INTERNATIONAL SPACE STATION
COMPLEX OPERATIONS GROUP
ASSEMBLY MALFUNCTIONS BOOK
ISS-5A

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MALFUNCTION PROCEDURES
If: APCU 1(2) CONV TEMP A(B) ≤ 20 or ≥ 130

Nominal Config: (R1)
PRI PL MNC – ON (tb-ON)
PL CAB – MNB (MNA)
PL AUX – ON
(L12/SSP 1)
cb SW PWR CB2 – cl
cb SW PWR CB1 – cl
APCU 1 CONV – ON (tb-gray)
APCU 1 OUTPUT RLY – CLOSE (tb-gray)
APCU 1 CONV – ON (tb-gray)
APCU 2 OUTPUT RLY – CLOSE (tb-gray)

Yes

No

1. APCU Status
2. SM 200 APCU STATUS

APCU 1(2) TRIP > -4.40
Any APCU 1(2) CONV A(B) AMPS > 8.5
APCU 1(2) VOLTS RES HIGH < 122 or > 126.5
All APCU 1,2 CONV A,B TEMPS (four) ≥ 130 and/or rising or ≤ 20?

None of the above.

Yes

No

1. APCU TRIP, all (SODF: ASSY MAL: MALFUNCTION: APCU)
2. (APCU AMPS), all (SODF: ASSY MAL: MALFUNCTION: APCU)
3. (APCU VOLTS), all (SODF: ASSY MAL: MALFUNCTION: APCU)

1. Loss of APCU 1 causes the loss of the LTA Heater Strings 1. Loss of APCU 2 causes the loss of the LTA Heater String 2.
2. MCC will determine between a transducer shift and a real circuitry failure
3. MCC will assess options for LAB thermal management.
There is a single point failure which will cause both the HIGH and LOW RES VOLTS to read low (broken wire).

SPEC voltage for APCU in the 120 Volts mode is 122 to 126.5 volts. If APCU volts are outside this range but stable and usable for Lab LTA Heaters, consideration will be given to continuing APCU operation.

APCU tripped but failed to set trip indicator (possible for a short circuit directly at the APCU output).

Loss of APCU 1 results in loss of LTA Heater String 1. Loss of APCU 2 results in loss of LTA Heater String 2.

APCU voltage regulation problem.

If: APCU VOLTS RES HIGH ≥ 126.5 or ≤ 122

Nominal Config:
(L12/SSP 1) cb SW PWR CB 2 – cl
APCU 1 CONV – ON (tb-gray)
APCU 1 OUTPUT RLY - CLOSE (tb-gray)
APCU 2 CONV – ON (tb-gray)
APCU 2 OUTPUT RLY - CLOSE (tb-gray)
(L12/SSP 2) cb SW PWR CB1 – cl
(R1) PRI PL MNC – ON (tb-ON)
PL CAB – MNB (MNA)
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MCC will determine between a transducer shift and a real single converter failure.

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.
MCC will determine cause of interruption of power or signal to the APCUs.

APCU TRIP
(ASSY MAL/5A/FIN)

(APCU TEMP), all (SODF: ASSY MAL: MALFUNCTION: APCU)
(APCU VOLTS), all (SODF: ASSY MAL: MALFUNCTION: APCU)
(APCU AMPS), all (SODF: ASSY MAL: MALFUNCTION: APCU)

S200 APCU 1(2) TRIP

If: APCU TRIP > -4.4 √APCU TRIP

STATUS TABLE

Nominal Config:
(L12/SSP 1)
cb SW PWR CB 2 – cl
APCU 1 CONV – ON (tb-gray)
APCU 1 OUTPUT RLY – CLOSE (tb-gray)
APCU 2 CONV – ON (tb-gray)
APCU 2 OUTPUT RLY – CLOSE (tb-gray)
(L12/SSP 2)
cb SW PWR CB1 – cl
(R1)
PRI PL MNC – ON (tb-ON)
PL CAB – MNB (MNA)
PL AUX – ON

APCU Status
(L12/SSP 1)
APCU 1,2 CONV (two)
tb – bp
and
APCU 1,2 OUTPUT RLY (two) tb – bp
and
SM 200 APCU STATUS both
APCU 1 TRIP and APCU 2 TRIP approx = 0

Both APCU 1 TRIP > -4.40
d and
APCU 2 TRIP > -4.40

Either APCU 1 TRIP > -4.40
e or
APCU 2 TRIP > -4.40

None of the above.

Transient trip indication.

Continue nominal operations.

Both A and B amps = 0.3L?

Both A and B converters tripped.

ConV A amps = 0.3L or ConV B amps = 0.3L?

False trip indicator.

Record TRIP Status

ConV – OFF (tb-bp)
Affected APCU 1(2) OUTPUT RLY – OPEN (tb-bp)

Record TRIP Status

Affected APCU 1(2)

Affected APCU 1(2)

Both APCUs tripped.

PRI PL Bus disconnect.

SM 200 APCU STATUS

Neither above.

Continue nominal operations.

Both A and B amps = 0.3L?

Both A and B converters tripped.

ConV A amps = 0.3L or ConV B amps = 0.3L?

False trip indicator.

Record TRIP Status

Affected APCU 1(2)

Affected APCU 1(2)

Both APCUs tripped.
Loss of APCU 1 causes the loss of LTA Heater String 1. Loss of APCU 2 causes the loss of LTA Heater String 2.

MCC will consider recovery actions. Loads are thermostatically controlled htrs which may unpredictably exceed 8.5 amps.
### Table 1. APCU Trip Status

<table>
<thead>
<tr>
<th>TRIP (STATUS VOLTAGE)</th>
<th>OV</th>
<th>OUV</th>
<th>OC</th>
<th>IUV</th>
</tr>
</thead>
<tbody>
<tr>
<td>+4.88</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>+4.23</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>+3.59</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>+2.95</td>
<td>X</td>
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<td></td>
</tr>
<tr>
<td>+2.27</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>+1.62</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>+0.98</td>
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<td></td>
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<tr>
<td>+0.34</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>-0.30</td>
<td>X</td>
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<tr>
<td>-0.95</td>
<td>X</td>
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<tr>
<td>-1.59</td>
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<td>-2.23</td>
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<td></td>
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<tr>
<td>-2.91</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>-3.56</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>-4.20</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>-4.86 (no trip)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

OV: Output Overvoltage  
OUV: Output Undervoltage  
OC: Output Overcurrent  
IUV: Input Undervoltage  

Tolerance for all reported voltages is ± 0.20 volts
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All displays in this procedure are on the PCS.

By issuing these two commands, the error indicators generated by the firmware are cleared, allowing Deploy/Retract commands to be sent once again.

Nominal Config:
P6: TCS: TTGR (STCR)
TTGR (STCR) Commands
EETCS LoopA TTGR (LoopB STCR)

TCR Config Fail
FDIR = Ena
TCR Auto Timeout
FDIR = Ena
TCR Auto Off = Ena

Attitude is in Free Drift

If possible, perform a visual check for obstructions to radiator motion.
Mode Transition should be performed for the power channel, which is associated with the radiator being transitioned. The TTCR is controlled by Loop A PFCS, which is associated with power channel 4B. The STCR is controlled by Loop B PFCS, which is associated with power channel 2B.

If Attitude adjustment is necessary, perform adjustment before continuing with block 14 or 15. Radiator motor must be stopped during any attitude maneuver. Docking, undocking and reboost can be performed with a partially deployed/retracted radiator if necessary. The Station must be in Free Drift mode before attempting block 14 or 15.
Mode Transition should be performed for the power channel, which is associated with the radiator being transitioned. The TTCR is controlled by Loop A PFCS, which is associated with power channel 4B. The STCR is controlled by Loop B PFCS, which is associated with power channel 2B.

The EVA will likely include a visual check for obstructions. If the radiator looks to be fully deployed/retracted and the pulleys are in their hardstop position, then the problem was likely due to a sensor failure.

### Commanding PSN Mode

- Perform \textit{[PVCA POWER SOURCE NODE TRANSITION TO NON-SOLAR TRACKING MODE]}, all (SODF: TBD), then:
  - Resume nominal operations.

### TCS: TTCR (STCR) Commmands

- cmd Stop – Arm
- cmd – Stop
- cmd Power Off – Arm
- cmd – Off

### Safing the TCR

P6: TCS: TTCR (STCR)

- EETCS LoopA TTCR (LoopB STCR)

### Transient condition.
LAB CBM RAPID SAFING
(ASY MAL/5A/FIN)

**CAUTION**
Must complete ABOLTS command successfully to withstand structural loads for RMS release and orbiter undocking.

1. **Mate Status**
   - Has First Stage Capture been completed?
     - Yes
     - No

2. **Flight Rules provide for jettison of payload if 1st stage capture has not been initiated.**
   - After RMS backs CBM away at least 2 feet, MCC-H will close petal covers per nominal procedures.
   - If capture failed during 1st stage, work mal procedure to complete capture, then return to Rapid Safing procedure.
   - If crew time is available to complete CBM/RMS operations prior to 1st stage capture, and still have 56 minutes left to complete rapid safing, can continue procedure in box 3 [Est. Times: CBM Rapid Safing procedure (~31 min) stow RMS (~10 min), and undock (~10 min)]

3. **Power/Data Verification**
   - ‘CBM Graphic’
     - RPC closed for CPAs (4)
     - ‘CBM Status’
     - ‘Mode - Activated’
   - Is CBM Activated and 3 or 4 RPCs closed?
     - Yes
     - No

4. **Reactivate/Power-up**
   - Return to Nominal/Mal procedure to apply power and activate (Lab Fwd CBM Prep for Mate steps 5 and 6)
   - If any No Broadcast Messages exist clear by using repeated Stop commands from any command window.

5. **Bolt/Latch Failures**
   - Are there more than 1 latch or more than 4 bolts failed (unable to drive nominally)?
     - Yes
     - No

6. **Rapid Safing must be done manually (Rapid Safing software will fail after initiation).**
   - Return to nominal procedure and complete at least Capture and ABOLTs prior to orbiter separation.

7. **Latches to 2nd Stage**
   - Has Second Stage Capture been commanded?
     - Yes
     - No

7a. **Was Second Stage Capture completed successfully?**
   - Yes
   - No

8. **Complete Capture Second Stage**
   - ‘Verify RMS Mode – Test’
     - ‘Capture Latch Status’
     - ‘Posn (4): 185 --- 187 deg’
     - ‘Command Sets’
   - ‘sel Mate’
   - ‘Node 1 XXX CBM Mate’
   - ‘cmd Capture Second Stage Execute’
   - ‘Confirmation Request’
     - ‘Override Capture Command?’
   - ‘cmd Yes Execute’
   - ‘Node 1 XXX CBM Display’
     - ‘CBM Status’
     - ‘Master Cmd Status – Complete’
     - ‘Capture Latch Status’
     - ‘Cmd Code (4) – Complete’
     - ‘Cmd Status (4) – Complete’
     - ‘Posn (4): 11 --- 13’
   - Did Capture 2nd Stage complete successfully?
     - Yes
     - No

10. **Set State**
   - Execute block 8 capture -- no
   - Confirm cmd required. (Ensures rapid safing sequence starts with bolting command)
   - Yes
   - No

11. **Start Rapid Safing Software**
   - ‘Commands by Task’
     - sel Rapid Safing
   - CBM I Rapid Safing
     - ‘cmd Execute Rapid Safing Execute’
       - ‘Confirmation Request’
       - ‘Override Rapid Safing Command?’
     - ‘cmd Yes Execute’
       - ‘Rapid Safing Validation Requested – Yes’
       - ‘cmd Validate Execute’
       - ‘Rapid Safing In Progress - X’
   - ‘Note’
     - When Rapid Safing goes in progress a caution flag/tone in the C&W log will occur. A warning will occur if the automated rapid safing sequence fails (as well as an X for Rapid Safing Failed on this display)

12. **Capture Failed.**
   - Go to CBM Mate Malfunction to recover and allow completion of Capture
   - Return to Rapid Safing Procedure as required.
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The messages 'MDM INT Detected Frame Count Fail CBM_LAFWD_P-Lab' and 'MDM INT Detected Frame Count Fail CBM_LAFWD_S-Lab' indicate RT failure. The nomenclature is as follows:
CBM-LAFWD –P for LB-SYS-LAB-2 masters.
CBM-LAFWD –S for LB-SYS-LAB-1 masters.
The message 'CBM INT LAB Fwd Pri Loss of Comm CW' is a valid message for CBM master controllers on both buses.

Unless otherwise indicated, all blocks with display checks begin with Lab Forward CBM

'CBM Graphic' refers to the schematic representation of the CBM at the bottom of Lab Forward CBM

Nominal Config:
- No Advisories;
- Time Code incrementing; CBM command response;

User Notification
- Lab:S&M sel Forward CBM
- Lab: S&M

1 Verify RPC Status
- 'RPCM LA1B-B'
- 'RPCM LA2B-B'
  - New on any RPC (display indicates RPC trip) or any RPC failed to open/close?

2 Verify 1553 Comm Status
- 'CBM Status'
  - Mode – Activated
  - Comm Error – no X
- 'CBM Graphic'
  - Time Code – incrementing each minute
Is Mode Deactivated and/or Comm Error indicated? Did Time Code stop incrementing?

3 Verify Active BIT Status
- 'Built In Test Failures'
  - - no left of Built In Test Failures button
Is - left of button?

4 Verify RS485 Comm Status
- 'CBM Status'
  - 485 Timeout – no X
Is 485 Timeout indicated?

5 Verify Command Accepted
- 'CBM Status'
  - Master Cmd Error – blank
  - Cmd Rejected Flag – blank
Is a Master Cmd Error or Cmd Rejection indicated or was there no end item response to a cmd?

6 Verify Cmd Statuses
- 'CBM Status'
  - Master Cmd Status – Complete
  - Powered Bolt Status
  - Cmd Status (16) – Complete
  - Capture Latch Status
  - Cmd Status (4) – Complete
Does any new controller Cmd Status indicate Failed or Binding or does Master Cmd Status indicate Timeout?

7 Verify CBM Controller Status
- 'Powered Bolt Status'
  - Cmd Status (16) - 'Capture Latch Status'
  - Cmd Status (4) - 'I_Latch X Details'
Cmd Status of abort or failed, capture switch not in correct position, or RTL switch indicates ?

8 Verify MCC-H

Yes No

LAB CBM 1553 COMM LOSS – PREP FOR MATE) (ASSEMBLY MAL:MAL:CBM)

LAB CBM 485 COMM LOSS – PREP FOR MATE) (ASSEMBLY MAL:MAL:CBM)

LAB CBM COMMAND ERROR – PREP FOR MATE) (ASSEMBLY MAL:MAL:CBM)

LAB CBM BOLT/LATCH ACTUATION ERROR – PREP FOR MATE) (ASSEMBLY MAL:MAL:CBM)

LAB CBM CONTROLLER ERROR – PREP FOR MATE) (ASSEMBLY MAL:MAL:CBM)
CBM Lab Forward CBM

1. Failure Type
   Did RPC fail to open (close) as commanded?
   - Yes: 2. Perform (RPC OPEN (CLOSE) FAILURE) (SODF: EPS) then:
   - No: 4. Record Positions
   - Record:
     - 'CBM Status'
     - '485 Channel - Capture Latch Status'
     - Record all latch positions
     L1___, L2___, L3___, L4___
     - 'Powered Bolt Status'
     - Record all bolt positions:
       B1-1____, B1-2____, B1-3____, B1-4____
       B3-1____, B3-2____, B3-3____, B3-4____
       B4-1____, B4-2____, B4-3____, B4-4____

2. Perform (RPC OPEN (CLOSE) FAILURE) (SODF: EPS) then:
   - Yes: 3. Verify RPC Status
     Did EPS mal successfully open (close) RPC?
   - No: 19

3. Verify RPC Status
   Did EPS mal successfully open (close) RPC?
   - Yes: 6. Verify CBM Mode
     'CBM Status'
     - Mode – Activated
     - Comm Error – no X
     Is CBM Activated?
     - No: 39
     - Yes: 9. CBM Mode
     Was CBM Activated when RPC failure occurred?
     - No: 11. RPC failure cleared. Can return to procedure, repeat last step as required, and continue nominal ops.
     - Yes: 12. Close Redundant RPC
     'CBM Graphic'
     - select appropriate RPC
     RPCM_LAYB_B_RPC_0Z
     - cmd RPC Position – Close
     - RPC Position – Cl
     Did redundant RPC trip?
     - Yes: 14
     - No: 16

4. Record Positions
   - Record:
     - 'CBM Status'
     - '485 Channel - Capture Latch Status'
     - Record all latch positions
     L1___, L2___, L3___, L4___
     - 'Powered Bolt Status'
     - Record all bolt positions:
       B1-1____, B1-2____, B1-3____, B1-4____
       B3-1____, B3-2____, B3-3____, B3-4____
       B4-1____, B4-2____, B4-3____, B4-4____

5. Perform (RPCM TRIP) (SODF: ECS), then:
   - Yes: 7. Verify RPC Status
     Did mal successfully clear trip and close RPC?
   - No: 38

6. Verify CBM Mode
   'CBM Status'
   - Mode – Activated
   - Comm Error – no X
   Is CBM Activated?
   - No: 39
   - Yes: 9. CBM Mode
   Was CBM Activated when RPC failure occurred?
   - No: 11. RPC failure cleared. Can return to procedure, repeat last step as required, and continue nominal ops.
   - Yes: 12. Close Redundant RPC
     'CBM Graphic'
     - select appropriate RPC
     RPCM_LAYB_B_RPC_0Z
     - cmd RPC Position – Close
     - RPC Position – Cl
     Did redundant RPC trip?
     - Yes: 14
     - No: 16

7. Verify RPC Status
   Did mal successfully clear trip and close RPC?
   - Yes: 8. RPC failed for CBM operations
   - No: 10. Redundant RPC Availability
     'CBM Graphic'
     - Identify which CPA receives power from failed RPC and which redundant RPC also supplies power to the same CPA
     Is the redundant RPC to this CPA available?
     - Yes: 13. Likely RPC failure or cable short.
     Should use redundant RPC for this CPA for remainder of procedure (do not close tripped RPC.)
     - No: 6
14  **MCC-H** - CBM Prep for Mate failed. Should repeat Prep for Mate after RPCM R&R (trip on only 1 RPC) or CPA R&R (both RPCs for one CPA tripped.)

16  Probable short in CPA. Consider CPA failed. Should repeat Prep for Mate after CPA R&R.

18  Verify CBM Safed
    - **'CBM Status'**
    - ✓ Mode - Deactivated
    - Is CBM Deactivated?

19  Verify RPCM Comm Status
    - Is RPCM comm lost (as determined by RPC Failed Closed mail)?

21  Determine Failure Type
    - Did an RPC fail to close?

23  Reverify RPCM Current
    - ✓ MCC-H to verify good current draw from RPCM for this RPC.
    - RPC still supplying power to CPA?

24  Can proceed with CBM operations without changing power source for this CPA.

25  Consider RPC open. Can proceed with CBM operations

26  **MCC-H** – Should replace RPCM or provide alternate power source. Upstream power source will need to be cycled to open any closed RPCs prior to RPCM R&R. Should repeat Prep for Mate after power restored.

27  Yes

32a  Yes

---

**LAB CBM POWER LOSS - PREP FOR MATE**

**ASSY MAL/5A/FIN**  Page 2 of 4 pages
21

27 Determine Failure Timeframe
Did RPC fail while performing nominal procedure steps to close RPCs?

No

Yes

28

• MCC-H

28a

Failed open occurred during off-nominal procedure. Need to consider reason why closing RPC.

29 Reverify RPCM Current

• MCC-H to verify no change in current draw from RPCM when this RPC was commanded closed.

Is RPC supplying power to CPA?

No

Yes

30 Consider RPC closed. Can proceed with CBM operations.

31 Redundant RPC Available

‘CBM Graphic’
• Identify which CPA receives power from failed RPC and which redundant RPC also supplies power to the same CPA

Is the redundant RPC to this CPA available?

No

Yes

32

• MCC-H

32a

CBM Prep for Mate failed. Should repeat Prep for Mate after RPCM R&R.

33 Close Redundant RPC

‘CBM Graphic’
• select appropriate RPC
RPCM_LAYB_B_RPC_0Z
• cmd RPC Position – Close
• MCC-H to verify no change in current draw from RPCM when this RPC was commanded closed.

Is redundant RPC closed?

No

Yes

35 One RPC failed for CBM ops. Can resume operations but should use redundant RPC for this CPA for remainder of procedure.
36 Reactivate CBM On Same Bus

‘Commands by Task’
- sel Prep for Mate

Lab Forward CBM Prep for Mate
- cmd Activate LB-SYS-LAB-1(2) Master

Execute
Lab Forward CBM
‘CBM Status’
- ✔ Mode – Activated
- ✔ Master – LB-SYS-LAB-1(2)
- ✔ Comm Error – no X

37 Determine RS 485 Channel

Was 485 Channel B in use when power loss occurred?

Yes

39 Clear 485 Errors

cmd Stop Execute (from any cmd window)

Lab Forward CBM

‘CBM Status’
- ✔ 485 Timeout – no X
- ✔ Powered Bolt Status
- ✔ Cmd Status (16) – Complete
- ✔ Capture Latch Status
- ✔ Cmd Status (4) – Complete

Does any controller have a Cmd Status of No Broadcast?

No

38 Select 485 Channel A

‘Commands by Type’
- sel Prebuilt
CBM I Prebuilt Cmds
- sel Set Last State
CBM I Set Last State Cmds
- cmd Select 485 Ch A Execute
Lab Forward CBM

‘CBM Status’
- ✔ 485 Channel - A

Yes

39 to clear No Broadcast indications.

No

40 Repeat block

39 to clear No Broadcast indications.

Lab Forward CBM

{LAB CBM POSITION RELOAD – PREP FOR MATE} (ASSY MAL: MAL:CBM)
LAB CBM 1553 COMM LOSS - PREP FOR MATE

1. Verify Master Power Status
   - Lab Forward CBM
     - RPCM LA1B B
       - RPC(4) – no
       - RPC LA2B B
     - RPC(4) – no
   - Does the RPC which was supplying the Master controller have an indicator? [Yes/No]

2. Verify Primary INT MDM Status
   - 'CBM Graphic'
     - INT2(1) - Primary
     - MCC-H to verify no state transition
   - Did INT2(1) fail or undergo a major state transition? [Yes/No]

3. Verify Auto Channel Switching Enabled
   - 'CBM Graphic'
     - sel INT2(1)
     - Primary INT MDM
     - sel LB-SYS-LAB-1(2)
     - LB_SYS_LAB_1(2)_Bus_Status
     - sel Bus Status
     - MCC-H
   - Is Auto Channel Switching Status – Enabled? [Yes/No]

4. Verify Current 1553 Channel
   - 'CBM Graphic':
     - LB-SYS-LAB-1(2) Bus Channel same as recorded in procedure
   - Did 1553 channel change? [Yes/No]

5. Verify Auto Channel Switching Enabled
   - 'CBM Graphic'
     - sel INT2(1)
     - Primary INT MDM
     - sel LB-SYS-LAB-1(2)
     - LB_SYS_LAB_1(2)_Bus_Status
     - MCC-H
   - Is Auto Channel Switching Status – Enabled? [Yes/No]

6. Verify CBM Comm Error
   - 'CBM Status':
     - Comm Error - X
   - Is Comm Error Indicated? [Yes/No]

LAB CBM 1553 COMM LOSS - PREP FOR MATE

(assy mal/5a/fin) page 2 of 5 pages

8 Verify reason for channel switch
• Was channel switch commanded by crew/ground while CBM was activated?
  No
  5
  4
9 Comm loss caused by channel switch.
10 Verify CBM Deactivated
• ‘CBM Status’
  • Mode - Deactivated
  Is CBM deactivated?
  No
  43
  5
12 Break CBM Polling
• ‘Commands by Task’
  • sel Prep for Mate
    Lab Fwd CBM Prep for Mate
  • cmd Deactivate Execute
    Lab Forward CBM
  • ‘CBM Status’
    • Mode - Deactivated
11 Verify CBM 1553 Comm Loss
• ‘CBM Graphic’
  • sel INT-2(1)
  Primary INT MDM
  • sel LB_SYS_LAB_1(2)
    LB_SYS_LAB_1(2)
  • sel RT Status
    LB_SYS_LAB_1(2)_RT_Status
  • √RT 24 CBM LAFWD-P(S) RT Comm Fail Status – Fail
  Is CBM RT Comm Fail Status - Fail?
  No
13 Verify Other RTs Status
• [LB_SYS_LAB_1(2)_RT_Status]
  • √RT Comm Fail Status – blank for all other RTs
  RT Comm Failed for any other RT?
  No
  23
  6
15 Comm loss caused by channel swap associated with failure of another RT. Can resume checkout on current bus.
18 Attempt Bus Recovery
On MCC-H go,
• Perform [LAB 1553 BUS FAILURE] (SODF:C&DH) and return.
  Was bus recovery successful?
  No
  43
  14
14 Verify Bus Status
• [LB_SYS_LAB_1(2)]
  • sel Bus Status
    LB_SYS_LAB_1(2)_Bus_Status
  • √Operational Status - blank
  Is bus failed?
  No
16 Verify Power Status
• ‘CBM Graphic’
  • sel RPCM LA1B B(LA2B B)
  • √Integration Counter - incrementing
  Is RPCM Integration Counter incrementing?
  No
20a Signature requires engineering assessment - potentially failures of multiple master controllers and/or unexplained bus problems.
21a CBM Prep for Mate failed. Bus failed (2 CPAs lost as master) for CBM ops. Can repeat Prep for Mate following bus recovery.
21 √MCC-H
22a CBM Prep for Mate failed due to DDCU or RPCM failure - Will need to repair/replace failed component or provide alternate power source for CBM and repeat Prep for Mate.
22 √MCC-H
23 √MCC-H
20 √MCC-H
19 Comm loss caused by bus problems. With bus restored, can resume checkout and repeat last step, if necessary.
When 1553 channel switches to a channel where the master controller has not been activated since power-up, MDM will not recognize that subsystem IDs are not incrementing. CBM polling of the master on the active bus channel must be broken by deactivating CBM (reference ISS SPN 508.)

22
Verify CBM Deactivated

'CBM Status'
• ✓Mode - Deactivated
Is CBM deactivated?

Yes
No

23
Dump Transaction Error Log

• Request BFdump the transaction error log for the affected bus to attempt to isolate which RT caused the channel switch.
Could cause of channel switch be isolated to an RT other than CBM?

Yes
No

24
Break CBM Polling by Deactivating

'Commands by Task'
• sel Prep for Mate
Lab Fwd CBM Prep for Mate
• cmd Deactivate Execute
Lab Forward CBM

'CBM Status'
• ✓Mode - Deactivated

25
Verify CBM Deactivated

'CBM Status'
• ✓Mode - Deactivated
Is CBM deactivated?

Yes
No

26
Break CBM Polling by Deactivating

'Commands by Task'
• sel Prep for Mate
Lab Fwd CBM Prep for Mate
• cmd Deactivate Execute
Lab Forward CBM

'CBM Status'
• ✓Mode - Deactivated

27
Reactivation on Same Bus

Lab Fwd CBM Prep for Mate
• cmd Activate LB-SYS-LAB-1(2) Master Controller Execute
Lab Forward CBM

'CBM Status'
• ✓Mode - Activated
• ✓Master - LB-SYS-LAB-1(2)
• ✓Comm Error - No X

28
485 Bus Status

'CBM Status'
• ✓485 Timeout - no X
Does master/latch on alternate 1553 channel indicate 485 timeout?

Yes
No

29
485 Bus Status

'CBM Status'
• ✓485 Timeout - no X

30
Perform Active BIT

Lab Fwd CBM Prep for Mate
• cmd Active BIT Execute
'Confirmation Request'
• ✓Override Active BIT Command?
cmd Active BIT Execute
Lab Forward CBM

'Capture Latch Status'
• sel Built-In Test Failures
CBM I Active Built In Test Failures
• ✓no X
Any BIT errors indicated?

Yes
No

31
No apparent CBM problems - suspect other RTs on bus, SPD card, or channel failure. Can support MCC-H troubleshooting efforts as required to ascertain cause.

No apparent CBM problems - suspect other RTs on bus, SPD card, or channel failure. Can support MCC-H troubleshooting efforts as required to ascertain cause.

32
(LAB CBM 485 COMM LOSS-PREP FOR MATE) (ASSY MAL:CBM)

33
(LAB CBM ACTIVE BUILT-IN TEST FAILURE - PREP FOR MATE) (ASSY MAL:CBM)
33 Reactivate on Same Bus

- Commands by Task
  - sel Prep for Mate

Lab Fwd CBM Prep for Mate
- cmd Activate LB-SYS-LAB-1(2) Master Controller
  - Execute

Lab Forward CBM
- 'CBM Status'
  - ✓ Mode – Activated
  - ✓ Master – LB-SYS-LAB-1(2)
  - ✓ Comm Error – No X

Was activation successful?

34 Firmware transitioned itself to Alternate mode (known transient failure mode for any master).

No

35 Switch 1553 Channels

36 Reactivate on Same Bus

Lab Fwd CBM Prep for Mate
- cmd Activate LB-SYS-LAB-1(2) Master Controller
  - Execute

Lab Forward CBM
- 'CBM Status'
  - ✓ Mode – Activated
  - ✓ Master – LB-SYS-LAB-1(2)
  - ✓ Comm Error – No X

Was activation successful?

37 Probable Bus/MDM Failure.

38 485 Bus Status

- 'CBM Status'
  - ✓ 485 Timeout – no X

Does master/latch on alternate 1553 channel indicate 485 timeout?

39 (LAB CBM 485 COMM LOSS - PREP FOR MATE) (ASSY MAL:MAL:CBM)

40 Perform Active BIT

Lab Fwd CBM Prep for Mate
- cmd Active BIT
  - Execute

Lab Forward CBM
- 'CBM Status'
  - ✓ Active Built In Test Failures
  - ✓ no X

Any BIT errors indicated?

40a (LAB CBM ACTIVE BUILT IN TEST FAILURE - PREP FOR MATE) (ASSY MAL:MAL:CBM)

41 Resume nominal CBM operations

44 Transient failure

If on LB-SYS-LAB-1 master, select LB-SYS-LAB-1. If on LB-SYS-LAB-2 master, select LB-SYS-LAB-2.

Block assumes the current 1553 channel is B. If 1553 channel is currently A, select channel B.
43 Reactivate CBM on Same Bus

'Commands by Task'
  - sel Prep for Mate
  - cmd Activate LB-SYS-LAB-1(2) Master Controller Execute

Lab Forward CBM

'CBM Status'
  - Mode – Activated
  - Master – LB-SYS-LAB-1(2)
  - Comm Error – no X

---

44 Determine RS 485 Channel

Was 485 Channel B in use when comm loss occurred?

45 Select 485 Channel B

Lab Forward CBM

'Commands by Type'
  - sel Prebuilt

CBM I Prebuilt Commands

'CBM Nonactuation Commands'
  - sel Set Last State

CBM I Set Last State Cmds

'cmd Select 485 Ch B Execute'

Lab Forward CBM

'CBM Status'
  - 485 Channel - B

---

46 Clear No Broadcast Indications

- cmd Stop Execute (from any cmd window)

'CBM Status'
  - Master Cmd Status - Complete
  - Powered Bolt Status
  - Cmd Status (16) – Complete
  - Capture Latch Status
  - Cmd Status (4) – Complete

Does any controller have a Cmd Status of No Broadcast?

47 Repeat block 46 to clear No Broadcast indications.

---

(LAB CBM POSITION RELOAD – PREP FOR MATE) (ASSY MAL:MAL:CBM)
1. **Record Failure Details**
   - Controller X = ___________
   - Type of Failure = __________

2. **Verify Error Type**
   - Is controller identified in Block 1 on the same CPA as the master controller?
   - Yes
   - No

3. **Switch Masters on Same Bus**
   - Command Sets
     - sel Prep for Mate
     - cmd Deactivate Execute
   - Lab Forward CBM
     - CBM Status
     - Mode – Deactivated
     - CBM Graphic
     - sel INT-2(1) MDM
     - sel LB SYS LAB 1(2)
     - sel Bus Status
     - Channel Selected – B(A)
     - Channel Selected – A(B)
   - Lab Fwd CBM Prep for Mate
     - cmd Activate LB-SYS-LAB-1(2) Master Controller
   - Lab Forward CBM
     - CBM Status
     - Mode – Activated
     - Master – LB-SYS-LAB-1(2)
     - cmd Stop Execute (from any cmd window)
     - ‘Powered Bolt Status’
     - ‘Capture Latch Status’

4. **Record Positions**
   - CBM Status
   - ‘Capture Latch Status’
   - ‘Powered Bolt Status’

5. **Verify Error Type**
   - Is failure identified in Block 1 Bus 6x553 or Digital Latches?
   - No
   - Yes

6. **Reset Failed Controller**
   - Commands by Type
     - sel Template
     - CBM I Template Commands
     - CBM Nonactuation Commands
     - sel Reset One Controller
   - CBM I Reset One Controller Template
     - pick: Controller 1 – (controller from block 1)
     - cmd Initiate Execute
   - Confirmation Request
     - Override Reset Command?
     - cmd Yes Execute
     - Wait 20 seconds
   - Lab Forward CBM
     - ‘Capture Latch Status’
     - ‘Powered Bolt Status’

7. **Perform Active BIT**
   - Commands by Task
     - sel Prep for Mate
   - Lab Fwd CBM Prep for Mate
     - cmd Active BIT Execute
       - ‘Confirmation Request’
       - Override Active BIT Command?
     - cmd Active BIT Execute
   - Lab Forward CBM
     - CBM Status
     - Master Cmd Status – Complete
     - Capture Latch Status
   - CBM I Active Built In Test Failures
     - - no X’s
   - Is BIT failure still present?
     - Yes
     - No

8. **Component startup or transient failure.** Can return to nominal procedure and continue, but should not use latch controller on this CPA as master for nominal ops (as a precaution for re-occurrence)
14 AUG 00

10 Repeat Active BIT
   ‘Commands by Task’
   • sel Prep for Mate
   Lab Fwd CBM Prep for Mate
   • cmd Active BIT Execute
   ‘Confirmation Request’
   • ✓ Override Active BIT Command?
   • cmd Active BIT Execute
   Lab Forward CBM
   ‘CBM Status’
   • ✓ Master Cmd Status – Complete
   • sel Built-In Test Failures
   ‘Capture Latch Status’
   CBM I Active Built In Test Failures
   • ✓ - no X’s
   Is BIT failure still present?

11 Component startup or transient failure. Should not use latch controller on this CPA as master for nominal ops (as a precaution for reoccurrence).

12 Failure Type
   Note: Failure types recorded in block 1
   Is fault Bus 61553?
   Is fault Hardware Type?
   Is fault Digital Latches?
   Is fault A/D Discrete or DAC/ADC Wrap?
   Is fault EEPROM Check or RAM Write/Read?

13 1553 card failure in controller.
   This master/latch cannot be used as a master but can be used nominally for all other ops.

14 Failed slave controller.
   Pin error between slave and CPA or avionics failure internal to slave. Should not use slave for ops.

15 Switch 485 Channel
   ‘CBM Status’
   • ✓ 485 Channel – A(B)
   • Record 485 Channel:____
   ‘Commands by Type’
   • sel Prebuilt CBM I Prebuilt Commands
   • sel Set Last State
   CBM I Set Last State Cmds
   • cmd Select 485 Ch B(A) Execute
   Lab Forward CBM
   ‘CBM Status’
   • ✓ 485 Channel – B(A)
   485 timeout on controller with error?

16 Failed slave controller.
   Bad memory location(s) in controller RAM or ROM. Should not use this controller for operations since software and other processes may be in error or as the master (if latch controller.)

17 Controller 485 card suspect, but exact failure cannot be determined with no 485 timeout. Should not use controller for nominal ops or as the master (if latch controller.) May be useable on both channels in contingency.

18 Slave controller failed on one 485 channel due to 485 card. Should not use this 485 channel for nominal ops.

19 Switch 485 Channel
   ‘CBM Status’
   • ✓ 485 Channel – B(A)
   • Record 485 Channel:____
   ‘Commands by Type’
   • sel Prebuilt CBM I Prebuilt Commands
   • sel Set Last State
   CBM I Set Last State Cmds
   • cmd Select 485 Ch A(B) Execute
   Lab Forward CBM
   ‘CBM Status’
   • ✓ 485 Channel – A(B)

20 Failed slave controller.
   Command/data internal transmission errors (controller not reliable). Slave cannot be used for actuation (inverter disabled) and should not be used as the master (if latch controller.)

21 22
X in mask Controller cmd will be the name of the slave controller being masked.

Cannot send Set Positions or BIT commands to clear No Broadcast indications for rest of procedure (not masked by MDM software). Sending these cmds to a controller with a BIT error will cause controller to abort command. Instead of sending Set All Positions Zero and BIT to clear No Broadcast messages, send repeated Stop commands. If need to set positions at a later time, will need to build a Set Bolt Positions or Set Latch Angles template (with the failed controllers excluded).
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**Record Data**
- Record: `'CBM Status'`  
- 485 Channel - ______  
- `'CBM Graphic'`  
- Master CPA ______  
- Controllers with 485 timeouts ______

**Verify Power Usage**
- `'MCC-H' to determine if current draw indicates that any controller may have tripped off during power up or when 485 Timeout occurred. Is current draw indicative of all controllers being properly powered?`

**Verify 485 Timeout**
- `cmd Stop Execute` (from any cmd window)  
- `'CBM Status'`  
- `'Master Cmd Status` – Complete  
- `'485 Timeout - blank` – ‘Powered Bolt Status’  
- `'Cmd Code` – Stop  
- `'Cmd Status` – Complete  
- `'Capture Latch Status'`  
- `'Cmd Code` – Stop  
- `'Cmd Status` - Complete  
- Did 485 timeout (s) clear?

**Determine Master**
- Is failed controller on the same CPA as the master?

**Switch Masters on Same Bus**
- `'Cmd Deactivate Execute`  
- Lab Forward CBM
- `'CBM Status'`  
- `'Mode` – Deactivated  
- `'CBM Graphic'`  
- sel INT-2(1) MDM  
- sel LB_SYS_LAB_1(2)  
- sel Bus status  
- LB_SYS_LAB_1(2) Bus Status  
- sel Channel Selected – B(A)  
- cmd Select Channel B(A)  
- sel Channel Selected – A(B)  
- cmd Activate LB-SYS-LAB-1(2) Master Controller Execute  
- Lab Forward CBM
- `'CBM Status'`  
- `'Mode` – Activated  
- `'Master` – LB-SYS-LAB-1(2)  
- cmd Stop Execute (from any cmd window)  
- `'Master Cmd Status` – Abort (due to 485 timeout)  
- `'Powered Bolt Status'`  
- `'Cmd Status` – Complete or In Progress  
- `'Capture Latch Status'`  
- `'Cmd Status` – Complete or In Progress  
- Repeat Stop cmd up to 5 times to clear No Broadcast indications

**Classify Failure**
- Were there originally (before the channel switch) 19 or 20 485 timeouts indicated?

**Locations**
- Are the 485 timeouts indicated on all 5 controllers on any CPA? (Can repeat mal for each CPA if true for more than one CPA)
Connector will be PTBD for primary power and JTBD for secondary power. Connector should have TBD pins in positions TBD.

7

13 Cycle RPC

‘CBM Graphic’
- sel RPC powering CPA with 485 errors
  RPCM_LAY_B_RPC_ZZ
- Verify Load – LAFWD CBM Pri(Sec) Y
- cmd RPC Position - Open
  ✓ RPC Position – Op
  ✓ RPC Position – Cl
Lab Forward CBM
- cmd Stop Execute (from any cmd window)
  ‘CBM Status’
  ✓ 485 Timeout – blank
Are 485 timeouts still indicated?

14 CPA EMI filter suspect can resume operations but will switch to redundant RPC for this CPA since EMI is suspect.
Should remain on the redundant RPC for the remainder of procedure.

15 Switch to Redundant RPC

‘CBM Graphic’
- sel RPC powering CPA with 485 error
  RPCM_LAY_B_RPC_ZZ
- Verify Load – LAFWD CBM Pri(Sec) Y
- cmd RPC Position - Open
  ✓ RPC Position – Op
  ✓ RPC Position – Cl
Lab Forward CBM
- sel redundant RPC for same CPA
  RPCM_LAY_B_RPC_ZZ
- cmd RPC Position - Close
  ✓ RPC Position – Cl
Lab Forward CBM
- cmd Stop Execute (from any cmd window)
  ‘CBM Status’
  ✓ 485 Timeout – blank

Are 485 timeouts still indicated?

79

16 Switch to Redundant RPC

‘CBM Graphic’
- sel RPC powering CPA with 485 error
  RPCM_LAY_B_RPC_ZZ
- Verify Load – LAFWD CBM Pri(Sec) Y
- cmd RPC Position - Open
  ✓ RPC Position – Op
Lab Forward CBM
- sel redundant RPC for same CPA
  RPCM_LAY_B_RPC_ZZ
- cmd RPC Position - Close
  ✓ RPC Position – Cl
Lab Forward CBM
- cmd Stop Execute (from any cmd window)
  ‘CBM Status’
  ✓ 485 Timeout – blank
Are 485 timeouts still indicated?

17 MCC-H CBM Prep for Mate failed. Can repeat checkout after CPA R&R.

18 Switch to Redundant RPC

‘CBM Graphic’
- sel RPC powering CPA with 485 error
  RPCM_LAY_B_RPC_ZZ
- Verify Load – LAFWD CBM Pri(Sec) Y
- cmd RPC Position - Open
  ✓ RPC Position – Op
Lab Forward CBM
- sel redundant RPC for same CPA
  RPCM_LAY_B_RPC_ZZ
- cmd RPC Position - Close
  ✓ RPC Position – Cl
Lab Forward CBM
- cmd Stop Execute (from any cmd window)
  ‘CBM Status’
  ✓ 485 Timeout – blank

19 Access

Is visual inspection possible?

21 CPA EMI failed Operations may continue. Should use the RPC presently powering this CPA for remainder of procedure.

22 Controller Cable problem (now fixed)
LAB CBM 485 COMM LOSS – PREP FOR MATE
(ASSY MAL/5A/FIN) Page 3 of 8 pages

23 Cables Removed
Have CPA connections been disconnected or in crew translation path since last checkout?

24 Startup
Was failure indicated during initial CBM activation?

25 Cycle RPC
‘CBM Graphic’
• sel RPC powering CPA with 485 errors
RPCM_LAY_B_RPC_ZZ
• Verify Load – LAFWD CBM Pri(Sec) Y
• cmd RPC Position - Open
• RPC Position – Op
• Close Cmd – Inhibit
• Close Cmd – Inh
• Remove/Inspect/Install power cable
 RPCM_LAY_B_RPC_ZZ
• cmd Close Cmd - Enable
• Close Cmd – Ena
• cmd RPC Position - Close
• RPC Position – Cl
• cmd Stop Execute (from any cmd window)

Do 485 timeouts still indicated?

26 Access
Is visual inspection possible?

27 Inspect Cables
‘CBM Graphic’
• sel RPC powering CPA with 485 error
RPCM_LAY_B_RPC_ZZ
• Verify Load – LAFWD CBM Pri(Sec) Y
• cmd RPC Position - Open
• RPC Position – Op
• Close Cmd – Inhibit
• Close Cmd – Inh
• Remove/Inspect/Install power cable
 RPCM_LAY_B_RPC_ZZ
• cmd Close Cmd - Enable
• Close Cmd – Ena
• cmd RPC Position - Close
• RPC Position – Cl
• cmd Stop Execute (from any cmd window)

Are 485 timeouts still indicated?

28 Cycle RPC - Fast
‘CBM Graphic’
• sel RPC powering CPA with 485 error
RPCM_LAY_B_RPC_ZZ
• Verify Load – LAFWD CBM Pri(Sec) Y
• cmd RPC Position - Open
• RPC Position – Op

The following RPC command sequence (3 cmd's) should be completed within a minute
• cmd RPC Position - Close
• RPC Position – Cl
• cmd RPC Position - Open
• RPC Position – Op
• cmd RPC Position - Close
• RPC Position – Cl
• cmd Stop Execute (from any cmd window)

‘CBM Status’
• 485 Timeout – blank
Are 485 timeouts still indicated?

29 Controller Cable problem (now fixed)

30 Switch to Redundant RPC
‘CBM Graphic’
• sel RPC powering CPA with 485 error
RPCM_LAY_B_RPC_ZZ
• Verify Load – LAFWD CBM Pri(Sec) Y
• cmd RPC Position - Open
• RPC Position – Op
Lab Forward CBM
• sel redundant RPC for same CPA
RPCM_LAY_B_RPC_ZZ
• cmd RPC Position - Close
• RPC Position – Cl
Lab Forward CBM
• cmd Stop Execute (from any cmd window)
‘CBM Status’
• 485 Timeout – blank

Are 485 timeouts still indicated?

31 Slave power-up failure due to internal controller short. Can resume nominal ops.

32 Slave controller power card failure on 1 power channel. Should use the current RPC for this CPA for remainder of procedure.

33 Idle Time
Wait ~1 hour (with CBM powered)

34 Fast Power Cycle
• Repeat cmd's (and notes) in block 28 (using the currently selected RPC)

Did 485 timeout clear?

35 Slave controller failed.
Will mask controller and not use for operations

Before commanding RPC, record which RPC will be used and confirm with MCC-H.

Fast cycle will be most effective if commanded within 30 seconds or so, but may not possible since need to verify end item response prior to next command.

Connector will be PTBD for primary power and JTBD for secondary power. Connector should have TBD pins in positions TBD.

Could consider switching RPCs for this CPA, but since only 1 controller suspect, can always mask and press if problem reoccurs during critical operations.

Known 485 timeout failure on flight 2A (bolts 1-2 and 4-2) due to FET short to ground before controller opens it on startup. Fast power cycle provides for a faster controller power-up to stop short prior to exceeding current limit. Failure is sensitive to initial temperature. Leaving the CPAs powered increases their temperature some prior to re-attempting fast cycle, thereby increasing chances of power cycle working.
If 485 A Channel is failed, will need to use “Select 485 Ch B” command after every activation.

Switch Masters on Same Bus

Lab Fwd CBM Prep for Mate
- cmd Deactivate Execute

Lab Forward CBM
- Mode – Deactivated
- Master – LB-SYS-LAB-1(2)

cbm Stop Execute (from any cmd window)
- Powered Bolt Status
- Cmd Status – Complete
- Capture Latch Status
- Cmd Status – Complete
- Repeat Stop cmd up to 5 times to clear No Broadcast indications

485 Channel

CBM Status
- 485 Channel – A(B)
- Record 485 Channel:____
- Commands by Type
- sel Prebuilt

CBM I Prebuilt Commands
- sel Set Last State …
- CBM I Set Last State Cmds
- cmd Set Last State to Stop 485 Ch B(A) Execute

Lab Forward CBM
- Mode – Activated
- Master – LB-SYS-LAB-1(2)
- cmd Stop Execute (from any cmd window)
- Powered Bolt Status
- Cmd Status – Complete
- Capture Latch Status
- Cmd Status – Complete
- Repeat Stop cmd up to 5 times to clear No Broadcast indications

485 card failure on previous master.
Will mask that latch for nominal ops and should not select it as master (unless as contingency to drive that latch only)

485 Channel

CBM Status
- 485 Channel – B(A)

Assess 485

485 timeout on previous master only?
485 timeout on 19 or 20 controllers?
Other signature?

MCC-H
multiple failures

Switch 485 Channel

CBM Status
- 485 Channel – A(B)
- Record 485 Channel:____
- Commands by Type
- sel Prebuilt

CBM I Prebuilt Commands
- sel Set Last State
- CBM I Set Last State Cmds
- cmd Set Last State to Stop 485 Ch B(A) Execute

Lab Forward CBM
- Mode – Activated
- Master – LB-SYS-LAB-1(2)
- cmd Stop Execute (from any cmd window)
- Powered Bolt Status
- Cmd Status – Complete
- Capture Latch Status
- Cmd Status – Complete
- Repeat Stop cmd up to 5 times to clear No Broadcast indications

485 Bus channel failed – short on channel. Can return to procedure but should remain on good 485 channel.
11 Cannot inspect for cable problem so continue to verify open circuit

12 Only change 1553 channel if required to enable the latch controller with timeout to communicate with MDM.

13 Cable JTBD
14 Connector will be PTBD. If currently on 485 A channel, use Select 485 Ch B command, and vice versa.
15 Only change 1553 channel if required to enable the latch controller with timeout to communicate with MDM.
16 Connector failure in JTBD.
17 Connector failure in JTBD.

12 Connector will be PTBD. If currently on 485 A channel, use Select 485 Ch B command, and vice versa.

15 Only change 1553 channel if required to enable the latch controller with timeout to communicate with MDM.

16 Connector failure in JTBD.

17 Connector failure in JTBD.

69 Connector problem (now fixed).

65 Access
Is visual inspection possible?

66 Connector problem for one channel fixed. Can repeat inspection to regain other channel. If second channel not regained, can continue procedure on good channel (should not use degraded channel for nominal ops).

67 /MCC-H CBM Prep for Mate failed. Can repeat checkout after CPA R&R.

68 Inspect
Check connectors using steps in block 61. Same 485 timeouts both channels?
No 485 timeouts on either channel?
Same 485 timeouts one channel?

63 Bad address pin connection

62 Failed slave controller (component failure.) Will mask controller and return to nominal procedure. Should use Stop commands instead of Initialize and BIT to clear No Broadcast messages.

64 Bad 1553/485 cable/connector

67 /MCC-H CBM Prep for Mate failed. Can repeat checkout after CPA R&R.

68 Inspect
Check connectors using steps in block 61.

69 Connector problem (now fixed).

70 Deactivate & Select Next Master
'CBM Status'
- Record 485 channel - _______
- 'CBM Graphic':
  - Select a latch controller that has a 485 timeout as master (preferably one with an active (blue) 1553 channel connected.)
  - Record Selection ______

Lab Fwd CBM Prep for Mate
- cmd Deactivate Execute

Lab Forward CBM
'CBM Status'
- / Mode – Deactivated
- 'CBM Graphic'
- sel INT-2(1) MDM
- sel LB_SYS_LAB_1(2)
- sel Bus Status

LB_SYS_LAB_1(2) Bus_Status
- / Channel Selected – B(A)
- cmd Select Channel A(B)
- /Channel Selected – A(B)

Lab Fwd CBM Prep for Mate
- cmd Activate LB-SYS-LAB-1(2) Master Controller Execute

Lab Forward CBM
'CBM Status'
- / Mode – Activated
- / Master – LB-SYS-LAB-1(2)
- cmd Stop (from any CBM cmd window)
  - Record which latches/bolts indicate 485 Timeout:__________

Same 5 485 timeouts?

Is CBM Deactivated?

61 Inspect Cables
'CBM Graphic'
- sel RPC powering CPA with 485 error RPCM_LAI_B_RPC_ZZ
  - Verify Load – LAFWD CBM Pri(Sec) Y
- cmd RPC Position - Open
- /RPC Position – Op
- cmd Close Cmd - Inhibit
- /Close Cmd – Inh
- Remove/Inspect/Install 1553/ 485 cable (JTBD)

RPCM_LAI_B_RPC_ZZ
- cmd Close Cmd - Enable
- /Close Cmd – Ena
- cmd RPC Position - Close
- /RPC Position – Cl
- cmd Stop Execute (from any CBM cmd window)

Lab Forward CBM
'CBM Graphic'
- Record which latches/bolts indicate 485 Timeout:__________

Command Sets’
- sel Instances
- sel Set Last State ...

CBM I Set Last State Cmds
- cmd Select 485 Ch A(B) Execute
  'CBM Graphic'
  - Record which latches/bolts indicate 485 Timeout:__________

Same 485 timeouts both channels?
No 485 timeouts on either channel?
Same 485 timeouts one channel?

60 Deactivate & Select Next Master

CBM Prep for Mate failed. Can repeat checkout after CPA R&R.

MCC-H CBM Prep for Mate failed. Can repeat checkout after CPA R&R.

65 Access
Is visual inspection possible?

66 Connector problem for one channel fixed. Can repeat inspection to regain other channel.
- If second channel not regained, can continue procedure on good channel (should not use degraded channel for nominal ops).

67 /MCC-H CBM Prep for Mate failed. Can repeat checkout after CPA R&R.

68 Inspect
Check connectors using steps in block 61.

69 Connector problem (now fixed).

70 Deactivate & Select Next Master

CBM Prep for Mate failed. Can repeat checkout after CPA R&R.

65 Access
Is visual inspection possible?

66 Connector problem for one channel fixed. Can repeat inspection to regain other channel.
- If second channel not regained, can continue procedure on good channel (should not use degraded channel for nominal ops).

67 /MCC-H CBM Prep for Mate failed. Can repeat checkout after CPA R&R.

68 Inspect
Check connectors using steps in block 61.

69 Connector problem (now fixed).

70 Deactivate & Select Next Master

CBM Prep for Mate failed. Can repeat checkout after CPA R&R.

65 Access
Is visual inspection possible?

66 Connector problem for one channel fixed. Can repeat inspection to regain other channel.
- If second channel not regained, can continue procedure on good channel (should not use degraded channel for nominal ops).

67 /MCC-H CBM Prep for Mate failed. Can repeat checkout after CPA R&R.

68 Inspect
Check connectors using steps in block 61.
If a CBM 485 bus has an open circuit it can still be used. A master can talk to any controllers between itself and the open circuit (and thus any master on other side of open can talk to any of the other controllers.)
**LAB CBM 485 COMM LOSS – PREP FOR MATE**  
(ASSY MAL/5A/FIN)  

### 78 Mask Failed Controller
- Repeat the following for each failed or degraded controller (per declaration in failure box):
  - ‘Commands by Type’
  - sel Prebuilt
  - CBM Mask Controller...  
  - **cmd** Mask “Controller X” Execute

```
Lab Forward CBM
'CBM Graphic'
✓ - ☑ on “Controller X”
```

### 79 Verify Command Status
- **‘Powered Bolt Status’**
  - ✓ Cmd Status (16) – Complete or In Progress
- **‘Capture Latch Status’**
  - ✓ Cmd Status (16) – Complete or In Progress

Any controller have a Cmd Status of No Broadcast?

- **Yes**
  - (LAB CBM POSITION RELOAD – PREP FOR MATE) (ASSY MAL:MAL:CBM)
- **No**

### 80 Clear 485 Errors
- **cmd** Stop Execute (from any command window)
  - ‘Powered Bolt Status’
  - ✓ Cmd Status (16) – Complete or In Progress
  - ‘Capture Latch Status’
  - ✓ Cmd Status (16) – Complete or In Progress
  - Repeat Stop Cmd as required all until No Broadcasts cleared.

---

X in Mask Controller **cmd** will be the name of the slave controller being masked.

Cannot send Set Positions or BIT commands to clear No Broadcast indications for rest of procedure (not masked by MDM software). Sending these **cmds** to a controller with a 485 timeout will cause master to abort command. Instead of sending Set All Positions Zero and BIT to clear No Broadcast messages, send repeated Stop commands. If need to set positions at a later time will need to build a Set Bolt Positions or Set Latch Angles template (with the failed controllers excluded).
Cmd rejection is an INTSYS software response that should only be set if the INTSYS software considers the CBM to be in the deactivated state.

The signature leading to the yes leg of this block could be caused a command build, 1553 bus, or master problem. If bus problems (i.e. random errors, multiple bus errors, command errors on multiple commands, etc.) are seen, MCC-H.

1. Identify Cmd Error
   - CBM Status'
   - √ Cmd Rejected Flag – blank
   - Is Command Rejected indicated?

2. Verify 1553 Communication
   - CBM Status'
   - √ Mode – Activated
   - √ Comm Error – no “X”
   - Is CBM Deactivated?
   - No
     - Command rejected since sent without an active CBM.
   - Yes
     - (LAB CBM 1553 COMM LOSS – PREP FOR MATE) (ASSY MAL:MAL:CBM)

3. Command rejection indication is old. Can return to nominal procedure (should ignore error unless command shown as rejected changes)

4. Verify Command Response
   - MCC-H to establish when the rejection flag was set.
   - Was MCC-H unable to determine when error initially appeared?
     - Yes
       - Command Rejected – XXXXX
       - Is the rejected command the last command that was issued to CBM?
         - No
           - Command rejection indication is old. Can return to nominal procedure (should ignore error unless command shown as rejected changes)
         - Yes
           - Master cmd error indicated?
             - No
               - 30
             - Yes
               - 13

5. Verify Time of Error
   - Did rejection flag appear after last cmd sent to CBM?
   - Did rejection flag appear before last cmd sent to CBM?

6. Verify Last Command
   - ‘CBM Status’
   - √ Command Rejected - XXXXX
   - Is the rejected command the last command that was issued to CBM?

7. Verify 1553 Communication
   - cmd Stop Execute (from any CBM command window)
   - ‘CBM Status’
   - √ Master Cmd Status – Complete
   - ‘Powered Bolt Status’
   - √ Cmd Code (16) – Stop
   - ‘Capture Latch Status’
   - √ Cmd Code (4) – Stop
   - Did stop cmd complete successfully?

8. Verify 1553 Communication
   - Master cmd error indicated?
   - No
     - 31
   - Yes
     - 11a

9. Verify Error Conditions
   - ‘CBM Status’
     - Record Master Cmd Error – ________________
     - cmd Stop Execute (from any CBM command window)
   - ‘CBM Status’
     - √ Master Cmd Status – Complete
     - √ Master Cmd Error – “blank”
   - ‘Powered Bolt Status’
     - √ Cmd Code (16) – Stop
   - ‘Capture Latch Status’
     - √ Cmd Code (4) – Stop

10. Verify Error Conditions
    - Master cmd error indicated?

11. Verify 1553 Communication
    - MCC-H

12. Likely that Command Rejected indication was not valid/new. Can resume nominal operations and monitor for changing Command Rejected flag.
If time permits, can have MCC-H verify instance command structure from Command Inventory using criteria in block 19.

MCC-H for detailed instructions for building each CBM template. These are found in the OSO Console Handbook section 4.1.8.7.

Initialize Template (Latch Angles or Bolt positions) can be used in place of a Set Positions/Angles template if that template is corrupt (only available in MCC).

19 Verify Template Build

- Reverify all template cmd variables. Depending on the type of error, extra focus should be spent on the following:
  - Parameter Out of Range: For latch commands, verify current threshold less than or equal to 1 RPM. For bolt commands, verify current threshold less than or equal to 160 N-M.
  - Invalid Delimiter: MCC-H to verify delimiter value is BBBBH (48059 [decimal])
  - Invalid Command: verify cmd code indicates proper command type. MCC-H to verify override bit and user bits are consistent with each other if applicable for this cmd structure.
  - Invalid Subsystem ID: verify Controller Count is correct and that there are no Null Devices listed within the controllers identified by this Controller Count.
  - Word Count: For set positions/angles commands, MCC-H to verify cmd contains 25 data words (excluding CCSDS header words). For all other commands, MCC-H to verify cmd contains 22 data words.

Did cmd contain incorrect values?

Yes

20 Alternate Method

- MCC-H - alternate method must be found to accomplish this malfunction operation (All nominal CBM commands in procedure have a corresponding template.)

No

21 Reattempt Template

- Reattempt procedure step/cmd which resulted in error

Did command generate a Master Cmd Error?

Yes

22 Erroneous cmd build (std-out or user.)

MCC-H for instructions to build template for erroneous command. Return to nominal procedure substituting this template for each instance of the erroneous cmd

No

23 Rebuild Template Command

Is incorrect value selectable by the user?

Yes

24 One-time transmission failure on 1553 bus. Can resume nominal procedure.

No

25 Alternate method

- MCC-H - Do not use this template structure again. Alternate method must be found to accomplish this malfunction operation if required (All nominal CBM commands in procedure are instantiations). Cmd from scratch is not recommended, but can be an acceptable alternative if this is only command to support a critical CBM operation.

26 Bad Std-Out build of command.

No

27 Bad user build of command

Yes

28 Alternate Method

- MCC-H - Do not use this template structure again. Alternate method must be found to accomplish this malfunction operation if required (All nominal CBM commands in procedure are instantiations). Cmd from scratch can be an acceptable alternative if this is only command to support a critical CBM operation.

29 Build Cmd & Resume Ops

- Rebuild template.
- Return to nominal procedure repeating last step as required
### CBM Command Error – Prep for MATE

**LAB CBM COMMAND ERROR – PREP FOR MATE**

(ASSY MAL/5A/FIN)  
Page 3 of 3 pages

#### 30 Switch Masters on Same Bus

**Lab Fwd CBM Prep for Mate**

- **cmd Deactivate Execute**  
  **Lab Forward CBM**

- **CBM Status**
  - Mode – Deactivated
  - ‘CBM Graphic’
  - sel INT-2(1) MDM
  - sel LB SYS LAB 1(2)
  - sel Bus Status

**LB_SYS_LAB_1(2)_Bus_Status**

- √ Channel Selected – B(A)
  - *cmd Select Channel A(B) Execute*
  - √Channel Selected – A(B)

**Lab Fwd CBM Prep for Mate**

- **cmd Activate LB-SYS-LAB-1(2) Master Controller Execute**  
  **Lab Forward CBM**

- **CBM Status**
  - ∧Mode – Activated
  - ∧Master – LB-SYS-LAB-1(2)
  - *cmd Stop Execute (from any CBM command window)*

**Lab Forward CBM**

- **CBM Status**
  - ∧Master Cmd Status – Complete
  - ∧Master Cmd Error – blank

**Is Master Cmd Error indicated?**

- **Yes**
  - **35 MCC-H - Bus failed for CBM Ops.**

- **No**

**31 Verify 1553 Communication**

- **‘CBM Graphic’**
  - √Time Code – incrementing each minute

**Is Time Code incrementing?**

- **Yes**

- **No**

**32 No end item response since command sent without an active CBM.**

**Perform (LAB CBM 1553 COMM LOSS – PREP FOR MATE) (ASSEMBLY MAL:MAL:CBM)**

**34 Verify Error Conditions**

- **cmd Stop Execute (from any CBM command window)**

**Lab Forward CBM**

- **CBM Status**
  - √Master Cmd Status – Complete
  - ‘Powered Bolt Status’
  - √Cmd Code (16) – Stop
  - ‘Capture Latch Status’
  - √Cmd Code (4) – Stop

**Did command complete successfully?**

- **Yes**

- **No**

**37 One-time transmission failure on 1553 bus. Can resume nominal procedure. Should repeat last step in procedure if did not complete.**

**38 Select 485 Channel B**

- **‘Commands by Type’**
  - sel Prebuilt CBM I Prebuilt Cmds
  - sel Set Last State CBM I Set Last State Cmds
  - **cmd Select 485 Ch B Execute**

**Lab Forward CBM**

- **CBM Status**
  - √485 Channel - B

**39 Cmd Stop**

- **cmd Stop Execute (from any CBM command window)**

**Lab Forward CBM**

- **CBM Status**
  - √Master Cmd Status – Complete
  - √Master Cmd Error – blank
  - ‘Powered Bolt Status’
  - √Cmd Code (16) – Stop
  - √Cmd Status (16) – Complete
  - ‘Capture Latch Status’
  - √Cmd Code (4) – Stop
  - √Cmd Status (4) – Complete
  - Repeat Stop command as necessary to clear all No Broadcast Cmd Statuses.

**40 Resume Operations**

- Resume nominal procedure with any constraints noted in conclusion box.
- Repeat last step in procedure if did not complete.
Unless otherwise indicated, all blocks with display call-outs begin with Lab Forward CBM.

If BBoltck template used, operator should also verify the commanded position is correct and greater than the currently indicated position.

Bolts extended out as far as 2 revolutions do not pose a hazard to CBM mating operations.

Can use current data and camera views to try to ascertain cause of binding. If no clear indications, will likely attempt deploy with higher current limit. If that fails, or FOD is preventing deploy, EVA will be required to release petal cover and restrain latch, if failed.

MCC-H will assess motor speed data for the controller exceeding the allotted command time. If motor speed appears normal, will likely reperform command. If speed is lower than expected, will likely mask a bolt. If a latch speed is slow during deploy, will likely increase time limit to get latch deployed, and then mask latch.
LAB CBM CONTROLLER ERROR – PREP FOR MATE

1 Identify Error Type
   ‘CBM Graphic’
   • sel controller with ! (for RTL open latch detail).
   Controller X Details
   • Record: Error - Controller - ________

   Does RTL or Capture Switch indicate Short Circuit or Open Circuit?
   Yes

   No

2 RTL or Capture Switch failed (Circuit or Physical failure).
   Can return to Prep for Mate procedure. If capture switch failed, will not get miss or malfunction indications for that latch. ✔ MCC-H for any deltas to capture procedures.

3 Identify Error Type
   Controller X Details
   • Invalid Command – no X
   X for Invalid Command?
   Yes

   No

4 Template
   Was command a template?
   Yes

   No

5 Reverify Template
   • Reverify all template cmd variables. Extra focus should be spent on:
     Controller Count = total number of IDs listed in command
     No Null values in values within Controller counts
     All Controllers are for a latch in a latch command or a bolt in a bolt command

   Command built correctly?
   Yes

   No

6 Identify Error Type
   Controller X Details
   • Framing Error – no X
   • Checksum Error – no X
   X for Framing Error or Checksum Error?
   Yes

   No

7 Command Check
   • cmd Stop Execute (from any CBM cmd window)
     ‘CBM Status’
     ✔ Master Cmd Status – Complete ‘CBM Graphic’
     • If ❌ present - open detail window and confirm error.

   Invalid Command, Framing Error, or Checksum Error indicated for same controller with previous error?
   Yes

   No

8 Identify Error Type
   Controller X Details
   • Passive BIT
   • all faults – no X
   X for any Background Status Fault?
   Yes

   No

9 Bad user build of command

10 Resume Ops
    • Rebuild template with proper values.
    • Return to procedure.
    • Repeat last cmd as required

11 ✔ MCC-H

12 Retransmit Failed Command
    • Resend Command that previously generated command error.
    Did command complete successfully?
    Yes

    No

13 Failed controller (internal component/software). Will mask controller and continue.

14 ✔ MCC-H - Unexplained cmd problems.

15 Apparent transmission/transient error. Can return to nominal procedure.

16 Resume Ops
    • Return to procedure. Repeat last cmd as required

17 Mask Failed Controller
    • Repeat the following for each failed or degraded controller (per declaration in failure box)
      ‘Commands by Type’
      • sel Prebuilt
        CBM I Prebuilt Commands
        INTSYS Software Commands’
      • sel Mask Controller
        CBM I Mask Controller Cmds
      • cmd Mask “Controller X”
        Execute
        Lab Forward CBM
        ‘CBM Graphic’
        ✔ on “Controller X”
17 Verify Error Type
Is controller identified in Block 1 the latch controller on the CPA identified as master?

18 Switch Masters on Same Bus

- 'Commands by Task'
  - sel Prep for Mate
    - Lab Fwd CBM Prep for Mate
      - cmd Deactivate Execute

- Lab Forward CBM
  - 'CBM Status'
    - 'Mode' – Deactivated
    - 'CBM Graphic'
    - sel INT-2(1) MDM
    - sel LB SYS LAB 1(2)
    - sel Bus Status
  - LB_SYS_LAB_1(2)_Bus_Status
    - ✓ Channel Selected – B(A)
    - cmd Select Channel A(B) Execute
    - ✓ Channel Selected – A(B)

19 Record Positions
- 'Capture Latch Status'
  - Record positions
    - L1, L2, L3, L4
- 'Powered Bolt Status'
  - Record positions
    - B1-1, B1-2, B1-3, B1-4
    - B3-1, B3-2, B3-3, B3-4
    - B4-1, B4-2, B4-3, B4-4

20 Reset Failed Controller

- 'Commands by Type'
  - sel Template
    - CBM I Template Commands
    - CBM Nonactuation Templates
      - sel Reset One Controller
        - CBM I Reset One Controller Template
          - pick: Subsystem ID 1 – (controller from block 1)
          - cmd Initiate Execute
          - 'Confirmation Request'
          - ✓ Override Reset Command?
          - cmd Yes Execute
          - Wait 20 seconds

- Lab Forward CBM
  - 'CBM Status'
    - ✓ Master Cmd Status – Complete
    - 'Capture Latch Status'
    - ✓ No Build In Test Failures
  - CBM I Active Built In Test Failures
    - ✓ - no X’s
    - Is BIT failure still present?

21 MCC-H - unexplained background BIT problems.

22 Apparent transient problem (monitor for reoccurrence).

(LAB CBM POSITION RELOAD – PREP FOR MATE) (ASSEMBLY MAL:MAL:CBM)

Depending on nature of background BIT fault may choose not to use this controller as a master controller (if it is a latch).
LAB CBM POSITION RELOAD - PREP FOR MATE
(ASSY MAL/5A/FIN)  Page 1 of 2 pages

Unless otherwise indicated, all blocks with display checks begin with:
Lab Forward CBM

Select current 485 channel to avoid changing channels; i.e. if currently using 485 A channel, issue Set Bolts Posns Zero Ch A.

The command example in block 7 assumes that 1 bolt, Bolt 1-1, has been masked. If a different bolt has been masked, remove that bolt from the Controller list, and insert Bolt 1-1. If multiple bolts are masked, remove the appropriate controllers from the list and also decrement the Controller Count field appropriately.

Following the master controller switch in the nominal procedure, the failed bolt controllers will need to have their mask reapplied (cleared on activation.) Also, will need to use CBM Set Bolt Positions Template to reload positions and Stop Cmd to clear No Broadcast indications.
10 Fail During Deploy
Did failure occur during Deploy to 210 Degrees command?

11 Reload Latch Position for 1 Latch
“Commands by Type”
• sel Template
CBM I Template Commands
‘CBM Nonactuation Templates’
• sel Set Latch Angles
CBM I Set Latch Angles Template
• set: Controller Count: 1
  • pick: Last Cmd - Stop
  • pick: RS485 Channel – A(B)
• set: Shaft Angle 17: Y deg
• set: Shaft Angle 18-20: 0 deg
• pick: Controller 17: Latch Z
• pick: Controller 18-20: Null Device
• cmd Set Execute

Lab Forward CBM
‘CBM Status’
• ✓ Master Cmd Status - Complete
  ‘Capture Latch Status’
  • ✓ Latch Z Cmd Code – Reload
  • ✓ Latch Z Cmd Status – Complete
  • ✓ Latch Z Posn – 0 deg

5 Select current 485 channel to avoid changing channels; i.e. if currently using 485 A channel, issue template using Ch A. Set Shaft Angle ‘Y’ using position recorded in original malfunction for Latch ‘Z’, which was deploying at the time of failure.

6 Select current 485 channel to avoid changing channels; i.e. if currently using 485 A channel, issue Set Berthing Start Posns Ch A.

12 Reload Bolt Positions
‘Commands by Type’
• sel Template
CBM I Template Commands
‘CBM Nonactuation Templates’
• sel Set Bolt Positions
CBM I Set Bolt Positions Template
• set: Controller Count: 20
  • pick: Last Cmd - Stop
  • pick: RS485 Channel – A(B)
• set: Shaft Position 1-16: 0 rev
• set: Shaft Angle 17-20: 202 deg
• pick: Controller 1-20: Bolt 2-1, 2-1, 3-1, 4-1, 1-2, 2-2, 3-2, 4-2, 1-3, 2-3, 3-3, 4-3, 1-4, 2-4, 3-4, 4-4, Latch 1, 2, 3, 4
• cmd Set Execute

Lab Forward CBM
‘CBM Status’
• ✓ Master Cmd Status - Complete
  ‘Powered Bolt Status’
  • ✓ Cmd Code (15) – Reload
  • ✓ Cmd Status (15) – Complete
  • ✓ Posn (15): 0.0 rev
    ‘Capture Latch Status’
  • ✓ Cmd Code (4) – Reload
  • ✓ Cmd Status (4) – Complete
  • ✓ Posn (4): 202 deg

7 The command example in block 12 assumes that 1 bolt, Bolt 1-1, has been masked. In its place, bolt 2-1 has been duplicated to allow a successful command build. If a different bolt has been masked, remove that bolt from the Controller list, and insert Bolt 1-1. If multiple bolts are masked, remove the appropriate controllers from the list and also duplicate controller entries to fill all fields.

13 Bolt Masking Check
Has any bolt controller been masked?

14 Reload Controller Positions
‘Commands by Task’
• sel Prep for Mate
Lab Fwd CBM Prep for Mate
• cmd Set Berthing Start Posns Ch A(B)
  Execute
Lab Forward CBM
‘CBM Status’
• ✓ Master Status - Complete
  ‘Powered Bolt Status’
  • ✓ Cmd Code (16) – Reload
  • ✓ Cmd Status (16) – Complete
  • ✓ Posn (16): 0.0 rev
    ‘Capture Latch Status’
  • ✓ Cmd Code (4) – Reload
  • ✓ Cmd Status (4) – Complete
  • ✓ Posn (4): 202 deg
LAB CBM MATE MALFUNCTION
(assy mal/5a/fin)

1 Verify RPC Status
‘RPCM LA1B B’
‘RPCM LA2B B’
• √RPC (4) – Cl
• √RPC (4) – no
New △ on any RPC?
Yes [LAB CBM POWER LOSS – MATE] (assembly mal:mal:cbm)

2 Verify 1553 Comm Status
‘CBM Status’
• √Mode – Activated
• √Comm Error – no X
‘CBM Graphic’
• √Time Code – incrementing each minute
Is Mode Deactivated and/or Comm Error indicated?
Did Time Code stop incrementing?
Yes [LAB CBM 1553 COMM LOSS – MATE] (assembly mal:mal:cbm)

3 Verify Command Accepted
‘CBM Status’
• √Master Cmd Error – blank
• √Cmd Rejected Flag – blank
Is a Master Cmd Error or Cmd Rejection indicated or was there no end item response to a command?
Yes [LAB CBM COMMAND ERROR – MATE] (assembly mal:mal:cbm)

4 Determine Mate Stage
Is Second Stage Capture Complete?
Yes 14

5 Check for Missed Capture
‘Capture Latch Status’
• √Cmd Status (4) – Complete
II Latch X Details
• √Command Time Exceeded – no X
Any latch Cmd Status “Missed” or any switch not open following first stage capture?
Yes [LAB CBM MISSED CAPTURE – MATE] (assembly mal:mal:cbm)

6 Check for Capture Failure
‘Capture Latch Status’
• √Cmd Status (4) – Complete
II Latch X Details
• √Command Time Exceeded – no X
Did any latch fail to complete Second Stage Capture due to a jam or command time exceeded?
Yes

7 Verify Latch Positions
‘Capture Latch Status’
• √Cmd Status (3) – Complete
• √Posn (3) – 11 deg
Did all other latches complete second stage capture and reach a position of 11 degrees?
Yes

8 Verify CBM Controller Status
‘CBM Graphic’
• - no △
If attention symbol exists, open latch details window
New △ on any RTL?
New △ on any Latch (and have not completed second stage capture)?
New △ on any Bolt?
Other Signature?

8a • √MCC-H

9 Determine Capture Stage
First Stage Capture Complete?

10 RTL Failed - will need to mask latch. Can resume capture with remaining 3 latches per instructions in First Stage Capture procedure.

11 Determine Capture Capability
Still 3 unmasked latches with no △?
Yes

12 Latch degraded - will mask latch and continue capture with remaining three latches after checking bolts on same CPA.

13 • √MCC-H - multiple latch failures.

14

15

29

29

29
Need to assess specific failures to establish attitude control constraints and whether to continue or back out of bolting.

4

14 Verify Load Capability
Has ABolts been completed?

Yes  "MCC-H" - Likely just leave latch where it is and continue deactivation/powerdown.

No  8 19

15 Verify Bolt Configuration
Are there at least twelve unmasked bolts with no △?

Yes  16 1 - 4 bolts degraded - will mask failed bolts and continue through ABolts command.

No  17 "MCC-H" - more than 4 bolt failures.

18 Verify Bolt Configuration
Do bolts on the CPA with the failed latch also have △?

Yes  19 Likely power or 485 problem.

No  20 Latch failure. Should mask failed latch in next block.

14

21 15 Good Bolts
Did failure occur during final latch closure?

Yes  22 "MCC-H" - Likely just leave latch where it is and continue deactivation/powerdown.

No

23 15 Good Bolts
Are there 15 unmasked bolts with no △ (or 14 unmasked bolts but the 2 failed/degraded are not adjacent)?

Yes  24 Enough bolts for good pressure seal.

No

25 Verify Command Status

‘CBM Status’
• ✓Master Cmd Status – Complete
• ‘Powered Bolt Status’
• ✓Cmd Status (16) – Complete
• ‘Capture Latch Status’
• ✓Cmd Status (4) – Complete

Any new controller Cmd Status or Master Cmd Status other than as expected?

Yes  25a "MCC-H"

No

26 Verify RS485 Comm Status

‘CBM Status’
• ✓485 Timeout – no X

Is 485 Timeout indicated?

Yes  (LAB CBM 485 COMM LOSS – MATE) (ASSEMBLY MAL: MAL: CBM)

No

27 Verify CBM Controller Status

‘CBM Graphic’
• ✓ - no △

New △ on any bolt?

Yes  (LAB CBM CONTROLLER ERROR – MATE) (ASSEMBLY MAL: MAL: CBM)

No  27a "MCC-H"
28 Mask Failed Controller(s)

- Controller X Details
- sel Commands
- Controller X Commands
- cmd Mask Controller X

Execute

Lab Forward CBM

'CBM Graphic'

- ✔️ on "Controller X"

29 Resume Ops

- Resume ops until at least 8 alternating bolts complete ABolts so can resume attitude control. If any bolts masked,
- ✔️MCC-H prior to IBolt to assess configuration (probably re-enter mal at block 23 to regain function.)
This Page Intentionally Blank
This malfunction is written assuming the Lab Forward CBM is in use.

Unless otherwise indicated all blocks begin with

Lab Forward CBM

Failure of RPC to open/close not covered since no nominal open/close ops during mate procedures.

Block 1 of (LAB CBM MATE MALFUNCTION) (ASSY MAL:CBM)

Block 2 of (LAB CBM 1553 COMM LOSS - MATE) (ASSY MAL:CBM)

1 Record Positions of All Controllers
   • Record 485 channel in use and position of each latch/bolt. Circle any controllers that are masked.
     ‘CBM Status’
     • 485 Channel -
     • ‘Capture Latch Status’
       L1___, L2___, L3___, L4___
     • ‘Powered Bolt Status’
       B1-1___, B1-2___, B1-3___, B1-4___
       B3-1___, B3-2___, B3-3___, B3-4___
       B4-1___, B4-2___, B4-3___, B4-4___

2 Verify RPC Status
   Perform (RPCM TRIP) (SODF: EPS), then:
   • Return to this block
   Did procedure clear trip and close RPC?
     Yes
     No

3 Verify CBM Mode
   ‘CBM Status’
   • ✓Mode – Activated
   • ✓Comm Error – no X
   Is CBM Activated?
     Yes
     No

4 RPC failed for CBM operations.

5 Close Redundant RPC
CBM Graphic'
   • sel appropriate RPC
     RPCM LAYB RPC ZZ
   • cmd RPC Position – Close
   • ✓RPC Position – Cl
   Is redundant RPC closed?
     No
     Yes

5a ✓MCC-H

3
6 Reactivate CBM On Same Bus

- "Commands by Task"
  - sel Prep for Mate
  
  **Lab Fwd CBM Prep for Mate**
  - cmd Activate CB-GNC-2(1) Master Controller **Execute**

**Lab Forward CBM**

- "CBM Status"
  - ✓ Mode – Activated
  - ✓ Master – CB-GNC-2(1)
  - ✓ Comm Error – no X

7 Determine RS 485 Channel

Was 485 Channel A in use when power loss occurred?

- Yes
  - 3
  - 10
  
- No

9 Clear 485 Errors

**cmd Stop Execute** (from any cmd window)

**Lab Forward CBM**

- "CBM Status"
  - ✓ 485 Timeout – no X
  - ✓ Powered Bolt Status
  - ✓ Cmd Status (16) – Complete
  - ✓ Capture Latch Status
  - ✓ Cmd Status (4) – Complete

Does any controller have a Cmd Status of No Broadcast?

- No
  - 4

11 Reload All Positions

- "Commands by Type"
  - sel Template

**CBM I Template Commands**

- sel CBM I Nonactuation Templates
  - sel Set All Positions

**CBM I Set All Positions Template**

- set: Controller Count: 20
  - pick: Last Cmd - Stop
  - pick: RS485 Channel – A(B)
  - set: Shaft Position 1-16: "Y" rev
  - set: Shaft Angle 17-20: "Y" deg
  - pick: Controller 1-20: Bolt 1-1, 2-1, 3-1, 4-1, 1-2, 2-2, 3-2, 4-2, 1-3, 2-3, 3-3, 4-3, 1-4, 2-4, 3-4, 4-4, Latch 1, 2, 3, 4
  - cmd Set Execute

**Lab Forward CBM**

- "CBM Status"
  - ✓ Master Cmd Status - Complete
  - ✓ Powered Bolt Status
  - ✓ Cmd Code (16) – Reload
  - ✓ Cmd Status (16) – Complete
  - ✓ Posn (15) – “Y” rev
  - ✓ Capture Latch Status
  - ✓ Cmd Code (4) – Reload
  - ✓ Cmd Status (4) – Complete
  - ✓ Posn (4) – “Y” deg

8 Select 485 Channel A

- "Commands by Type"
  - sel Prebuilt

**CBM I Prebuilt Commands**

- sel Set Last State

**CBM I Set Last State Cmds**

- cmd Select 485 Ch A **Execute**

**Lab Forward CBM**

- "CBM Status"
  - ✓ 485 Channel - A

10 Repeat block 9 to clear No Broadcast indications.

12 Resume Ops

- Return to nominal procedure.
- Repeat last command if it did not complete successfully.

4 Set Positions/Angles "Y" per values recorded in block 1. Select current 485 channel to prevent changing channels, i.e. if currently on 485 A channel, select A channel. If any bolt controller is masked, omit that controller and duplicate the entry for a good controller to keep 16 bolts in the command. If any latch controller is masked, omit the latch controller and decrement the Controller Count.
LAB CBM 1553 COMM LOSS - MATE
(assy mal/5a/fin) Page 1 of 3 pages

1. Record Positions of All Controllers
   - Record 485 channel in use and position of each latch/bolt. Circle any controllers that are masked.
   - 'CBM Status'
   - 485 Channel - ___
   - 'Capture Latch Status'
     L1___, L2___, L3___, L4___
   - 'Powered Bolt Status'
     B1-1___, B1-2___, B1-3___, B1-4___
     B3-1___, B3-2___, B3-3___, B3-4___
     B4-1___, B4-2___, B4-3___, B4-4___

2. Verify Master Power Status
   Lab Forward CBM
   'RPCM N13B B Primary Power'
   - RPC(4) – no
   'RPCM N14B B Secondary Power'
   - RPC(4) – no
   Does the RPC which was supplying the Master controller have \( \Delta \)?

3. Verify MDM Status
   'CBM Graphic'
   - INT-2(1) – Primary
   - MCC-H to determine if state transition occurred
   Did Primary INT MDM fail or undergo a major state transition?

4. Verify Power Status
   'CBM Graphic'
   - sel RPCM LA1B B (LA2B B)
   - Integ Counter - incrementing
   Is RPCM Counter incrementing?

5. MCC-H - DDCU/RPCM failure.
If previous failures exist, they may influence selection and availability of master, 1553 bus, or 485 channel.

485 timeouts or new BIT failures may exist. Stop may generate a master Cmd Status of Abort, but will still clear all No Broadcast indications.

485 timeouts or new BIT failure may exist. Stop may receive a master Cmd Status of Abort, but will still clear all No Broadcast messages.

If previous failures exist, they may influence selection and availability of master, 1553 bus, or 485 channel.

CBM is successfully reactivated and configured. Perform Mate Malfunction using new indications.
Set Positions/Angles “Y” per values recorded in block 1. Select current 485 channel to prevent changing channels, i.e. if currently on 485 A channel, select A channel. If any bolt controller is masked, omit that controller and duplicate the entry for a good controller to keep 16 bolts in the command. If any latch controller is masked, omit the latch controller and decrement the Controller Count.

If a new failure indication appeared following activation, block 11 did not set the position for that controller. If this failure is later cleared, (and use of this bolt or latch is required,) the position will need to be set using the Set Bolt Positions or Set Latch Angles template.

CBM is successfully reactivated and configured.
• Perform Mate Malfunction using new indications.
Cmd rejection is an INTSYS software response that should only be set if the INTSYS software considers the CBM to be in the deactivated state.

The signature leading to the yes leg of this block could be caused by a command build, 1553 bus, or master problem. If bus problems (i.e. random errors, multiple bus errors, command errors on multiple commands, etc.) are seen, \textbf{MCC-H}.

Verify 1553 Communication

\begin{itemize}
  \item CBM Status: \textbf{Activated}
  \item \textbf{Cmd Error} - no \textbf{X}
\end{itemize}

Is CBM deactivated?

No

Verify Command Response

Was there an end-item response to the issued command?

No

Master cmd error indicated?

No

6 Verify Command Response

8 Activate Master on Redundant Bus

\begin{itemize}
  \item \textbf{cmd} Stop \textbf{Execute} (from any CBM command window)
\end{itemize}

Is Master Cmd Error indicated?

Yes

\textbf{MCC-H}

9 Clear No Broadcasts

\begin{itemize}
  \item \textbf{cmd} Stop \textbf{Execute} (from any CBM command window)
\end{itemize}

Is Master Cmd Error indicated?

Yes

\textbf{MCC-H}

Resume Operations

\begin{itemize}
  \item Repeat nominal procedure.
  \item Repeat last step in procedure if did not complete.
\end{itemize}
1 If time permits, can have MCC-H verify instance command structure from Command Inventory using criteria in block 19.

4 MCC-H for detailed instructions for building each CBM template. These are found in the OSO Console Handbook section 4.1.8.7.

5 Initialize Template (Latch Angles or Bolt positions) can be used in place of a Set Positions/Angles template if that template is corrupt (only available in MCC).
24 Verify 1553 Communication
‘CBM Graphic’
• ✓ Time Code – incrementing each minute

Is Time Code incrementing?

Yes

25 No end item response since command sent without an active CBM.

No

LAB CBM 1553 COMM LOSS – MATE
(ASSEMBLY MAL:CBM)

27 Verify Error Conditions
• cmd Stop Execute (from any CBM command window)

Lab Forward CBM
‘CBM Status’
• ✓ Master Cmd Status – Complete
‘Powered Bolt Status’
• ✓ Cmd Code (16) – Stop
‘Capture Latch Status’
• ✓ Cmd Code (4) – Stop

Did command complete successfully?

Yes

28 One-time transmission failure on 1553 bus. Can resume nominal procedure. Should repeat last step in procedure if did not complete.

No
This procedure is written assuming the Lab Forward CBM is being operated. There are no radial ports affected by this malfunction until 10A.

Capture can be considered complete with 3 latches at 11 – 13 degrees if only 3 latches are being used.

Is view of a latch cannot be ascertained, it can be assumed to be on the fitting after first stage capture if the latch position is less than 186 and the capture switch changed state to indicate open.

X will be the number of the latch that missed the fitting.

If IVA/EVA view indicates RMS is misaligned, can have RMS translate slightly to provide better ring to ring alignment which should improve view of latches/capture fittings and allow completion of block. If view and telemetry still inconclusive, must treat as a case with no visuals for that latch (IVA should continue to monitor latch during procedure so if visuals become available they can be used).
If the RTL does not open when the RMS backs away, the failure was likely a failed closed RTL. If the RTL is failed closed, it is likely the PCBM was not in the capture envelope of this latch when capture was commanded.

If 3 latches had captured the fittings, the MCC will likely recommend moving the RMS in to obtain RTLs, mask the latch that missed, and re-perform 1st Stage Capture procedure with 3 good latches.

If more than one latch missed, further assessment and possible EVA latch or controller R&R will be required since not qualified to capture with only 2 latches.

Since no visual available, validity of miss is uncertain. Will troubleshoot by closing the missed latch. If the latch truly missed, it will close successfully. If the latch did not miss, it should jam on the PCBM capture fitting, indicating a capture switch failure.

In addition to assessing latch jam, should have confirming cues with SVS motion and potentially visual motion of passive element.

X will be the number of the latch that missed the fitting.
24 Verify Latch Configuration
Are at least three latches captured on the PCBM capture fittings?

25 Deploy Captured Latches
- Deploy any Latch that is captured on the capture fitting as follows:
  - 'Commands by Type'
  - sel Prebuilt
  - CBM I Prebuilt Commands
  - 'Latch Actuation Commands'
  - sel Deploy
  - CBM I Deploy Cmds
  - cmd Deploy Latch X Execute
  - Lab Forward CBM
  - 'CBM Status'
  - sel Confirmation
  - CBM I Confirmation
  - ✓ Override Capture Command?
  - cmd Yes Execute
  - Lab Forward CBM
  - 'CBM Status'
  - ✓ Master Cmd Status – Complete
  - 'Capture Latch Status'
  - ✓ Latch X Cmd Code – Capture
  - ✓ Latch X Cmd Status – Complete
  - ✓ Latch X Posn: 199 – 200 deg
  - Repeat for every latch confirmed captured on capture fitting

26 RMS Test Mode
Is RMS Test mode available for use during CBM second stage capture?

28 Assess Capture State
Does only 1 latch indicate a missed capture?

29 Assess RMS and Thermal Status
- ✓ MCC-H
- MCC-H may request closing petal to see if latch on fitting if RMS is in direct drive and time not available to back out of capture envelope and reacquire RTLs without threatening survival of the element being mated.

Did MCC-H request petal closure?

30 Assess Views
Is an IVA, EVA, or camera view available to observe petal cover movement?

31 Deploy Captured Latches
- Deploy any Latch that is captured on the capture fitting as follows:
  - 'Commands by Type'
  - sel Prebuilt
  - CBM I Prebuilt Commands
  - 'Latch Actuation Commands'
  - sel Deploy
  - CBM I Deploy Cmds
  - cmd Deploy Latch X Execute
  - Lab Forward CBM
  - 'CBM Status'
  - sel Confirmation
  - CBM I Confirmation
  - ✓ Override Capture Command?
  - cmd Yes Execute
  - Lab Forward CBM
  - 'CBM Status'
  - ✓ Master Cmd Status – Complete
  - 'Capture Latch Status'
  - ✓ Latch X Cmd Code – Capture
  - ✓ Latch X Cmd Status – Complete
  - ✓ Latch X Posn: 199 – 200 deg
  - Repeat for every latch confirmed captured on capture fitting

32 Close Missed Latch

CAUTION
The following cmd can cause the latch to close the petal cover. Stop should be commanded as soon as motion of the petal or PCBM (via SVS) is seen.

- 'CBM Graphic'
  - sel Latch X
  - Latch X Details
  - sel Commands
  - Latch X Cmds
  - cmd Close Latch X Execute
  - Lab Forward CBM
  - 'CBM Status'
  - sel Confirmation
  - CBM I Confirmation
  - ✓ Override Capture Command?
  - cmd Yes Execute
  - Lab Forward CBM
  - 'CBM Status'
  - ✓ Capture Latch Status'
  - ✓ Latch X Cmd Code – Close
  - ✓ Latch X Cmd Status – Complete
  - ✓ Latch X Posn: 0 – 2 deg

Did petal motion occur?

33

Yes

No

37

38

33

Yes

No

X will be the number of the latch that missed the fitting.
Latch should not be on fitting, but should it be, the RMS will "hang-up" during pullback. Stop the operation and proceed to block 38.

31

33 Reposition RMS
- Back PCBM out of Capture envelope to pre-install position

Was RMS able to successfully pull back from PCBM?

No

35 Maneuver to RTL
✓MCC-H
Will likely request maneuver RMS to achieve RTLs

Was RTL achieved?

Yes No

35a ✓MCC-H

34 Deploy Remaining Latches
CBM I Deploy Cmds
- cmd Deploy Latch X Execute
Lab Forward CBM
- 'CBM Status'
  - sel Confirmation
CBM I Confirmation
  - ✓Override Capture Command?
  - cmd Yes Execute
Lab Forward CBM
- 'CBM Status'
  - ✓Master Cmd Status – Complete
    - 'Capture Latch Status'
  - ✓Latch X Cmd Code – Capture
  - ✓Latch X Cmd Status – Complete
  - ✓Posn (4): 199 – 200 deg

36a ✓MCC-H

32

37 Latch engaging petal cover and can be considered to have missed in following blocks.

38 Latch has captured the fitting.

31

(LAB FWD CBM FIRST STAGE CAPTURE) (ASSY OPS:ASSY:CBM OPS)
1. This procedure is written assuming the Lab Forward CBM is being operated. Unless otherwise indicated, all blocks with display callouts begin with Lab Forward CBM.

2. Analysis indicates there should be no need to perform a multi-stage capture when RMS in test mode (per nominal procedure). MCC-H will perform detailed assessment of torque signatures.

3. If performing three latch capture, can consider complete with 3 latches between 11 – 13 degrees. If four latch capture and one latch will not stay below 13 degrees, MCC-H.

4. Two general types of latch motion likely if not complete below 13 degrees.
   1) Latch achieves 13 degrees, but after motor stops the RMS force overcomes the motor and backdrives latch to increase angle (may indicate capture complete).
   2) One latch stalls at a given position, allowing other latches to “catch-up”. They drive PCBM slightly closer to ACBM then all stall (only one gets jammed message).
During ground testing, this much torque has never been required to complete capture successfully. Three likely MCC-H options:
1) Cmd deploy nominal and revisit arm angles or other variables (including re-inspection)
2) If very close to bottom, build a capture template with an ending position at 8 degrees (vs. 12) to take advantage of latch’s mechanical advantage
3) Unrigidize RMS end-effector to reduce RMS load on interface
CBM LAB CBM 485 COMM LOSS - MATE
(assy mal/5a/fin) Page 1 of 8 pages

1 Record Data
- Record: 'CBM Status'
- 485 Channel - ______
- 'CBM Graphic'
- Master CPA ______
- Controllers with 485 timeouts ______

2 Verify Power Usage
- @MCC-H to determine if current draw indicates that any controller may have tripped off during power up or when 485 Timeout occurred.
- Is current draw indicative of all controllers being properly powered?

3 Verify 485 Timeout
- cmd Stop Execute (from any cmd window) 'CBM Status'
- 'Master Cmd Status – Complete'
- '485 Timeout - blank'
- 'Powered Bolt Status'
- 'Cmd Status - Complete'
- 'Capture Latch Status'
- 'Cmd Code – Stop'
- 'Cmd Status - Complete'
- Did 485 timeout (s) clear?

4 Determine Master
- Is failed controller on the same CPA as the master?

5 Switch Masters on Same Bus
- Lab Fwd CBM Prep for Mate
- cmd Deactivate Execute

6 Transient 485 timeout due to a data bus problem
- Lab Fwd CBM
- 'CBM Status'
- 'Mode – Deactivated'
- 'CBM Graphic'
- sel INT-2(1) MDM
- sel LB_SYS_LAB_1(2)
- sel Bus Status
- LB_SYS_LAB_1(2)_Bus_Status
- 'Channel Selected – B(A)
- cmd Select Channel A(B)
- 'Channel Selected – A(B)
- Lab Fwd CBM Prep for Mate
- cmd Activate LB-SYS-LAB-1(2) Master Controller Execute

7 Location of Timeouts
- Are the 485 timeouts indicated on all 5 controllers on a CPA? (if yes for more than one CPA repeat mal for each CPA)

8 Resume
- Nominal operations.

9 Switch 485 Channel
- 'CBM Status'
- '485 Channel – A(B)
- 'Record 485 Channel Type'
- sel Prebuilt
- CBM I Prebuilt Commands
- sel Set Last State
- CBM I Set Last State Cmds
- cmd Select 485 Ch B(A)
- Execute

10 Classify Failure
- Were there originally (before the channel switch) 19 or 20 485 timeouts indicated?

11 Verify 485 Status
- 'CBM Status'
- '485 Timeout - no X'
- 485 timeout indicated?

12 Locations
- Are the 485 timeouts indicated on all 5 controllers on any CPA? (Can repeat mal for each CPA if true for more than one CPA)

13 Switch 485 Channel
- 'CBM Status'
- '485 Channel – B(A)

MCC-H will assess plots of current during closure of the 4 RPCs (looking for a relative difference on closure/opening or a current drop at the time of the 485 indication.) If 485 timeout caused by controller tripping off, the current draw for the RPC which feeds it will be ~1/5 less than the RPCs which are powering 5 good controllers. Nominally currents are .25 to .28 amps (@122 V.) MCC-H will look for relative differences between RPCs with no 485 timeouts and those with this relative change of current excludes instrumentation error, voltage, etc. If power data is inconclusive, proceed to block 3.

If both CPAs that connect to 1553 bus being used (i.e. CPAs 1/4 when on LB-SYS-LAB-1 master or CPAs 2/3 when on LB-SYS-LAB-2 master) have a single 485 timeout, can treat as two separate failures. Proceed to work the failure not on the CPA with the master then return to block 5 to switch masters and work the other failure.
Connector will be PTBD for primary power and JTBD for secondary power. Connector should have TBD pins in positions TBD.

13 Cycle RPC

‘CBM Graphic’
- sel RPC powering CPA with 485 errors
  RPCM_LAY_B_RPC_ZZ
- Verify Load – LAFWD CBM Pri(Sec) Y
- cmd RPC Position - Open
- RPC Position – Op
- cmd RPC Position - Close
- RPC Position – Cl

Lab Forward CBM
- cmd Stop Execute (from any cmd window)

Are 485 timeouts still indicated?

14 CPA EMI filter suspect - can resume operations but will switch to redundant RPC for this CPA since EMI is suspect. Should remain on the redundant RPC for the remainder of procedure.

15 Switch to Redundant RPC

‘CBM Graphic’
- sel RPC powering CPA with 485 error
  RPCM_LAY_B_RPC_ZZ
- Verify Load – LAFWD CBM Pri(Sec) Y
- cmd RPC Position - Open
- RPC Position – Op

Lab Forward CBM
- cmd Stop Execute (from any cmd window)

‘CBM Status’
- 485 Timeout – blank

16 Switch to Redundant RPC

‘CBM Graphic’
- sel RPC powering CPA with 485 error
  RPCM_LAY_B_RPC_ZZ
- Verify Load – LAFWD CBM Pri(Sec) Y
- cmd RPC Position - Open
- RPC Position – Op

Lab Forward CBM
- sel redundant RPC for same CPA
  RPCM_LAY_B_RPC_ZZ
- cmd RPC Position - Close
- RPC Position – Cl

Lab Forward CBM
- cmd Stop Execute (from any cmd window)

‘CBM Status’
- 485 Timeout – blank

17 CPA failed – will mask all controllers on CPA and continue operations.

18 Switch to Redundant RPC

‘CBM Graphic’
- sel RPC powering CPA with 485 error
  RPCM_LAY_B_RPC_ZZ
- Verify Load – LAFWD CBM Pri(Sec) Y
- cmd RPC Position - Open
- RPC Position – Op

Lab Forward CBM
- sel redundant RPC for same CPA
  RPCM_LAY_B_RPC_ZZ
- cmd RPC Position - Close
- RPC Position – Cl

Lab Forward CBM
- cmd Stop Execute (from any cmd window)

‘CBM Status’
- 485 Timeout – blank

19 CPA EMI filter failed - Operations may continue. Should use the RPC presently powering this CPA for remainder of procedure.

20 Inspect Cables

‘CBM Graphic’
- sel RPC powering CPA with 485 error
  RPCM_LAY_B_RPC_ZZ
- Verify Load – LAFWD CBM Pri(Sec) Y
- cmd RPC Position - Open
- RPC Position – Op
- cmd Close Cmd - Inhibit
- Close Cmd – Inh
- Remove/Inspect/Install power cable
‘CBM Graphic’
- sel original RPC (that was cycled in block 13)
  RPCM_LAY_B_RPC_ZZ
- cmd Close Cmd - Enable
- Close Cmd – Ena
- cmd RPC Position Close
- RPC Position – Cl
- cmd Stop Execute (from any cmd window)

Are 485 timeouts still indicated?
If 485 A Channel is failed, will need to use "Select 485 Ch B" command after every activation.
11 Cannot inspect for cable problem so continue to verify open circuit

12 Only change 1553 channel if required to enable the latch controller with timeout to communicate with MDM.

13 Cable JTBD
CBM LAB CBM 485 COMM LOSS - MATE
(ASSY MAL/5A/FIN) Page 6 of 8 pages

14 Connector will be PTBD. If currently on 485 A channel, use Select 485 Ch B command, and vice versa.

15 Only change 1553 channel if required to enable the latch controller with timeout to communicate with MDM.

16 Connector failure in JTBD.

17 Connector failure in JTBD.

---

12 "CBM Status"
- Record 485 channel - _______
- Select a latch controller that has a 485 timeout as master (preferably one with an active (blue) 1553 channel connected.)
- Record Selection ______

Lab Fwd CBM Prep for Mate
- cmd Deactivate Execute

Lab Forward CBM
- "CBM Status"
- ✔ Mode – Deactivated
- ✔ Channel Selected – B(A)
- ✔ Channel Selected – A(B)

Lab Fwd CBM Prep for Mate
- cmd Activate LB-SYS-LAB-1(2) Master Controller Execute

Lab Forward CBM
- "CBM Status"
- ✔ Mode – Activated
- ✔ Master – LB-SYS-LAB-1(2)
- cmd Stop Execute (from any cmd window)
- Record which latches/bolts indicate 485 Timeout:____________________

Same 5 485 timeouts?

No CBM Deactivated?

---

62 Failed slave controller (component failure.)
Will mask controller and return to nominal procedure. Should use Stop commands instead of Initialize and BIT to clear No Broadcast messages.

63 Bad address pin connection

64 Bad 1553/485 cable/connector

65 Access
- Is visual inspection possible?

66 Connector problem for one channel fixed. Can repeat inspection to regain other channel.
If second channel not regained, can continue procedure on good channel (should not use degraded channel for nominal ops).

67 CPA failed – will mask all controllers on CPA and continue operations.

68 Inspect
- Check connectors using steps in block 61.

Same 485 timeouts both channels?
No 485 timeouts on either channel?
Same 485 timeouts one channel?
If a CBM 485 bus has an open circuit it can still be used. A master can talk to any controllers between itself and the open circuit (and thus any master on other side of open can talk to any of the other controllers.)
19 X in Mask Controller cmd will be the name of the slave controller being masked.

20 Cannot send Set Positions or BIT commands to clear No Broadcast indications for rest of procedure (not masked by MDM software). Sending these cmds to a controller with a 485 timeout will cause master to abort command. Instead of sending Set All Positions Zero and BIT to clear No Broadcast messages, send repeated Stop commands. If need to set positions at a later time will need to build a Set Bolt Positions or Set Latch Angles template (with the failed controllers excluded).

80 Clear 485 Errors
- **cmd** Stop Execute (from any command window)
  - ‘Powered Bolt Status’
    - ✓ Cmd Status (16) – Complete or In Progress
  - ‘Capture Latch Status’
    - ✓ Cmd Status (16) – Complete or In Progress
  - Repeat Stop Cmd as required all until No Broadcasts cleared.

81 Reload All Positions
- ‘Commands by Type’
  - sel Template
- CBM I Template Commands
  - CBM Nonactuation Templates
    - sel Set All Positions
  - CBM I Set All Positions Template
    - set: Controller Count: 20
    - pick: Last Cmd - Stop
    - pick: RS485 Channel – A(B)
    - set: Shaft Position 1-16: “Y” rev
    - set: Shaft Angle 17-20: “Y” deg
    - pick: Controller 1-20: Bolt 1-1, 2-1, 3-1, 4-1, 1-2, 2-2, 3-2, 4-2, 1-3, 2-3, 3-3, 4-3, 1-4, 2-4, 3-4, 4-4, Latch 1, 2, 3, 4
    - **cmd** Set Execute
  - Lab Forward CBM
    - ✓/✗ on “Controller X”
  - ‘CBM Status’
    - ✓/✗ Master Cmd Status - Complete
    - ‘Powered Bolt Status’
      - ✓ Cmd Code (16) – Reload
      - ✓ Cmd Status (16) – Complete
    - ✓ Posn (15) – “Y” rev
    - ‘Capture Latch Status’
      - ✓ Cmd Code (4) – Reload
      - ✓ Cmd Status (4) – Complete
      - ✓ Posn (4) – “Y” deg

82 Resume nominal operations.
Unless otherwise indicated, all blocks with display callouts begin with Lab Forward CBM.

Set Positions and BIT commands should not be used for nominal ops. Use repeated Stop cmd to clear No Broadcast indications and templates to set positions.

---

1 Identify Error Type

- 'CBM Graphic'
  - sel controller with △ (for RTL open latch detail).

Controller X Details
- Record: Error - Controller -

Does RTL or Capture Switch indicate Short Circuit or Open Circuit?

No

2 RTL or Capture Switch Failed (Circuit or Physical failure).

Capture should be complete, so can resume nominal ops. Otherwise, should \( \sqrt{\text{MCC-H}} \).

---

3 Identify Error Type

- Controller X Details
  - △ Invalid Command – no X

X for Invalid Command?

No

---

4 Template

Was command a template?

No

---

5 Reverify Template

Reverify all template cmd variables. Extra focus should be spent on:
- Controller Count = total number of IDs listed in command
- No Null values in values within Controller counts
- All Controllers are for a latch in a latch command or a bolt in a bolt command

Command built correctly?

Yes

---

6 Identify Error Type

- Controller X Details
  - △ Framing Error – no X
  - △ Checksum Error – no X

X for Framing Error or Checksum Error?

No

---

7 Command Check

- cmd Stop Execute (from any CBM cmd window)
  - 'CBM Status'
  - \( \sqrt{\text{Master Cmd Status}} \) – Complete
  - 'CBM Graphic'

- If △ present - open detail window and confirm error.

Invalid Command, Framing Error, or Checksum Error indicated for same controller with previous error?

Yes

---

8 Identify Error Type

- Controller X Details
  - "Passive BIT"
  - △ all faults – no X

X for any Background Status Fault?

No

---

9 Bad user build of command

---

10 Resume Ops

- Rebuild template with proper values.
- Return to procedure.
- Repeat last cmd as required

---

11 \( \sqrt{\text{MCC-H}} \)

---

12 Retransmit Failed Command

- Resend Command that previously generated command error.

Did command complete successfully?

No

---

13 Failed controller (internal component/software). Will mask controller and continue.

---

14 \( \sqrt{\text{MCC-H}} \) - unexplained cmd problems.

---

15 Apparent transmission/transient error. Can return to nominal procedure.

---

16 Resume Ops

- Return to procedure.
- Repeat last cmd as required.

---

16a Mask Failed Controller

- Repeat the following for each failed or degraded controller (per declaration in failure box): 'Commands by Type'
  - sel Prebuilt CBM I Prebuilt Commands
  - INTSYS Software Commands'
  - sel Mask Controller CBM I Mask Controller Cmds
  - cmd Mask "Controller X" Execute

Lab Forward CBM
- 'CBM Graphic'
  - \( \checkmark \) on "Controller X"
Depending on nature of background BIT fault may choose not to use this controller as a master controller (if it is a latch).

Is controller identified in Block 1 the latch controller on the CPA identified as master?

Yes

No

Record positions

L1___, L2___, L3___, L4___

Channel Selected – B(A)

Select Channel A(B) Execute

Channel Selected – A(B)

Activate LB-SYS-LAB-1(2) Master Controller Execute

Lab Fwd CBM Prep for Mate

Lab Forward CBM

'CMH' - unexplained background BIT problems.

Apparent transient problem (monitor for re-occurrence).

MCC-H for instructions on reloading position of controller.
**CBM NODE 1 CBM RAPID SAFING**

(ASY MAL/5A/FIN) Page 1 of 1 pages

**CAUTION**

Must complete ABOLTS command successfully to withstand structural loads for RMS release and orbiter undocking.

1. **Has First Stage Capture been completed?**
   - Yes
   - No

2. **Is CBM Activated and 3 or 4 RPCs closed?**
   - Yes
   - No

3. **Power/Data Verification**
   - 'CBM Graphic'
     - ✓ RPC closed for CPAs (4)
     - ✓ 'CBM Status'
     - ✓ Mode - Activated
   - Is CBM Activated and 3 or 4 RPCs closed?
     - Yes
     - No

4. **Reactivate/Power-up**
   - Return to Nominal/Mal procedure to apply power and activate (CBM XXX prep for mate steps 5 and 6)
   - If any No Broadcast Messages exist clear by using repeated Stop commands from any command window.

5. **Bolt/Latch Failures**
   - Are there more than 1 latch or more than 4 bolts failed (unable to drive nominally)?
     - Yes
     - No

6. **Rapid Safing must be done manually (Rapid Safing software will fail after initiation).**
   - Return to nominal procedure and complete at least Capture and ABOLTs prior to orbiter separation.

7. **Latches to 2nd Stage**
   - Has Second Stage Capture been commanded?
     - Yes
     - No
   - Neither

8. **Set State**
   - Execute Block 8 capture – no Confirm cmd required. (ensures rapid safing sequence starts with bolting command)

9. **Last Cmd**
   - Was Last cmd sent to CBM a Capture or ABolts?
     - Yes
     - No

10. **Start Rapid Safing Software**
    - 'Commands by Task'
      - sel Rapid Safing
    - Node 1 CBM Rapid Safing
      - cmd Execute Rapid Safing Execute 'Confirmation Request'
      - cmd Yes Execute
      - ✓ Rapid Safing Validation Requested – Yes
      - cmd Validate Execute
      - ✓ Rapid Safing In Progress -X

11. **NOTE**
    - When Rapid Safing goes in progress a caution flag/tone in the C&W log will occur. A second Caution will occur if the automated rapid safing sequence fails (as well as an X for Rapid Safing Failed on this display)

12. **Capture Failed. Go to CBM Mate Malfunction to recover and allow completion of Capture, then return to Rapid Safing Procedure as required.**

---

**NOTE**

- Can back out of capture if req’d by verifying all latches unmasked then cmd Deploy Nominal from Cmd Instances popup.

- In all boxes XXX will be the port of the CBM currently in operation.

1. If more time is available can cmd shortened Final Bolting Procedure to ensure full station structural integrity (Cmd IBOLTS 4th Stage [TBD min] then FBOLTs [TBD min]).

2. Latch position should be 185 to 187 deg if 1st stage capture complete. If Second Stage capture has already been completed this command will complete quickly not moving the latch, but setting the starting point for Rapid Safing sequence (ABOLT in this case).

3. Automated Safing sequence will be a single ABOLT, IBOLT, and FBOLT command sent one after another upon successful completion. It is recommended to monitor for ABOLTs completion since can then remove RMS and are in safe config to separate orbiter. If required, rapid safing can be initiated while a bolting cmd is currently in progress (will pick up with next cmd in seq).
This malfunction is written assuming the Node 1 Forward CBM is being operated. It is also valid for any other Node 1 CBM. For use on other Node 1 CBMs, replace Forward with the appropriate location in display callouts and advisories.

Specific RPCM callouts are for Node 1 Forward CBM. For other Node 1 CBMs, insert appropriate labels.

If time permits, MCC-H prior to continuing capture (to ensure latches in good configuration.)

If possible will likely deploy all latches and troubleshoot problem. If deploy is not possible will have to attempt to regain latches so have at least 3 to continue. Otherwise, will have to attempt capture/bolting with only 2 latches which is a non-qualified scenario.
Need to assess specific failures to establish attitude control constraints and whether to continue or back out of bolting.

4

14 Verify Load Capability
Has ABolts been completed?

15 Verify Bolt Configuration
Are there at least twelve unmasked bolts with no △?

16 1 - 4 bolts degraded. Will mask failed bolts and continue through ABolts command.

18 Verify Bolt Configuration
Do bolts on the CPA with the failed latch also have △?

19 Likely power or 485 problem.

20 Latch failure. Should mask failed latch in next block.

21 15 Good Bolts
Did failure occur during final latch closure?

22 /MCC-H - Likely just leave latch where it is and continue deactivation/powerdown.

23 15 Good Bolts
Are there 15 unmasked bolts with no △ (or 14 unmasked bolts but the 2 failed/degraded are not adjacent)

24 Enough bolts for good pressure seal.

24a Resume Nominal procedure with unmasked/healthy bolts (will try to recover other bolts after mating complete)

25 Verify Command Status
‘CBM Status’
  • / Master Cmd Status – Complete
  • /Powered Bolt Status
  • /Cmd Status (16) – Complete
  • /Capture Latch Status
  • /Cmd Status (4) – Complete

Any new controller Cmd Status or Master Cmd Status other than as expected?

26 Verify RS485 Comm Status
‘CBM Status’
  • / 485 Timeout – no X
Is 485 Timeout indicated?

27 Verify CBM Controller Status
‘CBM Graphic’
  • / - no △
New △ on any bolt?

28

19 JUL 00
28 Mask Failed Controller(s)
- Controller X Details
  - sel Commands
- Controller X Commands
  - cmd Mask Controller X Execute
- Node 1 Forward CBM Display
  - "CBM Graphic"
  - ✓: on "Controller X"

29 Resume Ops
- Resume ops until at least 12 bolts complete ABolts so can resume attitude control. If any bolts masked,
  - /MCC-H prior to IBolt to assess configuration (probably reenter mal at block 23 to regain function).
This malfunction is written assuming the Node 1 Forward CBM is in use. It is valid for any other Node 1 CBM. For use on other Node 1 CBMs, replace Forward with the appropriate Node 1 location in display callouts.

Unless otherwise indicated all blocks begin with Node 1 Forward CBM Display.

Failure of RPC to open/close not covered since no nominal open/close ops during mate procedures.

1. Record Positions of All Controllers
   - Record 485 channel in use and position of each latch/bolt. Circle any controllers that are masked.
   - CBM Status
   - 485 Channel - __
   - ‘Capture Latch Status’
   - L1 __, L2 __, L3 __, L4 __
   - ‘Powered Bolt Status’
   - B1-1 __, B1-2 __, B1-3 __, B1-4 __
   - B3-1 __, B3-2 __, B3-3 __, B3-4 __
   - B4-1 __, B4-2 __, B4-3 __, B4-4 __

2. Verify RPC Status
   - Perform (RPCM TRIP) (SODF: EPS), then:
     - Did procedure clear trip and close RPC?

3. Verify CBM Mode
   - ‘CBM Status’
     - ✓ Mode – Activated
     - ✓ Comm Error – no X
   - Is CBM Activated?
     - Yes
     - No

4. RPC failed for CBM operations.

5. Close Redundant RPC
   - CBM Graphic
     - sel appropriate RPC
     - [RPCM _NYY_RPC ZZ]
     - cmd RPC Position – Close
     - ✓ RPC Position – Cl
   - Is redundant RPC closed?

5a. MCC-H
   - Yes
   - No
Set Positions/Angles "Y" per values recorded in block 1. Select current 485 channel to prevent changing channels, i.e. if currently on 485 A channel, select A channel. If any bolt controller is masked, omit that controller and duplicate the entry for a good controller to keep 16 bolts in the command. If any latch controller is masked, omit the latch controller and decrement the Controller Count.

6 Reactivate CBM On Same Bus

- 'Commands by Task'
  - sel Prep for Mate

- Node 1 Fwd CBM Prep for Mate
  - cmd Activate CB-GNC-2(1) Master Controller

- Node 1 Forward CBM Display
  - CBM Status
    - ✓/Mode – Activated
    - ✓/Master – CB-GNC-2(1)
    - ✓/Comm Error – no X

7 Determine RS 485 Channel

Was 485 Channel A in use when power loss occurred?

- Yes
  - 8 Select 485 Channel A
    - 'Commands by Type'
      - sel Prebuilt
        - CBM Prebuilt Cmds
          - sel Set Last State
            - cbm Select 485 Ch A
              - Execute

    - 'CBM Status'
      - ✓/485 Channel - A

  - 10 Repeat block 9 to clear No Broadcast indications.

- No
  - 9 Clear 485 Errors
    - cmd Stop
      - (from any cmd window)

- Node 1 Forward CBM Display
  - CBM Status
    - ✓/485 Timeout – no X
    - ✓/Powered Bolt Status
    - ✓/Cmd Status (16) – Complete
    - capture Latch Status
    - ✓/Cmd Status (4) – Complete

  Does any controller have a Cmd Status of No Broadcast?

- No
  - 11 Reload All Positions
    - 'Commands by Type'
      - sel Template

      - CBM Template Commands
      - 'CBM Nonactuation Templates'
        - sel Set All Positions

      - CBM Set All Positions Template
        - set: Controller Count: 20
        - pick: Last Cmd - Stop
        - pick: RS485 Channel – A(B)
        - set: Shaft Position 1-16: "Y" rev
        - set: Shaft Angle 17-20: "Y" deg
        - pick: Controller 1-20: Bolt 1-1, 2-1, 3-1, 4-1, 1-2, 2-2, 3-2, 4-2, 1-3, 2-3, 3-3, 4-3, 1-4, 2-4, 3-4, 4-4, 1-5, 2-5, 3-5, 4-5
        - cmd Set Execute

    - Node 1 Forward CBM Display
      - CBM Status
        - ✓/Master Cmd Status - Complete
        - 'Powered Bolt Status'
        - ✓/Cmd Code (16) – Reload
        - ✓/Cmd Status (16) – Complete
        - ✓/Posn (15) – "Y" rev
        - capture Latch Status
        - ✓/Cmd Code (4) – Reload
        - ✓/Cmd Status (4) – Complete
        - ✓/Posn (4) – "Y" deg

  - 12 Resume Ops
    - Return to nominal procedure. Repeat last command if it did not complete successfully.
This malfunction is written for Node 1 Forward CBM. It is valid for any other Node 1 CBM by replacing Forward with the appropriate Node 1 location in display call-outs and advisories.

2 Unless otherwise indicated all blocks begin with Node 1 Forward CBM Display

3 'CBM Graphic' refers to the schematic representation at the bottom of Node 1 Forward CBM Display

4 Due to many potential problems resulting from disconnects between the two NCS MDMs, MCC-H in this situation. MCC-H will run through the Prep for Mate 1553 Comm Loss as quickly as possible, and provide instructions for recovery.

5 Do not use the master controller on the bus which experienced the comm loss unless detailed troubleshooting (per Prep for Mate 1553 Comm Loss) is competed. This ensures all SPNs and 1553 polling problems are resolved (can result in further MDM and CBM problems.)
If previous failures exist, they may influence selection and availability of master, 1553 bus, or 485 channel.

485 timeouts or new BIT failures may exist. Stop may generate a master Cmd Status of Abort, but will still clear all No Broadcast indications.

485 timeouts or new BIT failure may exist. Stop may receive a master Cmd Status of Abort, but will still clear all No Broadcast messages.
Set Positions/Angles "Y" per values recorded in block 1. Select current 485 channel to prevent changing channels, i.e., if currently on 485 A channel, select A channel. If any bolt controller is masked, omit that controller and duplicate the entry for a good controller to keep 16 bolts in the command. If any latch controller is masked, omit the latch controller and decrement the Controller Count.

If a new failure indication appeared following activation, block 11 did not set the position for that controller. If this failure is later cleared, (and use of this bolt or latch is required,) the position will need to be set using the Set Bolt Positions or Set Latch Angles template.

CBM Template Commands
'CBM Nonactuation Templates'
  • sel Set All Positions

CBM Set All Positions Template
  • set: Controller Count: 20
  • pick: Last Cmd - Stop
  • pick: RS485 Channel – A(B)
  • set: Shaft Position 1-16: “Y” rev
  • set: Shaft Angle 17-20: “Y” deg
  • pick: Controller 1-20: Bolt 1-1, 2-1, 3-1, 4-1, 1-2, 2-2, 3-2, 4-2, 1-3, 2-3, 3-3, 4-3, 1-4, 2-4, 3-4, 4-4, Latch 1, 2, 3, 4
  • cmd Set Execute

Node 1 XXX CBM Display
'CBM Status'
  • ✓/✓ Master Cmd Status - Complete
  • ✓/✓ Powered Bolt Status
  • ✓/✓ Cmd Code (16) – Reload
  • ✓/✓ Cmd Status (16) – Complete
  • ✓/✓ Posn (15) – “Y” rev

'Capture Latch Status'
  • ✓/✓ Cmd Code (4) – Reload
  • ✓/✓ Cmd Status (4) – Complete
  • ✓/✓ Posn (4) – “Y” deg

'Built In Test Failures'
  • ✓/✓ left of Built In Test Failures button
  • ✓/✓ CBM Graphic

Any new BIT indications or new attention symbols on bolts/or latches?

Yes

CBM is successfully reactivated and configured. Perform Mate Malfunction using new indications.

No

Resume Operations
  • Return to nominal procedure.
  • Repeat last command if it did not complete successfully.

Perform Mate Malfunction using new indications.
1. Identify Cmd Error
   - CBM Status
     - 'Cmd Rejected Flag' = blank
   - Is Command Rejected indicated?

2. Verify 1553 Communication
   - CBM Status
     - 'Mode' = Activated
     - 'Comm Error' = no "X"
   - Is CBM Deactivated?

3. Command rejected since sent without an active CBM.


5. Verify Command Response
   - Was there an end-item response to the issued command?

6. Verify Error Conditions
   - CBM Status
     - Record Master Cmd Error
     - cmd Stop Execute (from any CBM command window)
   - Master cmd error indicated?

7. Activate Master on Redundant Bus

8. Clear No Broadcasts
   - cmd Stop Execute (from any CBM command window)

9. Resume Operations
   - Resume nominal procedure.
   - Repeat last step in procedure if did not complete.
If time permits, can have MCC-H verify instance command structure from Command Inventory using criteria in block 19.

MCC-H for detailed instructions for building each CBM template. These are found in the OSO Console Handbook section 4.1.8.7.

Initialize Template (Latch Angles or Bolt positions) can be used in place of a Set Positions/Angles template if that template is corrupt (only available in MCC).

If cmd contains incorrect values?

1. Reattempt Command
   - Reattempt procedure step/cmd which resulted in error
   - Did command generate a Master Cmd Error?

2. Master Cmd Error?

3. One-time transmission failure on 1553 bus. Can resume nominal procedure.

4. Build Cmd & Resume Ops
   - MCC-H for instructions to build template for erroneous command. Return to nominal procedure substituting this template for each instance of the erroneous cmd

5. Alternate Method
   - MCC-H - alternate method must be found to accomplish this malfunction operation. (All nominal CBM commands in procedure have a corresponding template.)

6. Build Cmd & Resume Ops
   - MCC-H for instructions to build template for erroneous command. Return to nominal procedure substituting this template for each instance of the erroneous cmd

7. Build Cmd & Resume Ops
   - Rebuild template.
   - Return to nominal procedure repeating last step as required

8. Erroneous cmd build (std-out or user).

9. Alternate method
   - MCC-H - Do not use this template structure again. Alternate method must be found to accomplish this malfunction operation if required. (All nominal CBM commands in procedure are instantiations.) Cmd from scratch is not recommended, but can be an acceptable alternative if this is only command to support a critical CBM operation.

10. Verify Command Type
    - Was command sent an instance?

11. Reattempt Command
    - Reattempt procedure step/cmd which resulted in error
    - Did command generate a Master Cmd Error?

12. Build Cmd & Resume Ops
    - Is a template cmd available to perform step?


14. Tmpit Availability
    - MCC-H for instructions to build template for erroneous command. Return to nominal procedure substituting this template for each instance of the erroneous cmd

15. Build Cmd & Resume Ops
    - MCC-H for instructions to build template for erroneous command. Return to nominal procedure substituting this template for each instance of the erroneous cmd

16. Verify Template Build
    - For latch commands, verify speed limit less than or equal to 1 RPM. For bolt commands, verify current threshold less than or equal to 160 N-M.
    - Verify Controller Count is correct and that there are no Null Devices listed within the controllers identified by this Controller Count.

17. Alternate Method
    - MCC-H - alternate method must be found to accomplish this malfunction operation. (All nominal CBM commands in procedure have a corresponding template.)

18. Bad user build of command.

19. Reattempt Template
    - Reattempt procedure step/cmd which resulted in error
    - Did command generate a Master Cmd Error?

20. Erroneous cmd build (std-out or user).

21. Build Cmd & Resume Ops
    - Rebuild template.
    - Return to nominal procedure repeating last step as required

22. One-time transmission failure on 1553 bus. Can resume nominal procedure.

23. Alternate method
    - MCC-H - Do not use this template structure again. Alternate method must be found to accomplish this malfunction operation if required. (All nominal CBM commands in procedure are instantiations.) Cmd from scratch is not recommended, but can be an acceptable alternative if this is only command to support a critical CBM operation.
24 Verify 1553 Communication

'CBM Graphic'
- ✔ Time Code – incrementing each minute

Is Time Code incrementing?

Yes No

25 No end item response since command sent without an active CBM.

26 Verify Error Conditions

- cmd Stop Execute (from any CBM command window)

Node 1 Forward CBM Display

'CBM Status'
- ✔ Master Cmd Status – Complete
- 'Powered Bolt Status'
- ✔ Cmd Code (16) – Stop
- 'Capture Latch Status'
- ✔ Cmd Code (4) – Stop

Did command complete successfully?

No Yes

27 One-time transmission failure on 1553 bus. Can resume nominal procedure. Should repeat last step in procedure if did not complete.
This procedure is written assuming the Node 1 Forward CBM is being operated. For use on other Node 1 CBMs, replace Forward with the appropriate Node 1 location in display call-outs.

Capture can be considered complete with 3 latches at 11 – 13 degrees if only 3 latches are being used.

Is view of a latch cannot be ascertained, it can be assumed to be on the fitting after first stage capture if the latch position is less than 186 and the capture switch changed state to indicate open.

X will be the number of the latch that missed the fitting.

If IVA/EVA view indicates RMS is misaligned, can have RMS translate slightly to provide better ring to ring alignment which would improve view of latches/capture fittings and allow completion of block. If view and telemetry still inconclusive, must treat as a case with no visuals for that latch (IVA should continue to monitor latch during procedure so if visuals become available they can be used.)
If the RTL does not open when the RMS backs away, the failure was likely a failed closed RTL. If the RTL is failed closed, it is likely the PCBM was not in the capture envelope of this latch when capture was commanded.

If 3 latches had captured the fittings, the MCC will likely recommend moving the RMS in to obtain RTLs, mask the latch that missed, and re-perform 1st Stage Capture procedure with 3 good latches.

If more than one latch missed, further assessment and possible EVA latch or controller R&R will be required since not qualified to capture with only 2 latches.

Since no visual available, validity of miss is uncertain. Will troubleshoot by closing the missed latch. If the latch truly missed, it will close successfully. If the latch did not miss, it should jam on the PCBM capture fitting, indicating a capture switch failure.

In addition to assessing latch jam, should have confirming cues with SVS motion and potentially visual motion of passive element.

X will be the number of the latch that missed the fitting.
23 X will be the number of the latch that missed the fitting.

24 Verify Latch Configuration
Are at least three latches captured on the PCBM capture fittings?

25 Deploy Captured Latches
- Deploy any Latch that is captured on the capture fitting as follows:
  - 'Commands by Type'
    - sel Prebuilt
  - 'Latch Actuation Commands'
    - sel Deploy
    - cmd Deploy Latch X Execute
  - Node 1 Forward CBM Display
    - 'CBM Status'
    - sel Confirmation
    - Override Capture Command?
    - cmd Yes Execute

26 RMS Test Mode
Is RMS Test mode available for use during CBM second stage capture?

27 RMS Test Mode
Is RMS Test mode available for use during CBM second stage capture?

28 Assess Capture State
Does only 1 latch indicate a missed capture?

28a Assess Capture State
28a MCC-H

29 Assess RMS and Thermal Status
- MCC-H
  - MCC-H may request closing petal to see if latch on fitting if RMS is in direct drive and time not available to back out of capture envelope and reacquire RTLs without threatening survival of the element being mated.
  - Did MCC-H request petal closure?

30 Assess Views
Is an IVA, EVA, or camera view available to observe petal cover movement?

31 Deploy Captured Latches
- Deploy any Latch that is captured on the capture fitting as follows:
  - 'Commands by Type'
    - sel Prebuilt
  - 'Latch Actuation Commands'
    - sel Deploy
    - cmd Deploy Latch X Execute
    - Node 1 Forward CBM Display
      - 'CBM Status'
      - sel Confirmation
      - Override Capture Command?
      - cmd Yes Execute
    - Node 1 Forward CBM Display
      - 'CBM Status'
      - Master Cmd Status – Complete
      - Capture Latch Status
      - Latch X Cmd Code – Capture
      - Latch X Cmd Status – Complete
      - Latch X Posn: 199 – 200 deg
    - Repeat for every latch confirmed captured on capture fitting

32 Close Missed Latch

CAUTION
The following cmd can cause the latch to close the petal cover. Stop should be commanded as soon as motion of the petal or PCBM (via SVS) is seen.

- 'CBM Graphic'
  - sel Latch X
  - Latch X Details
  - sel Commands
    - Latch X Cmds
    - cmd Close Latch X Execute
    - Node 1 Forward CBM Display
      - 'CBM Status'
      - sel Confirmation
    - MCC-H
    - Override Capture Command?
    - cmd Yes Execute
    - Node 1 Forward CBM Display
      - 'CBM Status'
      - Master Cmd Status – Complete
      - Capture Latch Status
      - Latch X Cmd Code – Close
      - Latch X Cmd Status – Complete
      - Latch X Posn: 0 – 2 deg
    - Did petal motion occur?
Latch should not be on fitting, but should it be, the RMS will “hang-up” during pullback. Stop the operation and proceed to block 38.

31

33 Reposition RMS
- Back PCBM out of Capture envelope to pre-install position
Was RMS able to successfully pull back from PCBM?

Yes

No

35 Maneuver to RTL
- MCC-H
- Will likely request maneuver RMS to achieve RTLs
Was RTL achieved?

Yes

No

35a • MCC-H

32

34 Deploy Remaining Latches
CBM Deploy Cmds
- cmd Deploy Latch X Execute
Node 1 Forward CBM Display
- CBM Status
- sel Confirmation
CBM Confirmation
- Override Capture Command?
- cmd Yes Execute

Node 1 Forward CBM Display
- CBM Status
- Master Cmd Status – Complete
- Capture Latch Status
- Latch X Cmd Code – Capture
- Latch X Cmd Status – Complete
- Posn (4): 199 – 200 deg

36 • MCC-H

32

37 Latch engaging petal cover and can be considered to have missed in following blocks.
This procedure is written assuming the Node 1 Forward CBM is being operated. For use on other Node 1 CBMs replace Forward with the appropriate location in display call-outs.

Unless otherwise indicated, all blocks with display callouts begin with Node 1 Forward CBM Display.

Analysis indicates there should be no need to perform a multi-stage capture when RMS in test mode (per nominal procedure). MCC-H will perform detailed assessment of torque signatures.

If performing three latch capture, can consider complete with 3 latches between 11 – 13 degrees. If four latch capture and one latch will not stay below 13 degrees, MCC-H.

Two general types of latch motion likely if not complete below 13 degrees.
1) Latch achieves 13 degrees, but after motor stops the RMS force overcomes the motor and backdrives latch to increase angle (may indicate capture complete).
2) One latch stalls at a given position, allowing other latches to “catch-up”. They drive PCBM slightly closer to ACBM then all stall (only one gets Jammed message).
During ground testing, this much torque has never been required to complete capture successfully. Three likely MCC-H options:

1) Cmd deploy nominal and revisit arm angles or other variables (including re-inspection).
2) If very close to bottom, build a capture template with an ending position at 8 degrees (vs. 12) to take advantage of latch’s mechanical advantage.
3) Unrigidize RMS end-effector to reduce RMS load on interface.
**CBM NODE 1 CBM 485 COMM LOSS - MATE (ASSY MAL/5A/FIN)**

1. **Record Data**
   - Record: 'CBM Status'
   - 485 Channel - ______
   - 'CBM Graphic'
   - Master CPA____
   - Controllers with 485 timeouts____
   - 'Capture Latch Status'
   - Record positions
   - L1____, L2______,
   - L3____, L4____
   - 'Powered Bolt Status'
   - Record positions
   - B1-1____, B1-2____,
   - B1-3____, B1-4____,
   - B2-1____, B2-2____,
   - B2-3____, B2-4____,
   - B3-1____, B3-2____,
   - B3-3____, B3-4____,
   - B4-1____, B4-2____,
   - B4-3____, B4-4____

2. **Verify Power Usage**
   - McC-H to determine if current draw indicates that any controller may have tripped off during power up or when 485 Timeout occurred.
   - Is current draw indicative of all controllers being properly powered?
   - Yes
   - No

3. **Verify 485 Timeout**
   - cmd Stop Execute (from any cmd window)
   - 'CBM Status'
   - 'Master Cmd Status – Complete'
   - '485 Timeout - blank'
   - '485 Timeout - blank'
   - 'Powered Bolt Status'
   - 'Cmd Code – Stop'
   - 'Cmd Code – Stop'
   - 'Cmd Status – Complete'
   - Did 485 timeout(s) clear?
   - Yes
   - No

4. **Determine Master**
   - Is failed controller on the same CPA as the master?
   - Yes
   - No

5. **Switch Masters on Same Bus**
   - Node 1 XXX CBM Prep for Mate
   - cmd Deactivate Execute
   - Node 1 XXX CBM Display
   - 'CBM Status'
   - 'Mode – Deactivated'
   - 'CBM Graphic'
   - sel INT-2(1) MDM
   - sel CB_GNC_1(2)
   - sel Bus Status
   - CB_GNC_1(2)_Bus_Status
   - T Channel Selected – B(A)
   - cmd Select Channel A(B)
   - T Channel Selected – A(B)
   - Node 1 XXX CBM Prep for Mate
   - cmd Activate CB-GNC-1(2) Master Controller Execute
   - Node 1 XXX CBM Display
   - 'CBM Status'
   - 'Mode – Activated'
   - 'Master – CB-GNC-1(2)
   - cmd Stop Execute (from any cmd window)
   - 'Master Cmd Status – Abort (due to 485 timeout)
   - '485 Timeout - blank'
   - 'Cmd Status – Complete or In Progress'
   - 'Capture Latch Status'
   - 'Cmd Code – Stop'
   - 'Cmd Status – Complete'
   - Repeat Stop cmd up to 5 times to clear
   - No Broadcast indications

6. **Transmit 485 timeout due to a data bus problem**
   - Node 1 XXX CBM Prep for Mate
   - cmd Deactivate Execute
   - Node 1 XXX CBM Display
   - 'CBM Status'
   - 'Mode – Deactivated'
   - 'CBM Graphic'
   - sel INT-2(1) MDM
   - sel CB_GNC_1(2)
   - sel Bus Status
   - CB_GNC_1(2)_Bus_Status
   - T Channel Selected – B(A)
   - cmd Select Channel A(B)
   - T Channel Selected – A(B)
   - Node 1 XXX CBM Prep for Mate
   - cmd Activate CB-GNC-1(2) Master Controller Execute
   - Node 1 XXX CBM Display
   - 'CBM Status'
   - 'Mode – Activated'
   - 'Master – CB-GNC-1(2)
   - cmd Stop Execute (from any cmd window)
   - 'Master Cmd Status – Abort (due to 485 timeout)
   - '485 Timeout - blank'
   - 'Cmd Status – Complete or In Progress'
   - 'Capture Latch Status'
   - 'Cmd Code – Stop'
   - 'Cmd Status – Complete'
   - Repeat Stop cmd up to 5 times to clear
   - No Broadcast indications

7. **Location of Timeouts**
   - Are the 485 timeouts indicated on all 5 controllers on a CPA? (if yes for more than one CPA repeat mal for each CPA)
   - Yes
   - No

8. **Resume nominal operations.**
   - Execute

9. **Switch 485 Channel**
   - 'CBM Status'
   - '485 Channel – A(B)
   - 'Record 485 Channel:____'
   - 'Commands by Type'
   - sel Prebuilt
   - CBM Prebuilt Commands
   - sel Set Last State
   - CBM Set Last State Cmds
   - cmd Select 485 Ch B(A) Execute
   - Node 1 XXX CBM Display
   - 'CBM Status'
   - '485 Channel – B(A)

10. **Classify Failure**
    - Were there originally (before the channel switch) 19 or 20 485 timeouts indicated?
    - Yes
    - No

11. **Verify 485 Status**
    - 'CBM Status'
    - '485 Timeout - no X 485 timeout indicated?
    - Yes
    - No

12. **Locations**
    - Are the 485 timeouts indicated on all 5 controllers on any CPA? (Can repeat mal for each CPA if true for more than one CPA.)
    - Yes
    - No

---

**Notes:**
- Unless otherwise indicated, all blocks with display callouts begin with Node 1 XXX CBM Display.
- MCC-H will assess plots of current during closure of the 4 RPCs (looking for a relative difference on closure/opening or a current drop at the time of the 485 indication.) If 485 timeout caused by controller tripping off, the current draw for the 485 which feeds it will be ~1/5 less than the RPCs which are powering 5 good controllers. Nominally currents are .25 to .28 amps (@122 V.) MCC-H will look for relative differences between RPCs with no 485 timeouts and those with since this relative change of current excludes instrumentation error, voltage, etc. If power data is inconclusive, proceed to block 3.
- If both CPAs that connect to 1553 bus being used (i.e., CPAs 1/4 when on CB-GNC-3 master or CPAs 2/3 when on CB-GNC-2 master) have a single 485 timeout, can treat as two separate failures. Proceed to work the failure not on the CPA with the master then return to block 5 to switch masters and work the other failure.
### Node 1 CBM 485 Comm Loss - Mate

**ASSEMBLY MAL/5A/FIN**

**Page 2 of 8 pages**

**Connector will be PTBD for primary power and JTBD for secondary power. Connector should have TBD pins in positions TBD.**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Cycle RPC</td>
</tr>
<tr>
<td></td>
<td>• Select RPC powering CPA with 485 errors</td>
</tr>
<tr>
<td></td>
<td>• RPCM_N1YY_RPC_ZZ</td>
</tr>
<tr>
<td></td>
<td>• Verify Load – N1 XXX CBM Pri(Sec) Y</td>
</tr>
<tr>
<td></td>
<td>• CMD RPC Position - Open</td>
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<tr>
<td></td>
<td>• RPC Position – Op</td>
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<td>• CMD RPC Position - Close</td>
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<td></td>
<td>• RPC Position – Cl</td>
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<td></td>
<td>No</td>
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<tr>
<td>14</td>
<td>CPA EMI filter suspect -</td>
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<tr>
<td></td>
<td>• Can resume operations but will switch to redundant RPC for this CPA since EMI is suspect.</td>
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<td></td>
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<tr>
<td>15</td>
<td>Switch to Redundant RPC</td>
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<td></td>
<td>• Verify Load – N1 XXX CBM Pri(Sec) Y</td>
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<td></td>
<td>• CMD Stop Execute (from any cmd window)</td>
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<td></td>
<td>• CBM Status</td>
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<td></td>
<td>• 485 Timeout – blank</td>
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<td></td>
<td>Yes</td>
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<td>19</td>
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<td></td>
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<td>No</td>
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<td></td>
<td>• CMD Close Cmd - Inhibit</td>
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<td></td>
<td>• Close Cmd – Inh</td>
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<td></td>
<td>• Remove/Inspect/Install power cable</td>
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<tr>
<td></td>
<td>• CBM Graphic</td>
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<tr>
<td></td>
<td>• Select original RPC (that was cycled in block 13)</td>
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<tr>
<td></td>
<td>• RPCM_N1YY_RPC_ZZ</td>
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<td></td>
<td>• CMD Close Cmd - Enable</td>
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<td></td>
<td>• Close Cmd – Ena</td>
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<td></td>
<td>• CMD RPC Position Close</td>
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<td></td>
<td>• RPC Position – Cl</td>
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<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>• Operations may continue.</td>
</tr>
<tr>
<td></td>
<td>• Should use the RPC presently powering this CPA for remainder of procedure.</td>
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</table>
CBM NODE 1 CBM 485 COMM LOSS - MATE

(assy MAL/5A/FIN) Page 3 of 8 pages

7

23 Cables Removed

Have CPA connections been disconnected or in crew translation path since last checkout?

27

24 Startup

Was failure indicated during initial CBM activation?

25 Cycle RPC

‘CBM Graphic’

• sel RPC powering CPA with 485 errors [RPCM_N1YY_RPC_ZZ]

• Verify Load – N1 XXX CBM Pri(Sec) Y

• cmd RPC Position - Open

• RPC Position – Op

• RPC Position Close

• RPC Position – Cl

Node 1 XXX CBM Display

• cmd Stop Execute (from any cmd window)

‘CBM Status’

• 485 Timeout – blank

Are 485 timeouts still indicated?

26 Access

Is visual inspection possible?

No

Yes

27 Inspect Cables

‘CBM Graphic’

• sel RPC powering CPA with 485 error [RPCM_N1YY_RPC_ZZ]

• Verify Load – N1 XXX CBM Pri(Sec) Y

• cmd RPC Position - Open

• RPC Position – Op

• RPC Position Close

• RPC Position – Cl

Node 1 XXX CBM Display

• cmd Stop Execute (from any cmd window)

‘CBM Status’

• 485 Timeout – blank

Are 485 timeouts still indicated?

29 Controller Cable problem (now fixed)

30 Switch to Redundant RPC

‘CBM Graphic’

• sel RPC powering CPA with 485 error [RPCM_N1YY_RPC_ZZ]

• Verify Load – N1 XXX CBM Pri(Sec) Y

• cmd RPC Position - Open

• RPC Position – Op

Node 1 XXX CBM Display

• sel redundant RPC for same CPA [RPCM_N1YY_RPC_ZZ]

• cmd RPC Position - Close

• RPC Position – Cl

Node 1 XXX CBM Display

• cmd Stop Execute (from any cmd window)

‘CBM Status’

• 485 Timeout – blank

Are 485 timeouts still indicated?

31 Slave power-up failure due to internal controller short. Can resume nominal ops.

79

32 Slave controller power card failure on 1 power channel. Should use the current RPC for this CPA for remainder of procedure.

33 Idle Time

• Wait 1 hour (with CBM powered)

Did 485 timeout clear?

Yes

No

34 Fast Power Cycle

• Repeat cmds (and notes) in block 28 (using the currently selected RPC)

35 Slave controller failed. Will mask controller and not use for operations.
Switch Masters on Same Bus

Node 1 XXX CBM Prep forMate
- cmd Deactivate
  Execute

Node 1 XXX CBM Display
- 'CBM Status'
  - Mode – Deactivated
  - CBM Graphic
- sel INT-2(1) MDM
- sel CB_GNC_1(2)
- sel Bus Status

CB_GNC_1(2)_Bus_Status
- Channel Selected – B(A)
- cmd Select Channel A(B)
- Channel Selected – A(B)

Node 1 XXX CBM Prep forMate
- cmd Activate CB-GNC-1(2)
  Master Controller
  Execute

Node 1 XXX CBM Display
- 'CBM Status'
  - Mode – Activated
  - Master – CB-GNC-1(2)
- cmd Stop
  Execute (from any cmd window)

'Powered Bolt Status'
  Cmd Status – Complete
- 'Capture Latch Status'
  Cmd Status – Complete
- Repeat Stop cmd up to 5 times
to clear No Broadcast indications

485 Timeout on previous master only?

485 card failure on previous master.
Will mask that latch for
nominal ops and should
not select it as master
(unless as contingency to
drive that latch only).

Assess 485
485 timeout on previous master only?
485 timeout on 19 or 20 controllers?
Other signature?

MCC-H - multiple failures.

Switch 485 Channel

'CBM Status'
- 485 Channel – A(B)
- Record 485 Channel: ___
  'Commands by Type'
- sel Prebuilt
  CBM Prebuilt Commands
- sel Set Last State
  CBM Set Last State Cmds
- cmd Set Last State to Stop
  485 Ch B(A)
  Execute

Node 1 XXX CBM Display
- 'CBM Status'
  - 485 Channel – B(A)

4385 card channel failure for a master/ latch (or
open circuit inside CPA)
Can return to procedure but
should remain on good 485 channel.

485 Bus channel failed – short on
channel. Can return
to procedure but
should remain on
good 485 channel.
**Cannot inspect for cable problem so continue to verify open circuit.**

**Only change 1553 channel if required to enable the latch controller with timeout to communicate with MDM.**

**Cable JTBD**
Connector will be PTBD. If currently on 485 A channel, use Select 485 Ch B command, and vice versa.

Only change 1553 channel if required to enable the latch controller with timeout to communicate with MDM.

Connector failure in JTBD.

Connector failure in JTBD.

Connector failure in JTBD.

Is visual inspection possible?

Is visual inspection possible?

Is visual inspection possible?

Is visual inspection possible?

Is visual inspection possible?

Is visual inspection possible?

Is visual inspection possible?

Is visual inspection possible?

Is visual inspection possible?

Is visual inspection possible?
If a CBM 485 bus has an open circuit it can still be used. A master can talk to any controllers between itself and the open circuit (and thus any master on other side of open can talk to any of the other controllers.)
78 Mask Failed Controller
- Repeat the following for each failed or degraded controller (per declaration in failure box):
  - ‘Commands by Type’
  - sel Prebuilt CBM Prebuilt Commands
  - sel Mask Controller…
  - cmd Mask “Controller X” Execute

Node 1 XXX CBM Display
  - CBM Graphic
  - -- on “Controller X”

79 Verify Command Status
- ‘Powered Bolt Status’
  - ✓ Cmd Status (sixteen) – Complete or In Progress
  - Capture Latch Status
  - ✓ Cmd Status (sixteen) – Complete or In Progress

Any controller have a Cmd Status of No Broadcast?
Yes No

80 Clear 485 Errors
- cmd Stop Execute (from any command window)
  - ‘Powered Bolt Status’
  - ✓ Cmd Status (sixteen) – Complete or In Progress
  - Capture Latch Status
  - ✓ Cmd Status (sixteen) – Complete or In Progress
  - Repeat Stop Cmd as required all until No Broadcasts cleared.

81 Reload All Positions
- ‘Commands by Type’
  - sel Template CBM Template Commands
  - ‘CBM Nonactuation Templates’
  - sel Set All Positions CBM Set All Positions Template
  - set: Controller Count: 20
  - pick: Last Cmd - Stop
  - pick: RS485 Channel – A(B)
  - set: Shaft Position 1---16: “Y” rev
  - set: Shaft Angle 17---20: “Y” deg
  - pick: Controller 1-20: Bolt 1-1, 2-1, 3-1, 4-1, 1-2, 2-2, 3-2, 4-2, 1-3, 2-3, 3-3, 4-3, 1-4, 2-4, 3-4, 4-4, Latch 1, 2, 3, 4
  - cmd Set Execute

Node 1 XXX CBM Display
  - ‘CBM Status’
  - ✓ Master Cmd Status - Complete
  - ‘Powered Bolt Status’
  - ✓ Cmd Code (sixteen) – Reload
  - ✓ Cmd Status (sixteen) – Complete
  - ✓ Posn (fifteen) – “Y” rev
  - Capture Latch Status
  - ✓ Cmd Code (four) – Reload
  - ✓ Cmd Status (four) – Complete
  - ✓ Posn (four) – “Y” deg

82 Resume nominal operations.

17 X in Mask Controller cmd will be the name of the slave controller being masked.

18 Cannot send Set Positions or BIT commands to clear No Broadcast indications for rest of procedure (not masked by MDM software). Sending these cmds to a controller with a 485 timeout will cause master to abort command. Instead of sending Set All Position’s Zero and BIT to clear No Broadcast messages, send repeated Stop commands. If need to set positions at a later time will need to build a Set Bolt Positions or Set Latch Angles template (with the failed controllers excluded).

19 Set Positions/Angles “Y” per values recorded in block 1. Select current 485 channel to prevent changing channels; i.e., if currently on 485 A channel, select A channel. If any bolt controller is masked, omit that controller and duplicate the entry for a good controller to keep 16 bolts in the command. If any latch controller is masked, omit the latch controller and decrement the Controller Count.
1 Identify Error Type
   'CBM Graphic'
   • sel controller with
     (for RTL open latch detail).
   Controller X Details
   • Record:
     Error - Controller - __________
   Does RTL or Capture Switch indicates Short Circuit or Open Circuit?
   No

2 Identify Error Type
   Controller X Details
   • √ Invalid Command - no X
   X for Invalid Command?
   No

3 Identify Error Type
   Controller X Details
   • √ Framing Error - no X
   • √ Checksum Error - no X
   X for Framing Error or Checksum Error?
   No

4 Identify Error Type
   Controller X Details
   • √ Background Status - no X
   X for any Background Status Fault?
   No

5 Verify Template
   Reverify all template cmd variables. Extra focus should be spent on:
   • Controller Count = total number of IDs listed in command
   • No Null values in values within Controller counts
   • All Controllers are for a latch in a latch command or a bolt in a bolt command
   Command built correctly?
   Yes

6 Command Check
   • cmd Stop Execute (from any CBM cmd window)
     'CBM Status'
   • √ Master Cmd Status – Complete
     'CBM Graphic'
   • If present - open detail window and confirm error.
   Invalid Command, Framing Error, or Checksum error indicated for same controller with previous error?
   Yes

7 Retransmit Failed Command
   Resend Command that previously generated command error.
   Did command complete successfully?
   No

8 Failed controller (internal component/software). Can mask and continue.

9 Bad user build of command.

10 Resume Ops
   • Rebuild template with proper values and return to procedure. Repeat last cmd as required

11 Mask Failed Controller(s)
   Controller X Details
   • sel Commands
   Controller X Commands
   • cmd Mask Controller X Execute
     [Node 1 Forward CBM Display]
     'CBM Graphic'
   • ✓ on "Controller X"
Depending on nature of background BIT fault may choose not to use this controller as a master controller (if it is a latch).

18. **Verify Error Type**

   Is controller identified in Block 1 the latch controller on the CPA identified as master?

   Yes

20. **Record Positions**

   - 'Capture Latch Status'
     - Record positions
       L1____, L2____, L3____, L4____
   - 'Powered Bolt Status'
     - Record positions
       B1-1____, B1-2____, B1-3____, B1-4____, B2-1____, B2-2____, B2-3____, B2-4____, B3-1____, B3-2____, B3-3____, B3-4____, B4-1____, B4-2____, B4-3____, B4-4____

21. **Reset Failed Controller**

   - 'Commands by Type'
     - sel Template
       - CBM Template Commands
         - 'CBM Nonactuation Templates'
           - sel Reset One Controller
             CBM Reset One Controller Template
             - pick: Subsystem ID 1 – (controller from block 1)
             - cmd Initiate Execute
               'Confirmation Request'
             - ✓ Override Execute Command?
               - cmd Yes Execute
               - Wait 20 seconds
             Node 1 XXX CBM Display
             - 'CBM Status'
               - ✓ Master Cmd Status – Complete
                 'Capture Latch Status'
               - sel Built In Test Failures
                 Node_1_CBM_Active_Built_In_Test_Failures
                 - ✓- no Xs
               Is BIT failure still present?

   Yes

   - MCC-H - unexplained background BIT problems. Will likely mask controller and resume operations.

   No

22. **MCC-H**

   23. **Apparent transient problem** (monitor for re-occurrence).

   24. **MCC-H** for instructions on reloading position of controller.

   3
This malfunction is written assuming the Node 1 Forward CBM is being operated. It is also valid for any other Node 1 CBM. For use on other Node 1 CBMs, replace Forward with the appropriate location in display callouts and advisories.

Specific RPCM callouts are for Node 1 Forward CBM. For other Node 1 CBMs, insert appropriate labels.

Unless otherwise indicated, all blocks with display callouts begin on:

Node 1 Forward CBM Display

Failure signature not previously seen in CBM testing/flight experience. Consult with MCC regarding failure before proceeding.

1 Verify RPC Status

- RPCM N13B C'
- RPCM N14B A'

New △ on any RPC or any RPC failed to open/close?

Yes  No

2 Verify 1553 Comm Status

- 'CBM Status'
  - ○ Mode - Activated
  - ○ Comm Error - no X
  - ○ 'CBM Graphic'
  - ○ Time Code - incrementing each minute

Is Mode Deactivated and/or Comm Error indicated? Did Time Code stop incrementing?

Yes  No

3 Verify Active BIT Status

- 'Built In Test Failures'
  - ○ /- no △ left of Built In Test Failures button

Is △ left of button?

Yes  No

4 Verify RS485 Comm Status

- 'CBM Status'
  - ○ 485 Timeout - no X

Is 485 Timeout indicated?

Yes  No

5 Verify Command Accepted

- 'CBM Status'
  - ○ Master Cmd Error - blank
  - ○ Cmd Rejected Flag - blank

Is a Master Cmd Error or Cmd Rejection indicated or was there no end item response to a cmd?

Yes  No

6 Verify Cmd Statuses

- 'Powered Bolt Status'
  - ○ Cmd Status (sixteen) - 'Capture Latch Status'
  - ○ Cmd Status (four) -

Does any new controller Cmd Status indicate Jammed or Binding or does Master Cmd Status indicate Timeout?

Yes  No

7 Verify CBM Controller Status

- 'Functional CBM Representation (External View)'
  - ○ /- no △

Cmd Status of abort or failed, capture switch not in correct position, or RTL switch indicates △?

Yes  No

8 MCC-H
This Page Intentionally Blank
Unless otherwise indicated, all blocks with display checks begin with Node 1 XXX CBM Display.

This malfunction is written for use on any Node 1 CBM. Replace XXX with appropriate Node 1 location in display callouts.
14 MCC-H - CBM
Prep for Demate failed. Should repeat Prep for Mate after RPCM R&R (trip on only 1 RPC) or CPA R&R (both RPCs for one CPA tripped.)

16 Probable short in CPA. Consider CPA failed. Should repeat Prep for Demate after CPA R&R.

18 Verfiy CBM Safed
‘CBM Status’
•✓ Mode - Deactivated
Is CBM Deactivated?
Yes

21 Determine Failure Type
Did an RPC fail to close?
No

23 Reverify RPCM Current
•✓ MCC-H to verify good current draw from RPCM for this RPC.
RPC still supplying power to CPA?
Yes

24 Can proceed with CBM operations without changing power source for this CPA.

15 Deactivate CBM
‘Commands by Task’
• sel Mate

Node 1 XXX CBM Mate
‘Deactivate CBM’
• cmd Deactivate Execute

N1 XXX CBM Display
‘CBM Status’
•✓ Mode - Deactivated

17 Open Any Closed RPCs
‘CBM Graphic’
• sel appropriate RPC(s)
RPCM. N1YY. RPC. ZZ
• cmd RPC Position - Open
•✓ RPC Position – Op
• cmd Close Cmd - Inhibit
•✓ Close Cmd – Inh

19 Verify RPCM Comm Status
Is RPCM comm lost (as determined by RPC Failed Closed maal)?

20 Verify RPC position
‘CBM Graphic’
• Verify RPC position for each CPA
Are all CBM RPCs on failed RPCM closed?

22 MCC-H to verify good current draw from upstream power source (DDCU.) Should RPCM be found still supplying power, can resume CBM ops on current RPCs.

25 Consider RPC open. Can proceed with CBM operations.

26 MCC-H –Should replace RPCM or provide alternate power source. Upstream power source will need to be cycled to open any closed RPCs prior to RPCM R&R. Should repeat Prep for Demate after power restored.
21

27 Determine Failure Timeframe
Did RPC fail while performing nominal procedure steps to close RPCs?

29 Reverify RPCM Current
• √MCC-H to verify no change in current draw from RPCM when this RPC was commanded closed.

31 Redundant RPC Available
‘CBM Graphic’
• Identify which CPA receives power from failed RPC and which redundant RPC also supplies power to the same CPA

33 Close Redundant RPC
‘CBM Graphic’
• sel appropriate RPC
  RPCM_N1YY_RPC_ZZ
• cmd RPC Position - Close
• √RPC Position - Cl

35 One RPC failed for CBM ops.
Can resume operations but should use redundant RPC for remainder of procedure.

28 √MCC-H – Failed open occurred during off-nominal procedure. Need to consider reason why closing RPC.

32 √MCC-H - CBM Prep for Demate failed. Should repeat Prep for Demate after RPCM R&R.

34 √MCC-H - Multiple failures.

27 Yes

29 Yes

31 Yes

33 Yes

35 Yes
36 Reactivate CBM On Same Bus

'Commands by Task'
- sel Prep for Mate

Node 1 XXX CBM Prep for Mate
- cmd Activate CB-GNC-1(2) Master Controller Execute

Node 1 XXX CBM Display
'CBM Status'
- ✓Mode – Activated
- ✓Master – CB-GNC-1(2)
- ✓Comm Error – no X

37 Determine RS 485 Channel
Was 485 Channel A in use when power loss occurred?

6 40

39 Clear 485 Errors
- cmd Stop Execute (from any cmd window)

Node 1 XXX CBM Display
'CBM Status'
- ✓485 Timeout – no X
- 'Powered Bolt Status'
- ✓Cmd Status (sixteen) – Complete
- 'Capture Latch Status'
- ✓Cmd Status (four) – Complete

Does any controller have a Cmd Status of No Broadcast?

38 Select 485 Channel A

'Commands by Type'
- sel Prebuilt CBM Prebuilt Cmds
- sel Set Last State CBM Set Last State Cmds
- cmd Select 485 Ch A Execute

Node 1 XXX CBM Display
'CBM Status'
- ✓485 Channel - A

40 Repeat block 39 to clear No Broadcast indications.

39
This malfunction is written assuming the Node 1 Forward CBM is being operated. It is also valid for any other Node 1 CBM. For use on other Node 1 CBMs, replace Forward with the appropriate location in display callouts.

‘CBM Graphic’ refers to the schematic representation at the bottom of Node 1 Forward CBM Display.

Unless otherwise indicated all blocks begin with Node 1 Forward CBM Display.

If on CB-GNC-1 master, select N1-1 and CB-GNC-1. If on CB-GNC-2 master, select N1-2 and CB-GNC-2.
5. If on CB-GNC-1 master, select N1-1 and CB-GNC-1. If on CB-GNC-2 master, select N1-2 and CB-GNC-2.

6. Callouts assume Loss of Comm occurred while using Forward CBM. RT addresses for the other Node 1 CBMs are as follows: UB-ORB-N1-1(2)

5. Nadir
4. Port
3. Starboard
2. Zenith

7. Block assumes the 1553 channel is B. If 1553 channel is currently A, select channel B.

8. Channel is switched to stop MDM polling of CBM. If there is a reason not to switch back to previous channel, cycling CPA power will have the same effect. Reference ISS SPN 466.

9. Once CBM RT inhibited, channel may be switched again to achieve desired channel.

10. If bus failed flag is set while using UB-ORB-N1-1 master, bus failure may have been caused by CBM RT comm failure since CBM is only RT on the bus. If bus recovery is unsuccessful, may choose to work from block 17 to isolate any CBM problems. N/A for Forward CBM.

11. Use current channel. Do not switch 1553 channels as part of troubleshooting while CBM operations are ongoing.
When 1553 channel switches to a channel where the master controller has not been activated since power-up, MDM will not recognize that subsystem IDs are not incrementing. CBM polling of the master on the active bus channel must be broken manually (reference ISS SPN 466). This can be done by cycling power to the CPA or by switching the 1553 channel back to the prior channel selection. In this case, since another RT failed on the previous channel, it is safer to simply cycle power.

| 23 | Break CBM Polling By Cycling RPC | Yes 
| CB_GNC_1(2)_RT_Status | 
| RT 18 CBM N1FWD-P(S) Inhibit FDIR | Execute 
| RT 18 CBM N1FWD-P(S) RT FDIR Status - Inh | Node 1 Forward CBM Display 
| 'CBM GRAPHIC' | 
| sel RPC powering CPA connected to active CB-GNC-1(2) channel | 
| cmd RPC Position - Op | Wait 30 seconds 
| RPC Position - Cl | 
| CB_GNC_1(2)_RT_Status | 
| cmd RT 18 CBM N1FWD-P(S) Enable FDIR | Execute 
| RT 18 CBM N1FWD-P(S) RT FDIR Status - Ena | 
| 25 | Break CBM Polling By Cycling RPC | On MCC-H go 
| CB_GNC_1(2)_RT_Status | 
| RT 18 CBM N1FWD-P(S) Inhibit FDIR | Execute 
| RT 18 CBM N1FWD-P(S) RT FDIR Status - Inh | Node 1 Forward CBM Display 
| 'CBM GRAPHIC' | 
| sel RPC powering CPA connected to active CB-GNC-1(2) channel | 
| cmd RPC Position - Op | Wait 30 seconds 
| RPC Position - Cl | 
| CB_GNC_1(2)_RT_Status | 
| cmd RT 18 CBM N1FWD-P(S) Enable FDIR | Execute 
| RT 18 CBM N1FWD-P(S) RT FDIR Status - Ena | 
| 26 | Break CBM Polling By Cycling RPC | On MCC-H go 
| CB_GNC_1(2)_RT_Status | 
| RT 18 CBM N1FWD-P(S) Inhibit FDIR | Execute 
| RT 18 CBM N1FWD-P(S) RT FDIR Status - Inh | Node 1 Forward CBM Display 
| 'CBM GRAPHIC' | 
| sel RPC powering CPA connected to active CB-GNC-1(2) channel | 
| cmd RPC Position - Op | Wait 30 seconds 
| RPC Position - Cl | 
| CB_GNC_1(2)_RT_Status | 
| cmd RT 18 CBM N1FWD-P(S) Enable FDIR | Execute 
| RT 18 CBM N1FWD-P(S) RT FDIR Status - Ena | 
| 27 | Break CBM Polling By Cycling RPC | On MCC-H go 
| CB_GNC_1(2)_RT_Status | 
| RT 18 CBM N1FWD-P(S) Inhibit FDIR | Execute 
| RT 18 CBM N1FWD-P(S) RT FDIR Status - Inh | Node 1 Forward CBM Display 
| 'CBM GRAPHIC' | 
| sel RPC powering CPA connected to active CB-GNC-1(2) channel | 
| cmd RPC Position - Op | Wait 30 seconds 
| RPC Position - Cl | 
| CB_GNC_1(2)_RT_Status | 
| cmd RT 18 CBM N1FWD-P(S) Enable FDIR | Execute 
| RT 18 CBM N1FWD-P(S) RT FDIR Status - Ena | 
| 28 | 485 Bus Status | 'CBM Status' 
| /485 Timeout – no X | Yes 
| Does master/latch on alternate 1553 channel indicate 485 timeout? | No 
| 29 | Perform Active BIT | No 
| Node 1 Fwd CBM Prep for Demate | 
| cmd Active BIT Execute | 'Confirmation Request' 
| Override Active BIT Command? | 
| cmd Active BIT Execute | 
| Node 1 Forward CBM Display | 'Capture Latch Status' 
| sel Built-In Test Failures | Node1_Fwd_CBGNchantment-Latch Failures | 
| no X | Any BIT errors indicated? | 54 

14 AUG 00
If on CB-GNC-1 master, select N1-1 and CB-GNC-1. If on CB-GNC-2 master, select N1-2 and CB-GNC-2.

Block assumes the current 1553 channel is B. If 1553 channel is currently A, select channel B.
If N1-2 undergoes a major state transition (i.e. primary to primary) that does not cause a major state change in N1-1 MDM, cold init of N1-1 is required to break RT I/O with CBM. Reference ISS SPN 329.

Operation of N1-1 MDM has no effect on CBM while using CB-GNC-2 master.

CAUTION: Do not send any CBM commands to N1-1 (including activate) before power cycling. N1-1 may cause an ADA exception error.
53 Reactivate CBM on Same Bus

'Commands by Task'

- sel Prep for Demate
- cmd Activate CB-GNC-1(2) Master Controller Execute

54 Determine RS 485 Channel

Was 485 Channel A in use when comm loss occurred?

55 Select 485 Channel A

- cmd Select 485 Ch A Execute

56 Clear No Broadcast Indications

- cmd Stop Execute (from any cmd window)

- Does any controller have a Cmd Status of No Broadcast?

57 Repeat block 56 to clear No Broadcast indications.
This procedure is valid for any Node 1 CBM. Replace XXX with the appropriate location in display callouts.

Unless otherwise indicated, all blocks with display callouts begin with Node 1 XXX CBM.

Bus 61553 & Digital Latches tests are only performed during the powerup sequence and thus should be seen at activation. A/D Discrete test is only performed during an Active BIT, thus should only be seen following a commanded BIT. Other BITs are performed during both powerup and Active BIT.

Component startup or transient failure. Can return to nominal procedure and continue, but should not use latch controller on this CPA as master for nominal ops (as a precaution for re-occurrence).
MCC-H - 1553 card failure in controller. This master/latch cannot be used as a master. Should repeat Prep after CPA R&R.

MCC-H - Failed slave controller. Bad memory location(s) in controller RAM or ROM. Should repeat Prep after CPA R&R.

MCC-H - Failed slave controller. Command/data internal transmission errors (controller not reliable). Slave cannot be used for actuation (inverter disabled). Should repeat Prep after CPA R&R.

MCC-H - Failed slave controller. Pin error between slave and CPA or avionics failure internal to slave. Should repeat Prep after CPA R&R.

MCC-H - Slave controller failed on one 485 channel due to 485 card. Should repeat Prep after CPA R&R.
21 Verify Command Status

'Powered Bolt Status'
- ✓ Cmd Status (sixteen) - Complete or In Progress

'Capture Latch Status'
- ✓ Cmd Status (sixteen) - Complete or In Progress

Any controller have a Cmd Status of No Broadcast?

Yes

22 Clear 485 Errors

- cmd Stop Execute (from any command window)
  'Powered Bolt Status'
  - ✓ Cmd Status (sixteen) - Complete or In Progress
  'Capture Latch Status'
  - ✓ Cmd Status (sixteen) - Complete or In Progress
  - Repeat Stop Cmd as required all until No Broadcasts cleared.

No

(NOPE 1 CBM POSITION RELOAD – PREP FOR MATE)
(ASSY MAL:MAL:CBM)
**CBM NODE 1 CBM 485 COMM LOSS - PREP FOR DEMATE** (ASSY MAL:MAL:CBM)

1. **Record Data**
   - Record: 'CBM Status'
   - 485 Channel - ______
   - 'CBM Graphic'
   - Master CPA - ______
   - Controllers with 485 timeouts:
     - 'Capture Latch Status'
     - Record positions
       - L1______, L2______, L3______, L4______
   - 'Powered Bolt Status'
     - Record positions
       - B3-1______, B3-2______, B3-3______, B3-4______,
       - B4-1______, B4-2______, B4-3______, B4-4______

2. **Verify Power Usage**
   - Yes
   - No

3. **485 Timeout**
   - cmd Stop Execute (from any cmd window)
     - 'CBM Status'
     - 'Master Cmd Status – Complete'
     - '485 Timeout - blank'
     - 'Powerd Bolt Status'
     - 'Cmd Code – Stop'
     - 'Cmd Status - Complete'
     - 'Capture Latch Status'
     - 'Cmd Code – Stop'
     - 'Cmd Status - Complete'
   - Did 485 timeout(s) clear?
     - Yes
     - No

4. **Determine Master**
   - Is failed controller on the same CPA as the master?
     - Yes
     - No

5. **Switch Masters on Same Bus**
   - Node 1 XXX CBM Prep for Demate
     - cmd Deactivate Execute
     - Node 1 XXX CBM Display
       - 'CBM Status'
       - Mode – Deactivated
       - 'CBM Graphic'
       - sel N1-1(2) MDM
       - sel CB_GNC_1(2)
       - sel Bus Status
     - Node 1 XXX CBM Prep for Demate
     - cmd Activate CB-GNC-1(CB-GNC-2)
       - Master Controller Execute
     - Node 1 XXX CBM Display
       - 'CBM Status'
       - Mode – Activated
       - 'Master – CB-GNC-1(CB-GNC-2)
       - cmd Stop Execute (from any cmd window)
       - 'Master Cmd Status – Abort (due to 485 timeout)
       - 'Powerd Bolt Status'
       - 'Cmd Status – Complete or In Progress
       - 'Capture Latch Status'
       - 'Cmd Status – Complete or In Progress
       - Repeat Stop cmd up to 5 times to clear
       - No Broadcast indications

6. **Transient 485 timeout due to a data bus problem**
   - (NODE 1 CBM)
     - 485 timeout(s) clear?
       - Yes
       - No

7. **Location of Timeouts**
   - Are the 485 timeouts indicated on all 5 controllers on a CPA? (if yes for more than one CPA repeat mal for each CPA)
     - Yes
     - No

8. **Switch 485 Channel**
   - 'CBM Status'
     - 485 Channel – B(A)
     - Record 485 Channel – ______
   - 'CBM Graphic'
     - Node 1 XXX CBM Prep for Demate
       - cmd Deactivate Execute
     - Node 1 XXX CBM Display
       - 'CBM Status'
       - Mode – Deactivated
       - 'CBM Graphic'
       - sel N1-1(2) MDM
       - sel CB_GNC_1(2)
       - sel Bus Status
     - Node 1 XXX CBM Prep for Demate
     - cmd Activate CB-GNC-1(CB-GNC-2)
       - Master Controller Execute
     - Node 1 XXX CBM Display
       - 'CBM Status'
       - Mode – Activated
       - 'Master – CB-GNC-1(CB-GNC-2)
       - cmd Stop Execute (from any cmd window)
       - 'Master Cmd Status – Abort (due to 485 timeout)
       - 'Powerd Bolt Status'
       - 'Cmd Status – Complete or In Progress
       - 'Capture Latch Status'
       - 'Cmd Status – Complete or In Progress
       - Repeat Stop cmd up to 5 times to clear
       - No Broadcast indications

9. **Define Failure**
   - Were there originally (before the channel switch) 19 or 20 485 timeouts indicated?
     - Yes
     - No

10. **Verify 485 Status**
    - 'CBM Status'
      - 485 Channel – ______
    - 485 timeout(s) clear?
      - Yes
      - No

11. **Verify 485 Status**
    - 'CBM Status'
      - 485 Channel – ______
    - 485 timeout(s) clear?
      - Yes
      - No

12. **Locations**
    - Are the 485 timeouts indicated on all 5 controllers on any CPA? (if yes for more than one CPA repeat mal for each CPA)
      - Yes
      - No

This malfunction is written for use on any Node 1 CBM. Replace XXX with appropriate Node 1 location in display callouts.

Unless otherwise indicated, all blocks with display callouts begin with Node 1 XXX CBM Display.

MCC-H will assess plots of current during closure of the 4 RPCs (looking for a relative difference on closure/opening or a current drop at the time of the 485 indication). If 485 timeout caused by controller tripping off, the current draw for the RPC which feeds it will be ~1/5 less than the RPCs which are powering 5 good controllers. Nominally currents are .25 to .28 amps (@122 V). MCC-H will look for relative differences between RPCs with no 485 timeouts and those with since this relative change of current excludes instrumentation error, voltage, etc. If power data is inconclusive, proceed to block 3.

If both CPAs that connect to 1553 bus being used (i.e. CPAs 1/4 when on CB-GNC-1 master or CPAs 2/3 when on CB-GNC-2 master.) have a single 485 timeout, can treat as two separate failures. Proceed to work the failure not on the CPA with the master then return to block 5 to switch masters and work the other failure.
Connector will be PTBD for primary power and JTBD for secondary power. Connector should have TBD pins in positions TBD.
CBM  NODE 1 CBM 485 COMM LOSS - PREP FOR DEMATE
(ASSY MAL/5A/FIN)

1. Cables Removed
   Have CBM connections been disconnected or in crew translation path since last checkout?
   Yes
   No
   2. Startup
   Was startup failure during initial CBM activation?
   Yes
   No
   25. Cycle RPC
   ‘CBM Graphic’
   ● sel RPC powering CPA with 485 errors
   RPCM_N1YY_RPC ZZ
   ● Verify Load – N1 XXX CBM Pri(Sec) Y
   ○ cmd RPC Position – Open
   ○ RPC Position – Op
   ○ cmd RPC Position Close
   ○ RPC Position – Cl
   Node 1 XXX CBM Display
   ● cmd Stop Execute (from any cmd window)
   ‘CBM Status’
   ○ 485 Timeout – blank
   Are 485 timeouts still indicated?
   Yes
   No
   26. Cycle RPC - Fast
   ‘CBM Graphic’
   ● sel RPC powering CPA with 485 errors
   RPCM_N1YY_RPC ZZ
   ● Verify Load – N1 XXX CBM Pri(Sec) Y
   ○ cmd RPC Position – Open
   ○ RPC Position – Op
   ○ cmd RPC Position Close
   ○ RPC Position – Cl
   Node 1 XXX CBM Display
   ● cmd Stop Execute (from any cmd window)
   ‘CBM Status’
   ○ 485 Timeout – blank
   Are 485 timeouts still indicated?
   Yes
   No
   6. Before commanding RPC, record which RPC will be used and confirm with MCC-H.

27. Inspect Cables
   ‘CBM Graphic’
   ● sel RPC powering CPA with 485 error
   RPCM N1YY_RPC ZZ
   ● Verify Load – N1 XXX CBM Pri(Sec) Y
   ○ cmd RPC Position – Open
   ○ RPC Position – Op
   ○ cmd Close Cmd - Inhibit
   ○ Close Cmd – Inh
   • Remove/Inspect/Install power cable
   RPCM N1YY_RPC ZZ
   ● cmd Stop Execute (from any cmd window)
   Are 485 timeouts still indicated?
   Yes
   No
   28. Cycle RPC - Fast
   ‘CBM Graphic’
   ● sel RPC powering CPA with 485 error
   RPCM N1YY_RPC ZZ
   ● Verify Load – N1 XXX CBM Pri(Sec) Y
   ○ cmd RPC Position – Open
   ○ RPC Position – Op
   ○ cmd RPC Position Close
   ○ RPC Position – Cl
   Node 1 XXX CBM Display
   ● cmd Stop Execute (from any cmd window)
   ‘CBM Status’
   ○ 485 Timeout – blank
   Are 485 timeouts still indicated?
   Yes
   No
   7. Fast cycle will be most effective if commanded within 30 seconds or so, but may not possible since need to verify end item response prior to next command.

29. Controller Cable problem (now fixed)
   Yes
   No
   24. Startup
   (Note: Are 485 timeouts still indicated?)

30. Switch to Redundant RPC
   ‘CBM Graphic’
   ● sel RPC powering CPA with 485 error
   RPCM N1YY_RPC ZZ
   ● Verify Load – N1 XXX CBM Pri(Sec) Y
   ○ cmd RPC Position – Open
   ○ RPC Position – Op
   ○ cmd RPC Position Close
   ○ RPC Position – Cl
   Node 1 XXX CBM Display
   ● sel redundant RPC for same CPA
   RPCM N1YY_RPC ZZ
   ● cmd RPC Position – Open
   ○ RPC Position – Cl
   Node 1 XXX CBM Display
   ● cmd Stop Execute (from any cmd window)
   ‘CBM Status’
   ○ 485 Timeout – blank
   Are 485 timeouts still indicated?
   Yes
   No
   31. Slave power-up failure due to internal controller short. Resume nominal ops.
   Yes
   No
   79
   32. MCC-H - Slave controller power card failure on 1 power channel. Should repeat checkout after CPA R&R.
   Yes
   No
   8. Connector will be PTBD for primary power and JTBD for secondary power. Connector should have TBD pins in positions TBD.

33. Idle Time
   ● Wait – 1 hour (with CBM powered)
   Yes
   No
   10
   34. Fast Power Cycle
   ● Repeat cmds (and notes) in block 31 (using the currently selected RPC)
   Did 485 timeout clear?
   Yes
   No
   35. MCC-H - Slave controller failed. Should repeat checkout after CPA R&R.
36 Switch Masters on Same Bus

Node 1 XXX CBM Prep for Demate
• cmd Deactivate Execute

Node 1 XXX CBM Display
‘CBM Status’
• ✓ Mode – Deactivated
‘CBM Graphic’
• sel N1-1(2) MDM
• sel CB_GNC_1(2)
• sel Bus Status

CB_GNC_1(2)_Bus_Status
• ✓ Channel Selected – B(A)
• cmd Select Channel A(B)
• ✓ Channel Selected – A(B)

Node 1 XXX CBM Prep for Demate
• cmd Activate CB-GNC-1(2) Master Controller Execute

Node 1 XXX CBM Display
‘CBM Status’
• ✓ Mode – Activated
‘Master – CB-GNC-1(2)
• cmd Stop Execute (from any cmd window)
‘Powered Bolt Status’
• ✓ Cmd Status – Complete
‘Capture Latch Status’
• ✓ Cmd Status – Complete
• Repeat Stop cmd up to 5 times to clear No Broadcast indications

485 Timeout on previous master only?

Yes

37 Verify 485 Status

‘CBM Status’
✓ 485 Timeout – no X
485 timeout(s) indicated?

No

38 Switch Masters on Same Bus

Node 1 XXX CBM Prep for Demate
• cmd Deactivate Execute

Node 1 XXX CBM Display
‘CBM Status’
✓ Mode – Deactivated
‘CBM Graphic’
• sel N1-1(2) MDM
• sel CB_GNC_1(2)
• sel Bus Status

CB_GNC_1(2)_Bus_Status
✓ Channel Selected – B(A)
• cmd Select Channel A(B)
✓ Channel Selected – A(B)

Node 1 XXX CBM Prep for Demate
• cmd Activate CB-GNC-1(2) Master Controller Execute

Node 1 XXX CBM Display
‘CBM Status’
✓ Mode – Activated
✓ Master – CB-GNC-1(2)
• cmd Stop Execute (from any cmd window)
‘Powered Bolt Status’
✓ Cmd Status – Complete
‘Capture Latch Status’
✓ Cmd Status – Complete
• Repeat Stop cmd up to 5 times to clear No Broadcast indications

Yes

40 Switch 485 Channel

‘CBM Status’
✓ 485 Channel – A(B)
• Record 485 Channel:____
• ‘Commands by Type’
• sel Prebuilt CBM Prebuilt Commands
• sel Set Last State CBM Set Last State Cmds
• cmd Set Last State to Stop 485 Ch B(A) Execute

Node 1 XXX CBM Display
‘CBM Status’
✓ 485 Channel – B(A)

No

41 ✓ MCC-H - 485 card failure on previous master.
Should repeat Prep for Demate following CPA R&R.

42 Assess 485

485 timeout on previous master only?

No

43 ✓ MCC-H - 485 card channel failure for a master/latch (or open circuit inside CPA).
Should repeat Prep for Demate following CPA R&R.

44 ✓ MCC-H - multiple failures.

45 ✓ MCC-H - 485 Bus channel failed – short on channel.
Should repeat Prep for Demate following restoration of 485 bus channel.
Reperform Active BIT

‘Commands by Task’
• cmd Prep for Mate

Node 1 XXX CBM Prep for Demate
• cmd Active BIT Execute

‘Confirmation Request’
• Override Active Bit Command?
• cmd Active BIT Execute

Node 1 XXX CBM Display
‘CBM Status’
• Master Cmd Status – Complete
• Cmd Code (20) – Built In Test
• Cmd Status (20) – Complete
• sel Built-In Test Failures

Node 1 XXX CBM Built_In_Test_Failures
• - no X’s

BIT failure on controller that had 485 error?

Inspect Cables

‘CBM Graphic’
• sel RPC powering CPA with 485 error

RPCM N1YY_RPC ZZ
• Verify Load – N1 XXX CBM Pri(Sec) Y
• cmd RPC Position - Open
• RPC Position – Op
• cmd Close Cmd - Inhibit
• Close Cmd – Inh
• Remove/Inspect/Install 1553/485 cable

RPCM N1YY_RPC ZZ
• cmd Close Cmd - Enable
• Close Cmd – Ena
• cmd RPC Position - Close
• RPC Position – Cl
• cmd Stop Execute (from any CBM

cmd window)

Same five 485 timeouts?

Any 485 timeouts present?

No 485 Timeouts?

Cable problem now fixed. Resume
CBM procedure.

MCC-H -
Multiple failures.

Go to (NODE 1 CBM
ACTIVE BUILT IN TEST
FAILURE – PREP FOR
DEMATE) (ASSY
MAL:MAL:CBM)

MCC-H -
Slave controller suspect on one
485 channel due to 485 card.
Should repeat Prep after CPA
R&R.
Connector will be PTBD. If currently on 485 A channel, use Set Last State to Stop Ch B command, and vice versa.

Connector failure in JTBD.

Connector failure in JTBD.

MCC-H to attempt recovery with a power cycle.

Inspect Cables

- CBM Graphic
  - sel RPC powering CPA with 485 error

RPCM_N1YY_RPC_ZZ
  - cmd Close Cmd - Enable
  - cmd RPC Position - Close
  - cmd Stop Execute (from any CBM cmd window)

Node 1 XXX CBM Display

- CBM Graphic
  - Record which latches/bolts indicate 485 Timeout:

Same 485 timeouts both channels?
No 485 timeouts on either channel?
Same 485 timeouts one channel?

Connector problem for one channel fixed. Repeat inspection to regain other channel. Should MCC-H if second channel not regained.

Connectors in JTBD.

CBM Set Last State Cmds

- cmd Select 485 Ch A(B) CBM Graphic
  - Record which latches/bolts indicate 485 Timeout:

Same 485 timeouts both channels?
No 485 timeouts on either channel?
Same 485 timeouts one channel?

Inspect

- Check connectors using steps in block 61.

MCC-H - Failed slave controller (component failure.) Should repeat Prep for Demate following CPA R&R.

MCC-H - 1 CPA failed for CBM Ops. Should repeat Prep for Demate following CPA R&R.

1 CPA

13  Connector will be PTBD. If currently on 485 A channel, use Set Last State to Stop Ch B command, and vice versa.

14  Connector failure in JTBD.

15  Connector failure in JTBD.

16  MCC-H to attempt recovery with a power cycle.
If a CBM 485 bus has an open circuit it can still be used. A master can talk to any controllers between itself and the open circuit (and thus any master on other side of open can talk to any of the other controllers.)

71. **MCC-H - Slave controller failed. Should repeat Prep for Demate following CPA R&R.**

72. **MCC-H - Slave controller power card failure on 1 power channel. Should repeat Prep for Demate following CPA R&R.**

76. **MCC-H - 485 channel degraded. Open circuit in channel. Should repeat Prep for Demate after channel is restored.**

---

**CBM**

**NODE 1 CBM 485 COMM LOSS - PREP FOR DEMATE**

(ASYY MAL/5A/FIN) Page 7 of 8 pages
79 Verify Command Status

'Powered Bolt Status'

- Cmd Status (sixteen) – Complete or In Progress

'Capture Latch Status'

- Cmd Status (sixteen) – Complete or In Progress

Any controller have a Cmd Status of No Broadcast?

80 Clear 485 Errors

- cmd Stop Execute (from any command window)
- "Cmd Status (sixteen) – Complete or In Progress"
- "Capture Latch Status (sixteen) – Complete or In Progress"

Repeat Stop Cmd as required all until No Broadcasts cleared.

Yes

22 25 29 31 54 69

No

(INode 1 CBM POSITION RELOAD – PREP FOR DECADE) (ASSY MAL:CBM)
Cmd rejection is an NCS software response that should only be set if the NCS software considers the CBM to be in the deactivated state.

The signature leading to the yes leg of this block could be caused a command build, 1553 bus, or master problem. If bus problems (i.e., random errors, multiple bus errors, command errors on multiple commands, etc.) are seen, MCC-H.

Cmd rejection is an NCS software response that should only be set if the NCS software considers the CBM to be in the deactivated state.

The signature leading to the yes leg of this block could be caused a command build, 1553 bus, or master problem. If bus problems (i.e., random errors, multiple bus errors, command errors on multiple commands, etc.) are seen, MCC-H.

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The signature leading to the yes leg of this block could be caused a command build, 1553 bus, or master problem. If bus problems (i.e., random errors, multiple bus errors, command errors on multiple commands, etc.) are seen, MCC-H.
If time permits, can have MCC-H verify instance command structure from Command Inventory using criteria in block 19.

MCC-H for detailed instructions for building each CBM template. These are found in the OSO Console Handbook section 4.1.8.7.

Initialize Template (Latch Angles or Bolt positions) can be used in place of a Set Positions/Angles template if that template is corrupt (only available in MCC).

Did cmd contain incorrect values?

Yes

23 Rebuild Template Command
Is incorrect value selectable by the user?

No

24 One-time transmission failure on 1553 bus. Can resume nominal procedure.

Yes

MCC-H for instructions to build template for erroneous command. Return to nominal procedure substituting this template for each instance of the erroneous cmd.

19 Verify Template Build
• Reverify all template cmd variables. Depending on the type of error, extra focus should be spent on the following:
  • Parameter Out of Range: For latch commands, verify speed limit less than or equal to 1 RPM. For bolt commands, verify current threshold less than or equal to 160 N-M.
  • Invalid Delimiter: MCC-H to verify delimiter value is BBBBBH (48059 [decimal])
  • Invalid Command: verify cmd code indicates proper command type. MCC-H to verify override bit and user bits are consistent with each other if applicable for this cmd structure.
  • Invalid Subsystem ID: verify Controller Count is correct and that there are no Null Devices listed within the controllers identified by this Controller Count.
  • Word Count - For set positions/angles commands, MCC-H to verify cmd contains 25 data words (excluding CCSDS header words). For all other commands, MCC-H to verify cmd contains 22 data words.

Did cmd contain incorrect values?

No

20 Alternate Method

• MCC-H - alternate method must be found to accomplish this malfunction operation (All nominal CBM commands in procedure have a corresponding template.)

21 Reattempt Template
• Reattempt procedure step/cmd which resulted in error

Did cmd generate a Master Cmd Error?

No

22 Erroneous cmd build (std-out or user).

Yes

25 Alternate Method

• MCC-H - Do not use this template structure again. Alternate method must be found to accomplish this malfunction operation if required (All nominal CBM commands in procedure are instantiations). Cmd from scratch is not recommended, but can be an acceptable alternative if this is only command to support a critical CBM operation.

29 Build Cmd & Resume Ops
• Rebuild template. Return to nominal procedure repeating last step as required.

5 Alternate Method

MCC-H - alternate method must be found to accomplish this malfunction operation (All nominal CBM commands in procedure have a corresponding template.)

20 Alternate Method

21 Reattempt Template
• Reattempt procedure step/cmd which resulted in error

Did cmd generate a Master Cmd Error?

No

22 Erroneous cmd build (std-out or user).

Yes

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• MCC-H - Do not use this template structure again. Alternate method must be found to accomplish this malfunction operation if required (All nominal CBM commands in procedure are instantiations). Cmd from scratch is not recommended, but can be an acceptable alternative if this is only command to support a critical CBM operation.

29 Build Cmd & Resume Ops
• Rebuild template. Return to nominal procedure repeating last step as required.

5 Alternate Method

MCC-H - alternate method must be found to accomplish this malfunction operation (All nominal CBM commands in procedure have a corresponding template.)

20 Alternate Method

21 Reattempt Template
• Reattempt procedure step/cmd which resulted in error

Did cmd generate a Master Cmd Error?

No

22 Erroneous cmd build (std-out or user).

Yes

25 Alternate Method

• MCC-H - Do not use this template structure again. Alternate method must be found to accomplish this malfunction operation if required (All nominal CBM commands in procedure are instantiations). Cmd from scratch is not recommended, but can be an acceptable alternative if this is only command to support a critical CBM operation.

29 Build Cmd & Resume Ops
• Rebuild template. Return to nominal procedure repeating last step as required.

5 Alternate Method

MCC-H - alternate method must be found to accomplish this malfunction operation (All nominal CBM commands in procedure have a corresponding template.)

20 Alternate Method

21 Reattempt Template
• Reattempt procedure step/cmd which resulted in error

Did cmd generate a Master Cmd Error?

No

22 Erroneous cmd build (std-out or user).

Yes

25 Alternate Method

• MCC-H - Do not use this template structure again. Alternate method must be found to accomplish this malfunction operation if required (All nominal CBM commands in procedure are instantiations). Cmd from scratch is not recommended, but can be an acceptable alternative if this is only command to support a critical CBM operation.

29 Build Cmd & Resume Ops
• Rebuild template. Return to nominal procedure repeating last step as required.

5 Alternate Method

MCC-H - alternate method must be found to accomplish this malfunction operation (All nominal CBM commands in procedure have a corresponding template.)

20 Alternate Method

21 Reattempt Template
• Reattempt procedure step/cmd which resulted in error

Did cmd generate a Master Cmd Error?

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• Reattempt procedure step/cmd which resulted in error

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29 Build Cmd & Resume Ops
• Rebuild template. Return to nominal procedure repeating last step as required.
This malfunction is written for use on any Node 1 CBM. Replace XXX with appropriate Node 1 location in displays and windows.

Unless otherwise indicated, all blocks with display call-outs begin with Node 1 XXX CBM Display.

Can use current data and inspection to try to ascertain cause of binding. If no clear indications, will likely replace powered bolt assembly.

Can use current data and inspection to try to ascertain cause of binding. If no clear indications, will likely replace capture latch assembly.

MCC-H will assess motor speed data for the controller exceeding the allotted command time. If motor speed appears normal, will likely reperform command. If speed is lower than expected, will likely replace a CPA or bolt/latch, depending on current signature.
This malfunction is written for use on any Node 1 CBM. Replace XXX with appropriate location in display callouts.

Unless otherwise indicated, all blocks with display callouts begin with Node 1 XXX CBM Display.

1 Identify Error Type

'CBM Graphic'

- sel controller with △

(for RTL open latch detail).

Controller X Details
- Error - Controller - __________

Does RTL or Capture Switch indicates Short Circuit or Open Circuit?

No

3 Identify Error Type

Controller X Details
- △Invalid Command - no X

X for Invalid Command?

No

6 Identify Error Type

Controller X Details
- △Framing Error – no X
- △Checksum Error – no X

X for Framing Error or Checksum Error?

No

8 Identify Error Type

Controller X Details
- △Background Status

- △all faults – no X

X for any Background Status Fault?

No

11 △MCC-H

12 Retransmit Failed Command

- Resend Command that previously generated command error.

Did command complete successfully?

No

14 △MCC-H - unexplained cmd problems.

15 Apparent Transmission/transient error. Can return to nominal procedure.

16 Resume Ops

- Return to procedure.
- Repeat last cmd as required

17

10 Resume Ops

- Rebuild template with proper values and return to procedure. Repeat last cmd as required

13 △MCC-H - Failed controller (internal component/software). Should repeat Prep for Demate following CPA R&R.

19

5 Reverify Template

- Reverify all template cmd variables. Extra focus should be spent on:

  - Controller Count = total number of IDs listed in command
  - No Null values in values within Controller counts
  - All Controllers are for a latch in a latch command or a bolt in a bolt command

Command built correctly?

Yes

9 Bad user build of command

Invalid Command, Framing Error, or Checksum error indicated for same controller with previous error?

No

Yes

18

13 △MCC-H - Failed controller (internal component/software). Should repeat Prep for Demate following CPA R&R.

17

11 △MCC-H

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14 △MCC-H - unexplained cmd problems.

15 Apparent Transmission/transient error. Can return to nominal procedure.

16 Resume Ops

- Return to procedure.
- Repeat last cmd as required

17

9 Bad user build of command

Invalid Command, Framing Error, or Checksum error indicated for same controller with previous error?

No
17 Verify Error Type

Is controller identified in Block 1 the latch controller on the CPA identified as master?

Yes

19 Record Positions

'Capture Latch Status'
- Record positions L1____, L2____, L3____, L4____

'Powered Bolt Status'
- Record positions B1-1____, B1-2____, B1-3____, B1-4____, B2-1____, B2-2____, B2-3____, B2-4____, B3-1____, B3-2____, B3-3____, B3-4____, B4-1____, B4-2____, B4-3____, B4-4____

20 Reset Failed Controller

'Commands by Type'
- sel Template

CBM Template Commands
- sel CBM Nonactuation Templates

CBM Reset One Controller Template
- pick: Subsystem ID 1 – (controller from block 1)
- cmd Initiate Execute

'Confirmation Request'
- Override Reset Command?
- cmd Yes Execute
- Wait 20 seconds

Node 1 XXX CBM Display

'CBM Status'
- Master Cmd Status – Complete

Capture Latch Status
- sel Built In Test Failures

Node 1 CBM Active Built In Test Failures
- - no Xs

Is BIT failure still present?

Yes

21 MCC-H - unexplained background BIT problems. Will likely replace CPA and repeat Prep for Demate.

22 Apparent transient problem (monitor for recurrence).

(NO. 1 CBM POSITION RELOAD – PREP FOR MATE)

(ASSY MAL: MAL: CBM)

3 Depending on nature of background BIT fault may choose not to use this controller as a master controller (if it is a latch).
Unless otherwise indicated, all blocks with display checks begin with:

Node 1 XXX CBM Display

Select current 485 channel to avoid changing channels; i.e. if currently using 485 A channel, select Ch A.

Set Shaft Angle ‘Y’ using position recorded in original malfunction for Latch ‘Z’, which was deploying at the time of failure.

Fail Prior to Deploy

• Did failure occur prior to first Deploy to 210 (prior to initiation of command)?

Yes ➔ 2 Latch Position Check

Are all four capture latches fully deployed?

No ➔ 6 Fail During Deploy

Did failure occur during Deploy to 210 Degrees command?

Yes ➔ 7 Reload Latch Position for 1 Latch Position

Commands by Type’
• sel Template

‘CBM Template Commands’
• CBM Nonactuation Templates’
• sel Set Latch Angles

‘CBM Set Latch Angles Template’
• set: Controller Count: 1
• pick: Last Cmd - Stop
• pick: RS485 Channel – A(B)
• set: Shaft Angle 17: Y deg
• set: Shaft Angle 18-20: 0 deg
• pick: Controller 17: Latch Z
• pick: Controller 18-20: Null Device
• cmd Set Execute

‘Node 1 XXX CBM Display’
• ‘CBM Status’
• ‘Master Cmd Status - Complete’
• ‘Capture Latch Status’
• ‘Latch Z Cmd Code – Complete’
• ‘Latch Z Cmd Status – Complete’

No ➔ 3 Latch Reload Check

Have capture latch positions been set to 202 degrees?

Yes ➔ 8 Resume Ops

• Return to nominal procedure
• Repeat last command if it did not complete successfully

No ➔ 4 Latch Position Check

Have all four capture latches completed capture?

Yes ➔ 3 Latch Position Check

No ➔ 5 Resume Ops

Yes ➔ 11 Latch Position Check

• Return to nominal procedure
• Repeat last command if it did not complete successfully
4. Select current 485 channel to avoid changing channels; i.e., if currently using 485 A channel, issue template using Ch A. Set Shaft Angle 'Y' using positions recorded in original malfunction for each latch.

5. Select current 485 channel to avoid changing channels; i.e., if currently using 485 A channel, select 485 Ch A.
This malfunction is written assuming the Node 1 Forward CBM is being operated. It is also valid for any other Node 1 CBM. For use on other Node 1 CBMs, replace Forward with the appropriate location in display callouts and advisories.

Specific RPCM callouts are for Node 1 Forward CBM. For other Node 1 CBMs, insert appropriate labels.

Unless otherwise indicated, all blocks with display callouts begin on:

Node 1 Forward CBM Display

Failure signature not previously seen in CBM testing/flight experience. Consult with MCC regarding failure before proceeding.
This malfunction is written assuming the Node 1 Forward CBM is in use. It is valid for any other Node 1 CBM. For use on other Node 1 CBMs, replace Forward with the appropriate Node 1 location in display callouts.

Unless otherwise indicated all blocks begin with Node 1 Forward CBM Display.

Failure of RPC to open/close not covered since no nominal open/close ops during mate procedures.
Set Positions/Angles “Y” per values recorded in block 1. Select current 485 channel to prevent changing channels; i.e., if currently on 485 A channel, select A channel. If any bolt controller is masked, omit that controller and duplicate the entry for a good controller to keep 16 bolts in the command. If any latch controller is masked, omit the latch controller and decrement the Controller Count.

6 Reactivate CBM On Same Bus

- 'Commands by Task'
  - sel Prep for Mate
  - cmd Activate CB-GNC-2(1) Master Controller Execute

Node 1 Forward CBM Display

'CBM Status'
- \textbackslash Mode – Activated
- \textbackslash Master – CB-GNC-2(1)
- \textbackslash Comm Error – no X

7 Determine RS 485 Channel

Was 485 Channel A in use when power loss occurred?

8 Select 485 Channel A

- 'Commands by Type'
  - sel Prebuilt
  - sel Set Last State

CBM Prebuilt Cmds

CBM Set Last State Cmds

- cmd Select 485 Ch A Execute

Node 1 Forward CBM Display

'CBM Status'
- \textbackslash 485 Channel - A

9 Clear 485 Errors

- cmd Stop Execute (from any cmd window)

Node 1 Forward CBM Display

'CBM Status'
- \textbackslash 485 Timeout – no X
- \textbackslash Powered Bolt Status'
- \textbackslash Cmd Status (sixteen) – Complete
- ‘Capture Latch Status’
- \textbackslash Cmd Status (four) – Complete

Does any controller have a Cmd Status of No Broadcast?

10 Repeat block 9 to clear No Broadcast indications.

11 Reload All Positions

- 'Commands by Type'
  - sel Template

CBM Template Commands

'CBM Nonactuation Templates'
- sel Set All Positions

CBM Set All Positions Template

- set: Controller Count: 20
- pick: Last Cmd - Stop
- pick: RS485 Channel – A(B)
- set: Shaft Position 1-16: “Y” rev
- set: Shaft Angle 17-20: “Y” deg
- pick: Controller 1-20: Bolt 1-1, 2-1, 3-1, 4-1, 1-2, 2-2, 3-2, 4-2, 1-3, 2-3, 3-3, 4-3, 1-4, 2-4, 3-4, 4-4, Latch 1, 2, 3, 4

- cmd Set Execute

Node 1 Forward CBM Display

'CBM Status'
- \textbackslash Master Cmd Status - Complete
- \textbackslash Powered Bolt Status’
- \textbackslash Cmd Code (sixteen) – Reload
- \textbackslash Cmd Status (sixteen) – Complete
- \textbackslash Posn (fifteen) – “Y” rev
- ‘Capture Latch Status’
- \textbackslash Cmd Code (four) – Reload
- \textbackslash Cmd Status (four) – Complete
- \textbackslash Posn (four) – “Y” deg

12 Resume Ops

- Return to nominal procedure.
- Repeat last command if it did not complete successfully.
This malfunction is written for Node 1 Forward CBM. It is valid for any other Node 1 CBM by replacing Forward with the appropriate Node 1 location in display callouts.

Unless otherwise indicated all blocks begin with Node 1 Forward CBM Display.

‘CBM Graphic’ refers to the schematic representation at the bottom of Node 1 Forward CBM Display.

Due to many potential problems resulting from disconnects between the two NCS MDMs, MCC-H in this situation. MCC-H will run through the Prep for Mate 1553 Comm Loss as quickly as possible, and provide instructions for recovery.

Do not use the master controller on the bus which experienced the comm loss unless detailed troubleshooting (per Prep for Demate 1553 Comm Loss) is competed. This ensures all SPNs and 1553 polling problems are resolved (can result in further MDM and CBM problems.)
### CBM NODE 1 CBM 1553 COMM LOSS - DEMATE

**ASSY MAL/5A/FIN**

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<td>If previous failures exist, they may influence selection and availability of master, 1553 bus, or 485 channel.</td>
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<td>'Comm Error – No X'</td>
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- **Was activation successful?**
  - Yes
  - No

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<th>Clear No Broadcast Indications</th>
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<td>'Cmd Code (sixteen) – Stop'</td>
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<tr>
<td>15</td>
<td>'Cmd Status (sixteen) – Complete'</td>
</tr>
</tbody>
</table>

- **Was activation successful?**
  - Yes
  - No

| 8 | 485 timeouts or new BIT failures may exist. Stop may generate a master Cmd Status of Abort, but will still clear all No Broadcast indications. |

| 9 | 485 timeouts or new BIT failure may exist. Stop may receive a master Cmd Status of Abort, but will still clear all No Broadcast messages. |

<table>
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<th>Remask Controllers</th>
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<td>For each previously masked bolt/latch:</td>
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<td>Controller X Details</td>
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<td>'Powered Bolt Status'</td>
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<td>19</td>
<td>'Comm Error – No X'</td>
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- **Was activation successful?**
  - Yes
  - No

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<table>
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<tr>
<td>11</td>
<td>MCC-H</td>
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<th>Check for New Errors</th>
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<tr>
<td>13</td>
<td>'Built In Test Failures'</td>
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<td>•√ no left of Built In Test Failures button</td>
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<td>15</td>
<td>'CBM Graphic'</td>
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<tr>
<td>16</td>
<td>•√ no</td>
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  - No

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<tr>
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<td>Repeat Malfunction Procedure</td>
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<th>Resume Operations</th>
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<td>• Return to nominal procedure.</td>
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<td>16</td>
<td>• Repeat last command if it did not complete successfully.</td>
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23 AUG 00

154
Set Positions/Angles
“Y” per values recorded in block 1. Select current 485 channel to prevent changing channels, i.e. if currently on 485 A channel, select A channel. If any bolt controller is masked, omit that controller and duplicate the entry for a good controller to keep 16 bolts in the command. If any latch controller is masked, omit the latch controller and decrement the Controller Count.

If a new failure indication appeared following activation, block 11 did not set the position for that controller. If this failure is later cleared, (and use of this bolt or latch is required,) the position will need to be set using the Set Bolt Positions or Set Latch Angles template.
Connector will be PTBD for primary power and JTBD for secondary power. Connector should have TBD pins in positions TBD.

14 CPA EMI filter suspect - can resume operations but will switch to redundant RPC for this CPA since EMI is suspect. Should remain on the redundant RPC for the remainder of the procedure.

15 Switch to Redundant RPC

16 Switch to Redundant RPC

17 MCC-H - CPA failed
Will likely need to perform contingency reberth to allow CPA R&R.

21 MCC-H - CPA EMI failed - Will likely need to perform contingency reberth to allow CPA R&R.

22 Controller cable problem (now fixed)
23 Cables Removed
Have CPA connections been disconnected or in crew translation path since last checkout?

Yes

27 Inspect Cables

‘CBM Graphic’
- sel RPC powering CPA with 485 error
RPCM_N1YY_RPC_ZZ
- Verify Load – N1 XXX CBM Pri(Sec) Y
- cmd RPC Position - Open
- RPC Position – Op
- cmd Close Cmd - Inhibit
- RPC Position – Cl
- cmd Stop Execute (from any cmd window)
Are 485 timeouts still indicated?

No

Yes

24 Startup
Was failure indicated during initial CBM activation?

No

Yes

25 Cycle RPC
‘CBM Graphic’
- sel RPC powering CPA with 485 errors
RPCM_N1YY_RPC_ZZ
- Verify Load – N1 XXX CBM Pri(Sec) Y
- cmd RPC Position - Open
- RPC Position – Op
- cmd RPC Position Close
- RPC Position – Cl
Node 1 XXX CBM Display
- cmd Stop Execute (from any cmd window)
‘CBM Status’
- 485 Timeout – blank
Are 485 timeouts still indicated?

26 Cycle RPC - Fast
‘CBM Graphic’
- sel RPC powering CPA with 485 error
RPCM_N1YY_RPC_ZZ
- Verify Load – N1 XXX CBM Pri(Sec) Y
- cmd RPC Position - Open
- RPC Position – Op
The following RPC command sequence (3 cmds) should be completed within a minute
- cmd RPC Position - Close
- RPC Position – Cl
- cmd RPC Position - Open
- RPC Position – Op
- cmd RPC Position Close
- RPC Position – Cl
Node 1 XXX CBM Display
- cmd Stop Execute (from any cmd window)
‘CBM Status’
- 485 Timeout – blank
Are 485 timeouts still indicated?

27 Cycle RPC
‘CBM Graphic’
- sel RPC powering CPA with 485 errors
RPCM_N1YY_RPC_ZZ
- Verify Load – N1 XXX CBM Pri(Sec) Y
- cmd RPC Position - Open
- RPC Position – Op
- cmd RPC Position Close
- RPC Position – Cl
Node 1 XXX CBM Display
- cmd Stop Execute (from any cmd window)
‘CBM Status’
- 485 Timeout – blank
Are 485 timeouts still indicated?

30 Switch to Redundant RPC
‘CBM Graphic’
- sel RPC powering CPA with 485 error
RPCM_N1YY_RPC_ZZ
- Verify Load – N1 XXX CBM Pri(Sec) Y
- cmd RPC Position - Open
- RPC Position – Op
Node 1 XXX CBM Display
- sel redundant RPC for same CPA
RPCM_N1YY_RPC_ZZ
- cmd RPC Position - Close
- RPC Position – Cl
Node 1 XXX CBM Display
- cmd Stop Execute (from any cmd window)
‘CBM Status’
- 485 Timeout – blank
Are 485 timeouts still indicated?

31 Slave power-up failure due to internal controller short. Resume nominal ops.

32 Slave controller power card failure on 1 power channel. Should use the current RPC for this CPA for remainder of procedure.

33 Idle Time
Wait ~1 hour (with CBM powered)

34 Fast Power Cycle
- Repeat cmds (and notes) in block 31 (using the currently selected RPC)
Did 485 timeout clear?

No

Yes

35 MCC-H - Slave controller failed. Will likely need to perform contingency reberth to allow CPA R&R.
36 Switch Masters on Same Bus
Node 1 XXX CBM Prep for Demate
- cmd Deactivate Execute
Node 1 XXX CBM Display
- 'CBM Status'
  - 'Mode' - Deactivated
  - 'CBM Graphic'
- sel N1-1(2) MDM
- sel CB_GNC_1(2)
- sel Bus Status
- CB_GNC_1(2)_Bus_Status
  - 'Channel Selected' - B(A)
  - cmd Select Channel A(B)
  - 'Channel Selected' - A(B)
Node 1 XXX CBM Prep for Demate
- cmd Activate CB-GNC-1(2)
Master Controller Execute
Node 1 XXX CBM Display
- 'CBM Status'
  - 'Mode' - Activated
  - 'Master' - CB-GNC-1(2)
  - cmd Stop Execute (from any cmd window)
    - 'Powered Bolt Status'
  - 'Cmd Status' - Complete
    - 'Capture Latch Status'
  - 'Cmd Status' - Complete
  - Repeat Stop cmd up to 5 times to clear No Broadcast indications

485 Timeout on previous master only?

Yes

41 MCC-H - 485 card failure on previous master.
Will likely need to perform contingency reberth to allow CPA R&R.

No

37 Verify 485 Status
- 'CBM Status'
  - '485 Timeout - no X 485 timeout(s) indicated?'

Yes

39 485 Channel
- 'CBM Status'
  - '485 Channel - Does 485 channel match channel recorded in box 9?'

No

42 Assess 485
- 485 timeout on previous master only?
- 485 timeout on 19 or 20 controllers?

None of the above

38 Switch Masters on Same Bus
Node 1 XXX CBM Prep for Demate
- cmd Deactivate Execute
Node 1 XXX CBM Display
- 'CBM Status'
  - 'Mode' - Deactivated
  - 'CBM Graphic'
- sel N1-1(2) MDM
- sel CB_GNC_1(2)
- sel Bus Status
- CB_GNC_1(2)_Bus_Status
  - 'Channel Selected' - B(A)
  - cmd Select Channel A(B)
  - 'Channel Selected' - A(B)
Node 1 XXX CBM Prep for Demate
- cmd Activate CB-GNC-1(2)
Master Controller Execute
Node 1 XXX CBM Display
- 'CBM Status'
  - 'Mode' - Activated
  - 'Master' - CB-GNC-1(2)
  - cmd Stop Execute (from any cmd window)
    - 'Powered Bolt Status'
  - 'Cmd Status' - Complete
    - 'Capture Latch Status'
  - 'Cmd Status' - Complete
  - Repeat Stop cmd up to 5 times to clear No Broadcast indications

40 Switch 485 Channel
- 'CBM Status'
  - '485 Channel - A(B)
  - Record 485 Channel: ____
  - 'Commands by Type'
    - sel Prebuilt
      - CBM Prebuilt Commands
        - sel Set Last State ...
      - CBM Set Last State Cmds
        - cmd Set Last State to Stop 485 Ch B(A) Execute
Node 1 XXX CBM Display
- 'CBM Status'
  - '485 Channel - B(A)

43 MCC-H - 485 card channel failure for a master/latch (or open circuit inside CPA)
Will likely need to perform contingency reberth to allow CPA R&R.

44 MCC-H - multiple failures

45 MCC-H - 485 Bus channel failed - short on channel.
Will likely need to perform contingency reberth to allow restoration of 485 bus channel.
Only change 1553 channel if required to enable the latch controller with timeout to communicate with MDM.

Cable JTBD

57 Yes No

79

58 MCC-H - Slave controller suspect on one 485 channel due to 485 card. Should repeat Prep after CPA R&R.

55

161

14 AUG 00

8409.doc
Connector will be PTBD. If currently on 485 A channel, use Set Last State to Stop Ch B command, and vice versa.

Connector failure in JTBD.

Connector failure in JTBD.

MCC-H to attempt recovery with a power cycle.

MCC-H - Failed slave controller (component failure.)
Will likely need to perform contingency reberth to allow CPA R&R.

MCC-H - 1 CPA failed for CBM Ops.
Will likely need to perform contingency reberth to allow CPA R&R.

14 AUG 00
If a CBM 485 bus has an open circuit it can still be used. A master can talk to any controllers between itself and the open circuit (and thus any master on other side of open can talk to any of the other controllers.)
79 Verify Command Status
   ‘Powered Bolt Status’
   • √Cmd Status (sixteen) – Complete or In Progress
   ‘Capture Latch Status’
   • √Cmd Status (sixteen) – Complete or In Progress
   Any controller have a Cmd Status of No Broadcast?
   Yes No

80 Clear 485 Errors
   • cmd Stop Execute (from any command window)
   ‘Powered Bolt Status’
   • √Cmd Status (sixteen) – Complete or In Progress
   ‘Capture Latch Status’
   • √Cmd Status (sixteen) – Complete or In Progress
   • Repeat Stop Cmd as required all until No Broadcasts cleared.

81 Reload All Positions
   ‘Commands by Type’
   • sel Template
     CBM Template Commands
     ‘CBM Nonactuation Templates’
     • sel Set All Positions
     CBM Set All Positions Template
     • set: Controller Count: 20
     • pick: Last Cmd - Stop
     • pick: RS485 Channel – A(B)
     • set: Shaft Position 1-16: “Y” rev
     • set: Shaft Angle 17-20: “Y” deg
     • pick: Controller 1-20: Bolt 1-1, 2-1, 3-1, 4-1, 1-2, 2-2, 3-2, 4-2, 1-3, 2-3, 3-3, 4-3, 1-4, 2-4, 3-4, 4-4, Latch 1, 2, 3, 4
     • cmd Set Execute
     Node 1 XXX CBM Display
     ‘CBM Status’
     • √Master Cmd Status - Complete
     ‘Powered Bolt Status’
     • √Cmd Code (sixteen) – Reload
     • √Cmd Status (sixteen) – Complete
     • √Posn (fifteen) – “Y” rev
     ‘Capture Latch Status’
     • √Cmd Code (four) – Reload
     • √Cmd Status (four) – Complete
     • √Posn (four) – “Y” deg

82 Resume nominal operations.
Cmd rejection is an NCS software response that should only be set if the NCS software considers the CBM to be in the deactivated state.

The signature leading to the yes leg of this block could be caused by a command build, 1553 bus, or master problem. If bus problems (i.e., random errors, multiple bus errors, command errors on multiple commands, etc.) are seen, \( \text{MCC-H} \).

Identify Cmd Error

- CBM Status
  - Cmd Rejected Flag – blank
- Is Command Rejected indicated?
  - No
  - Yes

Verify Command Response

- Was there an end-item response to the issued command?
  - Yes
  - No

Verify Error Conditions

- CBM Status
  - Record Master Cmd Error – ______
- cmd Stop Execute (from any CBM command window)
- ‘CBM Status’
  - Master Cmd Status – Complete
  - Master Cmd Error – “blank”
  - Powered Bolt Status
  - Cmd Code (sixteen) – Stop
  - Capture Latch Status
  - Cmd Code (four) – Stop
- Master cmd error indicated?
  - No
  - Yes

Activate Master on Redundant Bus

- Node 1 Forward CBM Display
  - ‘Commands by Task’
  - ‘sel Prep for Mate’
- cmd Activate CB-GNC-1(2) Master Controller Execute

Node 1 Forward CBM Display

- CBM Status
  - Mode – Activated
  - Master – CB-GNC-1(2)
- cmd Stop Execute (from any CBM command window)

Node 1 Forward CBM Display

- CBM Status
  - Master Cmd Status - Complete
  - Master Cmd Error - blank
- Is Master Cmd Error indicated?
  - Yes
  - No

Verify 1553 Communication

- CBM Status
  - Mode – Activated
  - Comm Error – no “X”
- Is CBM Deactivated?
  - No
  - Yes

CMD rejected since sent without an active CBM.

MCC-H - NCS software problem.
If time permits, can have MCC-H verify instance command structure from Command Inventory using criteria in block 19.

MCC-H for detailed instructions for building each CBM template. These are found in the OSO Console Handbook section 4.1.8.7.

Initialize Template (Latch Angles or Bolt positions) can be used in place of a Set Positions/Angles template if that template is corrupt (only available in MCC).

14 Tmplt Availability
Is a template cmd available to perform step?

15 Build Cmd & Resume Ops
• MCC-H for instructions to build template for erroneous command. Return to nominal procedure substituting this template for each instance of the erroneous cmd

16 Verify Template Build
• For latch commands, verify speed limit less than or equal to 1 RPM. For bolt commands, verify current threshold less than or equal to 160 N-M.
• Verify Controller Count is correct and that there are no Null Devices listed within the controllers identified by this Controller Count.
Did cmd contain incorrect values?

17 Alternate Method
• MCC-H - alternate method must be found to accomplish this malfunction operation. (All nominal CBM commands in procedure have a corresponding template.)

18 Bad user build of command.

19 Reattempt Template
• Reattempt procedure step/cmd which resulted in error
Did command generate a Master Cmd Error?

20 Erroneous cmd build (std-out or user).

21 Build Cmd & Resume Ops
• Rebuild template. Return to nominal procedure repeating last step as required

22 One-time transmission failure on 1553 bus. Can resume nominal procedure.

23 Alternate method
• MCC-H - Do not use this template structure again. Alternate method must be found to accomplish this malfunction operation if required (All nominal CBM commands in procedure are instantiations). Cmd from scratch is not recommended, but can be an acceptable alternative if this is only command to support a critical CBM operation.
24 Verify 1553 Communication
   ‘CBM Graphic’
   • √ Time Code – incrementing each minute
   Is Time Code incrementing?
   Yes
   No

25 No end item response since command sent without an active CBM.

27 Verify Error Conditions
   • cmd Stop Execute (from any CBM command window)
   Node 1 Forward CBM Display
   ‘CBM Status’
   • √ Master Cmd Status – Complete
   ‘Powered Bolt Status’
   • √ Cmd Code (16) – Stop
   ‘Capture Latch Status’
   • √ Cmd Code (4) – Stop
   Did command complete successfully?
   Yes
   No

28 One-time transmission failure on 1553 bus. Can resume nominal procedure. Should repeat last step in procedure if did not complete.
This malfunction is written for use on any Node 1 CBM. Replace XXX with appropriate location in display callouts.

Unless otherwise indicated, all blocks with display callouts begin with

Node 1 XXX CBM Display

---

1. Identify Error Type
   - 'CBM Graphic'
     - sel controller with (for RTL open latch detail)

2. RTL or Capture Switch indicates Short Circuit or Open Circuit?
   - Record:
     - Error - Controller - 
   - Does RTL or Capture Switch failed (Circuit or Physical failure)?
     - MCC-H – may perform contingency reberth to R&R RTL of latch

3. Identify Error Type
   - Controller X Details
     - 'Invalid Command - no X'

4. Template
   - Was command a template?

5. Reverify Template
   - Reverify all template cmd variables. Extra focus should be spent on:
     - Controller Count = total number of IDs listed in command
     - No Null values in values within Controller counts
     - All Controllers are for a latch in a latch command or a bolt in a bolt command
   - MCC-H – may perform contingency reberth to R&R RTL of latch

6. Identify Error Type
   - Controller X Details
     - 'Framing Error - no X'

7. Command Check
   - cmd Stop Execute (from any CBM cmd window)
     - 'CBM Status'
     - 'Master Cmd Status – Complete CBM Graphic'
     - If present - open detail window and confirm error

8. Identify Error Type
   - Controller X Details
     - 'Background Status'

9. Bad user build of command
   - Validate build of command

10. Resume Ops
    - Build command with proper values and return to procedure.

11. Retransmit Failed Command
    - Resend Command that previously generated command error

12. Did command complete successfully?
    - MCC-H

13. Failed controller (internal component/software).
    - MCC-H – will likely perform contingency reberth to R&R CPA.


16. Resume Ops
    - Return to procedure. Repeat last cmd as required
17 Verify Error Type
Is controller identified in Block 1 the latch controller on the CPA identified as master? 

Yes

No

19 Record Positions
‘Capture Latch Status’
- Record positions
  L1, L2, L3, L4

‘Powered Bolt Status’
- Record positions
  B1-1, B1-2, B1-3, B1-4,
  B2-1, B2-2, B2-3, B2-4,
  B3-1, B3-2, B3-3, B3-4,
  B4-1, B4-2, B4-3, B4-4

20 Reset Failed Controller
‘Commands by Type’
- sel Template
  CBM Template Commands
  ‘CBM Nonactuation Templates’
  - sel Reset One Controller
    CBM Reset One Controller Template
    - pick: Subsystem ID 1 – (controller from block 1)
    - cmd Initiate Execute
      ‘Confirmation Request’
      - Override Reset Command?
      - cmd Yes Execute
      - Wait 20 seconds

Node 1 XXX CBM Display
‘CBM Status’
- √ Master Cmd Status – Complete
  ‘Capture Latch Status’
  - sel Built In Test Failures

Node 1 CBM Active Built In Test Failures
- √ - no Xs
  Is BIT failure still present?

Yes

3

No

21 MCC-H
unexplained background BIT problems. Will likely perform contingency rebirth to replace CPA if error prevents controller from actuating.

22 Apparent Transient problem (monitor for re-occurrence).

23 MCC-H
for instructions on reloading position of controller
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<td>2</td>
<td>Determine Which DECOM FDA Indicating Fail</td>
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<td>If Required, Select B/U DECOM Configuration</td>
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<td>Continue nominal operations.</td>
</tr>
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<td>16</td>
<td>Continue nominal operations.</td>
</tr>
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<td>17</td>
<td></td>
</tr>
</tbody>
</table>

**Nominal Config:**

- (A1L) PL DATA INTLVR PWR – ON
- S-BD PL PWR SYS – 1(2)
- S-BD PL PWR SEL – PSP
- S-BD PL PSP CMD OUTPUT – UMB
- OIU (R1) PL CAB – MNB (MNA) PL AUX – ON
- (SSP1) OIU PWR – OIU 1(2) ON (tb-UP(DN))

**SM ALERT**

**S62 PDI DECOM FAIL**

(S212 OIU AD 1 NOLK/LOSS OF NODE MDM TELEMETY), block 1 (SODF: ASSY MAL: MAL: COMM) or 2.4g S62 PDI DECOM FAIL (FDF, MAL, COMM)
TCS and SSV not addressed in MAL; FDA not nominally enabled.

Alternate (OIU 2) requires PSP 2.
SM 212 OIU TEMP

Nominal Config:
(R1)
PL CAB – MNB
(MNA)
PL AUX – ON
(SSP 1)
OIU PWR – OIU 1(2) ON (tb–UP(DN))

OIU TEMP ↑
(ASSY MAL/5A/FIN)

1. [SM 212 OIU]
   OIU 1(2) TEMP?
   No

2. Yes
   AOS or LOS?
   AOS

3. No
   MCC

4. LOS
   • Select OIU 2(1)
   (SSP1)
   • OIU PWR – OIU 2(1) ON
   (tb-DN(UP))

5. Switch to PSP 2(1)
   (A1L)
   • S-BD PL CNTL – CMD
   • S-BD PSP CMD OUTPUT – PL UMB
   • S-BD PWR SYS – 2(1)
   • S-BD PWR SEL – PSP
   • S-BD PL CNTL – PNL.CMD
   • Expect ‘S62 BCE BYP PSP 1(2)’
   S62 PCMMU/PL COMM
   • I/O RESET PSP 2(1) – ITEM 7(6) EXEC

6. Configure PDI for OIU 2(1)
   • sel DECOM – ITEM 9 +X EXEC
   • sel INPUT – ITEM 12 +2(1) EXEC
   • LOAD – ITEM 13 EXEC

7. If Required, Load OIU FMT and Configuration
   • MCC for correct OIU FMT/CONFIG
   • Perform LOAD OIU FMT/CONF (FDF, ORB OPS FS, COMM/INST), then:

8. • Continue nominal operations.

17 AUG 00
Loss of Node Telemetry on MCDS Displays, Static Frame Counter

Nominal Config:
(R1)
PL CAB – MNB
(MNA)
PL AUX – ON
(SSP 1)
OIU PWR – OIU 1(2)
ON (tb–UP(DN))
One PCS connected to N1-2 MDM

1
S212 OIU AD 1 NOLK

SM 62 PCMMU/PL COMM
• PDI DECOM for OIU is locked
OIU DECOM locked?
Yes
No
(S62 PDI DECOM FAIL), all (SODF: ASSY MAL: MALFUNCTION: COMM)

2
SM 212 OIU
• OIU SYNC
AD 1 LOCK – YES?
Yes
No
(S62 PDI DECOM FAIL), block 5
(SODF: ASSY MAL: MALFUNCTION: COMM)

3
• Momentary loss of node telemetry.

5
• MDM status using PCS
PCS CDS Main Control Panel Window
• sel Connect To MDM icon
Is MDM connected status box green?
Yes
No
• Node MDM status

7
Resync OIU to Node MDM; Reload OIU FMT 002
• Item 1 + 0 0 2 EXEC
AD 1 LOCK – YES?
Yes
No
(LOSS OF PCS TELEMETRY), all (SODF: C&DH: MALFUNCTION: PCS)

8
• Momentary loss of node telemetry.

9
Cycle OIU Power
(SSP1)
• OIU PWR – ctr (tb-bp)
• OIU PWR – OIU 1(2) ON (tb-UP(DN))
• For NODE MDM, perform LOAD OIU FMT/CONFIG, all (FDF, ORB OPS FS, COMM/INST), then:
AD 1 LOCK – YES?
Yes
No

10 Internal OIU logic lock up.

11
• Continue nominal operations.

12 OIU 1(2) BIA failure.

13

S212 OIU AD 1 NOLK/LOSS OF NODE MDM TELEMETRY
(ASSY MAL/5A/FIN)
13 Swap to OIU 2(1)

(SSP1)
- OIU PWR – OIU 2(1) ON
  (tb-DN(UP))

14 Switch to PSP2(1)

(A1L)
- S-BD PL CNTL – CMD
- S-BD PL PSP OUTPUT – PL UMB
- S-BD PL PWR SYS – 2(1)
- S-BD PL PWR SEL – PSP
- S-BD PL CNTL – PNL.CMD

- Expect 'S62 BCE BYP PSP 1(2)'

S62 PCMMU/PL COMM
- I/O RESET PSP 2(1) – ITEM 7(6) EXEC

15 Configure PDI for OIU 2(1)

- sel DECOM – ITEM 9 +X EXEC
- sel INPUT – ITEM 12 +2(1) EXEC
- LOAD – ITEM 13 EXEC

16 Load OIU Fmt

- For Node MDM, perform LOAD OIU FMT/CONF
  (FDF, ORB OPS FS, COMM/INST), then:

17 SM 212 OIU

- OIU SYNC

AD 1 LOCK – YES?

No

Yes

18 MCC

19 Continue nominal operations.
No response to OIU Configuration or Routed Commands

Nominal Config:
(A1L)
S-BD PL CNTL – CMD
S-BD PL PWR SYS – 1
S-BD PL PWR SEL – PSP
S-BD PL PSP CMD OUTPUT – PL UMB
(SSP1)
OIU PWR – OIU 1(2) ON (tb-UP(DN))
(R1)
PL CAB – MNB (MNA)
PL AUX – ON

1 Request PSP Dummy CMDs
- MCC will uplink PSP Dummy CMDs and verify telemetry.
- PSP Dummy CMD 2 (then 1)
- PSP CONFIG ID 2(1)
- UMB 1
- No SM/PSP LOAD errors
- PSP I/F to OIU OFF(ON)

MCC CMD successful?

2 Power Cycle PSP 1(2)
(A1L)
- S-BD PL CNTL – CMD
- S-BD PL PWR SYS – OFF
- S-BD PL CNTL – PNL
- S-BD PL PWR SYS – 1(2)
- S-BD PL CNTL – CMD

Expect 'S62 BCE BYP PSP 1(2)'

SM 212 PCMMU/PL COMM
- I/O RESET PSP 1(2) – ITEM 6(7) EXEC

3 OIU CMD

SM 212 OIU
- BUS 2 A – *(ITEM 8)
- BUS 2 B – ITEM 9 EXEC (*)

CMD successful?

4 Transient PSP 1(2) failure.

5 Determine Current OIU FMT

SM 212 OIU
- FMT (ITEM 1), and log____

6 Return BUS 2 to Nominal Configuration

SM 212 OIU
- BUS 2 A – ITEM 8 EXEC (*)

7 Pwr Cycle OIU 1(2)

On MCC GO
(SSP1)
- OIU PWR – ctr, then
- OIU PWR – OIU 1(2) ON
- OIU tb – UP(DN)
- Expect 'S62 PDI DECOM FAIL'

On MCC GO
(SSP1)
- OIU PWR – ctr, then
- OIU PWR – OIU 1(2) ON
- OIU tb – UP(DN)
- Expect 'S62 PDI DECOM FAIL'

8 Continue nominal operations.

9 OIU FMT block 5 = 255?

10 22 AUG 00 179

5440.doc
Determine Affected DECOM

SM 62 PCMMU/PL COMM
- DECOM indicating (↑), and log __

Try OIU CMD

SM 212 OIU
- BUS 2 B – ITEM 9 EXEC (*)
  CMD successful?

Transient OIU 1(2) failure.

Return BUS 2 to Nominal Configuration

SM 212 OIU
- BUS 2 A – ITEM 8 EXEC (*)

- Continue nominal operations.

Yes
No

Yes
No

Continue nominal operations.
Power cycle will place OIU in Format 255. OIU Station TLM will be lost until OIU CMD recovered. OIU H&S TLM will also be lost if PDI is not configured for OIU FMT 255.

17 Switch to OIU 2(1)

On MCC GO
(SSP1)
- OIU PWR – OIU 2(1) ON
- OIU tb – DN(UP)

Expect ‘S62 PDI DECOM FAIL’

Switch to PSP 2(1)
(5L)
- S-BD PL CNTL – CMD
- S-BD PL PWR OUTPUT – PL UMB
- S-BD PL PWR SYS – 2(1)
- S-BD PL SEL – PSP
- S-BD PL CNTL – PNL,CMD

Expect ‘S62 BCE BYP PSP 1(2)’

SM 62 PCMMU/PL COMM
- I/O RESET PSP 2(1) – ITEM 7(6) EXEC (*)

Config PDI for OIU 2(1)
- sel DECOM – ITEM 9 +X EXEC
- sel INPUT – ITEM 12 +2(1) EXEC
- LOAD – ITEM 13 EXEC

OIU FMT block 5 = 255?

No 23

Yes

18 SM 212 OIU
- BUS 2 B – ITEM 9 EXEC (*)

CMD successful?

Yes

No 19 PSP 1(2) to OIU 1(2) interface failure.

20 Return BUS 2 to Nominal Configuration

SM 212 OIU
- BUS 2 A – ITEM 8 EXEC (*)

22 • Continue nominal operations.

23 • OIU CMD by Attempting to Load Original OIU FMT

SM 212 OIU
- ITEM 1 +X X X EXEC, where X X X is original OIU FMT logged in block 5
- PDI DCM SYNC for affected DECOM

All three 'B', 'W', 'F' columns display an 'X'?

No 24

Yes

25 PSP 1(2) to OIU 1(2) interface failure.

26 • Continue nominal operations.
## ACTION A
If ‘I/O ERROR PL1’ message
- Loss of primary ground and crew interface to ISS via PSP 1/OIU 1.
  - If failure at IOP XMTR/RCVR at SM GPC, port mode to select PL2.

If ‘I/O ERROR PL2’ message
- Loss of secondary ground and crew interface to ISS via PSP 2/OIU 2.
  - If failure at IOP XMTR/RCVR at SM GPC
    - If PL1 interface with SM GPC failed, **MCC** for SM reassignment.
    - If PL2 interface with SM GPC OK, port mode to select PL1.

## ACTION B
Loss of ground and orbiter commanding to ISS via OIU 1(2).

## ACTION C
If PL1 failed, **MCC** and perform following
- If PSP 2 I/O reset not previously performed
  - **SM 62 PCMMU/PL COMM**
  - I/O RESET PSP 2 - ITEM 7 EXEC
  - Notify **MCC** when complete.

If PL1 or SM GPC recovered
- If PSP 1 I/O reset not previously performed
  - **SM 62 PCMMU/PL COMM**
  - I/O RESET PSP 1 - ITEM 6 EXEC
  - Notify **MCC** when complete.

### PROCEDURE

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<thead>
<tr>
<th>PROCEDURE</th>
<th>SECURE ACTION</th>
<th>RECOVERY ACTION</th>
<th>INFO</th>
</tr>
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<tbody>
<tr>
<td>SM OPS TRANSITION (DFD, ORB OPS, DPS)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>PL1(2) MDM I/O ERROR; PL1(2) MDM OUTPUT (DFD, ORB PKT, DPS)</td>
<td>N/A</td>
<td>A,C</td>
<td>N/A</td>
</tr>
<tr>
<td>I/O ERROR PL1(2); MDM OUTPUT PL1(2) (DFD, MAL, DPS)</td>
<td>N/A</td>
<td>A,C</td>
<td>N/A</td>
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<tr>
<td>PASS SM GPC FAIL (DFD, ORB PKT, DPS)</td>
<td>N/A</td>
<td>C,D</td>
<td>B</td>
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<tr>
<td>CS SPLIT (DFD, MAL, DPS)</td>
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<td>C,D</td>
<td>B</td>
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<tr>
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<td>N/A</td>
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<tr>
<td>I/O ERROR FLEX (DFD, MAL, DPS)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>BCE BYP FLEX (DFD, MAL, DPS)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>BCE BYP PL1(2) (DFD, MAL, DPS)</td>
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<td>A,C</td>
<td>N/A</td>
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<tr>
<td>GPC FRP-4 PASS RECOVERY AFTER BFS ENGAGE (DFD, MAL, DPS)</td>
<td>N/A</td>
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<tr>
<td>GPC FRP-7 DPS RECONFIG FOR LOSS OF AV BAY COOLING (DFD, MAL, DPS)</td>
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<td>B</td>
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<tr>
<td>DPS SSR-3 GNC REASSIGNMENT (DFD, MAL, DPS)</td>
<td>N/A</td>
<td>N/A</td>
<td>B</td>
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<tr>
<td>DPS SSR-4 SM REASSIGNMENT (DFD, MAL, DPS)</td>
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<td>C,D</td>
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<tr>
<td>ECLSS SSR-10 H2O PUMP OPS VIA GPC (DFD, MAL, ECLS)</td>
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**ACTION D**

Reload PDI DECOM FORMAT (FDF, ORB OPS FS, COMM/INST).

As required, reenable PDI DECOM FDA.

Resume SPEC 62.
## ORBITER ELECTRICAL BUS LOSS MATRIX

### ORBITER EQUIPMENT AND CARGO

<table>
<thead>
<tr>
<th>ORBITER ELECTRICAL BUSES</th>
<th>FC1</th>
<th>FC2</th>
<th>FC3</th>
<th>MNA DA1</th>
<th>MNB DA2</th>
<th>NC DA3</th>
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<td>PL1</td>
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<td>X = TOTAL LOSS OF OPERATIONAL PWR</td>
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<td>(R) = REQUIRES ACTION TO USE REDUNDANT SOURCE</td>
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<td>XC = TOTAL LOSS OF CTRL PWR</td>
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</table>

### ORBITER DC UTILITY OUTLETS

| PDIP (L12) DC1 and DC2 |     |     |     |         |         |       |
| O19 and M052J          |     |     |     |         |         |       |
| F1 and M013Q           |     |     |     |         |         |       |
| A11, A15, and M030F    |     |     |     |         |         |       |
| MUP (ML85E) J11, J12, J13 |     |     |     |         |         |       |
| MUP (ML85E) J21, J22, J23 |     |     |     |         |         |       |

### ISS EQUIPMENT

| O19 and M052J          |     |     |     |         |         |       |
| F1 and M013Q           |     |     |     |         |         |       |
| A11, A15, and M030F    |     |     |     |         |         |       |
| MUP (ML85E) J11, J12, J13 |     |     |     |         |         |       |
| MUP (ML85E) J21, J22, J23 |     |     |     |         |         |       |

### CABIN PL MNB

| CABIN PL MNB |     |     |     |         |         |       |
| AUX PL A     |     |     |     |         |         |       |
| AUX PL B     |     |     |     |         |         |       |
| PL PRI MNB   |     |     |     |         |         |       |
| PL PRI MNC   |     |     |     |         |         |       |
| PL PRI FC3   |     |     |     |         |         |       |
| AFT PL B     |     |     |     |         |         |       |
| AFT PL C     |     |     |     |         |         |       |

### X = TOTAL LOSS OF OPERATIONAL PWR

### P = LOSS OF PRIMARY PWR SOURCE

### R = LOSS OF REDUNDANT PWR SOURCE

### (R) = REQUIRES ACTION TO USE REDUNDANT SOURCE

### X = TOTAL LOSS OF CTRL PWR

### XRC = LOSS OF REDUNDANT CTRL PWR

### * = PNL ML86B.E CIRCUIT BREAKER
This Page Intentionally Blank
FC1
ESS 1BC
   CABIN PL MNA CNTRL
   AUX PL A CNTRL
   ESS1BC O13 & R14
        PMA 2/3 HOOKS – SYS A CNTRL (Redun Power Avail)
MNA DA1
   MNA O14
       O19, MO52J DC OUTLETS
       PL PRI MNC CNTRL (Redun Power)
       PL PRI FC3 CNTRL (Redun Power)
       AFT PLC CNTRL (Redun Power)
MNA MPC1
   AUX PLA
       CABIN PL1 (Redun Power Avail)
       CABIN PL2 (Redun Power Avail)
       CABIN PL3 (Redun Power Avail)

FC2
ESS 2CA
   CABIN PL MNB CNTRL
   AUX PLB CNTRL
   PL PRI MNB CNTRL (Redun Power)
   AFT PLB CNTRL (Redun Power)
   ESS 2CA O13 & R14
        PMA 2/3 HOOKS – SYS B CNTRL (Redun Power Avail)
MNB DA2
   PRI PL (Redun Power Avail)
   MNB O15
       F1, MO13Q DC OUTLETS
       PMA 2/3 HOOKS – SYS A CNTRL (Redun Power Avail)
MAR1 (ML86B)
       MUP (ML85E) DC OUTLETS J11, J12, J13
MAR2 (ML86B)
       MUP (ML85E) DC OUTLETS J21, J22, J23
MNB R14
   VPU
   MNB APC5
       MNB APC2
       AFT PLB
       SASA CRIT SPARE SIDEWALL CARRIER HTRS
MNB A6 & A14
       PMA 2/3 HOOKS – SYS B
MNB MPC2
   OSVS
   AUX PLB
   TCS
   SSP 1 FUSE 3
   OIU 2
SSP 2 FUSE 3
APCU 2 CNTRL
CABIN PL1 (Redun Power Avail)
SSP 1 CB2
APCU 1 CNTRL
SEC C/L CAMERA
CABIN PL2 (Redun Power Avail)
SSP 1 CB1
PDIP Ku BAND RATE sw
PDIP DC POWER 2 OUTLET
SSP 1 CB3
ODS X1/PMA X2 CONN MATE TLM (Redun Power)
ODS X2/PMA X1 CONN MATE TLM (Redun Power)
PDIP DC POWER 1 OUTLET
CABIN PL3 (Redun Power Avail)
SSP 1 FUSE 1
PAYLOAD TIMING BUFFER
SSP 1 FUSE 4
OIU 1
SSP 1 CB4
PRI C/L CAMERA
ODS X1/PMA X2 CONN MATE TLM (Redun Power)
ODS X2/PMA X1 CONN MATE TLM (Redun Power)

FC3
PRI PL (Redun Power Avail)
ESS 3AB
PL PRI MNC CNTRL (Redun Power)
PL PRI FC3 CNTRL (Redun Power)
AFT PLC CNTRL (Redun Power)
MNC DA3
PRI PL (Redun Power Avail)
APCU 1
US LAB HTRS
APCU 2
US LAB HTRS
MNC 016
A11, A15, MO30F DC OUTLETS
PMA 2/3 HOOKS – SYS B CNTRL (Redun Power Avail)
PL PRI MNB CNTRL (Redun Power)
AFT PLB CNTRL (Redun Power)
**ORBITER MDM LOSS IMPACTS**

(ASY MAL/5A/FIN)

Page 1 of 1 page

**FF1**
- Uplink thru NSP 1

**FF3**
- Uplink thru NSP 2

**PL1**
- ISS Cmd Path via PSP 1/OIU 1
  - APCU 1 tlm
  - OIU 1 temp
  - ODS X1/PMA X2 Conn Mate tlm
  - ODS X2/PMA X1 Conn Mate tlm

**PL2**
- ISS Cmd Path via PSP 2/OIU 2
  - APCU 2 tlm
  - OIU 2 temp
  - OSVS Interface
  - ODS X1/PMA X2 Conn Mate tlm
  - ODS X2/PMA X1 Conn Mate tlm

**OF1**
- PL BAY MECH PWR SYS 1 & 2
  - mon
- PL RETEN LOGIC PWR SYS 1 & 2
  - mon
- AUX PL MNA RPC ON tlm
- MID MCA 3 OP STATUS 1, 2, 3, 4
  - mon

**OF2**
- AUX PL MNB RPC ON tlm
- PL SEL 1 1B, 2B, 3B, 4B, 5B R-F-L
  - mon
- PL SEL 1 1B, 2B, 3B, 4B, 5B LAT
  - mon
- PL SEL 1 1B, 2B, 3B, 4B, 5B REL
  - mon
- MID MCA 1 OP STATUS 5, 6
  - mon
- MID MCA 3 OP STATUS 5, 7, 8
  - mon

**OF3**
- PL PRI MNC, MNB, FC3 ON tlm

**OF4**
- PSP Cmding
- PL RETEN PL SELECT sw mon
- CABIN PL MNA(MNB) ON tlm
- AUX PL ON tlm

**OA1**
- ODS X4/PMA X3 Conn Mate tlm
- PMA 2/3 GRP 1 Passive Hooks
  - (1,3,5), (7,9,11) Closed tlm

**OA2**
- AFT PL MNB PWR ON tlm
- AFT PL MNB amps
- ODS X3/PMA X4 Conn Mate tlm
- PMA 2/3 GRP 2 Passive Hooks
  - (2,4,6), (8,10,12) Closed tlm

**OA3**
- AFT PL MNC PWR ON tlm
- AFT PL MNC amps
- PL SEL 1 1A, 2A, 3A, 4A, 5A R-F-L
  - mon
- PL SEL 1 1A, 2A, 3A, 4A, 5A LAT
  - mon
- PL SEL 1 1A, 2A, 3A, 4A, 5A REL
  - mon

16 AUG 00
Table A. Power Connectivity by Assembly Phase

- RACU 5
- RACU 6
- RPDA N1RS1
- RPCM N1RS1-A
- RPCM N1RS1-A
- RPCM N1RS1-A
- P6 Ch. 2B
- RBI-5
- DDCU P62B
- RPCM P62B-A
- RPCM P62B-B
- SPDA Z13B
- RPCM Z13B-A
- RPCM Z13B-B
- RPCM N1RS2-A
- RPCM N1RS2-B
- RPCM N1RS2-C
- IDA
- DDCU Z13B
- RPDA N13B
- RPCM N13B-A
- RPCM N13B-B
- RPCM N13B-C
- RPCM N1RS2
- P6 Ch. 4B
- RBI-5
- DDCU P64B
- RPCM P64B-A
- RPCM P64B-B
- SPDA Z14B
- RPCM Z14B-A
- RPCM Z14B-B
- RPCM N14B-A
- RPCM N14B-B
- RPCM N14B-C
- RPCM LA1B-A
- RPCM LA1B-B
- RPCM LA1B-C
- RPCM LA1B-D
- RPCM LA1B-E
- RPCM LA1B-F
- RPCM LA1B-G
- RPCM LA1B-H
- IDA
- DDCU LA1B
- RPDA N14B
- RPCM LA2B-A
- RPCM LA2B-B
- RPCM LA2B-C
- RPCM LA2B-D
- RPCM LA2B-E
- RPCM LA2B-F
- RPCM LA2B-G
- RPCM LA2B-H
- RPCM LA2B
- RPC 1: RPCM LAD62B-A
- RPC 2: RPCM LAD52B-A
- RPC 3: RPCM LAD42B-A
- RPC 4: RPCM LAD22B-A
- RPC 3: RPCM LAP61B-A
- RPC 4: RPCM LAD11B-A
- RPCM LA562B-A
- RPCM LA562B-B
- RPCM LA562B-C
- RPCM LA562B-D
- RPCM LA562B-E
- RPCM LA562B-F
- RPCM LA562B-G
- RPCM LA562B-H

[] = After connection of LAB umbilicals.
### Table B. Power Bus Connectivity (End-Item Loads)

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<thead>
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<th>BUS LOST</th>
<th>EQUIPMENT LOST</th>
<th>FUNCTION/EQUIPMENT LOST</th>
<th>CONTROL/INSTRUMENTATION LOST</th>
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<tbody>
<tr>
<td>RPDA N1RS1</td>
<td>N1 Htr 1A</td>
<td>1 of 2 Node 1 MDMs (N1-1)</td>
<td>Control of RPCM N14B A, B, and C</td>
</tr>
<tr>
<td>RPDA N1RS1</td>
<td>N1 Htr 2A</td>
<td>1 of 2 Node 1 Shell Heater Strings (N1 A Heaters)</td>
<td>Instrumentation from RPCM N14B A, B, and C</td>
</tr>
<tr>
<td>RPDA N1RS1</td>
<td>N1 Htr 3A</td>
<td>1 of 2 Node 1 MDM (N1-1) Heaters (Operational Heater)</td>
<td>Control of CBM N1NAD-P, N1ZEN-P, N1PRT-P, and N1FWD-P</td>
</tr>
<tr>
<td>RPDA N1RS1</td>
<td>N1 Htr 4A</td>
<td>1 of 2 Node 1 MDM (N1-1) Heaters (Operational Heater)</td>
<td>Communication to PCS on UB ORB-N1-1 and CB GNC-1 (Pre CCS only)</td>
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<tr>
<td>RPDA N1RS1</td>
<td>N1 Htr 5A</td>
<td>1 of 2 Node 1 MDM (N1-1) Heaters (Operational Heater)</td>
<td>Communication to OIU on UB ORB-N1-1</td>
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<td>N1 Htr 6A</td>
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<td>Communication to SM on CB GNC-1 (Pre CCS only)</td>
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<td>RPDA N1RS1</td>
<td>N1 Htr 7A</td>
<td>1 of 2 Node 1 MDM (N1-1) Heaters (Operational Heater)</td>
<td>Communication to Early Comm on UB ORB N1-1</td>
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<td>RPDA N1RS1</td>
<td>N1 Htr 8A</td>
<td>1 of 2 Node 1 MDM (N1-1) Heaters (Operational Heater)</td>
<td>Closed Loop control of Node 1 MDM (N1-2) Survival Heater</td>
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<td>RPDA N1RS1</td>
<td>N1 Htr 9A</td>
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<td>LAB 1 LTA Htr1 (5A)</td>
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<td>RPDA N1RS1</td>
<td>PMA1 Htr 1A</td>
<td>1 of 2 PMA1 Shell Heater Strings (PMA1 A Heaters)</td>
<td>Early Comm capability</td>
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<tr>
<td>RPDA N1RS1</td>
<td>MDM N1-2 Srv Htr</td>
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### Table B. Power Bus Connectivity (End-Item Loads) (Cont)

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<td>Power to Node 1 Interior Lights&lt;br&gt;1 of 2 Nad CBM Power Sources&lt;br&gt;1 of 2 Zen CBM Power Sources</td>
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<td>Power to CMG 2 and CMG 3 Heaters</td>
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<td>Power to PCU 2 Heater</td>
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<td>RPC 2: S-Band SASA 2 Htr (on P6)</td>
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<td>Power to 1 of 2 Heaters to all other Z1 Heater Loads</td>
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See Table A for Upstream Power Source

Power to PCU 2 Htr
Power to S-Band ORU and Ku-Band ORU Heaters
Power to EETCS Heater
Power to 1 of 2 Plasma Contactor Units
Power to 2 of 4 Control Moment Gyros
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<td>RPC 1: ABC-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RPC 2: AUAI-2</td>
<td></td>
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</tr>
<tr>
<td><strong>RPCM LAD52B A</strong></td>
<td>RPC 2: IAC-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RPC 7: ABC-2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See Table A for Upstream Power Source
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SM 200 APCU STATUS display is available in SM OPS 2 and is used to monitor the health and status of the two assembly power converter units (APCUs). For STS-98, the APCUs are configured to convert orbiter 28 VDC power to ISS secondary 124 VDC power for the US Lab launch-to-activation heaters.

PARAMETER CHARACTERISTICS

<table>
<thead>
<tr>
<th>CRT NAME</th>
<th>MSID</th>
<th>UNITS</th>
<th>DISPLAY RANGE</th>
<th>STATUS IND [3]</th>
<th>FDA LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCU 1 CONV A OUT AMPS</td>
<td>P50C9003V</td>
<td>amps</td>
<td>0 --- 12.0</td>
<td>M H L ↑</td>
<td>8.5</td>
</tr>
<tr>
<td>APCU 1 CONV A TEMP</td>
<td>P50T9002V</td>
<td>deg F</td>
<td>0 --- 212.0</td>
<td>M H L ↑</td>
<td>8.5</td>
</tr>
<tr>
<td>APCU 1 CONV B OUT AMPS</td>
<td>P50C9004V</td>
<td>amps</td>
<td>0 --- 12.0</td>
<td>M H L ↑</td>
<td>8.5</td>
</tr>
<tr>
<td>APCU 1 CONV B TEMP</td>
<td>P50T9005V</td>
<td>deg F</td>
<td>0 --- 212.0</td>
<td>M H L ↑</td>
<td>8.5</td>
</tr>
<tr>
<td>APCU 1 OUT VOLTS RES LOW</td>
<td>[1] P50V9001V</td>
<td>volts</td>
<td>0 --- 180.0</td>
<td>M H L</td>
<td></td>
</tr>
<tr>
<td>APCU 1 OUT VOLTS RES HIGH</td>
<td>[1] P50V9000V</td>
<td>volts</td>
<td>110.0 --- 160.0</td>
<td>M H L ↑</td>
<td>122 126.5</td>
</tr>
<tr>
<td>APCU 1 TRIP</td>
<td>[2] P50V9006V</td>
<td>volts</td>
<td>-5.00 --- 5.00</td>
<td>M H L ↑</td>
<td>-4.40</td>
</tr>
<tr>
<td>APCU 2 CONV A OUT AMPS</td>
<td>P50C9009V</td>
<td>amps</td>
<td>0 --- 12.0</td>
<td>M H L</td>
<td>8.5</td>
</tr>
<tr>
<td>APCU 2 CONV A TEMP</td>
<td>P50T9010V</td>
<td>deg F</td>
<td>0 --- 212.0</td>
<td>M H L ↑</td>
<td>8.5</td>
</tr>
<tr>
<td>APCU 2 CONV B OUT AMPS</td>
<td>P50C9011V</td>
<td>amps</td>
<td>0 --- 12.0</td>
<td>M H L ↑</td>
<td>8.5</td>
</tr>
<tr>
<td>APCU 2 CONV B TEMP</td>
<td>P50T9012V</td>
<td>deg F</td>
<td>0 --- 212.0</td>
<td>M H L ↑</td>
<td>8.5</td>
</tr>
<tr>
<td>APCU 2 OUT VOLTS RES LOW</td>
<td>[1] P50V9007V</td>
<td>volts</td>
<td>0 --- 180.0</td>
<td>M H L</td>
<td></td>
</tr>
<tr>
<td>APCU 2 OUT VOLTS RES HIGH</td>
<td>[1] P50V9008V</td>
<td>volts</td>
<td>110.0 --- 160.0</td>
<td>M H L ↑</td>
<td>122 126.5</td>
</tr>
<tr>
<td>APCU 2 TRIP</td>
<td>[2] P50V9013V</td>
<td>volts</td>
<td>-5.00 --- 5.00</td>
<td>M H L ↑</td>
<td>-4.40</td>
</tr>
</tbody>
</table>
REMARKS

[1] OUT VOLTS LOW displays the measurements from the low resolution voltage sensor. OUT VOLTS HIGH displays the measurements from the high resolution voltage sensor.

[2] APCU TRIP indicates the status of the APCU shutdown logic. This status can be interpreted using the following table:

<table>
<thead>
<tr>
<th>TRIP (STATUS VOLTAGE)</th>
<th>TRIP CAUSE(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OV</td>
<td>OUV</td>
</tr>
<tr>
<td>+4.88</td>
<td>X</td>
</tr>
<tr>
<td>+4.23</td>
<td>X</td>
</tr>
<tr>
<td>+3.59</td>
<td>X</td>
</tr>
<tr>
<td>+2.95</td>
<td>X</td>
</tr>
<tr>
<td>+2.27</td>
<td>X</td>
</tr>
<tr>
<td>+1.62</td>
<td>X</td>
</tr>
<tr>
<td>+0.98</td>
<td>X</td>
</tr>
<tr>
<td>+0.34</td>
<td></td>
</tr>
<tr>
<td>-0.30</td>
<td>X</td>
</tr>
<tr>
<td>-0.95</td>
<td>X</td>
</tr>
<tr>
<td>-1.59</td>
<td>X</td>
</tr>
<tr>
<td>-2.23</td>
<td></td>
</tr>
<tr>
<td>-2.91</td>
<td>X</td>
</tr>
<tr>
<td>-3.56</td>
<td></td>
</tr>
<tr>
<td>-4.20</td>
<td></td>
</tr>
<tr>
<td>-4.86 (no trip)</td>
<td></td>
</tr>
</tbody>
</table>

NOTES
OV: Output Overvoltage
OUV: Output Undervoltage
OC: Output Overcurrent
IUV: Input Undervoltage
Tolerance for all reported voltages is ± 0.20 volts

[3] The parameter status field for all parameters will be blank for normal operation or will display an "M" for missing data. For analog parameters, this field will also display an "H" or "L" for offscale data. Some parameters displayed will be limit-sensed for SM alerts or C&W alarms. For discretes that are limit-sensed, the undesirable state is defined in the FDA low limit field and the FDA high limit field is left blank. Satisfaction of the undesirable state triggers a ‘↓’ indication. For analogs that are limit-sensed, an "↑" or a "↓" will be displayed when the parameter exceeds either an upper or lower limit. The symbols driven in the parameter status field have the following display priority from highest to lowest: M, H, L, ↑, ↓. All symbols driven in the parameter status column will be displayed four times normal intensity.
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SM 201 ISS C&W (1C) display is available in SM OPS 2 and is used for monitoring pertinent ISS C&W telemetry. Because the PCS does not have the capacity to annunciate alarm tones, the tone status flag from the ISS will be used to trigger the orbiter C&W system.

PARAMETER CHARACTERISTICS

<table>
<thead>
<tr>
<th>CRT NAME</th>
<th>MSID</th>
<th>UNITS</th>
<th>DISPLAY RANGE</th>
<th>STATUS IND [1]</th>
<th>FDA LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>FIRE</td>
<td>P79X0803E</td>
<td>M</td>
<td></td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>PRESS</td>
<td>P79X0801E</td>
<td>M</td>
<td></td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>TOX ATM</td>
<td>P79X0802E</td>
<td>M</td>
<td></td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>CAUT</td>
<td>P79X0830E</td>
<td>M</td>
<td></td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>WARN</td>
<td>P79X0831E</td>
<td>M</td>
<td></td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>

REMARKS

[1] The parameter status field for all parameters will be blank for normal operation or will display an "M" for missing data. For analog parameters, this field will also display an "H" or "L" for offscale data. Some parameters displayed will be limit-sensed for SM alerts or C&W alarms. For discretes that are limit-sensed, the undesirable state is defined in the FDA low limit field and the FDA high limit field is left blank. Satisfaction of the undesirable state triggers a ‘↓’ indication. For analogs that are limit-sensed, an “↑” or a “↓” will be displayed when the parameter exceeds either an upper or lower limit. The symbols driven in the parameter status field have the following display priority from highest to lowest: M, H, L, ↑, ↓. All symbols driven in the parameter status column will be displayed four times normal intensity.

[2] When the tone status flag is set for any FIRE, pressure (PRESS), toxic atmosphere (TOX ATM), caution (CAUT), or warning (WARN) event, a down arrow will be displayed in the appropriate status field. The FIRE, PRESS, and TOX ATM events will initiate a master alarm light and tone, B/U C&W light on panel F7, and a fault message. WARN and CAUT events will initiate an alert light, tone, and fault message. The PCS can be referenced for additional details on the fault condition.
### SPEC 212 OIU DISPLAY

**ASSY MAL5AFIN**

#### Page 1 of 8 pages

**31 JUL 00**

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**207**

---

**STATUS**

<table>
<thead>
<tr>
<th>ACTIVE DEVICES</th>
<th>PDI</th>
<th>1 FORMAT XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AD</strong></td>
<td><strong>PD</strong></td>
<td><strong>BUS</strong></td>
</tr>
<tr>
<td>1</td>
<td>XXXX</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>XXXX</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>XXXX</td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>XXXX</td>
<td>X</td>
</tr>
</tbody>
</table>

**OIU CMD CTR**

| PSP I/F | XXX |

**FLOAT POINT**

| XXXXS |

**LAST CMD**

| **PSP** | **XXX** |
| **OIU** | **XXX** |

**SSOR**

| PRI FRM SYNC | XXXXS |
| PRI STATUS | XXXXS |
| B/U FRM SYNC | XXXXS |
| B/U STATUS | XXXXS |

**18 SPARE CMD**

| **XXX** |

---

**BUS 1 RT**

| BC | 3X |
| 4X |
| 5X |

**BUS 2 RT**

| BC | 6X |
| 7X |
| 8X |
| 9X |

**BUS 3 RT**

| BC | 10X |
| 11X |
| 12X |
| 13X |

**BUS 4 RT**

| BC | 14X |
| 15X |
| 16X |
| 17X |
**SM 212 OIU** display is available in SM OPS 2 and is used to configure the OIU for cargo element operations, monitor OIU status, and monitor relevant PDI, PSP, and SSOR statuses.

**PARAMETER CHARACTERISTICS**

<table>
<thead>
<tr>
<th>CRT NAME</th>
<th>MSID</th>
<th>UNITS</th>
<th>DISPLAY RANGE</th>
<th>STATUS IND</th>
<th>FDA LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIU 1 TEMP</td>
<td>P50T4000V</td>
<td>deg F</td>
<td>-23.4 to +304.3</td>
<td>M H L ↑</td>
<td>212</td>
</tr>
<tr>
<td>OIU 2 TEMP</td>
<td>P50T4001V</td>
<td>deg F</td>
<td>-23.4 to +304.3</td>
<td>M H L ↑</td>
<td>212</td>
</tr>
<tr>
<td>OIU STATUS CTR</td>
<td>P50U4106D</td>
<td>sec</td>
<td>00 --- 59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS BC TIME</td>
<td>P50U4112D, P50U4113D, P50U4114D, P50U4115D, P50U4116D</td>
<td>time</td>
<td>see REMARKS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 1 PD</td>
<td>P50X4401E, P50X4402E, P50X4403E, P50X4404E, P50X4405E, P50X4406E</td>
<td>text</td>
<td>see REMARKS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 2 PD</td>
<td>P50X4411E, P50X4412E, P50X4413E, P50X4414E, P50X4415E, P50X4416E</td>
<td>text</td>
<td>see REMARKS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 3 PD</td>
<td>P50X4421E, P50X4422E, P50X4423E, P50X4424E, P50X4425E, P50X4426E</td>
<td>text</td>
<td>see REMARKS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRT NAME</td>
<td>MSID</td>
<td>UNITS</td>
<td>DISPLAY RANGE</td>
<td>STATUS IND</td>
<td>FDA LIMITS</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------------------------------</td>
<td>-------</td>
<td>---------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>AD 4 PD</td>
<td>P50X4431E, P50X4432E, P50X4433E, P50X4434E, P50X4435E, P50X4436E</td>
<td>text</td>
<td>see REMARKS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 1 BUS</td>
<td>P50U4055D</td>
<td>n/a</td>
<td>0 --- 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 2 BUS</td>
<td>P50U4065D</td>
<td>n/a</td>
<td>0 --- 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 3 BUS</td>
<td>P50U4075D</td>
<td>n/a</td>
<td>0 --- 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 4 BUS</td>
<td>P50U4085D</td>
<td>n/a</td>
<td>0 --- 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 1 LOCK</td>
<td>P50X4440E, P50X4441E</td>
<td>text</td>
<td>0,0='NONE'</td>
<td>M</td>
<td>↓ 1,0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0,1='YES'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,0='NO'</td>
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<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td>1,1='N/A'</td>
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<td></td>
</tr>
<tr>
<td>AD 2 LOCK</td>
<td>P50X4450E, P50X4451E</td>
<td>text</td>
<td>0,0='NONE'</td>
<td>M</td>
<td>↓ 1,0</td>
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<td></td>
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<td>0,1='YES'</td>
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<td>1,0='NO'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,1='N/A'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 3 LOCK</td>
<td>P50X4460E, P50X4461E</td>
<td>text</td>
<td>0,0='NONE'</td>
<td>M</td>
<td>↓ 1,0</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>0,1='YES'</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,0='NO'</td>
<td></td>
<td></td>
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<tr>
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<td></td>
<td></td>
<td>1,1='N/A'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 4 LOCK</td>
<td>P50X4470E, P50X4471E</td>
<td>text</td>
<td>0,0='NONE'</td>
<td>M</td>
<td>↓ 1,0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0,1='YES'</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,0='NO'</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,1='N/A'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDI DCM 1 B,W,F SYNC</td>
<td>V75X6403D, V75X6402D, V75X6401D</td>
<td>text</td>
<td>0=blank, 1=*</td>
<td>M</td>
<td>↓ 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0=blank, 1=*</td>
<td>M</td>
<td>↓ 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0=blank, 1=*</td>
<td>M</td>
<td>↓ 0</td>
</tr>
<tr>
<td>PDI DCM 2 B,W,F SYNC</td>
<td>V75X6407D, V75X6406D, V75X6405D</td>
<td>text</td>
<td>0=blank, 1=*</td>
<td>M</td>
<td>↓ 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0=blank, 1=*</td>
<td>M</td>
<td>↓ 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0=blank, 1=*</td>
<td>M</td>
<td>↓ 0</td>
</tr>
<tr>
<td>CRT NAME</td>
<td>MSID</td>
<td>UNITS</td>
<td>DISPLAY RANGE</td>
<td>STATUS IND</td>
<td>FDA LIMITS</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------</td>
<td>-------</td>
<td>---------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>PDI DCM 3 B,W,F SYNC</td>
<td>V75X6411D, V75X6410D, V75X6409D</td>
<td>text</td>
<td>0=blank, 1='*'</td>
<td>M</td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0=blank, 1='*'</td>
<td>M</td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0=blank, 1='*'</td>
<td>M</td>
<td>↓</td>
</tr>
<tr>
<td>PDI DCM 4 B,W,F SYNC</td>
<td>V75X6415D, V75X6414D, V75X6413D</td>
<td>text</td>
<td>0=blank, 1='*'</td>
<td>M</td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0=blank, 1='*'</td>
<td>M</td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0=blank, 1='*'</td>
<td>M</td>
<td>↓</td>
</tr>
<tr>
<td>OIU CMD CTR</td>
<td>P50U4132A</td>
<td>n/a</td>
<td>0 --- 255</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OIU PSP I/F</td>
<td>P50X4283E</td>
<td>text</td>
<td>0='OK', 1='ERR'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLOAT POINT</td>
<td>P50X4288E</td>
<td>text</td>
<td>0='OK', 1='ERR'</td>
<td>M</td>
<td>↓</td>
</tr>
<tr>
<td>PSP LAST CMD</td>
<td>V92X1102X, V92X1116X, V92X1129X</td>
<td>text</td>
<td>1,0,1='REJ'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0,1,1='INC'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>else = 'OK'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OIU LAST CMD</td>
<td>P50X4281E, P50X4303E, P50X4287E</td>
<td>text</td>
<td>1,0,0 or 1,1,0 or 1,1,0 or 0,0,1 or 1,0,1 or 0,1,1 or 1,1,1='REJ' else = 'OK'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSOR PRI FRM SYNC</td>
<td>V74X2050E</td>
<td>text</td>
<td>0='NO', 1='YES'</td>
<td>M</td>
<td>↓</td>
</tr>
<tr>
<td>SSOR PRI STATUS</td>
<td>V74X2051E</td>
<td>text</td>
<td>0='BAD', 1='OK'</td>
<td>M</td>
<td>↓</td>
</tr>
<tr>
<td>SSOR B/U FRM SYNC</td>
<td>V74X2053E</td>
<td>text</td>
<td>0='NO', 1='YES'</td>
<td>M</td>
<td>↓</td>
</tr>
<tr>
<td>SSOR B/U STATUS</td>
<td>V74X2052E</td>
<td>text</td>
<td>0='BAD', 1='OK'</td>
<td>M</td>
<td>↓</td>
</tr>
<tr>
<td>FORMAT</td>
<td>P50U4010A</td>
<td>n/a</td>
<td>0 --- 255</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 1 RT</td>
<td>P50X4021E</td>
<td>text</td>
<td>0='*', 1=blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 1 BC</td>
<td>P50X4021E</td>
<td>text</td>
<td>0=blank, 1='*'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 1 A</td>
<td>P50X4041E</td>
<td>text</td>
<td>0='*', 1=blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 1 B</td>
<td>P50X4041E</td>
<td>text</td>
<td>0=blank, 1='*'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 2 RT</td>
<td>P50X4022E</td>
<td>text</td>
<td>0='*', 1=blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 2 BC</td>
<td>P50X4022E</td>
<td>text</td>
<td>0=blank, 1='*'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 2 A</td>
<td>P50X4042E</td>
<td>text</td>
<td>0='*', 1=blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 2 B</td>
<td>P50X4042E</td>
<td>text</td>
<td>0=blank, 1='*'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 3 RT</td>
<td>P50X4023E</td>
<td>text</td>
<td>0='*', 1=blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 3 BC</td>
<td>P50X4023E</td>
<td>text</td>
<td>0=blank, 1='*'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 3 A</td>
<td>P50X4043E</td>
<td>text</td>
<td>0='*', 1=blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 3 B</td>
<td>P50X4043E</td>
<td>text</td>
<td>0=blank, 1='*'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRT NAME</td>
<td>MSID</td>
<td>UNITS</td>
<td>DISPLAY RANGE</td>
<td>STATUS IND [9]</td>
<td>FDA LIMITS</td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
<td>-------</td>
<td>-------------------</td>
<td>----------------</td>
<td>------------</td>
</tr>
<tr>
<td>BUS 4 RT</td>
<td>[15] P50X4024E</td>
<td>text</td>
<td>0=‘’, 1=blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 4 BC</td>
<td>[15] P50X4024E</td>
<td>text</td>
<td>0=blank, 1=‘’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 4 A</td>
<td>[15] P50X4044E</td>
<td>text</td>
<td>0=‘’, 1=blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUS 4 B</td>
<td>[15] P50X4044E</td>
<td>text</td>
<td>0=blank, 1=‘’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPARE CMD</td>
<td>[16] P93J0101C</td>
<td>n/a</td>
<td>1 --- 12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
REMARKS

[1] The OIU TEMP parameters will read 140° F when the OIU associated with that measurement is OFF. Note that this is the only sure method to determine which OIU is powered up from this display alone. Additional insight is available via the panel L12 OIU PWR tb.

[2] OIU STATUS CTR displays the OIU time parameter for seconds, reading from 00 to 59 and resetting to 00 again. This indicates OIU health by constantly counting from 00 to 59 and recycling when the OIU telemetry is being processed by the PDI. ISS BC TIME follows the format MM-DD-YY/HH:MM:SS and comes from whichever device is BC to the OIU. This parameter will read all zeros at powerup, will show the correct BC time at the time the BC comes up and starts sending telemetry to the OIU, and will remain static at the last good sample when the incoming telemetry from that BC goes away.

[3] ACTIVE DEVICES: The OIU active device (AD) status section provides insight for OIU processing on the external telemetry sources with which the OIU can interface. Status shown for each AD (1-4) includes the physical device (PD) assigned to that AD, the BUS being used to acquire that device’s telemetry, and a LOCK status indication. The computation used to drive the PD field is defined in the following table:

<table>
<thead>
<tr>
<th>MSID</th>
<th>Argument 1</th>
<th>Argument 2</th>
<th>Argument 3</th>
<th>Argument 4</th>
<th>Argument 5</th>
<th>Argument 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td></td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td></td>
<td>0 0 0 0</td>
<td>0 0 1 1</td>
<td>0 1 1 1</td>
<td>0 1 1 1</td>
<td>0 1 1 1</td>
<td>0 1 1 1</td>
</tr>
<tr>
<td></td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
</tr>
<tr>
<td></td>
<td>0 0 0 0</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
</tr>
<tr>
<td></td>
<td>0 0 0 0</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
</tr>
<tr>
<td></td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
<td>0 0 1 1</td>
</tr>
<tr>
<td>Displayed Text:</td>
<td>OIU</td>
<td>CC-1</td>
<td>CC-2</td>
<td>SR-1</td>
<td>SR-2</td>
<td>MP-1</td>
</tr>
</tbody>
</table>

If none of the above conditions are met, the default text displayed is ERR. Note that PD = OIU when no active device is assigned and is also displayed when OIU format supports an OIU error log dump, CC-1 and CC-2 are the ISS command and control MDMs, SR-1 and SR-2 are the Space to Space Orbiter Radios (SSOR), MP-1 and MP-2 are the MPLM MDMs, N1-1 and N1-2 are the Node MDMs, and FGB1 and FGB2 are the ISS FGB MDMs.

[4] BUS: Indicates the OIU bus 1 to 7, 0 indicates OIU bus 8. Note that the OIU hardware currently supports only buses 1 thru 4.

[5] LOCK: NONE if the current OIU format does not have an AD for this display location.
YES if the OIU is RT and in sync with the AD (ISS BC or SSOR).
YES if the AD is OIU in error log dump format (OIU must be in sync with itself).
NO if the OIU is RT and was in sync with the AD but has lost lock on the AD (ISS BC or SSOR).
N/A if the OIU is BC to the AD, except if the AD is SSOR.
Note that if LOCK goes from ‘YES’ to ‘NO’, the OIU stops attempting to acquire sync with that AD. To force the OIU to attempt to resync with an AD, the OIU format must be reloaded.
[6] OIU CMD CTR will start at ‘000’ at powerup, and will increment by one whenever the OIU receives a valid command from the PSP. The counter reads in decimal, and will count from ‘000’ to ‘255’ and roll over to ‘000’. All commands, whether from the MCC or the MCDS will cause the counter to increment if received and processed by the OIU.

[7] PSP I/F indicates OK if the OIU is receiving the 16 Khz command carrier from either PSP1 or PSP2. ERR is displayed if no command carrier is being received.

[8] The OIU can convert one ISS floating point parameter value per PDI minor frame (maximum of 100 per major frame) into a shuttle PDI-compatible parameter value. If an ISS floating point value is invalid or results in an invalid floating point value/operation during the conversion process, the OIU announces an error. The FLOAT POINT display parameter will read ERR for this condition, or OK if no floating point error/operation is detected.

[9] The parameter status field for all parameters will be blank for normal operation or will display an "M" for missing data. For analog parameters, this field will also display an "H" or "L" for offscale data. Some parameters displayed will be limit-sensed for SM alerts or C&W alarms. For discretes that are limit-sensed, the undesirable state is defined in the FDA low limit field and the FDA high limit field is left blank. Satisfaction of the undesirable state triggers a ↓↓ indication. For analogs that are limit-sensed, an ↑ or a ↓ will be displayed when the parameter exceeds either an upper or lower limit. The symbols driven in the parameter status field have the following display priority from highest to lowest: M, H, L, ↑, ↓. All symbols driven in the parameter status column will be displayed four times normal intensity.

[10] PSP LAST CMD indicates the command acceptance for crew originated command: OK if the PSP has not rejected a crew command, REJ if the PSP rejected the last crew command, or INC of the PSP was not able to complete the transfer of the last crew command. The REJ and INC indications are cleared by the next successfully processed PSP command from either crew or ground.

[11] OIU LAST CMD indicates the command acceptance by the OIU. REJ is displayed if the OIU has detected either a parity error or an incorrect byte count in a command received from the PSP. Otherwise, OK is displayed.

[12] For both the primary (PRI) and a backup (B/U) Space to Space Orbiter Radio (SSOR), the FRM SYNC indication gives the status of the frame synchronizer. YES indicates SSOR frame sync with the ISS Space to Space Station Radio (SSSR), NO indicates no SSOR frame sync, or the SSOR is off, or the SSOR is not present. The STATUS indication yields OK if the SSOR is operating normally, or indicates BAD if the SSOR BITE has sensed a failure.

[13] PDI DCM SYNC gives indication of the Bit (B), Word (W), and Frame (F) synchronizer statuses for all four PDI decommutators. For each DCM, the B, W, and F columns will be blank if the decom is not in bit, word, or frame sync, respectively. An asterisk will be displayed in each of the B, W, or F columns if the sync conditions do exist. Note that the decom actually processing OIU telemetry is dependent on orbiter PDI/PCMMU config.

[14] FORMAT: Indicates the currently loaded OIU format.
BUS 1-4: The OIU bus processing state (Bus Controller (BC) or Remote Terminal (RT)) and channelization (A or B) is indicated by asterisks for each of buses 1 thru 4.

SPARE CMD: Displays the item entry index associated with the last Item 18.

ITEM ENTRY CHARACTERISTICS

**Item 1:** FORMAT - indexed command item entry used to changing the OIU format (ITEM 1 + XXX EXEC). The valid decimal format numbers for entry via MCDS on STS-98 are 001 to 010, 250, 251, 254, and 255.

**Item 2 – 17:** BUS 1 – BUS 4 - This section allows changing the OIU’s current bus processing state (Bus Controller (BC) or Remote Terminal (RT)) and bus channel (A or B) for any of the currently implemented four OIU buses. For example, if Bus 3 is BC, and using Channel A, there will be an asterisk next to Items 11 and 12. To change Bus 3 to RT, an ‘ITEM 10 EXEC’ is performed. In the case of the bus channelization (A or B), the displayed telemetry indicates which channel is prime for command and telemetry transactions on that bus if the OIU is BC on that bus. If the OIU is BC on a bus, it will try to send a command for an AD using the prime channel. If the OIU receives no status message from that AD, it tries again on the prime channel, then it tries on the alternate channel, and if the AD has not responded, it declares it failed and stops trying to send that command to that AD. When the OIU is RT on a bus, it will respond on either channel, depending on which channel received a transaction from the BC; therefore, the channel indication has no meaning when the OIU is RT on a bus.

**Item 18:** SPARE CMD - an indexed command that allows performing the following internal OIU function mapping:

- **Item 18 + 1:** Change FGB MDM active device to FGB-2 MDM physical device
- **Item 18 + 2:** Change FGB MDM active device to FGB-1 MDM physical device
- **Item 18 + 3:** Change Node 1 MDM active device to N1-2 MDM physical device
- **Item 18 + 4:** Change Node 1 MDM active device to N1-1 MDM physical device
- **Item 18 + 5:** Move FGB -2 MDM physical device to OIU Bus 4 (UB ORB N1-2)
- **Item 18 + 6:** Move FGB -2 MDM physical device to OIU Bus 3 (UB ORB N1-1)
- **Item 18 + 7:** Move FGB -1 MDM physical device to OIU Bus 4 (UB ORB N1-2)
- **Item 18 + 8:** Move FGB -1 MDM physical device to OIU Bus 3 (UB ORB N1-1)
- **Item 18 + 9:** Move N1-1 MDM physical device to OIU Bus 4 (UB ORB N1-2)
- **Item 18 + 10:** Move N1-1 MDM physical device to OIU Bus 3 (UB ORB N1-1)
- **Item 18 + 11:** Move N1-2 MDM physical device to OIU Bus 4 (UB ORB N1-2)
- **Item 18 + 12:** Move N1-2 MDM physical device to OIU Bus 3 (UB ORB N1-1)
<table>
<thead>
<tr>
<th>SPEC 220 NODE 1-3N DISPLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ASSY MAL/5A/FIN)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NODE 1-3N</th>
</tr>
</thead>
<tbody>
<tr>
<td>XX X DDD/HH:MM:SS</td>
</tr>
<tr>
<td>XX X DDD/HH:MM:SS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CABIN PRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>XX.XXS</td>
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</table>

| BUS CONFIG               |
| CH A                     |
| CH B                     |

| LOAD SHED                |
| XX B                    |

| VIA NCS                  |
| XX B                    |

| NCS PASS THRU            |
| XX B                    |

| POWER ON                 |
| OFF TRIP                 |

| PRI MDM                  |
| N1-1 MDM                |
| N1-2 MDM                |
| N1-14 MDM               |
| N1-23 MDM               |

| ISS C & W TONE STATUS    |
| FIRE S                   |
| WARN S                   |
| CAUT S                   |

| PHYS ID                  |
| XX X 220/XXXX            |

| PRI MDM                  |
| XX X XXX                |

| SEC MDM                  |
| XX X XXX                |

| STBY                     |
| XXX                    |

| LOAD SHED                |
| XX B                    |

| VIA NCS                  |
| XX B                    |

| NCS PASS THRU            |
| XX B                    |

| POWER ON                 |
| OFF TRIP                |

| PRI MDM                  |
| N1-1 MDM                |
| N1-2 MDM                |
| N1-14 MDM               |
| N1-23 MDM               |

| ISS C & W TONE STATUS    |
| FIRE S                   |
| WARN S                   |
| CAUT S                   |

| PHYS ID                  |
| XX X 220/XXXX            |

| PRI MDM                  |
| XX X XXX                |

| SEC MDM                  |
| XX X XXX                |

| STBY                     |
| XXX                    |

| LOAD SHED                |
| XX B                    |

| VIA NCS                  |
| XX B                    |

| NCS PASS THRU            |
| XX B                    |

| POWER ON                 |
| OFF TRIP                |

| PRI MDM                  |
| N1-1 MDM                |
| N1-2 MDM                |
| N1-14 MDM               |
| N1-23 MDM               |

| ISS C & W TONE STATUS    |
| FIRE S                   |
| WARN S                   |
| CAUT S                   |

| PHYS ID                  |
| XX X 220/XXXX            |

| PRI MDM                  |
| XX X XXX                |

| SEC MDM                  |
| XX X XXX                |

| STBY                     |
| XXX                    |

| LOAD SHED                |
| XX B                    |

| VIA NCS                  |
| XX B                    |

| NCS PASS THRU            |
| XX B                    |

| POWER ON                 |
| OFF TRIP                |

| PRI MDM                  |
| N1-1 MDM                |
| N1-2 MDM                |
| N1-14 MDM               |
| N1-23 MDM               |

| ISS C & W TONE STATUS    |
| FIRE S                   |
| WARN S                   |
| CAUT S                   |

| PHYS ID                  |
| XX X 220/XXXX            |

| PRI MDM                  |
| XX X XXX                |

| SEC MDM                  |
| XX X XXX                |

| STBY                     |
| XXX                    |

| LOAD SHED                |
| XX B                    |

| VIA NCS                  |
| XX B                    |

| NCS PASS THRU            |
| XX B                    |

| POWER ON                 |
| OFF TRIP                |

| PRI MDM                  |
| N1-1 MDM                |
| N1-2 MDM                |
| N1-14 MDM               |
| N1-23 MDM               |

| ISS C & W TONE STATUS    |
| FIRE S                   |
| WARN S                   |
| CAUT S                   |

| PHYS ID                  |
| XX X 220/XXXX            |

| PRI MDM                  |
| XX X XXX                |

| SEC MDM                  |
| XX X XXX                |

| STBY                     |
| XXX                    |

| LOAD SHED                |
| XX B                    |

| VIA NCS                  |
| XX B                    |

| NCS PASS THRU            |
| XX B                    |

| POWER ON                 |
| OFF TRIP                |

| PRI MDM                  |
| N1-1 MDM                |
| N1-2 MDM                |
| N1-14 MDM               |
| N1-23 MDM               |

| ISS C & W TONE STATUS    |
| FIRE S                   |
| WARN S                   |
| CAUT S                   |

| PHYS ID                  |
| XX X 220/XXXX            |

| PRI MDM                  |
| XX X XXX                |

| SEC MDM                  |
| XX X XXX                |

| STBY                     |
| XXX                    |

| LOAD SHED                |
| XX B                    |

| VIA NCS                  |
| XX B                    |

| NCS PASS THRU            |
| XX B                    |

| POWER ON                 |
| OFF TRIP                |

| PRI MDM                  |
| N1-1 MDM                |
| N1-2 MDM                |
| N1-14 MDM               |
| N1-23 MDM               |

| ISS C & W TONE STATUS    |
| FIRE S                   |
| WARN S                   |
| CAUT S                   |

31 JUL 00  215
SM 220 NODE 1-3N display is available in SM OPS 2 and is used to control and monitor the Node 1 MDMs and monitor pertinent Node 1 telemetry.

PARAMETER CHARACTERISTICS

<table>
<thead>
<tr>
<th>CRT NAME</th>
<th>MSID</th>
<th>UNITS</th>
<th>DISPLAY RANGE</th>
<th>STATUS IND [10]</th>
<th>FDA LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRI MDM PHY ID [1]</td>
<td>P79X0484E</td>
<td>text</td>
<td>0=‘N1-1’, 1=‘N1-2’</td>
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<td></td>
</tr>
<tr>
<td>SEC MDM PHY ID [1]</td>
<td>P79X0486E</td>
<td>text</td>
<td>0=‘N1-1’, 1=‘N1-2’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRI MDM STATE [2]</td>
<td>P79X0120E,</td>
<td>text</td>
<td>0,0,1=‘STBY’ 0,1,0=‘PRI’ 0,1,1=‘SEC’ 1,1,1=‘DIA’</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P79X0487E,</td>
<td></td>
<td></td>
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<td>P79X0488E</td>
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</tr>
<tr>
<td>SEC MDM STATE [2]</td>
<td>P79X0111E,</td>
<td>text</td>
<td>0,0,1=‘STBY’ 0,1,0=‘PRI’ 0,1,1=‘SEC’ 1,1,1=‘DIA’</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P79X0489E,</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>P79X0490E</td>
<td></td>
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</tr>
<tr>
<td>PRI MDM CONFIG [3]</td>
<td>P79X0118E,</td>
<td>text</td>
<td>C01 thru C16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P79X0500E,</td>
<td></td>
<td></td>
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</tr>
<tr>
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<td>P79X0502E</td>
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<tr>
<td>SEC MDM CONFIG [3]</td>
<td>P79X0109E,</td>
<td>text</td>
<td>C01 thru C16</td>
<td></td>
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<tr>
<td></td>
<td>P79X0503E,</td>
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<tr>
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<td>P79X0504E,</td>
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</tr>
<tr>
<td></td>
<td>P79X0505E</td>
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<tr>
<td>PRI MDM FRM CTR [4]</td>
<td>P79U0509D</td>
<td>n/a</td>
<td>2-digit hex counter</td>
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</tr>
<tr>
<td>SEC MDM FRM CTR [4]</td>
<td>P79U0114D</td>
<td>n/a</td>
<td>2-digit hex counter</td>
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<td></td>
</tr>
<tr>
<td>SEC MDM SYNC [5]</td>
<td>P79X0112E</td>
<td>text</td>
<td>0=‘YES’, 1=‘NO’</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>TEMP N1-1</td>
<td>P79T0106A</td>
<td>deg F</td>
<td>-428 --- 1372</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEMP N1-2</td>
<td>P79T0107A</td>
<td>deg F</td>
<td>-1331 --- 469.4</td>
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<tr>
<td>LOAD SHED VIA FGB [6]</td>
<td>P79X0072E,</td>
<td>text</td>
<td>0,0,1=‘NO’ 0,1,0=‘YES’ 0,1,1=‘YES’ 1,0,0=‘NO’</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P79X0066E,</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
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<td>P79X0058E</td>
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<tr>
<td>NCS PASS THRU ENA</td>
<td>P79X0839E</td>
<td>text</td>
<td>0=blank, 1=‘*’</td>
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<td>P79X0781E</td>
<td>text</td>
<td>0=blank, 1=‘*’</td>
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</tr>
</tbody>
</table>
## SPEC 220 NODE 1-3N DISPLAY

### (ASSY MAL/5A/FIN) Page 3 of 6 pages

<table>
<thead>
<tr>
<th>CRT NAME</th>
<th>MSID</th>
<th>UNITS</th>
<th>DISPLAY RANGE</th>
<th>STATUS IND [10]</th>
<th>FDA LIMITS</th>
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<tbody>
<tr>
<td>N1-1 MDM POWER OFF</td>
<td>P79X0781E</td>
<td>text</td>
<td>0=‘*’, 1=blank</td>
<td>M</td>
<td>H</td>
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<tr>
<td>N1-1 MDM POWER TRIP</td>
<td>P79X0453E</td>
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<td>N1-1 MDM SDO A POWER ON</td>
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<td>HI</td>
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<td>M</td>
<td></td>
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<td>N1-2 MDM SDO B POWER ON</td>
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<td>N1-2 MDM SDO B POWER TRIP</td>
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<tr>
<td>CABIN PRESS</td>
<td>P79P0493A</td>
<td>psia</td>
<td>50.29 to -.093</td>
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<td>P79X0229E</td>
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<td>LB LAB SYS-1 BUS CONFIG</td>
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<td>M</td>
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<td>P79X0228E</td>
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<td></td>
</tr>
<tr>
<td>LB LAB SYS-1 CH B</td>
<td>P79X0228E</td>
<td></td>
<td>0=blank, 1=‘*’</td>
<td>M</td>
<td></td>
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## SPEC 220 NODE 1-3N DISPLAY

<table>
<thead>
<tr>
<th>CRT NAME</th>
<th>MSID</th>
<th>UNITS</th>
<th>DISPLAY RANGE</th>
<th>STATUS IND [10]</th>
<th>FDA LIMITS</th>
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<td>P79X0134E, P79X0495E</td>
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<td>M H L ↑ ↓ LO HI</td>
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</tr>
<tr>
<td>UB ORB N1-2 CH A</td>
<td>P79X0233E</td>
<td>text</td>
<td>0=’*’, 1=blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UB ORB N1-2 CH B</td>
<td>P79X0233E</td>
<td>text</td>
<td>0=blank, 1=’*’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB GNC-2 BUS CONFIG</td>
<td>P79X0132E, P79X0496E</td>
<td>text</td>
<td>0,0=’NA’, 0,1=’RT’, 1,0=’BC’</td>
<td>M H L ↑ ↓ LO HI</td>
<td></td>
</tr>
<tr>
<td>CB GNC-2 CH A</td>
<td>P79X0232E</td>
<td>text</td>
<td>0=’*’, 1=blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB GNC-2 CH B</td>
<td>P79X0232E</td>
<td>text</td>
<td>0=blank, 1=’*’</td>
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<td></td>
</tr>
<tr>
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<td>text</td>
<td>0,0=’NA’, 0,1=’RT’, 1,0=’BC’</td>
<td>M H L ↑ ↓ LO HI</td>
<td></td>
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<td>P79X0231E</td>
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<tr>
<td>UB EPS N1-14 BUS CONFIG</td>
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<td>text</td>
<td>0,0=’NA’, 0,1=’RT’, 1,0=’BC’</td>
<td>M H L ↑ ↓ LO HI</td>
<td></td>
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<tr>
<td>UB EPS N1-14 CH A</td>
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<td></td>
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<tr>
<td>UB EPS N1-14 CH B</td>
<td>P79X0234E</td>
<td>text</td>
<td>0=blank, 1=’*’</td>
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<tr>
<td>UB EPS N1-23 BUS CONFIG</td>
<td>P79X0122E, P79X0499E</td>
<td>text</td>
<td>0,0=’NA’, 0,1=’RT’, 1,0=’BC’</td>
<td>M H L ↑ ↓ LO HI</td>
<td></td>
</tr>
<tr>
<td>UB EPS N1-23 CH A</td>
<td>P79X0227E</td>
<td>text</td>
<td>0=’*’, 1=blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UB EPS N1-23 CH B</td>
<td>P79X0227E</td>
<td>text</td>
<td>0=blank, 1=’*’</td>
<td></td>
<td></td>
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<tr>
<td>FIRE</td>
<td>P79X0161E</td>
<td>M</td>
<td>↓ 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WARN</td>
<td>P79X0158E</td>
<td>M</td>
<td>↓ 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAUT</td>
<td>P79X0157E</td>
<td>M</td>
<td>↓ 1</td>
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</tr>
</tbody>
</table>
REMARKS

[1] PHY ID indicates which ISS Node 1 Multiplexer/ Demultiplexer (MDM) is the primary (PRI) and secondary (SEC) Node Control Software (NCS) MDM. For nominal operations, N1-2 will be the PRI MDM and N1-1 will be the SEC MDM.

[2] STATE indicates the operational state of the primary and secondary MDMs. This field will read ‘PRI’ for primary, ‘SEC’ for secondary, ‘STBY’ for standby, or ‘DIA’ for diagnostics.

[3] CONFIG indicates the configuration number (C01 - C16) of the NCS running in the primary and secondary MDMs. These fields are driven using the following comp:

| MSID | Argument 1 | 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 |
|      | Argument 2 | 0 0 0 0 1 1 1 1 0 0 0 0 1 1 1 1 |
|      | Argument 3 | 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 |
|      | Argument 4 | 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 |
| Displayed Text | C C C C C C C C C C C C C C C C C C C C C C |
|                | 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 |
|                | 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 |

[4] An incrementing frame counter (FRM CTR) for the PRI and SEC MDMs indicates that data is being received from the MDMs.

[5] SYNC indicates whether or not the SEC MDM is communicating with the PRI MDM. This field applies to the secondary MDM only. When the SEC MDM has lost sync with the PRI MDM, ‘NO’ will be displayed in the SYNC field and an on-board alert light, tone, and fault message will annunciate.

[6] If any three or more FGB batteries read 25 volts or less, the FGB will send a C&W to the Node 1 MDMs, which will activate the load shed table. If this occurs, the LOAD SHED VIA FGB field will display ‘YES’ and a down arrow will be displayed in the status field, and an on-board alert light, tone, and fault message will annunciate. Otherwise, the field will display ‘NO’.

[7] The CABIN PRESS field displays the Node 1 cabin pressure. When this parameter exceeds its lower/upper FDA limits, a down or an up arrow will be displayed in the status field. An on-board master alarm light and tone, a B/U C/W light on panel F7, and a fault message will be annunciated.

[8] BUS CONFIG indicates whether the N1 MDMs are ‘BC’ for bus controller, ‘RT’ for remote terminal, or ‘NA’ for not available on each of the communication busses.

[9] Because the PCS does not have the capacity to annunciate alarm tones, the tone status flag from the ISS will be used to trigger the orbiter C&W system. When the tone status flag is set for any FIRE, pressure (PRESS), toxic atmosphere (TOX ATM), caution (CAUT), or warning (WARN) event, a down arrow will be displayed in the appropriate status field. The FIRE, PRESS, and TOX ATM events will initiate a master alarm light and tone, B/U C&W light on panel F7, and a fault message. WARN and CAUT events will initiate an alert light, tone, and fault message. The PCS can be referenced for additional details on the fault condition.
The parameter status field for all parameters will be blank for normal operation or will display an "M" for missing data. For analog parameters, this field will also display an "H" or "L" for offscale data. Some parameters displayed will be limit-sensed for SM alerts or C&W alarms. For discretes that are limit-sensed, the undesirable state is defined in the FDA low limit field and the FDA high limit field is left blank. Satisfaction of the undesirable state triggers a ‘↓’ indication. For analogs that are limit-sensed, an “↑” or a “↓” will be displayed when the parameter exceeds either an upper or lower limit. The symbols driven in the parameter status field have the following display priority from highest to lowest: M, H, L, ↑, ↓. All symbols driven in the parameter status column will be displayed four times normal intensity.

ITEM ENTRY CHARACTERISTICS

Items 1 and 2: Commands the primary or secondary N1 MDM, respectively, to the standby state.

Item 3: Commands N1-1 MDM to the secondary state.

Item 4: Activates the Node 1 load shed table which will power off everything in the Node 1 except the MDMs. This command is protected from inadvertent execution by requiring an ITEM 4 + 99 entry.

Item 5 and 6: Enables and disables the NCS passthru mode. This allows the aft flight deck PCS to communicate directly with the CCS. An asterisk will be driven next to the appropriate item number to indicate the power status.

Items 7 – 18: Closes (POWER ON) and opens (POWER OFF) the RPCs associated with the N1 MDM power supplies and Solenoid Driver Output (SDO) A and B cards. An asterisk will be displayed next to the appropriate item number to indicate the power status. A down arrow will be displayed in the TRIP field when an RPC has tripped. The follow table provides a mapping between item entry and RPC:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>RPC</th>
</tr>
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<tbody>
<tr>
<td>7, 8</td>
<td>RPCM N1RS1 A RPC 11</td>
</tr>
<tr>
<td>9, 10</td>
<td>RPCM N1RS1 A RPC 5</td>
</tr>
<tr>
<td>11, 12</td>
<td>RPCM N1RS1 A RPC 6</td>
</tr>
<tr>
<td>13, 14</td>
<td>RPCM N1RS2 C RPC 13</td>
</tr>
<tr>
<td>15, 16</td>
<td>RPCM N1RS2 C RPC 3</td>
</tr>
<tr>
<td>17, 18</td>
<td>RPCM N1RS2 C RPC 4</td>
</tr>
</tbody>
</table>

Items 19 – 34: Selects either Channel A or B operation for each N1 MDM on each of the communication buses. An asterisk will be displayed next to the appropriate item number to indicate the selected channel.
SM 221 CBM CONTROL-3N display is available in SM OPS 2 and is used to provide insight and control of the zenith, nadir, forward and port Node 1 CBMs. The starboard CBM is not covered by this display since the starboard CBM power feeds are currently being utilized for Early Communication System (ECS) hardware. The display provides the commands and telemetry necessary to activate, deactivate, and provide insight into the various states of the software while commanded activities are in progress for the 16 bolt motor assemblies and four capture latches per CBM.

PARAMETER CHARACTERISTICS

<table>
<thead>
<tr>
<th>CRT NAME</th>
<th>MSID</th>
<th>UNITS</th>
<th>DISPLAY RANGE</th>
<th>STATUS IND</th>
<th>FDA LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZEN</td>
<td>[6] P93J0203C</td>
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<td>blank, 1, 2</td>
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<tr>
<td>ZEN M</td>
<td>P79X0606E, P79X0607E</td>
<td>text</td>
<td>0,0 = D (Deactivated) 0,1 = A (Activated) 1,0 = M (Monitor)</td>
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<td>ZEN S</td>
<td>[5] P79U0616D</td>
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<td>[6] P93J0204C</td>
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<td></td>
</tr>
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<td>MSID</td>
<td>UNITS</td>
<td>DISPLAY RANGE</td>
<td>STATUS IND [4]</td>
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<td>------</td>
<td>-------</td>
<td>---------------</td>
<td>----------------</td>
<td>------------</td>
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<td>PRT M</td>
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<td>0,0 = D (Deactivated) 0,1 = A (Activated) 1,0 = M (Monitor)</td>
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</tr>
<tr>
<td>PRT S</td>
<td>[5] P79U0624D</td>
<td>text</td>
<td>0, 1, 2</td>
<td>M</td>
<td>↓ 0</td>
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<tr>
<td>PRT ‘Status Indicator’</td>
<td>P79X0838E</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘CBM Validation Request’</td>
<td>P79X0632E</td>
<td>event</td>
<td>0 = blank 1 = flashing ‘VAL’</td>
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</tr>
<tr>
<td>MSTR STAT [7]</td>
<td>P79X0091E, P79X0524E, P79X0525E, P79X0526E</td>
<td>text</td>
<td>0,0,0,0 = CPLT 0,0,0,1 = PROG 0,0,1,0 = PEND 0,0,1,1 = ABRT 0,1,0,0 = FAIL 0,1,0,1 = TIME</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASK 1-1 (Row-Column)</td>
<td>P79X0633E</td>
<td>text</td>
<td>1 = ‘*’, 0 = blank</td>
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<td>1 = ‘*’, 0 = blank</td>
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<tr>
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<td>1 = ‘*’, 0 = blank</td>
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<td>text</td>
<td>1 = ‘*’, 0 = blank</td>
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<tr>
<td>MASK 1-5 ‘Latch 1’</td>
<td>P79X0649E</td>
<td>text</td>
<td>1 = ‘*’, 0 = blank</td>
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</tr>
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29 JUL 00
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<th>CRT NAME</th>
<th>MSID</th>
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<th>DISPLAY RANGE</th>
<th>STATUS IND [4]</th>
<th>FDA LIMITS</th>
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<td>LAT 1 ANG</td>
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<td>P79H0053A</td>
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<td>text</td>
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<td>text</td>
<td>1 = 'O' (open), 0 = blank</td>
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<td>↓ 1</td>
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<td>M</td>
<td>↓ 1</td>
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<td>P79X0196E, P79X0197E, P79X0192E, P79X0193E</td>
<td>text</td>
<td>1 = 'O' (open), 0 = blank</td>
<td>M</td>
<td>↓ 1</td>
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REMARKS

[1] The four-character field above CBM CONF is the ‘CBM confirmation request’ field where the commanded process in work is displayed upon execution of an ITEM 2. The following computation drives this field:

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<td>NRESFT</td>
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<td>P79X0628E</td>
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<td>NRESFT</td>
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<tr>
<td>P79X0631E</td>
<td>NRESFT</td>
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</table>

[2] Bolt Command Status (CMDST), Position (POS), and Loads (LOAD) are to the right of each bolt. The four-character CMDST field denotes if: the command is in progress (PROG), or is complete (CPTL), or has failed (FAIL), binding is detected (BIND), interference is detected (INTF), miss capture is detected (MISS), stripping is detected (STRP), there is a no engaged condition (NOEN), there is a not adjusted condition (NOAD), a malfunction is detected (MALF), a jam is detected (JAMD), a command missed a broadcast (MSBD), or a command was aborted (ABRT). The user is cued from this field in the event a command has to be masked or if ground intervention is required. The following computation drives this field:

<table>
<thead>
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<th>MSID</th>
<th>Displayed Text</th>
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<tbody>
<tr>
<td>Argument 1</td>
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<tr>
<td>Argument 2</td>
<td></td>
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<tr>
<td>Argument 3</td>
<td></td>
</tr>
<tr>
<td>Argument 4</td>
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</tr>
</tbody>
</table>

[3] For each of the four capture latches at the bottom right, the command status (CMDST) provides the user with latch insight as with the bolts above. Latch angle (ANG) shows the range of full latch extension to the retracted position. The capture switch position (CAPSW) displays an ‘O’ for open or ‘C’ for a closed under the ‘CA’ of the header. Under ‘SW’ of the header, a pair of stand alone statuses (left to right) provide insight to a switch short or an open circuit, respectively. In either case a down arrow is displayed if the event has occurred.

[4] The parameter status field for all parameters will be blank for normal operation or will display an "M" for missing data. For analog parameters, this field will also display an "H" or "L" for offscale data. Some parameters displayed will be limit-sensed for SM alerts or C&W alarms. For discretes that are limit-sensed, the undesirable state is defined in the FDA low limit field and the FDA high limit field is left blank. Satisfaction of the undesirable state triggers a ‘↓’ indication. For analogs that are limit-sensed, an "↑" or a "↓" will be displayed when the parameter exceeds
either an upper or lower limit. The symbols driven in the parameter status field have the following display priority from highest to lowest: M, H, L, ↑, ↓. All symbols driven in the parameter status column will be displayed four times normal intensity.

[5] The M/S fields show the user whether the CBM is activated, deactivated, or in the monitor state. An “A” is displayed if activated, a “D” is displayed if deactivated, and an “M” is displayed if in the monitor state. The S field displays a 0, 1, and 2 to indicate if the CBM selected is using no controller, a prime controller, or a backup controller, respectively.

[6] The field immediately to the right of ZEN, NAD, FWD, and PRT is mission unique and will represent Node 1 for early assembly flights and Node 2 for the later flights. Item 3+1 will select a primary (master) controller. Item 3+2 will select a secondary controller. In each case the index number is displayed in this hex field as to which was selected. This is the beginning of the nominal procedures after the power up steps.

[7] The Master Stat Code field provides the status of the master controller assigned (i.e., whether a command is complete (CPLT), in progress (PROG), pending (PEND), aborted (ABRT), failed (FAIL), or has timed out (TIME)).

[8] The RTL (Ready To Latch) area is a discrete feedback field to provide the RMS operator with an “O” for Open or “C” for a Closed indication for each of four latches. The characters indicate whether the CBM is in the capture envelope for the latch that corresponds to that specific RTL. Adjacent to each latch is a pair of stand alone statuses that (left to right) provide insight to a switch short or an open circuit, respectively. In either case a down arrow is displayed if the event has occurred.

**ITEM ENTRY CHARACTERISTICS**

**Item 1:** An ALL STOP command in the event the crew needs to stop any controller activity that could be considered a problem. This is boxed on top to allow rapid identification and execution.

**Item 2:** A two-step MDM software process to override the firmware command validation step or to send a command which the firmware considers non-default (nominally sent during the ABOLT command). The commanded process in work is displayed in the CBM CONFirmation request field upon execution of an ITEM 2.

**Item 3 - 6:** Select the Zenith, Nadir, Forward, or Port CBM. The Starboard CBM is dedicated to supplying power for Early Comm and will be used by PCS on later flights. Format for selection is ITEM 3 + X, where X = 1 (primary master controller) or X = 2 (secondary controller)

**Item 7:** The BBOLTCK command, drives all 16 bolts out two turns and in three turns. This is a test of the bolt and motor operation to ensure they work as desired prior to the mating operation.

**Item 8:** The Latch CLOSE command draws all latches from the extended position toward the retracted position, thus bringing the passive CBM toward the active CBM in preparation for the “ABOLT” command.
Item 9: The ABOLT command rotates and acquires all 16 bolts.

Item 10-14: The IBOLT commands continues the bolting process but takes all bolts to a higher or interim load (torquing all bolts five times).

Item 15: The FBOLT command continues the bolt torque until the bolts are taken to their final load. This command is also sent several times to ensure the bolts reach their final load.

Item 16: The LAT DEPLOY command, sends out the latches (four) from the retracted position in preparation to grapple the passive portion CBM of the component to be berthed.

Item 17: The CAPTURE-1 command moves all four capture latches to the closed position from the capture position. This is the end of the nominal mating operation.

Item 18: The CAPTURE-2 command sends out the four capture latches to catch the incoming passive CBM ring (or to close a cover if there is no module in the capture envelope).

Item 19: RSAFE executes the first of three commands to start the process of CBM support of the 20-minute separation requirement for a fast getaway of the orbiter should that become necessary. The second command in this sequence is the CBM Confirmation Command. Upon successful completion of this event, a VAL appears below Item 19 prompting the operator to be sure they really want to initiate Rapid Safing.

Item 20: SAF VAL is the third of three commands that are required to start the process of mating the CBM automatically to support the orbiter 20-minute separation requirement (the second command is the CBM Confirmation Command).

Item 21: RESET is a reset command similar to that on a home computer. It allows a restart if the software sequences lock up.

Item 22 + XX: The mask bolt commands are indexed item entries. The XX are integers 11, 12, 13, 14, 15, 21, 22, 23, 24, 25, 31, 32, 33, 34, 35, 41, 42, 43, 44 and 45. Each corresponds to the bolt groups. All other hex entries will result in an illegal entry message. These are grouped in a matrix to mask a single or multiple controller failure should that malfunction happen. This is a contingency area on the display which when a certain actuator is masked, an asterisk is driven at the appropriate X,Y coordinate of the controller/actuator being masked. For example, if an “Item 22+ 22 EXEC” is entered, an asterisk is driven adjacent the vertical column at 2 and under the horizontal column at 2. This command deselected the actuator/controller 2-2. Group 5 are the latch controller/actuators that can be masked similarly as with the bolts.

Items 23 - 25: The BITALL A and B commands are associated commands that show on PCS the last run active bit. These commands would be executed in conjunction with an X displayed on the Built-In-Test pop-up display.
SM 222 CBM POWER-3N display is available in SM OPS 2 and provides control and status of power going to the Node 1 CBM controllers. This power is used for mechanisms that drive bolts and latches during mating the active and passive CBM interface during assembly operations.

PARAMETER CHARACTERISTICS

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REMARKS

[1] The parameter status field for all parameters will be blank for normal operation or will display an "M" for missing data. For analog parameters, this field will also display an "H" or "L" for offscale data. Some parameters displayed will be limit-sensed for SM alerts or C&W alarms. For discretes that are limit-sensed, the undesirable state is defined in the FDA low limit field and the FDA high limit field is left blank. Satisfaction of the undesirable state triggers a ‘↓’ indication. For analogs that are limit-sensed, an "↑" or a "↓" will be displayed when the parameter exceeds either an upper or lower limit. The symbols driven in the parameter status field have the following display priority from highest to lowest: M, H, L, ↑, ↓. All symbols driven in the parameter status column will be displayed four times normal intensity.

ITEM ENTRY CHARACTERISTICS

Item 1: Applies ISS power to the Node 1 Forward CBM Primary Controller 1. The bolts and latches associated with this controller would lose power if the circuit were tripped (see the CBM Control display for the specific bolts and latch). Upon completion of each command, an asterisk is driven adjacent to the item number. The corresponding trip field indicates a tripped circuit and causes an asterisk and a down arrow to be driven in the parameter status column if the appropriate discrete is set high. Accompanying the tripped indication, a fault message is driven on the message line indicating the source of the tripped circuit.

Item 2: Removes ISS power from the Node 1 Forward CBM Primary Controller 1.

There are 40 power ON commands (all odd numbered) and 40 power OFF commands (all even numbered). Power for each of these circuits is provided by ISS. Consult the display to correlate item numbers with Node 1 CBM (Forward, Port, Zenith, or Nadir), Controller Number (four per CBM), and Primary vs. Secondary Controller. The Starboard CBM power feed is being used by ISS Early Comm hardware. Consult the ISS Electrical Bus Loss Impacts table for details. The following table provides a mapping between item entry and RPC:
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SM 223 EARLY COMM-3N is available in SM OPS 2 and is used to provide insight and control for the ISS Early Communication System (ECS) hardware.

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<td>0 --- 255</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBD ANT TEMP</td>
<td>P79U0602A</td>
<td>n/a</td>
<td>0 --- 255</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PORTCOM TEMP</td>
<td>P79U0603A</td>
<td>n/a</td>
<td>0 --- 255</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTP TEMP</td>
<td>P79U0604A</td>
<td>n/a</td>
<td>0 --- 255</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PORT ANT I/F</td>
<td>P79X0373E</td>
<td>text</td>
<td>0='OK', 1='ERR'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBD ANT I/F</td>
<td>P79X0374E</td>
<td>text</td>
<td>0='OK', 1='ERR'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PORTCOM I/F</td>
<td>P79X0375E</td>
<td>text</td>
<td>0='OK', 1='ERR'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SPEC 223 EARLY COMM-3N DISPLAY
(ASSY MAL/5AFIN) Page 4 of 4 pages

REMARKS

[1] Indicates if forward link packets are being discarded due to Reed-Solomon rejects.

[2] The KEY field displays the hexadecimal index number of the decryption key currently in use (bit 0/4/8). The POST field displays either ‘PASS’ or ‘FAIL’ to indicate the success of the decryption Power On Self-Test (POST). The Command/Telemetry Processor (CTP) POST field displays the ‘PASS’ or ‘FAIL’ status of the CTP POST.


[4] Displays the last ground commanded beam selection. The actual beam number is not displayed when in Automatic Pointing Mode.

[5] The SIG STR field displays the strength of the forward link signal.

ITEM ENTRY CHARACTERISTICS

Items 1 – 16: Powers on (CL) and powers off (OP) the Remote Power Controllers (RPCs) associated with the Early Communication System. An asterisk will be displayed next to the appropriate item number to indicate the open/closed status of each RPC.

Items 17 and 18: Powers ON and OFF the Early Communication System transmitter, respectively. An asterisk will be displayed next to the appropriate item number to indicate transmitter status.

Item 19: Turns OFF the Decryption function. An asterisk will be displayed next to item 19 to indicate that the decryption function is OFF; otherwise, an asterisk will be displayed under the ON column.

Items 20 and 21: Selects either the HI or LO system mode, respectively. An asterisk will be displayed next to the appropriate item entry to indicate the current system mode. HI mode is used for video teleconferencing and LO mode is used for command/telemetry transmission.

Items 22 and 23: Allow selection of either the MANUAL or AUTO pointing modes, respectively. An asterisk will be displayed next to the appropriate item entry to indicate the current mode. Normal operation of the system will be in automatic pointing mode.

Items 24 and 25: Allows selection of either the PORT or STBD OMNI antenna, respectively. These commands are used when in Low Data Rate and Manual Pointing Mode only. An asterisk will be displayed next to the appropriate item entry to indicate the antenna selected regardless of pointing mode.
SM 225 SVS CONTROL display is available in SM OPS 2. It is used to start and stop the Orbiter Space Vision System (OSVS) command translation process and to monitor the last real command that was translated.

PARAMETER CHARACTERISTICS

<table>
<thead>
<tr>
<th>CRT NAME</th>
<th>MSID</th>
<th>UNITS</th>
<th>DISPLAY RANGE</th>
<th>STATUS IND</th>
<th>FDA LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAST REAL CMD</td>
<td>V92U0320C</td>
<td>n/a</td>
<td>4-digit hex</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

REMARKS

[1] The Command Translator is a Mission Unique Process (MUP) that is used to translate Closed Circuit TV (CCTV) camera control commands received from the OSVS into compatible camera control commands to be transmitted to the CCTV Remote Control Unit (RCU). The SM GPC reads 32 16-bit words from the OSVS cyclically, via PL2 MDM card 15 channel 1, and on each cycle compares the first 16-bit word to a stored table of values for valid camera type, camera select, and camera operation. If the command is a valid command, the SVS Control translates the OSVS command into an MDM reset/set pair of commands that will be processed by the RCU. The LAST REAL CMD will be displayed on the SPEC in hexadecimal format.

ITEM ENTRY CHARACTERISTICS

Item 1: The SVS Control process is disabled upon entry into SM OPS 2. Item 1 issues bi-level command PROCESS SVS COMMANDS (V93X0309X) that causes the process to start and an asterisk is displayed next to the item number. A second Item 1 causes the process to stop and the asterisk is not displayed. When the process starts and the OSVS is operating, the SVS Control will read the 32 words from the OSVS and perform the translation process as well as providing all 32 words to the SM downlist processor for downlink to the ground. The “OSVS Processing Active” software discrete provides the state for the asterisk and is also downlisted. If the process interprets an illegal command from the OSVS, a software discrete will be set to indicate “OSVS Illegal Command Rcvd” and is provided in the downlist. If the input to the serial input of the MDM from the OSVS is no longer available, the software will set a software discrete for “OSVS Input Data Bypass” and an error message “225 OSVS ERR I/O” will be displayed on the error message line. This error state is also downlisted.
## LAB Act PCS

### Primary CCS MDM
- **MDM ID**
- **Temp** deg C
- **Frame Count**
- **Current State**
- **Hard Fail**
- **Rev. Soft Fail**
- **Soft Fail**
- **POST Stat**
- **I/O Bus Stat**
- **SX Card Slot**
- **OUI Data Path**
- **PCS Data Path**
- **NCS Passthr Status**

### Backup CCS MDM
- **RPDM LA52B_A**
- **Posn Trip**
- **RPC 3** Close
- **CC2 RT Status** Enable(T)
- **MDM ID**
- **Temp** deg C
- **Frame Count**
- **Current State**
- **Hard Fail**
- **Rev. Soft Fail**
- **Soft Fail**
- **POST Stat**
- **I/O Bus Stat**
- **SX Card Slot**
- **OUI Data Path**
- **PCS Data Path**
- **NCS Passthr Status**

### TCS Equipment
- **RPDM LA561B_A RT Status** Enable(T)
- **LAS52B_A RT Status** Enable(T)
- **PPA Avg Accum Qty**
- **Pump In Press** mmHg
- **IATCS Mode**
- **IATCS Activation** Status(T)
- **IATCS Stat**

### Primary Int MDM
- **MDM ID**
- **Frame Count**
- **Current State**
- **BIT Status**

### LA1 MDM
- **RPDM LA1B_B**
- **Posn Trip**
- **RPC 9** Close
- **LA1 RT Status** Enable(T)
- **Frame Count**
- **Current State**
- **BIT Status**

### LA2 MDM
- **RPDM LA2B_E**
- **Posn Trip**
- **RPC 4** Close
- **LA2 RT Status** Enable(T)
- **Frame Count**
- **Current State**
- **BIT Status**

### Command Response Window

**Execute**
### LAB Act TCS RPC Commands

#### TCS Equipment Power

<table>
<thead>
<tr>
<th>LTL</th>
<th>MTL</th>
<th>Posn Trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPCM LA1B_D</td>
<td>RPCM LA2B_F</td>
<td></td>
</tr>
<tr>
<td>RPC 3 - LAP6 RPC</td>
<td>RPC 1 - LAS6 RPC</td>
<td></td>
</tr>
<tr>
<td>RPC 5 - LTL SFCA SOV RPC</td>
<td>RPC 5 - MTL SFCA SOV RPC</td>
<td></td>
</tr>
<tr>
<td>RPC 6 - LTL SFCA Mod Vlv RPC</td>
<td>RPC 6 - MTL SFCA Mod Vlv RPC</td>
<td></td>
</tr>
<tr>
<td>RPC 7 - LTL NIA Vent Vlv RPC</td>
<td>RPC 7 - MTL NIA Vent Vlv RPC</td>
<td></td>
</tr>
<tr>
<td>RPC 8 - LTL NIA Isol Vlv RPC</td>
<td>RPC 8 - MTL NIA Isol Vlv RPC</td>
<td></td>
</tr>
<tr>
<td>RPC 18 - LTL PPA RPC</td>
<td>RPC 18 - MTL PPA RPC</td>
<td></td>
</tr>
<tr>
<td>RPCM LA1B_F</td>
<td>RPCM LA2B_G</td>
<td></td>
</tr>
<tr>
<td>RPC 4 - LTL TWMV RPC</td>
<td>RPC 2 - MTL TWMV RPC</td>
<td></td>
</tr>
<tr>
<td>RPC 15 - LCA Vlv1 RPC</td>
<td>RPC 1 - MTL Regen TWMV RPC</td>
<td></td>
</tr>
</tbody>
</table>

#### Command Response Window

19 JUL 00 2741.doc
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DEVICE TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3</td>
<td>APCU 1 CONV</td>
<td>Toggle sw, 2-posn (Maintained – Maintained) ON (up) – Applies CAB PL1 control power to APCU 1 converters OFF (dn) – Removes control power from APCU 1 converters</td>
</tr>
<tr>
<td>DS3</td>
<td>APCU 1 CONV</td>
<td>Event indicator, 2-posn grey – Indicates power at the output junction of APCU 1 converters bp – Indicates that neither APCU 1 converter is ON</td>
</tr>
<tr>
<td>S4</td>
<td>APCU 1 OUTPUT RLY</td>
<td>Toggle sw, 2-posn (Maintained – Maintained) CLOSED (up) – Provides CAB PL1 power to close APCU 1 output relay OPEN (dn) – Opens APCU 1 output relay by removing CAB PL1 power</td>
</tr>
<tr>
<td>DS4</td>
<td>APCU 1 CLOSE</td>
<td>Event indicator, 2-posn grey – Indicates APCU 1 is outputting power bp – Indicates APCU 1 is not outputting power</td>
</tr>
<tr>
<td>CB2</td>
<td>SW PWR 1</td>
<td>Circuit breaker, 5-amp closed (in) – Applies orbiter CAB PL1 power to SSP1 S3, S4, and SSP 2 S3 open (out) – Removes power from SSP1 S3, S4, and S19</td>
</tr>
<tr>
<td>CB1</td>
<td>PDIP PWR 2/ KuBAND RLY</td>
<td>Circuit breaker, 5-amp closed (in) – Applies orbiter CAB PL2 power to PDIP DC PWR 2 switched outlet and KuBAND RATE sw open (out) – Removes power from PDIP DC PWR 2 outlet and KuBAND RATE sw</td>
</tr>
<tr>
<td>S6</td>
<td>APCU 2 CONV</td>
<td>Toggle sw, 2-posn (Maintained – Maintained) ON (up) – Applies AUX PLB control power to APCU 2 converters OFF (dn) – Removes control power from APCU 2 converters</td>
</tr>
<tr>
<td>DS6</td>
<td>APCU 2 CONV</td>
<td>Event indicator, 2-posn grey – Indicates power at the output junction of APCU 2 converters bp – Indicates that neither APCU 2 converter is ON</td>
</tr>
<tr>
<td>S7</td>
<td>APCU 2 OUTPUT RLY</td>
<td>Toggle sw, 2-posn (Maintained – Maintained) CLOSE (up) – Provides AUX PLB power to close APCU 2 output relay OPEN (dn) – Opens APCU 2 output relay by removing AUX PLB power</td>
</tr>
<tr>
<td>ITEM</td>
<td>DEVICE TYPE</td>
<td>FUNCTION</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>DS7</td>
<td>APCU 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CLOSE</td>
<td>Event indicator, 2-posn</td>
</tr>
<tr>
<td></td>
<td></td>
<td>gray – Indicates APCU 2 is outputting power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bp – Indicates APCU 2 is not outputting power</td>
</tr>
<tr>
<td>DS13</td>
<td>Event indicator, 3-posn</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>UP – Indicates that CAB PL3 power is being supplied to OIU 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bp – Indicates power is removed from OIU 1 and OIU 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DN – Indicates that AUX PLB power is being supplied to OIU 2</td>
</tr>
<tr>
<td>S15</td>
<td>TCS PWR</td>
<td>Toggle sw, 2-posn</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Maintained – Maintained)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON (up) – Applies power to TCS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF (dn) – Removes power from TCS</td>
</tr>
<tr>
<td>DS15</td>
<td>Event indicator, 2-posn</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>gray – Indicates TCS powered</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bp – Indicates TCS not powered</td>
</tr>
<tr>
<td>S18</td>
<td>PRI C/L CAM PWR</td>
<td>Toggle sw, 2-posn</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Maintained – Maintained)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON (up) – Applies CAB PL3 power to PRI C/L camera</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF (dn) – Removes power from PRI C/L camera</td>
</tr>
<tr>
<td>S19</td>
<td>SEC C/L CAM PWR</td>
<td>Toggle sw, 2-posn</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Maintained – Maintained)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON (up) – Applies CAB PL1 power to SEC C/L camera</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF (dn) – Removes power from SEC C/L camera</td>
</tr>
<tr>
<td>CB4</td>
<td>SW PWR 2</td>
<td>Circuit breaker, 5-amp</td>
</tr>
<tr>
<td></td>
<td></td>
<td>closed (in) – Applies orbiter CAB PL3 power to SSP1 S18 and redundant power to S20 and S22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>open (out) – Removes power from SSP1 S18 and redundant power from S20 and S22</td>
</tr>
<tr>
<td>CB3</td>
<td>PDIP PWR 1</td>
<td>Circuit breaker, 5-amp</td>
</tr>
<tr>
<td></td>
<td></td>
<td>closed (in) – Applies orbiter CAB PL2 to PDIP DC PWR 1 switched outlet and redundant power to SSP1 S20 and S22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>open (out) – Removes power from PDIP DC PWR 1 outlet and redundant power from SSP1 S20 and S22</td>
</tr>
<tr>
<td>ITEM</td>
<td>DEVICE TYPE</td>
<td>FUNCTION</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>S20</td>
<td>ODS CONN MATE X1</td>
<td>ON (up) – Supplies CAB PL2 and CAB PL3 power for PMA 3 X1 connector mate signal</td>
</tr>
<tr>
<td></td>
<td>TLM PWR</td>
<td>OFF (dn) – Removes power for PMA 3 X1 connector mate signal</td>
</tr>
<tr>
<td></td>
<td>Toggle sw, 2-posn</td>
<td>(Maintained – Maintained)</td>
</tr>
<tr>
<td>S22</td>
<td>ODS CONN MATE X2</td>
<td>ON (up) – Supplies CAB PL2 and CAB PL3 power for PMA 3 X2 connector mate signal</td>
</tr>
<tr>
<td></td>
<td>TLM PWR</td>
<td>OFF (dn) – Removes power for PMA 3 X2 connector mate signal</td>
</tr>
<tr>
<td></td>
<td>Toggle sw, 2-posn</td>
<td>(Maintained – Maintained)</td>
</tr>
<tr>
<td>S24</td>
<td>OIU PWR</td>
<td>OIU 1 ON (up) – Provides CAB PL3 power to OIU 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OIU 2 ON (dn) – Provides AUX PLB power to OIU 2</td>
</tr>
<tr>
<td></td>
<td>Toggle sw, 3-posn</td>
<td>(Maintained – Maintained – Maintained)</td>
</tr>
<tr>
<td></td>
<td>OIU 1 ON (up) – Provides CAB PL3 power to OIU 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OFF (ctr) – Removes power from OIU 1 and OIU 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OIU 2 ON (dn) – Provides AUX PLB power to OIU 2</td>
</tr>
</tbody>
</table>
## STANDARD SWITCH PANEL #2
(ASSY MAL/5A/FIN)  Page 2 of 4 pages

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DEVICE TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
</table>
| S3   | FWD KEEL DIRECT ITVC CTRL | ON (up) – Applies CAB PL1 power to the Fwd Keel DIRECT ITVC Camera  
OFF (dn) – Removes power from the Fwd Keel DIRECT ITVC Camera |
| S4   | FWD KEEL DIRECT ITVC HTR/ILLUM | ON (up) – Applies CAB PL1 power to the Fwd Keel DIRECT ITVC Camera illuminator and thermistatically-controlled heaters. The initial ON causes the illuminator to flash once but then remain off. The next ON will cause it to illuminate and remain illuminated. This cycle repeats with each subsequent ON  
OFF (dn) – Removes heater and illuminator power from the Fwd Keel DIRECT ITVC Camera |
| S6   | FWD KEEL SVS PWR | ON (up) – Applies CAB PL3 power to the Fwd Keel SVS Camera  
OFF (dn) – Removes power from the Fwd Keel SVS Camera |
| S7   | FWD KEEL SVS ILLUM | ON (up) – Applies CAB PL3 power to the Fwd Keel SVS Camera illuminator and thermistatically-controlled heaters. The camera illuminator has four modes that it cycles though with each sequential ON. The initial ON causes the illuminator to flash once but then remain off. The second ON will cause it to illuminate full strength (all 156 leds) and remain illuminated. The third ON will result in partial illumination (84 of 156 leds). The fourth ON will result in 30 of 156 leds illuminated. The four mode cycle repeats with the next ON.  
OFF (dn) – Removes heater and illuminator power from the Fwd Keel SVS Camera |
| CB2  | SW PWR 2 | closed (in) – Applies orbiter CAB PL1 power to SSP2 S4, S15, and makes power available to the Fwd Keel DIRECT ITVC Camera  
open (out) – Removes power from the Fwd Keel DIRECT ITVC Camera and from SSP2 S4 and S15 |
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DEVICE TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB1</td>
<td>Circuit breaker, 5-amp</td>
<td>closed (in) – Applies orbiter CAB PL2 power to SSP2 S18 open (out) – Removes power from SSP2 S18</td>
</tr>
<tr>
<td>S15</td>
<td>Toggle sw, 2-posn (Maintained – Maintained)</td>
<td>ON (up) – Applies CAB PL1 power to the Aft Keel DIRECT Camera OFF (dn) – Removes power from the Aft Keel DIRECT Camera</td>
</tr>
<tr>
<td>S16</td>
<td>Toggle sw, 2-posn (Maintained – Maintained)</td>
<td>ON (up) – Applies CAB PL2 power for the Aft Keel DIRECT Camera illuminator and thermistatically-controlled heaters. The camera illuminator has four modes that it cycles though with each sequential ON. The initial ON causes the illuminator to flash once but then remain off. The second ON will cause it to illuminate full strength (all 156 leds) and remain illuminated. The third ON will result in partial illumination (84 of 156 leds). The fourth ON will result in 30 of 156 leds illuminated. The four mode cycle repeats with the next ON. OFF (dn) – Removes heater and illuminator power from the Aft Keel DIRECT Camera illuminator</td>
</tr>
<tr>
<td>S18</td>
<td>Toggle sw, 2-posn (Maintained – Maintained)</td>
<td>ON (up) – Applies CAB PL2 power to the Aft Keel SVS Camera OFF (dn) – Removes power from the Aft Keel SVS Camera</td>
</tr>
<tr>
<td>S19</td>
<td>Toggle sw, 2-posn (Maintained – Maintained)</td>
<td>ON (up) – Applies CAB PL3 power for the Aft Keel SVS Camera illuminator and thermistatically-controlled heaters. The camera illuminator has four modes that it cycles though with each sequential ON. The initial ON causes the illuminator to flash once but then remain off. The second ON will cause it to illuminate full strength (all 156 leds) and remain illuminated. The third ON will result in partial illumination (84 of 156 leds). The fourth ON will result in 30 of 156 leds illuminated. The four mode cycle repeats with the next ON. OFF (dn) – Removes heater and illuminator power from the Aft Keel SVS Camera</td>
</tr>
<tr>
<td>ITEM</td>
<td>DEVICE TYPE</td>
<td>FUNCTION</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>CB4</td>
<td>Circuit breaker, 5-amp</td>
<td>closed (in) – Applies orbiter CAB PL3 power to SSP2 S6, S7, and S19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>open (out) – Removes power from SSP2 S6, S7, and S19</td>
</tr>
<tr>
<td>SW PWR 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB3</td>
<td>Circuit breaker, 5-amp</td>
<td>closed (in) – Applies orbiter CAB PL2 power to SSP2 S16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>open (out) – Removes power from SSP2 S16</td>
</tr>
<tr>
<td>SW PWR 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>