

Payload Systems Data and Malfunction Procedures

STS-125

**Mission Operations Directorate
Operations Division**

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Houston, Texas



Verify this is the correct version for the pending operation (training, simulation or flight).
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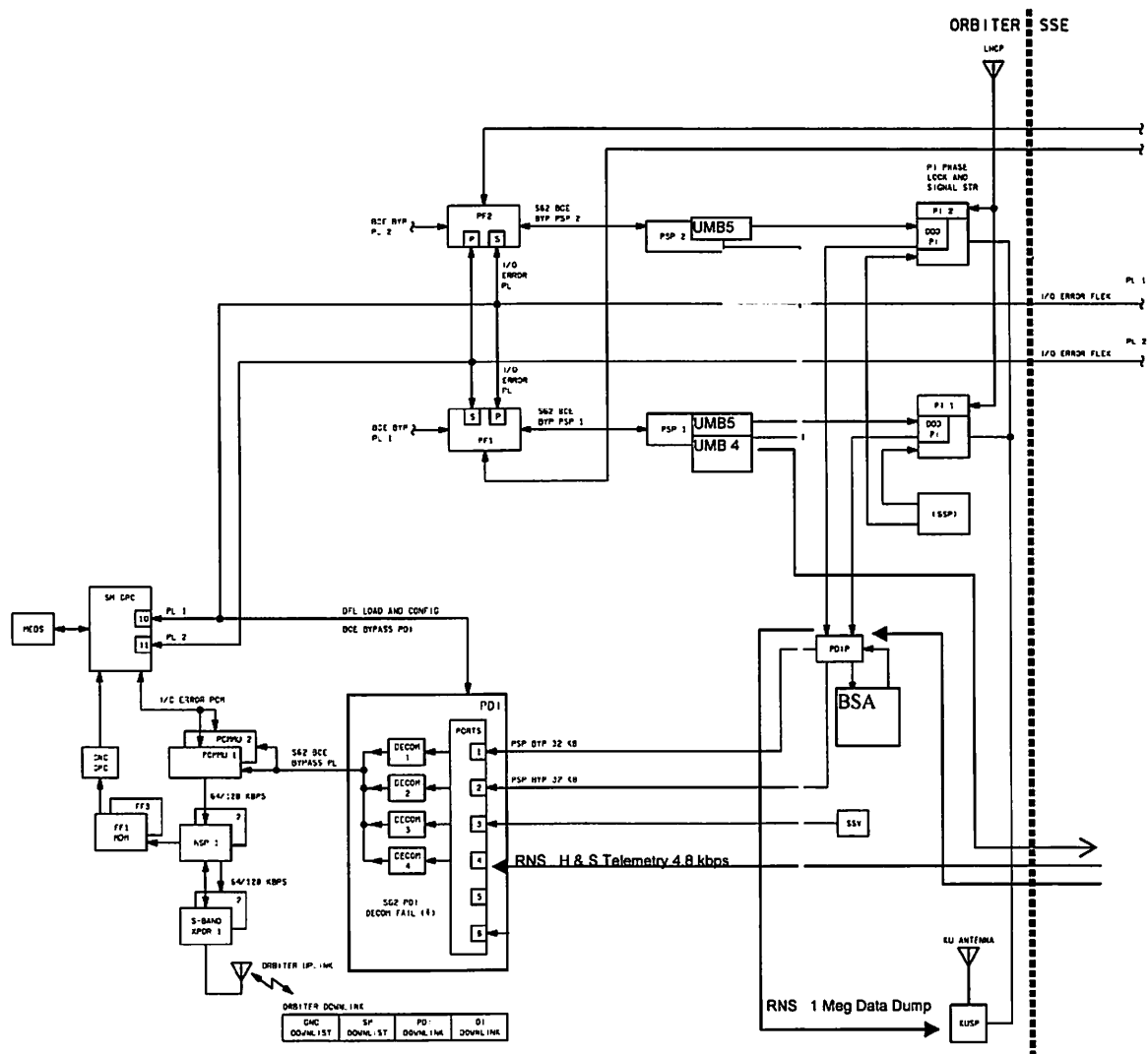
PL COMM

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PL COMM

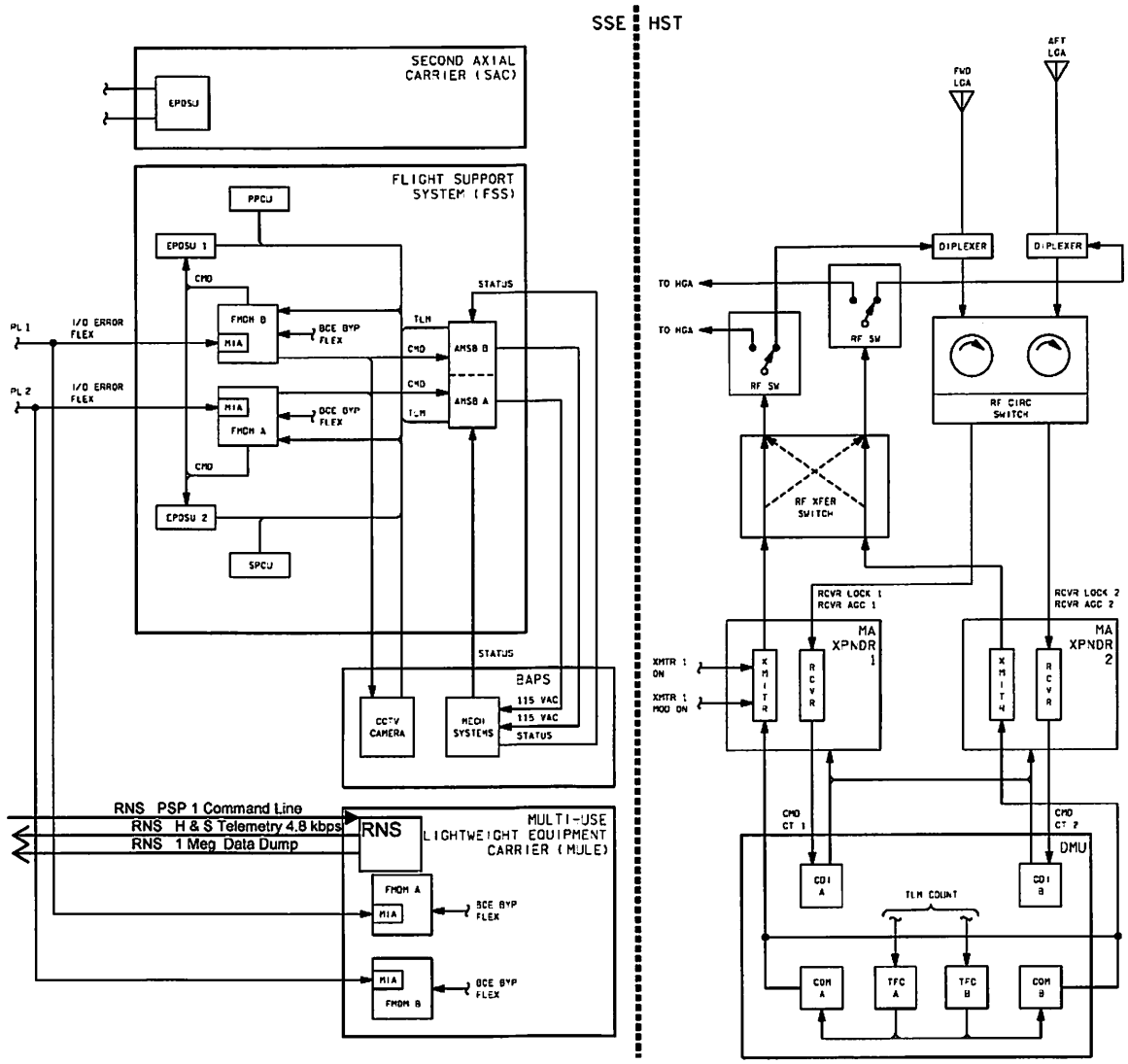
STS-125 COMM MALFUNCTION POINTS

PL COMM



48069009_109, SCH 1

STS-125 COMM MALFUNCTION POINTS (Cont)



4806901O_109. SCH 1

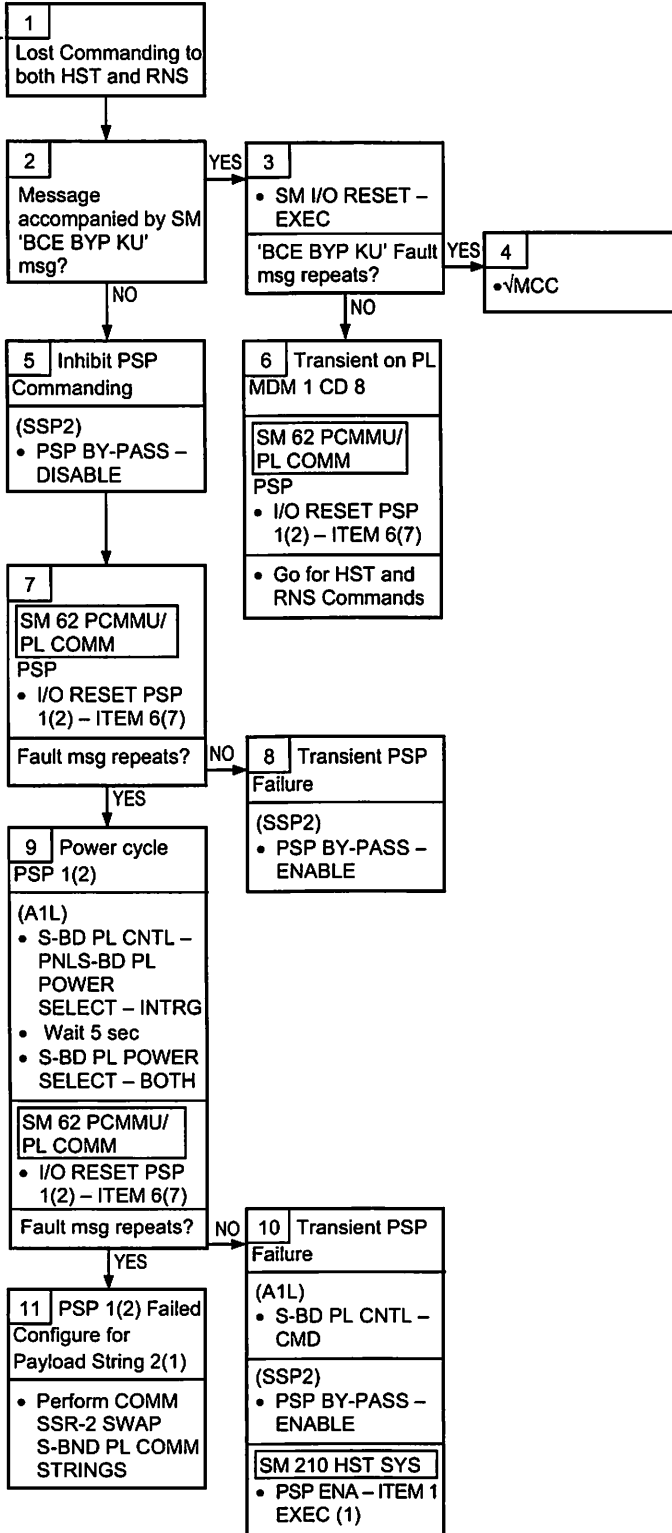
HST COMM

3.1a 'S62 BCE BYP PSP 1(2)'

**SM
ALERT**

S62 BCE BYP
PSP 1(2)

Nominal Config:
S-BD PL PWR
SYS - 1(2)
S-BD PL PWR
SEL - BOTH
S-BD PL PSP COM
OUTPUT - PL UMB



HST COMM

3.1b 'S62 PDI DECOM FAIL'

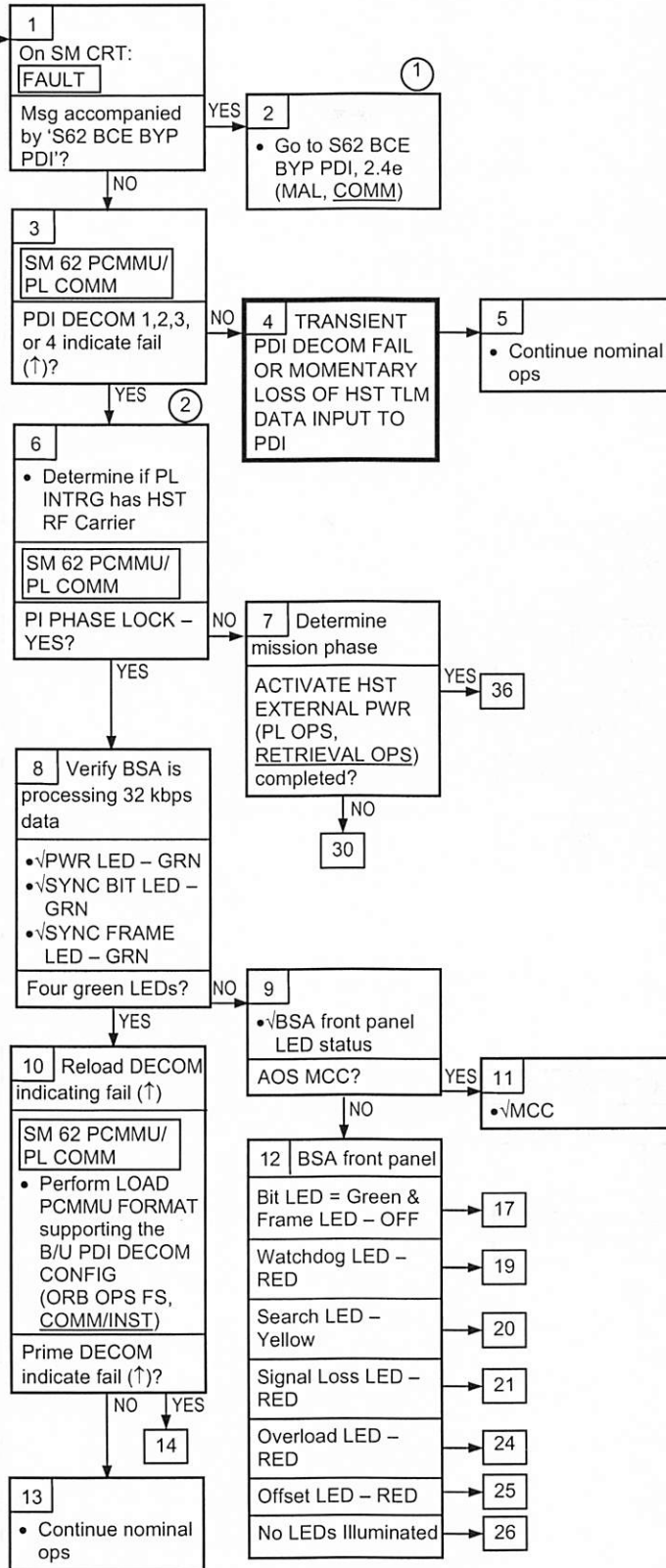
SM
ALERT

S62 PDI
DECOM FAIL

Nominal Config:

SM 210 HST SYS
PSP ENA 1 ID 1
(R1)
PL PRI MNC - ON
PL CAB - MNA (MNB)
(L12L)
cb SW PWR - cl
PSP BYP - ENA
(L12U)
cb SPACE TEL SW
PWR - cl
(A1L)
If S-BD PL CNTL -
CMD, √MCC
Else, √config:
If HST RF link:
S-BD PL ANT
POLAR - L CIRC
S-BD PL XMTR PWR:
LO (as reqd) MED
(> 40 ft) HI
(> 125 ft)
S-BD PL CH SEL
INTRG 1,2 (six) -
701,701
S-BD PL FREQ
SWEEP - OFF
S-BD PL MOD - ON
S-BD PL PWR
SYS - 1(2)
S-BD PL PWR
SEL - BOTH
S-BD PL PSP COM
OUTPUT - PL UMB

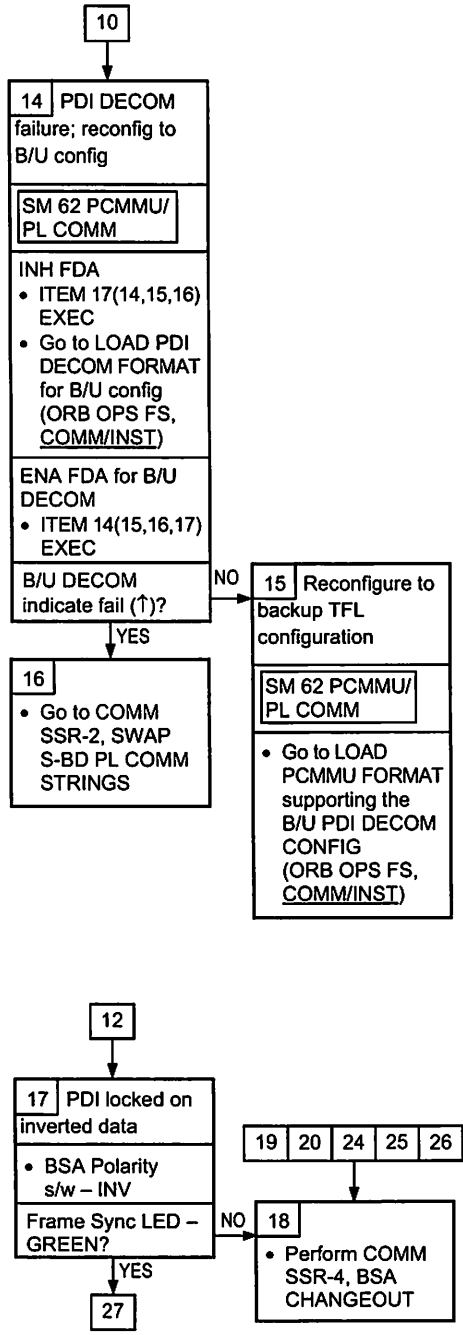
BSA
PWR - ON
RATE - AUTO
POLARITY -
NORM(INV)
WATCHDOG -
ENABLE



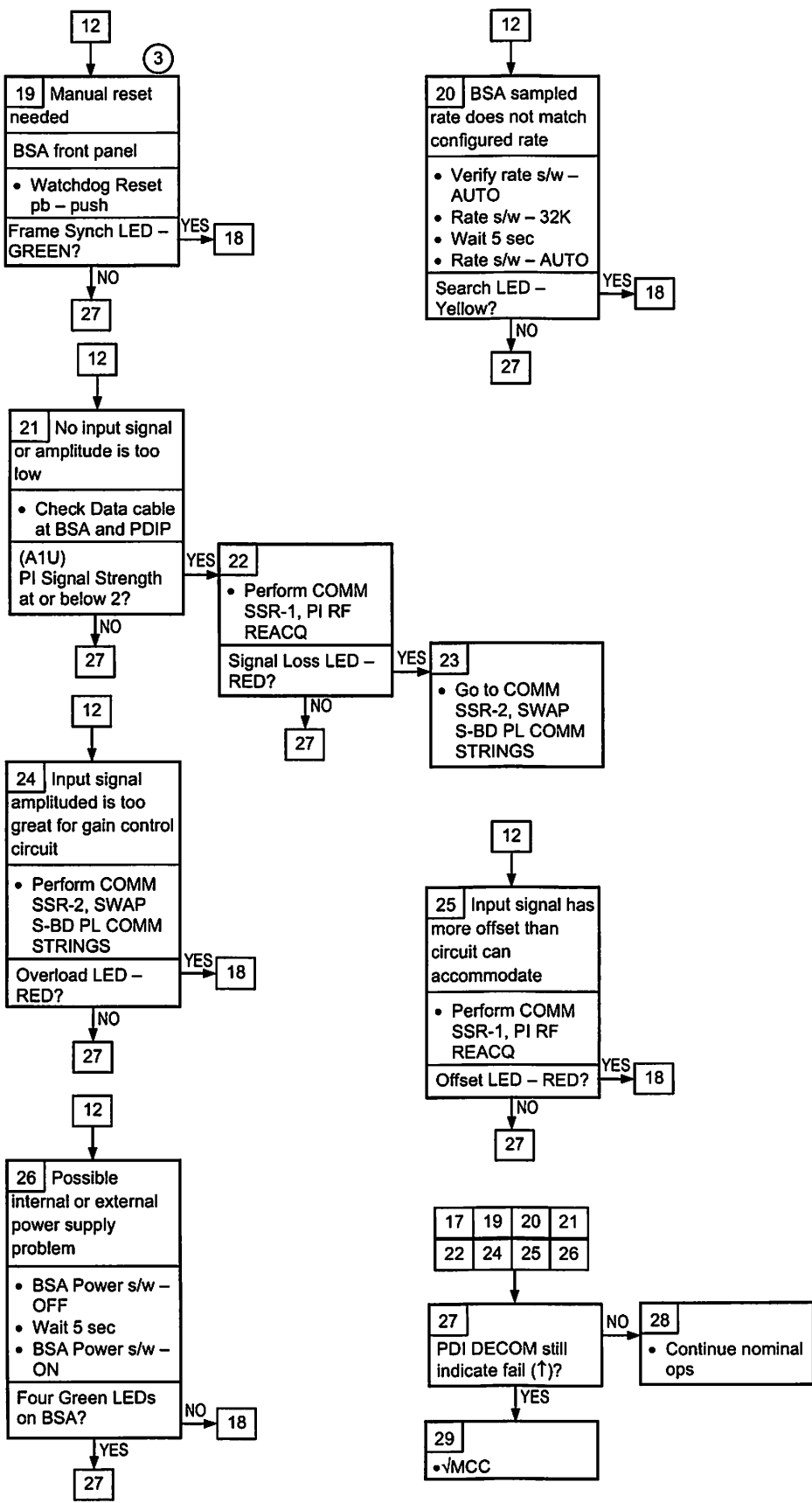
① Possible PDI Replacement IFM

② If KU downlink of HST tlm available, Ground will check with STOCC. If STOCC not receiving tlm via KU, then possible HST tlm system failure or PI receiver failure

HST COMM 3.1b (Cont)

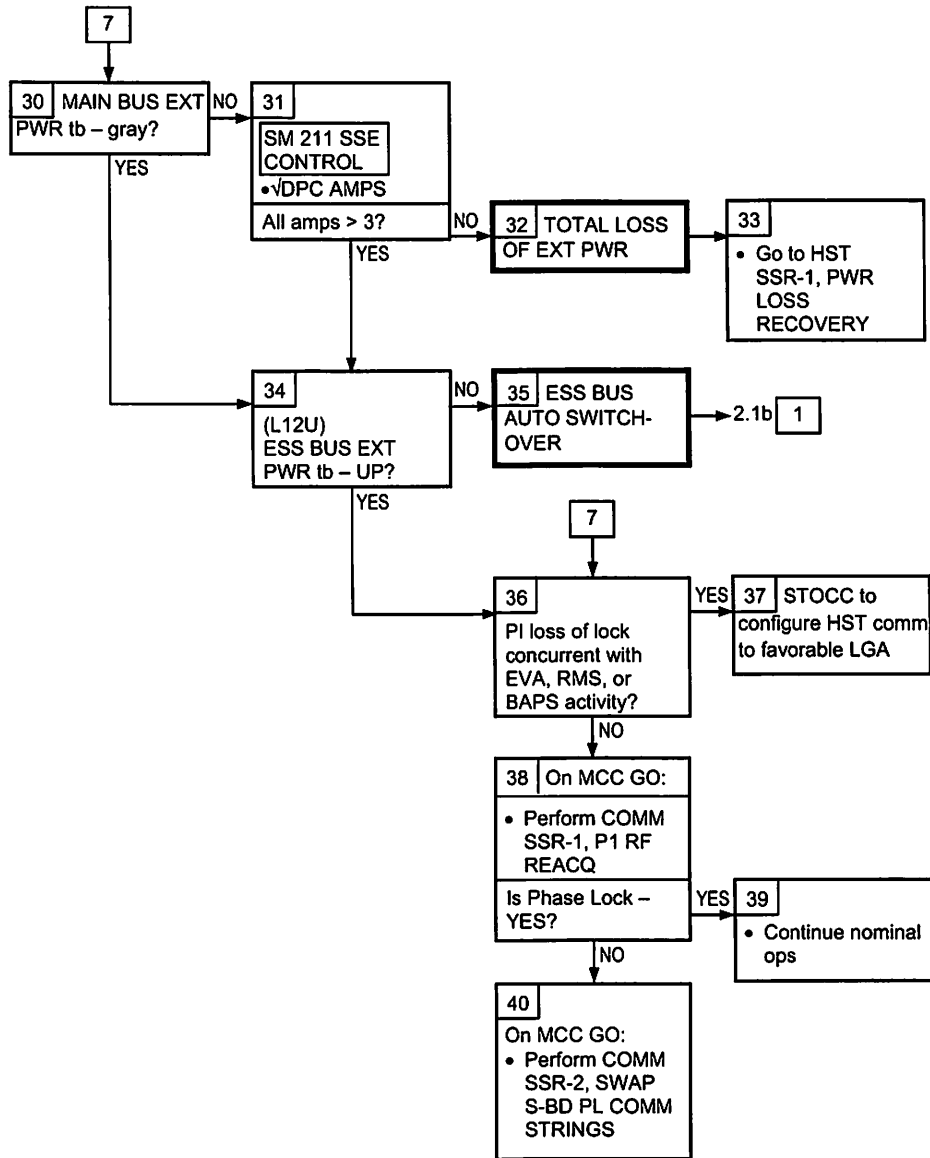


HST COMM 3.1b (Cont)



- ③ BSA Reset and Power Cycle Counters should clear
- ④ Upon powerup, all LEDs lit for 4 sec

HST COMM 3.1b (Cont)



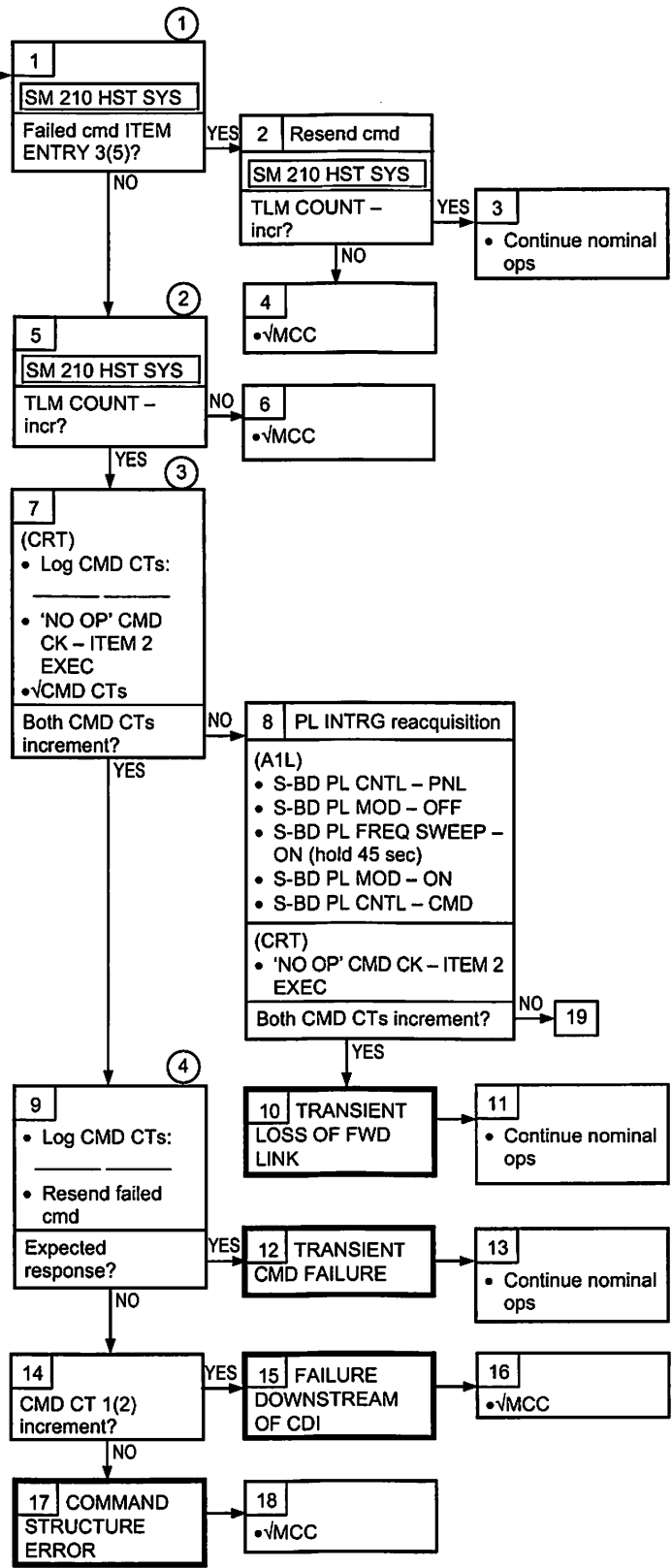
HST COMM

3.1c NO HST RESPONSE TO RF COMMAND

No Response to RF Cmd

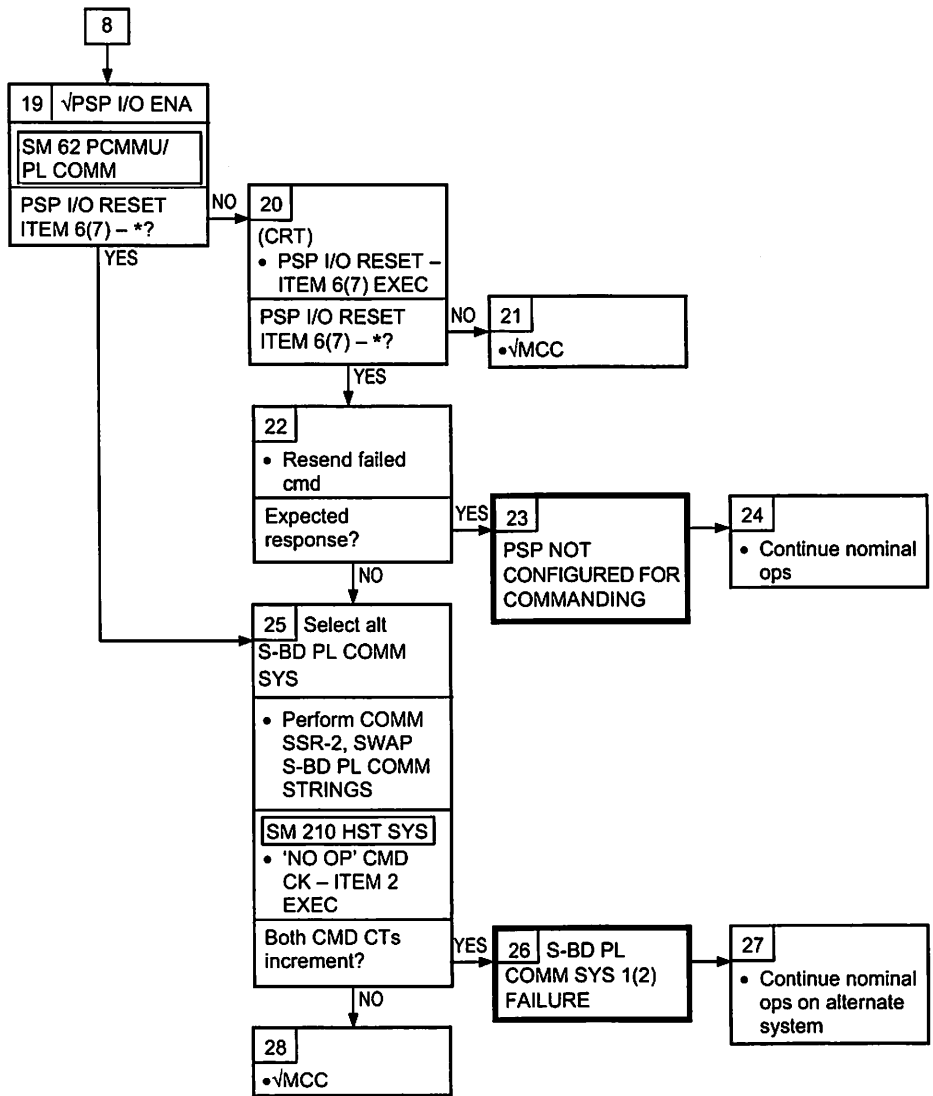
Nominal Config:
 PI link setup (A1L)
 S-BD PL CNTL – CMD
 S-BD PL ANT POLAR – L CIRC
 S-BD PL XMTR PWR: LO (as reqd) MED (> 40 ft) HI (> 125 ft)
 S-BD PL CH SEL INTRG 1,2 tw (six) – 701,701
 S-BD PL PWR SYS 1(2)
 S-BD PL PWR SEL – BOTH
 S-BD PL PSP CMD OUTPUT – PL UMB
 S-BD PL XMTR FREQ SWEEP – OFF
 S-BD PL XMTR MOD – ON
 S-BD PL CNTL – PNL,CMD
 L12L PSP BYPASS – ENABLE

SM 210 HST SYS
 PSP ENA 1 ID – (1)



- ① If failed cmd was XMTR 1 ON, ITEM 3, then XMTR MOD ON, ITEM 5 must be sent before tlm is received
- ② Must be in 32K T format or 4K A format, or 4K D format to receive valid tlm (DFL 5, 6,7,9, 16, 17 or 19). If not, when AOS, √MCC
- ③ HST RCVR could have lock but pwr level (AGC) could be too low for cmd processing. For this case, MCC may decide to go to PI MED pwr
- ④ CMD CT 1 corresponds to CDI A cmds and CMD CT 2 corresponds to CDI B

HST COMM 3.1c (Cont)



COMM

SSR-1 PI RF REACQ

①
STOCC can perform
blocks 3-5
if necessary

②
XMTR 1 ON
cmd also turns off
HST modulation

1	RF reacquisition
(A1L)	
•√S-BD PL CNTL – CMD	
•√S-BD PL ANT POLAR – L CIRC	
•√S-BD PL XMTR PWR – LO, MED (> 40 ft), HI (> 125 ft) (as reqd)	
•√S-BD PL CH SEL INTRG 1,2 tw (six) – 701,701	
•√S-BD PL MOD – OFF	
•√S-BD PL PWR SEL – BOTH	
•√S-BD PL SYS – 1(2)	
• S-BD PL CNTL – PNL	
SM 210 HST SYS	
• PSP ENA – ITEM 1 EXEC (1)	

2	Forward link reacquisition
(A1L)	
• S-BD PL FREQ SWEEP – ON (hold 45 sec)	
• S-BD PL MOD – ON	
• S-BD PL CNTL – CMD	

3	Return link reacquisition
SM 210 HST SYS	
• XMTR 1 ON CDI-A(B) – ITEM 3 +1(2) EXEC	
SM 62 PCMMU/PL COMM	
•√PL INTRG PHASE LOCK – YES	
• Log PL SIG STR: _____	

4	HST tlm verification
SM 210 HST SYS	
MOD ON CDI-A(B) – ITEM 5 +1(2) EXEC	

5	HST tlm verification
SM 210 HST SYS	
•√TLM COUNT – incr	
• Log MET: _____/_____:_____	

COMM

SSR-2 SWAP S-BD PL COMM STRINGS

1 | Swap BSA ports
• Perform COMM SSR-3 BSA PDIP PORT SWAP

2 | RF reacquisition
(A1L)
•√S-BD PL CNTL – CMD
•√S-BD PL ANT POLAR – L CIRC
•√S-BD PL XMTR PWR – LO
•√S-BD PL CH SEL INTRG 1,2 tw (six) – 701,701
• S-BD PL MOD – OFF
•√S-BD PL PWR SEL – BOTH
• S-BD PL PWR SYS – 2(1)
• S-BD PL CNTL – PNL
• Fault msg 'S62 BCE BYP PSP 1(2)
• Perform PSP I/O RESET
SM 62 PCMMU/PL COMM
• I/O RESET PSP 2(1) – ITEM 7(6) EXEC (*)
SM 210 HST SYS
• PSP ENA – ITEM 1 EXEC (1)

3 | Reload PDI switch matrix for alternate PI
SM 62 PCMMU/PL COMM
PDI: (DECOM 1)
• SEL DECOM – ITEM 9 +1 EXEC
• SEL INPUT – ITEM 12 +2(1) EXEC
• LOAD – ITEM 13 EXEC
PDI: (DECOM 4)
• SEL DECOM – ITEM 9 +4 EXEC
• SEL INPUT – ITEM 12 +2(1) EXEC
• LOAD – ITEM 13 EXEC

4 | Forward link reacquisition
(A1L)
• S-BD PL FREQ SWEEP – ON (hold 45 sec)
• S-BD PL MOD – ON
• S-BD PL CNTL – CMD

5 | Return link reacquisition
SM 210 HST SYS
• XMTR 1 ON CDI-A(B) – ITEM 3+1(2) EXEC
SM 62 PCMMU/PL COMM
• PL INTRG PHASE LOCK – YES
• Log PL SIG STR: _____

6 | HST tlm verification
SM 210 HST SYS
• MOD ON CDI-A(B) – ITEM 5 +1(2) EXEC
•√TLM COUNT – incr
• Log MET: ____/____:____

①
STOCC can perform blocks 2,4 if necessary

②
XMTR 1 ON cmd also turns off HST modulation

COMM SSR-3 BSA PDIP PORT SWAP

NOTE

Possible 'S62 PDI DECOM FAIL' msg

- L12L 1. REMOVE PI DATA FROM BSA
PSP BY-PASS – DISABLE
- BSA 2. BSA PWR OFF
BSA PWR – OFF
- PDIP1 3. PDIP PORT SWAP
Disconnect BSA data cable from HST PI NO 1(2)
Remove Turn-Around Plug on HST PI NO 2(1)
Install Turn-Around Plug on HST PI NO 1(2)
Connect BSA data cable to HST PI NO 2(1)
- BSA 4. BSA PWR UP AND LED VERIFICATION
BSA PWR – ON
√All LEDs illuminate for 4 sec
- After full LED check:
√PWR – GREEN
- * If pwr to BSA fails: *
- * Check pwr cable connection: *
- * BSA PWR – OFF *
- * BSA PWR – ON *
- L12L 5. ENABLE PSP BYPASS
PSP BY-PASS – ENABLE
- BSA 6. √BSA Rate – Auto
7. STATUS INDICATORS
- BSA Signal Status
√Sync BITE – GREEN
√Sync Frame – GREEN
- Report status to MCC

COMM SSR-4

BSA CHANGEOUT

TO REMOVE FAILED BSA

- BSA L12L 1. POWER OFF FAILED BSA
BSA PWR – OFF
PSP BY-PASS – DISABLE
- MO13Q 2. DISCONNECT FAILED BSA
DC UTIL PWR MNB – OFF
- BSA Disconnect: BSA Power cable
Disconnect: BSA Data cable
- 3. REMOVE FAILED BSA
Remove failed BSA with caution to avoid damaging velcro
- 4. STOW FAILED HST BSA
Stow BSA in locker

TO INSTALL SPARE BSA

- 5. UNSTOW SPARE BSA
Remove spare BSA from storage locker
 - L12L MO13Q BSA 6. VERIFY CONNECTORS DEADFACED FOR BSA INSTALLATION
√PSP BY-PASS – DISABLE
√DC UTIL PWR MNB – OFF
√BSA PWR – OFF
 - 7. POSITION BSA
Place Spare BSA into position and velcro
 - BSA 8. BSA INSTALLATION
Connect: BSA 14 foot data cable to BSA data port
Connect: BSA power cable to BSA power port
 - BSA 9. CONFIGURE BSA FRONT PANEL
RATE – Auto
POLARITY – Norm
WATCHDOG – Ena
 - L12L MO13Q 10. BSA POWERUP AND LED VERIFICATION
PSP BY-PASS – ENABLE
DC UTIL PWR MNB – ON
 - BSA BSA PWR – ON
√All LEDs illuminate for 4 sec
- After LED check:
- √PWR – Green
 - √RATE – 32k – Green
 - √SYNC – Bit – Green
 - √SYNC – Frame – Green
- * If status indicators do not agree, *
 - * call MCC *
 - * If pwr to BSA fails: *
 - * Check pwr cable connection *
 - * BSA PWR – OFF (wait 5 sec) *
 - * BSA PWR – ON *

Notify MCC, HST BSA CHANGEOUT is complete

PL/DPS RECONFIG

PL/DPS
RECONFIG

PL/DPS RECONFIG

PROCEDURE	SECURE ACTION	RECOVERY ACTION	INFO ONLY
PL1(2) MDM I/O ERROR; PL1(2) MDM OUTPUT (ORB PKT, <u>DPS</u>)	A,B	E	I
PASS SM GPC FAIL (ORB PKT, <u>DPS</u>)	N/A	F	J
GNC RECOVERY VIA G2FD (ORB PKT, <u>DPS</u>)	N/A	F	J
5.1a CS SPLIT (MAL, <u>DPS</u>)	N/A	F	J
5.3c I/O ERROR PL1(2), MDM OUTPUT PL1(2) (MAL, <u>DPS</u>)	---	D,E	I
5.3e I/O ERROR FLEX (MAL, <u>DPS</u>)	A,C	G	
5.3f BCE BYP FLEX (MAL, <u>DPS</u>)	A,C	G	
5.3g BCE BYP PL1(2) (MAL, <u>DPS</u>)	A,B	D,E	I
GPC FRP-4 PASS RECOVERY AFTER BFS ENGAGE (ASCENT/ORBIT/ENTRY) (MAL, <u>DPS</u>)	N/A	*F	J
GPC FRP-7 DPS RECONFIG FOR LOSS OF AV BAY COOLING (MAL, <u>DPS</u>)	N/A	*F,H	J
DPS SSR-3 GNC REASSIGNMENT (MAL, <u>DPS</u>)	N/A	N/A	J
DPS SSR-4 SM REASSIGNMENT (MAL, <u>DPS</u>)	N/A	F,H	J
ECLS SSR-10 H2O PUMP OPS VIA GPC (MAL, <u>ECLSS</u>)	N/A	N/A	
*Recovery procedure is not called from GPC FRP-7, specified actions are reqd to return to a nominal config			

ACTION A

If during FSS MECH OPS, terminate motor drive immediately

- A6U PL RETEN LAT 1,2 (two) – OFF
- R13L PL BAY MECH PWR SYS 1,2 (two) – OFF

NOTE

If port mode reqd, and operating on less than 12 DPC, √MCC; else, enable PCU hardline to ensure continuous HST ext pwr

If HST on ext pwr:

- L12U PCU CONTR A,B (two) – ON

ACTION B

If port moding to alternate ports, do not power off any flex MDMs. All 4 FMDMs can be powered

If port moding back to primary ports, power off alternate FMDMs, primary FMDMs will still be powered

PL/DPS RECONFIG

ACTION C

If entering from 5.3e, 'I/O ERROR FLEX' (MAL, DPS):
Go to 1.4a, 'I/O ERROR FLEX' (SSE), 9

If entering from 5.3f, 'BCE BYP FLEX' (MAL, DPS):
Go to 1.4b, 'BCE BYP FLEX' (SSE), 9

ACTION D

If procedure swapped to alternate FMDM,
Perform SSE SSR-1 FMDM SWAP A→B(B→A) (SSE), steps 6-14

ACTION E

L12U PCU CONTR A,B (two) – OFF

ACTION F (Can be performed by MCC if AOS)

If SM GPC recovered:

SM 62 PCMMU/PL COMM

I/O RESET PSP1(2) – ITEM 6(7) EXEC (*)

SM 210 HST SYS

PSP ENA – ITEM 1 EXEC (1) or SM 213 HST BATT, PSP ENA – ITEM 1 EXEC (1)

ACTION G

Verify SSE status:

SM 211 SSE OVERVIEW

POWER

- √FSS EPDSU 1/2 AMPS (two): < 3.0
- √FSS FMDM A/B AMPS (two): .5 to 1.1
- √HTR – 1/2
- √P1/P2 AMPS (two): < 0.4
- √R1/R2 AMPS (two): < 0.4
- √CCTV HTR AMPS: < .9
- √ORUC – A/B
- √AMPS (two): < 30
- √MULE FMDM A/B AMPS (two): .7 to 1.3
- √HTR – (no *)
- √HTR AMPS: < 0.4

- √COPE 1A/2A AMPS (two): < 3.5
- √1B&2B: < 6
- √3A/3B (two): < 3.5
- √SLIC EPDSU AMPS: < 16
- √FSS VOLTS (two): 24.0 to 32.0
- √SLIC VOLTS (two): 24.0 to 32.0
- √MULE VOLTS: 24.0 to 32.0

SM 212 SSE MECH/BPA/RNS

If RNS FRM CNT – INCR:

RNS TM ON – ITEM 25 EXEC

If during FSS CCTV operations:

CCTV ENA ON – ITEM 3 EXEC (*)

PWR ON – ITEM 5 EXEC (*)

ACTION H (Can be performed by MCC if AOS)

Perform LOAD PDI DECOM FORMAT (ORB OPS FS, COMM/INST)

Reenable PDI DECOM FDA as reqd

ACTION I

If 'I/O ERROR PL1' msg, note following losses:

Loss of onboard and ground cmd capability via PL comm string 1 (PF1/PSP1/PI1)
to HST

If 'I/O ERROR PL2' msg, note following losses:

Loss of onboard and ground cmd capability via PL comm string 2 (PF2/PSP2/PI2)
to HST

ACTION J

If affected GPC SM:

Note PL commanding (onboard and ground) via SM GPC not possible until
SM machine restored and PF1(2) MDM I/F restored

If affected GPC GNC:

Ground commanding not possible until GNC machine restored

HST DATA INVERSION 5-2

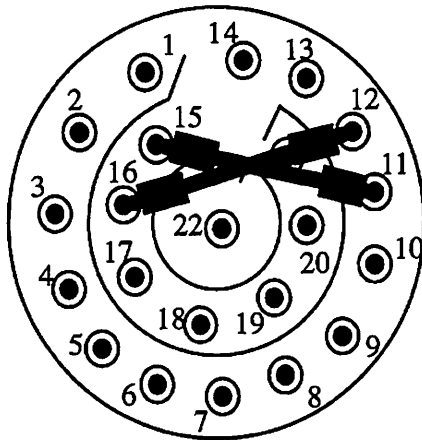
HST DATA INVERSION

OBJECTIVE: To recover onboard payload tlm by reversing polarity of telemetry signal coming from PI #1(PI #2)

LOCATION: PDIP (J101(J103)) on panel L12L

TOOLS REQD: Gray Tape
Pin Kit

- A1L 1. \sqrt{S} -BD PL PWR SEL – BOTH
 $\sqrt{SYS} - 1(2)$
- PDIP 2. Obtain two 5-in (22 ga) Pin/Pin Test Jumper Leads from Pin Kit
3. Demate connector from J101(J103) on PDIP
4. Install 5-in (22 ga) Pin/Pin Test Jumper Leads into following socket positions on J101(J103)



J101(J103)

5. Secure Jumpers with Gray Tape
6. Notify MCC: IFM complete
7. Stow tools

CRITICAL EQUIPMENT LOST

ELECTRICAL BUS LOSS MATRIX 6-3
MDM BUS LOSS IMPACTS 6-7

**CRITICAL
EQUIP LOST**

**CRITICAL
EQUIP LOST**

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ELECTRICAL BUS LOSS MATRIX (Cont)

ORBITER ELECTRICAL BUSES →	FC1	FC2		FC3	MNA DA1						MNB DA2						FC3	MNC DA3																		
	ESS 1BC	ESS 2CA		ESS 3AB	FPC1			R14	O14	A6 & A14	MPC 1	MPC2		A6 & A14	APC5	FPC2			O15	R14	(R)	(R)	P	O16	R14	APC6	FPC3									
	O13 & R15	O13 & R14	O13 & R16	CNTL AB1	CNTL AB2	AC1				AUX PLA	P	(R)	AUX PLB		A14	APC2	AC2	CNTL BC1	CNTL BC2	FLC2							APC3	FLC3	AC3	CNTL CA1	CNTL CA2					
											CABIN PL					AFT PLB												AFT PLC		A15 AC+C						
PRLAs																																				
MECH PWR SYS 1 (A MTRS)				XRC																													XRC			
AC ENA 1				XRC																													XRC			
AC ENA 2					XRC																													XRC		
AC PWR						X																														
PL RET SW 1			XRC																																	
MECH PWR SYS 2 (B MTRS)				XRC					XRC																											
AC ENA 1				XRC				XRC																												
AC ENA 2			XRC																																	
AC PWR																X																				
PL RET SW 2																																				
PL SEL POSN TLM					XRC																															
PAYLOADS																																				
HST POWER																																				X
SSE POWER (does not include ICBC3D)																																				X
ICBC 3D POWER											XC					X																				

X = Total loss of operational power
P = Loss of primary power source
R = Loss of redundant power source
(R) = Requires action to use redundant source
XC = Total loss of CNTL power
XRC = Loss of redundant CNTL power

* - CNTL bus name identifies power source (ex: CNTL BC1 is powered by MNB & MNC through RPCs and by MNA through cb and fuse)

ELECTRICAL BUS LOSS MATRIX (Cont)

ORBITER ELECTRICAL BUSES →	FC1	FC2		FC3	MNA DA1						MNB DA2						FC3	MNC DA3															
	ESS 1BC	ESS 2CA		ESS 3AB	FPC1		R14	O14	A6 & A14	MPC 1			MPC2		A6 & A14	APC5	FPC2			O15	R14	(R)	(R)	P	O16	R14	APC6	FPC3					
	O13 & R15	O13 & R14	O13 & R16		CNTL AB1	CNTL AB2				AUX PLA	P	(R)	AUX PLB			APC2	AC2 φA	CNTL BC1	CNTL BC2	FLC2				PRI	PL			APC3	FLC3	AC3	CNTL CA1	CNTL CA2	
											CABIN PL					AFT PLB												AFT PLC		A15			
										PL1	PL2	PL3																ACφC					
SSP2																																	
APCU 1 CONV																																	
APCU 1 OUTPUT RLY																																	
APCU 2 CONV																																	
APCU 2 OUTPUT RLY																																	
PSP BY-PASS																																	
ICBC3D PWR																																	
ICBC3D EMER RUN																																	
WSIPE HEATER A PWR																																	
WSIPE HEATER B PWR																																	
BPA PORT HEATER A PWR																																	
BPA PORT HEATER B PWR																																	
SLIC B SIDE PWR ENA																																	
BPA STBD HEATER A PWR																																	
BPA STBD HEATER B PWR																																	
SLIC EPDSU HTR PWR A																																	
SLIC EPDSU HTR PWR B																																	
SSP3																																	
RNS GPS REC																																	
RNS CAM REC																																	
MULE FMDM-A PWR																																	
MULE FMDM-B PWR																																	
SURV HTR B PWR																																	
SURV HTR A PWR																																	
HTR/ILLUM PWR																																	
KEEL CAM ENABLE																																	
RNS PWR																																	
MULE COPE HTR A PWR																																	
MULE COPE HTR B PWR																																	

X = Total loss of operational power
P = Loss of primary power source
R = Loss of redundant power source
(R) = Requires action to use redundant source
XC = Total loss of CNTL power
XRC = Loss of redundant CNTL power

* – CNTL bus name identifies power source (ex: CNTL BC1 is powered by MNB & MNC through RPCs and by MNA through cb and fuse)

MDM BUS LOSS IMPACTS

OF1

PL BAY MECH PWR SYS 1 & 2 mon
PL RETEN LOGIC PWR SYS 1 & 2 mon
AC1 PBM MMC 1 BUS ENA 1 & 2 mon
PRLA B SIDE TLM OF:
ORUC LATCHES
FSS KEEL LATCH
SLIC KEEL LATCH

OF2

ALL PL RETEN LATCH CMD mon
REL CMD mon
PRLA A SIDE TLM OF:
ORUC LATCHES
FSS KEEL LATCH
SLIC KEEL LATCH
PRLA B SIDE TLM OF:
FSS MECH PWR 1,2
PL INTRG SIG STR FROM PI 1,2

OF3

FC 2 & 3 AMPS INDICATION

OF4

PL RETEN PL SELECT SW mon
(and thus SPEC 097 update format)

OA1

AC2 PBM MMC 3 BUS ENA 1 & 2 mon

OA3

PRLA A SIDE TLM OF:
FSS MECH PWR 1,2

PF1 MDM

PRI RF CMD PATH VIA PSP1 (HST)
KU BAND ANTENNA CNTL
SLIC TLM (for more detail see SLIC PF 1
MDM CHANNELIZATION CHARTS)

PF2 MDM

REDUN RF CMD PATH VIA PSP2 (HST)
SLIC TLM (for more detail see SLIC PF 2
MDM CHANNELIZATION CHARTS)

FF1

UPLINK THRU NSP1

FF3

UPLINK THRU NSP2

FSS FMDM A(B)

MECHANISM SELECTION VIA S212
FSS CCTV CONTROL VIA S211
PCU CONTROL VIA S211
AMSB CONTROL VIA S212
TLM INDICATIONS VIA S211 & S212
(for more detail see FSS FMDM
CHANNELIZATION CHART)

MULE FMDM A(B)

TLM INDICATIONS VIA S211 (for more
detail see MULE FMDM
CHANNELIZATION CHARTS)

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CRT DISPLAYS

SM 210 HST SYS	8-2
211 SSE OVERVIEW	8-10
212 SSE MECH/BPA/RNS	8-15
213 HST BATT	8-20

CRT
DISPLAYS

	1	2	3	4	5
	12345678901	2345678901	2345678901	2345678901	2345678901
1	XXXX/210/XXX	HST SYS	XX X	DDD/HH:MM:SS	
2	TLM COUNT XXX	PCS		DDD/HH:MM:SS	
3	COMM	7+ MODE XX XXXX	ORU/ORI	DEACT	
4	PSP ENA 1 ID X	SNPT DIS 8+ XXX	WFPC2	10+ XXX	
5	RCVR 1 2	PSEA XXXX	COSTAR	11+ XXX	
6	LOCK X X		STIS	12+ XXX	
7	AGC ±XXX ±XXX	SOLAR ARRAY	ACS	13+ XXX	
8	NO-OP CMD 2	+WING -WING			
9	CMD CT XXX XXX	SLEW XXXS XXXS			
10	XMTR 1	POS XXX XXX	RSU 1 2 3		
1	3 ON X	SADE OFF 9+XXX	STAT	XXX XXX XXX	
2	SEL 4K 4		MAMP	XXX XXX XXX	
3	5 MOD ON X	HGA +V3 -V3		XXX XXX XXX	
4	6 SSA OFF	HNG XXXX XXXX	OFF	15+ 16+ 17+	
5	EPS ABC	LAT XXX XXX			
6	INT ESS BUS XXX		FGS	BUS V	
7	MAIN BUS V		3	18+ 2X XX.X	
8	A XX.X XXX		2	20+ 2X XX.X	
9	B XX.X XXX		OCE	19+ 4X XX.X	
20	C XX.X XXX		EPT	XX.X	
1	AMPS XXX		AME 3	XX.X	
2	UMB SG V INT EXT		AME 2	XX.X	
3	MN BUS XXS XXS				
4	ESS BUS XXS XXS				
5					(XX)
6					

PARAMETER CHARACTERISTICS: SM 210 HST SYS

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS				
					M	H	L	↑	↓
COMM:									
TLM COUNT	P34U3004A	486/DMU	integer	1 to 120					
PSP ENA ID	V92J1103C		integer						
RCVR 1 LOCK	P34X3050E	DMU	event	blank or '*'					
2 LOCK	P34X3051E	DMU	event	blank or '*'					
RCVR 1 AGC	P34Y3064A	DIU 4	dBMs	-51 to -131					
2 AGC	P34Y3065A	DIU 4	dBMs	-50.8 to -130					
CMD CT 1	P34U3001A	DMU	integer	0 to 255					
2	P34U3002A	DMU	integer	0 to 255					
XMTR 1 ON	P93J1000C		echo fb of item entry						
MOD ON	P93J1001C		echo fb of item entry						
EPS:									
INT ESS BUS A	P34X3085E	DIU 2	event	blank or '*'					
B	P34X3086E	DIU 2	event	blank or '*'					
C	P34X3087E	DIU 2	event	blank or '*'					

PARAMETER CHARACTERISTICS: SM 210 HST SYS (Cont)

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS				
					M	H	L	↑	↓
MAIN BUS V									
A	P34V3061A	486/DIU 2	volts	-0.56 to 35.39					
	P34X3046E	DIU 2	event	EXT, INT, ON *					
B	P34V3062A	486/DIU 2	volts	-0.42 to 35.53					
	P34X3047E	DIU 2	event	EXT, INT, ON *					
C	P34V3063A	486/DIU 2	volts	-0.42 to 35.53					
	P34X3048E/	DIU 2	event	OFF or ON					
	P34X3049E	DIU 2							
AMPS	P34C3060A	486/DIU 2	amps	-1.80 to 151.2					
UMB SG V									
MN BUS INT	P34V1027V	FMDM	volts	0 to 40	M	H	L		
EXT	P34V1009V	FMDM	volts	0 to 40	M	H	L		
ESS BUS INT	P34V1026V	FMDM	volts	0 to 40	M	H	L		
EXT	P34V1035V	FMDM	volts	0 to 40	M	H	L		
PCS:									
MODE	P93J1002C		echo fb of item entry						
	P34X3075E/	486	event	NORM, SNPT, DRFT, blank					
	P34X3076E	486							
SNPT DIS	P34X3005E	486	event	YES or NO					
PSEA	P34X3284E/	DIU 4	event	RSET or ACTV					
	P34X3285E	DIU 5							
SOLAR ARRAY:									
SLEW +WING	P34X3178E/	486/DIU 4	event	blank or +OP (flashing)					↓
	P34X3180E	486/DIU 4							
-WING	P34X3179E/	486/DIU 4	event	blank or -OP (flashing)					↓
	P34X3181E	486/DIU 4							
POS +WING	P34H3127A	486/DIU 4	degrees	-508 to 504					
-WING	P34H3128A	486/DIU 4	degrees	-508 to 504					

PARAMETER CHARACTERISTICS: SM 210 HST SYS (Cont)

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS				
					M	H	L	↑	↓
SADE OFF	P34X3129E/ P34X3130E	DIU 2 DIU 2	event	OFF or ON					
HGA HNG +V3	P34X3097E/ P34X3098E/ P34X3067E	DIU 4 DIU 4 DIU 5	event	blank, DPLY, STWD, TRAN					
-V3	P34X3099E/ P34X3100E/ P34X3067E	DIU 4 DIU 4 DIU 5	event	blank, DPLY, STWD, TRAN					
HGA LAT +V3	P34X3093E/ P34X3094E/ P34X3067E	DIU 4 DIU 4 DIU 5	event	blank, TRA, LAT, REL					
-V3	P34X3095E/ P34X3096E/ P34X3067E	DIU 4 DIU 4 DIU 5	event	blank, TRA, LAT, REL					
ORU/ORI DEACT: WFPC2	P34X3141E/ P34X3142E/ P34X3143E/ P34X3144E	DIU 2 DIU 5 DIU 5 DIU 5	event	OFF or ON					
COSTAR	P34X3212E/ P34X3213E/ P34X3214E/ P34X3215E	DIU 2 DIU 5 DIU 5 DIU 2	event	OFF or ON					
STIS	P34X3137E/ P34X3138E/ P34X3139E/ P34X3140E	DIU 2 DIU 5 DIU 5 DIU 2	event	OFF or ON					
ACS	P34X3015E/ P34X3016E/ P34X3017E/ P34X3018E	DIU 2 DIU 5 DIU 5 DIU 2	event	OFF or ON					
RSU:									
1 STAT	P34X3120E/ P34X3121E/ P34X3122E/ P34X3123E	DIU 5 DIU 5 DIU 5 DIU 5	event	OFF or ON					
2 STAT	P34X3029E/ P34X3030E/ P34X3031E/ P34X3032E	DIU 5 DIU 5 DIU 5 DIU 5	event	OFF or ON					
3 STAT	P34X3025E/ P34X3026E/ P34X3027E/ P34X3028E	DIU 5 DIU 5 DIU 5 DIU 5	event	OFF or ON					
1 MAMP	P34C3124A P34C3125A	DIU 5 DIU 5	m amps	-8.4 to 705.6					
2 MAMP	P34C3055A P34C3056A	DIU 5 DIU 5	m amps	-8.4 to 705.6					
3 MAMP	P34C3057A P34C3058A	DIU 5 DIU 5	m amps	-8.4 to 705.6					

PARAMETER CHARACTERISTICS: SM 210 HST SYS (Cont)

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS				
					M	H	L	↑	↓
FGS:									
3 BUS	P34X3023E	DIU 2	event	blank or ***					
V	P34V3022A	DIU 1	volts	-0.189 to 15.88					
2 BUS	P34X3023E	DIU 2	event	blank or ***					
V	P34V3021A	DIU 1	volts	-0.189 to 15.88					
OCE BUS	P34X3024E	DIU 2	event	blank or ***					
OV	P34V3022A	DIU 1	volts	-0.189 to 15.88					
EPT V	P34V3147A	DIU 1	volts	-0.09 to 7.20					
AME 3 V	P34V3020A	DIU 1	volts	-0.06 to 5.29					
2 V	P34V3019A	DIU 1	volts	-0.06 to 5.29					

ITEM ENTRY CHARACTERISTICS AND SUMMARY: SM 210 HST SYS

- ITEM 1: PSP can be configured to output commands to HST via PI by executing an item 1. Corresponding PSP config message ID of 1 will be displayed. PSP must be configured to enable idle pattern output to HST after RF acquisition.
- ITEM 2: Integrity of forward link from PI to HST receivers provided to allow crewmembers to verify a stable link to perform RF commanding. TLM COUNT parameter (PDI frame counter provided in HST 32 kbps stream) increments when PDI processing is established to allow verification that data is being updated on display when PDI processing is established. RCVR LOCK indicates '*' when command detector unit within each receiver detects presence of a stable forward link. RCVR AGC provides crewmembers a measure of received signal strength at receiver to be used in conjunction with lock status for troubleshooting link problems. Nominal range for RCVR AGC between -51 and -131 dBm for receiver 1 and -51 and -130 dBm for receiver 2. Item 2 provides NO-OP command to both strings of HST command system, causing command counter (CMD CT) from each HST command data interface (CDI) to increment.
- ITEM 3 +1,
+2: Item 3 has two indexes to select CDI-A or CDI-B versions of command to turn ON multi-access transmitter no. 1 in GSTDN mode without modulation. Crewmembers have previously swept PI forward link to lock HST MA receiver to PI carrier.
- ITEM 4: Item 4 selects 4 kbps fixed format (format D) for transmission. Used only when recovering from DMU power-on reset condition onboard HST.
- ITEM 5 +1,
+2: Once PI phase lock verified, item 5, which also has two indexes to transmit via the proper CDI, is then transmitted to enable modulation and start transmission of telemetry to ground via PI. (Subsequent ground commands MAY be required to select a telemetry format compatible with PDI.)
- ITEM 6: Powers OFF SSA Transmitters 1 and 2 via CDIs A and B.
- EPS: Status of HST onboard electrical power config provided to allow crewmember verification of various standard switch panel functions and insight into health and status of electrical interface to SSE and orbiter.
- INT ESS BUS monitor combines three relay statuses to provide feedback on internal essential bus status. HST essential bus provides power to HST command receivers and command decoders. An '*' is driven for each of the three internal essential buses when one corresponding bus is powered.
- MAIN BUS XFER SW statuses provide insight into internal main bus power status in response to use of main bus internal power ON/OFF switch on SSP. Transfer switches connect HST batteries to main bus when HST is on internal power. 'INT' is driven if transfer switches for MAIN BUS A/B are closed and 'EXT' if open. 'ON*' is driven if the respective main bus transfer switch is closed but one or both of the respective Diode Bus interconnect switches are open. MAIN BUS C cannot be directly powered from the external source; therefore, it will show 'ON' if transfer switch closed and 'OFF' if open.
- Bus voltages for HST MAIN BUS A and B and total MAIN BUS AMPS provide insight into interface to orbiter during attached operations. The total current for the MAIN BUS is displayed with a range of -2 to 151 amperes. The UMB SG V for the MN INT, MN EXT, ESS INT, and ESS EXT buses provides for limited insight into the interface in the absence of HST PDI telemetry. Their ranges are 0 to 40 V dc.

ITEM ENTRY CHARACTERISTICS AND SUMMARY: SM 210 HST SYS (Cont)

PCS:

ITEM 7 +9 1,
+9 2: Provides ability to command HST to free drift immediately after capture to prevent reaction wheel overspeed and to remove any torques HST might place on orbiter RMS after grapple. When executed, feedback transitions from NORM to DRFT, and SNPT DIS status transitions from NO to YES.

ITEM 7 +9 3,
+9 4: Item 7 has two indexes to select CDI-A or CDI-B versions of a command to initiate Sun pointing via 486. When executed, SNPT DIS feedback transitions from YES to NO immediately indicating 5-min sunpoint timer macro has been activated. MODE status will transition from DRFT to SNPT 5 min later indicating HST sunpoint control law is active. SNPT DIS will transition from NO to YES approximately 52 sec after sunpoint mode is entered (5:52 after command sent), indicating macro execution has stopped.

ITEM 7 +9 5,
+9 6,
+9 7: Items 7 +9 5, 7 +9 6 and 7 +9 7 will bypass HST main computer to initiate hardware sunpoint. These commands will only be sent if an HST jettison or RMS Quick Deploy is required. PDI DECOM FAIL FDA msg will accompany this command.

ITEM 8 +9 8: Item 8 +9 8 will reset both sides of the Pointing Safemode Electronics Assembly (PSEA). This command will be used to disable the HST hardware sunpoint pointing control after retrieval, effectively placing HST in free drift.

ITEM 8 +9 9: During retrieval, a backup stored program command is placed onboard HST by STOCC to maneuver vehicle back to a sun-favorable attitude approximately 180 minutes after initiation of maneuver to capture attitude in event orbiter has not captured it. If this timer command is near its timeout time but it becomes desirable to prevent HST from maneuvering because the orbiter is within a few minutes of capture, a SNPT DISable command (item 8 +9 9) is issued to disable timer command and is verified by transition of SNPT DIS status from NO to YES.

SOLAR ARRAY: The SLEW field indicates a flashing +OP or -OP when the +V2 or -V2 wing motor operate flags are set, respectively. The POS field indicates the angular position for each solar array wing, which is displayed in steps of 4 degrees.

ITEM 9 +9 9: If a solar array slew is in a runaway condition, an Item 9 +9 9 will power off SADE 1 and 2. This command is routed to both CDI-A and CDI-B. When both SADE 1 and 2 are off, the status will indicate 'OFF'. An 'ON' is displayed if either SADE is on.

HGA: Telemetry data provided for monitoring High Gain Antenna (HGA) deploy status. Hinge status (HNG) indicates 'DPLY' for fully deployed, 'TRAN' for in transit, and 'STWD' for fully stowed. HGA latch status (LAT) indicates 'LAT' for latch closed, 'TRA' for in transit, and 'REL' for latch open. Both HNG and LAT fields will be blanked if MCU-A link power supply is OFF since data is invalid in that case.

ORU/ORI DEACT:

ITEM 10 +9 8,
+9 9: An Item 10 +9 8 followed by an item 10 +9 9 will command OFF/Deadface the Wide Field Planetary Camera 2 (WFPC2), providing a status of 'OFF'. These commands will safe the WFPC2 primary and redundant power and the WFPC2 remote interface unit (RIU) primary and redundant power. If any of these items remains ON, status will indicate 'ON'.

ITEM ENTRY CHARACTERISTICS AND SUMMARY: SM 210 HST SYS (Cont)

- ITEM 11 +9 7,
+9 8,
+9 9: An item 11 +9 7 followed by an item 11 +9 8 and an item 11 +9 9 will command OFF/Deadface the Corrective Optics Space Telescope Axial Replacement (COSTAR), providing a status of 'OFF'. These commands will safe the High Speed Photometer (HSP) primary and redundant power and the HSP remote interface unit (RIU) primary and redundant power. If any of these items remains on, the status will indicate 'ON'.
- ITEM 12 +9 7,
+9 8,
+9 9: An Item 12 +9 7 followed by 12 +9 8 and 12 +9 9 will command OFF/Deadface the Space Telescope Imaging Spectrograph (STIS), providing a status of 'OFF'. These commands will safe the High Resolution Spectrograph (HRS) primary and redundant power and the HRS remote interface unit (RIU) primary and redundant power. If any of these items remain on, status will indicate 'ON'. These commands will also disable STIS side 2 heater control zone B.
- ITEM 13 +9 6,
+9 7,
+9 8,
+9 9: An Item 13 +9 6 followed by an item 13 +9 7, 13 +9 8, and 13 +9 9 will command OFF/Deadface the Advanced Camera for Surveys (ACS), providing a status of 'OFF'. These commands will safe the Faint Object Camera (FOC) primary and redundant power. If any of these items remain on, status will indicate 'ON'. These commands will also disable ACS side 1 heater control zone B.
- ITEM 15 +9 9,
16 +9 9,
17 +9 9: Powers OFF rate sensor units (RSUs) 1, 2, 3, respectively. RSU STAT field indicates 'OFF' when corresponding RSU control heater, survival heater, and channel power all deactivated. In addition, there is motor current telemetry corresponding to the B-phase for each Rate Gyro Assembly (RGA) motor, for a total of six. Assuming no failure of the B-phase flex leads, these motor currents provide an additional verification that each RGA has been shut down. If a failure of one of the B-phase flex leads occurs, SPEC 210 does not provide any insight as to whether the respective RGA is running. Motor currents go to zero mAmps when the RSU is commanded OFF.
- ITEM 18 +9 8,
+9 9: An item 18 +9 8 followed by an item 18 +9 9 will power off and deadface the Fine Guidance Sensor (FGS) 3. Disables FGE 3 Control #1, FGE 3 Inrush Control 1, selects the FGE 3 Redundant Power Bus. Powers OFF TCE Heaters: SM Primary, PM Primary, MR Primary, FGS1 Primary, FGS2 Primary, FGS3 Primary, FPS1 Primary, FPS2 Primary, and FPS3 Primary. Disables TCE Control 1 and 2. Powers OFF OTA Primary Bus 2. The DC/DC converter voltage for FGS3 is displayed to the right of item 18 and ranges from -0.2 to 15.9. The status of the Optical Telescope Assembly (OTA) primary bus 2 is displayed to the right of item 18, and is indicated by a "*" for the high state (on) and blank for the low state (off). Separate indexes are provided for each HST command path (i.e., CDI-A and CDI-B).
- ITEM 20 +9 8,
+9 9: An item 20 +9 8 followed by an item 20 +9 9 will power off and deadface the Fine Guidance Sensor (FGS) 2. The DC/DC converter voltage for FGS2 is displayed to the right of item 20 and ranges from -0.2 to 15.9. The status of the Optical Telescope Assembly (OTA) primary bus 2 is displayed to the right of item 20, and is indicated by a "*" for the high state (on) and blank for the low state (off). Separate indexes are provided for each HST command path (i.e., CDI-A and CDI-B).

ITEM ENTRY CHARACTERISTICS AND SUMMARY: SM 210 HST SYS (Cont)

- ITEM 19 +9 8,
+9 9: An item 19 +9 8 followed by an item 19 +9 9 will power off and deadface the Optical Control Electronics (OCE). Disables OCE Control 1, powers OFF OCE Inrush Control 1, disables FGE 3 Control 1, powers OFF FGE 3 Inrush Control 1, selects FGE 3 Redundant Power Bus, powers OFF OTA Primary Bus 4. The DC/DC converter voltage for OCE is displayed to the right of item 19 and ranges from -0.2 to 15.9. The status of the Optical Telescope Assembly (OTA) primary bus 4 is displayed to the right of item 19, and is indicated by a "*" for the high state (on) and blank for the low state (off). Separate indexes are provided for each HST command path (i.e., CDI-A and CDI-B).
- EPT: The Electrical Power and Thermal Control Electronics telemetry corresponds to PR DC/DC converter voltage. This telemetry is for verification prior to FGS-3 or FGS-2 changeout
- AME 3: The Actuator Mechanism Electronics Secondary Voltage telemetry for FGS-3 is provided for verification prior to FGS-3 changeout
- AME 2: The Actuator Mechanism Electronics Secondary Voltage telemetry for FGS-2 is provided for verification prior to FGS-2 changeout.

	1										2										3										4										5									
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
1	XXXX/211/XXX										SSE OVERVIEW										XX X										DDD/HH:MM:SS																			
2	ON OFF																														DDD/HH:MM:SS																			
3	PCU	X/X	1XS	2X	DPC										VOLTS										AMPS																									
4	CCTV	ENA	3XS	4X	1/2 XS/XS										XX.XS/XX.XS										XX.XS/XX.XS																									
5		PWR	5X5	6X	3/4 XS/XS										XX.XS/XX.XS										XX.XS/XX.XS																									
6	ZONE 1&2 3										5/6 XS/XS										XX.XS/XX.XS										XX.XS/XX.XS																			
7	COPE	A	HTR	XS	XS	7/8 XS/XS										XX.XS/XX.XS										XX.XS/XX.XS																								
8		B	HTR	XS	XS	9/10XS/XS										XX.XS/XX.XS										XX.XS/XX.XS																								
9	RNS	ENA	STAT	XS	11/12XS/XS										XX.XS/XX.XS										XX.XS/XX.XS																									
10		AMPS	XX.XS	23 ON XX										24 OFF XX																																				
1	POWER										AMPS										THERMAL										TEMP																			
2	FSS	EPDSU	1/2	XXX.XS/XXX.XS										FSS										EPDSU ±XXXX/±XXXX																										
3		FMDM	A/B	X.XXS/X.XXS																				FMDM ±XXXX/±XXXX																										
4		HTR	XS/XS																					PCU ±XXXX/±XXXX																										
5		P1/P2	XX.XS/XX.XS																				IPCU ±XXXX																											
6		R1/R2	XX.XS/XX.XS																				AMSB ±XXXX																											
7		CCTV	HTR	X.XXS										ORUC										PRJU ±XXXXX/±XXXXX																										
8	ORUC	XS/XS	XX.XS/XX.XS										MULE										PDSU ±XXXX																											
9	MULE	FMDM	A/B	X.XXS/X.XXS																				FMDM ±XXXX/±XXXX																										
20		HTR	XS	XX.XS										SLIC										EPDSU±XXXXX/±XXXXX																										
1		COPE	1A/2A	XX.XS/XX.XS																				VOLTS																										
2			1B&2B	XX.XS																				FSS XX.XS/XX.XS																										
3			3A/3B	XX.XS/XX.XS																				SLIC XX.XS/XX.XS																										
4	SLIC	EPDSU	XXX.XS																				MULE XX.XS																											
5																							(XX)																											
6																																																		

PARAMETER CHARACTERISTICS: SM 211 SSE OVERVIEW

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS					
					M	H	L	↑	↓	
PCU (P)	P34K4024Y/ P34K4026Y/ P34K4050Y/ P34K4052Y/ P34K4054Y/ P34K4056Y		event	blank, P, **						
(S)	P34K4028Y/ P34K4030Y/ P34K4058Y/ P34K4060Y/ P34K4062Y/ P34K4064Y		event	blank, S, **						
PCU ON	P34K4024Y/ P34K4026Y/ P34K4028Y/ P34K4030Y/ P34K4052Y/ P34K4060Y		event	blank or **	M					
OFF	P34K4024Y/ P34K4026Y/ P34K4028Y/ P34K4030Y/ P34K4052Y/ P34K4060Y		event	blank or **						

PARAMETER CHARACTERISTICS: SM 211 SSE OVERVIEW (Cont)

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS				
					M	H	L	↑	↓
CCTV ENA ON	P34X2096Y/ P34X2097Y		event	** , 1, 2, blank	M				
OFF	P34X2096Y/ P34X2097Y		event	** , 1, 2, blank					
PWR ON	P34X4041Y		event	blank or **	M				
OFF	P34X4041Y		event	** or blank					
COPE A HTR ZONE 1&2	P34X8406Y		event	blank or **	M				
3	P34X8407Y		event	blank or **	M				
COPE B HTR ZONE 1&2	P34X8409Y		event	blank or **	M				
3	P34X8410Y		event	blank or **	M				
RNS ENA STAT	P34X8412Y		event	blank or **	M				
AMPS	P34C8123C		amps	0.0 to 40.0	M	H	L	↑	
DPC 1	P34X2047Y		event	blank or **	M				
2	P34X2048Y		event	blank or **	M				
DPC 1 VOLTS	P34V2028V		volts	0.0 to 40.0	M	H	L		
2 VOLTS	P34V2029V		volts	0.0 to 40.0	M	H	L		
DPC 1 AMPS	P34C2008V		amps	0.0 to 20.5	M	H	L	↑	
2 AMPS	P34C2009V		amps	0.0 to 20.4	M	H	L	↑	
3	P34X2049Y		event	blank or **	M				
4	P34X2119Y		event	blank or **	M				
DPC 3 VOLTS	P34V2030V		volts	0.0 to 40.0	M	H	L		
4 VOLTS	P34V2031V		volts	0.0 to 40.0	M	H	L		
DPC 3 AMPS	P34C2010V		amps	0.0 to 20.2	M	H	L	↑	
4 AMPS	P34C2011V		amps	0.0 to 20.3	M	H	L	↑	
DPC 5	P34X2050Y		event	blank or **	M				
6	P34X2120Y		event	blank or **	M				
DPC 5 VOLTS	P34V2032V		volts	0.0 to 40.0	M	H	L		
6 VOLTS	P34V2033V		volts	0.0 to 40.0	M	H	L		
DPC 5 AMPS	P34C2012V		amps	0.0 to 20.2	M	H	L	↑	
6 AMPS	P34C2013V		amps	0.0 to 20.2	M	H	L	↑	
7	P34X2051Y		event	blank or **	M				
8	P34X2052Y		event	blank or **	M				
DPC 7 VOLTS	P34V2034V		volts	0.0 to 40.0	M	H	L		
8 VOLTS	P34V2035V		volts	0.0 to 40.0	M	H	L		
DPC 7 AMPS	P34C2014V		amps	0.0 to 20.0	M	H	L	↑	
8 AMPS	P34C2015V		amps	0.0 to 20.3	M	H	L	↑	
9	P34X2053Y		event	blank or **	M				
10	P34X2121Y		event	blank or **	M				
DPC 9 VOLTS	P34V2036V		volts	0.0 to 40.0	M	H	L		
10 VOLTS	P34V2037V		volts	0.0 to 40.0	M	H	L		
DPC 9 AMPS	P34C2016V		amps	0.0 to 20.3	M	H	L	↑	
10 AMPS	P34C2017V		amps	0.0 to 20.3	M	H	L	↑	
DPC 11	P34X2054Y		event	blank or **	M				
12	P34X2122Y		event	blank or **	M				
DPC 11 VOLTS	P34V2038V		volts	0.0 to 40.0	M	H	L		
12 VOLTS	P34V2039V		volts	0.0 to 40.0	M	H	L		
DPC 11 AMPS	P34C2018V		amps	0.0 to 20.2	M	H	L	↑	
12 AMPS	P34C2019V		amps	0.0 to 20.2	M	H	L	↑	
DPC ON	P93J0100C								
OFF	P93J0101C	echo fb of item entry							
		echo fb of item entry							

PARAMETER CHARACTERISTICS: SM 211 SSE OVERVIEW (Cont)

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS				
					M	H	L	↑	↓
POWER:									
FSS EPDSU 1 AMPS	P34C2113V		amps	0.0 to 180.0	M	H	L		
2 AMPS	P34C2116V		amps	-0.1 to 168.0	M	H	L		
FMDM A AMPS	P34C2115V		amps	0.0 to 5.0	M	H	L		
B AMPS	P34C2022V		amps	0.0 to 5.1	M	H	L		
HTR (1)	P34X2082Y		event	blank or 1	M				
HTR (2)	P34X2083Y		event	blank or 2	M				
FSS HTR P1 AMPS	P34C2026V		amps	0.0 to 20.6	M	H	L	↑	
P2 AMPS	P34C2027V		amps	0.0 to 19.9	M	H	L	↑	
R1 AMPS	P34C2024V		amps	0.0 to 19.9	M	H	L	↑	
R2 AMPS	P34C2114V		amps	0.0 to 20.5	M	H	L	↑	
FSS CCTV HTR AMPS	P34C2095V		amps	0.0 to 5.3	M	H	L		
ORUC HTR A	P34X2043Y		event	blank or A	M				
HTR B	P34X2044Y		event	blank or B	M				
A AMPS	P34C2020V		amps	0.0 to 40.3	M	H	L	↑	
B AMPS	P34C2021V		amps	0.0 to 40.5	M	H	L	↑	
MULE FMDM A AMPS	P34C8109V		amps	0.0 to 5.0	M	H	L		
B AMPS	P34C8114V		amps	0.0 to 5.0	M	H	L		
MULE HTR	P34X8411Y		event	blank or **	M				
AMPS	P34C8117V		amps	0.0 to 20.0	M	H	L	↑	
MULE ESM 1&2 AMPS	P34C8110V		amps	0.0 to 5.0	M	H	L	↑	
3 AMPS	P34C8111V		amps	0.0 to 5.0	M	H	L	↑	
MULE COPE 1A AMPS	P34C8112V		amps	0.0 to 20.0	M	H	L	↑	
2A AMPS	P34C8107V		amps	0.0 to 20.0	M	H	L	↑	
1B&2B AMPS	P34C8115V		amps	0.0 to 20.0	M	H	L	↑	
3A AMPS	P34C8113V		amps	0.0 to 20.0	M	H	L	↑	
3B AMPS	P34C8116V		amps	0.0 to 20.0	M	H	L	↑	
SLIC EPDSU AMPS	P34C5506V		amps	-1.2 to 150.0	M	H	L	↑	
THERMAL:									
FSS EPDSU (1) TEMP	P34T2004V		deg C	-35 to 65	M	H	L		
(2) TEMP	P34T2007V		deg C	-35 to 65	M	H	L		
FMDM (A) TEMP	P34T2001V		deg C	-55 to 120	M	H	L		
(B) TEMP	P34T2002V		deg C	-55 to 120	M	H	L		
PCU (P) TEMP	P34T2005V		deg C	-35 to 65	M	H	L		
(S) TEMP	P34T2006V		deg C	-35 to 65	M	H	L		
IPCU TEMP	P34T2093V		deg C	-35 to 65	M	H	L		
AMSB TEMP	P34T2003V		deg C	-35 to 65	M	H	L		
ORUC PRJU (A) TEMP	P34T1037V		deg C	-35 to 65	M	H	L		
(B) TEMP	P34T1038V		deg C	-35 to 65	M	H	L		
MULE PDSU TEMP	P34T8119V		deg C	-35 to 65	M	H	L		
FMDM (A) TEMP	P34T8120V		deg C	-55 to 120	M	H	L		
(B) TEMP	P34T8121V		deg C	-55 to 120	M	H	L		
SLIC EPDSU TEMP (1)	P34T5521V		deg C	-35 to 65	M	H	L		
(2)	P34T5505V		deg C	-35 to 65	M	H	L		
FSS EPDSU (1) VOLTS	P34V2040V		volts	0.0 to 40.0	M	H	L		
(2) VOLTS	P34V2041V		volts	0.0 to 40.0	M	H	L		
SLIC EPDSU VOLTS (A)	P34V5516V		volts	0.7 to 40.7	M	H	L		
(B)	P34V5508V		volts	0.7 to 40.7	M	H	L		
MULE PDSU VOLTS	P34V8122V		volts	0.0 to 40.0	M	H	L		

ITEM ENTRY CHARACTERISTICS AND SUMMARY: SM 211 SSE OVERVIEW

ITEM 1,2: Items 1 and 2 will set and reset, respectively, twelve FMDM discrete outputs to command the twelve FSS direct power converters (DPCs) on and off. Due to GPC limitations, the feedback for these commands is only based on command response from the six odd numbered DPCs. The feedback for item 3 ON will indicate a blank when all DPCs are commanded off (based on the BITE test 4 feedback) and an '*' when any of the DPCs are commanded on. The item 4 OFF status will be blank as long as any FMDM DPC ON discrete output is set, and will indicate an '*' when all are reset.

ITEM 3,4,5,6: Items 3 through 6 provide power control over the closed circuit television (CCTV) camera mounted on the FSS berthing and positioning system (BAPS) platform. Two power relays in series feed power to the CCTV camera by execution of item 3, whose status will nominally indicate an '*' when both relays indicate they are closed. If either relay remains open, a '1' or '2' will be displayed for the item 3 ON status to indicate the closed relay, while the item 4 OFF status will show the corresponding open relay number. When commanded off with an item 4, the item 4 OFF status will indicate an '*' upon both relays achieving an open condition. The camera iris is commanded open upon execution of an item 5, whose ON status will show an '*' driven by the setting of the corresponding FMDM discrete output (BITE test 4 feedback). This same FMDM BITE status is used for the item 6 OFF status, which is blank when the camera is commanded on (iris open) and an '*' when the camera is powered off (iris closed).

COPE HTR: COPE heater statuses are provided for each zone and heater string. An '*' indicates that the associated heaters are powered.

MULE RNS: MULE RNS power enable status indicated with a '*'. MULE RNS power enable current telemetry is listed from 0 to 40 amps.

DPC: Provides status and control of twelve DPCs used for powering berthed HST. The DPC status telemetry is provided for each DPC. The voltage for the twelve DPCs is displayed, each with a range of 0 to 40 V dc. Also, the current for the twelve DPCs is displayed, each with a range of 0 to 20 amperes. DPCs are commanded as follows:

ITEM 23,24: Status and control of the twelve DPCs used for powering the berthed HST are provided. The DPCs can be commanded individually by sending indexed commands as follows:

ON ITEM 23+	OFF ITEM 24+	DPC
1	71	1
2	72	2
3	73	3
4	74	4
5	75	5
6	76	6
7	77	7
8	78	8
9	79	9
10	80	10
11	81	11
12	82	12

The corresponding number of the index command sent appears to the right of 23 ON or 24 OFF.

ITEM ENTRY CHARACTERISTICS AND SUMMARY: SM 211 SSE OVERVIEW (Cont)

POWER: SSE power distribution telemetry is provided from the both the orbiter and FSS. The FSS EPDSU 1 and 2 voltages, ranging from 0 to 40 V dc, provide insight into orbiter-provided voltage at the interface to the FSS. The currents for active boxes on the SSE and heaters are provided. These currently include the two FSS Flex MDMs, the four heater current circuits on the FSS (along with status indications), the FSS CCTV heater circuit, the ORUC heater A and B on/off status and related currents (A is -1 to +40.3 Amps, B is -1 to +40.5 Amps), the MULE Flex MDM currents, the MULE survival heater circuit (along with status indication), the two ESM heater circuit currents, and the five COPE heater circuit currents. The current for the Super Lightweight Interchangeable Carrier (SLIC) enhanced power distribution and switching unit (EPDSU) is provided.

THERMAL: The heaters on the FSS, ORUC, MULE, and SLIC are controlled from the standard switch panels. Power for the FSS, ORUC, and MULE circuits was discussed in the POWER section. Temperatures are provided for the FSS EPDSU 1 and 2, FSS FMDM A and B, FSS, PCU Primary and Secondary, FSS IPCU, FSS AMSB, ORUC PRJU A and B, MULE PDSU, MULE FMDM A and B, and SLIC EPDSU 1 and 2 to verify each is within operating limits prior to its use.

```

1 2 3 4 5
123456789012345678901234567890123456789012345678901
1 XXXX/212/XXX SSE MECH/BPA/RNS XX X DDD/HH:MM:SS
2 DDD/HH:MM:SS
3 ON OFF DC AMPS AC AMPS TEMP
4 AMSB 7XS 8X X.XXS X.XXS ±XXXX
5 MECH X X SEL STAT TACH BATT PLATE TEMP
6 DLOCK 9XS XXX PORT-FWD ±XXXX
7 PIVOT HI 10XS XXX PORT-AFT ±XXXX
8 LO 11XS XXX X.XXS DEG/MIN STBD-FWD ±XXXX
9 ROTATOR 12XS XXX XX.XS DEG/MIN STBD-AFT ±XXXX
10 XLATOR 13XS XXX
1 B LAT 1 14XS XXX RNS
2 2 15XS XXX OPS ON 37
3 3 16XS XXX OFF 38
4 UMB MN 17XS XXX NO-OP 39
5 B/U 18XS XXX CMD CNT XXX
6 BSP 19XS XXX XXXXS/XXXXS/XXXXS ICE VOLTS XX.XS
7 DESEL 20 RNS AMPS XXX.XS
8 O/R ENA 21XS ICE TEMP ±XXXX
9 DIS 22XS
20
1 ON OFF FRM CNT ON OFF AMPS
2 TM 25 26 XXX OP HTR 27XS 28XS XX.XS
3 MSM1 29XS 30XS SP-CUBE 31XS 32XS XX.XS
4 MSM2 33XS 34XS SENSORS 35XS 36XS XX.XS
5 (XX)
6

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PARAMETER CHARACTERISTICS: SM 212 SSE MECH/BPA/RNS

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS				
					M	H	L	↑	↓
AMSB ON	P34X2076Y/ P34X2077Y		event	A, B, blank, or '*'	M				
OFF	P34X2076Y/ P34X2077Y		event	A, B, blank, or '*'					
AMSB DC AMPS	P34C2025V		amps	0.0 to 0.30	M	H	L	↑	↓
AC AMPS	P34C2111V		amps	0.0 to 5.0	M	H	L	↑	
TEMP	P34T2003V		deg C	-35 to 65	M	H	L		
MECH (A)	V54X8111E/ V54X8113E/ V54S8400E/ V54S8402E		event	A, A flash, blank					
(B)	V54X8122E/ V54X8124E/ V54S8400E/ V54S8402E		event	B, B flash, blank					
DLOCK SEL	P34X2064Y		event	blank or '*'	M				↓
STAT	P34X2064Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, DIS, ENG, '*', blank					
PIVOT HI SEL	P34X2061Y		event	blank or '*'	M				↓
STAT	P34X2061Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, DN, UP, '*', blank					

PARAMETER CHARACTERISTICS: SM 212 SSE MECH/BPA/RNS (Cont)

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS				
					M	H	L	↑	↓
PIVOT LO SEL STAT	P34X2060Y		event	blank or **	M				↓
	P34X2060Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, DN, UP, **, blank	M				↓
	P34R2108V		deg/min	0.0 to 5.3	M	H	L		↓
	P34X2062Y		event	blank or **	M				↓
	P34X2062Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, CCW, CW, **, blank	M				↓
TACH ROTATOR SEL STAT	P34R2109V		deg/min	0.0 to 18.0	M	H	L		↓
	P34X2063Y		event	blank or **	M				↓
	P34X2063Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, FWD, AFT, **, blank	M				↓
	P34X2065Y		event	blank or **	M				↓
	P34X2065Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, OP, CL, **, blank	M				↓
B LAT 1 SEL STAT	P34X2066Y		event	blank or **	M				↓
	P34X2066Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, OP, CL, **, blank	M				↓
	P34X2067Y		event	blank or **	M				↓
	P34X2067Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, OP, CL, **, blank	M				↓
	P34X2068Y		event	blank or **	M				↓
B LAT 2 SEL STAT	P34X2068Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
	P34X2069Y		event	blank or **	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
	P34X2070Y		event	blank or **	M				↓
	P34X2070Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, SET, L/A, **, blank	M				↓
B LAT 3 SEL STAT	P34X2070Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	blank or **	M				↓
	P34X2070Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, SET, L/A, **, blank	M				↓
	P34X2068Y		event	blank or **	M				↓
	P34X2068Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
	P34X2069Y		event	blank or **	M				↓
UMB MN SEL STAT	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
UMB B/U SEL STAT	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, MAT, **, blank	M				↓
BSP SEL STAT	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, SET, L/A, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, SET, L/A, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, SET, L/A, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, SET, L/A, **, blank	M				↓
	P34X2069Y/ P34X2087Y/ P34X2088Y/ P34X2089Y/ P34X2090Y		event	RDY, REL, SET, L/A, **, blank	M				↓

PARAMETER CHARACTERISTICS: SM 212 SSE MECH/BPA/RNS (Cont)

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS				
					M	H	L	↑	↓
BSP (RET)	P34X2102Y/		event	RET A, RET B, RET *,	M				
(ENG)	P34X2105Y/		event	blank	M				
(DIS)	P34X2103Y/		event	ENG A, ENG B, ENG *,	M				
O/R ENA	P34X2106Y/		event	blank	M				
DIS	P34X2104Y/		event	DIS A, DIS B, DIS *, blank	M				
	P34X2107Y		event	** or blank	M				
	P34X2072Y		event	blank or **	M				
BATT PLATE TEMP PORT-FWD	P34T5518V		deg C	-60 to 80	M				
PORT-AFT	P34T5517V		deg C	-60 to 80	M				
STBD-FWD	P34T5503V		deg C	-60 to 80	M				
STBD-AFT	P34T5502V		deg C	-60 to 80	M				
RNS TM FRM CNT	P73U9002A		counter	** or blank	M				
MSM1 ON	P73X9003E		event	** or blank	M				
OFF	P73X9003E		event	blank or **	M				
MSM2 ON	P73X9004E		event	** or blank	M				
OFF	P73X9004E		event	blank or **	M				
OP HTR ON	P34X8415Y		event	** or blank	M				
OFF	P34X8415Y		event	blank or **	M				
AMPS	P34C8125V		amps	0 to 10	M	H	L	↑	
SP-CUBE ON	P34X8417Y		event	** or blank	M				
OFF	P34X8417Y		event	blank or **	M				
AMPS	P34C8127V		amps	0 to 4	M	H	L	↑	
SENSORS ON	P34X8416Y		event	** or blank	M				
OFF	P34X8416Y		event	blank or **	M				
AMPS	P34C8126V		amps	0 to 5	M	H	L	↑	
CMD CNT	P73U9001A		counter		M				
ICE VOLTS	P34C8128V		volts	0.7 to 40.7	M	H	L		
RNS AMPS	P34C81234V		amps	0 to 40	M	H	L	↑	
ICE TEMP	P34T8131V		deg C	-35 to 65	M	H	L		↓

ITEM ENTRY CHARACTERISTICS AND SUMMARY: SM 212 SSE MECH/BPA/RNS

ITEM 7,8: Item numbers 7 and 8 provide power ON/OFF control over the flight support system (FSS) advanced mechanism selection box (AMSB). When both AMSBs are off, the item 7 ON status will be blank and the item 8 OFF status will show an '*'. When only AMSB A is on, the item 7 ON status will indicate 'A' and the item 8 OFF status will indicate 'B'. When only AMSB B is ON, the item 7 ON status will indicate 'B' and the item 8 OFF status will indicate 'A'. Under a contingency scenario where both sides of the FSS system are being used simultaneously with both AMSBs powered on, the item 7 ON status will show * and the item 8 OFF status will be blank. When commanded on, the DC current to the commanded AMSB will be displayed. When a mechanism is operated, the AC current being drawn by the motor will be displayed. The temperature of the AMSB is also displayed.

MECH: Two parameter fields to the right of the MECH text callout provide payload retention system feedback related to A6U circuits controlling FSS mechanism operations. The left-hand field will show a flashing 'A' whenever the A6U panel switch 1 is taken out of the OFF position. A steady 'A' is driven whenever system 1 latch 1 LATCHED or RELEASED feedbacks indicate high. The right-hand field will show a flashing 'B' whenever A6U panel switch 2 is taken out of OFF position. A steady 'B' is driven whenever system 2 latch 2 LATCHED or RELEASED feedbacks indicate high. During nominal A-side(B-side) operations, B(A) field should be blank.

ITEM 9,10,11, 12,13,14,15,16, 17,18,19,20 Items 9 through 19 are used to select FSS mechanisms. When a mechanism is selected, an '*' is driven next to the corresponding item number and the mechanism status is displayed in an adjacent field under the STAT heading. Item 20 deselects the last mechanism selected.

NOTE: The previously selected mechanism is deselected when a new mechanism is selected. The STAT field for each mechanism will indicate as follows:

Mechanism	REL(BOT)	Mid-travel	LAT(EOT)
Downlock (DLOCK)	DIS	RDY	ENG
PIVOT HI/LO	DN	RDY	UP
ROTATOR	CW	RDY	CCW
Translator (XLATOR)	FWD	RDY	AFT
Berthing latch (BLAT 1/2/3)	OP	RDY	CL
Main umbilical (UMB MN)	REL	RDY	MAT
Backup umbilical (UMB B/U)	REL	RDY	MAT
BAPS support post (BSP)	REL	*	SET

In the event of an error condition where both the beginning and end of travel microswitches of the selected mechanism indicate high, the STAT field will show '*', except for the BSP which will display 'L/A' if the BOT and EOT are indicated for the same microswitch, which is indicative of the Latch Assist mode.

The status of the BSP retracted A and B switches is provided. When only switch A is retracted, 'RETA' is displayed. When only switch B is retracted, 'RETB' is displayed. When both switches A and B are retracted, 'RET*' is displayed. When neither switch A or B is retracted, a blank is displayed. The next two fields below indicate the status of the BSP engaged A and B switches and the BSP disengaged A and B switches. They are handled in the same manner as the above BSP retracted A and B switches, except their feedbacks are: 'ENGA', 'ENGB', 'ENG*', and 'DISA', 'DISB', 'DIS*', respectively.

ITEM 21,22: Items 21 and 22 provide the ability to override (O/R) limit switch cutoff of the selected mechanism in the event of microswitch failures or if the need arises to drive the selected mechanism to the mechanical limit (stall). The O/R ENA/DIS status is a direct feedback from the AMSB override relay. An '*' is driven next to the appropriate item number to indicate enabled or disabled.

ITEM ENTRY CHARACTERISTICS AND SUMMARY: SM 212 SSE MECH/BPA/RNS (Cont)

- ITEM 25, 26: Item 25 (there are no items 23 and 24 on this SPEC) commands the Relative Navigation System (RNS) Telemetry Module (TM) mounted on the MULE to 'ON'. Item 26 commands the RNS TM to 'OFF'.
- ITEM 27, 28: Item 27 enables the RNS operational heaters, and item 28 disables them. Each item entry displays a '*' when selected.
- ITEM 29, 30: Item 29 powers ON the RNS Mass Storage Module 1 (MSM1), and then Item 30 powers it OFF. Each item entry displays a '*' when selected.
- ITEM 31, 32: Item 31 powers ON the RNS SPACECUBE. Item 32 powers it OFF. Each item entry displays a '*' when selected.
- ITEM 33, 34: Item 33 powers ON the RNS Mass Storage Module 2 (MSM2), and then item 34 powers it OFF. Each item entry displays a '*' when selected.
- ITEM 35, 36: Item 35 powers ON the RNS sensors. Item 36 powers them OFF. Each item entry displays a '*' when selected.
- ITEM 37, 38: Item 37 powers ON the RNS OPS. Item 38 powers it OFF.
- ITEM 39: Item 39 is a 'No-Op' command to RNS.


```

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
1 XXXX / 2 1 3 / XXX HST BATT XX X DDD / HH : MM : SS
2 DDD / HH : MM : SS
3
4 TLM COUNT XXX BATT 1 2 3 4 5 6 EE
5 COMM TRIM XXXXXX X
6 PSP ENA 1 ID X BYPASS XXXXXX
7 RCVR 1 2
8 LOCK X X BATT BAY2 BAY3
9 AGC ±XXX ±XXX DEACT 3+ 4+
10 NO-OP CMD 2 SA SECT XXX XXX
1 CMD CT XXX XXX DISCHG XXX XXX
2 PRI HTR XXX XXX
3 VIK XXX XXX
4
5 DIODE BUS
6 BATT PRESS CURR VOLTS VOLTS
7 1 XXXX XXX.X XX.XX A XX.XX
8 2 XXXX XXX.X XX.XX
9 3 XXXX XXX.X XX.XX B XX.XX
20 4 XXXX XXX.X XX.XX
1 5 XXXX XXX.X XX.XX C XX.XX
2 6 XXXX XXX.X XX.XX
3
4
5 (XX)
6

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PARAMETER CHARACTERISTICS: SM 213 HST BATT

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS				
					M	H	L	↑	↓
COMM:									
TLM COUNT	P34U3004A	486/DMU	cnt	1 to 120					
PSP ENA ID	V92J1103C		cnt						
RCVR 1 LOCK	P34X3050E	DMU	event	blank or ""					
2 LOCK	P34X3051E	DMU	event	blank or ""					
RCVR 1 AGC	P34Y3064A	DIU 4	dBm	-51 to -131					
2 AGC	P34Y3065A	DIU 4	dBm	-50.8 to -130					
CMD CT 1	P34U3001A	DMU	cnt	0 to 255					
2	P34U3002A	DMU	cnt	0 to 255					
BATT PRESS									
1	P34P3194A	DIU5	psi	+15.5 to +1632					
2	P34P3195A	DIU2	psi	-76.8 to +1558					
3	P34P3196A	DIU2	psi	-26.4 to +1614					
4	P34P3197A	DIU2	psi	+39.9 to +1607					
5	P34P3198A	DIU2	psi	+33.5 to +1662					
6	P34P3199A	DIU2	psi	-15.3 to +1675					
BATT CURR									
1	P34C3289A	DIU 2	amps	-25.6 to +25.4					
2	P34C3290A	DIU 2	amps	-25.6 to +25.4					
3	P34C3291A	DIU 2	amps	-25.6 to +25.4					
4	P34C3292A	DIU 2	amps	-25.6 to +25.4					
5	P34C3293A	DIU 2	amps	-25.6 to +25.4					
6	P34C3288A	DIU 2	amps	-25.6 to +25.4					
BATT VOLTS									
1	P34V3254A	DIU2	volts	-0.42 to +35.53					
2	P34V3255A	DIU2	volts	-0.42 to +35.53					
3	P34V3256A	DIU2	volts	-0.42 to +35.53					
4	P34V3257A	DIU2	volts	-0.42 to +35.53					
5	P34V3258A	DIU2	volts	-0.42 to +35.53					
6	P34V3259A	DIU2	volts	-0.42 to +35.53					

PARAMETER CHARACTERISTICS: SM 213 HST BATT (Cont)

CRT NAME	MSID	HST SRC	UNITS	DISPLAY RANGE	STATUS INDICATORS					
					M	H	L	↑	↓	
BATT:										
TRIM										
1	P34X3168E	DIU2	event	blank or ***						
2	P34X3163E	DIU2	event	blank or ***						
3	P34X3160E	DIU2	event	blank or ***						
4	P34X3159E	DIU2	event	blank or ***						
5	P34X3157E	DIU2	event	blank or ***						
6	P34X3164E	DIU2	event	blank or ***						
BYPASS										
1	P34X3218E	DIU4	event	blank or ***						
2	P34X3219E	DIU4	event	blank or ***						
3	P34X3220E	DIU4	event	blank or ***						
4	P34X3221E	DIU4	event	blank or ***						
5	P34X3222E	DIU4	event	blank or ***						
6	P34X3223E	DIU4	event	blank or ***						
EE	P34X3172E	DIU2	event	blank or ***						
BATT:										
SA SECT BAY2	P34X3217E	DIU4	event	ON or OFF						
	P34X3294E									
BAY 3	P34X3295E	DIU4	event	ON or OFF						
	P34X3216E									
	P34X3296E									
DISCHG BAY 2	P34X3297E	DIU2	event	ON or OFF						
	P34X3230E									
	P34X3231E									
	P34X3232E									
	P34X3233E									
	P34X3234E									
	P34X3235E									
BAY 3	P34X3236E	DIU2,	event	ON or OFF						
	P34X3237E	DIU4								
	P34X3238E									
	P34X3239E									
	P34X3240E									
	P34X3241E									
PRI HTR BAY 2	P34X3200E		event	ON or OFF						
	P34X3201E	DIU5								
	P34X3202E									
BAY 3	P34X3203E		event	ON or OFF						
	P34X3204E	DIU5								
	P34X3205E									
VIK BAY 2	P34X3242E		event	ON or OFF						
	P34X3243E	DIU2								
	P34X3244E									
BAY 3	P34X3245E		event	ON or OFF						
	P34X3246E	DIU2								
	P34X3247E									
DIODE BUS										
A	P34V3260A	DIU2	volts	-0.42 to +35.53						
B	P34V3261A	DIU2	volts	-0.56 to +35.39						
C	P34V3262A	DIU2	volts	-0.56 to +35.39						

ITEM ENTRY CHARACTERISTICS AND SUMMARY: SM 213 HST BATT

- ITEM 1: PSP: Item 1 will load the Payload Signal Processor (PSP) configuration message, which will allow commanding to HST via the Payload Interrogator (PI). The ID field will display the corresponding PSP configuration message ID of 1
- ITEM 2: Integrity of the forward link from the PI to the HST receivers is provided to allow the crew to verify a stable link to perform RF commanding. The RCVR 1/2 LOCK will indicate "*" when the command detector unit within each receiver detects the presence of a stable forward link. The RCVR 1/2 Automatic Gain Control (AGC) provides the crew a measure of received signal strength at the receiver to be used in conjunction with the lock status for troubleshooting link problems. The nominal range for the RCVR AGC is between -51 and -131 dBm for receiver 1 and between -51 and -130 for receiver 2. Item 2 provides a NO-OP command to both strings of the HST command system, causing the Command Counter (CMD CT) for each HST Command Data Interface (CDI) to increment. The command counter range is 0 to 255.
- ITEM 3+96, Items 3+96 and 3+97 are the first step in preparing the Bay 2 batteries for removal.
- +97: Powers off all Charge Current Controllers (CCCs) and connects Solar Array (SA) sections 1-3 to the diode buses. Separate indexes are provided for each HST command path (i.e., CDI-A and CDI-B).
- ITEM 3+98, Items 3+98 and 3+99 are the second step in preparing the Bay 2 batteries for removal.
- +99: Disables batteries 1-3 pressure excitations/redundant heaters, primary heaters and enables Voltage Improvement Kits (VIKs) (power at the connectors is off when VIK is enabled). Disables command and telemetry (CT) buses 1, 2, 3 and 5. Separate indexes are provided for each HST command path (i.e., CDI-A and CDI-B).
- ITEM 4+96, Items 4+96 and 4+97 are the first step in preparing the Bay 3 batteries for removal.
- +97: Powers off all Charge Current Controllers (CCCs) and connects Solar Array (SA) sections 4-6 to the diode buses. Separate indexes are provided for each HST command path (i.e., CDI-A and CDI-B).
- ITEM 4+98: Items 4+98 and 4+99 are the second step in preparing the Bay 3 batteries for removal.
- +99: Disables batteries 4-6 pressure excitations/redundant heaters, primary heaters and enables Voltage Improvement Kits (VIKs) (power at the connectors is off when VIK is enabled). Disables command and telemetry (CT) buses 1, 2, 3 and 5. Separate indexes are provided for each HST command path (i.e., CDI-A and CDI-B).

FDA

FDA CHARACTERISTICS: SM 210 HST SYS

Msg Text	Alarm Class	Noise Filter	Rate	SM Param ID	Sensed Parameter				Preconditions
					Nomenclature	SET	LO (STATE)	HI	
210 SADE WING	3	3	1	6343178	SADE-1 +WING MOTOR	1	1		
210 SADE WING	3	3	1	6343179	SADE-1 -WING MOTOR	1	1		
210 SADE WING	3	3	1	6343180	SADE-2 +WING MOTOR	1	1		
210 SADE WING	3	3	1	6343181	SADE-2 -WING MOTOR	1	1		

FDA CHARACTERISTICS: SM 211 SSE OVERVIEW

Msg Text	Alarm Class	Noise Filter	Rate	SM Param ID	Sensed Parameter				Preconditions
					Nomenclature	SET	LO (STATE)	HI	
211 DPC 1 AMPS	3	3	1	6342008	FSS PPCU DPC 1 CURRENT	1		19	
211 DPC 2 AMPS	3	3	1	6342009	FSS PPCU DPC 2 CURRENT	1		19	
211 DPC 3 AMPS	3	3	1	6342010	FSS PPCU DPC 3 CURRENT	1		19	
211 DPC 4 AMPS	3	3	1	6342011	FSS PPCU DPC 4 CURRENT	1		19	
211 DPC 5 AMPS	3	3	1	6342012	FSS PPCU DPC 5 CURRENT	1		19	
211 DPC 6 AMPS	3	3	1	6342013	FSS PPCU DPC 6 CURRENT	1		19	
211 DPC 7 AMPS	3	3	1	6342014	FSS SPCU DPC 7 CURRENT	1		19	
211 DPC 8 AMPS	3	3	1	6342015	FSS SPCU DPC 8 CURRENT	1		19	
211 DPC 9 AMPS	3	3	1	6342016	FSS SPCU DPC 9 CURRENT	1		19	
211 DPC 10 AMPS	3	3	1	6342017	FSS SPCU DPC 10 CURRENT	1		19	
211 DPC 11 AMPS	3	3	1	6342018	FSS SPCU DPC 11 CURRENT	1		19	

FDA CHARACTERISTICS: SM 211 SSE OVERVIEW (Cont)

Msg Text	Alarm Class	Noise Filter	Rate	SM Param ID	Sensed Parameter				Preconditions
					Nomenclature	SET	LO (STATE)	HI	
211 DPC 12 AMPS	3	3	1	6342019	FSS SPCU DPC 12 CURRENT	1		19	
211 PWR ORUC A AMPS	3	3	1	6342020	ORUC HEATER-A CURRENT	1		33	
211 PWR ORUC B AMPS	3	3	1	6342021	ORUC HEATER-B CURRENT	1		33	
	0	3	1	6342026	FSS HEATER-1A CURRENT	1		14	
	0	3	1	6342024	FSS HEATER-1B CURRENT	1		14	
	0	3	1	6342027	FSS HEATER-2A CURRENT	1		11	
	0	3	1	6342114	FSS HEATER-2B CURRENT	1		11	
	0	3	1	6345506	SLIC EPDSU TOTAL CURRENT	1		42	
	0	3	1	6348107	MULE COPE ZONE 2 HTR A CURRENT	1		3.5	
	0	3	1	6348112	MULE COPE ZONE 1 HTR A CURRENT	1		3.5	
	0	3	1	6348113	MULE COPE ZONE 3 HTR A CURRENT	1		3.5	
	0	3	1	6348115	MULE COPE ZONES 1&2 HTRS B CUR	1		6	
	0	3	1	6348116	MULE COPE ZONE 3 HTR B CURRENT	1		3.5	
	0	3	1	6348117	MULE SURVIVAL HEATER CURRENT	1		0	
	0	3	1	6348123	MULE RNS POWER ENABLE CURRENT	1		0	

FDA CHARACTERISTICS: SM 212 SSE MECH/BPA/RNS

Msg Text	Alarm Class	Noise Filter	Rate	SM Param ID	Sensed Parameter				Preconditions
					Nomenclature	SET	LO (STATE)	HI	
212 AMSB DC AMPS	3	2	1	6342025	AMSB DIRECT CURRENT	1	-1	0	
212 MECH SEL	3	2	1	6342060	PIVOTER LOW TORQUE SEL STATUS	1	BYPASS		PIV LOW TOR SEL STATUS = DSBL
						2	1		PIVOT HI = ENBL or ROTATOR = ENBL or XLATOR = ENBL or DLOCK = ENBL
						3	1		B LAT 1 = ENBL or B LAT 2 = ENBL or B LAT 3 = ENBL or UMB MN = ENBL
212 MECH SEL	3	2	1	6342061	PIVOTER HI TORQUE SEL STATUS	1	BYPASS		PIVOTER HI TORQUE SEL STATUS = DSBL
						2	1		ROTATOR = ENBL or XLATOR = ENBL or DLOCK = ENBL
						3	1		B LAT 1 = ENBL or B LAT 2 = ENBL or B LAT 3 = ENBL or UMB MN = ENBL
212 MECH SEL	3	2	1	6342062	ROTATER SEL STATUS	1	BYPASS		ROTATOR SEL STATUS = DSBL
						2	1		XLATOR = ENBL or DLOCK = ENBL
						3	1		B LAT 1 = ENBL or B LAT 2 = ENBL or B LAT 3 = ENBL or UMB MN = ENBL
212 MECH SEL	3	2	1	6342063	TRANSLATOR SEL STATUS	1	BYPASS		TRANSLATOR SEL STATUS = DSBL
						2	1		DLOCK = ENBL
						3	1		B LAT 1 = ENBL or B LAT 2 = ENBL or B LAT 3 = ENBL or UMB MN = ENBL
212 MECH SEL	3	2	1	6342064	DOWNLOCK SEL STATUS	1	BYPASS		DOWNLOCK SEL STATUS = DSBL
						2	1		B LAT 1 = ENBL or B LAT 2 = ENBL or B LAT 3 = ENBL or UMB MN = ENBL
212 MECH SEL	3	2	1	6342065	BERTH LATCH 1 SEL STATUS	1	BYPASS		BERTH LAT 1 SEL STATUS = DSBL
						2	1		B LAT 2 = ENBL or B LAT 3 = ENBL or UMB MN = ENBL

FDA CHARACTERISTICS: SM 212 SSE MECH/BPA/RNS (Cont)

Msg Text	Alarm Class	Noise Filter	Rate	SM Param ID	Sensed Parameter				Preconditions
					Nomenclature	SET	LO (STATE)	HI	
212 MECH SEL	3	2	1	6342066	BERTH LATCH 2 SEL STATUS	1 2	BYPASS 1	BERTH LAT 2 SEL STATUS = DSBL B LAT 3 = ENBL or UMB MN = ENBL	
212 MECH SEL	3	2	1	6342067	BERTH LATCH 3 SEL STATUS	1 2	BYPASS 1	BERTH LAT 3 SEL STATUS = DSBL UMB MN = ENBL	
212 PVT STALL	3	15*	1	6342108	PIVOTER TACHOMETER	1 2	-1 0.2**	PIVOT LO SEL STATUS = DSBL PIVOT LO SEL STATUS = ENBL and AMSB AC CURRENT = OL	
212 ROT STALL	3	15*	1	6342109	ROTATER TACHOMETER	1 2	-1 0.4**	ROTATOR SEL STATUS = DSBL ROTATOR SEL STATUS = ENBL and AMSB AC CURRENT = OL	
	0	3	1	6342111	AMSB TOTAL ALTERNATING CURRENT	1		0.30	

*FDA limit will be updated to listed value via TMBU during Post Insertion

**PVT STALL and ROT STALL FDAs have a time delay of 28 cycles after preconditioning is met

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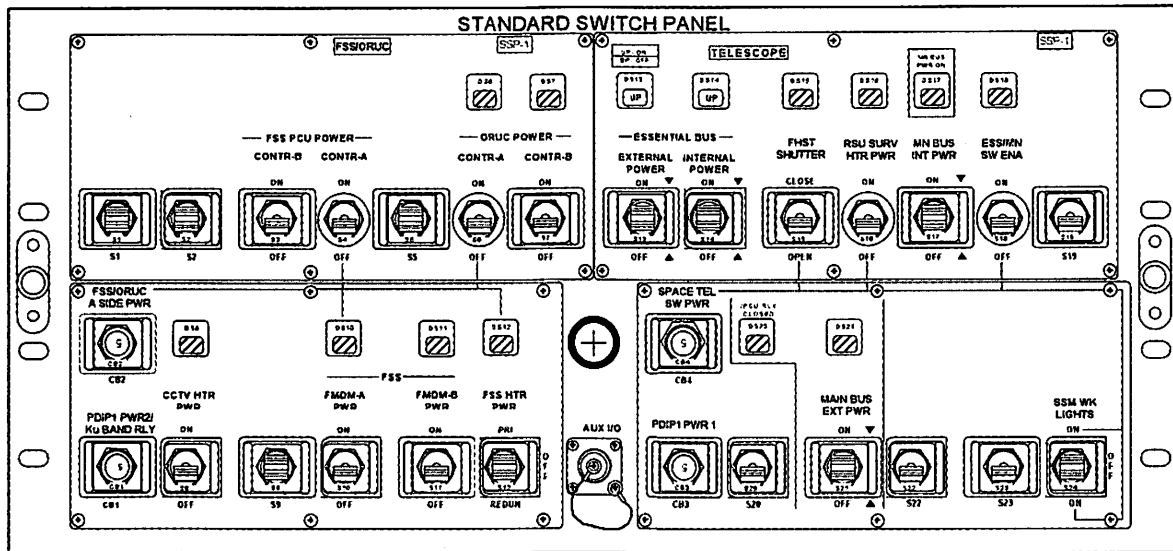
HST MECHANISM MOVEMENT TIMES

MECHANISM	NOMINAL TIME
SDM (deploy/retract)	5 min
SSM LATCHES (latch/unlatch)	136 sec
AD (open/close)	140 sec
HGA (deploy/retract)	461 sec
SA LATCH SLEW	(<5.8 deg) > 11 min

FSS MECHANISM DRIVE TIMES

MECHANISM	NOMINAL TIME (single)
PIVOTER	1428 sec \pm 90 sec/90° (3.78°/min)
ROTATOR	731 sec \pm 19 sec/180° (14.77°/min)
TRANSLATOR	170 sec \pm 5 sec/1.75 in
DOWNLOCK	24 sec \pm 2 sec
BERTH LATCH	15 sec \pm 2 sec
MAIN UMB	8 sec \pm 1 sec/4.5 in stroke (mate/demate)
B/U UMB	4 sec \pm 1 sec (demate only)
BSP	~1 sec

SSP 1



SSP 1 SWITCH PANEL FUNCTIONS (L12U)

ITEM	TYPE DEVICE	FUNCTION	USAGE
FSS PCU POWER CONTR-B Switch (S3 - SSP 1)	Toggle switch, 2-position DPST	ON (UP) – Enables the B hardline control signal to EPDSU-1 and EPDSU-2, providing power to the PCUs OFF (DOWN) – Disables the B control signal to EPDSU-1 and EPDSU-2, removing power to the PCUs	Not normally used. PCUs will normally be controlled via FMDM NOTE: The power on/off indication is observed on telemetry
FSS PCU POWER CONTR-A Switch (S4 - SSP 1)	Toggle switch, 2-position DPST	ON (UP) – Enables the A hardline control signal to EPDSU-1 and EPDSU-2, providing power to the PCUs OFF (DOWN) – Disables the A control signal to EPDSU-1 and EPDSU-2, removing power to the PCUs	Not normally used. PCUs will normally be controlled via FMDM NOTE: The power on/off indication is observed on telemetry
ORUC POWER CONTR-A Switch (S6 - SSP 1)	Toggle switch, 2-position DPST	ON (UP) – Enables the A hardline control signal to SLIC EPDSU-1 providing power to the ORUC PRJU OFF (DOWN) – Disables the A hardline control signal to SLIC EPDSU-1 removing power from the ORUC PRJU	Turned on during SSE activation Turned off during SSE deactivation

SSP 1 SWITCH PANEL FUNCTIONS (L12U) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
ORUC POWER CONTR-A Status Indicator (DS6 - SSP 1)	Display indicator, 2-position	ON – gray OFF – bp	Status indicator
ORUC POWER CONTR-B Switch (S7 - SSP 1)	Toggle switch, 2-position DPST	ON (UP) – Enables the B hardline control signal to SLIC EPDSU-2 providing power to the ORUC PRJU OFF (DOWN) – Disables the A hardline control signal to SLIC EPDSU-2 removing power from the ORUC PRJU	Turned on during SSE activation Turned off during SSE deactivation
ORUC POWER CONTR-B Status Indicator (DS7 - SSP 1)	Display indicator, 2-position	ON – gray OFF – bp	Status indicator
FSS/ORUC A SIDE PWR Circuit breaker (CB2 - SSP 1)	Circuit breaker	OUT – Open IN – Closed <u>NOTE:</u> FSS B side power is hardwired	Closed during SSE activation 5-amp circuit breaker which routes orbiter power to S4, S6, S8, S10, and S12 (UP)
PDIP PWR2/ Ku BAND RLY Circuit Breaker (CB1 - SSP 1)	Circuit breaker	OUT – Open IN – Closed	
CCTV HTR PWR Switch (S8 - SSP 1)	Toggle switch, 2-position DPST	ON (UP) – Enables EPDSU-1 power to the CCTV heater circuits. This allows thermostatic control of the CCTV heaters OFF (DOWN) – Disables EPDSU-1 power to CCTV heater circuits	Turned on during SSE activation (no later than 8 hr after PLBD opening) Turned off during SSE deactivation (no earlier than 1 hr prior to reentry)
CCTV HTR PWR Status Indicator (DS8 - SSP 1)	Display indicator, 2-position	ON – gray OFF – bp	Status indicator
FSS FMDM-A PWR Switch (S10 - SSP 1)	Toggle switch, 2-position DPST	ON (UP) – Enables EPDSU-1 power to FMDM-A OFF (DOWN) – Disables EPDSU-1 power to FMDM-A	Turned on during SSE check-out for continuous control and monitoring of FSS Turned off during SSE deactivation

SSP 1 SWITCH PANEL FUNCTIONS (L12U) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
FSS FMDM-A PWR Status Indicator (DS10 - SSP 1)	Display indicator, 2-position	ON – gray OFF – bp	Status indicator
FSS FMDM-B PWR Switch (S11 - SSP 1)	Toggle switch, 2-position DPST	ON (UP) – Enables EPDSU-2 power to FMDM-B OFF (DOWN) – Disables EPDSU-2 power to FMDM-B	Turned on during SSE activation for initial control and monitoring of FSS. FMDM-B is a redundant unit and will only be used during initial FSS activation and check-out and in the event of a failure on the A-side avionics or used in contingencies in conjunction with the A-side for dual mechanism operations Turned off during completion of SSE checkout
FSS FMDM-B PWR Status Indicator (DS11 - SSP 1)	Display indicator, 2-position	ON – gray OFF – bp	Status indicator
FSS HTR PWR Switch (S12 - SSP 1)	Toggle switch, 3-position DPDT	PRI (UP) – Enables EPDSU-1 and EPDSU-2 power to primary FSS heater circuits. This allows thermostatic control of primary FSS heaters OFF (CENTER) – Disables EPDSU-1 and EPDSU-2 power from FSS primary heater and redundant heater circuits RED (DOWN) – Enables EPDSU-1 and EPDSU-2 power to redundant FSS heater circuits. This allows thermostatic control of redundant FSS heaters	Turned on during SSE activation (no later than 8 hr after PLBD opening). Monitor current sensors A1 and B1 for primary heaters Turned off during SSE deactivation (no earlier than 1 hr prior to reentry) Redundant FSS heaters may be activated in the event of a failure in the primary FSS heaters. Monitors current sensors A2 and B2 for redundant heaters
FSS HTR PWR Status Indicator (DS12 - SSP 1)	Display indicator, 2-position	ON (PRI or RED) – gray OFF – bp	Status indicator

SSP 1 SWITCH PANEL FUNCTIONS (L12U) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
<p>ESSENTIAL BUS EXTERNAL POWER Switch (S13 - SSP 1)</p>	<p>Toggle switch, 3-position DPDT momentary (should be held for approximately 2 sec)</p>	<p>ON (momentary UP) – Enables IPCU power latching relays K6 and K7 that provide FSS PCU power to HST external essential bus feeds A and B. Relay K6 powers HST external essential bus A and relay K7 powers bus B Center Position – Normal</p> <p>OFF (momentary DOWN) – Disables IPCU power latching relays K6 and K7. This action disconnects FSS PCU power from HST external essential bus A and B feeds and connects HST battery power (internal) to HST essential buses A,B, and C</p>	<p>Used to provide FSS PCU power to HST external essential buses thru FSS umbilicals. Essential buses power the HST DMU CDIs and MA receivers. S13 is powered from S18</p> <p>Normal switch position when not in use Used to remove FSS PCU power from HST essential buses. Removal of FSS PCU power from HST essential buses, whether intentional or inadvertent, will automatically activate a fail-over circuit in the HST PCU which will connect HST battery power (internal) to HST essential buses</p>
<p>ESSENTIAL BUS EXTERNAL POWER Status Indicator (DS13 - SSP 1)</p>	<p>Display indicator, 3-position</p>	<p>ON – UP OFF – bp DOWN indication not used for HST</p>	<p>UP indicates that at least one external essential bus power service is activated inside the HST PCU. Indicates continuity thru HST umbilicals</p>
<p>ESSENTIAL BUS INTERNAL POWER Switch (S14 - SSP 1)</p>	<p>Toggle switch, 3-position DPDT momentary (should be held for approximately 1 sec)</p>	<p>ON (momentary UP) – Enables IPCU relay K12 to latch HST PCU power relays K7,K8,K9 closed, and turns on HST CDI A and B. This action connects battery power from HST diode buses A,B,C to HST essential buses A,B,C and ensures that both CDIs are on Center Position – Normal</p>	<p>Used to configure HST essential bus to internal battery power following PCU changeout</p> <p>Normal switch position when not in use</p>

SSP 1 SWITCH PANEL FUNCTIONS (L12U) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
ESSENTIAL BUS INTERNAL POWER Switch (S14 - SSP 1) (Cont)		OFF (momentary DOWN) – Enables IPCU relay K13 to unlatch HST PCU power relays K7,K8,K9. This action disconnects battery power from the HST essential buses A,B,C	Used to remove internal essential power when external (FSS PCU) power is provided. S14 is powered from S18 <u>NOTE:</u> For powerdown in preparation of PCU changeout, S14 will be held off while External Essential is powered off, to override the fail-over function and prevent unnecessary cycling of K7,K8,K9 relays
ESSENTIAL BUS INTERNAL POWER Status Indicator (DS14 - SSP 1)	Display indicator, 3-position	ON – UP OFF – bp DOWN indicator not used for HST	UP indicates that at least one internal essential bus power is activated inside the HST PCU. Indicates continuity thru HST umbilicals
FHST SHUTTER Switch (S15 - SSP 1)	Toggle switch, 2-position DPST	CLOSE (UP) – Provides SSP power (PL CAB3 thru CB4) to the HST FHST shutters 1,2,3. Also enables nonlatching relay K5 in the IPCU, which provides power from the FSS PCUs to the FHST shutters status indicator (DS15) <u>NOTE:</u> The IPCU is externally jumpered to provide this capability OPEN (DOWN) – Removes SSP power from the FHST shutters and disables relay K5 in the IPCU, removing FSS PCU power from the HST FHST shutter status indicator	Used to keep FHST shutter closed during SM to avoid FHST exposure directly to a bright object. Switch must be used to keep shutter closed whenever HST is on the FSS and the HST main bus is powered off unless the FHST cover has been installed Used following reapplication of main bus power to allow STOCC commanding of FHST shutters. Also used to deadface power to PCU, PDUs 1,2,3, and FHSTs for changeout of these units

SSP 1 SWITCH PANEL FUNCTIONS (L12U) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
FHST SHUTTER Status Indicator (DS15 - SSP 1)	Display indicator, 2-position	CLOSE – gray OPEN – bp	Gray indicates that external FHST shutter power is turned on at the IPCU. FHST shutter close is powered directly from SSP CAB PL3, bypassing IPCU and the SSP talkback is driven by IPCU relay. Does not indicate continuity thru HST umbilicals
RSU SURV HTR PWR Switch (S16 - SSP 1)	Toggle switch, 2-position DPST	ON (UP) – Enables IPCU nonlatching relays K16 and K17. This action provides FSS PCU power to RSU heaters 1,2,3 OFF (DOWN) – Disables IPCU relays K16 and K17, removing power from the RSU survival heaters	Used to maintain RSU survival thermal conditioning. (Not normally used for SM4) Used to allow STOCC commanding of RSU survival heaters. Also used to deadface power to PCU, PDUs 1,2,3,4, ECUs, and RSUs for changeout of these units
RSU SURV HTR PWR Status Indicator (DS16 - SSP 1)	Display indicator, 2-position	ON – gray OFF – bp	Gray indicates that external RSU survival heater power service is turned on at the IPCU. Does not indicate continuity thru HST umbilicals. Monitor is powered from the FSS DPCs

SSP 1 SWITCH PANEL FUNCTIONS (L12U) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
<p>MN BUS INT PWR Switch (S17 - SSP 1)</p>	<p>Toggle switch, 3-position DPDT momentary (should be held for approximately 2 sec). (Switch cover installed to prevent inadvertent actuation of the OFF command)</p>	<p>ON (momentary UP) – Enables IPCU relay K10 which supplies power from the FSS PCUs to close motorized main buses A and B transfer switches S1 and S2, open main bus C transfer switches S3 and S4, and to close the diode bus interconnect switches S7 thru S10. This action connects battery power from diode buses A, B, and C to main buses A and B, and disconnects bus C Center Position – None OFF (momentary DOWN) – Enables IPCU relay K11 which supplies power from the FSS PCUs to open motorized transfer switches S1 thru S4. This action disconnects battery power from main buses A,B,C</p>	<p>The ON command is used to connect HST main bus to HST batteries if the batteries have been switched off-line. During PCU changeout, reqd switch operations are performed by STOCC via ground command. S17 is powered from S18 Normal switch position when not in use The OFF command is used to disconnect the HST main bus from HST batteries. This action removes one of two inhibits that could cause a catastrophic HST failure under certain conditions when an SA SPA is connected directly to its respective diode bus</p>
<p>MN BUS PWR ON Status Indicator (DS17 - SSP 1)</p>	<p>Display indicator, 2-position</p>	<p>ON – gray OFF – bp</p>	<p>Gray indicates that at least one main bus is powered. Talkback does not indicate whether power is from internal or external source. Indicates continuity thru HST umbilicals bp indicates main buses are not powered from either internal or external source</p>
<p>ESS/MN SW ENA Switch (S18 - SSP 1)</p>	<p>Toggle switch, 2-position DPST</p>	<p>ON (UP) – Provides orbiter power thru CB4 (from PL CAB3 bus) to SSP switches S13,S14,S17,S21 OFF (DOWN) – Removes orbiter power from SSP switches S13,S14,S17,S21</p>	<p>Enables use of SSP control of HST main and essential buses via S13,S14,S17,S21 Disables use of SSP control of HST main and essential buses</p>

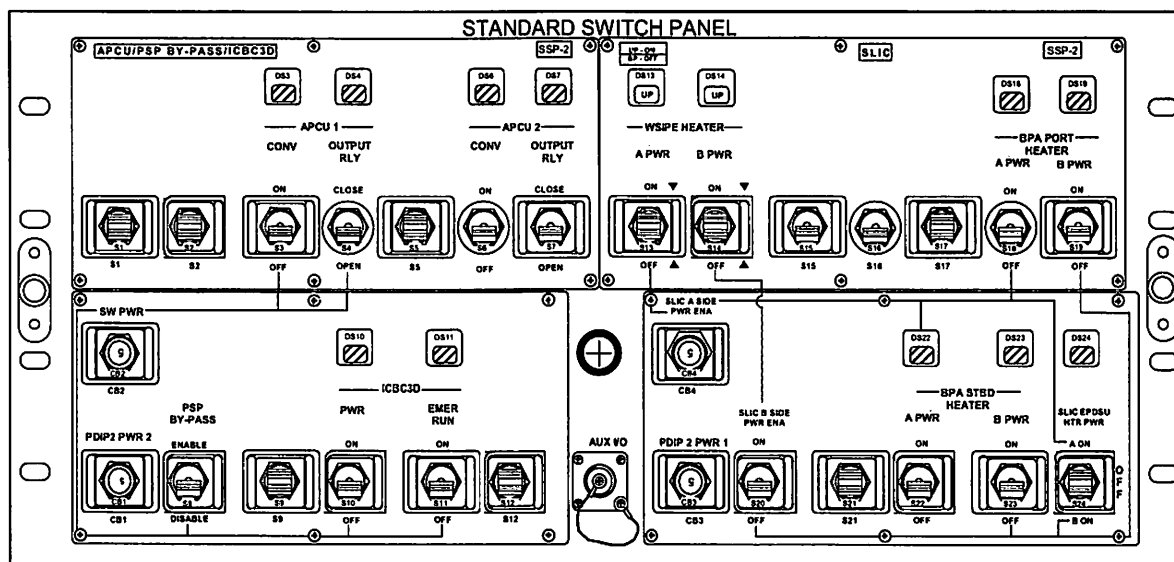
SSP 1 SWITCH PANEL FUNCTIONS (L12U) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
ESS/MN SW ENA Status (DS18 - SSP 1)	Display indicator, 2-position	ON – gray OFF – bp	Monitor power is provided from PL CAB3 bus thru CB4
SPACE TEL SW PWR Circuit Breaker (CB4 - SSP 1)	Circuit breaker	OUT – Open IN – Closed 5-amp circuit breaker which routes PL CAB3 power to S13,S14,S15,S16,S17,S18 (UP) concurrent with SSE activation	Opened following powerdown for PCU changeout and during umbilical deadfacing at HST redeployment Closed during SSE checkout and prior to PCUR powerup
PDIP1 PWR 1 Circuit Breaker (CB3 - SSP 1)	Circuit breaker	OUT – Open IN – Closed	
IPCU RLY CLOSED Status Indicator (DS20 - SSP 1)	Display indicator, 2-position	ON – gray OFF – bp	Display status of IPCU relays. Indicates that IPCU main power switches (S1 and S2) or (S3 and S4) are closed. Monitor is powered from the FSS DPCs
MAIN BUS EXT PWR Switch (S21 - SSP 1)	Toggle switch, 3-position DPDT, momentary	ON (momentary UP) – Closes motorized transfer switches S1 thru S4 in IPCU that provides orbiter power to HST main buses A and B Center Position – None OFF (momentary DOWN) – Opens motorized transfer switches S1 thru S4 in IPCU that provide orbiter power to the HST main buses A and B	Used to provide FSS PCU power to the HST main buses for initial external power activation after berthing and for PCUR powerup. S21 is enabled by S18 Normal switch position when not in use Used to remove orbiter power from HST prior to PCU changeout and redeployment
MAIN BUS EXT PWR Status Indicator (DS21 - SSP 1)	Display indicator, 2-position	ON – gray OFF – bp	Status indicator. Gray indicates that at least one external main bus is powered inside the HST PCU. Indicates continuity thru HST umbilicals

SSP 1 SWITCH PANEL FUNCTIONS (L12U) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
SSM WK LIGHTS Switch (S24 - SSP 1)	Toggle switch, 3-position DPDT	<p>ON (UP) – Enables IPCU relay K18 to provide FSS PCU power to all HST site receptacles, plus all SI latch indicator lights</p> <p>OFF (CENTER) – Disables IPCU relays K18 and K19, removing power from all internal/external worklight receptacles and latch indicator lights</p> <p>ON (DOWN) – Enables IPCU relay K19 to provide HST worklight receptacles, plus all SI latch indicator lights</p>	<p>Used to provide power to aft shroud (AS) internal/external worklight receptacles and latch indicator lights. For EVA use only</p> <p>Used to disable power to AS internal/external worklight receptacles and latch indicator lights</p> <p>Used to provide power to AS internal/external worklight receptacles and latch indicator lights. For EVA use only</p>

SSP 2



SSP 2 SWITCH PANEL FUNCTIONS (L12L)

ITEM	TYPE DEVICE	FUNCTION	USAGE
APCU 1 CONV Switch (S3 - SSP 2)	Toggle switch, 2-position DPST	ON (UP) – Look at recent flight Assembly Ops OFF (DOWN) – Look at recent flight Assembly Ops	
APCU 1 CONV Status Indicator (DS3 - SSP 2)		ON – gray OFF – bp	Status indicator
APCU 1 OUTPUT RLY Switch (S4 - SSP 2)	Toggle switch, 2-position DPST	CLOSE (UP) – Look at recent flight Assembly Ops OPEN (DOWN) – Look at recent flight Assembly Ops	
APCU 1 OUTPUT RLY Status Indicator (DS4 - SSP 2)		CLOSE – gray OPEN – bp	Status indicator
APCU 2 CONV Switch (S6 - SSP 2)	Toggle switch, 2-position DPST	ON (UP) – Look at recent flight Assembly Ops OFF (DOWN) – Look at recent flight Assembly Ops	
APCU 2 CONV Status Indicator (DS6 - SSP 2)		ON – gray OFF – bp	Status indicator

SSP 2 SWITCH PANEL FUNCTIONS (L12L) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
APCU 2 OUTPUT RLY Switch (S7 - SSP 2)	Toggle switch, 2-position DPST	CLOSE (UP) – Look at recent flight Assembly Ops OPEN (DOWN) – Look at recent flight Assembly Ops	
APCU 2 OUTPUT RLY Status Indicator (DS7 - SSP 2)		CLOSE – gray OPEN – bp	Status indicator
SW PWR Circuit Breaker (CB2 - SSP 2)	Circuit breaker (5 Amps)	OUT – Open IN – Closed, provides power to PSP BY-PASS selector switch	On orbit, as reqd
PDIP2 PWR 2 Circuit Breaker (CB1 - SSP 2)	Circuit breaker (5 Amps)	OUT – Open IN – Closed	
PSP BY-PASS Switch (S8 - SSP 2)	Toggle switch, 2-position DPST	ENABLE (UP) – Allows PDI data flow (DOD mode). Provides unique orbiter PI/PSP/PDI command/data configuration for HST only DISABLE (DOWN) – Inhibits PDI data flow (PSP Mode)	On orbit, as reqd
ICBC3D PWR Switch (S10 - SSP 2)	Toggle switch, 2-position DPST	ON (UP) - routes power to the ICBC3D assembly OFF (DOWN) – removes power from the ICBC3D assembly	Turned on during ICBC3D activation. Turned off during ICBC3D deactivation.
ICBC3D PWR Status Indicator (DS10 - SSP 2)	Display indicator, 2-position	ON – gray OFF – bp	
ICBC3D EMER RUN Switch (S11 - SSP 2)	Toggle switch, 2-position DPST	ON (UP) – provides Emergency Run power to the ICBC3D camera OFF (DOWN) – removes Emergency Run power from the ICBC3D camera	
ICBC3D EMER RUN Status Indicator (DS11 - SSP 2)	Status indicator, 2-position	ON – gray OFF – bp	

SSP 2 SWITCH PANEL FUNCTIONS (L12L) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
WSIPE HEATER A PWR Switch (S13 - SSP 2)	Toggle switch, 3-position DPDT momentary	ON (momentary UP) – Provides a latching signal to the SLIC EPDSU. This applies power for the thermostatic control of WSIPE A heaters Center Position – Normal OFF (momentary DOWN) – Disables the EPDSU power from the thermostatically controlled WSIPE A heaters	Turned on during SSE activation Normal switch position when not in use Turned off during SSE deactivation
WSIPE HEATER A PWR Status Indicator (DS13 - SSP 2)	Display indicator, 3-position	ON – UP OFF – bp DN indicator not used for HST	Status Indicator
WSIPE HEATER B PWR Switch (S14 - SSP 2)	Toggle switch, 3-position DPDT momentary	ON (momentary UP) – Provides a latching signal to the SLIC EPDSU. This applies power for the thermostatic control of WSIPE B heaters Center Position – Normal OFF (momentary DOWN) – Disables the EPDSU power from the thermostatically controlled WSIPE B heaters	Redundant WSIPE heaters may be activated in the event of a failure in the A side heaters Normal switch position when not in use
WSIPE HEATER B PWR Status Indicator (DS14 - SSP 2)	Display indicator, 3-position	ON – UP OFF – bp DN indicator not used for HST	Status Indicator
BPA PORT HEATER A PWR Switch (S18 - SSP 2)	Toggle switch, 2-position DPDT	ON (UP) – Enables the SLIC EPDSU. This applies power for the thermostatic control of the BPA A heaters OFF (DOWN) – Disables the EPDSU power from the thermostatically controlled BPA A heaters	Turned on during SSE activation Turned off during SSE deactivation
BPA PORT HEATER A PWR Status Indicator (DS18 - SSP 2)	Display indicator, 2-position	ON – gray OFF – bp	Status Indicator

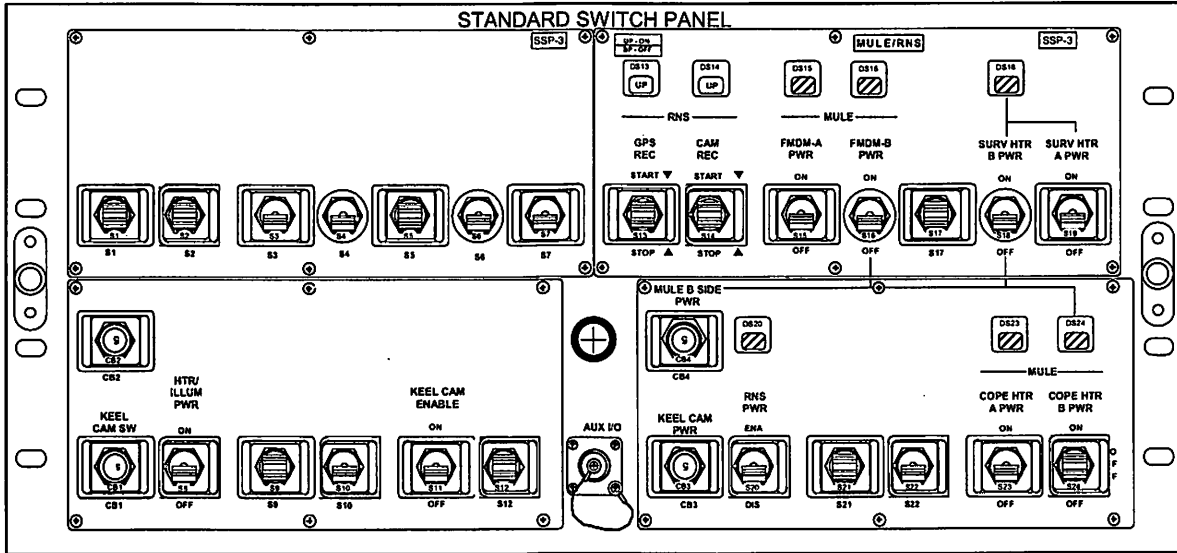
SSP 2 SWITCH PANEL FUNCTIONS (L12L) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
BPA PORT HEATER B PWR Switch (S19 - SSP 2)	Toggle switch, 2-position DPDT	ON (UP) – Enables the SLIC EPDSU. This applies power for the thermostatic control of the BPA B heaters OFF (DOWN) – Disables the EPDSU power from the thermostatically controlled BPA B heaters	Redundant BPA heaters may be activated in the event of a failure in the A side heaters
BPA PORT HEATER B PWR Status Indicator (DS19 - SSP 2)	Display indicator, 2-position	ON – gray OFF – bp	Status Indicator
SLIC A SIDE PWR ENA Circuit Breaker (CB4 - SSP 2)	Circuit breaker (5 Amps)	OUT – Open IN – Closed	Closed during SSE activation. 5-amp circuit breaker that routes orbiter power to S13,S18,S22,S24 (UP)
PDIP 2 PWR 1 Circuit Breaker (CB3 - SSP 2)	Circuit breaker (5 Amps)	OUT – Open IN – Closed	
SLIC B SIDE PWR ENA Switch (S20 - SSP 2)	Toggle switch, 2-position DPDT	ON (UP) – Provides fused orbiter power from the EPDSU to SSP switches S14,S19,S23,S24 (DN) for control of SLIC B side circuits OFF (DOWN) – Removes orbiter power from B side circuits	Turned on during SSE activation Turned off during SSE deactivation
BPA STBD HEATER A PWR Switch (S22 - SSP 2)	Toggle switch, 2-position DPDT	ON (UP) – Enables the SLIC EPDSU. This applies power for the thermostatic control of the BPA A heaters OFF (DOWN) – Disables the EPDSU power from the thermostatically controlled BPA A heaters	Redundant BPA heaters may be activated in the event of a failure in the B side heaters
BPA STBD HEATER A PWR Status Indicator (DS22 - SSP 2)	Display indicator, 2-position	ON – gray OFF – bp	Status Indicator

SSP 2 SWITCH PANEL FUNCTIONS (L12L) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
BPA STBD HEATER B PWR Switch (S23 - SSP 2)	Toggle switch, 2-position DPDT	<p>ON (UP) – Enables the SLIC EPDSU. This applies power for the thermostatic control of the BPA B heaters</p> <p>OFF (DOWN) – Disables the EPDSU power from the thermostatically controlled BPA B heaters</p>	<p>Turned on during SSE activation</p> <p>Turned off during SSE deactivation</p>
BPA STBD HEATER B PWR Status Indicator (DS23 - SSP 2)	Display indicator, 2-position	<p>ON – gray</p> <p>OFF – bp</p>	Status Indicator
SLIC EPDSU HTR PWR Switch (S24 - SSP 2)	Toggle switch, 3-position DPDT center off	<p>A ON (UP) – Enables the SLIC EPDSU. This applies power for the thermostatic control of the EPDSU A side heaters</p> <p>OFF (CENTER) – Removes power from the thermostatically controlled SLIC EPDSU A and B side heaters</p> <p>B ON (DOWN) – Enables the SLIC EPDSU. This applies power for the thermostatic control of the EPDSU B side heaters</p>	<p>Redundant SLIC EPDSU heaters may be activated in the event of a failure in the B side heaters</p> <p>Turned off during SSE deactivation</p> <p>Turned on during SSE activation</p>
SLIC EPDSU HTR PWR Status Indicator (DS24 - SSP 2)	Display indicator, 2-position	<p>ON A or B side – gray</p> <p>OFF – bp</p>	Status Indicator

SSP 3



SSP 3 SWITCH PANEL FUNCTIONS (L11U)

ITEM	TYPE DEVICE	FUNCTION	USAGE
KEEL CAM SW Circuit Breaker (CB1 - SSP 3)	Circuit breaker (5 Amps)	OUT – Open IN – Closed	5 amp circuit breaker which routes orbiter power to S8 and S11
HTR/ILLUM PWR Switch (S8 - SSP 3)	Toggle switch, 2-position DPST	ON (UP) – Enables power to Keel camera heaters and illuminator OFF (DN) – Disables power to Keel camera heaters and illuminator	
KEEL CAM ENABLE Switch (S11 - SSP 3)	Toggle switch, 2-position DPST	ON (UP) – Enables Keel camera controller OFF (DN) – Disables Keel camera controller	
RNS GPS REC Switch (S13 - SSP 3)	Toggle switch, 3-position DPDT momentary	START (momentary UP) – Enables hardline control to the RNS ICE on the MULE. ICE latches command and starts recording GPS data to the MSM hard drives Center Position – Normal STOP (momentary DOWN) – Enables hardline control to the RNS ICE on the MULE. ICE latches command and stops recording GPS data to the MSM hard drives	Operated by crew during RNS Checkout. Otherwise contingency use only. Normally controlled by the ground just prior to HST rendezvous and HST deploy Normal switch position when not in use Operated by crew during RNS Checkout. Otherwise contingency use only. Normally controlled by the ground just after HST rendezvous and HST deploy

RNS GPS REC Status Indicator (DS13 - SSP 3)	Display indicator, 3-position	START – UP STOP – bp DN indicator not used for HST	Status indicator
RNS CAM REC Switch (S14 - SSP 3)	Toggle switch, 3-position DPDT momentary	START (momentary UP) – Enables hardline control to the RNS ICE on the MULE. ICE latches command and starts recording RNS Cameras data to the MSM hard drives Center Position – Normal STOP (momentary DOWN) – Enables hardline control to the RNS ICE on the MULE. ICE latches command and stops recording RNS Cameras data to the MSM hard drives	Operated by crew during RNS Checkout. Otherwise contingency use only. Normally controlled by the ground just prior to HST rendezvous and HST deploy Normal switch position when not in use Operated by crew during RNS Checkout. Otherwise contingency use only. Normally controlled by the ground just after HST rendezvous and HST deploy

SSP 3 SWITCH PANEL FUNCTIONS (L11U) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
RNS CAM REC Status Indicator (DS14 - SSP 3)	Display indicator, 3-position	START – UP STOP – bp DN indicator not used for HST	Status indicator
MULE FMDM-A PWR Switch (S15 - SSP 3)	Toggle switch, 2-position DPDT	ON (UP) – Enables the PDSU power to FMDM-A, A-side thermistor biases, and PDSU current sensors OFF (DOWN) – Disables the PDSU power from FMDM-A, A-side thermistor biases, and PDSU current sensors	Turned on during SSE checkout for monitoring of the MULE Turned off during SSE deactivation
MULE FMDM-A PWR Status Indicator (DS15 - SSP 3)	Display indicator, 2-position	ON – gray OFF – bp	Status Indicator
MULE FMDM-B PWR Switch (S16 - SSP 3)	Toggle switch, 2-position DPDT	ON (UP) – Enables the PDSU power to FMDM-B, B-side thermistor biases, and PDSU current sensors OFF (DOWN) – Disables the PDSU power from FMDM-B, B-side thermistor biases, and PDSU current sensors	Turned on during SSE activation for initial monitoring of MULE. FMDM-B is a redundant unit and will only be used during initial MULE activation and checkout, and in the event of a failure on the A-side avionics Turned off during completion of SSE checkout
MULE FMDM-B PWR Status Indicator (DS16 - SSP 3)	Display indicator, 2-position	ON – gray OFF – bp	Status Indicator
SURV HTR B PWR Switch (S18 - SSP 3)	Toggle switch, 2-position DPDT	ON (UP) – Enables the PDSU power to the B-side heaters: PDSU, avionics radiator plate and RNS survival heaters OFF (DOWN) – Disables the PDSU power to the B-side heaters: PDSU, avionics radiator plate and RNS survival heaters	Turned on during SSE activation Turned off during SSE checkout
SURV HTR PWR Status Indicator (DS18 - SSP 3)	Display indicator, 2-position	ON A or B side – gray OFF – bp	Status Indicator

SSP 3 SWITCH PANEL FUNCTIONS (L11U) (Cont)

ITEM	TYPE DEVICE	FUNCTION	USAGE
SURV HTR A PWR Switch (S19 - SSP 3)	Toggle switch, 2-position DPDT	ON (UP) – Enables the PDSU power to the A-side heaters: PDSU, avionics radiator plate and RNS survival heaters OFF (DOWN) – Disables the PDSU power to the A-side heaters: PDSU, avionics radiator plate and RNS survival heaters	Turned on during SSE checkout Turned off during SSE deactivation
MULE B SIDE PWR Circuit Breaker (CB4 - SSP 3)	Circuit breaker (5 Amps)	OUT – Open IN – Closed	Closed during SSE activation. 5-amp circuit breaker that routes orbiter power to S16,S18,S24 (UP)
KEEL CAM PWR Circuit Breaker (CB3 - SSP 3)	Circuit breaker (5 Amps)	OUT – Open IN – Closed	5-amp circuit breaker which routes orbiter power to Keel camera
RNS PWR Switch (S20 - SSP 3)	Toggle switch, 2-position DPDT	ENA (UP) – Enables the MULE PDSU power to RNS DIS (DOWN) – Disables the MULE PDSU power to RNS	Turned on during SSE activation Turned off during SSE deactivation
RNS PWR Status Indicator (DS20 - SSP 3)	Display indicator, 2-position	ON – gray OFF – bp	Status Indicator
MULE COPE HTR A PWR Switch (S23 - SSP 3)	Toggle switch, 2-position DPDT	ON (UP) – Enables the PDSU power to COPE A-side heaters OFF (DOWN) – Disables the PDSU power to COPE A-side heaters	Turned on during SSE checkout Turned off during SSE deactivation
MULE COPE HTR A PWR Status Indicator (DS23 - SSP 3)	Display indicator, 2-position	ON – gray OFF – bp	Status Indicator
MULE COPE HTR B PWR Switch (S24 - SSP 3)	Toggle switch, 3-position DPDT center off	ON (UP) – Enables the PDSU power to COPE B-side heaters OFF (CENTER) – Disables the PDSU power to COPE B-side heaters (DOWN) – not wired	Turned on during SSE activation Turned off during SSE checkout
MULE COPE HTR B PWR Status Indicator (DS24 - SSP 3)	Display indicator, 2-position	ON – gray OFF – bp	Status Indicator