A and S1 EATCS_PTC, even though HXs are not connected.	Complete Loop A startup with command validation overrides for pump speed command or open PM outlet valve command.	Item in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.
S1 1	MDM	(5) Lose sensor data from NTA, ATA, and PM-A.  (6) Loss of Slot 00 SPD Card, Slot 03 AIO Card, Slot 02 DIO Card, Slot 05 HLA Card, Slot 07 LLA Card, Slot 06 SDO Card, and Slot 08 SDO Card functionality.	(7) Enable SEPS_14, PCVP_COMM, and EATCS_PTC applications in S1 2 MDM.  (8) Proceed with Loop A startup using PCVP data available through S1 2 MDM.  (9) Activate STR MDM to read RBVM pressures for Loop A startup.	(12) Must have insight to pressure readings before starting Loop A so number 3 in Operational Workaround Requirements column will be performed.

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**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

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MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
S1 1	BIA on IOCU Card (after powerup and operational S1 1)	Loss of S1 1 MDM interface.	<p>(10) Power off S1 1 MDM by removing power from S1-1A SPDA, enable SEPS_14 application in S1 2 MDM, and reapply power to S1-1A SPDA to be able to power and control PM-A and continue with Loop A startup.</p> <p>(11) Complete Loop A startup assuming proper valve configuration before power reconfiguration.</p>	<p>(13) Number 2 in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.</p> <p>(14) Problem indications: RPCM integration counter will be stale and RT status indication will be stale. BST A and BST B will not be accessible. S1 1 MDM Fail C&amp;W message will be generated.</p> <p>(15) Reapply power to S1 1 MDM and return to S1 MDM nominal configuration after Loop A startup has been completed and stable operations are achieved.</p>

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

258

MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
S1 1	CH 1 of SPD Card (A8/Slot 00)	<p>(7) Cannot communicate on UB SEPS-S1-14.</p> <p>(8) Cannot repress if needed before Loop A startup and cannot reduce system pressure to normal operating pressure at completion of Loop A startup.</p> <p>(9) Lose all S1 EATCS Loop A FDIR, particularly high/low pressure FDIR, ATA overpressure FDIR, ATA bellows overpressure FDIR, inadvertent pump shutdown FDIR, inadvertent valve motion detection, but retain PCVP FDIR.</p>	<p>(12) Disable SEPS_14 application in S1 1 MDM and enable it in S1 2 MDM to be able to power and control PM-A; leave S1 1 MDM running.</p> <p>(13) Complete Loop A startup assuming proper valve configuration before power reconfiguration.</p> <p>(14) If S1 1 MDM is unreliable, activate STR MDM and use RBVM pressures to verify system pressure.</p> <p>(15) Use PM-A, ATA, and NTA data available from operational S1 1 MDM.</p>	<p>(16) Number 2 in Operational Workaround Requirements column is completed during powerdown for this EVA, i.e., PM outlet valve is opened.</p> <p>(17) Problem indications: RPCM integration counter will be stale and RT status indication will be RT or BU on displays. BST A and BST B will register error to indicate HW problem.</p>

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

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MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
S1 1	AIO Card (A5/Slot 03)	<p>(10) Cannot repress if needed before Loop A startup and cannot reduce system pressure to normal operating pressure at completion of Loop A startup, which may result in inadvertent pump shutdown shortly after startup.</p> <p>(11) Lose high pressure FDIR and ATA bellows overpressure FDIR.</p> <p>(12) May cause loss of system pressure depending on how card fails.</p>	<p>(16) Inhibit high pressure, ATA tank overpressure, and ATA bellows overpressure FDIR, and continue with Loop A startup.</p> <p>(17) Turn GPRV off after fill and repress during powerdown.</p> <p>(18) Inhibit auto GPRV poweron before enabling EATCS_PTC during powerup so GPRV does not get changed accidentally. High pressure FDIR could turn on GPRV automatically.</p>	None.
S1 1	DIO Card (A9/Slot 02)	<p>(13) Lose insight into PM-A, ATA, and NTA valve positions.</p> <p>(14) Lose inadvertent valve motion detection.</p>	<p>(19) Proceed with Loop A startup.</p> <p>(20) To prevent failure of responses to other FDIR detections, set sensor overrides for valve position indicators.</p>	TBD if overriding sensors is acceptable to TCS community.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

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MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
S1 1	HLA Card (A4/Slot 05)	<p>(15) Lose insight into PM-A, ATA, and NTA pressures.</p> <p>(16) Depending on failure mode of HLA Card, probably not able to drop system pressure after Loop A startup.</p> <p>(17) Lose high/low system pressure FDIR, ATA overpressure FDIR, and ATA bellows overpressure FDIR.</p> <p>(18) Cannot repress if system pressure drops.</p>	Inhibit applicable FDIR, activate STR MDM, and proceed with Loop A startup.	(18) Perform instructions in Operational Workaround Requirements column.
S1 1	LLA Card (A3/Slot 07)	Lose temperature sensors, PM-A flowmeters, and ATA level sensors, all of which is used to verify proper Loop A startup.	Inhibit applicable FDIR and proceed with Loop A startup.	TBD if inhibiting FDIR is acceptable to TCS community.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

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MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
S1 1	SDO Card (A11/Slot 06)	(19) Cannot open PM-A outlet valve.  (20) Cannot perform Loop A startup if PM outlet valve is closed.	None. Loop A startup is not possible without preconfiguration.	Preconfigure PM-A outlet valve to open position (possible since no HXs are connected). PM-A outlet valve position is deciding point for EVA; if cannot open the valve, do not proceed with EVA. The PM-A outlet valve is closed for filling the loop with ammonia before the EVA.
S1 1	SDO Card (A12/Slot 08)	(21) Cannot power on GPRV, so cannot reduce system pressure after Loop A startup.  (22) Responses to FDIR detections will not be able to cycle NTA/ATA valves.	Inhibit applicable FDIR and proceed with Loop A startup.	(19) Do not power up GPRV during critical activation sequence; deal with this issue during nominal activation cleanup.
STR	MDM	Loss of Slot 02 HLA Card and Slot 00 LLA Card functionality.	None. Proceed with Loop A startup.	None.
STR	HLA Card (A6/Slot 02)	Lose insight into RBVM pressures.	None. Proceed with Loop A startup.	None.

**12A.1 CRITICAL CONTINGENCIES DURING POWERUP AFTER COMPLETION OF EPS CH 1/4 RECONFIGURATION**

(ASSY OPS/12A.1/FIN)

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MDM	Lost Component	Consequences Without Response	Operational Workaround Requirements	Procedural Considerations
STR	LLA Card (A5/Slot 00)	Lose insight into RBVM temperature sensors; impacts RGAC operation.	None. Proceed with Loop A startup.	(20) Starboard TRRJ will be in autotrack up until powerdown and will be in directed position mode afterwards through the EVA and Loop A startup. Starboard TRRJ may be returned to autotrack mode before end of EVA.  (21) If the STR MDM is off, RGAC will be run in PM RAD mode rather than FTC Off mode while TRRJ is in autotrack mode.
LA 2	MDM	Lose insight into smoke detectors, CCAA, IMV valve, AAA ISPR Fans, Water Vent system, ARS Valves, LAB Rack TCS RFCA and sensors, MTL sensors, PTCS sensors, LAB C&W Panel.	None. Proceed with Loop A startup.	No unique procedures. For details, refer to <a href="#">3.704 C&amp;DH SSR-4: LAB 2 MDM FAILURE</a> (SODF: C&DH: MALFUNCTION: SSR).
LA 3	MDM	Lose insight into smoke detectors, CDRA, IMV valve, AAA, Vacuum System, ISPR Fans, LAB Rack TCS RFCA and sensors.	None. Proceed with Loop A startup.	No unique procedures. For details, refer to <a href="#">{3.705 C&amp;DH SSR-5: LAB 3 MDM FAILURE}</a> (SODF: C&DH: MALFUNCTION: SSR).

NOMINAL

**NOMINAL**

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OBJECTIVE:

Procedure configures inhibits for P5 1553 Data Cable mating and verifies bus integrity post cable configuration.

1. INHIBITING TRANSITION TO DIAGNOSTIC FOR THE PMCU

NOTE

- 1. To prevent bus problems causing the Primary PMCU to transition to diagnostic, inhibit the transition to diagnostic.
- 2. These steps are also applicable for LTA Cable contingency.

PCS

CDH Summary: Primary PMCU MDM

Primary PMCU MDM

'Software Control'

sel MDM FDIR

Primary PMCU MDM FDIR

**cmd** Auto Transition to Diagnostic – Inhibit **Execute** (√ – Inh)

2. INHIBITING CHANNEL SWITCHING AND SELECT CHANNEL A(B) FOR DATA BUS CABLE MATING

NOTE

Cable/Connector W02-P42 contains Channel A for LB PMCU-2 and LB PMCU-4. Cable/Connector W07-P41 contains Channel B for LB PMCU-2 and LB PMCU-4. No bus traffic is permitted on the channel being mated.

CDH Summary: Primary PMCU MDM

Primary PMCU MDM

Verify frame count – incrementing

sel LB PMCU-2

LB PMCU 2

sel Bus Status

LB PMCU 2 Bus Status

√Channel – A(B)

Verify no transaction errors.

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

# EVA 1 1553 CHECKOUT

(ASSY OPS/12A.1/FIN)

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CDH Summary: Primary PMCU MDM

Primary PMCU MDM

sel LB PMCU-4

LB PMCU 4

sel Bus Status

LB PMCU 4 Bus Status

√Channel – A(B)

Verify no transaction errors.

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

### 3. PERFORMING CABLE RECONFIGURATION OF CHANNEL B(A)

EVA callout to mate W07-P41(W02-P42).

### 4. SWAPPING PMCU BUS CHANNELS FOR CHECKOUT AND DATA BUS CABLE MATING

CDH Summary: Primary PMCU MDM

Primary PMCU MDM

Verify frame count – incrementing

sel LB PMCU-2

LB PMCU 2

sel Bus Status

LB PMCU 2 Bus Status

**cmd** Select Ch B(A) **Execute** (√ – B(A))

Verify no transaction errors.

CDH Summary: Primary PMCU MDM

Primary PMCU MDM

sel LB PMCU-4

LB PMCU 4

sel Bus Status

LB PMCU 4 Bus Status

**cmd** Select Ch B(A) **Execute** (√ – B(A))

Verify no transaction errors.

√Auto Channel Switch Status – Inhibit

5. PERFORMING CABLE RECONFIGURATION OF CHANNEL A(B)

EVA callout to mate W02-P42(W07-P41).

6. SWAPPING PMCU BUS CHANNELS FOR CHECKOUT, NOMINAL CONFIGURATION (IF NEEDED) AND REENABLE BUS SWITCHING

CDH Summary: Primary PMCU MDM

Primary PMCU MDM

Verify frame count – incrementing

sel LB PMCU-2

LB PMCU 2

sel Bus Status

LB PMCU 2 Bus Status

If Channel Selected – A

**cmd** Select Ch B **Execute** (√ – B)

**cmd** Select Ch A **Execute** (√ – A)

Verify no transaction errors.

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

Verify no transaction errors.

CDH Summary: Primary PMCU MDM

Primary PMCU MDM

sel LB PMCU-4

LB PMCU 4

sel Bus Status

LB PMCU 4 Bus Status

If Channel Selected – A

**cmd** Select Ch B **Execute** (✓ – B)

**cmd** Select Ch A **Execute** (✓ – A)

Verify no transaction errors.

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

Verify no transaction errors.

7. [ENABLING TRANSITION TO DIAG FOR THE PMCU](#)

CDH Summary: Primary PMCU MDM

'Software Control'

sel MDM FDIR

**cmd** Auto Transition to Diagnostic – Enable **Execute** (✓ – Ena)

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

(EPS/E12 - ALL/FIN 1) Page 1 of 48 pages

##### OBJECTIVE:

This procedure will retract one of the USOS solar arrays on the P6 truss. This procedure is applicable only to P6 when it is attached to the Z1 truss, and supports array retraction for P6 relocation and Sequential Shunt Unit (SSU) Remove and Replace (R&R) activities.

##### NOTE

1. If retracting the solar array in preparation of P6 relocation, all steps are required. If retracting the solar array to protect EVA crew during replacement of a failed SSU, steps 1 to 13, 20, and 23 are required.
2. Crew will be primary for performing steps 12 and 13. **MCC-H** will be primary for performing all remaining steps, as S-Band and Ku-Band availability permits. The crew may be asked to perform additional steps (14 to 19) if video to the ground is unavailable.

##### Overview of Crew Steps for Nominal SAW Retraction

1. Retract 3 Bays of Mast, then stop retract.
  2. Perform a visual inspection of blanket.
  3. Retract Mast until only 1 Mast Bay is visible, stop retract.
  4. Unlatch Left Blanket Box (LBB) and Right Blanket Box (RBB).
  5. Perform visual inspection of blanket containment by rotating the Beta Gimbal Assembly (BGA).
  6. Retract Mast 100 %.
  7. Perform visual inspection of blanket containment by rotating the BGA.
  8. Latch LBB and RBB.
3. Live downlink video is required for steps 12.8, 13.8, and 16.2. It is highly desirable, but not required, to have video downlink of all remaining SAW retraction operations.
  4. Refer to this procedure for P6 SAWs. Refer to Table 1 for PVM power channel connectivity.

Table 1. PVM Connectivity

[PVM]	[XX]	[YY]
P6	2B	4B
P6	4B	2B

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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#### CAUTION

Steps that involve mechanical motion (e.g., Latch, Unlatch, Deploy, Retract) of the SAW hardware, must

1. Be performed during insolation to support crew visual cues.
2. Be performed with ISS and orbiter thrusters inhibited.

#### 1. VERIFYING PRERETRACTION INSPECTIONS COMPLETE **MCC-H**

##### NOTE

Both front and back of the SAW XX will be inspected at approximately L-5 weeks. The array will be inspected again at approximately L-3 days prior to mission when the solar array will be retracted.

Confirm SAW [XX] preretract visual inspections are complete and nominal.

Confirm {4.124 SAW XX PRE-RETRACT MDA CHECKOUT} (SODF: EPS: CORRECTIVE: PRIMARY POWER SYSTEM), is complete and nominal.

**MCC-H** ↑ ISS, Orbiter, “We have a Go to start SAW [XX] retract operations.”

#### 2. VERIFYING ECU XX CONFIGURED FOR SAW RETRACT

##### NOTE

Before retracting the solar array, the ECU XX primary power feed (RPCM XX A RPC 1) will be swapped to the redundant power feed (RPCM YY A RPC 2) from the opposite channel on the IEA. This configuration provides a power source to ECU XX, independent of the array being retracted.

Confirm {1.3.403 ECU XX CONFIG FROM PRIME TO REDUNDANT POWER} (SODF: EPS: ACTIVATION AND CHECKOUT: CHANNEL ACTIVATION), has been completed.

#### 3. VERIFYING COMM WITH BGA CONTROLLER

PCS

P6: EPS: BGA [XX]

**BGA [XX]**

‘ECU [XX]’

Verify ECU/BGA Integration Counter – incrementing

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

(EPS/E12 - ALL/FIN 1)

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#### 4. VERIFYING COMM WITH SAW CONTROLLER

P6: EPS: SAW [XX]

SAW [XX]

'ECU [XX]'

Verify ECU/SAW Integration Counter – incrementing

#### 5. REDUCING LOAD ON DDCU YY PRIOR TO SAW RETRACT (MCC-H)

##### NOTE

Power is supplied to ECU XX from the opposite channel through DDCU YY and RPCM YY A RPC 2 for the solar array retraction operations. Therefore, it may be necessary to reduce loads on DDCU YY to support a peak power load of 580 watts during array retraction.

Verify enough margin exist on DDCU [YY] to support a potential peak power load of 580 watts during retract operations. Reduce load as necessary to meet this requirement.

#### 6. VERIFYING ECU POWER SUPPLY TEMPERATURES AND VOLTAGE STATUS

SAW [XX]

'ECU [XX]'

Verify SAW PS Temp, deg C: -33 to 51

Verify SAW PS Voltage, V: 115 to 125

Verify BGA PS Temp, deg C: -33 to 51

Verify BGA PS Voltage, V: 115 to 125

#### 7. CONFIGURING BGA XX FOR SAW RETRACT

##### NOTE

1. BGA must be locked prior to retracting the SAW to provide structural rigidity and the prevention of BGA rotation during SAW retraction operations. During the retraction, visual confirmation of SAW mechanisms will be performed by viewing the back side of the array.
2. BGA 4B Latch 2 failed during the 5A.1 mission; therefore, BGA 4B will be positioned to 163.125 degrees and Latch 1 will be engaged.
3. BGA positions are the same for nominal retraction and retraction for SSU R&R, so the same SSRMS camera configurations can be used.

## 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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If SAW 4B is to be retracted

Position BGA 4B at 163.125 degrees and latch BGA on Latch 1.  
Perform {2.106 PVM CONFIGURE BGA XX TO SAFE/LOCK MODE},  
all (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM), then:

If SAW 2B is to be retracted

Position BGA 2B at 199.687 degrees and latch BGA on Latch 2.  
Perform {2.106 PVM CONFIGURE BGA XX TO SAFE/LOCK MODE},  
all (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM), then:

### 8. VERIFYING SAW STATUS

#### 8.1 Configuring for Dump of SAW Data

##### **MCC-H**

Configure for continuous data dump of SAW [XX]. To build dump command, perform {1.230 CCS BUILD DATA DUMP COMMAND}, all (SODF: GND AVIONICS: C&DH: NOMINAL). For unique PVCU start location addresses, refer to {5.294 EPS MDM BDT/50Hz ADDRESS}, for SAW with 1 Hz Data Collection, 224 words (SODF: GND SYSTEMS: EPS: NOMINAL). Verify initial SAW C&W flags and MDA data.

#### 8.2 Verifying SAW Operational Ranges and Limit Switch Status

##### NOTE

Disconnects are present in the MDA Over Temp Trip FDIR. The software implements an MDA Over Temp Trip at 77.8° C. The ECU firmware implements an MDA Over Temp Trip at 140° C. These FDIR responses remove power to the MDA. Potential damage to hardware occurs at 120° C. MDA upper limit temperatures indicated in this step are conservative. At a minimum, a 30° C Mast MDA temperature increase should be protected for during mast retraction.

sel SAW [XX]

SAW [XX]

'LBB'

##### NOTE

SABB limit switches are sensitive to thermal conditions and may indicate inaccurate values during eclipse and the first 15 minutes of insolation.



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Verify SW01,02 Pin Released – Yes  
Verify SW01,02 Latched – Yes  
Verify SW01,02 Unlatched – No  
Verify MDA Slow Alert – Nominal  
Verify MDA Voltage: 000.0 ( $\pm 2.8$ )  
Verify MDA Temp, deg C: -54 to 48  
Verify MDA Over Temp Trip – blank

'MAST'

##### NOTE

SAW 2B SW 02 Deployed limit switch failed prior to the 4A mission, No is always indicated.

Verify SW01,02 Retracted – No  
Verify SW01,02 Deployed – Yes  
Verify MDA Slow Alert – Nominal  
Verify MDA Voltage: 000.0 ( $\pm 2.8$ )  
Verify MDA Temp, deg C: -54 to 48  
Verify MDA Over Temp Trip – blank

'RBB'

##### NOTE

SABB limit switches are sensitive to thermal conditions and may indicate inaccurate values during eclipse and the first 15 minutes of insolation.

Verify SW 01,02 Pin Released – Yes  
Verify SW 01,02 Latched – Yes  
Verify SW 01,02 Unlatched – No  
Verify MDA Slow Alert – Nominal  
Verify MDA Voltage: 000.0 ( $\pm 2.8$ )  
Verify MDA Temp, deg C: -54 to 48  
Verify MDA Over Temp Trip – blank

'ECU [XX]'

Verify MDA Current, A: 0.00 ( $\pm 0.4$ )  
Verify MDA Over Current Trip – blank

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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\*\*\*\*\*

\* If any MDA temperature is out of range, notify **MCC-H** before  
\* proceeding.  
\*

**NOTE**

PVCU software implements an MDA Over Temp Trip  
at 77.8° C which will remove power from the motor.

\* If **MCC-H** unavailable and MDA temperature is greater than 48° C,  
\* inhibit MDA Over Temp Safing.  
\*

'ECU [XX]'

sel SAW Software Inhibits

SAW [XX] Software Inhibits

sel SAW [XX] Temp Safing

SAW [XX] Temp Safing

'LBB (RBB)(Mast) Over Temp Safing'

'Primary PVCU'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inhibit

√Over Temp Safing – Inh

'Backup PVCU'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inhibit

√Over Temp Safing – Inh

\*\*\*\*\*

### 8.3 Verifying SABB Limit Switch Override

**NOTE**

These steps must be performed nominally if the Mast  
will be deployed or retracted while an SABB is in an  
undetermined state. These steps also override a failed  
Latched, Unlatched, or Pin Released limit switch.

P6: EPS: SAW [XX]

SAW [XX]

'ECU [XX]'

sel SAW Software Inhibits

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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SAW [XX] Software Inhibits

'Deploy Reject'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inhibit

√Deploy Reject – Inh (Allows deploy or retract commands when SABB state is undetermined.)

#### 8.4 Verifying Mast Limit Switch Override

##### NOTE

These steps must be performed nominally if the SABBs will be latched or unlatched or if the BGA will be moved while the Mast is in an undetermined (partially deployed) state. These steps will also be performed to override a failed limit switch (e.g., SAW 2B SW 02 Deployed limit switch).

SAW [XX] Software Inhibits

'Latch Reject'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inhibit

√Latch Reject – Inh (Allows SABB unlatch or latch commands when Mast state is undetermined.)

#### 8.5 Verifying BGA Software Configuration

P6: EPS: BGA [XX]

BGA [XX]

sel BGA Software Inhibits

BGA [XX] Software Inhibits

'SAW Deployment'

'Primary PVCU'

√SAW Deployment – Ena (Allows BGA to be operated when SAW Mast is in an undetermined state.)

'Backup PVCU'

√SAW Deployment – Ena

#### 9. VERIFYING MDA HI TEMP REJECT FUNCTION INHIBITED

P6: EPS: SAW [XX]

SAW [XX]

sel SAW Software Inhibits

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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SAW [XX] Software Inhibits

sel SAW [XX] Temp Safing

SAW [XX] Temp Safing

'Hi Temp Reject'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inhibit

√Hi Temp Reject – Inh (Allows unlatch or latch and deploy or retract commands when MDA temperature is >30° C.)

#### 10. VERIFYING MDA SAFING CONFIGURATION

sel SAW Software Inhibits

SAW [XX] Software Inhibits

√Limit Sw Turnoff Function – Ena (Stops motor upon limit switch contact but does not turn motor off.)

##### NOTE

The Config Complete MDA Off Safing must be inhibited to prevent an inadvertent ECU trip during retraction operations. Due to an incorrect current limit value in PPL69, when enabled, the Config Complete MDA Off Safing functional inhibit removes power from the MDA and ECU, if the SAW is in a fully deployed configuration.

'Config Complete MDA Off Safing'

'Primary PVCU'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inhibit

√Config Complete MDA Off Safing – Inh (When enabled, this FI turns the motor off upon limit switch contact, if MDA current above limit.)

'Config Complete MDA Off Safing'

'Backup PVCU'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inhibit

√Config Complete MDA Off Safing – Inh

sel SAW [XX] Motor Stall Safing

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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##### SAW [XX] Motor Stall Safing

- √Motor Stall Safing, Primary PVCU – Ena
- √Motor Stall Safing, Backup PVCU – Ena (Turns motor off if Slow is indicated when between limit switches and if MDA current above limit.)

##### NOTE

Following step 11, no power will be supplied to Ch [XX] from SAW [XX].

#### 11. VERIFYING CHANNEL XX LOADS SUPPORTED FROM ANOTHER SOURCE

##### 11.1 Confirming Seamless Power Channel Handover (SPCH) Complete

##### NOTE

At the end of the SPCH all DCSU XX RBIs are closed and SSU XX is shunted. No power is supplied to channel XX loads from SAW XX.

Confirm {2.134 SEAMLESS POWER CHANNEL HANDOVER (SPCH)} (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM), has been completed.

##### 11.2 Shunting SSU XX

##### NOTE

If retracting the array to support an SSU R&R. The SSU may be failed such that shunting is not possible. In this event DCSU XX RBI 1 should be open.

P6: EPS: SSU [XX]

SSU [XX]

sel PVCE

SSU [XX] PVCE

**cmd** All PVCE Off – Off (single-step command – arm not required)

- √PVCE 1 Error Voltage: <5 Volts
- √PVCE 2 Error Voltage: <5 Volts
- √PVCE 3 Error Voltage: <5 Volts

**MCC-H** ↑ ISS: “Steps 1 to 11 of solar array retract procedure have been completed. Crew proceed to step 12.3 and confirm correct camera and RWS configuration for the retraction of 3 Mast Bays.”

## 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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### 12. RETRACTING FIRST THREE BAYS OF SOLAR ARRAY

#### NOTE

##### Overview of Crew Steps for Nominal SAW Retraction

1. Retract 3 Bays of Mast, then stop retract.
2. Perform a visual inspection of blanket.
3. Retract until only 1 Mast Bay is visible, stop retract.
4. Unlatch LBB and RBB.
5. Perform visual inspection of blanket containment by rotating the BGA.
6. Retract Mast 100 %.
7. Perform visual inspection of blanket containment by rotating the BGA.
8. Latch LBB and RBB.

The array will be retracted with the SABB latches in high-tension mode (latched) position, to minimize risk to Mast retraction operations due to SABB failures.

#### 12.1 Verifying Temperatures are Within Nominal Ranges Prior to SAW

##### Retract

P6: EPS: SAW [XX]

SAW [XX]

'ECU [XX]'

Verify SAW PS Temp, deg C: -33 to 51

Verify BGA PS Temp, deg C: -33 to 51

'Mast'

Verify MDA Temp, deg C: -54 to 48

#### 12.2 Powering On Mast Motor Drive Assembly (MDA)

#### NOTE

MDA Slow alert will be Nominal until MDA power is applied. Once this is done, the indication is Slow.

SAW [XX]

'Mast'

sel Mast Commands

SAW [XX] Mast Commands

'MDA'

'Power'

**cmd** On – Arm

**cmd** On – On

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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- √MDA Voltage, V: 120 to 125
- √MDA Current, A: ~0.10 (±0.4)
- √MDA Slow Alert: Slow

#### 12.3 Verifying Camera Configuration

NOTE

Perform a visual verification prior to, during, and at the completion of the mast retract operation to minimize the risk of potential collision hazards and monitor for any anomalies. Total number of visible Mast Bays is 31.5, 1 Bay is rigid batten to rigid batten.

Verify camera configuration correct for solar array retraction before proceeding.

#### Crew

If orbiter is performing mated attitude control, proceed to step 12.5.

Otherwise, proceed to step 12.6, and wait for **MCC-H GO** for retraction of 3 Mast Bays.

#### 12.4 Verifying Initial SAW Mast Configuration

SAW [XX] Mast Commands

'Mast'

NOTE

SAW 2B SW 02 Deployed limit switch failed prior to the 4A mission, No is always indicated.

- √SW01,SW02 Retracted – No
- √SW01,SW02 Deployed – Yes

#### 12.5 Preventing Thruster Firings

**CAUTION**

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free Drift will be maintained. At any time that the array retraction is stopped or aborted, thrusters may be enabled.

#### MCC-H

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, "Desats are Inhibited."

Go to step 12.6.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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```
*****
* If ISS is performing attitude control and ISS is not in TEA (MCC-H)
* | Perform {2.404 MODING CMG TA TO FREE DRIFT} (SODF:
* | MCS: NOMINAL: GNC MODING), then:
* |
* | MCC-H ↑ ISS, Orbiter, "ISS is in Free Drift."
* |
* | Go to step 12.6.
*****
```

C3(A6)

```
*****
* If orbiter is performing mated attitude control
* | DAP: FREE
* |
* | Orbiter ⇒ ISS, MCC-H, "Orbiter is in Free Drift."
* |
* | Go to step 12.6.
*****
```

#### 12.6 Retracting First Three Bays of SAW

##### WARNING

If retracting a solar array during EVA operations, confirm EVA crew outside of area that could be subject to solar array structural collapse.

##### CAUTION

Confirm no crew exercise or maximum EVA loads before proceeding.

##### NOTE

1. During the retraction of the first half Bay, the tension mechanisms will rotate (approximately two turns) and the tension bar will lower to the blanket box sill.
2. Upon successful retract command, the Slow alert will go to Nominal during transition and the MDA current will peak briefly at ~2 amps and then oscillate between 0.3 and 1.3 amps ( $\pm 0.4$ ) as Bays retract. Once power is removed from the MDA, the Slow alert will indicate Nominal.

**MCC-H** ↑ ISS, Orbiter, "Crew is GO to retract 3 Mast Bays."

PCS

P6: EPS: SAW [XX]

SAW [XX]

'Mast'

sel Mast Commands



#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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##### SAW [XX] Mast Commands

'Mast'

**cmd** Retract – Arm

**cmd** Retract – Retract

Wait approximately 1 minute (~3 Bays) (10 % of the array is retracted).

**cmd** Abort – Abort

Crew

If orbiter is performing mated attitude control, proceed to step 12.7.

Otherwise, proceed to step 12.8.

##### NOTE

The Mast – Abort command removes power from the MDA.

'MDA'

√Voltage, V: <10 (±2.8)

'Mast'

√SW01,SW02 Retracted – No

√SW01,SW02 Deployed – No

#### 12.7 Configuring for Nominal Attitude Control

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

Go to step 12.8.

\*\*\*\*\*

\* If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

\* | Perform {2.405 MODING FREE DRIFT TO CMG TA} (SODF:

\* | MCS: NOMINAL: GNC MODING), then:

\* |

\* | **MCC-H** ↑ ISS, Orbiter, "ISS is in Attitude Control."

\* |

\* | Go to step 12.8.

\*\*\*\*\*

**C3(A6)**

\* If orbiter is performing mated attitude control

\* | Perform rate damping DOCKED CONFIGURATION DAP

\* | REFERENCE (FDF: ORB OPS, REBOOST/DAP), then:

\* |

\* | Go to step 12.8.

\*\*\*\*\*

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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##### 12.8 Performing Visual Verification Via Cameras

This step requires live downlink of video for **MCC-H** evaluation.

NOTE

The LBB outboard FCC of SAW 4B has what might be an off-nominal fold at panels 61 and 62. This area should be closely scrutinized to ensure the LBB blanket is folding correctly.

Verify tension bar correctly seated in Y brackets.  
Verify initial panel folding (no blanket panels folding backwards.)  
Verify guide wires along back of blankets have no slack.

ISS ↓ **MCC-H**, “We confirm three Mast Bays retracted.”

**MCC-H** ↑ ISS, “We confirm nominal Mast retraction.”

Crew  
Proceed to step 13.3.

\*\*\*\*\*  
\* If retract sequence is not successful, notify **MCC-H** before  
\* proceeding.  
\*  
\* If **MCC-H** unavailable, perform {3.192 SAW XX FAILURE  
\* | **TO RETRACT MAST REMOTELY**}, all (SODF: EPS:  
\* | **MALFUNCTION: PRIMARY POWER SYSTEM**), then:  
\*\*\*\*\*

#### 13. RETRACTING 97 % OF SOLAR ARRAY UNTIL 1 BAY VISIBLE

##### 13.1 Verifying Temperatures are Within Nominal Ranges Prior to SAW

PCS

Retract  
P6: EPS: SAW [XX]  
SAW [XX]  
'ECU [XX]'

Verify SAW PS Temp, deg C: -33 to 51  
Verify BGA PS Temp, deg C: -33 to 51

'Mast'

Verify MDA Temp, deg C: -54 to 48

##### 13.2 Powering On Mast Motor Drive Assembly (MDA)

NOTE

MDA Slow alert will be Nominal until MDA power is applied.  
Once this is done, the indication is Slow.

SAW [XX]  
'Mast'

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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sel Mast Commands

SAW [XX] Mast Commands

'MDA'

'Power'

cmd On – Arm

cmd On – On

√MDA Voltage, V: 120 to 125

√MDA Current, A: ~0.10 (±0.4)

√MDA Slow Alert – Slow

### 13.3 Verifying Camera Configuration

#### NOTE

Perform a visual verification prior to, during, and at the completion of the mast retraction operation to minimize the risk of potential collision hazards, monitor for any anomalies, and to verify solar array retraction. Total number of visible Mast Bays is 31.5, 1 Bay is rigid batten to rigid batten.

Observe

1. Smooth Mast operation, Mast visually straight (no bending or twisting).
2. Broken or missing Mast members.
3. No bending or twisting of SABB cover and base.
4. Correct panel folding (no backward folding) and uniform stacking of blanket panels inside SABB skirts (outboard FCC STE loops stack inside SABB base goal posts).
5. Smooth retraction of guide wires (three per SABB) (no loose cable).

Verify camera configuration correct for solar array retraction before proceeding.

Crew

If orbiter is performing mated attitude control, proceed to step 13.5.

Otherwise, proceed to step 13.6 and wait for **MCC-H GO** for Mast retraction to 1 Bay.

### 13.4 Verifying Initial SAW Mast Configuration

SAW [XX] Mast Commands

'Mast'

√SW01,SW02 Retracted – No

√SW01,SW02 Deployed – No

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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### 13.5 Preventing Thruster Firings

#### CAUTION

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free Drift will be maintained. At any time the array retraction is stopped or aborted, thrusters may be enabled to clean up the attitude.

MCC-H

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, “Desats are Inhibited.”

Go to step 13.6.

\*\*\*\*\*

\* If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

\* Perform {2.404 MODING CMG TA TO FREE DRIFT} (SODF:

\* MCS: NOMINAL: GNC MODING), then:

\*

\* **MCC-H** ↑ ISS, Orbiter, “ISS is in Free Drift.”

\*

\* Go to step 13.6.

\*\*\*\*\*

C3(A6)

\* If orbiter is performing mated attitude control

\* DAP: FREE

\*

\* Orbiter ⇒ ISS, **MCC-H**, “Orbiter is in Free Drift.”

\*

\* Go to step 13.6.

\*\*\*\*\*

### 13.6 Retracting 97 % of SAW Leaving One Bay Visible

#### WARNING

If retracting a solar array during EVA operations, confirm EVA crew outside of area that could be subject to solar array structural collapse.

#### CAUTION

Confirm no crew exercise or maximum EVA loads before proceeding.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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##### NOTE

Upon successful retract command, the Slow alert will go to Nominal during transition and the MDA current will peak briefly at ~2 amps and then oscillate between 0.3 and 1.3 amps ( $\pm 0.4$ ) as bays retract. Once power is removed from the MDA, the Slow alert will indicate Nominal.

**MCC-H** ↑ ISS, Orbiter, "Crew is GO to retract to 1 Mast Bay."

PCS

P6: EPS: SAW [XX]

SAW [XX]

'Mast'

sel Mast Commands

SAW [XX] Mast Commands

'Mast'

**cmd** Retract – Arm

**cmd** Retract – Retract

Wait approximately 9 minutes 10 seconds (~28 Bays) or until only 1 Bay remains visible.

##### **CAUTION**

If mast begins to twist or bend, guide wires become slack, panels fold the wrong direction, or if the solar array does not appear to be retracting as expected. Immediately send the Mast – Abort command.

**cmd** Abort – Abort

Crew

If orbiter is performing mated attitude control, proceed to step 13.7.

Otherwise, proceed to step 13.8.

##### NOTE

The Mast – Abort command removes power from the MDA.

'MDA'

√Voltage, V: <10 ( $\pm 2.8$ )

'Mast'

√SW01,SW02 Retracted – No

√SW01,SW02 Deployed – No

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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**MCC-H** 13.7 Configuring Nominal for Attitude Control  
If ISS is performing attitude control and ISS is in TEA (**MCC-H**)  
Go to step 13.8.

```
*****
* If ISS is performing attitude control and ISS is not in TEA (MCC-H)
* | Perform {2.405 MODING FREE DRIFT TO CMG TA} (SODF:
* | MCS: NOMINAL: GNC MODING), then:
* |
* | MCC-H ↑ ISS, Orbiter, "ISS is in Attitude Control."
* |
* | Go to step 13.8.
*****
```

C3(A6) \* If orbiter is performing mated attitude control  
\* | Perform rate damping DOCKED CONFIGURATION DAP  
\* | REFERENCE (FDF: ORB OPS, REBOOST/DAP), then:  
\* |  
\* | Go to step 13.8.  
\*\*\*\*\*

#### 13.8 Performing Visual Verification Via Cameras

This step requires live downlink of video for **MCC-H** evaluation.

Verify blankets correct panel folding (no overhang outside of the blanket box containment).

Verify blanket box cover and base aligned.

Verify guide wires (three per SABB along back of blankets) retracted.

Verify hinge lines are parallel to one another in the blanket stack.

Verify mast canister tip is parallel to lip of mast canister.

ISS ↓ **MCC-H**, "We confirm only one Mast Bay remains visible."

**MCC-H** ↑ ISS, "We confirm nominal Mast Bay retraction and will verify full containment."

If retracting the solar array in preparation of P6 relocation  
Crew Proceed to step 14.3.

If retracting the array to support an SSU R&R  
Crew Exit procedure.

**MCC-H** go to step 20.

## 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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\*\*\*\*\*  
\* If retract sequence is not successful, notify **MCC-H** before  
\* proceeding.  
\*  
\* If **MCC-H** unavailable, perform {3.192 SAW XX FAILURE TO  
\* | **RETRACT MAST REMOTELY**}, all (SODF: EPS:  
\* | **MALFUNCTION: PRIMARY POWER SYSTEM**), then:  
\*\*\*\*\*

### 14. UNLATCHING (DETENSIONING) LEFT BLANKET BOX (LBB)

PCS

#### 14.1 Verifying Temperatures are Within Nominal Ranges Prior to Unlatch

P6: EPS: SAW [XX]

SAW [XX]

'ECU [XX]'

Verify SAW PS Temp, deg C: -33 to 51

Verify BGA PS Temp, deg C: -33 to 51

'LBB'

Verify MDA Temp, deg C: -54 to 48

#### 14.2 Powering On LBB Motor Drive Assembly (MDA)

##### NOTE

MDA Slow alert will be Nominal until MDA power is applied. Once this is done, the indication is Slow.

SAW [XX]

'LBB'

sel LBB Commands

SAW [XX] LBB Commands

'MDA'

'Power'

**cmd** On – Arm

**cmd** On – On

√MDA Voltage, V: 120 to 125

#### 14.3 Performing Visual Verification Via Cameras

##### NOTE

Perform a visual verification prior to, during, and at the completion of each blanket box unlatch (detension) operation. There are eight latches to be unlatched (detensioned) for each blanket box prior to SAW retract. Only four of eight latches are visible at a time.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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Verify camera configuration correct for solar array retraction before proceeding.

Verify latch position (four of eight) latched (tensioned).

##### Crew

If orbiter is performing mated attitude control, proceed to step 14.5.

Otherwise, proceed to step 14.6, and wait for **MCC-H GO** for left blanket box unlatch.

#### 14.4 Verifying Initial SAW Left Blanket Box Configuration

SAW [XX] LBB Commands

Verify parameters in LATCHED column in step 14.7 before executing unlatch command.

#### 14.5 Preventing Thruster Firings

##### CAUTION

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free Drift will be maintained. Anytime the latches are not in motion, thrusters may be enabled.

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, “Desats are Inhibited.”

Go to step 14.6.

\*\*\*\*\*

\* If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

\* Perform {2.404 MODING CMG TA TO FREE DRIFT} (SODF:

\* MCS: NOMINAL: GNC MODING), then:

\*

\* **MCC-H** ↑ ISS, Orbiter, “ISS is in Free Drift.”

\*

\* Go to step 14.6.

\*\*\*\*\*

C3(A6)

\*\*\*\*\*

\* If orbiter is performing mated attitude control

\* DAP: FREE

\*

\* Orbiter ⇒ ISS, **MCC-H**, “Orbiter is in Free Drift.”

\*

\* Go to step 14.6.

\*\*\*\*\*



#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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##### 14.6 Unlatching (Detension) SAW Left Blanket Box

#### CAUTION

Confirm no crew exercise or maximum EVA loads before proceeding.

#### NOTE

Upon successful unlatch command, the MDA current will increase (0.2 to 3.0 amps) and the Slow alert will go to Nominal during transition, then return to Slow. Once power is removed from the MDA, the Slow alert will indicate Nominal.

If crew is performing the LBB unlatch

**MCC-H** ↑ ISS, Orbiter, "Crew is GO to unlatch the left blanket box"

If ground is performing the LBB unlatch

**MCC-H** ↑ ISS, Orbiter, "We are ready to unlatch the left blanket box, please monitor cameras."

PCS

P6: EPS: SAW [XX]

SAW [XX]

'LBB'

sel LBB Commands

SAW [XX] LBB Commands

'LBB'

**cmd** Unlatch – Arm

**cmd** Unlatch – Unlatch

##### 14.7 Monitoring LBB Latch Parameters During Unlatch (detension) (Approximately 14 Seconds)

Refer to Table 2.

#### NOTE

SABB limit switches are sensitive to thermal conditions and may indicate inaccurate values during eclipse and the first 15 minutes of insolation.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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Table 2. LBB Parameters

PARAMETER	LATCHED→	TRANSITION→ Approximately 14 Seconds	UNLATCHED
LBB SW01,02 Pin Released	Yes	Yes	Yes
LBB SW01,02 Latched	Yes	No	No
LBB SW01,02 Unlatched	No	No	Yes
MDA Slow Alert	Slow	Nominal	Slow
MDA Voltage, V	120 to 125	120 to 125	120 to 125
MDA Temp, deg C	-54 to 48	-54 to 48	-54 to 48
MDA Over Temp Trip	blank	blank	blank
MDA Current, A	~0.10 (±0.4)	0.20 to 2.00 (±0.4)	~0.10 (±0.4)
MDA Over Current Trip	blank	blank	blank

#### Crew

If orbiter is performing mated attitude control, proceed to step 14.8.  
Otherwise, proceed to step 14.9.

\*\*\*\*\*

- \* If one Latched, Unlatched, or Pin Released limit switch fails
- \* | Confirm configuration visually and notify **MCC-H** before
- \* | proceeding.
- \* |
- \* | SABB limit switch status that would restrict Mast commanding
- \* | has already been overridden in step 8.3.
- \* |
- \* If two Latched, Unlatched, or Pin Released limit switches fail
- \* | Perform steps 14.8 and 14.9; then, notify **MCC-H** before
- \* | proceeding.

\*\*\*\*\*

#### 14.8 Configuring for Nominal Attitude Control

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)  
Go to step 14.9.

\*\*\*\*\*

- \* If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)
- \* | Perform {2.405 **MODING FREE DRIFT TO CMG TA**} (SODF:
- \* | MCS: NOMINAL: GNC MODING), then:
- \* |
- \* | **MCC-H** ↑ ISS, Orbiter, "ISS is in Attitude Control."
- \* |
- \* | Go to step 14.9.

\*\*\*\*\*

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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\*\*\*\*\*

- \* If orbiter is performing mated attitude control
- \* | Perform rate damping DOCKED CONFIGURATION DAP
- \* | REFERENCE (FDF: ORB OPS, REBOOST/DAP), then:
- \* |
- \* | Go to step 14.9.

\*\*\*\*\*

#### 14.9 Performing Visual Verification Via Cameras

Verify latch position (four of eight) unlatched (detensioned).

ISS ↓ **MCC-H**, "We confirm the left blanket box is unlatched."

**MCC-H** ↑ ISS, "We confirm nominal unlatch."

Crew

Proceed to step 15.3.

\*\*\*\*\*

- \* If unlatch sequence is not successful, notify **MCC-H** before proceeding.
- \* |
- \* |

- \* If **MCC-H** unavailable, perform {3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY}, all (SODF: EPS: MALFUNCTION: PRIMARY POWER SYSTEM), then:
- \* |
- \* |

\*\*\*\*\*

PCS

#### 14.10 Power Off Left Blanket Box MDA

P6: EPS: SAW [XX]

SAW [XX]

'LBB'

sel LBB Commands

SAW [XX] LBB Commands

'MDA'

'Power'

**cmd** Off – Off

√MDA Voltage, V: <10 (±2.8)

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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#### 15. UNLATCHING (DETENSIONING) RIGHT BLANKET BOX (RBB)

##### 15.1 Verifying Temperatures are Within Nominal Ranges Prior to Unlatch

P6: EPS: SAW [XX]

SAW [XX]

'ECU [XX]'

Verify SAW PS Temp, deg C: -33 to 51

Verify BGA PS Temp, deg C: -33 to 51

'RBB'

Verify MDA Temp, deg C: -54 to 48

##### 15.2 Powering On RBB Motor Drive Assembly (MDA)

###### NOTE

MDA Slow alert will be Nominal until MDA power is applied. Once this is done, the indication is Slow.

SAW [XX]

'RBB'

sel RBB Commands

SAW [XX] RBB Commands

'MDA'

'Power'

**cmd** On – On Arm

**cmd** On – On

√MDA Voltage, V: 120 to 125

##### 15.3 Performing Visual Verification Via Cameras

###### NOTE

Perform a visual verification prior to, during, and at the completion of each blanket box unlatch (detension) operation. There are eight latches to be unlatched (detensioned) for each blanket box prior to SAW retract. Only four of eight latches are visible at a time.

Verify camera configuration correct for solar array retraction before proceeding.

Verify Latch Position (four of eight) – latched (tensioned)

Crew

If orbiter is performing mated attitude control, proceed to step 15.5.

Otherwise, proceed to step 15.6, and wait for **MCC-H GO** for right blanket box unlatch.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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##### 15.4 Verifying Initial SAW Right Blanket Box Configuration

SAW [XX] RBB Commands

Verify parameters in LATCHED column in step 15.7 before executing unlatch command.

##### 15.5 Preventing Thruster Firings

#### CAUTION

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free will be maintained. Anytime the latches are not in motion, thrusters may be enabled.

MCC-H

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, “Desats are Inhibited.”

Go to step 15.6.

\*\*\*\*\*

\* If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

\* Perform {2.404 MODING CMG TA TO FREE DRIFT} (SODF:

\* MCS: NOMINAL: GNC MODING), then:

\*

\* **MCC-H** ↑ ISS, Orbiter, “ISS is in Free Drift.”

\*

\* Go to step 15.6.

\*\*\*\*\*

C3(A6)

\* If orbiter is performing mated attitude control

\* DAP: FREE

\*

\* Orbiter ⇒ ISS, **MCC-H**, “Orbiter is in Free Drift.”

\*

\* Go to step 15.6.

\*\*\*\*\*

##### 15.6 Unlatching (Detension) SAW Right Blanket Box

#### CAUTION

Confirm no crew exercise or maximum EVA loads before proceeding.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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##### NOTE

Upon successful unlatch commanding, the MDA current will increase (0.2 to 3.0 amps) and the Slow alert will go to Nominal during transition, then return to Slow. Once power is removed from the MDA, the Slow alert will indicate Nominal.

If crew is performing the RBB unlatch

**MCC-H** ↑ ISS, Orbiter, "Crew is GO to unlatch the right blanket box."

If ground is performing the RBB unlatch

**MCC-H** ↑ ISS, Orbiter, "We are ready to unlatch the right blanket box, please monitor cameras."

PCS

P6: EPS: SAW [XX]

SAW [XX]

'RBB'

sel RBB Commands

SAW [XX] RBB Commands

'RBB'

**cmd** Unlatch – Arm

**cmd** Unlatch – Unlatch

#### 15.7 Monitoring RBB Latch Parameters During Unlatch (Detension) (Approximately 14 Seconds)

Refer to Table 3.

##### NOTE

SABB limit switches are sensitive to thermal conditions and may indicate inaccurate values during eclipse and the first 15 minutes of insolation.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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Table 3. RBB Parameters

PARAMETER	LATCHED→	TRANSITION→ Approximately 14 Seconds	UNLATCHED
RBB SW01,02 Pin Released	Yes	Yes	Yes
RBB SW01,02 Latched	Yes	No	No
RBB SW01,02 Unlatched	No	No	Yes
MDA Slow Alert	Slow	Nominal	Slow
MDA Voltage, V	120 to 125	120 to 125	120 to 125
MDA Temp, deg C	-54 to 48	-54 to 48	-54 to 48
MDA Over Temp Trip	blank	blank	blank
MDA Current, A	~0.10 (±0.4)	0.20 to 2.00 (±0.4)	~0.10 (±0.4)
MDA Over Current Trip	blank	blank	blank

#### Crew

If orbiter is performing mated attitude control, proceed to step 16.8.  
Otherwise, proceed to 16.9.

\*\*\*\*\*

- \* If one Latched, Unlatched, or Pin Released limit switch fails
- \* | Confirm configuration visually and notify **MCC-H** before
- \* | proceeding.
- \* |
- \* | SABB limit switch status that would restrict Mast
- \* | commanding has already been overridden in step 8.3.
- \* |
- \* If two Latched, Unlatched, or Pin Released limit switches fail
- \* | Perform step 15.8 and 15.9; then, notify **MCC-H** before
- \* | proceeding.

\*\*\*\*\*

#### 15.8 Enabling Thrusters (or Configuring for Attitude Control)

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)  
Go to step 15.9.

\*\*\*\*\*

- \* If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)
- \* | Perform {2.405 **MODING FREE DRIFT TO CMG TA**} (SODF:
- \* | MCS: NOMINAL: GNC MODING), then:
- \* |
- \* | **MCC-H** ↑ ISS, Orbiter, "ISS is in Attitude Control."
- \* |
- \* | Go to step 15.9.

\*\*\*\*\*

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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C3(A6)

```
*****
* If orbiter is performing mated attitude control
* | Perform rate damping DOCKED CONFIGURATION DAP
* | REFERENCE (FDF: ORB OPS, REBOOST/DAP), then:
* |
* | Go to step 15.9.
*****
```

#### 15.9 Performing Visual Verification Via Cameras

Verify latch position (four of eight) unlatched (detensioned).

ISS ↓ **MCC-H**, “We confirm the right blanket box is unlatched.”

**MCC-H** ↑ ISS, “We confirm nominal unlatch.”

Crew

Proceed to step 16.2 and provide camera support as necessary during containment inspection.

```
*****
* If unlatch sequence is not successful, notify MCC-H before
* | proceeding.
* |
* | If MCC-H unavailable, perform {3.190 SAW XX FAILURE
* | TO UNLATCH SABB REMOTELY}, all (SODF: EPS:
* | MALFUNCTION: PRIMARY POWER SYSTEM), then:
*****
```

PCS

#### 15.10 Powering Off Right Blanket Box MDA

P6: EPS: SAW [XX]

SAW [XX]

‘RBB’

sel RBB Commands

SAW [XX] RBB Commands

‘MDA’

‘Power’

**cmd** Off – Off

√MDA Voltage, V: <10 (±2.8)

### 16. COMPLETING VISUAL CONTAINMENT INSPECTION

#### 16.1 Unlatching BGA

Perform {2.110 PVM BGA XX UNLATCH ANTIROTATION LATCH}, all (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM), then:



#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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#### 16.2 Positioning BGA for Containment Inspections

Refer to Figures 1, 2, and 3 for containment inspections and Table 4 for containment inspection positions.

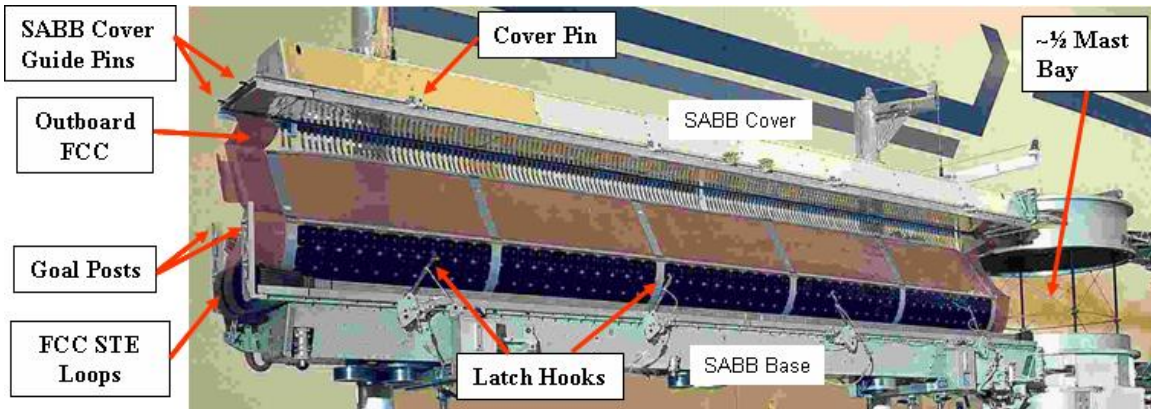


Figure 1.- Mast Half to 1 Bay Deployed.

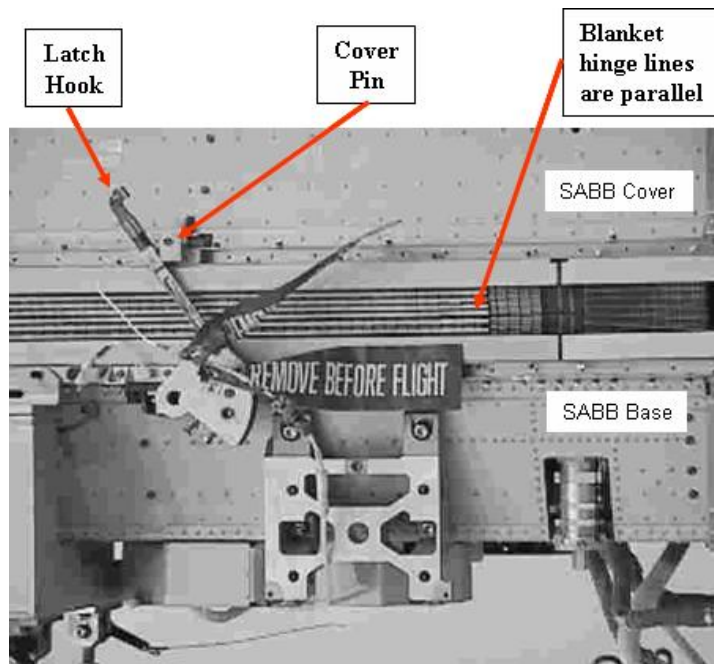


Figure 2.- Full Retract Blanket Containment Side View.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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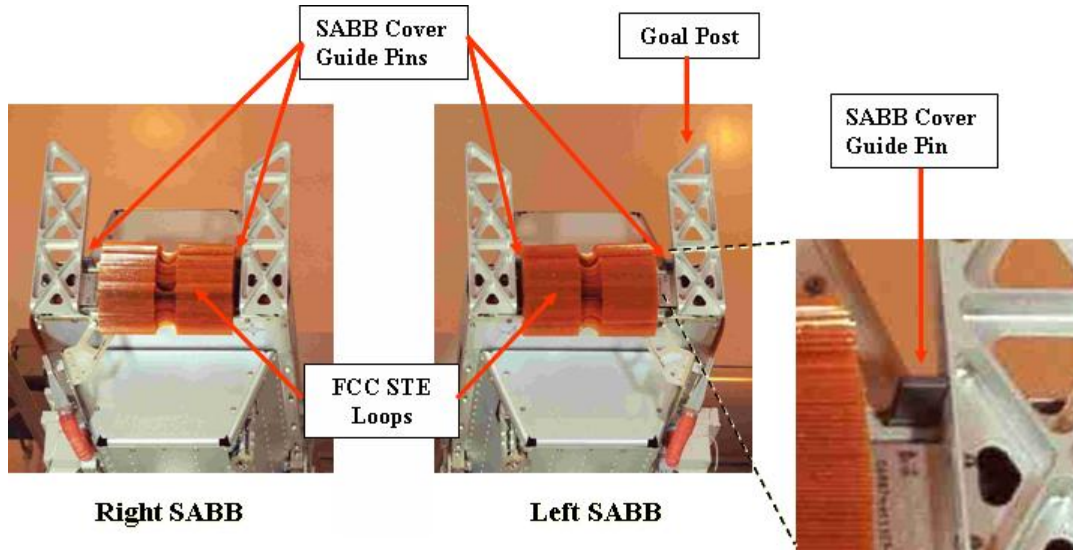


Figure 3.- Full Retract Blanket Containment Tip View.

Table 4. Solar Array Containment Inspection Positions

POSITION [P]	BGA 2B	BGA 4B
1 (Inactive Side of LBB/RBB)	199.687	163.125
2 (LBB Tip)	304	236
3 (Active Side of LBB/RBB)	20	340
4 (RBB Tip)	124	56

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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Perform for BGA [XX], where [XX] = 2B, 4B and [P] =

Position BGA for containment inspection at Position P.

##### NOTE

BGA rotation is not required for containment inspection at Position 1, since the first inspection is at the original safe/lock position.

P6: EPS: BGA [XX]

sel Channel Targeted Modes

'Column = Non-Solar Tracking, Row = Directed Position'

input Cmded Angle, deg: \_\_\_\_\_ (refer to Table 4)

**cmd Set**

Verify Ch [XX] Mode – Non-Solar Tracking

Verify BGA Mode – Directed Position

Verify Cmded Angle: \_\_\_\_\_ (refer to Table 4)

Verify Actual Angle: \_\_\_\_\_ (refer to Table 4)

##### NOTE

1. The following steps require downlink of video for **MCC-H** evaluation.
2. It can take 10 minutes to rotate the BGA to the next inspection position.
3. Planned inspection time at each position will be 5 minutes. For Ku-Band LOS periods video will be recorded via VTR. The BGA may be repositioned to the next inspection points; however, the recorded video must be downlinked and reviewed before final GO is given for that position. For Ku-Band AOS periods, the downlink video will be recorded by **MCC-H**.

Perform visual containment inspection.

Verify blanket fully contained within blanket box.

Verify hinge lines are parallel to one another in the blanket stack.

Verify outboard FCC STE loops neatly stacked within SABB goal posts.

Verify SABB cover guide pins aligned with base goal posts.

Verify guide wires (three per SABB) retracted.

Repeat

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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If first set of inspections indicate nominal containment

**MCC-H** ↑ ISS, "We confirm blanket containment at 1 Bay deployed."

Crew  
Proceed to step 17.3.

If second set of inspections indicate nominal containment

**MCC-H** ↑ ISS, "We confirm blanket containment at full retraction."

Crew  
Proceed to step 18.3.

#### 16.3 Positioning BGA for Full Retraction (or SABB Latch)

P6: EPS: BGA [XX]

sel Channel Targeted Modes

'Column = Non-Solar Tracking, Row = Directed Position'

input Cmded Angle, deg: 160 if BGA 4B (200 if BGA 2B)

**cmd** Set

Verify Ch [XX] Mode – Non-Solar Tracking

Verify BGA Mode – Directed Position

Verify Cmded Angle: 160 if BGA 4B (200 if BGA 2B)

Verify Actual Angle: 160 if BGA 4B (200 if BGA 2B)

#### 17. COMPLETING SOLAR ARRAY RETRACTION

##### NOTE

The last Bay of the solar array can be retracted while the BGA is in directed position mode. The BGA will be unlatched and the motor will remain on. Should the BGA experience a trip during this short duration of solar array mechanical motion, **MCC-H** will recover before allowing the crew to proceeding to step 18.

#### 17.1 Verifying Temperatures are Within Nominal Ranges Prior to SAW

Retract

P6: EPS: SAW [XX]

'ECU [XX]'

Verify SAW PS Temp, deg C: -33 to 51

Verify BGA PS Temp, deg C: -33 to 51

'Mast'

Verify MDA Temp, deg C: -54 to 48

## 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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### 17.2 Powering On Mast Motor Drive Assembly (MDA)

#### NOTE

MDA Slow alert will be Nominal until MDA power is applied. Once this is done, the indication is Slow.

SAW [XX]

'Mast'

sel Mast Commands

SAW [XX] Mast Commands

'MDA'

'Power'

**cmd** On – Arm

**cmd** On – On

√MDA Voltage, V: 120 to 125

√MDA Current, A: ~ 0.10 (±0.4)

√MDA Slow Alert – Slow

### 17.3 Verifying Camera Configuration

#### NOTE

Perform a visual verification prior to, during, and at the completion of the Mast retract operation to minimize the risk of potential collision hazards, monitor for any anomalies, and to verify solar array retraction. Total number of visible Mast Bays is 31.5, 1 Bay is rigid batten to rigid batten.

Verify camera configuration correct for solar array retraction before proceeding.

Crew

If orbiter is performing mated attitude control, proceed to step 17.5.

Otherwise, proceed to step 17.6, and wait for **MCC-H GO** for retraction of last Mast Bay.

### 17.4 Verifying Initial SAW Mast Configuration

SAW [XX] Mast Commands

'Mast'

√SW01,SW02 Retracted – No

√SW01,SW02 Deployed – No

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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#### 17.5 Preventing Thruster Firings

### CAUTION

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free Drift will be maintained. At anytime the array retraction is stopped or aborted, thrusters may be enabled.

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, “Desats are Inhibited.”

Go to step 17.6.

\*\*\*\*\*

\* If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

\* Perform {2.404 MODING CMG TA TO FREE DRIFT} (SODF:

\* MCS: NOMINAL: GNC MODING), then:

\*

\* **MCC-H** ↑ ISS, Orbiter, “ISS is in Free Drift.”

\*

\* Go to step 17.6.

\*\*\*\*\*

C3(A6)

\*\*\*\*\*

\* If orbiter is performing mated attitude control

\* DAP: FREE

\*

\* Orbiter ⇒ ISS, **MCC-H**, “Orbiter is in Free Drift.”

\*

\* Go to step 17.6.

\*\*\*\*\*

#### 17.6 Retracting 100 % of SAW

### WARNING

If retracting a solar array during EVA operations, confirm EVA crew outside of area that could be subject to solar array structural collapse.

### CAUTION

Confirm no crew exercise or maximum EVA loads before proceeding.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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##### NOTE

Upon successful retract command, the Slow alert will go to Nominal during transition and the MDA current will peak briefly at ~2 amps and then oscillate between 0.3 and 1.3 amps ( $\pm 0.4$ ) as bays retract. Once power is removed from the MDA, the Slow alert will indicate Nominal.

**MCC-H** ↑ ISS, Orbiter, "Crew is GO to retract last Mast Bay."

PCS

P6: EPS: SAW [XX]

SAW [XX]

'Mast'

sel Mast Commands

SAW [XX] Mast Commands

'Mast'

**cmd** Retract – Arm

**cmd** Retract – Retract

Wait approximately 10 seconds until 100 % retracted.

Crew

If orbiter is performing mated attitude control, proceed to step 17.8.  
Otherwise, proceed to step 17.9.

#### 17.7 Verifying Final SAW Mast Configuration

SAW [XX] Mast Commands

'Mast'

√SW01,SW02 Retracted – Yes

√SW01,SW02 Deployed – No

'MDA'

√Voltage, V: 120 to 125

√Current, A: ~0.10 ( $\pm 0.4$ )

√Slow Alert – Slow

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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```
*****
* If one Deployed or Retracted limit switch fails
* | Confirm configuration visually and notify MCC-H
* | before proceeding.
*
* | Mast limit switch status that would restrict SABB and
* | BGA commanding has already been overridden in
* | step 8.4.
*
* If two Deployed or Retracted limit switches fail
* | Perform steps 17.8 and 17.9; then, notify MCC-H
* | before proceeding.
*****
```

**MCC-H**

#### 17.8 Configuring for Nominal Attitude Control

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)  
Go to step 17.9.

```
*****
* If ISS is performing attitude control and ISS is not in TEA (MCC-H)
* | Perform {2.405 MODING FREE DRIFT TO CMG TA} (SODF:
* | MCS: NOMINAL: GNC MODING), then:
*
* | MCC-H ↑ ISS, Orbiter, "ISS is in Attitude Control."
*
* | Go to step 17.9.
*****
```

C3(A6)

```
*****
* If orbiter is performing mated attitude control
* | Perform rate damping DOCKED CONFIGURATION DAP
* | REFERENCE (FDF: ORB OPS, REBOOST/DAP), then:
*
* | Go to step 17.9.
*****
```

#### 17.9 Performing Visual Verification Via Cameras

This step requires live downlink of video for ground based inspection.

Verify blankets correct panel folding (no overhang outside of the blanket box containment).

Verify blanket panel waviness insignificant folded panel stack height is small enough such that SABB cover is not forced away from base at outboard end (i.e., SABB cover is parallel to base within 1 inch (tbr)).

Verify guide wires (three per SABB along back of blankets) fully retracted (no excess wire hanging out).

Verify latch hooks aligned with and above cover latch pins.

Verify Mast canister tip fitting resting on Mast canister (no gap).



#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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ISS ↓ **MCC-H**, “We confirm last Mast Bay retracted and good containment.”

**MCC-H** ↑ ISS, “We confirm nominal Mast Bay retraction and containment.”

Crew

If orbiter is performing mated attitude control, proceed to step 18.3.  
| Otherwise, proceed to step 18.4, and wait for **MCC-H GO** for left  
| blanket box latch.

\*\*\*\*\*  
\* If retract sequence is not successful, notify **MCC-H** before  
\* proceeding.  
\*  
\* If **MCC-H** unavailable, perform {3.192 SAW XX FAILURE  
\* | TO RETRACT MAST REMOTELY}, all (SODF: EPS:  
\* | MALFUNCTION: PRIMARY POWER SYSTEM), then:  
\*\*\*\*\*

PCS

##### 17.10 Powering Off Mast MDA

P6: EPS: SAW [XX]

SAW [XX]

'Mast'

sel Mast Commands

SAW [XX] Mast Commands

'MDA'

'Power'

**cmd** Off – Off

√MDA Voltage, V: <10 (±2.8)

##### 17.11 Completing Final Containment Verification

Perform steps 16.2 through 16.3 again as required.

#### 18. LATCHING LEFT BLANKET BOX (LBB)

##### 18.1 Powering On LBB Motor Drive Assembly (MDA)

###### NOTE

MDA Slow alert will be Nominal until MDA power is applied. Once this is done, the indication is Slow.

P6: EPS: SAW [XX]

SAW [XX]

'LBB'

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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sel LBB Commands

SAW [XX] LBB Commands

'MDA'

'Power'

cmd On – Arm

cmd On – On

√MDA Voltage, V: 120 to 125

#### 18.2 Verifying SAW Left Blanket Box Configuration

Verify parameters in UNLATCHED column in step 18.5 before executing latch command.

#### 18.3 Preventing Thruster Firings

### CAUTION

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free Drift will be maintained. Anytime the latches are not in motion, thrusters may be enabled.

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, “Desats are Inhibited.”

Go to step 18.4.

\*\*\*\*\*

\* If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

\* Perform {2.404 MODING CMG TA TO FREE DRIFT} (SODF:  
\* MCS: NOMINAL: GNC MODING), then:

\* **MCC-H** ↑ ISS, Orbiter, “ISS is in Free Drift.”

\* Go to step 18.4.

\*\*\*\*\*

\*\*\*\*\*

**C3(A6)**

\* If orbiter is performing mated attitude control

\* DAP: FREE

\* Orbiter ⇒ ISS, **MCC-H**, “Orbiter is in Free Drift.”

\* Go to step 18.4.

\*\*\*\*\*

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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##### 18.4 Latching SAW Left Blanket Box

#### CAUTION

Confirm no crew exercise or maximum EVA loads before proceeding.

#### NOTE

Upon successful latch command, the Slow alert will go to Nominal during transition, then return to Slow. Once power is removed from the MDA, the Slow alert will indicate Nominal.

If crew is performing the LBB Latch

**MCC-H** ↑ ISS, Orbiter, "Crew is GO to latch the left blanket box."

If ground is performing the LBB Latch

**MCC-H** ↑ ISS, Orbiter, "We are ready to latch the left blanket box, please monitor cameras."

PCS

P6: EPS: SAW [XX]

SAW [XX]

'LBB'

sel LBB Commands

SAW [XX] LBB Commands

'LBB'

**cmd** Latch – Arm

**cmd** Latch – Latch

##### 18.5 Monitor LBB Latch Parameters During Latch (Approximately 14 Seconds)

Refer to Table 5.

#### NOTE

1. Perform a visual verification prior to, during, and at the completion of each blanket box latching to monitor for any anomalies and to verify blanket box latching operation.
2. SABB limit switches are sensitive to thermal conditions and may indicate inaccurate values during eclipse and the first 15 minutes of insolation.

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Table 5. LBB Parameters

PARAMETER	UNLATCHED→	TRANSITION→ Approximately 14 Seconds	LATCHED
LBB SW01,02 Pin Released	Yes	Yes	Yes
LBB SW01,02 Latched	No	No	Yes
LBB SW01,02 Unlatched	Yes	No	No
MDA Slow Alert	Slow	Nominal	Slow
MDA Voltage, V	120 to 125	120 to 125	120 to 125
MDA Temp, deg C	-54 to 48	-54 to 48	-54 to 48
MDA Over Temp Trip	blank	blank	blank
MDA Current, A	~0.10 (±0.4)	0.20 to 2.00 (±0.4)	~0.10 (±0.4)
MDA Over Current Trip	blank	blank	blank

#### Crew

If orbiter is performing mated attitude control, proceed to step 18.6.  
Otherwise, proceed to step 18.7.

\*\*\*\*\*

- \* If one Latched or Unlatched limit switch fails
  - \* Confirm configuration visually and notify **MCC-H** before proceeding.
  - \* SABB limit switch status that would restrict Mast commanding has already been overridden in step 9.3.
- \* If two Latched or Unlatched limit switches fail
  - \* Perform step 18.6 and 18.7; then, notify **MCC-H** before proceeding.

\*\*\*\*\*

#### 18.6 Configuring for Nominal Attitude Control

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)  
Go to step 18.7.

\*\*\*\*\*

- \* If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)
  - \* Perform {2.405 MODING FREE DRIFT TO CMG TA} (SODF: MCS: NOMINAL: GNC MODING), then:
    - \* **MCC-H** ↑ ISS, Orbiter, "ISS is in Attitude Control."
    - \* Go to step 18.7.

\*\*\*\*\*

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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C3(A6)

```
*****
* If orbiter is performing mated attitude control
* | Perform rate damping DOCKED CONFIGURATION DAP
* | REFERENCE (FDF: ORB OPS, REBOOST/DAP), then:
* |
* | Go to step 18.7.
*****
```

#### 18.7 Performing Visual Verification Via Cameras

Verify latch position (four of eight) latched (hooks engaged with pins).

Verify blanket fully contained within blanket box.

ISS ↓ **MCC-H**, "We confirm the left blanket box is latched."

**MCC-H** ↑ ISS, "We confirm nominal latch."

Crew

If orbiter is performing mated attitude control, proceed to step 19.3.

| Otherwise, proceed to step 19.4 and wait for **MCC-H GO** for right blanket box latch.

```
*****
* If latch sequence is not successful, notify MCC-H before
* | proceeding.
* |
* | If MCC-H unavailable, perform {3.193 SAW XX FAILURE
* | TO LATCH (TENSION) SABB REMOTELY}, all (SODF:
* | EPS: MALFUNCTION: PRIMARY POWER SYSTEM),
* | then:
*****
```

PCS

#### 18.8 Powering Off Left Blanket Box MDA

P6: EPS: SAW [XX]

SAW [XX]

'LBB'

sel LBB Commands

SAW [XX] LBB Commands

'MDA'

'Power'

**cmd** Off – Off

√MDA Voltage, V: <10 (±2.8)

## 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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### 19. LATCHING RIGHT BLANKET BOX (RBB)

#### 19.1 Powering On RBB Motor Drive Assembly (MDA)

**NOTE**

MDA Slow alert will be Nominal until MDA power is applied. Once this is done, the indication is Slow.

P6: EPS: SAW [XX]

SAW [XX]

'RBB'

sel RBB Commands

SAW [XX] RBB Commands

'MDA'

'Power'

**cmd** On – Arm

**cmd** On – On

√MDA Voltage, V: 120 to 125

#### 19.2 Verifying SAW Right Blanket Box Configuration

Verify parameters in UNLATCHED column in step 19.5 before executing latch command.

#### 19.3 Preventing Thruster Firings

**CAUTION**

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free Drift will be maintained. Anytime the latches are not in motion, thrusters may be enabled.

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, "Desats are Inhibited."

Go to step 19.4.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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```
*****
* If ISS is performing attitude control and ISS is not in TEA (MCC-H)
* | Perform {2.404 MODING CMG TA TO FREE DRIFT} (SODF:
* | MCS: NOMINAL: GNC MODING), then:
* |
* | MCC-H ↑ ISS, Orbiter, "ISS is in Free Drift."
* |
* | Go to step 19.4.
*****
```

C3(A6)

```
*****
* If orbiter is performing mated attitude control
* | DAP: FREE
* |
* | Orbiter ⇒ ISS, MCC-H, "Orbiter is in Free Drift."
* |
* | Go to step 19.4.
*****
```

#### 19.4 Latching SAW Right Blanket Box

<b>CAUTION</b>
Confirm no crew exercise or maximum EVA loads before proceeding.

<u>NOTE</u>
Upon successful latch command, the Slow alert will go to Nominal during transition, then return to Slow. Once power is removed from the MDA, the Slow alert will indicate Nominal.

If crew is performing the RBB Latch

| **MCC-H** ↑ ISS, Orbiter, "Crew is GO to latch the right blanket box."

If ground is performing the RBB Latch

| **MCC-H** ↑ ISS, Orbiter, "We are ready to latch the right blanket box, please monitor cameras."

PCS

P6: EPS: SAW [XX]

SAW [XX]

'RBB'

sel RBB Commands

SAW [XX] RBB Commands

'RBB'

cmd Latch – Arm

cmd Latch – Latch

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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#### 19.5 Monitoring RBB Latch Parameters During Latch (Approximately 14 Seconds)

Refer to Table 6.

<u>NOTE</u>	
1.	Perform a visual verification prior to, during, and at the completion of each blanket box latching to monitor for any anomalies and to verify blanket box latching operation.
2.	SABB limit switches are sensitive to thermal conditions and may indicate inaccurate values during eclipse and the first 15 minutes of insolation.

Table 6. RBB Parameters

PARAMETER	UNLATCHED→	TRANSITION→ Approximately 14 Seconds	LATCHED
RBB SW 01,02 Pin Released	Yes	Yes	Yes
RBB SW 01,02 Latched	No	No	Yes
RBB SW 01,02 Unlatched	Yes	No	No
MDA Slow Alert	Slow	Nominal	Slow
MDA Voltage, V	120 to 125	120 to 125	120 to 125
MDA Temp, deg C	-54 to 48	-54 to 48	-54 to 48
MDA Over Temp Trip	blank	blank	blank
MDA Current, A	~0.10 (±0.4)	0.20 to 2.00 (±0.4)	~0.10 (±0.4)
MDA Over Current Trip	blank	blank	blank

#### Crew

If orbiter is performing mated attitude control, proceed to step 19.6.

Otherwise, proceed to step 19.7.

```

*****
* If one Latched or Unlatched limit switch fails
* | Confirm configuration visually and notify MCC-H before
* | proceeding.
* |
* | SABB limit switch status that would restrict Mast
* | commanding has already been overridden in step 8.3.
* |
* If two Latched or Unlatched limit switches fail
* | Perform steps 19.6 and 19.7; then, notify MCC-H before
* | proceeding.
*****
    
```



#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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**MCC-H** 19.6 Configuring for Nominal Attitude Control  
If ISS is performing attitude control and ISS is in TEA (**MCC-H**)  
Go to step 19.7.

```
*****
* If ISS is performing attitude control and ISS is not in TEA (MCC-H)
* | Perform {2.405 MODING FREE DRIFT TO CMG TA} (SODF:
* | MCS: NOMINAL: GNC MODING), then:
* |
* | MCC-H ↑ ISS, Orbiter, "ISS is in Attitude Control."
* |
* | Go to step 19.7.
*****
```

C3(A6) \* If orbiter is performing mated attitude control  
\* | Perform rate damping DOCKED CONFIGURATION DAP  
\* | REFERENCE (FDF: ORB OPS, REBOOST/DAP), then:  
\* |  
\* | Go to step 19.7.  
\*\*\*\*\*

19.7 Performing Visual Verification Via Cameras  
Verify latch position (four of eight) latched (hooks engaged with pins).  
Verify blanket fully contained within blanket box.

ISS ↓ **MCC-H**, "We confirm the right blanket box is latched."

**MCC-H** ↑ ISS, "We confirm nominal latch."

Crew

Exit procedure. Ground will require cameras until procedure is completed.

```
*****
* If latch sequence is not successful, notify MCC-H before
* | proceeding.
* |
* |
* | If MCC-H unavailable, perform {3.193 SAW XX FAILURE
* | TO LATCH (TENSION) SABB REMOTELY}, all (SODF:
* | EPS: MALFUNCTION: PRIMARY POWER SYSTEM),
* | then:
*****
```

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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PCS 19.8 Powering Off Right Blanket Box MDA  
P6: EPS: SAW [XX]  
SAW [XX]  
'RBB'

sel RBB Commands

SAW [XX] RBB Commands  
'MDA'  
'Power'

cmd Off – Of

$\sqrt{\text{MDA Voltage, V: } <10 (\pm 2.8)}$

#### 20. CONFIGURING SAW XX JUST PRIOR TO SSU R&R EVA

If array retracted to support P6 relocation  
Proceed to step 21.

If array retracted to support an SSU R&R (EVA)

#### WARNING

An EVA shock hazard exists, if the SSU is removed during insolation while the array is deployed.

#### CAUTION

1. The array is susceptible to hardware damage, from external structural loads, when retracted 100 % and unlatched. Time in this configuration is limited to minimize this risk.
2. The array circuit may be damaged during insolation if the SSU is not installed and the array is fully deployed.

Wait until EVA day and then perform the following.

Perform steps 17.1 to 17.10 (retracts array 100 %, while SABB latches remain in tension position).

Proceed to step 22.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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### 21. INHIBITING BGA VELOCITY LIMIT SAFING

#### NOTE

1. SCR 19659 - If the array is parked at 0 deg, motor velocity safing may be triggered due to angle oscillations between 0 and 359. Software interprets this as a large angle movement in a short time period. Inhibit motor velocity safing to prevent the RPCs supplying the ECU from being opened.
2. SCR 28128 - The following cautions may also be triggered if the array is commanded to 0.  
**'BGA XX Observed vs Last Commanded State Discrepancy - PVM'**  
**'BGA XX Pointing Control Command Response Failed - PVM'**

If the BGA will be taken to 0.0 ( $\pm 0.5$ ) degrees

[PVM]: EPS: BGA [XX]

[BGA [XX]]

sel Motor

[BGA [XX] Motor]

'Velocity Limit Safing, Primary PVCU'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inhibit

Verify Primary PVCU – Inh

'Velocity Limit Safing, Backup PVCU'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inhibit

Verify Backup PVCU – Inh

### 22. CONFIGURING BGA XX FOR DORMANCY OR EVA

#### NOTE

The BGA motor must remain on to maintain thermal requirements. This is done by powering the BGA and leaving it in Open Loop mode (performed in a different procedure). Just prior to relocating P6, both BGAs will be repositioned and locked at 90 degrees to support thermal constraints, dynamic loads, and clearances during the P6 relocation.

#### 4.118 P6 SAW XX RETRACT (P6 ON Z1 TRUSS)

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If positioning BGA 4B after solar array retraction

If positioning BGA 4B for P6 relocation

Position BGA 4B to 0 degree.

Perform {2.102 PVM CONFIGURE BGA XX TO DIRECTED POSITION MODE}, (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM), then:

Go to {2.108 PVM BGA XX OPEN LOOP CONTROL}, BGA 4B, steps 1 to 8 and 10 (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM).

If positioning BGA 4B for SSU 4B R&R (EVA)

**NOTE**

BGA 4B Latch 2 failed during the 5A.1 mission.

Position BGA 4B to 270 degrees and Latch BGA on Latch 1.

Perform {2.106 PVM CONFIGURE BGA XX TO SAFE/LOCK MODE}, (SODF: EPS: NOMINAL: PRIMARY POWER), then:

If positioning BGA 2B after solar array retraction

If positioning BGA 2B for P6 relocation

Position BGA 2B to 0 degree.

Perform {2.102 PVM CONFIGURE BGA XX TO DIRECTED POSITION MODE}, (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM), then:

Go to {2.108 PVM BGA XX OPEN LOOP CONTROL}, BGA 2B, steps 1 to 8 and 10 (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM).

If positioning BGA 2B for SSU 2B R&R (EVA)

Position BGA 2B to 270 degrees and latch BGA on Latch 1.

Go to {2.106 PVM CONFIGURE BGA XX TO SAFE/LOCK MODE}, (SODF: EPS: NOMINAL: PRIMARY POWER).

## 1.3.452 SAW XX DEPLOY

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### OBJECTIVE:

This procedure supports the initial deploy of a single USOS Solar Array Wing (SAW) and it is applicable to all arrays. A unique solar array thermal conditioning attitude is required for initial deploy operations. This procedure also supports redeploy of an array previously retracted to support Sequential Shunt Unit (SSU) Remove and Replace (R&R) activities. Solar array redeployment can be performed in any attitude that supports the visual verification requirements. Redeploy of the P6 arrays after the P6 truss is relocated, should be treated as an initial deploy for this procedure.

### NOTE

1. For initial solar array deployments, this procedure assumes that the Solar Array Blanket Boxes (SABBs) are unlatched and the associated Beta Gimbal Assembly (BGA) is locked. If the SABBs are not unlatched, refer to {1.3.450 SAW XX SABB INITIAL UNLATCH}, step 6 (SODF: EPS: ACTIVATION AND CHECKOUT: CHANNEL ACTIVATION). If the BGA is not locked, refer to {2.106 PVM CONFIGURE BGA XX TO SAFE/LOCK MODE}, all (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM).
2. Crew will be primary for performing steps 12.3, 12.7, 12.9, 13.8, 14.8, 15.3, 15.6 to 15.9, 17.3, 17.6 to 17.7, 17.9, 17.10.  
**MCC-H** will be primary for performing all remaining steps.

#### Overview of Crew Steps for SAW Deploy

1. Deploy 1 Bay of Mast, then stop deploy.
  2. Latch Left Blanket Box (LBB) and Right Blanket Box (RBB) for high tension deploy.
  3. Deploy Mast to 49 %, then stop deploy.
  4. Thermal condition for 24 to 30 minutes.
  5. Complete Mast deploy.
3. For redeploy of a solar array after an SSU R&R, this procedure assumes the array is fully retracted with the latches in high tension position, the SABBs are physically unlatched, and the associated BGA is locked. It also assumes no orbiter is present. Perform steps 1 to 4, 5.4, 6 to 9.1, 9.3 to 12, 17 to 19, and 20.2.
  4. Refer to this procedure for all applicable SAWs. Refer to Table 1 for PVM power channel connectivity.

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Table 1. PVM Connectivity

PVM	XX	YY
S4	1A	3A
S4	3A	1A
S6	1B	3B
S6	3B	1B
P4	2A	4A
P4	4A	2A
P6	2B	4B
P6	4B	2B

#### CAUTION

Steps that involve mechanical motion (e.g Latch, Unlatch, Deploy, Retract) of the SAW hardware, must

1. Be performed during insolation, to support crew visual cues.
2. Be performed with ISS and orbiter thrusters inhibited to avoid damage to solar array mechanisms.

#### 1. VERIFYING SARJ CONFIGURATION

#### CAUTION

1. If SARJ is not in correct position, there is a risk of P4(S4) solar arrays contacting the P6 SAW 4B(2B) array while P6 is attached to the Z1 truss and the SAW 4B(2B) is deployed. In which case, both the P6 and P4(S4) solar arrays could sustain damage.
2. The SARJ nearest the SAW to be deployed, must be stopped and locked. The SARJ farthest from the SAW to be deployed, can continue to be rotated. These configurations are required to minimize dynamic loading on the array and to support visual verification requirements.

PCS

For SARJ nearest the SAW to be deployed

P4 (S4): EPS: Port (Stbd) SARJ

Port (Stbd) SARJ

Verify Position, deg: 0.0 (200 deg if redeploying 2A or 4B; 20 deg if redeploying 2B or 4A; 160 deg if redeploying 3A or 1B; 340 deg if redeploying 3B or 1A after an SSU R&R, this assumes P6 is on the main truss.)

Verify DLA 1(2) Position – Locked

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For SARJ farthest from the SAW to be deployed

P4 (S4): EPS: Port (Stbd) SARJ

Port (Stbd) SARJ

Verify DLA 1(2) Position – Engaged or Locked (No restrictions to SARJ rotation during SAW deploy.)

## 2. CONFIRMING SSU XX SHUNTED

### CAUTION

If SSU has failed, and the SSU shunt plug is not available, do not attempt deploy. The array must remain retracted until the SSU is replaced. During insolation, there is a potential for array damage, if the SSU is not installed and the array is deployed.

PVM: EPS: SSU XX

SSU XX

'SSU'

Verify Integration Counter – incrementing

Verify Shunt Current 1 (LBB), A: ~0.0

Verify Shunt Current 2 (RBB), A: ~0.0

'PVCE'

'Error Voltage'

Verify 1: -0.7 to 0.7 V

Verify 2: -0.7 to 0.7 V

Verify 3: -0.7 to 0.7 V

'Output'

Verify Error Bus Voltage, V: <0.6

\*\*\*\*\*

\* If SSU is not shunted, then Shunt SSU at this time

\* PVM: EPS: SSU XX

\* SSU XX

\* sel PVCE

\* sel PVCE

\* SSU XX PVCE

\* 'All PVCEs Off'

\* 'All PVCEs Off'

\* 'All PVCEs Off'

\* cmd Arm

\* cmd Off

\*\*\*\*\*

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#### 3. VERIFYING COMM WITH BGA CONTROLLER

PVM: EPS: BGA XX

BGA XX

'ECU XX'

Verify ECU/BGA Integ Cnt – incrementing

#### 4. VERIFYING COMM WITH SAW CONTROLLER

sel SAW XX

SAW XX

'ECU XX'

Verify ECU/SAW Integ Cnt – incrementing

#### 5. REDUCING LOAD ON SUPPORTING CHANNEL PRIOR TO SAW DEPLOY OPERATIONS

If redeploying the array after an SSU R&R

Perform step 5.4; then, proceed to step 6.

##### 5.1 Verifying Which Support Channel (ZZ) is Providing Prime Power to ECU XX

###### NOTE

It is possible for both ECUs on a particular PVM to be powered from the same channel. This configuration will determine which channel should be powered down to support the peak power load of 580 watts.

PVM: EPS: BGA XX

BGA XX

sel RPCM XX A RPC 01

RPCM XX A RPC 01

Verify RPC Position – Close (Verify – Cl)

BGA XX

sel RPCM YY A RPC 02

RPCM YY A RPC 02

Verify RPC Position – Close (Verify – Cl)



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If ECU XX is receiving power from one closed RPC, use Table 2 to determine which support channel is affected.

If both RPCs, providing input power to ECU XX, are closed, RPCM XX A and RPCM YY A input current must be used to determine which source is providing prime power to ECU XX. Once this is determined, use Table 2 to determine which support channel is affected.

#### NOTE

Table 2 provides expected support channel connectivity. A support channel provides initial power to the channel being activated until the SAW is deployed and the batteries are charged (e.g., Ch 4B supports Ch 4A until Ch 4A is fully activated). If redeploying the array after an SSU R&R, confirm support channel with **MCC-H**.

Table 2. Support Power Channel Connectivity

XX	YY	ZZ
1A	3A	4A
3A	1A	2A
1B	3B	1A
3B	1B	3A
2A	4A	2B
4A	2A	4B
2B	4B	2A
4B	2B	4A

Record

RPCM XX (YY) - A, Providing Prime Power to ECU XX: \_\_\_\_\_

DDCU XX (YY) Supporting the RPCM: \_\_\_\_\_

Supporting Power Channel ZZ: \_\_\_\_\_

#### 5.2 Terminating All Battery Charging/Warming on Channel XX (Same Channel That the SAW is to be Deployed)

#### NOTE

1. Reducing load on the supporting power channel protects for a peak power load of 580 watts during SAW deployment operations. If unique attitude is required to support SAW thermal conditioning, load reduction also protects for power balance of the supporting channel.
2. BCDU/Battery caution messages are suppressed to prevent nuisance tones, during initial battery charging.

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Confirm the following Caution messages are suppressed,  
where [Y] = 1,2,3

BCDU XXY Battery SOC Low Failure  
BCDU XXY Trip  
Batt XXY1(XXY2) Undervoltage Condition  
Battery XXY1(XXY2) Trip

If batteries are charging

PVM: EPS: Energy Storage XX

**Energy Storage XX**

'BCDU XXY'

Perform for BCDU XXY, where [Y] =    (as required)

sel Conv

**BCDU XXY Converter FI**

'Converter'

**cmd Converter Off – Arm**

**cmd Converter Off – Off (Verify – Off)**

'Fault Isolator'

**cmd Open – Arm**

**cmd Open – Open (Verify – Op)**

Repeat

If batteries are warming, check with **MCC-H** for warming status.

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PVM: EPS: Energy Storage XX

Energy Storage XX

Perform for BCDU XXY, where [Y] = 1 2 3 and  
[Z] = 1 2 (as required)

'BCDU XXY'

Verify Htr Sw A(B) – On (green icon)

sel Software Inhibits

BCDU XXY Software

**cmd** Batt XXYZ Htr Cntl Inhibit – Arm

**cmd** Batt XXYZ Htr Cntl Inhibit – Inhibit (Verify – Inh)

sel BCDU XXY SoftwareBU

BCDU XXY SoftwareBU

**cmd** Batt XXYZ Htr Cntl Inhibit – Arm

**cmd** Batt XXYZ Htr Cntl Inhibit – Inhibit (Verify – Inh)

'Battery XXYZ'

sel BSCCM

Battery XXY

**cmd** Battery XXYZ Heater 1,2; Off – Arm

**cmd** Battery XXYZ Heater 1,2; Off – Off (Verify – Off)

Repeat

### 5.3 Powering Down ISS (As Necessary)

#### NOTE

If a unique attitude is required to support SAW thermal conditioning, loads may be reduced to protect overall ISS energy balance.

Powerdown ISS loads so that energy balance is maintained while in the SAW Deploy attitude.

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#### 5.4 Reducing Load on DDCU XX (YY) Prior to SAW Deploy

##### NOTE

Power can be supplied to ECU XX from DDCU XX or DDCU YY for the solar array deploy. Therefore, it may be necessary to reduce loads on the appropriate DDCU to support a peak power load of 580 watts during array deployment.

Verify enough margin exist on DDCU XX (YY) to support a potential peak power load of 580 watts during array deployment. Reduce load as necessary to meet this requirement.

#### 6. VERIFYING ECU POWER SUPPLY TEMPERATURES AND VOLTAGE STATUS

PVM: EPS: BGA XX

BGA XX

'ECU XX'

Verify SAW PS Temp, deg C: -33 to 51

Verify SAW PS Voltage, V: 115 to 125

Verify BGA PS Temp, deg C: -33 to 51

Verify BGA PS Voltage, V: 115 to 125

#### 7. VERIFYING CHANNEL MODE AND BGA MODE

BGA XX

'BGA XX'

Verify PV Ch XX Mode, Primary PVCU – Non-Solar Tracking or Fully Commanded

Verify BGA Mode, Primary PVCU – Safe Lock (Null if BGA is still in launch configuration)

#### 8. VERIFYING BGA STATUS

##### 8.1 Verifying BGA Antirotation Pin Engaged

##### **CAUTION**

Prior to deploying the solar array, the BGAs must be prepositioned and locked in order to support thermal conditioning (warming) of the inactive surface of the solar array blankets and visual verification requirements during deployment. Thermal conditioning begins once the array has been deployed to 49 %.

BGA XX

'BGA XX'

Verify BGA XX Actual Angle, deg: At Required Position for SAW XX Deploy

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#### NOTE

BGA 4B Latch 2 failed during the 5A.1 mission, this latch is unlatched and no longer used.

'Latch 1' or 'Latch 2'

Verify Pin Status – Latched

Record BGA XX Actual Angle, deg: \_\_\_\_\_

Record BGA XX Latch 1 Pin Status: \_\_\_\_\_

Record BGA XX Latch 2 Pin Status: \_\_\_\_\_

### 8.2 Inhibiting Motor Velocity Safing

#### NOTE

1. SCR 19659 - If the array is parked at 0 deg, motor velocity safing may be triggered due to angle oscillations between 0 and 359. Software interprets this as a large angle movement in a short time period. Inhibit motor velocity safing to prevent the RPCs supplying the ECU from being opened.
2. SCR 28128 - The following Caution messages may also be triggered if the array is commanded to 0.  
**'BGA XX Observed vs Last Commanded State Discrepancy - PVM'**  
**'BGA XX Pointing Control Command Response Failed - PVM'**

If the BGA at 0.0 ( $\pm 0.5$ ) degrees

PVM: EPS: BGA XX

sel Motor

'Velocity Limit Safing, Primary PVCU'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inhibit

Verify Primary PVCU – Inh

'Velocity Limit Safing, Backup PVCU'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inhibit

Verify Backup PVCU – Inh

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## 9. VERIFYING SAW STATUS

### 9.1 Verifying Initial SAW C&W Flags and MDA Data (MCC-H)

Configure for continuous Data Dump of SAW XX. To build dump command, perform {1.230 [CCS BUILD DATA DUMP COMMAND](#)}, all (SODF: GND AVIONICS: C&DH: NOMINAL). For unique start location addresses, refer to {5.294 [EPS MDM BDT/50HZ ADDRESS](#)}, all (SODF: GND SYSTEMS: EPS: NOMINAL), for SAW XX with 1 Hz Data Collection, 224 words.

If redeploying the array after an SSU R&R, go to step 9.3.

### 9.2 Verifying SAW Operational Ranges and Limit Switch Status

#### NOTE

Disconnects are present in the MDA Over Temp Trip FDIR. The software implements an MDA Over Temp Trip at 77.8° C. The ECU firmware implements an MDA Over Temp Trip at 140° C. These FDIR responses remove power to the MDA. Potential damage to hardware occurs at 120° C. MDA upper limit temperatures indicated in this step are conservative. At a minimum, a 30° C mast MDA temperature increase should be protected for during mast deployment.

sel SAW XX

**SAW XX**

'LBB'

#### NOTE

SABB limit switches are sensitive to thermal conditions and may indicate inaccurate values during eclipse and the first 15 minutes of insolation.

Verify SW01,02 Pin Released – Yes  
Verify SW01,02 Latched – No  
Verify SW01,02 Unlatched – Yes  
Verify MDA Slow Alert – Nominal  
Verify MDA Voltage: 000.0 (±2.8)  
Verify MDA Temp, deg C: -54 to 48  
Verify MDA Over Temp Trip – blank

'MAST'

#### NOTE

SAW 2B SW 02 Deployed limit switch failed prior to the 4A mission, No is always indicated.

Verify SW01,02 Retracted – Yes  
Verify SW01,02 Deployed – No  
Verify MDA Slow Alert – Nominal  
Verify MDA Voltage: 000.0 (±2.8)  
Verify MDA Temp, deg C: -54 to 48  
Verify MDA Over Temp Trip – blank



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#### 9.3 Verifying SABB Limit Switch Override

##### NOTE

The following steps must be performed nominally if the mast will be deployed or retracted while an SABB is in an undetermined state. These steps will also verify the override of a failed Latched, Unlatched, or Pin Released limit switch.

PVM: EPS: SAW XX

SAW XX

'ECU XX'

sel SAW Software Inhibits

SAW XX Software Inhibits

'Deploy Reject'

√Deploy Reject – Inh (Allows deploy or retract commands when SABB state is undetermined)

#### 9.4 Verifying Mast Limit Switch Override

##### NOTE

These steps must be performed nominally if the SABBs are latched or unlatched or if the BGA may be moved while the mast is in an undetermined (partially deployed) state. These steps will also be performed to verify the override of a failed limit switch (e.g., SAW 2B Sw 02 Deployed Limit Switch).

PVM: EPS: SAW XX

SAW XX

'ECU XX'

sel SAW Software Inhibits

SAW XX Software Inhibits

'Latch Reject'

√Latch Reject – Inh (Allows SABB unlatch or latch commands when mast state is undetermined)

PVM: EPS: BGA XX

BGA XX

sel BGA Software Inhibits

BGA XX Software Inhibits

'SAW Deployment'

'Primary PVCU'



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√SAW Deployment – Ena (Allows BGA to be operated when SAW mast is in an undetermined state)

'Backup PVCU'

√SAW Deployment – Ena

#### 10. VERIFYING MDA HI TEMP REJECT FUNCTION INHIBITED

PVM: EPS: SAW XX

**SAW XX**

sel SAW Software Inhibits

**SAW XX Software Inhibits**

sel SAW XX Temp Safing

**SAW XX Temp Safing**

'Hi Temp Reject'

√Hi Temp Reject – Inh (Allows unlatch or latch and deploy or retract commands when MDA Temp >30° C)

#### 11. VERIFYING MDA SAFING CONFIGURATION

sel SAW Software Inhibits

**SAW XX Software Inhibits**

√Config Complete MDA Off Safing, Primary PVCU – Ena

√Config Complete MDA Off Safing, Backup PVCU – Ena

(Turns motor off upon limit switch contact, if MDA current above limit.)

√Limit Sw Turnoff Function – Ena

(Stops motor upon limit switch contact but does not turn motor off)

sel SAW XX Motor Stall Safing

**SAW XX Motor Stall Safing**

√Motor Stall Safing, Primary PVCU – Ena

√Motor Stall Safing, Backup PVCU – Ena

(Turns motor off if Slow is indicated when between limit switches, and if MDA current above limit.)

If deploying both arrays on a PVM the same day

Perform steps 1 to 11 for both channels before proceeding to step 12.

If redeploying the array after an SSU R&R

Go to step 17.

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## 12. DEPLOYING FIRST BAY OF SOLAR ARRAY

### WARNING

All SABB initial unlatch activities (i.e., all BRS pins released and SABBs are unlatched) must be completed prior to performing the following steps. Verify EVA crew is clear of SAW mechanisms before proceeding.

**MCC-H** ↑ ISS, “Steps 1 to 11 of the Solar Array Deploy procedure have been completed. Proceed to step 12.3 and confirm correct camera and RWS configuration for solar array XX deploy.”

### NOTE

#### Overview of Crew Steps for SAW Deploy

1. Deploy 1 Bay of Mast, then stop deploy.
2. Latch LBB and RBB for high tension deploy.
3. Deploy Mast to 49 %, then stop deploy.
4. Thermal condition for 24 to 30 minutes.
5. Complete Mast deploy.

#### 12.1 Verifying Temperatures are Within Nominal Ranges Prior to SAW Deploy

PVM: EPS: SAW XX

SAW XX

Verify SAW PS Temp, deg C: -33 to 51  
Verify BGA PS Temp, deg C: -33 to 51  
Verify Mast MDA Temp, deg C: -54 to 48

#### 12.2 Powering on Mast Motor Drive Assembly (MDA)

### NOTE

MDA Slow alert will be Nominal until MDA power is applied. Once this is done, the indication is Slow.

SAW XX

'Mast'

sel Mast Commands

SAW XX Mast Commands

'MDA'

'Power'

**cmd** On – Arm

**cmd** On – On

√MDA Voltage, V: 120 to 125

√MDA Current, A: ~0.10 (±0.4)

√MDA Slow Alert – Slow

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#### 12.3 Verifying Camera Configuration

ISS must be in insolation to perform this verification.

##### NOTE

Perform a visual verification prior to, during, and at the completion of the mast deploy operation. This ensures all launch restraints have been removed, minimizes the risk of potential collision hazards, and monitor for any obvious anomalies. Total number of visible Mast Bays is 31.5, 1 Bay is rigid batten to rigid batten.

Verify camera configuration correct for solar array deployment before proceeding.

If orbiter is performing mated attitude control, proceed to step 12.6. Otherwise, proceed to step 12.7 and wait for **MCC-H GO** for 1 Mast Bay deployment.

**MCC-H** proceed to step 12.4.

#### 12.4 Verifying Initial SAW Mast Configuration

##### NOTE

SAW 2B SW 02 Deployed limit switch failed prior to the 4A mission, No is always indicated.

SAW XX Mast Commands

√Mast SW01,SW02 Retracted – Yes

√Mast SW01,SW02 Deployed – No

#### 12.5 Verifying Conditions are Correct for Visual Verification

##### **CAUTION**

Steps 12.7 and 12.9 are to be performed during insolation to support crew visual cues used to determine when to abort the solar array deployment.

Verify ISS is in insolation.

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#### 12.6 Preventing Thruster Firings

##### CAUTION

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free Drift will be maintained. At any time array deployment is stopped or aborted, thrusters may be enabled.

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, “Desats are Inhibited.”

Go to step 12.7.

If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

Perform {2.404 MODING CMG TA TO FREE DRIFT}, (SODF:

MCS: NOMINAL: GNC MODING), then:

**MCC-H** ↑ ISS, Orbiter, “ISS is in Free Drift.”

Go to step 12.7.

C3(A6)

If orbiter is performing mated attitude control

DAP: FREE

Orbiter ⇒ ISS, **MCC-H**, “Orbiter is in Free Drift.”

Go to step 12.7. Notify **MCC-H** before sending the Deploy command.

#### 12.7 Deploying First Bay of SAW

##### CAUTION

Confirm no crew exercise or Max EVA loads before proceeding.

##### NOTE

Upon successful deploy commanding, the MDA current will increase (0.2 to 3.0 amps) and the Slow alert will go to Nominal during transition. Once power is removed from the MDA, the Slow alert will indicate Nominal.

**MCC-H** ↑ ISS, Orbiter, “Crew is GO to Deploy Mast 1 Bay.”

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PCS

PVM: EPS: SAW XX

SAW XX

'Mast'

sel Mast Commands

SAW XX Mast Commands

'Mast'

**cmd** Deploy – Arm

**cmd** Deploy – Deploy

```
*****
* If at any time during the array deploy the blanket box
* | begins to distort
* | 'Mast'
* |
* | cmd Abort – Abort
* |
* | √MCC-H before proceeding.
*****
```

Wait approximately 20 seconds (~1 Bay).

'Mast'

**cmd** Abort – Abort

If orbiter is performing mated attitude control, proceed to step 12.8.  
Otherwise, proceed to step 12.9.

#### NOTE

1. The Mast - Abort command removes power from the MDA.
2. SAW 2B SW 02 Deployed limit switch failed prior to the 4A mission, No is always indicated.

√MDA Voltage, V: <10 (±2.8)

√Mast SW01,SW02 Retracted – No

√Mast SW01,SW02 Deployed – No

**MCC-H** proceed to step 12.8.

### 1.3.452 SAW XX DEPLOY

**MCC-H** 12.8 Configuring for Nominal Attitude Control  
If ISS is performing attitude control and ISS is in TEA (**MCC-H**)  
Go to step 12.9.  
If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)  
Perform {2.405 MODING FREE DRIFT TO CMG TA} (SODF:  
MCS: NOMINAL: GNC MODING), then:  
**MCC-H** ↑ ISS, Orbiter, "ISS is in Attitude Control."  
Go to step 12.9.

C3(A6) If orbiter is performing mated attitude control  
Perform rate damping DOCKED CONFIGURATION DAP  
REFERENCE, (FDF: ORB OPS, REBOOST/DAP), then:  
Go to step 12.9.

12.9 Performing Visual Verification Via Cameras  
Verify blanket box covers clear of latch hooks (left and right SABB).  
Verify number of visible mast bays ~1.

ISS ↓ **MCC-H**, "We confirm 1 mast bay deployed."

**MCC-H** ↑ ISS, "We confirm nominal mast deployment."

If orbiter is performing mated attitude control, proceed to step 13.5.  
Otherwise, proceed to step 13.8 and wait for **MCC-H** to latch the  
left blanket box.

**MCC-H** proceed to step 13.1.

\*\*\*\*\*  
\* If deploy sequence is not successful, √**MCC-H** before  
\* proceeding.  
\*  
\* If **MCC-H** unavailable, perform {3.191 SAW XX FAILURE TO  
\* EXTEND MAST REMOTELY}, all (SODF: EPS:  
\* MALFUNCTION: PRIMARY POWER SYSTEM), then:  
\*\*\*\*\*

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#### 13. LATCHING LEFT SOLAR ARRAY BLANKET BOX (ENGAGING HIGH TENSION MODE)

PCS

##### 13.1 Verifying Temperatures are Within Nominal Ranges Prior to SAW Deploy

PVM: EPS: SAW XX

SAW XX

Verify SAW PS Temp, deg C: -33 to 51

Verify BGA PS Temp, deg C: -33 to 51

Verify LBB MDA Temp, deg C: -54 to 48

##### 13.2 Powering On LBB Motor Drive Assembly (MDA)

###### NOTE

MDA Slow alert will be Nominal until MDA power is applied. Once this is done, the indication is Slow.

SAW XX

'LBB'

sel LBB Commands

SAW XX LBB Commands

'MDA'

'Power'

**cmd** On – Arm

**cmd** On – On

√MDA Voltage, V: 120 to 125

##### 13.3 Verifying SAW Left Blanket Box Configuration

Verify parameters in UNLATCHED column in step 13.7 before executing latch command.

##### 13.4 Verifying Conditions are Correct for Visual Verification

###### **CAUTION**

Steps 13.6 and 13.8 are to be performed during insolation, to support crew visual cues use to determine correct SABB latch configuration.

Verify ISS is in insolation.

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#### 13.5 Preventing Thruster Firings

##### CAUTION

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free Drift will be maintained. Anytime the latches are not in motion, thrusters may be enabled.

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, “Desats are Inhibited.”

Go to step 13.6.

If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

Perform {2.404 MODING CMG TA TO FREE DRIFT} (SODF:

MCS: NOMINAL: GNC MODING), then:

**MCC-H** ↑ ISS, Orbiter, “ISS is in Free Drift.”

Go to step 13.6.

C3(A6)

If orbiter is performing mated attitude control

DAP: FREE

Orbiter ⇒ ISS, **MCC-H**, “Orbiter is in Free Drift.”

Proceed to step 13.8 and wait for **MCC-H** to latch LBB.

**MCC-H** proceed to step 13.6.

#### 13.6 Latch SAW Left Blanket Box (Engage High Tension Mode)

##### CAUTION

Confirm no crew exercise or max EVA loads before proceeding.



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#### NOTE

1. Latching the blanket box engages high tension mode (75 lbs) and provides more control over stiction between blanket panels during array deployment.
2. Upon successful Latch commanding, the Slow alert will go to Nominal during transition, then return to Slow. Once power is removed from the MDA, the Slow alert will indicate Nominal.

**MCC-H** ↑ ISS, Orbiter, "Ready to latch the left blanket box."

PCS

PVM: EPS: SAW XX

SAW XX

'LBB'

sel LBB Commands

SAW XX LBB Commands

'LBB'

**cmd** Latch – Arm

**cmd** Latch – Latch (Be ready to visually monitor latch motion and check parameters in step 13.7 before sending this command. Latch nominally takes 14 seconds to complete.)

#### 13.7 Monitoring LBB Latch Parameters During Latch (Approximately 14 Seconds)

Refer to Table 3.

#### NOTE

1. Perform a visual verification prior to, during, and at the completion of each blanket box unlatch operation. Monitor for any obvious anomalies and verify blanket box latching operation.
2. SABB limit switches are sensitive to thermal conditions and may indicate inaccurate values during eclipse and the first 15 minutes of insolation.

**1.3.452 SAW XX DEPLOY**

Table 3. LBB Parameters

PARAMETER	UNLATCHED→	TRANSITION→ Approximately 14 seconds	LATCHED
LBB SW01,02 Pin Released	Yes	Yes	Yes
LBB SW01,02 Latched	No	No	Yes
LBB SW01,02 Unlatched	Yes	No	No
MDA Slow Alert	Slow	Nominal	Slow
MDA Voltage, V	120 to 125	120 to 125	120 to 125
MDA Temp, deg C	-54 to 48	-54 to 48	-54 to 48
MDA Over Temp Trip	blank	blank	blank
MDA Current, A	~0.10 (±0.4)	0.20 to 3.00 (±0.4)	~0.10 (±0.4)
MDA Over Current Trip	blank	blank	blank

```

*****
* If one Latched, Unlatched, or Pin Released limit switch fails
* | Confirm configuration visually and √MCC-H before proceeding.
* |
* | SABB limit switch status that would restrict mast commanding
* | has already been overridden as part of 1.3.400 ECU
* | Activation.
* |
* | If two Latched, Unlatched, or Pin Released limit switches fail
* | Perform step 13.8 and 13.9 (if orbiter performing attitude
* | control), then √MCC-H before proceeding.
* |
*****

```

**13.8 Performing Visual Verification Via Cameras**

Verify latch position (four of eight) latched (tensioned position).

ISS ↓ **MCC-H**, “We confirm the left blanket box is latched.”

**MCC-H** ↑ ISS, “We confirm nominal Latch.”

If orbiter is performing mated attitude control, proceed to step 13.9.  
Otherwise, proceed to step 14.8 and wait for **MCC-H** to latch the right blanket box.

**MCC-H** proceed to step 13.9.

```

*****
* If latch sequence is not successful, √MCC-H before proceeding.
* |
* | If MCC-H unavailable, perform {3.193 SAW XX FAILURE TO
* | LATCH (TENSION) SABB REMOTELY}, all (SODF: EPS:
* | MALFUNCTION: PRIMARY POWER SYSTEM), then:
* |
*****

```

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<b>MCC-H</b>	<p>13.9 <u>Configuring for Nominal Attitude Control</u></p> <p>If ISS is performing attitude control and ISS is in TEA (<b>MCC-H</b>) Go to step 13.10.</p> <p>If ISS is performing attitude control and ISS is not in TEA (<b>MCC-H</b>) Perform {2.405 <u>MODING FREE DRIFT TO CMG TA</u>} (SODF: MCS: NOMINAL: GNC MODING), then:</p> <p><b>MCC-H</b> ↑ ISS, Orbiter, "ISS is in Attitude Control."</p> <p>Go to step 3.10.</p>
C3(A6)	<p>If orbiter is performing mated attitude control Perform rate damping DOCKED CONFIGURATION DAP REFERENCE, (FDF: ORB OPS, <u>REBOOST/DAP</u>), then:</p> <p>If orbiter continues to perform mated attitude control, proceed to step 14.5 and wait for <b>MCC-H Go</b>. Otherwise, proceed to step 14.8 and wait for <b>MCC-H</b> to latch the right blanket box.</p> <p><b>MCC-H</b> proceed to step 13.10.</p>
PCS	<p>13.10 <u>Powering Off Left Blanket Box MDA</u></p> <p>PVM: EPS: SAW XX</p> <p><span style="border: 1px solid black; padding: 2px;">SAW XX</span></p> <p>'LBB'</p> <p>sel LBB Commands</p> <p><span style="border: 1px solid black; padding: 2px;">SAW XX LBB Commands</span></p> <p>'MDA'</p> <p>'Power'</p> <p><b>cmd</b> Off – Off</p> <p>√MDA Voltage, V: &lt;10 (±2.8)</p>

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#### 14. LATCHING RIGHT SOLAR ARRAY BLANKET BOX (ENGAGING HIGH TENSION MODE)

PCS

##### 14.1 Verifying Temperatures are Within Nominal Ranges Prior to SAW Deploy

PVM: EPS: SAW XX

SAW XX

Verify SAW PS Temp, deg C: -33 to 51  
Verify BGA PS Temp, deg C: -33 to 51  
Verify RBB MDA Temp, deg C: -54 to 48

##### 14.2 Powering On RBB Motor Drive Assembly (MDA)

###### NOTE

MDA Slow alert will be Nominal until MDA power is applied. Once this is done, the indication is Slow.

SAW XX

'RBB'

sel RBB Commands

SAW XX RBB Commands

'MDA'

'Power'

**cmd** On – Arm

**cmd** On – On

√MDA Voltage, V: 120 to 125

##### 14.3 Verifying SAW Right Blanket Box Configuration

Verify parameters in UNLATCHED column in step 14.7 before executing latch command.

##### 14.4 Verifying Conditions are Correct for Visual Verification

###### **CAUTION**

Steps 14.6 and 14.8 are to be performed during insolation, to support crew visual cues use to determine correct SABB latch configuration.

Verify ISS is in insolation.

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#### 14.5 Preventing Thruster Firings

##### CAUTION

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free Drift will be maintained. Anytime the latches are not in motion, thrusters may be enabled.

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, “Desats are Inhibited.”

Go to step 14.6.

If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

Perform {2.404 MODING CMG TA TO FREE DRIFT} (SODF:

MCS: NOMINAL: GNC MODING), then:

**MCC-H** ↑ ISS, Orbiter, “ISS is in Free Drift.”

Go to step 14.6.

C3(A6)

If orbiter is performing mated attitude control

DAP: FREE

Orbiter ⇒ ISS, **MCC-H**, “Orbiter is in Free Drift.”

Proceed to step 14.8 and wait for **MCC-H** to latch RBB.

**MCC-H** proceed to step 14.6.

#### 14.6 Latching SAW Right Blanket Box (Engage High Tension Mode)

##### CAUTION

Confirm no crew exercise or Max EVA loads before proceeding.

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#### NOTE

1. Latching the blanket box engages high tension mode (75 lbs) and provides more control over stiction between blanket panels during array deployment.
2. Upon successful latch commanding, the Slow alert will go to Nominal during transition, then return to Slow. Once power is removed from the MDA, the Slow alert will indicate Nominal.

**MCC-H** ↑ ISS, Orbiter, "Ready to latch the right blanket box."

PCS

PVM: EPS: SAW XX

SAW XX

'RBB'

sel RBB Commands

SAW XX RBB Commands

'RBB'

**cmd** Latch – Arm

**cmd** Latch – Latch (Be ready to visually monitor latch motion and check parameters in step 14.7 before sending this command. Latch nominally takes 14 seconds to complete.)

#### 14.7 Monitoring RBB latch parameters during latch (approximately 14 seconds)

#### NOTE

1. Perform a visual verification prior to, during, and at the completion of each blanket box unlatch operation. Monitor for any obvious anomalies and verify blanket box latching operation.
2. SABB limit switches are sensitive to thermal conditions and may indicate inaccurate values during eclipse and the first 15 minutes of insolation.

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Table 4. RBB Parameters

PARAMETER	UNLATCHED→	TRANSITION→ Approximately 14 seconds	LATCHED
RBB SW01,02 Pin Released	Yes	Yes	Yes
RBB SW01,02 Latched	No	No	Yes
RBB SW01,02 Unlatched	Yes	No	No
MDA Slow Alert	Slow	Nominal	Slow
MDA Voltage, V	120 to 125	120 to 125	120 to 125
MDA Temp, deg C	-54 to 48	-54 to 48	-54 to 48
MDA Over Temp Trip	blank	blank	blank
MDA Current, A	~0.10 (±0.4)	0.20 to 3.00 (±0.4)	~0.10 (±0.4)
MDA Over Current Trip	blank	blank	blank

\*\*\*\*\*  
 \* If one Latched, Unlatched, or Pin Released limit switch fails  
 \* | Confirm configuration visually and √**MCC-H** before  
 \* | proceeding.  
 \* |  
 \* | SABB limit switch status that would restrict mast commanding  
 \* | has already been overridden as part of 1.3.400 ECU  
 \* | Activation.  
 \* |  
 \* If two Latched, Unlatched, or Pin Released limit switches fail  
 \* | Perform step 14.8 and 14.9 (if orbiter performing attitude  
 \* | control), then √**MCC-H** before proceeding.  
 \*\*\*\*\*

#### 14.8 Performing Visual Verification Via Cameras

Verify latch position (four of eight) latched (tensioned position).

ISS ↓ **MCC-H**, “We confirm the right blanket box is latched.”

**MCC-H** ↑ ISS, “We confirm nominal latch.”

If orbiter is performing mated attitude control, proceed to step 14.9.  
 Otherwise, proceed to step 15.4.

**MCC-H** proceed to step 14.9.

\*\*\*\*\*  
 \* If latch sequence is not successful, √**MCC-H** before proceeding.  
 \* |  
 \* If **MCC-H** unavailable, perform {3.193 **SAW XX FAILURE TO**  
 \* | **LATCH (TENSION) SABB REMOTELY**}, all (SODF: EPS:  
 \* | **MALFUNCTION: PRIMARY POWER SYSTEM**), then:  
 \* |  
 \*\*\*\*\*

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<b>MCC-H</b>	<p>14.9 <u>Configuring for Nominal Attitude Control</u></p> <p>If ISS is performing attitude control and ISS is in TEA (<b>MCC-H</b>) Go to step 14.10.</p> <p>If ISS is performing attitude control and ISS is not in TEA (<b>MCC-H</b>) Perform {2.405 <u>MODING FREE DRIFT TO CMG TA</u>} (SODF: MCS: NOMINAL: GNC MODING), then:  <b>MCC-H</b> ↑ ISS, Orbiter, "ISS is in Attitude Control."  Go to step 14.10.</p>
C3(A6)	<p>If orbiter is performing mated attitude control Perform rate damping DOCKED CONFIGURATION DAP REFERENCE, (FDF: ORB OPS, <u>REBOOST/DAP</u>), then:  Proceed to step 15.3.  <b>MCC-H</b> proceed to step 14.10.</p>
PCS	<p>14.10 <u>Powering Off Right Blanket Box MDA</u></p> <p>PVM: EPS: SAW XX <span style="border: 1px solid black; padding: 2px;">SAW XX</span> 'RBB'</p> <p>sel RBB Commands</p> <p><span style="border: 1px solid black; padding: 2px;">SAW XX RBB Commands</span> 'MDA' 'Power'</p> <p><b>cmd</b> Off – Off</p> <p>√MDA Voltage, V: &lt;10 (±2.8)</p> <p>If deploying both arrays on a PVM the same day Perform steps 12 to 14 for both arrays before proceeding to step 15.</p> <p>Once both arrays have one bay deployed and both SABBs are in the high tension mode (Latched) Proceed to step 15.3. <b>MCC-H</b> proceed to step 15.1.</p> <p>If deploying only one array Proceed to step 15.3. <b>MCC-H</b> proceed to step 15.1.</p>



### 1.3.452 SAW XX DEPLOY

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#### 15. DEPLOYING 49 % OF SOLAR ARRAY

CAUTION
1. If unable to engage high tension mode (latching both LBB and RBB) then complete (100 %), deploy will not be attempted. Blanket stiction force will exceed capability of low tension mode causing a repeat of the 4A mission deployment anomaly. Due to increased storage time for subsequent wings, potentially greater consequences may result. The array may be deployed to 49 % in low tension mode if a SABB MDA failure is at fault, and EVA can later override it. Operations are restricted (as if array is partially deployed) with a fully deployed yet untensioned array.
2. ISS and orbiter attitude control is restricted from the time an array is deployed more than 1 bay (step 15) to when the array is feathered (step 18). The orbiter must maintain attitude control when deploying an array in the aft direction and ISS must maintain attitude control when deploying an array in the forward direction. This is to prevent damaging the array with thruster plumes.

#### 15.1 Verifying Temperatures are Within Nominal Ranges Prior to SAW

##### Deploy

PVM: EPS: SAW XX

SAW XX

Verify SAW PS Temp, deg C: -33 to 51

Verify BGA PS Temp, deg C: -33 to 51

Verify Mast MDA Temp, deg C: -54 to 48

#### 15.2 Powering On Mast Motor Drive Assembly (MDA)

##### NOTE

1. Mast MDA temperatures may be high due to direct sunlight in deploy configuration. MDA Over Temp Trip occurs at 77.8° C. At a minimum, a 30° C mast MDA temperature increase should be protected for during mast deployment. Delay MDA activation, until just prior to deploy time to minimize temperature increase if necessary.
2. MDA Slow alert will be Nominal until MDA power is applied. Once this is done, the indication is Slow.

SAW XX

'Mast'

sel Mast Commands

SAW XX Mast Commands

'MDA'

'Power'

cmd On – Arm

### 1.3.452 SAW XX DEPLOY

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**cmd On – On**

- √MDA Voltage, V: 120 to 125
- √MDA Current, A: ~0.10 ( $\pm 0.4$ )
- √MDA Slow Alert – Slow

#### 15.3 Verifying Camera Configuration

ISS must be in insolation to perform this verification.

##### NOTE

Perform a visual verification prior to, during, and at the completion of the mast deploy operation to minimize the risk of potential collision hazards, monitor for any obvious anomalies, and to verify solar array deployment. Total number of visible Mast Bays is 31.5, 1 Bay is rigid batten to rigid batten.

Verify camera configuration correct for solar array deployment before proceeding.

If orbiter is performing mated attitude control, proceed to step 15.6. Otherwise, proceed to step 15.7 and wait for **MCC-H GO** to deploy 15.5 (49 %) Mast Bays.

#### 15.4 Verifying Initial SAW Mast Configuration

##### NOTE

SAW 2B SW 02 Deployed limit switch failed prior to the 4A mission, No is always indicated.

SAW XX Mast Commands

- √Mast SW01, SW02 Retracted – No
- √Mast SW01, SW02 Deployed – No

#### 15.5 Verifying Conditions are Correct for Visual Verification

##### **CAUTION**

Steps 15.7 and 15.9 must be performed during insolation to support crew visual cues used to determine when to abort the solar array deployment.

Verify ISS is in insolation.

### 1.3.452 SAW XX DEPLOY

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#### 15.6 Preventing Thruster Firings

##### CAUTION

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free Drift will be maintained. At any time array deployment is stopped or aborted, thrusters may be enabled.

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, “Desats are Inhibited.”

Go to step 15.7.

If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

Perform {2.404 MODING CMG TA TO FREE DRIFT} (SODF:

MCS: NOMINAL: GNC MODING), then:

**MCC-H** ↑ ISS, Orbiter, “ISS is in Free Drift.”

Go to step 15.7.

C3(A6)

If orbiter is performing mated attitude control

DAP: FREE

Orbiter ⇒ ISS, **MCC-H**, “Orbiter is in Free Drift.”

Then go to step 15.7, notify **MCC-H** before sending the deploy command.

#### 15.7 Deploying 49 % of SAW (Approximately 15.5 Bays Visible)

##### WARNING

If deploying a solar array during EVA operations, confirm EVA crew outside of area that could be subject to solar array structural collapse.

1.3.452 SAW XX DEPLOY

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CAUTION
1. Confirm no crew exercise or maximum EVA loads before proceeding.
2. If the mast is in motion and the deploy to 49 % will not be completed before entering eclipse, the deploy must be stopped using the Mast – Abort command upon entering eclipse due to loss of visual insight. Once the deploy is stopped, the crew will perform step 15.8, if the orbiter is performing attitude control, then contact <b>MCC-H</b> . Otherwise, crew will contact <b>MCC-H</b> before proceeding.

NOTE
Upon successful deploy commanding, the MDA current will increase (0.2 to 3.0 amps) and the Slow alert will go to Nominal during transition. Once power is removed from the MDA, the Slow alert will indicate Nominal.

PCS

PVM: EPS: SAW XX

SAW XX

'Mast'

sel Mast Commands

SAW XX Mast Commands

'Mast'

**cmd** Deploy – Arm

**cmd** Deploy – Deploy

Monitor RBB and LBB inboard tension mechanisms and tension bars for motion.

\*\*\*\*\*

\* If tension mechanism motion is indicated, immediately abort the  
\* deploy.  
\*

NOTE
While the mast is being deployed, the tension mechanisms may experience small oscillations. This is acceptable and not cause for an abort.

\* 'Mast'

\* **cmd** Abort – Abort

\*  $\sqrt$ **MCC-H** before proceeding.  
\*

CAUTION
Panel forces are higher than expected and the likelihood of the tension bar rising is increased. Problem may not be due to stiction.

\*\*\*\*\*

### 1.3.452 SAW XX DEPLOY

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Wait approximately 5 minutes (confirm 15.5 Bays are visible).

'Mast'

**cmd** Abort – Abort

Record Time Mast – Abort command sent: \_\_\_\_\_ GMT

If orbiter is performing attitude control, proceed to step 15.8.

Otherwise, proceed to step 15.9.

#### NOTE

1. The Mast – Abort command removes power from the MDA.
2. SAW 2B SW 02 Deployed limit switch failed prior to the 4A mission, No is always indicated.

√MDA Voltage, V: <10 (±2.8)

√Mast SW01, SW02 Retracted – No

√Mast SW01, SW02 Deployed – No

**MCC-H**

#### 15.8 Configuring for Nominal Attitude Control

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

Go to step 15.9.

If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

Perform {2.405 **MODING FREE DRIFT TO CMG TA**} (SODF: MCS: NOMINAL: GNC MODING), then:

**MCC-H** ↑ ISS, Orbiter, "ISS is in Attitude Control."

Go to step 15.9.

**C3(A6)**

If orbiter is performing mated attitude control

Perform rate damping DOCKED CONFIGURATION DAP REFERENCE, (FDF: ORB OPS, REBOOST/DAP), then:

Go to step 15.9.

#### 15.9 Performing Visual Verification Via Cameras

Verify Number of visible mast bays: 15.5

Verify LBB blanket alignment and condition.

Verify LBB inboard tension mechanism visual indicator aligned.

Verify LBB tension bar resting on blanket box sill.

Verify RBB blanket alignment and condition.

Verify RBB inboard tension mechanism visual indicator aligned.

Verify RBB tension bar resting on blanket box sill.

### 1.3.452 SAW XX DEPLOY

ISS ↓ **MCC-H**, “We confirm 15.5 Mast Bays deployed.”

**MCC-H** ↑ ISS, “We confirm nominal deploy to 49 %.”

Proceed to step 17.3.

**MCC-H** proceed to step 16.

\*\*\*\*\*  
\* If Deploy sequence is not successful, √**MCC-H** before proceeding.  
\*  
\* If **MCC-H** unavailable, perform {3.191 SAW XX FAILURE TO  
\* | **EXTEND MAST REMOTELY**}, all (SODF: EPS: MALFUNCTION:  
\* | PRIMARY POWER SYSTEM), then:  
\*  
\*\*\*\*\*

### **MCC-H** 16. DETERMINING WHEN TO CONTINUE SOLAR ARRAY DEPLOYMENT

CAUTION
A Sun incidence angle of 90 degrees ( $\pm 30$ ), on the inactive surface of the solar array is required to achieve adequate thermal conditioning. This conditioning minimizes sticky panels during the deploy.

NOTE
<ol style="list-style-type: none"><li>1. If the deployment spans one insolation period, 24 to 30 minutes of thermal condition time is required. If the deployment spans two insolation periods, deployment cannot be resumed until orbital noon of insolation period 2 or after 30 minutes of thermal conditioning.</li><li>2. The thermal clock begins once the array is 49 % deployed and a Sun incidence angle of 90 degrees (<math>\pm 30</math>) to the array is achieved.</li></ol>

If the Sun incidence angle can be maintained at 90 degrees ( $\pm 2$ ) throughout the thermal conditioning period  
|  
| 24 minutes of thermal conditioning time is required.

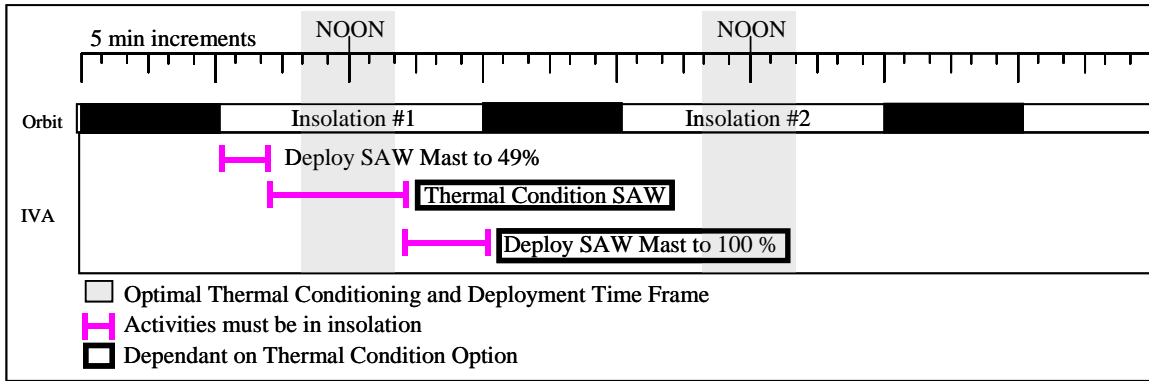
If the Sun incidence angle can be maintained at 90 degrees ( $\pm 30$ ) throughout the thermal conditioning period  
|  
| 30 minutes of thermal conditioning time is required.

If the Sun incidence angle cannot be maintained at 90 degrees ( $\pm 30$ ) throughout the thermal conditioning period  
|  
| Do not continue deploy.

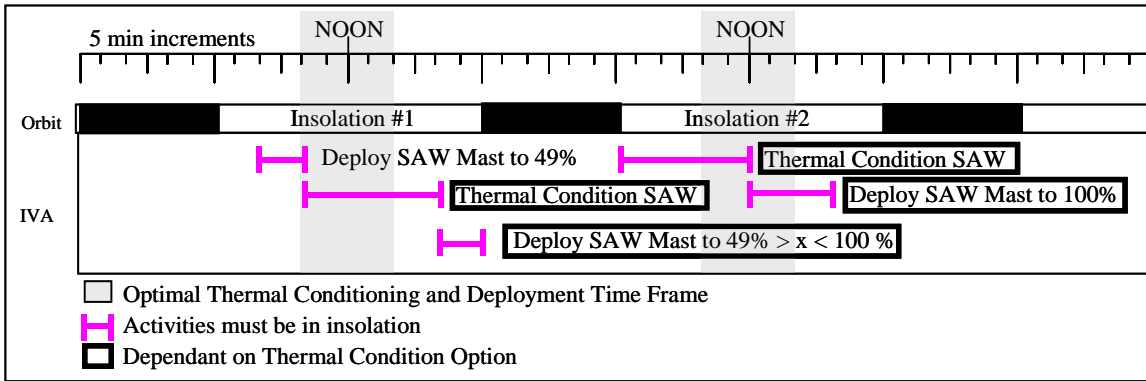
### 1.3.452 SAW XX DEPLOY

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#### OPTION A: 100 % Deploy in 1 Insolation Period



#### OPTION B: > 49 % Deploy in 1 Insolation Period and 100 % Deploy in 2 Insolation Periods



#### OPTION C: 49 % Deploy in 1 Insolation Period and 100 % Deploy in 2 Insolation Periods

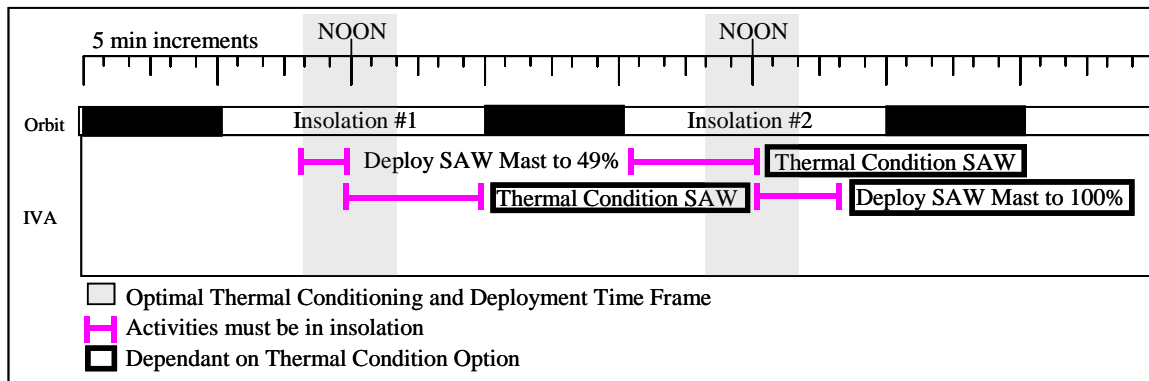


Figure 1.- Solar Array Deployment.

### 1.3.452 SAW XX DEPLOY

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If the Mast – Abort time recorded in step 15.8 occurred at or before orbital noon of the present (insolation 1) insolation period, Option A or B will be attempted.

Determine deploy times.

Mast – Abort Time (from step 15.8) +24 minutes = Earliest Deploy Time

Record earliest time deploy (step 17.8) can be performed: \_\_\_\_\_ GMT

Mast – Abort Time (from step 15.8) +30 minutes = Nominal Deploy Time

Record nominal time deploy (step 17.8) can be performed: \_\_\_\_\_ GMT

Proceed to step 17.

If the Mast – Abort time recorded in step 15.8 occurred after orbital noon of the present (insolation 1) insolation period, Option C will be attempted.

Determine deploy time.

Next Orbital Sunrise +30 Minutes = Contingency Deploy Time

Record contingency time deploy (step 17.8) can be performed: \_\_\_\_\_ GMT

#### NOTE

Steps 17.1 through 17.6 can be performed early.

## 17. COMPLETING SOLAR ARRAY DEPLOYMENT

### 17.1 Verifying Temperatures are Within Nominal Ranges Prior to SAW

#### Deploy

PCS

PVM: EPS: SAW XX

SAW XX

Verify SAW PS Temp, deg C: -33 to 51

Verify BGA PS Temp, deg C: -33 to 51

Verify Mast MDA Temp, deg C: -54 to 48



### 1.3.452 SAW XX DEPLOY

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#### 17.2 Powering On Mast Motor Drive Assembly (MDA)

##### NOTE

1. Mast MDA temperatures may be high due to direct sunlight in deploy configuration. MDA Over Temp Trip occurs at 77.8° C. At a minimum, a 30° C mast MDA temperature increase should be protected for during mast deployment. Delay MDA activation, until just prior to deploy time to minimize temperature increase if necessary.
2. MDA Slow alert will be Nominal until MDA power is applied. Once this is done, the indication is Slow.

**SAW XX**

'Mast'

sel Mast Commands

**SAW XX Mast Commands**

'MDA'

'Power'

**cmd On – Arm**

**cmd On – On**

√MDA Voltage, V: 120 to 125

√MDA Current, A: ~0.10 (±0.4)

√MDA Slow Alert – Slow

#### 17.3 Verifying Camera Configuration

ISS must be in insolation to perform this verification.

##### NOTE

Perform a visual verification prior to, during, and at the completion of the mast deploy operation to minimize the risk of potential collision hazards, monitor for any obvious anomalies, and to verify solar array deployment. Total number of visible Mast Bays is 31.5, 1 Bay is rigid batten to rigid batten.

Verify camera configuration is correct for solar array deploy to 100 %, before proceeding.

If orbiter is performing mated attitude control, wait for deploy time from **MCC-H**, then proceed to step 17.6. Otherwise, proceed to step 17.7 and wait for **MCC-H GO** to complete Mast deploy.

**MCC-H** proceed to step 17.4.

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#### 17.4 Verifying Initial SAW Mast Configuration

##### NOTE

SAW 2B SW 02 Deployed limit switch failed prior to the 4A mission, No is always indicated.

SAW XX Mast Commands

√Mast SW01,SW02 Retracted – No

√Mast SW01,SW02 Deployed – No

#### 17.5 Verifying Conditions are Correct for Visual Verification

##### **CAUTION**

Steps 17.7 and 17.10 must be performed during insolation to minimize sticky panels during the deploy and support crew visual cues use to determine when to abort the solar array deployment. A Sun incidence angle between 60 degrees and 90 degrees (optimal) on the inactive surface of the solar array is required to achieve an adequate thermal environment throughout the deploy.

Verify ISS is in insolation (orbital noon  $\pm$ 10 minutes is optimal for deploy).

#### 17.6 Preventing Thruster Firings

##### **CAUTION**

To minimize the potential for structural damage to hardware while the solar array mechanisms are in motion, nonpropulsive CMG control or Free Drift will be maintained. At any time array deployment is stopped or aborted, thrusters may be enabled.

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

MCS: MCS Configuration: Manual CMG Desat

Manual CMG Desat

√Desat Request – Inh

**MCC-H** ↑ ISS, Orbiter, “Desats are Inhibited.”

Go to step 17.7.

If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

Perform {2.404 [MODING CMG TA TO FREE DRIFT](#)}, all

(SODF: MCS: NOMINAL: GNC MODING), then:

**MCC-H** ↑ ISS, Orbiter, “ISS is in Free Drift.”

Go to step 17.7.

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C3(A6)

If orbiter is performing mated attitude control

DAP: FREE

Orbiter ⇒ ISS, **MCC-H**, "Orbiter is in Free Drift."

Go to step 17.8, notify **MCC-H** before sending the deploy command.

#### 17.7 Deploying 100 % of SAW (Approximately 31.5 Bays Visible)

##### WARNING

If deploying a solar array during EVA operations, confirm EVA crew outside of area that could be subject to solar array structural collapse.

##### CAUTION

1. Confirm no crew exercise or maximum EVA loads before proceeding.
2. If the mast is in motion and the deploy will not be completed (100 %) before entering eclipse, the deploy must be stopped using the Mast – Abort command upon entering eclipse due to loss of visual insight. Once deploy is stopped, crew will perform step 17.9, if orbiter is performing attitude control. Otherwise, crew will hold in step 17.7 and wait for **MCC-H GO** to complete mast deploy. **MCC-H** return to step 16, then perform steps 17.1 to 17.2 and 17.6.

##### NOTE

Upon successful deploy commanding, the MDA current will increase (0.2 to 3.0 amps) and the Slow alert will go to Nominal during transition, then return to Slow. Once power is removed from the MDA, the Slow alert will indicate Nominal.

PCS

PVM: EPS: SAW XX

SAW XX

'Mast'

sel Mast Commands

SAW XX Mast Commands

'Mast'

**cmd** Deploy – Arm

**cmd** Deploy – Deploy (Nominal deploy takes ~6 minutes. Tension mechanism monitoring is not required for redeploy after an SSU R&R. Redeploy takes 13 minutes.)

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If <24 Bays visible

Monitor RBB and LBB inboard tension mechanisms and tension bars for motion during deployment of the first 24 bays (75 % deployed mast).

\*\*\*\*\*

\* If motion (inboard tension mechanism rotates approximately  
\* 1/8 turn) is indicated between 49 % (15.5 bays) and 75 %  
\* (24 Bays) deployed, immediately abort deploy.

NOTE

While the Mast is being deployed, the tension mechanisms may experience small oscillations. This is acceptable and not cause for an abort.

'Mast'

**cmd** Abort – Abort

√**MCC-H** before proceeding.

**CAUTION**

Panel stiction forces are higher than expected and the likelihood of the tension bar rising is increased. Note that panels will separate from least to greatest stiction force.

\*\*\*\*\*

If >24 Bays visible

Monitor RBB and LBB inboard tension mechanisms and tension bars for motion until the last Mast Bay begins to deploy.

NOTE

During deployment of the last half Mast Bay (at Mast Bay 31) the tension bars of both blankets will rise off the blanket box sill (~20 inches) and the tension mechanisms will rotate approximately 1.5 turns.

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\*\*\*\*\*

\* If motion (inboard tension mechanism rotates a quarter turn) is  
\* indicated between 75 % (24 Bays) and 98 % (31 Bays)  
\* deployed, immediately abort the deploy.  
\*

**NOTE**

While the mast is being deployed, the tension mechanisms may experience small oscillations. This is acceptable and not cause for an abort.

'Mast'

**cmd Abort – Abort**

If either tension bar rises up excessively (>3") from the blanket box sill and does not return to the sill after the abort is issued, then immediately

**SAW XX Mast Commands**

'MDA'

'Power'

**cmd On – Arm**

**cmd On – On**

√MDA Voltage, V: 120 to 125

'Mast'

**cmd Retract – Arm**

**cmd Retract – Retract**

Retract the mast until the tension bar reaches the sill.

'Mast'

**cmd Abort – Abort**

√MDA Voltage, V: <10 (±2.8)

√**MCC-H** before proceeding.

If **MCC-H** unavailable, perform {3.194 SAW XX BLANKET PANEL STICTION DURING DEPLOYMENT}, all (SODF: EPS: MALFUNCTION: PRIMARY POWER SYSTEM), then:

Otherwise, √**MCC-H** before proceeding.

If **MCC-H** unavailable, perform {3.194 SAW XX BLANKET PANEL STICTION DURING DEPLOYMENT}, all (SODF: EPS: MALFUNCTION: PRIMARY POWER SYSTEM), then:

\*\*\*\*\*

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Wait approximately 6 minutes (13 minutes for redeploy post SSU R&R) until 100 % deployed (confirm 31.5 bays are visible).

If orbiter is performing mated attitude control, proceed to step 17.9. Otherwise, proceed to step 17.10.

**MCC-H** proceed to step 17.8

#### 17.8 Verifying Final SAW Mast Configuration

**NOTE**  
SAW 2B SW 02 Deployed limit switch failed prior to the 4A mission, No is always indicated.

SAW XX Mast Commands

- √Mast SW01, SW02 Retracted – No
- √Mast SW01, SW02 Deployed – Yes
- √MDA Voltage, V: 120 to 125
- √MDA Current, A: ~0.10 (±0.4)
- √MDA Slow Alert – Slow

\*\*\*\*\*

- \* If one Deployed or Retracted limit switch fails
- \* | Confirm configuration visually and √**MCC-H** before
- \* | proceeding.
- \* |
- \* | Mast limit switch status that would restrict SABB and BGA
- \* | commanding has already been overridden as part of ECU
- \* | activation.
- \* |
- \* If two Deployed or Retracted limit switches fail
- \* | Perform steps 17.9 (if orbiter performing attitude control) and
- \* | 17.10, then √**MCC-H** before proceeding.

\*\*\*\*\*

#### 17.9 Configuring for Nominal Attitude Control

**MCC-H**

If ISS is performing attitude control and ISS is in TEA (**MCC-H**)

| Go to step 17.10.

If ISS is performing attitude control and ISS is not in TEA (**MCC-H**)

| Perform {2.405 MODING FREE DRIFT TO CMG TA},  
(SODF: MCS: NOMINAL: GNC MODING), then:

| **MCC-H** ↑ ISS, Orbiter, "ISS is in Attitude Control."

| Go to step 17.10.



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PCS 17.11 Power Off Mast MDA  
PVM: EPS: SAW XX  
SAW XX  
'Mast'

sel Mast Commands

SAW XX Mast Commands  
'MDA'  
'Power'

cmd Off – Off

√MDA Voltage, V: <10 (±2.8)

### 18. FEATHERING SOLAR ARRAY TO PROTECT AGAINST ISS/ORBITER PLUME LOADS

#### WARNING

Confirm EVA, SSRMS, and SRMS, clear of solar array rotation path before unlatching and rotating BGA.

#### CAUTION

Once deployed, the solar array must be placed edge-on to ISS and orbiter thruster plume, to minimize array structural loads and contamination. The active surface of the array will be pointed toward the Sun. This requirement is not applicable to P6 arrays, when P6 is located on the Z1 truss.

PVM: EPS: BGA XX

BGA XX  
'BGA XX'

Perform {2.110 PVM BGA XX UNLATCH ANTIROTATION LATCH}, all (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM), then:

Refer to Table 5 for the BGA XX Cmd Angle and perform {2.102 PVM CONFIGURE BGA XX TO DIRECTED POSITION MODE}, steps 5 to 8 (SODF: EPS: NOMINAL: PRIMARY POWER SYSTEM), then:



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Table 5. Solar Array Feather Angles

PVM	BGA/SA W (XX)	Cmd Angle, deg
S4	1A	90
S4	3A	270
S6	1B	270
S6	3B	90
P4	2A	90
P4	4A	270
P6 on Z1	2B	Not Required
P6 on Z1	4B	Not Required
P6	2B	270
P6	4B	90

If deploying both arrays on a PVM the same day

Perform steps 15 to 18 for both channels before proceeding to step 19.

If deploying only one array or redeploying the array after an SSU R&R, go to step 19.

#### 19. ENABLING MOTOR VELOCITY SAFING (IF REQUIRED)

##### NOTE

If BGA is at 0 degrees, then delay this velocity limit safing - enable step until next time the BGA is reconfigured.

If the BGA is not at 0.0 ( $\pm 0.5$ ) degrees

PVM: EPS: BGA XX

sel Motor

'Velocity Limit Safing, Primary PVCU'

**cmd** Enable – Arm

**cmd** Enable – Enable

Verify Primary PVCU – Ena

'Velocity Limit Safing, Backup PVCU'

**cmd** Enable – Arm

**cmd** Enable – Enable

Verify Backup PVCU – Ena

20. POST SAW DEPLOY RECONFIGURATION

- NOTE
1. Once this procedure is complete, SSU XX is still shunted, and the array is not yet supporting channel XX. Channel XX IEA hardware is still receiving power from a support channel.
  2. Table 6 provides support channel connectivity. A support channel, provides initial power to the channel being activated until the SAW is deployed and the batteries are charged (e.g., Ch 4B supports Ch 4A until Ch 4A is fully activated). If redeploying the array after an SSU R&R, confirm support channel with **MCC-H**.

If the array was redeployed after an SSU R&R, perform step 20.2 then exit procedure.

Table 6. Support Power Channel Connectivity

XX	YY	ZZ
1A	3A	4A
3A	1A	2A
1B	3B	1A
3B	1B	3A
2A	4A	2B
4A	2A	4B
2B	4B	2A
4B	2B	4A

20.1 Powering Up Loads on ISS (As Necessary)

- NOTE
- Loads previously powered down, may be reactivated if no longer in the solar array deploy attitude.

Reactivate those loads previously deactivated for array deployment.

20.2 Recover Loads on DDCU XX (YY) After SAW Deploy

- NOTE
- Power can be supplied to ECU XX from DDCU XX or DDCU YY for the solar array deploy. Therefore, it may have been necessary to reduce loads on the appropriate DDCU to support a peak power load of 580 watts during array deployment.

Reactivate those loads previously deactivated on DDCU XX (YY) for array deployment.

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### 20.3 Configure for Charging Batteries from Channel XX Array (Same Channel the SAW Was Deployed)

Go to {[1.3.100 PRIMARY POWER CHANNEL ACTIVATION](#)}, step 72 (SODF: EPS: ACTIVATION AND CHECKOUT: CHANNEL ACTIVATION).

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LBB(RBB) Failed to Unlatch

LBB(RBB) Partially Unlatched

CAUTION ALARM

BGA XX Loss of Comm - PVM

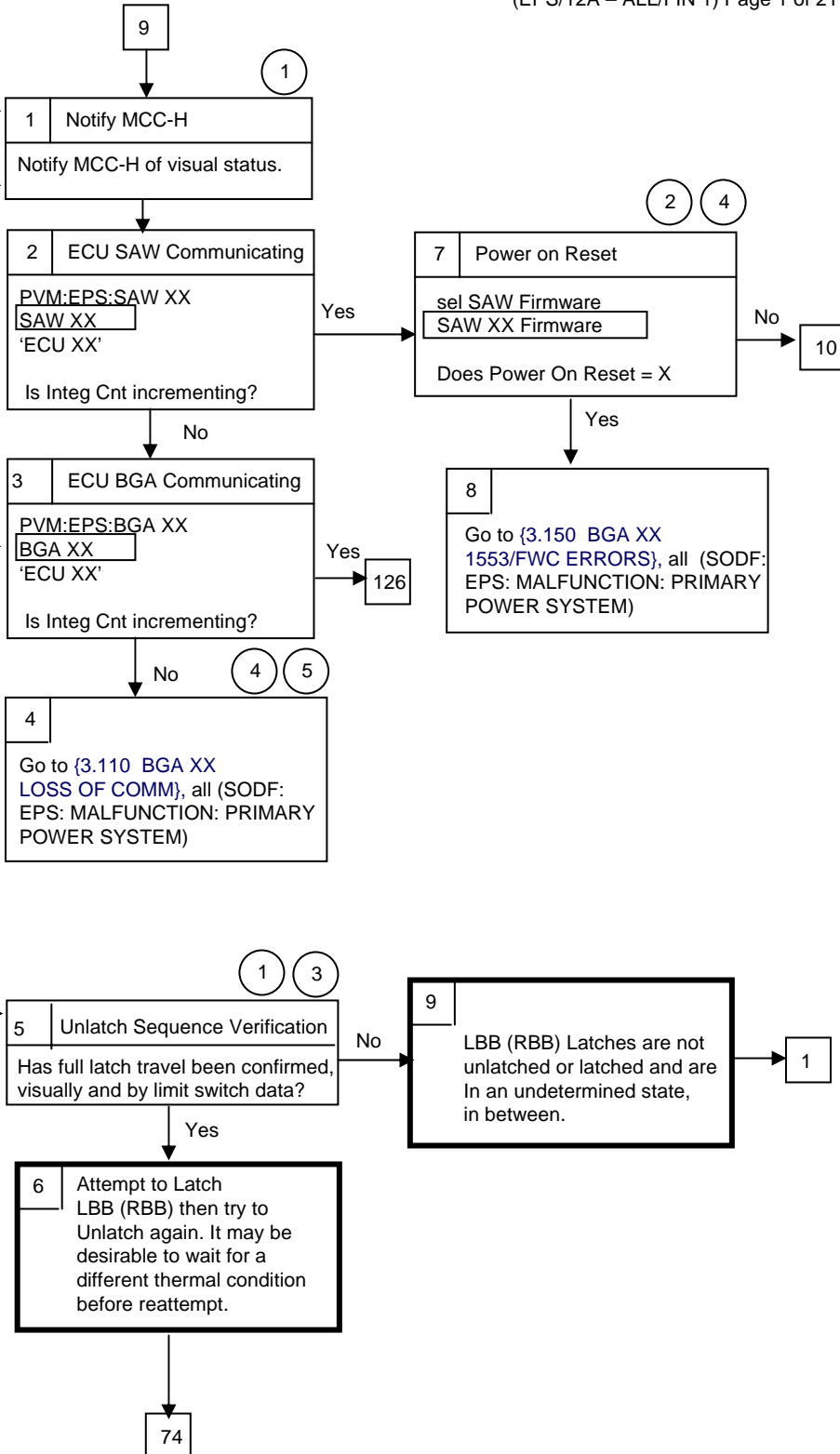
No C&W messages are available for SAW hardware

LBB(RBB) BRS Pin Fail to Release

Power Channel Connectivity

PVM	XX	YY
S4	1A	3A
S4	3A	1A
S6	1B	3B
S6	3B	1B
P4	2A	4A
P4	4A	2A
P6	2B	4B
P6	4B	2B

Nominal Config:  
 ECU SAW XX:  
 RPCM XX A  
 RPC 1 - CI  
 RPCM YY A  
 RPC 2 - CI



1 This procedure assumes the SABBs will be unlatch at specific times during the mission. For Deployments: 1) Initial SABB Unlatch, 2) Unlatch SABBs Day of Deploy. For Retractions: 1) Unlatch SABBs when Mast at 1 Bay.

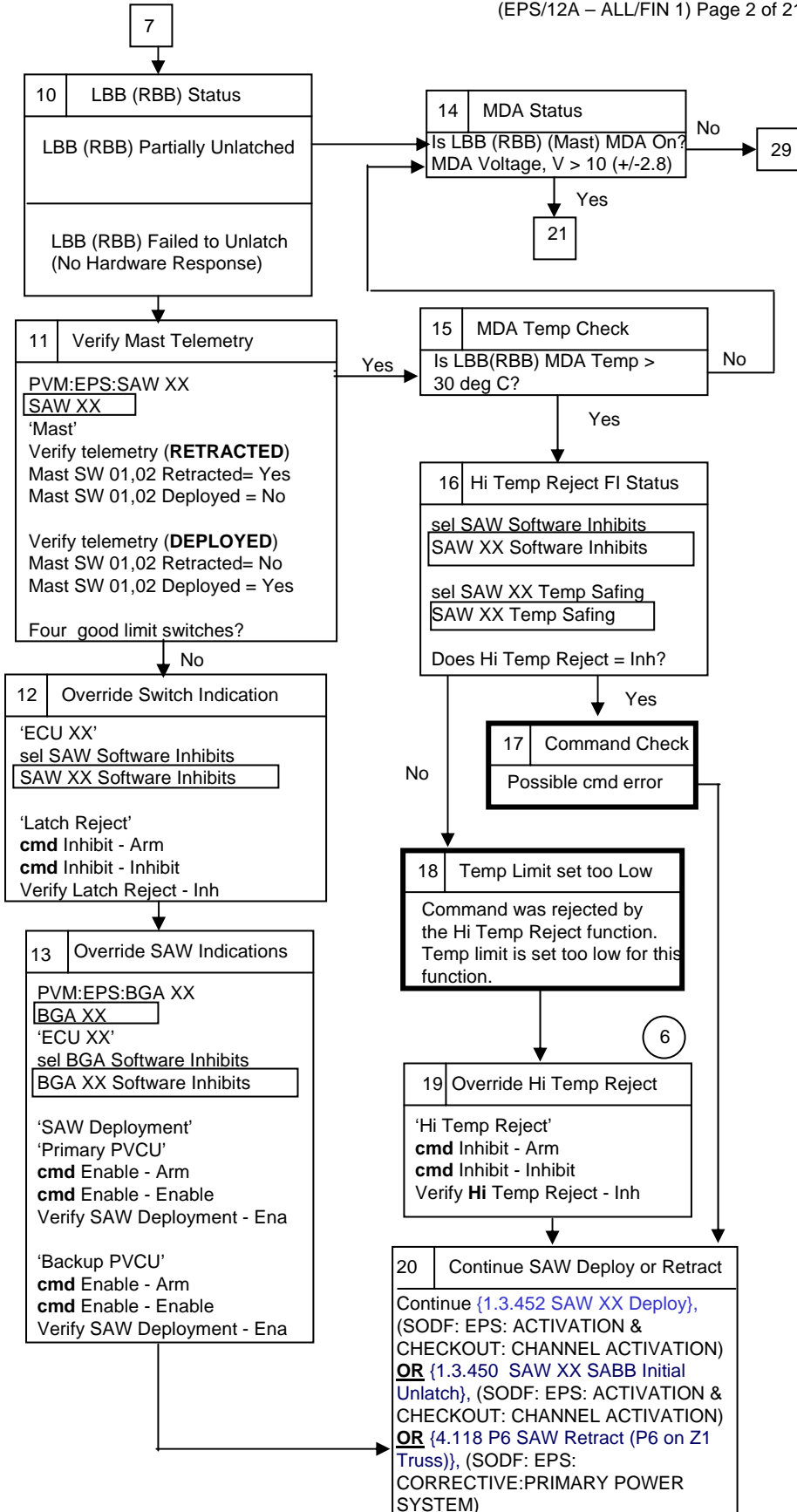
2 Caution message BGA XX 1553/FWC Errors- PVM may also be received if a Power on Reset has occurred.

3 Damage to SABB hardware when driving a MDA in the opposite direction from the initial cmded direction.

4 If power was removed from the ECU you must begin again with step 1 of the Deploy/Retract procedure, to reset the F/W inhibits.

5 If Current sensor fails high > 0.78 A RPCs providing power to ECU will be opened. A new PPL with a higher Current limit must be uploaded before the ECU can be recovered. There is no inhibit for SAW MDA Config Complete Persistent Current Safing.

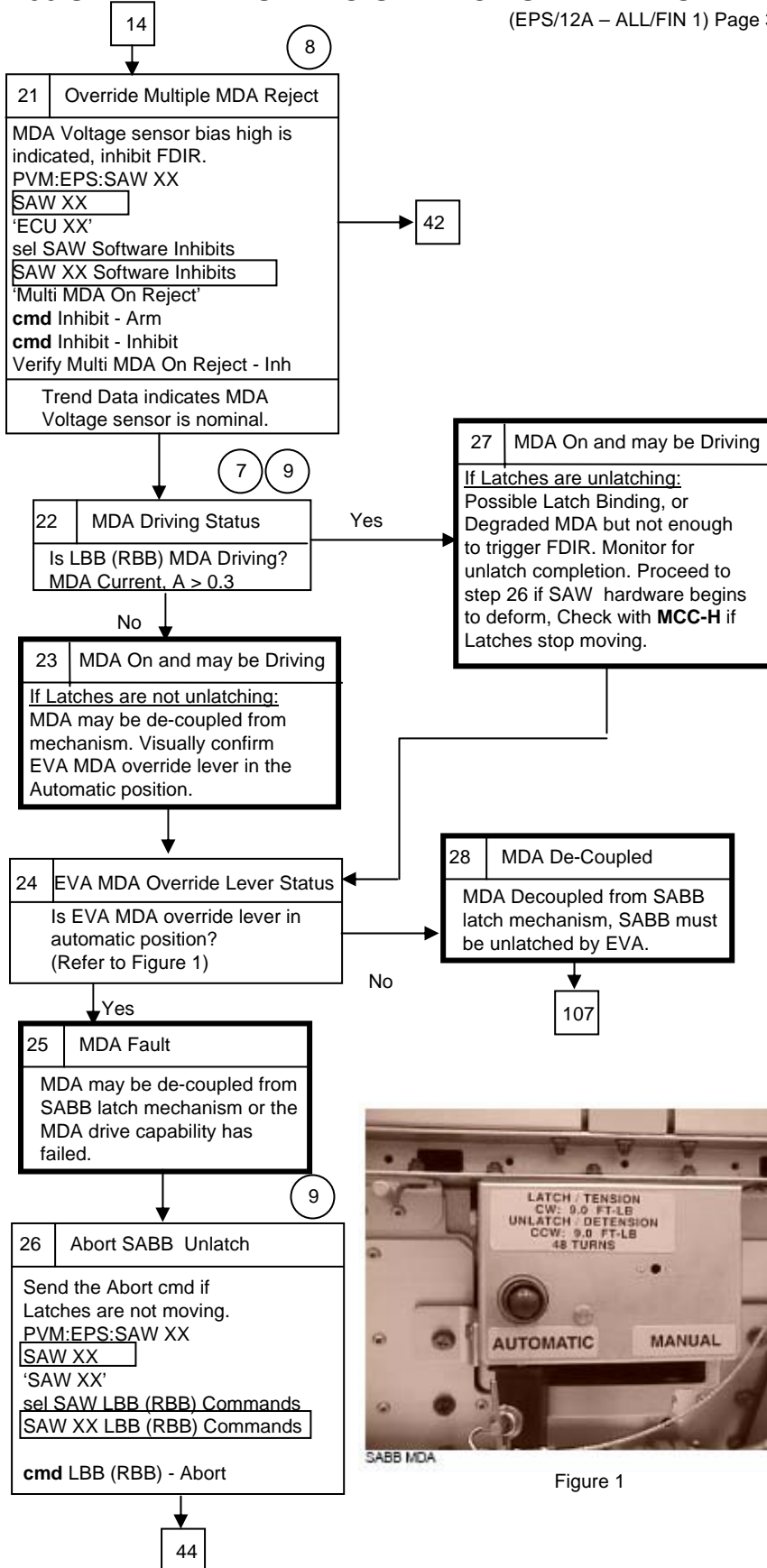
3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY



6

MDA operating temperature range is -54 to 48 deg C.

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY



7

The manual MDA override lever is located on the back (inactive side) of the SABB base. (MDA current with no load = 0.3A)

8

There is no overvoltage FDIR for the MDA. The MDA will continue to operate if a Voltage sensor has failed high. Check voltages of all MDAs. The multiple MDA On Reject FDIR will reject an MDA on command if another MDA is already on.

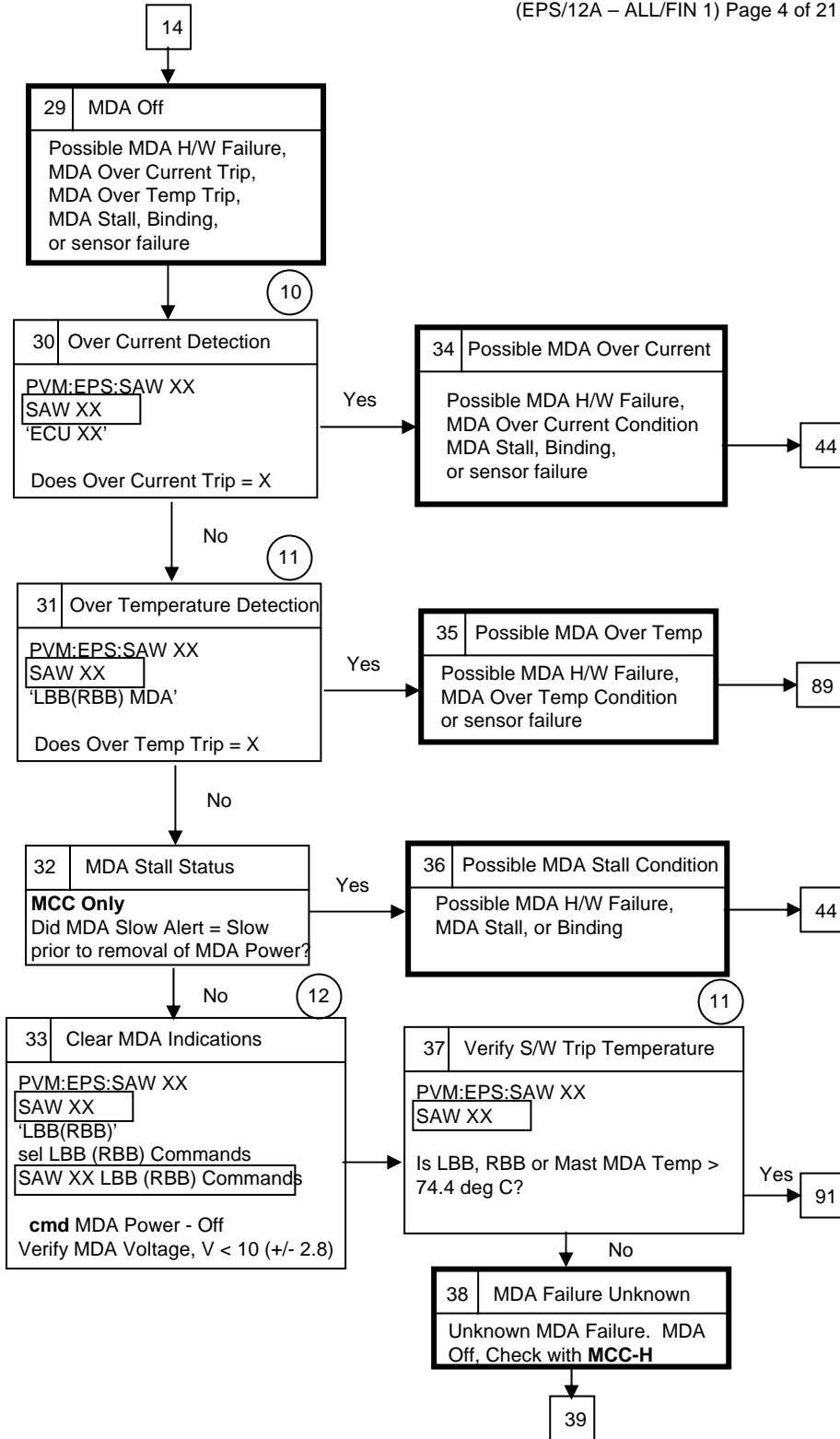
9

If MDA de-coupled you may not be able to tell if the MDA is driving based on the current.



Figure 1

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY



10 ECU Firmware MDA Over Current Trip occurs at 6.2 Amps. S/W Limit (0.78 A) is reached first and it does **not** set the MDA Over Current Trip Flag.

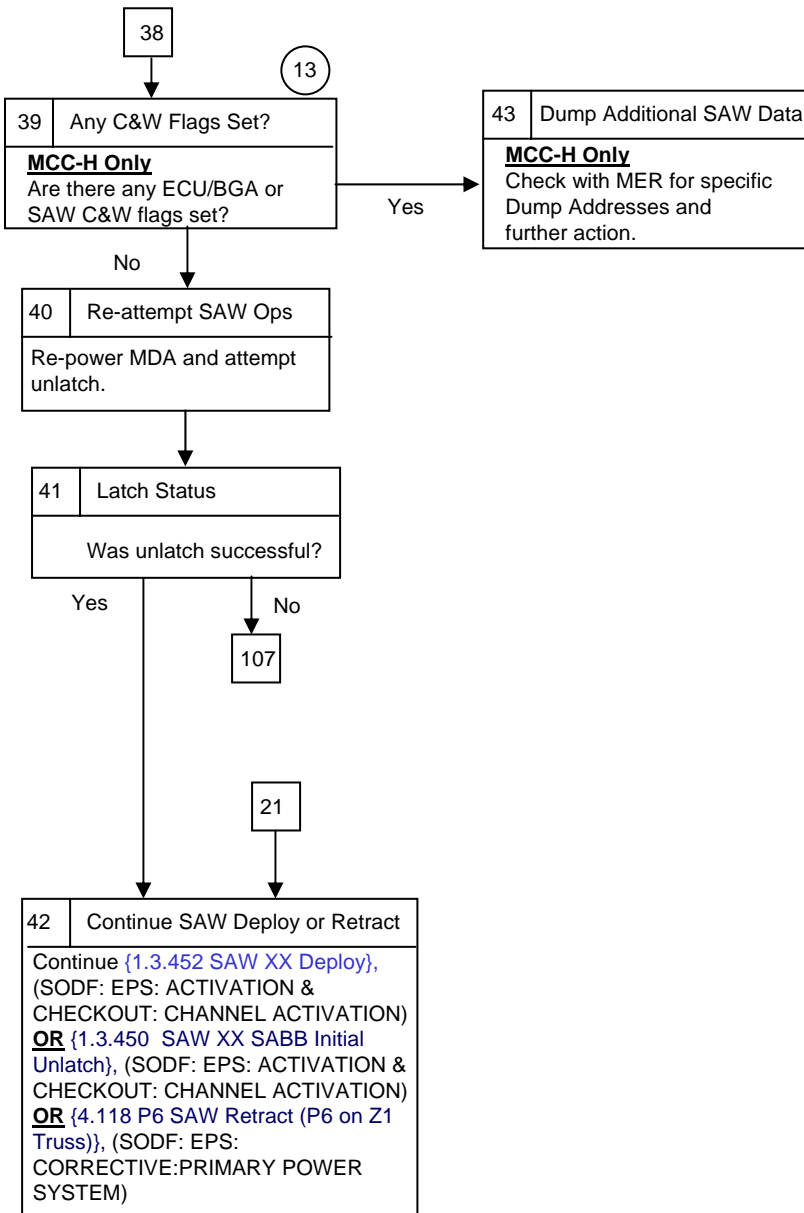
11 Disconnects are present in the MDA Over Temp FDIR. S/W Trip level = 77.7 deg C. F/W Trip level = 140 deg C. H/W damage occurs at 120 deg C. S/W Temp limit is reached first and it does **not** set the MDA Over Temp Trip Flag.

12 MDA Power off is a one step command.



3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY

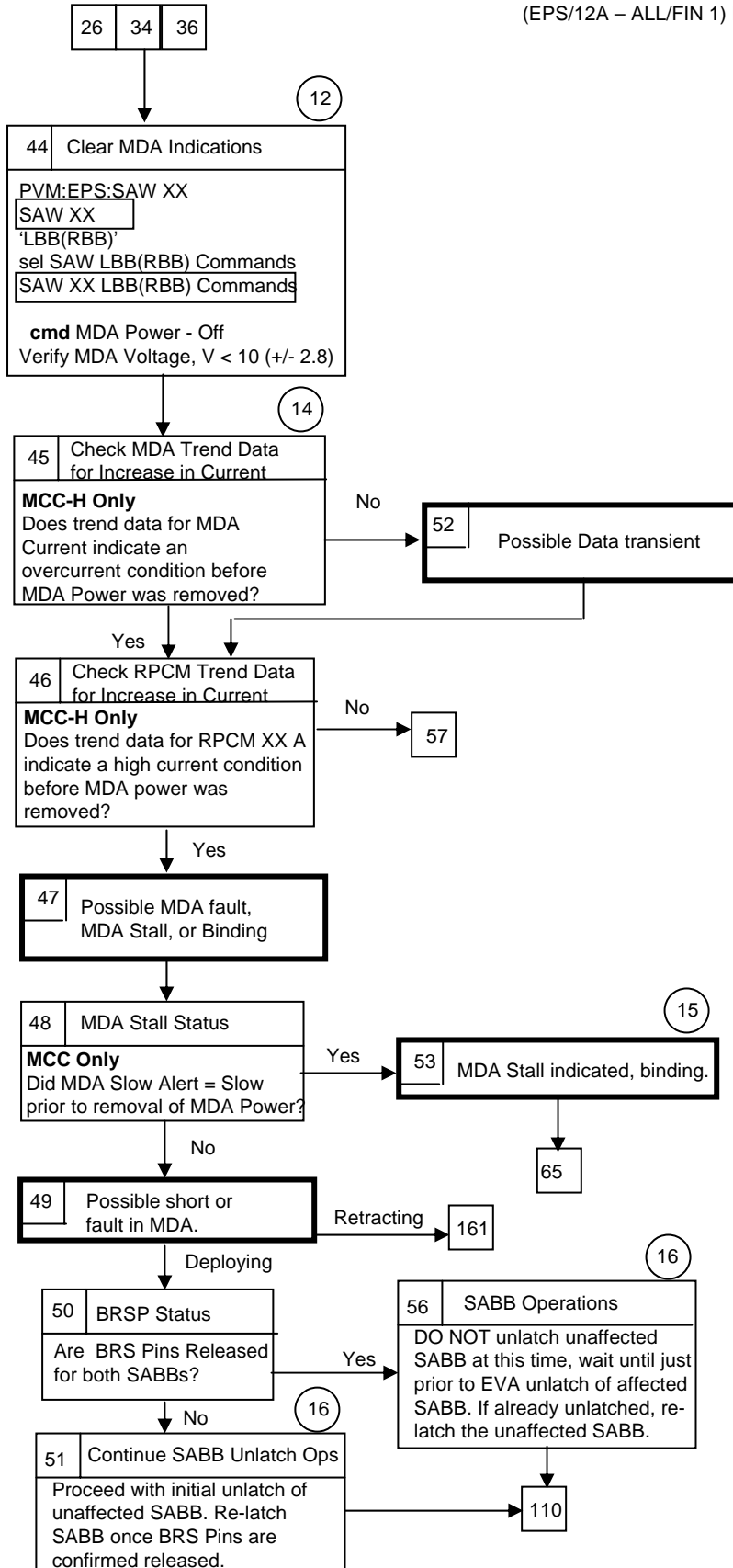
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13

SAW Caution and Warning Flags are available for downlink only during missions that scheduled SAW activities. (e.g 12A) Flags are not available on PCS displays.

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY



12  
MDA Power off is a one step command.

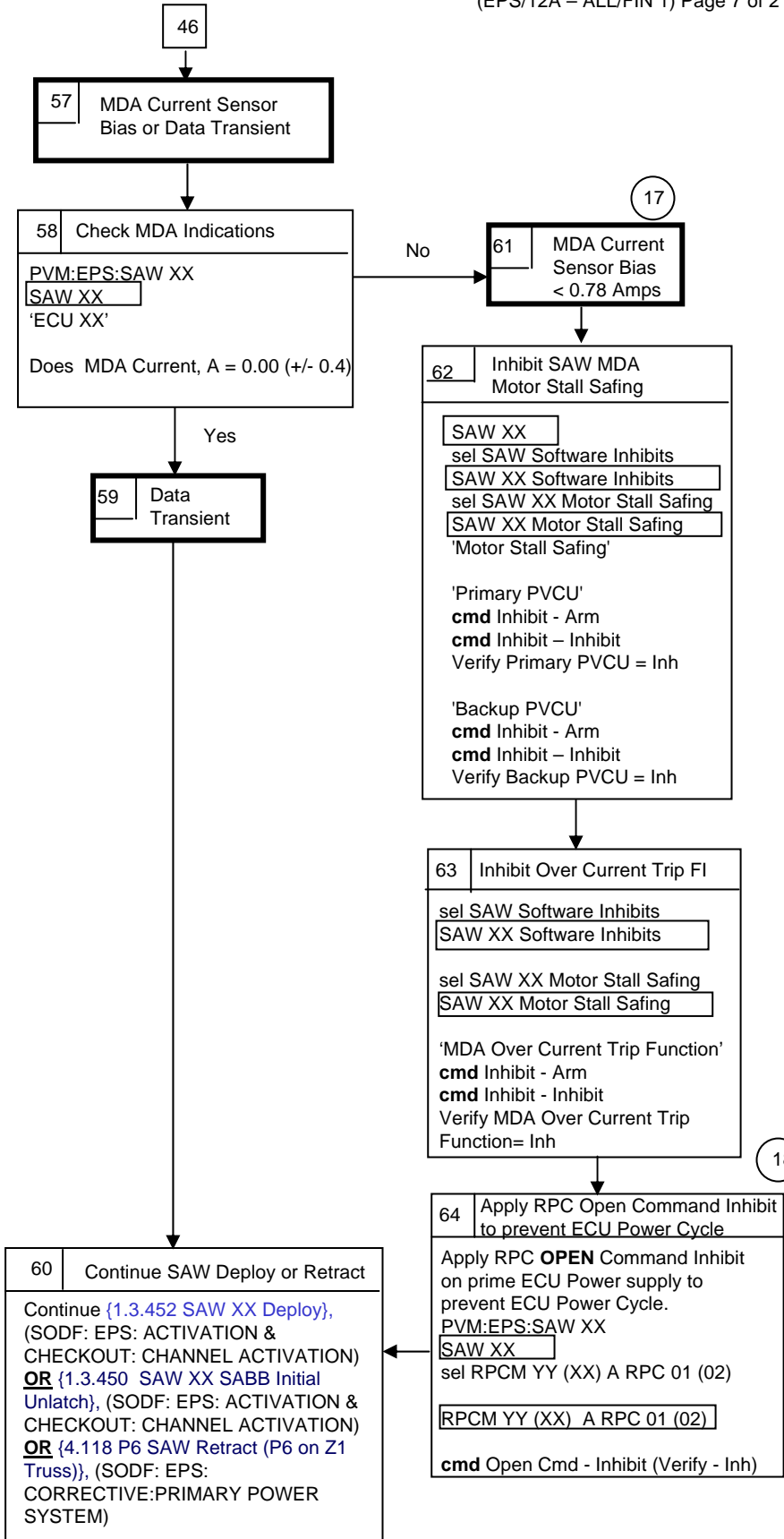
14  
PVCU Software MDA Over Current Trip occurs at 0.78 Amps.

15  
If a Stall Condition is indicated, Current > 0.78 A and motor speed is < 25 RPM, power is removed from the MDA

16  
Re-latch SABB to protect blanket from external loads.

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY

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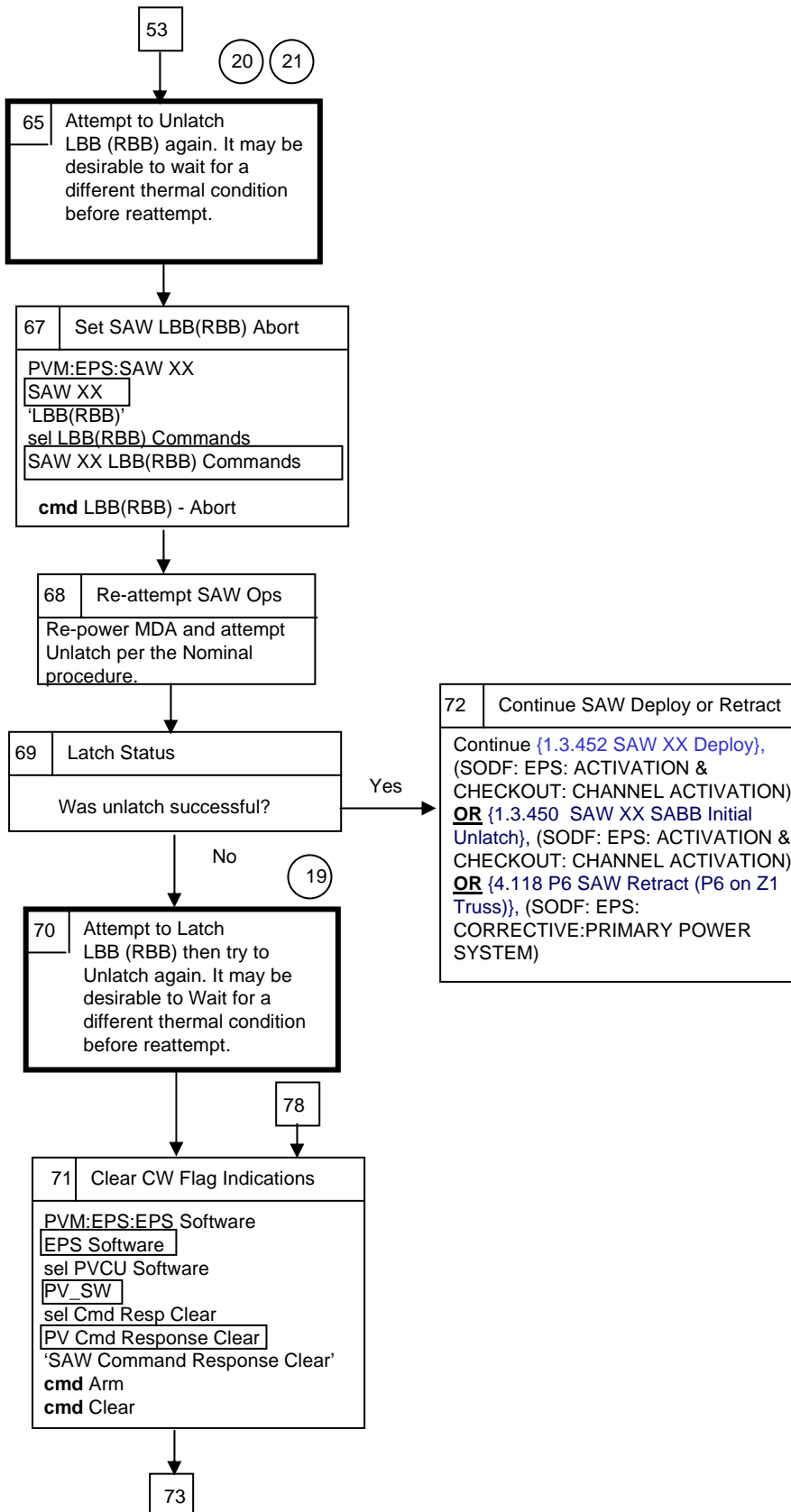
17

If Current sensor fails high > 0.78 A RPCs providing power to ECU will be opened. A new PPL with a higher current limit must be uploaded before the ECU can be recovered. There is no inhibit for SAW MDA Motor Stall Persistent Current Safing. Refer to block 3.

18

Nominal SABB unlatch, takes approximately 14 seconds to complete. However, all MDAs use the same current sensor. A new PPL 69 must be uplinked prior to SAW operations or Inhibit the RPC Open Command to avoid power cycling the ECU.

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY

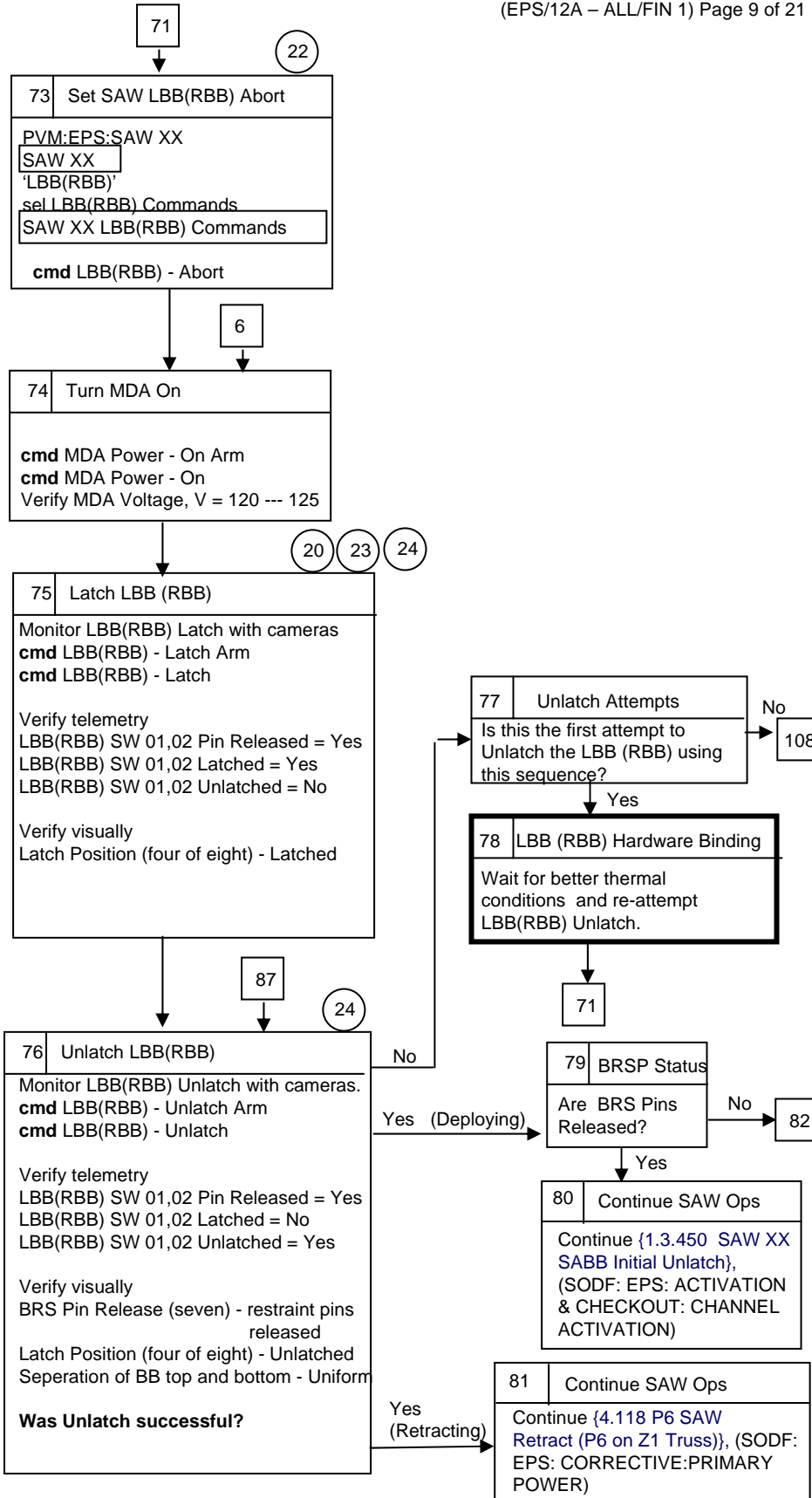


19 There is a very limited partially unlatched range in which a re-latch can be attempted without damaging the hardware. This must be confirmed visually by MCC-H. CAUTION Re-latch cannot be attempted if BRSP are not released. Damage to hardware can occur

20 Damage to SABB hardware when driving a MDA in the opposite direction from the initial cmded direction.

21 Re-attempt will be made at the end of insolation or end of eclipse, whichever case is opposite initial attempt.

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY



20 Damage to SABB hardware when driving a MDA in the opposite direction from the initial cmded direction.

22 MDA Abort must sent to prevent MDA from driving once power is re-applied. This is a single step cmd.

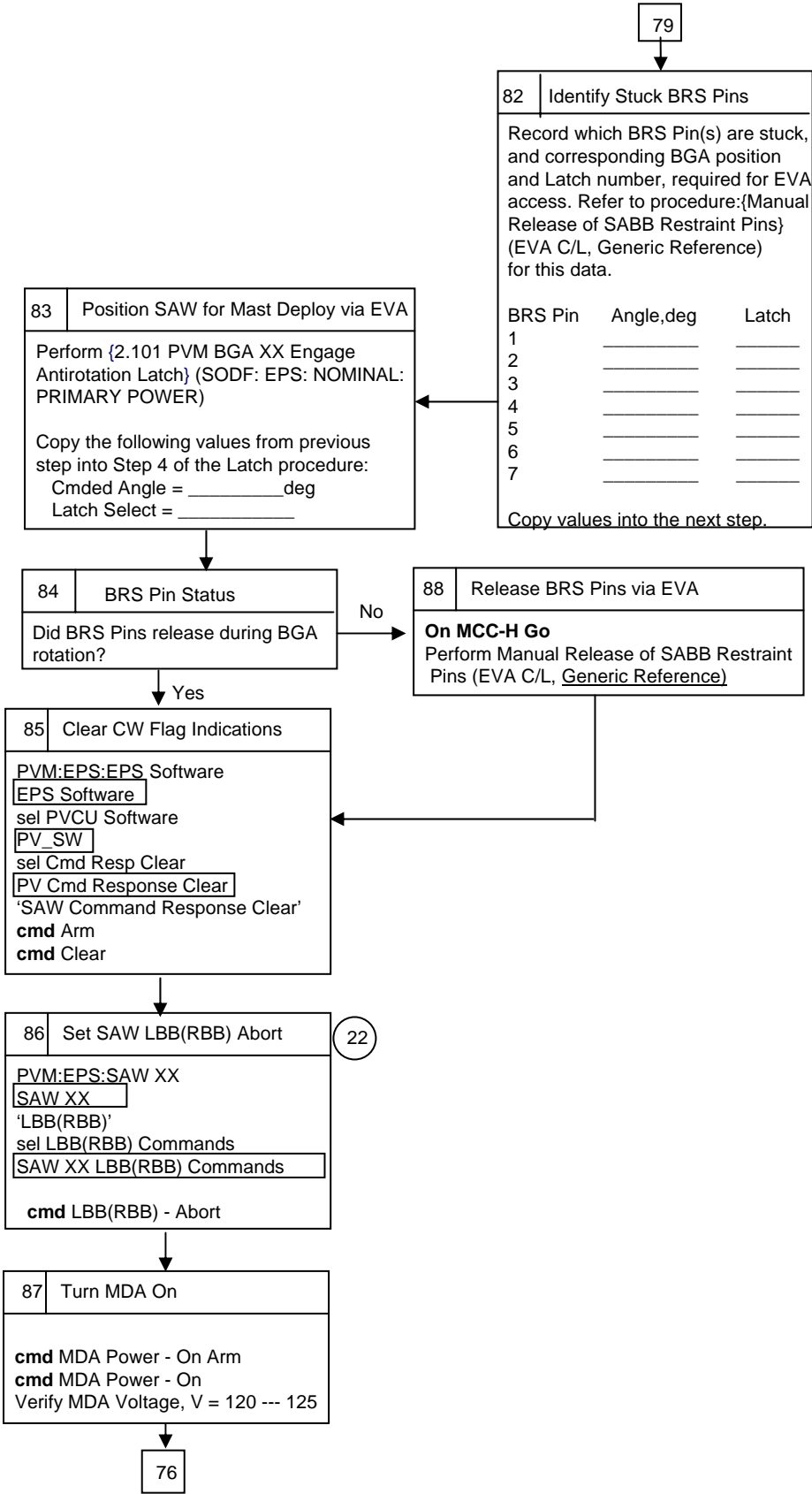
23 There is a very limited partially unlatched range in which a re-latch can be attempted without damaging the hardware. This must be confirmed visually by MCC-H before block 75 can be executed. If block 75 cannot be performed continue in block 76.

24 Confirm that ISS Thrusters are inhibited or ISS/Orbiter in Free Drift and no crew exercise or max EVA loads prior to sending the Unlatch or Latch command. If at any time the array mechanical movement is stopped or aborted, attitude control may be resumed.

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY

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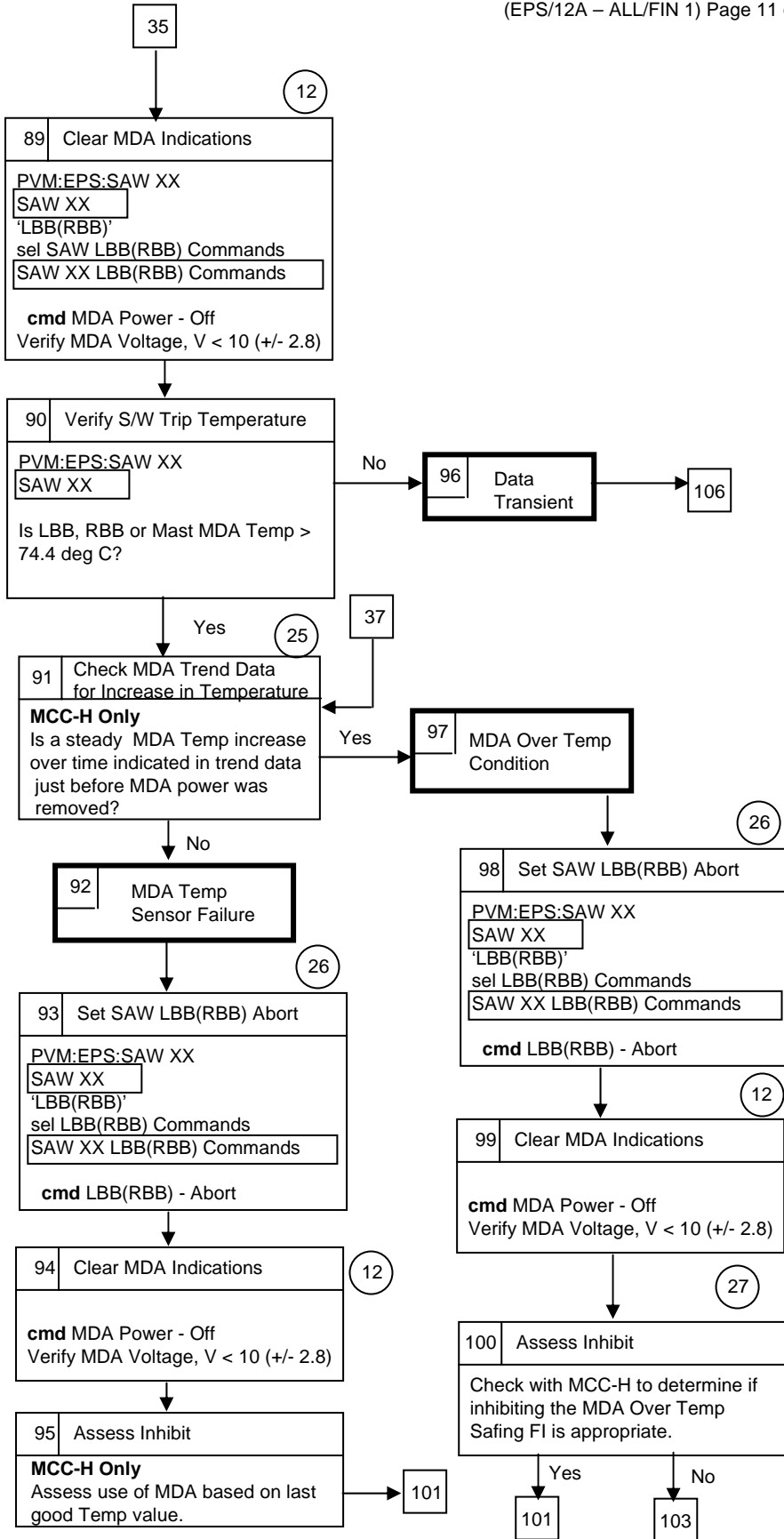
22



MDA Abort must be sent to prevent MDA from driving once power is re-applied. This is a single step cmd.

22

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY



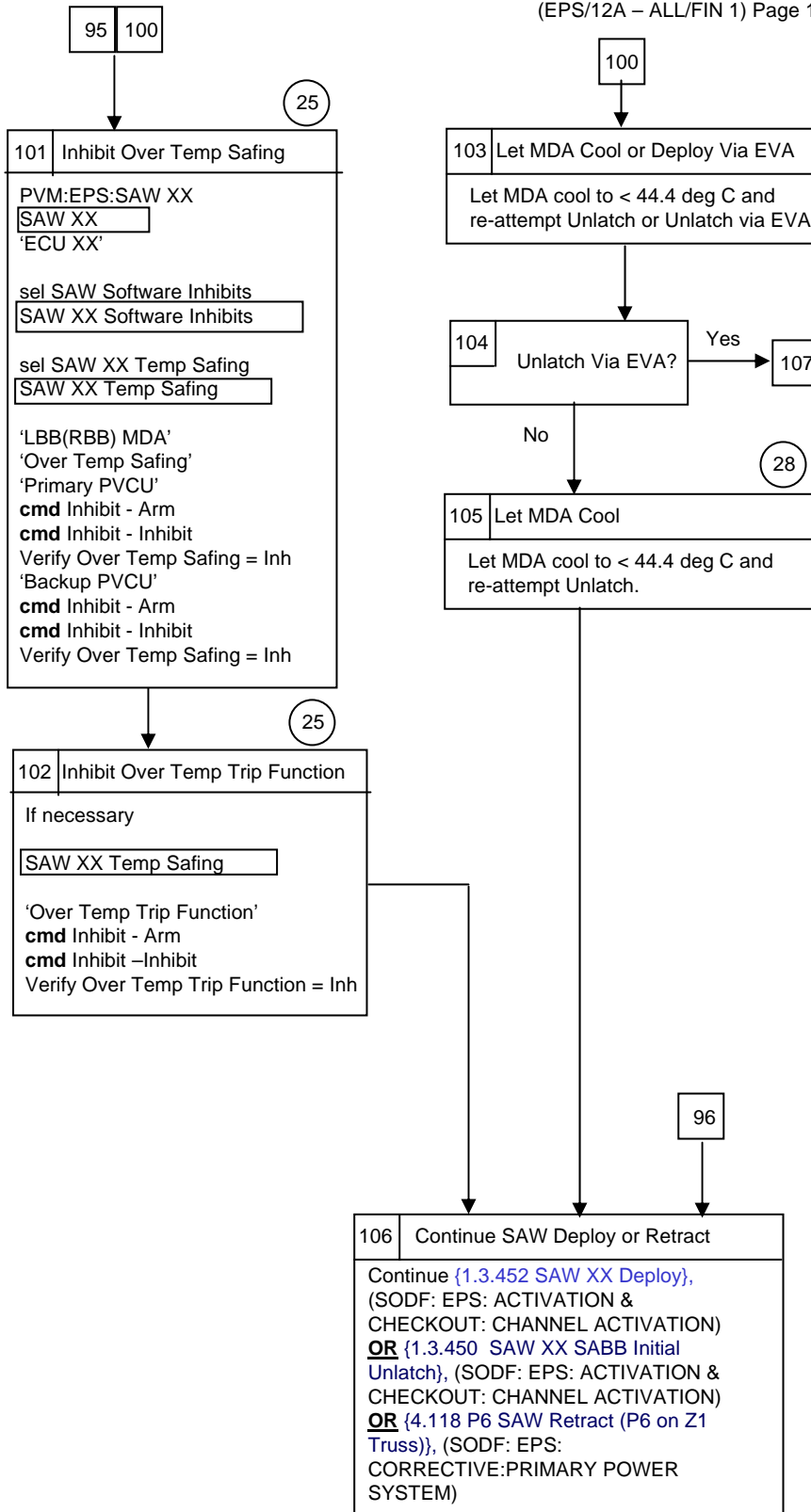
12  
MDA Power off is a one step command.

25  
Disconnects are present in the MDA Over Temp FDIR. S/W Trip level = 77.7 deg C. F/W Trip level = 140 deg C. H/W damage occurs at 120 deg C.

26  
Since S/W Temp limit is reached first and it does not set the MDA Over Temp Trip flag, a MDA Abort must sent to prevent MDA from driving, once power is re-applied. This is a single step cmd.

27  
Per Flight Rule B9-207, MDA operations can proceed even if MDA temp is high in order to meet critical mission objectives. SABB unlatch takes approximately 14 seconds. Measurement Out of Range will be indicated if MDA temp >72.2 deg C.

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY



25

Disconnects are present in the MDA Over Temp FDIR. S/W Trip level = 77.7 deg C. F/W Trip level = 140 deg C. H/W damage occurs at 120 deg C.

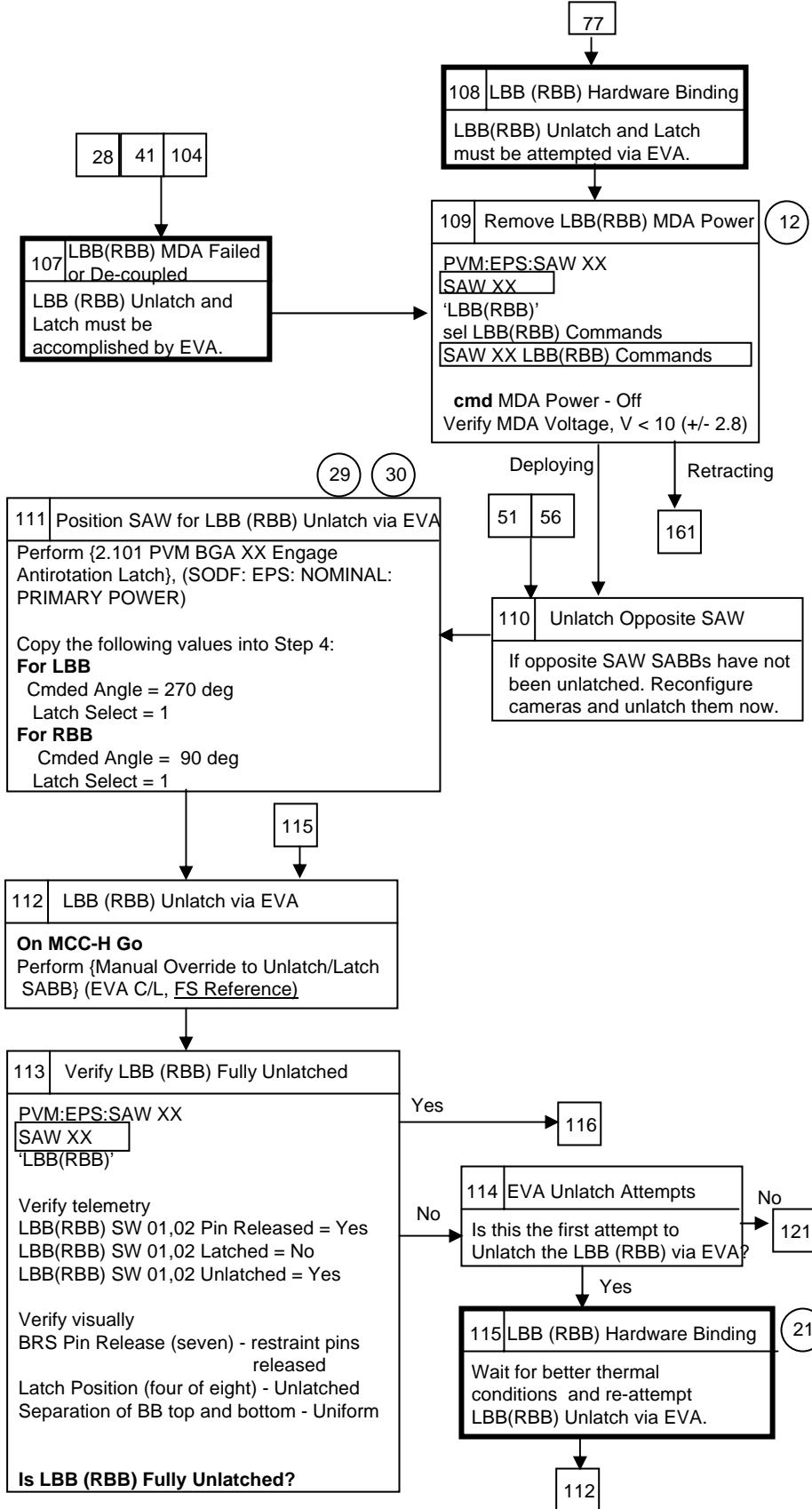
28

Retry temperatures can be higher for SABBs since they are only operated a few seconds.



3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY

(EPS/12A – ALL/FIN 1) Page 13 of 21



12 MDA Power off is a one step command.

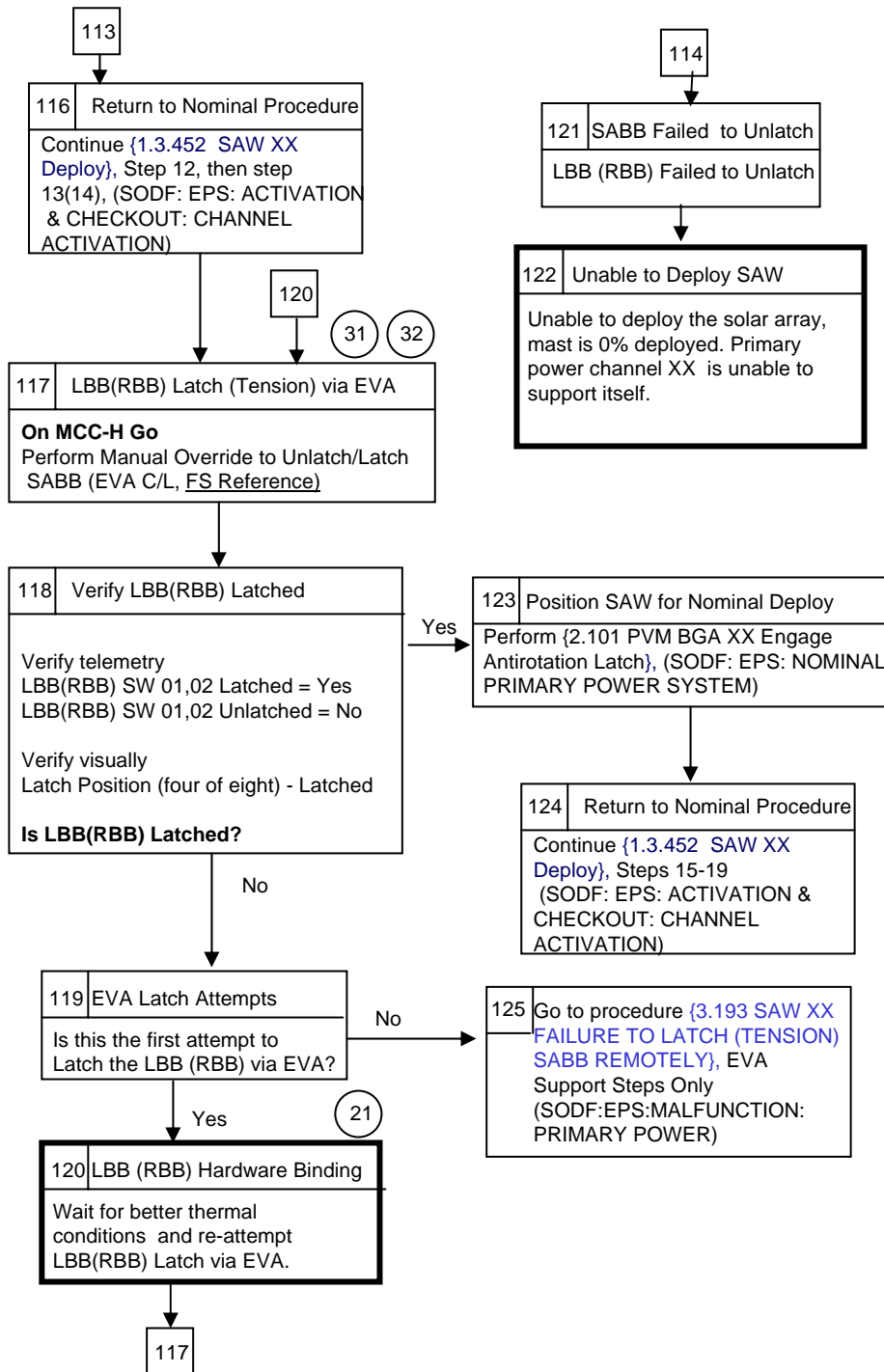
21 Re-attempt will be made at the end of insolation or end of eclipse, which ever case is opposite initial attempt.

29 This step can take up to 1 hr to complete. The latch cmd can be sent when the BGA Actual Angle is within 1 deg of the commanded value in order to save time.

30 This step may be omitted if EVA crew can free float and drive the MDA.

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY

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21

Re-attempt will be made at the end of insolation or end of eclipse, whichever case is opposite initial attempt.

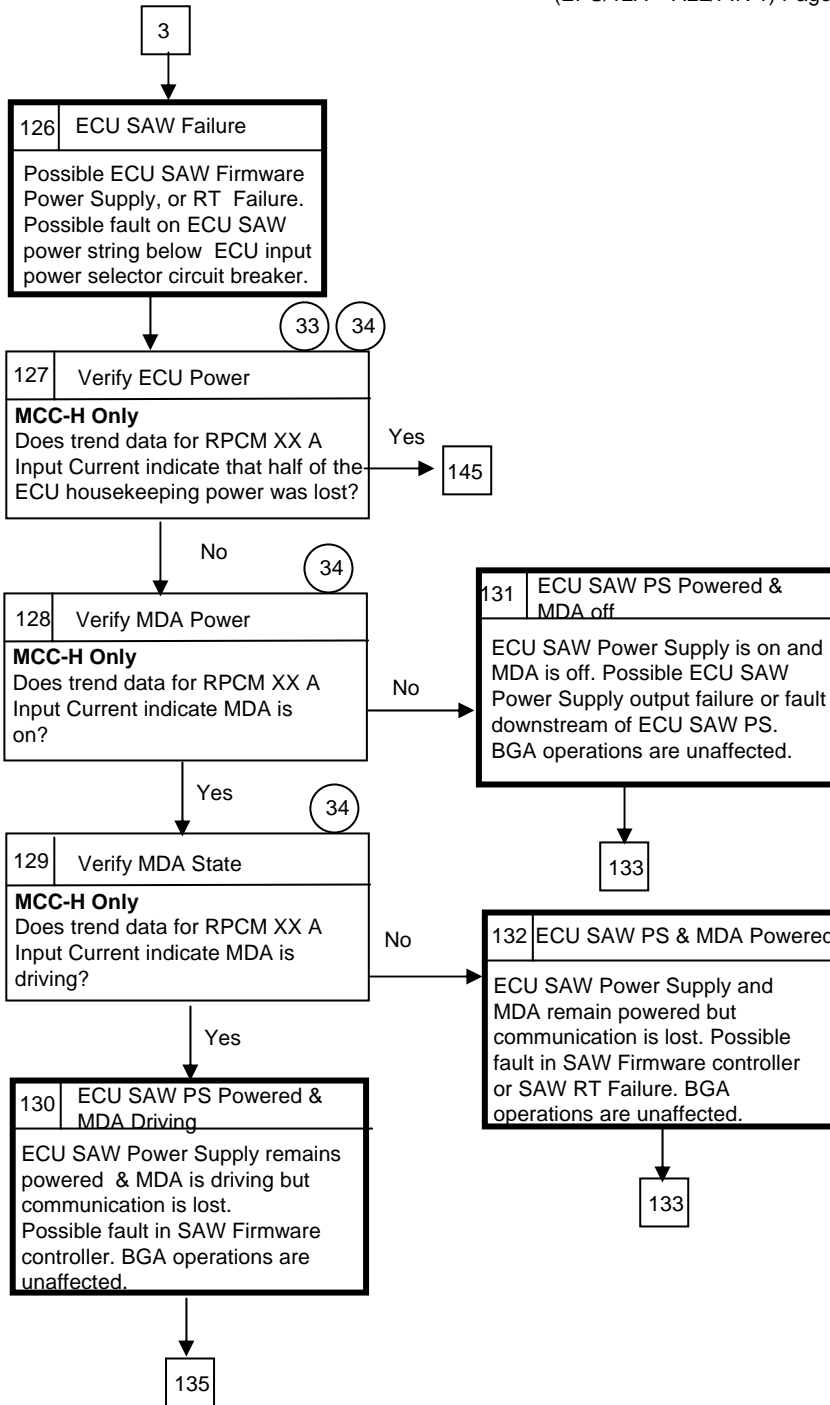
31

Assumes that one or more mast bays have already been deployed.

32

Both SABBs must be Latched (Hi Tension Mode) before the SAW can be deployed, to protect H/W against damage due to high stiction forces.

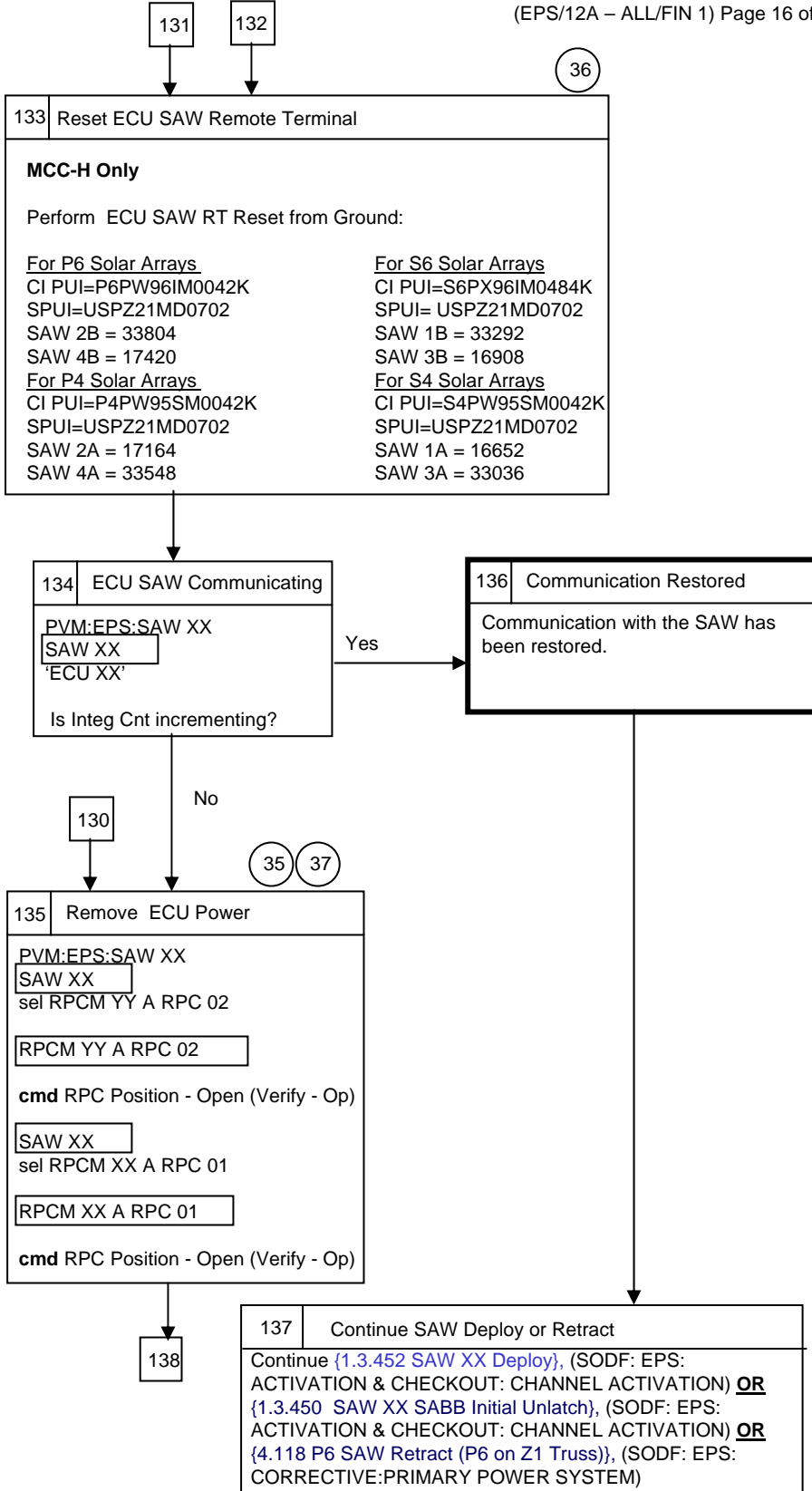
3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY



33  
Total ECU housekeeping power is 115W (0.93A) at initialization and before BGA mtr or MDAs are turned on. Half of the ECU housekeeping power is 57.5W (0.47A)

34  
It only takes 14 sec to unlatch SABBs. When the MDA is on it draws about 0.22A. When the MDA is driving it can draw as high as 3.0A. MDA over current trip occurs at 0.78A. The MDA will stop driving but will remain on if one of the two "Unlatched" limit switches have contacted.

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY

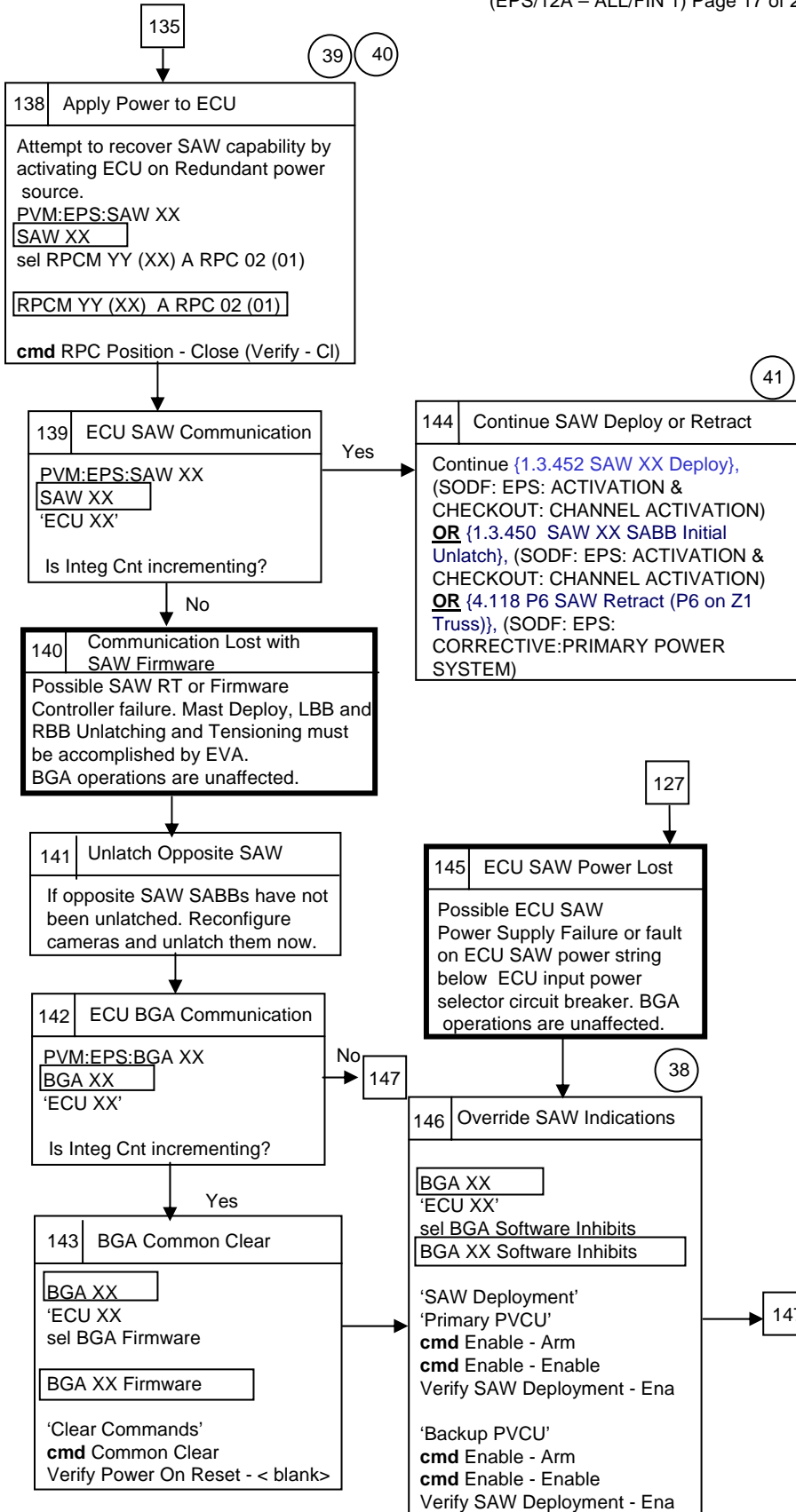


(35) Removes Power from MDA. When power is re-applied to the ECU the MDA will be off.

(36) MCC-H must build and perform this step from command inventory.

(37) Expect Caution message BGA XX Loss of Comm - PVM when RPC 01 is cmded open.

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY



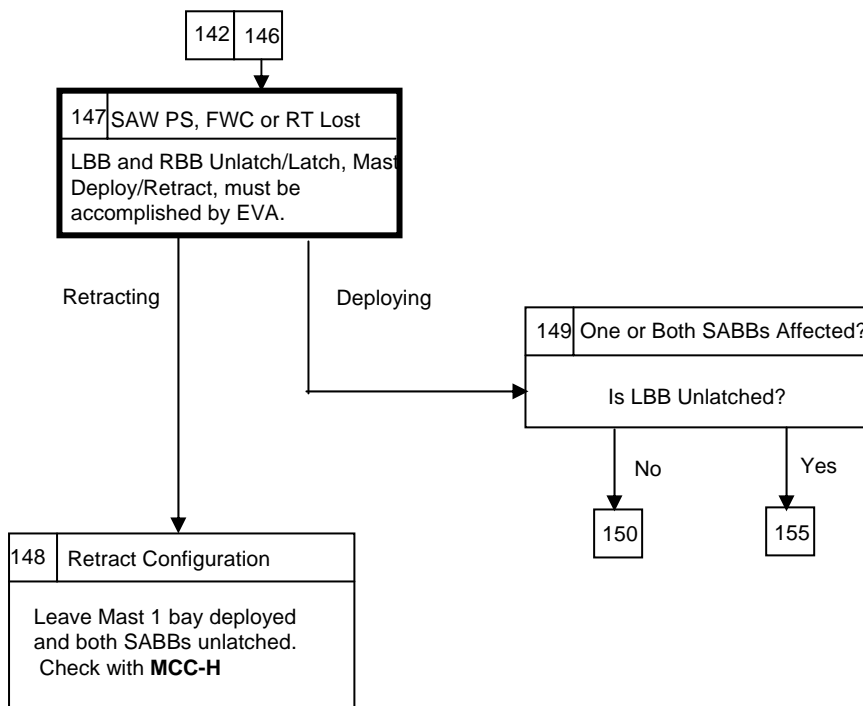
38 Allows BGA to be operated when SAW Mast is in an undetermined state, or comm is lost with SAW FWC

39 Caution message BGA XX 1553/ FWC Errors- PVM may be received after RPC 01 is closed.

40 ECU power is supplied by the opposite deck channel (YY) for SAW Retraction Operations and Channel (XX) for Deploy Operations

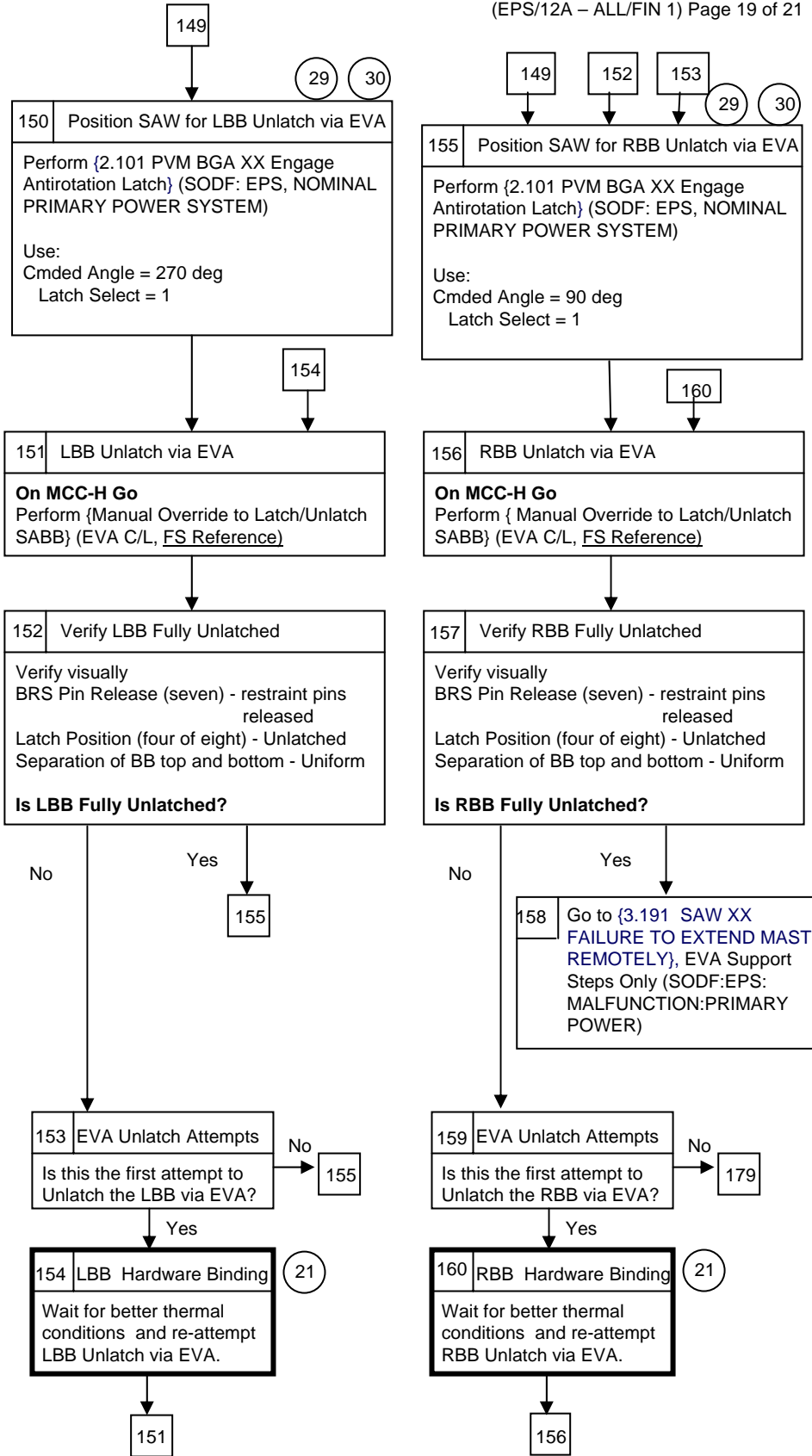
41 If power was removed from the ECU you must begin again with step 1 of the Deploy/Retract procedure, to reset the F/W inhibits.

### 3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY



3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY

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21

Re-attempt will be made at the end of insolation or end of eclipse, whichever case is opposite initial attempt.

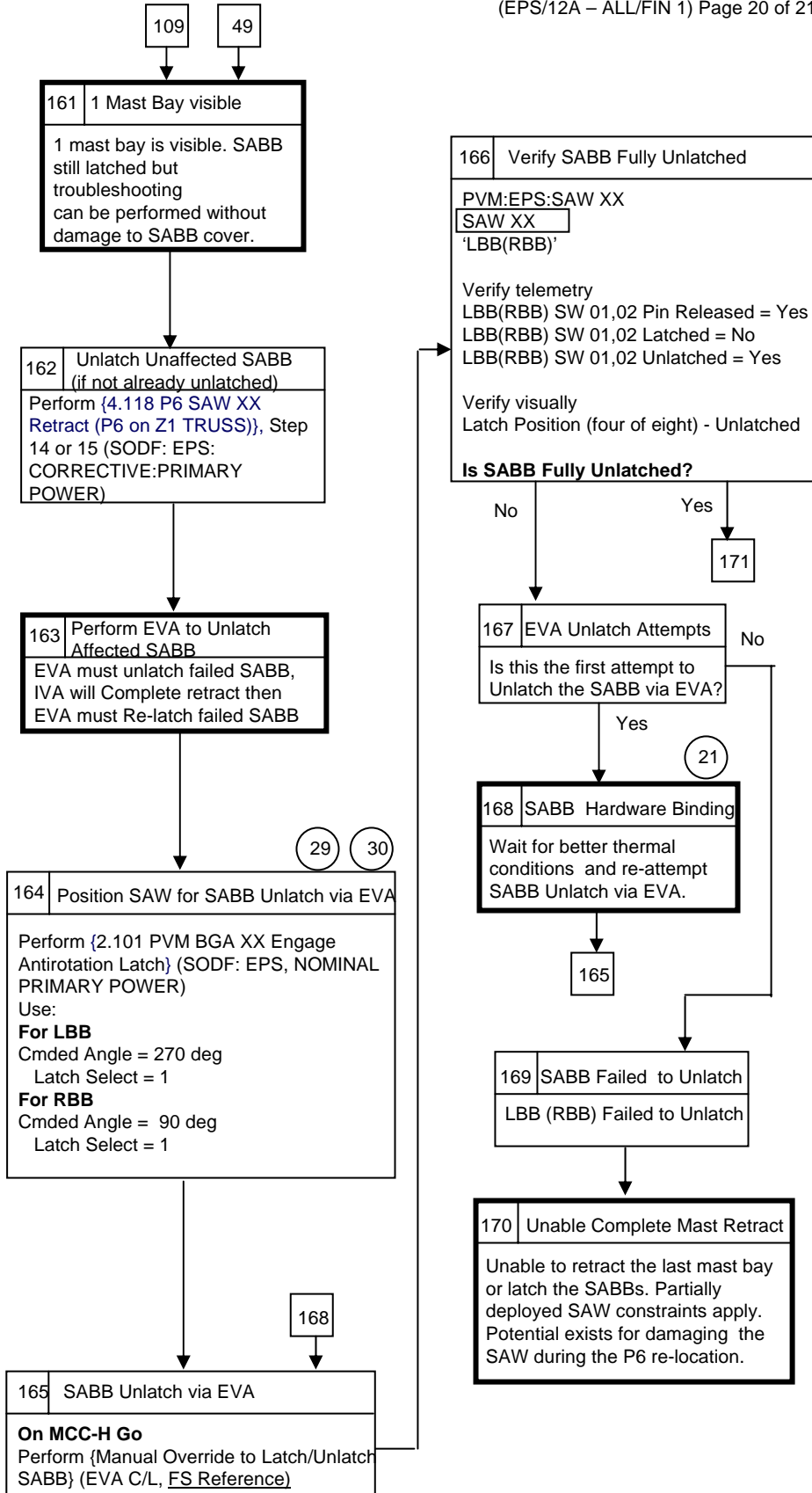
29

This step can take up to 1 hr to complete. The latch cmd can be sent when the BGA Actual Angle is within 1 deg of the commanded value in order to save time.

30

This step may be omitted if EVA crew can free float and drive the MDA.

3.190 SAW XX FAILURE TO UNLATCH SABB REMOTELY



21

Re-attempt will be made at the end of insolation or end of eclipse, whichever case is opposite initial attempt.

29

This step can take up to 1 hr to complete. The latch cmd can be sent when the BGA Actual Angle is within 1 deg of the commanded value in order to save time.

30

This step may be omitted if EVA crew can free float and drive the MDA.



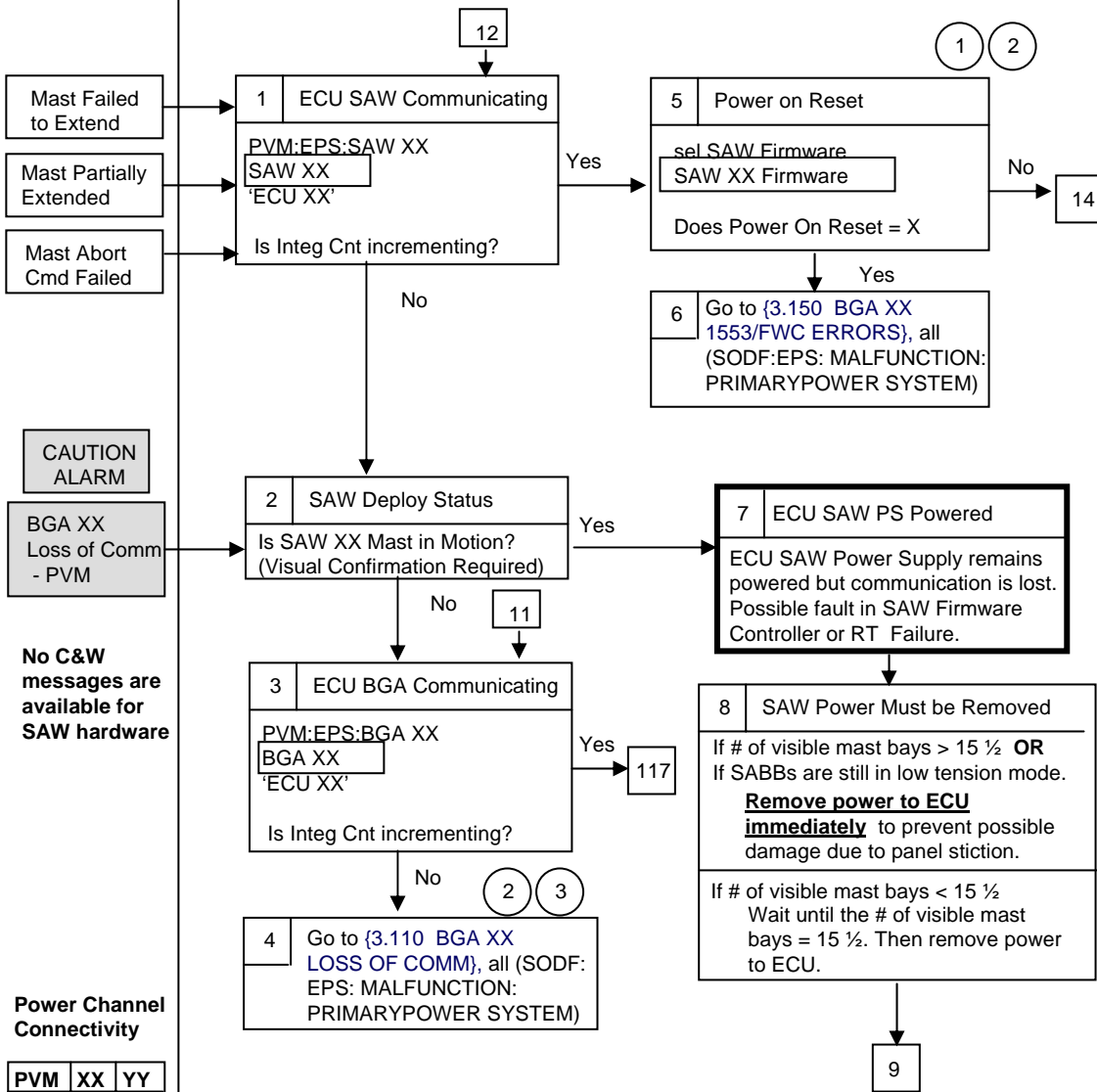


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# EPS

## 3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

(EPS/12A – ALL/FIN 1) Page 1 of 19



1  
Caution message BGA XX 1553/ FWC Errors- PVM may also be received if a Power on Reset has occurred.

2  
If power was removed from the ECU you must begin again with step 1 of the Deploy/Retract procedure, to reset the F/W inhibits.

3  
If Current sensor fails high > 0.78 A RPCs providing power to ECU will be opened. A new PPL with a higher Current limit must be uploaded before the ECU can be recovered. There is no inhibit for SAW MDA Config Complete Persistent Current Safing.

Mast Failed to Extend  
Mast Partially Extended  
Mast Abort Cmd Failed

CAUTION ALARM  
BGA XX Loss of Comm - PVM

No C&W messages are available for SAW hardware

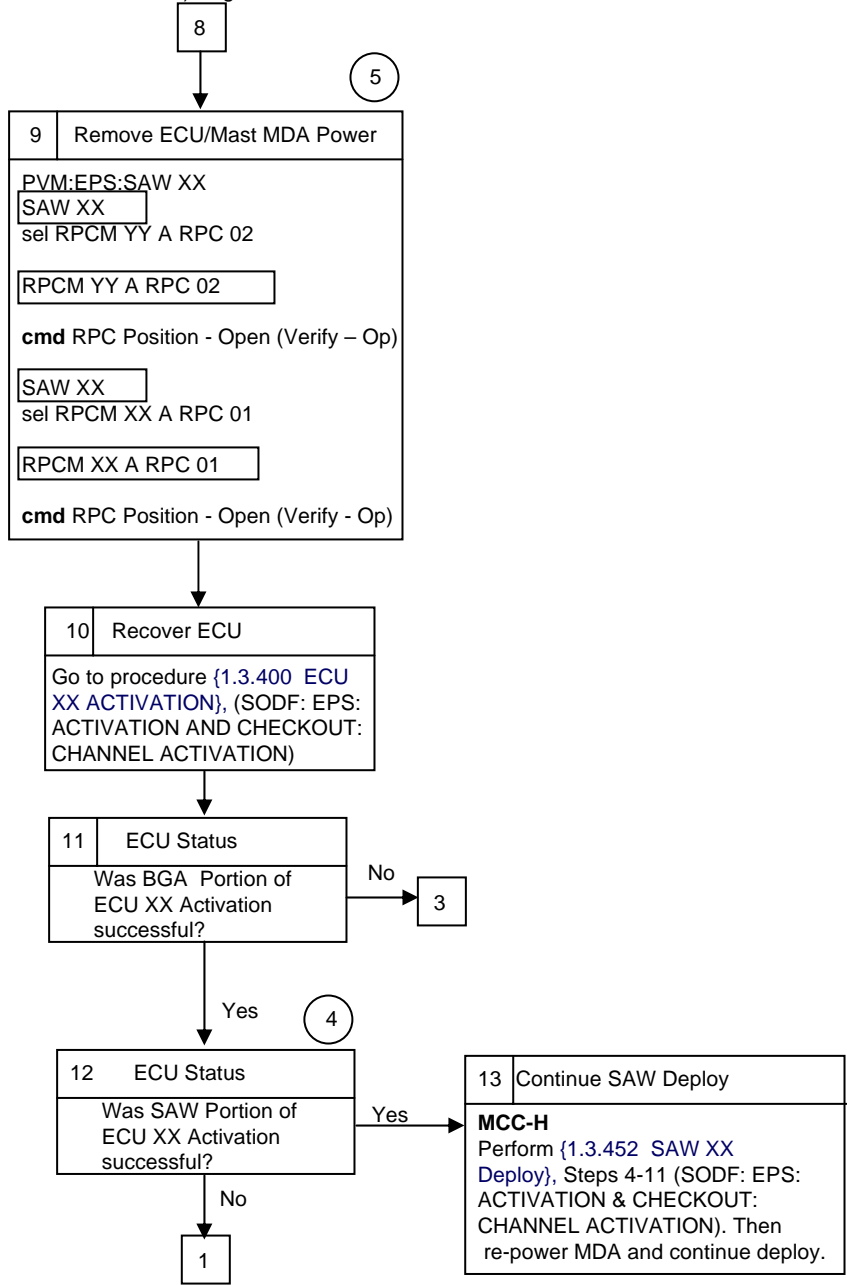
Power Channel Connectivity

PVM	XX	YY
S4	1A	3A
S4	3A	1A
S6	1B	3B
S6	3B	1B
P4	2A	4A
P4	4A	2A
P6	2B	4B
P6	4B	2B

Nominal Config:  
ECU SAW XX:  
RPCM XX A  
RPC 1 - CI  
RPCM YY A  
RPC 2 - CI

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

(EPS/12A – ALL/FIN 1) Page 2 of 19

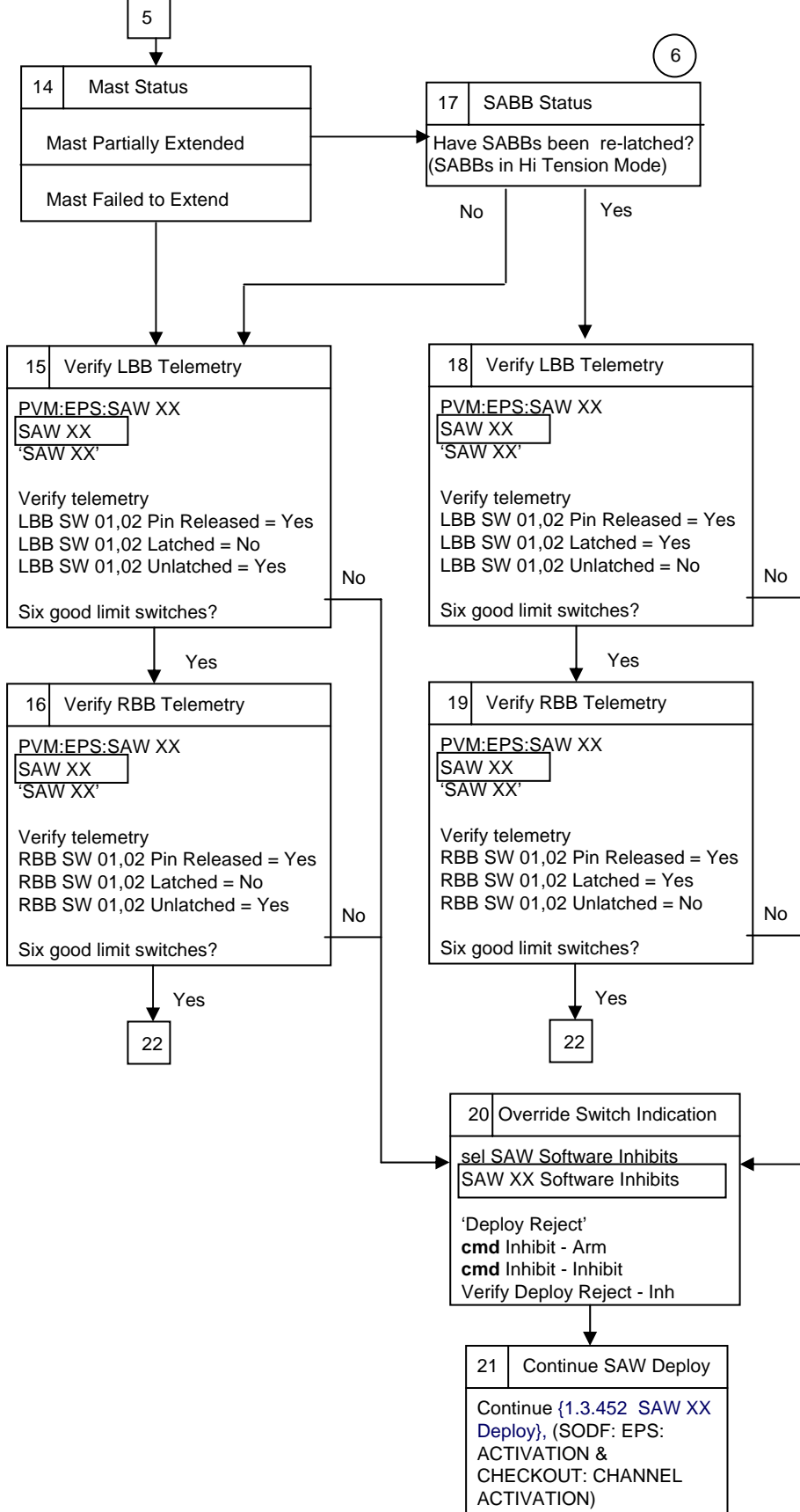


4  
Communication with the BGA is not required in order to complete SAW deploy/retract This assumes that the BGA is already locked and at the SAW deployment position. BGA trouble-shooting can wait until after the array is deployed.

5  
Remove the ECU power to remove power from the MDA. Note the ECU may attempt a power on reset after the first RPC is opened depending on which channel is supplying prime power to the ECU. Expect Caution message BGA XX Loss of Comm - PVM when RPC 01 is cmded open.

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

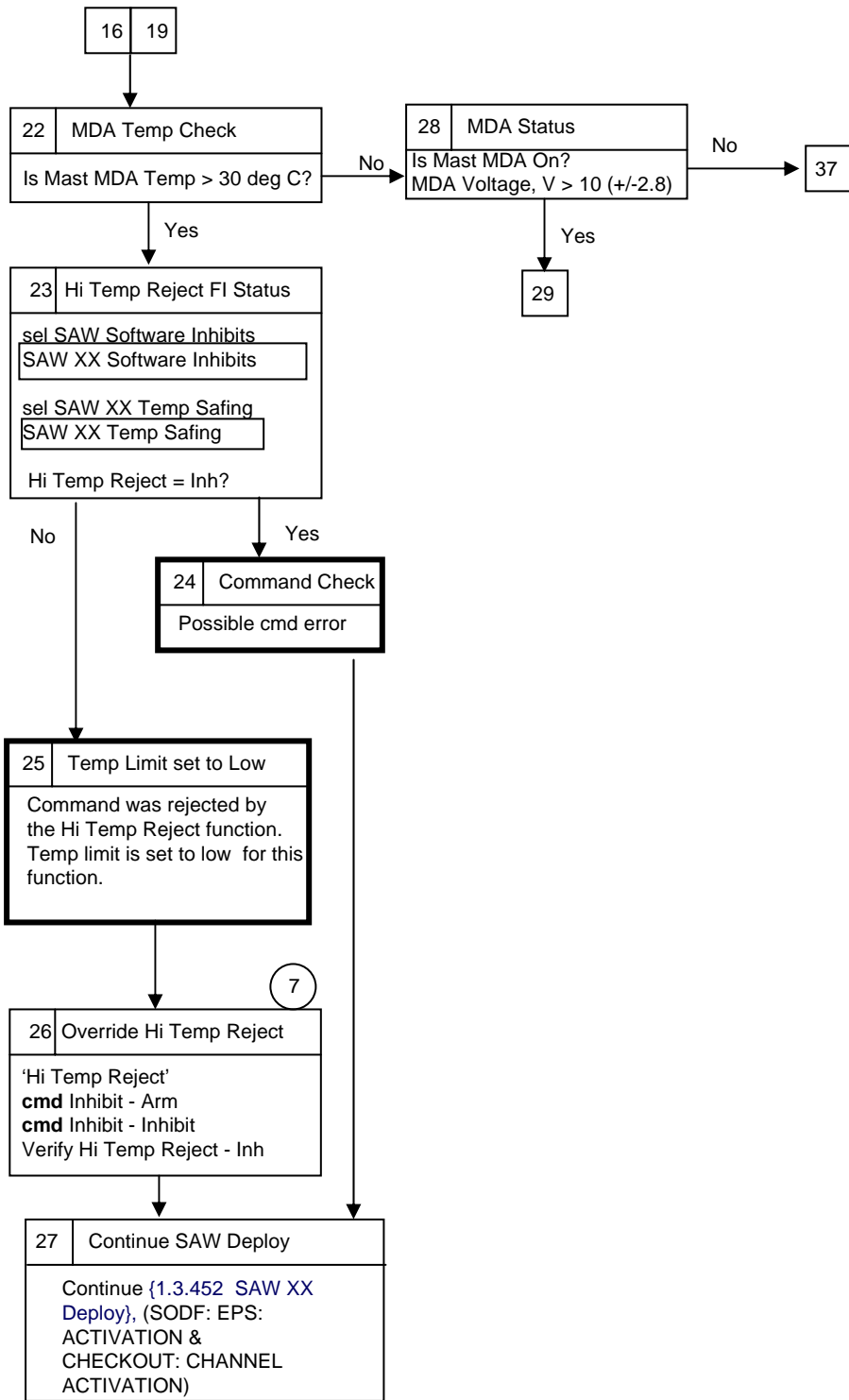
(EPS/12A – ALL/FIN 1) Page 3 of 19



6  
SABBs are latched after the mast has been deployed 1 mast bay in order to clear the latch mechanisms. Hi tension mode is used to reduce the potential for damage due to panel stiction problems.

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

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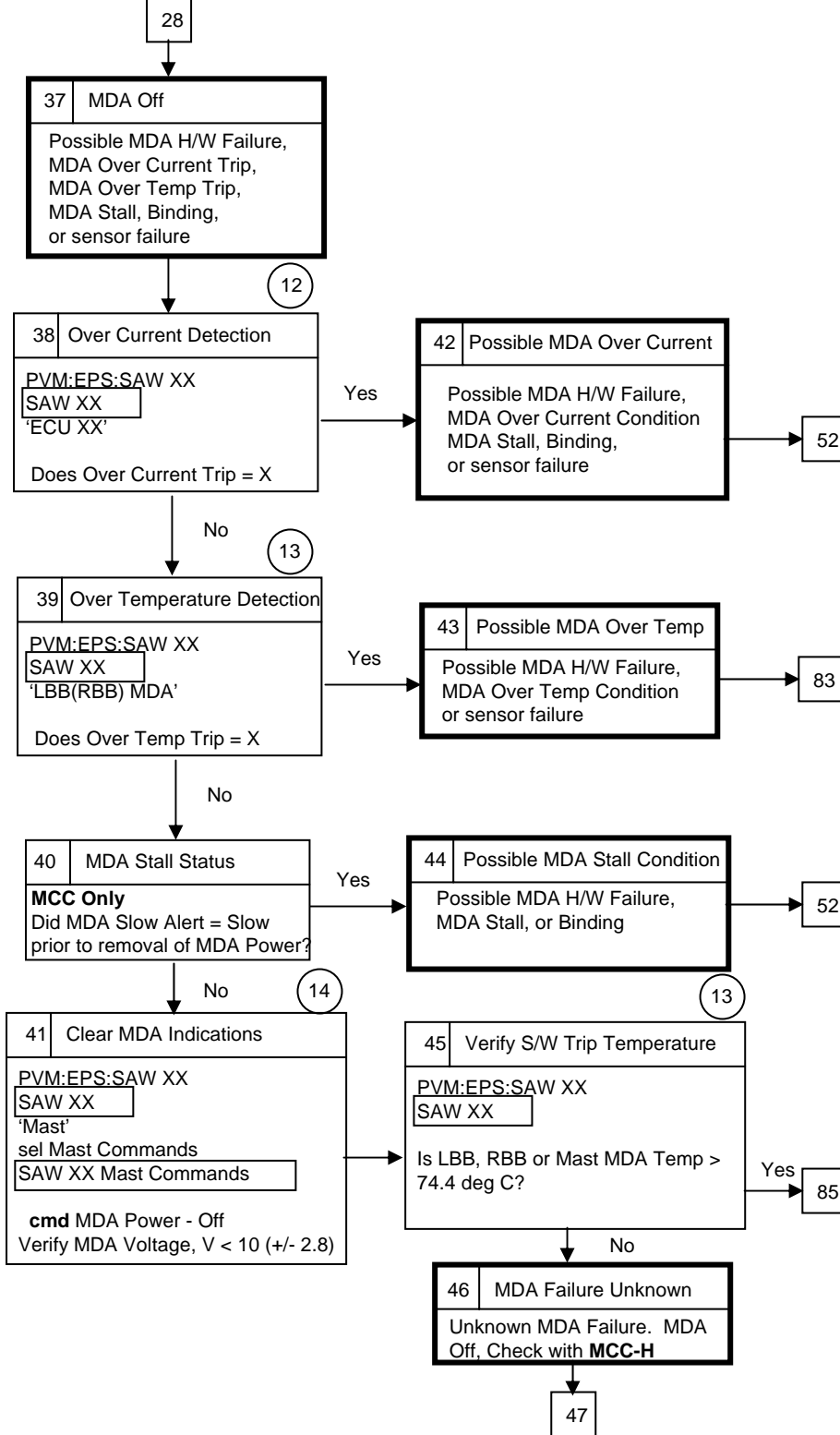
7

MDA operating temperature range is -54 to 48 deg C.



3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

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12  
ECU Firmware MDA Over Current Trip occurs at 6.2 Amps. S/W Limit (0.78 A) is reached first and it does **not** set the MDA Over Current Trip Flag.

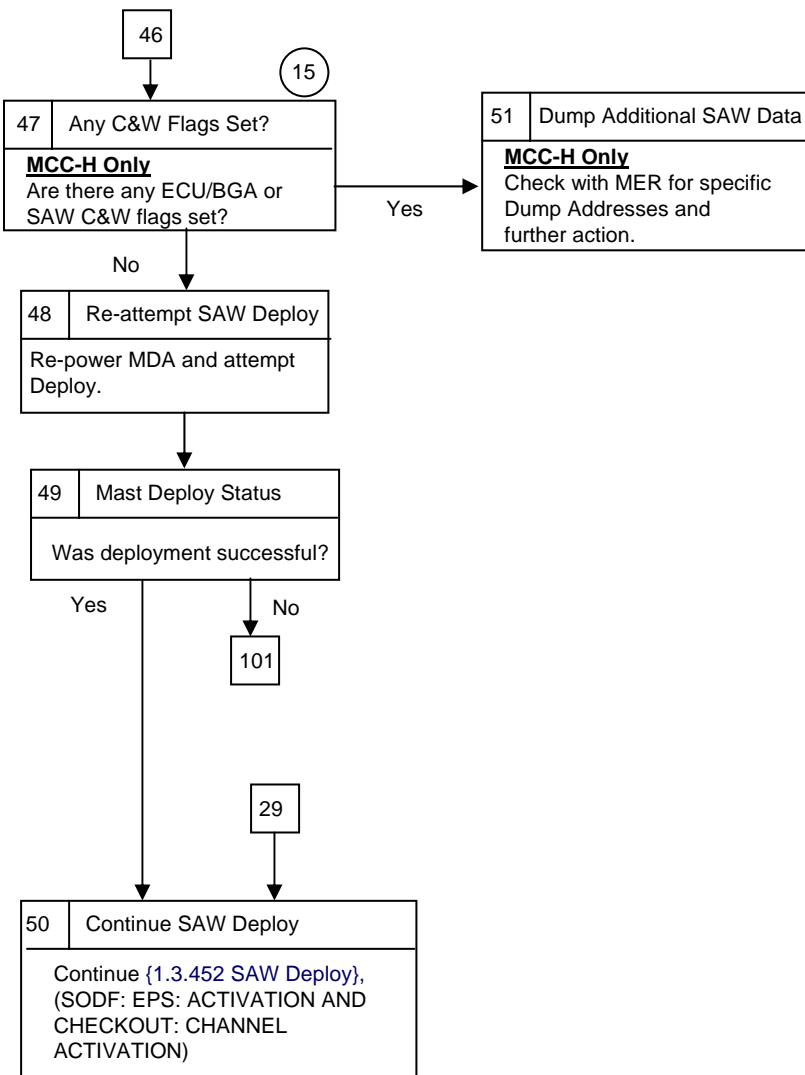
13  
Disconnects are present in the MDA Over Temp FDIR. S/W Trip level = 77.7 deg C. F/W Trip level = 140 deg C. H/W damage occurs at 120 deg C. S/W Temp limit is reached first and it does **not** set the MDA Over Temp Trip Flag.

14  
MDA Power off is a one step command.



3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

(EPS/12A – ALL/FIN 1) Page 7 of 19

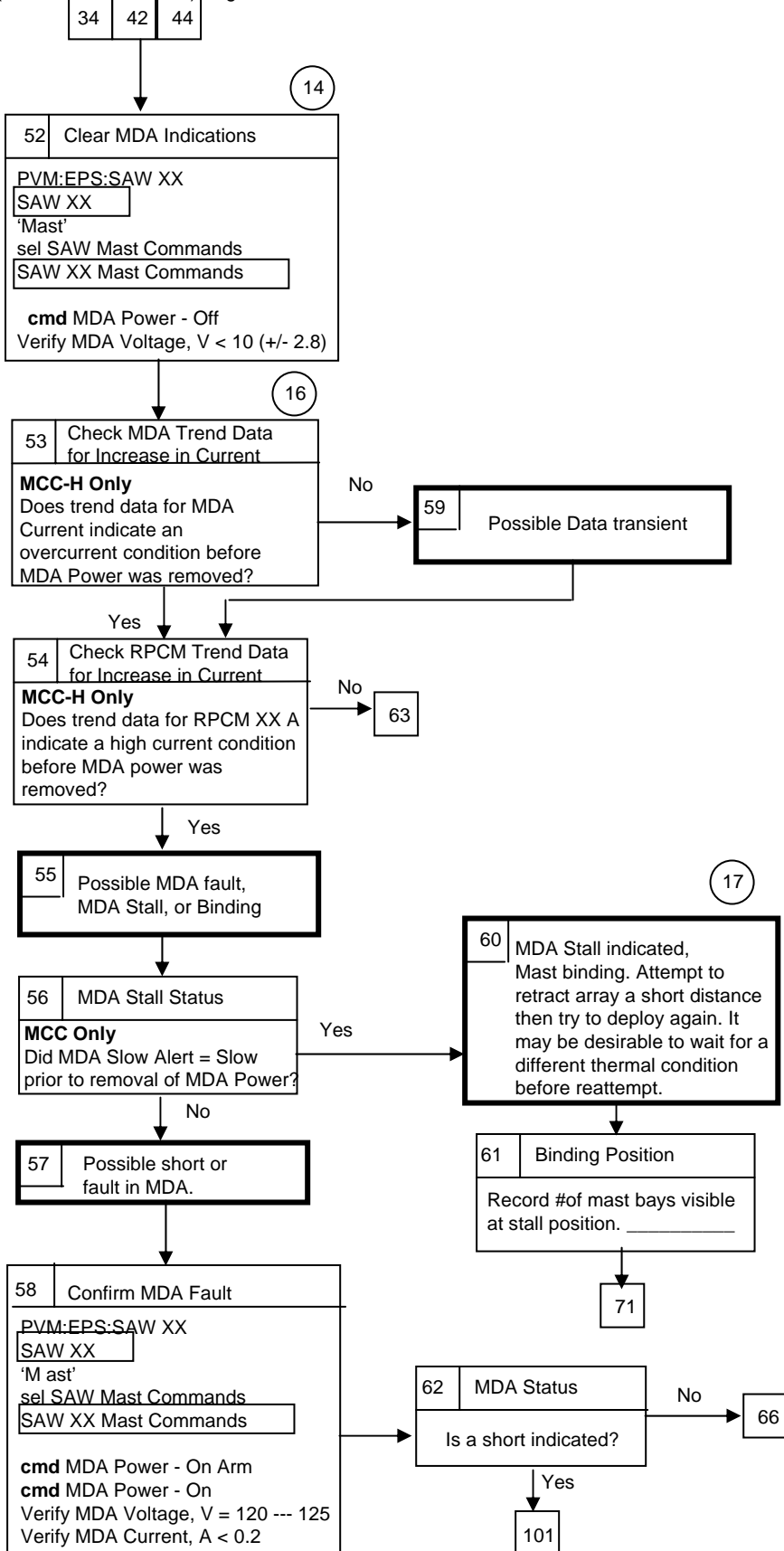


15

SAW Caution and Warning Flags are available for downlink only during missions that scheduled SAW activities. (e.g 12A) Flags are not available on PCS displays.

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

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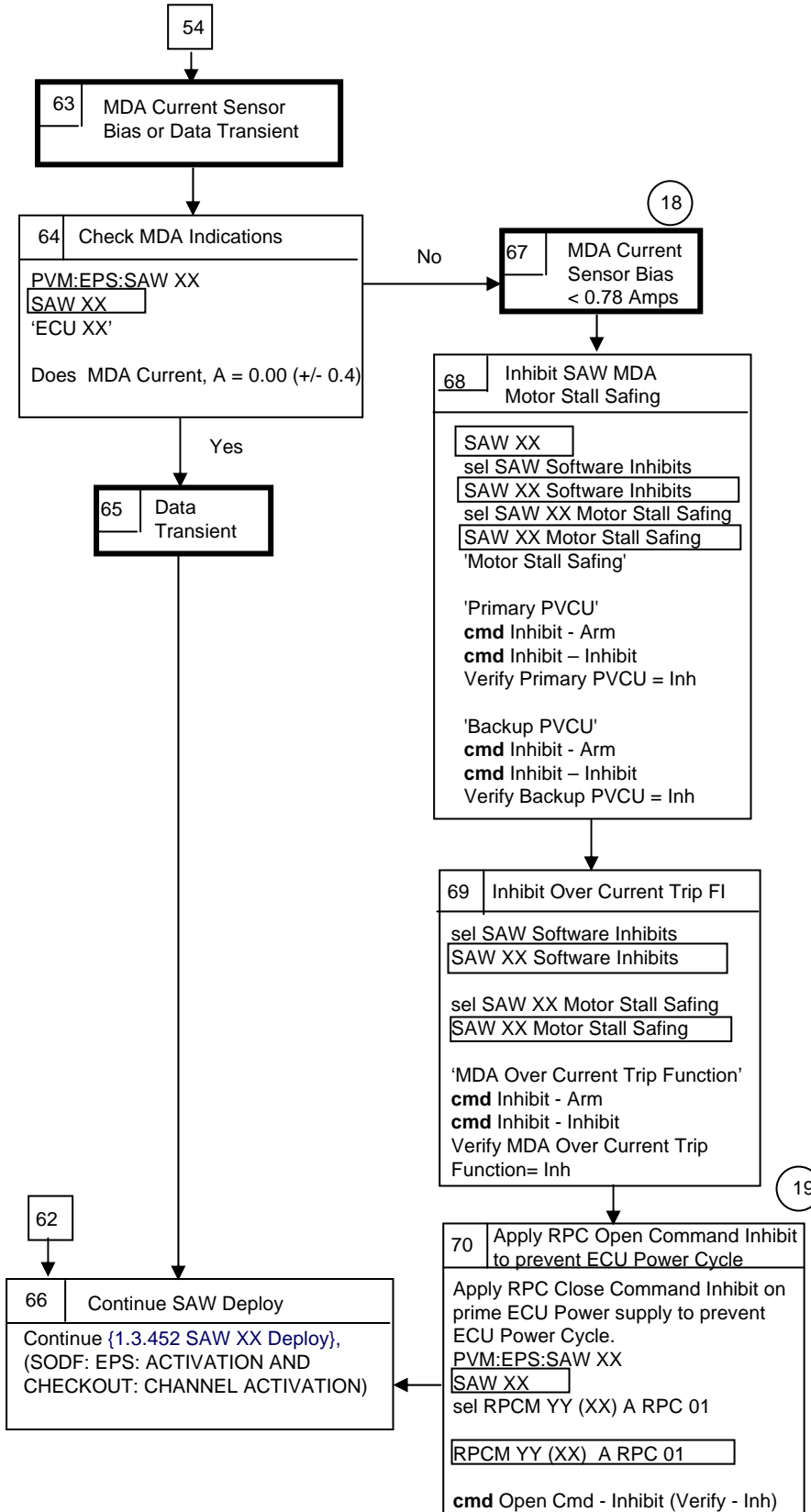
14 MDA Power off is a one step command.

16 PVCU Software MDA Over Current Trip occurs at 0.78 Amps.

17 If a Stall Condition is indicated, Current > 0.78 A and motor speed is < 25 RPM, power is removed from the MDA

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

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18

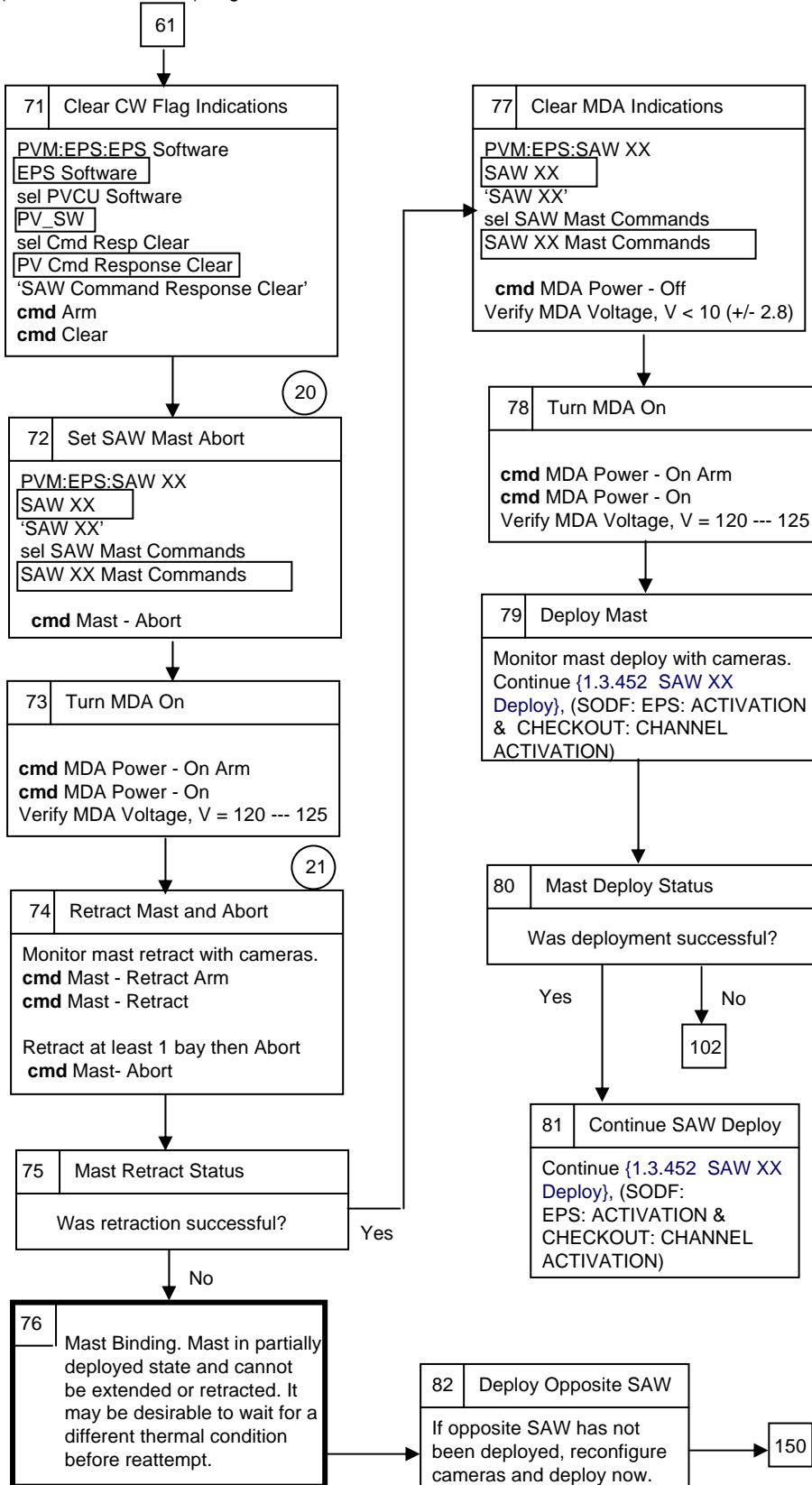
If Current sensor fails high > 0.78 A RPCs providing power to ECU will be opened. A new PPL with a higher current limit must be uploaded before the ECU can be recovered. There is no inhibit for SAW MDA Motor Stall Persistent Current Safing. Refer to block 3.

19

However, all MDAs use the same current sensor. A new PPL 69 must be uplinked prior to SAW operations or Inhibit the RPC Open Command to avoid power cycling the ECU.

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

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20

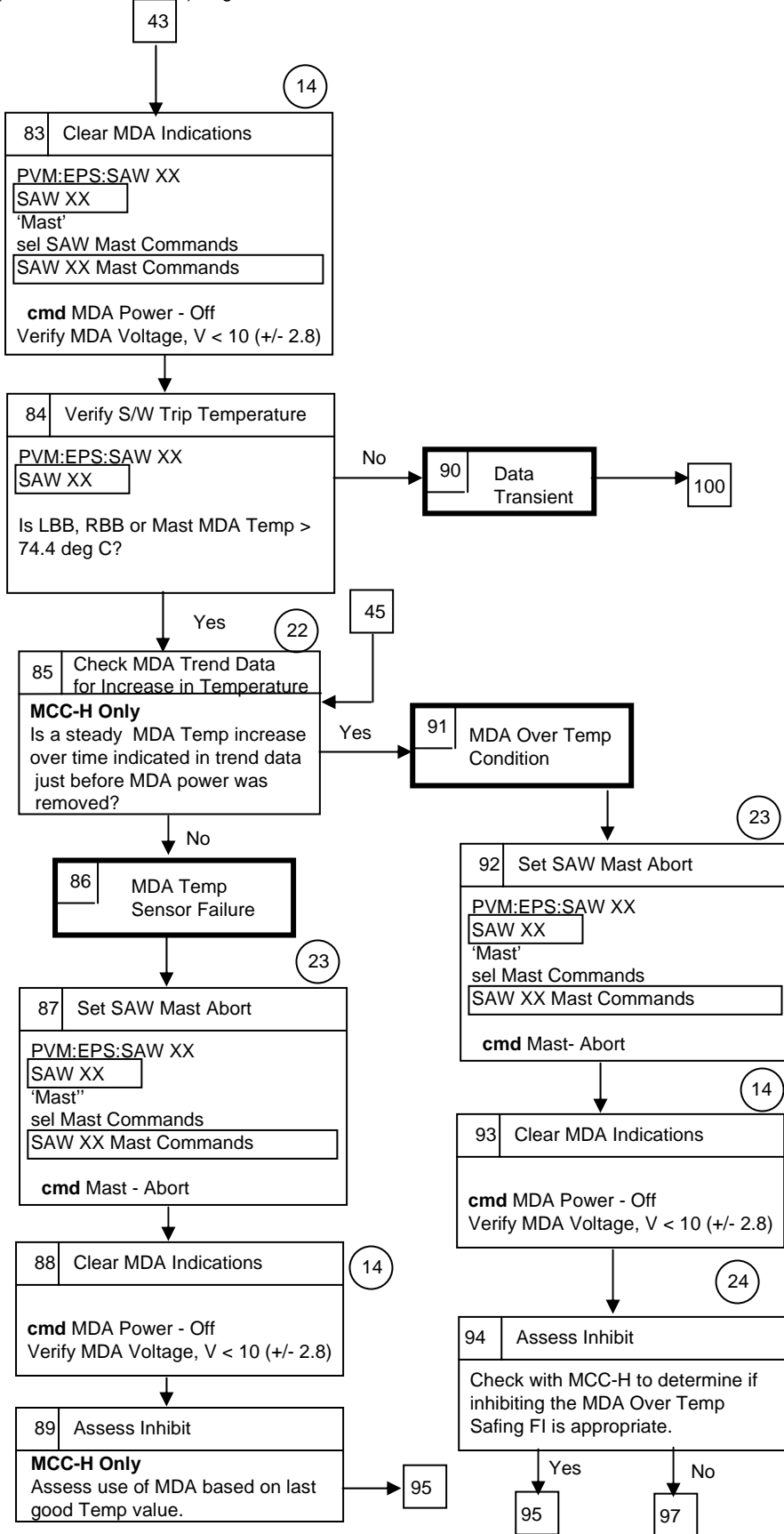
MDA Abort must be sent to prevent MDA from driving once power is re-applied. This is a single step cmd

21

Confirm that ISS Thrusters are inhibited or ISS/Orbiter in Free Drift and no crew un-isolated exercise or max EVA loads prior to sending the Deploy or Retract command. If at any time mechanical movement is stopped or aborted, attitude control may be resumed.

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

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14 MDA Power off is a one step command.

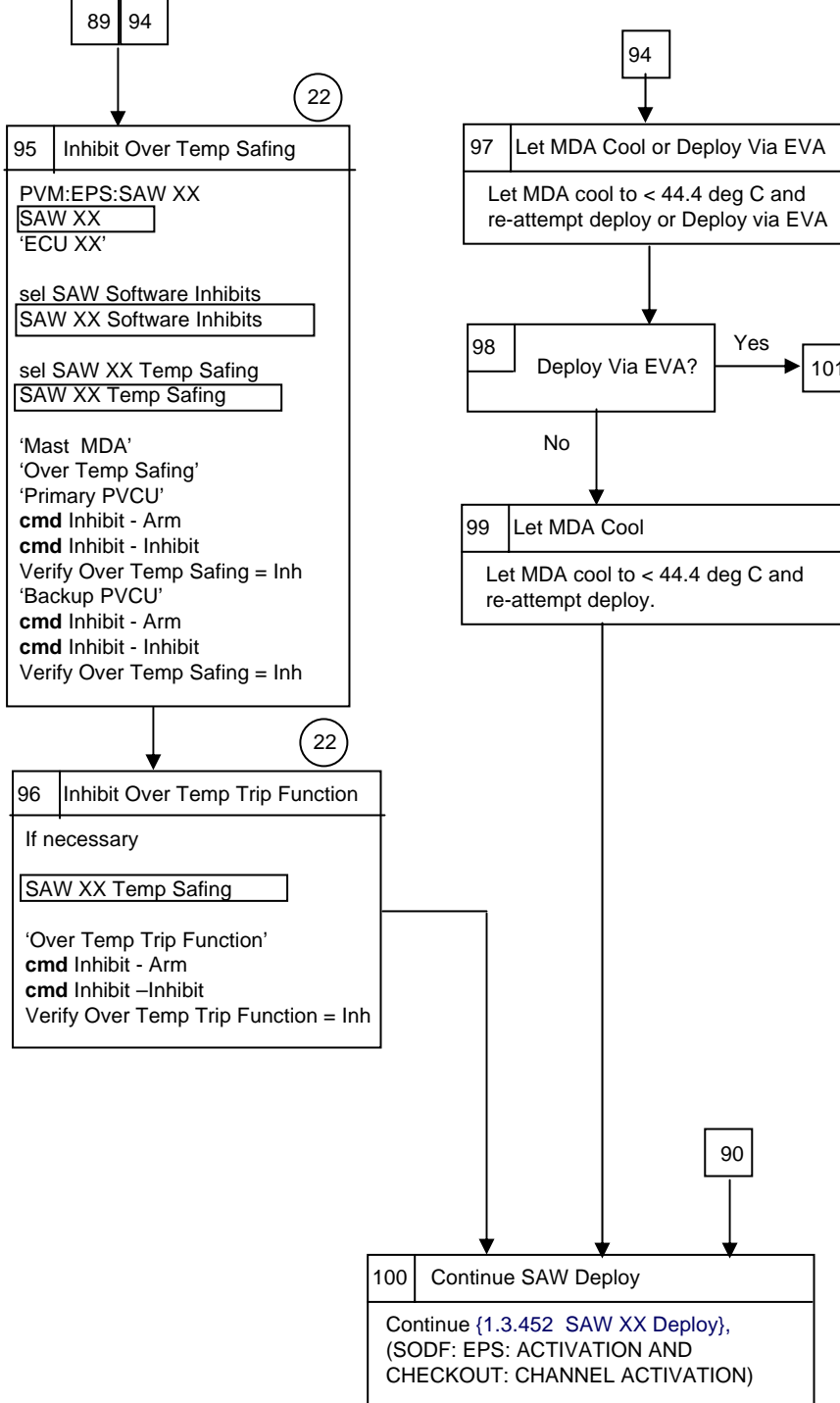
22 Disconnects are present in the MDA Over Temp FDIR. S/W Trip level = 77.7 deg C. F/W Trip level = 140 deg C. H/W damage occurs at 120 deg C. At a minimum a 30 deg C Mast MDA Temp increase should be protected for during mast deploy/retract

23 Since S/W Temp limit is reached first and it does not set the MDA Over Temp Trip flag, a MDA Abort must sent to prevent MDA from driving, once power is re-applied. This is a single step cmd.

24 Per Flight Rule B9-207, MDA operations can proceed even if MDA temp is high in order to meet critical mission objectives. Measurement Out of Range will be indicated if MDA temp >72.2 deg C.

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

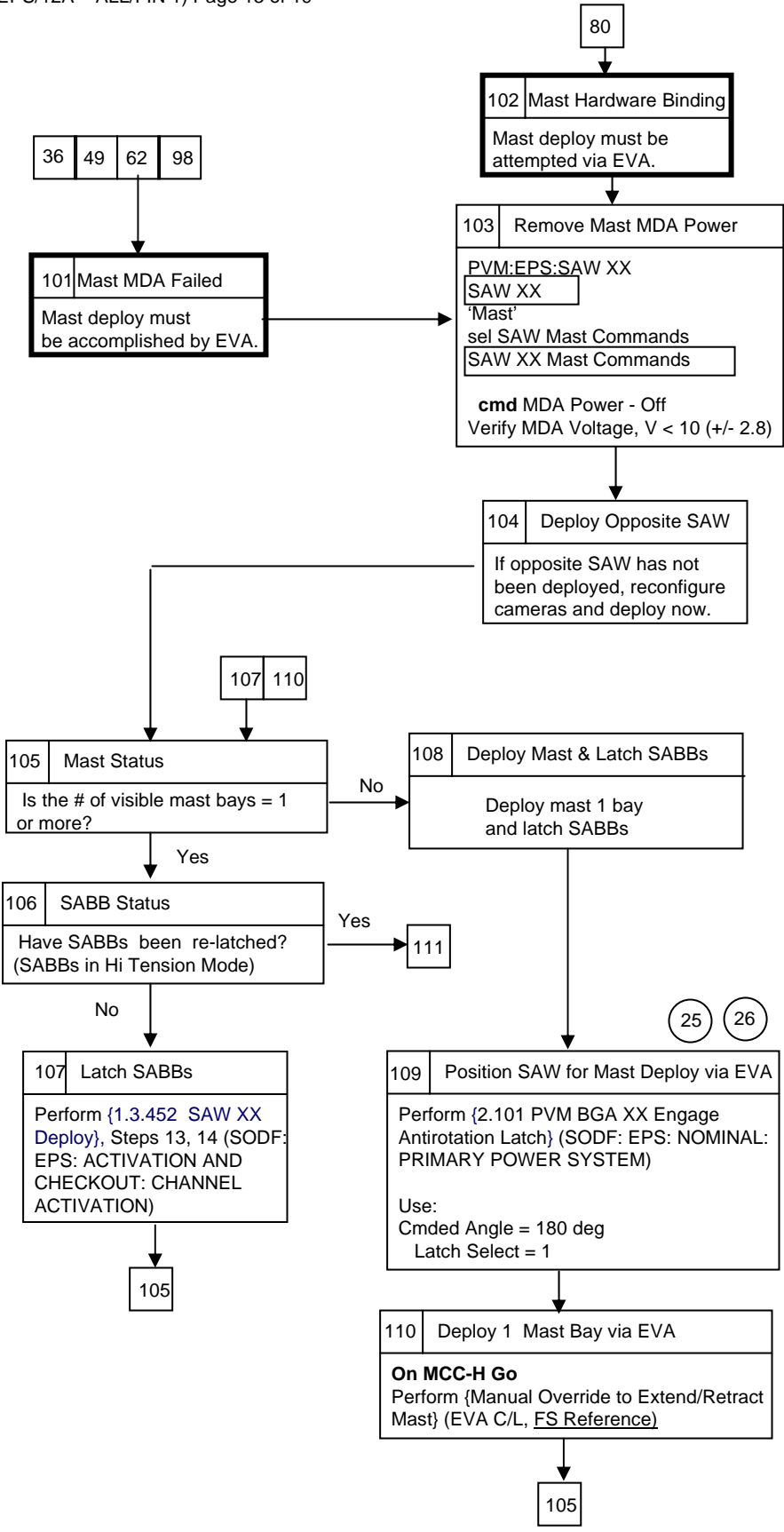
(EPS/12A – ALL/FIN 1) Page 12 of 19



22  
Disconnects are present in the MDA Over Temp FDIR. S/W Trip level = 77.7 deg C. F/W Trip level = 140 deg C. H/W damage occurs at 120 deg C. At a minimum a 30 deg C Mast MDA Temp increase should be protected for during mast deploy/retract

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

(EPS/12A – ALL/FIN 1) Page 13 of 19



25

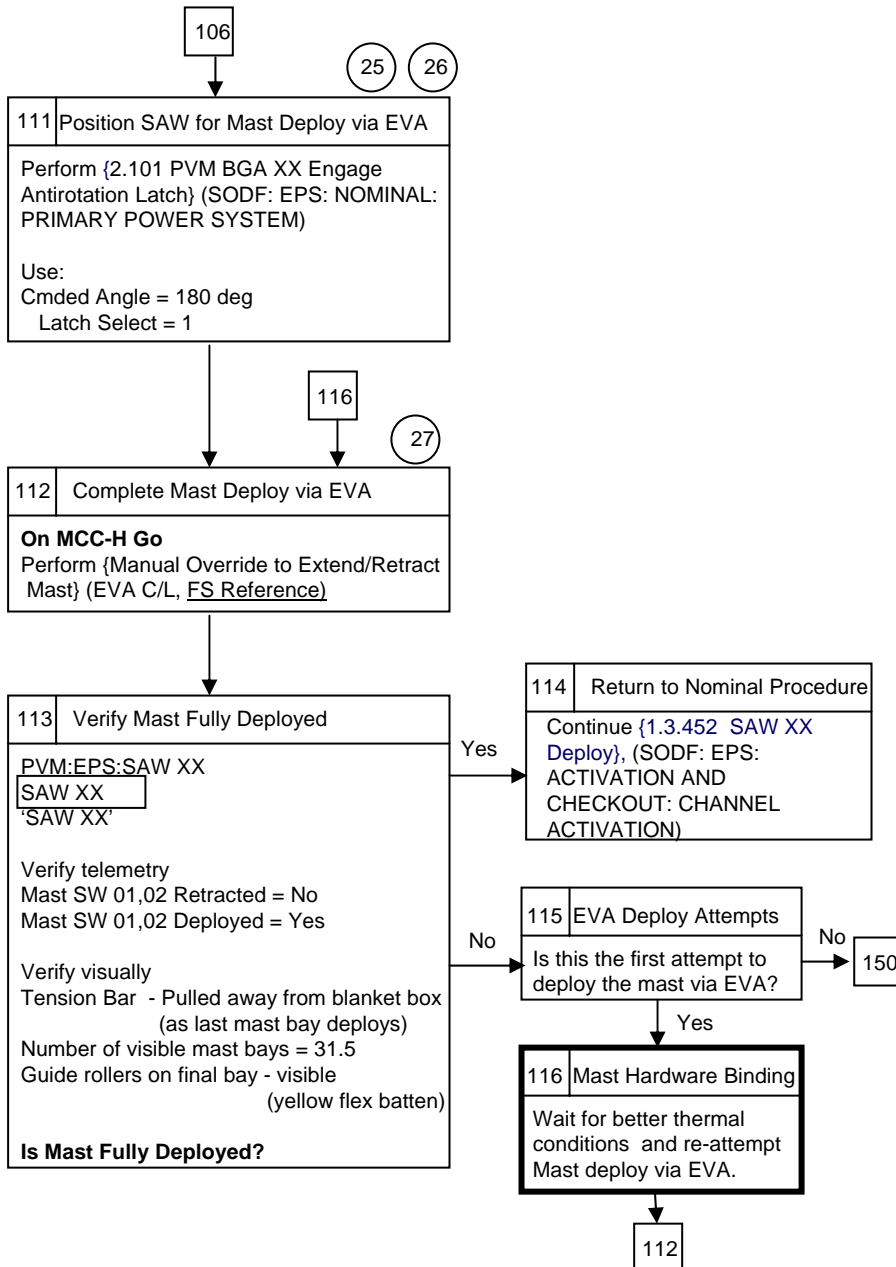
This step can take up to 1 hr to complete. The latch cmd can be sent when the BGA Actual Angle is within 1 deg of the commanded value in order to save time.

26

This step may be omitted if EVA crew can free float and drive the Mast MDA.

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

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25

This step can take up to 1 hr to complete. The latch cmd can be sent when the BGA Actual Angle is within 1 deg of the commanded value in order to save time.

26

This step may be omitted if EVA crew can free float and drive the Mast MDA.

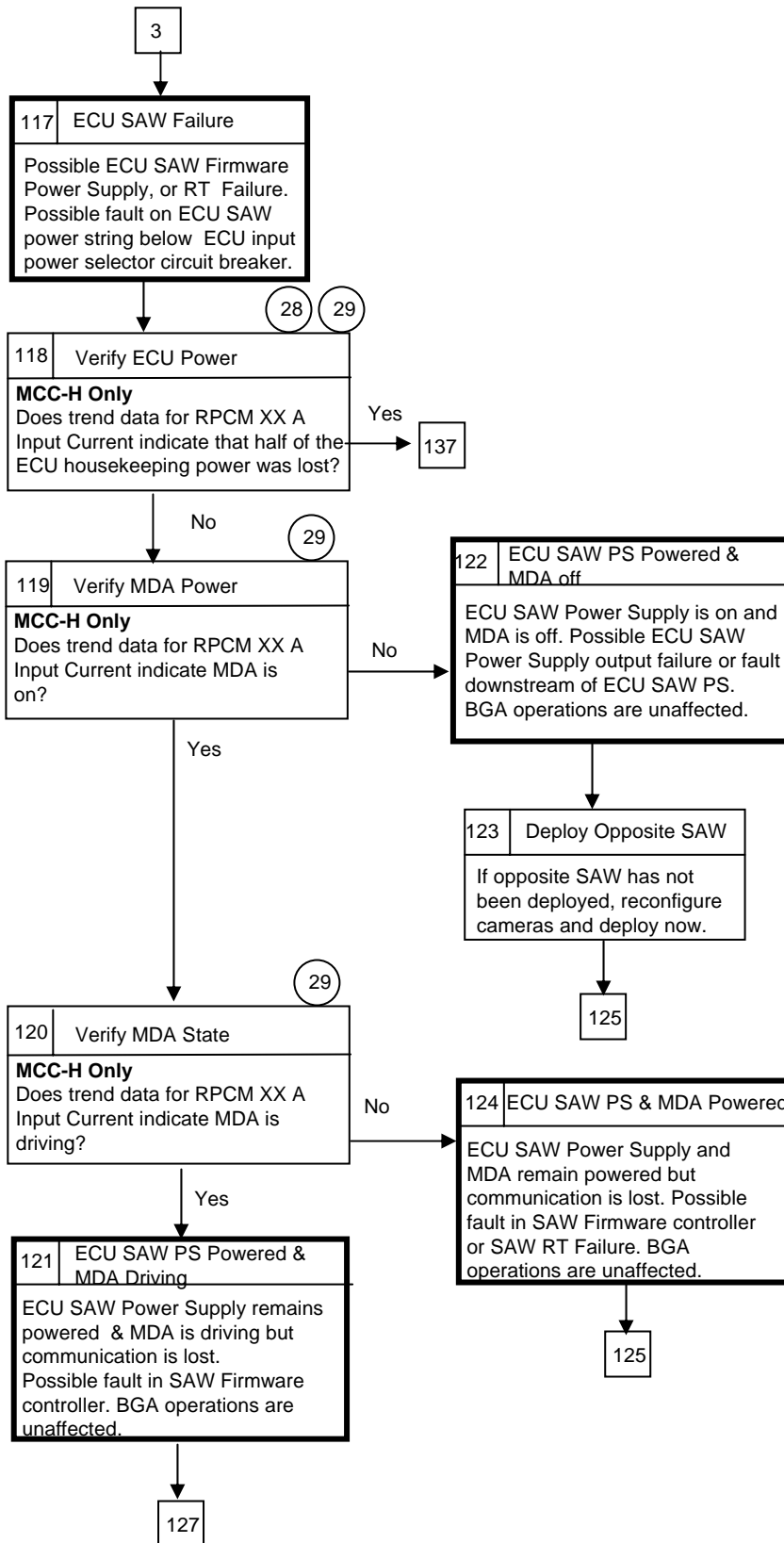
27

No thermal conditioning of the SAW is required if manually deploying, due to fact that it takes longer to deploy and it is warming throughout the manual deploy, also the crew can respond faster to stop the deploy.



3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

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(28)  
Total ECU housekeeping power is 115W (0.93A) at initialization and before BGA mtr or MDAs are turned on. Half of the ECU housekeeping power is 57.5W (0.47A)

(29)  
When the MDA is on it draws about 0.22A. When the MDA is driving it can draw as high as 3.0A. MDA over current trip occurs at 0.78A. The MDA will stop driving but will remain on if one of the two "Deployed" limit switches have contacted.

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

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123 124

31

125 Reset ECU SAW Remote Terminal

**MCC-H Only**

Perform ECU SAW RT Reset from Ground:

<u>For P6 Solar Arrays</u>	<u>For S6 Solar Arrays</u>
CI PUI=P6PW96IM0042K	CI PUI=S6PX96IM0484K
SPUI=USPZ21MD0702	SPUI= USPZ21MD0702
SAW 2B = 33804	SAW 1B = 33292
SAW 4B = 17420	SAW 3B = 16908
<u>For P4 Solar Arrays</u>	<u>For S4 Solar Arrays</u>
CI PUI=P4PW95SM0042K	CI PUI=S4PW95SM0042K
SPUI=USPZ21MD0702	SPUI=USPZ21MD0702
SAW 2A = 17164	SAW 1A = 16652
SAW 4A = 33548	SAW 3A = 33036

30

Removes Power from MDA. When power is re-applied to the ECU the MDA will be off.

31

MCC-H must build and perform this step from command inventory.

32

Expect Caution message BGA XX Loss of Comm - PVM when RPC 01 is cmded open.

126 ECU SAW Communicating

PVM:EPS:SAW XX  
SAW XX  
'ECU XX'

Is Integ Cnt incrementing?

128 Communication Restored

Communication with the SAW has been restored. Confirm SAW and BGA configurations are as expected before continuing nominal procedure.

121

30 32

127 Remove ECU Power

PVM:EPS:SAW XX  
SAW XX  
sel RPCM YY A RPC 02

RPCM YY A RPC 02

cmd RPC Position - Open (Verify - Op)

SAW XX  
sel RPCM XX A RPC 01

RPCM XX A RPC 01

cmd RPC Position - Open (Verify - Op)

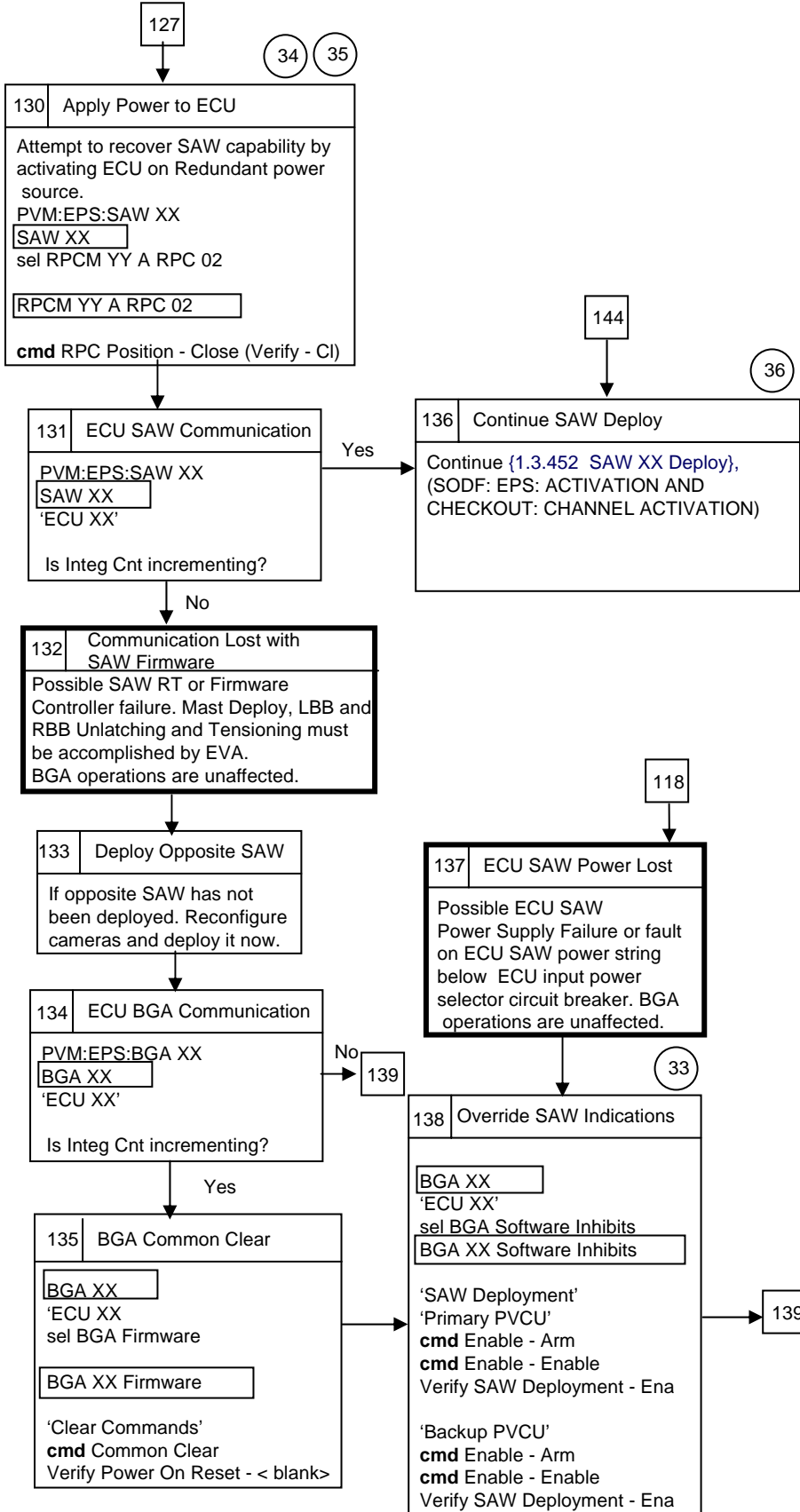
130

129 Continue SAW Deploy

Continue {1.3.452 SAW XX Deploy}, (SODF: EPS: ACTIVATION AND CHECKOUT: CHANNEL ACTIVATION)

3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

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33 Allows BGA to be operated when SAW Mast is in an undetermined state, or comm is lost with SAW FWC.

34 Caution message BGA XX 1553/ FWC Errors- PVM may be received after RPC 01 is closed.

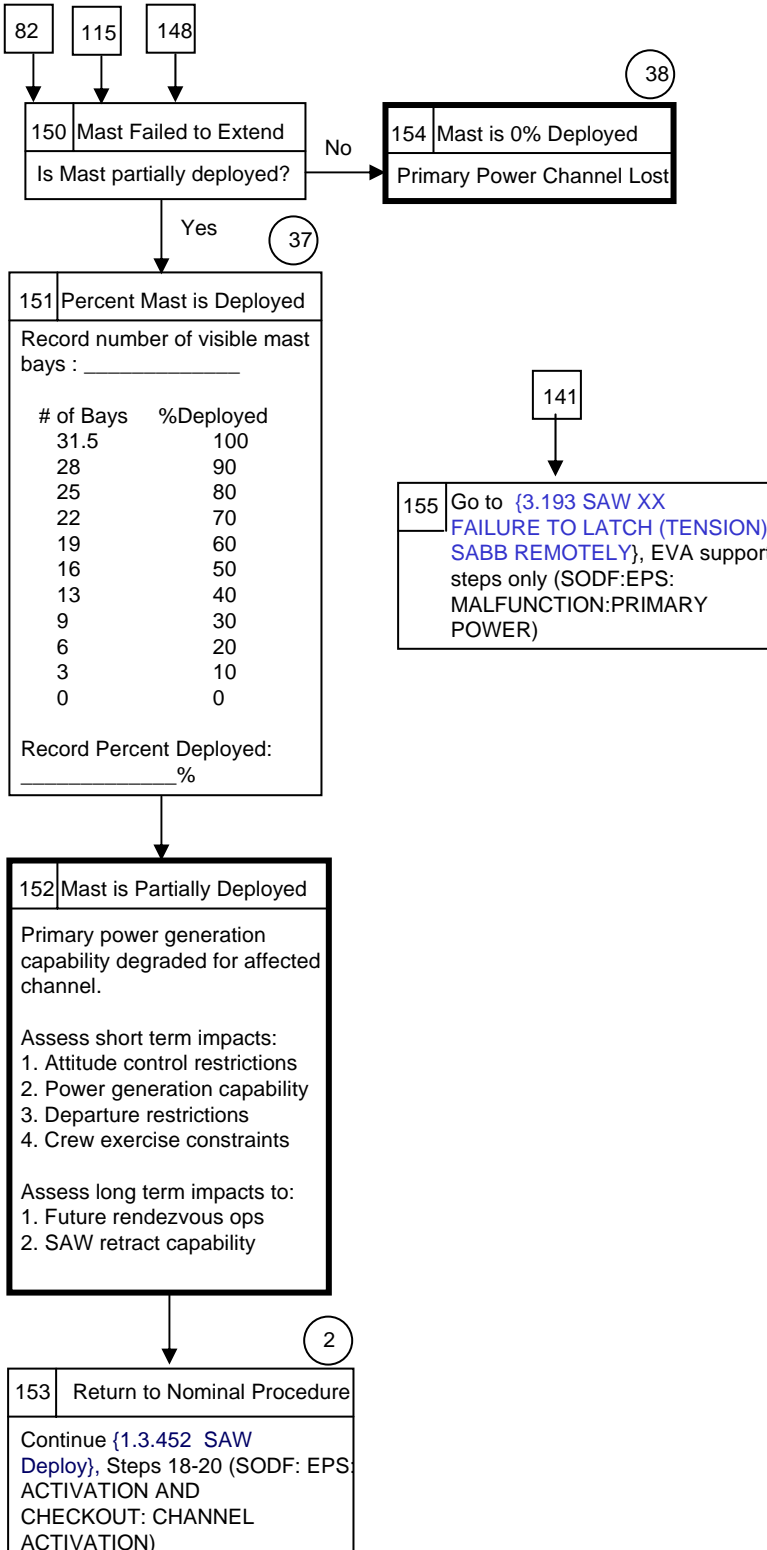
35 ECU power is supplied by channel (XX) for SAW Deployment operations.

36 If power was removed from the ECU you must begin again with step 1 of the Deploy/Retract procedure, to reset the F/W inhibits.



3.191 SAW XX FAILURE TO EXTEND MAST REMOTELY

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37

Tensioning the SAW is ineffective if < 31.5 bays are visible.

38

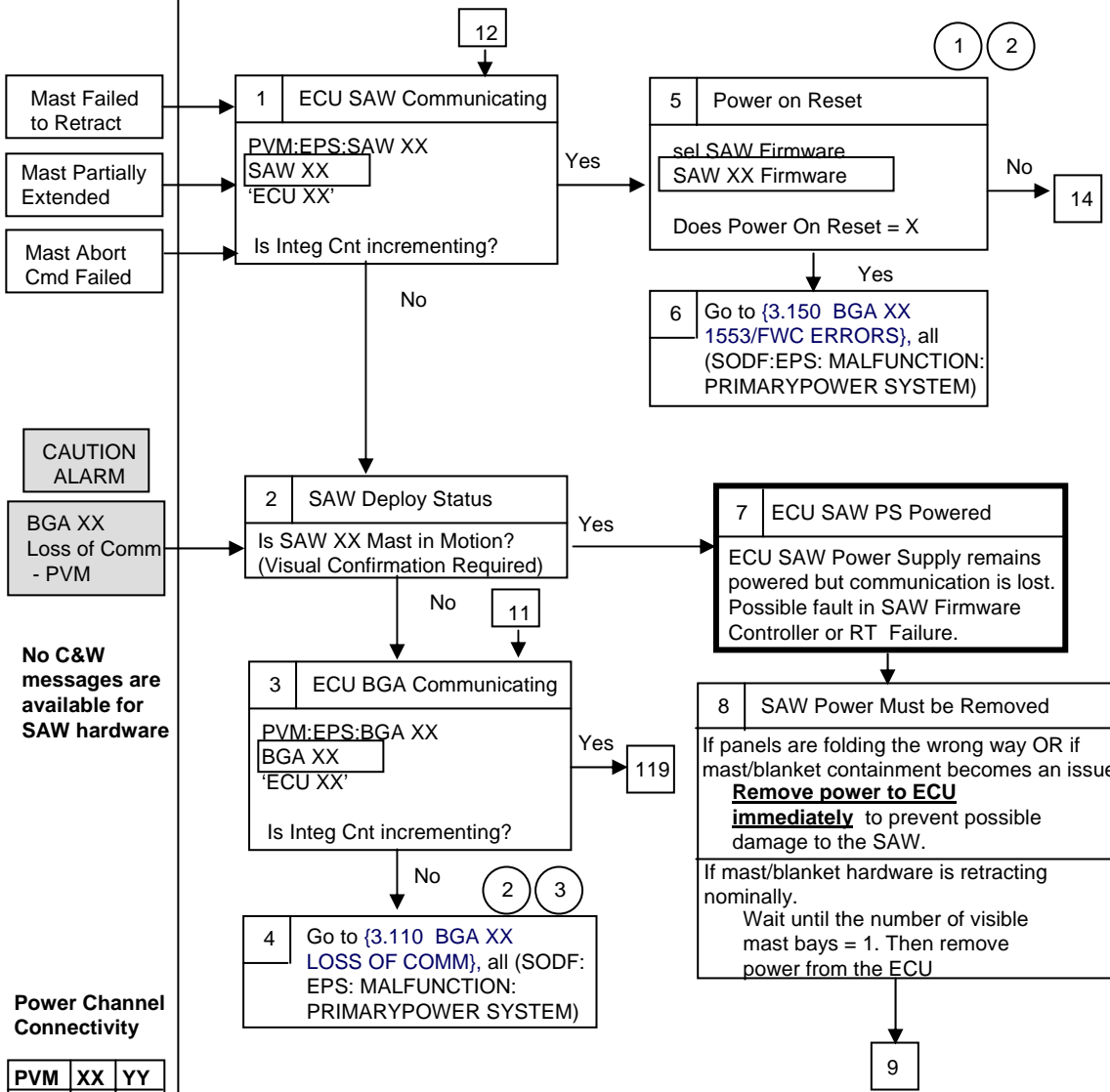
Remove MDA Power (Mast MDA-Off) if you have not already done so.

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# EPS

## 3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

(EPS/12A – ALL/FIN) Page 1 of 20



1  
Caution message BGA XX 1553/ FWC Errors- PVM may also be received if a Power on Reset has occurred.

2  
If power was removed from the ECU you must begin again with step 1 of the Deploy/Retract procedure, to reset the F/W inhibits.

3  
If Current sensor fails high > 0.78 A RPCs providing power to ECU will be opened. A new PPL with a higher Current limit must be uploaded before the ECU can be recovered. There is no inhibit for SAW MDA Config Complete Persistent Current Safing.

Mast Failed to Retract

Mast Partially Extended

Mast Abort Cmd Failed

CAUTION ALARM

BGA XX Loss of Comm - PVM

No C&W messages are available for SAW hardware

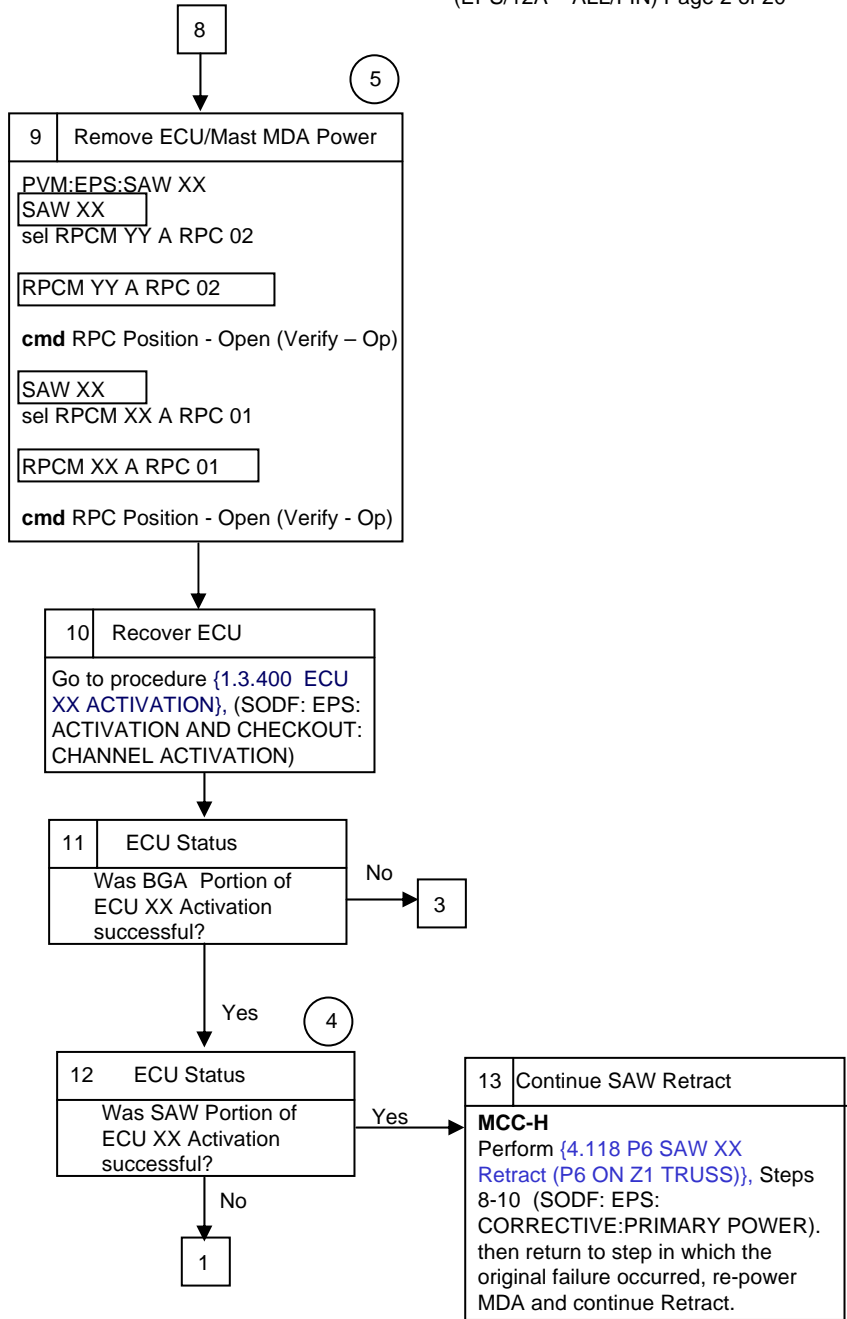
Power Channel Connectivity

PVM	XX	YY
S4	1A	3A
S4	3A	1A
S6	1B	3B
S6	3B	1B
P4	2A	4A
P4	4A	2A
P6	2B	4B
P6	4B	2B

Nominal Config:  
ECU SAW XX:  
RPCM XX A  
RPC 1 - CI  
RPCM YY A  
RPC 2 - CI

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

(EPS/12A – ALL/FIN) Page 2 of 20



4

Communication with the BGA is not required in order to complete SAW deploy/retract This assumes that the BGA is already locked and at the SAW retraction position. BGA trouble-shooting can wait until after the array is retracted.

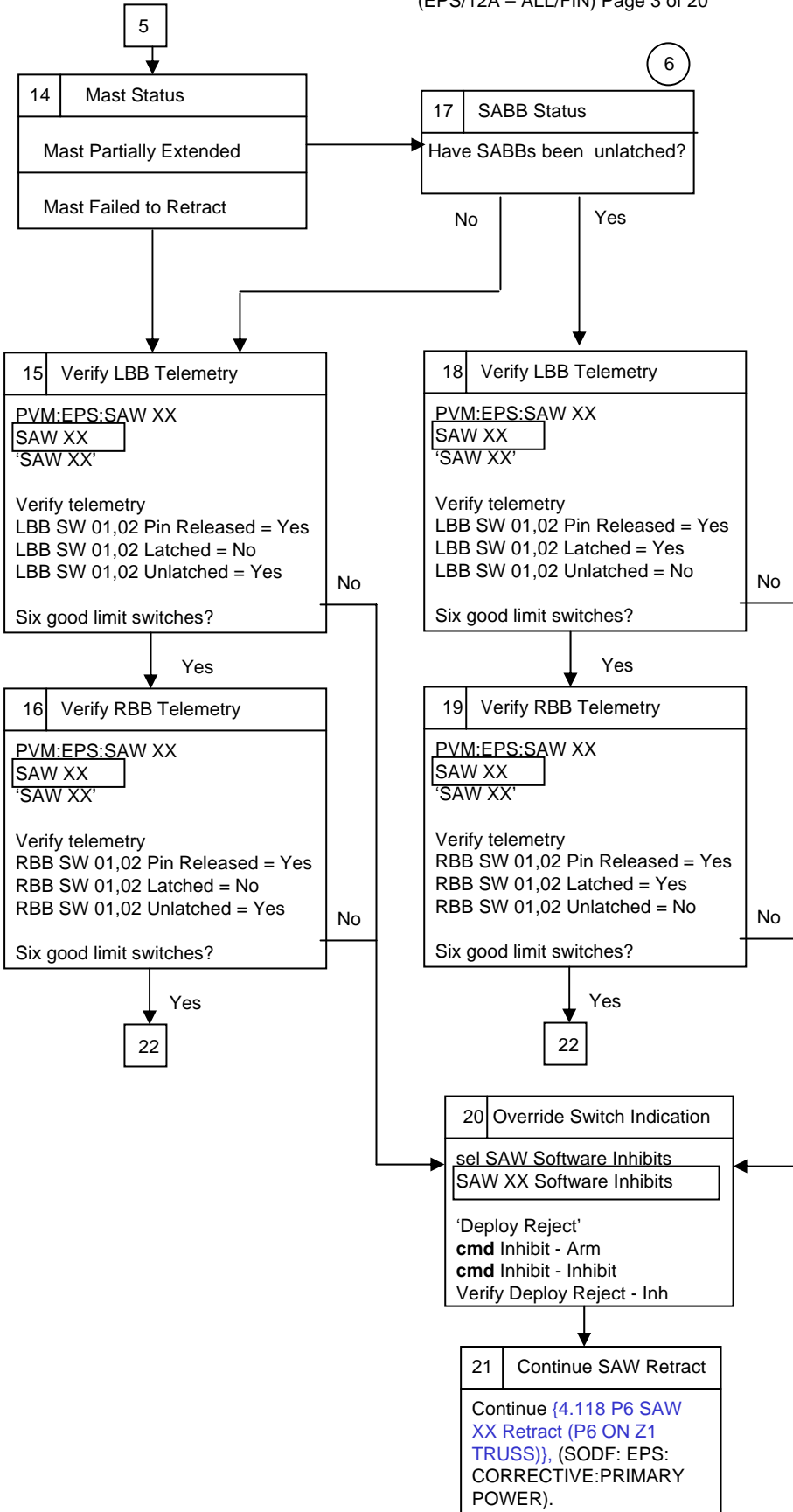
5

Remove the ECU power to remove power from the MDA. ECU power is supplied by the opposite deck channel (YY) for SAW Retraction operations. Expect Caution message BGA XX Loss of Comm - PVM when RPC 01 is cmded open.



3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

(EPS/12A – ALL/FIN) Page 3 of 20

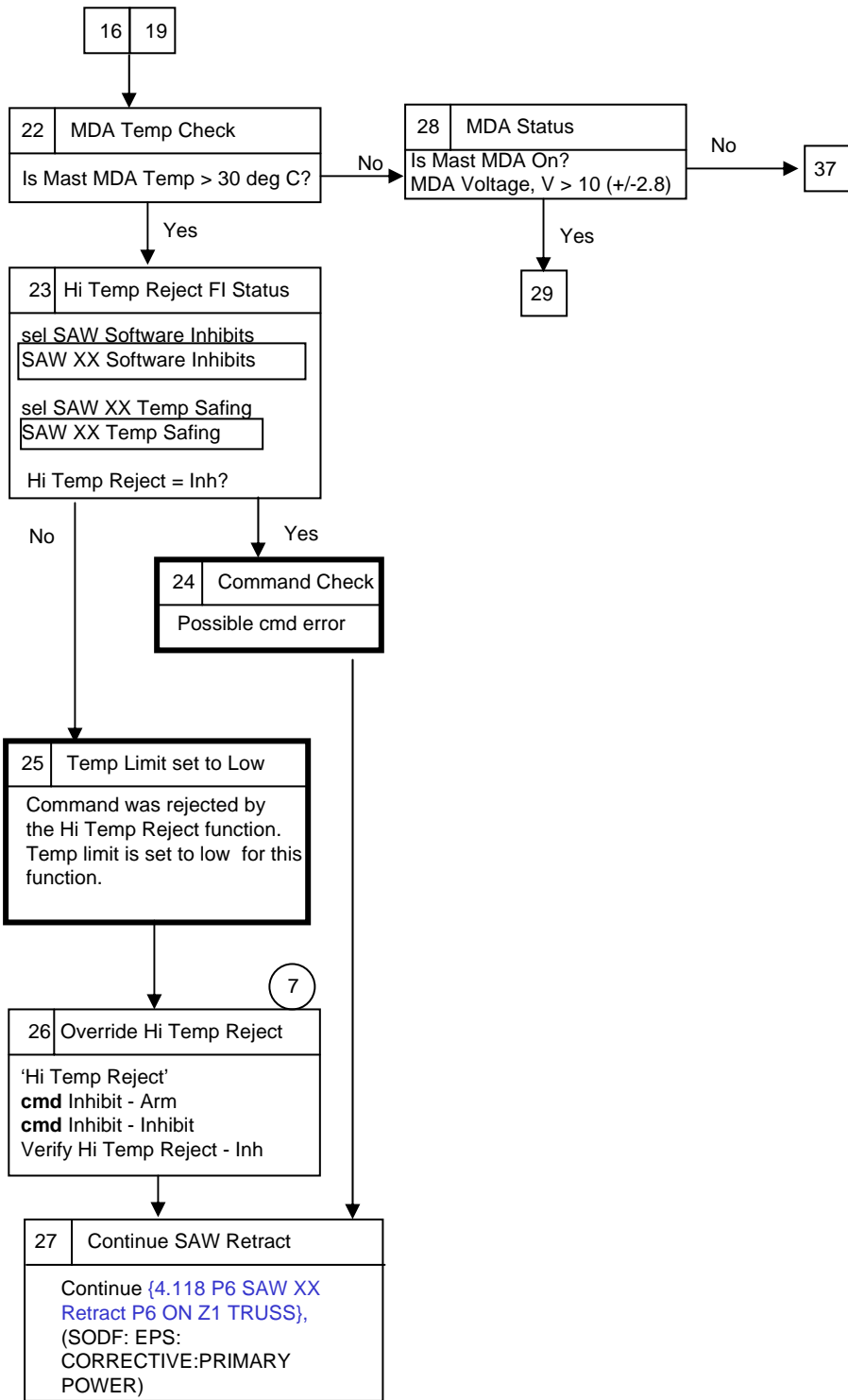


6

SABBs are unlatched after the mast has been retracted until only 1 mast bay is visible so the SABB cover is clear of the latch operations.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

(EPS/12A – ALL/FIN) Page 4 of 20

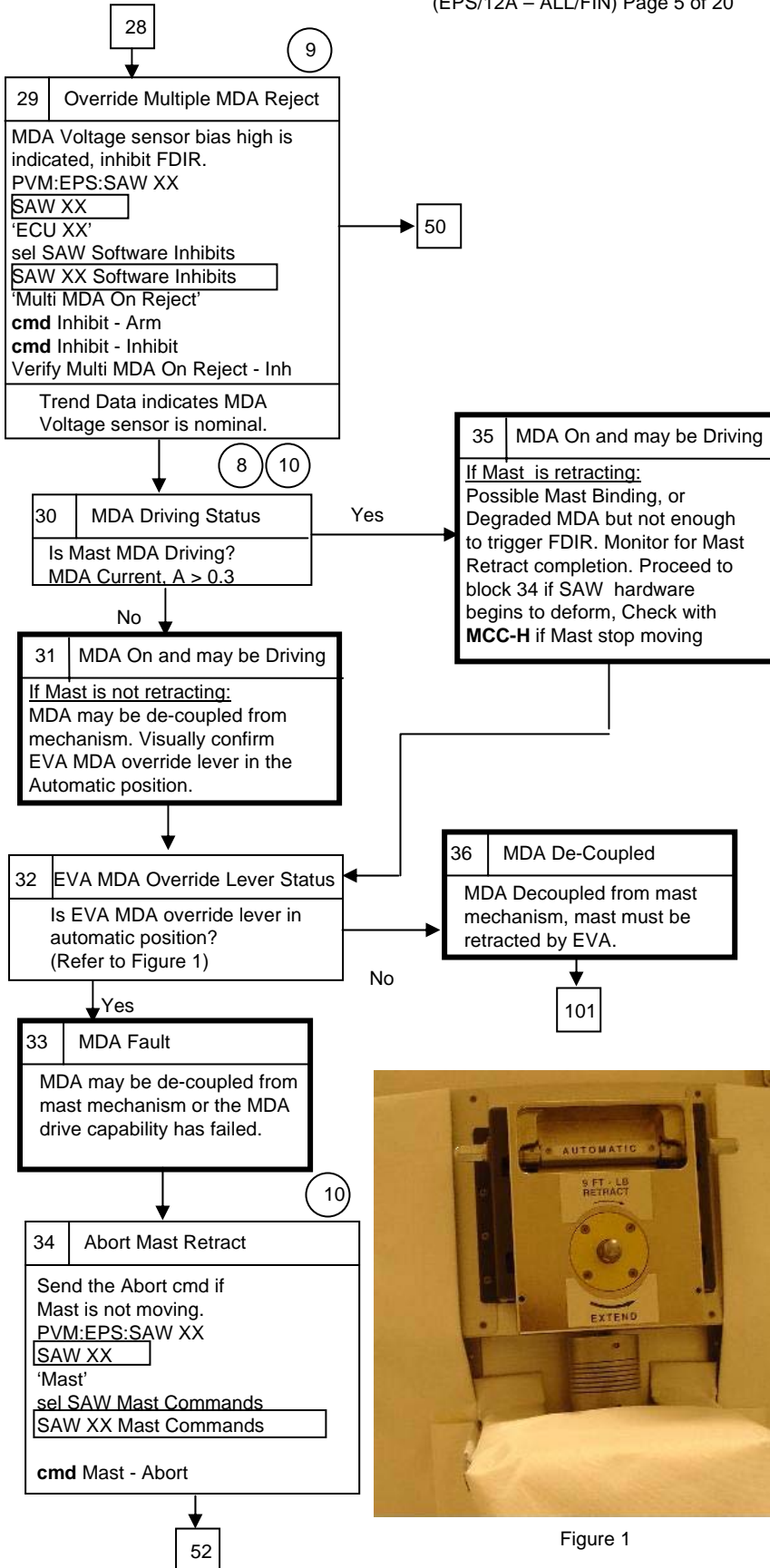


7

MDA operating temperature range is -54 to 48 deg C.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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8

The manual MDA override lever is located on the back (inactive side) of the mast canister. (MDA current with no load = 0.3A)

9

There is no overvoltage FDIR for the MDA. The MDA will continue to operate if a Voltage sensor has failed high. Check voltages of all MDAs. The multiple MDA On Reject FDIR will reject an MDA on command if another MDA is already on.

10

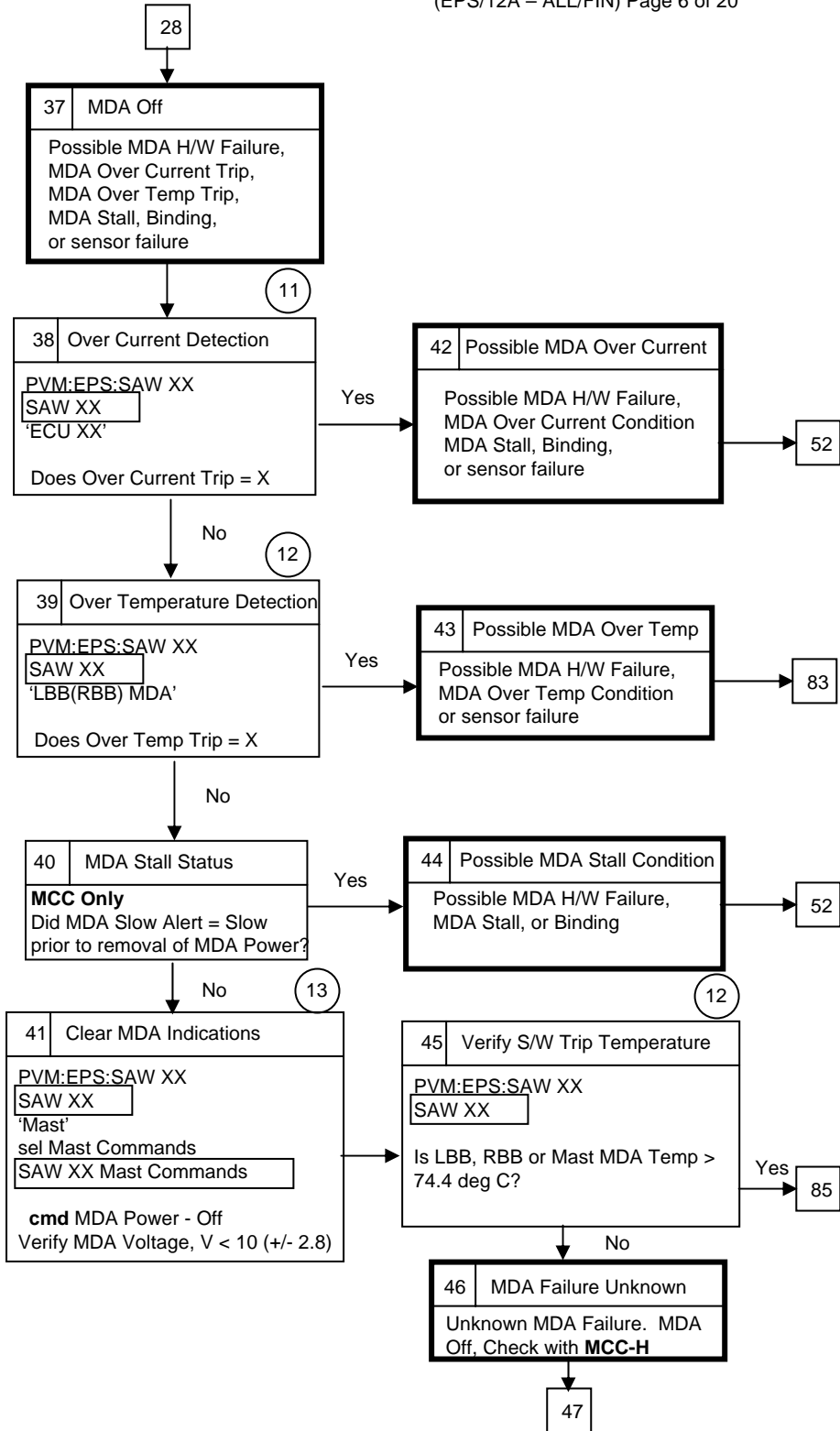
If MDA de-coupled you may not be able to tell if the MDA is driving based on the current.



Figure 1

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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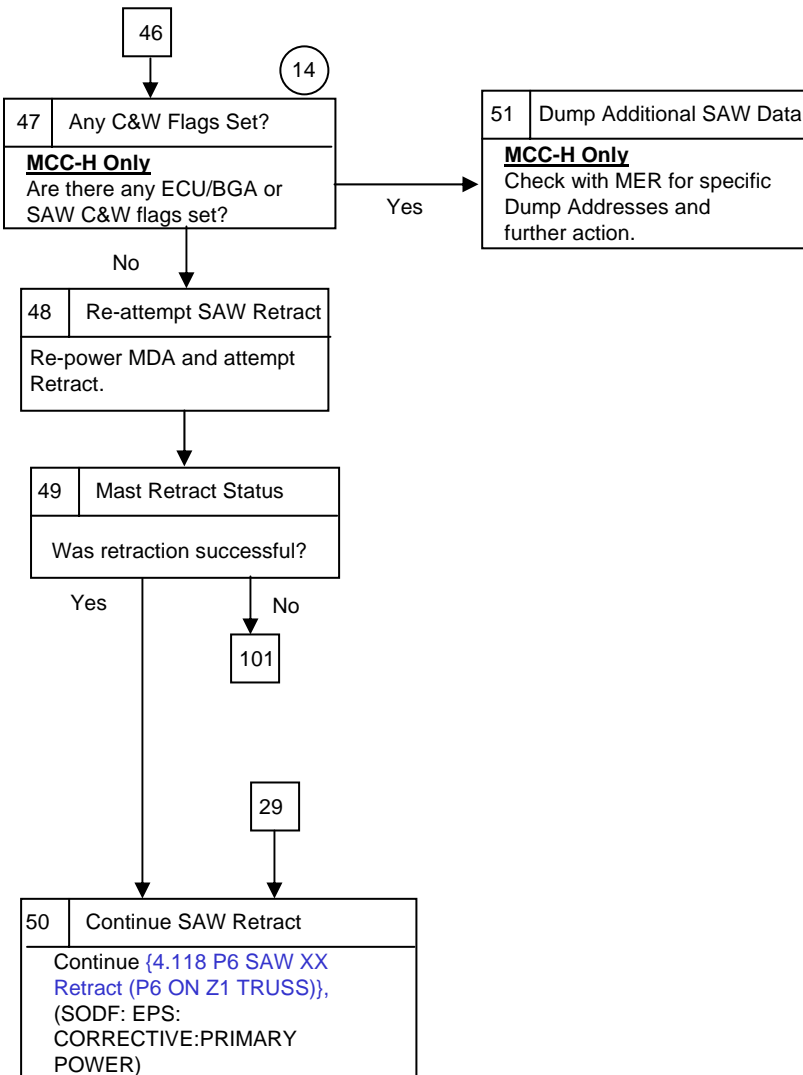
11 ECU Firmware MDA Over Current Trip occurs at 6.2 Amps. S/W Limit (0.78 A) is reached first and it does **not** set the MDA Over Current Trip Flag.

12 Disconnects are present in the MDA Over Temp FDIR. S/W Trip level = 77.7 deg C. F/W Trip level = 140 deg C. H/W damage occurs at 120 deg C. S/W Temp limit is reached first and it does **not** set the MDA Over Temp Trip Flag.

13 MDA Power off is a one step command.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

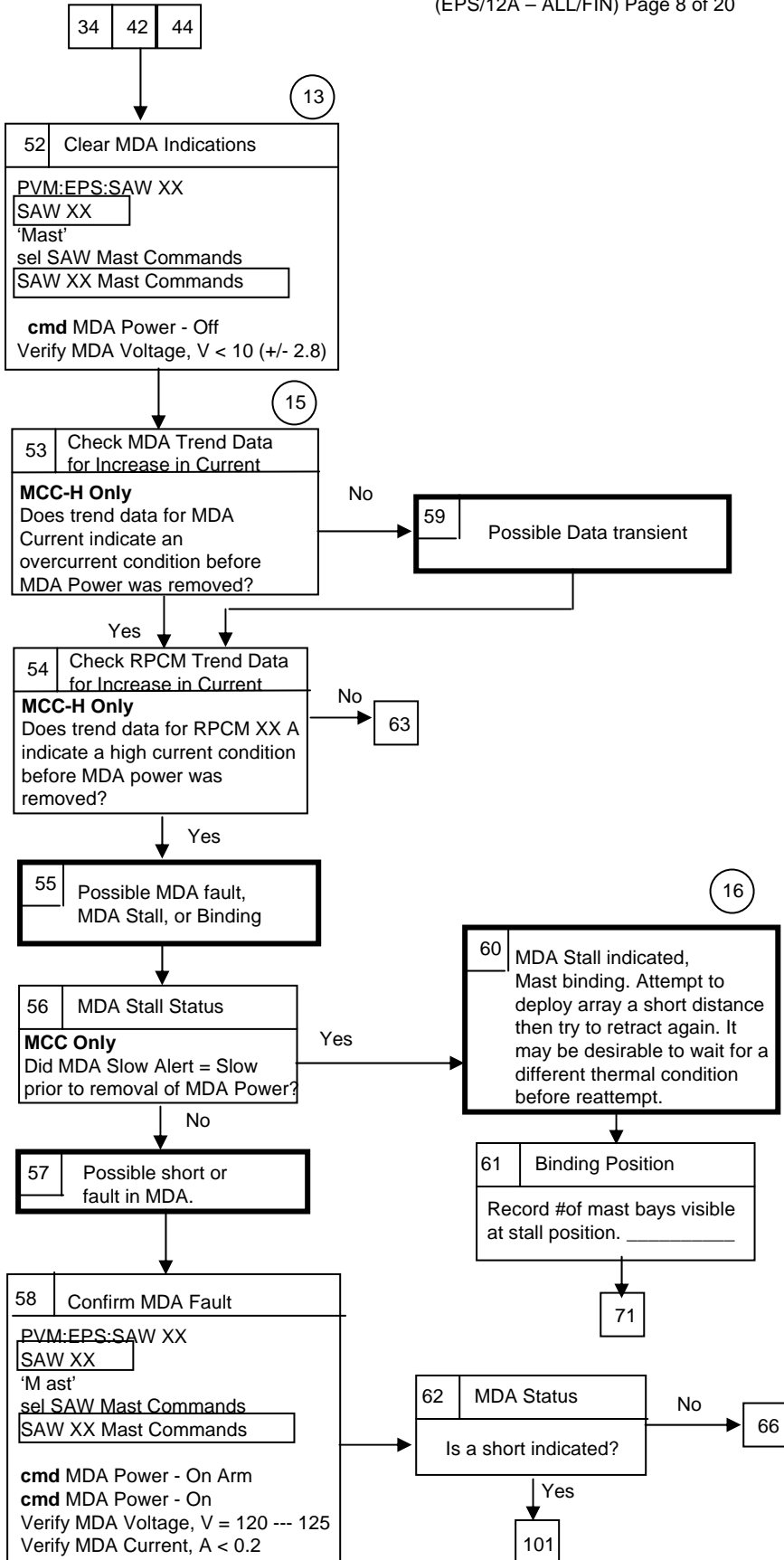
(EPS/12A – ALL/FIN) Page 7 of 20



14  
 SAW Caution and Warning Flags are available for downlink only during missions that scheduled SAW activities. (e.g 12A) Flags are not available on PCS displays.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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13

MDA Power off is a one step command.

15

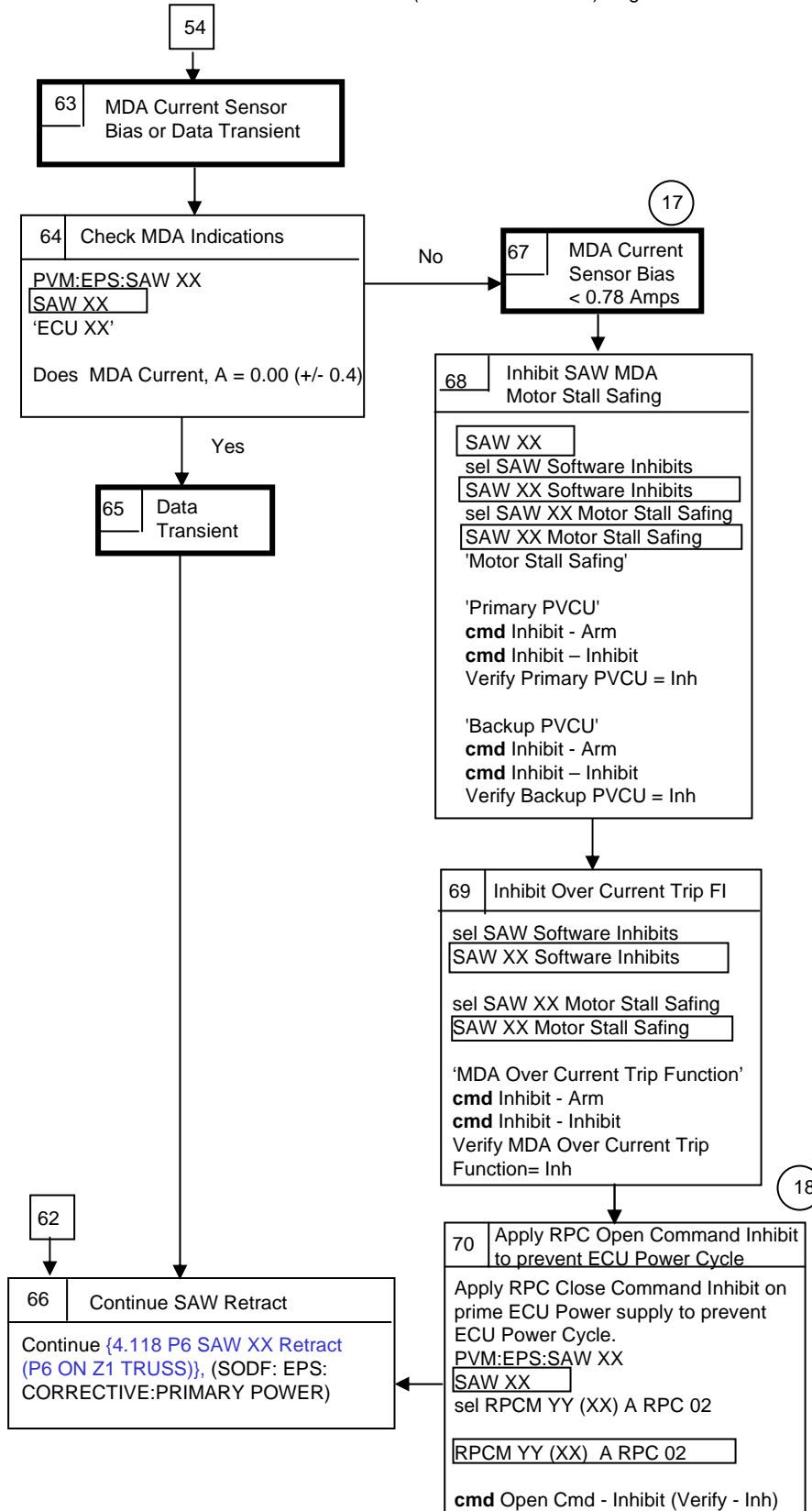
PVCU Software MDA Over Current Trip occurs at 0.78 Amps.

16

If a Stall Condition is indicated, Current > 0.78 A and motor speed is < 25 RPM, power is removed from the MDA

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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17

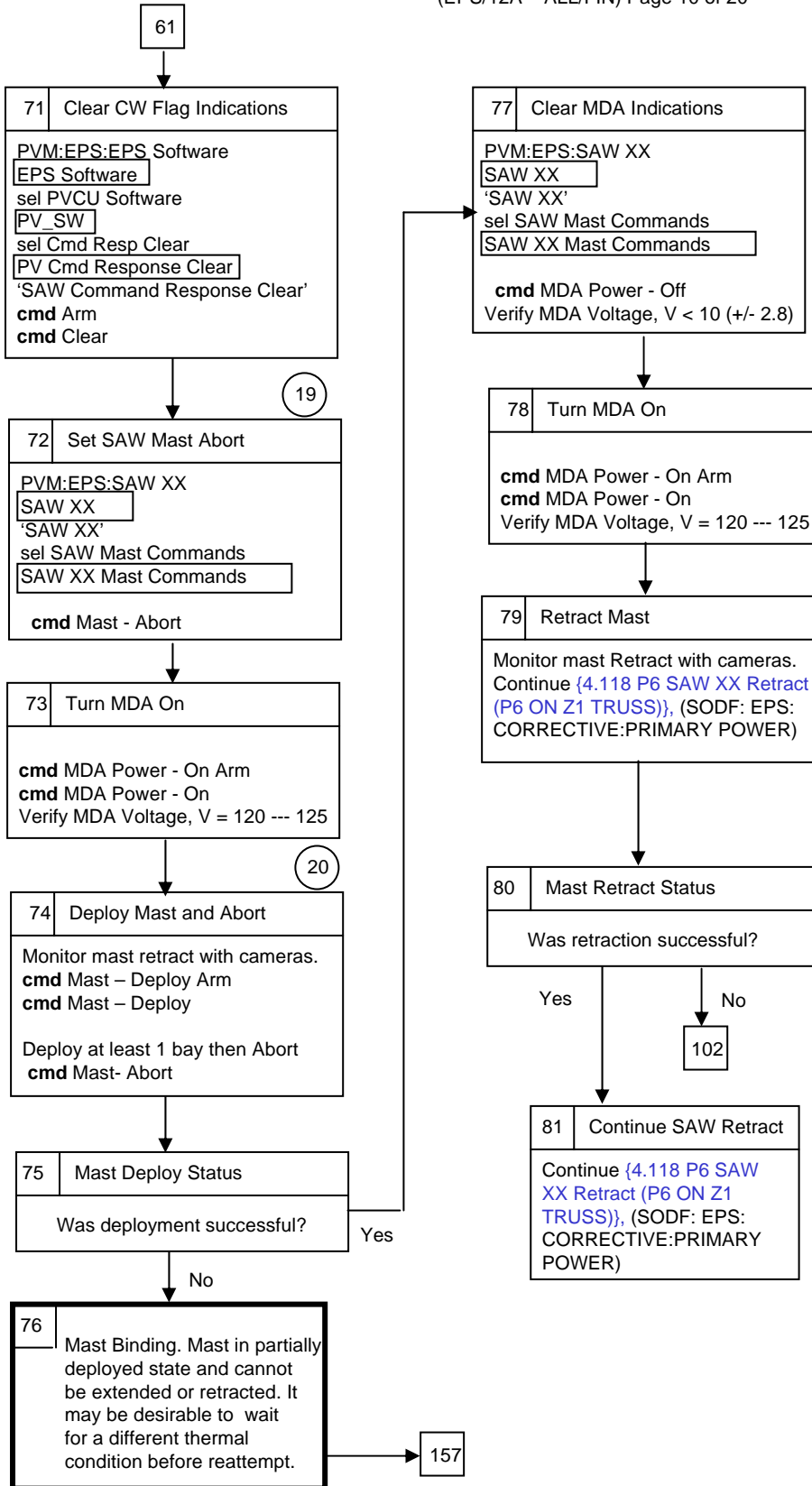
If Current sensor fails high > 0.78 A RPCs providing power to ECU will be opened. A new PPL with a higher current limit must be uploaded before the ECU can be recovered. There is no inhibit for SAW MDA Motor Stall Persistent Current Safing. Refer to block 3.

18

However, all MDAs use the same current sensor. A new PPL 69 must be uplinked prior to SAW operations or Inhibit the RPC Open Command to avoid power cycling the ECU.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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19

MDA Abort must be sent to prevent MDA from driving once power is re-applied. This is a single step cmd.

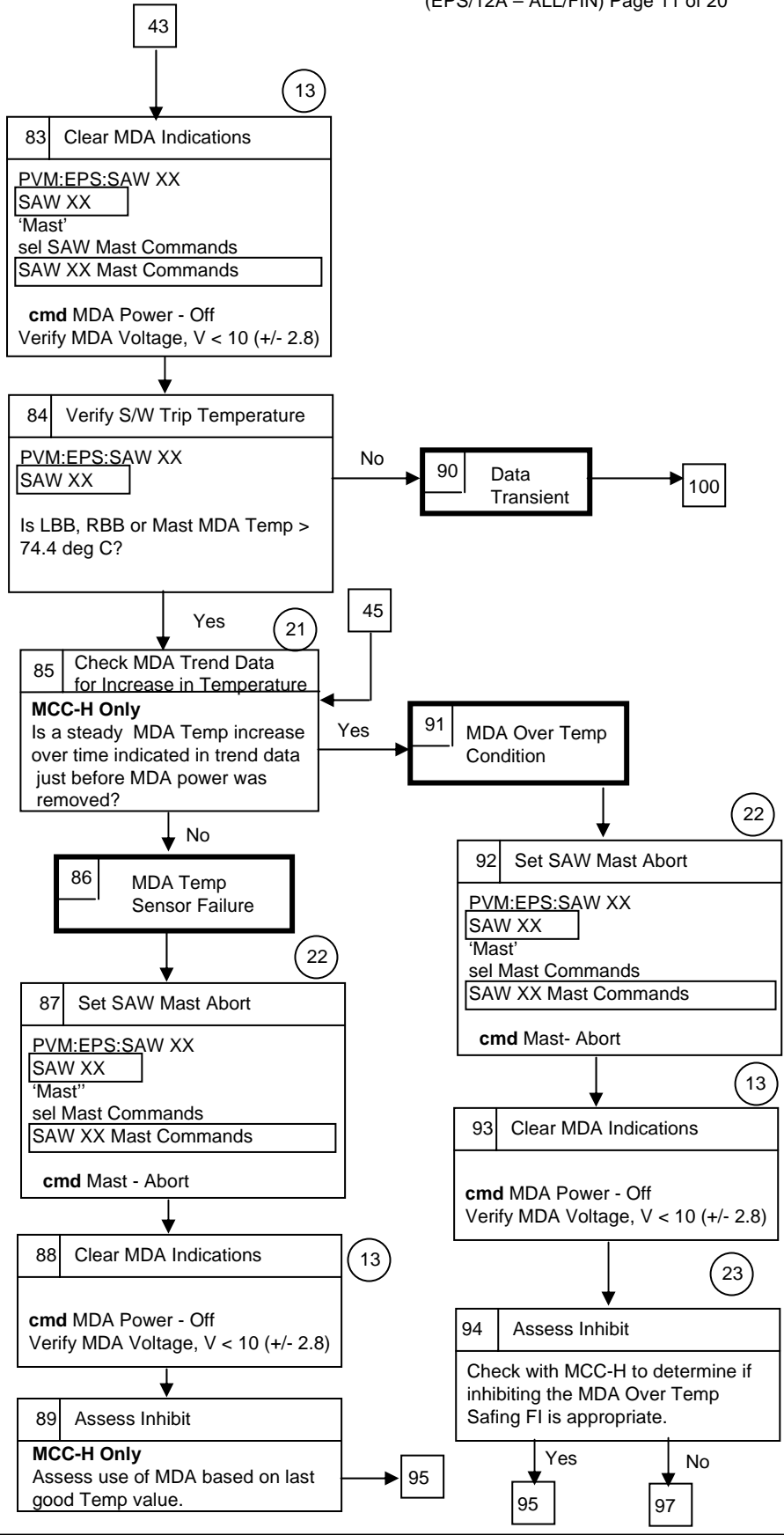
20

Confirm that ISS Thrusters are inhibited or ISS/Orbiter in Free Drift and no crew un-isolated exercise or max EVA loads prior to sending the Deploy or Retract command. If at any time mechanical movement is stopped or aborted, attitude control may be resumed.

Step 82 Deleted



3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY



13 MDA Power off is a one step command.

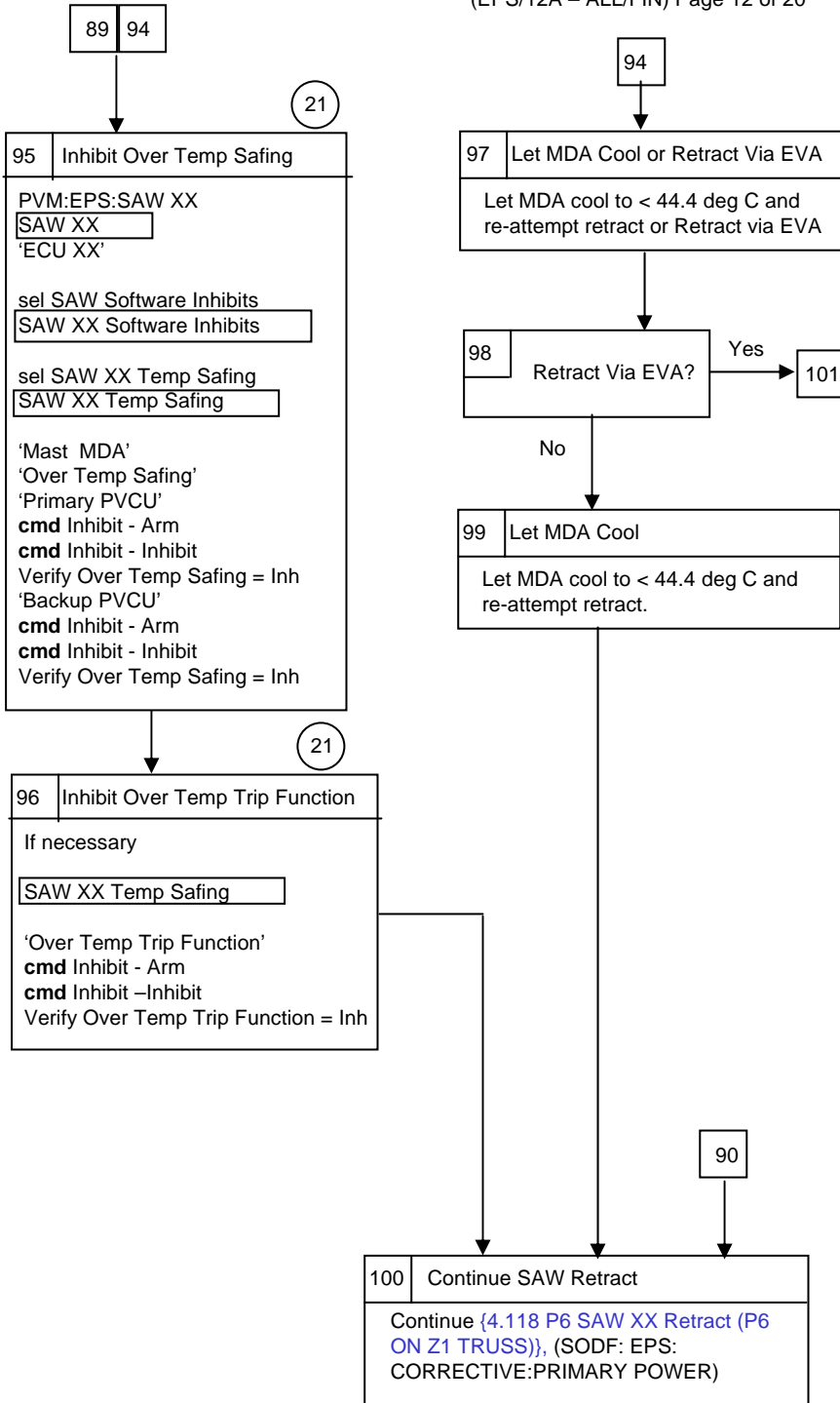
21 Disconnects are present in the MDA Over Temp FDIR. S/W Trip level = 77.7 deg C. F/W Trip level = 140 deg C. H/W damage occurs at 120 deg C. At a minimum a 30 deg C Mast MDA Temp increase should be protected for during mast deploy/retract

22 Since S/W Temp limit is reached first and it does not set the MDA Over Temp Trip flag, a MDA Abort must sent to prevent MDA from driving, once power is re-applied. This is a single step cmd.

23 Per Flight Rule B9-207, MDA operations can proceed even if MDA temp is high in order to meet critical mission objectives. Measurement Out of Range will be indicated if MDA temp >72.2 deg C.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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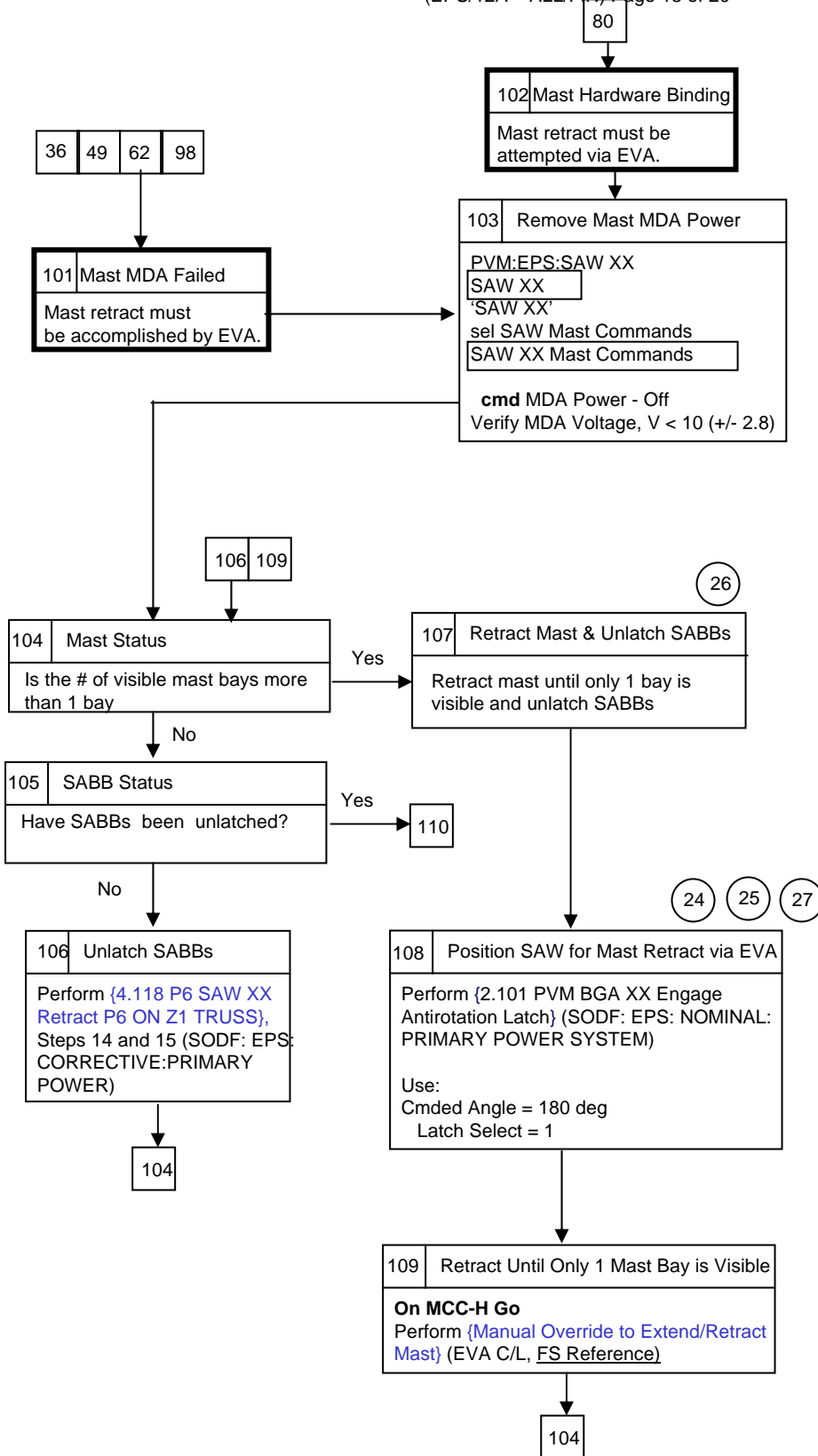


21

Disconnects are present in the MDA Over Temp FDIR. S/W Trip level = 77.7 deg C. F/W Trip level = 140 deg C. H/W damage occurs at 120 deg C. At a minimum a 30 deg C Mast MDA Temp increase should be protected for during mast deploy/retract

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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24 This step can take up to 1 hr to complete. The latch cmd can be sent when the BGA Actual Angle is within 1 deg of the commanded value in order to save time.

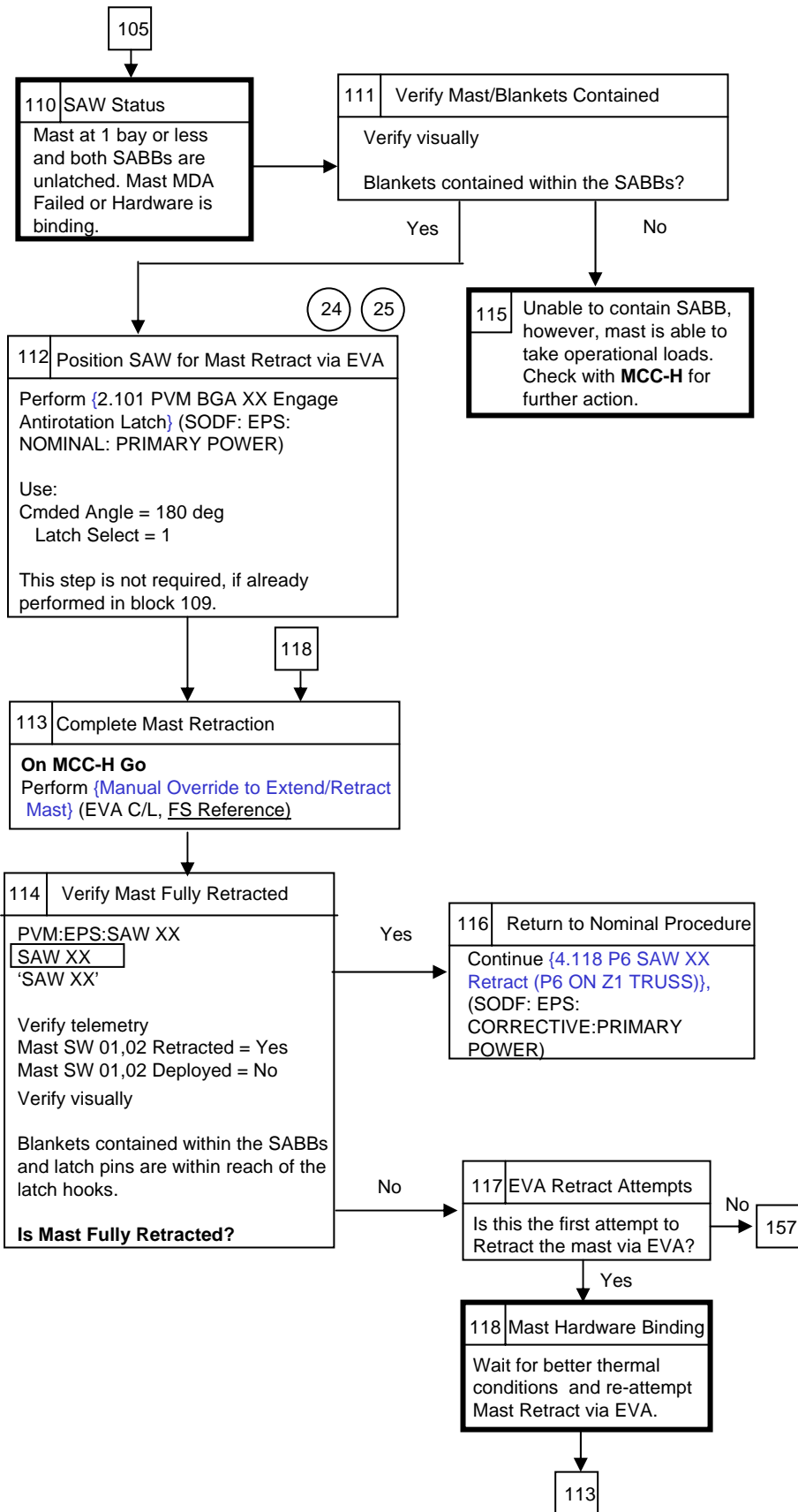
25 This step may be omitted if EVA crew can free float and drive the Mast MDA.

26 SABBs can be unlatched anytime the Mast is less than 13.5 or greater than 1 bay. May consider unlatching prior to BGA positioning to support EVA, if there will be no attempt to redeploy. Camera config. is still available to view unlatch, prior to BGA rotation, and unlatching early will reduce EVA time.

27 When the BGA is repositioned, the thermal environment of the Mast is changed. Consider another attempt to retract if binding was the problem.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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24

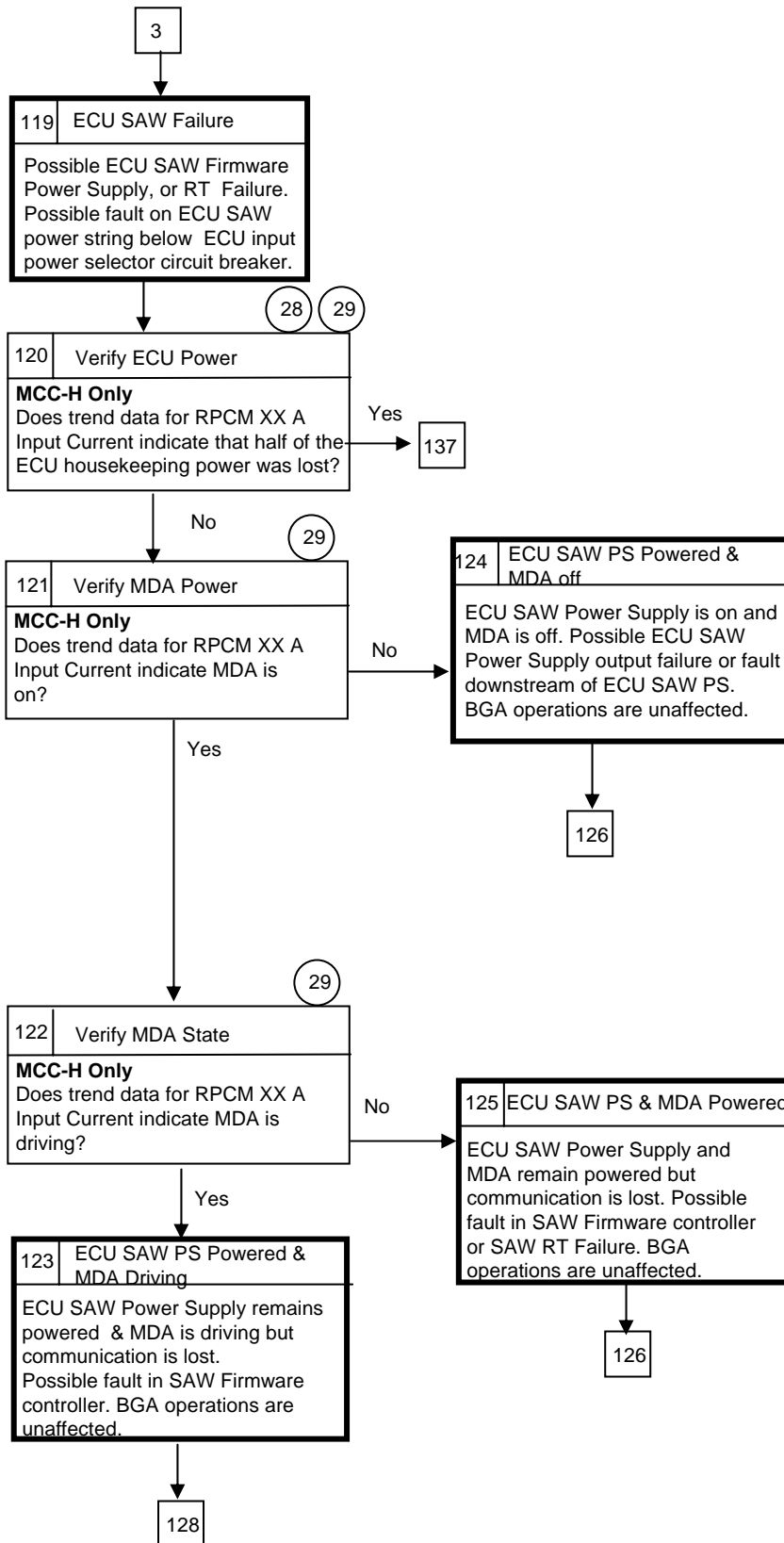
This step can take up to 1 hr to complete. The latch cmd can be sent when the BGA Actual Angle is within 1 deg of the commanded value in order to save time.

25

This step may be omitted if EVA crew can free float and drive the Mast MDA.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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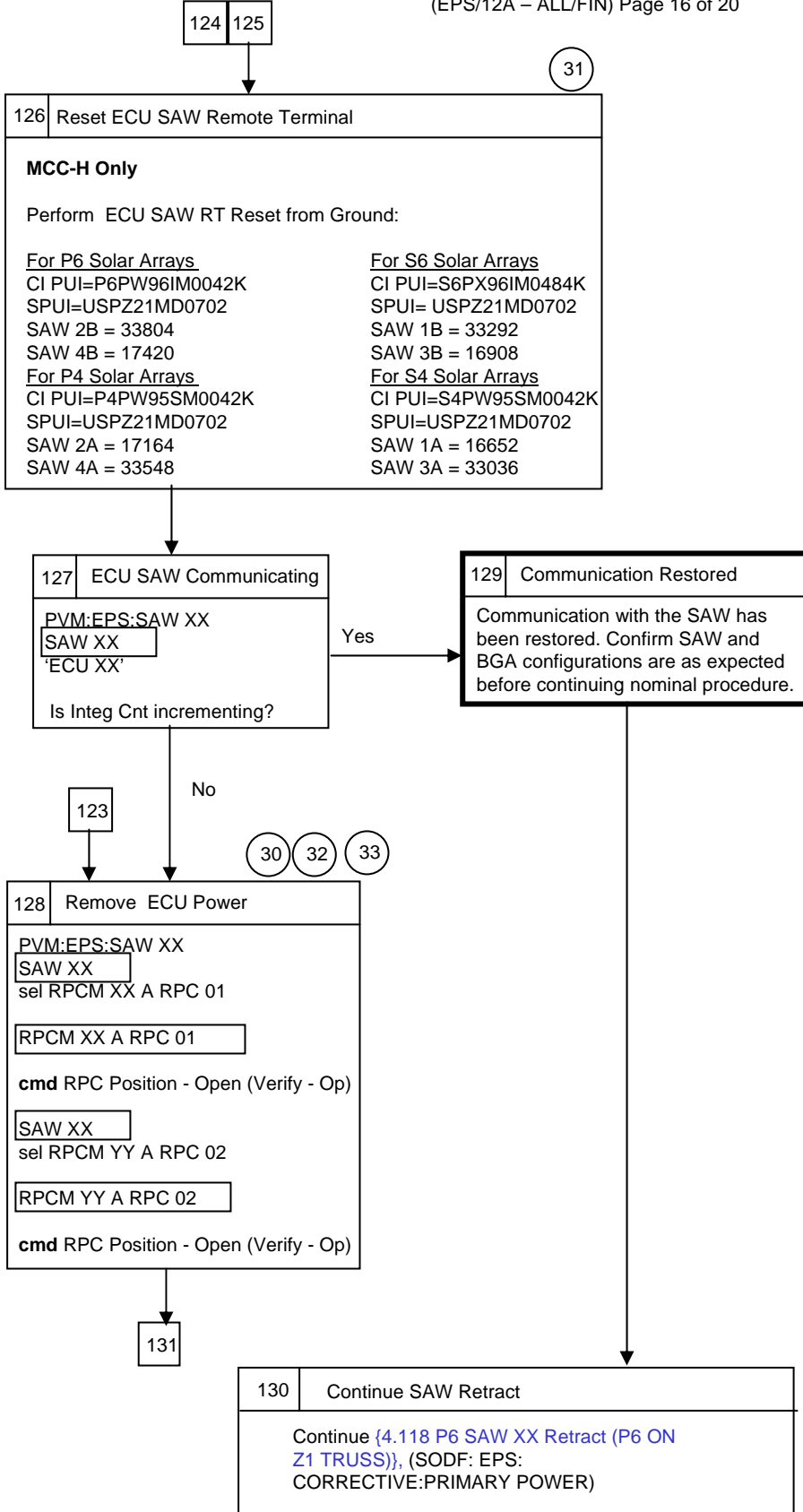


28  
Total ECU housekeeping power is 115W (0.93A) at initialization and before BGA mtr or MDAs are turned on. Half of the ECU housekeeping power is 57.5W (0.47A)

29  
When the MDA is on it draws about 0.22A. When the MDA is driving it can draw as high as 3.0A. MDA over current trip occurs at 0.78A. The MDA will stop driving but will remain on if one of the two "Retracted" limit switches have contacted.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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30 Removes Power from MDA. When power is re-applied to the ECU the MDA will be off.

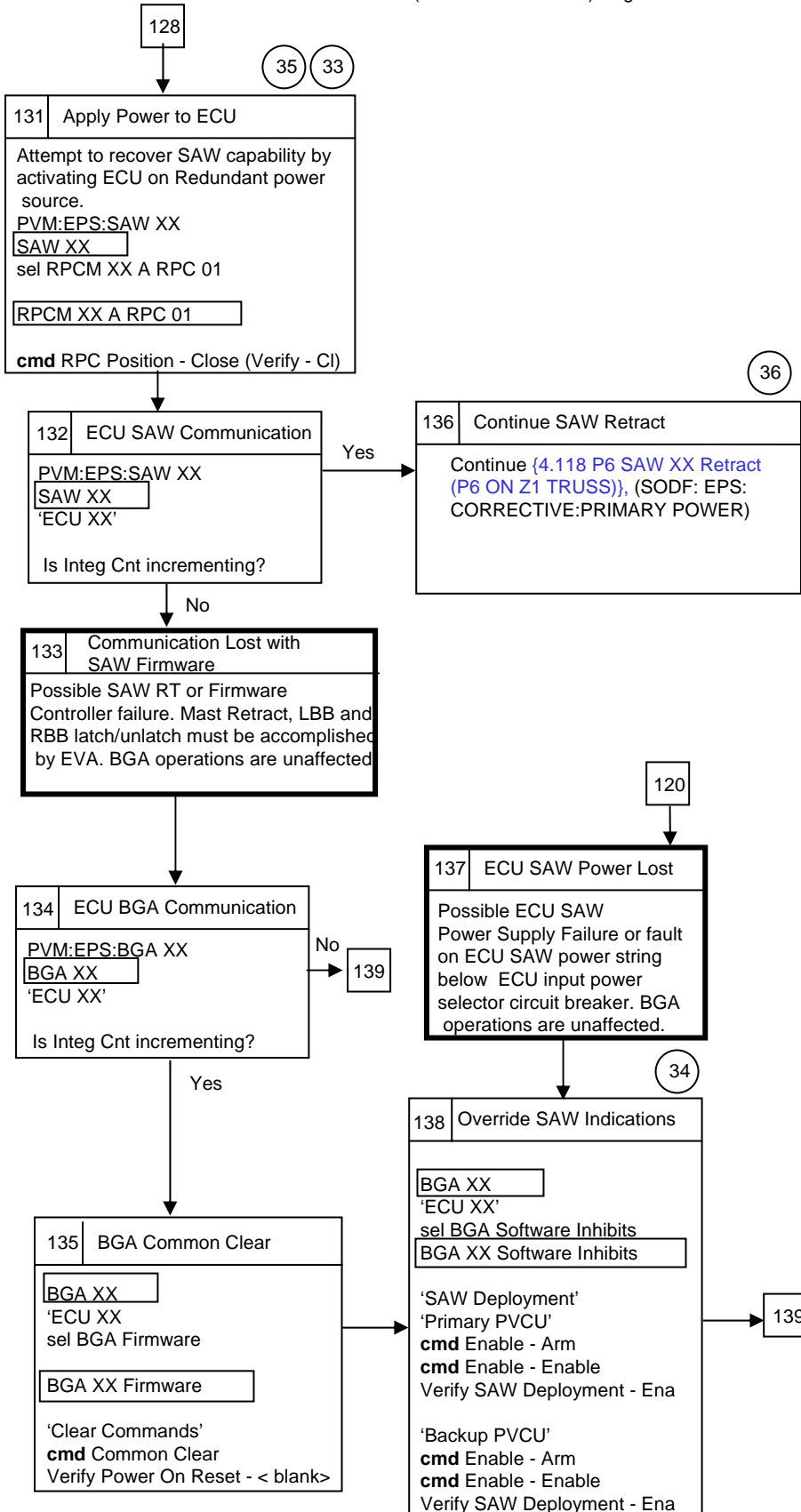
31 MCC-H must build and perform this step from command inventory.

32 Expect Caution message BGA XX Loss of Comm - PVM when RPC 01 is cmded open.

33 ECU power is supplied by the opposite deck channel (YY) for SAW Retraction operations.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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33 ECU power is supplied by the opposite deck channel (YY) for SAW Retraction operations.

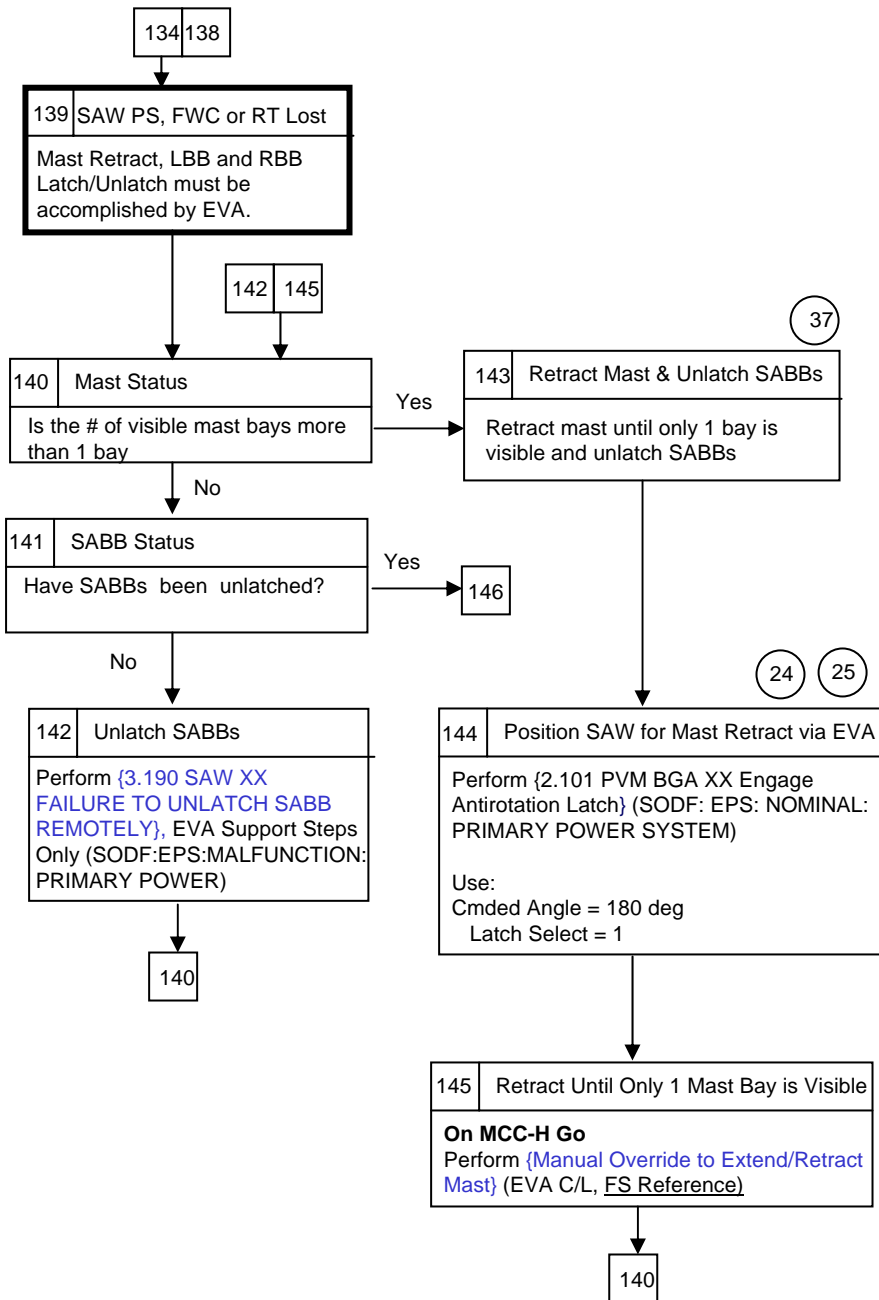
34 Allows BGA to be operated when SAW Mast is in an undetermined state, or comm is lost with SAW FWC.

35 Caution message BGA XX 1553/ FWC Errors- PVM may be received after RPC 01 is closed.

36 If power was removed from the ECU you must begin again with step 1 of the Deploy/Retract procedure, to reset the F/W inhibits.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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24

This step can take up to 1 hr to complete. The latch cmd can be sent when the BGA Actual Angle is within 1 deg of the commanded value in order to save time.

25

This step may be omitted if EVA crew can free float and drive the Mast MDA.

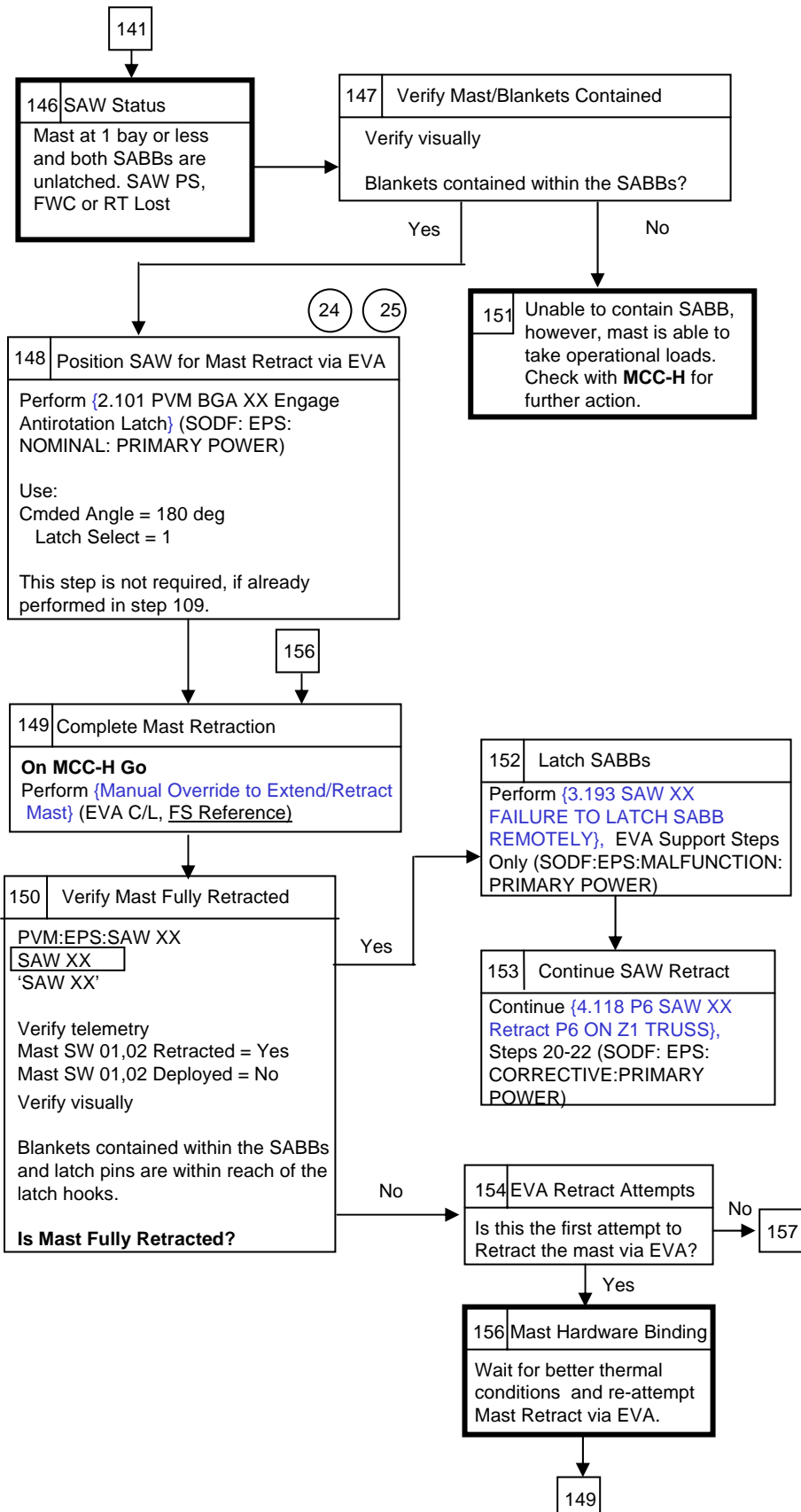
37

Retracting while still latched, allows for early SARJ positioning, or improved power generation, while the crew is still working on the rest of the SAW EVA tasks



3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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24

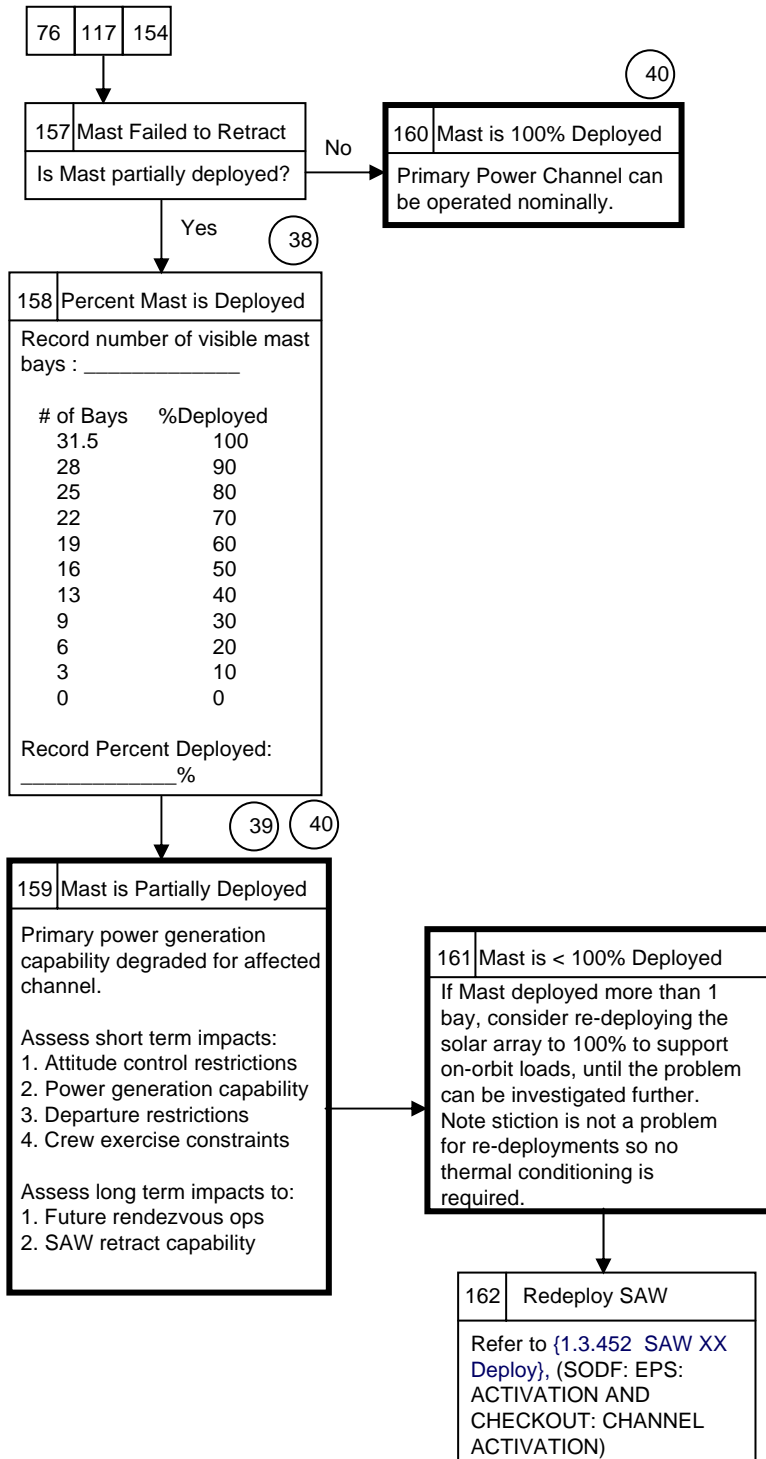
This step can take up to 1 hr to complete. The latch cmd can be sent when the BGA Actual Angle is within 1 deg of the commanded value in order to save time.

25

This step may be omitted if EVA crew can free float and drive the Mast MDA.

3.192 SAW XX FAILURE TO RETRACT MAST REMOTELY

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38

SAW is un-tensioned if < 31.5 bays are visible.

39

Analysis indicates that the Mast must be deployed > 60% before adequate power generation can be achieved.

40

Remove MDA Power (Mast MDA-Off) if you have not already done so.

# EPS

## 3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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LBB(RBB) Failed to Latch

LBB(RBB) Partially Latched

CAUTION ALARM

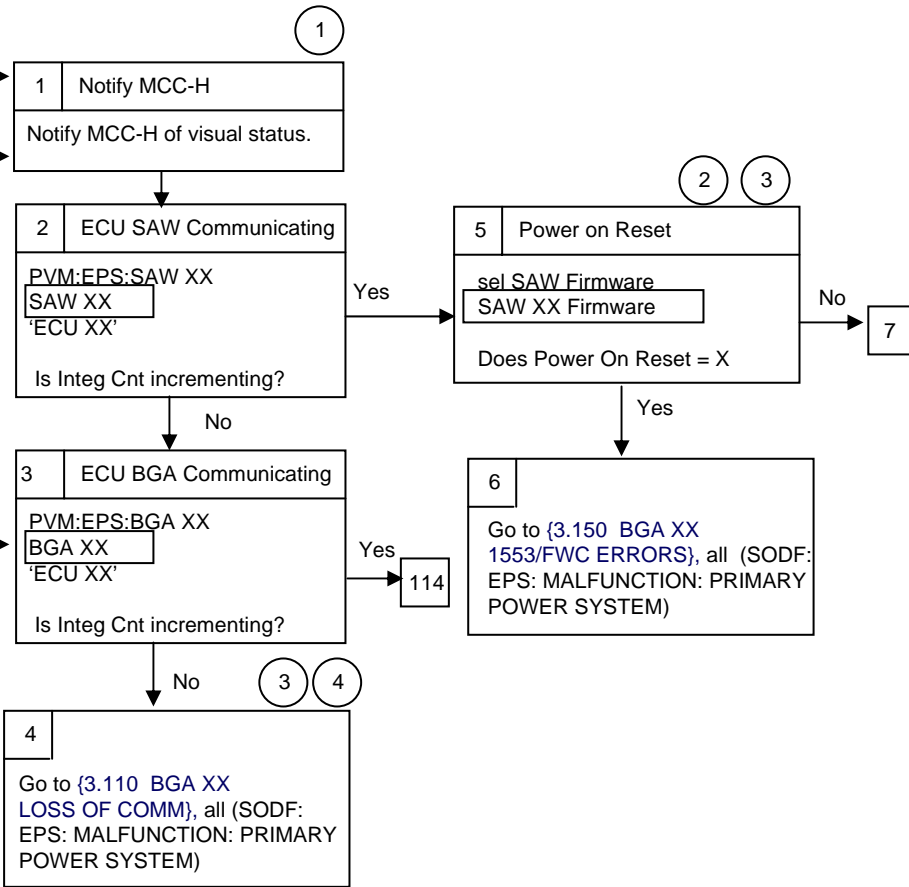
BGA XX Loss of Comm - PVM

No C&W messages are available for SAW hardware

### Power Channel Connectivity

PVM	XX	YY
S4	1A	3A
S4	3A	1A
S6	1B	3B
S6	3B	1B
P4	2A	4A
P4	4A	2A
P6	2B	4B
P6	4B	2B

Nominal Config:  
 ECU SAW XX:  
 RPCM XX A  
 RPC 1 - CI  
 RPCM YY A  
 RPC 2 - CI



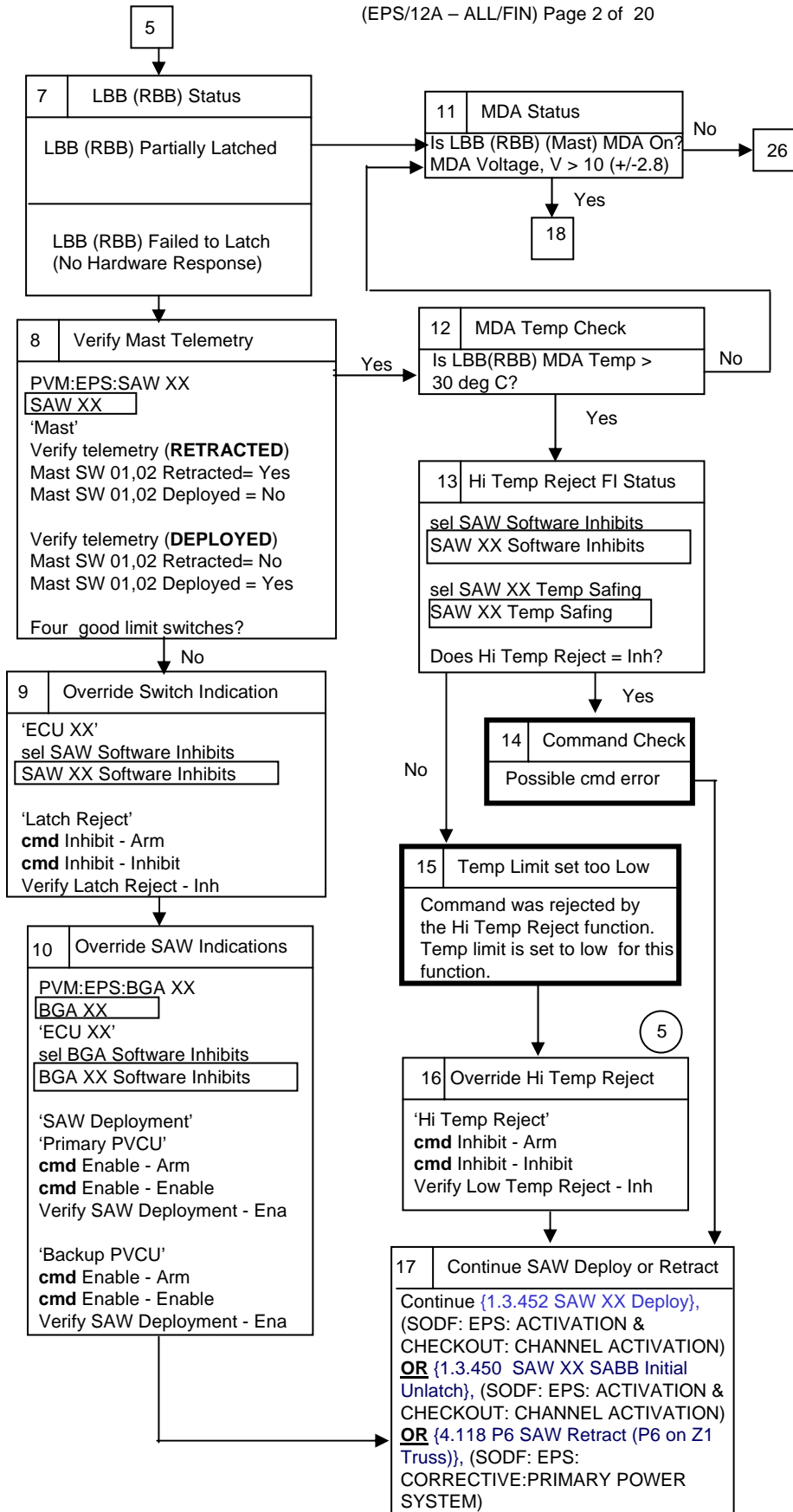
1 This procedure assumes the SABBs will be latched at specific times during the mission. For Deployments: 1) Re-latch after Initial SABB Unlatch, 2) Re-latch SABBs when Mast at 1 Bay. For Retractions: 1) Latch when 100% retracted.

2 Caution message BGA XX 1553/FWC Errors- PVM may also be received if a Power on Reset has occurred.

3 If power was removed from the ECU you must begin again with step 1 of the Deploy/Retract procedure, to reset the F/W inhibits.

4 If Current sensor fails high > 0.78 A RPCs providing power to ECU will be opened. A new PPL with a higher Current limit must be uploaded before the ECU can be recovered. There is no inhibit for SAW MDA Config Complete Persistent Current Safing.

3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

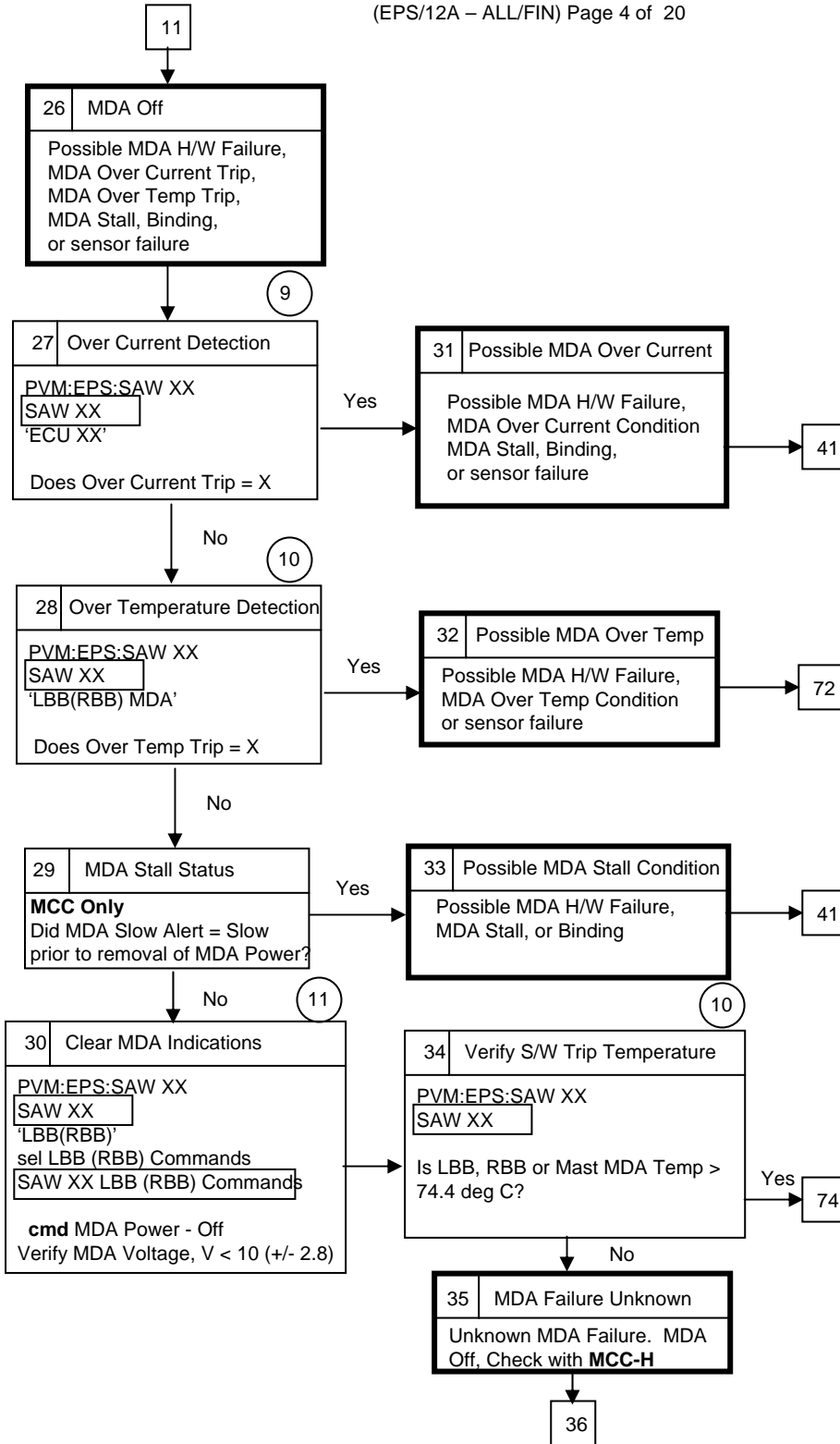


5  
MDA operating temperature range is -54 to 48 deg C.



3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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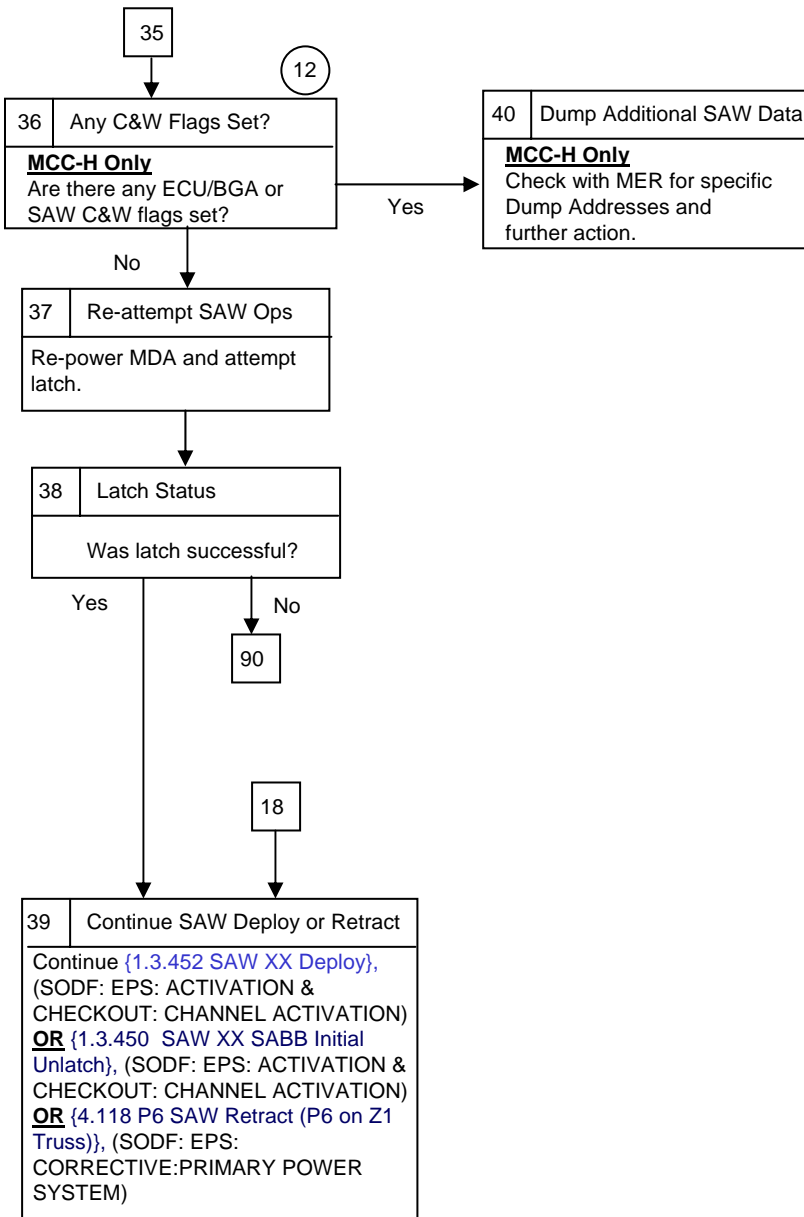
9  
ECU Firmware MDA Over Current Trip occurs at 6.2 Amps. S/W Limit (0.78 A) is reached first and it does **not** set the MDA Over Current Trip Flag.

10  
Disconnects are present in the MDA Over Temp FDIR. S/W Trip level = 77.7 deg C. F/W Trip level = 140 deg C. H/W damage occurs at 120 deg C. S/W Temp limit is reached first and it does **not** set the MDA Over Temp Trip Flag.

11  
MDA Power off is a one step command.

3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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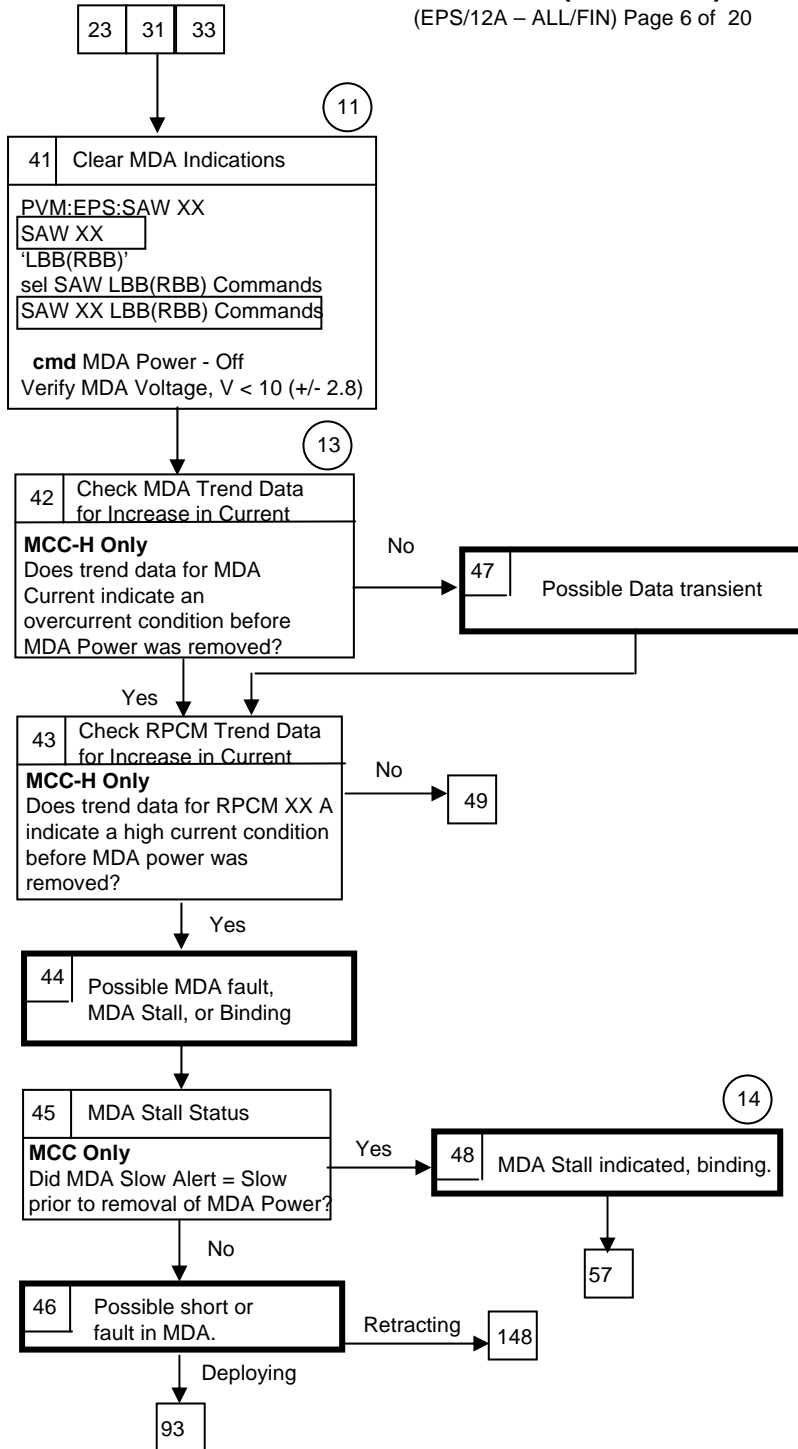


12

SAW Caution and Warning Flags are available for downlink only during missions that scheduled SAW activities. (e.g 12A) Flags are not available on PCS displays.

3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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11  
MDA Power off is a one step command.

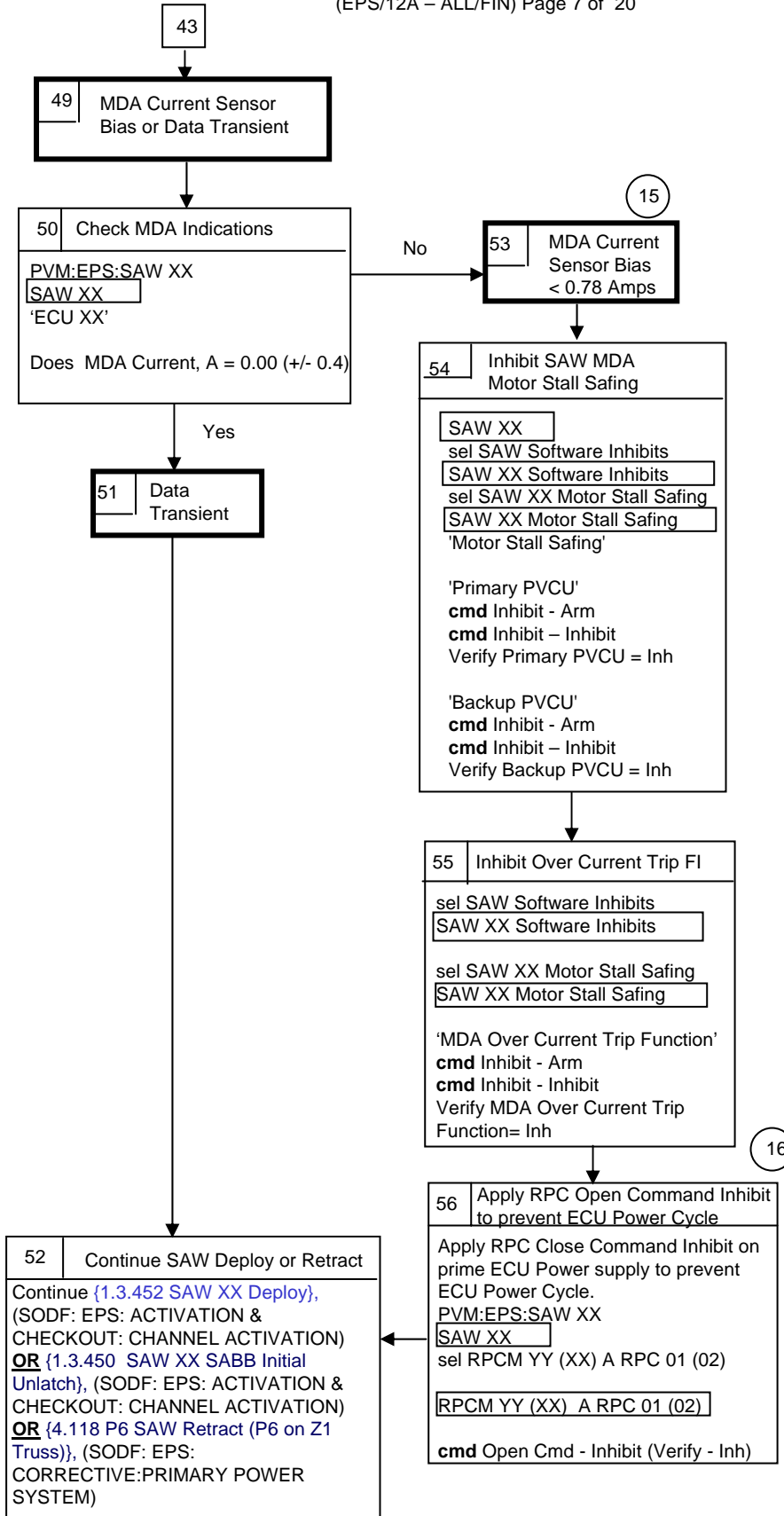
13  
PVCU Software MDA Over Current Trip occurs at 0.78 Amps.

14  
If a Stall Condition is indicated, Current > 0.78 A and motor speed is < 25 RPM, power is removed from the MDA



3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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15

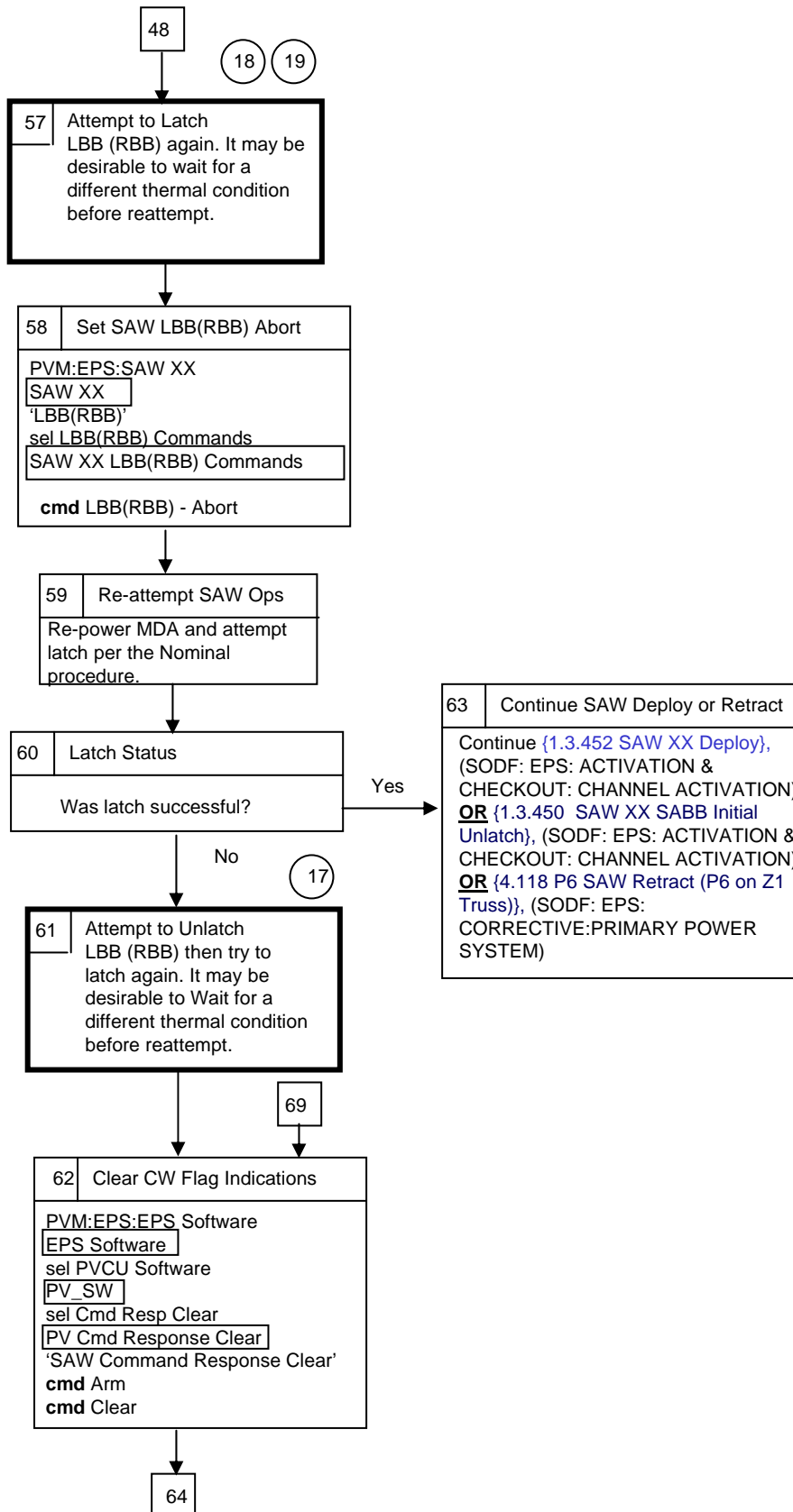
If Current sensor fails high > 0.78 A RPCs providing power to ECU will be opened. A new PPL with a higher current limit must be uploaded before the ECU can be recovered. There is no inhibit for SAW MDA Motor Stall Persistent Current Safing. Refer to block 3.

16

Nominal SABB latch, takes approximately 14 seconds to complete. However, all MDAs use the same current sensor. A new PPL 69 must be uplinked prior to SAW operations or Inhibit the RPC Open Command to avoid power cycling the ECU.

3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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17

There is a very limited partially unlatched range in which a unlatch can be attempted without damaging the hardware. This must be confirmed visually by MCC-H.

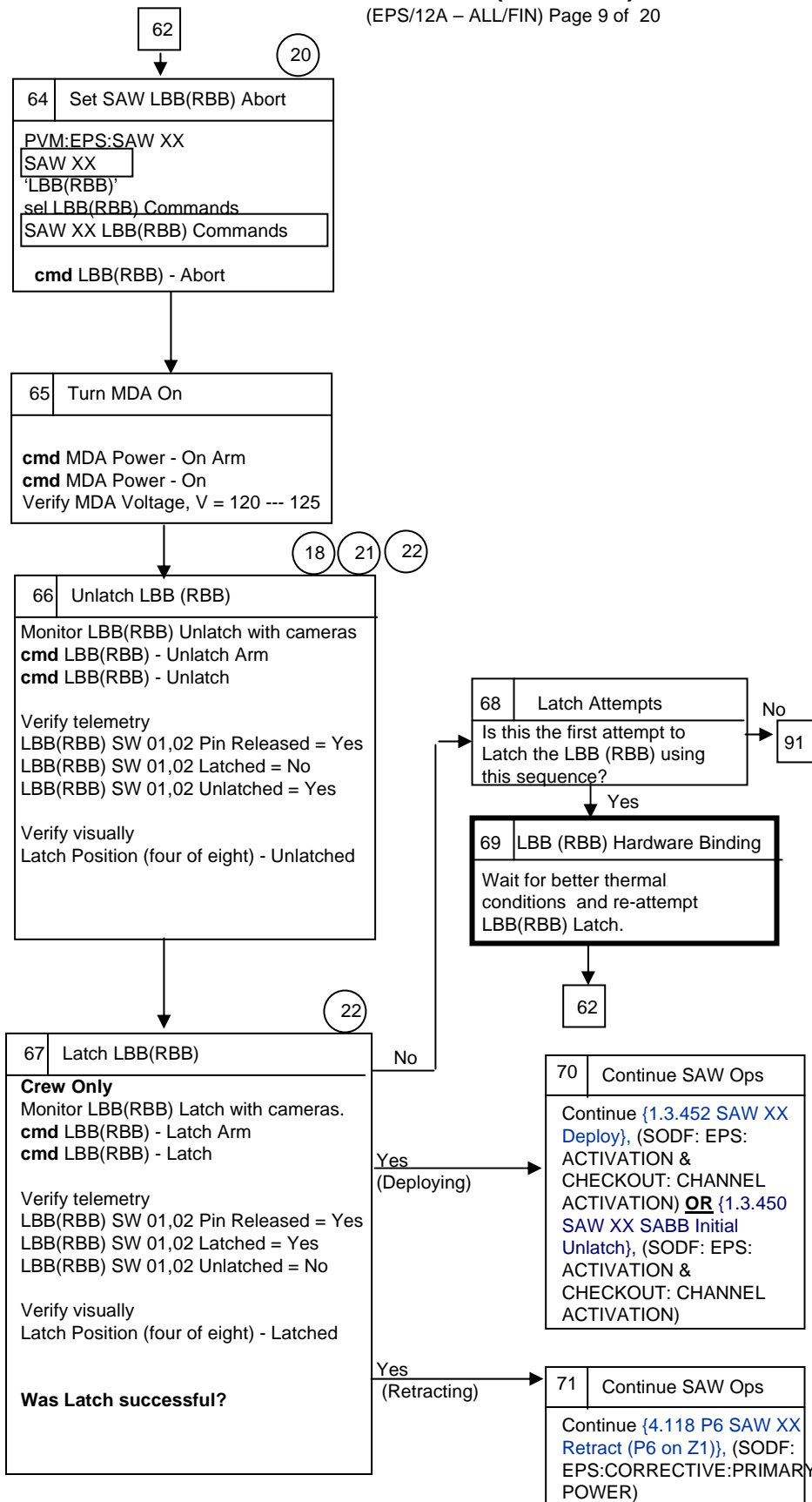
18

Damage to SABB hardware when driving a MDA in the opposite direction from the initial cmded direction.

19

Re-attempt will be made at the end of insolation or end of eclipse, which ever case is opposite initial attempt.

### 3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY



18 Damage to SABB hardware when driving a MDA in the opposite direction from the initial cmded direction.

20 MDA Abort must be sent to prevent MDA from driving once power is re-applied. This is a single step cmd.

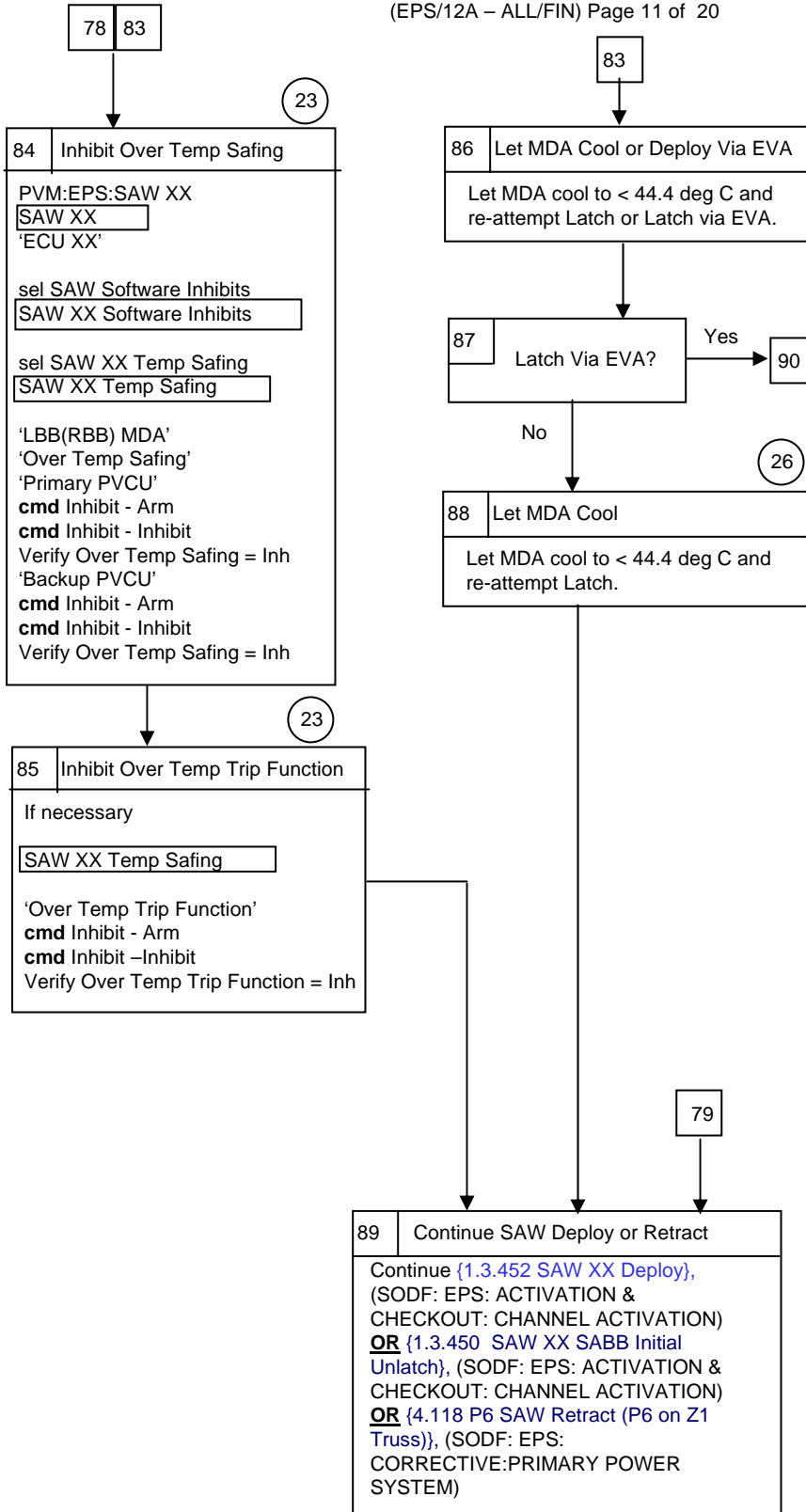
21 There is a very limited partially unlatched range in which an unlatch can be attempted without damaging the hardware. This must be confirmed visually by MCC-H before step 66 can be executed. If step 66 cannot be performed continue in step 67.

22 Confirm that ISS Thrusters are inhibited or ISS/Orbiter in Free Drift and no crew un-isolated exercise or max EVA loads prior to sending the Unlatch or Latch command. If at any time the array mechanical movement is stopped or aborted, attitude control may be resumed.



3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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23

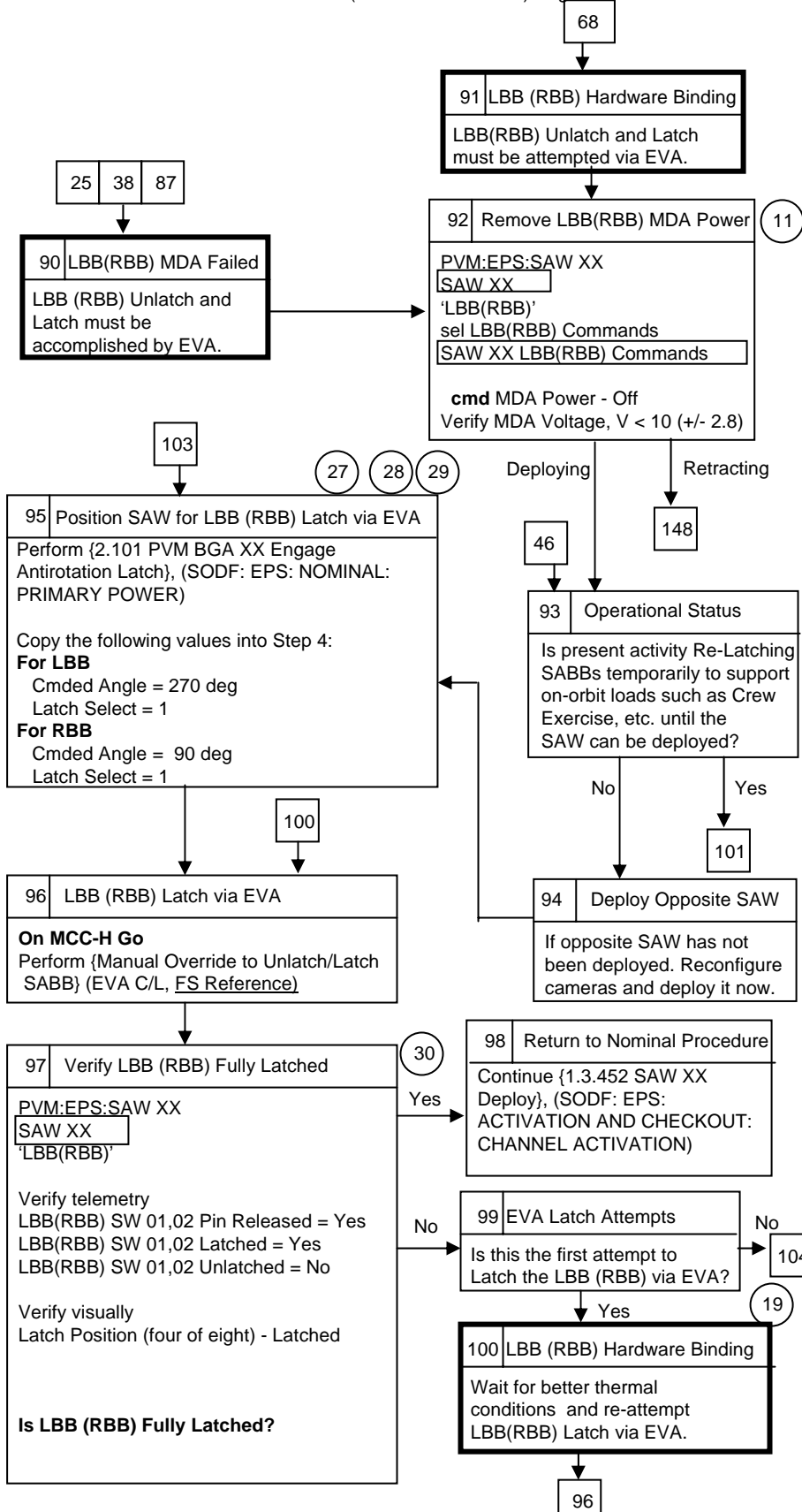
Disconnects are present in the MDA Over Temp FDIR. S/W Trip level = 77.7 deg C. F/W Trip level = 140 deg C. H/W damage occurs at 120 deg C.

26

Retry temperatures can be higher for SABBs since they are only operated a few seconds.

3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

(EPS/12A – ALL/FIN) Page 12 of 20



11 MDA Power off is a one step command.

19 Re-attempt will be made at the end of insolation or end of eclipse, which ever case is opposite initial attempt.

27 This step can take up to 1 hr to complete. The latch cmd can be sent when the BGA Actual Angle is within 1 deg of the commanded value in order to save time.

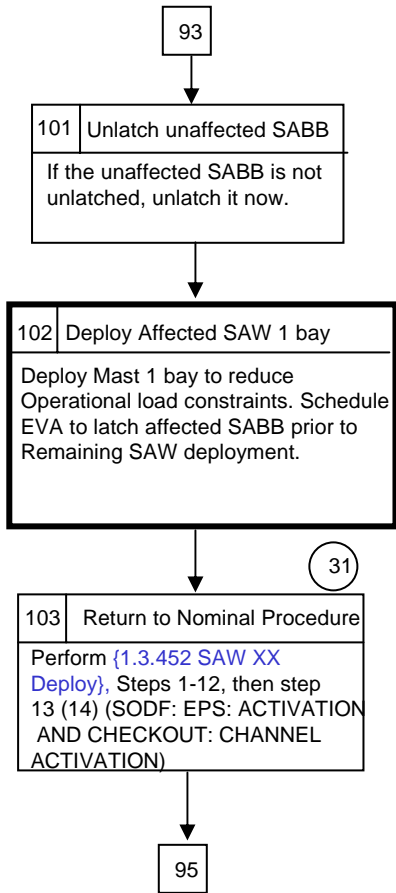
28 This step may be omitted if EVA crew can free float and drive the MDA.

29 Assumes that one or more mast bays have already been deployed, to allow latches to clear SABB Structure

30 Both SABBs must be Latched (Hi Tension Mode) before the SAW can be deployed, to protect H/W against damage due to high stiction forces.

### 3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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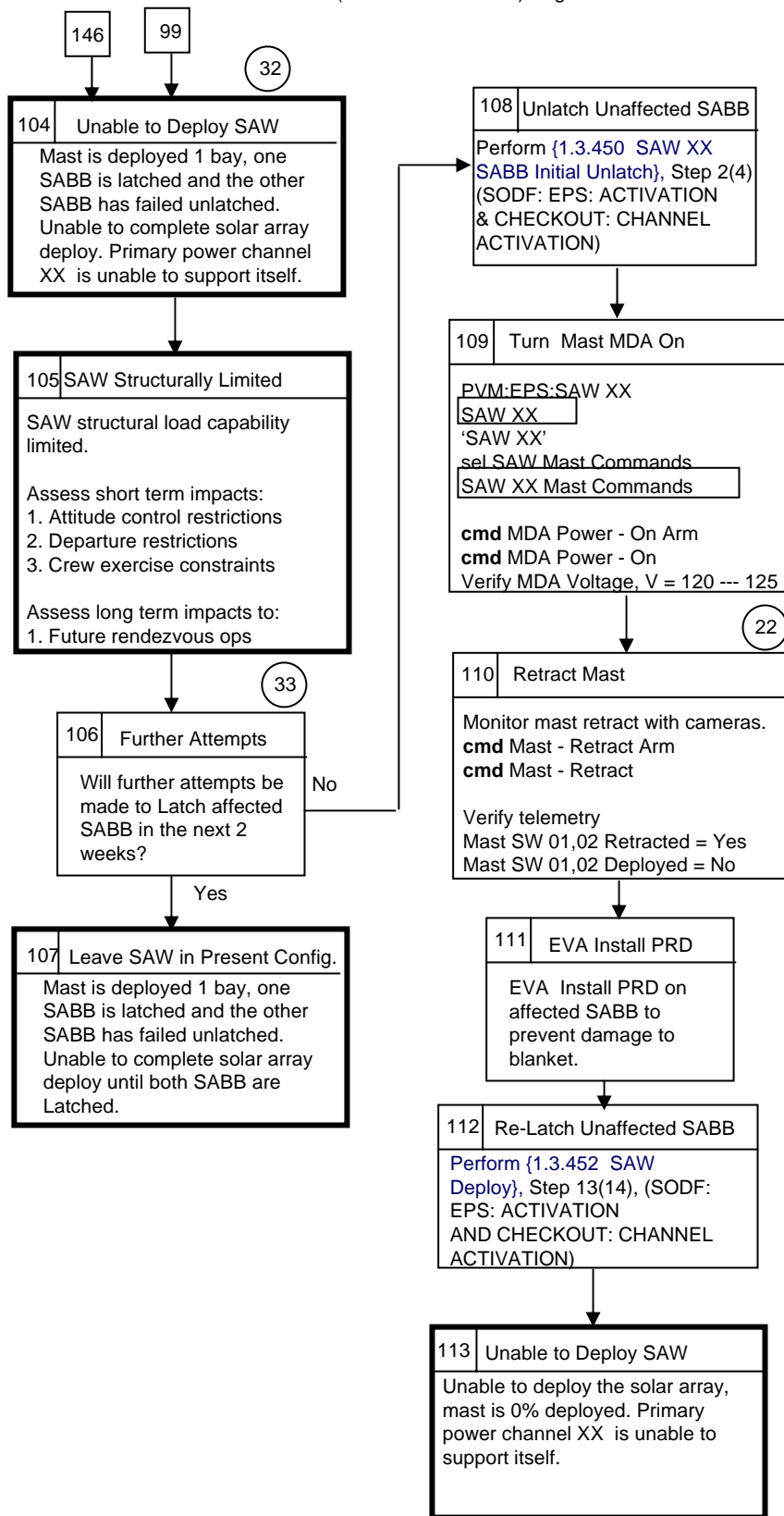


31

Operational load constraints apply for a partially deployed array

### 3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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22 Confirm that ISS Thrusters are inhibited or ISS/Orbiter in Free Drift and no crew un-isolated exercise or max EVA loads prior to sending the Deploy or Retract command. If at any time mechanical movement is stopped or aborted, attitude control may be resumed.

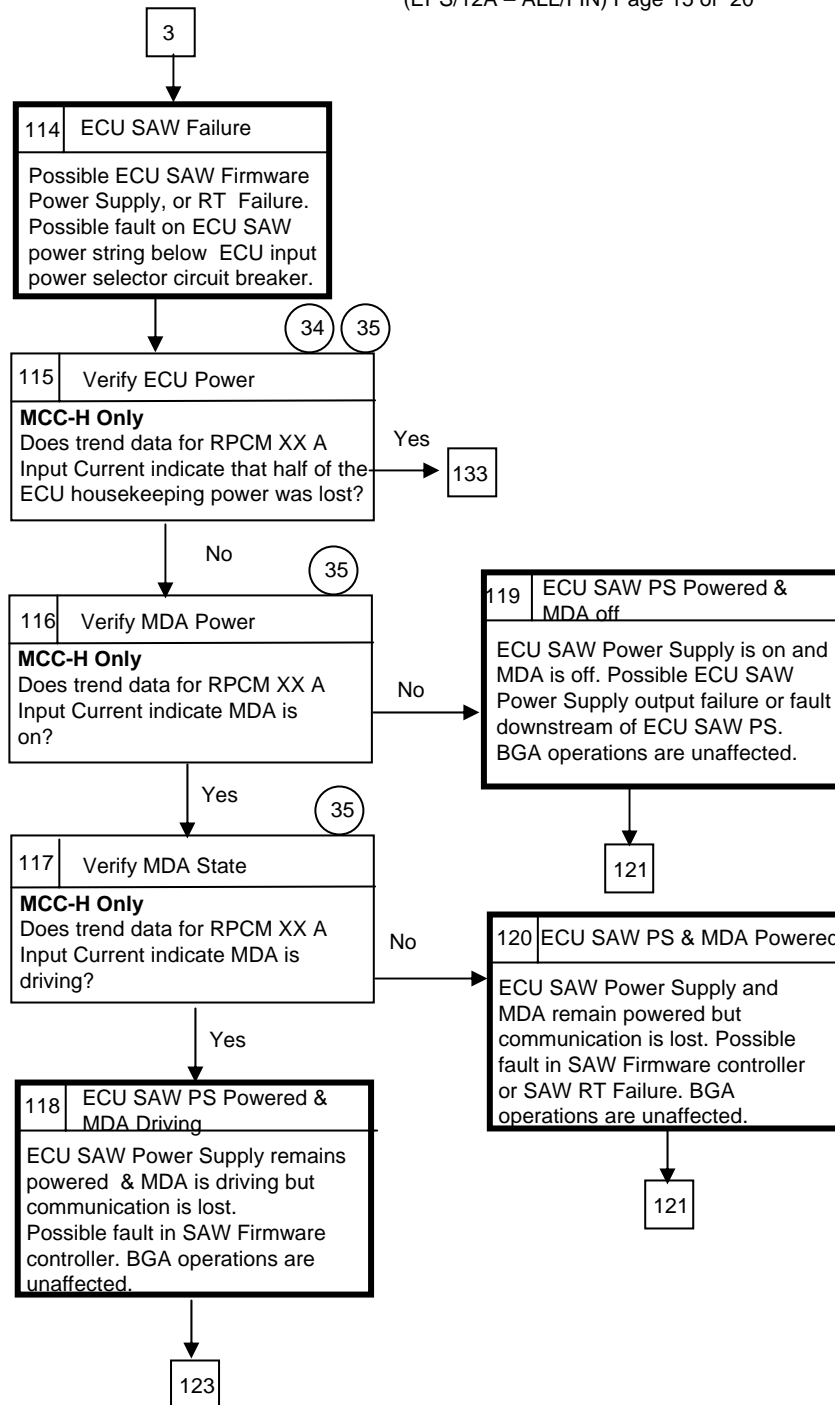
32 Both SABBs must be latched before deployment can continue. If the SABB is not latched, the blanket will not be tensioned when the array is at 100% deployed, and subject to damage from thrusters and external loads. The array can handle most loads in the 1 bay deployed configuration.

33 If unable to latch one of the SABBs, and PRD is not available, it is better to remain deployed to 1 mast bay than retract. Blanket is subject to damage when mast is fully retracted and the SABB is unlatched.



3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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34  
Total ECU housekeeping power is 115W (0.93A) at initialization and before BGA mtr or MDAs are turned on. Half of the ECU housekeeping power is 57.5W (0.47A)

35  
It only takes 14 sec to latch SABBs. When the MDA is on it draws about 0.22A. When the MDA is driving it can draw as high as 3.0A. MDA over current trip occurs at 0.78A. The MDA will stop driving but will remain on if one of the two "Latched" limit switches have contacted.

3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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119 120

37

121 | Reset ECU SAW Remote Terminal

**MCC-H Only**

Perform ECU SAW RT Reset from Ground:

<u>For P6 Solar Arrays</u>	<u>For S6 Solar Arrays</u>
CI PUI=P6PW96IM0042K	CI PUI=S6PX96IM0484K
SPUI=USPZ21MD0702	SPUI= USPZ21MD0702
SAW 2B = 33804	SAW 1B = 33292
SAW 4B = 17420	SAW 3B = 16908
<u>For P4 Solar Arrays</u>	<u>For S4 Solar Arrays</u>
CI PUI=P4PW95SM0042K	CI PUI=S4PW95SM0042K
SPUI=USPZ21MD0702	SPUI=USPZ21MD0702
SAW 2A = 17164	SAW 1A = 16652
SAW 4A = 33548	SAW 3A = 33036

36

Removes Power from MDA. When power is re-applied to the ECU the MDA will be off.

37

MCC-H must build and perform this step from command inventory.

38

Expect Caution message BGA XX Loss of Comm - PVM when RPC 01 is cmded open.

122 | ECU SAW Communicating

PVM:EPS:SAW XX  
SAW XX  
'ECU XX'

Is Integ Cnt incrementing?

124 | Communication Restored

Communication with the SAW has been restored.

118

36 38

123 | Remove ECU Power

PVM:EPS:SAW XX  
SAW XX  
sel RPCM YY A RPC 02

RPCM YY A RPC 02

cmd RPC Position - Open (Verify - Op)

SAW XX  
sel RPCM XX A RPC 01

RPCM XX A RPC 01

cmd RPC Position - Open (Verify - Op)

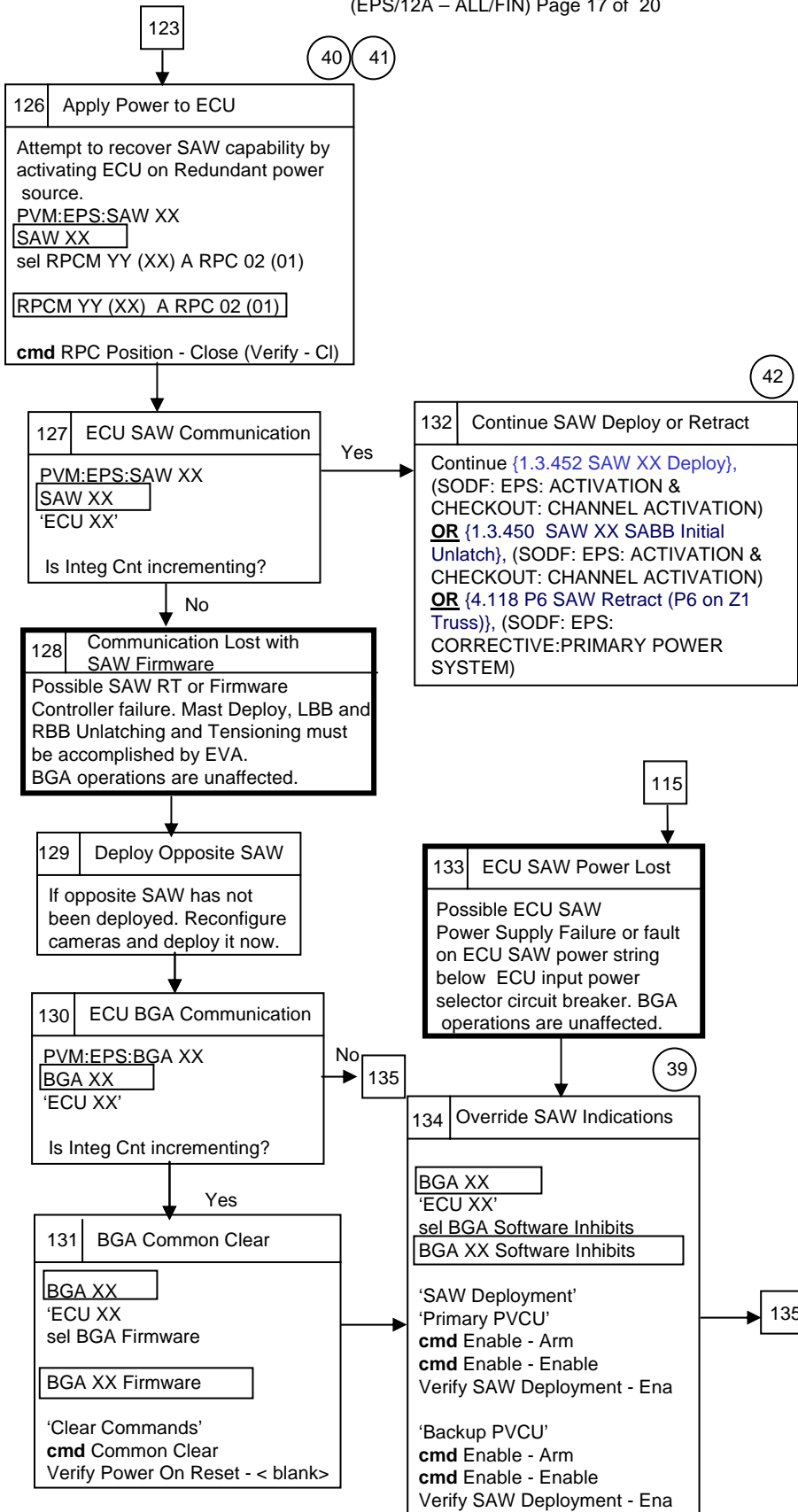
126

125 | Continue SAW Deploy or Retract

Continue {1.3.452 SAW XX Deploy}, (SODF: EPS: ACTIVATION & CHECKOUT: CHANNEL ACTIVATION) **OR** {1.3.450 SAW XX SABB Initial Unlatch}, (SODF: EPS: ACTIVATION & CHECKOUT: CHANNEL ACTIVATION) **OR** {4.118 P6 SAW Retract (P6 on Z1 Truss)}, (SODF: EPS: CORRECTIVE:PRIMARY POWER SYSTEM)

### 3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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39 Allows BGA to be operated when SAW Mast is in an undetermined state, or comm is lost with SAW FWC

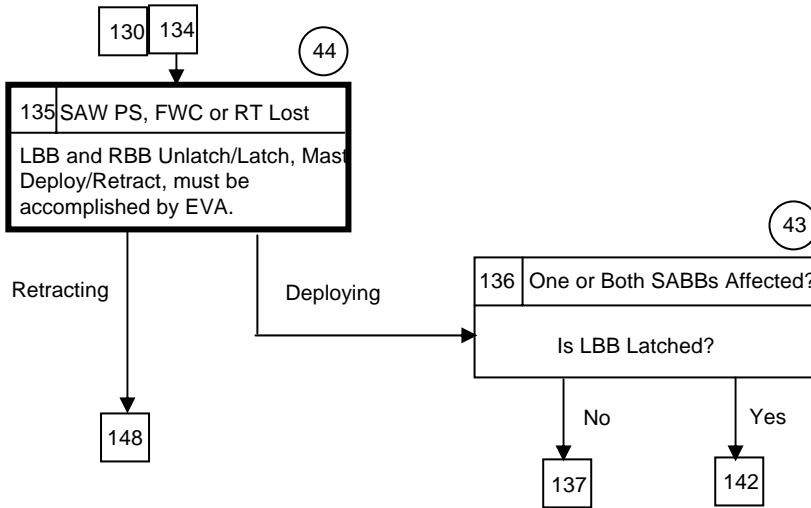
40 Caution message BGA XX 1553/ FWC Errors- PVM may be received after RPC 01 is closed.

41 ECU power is supplied by the opposite deck channel (YY) for SAW Retraction Operations and Channel (XX) for Deploy Operations

42 If power was removed from the ECU you must begin again with step 1 of the Deploy/Retract procedure, to reset the F/W inhibits.

3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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43

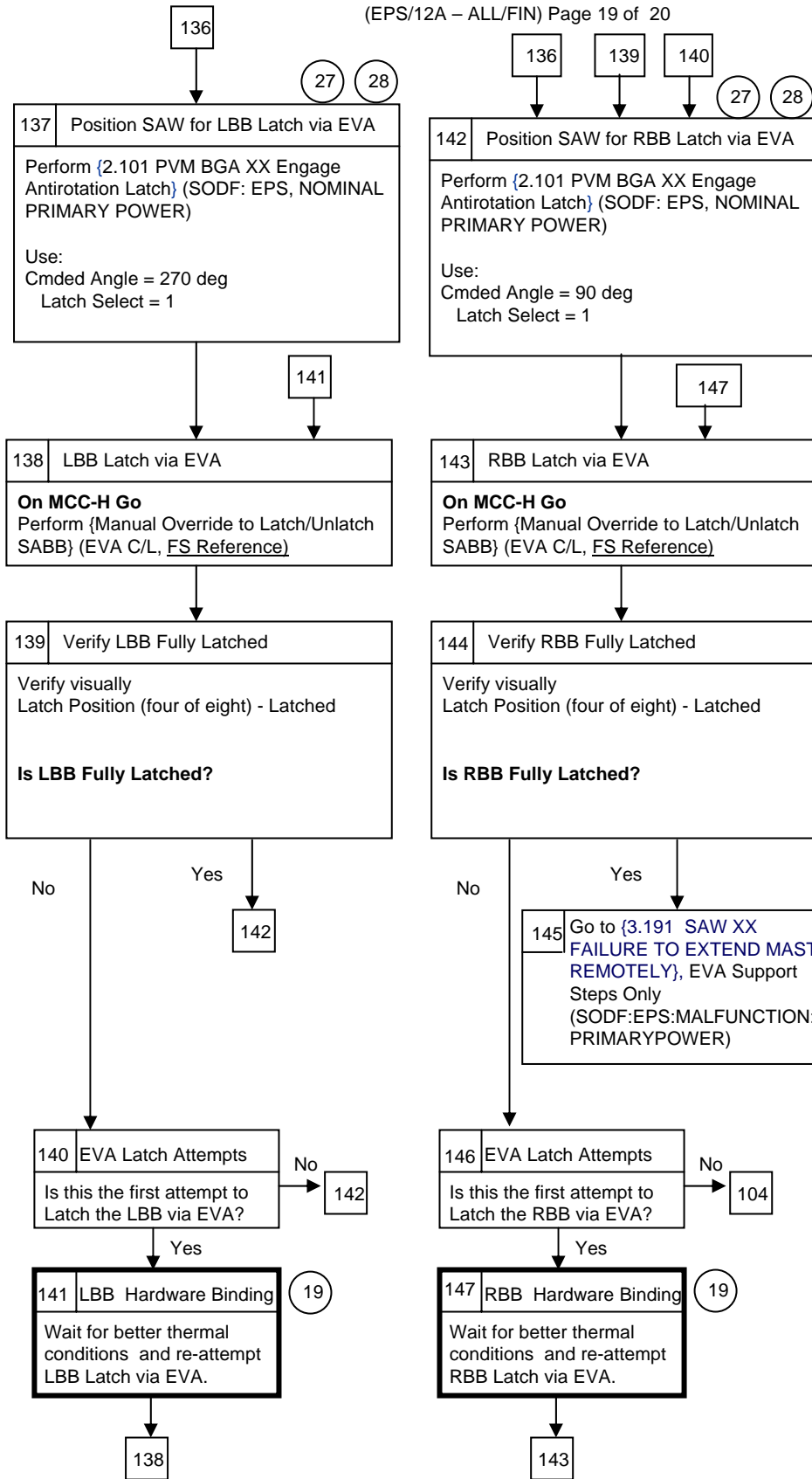
Assumes 1 bay has been deployed and one (both) SABBs are unlatched.

44

No thermal conditioning of the SAW is required if manually deploying, due to fact that it takes longer to deploy and it is warming throughout the manual deploy, also the crew can respond faster to stop the deploy.

3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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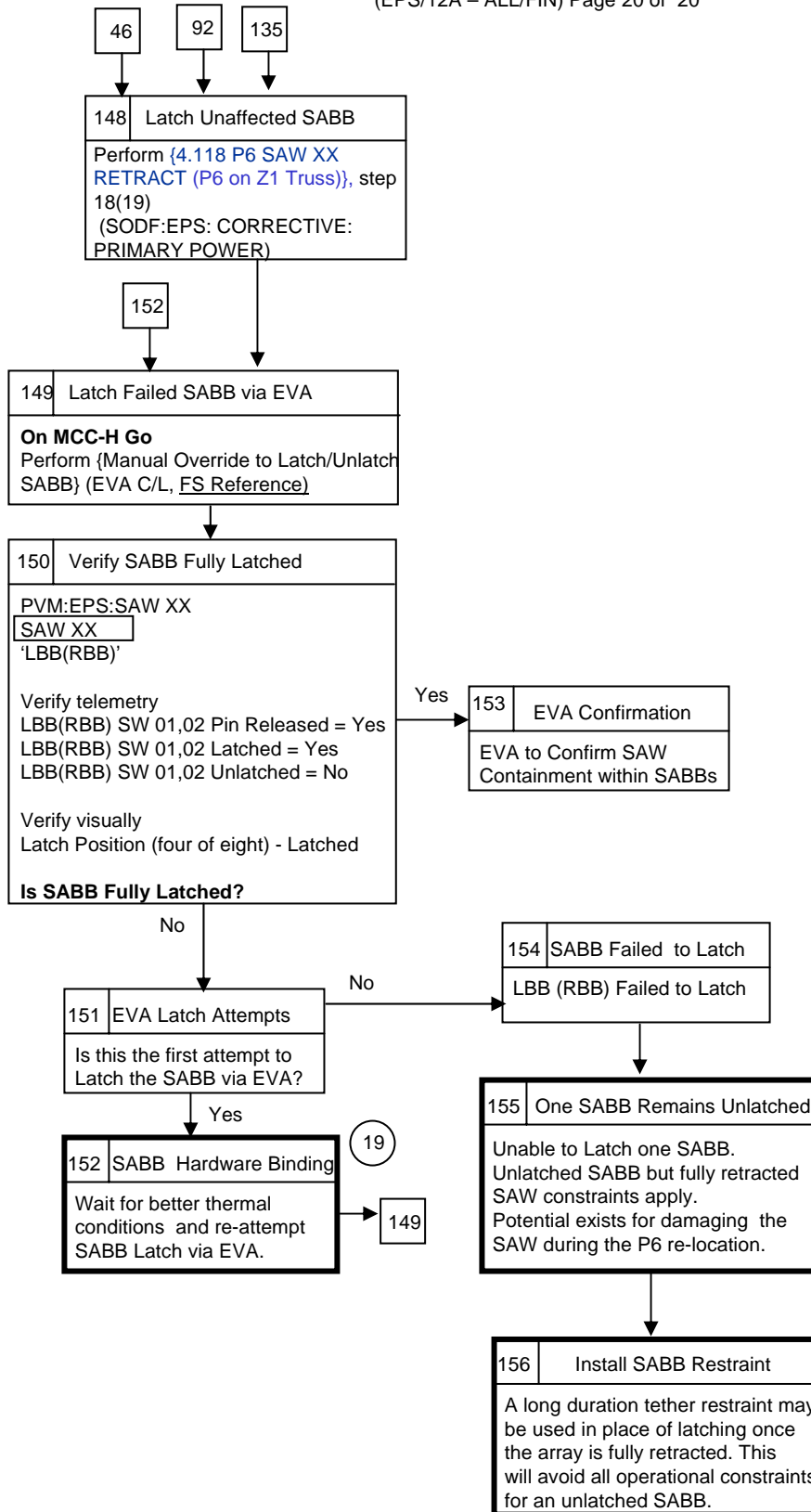
19 Re-attempt will be made at the end of insolation or end of eclipse, which ever case is opposite initial attempt.

27 This step can take up to 1 hr to complete. The latch cmd can be sent when the BGA Actual Angle is within 1 deg of the commanded value in order to save time.

28 This step may be omitted if EVA crew can free float and drive the MDA.

3.193 SAW XX FAILURE TO LATCH (TENSION) SABB REMOTELY

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19

Re-attempt will be made at the end of insolation or end of eclipse, whichever case is opposite initial attempt.

# LAB LTL IFHX CONFIG FOR CHANGEOVER

(ASSY OPS/12A.1/FIN/SPN) Page 1 of 4 pages

## OBJECTIVE:

This procedure configures the LAB ITCS, P6 EETCS and S1 ETCS in preparation for swapping the LAB LTL IFHX from EETCS to ETCS. This procedure also removes and inhibits Node 1 power to the LTL IFHX valves in preparation for the EVA activity to transfer the LTL IFHX power and data connection to S0.

### 1. UPLINKING EXISTENCE PPLs

**MCC-H**

If not already performed

Build EXT MDM PPL data load: FFLM - ETCS Loop A Hardware  
Install State - Version 12101 per {1.231 [CCS BUILD DATA LOAD COMMAND](#)} (SODF: GND AVIONICS: C&DH: NOMINAL), then:

Uplink EXT MDM PPL data load: FFLM - ETCS Loop A Hardware  
Install State - Version 12101 per {1.236 [CCS DATA LOAD MANAGEMENT](#)} (SODF: GND AVIONICS: C&DH: NOMINAL), then:

Build S0 1 MDM PPL data load: FFLA - ETCS Loop A Hardware  
Install State - Version 12101 per {1.231 [CCS BUILD DATA LOAD COMMAND](#)} (SODF: GND AVIONICS: C&DH: NOMINAL), then:

Uplink S0 1 MDM PPL data load: FFLA - ETCS Loop A Hardware  
Install State - Version 12101 per {1.236 [CCS DATA LOAD MANAGEMENT](#)} (SODF: GND AVIONICS: C&DH: NOMINAL), then:

### 2. CHANGING LAB ITCS MODE

US Lab: TCS

'Status'

If ITCS Mode = Dual

Perform {2.204 [LAB IATCS TRANSITION TO SINGLE LT \(AUTO\)](#)},  
all (SODF: TCS: NOMINAL: IATCS), then:

### 3. CHANGING MTL SETPOINT

√**MCC-H** for desired LTL temperature

To change MTL setpoint to desired LTL temperature, perform {2.201 [LAB IATCS SETPOINT CHANGE](#)}, all (SODF: TCS: NOMINAL: IATCS),  
then:

### 4. DISABLING LAB AFT ENDCONE HEATERS

P6: TCS: LTL IFHX: LTL IFHX Heater Commands

'Commands'

'LTL IFHX'

'Htr Sys'

**cmd** CLC Inhibit – Arm (√ – √)

**cmd** CLC Inhibit – Inh (√ – Inh)

## LAB LTL IFHX CONFIG FOR CHANGEOVER

(ASSY OPS/12A.1/FIN/SPN)

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√Htr Sys CLC – Inh

US Lab: TCS: IATCS Details: LAB Shell Heater Control: LAB Shell Htr1

**LAB Shell Htr1**

'Heater 1 Cmd Status'

**cmd** Override Off – Arm (√ – √)

**cmd** Override Off – OvrD Off

√Heater 1 Cmd Status – OvrD Off

### 5. POSITIONING LTL TWMV

US Lab: TCS: LTL TWMV icon

**LTL TWMV Commands**

'Commands'

'LTL TWMV'

**cmd** CLC – Inh **Execute** (√ – Inh)

**cmd** Posn – Byp **Execute** (√ – Byp)

sel RPCM LA1B F RPC 04

**RPCM LA1B F RPC 04**

**cmd** RPC Position – Open (√ – Op)

Wait 5 minutes.

### 6. SHUTTING DOWN EETCS LOOP A

For Loop A, perform {2.105 EETCS LOOP A(B) PFCS SHUTDOWN}, steps 2, 3, 4 and 8 (SODF: TCS: NOMINAL: EETCS), then:

### 7. INHIBITING EETCS UNDERTEMP FDIR

P6: TCS: LoopA Details: LoopA PFCS FDIR Commands

**LoopA PFCS FDIR Commands**

'EETCS Loop APFCS'

'Min Out Temp FDIR'

**cmd** Inhibit – Arm (√ – X)

**cmd** Inhibit – Inh

√Min Out Temp FDIR – Inh

sel LoopA Bkup PVCU Commands

**LoopA Bkup PVCU Commands**

'Bkup PVCU EETCS LoopA'

'PFCS Min Out Temp FDIR'



## LAB LTL IFHX CONFIG FOR CHANGEOVER

(ASSY OPS/12A.1/FIN/SPN)

Page 3 of 4 pages

**cmd** Inhibit – Arm

**cmd** Inhibit – Inh

√PFCS Min Out Temp FDIR – Inh

P6: TCS: LTL IFHX

LAB LTL IFHX Commands NCS

'Commands'

'LTL IFHX NH3'

**cmd** Undtemp Resp – Inh **Execute** (√ – Inh)

### 8. INHIBITING IFHX LEAK FDIR

sel IFHX Safing

IFHX Safing

'LTL IFHX Leak Resp'

**cmd** Inhibit – Arm (√ – √)

**cmd** Inhibit – Inh

√LTL IFHX Leak Resp – Inh

### 9. REDUCING ETCS AMMONIA LOOP PRESSURE (IF REQUIRED)

S1: TCS: ATA

Loop A ATA

'Telemetry'

'ATA'

If Voted Out Press > 1825 kPa

For Loop A to pressure of 1725 kPa, perform {2.506 CHANGE ETCS LOOP A(B) PRESSURE - AUTO}, all (SODF: TCS: NOMINAL: ETCS), then:

### 10. INHIBITING S0 POWER TO THE LTL IFHX VALVES

S0: EPS: RPCM S01A D: RPC 3

RPCM S01A D RPC 03

√RPC Position – Op

**cmd** Close Cmd – Inhibit (√ – Inh)

### 11. REMOVING NODE 1 POWER FROM LAB LTL IFHX VALVES

#### NOTE

Notify ECLSS and ODIN that N1 MDM heaters and SDS valves will lose power upon execution of this step.

## LAB LTL IFHX CONFIG FOR CHANGEOVER

(ASSY OPS/12A.1/FIN/SPN) Page 4 of 4 pages

P6: TCS: LTL IFHX: RPCM N1RS1 A RPC 05

RPCM N1RS1 A RPC 05

**cmd** RPC Position – Open (√ – Op)

**cmd** Close Cmd – Inhibit (√ – Inh)

P6: TCS: LTL IFHX: RPCM N1RS1 A RPC 06

RPCM N1RS1 A RPC 06

**cmd** RPC Position – Open (√ – Op)

**cmd** Close Cmd – Inhibit (√ – Inh)

Notify EVA crew, “Go for LAB LTL IFHX power and data connection transfer from Node 1 to S0.”

### 12. CONFIGURING NODE MDM HEATERS

CDH: MDM N1-2

Primary Node 1 MDM

'N1-1 Heaters'

sel Op

N1 1 MDM Operational Heater

**cmd** Inhibit **Execute**

Verify Availability – Inh

CDH: MDM N1-2

Primary Node 1 MDM

'N1-1 Heaters'

sel Surv

N1 1 MDM Survival Heater

**cmd** Ena Opr **Execute**

Verify Availability – Ena Opr

# LAB LTL IFHX CHECKOUT - POST DATA RECONFIG

(ASSY OPS/12A.1/FIN)

Page 1 of 3 pages

## OBJECTIVE:

This procedure cycle the LAB LTL IFHX valves through all positions after the data and power connectivity has been swapped over to the S0 1 MDM, but prior to changing the fluid umbilicals from EETCS to ETCS.

### NOTE

1. If previous failures have taken ETCS Loop A out of Cooling mode, the IFHX commands in this procedure will not work without command overrides.
2. This procedure assumes that EETCS Loop A flow is stopped.

- PCS
1. CONFIGURING FOR IFHX CHECK  
S1: TCS: Loop A Software: Loop A Logical Thread  
Loop A Logical Thread  
'Commands'  
'S0-1 MDM'

√ETCS HAC – Ena

S0: EPS: RPCM S01A D: RPC 3  
RPCM S01A D RPC 03

**cmd** Close Cmd – Enable (√ – Ena)

2. COMMANDING LAB LTL IFHX BYPASS VALVE TO FLOTHRU

### **CAUTION**

The valves listed below (in steps 2 through 5) must complete the transition to the desired position. If the valve stops when in transition and is commanded in a different direction, it will be damaged.

### NOTE

As described in PRACA 3289, the IFHX valves (steps 2 through 5) may require commanding several times in order to reach end item. If one of the valves fails to reach the command position, it may be re-commanded in the same direction up to 10 times.

S0: TCS: Loop A IFHX: LAB LTL IFHX Commands  
LAB LTL IFHX Commands  
'Commands'  
'LAB LTL IFHX NH3'  
'Byp Vlv'

**cmd** Flothru – Ena

√Cntrl Avail – Ena

**cmd** Position – Flothru (√ – Flothru)

3. COMMANDING LAB LTL IFHX BYPASS VALVE TO BYPASS

**LAB LTL IFHX Commands**

'Commands'  
'LAB LTL IFHX NH3'  
'Byv Vlv'

**cmd** Bypass – Ena

√Cntrl Avail – Ena

**cmd** Position – Byp (√ – Bypass)

4. OPENING LAB LTL IFHX ISOLATION VALVE

**LAB LTL IFHX Commands**

'Commands'  
'LAB LTL IFHX NH3'  
'Isol Vlv'

**cmd** Open – Ena

√Cntrl Avail – Ena

**cmd** Position – Open (√ – Open)

5. ISOLATING LAB LTL IFHX

**LAB LTL IFHX Commands**

'Commands'  
'LAB LTL IFHX NH3'  
'Isol Vlv'

**cmd** Close – Ena

√Cntrl Avail – Ena

**cmd** Position – Close (√ – Closed)

6. INHIBITING ETCS UNDERTEMP FDIR

S1: TCS: Loop A Software: Loop A FDIR: Loop A ETCS FDIR

Commands

**Loop A ETCS FDIR Commands**

'Commands'  
'ETCS FDIR'  
'PM Undertemp'

**cmd** Inhibit – Arm (√ – √)

**cmd** Inhibit – Inhibit

# LAB LTL IFHX CHECKOUT - POST DATA RECONFIG

(ASSY OPS/12A.1/FIN)

Page 3 of 3 pages

√Availability – Inh

sel Loop A ETCS FDIR Addl Commands

Loop A ETCS FDIR Addl Commands

'Commands'

'ETCS FDIR'

'HAC Undertemp'

√Availability – Inh

S1: TCS: Loop A Software: Loop A FDIR: Loop A PCVP FDIR

Loop A PCVP FDIR

'Commands'

**cmd** Low Temp – Inh **Execute** (√ – Inh)

Notify EVA crew, "Go for LTL IFHX fluid umbilical transfer."

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# LAB MTL IFHX CONFIG – POST CHANGEOVER

(ASSY OPS/12A.1/FIN)

Page 1 of 5 pages

## OBJECTIVE:

This procedure integrates the LAB MTL IFHX after power and data to the MTL IFHX valves has been transferred to the S0 2 MDM, MTL IFHX valve checkout is complete, and both supply and return fluid umbilicals have been connected. The procedure also fully shuts down the P6 EETCS and returns the LAB ITCS and P1 ETCS to nominal configurations.

### NOTE

If previous failures have taken ETCS Loop B out of Cooling mode, the IFHX commands in this procedure will not work.

- PCS
1. ENABLING LAB AFT ENDCONE HEATERS  
US Lab: TCS: IATCS Details: LAB Shell Heater Control: LAB Shell Htr1  
LAB Shell Htr1  
'Heater 1 Cmd Status'

**cmd** Override On – Ovr On

√Heater 1 Cmd Status – Ovr On

P6: TCS: MTL IFHX: MTL IFHX Heater Commands

MTL IFHX Heater Commands

'Commands'

'MTL IFHX'

'Htr Sys'

**cmd** CLC Enable – Ena

√Htr Sys CLC – Ena

2. VERIFYING ETCS TEMPERATURES

### NOTE

Ensure ETCS temperatures are stable prior to performing the verification in this step.

P1: TCS

P1:Loop B Overview

'PM (Pump Module)'

Verify PM Out Temp > 5.0 deg C

3. ENABLING ETCS UNDERTEMP FDIR

P1: TCS: Loop B Software: Loop B FDIR: Loop B ETCS FDIR  
Commands

Loop B ETCS FDIR Commands

'Commands'

'ETCS FDIR'

'PM Undertemp'

**cmd** Enable – Enable

# LAB MTL IFHX CONFIG – POST CHANGEOVER

(ASSY OPS/12A.1/FIN)

Page 2 of 5 pages

√Availability – Ena

sel Loop B ETCS FDIR Addl Commands

Loop B ETCS FDIR Addl Commands

'Commands'

'ETCS FDIR'

'HAC Undertemp'

**cmd** Enable – Enable

√Availability – Ena

P1: TCS: Loop B Software: Loop B FDIR: Loop B PCVP FDIR

Loop B PCVP FDIR

'Commands'

**cmd** Low Temp – Ena **Execute** (√ – Ena)

## 4. OPENING LAB MTL IFHX ISOLATION VALVE

### CAUTION

The valves listed below (in steps 4 through 5) must complete the transition to the desired position. If the valve stops when in transition and is commanded in a different direction, it will be damaged.

### NOTE

As described in PRACA 3289, the IFHX valves (steps 4 through 5) may require commanding several times in order to reach end item. If one of the valves fails to reach the command position, it may be recommanded in the same direction up to 10 times.

S0: TCS: Loop B IFHX: LAB MTL IFHX Commands

LAB MTL IFHX Commands

'Commands'

'LAB MTL IFHX NH3'

'Isol Vlv'

**cmd** Open – Ena

√Cntrl Avail – Ena

**cmd** Position – Open (√ – Open)



## LAB MTL IFHX CONFIG – POST CHANGEOVER

(ASSY OPS/12A.1/FIN)

Page 3 of 5 pages

### 5. COMMANDING LAB MTL IFHX BYPASS VALVE TO FLOTHRU

**LAB MTL IFHX Commands**

'Commands'

'LAB MTL IFHX NH3'

'Byv Vlv'

**cmd** Flothru – Ena

√Cntrl Avail – Ena

**cmd** Position – Flothru (√ – Flothru)

### 6. RESTORING POWER TO MTL TWMV

US Lab: TCS: MTL TWMV icon: RPCM LA2B G RPC 02

**RPCM LA2B G RPC 02**

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

### 7. CLEANING UP LAB ITCS MODE

If desired ITCS Mode is Dual

Perform {2.203 LAB IATCS TRANSITION TO DUAL (AUTO)}, all  
(SODF: TCS: NOMINAL: IATCS), then:

If desired ITCS Mode is Single LT

Perform {2.204 LAB IATCS TRANSITION TO SINGLE LT (AUTO)},  
all (SODF: TCS: NOMINAL: IATCS), then:

If desired ITCS Mode is Single MT

Perform {2.205 LAB IATCS TRANSITION TO SINGLE MT (AUTO)},  
all (SODF: TCS: NOMINAL: IATCS), then:

### 8. RESTORING POWER TO NODE 1 SDO CARDS

P6: TCS: MTL IFHX: RPCM N1RS2 C RPC 04

**RPCM N1RS2 C RPC 04**

**cmd** Close Cmd – Enable (√ – Ena)

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

### 9. INHIBITING CCS TCS FDIR

US Lab: TCS: Thermal Load Reduction

**Thermal Load Reduction**

'IATCS Reconfig'

**cmd** Inhibit – Arm (√ – √)

**cmd** Inhibit – Inh

√IATCS Reconfig – Inh

'Auto Thermal Load Shed'

# LAB MTL IFHX CONFIG – POST CHANGEOVER

(ASSY OPS/12A.1/FIN)

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**cmd** Inhibit – Arm (√ – √)

**cmd** Inhibit – Inh

√Auto Thermal Load Shed – Inh

- MCC-H** 10. [UPLINKING IATCS CONFIGURATION PPL](#)  
Build CC MDM PPL data load: 196 - TCS Configuration - Version 4005  
per {1.231 [CCS BUILD DATA LOAD COMMAND](#)} (SODF: GND  
AVIONICS: C&DH: NOMINAL), then:

Uplink CC MDM PPL data load: 196 - TCS Configuration - Version 4005  
per {1.236 [CCS DATA LOAD MANAGEMENT](#)} (SODF: GND  
AVIONICS: C&DH: NOMINAL), then:

- PCS** 11. [ENABLING CCS TCS FDIR](#)  
US Lab: TCS: Thermal Load Reduction  

Thermal Load Reduction
------------------------

  
'IATCS Reconfig'

**cmd** Enable – Ena

√IATCS Reconfig – Ena

'Auto Thermal Load Shed'

**cmd** Enable – Ena

√Auto Thermal Load Shed – Ena

12. [ENABLING IFHX LEAK FDIR](#)  
US Lab: TCS: LTL IFHX: NCS: IFHX Safing  

IFHX Safing
-------------

  
'LTL IFHX Leak Resp'

**cmd** Enable – Ena

√LTL IFHX Leak Resp – Ena

'MTL IFHX Leak Resp'

**cmd** Enable – Ena

√MTL IFHX Leak Resp – Ena

## LAB MTL IFHX CONFIG – POST CHANGEOVER

(ASSY OPS/12A.1/FIN)

Page 5 of 5 pages

### 13. REMOVING POWER FROM EETCS LOOP B PFCS

If full EETCS Shutdown is desired

For Loop B, perform {2.105 EETCS LOOP A(B) PFCS SHUTDOWN}, steps 5 and 6 (SODF: TCS: NOMINAL: EETCS), then:

If full EETCS Shutdown is not desired

For Loop B, perform {4.106 EETCS LOOPS A(B) RESTART}, steps 5 to 8, 11 to 12, 14, and 20 to 21, (SODF: TCS: CORRECTIVE: EETCS), then:

### 14. CONFIGURING NODE MDM HEATERS

CDH: MDM N1-2

Primary Node 1 MDM

'N1-2 Heaters'

sel Surv

N1 2 MDM Survival Heater

**cmd** Ena Bkup **Execute**

Verify Availability – Ena Bkup

CDH: MDM N1-2

Primary Node 1 MDM

'N1-2 Heaters'

sel Op

N1 2 MDM Operational Heater

**cmd** Ena Opr **Execute**

Verify Availability – Ena Opr

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# LAB MTL IFHX CONFIG FOR CHANGEOVER

(ASSY OPS/12A.1/FIN)

Page 1 of 4 pages

## OBJECTIVE:

This procedure configures the LAB ITCS, P6 EETCS and P1 ETCS in preparation for swapping the LAB MTL IFHX from EETCS to ETCS. This procedure also removes and inhibits Node 1 power to the MTL IFHX valves in preparation for the EVA activity to transfer the MTL IFHX power and data connection to S0.

### 1. UPLINK EXISTENCE PPLs

MCC-H

If not already performed

Build EXT MDM PPL data load: FFMM - ETCS Loop B Hardware  
Install State - Version 12101 per {1.231 CCS BUILD DATA LOAD  
COMMAND} (SODF: GND AVIONICS: C&DH: NOMINAL), then:

Uplink EXT MDM PPL data load: FFMM - ETCS Loop B Hardware  
Install State - Version 12101 per {1.236 CCS DATA LOAD  
MANAGEMENT} (SODF: GND AVIONICS: C&DH: NOMINAL), then:

Build S0 2 MDM PPL data load: FFMB - ETCS Loop B Hardware  
Install State - Version 12101 per {1.231 CCS BUILD DATA LOAD  
COMMAND} (SODF: GND AVIONICS: C&DH: NOMINAL), then:

Uplink S0 2 MDM PPL data load: FFMB - ETCS Loop B Hardware  
Install State - Version 12101 per {1.236 CCS DATA LOAD  
MANAGEMENT} (SODF: GND AVIONICS: C&DH: NOMINAL), then:

### 2. CHANGING LAB ITCS MODE

PCS

US Lab: TCS

Lab:IATCS Overview

'Status'

If ITCS Mode = Dual

Perform {2.204 LAB IATCS TRANSITION TO SINGLE LT (AUTO)},  
all (SODF: TCS: NOMINAL: ITCS), then:

### 3. DISABLING LAB AFT ENDCONE HEATERS

P6: TCS: MTL IFHX: MTL IFHX Heater Commands

MTL IFHX Heater Commands

'Commands'

'MTL IFHX'

'Htr Sys'

**cmd** CLC Inhibit – Arm ( $\surd$  –  $\surd$ )

**cmd** CLC Inhibit – Inh ( $\surd$  – Inh)

$\surd$ Htr Sys CLC – Inh

US Lab: TCS: IATCS Details: LAB Shell Heater Control: LAB Shell Htr1

LAB Shell Htr1

'Heater 1 Cmd Status'

**cmd** Override Off – Arm (√ – √)  
**cmd** Override Off – Ovrđ Off

√Heater 1 Cmd Status – Ovrđ Off

4. [POSITIONING MTL TWMV](#)

LAB: TCS: MTL TWMV icon

**MTL TWMV Commands**

'Commands'

'MTL TWMV'

**cmd** CLC – Inh **Execute** (√ – Inh)

**cmd** Posn – Byp **Execute** (√ – Byp)

sel RPCM LA2B G RPC 02

**RPCM LA2B G RPC 02**

**cmd** RPC Position – Open (√ – Op)

Wait 5 minutes.

5. [SHUTTING DOWN EETCS LOOP B](#)

For Loop B, perform {2.105 EETCS LOOP A(B) PFCS SHUTDOWN}, steps 2, 3, 4, and 8 (SODF: TCS: NOMINAL: EETCS), then:

6. [INHIBITING EETCS UNDERTEMP FDIR](#)

P6: TCS: LoopB Details: LoopB PFCS FDIR Commands

**LoopB PFCS FDIR Commands**

'EETCS LoopB PFCS'

'Min Out Temp FDIR'

**cmd** Inhibit – Arm (√ – X)

**cmd** Inhibit – Inh

√Min Out Temp FDIR – Inh

sel LoopB Bkup PVCU Commands

**LoopB Bkup PVCU Commands**

'Bkup PVCU EETCS LoopB'

'PFCS Min Out Temp FDIR'

**cmd** Inhibit – Arm

**cmd** Inhibit – Inh

√PFCS Min Out Temp FDIR – Inh

# LAB MTL IFHX CONFIG FOR CHANGEOVER

(ASSY OPS/12A.1/FIN)

Page 3 of 4 pages

P6: TCS: MTL IFHX

LAB MTL IFHX Commands NCS

'Commands'

'MTL IFHX NH3'

**cmd** Undtemp Resp – Inh **Execute** ( $\surd$  – Inh)

## 7. INHIBITING IFHX LEAK FDIR

sel IFHX Safing

IFHX Safing

'MTL IFHX Leak Resp'

**cmd** Inhibit – Arm ( $\surd$  –  $\surd$ )

**cmd** Inhibit – Inh

$\surd$ MTL IFHX Leak Resp – Inh

## 8. REDUCING ETCS AMMONIA LOOP PRESSURE

P1: TCS: ATA

Loop B ATA

'Telemetry'

'ATA'

If Voted Out Press > 1825 kPa

For Loop B to pressure of 1725 kPa, perform {2.506 CHANGE ETCS LOOP A(B) PRESSURE - AUTO}, all (SODF: TCS: NOMINAL: ETCS), then:

## 9. INHIBITING S0 POWER TO THE MTL IFHX VALVES

S0: EPS: RPCM S02B D: RPC 3

RPCM S02B D RPC 03

$\surd$ RPC Position – Op

**cmd** Close Cmd – Inhibit ( $\surd$  – Inh)

## 10. REMOVING NODE 1 POWER FROM LAB MTL IFHX VALVES

### NOTE

Notify ODIN that N1 MDM heaters will lose power upon execution of this step.

P6: TCS: MTL IFHX: RPCM N1RS2 C RPC 03

RPCM N1RS2 C RPC 03

**cmd** RPC Position – Open ( $\surd$  – Op)

**cmd** Close Cmd – Inhibit ( $\surd$  – Inh)

## LAB MTL IFHX CONFIG FOR CHANGEOVER

(ASSY OPS/12A.1/FIN)

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P6: TCS: MTL IFHX: RPCM N1RS2 C RPC 04

RPCM N1RS2 C RPC 04

**cmd** RPC Position – Open (√ – Op)

**cmd** Close Cmd – Inhibit (√ – Inh)

Notify EVA crew, “Go for LAB MTL IFHX power and data connection transfer from Node 1 to S0.”

### 11. CONFIGURING NODE MDM HEATERS

CDH: MDM N1-2

Primary Node 1 MDM

'N1-2 Heaters'

sel Op

N1 2 MDM Operational Heater

**cmd** Inhibit **Execute**

Verify Availability – Inh

CDH: MDM N1-2

Primary Node 1 MDM

'N1-2 Heaters'

sel Surv

N1 2 MDM Survival Heater

**cmd** Ena Opr **Execute**

Verify Availability – Ena Opr



# LAB MTL IFHX CHECKOUT - POST DATA RECONFIG

(ASSY OPS/12A.1/FIN)

Page 1 of 3 pages

## OBJECTIVE:

This procedure cycles the LAB MTL IFHX valves through all positions after the data and power connectivity has been swapped over to the S0 2 MDM, but prior to changing the fluid umbilicals from EETCS to ETCS.

### NOTE

1. If previous failures have taken ETCS Loop B out of Cooling mode, the IFHX commands in this procedure will not work without command overrides.
2. This procedure assumes that EETCS Loop B flow is stopped.

PCS

## 1. CONFIGURING FOR IFHX CHECK

P1: TCS: Loop B Software: Loop B Logical Thread

Loop B Logical Thread

'Commands'

'S0-2 MDM'

√ETCS HAC – Ena

S0: EPS: RPCM S02B D: RPC 3

RPCM S02B D RPC 03

**cmd** Close Cmd – Enable (√ – Ena)

## 2. COMMANDING LAB MTL IFHX BYPASS VALVE TO FLOTHRU

### **CAUTION**

The valves listed below (in steps 2 through 5) must complete the transition to the desired position. If the valve stops when in transition and is commanded in a different direction, it will be damaged.

### NOTE

As described in PRACA 3289, the IFHX valves (steps 2 through 5) may require commanding several times in order to reach end item. If one of the valves fails to reach the command position, it may be re-commanded in the same direction up to 10 times.

S0: TCS: Loop B IFHX: LAB MTL IFHX Commands

LAB MTL IFHX Commands

'Commands'

'LAB MTL IFHX NH3'

'Byv Vlv'

**cmd** Flothru – Ena

√Cntrl Avail – Ena

**cmd** Position – Flothru (√ – Flothru)

3. COMMANDING LAB MTL IFHX BYPASS VALVE TO BYPASS

**LAB MTL IFHX Commands**

'Commands'

'LAB MTL IFHX NH3'

'Byv Vlv'

**cmd** Bypass – Ena

√Cntrl Avail – Ena

**cmd** Position – Byp (√ – Bypass)

4. OPENING LAB MTL IFHX ISOLATION VALVE

**LAB MTL IFHX Commands**

'Commands'

'LAB MTL IFHX NH3'

'Isol Vlv'

**cmd** Open – Ena

√Cntrl Avail – Ena

**cmd** Position – Open (√ – Open)

5. ISOLATING LAB MTL IFHX

**LAB MTL IFHX Commands**

'Commands'

'LAB MTL IFHX NH3'

'Isol Vlv'

**cmd** Close – Ena

√Cntrl Avail – Ena

**cmd** Position – Close (√ – Close)

6. INHIBITING ETCS UNDERTEMP FDIR

P1: TCS: Loop B Software: Loop B FDIR: Loop B ETCS FDIR

Commands

**Loop B ETCS FDIR Commands**

'Commands'

'ETCS FDIR'

'PM Undertemp'

**cmd** Inhibit – Arm (√ – √)

**cmd** Inhibit – Inhibit

# LAB MTL IFHX CHECKOUT - POST DATA RECONFIG

(ASSY OPS/12A.1/FIN)

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√Availability – Inh

sel Loop B ETCS FDIR Addl Commands

Loop B ETCS FDIR Addl Commands

'Commands'

'ETCS FDIR'

'HAC Undertemp'

√Availability – Inh

P1: TCS: Loop B Software: Loop B FDIR: Loop B PCVP FDIR

Loop B PCVP FDIR

'Commands'

**cmd** Low Temp – Inh **Execute** (√ – Inh)

Notify EVA crew, "Go for MTL IFHX fluid umbilical transfer."

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# LAB LTL IFHX CONFIG - POST CHANGEOVER

(ASSY OPS/12A.1/FIN)

Page 1 of 4 pages

## OBJECTIVE:

This procedure integrates the LAB LTL IFHX after power and data to the LTL IFHX valves has been transferred to the S0 1 MDM, LTL IFHX valve checkout is complete, and both supply and return fluid umbilicals have been connected. The procedure also returns the LAB ITCS and S1 ETCS to nominal configurations.

### NOTE

If previous failures have taken ETCS Loop A out of Cooling mode, the IFHX commands in this procedure will not work.

- PCS 1. ENABLING LAB AFT ENDCONE HEATERS  
US Lab: TCS: IATCS Details: LAB Shell Heater Control: LAB Shell Htr1

LAB Shell Htr1

'Heater 1 Cmd Status'

**cmd** Override On – OvrD On

√Heater 1 Cmd Status – OvrD On

P6: TCS: LTL IFHX: LTL IFHX Heater Commands

LTL IFHX Heater Commands

'Commands'

'LTL IFHX'

'Htr Sys'

**cmd** CLC Enable – Ena

√Htr Sys CLC – Ena

2. VERIFYING ETCS TEMPERATURES

### NOTE

Ensure ETCS temperatures are stable prior to performing the verification in this step.

S1: TCS

S1:Loop A Overview

'PM (Pump Module)'

Verify PM Out Temp > 5.0 deg C

3. ENABLING ETCS UNDERTEMP FDIR

S1: TCS: Loop A Software: Loop A FDIR: Loop A ETCS FDIR  
Commands

Loop A ETCS FDIR Commands

'Commands'

'ETCS FDIR'

'PM Undertemp'

# LAB LTL IFHX CONFIG - POST CHANGEOVER

(ASSY OPS/12A.1/FIN)

Page 2 of 4 pages

**cmd** Enable – Enable

√Availability – Ena

sel Loop A ETCS FDIR Addl Commands

Loop A ETCS FDIR Addl Commands

'Commands'

'ETCS FDIR'

'HAC Undertemp'

**cmd** Enable – Enable

√Availability – Ena

S1: TCS: Loop A Software: Loop A FDIR: Loop A PCVP FDIR

Loop A PCVP FDIR

'Commands'

**cmd** Low Temp – Ena **Execute** (√ – Ena)

## 4. OPENING LAB LTL IFHX ISOLATION VALVE

### CAUTION

The valves listed below (in steps 4 through 5) must complete the transition to the desired position. If the valve stops when in transition and is commanded in a different direction, it will be damaged.

### NOTE

As described in PRACA 3289, the IFHX valves (steps 4 through 5) may require commanding several times in order to reach end item. If one of the valves fails to reach the command position, it may be re-commanded in the same direction up to 10 times.

S0: TCS: Loop A IFHX: LAB LTL IFHX Commands

LAB LTL IFHX Commands

'Commands'

'LAB LTL IFHX NH3'

'Isol Vlv'

**cmd** Open – Ena

√Cntrl Avail – Ena

**cmd** Position – Open (√ – Open)

**5. COMMANDING LAB LTL IFHX BYPASS VALVE TO FLOTHRU**

**LAB LTL IFHX Commands**

'Commands'

'LAB LTL IFHX NH3'

'Byv Vlv'

**cmd** Flothru – Ena

√Cntrl Avail – Ena

**cmd** Position – Flothru (√ – Flothru)

**6. ENABLING LTL TWMV**

US Lab: TCS: LTL TWMV icon: RPCM LA1B F RPC 04

**RPCM LA1B F RPCM 04**

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

US Lab: TCS: LTL TWMV icon

**LTL TWMV Commands**

'Commands'

'LTL TWMV'

**cmd** CLC – Ena **Execute** (√ – Ena)

**7. RESTORING MTL SETPOINT TO NOMINAL (IF NEEDED)**

If desired ITCS Mode is Single LT

    | To change MTL setpoint to 12.2 deg C, perform {[2.201 LAB IATCS SETPOINT CHANGE](#)}, all (SODF: TCS: NOMINAL: IATCS), then:

**8. CHANGING LAB ITCS MODE (IF NEEDED)**

If desired ITCS Mode is Dual

    | Perform {[2.203 LAB IATCS TRANSITION TO DUAL \(AUTO\)](#)}, all (SODF: TCS: NOMINAL: IATCS), then:

If desired ITCS Mode is Single MT

    | Perform {[2.205 LAB IATCS TRANSITION TO SINGLE MT \(AUTO\)](#)}, all (SODF: TCS: NOMINAL: IATCS), then:

**9. RESTORING POWER TO NODE 1 SDO CARDS**

P6: TCS: LTL IFHX: RPCM N1RS1 A RPC 05

**RPCM N1RS1 A RPC 05**

**cmd** Close Cmd – Enable (√ – Ena)

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

## LAB LTL IFHX CONFIG - POST CHANGEOVER

(ASSY OPS/12A.1/FIN)

Page 4 of 4 pages

P6: TCS: LTL IFHX: RPCM N1RS1 A RPC 06

RPCM N1RS1 A RPC 06

**cmd** Close Cmd – Enable (√ – Ena)

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

### 10. REMOVING POWER FROM EETCS LOOP A PFCS

If full EETCS Shutdown is desired

For Loop A, perform {2.105 EETCS LOOP A(B) PFCS SHUTDOWN}, steps 5 and 6 (SODF: TCS: NOMINAL: EETCS), then:

If full EETCS Shutdown is not desired

For Loop A, perform {4.106 EETCS LOOPS A(B) RESTART}, steps 5 to 8, 11 to 12, 14, and 20 to 21, (SODF: TCS: CORRECTIVE: EETCS), then:

### 11. CONFIGURING NODE MDM HEATERS

CDH: MDM N1-2

Primary Node 1 MDM

'N1-1 Heaters'

sel Surv

N1 1 MDM Survival Heater

**cmd** Ena Bkup **Execute**

Verify Availability – Ena Bkup

CDH: MDM N1-2

Primary Node 1 MDM

'N1-1 Heaters'

sel Op

N1 1 MDM Operational Heater

**cmd** Ena Opr **Execute**

Verify Availability – Ena Opr



# EXTERNAL TELEVISION CAMERA GROUP (ETVCG) - ASSEMBLY

(ASSY OPS/12A.1/FIN) Page 1 of 7 pages

## OBJECTIVE:

Assemble piece parts of External TV Camera Group (ETVCG) Assembly (Pan Tilt Unit (PTU), Color TV Camera (CTVC), Camera Lens Hood, TV Camera Interface Converter (TVCIC), ETVCG Light). The PTU, CTVC, and TVCIC are assembled in SPACEHAB and are transferred to the ISS. The ETVCG Light is installed post transfer and the entire assembly will be installed during an EVA to stanchions on the trusses and LAB to provide external camera views.

## LOCATION:

Stowed: Maximum Envelope Stowage System (MESS) Rack  
Assembled: steps 1, 2, 3, 5 - SPACEHAB Module  
steps 4, 5 - ISS

## DURATION:

45 minutes

## CREW:

Two

## PARTS:

Pan Tilt Unit (PTU) P/N 10033212-1  
Color TV Camera (CTVC) P/N 10033497-1  
TV Camera Interface Converter (TVCIC) P/N 10033211-501  
ETVCG Light P/N 1F01194-1

## MATERIALS:

SPACEHAB

AC08 Subsystem Stow Locker 4:  
ETVCG Materials and Tools Bag  
Disposable Gloves  
Braycote 601  
Dry Wipes

ISS

Disposable Gloves

## TOOLS:

SPACEHAB

AC08 Subsystem Stow Locker 4:  
ETVCG Materials and Tools Bag  
Ratchet, 1/4" Drive  
3/16" Hex Head, 3/8" Drive  
1/4" to 3/8" Adapter  
(40-200 in-lbs) Trq Wrench, 1/4" Drive  
Antistatic Wrist Tether  
Bungee Cords (two)

**EXTERNAL TELEVISION CAMERA GROUP (ETVCG) - ASSEMBLY**  
(ASSY OPS/12A.1/FIN) Page 2 of 7 pages

- ISS  
NOD1D4 ISS IVA Toolbox:  
Drawer 2:  
7/16" EVA Socket, 3/8" Drive  
Ratchet, 1/4" Drive  
1/4" to 3/8" Adapter  
(40-200 in-lbs) Trq Wrench, 1/4" Drive  
Drawer 5:  
Static Wrist Tether  
8-1/4" Long, 2" Cut Scissors

REFERENCED PROCEDURE(S):  
RACK FRONT STOWAGE TRAY REMOVAL

MESS Rack  
SPACEHAB

1. UNSTOWING ETVCG HARDWARE
  - 1.1 Remove rack front stowage from locations PF13 – PF18  
Temporarily stow, restrain for docking.
  - 1.2 Perform {RACK FRONT STOWAGE TRAY REMOVAL}, all (FDF: SH OPS, TRANSFER) for top two trays, then:
  - 1.3 Remove the foam covering the ETVCG hardware.  
Remove the ETVCG hardware (includes PTU, CTVC, TVCIC) from its stowage location within the rack.  
Temporarily stow all loose foam in MESS Rack.
2. VERIFYING TVCIC KEY CONFIGURATION

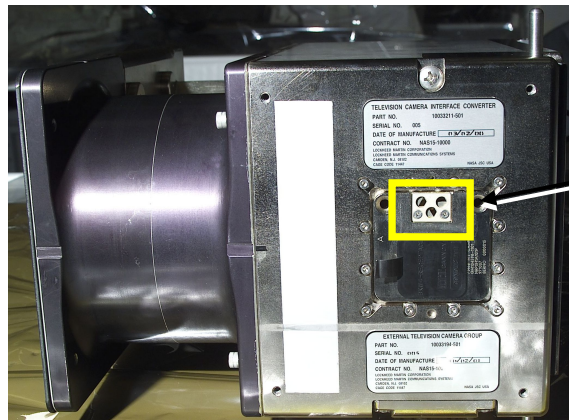


Figure 1.- Location of Keying Plate on TVCIC.

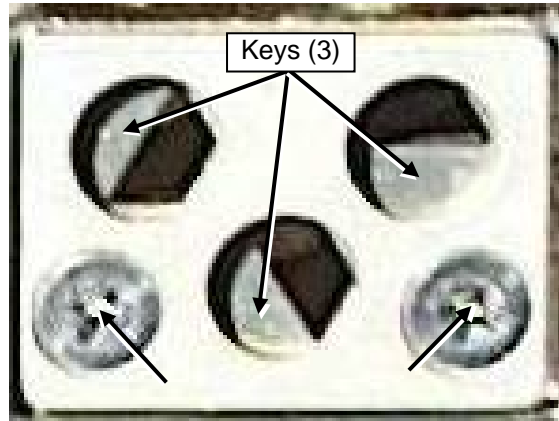


Figure 2.- Proper TVCIC Key Configuration.

- 2.1 Verifying Keying on TVCIC  
 Refer to Figures 1, 2.  
 If configuration incorrect, √**MCC-H**.

3. INSTALLING PTU, CTVC ON TVCIC

**NOTE**  
 The CTVC and PTU are launched preassembled.

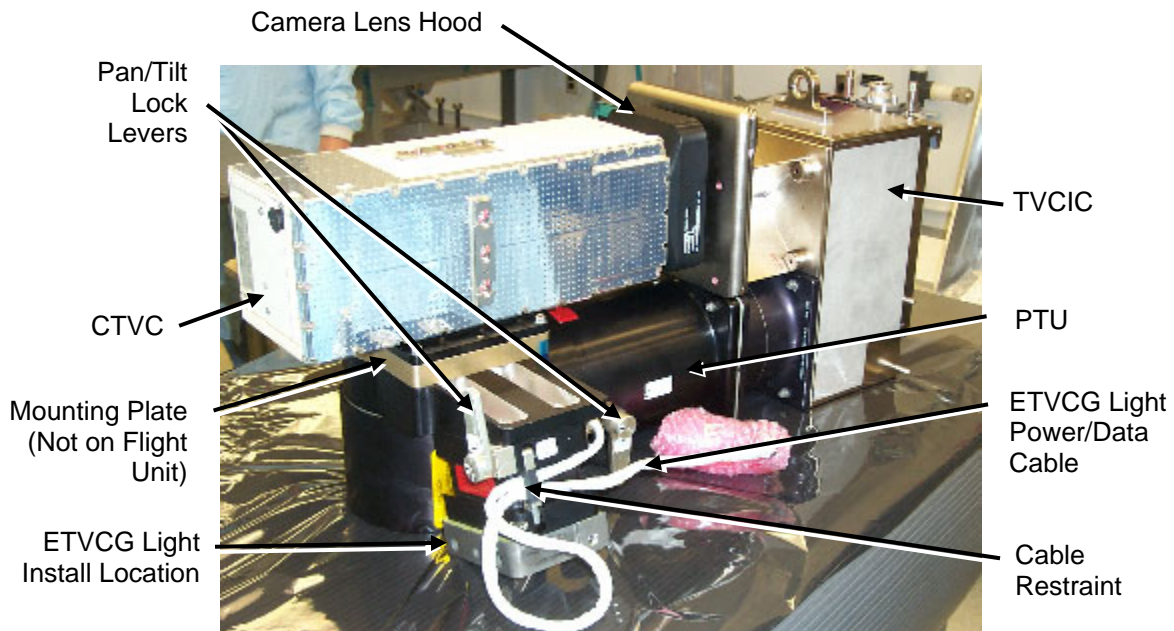


Figure 3.- ETVCG Assembly (Partially Assembled).

- 3.1 Verify CTVC is in stowed position, Pan/Tilt Lock Levers are in LOCKED position.  
 Refer to Figure 3.

If CTVC is not in stowed position with Pan/Tilt Lock Levers in the LOCKED position, √**MCC-H**.

## EXTERNAL TELEVISION CAMERA GROUP (ETVCG) - ASSEMBLY

(ASSY OPS/12A.1/FIN)

Page 4 of 7 pages

- 3.2 If installed, remove, discard any protective covering on CTVC or lens hood.

### CAUTION

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



Figure 4.- Connection from Pan Tilt Unit to TVCIC.

- 3.3 Don Anti-Static Wrist Tether.  
Secure to unpainted, unanodized metal surface.
- 3.4 Remove Protective Caps (two) from PTU Power/Data Connector A2/P3, TVCIC, and remove plastic film from PTU and TVCIC.  
Discard caps, plastic film.  
Refer to Figures 3 and 4.
- 3.5 PTU Power/Data Connector A2/P3 →|← TVCIC
- 3.6 Doff Antistatic Wrist Tether.

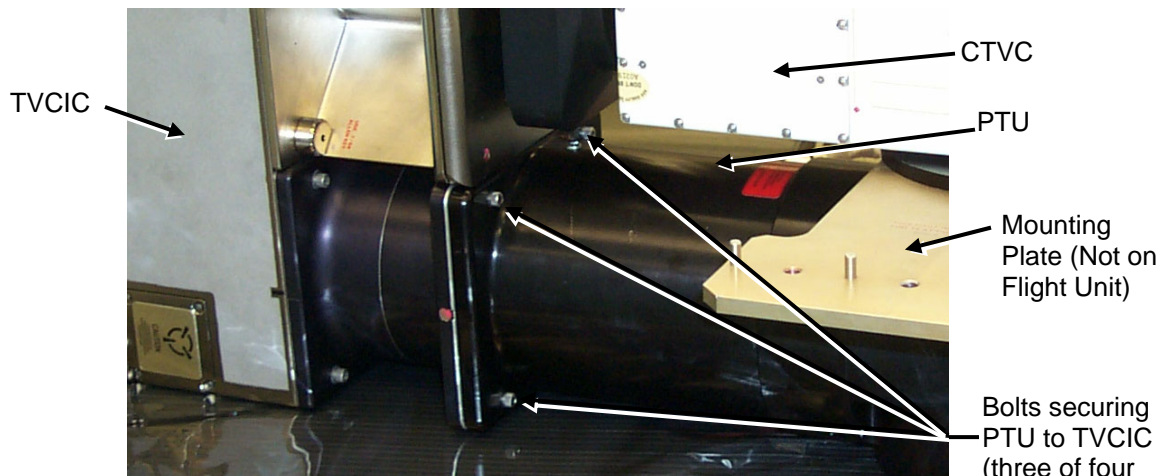


Figure 5.- Close up View of TVCIC, PTU Interface (ETVCG Shown Assembled).

**CAUTION**

All bolts are noncaptive. To keep bolts restrained, they should only be removed enough to see the first thread. Failure to comply may result in FOD.

Removed too far -  
bolt may come loose



Figure 6.- Bolt Removed Too Far (Should See Only One Thread).

**NOTE**

1. A thin film of Braycote should be applied to the threads of all bolts before installation.
2. Braycote 601 is very difficult to remove from hands. Gloves should be worn.

**3.7 Preparing Bolt Receptacles**

3.7.1 Don Disposable Gloves.

3.7.2 Apply a small amount of Braycote 601 Lubricant to fingertip. Work Braycote 601 Lubricant between fingertips until a very thin film is achieved with no visible white pieces of Braycote 601 present.

3.7.3 Use lubricated fingertip on TVCIC bolt receptacles (four).

If glove begins to stick to the surface being lubricated, repeat step 3.7.2 for relubrication of the glove.

3.7.4 Doff Disposable Gloves.

3.8 Install TVCIC on PTU, bolts (four) (Ratchet, 1/4" drive; 1/4" to 3/8" Adapter; 3/16" Hex Head, 3/8" Drive). Refer to Figures 5 and 6.

3.9 Tighten, Torque bolts (four) securing TVCIC to PTU to 57 in-lbs, (Ratchet, 1/4" Drive; 3/16" Hex Head, 3/8" Drive; 1/4" to 3/8" Adapter; (40-200 in-lbs) Torque Wrench, 1/4" Drive).

3.10 Temporarily stow partially assembled ETVCG in MESS Rack stowage area no longer used by the PTU, CTVC. Restrain as needed for docking (Bungee Cords).

3.11 Perform step 5 (step 4 will be performed post transfer).

ISS 4. INSTALLING ETVCG LIGHT ON PTU

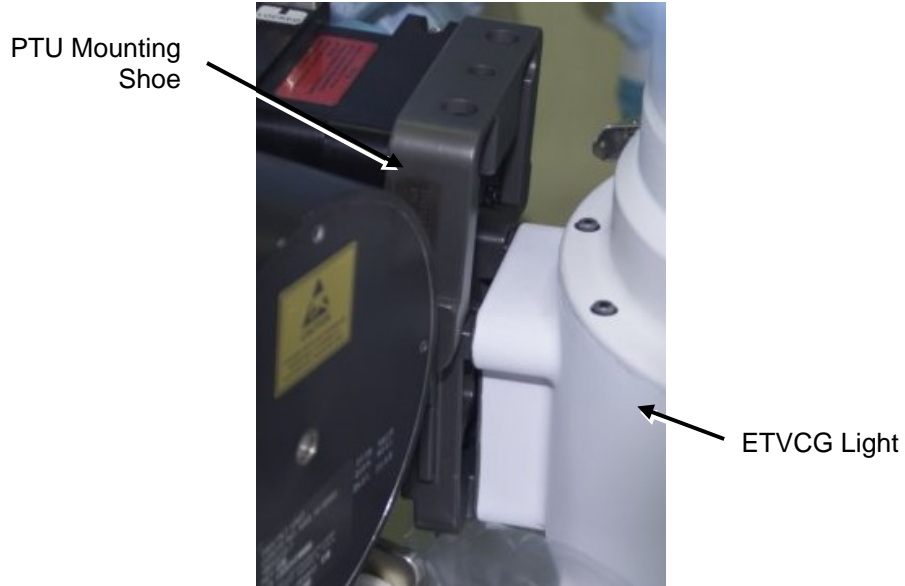


Figure 7.- ETVCG Light Bracket and Mounting Shoe.



Figure 8.- ETVCG Light Installed on ETVCG With Protective Packaging Left in Place.

## EXTERNAL TELEVISION CAMERA GROUP (ETVCG) - ASSEMBLY

(ASSY OPS/12A.1/FIN)

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### CAUTION

1. White coating on ETVCG Light is an integral part of its passive thermal control system. Gloves should be worn to prevent contaminating this surface.
2. ETVCG Light is sensitive to ESD. Static Wrist Tether should be donned during assembly.
3. Avoid contact with ETVCG Light cover glass. Reflective coating may be damaged.

### NOTE

Plastic packaging around ETVCG Light should be left in place and removed just prior to EVA. Scissors can be used to cut holes in the packaging for access to mounting shoe and connectors.

- 4.1 Don Static Wrist Tether.  
Secure to unpainted, unanodized metal surface.  
Don Disposable Gloves.
- 4.2 Cutting ETVCG Light plastic packaging as required (8-1/4" Long, 2" Cut Scissors), slide ETVCG Light into soft dock position on Mounting Shoe located on PTU.  
Refer to Figures 7 and 8.
- 4.3 Secure ETVCG Light by tightening fastener (one), then torque to 120 in-lbs (Ratchet, 1/4" drive; 1/4" to 3/8" Adapter; 7/16" EVA Socket, 3/8"; (40-200 in-lbs) Trq Wrench, 1/4" drive).

### NOTE

Ensure the lever on the Zero-G (EVA) connector plug is in the fully demated position. Mating consists of two steps: (1) sliding the plug into the receptacle until the soft dock click is felt, then (2) pushing the locking lever toward the receptacle until it locks in the overcenter mated position pointing toward the receptacle.

- 4.4 Cutting ETVCG Light plastic packaging as required (8-1/4" Long, 2" Cut Scissors), remove protective caps, mate ETVCG Light Jumper Cable P4 to J1 on ETVCG Light.  
Refer to Figure 8.
- 4.5 Doff Static Wrist Tether, Disposable Gloves.

## 5. POST MAINTENANCE

- 5.1 Check for FOD within 3' radius.
- 5.2 Stow tools, materials.
- 5.3 Shuttle(ISS) ↓ **MCC-H** of task completion.

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## **EXTERNAL TELEVISION CAMERA GROUP (ETVCG) - DISASSEMBLY**

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

### OBJECTIVE:

Remove TV Camera Interface Converter (TVCIC) and ETVCG Light from the remainder of the External Television Camera Group Assembly (ETVCG). The ETVCG is comprised of five components: the Pan Tilt Unit (PTU), Color TV Camera (CTVC), Camera Lens Hood, TV Camera Interface Converter (TVCIC), and ETVCG Light.

### LOCATION:

ISS

### DURATION:

45 minutes

### CREW:

Two

### PARTS:

Pan Tilt Unit (PTU) P/N 10033212-1

Color TV Camera (CTVC) P/N 10033497-1

TV Camera Interface Converter (TVCIC) P/N 10033211-501

ETVCG Light P/N 1F01194-1

### MATERIALS:

Disposable Gloves

Kapton Tape

Ziplock Bags

### TOOLS:

ISS IVA Toolbox:

Drawer 2:

Ratchet, 1/4" Drive

3/16" Hex Head, 1/4" Drive

1/4" to 3/8" Adapter

7/16" EVA Socket, 3/8" Drive

Drawer 5:

Static Wrist Tether

8-1/4" Long, 2" Cut Scissors

### REFERENCED PROCEDURE(S):

None

1. REMOVING THE ETVCG LIGHT

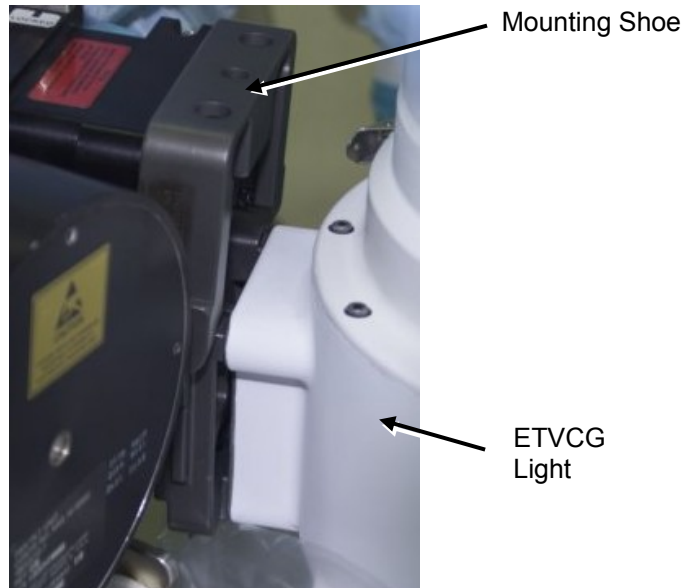


Figure 1.- ETVCG Light Bracket and Mounting Shoe.

CAUTION
1. White coating on ETVCG Light is an integral part of its passive thermal control system. Gloves should be worn to prevent contaminating this surface.
2. ETVCG Light is sensitive to ESD. Static Wrist Tether should be donned during assembly.
3. Avoid contact with ETVCG Light cover glass. Reflective coating may be damaged.

- 1.1 Don Static Wrist Tether.  
Secure to unpainted, unanodized metal surface.  
Don Disposable Gloves.

<u>NOTE</u>
The Zero-G connector plug is attached to the cable and the receptacle is an integral part of the hardware. The locking lever is on the plug.
Demating consists of two steps:
1. Grasping the plug and pulling the lever away from the receptacle until it locks in the “over-center” demated position pointing away from the receptacle, and
2. Sliding the two halves apart.

- 1.2 ETVCG Light Jumper Cable P4 ←|→ J1 on ETVCG Light  
Protect ETVCG Light Jumper Cable P4, ETVCG Light J1 connector  
(Ziplock Bags, Kapton Tape).

# EXTERNAL TELEVISION CAMERA GROUP (ETVCG) - DISASSEMBLY

(ASSY OPS/12A.1/FIN) Page 3 of 5 pages

- 1.3 Unfasten ETVCG Light fastener (one) (Ratchet, 1/4" Drive; 1/4" to 3/8" Adapter; 7/16" EVA Socket, 3/8" drive).
- 1.4 Remove ETVCG Light by sliding away from Mounting Shoe. Refer to Figure 1.
- 1.5 Doff Static Wrist Tether, Disposable Gloves.

## 2. SEPARATING PTU, CTVC FROM TVCIC

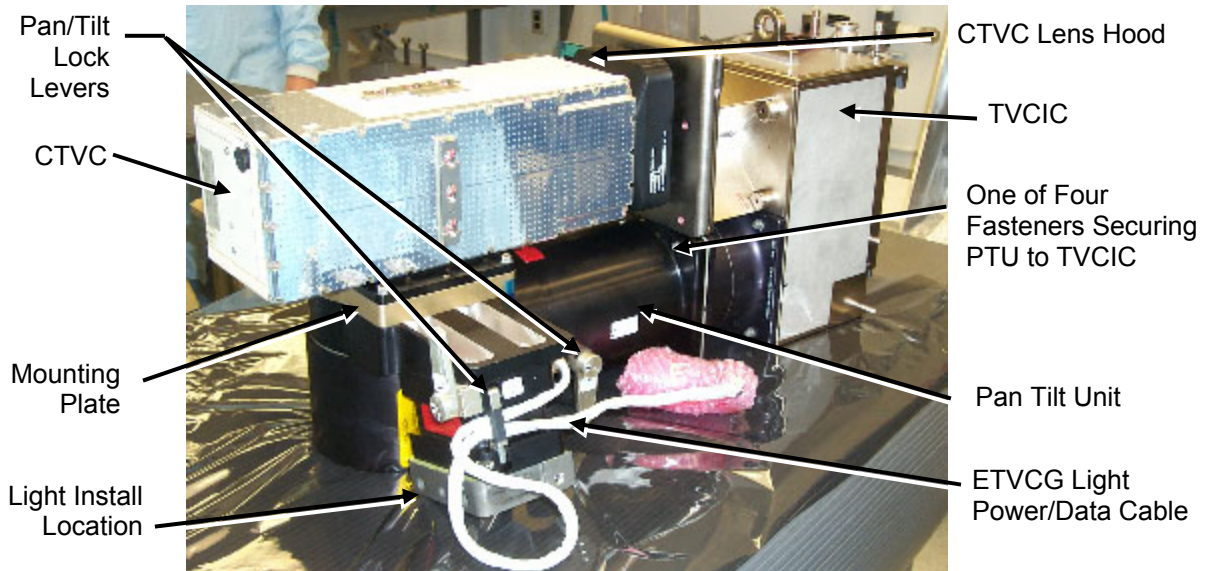


Figure 2.- ETVCG Assembled.

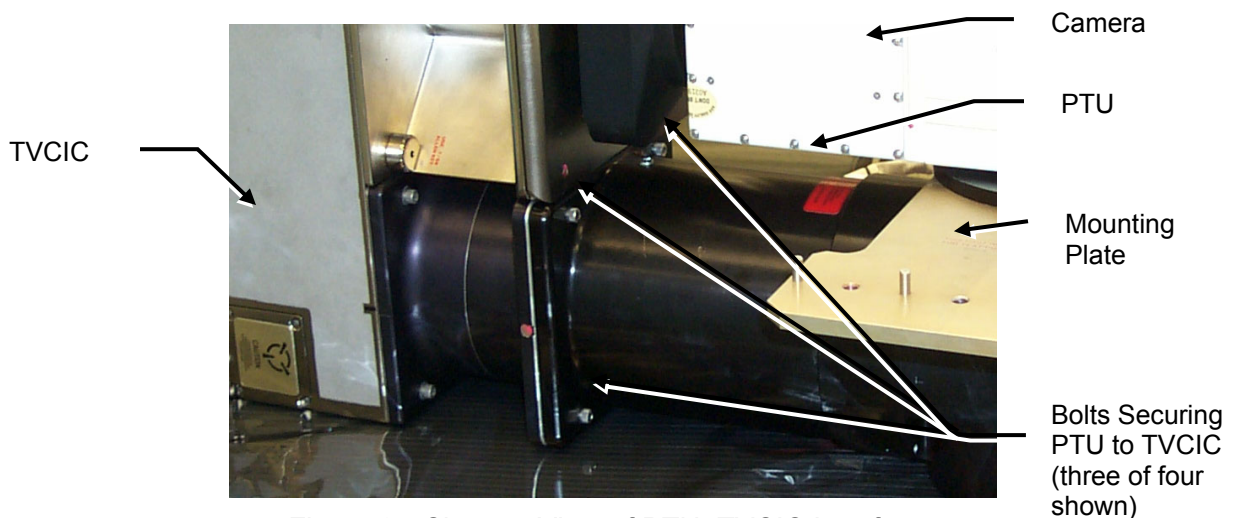


Figure 3.- Closeup View of PTU, TVCIC Interface.

**NOTE**

The bolts that secure the PTU to the TVCIC are noncaptive; however, to avoid complete removal, CCW rotation should stop when the first (top) thread of each bolt is visible. At this point, the bolt is no longer engaged with the TVCIC and will remain in the PTU.

- 2.1 Loosen bolts (four) securing PTU to TVCIC (Ratchet, 1/4" drive; 3/16" Hex Head).  
Secure bolts to PTU (Kapton Tape).  
Refer to Figures 2 and 3.



Figure 4.- Connection from Pan Tilt Unit to TVCIC.

- 2.2 Don Static Wrist Tether.  
Secure to unpainted, unannodized metal surface.
- 2.3 Gently pull the TVCIC approximately 4 inches away from the PTU, CTVC.  
Refer to Figure 4.
- 2.4 PTU Power/Data Connector A2-P3  $\leftrightarrow$  TVCIC  
Protect connectors (two) (Ziplock Bags, Kapton Tape)  
Refer to Figure 4.

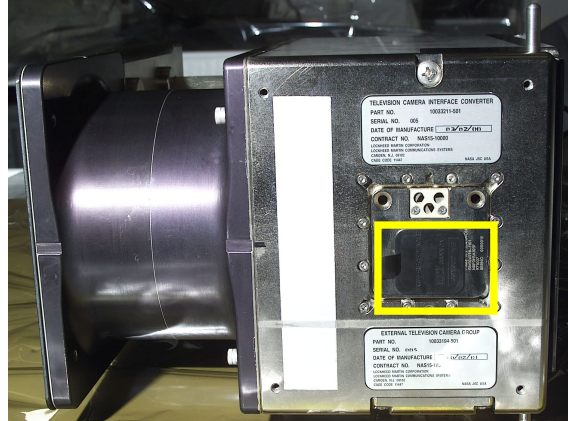


Figure 5.- TVCIC Blind Mate Connector  
(With Protective Cap Installed).

- 2.5 Protect TVCIC Blind Mate Connector (Kapton Tape).  
Refer to Figure 5.
- 2.6 Protect CTVC Lens by securing Ziplock Bag tightly over lens hood  
(8-1/4" Long, 2" Cut Scissors, Kapton Tape).  
Refer to Figure 2.
- 2.7 Doff Static Wrist Tether.
3. POST MAINTENANCE
  - 3.1 Check for FOD within 3' radius.
  - 3.2 Stow tools, materials.  
Stow ETVCG components per transfer list.
  - 3.3 ISS ↓ **MCC-H** of task completion.

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## APCU ACTIVATION

(ASSY OPS/12A.1/FIN)

Page 1 of 1 page

CRT SM 200 APCU Status

R1 1. VERIFYING ORBITER PAYLOAD BUS CONFIGURATION

√tb PL PRI MNC – ON

√PL CAB – MNA(MNB)

SSP 1 2. VERIFYING SWITCH POWER

√cb SW PWR 1 – cl

3. CLOSING APCU OUTPUT RELAY

√tb APCU 1 CONV – bp

APCU 1 OUTPUT RLY – cl

4. TURNING APCU CONVERTER ON

APCU 1 CONV – ON

√tb APCU 1 CONV – gray

√tb APCU 1 OUTPUT RLY – gray

CRT SM 200 APCU Status

√APCU 1 OUT VOLTS RES HIGH: 122 to 126.5V

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## APCU DEACTIVATION

(ASSY OPS/12A.1/FIN)

Page 1 of 1 page

### NOTE

Expect '**S200 APCU 1 VOLT LMT**' message when the APCU Converters are powered OFF.

CRT

SM 200 APCU Status

SSP 1

1. TURNING APCU CONVERTER OFF  
APCU 1 CONV – OFF

√tb APCU 1 CONV – bp

√tb APCU 1 OUTPUT RLY – bp

2. OPENING APCU OUTPUT RELAY  
APCU 1 OUTPUT RELAY – OP

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PAYLOAD

**PAYLOAD**

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# CGBA TRANSFER SPACEHAB TO ISS

(ASSY OPS/12A.1/FIN)

Page 1 of 3 pages

## OBJECTIVE:

Transfer Commercial Generic Bioprocessing Apparatus (CGBA-4) payload from Spacehab to ISS (US Lab, EXPRESS-4 Rack). This activity removes closeout covers, configures EXPRESS-4 Rack Cables, installs CGBA to EXPRESS-4 Rack, then powers it to a Survival state.

## LOCATION:

Stowed: Spacehab

Installed: EXPRESS-4 Rack (LAB1P2\_G2)

## DURATION:

30 minutes

## CREW:

One

## PARTS:

EXPRESS Rack Power Cable (24") (683-44024-1)

EXPRESS Rack Data Cable (38") (683-44267-2)

Velcro Strip

Velcro Cable Ties

## TOOLS:

3/32" Hex Head, 1/4" Drive

Driver Handle, 1/4" Drive

### **CAUTION**

When mating cables, verify pins straight, inspect both connector halves for debris, and mate dust caps, if applicable.

## 1. TRANSFERING CGBA AND REMOVING CLOSEOUT PANELS

1.1 Transfer CGBA to ISS per Transfer List.

LAB1P2\_  
G2

1.2 Remove left, center, right Door Panels by rotating stud fasteners 1/4-turn ccw using 3/32" Hex Head, 1/4" Drive and Driver Handle, 1/4" Drive.  
Temporarily stow.

1.3 Unlatch, open locker door.  
Reach inside locker and rotate knobs on Internal Rear Closeout to the OPEN position.  
Remove Internal Rear Closeout.  
Temporarily stow.

1.4 Remove CGBA from CTB.  
Insert CGBA into locker.  
Close, latch CGBA locker door.

√No red dot visible on locker latches (two).

# CGBA TRANSFER SPACEHAB TO ISS

(ASSY OPS/12A.1/FIN)

Page 2 of 3 pages

## 2. CONNECTING CABLE AT EXPRESS-4 RACK

LAB1P2\_  
F1

2.1 √sw LOCKER-7 POWER – OFF (Power Lt – Off)

2.2 Remove connector covers on panel, cable ends (captive).  
Connect the following

EXPRESS Rack Power Cable (24") →|← LOCKER-7 POWER - J1

EXPRESS Rack Data Cable (38") →|← LOCKER-7 DATA - J2

CGBA

2.3 √cb MAIN POWER – Open

2.4 Remove connector covers on cable ends (captive).

Connect the following, use connector pliers as required:

EXPRESS Rack Power Cable (24") →|← J-1 POWER-IN 28VDC

EXPRESS Rack Data Cable (38") →|← J-4 EXPRESS DATA

## 3. POWERING ON CGBA

LAB1P2\_  
F1

3.1 sw LOCKER-7 POWER → ON (Power Lt – On)

\*\*\*\*\*

\* If Power Lt – Off, record status (check)

\* | Power Lt – Off \_\_\_\_\_

\* | Continue Ops.

\*\*\*\*\*

CGBA

3.2 cb MAIN POWER → Close

3.3 √LED-MAIN POWER – On

3.4 Remove CGBA muffler from CTB.

If required, cut Velcro and attach to locker door to match muffler pattern.

Install CGBA Muffler as shown in Figure 1.

Route power and data cables as shown in Figure 1.

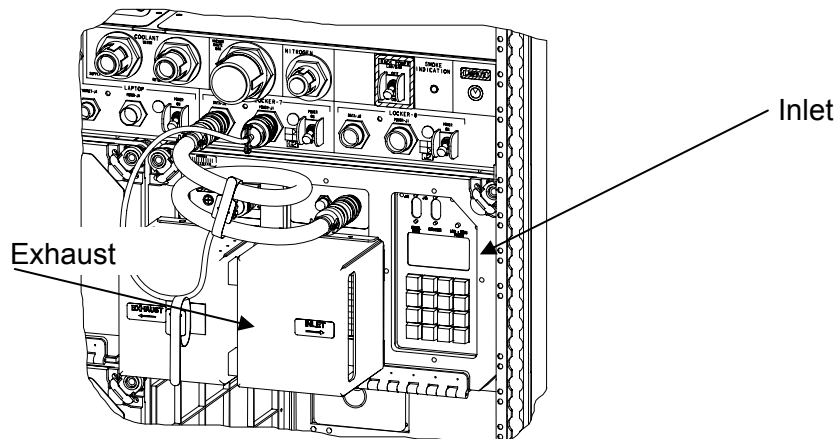


Figure 1.-

**CGBA TRANSFER SPACEHAB TO ISS**

(ASSY OPS/12A.1/FIN)

Page 3 of 3 pages

3.5 Restow tools, parts, and materials as required to original locations  
except

- Left Locker Door Closeout Panel
- Center Locker Door Closeout Panel
- Right Locker Door Closeout Panel
- Locker Internal Closeout

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## PRE EVA PL CONFIG

(ASSY OPS/12A.1/FIN 1) Page 1 of 1 page

### SPACEHAB PREP

If SPACEHAB is to remain isolated for remainder of mission

Go to ENTRY PREP (FDF: SH OPS).

If SPACEHAB will be reentered

Go to SPACEHAB PREP FOR DOCKING (FDF: SH OPS, DOCKING).

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## POST EVA PL CONFIG

(ASSY OPS/12A.1/FIN 1) Page 1 of 1 page

### SPACEHAB RECONFIG

If SPACEHAB will be reentered

Go to SPACEHAB RECONFIG POST DOCKING (FDF: SH OPS,  
DOCKING).

If otherwise, no actions are required.

SPACEHAB is configured for entry.

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# ICU-ANDE DEPLOY

(ASSY OPS/12A.1/FIN)

Page 1 of 3 pages

## 1. DEPLOY PAD

DEPLOY WINDOW OPEN MET = \_\_\_\_/\_\_\_\_:\_\_\_\_:\_\_\_\_

DEPLOY WINDOW CLOSE MET = \_\_\_\_/\_\_\_\_:\_\_\_\_:\_\_\_\_

(Set up countdown timer if desired)

## 2. CONFIGURATION FOR PHOTO/TV

Perform P/TV 11 Deployable Payloads – ANDE, RAFT, MEPSI  
(FDF: PHOTO/TV FS, SCENES)

-25:00

## 3. ANDE INITIAL CONFIGURATION

- R1      √PL CAB                    – MNA(MNB)  
          √AFT MN C            – OFF
- SSP1    √cb SW PWR 2            – op  
          √ANDE ARM/SAFE    – SAFE (tb-bp)  
          √NEA GOOD tb      – bp  
          √DEPLOY/SAFE      – ctr  
          √PRE-ARM/SAFE – SAFE (tb-bp)

**SM 201 STP-H2**

√ANDE POWER OFF – (\*)

### NOTE

SSP2 PDIP 2 PWR1 cb provides power to SSP1 ANDE  
DEPLOY PWR sw

SSP2    √cb PDIP 2 PWR 1 – cl

## 4. VERIFY DEPLOY PATH CLEAR

√OBSS clear of deploy path

√RMS clear of deploy path

\*\*\*\*\*

\* √MCC If ANDE deploy path not clear

\*\*\*\*\*

-05:00

## 5. CHECK DAP CONFIG

**GNC 020 DAP CONFIG**

√DAP: A1/AUTO/VERN

**GNC 201 UNIV PTG**

√In Attitude

√Roll, Pitch, and Yaw rates ≤ 0.02 degrees/second

**ICU-ANDE DEPLOY**

(ASSY OPS/12A.1/FIN)

-02:00 A6U

6. DEPLOY PREP  
DAP: FREE

R1 PL AFT MN C – ON

SM 201 STP-H2

ANDE POWER ON – ITEM 5 EXEC (\*)

SSP1

cb SW PWR 2 – cl  
ANDE PRE-ARM/SAFE – PRE-ARM (tb-gray)  
√NEA GOOD tb – gray

\*\*\*\*\*

\* If any tb is not gray  
\* | If LOS with **MCC**  
\* | | Continue deploy procedure  
\* |  
\* | If AOS with **MCC**  
\* | | √**MCC**

\*\*\*\*\*

ANDE ARM/SAFE – ARM (tb-gray)

-00:00

SSP1

7. DEPLOY/SAFE  
ANDE DEPLOY/SAFE – DEPLOY (hold 5 seconds maximum)  
√NEA GOOD tb – bp

Visually verify deployment.  
Record deploy time: MET \_\_\_\_/\_\_\_\_:\_\_\_\_:\_\_\_\_

ANDE ARM/SAFE – SAFE (tb-bp)  
PRE-ARM/SAFE – SAFE (tb-bp)

\*\*\*\*\*

SSP1 \* If ANDE not deployed  
\* | √NEA GOOD tb – bp  
\* |  
\* | | √**MCC**

\*\*\*\*\*

Notify **MCC** of Deploy MET  
Visually track and videotape ANDE for up to 4 minutes or until out of sight

+02:00 A6U

DAP: INTRL



**ICU-ANDE DEPLOY**

(ASSY OPS/12A.1/FIN)

Page 3 of 3 pages

- 8. POWERDOWN
  - SSP1      cb SW PWR 2 – op
  - |               |
|---------------|
| SM 201 STP-H2 |
|---------------|
  - ANDE POWER OFF – ITEM 6 EXEC (\*)
- R1           PL AFT MN C – OFF

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# MEPSI DEPLOY

(ASSY OPS/12A.1/FIN)

Page 1 of 2 pages

## 1. DEPLOY PAD

DEPLOY WINDOW OPEN MET = \_\_\_\_/\_\_\_\_:\_\_\_\_:\_\_\_\_

DEPLOY WINDOW CLOSE MET = \_\_\_\_/\_\_\_\_:\_\_\_\_:\_\_\_\_

(Set up countdown timer if desired)

## 2. CONFIGURATION FOR PHOTO/TV

Perform P/TV 11 DEPLOYABLE PAYLOADS – ANDE, RAFT, MEPSI (FDF: PHOTO/TV FS, SCENES), then:

-25:00

## 3. MEPSI INITIAL CONFIGURATION

R1	√PL CAB	– MNA(MNB)
	√AFT MN C	– OFF
SSP1	√MEPSI POWER	– OFF
	√PRE-ARM/SAFE	– SAFE (tb – bp)
	√ARM/SAFE	– SAFE (tb – bp)
	√DEPLOY/SAFE	– SAFE
	√NEA GOOD tb	– bp

## 4. VERIFYING DEPLOY PATH CLEAR

√OBSS clear of deploy path

√RMS clear of deploy path

\*\*\*\*\*

\* Notify **MCC** If MEPSI deploy path not clear.

\*\*\*\*\*

-05:00

## 5. CHECKING DAP CONFIGURATION

GNC 020 DAP CONFIG

√DAP: A1/AUTO/VERN

GNC 201 UNIV PTG

√In Attitude

√Roll, Pitch, and Yaw rates  $\leq 0.135$  degrees/second

-02:00

A6U

## 6. DEPLOY PREPARATION

DAP: FREE

R1 PL AFT MN C – ON

SSP1 MEPSI POWER – ON

### CAUTION

To prevent solenoid overheating, the MEPSI PRE-ARM/SAFE switch is limited to 60 seconds in the PRE-ARM position.

**MEPSI DEPLOY**

(ASSY OPS/12A.1/FIN)

-00:00    SSP1    7. DEPLOY/SAFE  
MEPSI PRE-ARM/SAFE – PRE-ARM (tb – gray)

√NEA GOOD tb – gray

\*\*\*\*\*  
\* If any tb not gray, continue deploy.  
\*\*\*\*\*

MEPSI ARM/SAFE – ARM (tb – gray)

<b>CAUTION</b>
Do not hold switch in the deploy position for more than 5 seconds.

MEPSI DEPLOY/SAFE – DEPLOY (Verify deployment visually)

√NEA GOOD tb – bp

DEPLOY/SAFE – SAFE

Record deploy time: MET \_\_\_\_/\_\_\_\_:\_\_\_\_:\_\_\_\_

▶ +00:60

ARM/SAFE – SAFE (tb – bp)  
PRE-ARM/SAFE – SAFE (tb – bp)

SSP1    \*\*\*\*\*  
\* If MEPSI not deployed  
\*    |    √NEA GOOD tb – bp  
\*    |  
\*    |    Notify **MCC**.  
\*\*\*\*\*

Notify **MCC** of deploy MET.

Visually track and videotape MEPSI for up to 4 minutes or until out of sight.

+02:00    A6U    DAP: AUTO

SSP1    8. POWERDOWN  
MEPSI POWER – OFF

R1    PL AFT MN C – OFF

# RAFT DEPLOY

(ASSY OPS/12A.1/FIN)

Page 1 of 2 pages

## 1. DEPLOY PAD

DEPLOY WINDOW OPEN MET = \_\_\_\_/\_\_\_\_:\_\_\_\_:\_\_\_\_

DEPLOY WINDOW CLOSE MET = \_\_\_\_/\_\_\_\_:\_\_\_\_:\_\_\_\_

(Set up countdown timer if desired)

## 2. CONFIGURATION FOR PHOTO/TV

Perform P/TV 11 DEPLOYABLE PAYLOADS – ANDE, RAFT, MEPSI (FDF: PHOTO/TV FS, SCENES), then:

-25:00

## 3. RAFT INITIAL CONFIGURATION

- R1     √PL CAB               – MNA (MNB)  
          √AFT MN C       – OFF
- SSP2   √cb RAFT             – op  
          √RAFT ARM/SAFE – SAFE (tb – bp)  
          √NEA GOOD tb   – bp  
          √RAFT DEPLOY   – SAFE

SM 201 STP-H2

- √RAFT SAFE           – (\*)  
  √POWER OFF       – (\*)

## 4. VERIFYING DEPLOY PATH CLEAR

- √OBSS clear of deploy path  
√RMS clear of deploy path

\*\*\*\*\*  
\* Notify **MCC** If RAFT deploy path not clear.  
\*\*\*\*\*

-05:00

## 5. CHECKING DAP CONFIGURATION

GNC 020 DAP CONFIG

√DAP: A1/AUTO/VERN

GNC 201 UNIV PTG

- √In Attitude  
√Roll, Pitch, and Yaw rates ≤ 0.135 degrees/second

-02:00

A6U

## 6. DEPLOY PREPARATION

DAP: FREE

R1

PL AFT MN C – ON

SM 201 STP-H2

RAFT POWER ON – ITEM 1 EXEC (\*)  
PRE-ARM – ITEM 2 EXEC (\*)

**RAFT DEPLOY**

(ASSY OPS/12A.1/FIN)

SSP2      cb RAFT – cl

<b>CAUTION</b>
To prevent solenoid overheating, the RAFT ARM/SAFE switch is limited to 60 seconds in the ARM position.

-00:00      SSP2      7. DEPLOY/SAFE  
RAFT ARM/SAFE – ARM (tb – gray)

√NEA GOOD tb – gray

\*\*\*\*\*  
\* If any tb not gray, continue deploy.  
\*\*\*\*\*

<b>CAUTION</b>
Do not hold switch in the deploy position for more than 5 seconds.

RAFT DEPLOY/SAFE – DEPLOY (Verify deployment visually)

√NEA GOOD tb – bp

DEPLOY/SAFE – SAFE

Record deploy time: MET \_\_\_\_/\_\_\_\_:\_\_\_\_:\_\_\_\_

▶+00:60

ARM/SAFE – SAFE (tb – bp)

\*\*\*\*\*  
\* If RAFT not deployed  
|      √NEA GOOD tb – bp  
|  
|      Notify **MCC**.  
\*\*\*\*\*

SSP2

Notify **MCC** of deploy MET.

Visually track and videotape RAFT for up to 4 minutes or until out of sight.

+02:00      A6U      DAP: AUTO

SSP2      8. POWERDOWN  
cb RAFT – op

SM 201 STP-H2
---------------

RAFT SAFE – ITEM 3 EXEC (\*)  
POWER OFF – ITEM 4 EXEC (\*)

R1      PL AFT MN C – OFF

N/A

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N/A

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# PAYLOAD ENTRY SWITCH LIST/VERIFICATION

(ASSY OPS/12A.1/FIN) Page 1 of 2 pages

TIG-1:55

## PAYLOAD POWER CONFIG

R1	√PL CAB – MNA	
	√PRI MNC – ctr (tb-ON)	
	√MNB – ctr (tb-OFF)	
	√FC3 – ctr (tb-OFF)	
	√AUX – ON	
	√AFT MNB – ON	
	√MNC – OFF	
MA73C:E	√cb AC3 PL 3φ – op	
L1	√FLOW PROP VLV LOOP 1,2 (two) – ctr (tb-ICH)	
	√SMOKE DETN B PL It – off	
C3	√SH FIRE SUPPR MCP – SAFE	
	√MCP – NO-OP	
	√FSCU – SAFE	
	√FSCU – NO-OP	
	√H2O LN HTRS – OFF	
(SSP1)	√APCU 1 CONV	– OFF (tb-bp)
L12U	√OUTPUT RLY	– OP (tb-bp)
	√cb SW PWR 1	– op
	√APCU 2 CONV	– OFF (tb-bp)
	√cb PDIP1 PWR2 KuBAND RLY	– op
	√MEPSI PWR	– OFF
	√PRE-ARM/SAFE	– SAFE (tb-bp)
	√ARM/SAFE	– SAFE (tb-bp)
	√DEPLOY/SAFE	– SAFE (tb-bp)
	√TCS PWR	– OFF (tb-bp)
	√ANDE ARM/SAFE	– SAFE (tb-bp)
	√DEPLOY/SAFE	– ctr (tb-bp)
	√ORB H2O LINE HTR PWR A	– OFF (B ENA)
	√B	– OFF (A ENA)
	√cb SW PWR 2	– op
	√cb X1/X2 SW PDIP1 PWR1	– op
	√ODS CONN MATE X1 TLM PWR	– OFF
	√X2 TLM PWR	– OFF
	√ANDE PRE-ARM/SAFE	– SAFE (tb-bp)
	√OIU PWR	– OFF (tb-bp)
(SSP2)	√cb RAFT	– op
L12L	√cb PDIP2 PWR2	– op
	√RAFT ARM/SAFE	– SAFE (tb-bp)
	√DEPLOY/SAFE	– SAFE (tb-bp)
	√C/L CAM PWR	– OFF
	√FIRE SUPPR FSCU ARM/SAFE	– ctr (tb-DN)
	√DISCH	– ctr (tb-DN)

## PAYLOAD ENTRY SWITCH LIST/VERIFICATION

(ASSY OPS/12A.1/FIN) Page 2 of 2 pages

√CAB DEPRESS VLV ARM/SAFE – SAFE (tb-bp)  
√OPEN/CLOSE – CL (tb-bp)  
√NOT CLOSED (tb-bp)

√SMOKE SENSOR RESET/TEST – ctr  
√A – ENA (tb-gray)  
√B – ENA (tb-gray)

√cb SW PWR 4 – cl  
√cb PDIP2 PWR1 – op  
√MN PWR – NO-OP  
√SS DC BUS – ctr (tb-gray)  
√ORB SEC DC BUS – ON (tb-gray)  
√INVERTER – NO-OP (tb-gray)  
√EXP DC BUS – ctr (tb-gray)

(PDIP1)  
L12L √KuBAND RATE – OFF  
√DC PWR 1 CABIN P/L – OFF  
√2 CABIN P/L – OFF

(PDIP2)  
L12L √DC PWR 1 CABIN P/L – OFF  
√2 CABIN P/L – OFF

MALFUNCTION

**MALFUNCTION**

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**MALFUNCTION**

**COMM**

**S212 OIU AD 1 NOLK/LOSS OF ISS OR SSOR TELEMETRY**  
(ASSY OPS/12A.1/FIN) Page 1 of 3 pages

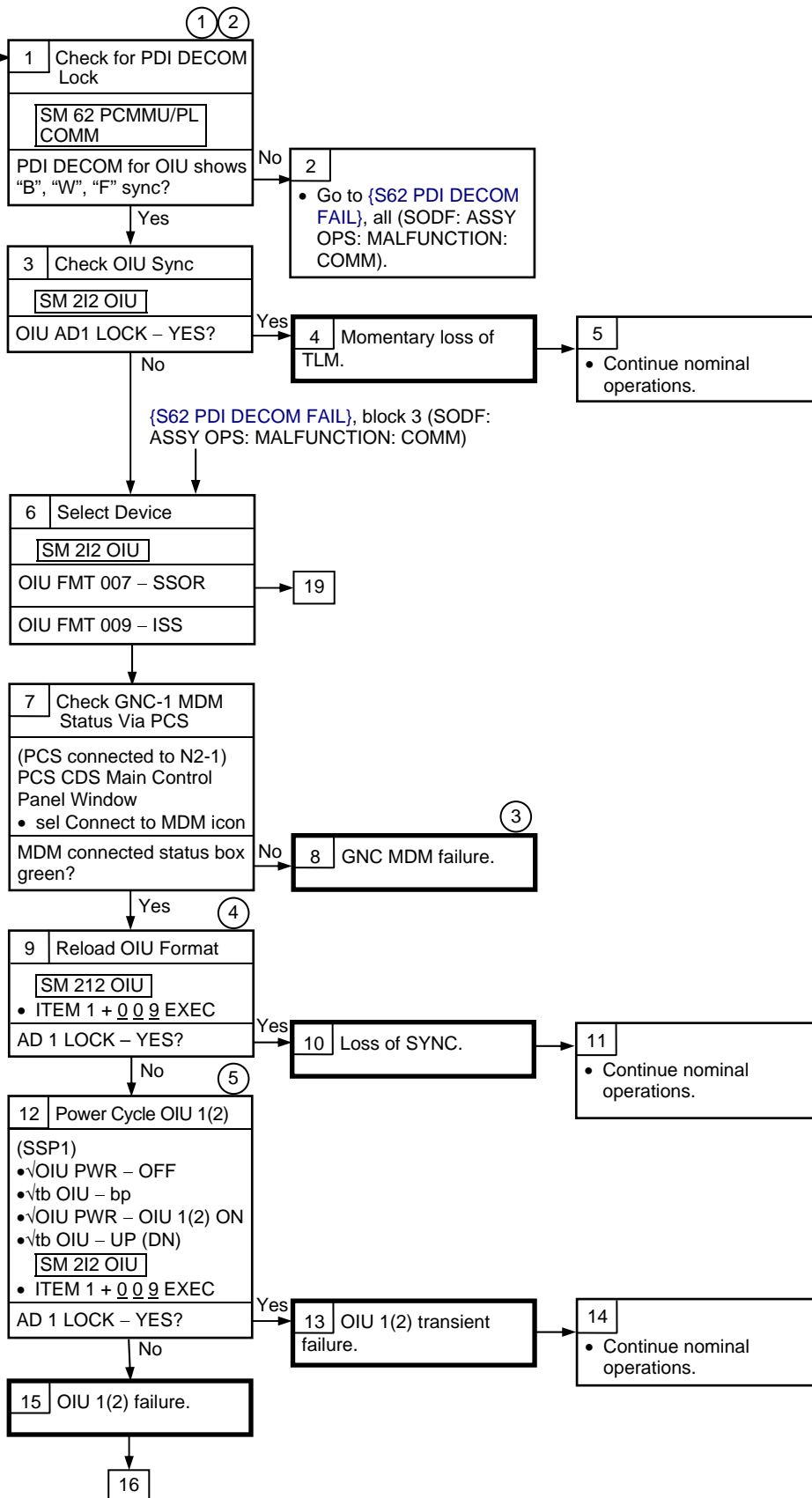
SM ALERT

S212 OIU AD1 NOLK

Loss of Data On SPEC 205 During Undocking

MCC-H Reports Loss of ISS Data To Ground Via OIU

**Nominal Config:**  
(R1)  
PL CAB – MNB(MNA)  
PL AUX – ON (SSP1)  
OIU PWR – OIU 1(2) ON  
tb OIU – UP(DN)  
  
For ISS  
One PCS connected to GNC-1 MDM  
SM 212 OIU  
OIU FMT: 009  
  
For SSOR  
(R14)  
cb MNA UHF EVA – cl  
cb MNC UHF EVA – cl  
(O6)  
EVA STRING: 1(2)  
UHF MODE – EVA  
SM 212 OIU  
OIU FMT – 007



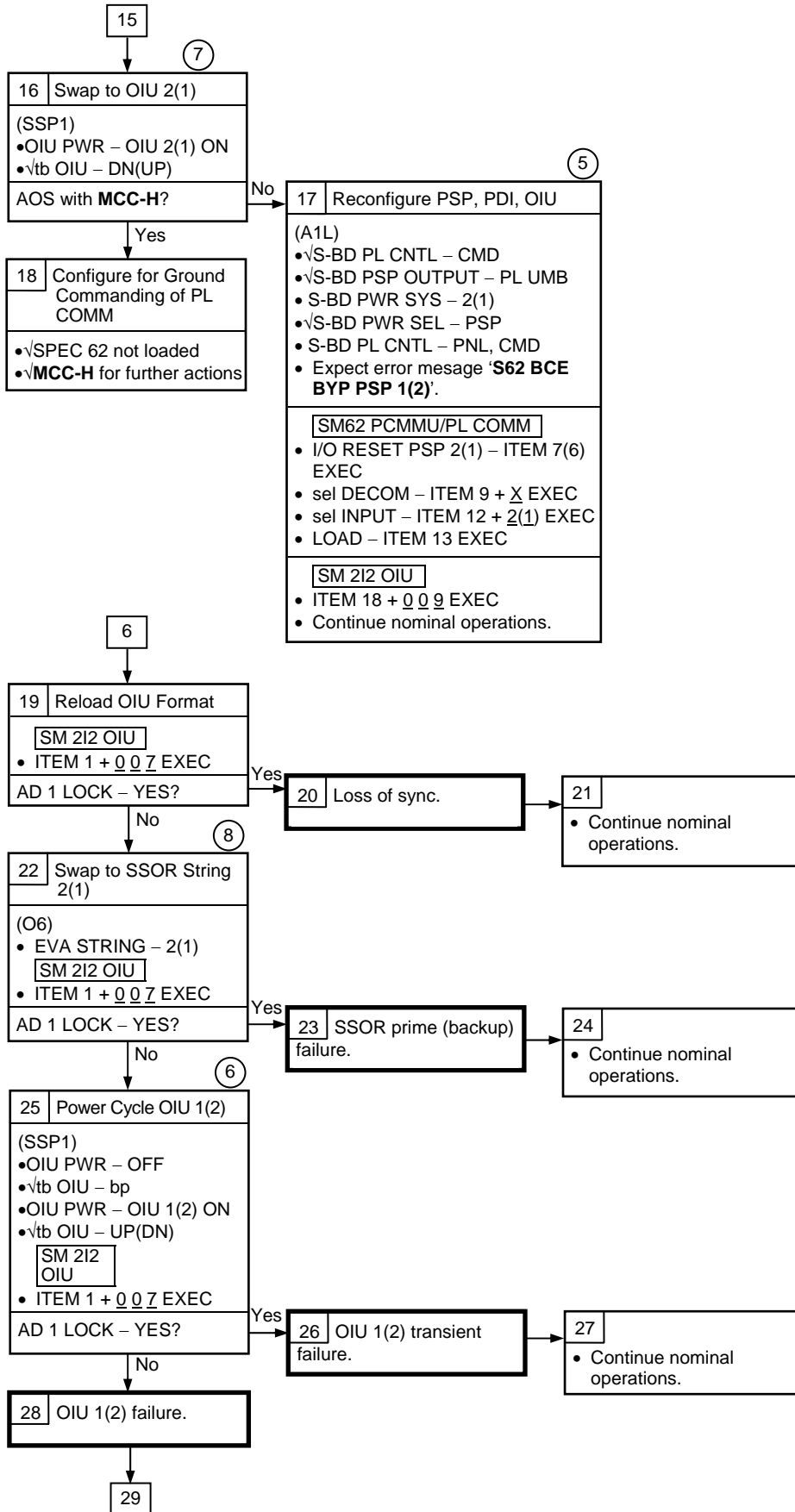
① All displays in this procedure are on the PCS.

② OIU to PDI problems would announce a 'S62 PDI DECOM FAIL' message if FDA enabled.

③ MCC-H will likely direct STS or ISS crew to perform {3.602 LOSS OF PCS TELEMETRY (POST CCS)} (SODF: JNT OPS: MALFUNCTION).

④ Reloading the OIU format forces a resync with the GNC MDM or SSOR.

⑤ Default condition on powerup is GNC 1 on Bus 3 RT.



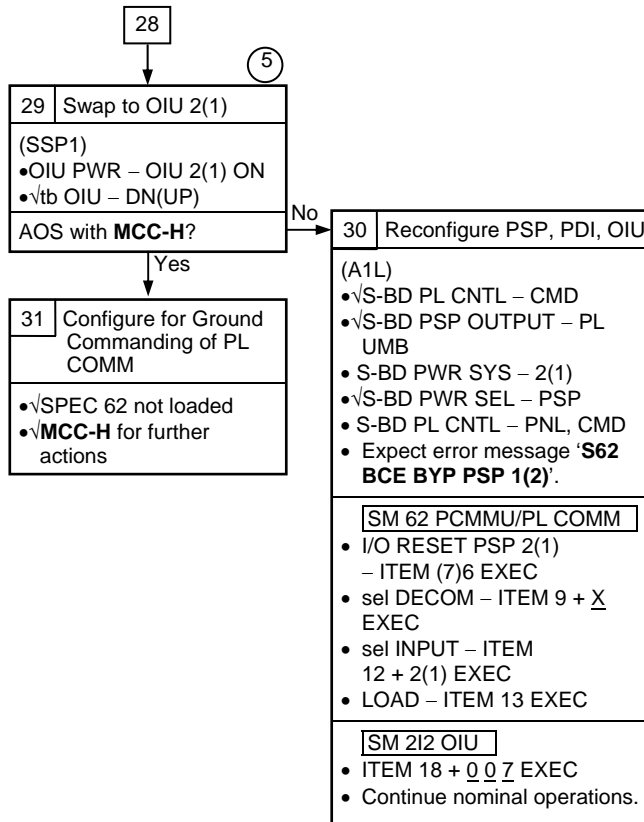
5 Default condition on power up is GNC 1 on Bus 3 RT.

6 OIU active device mapping occurs with format load.

7 Malfunction restores operational capability; additional troubleshooting to determine BIA failure may be performed later.

8 Reloading the OIU format forces a resync with the SSOR.





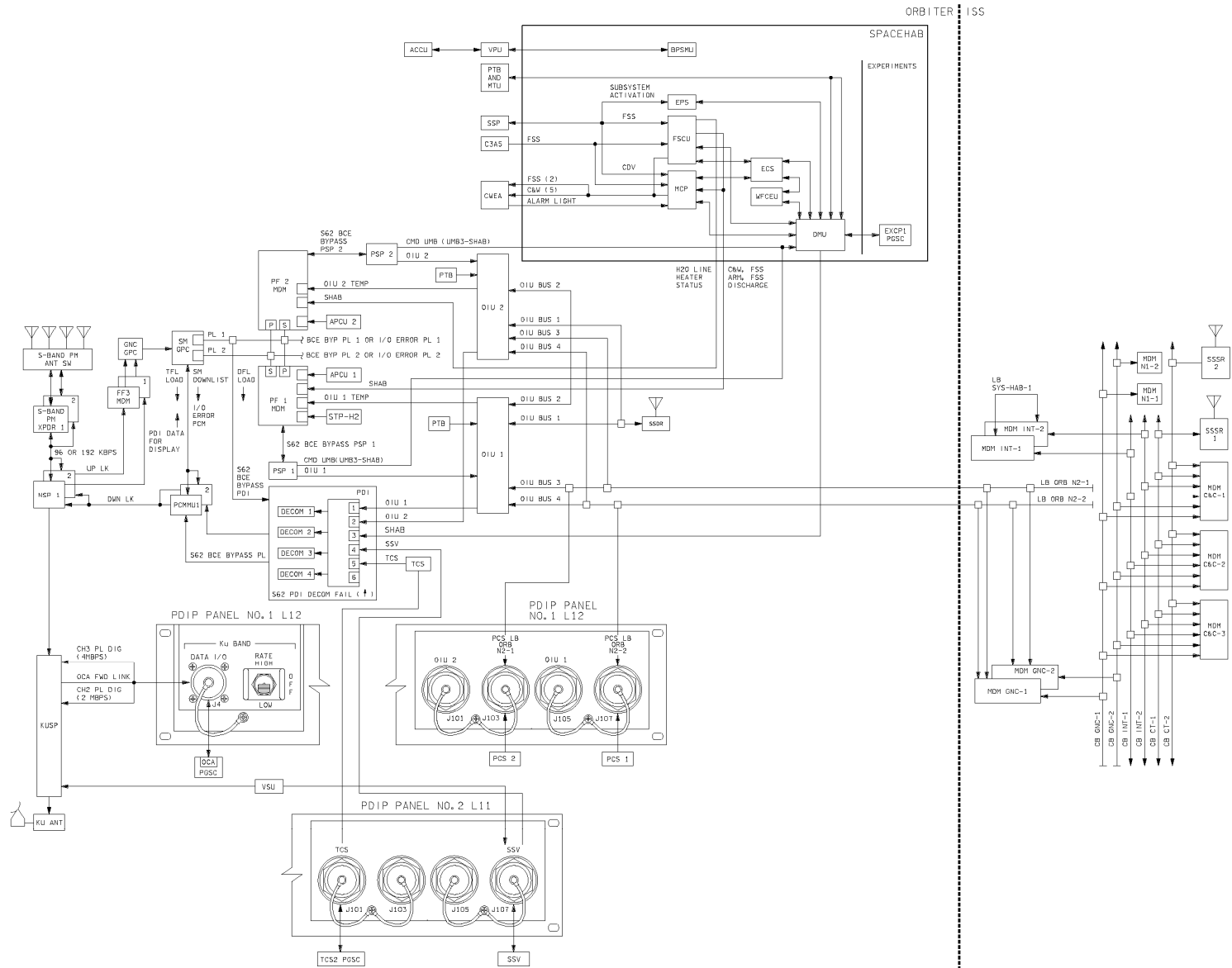
⑤  
 Default condition on  
 power up is GNC 1  
 on Bus 3 RT.

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# COMM MALFUNCTION POINTS

(ASSY OPS/12A.1/FIN 1) Page 1 of 1 page

527



4850201\_116, SCH: 4

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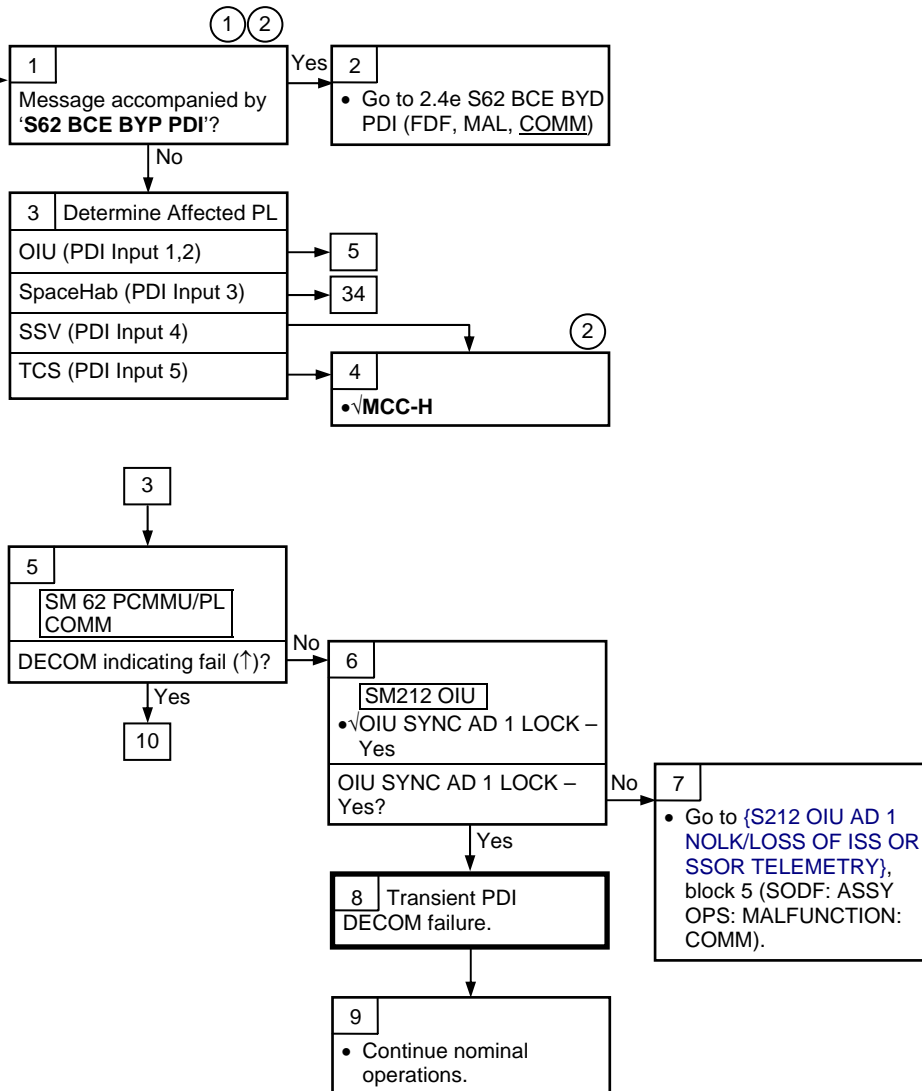
**COMM**

**S62 PDI DECOM FAIL**  
(ASSY OPS/12A.1/FIN) Page 1 of 7 pages

SM ALERT

'S62 PDI DECOM FAIL'

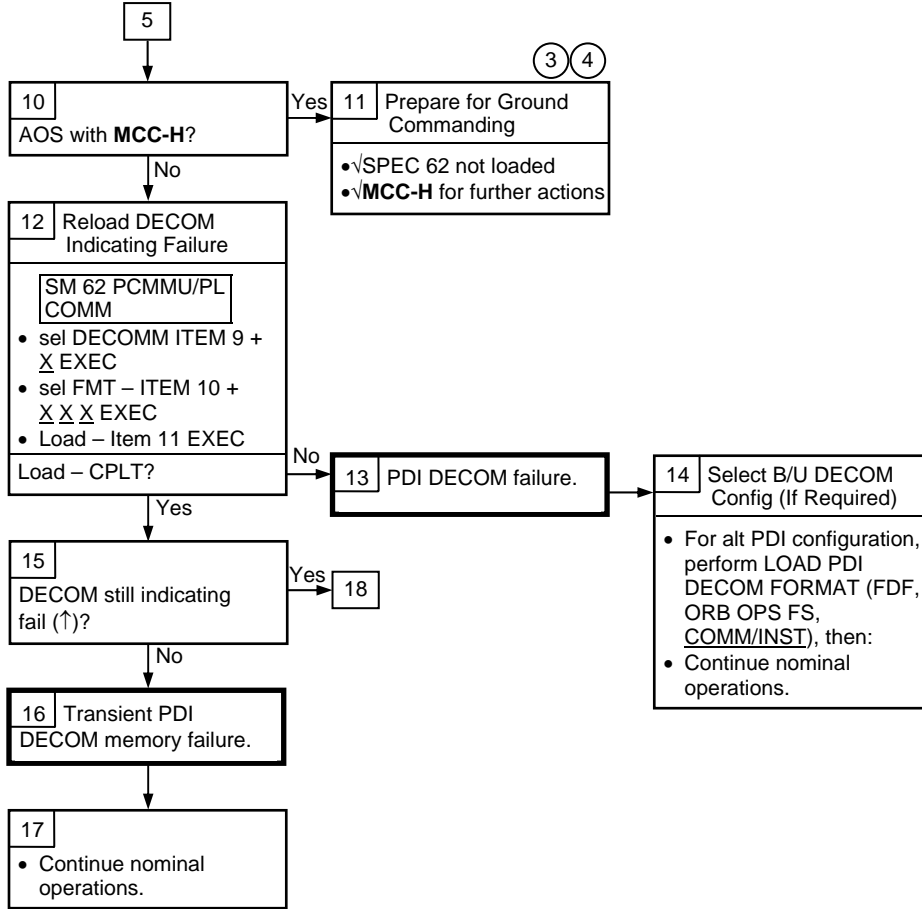
**Nominal Config:**  
(A1L)  
PL DATA INTLVR  
PWR – ON  
(R1)  
PL PRI MNC – ON  
PL AUX – ON  
PL AFT MNB – ON  
PL CAB –  
MNB(MNA)  
(SSP1)  
OIU PWR – OIU 1(2)  
ON [(tb – UP(DN))]



① All displays in this procedure are on the PCS.

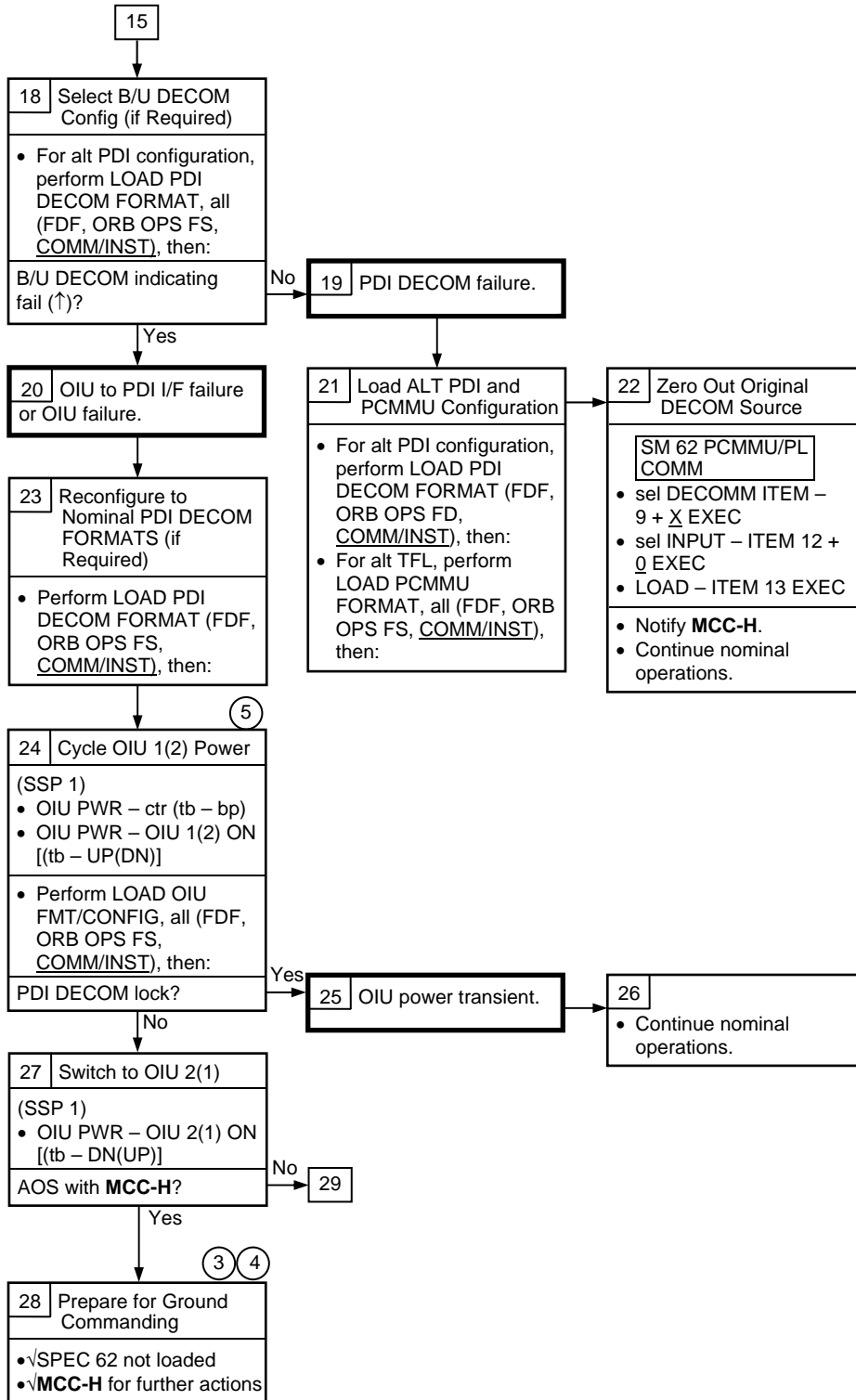
② TCS and SSV not addressed in MAL; FDA not nominally enabled.

**S62 PDI DECOM FAIL**  
(ASSY OPS/12A.1/FIN) Page 2 of 7 pages



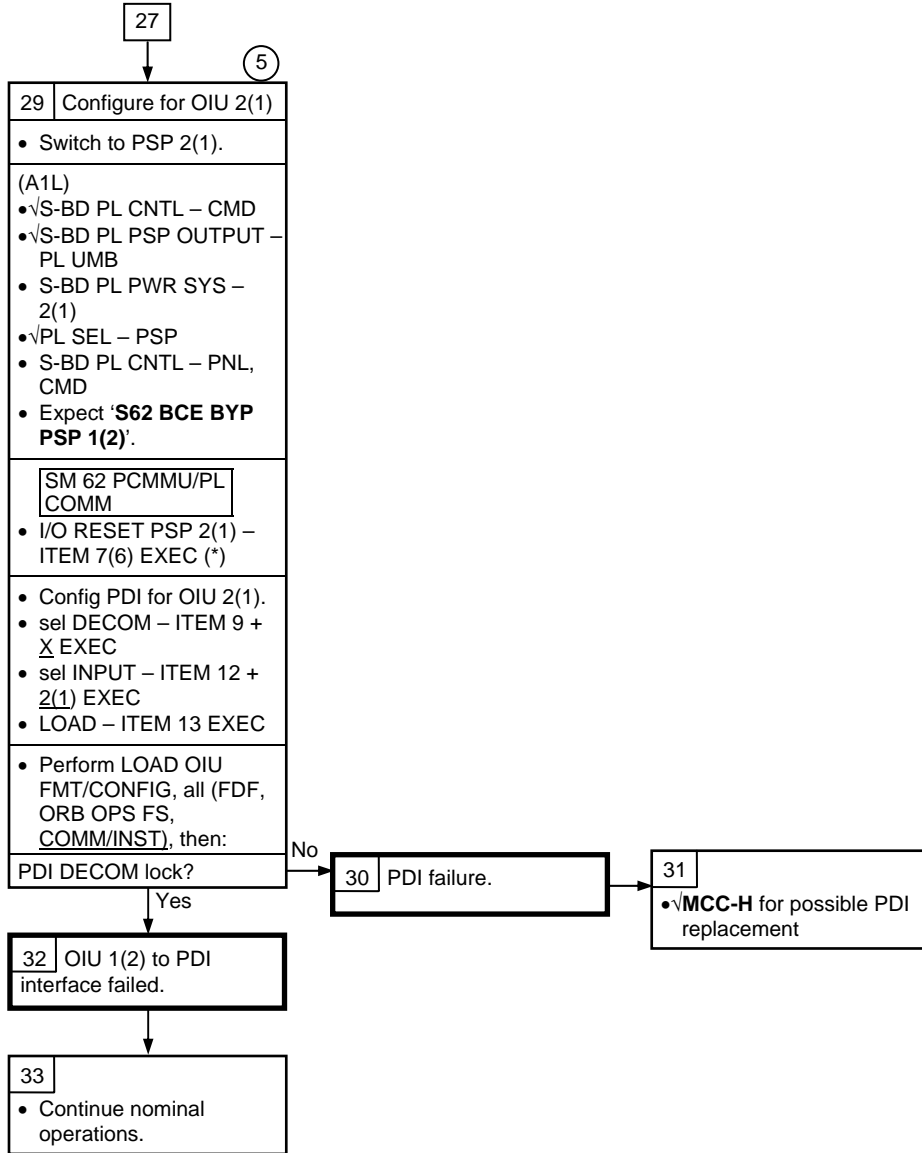
③ For ground commanding of PL COMM system, SPEC 62 must not be loaded.

④ **MCC-H** can perform all PL COMM reconfig except OIU PWR cycle and swap steps.



- ③ For ground commanding of PL COMM system, SPEC 62 must not be loaded.
- ④ **MCC-H** can perform all PL COMM reconfig except OIU PWR cycle and swap steps.
- ⑤ Default condition on powerup is GNC 1 Bus 3 RT.

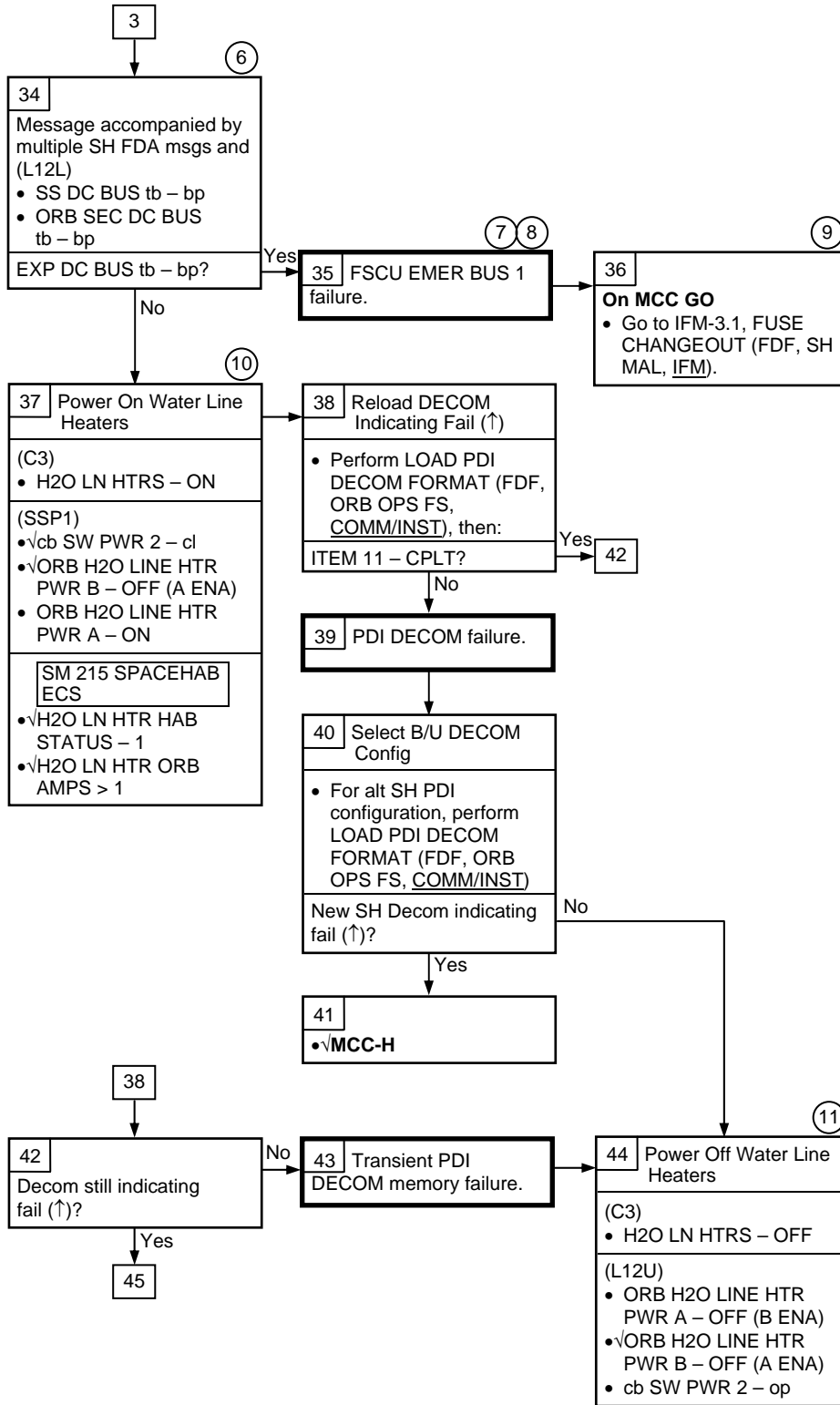
**S62 PDI DECOM FAIL**  
 (ASSY OPS/12A.1/FIN) Page 4 of 7 pages



⑤  
 Default condition on powerup is GNC 1 Bus 3 RT.



**S62 PDI DECOM FAIL**  
(ASSY OPS/12A.1/FIN) Page 5 of 7 pages



⑥ If listed tbs are bp, then an emergency bus problem has affected the DMU. Possible FDA messages include '214 SH EXP BUS V', '214 SH WFCEU V', '214 SH EMG BUS V'.

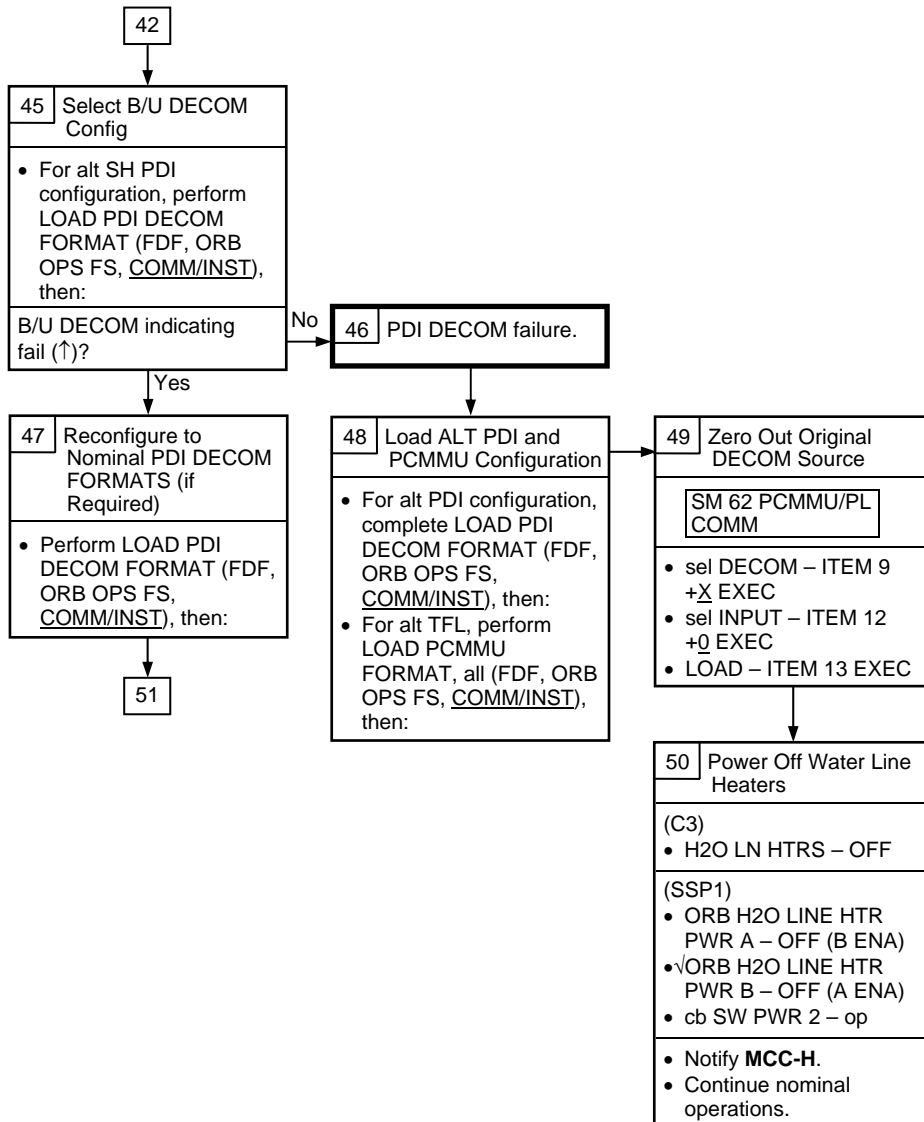
⑦ H2O LN HTR cmd from C3 lost due to this failure. H2O Pump 2 remains operational. Monitor ORB AC Bus currents for pump health status.

⑧ Refer to BUS/CRITICAL EQUIPMENT LOSS (FDF, SH MAL, CRITICAL EQUIPMENT LOSS) for system impacts.

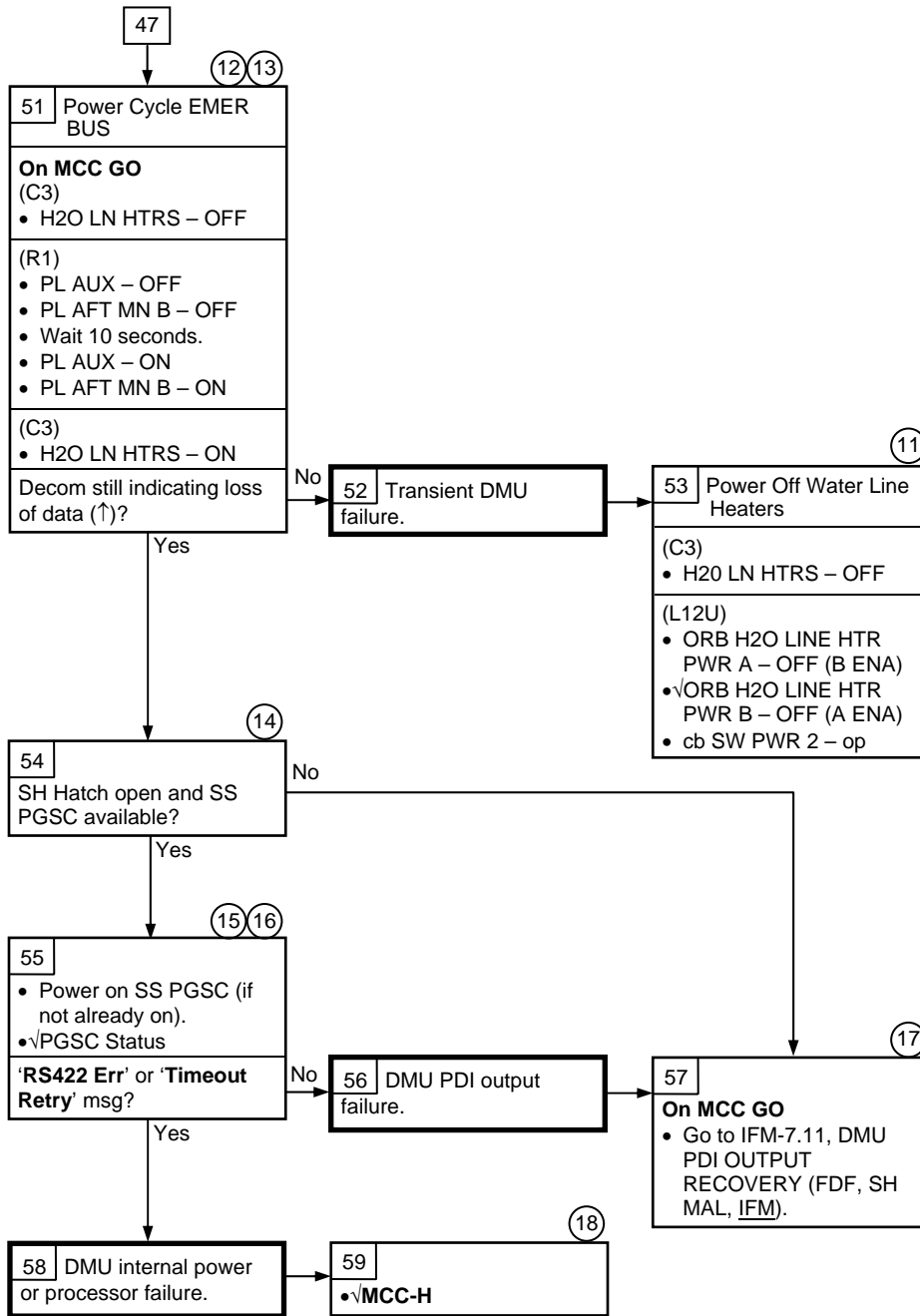
⑨ FDF SH MAL IFM-3.1 can be performed to check for fuse continuity.

⑩ Water line heaters on as precaution since loop status not directly available with loss of PDI data. H2O Pump 2 remains operational.

⑪ Expect FDA messages '215 SH H2O HTR HAB' and '215 SH H2O HTR ORB'.



**S62 PDI DECOM FAIL**  
(ASSY OPS/12A.1/FIN) Page 7 of 7 pages



- ① Expect FDA messages '215 SH H2O HTR HAB' and '215 SH H2O HTR ORB'.
- ② SH H2O Ln Htrs powered off while cycling Aft Mn B. Expect '215 SH H2O HTR HAB' message.
- ③ The following occur during emergency bus power cycle Master Alarm from CWEA ch 55, 65, 85, 95, FDA message '214 SH PPO2 2', loss of emergency lt.
- ④ If SH hatch open, subsys PGSC can provide additional insight into DMU health.
- ⑤ Subsys PGSC not required to be powered on at all times. For power on steps, refer to SS PGSC ACT (FDF, SH OPS, ON-ORBIT).
- ⑥ If PGSC has indicated msgs, then the problem is in the DMU. If PGSC shows no msgs, SH data is being received from the DMU and problem lies in DMU to PDI interface.
- ⑦ IFM-7.11 can be performed to recover PDI output by using the PLR (SSR) DMU output feed.
- ⑧ MCC will investigate further troubleshooting options. If PGSC was not verified as having good DMU data earlier in the mission, then the DMU to PGSC cables could be suspect and IFM 7-11 might be an option.

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**ORBITER ELECTRICAL BUS LOSS MATRIX**  
(ASSY OPS/12A.1/FIN)

Continuation of Table 1. Orbiter Electrical Bus Loss Matrix

	FC1		FC2	FC3	MNA DA1						MNB DA2						FC3	MNC DA3			MNC FPC3							
	ESS 1BC	ESS 2CA	ESS 3AB	R15	O14	A6&A14	MPC1		MPC2		A6&A14	APC5	FPC2	O15	R15	MAR1	MAR2	(R)	(R)	P	O16	R15	APC6	AC3				
	O13&R15	O13&R14					AUX PLA	(R)	P	AUX PLB		APC2	AC2									APC3	A15					
								CABINPL				AFT PLB	φA										AFT PLC	ACφC				
							PL1	PL2	PL3																			
<b>SPACEHAB SUBSYSTEMS</b>																												
MAIN BUS																									X			
SEC FEED TO MAIN BUS																										X		
FSCU EMER 1 BUS													R															
MCP EMER 2 BUS													R															
SS DC BUS																										X		
EXP DC BUS													XRC														X	
INVERTER AC													XRC														X	
ARS FAN																											(R)	
CABIN FAN																											(R)	
WATER PUMP 1																											X	
WATER PUMP 2																											(R)	
DMU													R															
BPSMU (SH audio via PLT ATU)																											X	
WFCEU													XRC															X
MCP (LIGHTS ONLY)													XRC															X
CABIN DEPRESS VALVE													R															
CABIN DEPRESS VALVE ARM/SAFE													R															
PPRV OPEN/CLOSE													R															
SMOKE SENSOR A ENABLE													R															
SMOKE SENSOR B ENABLE													XRC, R															
SMOKE SENSOR TEST/RESET (SSP)																												
SMOKE SENSOR TEST/RESET (MCP)													R															
MAIN POWER KILL CIRCUITRY													XRC, R															
FSS DISCHARGE (FSCU & MCP)													XRC, R															
FSS ARM/SAFE (FSCU & MCP)													XRC, R															
SH H2O LN HTRS													XRC															
ORBITER H2O LN HTRS																												X, XC
ORBITER H2O LN HTRS CURRENT SENSOR																												X

X = Total loss of operational power  
P = Loss of primary power source  
R = Loss of redundant power source  
(R) = Requires action to use redundant source  
XC = Total loss of CNTL power

XRC = Loss of redundant CNTL power

\*- CNTL bus name identifies power source (ex: CNTL BC1 is powered by MNB & MNC through RPCs and by MNA through cb and fuse)

**ORBITER ELECTRICAL BUS LOSS MATRIX**  
(ASSY OPS/12A.1/FIN)

Continuation of Table 1. Orbiter Electrical Bus Loss Matrix

	FC1		FC2	FC3	MNA DA1							MNB DA2							FC3			MNC DA3			MNC FPC3	
	ESS 1BC	ESS 2CA	ESS 3AB	R15	O14	A6&A14	MPC1		(R)	P	MPC2		A6&A14	APC5	FPC2	O15	R15	MAR1	MAR2	(R)	(R)	P	O16	R15	APC6	AC3
	O13&R15	O13&R14				AUX PLA	CABINPL				AUX PLB		APC2	AC2							PL PRI			APC3	A15	
							PL1	PL2	PL3					AFT PLB	φA									AFT PLC	ACφC	
STP-H2																										
ANDE Deploy																									X	
MEPPSI Deploy																								X		
RAFT Deploy																								X		
OBSS																										
LCS (+124 VDC via APCU 1)																									X	
LDRI, ITVC, PTU (on SRMS)							X																			
LDRI, ITVC, PTU, LCS HTRS (In MPMs)																										
RSC																										
RSC Illuminator																										
DTV MUX & VTR																										

X = Total loss of operational power  
P = Loss of primary power source  
R = Loss of redundant power source  
(R) = Requires action to use redundant source  
XC = Total loss of CNTL power  
XRC = Loss of redundant CNTL power

\*- CNTL bus name identifies power source (ex: CNTL BC1 is powered by MNB & MNC through RPCs and by MNA through cb and fuse)

**ORBITER ELECTRICAL BUS LOSS MATRIX**  
(ASSY OPS/12A.1/FIN)

Table 2. Orbiter Electrical Bus Loss Matrix (PRLA)

ORBITER ELECTRICAL BUSES →	MNA DA1		CNTL BUS*						MNB DA2	
	FPC1	PNL A6&A14	AB1	AB2	BC1	BC2	CA1	CA2	FPC2	PNL A6&A14
	AC1								AC2	
PRLA-PAYLOAD RETENTION LATCHES										
PRLA PL 1, 2, & 3- Latch 1/Sys A, 2/A, 3/A, 4/A, 5/A DC Logic Pwr		X								
PRLA PL 1, 2, & 3- Latch 1/Sys A, 2/A, 3/A, 4/A, 5/A Cntl Bus			XC							
PRLA PL 1, 2, & 3- Latch 1/Sys A, 2/A, 3/A, 4/A, 5/A AC Mech Pwr	X									
PRLA PL 1, 2, & 3- Latch 1/Sys B, 2/B, 3/B, 4/B, 5/B DC Logic Pwr										X
PRLA PL 1, 2, & 3- Latch 1/Sys B, 2/B, 3/B, 4/B, 5/B Cntl Bus					XC					
PRLA PL 1, 2, & 3- Latch 1/Sys B, 2/B, 3/B, 4/B, 5/B AC Mech Pwr									X	
Logic Pwr Sys 1		X								
Logic Pwr Sys 2										X
PL Bay Mech Pwr Sys 1	X		XRC	XRC			XRC	XRC		
PL Bay Mech Pwr Sys 2					XC	XC			X	

**X** = Total loss of operational power  
**P** = Loss of primary power source  
**R** = Loss of redundant power source  
**(R)** = Requires action to use redundant source  
**XC** = Total loss of CNTL power  
**XRC** = Loss of redundant CNTL power

\*- CNTL bus name identifies power source (ex: CNTL BC1 is powered by MNB & MNC through RPCs and by MNA through cb and fuse)

Table 3. Payload Retention Usage

Payload	Latch	PL SEL	Latch Use	Latch Location
P5 Truss	1	1	Latch/Release	Fwd, Port
	2	1	Latch/Release	Fwd, Stbd
	3	1	Latch/Release	Aft, Port
	4	1	Latch/Release	Aft, Stbd
	5	1	Latch/Release	Keel



## ORBITER MDM LOSS IMPACTS

(ASSY OPS/12A.1/FIN)

Page 1 of 3 pages

- FF1 Uplink through NSP 1 (secondary)
- FF3 Uplink through NSP 2 (primary)
- PF1 ISS Primary command path (via PSP 1 - UMB 1/OIU 1)
  - APCU-1 telemetry
  - OIU 1 telemetry (PDI Telemetry 1)
  - Ku-Band command and telemetry
  - DIH ODS X1/PMA-2 X2 connector mate telemetry (input 14)
  - DIH ODS X1/PMA-2 X1 connector mate telemetry (input 15)
  - Spacehab command path via PSP 1
  - Spacehab C/W Annunciation (B/U C/W Alarm)
  - Spacehab Discrete Commands
    - ARS Fan On
    - ARS Fan Off
    - Cabin Fan On
    - Cabin Fan Off
    - FSS Arm (FCSU)
    - FSS Safe (FSCU)
    - Water Pump 2 On/Water Pump 1 Off
    - Water Pump 1 On/Water Pump 2 Off
    - Water Pump 2 to Inverter
    - Water Pump 2 to Orbiter
  - Spacehab Discrete Monitors
    - Water Pump 1 Off/On
    - Water Pump 2 Off/On
    - FSS Discharged
    - Multibottle Halon Discharge
    - Smoke Sensor A Alarm
    - Smoke Sensor B Alarm
    - FSS Arm/Safe (MCP)
    - FSS Arm/Safe (FSCU)
  - Spacehab Analog Monitors
    - PPCO #2
    - PPO #2
    - Orbiter Waterline Heater Current
- STP-H2 RAFT Power Status
  - RAFT Power On Command (no deploy)
  - RAFT Pre-Arm/Safe Status
- ANDE Power Status
  - ANDE Power On Command (no deploy)

## ORBITER MDM LOSS IMPACTS

(ASSY OPS/12A.1/FIN)

Page 2 of 3 pages

- PF2 ISS Redundant command path (via PSP 2 - UMB 1/OIU 2)  
APCU-2 telemetry  
OIU 2 telemetry (PDI Telemetry 2)  
CCTV command path from **MCC** (crew still has control from PNL A7)  
DIH ODS X1/PMA-2 X1 connector mate telemetry (input 08)  
DIH ODS X1/PMA-2 X2 connector mate telemetry (input 09)  
Spacehab redundant command path via PSP 2  
Spacehab Discrete Command  
    FSS Discharge (FSCU)  
Spacehab Analog Monitor  
    Waterline Heater Status  
C/W Annunciation (PL Caution, B/U C/W Alarm)
- OF1 PCMMU 1 – mode select telemetry  
PCMMU 1,2 – ON/OFF power telemetry  
PCMMU 1,2 – RPC A telemetry  
PL AUX A – RPC ON/OFF telemetry  
MID MCA 1 OP STATUS 1, 2, 3, 4 telemetry  
MID MCA 3 OP STATUS 1, 2, 3, 4 telemetry  
PL BAY MECH PWR SYS 1, 2 telemetry  
PL RETEN LOGIC PWR SYS 1, 2 telemetry
- OF2 PSP 1,2 – bit and frame sync  
PCMMU 2 – mode select telemetry  
PCMMU 2 RPC B telemetry  
PL AUX B – RPC ON/OFF telemetry  
MID MCA 1 OP STATUS 5, 6 telemetry  
MID MCA 3 OP STATUS 5, 6, 7, 8 telemetry  
PRLA PL SEL 1  
    Latch/System 1B, 2B, 3B, 4B, 5B  
    R-F-L, LAT, REL telemetry  
PRLA PL SEL 1  
    System A REL and LAT command state telemetry
- OF3 Orbiter comm system telemetry (refer to OI MDM/DSC Failure Impacts)  
PL PRI MNC, MNB, FC3 – ON/OFF telemetry  
PCMMU 1 RPC B telemetry
- OF4 Ku-Band – RADAR mode and output power  
S-Band, Ku-Band – PNL/CMD switch position  
PSP, GCIL – ON/OFF telemetry  
Orbiter comm system telemetry (refer to OI MDM/DSC Failure Impacts)  
CAB PL (MNA, MNB), PL AUX – ON/OFF telemetry
- OA1 ODS X4/PMA X3 connector mate telemetry  
PMA 2/3 GRP 1 passive hooks (1,3,5,7,9,11) Close telemetry
- DSC OA1 ODS X4/PMA X3 connector mate telemetry  
PMA 2/3 GRP 1 passive hooks (1,3,5,7,9,11) Close telemetry

## ORBITER MDM LOSS IMPACTS

(ASSY OPS/12A.1/FIN)

Page 3 of 3 pages

- OA2            AFT PL MNB PWR ON telemetry  
                 AFT PL MNB amps  
                 ODS X3/PMA X4 connector mate telemetry  
                 PMA 2/3 GRP 2 passive hooks (2,4,6,8,10,12) Close telemetry
  
- DSC OA2       ODS X3/PMA X4 connector mate telemetry  
                 PMA 2/3 GRP 2 passive hooks (2,4,6,8,10,12) Close telemetry
  
- OA3            AFT PL MNC PWR ON telemetry  
                 AFT PL MNC amps  
                 PRLA PL SEL 1  
                 Latch/System 1A, 2A, 3A, 4A, 5A  
                 R-F-L, LAT, REL telemetry

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# PL/DPS RECONFIGURATION

(ASSY OPS/12A.1/FIN)

Page 1 of 3 pages

Procedure	Secure Action	Recovery Action	Information Only
PL 1(2) MDM I/O ERROR; PL 1(2) MDM OUTPUT (ORB PKT, <u>DPS</u> )	N/A	N/A	D
5.3c I/O ERROR PL1(2); MDM OUTPUT PL1(2) (MAL, <u>DPS</u> )	N/A*	N/A	D
PASS SM GPC FAIL (ORB PKT, <u>DPS</u> )	N/A	B	E
GNC RECOVERY VIA G2FD (ORB PKT, <u>DPS</u> )	N/A	A,B	E
5.1a CS SPLIT (MAL, <u>DPS</u> )	N/A	A,B,C**	E
5.3e BCE I/O ERROR FLEX (MAL, <u>DPS</u> )	N/A	N/A	N/A
5.3f BCE BYP FLEX (MAL, <u>DPS</u> )	N/A	N/A	N/A
5.3g BCE BYP PL 1(2) (MAL, <u>DPS</u> )	N/A*	N/A**	D
GPC FRP-4 PASS RECOVERY AFTER BFS ENGAGE (ASCENT/ORBIT/ENTRY) (MAL, <u>DPS</u> )	N/A*	A,B**	E
GPC FRP-7 DPS RECONFIG FOR LOSS OF AV BAY COOLING (ASCENT/ORBIT) (MAL, <u>DPS</u> )	N/A	A,B,C**	E
DPS SSR-3 GNC REASSIGNMENT (MAL, <u>DPS</u> )	N/A*	N/A	E
DPS SSR-4 SM REASSIGNMENT (MAL, <u>DPS</u> )	N/A	A,B	E
ECLS SSR-10 H2O PUMP OPS VIA GPC (MAL, <u>ECLS</u> )	N/A	A,B,C**	E

\*Procedure does not call out PL/DPS RECONFIG, Secure

\*\*Procedure does not call out PL/DPS RECONFIG, Recovery

## ACTION A

If PSP I/O reset not previously performed

SM 62 PCMMU/PL COMM

I/O RESET PSP 1(2) – ITEM 6(7) EXEC

Notify **MCC** when complete.

## ACTION B

Reload PDI DECOM FORMAT (ORB OPS FS, COMM/INST).

Reenable PDI DECOM FDA as required.

Resume SPEC 62.

## PL/DPS RECONFIGURATION

(ASSY OPS/12A.1/FIN)

Page 2 of 3 pages

### ACTION C

Reload PCMMU TFLs, load PCMMU FORMAT (FDF, ORB OPS FD, COMM/INST).

### INFO D

If '**I/O ERROR PL1**' message:

Loss of ground and orbiter MCDS command interface to ISS via PSP 1/OIU 1.

Loss of command capability (onboard and ground) and telemetry via PL comm string 1 for SPACEHAB.

Loss of command capability and telemetry via PL1 for STP-H2.

Loss of PL1 telemetry on SPECs 201, 206, 214, 215 denoted by 'M'.

Failed IOM can be determined using chart from PF MDM CHANNELIZATION (SH MAL, CRITICAL EQUIP LOSS).

For additional impacts, refer to {[ORBITER MDM LOSS IMPACTS](#)}, all (SODF: ASSY OPS: MALFUNCTION: CRITICAL EQUIPMENT LOST).

If failure at IOP XMTR/RCVR at SM GPC

    | Port mode to select PF2 (this will cause loss of PF2/SM GPC interface).

If '**I/O ERROR PL2**' message:

Loss of ground and orbiter MCDS command interface to ISS via PSP 2/OIU 2.

Loss of command capability (onboard and ground) and telemetry via PL comm string 2 for SPACEHAB.

Note associated loss of H2O LN HTR HAB STATUS and ORB AMPS on SPEC 215 denoted by 'M'.

Loss of SPACEHAB FSS DISCHARGE (FSCU) onboard and ground discrete command via PL2.

If failure at IOP XMTR/RCVR at SM GPC

    | If PL1 interface with SM GPC failed  
    |     Notify **MCC** for SM GPC reassignment.

    | If PL1 interface with SM GPC is okay  
    |     ORT mode to select PF1 (this will cause loss of PF1/SM GPC interface).

For additional impacts, refer to {[ORBITER MDM LOSS IMPACTS](#)} (SODF: ASSY OPS: MALFUNCTION: CRITICAL EQUIPMENT LOST).

## PL/DPS RECONFIGURATION

(ASSY OPS/12A.1/FIN)

Page 3 of 3 pages

### INFO E

If affected GPC is SM

| Loss of command capability (onboard and ground) via SM GPC until  
| SM GPC restored and/or PL 1(2) I/F restored.

If affected GPC is GNC

| Loss of ground command capability until GNC GPC restored.

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# APCU

## APCU AMPS ↑ (ASSY OPS/12A.1/FIN) Page 1 of 1 page

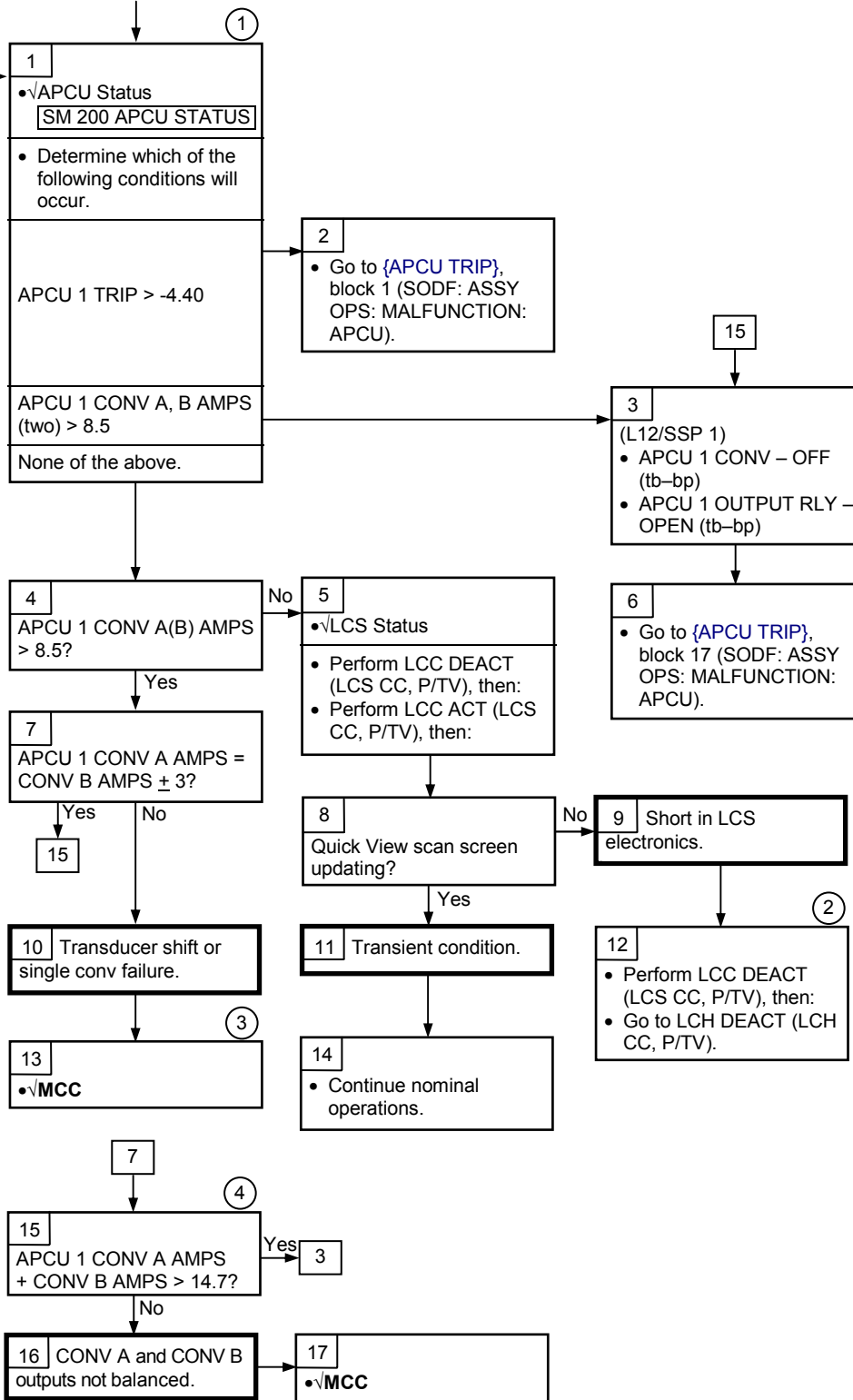
SM  
ALERT

**'S200 APCU 1  
AMPS HIGH'**  
If APCU 1 CONV  
AMPS ≥ 8.5

**Nominal Config:**  
(R1)  
PRI PL MNC – ON  
(tb–ON)  
PL CAB –  
MNA(MNB)  
(L12/SSP 1)  
cb SW PWR 1 – cl

**Single APCU  
Config:**  
(L12/SSP 1)  
APCU 1 CONV – ON  
(tb–gray)  
APCU 1 OUTPUT  
RLY – CLOSE  
(tb–gray)

{APCU TEMP ↓↑}, block 1 (SODF: ASSY OPS: MALFUNCTION: APCU)  
{APCU VOLTS ↑↓}, block 1 (SODF: ASSY OPS: MALFUNCTION: APCU)



① All displays in this procedure are on the PCS.

② APCU 1 and the Primary Payload Bus will be deactivated in LCH DEACT.

③ MCC will determine between a transducer shift and an actual single converter failure.

④ Total output for each APCU must be maintained less than 14.7 amps and each CONV output must be maintained less than 8.5 amps.

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# APCU

## APCU TEMP ↓↑ (ASSY OPS/12A.1/FIN)

SM  
ALARM

'S200 APCU 1  
TEMP HIGH'

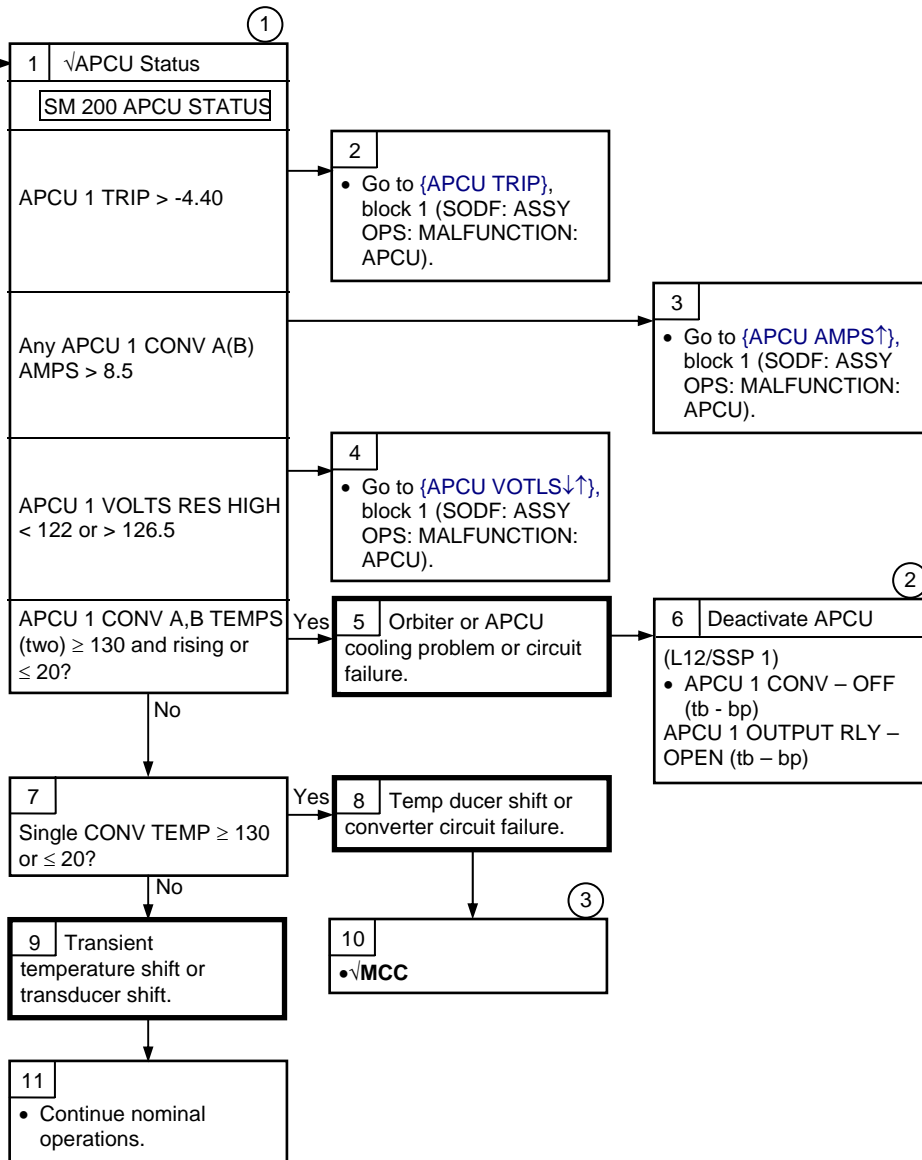
If: APCU 1 CONV  
TEMP A(B)  
≤ 20 or ≥ 130

### Nominal Config:

R1  
PRI PL MNC – ON  
(tb – ON)  
PL CAB – MNA  
(MNB)  
L12 (SSP 1)  
cb SW PWR 1 – cl

### Single APCU Config:

L12 (SSP 1)  
APCU 1 CONV – ON  
(tb – gray)  
APCU 1 OUTPUT  
RLY – CLOSE  
(tb – gray)



① All displays in this procedure are on the PCS.

② Loss of APCU 1 output results in loss of orbiter 120V power to LCS.

③ **MCC** will determine between a transducer shift and a real circuitry failure.

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# APCU

## APCU TRIP (ASSY OPS/12A.1/FIN) Page 1 of 3 pages

SM  
ALERT

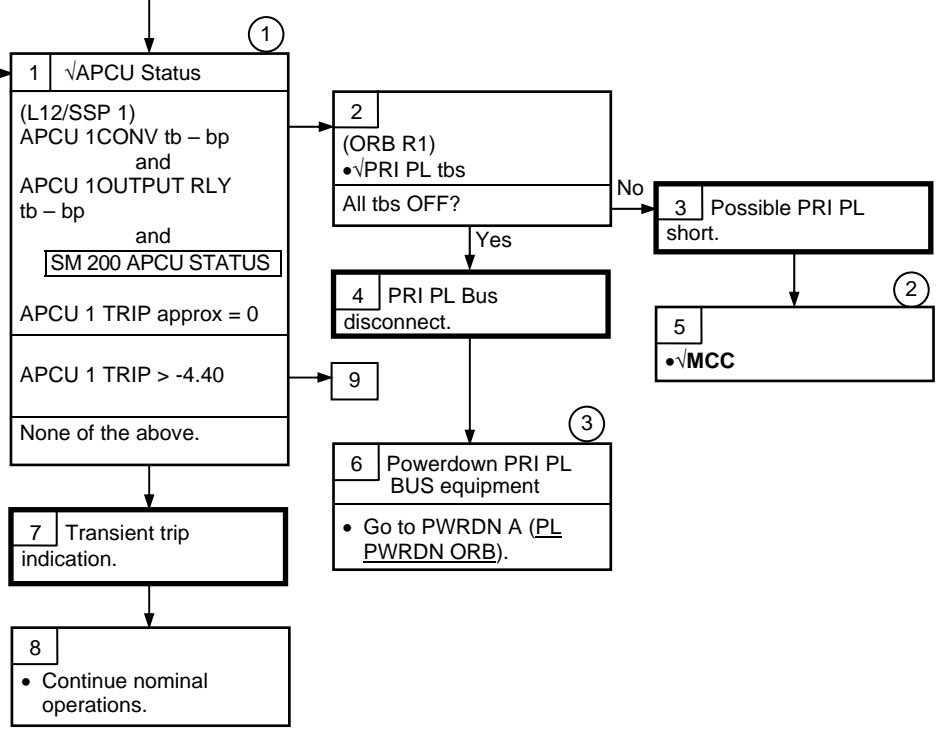
{APCU TEMP ↓↑}, block 1 (SODF: ASSY OPS: MALFUNCTION: APCU)  
 {APCU VOLTS ↑↓}, block 1 (SODF: ASSY OPS: MALFUNCTION: APCU)  
 {APCU AMPS ↑↓}, block 1 (SODF: ASSY OPS: MALFUNCTION: APCU)

'S200 APCU 1 TRIP'

If: APCU TRIP > -4.4  
 Check Table 1, APCU Trip Status

**Nominal Config:**  
 (R1)  
 PRI PL MNC – ON (tb–ON)  
 PL CAB – MNA(MNB) (L12/SSP 1)  
 cb SW PWR 1 – cl

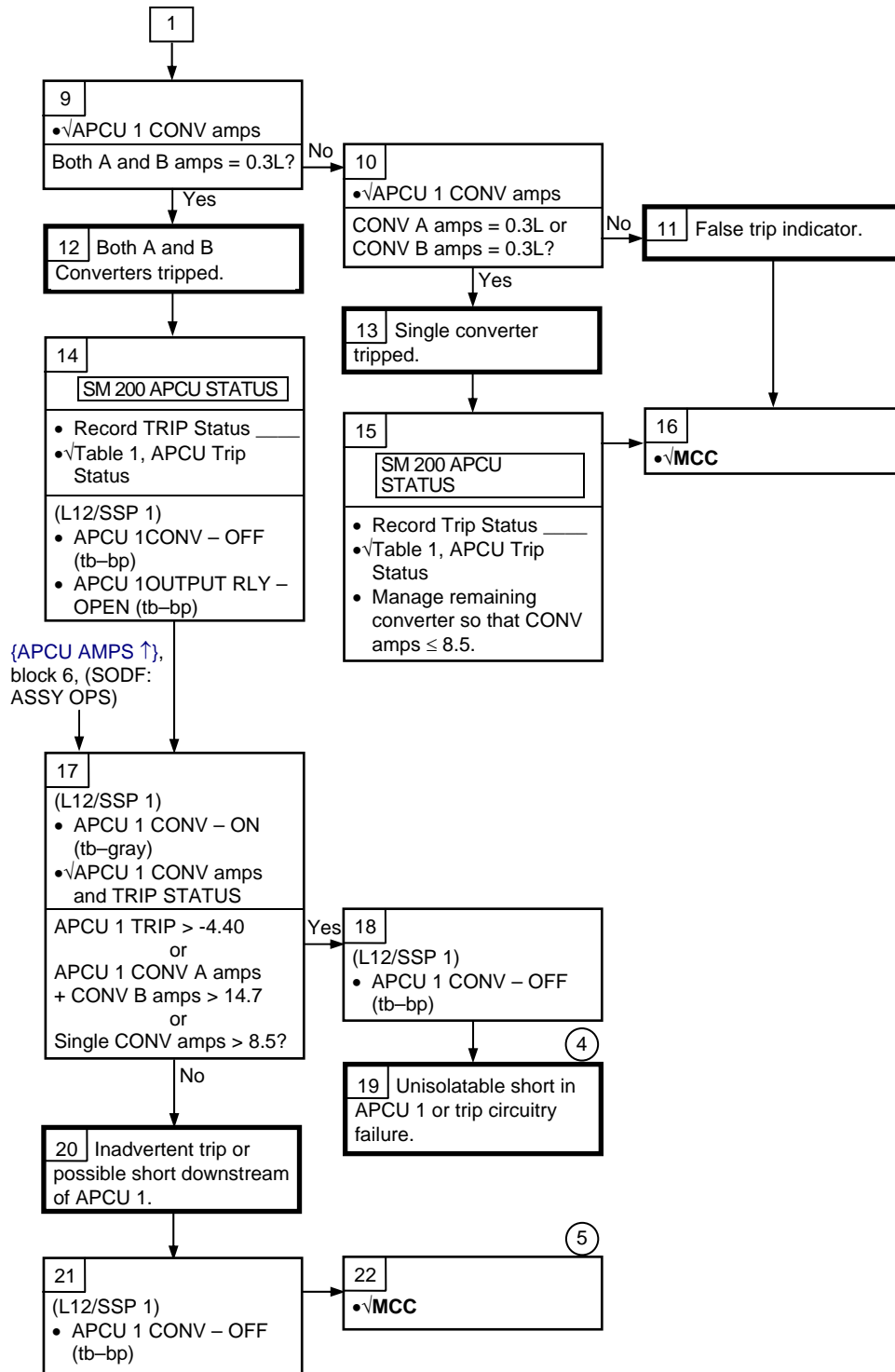
**Single APCU Config:**  
 (L12/SSP 1)  
 APCU 1 CONV – ON (tb–gray)  
 APCU 1 OUTPUT RLY – CLOSE (tb–gray)



① All displays in this procedure are on the PCS.

② MCC will determine cause of interruption of power or signal to the APCU.

③ MCC will coordinate recovery of the PRI PL bus and equipment.



④  
Loss of APCU 1 output results in loss of orbiter 120V power to LCS.

⑤  
MCC will consider recovery actions. May activate downstream loads one at a time to find shorted load.

**APCU****APCU TRIP**

(ASSY OPS/12A.1/FIN) Page 3 of 3 pages

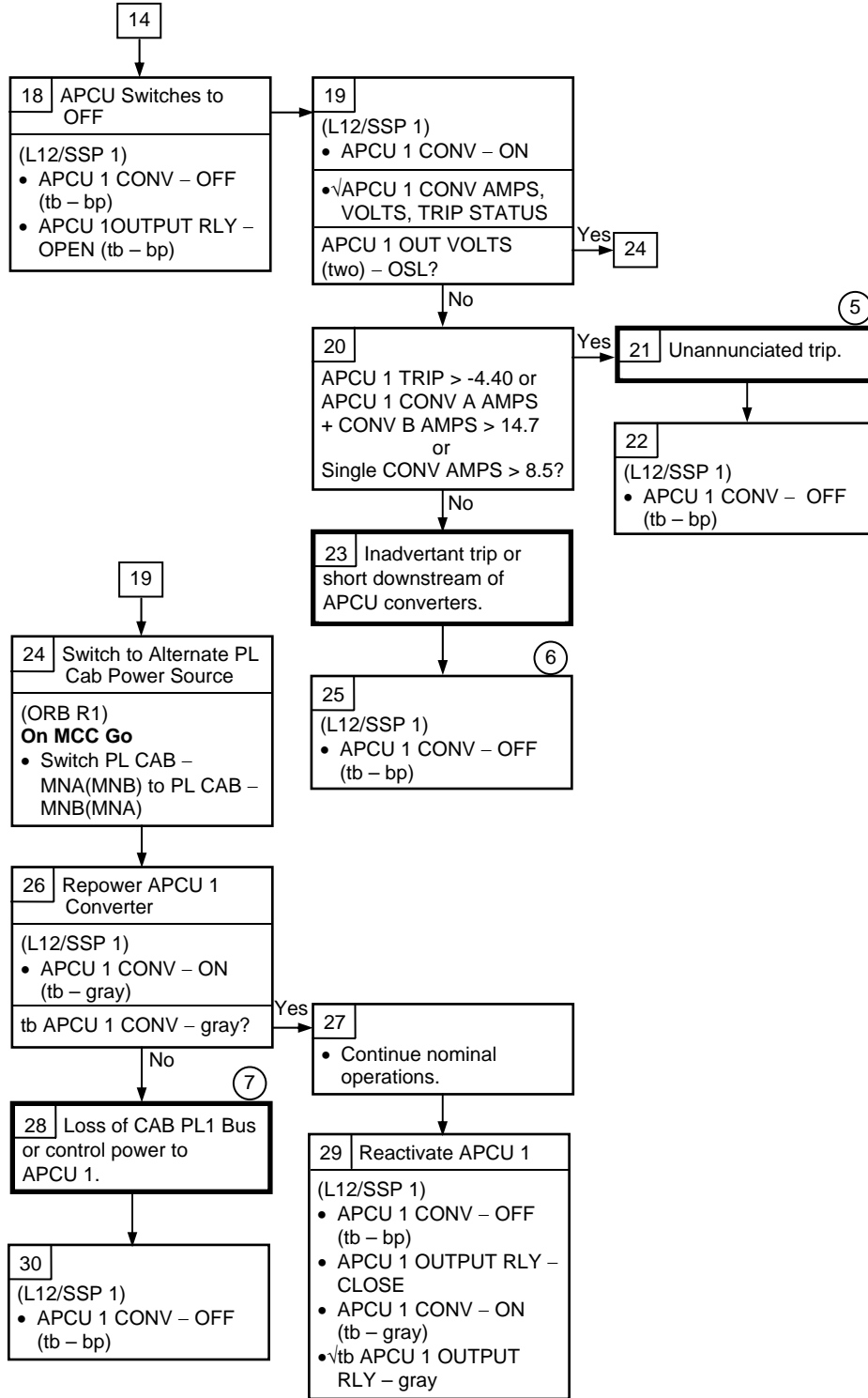
Table 1. APCU Trip Status

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
-4.84 (no trip)				
<b>NOTE</b>				
OV: Output Overvoltage				
OUV: Output Undervoltage				
OC: Output Overcurrent				
IUV: Input Undervoltage				
Tolerance for all reported voltages is $\pm 0.20$ volts.				

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5 APCU tripped but failed to set trip indicator (possible for a short circuit directly at the APCU output).

6 MCC will consider recovery APCU actions.

7 Loss of APCU 1 output results in loss of orbiter 120V power to LCS.

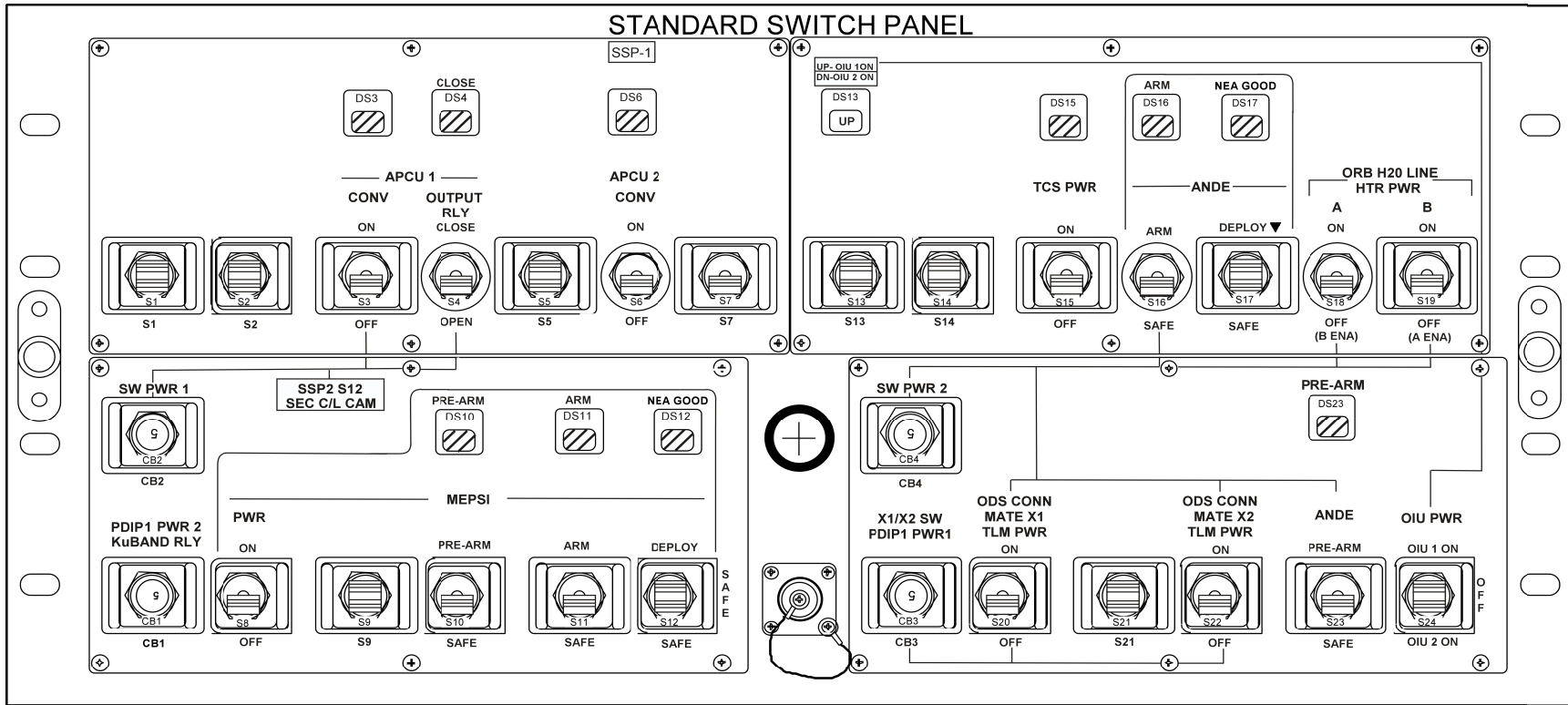
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**STANDARD SWITCH PANEL 1**  
(ASSY OPS/12A.1/FIN)

561



# STANDARD SWITCH PANEL 1

(ASSY OPS/12A.1/FIN 1)

Page 2 of 5 pages

ITEM	DEVICE TYPE	FUNCTION
S3  APCU 1 CONV	Toggle switch, two-position  (Maintained - Maintained)	ON (up) - Applies CAB PL1 control power to turn APCU 1 converters ON. OFF (dn) - Removes control power from APCU 1 converters. *Converter must be off before OUTPUT switch is opened or closed.
DS3  APCU 1 CONV	Event indicator, two-position	gray - Indicates either APCU 1 or APCU 2 converters powered ON. bp - Indicates APCU 1 and APCU 2 converters OFF.
S4  APCU 1 OUTPUT RLY	Toggle switch, two-position  (Maintained - Maintained)	CLOSE (up) - Applies CAB PL1 control power to close APCU 1 output relay. OPEN (dn) - Opens APCU 1 output relay by removing CAB PL1 control power. *Output relay should never be commanded on while converters are on.
DS4  APCU 1 OUTPUT RLY CLOSE	Event indicator, two-position	gray - Indicates APCU 1 or 2 is ouputting power. bp - Indicates APCU 1 or 2 is not outputting power.
S6  APCU 2 CONV	Toggle switch, two-position  (Maintained - Maintained)	ON (up) - Applies AUX PLB control power to turn APCU 2 converters ON. OFF (dn) - Removes control power from APCU 2 converters. *Converters must be powered off before OUTPUT switch is opened or closed.
DS6  APCU 2 CONV	Event indicator, two-position	gray - Indicates either APCU 1 or APCU 2 converters powered ON. bp - Indicates APCU 1 and APCU 2 converters OFF.
DS13  [OIU PWR]	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.

**STANDARD SWITCH PANEL 1**

(ASSY OPS/12A.1/FIN 1)

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ITEM	DEVICE TYPE	FUNCTION
DS15  TCS PWR	Event indicator, two-position	gray - Indicates TCS is powered. bp - Indicates TCS is not powered.
S16  ANDE ARM/SAFE	Toggle switch, two-position  (Maintained - Maintained)	ARM (up) - Closes ARM relay in ANDE deploy circuit (enables ground path for high current mode). SAFE (down) - Opens ARM relay in ANDE deploy circuit.
DS16  ANDE ARM	Event indicator, two-position	gray - Indicates ARM Relay is Closed. bp - Indicates ARM Relay is Open.
S17  ANDE DEPLOY/SAFE	Toggle switch, two-position  (Momentary - Maintained)	DEPLOY (up) - Closes DEPLOY relay in ANDE deploy circuit (enables high current mode by switching FET). SAFE (dn) - Opens DEPLOY relay in ANDE deploy circuit.
DS17  ANDE NEA GOOD	Event indicator, two-position	gray - Indicates bus power to NEA. bp - Indicates no power to NEA or NEA is expended.
S18  ORB H2O LINE HTR PWR A	Toggle switch, two-position  (Maintained - Maintained)	ON (up) - Applies A heater power to the orbiter portion of the SH water line heaters. OFF (dn) - Disables A heater power, enables B heater power.
S19  ORB H2O LINE HTR PWR B	Toggle switch, two-position  (Maintained - Maintained)	On (up) - Applies B heater power to the orbiter portion of the SH water line heaters. OFF (dn) - Disables B heater power, enables A heater power.
CB2  SWITCH PWR 1	Circuit breaker, 5 amp	closed (in) - Applies orbiter CAB PL1 power to APCU 1 CONV (S3) and APCU 1 OUTPUT (S4), and C/L CAM PWR (SSP2, S12). open (out) - Removes power from APCU 1 CONV (S3) and APCU 1 OUTPUT (S4), and C/L CAM PWR (SSP2, S12).
CB1  PDIP 1 PWR 2/ KuBAND RLY	Circuit breaker, 5 amp	closed (in) - Applies orbiter CAB PL2 power to PDIP DC PWR 2 switch outlet and KuBAND RATE switch. open (out) - Removes power from PDIP DC PWR 2 outlet and KuBAND RATE switch.

# STANDARD SWITCH PANEL 1

(ASSY OPS/12A.1/FIN 1)

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ITEM	DEVICE TYPE	FUNCTION
S8 MEPSI Power ON/OFF	Toggle switch, two-position  (Maintained - Maintained)	ON (up) - Enables Power ON relay in MEPSI deploy circuit. Provides power to PRE-ARM, ARM, and DEPLOY switches. OFF (down) - Disables power in MEPSI deploy circuit.
S10 MEPSI PRE-ARM/SAFE	Toggle switch, two-position  (Maintained - Maintained)	PRE-ARM (up) - Enables PRE-ARM relay in MEPSI deploy circuit. SAFE (down) - Disables PRE-ARM relay in MEPSI deploy circuit.
DS10 MEPSI PRE-ARM	Event indicator, two-position	gray - Indicates PRE-ARM relay is closed. bp - Indicates PRE-ARM relay is open.
S11 MEPSI ARM	Toggle switch, two-position  (Maintained - Maintained)	ARM (up) - Closes ARM relay MEPSI deploy circuit (enables ground path for high current mode). SAFE (down) - Opens ARM relay in MEPSI deploy circuit.
DS11 MEPSI ARM	Event indicator, two-position	gray - Indicates ARM relay is Closed. bp - Indicates ARM relay is Open.
S12 MEPSI DEPLOY/SAFE	Toggle switch, three-position  (Maintained - Maintained - Maintained)	DEPLOY (up) - Closes DEPLOY relay in MEPSI deploy circuit (enables high current mode by switching FET). SAFE (ctr) - Opens DEPLOY relay in MEPSI deploy circuit. SAFE (dn) - Opens DEPLOY relay in MEPSI deploy circuit.
DS12 MEPSI NEA GOOD	Event indicator, two-position	gray - Indicates bus power to NEA. bp - Indicates no power to NEA or NEA is expended.
CB4 SW PWR 2	Circuit breaker, 5 amp	closed (in) - Applies orbiter CAB PL3 power to ANDE ARM (S16), ORB H2O LN HTR A (S18), ORB H2O LN HTR B (S19), ANDE PRE-ARM (S23), and redundant power to ODS CONN MATE X1 (S20) and ODS CONN MATE X2 (S22). open (out) - Removes power from ANDE ARM (S16), ORB H2O LN HTR A (S18), ORB H2O LN HTR B (S19), ANDE PRE-ARM (S23), and redundant power to ODS CONN MATE X1 (S20) and ODS CONN MATE X2 (S22).



**STANDARD SWITCH PANEL 1**

(ASSY OPS/12A.1/FIN 1)

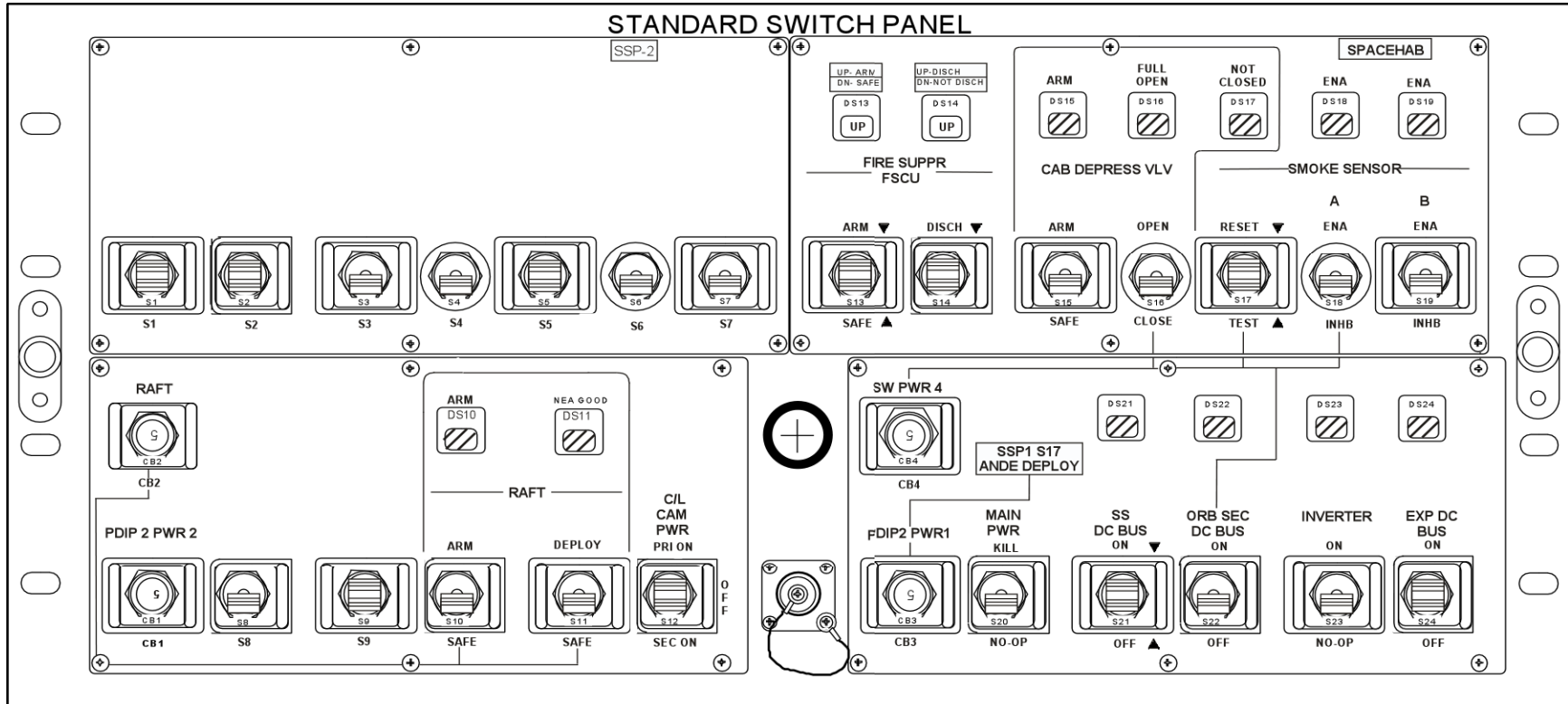
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ITEM	DEVICE TYPE	FUNCTION
CB3  X1/X2 SWITCH PDIP1 PWR 1	Circuit breaker, 5 amp	closed (in) - Applies orbiter CAB PL2 to PDIP DC PWR 1 outlet and redundant power to ODS CONN MATE X1 (S20) and ODS CONN MATE X2 (S22). open (out) - Removes power from PDIP DC PWR 1 outlet and redundant power from ODS CONN MATE X1 (S20) and ODS CONN MATE X2 (S22).
S20  ODS CONN MATE X1 TLM PWR	Toggle switch, two-position  (Maintained - Maintained)	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.
S22  ODS CONN MATE X2 TLM PWR	Toggle switch, two-position  (Maintained - Maintained)	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.
S23  ANDE PRE- ARM/SAFE	Toggle switch, two-position  (Maintained - Maintained)	PRE-ARM (up) - Closes ARM relay in ANDE deploy circuit (enables ground path for high current mode). SAFE (down) - Opens PRE-ARM relay in ANDE deploy circuit.
DS23  ANDE PRE- ARM	Event indicator, two-position	gray - Indicates PRE-ARM relay is closed. bp - Indicates PRE-ARM relay is open.
S24  OIU PWR	Toggle switch, three-position  (Maintained - Maintained - Maintained)	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.

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**STANDARD SWITCH PANEL 2**  
(ASSY OPS/12A.1/FIN)

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## STANDARD SWITCH PANEL 2

(ASSY OPS/12A.1/FIN 1)

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ITEM	DEVICE TYPE	FUNCTION
S13 FIRE SUPPR FSCU ARM	Momentary sw, two-position	ARM (up) - Applies 28 VDC command to FSS discharge logic within FSCU. This command combined with DISCHARGE command, detonates Halon Bottles. SAFE (dn) - Removes 28 VDC command above, which interrupts ARM command or DISCHARGE command.
DS13 FIRE SUPPR FSCU ARM	Event indicator, three-position	Provides status of FSS firing circuitry in FSCU Down - SAFE Up - ARM bp - unpowered
S14 FIRE SUPPR FSCU DISCH	Momentary sw, two-position	DISCHARGE - Applies 28 VDC command to FSS discharge logic within FSCU. This command detonates Halon Bottles once ARM command is present. Other switch position not used.
DS14 FIRE SUPPR FSCU DISCH	Event indicator, three-position	Provides status of Halon Bottles Up - Nine Bottles have discharged. Down - Less than nine Bottles have discharged. bp - unpowered
S15 CAB DEPRESS VLV ARM/SAFE	Toggle switch, two-position  (Maintained - Maintained)	ARM (up) - Applies 28 VDC command to CDV control logic within MCP. This command combined with OPEN command from S16 opens CDV. SAFE (dn) - Removes 28 VDC pwr from CDV control logic. This position not electrically wired.
DS15 CAB DEPRESS VLV ARM	Event indicator, two-position	gray - Indicates CDV control logic has been armed. bp - Indicates CDV control logic has not received power and valve is safed.
S16 CAB DEPRESS VLV OPEN/CLOSE	Toggle switch, two-position  (Maintained - Maintained)	OPEN (up) - Applies 28 VDC command to CDV control logic in MCP, which opens CDV if ARM command from S15 present. CLOSED (dn) - Applies 28 VDC command to CDV control logic in MCP, which closes CDV if ARM command present.
DS16 CAB DEPRESS VLV FULL OPEN	Event indicator, two-position	gray - (full open) Indicates CDV has reached full open position. bp - (not full open) indicates CDV has not reached full open position.

## STANDARD SWITCH PANEL 2

(ASSY OPS/12A.1/FIN 1)

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ITEM	DEVICE TYPE	FUNCTION
DS17 CAB DEPRESS VLV NOT CLOSED	Event indicator, two-position	gray - (not closed) Indicates CDV is not closed (partially open). bp - (closed) Indicates CDV is closed.
S17  SMOKE SENSOR TEST/RESET	Momentary sw, two-position	TEST (up) - Applies 28 VDC test input to both smoke sensors causing them to produce an alarm signal if sensors enabled. RESET (dn) - Applies to 28 VDC signal to reset input of both smoke sensors returning them to normal operational mode.
S18  SMOKE SENSOR A	Toggle switch, two-position  (Maintained - Maintained)	ENA (up) - Applies 28 VDC to relay inside FSCU, which allows Smoke Sensor A alarm signal to travel to the CWEA and the MDM. INHIB (dn) - Other switch position not wired to SH. However, inhibit signal occurs by removing 28 VDC from above relay at this switch position.
DS18  SMOKE SENSOR A ENA	Event indicator, two-position	Provides status of Smoke Sensor A: gray - Smoke Sensor A ENABLED bp - Smoke Sensor A is INHIBITED
S19  SMOKE SENSOR B	Toggle switch, two-position  (Maintained - Maintained)	ENA (up) - Applies 28 VDC to relay inside the MCP, which allows Smoke Sensor B alarm signal to travel to the CWEA and the MDM. INHIB (dn) - Other switch position not wired to SH. However, inhibit signal occurs by removing 28 VDC from the above relay at this switch position.
DS19  SMOKE SENSOR B ENA	Event indicator, two-position	Provides status of Smoke Sensor B: gray - Smoke Sensor B ENABLED bp - Smoke Sensor B INHIBITED
CB 2  RAFT	Circuit breaker, 5 amp	closed (in) - Enables SSP2 S10, S11 RAFT deploy power open (out) - Disables SSP1 S10, S11 switches
CB1  PDIP 2PWR 2	Circuit breaker, 5 amp	closed (in) - Applies orbiter pwr to PDIP DC pwr 2 open (out) - Removes orbiter pwr from PDIP DC pwr 2

## STANDARD SWITCH PANEL 2

(ASSY OPS/12A.1/FIN 1)

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ITEM	DEVICE TYPE	FUNCTION
S10  RAFT ARM/SAFE	Toggle switch, two-position  (Maintained - Maintained)	ARM (up) - Closes ARM relay in RAFT deploy circuit (enables ground path for high current mode). SAFE (down) - Opens ARM relay in RAFT deploy circuit.
DS10  RAFT ARM	Event indicator, two-position	gray - Indicates ARM relay is closed. bp - Indicates ARM relay is open.
S11  RAFT DEPLOY/SAFE	Toggle switch, two-position  (Maintained - Maintained)	DEPLOY (up) - Closes DEPLOY relay in RAFT deploy circuit (enables high current mode by switching FET). SAFE (dn) - Opens DEPLOY relay in RAFT deploy circuit.
DS11  RAFT NEA GOOD	Event indicator, two-position	gray - Indicates bus power to NEA. bp - Indicates no power to NEA or NEA is expended.
S12  C/L CAM PWR PRI ON/SEC ON	Toggle switch, three-position  (Maintained - Maintained - Maintained)	PRI ON (up) - Provides primary power to centerline camera. OFF (ctr) - Removes power from centerline camera. SEC ON (dn) - Provides secondary power to centerline camera.
CB4  SW PWR 4	Circuit Breaker, 5 amp	closed (in) - Applies orbiter power to CAB DEPRESS VLV (S16), SMOKE SENSOR TEST/RETEST (S17), SMOKE SENSOR A (S18), and ORB SEC DC BUS (S22). open (out) - Removes power from CAB DEPRESS VLV (S16), SMOKE SENSOR TEST/RETEST (S17), SMOKE SENSOR A (S18), and ORB SEC DC BUS (S22).
CB3  PDIP2 PWR1	Circuit breaker, 5 amp	closed (in) - Applies 28 VDC pwr to PDIP2 and ANDE DEPLOY (SSP1, S17) open (out) - Removes 28 VDC pwr from PDIP2 and ANDE DEPLOY (SSP, S17).
S20  MAIN PWR	Toggle switch, two-position  (Maintained - Maintained)	KILL (up) - Applies 28 VDC command to open PDU relays K1, K13, K14, K15, K16, K18, K21, and pwr contactors 1 and 2. This effectively removes AC and DC pwr from all SH subsystem and experiment equipment, except ARS Fan, Water Pump 2, and emergency bus powered equipment. NO-OP (dn) - Not wired to SH.

## STANDARD SWITCH PANEL 2

(ASSY OPS/12A.1/FIN 1)

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ITEM	DEVICE TYPE	FUNCTION
S21 SS DC BUS	Momentary sw, two-position	ON (up) - Applies 28 VDC command to close PDU relays K13 and K14 which enables distribution of DC pwr to SH subsystem bus. OFF (dn) - Applies 28 VDC command to open above relays removing pwr from SH subsystem equipment bus.
DS21 SS DC BUS	Event indicator, two-position	gray - Indicates both PDU relays K13 and K14 closed. bp - Indicates both PDU relay K13 and K14 open.
S22 ORB SEC DC BUS	Toggle switch, two-position  (Maintained - Maintained)	ON (up) - Used to activate PDU pwr contactor 1 and relay K15 which allows distribution of secondary feed. OFF (dn) - Applies 28 VDC command to open above relays removing secondary DC power from subsystems and experiments.
DS22 ORB SEC DC BUS	Event indicator, two-position	gray - Indicates PDU pwr contactor 1 is closed. bp - Indicates PDU pwr contactor 1 is open.
S23 INVERTER	Toggle switch, two-position  (Maintained - Maintained)	ON (up) - Applies 28 VDC command to close PDU relay K1 which sends DC pwr to inverter for AC conversion. NO-OP (dn) - Switch position not wired to SH.
DS23 INVERTER	Event indicator, two-position	gray - Indicates PDU relay K1 closed. bp - Indicates PDU relay K1 open.
S24 EXP DC BUS	Toggle switch, three-position  (Maintained - Maintained)	ON (up) - Applies 28 VDC command to close PDU pwr contactor 2 and relay K16 which allows distribution of DC pwr to locker and rack experiments. ctr - Not wired. OFF (dn) - Applies 28 VDC command to above relays removing DC pwr from all experiments.
DS24 EXP DC BUS	Event indicator, two-position	gray - Indicates PDU pwr contactor 2 closed. bp - Indicates PDU pwr contactor 2 open.

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### C3 PAYLOAD SAFING

(ASSY OPS/12A.1/FIN)

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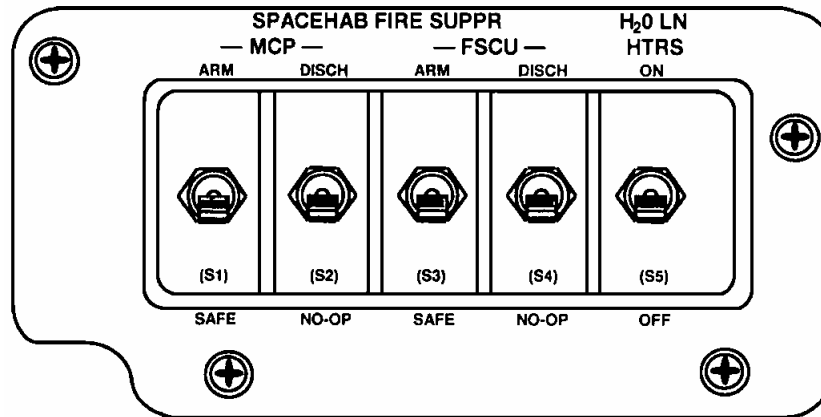


Figure 1.- Spacehab Fire Suppressor and H2O Line Heaters Panel.

Table 1. Spacehab Fire Suppressor and H2O Line Heaters Panel

Item	Type Device	Function
S1 SPACEHAB FIRE SUPPR MCP ARM/SAFE	Two-position toggle switch: (up, down - maintained)	ARM (up) - Sends Arming signal to MCP FSS Discharge circuitry, which closes ground path for pyro circuit.  SAFE (down) - Sends Safing signal to MCP FSS Discharge circuitry.
S2 SPACEHAB FIRE SUPPR MCP DISCH/NO-OP	Two-position toggle switch: (up, down - maintained)	DISCH (up) - Sends Fire signal to MCP FSS Discharge circuitry. If circuit is armed, firing pulses will be sent to pyro circuits.  NO-OP (down) - not wired
S3 SPACEHAB FIRE SUPPR FSCU ARM/SAFE	Two-position toggle switch: (up, down - maintained)	ARM (up) - Sends arm signal to FSCU FSS Discharge circuitry, and closing ground path for pyro circuit.  SAFE (down) - Removes arm signal from FSCU FSS Discharge circuitry.
S4 SPACEHAB FIRE SUPPR FSCU DISCH/NO-OP	Two-position toggle switch: (up, down - maintained)	DISCH (up) - Sends Fire signal to FSCU FSS Discharge circuitry. If circuit is armed, firing pulses will be sent to pyro circuits.  NO-OP (down) - not wired
S5 H2O LN HTRS	Two-position toggle switch: (up, down - maintained)	ON (up) - Closes relays, allowing PL AFT B to power SH Water Line heaters.  OFF (down) - not wired

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OBJECTIVE:

The purpose of this display is to allow the orbiter crew to command the ANDE and RAFT payloads and monitor the relay status. Figure 1 shows the display.

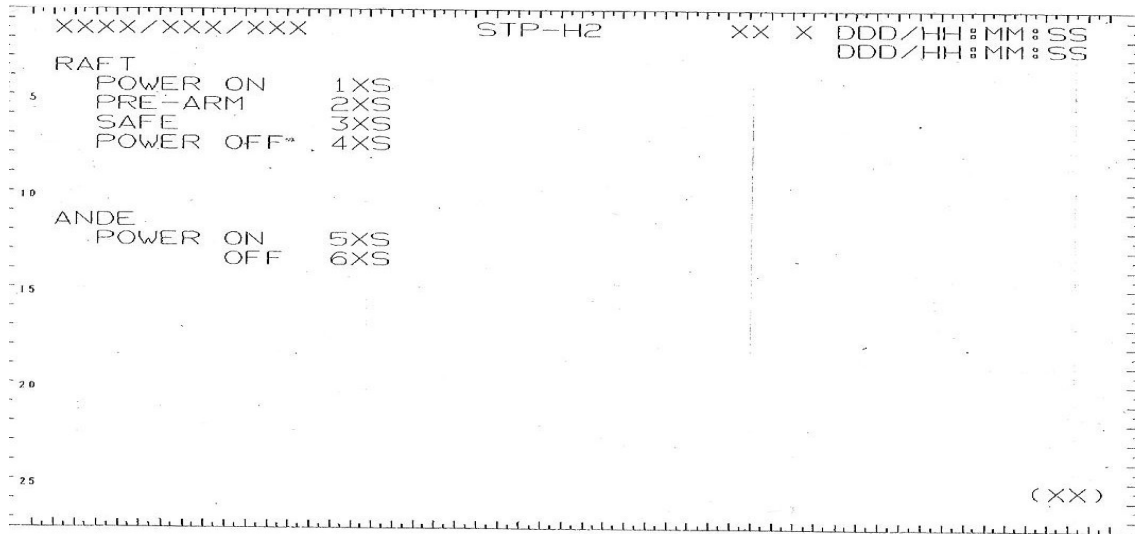


Figure 1.- SPEC 201: STP-H2.

TITLE: STP-H2

TYPE: SPEC 201

PURPOSE, OPERATION, AND ORGANIZATION

This display is used to close and open the ANDE and RAFT relays and monitor relay status. The function of the display is described below.

1. RAFT POWER ON shows when the RAFT POWER relay is Closed. It is denoted by the asterisk. To close, the relay crew executes Item 1.
2. RAFT PRE-ARM shows when the RAFT PRE-ARM relay is Closed. It is denoted by the asterisk. To close, the relay crew executes Item 2.
3. RAFT SAFE shows when the RAFT PRE-ARM relay is Open. It is denoted by the asterisk. To open, the relay crew executes Item 3.
4. RAFT POWER OFF shows when the RAFT POWER relay is Open. It is denoted by the asterisk. To open, the relay crew executes Item 4.
5. ANDE POWER ON shows when the ANDE POWER relay is Closed. It is denoted by the asterisk. To close, the relay crew executes Item 5.
6. ANDE POWER OFF shows when the ANDE POWER relay is Open. It is denoted by the asterisk. To open, the relay crew executes Item 6.

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**CHANNEL 2/3 POWERDOWN SUMMARY - (EVA 2)**

(ASSY OPS/12A.1/FIN)

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	2/3 Power Reconfiguration		Z1 SPDA Power Reconfiguration
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>C&amp;DH</b>			
<b>MDMs</b>	<b>INTERNAL:</b> C&C-1, C&C-2 <sup>(2)</sup> , C&C-3 INT-1 PMCU-1 GNC-1 LA-1 PL-1 A/L <sup>(4)</sup>  <b>EXTERNAL:</b> EXT-1 N1-1 P1-1, P3-1 S0-1 STR, S1-1 PVCU-2B, PVCU-4B, PVCU-2A, PVCU-4A	<b>INTERNAL:</b> INT-2 <sup>(3)</sup> PMCU-2 <sup>(3)</sup> GNC-2 LA-2, LA-3 PL-2  <b>EXTERNAL:</b> EXT-2 N1-2 PTR, P1-2, P3-2 S0-2 S1-2	
<b>Heaters</b>	EXT-2, N1-2, P3-2, P1-2, PTR, S1-2	EXT-1, N1-1, P3-1, P1-1, S0-1, S1-1, STR	
<b>C&amp;W</b>		LAB Panel	
<b>PCS</b>	PCS-2 (LAB RWS)	PCS-1 (Cupola RWS)	
<b>Misc</b>	SDMS Signal Conditioner-1 SDMS Signal Conditioner-1 Heater  APS-1 PEHG-1	SDMS Signal Conditioner-2 SDMS Signal Conditioner-2 Heater  APS-2 PEHG-2	

Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power Av Rack 1 from Channel 1/4.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 1 from Channel 1/4.
- <sup>(4)</sup> Assumes Airlock Avionics Power Reconfiguration is complete.

**CHANNEL 2/3 POWERDOWN SUMMARY - (EVA 2)**

(ASSY OPS/12A.1/FIN)

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	<b>2/3 Power Reconfiguration</b>		<b>Z1 SPDA Power Reconfiguration</b>
	<b>Powered</b>	<b>Unpowered</b>	<b>Unpowered<sup>(1)</sup></b>
<b>CHeCS</b>	EV-CPDS IV-CPDS  MEC TEPC	CHeCS Rack (LAB1D4) AAA VOA Defibrillator  EV-CPDS Heater  CEVIS	
<b>C&amp;T</b>			
<b>General</b>	S-Band String 1 (S1) S-Band String 1 (S1) Heaters S-Band String 2 (P6) <sup>(1)</sup> S-Band String 2 (P6) Heaters  Ku-Band External ORUs <sup>(1)</sup> Ku-Band Heaters	*Ku-Band Internal ORUs (see Data section)  *Ku-Band system is down for the main powerdown due to Internal ORUs being down. The External ORUs will not be powered down until the Z1 Patch Panel Reconfiguration.	S-Band String 2 (P6) Ku-Band External ORUs
<b>Audio</b>	IAC-1 ATUs: LAB Fwd (ATU-2), A/L1 <sup>(4)</sup> , EMU1 <sup>(4)</sup> , EMU2 <sup>(4)</sup> AUAI-2S ABC-1 DAIU SSSR-2 (UHF-2) EMU Audio Control Panel <sup>(4)</sup>	IAC-2 <sup>(3)</sup> ATU-1 (LAB Aft) AUAI-1P ABC-2 <sup>(3)</sup> RAIU-1 - No intermodule voice with RS; C&W still avail in RS SSSR-1 (UHF-1) <sup>(3)</sup>	

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Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 1 from Channel 1/4.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 1 from Channel 1/4.
- <sup>(4)</sup> Assumes Airlock Avionics Power Reconfiguration is complete.

**CHANNEL 2/3 POWERDOWN SUMMARY - (EVA 2)**

(ASSY OPS/12A.1/FIN)

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	<b>2/3 Power Reconfiguration</b>		<b>Z1 SPDA Power Reconfiguration</b>
	<b>Powered</b>	<b>Unpowered</b>	<b>Unpowered<sup>(1)</sup></b>
<b>Video</b>	VTR-1 VSU-1 CVIU-1, 2, 3, 7 <sup>(4)</sup> , 12 SCU-1 EVSU-1, -3 EVSU-2 Heaters MSS Trunklines 4, 5, 8, 9 USOS Trunklines 1, 2, 5 to 7, 10, 14 to 22 Orbiter Video Channel 2	VTR-2 VSU-2 <sup>(3)</sup> , 3 CVIU-4, 5, 6, 8 SCU-2 <sup>(3)</sup> EVSU-2 EVSU-1, -3 Heaters MSS Trunklines 1, 2, 3, 6, 7 USOS Trunklines 3, 4, 8, 9, 11, 12, 13, 23 to 26 Orbiter Video Channel 1  Summary: No downlink Video; limited internal Video Routing capability; limited external/SSRMS video routing capability; no video from Cup RWS or Node ports. Only one view to or from orbiter.	
<b>Data</b>	Ku-Band Fwd Receiver (powered from EXPRESS Rack 4)	HCOR High Rate Frame Mux (HRFM) High Rate Modem (HRM) VBSP (no downlink video)  Summary: No payload telemetry, no OCA.	

Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 1 from Channel 1/4.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 1 from Channel 1/4.
- <sup>(4)</sup> Assumes Airlock Avionics Power Reconfiguration is complete.

**CHANNEL 2/3 POWERDOWN SUMMARY - (EVA 2)**

(ASSY OPS/12A.1/FIN)

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	<b>2/3 Power Reconfiguration</b>		<b>Z1 SPDA Power Reconfiguration</b>
	<b>Powered</b>	<b>Unpowered</b>	<b>Unpowered<sup>(1)</sup></b>
<b>VCSA Ports</b>	<u>WETAs:</u> Port 8 (P1UPOB) Heaters Port 12 (NOD1UP) Heaters  <u>ETVCGs:</u> Port 3 (S1 LOOB) Port 9 (P1 LOOB) Port 13 (LAB_S)  FPMU - Port 2 (S1 UPOB) Heaters	<u>WETAs:</u> Port 8 (P1UPOB) Port 12 (NOD1UP)  <u>ETVCGs:</u> Port 3 (S1 LOOB) Heaters Port 9 (P1 LOOB) Heaters Port 13 (LAB_S) Heaters  FPMU - Port 2 (S1 UPOB)  Summary: Helmet-cam not available via station assets.	

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Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 1 from Channel 1/4.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 1 from Channel 1/4.
- <sup>(4)</sup> Assumes Airlock Avionics Power Reconfiguration is complete.



**CHANNEL 2/3 POWERDOWN SUMMARY - (EVA 2)**

(ASSY OPS/12A.1/FIN)

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	<b>2/3 Power Reconfiguration</b>		<b>Z1 SPDA Power Reconfiguration</b>
	<b>Powered</b>	<b>Unpowered</b>	<b>Unpowered<sup>(1)</sup></b>
<b>ECLSS</b>			
<b>Node</b>	N1 Stbd Fwd IMV Valve N1 Stbd Aft IMV Valve N1 Aft Stbd IMV Valve N1 Aft Port IMV Valve N1 Aft Port IMV Fan N1 RAMV N1 Cabin Fan N1 Smoke Detector 1	N1 Fwd Port IMV Valve N1 Fwd Stbd IMV Valve N1 Stbd Aft IMV Fan Node 1 Smoke Detector 2	
<b>LAB</b>	LAB Aft Port IMV Fan LAB Fwd Port IMV Fan LAB Fwd Stbd IMV Valve Pressure Control Assembly LAB1P6 CCAA Port Waste Water Vent Valve LAB Smoke Detector PD1	LAB Aft Port IMV Valve LAB Aft Stbd IMV Valve LAB Fwd Stbd IMV Fan LAB Smoke Detector SD5 LAB1S6 CCAA Stbd Waste Water Vent Valve ARS Rack (AAA, MCA, CDRA, TCCS, Rack Smoke Detector)	
<b>A/L</b>	Pressure Control Assembly <sup>(4)</sup> Smoke Detectors <sup>(4)</sup> A/L CCAA <sup>(4)</sup>	Depress Pump <sup>(4)</sup> ORCA <sup>(4)</sup> Metox Recharger <sup>(4)</sup>	

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Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 1 from Channel 1/4.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 1 from Channel 1/4.
- <sup>(4)</sup> Assumes Airlock Avionics Power Reconfiguration is complete.

**CHANNEL 2/3 POWERDOWN SUMMARY - (EVA 2)**

(ASSY OPS/12A.1/FIN)

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	2/3 Power Reconfiguration		Z1 SPDA Power Reconfiguration
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>EPS</b>			
<b>Lights</b>	<u>Node:</u> NOD1OP4 NOD1SD2 NOD1OP2-1 (Fwd) NOD1OP2-2 (Aft)  <u>LAB:</u> LAB1OS1 LAB1OS3 LAB1OS5 LAB1OP2 LAB1OP4 LAB1OP6  <u>CETA:</u> S1-1 N1-1 LAB Luminaire Heater S1-2 Luminaire Heater N1-2 Luminaire Heater	<u>Node:</u> NOD1OS4 NOD1PD2 NOD1OS2-1 (Fwd) NOD1OS2-2 (Aft)  <u>LAB:</u> LAB1OS2 LAB1OS4 LAB1OS6 LAB1OP1 LAB1OP3 LAB1OP5  <u>CETA:</u> LAB S1-2 N1-2 S1-1 Luminaire Heater N1-1 Luminaire Heater	
<b>SARJ</b>	SARJ RJMC P3-1 SARJ RJMC P3-2 Heaters	SARJ RJMC P3-2 SARJ RJMC P3-1 Heaters	
<b>Russian Power</b>	FGB ARCUs 51 and 52 <sup>(1)</sup> FGB ARCUs 53 and 54 SM CHTs 23 and 24 <sup>(1)</sup>	SM CHTs 21 and 22	FGB ARCUs 51 and 52 SM CHTs 23 and 24

Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 1 from Channel 1/4.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 1 from Channel 1/4.
- <sup>(4)</sup> Assumes Airlock Avionics Power Reconfiguration is complete.

**CHANNEL 2/3 POWERDOWN SUMMARY - (EVA 2)**

(ASSY OPS/12A.1/FIN)

Page 7 of 11 pages

	<b>2/3 Power Reconfiguration</b>		<b>Z1 SPDA Power Reconfiguration</b>
	<b>Powered</b>	<b>Unpowered</b>	<b>Unpowered<sup>(1)</sup></b>
<b>Misc</b>	MBSU 2, 3 Coldplate Heaters DDCU S0-2B, S0-3B P1-3A Coldplate Heaters  A/L Power Supply Assembly (PSA) <sup>(4)</sup>  PCU Z1-3B <sup>(1)</sup> PCU Z1-3B Heater PCU Z1-4B PCU Z1-4B Heater <sup>(1)</sup>	MBSU 1, 4 Coldplate Heaters DDCU S0-4B, S0-1A, S1-4B Coldplate Heaters  A/L Battery Charger <sup>(4)</sup>	PCU Z1-3B PCU Z1-4B Heater

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Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 1 from Channel 1/4.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 1 from Channel 1/4.
- <sup>(4)</sup> Assumes Airlock Avionics Power Reconfiguration is complete.

**CHANNEL 2/3 POWERDOWN SUMMARY - (EVA 2)**

(ASSY OPS/12A.1/FIN)

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	2/3 Power Reconfiguration		Z1 SPDA Power Reconfiguration
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>MCS</b>	CMG-1 CMG-2 <sup>(1)</sup> CMG-3 <sup>(1)</sup> CMG-4  CMG 1 Heater <sup>(1)</sup> CMG 2 Heater CMG 3 Heater CMG 4 Heater <sup>(1)</sup>  RGA-1 SIGI-1	RGA-2 SIGI-2	CMG-2 CMG-3 CMG-1 Heater CMG-4 Heater
<b>Payloads</b>	<u>Racks:</u> LAB1P2 (EXPRESS-4)	<u>Racks:</u> LAB1O1 (EXPRESS-2) LAB1O2 (EXPRESS-1) **LAB1O3 (EXPRESS-3) LAB1O4 (MELFI) LAB1P4 (HRF-2) *LAB1S2 (HRF-1) **LAB1S3 (MSG) LAB1S4 (EXPRESS-5)  *These racks are powered by Channel 1/4 but planned to be powered off for power savings.  **These racks could be powered from Channel 1/4 but are nominally planned to be off.	

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Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 1 from Channel 1/4.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 1 from Channel 1/4.
- <sup>(4)</sup> Assumes Airlock Avionics Power Reconfiguration is complete.

**CHANNEL 2/3 POWERDOWN SUMMARY - (EVA 2)**

(ASSY OPS/12A.1/FIN)

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	2/3 Power Reconfiguration		Z1 SPDA Power Reconfiguration
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>Robotics</b>	AVU-1 LAB RWS (LAB1P5)  MBS/SSRMS Prime String MT 4B Power Channel	AVU-2 Cupola RWS (LAB1S5)  MBS/SSRMS Redundant String MT 3A Power Channel 1 SSRMS Camera or the Mast Camera	
<b>S&amp;M</b>			

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Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 1 from Channel 1/4.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 1 from Channel 1/4.
- <sup>(4)</sup> Assumes Airlock Avionics Power Reconfiguration is complete.

**CHANNEL 2/3 POWERDOWN SUMMARY - (EVA 2)**

(ASSY OPS/12A.1/FIN)

	<b>2/3 Power Reconfiguration</b>		<b>Z1 SPDA Power Reconfiguration</b>
	<b>Powered</b>	<b>Unpowered</b>	<b>Unpowered<sup>(1)</sup></b>
<b>TCS</b>			
<b>ITCS</b>	LAB LTL System LAB MTL IFHX Heaters Loop Crossover Assembly Valve 1	LAB MTL System LAB LTL IFHX Heaters Loop Crossover Assembly Valve 2	
<b>ETCS</b>	Loop A PM PCVP Loop A PM Htr 2 Loop A PM Line Heaters Loop A PM Bypass Return Flowmeter Loop A PM Outlet Flowmeter Loop A NTA Tank and GPRV Heater 2 Loop A ATA Tanks - Heater 2  Loop B PM Heater 1 Loop B NTA Tank and GPRV Heater 1 Loop B ATA Tanks - Heater 1	Loop B PM PCVP Loop B PM Htr 2 Loop B PM Line Heaters Loop B PM Bypass Return Flowmeter Loop B PM Outlet Flowmeter Loop B NTA Tank and GPRV Heater 2 Loop B ATA Tanks - Heater 2  Loop A PM Heater 1 Loop A NTA Tank and GPRV Heater 1 Loop A ATA Tanks - Heater 1	
<b>EETCS</b>	All Loop A equipment All Loop B equipment		

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Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 1 from Channel 1/4.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 1 from Channel 1/4.
- <sup>(4)</sup> Assumes Airlock Avionics Power Reconfiguration is complete.

**CHANNEL 2/3 POWERDOWN SUMMARY - (EVA 2)**

(ASSY OPS/12A.1/FIN)

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	<b>2/3 Power Reconfiguration</b>		<b>Z1 SPDA Power Reconfiguration</b>
	<b>Powered</b>	<b>Unpowered</b>	<b>Unpowered<sup>(1)</sup></b>
<b>Radiators</b>	TRRJ RJMC S1-1 TRRJ RJMC P1-1  <u>Heaters:</u> RJMC S1-1 Htr 1 and Htr 4 RJMC S1-2 Htr 2 and Htr 3 RJMC P1-2 Gp-1 Htr-1 and Gp-2 Htr-2 RJMC P1-2 Gp-1 Htr-2 and Gp-2 Htr-1 DLA S1-1 Htr DLA P1-1 Htr TRRJ S1 Cradle Htr Radiator Beam S1 Misc Groups 1 to 4 Power Buses Radiator Beam P1 Thermo Groups 1 to 3 Power Buses	TRRJ RJMC P1-2 TRRJ RJMC S1-2  <u>Heaters:</u> RJMC S1-1 Htrs 2 and 3 RJMC S1-2 Htrs 1 and 4 RJMC P1-1 Htr Gp-1 Htr-2 and GP-2 Htr-3 RJMC P1-2 Gp-1 Htr-1 and Gp-2 Htr-4 DLA S1-2 Htr DLA P1-2 Htr TRRJ P1 Cradle Htr Radiator Beam P1 Misc Groups 1 to 4 Power Buses Radiator Beam S1 Thermo Groups 1 to 3 Power Buses	
<b>CIO</b>	Ops LAN Equipment Channel 1/4 SSCs (crew can access procedures from ODF CDs)	Ops LAN Equipment Channel 2/3 SSCs Channel 2/3 Printers SSC Fileserver OCA Router (OCA not available due to Ku-Band system being down)	
<b>UOPs</b>	NODE UOP 1 (NOD1SD4) LAB UOP 1 (LAB1OS2) LAB UOP 2 (LAB1OS4) LAB UOP 6 (LAB1SD4) LAB RWS (LAB UOP 7 bypass) A/L UOP <sup>(4)</sup>	NODE UOP 2 (NOD1PD4) LAB UOP 3 (LAB1OP2) LAB UOP 4 (LAB1OP4) LAB UOP 5 (LAB1PD2) CUPOLA RWS (LAB UOP 8 bypass)	

Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 1 from Channel 1/4.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 1 from Channel 1/4.
- <sup>(4)</sup> Assumes Airlock Avionics Power Reconfiguration is complete.

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# CHANNEL 1/4 POWERDOWN SUMMARY - (EVA 3)

(ASSY OPS/12A.1/FIN)

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	1/4 Power Reconfiguration		Z1 SPDA Power Reconfig
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>C&amp;DH</b>			
<b>MDMs</b>	<u>INTERNAL:</u> C&C-1 <sup>(2)</sup> , C&C-2 INT-2 PMCU-2 GNC-2 LA-2, LA-3 PL-2 A/L  <u>EXTERNAL:</u> EXT-2 N1-1 <sup>(4)</sup> , N1-2 PTR, P1-2, P3-2 S0-2 S1-2 PVCU-2B, PVCU-4B, PVCU-2A, PVCU-4A	<u>INTERNAL:</u> C&C-3 INT-1 <sup>(3)</sup> PMCU-1 <sup>(3)</sup> GNC-1 LA-1 PL-1 <sup>(3)</sup>  <u>EXTERNAL:</u> EXT-1 P1-1, P3-1 S0-1 STR, S1-1	
<b>Heaters</b>	EXT-1, N1-1, P3-1, P1-1, S0-1, S1-1, STR	EXT-2, N1-2, P3-2, P1-2, PTR, S1-2	
<b>C&amp;W</b>	LAB Panel		
<b>PCS</b>	PCS-1 (Cupola RWS)	PCS-2 (LAB RWS)	
<b>Data</b>	SDMS Signal Conditioner-2 SDMS Signal Conditioner-2 Heater  APS-2 PEHG-2	SDMS Signal Conditioner-1 SDMS Signal Conditioner-1 Heater  APS-1 PEHG-1	

## Notes

- (1) Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- (2) Assumes Av Rack Power Jumper installed to power AV Rack 2 from Channel 2/3.
- (3) Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 2 from Channel 2/3.
- (4) Assumes Node 1 Y-Jumper installed to power Node loads from RACU 6.
- (5) Assumes S0/N1 Primary Power Jumper installed but not connected.

**CHANNEL 1/4 POWERDOWN SUMMARY - (EVA 3)**

(ASSY OPS/12A.1/FIN)

Page 2 of 10 pages

	1/4 Power Reconfiguration		Z1 SPDA Power Reconfig
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>CHeCS</b>	CHeCS Rack AAA VOA Defibrillator  EV-CPDS Heater  CEVIS	EV-CPDS IV-CPDS  MEC TEPC	

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Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 2 from Channel 2/3.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 2 from Channel 2/3.
- <sup>(4)</sup> Assumes Node 1 Y-Jumper installed to power Node loads from RACU 6.
- <sup>(5)</sup> Assumes S0/N1 Primary Power Jumper installed but not connected.

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# CHANNEL 1/4 POWERDOWN SUMMARY - (EVA 3)

(ASSY OPS/12A.1/FIN)

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	1/4 Power Reconfiguration		Z1 SPDA Power Reconfig
	Powered	Unpowered	Unpowered <sup>(1)</sup>
C&T			
<b>General</b>	S-Band String 2 (P6) S-Band String 2 (P6) Heaters <sup>(1)</sup> Ku-Band Ku-Band Heaters <sup>(1)</sup>	S-Band String 1 (S1) S-Band String 1 (S1) Heaters	Ku-Band Heaters String 2 S-Band (P6) Heaters
<b>Audio</b>	IAC-2 ATUs: LAB Aft (ATU-1), A/L1, EMU1, EMU2 AUAI-1P ABC-2 RAIU-1 SSSR-1(UHF-1) EMU Audio Control Panel	IAC-1 ATU-2 (LAB Fwd) AUAI-2S <sup>(3)</sup> ABC-1 <sup>(3)</sup> DAIU (No hardline voice with orbiter) SSSR-2 (UHF-2)	
<b>Video</b>	AVU-2 VTR-2 VSU-2, 3 CVIU-4, 5, 6, 7, 8 SCU-2 EVSU-2 EVSU-1, -3 Heaters MSS Trunklines 1, 2, 3, 6, 7 USOS Trunklines 3, 4, 8, 9, 11, 12, 13, 23 to 26 VBSP Orbiter Video Channel 1	AVU-1 VTR-1 VSU-1 <sup>(3)</sup> CVIU-1 <sup>(3)</sup> , 2, 3, 12 SCU-1 <sup>(3)</sup> EVSU-1, -3 EVSU-2 Heaters MSS Trunklines 4, 5, 8, 9 USOS Trunklines 1, 2, 5-7, 10, 14-22 Orbiter Video Channel 2	
<b>Data</b>	HCOR High Rate Frame Mux (HRFM) High Rate Modem (HRM) Ku-Band Fwd Receiver (powered from EXPRESS Rack 4)		

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## Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 2 from Channel 2/3.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 2 from Channel 2/3.
- <sup>(4)</sup> Assumes Node 1 Y-Jumper installed to power Node loads from RACU 6.
- <sup>(5)</sup> Assumes S0/N1 Primary Power Jumper installed but not connected.

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**CHANNEL 1/4 POWERDOWN SUMMARY - (EVA 3)**

(ASSY OPS/12A.1/FIN)

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	1/4 Power Reconfiguration		Z1 SPDA Power Reconfig
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>VCSA Ports</b>	<u>WETAs:</u> Port 8 (P1UPOB) Port 12 (NOD1UP)  <u>ETVCGs:</u> Port 3 (S1 LOOB) Heaters Port 9 (P1 LOOB) Heaters Port 13 (LAB_S) Heaters  FPMU - Port 2 (S1 UPOB)	<u>WETAs:</u> Port 8 (P1UPOB) Heaters Port 12 (NOD1UP) Heaters  <u>ETVCGs:</u> Port 3 (S1 LOOB) Port 9 (P1 LOOB) Port 13 (LAB_S)  FPMU - Port 2 (S1 UPOB) Heaters	

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Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 2 from Channel 2/3.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 2 from Channel 2/3.
- <sup>(4)</sup> Assumes Node 1 Y-Jumper installed to power Node loads from RACU 6.
- <sup>(5)</sup> Assumes S0/N1 Primary Power Jumper installed but not connected.

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**CHANNEL 1/4 POWERDOWN SUMMARY - (EVA 3)**

(ASSY OPS/12A.1/FIN)

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	1/4 Power Reconfiguration		Z1 SPDA Power Reconfig
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>ECLSS</b>			
<b>Node</b>	N1 Fwd Port IMV Valve N1 Fwd Stbd IMV Valve N1 Stbd Aft IMV Fan Node 1 Smoke Detector 2 N1 Stbd Fwd IMV Valve <sup>(4)</sup> N1 Stbd Aft IMV Valve <sup>(4)</sup> N1 Aft Stbd IMV Valve <sup>(4)</sup> N1 Aft Port IMV Valve <sup>(4)</sup> N1 Aft Port IMV Fan <sup>(4)</sup> N1 RAMV <sup>(4)</sup> N1 Cabin Fan <sup>(4)</sup> N1 Smoke Detector 1 <sup>(4)</sup>		
<b>LAB</b>	LAB Aft Port IMV Valve LAB Aft Stbd IMV Valve LAB Fwd Stbd IMV Fan LAB Smoke Detector SD5 LAB1S6 CCAA Stbd Waste Water Vent Valve ARS Rack (AAA, MCA, CDRA, TCCS, Rack Smoke Detector)	LAB Aft Port IMV Fan LAB Fwd Port IMV Fan LAB Fwd Stbd IMV Valve Pressure Control Assembly LAB1P6 CCAA Port Waste Water Vent Valve LAB Smoke Detector PD1	
<b>A/L</b>	Pressure Control Assembly Smoke Detectors A/L CCAA	Depress Pump ORCA Metox	

Notes

- (1) Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- (2) Assumes Av Rack Power Jumper installed to power AV Rack 2 from Channel 2/3.
- (3) Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 2 from Channel 2/3.
- (4) Assumes Node 1 Y-Jumper installed to power Node loads from RACU 6.
- (5) Assumes S0/N1 Primary Power Jumper installed but not connected.

**CHANNEL 1/4 POWERDOWN SUMMARY - (EVA 3)**

(ASSY OPS/12A.1/FIN)

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	1/4 Power Reconfiguration		Z1 SPDA Power Reconfig
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>EPS</b>			
<b>Lights</b>	Node: NOD1OS4 NOD1PD2 NOD1OS2-1 (Fwd) NOD1OS2-2 (Aft) LAB: LAB1OS2            A/L: LAB1OS4            A/L1OA1 LAB1OS6            A/L1F3 LAB1OP1            A/L1A3 LAB1OP3 LAB1OP5 CETA: LAB S1-2 N1-2 S1-1 Luminaire Heater N1-1 Luminaire Heater	Node: NOD1OP4 NOD1SD2 NOD1OP2-1 (Fwd) NOD1OP2-2 (Aft) LAB: LAB1OS1 LAB1OS3 LAB1OS5 LAB1OP2 LAB1OP4 LAB1OP6 CETA: S1-1 N1-1 LAB Luminaire Heater S1-2 Luminaire Heater N1-2 Luminaire Heater	
<b>SARJ</b>	SARJ RJMC P3-2 SARJ RJMC P3-1 Heaters	SARJ RJMC P3-1 SARJ RJMC P3-2 heaters	
<b>Russian Power</b>	FGB ARCUs 51 and 52 (1 & 2) <sup>(1)</sup> FGB ARCUs 53 and 54 (3 & 4) <sup>(1)</sup> SM SNTs 1 and 2 <sup>(1)</sup> SM SNTs 3 and 4 <sup>(1)</sup>		FGB ARCUs 51 and 52 <sup>(5)</sup> FGB ARCUs 53 and 54 <sup>(5)</sup> SM SNTs 21 and 22 <sup>(5)</sup> SM SNTs 23 and 24 <sup>(5)</sup>

Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 2 from Channel 2/3.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 2 from Channel 2/3.
- <sup>(4)</sup> Assumes Node 1 Y-Jumper installed to power Node loads from RACU 6.
- <sup>(5)</sup> Assumes S0/N1 Primary Power Jumper installed but not connected.

**CHANNEL 1/4 POWERDOWN SUMMARY - (EVA 3)**

(ASSY OPS/12A.1/FIN)

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	<b>1/4 Power Reconfiguration</b>		<b>Z1 SPDA Power Reconfig</b>
	<b>Powered</b>	<b>Unpowered</b>	<b>Unpowered<sup>(1)</sup></b>
<b>Misc</b>	MBSU 1, 4 Coldplate Heaters DDCU S0-4B, S0-1A, S1-4B Coldplate Heaters  A/L Power Supply Assembly (PSA)  PCU Z1-3B PCU Z1-3B Heater <sup>(1)</sup> PCU Z1-4B <sup>(1)</sup> PCU Z1-4B Heater	MBSU 2, 3 Coldplate Heaters DDCU S0-2B, S0-3B P1-3A Coldplate Heaters  A/L Battery Charger	PCU Z1-3B Heater PCU Z1-4B RPCM Z14B-A RPCM Z14B-B

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Notes

- <sup>(1)</sup> Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- <sup>(2)</sup> Assumes Av Rack Power Jumper installed to power AV Rack 2 from Channel 2/3.
- <sup>(3)</sup> Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 2 from Channel 2/3.
- <sup>(4)</sup> Assumes Node 1 Y-Jumper installed to power Node loads from RACU 6.
- <sup>(5)</sup> Assumes S0/N1 Primary Power Jumper installed but not connected.

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**CHANNEL 1/4 POWERDOWN SUMMARY - (EVA 3)**

(ASSY OPS/12A.1/FIN)

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	1/4 Power Reconfiguration		Z1 SPDA Power Reconfig
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>MCS</b>	CMG-2 CMG-3 CMG-4 <sup>(1)</sup> CMG 1 Heater CMG 2 Heater <sup>(1)</sup> CMG 3 Heater <sup>(1)</sup> CMG 4 Heater RGA-2 SIGI-2	CMG-1 RGA-1 SIGI-1	CMG-4 CMG-2 Heater CMG-3 Heater
<b>Payloads</b>	Racks: *LAB1O1 (EXPRESS-2) *LAB1O2 (EXPRESS-1) *LAB1O3 (EXPRESS-3) *LAB1O4 (MELFI) LAB1P2 (EXPRESS-4) *LAB1P4 (HRF-2) *LAB1S3 (MSG) *LAB1S4 (EXPRESS-5) *These racks may be powered off for power savings.	Racks: LAB1S2 (HRF-1)	
<b>Robotics</b>	Cupola RWS (LAB1S5) MBS/SSRMS Redundant String MT 3A Power Channel 1 SSRMS Camera or the Mast Camera	LAB RWS (LAB1P5) MBS/SSRMS Prime String MT 4B Power Channel	
<b>S&amp;M</b>			

Notes

- (1) Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- (2) Assumes Av Rack Power Jumper installed to power AV Rack 2 from Channel 2/3.
- (3) Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 2 from Channel 2/3.
- (4) Assumes Node 1 Y-Jumper installed to power Node loads from RACU 6.
- (5) Assumes S0/N1 Primary Power Jumper installed but not connected.

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**CHANNEL 1/4 POWERDOWN SUMMARY - (EVA 3)**

(ASSY OPS/12A.1/FIN)

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	1/4 Power Reconfiguration		Z1 SPDA Power Reconfig
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>TCS</b>			
<b>ITCS</b>	LAB MTL System LAB LTL IFHX Heaters Loop Crossover Assembly Valve 2	LAB LTL System LAB MTL IFHX Heaters Loop Crossover Assembly Valve 1	
<b>ETCS</b>	Loop B PM PCVP Loop B PM Htr 2 Loop B PM Line Heaters Loop B PM Bypass Return Flowmeter Loop B PM Outlet Flowmeter Loop B NTA Tank and GPRV Heater 2 Loop B ATA Tanks - Heater 2  Loop A PM Heater 1 Loop A NTA Tank and GPRV Heater 1 Loop A ATA Tanks - Heater 1	Loop A PM PCVP Loop A PM Htr 2 Loop A PM Line Heaters Loop A PM Bypass Return Flowmeter Loop A PM Outlet Flowmeter Loop A NTA Tank and GPRV Heater 2 Loop A ATA Tanks - Heater 2  Loop B PM Heater 1 Loop B NTA Tank and GPRV Heater 1 Loop B ATA Tanks - Heater 1	
<b>EETCS</b>	All Loop A equipment All Loop B equipment		

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Notes

- (1) Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- (2) Assumes Av Rack Power Jumper installed to power AV Rack 2 from Channel 2/3.
- (3) Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 2 from Channel 2/3.
- (4) Assumes Node 1 Y-Jumper installed to power Node loads from RACU 6.
- (5) Assumes S0/N1 Primary Power Jumper installed but not connected.

**CHANNEL 1/4 POWERDOWN SUMMARY - (EVA 3)**

(ASSY OPS/12A.1/FIN)

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	1/4 Power Reconfiguration		Z1 SPDA Power Reconfig
	Powered	Unpowered	Unpowered <sup>(1)</sup>
<b>Radiators</b>	TRRJ RJMC P1-2 TRRJ RJMC S1-2  <u>Heaters:</u> RJMC S1-1 Htrs 2 and 3 RJMC S1-2 Htrs 1 and 4 RJMC P1-1 Htr Gp-1 Htr-2 and GP-2 Htr-3 RJMC P1-2 Gp-1 Htr-1 and Gp-2 Htr-4 DLA S1-2 Htr DLA P1-2 Htr TRRJ P1 Cradle Htr Radiator Beam P1 Misc Groups 1 to 4 Power Buses Radiator Beam S1 Thermo Groups 1 to 3 Power Buses	TRRJ RJMC S1-1 TRRJ RJMC P1-1  <u>Heaters:</u> RJMC S1-1 Htr 1 and Htr 4 RJMC S1-2 Htr 2 and Htr 3 RJMC P1-2 Gp-1 Htr-1 and Gp-2 Htr-2 RJMC P1-2 Gp-1 Htr-2 and Gp-2 Htr-1 DLA S1-1 Htr DLA P1-1 Htr TRRJ S1 Cradle Htr Radiator Beam S1 Misc Groups 1 to 4 Power Buses Radiator Beam P1 Thermo Groups 1 to 3 Power Buses	
<b>CIO</b>	Ops LAN Equipment Channel 2/3 SSCs Channel 2/3 Printers SSC Fileserver OCA Router	Ops LAN Equipment Channel 1/4 SSCs	
<b>UOPs</b>	NODE UOP 2 (NOD1PD4) LAB UOP 3 (LAB1OP2) LAB UOP 4 (LAB1OP4) LAB UOP 5 (LAB1PD2) CUPOLA RWS (LAB UOP 8 bypass) A/L UOP	NODE UOP 1 (NOD1SD4) LAB UOP 1 (LAB1OS2) LAB UOP 2 (LAB1OS4) LAB UOP 6 (LAB1SD4) LAB RWS (LAB UOP 7 bypass)	

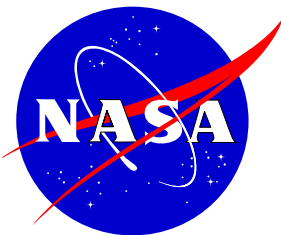
Notes

- (1) Equipment powered off for the Z1 SPDA Patch Panel Reconfiguration.
- (2) Assumes Av Rack Power Jumper installed to power AV Rack 2 from Channel 2/3.
- (3) Could be powered, if needed, while the Av Rack Power Jumper is connected to power Av Rack 2 from Channel 2/3.
- (4) Assumes Node 1 Y-Jumper installed to power Node loads from RACU 6.
- (5) Assumes S0/N1 Primary Power Jumper installed but not connected.



# INTERNATIONAL SPACE STATION

## ASSEMBLY OPERATIONS







# INTERNATIONAL SPACE STATION

# ASSEMBLY OPERATIONS

